

MS Windows 95 Reviewer's Guide

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Final Beta

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Introduction

As the successor to Microsoft's MS-DOS, Windows 3.1, and Windows for Workgroups 3.11, Windows 95 is the next major release of the standard operating system for desktop and portable PCs. This release offers something for everyone, including a more intuitive way to work, new capabilities such as "surfing the information highway," and better support for managing an installation site with thousands of PCs.

Where We've Been

Over the past decade, the PC industry has delivered innovative, cost-effective products that have made the personal computer a widely used tool both in the office and in the home. The development of these products was made possible by a number of key advances during the 1980s and early 1990s:

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The adoption of MS-DOS as an operating system standard for PCs, which provided a platform for application development

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Rapid decreases in price and increases in performance made possible by innovative PC components, especially the Intel i386 and i486 microprocessors

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The wide adoption of the Microsoft Windows operating system, which provided an appealing graphical user interface and multitasking capabilities and made possible a new generation of graphical applications, thereby making PCs much easier to use

Where We Are Today

Although the PC has made dramatic gains over the past decade, a number of limitations prevent current users from taking full advantage of their PCs and discourage others from beginning to use them:

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PCs are still not easy enough to use. Learning how to use the PC is difficult because the PC does not lend itself to learning through experimentation. The wrong set of keystrokes can, for example, inexplicably cause programs to disappear. As a result, learning basic processes such as launching or switching between applications is frustrating. Configuring the PC is also difficult; for example, tasks such as connecting to a printer or adding a CD-ROM drive are too complicated.

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Users want software that takes full advantage of the power of their

hardware. The performance delivered by hardware—the CPU, video system, CD-ROM drive, video subsystem, and so on—is constantly accelerating. And new hardware, such as wireless, PCMCIA, and MPEG, continuously arrives on the market. Users want their software to fully exploit all this power.

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Connecting to a network is hard. The two primary PC operating systems,

MS-DOS and Windows, were not designed with easy connection to a network in mind. Consequently, the basic task of connecting a PC to a server and to other PCs is still a challenge, in spite of the prevalence of networks in organizations of all sizes.

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PCs are expensive to support. The cost of hardware is small relative to the

cost of installing, configuring, and maintaining a PC and of training and supporting users. These costs must be reduced to make PCs a more cost-effective tool for business.

Where We're Headed

Windows 3.1 moved the PC platform forward by making PCs easier to use. Yet the problems of today's users indicate that the ease, power, and overall usefulness of the PC must be further increased. Windows 95 raises the PC platform to new levels in the following ways:

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Making what you do now easier and faster. Windows 3.1 put a friendly

interface on top of MS-DOS to make common PC tasks easier. With Windows 95, the goal is to make those tasks more intuitive, or where possible, automatic. A redesigned user interface, highlighted by the Windows Taskbar and Start button, makes computing more automatic for novices. (Usability tests show a ten-fold improvement over Windows 3.1 in the time it takes to complete certain common tasks, such as starting an application.) The interface also makes the power of the PC more discoverable for intermediate and advanced users, thus making users more efficient and productive. Plug and Play makes adding and configuring new hardware devices easier—Windows 95 automatically loads the appropriate drivers, sets IRQs, and notifies applications of the new capabilities of the hardware device without any action by the user. Long filenames now make it easier to name and recall documents that contain your information. Faster performance from a new disk and file system and a new print subsystem allows you to complete your tasks in less time.

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Making what you want to do and more possible. Ease on the surface

requires power and speed at the core, and the modern, 32-bit architecture of Windows 95 meets these requirements. Freed from the limitations of MS-DOS, Windows 95 preemptively multitasks for better PC responsiveness; for example, users will no longer have to wait while the system copies files. Built-in Fax and electronic messaging enhances your ability to communicate with others. Windows 95 also delivers increased robustness and protection for applications and provides the foundation for a new generation of easier, more powerful, multithreaded 32-bit applications. And most important, Windows 95 delivers this power and robustness on today's average PC platform while scaling itself to take advantage of additional memory and CPU cycles.

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Making your workplace better connected and more manageable. Windows

3.1 gave users the power to make better use of their PCs, but it did not make the same strides for MIS organizations. Windows 95 addresses this deficiency by providing a system architecture that makes network connectivity easy. By integrating high-performance, 32-bit client support into the operating system—including the 32-bit Microsoft Client for Novell NetWare Networks—Windows 95 goes beyond simple connectivity to enable the central management and control of the PC. User profiles, policies, and the ability to leverage server-based security make it much easier for MIS organizations to administer and support large numbers of PCs.

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Making whatever you do more fun. Users will find the entire computing

experience to be less frustrating. You will be able to concentrate on your tasks at hand, and not battle your computer to complete them. Better, faster games will now be possible due to capabilities like WinG and improved system performance. Multimedia applications will be able to take advantage of the computing power locked in your PC and support, for example, larger, smoother, video playback. Built-in sound and video support will enhance your PC experience.

Windows 95 is more than the next generation of Windows; it is a catalyst that will move the PC industry to a higher level. Windows 95 will spawn not only a new generation of PCs and peripherals that support Plug and Play, but also a new generation of powerful 32-bit Windows-based applications.

How We Get There

The development of Windows 95 has been guided by the primary principle that all technological improvements must translate into practical benefits for users, and that these benefits must be easily and inexpensively available to everyone. This principle has produced the following results:

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Compatibility with existing MS-DOS-based and Windows-based

applications. Because Windows 95 is designed to add significant value to any PC without requiring additional software or hardware, compatibility with existing applications is essential. Windows 95 not only supports the enormous range of existing MS-DOS-based and Windows-based applications, it goes a step further by fixing key compatibility deficiencies of Windows 3.1; for example, it provides much better support for demanding MS-DOS-based applications (such as certain types of games, which can now be run from Windows).

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Compatibility with existing hardware. The wide range of hardware

available for Windows 3.1—from scanners to plotters to fax modems to video-capture boards—is enormously valuable to users. While providing support for new, easier-to-use peripherals through Plug and Play, Windows 95 preserves the huge investment of users and manufacturers by maintaining compatibility with existing peripherals and their associated device drivers.

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Performance equal to or better than that of Windows 3.1. In keeping with

the goal of adding value to existing PCs without requiring additional hardware and software, Windows 95 matches or exceeds the performance of Windows 3.1 on today's average PC (386DX with 4 MB of RAM). As more memory is added to the PC, performance scales faster than Windows 3.1. As a result, access to all the new features in Windows 95 should not incur any performance penalty.

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Safe, hassle-free upgrade and migration. Windows 95 makes the upgrade

process as easy as possible by providing a Setup program that installs cleanly over Windows 3.x. Windows 95 includes the Windows 3.1 Program Manager and File Manager so that users can migrate to the new user interface at their own pace.

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Chapter 1: The MS Windows Operating System Family

The Microsoft Windows operating system family provides users and developers with a rich set of services that take full advantage of the broad range of available hardware platforms, from small form-factor portable systems to multiprocessor servers. Windows 95 is for users of Intel-based desktop and laptop PCs. Windows NT Workstation and Windows NT Server are advanced operating systems for workstations and network servers, respectively, and support both Intel and reduced-instruction set computing (RISC) microprocessors, as well as symmetric multiprocessing (SMP).

The scaleable architecture of the Windows operating system family supports the same user interface, applications, and development tools across an ever-expanding range of hardware. At the same time, the Windows operating systems meet the spectrum of customer requirements, from productivity applications to powerful, secure, mission-critical applications.

Windows 95 and Windows NT Workstation

Because it is not currently possible to have one operating system that fully exploits the broad range of available hardware, the Microsoft Windows operating system family, shown in Figure 1, has two distinct design points: one centered on mainstream systems, and the other centered on leading-edge systems.

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Figure 1. A consistent platform for development, deployment, and training

For mainstream systems (currently represented by products such as subnotebook and entry-level desktop machines), Windows 95 delivers responsive performance for a broad range of applications while conserving the amount of system resources used. Windows 95 is designed for use on Intel-based PCs and supports the Intel 80386DX, 80486, and Pentium processors used in mainstream desktop and portable PCs.

For leading-edge systems, Windows NT fully exploits the capabilities of the hardware and provides the most advanced services for the most demanding applications. Windows NT is designed for use on Intel-based and workstation PCs—for example, a MIPS R4400 or Digital Alpha AXP-based system, a dual-processor workstation, or a multiprocessor RISC server.

Because of the requirements placed on new enterprise solutions, all major operating system developers—including Microsoft, IBM, Sun (and most UNIX vendors), and Novell—have recognized the necessity of moving to a micro-kernel architecture for their leading-edge operating systems. Microsoft made this commitment over five years ago and began shipping Windows NT to developers in July 1992 with general

availability in July 1993. This architecture allows vendors to enhance systems to respond to the rapidly changing requirements of evolving business solutions while maintaining the flexibility needed to exploit new hardware and peripherals.

Both Windows 95 and Windows NT Workstation provide a common base of functionality that is required by all customers, including ease of use, power, connectivity and manageability. Microsoft is committed to and will deliver parity in basic functionality (such as the user interface) to each platform as quickly as possible.

The differences between the two platforms are a result of their different design goals. Windows 95 is focused on making computing easier for anyone using a wide range of personal and business applications on desktop and portable computers. To protect their current investment, these users require the highest level of compatibility with today's applications and device drivers. Windows NT Workstation is focused on providing the most powerful desktop operating system for solving complex business needs. For developers; technical/engineering/financial users; and business operations application users, Windows NT Workstation delivers the highest level of performance to support the most demanding business applications. It also provides the highest levels of reliability, protection, and security for critical applications while exploiting the latest hardware innovations, such as RISC processors and multiprocessor configurations. This focus on solving business needs is also reflected in the emphasis on maintenance and regular system updates.

Over time, as mainstream systems become more powerful, technologies implemented first in the leading-edge Windows operating system will migrate to the mainstream operating system. Sometimes technical innovations will appear first in the mainstream operating system because of timing of releases or because some features improve ease of use for general users. However, the guiding principle for product planning is that the leading-edge operating system will provide a superset of the functionality of the mainstream operating system.

For application developers, Microsoft provides only one Windows programming platform, defined by Win32 — the 32-bit Windows application programming interface — and OLE. By following a few simple guidelines, developers can write a single application that runs across the Microsoft Windows operating system family. Optionally, developers can target a specific operating system whose functionality is important to a particular application, but targeting is not a requirement.

Which Operating System?

The decision about which of the Microsoft Windows operating systems to deploy should be based on the tasks to be accomplished. The two operating systems provide a complementary set of capabilities that can accommodate a broad range of usage scenarios.

The following examples illustrate scenarios where Windows 95 is the best choice.

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Most office environments require people to perform a variety of general

tasks, such as word processing, database queries, or spreadsheet analyses, using productivity applications, such as the Microsoft Office suite. These people may also be using applications that are specific to their particular business. Their companies have an installed base of personal computers, peripheral devices and applications, and Windows 95 allows them to maximize their investment in that computing infrastructure.

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Many companies have employees who spend a high percentage of their

working hours away from the office—for example, at customer sites, in hotels, or out in the field—and rely on personal computers to help them perform their jobs. Windows 95 meets the requirements of these mobile computer users for the same application and device compatibility as their office-based colleagues, but also places lower demands on their hardware, including amount of memory, battery power, and use of disk space.

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Most users of computers in the home find them both challenging and

unfriendly. However, they want to be able to take advantage of new capabilities, such as multimedia, and to easily access online information services. Windows 95 is easy for all family members to use, yet has the power to do what they want to do. Built into the operating system are rich multimedia capabilities; the highest levels of compatibility for running MS-DOS-based applications, such as games; and connectivity to information services, such as the Internet or other online

services. In addition, technology such as Plug and Play allow some users to effortlessly add new components, such as printers, modems, and other peripherals, to their systems.

The following examples illustrate scenarios where Windows NT Workstation is the best choice.

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Engineers, scientific researchers, statisticians, and other technical users

often need to use processing-intensive applications for data analysis and large design activities. Windows NT Workstation, with its support for SMP and its portability to high-performance platforms, such as those based on Pentium, Alpha, or MIPS CPUs, can provide the performance of a leading-edge workstation or minicomputer at a fraction of the cost. Moreover, with Windows NT Workstation, users can also run personal productivity applications on their systems.

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For industries that need to protect sensitive data or application files, such

as banking and defense, Windows NT Workstation provides a secure desktop. The NTFS file system, combined with appropriate security procedures, helps prevent unauthorized access to systems and data, and the security model in Windows NT Workstation is designed to be compliant with C2-level certification. With these features, a single Windows NT system can be shared by multiple users and still maintain security for all files on the system.

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Many companies require high levels of availability and performance and

cannot afford downtime, regardless of which application is running. Often these types of systems are being “right-sized” from mini and mainframe systems. For example, many manufacturing companies use 16-bit applications to manage their production lines. With Windows NT Workstation, these Win16-based applications can be run in separate address spaces (often referred to as separate virtual machines). Then even if one application fails, the other applications continue to run. Windows NT Workstation also provides complete protection for 32-bit applications and automatic recovery (reboot, if necessary) if the system goes down.

Evaluating Windows 95

As you compare Windows 95 with other operating system products on the market, including Windows 3.1, you should examine the following areas to help identify the operating system that best meets your needs and the needs of your system's users:

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Ease of use

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Performance

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Compatibility of device and application support

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Support for networking and connectivity

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Support for manageability and administration

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Support for communications and messaging

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Support for mobile services and remote access

In the following sections, we briefly discuss these evaluation criteria. The remaining chapters in this guide show how Windows 95 provides the best desktop operating system for mainstream platforms in each of these areas.

It is important to look at the ease-of use aspects of an operating system from the perspectives of both a novice and an experienced user. Novice users include both people who have never used a PC and people who have used one infrequently, often because they find PCs intimidating. Novices might have trouble moving around the user interface and might need more information or coaching—for example, from an online Help system. Experienced users generally interact with more areas of the operating system than novice users, and they demand flexibility, speed, and power.

As you evaluate the ease of use of an operating system, it's helpful to answer these questions:

n Is the operating system easy to learn and use and efficient for the widest range of users?

n Can users discover new features and new, more efficient ways of performing tasks as they become more experienced?

n Does the operating system make it easy for novice users to complete common tasks, such as starting new applications, switching between two or more active applications, or manipulating files?

n

Is the operating system flexible enough that experienced users can customize it to reflect the way they interact with the computer?

The term SYSTEM PERFORMANCE refers to how the operating system performs overall while performing a set of broad tasks—for example, running a group of applications and programs that are normally run simultaneously. The term PERFORMANCE also refers to the ability of individual system components or subsystems to perform a more narrow set of tasks—for example, file input/output (I/O) operations.

Several available suites of benchmarks test the ability of operating systems to complete a set of tasks that are designed to mimic real-world use of a particular PC/operating system combination. These benchmark suites produce numbers that represent the responsiveness of the operating system for a given set of commercially available applications. You can run the same set of applications in your environment and use the benchmark information to determine the relative performance of various operating systems.

However, benchmark suites don't tell the whole story. In addition to running application benchmark suites, you should isolate and separately test various components and subsystems of the operating system to obtain low-level results that indicate how well the operating system can support the services used by applications. Areas commonly isolated and benchmarked on standalone PCs include the performance of the local file system for disk and file I/O, the performance of the graphics subsystem and video display drivers for graphics and text I/O, and the performance of the printing subsystem for printing I/O. In addition, you should test desktop operating systems in networked environments for their ability to support network I/O throughput for the supported network clients, as well as server functionality responsiveness (if supported by the operating system).

All operating systems perform at their best on a PC that has the maximum amount of RAM. However, most users' PCs have less than the maximum amount. You should run performance tests against different hardware configurations, including memory ranges from 4 MB to 16 MB and PCs containing Intel 80386DX, 80486, and Intel Pentium-based CPUs. Because different hardware resources deliver different performance testing results, it's important to test not only on more than one PC configuration, but also on hardware that is currently mainstream in the industry.

As you evaluate the performance of an operating system, it's helpful to answer these questions:

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Does the operating system perform well on a wide variety of hardware and software?

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How well does the operating system complete benchmark tests on a suite of applications on a given hardware platform?

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How well does the operating system complete benchmark tests on individual components and device drivers provided as part of the system?

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Does the operating system perform well as far as network connectivity for supported network clients or provided network server functionality is concerned?

When it's time to replace an old operating system, a key question to consider is "Can my company still use its existing hardware and software with the new operating system?" Your company has probably invested a large amount of money in

applications, printers, modems, and other PC-related peripheral devices. It's important to find out whether the replacement operating system can run with the existing hardware and software.

It's also important to know how broad a range of devices is supported by the operating system you choose. No doubt, as your company grows, your hardware needs will grow too. Your choice of an operating system should not unreasonably restrict the peripheral devices your company can buy later. The operating system you choose should include ample device drivers, not only to support the devices you currently own, but also those you will buy in the future.

When examining device support of an operating system, consider the number of devices supported, the industry standards that the operating system supports, and compatibility with existing device drivers shipped with earlier operating systems or with the devices themselves.

As you evaluate the device and application support of an operating system, it's helpful to answer these questions:

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Does the operating system provide broad support for your company's

existing hardware and the associated MS-DOS-based and Windows-based device drivers?

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Are devices easily recognized, installed, and configured by the operating

system?

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Does the operating system allow you to run your existing MS-DOS-based

or Windows-based applications as well as MS-DOS 6.X or Windows 3.1?

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Does the operating system allow the easy exchange of information among applications, or does it support advanced interapplication communication mechanisms?

n

Does the operating system provide services for new types of applications, such as multimedia, remote access, and communications-related applications?

In a corporate environment, an operating system must be able to provide network support for a broad base of clients. You should compare each operating system's ability to support connectivity in a heterogeneous environment, as well as how successfully network functionality and other areas of the system, such as the user interface, are integrated in each operating system. Bear in mind that, in general, companies are not looking for the incorporation of proprietary network functionality in an operating system. They want the operating system to support industry-wide standards so that they don't have to rely on a single vendor to support a multivendor environment.

As you evaluate the networking support of an operating system, it's helpful to answer these questions:

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Is the operating system an open, layered networking architecture that lets you mix and match best-of-breed components at every layer?

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Does the operating system have built-in, native support for popular networks?

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Does the operating system natively support a wide range of network transports, such as TCP/IP and IPX/SPX; industry-wide communication protocols, such as RPC, NetBIOS, DCE, and named pipes; and existing network device standards, such as NDIS and ODI?

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Does the operating system provide a simple, consistent user interface for accessing the network and using network resources?

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Does the operating system support an open architecture that allows third-party and network operating system vendors to easily integrate or add network connectivity enhancements or application support?

PCs are now one of the largest expenses of an MIS organization. Medium and large businesses invest tens of thousands of dollars each year, not only on the hardware

and software for new and existing computer systems, but also for setup and administration of these systems. Currently, the available tools for managing and administering PCs in a networked environment have little consistency and almost no integration.

Standards organizations are now working to simplify system administration by developing standard methods for managing PCs. These standards will mean better and more integrated management tools for the network administrator. For an administrator to reap any benefits, however, the operating system must support management mechanisms that adhere to existing standards or its infrastructure must be designed for adaptability to a new standard.

As you evaluate the support for manageability and administration of an operating system, it's helpful to answer the following questions:

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Does the operating system provide the tools and platform infrastructure for

supporting management mechanisms that adhere to existing industry standards, such as SNMP, and is it flexible enough to support future standards, such as DMI?

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Does the operating system provide tools and mechanisms for MIS-

organizations and administrators to customize and control the functionality and capabilities on the desktop?

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Does the operating system provide support for managing desktop PCs-

remotely over a network?

With the explosive growth of services such as CompuServe, America Online, and the Internet, the increase in demand for an operating system that provides access to online and mail services has been dramatic. The support and services provided by an operating system can open the door to the Information Age, allowing users to discover new communications and messaging possibilities.

As you evaluate the communications and messaging support of an operating system, it's helpful to answer these questions:

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Does the operating system support high-speed communications and background multitasking capabilities?

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Does the operating system provide support for communication hardware; for new communication functionality, such as sharing communication ports; for unified device configuration; and for emerging communications technology?

n

Does the operating system provide support for industry-standard messaging services?

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Does the operating system provide broad communication and messaging capabilities, such as faxing, dial-up access to resources, and access to online information services, and consolidated information access?

To realize seamless mobility, users must be able to easily communicate and remain productive, whether they are in the office, at a customer site, or at home. Users must be able to communicate with coworkers and clients regardless of their location. In addition, transitions from home computer to portable computer to office computer must not cause interruptions in workflow. Including support for mobility services as part of the operating system ensures tight integration and connectivity between portable computers and desktop PCs, allowing minimal work interruptions as users switch from one location and/or computer to another.

As you evaluate the support for mobile services of an operating system, it's helpful to answer these questions:

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Does the operating system support remote access to the key services or information you need on your corporate network?

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Does the operating system have robust support for the dynamic nature of mobile hardware, such as PCMCIA, power management, and docking stations?

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Chapter 2: An Overview of Windows 95

Windows 95 is an extremely feature-rich operating system. Virtually every aspect of Windows 95 reflects improvements over Windows 3.1 and Windows for Workgroups. This guide discusses the areas of technology that make up Windows 95, focusing on the following features, functionality, and components:

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The Windows 95 user interface

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Base system architecture

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Robustness

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Support for running MS-DOS-based applications

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Plug and Play

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Device support

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Networking

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Systems management

n

Printing

n [Communications](#)

n [Mobile computing services](#)

n [Microsoft Exchange: e-mail, fax, and more](#)

n [The Microsoft Network online information service](#)

n [Multimedia services](#)

n

Installation and setup of Windows 95

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International language support

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Accessibility

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Applications and utilities

Where appropriate, each discussion includes the following:

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A summary of improvements in Windows 95 over Windows 3.1. This

section provides a quick overview of ways in which Windows 95 addresses Windows 3.1 problems or improves upon Windows 3.1 functionality. These discussions also apply to Windows for Workgroups, even though Windows for

Workgroups may not be explicitly identified.

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A Try It! section. You are encouraged to see for yourself that Windows 95

is a flexible, powerful, and robust operating system by following brief sets of instructions for performing specific tasks.

Key New Features

As you read this book, it's important to keep in mind the needs of the marketplace and how Windows 95 is designed to meet those needs. This section briefly outlines some of the key new features in Windows 95, the problems they solve, and the benefits they bring. Because the scope of the new features is broad and their appeal is wide, they are organized here in terms of improvements over Windows 3.1 as they benefit end-users, and MIS organizations.

Windows 95 offers many improvements and new capabilities over Windows 3.1 and Windows for Workgroups. These improvements benefit the user of any PC environment. This section discusses some of the improvements and addresses the key benefits that Windows 95 brings to the user of a PC.

[Making What You Do Now Easier and Faster](#)

For end-users and MIS organizations alike, improvements in ease of use in Windows 95 fix the problems identified in Windows 3.1. For example, less-experienced users found overlapping windows and tasks such as minimizing and maximizing windows too complex, while more experienced users craved greater efficiency. But the improvements go beyond simply solving these problems, by also encompassing hardware, connectivity, and applications. Windows 95 offers these solutions:

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A new user interface (UI). A shower of improvements greatly enhances

ease of learning, usability, and efficiency for all users, no matter what their level of expertise. Novice users can get started more quickly, and experienced users can fully unlock the power of their PCs. The Windows Explorer provides a powerful navigation tool for experienced users to browse the file system of their local machine, and the network environment they are attached to.

n

Plug and Play. The goal of Plug and Play is simple: When a user installs a

new hardware device, it works. It's easier to expand the capabilities of your PC.

n

Long filenames. Signaling the end of cryptic 8.3 filenames, long filenames

are just one example of the many usability improvements in Windows 95.

n

Improved system performance. A new 32-bit disk and file system, and a

new 32-bit print subsystem, result in improved performance when running applications under Windows 95—Making it easier for you to complete your tasks quicker.

[Making More of What You Want To Do Possible](#)

A major area of concern for end-users is improving the power and speed with which they use Windows. Users want to get their work done faster. To do this, they want to be able to run more than one application or computer process at a time instead of waiting for their PCs to finish one task before starting another. They want to be more effective without sacrificing system stability or performance. And perhaps most important of all, they want to escape the feeling that they take advantage of only a small fraction of the capabilities of their PC.

Windows 95 is designed to anticipate and exploit key emerging trends and technologies. Users will be able to communicate more effectively by accessing the Internet and sending fax messages and electronic mail from their PCs. For example, the need for seamless mobile computing is becoming more important as more hardware power is packed into smaller and lighter designs and more users work at home or on the road.

The following features of Windows 95 bring more power and speed to users:

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True preemptive multitasking. Windows 95 can preemptively multitask 32-bit applications smoothly and efficiently.

n

Scaleable performance. As the amount of RAM in the PC is increased, the performance of Windows 95 increases more rapidly than that of Windows 3.1 because of the dynamic, high-performance, 32-bit architecture of Windows 95.

n

Built-in fax and electronic messaging. Windows 95 provides built-in fax and electronic messaging to allow users to communicate easier and more effectively with others. The Microsoft Exchange client provides a single inbox for

electronic messages, and enhances the ability for users to send and receive fax messages with Microsoft Fax.

n

The Microsoft Network online service. Windows 95 provides the online

service client for The Microsoft Network, Microsoft's new online service. Through the user interface of Windows 95, The Microsoft Network brings mainstream PC users access to the expanding world of electronic information and communication through electronic mail, bulletin boards, chat rooms, file libraries, and access to information on the Internet.

n

Access to the Internet. Windows 95 makes it easier to access the world of

information on the Internet. Through The Microsoft Network online service, users can exchange electronic mail with Internet users, and gain access to Internet information such as newsgroups, quickly and easily from the graphical environment. In addition, Windows 95 provides the plumbing you need to dial up to Internet access providers and hop on to the "information highway."

n

Support for 32-bit applications. Support for the Win32 API in Windows 95

means that users can look forward to a new generation of easier, more powerful multithreaded 32-bit applications.

n

Mobile computing anywhere. Windows 95 includes a remote networking

client that allows dial-up access to any network (including the Internet) running IPX/SPX, TCP/IP or NetBEUI protocols over PPP. Mobile users will also benefit from the Briefcase, a file synchronization tool that makes it easy to ensure you have the most up to date files before you leave the office.

n

Increased robustness. New features mean greater robustness and

protection for existing MS-DOS and Windows-based applications, and the highest level of protection for new 32-bit Windows-based applications.

n

More memory for MS-DOS-based applications. The use of protected-

mode device drivers and file systems in Windows 95 means users will routinely have 600KB or more of free conventional memory available in each MS-DOS session, even if they are connected to a network, using a CD-ROM drive, a mouse, and so on.

[Making Whatever You Do More Fun](#)

The PC is becoming more of an information appliance, rather than just a high-tech toy. Windows 95 makes using the PC less frustrating to use and configure, and thus makes it easier for users to have fun with their PC. Through the improved user interface, and the incorporation of Plug and Play technology—that makes it easier to expand the capabilities of the PC—users will find the total PC experience more fun. Through multimedia, the PC becomes more engaging, and titles help to open a world of wonder not previously possible. Multimedia also helps to make games and entertainment software more than just flashing lights, it helps to make the PC

experience more interactive and enjoyable.

n

The whole computing experience will be less frustrating. With Windows

95, novice users will find their PC environment more friendly and less intimidating than other interfaces they may have used in the past. Their ability to connect peripherals to their PC AND have them work, will help them to feel they can easily expand their PC system to offer new capabilities. They'll find their system to be more discoverable and allow them to broaden their computing experience as their needs and desires change. They'll discover that they are no longer limited by the capabilities of their PC, but that their PC can grow with them.

n

Better, faster games. With the system improvements in Windows 95, and

the incorporation of fast display technology such as WinG, PC users will find that the myth of "only the good games are written for MS-DOS" to no longer be true—Windows 95 will be a truly world-class games platform. Built in support for multimedia sound cards, CD-ROM drives, and joysticks, makes turning any PC into a multimedia PC simple and easy. Games developers are taking advantage of the functionality and built-in system multimedia services in Windows 95 to deliver better, faster games that were not previously possible in the Windows-based environment.

n

Larger, smoother video. Windows 95 will leverage the computing power of

your PC like no other operating system has. With the increasing performance power coming from the new breed of CPUs in PCs (e.g., Intel's Pentium processor), Windows 95 makes capabilities like full-screen digital video now possible using software-only solutions, where previously expensive specialized hardware was required. Windows 95 delivers a platform that will make using the

PC more fun.

n

Better CD support. Windows 95 includes support for new CD-based

technology that is both pioneered and maximized in the product. Through technology called AUTOPLAY, Windows 95 makes using CD-ROM titles as easy as inserting a CD-ROM in the CD player—when inserted, Windows 95 will detect the AutoPlay title, and begin executing the pre-programmed set of instructions (which may be to run Setup for the CD-ROM title, or even start the CD-ROM title automatically). Another CD technology called ENHANCED CD, provides the ability for CD audio titles to contain digital information, and allow the use of the CD in either your audio CD player, or deliver a multimedia application for use in your PC. Enhanced CD allows musical groups to deliver digital information about the band or musical performer in the form of biographical information, digital videos, sound snippets of other album releases, and even the ability to see and hear synchronized lyrics and audio for the songs on the CD.

[Compatible With What You Have](#)

If an operating system upgrade requires new software, more memory, or new hardware, then the cost of the upgrade is far higher than just its purchase price. Currently, users often have to wait a substantial amount of time—usually until their next PC purchase—before they can benefit from new technology. One of the biggest goals of Windows 95 was to make it possible for everyone to stay up to date with the latest version of Windows.

The following features were included in Windows 95 with this goal in mind:

n

Compatibility with existing MS-DOS-based and Windows-based

applications. Windows 95 works with and even improves today's software.

n

The same or better performance. Windows 95 runs PCs with at least a

386DX processor and 4 MB of RAM at least as fast as Windows 3.1 does for the same tasks—faster in many cases. Windows 95 requires no additional RAM to maintain performance.

n

Backwards compatibility with existing hardware devices. Windows 95

supports existing hardware and device drivers while enabling next generation, easier-to-use hardware through Plug and Play.

In addition to improving the use of the PC for the end-user, Windows 95 contains features and functionality specifically designed to help the MIS organization and system administrator manage and control the desktop environment of their enterprise. This section discusses the improvements in Windows 95 that makes this possible.

[Windows 95 Will Reduce Your Support Burden](#)

The two biggest factors driving up support costs in an organization are initial training, and on-going support. Windows 95 will make your support organization more effective by reducing the number and time of support calls, and providing better tools and components to make support-desk people more efficient in troubleshooting and handling problems.

Takes less time to train a new PC user

With Windows 95, it will be easier for new users to learn to use a PC, and for existing users to learn new tasks with less help, compared to Windows 3.x and Windows for Workgroups 3.x. This is due to several factors:

n

Functionality is more discoverable.—Windows 95 is more intuitive and

provides better visual cues to users than Windows 3.1. For example, the Start button provides the majority of functionality that users need (such as, starting programs, opening documents, finding information, getting help, etc.), and the taskbar provides better visual cues to the applications and windows that the user has open on the screen (users will be able to realize quicker that they can execute and perform multiple tasks at the same time).

n

Fewer concepts to learn.—Windows 95 integrates user interface

components together that previously were separate applications that a user needed to become familiar with. Users no longer have to learn a separate Program Manager, File Manager, Print Manager, or Control Panel.

n

Long filenames.—The ability to create and use filenames longer than 11-

characters is a great advantage for improving the ease-of-use of the system. In addition to using long filenames on the local PC, long filenames also carry over to the network environment.

n

Better tools for learning new tasks.—User aids such as Wizards and

more comprehensive on-line help improve the ability for the user to complete or

obtain information on their interaction with the system.

n

Browse and connect to all networked resources in a consistent manner.

As the enterprise environment becomes increasingly heterogeneous, users will benefit from consistent network interaction mechanisms in Windows 95 such as the network neighborhood, the common dialog boxes, and in the Windows Explorer. Any of the networking clients designed for use with Windows 95 will allow the user to navigate the network in the same familiar way.

n

Less configuration necessary. — Windows 95 is much more dynamic than

Windows 3.x or Windows for Workgroups, requiring little or no tweaking to the system to maximize the performance of the system. For example, the virtual memory support in Windows 95 is dynamic and the system will grow or shrink the size of the swapfile as necessary, and the size of the disk cache is dynamic as well and will grow or shrink depending on the tasks that the PC is running — the system tunes itself.

Users will have fewer system problems

With Windows 95, you'll spend less time fixing systems and handling reports of operating system-related problems due to reliability improvements and Plug and Play architecture built into the system.

With Windows 95, the system and networking are more reliable, 32-bit protect mode networking is now seamlessly integrated into the operating system, separate address spaces for Win32 applications ensure errant applications can't affect other tasks running in the system, and out of the box compatibility with Novell NetWare and all major networks ensures compatibility in your environment.

n

The system is more reliable and stable. Major system components are

implemented as 32-bit protect mode components and designed to operating in a multitasking environment, and don't rely on drivers that reside real-mode, thus providing a more stable environment (many of the real-mode drivers or networking components in use today with Windows 3.1 were designed to operate with MS-DOS and functionality for Windows was added afterwards).

n

Networking is more reliable and robust. The 32-bit networking

components in Windows 95 are designed to be more robust, and better recover from external problems. For example, with the network clients included with Windows 95 (i.e., client for Microsoft networks, and client for NetWare networks), if the server goes down, the user's PC won't this is not true, for example, when using the real-mode NetWare client software with Windows 3.1.

n

Current applications run more reliably. Just adding Windows 95 to a

users system will result in fewer "out of memory" messages (due to increased system resource limits), fewer application faults caused by unreliable display drivers (due to a new display driver architecture making it easier to write reliable drivers), the ability for users to shut down errant Win16-based applications without crashing the system (including better resource cleanup when the application terminates abnormally), and improved protection of the system from MS-DOS-based applications.

n

Future applications run more reliably. While Windows 95 brings many

gains for running current applications, a new breed of 32-bit applications will leverage operating system services to further increase the reliability of the system. Win32-based applications run in their own separate address spaces, so they are protected from other applications running in the system. In addition, one Win32-based application can't prevent another application from processing input, due to support for separate message queues.

Simplifies common administrator support tasks

Administrators will appreciate the way Windows 95 simplifies common administrative support tasks due to simplified network installation, Plug and Play, and an open architecture for third-party integration.

The Gartner Group "Total Cost of Ownership" study found that Windows 95 can save a typical organization over \$1000/desktop/year versus Windows 3.1 over a five-year period. The payback period for implementing Windows 95 is only 3-6 months according to the Gartner Group analysis.

n

Simplified network installation. Client support for Novell NetWare,

Windows NT Server, and compatible systems is built in and provided in the box. Adding other clients is easy. The networking architecture of Windows 95 provides the ability to support multiple clients, multiple network transports, and multiple driver standards concurrently.

n

Automatic device installation/configuration. Adding new devices to the

system, such as network cards, is quick and easy due to the Plug and Play architecture of Windows 95. Users of all systems, including legacy PC systems, benefit from the Plug and Play support built into the operating system.

n

Built-in server-based backup agents.—Windows 95 includes backup

agents for Cheyenne ARCServer, and Arcada, making it easy to backup networked PCs running Windows 95 using your existing network management tools.

n

Remote performance monitoring and configuration editing tools.—

Windows 95 includes tools for administrators to remotely monitor and configure the Windows 95 environment over the LAN or WAN. This makes it easy to troubleshoot, repair, and to even spot problems before they happen. Tools such as System Monitor, System Policy Editor, RegEdit, and Dial-up Networking are included with Windows 95.

n

Support for system management applications.—Windows 95 has a

complete architecture for building advanced system management applications, and integrates into your existing system management consoles via standard agents.

n

Can restore crashed system to working state.—If the PC fails due to a

hardware problem, a corrupt configuration, or a bad driver, Windows 95 still makes it easy to get into the graphical user interface to change the configuration of the system. A “fail-safe” boot will allow an administrator to be able to change system settings to restore the working state of the PC.

Windows 95 Will Increase Your Control Over the Desktop

A key benefit of Windows 95 is the opportunity it provides for the system administrator to have greater control over desktop systems no matter where in the organization they may be located.

More control over installation options

Windows 95 provides better control over installation options, providing support not only for your existing Windows-based environment, but also tighter control of the setup options that may be performed by users. Windows 95 supports running in a variety of configuration environments to support your existing workplace.

n

Run Windows 95 locally or from a server.—Windows 95 can be configured

to run either locally from the hard disk of the user's PC, or can be loaded to run from a network server. Furthermore, administrators can configure the shared installation of Windows 95 to control the installation options to prevent, for example, users from installing Windows 95 on their local PC and require them to run from the network server (if desired).

n

Run Windows 95 on a diskless workstation. — For environments that have

minimal resources and have PCs that only include a floppy drive, Windows 95 can be configured to allow the user to boot from a disk, and then invoke Windows 95 to run from a network server.

n

Run Windows 95 on a RIPL workstation. — Windows 95 can be configured

to run on a workstation configured for a RIPL boot off of a network server. This provides support for environments where security is important and the PCs do not have a floppy drive (or hard drive) installed in the local PC.

More control over configuration options

In addition to controlling the type of installation that a user can perform, administrators can control the specific configuration of the Windows 95 environment as well.

n

Can dictate what functionality is installed for specific users. — Through a

flexible batch installation script, administrators can define the capabilities and default configuration of the Windows 95 installation. This allows better control over the configuration to, for example, install system management agents on every PC during Setup.

n

Can “lock down” the desktop configuration. —Through the use of System

Policies (set with the System Policy Editor), administrators can control the interaction between the user and the system to either prevent users from doing unauthorized things, or by hiding functionality of the user interface to help keep them out of trouble. For example, administrators can “lock” the user into the user interface and prevent them from running applications not pre-configured by the administrator.

n

Multiple users can share a single system and get different configurations.:

User profiles in Windows 95 allows multiple users to share the use of a single system, yet maintain their separate configuration environment so, for example, their desktop properties are personalized.

n

Single user can use multiple systems and same configuration. —User

profiles can also be used to support the “roaming user” scenario where a user may not be tied to a particular PC, and their user configuration can “follow” them around to other PCs on the network.

Improved desktop security

Management features in Windows 95 make it easy to configure and manage network access and desktop configurations. Windows 95 can leverage the existing namespace defined in your enterprise environment to leverage the names present in the bindery of your NetWare servers, or Windows NT Server domains, to offer user-level security for protecting shared information.

n

Restrict access to shared desktop resources to only specific authorized

users. — When Windows 95 is on a network with a server running Novell NetWare or Windows NT Server, it can provide user-level security so you can protect a shared resource by designating only certain people to have access. — The “pass-through implementation” uses security database and access controls on the server to provide access to resources shared with the peer server on a PC running Windows 95. — This way administrators can leverage the existing database of network users and simplify the management responsibilities.

Support for new, improved system management applications

The architecture of the registry in Windows 95 makes it easy to enhance the ability to manage desktop PCs using a variety of industry standard mechanisms, or third-party tools.

n

Plumbing for systems management included. — All configuration-related

information about a PC running Windows 95 is stored in the registry — information about applications, the Windows 95 shell, operating system drivers and services, and the hardware configuration through Plug and Play, can be obtained from the registry. — Given the consolidated database of configuration information, management tools built on top of the registry can provide remote access to the statistics and state of a PC running Windows 95.

n

Includes support for existing and emerging system management

standards. — Windows 95 includes a management agent based on the SNMP standard, and an agent supporting DMI is presently in the works. — Support for

industry standards mean that your existing or future management tools will be able to be used to simplify the management task for your enterprise.

[Windows 95 Will Improve the Productivity of Your End-Users](#)

In developing Windows 95, Microsoft focused on three major areas of improvement: LEARNABILITY and how easy is it for someone to be productive, USABILITY and how easy is the product to understand and work with, and EFFICIENCY and how many steps does it take to complete a task. Microsoft has been working with the user interface of Windows 95 for the past two years and has refined it based on usability tests performed on users with a wide range of PC ability.

Through usability testing, it was learned that beginners have difficulty with the concept of double-clicking (as used to launch applications with Program Manager in Windows 3.1), complex hierarchies are difficult to use (as used with File Manager to represent the structure of files on a PC), and that managing windows and working with multiple applications under Windows 3.1 is not as intuitive as it can be. Microsoft has addressed each of these issues in Windows 95.

Usability Sciences Inc. found that Windows 3.1 users will nearly double their productivity by using Windows 95, based on tests of Windows 3.1 users performing common tasks that they perform today (they were able to perform a set of tasks in nearly half the time on Windows 95).

For your users, Windows 95 will:

n

Make the tasks people do today simpler and more efficient.—The new

user interface in Windows 95 makes it easier for users to learn how to use the system, to complete their tasks on the system, and to discover functionality offered by the system. The capabilities and power of the system can grow as the user's experience grows.

n

Make the tasks people do today faster.—Windows 95 speeds up printing,

graphics, disk access, and network access due to new 32-bit operating system components and services.

n

Enable people to work on multiple things at once. —The preemptive

multitasking capability of Windows 95 enables users to operate on multiple tasks at the same time. This means, for example, that their PC is no longer idle while it is printing a large document.

n

Make information easier to access. —Built in electronic messaging and

Dial-up networking in Windows 95 makes it easier to access information wherever you are.

n

Enable new, more productive applications and systems. —Windows 95

benefits the user of a PC by simply upgrading from Windows 3.1. However, new capabilities enabled by services of Windows 95 such as the Win32 API and Plug and Play, now allows the user to do things that previously were not possible.

[Windows 95 Will Provide a Safe and Smooth Migration](#)

The benefits previously discussed won't help much if they're too difficult or costly to migrate to. That's why Microsoft designed Windows 95 to work with what you have today. Microsoft is testing to ensure that you'll have a smooth migration, that Windows 95 is compatible, and that it's reliable. If all you do is upgrade from Windows 3.1 or Windows for Workgroups to Windows 95, everything continues to work (both hardware and software).

Reliable, and most thoroughly tested product in history

Microsoft is going to great lengths to ensure that Windows 95 is stable and reliable, and it will be a quality product when released for general availability. Some examples of the steps that Microsoft is taking include:

n

Rigorous internal testing.—The Windows 95 developers have been “self-

hosted” (i.e., using Windows 95 to develop Windows 95) since 1992. The team that is tasked with doing nothing but testing the operating system consists of over 200 people, doing over 500 thousand person hours of testing with hundreds of applications and systems, including round the clock simulation testing.

n

Largest beta program in history.—The beta test program for Windows 95 is

the largest ever done by Microsoft, and by all accounts the largest in the industry to date. By the time Windows 95 is release to manufacturing, more than 50,000 technical beta sites (i.e., sites that actively test and report bugs) will have used and tested Windows 95 with their hardware and software in their own environment.

n

Large preview program.—In addition to technical beta testers, the

Windows Preview Program will make Windows 95 available to 400,000 users world-wide prior to the commercial availability of Windows 95. This will allow feedback to be obtained on the use of Windows 95 from a very broad set of users beyond the technical beta test program, and to help organizations begin evaluating Windows 95 and to get a head start on developing a plan for deployment.

n

10,000 upgrades tracked by test teams. —Microsoft test teams are working

with users in home, small business users, and large organization environments
AT THEIR SITE LOCATION, to gain additional experience with installing Windows 95
in real-world scenarios. —These sites are above and beyond the sites used in the
other testing programs.

n

Over 75 million of hours of use before commercial release. —By the time

Windows 95 is released to manufacturing, the product will have gone through
over 75 million hours of hands-on usage by hundreds of thousands of users prior
to it's general availability.

Works on the hardware and software you already have

Windows 95 was designed to be compatible with your existing software and
hardware from day one. —Yet, Windows 95 was also designed to take advantage of
a new generation of applications and hardware to deliver a platform for the future.

n

Compatible with existing MS-DOS-based and Windows-based

applications. —Windows 95 will work with the existing applications you are using
today. —If all you do is upgrade from Windows 3.1 to Windows 95, your
applications will continue to run, and you will benefit from the system
improvements previously discussed to have a stable, more reliable, faster
platform on which to work.

n

Compatible with existing MS-DOS and Windows drivers. — Windows 95 is

not only compatible with your existing applications, but is compatible with your existing device drivers that are used to operate your existing hardware. — In many cases, Windows 95 offers new 32-bit drivers that replace the existing drivers used on your system to deliver improved performance and reliability, but you can rest assured that when you upgrade your system what you have will still work.

n

Runs well on mainstream systems, and exploits additional resources if you

have them. — Windows 95 has minimum system requirements of an Intel-80386DX (or compatible) processor with 4MB of memory, however it fully exploits additional resources (such as 8MB or more of memory) and the latest generation of processor performance (such as the Intel Pentium processors) if you have them. — As you add more resources to your computer (such as more memory), the performance of your system will scale as well and automatically take advantage of the newly added resources. — The performance goal of Windows 95 is that if all you do is upgrade to Windows 95 (and your system meets the minimum system requirements), your PC will operate as fast or faster for the same tasks, as Windows 3.1.

Designed to make Windows 3.1 users productive quickly

Windows 95 is Windows. — Windows management, file copying, data storage, and so on, are the same. — Keyboard shortcuts and other operating system functionality that users were familiar with when using Windows 3.1 (e.g., Alt-TAB to switch tasks) are still supported. — The efficiency of the system has been improved for all users, making it easier for novice users, and more powerful for experienced users.

Usability Sciences, Inc. found that after only a 20 minute tutorial on Windows 95, current Windows 3.1 users were able to perform a set of common tasks nearly as efficiently as on Windows 3.1 on their first attempt. — Moreover, they were able to complete more tasks successfully.

Examples of areas where we focused on helping existing users of Windows 3.1

include:

n

Usability testing of features with Windows 3.1 users.—Working closely with

existing users of Windows 3.1, the Windows 95 development team was able to identify areas where the efficiency of the system could be improved, but also testing could be performed to ensure that any changes to the system didn't have a negative usability hit.

n

Built-in transition tools for Windows 3.1 users.—For existing users of

Windows 3.1, a computer-based tutorial and on-line help information make it easy for users to navigate through the Windows 95 user interface quickly and easily. If users have difficulty with their transition, information to point them in the right direction is just a help screen away.

n

Tests results show Windows 3.1 users are as productive as on Windows

3.1 the first time they perform a set of common tasks.—Usability tests show that existing users of Windows 3.1 are as productive using Windows 95 as they are with Windows 3.1 the first time they use the new operating system. On subsequent execution of similar tasks, their productivity increases significantly.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 3: The Windows 95 User Interface

When you first boot Microsoft Windows 95, you know immediately that the old world of Windows running on top of MS-DOS is no more. Gone are the character-mode boot messages that held meaning only for a very small minority of computer users. Instead, you are graphically carried to the desktop of the new Windows 95 user interface (UI).

More than any other part of the operating system, the UI defines the user's overall experience. The easier, more powerful, and more compelling the UI, the better the user feels about computing and the more productive the user is likely to be. A great UI helps the computer industry grow because it makes computing easier and more natural for ALL people, from the novice user to the power user.

This chapter discusses the design process that produced the UI in Windows 95 and then introduces the components of the UI, organized into the following categories:

n

Easy. Outlines UI features that make Windows 95 easy to learn and use, especially for those new to Windows.

n

Powerful. Outlines UI features that make Windows 95 more powerful, efficient, and customizable for the experienced Windows user.

n

Compatible. Outlines UI features that make Windows 95 easy to learn and to use for those familiar with Windows 3.1.

Designing the Windows 95 User Interface

The overarching goal of the UI in Windows 95 is to make PCs even easier to use for ALL people. Fulfilling this goal is a challenge because different people work in very different ways. Novices want learning how to perform a task to be easy, even at the expense of efficiency. However, experienced users want to do more with their PCs, and they want efficiency and flexibility. In addition, users upgrading from Windows 3.1 want to make the transition without throwing out everything they have already learned.

Windows 95 meets these disparate needs by being scaleable—that is, by being able to fit the proficiency and preferences of the individual user. For novices, the most common and essential features of Windows 95, such as launching an application, task switching, and finding a file, are easily “discoverable” via the taskbar, with its Start button and push-button task switching. For experienced users, Windows 95 promotes efficiency, customizability, and control via such power-user capabilities as the Windows Explorer, rich secondary mouse-button clicking, property sheets, and shortcuts.

The UI in Windows 95 was not constructed from a blueprint drawn from a master specification. It started with clear objectives, guiding design principles, and a skilled team. The design process started with the basic question, “How can the UI in Windows 3.1 be improved?” That question launched a continuous cycle of discarding old ideas, conceiving new ideas, and learning—a constantly iterating design-usability test-redesign loop like the one shown in Figure 2.

`{ewc msdncd, EWGraphic, ux0c 0 /a "psC.bmp"}`

Figure 2. The design loop of Windows 95

[Improving the Windows 3.1 User Interface](#)

There was no shortage of information about how the Windows 3.1 UI might be improved. The table on the following page summarizes key findings.

The following mechanisms were used to compile this feedback data:

n

Usability tests. The Microsoft Usability Lab, described on the following page, is primarily used for testing usability of new designs. However, to better understand how people use Windows 3.1 and to establish a baseline, several phases of testing were dedicated to Windows 3.1.

n

Focus groups. Several focus groups were conducted with different levels of users to identify the problems people have with Windows 3.1.

n

Educator feedback program. A team of UI designers and testers visited 12 independent software education companies. More than any other group of users, software educators understand the everyday usage challenges faced by novice and intermediate users. The educators were asked questions such as, "What are the five hardest tasks for students to learn in Windows?" and "What five changes would you make to Windows to make it easier to learn?" The educators also tested prototypes of the UI in Windows 95.

n

Suggestion database. Thousands of UI suggestions from Windows 3.1 users and corporate customers were compiled and analyzed, along with beta-tester UI feedback.

How Can the Windows 3.1 UI Be Improved?

Easier to manage multiple windows (overlapping and minimized windows) is confusing.

- Hierarchical views (like those in File Manager) are confusing.

- Double-clicking to launch applications is not discoverable.

- Task switching is not discoverable. As a result, many users never run multiple applications.

More efficient management, with

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- 8.3
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- The UI is
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- Network
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is poor.

Conducting extensive live tests in a variety of settings with a variety of subjects has been key to engineering a state-of-the-art UI. A large portion of the total development budget of Windows 95 has been expended on this critical activity, and Windows 95 is probably the most usability tested product ever. The following methods have been used to test the UI in Windows 95:

n

Formative testing in the Usability Lab. Conducted primarily in the

groundbreaking Microsoft Usability Lab, formative testing collects data as test subjects perform specific tasks, such as launching a program, finding a file, and installing a printer. The Usability Lab has nine testing suites, each with a one-way mirror, cameras, and other equipment for observing and recording users as they work. Central to the Lab's operations is online data-collection software that helps specialists collect cognitive and quantitative process data as subjects work through the sets of tasks.

Usability tests are observed firsthand by the design team and are essential in future designs. At the time this guide was being written, more than 1000 hours of usability testing in 48 phases with more than 400 participants had been conducted. The experience of test subjects has ranged from novice users to intermediate/advanced users, so the test results focus on new computer users as well as users familiar with Windows.

n

Summative testing. Conducted at customer sites and in the Usability Lab.

summative testing involves testing the UI as a whole with real users over longer periods of time.

n

UI-expert and industry-expert review. In the fall of 1993, a panel of UI

experts and industry experts was assembled to review and critique the UI in Windows 95. In addition, four independent consultants each spent large blocks of time with Windows 95 and gave extensive feedback.

This section describes the features of the UI that are designed to make learning Windows 95 easy for novices.

After users start their computers, they are presented with the Windows 95 desktop shown in Figure 3. It's neat and clean and displays only a few graphical objects.

`{fewc msdncd, EWGraphic, ux0c 1 /a "psC.bmp"}`

Figure 3. The desktop

The simplicity of the desktop appeals to all users' sense of organization, but it also serves to focus the novice user on the following essential elements:

n

The Taskbar. Users can quickly start a program or open a document by clicking the Start button. And they can easily switch between tasks.

n

My Computer. Browsing a PC is now logical and easy.

n

The Network Neighborhood. In the world of mapped drives and complex interfaces, users can't browse their network. With the Network Neighborhood, they can easily browse the network, regardless of which network provider (such as Windows NT Server, a NetWare server, or Windows 95 itself) is being used.

n

The Recycle Bin. The Recycle Bin allows users to recover deleted files and easily return them to their original location on the local system.

More than any other feature, the taskbar, which is shown in Figure 4, exemplifies the order of magnitude improvement in ease of use and ease of learning of the UI in Windows 95. It is the UI's anchor. Its mission is to make 95 percent of what a typical user wants to do with the operating system easy to accomplish at all times. The taskbar started out specifically as a program launcher and task switcher for novices. However, because of its simplicity and power, the taskbar is also popular with experienced users, who can take advantage of its many other capabilities.

```
{ewc msdncd, EWGraphic, ux0c 2 /a "psC.bmp"}
```

Figure 4. The Taskbar

The two key features of the taskbar are the Start button and push-button task switching, which are examined in the next two sections.

The Start Button: Up and Running in Seconds

Usability tests on Windows 3.1 have shown that launching Write takes a new Windows user an average of nine minutes. With Windows 95, launching WordPad takes a new user an average of three minutes. If only the users that launch WordPad via the Start button (rather than by another means) are counted, the average launch time drops below one minute!

The main reason for this dramatic 3x–9x speed improvement is the Start button, which is shown in Figure 5. Without knowing about double clicking or complex hierarchies, a novice user of Windows 95 can quickly launch a program and get to work.

```
{ewc msdncd, EWGraphic, ux0c 3 /a "psC.bmp"}
```

Figure 5. The Start button and its menu

However, the Start button is much more than a super-efficient program launcher. Its capabilities include the following:

n

Programs. The Start button's Programs menu allows users to quickly launch programs. This menu is the equivalent of Program Manager in Windows 3.1, and in fact, when a PC running Windows 3.1 is upgraded to Windows 95, the contents of the program groups in Program Manager are transferred to the Programs menu.

n

Documents. The Start button's Documents menu contains a list of the last 15 documents opened. This menu provides very quick access to the information most recently worked with and helps prevent time-consuming and frustrating browsing. It also helps users think of their work in terms of documents (a concept known as DOCUMENT-CENTRICITY), rather than applications.

n

Settings. The Start button's Settings menu allows users to quickly change or view the PC's settings and options, including the Control Panel (for computer settings), the Start menu, and the Printers folder. It also allows users to customize the Taskbar to suit personal working preferences—for example, to specify which programs should be included on the Start button's Programs menu.

n

Find. The Find item in Windows 95 goes far beyond the Search feature of File Manager in Windows 3.1. Searches do need not conform to the *.* searching

syntax, and criteria such as last modification date, size of file, and actual text within a document can be used to find information.

n

Help. Help has been overhauled in Windows 95 and is easily accessible

via the Start button.

n

Run. The Start button's Run item provides enhanced command-line type

functionality.

n

Shutdown. The Shutdown item provides easily accessible and safe

shutdown, restart, and logoff.

[Task Buttons: Task Switching Made Simple](#)

Novices need to have powerful features presented to them in a simple and compelling way; otherwise they won't use these features. Research conducted with active Windows users indicates that fewer than 50 percent frequently use more than one application at a time and only 20 percent frequently use ALT+TAB task switching. These powerful features of Windows 3.1 are simply not discoverable.

The objective of the taskbar is to make switching among multiple applications as simple as changing channels on a television set. Every open window has a button on the taskbar, allowing the user to see which documents and applications are currently open. Switching applications is a simple matter of selecting the desired "channel" on the taskbar. No more minimized program icons; no more disappearing windows. The user can see all the active tasks simply by looking at the taskbar, the

TV GUIDE of Windows 95. When a task is minimized into the taskbar or maximized from the taskbar, animation helps new users understand “where” the task goes.

Task buttons resize themselves automatically depending on the number of active tasks. If the buttons get too small to be useful, the user can customize the taskbar. In fact, a host of other taskbar configuration options allow the user to customize it in other ways, including the following:

n

Reposition. The Taskbar can be dragged to any perimeter position on the screen.

n

Resize. The width of the Taskbar can be widened by dragging its inside edge.

n

Auto Hide. The Taskbar can be hidden and made to appear on the screen only when the mouse hits the screen edge, by selecting Settings and then Taskbar from the Start menu.

In addition to making task switching dramatically easier and more accessible via the taskbar, the UI in Windows 95 includes an updated version of the familiar ALT+TAB “cool switch.” It now displays an iconic road map of all active tasks to prevent users from getting lost in an infinite ALT+TAB loop, as was common under Windows 3.1.

[Try It!](#)

Customize the Start Button

1. Click START, and then SETTINGS, and then TASKBAR.
2. On the CHANGE START MENU property sheet, select the programs you want to appear either at the START button's first level or on the PROGRAMS menu.
3. Close the property sheet and check your new configuration by clicking the START button.

Hint: You can also add a program to the START button by dragging a shortcut defined for the program to the button.

Test a Novice

1. Find a stopwatch and a friend or family member who is a computer novice.
2. Sit the novice down at a PC that is running Windows 95 with no programs loaded and a clean desktop.
3. Ask the novice to start an application that you know is listed on the PROGRAMS menu. Note the time taken to successfully start the application.
4. Try the same task on a PC running Windows 3.1.
5. Compare the times to complete the task. The time using Windows 95 should be the same or faster than the time using Windows 3.1.

Display the Start Menu

n

Press CTRL+ESC, and the START menu pops up.

File management and browsing in Windows 3.1 are not intuitive. Fewer than 55 percent of Windows users regularly use File Manager, and File Manager is especially confusing and intimidating for novice users.

Designing a discoverable and comfortable model for browsing and file management for the novice user has been a priority for the UI design team because of the observed difficulties with Windows 3.1. Several significantly different designs have been tested and thrown out. In the course of this testing, the design team made the following discoveries about basic file management and browsing:

n

Exposed hierarchies are intimidating and un-intuitive.

n

Dual-pane views—hierarchy on the left and contents on the right—are

also intimidating and un-intuitive. Novices have difficulty understanding the connection between the logical tree hierarchy pane and the contents pane.

n

An object-oriented UI works well for basic tasks but not for complex ones.

The general belief is that the more object oriented a UI is, the easier it is to use. However, this is not the case. Although the direct manipulation of screen objects to achieve logical results is important for basic tasks (such as dragging a file from a folder to the desktop), direct manipulation to carry out more advanced tasks (such as dragging a file to a printer icon) is not intuitive. On the other hand, selecting an object with the mouse and then browsing menus or buttons for actions to perform on that object is intuitive.

n

Large icon views are much more comfortable than list views.

n

Whether novice users can find what they are looking for and whether they feel comfortable and “grounded” along the way are the defining characteristics of a good browsing experience. Efficiency and speed are less important.

The My Computer default browsing model is the result of this testing. A folder or drive can be opened by double-clicking it, or by selecting it and choosing Open from the File menu. The default browsing model brings up a new window in large icon view, as shown in Figure 6.

`{ewc msdn cd, EWGraphic, ux0c 4 /a "psC.bmp"}`

Figure 6. Browsing My Computer

To many advanced users this behavior seems cumbersome. “Why not open in list view?” they ask. “Why create a new window that just clutters up my screen?” “Why not open in a dual-pane view? It’s much more efficient for me.” “Why not turn the Toolbar on by default?” All of these possible default models and more were tested thoroughly and discarded because they caused confusion and stress for novices. Novices respond best when they are presented only with essential information and when they can easily “get back” to where they just were, so the default model was designed to meet these needs.

(Experienced users can select from multiple configuration options by choosing Options from the View menu. Also for experienced users, Windows 95 has a very powerful dual-pane browsing application called the Windows Explorer. In addition, File Manager from Windows 3.1 is still available and can be run for backward compatibility.)

The new capabilities of the default browsing model should not be overlooked in this discussion of simplicity. Folders can be created within folders. Files and folders respond logically to being dragged and dropped. Files and folders can be cut, copied, and pasted just like text and objects within applications can. Views can be customized, and each window “remembers” how it was last configured and opens automatically in that view. The best way to discover the capabilities of the default browsing model is to explore it, or better yet, watch a novice user explore it.

[Try It!](#)

Browse Folders with a Single Window

1. Double-click MY COMPUTER.
2. From the VIEW menu, choose OPTIONS. On the FOLDER property sheet, select the BROWSE FOLDERS WITH A SINGLE WINDOW THAT FOLLOWS YOU AS YOU OPEN EACH FOLDER option.
3. Turn on the Toolbar by choosing TOOLBAR from the VIEW menu.
4. Now double-click the icon for your hard drive. No new window opens.

By far the most-requested file system feature since Microsoft first released MS-DOS is support for long filenames, but until Windows 95 long filenames have not been possible. Windows 95 allows filenames of up to 255 characters. An example is shown in Figure 7. Eliminating the need to conform to the 8.3 naming convention results in obvious and large gains in usability. However, to ensure backward compatibility with existing MS-DOS and Win16-based applications, extensions have not been eliminated entirely; they are simply hidden from view by default.

`{ewc msdncd, EWGraphic, ux0c 5 /a "psC.bmp"}`

Figure 7. A sample long filename

Files can be renamed in place in Windows 95 by selecting the file, clicking the filename, and typing the new name. The hidden file extension is not affected when a file is renamed. Files can also be renamed from within the new common dialog boxes, including the Open and Save dialog boxes.

[Try It!](#)

Display the File Extensions

1. From any folder, choose OPTIONS from the VIEW menu.
2. Select the VIEW tab.
3. Deselect the checkbox for the DON'T DISPLAY MS-DOS FILE EXTENSIONS FOR FILES THAT ARE PROPERLY REGISTERED option.

This section discusses how the network client in Windows 95 makes browsing networks not only possible but easy, regardless of the network provider (Windows NT Server, Novell NetWare, Windows 95, and so on). For more details about the networking capabilities of Windows 95, see Chapter 9, "Networking."

Network browsing is accomplished by means of the Network Neighborhood, which sits on the desktop and logically represents the resources not available via My Computer. Its icon is shown in Figure 8.

`{ewc msdncd, EWGraphic, ux0c 6 /a "psC.bmp"}`

Figure 8. The Network Neighborhood icon

Browsing the network via the Network Neighborhood is as easy as browsing a local hard disk.

n

Top-level configuration. The Network Neighborhood can be configured by

the network administrator to display only those PCs, servers, and printers that are in the user's immediate workgroup. Top-level configuration insulates the user from the vastness of large corporate networks. The user can still browse the larger network by opening Entire Network from within the Network Neighborhood. (Until Windows 95, browsing the larger network was not possible.) When a user browses a server, network connections are made without drive "mapping" (the assigning of new drive letters to a specific network resource).

n

System-wide support for UNC pathnames. This technology makes

obsolete the process of mapping drives and allows natural network browsing via the Network Neighborhood. UNC pathname support allows a whole host of usability improvements of which network browsing is just one.

n

The Network Control Panel tool. This tool consolidates all networking

configuration in one location, and thereby eliminates the difficulty of configuring

networking under Windows 3.1 and Windows for Workgroups 3.x.

n

Easy drive mapping. A Map Network Drive button on the Windows-

Explorer and browsing window toolbars make drive mapping available in Windows 95. (Power users can also right-click My Computer.) Mapped drives appear as connections in My Computer.

n

Networking and mobility. The UI in Windows 95 was designed from the-

ground up with networking and remote access in mind. For example, when a file is copied over a slow link (a modem connection), the Copy dialog box includes an ESTIMATED TIME TO COMPLETION status message.

n

Networking integration with new common dialog boxes. The new common-

dialog boxes, which are standardized in applications that make use of them, provide a consistent way to open and save files on network resources as well as on local drives. In addition, the Network Neighborhood can be browsed directly from the common dialog boxes, and the majority of basic file management tasks can be performed from them.

[Try It!](#)

Create a Shortcut to a Network Folder on the Desktop

1. Browse the NETWORK NEIGHBORHOOD until you find an often-used network folder.
2. Point to the folder, hold down the right mouse button, and drag the folder to the-

desktop.

3. Choose CREATE SHORTCUT HERE.

4. Close the network window.

5. Double-click the shortcut. The network folder opens in a new window. The shortcut will be available every time you boot Windows 95.

Use the UNC Path to "Run" a Favorite Network Folder

1. From the START menu, choose RUN.

2. Type the full UNC path to your favorite network folder, such as \\MKTG\PROGRAMS\SARAHB, and press ENTER. The folder opens in a new window, with no drive mapping.

Create a New Folder from Within Common Dialog Boxes

1. Click the START button, and then choose PROGRAMS, ACCESSORIES, and WORDPAD. (WordPad is the word processing equivalent in Windows 95 of Write in Windows 3.1. It uses the common dialog boxes.)

2. From the FILE menu, choose OPEN, and click the LOOK IN drop-down box, which provides access to the entire PC hierarchy, including the Network Neighborhood.

3. From the FILE menu, choose SAVE, and click the CREATE NEW FOLDER icon. Unlike in Windows 3.1, where you have to start File Manager or exit to the MS-DOS command prompt to create a new folder, you can create a folder when you save a document.

The Recycle Bin is an easily recognizable metaphor for being able to "throw away" files and then recover them by simply removing them from the bin. Files deleted in Windows 95, or deleted from the common dialog boxes in applications that support them, are moved to the Recycle Bin. Users can remove an item from the Recycle Bin and drag or cut/copy/paste it to another location, or they can restore it to its original location by choosing Undo Delete from the Edit menu.

The Recycle Bin graphically indicates whether it is empty or contains items. Information about "deleted" items is available in the Recycle Bin's details view, as shown in Figure 9.

```
{ewc msdncd, EWGraphic, ux0c 7 /a "psC.bmp"}
```

Figure 9. The Recycle Bin with deleted items and the Recycle Bin details view showing additional information

OLE introduced the concept of “document-centricity” by incorporating in-place editing of objects. In a document-centric environment, the application window changes and the document stays the same, so that software works the way people work, rather than vice-versa.

The UI in Windows 95 picks up on the concept of document-centricity in the following subtle but powerful ways:

n

Windows as views of objects. When the user opens an object from

anywhere in the UI, a new window opens. Logically, the title of the new window is the same as that of the object's icon. For example, when the icon of a Microsoft Word document called My Document is double-clicked from the anywhere in the UI, a new window opens entitled My Document—Microsoft Word.

n

Document creation from within folders and in the Windows Explorer. From

within any folder in Windows 95 or from the desktop, users can create new files in place by choosing New from the File menu and then selecting a file type. An icon like the one shown in Figure 10 is then created to represent the new file. This flexibility makes it very convenient to manage files based on projects, rather than at the whim of an application.

`{ewc msdncd, EWGraphic, ux0c 8 /a "psC.bmp"}`

Figure 10. The icon for a new Word document

[Try It!](#)

Create a New Document from Within a Folder

1. Select a project folder in which you want to create a new document.

2. From the FILE menu, choose NEW and then select MICROSOFT WORD 6.0 DOCUMENT.

3. Type a name and press the ENTER key.

4. Double click the new document to open it in WordPad.

Hint: This functionality can also be accessed by right-clicking from within any folder or on the desktop.

When working with files on your system, how many times have you said to yourself, "I didn't mean to do that!" after accidentally deleting, renaming, moving, or copying a file that you didn't intend to? Windows 95 has a simple answer for putting things back the way they were. Windows 95 provides a multilevel undo feature that allows users to undo one or more of their preceding actions. Users can undo file deletions, renames, moves, or copies by simply choosing Undo from the Edit menu of any UI window, as shown in Figure 11.

`{ewc msdn cd, EWGraphic, ux0c 9 /a "psC.bmp"}`

Figure 11. The Undo command on the Edit menu, which can be used to undo file operations

[Try It!](#)

Undo a File Operation

1. Open a folder and select a file.

2. Rename the selected file.

3. From the EDIT menu, choose UNDO RENAME to undo the rename operation.

Undo Multiple File Operations

1. Open a folder and select a file.

2. Rename the selected file.

3. Drag the file from the folder to the desktop.

4. Delete the file.

5. Go back to the folder you first opened.

6. From the EDIT menu, choose UNDO DELETE to undo the delete operation.

7. Choose UNDO MOVE from the EDIT menu to undo the move operation.

8. Choose UNDO RENAME from the EDIT menu to undo the rename operation.

Originally developed in Microsoft's Applications Group and used in applications such as Microsoft Word and Microsoft Excel, Wizards are a proven tool that make it easy for all classes of user to take advantage of powerful but complex functionality. The Wizards guide a user through a series of questions, which are posed to the user in a friendly and straightforward way, and walk the user through a process like the one shown in Figure 12.

`{ewc msdncd, EWGraphic, ux0c 10 /a "psC.bmp"}`

Figure 12. The Add Printer Wizard, which walks the user through the printer installation process

Windows 95 uses Wizards throughout the operating system to assist all types of users. For example, Wizards are used to perform the following operations:

n

Displaying Setup options to the user during the installation process

n

Adding a new device to the system, such as a printer or modem

n

Setting up remote access in the Network Neighborhood

n

Creating a shortcut for an application

n

Installing a new application

n

Creating a Briefcase for synchronizing files between two PCs

n

Creating a workgroup post office for use with the Microsoft Exchange

e_mail client

Online Help has been completely retooled in Windows 95. It underwent extensive usability testing and the result is a significantly easier to use and easier to learn Help system. Additionally, it is now dramatically easier for independent software vendors (ISVs) and corporate customers to customize and develop Windows help files. Following are brief descriptions of the major features of the new Help system in Windows 95:

n

Simplified interface. Help in Windows 3.1 was difficult to learn and to use.

It had three main functions: Contents, Search, and Glossary. The Contents view was not well organized and presented, and there was some ambiguity about which functions to use when. Windows 95 behaves much more intuitively and more like a real reference book. It only has two Tabs: Contents and Index.

n

The Contents tab. Organized like a book's table of contents, the Contents

tab displays top level "chapters" (iconically represented as books) from which users can "drill down" to subtopics (iconically represented as pages). Many chapters also have Tips and Tricks subsections that have proved popular in lab testing.

n

Short Help topics. Topics all fit in one small window, so users don't have to

scroll through large, complicated help information.

n

Shortcut buttons. New shortcut buttons make using Help even easier in

Windows 95. Some Help topics contain shortcut buttons, like the one shown in step 1 in Figure 13, that take users to the referenced area in Windows 95. For example, a user who is searching for help on how to change the date on a PC can "jump" right to the Clock Control Panel tool from within Help.

```
{ewc msdn cd, EWGraphic, ux0c 11 /a "psC.bmp"}
```

Figure 13. A Help shortcut button (in step 1)

n

What's This? button. All Control Panel tools in Windows 95 have a ?

button at the right end of their title bars. When the user clicks this button, the pointer changes to a question mark. Clicking any object in the dialog box with this pointer brings up a short description of the object. Users can also access the question mark pointer by right-clicking within a Control Panel tool.

[Try It!](#)

Use Help's Shortcut Button to Change the Desktop Color

1. From the START menu, choose HELP.
2. Select the INDEX tab.
3. Type DISPLAY. Double-click the BACKGROUND PICTURES OR PATTERNS, CHANGING topic.
4. Click the PROPERTIES FOR DISPLAY shortcut button to move directly to this property sheet.

Windows 95 provides several aids for helping both users new to Windows and users of Windows 3.1 become productive quickly in the Windows 95 UI. Usability tests indicate that, with little or no additional training, users can complete common tasks under Windows 95 as quickly as they did under Windows 3.1, or even quicker. Windows 95 offers the following self-paced aids:

n

Quick tutorial of Windows 95. This tutorial walks users through the basics

of Windows 95 and covers topics such as starting programs, task switching between open windows, finding information on the local computer, and using the online Help system. The tutorial is designed for both novice users and experienced Windows users and shows how to complete common tasks.

n

Transition aids for Windows 3.1 users. The Help system provides

additional Help topics designed to make the transition to the UI in Windows 95 easier for Windows 3.1 users. These Help topics answer common questions to help users familiar with the components of Windows 3.1 quickly and easily find the respective tools or commands in Windows 95.

n

Readily available information in the online Help system. The Help system

in Windows 95 is designed to provide the information needed to complete the desired task. Topics include How To, Tips and Tricks, and Troubleshooting categories. Help is always available and can be easily accessed by choosing Help from the Start menu.

Powerful Features

Experienced users glean many of the same benefits from the taskbar and the Start button—quickly launching a new program, quickly switching to another task, and so on—as novices. However, experienced users need more, including the following:

n

They need a powerful way to browse and manage file hierarchies, whether

they are local or not.

n

They need to be able to customize the UI to suit their needs and tastes.

n

They need to be able to take shortcuts to get tasks done more quickly and efficiently.

n

They need to be able to do more.

The new UI in Windows 95 definitely enables the experienced user to do more, as the following sections show.

The Windows Explorer, shown in Figure 14, has been described as “File Manager on steroids.” It is powerful, flexible, efficient, and extensible. It also solves many of File Manager’s fundamental problems, such as having different windows for different drives. For many power users of Windows 95, the Windows Explorer will be the primary interface for navigating through information.

`{ewc msdn cd, EWGraphic, ux0c 12 /a "psC.bmp"}`

Figure 14. The Windows Explorer

The best way to understand the Windows Explorer is to experience it firsthand. However, here is an overview of its major features:

n

Single view of a world of information. The Windows Explorer is the eyes of

any PC running Windows 95. With it, users can view the entire namespace (all resources, local or connected) from the equivalent of 10,000 feet, or they can zoom down to the equivalent of 10 inches. My Computer and the Network Neighborhood can be browsed and managed, quickly and easily.

n

Flexible and customizable. Via the Windows Explorer toolbar and the View

menu, users can view folder contents in several ways, including large icon, small icon, list, and details views. Folder contents can easily be sorted by name, size, type, and modification date by selecting the column title. Users can also map network drives from the Windows Explorer toolbar.

n

Rich information about objects in details view. Details view provides a

wealth of context-sensitive information about folder contents. For example:

n

Files retain their identifying icons.

n

Drive sizes and free space (even mapped network drives) are reported in My Computer.

n

Descriptions of Control Panel tools are provided.

n

Jobs in the print queue are listed in the Printers folder.

n

Comments on other computers in the Network Neighborhood can be viewed.

All the powerful right-click and properties features described in the next two sections are supported in the Windows Explorer.

[Try It!](#)

Copy a File to a Different Drive Without Opening a New Window

1. Right-click MY COMPUTER and choose EXPLORE. Maximize the window.
2. Select a file that you want to copy to a network or floppy drive.

3. Move to the left pane in the Windows Explorer and use the + icons to the left of the folder and drive icons to find the network folder to which you want to copy the file. Do not click the destination folder.
4. Go back to the right pane where the file is currently stored and drag or cut/copy/paste the file to the destination folder.

Operations like this one could not be performed in Windows 3.1 without opening two or more File Manager windows.

Right-Click to Create a New Folder

1. In the WINDOWS EXPLORER, right-click an unused space inside a folder in which you want to create a new folder.
2. Choose NEW FOLDER.

Shortcuts are an extremely powerful tool for increasing efficiency. They are especially useful in a networked environment. Users can create a shortcut to any object, such as a file, program, network folder, Control Panel tool, or disk drive, and place it anywhere in the UI or in an application. Opening the shortcut opens the object that the shortcut is "pointing" to. For example, if a user creates a shortcut to My Network Folder on a network server and drops the shortcut on the local desktop, opening the shortcut actually opens My Network Folder. Shortcuts are represented by icons that have a small "jump" arrow in the lower-left corner, as shown in Figure 15.

{ewc msdn cd, EWGraphic, ux0c 13 /a "psC.bmp"}_{ewc msdn cd, EWGraphic, ux0c 14 /a "psC.bmp"}

Figure 15. Shortcut icons for a folder and a program

Shortcuts are created by selecting an object and choosing Create Shortcut from the File menu or by right-clicking the object and choosing Create Shortcut. After creation, shortcuts can be renamed. If the shortcut is for an object that was created after installation of Windows 95 and the object is renamed, Windows 95 changes the shortcut definition to reflect the new name. For example, if a user creates a shortcut on the local desktop to \\Server\Share\Public Folder and the folder is subsequently renamed, the shortcut will still work. A shortcut can be deleted without affecting the object to which it points.

Uses for shortcuts are virtually limitless, but the following are some common powerful uses for shortcuts:

n

Shortcuts in the Programs folder. Shortcuts are an extension of the icons

that in Program Manager groups in Windows 3.1. The icons simply pointed to an executable file somewhere in the file system. In Windows 95, the icons that appear on the Start button's Programs menu, which can be customized by choosing Settings and then Start Menu from the Start menu, also appear as shortcuts in the Programs folder. When a shortcut is added to or deleted from the Programs folder, it is also added to or deleted from the Programs menu. As a result, users can keep shortcuts to all favorite programs in one central place, regardless of where the programs are actually stored.

n

Shortcuts on the desktop. Power users can create shortcuts to commonly

accessed files, programs, drives, folders, and utilities right on their desktops. This capability is especially powerful with network resources because no complicated browsing or drive mapping is required to access network folders.

n

Embedded shortcuts in applications. A shortcut to a large file stored on the

network can be dragged to an e-mail message. When the message recipient double-clicks the shortcut, the network file opens. This process is much more efficient than embedding the actual file in an e-mail message because the message is smaller, and embedding shortcuts cuts down on file version proliferation.

[Try It!](#)

Discover Where the Start Button's Programs Menu Is Stored

n

From the START menu, choose SETTINGS and then START MENU. The Start

Menu folder, which is a sub-folder of the Windows folder, opens. The Programs folder contains the items that appear on the Start button's Programs menu.

The shortcuts and folders are those that appear on the Programs menu. Adding or deleting shortcuts and folders changes the items that appear on the menu.

Property sheets are a pervasive feature in Windows 95. All objects in the UI carry context-sensitive properties that can be accessed and customized by choosing Properties from the File menu or by right-clicking the object and choosing Properties. Good, consistent, easily accessible property sheets have been a favorite of power-user testers. Try the following examples to see how property sheets work.

[Try It!](#)

Rename a Hard Drive

1. In the WINDOWS EXPLORER or MY COMPUTER, right-click to select your hard disk and choose PROPERTIES to open a property sheet like the one shown in Figure 16.
2. In the LABEL box, type a new name and choose OK.
3. From the VIEW menu, choose REFRESH.

`{ewc msdn cd, EWGraphic, ux0c 15 /a "psC.bmp"}`

Figure 16. The properties for a disk drive

Share a Folder

1. In the WINDOWS EXPLORER, right-click a folder you want to make available to others on your network and choose PROPERTIES.
2. Select the SHARING tab.
3. Select SHARED AS, and then complete the other fields in this dialog box.

Customize a Shortcut Icon

1. Click the START button and choose SETTINGS and START MENU.
2. Open the PROGRAMS folder.
3. Right-click any shortcut and choose PROPERTIES.
4. Select the SHORTCUT tab.
5. Click the CHANGE ICON button.
6. Select a new icon for the shortcut and choose OK.
7. From the VIEW menu, choose REFRESH.

Right-clicking, like properties, is a pervasive, context-sensitive feature of Windows-95. (In this book, "right-clicking" refers to clicking the secondary mouse button. Most right-handed people set their mouse options to use the left button as primary and the right button as secondary.) Usability tests have shown that right-clicking as a shortcut way of performing common actions on an object is a very popular power-user feature. However, in general, right-clicking is not a feature that novices discover or remember, so the vast majority of functions that can be performed by right-clicking can also be performed by choosing the corresponding menu commands.

The power of right-clicking can be explored by carrying out the following examples.

[Try It!](#)

Right-Click the Desktop to Customize It

1. Right-click a blank space on the desktop.
2. Choose PROPERTIES.

Minimize or Tile All Open Windows

1. Right-click a blank space on the TASKBAR.
2. Choose MINIMIZE ALL OR TILE HORIZONTALLY.
3. To undo this operation, right-click a blank space on the TASKBAR and choose either UNDO MINIMIZE ALL OR UNDO TILE.

Create a Shortcut

1. Right-click an object for which you want to create a shortcut.

2. Choose CREATE SHORTCUT.

Drag a File and Create a Shortcut

1. Right-click and drag a file from the WINDOWS EXPLORER onto the desktop. A menu like the one shown in Figure 17 appears.

2. Choose CREATE SHORTCUT(S) HERE.

{ewc msdncd, EWGraphic, ux0c 16 /a "psC.bmp"}

Figure 17. The menu that appears when a file is dragged using the right mouse button

Right-Click a Screensaver to Test It

1. Choose FIND FILES OR FOLDERS from the START menu.

2. Type BEZIER and choose FIND NOW.

3. Right-click BEZIER.

4. Choose TEST.

Close a Task from the Taskbar

1. Right-click the TASK button for a window or program you want to close.

2. Choose CLOSE.

Access the Property Sheet for an Open Window

1. Right-click the mini-icon in the upper-left corner of any window.

2. Choose PROPERTIES.

The objective of the Control Panel is to consolidate all command, control, and configuration functions in one location. With Windows 3.1, these functions were difficult to find, use, and remember—for example, video resolution was changed in Windows Setup, but a printer was installed by selecting the Control Panel's Printers icon. As shown in Figure 18, in Windows 95 distinct graphics make all important functions instantly recognizable and previews are offered where appropriate.

{ewc msdncd, EWGraphic, ux0c 17 /a "psC.bmp"}

Figure 18. The large icon view of the Control Panel in the Windows Explorer

The individual functions available through the Control Panel tool are discussed in the relevant sections of this book—for example, the Network tool is discussed in Chapter 9, “Networking.” However, one Control Panel tool, Display, controls the configuration of the UI in Windows 95 and allows users to customize the UI itself. As shown in Figure 19, its property sheet has the following four tabs:

n

Background. Allows pattern and wallpaper configuration and preview.

n

Screen Saver. Allows screen saver configuration and preview.

n

Appearance. Allows configuration and preview of all of the user interface metrics (fonts, sizes, colors, and so on).

n

Settings. Allows configuration of monitor resolution and color palette size.

`{ewc msdncd, EWGraphic, ux0c 18 /a "psC.bmp"}`

Figure 19. The display properties

[Try It!](#)

Switch the Display Resolution

Dynamic resolution switching allows the resolution of the display to be changed without having to restart Windows 95 or reboot the PC. This feature depends on several factors, including the type of video card and the selected color palette.

1. Choose SETTINGS and then CONTROL PANEL from the START menu.
2. Open the DISPLAY icon.
3. Select the SETTINGS tab.
4. Set COLOR PALETTE to 256 COLORS and click APPLY NOW to restart your PC.
5. After your PC restarts, repeat steps 1 and 2 to reopen the Display icon.
6. Choose another video resolution that is supported by your card by sliding the DESKTOP AREA slider bar. For example, change the desktop area size from 640 x 480 to 1024 x 768.
7. Click APPLY NOW.
8. Now try playing a video clip.

A powerful new Find utility is built into Windows 95. As shown in Figure 20 and Figure 21, it goes far beyond the minimal functionality of File Manager's Search utility in Windows 3.1.

{ewc msdncd, EWGraphic, ux0c 19 /a "psC.bmp"}

Figure 20. Finding files or folders in Windows 95

{ewc msdncd, EWGraphic, ux0c 20 /a "psC.bmp"}

Figure 21. Searching in Windows 3.1

The Find utility includes the following features:

n

Partial name searches. Type REP in the Find Files Named window, and all

files and folders with REP somewhere in their names are found.

n

Searches on last modification date. Because files can be searched on their last modification dates, users can perform searches such as FIND ALL WORD DOCUMENTS MODIFIED IN THE LAST 3 DAYS.

n

Full-text searches. Documents containing specified text can be searched for.

n

Saving of search results. Complex or useful searches can be saved.

n

File management from the search results pane. Operations such as renaming files or viewing file properties can be carried out within the results pane in the same way as in the Windows Explorer.

[Try It!](#)

Save the Results on a Complex Search

1. Click the START button, and choose FIND and then FILES OR FOLDERS.

2. Type a partial string that you know will be present in many files, such as REP or DOC.
3. Select the DATE MODIFIED tab.
4. Select MODIFIED DURING THE PREVIOUS SEVEN DAYS.
5. Select the ADVANCED tab.
6. If necessary, select a file type.
7. Click FIND NOW.
8. When the find operation is complete, choose SAVE SEARCH from the FILE menu. (Notice that because the Find feature is 32-bit preemptively multitasked, you have control and can go perform other tasks while Find is running.) A FIND RESULTS icon is automatically created on the desktop.
9. Double-click the FIND RESULTS icon.

The Printers folder, shown in Figure 22, offers one-stop shopping for printer management and configuration. It replaces the troublesome Print Manager and Printers dialog box in the Windows 3.1 Control Panel, which is shown in Figure 23.

{ewc msdncd, EWGraphic, ux0c 21 /a "psC.bmp"}

Figure 22. The Printers folder in Windows 95

{ewc msdncd, EWGraphic, ux0c 22 /a "psC.bmp"}

Figure 23. The Printers dialog box in Windows 3.1

The Printers folder is discussed in more detail in Chapter 11, "Printing."

The Fonts folder in the WINDOWS directory represents a single namespace in which all fonts used in the system can be installed or manipulated. (If any fonts are identified in the WIN.INI file, Windows 95 moves them to the Fonts folder on startup, so all fonts in the system reside in a single location.) Different views of the Fonts folder present additional information about the fonts installed in the system (the large icon view is shown in Figure 24.)

{ewc msdncd, EWGraphic, ux0c 23 /a "psC.bmp"}

Figure 24. The large icon view of the Fonts folder

Operations can be performed on fonts in the same way they are performed on other

file system objects. For example, a font can be removed from the Fonts folder by dragging it to another location, a font can be deleted from the system by deleting it from the Fonts folder, and a font can be added to the system by dragging it from another location into the Fonts folder.

[Try It!](#)

Preview the Fonts

1. Open MY COMPUTER and double-click the FONTS folder, or open the FONTS icon in the CONTROL PANEL.
2. Right-click the font you want to preview.
3. Choose OPEN. Samples of the selected font are displayed and may be printed.

The Quick Viewers allow users to preview a file from the UI without having to open the application that created the file. In fact, users don't even have to have the application that created the file on their system. As a result, documents can be sent over a network or through e-mail. Figure 25 shows a quick view of a Microsoft Excel worksheet.

```
{ewc msdncd, EWGraphic, ux0c 24 /a "psC.bmp"}
```

Figure 25. A quick view of a Microsoft Excel worksheet

For more information about the Quick Viewers in Windows 95, see Chapter 20, "Applications and Utilities."

[Try It!](#)

Quick-View a File

1. Right-click an icon for a file created by a registered application—for example, a bitmap, a text file, or a WordPad document.
2. Choose QUICK VIEW.

Compatibility

Compatibility is a requirement for Windows 95. It is a no-excuses, "no-brainer" upgrade from Windows 3.1. Overall, compatibility is most important for third-party software and hardware. However, it also applies to the UI. The UI in Windows 95-

must be compatible with the way current Windows and MS-DOS users work, and it must scale itself to the level and preferences of individual users.

Of primary importance is that new UI features be easy for current Windows 3.1 users to learn at their own pace. In addition, UI visual elements and operations in Windows 95 must be consistent, to the extent possible, with the elements users are already familiar with in Windows 3.1. In addition to providing aids for users migrating from Windows 3.1, Windows 95 also includes tools familiar to Windows 3.1 users. For example, the system menu in the upper-left corner of most windows, and keyboard shortcuts such as ALT+F4, ALT+TAB, CTRL+X, CTRL+C, and CTRL+V, are present in Windows 95, easing the requirement for relearning or retraining.

With minimal changes in appearance, Program Manager and File Manager run under Windows 95 and are easily accessible via the Start button. As of this writing, the designs for access and default configuration of these Managers is not yet set. For example, when a user who has upgraded boots Windows 95 for the first time, the Program Manager window might be open. Or the Start button might have a Windows 3.1 Compatibility menu item that will launch Program Manager and File Manager. Regardless of the final design, many help and learning devices will be specifically designed for the upgrade, such as a Click Here to Begin arrow that zooms to the taskbar when the user first boots Windows 95.

Users of the command line in MS-DOS won't have to give it up when they move to the graphical UI of Windows 95. In fact, "command-line junkies" will find that the usability and power of the MS-DOS command prompt have been dramatically improved. New command-line functionality includes the following:

n

Launching Windows-based applications

n

Opening documents from a command line

n

Scaling the size of the MS-DOS command prompt

n

Using cut/copy/paste operations to integrate information from MS-DOS
and Windows-based applications

n

UNC pathname support

See Chapter 6, "Support for Running MS-DOS-based Applications," for more
information.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 4: Base System Architecture

Ease on the surface requires power and speed at the core, and the modern, 32-bit architecture of Windows 95 meets these requirements. Freed from the limitations of MS-DOS, Windows 95 preemptively multitasks for better PC responsiveness—for example, users no longer have to wait while the system copies files—and delivers increased robustness and protection for applications. Windows 95 also provides the foundation for a new generation of easier, more powerful multithreaded 32-bit applications. And most important, Windows 95 delivers this power and robustness on today's average PC platform while scaling itself to take advantage of additional memory and CPU cycles.

The mission of Windows 95 is to deliver a complete, integrated operating system that offers modern, 32-bit operating system technology and includes built-in connectivity support. In addition to the high-level mission of Windows 95, market requirements dictate delivery of a high performance, robust, and completely backward-compatible operating system that provides a platform for a new generation of applications.

This chapter discusses the base system architecture used by Windows 95. The base architecture covers low-level system services for managing memory, accessing disk devices, and providing robust support for running applications.

Summary of Improvements over Windows 3.1

Improvements made to the base architecture of Windows 95 result in many benefits to users. Following is a summary of some of the key improvements:

n

A fully integrated 32-bit protected-mode operating system. The need for a separate copy of MS-DOS has been eliminated.

n

Preemptive multitasking and multithreading support. System responsiveness and smooth background processing have been improved.

n

32-bit installable file systems. Systems such as VFAT, CDFS, and network
redirectors provide better performance, use of long filenames, and an open
architecture that supports future growth.

n

32-bit device drivers. Available throughout the system, these drivers
deliver improved performance and intelligent memory use.

n

A complete 32-bit kernel. Included are memory management, scheduler,
and process management.

n

Improved system-wide robustness and cleanup. This more stable and
reliable operating environment also cleans up after an application ends or
crashes.

n

More dynamic environment configuration. The need for users to tweak their systems is reduced.

n

Improved system capacity. Included are better system resource limits to address the problems Windows 3.1 users encountered when running multiple applications.

A Fully Integrated Operating System

The first thing that users of Windows 3.1 and MS-DOS will notice when they turn on their computers is the lack of an MS-DOS command prompt from which they would formerly have invoked Windows. Windows 95 is a tightly integrated operating system that features a preemptive multitasking kernel which boots directly into the graphical UI and also provides full compatibility with the MS-DOS operating system.

Many of the components of Windows 95 overcome limitations inherent in MS-DOS and Windows 3.1. However, these improvements do not come at the cost of compatibility with existing software, hardware, or computing environments.

The job of the operating system is to provide services to the applications running on the system and, in a multitasking environment, to provide support that allows more than one application to run concurrently. In Windows 3.1, multiple applications ran concurrently in a COOPERATIVE multitasking manner. The Windows 3.1 operating system required an application to check the message queue every once in a while to allow the operating system to give control to other running applications. Applications that did not check the message queue on a frequent basis effectively hogged all the CPU time and prevented switching to another running task.

Windows 95 uses a PREEMPTIVE multitasking mechanism for running Win32-based applications, and the operating system takes control away from or gives control to

another running task depending on the needs of the system. Unlike Win16-based applications, Win32-based applications do not need to YIELD to other running tasks in order to multitask in a friendly manner. (Win16-based applications are still cooperatively multitasked for compatibility reasons.) Windows 95 provides a mechanism called MULTITHREADING that allows Win32-based applications to take advantage of the preemptive multitasking nature of the operating system and that facilitates concurrent application design. In operating-system terms, a running Win32-based application is called a PROCESS. Each process consists of at least a single THREAD. A thread is a unit of code that can get a time slice from the operating system to run concurrently with other units of code. It must be associated with a process, and it identifies the code path flow as the process is run by the operating system. A Win32-based application can SPAWN (or initiate) multiple threads for a given process. Multiple threads enhance the application for the user by improving throughput and responsiveness and aiding background processing.

Because of the preemptive multitasking nature of Windows 95, threads of execution allow background code to be processed in a smooth manner. For example, a word-processing application (process) can implement multiple threads to enhance operation and simplify interaction with the user. The application might have one thread of code responding to the keys pressed on the keyboard by the user to enter characters in a document, while another thread is performing background operations such as spell-checking or pagination, and yet another thread is spooling a document to the printer in the background.

Some available Windows 3.1 applications provide functionality similar to that just described. However, because Windows 3.1 does not provide a mechanism for supporting multithreaded applications, the application developer has to implement a threading scheme. The use of threads in Windows 95 facilitates the adding of asynchronous processing of information to applications by their developers.

Applications that use multithreading techniques can also take advantage of improved processing performance available from a symmetric multiprocessing (SMP) system running Windows NT, which allows different portions of the application code to run on different processors simultaneously. (Windows NT uses a thread as the unit of code to schedule symmetrically among multiple processors.)

For information about how Windows 95 runs MS-DOS-based applications in a preemptive manner (as Windows 3.1 does today), Win16-based applications in a cooperative manner (as Windows 3.1 does today), and Win32-based applications in a preemptive manner (as Windows NT does today) see later sections in this chapter.

Windows 95 doesn't need the separate CONFIG.SYS or AUTOEXEC.BAT file required by MS-DOS and Windows 3.1. Instead, Windows 95 is intelligent about the drivers and settings it requires and automatically loads the appropriate driver files or

makes the appropriate configuration settings during its boot process. If a CONFIG.SYS or AUTOEXEC.BAT file is present, the settings in these files are used to set the global environment. For example, the default search path or the default appearance of the command prompt can be defined by using the appropriate entries in the AUTOEXEC.BAT file. While Windows 95 itself does not need a CONFIG.SYS or AUTOEXEC.BAT file, compatibility is maintained with existing software or environments that may require one or both of these files.

Unlike Windows 3.1, Windows 95 is not dependent on real-mode operating system components for its interaction with the file system. However, the Windows 95 boot sequence does begin by loading real-mode operating system components that are compatible with MS-DOS. During the boot sequence, support for loading any real-mode drivers and TSRs that are identified in a CONFIG.SYS or AUTOEXEC.BAT file is processed. Because these drivers explicitly look for or use MS-DOS application support, the real-mode operating system components of Windows 95 help maintain compatibility with software that users already have on their system. After the real-mode drivers are loaded, Windows 95 begins loading the protect-mode operating system components. In some cases where a protect-mode Windows-based driver is provided, Windows 95 actually removes real-mode drivers from memory. More information about this subject is given later.

32-Bit Versus 16-Bit Components

To provide a good balance between delivering compatibility with existing applications and drivers, decreasing the size of the operating system working set, and offering improved system performance over Windows 3.1, Windows 95 uses a combination of 32-bit and 16-bit code. In general, 32-bit code is provided in Windows 95 to maximize the performance of the system, while 16-bit code balances the requirements for reducing the size of the system and maintaining compatibility with existing applications and drivers. System reliability is also improved without a cost in terms of compatibility or increased size.

The design of Windows 95 deploys 32-bit code wherever it significantly improves performance without sacrificing application compatibility. Existing 16-bit code is retained where it is required to maintain compatibility, or where 32-bit code would increase memory requirements without significantly improving performance. All of the I/O subsystems and device drivers in Windows 95, such as networking and file systems, are fully 32-bit, as are all the memory management and scheduling components (the kernel and virtual memory manager). Figure 26 depicts the relative distribution of 32-bit code versus 16-bit code present in Windows 95 for system-level services.

{fewc msdncd, EWGraphic, ux0d 0 /a "psD.bmp"}

Figure 26. The relative code distribution in Windows 95

As shown in the figure, the lowest-level services provided by the operating system kernel are provided as 32-bit code. Most of the remaining 16-bit code consists of hand-tuned assembly language, delivering performance that rivals some 32-bit code used by other operating systems available on the market today. Many functions provided by the Graphics Device Interface (GDI) have been moved to 32-bit code, including the spooler and printing subsystem, the font rasterizer, and the drawing operations performed by the graphics DIB engine. Much of the window management code (User) remains 16-bit to retain application compatibility.

In addition, Windows 95 improves upon the MS-DOS and Windows 3.1 environments by implementing many device drivers as 32-bit protected-mode code. Virtual device drivers in Windows 95 assume the functionality provided by many real-mode MS-DOS-based device drivers, eliminating the need to load them in MS-DOS. This technique results in a minimal conventional-memory footprint, improved performance, and improved reliability and stability of the system over MS-DOS-based device drivers.

A virtual device driver is a 32-bit, protected-mode driver that manages a system resource, such as a hardware device or installed software, so that more than one application can use the resource at the same time. To understand the improvements available in Windows 95 over the combination of MS-DOS and Windows 3.1, it helps to have a basic understanding of what virtual device drivers (VxDs) are and the role they play in the Windows 95 environment.

The term VxD refers to a general virtual device driver, with x representing the type of device driver. For example, VDD is a virtual device driver for a display device, a VTD is a virtual device driver for a timer device, a VPD is a virtual device driver for a printer device, and so on. Windows uses virtual devices to support multitasking for MS-DOS-based applications, virtualizing the different hardware components on the system to make it appear to each MS-DOS virtual machine (VM) that it is executing on its own computer. Virtual devices work in conjunction with Windows to process interrupts and carry out I/O operations for a given application without disrupting how other applications run.

Virtual device drivers support all hardware devices for a typical computer, including the programmable interrupt controller (PIC), timer, direct-memory-access (DMA) device, disk controller, serial ports, parallel ports, keyboard device, math coprocessor, and display adapter. A virtual device driver can contain the device-specific code needed to carry out operations on the device. A virtual device driver is required for any hardware device that has settable operating modes or retains data over any period of time. In other words, if the state of the hardware device can be disrupted by switching between multiple applications, the device must have a

corresponding virtual device. The virtual device keeps track of the state of the device for each application and ensures that the device is in the correct state whenever an application continues.

Although most virtual devices manage hardware, some manage only installed software, such as an MS-DOS device driver or a terminate-and-stay-resident (TSR) program. Such virtual devices often contain code that either emulates the software or ensures that the software uses only data applicable to the currently running application. ROM BIOS, MS-DOS, MS-DOS device drivers, and TSRs provide device-specific routines and operating system functions that applications use to indirectly access the hardware devices. Virtual device drivers are sometimes used to improve the performance of installed software—for example, the 80386 and compatible microprocessors can run the 32-bit protected-mode code of a virtual device more efficiently than the 16-bit real-mode code of an MS-DOS device driver or TSR. In addition, performance is enhanced by eliminating ring transitions that result in executing 32-bit applications that access 16-bit real-mode services, because with virtual device drivers, the system can stay in protected mode.

Windows 95 benefits from providing more device driver support implemented as a series of VxDs in the Windows environment, instead of using the device drivers previously available as real-mode MS-DOS device drivers. Functionality that was previously supported as MS-DOS device drivers but is now supported as VxDs in Windows 95 includes the following components:

n MS-DOS FAT file system

n SmartDrive

n

CD-ROM file system

n

Network card drivers and network transport protocols

n

Network client redirector and network peer server

n

Mouse driver

n

MS-DOS SHARE.EXE TSR

n

Disk device drivers including support for SCSI devices

n

DriveSpace (and DoubleSpace) disk compression

In summary, in Windows 95 VxDs provide the following advantages:

n

Improved performance as a result of a 32-bit code path and the

elimination or reduction of the need to switch between real and protected mode

n

Reduced conventional memory footprint by providing device driver and

TSR functionality as protected-mode components that reside in extended memory

n

Improved system stability and reliability compared to MS-DOS device

driver counterparts

Virtual device drivers in Windows 95 can be identified by .VXD extensions, and virtual device drivers from Windows 3.1 can be identified by .386 extensions.

The System Architecture Layout in Windows 95

Figure 27 illustrates the layout of the base system architecture for Windows 95. Components of the system are divided between Ring 0 and Ring 3 code, offering different levels of system protection. The Ring 3 code is protected from other running processes by protection services provided by the Intel processor architecture. The Ring 0 code consists of low-level operating system services such as the file system and the virtual machine manager.

```
{ewc msdncd, EWGraphic, ux0d 1 /a "psD.bmp"}
```

Figure 27. The integrated architecture of Windows 95, which supports running MS-DOS-based, Win16-based, and Win32-based applications

Figure 27 also depicts the way that MS-DOS-based, Win16-based, and Win32-based applications run in the system. The following section discusses the provisions that the system makes for running these applications.

Support for Win16-Based Applications

Win16-based (16-bit) applications run together within a unified address space and run in a cooperatively multitasking manner, as they do under Windows 3.1. Win16-based applications benefit from the preemptive multitasking of other system components, including the 32-bit print and communications subsystem and the improvements made in system robustness and protection from the system kernel in Windows 95.

Based on customer needs, resource needs, and market needs, three goals drove the architectural design of Win16-based application support: compatibility, size, and performance. Functionality adjustments, such as preemptively running Win16-based applications together in the Win16 subsystem or running Win16-based applications in separate VMs, were considered, but each of the options considered failed to meet the three design goals. The following discussion provides some insight into the architecture of Windows 95 as far as running Win16-based applications in a fast, stable, and reliable way is concerned.

First and foremost, Windows 95 needs to run existing Win16-based applications without modification. This factor is extremely important to existing users who want to

take advantage of the new functionality offered in Windows 95, such as 32-bit networking, but don't want to have to wait until new Windows 95-enabled applications are available on the market.

Windows 95 builds upon the Windows 3.1 platform to provide support for running existing Win16-based applications and using existing Windows-based device drivers, while providing support for the next generation of 32-bit applications and components. Windows 95 extends the Windows 3.1 architecture in areas that have little or no impact on compatibility, as well as enhances the architecture to deliver a faster, more powerful 32-bit operating system.

While many newer computer purchases are Intel 80486-based computers with 4 MB or 8 MB (or more) of memory, a high percentage of 80386DX-based computers with 4 MB of memory running Windows 3.1 are still in use. To support the needs of the market, Windows 95 must run on a base platform of an Intel 80386DX-based computer with 4 MB of RAM and provide access to its new features and functionality without requiring an upgrade of existing hardware or the addition of more RAM.

To meet its goals, Windows 95 is designed to occupy a working set of components no larger than Windows 3.1, thereby ensuring that any Win16-based application running at a perceived speed on a 4 MB or 8 MB (or greater) computer runs at the same (or higher) speed under Windows 95 without suffering any performance degradation. To meet the size goals of Windows 95, Win16-based applications run within a unified address space, resulting in little overhead beyond that required by Windows 3.1 to support the running of Windows-based applications. Running in a unified address space allows Windows 95 not only to fit on a 4 MB computer, but also to perform well. The architecture of Windows 95 includes innovative design features, such as dynamically loadable VxDs, to decrease the working set of components and memory requirements used by the operating system.

Meeting the size design goal (as well as meeting the compatibility goal) precluded the strategies of running Win16-based applications in a separate VM (by running a separate copy of Windows 3.1 on top of the operating system, which would involve paying a several megabyte "memory tax" for each application) as OS/2 does, or of emulating Windows 3.1 on top of the Win32 subsystem (which would also involve paying a "memory tax" for running Win16-based applications) as Windows NT does.

Running Win16-based applications in separate VMs is very expensive memory-wise. This strategy would require separate GDI, USER, and KERNEL code in each VM that is created, increasing the working set by as much as 2 MB for each Win16-based application that is running (as is the case with OS/2 for Windows). On a computer with 16 MB or more, this increase may not appear significant. However, bearing in mind the existing installed base of computers, running Win16-based applications in their own separate VMs in 4 MB of memory is impossible, and

running them in 8 MB with the level of performance observed and expected under Windows 3.1 is very difficult.

Users expect their existing Win16-based applications to run as fast as or faster than they do under Windows 3.1. Both Win16-based applications and MS-DOS-based applications benefit from the 32-bit architecture of Windows 95, including the increased use of 32-bit device driver components and 32-bit subsystems.

Win16-based applications run within a unified address space and interact with the system much as they do under Windows 3.1. Running Win16-based applications in separate VMs requires either mapping Win16 system components in each address space, as Windows NT does, or providing a separate copy of each system component in each address space, as OS/2 for Windows does. The additional memory overhead required for Win16 system components in each VM to run a Win16-based application has a negative impact on system performance.

Windows 95 balances the issue of system protection and robustness with the desire for better system performance and improves on the system robustness of Windows 3.1. The improvements in this area are briefly discussed in the next section and are described in greater detail in Chapter 5, "Robustness."

The support for running Win16-based applications provides protection of the system from other running MS-DOS-based applications or Win32-based applications. Unlike Windows 3.1, an errant Win16-based application cannot easily bring down the system or other running processes on the system. While Win32-based applications benefit the most from system memory protection, the robustness improvements in Windows 95 result in a more stable and reliable operating environment than Windows 3.1.

Win16-based applications run within a unified address space and cooperatively multitask as they do under Windows 3.1. The improvements made to overall system-wide robustness greatly enhance the system's ability to recover from an errant application, and improved cleanup of the system lessens the likelihood of application errors. General protection faults (GPFs) under Windows 3.1 are most commonly caused by an application overwriting its own memory segments, rather than by an application overwriting memory belonging to another application. Windows 3.1 did not recover gracefully when a Windows-based application crashed or hung. When a GPF caused the system to halt an application, the system commonly left allocated resources in memory, causing the system to degenerate.

Because of improved protection in Windows 95, an errant Win16-based application cannot easily bring down either the system as a whole or other running MS-DOS or

Win32-based applications. At most, it can impact other running Win16-based applications.

Other protection improvements include the use of separate message queues for each running Win32-based application. The use of a separate message queue for the Win16 address space and for each running Win32-based application provides better recovery of the system and doesn't halt the system if a Win16-based application hangs.

System robustness when running Win16-based applications under Windows 95 is greatly improved over Windows 3.1. Windows 95 now tracks resources allocated by Win16-based applications and uses the information to clean up the system after an application exits or ends abnormally, thus freeing up unused resources for use by the rest of the system.

Robustness improvements are discussed in Chapter 5, "Robustness."

Support for MS-DOS-Based Applications

Windows 95 includes many improvements over Windows 3.1 for running MS-DOS-based applications. As with Windows 3.1, each MS-DOS-based application runs in its own VM. A VM takes advantage of the Intel 80386 (and higher) architecture, which allows multiple 8086-compatible sessions to run on the CPU and thereby allows existing MS-DOS applications to run preemptively with the rest of the system. As with Windows 3.1, the use of virtual device drivers provides common regulated access to hardware resources, causing each application running in a VM to think that it is running on its own individual computer and allowing applications not designed to multitask to run concurrently with other applications.

Windows 95 provides a flexible environment for running MS-DOS-based applications. In Windows 3.1, users sometimes needed to exit Windows to run MS-DOS-based applications that were either ill behaved or required direct access to system resources. MS-DOS-based application compatibility is improved in Windows 95 to the point that almost all MS-DOS-based applications should run under Windows 95.

A detailed discussion of the improvements made to the support for running MS-DOS-based applications within the Windows environment is provided in Chapter 6, "Support for Running MS-DOS-based Applications."

In Windows, VMs are fully protected from one another, as well as from other

applications running on the system. This protection prevents errant MS-DOS-based applications from overwriting memory occupied or used by system components or other applications. If an MS-DOS-based application attempts to access memory outside of its address space, the system notifies the user and terminates the MS-DOS-based application.

System robustness is greatly improved when running MS-DOS-based applications in Windows 95. Robustness is discussed in Chapter 5, "Robustness."

Support for Win32-Based Applications

Win32-based applications can fully exploit and benefit significantly from the design of the Windows 95 architecture. In addition, each Win32-based application runs in its own fully protected, private address space. This strategy prevents Win32-based applications from crashing each other, from crashing running MS-DOS-based applications, from crashing running Win16-based applications, or from crashing the Windows 95 system as a whole.

Win32-based applications feature the following benefits over Win16-based applications in Windows 95 and over Windows 3.1:

n

Preemptive multitasking

n

Separate message queues

n

Flat address space

n

Compatibility with Windows NT

n

Long filename support

n

Memory protection

n

Robustness improvements

Unlike the cooperative multitasking used by Win16-based applications under

Windows 3.1, 32-bit Win32-based applications are preemptively multitasked in Windows 95. The operating system kernel is responsible for scheduling the time allotted for running applications in the system, and support for preemptive multitasking results in smoother concurrent processing and prevents any one application from utilizing all system resources without permitting other tasks to run.

Win32-based applications can optionally implement threads to improve the granularity at which they multitask within the system. The use of threads by an application improves the interaction with the user and results in smoother multitasking operation.

Under Windows 3.1, the system uses the point when an application checks the system message queue as the mechanism to pass control to another task, allowing that task to run in a cooperative manner. If an application doesn't check the message queue on a regular basis, or if the application hangs and thus prevents other applications from checking the message queue, the system keeps the other tasks in the system suspended until the errant application ends.

Each Win32-based application has its own message queue and is thus not affected by the behavior of other running tasks on their own message queues. If a Win16-based application hangs, or if another running Win32-based application crashes, a Win32-based application continues to run preemptively and can still receive incoming messages or event notifications.

Message queues are discussed in more detail in Chapter 5, "Robustness."

Win32-based applications benefit from improved performance and simpler construct because they can access memory in a linear fashion, rather than being limited to the segmented memory architecture used by MS-DOS and Windows 3.1. To provide a means of accessing high amounts of memory using a 16-bit addressing model, the Intel CPU architecture provides support for accessing 64K chunks of memory, called SEGMENTS, at a time. Applications and the operating system suffer a performance penalty under this architecture because of the manipulations required by the processor for mapping memory references from the segment/offset combination to the physical memory structure.

The use of a flat address space by the 32-bit components in Windows 95 and by Win32-based applications allows application and device driver developers to write software without the limitations or design issues inherent in the segmented memory architecture used by MS-DOS and Windows 3.1.

Win32-based applications that exploit Win32 APIs common to Windows 95 and Windows NT can run without modification on either platform on Intel-based computers. The commonality of the Win32 API provides a consistent programmatic interface and allows application developers to leverage a single development effort to deliver software that runs on multiple platforms. It also provides scalability of applications and broadens the base of platforms available for running ISV or custom applications with minimal additional effort.

Application developers are encouraged to develop applications either under Windows 95 or under Windows NT and to test compatibility on both platforms.

Win32-based applications that call the file I/O functions supported by the Win32 API benefit from the ability to support and manipulate filenames of up to 255 characters with no additional development effort. To ease the burden of the application developer, the Win32 APIs and common dialog support handle the work of manipulating long filenames, and the file system provides compatibility with MS-DOS and other systems by automatically maintaining the traditional 8.3 filename.

Each Win32-based application runs in its own private address and is protected by the system from other applications or processes that are running in the system. Unlike errant Win16-based applications under Windows 3.1, errant Win32-based applications under Windows 95 end only themselves, instead of bringing down the entire system if they attempt to access memory belonging to another application.

The use of separate message queues for Win32-based applications also ensures that the system continues to run if an application hangs or stops responding to messages or events.

Win32-based applications benefit from the highest level of system robustness supported under Windows 95. Resources allocated for each Win32-based application are tracked on a per-thread basis and are automatically freed when the application ends. If an application hangs, users can perform a LOCAL REBOOT operation to end the hung application without affecting other running tasks, and the system then cleans up properly.

Detailed information about robustness enhancements is given in Chapter 5, "Robustness."

The file system in Windows 95 has been redesigned to support the characteristics and needs of the multitasking nature of its kernel. The changes present in Windows 95 provide many benefits to users and have the following results:

n

Improved ease of use. Ease of use is improved by the support of long

filenames because users no longer need to reference files by the MS-DOS 8.3 filename structure. Instead they can use up to 255 characters to identify their documents. Ease of use is also improved by hiding the filename extensions.

n

Improved performance. As in Windows for Workgroups 3.11, file I/O

performance is improved dramatically over Windows 3.1 by featuring 32-bit protected-mode code for reading information from and writing information to the file system, reading from and writing to the disk device, and intelligent 32-bit caching mechanisms (a full 32-bit code path is available from the file system to the disk device).

n

Improved system stability and reliability. File system components

implemented as 32-bit protected-mode device drivers offer improved system stability and reliability over their MS-DOS device driver counterparts because they can remain in protected mode for code execution and because they leverage existing driver technology first implemented in Windows NT and also available in Windows for Workgroups 3.11.

Windows 95 features a layered file system architecture that supports multiple file systems and provides a protected mode path from the application to the media device, resulting in improved file and disk I/O performance over Windows 3.1. The following features are included in the new file system architecture:

n

Win32 API support

n

Long filename support

n

32-bit FAT file system

n

32-bit CD-ROM file system

n

Dynamic system cache for file and network I/O

n

Open architecture for future system support

n

Disk device driver compatibility with Windows NT

Figure 28 depicts the file system architecture used by Windows 95.

`{ewc msdn cd, EWGraphic, ux0d 2 /a "psD.bmp"}`

Figure 28. The file system architecture

The file system architecture in Windows 95 is made up of the following components:

n

Installable File System (IFS) Manager. The IFS Manager is responsible for
arbitrating access to different file system components.

n

File system drivers. The file system drivers layer includes access to file

allocation table (FAT)-based disk devices, CD-ROM file systems, and redirected
network device support.

n

Block I/O subsystem. The block I/O subsystem is responsible for interacting with the physical disk device.

Components of each of these layers are examined in the next three sections.

Under MS-DOS and Windows 3.1, the MS-DOS Int 21h interrupt is responsible for providing access to the file system to manipulate file information on a disk device. To support redirected disk devices, such as a network drive or a CD-ROM drive, other system components, such as the network redirector, would hook the Int 21h function so that it could examine a file system request to determine whether it should handle the request or the base file system should. Although this mechanism provided the ability to add additional device drivers, some add-on components were ill behaved and interfered with other installed drivers.

Another problem with the MS-DOS based file system was the difficulty in supporting the loading of multiple network redirectors to provide concurrent access to different network types. Windows for Workgroups provided support for running the Microsoft network redirector at the same time as an additional network redirector, such as Novell NetWare, Banyan VINES, or SUN PC-NFS. However, support for running more than two network redirectors at the same time was not provided.

The key to friendly access to disk and redirected devices in Windows 95 is the Installable File System (IFS) Manager. The IFS Manager is responsible for arbitrating access to file system devices, as well as other file system device components.

Windows 95 includes support for the following file systems:

n

32-bit file allocation table (VFAT) driver

n

32-bit CD-ROM file system (CDFS) driver

n

32-bit network redirector for connectivity to Microsoft network servers,

such as Windows NT Server, along with a 32-bit network redirector to connect to Novell NetWare servers

In addition, third parties will use the IFS Manager APIs to provide a clean way of concurrently supporting multiple device types and adding additional disk device support and network redirector support.

[The 32-Bit Protected Mode FAT File System](#)

The 32-bit VFAT driver provides a 32-bit protected mode code path for manipulating the file system stored on a disk. It is also re-entrant and multithreaded, providing smoother multitasking performance. The 32-bit file access driver is improved over that provided originally with Windows for Workgroups 3.11 and is compatible with more MS-DOS device drivers and hard disk controllers.

Benefits of the 32-bit file access driver over MS-DOS-based driver solutions include the following:

n

Dramatically improved performance and real-mode disk caching

n

No conventional memory used (replacement for real-mode SmartDrive)

n

Better multitasking when accessing information on disk with no blocking

n

Dynamic cache support

Under MS-DOS and Windows 3.1, manipulation of the FAT and writing to or reading from the disk is handled by the Int 21h MS-DOS function and is 16-bit real-mode code. Being able to manipulate the disk file system from protected mode removes or reduces the need to transition to real mode in order to write information to the disk through MS-DOS, which results in a performance gain for file I/O access.

The 32-bit VFAT driver interacts with the block I/O subsystem to provide 32-bit disk access to more device types than are supported by Windows 3.1. Support is also provided for mapping to existing real-mode disk drivers that may be in use on a user's system. The combination of the 32-bit file access and 32-bit disk access drivers results in significantly improved disk and file I/O performance.

The 32-Bit Cache

The 32-bit VFAT works in conjunction with a 32-bit protected-mode cache (VCACHE) driver and replaces and improves on the 16-bit real-mode SmartDrive disk cache software provided with MS-DOS and Windows 3.1. The VCACHE driver features a more intelligent algorithm for caching information read from or written to a disk drive than SmartDrive, and results in improved performance when reading information from cache. The VCACHE driver is also responsible for managing the cache pool for the CD-ROM File System (CDFS) and the provided 32-bit network redirectors.

Another big improvement VCACHE provides over SmartDrive is that the memory pool used for the cache is dynamic and is based on the amount of available free system memory. Users no longer need to statically allocate a block of memory to set aside as a disk cache because the system automatically allocates or deallocates memory used for the cache based on system use. Because of intelligent cache use, the performance of the system also scales better than with Windows 3.1 or Windows for Workgroups 3.11.

The 32-Bit Protected-Mode CD-ROM File System

The 32-bit protected-mode CD-ROM file system (CDFS) implemented in Windows 95 provides improved CD-ROM access performance over the real-mode MSCDEX driver in Windows 3.1 and is a full 32-bit ISO 9660 CD file system. The CDFS driver replaces the 16-bit real-mode MSCDEX driver and features 32-bit protected-mode caching of CD-ROM data. The CDFS driver cache is dynamic and shares the cache memory pool with the 32-bit VFAT driver, requiring no configuration or static allocation on the part of the user.

Benefits of the new 32-bit CDFS driver include the following:

n

No conventional memory used (replaces real-mode MSCDEX)

n

Improved performance over MS-DOS-based MSCDEX and real-mode

cache

n

Better multitasking when accessing CD-ROM information, with no blocking

n

Dynamic cache support to provide a better balance between providing

memory to run applications versus memory to serve as a disk cache

If MSCDEX is specified in the AUTOEXEC.BAT, the 32-bit CDFS driver takes over the role played by the MSCDEX driver and communicates with the CD-ROM device. The use of MSCDEX is no longer necessary under Windows 95.

Users of CD-ROM multimedia applications benefit greatly from the new 32-bit CDFS. Their multimedia applications run smoother and information is read from the CD-ROM quicker, providing improved performance.

The block I/O subsystem in Windows 95 improves upon the 32-bit disk access fast-disk device architecture in Windows 3.1 and therefore improves performance for the entire file system and a broader array of device support.

As shown in Figure 29, the components of the block I/O subsystem include the high-level I/O Supervisor (IOS) layer, which provides an interface to the block I/O subsystem for the higher layer components; the port driver, which represents a monolithic disk device driver; the SCSI layer, which provides a standard interface and driver layer to provide device-independent control code for SCSI devices; and the SCSI mini-port driver, which contains the device-dependent control code responsible for interacting with individual SCSI controllers.

`{ewc msdncd, EWGraphic, ux0d 3 /a "psD.bmp"}`

Figure 29. The architecture of the block I/O subsystem

The block I/O subsystem provides the following support in Windows 95:

n

A fully Plug and Play enabled architecture

n

Support for mini-port drivers that are binary compatible with Windows NT

n

Support for Windows 3.1 fast disk drivers for backward compatibility

n

Protected-mode drivers that take over real-mode MS-DOS device drivers

when safe to do so

n

The ability to support existing MS-DOS real-mode disk device drivers for

compatibility

The following sections examine the different areas that make up the block I/O subsystem. The explanations are provided to facilitate an understanding of the

components, bearing in mind that the configuration of the disk device driver layers is isolated from the user.

[The I/O Supervisor](#)

The I/O Supervisor (IOS) provides services to file systems and drivers. The IOS is responsible for the queuing of file service requests and for routing the requests to the appropriate file system driver. The IOS also provides asynchronous notification of file system events to installed drivers.

[The Port Driver](#)

The port driver is a monolithic 32-bit protected-mode driver that communicates with a specific disk device, such as a hard disk controller. This driver is specifically for use with Windows 95 and resembles the 32-bit disk access (fast disk) driver used in Windows 3.1, such as the WDCTRL driver used for Western Digital compatible hard disk controllers. In Windows 95, the driver that communicates with IDE/ESDI hard disk controllers and floppy disk controllers is implemented as a port driver. A port driver provides the same functionality as the combination of the SCSI manager and the mini-port driver.

[The SCSI Layer](#)

The SCSI layer applies a 32-bit protected-mode universal driver model architecture to communication with SCSI devices. The SCSI layer provides all the high-level functionality that is common to SCSI-like devices and then uses a mini-port driver to handle device-specific I/O calls. The SCSI Manager is part of this system and provides compatibility support for using Windows NT mini-port drivers.

[The Mini-Port Driver](#)

The mini-port driver model used in Windows 95 simplifies the task of writing device drivers for disk device hardware vendors. Because the SCSI Stub provides the high-level functionality for communicating with SCSI devices, disk device hardware vendors need to create only a mini-port driver that is tailored to their own disk device. The mini-port driver for Windows 95 is 32-bit protected-mode code and is binary compatible with Windows NT mini-port drivers, another factor that simplifies the task of writing device drivers. Binary compatibility with NT also results in a more stable and reliable device driver because hardware vendors need to maintain only one code base for device support. Users of Windows 95 also benefit because many mini-port drivers are already available for Windows NT.

[Support for IDE, ESDI, and SCSI Controllers](#)

Through the use of either a port driver or a mini-port driver, support for a broad array of disk devices will be available for Windows 95, including popular IDE, ESDI, and SCSI disk controllers. Users won't have to decide whether to use a port driver or a mini-port driver because the driver is provided by the hardware vendor and configuration of the driver is handled by the Windows 95 system.

[The Real-Mode Mapper](#)

To provide binary compatibility with real-mode MS-DOS-based disk device drivers for which a protected-mode counterpart does not exist in Windows 95, the block I/O subsystem provides a mapping layer to allow the protected-mode file system to communicate with a real-mode driver as if it were a protected-mode component. The layers above and including this real-mode mapper (RMM) are protected-mode code, and the real-mode mapper translates file I/O requests from protected mode to real mode so that the MS-DOS device driver can perform the desired read or write operation from or to the disk device. An example of when the real-mode mapper would come into play is when real-mode disk compression software is running and a protected-mode disk compression driver is not available.

The use of long filenames of up to 255 characters in Windows 95 overcomes the sometimes cryptic 8.3 MS-DOS filename convention and allows more user-friendly filenames. MS-DOS 8.3 filenames are maintained and tracked by the system to provide compatibility with existing Win16-based and MS-DOS-based applications that manipulate only 8.3 filenames, but as users migrate to Win32-based applications, the use of 8.3 filename conventions is hidden from the user.

Long filenames are supported by extending the MS-DOS FAT file system and using bits and fields that were previously reserved by the operating system to add special directory entries that maintain long filename information. Extending the MS-DOS FAT layout, rather than creating a new format, allows users to install and use Windows 95 on existing disk formats without having to change their disk structure or reformat their drives. This implementation provides ease of use and allows future growth while maintaining backward compatibility with existing applications.

Because Windows 95 simply extends the FAT structure, long filenames are supported on disks as well as hard disks. If a file on a disk that has a long filename is viewed on a computer that is not running Windows 95, only the 8.3 filename representation is seen.

Figure 30 shows a disk directory with long filenames (shown graphically in Figure 14) and their corresponding 8.3 filename mappings on a computer running Windows 95.

Volume in drive C is MY HARDDISK

Volume Serial Number is 1E30-830F
Directory of C:\Long Filename Directory

```
.<DIR>07-11-94 10:02a .  
..<DIR>07-11-94 10:02a ..  
4THQUART XLS147 05-11-94 12:25a 4th Quarter Analysis.xls  
BOSS'SBI TXT147 05-11-94 12:25a Boss's birthday card.txt  
1994FINA DOC147 05-11-94 10:35a 1994 Financial Projections.doc  
FISCALYE<DIR>07-11-94 10:02a Fiscal Year Information  
COMPANYL BMP478 03-27-94 12:00a Company Logo.bmp  
SHORTC~2 PIF967 02-16-95 4:55p Shortcut to MS-DOS-  
Application.pif  
NEWWAVES WAV0 06-14-94 1:14p New Wave Sound.wav  
NEWVID~1 AVI0 06-14-94 1:15p New video.avi  
DIRECTIO DOC147 05-11-94 12:25a Directions to company picnic.doc  
8 file(s)2,033 bytes  
3 dir(s)134,643,712 bytes free
```

Figure 30. A directory listed from the command prompt, showing both 8.3 and long filenames

[Support for Existing Disk Management Utilities](#)

For existing disk management utilities to recognize and preserve long filenames, utility vendors need to revise their software products. Microsoft is working closely with utilities vendors and is documenting long filename support and its implementation as an extension to the FAT format as part of the Windows 95 Software Development Kit (SDK).

Existing MS-DOS-based disk management utilities that manipulate the FAT format, including disk defragmenters, disk bit editors, and some tape backup software, may not recognize long filenames as used by Windows 95 and may destroy long filename entries in the FAT format. However, no data is lost if the long filename entry is destroyed because the corresponding system-defined 8.3 filename is preserved.

Like Windows 3.1, Windows 95 uses file extensions to associate a given file type with an application. However, to make it easier to manipulate files, file extensions are hidden from users in the Windows 95 shell and in the Windows Explorer, and instead, icons are used in the UI in Windows 95 to differentiate the documents associated with different applications. Information about file type associations is stored in the Registry, and the associations are used to map a given file with the icon that represents the document type. (For compatibility reasons, Windows 95 must track filename extensions for use with existing MS-DOS and Win16-based applications.)

In addition to hiding filename extensions in the Windows 95 shell and the Windows Explorer, application developers can hide filenames from users in their applications. Mechanisms for hiding filenames are documented in the Windows 95 SDK. A good Windows 95 application makes use of these mechanisms for handling files to be consistent with the rest of the Windows 95 environment.

To further enhance the file system, Windows 95 maintains additional date/time attributes for files that MS-DOS does not track. Windows 95 tracks the date/time when a new file was created, the date/time when a file was modified, and the date when a file was last opened. These file attributes are displayed in the file's property sheet, as shown in Figure 31.

```
{ewc msdncd, EWGraphic, ux0d 4 /a "psD.bmp"}
```

Figure 31. The properties for a file, showing the new file date/time attributes

Utilities vendors can take advantage of this additional date/time information to provide enhanced backup utilities—for example, to use a better mechanism when determining whether a given file has changed.

MS-DOS has traditionally used the local time of the computer as the time stamp for the directory entry of a file, and continues to use local time for files stored on the local system. However, Windows 95 supports the use of the coordinated universal time (UTC) format for accessing or creating information on network file servers. This format provides the superior, more universal tracking of time information required by networks that operate across time zones.

Disk management utilities, such as disk defragmenters, sector editors, and disk compression utilities, don't get along well with Windows 3.1. File system programs, such as CHKDSK and DEFRAG, require exclusive access to the file system to minimize the disk access complexities that are present in a multitasking environment where disk I/O occurs. For example, without exclusive access to the disk, data corruption might occur if a user requests that a disk operation move information on the disk at the same time that another task is accessing that information or writing other information to disk. However, Windows 3.1 and MS-DOS do not provide a means of controlling access to the disk, so users have been forced to exit Windows and enter MS-DOS to run disk management utilities.

The file system in Windows 95 has been enhanced to support the use of Windows—

based disk management utilities by permitting exclusive access to a disk device. Exclusive disk access is handled as part of the file system through a new API mechanism and can be used by utilities vendors to write Windows-based disk management utilities. Microsoft is encouraging third-party utilities vendors to use this API mechanism to move existing MS-DOS-based utilities to Windows, and is also using it to deliver disk management utilities as part of Windows 95.

For example, this mechanism is used by the Disk Defragmenter (Optimizer) utility delivered as part of Windows 95. Unlike the disk defragment utility used under the combination of MS-DOS and Windows 3.1, the Disk Defragmenter in Windows 95 can be run from the Windows 95 shell and can even be run in the background while users continue to work on their systems.

DriveSpace Disk Compression

Windows 95 provides built-in support for DriveSpace disk compression. Compatible with DoubleSpace and DriveSpace disk compression provided with MS-DOS, Windows 95 provides base compression in the form of a 32-bit virtual device driver that delivers improved performance over previously available real-mode compression drivers and frees conventional memory for use by MS-DOS-based applications. Users of MS-DOS-based DoubleSpace and DriveSpace don't need to change their existing compressed volume file (CVF) and thus don't need to take any special actions when they install Windows 95.

As shown in Figure 32, the DriveSpace disk compression tool provided with Windows 95 is GUI-based and provides the ability to compress a physical hard drive or removable floppy drive. The Compress a Drive dialog box, shown in Figure 33, graphically depicts the amount of free space available before compression and the estimated space available after compression.

{ewc msdncd, EWGraphic, ux0d 5 /a "psD.bmp"}

Figure 32. The DriveSpace disk compression tool

{ewc msdncd, EWGraphic, ux0d 6 /a "psD.bmp"}

Figure 33. The Compress a Drive dialog box, which graphically displays free space

System Capacity Improvements

Windows 95 provides better system capacity for running MS-DOS and Win16-based applications than Windows 3.1. A number of internal enhancements to the base system prevent internal system resources from being exhausted as quickly as was possible when running multiple Windows-based applications under Windows 3.1.

Many of the artificial limitations present in Windows 3.1 were due to its architecture

or internal data structures, which were in turn largely due to the fact that Windows 3.1 had to run on an Intel 80286-based computer. These limitations have for the most part been overcome in Windows 95, to the benefit of users as well as ISVs and other developers.

Many users have encountered OUT OF MEMORY error messages when running multiple Windows-based applications under Windows 3.1, even though the system still reports several megabytes of available free memory. Typically these messages were displayed because the system could not allocate an internal memory resource in a Windows API function call due to lack of available space in a region of memory called a HEAP.

Windows 3.1 maintains heaps for system components called GDI and USER. Each heap is 64 KB in size and is used for storing GDI or memory OBJECT information allocated when an application calls a Windows API function. The amount of space available in the combination of these two heaps is identified as the percentage of system resources that are free and is displayed in the About dialog box in Program Manager and other Windows applications, as shown in Figure 34.

`{ewc msdncd, EWGraphic, ux0d 7 /a "psD.bmp"}`

Figure 34. The About dialog box in Program Manager in Windows 3.1, showing free system resources

The percentage of free system resources displayed in the About dialog box is calculated using an internal algorithm to represent the aggregate percentage of free memory in the GDI and USER heaps. When the free system resources percentage gets too low, users commonly see an OUT OF MEMORY error message, even though the amount of free memory shown in the About dialog box is still quite high. This error can result from low memory in either the GDI or USER heap (or both).

To help reduce the system resource limitation, a number of the data structures stored in the 16-bit GDI and USER heaps in Windows 3.1 have been moved out of these heaps and stored in 32-bit heaps, providing more room for the remaining data elements to be created. As a result, system resources decrease less rapidly in Windows 95 than they did in Windows 3.1.

For compatibility, not all objects were removed from the 16-bit GDI or USER heap and placed in a 32-bit heap. For example, some Windows-based applications manipulate the contents of the GDI heap directly, bypassing the published API mechanisms for doing so, because their developers think direct manipulation increases performance. However, because these applications bypass the Windows API mechanisms, moving their data from the existing heap structures and placing them in 32-bit heaps would cause these applications to fail because of memory access violations.

Win16-based and Win32-based applications use the same GDI and USER heaps. The impact of removing selected items from the heaps was closely examined and objects were selected based on the biggest improvement that could be achieved while affecting the fewest number of applications. For example, the GDI heap can quickly become full because of the creation of memory-intensive region objects that are used by applications for creating complex images and by the printing subsystem for generating complex output. Region objects were removed from the 64 KB 16-bit GDI heap and placed in a 32-bit heap, benefiting graphic-intensive applications and providing for the creation of more smaller objects by the system. Windows 95 improves the system capacity for the USER heap by moving menu and window handles to the 32-bit USER heap. Instead of the total limit of 200 for these data structures in Windows 3.1, Windows 95 allows 32,767 menu handles and an additional 32,767 window handles PER PROCESS rather than system-wide.

In addition to moving information from the GDI and USER heaps, robustness improvements in Windows 95 that facilitate system cleanup of unfreed resources also relieve system resource limitations. When Windows 95 determines that the owner and other ended processes no longer need the resources in memory, Windows 95 cleans up and deallocates leftover data structures. The robustness improvements in Windows 95 are discussed in Chapter 5, "Robustness."

Better Memory Management

Windows 95 improves addressability to provide better access to physical memory, as well as improves upon the swapfile implementation provided in Windows 3.1 to support virtual memory supplementation of physical memory.

To support a 16-bit operating environment, the Intel processor architecture uses a mechanism, called SEGMENTS, to reference memory by using a 16-bit segment address and a 16-bit offset address within the segment. A segment is 64 KB in size, and applications and the operating system pay a performance penalty when they access information across segments. For 32-bit operating system functionality and Win32-based applications, Windows 95 addresses this issue by using the 32-bit capabilities of the Intel 80386 (and above) processor architecture to support a flat, linear memory mode. A linear addressing model simplifies the development process for application developers, removes the performance penalties imposed by the segmented memory architecture, and provides access to a virtual address space that permits the addressing of up to 4 GB (4 gigabytes, or 4 billion bytes) of memory. Windows 95 uses the flat memory model internally for 32-bit components and virtual device drivers.

Windows 95 uses the same memory model architecture as Windows NT, providing high-end operating system functionality for the mainstream system. Windows 95 allows full use of the 4 GB of addressable memory space to support even the largest desktop application. The operating system provides a 2 GB memory range for applications and reserves a 2 GB range for itself.

Windows 95 addresses problems and limitations imposed in Windows 3.1 by its virtual memory swapfile implementation. With Windows 3.1, users were faced with a myriad of choices and configuration options for setting up a swapfile to support virtual memory. They had to decide whether to use a temporary swapfile or a permanent swapfile, how much memory to allocate to the swapfile, and whether to use 32-bit disk access to access the swapfile. A temporary swapfile did not need to be contiguous, and Windows would dynamically allocate hard disk space when it was started and free up the space when it was terminated. A permanent swapfile provided the best performance, but it had to be contiguous, had to be set up on a physical hard disk, and was statically specified by the user and not freed up when the user exited Windows.

The swapfile implementation in Windows 95 simplifies the configuration task for the user and, because of improved virtual memory algorithms and access methods, combines the best of a temporary swapfile and a permanent swapfile. The swapfile in Windows 95 is dynamic and can shrink or grow based on the operations performed on the system. The swapfile can occupy a fragmented region of the hard disk and it can be located on a compressed disk volume.

Windows 95 uses intelligent system defaults for the configuration of virtual memory, relieving the user of the task of changing virtual memory settings. Figure 35 shows the simplified virtual memory configuration settings.

`{ewc msdncd, EWGraphic, ux0d 8 /a "psD.bmp"}`

Figure 35. The simplified virtual memory settings

The Registry: A Centralized Configuration Store

Windows 95 uses a mechanism called the REGISTRY to serve as the central configuration store for user, application, and computer-specific information. The Registry solves problems associated with the .INI files used in Windows 3.1 and is a hierarchical database that stores system-wide information in a single location, making it easy to manage and support.

Windows 3.1 uses initialization (.INI) files to store system-specific or application-specific information about the state or configuration of the system. For example, the WIN.INI file stores state information about the appearance or customization of the Windows environment; the SYSTEM.INI file stores system-specific information on the hardware and device-driver configuration of the system; and various .INI files, such as WINFILE.INI, MSMAIL.INI, CLOCK.INI, CONTROL.INI, and PROGMAN.INI, store application-specific information about the default state of an application.

Problems with .INI files under Windows 3.1 for configuration management include the following:

n

Information is stored in several different locations, including CONFIG.SYS,

AUTOEXEC.BAT, WIN.INI, SYSTEM.INI, PROTOCOL.INI, private .INI files, and private .GRP files.

n

.INI files are text-based and limited in total size to 64KB, and APIs allow

for get/write operations only.

n

Information stored in .INI files is non-hierarchical and supports only two

levels of information: key names broken up by section headings.

n

Many .INI files contain a myriad of switches and entries that are complicated to configure or are used only by operating system components.

n

.INI files provide no mechanism for storing user-specific information, thus making it difficult for multiple users to share a single computer.

n

Configuration information in .INI files is local to each system, and because no API mechanisms are available for remotely managing configuration, managing multiple systems is difficult.

To solve these problems, the Registry was designed with the following goals in mind:

n

Simplify the support burden.

n

Centralize configuration information.

n

Provide a means to store user, application, and computer-specific information.

n

Provide local and remote access to configuration information.

The Registry is structured as a database of keys in which each key can contain a value or other keys (subkeys). As shown in Figure 36, the Registry uses a hierarchical structure to store text or binary value information and maintains all of the configuration parameters normally stored in the Windows system .INI files such as WIN.INI, SYSTEM.INI, and PROTOCOL.INI. Although similar in some ways to the Registration Database used in Windows 3.1, which served as a central repository for file associations and OLE registration information, the Registry in Windows 95 extends the Registration Database structure to support keys that can have more than one value and also support data of different types.

`{ewc msdn cd, EWGraphic, ux0d 9 /a "psD.bmp"}`

Figure 36. The hierarchy of the Registry, as displayed by the Registry Editor

The Registry is made up of several .DAT files that contain system-specific information (SYSTEM.DAT) or user-specific information (USER.DAT). System-specific information, such as the static reference to loading virtual device drivers, is moved as appropriate from the SYSTEM.INI file to the Registry.

System Switch Simplification

Another improvement in Windows 95 over the Windows 3.1 use of .INI files is related to system switch simplification. Windows 3.1 supports several hundred different configuration switches that can be specified in system .INI files, including WIN.INI and SYSTEM.INI. With intelligent enhancements made to the system and better dynamic configuration properties, Windows 95 has reduced the number of entries normally associated with .INI files. These reductions didn't result from simply moving .INI entries to the Registry but by examining and justifying the presence of each and every one.

Like CONFIG.SYS and AUTOEXEC.BAT, WIN.INI and SYSTEM.INI and application-specific .INI files still exist for compatibility reasons. The Win16 APIs for manipulating .INI files still manipulate .INI files, but developers of Win32-based applications are encouraged to use the Registry APIs to consolidate application-specific information.

Many existing Win16-based applications expect to find and manipulate the WIN.INI and SYSTEM.INI files to add entries or load unique device drivers, so Windows 95 examines .INI files during the boot process. For example, the [386Enh] section of SYSTEM.INI is checked for virtual device drivers during start up.

One of the primary roles of the Registry in Windows 95 is to serve as a central repository for hardware-specific information for use by the Plug and Play system components. Windows 95 maintains information about hardware components and devices that have been identified through an enumeration process in the hierarchical structure of the Registry. When new devices are installed, the system checks the existing configuration in the Registry to determine which hardware resources—for example, IRQs, I/O addresses, DMA channels, and so on—are not being used, so that the new device can be properly configured without conflicting with a device already installed in the system.

Another advantage of the Registry for Win32-based applications is that many of the Win32 Registry APIs use the remote procedure call (RPC) mechanism in Windows 95 to provide remote access to Registry information across a network. As a result, desktop management applications can be written to aid in the management and support of Windows-based computers, and the contents of the Registry on a given PC can be queried over a network. Industry management mechanisms, such as SNMP or DMI, can easily be integrated into Windows 95, simplifying the management and support burden of an MIS organization. For more information

about manageability and remote administration, see Chapter 9, “Networking.”

Better Font Support

Font support in Windows 95 has been enhanced to provide better integration with the UI and has been optimized for the 32-bit environment.

The rasterizer component for rendering and generating TrueType fonts is enhanced in Windows 95. The rasterizer is written as a 32-bit component, and delivers better fidelity from the mathematical representation to the generated bitmap, as well as better performance for rendering TrueType fonts.

In addition to performance enhancements, the new 32-bit rasterizer provides support for generating complicated glyphs—for example, Han—and results in a faster initial boot time in Windows 95 than in Windows 3.1 when many fonts are installed.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 5: Robustness

Windows 95 improves on the robustness of Windows 3.1 to provide great support for running MS-DOS-based, Win16-based, and Win32-based applications, and to provide a high level of system protection from errant applications.

Windows 3.1 provided a number of mechanisms to support a more robust and stable environment over Windows 3.0, including the following:

n

Better resource clean-up. When an MS-DOS-based or Windows-based application crashed, users could continue running in a way that allowed them to save their work.

n

Local reboot. Users could shut down an application that hung.

n

Parameter validation for API calls. The system could catch many common application errors and fail the API call, rather than allow bad data to be passed to an API.

Just as the improvements in Windows 3.1 provided a more robust and stable environment than Windows 3.0, the improvements in Windows 95 provide an even better environment.

System-Wide Robustness Improvements

System-wide improvements resulting in a more robust operating system

environment than Windows 3.1 include:

n

Better local reboot

n

Virtual device driver thread clean-up when a process ends

n

Per-thread state tracking

n

Virtual device driver parameter validation

The capability whereby users can end an application or VM that hangs is called a LOCAL REBOOT. With Windows 3.1, users could perform a local reboot by pressing the three-key CTRL+ALT+DEL combination. Users could pretty easily end errant VMs with a local reboot request, but a local reboot request for a Windows-based application often didn't end the errant Windows-based process or brought the entire system down.

Windows 95 greatly improves the local reboot support by providing a means to end

an MS-DOS-based application running in a VM, a Win16-based application, or a Win32-based application without bringing down the entire system. Moreover, the process of cleaning up the system after a local reboot is now more complete than for Windows 3.1. (This process is described later in this chapter.)

In Windows 3.1, when a user requests a local reboot, the system may identify the active application as the application that has the focus of the local reboot request, or it may report back that there is no application in a hung or inactive state. In Windows 95, the system displays the Close Program dialog box, which identifies the tasks that are running and the state that the system perceives each one to be in, as shown in Figure 37. This level of detail affords the user much more flexibility and control over the local reboot than with Windows 3.1.

`{ewc msdncd, EWGraphic, ux0e 0 /a "psE.bmp"}`

Figure 37. The Close Program dialog box

Applications are identified as “not responding” when they haven’t checked the message queue for a period of time. Although some applications don’t check the message queue while performing computationally intensive operations, well-behaved applications check the message queue frequently. In Windows 95, as in Windows 3.1, Win16-based applications must check the message queue to relinquish control to other running tasks.

[Try It!](#)

Perform a Local Reboot

1. With a couple of applications running, press CTRL+ALT+DEL. You are presented with a list of active applications. Applications that are hung are identified as NOT RESPONDING.
2. Terminate one of the tasks by clicking END TASK.

Local reboot support is also aided by improved VxD thread clean-up when a given process ends. With Windows 3.1, the system often couldn’t recover either if it was running real-mode code, such as BIOS routines, when an application ended abnormally, or if the user requested a local reboot to end a seemingly hung application. For example, if an operation (such as a network operation in real-mode, a disk I/O, or an asynchronous application request) ended abnormally because of another application-based error, Windows 3.1 sometimes couldn’t clean up properly to free allocated resources and sometimes couldn’t even return control to the user.

Windows 95 improves system clean-up by providing each system VxD with the

ability to track the resources it allocates on a per-thread basis. Because most computer system functionality and support is handled in Windows 95 by VxDs rather than by real-mode code or BIOS routines, Windows 95 can recover from errors or situations that, under Windows 3.1, would require that the computer be rebooted.

When Windows 95 ends a given thread (because the user exited the application, a local reboot was requested, or the application ended abnormally), each VxD receives notification that the thread is ended. This notification allows the VxD to safely cancel any operations it is waiting to finish and frees any resources that the VxD previously allocated for the thread or application. Because the system tracks each VM, Win16-based application, and Win32 thread as a separate per-thread instance, the system can clean up properly at each of these levels, without affecting the integrity of the system.

To aid in system clean-up, resource tracking in Windows 95 is much better than in Windows 3.1. In addition to tracking resources on a per-thread basis by system VxDs, resources such as memory blocks, memory handles, graphics objects, and other system items are allocated and also tracked by system components on a per-thread basis. Tracking these resources on a per-thread basis allows the system to clean up safely when a given thread ends, either normally—at the user's request—or abnormally. Resources are identified and tracked by both a thread ID and the major Windows version number that is stored in the .EXE header of the application.

For a discussion of how the thread ID and the Windows version number are used to facilitate clean-up of the system and recovery of allocated resources for Win16-based and Win32-based applications, see the robustness sections for Win16-based and Win32-based applications later in this chapter.

Virtual device drivers are an integral part of the Windows 95 operating system and have a more important role than in Windows 3.1, because many operating system components are implemented as VxDs. To help provide a more stable and reliable operating system, Windows 95 provides support for parameter validation of virtual device drivers, which was not available for Windows 3.1. The debug version of Windows 95 system files provided as part of the Windows 95 SDK and Windows 95 DDK can be used by VxD developers to debug their VxDs during the course of development, ensuring that their VxDs are stable and robust.

In addition to improving system-wide robustness, Windows 95 provides improved robustness for running MS-DOS-based, Win16-based, and Win32-based applications, which also ensures that Windows 95 is a more stable and reliable environment than Windows 3.1.

Robustness for MS-DOS-Based Applications

Because of improved support, users can run MS-DOS-based applications under Windows 95 that they could not run under Windows 3.1. Several improvements that provide great robustness for running MS-DOS-based applications are described in the next two sections.

Each MS-DOS-based application runs in a separate VM and is configured by default to execute preemptively and run in the background when another application is active. Each VM is protected from other tasks running in the system, so an errant Win16-based or Win32-based application can't crash a running MS-DOS-based application, and vice versa.

Under Windows 3.1, each VM inherited the attributes and environment configuration from the global System VM. Each VM was protected from other VMs, preventing errant MS-DOS-based applications from accessing memory or overwriting system code and thus possibly bringing the system down. However, the VMs did not completely prevent an MS-DOS-based application from overwriting MS-DOS system code, because MS-DOS-based applications had full access to all memory locations in the first megabyte of addressable memory space (the real-mode memory range).

Windows 95 provides a higher level of memory protection for running MS-DOS-based applications by preventing the applications from overwriting the MS-DOS system area in real mode. If users want the highest level of system protection, they can configure their MS-DOS-based applications to run with general memory protection enabled. (This mode is not enabled by default because of the overhead required to validate memory access requests.) In addition, parameter validation of Int 21h operations on pointers is performed, thereby increasing the robustness of the system.

When a VM ends in Windows 3.1, some resources, such as DPMI memory, are not released properly. When a VM ends in Windows 95—either normally because the user exited the application or VM or requested a local reboot, or abnormally because the application hung—the system frees all resources allocated to the VM. These resources include not only those allocated and maintained by the system VxDs, but also those allocated for the VM by the Virtual Machine Manager, including any DPMI and XMS memory that the VM requested.

Robustness for Win16-Based Applications

Windows 95 provides improved support for running Win16-based applications. It also provides robust support for Win16-based applications, plus compatibility with existing Windows-based applications, while keeping memory requirements low. The next two sections describe improvements for Win16-based applications running under Windows 95.

With Windows 3.1, when a Windows-based application ended, the resources that had been used by the application were not released by the system. Some Windows-based applications took this behavior into account and didn't free certain resources, so that their allocated resources could be accessed by other in-memory Windows-based applications or by system components such as DLLs.

Changing the way the system behaves when a Win16-based application ends—for example, immediately freeing up all the resources allocated to the application—might have resulted in the breaking of existing applications. To facilitate resource tracking under Windows 95, each Win16-based application runs as a separate thread in the Win16 address space. When a Win16-based application ends, Windows 95 doesn't immediately release the resources allocated to the application but holds them until the last Win16-based application has ended. (Windows 95 determines that no more Win16-based applications are running by associating the Windows version number of the application with the thread ID for the running process.) When the last Win16-based application has ended and it is safe to free all resources allocated to Win16-based applications, Windows 95 begins releasing the resources.

Windows 3.0 was perceived by some users as unstable because Unrecoverable Application Errors (UAEs) were common when working with Windows-based applications. Most of this instability was in fact caused by Windows-based applications that passed invalid parameters to Windows API functions. The APIs in turn attempted to process this bad data and usually attempted to access an invalid area of memory. For example, when an application inadvertently passed a NULL pointer to a Windows API function and the function tried to access memory at the reference, a UAE or "general protection fault" would be generated.

Windows 95 provides parameter validations for all Win16-based APIs and checks incoming data to API functions to ensure that the data is valid. For example, functions that reference memory are checked for NULL pointers, and functions that operate on data within a range of values are checked to ensure that the data is within the proper range. If invalid data is found, an appropriate error number is returned to the application, and it is then up to the application to catch the error condition and handle it accordingly.

The Windows 95 SDK provides debug system components to help software developers debug their applications. The debug components provide extensive error reporting for parameter validation to assist developers in tracking common problems related to invalid parameters during the course of development.

Robustness for Win32-Based Applications

Although better robustness for running MS-DOS-based and Win16-based applications is provided by Windows 95 than by Windows 3.1, even greater support for robustness is available for running Win32-based applications. Win32-based applications also benefit from preemptive multitasking, a linear (rather than segmented) address space, and support for a feature-rich API set.

Robustness support for Win32-based applications includes the following:

n

A private address space for each running Win32-based application,

segregating and protecting one application from others that are running concurrently

n

Win32 APIs that support parameter validation and provide a stable and

reliable environment

n

Resource tracking by thread and the immediate freeing of resources when

the thread ends

n

Separate message queues for each running Win32-based application, ensuring that a hung Win32-based application does not suspend the entire system

Each Win32-based application runs in its own private address space so that its resources are protected at the system level from other applications running in the system. This strategy also prevents other applications from inadvertently overwriting the memory area of a given Win32-based application and prevents that Win32-based application from inadvertently overwriting the memory area of another application or of the system as a whole.

As with Win16-based applications, Windows 95 provides parameter validation for Win32 APIs used by Win32-based applications. The Windows 95 SDK helps software developers debug errors resulting from attempts to pass invalid parameters to Windows APIs. For additional information about parameter validation for Win16 APIs, see the discussion of robustness for Win16-based applications presented earlier in this chapter.

Windows 95 tracks the resources allocated to Win32-based applications by thread. Unlike resources allocated to Win16-based applications, resources allocated to Win32-based applications are automatically released when a thread ends processing. This immediate freeing of system resources ensures that the resources are available for use by other running tasks.

Resources are cleaned up properly when threads either end execution on their own—for example, if the application developer inadvertently failed to free allocated resources—or when the user requests a local reboot that ends a given Win32-based application thread or process. Unlike Win16-based applications designed to run under Windows 3.1, Win32-based applications free up their allocated resources immediately when a separate thread or the application itself ends.

The Windows environment performs tasks based on the receipt of messages sent by system components. Each message is generated based on an action, or EVENT, that occurs on the system. For example, when a user presses a key on the keyboard and releases it or moves the mouse, a message is generated by the system and passed to the active application to inform it of the event that occurred. Windows-based applications call specific Windows API functions to extract event messages from message queues and perform operations on the messages—for example, accept an incoming character typed on the keyboard, or move the mouse cursor to another place on the screen.

Under Windows 3.1, a single message queue was used by the entire system. Win16-based applications cooperatively examined the queue and extracted messages addressed to them. This single-queue scheme posed some problems. For example, if a Win16-based application hung and prevented other applications from checking the message queue, the message queue would become full and accepted no new messages. Other Win16-based applications were then suspended until control was relinquished to them and they were able to check for event messages.

Windows 95 solves the problems inherent with the single message queue in Windows 3.1 by providing separate message queues for each running Win32-based application (each thread in a Win32-based application may have its own message queue.) As shown in Figure 38, the system takes messages from the input message queue and passes them to the appropriate Win32-based application or to the Win16 Subsystem if the message is destined for a Win16-based application. If a Win32-based application hangs and no longer accepts and processes its incoming messages, other running Win16 and Win32-based applications are not affected.

`{ewc msdncd, EWGraphic, ux0e 1 /a "psE.bmp"}`

Figure 38. Win32-based applications use separate message queues for increased robustness

If a Win32-based application ends or the user requests a local reboot for a Win32-based application, having separate message queues improves the robustness of the operating system by making it easier to clean up and free the system resources used by the application. It also provides greater reliability and recoverability if an application hangs.

Because of robustness improvements for Win32-based applications, including the use of a private address spaces, separate message queues, and resource tracking by thread, users should be able request a local reboot to end almost all ill-behaved Win32-based applications without affecting the integrity of the Windows system or

other running applications.

When Windows 95 ends a Win32-based application, its resources are immediately deallocated and cleaned up by the system. Because Win32-based applications run in their individually allocated environments, this method is even more robust than the method for reallocation of Win16-based application resources. For more details of the robustness of Win16-based applications, see the appropriate section earlier in this chapter.

An EXCEPTION is an event that occurs during the execution of a program and requires the execution of software outside the normal flow of control. Hardware exceptions can result from the execution of certain instruction sequences, such as division by zero or an attempt to access an invalid memory address. A software routine can also explicitly initiate an exception.

The Win32 API supports a mechanism called STRUCTURED EXCEPTION HANDLING for handling hardware-generated and software-generated exceptions. Structured exception handling gives programmers complete control over the handling of exceptions. The Win32 API also supports termination handling, which enables programmers to ensure that whenever a guarded body of code is executed, a specific block of termination code is also executed. The termination code is executed regardless of how the flow of control leaves the guarded body. For example, a termination handler can guarantee that clean-up tasks are performed even if an exception or some other error occurs while the guarded body of code is being executed. Structured exception and termination handling is an integral part of the Win32 system, and it enables a very robust implementation of system software.

Windows 95 provides structured exception and termination handling for Win32-based applications. By using this functionality, applications can identify and rectify error conditions that might occur outside their realm of control, providing a more robust computing environment.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 6: Support for Running MS-DOS-Based Applications

Support for MS-DOS-based applications, device drivers, and TSRs is maintained in Windows 95. In fact, Windows 95 offers better compatibility for running MS-DOS-based applications than Windows 3.1 does, including applications that are hardware-intensive, such as games.

Like Windows 3.1, Windows 95 allows users to launch an MS-DOS command prompt as an MS-DOS VM. The functionality supported in an MS-DOS VM is the same as that available under the latest version of MS-DOS, allowing users to run the same intrinsic commands and utilities.

Windows 95 delivers great support for running MS-DOS-based applications and enables even applications that would not run under Windows 3.1 to run properly. This support allows MS-DOS-based applications to coexist peacefully with the rest of the Windows 95 environment.

Summary of Improvements over Windows 3.1

Improvements made to the system provide the following benefits for running MS-DOS-based applications in the Windows 95 environment:

n

Zero conventional memory footprint for protected-mode components

n

Improved compatibility for running MS-DOS-based applications

n

Improved robustness for MS-DOS-based applications

n

Better support for running MS-DOS-based games, including in a window

n

Support for running existing MS-DOS-based applications without exiting

Windows 95 or running MS-DOS externally

n

Consolidated attributes for customizing the properties of MS-DOS-based

applications

n

The availability of the Toolbar when running an MS-DOS-based

application in a window, providing quick access to features and the functionality for manipulating the window environment

n

A user-scalable MS-DOS window through the use of TrueType fonts

n

The ability to gracefully end an MS-DOS-based application without exiting
the application

n

The ability to specify local VM environment settings on a per-application-
basis through the use of a separate batch file

n

Support for new MS-DOS commands, providing tighter integration
between the MS-DOS command line and the Windows environment

Zero Conventional Memory Footprint Components

Windows 95 helps make the maximum amount of conventional memory available for
running existing MS-DOS-based applications. Some MS-DOS-based applications
did not run under Windows 3.1 because by the time MS-DOS-based device drivers,
MS-DOS-based TSRs, MS-DOS-based networking components, and Windows 3.1
were loaded, not enough conventional memory was available. Windows 95 replaces
many of the 16-bit real-mode components with 32-bit protected-mode counterparts

to provide the same functionality while improving overall system performance and using no conventional memory.

32-bit virtual device drivers are provided to replace their 16-bit real-mode counterparts for functions such as those listed in the table on the facing page.

The memory savings that results from using 32-bit protected-mode components can be quite dramatic. For example, if a PC were configured with the NetWare NetX-client software and used a SCSI CD-ROM drive, SMARTDrive, the MS-DOS mouse driver, and DriveSpace disk compression, the conventional memory savings that would result from using Windows 95 would be OVER 262 KB!

Functions Carried Out by 32-Bit Device Drivers in Windows 95

Micros	NET.	95
oft	EXE	KB
Netwo	(full)	3
rk	PRO	KB
client	TMA	35
softwa	N	KB
re	NET	8
	BEU	KB
	I	
	EXP	
	16.D	
	OS	
	(MA	
	C)	
Novell	LSL	5
NetW	EXP	KB
are	16O	9
client	DI	KB
softwa	(MLI	16
re	D)	KB
	IPX	30
	ODI.	KB
	CO	48
	M	KB
	NET	47
	BIO	KB
	S.E	
	XE	
	NET	
	X.E	
	XE	

	VLM	
	.EX	
	E	
MS-	SHA	17
DOS	RE.	KB
exten	EXE	
ded		
file		
sharin		
g and		
lockin		
g		
suppo		
rt		
Adapt	ASP	5
ec	I4D	KB
SCSI	OS.	
driver	SYS	
Adapt	ASP	11
ec	ICD.	KB
CD-	SYS	
ROM		
driver		
Micros	MSC	39
oft	DEX	KB
CD-	.EX	
ROM	E	
Exten		
sions		
Smart	SMA	28
Drive	RTD	KB
disk	RV.E	
cachin	XE	
g		
softwa		
re		
Micros	MO	17
oft	USE	KB
Mous	.CO	
e	M	
driver		
Micros	DRV	37

off SPA KB
Drive CE.
Space BIN
disk
compr
ession
driver

[Try It!](#)

Test Conventional Memory Savings

1. Install Windows 95 on a PC with a configuration similar to one that now runs Windows 3.1. For example, use PCs with SCSI drivers, network drivers, and system support files, such as SMARTDRV, MSCDEX, or SHARE.
2. With MS-DOS-based device drivers and TSRs loaded on both machines, type MEM /C at a command prompt command under Windows 3.1 and under Windows 95. Notice the memory savings under Windows 95 for the same configuration.

Compatibility Improvements

For a number of reasons, some MS-DOS-based applications wouldn't run properly under Windows 3.1. For example, some MS-DOS-based applications required that lots of free conventional memory be available and thus were prevented from running in an MS-DOS VM by large real-mode components, such as network drivers or device drivers. Other MS-DOS-based applications wouldn't run under Windows 3.1 because they required direct access to the computer hardware and conflicted with Windows internal drivers or other device drivers.

The MS-DOS support goal of Windows 95 is to be able to run the "clean" MS-DOS-based applications that ran under Windows 3.1 AND the "bad" MS-DOS-based applications that tried to take over the hardware or required machine resources unavailable under Windows 3.1.

Many MS-DOS-based games assume that they are the only application running on the system and access and manipulate the underlying hardware directly, thus preventing them from being run in an MS-DOS VM under Windows 3.1. Games are the most notorious class of MS-DOS-based applications that don't get along well with Windows 3.1. Some of these applications write to video memory directly, manipulate hardware support resources such as clock timers, and take over hardware resources such as sound cards.

A number of strategies have been used to provide better support for running MS-DOS-based applications that interact with the hardware, including better

virtualization of computer resources such as timers and sound devices. In addition, the use of 32-bit protected-mode device drivers benefits MS-DOS-based applications by providing more free conventional memory than was available under Windows 3.1, so that memory-intensive applications run properly.

Different MS-DOS-based applications require varying levels of support from both the computer hardware and from the operating system. For example, some MS-DOS-based games require close to 100 percent use of the CPU to perform properly, and other MS-DOS-based applications modify interrupt addresses and other low-level hardware settings. Windows 95 provides several different levels of support for running MS-DOS-based applications. These levels of support take into account that different applications interact with the hardware in different ways, and that some behave well, whereas others expect exclusive access to the PC system and hardware. By default, MS-DOS-based applications are preemptively multitasked with other tasks running on the system and can run either full-screen or in a window. (CPU-intensive MS-DOS-based applications may not perform well in a window but can be run in full-screen mode to get the best response level.)

Windows 95 provides an .INF file that contains program settings for many of the popular MS-DOS-based applications. These program settings are based on results from testing of Windows 95 and specify standard and special configuration-related settings that are necessary to allow the application to run under Windows 95.

The APPS.INF file is processed when the user attempts to execute an MS-DOS-based application from the Windows 95 user interface. If a program information file (.PIF) doesn't exist for the MS-DOS-based application, the APPS.INF file will be examined by the system for information about the specified MS-DOS-based application. If the application is listed in the APPS.INF file, the system will read the contents and create a PIF that will be used when the application is executed.

To provide support for the most intrusive set of MS-DOS-based applications that work only under MS-DOS and require 100 percent access to the system components and system resources, Windows 95 provides a mechanism that is the equivalent of running an MS-DOS-based application in real-mode MS-DOS. This mechanism, called MS-DOS mode, provides an "escape hatch" for applications that run only under MS-DOS. In this mode, Windows 95 removes itself from memory (except for a small stub) and provides the MS-DOS-based application with full access to all the resources in the computer. Relatively few MS-DOS-based applications need to run in single MS-DOS application mode because of the improved compatibility support provided by Windows 95.

To run an MS-DOS-based application in this mode, the user sets the MS-DOS Mode

property on the Advanced Program Settings dialog (from the Advanced button on the Program tab) of the MS-DOS property sheet for the application. To create a unique environment tailored to an application's needs and system requirements, the user can also specify a CONFIG.SYS or AUTOEXEC.BAT file to run for the application. When the user runs an MS-DOS-based application in this mode, Windows 95 asks whether running tasks can be ended. With the user's approval, Windows 95 ends all running tasks, configures the machine to use the CONFIG.SYS and AUTOEXEC.BAT files for the MS-DOS mode session, restarts the computer, loads a real-mode copy of MS-DOS, and launches the specified application. This process is like exiting Windows 3.1 and then running the specified MS-DOS-based application under MS-DOS. When the user exits the MS-DOS-based application, Windows 95 restarts and returns the user to the Windows 95 shell. This solution is much more elegant than requiring users to dual-boot between different operating systems in order to run desired applications.

Some entries in the APPS.INF file contain setting information that instruct Windows 95 to run an MS-DOS-based application in MS-DOS MODE. For these applications, they will only run in MS-DOS mode due to problems they have running in the protect-mode environment of Windows 95, or due to assumptions they make about the environment (e.g., addressing of extended memory for loading their information) that prevent them from running under Windows 95.

[Try It!](#)

Run an MS-DOS-Based Application

1. Identify an MS-DOS-based application that you know does not run under Windows 3.1, and run it under Windows 95. Does it work?
2. Identify an MS-DOS-based application that you know runs under Windows 3.1 full-screen but not in a window, and run it under Windows 95 in a window. Does it work?

Support for Graphic-Intensive MS-DOS-Based Applications

Windows 95 improves the support for running graphic-intensive MS-DOS-based applications in the Windows environment. MS-DOS-based applications that use VGA graphic video modes can now be run in a window; they no longer have to be run in full-screen mode as with Windows 3.1. Users can still choose to run graphic-intensive MS-DOS-based applications in full-screen mode for the best level of performance.

Memory Protection

To support a higher level of memory protection for running MS-DOS-based

applications, Windows 95 includes on the Program property sheet a global memory protection attribute that allows the MS-DOS system area to be protected from errant MS-DOS-based applications. When the global memory protection attribute is set, the MS-DOS system area sections are read-protected so that applications can't write to this memory area and corrupt MS-DOS support and MS-DOS-based device drivers. In addition to system area protection, enhanced parameter validation is performed for file I/O requests issued through the MS-DOS Int 21h function, providing a higher degree of safety.

This option is not enabled by default for all MS-DOS-based applications because of the additional overhead associated with providing improved parameter and memory address checking. Users can set this flag if they constantly have difficulty running a specific MS-DOS-based application.

Better Defaults for Running MS-DOS-Based Applications

By default, Windows 3.1 ran MS-DOS-based applications full screen and disabled the ability of MS-DOS-based applications to run in the background. To change this default behavior for a specific MS-DOS-based application, users had to use the PIF Editor (PIFEDIT) application to modify or create a program information file (PIF) for the application.

By default, Windows 95 runs MS-DOS-based applications in a window and enables the background-execution setting, allowing the application to continue to run when it is not the active application. This change in default behavior provides better integration of running MS-DOS-based applications and Windows-based applications without requiring users to change or customize the state of the system.

Consolidated Customization of MS-DOS-Based Application Properties

Each MS-DOS-based application has different characteristics and mechanisms for using machine resources such as memory, video, and keyboard access. Both Windows 95 and Windows 3.1 understand how to run Windows-based applications because requests for system services are handled through the use of the Windows API. However, MS-DOS-based applications include only minimal information about their requirements in the format of their .EXE headers. To provide additional information about their requirements to the Windows environment, PIFs are used to specify the necessary configuration settings.

Under Windows 3.1, the PIF Editor application, shown in Figure 39, was used to create or change properties associated with running MS-DOS-based applications. Problems associated with the PIF Editor and the PIF creation process included difficulty in accessing the PIF Editor and PIF settings, the lack of association for new users between PIF properties and the MS-DOS-based application, the lack of a single location for storing PIF files (other than placing them all in the Windows directory), and less-than-intelligent defaults for running MS-DOS-based

applications.

`{ewc msdn cd, EWGraphic, ux0f 0 /a "psF.bmp"}`

Figure 39. The PIF Editor in Windows 3.1

Windows 95 enhances the ability to define properties for running MS-DOS-based applications by consolidating PIF files into a single location (the PIF directory where Windows 95 is installed), providing easy access to property information for an application (right-clicking the application's icon or window), and providing better organization of properties (through the use of a tabbed property sheet, shown in Figure 40). By means of these improvements, Windows 95 provides greater flexibility and control for running MS-DOS-based applications.

`{ewc msdn cd, EWGraphic, ux0f 1 /a "psF.bmp"}`

Figure 40. The property sheet for configuring an MS-DOS-based application

[Try It!](#)

View the Property Sheet for an MS-DOS-Based Application

1. Right-click the icon for an MS-DOS-based application, and choose PROPERTIES.
2. Right-click the title bar of an active MS-DOS-based application, and choose PROPERTIES.

Toolbars in MS-DOS Windows

In addition to providing compatibility enhancements to better support the running of MS-DOS-based applications, Windows 95 makes using MS-DOS-based applications in the Windows environment even easier than Windows 3.1. Many Windows-based applications provide one or more toolbars for quickly accessing common features and functionality. Windows 95 extends this simple but powerful feature to provide easy access to the functionality associated with an MS-DOS-based application, as shown in Figure 41.

`{ewc msdn cd, EWGraphic, ux0f 2 /a "psF.bmp"}`

Figure 41. A toolbar in a windowed MS-DOS box

Optionally, users can enable the display of a toolbar in the window of a running MS-DOS-based application to provide the user with quick access to the following functionality:

n

Simpler access to cut, copy, and paste operations for integrating text or graphic MS-DOS-based applications with Windows-based applications

n

Easy switching from windowed to full-screen mode

n

Quick access to property sheets associated with the MS-DOS-based application

n

Access to MS-DOS VM tasking properties, such as exclusive or foreground processing attributes

n

Easier access to font options for displaying text in a windowed MS-DOS VM

Scaleable MS-DOS Windows

Windows 95 supports the use of a TrueType font in a windowed MS-DOS VM, which allows users to scale the MS-DOS window to any size. When the font size is set to Auto, the contents of the MS-DOS window are sized automatically to display the entire window within the user-specified area. Figure 42 shows the size of the MS-DOS command prompt window being made smaller.

`{ewc msdncd, EWGraphic, ux0f 3 /a "psF.bmp"}`

Figure 42. Because of TrueType font support, the contents of this MS-DOS window will be scaled to fit the smaller size of the window so that they are still displayed in their entirety.

Try It!

Scale an MS-DOS Window

1. Open an MS-DOS VM window, click the FONT tab on the property sheet, and check that the font size is set to AUTO.
2. Point to the scale region in the lower-right corner of the window, change the size of the window, and notice how the window's contents are rescaled. (This functionality is more noticeable when performed at higher resolutions.)

Ending MS-DOS-Based Applications Gracefully

Windows 95 provides support for gracefully closing an MS-DOS VM through a property sheet setting that is available on an application-by-application basis. When this setting is enabled, users can close the MS-DOS-based application just as they would a Windows-based application—by clicking the Close Window button.

In addition to gracefully ending an MS-DOS-based application, robustness improvements made to the Windows 95 system ensure that system clean-up is completed properly and that all allocated resources are freed. As a result, memory used by an MS-DOS-based application running under Windows 95 is deallocated properly and made available for use by other applications (unlike under Windows 3.1, which didn't properly free DPMI memory).

Local Virtual Machine Environment Settings

When Windows 3.1 started, it used the MS-DOS environment specified before it started as the default state for each subsequently created MS-DOS VM. Any TSRs or other memory resident software that was loaded before Windows started was replicated across all MS-DOS VMs, whether the VM needed it or not. With Windows

3.1, users could not run a batch file to set the VM environment before starting a given MS-DOS-based application. (Actually, users could run a batch file under Windows 3.1, but when the batch file finished processing the command statements, the MS-DOS VM was closed.)

Under Windows 95, a batch file can be optionally specified for a given MS-DOS-based application, allowing customization of the VM on a local basis before running the MS-DOS-based application. The batch file is specified on the Program tab of the MS-DOS-based application's property sheet, as shown in Figure 43. Using a batch file allows MS-DOS environment variables to be set or customized for individual MS-DOS-based applications and for TSRs to be loaded in the local VM only. This mechanism is like having different AUTOEXEC.BAT files for different MS-DOS-based applications.

{ewc msdncd, EWGraphic, ux0f 4 /a "psF.bmp"}

Figure 43. Specifying a batch file on the Program tab of the MS-DOS-based application property sheet

Support for Accessing Network Resources with UNC Pathnames

Windows 95 makes accessing network resources from the MS-DOS command prompt easier by supporting the use of universal naming conventions (UNC). UNC provides a standard naming scheme for referencing network servers and shared directories. It uses the following syntax:

\\SERVERNAME\SHARENAME[PATHNAME]

The Windows 95 shell allows users to browse and connect to network servers without mapping a drive letter to the network resource. Windows 95 supports the same functionality at an MS-DOS command prompt and allows the user to do the following:

n

View the contents of shared directories on network servers from both

Microsoft Network servers and Novell NetWare servers by typing DIR \\
SERVERNAME\SHARENAME[PATHNAME]

n

Copy files from the contents of shared directories on network servers from

both Microsoft Network servers and Novell NetWare servers by typing COPY |
|SERVERNAME|SHARENAME|PATHNAME|FILE_DESTINATION

n

Run applications from shared directories on network servers for both

Microsoft Network servers and Novell NetWare servers by typing |
|SERVERNAME|SHARENAME|PATHNAME|FILENAME

New MS-DOS Prompt Commands

The MS-DOS command processor and utilities have been enhanced to provide
better integration between MS-DOS functionality and the Windows environment.
Commands that manipulate files have been extended to support long filenames, and
some new commands have been added to Windows 95 to provide access to new
capabilities supported by the system.

For example, the start command, which has the following syntax:

start <application name> | <document name>

allows users to start an MS-DOS or Windows-based application from the command
prompt in one of the following ways:

n

Start an application by specifying the name of a document to open, and

Windows 95 launches the application associated with the given file type. For
example, typing START MYFILE.XLS starts the application associated with the

specified file, if there is a valid association.

n

Start an MS-DOS-based application in a different MS-DOS VM instead of the current one.

n

Start a Windows-based application from an MS-DOS command prompt.

Typing the name of a Windows-based application is essentially the same as typing START <APPLICATION>.

[Try It!](#)

Launch an Application from the MS-DOS Command Prompt

1. Type START /? to see the options available.
2. Type START EDIT to start the MS-DOS Edit application in another VM.
3. Type START /M NOTEPAD to start the Notepad Windows-based application in minimized form.

Support for Long Filenames

Many MS-DOS intrinsic commands and utilities have been extended to support the use of long filenames. For example, the following commands are among those that have been extended to support long filenames:

n

The *dir* command has been extended to show long filenames in the directory structure, along with the corresponding 8.3 filename. Also, the *dir* command now supports a verbose mode so that users can display additional file details by typing `DIR /V`.

n

The *copy* command has been extended to allow mixing of long and short filenames in copy operations. For example, typing `COPY MYFILE.TXT "THIS IS MY FILE"` creates a new file with a long filename.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Chapter 7: Plug and Play

Personal computers have revolutionized the way people work. Today, PCs are being used extensively both at work and home for various tasks — for personal productivity, information exchange, and education and entertainment (“edutainment”). Furthermore, as hardware technology has advanced in the areas of graphics, audio, networking, storage, imaging and communication, PCs have become more powerful and less expensive, accelerating their adoption on a worldwide basis. The widespread adoption of the Microsoft Windows operating system has gone hand in hand with the advances in hardware technology.

With these innovations, however, have come new industry challenges. Specifically, configuring PC hardware and operating systems to work with different networks and peripheral devices can pose a significant problem. Changing the hardware configuration of a machine is a task that few end users attempt and even trained technicians can find difficult, time-consuming and frustrating. This problem is compounded by the growing use of mobile computers, because users of mobile computers typically need to change their PC configurations more frequently. Mobile devices are often unplugged from corporate networks and peripheral devices in the office and reconfigured to allow computing and remote communication from home or while on the road.

Whether related to changing the configuration of a notebook computer from an office to a mobile setting or simply adding a CD-ROM or other device to an existing desktop computer, today’s PC configuration difficulties can result in low customer satisfaction and high support costs. With the Microsoft Windows 95 operating system, together with the Plug and Play framework architecture, Microsoft is attempting to reduce the cost of owning PCs while increasing their ease of use and value.

Plug and Play

Plug and Play is both a design philosophy and a set of PC architecture specifications. Microsoft’s goal for Plug and Play is to make the PC, add-in hardware devices, drivers and operating system work together automatically without user intervention. In order to achieve this goal, all the components need to be Plug and Play compatible. The components of a fully Plug and Play system consist of the following:

n

A Plug and Play operating system

n

A Plug and Play Basic Input Output System (BIOS)

n

Plug and Play hardware devices with drivers

The system's ease of use and dynamic operation depends on how many of the three main components — the operating system, system BIOS and hardware devices with drivers — support Plug and Play. At the lowest level, when none of the components supports Plug and Play, the user needs to set card jumpers and switches manually, and load drivers from floppies.

At the next level, when the operating system supports Plug and Play but is used with legacy or non-Plug and Play hardware, user intervention is reduced but not completely eliminated. To aid the user in hardware setup, the Plug and Play operating system provides tools like the Device Wizard, the Device Manager, and the Registry (see the section Plug and Play Architecture in Windows 95 for a description of these features). In addition, drivers are installed, loaded and unloaded automatically.

At the highest level, when all three components support Plug and Play, installing new devices is as easy as plugging them in and turning on the system. Hardware identification and configuration is completely automated and transparent to users. And because of the Plug and Play BIOS, the system supports full dynamic

operation, including hot docking, APM 1.1 power management, automatic configuration of boot devices, and programming of motherboard devices.

A complete Plug and Play system provides substantial benefits to both users and computer industry vendors. The PC is easier to use, since users do not have to worry about switches, jumpers, hardware conflicts or loading drivers manually. For example, to turn a desktop computer system into a great multimedia system, all the user has to do is plug in a Plug and Play audio card, CD-ROM drive and SCSI adapter, turn on the system, and play a video clip.

Users will also have great mobility. For example, hot-docking stations that support Plug and Play enable the user to remove a portable system while it is running and bring the system to a meeting without having to close or reboot the computer. The system automatically senses its removal from the station, reconfigures itself to work with a new display, and adjusts for the absence of a network card and large disk drive.

For PC vendors, Plug and Play can provide cost reductions. As many as 50 percent of support calls to PC vendors result from installation and configuration problems. By making operations easier and automatic, manufacturers can achieve lower support costs and pass these savings to the user. Easier installation and configuration during setup also benefit original equipment manufacturers (OEMs) who offer systems with Windows preinstalled; they, too, can pass cost savings to the user. Similarly, Plug and Play's Universal Driver simplifies device-driver development, which enables a developer to create a single driver that works across multiple bus types and eliminates the need to include bus-specific code in several drivers.

Finally, Plug and Play provides a common platform that enables PC vendors to develop innovative features and differentiate their products from others. This effort can have the effect of expanding the overall PC market.

The Plug and Play effort was formally introduced in March 1993 at the Windows Hardware Engineering Conference to more than 1,300 attendees by Microsoft Corp., Intel Corp. and Compaq Computer Corp. At COMDEX/Fall 93, 18 Plug and Play devices were demonstrated. Today, acceptance of Plug and Play is widespread throughout the PC industry. More than 100 Plug and Play products from over 60 vendors have been demonstrated to work, most of which are already available (see the Plug and Play Catalog for a comprehensive list of these products).

In addition, Plug and Play hardware specifications for BIOS, APM, ISA, SCSI, LPT, COM, ESCD, PCI, PCMCIA, VL and VESA DDC have been completed and are

publicly available to PC vendors. These specifications were generated using an open design process via CompuServe®. The PLUGPLAY forum on CompuServe was used to distribute the specifications and solicit feedback from more than 3,000 participants.

Finally, Plug and Play is an integral part of PC vendors' product plans for 1995. Vendors are using the specifications, in addition to the "Hardware Design Guide for Microsoft Windows 95," to build all three components of Plug and Play systems. These components were tested during Plug and Play interoperability workshops (or "PlugFests") held during 1994.

Configuration Process in a Plug and Play System

A certain amount of configuration must first be performed by the system BIOS during the power-up phase. In order for the system to boot, the BIOS must, at a minimum, configure a display device, an input device and a device for initial program loading. Then, it must pass the information about each of these devices to the operating system for additional system configuration.

When devices are added and removed, the three components of a Plug and Play system coordinate and perform the following basic tasks:

n

Identify installed devices

n

Determine device resource requirements

n

Create a nonconflicting system configuration

n

Program devices

n

Load device drivers

n

Notify the operating system of configuration changes

The operating system first identifies every installed device in the system and determines the resource requirements for each device. Each nonbooting device is inactive upon power-up, so that the operating system can identify any conflicts between the resource requirements of different devices before configuring them. The operating system then identifies and creates a nonconflicting system configuration. Once any resource conflicts have been resolved, the operating system programs each hardware device automatically with its working configuration, then stores all configuration information in the central database. Finally, the operating system loads the device drivers for each device and notifies these drivers of the resource assignments. This process, which is centrally managed by the Plug and Play operating system, is repeated as devices are added or removed.

If a change occurs to the system configuration during operation, the hardware must be able to notify the operating system of the event so that the operating system can configure the new device. Additionally, applications must be able to respond to configuration changes to take advantage of new devices and to cease calling devices that have been removed. Such dynamic configuration events might include the insertion of a PCMCIA card, the addition or removal of a peripheral such as a mouse, CD-ROM drive or printer, or a docking event for a notebook computer.

Plug and Play Support in Windows 95

The Plug and Play specifications are designed to be implementation-independent and are not tied to a specific operating system. It is up to the operating system developer to define the level of support the system provides. Windows 95 was designed and built with Plug and Play support in mind and therefore every component provides a very rich implementation of Plug and Play functionality. With Windows 95, configuration of hardware resources is greatly simplified over legacy configuration techniques: IT JUST WORKS.

Plug and Play in Windows 95 makes PCs even easier to use and supports both existing market requirements and future PC growth to deliver the following:

n

Compatibility with legacy hardware. With over 140 million MS-DOS-based

and Windows-based PCs used throughout the world, providing compatibility with legacy hardware was a requirement. Compatibility with existing hardware ensures that neither Windows 95 nor the new Plug and Play peripherals require the purchase of completely new hardware.

n

Automatic installation and configuration of Plug and Play devices. With

Plug and Play, initial PC configuration is automatic. Users no longer need to configure their systems and make system-resource assignments, such as those for IRQs, I/O ports, and DMA addresses. These assignments are handled by the BIOS and operating system, thus avoiding configuration conflicts. Installation and configuration of add-on devices and peripherals is also automatic.

n

A dynamic operating environment that supports mobile computing

environments. This functionality brings out the real power of the Plug and Play architecture and sets Windows 95 apart from other operating system implementations of Plug and Play. Dynamic Plug and Play properties in Windows 95 include support for the following:

n

Hot docking and undocking of mobile computers to change the state of

the system dynamically

n

Hot plugging and unplugging of Plug and Play devices on the fly

n

“Dynaload drivers,” which are loaded by the operating system for

devices that are present and removed from memory when the device is no longer available

n

Unified messaging mechanism for dynamically notifying other

operating system components and applications about changes to the state of the system

Users of Windows 95 can reconfigure their PCs on the fly and have the changes take effect immediately, without rebooting.

n

A universal driver model that simplifies device driver development. To

simplify the development of device drivers for independent hardware vendor (IHV) hardware devices, Windows 95 incorporates the use of a universal driver model in various components of the system. Whereas Windows 3.1 supported a universal driver model only for printer drivers, Windows 95 provides this support for several other areas, including communications drivers, display adapter drivers, mouse drivers, and disk device drivers. The universal driver model ensures that IHVs can easily write peripheral drivers, thus increasing the number of Plug and Play devices available on the market.

n

An open and extensible architecture that supports new technologies. The

Plug and Play implementation in Windows 95 is flexible and extensible enough to support future technologies as they emerge on the market. The Plug and Play Initiative will spur the creation of new and innovative technologies, and Windows 95 will support them.

n

The availability of configuration information for simplified systems

management. The sharing of configuration information not only helps users solve configuration problems, but also helps MIS organizations support and manage PCs within corporate environments, which may have hundreds or thousands of PCs. Through the use of the Registry, configuration information is easily available to the system and to applications, both locally and remotely.

Plug and Play Architecture in Windows 95

To provide complete Plug and Play functionality in Windows 95, Microsoft has included the following new components:

n

Configuration Manager

n

Hardware Tree and Registry

n

Bus and Port Enumerators

n

Resource Arbitrators

n

Setup and Device Installer

The Configuration Manager is the central software component that handles all phases of the configuration process. It orchestrates the entire flow of operations performed by all the components involved in the configuration process, and it accepts and responds to communications from the BIOS and hardware devices during the configuration process. It also responds to dynamic events during operation, including the insertion or removal of devices and the docking or undocking of mobile computers. As these events occur, the Configuration Manager communicates the information to the applications.

The hardware tree is a record of the current system configuration. The tree information is drawn from a central database of configuration information for all devices, called the Registry. The Registry is stored locally for each computer and holds information about all device types, whether they are currently installed or not. The hardware tree is created by the Configuration Manager each time the system boots or a run-time change occurs to the system configuration. The existence of the Registry eliminates the need for most of the device-specific initialization files used today. The hardware tree is displayed to the user on the Device Manager property sheet page as shown in Figure 44.

{ewc msdncd, EWGraphic, ux0g 0 /a "psG.bmp"}

Figure 44. The Device Manager property sheet

Bus enumerators are responsible for building (enumerating) the hardware tree on a Plug and Play system. The bus enumerators are a new type of driver. Enumerators are based on specific bus architectures and understand the implementation details of their bus types. Therefore, an ISA enumerator can identify the devices on an ISA bus, read their resource requirements, and configure them as instructed by the Configuration Manager. Other enumerators include those for VLB, PCI, SCSI, PCMCIA, serial ports and parallel ports. During installation, Windows will determine automatically which bus enumerators are applicable to a given computer.

Resource Arbitrators allocate specific types of resources to devices and resolve conflicts between devices that request identical resource assignments. The functional separation of the Resource Arbitrator and the Configuration Manager provides for future extension of the Windows operating system to address new types of resources.

A new operating system setup program will create the central configuration database during initial system setup. Although under normal circumstances the system will not require user intervention to perform any initial setup configuration operations, there are some exceptions. For example, if the system fails to detect a non-Plug and Play device, the user can force an installation by using the Add New Hardware Wizard in the Control Panel (shown in Figure 45.) At times, the system may be unable to generate a nonconflicting configuration for a non-Plug and Play device. In this case, a new Windows user interface component will communicate the event to the user and present the user with several options to resolve the problem.

{ewc msdncd, EWGraphic, ux0g 1 /a "psG.bmp"}

Figure 45. Add New Hardware Wizard

Plug and Play Hardware Design

PC 95 hardware is optimized for Windows 95 and takes full advantage of Plug and Play. PC 95 hardware meets certain requirements that are listed in the Hardware Design Guide for Microsoft Windows 95 and the Plug and Play specifications.

To help users easily identify PC 95 hardware and software that is optimized for Windows 95, a “Designed for Microsoft Windows 95” logo is available. This new logo replaces the old “Windows Ready-to-Run” and “Windows Compatible” logos. To encourage users to look for the logo when purchasing PCs, peripherals and software, Microsoft will actively promote the benefits of logo-authorized products.

Building PC 95 hardware is the first of three essential steps PC hardware vendors must follow to qualify for the Windows 95 logo. The other two steps are passing the Windows 95 Hardware Compatibility Tests (HCTs) and returning a signed logo-license agreement to Microsoft (see the Windows 95 Logo Program for PC Hardware Vendors Backgrounder for more information). PC 95 hardware covers all the major buses (ISA, PCI and VLB); connectors (PCMCIA and SCSI); ports (LPT, COM, keyboard and mouse); systems (desktops and mobiles); motherboard devices; and add-on devices (such as monitors, display adapters and network adapters, as well as SCSI, IDE and floppy storage devices, printers and other LPT devices, fax/modems, and other COM devices).

Summary

Plug and Play technology will benefit the entire personal-computer industry. The technology will increase customer satisfaction by making PCs easier to use and maintain and will help lower support and maintenance costs for both vendors and users. Plug and Play will provide a flexible, robust platform for increased functionality and industrywide innovation.

Systems incorporating the three components of the Plug and Play architecture — a Plug and Play operating system, a Plug and Play BIOS, and Plug and Play hardware devices — will achieve the full benefits of Plug and Play. These systems will be able to configure hardware devices automatically without any user intervention and respond to dynamic configuration events. Excellent docking-system solutions will be feasible, because the system will be able to load and unload device drivers automatically to reflect the devices attached to the system when it is docked or undocked. Also, applications will be able to adjust their configurations automatically to reflect the insertion or removal of devices such as network cards and fax/modem cards.

To achieve this full Plug and Play functionality, vendors of the operating system, the BIOS, and hardware need to deliver Plug and Play products. Microsoft is delivering the Plug and Play operating system with Windows 95. Similarly, hardware vendors need to build and use PC 95 hardware, implement 32-bit drivers for Windows 95, and test the hardware with Windows 95 HCTs. They are also encouraged to help users identify great Plug and Play hardware by applying for and using the “Designed

for Microsoft Windows 95" logo and engaging in joint-marketing activities with Microsoft, such as demonstrating PC 95 hardware at trade shows, engaging in joint advertising, and selling systems preinstalled with Windows 95.

For More Information

The following documents can be obtained via CompuServe from the libraries in the PLUGPLAY forum, or from the <ftp://ftp.microsoft.com/developr/drg/Plug-and-Play> subdirectory:

n Plug and Play specifications

n BIOS 1.0a

n APM 1.1

n ISA 1.0a

n [SCSI 1.0](#)

n [LPT Device 1.0a](#)

n [COM Device 0.99](#)

n [ESCD 1.02a](#)

n [Plug and Play Catalog, Oct. 18, 1994](#)

n

[Plug and Play in Window 95 Fact Sheet, October 1994](#)

n

[Windows 95 Questions and Answers, November 1994](#)

n

[Windows 95 Logo Fact Sheet, October 1994](#)

n

[Windows 95 Logo Program for PC Hardware Vendors Backgrounder,](#)

[scheduled to be available in the first quarter of 1995](#)

[In addition, the Hardware Design Guide for Windows 95 \(1994, ISBN 1-55615-642-1\) is available in bookstores, or call \(800\) MSPRESS 677-7377 to order.](#)

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 8: Device Support

Microsoft Windows 95 features improved support for hardware devices and peripherals including disk devices, video display adapters, mice, modems, and printers. With Windows 3.1, device drivers were, for the most part, monolithic and complex for device manufacturers to develop. However, Windows 3.1 simplified printer driver development by using a mini-driver architecture, which provides printer device-independent code in a universal driver written by Microsoft, and device-dependent code for direct communication with the printer written by the IHV. The mini-driver architecture increased the stability of driver support for the printer and decreased the amount of time needed for printer manufacturers to develop driver support for a new printer. In Windows 95, the mini-driver architecture is now available for other types of drivers, and although IHVs can still write monolithic drivers, use of the mini-driver model is recommended because of the advantages it provides.

Device Driver Philosophy

The device driver philosophy of Windows 95 is based upon a mini-driver/mini-port layered model that provides the following benefits:

n

Leverages IHVs' hardware knowledge. IHVs know their hardware. They

understand the various I/O mechanisms that their hardware supports, and they know the commands that their hardware device will respond to. The mini-driver model allows IHVs to implement the device-dependent portion of the code used to interact with their hardware device.

n

Leverages Microsoft's Windows knowledge. Microsoft developed the

universal driver code, which is the layer of code that sits between the API layer of device interaction (as used by other Windows components) and the device-dependent code that controls the device. The development team that wrote the Windows components above the API layer understands the mechanisms available from the operating system for interacting with the code. This model

leverages Microsoft's knowledge of the operating system with the IHVs' knowledge of their hardware.

n

Increases system stability and reliability. Because the universal driver is

the mechanism through which the Windows components communicate with the device, this driver receives a high level of scrutiny and debugging. Through extensive use and testing, the universal driver code is made stable and reliable. Because IHVs no longer have to write the code that would be considered device-independent (as they did when they wrote monolithic drivers), the code required for driver-dependent functions for interacting with the hardware device is minimized. The complexity of the necessary code is reduced and the driver development process is simplified. A less complex driver is presumably more stable and reliable than a traditional monolithic driver.

n

Increases forward compatibility. Forward compatibility is ensured by

allowing the device-independent code to continue to evolve and by encapsulating the device-dependent code in a mini-driver. If an IHV develops new functionality in a hardware device, the mini-driver model also simplifies modifications to the driver. The IHV doesn't need to completely rewrite the entire device driver; the new functionality can simply be added to the mini-driver (if even necessary).

n

Supports OEM/IHV innovation. The mini-driver model provides

mechanisms for IHVs to add special device functionality support beyond what would be considered the base set of required functionality. The mini-driver model doesn't require IHVs to sacrifice any flexibility to simplify the driver development process.

Windows 95 uses the mini-driver/mini-port layered model for components throughout the operating system, including printers, display devices, modems, communication devices, and mice.

Disk Device Support

In addition to providing compatibility with existing MS-DOS-based and Windows-based disk device drivers, Windows 95 provides better disk device support than is available under Windows 3.1. Windows 95 features a new block I/O subsystem that provides broader 32-bit disk device support as well as improved disk I/O performance. In addition, disk mini-port device drivers written for use with Windows 95 are compatible with Windows NT, and vice versa.

Windows 95 also enhances the disk device support provided in MS-DOS and Windows 3.1 to provide improved support in the following areas:

n

Support for large media using logical block addressing. Extensions to the

Int 13h disk controller support are provided in the protected-mode disk handler drivers to support disks with cylinder numbers greater than 1024. (Windows 3.1 did not provide support for hard drives with more than 1024 cylinders in the 32-bit disk access drivers.)

n

Better support for removable media. Windows 95 provides better support

for removable media devices and allows the system to lock or unlock the device to prevent the media from being removed prematurely. Windows 95 also provides an eject mechanism for devices that support it, so that users can use software control to eject media from a device—for example, new floppy drives that support software-based media ejection.

Windows 95 provides improved support for IDE drive configurations. The enhanced

support includes the following:

n

Support for large IDE disk drives. Some new IDE drives support a logical-

block addressing (LBA) scheme that allows them to exceed the 1/2 gigabyte (528 MB) size limitation. Support for IDE disk drives as large as 137 GB is provided by the Windows 95 operating system. This support was provided in real-mode before Windows 95, but is provided in a protected-mode disk driver by Windows 95.

n

Support for an alternate IDE controller. Windows 95 allows the use of two-

IDE controllers in a PC, or the combination of an IDE controller in a laptop and an alternate controller in a laptop docking station—available, for example, in some Compaq laptop/docking station combination products. This support was provided in real-mode before Windows 95, but is provided in a protected-mode disk driver by Windows 95.

n

Support for IDE-based CD-ROM drives. The majority of disk devices in-

personal computers use an IDE-based hard disk controller. Adding a CD-ROM drive typically requires adding an additional controller card to provide either SCSI or a proprietary interface for connecting to the CD-ROM drive. A new crop of inexpensive CD-ROM drives that connect to IDE-compatible disk controllers are emerging onto the market, and Windows 95 recognizes and supports these devices.

Windows 95 provides great support for SCSI disk devices, which was not available in Windows 3.1. The following support is available for SCSI devices:

n

Broad support for popular SCSI controllers. Windows 95 includes 32-bit

disk device drivers for popular SCSI controllers from manufacturers such as Adaptec, Future Domain, Trantor, and UltraStor, providing great support right out of the box.

n

Compatibility with Windows NT mini-port drivers. Windows 95 supports the

use of Windows NT mini-port SCSI drivers without modification or recompiling. Compatibility with Windows NT-based mini-port drivers ensures broad device support for disk devices under Windows 95, while simplifying driver development efforts for hardware manufacturers.

n

ASPI/CAM compatibility for MS-DOS-based applications and drivers.

Support for the Advanced SCSI Programming Interface (ASPI) and Common Access Method (CAM), which allow application and driver developers to submit I/O requests to SCSI devices, is provided in Windows 95. As a result, existing MS-DOS-based applications and drivers that use the ASPI or CAM specification work properly under Windows 95.

n

16-bit and 32-bit ASPI for Windows-based clients and applications. In

addition to MS-DOS-based compatibility with ASPI, Windows 95 includes 16-bit and 32-bit drivers to support Windows-based ASPI clients and applications.

In addition to supporting IDE and SCSI disk devices, Windows 95 provides 32-bit disk driver support for ESDI controllers.

As with hard disk controller support, Windows 95 provides protected mode support for communicating with floppy disk controllers. Windows 95 provides Int 13h hard disk controller support as 32-bit device drivers, resulting in improved performance, stability, and robustness of the system. Windows 95 provides floppy disk controller support as a 32-bit device driver, resulting in improved performance for file I/O to floppy disk drives, plus improved system reliability.

Users can now effectively format a disk or copy files to/from a disk while performing other tasks.

[Try It!](#)

Test Floppy Disk and Multitasking Performance

1. Perform common tasks under Windows 95 while you are formatting a floppy disk or copying files to a disk. For example, try navigating through the shell or launching another application.
2. Perform the same tasks under Windows 3.1 to compare the different multitasking behavior.

Display Adapter and Monitor Support

Video display adapter and monitor support in Windows 95 is another area that has received a lot of attention during the design phases of Windows 95.

Windows 95 addresses many of the problems inherent in Windows 3.1 display drivers and provides enhanced functionality and easier setup and configuration. Benefits of the new display driver support in Windows 95 include the following:

n

More stable and reliable video display adapter drivers

n

Support for many more video cards provided by drivers in Windows 95

n

A mini-driver architecture that makes it easier for IHVs to write video display drivers

n

Support for new features, including the ability to change video resolution on the fly without restarting Windows 95 (important for hot docking and warm-docking support)

n

Video driver support for mobile computer docking and undocking,

providing the functionality to autoswitch between the video card in the portable computer and the video card in the base unit

n

Consistent and unified installation and configuration of display drivers and

of display properties, such as colors, wallpaper patterns, and screen savers

n

Image Color Matching support for device-independent color usage, which

Microsoft worked in conjunction with Kodak to offer

n

Support for new generations of hardware and device functionality, such as

Energy Star Monitors conforming to the VESA Display Power Management Signaling (DPMS) specification, and detection of monitor properties, such as the maximum resolution supported when used in conjunction with monitors that support the VESA Display Data Channel (DDC) specification

By using a mini-driver architecture for video display adapter drivers, Windows 95

improves support for the range of products offered by IHVs and provides more stable and reliable drivers. Windows 95 provides a universal driver to support device-independent code and functionality normally handled by a monolithic video display driver, and supports device-dependent code in a display mini-driver. The mini-driver uses the Windows 95 graphics device-independent bitmap (DIB) engine, providing a better mechanism for manipulating memory bitmaps, including improved performance.

Because mini-drivers are simpler than monolithic display drivers, they are easier to write and to debug. Extensive testing on a less complex driver results in better stability and reliability in the overall operating system.

Furthermore, to ensure broad display adapter device support in Windows 95, Microsoft developed many display drivers with the cooperation of all major display controller IHVs. Microsoft also worked closely with IHVs to write additional display drivers, and assisted IHVs with optimizing their display drivers and performance-tuning them to enhance the speed at which information is displayed by the driver. This development effort results in improved graphic performance over Windows 3.1 and over native Windows 3.1 display drivers.

The use of the mini-driver architecture for display drivers in Windows 95 leverages Microsoft's development experience in writing fast, reliable graphics code with the IHVs' engineering experience, allowing IHVs to concentrate on delivering high-performance hardware accelerated display adapters.

Not only are the video display adapters in Windows 95 more stable and reliable, but the display drivers should also benefit from improved performance. The mini-driver architecture for display drivers in Windows 95 is centered around a new 32-bit DIB engine that features 386/486 optimized code for fast, robust drawing for high-resolution and frame buffer-based display adapters. The use of a universal driver to provide the device-independent display adapter support, instead of requiring each IHV to redesign this code, allows base functionality to be optimized and thus benefits all mini-driver display drivers.

For example, graphics performance at 256 colors is dramatically improved on unaccelerated Super VGA graphics controllers such as the Tseng Labs ET4000, which has received benchmark results over 90 percent faster than Windows 3.1. Windows 95 includes drivers for nearly all popular graphics accelerators and has benchmarked faster than Windows 3.1 from the following vendors:

n

ATI Technologies

n

Chips & Technologies

n

Cirrus Logic

n

Compaq QVision

n

Matrox MGA

n S3

n Tseng Labs

n Western Digital

Setup in Windows 95 includes support for automatically detecting the video display adapter installed in the PC and installing the appropriate Windows 95 display driver. Although Windows 95 supports the use of display device drivers written for use with Windows 3.1, Microsoft is working closely with IHVs to provide Windows 95-specific display drivers that take advantage of new features and functionality available in Windows 95. For example, efforts are ongoing to assist third parties in implementing extensions to support Plug and Play detection and on-the-fly resolution changes, and in redesigning display drivers to leverage the mini-driver model.

The video drivers provided with Windows 95 are stringently tested to ensure greater reliability and stability than drivers for Windows 3.1.

In addition to better quality video drivers, Windows 95 includes mechanisms to ensure that bad or incompatible video drivers cannot prevent users from accessing the system. Under Windows 3.1, a bad video driver would commonly result in

returning users back to an MS-DOS command prompt with no explanation about the failure. Under Windows 95, if a video driver fails to load or initialize when the system starts, Windows 95 defaults to the generic VGA video driver. Given that driver configuration is handled through a graphical interface, users can then at least get into Windows 95 to fix the system.

Windows 95 consolidates display properties into a common Display icon in the Control Panel, allowing easy customization of the colors, wallpaper, screen saver, and display adapter settings from a single location. Access to display properties is as easy as selecting Control Panel from the Start button's Settings menu or by right-clicking the desktop to display the appropriate property sheet, which is shown in Figure 46.

{ewc msdncd, EWGraphic, ux0h 0 /a "psH.bmp"}

Figure 46. The property sheet for the display

Through the new consolidated display properties, users can now do the following:

n

See the appearance of display changes modeled on screen before the changes are applied. This capability has been referred to as WHAT YOU SEE BEFORE YOU GET IT (WYSBYGI).

n

Change background settings to select patterns or wallpaper for the desktop.

n

Select a screen saver to be activated after the computer is idle for a specified amount of time.

n

Change window appearance properties for displaying text in title bars or menus, such as the font, font style (including bold or italic), and font size, providing more flexibility and levels of customization than Windows 3.1.

n

Change the display settings, such as the number of colors to use with the display driver, or change the size of the desktop area on the fly (if the display driver and display adapter supports this functionality).

The consolidation of display properties is another example of how Windows 95 makes using and customizing the environment easier for users.

Windows 95 provides image color matching (ICM) support for mapping colors displayed on screen and colors generated on output devices to provide consistency. For more information, see the discussion of ICM support in Chapter 11, "Printing."

Energy Star is an effort inspired by the Environmental Protection Agency (EPA) to develop computer hardware and peripherals that conserve power when in idle states. This idea is similar to the standby mode commonly implemented in laptop

computers to save power.

In a PC system, the video display monitor is typically one of the power-hungry components. Manufacturers of newer display monitors have incorporated energy-saving features into their monitors based on the VESA Display Power Management Signaling (DPMS) specification. Based on signals from a video display adapter, software can place the monitor in standby mode or even turn it off completely, thus reducing the power it uses when inactive.

Users typically display screen savers to prevent burn-in of a monitor image. Windows 95 extends this screen saver mechanism to provide a time-delay setting that allows the user to put the display monitor in a low-power standby mode, as well as a delay setting for turning the monitor off completely. Figure 47 shows the delay settings that enable this capability.

`{ewc msdncd, EWGraphic, ux0h 1 /a "psH.bmp"}`

Figure 47. The screen saver settings for monitor energy-saving features

For example, a user may want to set options to display a specific screen saver after 5 minutes of inactivity, to set the PC to standby after the screen saver has displayed for 10 minutes, and to turn off the monitor after 15 minutes of standby.

To take advantage of the Energy Star power consumption mechanisms, users need both a monitor that meets the DPMS/Energy Star specifications and a video card that meets the VESA DPMS specifications. The video display driver must support the extensions necessary to control the monitor device. Several manufacturers are presently shipping monitors designed to support the Energy Star goals.

[Try It!](#)

Change the Display Settings

1. Open the CONTROL PANEL and click the DISPLAY icon. The display property sheet appears.
2. Change the desktop background.
3. Select a screen saver.
4. Change the display appearance.
5. Switch video resolutions on the fly (if supported by your video display adapter and monitor).

Mouse and Pointing Device Support

As with other device drivers, the mini-driver architecture of Windows 95 simplifies mouse driver development and improves virtualization in a protected-mode mouse driver to better support MS-DOS-based applications in the Windows environment.

Mouse support in Windows 95 results in the following improvements over Windows 3.1:

n

Provides smooth, reliable input support through the use of protected-mode drivers

n

Supports more devices by making it easier for IHVs to write drivers, and supports a mini-driver architecture model

n

By supporting Plug and Play, makes mouse and pointing devices easy to install and use

n

Implements mouse driver functionality in a single driver and eliminates the need to use MS-DOS-based mouse drivers, which increases robustness and

saves conventional memory

n

Supports connecting a mouse AFTER Windows 95 has started. Mobile-

computer users who forget to connect a mouse before turning on the computer
can connect a mouse without restarting the computer

Windows 3.1 provided support for using the system mouse in an MS-DOS-based
application running in a window, but using a mouse in an MS-DOS-based
application running full screen required that an MS-DOS-based mouse driver be
loaded before starting Windows.

Windows 95 provides mouse support as a protected-mode VxD and eliminates the
need to load an MS-DOS-based mouse driver. Better virtualization of mouse-
interrupt services allows protected-mode Windows-based mouse drivers to provide
mouse support for Windows-based applications, for MS-DOS-based applications
running in a window, and for MS-DOS-based applications running in full-screen
mode. The improvements in this area result in a zero conventional memory footprint
for mouse support in the Windows 95 environment.

In addition to better mouse services, Windows 95 improves the device support to
allow the use of serial ports COM1 through COM4 for connecting a mouse or other
pointing device.

Windows 3.1 provided rudimentary support for configuring a mouse as part of the
Mouse option in the Control Panel and also provided more flexible mouse settings in
a separate driver-specific applet. Windows 95 consolidates mouse configuration and
customization support into a single Control Panel icon and uses a tabbed property
sheet, shown in Figure 48, to provide easy access to all the possible settings, such
as the setting for the behavior of the mouse buttons and for the behavior of the
mouse pointer.

{ewc msdncd, EWGraphic, ux0h 2 /a "psH.bmp"}

Figure 48. The mouse property sheet

[Try It!](#)

Use a Single Mouse Driver

1. Remove the real-mode mouse driver from your CONFIG.SYS or AUTOEXEC.BAT and after restarting your PC, run an MS-DOS-based application that supports the use of a mouse.
2. Open an application, such as MS-DOS Edit, and use it both in a window and full-screen. Notice that the mouse is available in both modes.
3. Type MEM /C at the MS-DOS prompt and verify that the mouse driver is not loaded in real-mode.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 9: Networking

Windows-based desktops are being connected to corporate networks at a steadily increasing rate. As a result, demands for better network integration, improved network and system management capabilities, and better network performance and reliability are growing as more business-critical functions rely on the PC network. Because of these demands, companies are faced with increased costs to run PC networks and are investing in tools and staff to meet the challenge of day-to-day network management.

Windows 95 is constructed to address the needs of corporate network administrators with a well integrated, high-performance, manageable 32-bit network architecture. Windows 95 is also designed to address the needs of the Windows user by making access to and control of the network consistent, and by making network browsing and printing much easier through the many enhancements in the UI. In addition, Windows 95 is designed to address users' mobility needs by enabling remote access to the network from portable PCs.

Given the size of customers' current investments in both Windows and their PC network infrastructures, one overriding goal for networking in Windows 95 is compatibility. Compatibility involves ensuring continued support for existing real-mode components, as well as making the new 32-bit protected-mode components in Windows 95 compatible with existing 16-bit MS-DOS-based applications and device drivers and existing 16-bit Windows-based applications and DLLs.

This chapter introduces the 32-bit, protected-mode networking architecture built into Windows 95 and shows how it provides well integrated network support, manageability, improved performance, user-level network security, and dial-up access to the network.

Summary of Improvements over Windows 3.1 and Windows for Workgroups 3.11

The primary improvements in networking for Windows 95 include the following:

n

A robust, open, high-performance 32-bit network architecture, with 32-bit network client software, 32-bit file and printer sharing software, 32-bit network protocols, and 32-bit network card drivers

n

Support for using multiple redirectors, multiple protocols, and multiple network card device drivers simultaneously to facilitate integrating the desktop into a heterogeneous network environment

n

Support for industry standard connectivity and systems management solutions, including TCP/IP, IPX, SNMP, and DMI

n

Great integration with Novell NetWare, including high-performance, 32-bit protected-mode NetWare-compatible client software for connecting to NetWare 3.x and 4.x servers, and peer sharing for NetWare environments

n

Great integration with Windows NT Server to support a powerful client/server solution

n

Built-in support for systems management, including the ability to remotely administer, monitor, and view the configuration of PCs over the network

n

Improved dial-up network access support, providing remote access to Microsoft Network servers, Novell NetWare servers, and UNIX servers. Support for remote protocols such as PPP and SLIP is provided.

n

Improved network printing, making it easier for users to connect and configure printers in network environments

Easier Networking with Windows 95

The Microsoft Network support provides full interoperability with other Windows 95 PCs, and PCs running Windows for Workgroups, Windows NT, Windows NT Server, LAN Manager, and any other Microsoft-compatible servers. Windows 95 includes support for both client access and peer services capabilities on a Microsoft Network. Additionally, other network servers and services are provided by third parties—for example, Artisoft, Banyan, DEC, Novell, and SunSelect provide Windows 95 support for their respective network servers.

This section summarizes the key features and concepts in Windows 95 that make networking much easier to implement and use.

Windows 95 has built-in support for two networks: the Microsoft and Novell NetWare networks. (Built-in support for Novell NetWare is new with Windows 95.) Installation of support for one or both networks is as simple as clicking the Setup program for Windows 95 or the Network icon in the Control Panel. Both the Client for Microsoft Networks and the Microsoft Client for NetWare Networks are implemented as high-performance, high-reliability 32-bit protected-mode components.

[Microsoft Client for NetWare Networks](#)

The Microsoft Client for NetWare Networks in Windows 95 provides interoperability for NetWare 3.x and 4.x servers. Systems running Windows 95 can use all NetWare server services, browse NetWare servers, connect to servers, and queue print jobs either using the UI in Windows 95 or using Novell's NetWare command line utilities. The Microsoft Client for NetWare Networks in Windows 95 even run "TSR clean" NetWare logon scripts. In addition, Windows 95 provides continued support for Novell NetWare real-mode components, thereby supporting both the NetWare 3.x NetX shell and the NetWare 4.x VLM shell.

[File and Printer Sharing Services for NetWare Networks](#)

Windows 95 also provides NetWare-compatible peer services for file and printer sharing. These services feature user-level security by implementing a "pass through" security link to an existing Novell NetWare server to leverage the existing user database. Windows 95 doesn't introduce a new security scheme; rather, it fully leverages the existing user-level security built into NetWare's bindery.

Today's networks are heterogeneous and becoming even more connected. Companies are linking their Windows PCs to multiple PC network servers, mainframe and mini-computer host systems, UNIX machines, and a variety of services like the Internet. The desktop operating system must meet this challenge and provide support for often very disparate connectivity needs on the network. Today's desktop operating systems do not provide the necessary support for running multiple network clients simultaneously. Windows 95 has been explicitly designed with multiple network support as a key design goal.

Because integrated networking support is a key focus of the design of Windows 95, it's much easier to install and manage support for a single network or even multiple networks simultaneously using Windows 95. Building upon the support in Windows for Workgroups 3.11, which was capable of supporting up to two networks, Windows 95 can simultaneously support up to ten 32-bit, protected-mode network clients using its Network Provider Interface. This interface defines a set of APIs used by Windows 95 to access the network for tasks such as logging onto the server, browsing servers, connecting to servers, printing, and so on.

Installing network provider support is simple; it's done via the Network Setup icon in the Control Panel or from the Network Setup dialog box when first installing Windows 95. A Windows 95 desktop can run client support for NetWare, Windows NT Server, Banyan, DEC PathWorks and Sun NFS simultaneously.

PC users in a network environment that includes Apple Macintosh computers can use Windows 95 to exchange documents and share information with Macintosh users when Macintosh-compatible file services are used with Windows NT Server or Novell NetWare to connect to the common file server. (Long filename support in Windows 95 further simplifies the integration of the two systems.)

With Windows 95, you have easy access to the Internet, whether you dial into a commercial Internet provider or you gain access via your corporate network over TCP/IP. Windows 95 provides all the "plumbing" you need to tap into the information on the worldwide Internet network. Built-in support for TCP/IP, dial-up protocols, such as Point to Point Protocol (PPP) and Serial Line Internet Protocol (SLIP), and Windows Socket services make connecting to the Internet and the information highway just a mouse-click away.

TCP/IP, the protocol used on the Internet, is implemented in Windows 95 as a fast, robust, 32-bit Windows-based TCP/IP stack. This implementation does not have the conventional memory footprint common with MS-DOS-based drivers or TSRs.

Dial-up protocol support gives users flexibility in choosing the Internet access provider they want to dial into. Connection can be via a standard asynchronous modem or an ISDN connection.

Support for Windows Socket services allows use of any of the large collection of third-party and public-domain Internet utilities, such as Mosaic, WinWAIS, and WinGopher, to easily connect to the Internet and access the thousands of worldwide information servers.

Additionally, Windows 95 includes telnet and ftp to help users take advantage of the Internet. Windows 95 also supports sending and receiving e-mail messages over the Internet through the use of a provided mail driver that integrates with the Microsoft Exchange client, the universal inbox in Windows 95. For more information about Internet mail support in Windows 95, see Chapter 14, "Microsoft Exchange: E-Mail, Faxes, and More."

For users, running even one network client can be confusing and running multiple network clients is nearly unmanageable. Each server has its own set of unique client-side utilities and commands that are often difficult to remember and use. When

the desktop PC has support for multiple networks loaded, the user is faced with at least twice the number of commands and utilities to remember and may have to remember multiple passwords to access network resources.

The easy-to-use Network Neighborhood in Windows 95 makes it easier for users to perform common network operations on disparate servers. First, the network manager can establish one password to log a user onto the appropriate Windows 95 PC and network resources. These services could, for example, include e-mail, group scheduling applications, dial-in support, or database access. Additionally, common network actions, such as browsing servers, managing connections, and printing, are all performed identically through the UI in Windows 95, regardless of the type of server Windows 95 is connected to. As a result, users can locate, connect, and start print jobs on a NetWare print server as easily as they can with a printer attached to a Windows NT Server. All the common network actions can be accomplished visually, using the mouse to navigate through the network resources, the connections, and so on. Users aren't required to memorize any new network commands. For both the Client for Microsoft Networks and Microsoft Client for Novell NetWare Networks, users can run the corresponding command line utilities as well. This ongoing backward compatibility is necessary to support batch files that are currently in use and to ease the transition to the Windows 95 environment.

The Network Neighborhood also helps to manage the complexity of the network by showing it from the user's perspective—that is, it shows only what the user is interested in seeing. When the user initially opens the Network Neighborhood, the window contains only the servers the user has logged onto or the servers the user most frequently connects to, unless the user has explicitly customized the network view by dragging and dropping the server into the Network Neighborhood. This context-sensitive view of the network reduces the number of network resources the user initially encounters to a more manageable number of objects. For Windows NT domains and NetWare 3.x and 4.x, the network context presented is the “login server” and any other connected servers.

For a more in-depth discussion of the Network Neighborhood and the UI, see Chapter 3, “The Windows 95 User Interface.”

Two features in Windows 95 make connecting to a network easier for mobile PC users: Plug and Play and Dial-Up Networking.

n

Plug and Play. Plug and Play in Windows 95 solves several problems that

face mobile PC users. Mobile users no longer have to maintain multiple configurations, such as desktop and portable configurations. Windows 95 recognizes when they add or remove peripherals, such as when they remove a network card and add a modem for dial-up network access. Because Windows 95 supports hot and warm docking, users no longer have to reboot their systems each time they make a change to the configuration. In addition, Windows 95 has built-in Card and Socket services that allow for hot removal and insertion of PCMCIA cards, including network cards.

Network Plug and Play support in Windows 95 also includes application-level support. An application that is network-aware understands whether or not the network is available. If the network adapter is removed, the application automatically put itself into "offline" mode to allow the user to continue to work, or it shuts down gracefully.

n

Dial-Up Networking. Maintaining data access to their corporate network

while working in a remote location is another challenge for mobile users. Currently, several solutions for dialing into the corporate network exist, but most of these solutions are not well integrated with Windows, requiring a different set of tools. The Dial-Up Networking client in Windows 95 provides modular support for multiple dial-up providers, including Windows NT RAS servers and NetWare. It also supports several protocols, including NetBEUI, IPX/SPX, and TCP/IP via PPP and SLIP. Support for dial-up can also be offered by third parties—for example, Shiva has implemented Windows 95 support using the modular architecture of the Dial-Up Networking client in Windows 95.

Many corporations have rapidly growing networks that in some cases run worldwide. Keeping the networks and the ever increasing number of systems connected to the networks running at peak performance is a challenge for both end-users and network managers. Corporations are beginning to deploy network and desktop

management tools to help them meet this challenge.

Windows 95 has built-in network and system management instrumentation to enable current and future management tools to remotely monitor, query, and configure Windows 95 PCs. Using these tools, network managers can quickly inventory the software and hardware used on their networks. Working from a Windows 95 PC, network managers can remotely diagnose and reconfigure Windows 95 systems, as well as remotely monitor system and network performance on a Windows 95 PC. The following key components make Windows 95 very manageable:

n

The SNMP agent. Windows 95 incorporates an agent that implements the

Simple Network Management Protocol (SNMP). This agent complies with the Internet Engineering Task Force (IETF) SNMP specification, responding to queries and sending notifications of events that take place on the PC to an SNMP console. The SNMP console allows a network manager to remotely monitor and manage the Windows 95 PC. Events can be managed from a central SNMP management console.

n

The SNMP MIB, MIB-II. The SNMP MIB describes what information about

the system is available to the SNMP console. Windows 95 includes the MIB-II, which describes the Microsoft TCP/IP protocol and allows information about the protocol stack to be communicated back to the management console. For example, the management console can query the MIB-II for the IP address, the name of the user at this IP address, or IP routing information.

n

The DMI agent. DMI applications provide cross-platform desktop

management capabilities. Version One of the DMI specification was finalized this

spring, and Microsoft, as a founding member of the DMTF, will follow the specification's ongoing evolution. Soon after its release, Windows 95 will offer a DMI agent, with support for the agent built on top of the Registry.

n

Registry-based system management. Central to the operation of Windows

95 is the Registry. Similar in design to the Registry in Windows NT, the Registry in Windows 95 replaces the many .INI files previously used by Windows and Windows-based applications. The Registry contains information used by Windows 95 that describes the hardware configuration of the PC, preferences defined by the user, and application specific information. The Registry is a database containing keys and values. For example, HKEY_USER_NAME is the key for the user's name, and the name "Fred Smith" is the value associated with this key. A special category of keys, called DYNAMIC KEYS, are memory resident and can contain frequently changing data updated by system components, device drivers, or applications. For example, the number of packets sent per second could be registered by the network adapter device driver.

The Registry consists of three components: SYSTEM.DAT, which describes the PC configuration and computer-specific application information; USER.DAT, which defines user preferences and user-specific application information; and POLICY.POL, which defines "system policies" relating to either of the other two components. Each component is a file that resides on the PC or on a network server. The Registry is remotely accessible via an RPC-based interface. The Win32 Registry APIs are used to access the Registry, both locally and remotely.

[Management Tools for Windows 95](#)

Several tools for Windows 95 make managing the system or the network much easier. These tools include the following:

n

The Registry Editor. Allows local or remote editing of the Registry in

Windows 95.

n

The System Policy Editor. Used by network managers to set per-user or

per-group “policy” overrides on Registry entries. It creates the POLICY.POL
component of the Registry. This tool (the Windows for Workgroups’ admincfg
tool) contains a superset of those settings.

n

The System Monitor. Allows local or remote viewing of the performance of

the various I/O components of a local system or remote PC. For example, the file
system, the network components, or data from the network card can be
monitored. The data is updated dynamically using the Registry’s dynamic keys.

n

NetWatcher. Allows local or remote viewing and management of the

network connections of peer services in Windows 95.

Easier to Set Up and Install

PC and network managers faced several challenges when installing Windows in the
past. Some network managers installed Windows on the network server for later
installation onto users’ PCs or to run Windows from the server. In the case of later
installation, network managers had to decide on an approach for a number of
variables: making the process appear transparent to the user; rolling out Windows
using a “push” or “hands-free” installation; using specific settings for different
categories of users; and updating these configurations when either Windows,
Windows applications, or device driver updates were available. In the case of
running Windows from the server, network managers had to manage variables such
as having local swapping files and some local .INIs and applications; allowing user-
level configurations; supporting disparate hardware configurations; and handling the

roving user on the network.

Windows 95 addresses several elements of these problems with an improved Setup utility and the Registry. The new Setup streamlines the installation of Windows 95 on a network server for both later installation onto users' PCs and running Windows 95 from the server. In fact, the Windows 95 Setup utility has a scripting feature, making it possible to implement "hands-free" installation of Windows 95 from a network server to client PCs.

Running Windows 95 from a server becomes much simpler largely because of its Registry. The Registry is a centralized database of all hardware, software, and user information that is easy to maintain remotely on the server. This simple mechanism contrasts sharply with the state of configuration under Windows 3.1, with CONFIG.SYS, AUTOEXEC.BAT, and a myriad of .INI files for Windows and Windows-based applications. Moreover, the separation of hardware configuration and user profiles in the Registry means that if users move around on the network, their preferences follow them from PC to PC, regardless of the hardware configuration they're currently working on.

Network Architecture in Windows 95

The Network architecture in Windows 95 radically improves on the level of network support and integration that existed in Windows 3.1. The key design points of the networking architecture in Windows 95 are the following:

n

Fast, 32-bit VxDs. The networking components in Windows 95 are built as

32-bit virtual device drivers, which have no conventional memory footprint, and are loaded dynamically when needed by the system. In addition, because the operating system and the device drivers are all running in protected mode and overhead for mode switching and virtualization between protected and real-mode operation is no longer incurred, network I/O performance is 50 to 200 percent faster than under Windows 3.1.

n

Reliability. Because the networking components in Windows 95 run in

protected mode and are designed to a well-defined set of interfaces, they are more reliable than real-mode network components. Real-mode network components may conflict in memory or attempt to exclusively chain the same set of interrupts, which commonly leads to system hangs or error conditions. These errors don't occur with protected-mode network components because Windows 95 arbitrates the hardware resource allocation.

n

Modular, open design. The network architecture in Windows 95 is highly

modular and includes a new Network Provider Interface (NPI), an Installable File System (IFS) interface, and a version of Network Driver Interface Specification (NDIS) version 3.1 that has been enhanced for Plug and Play support. The specifications for all three interfaces are available to third-party network vendors.

n

Multiple network support. Windows 95 is designed to accept multiple

network providers, multiple network redirectors written to the IFS interface, and multiple NDIS drivers as needed. As a result, client support for Microsoft Networks and Novell NetWare can be run simultaneously. Windows 95 is capable of concurrently supporting the use of multiple 32-bit, protected-mode network clients and one real-mode network client.

n

Multiple protocol support. One of the NDIS components in Windows 95,

the Protocol Manager, supports the loading of multiple transport protocols. The Protocol Manager enables Microsoft and third parties to independently write protocol stacks that coexist well for Windows 95. Windows 95 includes built-in support for IPX/SPX, TCP/IP, and NetBEUI.

n

Plug and Play. All of the networking components in Windows 95 are

designed for dynamic Plug and Play operation. For example, when a PCMCIA network card is inserted, the NDIS 3.1 network card driver is automatically loaded, and the network is available. When either the PCMCIA network card or the network cable is removed, Windows 95 doesn't hang as many real mode networks do, but instead notifies any applications using the network that the network is no longer available and continues to run.

Figure 49 shows the general layout of the network architecture built into Windows 95. The following sections in this chapter describe key aspects of this architecture, including the NPI, the IFS, and NDIS 3.1.

`{ewc msdncl, EWGraphic, ux0i 0 /a "psl.bmp"}`

Figure 49. The layered network architecture of Windows 95

Network Provider Interface: Concurrent Support for Multiple Network Servers

Windows 95 has an open, modular Network Provider Interface to allow support for multiple networks to be installed in Windows 95 simultaneously. The NPI enables Microsoft or any third party network provider to integrate various network services seamlessly into Windows 95. The NPI has the following key benefits:

n

The open interface allows network vendors to supply tightly integrated support for their network servers for Windows.

n

All supported networks are identically accessed and managed through the Windows 95 Network Neighborhood UI.

The NPI abstracts the network services for the Windows 95 UI components, as well as the various Windows 95 network and desktop management components. The NPI consists of two parts: the network provider API and the network providers. The network provider API is a single, well-defined set of APIs used by Windows 95 to request network services, such as those for browsing servers, connecting to and disconnecting from servers, and queuing a print job. These requests are then passed to the network providers. The network provider layer sits below the API layer and provides the network services requested by components of Windows 95. Conceptually, this model is similar to the design of the various device driver interfaces of Windows 95—a well-defined set of interfaces used by the operating system to request services, and the services themselves, which are provided by a device driver that is often written by a third party.

The most obvious abstraction of the various network services provided by the NPI is the Windows 95 system login. Each network provider can provide a unique logon dialog box to suit the needs of the network server's security model. For example, the logon dialog box shown in Figure 50 is for logging onto a Windows NT Server domain:

{ewc msdncd, EWGraphic, ux0i 1 /a "psl.bmp"}

Figure 50. The network logon dialog box for the Windows NT Server domain

The dialog box for logging onto a Novell NetWare 3.x server, shown in Figure 51, offers additional information to allow users to log on as GUEST. This dialog box is invoked when a user first accesses a NetWare server.

{ewc msdncd, EWGraphic, ux0i 2 /a "psl.bmp"}

Figure 51. The network logon dialog box for Novell NetWare 3.x or 4.x

When the logon information from the dialog box has been validated against the requested server, the password is passed back to Windows 95, which can then use the password as the “password control” and unlock any linked system or network resources. In this fashion, Windows 95 can accommodate the various ways that network servers provide their services, while offering the user a very consistent interface.

Another example of support from the network provider that is visible to users occurs when they specify server name strings. For example, Microsoft-compatible networks use the Universal Naming Convention, which takes this form:

\\SERVER-NAME\SHARE-NAME

However, NetWare servers are specified in this form:

SERVER-NAME/VOLUME-NAME:DIRECTORY-NAME

The respective network providers correctly parse the syntax of their server name strings, so users who are accustomed to using the NetWare server syntax can type name strings in that form wherever strings are required by the Windows 95 UI to access NetWare server resources.

Installable File System: Support for Multiple Network Redirectors

The Installable File System interface built into Windows 95 is a well-defined set of APIs that are used to implement all file systems in the operating system, including the VFAT (32-bit FAT) and CD-ROM file systems. The IFS implementation in Windows 95 is functionally similar to the IFS implementations in Windows for Workgroups and Windows NT. For networking, the IFS is used to implement network redirectors. The IFS interfaces are documented for use by vendors of network servers when implementing their redirectors for Windows 95. The IFS offers the following key benefits for network redirectors for Windows 95:

n

Multiple redirector support. The IFS interface was designed for multiple redirectors.

n

Increased reliability. The IFS model arbitrates resource requests, removing the source of many real-mode redirector conflicts.

n

Improved performance. Network redirectors benefit from the unified IFS cache, which makes client side network redirector caching available.

The IFS consists of a set of file system APIs and loadable file system drivers (FSDs). Multiple FSDs can be resident in the system simultaneously. The FSDs provide the logic necessary for the file system to provide a consistent view of devices and arbitrates access, update, and control of devices of very different physical media types. For network redirectors, the FSDs provide mechanisms to locate, open, read, write and delete files, as well as services such as named pipes and mailslots.

To illustrate the flow of control, take as an example opening a file that is actually a link to a file on a server from a Windows 95 desktop. The user double-clicks the icon. The Windows 95 shell parses the link and determines that the file is a network object. The shell passes the filename to the NPI, which if necessary reestablishes the network connection to the server on which the object resides. The NPI then calls the network redirector to open the file on the file server. The network redirector translates the file request into a request formatted for the specified network file server, transmits the request to the server via its link through the NDIS layer, and returns to the NPI and the shell a handle to the open file.

The Microsoft-supplied redirectors for the Client for Microsoft Networks and the Microsoft Client for NetWare are both implemented as IFS FSDs.

NDIS 3.1: Multiple Protocol Support

Network Driver Interface Specification version 3.1 is a superset of the NDIS 3.0 functionality that exists for Windows NT and Windows for Workgroups 3.11. NDIS 3.1 has enhancements for Windows 95 in the following key areas:

n

Plug and Play enhancements to the Protocol Manager and Media Access

Control (MAC) layer. These enhancements enable network drivers to be dynamically loaded and unloaded.

n

A new NDIS mini-driver model. The mini-drivers for use with Windows 95

are binary compatible with the mini-driver implementation used in Windows NT 3.5.

The primary changes to the NDIS model were extensions for Plug and Play support, and upgrading an NDIS 3.0 driver to NDIS 3.1 is very straight forward — for example, in some cases Microsoft engineers have taken only one hour to update an NDIS driver's source code. However, instead of making this type of upgrade, vendors can instead choose to provide a mini-driver. The mini-driver model dramatically decreases the amount of code that a network adapter vendor must write, and NDIS mini-drivers developed for Windows 95 and Windows NT are binary compatible.

Conceptually, the mini-driver model is similar to the driver models implemented for printers, disk drivers, and display drivers. Essentially the mini-driver divides the existing NDIS Media Access Control (MAC) layer into two halves. The mini-driver half implements only the code that is specific to the network adapter card, including specific implementation details, such as establishing communications with the card, turning electrical isolation on and off (if implemented) for Plug and Play, doing media detection, and enabling any value-added features the card may contain. The mini-driver is wedded to the NDIS wrapper, which implements the other half of the MAC functionality. This NDIS wrapper contains the code that is “common” to all NDIS drivers. (NDIS 3.1 mini-drivers are roughly 40 percent smaller than existing NDIS 3.0 MACs because in earlier versions of NDIS, each MAC carried this redundant code.)

An NDIS 3.1 stack is composed of three components: the protocol, the MAC or mini-port, and the mini-port wrapper. NDIS contains the Protocol Manager, which loads and unloads the protocol. This manager can manage multiple protocols loaded simultaneously. Immediately below the protocol is either the MAC or the mini-driver, if a mini-driver is used. Multiple MACs or mini-drivers can be loaded in systems in

which multiple network adapter cards are loaded. Finally, the mini-port wrapper layer below the mini-port does a mapping of Windows NT Hardware Abstraction Layer (HAL) layer APIs for I/O. This mini-port wrapper layer is very thin because Windows 95 can always assume that it's being run on an Intel architecture.

Novell NetWare Integration

Windows 95 provides a complete, Microsoft-supplied Microsoft Client for NetWare Networks for Windows. This client can be installed as the default network support for Windows 95, or it can coexist with the Client for Microsoft Networks, as shown in Figure 52. The Microsoft Client for NetWare Networks for Windows 95 provides interoperability with NetWare 3.x and 4.x servers.

`{ewc msdncd, EWGraphic, ux0i 3 /a "psl.bmp"}`

Figure 52. The Control Panel's Network tool, showing the Client for Microsoft Networks and the Microsoft Client for NetWare Networks running simultaneously

Windows 95 can also run on top of the existing Novell NetWare 3.x or 4.x clients, the NETX or VLM shells. This support is intended to help customers make the transition from their real-mode network to the fully 32-bit protected-mode network implementation in Windows 95, using smaller steps if necessary.

The Microsoft Client for NetWare Networks has the following key features:

n

High performance—up to 200 percent faster for some network operations compared with Windows 3.1 with the NetWare VLM shell installed

n

Robust and reliable client support

n

Zero conventional memory footprint

n

An auto-reconnect feature

n

Packet burst protocol support

n

Client side caching

n

Plug and Play awareness

n

Full integration with the UI in Windows 95

n

Full interoperability with Novell NetWare 3.X and 4.x clients and servers

n

The ability to run NetWare command line utilities

n

Graphical logon to NetWare 3.X, or 4.x via the NetWare Bindery

n

User level security implemented using “pass-through” to the Bindery

n

A NetWare-compatible logon command processor

n

Point and Print support

The client is fully implemented as 32-bit virtual device driver components. Designed to run in protected mode and operate in a multitasking environment, the client is much more robust than real-mode networking components and takes no conventional memory.

The Microsoft Client for NetWare Networks has great performance characteristics. On large block transfers over the network, it is up to 200 percent faster than Windows 3.1 using the VLM shell; in fact, it is up to 200 percent faster than Windows 95 using the VLM shell. For most network operations that are a mix of reading and writing, the Microsoft Client for NetWare Networks is between 50 and 200 percent faster, depending on the mix of network I/O.

The Microsoft Client for NetWare Networks is enabled for Plug and Play. Portable computers that support this capability can be hot-docked or undocked and the networking support is properly loaded and unloaded without hanging the system. (Hot-docking and undocking is the equivalent of connecting and disconnecting the network cable from a Windows 95 PC. Under Windows 95, the system continues to function, whereas in real-mode networks, connecting and disconnecting causes the system to hang.) PCMCIA network cards also function in the same manner.

Logon to Windows 95 is linked to a NetWare Bindery. This link logs users onto both the Windows 95 system and their preferred NetWare server via a single graphical logon process.

As shown in Figure 53, users can specify that the Microsoft Client for NetWare Networks should process NetWare logon scripts. If drive mappings and search drives are specified in a logon script, the same user configuration is implemented under Windows 95, with no changes necessary. The Windows 95 logon processor can also parse conditional statements in NetWare logon scripts. One key difference in logon processing is that because the Windows 95 logon processor operates in

protected mode, it cannot load TSRs. Logon scripts that load TSRs must be updated to remove the TSR-loading commands, and the TSRs must be loaded in the 16-bit driver load prior to the protected-mode operation. (In some cases, these TSRs have protected-mode equivalents built into Windows 95, and loading them may not be necessary.)

`{ewc msdncd, EWGraphic, ux0i 4 /a "psl.bmp"}`

Figure 53. The property sheet for the Microsoft Client for NetWare Networks, showing that a preferred server has been specified and logon scripts have been enabled

The Microsoft Client for NetWare Networks in Windows 95 can also load and run NetWare command line utilities. It supports the MS-DOS level NetWare APIs, and the 16-bit Windows DLLs that NetWare supplies can be run on the Microsoft Client for NetWare.

Windows 95 provides peer services for NetWare clients. During the installation of Windows 95 and via the Network icon in Control Panel, users can install either the NetWare Compatible Peer Services or Microsoft Network Peer Services. The peer services in Windows 95 are meant to work in concert with an existing Novell NetWare server and add complementary sharing services.

The NetWare Compatible Peer Services enable the sharing of local files and printers on the Windows 95 system. For the NetWare Compatible Peer Services to be activated, a Novell NetWare server must be on the network. Without this server, file and printer sharing cannot be enabled because of the pass-through security model. Under this model, user-level security is implemented using the Bindery, the NetWare server's security authority, which passes the validation of users through to the NetWare server. (Unlike with file and printer sharing services for Microsoft Networks, share level security is not supported.)

Before sharing is enabled, a NetWare server must be specified via the Security tool in the Control Panel. The Control Panel's Network tool is then used to specify which server or domain controller is the PC's designated security authority, as shown in Figure 54.

`{ewc msdncd, EWGraphic, ux0i 5 /a "psl.bmp"}`

Figure 54. Specifying user-level (pass-through) security from a Windows NT domain named SYS-WIN4

Adding users to the list of those who can share the PC's hard drive is accomplished via an Add Users option on the hard disk's property sheet. Selecting this option displays the dialog box shown in Figure 55, where access privileges are specified.

The list of users that can share the hard disk is obtained from the security authority specified in the Control Panel's Network tool—SYS-WIN4 in this case.

`{ewc msdncd, EWGraphic, ux0i 6 /a "psl.bmp"}`

Figure 55. Specifying access privileges for a user through user-level security

When a user attempts to access a shared device on the Windows 95 system, the Windows 95 PC receives the connection request and validates the user name or group membership with the NetWare server. If the name or group membership is valid, the peer services in Windows 95 then check whether the name or group has been granted access rights to the shared resource and grants or denies the connection request accordingly.

The sharing-enabling process illustrates two points:

n

User management is all done in the namespace of the existing NetWare

server. Windows 95 doesn't add another namespace to administer, and the NetWare server is administered using the tools that are currently in use—for example, tools that the NetWare network manager currently uses, such as SYSCON, are used for user account management for Windows 95 user-level security.

n

Only valid user accounts and groups can be shared with NetWare

Compatible Peer Services:

Peer services in Windows 95 are remotely administrable via the NetWatcher. The network manager can monitor connections to any resource on any Windows 95 peer services PC on the network, and can disconnect users and remotely change access rights for specific users. By default, remote administration is limited to user accounts with the administrator privilege.

[The Microsoft Print Server for NetWare Networks](#)

In Windows 95, the file and printer sharing services for NetWare networks include a Win32-based PSERVER capability, which can despool print jobs from NetWare queues to printers on Windows 95 PCs. Consequently, a NetWare server queue can be serviced by a printer attached to a system running the file and printer sharing services for NetWare. One benefit of this capability is that because print queues can all be managed centrally from the NetWare server, users can print to one queue. If the network includes several systems running Windows 95 with peer services enabled, each system can despool from one queue, increasing overall network-based printer capacity. Alternatively, queues can be designated specifically for printers attached to a system running the file and printer sharing services for NetWare networks.

[NetWare 4.x Support](#)

The Microsoft Client for NetWare Networks supports a NetWare 4.x server if it is running Bindery emulation. The NetWare 4.x server is then browsable from the Network Neighborhood like any other NetWare server.

Microsoft is working to provide an updated Microsoft Client for NetWare Networks with support for NDS logon and browsing and will make this client support available for little or no cost when it is complete. Current plans call for this support to be available shortly after Windows 95 is released.

The Microsoft Client for NetWare Networks includes support for both the MS-DOS-based APIs and Windows-based APIs defined by Novell. Both of the 16-bit Novell DLLs for Windows—NWNET.DLL and NWCALLS.DLL—can be run with the Microsoft Client for NetWare Networks, ensuring that any MS-DOS or Windows-based applications and utilities that are NetWare-aware run compatibly with the Microsoft Client for NetWare Networks.

Windows 95 offers these additional interoperability features:

n

Full support for Novell command-line utilities (client and server) for

NetWare 3.X

n

Support for booting diskless workstations from NetWare servers

n

Floppy boot capability

n

Dial-up connectivity to Novell's NetWare Connect server

Microsoft Network Integration

Windows 95 includes a network client that implements support for Microsoft Network functionality. This client allows Windows 95 to connect to Windows for Workgroups, Windows NT Server, and LAN Manager and interoperate with IBM LAN Server, DEC Pathworks, AT&T Starlan, and LAN Manager for UNIX, as well as other SMB-compatible networks.

Key Client for Microsoft Networks features include the following:

n

Robustness

n

Zero conventional memory footprint

n

An auto-reconnect feature

n

Client-side caching

n

Plug and Play awareness

n

Full integration into the UI in Windows 95

n

Protocol independence

n

Point and Print for one-click printer setup

The Client for Microsoft Networks is implemented as a collection of 32-bit, protected-mode components. The Network Provider, the Redirector, and NDIS 3.1 drivers are implemented as VxDs, and because the components execute in protected mode without the overhead of switching to real mode, they provide great performance. The Network Provider implements client-side caching for an additional performance boost. The client's components have higher reliability than real-mode components, they are designed for operation in a multitasking environment, and they run in kernel Ring 0 context. As a result, they are not affected by errant Windows-based applications as real-mode network components are. And because they run in protected mode, they have no conventional memory footprint.

The client is enabled for key features of Windows 95, such as long filenames, links, auto-reconnect to servers, Point and Print, and Plug and Play, and it is integrated tightly into the Windows 95 shell via the NPI. The client is protocol-independent, and it can use IPX/SPX (the default installed protocol), TCP/IP, or NetBEUI.

The client provides full interoperability with Windows for Workgroups, Windows NT Server, LAN Manager, and LAN Manager for UNIX. It also provides compatibility with AT&T StarLAN, IBM LAN Server, 3Com 3+Open and 3+Share, and DEC Pathworks.

For compatibility and to help customers implement floppy boot or better manage the transition to Windows 95, a real-mode client for Microsoft Networks is also included. The Microsoft real-mode components can be "unloaded" by the operating system after the protected-mode networking software is loaded.

Windows 95 includes enhanced peer services for Microsoft Networks. The peer server in Windows 95 supports the user-level security model when used in-

conjunction with a Windows NT Server, and the peer services can be linked directly to domain-based user accounts. As a result, network administrators can centrally control access to peer services at the domain controller. This domain controller can be either a Windows NT Server or a LAN Manager domain controller.

User-level security begins with sharing a device on a Windows 95 system. The list of users that appears in the sharing dialog box are provided by the domain controller, so only validated domain users can share the device. After the share is established, user logons are specified for access rights. When a user requests access to a shared Windows 95 resource, the Windows 95 peer services check the user's logon name against the domain controller's list. If the user logon is valid, the peer services then check whether this user has access privileges for this resource. If the user has access privileges, the connection is established.

Like Windows for Workgroups, Windows 95 includes share-level peer services. This level of security associates a password with a shared disk directory or printer. Share-level security can be implemented in a network consisting of only PCs running Windows 95 or in a network that includes other Microsoft Networks-compatible servers.

Peer services in Windows 95 are remotely administerable via the NetWatcher. A network manager can monitor connections to any resource on any Windows 95 peer services PC on the network and can disconnect users and remotely change access rights for specific users. By default, remote administration is limited to user accounts with the administrator privilege.

Network Compatibility

Windows 95 includes built-in support for Microsoft Networks and Novell NetWare Networks. In addition, the Setup program in Windows 95 can correctly install and configure Windows 95 for a variety of existing real-mode networks, including, but not limited to the following:

n

3Com: 3+Open and 3+Share

n

Artisoft LANtastic

n

Banyan VINES

n

Beame and Whiteside's B&W-NFS

n

DEC PATHWORKS

n

IBM: LAN Server, LAN Program, and PC LAN Program

n

Microsoft LAN Manager and MS Net

n

Novell NetWare

n

SunSelect PC-NFS

n

TCS 10net

Protocol Support

Protocols for networking components in Windows 95 are implemented as 32-bit protected-mode components. Windows 95 can support multiple protocols simultaneously. Protocol stacks can be shared among the installed networks. As an example, a single TCP/IP protocol stack can serve the needs of both the Client for Microsoft Networks and the Microsoft Client for NetWare Networks.

All three protocols included with Windows 95 (IPX/SPX, TCP/IP, and NetBEUI) are Plug and Play enabled. As a result, the Windows 95 system continues to run if the network is unavailable, either because a portable computer has been undocked or a

PCMCIA network card has been removed. If the network is unavailable, the protocol stacks unload themselves from the system after sending notification to any dependent applications. Plug and Play enabling also means protocols can be loaded automatically. For example, if a portable computer is undocked and attached to an infrared (IR) line-of-sight network, the TCP/IP protocol is unloaded and the appropriate IR protocol is loaded.

The IPX/SPX stack is the new default protocol for Windows 95 and is compatible with the Novell NetWare IPX/SPX implementation. This protocol stack can be used to communicate to either a NetWare server, or a Windows NT Server 3.5. This protocol is routable, and will run compatibly on most network infrastructure (such as bridges, routers, and so on) that are designed for IPX/SPX routing. The IPX/SPX protocol in Windows 95 includes support for "packet burst" which can offer improved network performance.

One enhancement made to the Microsoft IPX/SPX implementation is Windows Sockets programming interface support. The Windows Sockets interface is supported using IPX/SPX as the protocol. Hence, any WinSock applications can run on top of IPX/SPX with Windows 95. Support is provided for only Win32 WinSock applications.

The IPX/SPX implementation in Windows 95 also has support for the NetBIOS programming interface.

The TCP/IP protocol is becoming widely accepted for connectivity to the Internet and as an industry standard for many corporate networks. In Windows 95, TCP/IP is fully implemented as a 32-bit, high-performance VxD that consumes no conventional memory. It includes several of the more commonly used command-line utilities, such as telnet, ftp, arp, ping, route, netstat, nbstat, ipconfig, tftp, rexec, rcp, rsh, and traceroute.

The TCP/IP protocol support in Windows 95 includes the Windows Sockets programming interface and a WinSock DLL. (A 16-bit WinSock is provided for compatibility with existing WinSock applications, and a 32-bit WinSock is provided for Win32-based WinSock applications.)

NetBIOS programming interface support is also supplied with the TCP/IP support.

[DHCP Support](#)

Working with other industry leaders, Microsoft has created a BOOTP backward-

compatible mechanism for automatic allocation of IP addresses to make implementation of the TCP/IP protocol more manageable. The Dynamic Host Configuration Protocol (DHCP) runs from a Windows NT DHCP server and allows network managers to centrally establish a range of IP addresses per subnet for any Windows 95 TCP/IP client requesting an address. It also allows network managers to centrally establish a "lease time" — how long the allocated IP address is to remain valid. Unlike bootp, the address allocation is dynamic, not preconfigured. In this fashion, it is possible to move from subnet to subnet and always have a valid IP address mask. Windows 95 includes a ipconfig utility that allows a user or administrator to quickly examine the allocated IP address, its lease time, and other useful data about the DHCP allocation, as shown in Figure 56.

Windows IP Configuration Version 0.1

Host Name :
DNS Servers :
DNS Lookup Order. . . . :
Node Type : Mixed
NetBIOS Scope ID. . . . :
IP Routing Enabled. . . : No
WINS Proxy Enabled. . . : No
WINS Resolution For Windows Sockets Applications Enabled : No
DNS Resolution For Windows Networking Applications Enabled : No

Adapter Address 00-AA-00-18-B0-C4:

DHCP Enabled. : Yes
IP Address. : 11.105.43.177
Subnet Mask : 255.255.0.0
Default Gateway : 11.105.0.1
DHCP Server : 11.105.43.157
Primary WINS Server . . : 11.101.13.53
Secondary WINS Server . : 11.101.12.198
Lease Obtained. : Tue 10th. May 1994 6:44:40 am
Lease Expires : Wed 11th. May 1994 6:44:40 am

Figure 56. The output of the ipconfig utility, showing useful data about the DHCP allocation

DHCP support can be specified at installation time or enabled via the Control Panel's Network tool. If DHCP support is disabled, an IP address can be entered in the Microsoft TCP/IP property sheet, as shown in Figure 57.

{ewc msdncd, EWGraphic, ux0i 7 /a "psl.bmp"}

Figure 57. The Microsoft TCP/IP property sheet, showing the DHCP configuration

[WINS Support](#)

The TCP/IP protocol stack in Windows 95 lets users choose to install support for either the Windows NT Windows Internet Naming Service (WINS) or the OSF DCE Domain Naming Service (DNS). These naming services provide name resolution by binding the node name and the currently allocated IP address, providing for correct addressing of any requests for resources from a node anywhere on the network. The amount of network traffic needed to locate the node on the network is thus minimized. Windows 95 supports a single DNS server and up to two WINS servers.

[The NetBEUI Protocol](#)

Windows 95 includes a NetBEUI protocol stack that is compatible with existing networks using NetBEUI. This stack provides compatibility with Windows for Workgroups, Windows NT Server, LAN Manager, and other networks. A NetBIOS programming interface is also supported.

Network Interprocess Communications Interfaces

Windows 95 includes support for a variety of distributed computing programming interfaces, including the following:

n

Client-side named pipes

n

Mail slots

n

OSF DCE-compliant Remote Procedure Call (RPC)

n

Network DDE

n

The Windows Sockets interface

Long Filename Support

The network clients in Windows 95 support the use of long filenames. If the Windows 95 system is connected to a network server that supports long filenames, then support for filenames on the server is identical to the local long filename support in Windows 95. (On some servers, the length of filenames and the list of restricted characters may differ from those of Windows 95.) Long filename support is possible on both the Windows NT Server and NetWare servers if the servers are properly configured.

Network Printing

Windows 95 includes a number of enhancements designed to make printing easier over the network, including the following:

n

Point and Print. A printer driver can be automatically installed when

connecting to a printer attached to a Novell NetWare, Windows NT Server, or Windows 95 print server. As a result, Windows 95 printer drivers can be located on a Windows NT Server or Novell NetWare server and automatically installed by their Windows 95 clients.

n

The Microsoft Print Server for NetWare Networks. For compatibility with

NetWare's PSERVER functionality, Windows 95 peer services can despool print jobs from Novell NetWare print queues.

n

Deferred printing. When a Windows 95 PC is disconnected from the

network, print jobs are deferred until the PC is once again attached to the network. Print jobs that have been deferred automatically start when the PC is reconnected.

n

Remote printing management. Print jobs can be held, canceled, or

restarted remotely. In addition, on systems that have ECP ports, information about the print job status can be returned, such as paper tray status, paper jams, or other error conditions.

Network Security

Windows 95 implements a full user logon. The first thing most users encounter after booting their Windows 95 systems is a logon dialog box, which varies depending on the type of network. For example, the Windows NT Server logon dialog box may prompt for a username, password, and domain name. The Novell NetWare 4.x logon dialog box may prompt for a username, password, and preferred server name. When the username and password pair have been validated against the network server's security authority, the Windows 95 UI is displayed.

Network managers can configure the Windows 95 system to allow entry into the UI with no network access if users fail to log on. (This configuration is the default.) As

an alternative solution to this problem, network managers can specify guest accounts that have limited network access.

The Windows 95 user logon should not be construed as a mechanism to fully secure PCs. Because the PCs are still vulnerable to a floppy boot, all data stored on their hard disks is potentially available. The underlying file system in Windows 95 is the MS-DOS FAT file system, which has no built-in encryption or other security mechanisms.

Network resources are secured under Windows 95 using the same security mechanisms employed by network servers on corporate networks. The username and password in Windows 95 can be configured to be the same as those used by the network server so as to control network access, provide user-level security for access to shared resources on the local PC, and control the various agents in Windows 95, as well as limit who has remote administration authority on this Windows 95 system. In this fashion, Windows 95 leverages the existing investment in network servers, management tools, utilities and infrastructure. Network managers can manage user accounts centrally on the server, just as they always have. They can also use familiar tools for managing user accounts.

The Password Control in Windows 95 can provide a unified logon for all system components requiring password authentication services, as well as for any applications that choose to use the Password Control services. For example, protected spreadsheets or databases might use the Password Control services.

The Password Control associates the username and password supplied at Windows 95 logon with other authentication-conscious programs or system components. However, for higher security, network managers can choose to associate other passwords with access to vital corporate data or other sensitive network services.

Figure 58 shows the Password Control dialog box, which is accessible from the Control Panel:

{ewc msdncd, EWGraphic, ux0i 8 /a "psl.bmp"}

Figure 58. The property sheet for security, showing the Password Control settings

The Password Control provides a mechanism to individually manage components that choose to use the unified password cache. Windows 95 can be configured to use the Windows 95 logon for authentication on a service by service or application by application basis, making it possible to access all resources on the Windows 95 system, as well as on the network, using the Password Control in Windows 95. One example of how the Password Control service is used within Windows 95 is to provide a single logon to both the network and the Microsoft Exchange client, the mail client provided with Windows 95. Then when users log onto their PCs, the

password they entered to log onto Windows 95 also automatically logs them onto e-mail. This single logon provides a solution for the problem of password proliferation.

Windows 95 uses the logon process to provide user-level security for a variety of services beyond network resource access, including the following services that are remotely accessible:

n

File and printer sharing

n

Dial-up network Access gateway control

n

Backup agent

n

Network and system management

[Pass-Through Security](#)

Pass-through security is implemented in Windows 95 as the mechanism to enable user-level security. Pass-through literally means that Windows 95 passes authentication requests through to a Windows NT Server or NetWare server. Windows 95 does not implement its own unique user-level security mechanism but instead uses the services of an existing server on the network.

[File and Printer Sharing](#)

For file and printer sharing using Windows 95 peer services, enabling pass-through security is a two-step process. First, user-level security must be enabled using the Control Panel. Second, the device must be shared and users with access privileges must be specified. Right-clicking the drive C icon in My Computer displays a property sheet that shows what shares already exist and which users have access, and allows new devices to be shared and new users to be added to specific shares. The usernames listed in this property sheet are supplied by either the Windows NT Server domain, the NetWare Bindery, or NDS.

[Remote Administration](#)

The Remote Administration function of a Windows 95 PC specifies the users or groups who have authority to manage the Windows 95 system, including the following:

n Dial-up network access gateway control

n Backup agent

n

Remote access to the Registry

n

Remote NetWatcher access

n

Remote system performance monitoring

Remote Administration is controlled via the Network Security tool in the Control Panel. Figure 59 shows Remote Administration enabled. In this case, Remote Administration is limited to the Domain Admins network manager group—any user who is a member of this group can remotely administer this Windows 95 system. Individual users can also be designated as remote administrators—for example, sophisticated users could be given remote administrator access to their systems.

{ewc msdncd, EWGraphic, ux0i 9 /a "psl.bmp"}

Figure 59. The property sheet for security, showing the Remote Administration settings

Dial-Up Server Remote Access Gateway

Windows 95 includes a single-line, dial-in gateway that allows a Windows 95 PC with peer services enabled to serve as a gateway to the network. The gateway is established via the property sheet shown in Figure 60.

Like the Dial-Up Networking client, the Remote Access Gateway supports the following protocols:

n

TCP/IP via the Point to Point Protocol (PPP)

n

IPX/SPX via PPP

n

NetBEUI

The Remote Access Gateway implements pass-through security, so only authenticated users can log onto the Gateway services. After connecting to the Gateway, Dial-Up Networking clients can access any network resource that they have privileges to use, including network server resources and peer services.

{ewc msdncd, EWGraphic, ux0i 10 /a "psl.bmp"}

Figure 60. The Remote Access Gateway dial-in property sheet, which shows that dial-in access to the network is available via this Windows 95 PC

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 10: Systems Management

Windows 95 is the first version of Windows expressly designed for manageability. The design ensures that management of the Windows 95 PC is accessible both locally and remotely via a privileged network manager. Network security is used to determine administrator-privileged accounts using pass-through security. Windows 95 also provides for PC users to be logically separated from the underlying configuration of their PCs so that the PC and user configurations and privileges can be managed independently. As a result, network managers can allow users to “rove” on the network—that is, log on from virtually any PC on the network and then operate from a desktop that has the correct settings and network privileges. The logical separation also means that a single PC can be shared by multiple users, each with a different desktop configuration and different network privileges.

Given the proliferation of PCs connected to corporate networks, the Windows 95 PC must be able to participate in any network-wide management schemes. Windows 95 is designed to meet various network management criteria by providing built-in support for several of the key network management standards. With this infrastructure built into Windows 95, network management applications will be able to provide tools for network managers to keep PCs and networks running more efficiently and cost effectively.

Open management interfaces are key to the management implementation in Windows 95. Where a standard exists, Windows 95 implements an enabling technology to embrace the standard—for example, an SNMP agent is supplied to enable remote management of Windows 95 PCs via any number of third-party SNMP consoles. Where no standard exists, the management interfaces are documented in the Win32 API set. Microsoft expects that management software will be available for Windows 95 from a wide range of vendors.

The following list outlines the key components of the management infrastructure in Windows 95:

n The Registry

n

The Registry Editor

n

User Profiles (the user component of the Registry)

n

Hardware Profile (the system component of the Registry)

n

System Policies (the network and system policy component of the
Registry)

n

The System Policy Editor

n

Remote Administration Security (the remote admin authentication scheme)

n

Remote Procedure Call (the mechanism used to remotely administer

Windows 95)

n

NetWatcher

n

The System Monitor

n

The SNMP Agent

n The DMI Agent

n Backup Agents, such as Cheyenne ARCServe and Arcada MTF

The discussion of the management infrastructure in Windows 95 is organized as follows:

n The Registry

n User Management

n System Management



Network Management

The Registry

The Registry is the central repository in which Windows 95 stores all its configuration data. The Windows 95 system configuration, the PC hardware configuration, Win32-based applications, and user preferences are all stored in the Registry. For example, any Windows 95 PC hardware configuration change that is made via a Plug and Play device is immediately reflected in a configuration change in the Registry. Because of these characteristics, the Registry serves as the foundation for user, system, and network management in Windows 95.

The Registry essentially replaces the various MS-DOS and Windows 3.11 configuration files, including AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, SYSTEM.INI, and the other applications .INI files. However, for compatibility purposes, instances of CONFIG.SYS, WIN.INI, and SYSTEM.INI files may exist on a Windows 95 PC for backward compatibility with either 16-bit device drivers or 16-bit applications that must run on Windows 95. For example, 16-bit applications will probably continue to create and update their own .INI files.

The Registry concept in Windows 95 is built upon the Registry concept first implemented in Windows NT. The Registry is a single configuration datastore built directly into the operating system. Although it is logically one datastore, physically it consists of three different files to allow maximum network configuration flexibility. Windows 95 uses the Registry to store information in the following three major categories:



User-specific information, in the form of User Profiles, is contained in the

USER.DAT file.

n

Hardware or computer-specific settings (the Hardware Profile) are contained in the SYSTEM.DAT file.

n

System Policies are designed to provide an override for any settings contained in the other two Registry components. System Policies may contain additional data specific to the network or corporate environment, as established by the network manager. They are contained in the POLICY.POL file. Unlike SYSTEM.DAT and USER.DAT, POLICY.POL is not a mandatory component of a Windows 95 installation.

Together, these three components comprise the Registry. Breaking the Registry into these three logical components provides the following benefits:

n

The Registry components can be located in physically different locations.

For example, the SYSTEM.DAT component and other Windows 95 system files might be located on the PC's hard disk, and the USER.DAT component might be located in the user's logon directory on a network server. With this configuration, users can log on to various PCs on the network and still have their unique network privileges and desktop configuration, allowing the "roving user" network configuration for Windows 95.

n

All of the Registry files and the rest of the system files in Windows 95 can be installed on a network server. This configuration enables Windows 95 to be run on a diskless or remote initial program load (RIPL) workstation, or from a floppy disk boot configuration. With this scenario, Windows 95 can be configured to page to a local hard disk but still load all its system files from a server.

n

The Registry and all of the system files can be installed on the local hard disk. With this configuration, multiple users can share a single Windows 95 PC. Each user has a separate logon username, separate user profile, separate privileges, and separate desktop configuration.

n

The network manager can administer an entire network's user privileges by having a single, global POLICY.POL file. Or the network manager can establish these policies on a server basis or on a per-user basis. In this fashion, a network manager can centrally enforce a "common desktop configuration" for each end-user type. For example, a data-entry Windows 95 PC can be configured so that only two applications—the data entry application and e-mail—can be run. Additionally, the network manager can specify that data-entry users cannot modify this desktop configuration. In spite of this configuration, the Windows 95 PC can fully participate in the network and is fully configurable if a different user with more network privileges logs onto the same PC.

n

Separate privileges can be assigned to users and to a PC. For example, if

a user who has sharing privileges logs onto a Windows 95 PC that has no sharing (no peer services), the user cannot access the PC's resources. This feature is useful if certain PCs contain sensitive data that should not be "shareable" to the corporate network.

The Registry contains ordered pairs of keys and their associated values that are manipulated via the Win32 Registry APIs. For example, the Registry might have a Wallpaper key with an associated value of WORK.BMP, meaning that the current desktop background is configured to use the "Work" bitmap.

Additionally, a special category of keys known as DYNAMIC KEYS are either pointers to a memory location or a call-back function. Dynamic keys are a new Registry enhancement in Windows 95. They are used by device drivers or Windows 95 subsystems that want to register a dynamic data type, such as a counter, in the Registry. In the case of network cards, the dynamic keys represent data such as data transfer rates, number of framing errors, packets dropped, and so on. In general, dynamic keys are used for data that is updated frequently and is therefore not well suited for storage in the disk-based Registry. Because the dynamic keys exist in memory, their data can be quickly updated and quickly accessed. The data can be accessed by the system performance tools in Windows 95, which call the Registry for the data they are monitoring.

Arbitrary keys and values can be created either programmatically or by using the Registry Editor (REGEDIT) tool. The APIs for managing the Registry are the Win32-Registry APIs, which can be remotely invoked via the Microsoft RPC (DCE-compliant) support built into Windows 95. Windows 95 includes both the client and server portions of Microsoft RPC, making the Registry manageable remotely from another Windows 95 PC. In this scenario, the network manager's system is the RPC client. It accesses the Registry APIs on the target Windows 95 PC via the RPC server running on the target machine. This RPC access to the Registry is secure, and network managers can limit access to either named privileged users or a group of network managers.

The Registry is also editable using the Registry Editor utility. As shown in Figure 61, the Registry consists of various parallel "trees." The Registry Editor is built upon the RPC support and can edit the local Windows 95 Registry, as well as the Registries on remote Windows 95 PCs. Although the Registry Editor is very powerful, it is fairly rudimentary in design and is intended for use by knowledgeable PC and network support staff or power users. Most end-users will never use the Registry Editor

because Registry entries are usually modified via the Control Panel, by applications, or via Plug and Play.

`{ewc msdncd, EWGraphic, ux0j 0 /a "psJ.bmp"}`

Figure 61. The Registry Editor, showing the settings stored in the Registry, which can be accessed remotely

As Figure 62 illustrates, the Registry is the central datastore that all system-management services build upon. Note that all key subsystems are united by the Registry, and “agents” for standard management protocols, such as SNMP, are implemented for Windows 95 using the Registry and Registry services.

`{ewc msdncd, EWGraphic, ux0j 1 /a "psJ.bmp"}`

Figure 62. The Windows 95 management architecture, showing the central role of the Registry

User Management

Windows 95 is the first version of Windows to implement functionality for management of user-specific configurations and user-specific privileges. User management under Windows 95 is most evident with the introduction of a user logon dialog box that minimally prompts users for their logon names and passwords each time they reboot a Windows 95 PC. This logon dialog box captures the username and password, which can trigger Windows 95 to dramatically reconfigure the desktop and, as needed, limit access to either network resources or sharing capabilities from this Windows 95 PC. Windows 95 can also pass the username and password through to registered applications and network services that use the Windows 95 logon information as a “master key” for granting or denying access.

The user management capabilities in Windows 95 are built upon the following components:

n User Profiles

n

System Policies

n

Server-Based Security

In Windows 3.11, settings unique to a user were located in many disparate locations, including AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, SYSTEM.INI, and numerous application-specific .INI files. Because this data was often intertwined with the Windows internal configuration data, providing good user management using Windows 3.11 was very difficult. For example, the simple task of allowing multiple users to work on a single PC was not possible with “out of the box” Windows 3.11. Managing multiple user configurations on a network was even more difficult.

Various tools and products attempted to retroactively address the lack of user management capabilities in Windows 3.11. Out of necessity, many companies wrote their own user management tools or used third-party products to help manage multiple users on their networks. Very often, this user namespace did not leverage the existing namespace of the corporate network resident on the network servers. In some cases, the user management software was implemented as a replacement Windows shell, with varying degrees of compatibility with existing Windows-based applications and the underlying network client software.

User management in Windows 95 is integral to the system and is implemented in a feature known as User Profiles. User Profiles are part of the Registry, and they contain system, application, and network data that are unique to individual users of a Windows 95 PC. The User Profile characteristics can be set by the user, by the network manager, or by the help-desk staff. In contrast to Windows 3.11, the User Profiles in Windows 95 are contained within a single file named USER.DAT. By keeping all user-specific data in one file, Windows 95 can provide a means to manage the user of the PC separately from the configuration of the Windows 95 operating system and the PC hardware. This separation also allows the user information to be located in a physically different location than that of the system

configuration. It also allows the User Profiles to be updated separately from the rest of the Registry. All settings contained within a User Profile are administerable locally or remotely from another Windows 95 PC. Windows 95 enables centralized user management, and the network manager can use the Registry Editor provided with Windows 95 or a variety of third-party tools to automate management of User Profiles.

The settings contained in User Profiles include the following:

n

Windows 95 settings, including desktop layout, background, font selection, colors, shortcuts, display resolution, and so on

n

Network settings, including network connections, workgroup, preferred server, shared resources, and so on

n

Application settings, including menu and toolbar configurations, fonts, window configuration preferences, and so on

User Profiles can effectively be disabled for Windows 95 PCs with only one user, by disabling the option that gives each user a separate desktop in the property sheet for security, shown in Figure 63.

`{ewc msdncd, EWGraphic, ux0j 2 /a "psJ.bmp"}`

Figure 63. The property sheet for security, showing User Profiles enabled and specifying unique desktops, Taskbar options, and program groups for each user

System Policies are designed to give network managers the ability to customize control over Windows 95 for users of differing capabilities or network privilege levels, including control of the user interface, network capabilities, desktop configuration, sharing capabilities, and so on. Like the other two Registry components, System Policies consist of pairs of keys and values. Unlike the other two Registry components, System Policies are designed to override any settings that may exist in User Profiles or Hardware Profile. System Policies are not necessary to enable a Windows 95 system to boot. They are loaded last and are typically downloaded from a location on the network server defined by the network manager.

System Policies can be used to define a “default” setting for the User Profile or the Hardware Profile, as shown in Figure 64. Default settings for both a default user and a default computer may solve the problem of preconfigured PCs for network managers. New PC hardware comes pre-installed with Windows and, in some cases, with the network hardware and software necessary to connect to the corporate network. Many network managers have a network-wide standard Windows 3.11 that they configure by hand on each PC before the PC is allowed on the corporate network. However, if a PC is delivered directly to an end-user, as is often the case, the network manager doesn’t have the opportunity to install the network-wide standard configuration on that PC. Default System Policies can solve this problem. For example, if the network-wide standard Windows configuration consists of a standard set of applications and a standard set of network privileges, such as servers to which connection is allowed, the network manager can preconfigure a default user-based set of System Policies to “enforce” these standards the first time the PC is connected to a network server. Assuming that the user logs on with a valid network logon username, the network privileges made available will be exactly those that the user is entitled to.

`{ewc msdncd, EWGraphic, ux0j 3 /a "psJ.bmp"}`

Figure 64. The System Policies properties for a default computer

The range of desktop control offered by System Policies is fairly comprehensive and includes standard network connections and the enabling and disabling of peer sharing capabilities, as well as such controls as password aging. For example, the network manager can define a desktop for a user and then “lock down” this desktop configuration by turning on the attribute that makes the desktop unmodifiable by the user. The network manager can also ensure that the user has access only to approved applications by not allowing the user to run any other programs. This restriction prevents the user from running programs from the command line or from the UI browsers and thus prevents installation of additional software. Another example of the way System Policies might be used is to disable elements of the Control Panel for users who have the habit of reconfiguring their PCs and as a result, are perennially “help-desk intensive.”

System Policies for Users

Windows 95 supports a set of System Policies integrated with various system components for controlling the Windows 95 environment on a per-user basis. The following areas and System Policies can be controlled for users:

n

Control Panel. Within this category of options, network managers can set policies to prevent the user from accessing Control Panel features. Policies include:

n

Restricting access to the Control Panel's Display settings, Network settings, Printers settings, System settings, and Security settings

n

Desktop. Policies can prevent users from modifying desktop features. Policies include:

n

Specifying a wallpaper and color scheme to be used

n

Network. The network policies provide restrictions to file and printer sharing. Policies include:

n

Disabling file sharing and printer sharing controls

n

Shell. The shell (UI) policies can be used to customize folders and other elements of the desktop and to restrict changes to the UI. Policies include:

n

Customizing the user's Programs folder, Desktop items, Startup folder, Network Neighborhood, and Start menu
Restrictions include:

n

Removing the Run and Find commands from the Start menu

n

~~Removing folders and the Taskbar from Settings on the Start menu~~

n

~~Hiding drives in My Computer and hiding the Network Neighborhood~~

n

~~Removing Entire Network from the Network Neighborhood~~

n

~~Hiding all items on the desktop~~

n

~~Disabling the Shut Down command, which prevents changed settings
from being saved at exit~~

n

System. These policies restrict the use of Registry editing tools, applications, and MS-DOS-based applications. Policies include:

n

Restricting the use of Registry editing tools

n

Running only selected Windows-based applications

n

Disabling the ability to run an MS-DOS command prompt and single MS-DOS application mode

[System Policies for Computers](#)

Windows 95 supports a set of System Policies integrated with various system components for controlling the Windows 95 environment on a per-computer basis. The following areas and System Policies can be controlled for computers:

n

System. These policy settings relate to the computer configuration.

Policies include:

n

Identifying the network path for Windows Setup

n

Enabling User Profile support

n

Identifying items to be run each time the computer starts or to be run
only once when the computer first starts

n

Network. These policy settings relate to the network configuration of the
computer. Policies include:

n

Controlling logon settings

n

Disabling file and printer sharing

n

Activating user-level security

n

Controlling password settings

n

Disabling remote dial-up access

n

Controlling remote access to the Registry

n

Defining properties for remote policy updates

n

Defining settings for the Client for Microsoft Networks and the

Microsoft Client for NetWare Networks

n

Setting attributes for the SNMP service

The primary user management tools in Windows 95 are the Registry Editor and the System Policy Editor. For most other types of user administration, network managers use the same user accounts tools on their PC servers that they used before Windows 95.

[Registry Editor](#)

The Registry Editor allows network managers to directly read and write values that

are contained in the User Profiles and the Hardware Profile in the Registry. Using this tool, network managers can read current settings, modify them, create new keys and values, or delete current keys and values in the Registry.

The Registry Editor can edit remote Registries using the RPC-enabled Win32 Registry APIs built into Windows 95. In the case of a User Profile residing on a network server, the network manager simply connects to the network server and opens the file using normal file I/O—no RPC connection is needed between the Windows 95 client and the network server.

[System Policy Editor](#)

The System Policy Editor, shown in Figure 65, generates the System Policies file, POLICY.POL. This tool allows network managers to specify specific network policies or user configurations for Windows 95. The tool is extensible by third parties; the ADF format is a text file that can be extended by network tool vendors or by network managers as needed. The System Policy Editor works via local file I/O and is not RPC-enabled. Because the System Policies file is located centrally on a network server, typically one copy is needed per server. All the network manager needs to do is connect to the network server and edit the System Policies file.

{ewc msdncd, EWGraphic, ux0j 4 /a "psJ.bmp"}

Figure 65. The System Policy Editor, which enables administrators to define policies on a per-user basis

In user management, the server plays a central role. All user namespace management is performed on the network server, so the native user-level security mechanism built into the network server is used by Windows 95 for user logon authentication and pass-through security. Windows 95 has no built-in user-level security mechanism of its own. As a consequence, network managers can use the familiar server administration tools to manage user accounts for Windows 95.

The second role of the server in user management in Windows 95 is to contain copies of User Profiles and System Policies. Typically, User Profiles are stored in user directories that are read/write enabled for the user. As changes are made to the local copy of User Profiles, the copy that resides on the server is updated—Windows 95 keeps the local and network image synchronized. System Policies should be stored in a directory that is accessible to all user logons and should be made read-only for users to ensure that only network managers can modify the network-wide policies that the System Policies file may define.

System Management

Windows 95 systems have been designed to be managed well, both locally and remotely, using the Registry's remote capabilities. The Registry enables network managers to remotely manage the system software settings of Windows 95, including settings used by device drivers. For example, network managers can remotely change the network frame type in use on all the PCs under their oversight. Prior to Windows 95, this task would, in many cases, be performed by directly editing the NET.CFG or PROTOCOL.INI files.

Plug and Play makes the hardware configuration of Windows 95 PCs much more manageable. It also addresses a paramount problem facing users and help-desk staff: that of proper hardware configuration. One of the more complex hardware/software configuration problems revolves around the use of portable computer docking stations. Typically, portable computer users have a "boot configuration" manager to help manage the different devices that need to be installed when the computer is docked or when it is remote. Creating these configurations is very time-consuming and must often be done for each system setup because of conflicts with other device drivers that may be installed. Plug and Play automates docking, as well as the use of PCMCIA cards, and helps with link management when moving from fast links to slower asynchronous links. The Windows 95 system detects events such as docking/undocking, PCMCIA card insertion/removal, and moving between fast/slow media and appropriately loads and unloads device drivers and configures them automatically. Windows 95 also notifies applications that the device is either available or unavailable.

Windows 95 includes a variety of tools that allow users or network managers to configure the hardware and software on a Windows 95 PC. These include the following:

n

The Control Panel. Most key system settings are accessible via the

Control Panel, which has traditionally been the only interface available for directly modifying the configuration of hardware and software settings in Windows. The Control Panel in Windows 95, like its Windows 3.1 predecessor, is extensible and provides the best local mechanism for managing all system settings. In Windows 95, all network settings have been consolidated into a single Network tool, rather than being split between several discrete applications as in prior versions of Windows.

n

Context Menus and Property Sheets. Context menus and property sheets

list a number of actions that can be directly applied to system objects. They are displayed by right-clicking the object. For example, the Properties command on the context menu for a directory with sharing enabled allows users to invoke sharing of the directory. The Properties command on the context menu for a server tells whether the server is a NetWare server, a Windows NT server, or a Windows 95 system.

n

Plug and Play. The current hardware configuration for the system is

accessible via the Control Panel's System tool. All hardware device nodes in the hardware tree are shown, with current configuration settings. These settings are updated dynamically whenever a device's configuration changes or if the device is inserted or removed.

n

The Registry Editor. For network managers or help-desk staff, the Registry

Editor allows remote viewing and editing of the full Registry. Data contained in the Registry is represented in its hierarchical tree structure as pairs of keys and values.

n

The System Policy Editor. System capabilities can be enabled or disabled

using the System Policy Editor. For example, sharing can be disabled on a machine basis, or local Control Panel usage can be disabled for non-privileged users.

n

The SNMP agent. Remote desktop management, including hardware and

software inventory and the ability to make remote changes to the system, is possible via the SNMP agent for Windows 95.

Windows 95 includes an enhanced performance monitoring utility that enables network managers and help-desk staff to more quickly troubleshoot performance problems caused by an invalid configuration or some other conflict. The System Monitor, shown in Figure 66, is the replacement for WinMeter in Windows for Workgroups. It provides more detailed information about the system's I/O performance, including file I/O and network I/O performance. Data is gathered on an FSD basis, which means information can be gathered from the FAT file system and any number of network redirectors that may be loaded. The interfaces to the System Monitor are open and are extensible by third parties.

`{ewc msdn cd, EWGraphic, ux0j 5 /a "psJ.bmp"}`

Figure 66. The System Monitor, which allows local and remote monitoring of system performance

For network managers, the key feature of System Monitor is its ability to monitor a remote system. This capability is built upon remote Registry access because performance data is registered with the system using dynamic keys contained within the Registry. For example, a network manager who is attempting to troubleshoot a "slow PC" can discover remotely that the NIC has an unusually high number of dropped frames and can then use the Registry Editor to see how the network card is configured.

Network Management

Windows 95 includes a number of features to facilitate the use of a variety of network management tools. Many of these tools require support in the client to enable their operation. In some cases a formal industry standard exists, and in others, a de facto standard has emerged. Either way, Windows 95 enables some of

the key network management tools by building the necessary “agent” software into the client operating system.

Windows 95 includes agents for the remote backup of the Windows 95 system by a server-based backup system. The following backup agents are included with Windows 95:

n

Cheyenne ARCServe agent for backup to NetWare and Windows NT

Server servers

n

Arcada Backup agent for backup to NetWare and Windows NT Server

servers

These agents make it possible to include Windows 95 systems in a scheduled, automatic remote backup scheme managed centrally via the server-based backup system. Their property sheets are shown in Figure 67 and Figure 68.

{ewc msdncd, EWGraphic, ux0j 6 /a "psJ.bmp"}

Figure 67. The property sheet for the Cheyenne ARCServe agent

{ewc msdncd, EWGraphic, ux0j 7 /a "psJ.bmp"}

Figure 68. The property sheet for the Arcada Backup agent

Both backup agents include a number of enhancements for Windows 95. For example, both agents include the ability to backup and restore long filenames. (If the native tape format does not include a mechanism for storing long filenames, the agents provide special logic to facilitate saving and restoring the long filenames.) Both agents have also been enhanced to backup and restore the Registry.

Another enhancement for Windows 95 is the ability to secure operation of the

backup agent by means of user-level security. By default, remote administration of the Windows 95 PC is enabled only for supervisor privileged accounts, giving the ability to remotely back up Windows 95 systems only to network managers or help-desk staff. For example, only authorized personnel should be able to back up the hard disk of the CEO's and the corporate controller's PCs.

A category of tools is emerging onto the market that all claim to be network-management tools. Many of these tools were actually designed to solve a specific problem but have been extended to become more general-purpose network-management tools.

SNMP Support

Simple Network Management Protocol (SNMP) consoles are a good example of this trend. They are now being enhanced to monitor components of desktop systems as well as server applications such as database servers. Windows 95 includes an SNMP agent that supports the use of an SNMP console to manage Windows 95 PCs. The SNMP support in Windows 95 includes the following:

n

An SNMP Agent

n

An extensible MIB handler interface

n

MIB-II support via TCP/IP

The SNMP agent provided with Windows 95 is extensible via its MIB handler interface, which enables third parties to include instrumentation of their software or hardware components and allows remote management via the SNMP console.

Because many corporations are beginning to migrate to TCP/IP as a standard protocol, the TCP/IP stack in Windows 95 has been instrumented for SNMP remote management. The MIB-II supports the Internet Engineering Task Force (IETF) Request for Comment (RFC) for the TCP/IP MIB definition. This support enables network managers to centrally monitor the performance of TCP/IP on the network from a central console.

[DMI Support](#)

Support for a Desktop Management Task Force (DMTF) DMI Agent will be made available for Windows 95 by Microsoft after the release of Windows 95.

Windows 95 includes a number of built-in tools for network management, including NetWatcher (shown in Figure 69). NetWatcher allows local and remote management of users' connections to Windows 95 peer services. The tool shows all current connections to the Windows 95 system, who is connected, and which files and printers are in use. It allows disconnection of users and maintains a log of key system events, such as logon, logoff, system boot and shutdown, and failed attempts to connect.

{ewc msdncd, EWGraphic, ux0j 8 /a "psJ.bmp"}

Figure 69. NetWatcher, which supports local and remote monitoring of connections to peer services

Additionally, Windows 95 includes the capability to access a special "administration share" of any capable Windows 95 PC. This share, which allows network managers to reconfigure the hard disks of remote PCs from their desktops, is accessed by displaying the property sheet for the remote PC from the Network Neighborhood. When this feature is activated, a window opens that appears to be a normal browsing window but is actually the remote PC's My Computer view. All files and other resources on the remote PC are then accessible.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 11: Printing

In Windows 95, several changes have been made to the way printing is handled to address requests from customers and independent software and hardware vendors. The improvements focus on the following three major areas:

n

Better performance. Windows 95 has a new 32-bit printing architecture that supports preemptive multitasking and improves overall performance.

n

Easier. Improvements in the UI in Windows 95 make printing easier, and Plug and Play support makes installing new printers easier.

n

Better integration of network printing. Windows 95 has extended the local printing architecture to the network environment and ties together installation enhancements to shared network printers.

This chapter describes the printing architecture used in Windows 95 and discusses the areas where printing is improved over Windows 3.1.

Summary of Improvements over Windows 3.1

The primary improvements in printing for Windows 95 are the following:

n

A new 32-bit print subsystem modeled after the subsystem in Windows NT, providing smooth background printing

n

Increased printing performance through the use of enhanced metafile (EMF) spooling, which decreases the time needed to return control to the application

n

Support for over 800 different printer models (versus over 300 for Windows 3.1) through the development of new printer mini-drivers

n

Support for PostScript Level II printers

n

Spooling of MS-DOS-based application print jobs along with those of

Windows-based applications, with conflict resolution when MS-DOS and Windows-based applications try to print at the same time

n

Image color matching support, which provides better WYSIWYG between color in images displayed on screen and color generated on an output device

n

Deferred printing for mobile computer users, allowing users to issue the command to print while undocked and not connected to a printer, so that print jobs will be automatically started when the computer is docked into a docking station

n

Simplified printer driver installation, configuration, ease of use, and ease of support through a new, consolidated user interface

n

System support for new bidirectional printers and ports, providing improved I/O performance with fast parallel ports (ECP) and error status reporting

n

Better integration of network printing support, including Point and Print support for the automatic installation of printer drivers from Windows 95, Windows NT Server, or Novell NetWare servers

n

Plug and Play support for printers, simplifying installation and configuration

The 32-Bit Print Subsystem

Windows 95 features a 32-bit print subsystem that includes a multithreaded, preemptive spooler architecture and provides improved printing performance, smoother background printing, and quicker return to the application after a print job is initiated by a user in an application. The architecture of the print subsystem is compatible with the Windows NT 3.1 print subsystem.

In Windows 3.1, print spooling functionality was handled by Print Manager and was supported by code in several different Windows components. In Windows 95, the print spooler is implemented as a series of 32-bit virtual device drivers and the spooler functionality is consolidated into a single architecture, with the following benefits:

n

Smooth background printing. In Windows 3.1, Print Manager passed a fixed amount of information to the printer, whether or not the printer was ready to

receive the information. If the printer wasn't ready, the system would be suspended until it was ready. Unlike Print Manager, the Windows 95 spooler passes data to the printer only when the printer is ready to receive it. This strategy helps reduce the "jerkiness" often experienced when printing documents with Windows 3.1 Print Manager.

n

Quick return to the application. Because of the smooth background

printing made possible by the new 32-bit print subsystem, Windows 95 spools enhanced metafiles (EMFs) rather than raw printer data when printing from Windows-based applications, resulting in a quicker return-to-application time. After it is spooled, the EMF is interpreted in the background by the printer driver, and output is then sent to the printer. For more details, see the following "Enhanced Metafile Spooling" section.

n

More power and flexibility. The new architecture allows users to select

printer attributes on a per-printer basis, instead of requiring global printing attributes as in Windows 3.1. For example, each printer can have a different separator page and the option of printing direct via a queue.

[Enhanced Metafile Spooling](#)

EMF spooling results in a quicker return-to-application time and hence quicker return of control to the user after a print job is initiated in a Windows-based application (Win16 or Win32).

Before discussing how EMFs fit into the printing architecture used by Windows 95, it is worth reviewing how print jobs are handled by Windows 3.1, because the improvements in Windows 95 result in much better printing performance than in Windows 3.1.

In Windows 3.1, all interpretation of print API calls were handled by the Windows printer driver BEFORE the information was spooled to Print Manager, as shown in Figure 70. The interpretation of print information for printers was the most time-

consuming operation in the print process. Users of PostScript printers were not impacted by this process because the printer driver sends high-level Page Description Language (PDL) based information to the printer, rather than sending raw image data that must be interpreted by the printer itself. However, users of non-PostScript printers experienced a delay in returning to their applications after a print job was initiated, while the GDI print API calls were processed by the printer driver. After the output image file was created by the printer driver, the Print Manager spooler took over, and control was returned to the user's application. As a result, background printing under Windows 3.1 often seemed jerky.

`{ewc msdn cd, EWGraphic, ux0k 0 /a "psK.bmp"}`

Figure 70. The spooler's relationship to printing in Windows 3.1

Windows 95 greatly improves the return-to-application time by spooling high-level command information generated by the GDI print API, collectively referred to as an enhanced metafile, rather than spooling raw printer data generated by the printer driver. For example, if a document contains a solid black rectangle, the EMF contains a command to draw a rectangle with the given dimensions that should be solidly filled with the color black. After the EMF is created, control is returned to the user, and the EMF file is interpreted in the background by the 32-bit print subsystem spooler and sent to the printer driver. This process, which is shown in Figure 71, results in control being returned to users in significantly less time because they don't have to wait for the print calls to be directly interpreted by the printer driver.

`{ewc msdn cd, EWGraphic, ux0k 1 /a "psK.bmp"}`

Figure 71. The spooler's relationship to printing in Windows 95

[Try It!](#)

Test the Quicker Return-to-Application Time

1. Under Windows 3.1, start Print Manager.
2. Turn off background printing if it is supported by your application—for example, Word for Windows version 6.0.
3. Print from your application, noting the time it takes for control to be returned to you.
4. Perform the same task under Windows 95, again noting the time it takes for control to be returned to you.
5. Print from an MS-DOS-based application under both Windows 3.1 and Windows 95, and again note the return-to-application time.
6. Compare the above.

Support for MS-DOS-Based Applications

Windows 95 improves on the support provided by Windows 3.1 for printing from an MS-DOS-based application in the Windows environment by allowing MS-DOS-based applications to spool print jobs to the 32-bit print subsystem spooler. With Windows 3.1, users printing from MS-DOS-based applications could not take advantage of the Windows-based spooling functionality offered by Print Manager, and they encountered device contention issues when trying to print from MS-DOS-based applications at the same time as printing from Windows-based applications.

Windows 95 addresses these printing problems by incorporating the functionality for an MS-DOS-based application to spool directly to the 32-bit print spooler. This support is integrated into a print spooler virtual device, which takes the output destined for a printer port and places it in the print spooler before sending the data to the printer. The print spooler is automatically installed and configured and its handling is transparent to users. It works with all existing MS-DOS-based applications and results in a quicker return-to-application time. Although MS-DOS-based applications do not benefit from EMF spooling, which is supported only for Windows-based applications, the print spooler mechanism means that users won't encounter device contention issues and will benefit from smoother background printing and improved printing performance.

[Try It!](#)

Spool from an MS-DOS-Based Application

1. In Windows 95, pause the print queue for your printer.
2. Print from an MS-DOS-based application. Notice that print jobs generated by MS-DOS-based applications show up in the print queue and can be manipulated just like print jobs from Windows-based applications.

Support for Deferred Printing

To benefit mobile computer users, the print subsystem in Windows 95 features support for deferred printing. This capability allows users not connected to a printer to generate print jobs that are stored on their local computers. Items not immediately printed are held in the print queue until the computer is connected to a printer. Using this feature, mobile users can create print jobs from Windows-based applications (Win16 or Win32) or MS-DOS-based applications while on the road and then print on a physical printer when they return to the office. This feature is also handy for users in the office who temporarily lose printer connections because of network or printer problems.

Image Color Matching Support

Using technology licensed from Kodak, Windows 95 provides Image Color Matching (ICM) support, enabling applications to offer greater consistency between the color of images displayed on the screen and the color of images generated by an output device. ICM support is included for display, printer, and scanner devices.

ICM provides consistent (predictable) color rendering from input through monitor preview to output. With ICM functionality, color information is portable across applications that manipulate the information; across users, providing consistent use of colors; and across platforms, allowing the information to be easily moved to different systems in which ICM has been implemented.

ICM support in Windows 95 provides the following benefits to application developers, which in turn result in benefits to users:

n

Makes enabling color awareness in applications easy

n

Allows for color

n

Provides consistent color output across devices

Because Windows 3.1 did not provide ICM support as part of the operating system or in an external driver, this support was implemented in a proprietary manner by application developers, and the burden was on the developers to properly map the colors generated by a display device to the colors generated by a printer device. Windows 95 simplifies this process by including ICM support as part of the operating system, allowing application developers to integrate ICM functionality into their applications and thus take advantage of this new system service.

To provide support for device-independent color matching, colors used in applications are tied to international (CIE-based) colorimetric standards rather than specific hardware devices. The operating system does the appropriate color transformations to map the device-independent color representations to the colors supported by the physical device.

The key to ICM support is the use of a profile that represents the color properties of a monitor, printer, or scanner device. The profile format used by the ICM support in Windows 95 is the work of InterColor 3.0, an industry consortium made up of many industry hardware vendors—Kodak, Microsoft, Apple Computer, Sun, and Silicon Graphics, among others—and industry standard-setting bodies. The InterColor 3.0 efforts provide for a consistent cross-platform color standardization process that will result in industry-wide standards for defining the ICM properties of output and display devices.

Installing and Configuring a Printer

Unlike Windows 3.1, Windows 95 has no Print Manager and no Print icon in the Control Panel. Gone also is the confusion about which tool to use for managing print jobs, installing new printers, creating queues, and performing other tasks related to printing. Windows 95 consolidates the printer and printing functions into a single Printers folder, shown in Figure 72. The Printers folder provides easy ways of adding new printers, configuring existing printers, and managing print jobs.

`{ewc msdn cd, EWGraphic, ux0k 2 /a "psK.bmp"}`

Figure 72. The Printers folder

Windows 95 makes it easy to install new printers by supporting the following installation mechanisms:

n

Plug and Play printer detection. For Plug and Play printers, Windows 95

will automatically detect the printer at installation time or during the boot process. The Plug and Play detection code will prompt the user for the appropriate driver files if they are not resident in the Windows directory.

n

The Add Printer Wizard. Windows 95 provides a wizard that walks users

through the printer installation process. Whether the printer is connected to the local PC or shared on another PC on the network, installing it is easier than ever before. Figure 73 shows the Printer Installation Wizard's first dialog box.

{fewc msdncd, EWGraphic, ux0k 3 /a "psK.bmp"}

Figure 73. The Add Printer Wizard, which walks users through the printer installation process

n

Point and Print printing. The Point and Print feature enables users to

quickly connect to and use a printer shared on another Windows 95 PC, a Windows NT Server, or a Novell NetWare server. When users connect to a shared printer, Windows 95 automatically copies and installs the correct driver for the shared printer from the remote Windows 95 PC, the Windows NT Server, or the Novell NetWare server. They can then simply begin printing.

n

Point and Print printing is discussed in more detail in Chapter 9,

"Networking."

Configuring a printer in Windows 95 is much simpler than in Windows 3.1. All printer configuration is consolidated onto a single property sheet for the printer that can be accessed from the Printers folder. As shown in Figure 74, the property sheet contains all printer parameters, such as the printer port (or network path) that the printer is connected to, the paper options for the printer, the fonts built into the

printer, and device options specific to the printer model.

{ewc msdncd, EWGraphic, ux0k 4 /a "psK.bmp"}

Figure 74. The property sheet for the Hewlett-Packard LaserJet IIIsi printer

To further simplify printer configuration, Windows 95 supports bidirectional communications between compatible printers and printer ports. With this functionality, Windows 95 can query the characteristics and configuration options directly from the printer and can automatically configure the printer driver to exactly match the configuration of the printer, including the amount of memory, the paper options, and the fonts installed in the printer.

Managing Print Jobs

Windows 95 provides better print job management capabilities than Print Manager does in Windows 3.1 and Windows for Workgroups. Improvements provided in Windows 95 include the following:

n

Direct integration with the UI in Windows 95. The Printers folder serves as

the centralized location for interacting with or configuring with printer devices. Opening a printer window and switching to Details view, as shown in Figure 75, displays detailed information about the contents of active print jobs or jobs that are waiting in the queue, including the name of the document, the status of the document, the owner of the document, when the document was submitted to the print queue, the number of pages in the document (when printing, the status of the print job down to the page that is being printed is displayed), the size of the document, and the priority of the print job.

{ewc msdncd, EWGraphic, ux0k 5 /a "psK.bmp"}

Figure 75. A Details view of a remote print queue's status

n

Local and remote management of print jobs. With Windows for

Workgroups, users had to physically walk over to a remote PC to cancel a printing operation on that PC's shared printer. With Windows 95, it is no longer necessary to walk over to the PC where the queue resides to terminate print jobs or resume the printer if an error occurs. Users can pause or cancel the printing of print jobs residing in a remote print queue on a Windows 95 PC. Users with administrator access to a Windows 95 PC that is sharing a printer can remotely manage and administer the print queue with the same UI and functionality available for a local printer.

Network Printing Improvements

Windows 95 provides better support than Windows 3.1 for printing in a networked environment. The enhancements include the following:

n

Network Point and Print functionality. Users can print to a shared network

printer connected to a computer running Windows 95, Windows NT Advanced Server, or Novell NetWare and have the appropriate printer driver automatically copied from the remote computer and configured on the local Windows 95 computer. Point and Print simplifies the printer installation process and ensures that the correct printer driver is installed for the remote printer.

n

Remote administration of print jobs. Windows 95 provides full remote

administration of print jobs for printers shared on computers running Windows 95. With the appropriate access privileges, operations such as holding a print job, canceling a print job, and resuming printing when the print queue is paused can be performed remotely.

More information about network printing enhancements in Windows 95 is provided in Chapter 9, "Networking."

Plug and Play Support

Installing and configuring printers in Windows 95 is much simpler than in Windows 3.1. As with other components of the Windows 95 system, setting up a new printer benefits from the Windows 95 Plug and Play capabilities. Using bidirectional parallel communications, Windows 95 detects that a Plug and Play compatible printer is connected to the PC (see Figure 76) by means of a returned device ID value, as described in the IEEE 1284 Specification. Bidirectional parallel communications with the printer also enable Windows 95 to obtain information about other physical attributes of the device.

{ewc msdncd, EWGraphic, ux0k 6 /a "psK.bmp"}

Figure 76. The New Device Found dialog box, showing detection of a Plug and Play printer

Windows 95 detects a Plug and Play printer in one of three ways: when Windows 95 is first installed on a PC, each time Windows 95 starts, or when a user explicitly requests that a detection be made. When Windows 95 is first installed on a PC and when Windows 95 starts, a Plug and Play printer connected to a bidirectional communications port attempts to identify itself by sending its detection code. If the connected printer is not presently configured in the Windows 95 system, the user is asked whether the printer should be installed. If the user says "Yes" and the appropriate printer driver is already present on the system, Windows 95 automatically installs and configures the driver for the printer. If the printer driver is not already present, Windows 95 prompts the user for the appropriate Setup And Installation disk for Windows 95. If the system doesn't recognize the printer, Windows 95 prompts the user to insert a disk containing the printer driver provided by the printer manufacturer.

[Try It!](#)

Test Plug and Play Support

1. Connect a Plug and Play printer to your computer before starting Windows 95. Supported printers include the Hewlett-Packard LaserJet 4 models (4L, 4Plus, 4P, 4MP, 4MPlus, and 4ML, 4si), the LexMark 4039 and 4039+, and the ValueWriter 600.
2. Start Windows 95. During the boot process, notice that the system automatically detects the Plug and Play printer and prompts you to install the appropriate printer driver (if not already present).

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 12: Communications

Windows 95 features a new 32-bit communications subsystem that provides higher throughput, better reliability, and greater device independence for communications operations than Windows 3.1. The new communications subsystem serves as the underlying architecture on which Windows 95 provides communications services that support telecommuting and dial-up network access, Microsoft Fax services, access to online information services, computer-telephone integration, conferencing, and remote access to mail.

The communications subsystem addresses problems that users encountered with communications support in Windows 3.1 and provides a powerful, robust, and flexible communications architecture.

Summary of Improvements over Windows 3.1

Changes made to the Windows 3.1 kernel and communications architecture resulted in the following improvements and benefits to the Windows 95 user:

n

Robust and reliable, high-baud-rate communications throughput

n

Better multitasking of communications applications

n

Simpler centralized setup and configuration

n

Broader device support

n

Better support for sharing communication devices, such as modems,
among different communications applications

n

Telephone network independence

The Communications Architecture

Around the time when Windows 3.0 was first developed, 2400-baud modems were the mainstream and 9600-baud modems were just becoming affordable. Windows was able to handle receiving data at these relatively slow rates without much difficulty. However, as mechanisms to transfer communications information at faster rates—for example, higher baud rates or the use of data compression—became more popular, the communications architecture of Windows needed to be examined closely.

When Windows 3.1 was released, 9600-baud modems were extremely popular, but because of communications barriers under Windows 3.1, the overall effectiveness of reliable high data throughput was limited, and the efficiencies of multitasking were eroded when running communications applications. These communications barriers included high interrupt latency and overhead that affected high-speed communications, and a monolithic driver architecture that made it necessary for some third parties to replace the communications driver provided with Windows to allow their devices to run efficiently on the system.

Windows 95 greatly improves upon the Windows 3.1 architecture to support communications applications, support high-speed communications, and provide a modular communications architecture that allows third parties and communications device manufacturers to easily plug in new communications device drivers. This section describes the communications architecture used in Windows 95.

The goals of communications support in Windows 95 are to deliver better performance than Windows 3.1, and to enhance ease of use through Plug and Play communications. The communications architecture of Windows 95 delivers the following performance benefits over Windows 3.1:

n

High-speed reliability. Windows 95 supports reliable high-speed

communications by keeping up with data coming in from the communications port, thereby incurring no lost characters because of interrupt latency. In addition, the use of a 32-bit protected mode file system and network architecture has less impact on the communications system because required mode transitions and interrupt latency are reduced.

n

Higher data throughput. The 32-bit communications subsystem leverages

the preemptive multitasking architecture of Windows 95 to provide better responsiveness to communications applications and support higher data throughput. Communications transfers in 32-bit applications are not as affected by other tasks running in the system as Win16-based applications under Windows 3.1.

n

Support for time-critical protocols. The communications architecture provides support for time-critical protocols and allows for real-time serial device control.

n

Independence of underlying telephone networks. Windows 95 allows application developers to build telephony applications that can run on a wide variety of telephone networks, including analog, proprietary digital PBXs, key systems, ISDN, and cellular.

The Plug and Play initiative provides ease-of-use enhancements throughout Windows 95, and communications support is no exception. Plug and Play support for communications delivers the following benefits:

n

Broad device support. Windows 95 features a new communications driver architecture that makes it easier for third parties to extend the communications support provided as part of the operating system without sacrificing functionality or stability. In addition, the new communications architecture features APIs that support more robust communications devices beyond base RS-232 devices—for example, ISDN.

n

Easy-to-install and easy-to-use communications devices. Windows 95

features centralized modem installation and configuration to simplify setup for users and simplify communications development efforts for application developers. Windows 95 leverages the use of a single universal modem driver (UniModem) to provide a consistent mechanism for communicating with modem devices. It also provides detection support for Plug and Play modems and supports existing hardware by including mechanisms for detecting legacy modems.

n

Device sharing among communications applications. Through the use of

the Telephony API (TAPI), Windows 95 provides consistent, device-independent mechanisms for controlling communications devices for operations such as dialing and answering incoming calls. Arbitration for the sharing of communications ports and devices is also handled through TAPI. For example, while dial-up networking in Windows 95 is waiting for an incoming call, a TAPI-aware fax communications application can send an outgoing fax without having to first terminate the already running communications application.

To further describe the improvements resulting from the new 32-bit communications subsystem in Windows 95, the rest of this section examines the components that comprise the communications support.

When data comes into the system from a serial communications port, an interrupt tells the system that a piece of data has been received. If information was received at a high rate under Windows 3.1, the system sometimes could not keep up with the incoming data, resulting in errors or lost information at the port.

Whereas disk I/O and network I/O manipulate blocks of information at a time, serial communications I/O generates one interrupt on the system for EACH incoming character. The burden on the communications driver to keep up is quite high. To support high-speed throughput of information from a communications device, the

system must be able to respond quickly to incoming data, but in Windows 3.1, real-mode drivers sometimes disabled system-wide interrupts for “long” periods of time (usually milliseconds), during which no incoming information could be received.

To address the issue of supporting higher, sustained communications throughput, the Windows 95 development team focused on areas in the Windows 3.1 kernel that resulted in periods of time when interrupts were disabled by the system. The Windows 3.1 kernel and other components were limited to reliable serial communications at rates of 9600 bps or slightly higher (dependent on CPU speed) because of high interrupt latency or other systems design limitations. In addition, when Windows 3.1 had to execute real-mode code, the use of real-mode file system and networking drivers blocked the system, thus preventing the system from being able to keep up with incoming data.

To improve performance and the rate at which the system can accept incoming data reliably, the code that can be used by only one process at a time (critical sections) was reduced and interrupt latency in the core system was also reduced. In addition, the use of new 32-bit protected-mode components for the implementation of the file system and network subsystem helped to improve the system responsiveness. Windows 95 is now truly limited in baud rate only by PC hardware characteristics, such as the processor speed and type of communications port.

The Windows 95 communications subsystem consists of a modular, 32-bit protected-mode architecture with new communications drivers. A new layer called VCOMM provides protected-mode services that allow Windows-based applications and device drivers to use ports and modems. To conserve system resources, communications device drivers are loaded into memory only when in use by applications. VCOMM uses the Windows 95 Plug and Play services to assist with configuration and installation of communications devices.

In Windows 3.1, a monolithic communications driver called COMM.DRV provided an API interface, through which Windows-based applications interacted with communications devices, and the code that serves as the communications port driver. The monolithic approach made it necessary to completely replace the Windows communications driver if new functionality was required by a hardware device. Figure 77 shows the relationship between the COMM.DRV driver and the hardware device in Windows 3.1.

{ewc msdn cd, EWGraphic, ux01 0 /a "psL.bmp"}

Figure 77. The communications architecture of Windows 3.1

Windows 95 provides a more flexible communications architecture than Windows 3.1, separating communications operations into three primary areas: Win32 communications APIs and TAPI, the universal modem driver, and communications

port drivers. Figure 78 shows the relationship between the VCOMM communications driver and the port drivers to communicate with hardware devices. The flow path for a Win16-based application is also illustrated to show how compatibility is maintained for existing Windows-based applications. Compatibility is maintained for IHVs and ISVs that replace the Windows 3.1 COMM.DRV driver; however the vendor-specific communications driver communicates directly with the I/O port, rather than going through VCOMM.

{ewc msdncd, EWGraphic, ux0l 1 /a "psL.bmp"}

Figure 78. The communications architecture of Windows 95

The primary areas that make up this architecture are the following:

n

Win32 communications APIs and TAPI. The Win32 communications APIs

in Windows 95 provide an interface for using modems and communications devices in a device-independent fashion. Applications call the Win32 communications APIs to configure modems and perform data I/O through them. Through the Telephony API, applications can control modems or other telephony devices for operations such as dialing, answering, or hanging up a connection, in a standard way. TAPI-aware communications applications no longer need to provide their own modem support list because interaction with a modem is now centralized by Windows 95. The communications functionality provided with Windows 95 utilizes these services.

n

Universal modem driver. Also new in Windows 95 is the universal modem

driver, UniModem, which is a layer for providing services for data and fax modems and voice. Users no longer have to learn (and application developers no longer have to maintain) difficult modem AT commands to dial, answer, and configure modems. UniModem handles these tasks automatically, using mini-drivers written by modem hardware vendors. Application developers can use TAPI to perform modem control operations in a modem-independent manner.

n

Port drivers. Port drivers are responsible for communicating with I/O ports,

which are accessed through the VCOMM driver and provide a layered approach to device communications. For example, Windows 95 provides a port driver to communicate with serial communications and parallel ports, and third parties and IHVs can provide port drivers to communicate with their own hardware adapters, such as multiport communications adapters. With the port driver model in Windows 95, third parties no longer have to replace the communications subsystem as they did in Windows 3.1.

The Telephony API (TAPI)

The Windows Telephony API is part of the Microsoft Windows Open Services Architecture (WOSA), which provides a single set of open-ended interfaces to enterprise computing services. WOSA encompasses a number of APIs, providing application and corporate developers with an open set of interfaces to which applications can be written and accessed. WOSA also includes services for data access, messaging, software licensing, connectivity, and financial services.

Like other WOSA services, the Windows Telephony API consists of two interfaces: the applications programming interface (API) that developers write to, and the service provider interface (SPI) that is used to establish the connection to the specific telephone network. This model is similar to the one whereby printer manufacturers provide printer drivers for Windows-based applications. Figure 79 shows the relationship between the "front-end" Windows Telephony API and the "back-end" Windows Telephony SPI.

`{ewc msdncd, EWGraphic, ux0l 2 /a "psL.bmp"}`

Figure 79. The seamless integration of applications and telephone networks by means of the Windows Telephony API and the Windows Telephony SPI

The Windows Telephony API provides a standard way for communications applications to control telephony functions for data, fax, and voice calls. The API manages all signaling between a PC and a telephone network, including such basic functions as establishing, answering, and terminating a call. It also includes supplementary functions, such as hold, transfer, conference, and call park, found in PBXs, ISDN, and other phone systems. In addition, the API provides access to features that are specific to certain service providers, with built-in extensibility to accommodate future telephony features and networks as they become available.

The Telephony API supports four models for integrating Windows 95 PCs with telephone networks, as illustrated in Figure 80. Applications using the Telephony API can work in any of these four connection models, whether they involve a physical connection between a PC and phone on the desktop, such as the phone or PC-centric models, or a logical connection in either of the client-server models.

{fewc msdncd, EWGraphic, ux0l 3 /a "psL.bmp"}

Figure 80. Four models for integrating Windows 95 PCs with telephones

Through the use of the TAPI services, applications that support communications services have a device-independent means for interacting with telecommunications networks. TAPI also provides a common access mechanism for requesting the use of communications ports and devices, thus providing a means for multiple communications applications to share a single modem—data, fax or voice—in the computer.

Windows 95 includes TAPI support in the base operating system, allowing application developers to leverage this functionality in their Windows 95-aware applications. In addition, all communications components included as part of Windows 95 are TAPI clients.

Through the TAPI interface, communications applications can ask for access to the modem or telephone device, allowing the communications subsystem in Windows 95 to arbitrate device contention and allow applications to share the communications device in a cooperative manner.

Win32-based applications can utilize TAPI functionality to allow some applications to make outgoing calls while others are waiting for inbound calls. For example, while a dial-up network service that is configured for auto-answer mode is for an incoming call, a Win32-based communications application can call the TAPI services to request the use of the modem to perform an outgoing call. Only one call can be performed at a time, but users no longer have to terminate other applications that are using a communications port in order to run a different application. The TAPI services arbitrate requests to share communications ports and devices.

[Try It!](#)

Test the Power of the Telephony API

1. In Windows 95, install and configure a modem for use on your system.
2. Run TAPI-enabled applications, such as Phone Dialer, HyperTerminal, Dial-Up Networking, and Microsoft Fax software, and note that after the modem is

configured you don't have to change modem settings in any of these applications.

Centralized Modem Setup and Configuration

Support for installing and configuring a modem under Windows 95 is greatly simplified over Windows 3.1. Configuring each individual communications application for the correct serial port, modem type, and other related modem configuration parameters is no longer necessary. Windows 95 provides central configuration of communications devices through a tool in the Control Panel. Win32-based applications that take advantage of the TAPI services implemented in Windows 95 can completely leverage the user's configuration of their communications hardware, making subsequent configuration of communications applications easy.

Windows 95 brings the following benefits to modem configuration:

n

Easy modem configuration of new communications applications for use by entire system

n

Centralized communications port status and configuration

n

Supported by TAPI and Win32 communications APIs

n

Support for 100+ modems

With Windows 3.1, when users added a new communications application to their computer, they first had to configure the application to communicate with their modem by specifying the COM port to use and the type of modem, in addition to other communication parameters. Communications and modem configuration was either handled by the application developer and specified as a series of default modem AT commands, or users had to read through the modem manual and type in the appropriate command strings. For example, Figure 81 shows the Modem Commands dialog box in Terminal. Many Windows 3.1-based communications applications support only a limited set of modems because, given the number of modems available on the market, the burden on the application developer of providing global support is too great.

`{ewc msdn cd, EWGraphic, ux01 4 /a "psL.bmp"}`

Figure 81. Configuring a modem in Windows 3.1 Terminal

As with support for printers, the support for modems in Windows 95 is centralized. When users first install Windows 95, they are prompted to detect or identify the modem device that they have connected to or installed in their computer. When a modem has been selected and configured, any communications application that supports TAPI services can interact with the modem in a device-independent way. Users no longer need to know or understand AT command sequences to customize their communications application.

Configuring a modem under Windows 95 is as easy as performing three simple steps: identifying the new modem device, configuring the modem device, and configuring the Telephony services.

[Identifying a New Modem Device](#)

If a modem is not selected when Windows 95 is first installed, The Modem Wizard can be used to identify a new modem, by using the Modems tool in the Control-

Panel. When the Modem Wizard dialog box is displayed, as shown in Figure 82, the user can have the Wizard detect the modem connected to the PC or can manually select a modem from the list of known manufacturers and modem models. The detect option uses Plug and Play to configure the correct device. If the Wizard cannot detect the device, the user can still manually select the correct modem.

{ewc msdncd, EWGraphic, ux01 5 /a "psL.bmp"}

Figure 82. The Modem Wizard, which can detect and install a modem

[Configuring a Modem Device](#)

After the correct modem has been selected, users can optionally change configuration parameters, such as the volume for the modem speaker, the time to wait for the remote computer to answer a call, and the maximum baud rate to use, on a property sheet like the one shown in Figure 83. (The maximum baud rate is limited by the speed of the PC's CPU and the speed supported by the communications port.)

{ewc msdncd, EWGraphic, ux01 6 /a "psL.bmp"}

Figure 83. A Modem property sheet

[Configuring Telephony Services](#)

In addition to configuring the modem device, users configure telephony services to identify the various dialing parameters associated with the different locations where the PC will be used. For each location, information is stored for use by TAPI-aware applications, including information needed to dial a local call and a long distance call, the location's area code (for use in determining whether the call is inside or outside the calling area code), and calling card information. For a desktop PC, the default location would commonly be used—the default name could be changed to IN THE OFFICE—whereas for a portable computer, a mobile user might add several different locations to accommodate those where the computer is commonly used. For example, a mobile user might use the computer in the office, on the road, or in a remote city. Figure 84 shows three location configurations that are selectable depending on the location where the computer is being used.

{ewc msdncd, EWGraphic, ux01 7 /a "psL.bmp"}

Figure 84. Dialing Properties for configuring location calling information

[Device/Hardware Support](#)

Windows 95 provides improved communications device and hardware support over

Windows 3.1. A few areas of improvement are discussed below.

Windows 95 provides greater robustness and performance at high baud rates for MS-DOS-based and Windows-based communications applications using local serial ports with 16550A-compatible UARTs. The 16550A UART contains a 16-byte FIFO buffer to prevent character overflow resulting from interrupt latency, and help to reduce overall interrupt overhead. Because the Windows 3.1 communications driver did not fully support the use of the 16550A UART, some third-party communications vendors had to replace the driver. Improvements in Windows 95 communications should alleviate this problem.

Windows 3.1 limited the number of logical names that could be used to address serial communications ports to nine and the number that could be used to address parallel ports to four. This limit inhibited the use of multiport serial devices in Windows 3.1. The communications APIs in Windows 95 have been enhanced to support the same number of logical ports as MS-DOS: 128 serial ports and 128 parallel ports. Obviously, the number of usable ports is still a function of the number of physical ports available to the system.

Windows 95 supports Enhanced Capabilities Ports (ECP) to facilitate higher speed communications than is possible over a serial device. This support provides for the use of future parallel port modems.

Plug and Play Support

Plug and Play support for communications devices in Windows 95 facilitates the detection of connected modem devices and assignment of system resources—for example, IRQs and I/O addresses for communications ports—which simplifies configuration and setup. In addition to Plug and Play detection, Windows 95 provides for manual detection of non-Plug and Play communications devices, such as modems. Because no standard for automatically obtaining device information using the AT modem command strings presently exists, detection of legacy modems is handled manually by querying the modem device and checking the information returned against a database of known modem information. As part of a Telecommunications Industry Association (TIA) proposed standard called IS-131, Microsoft is working with other leading industry manufacturers to standardize the modem command set. When this proposal is adopted, Windows 95 will support the standardized command set, which will aid detection of legacy modems.

External modems require new firmware to return the required Plug and Play ID information, whereas internal modems utilize the ISA Plug and Play specification. PCMCIA communications devices are supported as part of the Plug and Play services for the PCMCIA specification. Some modem manufacturers will improve their communications product offerings by revising their existing modem lines, while others will produce a new line of Plug and Play modems.

Detection of Plug and Play serial devices, such as modems, is handled when Windows 95 is initially installed, during the boot process, or when a new modem device is connected to the system. As with other Plug and Play devices, the user is notified that the new device has been detected and is asked to confirm the installation and configuration of the device.

Support for legacy modems is provided by using device-specific information to provide a manual detection mechanism, or by displaying a list of supported modems from which a user can choose the appropriate one. After the modem has been identified for the system, it can be used by TAPI-enabled communications applications, including dial-up networking, Microsoft Fax services, and the new HyperTerminal communications application.

HyperTerminal

Windows 95 includes a new 32-bit communications application called HyperTerminal that has all the qualities of a good Windows 95 communications application. HyperTerminal offers the same base communication capabilities as the Terminal program included with Windows 3.1, but integrates well with the UI in Windows 95 and demonstrates how the Win32 communications APIs and TAPI services support more flexible communications applications than Windows 3.1-based applications.

Good communications applications utilize the Windows 95 services and capabilities to offer a more robust and powerful product, as follows:

n

They are Win32-based applications that use the Win32 communications

APIs.

n

Their internal architecture uses multiple threads of execution to provide

good responsiveness to the user and great error-free high-speed communications. Multiple threads allow full preemptive multitasking of communications tasks and support concurrent interaction with the user, downloading of remote data, and display of communications status.

n

They take advantage of TAPI services for making remote connections and

controlling the modem device.

[Try It!](#)

Run Communications Applications in the Background

1. Start Windows 3.1.
2. Run an MS-DOS-based communications application in the background with other foreground activities.
3. Run a Win16-based communications application and perform other CPU or disk-intensive tasks, such as copying files, accessing a network, or formatting a floppy disk.
4. Now start Windows 95 and repeat steps 2 and 3.
5. Run the 32-bit HyperTerminal communications application and perform other CPU or disk-intensive tasks, such as copying files, accessing a network, or formatting a floppy disk.

Phone Dialer

The Phone Dialer application in Windows 95 provides basic support for making telephone calls. As shown in Figure 85, it includes a telephone dial pad, user-programmable speed dials, and a call log.

`{ewc msdncd, EWGraphic, ux0l 8 /a "psL.bmp"}`

Figure 85. Phone Dialer Application

Increasingly, new communications hardware will support voice communications in addition to data and fax. The next generation of modems will support the AT+V standard (TIA IS-101), which adds voice support to the standard AT command set, effectively turning the modem into a telephone designed to be a PC peripheral. Other devices, such as those built on digital signal processors (DSPs), will also include voice telephony support. Windows 95 communications applications will bring control of the telephone to the PC, enabling programmable "smart" answering machines, dynamic call filtering and routing, dialing from any PC application or directory, drag-and-drop setup of conference calls, and other types of computer-telephone integration.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Chapter 13: Mobile Computing Services

As computing moves beyond its traditional desktop environment, Microsoft is committed to delivering system services and end-user functionality that dramatically improve the ease-of-use of portable PC hardware and enrich the mobile computing experience.

The Windows 95 Vision of Mobile Computing

Windows 95 is the first desktop operating system designed from the beginning with mobile computing in mind. Portable PC's are forecasted to comprise 33% or more of the run rate of new computer systems in 1995; therefore, it makes sense to build strong mobile computing support into a mainstream operating system. When nearly one-third of the user community may be utilizing mobile computing features, it is unacceptable to add mobile computing support on as an afterthought or implement it as a set of utilities. Instead, in Windows 95, the core networking, device support, communications, and other architectures the following observations about mobile computing:

n

Mobile computing encompasses anyone who moves computing

capabilities away from a traditional desktop PC. The Windows 95 vision for mobile computing includes everyone who uses a portable PC (including "luggables," notebook and subnotebook computers, but not PDAs), from people who move from meeting to meeting in an office building, to those who telecommute between their homes and offices, to business travelers, to those who have no office at all and move from customer site to customer site.

n

The tasks people want to perform away from their desks are

fundamentally similar to those that they perform on their desktop. While they're in the office, users want to draft a memo, review a budget spreadsheet, query a database, browse e-mail, peruse a presentation on the network, send a fax, or look at their schedule for the day. Away from their offices and their desktop PCs, users want to continue performing these same tasks.

n

The “mobile” computer environment is fundamentally different from the

desktop environment. When users move away from their office, their computing environment changes dramatically. Their hardware environment is dynamic, as they plug in and unplug different components to deal with the task at hand. Portable PC users may be operating in a power-constrained environment with video displays often half the size of their desktop displays. They can’t easily access a file on a server or receive e-mail. As a result, the mobile computing environment can be constrictive to users.

According to customers, mobile computing presents three challenges: getting the most out of portable PC hardware; staying in touch; and keeping organized. — Windows 95’s mobile computing features are designed to address these challenges, and thus provide mobile users with an easier to use and more powerful environment.

n

Getting the Most out of Portable PC Hardware. — For most purchasers, a

portable computer is a big investment. Customers expect their new hardware to work well, and not require time-consuming setup hassles or elaborate re-configuration for different work environments. Rapid advances in portable computing technologies have minimize the functionality and performance differences between desktop and portable PCs, and customers want to take advantage of new capabilities. At the same time, customers resist “forced obsolescence,” and hope to extend the lifetime of older but still useful machines with smaller hard disks.

n

Staying In Touch. At their desks, users have a wide array of

communications capabilities to keep them connected to other people, both inside and outside their organizations. They have access to the LAN and all its services.

such as e-mail, file sharing, and print sharing. A phone, a fax machine, and perhaps a modem are close at hand. When they leave their desks, these users become communications islands. They are cut off from their network and all its services. Phones, faxes, and modems are not readily available. Being mobile entails a constant struggle to stay in touch. The ideal for most mobile users is to be as productive while mobile as they would be at a desk. To achieve this ideal, users must have easy access to powerful communications tools, regardless of location. Channels of communication must exist between their portable and desktop PCs, between themselves and the rest of their workgroup, and between themselves and the broader community of PC, fax, and other equipment users.

n

Keeping Organized.—The nature of the mobile work environment

introduces significant, time-consuming organizational challenges — many of which can be addressed through software. For example, mobile users can spend inordinate amounts of time making sure that files stay “in synch” between a portable PC and a desktop PC or file server. Likewise, few good methods currently exist for managing print jobs created out of the office.

The development investments for mobile computing in Windows 95 have focused on delivering features which enable users to get the most out of their portable computing hardware (PCMCIA, Plug and Play, Disk Compression and Power Management), stay connected (Dial-Up Networking, Exchange and Microsoft Fax) and keep organized (the Briefcase and Deferred Printing). The following sections provide detailed explanations of these features and other Windows 95 support for mobile users.

Getting the Most out of Portable PC Hardware

Windows 95 is designed to enable computer users to get the most out their portable PC. On newer machines, Windows 95 supports innovations such as PCMCIA, docking stations and port replicators, and Advanced Power Management. Features like DriveSpace disk compression help to extend the useful life of older portable PCs. Inherent in Windows 95's new support for portable PC hardware are architecture enhancements which enable applications and system programs to be smart about conserving battery power and managing configuration changes.

The emergence of PCMCIA cards has been one of the most exciting advances in the

portable computer market. However, users were never sure whether a particular card was compatible with their portable PC, they had to struggle through installation and configuration of card drivers and socket services, and card insertion and removal were anything but dynamic.

Through the Plug and Play architecture, Windows 95 delivers power, compatibility, ease of installation, and dynamic card insertion and removal to PCMCIA users. PCMCIA drivers in Windows 95 are robust, 32-bit, dynamically loadable virtual device drivers with zero conventional memory footprint. Windows 95 ships with an updated version of card and socket services. Microsoft's compatibility testing/logo program ensures compatibility with these standards.

Installation of a PCMCIA device is as simple as inserting the card, and insertion and removal of cards happens dynamically. For example, when a user plugs in a PCMCIA network card, the portable computer detects the network card, loads the network drivers, and establishes a network connection. Then the shell updates its user interface to reflect that the mapped network drives are now active. Prior to Windows 95, users would have needed to shut down their systems and reboot in order to begin using the device.

Many older portable computers have small disk drives. While these machines may still be perfectly functional for word processing, checking e-mail, or other non-compute-intensive tasks, the lack of disk space is a major constraint.

Windows 95 incorporates DriveSpace Disk Compression, the same compression technology used in MS-DOS 6.22. Windows 95 disk compression is backwards-compatible with compressed volumes created by DoubleSpace (DOS 6.0) and Stacker compression software.

In a major enhancement over MS-DOS 6.22 functionality, all disk compression in Windows 95 is handled by 32-bit protected mode code integrated into the file system. In addition to the inherent performance advantages, such tight integration with the underlying device driver code means that all compression operations are for the most part transparent to the user. Windows 95 is also much more sophisticated about the relationship between system files and compressed volumes. For example, system paging (swap) files can now reside on compressed drives (they are marked as "uncompressible" to avoid impacting system performance).

The bane of a portable computer users' existence is battery life. While true innovation in battery life depends in large part on physics and hardware engineering, Windows 95 supports Advanced Power Management (APM) 1.1, which represents a major step forward from existing software-based power management technologies.

From an end-user perspective, APM 1.1 offers three major benefits:

n

The Windows 95 shell includes a battery meter that provides users with an accurate representation of the battery life they have remaining.

n

Users can put their systems in Suspend mode directly from the Start menu, as opposed to going to a hardware control. Users also have the option to automatically power their PCs off when they shut down Windows, instead of having to shut down Windows and then use the hardware power switch to shut off the PC. Software-managed power control enables Windows to properly deactivate and reset peripheral devices to prevent data loss and conserve power.

n

Plug and Play APM messages allow application software to react to changes in the power state and battery life. For example, a mail program or a utility that does background disk compression could disable this feature when running on limited battery power, or could prompt the user to save their work and avoid data loss when battery power runs low.

Many portable PC users have had to compromise storage, extensibility, and display size and resolution in favor of mobility. Docking stations (or simpler port replicators) provide users with both the mobility of the portable PC and the storage, extensibility, and versatile display capabilities of a desktop PC. However, users with docking stations spend a lot of time reconfiguring and rebooting their machines when they take them in and out of their docking stations.

Microsoft forged partnerships with leading portable vendors like Toshiba and Compaq, and BIOS vendors like Phoenix Technologies to achieve a level of integration between hardware and software never achieved before. On the hardware side, docking stations have enabled docking and undocking operations without powering off the computer. On the software side, Windows 95 detects the impending changes in configuration and anticipates the resulting changes in hardware, manages any conflicts (such as open files on an external hard drive or network), and loads the hardware drivers appropriate to the new configuration.

Instead of rebooting and fooling with configuration files, users now simply click the UI's Start button and choose Eject PC from the Start menu. Windows 95 checks for any potential problems and then undocks, without users having to power down. After undocking, the system automatically reconfigures itself for the different hardware—for example, changing the video resolution to match the resolution of the built-in display—and continues running.

[New Message Support](#)

The Windows Plug and Play initiative provides a new set of Windows messages that alert applications and device drivers to changes in the hardware so that they can react intelligently. These messages include the following:

n Docking.

n About to change configuration (for example, when the user is about to undock)

n

Device about to be removed

n

Configuration changed (for example, when the user just undocked)

n

Device about to be added

n

Power management.

n

System about to suspend

n System suspended

n System resumed

n PCMCIA.

n Device inserted

n Device removed

n Miscellaneous.

n New device inserted (for a device that needs to be set up)

n Serial mouse inserted

n Parallel cable inserted

These messages enable applications and system services to better support portable PC users. Windows 95 itself takes full advantage of these messages. For example, the applications shipped with Windows 95 use the CONFIGURATION CHANGED message in the following ways:

n The Briefcase uses it to try to start updating.

n

The print spooler uses it to print all deferred print jobs.

n

Mail uses it to try to reestablish a network connection.

[The Registry](#)

The Registry provides centralized, dynamic data storage for all Windows settings. The Registry defines a current configuration branch to enable ISVs to better serve the needs of mobile users. This branch stores information on a per-configuration basis. For example, the Control Panel's Desktop tool stores per-configuration information about video resolution changes and Print Manager stores per-configuration information about the default printer.

Configurations are created when Windows 95 queries the BIOS for a dock serial ID, asks the user for a name for the configuration, and then stores information about hardware and software associated with this configuration. Multiple configurations can also be created manually via the Hardware Profile manager. This functionality enables users to create different configuration settings for the same hardware setup. Applications access and store information for each of the different hardware configurations used by mobile users. This Registry support enables applications to gracefully adapt to different hardware configurations.

"Poor displays" have been cited as a leading limitation of portable computers. To overcome that limitation, portable computer vendors are putting high-end video controllers into portable PC systems, and users are plugging external monitors into their portable PCs when they are at their desks.

Windows 95 stores video resolution on a per-configuration basis and supports dynamic resolution changes. As a result, when users have monitors attached to their portable PCs, they can set the video to a higher resolution—for example, 1024x768.

When they undock (or detach the monitor), the video resolution changes to 640x480. Whenever they return to their connected or docked configuration, the resolution automatically returns to 1024x768.

Portable PC users often describe difficulties in switching between the integrated pointing device on their portable computers—for example, a trackball or clip-on mouse—to a desktop pointing device. Windows 95 addresses these difficulties in two ways:

n When users change configurations, Windows 95 automatically detects which pointing device is available and enables it.

n When users connect a Plug and Play serial mouse, the system detects the new mouse and dynamically reconfigures itself to enable its use. No manual configuration changes are necessary.

Like other PC users, portable PC users often exchange documents with customers or other people in a different work environment. Because of limited disk space or lack of network access, however, mobile users often don't have the applications needed to view the files they receive.

An extensible, replaceable File Viewer technology has been seamlessly integrated into the Windows 95 UI. File Viewers enable portable PC users to view many common file formats, even though their machines may lack the disk space or processor power to run full versions of the underlying applications. Users simply select a file and choose Quick View. Windows 95 directly supports more than 30 file types and publishes interfaces to allow applications to add support for additional formats (and even to add their own viewer). For more information, see Chapter 4.

"The Windows 95 User Interface."

Staying In Touch

To enable mobile computer users to stay in touch with essential information resources, Windows 95 provides powerful, easy-to-use, end-user communications capabilities and an open, extensible set of services for applications. Dial-Up Networking support has been integrated into the Windows 95 network architecture and user interface; finally, accessing a network via a modem is as easy and reliable as using a hardwired network adapter. Similarly, the Exchange email client and Microsoft Fax system are optimized to enable portable computer users to easily send and receive email and faxes while mobile.

In the office, well over 50 percent of PC users have become accustomed to full-workgroup computing capabilities—printing to a network printer, sending and receiving e-mail, and accessing shared files. However, when users leave the office, they cannot take all the shared resources from their workgroup environment with them.

The dial-up networking features in Windows 95 give users complete workgroup computing capabilities while mobile. Dial-up networking is smoothly integrated into the Windows 95 shell. Whether users are running a client-server application, accessing a customer database, downloading and/or browsing e-mail, or accessing shared files, network access while mobile looks and works exactly like network access in the office, and establishing a remote connection works the same as establishing a connection in the office. Users simply double-click the desired network object. Similarly, if users double-click Mail, a remote connection is automatically established.

The Dial-Up Networking client software component, like the rest of networking in Windows 95, provides an open architecture and connects to a broad set of networks, including Windows NT, NetWare Connect, and the Internet. Support is included for TCP/IP, IPX, and NetBEUI network protocols, using industry standard point-to-point protocol (PPP) over the wire, as shown in Figure 86. Because remote access is part of the dynamic 32-bit protected mode network architecture of Windows 95, users don't have to reconfigure or reboot their computers to continue working after establishing or ending a connection.

`{ewc msdn cd, EWGraphic, ux0m 0 /a "psM.bmp"}`

Figure 86. The Windows 95 remote access functionality, which supports TCP/IP, IPX, and NetBEUI over PPP.

As Figure 87 shows, a Windows 95 desktop PC can be used as a convenient access

point to a small LAN or simply to the desktop PC itself. (Windows NT Server 3.5 supplements the remote network access functionality in Windows 95 to provide a large network solution that allows for as many as 256 simultaneous dial-in sessions.) When used as a host computer—that is, the computer the user dials into—a Windows 95 PC provides an easy-to-use, single-port host, capable of multiprotocol routing for IPX and NetBIOS with pass-through user-level security. The Windows 95 security scheme employs the Windows NT or NetWare authentication mechanism and user database to validate the user. Share-level security is also available. Using the desktop management capabilities in Windows 95, an administrator can disable dial-up access so users cannot dial into a particular desktop PC or cannot remotely access the entire network. (For more details about the desktop management infrastructure in Windows 95, see Chapter 9, “Networking.”) If the user dials into a host system, such as Windows NT, Shiva Netmodem/ LanRover, or NetWare Connect, Windows 95 offers full connectivity.

{ewc msdncd, EWGraphic, ux0m 1 /a "psM.bmp"}

Figure 87. The flexible remote connectivity options and broad network access provided by Windows 95

Windows 95 provides a modular, open architecture that enables applications to establish a “pipeline” to the remote network. The Remote Access API, a component of the Win32 API, provides ISVs with services to initiate and resume a remote connection, as well as to gather information about the type and status of the connection. These APIs enable applications to adjust their behavior depending on the transmission speed and other characteristics of the network connection.

Another key component of the Windows 95 architecture is the Remote Access subsystem. This open subsystem is network-independent and device-independent to enable universal connectivity. For example, Windows 95 supports ISDN boards, PBX modems, and so on. This capability is accomplished through service providers—software components that manage physical connections and network traffic over the remote media.

The Remote Access subsystem includes a modular authentication provider that can be supplemented or replaced to provide custom security services. For example, if a company wants to provide its own custom services, that company can replace the authentication DLL in Windows 95 with its own to take advantage of company-specific security features.

Figure 88 highlights the various components of the Remote Access subsystem that can be replaced by third-party service providers. The shadowed items can be replaced to add functionality not provided by Windows 95.

{ewc msdncd, EWGraphic, ux0m 2 /a "psM.bmp"}

Figure 88. The Windows 95 Remote Access architecture, which allows direct integration by third-party service providers

[Telephony API](#)

To communicate in a mobile environment, users and applications must dial phones or modems. Whether the device is a phone on a PBX system, an ISDN board, or a modem, applications can use the Telephony API (TAPI) in Windows 95 to dial. TAPI provides services that allow applications to share a line so that more than one application can wait for an incoming call while another dials out. TAPI itself is extensible, so third-party developers can write TAPI service providers to extend dial support to new devices. One such TAPI service provider is UniModem, which is discussed in detail in the following section.

TAPI also provides the Dial Helper to guide users through the process of defining a correct phone number, given their location and telephone system. The Dial Helper gives users the opportunity to define phone numbers in a location-independent fashion. Users enter an area code and phone number, and the Dial Helper applies location-specific parameters to the number, such as a prefix to get an outside line. When users dial this same number from a different location, they simply switch their location, and Dial Helper automatically adjusts the prefixes, area codes, and other parameters.

[UniModem](#)

Windows 95 provides an easy, central, extensible mechanism for installing and configuring modems. (This mechanism is similar to the Windows 95 infrastructure for printers.) Windows 95 automatically detects the modem and provides a default configuration for it. After the modem is installed, it is available to all applications, which no longer need to store modem commands or data about the capabilities of different modems. Windows 95 ships with support for the top 200 modems worldwide. Adding new modems is as simple as supplying the appropriate installation data (.INF) file. Microsoft will certify the .INF files for each new modem and provide a logo identifying it as Windows-compatible.

Both TAPI and UniModem use the extensible 32-bit communications architecture in Windows 95. For more information, see Chapter 12, "Communications."

Historically, network users with portable computers have dealt with CONFIG.SYS files and a regular stream of error messages as they connected and disconnected from the network.

To adapt to changes in link speed and configuration, the network architecture in Windows 95 is completely dynamic, regardless of whether users are using the NetWare-compatible components or the Microsoft networking components. All the underlying drivers, transports, and redirectors are robust, 32-bit, dynamically-loadable, protected-mode virtual devices that support Plug and Play. This

architecture enables Windows 95 to load and unload components of the network stack as demanded by hardware events. For example, when the user docks a portable PC or inserts a PCMCIA network card, the appropriate network components are loaded and connections are established without user interaction. Even assigning a TCP/IP address is now dynamic, using the Dynamic Host Configuration Protocol (DHCP) servers to allocate addresses on demand.

Users can forget about the intricacies of network hardware and configurations. Virtually every aspect of networking, including dynamic configuration, is handled transparently by Windows 95

Users constantly strive to protect the data on their portable computers from prying eyes and hands. This chore is not easy. Password protection at boot up, after a suspend (reduced power) state, and at network logon means users must often contend with inconsistent user interfaces and multiple passwords.

The Security icon in the Windows 95 Control Panel provides a central, extensible mechanism for users to easily manage the security of their computers. The Master Password gives users the opportunity to unify all their different passwords under a single password.

The interface for the Control Panel's Security tool is open and extensible. As a result, ISVs and portable PC manufacturers can add their own security property sheets and hook their password services to the Master Password.

Fax is one of the most common tools mobile users employ to send messages and documents. Rich fax services are seamlessly integrated into the Microsoft Exchange e-mail client provided with Windows 95. Users of Windows 95 send a fax message the same way they send any other electronic message.

Microsoft Fax services extend the capabilities of today's "paper-based" fax machines. For example, users can address a fax message in the Microsoft Exchange client and attach a binary file, such as a word processing document. Depending on the capabilities of the recipient's PC or fax machine, the message could appear as a message in their inbox with an attachment or, in the case of Class 3 fax machines, the attached document could be rendered and printed with a cover sheet. Microsoft Fax provides security to ensure the correct recipient via an RC4-encrypted password or public key and private key encryption.

If users want to send faxes when they are not connected to a phone line or network, they can spool them to their outbox. When they reconnect, the faxes are automatically sent.

Microsoft Fax uses the open, extensible architecture of MAPI, plugging in as a transport provider and then leveraging the user interface provided by the Windows 95 client. Users do not need to learn how to operate a separate fax software package. For more information, see Chapter 14, "Microsoft Exchange: E-Mail, Fax, and More."

Historically, when users left the office, they left behind robust e-mail capabilities. Microsoft, Lotus, and other e-mail vendors are changing this scenario. Windows 95 delivers the next generation of remote mail so that users can simply connect a phone line to their modem and start using mail. The remote connection is established automatically using Remote Access services.

Windows 95 has also optimized Mail to gracefully handle remote network connections and slow network links. Performance over the wire has been enhanced, and users can browse message headers and download specific messages, getting an estimated time to download and status of the download process.

[The Messaging API](#)

More than any other class of users, mobile users need access to multiple messaging providers and the ability to seamlessly move between these providers. While desktop users receive most of their electronic mail through a corporate or network-based electronic mail system, mobile users frequently connect to several different messaging providers—for example, both CompuServe and their corporate network.

The Windows 95 Messaging API (MAPI) makes the communications abilities of mobile users significantly more powerful. MAPI is an open, extensible messaging infrastructure standard that ensures complete independence of Windows applications and client software from underlying messaging systems, while enabling vendors to supply a wide array of providers. To the end-user, each messaging provider looks more or less the same. MAPI provides the support to dynamically switch between providers and associate multiple providers and preferences with a "profile."

[Keeping Organized](#)

The mobile computing environment presents significant data management challenges for end users. Since portable PCs typically exist in at least two states: on the network and off, portable users need to contend with the possibility that they and their data will be separated. Most portable computer users deal with this possibility by making copies of important documents on their portable PCs. This practice introduces the problem of file synchronization. What happens to the portable PC user if the original copy of the document changes? What if the portable

PC user edits his copy of the document?—Windows 95 attempts to address these issues through the metaphor of a Briefcase.

Windows 95 also addresses the problem of getting a portable PC connected to a desktop PC or for the purposes of transferring files through Direct Cable Connect, which enables a standard parallel cable to serve as a simple network connection.

Deferred printing support handles the problem of creating print jobs while on the road. Instead of forcing users to contend with error messages when printers are unavailable, Windows 95 is “smart” about managing the printing process in different environments.

Portable PC users who also have desktop PCs (or who connect to a network) need to keep the most up-to-date files on the computer they are currently using. Users most often stay up to date by comparing the dates stamped on files and manually copying files from one machine to another—a tedious, unintuitive, and error-prone process.

The Windows 95 Briefcase minimizes the headaches of staying up to date by keeping track of the relationships between different versions of a file on different computers. As shown in Figure 89, the user interface for this feature employs a simple metaphor that users are already comfortable with: a briefcase.

`{ewc msdncd, EWGraphic, ux0m 3 /a "psM.bmp"}`

Figure 89. The initial Briefcase screen, outlining the Briefcase process

After installing the Briefcase software on their portable PCs, users can specify which files and directories they want to keep up to date, by dragging and dropping those objects into the Briefcase. When users reconnect their portable PCs to a network or their desktop PCs, the Briefcase automatically updates unmodified files on the host with the recently modified files from the portable computer. Figure 90 shows the contents of a typical Briefcase.

`{ewc msdncd, EWGraphic, ux0m 4 /a "psM.bmp"}`

Figure 90. Sample Briefcase contents, showing document status

Windows 95 provides a set of OLE 2.0 interfaces that allow applications to define “reconciliation handlers.” When both the file in the Briefcase and the corresponding original document have changed, Windows 95 calls the appropriate reconciliation handler to merge the two files. (The Windows 95 reconciliation APIs will also serve as the foundation for Cairo’s reconciliation APIs. As a result, ISVs writing to the reconciliation APIs in Windows 95 can leverage that investment as they write Cairo applications in the future.)

Roughly 70 percent of portable PC users also use a desktop PC. As a result, they constantly need to transfer files and other data between the two machines. A simple way to effect these transfers is via a direct parallel or serial cable connection. Windows 95 makes this process significantly easier than it was under Windows 3.1. Like remote access, establishing a local connection is seamlessly integrated into the shell and provides full participation for the client on a variety of networks. The services provided by a direct cable connection are much the same as those provided via a dial-up connection, only faster!

Wireless technologies, such as infrared (IR), provide another form of local connection. Using the extensible device driver architecture in Windows 95, Microsoft is working closely with creators of wireless devices to develop and ship Windows drivers for these new technologies.

Users generate print jobs regardless of where they are. Windows 95 supports "deferred" print jobs, enabling users to generate print jobs even if a printer is not currently available. The print jobs are stored by the system until a printer becomes available, at which time Windows 95 detects the connection and automatically spools the print jobs as a background process.

Windows 95 also gives users the ability to print to a generic printer. If they aren't sure which printer they will be connected to, they can queue the print jobs and specify the printer only when a physical device is available. This functionality enables users to easily use printers available at customer sites, in copy centers, and so on.

Finally, to better support the mobile user, Windows 95 stores the default printers on a per-configuration basis. If users have a different printer at home than they do at the office, Windows 95 changes the default printer when it detects the computer's change in location—for example, from docked status to undocked status.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 14: Microsoft Exchange: E-Mail, Fax, and More

Personal computers today are being used for an increasingly wide range of tasks, beyond simply creating and editing documents. Electronic mail has become a primary communication vehicle, not only within many companies, but also among individuals, families, and the public at large. Additionally, usage of online information services has dramatically increased, due in large part to e-mail. Witness the astounding 15 percent PER MONTH growth rate seen by the Internet, in addition to the rapid growth in online commercial services, such as CompuServe and others.

The growing use of messaging and communication services has resulted in a plethora of software tools. A very real problem users face today is that each of these different information sources and services comes with its own unique software and user interface. Users often have software for an e-mail client such as Microsoft Mail, a groupware client such as Lotus Notes, an online services client such as CompuServe Information Manager, and perhaps some electronic fax software that came with their modem—all in addition to the basic File Manager they use for accessing and manipulating documents.

Windows 95 addresses this growing complexity by including an integrated messaging and workgroup communications system that provides universal e-mail, fax, and information-sharing solutions. These different services are all presented in Windows 95 with a single user interface called Microsoft Exchange. Microsoft Exchange includes the following features:

n

The ability to send and receive rich-text e-mail messages over virtually any e-mail system, including public networks such as the Internet.

n

The ability to send faxes directly from the desktop and receive incoming faxes directly in Microsoft Exchange's universal inbox.

n

A complete, built-in e-mail system to quickly get workgroups up and running, including the Microsoft Mail Post Office. The system can be easily upgraded to a full Microsoft Mail Server or Microsoft Exchange Server to connect multiple workgroups or the entire enterprise.

n

The ability to move messages and documents between the file system and mail folders, and to organize documents using sophisticated custom views with searching and filtering capabilities.

n

Support for taking full advantage of MAPI-enabled applications, ranging from desktop productivity to workflow and document management.

This chapter introduces the Microsoft Exchange client and other components of the Windows Messaging subsystem, including Microsoft Fax software, MAPI, and the Microsoft Mail Post Office.

The Windows Messaging Subsystem

Microsoft Exchange is built upon the open Messaging API (MAPI) 1.0 architecture, so it can work with many different e-mail systems and information services simultaneously and provide a universal inbox for communication between individuals and workgroups. Because e-mail and other messaging-enabled applications are becoming so ubiquitous, Windows 95 includes a set of operating system-level components that provide built-in messaging services to any application that wishes to take advantage of them.

Windows 95 ships with a number of components that together make up the Windows Messaging subsystem. (The term WINDOWS MESSAGING SUBSYSTEM is sometimes used synonymously with MAPI 1.0, because Windows 95 represents the first complete implementation of the “extended” MAPI architecture.) These components include the following:

n

The Microsoft Exchange client. The built-in universal inbox in Windows 95,

which is used to send, receive, and organize e-mail, faxes, and other information, includes an OLE-compatible rich-text editor used for composing and reading messages, as well as powerful custom views, searching, and filtering. Through the use of MAPI drivers (described later), the Microsoft Exchange client can work directly with most public or private e-mail systems.

n

The Personal Address Book. The Personal Address Book contains not

only e-mail addresses, but names, phone/fax numbers, mailing addresses, and other personal contact information. Through the open MAPI interfaces, the Personal Address Book is accessible from a wide variety of applications, and through the use of MAPI drivers, it is also the user interface for corporate e-mail and information services directories. The Personal Address Book can store addresses for multiple e-mail systems at the same time.

n

The Personal Information Store. This sophisticated local “database” file

allows users to store e-mail messages, faxes, forms, documents, and other information in a common place. The Personal Information Store functions as the user’s mailbox and includes a universal inbox and outbox, as well as any other mail or document folders the user wishes to create. It supports long filenames, plus sorting and filtering on various fields of the stored objects. Custom views

can be created and saved in the Personal Information Store.

n

The Messaging Application Programming Interface (MAPI) 1.0. These

core system components seamlessly connect the Microsoft Exchange client and other mail-enabled and workgroup applications to various information services. MAPI also defines a Service Provider Interface (SPI) that allows MAPI drivers to be written for nearly any messaging or workgroup service.

n

The Microsoft Mail drivers. This set of MAPI drivers allows the Microsoft

Exchange client to be used with a Microsoft Mail Post Office—either the “workgroup edition” that’s provided with Windows 95 or the “full” server edition that’s available separately.

n

The Microsoft Fax driver. This MAPI driver allows the Microsoft Exchange

client to send and receive electronic faxes in the same way as any other piece of e-mail. Documents can be exchanged as traditional ‘published’ facsimiles, or in their original ‘editable’ format using Microsoft Fax’s Binary File Transfer capability.

n

The Microsoft Internet Mail drivers. This set of MAPI drivers lets the

Microsoft Exchange client send and receive mail directly on the Internet using the

built-in TCP/IP and PPP communications protocols provided with Windows 95.

n

Optional third-party MAPI drivers. Drivers for other messaging systems

are available separately from a large number of vendors. Examples of vendors working on MAPI drivers that integrate into the Microsoft Exchange client include the following:

n

America Online

n

Apple

n

AT&T

n

Banyan

n CompuServe

n DEC

n Hewlett-Packard

n Novell

n Octel

n

RAM Mobile Data

n

Skytel

The Microsoft Exchange client is designed to work with virtually any messaging or workgroup system, whether it is LAN-based, host-based, or an online service. Transparent access to these various messaging systems is available to ANY application, not just Microsoft Exchange. The key to this open architecture is MAPI, which is illustrated in Figure 91.

`{ewc msdncd, EWGraphic, ux0n 0 /a "psN.bmp"}`

Figure 91. The open MAPI architecture

MAPI defines both an Applications Programming Interface (API) and a Service Provider Interface (SPI). The API is used by end-user applications, including Microsoft Exchange, whereas the SPI is used to write drivers (sometimes called PROVIDERS). As Figure 91 shows, MAPI defines three different types of drivers:

n

Transport drivers provide the ability to send and receive e-mail on any messaging system.

n

Address Book drivers allow seamless access to any directory service, mailing list, or other name database.

n

Store drivers let MAPI applications read and write to local or server-based message stores, mailboxes, and workgroup databases.

As Figure 92 shows, Windows 95 users can install any combination of drivers so that their Microsoft Exchange client can be used for multiple e-mail or workgroup systems at the same time.

{fewc msdncd, EWGraphic, ux0n 1 /a "psN.bmp"}

Figure 92. Configuring the Microsoft Exchange client for use with multiple services

Microsoft Exchange

As already mentioned, Windows 95 has a built-in advanced e-mail and workgroup client called Microsoft Exchange. Far more than a "basic" bundled e-mail client, Microsoft Exchange actually provides more features than almost all existing e-mail clients on the market, including the current version of Microsoft Mail.

Microsoft Mail is currently available as part of Windows for Workgroups and Windows NT, as well as separately for Windows 3.1 users. The Microsoft Exchange client goes beyond the current Microsoft Mail by providing the following features:

n

Rich-text e-mail, including full use of fonts, colors, bullets, and so on, that supports drag-and-drop text editing and Find/Replace

n

Full OLE support, including visual editing and cross-application drag and drop

n

Built-in Remote Mail—no separate “remote” product is required—that uses TAPI and Remote Network Access to support all common modems and network protocols

n

Full integration with the Windows 95 file system so that messages can simply be dragged to hard drive directories or files can be dragged into mail folders

n

A customizable Toolbar with Tooltips and right-click “shortcut” menus for commonly used tasks

n

A Blind Carbon Copy (BCC:) feature

n

Intelligent message replies that are automatically indented and rendered with a personal font/color, for better tracking of who made which comments

n

The ability to connect to multiple mailbox files simultaneously

n

Custom views of any folder, with user-defined columns and sorting/filtering/categorization

n

Integration with the Windows 95 Registry so that use can be made of

Master Password logon

Note—— Microsoft Exchange and the other Windows Messaging subsystem components are optionally installed by selecting Custom setup and then selecting the components during the installation of Windows 95. After installation of Windows 95, Microsoft Exchange can be installed by opening the Control Panel, running Add/Remove Programs, clicking the Maintain tab, and selecting Microsoft Exchange.

Microsoft Exchange can be started in several ways. The simplest is to double-click the Microsoft Exchange icon and start viewing e-mail and messages from the inbox, as shown in Figure 93.

{ewc msdncd, EWGraphic, ux0n 2 /a "psN.bmp"}

Figure 93. The Windows 95 desktop, showing the Microsoft Exchange client

To start Microsoft Exchange and read new e-mail, by far the easiest way is to choose Open Inbox from the Start button's Programs menu, as shown in Figure 94.

{ewc msdncd, EWGraphic, ux0n 3 /a "psN.bmp"}

Figure 94. The Open Inbox item on the Start button's Programs menu

No matter what application is active in Windows 95, new e-mail is announced by a notification at the right end of the taskbar, as shown in Figure 95. Other notifications indicate whether the system is currently sending or receiving mail, in addition to standard system notifications, such as print status and the time, as well as the battery power indicator.

{ewc msdncd, EWGraphic, ux0n 4 /a "psN.bmp"}

Figure 95. A new mail notification on the Taskbar

When designing Microsoft Exchange, Microsoft conducted extensive activity-based planning research into how people actually use e-mail during their work day. One of the strongest findings was that people use e-mail six to eight times more often than their word processor for tasks such as sending memos to people. Customers expressed a strong desire to be able to combine the power and immediacy of e-mail with the expressive capabilities of their word processor, but most e-mail packages on the market limit messages to a single font. To accommodate this desire, the Microsoft Exchange client includes a complete rich-text editor that is fully compatible with OLE. Figure 96 shows a message composed in Microsoft Exchange.

`{ewc msdncd, EWGraphic, ux0n 5 /a "psN.bmp"}`

Figure 96. A rich-text e-mail message with an embedded OLE object

Because the Microsoft Exchange client works as a universal e-mail client, it has been designed to correctly transmit rich text and formatting over any mail system, even those that were not originally designed to handle rich text, such as the Internet. The rich-text information is automatically packaged as a separate compressed file attachment and is decompressed on the receiving end by another Windows 95 client. If the message is sent to someone who doesn't use Windows 95—for example, over the Internet—the “plain text” equivalent of the message is received, and any embedded objects are sent as binary attachments.

Messages received in the inbox can be saved for future reference by dragging the messages into any of the other folders (message stores) in the mailbox. Users can also drag a message to any directory on their local or network hard drives. In the latter case, the message becomes an .MSG file but maintains all of the messaging-specific fields, such as Sender, Recipient, and so on. At any time in the future, the user can still double-click the .MSG file to open it and then forward it to other e-mail users.

A universal e-mail client needs to work with a universal address book—one that can seamlessly handle e-mail addresses of different types. Windows 95 includes a Personal Address Book that is implemented as a MAPI service. As a result, in addition to the local address book that the user maintains, Microsoft Exchange has transparent access to the address books and directory services of any other e-mail system that supports MAPI. For example, the same Personal Address Book could show a Microsoft Mail global address list or a corporate X.500 directory service.

For each new set of MAPI drivers installed, the Personal Address Book adds a new “template” to help the user in composing addresses of different types—for example, Internet e-mail addresses are typed on a predefined Internet template. After names have been entered, the user simply addresses e-mail to those people using their names, without having to remember complex addressing conventions.

As shown in Figure 97, the Personal Address Book also allows users to keep vital personal information about people, such as their telephone numbers, postal addresses, and office locations. Any phone number in the address book can be auto-dialed using the built-in Windows 95 TAPI services.

{ewc msdncd, EWGraphic, ux0n 6 /a "psN.bmp"}

Figure 97. The Personal Address Book, showing entries for people on different e-mail systems

Messages are typically stored in the user's Personal Information Store. Although the Personal Information Store is a single file, users see this file as sets of folders containing messages or documents. Normally, users have a single information store containing an inbox, an outbox, and perhaps other mail folders. However, Microsoft Exchange allows users to create as many "stores" as they like—for example, one store for current e-mail and another for backup or archive purposes. The built-in Personal Information Store is only one kind of information store. Any e-mail or workgroup system can expose its mailboxes or databases to users as information stores by creating an appropriate MAPI driver.

Information stores can be physically stored in local files, or they can represent a database on a network server. For example, when the Microsoft Exchange client is connected to a Microsoft Exchange Server, users see sets of folders (information stores) that represent replicated databases or "groupware" applications on the server in addition to their standard mailbox folders.

In addition to storing mail messages, users can store files or documents in information stores by dragging the files or documents into these folders. (Additionally, any MAPI-compatible forms software can store its form data and form definitions in an information store.) Users might want to store these items in an information store, rather than in the regular file system, for the following reasons:

n

MAPI properties. MAPI associates additional fields with items in

information stores, such as Sender, Subject, Received Time, Size, Importance, and Sensitivity. These "properties" can be used for searching, filtering, and sorting.

n

OLE document properties. Documents that are stored as OLE compound

documents have many additional built-in properties, such as Title, Author, Keywords, Comments, Last Edited Time, and Number of Pages. When a document is placed in an information store, these built-in properties can be made available to the user through custom views.

n

Rich custom views. Unlike the regular file system, which displays only a

few standard views based on filename, date, size, and so on, information stores allow users to create rich custom views of information by defining the following:

n

Which columns to show, including any of the MAPI or OLE document

properties just described

n

How to sort and filter the items to show only those of interest

n

Custom grouping, which allows for multilevel categorized (or “outline”) views of the information

Figure 98 shows a custom view of a folder created in an information store to display the OLE properties of the folder’s documents. This particular view uses the grouping feature to categorize the information by author.

{ewc msdncd, EWGraphic, ux0n 7 /a "psN.bmp"}

Figure 98. A custom view of a folder, showing OLE document properties

Users can create as many custom views of individual folders as they like, or they can create views that are shared among all folders. Custom views are useful in the universal inbox as well as in other folders. Two possible views are the following:

n

View the inbox by Subject to create a “conversation thread” view, in which all the messages and responses on a particular topic are, categorized together.

n

View the inbox by From to quickly locate and track all e-mail from a particular person.

Windows 95 includes MAPI drivers for the Microsoft Mail e-mail system, so the Microsoft Exchange client can send and receive mail as a member of a Mail network—either a full, enterprise-wide mail system or a local workgroup mail system that

uses the Windows 95 built-in Microsoft Mail Post Office. Microsoft Exchange users can fully interoperate with existing Microsoft Mail users on other platforms, although rich-text messages are converted to plain-text messages when sent to an existing Mail client.

To use mail on the road or from home, existing users of Mail typically purchase a separate product called Microsoft Mail Remote for Windows and dial into a special Mail remote gateway. They can then preview their waiting mail messages, decide which ones they really want to receive, and then download only the selected messages. They can compose new messages off line and have the messages sent automatically the next time they connect.

In keeping with the Windows 95 focus on facilitating mobile and remote computing, the Microsoft Exchange client is designed to provide the benefits of remote mail without requiring any additional client software or a special gateway to dial into. Mobile or remote users can easily send and receive e-mail using the following features:

n

Remote preview. Using the built-in Mail drivers, Microsoft Exchange users

can dial into their network and preview the headers of their new messages—that is, they can see who sent the new mail, what the subject is, how large the message is, and the estimated time it will take to download the message.

n

Selective download. After the headers are retrieved, users can mark which

messages they want to download and which messages should be deleted without downloading. Users can either download the selected messages immediately after retrieving the headers, or they can make another call later to download them.

n

Remote network access. Rather than using a specialized e-mail gateway

for remote mail, Microsoft Exchange relies on the standard Dial-Up Networking that is built into Windows 95. Users can dial into another computer running Windows 95, Windows NT Server, or a third-party remote access server such as Shiva LanRover. Remote e-mail then becomes protocol independent, because RNA supports standard network protocols such as TCP/IP, IPX, and NetBEUI.

n

Offline use. Microsoft Exchange users can compose messages while off

line and have the messages queued up in the outbox until the next time they connect to the appropriate mail service. For example, a user can download new mail at an airport, read the messages and compose replies while on an airplane, dial in from a hotel, and then send the responses automatically.

n

Scheduled connections. Users can dial in as needed to retrieve mail

remotely, or they can set up scheduled connections to dial in at a specific time or on a regular basis—for example, if the computer is permanently remote.

n

Telephony API. Microsoft Exchange uses the Windows 95 TAPI facilities to

dial in and retrieve mail remotely, allowing for effective sharing of modem resources between applications. For example, if users set their modems to listen

for incoming faxes while still making a call to get e-mail, TAPI handles the resource management between the relevant applications. Microsoft Exchange also uses the TAPI Dial Helper feature to easily handle multiple locations, hotel dialing prefixes, and credit card calls.

Windows 95 includes the workgroup edition of the Microsoft Mail Post Office, providing everything that is needed to set up and manage a complete e-mail system for a workgroup. Typically, one workgroup member, who is designated as the Mail Administrator, creates a Post Office by using the Workgroup PO applet in the Windows 95 Control Panel. The Post Office is simply a shared directory on the administrator's computer where e-mail is stored. A Wizard steps the administrator through the process of creating the Post Office, and is also used to add new users, delete users, and manage shared folders. After the administrator shares the Post Office directory, users can start Microsoft Exchange, enter the shared directory name, and connect to the Post Office in order to send or retrieve mail.

The Microsoft Mail Post Office included in Windows 95 is a workgroup edition, meaning that it is limited to exchanging mail with users of a single Post Office. A single Post Office can potentially support dozens of users, depending on the server performance of the Post Office computer. However, a large group may need to be split up into separate workgroups, each accessing their own Post Office. In that case, a full Microsoft Mail Server will be needed. The full edition of the Microsoft Mail Post Office allows mail to be routed between multiple Post Offices, as well as to other e-mail gateways.

The Microsoft Mail Post Office that comes with Windows 95 can easily be upgraded to a Microsoft Exchange Server, a client/server messaging system that provides not only e-mail services, but also personal/group scheduling, information sharing applications ("groupware"), and forms and application design tools.

Windows 95 includes a set of MAPI drivers that allows the Microsoft Exchange client to send and receive mail directly on the Internet. Because Windows 95 already includes great support for TCP/IP—including remote TCP/IP over PPP dial-up lines—everything needed to connect to the Internet and start sending and receiving mail is "in the box." Users can make a LAN connection if their company has direct access to the Internet, or they can obtain access through one of many Internet service providers. MAPI enables configuration of the Microsoft Exchange client to simultaneously support Internet mail along with other e-mail systems, such as the built-in Microsoft Mail.

The following benefits are provided by the Microsoft Internet Mail drivers:

n

Supports Internet e-mail standards, including SMTP and POP

n

Leverages the great built-in TCP/IP support of Windows 95—a true
Windows Sockets application

n

Runs either via direct LAN connection or using Dial-Up Networking and
PPP

n

Supports the Multipurpose Internet Mail Extensions (MIME) to allow
interchange of video, images, voice, text, and graphics with other Internet users
in e-mail messages. (The MIME Associations Option allows association of
multimedia elements with programs on PCs so that they can be directly
“launched” from the programs.)

n

Supports remote preview, including the Microsoft Exchange header and selective-download options, to make the most of users' connect time on the Internet (see the earlier section titled "Remote Mail")

n

Automatically uses standard encoding (UUENCODE) to send and receive binary attachments to and from other Internet or UNIX mail users

n

Provides great international support, including support for character sets of all countries that have rapidly growing Internet usage

n

Can send rich-text e-mail over the Internet to Windows 95 users (other users receive plain-text messages)

n

Provides complete integration with all other Microsoft Exchange client features, including custom views, filtering, searching, and so on

n

As shown in Figure 99, provides simple, graphical configuration and management tools, including detailed troubleshooting and logging facilities

{ewc msdn cd, EWGraphic, ux0n 8 /a "psN.bmp"}

Figure 99. Graphically configuring the Microsoft Internet Mail driver

Microsoft Fax

Windows 95, in conjunction with Microsoft Exchange, provides PC users with the ability to send and receive faxes directly from their desktops. This capability, called Microsoft Fax, sets the standard for desktop faxing as an easy-to-use messaging facility that is well-integrated with Windows.

Microsoft Fax provides the following key features:

n

High-resolution printed documents are faxed from within Windows-based applications using a fax printer driver.

n

Microsoft At Work Binary File Transfer (BFT) capability sends original documents to users of Windows 95, Windows for Workgroups 3.11, and other Microsoft At Work-enabled platforms as e-mail attachments via fax.

n

The use of encryption and digital signatures makes the exchange of confidential documents secure.

n

High-speed communications with popular Class 1 fax modems and the millions of traditional Group 3 fax machines worldwide is supported. Microsoft Fax supports Error-Correction Mode (ECM) and transmission speeds of up to 14.4kbps.

n

Networked Windows 95 users can send and receive faxes through a network fax service on one of the Windows 95 workstations on the network.

n

A fax viewer allows users to browse multipage faxes using either “thumbnails” or full-page view mode.

n

A cover page designer enables users to easily create new fax cover pages that incorporate graphics and text, or to customize one of the predefined cover pages included with Microsoft Fax.

n

Users can easily connect to “faxback” fax information services, using a built-in “poll-retrieve” feature that allows them to download faxes directly to their desktops.

Microsoft Fax is integrated into Windows 95 as a MAPI transport service provider, leveraging Microsoft Exchange’s universal inbox, rich-text message creation, and browsing capabilities to deliver ease of use and consistency to the management of fax messages. The fax provider coexists with other information or messaging services that users may have installed, and leverages Microsoft Exchange’s common address book and inbox.

Windows 95 users can take advantage of Microsoft Fax innovations that provide the secure exchange of editable documents. Users can send faxes from within mail-enabled Windows-based applications, such as Microsoft Word and Microsoft Excel, by using the File/Send command. Additionally, a fax printer driver lets users “print” documents to their local fax modems, either via the File/Print command or by dragging the documents to a Fax icon on the Windows 95 desktop.

Microsoft Fax leverages the power of the Windows 95 operating system through the Win32 API. As a 32-bit application, Microsoft Fax integrates seamlessly with other

Windows 95 applications through its support for MAPI, TAPI, and OLE. In addition to tight integration with Windows 95, Microsoft Fax incorporates Microsoft At Work technologies that support Binary File Transfer (BFT), security, and high-quality document rendering. These technologies put powerful desktop fax messaging at the fingertips of Windows 95 users.

When faxes are sent to other users of Windows 95 (or Windows for Workgroups 3.11 and other Microsoft Fax devices), the Microsoft At Work Binary File Transfer capability can be used to send the original file over the fax connection. For example, a user can attach a Microsoft Word document to an e-mail message and address the message to a customer's fax number. If the customer receives the fax via Microsoft Fax, the Word document is attached to an incoming e-mail message. By clicking on the Word icon, the customer can open the original document. However, if the customer receives the fax via a traditional Group 3 fax machine, Microsoft Fax automatically renders the Word document as an appropriate Group 3 fax image. The highest speed and image compression that is supported by the customer's fax machine is used when transmitting the fax.

Microsoft Fax has been designed to allow Windows 95 users to exchange printed documents and binary files easily and with a minimum of setup. Because fax capabilities are provided as a core system service, they are always available from within Windows 95-based applications or via Microsoft Exchange. Faxes can be transmitted using Microsoft Exchange's e-mail client or by printing documents to a fax printer. Faxes that have been received from other sources are always delivered via the Microsoft Exchange client.

Users can identify a fax recipient by selecting a fax address from an address book—for example, the Personal Address Book—or by directly entering an address, such as [FAX:555-1212]. The MAPI service provider architecture allows users to mix different types of recipients in the same message. For example, users can send a message simultaneously to Microsoft Mail, CompuServe, Internet, and fax users as long as the Microsoft Exchange client contains profiles for these destinations.

Attaching a document to a Microsoft Exchange e-mail message is the easiest way to fax original or editable documents from Windows 95. The Send command on the File menu within any MAPI-enabled application—for example, Microsoft Word or Microsoft Excel—displays Microsoft Exchange's Send dialog box, in which fax users can address the intended recipient. The attached faxed document appears as an icon within the body of the message.

Microsoft Fax provides powerful features, as well as single-click ease of use. The Fax menu item under Accessories (shown in Figure 100) provides single-click access to most fax features. The 'Compose New Fax' selection activate a Wizard that quickly guides the Windows 95 user through the process of addressing,

selecting a cover page and attaching documents to a fax. The 'Cover Page Editor' provides an easy way to create personalized fax cover pages. The 'Retrieve File' selection puts the power of 'fax-back' fax information services at your fingertips.

{ewc msdn cd, EWGraphic, ux0n 9 /a "psN.bmp"}

Figure 100. Fax item on the Accessory menu allows users to send and retrieve fax messages

Microsoft Fax also provides a 'print to fax' interface. Windows 95 users can fax documents from within their favorite Windows applications by printing to the Microsoft Fax printer driver. Microsoft Fax will then activate the 'Compose New Fax' wizard, which will guide the user through the addressing and transmission of the fax.

{ewc msdn cd, EWGraphic, ux0n 10 /a "psN.bmp"}

Figure 101. The Compose New Fax Wizard

Microsoft Fax supports the rich-text capabilities of the Microsoft Exchange client and the advanced capabilities provided by Microsoft At Work Binary File Transfer (BFT) and Rendering technologies. The Microsoft At Work capabilities are effective when a Microsoft Fax user connects to another Microsoft Fax user, or to any Microsoft At Work-enabled fax machine. Microsoft Fax exchanges information with the receiving device about their respective capabilities to determine whether the receiving device is a Microsoft At Work-enabled device or a Group 3 fax machine. It can then proceed as follows:

n

If the receiving fax device supports Microsoft Fax, an editable document

attached to an e-mail message is transferred in its native format. In this case, fax works exactly like electronic mail between the originator and recipient. This fax capability supports the universal inbox provided by Microsoft Exchange.

n

If the receiving fax device is a traditional Group 3 fax machine, Microsoft

Fax converts the document to the most compact fax supported by the machine—
that is, MH, MR, or MMR format—and transmits the image at the highest speed
supported by the mutual connection (up to 14.4 KB per second).

n

If the receiving fax device is Windows 95 or Windows for Workgroups

3.11, and the originating computer sent a printed document, the file is transmitted
between the two computers using a special Microsoft At Work rendered (printed)
document format. The exchange of printed documents between Microsoft At
Work devices is always faster than between Group 3 fax machines because the
Microsoft At Work rendered image format achieves greater compression ratios
than Group 3 MMR.

Figure 102 shows the property sheet displayed when Microsoft Exchange's
FileSend Options command is chosen:

`{ewc msdncd, EWGraphic, ux0n 11 /a "psN.bmp"}`

Figure 102. The Microsoft Fax Message property sheet

Microsoft Fax supports Windows 95 users on local area networks by providing a
simple network fax service.

If a local fax modem is installed in one Windows 95 workstation, all other Windows
95 users who are on the same physical network can send and receive faxes through
the shared modem. The Windows 95 workstation to which the modem is connected
is called the “network fax server.” Incoming faxes are stored on the network fax
server. An administrator can use Microsoft Exchange to manually route faxes
from the fax server to the final recipients via e-mail.

In a similar way, Windows users can connect to Microsoft At Work-enabled fax-

servers and fax machines over a network connection. Microsoft and a variety of hardware and software vendors are in partnership to develop fax products and services that incorporate Microsoft At Work technologies. These products and services will all be compatible with and leverage the capabilities of Microsoft Fax in Windows 95.

Microsoft Fax provides the capability to retrieve documents, software, binary files, and fax images from fax-on-demand systems and fax machines that support Group 3 poll retrieve. The ability to easily download information directly into a Windows 95 workstation via fax vastly improves the capabilities of fax-on-demand systems, as a way for companies and information services to cost-effectively distribute information.

For example, the distribution of information could include the automatic distribution of software updates. A Windows 95 workstation with Microsoft Fax could make a connection to a fax-on-demand server and request the name of a binary file via its poll retrieve capability. The server would respond to the request by downloading the binary file to the Windows 95 workstation. This exchange could be accomplished using a single fax call to the fax-on-demand system. Figure 103 illustrates Microsoft Fax's poll retrieve Wizard:

{ewc msdncd, EWGraphic, ux0n 12 /a "psN.bmp"}

Figure 103. Retrieving a document from a fax information service that supports poll retrieve

Windows 95 includes a Fax Viewer for viewing incoming faxes and a Fax Cover Page Designer for creating customized cover pages for faxes sent to other users. These tools are provided in Windows 95 as accessories.

When a Windows 95 user receives a fax image (as opposed to an editable document), the Fax Viewer is automatically activated when the fax message is opened in Microsoft Exchange. The viewer allows the user to scale, rotate, print, and visually enhance "fuzzy" faxes. For multiple-page faxes, the viewer provides a thumbnail view of the fax that makes it easy to quickly scan the contents of the fax. Figure 104 illustrates this capability.

{ewc msdncd, EWGraphic, ux0n 13 /a "psN.bmp"}

Figure 104. The Fax Viewer in "thumbnails" view

The Microsoft Fax Cover Page Designer allows users to create customized fax cover pages or to modify one of the predefined cover pages included with Windows 95.

The Fax Cover Page Designer is an OLE application that makes it easy for the casual user to create attention-grabbing cover pages.

Microsoft Fax protects valuable and confidential documents through encryption and digital signature capabilities. The sender of a document or traditional fax can encrypt the fax using either a simple password or sophisticated RSA public/private key security. The fax software includes the capability to exchange public keys with other users, and users can store and maintain the public keys they receive from other users in their Personal Address Book.

When an encrypted fax is transmitted to a recipient, it cannot be read unless the recipient knows either the password that was used to encrypt the file or the originator's public key, depending on the security mechanism used.

{ewc msdn cd, EWGraphic, ux0n 14 /a "psN.bmp"}

Figure 105. The Fax Security dialog box, showing encryption and digital signature support

Faxed documents can be "signed" with a digital signature to ensure that the fax data is not modified during transmission. A sender uses a private key to sign the fax, and anyone with that sender's public key can read it, but with the knowledge that only the owner of that specific private key could have sent the fax.

The ability to protect confidential documents in a fax environment is an extremely important feature that puts Microsoft Fax ahead of other desktop fax applications.

Microsoft delivered the first Microsoft Fax capability with Windows for Workgroups 3.11. This large installed base, along with the installed base of millions of Group 3 fax machines, has made compatibility a priority for fax in Windows 95.

To ensure fax connectivity with the widest possible variety of fax applications, fax machines, and fax modems, Microsoft Fax in Windows 95 supports the following:

n

The ITU (International Telecommunications Union, formerly the CCITT)

T.30 standard for Group 3 fax. Microsoft At Work capabilities such as BFT are

implemented as T.30 nonstandard facilities (NSF), thereby maintaining compatibility with the installed base of Group 3 fax machines.

n

The ITU V.17, V.29, and V.27ter standards for high-speed fax communications (up to 14.4 KB per second).

n

Class 1 and Class 2 fax modems. A Class 1 modem is required for Microsoft At Work BFT and Security. Fax printing to traditional Group 3 fax devices is available on both Class 1 and Class 2 modems. Microsoft is working directly with fax modem manufacturers to ensure excellent compatibility.

n

MH, MR, and MMR compression for Group 3 fax communication.

Microsoft Fax also supports Error Correction Mode (ECM) for reliable fax transmission over 'noisy' telephone lines.

The ability of the Microsoft Exchange client to support multiple simultaneous MAPI service providers in Windows 95 means that users will want to have available connections to the Internet, CompuServe, and fax. Well behaved telecommunications applications that support the Windows Telephony API (TAPI) can coexist and share a local modem in a Windows 95 computer.

The implication of TAPI support for fax is that fax can be listening to the phone line in auto-answer mode while other telecommunications applications and Microsoft Exchange providers dial out to information sources over the phone network. TAPI

provides the call arbitration to ensure that physical modem resources are allocated to the appropriate telephony applications when they are needed.

Fax also leverages TAPI concepts such as locations and the Dial Helper dialog box to ensure that fax calls are made consistently, whether the fax user is connected to the network, is at home, or is on the road.

The fax capability in Windows for Workgroups 3.11 has evolved into Microsoft Fax in Windows 95, creating a powerful and extensible integration platform for fax-enabled applications. The extensibility, through MAPI, of Microsoft Fax and Microsoft Exchange makes it easier for third-party software developers to deliver new fax-enabled applications and enhanced fax services.

Because fax is implemented in Windows 95 as a MAPI transport service provider, users can fax information to other users from any MAPI-enabled application by using the File menu's Send command. In addition, fax features such as poll retrieve have been added to ensure that Microsoft Fax is an excellent client for enhanced fax services.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 15: The Microsoft Network

Microsoft is driven by a vision of creating a world of “Information at Your Fingertips.” Online services play a significant role in this vision since they offer “any time” access to the rapidly expanding world of electronic information and communication. Microsoft’s goal is to bring these online benefits to mainstream PC users for the first time, not just to the early adapters of technology who already use online services. To achieve this goal, Microsoft has created a new online service, The Microsoft Network, and has included worldwide access to The Microsoft Network as a feature of Windows 95.

The Microsoft Network (MSN) will bring all Windows 95 customers affordable and easy-to-use access to:

n

Electronic mail, for sending messages to and receiving them from other

MSN members, or anyone with an electronic mailbox on the Internet.

n

Bulletin boards, for in-depth discussions on a variety of topics, such as

hardware or software support from computer companies.

n

Chat rooms, for online conversations and special events with celebrities or

business personalities.

n

File Libraries, for easy access to images, add-ins, utilities, and programs

that can be copied to the user's PC.

n

The Internet, for e-mail and "newsgroup" bulletin boards.

In addition, The Microsoft Network offers advanced features such as Shortcuts, multitasking, and advanced e-mail services, all presented in an engaging, highly graphical format. Microsoft Windows 95 customers worldwide will be able to access MSN with a local phone call. The Microsoft Network will offer a wide range of online information and services, and in particular, Microsoft customers will find MSN the single best place to go to get information and support for Microsoft products.

Access to The Microsoft Network is a feature of Windows 95. The customer doesn't need to install any software, and Windows 95's Plug and Play feature automatically sets the modem up correctly. To get started, all Windows 95 customers have to do is run the Windows 95 online registration and accept the MSN trial offer that follows.

`{ewc msdncl, EWGraphic, ux0o 0 /a "psO.bmp"}`

Figure 106. The Microsoft Network signup screen

The Microsoft Network is tightly integrated into Windows 95 in terms of both functionality and look and feel. Because of the consistent interface, Windows 95 customers will immediately feel comfortable navigating around the MSN service. The Microsoft Network's integration is so complete that experienced customers can also use the more powerful Windows 95 Explorer navigation tool to move around MSN. To customers familiar with Windows 95, The Microsoft Network is as familiar as their local system, with no new commands or concepts to learn.

[Shortcuts](#)

Shortcuts (OLE links to services on The Microsoft Network) are a way to go immediately to specific areas within MSN. When MSN members double-click a Shortcut, they'll be brought directly to the appropriate area on MSN. If the member is not logged on to MSN, the Shortcut will start MSN and prompt the member to log on before executing the Shortcut. Members can create Shortcuts to anything on MSN: any folder, forum, bulletin board, or even a particular file in a File Library. The most-used Shortcuts can be stored in a MSN Favorite Places folder, or anywhere on the member's own system. And because Shortcuts are OLE objects, they can be moved around easily as files. For example, to share a favorite "find" a member could send a friend a Shortcut by e-mail, or even post it on a bulletin board.

[Electronic Mail](#)

In line with close integration of MSN with Windows 95, MSN uses the Microsoft Exchange client (the universal e-mail client included with Windows 95). MSN e-mail messages will appear in the same mailbox as other e-mail (such as LAN e-mail) in the Exchange. Because MSN uses the Microsoft Exchange to manage its e-mail, there is only one e-mail application to learn how to use. The Microsoft Network's e-mail supports file attachments, so members can attach spreadsheets, graphics files, word processing documents, or almost any other kind of electronic file.

[Multitasking](#)

The Microsoft Network takes advantage of the multitasking provided by Windows 95 with a multi-threaded design. This means that several different MSN tasks can run at the same time. This is particularly useful when downloading files: while the file is being downloaded, the member can still browse around, read e-mail, participate in a chat room, or do anything else on MSN without waiting.

[World Wide Access](#)

The Microsoft Network will be available around the world at launch. Local dial-up access will be available in over 40 countries, and the MSN application will be localized into many different languages.

n

The Microsoft Network is not part of the “typical” or “laptop”, or “compact”

Windows 95 installations. This means that in order to use The Microsoft Network, you will need to either select the “custom” option during your Windows 95 installation, or add the software later using the “Add/Remove Programs” applet in the Control Panel (go to the Windows Setup tab).

n

In either case, you should add support for MSN by clicking in the check-

box next to “The Microsoft Network Online Service.” After you have added the MSN software, you can start using MSN using any of the three methods described below.

1. In the Welcome to Windows 95 dialog box, there is an Online Registration button that gives you the opportunity to register Windows 95 electronically. After you have filled out your registration information, you will be asked if you would like to learn more about The Microsoft Network. Choose “Yes” to begin MSN Signup.(If your modem isn't already configured automatically by Windows 95's Plug and Play feature, you will be prompted to install one at this point.)
2. If you have disabled the Welcome to Windows dialog box, you can still run Online Registration from the Start menu (Online Registration is located in the Accessories program folder on the Programs submenu.) As with the steps above, when you have finished supplying your registration information, run MSN Signup by choosing “Yes” at the end of Online Registration.

n

If you would prefer not to register Windows 95 electronically, you can

obtain an MSN account by simply double-clicking the new MSN icon on your desktop.

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```

Chapter 16: Multimedia Services

For the past year, the home market has been the fastest-growing segment of the PC business, and multimedia titles have been one of the fastest-growing segments of the software industry. A large and increasing percentage of the PCs purchased for home use include the equipment that makes multimedia applications possible, notably horsepower, CD-ROM drives, sound subsystems, and local-bus video.

In 1993, the installed base of multimedia-capable Windows PCs grew rapidly to become the largest multimedia computing platform in the world (see Figure 107). By Christmas of 1993, more multimedia titles were available for Windows than there were for any other computing platform (see Figure 108 on the following page).

{ewc msdncd, EWGraphic, ux0p 0 /a "psP.bmp"}

Figure 107. Estimated and forecast sales of multimedia-capable PCs (source: Dataquest)

{ewc msdncd, EWGraphic, ux0p 1 /a "psP.bmp"}

Figure 108. The number of multimedia titles sold by computer software retailers in 1993, by platform and by quarter (source: PC Data)

A Little History

It is worth dwelling for a moment on how far Windows multimedia has come in the last few years. When Microsoft Video for Windows 1.0 was released in 1992, sound cards and CD-ROM drives were relatively rare. Graphics subsystems were universally ISA-based, and software codec (compression/decompression) technology was in its infancy. The standard size for a digital video clip was 160 pixels by 120 pixels—one sixteenth of a VGA resolution screen. Technologists, who understood the difficulties of this accomplishment, cheered wildly and proclaimed the dawn of the multimedia computing era. Customers shrugged. What was so great about a video clip the size of a “dancing postage stamp”?

In 1993, hardware and software makers began to deliver equipment and technology that offered better than postage-stamp performance at reasonable consumer prices. Double-speed CD-ROM drives and local bus video offered more bandwidth to support the massive data requirements of digital video and quality sound. A second-generation of software codecs made more effective use of the data available. Prices on 16-bit sound cards dropped into consumer range. With Microsoft Video for Windows 1.1, the size of a digital video clip that a mainstream computer could display reliably increased to 320 pixels by 240 pixels—one-quarter the size of the screen. Critics labeled these digital video clips “dancing credit cards,” but consumers found digital video of this size compelling enough that it spurred a virtual tidal wave of multimedia title development. Retail software store shelves are now crowded with

multimedia titles and games, and progress marches on.

Installing Windows 95 provides today's multimedia PCs with an overnight upgrade in multimedia capabilities. Based on the capabilities of high-end PCs in 1994, the mainstream PC of 1995 will be able to play digital video segments that are larger, smoother, and better looking than ever before—even up to 640 pixels by 480 pixels (full screen) and beyond (see Figure 109). We are now able to look forward quite realistically to a time when the amount of data that can be stored on a CD-ROM, rather than the speed of the video subsystem, is the most relevant factor limiting the richness of a consumer's experience with a multimedia title or game.

`{ewc msdn cd, EWGraphic, ux0p 2 /a "psP.bmp"}`

Figure 109. Digital video, evolving through the dancing postage stamp (1991) and dancing credit card (1993) eras to full screen

A New High-Performance Multimedia Platform

Windows 95 delivers a new high-performance platform for PC multimedia. From a "big picture" perspective, the "greatest hits" of what Windows 95 contributes to the world of multimedia computing are as follows:

n

For consumers, Windows 95 makes multimedia easier, more engaging, and more fun.

n

Easier. Plug and Play makes the successful installation of multimedia devices far easier for consumers. All of the architectural support for digital video, audio, and MIDI is built into Windows 95, so that users are relieved of setup challenges. And Windows 95 is compatible with multimedia titles and tools created for Windows 3.1.

n

More engaging. Installing Windows 95 is an immediate multimedia upgrade that allows any PC to become a better, more exciting multimedia playback machine. Authors creating titles and games for Windows 95 can make their products faster and more exciting to play.

n

More fun. Windows 95 is a much better platform for computer games than any earlier version of Windows and includes support for fast, intensely graphical games.

n

For developers, Windows 95 offers a powerful platform for professional multimedia authoring.

n

Power. The new 32-bit architecture in Windows 95 squeezes vastly improved multimedia performance out of PCs, so developers can capture digital video and sound that is bigger and bolder than ever before. The multitasking architecture of Windows 95 makes it a much more convenient working environment for multimedia authors.

n

Professional quality. The streamlined architecture of digital video,

digital audio, MIDI, and file handling subsystems in Windows 95 enables authors and toolmakers to create high-quality sound, video, and animation effects. Windows 95 is an attractive platform for the professional development of multimedia effects and footage beyond the realm of the PC—for example, TV commercials.

n

For hardware makers, Windows 95 offers exciting new opportunities.

n

Graphics. A display driver technology called Display Control Interface

(DCI) offers ways for Windows 95 to take advantage of hardware assistance for several graphical operations, such as image stretching.

n

Sound. A new technology called Polymessage MIDI offers sound card

manufacturers a way to play complex MIDI sequences with virtually no CPU use. Sound cards are improving rapidly, and competition based on features is increasing.

Microsoft is committed to making Windows the leading force in multimedia technologies and systems for PCs. This commitment takes many forms, the most important being an ongoing investment in multimedia-related research and development. Some of the results of the last few years of research and development are described in this chapter. Multimedia technologies are evolving rapidly, and Microsoft will continue to press ahead in providing tools and architectural enhancements to enable developers and consumers to take advantage of new innovations.

As multimedia applications, titles, tools, and games have become more and more compelling, consumers have begun buying add-on multimedia components, such as CD-ROM drives and sound cards. Buying these devices has been cheap and easy; installing them has been a different matter. To put it mildly, installing a CD-ROM in a PC has required . . . patience.

Support of Plug and Play in Windows 95 makes the prospect of adding a new multimedia device to a PC considerably less daunting. Just plug in a Plug and Play-enabled sound card and, literally, it plays. In fact, Windows 95 even makes the prospect of installing OLD multimedia devices less daunting because it includes tools that make identifying and resolving conflicts between legacy devices that are not Plug and Play-enabled vastly easier. To make this process as painless as possible, Windows 95 includes built-in drivers for the most popular sound cards.

It is difficult to overstate the importance of Plug and Play for multimedia. For the multimedia market, Plug and Play will have the following three effects:

n

It will allow the base of multimedia-capable PCs to grow through Plug and

Play upgrade kits, rather than placing so much of the growth burden on the purchase of new CPUs. Because Windows 95 includes the basic architecture for handling sound, MIDI, and digital video, every PC running Windows 95 can easily be made into a multimedia PC by plugging in a sound card and/or a CD-ROM drive.

n

It will substantially decrease the cost of installing and supporting multimedia devices, which will help speed their adoption for business use.

n

As multimedia standards, such as CD-ROM speed, continue to improve, Plug and Play will allow consumers to conveniently upgrade multimedia components without replacing their entire PC. Plug and Play support will be vital to the adoption of new multimedia devices, such as MPEG cards.

In various ways, titles and games that run off a CD-ROM feel different from other applications. First, starting CD-ROM programs differs from starting hard-disk-based applications. First, users have to open a drawer, extract the right disk, and place it in the CD-ROM drive before they can run the program like any other program—assuming, of course, that they can find the icon they created when they first installed the program. A second difference between CD-ROM programs and hard-disk-based applications is that CD-ROM products may be used irregularly.

While watching users run multimedia applications, Microsoft realized that the act of placing a disk in a CD-ROM drive is loaded with information. If the CD-ROM is a program that the user has never run before, the act of putting the CD-ROM in the drive means that the user intends to install the program. If the program has already been installed, the act of putting the CD-ROM in the drive means that the user intends to run the program.

In Windows 95, a feature called AutoPlay allows software developers to make their products easier for users to install and run. When the user puts a disk in a CD-ROM drive, Windows 95 automatically spins it and looks for a file called AUTORUN.INF. If this file exists, Windows 95 opens it and follows the instructions. This new feature makes the setup instructions for a Windows 95-based multimedia game or title almost absurdly easy, reducing them to something like the following:

1. To play this program, insert the disk in your CD-ROM drive.

2. Have a nice day!

For the past several years, Microsoft has been developing a high-performance architecture for digital video: Microsoft Video for Windows. (For more details, see the section titled “Multimedia Graphics Architecture” later in this chapter.)

In the past, Video for Windows was distributed separately (principally as a Software Developers Kit), but with the release of Windows 95, Video for Windows is now built into every copy of Microsoft Windows, including Windows NT. The widespread ability to play digital video has the following implications:

n Users and ISVs can use the .AVI file format to distribute digital video files with the same confidence that they distribute files of other Windows-supported formats, such as .TXT, .WRI, .BMP, .PCX, and .WAV.

n The barriers to entry for would-be multimedia title and tool developers are further lowered because the issues of licensing and installing Microsoft Video for Windows disappear.

MIDI is the computer equivalent of sheet music. Using sheet music, an arranger can describe how to play Beethoven’s MOONLIGHT SONATA in a few pages, but to actually play the piece, a person who knows how to read sheet music needs a piano. The music performed from the sheet music varies in sound depending on the circumstances—for example, when played on an expensive grand piano, the sonata sounds better than when played on an old upright.

Similarly, a MIDI file can contain the electronic instructions for playing the MOONLIGHT SONATA in just a few kilobytes, but playing the piece requires a device, such as a

sound card, that knows how to “read” MIDI instructions and can produce a piano sound. And just as the sound of real pianos varies somewhat, so does the piano sound produced by sound cards.

At the high end, MIDI is used as a development tool for musicians. Virtually all advanced music equipment today supports MIDI, and MIDI offers a convenient way to control the equipment very precisely. At the low end, MIDI is becoming an increasingly popular tool for multimedia product developers because it offers a way to add music to titles and games with a tiny investment of disk space and data rate. The majority of sound cards today have on-board MIDI support built in. Windows 95 includes built-in support for both MIDI and waveform audio (.WAV).

Many people like to play audio CDs in their CD-ROM drives while working, so Windows 95 includes the CD Player. As Figure 110 shows, the controls on this player look just like those on a regular CD player, and the Windows 95 CD Player supports many of the same features found in advanced CD players, such as random play, programmable playback order, and the ability to save programs so that users don't have to re-create their playlists each time they pop in a CD.

`{ewc msdncd, EWGraphic, ux0p 3 /a "psP.bmp"}`

Figure 110. The CD Player, which will play, uninterrupted, in the background

Making Multimedia More Engaging

With Windows 95, users' PCs become a better multimedia machine, so software developers can produce faster and more engaging titles and games.

In addition to making it easy for users to play their favorite audio CDs from their current collection, Windows 95 is helping to define a standard for music CDs of the future. Windows 95 is the first operating system to announce support for the new Sony/Phillips Enhanced CD format, which will enable audio CD players and multimedia PCs to easily play the same compact discs. This new format allows both audio and data to be integrated on the same CD, in a manner conducive to users of both audio CDs and PC-based CD-ROM titles.

The Enhanced CD format uses new technology, called “stamped multisession,” that solves the “track one” problem that has prevented easy use of CD-ROMs in audio CD players. Until now, CD-ROM titles have used the first track of a compact disc for data, thus producing static—and potential speaker damage—when played on audio CD players. Sony and Phillips are implementing stamp multisession under the brand

name Enhanced CD. Other music-industry companies can license the Enhanced CD brand from them or create their own implementations of stamp multisession. Microsoft Windows 95 will accommodate all compatible implementations of the technology.

Because data and audio information can be combined on the same CD, the new Enhanced CD format will open up a broad, new category of CD titles that can be enjoyed fully as audio discs and, when inserted into a PC running Windows 95, can also provide digital information in the form of music videos, song lyrics, biographies, and other text, and even promote online exchanges with musicians.

The new format leverages a range of new features being included exclusively in Windows 95 to help make multimedia more engaging. The AutoPlay feature, for example, enables users to insert a compact disc in their CD-ROM drive and have it automatically play. Also, the 32-bit multimedia subsystems in Windows 95 enable unprecedented playback performance. The new CD file system further facilitates multimedia use, while Plug and Play support makes installing and using CD-ROM drives and related hardware simple for consumers.

Displaying digital video involves moving and processing huge streams of data continuously and efficiently. The new digital video implementation in Windows 95 offers some exciting new efficiencies, allowing software developers to confidently create multimedia titles that are more compelling and better-looking than ever before.

Multimedia title and game developers are business people. When they create a product, they do so with the hope of turning a profit. To maximize the number of PCs that can run a title, most developers tend to include lowest-common-denominator digital video. As a result, video windows the size of postage stamps with low frame-rates (which make movement look “jerky”) and extreme compression (which makes the video look “blocky”) have tended to be the norm. However, Windows 95 raises the lowest common denominator significantly.

In the past, the process of displaying digital video has relied on a series of 16-bit systems that read data from the disk, decompress the video data, and display it on screen. One key design goal of Windows 95 was to enable this architecture to make the transition to 32 bits, and the difference is eye-popping. For multimedia users, installing Windows 95 is the quickest and cheapest multimedia upgrade available. Without adding any hardware, Windows 95 enables users to display bigger, smoother, more colorful digital video than ever before.

This improvement does not come at the expense of compatibility. Multimedia in Windows 95 is fully compatible with 16-bit multimedia titles. Early testing has shown that the 32-bit improvements in file access speed and stream handling results in performance improvements even for 16-bit multimedia applications. However, the

biggest improvements will obviously be realized in the new generation of fully 32-bit titles that will be designed for Windows 95.

For users who upgrade their PCs to Windows 95, one easy-to-overlook source of performance improvements is the display driver. Many display drivers are updated more or less continuously, whether to fix problems, enhance performance, or incorporate new features such as DCI. Most users, however, don't update drivers on their system unless they are having a problem. Upgrading to Windows 95 ensures that they have the latest and greatest.

Multimedia applications don't take well to interruption. When watching a video clip or listening to a sound file, users really don't want it to stop in the middle. Because of multitasking, interruption is less likely. The multitasking in Windows 95 is quite different from earlier versions of Windows because it is preemptive. In Windows 95, multiple 32-bit processes can share the CPU at the same time, whether those processes have been initiated by different applications (multitasking) or by one application (threading).

Threading has a very important implication because it allows multimedia titles and games to have a smoother, more finished feel to them. A game might have one thread that plays background music continuously during game play to help smooth out the breaks between scenes while another thread is loading new data.

As applications, tools, and codecs are gradually rewritten to 32 bits, video and other multimedia processes will become less and less likely to be interrupted by other applications. For example, in Windows 95 you can move a video window while it is playing without interrupting it.

The development of faster CD-ROM drives (double and triple speed) has been essential for the growth of multimedia computing because faster reading of CD-ROM data helps make video and audio playback from CD-ROM drives look and sound better.

To get the best possible performance from these new devices, Windows 95 includes a new 32-bit CD-ROM file system (CDFS) for reading files from CD-ROM drives as quickly and efficiently as possible. (The Windows 3.1 system for reading files from CD-ROM drives [MSCDEX.DLL] is also included in Windows 95 for compatibility with products that rely on it.) CDFS is an important component of the overall performance enhancements to multimedia in Windows 95.

Windows 95 also extends its support for CD-ROM to drives that read XA-encoded disks, such as Kodak PhotoCD and video CDs.

Digital video and stereo audio can be squeezed into an incredibly small data stream using a complex codec called MPEG. For example, with MPEG compression most feature movies can fit on two CD-ROMs. Because MPEG is so complex, displaying video from an MPEG file is a calculation-intensive process—so calculation-intensive, in fact, that the most appealing way to display MPEG video on today's PCs is by using hardware assistance.

Together with the Open PC MPEG Consortium, Microsoft has defined an industry standard for MPEG board and chip manufacturers who want to ship MPEG devices for Windows 95. This standard allows applications to incorporate MPEG video without worrying about precisely which vendor's MPEG device is present to decompress it.

Making Windows More Fun

In 1994, the home market was the fastest-growing segment of the PC business, and more and more users have been demanding games for Windows. Games are already the largest category of multimedia application, but most computer games are designed to run on MS-DOS (see Figure 111). Windows 95 is a much better platform for computer games than any earlier version of Windows because it includes support for fast, intensely graphical games. It also has built-in joystick support, so users don't need to load external drivers.

`{ewc msdn cd, EWGraphic, ux0p 4 /a "psP.bmp"}`

Figure 111. At the end of 1993, computer games were one of the last remaining software categories for which Windows product sales trailed MS-DOS product sales

The speed of graphics (or, more accurately, the lack of it) in Windows has been one of the biggest obstacles that prevented game developers from choosing the Windows platform for their games. Windows 95 addresses this issue head-on in a way that provides substantially improved speed while preserving the device-independence that makes Windows appealing in the first place.

A new 32-bit call, CreateDIBSection, has been added to the Win32 API for Windows 95 and Windows NT. This new feature allows developers to quickly get bitmaps onto the screen. If nothing fancy (such as clipping or stretching) is involved, the CreateDIBSection call actually allows applications to send DIBs more or less directly to the video frame buffer. (For more information, see the diagram in the section titled "Multimedia Graphics Architecture" later in this chapter.)

Because this kind of graphic speed is critically important to quality games, Microsoft

has moved a portion of the CreateDIBSection improvements of Windows 95 into a tool for Windows 3.1 called the WinG (pronounced WIN GEE; the G stands for GAMES) libraries. The WinG libraries allow game developers to create fast, graphical games for Windows 3.1 with the assurance that the game will be fast and compatible with Windows 95. Figure 112 shows such a game.

```
{fewc msdncd, EWGraphic, ux0p 5 /a "psP.bmp"}
```

Figure 112. The graphics core of DOOM for Windows (from Id Software) was ported from MS-DOS to the WinG library in two days.

A Powerful Development Environment

Because of its new 32-bit, multitasking architecture, Windows 95 is an attractive platform for the professional development of multimedia titles.

Sound can take up a lot of disk space. Full CD-quality, uncompressed stereo audio contains a lot of data—about 176 KB for every second of sound! An entire CD-ROM can contain only a little over an hour of music. Sound can also eat up a fair-sized chunk of the data rate that a CD-ROM drive is capable of sustaining.

To lessen the burden of storing and playing sound from an application, Windows 95 includes a family of sound compression technologies. These codecs can be divided into the following two groups:

n

Music-oriented codecs, such as IMADPCM, allow close to CD-quality sound to be compressed to about one-quarter of its original size.

n

Voice-oriented codecs, such as TrueSpeech, allow extremely efficient compression of voice data.

This support for compressed sound is two-way: Sound can be played from a compressed sound file, or a sound file can be compressed using the built-in sound-recording and editing utility. If users have microphones, they can turn on voice-compression when recording so that the file is compressed in real time.

In addition to the codecs that come with Windows 95, the audio architecture of Windows multimedia is designed to be extensible through other installable codecs. (The Windows 95 video architecture can be extended in the same way.)

Windows 95 comes with Microsoft's best-ever implementation of MIDI, including a new technology called "polymessage MIDI support." This enhancement allows Windows 95 to communicate multiple MIDI instructions simultaneously within a single interrupt. As a result, playing MIDI files requires even less computing power than it did before and allows developers to process MIDI instructions alongside graphics and other data even more successfully.

Multitasking makes Windows 95 a much more attractive platform for multimedia authoring. Creating multimedia content is very CPU-intensive work that can take a long time to complete. For example, compressing a digital video file could take—hours, depending on the complexity of the file and what type of system is doing the compression. Moreover, digital video files had to be compressed one at a time. As a result, video authors were virtually chained to their desks until their work was done.

Because of the Windows 95 multitasking capabilities, authors retain control of their PCs, even when an enormous compression operation is underway. Digital video authors can initiate several compression operations at once—and then head home.

Professional Quality

The digital video, digital audio, MIDI, and file handling subsystems in Windows 95 make it an ideal platform for developing high-quality video, sound, and animation effects.

The grim reality is that video contains an enormous amount of data. Capturing digital video is even more data-intensive than playing it back, because raw digital video footage is uncompressed. A single frame of full-color video at 640 pixels by 480 pixels contains close to a megabyte of data. At 30 frames per second, you can fill up a 1 GB hard drive with uncompressed video data in less than a minute. This data

can be compressed to make storage go further, but for multimedia developers, the rate at which they can write data to disk is still an important concern.

The 32-bit file access of Windows 95 is every bit as important to digital video authors as it is to digital video users. Because data can be written to disk more quickly in Windows 95, authors can capture better-looking video—bigger, more frames per second, and more colorful. After the raw footage is captured, the potentially time-consuming process of compression begins. Both Cinepak and Indeo will be available in 32-bit versions for Windows 95 to make the compression process considerably more efficient.

One of the early challenges for MIDI was that it was, in a way, too flexible. Any instrument can be “connected” to any MIDI channel so that a “sequence” (song) written for a piano might accidentally end up being played on a tuba. Windows 95 supports the General MIDI specification, an industry-standard way for MIDI authors to request particular instruments and sounds.

Windows 95 includes built-in support for common multimedia authoring devices, such as laser disks and VCRs. This support simplifies the process of setting up a system for “step capture,” a process in which the author captures digital video data one frame at a time, usually to be compressed later. Step capture is a slow process, but it is the best way to capture the highest quality digital video. Frame-accurate control of the VCR is also important for recording broadcast-quality special effects for use in commercials, movies, television programs, music videos, and so on.

Multimedia PCs for 1995

All things being equal, installing Windows 95 upgrades any PC into a more capable multimedia tool. However, all things are NOT equal. The quality and capability of multimedia PCs and devices varies a great deal.

Microsoft is publishing the MICROSOFT PC 95 HARDWARE DESIGN GUIDE to help IHVs and OEMs identify opportunities to take advantage of new capabilities in Windows 95. This guide makes the following five high-level recommendations to OEMs:

n

Balance beats horsepower. Multimedia playback places heavy demands

on many parts of the system, from the CD-ROM (reading) to the hard disk (writing) to the CPU (decompressing) to the video and audio subsystems (playing). A fast CPU does not guarantee a great playback system. In fact, multimedia playback on most high-end PCs is not constrained by the CPU.

n

Local bus video is indispensable. Even OEMs creating non-multimedia

systems should use local bus video because doing so gives consumers the option of using Plug and Play to create a multimedia system later. Without local bus video, a PC cannot keep up with the amount of video data that 1995's consumer multimedia titles and games will want to display continuously.

n

CD-ROM drives must be double-speed or better. Titles in 1995 will

assume double-speed data rates.

n

Displays must be SVGA (800 x 600) or better with 16-bit color. Why are

more than 256 colors required? Because multimedia applications use a lot of colors and tend to compete for access to the system palette. For example, if a multimedia presentation includes a digital video clip of an underwater scene on a slide with a smooth-shaded maroon background, a 256-color palette doesn't

have enough colors to make both the slide background and the underwater scene look good.

n

Audio must be 16-bit. The installed base of sound cards that can interpret

MIDI is now large enough to be tempting to game and title developers. Not all sound systems are equal: Some sound great (16-bit with sampled sounds), and some sound like STAR TREK reruns. The differences are significant, and consumers will be able to tell the difference.

The quality of audio cards and sound systems varies a great deal. Sound cards have generally been used for their ability to play waveform audio—the equivalent of recorded sound. For some uses, such as voice overs, recorded waveforms have no realistic alternative. However, recorded sound is very resource-intensive for both the CD-ROM and the CPU.

In Windows 95, enhancements to the handling of MIDI make it an even more appealing alternative to .WAV for playing music within games and multimedia titles. Makers of audio cards and systems can provide the following features to distinguish themselves in the marketplace:

n

Polymessage MIDI support. This highly efficient new technology is

included in Windows 95 to make using MIDI easier for application and game writers. When a sound card supports polymessage MIDI, the CPU use required to play even a very complex song is quite small.

n

16-voice-or-better polyphony. Polyphony is the ability to play multiple sounds at once. Support for more concurrent sounds means fuller-sounding playback.

n

Sampled sound rather than waveform synthesis. Waveform synthesis uses a mathematical approximation of a sound such as a piano. Sampled sound is an actual recording of the piano, and it sounds considerably better. Including samples of at least the most common general MIDI instruments helps ensure that music in games and titles doesn't sound synthetic.

In the summer of 1994, Microsoft released the new DCI display driver development kit. The DCI technology was developed in partnership with Intel and other makers of advanced video display cards.

DCI is a device driver level interface that allows Windows to take advantage of the following hardware features when they are built into advanced display adapters:

n

Stretching. Speeds up the rendering of images that are stretched or distorted.

n

Color-space conversion. Assists in playback of compressed digital video by accepting YUV data instead of requiring RGB.

n

Double buffering. Allows faster, smoother block transfers (BLTs) of images by providing memory space for off-screen drawing.

n

Chroma key. Facilitates the merging of video data streams, allowing a particular color to be treated as “transparent” in the merge operation.

n

Overlay. Speeds display of partly concealed objects.

n

Asynchronous drawing. Along with double buffering, provides a faster method for “drawing” into offscreen memory space.

Most of these hardware features relate to the fast, efficient decompression and playback of digital video. Applications that use the Microsoft Video for Windows architecture will benefit from these features automatically and substantially.

The Multimedia Architecture

The Windows 95 graphics architecture is illustrated in Figure 113. As the figure shows, an application might want to “draw” the following four kinds of graphics on the screen, and it can use four APIs to do so:

n

“Productivity application” graphics: Applications that want the system to

help them draw scroll bars, fonts, buttons, and so on use GDI, the basic Windows graphics API.

n

Digital video: Applications that want to play digital video use the Video for

Windows API. (More details about the Video for Windows architecture are provided in the next section.)

n

Game graphics: Games draw their own graphics (in memory) and use

WinG when they want bitmaps blasted to the screen as fast as possible. WinG is available for Windows 3.1, and provides many of the same benefits as the CreateDIBSection function in Windows 95, as well as fast access to the frame buffer through DCI.

n

3D engineering graphics. Applications that want the system to help them

draw 3D solids use OpenGL. OpenGL is Microsoft's strategic choice for a 3D application programming interface, and Microsoft has a long-term commitment to deliver an implementation of OpenGL as part of the broader Win32 API. Microsoft's first OpenGL implementation shipped in Windows NT 3.5.

{ewc msdn cd, EWGraphic, ux0p 6 /a "psP.bmp"}

Figure 113. The Windows 95 graphics architecture

The device driver interface in Windows 95 has the following three parts, and the APIs described earlier are designed to take advantage of whichever part provides the best performance:

n

GDI-DDI. The basic graphics device driver interface for Windows. It is

optimized for the flexible graphics requirements described earlier for the GDI API.

n

DCI. The new device driver interface created jointly by Microsoft and Intel.

DCI drivers provide a fast, direct way for games and digital video to write to the video frame buffer. They also enable digital video playback to take advantage of several specific kinds of hardware support included in advanced graphics adapters. For example, stretching hardware can allow users to scale up the size of a digital video clip with virtually no additional strain on the CPU. Color space conversion support in hardware can reduce the amount of work a codec must perform by up to 30 percent, allowing substantially better video playback.

n

3D-DDI. Enables applications that use OpenGL to take advantage of accelerated 3D support in hardware.

The diagram in Figure 114 illustrates (in simplified form) the path that synchronized multimedia data travels from storage to playback.

```
{ewc msdn cd, EWGraphic, ux0p 7 /a "psP.bmp"}
```

Figure 114. Multimedia data routing

To start with, the data—usually an .AVI file—must be stored somewhere, such as a CD-ROM, a local hard drive, or a network file server. The quality of the eventual playback will be constrained by the amount of data that the storage medium can supply continuously to the file system.

A command—for example, Play—that is usually issued through the Media Control Interface (MCI) causes the relevant part of the file system in Windows 95 to retrieve the stored data. Obtaining this data swiftly and steadily is vital to the success of overall playback performance, and the 32-bit protected-mode enhancements in the new file system (and CDFS) in Windows 95 make a big contribution to the overall performance enhancements of multimedia in Windows 95.

A multimedia data stream, such as an .AVI file, generally contains multiple components, such as digital video data, audio data, text, and perhaps other data such as hot spot information, additional audio tracks, and so forth. As multimedia information comes off the CD-ROM, the first job of the Video for Windows architecture is to figure out what the data stream contains and to separate and route it accordingly.

In most cases, digital video and digital audio are stored in a compressed form, and before it can be seen or heard, it must be decompressed. Frequently, this function is performed in software. However, if hardware support is available on the graphics adapter or sound card for all or part of the decompression work, Video for Windows can tap into it.

Windows 95 ships with a set of useful software-only codecs for both video and audio. However, the Video for Windows architecture has been created in a way that allows additional codecs to be installed. As new codecs become available for

particular audio and digital video needs, they can be plugged into the Video for Windows architecture. For example, motion JPEG, which is not included in Windows 95, is a useful codec for multimedia authoring, and capture cards that support JPEG compression and decompression are easily available.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 17: Installation and Setup

The very first contact that users have with Windows 95 is during initial installation on their computer. If the installation process is not easy, or if novice or intermediate users are confronted with a series of configuration-related questions that they don't know how to answer, their initial experience with the operating system will be bad, and that tone will be set for their first trial of the system itself. Advanced users can overcome difficult installation procedures, but their frustration level still has a finite threshold.

For Windows 95, the Setup program has been completely rewritten to offer greater flexibility and better customization than Windows 3.1. In addition, Setup in Windows 95 is more modularized than Setup in Windows 3.1, allowing the easy customization of individual Setup steps, as well as the easy installation of new custom components.

Summary of Improvements over Windows 3.1

The installation of Windows 95 has been improved over Windows 3.1 in a number of areas, including the following:

n

A modular setup architecture that provides increased customization and flexibility

n

An entirely GUI-based approach and improved interaction with the user, including better visual feedback of progress during setup

n

Improved hardware device detection and configuration support

n

Better customization of components to install

n

Built-in smart recovery mechanisms for failed setup

n

Built-in verification of installed components for easy correction and
replacement of corrupted or deleted files

n

A network setup process that is well integrated with other setup
components and that provides support for a number of network installation
configuration scenarios

n

Support for an automated batch installation procedure, allowing Windows 95 to be installed with little or no user intervention

n

Better flexibility so that PC installers, VARs, and MIS organizations can customize Setup by adding components to be installed at setup time, such as custom in-house applications

A Modular Setup Architecture

In MS-DOS, Setup is responsible for installing the basic disk operating system on the PC. In Windows 3.1, Setup is a combination of components and installation procedures inherited from prior versions and is responsible for installing the GUI on the PC. In Windows for Workgroups, the Setup functionality of Windows 3.1 was extended to install networking components on top of the GUI and disk operating system. Because Windows 95 is a complete, integrated operating system, it is now responsible for installing the disk operating system, the GUI, and the networking functionality on the PC. These responsibilities posed some interesting problems when the Windows 95 development team first approached the daunting task of writing Setup for Windows 95.

The original Setup written for Windows was not flexible enough to easily add components without making the installation procedures unwieldy. To make the installation process easier, modularized, and more flexible, the Windows 95 development team for Setup completely rewrote the installation code. As a result, Windows 95 uses more intelligent defaults and mechanisms for automatically configuring or installing key components while requiring only minimal user intervention, furthering the ease of use of the operating system.

For end-users, Setup in Windows 95 provides a simple, easy way to initially install and configure Windows 95. For MIS organizations, Setup in Windows 95 provides greater control and flexibility over components that are installed and offers support for automated batch installation to further simplify the setup procedure.

Setup in Windows 95 differs from that in Windows 3.1 by featuring an entirely GUI-based setup process. Using a GUI-based setup simplifies the interaction with the user by providing better visual feedback of configured options and greater flexibility for navigating through the setup process. To support a GUI-based setup, Windows 95 features a Setup program that runs entirely from within the Windows environment. Users who already have either Windows or Windows for Workgroups on their PCs can run Windows 95 Setup the same way that they would run an installation program for any Windows-based application. For new installations, Windows 95 Setup includes the necessary components to install a minimal version of Windows to support the GUI-based setup process.

The GUI-based Setup provides better visual feedback to users throughout the installation process. Users are constantly shown where they are in the setup process and are given a number of visual cues that the system is engaged in the setup process.

Setup's modular architecture allows the leveraging of detection and installation procedures beyond the initial setup process. The same procedures and detection mechanisms used by Setup to detect and initially configure hardware devices and peripherals during the setup process are also used for maintaining or detecting devices after installation. For example, the same code base used during the setup process for the detection of Plug and Play or legacy hardware devices is also used to detect or configure new devices after Windows 95 is up and running.

For system administrators, Windows 95 makes customization easier than Windows 3.1, which provided few mechanisms for easily customizing the setup process. Customization of Setup allows for better control over components installed into an existing environment. MIS organizations can now easily tailor the existing configuration options for Setup components, such as supported network interface cards or supported printers. Windows 95 also offers the flexibility for system administrators to add components to be installed during the setup process or to run additional procedures during the final phases of Setup.

Hardware Detection Improvements

During the setup process, Windows 95 detects the hardware devices and components configured on the computer and uses this information to install drivers and set the appropriate entries in the Registry. Unlike the simple hardware detection mechanisms used in Windows 3.1, which identified the PC configuration for a narrow

group of devices, Windows 95 provides more versatile hardware detection and configuration mechanisms and provides detection support for a wider range of devices.

Windows 95 provides straightforward detection support for the base computer components, such as communication ports and processor type, but provides more robust detection of system devices, including video display adapters, pointing devices, hard disk controllers, floppy disk controllers, and network interface cards.

Hardware resources, such as IRQs, I/O addresses, or the DMA address, that are in use by more than one device can cause havoc when initially installing an operating system and may prevent the system from starting properly. Windows 95 Setup helps detect any hardware resource conflicts early in the setup process.

Windows 95 detects hardware components and devices one of two ways:

n

It leverages Plug and Play detection to identify Plug and Play devices and peripherals.

n

It uses a manual query detection mechanism for legacy devices and peripherals.

After Setup detects a device, Windows 95 installs the appropriate device drivers and configures the system.

The Setup Process

Setup in Windows 95 provides options to support the following four common scenarios and is designed to make it easy to install Windows 95 to meet users' needs:

n

Typical. Most users will select this the option to perform a “typical” installation of Windows 95.

n

Portable. This option installs the components of Windows 95 that are useful for portable or mobile computer users.

n

Compact. This option performs a “compact” installation of Windows 95, installing the minimal files needed for proper operation.

n

Custom. This option provides full customization of the Windows 95 setup process, allowing users to install all or selected components.

Setup in Windows 95 is less complex than Setup in Windows 3.1 from a user’s perspective and is divided into the following four logical phases:

n

Detecting hardware

n

Asking configuration questions

n

Copying component files for Windows 95

n

Configuring the final system

The following sections describe what happens in each of these phases.

During the hardware detection phase, Setup analyzes installed system components, detects installed hardware devices, and detects connected peripherals. During this phase of Setup, Windows 95 analyzes the system to identify the hardware resources that are available—for example, IRQs, I/O addresses, and DMA addresses—identifies the configuration of installed hardware components—for example, IRQs in use—and builds the hardware tree in the Registry.

Windows 95 uses a number of mechanisms to detect installed hardware devices.

during setup. For legacy PCs, Windows 95 maintains a database of known hardware devices and performs a manual detection to check I/O ports and specific memory addresses to attempt to identify whether they are being used by recognized devices. Windows 95 also checks for Plug and Play peripherals connected to legacy PCs, which return their own device identification codes. For PCs that contain a Plug and Play BIOS, Windows 95 queries the PC for installed components and the configuration used by these components. (Windows 95 also checks for Plug and Play peripherals connected to Plug and Play PCs.)

During the hardware detection phase of Setup, Windows 95 tries to identify hardware conflicts and provides a mechanism to resolve conflicts early in the installation process to overcome the hardware configuration issues that Windows 3.1 users encounter.

When the hardware detection phase is complete, a dialog box allows users to proceed with Setup or to review the hardware devices that were detected and the system components that Windows 95 will install.

Windows 95 uses information found in the first phase to determine which system components it should install. During the Windows 3.1 setup process, users were constantly asked for system configuration information and confirmations. By contrast, Windows 95 consolidates the configuration and customization phase of Setup into a single procedure at the beginning of the setup process. Users can review the components Windows 95 will install and remove or add any components.

This phase of Setup is the most straightforward. After users have identified or confirmed which components Windows 95 should install, Setup begins copying files from the Windows 95 installation disks (or from a network server, if specified). When the necessary files have been copied to the PC, Setup prompts users to remove any disks in floppy drives and then reboot the system to proceed with the final phase of Setup.

During the final system configuration phase, Setup upgrades the existing configuration of Windows and replaces the existing version of MS-DOS with the new Windows 95 operating system. After files are updated and the system is configured, Setup guides users through a process to configure peripheral devices, such as modems or printers, that are connected to the system. When this configuration is complete, Windows 95 is ready to use.

Users now have greater control over components and parts of Windows 95 that are installed during the Setup process. Based on the modular architecture of Windows 95, users will be able to selectively choose the options that Windows 95 will install for the given functionality that they desire.

During setup of Windows 3.1, if the system hung during device detection or if the setup process ended abnormally, a flag would be set disabling hardware detection for the next time that Setup was run. This mechanism provided a means for users to bypass a section of Setup that would otherwise fail. However, they were required to rerun the entire setup process and manually identify hardware devices.

Windows 95 supports a far better recovery mechanism in the case of Setup failure. During the setup process, Windows 95 creates and maintains a log as the setup operations are performed and the hardware devices are detected. If Setup fails—for example, because of a hang during hardware detection—the last entry in the Setup log identifies where the process was interrupted. To recover and resume, users simply rerun Setup. The Setup program recognizes that it was run before and begins from where it left off. In the case of a hang during a hardware detection procedure, the system actually bypasses the detection module where the hang occurred and allows users to manually select the correct device installed in or connected to the system.

Under Windows 3.1, if a component file was accidentally deleted or a system file was corrupted, users had no easy way to recover the given file. They needed either to use the Expand utility to recopy a known file or to completely reinstall Windows 3.1 to reinstate a lost file.

Windows 95 provides some flexible solutions to this problem. During the setup process (and during subsequent maintenance of the Windows 95 system), Windows 95 creates and maintains a log of the installed components. This information is used as part of Setup's smart recovery support and is also used to verify the integrity of installed components.

If users run Setup after Windows 95 is already installed, Setup asks them whether to reinstall Windows 95 or simply to verify installed components. If they want to verify installed components, Setup examines the setup log and runs through the setup process WITHOUT copying all system components. Instead, it verifies the integrity of the files that were installed during Setup against the files provided on the Windows 95 installation disks. If the integrity check fails because of either a missing or corrupted file on the Windows 95 computer, Setup automatically reinstalls the

missing or corrupted file.

This capability in Windows 95 greatly simplifies and reduces the time required to resolve missing files or corrupted configurations, thereby helping to reduce the time and money required to support desktop configurations.

Windows 95 provides improved support for installation and use in network environments. Windows 95 can be installed on a network to upgrade existing Windows users, or it can be used to convert existing MS-DOS PCs. Windows 95 offers the same capabilities for running Windows from a network but also provides additional functionality to better address the requests of MIS organizations.

In addition to basic support for stand-alone computers, Windows 95 includes Setup provisions for better supporting the following:

n

Installing and running Windows 95 from a local computer on a network

n

Installing and running Windows 95 from a network server instead of

installing it on the local computer

n

Installing Windows 95 on a network server and supporting diskless

computers that RIPL boot from the network server

n

Installing Windows 95 on a network server and supporting computers with a single floppy drive that run Windows 95 from the network server

Additional information about network support in Windows 95 is given in Chapter 9, "Networking."

When users modify the configuration of their PCs in a networked environment, the Windows 95 Setup program makes the installation of new drivers easy by remembering the location on the network from which Windows 95 was installed. Any user that has been prompted for the insertion of a disk containing needed files for Windows or Windows for Workgroups will appreciate this new functionality. Whether the server is a NetWare server or a Windows NT server, when users add a device or require additional driver support files to properly run Windows 95, Setup automatically attempts to get the files from the network server. Setup stores a UNC pathname in the Registry, eliminating the need to maintain a permanent network connection on the PC.

Windows 95 features a batch installation option that permits the use of an installation script to automate the installation process. MIS organizations or VARs can simplify the installation procedure for users by specifying answers to questions that Setup asks, as well as specifying defaults for installing and configuring devices such as printers.

System administrators can use the NetSetup tool provided with Windows 95 to create a batch script that specifies all of the options that Setup needs, thereby providing support for hands-free installation. The batch installation capability of Windows 95 is more flexible and customizable than that provided with Windows 3.1 or Windows for Workgroups 3.11.

Windows 95 can easily be installed as an upgrade on a PC where Windows or Windows for Workgroups already exists. During the upgrade process, Windows 95 uses existing configuration information to set installation defaults and examines the

contents of specific .INI files to further determine the appropriate Setup options.

Windows 95 preserves configuration information, such as the Program Group definitions created by the user, and maps user interface-related features or functionality from Windows 3.1 or Windows for Workgroups to that of the interface used by Windows 95.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 18: International Language Support

With the growth of the worldwide PC market, Microsoft Windows and Windows-based applications have made PCs easier to use around the globe. The fact that Windows and Windows-based applications are sold and used worldwide poses some unique problems for both Microsoft as an operating-system vendor and ISVs as application developers.

When a new software application or operating system intended for a world market is developed, efforts must be made to localize the software to the countries and written languages in which it will be used. In many cases, localization is a simple matter of translating the names of menus, menu items, and strings displayed by the software into the language used in the locale. However, as the features and functionality of a software product grow, so does the complexity required to tailor the application to characteristics of the native country. Since the start of the design work for the Windows NT operating system, Microsoft has been adding to the level of support for international languages and cultural conventions in the 32-bit editions of the Windows family of operating systems.

This section discusses the localization plans for Windows 95, the built-in international support for using Windows 95 on a worldwide basis, and the special provisions that Windows 95 includes for enhancing existing or developing new applications that can be used in different parts of the world.

Summary of Improvements over Windows 3.1

Support for using the Windows operating system on a global basis is improved in Windows 95. The benefits for both users and software developers are summarized below.

The benefits for users include the following:

n

Easy switching from one language to another. Windows 95 makes both

the use of multiple language fonts and character sets, and switching among the different keyboard layouts required to support them, easy.

Included in the CD-ROM version of Windows 95 (all languages) is an option that lets any application write text in not only Western European but also in all Eastern European Languages. (note that you can only write text in these languages, if you need to run for example a Russian version of Microsoft Excel

you will need either Russian or the Pan European Edition of Windows 95). To install the Multilingual support, you either choose it when you setup Windows 95 or install it later through Control Panel (Add/Remove programs icon, Windows Setup tab, Accessories, Multilingual support.)

With the old Eastern European version of Windows 3.1, users can directly switch between only two keyboard layouts—for example, Russian and English. With the standard Latin versions of Windows 3.1, users cannot easily switch between different keyboard layouts; they have to go to the Control Panel for each language switch. As an added complexity you can only switch between languages within the Latin hemisphere, you can't switch to for example Russian.

With Windows 95 this is now an easy and seamless operation, users can easily switch among all available languages and corresponding keyboard layouts configured on their system by using the ALT+SHIFT key combination or click on the language indicator on the taskbar, making the creation and integration of information in a multilingual document easy.

n

Font substitution. Windows 95 substitutes fonts when switching among

different languages if the original font is not present on the system. When switching among different languages, matching fonts for the new language are substituted if the original font is not available. As a result, users can read and use the text for a similar character set, even if they don't have the font that the original information was created in.

n

Correct sorting and formatting rules. Different locales and cultures have

different rules for interpreting information. For example, cultures use different sequence algorithms for sorting information, use different comparison algorithms for finding or searching for information, and use different formats for specifying time and date information. Win32-based applications that use the National Language Support (NLS) APIs allow users to easily exchange information on a global basis, while preserving the integrity of the information.

The benefits for developers include the following:

n

Easy addition of international language support to applications.

Developers can now use the Win32 NLS APIs for sorting, searching, and manipulating information in a locale-independent way. NLS services in Windows 95 ensure that information is handled correctly for the given culture or locale. The correct national format is automatically supplied based on the international settings specified by the user in the Control Panel. For example, to obtain the current date format information to match the current locale, the application calls an NLS API, and the system returns the correct format. Likewise, to sort information in the proper sequence in French, Norwegian, or Spanish, the application calls a corresponding culture-independent NLS API.

n

Automatic switching of fonts and keyboard layouts. Windows 95 provides

services that application developers can use to ensure that as users move through a multilingual document, the correct fonts and keyboard layouts are used. For users who create or edit multilingual document content—for example, translators—a Win32-based application that uses the international services in Windows 95 automatically activates the correct fonts and corresponding keyboard layouts for the edit point in the text. This feature allows easy editing of information contained within multilingual documents.

n

Preservation of language-specific attributes on the Clipboard. Windows 95

provides additional services for application developers so that information can be passed through the Clipboard to easily exchange information between internationally-aware applications, while preserving all language formatting characteristics.

n

Switching of languages by multilingual-aware applications. Windows 95

provides services that application developers can use to automatically switch the language that the system uses to match attributes in a document. For example, as users scroll through a multilingual document, the application can automatically switch the system language to match the format of the information contained within the document.

n

Storage of international language information in RTF format. Extensions

have been provided to the RTF specification to support saving language-relevant information in Rich Text Format (RTF) from a multilingual-aware application.

The Localization of Windows 95

As a result of the success of Microsoft Windows around the world, Windows and Windows-based applications have been localized into many different languages. Microsoft Windows 3.1 was localized into more than 25 major languages, a process that took as long as 18 months and delayed the availability of Windows 3.1 for some language versions. With Windows 95 international localization, It is much easier to do a quality localization in shorter time. To better support a global market, Microsoft plans to localize Windows 95 into at least 29 different language versions, including German, French, Spanish, Swedish, Dutch, Italian, Pan-European Edition (an English version that supports running Eastern European applications), Norwegian, Danish, Finnish, Portuguese (Brazilian and Iberian), Japanese, Chinese, Korean, Russian, Czech, Polish, Hungarian, Turkish, Greek, Arabic, Basque, Hebrew, Thai, and Catalan (as well as several variations of these languages). The localized versions of Windows 95 will be released on a planned development schedule that does not exceed 120 days—exceptions being Arabic and Hebrew that will release in about 180 days after the English version due to the added complexity of bilingual-switching (switching between English and for example Arabic menus).

International Language Issues

Localization is only a small part of the effort that goes into ensuring that an operating system can be used effectively in a worldwide environment. A worldwide operating system must also provide services to support the use of international applications and to support the global market by making the application developer's job easier. This section discusses some of the language issues that international users and application developers face:

n

From the user's perspective. Some users need to include more than one

language in a document. For example, they might be translating from English into Russian or they might be writing a product instruction manual in many different languages. When using more than one language, users must deal with a series of obstacles. For example, they must repeatedly switch to another keyboard layout on-the-fly so that they can continue writing in a different language. When using a database, users faces the problem of sorting the information in the correct order for a given language.

n

From the developer's perspective. When localizing a product into different

languages, developers are faced with several questions, such as the following: "What is the correct sorting order for French?" "How is a date represented in Germany?" "Do the Swedes really need to have the ability to use the characters Å, Ä, and Ö?" "If a document contains text in more than one language, is there some way for the software to know which part of the document is in which language?" "Can information in a multilingual document be passed to another application via the Clipboard?" Many developers try to address these issues in their applications and fall short, creating problems for the users, their support organization, and their own development team.

Because the mainstream Windows platform has not previously offered international language support as an operating system service, many application vendors have hard-coded global characteristics into their applications. Hard coding allows their applications to be used in a given locale, but prevents the applications from being used easily in a different cultural environment. As a result, users depend on application developers to provide a version of the application that matches their locale attributes.

In Windows 95, Microsoft has set out to offer international language support at the operating system and API level. This support adds functionality that provides solutions for using software and exchanging documents around the world. Providing international language support services in Windows 95 makes it easier for application developers to solve international language issues related to presenting or manipulating information in their applications. This section discusses those issues.

Date and time information needs to be represented in different formats depending on the locale where the information is being used. For example, date information presented in American English places the day between the month and year, as in “March 9, 1994,” whereas a different locale may represent the same date as “9 March 1994.”

International language issues are much more complex than simply representing date and time information in the correct format. Sorting and searching algorithms in applications must correspond to the proper language rules for the locale in which the information is being used and manipulated. The following examples illustrate the subtle differences between language rules:

n

In French, diacritics are sorted right to left instead of left to right, as in English.

n

In Norwegian, some extended characters follow the Z character because they are considered unique characters rather than characters with a diacritic.

n

In Spanish, CH is a unique character between C and D, and Ñ is a unique character between N and O.

As a further example, if a database in Swedish is sorted with an English-language sort algorithm, the names would be sorted as shown in the left column of this table:

How Are Names Sorted?

Ander sson	Ander sson
Åkess on	Karlss on
Ärling mark	Magnu sson
Karlss on	Turess on
Magn usson	Åkess on
Tures son	Ärling mark

The system treats the Å and Ä as an A and therefore sorts them after A at the top of the list. However, in the correct Swedish sort order, the Å and Ä are sorted after Z because they are separate vowels that occur at the very end of the alphabet. A Swede looking for “Ärlingmark” would be confused to find it near the beginning, instead of at the end, of a list of names.

With Windows 3.1, many developers came up with their own sorting routines for different languages and hard-coded this functionality into their applications. Their applications are too inflexible to support the numerous right sorting tables required for all the languages into which they might want to localize their applications.

In standard Windows 3.1, fonts native to the Eastern European countries, such as

Greece, Russia, and Turkey, cannot be used. For example, if users tried to install a Russian font with an English or French version of Windows 3.1, the characters appeared unintelligible on the screen, and users couldn't use the font. To solve this problem, a special English Eastern European version of Windows 3.1 was designed for English users who needed to use Eastern European fonts, including Russian Cyrillic or Greek. The English Eastern European version of Windows 3.1 offered the same capabilities as the true Russian or Turkish Eastern European version of Windows for displaying font and character information.

The Solution: Multilingual Content Support

Windows 95 resolves many of the problems related to international language issues by integrating multilingual content support in the core of the operating system. Windows 95 also offers national language support to application developers as a series of APIs that are part of the Win32 API set.

Multilingual content support is the ability to display and edit text of various languages and scripts in a single document. Multilingual content support is a core feature of Windows 95 and will be also be provided in the next major release of Windows NT (code-named Cairo).

Multilingual content support in an application provides the following two major benefits:

n

Users can create and edit documents with content in multiple languages

and scripts and exchange these documents with users of other language systems. This feature is important within the European Union, for example, where Greek and Latin-based languages must coexist in documents.

n

An application that supports multilingual content supports the native

content of any market into which it is sold.

Windows 95 allows users to add support for multiple keyboard layouts to match different international conventions. In the Control Panel, the Keyboard icon provides the ability to configure the system to support the preferred keyboard layouts, as shown in Figure 115.

{ewc msdncd, EWGraphic, ux0r 0 /a "psR.bmp"}

Figure 115. The Keyboard property sheet, showing international layout support

To change the keyboard layout in Windows 3.1, users had to go to the Control Panel each time they wanted to switch to a different keyboard layout. In Windows 95, switching keyboard layouts is much easier. Figure 116 shows a sample legacy word processing document that illustrates the ability to integrate text by using the Lucida Console font in different languages within the same document. The language identifier in the status area of the taskbar allows users to easily switch the system language among the available language options. A Windows 95 application that uses NLS APIs would incorporate the ability to switch the preferred language directly on the Toolbar of the application.

{ewc msdncd, EWGraphic, ux0r 1 /a "psR.bmp"}

Figure 116. Switching among different languages to create a multilingual document

The ChooseFont common dialog box has been enhanced to include a list box showing the character set scripts supported by a particular font. This mechanism ensures the correct representation of fonts for a given language.

Figure 117 shows the new ChooseFont common dialog box, illustrating the integration of font script selection options. The Font Script list shows the script names for each of the character sets covered by the font selected in the Font list. The Sample box displays a font sample that is dependent on the script selected, as well as the other font attributes. The sample preview string, which is specific to the selected character set, shows what each of the different scripts looks like.

{ewc msdncd, EWGraphic, ux0r 2 /a "psR.bmp"}

Figure 117. The Font dialog box, showing the new Font Script list

Internationally aware applications can support multilingual font selection by allowing users to select fonts via the ChooseFont common dialog box and by recognizing the extensions to the ChooseFont data structures in Windows 95. Even Windows-based applications—which, though not originally designed for Windows 95, support formatted text but not multilingual messages—can gain some basic level of support

for multilingual content. If an application uses the ChooseFont common dialog box, it benefits from the enhancements, allowing users to select from the full range of character sets and fonts configured in the system. As long as the application saves the complete logical font data structure representation for fonts, an existing Windows-based application can get by without being aware that the font selected by the user includes a possible change of character set. (Applications generally do save this data when saving text in their native format, but not all save this data when writing to interchange formats, such as RTF.)

A good multilingual-aware application can exchange multilingual content with other aware applications and can exchange appropriate flat text with unaware applications, within the limitations of the ASCII text formats. Windows 95 provides special support in the data exchange APIs to pass language information along with the rich text data.

[Try It!](#)

Test Multilingual Content Support

1. In the Control Panel, open the Keyboard tool and click the Language tab. Add a couple of keyboards—for example, Swedish and French—and then click OK. At the right end of the Taskbar, notice that a small square is displayed in the status area to represent the active keyboard layout. Two letters in the square represent the language—for example, “EN” for “English.”
—(If you want to write in an Eastern European language like for instance Russian, you will have to install the Multilingual language option: To install this Multilingual support, you either choose it at setup or install it later through Control Panel, Add/Remove programs, Windows setup, Accessories, Multilingual support)
2. Start a word processing application and create a document in which to test the multilingual content support.
3. Hot-switch among different input languages by pressing ALT+SHIFT, toggle through the available configured languages, and select one.
4. After you have switched to a new input language, type something. A multilingual-aware application automatically switches the font if necessary. (Of course you have to know where the keys are on that country-specific keyboard layout.)
5. Switch to a different language and type something.
6. Move the insertion point through the text. A true multilingual-aware application automatically switches the input language to match the current language format when you move through different languages in the text.

The Win32 National Language Support APIs

When users install Windows 95, they specify a locale preference. (This preference can be changed later via the Control Panel.) The Win32 NLS APIs can use either this default locale setting or a specific locale setting. Using the Win32 NLS APIs offers the following benefits to developers:

n

They can easily integrate international language support into their Win32-

based applications. These APIs, which are supported on both the Windows 95 and Windows NT platforms (with limited support available for Win32-based applications under Windows 3.1) allow applications to correctly retrieve regional and language settings, format date and time, sort lists according to cultural rules, compare and map strings, and determine character type information. Application developers in the U.S. can be sure that the sorting order and date formats that Microsoft provides with the operating system are correct, so all they have to do to sort or display information is use the appropriate Win32 NLS APIs.

n

They can more easily develop applications for new global markets. Using

this API set lowers development costs by eliminating the need for proprietary sorting methods, parsing the WIN.INI file or Registry, and locale-specific coding.

Perhaps more important for developers, the API set provides a mechanism for accurate and consistent behavior on all 32-bit Windows platforms.

Users benefit because the API set ensures that information is handled and displayed correctly for a given locale-specific format. In addition, users don't have to worry about whether their international text is being sorted properly.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Chapter 19: Accessibility

Microsoft is committed to making computers easier to use for everyone. Personal computers are powerful tools that enable people to work, create, and communicate in ways that might otherwise be difficult or impossible. The vision of making computers easier to use for everyone can be realized only if people with disabilities have equal access to the powerful world of personal computing.

The issue of computer accessibility in the home and workplace for people with disabilities is becoming increasingly important. Seven to nine out of every ten major corporations employ people with disabilities who may need to use computers as part of their jobs. In the U.S. alone, an estimated 30+ million people have disabilities that can potentially limit their ability to use computers. Additionally, as the population ages, more people experience functional limitations, causing the issue of computer accessibility to become important to the population as a whole.

Legislation, such as the Americans with Disabilities Act (which affects private businesses with more than 15 employees) and Section 508 of the Rehabilitation Act (which addresses government spending), also brings accessibility issues to the forefront in both the public and private sectors.

Microsoft already offers a number of products specifically for users with disabilities and includes features in its mainstream software products to help make them more accessible. Microsoft's two most prominent accessibility products are Access Pack for Microsoft Windows and AccessDOS. Both were developed by the Trace Research and Development Center at the University of Wisconsin–Madison using research funded by the National Institute on Disability and Rehabilitation Research (NIDRR). Also available is Access Pack for Microsoft Windows NT. These products enhance the Windows, MS-DOS, and Windows NT operating systems by adding a variety of features that make the computer more accessible for users with limited dexterity or hearing impairments. Microsoft distributes these utilities at no charge to customers and announces their availability in each of its new products.

Windows 95 offers several enhancements designed to make the system more accessible and easier to use for people with disabilities. In recent years Microsoft has established close relationships with users who have disabilities, organizations representing disabled people, workers in the rehabilitation field, and software developers who create products for this market. Based on their combined input, the following specific design goals were defined for Windows 95:

n

Integrate and improve the features from Access Pack that compensate for the difficulties some people have using the keyboard or the mouse.

n

Make the visual user interface easier to customize for people with limited vision.

n

Provide additional visual feedback for users who are deaf or hard of hearing.

n

Provide new APIs and “hooks” for ISVs developing third-party accessibility aids, including those that allow blind people to use Windows.

n

Make information on accessibility solutions more widely available and

increase public awareness of these issues.

Enhancements designed to meet these goals are included throughout Windows 95. This chapter describes these enhancements, which will make computing easier for people who have disabilities.

Summary of Improvements over Windows 3.1

The primary improvements in accessibility for Windows 95 are the following:

n

Make UI elements scaleable

n

Compensate for difficulties using the keyboard

n

Emulate the mouse with the keyboard

n

Support alternative input devices that emulate the keyboard and mouse

n

Provide visual cues to tell users when an application is making sounds

n

Advise applications when the user has limited vision

n

Advise applications when the user needs additional keyboard support due to difficulty using a mouse

n

Advise applications when the user wants visual captions displayed for speech or other sounds

n

Advise applications when they should modify their behavior to be compatible with accessibility software utilities running in the system

n

Optimize keyboard layouts for users who type with one hand, one finger, or a mouthstick

n

Include audible prompts during Setup for users who have low vision

n

Optimize color schemes for users with low vision

n

Include accessibility information in Microsoft product documentation

General Features of Accessibility Enhancement

To provide information about accessibility features and to provide ways of controlling the features, Windows 95 includes several enhancements.

An Accessibility section in the Windows 95 contents and index of online Help provides a quick reference and pointer to topics that can help adjust the behavior of the system for people with disabilities.

In Windows 95, most of the accessibility features described in this chapter are adjusted through the Accessibility Options icon in the Control Panel. Clicking this tool displays the property sheet shown in Figure 118 on the following page, which enables users to turn the accessibility features on or off and customize timings, feedback, and other behavior for their particular needs.

`{ewc msdn cd, EWGraphic, ux0s 0 /a "psS.bmp"}`

Figure 118. The Accessibilities property sheet

Most of the accessibility features described in this chapter are adjusted through the Control Panel. But if users can't use the computer until an accessibility feature is turned on, how can they use the Control Panel to activate it? This chicken-and-egg problem is solved by providing emergency hotkeys with which users can temporarily turn on the specific feature they need. Then, after a feature is turned on, users can navigate to the Control Panel and adjust the feature to their own preferences or turn it on permanently.

If a feature gets in the way or if another person needs to use the computer, the same hotkey can be used to temporarily turn off the feature.

Microsoft has worked hard to ensure that the emergency hotkeys don't get in the way of users who don't need them. Each hotkey is an obscure key combination or key sequence that should not conflict with applications. If a conflict does arise, the hotkeys can be disabled, and the features will still be available as needed.

As an additional precaution, each emergency hotkey plays a rising tone and displays a confirmation dialog box that briefly explains the feature and how it was activated. If users pressed the hotkey unintentionally, this notification allows them to deactivate the feature. It also provides a quick path to a more detailed Help topic and the Control Panel settings for that feature, allowing users to disable the hotkey permanently.

The Accessibility TimeOut turns off Access Pack's functionality after the system has been idle for a certain period of time. It returns the system to its default configuration. This feature is useful on machines shared by multiple users. The Accessibility TimeOut can be adjusted using the Control Panel.

Windows 95 provides an optional visual indicator, shown in Figure 119, that tells users which accessibility features are turned on, helping users unfamiliar with the features to identify the cause of unfamiliar behavior. The indicator also provides feedback on the keys and mouse buttons currently being “held down” by the StickyKeys and MouseKeys features (discussed later in this chapter). The status indicator can be displayed on the taskbar or as a free-floating window and can be displayed in a range of sizes.

`{ewc msdn cd, EWGraphic, ux0s 1 /a "psS.bmp"}`

Figure 119. The Accessibility status indicator

Features for Users with Low Vision

Windows 95 offers several enhancements designed to make the system more accessible and easier to use for people with low vision.

Users who have limited vision or who suffer eyestrain during their normal use of Windows can adjust the sizes of window titles, scroll bars, borders, menu text, and other standard screen elements. These sizes are completely customizable through the Control Panel in Windows 95. Users can also choose between two sizes for the built-in system font.

Users who have difficulty seeing or following the mouse pointer can now choose from three sizes: normal, large, and extra large. They can also adjust the color or add animation, both of which can increase the pointer's visibility.

The Windows color schemes allow users to choose from several well-designed sets of screen-color options designed both to match users' individual tastes and to meet their visual needs. The new color schemes in Windows 95 include high-contrast colors designed to optimize the visibility of screen objects, making it easier for users with visual impairments to see them.

Many users with low vision require a high contrast between foreground and background objects to be able to distinguish one from the other. For example, they may not be able to easily read black text on a gray background or text drawn over a

picture. Users can set a global flag to advise Windows 95 and applications that they need information to be presented with high contrast.

Windows 95 also provides an emergency hotkey that allows users to set the computer into high-contrast mode when they can't use the Control Panel or when the current color scheme makes the computer unusable for them. Pressing this hotkey—Left ALT, Left SHIFT, and PRINT SCREEN keys simultaneously—allows them to choose an alternate color scheme that better meets their needs.

[Try It!](#)

Take a New Look

1. Imagine you can't read black text on a gray background because all the lines blur together.
2. Press Left ALT + Left SHIFT + PRINT SCREEN until you find a text/background combination that's more suitable to your needs.

Features for Easier Keyboard and Mouse Input

Windows 95 offers several enhancements designed to make inputting information via the keyboard and mouse easier.

Many software programs require users to press two or three keys at one time. For people who type with a single finger or a mouthstick, that just isn't possible. StickyKeys allows users to press the keys of a key combination one at a time and instructs Windows to respond as if the keys had been pressed simultaneously.

When StickyKeys is turned on, pressing any modifier key—that is, CTRL, ALT, or SHIFT—latches that key down until either the mouse button or a non-modifier key is released. Pressing a modifier key twice in a row locks it down until it is pressed a third time.

The functionality of StickyKeys is adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by pressing the SHIFT key five consecutive times.

The sensitivity of the keyboard can be a major problem for some people, especially if they often press keys accidentally. SlowKeys instructs Windows to disregard

keystrokes that are not held down for a minimum period of time, allowing users to brush against keys without any ill effect. When users put a finger on the correct key, they can hold the key down until the character appears on the screen.

The functionality of SlowKeys is adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by holding down the Right SHIFT key for eight seconds. (This hotkey also turns on RepeatKeys.)

Most keyboards allow users to repeat a key just by holding it down. This feature is convenient for some but can be a major annoyance for people who can't lift their fingers off the keyboard quickly. RepeatKeys lets users adjust the repeat rate or disable it altogether.

The functionality of RepeatKeys is adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by holding down the Right SHIFT key for eight seconds. (This hotkey also turns on SlowKeys.)

For users who "bounce" keys and produce double strokes of the same key or similar errors, BounceKeys instructs Windows to ignore unintended keystrokes.

The functionality of BounceKeys is adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by holding down the Right SHIFT key for 12 seconds. Users hear an up-siren after eight seconds, and another double-tone after 12 seconds. Releasing the SHIFT key after the double-tone activates BounceKeys.

The MouseKeys feature lets people control the mouse pointer using the keyboard. Users don't need to have a mouse to use this feature. Windows 95 is designed to allow users to perform all actions without needing a mouse, but some applications may require one, and a mouse can be more convenient for some tasks. MouseKeys is also useful for graphic artists and others who need to position the pointer with great accuracy.

When MouseKeys is turned on, the following keys navigate the pointer on the screen:

n

Press any number key except 5 on the numeric keypad—these keys are also called the direction keys—to move the pointer in the directions indicated in Figure 120.

n

Press the 5 key for a single mouse-button click, and press the + key for a double-click.

n

To drag an object, point to the object, press INS to begin dragging, move the object to its new location, and press DEL to release it.

n

Select the left or right mouse button or both mouse buttons for clicking by pressing the /, -, or * key, respectively.

n

Hold down the CTRL key while using the direction keys to “jump” the pointer in large increments across the screen.

n

Hold down the SHIFT key while using the direction keys to move the mouse a single pixel at a time for greater accuracy.

```
{ewc msdn cd, EWGraphic, ux0s 2 /a "psS.bmp"}
```

Figure 120. The keys on the numeric keypad that control the mouse pointer

The functionality of MouseKeys can be adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by pressing the Left ALT, Left SHIFT, and NUM LOCK keys simultaneously.

ToggleKeys provide audio cues—high and low beeps—to tell users whether a toggle key is active or inactive. It applies to the CAPS LOCK, NUM LOCK, and SCROLL LOCK keys.

The functionality of ToggleKeys can be adjusted using the Control Panel, or it can be turned on or off using an emergency hotkey, by holding down the NUM LOCK key for eight seconds.

[Try It!](#)

Type with a Pencil

1. Suppose you could only type with a single finger, or with a pencil held between your teeth. How would you press ALT+TAB? Start by pressing SHIFT five times to turn on StickyKeys. (Notice the status indicator on the Taskbar.)

2. Now press ALT and see what happens. Press TAB and you'll have just typed two keys at once with a single finger.
3. Press ALT twice and then press TAB a few times to see the ALT+TAB window and to cycle through all the tasks you have running.
4. When the name of the task you want to switch to is displayed, press ALT one more time to release it.
5. Turn off StickyKeys by pressing two keys at the same time.

Don't Touch That Mouse

1. Press the Left ALT, the Left SHIFT, and the NUM LOCK keys simultaneously.
2. Try dragging and dropping a selection and clicking or double-clicking both the left and right mouse buttons by using your keyboard's numeric keypad. (For details, see the section titled "MouseKeys.")

Test Support for MS-DOS-Based Applications

1. Start an MS-DOS-based application.
2. Try StickyKeys or MouseKeys. All of the accessibility features are available when you are running an MS-DOS-based application. They are available any time you need them, whatever you may be doing.

Features for Users Who Are Deaf or Hard-of-Hearing

Windows 95 offers several enhancements designed to make the system more accessible and easier to use for people who are hearing-impaired.

Some applications present information audibly, as waveform files containing digitized speech or through audible cues that each convey a different meaning. These cues might be unusable by a person who is deaf or hard of hearing, or someone who works in a very noisy environment, or someone who turns off the computer's speakers in a very quiet work environment. In Windows 95, users can set a global flag to let applications know they want visible feedback, in effect asking the applications to be "close captioned."

SoundSentry tells Windows to send a visual cue, such as a blinking title bar or screen flash, whenever the system beeps. Turning on this feature allows users to

see messages that they might not have heard.

Support for Alternative Input Devices

Windows 95 provides support for the use of alternative input devices, such as head pointers or eye-gaze systems, with which users can control the computer.

The SerialKeys feature, in conjunction with a communications aid interface device, allows users to control the computer using an alternative input device. These devices can send coded command strings through the computer's serial port to specify keystrokes and mouse events that are then treated like normal keyboard and mouse input.

The Plug and Play architecture in Windows 95 inherently supports multiple cooperating pointing devices. This capability allows seamless addition of alternative pointing devices, without requiring users to replace or disable the normal mouse.

Features for Software Developers

Windows 95 contains many built-in features designed to make the computer more accessible to people with disabilities. To make a computer running Windows 95 truly accessible, application developers must provide access to their applications' features, taking care to avoid incompatibilities with accessibility aids.

As part of the WINDOWS 95 SOFTWARE DEVELOPMENT KIT and the WINDOWS 95 USER INTERFACE DESIGN GUIDELINES, Microsoft provides developers with documentation that not only outlines these important concepts, but also provides technical and design tips to help ISVs produce more accessible applications. Most of these tips involve very little additional work for developers, as long as they are aware of the issues and incorporate accessibility into application designs at an early stage. By providing this information to application developers, Microsoft hopes to increase the general level of accessibility of all software running on the Windows platform.

Windows 95 now allows developers of voice-input systems and other alternative input systems to easily simulate keyboard and mouse input using fully documented

and supported procedures.

Some accessibility aids, such as screen review packages for low-vision users, need to detect information as it is drawn to the screen. Windows 95 supports chaining display drivers that allow these utilities to intercept text and graphics being drawn, without interfering with the normal computer operation.

Many accessibility aids have difficulty working with applications that implement nonstandard controls. Windows 95 introduces a whole new set of controls for mainstream software developers, and these standardized implementations are designed to cooperate with accessibility aids.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 20: Applications and Utilities

Windows 95 includes a set of applications and utilities designed to take advantage of new areas of the operating system, including 32-bit preemptive multitasking, long filenames, new visual elements and common dialog boxes, OLE, TAPI, MAPI, and other Win32 API features. This chapter describes some of the new applications and utilities.

The applications and utilities listed in this chapter have been either completely redesigned or designed from scratch so that novice users' first experiences of using the applications will be good ones. Experienced users will find the applications both powerful and flexible, but the applications were not necessarily designed to satisfy all the needs of advanced users. Many of the applications and utilities will help to inspire third-party developers to further utilize technology included in Windows 95.

The Quick Viewers

The Quick Viewers included in Windows 95 provide a new capability, allowing users to view files in most popular file formats without opening the application used to create the files. The Quick Viewers are really convenient for looking at attachments sent in e-mail messages or browsing files on a network. Figure 121 shows the right-click context menu with the Quick View command chosen and the resulting Quick View window showing the contents of a Microsoft Excel worksheet.

`{ewc msdncd, EWGraphic, ux0t 0 /a "psT.bmp"}`

Figure 121. A Microsoft Excel worksheet in a Quick View window

The Quick Viewers also support the ability to drag and drop a file from the Windows Explorer or desktop into an open Quick View window. If the extension of a file is not associated with a known application, the Open With dialog box is displayed so that users can specify whether they want to view the file in a Quick View window or open the selected file with an application.

Users can choose Options from the Window Explorer's View menu and specify the default Open command for any file type to be quick-viewed, which is convenient for users who often view a particular file type but do not have the corresponding application on their hard disk. Users can also assign extensions to applications to view files with those extensions in a specific file format.

Users can customize the Quick View window in the following ways:

n

They can view files in standard view or page view, in both landscape and portrait modes.

n

They can view files in different fonts and font sizes.

n

They can rotate bitmap files so that documents such as fax messages are oriented correctly.

Jointly developed by Microsoft and Systems Compatibility Corporation (SCC), the Quick Viewers are available for most popular file formats. SCC offers additional viewers and features in their Outside In for Windows product. In addition, ISVs are encouraged to include Quick Viewers for the file formats they support in future releases of their software. Windows 95 provides Quick Viewers that support the following file formats:

.ASC — ASCII files

.BMP — Windows Bitmap Graphics files

.CDR — Corel Draw files

.DOC — Files created by Word for MS-DOS versions 5 and 6; Word for Windows versions 2 and 6; and WordPerfect versions 4.2, 5, 6, and 6.1

.DRW — Micrographix Draw files

.EPS — Encapsulated PostScript files

.GIF — CompuServe GIF files

.INF — Setup files

.INI — Configuration files

.MOD — Files created by Multiplan versions 3, 4.0, and 4.1

.PPT — PowerPoint version 4 files

.PRE — Freelance for Windows files
.RLE — Bitmap files (RunLengthEncoding)
.RTF — Rich Text Format files
.SAM — AMI and AMI PRO files
.TIF — TIFF files
.TXT — Text files
.WB1 — Quattro Pro for Windows spreadsheet files
.WK1 — Lotus 1-2-3 Release 1 and 2 files
.WK3 — Lotus 1-2-3 Release 3 files
.WK4 — Lotus 1-2-3 Release 4 spreadsheet and chart files
.WKS — Lotus 1-2-3 files and Microsoft Works version 3 files
.WMF — Windows Metafiles
.WPD — WordPerfect demo files
.WPS — Works Word Processing files
.WQ1 — Quattro Pro for MS-DOS files
.WQ2 — Quattro Pro version 5 for MS-DOS files
.WRI — Windows 3.x Write files
.XLC — Excel 4 chart files
.XLS — Excel 4 spreadsheet and Excel 5 spreadsheet and chart files

WordPad

WordPad is a 32-bit editor that replaces the Write and Notepad applications provided with Windows 3.1. Although it is not a full-blown word processor, WordPad makes creating simple documents and memos easy for users. The WordPad window is shown in Figure 122.

{ewc msdncd, EWGraphic, ux0t 1 /a "psT.bmp"}

Figure 122. The WordPad application

WordPad was written from scratch as a good example of the user interface style that applications written for Windows 95 should use. It utilizes the new common dialog boxes for opening, saving, and printing files, which makes it easy for users to use long filenames.

As an OLE server and client application, WordPad provides easy integration with other OLE-enabled applications provided with Windows 95 or available from third parties. WordPad uses the same native file format as Microsoft Word for Windows version 6, but also supports the reading and writing of rich text files (RTF) and text files, and the reading of Write (.WRI) files.

WordPad is MAPI-enabled, so it is easily integrated with Microsoft Exchange to allow users to send files over electronic mail, or by fax, directly from within WordPad.

Paint

Like WordPad, Paint is a new 32-bit Windows 95 application. It replaces its Windows 3.1 counterpart, Paintbrush. The Paint window is shown in Figure 123.

{ewc msdncd, EWGraphic, ux0t 2 /a "psT.bmp"}

Figure 123. The Paint application

Paint is an OLE server, allowing the creation of OLE object information that can be embedded or linked into other documents. Paint is also MAPI-enabled, so it is easily integrated with Microsoft Exchange for sending images as e-mail messages or as fax messages.

Using the combination of Paint and WordPad allows novice users to see the interaction of good 32-bit applications written for Windows 95.

Backup

Backup is a new 32-bit application for Windows 95 that makes it easy for users to back up information from their computer to another storage medium, such as floppy disk or tape. As shown in Figure 124, the Backup user interface takes full advantage of the Windows 95 user interface. To make understanding and using the Backup user interface easy, it uses standard controls, such as the tree and list view controls, so that both novices and users familiar with these controls in the Windows Explorer can perform backups quickly and simply.

{ewc msdncd, EWGraphic, ux0t 3 /a "psT.bmp"}

Figure 124. The Backup application, which can back up the local hard disk, floppy disks, or network drives

Backup includes the ability to drag and drop file sets and backup sets onto a link to the Backup application, which can be placed on the desktop to make starting a backup operation a simple "click and drag" procedure. The Backup application can also be run in the usual way, or users can select the Backup option on the Tools tab of the Disk property sheet.

Backup is extremely flexible and allows backing up, restoring, and comparing of files on the following:

n Hard disks

n Network drives

n Floppy disks

n QIC 40, 80, 3010, and 3020 tape drives connected to the primary floppy disk controller

n QIC 40, 80, and 3010 tape drives, manufactured by Colorado Memory Systems, which connect to the parallel port

Backup also supports compression of files to maximize storage space. The on-tape format is the industry-standard QIC-113 format. The Backup application can read tapes created with other backup applications that use this standard, both with and without file compression.

Other standard options include differential and full backup, redirection of files on restore, and always erasing floppies or tapes before a backup. Backup includes a full-system backup/restore feature that allows users to simply select the full-system backup file set (which is automatically created when Backup is first launched), perform the backup, and then restore files later. This feature works even if users

replace their hard disk with a completely different type of hard disk. The Backup application does all the necessary merging of Registry settings and manages the replacement of files in use so that novice users don't have to understand all of the technical details associated with this fairly complex operation.

HyperTerminal

HyperTerminal is a new 32-bit communications application included with Windows 95 that provides asynchronous connectivity to host computers, such as online services, or other PCs. HyperTerminal replaces the Terminal application included in Windows 3.1, and is a completely different application, providing advanced features and functionality not supported by Terminal.

HyperTerminal represents a good communications application written for Windows 95 and is completely integrated with, and takes full advantage of, the new Telephony API and UniModem subsystems built into Windows 95. HyperTerminal uses the new 32-bit communications subsystem and provides error-free data transfer by leveraging the new architecture components in Windows 95, including multithreading and preemptive multitasking. The HyperTerminal user interface reflects the document-centric nature of Windows 95 and focuses on the communications connection that users make, rather than the main application. As with the other applications and utilities included with Windows 95, HyperTerminal uses the new common dialog boxes and supports the use of long filenames.

HyperTerminal makes connecting to remote computers easy for both novices and experienced PC users. Through the use of innovative autosensing technology, complex communications settings, such as baud rate, number of stop bits, parity, and terminal emulation type, are automatically determined by HyperTerminal so that users don't have to deal with these settings at all. The result is a significant usability improvement.

HyperTerminal provides mainstream communications program functionality, including terminal emulation and binary file transfer capability. Terminal emulation support includes emulation of ANSI, TTY, VT52, and VT100 terminals. Binary file transfer protocol support includes Xmodem, Ymodem, Zmodem, and Kermit file transfer protocols. Figure 125 shows HyperTerminal in action.

{ewc msdncd, EWGraphic, ux0t 4 /a "psT.bmp"}

Figure 125. The HyperTerminal application, which makes connecting to host computer services and performing error-free downloading of files easy

The New MS-DOS-Based Editor

Windows 95 includes a new version of the MS-DOS-based text editor, EDIT.COM. Enhancements have been made to the editor provided with MS-DOS to make it

easier for users to work with text files in case the Windows 95 shell cannot for some reason be loaded.

Users of MS-DOS will find the Edit program very familiar while at the same time benefiting from several dramatic improvements. Edit is smaller and faster than its MS-DOS predecessor. It allows users to open up to nine files at the same time, split the screen between two files, and easily copy and paste information between files. Users can also open files as large as 4 MB in size. Edit supports long filenames and allows users to open filenames and navigate through their directory structure just as they can in the Windows 95 UI. Figure 126 shows the new Edit window.

`{ewc msdncd, EWGraphic, ux0t 5 /a "psT.bmp"}`

Figure 126. The MS-DOS Editor, which supports a split screen and the use of long filenames

Disk Utilities

Windows 95 includes a collection of disk utilities designed to keep the system error-free and performing optimally. In addition to the DriveSpace disk compression tool discussed in the Chapter 4, "Basic System Architecture," Windows 95 provides a disk optimizer tool and a disk checking and repair tool.

The Disk Defragmenter optimizes a hard disk by rearranging information so that it is better organized. Rearranging information helps minimize the hard disk area Windows 95 needs to search to load requested information. Unlike the disk defragmenter utility provided with MS-DOS, the Disk Defragmenter is a graphical application that runs under Windows 95.

For convenience, users can defragment their disks in the background while other applications are running on their system. Additionally, users can see details of the defragmentation process and watch its progress, or they can display a minimal status, as shown in Figure 127, that simply shows the status of the defragmentation process.

`{ewc msdncd, EWGraphic, ux0t 6 /a "psT.bmp"}`

Figure 127. The Disk Defragmenter utility, which helps users optimize the performance of their disks

The ScanDisk disk checking and repair tool included with Windows 95 is designed to

help users check the integrity of their disks and to remedy problems that are detected. Unlike the Scandisk utility provided with MS-DOS, ScanDisk is a graphical application that runs under Windows 95. As shown in Figure 128, users can run either a standard scan, in which ScanDisk checks the files on the user's system for errors only, or a thorough scan, in which ScanDisk checks the files for errors and performs a disk surface test to check for additional errors.

As with the Disk Defragmenter, users do not need to exit any running applications to run ScanDisk. As a result, checking the integrity of a disk system and thereby preventing possible catastrophic errors in the future is easy and convenient for users.

{ewc msdncd, EWGraphic, ux0t 7 /a "psT.bmp"}

Figure 128. The ScanDisk utility, which allows users to perform a standard or thorough scan to check the integrity of their files and disk

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 21: What Makes a Great Windows 95 Application?

Although MS-DOS-based and Win16-based applications can run under Windows 95, users benefit from the additional functionality supported by Win32-based applications. This functionality includes the preemptive multitasking architecture of Windows 95 and the increased robustness and protection for running applications. In addition, the following six key contributors make a Windows 95-based application great from the user's perspective:

n

The Win32 Application Programming Interface (API)

n

OLE functionality

n

The WINDOWS 95 USER INTERFACE DESIGN GUIDELINES

n

Support for handling Plug and Play events

n

Support for quickly identifying files

n

Adherence to common setup guidelines for consistent software installation

The next section discusses why these components make these applications great for users.

The Win32 Application Programming Interface

Microsoft supports the use of the Win32 API on three operating system platforms: Windows NT, Windows 95, and Windows 3.1 with Win32s. Each operating system supports a common set of Win32 APIs, allowing applications developed using a single API set to run on multiple platforms. As a result, application developers and corporate developers can learn a single API set and leverage development resources to support a broad base of hardware systems. Users benefit from being able to run the same application on multiple platforms and from increased system reliability under Windows 95 because of the improved robustness and memory protection available to 32-bit applications.

Windows 95 delivers a robust and powerful 32-bit platform on which 32-bit applications are preemptively multitasked, run in private address spaces, and can spawn multiple threads of execution. Preemptive multitasking ensures excellent system responsiveness, allowing users to run multiple applications simultaneously and integrate personal productivity and business-critical applications in a smooth manner. (This model is similar to the one used by Windows NT.) The use of a private address space for each Win32-based application ensures that multiple applications can run simultaneously without interfering with each other or the operating system itself. Windows 95 is able to provide smooth, preemptive multitasking and protected virtual memory because it is based on a redesigned 32-bit protected-mode kernel and a 32-bit protected-mode driver model.

Running 32-bit applications under Windows 95 provides the following improvements from a user perspective:

n

Running multiple applications is smoother because of the preemptive multitasking architecture.

n

Overall system performance is improved because of 32-bit operating system components.

n

Robustness and system reliability are improved because of 32-bit memory protection and separate message queues.

n

Applications have new functionality because of Win32 and other operating system services.

n

File manipulation is easier because of long filename support.

OLE Functionality

Users are buying and using more applications per PC than ever before. In 1992, InfoCorp reported that the average number of applications purchased per desktop running the Windows operating system increased to more than seven programs, up from an average of 3.4 programs for customers using the MS-DOS operating system in 1986. Users who learn one Windows-based application find learning a second or third application easy, and research shows that users cite the ability to move and share information among applications as the most important reason for using Windows-based applications.

People are not only acquiring more applications, but they are also using them together, accessing several applications in order to create compound documents. The mechanism that allows applications to interoperate effectively, and thereby enables users to work more productively, is OLE. Users of OLE applications can create and manage compound documents that seamlessly incorporate data, called OBJECTS, of different formats. Sound clips, spreadsheets, text, and bitmaps are some examples of objects commonly found in compound documents. Each object is created and maintained by its server application, but through the use of OLE, the services of the different server applications are integrated. Users of OLE-enabled applications feel as if they are working with a single application that has all the functionality of each of the server applications. They don't need to be concerned with managing and switching between the various server applications. Instead, they can focus on the compound document they are creating and the task they are performing using OLE-based features.

With OLE, Windows 95 increases the degree of application integration available to any application that takes advantage of the services. Tight integration gives users tangible benefits, allowing them to share data and functionality across applications and combine the data as they please. Because OLE is based on an open industry standard, users can extend their applications with additional third-party products, further expanding their choices and flexibility.

OLE provides the following features to allow users to easily combine information from multiple applications:

n

Cross-application drag and drop. Users can drag and drop graphs, tables, and pictures directly onto slides, worksheets, and documents to mix text, data,

and graphics into compound documents.

n

Visual editing. Users can double-click an object to directly edit it while

remaining in the original document.

[Cross-Application Drag and Drop](#)

Drag and drop is a new, intuitive method of moving data between applications. Until recently, this method was available only for moving information WITHIN applications. The most widely used way of transferring data BETWEEN applications has been to use the Clipboard, but this method involves multiple steps—using the Copy or Cut command, moving to the destination application, and using the Paste command. With the current release of OLE, drag and drop now works between applications. Users simply select an object in one application, drag it to its destination in another application, and drop it into place. Objects can also be dragged over the desktop to system resource icons, such as printers and mailboxes, making the sending, printing, and sharing of files faster and easier.

[Visual Editing](#)

Visual editing makes revising a compound document faster, easier, and more intuitive. For example, Figure 129 shows a Microsoft Excel worksheet embedded as an object in a Word document. When the user double-clicks the worksheet object, the menus and toolbars necessary to interact with the Microsoft Excel worksheet temporarily replace Word's menus and controls. Microsoft Excel, the application that is needed to edit or modify the worksheet, partially "takes over" the Word document window, as shown in Figure 130. The user can then interact with the Microsoft Excel worksheet without switching to a different application or window. (Unlike the first release of the OLE technology, the current release of OLE does not launch users into a separate Excel window to work on the spreadsheet data.) When users move on to work on the word processing portion of the document, the focus returns to Word, and the original Word menus and controls are restored.

{ewc msdncd, EWGraphic, ux0u 0 /a "psU.bmp"}

Figure 129. A Microsoft Excel worksheet object embedded in a Word document

{ewc msdncd, EWGraphic, ux0u 1 /a "psU.bmp"}

Figure 130. Activating the Excel worksheet object, which displays the Excel menus in the Word environment

The advantage of visual editing is even greater when compound documents include large numbers of objects created by different applications, such as Microsoft Excel worksheets and charts, PowerPoint graphics, sound, video clips, and so on. Instead of switching back and forth among different windows to update the objects, users can work in a single document window, which provides one location for editing and otherwise interacting with the data. Visual editing thus offers users a more document-centric approach, putting the primary focus on the creation and manipulation of information rather than on the operation of the environment and its applications.

The Windows 95 User Interface Design Guidelines

As with previous versions of Windows, one of the reasons that Windows 95 applications are easy to learn is the fact that they look and act alike. Microsoft has taken great steps to improve the basic common controls that all applications can share. These controls, which have evolved based on user feedback and extensive usability testing, are among the features described in the WINDOWS 95 USER INTERFACE DESIGN GUIDELINES:

Applications that use the basic controls provide their users with common, improved features, such as being able to create new folders in the Save As dialog box without having to switch to the Windows Explorer or File Manager (see Figure 131).

{ewc msdn cd, EWGraphic, ux0u 2 /a "psU.bmp"}

Figure 131. The Save As common dialog box

The new Printer property sheet, shown in Figure 132, illustrates some of the controls that make accessing features easier for users. At the top of the property sheet are tabs on which different categories of properties are arranged. Clicking any tab displays that category of properties. Figure 132 also shows an example of a spin control, which increments and decrements the number in the Copies box.

{ewc msdn cd, EWGraphic, ux0u 3 /a "psU.bmp"}

Figure 132. The tabbed Printer property sheet

The new Open common dialog box, shown in Figure 133, allows users to see long filenames and navigate around the entire PC or network to look for the files they want to open. As shown in Figure 134, this dialog box uses tree lists to display the hierarchy of the PC's hard disk and the network to which the PC is connected.

{ewc msdn cd, EWGraphic, ux0u 4 /a "psU.bmp"}

Figure 133. The Open common dialog box

{ewc msdncd, EWGraphic, ux0u 5 /a "psU.bmp"}

Figure 134. The tree list in the Open common dialog box

Figure 135 shows another tree list control that makes viewing and accessing hierarchical information easier. This tree list is found in the property sheet for the Device Manager in the Control Panel's System tool. As users expand and collapse the tree, they can see information relevant to their chosen topic.

{ewc msdncd, EWGraphic, ux0u 6 /a "psU.bmp"}

Figure 135. The tree list in the Device Manager property sheet

Applications no longer have to include their own custom slider controls. Figure 136 shows the Mouse property sheet, where the pointer's Size option is controlled by the slider control included in Windows 95.

{ewc msdncd, EWGraphic, ux0u 7 /a "psU.bmp"}

Figure 136. A slider control in the Mouse property sheet

Many new common controls are included in Windows 95, such as toolbars, the status bar, column headings, tabs, sliders, progress indicators, rich-text controls, list views, and tree views. Great Windows 95-based applications will use these controls to make user access to features consistent across applications, thereby making the entire system much easier to use.

Support for Handling Plug and Play Events

Applications that provide Plug and Play event awareness help users by seamlessly adapting to hardware configuration changes. Users reap the following two key benefits:

n

Applications automatically recognize and respond to hardware changes.

Consider this scenario: A user has a mobile PC installed in a docking station and is using an external monitor running at a resolution of 1024x768. When the user undocks the PC, the desktop Control Panel recognizes this action and switches the resolution for the mobile PC to 640x480. When this change occurs, Plug and

Plug-aware applications resize their windows and toolbars accordingly. The user doesn't have to do a thing; it's all automatic.

Here's another scenario: A user is working on a document on a mobile PC. Battery power is running low. The computer sends a message to all the active Plug and Play-aware applications, telling them to save the user's data and shut down because the power is going off in a few minutes.

n

Applications warn users about open network files when hot-undocking

their computers. Consider this scenario: A user has a PCMCIA network card installed in a laptop computer. Before leaving the office, the user switches PCMCIA cards and installs a modem for dial-up network access. With Plug and Play, the user doesn't have to fuss with software configuration. Windows 95 simply knows that the network has been replaced by a modem and passes this information on to a Plug and Play-aware e-mail application. The application then knows that it now needs to use the modem to make connections.

Applications that are Plug and Play-aware provide seamless adaptation to changes in the hardware configuration so that users can focus on their work, not their configuration.

Support for Quickly Identifying Files

As discussed in Chapter 3, "The Windows 95 User Interface," the UI for Windows 95 is much improved. But the UI itself is only part of the benefit for users. Applications that take advantage of the new UI support can offer their users long filenames and direct file viewing. Long filename support means that document names are no longer limited to eight characters; they can now have up to 255 characters, as shown in Figure 137. Instead of 23ISM_JB.DOC, users can name a file STATUS REPORT JULY-23 REGARDING THE ISM PROJECT FOR MY BOSS JIM BERNSTEIN—a title that clearly identifies the document's contents. Applications that support the Quick View capabilities of Windows 95 provide users with a quick and easy way to identify files by viewing them directly from the UI without launching the applications that created them.

```
{ewc msdncd, EWGraphic, ux0u 8 /a "psU.bmp"}
```

Figure 137. Sample long filenames supported by Windows 95

Consistent Setup Guidelines

In the past, users have generally had an easy way to set up new applications, but removing applications from their hard disks was not so simple. Most users of Windows 3.1 eventually ended up with hard disks clogged with files that were never used because they belonged to a deleted application. Because many applications use the same library files, users of Windows 3.1 quite commonly had several copies of a file stored in different places on their hard disks—an inefficient use of precious disk space. Another common problem with Windows 3.1 was that applications put files not only in their own directories, but also in the Windows directory, in the System directory, and even in the root directory, creating a nightmare for users who were trying to keep track of what was where.

The WINDOWS 95 SOFTWARE DEVELOPMENT KIT offers some guidelines to developers for consistent installation locations and uninstall functionality in their applications. Common libraries can be shared by applications, thereby reducing the amount of disk space consumed by duplication. The guidelines also set standards for where developers should put files on the hard disk so as to provide an easy, powerful, and compatible structure for users. Setup programs that follow the guidelines all operate similarly, use consistent naming conventions, and offer the same setup options, thereby reducing the learning curve for users, improving manageability and support for corporations, and increasing the efficiency of remote administration of installed software.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Chapter 22: The Windows 95 Logo Program

Much of the industry is working very hard and very creatively to develop software, hardware, and peripheral products that are not just compatible with Windows 95 but are designed specifically for it. The Windows 95 logo program is intended to help users easily identify these great new products, which exploit the rich capabilities of the operating system. Examples of these new capabilities are Plug and Play and support for 32-bit applications.

Products developed for Windows 95 will bear the Designed for Microsoft Windows 95 logo. This logo makes it easy for customers to choose products that were designed to deliver the benefits and functionality of Windows 95. Customers can mix and match hardware and software products identified by the Designed for Microsoft Windows 95 logo and be assured that the products are fully compatible with Windows 95. They no longer have to figure out which technical details make one product more compelling than another or worry about compatibility. To make computing easier and more powerful, they can simply look for the Designed for Microsoft Windows 95 logo to choose a product built to work synergistically with Windows 95.

The Availability of Windows 95-Based Products

Licensing of the Designed for Microsoft Windows 95 logo will begin in Spring, 1995. Products supporting the new logo are expected to appear on the market within two to three months of the release of Windows 95, although some will appear as soon as Windows 95 is available. The Windows 95 logo program is completely optional for vendors, and products without the logo will continue to be sold as they always have. Products that meet current Windows logo licensing requirements but do not meet the requirements for the Windows 95 logo can continue to use phrases such as FOR WINDOWS or WINDOWS COMPATIBLE to indicate that the product runs on the Windows platform.

`{ewc msdncd, EWGraphic, ux0v 0 /a "psV.bmp"}`

Figure 138. Designed for Microsoft Windows 95 logo

Licensing Criteria for the Windows 95 Logo

To license the Designed for Microsoft Windows 95 logo for use with their products and to be a part of the logo program, vendors of hardware and software products must meet specific criteria. Customers can feel comfortable that products that use the logo offer the following capabilities:

n

Hardware products. For hardware products, including PC systems and

subsystems, the baseline criteria include supporting Plug and Play in Windows 95. Historically, installing new hardware devices has required substantial technical expertise to configure and load hardware and software. Plug and Play provides a mechanism for configuration to happen automatically. Computers, add-on boards, and peripheral devices supporting Plug and Play bring true ease of use to users of Windows 95. The logo is an easy-to-remember way to identify which products support the Plug and Play benefits of the Windows 95 operating system.

n

Software products. Software products must be 32-bit Windows-based

applications, providing better multitasking and application robustness. Applications with the Designed for Microsoft Windows 95 logo will also feature the enhanced Windows 95 UI and provide support for long filenames, automated installation, and uninstall capabilities. Many applications, especially typical productivity applications, will also support OLE component software technology, providing better cross-application interoperability and efficiency through features such as OLE drag and drop.

For More Information

Additional information about the Windows 95 logo program is available through the Microsoft Developer Solutions Phone-Fax Service at (206) 635-2222, and in the WinNews forums on CompuServe, America OnLine, and other electronic services.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Chapter 23: Questions and Answers About Windows 95

Microsoft is continually enhancing the Microsoft Windows product line to deliver easy-to-use yet powerful operating systems that exploit the latest advancements in microcomputer hardware technology. Windows 95 has sparked a great deal of interest and speculation. It is the official name of the Windows “Chicago” project, which is the technology development effort that will deliver the next major release of Windows for the mainstream desktop and portable PC. The purpose of this chapter is to answer the questions customers have asked most often about Windows 95.

Note — The list of questions and answers about Windows 95 is updated on an as-needed basis. To obtain the latest list, connect to an online information service and access the Microsoft WinNews information forum. See the end of this chapter for more information about where to find Microsoft WinNews information.

What Is Windows 95?

n

What is Windows 95? Why change from the name Windows “Chicago” to

Windows 95?

Windows 95 is the official product name of the next major version of Microsoft Windows. Windows “Chicago” was the code name for the development project to produce the successor to Windows 3.x and Windows® for Workgroups 3.x, and this name was used until the official product name was decided and announced.

n

What are the key benefits and features of Windows 95? What features

will Windows 95 not have?

Windows 95 will present a major step forward in functionality on desktop and portable PC platforms by providing a system that is even easier, faster and more powerful to use, and which maintains compatibility with the Windows and MS-DOS® operating system-based applications and hardware peripherals in which

customers have invested.

Ease of use will be improved through the Plug and Play architecture and a more intuitive user interface. With the introduction of the Windows 95 operating system, the engine of Microsoft Windows is being revamped to improve performance and provide smooth multitasking. Windows 95 will be a complete, integrated 32-bit operating system that does not require MS-DOS, although it can run MS-DOS-based applications. It implements the Win32® API and provides pre-emptive multitasking and multiple threads of execution for 32-bit applications. Windows 95 will include reliable and open networking support and high performance, as well as messaging and dial-up network access services.

As the successor to Windows 3.x and Windows for Workgroups 3.x, Windows 95 will meet a number of key requirements. First, Windows 95 will be compatible with applications and device drivers for both MS-DOS and Windows. When a customer upgrades to Windows 95, performance will meet or exceed performance of Windows 3.1, as long as the customer has an 80386DX or higher system with at least 4 MB of RAM. For systems with more than 4 MB of memory, performance will be improved over Windows 3.1. The transition to the new user interface will be easy for current users of Windows, and companies that want to make the transition at their own pace will still be able to run Program Manager and File Manager during the transition period.

Windows 95 will not be processor-independent nor will it support symmetric multiprocessing systems. Windows 95 is also not designed to meet C2-level security specifications. If these features are important to a customer, Windows NT™ is the right operating system to use.

n

What will be the hardware requirements for Windows 95?

Windows 95 will run on Intel (or compatible) 80386DX or higher processors with a minimum of 4MB of memory (8MB recommended). A VGA-compatible video adapter is also required. Windows 95 is expected to use approximately 10-15-MB additional hard disk space as a typical upgrade from Windows 3.x or Windows for Workgroups 3.x, and MS-DOS.

n

How does Windows 95 compare to the Windows 3.1, Windows for

Workgroups and Windows NT operating systems?

Windows 95 is designed to make mainstream PCs easier and more powerful. It will be the right choice for customers who want to run business and personal productivity applications and for use on home computers. Windows NT is designed for the most demanding business uses such as development or advanced engineering and financial applications. Windows NT is the right choice for customers who need the highest level of protection for their data and applications. Windows NT is also the right choice for those who need scalability to multiprocessing and RISC systems.

n

Why is Microsoft changing the numbering system for Windows?

Until recently, version numbers have served us well. Version numbers helped inform customers that new versions were available and gave some sense for the significance of the improvements. However, our customer base has broadened to include less technical users, and our research indicates that even our most sophisticated customers find our current version-numbering scheme confusing. For example, Windows 3.1 provided far more new capabilities than a typical 0.1 release, and Windows for Workgroups 3.11 introduced dramatically more than the usual .01 release. We must make it easier for customers to understand which version of our software they are using, so they know when to consider upgrading to the next release.

n

Does this numbering system mean Microsoft will release a new version of

Windows every year?

No. It means that the version numbers will help give users a sense for the “model year” of their software, in the same way that customers have a sense of the model year of their cars today.

Why Will I Want Windows 95?

n

Why will individual customers want to upgrade to Windows 95?

The sheer quantity of the improvements included in Windows 95 represents a great value for customers. Top on the list of requested improvements was an easier way to work with the PC. As a result, a new user interface was designed in Windows 95 that will help make computing even easier for both less experienced users and experienced users who want greater efficiency and flexibility.

Long file name support is one of many usability improvements in Windows 95. Improving ease of use goes beyond fixing problems with Windows — it encompasses the hardware, applications and network as well. Plug and Play will make hardware setup automatic, and built-in networking will make starting a new network or connecting to an existing network server such as Novell® NetWare® and Windows NT Server just as easy.

Customers also want greater efficiency and power and to get their work done faster. They want to run more than one application or task at the same time. They want to use their computers to access files, electronic mail, and public-information networks from any location — at work, at home, or on the road. They also want better multimedia, whether for playing MS-DOS based games or for teleconferencing using TV-quality video resolution. The following are highlights of capabilities in Windows 95 that address these requests:

n

Pre-emptive multitasking. Windows 95 can perform multitasking

smoothly and responsively for 32-bit applications.

n

Scalable performance.—The performance improvements that Windows

95 provides over Windows 3.1 increase as the amount of RAM increase, due to the high-performance 32-bit architecture of Windows 95.

n

Support for 32-bit applications.—Windows 95 supports the Win32 API,

which means customers can look forward to a new generation of easier, faster and more reliable applications.

n

Increased reliability.—Windows 95 increases protection for running

existing MS-DOS— and Windows-based applications and provides the highest level of protection for new 32-bit applications for Windows. As a result, an errant application will be much less likely to disable other applications or the system.

n

Faster printing.—Windows 95 features a new 32-bit printing subsystem

that reduces the time spent waiting for print jobs to finish and improves system response when jobs are printing in the background.

n

Better multimedia support.— Just as Windows 3.1 made sound a part of

the system, Windows 95 now includes support for video playback. The video system and CD-ROM file system will provide high-quality output for multimedia applications.

n

More memory for MS-DOS-based applications.— Windows 95's use of

protected-mode drivers means customers will have more than 600K free conventional memory in each MS-DOS session, even when they are connected to the network and using a CD-ROM drive and a mouse.

n

Microsoft Exchange client.— Windows 95 includes the Microsoft

Exchange client, a universal client that retrieves messages into one universal inbox from many kinds of systems, including Microsoft Mail, faxes, Internet Mail, The Microsoft Network, CompuServe® Mail, and so on.

n

Why will companies want to upgrade to Windows 95?

Companies will want to move to Windows 95 because it will help reduce their PC support burden, help increase their control over the desktop, and help increase the productivity of their end users. Numerous studies have shown that

as much as 80 percent of the cost of owning a PC over the long term are the costs associated with support, including installing, configuring and managing the PC, and training the PC user. The Gartner Group has concluded that

Windows 95 will likely lead to significantly lower total cost of ownership compared to MS-DOS and Windows 3.1 (PC Research Note: Personal Computing Costs: A Windows 95 Model, Aug. 15, 1994). Their model estimates the support savings will be \$1,180 per user per year. Over the five-year ownership period assumed in the analysis, this translates into savings of nearly \$6,000 per user.

Windows 95 includes numerous features designed to reduce the costs of supporting PCs and PC users, including the following:

n

A simpler, more intuitive user interface that can reduce training

requirements for novice users and enable experienced users to learn new tasks with less help. The start button, taskbar, Windows Explorer, wizards, a new help system and more will make Windows 95 easy to learn and make functionality easy to discover.

n

Built-in networking support that is easier to set up and configure and is

faster and more reliable to use. Whether you're running NetWare or Microsoft networks using NetBEUI, IPX/SPX or TCP/IP protocols, and using NDIS or ODI drivers, Windows 95 has integrated support for your network client, protocol and driver. Additional networks are added easily. Windows 95 includes 32-bit clients for both NetWare and Microsoft networks that are fast, reliable, and require no conventional memory. A Windows 95-based PC can have multiple network clients and transport protocols running simultaneously for connecting heterogeneous systems.

n

Plug and Play device installation to automate the difficult process of

adding devices to a PC. Windows 95 supports the industry-standard Plug and Play specification to enable automatic installation and configuration of add-on devices. If you install Windows 95 on the system you have today and purchase a Plug and Play add-on device, you will be able to install that device by just plugging it in and turning on your system. Plug and Play takes care of the messy details of installation and configuration. Plug and Play also enables innovative new system designs that support such capabilities as hot-docking and undocking.

n

System-management capabilities that will simplify remote

administration and enable new system-management applications. Windows 95 features an infrastructure for the management of PCs that leverages a hierarchical database of system-configuration information, called the Registry. The Registry holds all the pertinent information about the system — hardware, software, user preferences and privileges — and provides access to its contents over the network through a variety of industry-standard interfaces, including SNMP, DMI, and Remote Procedure Call. This infrastructure will simplify many administrative tasks by including tools for remote configuration of the desktop and will lead to a new generation of sophisticated system-management applications for managing the desktop, performing hardware and software inventorying, and supporting software distribution.

n

System policies that enable an administrator to control a desktop

configuration. Windows 95 supports policies, which are settings an-

administrator configures to define the operations users can access on their PCs. Policies also can be used to define the appearance of the desktop. For example, the administrator can set a policy to disable the MS-DOS prompt and the “Run” commands, to prevent users from arbitrarily running applications.

n

Support for roving users.—Windows 95 can present different

configurations, depending on who has logged into the PC. This option allows users to log into different machines on the network and see their personal configurations.

n

Built-in agents for automating backup of desktop systems.—Windows

95 includes the software required to backup a desktop system using a server-based backup system. The backup agents included with Windows 95 work with the most popular server-based systems.

In addition to reducing support costs and increasing control over the desktop, Windows 95 will help make end users more productive. In usability test studies, users of Windows 3.1 are able to perform a series of typical tasks that they perform today in 25 percent less time using Windows 95. These tests did not take into account many of the tasks that users would like to perform but which are too difficult today, such as installing a CD-ROM drive and sound card or retrieving a file from the desktop system while using the computer at home or traveling on business. By making these capabilities much more accessible, Windows 95 will enable customers to be even more productive using PCs.

n

Won't it be expensive to put Windows 95 on all the PCs in a company?

Windows 95 has been designed to provide a safe and smooth transition to the new operating system. Windows 95 will work on the hardware and software you already have through support for existing device drivers and applications for MS-DOS and Windows. On mainstream systems — those with at least 4 MB of RAM and an 80386DX processor — Windows 95 will perform as fast or faster than Windows 3.1 if all you do is upgrade the operating system. The installation program will detect and maintain current system settings and enable automated installation through a variety of techniques, including login scripts and software distribution applications. Users of Windows 3.1 will be productive quickly, as confirmed by the thorough usability testing Microsoft conducted with users of Windows 3.1 and the learning aids that will be included with the product. After a 15-minute “play period” and with the help of a computer-based tutorial, users of Windows 3.1 participating in tests have been found to be as productive using Windows 95 as they are using Windows 3.1 the first time they perform a set of typical tasks. By the time it is commercially available, Windows 95 will have been subjected to hundreds of thousands of hours of rigorous internal testing and will have undergone the most extensive beta testing in history.

The savings achieved by using Windows 95 will outweigh the costs of making the migration. The Gartner Group has estimated that migration costs can be recouped in three to six months. Good planning and deployment techniques can help keep these costs to a minimum.

n

Given the recent delays in the availability date, should companies delay

their efforts to evaluate, test, and deploy Windows 95?

Not at all. The delay actually gives corporations a good opportunity to begin their planning now, as the Windows Preview Program will make Windows 95 beta 3 available during or shortly after the first quarter of 1995. Microsoft is working hard to provide tools and assistance for corporations to do thorough migration planning—these tools include TrainCast, where a series of free training programs covering Windows 95 migration will be broadcast to VARs, support professionals, corporate helpdesk personnel, OEMs, Authorized Training Education Centers and others interested in in-depth training; and the Windows 95 Resource Kit, which is the essential source of technical information and tools for MIS managers and network administrators. Thorough advance planning can save time and money as indicated in a recent Gartner Group migration analysis. The Gartner Group believes the cost of migrating to Windows 95 can be as low as \$200 per desktop by carefully planning how to train end users and support staff, how to automate the actual deployment and how to take advantage of the new capabilities built in to Windows 95. The best starting point for IS managers

interested in learning more is to attend the upcoming Windows 95 TrainCast. Call 1-800-597-3300 for more details on TrainCast.

Availability and Packaging Plans

n

When will Windows 95 be available?

Windows 95 is scheduled to ship in August 1995. Microsoft's commitment is to ship a great product. The intense testing period that the product is going through will help ensure a great release based on feedback from tens of thousands of beta testers. A mainstream operating system product must install smoothly and compatibility must be there. With tens of millions of potential upgraders, the complexity of assuring this is enormous. Why did we delay the release until August? Every constituent we have talked with has said that whatever we do we shouldn't ship too soon, so we're taking the extra time we believe we need to get it right.

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What different packages will you have for Windows 95?

Packaging decisions will be made in the final stages of the development cycle.

n

I understand there is a new logo for Windows 95. What will it mean to me?

The new logo, which looks quite similar to the current logo, featuring the same Windows flag, will be used optionally by vendors to identify their hardware, software and peripheral products that take advantage of new capabilities in Windows 95. The logo will let customers know at a glance, for example, which

CD-ROM drives are Plug and Play-enabled and which applications are 32-bit.

Vendors can obtain detailed logo requirements by accessing the Microsoft Developer Solutions Phone-Fax service at (206) 635-2222 and requesting document 130.

n

I hear rumors that Microsoft is working on versions of Windows 95 for non-

Intel microprocessors. Is this true?

No, Microsoft is not working on versions of Windows 95 for non-Intel® microprocessors. Windows NT is Microsoft's portable operating system, and it's already available on high-end Intel, MIPS®, Alpha AXP™, PowerPC™ and Clipper™ computers.

n

What will happen to MS-DOS?

Microsoft will continue to enhance MS-DOS as long as customers require it. Future versions will be derived from the protected-mode technology developed in the Windows 95 project.

n

Will MS-DOS 6.22, Windows 3.11, and Windows for Workgroups 3.11 still

be available when Windows 95 ships?

Yes. These products will still be available from the same channels you presently obtain them from. We will continue to make these products available as customer demand dictates.

User Interface

n

How will the new user interface in Windows 95 make the PC easier to

use?

The goal for the user interface for future versions of Windows is to make computers easy for all people to use. The user interface design in Windows 95 will achieve these goals through the most extensive usability testing effort ever (thousands of hours of laboratory testing, with hundreds of users of all levels of experience) and through feedback from various sources, including testing at customer sites, reviews with experts on training in Windows, audits by user-interface consultants, feedback from focus groups, and analysis of product-support calls.

We expect both inexperienced and experienced users will find that the changes being made to the user interface in Windows 95 make it even easier to learn and use. The system taskbar will make all the functions most users need accessible with a single click of a button. The taskbar will show all open windows and will make it much easier to switch between windows by just clicking on a button representing that window. Instead of mastering different kinds of tools (Program Manager, File Manager, Print Manager and Control Panel) to work with different resources on their computers, users of Windows 95 will be able to browse for and access all resources in a consistent fashion with a single tool. All resources in the system will have property sheets, which present tabbed notebook-style interface settings that can be directly changed; a new integrated Help system makes it easy and fast to get help at all times.

n

Won't a new user interface mean a lot of retraining for current users of

Windows?

The Windows 95 user interface is designed to make experienced users of Windows 3.x productive immediately, and usability testing has found this to be the case. After a few iterations of working with the Windows 95 environment, users of Windows 3.1 are able to complete common tasks faster with Windows 95. With subtle refinements in the user interface and the addition of migration-training aids during the continued testing process, productivity can be expected

to improve even more.

Windows 95 will enable corporate customers and individuals who want to move gradually to the new user interface to continue running Program Manager and File Manager while they become familiar with the new user interface features.

Architecture

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Your performance goals sound very ambitious, considering all the

functionality you're adding to Windows 95. How will you achieve those goals?

The stated performance goal of Windows 95 is that when a customer upgrades to Windows 95, performance will meet or exceed performance of Windows 3.1, as long as the customer has an 80386DX or higher system with at least 4 MB of RAM. (For systems with more memory, performance will be improved over Windows 3.1.) Windows 95 will meet this performance goal by implementing new technologies to better optimize the use of memory on low-end system configurations. The networking, disk, CD-ROM and paging caches will be fully integrated to scale better as more memory is added to the system. Protected-mode device drivers will be dynamically loadable to ensure that only the drivers that are immediately needed are consuming memory. Great attention will be paid to effective tuning, including hand-tuning source code.

n

I've heard Windows 95 described as a 32-bit operating system, yet I've

also heard that portions of Windows 95 are implemented with 16-bit code. Are both these statements correct?

Windows 95 is a 32-bit, pre-emptive multitasking operating system that implements some 16-bit code to provide compatibility with existing applications. Windows 95 deploys 32-bit code wherever it significantly improves performance without sacrificing compatibility. It retains existing 16-bit code where it is required to maintain compatibility or where 32-bit code would increase memory requirements without significantly improving performance. All of the I/O subsystems and device drivers (such as networking and file systems) in

Windows 95 are fully 32-bit, as are all the memory management and scheduling components. Many functions provided by the Graphics Device Interface (GDI) have been moved to 32-bit code, including the spooler and printing subsystem, the TrueType® font rasterizer, and key drawing operations. Windows 95 includes a 32-bit implementation of OLE. Much of the window management code (user) remains 16-bit to help ensure application compatibility.

n

Does Windows 95 improve limits on system resources?

Yes. Windows 95 improves system resource limits dramatically while maintaining compatibility with existing Windows-based applications. This means that users will not only be able to run more applications than Windows 3.1 or Windows for Workgroups 3.11, but will also be able to create more complex documents.

Plug and Play

n

What is Plug and Play? What benefits does Plug and Play provide?

Plug and Play is a technology jointly developed by PC product vendors that will dramatically improve the integration of PC hardware and software. Windows 95 is a key enabling technology for Plug and Play. Plug and Play is built into all levels of Windows 95 and covers both common desktop and laptop devices, such as monitors, printers, video cards, sound cards, CD-ROM drives, SCSI adapters, modems and PCMCIA devices.

With Windows 95, a user can easily install or connect Plug and Play devices to the system, letting the system automatically allocate hardware resources with no user intervention. For example, by simply plugging in a CD-ROM and sound card, a desktop PC can be easily turned into a multimedia playback system. The user simply plugs in the components, turns on the PC, and “plays” a video clip.

Windows 95 also enables new Plug and Play system designs that can be dynamically reconfigured. For example, a Windows 95 Plug and Play laptop can

be removed from its docking station while still running and taken to a meeting; the system automatically reconfigures to work with a lower-resolution display and adjusts for the absence of the network card and large disk drive.

n

Will Plug and Play devices work with my current system, or will I need a

new system? What benefits will I receive when I purchase a Plug and Play device with my current system after I have installed Windows 95?

Windows 95 and Plug and Play devices will provide complete backward compatibility to work with systems that were not designed according to the Plug and Play specification. And when you purchase a Plug and Play device for a non-Plug and Play PC running Windows 95, you still benefit from the automatic installation features of Plug and Play add-on devices.

Application Support

n

What support does Windows 95 have for applications?

Windows 95 supports applications for MS-DOS and 16-bit Windows-based applications supported by Windows 3.x as well as a new generation of 32-bit applications. It provides this support through the Win32 API, which is also available in Windows NT. This new generation of 32-bit applications will provide benefits such as greater robustness, smoother multitasking, long filename support, a new look and feel, and threads, to name a few.

n

When will applications that exploit Windows 95 be available?

Applications written for Windows 3.1 and Windows NT that follow guidelines

provided by Microsoft will be able to run on Windows 95. There are hundreds of 32-bit Windows-based applications available today for Windows NT, and more are released every day. In addition, leading software vendors have already begun developing 32-bit applications for Windows 95, and we expect many to ship within 90 days of the ship date of Windows 95.

Networking

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Will I need new networking software to connect Windows 95 to my

network server?

No. Windows 95 will continue to run existing real-mode networking components while enhancing the 32-bit protected-mode networking components first delivered with Windows for Workgroups.

n

What improvements will the networking support in Windows 95 offer over

the support in Windows for Workgroups 3.11?

In addition to being backward compatible with today's network clients, Windows 95 will enhance the open and flexible, high-performance 32-bit networking architecture offered today with Windows for Workgroups 3.11 that enables customers to mix and match networking components. Windows 95 includes fast 32-bit, native clients for both NetWare and Windows NT Server networks; supports NDIS 2.x, 3.x and ODI drivers; and provides 32-bit NetBEUI, IPX/SPX and TCP/IP protocols. In addition, the network architecture in Windows 95 will make it possible for users to connect simultaneously to multiple networks using multiple protocols.

n

Will there be a Windows 95 server product?

Windows 95 will not be provided in a separate server product. Windows NT Server is the Microsoft product to use for production servers. Windows 95 does improve upon the peer-server capabilities offered in Windows for Workgroups by offering additional features for remote installation, control and administration. These features will make Windows 95 an even better product for an easy-to-use file-sharing and print-sharing LAN that is ideally suited for a small business, small department or remote office.

n

Can Windows 95 connect to the Internet?

Yes. Windows 95 includes the networking support you need to connect to the Internet. It includes a fast, robust, 32-bit TCP/IP protocol stack (TCP/IP is the language used by the Internet) as well as PPP or "dial-in" support. Windows 95 supports the large number of tools used to connect to the Internet, such as Mosaic, WinWAIS and WinGopher, through the Windows Sockets programming interface. Windows 95 also includes standard Internet utility support, such as telnet and ftp. In addition, the Microsoft Exchange mail client included with Windows 95 provides a mail driver that supports Internet electronic mail standards, including SMTP and POP, to make it easy to send and receive mail over the Internet.

Systems Management

n

What specific desktop-management features will Windows 95 enable?

The Windows 95 operating system can be set up from a network server and can be configured at the desktop to run locally or across the network. In each case, the administrator can establish a specific configuration for the installation, controlling which features are installed and which features can be accessed or altered by the end user.

Windows 95 supports policies, which are settings an administrator configures to define what applications or services users or groups of users can access using their PCs. Using policies, for example, the administrator can disable the MS-DOS prompt and the "Run" commands to prevent users from arbitrarily running applications and can disable file and print sharing.

To enable users to rove and use any system on the network, Windows 95 will provide user profiles. These profiles will be centrally stored, accessed when the user logs in to a Windows 95 system, and used to install the appropriate configuration and set the appropriate policies for that user. Windows 95 also enhances the security provided by Windows for Workgroups to include user-level security.

Windows 95 also includes key desktop agents for popular server-based backup programs as well as SNMP and DMI. Finally, hardware installation and configuration will be made much easier and less costly with the implementation of the Plug and Play architecture in devices and systems. The Windows Registry will provide data about hardware resources. The data can be accessed by third-party vendors to provide inventory management solutions.

Messaging and Mail

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What is Microsoft Exchange?

Microsoft Exchange is a universal information client built into the Windows 95 user interface that can read and send electronic mail from different e-mail systems, including LAN-based systems such as Microsoft Mail, Internet mail, or mail on remote on-line system services such as CompuServe or The Microsoft Network, and can send and receive faxes and other remote messages. Microsoft Exchange in Windows 95 also includes Microsoft At Work fax software for sending and receiving electronic fax messages. Microsoft Exchange also provides an effective way to organize, sort, categorize and filter messages.

The Microsoft Network - Online Service

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What is The Microsoft Network?

The Microsoft network is a new on-line service that Microsoft is developing to help bring the rapidly expanding world of electronic information and communication to mainstream PC users. The Microsoft Network (MSN) will bring all Windows 95 customers affordable and easy-to-use access to electronic mail, bulletin boards, chat rooms, file libraries, and Internet newsgroups. Microsoft Windows 95 customers worldwide will be able to access MSN with a local phone call. The Microsoft Network will offer a wide range of online information and services, and in particular Microsoft customers will find MSN the single best place to go to get information and support for Microsoft products. The MSN client's tight integration with Windows 95 allows customers already familiar with Windows 95 to leverage their learning, and feel comfortable on-line immediately.

n

Why is Microsoft getting into the online services business with The

Microsoft Network?

Microsoft has long believed in "Information At Your Fingertips," and we believe that the Microsoft Network represents a major opportunity for us to deliver on that vision. Enabling PC users to easily communicate and access information is the next great opportunity in our industry. The online service business has great promise to provide consumers with that easy communication and information access, but it's still in the infancy stage and many factors must come together to make it a mainstream phenomena. Online services must offer a more compelling multimedia-rich set of publications, shopping services, games, etc., that will both attract and retain a large audience. This will require investments by both the providers of information and services, and new tools and infrastructure investments by the online service companies. Microsoft hopes to help expand this market by enabling the providers of information and services with better technology and tools, while motivating them with a more attractive business model.

n

What improvements will Windows 95 offer for people who use a mobile or remote computer?

Windows 95 is designed to make using PCs “away from the desk” easier and more powerful for everyone. Any notebook or portable computer user will benefit from improved support in three areas: remote network access (or “dial-up networking”), hardware support, and support for the mobile work environment.

n

“Dial-Up Networking” provides access to information when you’re on the road. Windows 95 includes a dial-up network client that allows a mobile or remote computer to dial into popular remote networking server products, such as Shiva® Netmodem, NetWare Connect and Windows NT Remote Access Services, using the same network protocols and advanced security features provided for desktop PCs.

n

Windows 95 includes new support for the dynamic nature of mobile computer hardware. The Plug and Play implementation in Windows 95 will support inserting, configuring and removing devices such as PCMCIA cards while the operating system is running. Windows 95 will also support automatic reconfiguration of portable computers when they are inserted or removed from docking stations or port replicators.

n

Windows 95 includes features optimized for mobile computer users.—

Mobile computer users face special problems because of their work environment. Electronic mail and Fax work differently on a mobile computer than they do on a desktop system. Mobile computer users must contend with limited resources, such as disk space or battery power. And many mobile computer users exchange files with a second, desktop, PC or file server.

—The Microsoft Exchange client (see above) includes features such as Remote Mail and Microsoft At Work™ Fax that make staying in touch while on the road easy and reliable.

—An enhanced version of Advanced Power Management (APM) will further extend battery life. File Viewers for the top 20 or 30 application file formats, plus support for integrated disk compression, reduce demands on hard disk space. Deferred Printing support enables storage of print jobs while on the road, for eventual printing back in the office.

—Finally, Windows 95 will provide file-synchronization services and a direct-cable-connection file-transfer utility to simplify coexistence with other computers.

n

How are the remote-client capabilities in Windows 95 different from those

in Windows for Workgroups 3.11?

—Clients running Windows for Workgroups could dial into Windows NT Server or Windows for Workgroups-based servers only. Windows 95 supports a much more diverse remote-access environment; it can connect to the majority of the dial-in systems in common use today. Windows 95 dial-up networking has been extensively tested with Windows NT Server and other PCs running Windows 95, NetWare servers running NetWare Connect, popular network devices such as the Shiva Netmodem, and many Internet service providers. Windows 95 includes built-in protocol support for Windows 3.1 RAS, PPP (Point-to-Point Protocol, the emerging standard for dial-up networking and Internet access), SLIP, and NetWare connect. All dial-up networking and communications services are fully

32-bit, in order to increase performance and reliability.

n

Does Windows 95 offer any improvements in ways to roll out and support remote network access in an organization?

Yes. Windows 95 greatly simplifies remote network access. System administrators can supply end users with pre-configured network shortcuts and pre-defined connections to remote networks. Double-clicking on a shortcut will dial the phone, log users into the network, and open the desired network resource (such as a file folder on a remote server). Alternatively, a “New Connection Wizard” steps users through the process of setting up a remote access client or server. Users no longer need to know how to set up a modem, establish a connections, or operate a remote communications package.

For small organizations, a Windows 95 PC can operate as a dial-in server. A Wizard assists with the setup process. Dial in server functionality can be disabled, if desired.

n

Has Windows 95 improved support for PCMCIA cards and other hardware like docking stations?

Yes. Windows 95 offers vastly improved support for PCMCIA cards and other mobile computing devices. PCMCIA is built into the core of Windows 95. The operating system will automatically load the necessary drivers for each card as it is inserted, and unload the drivers once the card is ejected. No real-mode card or socket drivers are required. When a new card is first inserted, Windows 95 will detect the card and install the appropriate drivers automatically.

If you use a docking station or port replicator, all pertinent system settings, including video resolution, keyboard, pointing device, and network, are automatically re-configured “on the fly” when your computer is inserted or removed from the dock or port replicator. On systems featuring a Plug-and-Play BIOS, no reboot is required. On non-Plug-and-Play machines from the leading manufacturers, multiple configurations are supported automatically when the system is restarted.

n

I use both a desktop PC and a portable PC. What support does

Windows 95 offer for this environment?

Windows 95 introduces the Briefcase, an easy-to-use interface for keeping multiple versions of files “in sync.” For example, if you copy several files from your desktop PC to your laptop, the Briefcase automates the process of comparing your (perhaps edited) files to the original versions, and performing any needed copy operations to keep all the files up to date. The Briefcase also enables applications to provide “reconciliation handlers” that merge documents together when both the original and the copy have changed.

To simplify the process of exchanging files between two machines, Windows 95 implements “Direct Cable Connection.” Direct Cable Connection provides a simple, fast, network-like connection (including security) between two machines, using a parallel or serial cable.

For More Information

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How can I obtain the latest information directly from Microsoft about

Windows 95?

To help keep you informed of the latest information on Windows, Microsoft has created the WinNews information forum, which serves as an easily accessible electronic distribution point for new white papers, press releases and other pertinent documentation. If you have a modem or access to the Internet, you can always get up to the minute information on Windows 95 direct from Microsoft on WinNews. Use the following electronic addresses to access further information:

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To subscribe to Microsoft's WINNEWS Electronic Newsletter, send e-mail to enews@microsoft.nwnet.com with the words SUBSCRIBE WINNEWS as the only text of your message.

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Overview of MS Windows 95

As the successor to Microsoft® MS-DOS®, Windows™ 3.1 and Windows™ for Workgroups 3.11, Windows 95 (a.k.a. Chicago) is the next major release of the standard operating system for the desktop and portable PC. There is something for everyone, whether it's a more intuitive way to work, new capabilities like "surfing the information highway," or better support for managing a 1,000 PC installation site.

The mission for Windows 95 is to go beyond making PCs easier to make them truly usable. This means a more intuitive and automatic PC that also integrates the latest technologies and offers superior responsiveness and stability. For end-users, this means an even easier, faster, and more powerful PC that is compatible with today's existing software and hardware. Windows 95 aims to make the upgrade and transition easy, without pain and without loss of performance or capability.

Windows 3.1 moved the PC platform forward by making PCs easier to use. Yet today's customer problems highlight the need to significantly further the ease, power, and overall usefulness of the PC. Windows 95 goes beyond simple ease of use. It not only enables a new range of people to become PC users by making the PC dramatically easier to use, but also enables a wide new range of uses for the PC for existing users as follows:

n

Windows 95 makes PCs even easier to use. Windows 3.1 put a friendly

interface on top of MS-DOS to make common PC tasks easier. In Windows 95, the goal is to make those tasks more intuitive, or where possible, automatic. The addition and configuration of new hardware devices on the PC is one example. Windows 95 automatically loads the appropriate drivers, sets IRQs, and notifies applications of the new capabilities of the hardware device without any action by the user. A redesigned user interface, highlighted by the Windows Taskbar, makes computing more automatic for novices. Windows 95 usability tests show a ten-fold improvement over Windows 3.1 in time to complete certain common tasks such as starting an application—and makes the power of the PC more discoverable for intermediate and advanced users.

n

Windows 95 is a faster and more powerful operating system. —Ease on

the surface requires power and speed at the core, and Windows 95's modern, 32-bit architecture meets these requirements. — Freed from the limitations of MS-DOS, Windows 95 preemptively multitasks for better PC responsiveness — so users will no longer have to wait while the system copies files, for example — and also delivers increased robustness and protection for applications. Windows 95 also provides the foundation for a new generation of easier, more powerful multi-threaded 32-bit applications. — And most importantly, Windows 95 delivers this power and robustness on today's average PC platform while scaling well to take advantage of additional memory and CPU cycles.

n

Windows 95 integrates network connectivity and manageability. —Windows

3.1 gave end-users the power to better use their PCs, but it did not make the same strides for MIS organizations. — Windows 95 addresses this deficiency by providing a system architecture that makes basic network connectivity easy by integrating high performance, 32-bit client support into the operating system — including a 32-bit client for Novell® NetWare® — and goes beyond simple connectivity by enabling the central management and control of the PC. — Windows 95's user profiles, policies, and ability to pass through server-based security make it much easier for MIS organizations to administer and support large numbers of PCs within the corporation.

Windows 95 is more than the next generation of Windows — it is a catalyst that will move the PC industry to a higher level of usefulness for end-users. — We expect the release of Windows 95 to spawn not only a new generation of PCs and peripherals that support Plug and Play, but a new generation of powerful, 32-bit Windows-based applications as well.

[Even Easier](#)

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New Windows 95 User Interface Makes Using the PC Even Easier with the Task

Bar, Start Button, and Explorer

Windows 95 makes using your PC even easier by featuring a new, intuitive, user interface that greatly enhances the learnability, usability, and efficiency for users of all levels of expertise; support for using long filenames, eliminating the difficulties posed by using cryptic 8.3 filenames; and simpler configuration of hardware devices through Plug and Play. Specifically for MIS users, Windows 95 features built-in integrated networking making it easy to connect to Microsoft Windows Networks such as Windows NT™ Server, and Novell NetWare, as well as other third-party networks; improved administration and manageability for PCs on the network running Windows 95 through mechanisms such as the centralized Registry, and user profiles allowing multiple users to use a single PC while preserving user preferences, as well as support for users to move to different PCs on the network and maintain their preferences; and the inclusion of backup agents making it easy to back up individual PCs on the network from a central location.

The new user interface in Windows 95 is the result of thousands of hours of usability testing, and careful analysis of the types of activities that users perform. Windows 95 features a “desktop” on which users may place applications, documents, or shortcuts (links to information or resources), and which also serves as the location where users can access information on their computer (My Computer) or on the network (Network Neighborhood). The Info Center serves as a central location for storing electronic mail messages, sending and receiving Fax messages, and organizing other types of information. The Task Bar is the focal point of the user interface and provides easy access to Windows 95 operations through the Start button, or to easily switch between tasks that are running in the system. The Start Button on the Task Bar provides quick access to common operations such as starting applications or opening documents, changing settings on the computer, or finding information. The combination of the Task Bar and Start button operations makes it easy for both new users and experienced users to quickly and easily complete their tasks.

Faster and More Powerful

Another major area of concern for end-users is improving the efficiency and power with which they use Windows. Users care about getting their work done faster. They'd like to run more than one application or computer process at a time so they spend less time waiting on their PC. They'd like to be more effective without sacrificing system stability or performance. And perhaps most important of all, they'd like to escape the feeling that they take advantage of only a small fraction of what their PC can do. MIS users also want better integration between networking software and the operating system, and improved connectivity.

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Windows 95 Delivers 32-bit Multitasking Power to Perform Multiple Operations

Concurrently

Windows 95 delivers benefits from new 32-bit subsystem components and operating system functionality to deliver improved performance, robustness, and functionality over Windows 3.1 and Windows for Workgroups 3.11. Under the hood, Windows 95 features a 32-bit preemptive operating system kernel providing true preemptive multitasking for 32-bit operating system components and 32-bit Windows-based applications; scalable system performance due to a new 32-bit dynamic disk and network cache; 32-bit subsystem components for areas such as disk I/O, networking, printing, communications, and multimedia—delivering improved performance and system responsiveness; more memory for running MS-DOS-based applications due to more functionality provided as Windows 32-bit device drivers, rather than through MS-DOS-based device drivers or TSRs. Support for a new generation of applications is provided through the Win32® application programming interface (API) that is shared in common with Windows NT, allowing a single application to run on a scalable computing platform to offer flexibility based on computing needs.

Compatible

If an operating system upgrade requires new software, more memory, or new hardware, then the upgrade's cost is far higher than just its purchase price. Unfortunately, users usually need to wait a substantial amount of time—usually until their next PC purchase—before benefiting from the latest technology. MIS organizations have had similar problems as those of end users in terms of the cost to upgrade to a new operating system. Compatibility with today's hardware and software is even more important, not only because of the larger scale of the upgrade, but because of compatibility problems with having differing operating system platforms within the organization. Having to support more than one platform only multiplies the problems MIS organizations face. MIS professionals worry about re-training users and about the need to migrate users to a new platform quickly, easily, and in an orderly way.

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Windows 95 Provides Compatibility with Existing Device Drivers and Applications, While Supporting a New Generation of Applications

Windows 95 adds support for a new generation of applications and system services, while providing compatibility for drivers, software, and hardware that customers are using today. Compatibility is maintained for MS-DOS-based device drivers, MS-DOS-based applications, Windows-based device drivers, and Windows-based applications—this allows users to continue to use their existing software after installing Windows 95. In addition, users can expect the same or better performance from Windows 95 on a base computer platform of an Intel 80386DX with 4MB of RAM—Windows 95 requires no additional RAM to maintain

performance. — Windows 95 even adds functionality for running MS-DOS-based applications including a toolbar and the ability to run hardware-intensive applications like games that may not have run under Windows 3.1. — MIS users will find that Windows 95 maintains compatibility with existing Windows 3.1-compatible networking software, and makes migration easy through the inclusion of Windows 3.1 Program Manager and File Manager to allow staging of training and deployment.

[Where can I find more information about Windows 95 \(a.k.a. Chicago\)?](#)

Microsoft has established a number of easily accessible electronic distribution points for new whitepapers, press releases and other product-related information. — Use the following electronic addresses to access further information:

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N N E W S

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Supporting Microsoft Windows 95 M7 Course Datasheet

 Course No. 385 Five days

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This course is intended for system engineers and other support professionals who are responsible for installing, configuring, maintaining, and troubleshooting Windows 95.

This course syllabus should be used to determine whether the course is appropriate for you, based on your current skills and technical training needs. Technical information is provided on the intended audience, course prerequisites, covered topics, lab exercises, course materials, and software.

Course content, prices, and availability are subject to change without notice.

This course helps students gain the knowledge and skills needed to support Microsoft® Windows™ 95, the next major release of the Windows operating system. These skills include installation, configuration, customization, optimization, network integration, administration, troubleshooting, messaging, and other support issues.

This version of the course is planned to release in coordination with the M7 (Beta 2) version of the product; the course will be revised for the final product.

The topics covered in this course are:

 Installation and configuration

n User interface

n Architecture

n Plug and Play

n File systems

n Networking

n Communication

n Printing

n Applications

n Administration

n Boot process

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Microsoft Exchange

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Transitioning

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Interoperability with Windows-based networks

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Interoperability with Novell® networks

n

Interoperability with Transmission Control Protocol/Internet Protocol

(TCP/IP) networks

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Mobile services

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Troubleshooting

At the end of the course, students will be able to install Windows 95; configure the system to meet the requirements of different users; identify and correct problems when running applications for Microsoft MS-DOS®, 16-bit Windows, or 32-bit Windows; discuss the networking architecture; remotely manage a workstation in a network; implement either share-level or user-level security as required; manage printing; implement message services; and diagnose and solve problems that may occur.

This course is designed for the beta product. As such, the exams for this course are not currently available. The final version of this course will help you prepare for the Microsoft Certified Professional exam for supporting Windows 95.

Note — For a referral to a Microsoft Solution Provider Authorized Technical Education Center in your area, call (800) SOLPROV. Call your local Microsoft Authorized Technical Education Center for more information and to register for classes.

Students must be certified to teach any one of the following courses:

n

Successfully completed the Microsoft Certified Professional examination(s) for MS-DOS, Microsoft Windows 3.1 and Basic Networking, or meet the following criteria:

n

Have advanced experience with MS-DOS® version 6.0 or later (understand how to optimize memory, move around the directory structure, copy files, and so on).

n

Be able to define how BIOS, memory, hard disks, types of CPUs, communication ports, display adapters, and pointing devices are implemented in a personal computer system.

n

Have extensive experience with Windows 3.x (or Windows for Workgroups 3.x) including being able to install, optimize, and customize Windows.

n

Have extensive experience supporting end users (install, optimize, and customize applications).

The course materials, lectures, and lab exercises are in English. To benefit fully from our instruction, students need an understanding of the English language and completion of the prerequisites.

The course workbook and lab book are yours to keep.

You will be provided with the following software for use in the classroom:

n

Windows 95 (M7 release)

Course Outline

n

Supporting Microsoft Windows 95 (M7 Beta)

[Topics:](#)

Types of installations
Requirements
Setup procedures
Failure and recovery
Switches

Lab:

Installation

Skills:

Students will be able to:

List the hardware and software requirements.
Verify system configuration and determine setup parameters.
Install Windows 95.

Topics:

Mouse, Taskbar, and Start menu
Explorer
Folders and property sheets
Shortcuts
Viewer
Open
Control Panel
Customizing the desktop
Find
Help

Lab:

Exploring the user interface

Skills:

Students will be able to:

Identify and manipulate various components of the operating system.
Create and manipulate files and applications.

Configure various user preferences.

Topics:

Virtual machines

Internal messaging

Operating system functions

System drivers

Registry

Lab:

Virtual machines

Skills

Students will be able to:

Explain the use of virtual machines.

Describe the internal messaging queues.

Locate entries in the Registry.

Topics:

Multitasking

Processes and threads

Prioritizing threads

Scheduling

Dynamic priorities

Lab:

Examining threads

Skills

Students will be able to:

Explain the difference between preemptive and cooperative multitasking.
Describe how the scheduler uses a thread's priority to determine central processing unit (CPU) usage.

Topics:

Virtual memory

Virtual addresses

Virtual memory manager

Lab:

Memory management

Skills

Students will be able to:

Define virtual memory.

Explain the use of virtual address space.

Explain how virtual memory is mapped to physical memory.

Topics:

Definition

Design goals

Architecture

Devices

Modifying the configuration

Lab:

Manually modifying the system configuration

Skills:

Students will be able to:

Explain Plug and Play architecture.

Explain the generic Plug and Play process, which components are loaded, how device arbitration is handled, and so on.

Given a specific bus configuration, indicate areas of potential problems.

Topics:

Installable file system (IFS) manager

Virtual file allocation table (VFAT)

Small computer system interface (SCSI)

Compact disk filing system (CDFS)

Long filename support

Lab:

Long filenames

Skills:

Students will be able to:

Explain how the installable file system works.

Identify the services provided by the VFAT, SCSI, and CDFS installable file systems.

Given a specified long filename, identify potential problems when using a utility that does not recognize the long filename.

Topics:

Uniform naming convention (UNC)

Architecture

Registry entries

Configuration

Lab:

Networking

Skills:

Students will be able to:

Browse network resources without assigning drives.

Explain the network architecture.

Topics:

Architecture

Modems

Telephony API (TAPI)

Labs:

Installing a modem

Using TAPI functions

Skills

Students will be able to:

Install a modem.

Configure Telephony.

Topics:

Printing process

Metafile spooling

Installing and managing printers

Point and print

Remote network print servers

Common printing problems

Lab:

Printing

Skills:

Students will be able to:

Share printers.

Administer local and remote print queues.

Install both local and remote printers.

Set up and remove printer drivers.

Topics:

How applications can affect each other

General protection faults

Application hangs

16-bit system code

Lab:

Application types

Skills:

Students will be able to:

Explain the differences among running applications for MS-DOS, 16-bit Windows, and 32-bit Windows.

Topics:

Tuning MS-DOS-based applications

Lab:

Optimization

Skills:

Students will be able to:

Tune the properties for an MS-DOS-based application.

Topics:

Administrative capabilities

Administrative tools

System Policy Editor

NetWatcher

System Monitor

Remote administration

Lab:

Administration configuration

Skills:

Students will be able to:

Use System Policy Editor to create default users and workstations.

Use NetWatcher to monitor a remote resource.

Use System Monitor to generate data for improving performance.

Use the administrate option to remotely create and share resources.

Use an existing template to set specific restrictions, based on user name.

Use an existing template to set specific restrictions, based on workstation name.

Topics:

Disk checking

Backup

Defragmenting

Lab:

Backing up a folder

Skills

Students will be able to:

Use disk utilities to monitor and optimize a hard disk.
Archive files, folders, and drives using the Backup utility.

Topics:

Boot process
Plug and Play device initialization
System boot files
Plug and Play configuration
Final component load
Troubleshooting startup

Lab:

Boot process

Skills:

Students will be able to:

Step through the boot process and selectively invoke parameters.
Examine the boot log to troubleshoot a boot.

Topics:

Mail API
Microsoft Exchange
Message profile

Using Mail
Fax

Lab:

Installing and configuring Microsoft Exchange

Skills:

Students will be able to:

Implement Microsoft Exchange.
Set up a workgroup postoffice.

Topics:

Briefcase
Managing files
Briefcase internals

Lab:

File synchronization

Skills

Students will be able to:

Use Briefcase to transfer and synchronize data between two computers.
Troubleshoot problems with files contained in Briefcase.

Topics:

RA architecture
Clients

Protocol support
Modem support
Installation
Using RA
Dial-in access

Lab:

Using RA

Skills:

Students will be able to:

Implement RA and dial-in access.
Determine the level of RA security appropriate for a given site.

Topics:

Transition issues
Transition techniques
——.INF files
——NetSetup
——Administrative install
Testing
Rollout
Training

Lab:

NetSetup

Skills:

Students will be able to:

Customize a setup script to meet a specific set of requirements.
Explain how to test a transition plan.

Topics:

Domains

User versus share-level security

Groups

BrowseMaster

Configuring for a Windows network

Lab:

Configuring for a Windows network

Skills

Students will be able to:

Describe the advantages and disadvantages of domains and workgroups.

Describe the advantages and disadvantages of user-level and share-level security.

Set up a user with custom access to a resource.

Explain the function of BrowseMaster.

Configure for a Windows network.

Topics:

Differences between Windows 95 and Novell network architecture

Configuring the client

Configuring the file and print sharing services

Sharing resources

Lab:

Configuring for a NetWare® network

Skills

Students will be able to:

Explain the differences among networking architectures.

Configure for a Novell network.

Topics:

What is TCP/IP?

IP addresses

Subnet masks

Dynamic Host Configuration Protocol (DHCP)

Windows Internet Name Service (WINS)

Domain name service (DNS)

TCP/IP utilities

Lab:

Configuring for a TCP/IP network

Skills

Students will be able to:

Explain how a TCP/IP address is assigned and what the address indicates.

Describe how a subnet mask works.

Use DHCP services on the network to lease an IP address.

Use the available utilities (WINS and DNS) to obtain a valid TCP/IP address.

Topics:

Audio

Video

Multimedia utilities

Lab:

Sound recorder (optional)

Skills:

Students will be able to:

Implement multimedia for a given application.

Configure the following:

- Event schemes
- Musical instrument digital interface (MIDI) objects
- Media control interface (MCI) devices
- Compression (audio and image)
- Mixer

Configure a driver to meet a specified set of requirements.

Topics:

Basic strategies

Modem problems

Remote administration

Log files

New devices

Device configuration

Rebuilding default groups

Resources

TechNet

CompuServe®

Internet

Microsoft Download Service

Skills:

Students will be able to:

Diagnose and solve problems.

Monitor and diagnose remote computers.

Identify and access sources of additional troubleshooting information.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Windows 3.1 vs. Windows 95 Quantification of Learning Time & Productivity

Usability Sciences Corporation

November, 1994

Overview

Usability Sciences Corporation was retained by Microsoft to quantify the learning time and productivity of users in the migration from Windows 3.1 to Windows 95. The study's objectives were to:

n

Analyze the transition from Windows 3.1 to Windows 95

n

Evaluate users' productivity with Windows 95

To achieve the objectives Usability Sciences recruited 75 current users of Windows 3.1 from the general business population of Dallas/Fort Worth as participants. Users were usability tested with both Windows 3.1 and Windows 95. The tasks used in the testing required users to exploit various functions of each operating system including:

n

Finding and opening files and programs

n

Copying and moving files

n

Switching between active programs

n

Finding lost and deleted files on the hard disk

During the testing, data was collected on task time to completion, task completion success rate, user satisfaction, and user operating system preference.

Overall, users were substantially more productive with Windows 95 than with Windows 3.1. After using Windows 95 for 1.5 hours:

n

Users finished the same tasks in Windows 95 in almost half the time it

took them in Windows 3.1, making them 91% more productive.

n

Users completed 94% of the tasks with Windows 95 vs. 86% with Windows 3.1.

n

Users were more satisfied with Windows 95 in 20 of the 21 categories surveyed.

n

97% of the users said they would migrate to Windows 95.

Background of the Study

There has been a great deal of speculation about the impact of Windows 95 on the current population of Windows 3.1 users. Microsoft wanted to create an objective study that would quantify the learning curve of Windows 95. Usability Sciences was retained as an independent third party usability testing organization that has done extensive work in comparing various PC software programs and quantifying their relative effectiveness with users.

Microsoft and Usability Sciences established the following objectives for the study:

n

Quantify the learning curve of Windows 95 for current Windows 3.1 users that will migrate to the new operating system

n

Quantify the effectiveness/productivity of users with Windows 95 in their first experience with the new operating system.

To meet the objectives, Usability Sciences conducted controlled usability tests of Windows 3.1 and Windows 95 in a way that allowed the operating systems to be directly compared. It was essential that the testing population be large and diverse so the results would be projectable to the general business population of Windows users. All testing was done in Usability Sciences lab facilities in Dallas.

Process

In order to ensure the projectability of the study results, 75 people were recruited to participate in the testing. All participants were recruited from the general business population of Dallas/Fort Worth. All participants were employees of corporations ranging in size from a minimum of 50 employees to over 10,000. No more than 3 individuals were tested from the same company and 43 different companies were represented in the study. One third of the test pool was advanced, one third intermediate, and one third was beginner users of Windows 3.1.

It was essential in the recruiting process to establish the skills of the users ranging from beginner to advanced. To do so, Usability Sciences developed a screening questionnaire that asked users to evaluate their Windows skills. This screener was used to classify users as follows:

Beginner—Uses one or two applications in Windows and rarely performs any functions or operations outside these applications.

Intermediate—Uses more than two Windows applications and also uses some facilities of the operating system such as File Manager or Control Panel.

Advanced—Uses many Windows applications at an advanced level and has in-depth knowledge of most features of the operating system.

In four cases it was determined by Usability Sciences testing personnel that users had misrepresented their knowledge of Windows. In these cases the users were reclassified so that the final sample was evenly divided between beginner, intermediate, and advanced level users.

In order to establish the work patterns and experiences of the current Windows 3.1 user population, Microsoft commissioned a telephone market research study of over 200 corporate users. This research was conducted by Market Decisions Corporation, an independent market research company in Portland, Oregon.

Based on the results of the market research Microsoft proposed a set of tasks that closely mirrored operating system usage by beginner through advanced users. The tasks were divided into three sections, A through C for each operating system. Sections A and B were designed to reflect those procedures commonly encountered in day to day computer use. Section C was designed to reflect common advanced tasks.

Usability Sciences developed a new task set that was used for the study itself. The new task set consisted of Sections 1 through 4 for each operating system. Sections 1 through 3 were completed by beginner and intermediate users; advanced users were asked to complete section 4 as well during the testing.

When users arrived for the testing they were escorted to one of Usability Sciences' lab test rooms. A briefing sheet was developed and read to each participant so they understood the purpose of the testing and the test procedures. Users were then given the Windows 3.1 task set and asked to complete it to the best of their ability. Upon completing the Windows 3.1 tasks users were given exactly 20 minutes to familiarize themselves with Windows 95. They were asked to take the Windows 95 computer based tutorial (included with Windows 95) and then explore on their own for the remainder of the familiarization time. At the end of the 20 minutes, users were given 3 task sets to complete for Windows 95. The task sets were isomorphic (similar in function but not identical in program use and file name).

Users were observed and videotaped as they worked with the operating systems to perform the tasks. Users were not given assistance from the observers if they had difficulty. Users had the availability of the on-line Help and Users Guide.

documentation for each system. A maximum time limit of 5 minutes per task was enforced. If a user exceeded 5 minutes in a given task they were asked to move on to the next task. Users completed a 21 question satisfaction survey at the end of Windows 3.1 use and completed the same survey after using Windows 95. Users were interviewed at the completion of the test to gather their thoughts on the ease of use and learning of each operating system.

The testing was conducted on identical 486/33 Compaq computers with 8 MB of RAM. Each user was provided with two machines: one with Windows 3.1 installed and one with Windows 95 installed. Each operating system was set up in its default state with no non-default programs resident. Windows 95 M 6.4 was used for the testing.

Data was collected on the following:

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Task completion time

n

Task success rate

n

User satisfaction



User product preference from post test interviews

Usability Sciences utilized its data logging software TestLogr® to capture task completion times and success rates. When users were unsuccessful in task completion it was noted that they either exceeded the 5 minute time limit, performed the task incorrectly, or gave up. In the post test interviews users were asked a series of questions to gauge their level of comfort, satisfaction, and productivity with each operating system. Users were also asked whether or not they would upgrade to Windows 95 from Windows 3.1. The user satisfaction survey measured 21 items on a scale of 7 – Very Satisfied to 1 – Very Dissatisfied.

Results

The users were timed for each task and an overall timing was taken for each system. The timings in seconds are the raw timings and do not show whether or not the users completed the task successfully, gave up, or performed it incorrectly. The Task Success Rate reflects the rate at which the users successfully completed the tasks, and is outlined in the next section of this summary.

Overall Task Timings

Average Task Timings for All 75 Users

`{ewc msdn cd, EWGraphic, uz0g 0 /a "psG.bmp"}`

Overall, current Windows 3.1 users took longer to complete the tasks in the first round of Windows 95 testing. However, the users' productivity drastically increased for the second round of Windows 95, and by the third round of Windows 95 testing, the users were 91% more productive than they were with Windows 3.1.

There was a notable difference in task timings for the beginner users versus the intermediate and advanced users. The beginner users actually completed the tasks faster in Windows 95 in their first time to work with it. The beginners finished the tasks more than 1 1/2 minutes faster and still completed more tasks correctly than in Windows 3.1. The beginners were not only more productive in their first time to use Windows 95, but got more of their work done correctly than in Windows 3.1.

Across all three categories of users, not only were they more productive with Windows 95, but they completed more tasks correctly in Windows 95 in less time. Even in the first round of Windows 95, users completed more tasks correctly.

The Task Success Rate shows how many tasks each user attempted and successfully completed within the time constraint of 5 minutes. A list of 17 tasks for each system were given to the users to complete. If a user exceeded the 5 minute time limit for a task, incorrectly completed the task, or gave up on the task, the task was considered missed and not counted towards the total number of tasks completed. The graph below illustrates the rate at which the tasks were successfully completed for each system.

[Overall Task Completion](#)

Average Task Success Rate for All 75 Users

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In the first round of Windows 95 testing, the users completed more tasks than in Windows 3.1. The task completion rate consistently increased the more the users worked with Windows 95. By the third round with Windows 95, the users completed on average 1.5 more tasks out of 17 total tasks than in Windows 3.1.

After testing each system, users ranked the system across 21 different factors that are important to users of operating systems. Factor scores were on a scale of 7-Very Satisfied to 1-Very Dissatisfied. In addition, users were asked to rank the importance of each of these factors as high, medium, or low. Based on Usability Sciences' experience with user product ratings, a 0.5 difference in ratings between two products on the 7-point scale shows a distinct preference for a product. A margin in ratings larger than 0.5 is considered significant.

The graph below illustrates the users' preferences for Windows 95 over Windows 3.1 for the 5 factors they rated as most important in their evaluation of the operating systems.

User Satisfaction Survey Results

Windows 95 vs. Windows 3.1

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Overall, users were significantly more satisfied with Windows 95. This can be

determined from the high ratings given to Windows 95 versus Windows 3.1. In addition, when breaking down the survey into the 21 separate categories, Windows 95 was ranked higher in 15 of the categories by more than 0.5, which shows that users notably preferred Windows 95 to Windows 3.1.

The areas of Windows 95 that users especially preferred over Windows 3.1 (with a difference in ratings of 0.85 or more) were the overall ease of learning of Windows 95, ease of locating applications in Windows 95, the terminology used in the menus and dialog boxes, and the new on-line Help system.

Users also ranked the areas in which they felt were most important for an operating system to perform well. In the 16 most important aspects of an operating system as ranked by the users, the users consistently preferred Windows 95 over Windows 3.1.

On the survey's 7-point scale, the average of all 75 users' ratings for Windows 95 was extremely high, and the difference in ratings for Windows 95 and Windows 3.1 was significant, with each area being ranked an average of 0.53 points higher.

The users were interviewed at the end of the test to capture their opinions and overall preferences for each operating system. The questions were designed to obtain the users' preferences for each system in the areas of ease of use, productivity, and overall preference. The table below illustrates the results of the post-test interview sessions comparing Windows 3.1 and Windows 95.

Windows 95 vs. Windows 3.1

Which operating system was easier to use?	51	24	0
Which operating system were you more comfort	25	48	2

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with?

Which 61 10 4
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satisfie
d with?

Which 63 5 7
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tasks
most
effectiv
ely and
quickly
?

Which 64 9 2
operati
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system
do you
prefer?

Would 73 2 0
you
upgrad
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Window
s 95?

The interview results showed that the users generally preferred Windows 95 over Windows 3.1 across several areas. Of the six questions asked, Windows 3.1 was preferred over Windows 95 in only one area – how comfortable they felt using the operating system. This is understandable, and was expected, since all 75 users currently use Windows 3.1 on a regular basis.

In general, the users felt Windows 95 was easier to use and allowed them to complete their tasks most effectively and quickly. An overwhelming majority, 73 of the 75 Windows 3.1 users (97%), said they would definitely upgrade to Windows 95.

Conclusions

Overall, in analyzing the transition from Windows 3.1 to Windows 95 and evaluating the users' productivity after training, Windows 95 was the superior operating system. Windows 95 not only far exceeded Windows 3.1 in the areas of satisfaction and productivity, but the current Windows 3.1 users that tested the two operating systems preferred Windows 95 and said they would definitely upgrade from Windows 3.1 to Windows 95.

In this study users were allowed 20 minutes to explore Windows 95 including a 10-minute CBT. Combining this time and actual test time, the users worked on Windows 95 an average of one hour. One of the compelling results of this study was, in the period of one hour using Windows 95, users achieved a higher rating of task completion and were more satisfied with Windows 95. People also enjoyed working with the new operating system more than with Windows 3.1.

Discoverability played a key role in easing the transition between operating systems. With Windows 95 there are a number of ways to perform the same tasks. Users took advantage of this ability using their own learned experiences and logic even in the confines of this study.

Some of the new features that also directly impacted easing the users' transition to the new operating system were: the Task Bar, the new on-line Help system, the My Computer approach to disk and file management, the fuzzy search capabilities, the Start Button, and the ease of finding their applications. The users also liked the 'Open With...' and the Wastebasket features in Windows 95. These new features made Windows 95 more appealing and more exciting to the users.

Users perceived Windows 95 to be far better than Windows 3.1 in most of the areas surveyed.

n

Ease of use

n

Ease of learning

n

Ease of locating applications within the operating system

n

Better terminology in the menus and dialog boxes

n

Easier and faster on-line Help system

Further experience with Windows 95 will lead to increased comfort and productivity that should far exceed current levels with Windows 3.1. Users will need some training to grasp the new concepts of Windows 95, but we do not perceive lengthy classroom training will be needed to effectively make the transition.

Based on the data gathered in this study, we feel that users will be considerably more productive with Windows 95. The users in this study achieved a 91% productivity increase after working with Windows 95 for less than one hour. Key contributors to this productivity are the new operating features: the Task Bar, the new

on-line Help system, and the application menuing system.

Since Windows 95 offers users many different ways of performing the same task, the users found ways to complete their tasks more often in Windows 95 than in Windows 3.1. The beginner level users were more productive with Windows 95 in their first experience using it, and completed their first set of tasks with Windows 95 faster and with more success than with Windows 3.1, the operating system they currently use everyday. We also found that many advanced users enjoyed trying to discover new ways of performing their tasks in Windows 95 and took extra time to explore its possibilities.

Users perceived Windows 95 as having a better look and feel than Windows 3.1. We observed that as users experienced more success in completing their tasks, they were more confident in the system and more likely to try new things. In our experience, this tends to encourage users to explore and discover additional features and functionality within the system. As one user stated after working with Windows 95, "In Windows 95 you are just a click away from anything."

Based on the objective data gathered in this study, as well as the subjective observations of users' attitudes towards Windows 95, we feel comfortable in strongly endorsing the new operating system. Migrators to Windows 95 will be more satisfied, more productive and feel better about using their computer.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Rescue for the HelpDesk - The Impact of Windows 95

A COMPREHENSIVE STUDY OF THE OPERATIONS OF F100 HELPDESKS WITH PROJECTIONS OF THE BUSINESS BENEFITS THAT WILL ACCRUE WHEN THE USERS MIGRATE TO WINDOWS 95.

March 9, 1995

WORKGROUP TECHNOLOGIES, Inc.

400 Lafayette Road

Hampton, N.H. USA 03842

Over the last two months, WorkGroup Technologies undertook a comprehensive study of 12 Helpdesks in F100 firms having large numbers of installed PCs. After extensive research and evaluation of each Helpdesk's experiences with the Windows® 3.x and Windows® for Workgroups 3.x operating systems, we have determined that Windows® 95 will provide substantial Helpdesk savings for high volume users who switch to Windows 95.

The research program consisted of in-depth discussions with twelve helpdesk managers in F100 companies representing over 100,000 PC users and more than 1.5 million Helpdesk calls per year. After analyzing more than ten thousand individual Helpdesk call reports and having extensively evaluated and used Windows 95 for the past four months, WorkGroup Technologies is able to identify many areas where Windows 95 will offer significant Helpdesk operations impact. Our analysis has shown that in a steady state environment, users should see a reduction in volume of PC Helpdesk calls of between 7% and 15% annually due to Windows 95 robustness and ease of use. Using an example average site (based on this study), with 8500 PCs¹, the reader could anticipate an elimination of 1120 calls per month for a potential savings of \$22,400 per month. We expect different sized sites will see proportional benefits. Alternatively, existing Helpdesk resources would be able to handle more users with no increase in Helpdesk staff. Obviously, savings will vary based on site population as well as other variables.

From our analysis, WorkGroup Technologies expects to see an equally significant reduction in the number of calls that will require a technician to visit the user's site. Windows 95 features such as remote management, remote communications access, hardware and software plug & play support, user and configuration registry and improved network and systems security features all contribute to reductions in onsite technician visits through centralized access, control and diagnostics. Again, using an example average installation consisting of 8500 PCs, we expect there will be a 30% to 50% reduction in the number of calls needing a site visit. This corresponds to an elimination of 1948 calls per month, generating an estimated monthly savings of \$389,600.

The savings cited above are for larger computer sites, however we feel the results can be extrapolated to different sized sites and your results should vary proportionately. It was readily apparent from our research that each organization's Helpdesk varies considerably in the types and range of problems encountered, as well as costs associated with resolving the problems.

In addition to the obvious cost savings, there are also numerous business and productivity benefits that accrue through increased user satisfaction, less end user downtime and improved confidence in system reliability.

[Study Background](#)

HELPDESKS ARE MOVING FROM AN EXPENSE CENTER TO AN INTEGRAL PART OF THE TECHNOLOGY IMPLEMENTATION MATRIX.

WorkGroup Technologies was retained to quantify potential Helpdesk benefits that might be derived through the major operational enhancements that will be delivered as part of Windows 95. Examples of these enhancements include: Remote Access Communications Service, hardware and software Plug & Play extensions, simple and intuitive user interface, support for long file names, and User Configuration information centralized in a registry, etc.

If your Helpdesk is like most support organizations today, it is probably being asked to do more with less. Demand for support has risen sharply, but staff levels have either remained flat or dropped. For this reason, the future of successful support rests in a user's ability to interface with a Helpdesk possessing complementary support tools that take advantage of broad open-system standards which facilitate the required technology interfaces.

Client server system implementations have brought an unexpected dark side – the cost of technical support. Many times the customer bought the vision of re-engineered, open, flexible client server systems as the way to reduce cost and increase service to all users. Frequently, what users have experienced has been increasing complexity, sometimes unmanageable application development, soaring support costs and less-than-effective implementations.

As more advanced networked applications have been deployed over the past five years, the cost of the Helpdesk and technical support has grown geometrically. The desktop user effectively became a desktop (and larger) systems manager. Many times users inadvertently brought down their systems by deleting files or altering settings that ultimately required a technician's visit to complete a repair. Microsoft has addressed a significant number of these operational issues with Windows 95. The result will be a sharp reduction in the number of user calls to the Helpdesk due to more intuitive ease of use, as well as functional improvements, making systems more crashworthy and controllable.

Previous cost of ownership reports from a variety of different sources indicate the

cost of technical support for MS-DOS® and Windows 3.x – based PCs exceeds the software cost of purchase every year of the product's life. Based on our study findings, we expect the payback period on the cost of upgrade to Windows 95 will be less than one year and annual Helpdesk savings will, exceed the cost of upgrade every year over the product's life.²

This paper reviews the Helpdesk operations of a number of large existing users of Windows 3.x, identifies the types of problems they are currently experiencing, and then isolates those problems that Windows 95 will either prevent or assist in resolving more efficiently. It is the objective of this white paper to provide reasonable quantitative estimates of how the inclusion of Windows 95 functional enhancements deliver productivity improvements to users, while lowering customer's internal and external support costs.

Primary white paper objectives are to:

n

Analyze existing Helpdesk loads and costs running Windows 3.x or

Windows for Workgroups 3.x

n

Project cost and productivity benefits when the organization migrates to

Windows 95

n

Provide a methodology that can be extrapolated to a customer's current

Helpdesk environment

n

Project user productivity gains through improved Helpdesk efficiency

Site Selection and Qualification

To achieve the objective of this study, WorkGroup Technologies recruited large user sites from a variety of industries among both large Microsoft® Windows 3.x installed user and the F500. A dozen sites were chosen, representing a wide range of industries, with no more than two users in any one industry. The study was limited to sites in the USA, however we expect similar results where local language versions of Windows 95 are used. Users were screened to determine if they met certain criterion. In order for sites to qualify, they had to:

n

Operate a centralized Helpdesk

n

Utilize electronic logging of call reports or tickets

n

Support 2000 or more PC users

n

Be willing to provide 6 months of call reports.

The study participants included firms engaged in the following types business:

Aerosp
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Manufa
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Manufa
cturer

Full
Service
Bank Manufa
cturing
Compa
ny

Major
Consult
ing Life
Insuran
ce
Firm Compa
ny

Retailer
Automotive
Compa
ny

Chemic
al
Compa
ny Financi
al
Service
s
Compa
ny

Stock
Broker
age
Firm

[Data collection process](#)

After qualifying and selecting the sites, WorkGroup Technologies provided a briefing package of documents that outlined the research program's objectives and the type of information we were seeking. We then conducted telephone interviews to determine the structure of their Helpdesk operation and to acquire demographics on users, desktop device base, business problems and general information about their help desk. We requested call report summary information and up to 6 months of call report detail for our analysis. During the research project WorkGroup Technologies acquired more than 50,000 call detail reports and then performed detailed analysis on more than 10,000 PC related call reports to generate statistically significant data for this report. We identified common trouble call clusters and then coded the call reports along a common schema so we could develop a comparative matrix. Specific call types were then analyzed to determine if Windows 95 would either eliminate the call or contribute materially to a faster, more efficient resolution. The results of this detailed analysis provided the call ticket counts used to generate the improvement figures cited throughout this report.

[Help Desk Goals](#)

The existence of a Helpdesk clearly has a singular purpose – to assist users in resolving difficulties they incur while using their PCs. Every Helpdesk subscribes to the following three goals:

Call avoidance

Obviously, the best call is no call at all. The majority of Helpdesks, today, attempt to do everything possible to eliminate calls, from assisting in the selection of a more reliable product to conducting in-depth training for users. Any product or methodology that will result in a reduction of calls is examined closely. Windows 95 is clearly such a product.

Rapid problem resolution; either on-the-phone or via the network.

If a call cannot be avoided, then the Helpdesk's goal is to resolve the call as effectively and quickly as possible. Simply put, user downtime is unproductive time. While our sample achieved an average repair time of less than one hour 61% of the time, all indicated their goal was to achieve better than 80%. Systems or software that allow easy remote access to a user's PC for diagnostics, rebooting, remote loading of software and lockdown are very effective methods of resolving problems without the overhead of a site visit. Again, Windows 95 offers a rich set features that responds to these requirements.

Technician visit prevention by reducing events that will cause visits

Finally, while site visits will always be a necessity, substantially reducing the number

of visits as well as their duration is a major goal given the costs associated with field calls. Remote access features (described above) is but one method. While onsite, Windows 95 offers additional features that significantly improve the technician's ability to render a repair more quickly. Further, many current site visit problems encountered by users will be either eliminated or shifted to remote repair categories with the implementation of Windows 95.

[Typical Helpdesk Position in the Organization](#)

The Helpdesk has long been considered part of the MIS backwater; a service organization that was typically treated as an expense center. However, we found the Helpdesk is increasingly an integral part of the IT organization as shown in figure 1, and is usually centrally funded from the IT budget. Regardless of how a company implements a Helpdesk function, Windows 95 offers substantial potential savings.

`{ewc msdn cd, EWGraphic, uz0h 0 /a "psH.bmp"}`

The evolution is from an organization historically noted for simple reflex response to one that is becoming extremely proactive and integral to technology employment decisions. It is not unusual, today, to have the Helpdesk staff evaluate a product for serviceability and reliability as well as provide input to user training programs.

For many of the sites we worked with, at least some portion of the Helpdesk and technical support function was outsourced to a third party organization. Often the outsourcing was done on a flat per call basis, especially for onsite technician visits. Although usually providing very effective support, it is clearly not in the third party's best interest to effect sharp reductions in call or visit volume.

[Helpdesk Functions and Responsibility](#)

Most sites operated a three level Helpdesk structure. The first level usually qualified the call, logged it and tried simple remedies for the most frequently observed problems. If unsuccessful in resolving the problem, the call is escalated to level 2. Level two technicians investigate the problem and do everything possible short of visiting the site to effect a fix. If a fix is not possible after an hour or two, the job is handed over to a field technician to resolve at the user's site. If the fix requires new hardware or parts, the technician frequently has to make a return visit with the new part to complete the repair.

The three levels of help desk responsibility are:

n

Dispatch, qualifying, fixing easy problems

n

Technical support working via network or dial-in access

n

Field Technician — or third party dispatch sent to site

There is also a management layer that handles human resources as well as proactive problem identification and prevention. In nearly every site there are proactive measures taken to seek out the top problem call generators and fix them through special training or by changing systems to reduce recurring problems. Many Helpdesks also provide direct input to the development of user training courses.

Current Helpdesk Problems

After evaluating over 50,000 call detail reports from a dozen Helpdesks (responsible for more than 1.5 million Helpdesk calls per year), WorkGroup Technologies has gained significant insight into the types and frequencies of problems experienced by users. The size of the sample base is more than adequate to achieve statistically significant results.

During our analysis we segmented the customer call reports into the following categories:

Hardware — All hardware attributable problems including descriptions such as: “burned out monitor, squealing hard drive, paper jams, broken keyboard, dead mouse, memory failure, stolen mouse, disk failure, need hardware installed, stolen

SIMMs, smoke coming out of monitor”...

Printing—— Printing software difficulties described as: “can’t print, printing garbage, can’t connect to printer, printer queue is stalled, won’t print right, pagination is not right, won’t print the right fonts, can’t get application to print, printer not accessible, print job hangs”...

Networking—— Network related problems shown on the call reports as: “Netware password failure, can’t access server, cannot connect to host, network down, TCP/IP address problems, can’t connect via dial in, slow response, network application locks up, can’t get network response, log me out”....

Application—— Application software related problems such as typical “How To” questions as well as “can’t open file, can’t import file, application freezes the PC, out of memory”....

Operating System—— Operating system software difficulties frequently described by the users as: “General Protection Faults, won’t boot, out of memory, out of heap space, crashes, lost files, can’t start Windows, can’t run MS-DOS, lost application groups, out of GDI resources, not enough, stuff in autoexec.bat bad, system crashes or locks up”....

Other—— Other problems that did not fit in the above categories such as: “need audiovisual equipment, need LCD panel, need new telephone number, need voicemail setup, projector broken, need carrying bag for laptop, need new battery for laptop, etc.”

For a sample of seven of the sites for which we conducted a detailed analysis, the call reports breakout is outlined in the table below. The average for all sites is consistent with those shown below. A later version of this report will include data from all 10 sites. We do not expect the new data will significantly change the averages that we have seen to date.

[Help Desk Problem Mix](#)

Ha	1	5	4	3	4	2
rd	%0	%1	%6			
wa	%	%	%			
re						
Pri	0	9	9	5	1	1
nti	%	%	%	%	2	5
ng					%	%
Ne	1	5	1	7	8	2

tw	2	%	0	%	%	%
ork	%		%			
ing						
Ap	4	8	3	2	4	2
pli	8	%	1	4	8	0
cat	%		%	%	%	%
ion						
Op	3	2	1	2	2	3
era	8	8	9	9	8	6
tin	%	%	%	%	%	%
g						
Sy						
ste						
m						
Ot	1	0	2	4	0	1
her	%	%	8	%	%	%
			%			

The most consistent problem areas are hardware, applications and operating systems followed by networking and printing. Hardware shows substantial swings due primarily to age and equipment configurations.

Clearly, Windows 95 will have impact upon the OS, networking and printing categories and will provide some relief for hardware and application based problems. The nature of how Windows 95 impacts each of the problem categories is described below.

There are a very large number of functional and product improvements in Windows 95 that will allow end users to run more effectively and reduce the number of trouble calls. As indicated in the table below, there are many areas where Windows 95 can prevent and/or easily resolve problems that present users are experiencing.

How	Intuitive and
to	Easy to use
proble	interface
ms....	
	Improved File
	system, long
	names, short
	cuts to
	applications,

disks or any
tool in the
system or
network.

Extensive On-
line Help

Help wizards
that guide the
user easily
through tasks

Printer Hardware
problem detection
ms senses the
hardware and
installs the
right software
to get a
running system

Plug & Play
support
enables easy
printer or other
hardware
changes

Feedback from
network
printers to let
the user know
progress

Networked
print
management
to ease
network
printing

System Memory
ms protection and
hangs memory
or management
crashes prevent
s systems
crashes and

provide for
smother
operations

Preemptive
multi-tasking,
allows more
applications to
be running at
the same time,
hence more
throughput

Full 32 bit
robust software
architecture
takes
advantage of
the new Intel®
chip
architectures
for more
dependable
operations

Passw Embedded
ord network clients
proble for Novell,
ms Windows NT™
Server, and
EMS server
allow the user
to login once
and have
Windows 95
negotiate the
services from a
server, hence
reducing the
multiple logins
problems.
Users should
only have to
remember a
single
password

Networking Supports multiple network protocols for easy connection to existing network systems.

Supports hot switching of communication stacks to allow the users to dock or undock systems without shutting down the power

Supports hot connecting of PCMCIA network cards

Hardware detection eases installations and changes e.g. docking or undocking

Embedded clients provide robust 32 bit network software clients, for faster throughput and more dependable communications

Supports

multiple
simultaneous
communication
s protocols
enabling
multiple types
of network
connections
concurrently

Mobile
computing
support that
greatly
improves the
chances of
getting a
remote dial in
connection to
work.

Based on our knowledge and working experience with Windows 95, as well as the in-depth analysis of calls experienced by users in this study, the improvements in Helpdesk activities can be segmented into the following categories. By individually examining each of the call reports for each class of problems, we have determined which problems will be resolved by Windows 95. The resultant calculations are shown below.

Avoidable — One of the first areas of benefit comes from the class of problems that will be avoided, where the user is able to perform the tasks correctly without help. This class of problems that occur under Windows 3.x systems should be entirely eliminated due to design improvements in Windows 95. These problems should rarely occur with Windows 95 due to a simpler and more intuitive user interface, better file system with long filename support and search tools, crashworthiness due to improved memory management, system wizards to help users easily complete complex tasks, improved communications and networking connectivity, hardware plug & play and simpler user environments due to lockdown and central registry improvements in Windows 95.

Fixed by Helpdesk — This a class of problem can be solved via the first level Helpdesk operator. This includes logging the call, qualifying the call and providing remedies for the most frequent recurring problems.

Helpdesk Technician — This class of calls will be solved by the technician working

both with the end user by phone and via network connections, running remote network tests and checks of the user's system to try to locate and correct the problems. Now, with Windows 95 robustness, plug & play, central registry, network policy files, and remote manageability, many of the calls can be fixed over the network, avoiding travel to the user's site. The technician may ask for assistance from the user to try to get the PC running and connected to the network or walk the user through a self help process to locate the problem.

Technician Visit—These problems will continue to require a field service technician to visit the site. The technician will often reload software or replace parts to get the PC up and running. This activity may include swapping out the whole unit if the problems cannot be rectified.

WorkGroup Technologies received over 50,000 calls and performed a detailed analysis on a sample of over 10,000 PC related call details and is able to project how each of the various problems can be avoided and/or more easily fixed with Windows 95. While there may be some "hindsight effect" that makes it easier to fix a problem after you know what the problem is, the vast majority of problems are directly impacted by Windows 95.

It should be noted that the results of our research are specific to the companies that participated in the program. It is clear from the research that every company encounters significant differences in Helpdesk call make up, as well as costs, due to variations in hardware, software and peripherals populations. We do believe due the large number of calls analyzed, this information is applicable to other firms, we believe that similar ratios of savings should be realized by a wide range of firms, however as they say; " your mileage may vary"...

Another major corporate benefit is the increase in productivity due to the reduction of end user downtime. Further, new users will be able to use the Windows 95 system with less training or learning time. This increases their ability to use their PC effectively and efficiently. While not a quantifiable factor for this report, our experience clearly points to significant gains in this area as well.

After analyzing thousands of Helpdesk call reports, talking to twelve Helpdesk managers in F100 companies supporting over 100,000 PC users, with more than 1.5 million calls per year, and having studied and used Windows 95 for the past four months, WorkGroup Technologies has been able to identify areas where we expect Windows 95 will offer significant operational impact. Our analysis has shown, that after the initial learning curve, user organizations should see a reduction in the total number of PC Helpdesk calls of 7-15% due to Windows 95 robustness and ease of use. This may also mean that your existing Helpdesk resources may be able to

handle 7-15% more users with no increase in staff. In our example, an average site, with 8500 PCs, we estimate a reduction of approximately 1100 calls per month for a savings of approximately \$264,000 per year. We expect proportional savings in other larger and smaller installations.

We also expect to see a reduction in the number of calls that will require a technician to visit the users site, as more problems are solved through the network using Windows 95 remote management, remote communications access, hardware and software plug & play support, central registry and improved network and systems security features. From our analysis, WorkGroup Technologies expects Windows 95 will significantly reduce the number of calls that will require a technician to visit the user's site. For typical installation with 8500 PCs we expect there will be 30-50% reduction in the calls needing site visits, corresponding to 1950 calls per month, generating an estimated savings of \$4.6 million per year.

In addition to these substantial projected cost savings, there may also be business benefits due to reduced end user downtime.

Bottom line - Based on the average call volume savings and their attendant costs we have observed across these 10 sites, WorkGroup Technologies projects an average annual Helpdesk cost saving of \$576 per user. We expect these savings to continue over the life of the product. These findings clearly support a move to migrate to Windows 95.

[Windows 95 User Interface improvements](#)

Taskbar - Easily allows user to manage a number of tasks and applications. Start button has been shown to reduce application start times 3X-9X faster. Taskbar 'start' button provides the capability to run a number of applications at the same time. The task bar will show all open applications, and make it easier to switch between applications by touching a button in a simple consistent location. Instead of using different kinds of tools like Program Manager, File Manager, Print Manager, and Control Panels, the user in Windows 95 can gain access to all system resources from the Taskbar.

Recycle Bin - An electronic dumpster where you drag your trash, however you can beck and sort through the trash to find something that was just thrown out.

Network Map - Intuitive maps your networking neighborhood -- your highways and byways--

My Computer - A simpler and more intuitive way to organize files-- Disks, folders, documents and files

Long Filenames- The combination of organizing your documents in project folders(with drag and drop), and then using long file names makes your work more easily organized and more easy to share and browse.

Short Cuts- It is easy for the user to create 'aliases' or short cuts to frequently accessed networked documents or applications. These can be dragged to the desktop or stored in your own favorite folder for quick and easy access.

Undo- This provides the user a easy way to undo some of the latest file operations (such as rename, move, or deletion of files) if they find the made and error or simple want to change their mind.

Wizards- These help wizards can be invaluable in guiding a new user through a multi-level tasks and show the user 'English sign posts' choices to complete complex tasks as a series of simple steps. They are crash proof and allow the user a way to trail run extensions to their system without the fear of crashing the system.

On-line Help- An improved, context sensitive help system with a lot of graphics, provide more intuitive on-line help

Windows Explorer- A more concise way for the power user to explore and navigate documents and applications on their system or network.

Properties-Property sheets are available for all documents, files, folders, applications, disk drives, and other elements in a users system. These are areas where users can modify the behavior of these elements in their computing environment. It is where they can modify the personality of their computing system.

Right clicking- This function triggers a series on context sensitive menu Pop-ups that can greatly reduce the number of mouse clicks required to perform common tasks. This item will be a great boon for the power users.

Control Panel- Much improved control panel is the main user interface to all computer hardware. It includes the new utilities for hardware detection, plug & play, networks, printers, multimedia, install & uninstall and the ability to switch communications stacks and any hardware drivers on a live system. This function will be of a great assistance in both preventing problems and in solving technical on-line with the user.

Quick Viewer- This viewer easily allows users to browse through network documents and see a preview of the document even if they do not have that application installed. This is great for sharing attachments in E-mail with other users.

Systems Management Improvements

Registry- The central registry consolidates and replaces a lot of the *.ini, *.sys, and *.bat files that used to exist in Windows 3.1. and is built into the operating system.

User preferences, hardware profiles and system policies information may be contained here for control and ease of use. These files provide the systems administrators a level of control and security, while being able to offer the end users some control over the personality of their computing environment.

User information, system information and Network policy information can be managed separately to provide an optimum environment for the roving user, mobile user, shared PC, and all operate within the IT policies and security.

System Management- Windows 95 is designed to be either centrally or locally managed. This will save an enormous amount of time in fixing technical problems, performing installs, or moving users data without going to the site. Other useful items for central or local systems management include: Control panels, Property sheets, Plug & Play, Registry editor, Systems policies editor, and DMI agent.

Remote Administration Security-These set of capabilities enable desktop systems to be tested, configure, fixed and updated via the network and hence are key in reducing the time to fix distributed PCs.

Hardware Profile-Hardware detection can be run by the user or network administrator to generate a log of the hardware configuration that will be stored in the registry. This will be used by both the user and support personnel in fixing or making changes to user desktop software. This is a key in de-skilling the PC support function and enabling end users to correct problems and prevent trouble calls.

Systems Policies-These are a set of files that are typically downloaded from a server to override and enforce a level of compliance and security on certain classes of users. These may include controls on the user interface, network, desktop configuration, sharing capabilities, etc.

System Performance Monitor-System includes a performance monitor that can be used by PC Helpdesk persons to quickly get an accurate picture of the performance the user experiences. It can be helpful in tuning a system to meet the local workload demands

Remote Procedure Calls-These are the electronic hooks that are used to enable central control of a users PC to enable the on-line diagnosis, and the administration of the prescription to fix a desktop system.

Tape Backup-These embedded tools make it easier for the local PC user to be able to move data in and out of their system as well as archive/restore information for storage management and data protection.

Network Management-Windows 95 includes a number of key network agents or clients to allow the user to access and use network servers, e.g., Netware® client for print and file services, Windows NT-based servers – for LAN manager enterprise scaleable file and print services, EMS client for access to future Back Office

services, NTAS servers for access to structured data from SQL databases, SNMP client – for connection to a Network management systems e.g. Netview®, Windows 95

Netwatcher - It allows local and remote management of users connections to network data and services. This enable the network administrator and Helpdesk to test, modify, and control user network access for both problem resolution and normal operations.

Administrate File Systems- This feature allows the network manager to take control of your local system, to test and reconfigure all the file systems and other resources.

SNMP (Simple Network Management Protocol) Agent- Is now a common industry standard that is part of Netview (IBM & DEC), Openview (HP). It provides an industry standard mechanism to remotely (via the network) manage desktop machines and – enable the Helpdesk diagnosis and control of a local desktop machine.

DMI (Desktop Management Interface) Agent- This is an emerging standard for the support of remote desktop management. This will enable new capabilities in the future.

User Management- This set of features captures the users identity through a logon procedure and then will configure the system to reflect the personal preferences that that user has setup. These preferences can be set to follow the user if he/she logs on from another desktop in the network. This logon information can be used as a users master key to access a range of other network services e.g. Netware files. The user management services will include other information such as User Profiles, System Policies, and Server Based Security.

User Profiles- User profiles, part of the registry, are maintained to allow shared PCs to quickly change their personality to fit the specific user preferences, such as desktop settings, backgrounds, colors, shortcuts, file-system behaviors, network access, etc.

System Policies- System policies, part of the registry information, – are designed to override any user settings to allow the network or PC manager the ability to customize control over the Windows 95 users environment and grant the appropriate level of privileges. These capabilities include control of the users interface, network capabilities, desktop configuration, sharing capabilities, applications access, etc. Users can be locked into a standard user interface, restricted to only a select set of applications, prevented from loading their own applications, and prevented from futzing with the PC setups and causing a lot of extra Helpdesk calls.

Server Based Security- The system policy tool enables a way to control

access and security policies in a networked group or campus environment. The system policy file, part of the registry is managed from the server and down loaded to each desktop when they are started. All user namespace management, user logon authentication, is maintained in Windows 95 and can also be used to gain access to other network services. This 'control' hook enables the effective IT control of desktop systems in a more automated and efficient way than ever before.

The 'FIX' for Printing problems with Windows 95

Easier to use- There are a range of new Windows 95 features that will make it easier for users to install, setup, configure, access and manage their printing environments easily and efficiently. These include a number of elements as outline below.

32 bit print subsystem- The new 32 bit preemptive print subsystem is able to ride through MS-DOS partition crashes and still deliver a more reliable and manageable set of print services

Enhanced print spooling- Provide faster return to application times for better user productivity and smooth background printing.

Deferred printing for mobile users- Enables mobile users to work on the road and get their printouts after they get to a network or back to their home office.

Color matching- Uses Kodak® color matching technology for better WYSIWYG publishing with predictable color control.

Installing and configuring- Plug & Play printer detection for more than 800 printers and device installation wizard support, assures easy and accurate installation of new printers and setup of network printing

Managing print jobs- provides the ability to easily manage both local and networked print jobs

Network Integrated Printing- provides for full network support of either Netware printing or Windows NT Server printing.

Remote administration of printing- With the appropriate access privileges, remote printing can be managed on remote printers, including ability to hold, cancel or resume jobs. This enable printer queues to be managed from a central sites. Program or operator monitoring of network printers Could check if they are stopped and dispatch resources before it becomes a production problem.

Improved Performance -The new Windows 95 print spooler operates as a background task and now offers faster return to application times so users can continue work sooner.

1—Based on the average size of the sites WorkGroup Technologies studied for this report

2—Assuming an upgrade cost of a \$100 software license plus \$100 installation

{ewl msdncd.dll, ewcright, /c"Microsoft"}

MS Windows NT Workstation and Windows 95 Product Review and Comparison

ABSTRACT: Microsoft Windows NT and Windows 95 are compared to provide general guidelines for selecting the best desktop operating system for your needs. Features and highlights are discussed extensively, as are ways of creating an accurate assessment of needs based on functionality, organization size, installation and migration requirements. The section "Technical Criteria: Evaluating Windows 95 and NT 3.5 Workstation" presents comparative data in table form. Appendices provide references, specifications and an evaluation plan. (White Paper)

Introduction

Microsoft® has recently shipped its enhanced 32-bit desktop operating system, Windows™ NT Workstation 3.5, and is about to make the Windows follow-on product, Windows™ 95, readily available through a pre-release program. Although Windows 95 will not be shipped until this summer, Microsoft made some 400,000 copies of the final beta release of Windows 95 available to the general public in the March.

This report reviews these two operating systems, and provides general guidelines for choosing the appropriate desktop operating system. As Windows 95 is still in beta testing, this report relies heavily on Microsoft's published goals for Windows 95. It is recommended that once beta3 is available, extensive testing and evaluation be performed. See Appendix D for a detailed evaluation plan.

Both Windows 95 and Windows NT Workstation provide a common base of functionality, including ease of use, power, connectivity and manageability. Microsoft's strategic direction is to deliver parity in basic functionality (such as the user interface) to each platform as quickly as possible. See Appendix A for a comparison of features.

The goal of Windows 95 is focused on making computing easier for anyone using a wide range of personal and business applications on desktop or portable computers. To protect current investments in hardware and software, the highest level of compatibility with today's applications and installed systems is the primary goal of Windows 95.

Windows NT Workstation is focused on providing the most powerful desktop operating system for solving complex business needs. It is targeted at developers, as well as technical, engineering, financial, and business application users. Windows NT Workstation delivers the highest level of performance to support the most demanding business applications. It also provides the highest levels of reliability, protection, and security for mission-critical applications, while exploiting the latest hardware innovations such as RISC processors and multi-processor configurations. This focus on solving business needs is also reflected in the emphasis on maintenance and regular system updates.

Over time, as mainstream machines become more powerful, technologies implemented first on the leading-edge Windows operating system product will migrate to the mainstream product. Sometimes technical innovations will appear first on the mainstream product, due to timing of releases or because some features are focused on ease of use for general end-users. The guiding principle is for the leading-edge product to provide a superset of the functionality in the mainstream product.

The adoption of a new desktop operating system has an impact all areas of information resources.

n

Users and support staff require training.

n

Inclusion of TCP/IP networking in these products requires that the roll-out follow the networking strategy.

n

Ease of network browsing requires careful analysis of network resource security.

n

Application developers can take advantage of the new Win32 APIs for new applications, and the Win16 APIs are still supported.

n

The capability to remotely manage and configure the desktop ties into the System Management Server project.

n

Desktop upgrade costs need to be defined.

Each of these topics is discussed below.

Background: Desktop Operating Systems

The scalable architecture of the Windows family of operating systems will support the same user interface, applications, and development tools across an expanding range of hardware. The Windows operating systems meet the spectrum of customer requirements, from productivity applications to powerful, secure, mission-critical applications. Windows 95 will include the features needed by the majority of desktop PC users. Windows NT Workstation and Windows NT Server are advanced, 32-bit operating systems for workstations and network servers. Windows NT supports Intel and reduced instruction set computing (RISC) microprocessors and provides symmetric multiprocessing on both platforms.

Microsoft has always offered a range of operating systems that are tailored to the needs of users throughout the workplace. The consistency of the Windows interface enables customers to leverage the same user expertise, training, and support for both client and server implementations.

[Microsoft Windows 3.11](#)

Microsoft Windows 3.11 enhanced MS-DOS to make PCs easier to use. Windows 3.11 was designed for desktop PC users and also ran on laptops and pen-based PCs. Windows 3.11 enhanced application support that included object linking and

embedding (OLE), built-in multimedia capabilities, TrueType scalable fonts, and advanced memory management. In addition, Windows 3.11 supported a variety of network architectures.

[Microsoft Windows for Workgroups 3.11](#)

Windows for Workgroups 3.11 added powerful communication services and network capabilities to Windows 3.11 and represented the best version of Windows on MS-DOS for most customers using stand-alone, networked, and mobile PCs. The operating system provided fast, 32-bit access to network server-based systems, including Windows NT Advanced Server, Novell NetWare, Banyan VINES, DEC Pathworks, and IBM LAN Server. Customers could also take advantage of the new Windows for Workgroups 32-bit, protected-mode file system, which sped up access to the local hard disk by 50 to 150 percent. Special versions of Microsoft Mail and Schedule+ were included in Windows for Workgroups, making it possible to connect to a mail server to send messages and schedule group meetings across the network. For the mobile user, Windows for Workgroups 3.11 included Windows-based Remote Access Services (RAS) which allows customers to connect to Windows NT Server networks and access network resources across any telephone line. Additionally, Microsoft's built-in Microsoft At Work fax technology enabled stand-alone and networked PCs to send, receive, and edit facsimiles directly from the desktop.

Windows NT Workstation 3.5 is the most powerful desktop operating system for the most demanding business needs. It provides the power, responsiveness, and security of a workstation with the ease-of-use, productivity, and compatibility of a PC. Windows NT Workstation delivers workstation power through advanced operating system features such as OpenGL for three-dimensional graphics and symmetric multiprocessing, preemptive multi-tasking, and multithreading to maximize hardware performance. Built on a portable microkernel design, Windows NT Workstation runs on a wide range of powerful hardware platforms including the Intel 486 and Pentium processors, multiprocessor systems, and new RISC microprocessors.

With Windows NT Workstation, business-critical applications that used to be available only on expensive workstations and minicomputers are now available for the PC platform. These applications include CAD/CAM, architectural, engineering and construction, manufacturing and process control, accounting, financial analysis, and financial traders' workstations. Windows NT Workstation also runs existing applications for Windows and MS-DOS, so that information can be integrated with these new 32-bit applications for Windows NT.

[NT Workstation Overview](#)

As the pace of business picks up in an increasingly competitive environment,

companies are racing to increase their productivity by developing more efficient, cost-effective ways to get work done. And they're looking for operating systems like Microsoft Windows NT Workstation, which puts popular productivity applications to work with powerful, mission-critical applications—all on a single computer, in a secure, multitasking environment.

Whether a developer, a user of technical and financial workstations, or a business-critical application user, users can integrate information with Microsoft Windows NT Workstation. For instance, high-end business applications (such as CAD/CAM, manufacturing and process control, architecture, engineering and construction, accounting, development, financial analysis, and traders' workstations) can now share data quickly and easily with personal productivity applications, such as Microsoft Excel and Word, written for Windows on the PC.

Microsoft Windows NT Workstation is the operating system that combines the power of a workstation with the ease of use, productivity, and compatibility of a PC. So you can actually share more data across more systems.

Inside the Windows 95 operating system is something for everyone, whether using a single PC or supporting and managing thousands.

The Windows and Windows for Workgroups operating systems provided a graphical environment, networking, and performance enhancements to the MS-DOS operating system. Now one integrated operating system will take users to the next level of usability, power, and access to PC resources.

The first thing users notice in Microsoft Windows 95 is the easy graphical interface that makes it dramatically simpler to use the PC while at the same time being more efficient and customizable. Plug and Play technology allows you to install modems, CD-ROM drives, and other peripherals, confident that those devices will configure themselves automatically.

The Windows 95 operating system can run the current MS-DOS and Windows-based programs in a more stable environment and, in many cases, even faster. It also enables a new world of robust 32-bit programs that use preemptive multitasking and multi-threading to perform several actions at the same time.

Windows 95 also offers enhanced multimedia, more powerful mobile features, and integrated and seamless networking. You even get new tools for traveling the "infobahn."

For organizations, Windows 95 provides an opportunity to cut overall computing costs while increasing the efficiency of users and those who support them. This helps reduce the support burden of PCs, increase control of the desktop, and improve end-user productivity.

For users at every level of experience, Windows 95 ushers in a new generation in computing.

Comparing Windows 95 and Windows NT Workstation

As we begin to compare these two operating systems, it is important to understand that there are two distinct design points for the Microsoft family of operating systems—one centered on the mainstream system, and another centered on the leading-edge system. It is not currently possible to have one operating system implementation that fully exploits the broad range of hardware available at any point in time.

For mainstream systems (currently represented by products such as sub-notebook and entry-level desktop machines), the Windows 95 design goal is to deliver responsive performance for a broad range of applications while conserving the amount of system resources used. Designed for use on Intel-based PCs, Windows 95 supports the Intel 80386DX, 80486, and Pentium processors used in mainstream desktop and portable PCs.

On Intel-based and workstation PCs (for example, MIPS R4400 or Digital Alpha AXP-based systems, a dual-processor workstation or multi-processor RISC server), Windows NT was designed to fully exploit the capabilities of the hardware and provide the most advanced services for the most demanding applications.

As a result of the requirements placed on the new enterprise solutions, all major operating system developers have recognized the necessity of moving to a microkernel architecture for their leading-edge operating systems. This includes Microsoft, IBM, Sun (and most UNIX vendors), and Novell. Only Microsoft made this commitment over five years ago and began shipping Windows NT to developers in July 1992 with general availability in July, 1993. This architecture allows vendors to enhance systems to respond to the rapidly changing requirements of the business solutions being developed, while maintaining flexibility to exploit new hardware and peripherals.

Both Windows 95 and Windows NT Workstation provide the common base of functionality required by all customers, including ease of use, power, connectivity and manageability. Microsoft is committed to and will deliver parity in basic functionality (such as the user interface) to each platform as quickly as possible. The other differences between the two platforms are a result of their different design goals. Windows 95 is focused on making computing easier for anyone using a wide range of personal and business applications on desktop and portable computers. To protect their current investment, these users require the highest level of compatibility with today's applications and device drivers.

Windows NT Workstation is focused on providing the most powerful desktop operating system for solving complex business needs. It delivers the highest level

of performance to support the most demanding business applications for developers, for technical, engineering, and financial users, and for critical line-of-business applications. It provides the highest levels of reliability, protection, and security for applications you can't afford to have fail. Windows NT Workstation also allows you to exploit the latest hardware innovations such as RISC and multi-processor configurations. This focus on solving business needs is also reflected in the emphasis on maintenance and regular system updates.

Over time, as mainstream machines become more powerful, technologies implemented first on the leading-edge Windows operating system product will migrate to the mainstream product. Sometimes technical innovations will appear first on the mainstream product, due to timing of releases or because some features are focused on ease of use for general end users. The guiding principle for product planning is for the leading-edge product to provide a superset of the functionality in the mainstream product.

For application developers Microsoft has just one Windows programming platform, defined by Win32—the 32-bit Windows application programming interface and OLE. By following a few simple guidelines, developers can write a single application that runs across the Windows operating system product family. If they wish, developers can target specific operating system products because the functionality they provide is important to their particular application, but that is not a requirement.

Conducting an evaluation of Windows 95 and NT Workstation should include several areas of examination. The following areas identify which operating system meets the needs of end users and business. The areas of concentration involve technical and business case analysis.

Before beginning to evaluate the two systems, however, it is important to know about the users in your organization. Breaking the organization into disciplines can help make decisions easier. For instance, analyzing the finance group and human resources groups separately can help you more clearly define the types of users you have, and decide which operating system to choose on a group-by-group basis instead of organization-wide. As a start, you may want to learn these things about your organization and its departments:

n

What are the technical levels of your users? How many are power users, information analysts, or software developers, etc.?

n

What hardware is being used in your organization? How many Intel-based machines? How many multiprocessor machines?

n

What software is being used?

n

What training resources are available to you?

n

How important is it to have users remotely access to your network?

Technical Criteria (Features and Functionality)

n

Ease of use

n Performance

n Security

n Support for networking and connectivity

n Compatibility of device and application support

n Support for new applications

n

Support for manageability and administration

n

Support for communications and messaging

n

Support for mobile services and remote access

Ease of Use

When looking at the ease-of-use aspects of an operating system, it is important to look at it from the perspective of both a novice and an experienced user. — Novices include those who have never used a PC, and those who use it infrequently, often because they find PCs intimidating. — Typical problems for novices include finding it hard to navigate through the user interface and needing more information or coaching (for example, from online Help). — Experienced users interact with more areas of the operating system than a novice user. — These users demand flexibility, speed, and power.

As you evaluate how easy an operating system is to use, consider these questions:

n

Is the operating system easy to learn and use, and efficient for the widest range of users?

n

Is the operating system discoverable? Does it reveal new efficiencies as a user becomes more experienced?

n

Does the operating system make it easy for a novice user to complete common tasks such as starting new applications, switching between two or more active application, or manipulating files?

n

Is the operating system flexible for experienced users to customize and tailor to the way they interact with the computer?

Performance

System performance refers to how the operating system performs overall while running a set of broad tasks, such as running a group of applications and programs simultaneously). Performance also refers to the ability of individual system components or subsystems to perform a more narrow set of operations (for

example, file I/O).

Several suites of benchmarks are available that test the ability of operating systems to complete a set of tasks designed to mimic real world use of the PC and operating system combination. These benchmark tests produce numbers that represent the responsiveness of the operating system for a given set of commercially available applications. It's possible to run the same suite of applications in our environment and use this information as a baseline to identify the relative performance between the operating systems we compare. However, benchmark suites don't tell the whole story and should be used in conjunction with traditional component-level benchmark tests and actual application tests.

In addition to running application suite benchmarks, it's best to isolate and separately test various components and operating system subsystems to obtain low level results indicating how well the operating system can support services used by applications. Areas of performance that are commonly isolated and benchmarked on standalone PCs include the performance of the local file system for disk and file I/O, the performance of the graphics subsystem and video display drivers for graphics and text I/O, and the performance of the printing subsystem for printing I/O. In addition, desktop operating systems should be tested in networked environments for their ability to support network I/O throughput for the supported network clients, as well as the responsiveness for server functionality if supported by the operating system.

Of course, any operating system will perform best on a PC with the maximum amount of RAM, but this is an unrealistic criterion because most end-users' PCs have less than the maximum. Performance test suites should be run against different hardware platforms including memory ranges from 8MB to 16MB, on platforms that include PCs containing Intel 80386DX, 80486, and even Intel Pentium-based CPUs. In addition, different hardware resources will deliver different performance testing results, so it's important to test on not only more than one type of configured PC, but on hardware that is currently mainstream in the industry.

When you evaluate performance, consider these questions:

n

Does the operating system perform well on a wide variety of hardware and software?

n

How well does the operating system complete a benchmark test exercising a suite of applications on a given hardware platform?

n

How well does the operating system complete benchmark tests exercising individual components and device drivers provided as part of the system?

n

How well does the operating system perform for network connectivity for supported network clients or provided network server functionality?

Protection and Security

Protection of corporate resources from unauthorized access is a high priority in most organizations. Although ultimate security of resources remains the responsibility of the end user, both operating systems allow share and user-level security.

Possibly the best single long-term differentiating factor between these two operating systems is security, and it can be evaluated by the means of protecting data. Most organizations will find Windows 95 security more than adequate. Those requiring more stringent security specifications will find Windows NT Workstation conforms to "Class C2 level security" as authored by the US Department of Defense (DOD).

As you evaluate operating system protection and security, consider these questions:

n

How well can a PC's data be secured against those with physical access to the machine?

n

How well are server-based resources protected by the desktop operating system's security integration with the underling network?

n

How well are locally shared resources secured on the network?

n

Does the system have the ability to record both PC and network events that enable administrators to perform security audits and trace security breaches?

Support for Network Services and Connectivity

In a corporate environment, it's extremely important for an operating system to be able to provide network support for a broad base of clients. An operating system that can support connectivity in a heterogeneous environment distinguishes that operating system from the others. Likewise, it's important to compare how well network functionality and other areas of the system (such as the user interface) are

integrated in each operating system.

In general, users want more than just incorporating proprietary network functionality in an operating system. They also want support for industry-wide standards to prevent reliance on a single vendor to support a multi-vendor environment.

As you evaluate networking support for an operating system, consider these questions:

n Is the operating system an open, layered networking architecture that lets you mix and match best of breed components at every layer?

n Does the operating system have built in, native support for popular networks?

n Does the operating system natively support a wide range of network transports (such as TCP/IP and IPX/SPX), industry-wide communication protocols (such as RPC, NetBIOS, DCE, named pipes), and existing network device standards (such as NDIS and ODI)?

n Does the operating system provide a simple, consistent user interface for

accessing the network and using network resources?

n

Does the operating system support an open architecture to allow third-

parties and network operating system vendors to easily integrate or add network connectivity enhancements or application support?

Compatibility: Device and Applications Support

When it's time to replace an old operating system, a key question to consider is "Can my company still use our existing applications and hardware with the new operating system?" Many companies have invested a large amount of money in applications, printers, modems, and other PC-related peripheral devices. It's important to find out if a new operating system can run with existing hardware and software.

It's also important to consider how broad a range of devices is supported by the operating system. No doubt, as a company grows, its hardware needs will grow too. The choice of an operating system should not unreasonably restrict the peripheral devices the company can buy later. The operating system should include ample device drivers, to support devices currently in use and those bought later.

When examining device support of an operating system, consider the number of devices supported, the industry standards that the operating system supports, and the compatibility for using existing device drivers shipped with earlier operating systems or with devices themselves.

As you evaluate the device and application support in an operating system, consider these questions:

n

Does the operating system provide broad device support for existing

hardware and associated MS-DOS and Windows-based device drivers in use today?

n

Does the operating system easily recognize, install, and configure devices?

n

Does the operating system support running existing MS-DOS or Windows-based applications as well as MS-DOS 6.X or Windows 3.1?

n

Does the operating system allow easy exchange information between applications or support advanced inter-application communication mechanisms?

n

Does the operating system provide services for new types of applications such as, multimedia, remote access, and communications-related applications?

Support for Manageability and Administration

PCs are now one of the largest expenses of an MIS organization. Medium and large businesses invest tens of thousands of dollars each year, not only on the hardware and software for new and existing computer systems, but also for system setup and administration. Thus far, there is little consistency and almost no integration among available tools for managing and administering PCs in a

networked environment.

The good news is that standards organizations are now working to simplify the management scenario by developing standard ways for managing PCs. These standards will mean better and more integrated management tools for the network administrator. To reap any benefits, however, an administrator must choose an operating system that supports management mechanisms adhering to existing standards or one with an infrastructure designed for adaptability to a new standard.

As you examine the support for manageability or administration of a desktop operating system, consider these questions:

n

Does the operating system provide the tools and platform infrastructure for

supporting existing industry standard management mechanisms such as SNMP, and provide the flexibility for supporting future standards such as DMI?

n

Does the operating system provide tools and mechanisms for MIS

organizations and administrators to customize and control the functionality and capabilities on the desktop?

n

Does the operating system provide support for administering or managing

the desktop PC remotely over a network?

Support for Communications and Messaging (The Microsoft Network)

The explosive growth of services such as CompuServe, America Online, and the Internet show the dramatic increase in demand for an operating system that enables

connectivity beyond the desktop to provide access to online and mail services. The support and services that an operating system provides can open the door for users to discover the communications and messaging possibilities in the Information Age.

As you evaluate communications and messaging support in an operating system, consider these questions:

n

Does the operating system support high-speed communications and background multitasking capabilities?

n

Does the operating system support communication hardware, and provide services for supporting new communication technology and functionality such as sharing communication ports, unified device configuration?

n

Does the operating system provide support for industry-standard messaging services?

n

Does the operating system provide broad communication and messaging capabilities and consolidated information access (for example, faxing, dial-in access to resources, and access to online information services) ?

Support for Mobile Services and Remote Access

To realize seamless mobility, you must be able to easily communicate and remain productive, whether you are in the office, at a customer site, or at home. You must be able to communicate with coworkers and clients regardless of their location, and your transitions between home computer, portable computer and office computer must not interrupt your workflow. Support for mobility services as part of the operating system ensures tight integration and connectivity between portable computer and desktop PCs, allowing minimal interruption from real work as you switch from one location and/or computer to another.

As you evaluate the operating system support for mobile services, consider these questions:

n

Does the operating system support remote access to the key services or information you need on your corporate network?

n

Does the operating system have robust support for the dynamic nature of mobile hardware, such as PCMCIA, power management, and docking stations?

Business Criteria (Cost and Requirements)

n

Training requirements

n

Equipment requirements

n

Anticipated support cost

n

Migration cost

Training Requirements

End-user training and support training help ensure effective use of any product. A product's features and intuitiveness, however, can determine what and how much training is necessary.

As you evaluate an operating system's training requirements, consider these questions:

n

Does the operating system present any new features that may be difficult to use or support?

n

Does the operating system offer on-line help to provide answers to common questions?

n

Does the operating system offer tools that will help your support staff resolve end-user issues?

n

What changes will be evident, but not intuitive?

Equipment Requirements

Stated system requirements are usually the minimum supported environment, which will normally not meet the needs of most large businesses.

As you evaluate operating system equipment requirements, consider these questions:

n

What are the recommended minimum system requirements?

n

What is your current configuration of desktop or laptop systems?

n

Can the systems be upgraded?

Anticipated Support Cost

Support costs related to a operating system are often a byproduct of training or the lack of it. Adequate training costs money, but it can diminish support costs.

As you evaluate anticipated operating system support, consider these questions:

n

Does the operating system present any new features that may be difficult to support?

n

Does the operating system offer tools that will help support staff resolve end-user issues?

n

Are advanced documentation or support tools available to reduce problem research time?

Migration Cost

Migration costs usually involve upgrading current equipment and installing the new software. In large organizations, these cost can be significant.

As you evaluate the migration cost of an operating system, consider these questions:

n

Does the operating system lend itself to an automated installation procedure?

n

What is the cost to upgrade the current standard machines to the operating system requirements?

n

What is the cost of the products?

n

If manual installation is necessary, how long does it take?

The decision about which platform to deploy should be based on what tasks people are trying to accomplish. Windows 95 and Windows NT Workstation provide complementary sets of capabilities that can accommodate a broad range of use scenarios. Consider the following examples:

[Windows 95 Usage Scenarios](#)

n

Most office environments require people to perform a variety of general

tasks such as word processing, database queries, or spreadsheet analysis, using productivity applications such as the Microsoft Office suite, or applications specific to a particular business. Most companies have an installed base of personal computers, peripheral devices and applications and want to maximize their investment in that computing infrastructure.

n

Many companies have employees who spend a lot of their working hours

away from their office (at a customer site, in a hotel or out in the field) relying on personal laptop computers to help them perform their jobs. These mobile computer users have similar requirements for application and device compatibility, but also need an operating system that places lower demands on the hardware, including amount of memory, battery power, and use of disk space.

n

Most home-based users find computers challenging and unfriendly. They

want to be able to take advantage of new capabilities such as multimedia and easily access on-line information services. Home users will find Windows 95 to be easy to use yet powerful enough to do the things they want to do. They'll find it engaging because of its rich built-in multimedia capabilities, its high levels of compatibility for running MS-DOS-based applications such as games, and its built-in connectivity to the Internet or other on-line information services. In addition, technology such as Plug and Play will make their PC experience more enjoyable as they add components such as printers, modems, and other peripherals. For home PC users, Windows 95 is the best choice.

[Windows NT Workstation Usage Scenarios](#)

n

Engineers, scientific researchers, statisticians, and other technical users

often use processing-intensive applications for data analysis and large design activities. Windows NT Workstation, with its support for symmetric multiprocessing (SMP) and its portability to different high-performance platforms like those based on Pentium, Alpha, or MIPS CPUs, can provide the performance of a leading-edge workstation or minicomputer at a fraction of the cost. Moreover, Windows NT Workstation still runs personal productivity applications on the same machine.

n

Industries such as banking and defense that need to protect sensitive data

or application files, will find Windows NT Workstation to be the right choice for the secure desktop. The NTFS file system, combined with appropriate security procedures, helps prevent unauthorized access to systems and data. Moreover,

the security model in Windows NT Workstation is designed to be compliant with C2-level certification. With these features, a Windows NT system can even be shared by multiple users and still maintain security for all files on the system.

n

Many users require very high levels of availability and performance, and

cannot afford downtime, regardless of the application that they are running. Very often, these types of systems are being “right-sized” from mini and mainframe systems. For example, many manufacturing systems today use 16-bit applications to manage their company's production line. Windows NT Workstation supports running these Win16-based applications in separate address spaces (often referred to as separate virtual machines). For users, this means that even if one of these applications fails, all of the other applications continue to run. Windows NT Workstation also provides complete protection for 32-bit applications and the ability to automatically recover (reboot if necessary) if the system goes down.

[Windows 95](#)

With each beta release of Windows 95, we can continue reviewing and evaluating the features and functionality that Windows 95 brings to the desktop and to the industry. To effectively evaluate Windows 95, you need to know more than its feature set: you also have to understand the goals of the development team and the needs of the marketplace that have evolved into the development of the next generation of the Windows operating system.

The best way to review or evaluate Windows 95 is to:

n

Read the Deployment section of the WINDOWS 95 RESOURCE KIT to

understand Windows 95 from the point of view of providing a leadership operating system for the desktop and mobile computer user.

n

Read the [WINDOWS 95 REVIEWERS GUIDE](#) (available on your TechNet

CD) to understand the goals behind the Windows 95 project, and what features and improvements Windows 95 offers over Windows 3.1. Windows 95 is a large project, offering many features and benefits to end-users as well as corporate MIS organizations—this guide discusses these features and benefits.

—Note Refer to the Product Overview section of the Windows 95 Reviewer's Guide (on the TechNet CD) for a quick overview of new features and functionality provided in the final beta release.

n

Read the [RELEASE NOTES](#) for the latest information about the final beta

release. Windows 95 final represents work in progress and the release notes will identify known bugs or incomplete feature sets to help testers avoid known problems that may impair our use of the final release.

n

Look on the Microsoft World Wide Web server for information on both

Windows 95 and Windows NT: www.microsoft.com.

[NT 3.5 Workstation](#)

The best way to review or evaluate NT 3.5 Workstation is to:

n

Read INSIDE WINDOWS NT by Helen Custer to understand Windows NT as a leadership operating system for the developer and desktop computer user.

n

Read the WINDOWS NT RESOURCE KIT by Microsoft Press to

understand the goals behind the Windows NT Workstation project, as well as to understand the features and improvements that Windows NT 3.5 offers over Windows NT 3.1. Windows NT Workstation was a large project, offering many features and benefits to end-users, developers, and corporate MIS organizations as well the Resource Kit discusses these features and benefits as well.

n

Review the WINDOWS NT WORKSTATION online documentation.

Similarities

Ease of Use

Auto-detection of hardware during installation and configuration	Yes	Yes
--	-----	-----

Next-generation Windows User Interface	Yes	Next Release
--	-----	--------------

Plug and Play technology that lets you add hardware without reconfiguring your computer.	Yes	Next Release
--	-----	--------------

Performance

32-bit, preemptive multitasking design provides responsiveness between applications that you need to work more efficiently. No more waiting.	Yes	Yes
--	-----	-----

Win32 API for application development, OLE for linking data across apps.	Yes	Yes
--	-----	-----

Compatibility: Device and Application Support

Runs Win16 applications	Yes	Yes
-------------------------	-----	-----

Runs Win32 and OLE	Yes	Yes
--------------------	-----	-----

applications

Network
Services and
Connectivity

LAN connectivity and peer-to- peer networking, with all popular protocols including TCP/IP, IPX/SPX, and NetBEUI	Yes	Yes
---	-----	-----

Open networking architecture provides choice of clients, transports and drivers and extensibility for support of third party networking applications	Yes	Yes
--	-----	-----

Remote access services built into give you remote access to your workstation	Yes	Yes
---	-----	-----

Manageability
and
Administration

Open system management	Yes	Yes
---------------------------	-----	-----

architecture
provides
infrastructure
for third party
system
management
solutions

Supports existing and emerging system management standards (SNMP, DMI)	Yes	SN MP Yes , DM I exp ect ed
--	-----	---

Desktop user profiles (can be modified by anyone on the system) and monitoring tools	Yes	Yes
---	-----	-----

Communicatio
ns and
Messaging

32-bit Remote Network Access	Yes	Yes
------------------------------------	-----	-----

Built-In Internet Access capability	Yes	Yes
--	-----	-----

RAS PPP compression	Yes	Yes
------------------------	-----	-----

Protection
and Security

RAS PPP data encryption	Yes	Yes
-------------------------------	-----	-----

System and
Peripheral
Support

Fully exploits 386DX, 486,
and Pentium
platforms

Yes Yes

Differences

Ease of Use

Auto-
detection of
hardware
during
installation
and
configuration

Yes Partial

Performance

Pre-emptive
multitasking
design
provides
responsiveness
between
applications
that you need
to work more
efficiently.
No more
waiting.

Win 32
Yes
apps
only

Compatibility:
Device and
Application
Support

Runs MS-
DOS
applications

Yes most

Supports
multiple file

No Yes

systems
beyond MS-
DOS's FAT
file system--
HPFS, NTFS

Uses Open GL graphics library to enable advanced 3- D graphics.	Sho Yes rtly afte r rele ase
--	---

Runs IBM Presentation Manager (through 1.3) & POSIX 1003.1 applications	No Yes
---	--------

Network
Services and
Connectivity

Provides User Level Network Security	Yes Yes , Wh en vali dat ed by NT
---	---

Provides NetWare Server Services	No Yes
---	--------

Manageability
and
Administratio
n

Manageable from SMS	Yes Yes
------------------------	---------

Communicati

ons and
Messaging

Supports PCMCIA	Yes	wit h v3. 51
--------------------	-----	-----------------------

Protection &
Security

Complete crash- protection between Win16 applications by running Win16 applications in separate address spaces	No	Yes
---	----	-----

Offers C-2 certifiable user-level security over access to a standalone workstation. Files, folders, and applications on both desktop and server can be made “invisible” to specific users	No	Yes
--	----	-----

Secure- user profiles to control access to desktop, applications, and system	Yes	Yes
--	-----	-----

configuration
files

Data protection through transacted file system	No	Yes
--	----	-----

Has automatic recovery from a system failure.	No	Yes
---	----	-----

System and
Peripheral
Support2

Runs MS-DOS device drivers	Yes	No
----------------------------	-----	----

Runs Win16 device drivers	Yes	No
---------------------------	-----	----

Supports disk compression	Yes	with v3.51
---------------------------	-----	------------

Runs on PowerPC, MIPS, and DEC Alpha based RISC systems	No	Yes
---	----	-----

Supports multi-processor configurations for scaleable performance without changing operating system or	No	Yes
--	----	-----

applications

Support &
Service

Quick Fix Yes Yes
Engineering
teams to
solve
problems in
critical sites
(issues which
block
business
systems
usage or
deployment)

Quarterly No Yes
Service Pack
Releases:
Distribution
vehicle (CD
ROM and
floppy) for
maintenance
releases

1 MS-DOS applications which write directly to the hardware violate the specifications of C-2 security and are therefore not supported under Windows NT Workstation. Most MS-DOS applications will run unchanged.

2 Windows NT Workstation implements a new driver model which is currently supported by most popular peripherals.

[Training Requirements](#)

End User

n

NT Workstation: The similar Windows interface will not require additional training to Windows for Workgroups users. Additional training to Windows 3.1 will be needed to cover additional network and other services available in Control Panel and File Manager.

n

Windows 95: Training for the new user interface will be required for those users who are migrated immediately. Windows 95 will allow the use of the Win 3.1 interface. This can be used to manage the users affected by the change and provide a means of scheduling training.

—Note Training for the new UI is recommended to begin at the earliest convenience. Incremental releases of Windows NT will parallel the UI of Windows 95.

Support Staff

n

NT Workstation: Training and certification (Microsoft Certification Program) is recommended prior to rollout to end-users. Although somewhat familiar with NT through the current server platforms, it is anticipated that NT-related support calls will increase once the operating system is established on the desktop and the number of users increases. An increased awareness of features and functionality will be required.

n

Windows 95: The same requirements exist for Windows 95 as for NT

Workstation. Advanced training will be required of the support staff for those features enabled on the desktop which are not currently available in NT, and required by designated Windows 95 users. Features including TAPI, Plug and Play, PCMCIA, new networking services, etc. Good sources of training include: the Windows 95 Resource Kit, Traincast videos, ATEC courses and the WinNews server.

Equipment Requirements

n

Windows NT Workstation 3.5: Microsoft lists system requirements for NT

Workstation at: a x86 or Pentium-based system, 386/25 or higher processor, 12MB of memory, One CD-ROM drive, a hard disk with 90 MB available, and a VGA or higher-resolution video display adapter. All components must be Windows NT Workstation 3.5 compatible as defined by the Windows NT Hardware Compatibility List updated quarterly on your TechNet CD.

n

Windows 95: Microsoft's Beta Windows 95 Resource Kit lists the following

system requirements for a Windows 95 workstation: An x86 or Pentium-based system, 386DX or higher processor, 4MB of memory, 10-15MB of available hard disk space for upgrading from MS-DOS or Windows.

Anticipated Support Cost

Windows NT Workstation continues the use of the Windows 3.x interface, so an increase of support cost related to user interface is not anticipated.

Windows 95 is anticipated to be released with the option of using either the Windows 3.x interface or using the new "ease-of-use" interface. This option will allow a controlled migration to mirror training availability if needed. In either case, published reports by the Gartner Group reflect an anticipated decrease in support cost in the amount of \$1180 per user/per year compared to Windows 3.x. Support costs would be decreased through a number of factors: increased system resource capabilities, 32-bit vxds such as Novell NetWare that need no conventional memory, easy to use user interface elements, installation wizards for hardware, system policies to limit user access, and backward compatibility with existing hardware and software.

[Migration Cost](#)

The cost of migration can be addressed on two points:

n

Product Distribution: Microsoft recommends utilizing Microsoft Systems

Management Server (SMS) as a foundation of all product distribution and support. The measurable savings of using SMS to distribute software will result directly from eliminating the need for manual installation at each desktop. Windows NT Workstation 3.5 and Windows 95 will be completely compatible with SMS. Organizations will not see migration costs associated with distributing software through this channel.

n

Upgrade Requirements: Upgrade requirements also need to be addressed

at the organizational level. Costs of both the hardware and software need to be figured into the analysis. Windows 95 is expected to be approximately \$100 (US) and NT Workstation street price is approximately \$319 (US).

Appendix A: References

Note * Available on the TechNet CD

*Microsoft; WINDOWS NT RESOURCE GUIDE, VOLUME 1 OF 3; Microsoft Press; Redmond, WA; 1995

*Microsoft; BETA -- WINDOWS 95 RESOURCE KIT; Microsoft TechNet CD, Jan. 95

*Microsoft; MICROSOFT WINDOWS NT WORKSTATION, EVALUATION GUIDE; 7/94

*Microsoft; "Why Have Two Desktop Operating Systems?"; Microsoft Windows NT Workstation and Windows 95 Product Groups; July 1994

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Parker, Jeff; DIRECTIONS ON MICROSOFT; "Microsoft's Desktop Operating System -- Part 1"; Redmond Communications Inc.; Redmond, WA; 12/94

*Microsoft; MICROSOFT WINDOWS 95; Electronic Datasheet part# 098-57343; Redmond, WA; 1994

*Microsoft; MICROSOFT WINDOWS NT 3.5: THE INTERNET PLATFORM FOR TODAY'S BUSINESS NEEDS; Electronic Datasheet part# 098-57561; Redmond, WA; 1994

Appendix B: NT 3.5 Workstation Highlights and Specifications

Exploits the power of a workstation for the price of a PC.

n

Full 32-bit functions help accomplish more with business-critical and other

data-intensive applications:

n

CAD/CAM

n

Architectural design

n

Engineering

n

Critical line-of-business

n

Manufacturing and process control

n

Development

n Accounting

n Financial analysis

n Traders' workstations

n Real-time systems

n A broad set of high-end features, previously available only on high-end workstations, allows whole new categories of applications on the PC:

n

OpenGL 3D graphics

n

Portability across processors (for example, Intel and RISC-based systems)

n

Symmetric multiprocessing (SMP) support

n

Security

n

Preemptive multitasking for both 16 and 32 bit

n

Multithreading

n

Windows NT Workstation is the ideal platform for deploying business-critical applications, such as customer-service front ends to SQL Server-based client-server databases.

n

Small, fast system foundation works well on a 16-MB 486

n

Preemptive multitasking offers new power and crash protection for both 32-bit business-critical applications and existing 16-bit personal productivity applications

n

Security protects data and applications from malicious tampering or

user errors

n

Concurrently supports a large number of applications, including

communications applications

n

Simple, powerful, and robust configuration management eases

maintenance of workstations

n

The familiar Windows interface extends investment in training, knowledge,

hardware, and software.

n

Windows NT Workstation offers a high degree of compatibility with existing

applications and systems.

n

Runs most applications for the MS-DOS operating system and 16-bit applications for Windows

n

16-bit OS/2® and Presentation Manager applications (requires additional software)

n

POSIX 1003.1-compliant applications

n

Offers a high level of compatibility with hardware and peripherals

n

Windows NT Workstation increases overall user productivity.

n

Increase responsiveness and provide crash protection by preemptively multitasking 16-bit applications for Windows and MS-DOS in separate, protected memory spaces

n

Integrate traditional 16-bit personal productivity applications with business-critical 32-bit applications

n

OLE, Microsoft's object technology, offers convenient data sharing among applications:

n

Drag and drop data between applications (including integration and interoperability of 16-bit and 32-bit applications)

n

Edit in place (regardless of which application created the data)

n

Use the functionality of commercial applications as pretested
components in your own applications

n

Advanced networking client support includes compatibility with these
network operating systems:

n

Banyan VINES (available from third-party software vendors)

n

DEC PATHWORKS (available from third-party software vendors)

n

IBM LAN Server

n

Microsoft LAN Manager

n

Microsoft Windows NTTM Server

n

Novell NetWare

n

UNIX systems

n

Windows NT Workstation includes support for TCP/IP and connectivity to

NetWare file, print, and application servers. Support for NFS and SNA environments available separately.

n

Support for a variety of advanced processors and multiprocessor

machines frees you to move to more powerful hardware architectures without leaving applications or operating system behind. Advanced systems supported include:

n

Intel Pentium

n

MIPS

n Alpha AXP

[System requirements](#)

x86 or Pentium-based system

n Personal computer with a 386/25 or higher processor

n 12 MB of memory

n One 3.5" high-density disk drive or CD-ROM drive and a hard disk with 90-
MB available

n

VGA or higher-resolution video display adapter compatible with Windows

NT Workstation 3.5.

RISC-based system

n

RISC-based workstation compatible with Windows NT Workstation 3.5.

n

16 MB of memory

n

One CD-ROM drive (compatible with Windows NT Workstation 3.5). Hard

disk with 120 MB available

n

VGA or higher-resolution video display adapter (compatible with Windows

NT Workstation 3.5; check with your retailer for details.)

Note —: Software in package is for use with one or two processors. See reseller for list of compatible systems. Additional processor support is available from OEMs. Microsoft Windows NT Workstation supports a maximum of 10 inbound network connections simultaneously.

Options

n

Microsoft Mouse or compatible pointing device (mouse recommended)

n

Network adapter card

n

Audio board

n

Other peripherals available

[Networking options](#)

Microsoft Windows NT Workstation is supported on the following networks:

n

Banyan VINES

n

DEC PATHWORKS

n

IBM LAN Server

n

Microsoft LAN Manager

n

Microsoft Windows NT Server

n

Novell NetWare

n

TCP/IP

n

UNIX

Microsoft 32-bit applications for Windows NT Workstation

n

Microsoft Office version 4.2 for Microsoft Windows NT (scheduled to be

available following shipment of Windows NT Workstation version 3.5) featuring
32-bit versions of Microsoft Excel version 5.0 and Word version 6.0

n

Microsoft Visual C++ and FORTRAN PowerStation development systems

Easiest Windows operating system yet.

n

Navigate your system quickly with powerful new tools:

n

The Start button and taskbar are your primary jump off points for

working with programs and documents, and they are always visible—even
when applications are open full screen.

n

Windows Explorer unites File Manager, Program Manager, Control

Panel, and Print Manager from Windows 3.1 into a more efficient tool for
browsing and managing your PC's resources.

n

Natural, full-length filenames. File names can be up to 255 characters

long—making it easy to find what you're looking for.

n

Plug and Play frees you from manually setting up hardware devices.

Windows 95 detects and configures Plug and Play-compatible devices automatically.

n

Customize and use resources efficiently. Just click the right mouse

button wherever you're working, and a context menu appears in order to help you manipulate objects directly.

n

Microsoft Exchange is your one-stop inbox for viewing and working with

such things as: electronic mail from multiple sources, faxes, documents, and bulletin boards.

n

Automatic file synchronization. Windows 95 Briefcase automatically

updates files between two PCs, so you can easily keep files on your portable PC in synch with your desktop PC or the network.

A faster, more powerful Windows.

n

Increase your productivity. A 32-bit architecture delivers better performance and reliability in areas such as networking, printing, communicating, and multimedia.

n

Reduce support burden. A more intuitive interface guides users through tasks, and greater system reliability, through protected-mode networking, reduces downtime both of which previously required helpdesk intervention.

n

Increase control of the desktop. Centralized security, remote administration, and a Registry that stores each user's environment.

n

User profiles define preferences, and network and application settings for individuals.

n

System policies control what users can and cannot do on the desktop or network.

n

Improve end-user productivity with the intuitiveness, speed, and power of Windows 95. For example, Windows 95 reduces the complexity of remote computing with built-in dial-up networking and support for Plug and Play hardware.

n

Smooth migration to Windows 95. Testing shows users of Windows 3.1 becoming more productive after just one hour with Windows 95 and end-user transition is eased with reference aids such as a computer-based tutorial and powerful new Help system.

Work on several tasks at once with fast, new 32-bit programs that support preemptive multitasking and multi-threading and run in their own memory space, so errant programs can't affect one another.

n

Focus on your documents instead of the programs that created them.

Programs that use OLE, Microsoft's strategic object technology, let you create and edit documents easily, allowing you to work not only within a single

document, but within multiple programs.

Built-in networking. Windows 95 is network ready, providing easy 32-bit access to network resources, even simultaneously. Connect to servers running Novell NetWare or Microsoft Windows NT Server, the Internet, or other PCs running Windows 95 from a local or remote connection using a phone line.

n

Easy networking from anywhere. Dialing in remotely to network services is

just like connecting to them from your desktop PC—a couple of mouse clicks and you're ready to run.

n

Automatic multimedia upgrade. Windows 95 can provide full-screen, full-

motion video on today's high-end PC with no special hardware assistance.

n

Play today's hottest games on Windows 95, thanks to faster graphics

support for Windows-based action games.

Compatibility is built in.

Works with all your current software:

n

Your existing 16-bit programs and drivers for Windows, Windows for Workgroups, and MS-DOS are completely compatible with Windows 95. Programs meet or exceed their current performance on Windows 3.1.

n

Runs on today's PC platform. Use Windows 95 on a PC with as little as 4-MB of memory (8 MB recommended) and a 386DX processor.

Usability Study: Windows 95 vs. Window 3.X
(Time to complete a common set of tasks)

{fewc msdncd, EWGraphic, uz0i 0 /a "psl.bmp"}

After a 20-minute play period that included the tutorial, users of Windows 3.x took just 90 minutes to become nearly twice as fast on Windows 95. (Source: Usability Sciences Study, October 1994)

Reasons why your organization will benefit from upgrading to Windows 95.

Return on investment

n

Reduced cost of ownership. Gartner Group found that the reduced total cost of ownership of Windows 95, including support and training, far outweighs the cost of migrating—\$1,180 less per year, per user.

n

Fast payback period. Gartner Group study estimates that a typical organization will recoup the cost of migrating within three to six months.*

Productivity gains

In a controlled test, Usability Sciences Corporation found that PC users, on the third repetition of a common set of tasks, were nearly TWICE AS FAST with Windows 95 than with Windows 3.1.

Conclusions

n

Migrate. Gartner Group believes organizations running Microsoft Windows should migrate to Windows 95 "if only to run 16-bit applications for Windows on a more stable, easier-to-use platform."

n

Plan ahead. Through prior planning, particularly in the installation process, an organization could upgrade to Windows 95 for less than the average cost of upgrading from Windows 3.0 to Windows 3.1.

Note — Source for this section: Personal Computing Costs: a Chicago Model, August 1994

There's a lot more to know about Microsoft Windows 95; for starters, check into any

or all of the following online sources:

n

WORLDWIDE WEB (Mosaic) <http://www.microsoft.com>

n

INTERNET ftp://ftp.microsoft.com/peropsys/win_news

n

COMPUSERVE [go winnews](#)

n

PRODIGY [jump winnews](#)

n

AMERICA ONLINE [Use keywords winnews](#)

n

GENIE—Download files from the WinNews area under the Windows
RTC.

n

To get on our bi-weekly WINDOWS 95 UPDATE LIST, send mail to:
ENEWS@MICROSOFT.NWNET.COM, As the only text in your message write:
SUBSCRIBE WINNEWS

To run Microsoft Windows 95, you need:

n

Personal computer with a 386DX or higher processor

n

4 MB of memory (8 MB recommended)

n

10–15 MB of available hard disk space for upgrading from MS-DOS or

Windows

Appendix D: Evaluation Plan

Here is a proposed plan of action for testing seven distinct phases of the decision process including evaluating the product, testing the installation and cost/benefit analysis.

The proposed steps are:

1. Assemble the Evaluation Team and Tools
2. Review the Product Specifications
3. Specify the Client Configuration and Dependencies
4. Lab-Test the Installation
5. Evaluate and Plan the Installation
6. Pilot-Test the Installation
7. Create the Rollout Plan

At this early phase of the process a core team should be put in place to define the testing and evaluation plan.

Tasks

1. Assign the project manager.
2. Select key planning and implementation team members.
3. Profile and inventory your client and server hardware and software configurations.
4. Secure a testing lab.
5. Acquire test computers for clients and servers.
6. Install the application software and line-of-business tools in the lab to simulate the users environment.

7. Have the implementation team review features in the Windows 95 and Windows NT Workstation Resource Kit, Guided Tour and Reviewer's Guide. Study the Installation chapters in the Resource Kit.
8. Define dependencies with other applications and projects, such as SMS, networking strategy, application deployment.
9. Review additional training requirements for the team.

Reviewing the specifications of the new and enhanced features in the operating systems is the first step in planning for new desktop operating systems.

Windows 95 and Windows NT Workstation provide an extremely broad and powerful range of features that should improve the manageability and supportability of computing infrastructures. Understanding how these features can help reduce support costs and increase systems manageability is important in implementing the desktops correctly and most efficiently. For example, in Windows 95 one new feature—system policies—enables desktop systems to be remotely administered and managed.

Windows 95 is also designed to make deployment and management easier. By understanding how System Management Services help automate the installation and management process, potential cost reductions can be estimated. For information about ownership costs, migration costs, and productivity benefits, a library of consulting reports and white papers needs to be built.

Collect other sources such as the Resource Kit, books and articles on Windows 95 as reference materials.

Tasks

1. Acquire Windows 95 Beta3, REVIEWER'S GUIDE and RESOURCE GUIDE from your TechNet CD.
2. Read the WINDOWS 95 REVIEWER'S GUIDE on the CD.
3. Review Total Cost of Ownership, Migration, and Productivity studies on the CD.
4. Read books, articles, and white papers on Windows 95.
5. Review video tapes from Microsoft TV broadcasts on Windows 95. For more information call 1-800-597-3200.

With the evaluation team assembled and educated about Windows 95 and Windows NT Workstation features, it is time to specify the client configurations for testing.

This will require assistance from the divisions to ascertain their current and planned desktops so as to accurately duplicate the layout, configuration, and features of each of their client setups. For the purposes of discussion, "client computer" refers to any computer running Windows 95 or Windows NT Workstation, including computers that may run peer sharing services.

The recommended approach is to review each of the features available in Windows 95 and/or Windows NT Workstation, considering its alternatives, including whether it is required at all. This will help determine the ideal client configurations to begin testing against.

Here are some general considerations. Use of 32-bit, protected-mode network client software to provide the best network performance and functionality under Windows. Use of system policies to pre-configure desktop security, and user access to controls, features, and the network. Use of user profiles to allow multiple users to use a single PC with their own settings or conversely, allowing a user the ability to logon from multiple locations.

The initial client configurations should be installed directly to the local systems' hard drive. This simplifies the number of steps to begin learning and testing, and allows the team to focus on getting the preferred clients working correctly.

Success in this phase is measured simply by testing that the preferred client configurations works as expected while remaining compatible with your existing applications and processes. A side-by-side evaluation with the current client should be performed. After the team determines that the client appears to be working, power-users from the divisions should be brought in to stress test the configuration.

Tasks

1. Before running setup, ensure that network taps are working, power supplies are available, and so on.
2. Make sure that the computer meets your standards and the desktop. Windows 95 minimum: at least a 4-megabyte 386SX. Windows NT Workstation minimum: at least a 12-megabyte 486DX.
3. Defragment the hard disk and do a virus scan. Create and copy an MSD report to a floppy disk.
4. Back up and verify key data and configuration files such as *.GRP, *.INI, AUTOTEXEC.BAT, and CONFIG.SYS and data files.
5. Ensure that your current client configuration works properly on the test computers.
6. Install software on the test computers in the lab, using your preferred client

configuration.

7. Test the installation. Can you connect and browse the network? Can you print both locally and across the network? Can you open, run, and close applications locally and on the network? Can you shut down successfully?
8. Compare the old client configuration under Windows 3.x and your new preferred configuration on these topics: functionality for both administering the computer and using it for common tasks; performance for local disk and network actions; discoverability and ease of use for common tasks; stability of the two systems under stress; compatibility with applications and hardware.
9. If the specified client configuration did not work as expected, modify and document the differences until a working preferred client configuration is installed.
10. Perform a complete restoration of operating system files and system capabilities for your old client configuration on a computer running with the new client configuration.
11. Evaluate the restoration process for problems. Document the process and modifications made for your system.
12. Install the preferred configuration on a wider variety of hardware, with your team assisting in performing the installations.

Now that the team has a thorough understanding of the functionality of Windows 95 and Windows NT Workstation, it is time to plan the rollout to a pilot test case. This involves expanding the team to include installation and support personnel, creating an automated installation process, planning the logistics of a pilot test, and creating a training plan for users.

Automating the installation is a key step in reducing the cost of migration. The creation of a batch script with predetermined answers for installation questions, will enable the installation process to run unprompted until completion. Further, the team will want to test a method to “push” the installation from the server, so that Windows 95 and Windows NT Workstation can be installed on an individual PC with as little user intervention as possible. This installation testing is first tested and verified in the lab.

The planning for the pilot test involves assessing how you will schedule, communicate, conduct, and support the pilot installation. Working through the logistics in the pilot test is key to a smooth rollout. You’ll also want to develop an end-user training plan that precedes the pilot test so that your users are trained and ready to use Windows 95 before it arrives on their desks.

Tasks

1. Have the installation and support groups assign resources to the team.
2. Use install the source files on a server.
3. Set up the client from the network. Thoroughly document this process.
4. Create and test an automated installation by creating a batch script to answer Setup settings requests. Document the key parts of the batch script that vary by division.
5. Determine and test how you will push the installation from the server without having to touch the client computers. This can involve a variety of options: modifying logon scripts on the server, using a management software tool such as Microsoft System Management Server, sending an embedded link to the server by electronic mail. Document the preferred and alternate processes for the rest of the implementation team.
6. Evaluate the installation process for opportunities to upgrade or improve your organization's technology infrastructure. For example, a systems management software tool can help you administer computers on the network more easily, and it can help with the push installation process.
7. Document the logistics of the pilot installation. This includes the total time for installation, purchase of new software or tools, selection of the pilot group, and scheduling of specific installations.
8. Put together a memo for your users which clearly explains how the installation process will affect their daily work schedule and the differences they will see once the installation is completed.
9. Put a support plan in place for the pilot group. This includes a contact name and phone number for assistance, and a short list of the top questions and answers, and troubleshooting tips.
10. Put together or hire a third party to provide a user training course. Windows 95 and Windows NT Workstation come with tutorials that can be used to jump-start the training efforts.
11. Set up the lab or classroom with computers for hands-on training.
12. Put together a training script that covers the computer's basics and your company's specific applications.
13. Edit the Help files (if appropriate) to include any company-specific information. You'll want to do this again after the pilot test is completed.

If the team did a good job of anticipating problems during the previous phase in planning the installation, conducting the actual pilot test should be straight forward. The key goals of the pilot program are to test the installation plan on a limited basis in real user scenarios to determine the problems that will hinder or slow the

deployment process. It can then be determined what resources will be required for the formal rollout, and accurately gauge the impact on the company of the move to Windows 95 and Windows NT Workstation. Also, the pilot test will set the tone for the rest of the deployment process, and if done successfully, will help obtain the appropriate cooperation and excitement to make the other installations run smoothly.

Tasks

1. Select a pilot group that is willing and has the time to handle the installation process.
2. Train the users.
3. Perform the installation in the same manner that you expect to install Windows 95 and Windows NT workstation throughout the company.
4. Have your technicians on-site for the initial installations to document the process and problems and to support the users. Have other technicians time and measure all phases of the installation process.
5. Ensure that all systems are up and running as expected. Document areas in which the installation, training, or support can be improved.
6. Survey members of the pilot group about their satisfaction with the installation process and take feedback on what could have been done better.
7. Continue to monitor the pilot installation for a week to ensure that everything continues to run smoothly.
8. If the pilot test did not run smoothly or user feedback was poor, conduct additional pilot installations until the process works well.

The creation of the formal rollout plan is the final step in organizing and planning the deployment process. This involves working with the divisions in setting the goals for the timing and scope of the installation process company wide, and updating the company's related policies and standards.

By projecting the results of the pilot test to your entire network, the time and resources required to move to Windows 95 and Windows NT Workstation can be forecast. This will allow accurate budgeting estimates for the needed resources moving forward.

Tasks

1. Determine rollout goals specifically the number of computers where Windows 95 and Windows NT Workstation will be installed and the time expected to complete.
2. Budget the resources for personnel and tools required to meet these goals.
3. If necessary, present and obtain approval for the resources and the rollout.

process

4. Hire and train the extended implementation team and purchase any additional software or tools needed.
5. Update the company's hardware and software standards lists.
6. Update the company's policies and practices manuals or guidelines for use of the PC and network.
7. Notify your users that the standards and policies lists will be enforced prior to the installation and to clean their systems and bring them up to compliance.
8. If appropriate, edit the Help files to add company-specific help for line-of-business applications, and to remove unwanted information about the capabilities you plan to disable.
9. Create a registration template or worksheet that lists the specific configurations and use of each computer. Be sure to leave room to document any problems or deficiencies with the system that require further attention.
10. Post the updated registration file on a central network location.

{ewl msdn.cd.dll, ewcright, /c"Microsoft"}

Windows 95 and NetWare: A Networking Insight

by Charles Rose, RoseWare

Abstract

Charles Rose, RoseWare President, author and consulting software developer and NetWare systop provides here an in-depth look at Windows 95 from the perspective of a Novell NetWare expert. Rose concludes that Windows 95 is a compelling upgrade for customers who connect Windows to NetWare.

Ask network administrators about the client environments they support and the Microsoft® Windows® operating system usually mentioned as the most popular client—and perhaps the most involved to support. Network administrators generally recognize the benefits of a graphical environment, but the installation, configuration, and support aspects of a graphical user interface (GUI) seem to as ease of use increases.

Microsoft Windows version 3.1 brought tremendous flexibility and ease of use to the desktop, but it created extensive work for network administrators. Managing a diverse network with individual Windows-based configurations turned out to be no mean feat.

The Windows 95 operating system promises even more power and flexibility to the user. As a network administrator, you might be excited by the latest technology and the power of the new features, yet worried about how you will handle installation, configuration, and support. But Windows 95 promises more power and flexibility to the NETWORK ADMINISTRATOR than any previous version of Windows. Your life may become easier—not harder—with the introduction of Windows 95. Microsoft has listened to the requests of network administrators for more performance, better security, easier setup and administration, and smarter network management tools.

It can be difficult to separate marketing promises from the hard realities of network management. The purpose of this paper is to identify these realities and explain how Windows 95 will make your life easier.

What does Windows 95 mean to you?

Windows 95 means different things to different types of people involved with local area networks (LANs).

For the NETWORK ADMINISTRATOR, Windows 95 will require a certain time commitment for planning but the deployment will require less time than previous versions of Windows, given the tools provided by Microsoft.

Integrating any new environment involves change. However, if the network administrator takes sufficient time to plan the deployment of Windows 95 and learn the tools provided for network setup, the time spent will be well worth it.

Microsoft has put special emphasis on network setup for its new environment. Batch/scripted setup and global system policies provide a powerful mix of setup tools. Large corporate sites involved in beta testing of Windows 95 found network setup one of the most valuable aspects of Windows 95-based networking.

The prospect of visiting each personal computer (PC) in a medium to large network can be daunting at best. But with the new network tools, the setup process can be launched from the network login script. Setup can be configured to run entirely hands-free or the administrator can choose those fields that are open to user input.

For the CERTIFIED NETWARE® ENGINEER (CNE) OR NETWORKING CONSULTANT, Windows 95 presents new business opportunities and new ways of doing business. Most businesses will likely choose to upgrade to Windows 95 and they will need assistance. Windows 95 is easier to install and configure than previous versions of Windows, but it requires a fair amount of planning to install on existing systems. CNEs and consultants should find more business aiding companies with the planning, installation, integration/configuration, training, and support phases of product deployment. In addition, the remote management capabilities of Windows 95 will allow CNEs and consultants to perform their network management over an asynchronous connection. Finally, after companies have successfully integrated Windows 95 at the software/hardware level, they will need to integrate it at the user level. To take maximum advantage of the new environment, users must be made aware of the new features available to them.

For the NETWORK SOFTWARE DEVELOPER, Windows 95 provides exciting new opportunities. As modern operating environments are becoming 32-bit protected-mode systems, the demand for 32-bit applications is rising dramatically. Thus, application vendors will need to build 32-bit versions of their applications to take advantage of the new resources of Windows 95 (32-bit application programming interface, the registry, and so on). In addition, the fact that Windows 95 supports a wide array of networks means that applications written to the WinNet API (discussed in more detail following) will run on all supported networks. Develop an application for Windows 95 using the WinNet API, and it will run without modification on Windows NT™, NetWare, Banyan® and other networks.

For the USER, Windows 95 brings a plethora of new features. Users will notice better performance, both in terms of increased speed and a more stable environment. And they will benefit from a better-looking, more tightly integrated desktop environment. As Windows 3.1 improved the landscape of the desktop, Windows 95 provides similar dramatic improvements. Users will see the network more as a unified collection of resources rather than a random accumulation, each with its own interface and individual quirks.

Why should you care?

What are the specific advantages and improvements to Windows 95? The rest of this paper will examine in detail the feature-level improvements. But at a higher level, the value of moving to Windows 95 can be expressed in terms of higher productivity, increased user satisfaction, and improved manageability of the network. Organizations that move to Windows 95 and take the time to properly plan should see these improvements from better performance, a more robust feature set, and enhanced desktop management support.

Because most readers are familiar with Windows 3.1, let's start by examining some of the differences between networking in Windows 3.1 and Windows 95:

Multiple network support is difficult to impossible, with different interfaces for each	True multiple network support and native support for more network environments and consistent interface for each
---	--

No native network management support	Plugs into HP® OpenView, NMS, and Microsoft Systems Management Server; simple network management protocol (SNMP) agent over IPX/SPX or TCP/IP; information pulled from
--------------------------------------	--

the
registry;
Desktop
Managem
ent
Interface
support
(cross-
platform
developing
, registry-
based,
MIF) (DMI
support is
not in the
first
release of
Windows
95)

.INI files managed separately for each workstation on the network Remote management of the registry allows network administrators to manage all PC configurations (even on local hard disks) across the network

Lots of .INI files to manage Windows 95 registry database contains configuration for PC, Windows, and other applications, all in one place

Changing security of Program Manager requires use of obscure .I NI parameter s

System Policy Editor is a GUI tool that lets you restrict certain functions on the desktop by providing a GUI front end to the desktop registries

Windows ® for Workgroups had no real security tools

Peer security works with existing LAN administration tools (Syscon, NWAdmin, and so on.)

Hardware setup is usually a hassle

Plug and Play lets Windows 95 set hardware configuration

16-bit network interface card (NIC) drivers

16-bit or 32-bit NIC drivers; 32-bit network driver interface specification (NDIS) 3 drivers up to 200

percent
faster than
16-bit
drivers

Frame type (802.2 vs. 802.3) must be identified and set consistently for each workstation	Automatic detection of frame type so network administrator does not have to set it for each workstation
---	---

Network login must occur before running Windows in order to have login script support and login under Windows supported only through nonnative (NWUSER) utilities	Native support for NetWare login and login scripts
---	--

Print to NetWare print queues	Point and Print, Drag and Drop to network printers
-------------------------------	--

Windows for Workgroups	NWServer allows Windows 95-based
------------------------	----------------------------------

provides PCs to
peer-to- appear as
peer NetWare
networkin file servers
g, but only across the
among network
Windows (users can
for map
Workgrou drives,
ps— share files,
equipped and print
PCs— to
security is Windows
only on a 95-based
password PCs as if
(share- they were
level) NetWare
basis file
servers)

Backup Win32®
with backup
software agents
from included
Arcada or inside
Cheyenne Windows
requires 95 so
memory- memory-
resident resident
programs programs
to be are not
loaded needed

When Automatic
network disconnect
goes and
down, reconnect
workstatio allows
n goes local PCs
down to keep
running
even when
the
“network
resource”
goes
away;

when it's available again, PCs reconnect.

16-bit, real-mode network drivers consume conventional memory and quickly exhaust upper memory	32-bit virtual device driver (VxD) architecture means network drivers and related software run above 1 megabyte (MB), so more than 600 kilobytes (KB) are free for MS_DOS®-based applications
MS_DOS 8.3 filename support	Long (up to 255 characters) filename support on local drives and on network file servers (including NetWare)
Supports 16-bit applications for Windows	Supports 32-bit and 16-bit applications for

Windows
and
NetWare;
fully
forward
and
backward
compatible

16-bit	32-bit
nonpreem	preemptive
ptive	environme
environme	nt provides
nt	performan
	ce,
	protection,
	and
	flexibility

Now let's discuss these issues in more depth. We'll begin with the more apparent networking changes and work our way down into the architecture. We will conclude with a discussion of the Windows 95 networking APIs.

One of the design goals for Windows 95 was to have a "seamless" interface to all of the various networking platforms it supports, such as NetWare; Windows NT; Microsoft LAN Manager; Banyan VINES®; Artisoft® LANtastic®; DEC™; PATHWORKS™; Sun® PC-NFS®; 3Com® 3+Open® and 3+Share®; Beame and Whiteside B&W-NFS; IBM® LAN Server; LAN Program; and PC LAN Program.

This makes life much easier for the user, because the user interface does not change according to the type of network resource. To the user, one vendor's file server volume looks like another network vendor's volume, which relieves the burden of remembering platform-specific details.

[Similar interface to local and network resources](#)

There are several areas where this seamless interface manifests itself. The first area is in the My Computer and Network Neighborhood boxes (see Figures 1 and 2). The first provides a folder/document type interface to the user's local drives and mapped network drives, while the latter provides an identical interface to network resources.

Figure 1: My Computer dialog box

{ewc msdncd, EWGraphic, vg0c 0 /a "psC.bmp"}

Figure 2: Network Neighborhood

{ewc msdncd, EWGraphic, vg0c 1 /a "psC.bmp"}

[Windows 95-based desktops can appear as NetWare file servers](#)

In addition to providing a consistent user interface to dissimilar networks, the peer-to-peer capabilities of Windows 95 behave like a NetWare file server to NetWare clients. You can ATTACH to a Windows 95-based desktop, see it in SLIST (see Figure 3), and use VOLINFO or other NetWare utilities. You can MAP a drive to it, and it will function just like a NetWare file server.

These features can be particularly useful to relatively small workgroups. Administrators of large networks may choose not to allow peer services.

Figure 3: List of NetWare servers, including Windows 95 NetWare file and print server

F:\>slist

Known NetWare File Servers	Network	Node Address	Status
NETWARE_41	[ACE]	1]	Default
WIN95PC	[1]	20AF41B946]	Attached

Total of 2 file servers found

Microsoft provides a 32-bit client for NetWare with Windows 95. NetWare 2.X, 3.X, and 4.X (Bindery emulation) are supported. Windows 95 also allows for login completely under Windows, including full support for NetWare login scripts.

Microsoft has gone to great lengths to ensure NetWare compatibility. NetWare performance enhancements such as Packet Burst and Large Internet Packet (LIP) are supported. Packet Burst improves the speed of workstation and server communication by reducing the number of packets involved. LIP support means network routers and gateways can send packets at their normal size, rather than breaking them down into smaller parcels.

Windows 95 does not support packet signature, however, nor does it provide a GUI frontend for password changes. (You must execute Novell's SETPASS.EXE to change your NetWare password.)

In addition, Microsoft's 32-bit client provides Plug and Play support (see below under

Windows/Network Setup for more information), and client-side caching, both of which provide improved functionality and performance.

[Intelligent NetWare support: NetWare login scripts and frame type autodetection](#)

The NetWare login script support is one of the key features of Microsoft's 32-bit NetWare client. Windows 95 processes system and personal login scripts, and it supports the commands and variables of NetWare's login scripts. Network administrators should note that TSRs cannot be loaded in the login script, although you can execute programs as long as they don't stay resident.

In addition, Microsoft wrote the client software so that it automatically discovers the network frame type and network number. This can be a time saver for network administrators who would normally have to manually coordinate server and workstation setup of the frame type.

Both of these features result in a desktop that is far more "network-aware" than others.

[Network tools built into the graphical desktop](#)

In addition to the architectural NetWare support that has been built into Windows 95, you will also notice certain GUI enhancements that provide a graphical way of performing tasks once done under MS-DOS, or through a third-party utility. Right-click on the "Network Neighborhood" icon on the Windows 95 desktop and you see options such as "Who Am I," "Map Network Drive...", and "Disconnect Network Drive." These options function like Novell's WHOAMI and MAP commands (or the NWUSER utility).

Also, if you right-click on a NetWare file server under the Network Neighborhood, you will see options such as "Who Am I," "Log Out," "Attach As...", "Map Network Drive," and "Properties." These options function like Novell's WHOAMI, LOGOUT, ATTACH/LOGIN, MAP, and NVER commands.

GUI support for these networking tasks makes using the network more of a natural part of the desktop environment, rather than something external to the user. It will make the user feel and act more as a part of the network.

Figure 4: Network Neighborhood Menu

{ewc msdncd, EWGraphic, vg0c 2 /a "psC.bmp"}

Figure 5: NetWare File Server Menu

{ewc msdncd, EWGraphic, vg0c 3 /a "psC.bmp"}

Heterogeneous network support

With Windows 95, you can run multiple protocols from the same workstation. The 32-bit versions of IPX, TCP/IP, and NetBEUI are provided.

The Windows Sockets interface allows a common API to these heterogeneous protocols (IPX, TCP/IP) and the DCE remote procedure call (RPC) interface is supported—both of which are useful in client-server applications.

Long filename support

A common frustration of MS-DOS users is the 8.3 naming convention. Windows 95 supports long filenames that may be up to 255 characters (the complete file path may be up to 255 characters long, so the actual file name will be less, depending on the length of the path name). Figure 6 shows how long filenames are displayed by the MS-DOS DIR command.

Figure 6: Long filenames displayed by the MS-DOS DIR command

Volume in drive C is DOSWINFAX

Volume Serial Number is 15EC-2251

Directory of C:\TEST

```
.<DIR>01-17-95 5:38p .
..<DIR>01-17-95 5:38p ..
MSD EXE 166,099 01-30-95 11:31p MSD.EXE
EGYPTI~1 BMP 630 02-08-95 6:39p Egyptian Stone.bmp
HONEYC~1 BMP 854 02-08-95 6:40p Honeycomb.bmp
THATCHES BMP 598 02-08-95 6:45p Thatches.bmp
FORYOU~1 CPE 4,133 02-08-95 6:40p For your information.cpe
SYSTEM CB 98 02-13-95 10:37a SYSTEM.CB
```

Windows 95 can display files on NetWare file servers with long filenames; network administrators simply load the OS/2® name space. This means that not only will NetWare users see long filenames (like those shown in Figure 6) on their local drives, they will see long filenames on NetWare drives as well.

Networks are becoming larger and more complex, which places increasing demands on the network administrator. The administrator needs a set of tools that are powerful enough to monitor, configure, and manage the entire network. Windows 95 goes well beyond Windows 3.1 and Windows for Workgroups in providing tools for network management and support.

[Tools: Net Watcher and System Monitor](#)

NetWatcher is a tool for the peer capabilities of Windows 95. It shows which users are attached to the workstation, the shared local drives, and what files are currently open. System Monitor allows you to view (as a histogram, graphic bar, or numeric value) a vast number of performance statistics. You can choose statistics from the file system, network protocols, the kernel, memory manager, peer server engine, or network client. NetWare users can check Burst Packet statistics, NCP dropped packets, bits per second, local cache statistics, pending requests, and more. It is important to note that both Net Watcher and System Monitor function locally as well as remotely. Figures 7 and 8 show Net Watcher and System Monitor, respectively.

Figure 7: Net Watcher

{ewc msdncd, EWGraphic, vg0c 4 /a "psC.bmp"}

Figure 8: System Monitor

{ewc msdncd, EWGraphic, vg0c 5 /a "psC.bmp"}

[Registry/RegEdit](#)

The Windows 95 registry is a database that contains system and user-specific configuration information, and is an incremental improvement over the .INI files in Windows. Rather than using simple text editors, Microsoft provides a GUI front end to the registry called RegEdit. The registry stores information in a hierarchical order, and the GUI lets you browse and modify this information by expanding levels of information in an outline format. One of the more powerful features of RegEdit is the ability to remotely manage another user's registry. Given the proper security, you can access a remote user's registry and browse or update certain values.

The table below illustrates the differences between the new registry and the old .INI configuration files:

Many (often well over 100) small .INI files	Three files at most: SYSTEM. DAT for PC-specific information , USER.DAT for user- specific details, and
---	--

(optional)
POLICIES.
DAT for
system-
wide items

64K limit on each .INI file	No logical limit on registry file size
--------------------------------------	---

At most, two levels of informatio n: [section] name and s settings under that section	Hierarchica l structure; can be any depth required by application s
--	---

Complicat ed to administer	Easier to administer with RegEdit registry editor and PolEdit policy editor
----------------------------------	---

No user- specific informatio n	Registry separates information specific to the local PC (SYSTEM. DAT) versus user configurati on (USER.DA T). This way, multiple
---	---

users can
share the
same
workstation
and retain
individual
settings

.INI files managed locally using text editors	Registry files may be managed locally or remotely (across the network) using GUI tools
---	---

All .INI files placed in \\WINDO WS directory	Registry files can be placed in the Windows directory or distributed according to use. PC- specific information can be stored on the hard disk, user info on the login directory, and system policies in the SYS:PUBL IC directory.
--	---

The registry simplifies the storage and management of configuration information. It works well with the centralized/distributed model. Information that should be

distributed (PC-specific data) is stored on the local workstation; information that should be centralized (user-specific and system-wide data) is stored at the file server. In addition, Windows 95 does a good job of coordinating local and remote configurations. For example, the registry is stored locally and is replicated on the network file server. The files are compared and updated during network login/logout operations. Two copies of the file are maintained so that laptop users, for example, can disconnect from the network and still retain a registry database.

The existence of the registry does not free you from .INI files completely. They must exist in order to be compatible with existing applications for Windows. However, more and more applications will be supporting the registry for storage of configuration information, so the burden of managing .INI files should fade over time.

[Why does the NetWare user care about the registry?](#)

There are several reasons why the registry is important on the network. First, the registry is the central depository for Plug and Play and other hardware configuration information, including the network setup. Network administrators can manage the configuration of each PC on the network remotely using RegEdit. Also, more formal network management software, such as those that use SNMP or DMI, relies on information that is stored in the Registry.

Anyone who has managed a medium to large network with Windows and wanted to update a .INI setting globally knows what a nightmare this can be. Most users will have .INI files stored locally, which either requires special software just for .INI management, or lots of aerobics—visiting each individual workstation to manage these files. The registry (and a system policy) allows the administrator to make one setting that each user reads and incorporates upon login. This can be a tremendous time-saver.

Another important aspect of the registry is the integration with the network and the fact that information can be stored where it makes sense for it to reside. For example, PC-specific information resides at the workstation (SYSTEM.DAT) while user-specific information can be stored in the user's login directory on the file server (as discussed above, the user-specific information is actually stored locally and replicated to the network file server). This allows users to roam the network and log in to different workstations while still preserving their user-specific environment (wallpaper, desktop setup, and so on.). Also, system-wide registry information or "policies," which override PC-specific or user-specific information, are stored in the SYS:PUBLIC directory on the NetWare file server.

Optionally, an administrator may choose to place all three registry files on the server. This would be the only option for workstations that do not have local drives, such as with remote initiation program load (RIPL) or diskless workstations.

Not all information in the registry is stationary. Like the NetWare Bindery, the registry stores some information that is static (configuration information, for example) and

other information that is dynamic. Dynamic registry settings include network adapter statistics, which can be useful for network administrators to query.

One useful aspect of the registry for network administrators is its extensibility. The registry is not just for Windows 95: Applications can use the registry to store user configurations as well, which adds to the flexibility of the network.

[Policies/PolEdit](#)

The registry is a powerful new means of configuration, but something is missing. Even though you can remotely connect to each desktop to make configuration changes, you still manually connect to each desktop. Windows 95 includes “policies” software to handle this dilemma. Policies are one of the more powerful network management features of Windows 95. They allow network administrators to globally control certain registry settings and they map to one or more keys in the registry.

The interface to policies is called PolEdit, a GUI outline-based front end. When you change settings in PolEdit, you are making changes that will affect the registry of certain users.

Network administrators can specify policies globally, per-server, on a group, or even on a single user basis.

Policies can be used to make registry-based configuration changes for certain groups of users (or for all users). Policies also can help administer security by restricting access to certain system functions, such as the Run system menu option. Additionally, policies help the network administrator to create defaults during network setup. The network administrator can specify default workgroup and organization names, or hardware configurations for network boards, and the like.

The batch setup aspects of policies can be a true lifesaver. Rather than setting defaults in each user's registry, the network administrator can make global defaults (or defaults specific to just a few users) for certain settings, such as the workgroup, company name, network adapter, and so on.

Like the registry, policies are not restricted to managing system settings; network managers can create their own policies, manageable in the GUI-based PolEdit (see Figure 9). This can be useful for creating defaults in certain applications or in grouping settings in ways other than is provided in Windows 95.

There are three types of policies that the network administrator will manage:

1. Policies for settings that already are in the registry (such as for setting the network Preferred Server)
2. Policies that restrict access to certain parts of the desktop (for example, to disable Control Panel or Start|Run)

3. Custom desktop settings for users who roam to other workstations

Figure 9: Policy Editor

```
{ewc msdncd, EWGraphic, vg0c 6 /a "psC.bmp"}
```

Figure 10: Registry Editor

```
{ewc msdncd, EWGraphic, vg0c 7 /a "psC.bmp"}
```

[Plugging into HP OpenView, NMS, and Microsoft Systems Management Server via SNMP agent](#)

Windows 95 plugs cleanly into Hewlett-Packard OpenView, Novell Network Management System (NMS), and Microsoft Systems Management Server through the use of its SNMP agent. Built-in support allows for easy management of workstations under these network management platforms.

Simple network management protocol support in Windows 95 includes an SNMP agent, an extensible MIB handler interface, and MIB I and MIB II support. Support of SNMP makes it easy to add workstations into a formally managed network without having to struggle with loading special software on each workstation. In addition, the extensible MIB handler interface allows hardware or software vendors to instrument their components so they can be remotely managed via the SNMP console.

The Windows 95 SNMP support works over TCP/IP and IPX transports.

[DMI support](#)

Desktop Management Interface (DMI) is a specification designed by the Desktop Management Task Force (DMTF). The DMI agent for Windows 95 should be included in the next version of SMS, due for release the same time Windows 95 is released.

[Inventory](#)

Windows 95 makes it easy for ISVs to develop network inventory applications. The registry for each PC stores local hardware information that can be sent to an inventory application across the network. So inventory applications simply gather updated inventories of the network.

One of the most impressive features of Windows 95 is the ease of setup for network administrators, particularly given the size of the new operating system. As the size of

network applications and environments have grown, so has the complexity (not to mention drudgery) of installing and configuring for a large network. The larger the network, the more the administrator will appreciate the network installation features of Windows 95. These features include: setup scripts and automated installation, significantly improved client support and full 32-bit network support during setup.

Setup scripts and automated installation

The combination of setup scripts and system policies provides the network administrator with the power to perform batch installations for large networks. Imagine running the setup program from a login script so that users logging in on a given day have their local workstations automatically set up under Windows 95. The time savings for the administrator can be significant.

Significantly improved client support

Windows 95 supports many more clients than were available under previous versions of Windows. Figure 11 shows the clients that are supported under each boot option. Client configurations that were supported under Windows for Workgroups 3.11 are shown with an asterisk (*).

Figure 11: Network Client Support under Windows 95

	Y	Ye	Y	Y	Y	Y
	e	s	e	es	e	es
	s*		s*	*	s	
	Y	Ye	Y	Y	Y	Y
	e	s	e	es	e	es
	s		s		s	
	N	Ye	Y	Y	N	N
	T	s	e	es	o	o
	at		s			
	s					
	hi					
	p					
* Windows for Workgroups supported clients/platforms						

32-bit network during setup

Windows 95 provides a full 32-bit network client during setup, which provides performance improvements over the older 16-bit network clients, as well as

protection during the setup phase.

[Setup options](#)

There are three major configuration possibilities when installing Windows 95 on the network: hard disk installation, floppy boot, or remote initiation program load. The administrator can install Windows 95 to a user's local hard disk, deciding whether to place most of the operating system files and swap file locally or on the network. For workstations without hard disks, the administrator may choose to boot the workstation from a floppy disk and, once connected with the network, boot and run Windows 95 from the file server. For diskless PCs, the RIPL solution is provided, which allows diskless workstations to boot, log in to the network, and load and run Windows 95 from the network.

Administrators will find advantages to each approach. The final decision should be made based on local workstation configuration, disk space and random access memory, number of users, and so on. Configurations that place more files on the local workstation reduce network traffic but decentralize the placement of files. Centralizing files on the network can be convenient, but the price paid is in performance. The system is flexible enough to allow for a number of configuration options, such as keeping most Windows 95 files on the server but using local swap files.

[Performance considerations](#)

When deciding how to set up and configure local workstation support, a critical consideration is performance. The performance from any of the above configurations will depend heavily on:

n

The type of applications running on the clients

n

How paging is set up (server-based swap files consume more bandwidth)

than local swap files)

n

Memory in the workstations (floppy/RIPL clients may require more
memory)

The advantage of network swapping is centralized management. Increasing workstation memory reduces the amount of swapping involved, thus reducing network traffic. The network administrator can also disable swapping to disk, if desired.

In addition to the previously mentioned features, there are a few other, less-obvious features that are hidden deeper within Windows 95 to help the network administrator. For example, Microsoft wrote the client software so that it automatically discovers the network frame type and network number. Because NetWare 3.1 (and below) servers default to the Ethernet 802.3 frame type and NetWare 3.12 and 4.X default to Ethernet 802.2, it can be frustrating to coordinate server and workstation setup, particularly in a large environment. The Microsoft feature makes the behavior of Windows 95 on the network more intuitive and allows the network administrator to concentrate on core management issues.

[Plug and Play](#)

Windows 95 removes more of the hassle and headache of network setup with Plug and Play architecture. For systems with Plug and Play-compatible hardware, Windows 95 configures and assigns resources such as input/output (I/O) ports, interrupts, and direct memory access (DMA). It resolves conflicts that can take hours to troubleshoot through traditional methods.

Plug and Play allows hot docking and configuration for laptop computers. For laptops that support this feature, Windows 95 senses that the computer is docked and makes the new resources (network, CD-ROM, sound, etc.) available without having to reboot the machine.

This “dynamic configuration” works for PCMCIA cards as well. Unplug a network PCMCIA card while logged in and Windows 95 unloads the network drivers and lets the user continue working. Plug the card back in and Windows 95 logs in the background and reconnects to the previous devices (re-map drives, and so on.). This is a refreshing change from dealing with a “frozen” computer.

In addition to performance, network security is one of the top priorities for network administrators. Windows 95 provides a variety of security features and allows the network administrator to choose those that are most appropriate to the network.

If the network administrator decides to use peer services, there are two options available: share-level security and user-level (pass-through) security. The former method controls access to a shared resource (a local hard disk) by using a password. For example, if you want to connect to Bob's hard disk, you would need to use the appropriate password to access his files.

User-level is a more sophisticated method of sharing the resource that involves relying on a NetWare file server for a list of users and groups. Access is granted on a user or group level. Administrators choose between full access, read-only, or custom access (these options function like volume-level NetWare trustee assignments). Users can be granted read, write, create, delete, change attribute, directory search, and access control rights to shared resources.

For example, if Bob wants to share his local disk using user-level security, he specifies to Windows 95 the users and groups that have access and the type of access allowed. When Joe tries to access Bob's hard disk, Joe uses the same user name and password that he uses for his NetWare file server. Bob's computer will then ask the NetWare file server to authenticate Joe, and if the password is valid, Joe will be granted access to Bob's local disk.

To accomplish this, the network administrator must create a user (with no password and no trustee assignments) on a NetWare file server called WINDOWS_PASSTHROUGH. Because most Bindery information is not available without an object logged in, Windows 95 needs this login to scan the NetWare Bindery.

The advantage to the pass-through approach is that administrators have to maintain security and access through only one place: the NetWare utilities such as SYSCON. The range of access privileges allows the network administrator to create a variety of access profiles. For example, the administrator can set up a group for read-only users and another for full-access users. The administrator can use NetWare SYSCON to determine who is in which group.

Some network administrators, particularly those managing large networks, may not want to offer peer services to users. In these environments, peer services can be disabled entirely so that all resource sharing is done at the network file server.

The system policies mentioned previously can be used as a means of controlling how Windows 95 and the network are accessed. Through system policies, administrators can restrict the actions of specific users, groups, or even individual workstations (regardless of who logs in). Policies are stored in SYS:PUBLIC on a NetWare file server.

One of the frustrating aspects of working on a diverse network can be having to remember multiple login names and passwords. This can be frustrating for users, who have to type multiple names and passwords. It also can be frustrating for the network administrator who performs the maintenance. Windows 95 provides a facility called password caching, where passwords are encrypted and stored locally. Users type one password and Windows 95 keeps track of the passwords on other systems (such as for NetWare file servers).

One of the more compelling features of Windows 95 is its 32-bit support. Running in 32-bit mode provides a number of performance improvements, including increases in speed and better protection against system errors. The network is not left out of these performance enhancements from 32-bit support.

First, 32-bit NDIS 3 drivers generally run faster than their 16-bit counterparts. (Microsoft research shows that a twofold speed increase can be realized over 16-bit network card drivers.) Memory protection is also a welcome feature.

Another feature of the memory model is the ability to load drivers (network and other) and other software above conventional MS-DOS memory. This leaves more than 600K of free conventional memory.

Many of the software modules in Windows 95 are Windows virtual device drivers and the NDIS 3 drivers are no exception. Network VxDs are fast for a number of reasons:

n

There is no real-mode context switch overhead. For network drivers, this

eliminates the need to switch back to real mode, populate real mode buffers, exchange packets with the file server, and copy the real mode buffers back into protected memory.

n

The software performs client-side caching. Network requests are cached

at the workstation, which not only increases speed locally but reduces traffic on the wire which improves performance for everyone on the network.

n

The peer server (the network software component that shares local resources with the rest of the network) is fast because it is implemented as a VxD. Its threaded 32-bit architecture provides improved performance over 16-bit peer services, such as in Windows for Workgroups.

Network administrators have the freedom of choice between 32-bit NDIS 3 drivers and 16-bit NDIS 2 and ODI drivers.

Printing is one of the core functions of any local area network, and Windows 95 provides a number of interfaces that make network printing easier—for the user as well as the network administrator.

Windows 95 supports a document-oriented view of local and network resources, and printing is one area where this support is fully demonstrated. Point and Print support means a user can click the right mouse button on any file and choose Print from the pop-up menu, and Windows 95 uses the application that is associated with that file to print it. For example, a user may click the file README.TXT with the right mouse button. When the user chooses Print from the pop-up menu, Windows 95 launches the application associated with a .TXT file—in this case, Notepad. After NotePad prints the file, it unloads, returning the user to the previous state.

Printers are represented by icons on the Windows 95 desktop. So, in addition, users may Drag and Drop a file on the printer icon to print.

For network administrators, network printer setup is easy with the Add Printer wizard. Administrators specify a path to the network printer (or browse for it) by using the universal naming convention (UNC) name for the printer (for example, \\SERVER\PRINT_QUEUE). If the administrator selects MS-DOS-based printing, Windows 95 redirects local printer ports to the network printer, similar to Novell CAPTURE. In addition, print drivers can be stored on the file server for quick connection and driver configuration. In this scenario, users can browse the network to find a printer. If the administrator has set up things properly, when the user double-clicks on the printer, the proper drivers will be installed automatically. The user doesn't have to know the type of printer he or she are using.

Windows 95 includes a 32-bit NetWare-compatible print server that interacts with NetWare print queues and services the jobs. The 32-bit remote printer is convenient because it consumes no conventional memory, runs faster than real-mode print servers, and is better integrated into the environment.

Print jobs can be deferred to a later date. This is useful for laptop users on the road; when they dock or connect to the network, their jobs print automatically.

Windows 95-based printers can be remotely managed. Jobs can be held, canceled, or restarted remotely. Windows 95 supports enhanced printer ports and can return detailed information about printer status.

Network backup is an important duty of the network administrator, but one that is often avoided because of the perceived hassle involved. Windows 95 provides backup agents for popular network backup utilities. Agents are provided for Cheyenne and Arcada server-based backup solutions. These agents enable the backup server (usually running on the NetWare file server) to archive the Windows 95-based workstations without having to consume any conventional memory on the workstations.

Windows 95 is compatible with 32-bit applications as well as older 16-bit applications. It will run all of the current applications for Windows as well as new 32-bit applications that will be released around the time Windows 95 ships. Microsoft has gone to great lengths to ensure NetWare API compatibility, including inviting top independent software developers (ISVs) to test their NetWare-specific applications on Windows 95 at Microsoft's ISV Testing Laboratory.

The NetWare API support can be broken down into components for MS-DOS and Windows. The API support for MS-DOS includes the standard Int 21h API, the Int 21h F2h "raw NCP" interface, and the Int 2F interface to the VLMs. IPX programming can be done using Int 7Ah or an Int 2Fh mechanism that is similar to calling the requester for MS-DOS.

Windows 95 also supports the Windows-based programming interfaces to NetWare, such as Novell's dynamic-link libraries (DLLs), and NETWARE.DRV. (Novell supplies the DLLs, but Windows 95 provides the NETWARE.DRV).

16-bit versus 32-bit development

NetWare developers undoubtedly will want to exploit the power of 32-bit applications by writing programs that run under Windows 95. The simplest option is to use the WinNet API, which provides a 32-bit API plus portability across all network platforms.

supported by Windows 95. However, there are certain NetWare-specific APIs not available using WinNet. For them, several options exist:

1. Use the existing 16-bit NetWare DLLs and “thunk” the headers for the calls you need. The thunking process, described in the Windows 95 Software Development Kit (SDK), translates between 32-bit calls to 16-bit calls.
2. Populate your own request/reply buffers and registers, and then call NetWareRequest() in NETWARE.DRV.
3. Use Novell’s 32-bit DLLs once they become available. Novell is expected to make an announcement soon concerning the availability of a 32-bit NetWare Client SDK.

Obscure support

Microsoft has gone to some lengths to ensure NetWare compatibility, including support for undocumented APIs and practices that are not well known to all developers. For instance, when calling the API that places a job into a queue, NetWare client software opens a pseudo-device called NETQ. Data written to this device gets placed into the queue.

Unsupported APIs

As of this writing, the Novell Directory Services (NDS) APIs are not supported natively (although you can use Novell’s NW* DLLs to access NDS), but they will be supported in the future. If you use NWNET.DLL to access Directory Services, you will need to use Novell’s VLM client software. Microsoft is demonstrating NDS support at network conferences.

Also, MS_DOS-based file-control block (FCB) APIs are not supported.

One of the design goals for the networking aspects of Windows 95 is that it react more intuitively to the addition or removal of network connections. When the user is logged into the network and the LAN goes down, the cable is cut, or the network connector is disconnected, the network drivers unload and Windows 95 continues to function without network resources. When the network comes back up or the cable is reconnected, the network drivers will reload and the network connections will be restored.

The Windows 95 network architecture is based on the Windows Open Services Architecture (WOSA) model, comprising an API layer, a routine module, and a service provider interface. Transport and driver layers round out the Windows 95

network architecture.

[Windows Open Services Architecture \(WOSA\)](#)

WOSA is not necessarily specific to networking, although it originated within Microsoft as a means to allow multiple software components (with a similar interface) to coexist. Because part of the design goal of Windows 95 was to encompass a wide range of network platforms, WOSA helps provide a structure for incorporating these platforms using a layered approach.

In the WOSA model, there is an API LAYER that is independent of the underlying hardware or services. Servicing the API is a ROUTING MODULE which directs the API calls to the appropriate SERVICE PROVIDER INTERFACE. The service provider interface works with the operating system to perform service-specific duties.

Figure 12: Network architecture of Windows 95

{ewc msdncd, EWGraphic, vg0c 8 /a "psC.bmp"}

[Application Programming Interface \(API\)](#)

The Windows 95 API layer consists primarily of the 32-bit WinNet interface, discussed below in "WinNet APIs." This API layer works with all supported networks of Windows 95, so that you can log in to a Windows 95-based peer server, Windows NT™ Server, a NetWare file server, and a Banyan VINES server with the same API call.

[Multiple provider router \(MPR\)](#)

The multiple provider router handles all routing for network operations in Windows 95. It handles all 32-bit WinNet APIs and routes requests to the appropriate service provider. Multiple provider routers are 32-bit DLLs.

[Service provider interface \(SPI\)](#)

Each network platform has its own network provider which implements the platform-specific functionality using the service provider interface. Operations such as login/logout and resource mapping are provided by the service provider interface. Note that only the multiple provider router calls the network provider.

[IFS manager](#)

Windows 95 supports installable file systems (IFSs). The IFS manager routes requests to the network-specific file system driver. So, each network platform has its

own network provider and file system driver. The advantages of the Windows 95 IFS are: multiple redirector support, increased reliability, and improved performance due to an IFS cache (client-side network redirector caching). Network file system drivers are 32-bit VxDs.

Network transport

NetBEUI, IPX/SPX, and TCP/IP are examples of transport protocols. Network file system drivers use the network transports to send data to the network. In addition, application programmers can use transport-independent programming interfaces such as Windows Sockets and NetBIOS, or they can program specific transports, such as Novell's IPX/SPX. Network transports are 32-bit VxDs.

NDIS 3.1

Microsoft's network driver interface specification, version 3.1 is a 32-bit, vendor-independent specification for interaction between a network device driver and a network transport. According to Microsoft, 80 percent of existing network interface cards have NDIS 3.1 drivers available. Key features of NDIS 3.1 include Plug and Play enhancements that enable dynamic loading and unloading, and a new NDIS mini-driver model, which dramatically decreases the amount of code a network adapter vendor must write.

If network administrators wish to configure 16-bit ODI or NDIS 2.0 drivers for Windows 95, they may do so, but they all talk to NDIS 3.1. NDIS 2.0 works directly with NDIS 3.1, and ODI talks with NDIS 3.1 by the use of a shim (called ODIHLP.EXE) that gets loaded before the ODI driver (such as IPXODI.EXE).

There are several ways to program Windows 95 for networks, and they generally fall into two discrete groups: APIs that are common to all supported networks and APIs that are specific to a certain platform, such as NetWare.

Microsoft's common network API is called the WinNet API. The WinNet API contains calls that are common to all network platforms, such as "login" or "connect" (to a network resource). Windows 95 also supports calls that are platform-specific, such as Novell's APIs for MS-DOS and Windows.

WinNet APIs

Microsoft has had a Windows networking API set since Windows 3.0, which was enhanced in Windows 3.1. The interface provides network platform-independent APIs. LAN Manager version 2.1 provided the multinetwork DLL which routed requests from the interface to NetWare or LAN Manager networks. Windows for

Workgroups 3.1 extended the API and incorporated common network dialogs that used the WinNet interface. Windows NT extended the API further by formalizing the multi-net layer to be the Multi-Protocol Router and the API was extended to provide network browsing. Also, the API was modified to allow for network differences (such as different naming conventions and the NetWare server's security model).

Windows 95 further expands the API. According to Microsoft, the goals of the Windows 95 WinNet interface are:

n

Support for the Win32 WinNet APIs as defined in Windows NT.

n

An interface that allows seamless browsing of network resources (network directories and printers, for example). This includes consistent handling of authentication requirements across multiple networks.

n

Backward compatibility with Windows for Workgroups 3.11.

WinNet function groups

There are several groups of WinNet API calls, many of which are called by network providers and are not used by applications. Most developers will use only the Connection and Enumeration API groups. The groups of WinNet API calls are as follows:

n

Connection API—Allows applications to create, manage, and destroy connections to specific network resources.

n

Enumeration API—Allows the application to browse and examine the details of available network resources. Programs can build a list of available resources and retrieve relevant details.

n

Error Reporting API—Allow for getting and setting error codes. These APIs are to be used by network providers and are not general APIs.

n

Local Device Name API—Another network provider interface, these calls help standardize device naming.

n

UNC API—A network provider interface that helps treat UNC paths consistently.

n

Password Cache API—Lets a network provider use (or prevent use of) the Windows 95 password cache.

n

Authentication Dialog API—Used by a network provider to provide a consistent login/authentication interface.

NetWare API compatibility

The NetWare API has evolved over the years to provide a number of ways to interact with Novell file servers. The following sections describe the NetWare API support provided by Windows 95:

MS DOS-based NetWare APIs

There are several MS DOS interfaces, such as the standard Int 21h API and the Int 21h F2h “raw NCP” interface. Under the standard interrupt 21h interface, the developer creates request and reply buffers, populates them with certain values, loads certain registers that point to the buffers, and then calls interrupt 21h. When the application calls interrupt 21h, Novell’s client software (NETX or VLM) creates an NCP packet and sends it to the file server. Once the reply is received, the client software populates the reply buffer supplied by the application and returns back to the application.

Novell documented several calls from the “raw NCP” API. Under this interface, the

user builds the actual packet that is sent to the NetWare file server — no translation is involved, hence the “raw” name. To make these calls, developers create request and reply buffers similar to the standard Int 21h interface, load registers pointing to these buffers, and then call Int 21h with F2h in the AH register and the function code in AL.

In addition, you can program NetWare using the Int 2F interface for the VLMs. Under this interface, developers set the AX register to 7A20h, and the BX register to 0, and call interrupt 2Fh. The far “calling address” to the MS-DOS requester (VLM) is returned in the ES:BX register pair. Next, developers populate request/reply buffers similar to methods described above and call the requester calling address.

MS-DOS-based IPX programming can be done using Int 7Ah or an Int 2Fh-mechanism that is similar to calling the MS-DOS requester.

Microsoft's NetWare client supports these programming interfaces.

Windows-based NetWare APIs

In addition to supporting the MS-DOS-based APIs, Windows 95 must support the Windows-based programming interfaces to NetWare in order for it to be compatible. Such interfaces include Novell's DLLs for Windows, and NETWARE.DRV (the NW*-DLLs are available only from Novell, but a special version of NETWARE.DRV is provided in Windows 95).

Novell distributes the following DLLs (with the NetWare Client SDK) that support the standard NetWare API calls: NWLOCALE.DLL, NWINNET.DLL, NWIPXSPX.DLL, NWCALLS.DLL, and NWPSRV.DLL. In addition, Novell distributes TLI_SPX.DLL, TLI_WIN.DLL, and TLI_TCP.DLL to support the Transport Level Interface (TLI).

For many of the API calls, these DLLs populate request/reply buffers and set registers just like the MS-DOS Int 21h interface described above. Then, instead of calling Int 21h, the DLLs call NetWareRequest() in Novell's NETWARE.DRV (which is itself a DLL). Windows 95 provides a “stub” NETWARE.DRV that passes the call to NWREDIR.VXD, the Windows 95 handler for NetWare Core Protocol calls.

Some applications do not use Novell DLLs; they populate the request/reply buffers, set the appropriate registers, and call NetWareRequest() in NETWARE.DRV directly. Because Windows 95 provides that stub NETWARE.DRV, this method of programming is also supported.

If developers wish to write 16-bit NetWare-compatible applications, they can do so immediately using Novell's NetWare Client SDK and the DLLs described above.

Whatever you have heard about Windows 95 in the press and whatever you think after reading this paper, one thing seems inevitable: Windows 95 is coming to a

desktop near you. From what I have seen of Windows 95, Microsoft has fulfilled their promise of a "well-connected client." Windows 95 has many features that, as a desktop environment, make it compelling. When you add the NetWare integration (including network batch setup, network management, NetWare 32-bit client, login scripts, network GUI tools, security, peer services, NetWare print services, remote management, Long Filename support, frame type autodetection, and so on) you have a powerful NetWare platform from which to work.

I think it would be difficult for anyone not to find something to like about Windows 95. Having said that, I'm certain there will be some conflicts between Windows 95 and NetWare. Conflicts and bugs are inevitable in any environment; what makes the difference is how software vendors handle them. While visiting the Redmond campus on several occasions, I met major network software vendors as they were testing their NetWare-compatible software with Windows 95. Microsoft had invited them to make sure Windows 95 completely supported NetWare software. I also find it encouraging that Microsoft chose to make the default network transport IPX.

As someone more deeply rooted in the Novell culture than in Microsoft's (but involved with both), it has been frustrating in the past to see technical progress stifled by politics and competition. The companies may gain by it, but the customer ultimately loses. The networking industry was founded on the concept of integrating different kinds of components. I believe the integration of Windows and NetWare will ultimately prove extremely valuable for companies—from the CEO to the end-user.

If these two companies can work together, each providing what they do best, I feel that the customer will ultimately benefit. Only then will we see computing that is truly "pervasive."

CHARLES ROSE
ROSEWARE

The following resources are available for further information on Windows 95:

MICROSOFT WINDOWS 95 RESOURCE KIT

INSIDE WINDOWS 95 by Adrian/King. Published by Microsoft Press. 476 pages, ISBN-1 55615-626-X, \$24.95. For more information or to order call (800)-MSPRESS (or GO MSP on CompuServe®).

For more information about Microsoft Windows 95, look at the Microsoft WinNews file sections found on most major online services and networks.

n

On the Internet, use FTP (ftp://ftp.microsoft.com/PerOpSys/Win_News) or
World Wide Web (<http://www.microsoft.com>).

n

On The Microsoft Network, open Computers and Software\Software
Companies\Microsoft\Windows 95\WinNews.

n

On CompuServe, type *GO WINNEWS*.

n

On Prodigy™, *JUMP WINNEWS*.

n

On America Online®, use keyword *WINNEWS*.

n

On GEnie™, download files from the WinNews area under the Windows

RTC.

To receive regular biweekly updates on the progress of Windows 95, subscribe to Microsoft's WinNews electronic newsletter. These updates are sent by electronic mail directly to you, saving you the time and trouble of checking the WinNews servers for updates. To subscribe to the electronic newsletter, send an Internet message to enews@microsoft.nwnet.com with the words SUBSCRIBE WINNEWS as the only text in your message.

Charles Rose's main areas of expertise include networking (especially Novell), commercial software development, publishing (newsletters and CD-ROMs), on-line systems (he runs his own), and operating environments (MS-DOS, Microsoft Windows, Pick, and Apple).

Charles is the author of NETWORK POWER TOOLS FOR WINDOWS (Bantam Electronic Publishing) and the PROGRAMMER'S GUIDE TO NETWARE (McGraw-Hill/LAN Times). In addition, he has served as contributing editor for the NETWORK ADVISOR and was the senior technical editor for the NETWORK TECHNICAL JOURNAL. He has written for BEYOND COMPUTING (an IBM publication), WINDOWS MAGAZINE, LAN TECHNOLOGY, LAN TIMES, AND PC TECH JOURNAL.

Rose's first book, PROGRAMMER'S GUIDE TO NETWARE (McGraw-Hill) is considered an industry bible for NetWare development. The book was the Main Selection for the Byte, Tab, and Newbridge book clubs and went into its second printing less than three months after its initial release. Rose's most recent book is NETWORK POWER TOOLS FOR WINDOWS (originally published by Bantam Electronic Publishing), which details the complexities of NetWare and Windows integration.

Charles divides his time between writing books and articles, commercial software development, consulting, teaching, and running his on-line system, RoseNet™ Online. He has been developing NetWare applications since the early '80s and has written for several major network software vendors. He has taught NetWare programming courses in Washington, DC and in London. He is a sysop for Novell on their NetWire service on CompuServe.

One of Charles' most recent projects is a CD-ROM, the NETWORK SUPPORT LIBRARY™, which contains network-specific files from his BBS. RoseWare has their own section on CompuServe in Novell's NVENA (Novell Vendor) Forum (GO ROSEWARE on CompuServe).

Charles is an instrument-rated private pilot, currently pursuing his commercial license.

He can be reached on CompuServe at 76711,110 or on the Internet at 76711.110@compuserve.com.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Backgrounder: The Microsoft Network

For more information, contact:

Waggener Edstrom

June Peters, (206) 637-9097

Introduction

Microsoft Corporation has long believed in the promise of personal computers to enable new ways of thinking and communicating that are accessible, useful, personal and fun for all computer users. It calls this vision "Information At Your Fingertips." The introduction of The Microsoft® Network online service represents Microsoft's next step toward the realization of this vision.

While interactive online services are well-publicized throughout the print and broadcast media, today's services are surprisingly less popular with consumers than all the hype might suggest. For example, although 40 percent of users of the Microsoft Windows™ operating system have modems, fewer than 10 percent of users of Windows and 4 percent of U.S. households subscribe to any online service. The online services business today remains in its infancy, with providers of existing online services working to find the right technical, business-model and usability solutions that will promote acceptance beyond the early adopter audience that has sustained this category to date. But the potential of these services is tremendous. The online consumer market could become a \$2 billion market within five years, according to SIMBA Research.

For this projection to come true, significant investments must be made to deliver the promise of "Information At Your Fingertips" and to establish mainstream viability for interactive online technology. Online services must offer easier access and a more compelling environment for all computer users to attract and maintain a broader audience. Content and service providers must be offered greater publishing abilities and viable long-term profit opportunities before consumers will see compelling benefits.

Introducing The Microsoft Network

Access to The Microsoft Network is a feature of Windows 95, the forthcoming version of the Microsoft Windows operating system. It is an online service that makes accessing electronic information and communications easy and inexpensive for any user of Windows 95. It removes the primary barriers to online service use—cost, difficult user interface and inertia. The Microsoft Network extends the Windows-based desktop to a worldwide community of people, ideas and information. It provides a setting for a worldwide electronic marketplace of products and services from Microsoft and third-party companies.

With The Microsoft Network, Microsoft hopes to expand the online market by delivering the needed technology and business model to provide an online experience that meets the needs and expectations of both consumers and content providers.

The Microsoft Network Strategy

To succeed in the marketplace, interactive online services must provide uniquely rich and valuable solutions to customer needs, offered in a more compelling and accessible way than other alternatives. This premise drives the strategy behind The Microsoft Network. The Microsoft Network extends the benefits of online services to a larger audience by addressing the limitations that curb the widespread adoption of online services today.

The Microsoft Network differs from existing online services in many ways. Among the chief differences is the fact that it offers a new platform model that is flexible enough to encourage and reward independent content and service providers for their participation. This model facilitates the rapid development of a broad range of content and services, attracting users and expanding the market.

The online business environment must reflect the diverse nature of business itself in order to realize its full potential. Companies succeed in business by adopting practices, branding, packaging and selling models that are tailored to their products and their customers. They invest in channels of distribution that provide the infrastructure and flexibility to support these strategies and their resulting profitability. Current online services inhibit the way providers can present their information and services, and limit the profits that independent providers can realize, often to a small share of a shrinking revenue model based on customer online connection-time charges.

The success of The Microsoft Network will be based on the success of Microsoft's content providers in reaching and motivating customers. So Microsoft is going to lengths to help ensure that success. The Microsoft Network provides a new and different business environment that puts significant revenue control in the hands of the content or service providers.

Providers aren't limited in the ways in which they realize revenues for their services. Variable revenue and pricing models such as subscriptions, online transactions, advertising subsidies, and ticketed events are at the provider's discretion. More important, providers retain the majority of the revenues that their content and services generate.

Meeting customer demands for easier access to technology is a fundamental charter of Microsoft products. To that end, customers will find it easy to sign up and access The Microsoft Network as a feature of the Windows 95 operating system. The Microsoft Network fully harnesses the power and ease of use of Windows 95.

By extending the feature set and graphical interface of Windows 95, The Microsoft Network provides a familiar environment that facilitates easier exploration and interaction in the online world. In all respects, The Microsoft Network looks and acts just like Windows 95, offering customers easy, consistent and graphical functionality.

For example, The Microsoft Network services can be browsed using the Explorer in Windows 95 or from an icon-based container view. Actions such as downloading files are simple copy operations accomplished by drag and drop. Shortcuts enable personalized and efficient navigation. The Microsoft Network's e-mail and rich-text content documents are managed through the Information Exchange and WordPad services built into Windows 95 with the same familiar user interface carried through all core communications functionality.

The Microsoft Network also offers affordable access. By adopting a business model that emphasizes member and content activity rather than connect time, The Microsoft Network delivers services at the lowest possible cost to its members.

The Microsoft Network supports and promotes personalized discovery and investment for members and content providers alike. Both are enabled with a new generation of technology and capabilities and are empowered to shape and evolve online communities.

The Microsoft Network interactive experience revolves around these dynamic content communities, each produced to make the most of the interactive medium and the specific topic, product or experience at hand. For example, content areas cover the following subjects:

n Arts and entertainment

n

News and weather

n

Business and finance

n

Sports, health and fitness

n

Science and technology

n

Computers and software

n

Community and public affairs

n

Home and family

These communities will be facilitated by a select group of Forum Managers, who bring specialized knowledge, credibility and respect in their areas of expertise.

Members will have tremendous breadth and depth of technical, vertical-market and general-interest communities with which to explore and interact on a local or worldwide basis. Content and service providers will discover the opportunity to extend their brands, products and businesses in a graphically robust, interactive manner.

The Microsoft Network will further facilitate a higher quality of content and services by providing tools and technology to support a truly personalized, multimedia presentation.

World-Class Communications

Access to communication abilities that transcend the traditional boundaries of time, cost, resources and geography is one of the primary benefits of the Microsoft online system.

The Microsoft Network is designed from the ground up to accommodate full international access. The ability to access the network from anywhere in the world — and to exchange information with users anywhere in the world — makes the system even more compelling.

By integrating with the Information Exchange in Windows 95 and extending this functionality to bulletin board, file library and “chat” services, The Microsoft Network will offer the most robust, easy-to-use communication capabilities.

Consistent user interface, OLE support, drag-and-drop management, Explorer

navigation, and rich-text formatting all extend the consistent experience of using Windows 95 within The Microsoft Network communication environment.

The Microsoft Network Services

When The Microsoft Network becomes available, subscribers will have access to the following basic services:

n

Rich communications features, including e-mail, bulletin boards and “chat” services

n

Internet access, including e-mail and news groups

n

Information services, including news, sports, stock and weather reports, product and product support information, and special-interest group information

n

File download libraries — shareware, graphics and wave files, applets, product support, article archives, and the Microsoft Knowledge Base

n

Microsoft information and support for customer service, product

information and technical support

The Microsoft Network's extended services and products will include both Microsoft-branded and independently branded options available to users. Some will be available for an additional charge, and others will be available at no additional charge, with their revenues coming from advertising or shopping transaction fees.

Conclusion

By combining unprecedented access and ease of use, a new business model to attract and reward independent content and service providers, a compelling online experience, and world-class communications, The Microsoft Network will spur the market for online services, closing the gap that exists today between the potential and actual installed base for these services. In bringing highly functional and entertaining online service to millions of users, Microsoft is further realizing its mission of enabling "Information At Your Fingertips".

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

Microsoft Plug and Play Catalog - March 1995

Purpose of this Catalog

The Plug and Play Hardware Catalog lists companies who have made a commitment to support the Plug and Play specifications and showcases specific hardware which they have committed to offer. The hardware is to be used with Plug and Play operating system platforms, such as Microsoft Windows 95.

This catalog will be updated periodically. If you are a manufacturer of Plug and Play products and would like to receive information concerning participation in this catalog, please email us or fax us the form shown on the next page.

Overview of Plug and Play

Plug and Play is the name of a technology that lets PC hardware and attached devices work together automatically. A user can simply attach a new device ("plug it in") and begin working ("begin playing"). This should be possible even while the computer is running, without restarting it. Plug and Play technology is implemented in hardware, in operating systems such as Microsoft Windows, and in supporting software such as drivers and BIOS.

With Plug and Play technology, users can easily add new capabilities to their PCs, such as sound or fax, without having to concern themselves with technical details or encountering problems. For users of mobile PCs (who are frequently changing their configurations with docking stations, intermittent network connections, etc.) Plug and Play technology will easily manage their changing hardware configuration. For all users, Plug and Play will reduce the time wasted on technical problems and increase their productivity and satisfaction with PCs.

The Plug and Play technology is defined in a series of specifications covering the major component pieces. There are specifications for BIOS, APM 1.1, ISA, SCSI, parallel port devices, and external COM devices. In a nutshell, each hardware device must be able to be uniquely identified, it must state the services it provides and the resources which it requires, it must identify the driver which supports it, and finally it must allow software to configure it.

3Com Corporation

5400 Bayfront Plaza
PO Box 58145
Santa Clara CA 95052-8145
USA

EtherLink III Parallel Tasking ISA adapters(3C509B)

Availability Date: 01-Nov-94

Estimated Pricing: \$125-\$150

Parallel Tasking Ethernet

The EtherLink III ISA family of adapters is now faster and easier to use with this new Plug and Play version. Enhancements include a performance increase of up to 25% faster than the original EtherLink III, and support for Plug and Play PC's.

Sales contact: Direct Sales

Sales Phone: 800-NET-3COM

3Com Corporation

5400 Bayfront Plaza

PO Box 58145

Santa Clara CA 95052-8145

USA

EtherLink III Parallel Tasking PCMCIA (3C589B)

Availability Date: 17-Oct-94

Estimated Pricing: \$229-\$288

Parallel Tasking Ethernet

3Com brings you full Parallel Tasking performance in a credit-card size package. Along with unparalleled performance, advanced Hot-swapping capability allows for the EtherLink III card to be removed and returned to a different slot without interruption to the network session. The 3Com Type II adapters are guaranteed compatible with all leading notebooks, and are backed by a lifetime warranty.

Sales contact: Direct Sales

Sales Phone: 800-NET-3COM

3Com Corporation

5400 Bayfront Plaza

PO Box 58145

Santa Clara CA 95052-8145

USA

TokenLink III PCMCIA (3C689)

Availability Date: 01-Oct-94

Estimated Pricing: \$460

100% IBM compatibility

3Com's TokenLink III PCMCIA adapter brings unmatched ease of use and affordability to Token Ring. The TokenLink III PCMCIA is 100% IBM compatible, works with every major manufacturer's notebook computers, and comes with a lifetime warranty.

Sales contact: Direct Sales

Sales Phone: 800-NET-3COM

Accton Technology Corporation

1962 Zanker Road
San Jose, CA 95112
USA

PnP ISA Ethernet Card

Availability Date: 01-Jan-95

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 408-452-8080

Adaptec, Inc.

691 S. Milpitas Blvd.
Milpitas CA 95035
USA

1530P/1532P PnP PIO ISA/SCSI

Availability Date: 10-Jul-94

Estimated Pricing:

AHA1530P/1532P Plug and Play ISA PIO SCSI Card

Sales contact: Carol Bergman

Sales Phone: 408-957-4811

Adaptec, Inc.

691 S. Milpitas Blvd.
Milpitas CA 95035
USA

1540CP PnP Bus Master. ISA/SCSI

Availability Date: 01-Nov-94

Estimated Pricing:

Sales contact: Carol Bergman

Sales Phone: 408-957-4811

Adaptec, Inc.

691 S. Milpitas Blvd.
Milpitas CA 95035
USA

AHA 2940/2942 PCI/SCSI

Availability Date: 01-Nov-94

Estimated Pricing:

AHA2940/2942 PCI/SCSI Card

Sales contact: Carol Bergman

Sales Phone: 408-957-4811

Adaptec, Inc.

691 S. Milpitas Blvd.
Milpitas CA 95035
USA

SlimSCSI APA-460 PCMCIA Adapter

Availability Date: 01-Nov-94

Estimated Pricing:

16-bit PCMCIA-to-SCSI Host Adapter. Installs in a snap, lets you position
peripherals for best use of your workspace. Simple reversible connection with
detachable 3 foot cable. Simultaneous connection of up to seven SCSI-2 devices.
2-Mbyte/sec data transfer rate via 16-bit bus. Support for SCSI-2 erasable media --
fixed or removable. Low .5-watt power consumption. Compact design -- credit

card-sized adapter and cable weigh only 7.2 oz.

Sales contact: Carol Bergman

Sales Phone: 408-957-4811

Adaptec, Inc.

691 S. Milpitas Blvd.
Milpitas CA 95035
USA

The SCSI Master TM AHA-1542CF ISA to Fast

Availability Date:

Estimated Pricing: \$367.00

The leading ISA solution to run today's powerful applications on the PC

Containing the industry-standard AHA-1542 host adapter, The SCSI Master is the perfect solution for multi-tasking environments. The AHA-1542 incorporates an on-board processor to off-load the system CPU and is compatible with more third-party software than any other host adapter in the market.

Sales contact: Carol Bergman

Sales Phone: 408-957-4811

Advanced Micro Devices

901 Thompson Place
P. O. Box 3453
Sunnyvale CA 94088-3453
USA

PCnet-ISA+

Availability Date: 01-Jun-94

Estimated Pricing:

PCnet-ISA+

Single chip Ethernet controller for the ISA bus which supports the ISA Plug and Play specification.

Sales contact: Jim Lockmiller

Sales Phone: 408-749-2791

Advanced Micro Devices

901 Thompson Place

P. O. Box 3453

Sunnyvale CA 94088-3453

USA

PCNet-PCI

Availability Date: 01-Jun-94

Estimated Pricing:

PCNet-PCI

Single chip Ethernet controller for the PCI bus which supports, by virtue of the PCI bus, the Plug and Play specification.

Sales contact: Jim Lockmiller

Sales Phone: 408-749-2791

Advanced Micro Devices

901 Thompson Place

P. O. Box 3453

Sunnyvale CA 94088-3453

USA

PCnet-SCSI

Availability Date: 9/1/94

Estimated Pricing: 39.95 for 1000 qty

A one chip Ethernet and SCSI device for PCI bus computers eliminates the need for costly slot consuming adapter boards.

Sales contact: Jim Lockmiller

Sales Phone: 408-749-2791

Alliance Semiconductor

3099 North First Street

San Jose CA 95134-2006

USA

ProMotion -- 3210

Availability Date: 01-Jul-94

Estimated Pricing: \$19.00

World's First Low-Cost MMUI Accelerator

Pro-Motion-3210 provides advanced graphics acceleration and motion video acceleration at a price comparable to graphics-only controllers. It's scaling and color space conversion engines assist software to achieve 30 fps full screen, full motion video playback of MPEG, Indeo, Cinepak and other standards. ProMotion-3210 supports VL and PCI Bus. 1-4 MB DRAM, resolution up to 1600x1200 non-interlaced.

Sales contact: Jim Keim

Sales Phone: 408-383-4900

Analog Devices

181 Ballardvale Street
Wilmington MA 01887

AD1812 Overture Sound Processor ISA Reference Design

Availability Date: 1/1/95

Estimated Pricing: <\$20 (component)

AD1812 Overture Sound Processor ISA Reference Design

Analog Devices is developing a single chip audio sub-system for adding 16-bit stereo audio to personal computers. The audio sub-system combines an integrated digital audio controller, ROM coded Digital Signal Processor, a 16-bit sigma delta stereo converter and a Plug and Play ISA interface. The 1812 includes a DOS games compatible register set, an ADSP-2171 fixed-point Digital Signal Processor, and the AD1845 SoundPort Codec in a 144-lead PQFP package. The system exceeds PC95 audio conversion requirements, and is designed to run under Win95.

Features:

Supports the Microsoft Windows Sound System

DOS games compatible

Plug and Play 1.0 compliant

Exceeds the MPC level 2 mixing requirement

24 ma bus drive capability

Advanced Power management

Variable sample rates from 4,000 to 50,000 Hz in 1 Hz increments

Simultaneous record and playback

DMA flexibility: (2) 16-bit DMA channels, (1) 16-bit DMA channel and (1) 8-bit DMA channel, or (1) 8-bit DMA channel

Operates from a single 14.31818 MHz crystal or clock source

Software Support: Windows Sound System driver, DOS games, standard Windows applets

Schedule:

Samples January 1995

Production March 1995

American Megatrends, Inc.

6145-F Northbelt Pkwy.
Norcross, GA 30071
USA

PCMCIA Platinum SCSI adapter

Availability Date: 30-Sep-94

Estimated Pricing:

Platinum Access Card - SCSI PCMCIA

The Platinum Access SCSI Card is a PCMCIA type II. Includes a 2 foot long cable with a 25 pin PCMCIA connector to a 50 pin connector. Platinum Access provides the convenience of mobile SCSI for today's sophisticated PCMCIA notebook systems.

Sales contact: Inside Sales

Sales Phone: 800-828-9264

Angia Communications

441 E. Bay Blvd.
Provo, UT 84606
USA

Angia 14.4 PCMCIA Modem

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-877-9159

Apex Data, Inc.

6624 Owens Dr.
Pleasanton, CA 94588
USA

V.34 Cellular PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-841-APEX

AST Research Inc.

16215 Alton Pkwy.
Irvine, CA 92718
USA

Token Ring Credit Card Adapter

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-876-4AST

ATI

Graphics Pro Turbo

Availability Date: Now

Estimated Pricing:

PCI display adapter.

ATI

Graphics Xpression

Availability Date: Now

Estimated Pricing:

PCI display adapter.

AT&T Paradyne

8545 126th Ave. N

Largo, FL 34649

USA

KeepInTouch 3762 (Cellular)

Availability Date: 01-Jan-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 813-530-2000

AT&T Paradyne

8545 126th Ave. N

Largo, FL 34649

USA

KeepInTouch Express PCMCIA Card

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 813-530-2000

AT&T Paradyne

8545 126th Ave. N
Largo, FL 34649
USA

KeepInTouch PCMCIA Card

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 813-530-2000

Axonix Corporation

844 South 200 East
Salt Lake City, UT 84111
USA

PCMCIA MM Expansion Card

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-866-9797

Boca Research, Inc.

6413 Congress Avenue
Boca Raton, FL 33487
USA

14.4 KBPS V.32 bis PCMCIA

Availability Date: 07-Jul-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 407-997-6227

BusLogic Inc.

4151 Burton Drive

Santa Clara — CA — 95054
USA

BT-930 PCI SCSI Host Adapter

Availability Date: 01-Jan-95

Estimated Pricing:

BT-930 PCI SCSI Host Adapter

Sales contact: Sales

Sales Phone: 800-707-7274

Cabletron Systems, Inc.

35 Industrial Way
Rochester, NH — 03867
USA

E2219 Ethernet DNI Card (PnP)

Availability Date: 19-Jul-94

Estimated Pricing: Call

Plug and Play full duplex Ethernet ISA NIC

Cabletron has created a series of E2200s which are available in six styles for any IBM PC AT or compatible with a 15-bit AT or EISA bus. Each E2200 card is ready to run Full Duplex 20 Mbps Ethernet once the increased speed is required for your network. You can still run the E2200 series at 10 MBps until you are ready for Full duplex. Each E2200 series is Bus Mastered and designed for easy installation through software with no manual jumpers to set. The E2200 conforms to the plug-and-play ISA specification. The series is certified by most popular operating systems for use in server or client configurations using Packet, IDI and NDIS device driver, including Novell 9.x and 4.x, Microsoft, IBM and DEC.

Sales contact: Sales

Sales Phone: 800-332-9401

Cirrus Logic, Inc.

14,400 bps PCMCIA Data-Fax Modem

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Sales Department

Sales Phone: 510-623-8300

Cirrus Logic, Inc.

3100 West Warren Ave
Fremont CA 94538
USA

CL-GD5430

Availability Date: 01-Oct-94

Estimated Pricing: \$25

Alpine 32-bit VGA GUI Accelerator

The CL-GD5430 32-bit GUI accelerator incorporates a BitBIT VGA controller with a 24-bit true-color DAC, dual-clock synthesizer, and direct-connect 32-bit VESA VL-Bus or PCI (Plug and Play) interface. Optimized for 1-MByte frame buffers, the CL-GD5430 is easily upgraded to the 64-bit performance with the pin and software-compatible CL-GD5434.

Sales contact: Dan Hauck

Sales Phone: 510-252-6011

Cirrus Logic, Inc.

3100 West Warren Ave
Fremont CA 94538
USA

CL-GD5434

Availability Date: 01-Jun-93

Estimated Pricing: \$30

Alpine 64-bit VGA GUI Accelerator

64-Bit Graphics accelerator engine with integrated 24-bit RAMDAC and 135-MHz dual-clock synthesizer. Supports display resolutions up to 1280x1024 at 75-Hz refresh rates, VESA DPMS for powering down monitors and DDC support for Plug and Play. Supports PCI(Plug and Play), VL-Bus and ISA buses.

Sales contact: Dan Hauck

Sales Phone: 510-252-6011

Cirrus Logic, Inc.

2820 Northrup Way

#120

Bellevue WA 98004

USA

CL-PD6729

Availability Date: 30-Sep-94

Estimated Pricing:

CL-PD6729 dual-socket PCI-PCMCIA adapter

The CL-PD6729 is a single-chip PCMCIA host adapter solution capable of controlling two fully independent PCMCIA sockets. The chip is fully PCMCIA 2.1 and JEIDA 4.1 compliant, and is optimized for use in notebook and handheld computers where reduced form factor and low power consumption are critical design objectives. With the CL-PD6729, a complete dual-socket PCI-PCMCIA solution with power-control logic can occupy less than 2 square inches (excluding the connectors).

Sales contact: Kasturi Gopalaswini

Sales Phone: 510-226-2261

Cogent Data Technologies, Inc.

175 West St.

Friday Harbor, WA 98250

USA

Quartet PCI LAN/bridge card

Availability Date: 15-Aug-94

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 206-603-0333

Compaq Computer Corp.

288 PCMCIA Modem

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-345-1518

Compaq Computer Corp.

PCMCIA Floppy Disk Controller

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-345-1518

Compaq Computer Corp.

SpeedPaq 192 PCMCIA Modem

Availability Date: 14-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-345-1518

Creative Labs, Inc.

1901 McCarthy Blvd.
Milpitas CA 95035
USA

Modem Blaster 14.4 PCMCIA

Availability Date: 15-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-998-5227

Creative Labs, Inc.

1901 McCarthy Blvd.
Milpitas CA 95035
USA

PnP Sound Blaster 16

Availability Date: 01-Dec-94

Estimated Pricing: Call for pricing.

Creative Labs PnP Sound Blaster 16 Sound Card

Plug and Play enabled, high performance, CD-quality audio solution for business-
applications, multimedia presentations, and educational and entertainment software.

Sales contact: Inside Sales

Sales Phone: 800-998-5227

Crystal Computer Corporation

2157L O'Toole Avenue
San Jose, CA 95131
USA

PnP SCSI/AUDIO Card

Availability Date: 30-Sep-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-547-5444

Crystal Semiconductor

P.O. Box 17847

4210 S. Industrial Drive
Austin TX 78744
USA

Plug and Play Audio Subsystem

Availability Date: 01-Oct-94

Estimated Pricing: \$25

Crystal Semiconductor PnP Audio Subsystem Component

Complete 16-bit audio subsystem with full Windows Sound System and MPC level 2 compatibility. This new product is the first single chip multimedia audio solution designed specifically for operation under "Chicago" with integrated Plug and Play capability.

Sales contact: Al Schuele

Sales Phone: 512-445-7222

Dallas Semiconductor

4401 South Beltwood Parkway
Dallas TX 75244
USA

DS2109

Availability Date: 01-Aug-94

Estimated Pricing:

PnP SCSI Terminator provides one chip solution for automatic termination at exit point of host adapter or mother board, a byte identifier is lessered at factory guaranteeing unique serial number.

Sales contact: Louis Grantham

Sales Phone: 214-450-8110

Dallas Semiconductor

4401 South Beltwood Parkway
Dallas TX 75244
USA

DS2110

Availability Date: 01-Aug-94

Estimated Pricing:

PnP SCSI Terminator provides one chip solution for automatic termination at exit point of host adapter or mother board, 1K to 4K bits of EEPROM for PnP parameter storage.

Sales contact: Louis Grantham

Sales Phone: 214-450-8110

Databook, Inc.

112 Prospect St.
Ithaca NY 14850
USA

DB86x84 TCIC-2/R

Availability Date: 01-Jan-94

Estimated Pricing:

DB86x84 TCIC-2/R

Single chip, dual-socket PCMCIA controller and software for DOS and Windows.
Handles wide variety of PCMCIA hard disk, I/O and memory PC Cards.
Features Radial Socket architecture -- two fully independent, isolated sockets.
Both Single-voltage and Dual-voltage versions available.
Supports Plug and Play ISA on-chip.

Sales contact: Jeff Rose

Sales Phone: 716-292-5720

Digicom SPA

188 Topaz St.
Milpitas, CA 95035
USA

Scout 14400 PCMCIA Fax Modem

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-833-8900

Distributed Processing Technology (DPT)

140 Candace Dr.
Maitland FL 32751
USA

PM XX24 family of PCI/SCSI Controllers

Availability Date: 15-Sep-94

Estimated Pricing:

PM2024, PM2124 and PM3224 PCI SCSI Adapters

PM2024 is a low-cost SCSI adapter using the 68000 processor for on-board intelligence. The PM2124 is a high-performance adapter powered by a 68020 for three times more I/O processing bandwidth than the PM2024. The PM3224 SmartRAIC controller uses a 40 MHz 68030 processor for the ultimate in RAID performance.

Sales contact: Channel Marketing

Sales Phone: 407-830-5522

E-Tech Research, Inc.

1800 Wyatt Dr.
Suite 2
Santa Clara, CA 95054
USA

C1414AX Fax PCMCIA

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-328-5538

Eagle Technology

2865 Zanker Rd.
San Jose, CA 95134
USA

NE200T PCMCIA Ethernet Card

Availability Date: 01-Oct-94

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 800-733-2453

ESS Technology, Inc.

46107 Landing Parkway
Fremont CA 94538
USA

ESS 688

Availability Date: 01-Jan-94

Estimated Pricing: N/A

ESS AudioDrive PnP component

The ESS688 AudioDrive is a single chip with 16-bit stereo and a 5 channel mixer for PC audio applications. With simple adaptation of external logic, an ESS688-based design can be Plug and Play ready. ESS also provides a device driver for Plug and Play.

Sales contact: Abbie Ibrahim

Sales Phone: 510-226-1088

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

1414CL Fax-Data PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

14400-14400 fax-Data PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

144i Fax-Data PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

28.8i Fax-Data PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

ThinFax 9696

Availability Date: 07-Jul-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

ThinFax Basic Fax-Data PCMCIA Modem

Availability Date: 07-Jul-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

EXP Computer Inc.

223 Michael Drive
Syosset, NY 11791
USA

ThinFax Basic-LX PCMCIA Modem

Availability Date: 07-Jul-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 516-496-3703

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

18PnP300 PIO ISA/SCSI

Availability Date: 01-Dec-94

Estimated Pricing:

18PnP300 High Performance Plug and Play 16 Bit SCSI-2 Integrated Circuit

The 18PnP300 chip is a completely integrated 84 pin, high performance SCSI-2 solution for Plug and Play ISA system motherboard designers. This versatile, low cost integrated circuit provides an industry first – Plug and Play ISA bus to SCSI-2 interface, plus a FIFO Buffer on a single chip! The 18PnP300 is part of Future Domain's PnP SMART (Plug and Play SCSI Modular Architecture Technology) family of register set compatible SCSI ICs that share a standard subset of functions for ease in implementation across PC platforms and Operating Systems. The 18PnP300 provides the latest SCSI-2 hardware innovations, including 10 megabyte-per-second Fast-Sync mode operation and 48mA bus drivers featuring active deassertion for reliable SCSI bus operation. And because of its compact implementation, you receive benefits in reliability, reduced real estate, performance and cost!

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

PnP-16xx 16 Bit PIO ISA/SCSI

Availability Date: 7/15/94

Estimated Pricing:

PnP-16xx series Plug and Play SCSI Host Adapters

PnP-1620 25 pin, passive termination; PnP1630 50 pin, Active/Auto Termination;
PnP1640 50 pin, Floppy.

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

PnP-1630 ISA SCSI Controller

Availability Date: 15-Mar-95

Estimated Pricing:

PnP-1630 PnP ISA SCSI Controller

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

PNP-1640 PnP ISA SCSI Controller with Floppy Support

Availability Date: 15-Mar-95

Estimated Pricing:

PNP-1640 PnP ISA SCSI Controller with Floppy Support

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

PnP-1695 ISA/SCSI Card

Availability Date: 15-Jul-93

Estimated Pricing: \$349

Plug and Play 1695 ISA/SCSI Host Adapter

The PnP-1695 is a complete Plug and Play ISA/SCSI Kit consisting of the Future Domain PnP-1695 SCSI-2 controller, cable, PowerSCSIII and Intel Configuration Manager software. The PnP 1695 is the industry's first Plug and Play SCSI-2 controller featuring a 50-pin FAST SCSI-2 connector, active termination and is SCAM level 1 compliant. The PnP-1695 Kit contains everything you need to connect FAST SCSI peripherals to your Plug and Play ISA PC system!

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714

USA

SCSI2GO PCMCIA PnP SCSI

Availability Date: 01-Oct-94

Estimated Pricing:

SCSI2GO, Plug and Play PCMCIA

SCSI2GO - The most advanced, full-featured Plug and Play PCMCIA credit card-
SCSI controller on the market.

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

TMC-3260 PCI SCSI Controller

Availability Date: 15-Mar-95

Estimated Pricing:

TMC-3260 PCI SCSI Controller

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

TMC-3260MEX PCI Controller without boot ROM

Availability Date: 15-Mar-95

Estimated Pricing:

TMC-3260MEX PCI Controller without boot ROM

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Future Domain Corp.

2801 McGaw Avenue
Irvine CA 92714
USA

TMC-8xx 8 Bit PIO ISA/SCSI

Availability Date: 15-Jul-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 714-253-0400

Gateway 2000, Inc.

610 Gateway Dr. North
North Sioux City, SD 57049
USA

2400-9600 PCMCIA

Availability Date: 15-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 605-232-2000

Gateway 2000, Inc.

610 Gateway Drive
N. Sioux City SD 57049-2000
USA

Gateway PCMCIA Ethernet Adapter

Availability Date: 01-Apr-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 605-232-2000

Gateway 2000, Inc.

610 Gateway Drive
N. Sioux City SD 57049-2000
USA

Telepath 14.4-14.4 PCMCIA

Availability Date: 15-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 605-232-2000

Gateway 2000, Inc.

610 Gateway Drive
N. Sioux City SD 57049-2000
USA

Telepath 14.4-14.4 XJack PCMCIA

Availability Date: 15-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 605-232-2000

Hayes

Optima 288 PnP

Availability Date: Now

Estimated Pricing:

A serial bus Plug and Play modem.

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4 Plus

Availability Date: 01-May-94

Estimated Pricing:

A member of the current HP LaserJet printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4L C2003A

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4M Plus

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4ML

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4MP

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4P

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4Si C2010A

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

Hewlett-Packard Co.

11311 Chiden Blvd.
Boise ID 83714
USA

LaserJet 4Si MX C2011A

Availability Date: 01-Jan-94

Estimated Pricing:

A member of the current HP LaserJet 4 printer family.

Sales contact: Inside Sales

Sales Phone: 208-396-4628

IBM Corporation

Auto 16/4 Token-Ring

Availability Date: Now

Estimated Pricing:

An ISA bus Plug and Play network adapter.

I/O Magic Corporation

199 Technology Dr.
Bldg. 140
Irvine, CA 92718
USA

Video Capture Card

Availability Date: 30-Sep-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-607-7466

Integral Peripherals

5775 Flatiron Parkway
Suite 100
Boulder CO 80301-0000
USA

1841PA-PK

Availability Date: 01-Jan-94

Estimated Pricing:

Family of PCMCIA Disk Drives

Sales contact: Doug McCampell

Sales Phone: 303-449-8009

Iomega Corp.

1821 West Iomega Way
Roy 84067
USA

MD150 plus SCSI Adapter

Availability Date: 12/15/94

Estimated Pricing:

MD150 Bernoulli

Dual external 150 MB Drive For use with PC, PS/2, Macintosh, WorkStations &

Networks:

Kensington

Expert Mouse 5

Availability Date: Now

Estimated Pricing:

The Expert Mouse 5 is a Plug and Play mouse.

Kingston Technology Corp.

17600 Newhope St.
Fountain Valley, CA 92708
USA

DataRex 14.4 PCMCIA Modem

Availability Date: 15-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-835-6575

Kingston Technology Corp.

17600 Newhope St.
Fountain Valley, CA 92708
USA

Etherx Ethernet PCMCIA Adapter

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-835-6575

Kingston Technology Corp.

17600 Newhope St.
Fountain Valley, CA 92708
USA

Etherx PCMCIA (KNE-PCM/T)

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-835-6575

Kingston Technology Corp.

17600 Newhope St.
Fountain Valley, CA 92708
USA

Token Ring 16/4 PCMCIA Adapter (KTR-PCM16/4)

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-835-6575

Lexmark International, Inc.

740 New Circle Rd N.W.
Lexington KY 40511
USA

IBM LaserPrinter 4039 12L plus

Availability Date: 01-Jan-94

Estimated Pricing: \$2299

The IBM LaserPrinter 4039 12L plus is a 12 page-per-minute LAN printer with a high speed 32-bit RISC processor, 4MB of RAM with intelligent memory management, Postscript Level 2 and enhanced PCL 5 emulation's, an IEEE 1284 compatible parallel port, and advanced connectivity, capabilities that make the 4039 12L plus the smart midrange LAN printer for high-volume office printing.

Sales contact: Mark Barnett

Sales Phone: 606-232-5379

Lexmark International, Inc.

740 New Circle Rd N.W.
Lexington KY 40511
USA

IBM LaserPrinter 4039 12R plus

Availability Date: 01-Jan-94

Estimated Pricing: \$1749

The new 4039 12R plus is ideal for single user and LAN printing environments. It features a fast RISC processor, 2MB of memory with intelligent memory management, the IEEE 1284-compatible MarkTronics parallel port with FastBytes, and high-speed printer drivers. All this plus a 12-page-per-minute engine means faster throughput for every user.

Sales contact: Mark Barnett

Sales Phone: 606-232-5379

Lexmark International, Inc.

740 New Circle Rd N.W.
Lexington KY 40511
USA

IBM LaserPrinter 4039 16L plus

Availability Date: 01-Jan-94

Estimated Pricing: \$3399

The 4039 16L plus features a 20-MHz 32-bit RISC processor, a 16-ppm print engine, 4MB of memory with intelligent memory management, Postscript Level 2 and enhanced PCL 5 emulation's, advanced high-speed paper handling, and a multitude of advanced connectivity options, making this top-of-the-line laser printer the ideal high-performance LAN printer.

Sales contact: Mark Barnett

Sales Phone: 606-232-5379

Lexmark International, Inc.

740 New Circle Rd N.W.
Lexington KY 40511
USA

IBM LaserPrinter Model 4039-10R

Availability Date: 01-Jan-94

Estimated Pricing: \$1499

The IBM LaserPrinter 4039 10R is a true 600x600 dpi laser printer designed to serve as a highly economical desktop printer.

With Postscript and PCL5 emulation's standard, 2MB of standard RAM, a high-speed RISC processor, and an IEEE 1284 compatible parallel port, this network-capable workhorse is ideal for almost any office.

Sales contact: Mark Barnett

Sales Phone: 606-232-5379

Lexmark International, Inc.

740 New Circle Rd N.W.
Lexington KY 40511
USA

IBM LaserPrinter Model 4039-10R Duplex

Availability Date: 01-Jan-94

Estimated Pricing: \$2099

The IBM LaserPrinter 4039 10R Duplex is the lowest cost solution for two-sided printing.

With Postscript and PCL5 emulation's standard, 2MB of standard RAM, a high-speed RISC processor, and an IEEE 1284 compatible parallel port, this network-capable workhorse is ideal for almost any office.

Sales contact: Mark Barnett

Sales Phone: 606-232-5379

Linksys

16811A Millikan Avenue
Irvine, CA 92714
USA

PCMCIA Net Card

Availability Date: 07-Jul-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-LINKSYS

Logitech, Inc.

6505 Kaiser Drive

Fremont CA 94555

USA

MouseMan Serial Plug and Play

Availability Date: Now

Estimated Pricing: TBD

A Plug and Play serial mouse. Samples available now.

Logitech, Inc.

6505 Kaiser Drive

Fremont CA 94555

USA

SoundMan Wave Plug and Play

Availability Date:

Estimated Pricing:

SoundMan Wave: wave table synthesis sound card incorporating Plug and Play support.

Longshine Microsystems Inc.

10400-9 Pioneer Blvd.

Santa Fe Springs CA 90670

USA

LCS-8634L

Availability Date: 31-Dec-94

Estimated Pricing: \$70.00

Plug and Play Ethernet Card

Compliant with IEEE 802.3 Standard

NE2000 Compatible

Optional remote Boot ROM

Supports Plug and Play Environment

Supports 16 I/O Options: (200h-3C0h)

Supports 8 IRQ Options: 2,3,4,5,10,11,12,15

Supports 3 Boot ROM sizes and up to 8 Boot ROM base add

Sales contact: James Wong

Sales Phone: 310-903-0899

Madge Networks, Inc.

2310 North First Street
San Jose CA 95131-1011
USA

Smart 16/4 PCMCIA Ringnode

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Nick Holden

Sales Phone: 408-383-1378

Matsushita/Panasonic

9401 West Grand Ave. 5th Floor
Franklin Park IL 60131
USA

CR-571B/CR-571S

Availability Date: 01-Jul-94

Estimated Pricing: OEM

Panasonic Industrial Company - CR-571x (ATAPI) IDE CD-ROM Drive
Panasonic's CR-571x ATAPI IDE CD-ROM drive will be available to OEMs in June
'94.

Sales contact: Inside Sales

Sales Phone: 708-452-2414

Maxtor Corp.

251 River Oaks Parkway

MS-C217

San Jose CA 95134

USA

MobileMax Hard Drive Family

Availability Date: 01-Jan-94

Estimated Pricing:

Mobile Storage Solutions

PCMCIA-compatible 1.8-inch Type III 105MB and 131MB Hard Drives

Sales contact: Evan Steiner

Sales Phone: 408-432-4209

Maxtor Corp.

251 River Oaks Parkway

MS-C217

San Jose CA 95134

USA

X-Calliber PnP SCSI Hard Drives

Availability Date: 15-Dec-94

Estimated Pricing:

Sales contact: Evan Steiner

Sales Phone: 408-432-4209

Media Vision Technology Inc.

47300 Bayside Parkway

Fremont CA 94538

USA

Pro Audio PCMCIA

Availability Date: 12/1/94

Estimated Pricing: \$499

MediaVision Pro Audio PCMCIA

A PCMCIA version of MediaVision's popular Pro Audio sound card.

Megahertz Corp.

605 North 5600 West
Salt Lake City, UT 84116
USA

LAN-T/2 PCMCIA LAN cards

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 801-320-7701

Megahertz Corp.

605 N. 5600 W.
Salt Lake City UT 84116
USA

XJ2144 V.32 bis PCMCIA Modem

Availability Date: 30-Jun-94

Estimated Pricing: \$299

Megahertz Gold Series 14,400bps PCMCIA Fax Modems with XJACK

Credit-card sized modems with a built-in extendible connector which pops out for use with standard telephone lines and then back in for travel, eliminating extra cables. The modems also include Flash ROM for updating modems to the latest enhancements from home or office and MNP 10 for improved data transmission, particularly over cellular connections. Megahertz PCMCIA modems feature auto-installation for quick and simple modem installation, hot insertion for inserting and removing modems without rebooting, V.42/V.42bis for data compression up to 57,600bps with 100% accuracy, and cellular capability with the additional purchase of a portable interface.

Sales contact: Inside Sales

Sales Phone: 801-320-7000

Megahertz Corp.

605 N. 5600 W.
Salt Lake City UT 84116
USA

XJ2288 PCMCIA Modem

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 801-320-7000

Microdyne Corp.

3601 Eisenhower Avenue
Suite 300
Alexandria, VA 22304
USA

NE4000 PCMCIA Adapter

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-255-3967

Mitron

2220 S. Bascom Avenue
Campbell, CA 95008
USA

LX-2100+/T2 Plug & Play

Availability Date: 20-Oct-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-713-6888

Mitron

2220 S. Bascom Avenue
Campbell, CA 95008
USA

PCI Ethernet Adapter

Availability Date: 20-Oct-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-713-6888

MiniStor

2801 Orchard Parkway
San Jose CA 95134
USA

85MB PCMCIA ATA card

Availability Date: 9/1/94

Estimated Pricing:

Family of PCMCIA ATA Hard Drives

Mitsumi Electronics Corp.

6210 N. Beltline Road
Suite 170
Irving, TX 75063
USA

CRMC-FX300

Availability Date: 30-Sep-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-MITSUMI

Mitsumi Electronics Corp.

6210 N. Beltline Road
Suite 170
Irving, TX 75063
USA

CRMC-FX400

Availability Date: 31-Dec-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-MITSUMI

Multi-Tech Systems Inc.

2205 Woodale Dr.
Mounds View, MN 55112
USA

MultiModem MT2834LT PCMCIA V.34

Availability Date: 16-Mar-95

Estimated Pricing: \$399

Type 2 PCMCIA V34 Fax Modem

Sales contact: Inside Sales

Sales Phone: 800-328-9717

Motorola/UDS

HMTA 200

Availability Date:

Estimated Pricing: \$895

HMTA 200

The HMTA 200 is an ISDN terminal adapter with integral V.32b modem. The unit can originate or answer ISDN data or analog modem/fax calls. The HMTA 200 has a 17-key pad and LCD display and ships with 3 different interfaces V.35 RS232 and RS-366.

Motorola/UDS

14.4 CELlect

Availability Date:

Estimated Pricing:

The 14.4 CELlect is Plug and Play PCMCIA modem.

Motorola/UDS

V.3400 PnP

Availability Date:

Estimated Pricing:

The V.3400 is a serial bus Plug and Play modem.

Nanao USA Corporation

23535 Telo Ave.

Torrance CA 90505

USA

FlexScan F2-15

Availability Date: 01-Jan-95

Estimated Pricing:

15-inch high resolution monitor

FlexScan F2-15 is a 15-inch multifrequency, color monitor that uses the Invar Shadow Mask tube and operates in non-interlaced mode at 640 by 480 to 1280 by 1024. It comes equipped with Auto Power ON/OFF and PowerManager. The 0.28mm dot pitch CRT monitor with SuperErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.

Torrance CA 90505

USA

FlexScan F2-17

Availability Date: 01-Jan-95

Estimated Pricing:

17-inch high resolution monitor

FlexScan F2-17 is a 17-inch multifrequency, color monitor that uses the Invar Shadow Mask tube and operates in non-interlaced mode at 640 by 480 to 1280 by 1024. It comes equipped with ScreenManager Digital On Screen Display Control, Auto Power ON/OFF and PowerManager. The 0.28mm dot pitch CRT Monitor with ErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505
USA

FlexScan F2-17EX

Availability Date: 01-Jan-95

Estimated Pricing:

17-inch high resolution monitor

FlexScan F2-17EX is a 17-inch multifrequency, color monitor that uses the Invar Shadow Mask tube and operates in non-interlaced mode at 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital On Screen Display Control, Auto Power ON/OFF and PowerManager. The 0.26mm dot pitch CRT monitor with SuperErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505
USA

FlexScan F2-21

Availability Date: 01-Jan-95

Estimated Pricing:

21-inch high resolution monitor

FlexScan F2-21 is a 21-inch multifrequency, color monitor that uses the Invar Shadow Mask tube and operates in non-interlaced mode at 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital On Screen Display Control, 256 Grid Digital Convergence System, Auto Power ON/OFF and PowerManager. The 0.28mm dot pitch CRT monitor with SuperErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505
USA

FlexScan F550iW

Availability Date: 01-Jan-95

Estimated Pricing:

17-inch high resolution monitor

The FlexScan F550iW is a 17-inch high-resolution, multifrequency, color monitor that operates in non-interlaced mode in resolutions from 640 by 480 to 1280 by 1024. It comes equipped with standard features including Auto Power ON/OFF, PowerManager and dynamic focus circuitry. The 0.28mm dot pitch CRT monitor with ErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II and is rated FCC(B). The FlexScan F550iW, as well as all our current models, is PnP compatible with the new Windows '95 Plug and Play adapter.

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505
USA

FlexScan FX2-21

Availability Date: 01-Jan-95

Estimated Pricing:

21-inch high resolution monitor

FlexScan FX2-21 is a 21-inch multifrequency, color monitor that uses the Super EA-Gun Invar Shadow Mask tube and operates in non-interlaced mode at 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital on Screen Display Control, 256 Grid Digital Convergence System, Auto Power ON/OFF and PowerManager. The 0.26mm dot pitch CRT monitor with ErgoPanel anti-reflection, anti-static bonded panel meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(A).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505
USA

FlexScan T2-17

Availability Date: 01-Sep-94

Estimated Pricing:

17-inch high resolution monitor

FlexScan T2-17 is a 17-inch multifrequency, color monitor that uses the Sony SE-Trinitron tube and operates in non-interlaced mode at resolutions from 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital On Screen Display Control, Auto Power ON/OFF and PowerManager. The 0.25mm screen pitch CRT monitor with SuperErgoCoat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.
Torrance CA 90505

USA

FlexScan T2-17TS

Availability Date: 01-Jan-95

Estimated Pricing:

17-inch high resolution monitor

FlexScan T2-17TS is a 17-inch multifrequency, color monitor that uses the Mitsubishi tension tube and operates in non-interlaced mode at resolutions from 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital On Screen Display Control, Auto Power ON/OFF and PowerManager. The 0.25mm screen pitch CRT monitor with SuperErgo Coat anti-reflection, anti-static coating meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

Nanao USA Corporation

23535 Telo Ave.

Torrance CA 90505

USA

FlexScan T2-20

Availability Date: 01-Jan-95

Estimated Pricing:

20-inch high resolution monitor

FlexScan T2-20 is a 20-inch multifrequency, color monitor that uses the Sony SA-Trinitron tube and operates in non-interlaced mode at resolutions from 640 by 480 to 1600 by 1200. It comes equipped with ScreenManager Digital On Screen Display Control, Auto Power ON/OFF and PowerManager. The 0.30mm screen pitch CRT monitor with ErgoPanel anti-reflection, anti-static bonded panel meets the Swedish MPR II, TCO, ISO9241-3 and is rated FCC(B).

Sales contact: Chris Ota

Sales Phone: 310-325-5202

National Instruments Corporation

DAQCard-700

Availability Date: 1/1/94

Estimated Pricing:

PCMCIA Data Acquisition and Instrument Control Boards

National Instruments manufactures hardware products that engineers and scientists use to build PC-based instrumentation systems

National Semiconductor

2900 Semiconductor Dr.
Santa Clara, CA 95052
USA

InfoMover NE4100 PCMCIA Ethernet Card

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-231-6072

NEC Technologies, Inc.

1255 Michael Drive
Wood Dale IL 60191-1094
USA

MultiSync XE15 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$575

Enterprise Series designed for main stream business computing

The MultiSync XE15 monitor gives you a 15" CRT (13.8" viewable image size) that displays large, sharp, colorful images today's graphics intensive business applications demand.

Sales contact: Pam Himmel

Sales Phone: 708-238-7814

NEC Technologies, Inc.

1255 Michael Drive
Wood Dale IL 60191-1094
USA

MultiSync XE17 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$1060

Enterprise Series designed for main stream business computing

The MultiSync XE17 monitor offers a 17" CRT (15.6" viewable image size) that gives you more active display area to view your work, making it easier to view multiple applications or windows at one time.

Sales contact: Pam Himmel

Sales Phone: 708-238-7814

NEC Technologies, Inc.

1255 Michael Drive
Wood Dale IL 60191-1094
USA

MultiSync XE21 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$2095

Enterprise Series designed for main stream business computing

The largest XE Series monitor, the MultiSync XE21 features a large 21" CRT (19.8" viewable image size) that can improve productivity by providing ample room to display large screen business applications, such as spreadsheets and page layout.

Sales contact: Pam Himmel

Sales Phone: 708-238-7814

NEC Technologies, Inc.

1255 Michael Drive
Wood Dale IL 60191-1094
USA

MultiSync XP15 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$695

Professional Series for sophisticated, high performance users

The MultiSync XP15 features a 15" CRT (13.8" viewable image size) and delivers the advanced features and capabilities professional users demand with a smaller footprint. The MultiSync XP15 features a maximum resolution of 1280x1024 non-interlaced.

Sales contact: Sylvio Jeloveich

Sales Phone: 708-238-7815

NEC Technologies, Inc.

1255 Michael Drive

Wood Dale IL 60191-1094

USA

MultiSync XP17 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$1295

Professional Series for sophisticated, high performance users

The MultiSync XP17 monitor features a 17" CRT (15.6" viewable image size). The XP17 is designed for the power user who needs a larger screen area and high resolution up to 1280x1024 non-interlaced at 76 Hz.

Sales contact: Sylvio Jeloveich

Sales Phone: 708-238-7815

NEC Technologies, Inc.

1255 Michael Drive

Wood Dale IL 60191-1094

USA

MultiSync XP21 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing: \$2580

Professional Series for sophisticated, high performance users

The largest XP Series monitor, the XP21 provides a 21" CRT (19.8" viewable image size) that gives the graphic design professional dual page WYSIWYG display for desktop publishing applications. Its fine .28mm dot pitch also displays complex CAD images with amazing clarity and detail. In addition, a high resolution of 1600x1200 non-interlaced at 70 Hz makes the XP21 ideal for document image processing.

Sales contact: Sylvio Jeloveich

Sales Phone: 708-238-7815

NEC Technologies, Inc.

1255 Michael Drive
Wood Dale IL 60191-1094
USA

MultiSync XB17 Color Monitor

Availability Date: 04-Oct-94

Estimated Pricing:

Enterprise Series designed for main stream business computing

The MultiSync XE17 monitor offers a 17" CRT (15.6" viewable image size) that gives you more active display area to view your work, making it easier to view multiple applications or windows at one time.

Sales contact: Sales

Sales Phone: 1-800-NEC-INFO

NEC Technologies, Inc.

1414 Massachusetts Avenue
Boxborough MA 01719-2298
USA

MultiSync XV14 Color Monitor

Availability Date: 07-Mar-95

Estimated Pricing:

Outstanding performance and value for today's home or business environments

The MultiSync XV14 monitor gives you a 14" CRT (13" viewable image size), .28mm dot pitch, high resolutions and refresh rates up to 1024x768 @ 70Hz, Energy Star, MPRII, 3 year limited warranty, and displays bright, sharp, colorful images.

Sales contact: Jack Hosek

Sales Phone: 708-860-9500

NEC Technologies, Inc.

1414 Massachusetts Avenue
Boxborough MA 01719-2298
USA

MultiSync XV15 Color Monitor

Availability Date: 03-Jan-95

Estimated Pricing:

Outstanding performance and value for today's home or business environments

The MultiSync XV15 monitor gives you a 15" CRT(13.8" viewable image size), .28mm dot pitch high resolutions and refresh rates up to 1024x768 @ 76Hz, Energy Star, MPRII, 3 year limited warranty, and displays large, sharp, colorful images today's graphics intensive applications demand.

Sales contact: Jack Hosek

Sales Phone: 708-860-9500

NEC Technologies, Inc.

1414 Massachusetts Avenue
Boxborough MA 01719-2298
USA

MultiSync XV17 Color Monitor

Availability Date: 07-Mar-95

Estimated Pricing:

Outstanding performance and value for today's home or business environments

The MultiSync XV17 monitor offers a 17" CRT (15.6" viewable image size), .28mm dot pitch, high resolutions and refresh rates up to 1024x768 @ 76Hz, On Screen Manager, Energy Star, MPRII, 3 year limited warranty, and gives you more active display area to view your work, making it easier to view multiple applications or

windows at one time.

Sales contact: Jack Hosek

Sales Phone: 708-860-9500

New Media Corp.

One Technology

Bldg. A

Irvine, CA 92718

USA

.WAVJammer

Availability Date: 30-Apr-94

Estimated Pricing: \$399

New Media .WAVJammer PCMCIA audio card

The New Media .WAVJammer is the world's first PCMCIA 16 bit stereo sound card. Developed for use with Microsoft's Windows Sound System, the .WAVJammer features New Media's Sound System VxD and Windows drivers as well as New Media's true Plug and Play PCMCIA client drivers. Meeting the needs of portable computing, the .WAVJammer can be added to the computer after the machine is booted up or added and removed any time during operation. Plug and Play allows users to share cards or single users to use multiple cards by swapping cards in and out during operation. All of New Media's PCMCIA products fully support the Plug and Play standards.

Sales contact: Inside Sales

Sales Phone: 800-CARDS4U

New Media Corp.

One Technology

Bldg. A

Irvine, CA 92718

USA

14.4 Fax Modem

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-CARDS4U

New Media Corp.

One Technology
Bldg. A
Irvine, CA 92718
USA

Bus Toaster PCMCIA SCSI

Availability Date: 01-Sep-94

Estimated Pricing:

High Performance SCSI II Adapter Card

Sales contact: Inside Sales

Sales Phone: 800-CARDS4U

Nokia Corp.

P.O. Box 68
Kanslerinkatu 14, 4th Floor
Tampere FIN-33721
Finland

14.4 PCMCIA

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Mikko Terho

Sales Phone: +358-31-316-5686

Nokia Corp.

P.O. Box 68
Kanslerinkatu 14, 4th Floor
Tampere FIN-33721
Finland

Cellular Data Card DTP-2

Availability Date: 16-Mar-95

Estimated Pricing:

Sales contact: Mikko Terho

Sales Phone: +358 31 316 5686

NovaLink

48511 Warm Springs Blvd.

Suite 208

Fremont, CA 94539

USA

NovaModem 144

Availability Date: 15-Nov-94

Estimated Pricing:

Data-Fax-Voice

Sales contact: Inside Sales

Sales Phone: 510-249-9777

Oak Technology, Inc.

139 Kifer Court

Sunnyvale CA 94086

USA

Spitfire OTI-64107

Availability Date: 17-Oct-94

Estimated Pricing: \$25/10K

64-bit DRAM Video/Graphics Accelerator

Spitfire is a 64-bit DRAM Video/Graphics Accelerator. It provides integrated multimedia support with a 16-bit interface and a shared display memory architecture. Spitfire's unique architecture allows the simultaneous display of multiple, overlapping video and graphics windows. The chip interfaces directly to the PCI (Plug and Play) bus as well as the VL and ISA busses with no external logic. It's 64-bit drawing engine and 64-bit DRAM interface provides high performance at a cost-effective price.

Sales contact: Cosmo D'Aquila

Sales Phone: 408-737-0888

Olicom

900 E. Park Blvd.
Suite 180
Plano, TX 75074
USA

Token-Ring PCI Adapter

Availability Date: 01-Dec-94

Estimated Pricing: \$580

High-powered Plug-and-Play NIC

The Olicom Token-Ring PCI Adapter provides PC users -- particularly power users -- with optimal performance for new and more demanding applications like multimedia. Incorporating a full 32-bit PCI bus master interface, Olicom's PCI Adapter can achieve peak data transfer rates as high as 133 Mbytes/sec., making it an excellent choice for networks using multimedia or other applications where performance is crucial.

The adapter provides plug-and-play performance for both servers and workstations at either 4 or 16 Mbsp so that users can easily install the adapter. It also features minimum power consumption, auto-sensing support of UTP and STP connections for added ease of installation and an optional Flash Remote Program Load to allow diskless workstations to boot directly from the server.

Sales contact: Tonya McMurray

Sales Phone: 214-423-7560

Panasonic

9401 West Grand Ave. 5th Floor
Franklin Park IL 60131
USA

CR-571B/CR-571S

Availability Date: 7/1/94

Estimated Pricing: OEM

Panasonic Industrial Company - CR-571x (ATAPI) IDE CD-ROM Drive
Panasonic's CR-571x ATAPI IDE CD-ROM drive will be available to OEMs in June '94.

Philips Consumer Electronics Company

One Philips Dr.
Knoxville, TN 37914
USA

Brilliance 21A

Availability Date: 01-Mar-95

Estimated Pricing: \$2999

Philips Brilliance 21A, Model 2130DC

21" Monitor (30-82KHz) Digital Controls, 0.28mm dot pitch. Uses Philips
CybersScreen Technology which provides for optimum resolution with less than
0.2mm misconvergence and >90% color and brightness uniformity.

Sales contact: Direct Sales

Sales Phone: 615-475-8869

Philips LMS

4425 ArrowsWest Drive
Colorado Springs CO 80907-34898
USA

CM-207

Availability Date: 01-Jul-94

Estimated Pricing:

CM-207

Philips' ATAPI IDE CD-ROM drive.

Sales contact: Inside Sales

Sales Phone: 719-593-4564

Phoenix Technologies, Ltd.

2575 McCabe Way
Irvine CA 92714-0000
USA

PhoenixPnP

Availability Date:

Estimated Pricing: contact Phoenix

PhoenixPnP

Phoenix Technologies offers PhoenixPnP for Desktop and Notebook architectures. Phoenix Technologies' superior Plug and Play solution provides automatic and intelligent configuration of PC add-on cards and system board devices through a user friendly Windows 3.1 based application, and a Microsoft Windows "Chicago" compliant system BIOS.

Pioneer New Media Technologies

PCMCIA Bus Toaster SCSI II Adapter

Availability Date: 11/30/94

Estimated Pricing:

PCMCIA Bus Toaster SCSI II Interface Card

Plug and Play PCMCIA to Fast SCSI Adapter for transfers of over 10 megabytes per second.

Piiceon

1996 Lundy Avenue
San Jose, CA 95131
USA

PCMCIA Ethernet Cards

Availability Date: 01-Jan-95

Estimated Pricing:

Sales contact: Sales

Sales Phone: 800-366-2983

Q-logic

3545 Harbor Blvd.
PO Box 5001
Costa Mesa CA 92628-5001
USA

Fast!SCSI IQ PCI

Availability Date: 01-Nov-94

Estimated Pricing: 359.95

Fast!SCSI IQ PCI—The Next Generation of SCSI Technology

Fast (10MB/sec) and Wide (20MB/sec) and Wide (20 MB/sec) SCSI capability.
High-speed 1000 series RISC SCSI processor. Throughput of more than 2500 I/Os
per second (512byte read commands from hard drive. Up to 1128 queued I/O
processing capability. Uses a single PCI slot. On-board support for both Fast and
Wide SCSI. 5-year warranty.

Sales contact: Inside Sales

Sales Phone: 800-854-7112

Q-logic

3545 Harbor Blvd. PO Box 5001
Costa Mesa CA 92628-5001
USA

Fast!SCSI PCMCIA

Availability Date: 01-Dec-94

Estimated Pricing:

Fast!SCSI PCMCIA

PCMCIA type I SCSI adapter card w/free Core!SCSI for HDD & CD-ROM, free
CardSoft, external cable, PIO, 5MB/sec.

Sales contact: Inside Sales

Sales Phone: 800-854-7112

Quantum Corp.

500 McCarthy Blvd.
Milpitas CA 95035
USA

Quantum Lightning hard drivers

Availability Date: 4/15/94

Estimated Pricing:

Quantum PnP Lightning 365MB, 540MB and 730MB hard drivers for performance PCs

High performance coupled with full support for Plug and Play SCSI including SCSI-3 "SCAM" for automatic ID assignment.

Realtek

1F No. 11 Industry E Rd. IX
Science Based Industrial Park
Hsinchu 300
Taiwan ROC

RealPnP (RTL8019)

Availability Date: 01-Oct-94

Estimated Pricing:

Single chip PnP NE2000 Compatible Ethernet Controller Single chip NE2000 Compatible Ethernet Controller for the ISA bus supporting Plug and Play ISA specification. Other features include supporting Full-Duplex Ethernet and power conservation mode.

Sales contact: W. H. OuYang

Sales Phone: 886-35-780211

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Trio32

Availability Date: 14-Sep-94

Estimated Pricing: \$20/10K

32-bit Integrated Windows GUI Accelerator

The Trio32 is the first in a series of highly integrated cost effective products to be offered by S3. The Trio32 combines a 24-bit RAMDAC, dual programmable clock generators, and high-performance accelerator core in a single device. This provides an optimal, cost-effective DRAM-based graphics solution targeted for motherboard designs as well as add-in card applications. By incorporating an enhanced version of the 32-bit graphics engine used in the S3 Vision family products with an on-chip RAMDAC/clock synthesizer capable of 135-MHz output pixel data

rates, the Trio32 provides extremely high graphics performance and support of non-interlaced screen resolutions of up to 1280x1024x256 colors at 60Hz. The cost-effective Trio32 and the high-performance Trio64 are pin-compatible with each other, enabling easy implementation of graphics subsystems at different price/performance points. System designs that implement the Trio32 with 1 MByte of video memory can be quickly upgraded to the higher-performance Trio64 with 2 MBytes of video memory.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Trio64

Availability Date: 14-Sep-94

Estimated Pricing: \$30/10K

64-bit Integrated Windows GUI Accelerator

The Trio64 is the first in a series of highly integrated products to be offered by S3. The Trio64 combines a 24-bit RAMDAC, dual programmable clock generators, and high-performance accelerator core in a single device. This provides an optimal, cost-effective DRAM-based graphics solution targeted for motherboard designs as well as add-in card applications. By incorporating an enhanced version of the 64-bit graphics engine used in the S3 Vision family products with an on-chip RAMDAC/clock synthesizer capable of 135 MHz output pixel data rates, the Trio64 provides extremely high graphics performance and support of non-interlaced screen resolutions of up to 1280x1024x256 colors at 72 Hz. The high-performance Trio64 and cost-effective Trio32 are pin-compatible with each other, enabling easy implementation of graphics subsystems at different price/performance points. System designs that implement the Trio32 with 1 MByte of video memory can be quickly upgraded to the higher-performance Trio64 with 2 MBytes of video memory.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981

USA

Vision864

Availability Date: 01-Nov-93

Estimated Pricing: \$30/5K

64-bit DRAM-based Windows GUI Accelerator

The S3 Vision864 64-bit DRAM-based graphics accelerator for both the PCI (version 2.0, Plug and Play) and VESA local busses provides high resolutions and true color capabilities to Intel, PowerPC, Alpha and MIPS hardware platforms. The Vision864 incorporates a 64-bit graphics engine and a 64-bit wide pixel data bus to the frame buffer to accelerate common graphics operations such as bit block transfers (BitBLTs) and rectangle fills. Other architectural features enhancing performance include a hardware cursor, linear addressing of video memory and write posting of CPU writes to video memory. The Vision864 is register-level compatible with standard VGA, supports the VESA extended VGA modes and provides a set of enhanced modes for accelerated operation with higher resolutions and pixel depths (bits/pixel). It supports high resolutions and refresh rates, including non-interlaced operation at 800x600x24 @ 75 Hz, 1280x1024x8 @ 75 Hz and 1024x768x24 @ 60 Hz.

S3 provides video BIOS support for RAMDACs covering a large performance range. For low power consumption designs (Green PC), the Vision864 allows software to control the power state of monitors. The Vision864 also supports the VESA Display Data Channel (DDC1 and DDC2) standard that permits transfer of monitor identification and resolution support data. The Vision864 is available in a 208-pin PQFP package.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Vision866

Availability Date: 14-Sep-94

Estimated Pricing: \$35/5K

64-bit DRAM-based Windows GUI Accelerator

The S3 Vision866 64-bit DRAM-based graphics accelerator for both the PCI (version 2.0, Plug and Play) and VESA local busses provides high resolutions and true color capabilities to Intel, PowerPC, Alpha and MIPS hardware platforms. The Vision866 incorporates a 64-bit graphics engine and a 64-bit wide pixel data bus to the frame-buffer to accelerate common graphics operations such as bit block transfers (BitBLTs) and rectangle fills. Other architectural features enhancing performance include a hardware cursor, linear addressing of video memory and write posting of CPU writes to video memory. The Vision866 is register-level compatible with standard VGA, supports the VESA extended VGA modes and provides a set of enhanced modes for accelerated operation with higher resolutions and pixel depths (bits/pixel). It supports high resolutions and refresh rates, including non-interlaced operation at 800x600x24 @ 75 Hz, 1280x1024x8 @ 75 Hz and 1024x768x24 @ 60 Hz.

S3 provides video BIOS support for RAMDACs covering a large performance range. For low power consumption designs (Green PC), the Vision866 allows software to control the power state of monitors. The Vision866 also supports the VESA Display Data Channel (DDC1 and DDC2) standard that permits transfer of monitor identification and resolution support data. The Vision866 is available in a 208-pin PQFP package that is pin compatible with S3's Vision864 graphics accelerator.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Vision868

Availability Date: 14-Sep-94

Estimated Pricing: \$42/5K

64-bit DRAM-based Windows GUI Accelerator with Video

The S3 Vision868 64-bit DRAM-based multimedia accelerator for both the PCI (version 2.0, Plug and Play) and VESA local busses provides high resolutions and true color capabilities to Intel, PowerPC, Alpha and MIPS hardware platforms. The Vision868 accelerates video playback and display of decompression algorithms (including Cinepak, Indeo, and MPEG) and digitized live video via its integrated color space conversion, scaling and dithering engines. In addition, the Vision868 incorporates a 64-bit graphics engine and a 64-bit wide pixel data bus to the frame-buffer to accelerate common graphics operations such as bit block transfers (BitBLTs) and rectangle fills. Other architectural features enhancing performance

include a hardware cursor, linear addressing of video memory and write posting of CPU writes to video memory. The Vision868 is register level compatible with standard VGA, supports the VESA extended VGA modes and provides a set of enhanced modes for accelerated operation with higher resolutions and pixel depths (bits/pixel). It supports high resolutions and refresh rates, including non-interlaced operation at 800x600x24 @ 75 Hz, 1280x1024x8 @ 75 Hz and 1024x768x24 @ 60 Hz.

S3 provides video BIOS support for RAMDACs covering a large performance range. For low power consumption designs (Green PC), the Vision868 allows software to control the power state of monitors. The Vision868 also supports the VESA Display Data Channel (DDC1 and DDC2) standard that permits transfer of monitor identification and resolution support data. The Vision868 is available in a 208-pin PQFP package that is pin compatible with S3's Vision864 graphics accelerator.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Vision964

Availability Date: 01-Nov-93

Estimated Pricing: \$50/1K

64-bit VRAM-based Windows GUI Accelerator

The S3 Vision964 64-bit VRAM-based multimedia accelerator for both the PCI (version 2.0, Plug and Play) and VESA local busses provides high resolutions and true color capabilities to Intel, PowerPC, Alpha and MIPS hardware platforms. In addition, the Vision964 incorporates a 64-bit graphics engine and a 64-bit wide pixel data bus to the frame buffer to accelerate common graphics operations such as bit block transfers (BitBLTs) and rectangle fills. Other architectural features enhancing performance include a hardware cursor, linear addressing of video memory and write posting of CPU writes to video memory. The Vision964 is register-level compatible with standard VGA, supports the VESA extended VGA modes and provides a set of enhanced modes for accelerated operation with higher resolutions and pixel depths (bits/pixel). It supports high resolutions and refresh rates, including non-interlaced operation at 1024x768x24, 1280x1024x24 and 1600x1200x24.

S3 provides video BIOS support for RAMDACs covering a large performance range.

For low power consumption designs (Green PC), the Vision964 allows software to control the power state of monitors. The Vision964 also supports the VESA Display Data Channel (DDC1 and DDC2) standard that permits transfer of monitor identification and resolution support data. The Vision964 is available in a 208-pin PQFP package.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

S3 Incorporated

2770 San Tomas Expwy
Santa Clara CA 95051-0981
USA

Vision968

Availability Date: 14-Sep-94

Estimated Pricing: \$60/1K

64-bit VRAM-based Windows GUI Accelerator with Video

The S3 Vision968 64-bit VRAM-based multimedia accelerator for both the PCI (version 2.0, Plug and Play) and VESA local busses provides high resolutions and true color capabilities to Intel, PowerPC, Alpha and MIPS hardware platforms. The Vision968 accelerates video playback and display of decompression algorithms (including Cinepak, Indeo, and MPEG) and digitized live video via its integrated color space conversion, scaling and dithering engines. In addition, the Vision968 incorporates a 64-bit graphics engine and a 64-bit wide pixel data bus to the frame-buffer to accelerate common graphics operations such as bit block transfers (BitBLTs) and rectangle fills. Other architectural features enhancing performance include a hardware cursor, linear addressing of video memory and write posting of CPU writes to video memory. The Vision968 is register-level compatible with standard VGA, supports the VESA extended VGA modes and provides a set of enhanced modes for accelerated operation with higher resolutions and pixel depths (bits/pixel). It supports high resolutions and refresh rates, including non-interlaced operation at 1024x768x24, 1280x1024x24 and 1600x1200x24.

S3 provides video BIOS support for RAMDACs covering a large performance range. For low power consumption designs (Green PC), the Vision968 allows software to control the power state of monitors. The Vision968 also supports the VESA Display Data Channel (DDC1 and DDC2) standard that permits transfer of monitor identification and resolution support data. The Vision968 is available in a 208-pin PQFP package that is pin compatible with S3's Vision964 graphics accelerator.

Sales contact: Andrew Logan

Sales Phone: 408-980-5400

Sony Corp.

3300 Zanker Road
San Jose CA 95134
USA

CDU-55E

Availability Date: 6/1/94

Estimated Pricing: OEM/Retail \$249

Sony CDU-55E IDE(ATAPI) CD-ROM Drive

Sony's CD-ROM drive provides the solution for today's low-cost, high-performance-16- or 32-bit multimedia systems with state of the art AT-API interface. The CDU-55E drive combines high performance features such as 256 Kbyte read ahead cache buffer and 250 ms average access time to data under random seek operations in a rugged and durable mechanism.

Standard Microsystems Corp.

80 Arkay Drive
Hauppauge NY 11788
USA

EliteCard 8016C/PC

Availability Date: 01-Oct-94

Estimated Pricing: \$279

EliteCard PCMCIA Ethernet Adapter

Credit-card-size board for PCs with Type II PCMCIA slot that is compatible with PCMCIA 2.00 and above (also JEIDA 4.1) standards, fully software-configurable and features PCMCIA-compliant Card and Socket Services for easy setup, true "plug-n-play" capabilities.

Sales contact: Direct Sales

Sales Phone: 800-SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive
Hauppauge NY 11788
USA

EliteCard 8016T/PC

Availability Date: 01-Oct-94

Estimated Pricing: \$229

EliteCard PCMCIA Ethernet Adapter

Credit-card-size board for PCs with Type II PCMCIA slot that is compatible with PCMCIA 2.00 and above (also JEIDA 4.1) standards, fully software-configurable and features PCMCIA-compliant Card and Socket Services for easy setup, true "plug-n-play" capabilities.

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive

Hauppauge NY 11788

USA

EtherEZ (8416-B)

Availability Date: 01-Oct-94

Estimated Pricing: \$124

Plug and Play ISA Ethernet Adapter

SMCs EtherEZ 16-Bit ISA bus Ethernet adapter is fully Plug and Play (PnP)-compliant -- no configuration required in PnP systems. Simply plug the adapter in a slot and power-up -- even the media type is automatically detected!

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive

Hauppauge NY 11788

USA

EtherEZ (8416-BT)

Availability Date: 01-Oct-94

Estimated Pricing: \$129

Plug And Play ISA Ethernet Adapter

SMCs EtherEZ 16-Bit ISA bus Ethernet adapter is fully Plug and Play (PnP)-compliant -- no configuration required in PnP systems. -- Simply plug the adapter in a slot and power up -- even the media type is automatically detected!

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive
Hauppauge NY 11788
USA

EtherEZ (8416-T)

Availability Date: 01-Oct-94

Estimated Pricing: \$119

Plug and Play ISA Ethernet Adapter

SMCs EtherEZ 16-Bit ISA bus Ethernet adapter is fully Plug and Play (PnP)-compliant -- no configuration required in PnP systems. -- Simply plug the adapter in a slot and power up -- even the media type is automatically detected!

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive
Hauppauge NY 11788
USA

EtherPower (8432BT)

Availability Date: 01-Oct-94

Estimated Pricing: \$209

EtherPower PCI Bus Ethernet Adapter

32-bit, 10BASE-T or Combo (RJ-45 and BNC) bus-master board that is auto-

configurable upon power-up in PCI-bus computers for plug-and-play installation, and features speeds up to 33MHz, data throughput at rates as high as 132MBps.

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

Standard Microsystems Corp.

80 Arkay Drive

Hauppauge NY 11788

USA

EtherPower (8432T)

Availability Date: 01-Oct-94

Estimated Pricing: \$189

EtherPower PCI Bus Ethernet Adapter

32-bit, 10BASE-T or Combo (RJ-45 and BNC) bus-master board that is auto-configurable upon power-up in PCI-bus computers for plug-and-play installation, and features speeds up to 33MHz, data throughput at rates as high as 132MBps.

Sales contact: Direct Sales

Sales Phone: 800 SMC-4YOU

STB Systems Inc.

1651 N Glenville

Suite 210

Richardson TX 75081

USA

Horizon Plus

Availability Date: 01-Jul-94

Estimated Pricing:

DRAM Graphics Display Controller

Horizon Plus is a 1mb graphics display adapter based on the Cirrus Logic GD5430-graphics controller. Horizon Plus is capable of displaying pixel resolutions up to 1024x768 in up to 256K colors and high refresh rates of 75Hz are available.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

STB Systems Inc.

1651 N Glenville

Suite 210

Richardson TX 75081

USA

NITRO 64

Availability Date: 01-Aug-94

Estimated Pricing:

DRAM GRAPHICS DISPLAY CONTROLLER

NITRO 64 is a 1Mb/2Mb Graphics Display adapter based on the cirrus Logic GD5434 64-bit graphics controller. NITRO 64 is capable of displaying pixel resolutions up to 1280x1024 in up to 256K colors and high refresh rates of 75Hz are available.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

STB Systems Inc.

1651 N Glenville

Suite 210

Richardson TX 75081

USA

Power 3-D system

Availability Date: 01-Nov-94

Estimated Pricing:

High performance display adapter with video and 3D acceleration

STB's Power 3-D system offers a complete solution to high-end graphics and 3-D hardware acceleration needs. Based on the combination of the 3dlabs GLINT-300SX 3D/OpenGL accelerator coupled with an S3 Vision 968 graphics and video playback controller.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

STB Systems Inc.

1651 N Glenville
Suite 210
Richardson TX 75081
USA

Power Graph 64

Availability Date: 01-Oct-94

Estimated Pricing:

Dram Graphics Display Controller

PowerGraph 64 is a 1Mb/2Mb Graphics Display Adapter based on the S3Trio64-
DRAM 64-bit graphics controller. PowerGraph 64 is capable of displaying pixel
resolutions up to 1280x1024 in up to 256K colors and all resolutions support refresh
rates of 75Hz.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

STB Systems Inc.

1651 N Glenville
Suite 210
Richardson TX 75081
USA

PowerGraph Pro/V

Availability Date: 01-Nov-94

Estimated Pricing:

DRAM GRAPHICS/VIDEO DISPLAY CONTROLLER

PowerGraph Pro/V is a 2Mb Video/Graphics Display adapter based on the S3-
Vision868 DRAM video/graphics controller. PowerGraph Pro/V is capable of
displaying pixel resolutions up to 1600x1200 in up to 256K colors.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

STB Systems Inc.

1651 N Glenville
Suite 210
Richardson TX 75081
USA

VELOCITY 64V

Availability Date: 01-Nov-94

Estimated Pricing:

VRAM Graphics/Video Display Controller

Velocity 64V is a 2Mb/4Mb video/Graphics Display adapter based on the S3-
Vision968 VRAM video/graphics controller. Velocity 64V is capable of displaying
pixel resolutions up to 1600x1200 in up to 64K colors and all resolutions support
refresh rates of 76Hz.

Sales contact: Gary Kellar

Sales Phone: 214-234-8750

Sundisk Corporation

SDP5 Series FlashDisk

Availability Date: 01-Jan-94

Estimated Pricing:

PCMCIA PC CARD-ATA FlashDisk

Capacities ranging from 1.8 to 40MB (up to 80MB with software compression)

Sales contact: Sales

Sales Phone: 408-562-3595

SyQuest Technology

SQ1080 Removable 80MB Hard Drive

Availability Date: 12/15/94

Estimated Pricing:

SQ1080 Removable Cartridge PCMCIA Hard Disk Drive
80 MB removable cartridge drive on a PCMCIA card

SystemSoft Corporation

313 Speen St.
Natick MA 01760-0000
USA

PnP System BIOS

Availability Date: 5/3/94

Estimated Pricing: custom

PnPBIOS

A fully AT compatible, PnP specification compliant BIOS providing support for ISA, PCI, and PCMCIA devices, or any combination thereof. SystemSoft offers a complete suite of Plug and Play system software (PnPSoft) for 486 and Pentium based systems. The suite also includes support for PnP under Windows 3.1 as well as compatibility with SystemSoft's CardSoft(tm) PCMCIA software and pmSOFT(tm) desktop power management software.

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

NCR 53C8xx PCI-SCSI chip series

Availability Date: 01-Sep-94

Estimated Pricing:

PCI-SCSI 53c8xx chip series offer complete single-chip motherboard solutions

53C8xx PCI-SCSI offer fast SCSI with bus master DMA and optional ROM BIOS. 53C810 / 815 are 8 bit SCSI. 53C820 / 825 are 8/16 bit SCSI with differential or single ended options.

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

NCR8150S PCI Host Adapter

Availability Date: 16-Mar-95

Estimated Pricing:

NCR8150S PCI Host Adapter Board

Direct PCI to SCSI connection for simplicity and reliability. Full 32-bit PCI DMA for maximum performance. SCSI-2 Support: fast synchronous up to 10 Mbytes/sec. and asynchronous up to 5 Mbytes/sec. transfers.

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

NCR8251D PCI Host Adapter

Availability Date: 16-Mar-95

Estimated Pricing:

NCR8251D PCI Host Adapter Board

Direct PCI to SCSI connection for simplicity and reliability. Full 32-bit PCI DMA bus master for maximum performance. SCSI-2 support: fast synchronous (up to 20 Mbytes/sec.) and asynchronous (up to 10 Mbytes/sec) transfers.

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

NCR8251S PCI Host Adapter

Availability Date: 16-Mar-94

Estimated Pricing:

NCR8251S PCI Host Adapter Board

Direct PCI to SCSI connection for simplicity and reliability. Full 32-bit PCI DMA bus master for maximum performance. Dual internal SCSI connectors for 8-bit and 16-bit support.

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

NCR 8100ASP

Availability Date: 16-Mar-95

Estimated Pricing:

NCR 8100ASP Host Bus Adapter

NCR 8100ASP Host Bus Adapter

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Symbios Logic (formerly NCR Microelectronics)

1635 Aeroplaza Drive
Colorado Springs CO 80916
USA

SCSI5000

Availability Date: 16-Mar-95

Estimated Pricing:

SCSI5000

Sales contact: Inside Sales

Sales Phone: 719-596-5795

Tandberg Data Inc.

2649 Townsgate Rd.

Westlake Village — CA — 91361
USA

Panther PnP 2500

Availability Date: 01-Sep-94

Estimated Pricing:

Panther Plug and Play 2500 Tape Backup System

Plug and Play tape backup system includes PnP SCSI adapter, 2.5 GB TDC 4220-
PnP SCSI tape drive and 32 Bit tape backup software for Windows Plug and Play.

Sales contact: Inside Sales

Sales Phone: 805-495-8384

Texas Instruments, Inc.

5701 Airport Rd.
Temple — TX — 76502
USA

microLaser Pro 600

Availability Date: 01-Jan-94

Estimated Pricing: \$1599

Texas Instruments microLaser Pro 600

The Texas Instruments microLaser Pro 600 incorporates an 8ppm laser engine,
high-speed RISC-based printer controller, PCL5 and Adobe PostScript level 2-
support, and a bi-directional parallel port to support printer-host communication to
facilitate Plug and Play.

Sales contact: Inside Sales

Sales Phone: 817-774-6148

Thomas-Conrad Corporation

1908-R Kramer Lane
Austin — TX — 78758
USA

TC4145-C 16/4 Token Ring Adapter/PnP ISA

Availability Date: 17-Oct-94

Estimated Pricing: \$350 (Est.)

Bus-mastering Plug and Play ISA adapter for client platforms

As the industry's first Plug and Play ISA token ring adapter, the 16/4Mbps TC4145-C was designed with special attention to ease of installation and outstanding client performance.

Sales contact: Ron Taylor

Sales Phone: 512-834-6152

Thomas-Conrad Corporation

1908-R Kramer Lane
Austin TX 78758
USA

TC5041-x (PCMCIA E-Net)

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Ron Taylor

Sales Phone: 512-834-6152

Thomas-Conrad Corporation

1908-R Kramer Lane
Austin TX 78758
USA

TC5048 Ethernet Adapter/PCI

Availability Date: 01-Oct-94

Estimated Pricing: \$185-\$222 (est.)

High-performance Ethernet adapter for PCI-bus machines

Thomas-Conrad's TC5048 PCI Ethernet adapter brings the power of the PCI local bus to Ethernet networks. The PCI bus provides greater system performance than any previous bus technology, surpassing the speed of the EISA bus by 400% and the ISA bus by more than 1600%. The TC5048 takes full advantage of this increased level of performance to offer extremely high throughput while minimizing

CPU utilization:

The TC5048 adapter conforms to the PCI Plug and Play specifications and automatically configures upon start up. In addition, the TC5048 is capable of Full-Duplex Ethernet operation over switched connections.

The TC5048 is available in two media versions: the TC5048-T for 10BASE-T networks and the TC5048-T2 for direct connection to 10BASE-T and 10BASE2 networks.

Sales contact: Ron Taylor

Sales Phone: 512-834-6152

Tseng Labs

6 Terry Drive
Newtown PA 18940
USA

ET4000/W32p

Availability Date: 01-Aug-94

Estimated Pricing: \$20

Advanced PCI Bus Graphics Accelerator

W32p features a GUI Accelerator and advanced features for the developing imaging and multimedia markets. The W32p supports 512KB-4MB DRAM Memory, allowing DRAM designs to significantly outperform competing and more costly VRAM solutions. Multimedia and video imaging are enhanced through inclusion of the Image Memory Access (IMA) port that allows direct access to the frame buffer at high speeds.

Sales contact: Joe Curley

Sales Phone: 215-579-3265

Tseng Labs

6 Terry Drive
Newtown PA 18940
USA

VIPER

Availability Date: 01-Nov-94

Estimated Pricing: <\$20

Video Image Processor

VIPER offers a variety of motion video capabilities to enable complete multimedia solutions. Featuring simultaneous real-time capture of live video and high quality playback of Video for Windows AVI files. VIPER has the ability to scale video to arbitrary window sizes, retaining image quality without dropping frames. With the W32p, VIPER allows single slot PCI (Plug and Play) solutions such as TV in a Window, MPEG Playback, Video Conferencing and others, without the cost of VRAM or dual frame buffer solutions.

Sales contact: Joe Curley

Sales Phone: 215-579-3265

Tulip Computers International bv.

Hambakenwetering 2
5231 DC 's-Hertogenbosch
The Netherlands

TNCC-16 PnP

Availability Date: 25-Jul-94

Estimated Pricing:

TNCC-16 PNP

A 16-bit Ethernet Plug and Play network card for the ISA bus.

Sales contact: Wim Vervoorn

Sales Phone: +31-73-405177

US Robotics

8100 N. McCormick Blvd.
Skokie, IL 60076
USA

Sportster 28800 PCMCIA

Availability Date: 13-Mar-95

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 708-982-5001

US Robotics

8100 N. McCormick Blvd.
Skokie, IL 60076
USA

Worldport PCMCIA 16800 Dual Standard Fax

Availability Date: 13-Mar-95

Estimated Pricing:

Sales contact: Direct Sales

Sales Phone: 708-982-5001

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CE-10 CreditCard Ethernet Adapter

Availability Date: 01-Jan-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard Ethernet (Corporate Series)

Availability Date: 01-Oct-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard Ethernet + Modem II

Availability Date: 22-Oct-94

Estimated Pricing: \$799

PCMCIA Ethernet LAN and Modem Adapter

Description: Xircom's CreditCard Ethernet+Modem II revolutionizes mobile connectivity by combining both an Ethernet LAN Adapter and a 19.2 Kbps data/14.4 Kbps fax modem into a single PCMCIA Type II card. Providing simultaneous Ethernet LAN and fax/modem operation, the CreditCard Ethernet+Modem II uses a high speed block mode interface to achieve optimum throughput. The CreditCard Ethernet+Modem is cellular-capable for wireless fax/data operation

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard Ethernet IIps

Availability Date: 01-Oct-94

Estimated Pricing: \$269

High Performance PCMCIA Ethernet LAN Adapter

Description: Xircom's leadership and expertise in mobile networking solutions offers the highest performance Ethernet LAN connectivity for the mobile computing professional -- The CreditCard Ethernet Adapter IIps. Designed for the most demanding users, the CreditCard Ethernet Adapter IIps delivers unprecedented speed by integrating full duplex support and advanced Look-Ahead Pipelining capabilities. It is the ultimate high-performance solution for connecting your portable PC to a LAN.

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard Netwave Adapter

Availability Date: 01-Oct-94

Estimated Pricing: \$599

PCMCIA Cordless LAN Adapter

Xircom's CreditCard Netwave Adapter provides a cordless connection to a wired LAN through a Xircom Netwave Access Point (sold separately). Users will benefit from increased mobility by moving around the office with their PC while maintaining a real-time cordless connection to a wired LAN. Reliable and easy to use, the Xircom CreditCard Netwave Adapter installs in your computer's PCMCIA slot. The adapter features a fully integrated 2.4 GHz radio and antenna and has no circuitry.

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard Token Ring II ps

Availability Date: 01-Oct-94

Estimated Pricing: \$599

High Performance PCMCIA Token Ring LAN Adapter

Xircom's CreditCard Token Ring Adapter IIps provides the highest performance Token-Ring LAN connectivity for the mobile computer professional. The CreditCard Token Ring Adapter IIps is compatible across the widest range of platforms making it the ultimate 16/4 Token-Ring connectivity solution for portable PCs.

Sales contact: Inside Sales

Sales Phone: 800-438-4526

Xircom, Inc.

2300 Corporate Center Drive
Thousand Oaks CA 91320
USA

CreditCard TokenRing (Corporate Series)

Availability Date: 01-Oct-94

Estimated Pricing:

Sales contact: Inside Sales

Sales Phone: 800-438-4526

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{ewl msdncd.dll, ewcright, /c"Microsoft"}

Guided Tour for Administrators

This part of the RESOURCE KIT provides an overview of the Windows 95 features that are uniquely important to network administrators and systems support professionals. In this chapter, descriptions of these features — along with highlights of how to implement them — are grouped according to the special benefits they offer for managing and supporting corporate networks:

n

Reduced support costs

n

Increased control over the desktop

n

Improved user productivity

n

Smooth and easy migration

Taken together, these benefits represent a potential reduction in total cost of ownership for personal computers in an organization. In fact, independent industry analysts estimate that organizations currently using Windows version 3.1 can realize total cost-of-ownership savings so substantial that migration costs can be recouped

within the first three to six months of implementation.

By reading this guided tour, network administrators and MIS professionals learn which features of Windows 95 can reduce the total cost of ownership for personal computers in their organizations, and how to make these features work.

Windows 95 Reduces Support Costs

Support costs constitute a large portion of an organization's costs for computer ownership. Factors such as system reliability and usability have a significant impact on these costs. The following Windows 95 features help administrators manage these factors and control support costs:

n

A user interface that makes the operating system easier to use

n

Support for Plug and Play technology, which simplifies device installation

n

32-bit operating system architecture, which enhances system reliability and performance

n

Built-in networking, for easier and more stable connectivity to your existing networks

System control features of Windows 95 also have a role in reducing support costs. See “Windows 95 Increases System Control” later in this chapter for details.

Windows 95 introduces a new user interface that makes using the personal computer easier and more efficient for users, regardless of their expertise.

{ewc msdn cd, EWGraphic, x0au 0 /a "ps.bmp"}

{ewc msdn cd, EWGraphic, x0au 1 /a "ps.bmp"}

By clicking this button, novice users have access to nearly everything they need — from starting programs and documents, to changing computer settings, and getting help. The Start button provides an obvious starting point for the functions users perform on their computers every day — a more intuitive approach than Program Manager.

The desktop makes it easy to find and use tasks and connections to resources. The Network Neighborhood icon provides a single namespace for viewing network servers and connections — just point and click to connect to the server you want.

{ewc msdn cd, EWGraphic, x0au 2 /a "ps.bmp"}

For information about customizing the user interface, see Chapter 5, “Custom, Automated and Push Installations,” and Chapter 15, “User Profiles and System Policies.”

[Tips for the administrator](#)

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You can centrally control and customize the desktop with system policies and user profiles. For the rare cases where users are more comfortable with the Program Manager and File Manager, you can install these applications through Custom Setup.

Plug and Play technology provides a logical and consistent framework for devices to identify themselves and configure their settings on the computer. With Plug and Play, Windows 95 makes it easier to set up new hardware and software.

Windows 95 enables many new hardware devices that automatically configure themselves on the computer. Plug and Play devices choose settings such as IRQs or DMA channels, without requiring the administrator to set them. And, under Windows 95, Plug and Play devices can be added to a computer that doesn't have Plug and Play BIOS.

{ewc msdncd, EWGraphic, x0au 3 /a "ps.bmp"}

Windows 95 simplifies setup and configuration of devices that aren't Plug and Play compliant. By detecting legacy devices and migrating hardware settings to the Registry during installation, Windows 95 avoids overwriting legacy device settings when Plug and Play devices are added.

Support for PCMCIA and portable "hot" docking and undocking means that users can add or remove a device such as a PCMCIA card while the computer is running. The computer automatically detects that the state of the hardware has changed and adjusts the system settings accordingly.

For more information about Plug and Play and hardware detection, see Chapter 6, "Setup Technical Discussion," and Chapter 19, "Devices." Also see Chapter 31, "Windows 95 Architecture."

[Tips for the administrator](#)

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Whenever you can, choose Plug and Play-compliant devices and components for your computers, whether or not they are legacy computers. Look for the “Designed for Microsoft Windows 95” logo.

n

Plug and Play means the system selects and assigns values to hardware devices. To override these values, do so manually using Device Manager.

n

Check for any known hardware issues in the README file for Windows 95 and modify your installation accordingly.

The 32-bit architecture and superior resource handling in Windows 95 reduce downtime and support calls by providing a more stable operating system environment.

With 32-bit support for networking and all other subsystems under Windows 95, computers continue to run, even if the server goes down. Similarly, an errant application is less likely to stop the system, because 32-bit applications run in their own address space. And, for 16-bit applications, closing an errant process will not affect other programs.

Out-of-memory errors are not a practical issue in Windows 95 because the system resource constraints have been virtually eliminated. This lets your users run numerous applications without running out of memory.

Compared with Windows 3.1, Windows 95 does a better job of tracking program resources and cleaning up after an errant application stops. The freeing of system resources after an application shutdown means system performance is less likely to degrade over time.

{ewc msdn cd, EWGraphic, x0au 4 /a "ps.bmp"}

For more information, see Part 1, "Corporate Planning Guide," Chapter 20, "Disks and File Systems," Chapter 22, "Application Support," and Chapter 31, "Windows 95 Architecture."

[Tips for the administrator](#)

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Although system components are predominantly 32-bit, for compatibility

reasons Windows 95 also offers support for a variety of 16-bit component options. For example, the existing 16-bit network redirector for Novell is supported. Read the Corporate Planning Guide to understand choices and trade-offs in detail.

Windows 95 comes complete with 32-bit networking components to allow it to work seamlessly with all major networks—including Novell® NetWare® and Windows NT™ Server—and other Windows 95 peer servers.

Windows 95 support for 32-bit components includes the redirector, the protocol, the network adapter, and File and Printer Sharing services. Written to run in a multitasking environment, these components take up no real-mode memory and offer fast and stable networking.

Windows 95 comes with 32-bit versions of an IPX/SPX-compatible protocol and TCP/IP (with a DHCP client). A variety of other protocols and 16-bit network clients are also supported.

```
{ewc msdn cd, EWGraphic, x0au 5 /a "ps_A.bmp"}
```

With Network Neighborhood, users can browse network servers—even those from different network vendors—all in a single namespace. And, with support for universal naming convention (UNC) pathnames, it's as easy to access resources on the network as it is those on the local hard disk.

```
{ewc msdn cd, EWGraphic, x0au 6 /a "ps.bmp"}
```

For more information, see Part 3, "Networking," and Chapter 32, "Windows 95 Network Architecture."

[Tips for the administrator](#)

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Use 32-bit protected-mode networking software components instead of

the real-mode equivalents to ensure speed and stability. You'll need to evaluate whether to upgrade your NetWare protocols and client software to 32-bit. Issues of compatibility with certain programs are the only reasons you may choose not to upgrade your real-mode components.

n

You need to use Windows NT Server to take advantage of DHCP

autoconfiguring options and WINS name-resolution capabilities if you are moving to TCP/IP as your strategic protocol.

Windows 95 Increases System Control

Control and security are important issues in system administration and management. Problems with maintaining system control and enforcing system security can have costly repercussions within an organization.

Windows 95 provides solutions to system management problems and gives administrators an operating system that greatly increases their control over the network. Using the Registry (a logical database of system values), integrated networking, and other capabilities, Windows 95 offers these features to establish a more secure and controlled environment:

n

Centralized pass-through security, validated logon, and logon script processing for use with NetWare and Windows NT Server networks

n

System policies, which set restrictions on network and desktop functionality, on both a user-specific and a computer-specific basis

n

User profiles, which allow users to maintain a customized desktop and environment based on the user logon — or allow administrators to enforce a mandatory desktop

n

Remote administration tools and agents, including backup agents to manage the file system and network sharing options

Windows 95 supports pass-through, server-based security for NetWare and Windows NT networks, allowing each client computer to leverage the existing

security scheme. This makes implementing network security easy and efficient, using your existing user accounts.

Windows 95 supports requiring a validated logon to the server before the user can use Windows 95 in a network environment. In this fashion, users cannot get past the logon screen until they provide a correct user name and password combination. Although not as secure as a Windows NT workstation on the local computer, Windows 95 ensures administrators dependable network security, through the use of validated logon and other system customization.

{ewc msdn cd, EWGraphic, x0au 7 /a "ps.bmp"}

Using the NetWare bindery information or the user accounts on the Windows NT Server domain controller, administrators can enable security on a user-specific basis for all resources on the network, including the optional File and Printer Sharing services in Windows 95.

Windows 95 provides additional security for tasks such as remote Dial-Up Networking. Windows 95 supports encrypted dial-in passwords and callback options, and a host of third-party hardware devices to make remote access more secure. For more information, see Chapter 14, "Security," and Chapter 28, "Dial-Up Networking and Mobile Computing."

[Tips for the administrator](#)

As you plan your network:

n

Define password requirements and access rights before installing

Windows 95.

n

Enable user-level security and set up a validated logon process if you are connecting computers running Windows 95 to a Windows NT or a NetWare network. Users can also synchronize the Windows password with the network password.

n

Define the security needed for Dial-Up Networking.

System policies enable administrators to centrally define and control user access to the network and desktop functionality, such as the ability to share data and edit system settings. These restrictions can be set on the basis of the user, the computer, or the group.

System Policy Editor is the administration tool used to set rights and restrictions for specific users and computers and create policies that define general default settings. Administrators can use system policies to control access to the network, specify desktop configuration settings, and prevent users from modifying applications or desktop settings. Administrators can also limit users to running only a defined list of applications. System Policy Editor can be used remotely to modify Registry settings on individual computers. Policy files can be automatically downloaded at logon on NetWare or Windows NT Server networks.

{ewc msdncd, EWGraphic, x0au 8 /a "ps.bmp"}

In addition to System Policy Editor, Windows 95 provides support for DMI and SNMP agents to query and manage the Registry on the client computer. As a result, administrators can write in-house system management software or use third-party software for more powerful network management.

For more information, see Chapter 15, “User Profiles and System Policies” and Chapter 16, “Remote Administration.”

[Tips for the administrator](#)

n

System policies are a must for any network administrator who wants to

manage access rights and permissions for system configuration. System policies are easily enabled and modified at any time. To add support for group policies, or change the default of the central policy file, enable them manually. System Policy Editor is located in the ADMIN\APPTOOLS directory on the Windows 95 compact disc.

User profiles describe user-specific or computer-specific information such as software preferences and settings. Hardware profiles define current hardware settings for the computer. With profiles, users can get a consistent and customized environment, which makes it easier to use and manage computers.

User profiles define user-specific settings, such as the icons on the desktop or the choice of screen saver, so that multiple users or “roving” users can maintain a consistent desktop, regardless of which computer is used to log on. User name and logon password determine which user profile is active.

`{ewc msdncd, EWGraphic, x0au 9 /a "ps.bmp"}`

For “roving” users who log onto different computers at different times, user profiles stored on the network server ensure that the user has the same work environment at every logon location.

For multiple users of the same computer, user profiles determine the desktop environment and the associated privileges for each specific user, to maintain a secure and consistent environment.

Hardware profiles are known configuration states for a specific computer—such as docked or undocked, in the case of a portable computer. Hardware profiles enable Windows 95 to adjust system capabilities to match the current state of the hardware.

For example, when a portable computer is undocked, Windows 95 removes the system's printing and networking capabilities.

For more information, see Chapter 15, "User Profiles and System Policies," and Chapter 19, "Devices."

Tips for the administrator

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User profiles are an option, not installed by default, that you can enable at any time. A 32-bit network client is required to support user profiles.

n

You can also define mandatory user profiles in a file called USER.MAN for all users who log onto a specific home directory of a network server. This mandatory user profile protects novice users from inadvertently making changes to their environment.

Windows 95 includes remote administration tools— System Monitor, Registry Editor, and NetWatcher—and backup agents for popular server-based backup programs. Windows 95 also provides agents for other system management tools.

System Monitor provides graphical measurements of network traffic, file system performance, and other activity on remote computers. With these measurements, an administrator can identify and troubleshoot problems on remote computers.

`{ewc msdn cd, EWGraphic, x0au 10 /a "ps.bmp"}`

NetWatcher allows the administrator to remotely view and disconnect network connections, and control the File and Printer Sharing services for any computer

running Windows 95 with the Remote Registry service.

{ewc msdn cd, EWGraphic, x0au 11 /a "ps.bmp"}

Registry Editor allows the administrator to remotely edit the Registry for a particular computer. When used in combination with System Monitor and NetWatcher, Registry Editor enables administrators to correct computer problems for remote users without traveling to the remote site.

Windows 95 includes backup agents for the Cheyenne and Arcada server-based backup systems. With the appropriate server software, Windows 95 can be easily backed up to a NetWare server with these agents.

For more information, see Chapter 16, "Remote Administration."

[Tips for the administrator](#)

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To manage network computers remotely, enable the Remote Registry and

Network Monitor agent, and assign remote administration privilege for each computer when installing Windows 95.

Windows 95 Improves User Productivity

By raising user productivity, administrators have the potential not only to cut costs but also to boost revenue generation for their organizations. The following user productivity features of Windows 95 enable organizations, administrators, and users to get the most out of their computers:

n

Faster computing when performing common actions such as printing documents, or saving and copying files

n

Preemptive multitasking and multithreading of 32-bit applications for a more responsive environment

n

Dial-Up Networking and file synchronization to enable users to work from home or on the road

n

Built-in messaging with a universal inbox for electronic mail, faxes, and Internet messages

New 32-bit printing, graphics, and other subsystems speed up operations for common tasks.

Printing is faster in Windows 95, both in terms of the return-to-application time, and in terms of the speed of printing output.

With a new 32-bit file system and caching algorithms, operations that access the hard disk, such as sorting a database and saving or copying a file, are completed more quickly than under Windows 3.1.

Networking is also faster in Windows 95 because the new 32-bit networking components provide raw speed improvements. In addition, new browsing and data-caching algorithms improve network responsiveness.

In general, Windows 95 is as fast or faster than Windows 3.1 on a 4MB 386DX or better computer. In addition, as RAM is added, a computer running Windows 95 becomes comparatively faster (as measured on industry-standard benchmarks), scaling to handle the additional memory.

For more information, see Chapter 17, "Performance Tuning," Chapter 31, "Windows 95 Architecture," and Chapter 32, "Windows 95 Network Architecture."

[Tips for the administrator](#)

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Wherever possible, the 32-bit subsystems are enabled by default during

installation, so no additional work is required for setup. In rare cases, you may disable or use a 16-bit component alternative, such as a real-mode networking client, to maintain compatibility with certain programs.

Windows 95 supports and enables a whole new class of 32-bit applications with preemptive multitasking, allowing the computer to do more than one task at a time.

`{ewc msdn cd, EWGraphic, x0au 12 /a "ps.bmp"}`

With 32-bit applications, users do not need to wait for completion of a particular task, such as downloading a large file from a BBS, before they can begin work on another

task.

Similar to Windows NT, Windows 95 supports the Win32® API, which enables software vendors to write preemptive multitasking applications. For administrators, this means more productive and more stable applications for users.

Because these applications are based on the same API as Windows NT, applications are binary-compatible between the two operating systems.

Under Windows 95, 32-bit applications also support new capabilities such as long filenames and UNC paths in common dialog boxes. This makes it easier and more efficient for users to name files what they want, and to find and open files without mapping drives.

Because of its 32-bit system components, Windows 95 provides a more stable environment than Windows 3.1 for running your Windows-based and MS-DOS—based applications.

For more information, see Chapter 22, “Application Support,” and Chapter 20, “Disks and File Systems.”

[Tips for the administrator](#)

n

Even though Windows 95 provides a more stable and functional

environment for your existing applications, to take advantage of multitasking and long filenames, you'll want to upgrade to the latest 32-bit applications.

Windows 95 makes computing more efficient for remote and mobile users by supporting several capabilities such as dial-up network access and file synchronization.

Dial-Up Networking in Windows 95 allows the user to connect to network resources, such as files and electronic mail, using Point-to-Point Protocol or server-based dial-in packages such as NetWare Connect, Windows NT RAS, or Shiva® Netmodem.

{ewc msdncd, EWGraphic, x0au 13 /a "ps.bmp"}

Briefcase is a tool that allows mobile users to easily track and update copies of files stored on two or more computers—usually an office computer and a portable computer. Users put the files that need to stay in sync into Briefcase before going on the road. After users return and connect to the network, Windows 95 prompts them to synchronize the files. Briefcase then updates the file on the network to match the file on the portable computer.

{ewc msdncd, EWGraphic, x0au 14 /a "ps.bmp"}

[Tips for the administrator](#)

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Although Dial-Up Networking is a powerful productivity feature for users, it

may present security and control concerns for the administrator. To disable Dial-Up Networking, use system policies to centrally configure Windows 95. Also, additional security such as callback or hardware signature devices can be used.

Windows 95 includes support for a variety of messaging services including electronic mail and fax, plus access to the Internet and online services. These services enable users to communicate more easily with others.

The Windows 95 Microsoft Exchange feature provides a single inbox for all messaging services that support MAPI, so that users only go to one location to retrieve their electronic mail and fax information.

{ewc msdncd, EWGraphic, x0au 15 /a "ps.bmp"}

Windows 95 supports a wide variety of electronic mail systems and includes a simple workgroup mail system for messaging, based on MS Mail 3.2.

Microsoft Fax provides built-in fax capability to Windows 95 and supports client and server fax software from other vendors.

Windows 95 includes all the necessary protocols and modem software for access to the Internet. Support for basic FTP and Telnet TCP/IP utilities and for advanced software such as Mosaic makes Windows 95 Internet-ready.

Similar to Windows 3.1, Windows 95 supports a wide variety of online services. For those unfamiliar with online services, The Microsoft Network introduces users to online features such as product information and chat forums.

For more information on messaging services in Windows 95, see Part 6, "Communications."

[Tips for the administrator](#)

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Many of the messaging services in Windows 95 are optional during

installation. These include Microsoft Exchange, Microsoft Fax, and The Microsoft Network features. You also need to set up the appropriate protocols and dial-up connections for access to the Internet.

Windows 95 Supports Smooth, Easy Migration

Because organizations cannot realize the benefits of using a new operating system until the existing system has been upgraded, the upgrade process itself determines when the organization starts to achieve cost and labor savings from its new system.

investment.

To shorten the payback period on the upgrade, Windows 95 provides:

n

A powerful setup program that ensures compatibility and upgrades existing Windows 3.x installations so that 32-bit settings for printers, applications, and so on, are automatically available (as appropriate)

n

Server-Based Setup, which allows for automated installation on network computers from a central location

n

Batch-script support, which allows for a “hands-free” installation

n

A task-based tutorial that explains Windows 95 operations in terms of their Windows 3.x equivalents

Easier customization and setup for multiple computers

For network administrators, Windows 95 includes a setup program that automates installation and provides easy customization when installing Windows 95 from source files on the network.

This setup program automatically copies Windows 95 files to the selected server path, so that Windows 95 can be installed on individual computers directly from the network without accessing disk or CD-ROM drives. Administrators can manually adjust the source files on the shared directory, adding or removing files as necessary to specify those to be copied for local computer setup.

During Server-Based Setup, administrators can view or add home directories on the server for particular computers on the server. This enables administrators to configure and store the user-specific or computer-specific information in these directories for use in installing Windows 95 in custom configurations.

For greater network security and manageability, Windows 95 can be set up to run from the server, either partially or completely (as in the case of remotebooting (RPL) from a ROM card).

{ewc msdncl, EWGraphic, x0au 16 /a "ps.bmp"}

For more information, see Chapter 4, "Server-Based Setup for Windows 95," and Chapter 5, "Custom, Automated, and Push Installations."

[Tips for the administrator](#)

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Although Server-Based Setup automates the copying of files to the server,

you may want to customize the shared directory, by adding or removing files that are specific to your network.

Windows 95 supports scripting of the installation process so that predetermined settings and responses to setup prompts can be automatically read from a single

file, significantly reducing the installation time.

Server-Based Setup has an option for creating batch scripts. By choosing this option, the administrator can easily create scripts by clicking check boxes and typing in text strings as prompted by the program. There's no need to edit a text file for the correct syntax of every option.

With Microsoft Systems Management Server commands and a Windows 95 batch script, administrators can install Windows 95 on a computer without having to physically visit the site. As soon as the user logs onto the network, the installation runs by itself.

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{ewc msdn cd, EWGraphic, x0au 17 /a "ps.bmp"}
```

For more information, see Chapter 5, "Custom, Automated, and Push Installations," Appendix D, "MSBATCH.INF Parameters," and Appendix K, "Microsoft Systems Management Server."

[Tips for the administrator](#)

n

Define a default computer configuration and test setup from a batch script

file in the lab—to ensure that the batch script file installs all of the software correctly—before rolling it out to the network.

n

To automate the user and computer name entries in the script file, either

copy them from your current server or create a text file with the predefined names.

Windows 95 includes new task-based Help and a tutorial that assists users in getting up to speed.

Windows 95 Help is designed to make it easier for users to get the information they need to perform a specific task. Most procedures have moved out of documentation and into online Help, where they're easier to access while you're working.

{ewc msdn cd, EWGraphic, x0au 18 /a "ps.bmp"}

Also, Help is streamlined and task-oriented, so it is easier to remember and to use.

Whenever a user wants Help for a task, a Help window appears alongside the window where the task is running, or if no task is running, Help provides a single-click shortcut to the dialog box or feature that brings up the task immediately.

Windows 95 also introduces a new tutorial that makes it easier for users to get "up and running" on common tasks. Its graphical approach illustrates the steps for tasks such as opening files using the Start button. In addition, to help with migration, the Introducing Windows Tutorial includes tips and examples of common Windows 3.1 tasks as they are now performed under Windows 95.

{ewc msdn cd, EWGraphic, x0au 19 /a "ps.bmp"}

For more information, click Help on the Start menu.

To get specific help information in a dialog box, right-click an item, and then click the What Is This? button. Or click the Help button in the title bar, and then click the item in the dialog box that you want to read about.

[Tips for the administrator](#)

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To speed up user training in Windows 95, use system policies to modify

the computer's startup so that the Tutorial runs in full-screen mode in the Startup group. After training is complete, change the system policies to remove the Tutorial from the startup.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 1 Corporate Deployment Guide

This chapter is for administrators responsible for corporate implementation of Windows 95, providing an overview of the significant steps in the deployment schedule. Chapter 2, “Corporate Implementation Strategy,” contains the details about how to make decisions and perform actions listed in the overview.

For step-by-step instructions for conducting the installation, see Chapter 3, “Introduction to Windows 95 Setup,” and Chapter 5, “Custom, Automated, and Push Installations,” in the WINDOWS 95 RESOURCE KIT.

Overview of the Process

The deployment process for Windows 95 is divided into distinct phases that span everything from evaluating the product, to specifying the preferred network client configuration, and pushing the installation from a central network server. The following are the suggested phases of deployment:

n

Review Windows 95

n

Assemble the planning team and tools

n

Specify the preferred network client configuration

n

Conduct the lab test of the client configuration

n

Plan the pilot rollout

n

Conduct the pilot rollout

n

Finalize the rollout plan

n

Roll out Windows 95

In the sections that describe each phase, checklists are provided to describe the tasks for the specific phase. Detailed instructions for performing each task are provided in Chapter 2, "Corporate Implementation Strategy."

The following sample illustrates how to use the checklists at your site.

Sample of Checklist Format

Deployment Phase

	Wh	Wh	Ho
Summary of the task.	on	en	w
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	on	s	it
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	s	k	e
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The tasks may vary for your particular organization's structure and needs. For the purpose of this guide, individuals performing tasks are grouped in the following teams, made up of employees from your organization.

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ve (usually the
head of the
Information
Systems
department)
and
members of
the executive
committee of
the
corporation

PI Deployment
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ni manager,
ng key
Installation
team
members,

and a
representativ
e from the
Support and
Training
teams

In Technicians
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all individuals
ati who will be
on conducting
the
installation

Su Staff of the
pp Help desk or
ort Support
department,
and select
individuals
from the
Planning
team

Tr Individuals
ai responsible
ni for user
ng training

Review Windows 95

When Windows 95 is implemented, it can yield significant benefits to your organization in terms of cost savings and increased system control. However, because many decisions — starting with the decision to acquire Windows 95 — depend on anticipated benefits, the first step in beginning to plan the rollout process is to closely examine the new and enhanced features in Windows 95.

Windows 95 is designed to make deployment easy in the corporate environment. By understanding how best to plan and automate the installation process, you can potentially reduce the cost of migration, making it significantly less than the migration cost from Windows 3.0 to Windows 3.1! For information on how Windows 95 reduces migration costs and simplifies the deployment process, consult studies from industry analysts such as Gartner Group, Inc., or information from Microsoft concerning business justifications for Windows 95.

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workings of
Windows
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Assemble the Planning Team and Tools

After the assigned teams complete the review phase and have a general perspective on Windows 95 features and benefits, you are ready to assemble the people and tools needed to plan the Windows 95 implementation. The tasks for assembling the resources are described in the following checklist.

Assemble the Planning Team and Tools

the project manager (if appropriate); usually this is the head of the Information Systems department).

Select key Planning and Installation team members.

Acquire Windows 95 (compact disc version is preferred).

Inventory your client and server hardware and software configurations on the network.

Set up a testing lab.

Acquire test computers for use as the

network
server and
clients.
Choose
computer
models
that are
typical of
those used
in your
organization.
n.

Install the application software and line-of-business tools in the lab to simulate the network environment.

Have the Installation team review discussion of product features in the

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If needed, send team members to a Microsoft Authorized Technical Education Center for additional training. Ins W 10 tall ee da ati k ys on, 3 Su pp ort, Tra ini ng

Specify the Preferred Network Client Configuration

With the Planning team assembled and educated about Windows 95 capabilities, the next step is to specify the preferred configuration for client computers; this configuration will be used for evaluation and testing, prior to full implementation. This phase involves documenting the configuration layout (where Windows 95 files will be located) and which features will be used in the preferred configuration on client computers. (For the purposes of this discussion, “client computer” refers to any computer running Windows 95, including computers that act as peer servers by running File and Printer Sharing services.)

For any given feature or capability, such as the network redirector or a particular protocol implementation, there are several options to choose from. Before making a decision, evaluate the features and consider the alternatives—including whether to use them at all. Then choose the appropriate implementation based on its performance, functionality, and compatibility.

Although you can use other methods to determine the preferred client configuration, Microsoft recommends that you start from the “ideal” configuration, which uses all of the most powerful features of Windows 95, and then work backward to a configuration that may have fewer features but more closely fits your company’s needs. The selected configuration and any modifications will be rigorously tested in the lab before company-wide implementation.

The following tables list the features and capabilities of the ideal configuration and related alternatives, plus the chapters where these features are discussed in the RESOURCE KIT. Work through this table, checking off the features you plan to implement. To learn more about these features, see Chapter 2, “Corporate Implementation Strategy,” or the related RESOURCE KIT chapters.

The last table in this section lists features which Microsoft recommends for implementation by all organizations.

Configuration Layout Decisions

Local tion of Win dow s files	Depends on your need to maximize central security and administr ation	Chapter 4, “Ser ver- Base d Setu p for Wind ows 95”
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versus
performa
nce on
the client
computer.

Also
depends
on the
hardware
platform
of the
client
computer.

Options:

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Run
Windows
95 on the
client
computer
for best
performance.

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Run
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95 from
the server
for easier
administration.

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Key Features of the Ideal Network Client

Use	Depends	Part
32-bit, protected-mode network client software	on the compatibility of your required applications. Options vary based on your network. For example, for Novell® NetWare® networks:	3, “Networking”

T

on

Protected-mode Client for NetWare Networks

is the preferred client.

n

p Real-mode Novell NETX or VLM clients

r may offer slightly better compatibility with some network utilities.

o n

v A real-mode network client for another network can also be used.

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Library

Use 32-bit, protected-mode protocols
Depends on compatibility with your choice of client. Options depend on your choice of protocol.
Chapter 12, "Network Technical Discussion"

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Microsoft
IPX/SPX-
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e protocol
is
preferred
(with or
without
IPX over
NetBIOS)

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more
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server is
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Use the latest driver if available; otherwise, use the driver that is installed by default. Choose the older, real-mode driver if a new driver is unavailable.

T

Options:

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Always use the newest drivers available; implemented by default.

on

Manually
choose to
keep
using an
older
driver,
including
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Use Depends Cha
the on timing pter
new or 22,
Win preferenc “App
dow e rather licati

s 95 than on
user functional Sup
interf ity port”
ace because

the new
user
interface
is
significant
ly more
functional
and
efficient.

But, if a
rapid
migration
is
required,
and
training is
not
immediat
ely
available,
the
Windows
3.1 user
interface
can be
temporari
ly used.

Options:

p
n
r

Use the
new user
interface;
this is
preferred

onv v i d e

and
installed
by
default.

Install the
Windows
3.x File
Manager
and
Program
Manager.

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t u r e s

Microsoft recommends that you include the following features in your preferred configuration. These features define how Windows 95 will be installed and administered in your organization.

Recommended Windows 95 Features for Client Configurations

Use Choose Cha
syst this pter
em feature to 15,
polic restrict “Use
ies the user’s r
ability to Profil
use es
Control and
Panel Syst
options or em
configure Polic
compone ies”
nts.

Options:

On

Use
System
Policy
Editor to
define
policies at
any time.

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For
computer
s running
a shared
copy of
Windows

estrir

95 from a server, configure the shared installation directory with a limited set of components for Windows 95. This is not an optimal choice.

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Use Choose Cha
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profil feature to 15,
es maintain “Use
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t desktop Profil
and es
environm and
ent Syst
settings em
on a Polic
user- ies”
specific
basis.
Enabling
user
profiles
causes a
slight
delay
during

logon.

Options:

n
a
I
Users
can
control
changes
to their
user
profiles
and
update
them as
they
want.

l
n
o
Administrators can
predefine
a
mandatory profile
for
specific
users,
that can
only be
changed
by the
administr

ator.

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S

Enable this Character Set Service to permit remote administration. To use it, you must use a 32-bit

T

network client and also enable user-level access.

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S

Use this batch script to install Windows 95 on more than five computers. Choose this feature if you must install Windows 95 on more than five computers. Chapter 5, “Custom, Automated, and Pushh

T

Server-Based Setup offers an easy to use, graphical tool for creating batch scripts. You can also manually create a script with additional options by creating a text file with the appropriate entries. Insta llation ns,” and App endi x D, “MS BAT CH.I NF Para mete rs”

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S

Set up for push installation, based on the location and number of computers you must upgrade.

Options:

On

Edit the logon script to run a setup

Chapter 5, "Custom, Automated, and Push Installation," and Appendix K, "Microsoft Systems Management Server"

batch
script.

n

a Use a
tool such
as the
Microsoft
Systems
Managem
ent
Server to
facilitate
the setup.

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Use peer resource shari
Choose this feature based on your
Chapter 11, “Log on,

ng site's Brow
servi security sing,
ces needs. If Res
users are ourc
allowed e
to share Shar
local ing"
resources
on their
computer
s, then
peer
resource
sharing
can save
network
traffic and
hard disk
space on
the
server.
For
central
control or
to prevent
users
from
turning on
this
feature,
use
system
policies.
This
feature
can only
be
installed
on
computer
s that use
a 32-bit,
protected
-mode
network

client.

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Use Choose Cha
user this pter
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level maintain “Sec
secu network urity”

urity security
on a
user-
specific
basis
from the
server.
Validation
by a
Windows
NT
Server or
NetWare
server
can also
be
required
before
access to
any
resources
is
possible
under
Windows
95.

Options:

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a
User-
level
security is
enabled
by
requiring
the client
to log
onto the
server at

i startup. It
can also
be
required
for peer
resource
sharing
services.

m

t User-
level
security is
required
for
remote
administr
ation of
the
Registry
and for
network
access to
full user
profiles.

i n

Share-
level
security
can
additional
ly be

used with
or without
user-level
server-
based
security
for SMB
resource
sharing
services.

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The following table lists other features that may be useful to include in your preferred configuration.

Other Optional Windows 95 Features

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rosoft	whether	26,
Exch	you have	"Elec
ange	an	troni
Mail	existing	c
	mail	Mail
	system	and
	and	Micr
	whether	rosoft
	you want	Exch
	the added	ange
	integratio	"
	n of	
	messaging	
	g	
	services	
	offered by	
	Microsoft	
	Exchange	

Options:

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h
Install all
or part of
Microsoft
Exchange
during the
installatio
n.

an

v
Run your
existing
mail client
as usual.

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res disk
space
and use a

Third-
party
utility or
applicatio
n with the
same
capabilitie
s, you
should
install the
new
features
and test
their
value.

These
features
are not
installed
by default
but can be
specified
during
Setup or
installed
later:

e
n

Dial-Up
Networkin

n
g client
software
for dial-up
connectio
n to
popular
servers

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Microsoft
Fax for
fax
receipt
and
transmiss
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The
Microsoft
Network
for online
services

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Checklist to be provided:

Specify the Preferred Network Client Configuration

Conduct the Lab Test

Using the network client configuration that you have developed on paper, the people and tools assembled earlier for the Planning team now need to install this configuration in the lab for testing and evaluation. Because only the client computer configuration is being installed (server installation is described in the following section), this test only determines whether the preferred configuration performs as expected, and whether it is compatible with your current applications and processes.

Depending on how the test installation proceeds, it may be necessary to modify the configuration, by either adding or removing selected features. If more than one configuration is being considered, side-by-side evaluations of different configurations can be performed to help determine which one works best.

The tasks in the following checklist apply for each computer used to install a client configuration. For step-by-step instructions on installing and selecting features, see Chapter 3, "Introduction to Windows 95 Setup."

Conduct the Lab Test

Before Ins W 1
running tall ee da
Windows ati k y
95 Setup, on 4
make sure
that the
computer
meets your
company's
standards
and the
Windows
95
minimum
standards
for
operation
— at least
a 4MB
386DX or
better. If
not,
perform
the
hardware
upgrades
now.

Ins W 0.
Defragmen tall ee 5
t the hard ati k da
disk and on 4 y
scan it for
viruses.
Create an
MSD
report and
copy it to a
floppy disk.

Back up Ins W 0.
and verify tall ee 5
key data ati k da
and on 4 y
configurati
on files,
such as

GRP, INI,
AUTOTEX
EC.BAT,
and
CONFIG.S
YS files.

Ensure that the current network client software is functioning properly and that all important application s operate correctly.

Install Windows 95 on the test computer in the lab, using your preferred client configurati on.

Test the installation:

n

Can you
connect to
and
browse the

network?

n

Can you
print both
locally and
across the
network?

n

Can you
open, run,
and close
application
s locally
and on the
network?

n

Can you
shut down
successfull
y?

Ins W 5
Optionally, tall ee da
if you have ati k

several on, 5 ys
test PI
computers, an
compare nin
your old g
client
configurati
on under
Windows
3.x and
your new
preferred
configurati
on. How do
the two
compare in
terms of
the
following:

n

Functionali
ty for
administeri
ng the
computer
and using
it for
common
tasks?

n

Performan

ce for local
disk and
network
actions?

n

Ease of
use for
performing
common
tasks?

n

Stability of
the two
computers
under
stress?

n

Compatibili
ty with
application
s and
hardware?

. If the PI W As

specified an ee re
client nin k qu
configurati g, 5 ire
on did not Ins d
work as tall
expected, ati
modify and on
document
the
differences
until a
working
preferred
client
configurati
on is
installed.

. Perform a Ins W 1
complete tall ee da
restoration ati k y
of on 5
operating
system
files and
system
capabilities
for your old
client
configurati
on on the
computer
running
Windows
95.

. Evaluate Ins W 0.
the tall ee 5
restoration ati k da
process for on, 5 y
problems. PI
Document an
the nin
process g
and the
modificatio
ns made.

. Install the Ins W 3
 preferred tall ee da
 configurati ati k ys
 on on a on, 5
 wider PI
 variety of an
 hardware, nin
 with your g
 team
 assisting in
 performing
 the
 installation
 s.

Plan the Pilot Rollout

The previous phase helped to determine the best client configuration for Windows 95. In this phase, appointed teams will determine the best methods for automatically installing the specified configuration for a pilot or trial rollout. Planning for this pilot program involves creating the automated installation process, determining the logistics of testing, and preparing a training plan for users.

Automating the installation is a key step in reducing the cost of migration. By creating a batch script with predetermined answers for installation questions, the installation process can run from start to finish without user intervention. It is also possible to “push” the installation from the server, so that you can install Windows 95 on an individual personal computer without ever touching the computer. This automation work is done in the lab, prior to conducting the pilot rollout.

Plan the Pilot Rollout

Use PI W 2
 Server- an ee da
 Based nin k ys
 Setup to g, 6
 install Ins
 Windows tall
 95 source ati
 files on a on
 server.
 Make
 setup
 choices

based on
your client
configurati
on,
including
whether
you will run
a shared
copy of
Windows
95 from the
server, or
run
Windows
95 locally
on the
client
computer.
Perform
the
following
steps:

n

Set up the
distribution
server

n

Set up the
client from
the
network

See
Chapter 4,
“Server-
Based
Setup for
Windows
95,” for
step-by-
step
instructions

Document
any
changes to
this
process.

Create PI W 1
and test an an ee da
automated nin k y
installation g, 6
by creating Ins
a batch tall
script to ati
predefine on
settings for
Setup.
Document
the key
parts of the
batch
script that
vary by
installation.

PI W 3
Determine an ee da
and test nin k ys
how you g, 6
will push Ins
the tall
installation ati
from the on
server
without
having to
touch the

client
computers.
(See
Chapter 5,
“Custom,
Automated
, and Push
Installation
s.”)
Options:

n

Modify
logon
scripts on
the server.

n

Use
manageme
nt software
such as
Microsoft
System
Manageme
nt Server.

n

Send a batch file that runs Windows 95 Setup as an embedded link in an electronic mail message.

Document the process for the rest of the Installation team.

Evaluate the Windows 95 installation process for opportunities to upgrade or improve your organization's existing technology infrastructure. For example, a

PI W 2
an ee da
nin k ys
g, 7
Ex

ec
uti
ve

management software tool can help you administer computers on the network more easily, and it can help with the push installation process.

Document the logistics of the pilot installation. This includes the total time for installation, the purchase of new software or tools, selection of the pilot user group, and scheduling of specific installations.

Prepare a memo for your users to clearly explain how the

Ins W 3

tall ee da

ati k ys

on, 7

PI

an

nin

g

installation
process
will affect
their daily
work
schedule
and
describe
the
differences
they will
see after
the
installation
is
completed.

PI W 5
Establish a an ee da
support nin k ys
plan for the g, 7
pilot user Su
group. This pp
includes a ort
contact
name and
phone
number for
assistance,
a short list
of the top
questions
and
answers,
and
troublesho
oting tips.

Prepare PI W 10
a user an ee da
training nin k ys
course (or g, 6
hire a Su
training pp
vendor to ort
prepare ,
one). Use Tr

Windows 95 training
95 tutorials to jump-
start your
training
efforts.

Set up the lab or classroom with computers for hands-on training.

Edit the Windows 95 Help file (if appropriate) to include any company-specific information. Repeat this after the pilot rollout is completed.

Conduct the Pilot Rollout

The goal of the pilot program is to test your automated installation in everyday use among a limited group of users (for example, between 15 and 50). This process will help to identify problems that may impede or delay the deployment process, and to determine what resources you'll require for the final, company-wide rollout. The pilot rollout will also set the tone for the rest of the deployment process; a successful pilot rollout will help other installations to run smoothly by stimulating the cooperation and enthusiasm of your users.

Conduct the Pilot Rollout

Select a pilot user

group that is willing and able (particularly in terms of their workload) to handle the installation process.

Train the users. Training begins

Back up the test computers. Install Windows 95 on

Perform the installation in the same manner that you expect to install Windows 95 throughout the company.

Have your technicians on-site for the initial installation to document the process

and
problems,
and to
support the
users.
Have other
technicians
monitor
time and
all
measurabl
e factors in
the
installation
process.

Ensure PI W 3
that all an ee da
computers ni k ys
are “up ng 11
and ,
running” as In
expected. st
Document all
areas in ati
which the on
installation, ,
training, or Su
support pp
can be ort
improved.

Survey PI W 3
members an ee da
of the pilot ni k ys
user group ng 12
about their
satisfaction
with the
installation
process
and take
feedback
on what
could have
been done
better.

	Su	W	5
Continue	pp	ee	da
to monitor	ort	k	ys
the pilot	,	11	
installation	PI		
for a week	an		
to ensure	ni		
that	ng		
everything			
continues			
to run			
smoothly.			

If the	PI	W	Se
pilot	an	ee	e
program	ni	k	"PI
did not run	ng	12	an
smoothly	,		th
or user	In		e
feedback	st		Pil
was poor,	all		ot
conduct	ati		Ro
additional	on		llo
pilot			ut"
installation			
s until the			
process			
works well.			

Finalize the Rollout Plan

The results of the pilot installation provide the basis for developing a final plan for rollout. Using the actual time and resource requirements from the smaller-scale pilot rollout, teams make projections for time and resources, corresponding to the company-wide scope of the final rollout. If additional resources are required, these should be identified and acquired at this time. In addition, company policies and standards regarding computer and network use should be updated in accordance with the Windows 95 implementation.

Finalize the Rollout Plan

	PI	W	5
Determine	an	ee	da
your rollout	nin	k	ys

goals — g, 12
specifically Ex
the number ec
of uti
computers ve
on which
you will
install
Windows
95 and the
time
expected
for
completion

. Budget PI W 3
the an ee da
resources, nin k ys
in terms of g 12
personnel
and tools,
required to
meet your
goals.

. If Ex W 2
necessary, ec ee da
present uti k ys
and obtain ve, 13
approval PI
for the an
resources nin
and the g
rollout
process.

. Hire Tr W 10
and train ain ee da
the ing k ys
extended , 13
Installation Ins
team and tall
purchase ati
the on
additional
software or

tools
needed.

. Update PI W 2
the an ee da
company's nin k ys
hardware g 13
and
software
standards
lists.

. Update PI W 2
the an ee da
company's nin k ys
policies g 13
and
practices
manuals or
guidelines
for use of
computers
and the
network.

. Notify PI W 1
your users an ee da
that nin k y
company g 13
standards
and
policies for
computer
use will be
enforced
prior to the
installation
and that
they must
bring their
computers
into
compliance

. If PI W 3
appropriate an ee da
, edit the nin k

Windows 95 Help file. To add company-specific Help for line-of-business applications, and to remove unwanted information about the capabilities you plan to disable in Windows 95.

Create a registration template or worksheet that lists the specific configurations and use of each computer. Be sure to leave room to document any system problems or deficiencies that require further attention.

Post the updated

registration at the key
template to on 13
a central
network
location.

Roll Out Windows 95!

After the extensive research, planning, testing, and analysis performed in the previous phases, the final step in the deployment process is rolling out the Windows 95 installation to the entire company.

Roll Out Windows 95

Set up the Windows 3
the tall employee data
distribution at the key
servers by on 15
using the
Server-
Based
Setup and
configuring
the system
policy files.

Ins W 2
Customize the tall employee data
the server at the key
installation on 15
by adding
or
removing
the
appropriate
files,
including
the
MSBATCH
.INF file.

Notify the users of the upcoming
PI W 1
announcement
on the key

installation g 15

Train the users on Windows 95. Tr ain ee re ing k qui 16 re d

If needed, upgrade the hardware on the client computers and remove any software not complying with company policy. Ins tall ee re ati k qui on 16 re d

If needed, back up critical data and configuration files on the client computers. Ins tall ee re ati k qui on 16 re d

If needed, defragment the client hard disks. Ins tall ee re ati k qui on 16 re d

Optionally, you can temporarily reset the user password. PI W As an ee re nin k qui g 17 re d

and ID for each computer, to allow your technician s easy access to the client computer and ensure that the logon scripts and environment operate correctly.

Ensure that the client computers are fully operational and the real-mode network, if present, is running.	Ins W As tall ee re ati k qui on 17 re d
---	--

Prepare the client computers for the push installation process: edit the logon scripts; run the management software; or send the batch	Ins W As tall ee re ati k qui on 18 re d
--	--

file for
setup, by
electronic
mail, to the
user.

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batch file,
and so on.

For details of each task in the deployment checklists, see Chapter 2, "Corporate Implementation Strategy." For step-by-step instructions on how to set up, maintain and use Windows 95 in a corporate environment, see the appropriate chapters of the RESOURCE KIT.

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Chapter 2 Corporate Implementation Strategy

This chapter contains details on the phases and tasks for rolling out Windows 95 that are summarized in Chapter 1, "Corporate Deployment Guide." If you are comfortable with the early planning phases of deployment, you can skip ahead to the section, "Specify the Preferred Network Client Configuration: The Details."

Review Windows 95: The Details

This is the first phase of the deployment process, which entails reading about Windows 95 features and benefits. In this phase, those responsible for planning and conducting the rollout learn how Windows 95 helps reduce support costs and increase business profitability.

INTRODUCING MICROSOFT WINDOWS 95, available from Microsoft Press, provides information about Windows 95 features and functionality. This book discusses the changes and enhancements made to the Microsoft Windows operating system to provide easier management and support in a network environment. To order this title from Microsoft Press, call (800) MSPRESS ((800) 677-7377).

The information contained in INTRODUCING MICROSOFT WINDOWS 95 is also provided in electronic form under the title REVIEWER'S GUIDE. For online access to the REVIEWER'S GUIDE or other current information on Windows 95, connect to the Microsoft WIN_NEWS forum at any of the following electronic locations.

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Many leading industry analysts have developed independent assessments of the impact of Windows 95 on corporate operations. The reports of two notable firms, Gartner Group, Inc. and Usability Sciences Corporation, are discussed in this section, to assist rollout planners in understanding specifically how Windows 95 reduces the total cost of ownership for a personal computer in your organization.

[Gartner Group, Inc. Reports](#)

Two published reports are available, describing the cost of migrating to Windows 95 from Windows 3.x and the effect of Windows 95 on the total cost of ownership of a personal computer. This section summarizes key findings of the reports. To receive the complete report, contact Gartner Group, Inc. at (203) 967-6700 and ask for the Total Cost of Ownership study (reference Personal Computing Service K-820-1094) and the report entitled "GUI Operating System Migration: How Sticky Will It Be?" (August 22, 1994).

Highlights of these reports include the following.

Payback period is short.—Gartner Group projects that a typical organization will earn back the cost of migrating to Windows 95 within three to six months, based on support cost savings alone. Assuming that, on an annual basis, Windows 95 costs \$1,180 less per user to run than Windows 3.1, over five years, Gartner Group estimates that organizations will save nearly \$6,000 per user. Notice that, even if organizations do not realize this precise reduction in costs, the support cost savings should substantially exceed the cost of migration.

Migration is justified even when only using 16-bit applications.—Gartner Group recommends that organizations migrate to Windows 95 "if only to run 16-bit Windows applications on a more stable, easier to use platform."

Planning Windows 95 deployment increases potential savings.—In its "Cost of Migration" study, Gartner Group demonstrates that organizations benefit substantially through decreased costs by planning their deployment of Windows 95. In fact, by planning the traditional labor-intensive operations (for example, the installation process) an organization could realize costs of migrating to Windows 95 that are less than the average upgrade cost from Windows 3.0 to Windows 3.1.

Although not cited in these reports, additional payback should result from increased user productivity due to features such as Dial-Up Networking, multitasking, multithreading, and so on.

[Usability Sciences Corporation Report](#)

Usability Sciences Corporation, an independent usability testing group, performed a study on how users are affected by moving to Windows 95. Their study included 75 existing Windows 3.1 users with varied levels of skill in performing common tasks. Details of the study and its findings are available from the WinNews electronic forum.

Highlights of the study's results include the following.

Users get started quickly.—After testing users on Windows 3.1 on specific tasks, and then allowing them a 20-minute "play" period with Windows 95, the study found

that the same users were almost as fast under Windows 95 in performing comparable tasks as they were in Windows 3.1.

Users perform faster.— Usability Sciences reported that, within 1.5 hours of first using Windows 95, Windows 3.1 users performed operations nearly twice as fast as they did on Windows 3.1.

Extensive user training is not needed.— Since all tests in the study were performed using the computer-based training (CBT) module that comes with Windows 95, the results demonstrate that lengthy training sessions are not necessary.

As additional reports and studies are published, they'll be placed on the WinNews online forum. Check these forums for periodic updates.

The WINDOWS 95 RESOURCE KIT is a technical supplement to the Windows 95 product documentation, written to assist administrators in installing, supporting, and managing Windows 95 on corporate networks.

Each Planning and Installation team member should obtain a copy of the RESOURCE KIT for review during the deployment process.

For background information on the architecture, internal processes, and development history of the product, Microsoft Press has published INSIDE WINDOWS 95. Author Adrian King, who spent seven years in the Microsoft Systems Software Division, wrote the book while Windows 95 was under development. With his insider's view, King explains the base system and the new user interface, and offers new guidelines for application developers, along with tips on porting, multitasking, OLE, internationalization, color matching, device-independent bitmaps, and the printing subsystem. King also includes perspectives on why design decisions were made and how the design changed during development.

Assemble the Planning Team and Tools: The Details

This phase involves gathering the resources to properly plan for testing and evaluating Windows 95.

The deployment project manager participates in the Executive team and leads the Planning team. This individual is usually the head of the Information Systems

department; however, the executive committee may find another individual to be more appropriate, depending on the organization.

When setting up the Planning team, it is important to include a set of individuals representing the groups involved in the deployment process. This includes people from Corporate Support and Employee Training departments, the Corporate Standards Committee, and key Installation team members. Individuals from the Finance and Accounting group will need to take part in planning and evaluation later on, but need not be assigned to the team for the duration of the process.

You'll need to survey a representative sample of your network to compile an inventory of hardware and software used on client and server computers. When this inventory is compiled, you can accurately simulate the organizational environment in the lab. Such a simulation helps you make broad decisions about your organization's computing infrastructure, such as the choice of protocol or the default desktop configuration as it pertains to applications.

Software management tools can be used to query computers on the network for their hardware and software configurations. For example, the Microsoft Diagnostics (MSD) tool can run a report for output to a text file, describing a computer's specific hardware and settings. For more detailed information about a large number of computers on a network, you can use system management programs, such as the Microsoft Systems Management Server, to conduct the inventory.

To effectively evaluate and test the Windows 95 installation process, you need to set aside enough physical space and to assemble a sufficient number of computers to test everything from Server-Based Setup to hand tuning options for the local computer. In addition, if your network environment includes the use of portable computers that dial into the company, or if you use additional servers or mainframe computers for business data, you'll want to ensure that the lab computers have full access to the network and an analog phone line. It is important that you comprehensively test and implement all of the Windows 95 features in the lab with all of your business-specific applications before moving to the pilot installation.

Microsoft Official Curriculum for Microsoft Windows 95 currently includes SUPPORTING MICROSOFT WINDOWS 95, a five-day course, and SELF STUDY course material. For information about authorized training offered for Windows 95, call (800) SOLPROV ((800) 765-7768) for a referral to a local Microsoft Solution Provider.

Authorized Technical Education Center (ATEC), or call the Microsoft Fax Server at (800) 727-3351 and request document number 10000256 for the location of the Authorized Academic Training Program (AATP) site nearest you. Microsoft ATECs and Microsoft AATPs offer Microsoft Official Curriculum delivered by Microsoft Certified Trainers to educate computer professionals on Microsoft technology.

For other training information, see Appendix J, "Windows 95 Resource Directory."

Specify the Preferred Network Client Configuration: The Details

Detailed analysis is required to determine your preferred client computer configuration. Starting with the ideal configuration, which uses the most functional and best-performing client software, you must evaluate each feature against your organization's needs and environment to determine its appropriateness and compatibility. If you are considering different configuration alternatives, repeat this evaluation for each configuration.

The following sections describe feature options and decisions to evaluate in specifying the network client configuration.

When deciding where to place Windows 95 files, consider how the computer will be used and evaluate the benefits of each placement option. If the computers are personal workstations, portable computers that occasionally connect to the network, or are used in workgroups that only share data and applications such as word processors (not operating system software), then you might want to install Windows 95 executable files and applications on the local hard disk and run these locally. Swap files and TEMP files are also located on the local hard disk. The network is used only to store commonly used data.

On the other hand, if you want to run a shared copy of Windows 95 to reduce the hardware requirements for the network computers, allow users to access more than one computer, and provide a centralized location for managing users' system configurations, then you would install Windows 95 files so that all Windows 95 executables and applications run from the network. All data is saved on the network. Swap files and TEMP directories are placed on network drives.

Support for diskless workstations is available for NetWare networks at the time of the initial release of Windows 95. For information about support under Windows NT, contact your Microsoft sales support representative.

This section provides detailed discussions of the features which might be included in

an ideal network client configuration.

Using a 32-bit Network Client

For best performance, the preferred network client is one that uses a 32-bit redirector for accessing servers. Windows 95 includes the 32-bit Microsoft Client for NetWare and Client for Microsoft Networks. Network vendors are also creating additional 32-bit redirectors. The benefits of using a 32-bit, protected-mode client include the following:

n

Uses no real-mode memory

n

Provides faster data I/O across the network

n

Offers greater stability than real-mode redirectors

n

Allows more than one redirector to be run at one time, and thereby

enables access to servers for multiple networks without having to reload the operating system for a new network client

n

Makes networking seamless in the Windows 95 user interface; users can

browse the server for multiple networks in Network Neighborhood, all in the same namespace — users don't need to know which type of network they are browsing

Although 32-bit clients are available, a 32-bit client is not required if you are running either a NetWare network or a Microsoft network. However, if you are using a Microsoft network, there are no significant reasons not to use the 32-bit redirector and, for most NetWare networks, there are no barriers to using the 32-bit redirector. For troubleshooting purposes, you may want to temporarily use the real-mode redirector.

As of this writing, all other networks require a real-mode client. However, you can run a protected-mode Windows 95 client such as Client for Microsoft Networks in conjunction with a real-mode network client. Many network vendors are developing 32-bit clients for Windows 95; contact your network sales representative for information.

[Using a 32-bit Protocol](#)

If you select a 32-bit client, then by default Windows 95 will also set up a 32-bit protocol. Even if you are running a real-mode client such as the Novell® 3.x workstation shell (NETX) with a real-mode implementation of IPX/SPX to access NetWare® servers, you can still load the 32-bit version of the Microsoft IPX/SPX-compatible protocol. The benefits of adding the protected-mode protocol are better performance and better stability for network communications to servers that are not running NetWare (for example, computers running Windows 95 or Windows NT).

In addition, for protocols such as TCP/IP, the Microsoft 32-bit version enables additional functionality such as the ability to use DHCP and WINS servers which dynamically set the IP addresses and resolve computer names for client computers on the network. Each protocol has a number of benefits, as discussed in Chapter 12, "Network Technical Discussion."

[Using the Latest Network Adapter Drivers](#)

For best performance, use the latest network adapter drivers available. These should be NDIS 3.1-compatible drivers which provide Plug and Play capabilities. Such drivers take up no real-mode memory and can be loaded or unloaded dynamically as required.

The only instances in which you wouldn't use the latest drivers are:

n

The newest driver isn't available for your network adapter.

n

Your site uses ODI cards and drivers.

The following optional features are recommended for your preferred configuration. These features define how Windows 95 will be installed and administered in your organization.

[Using System Policies](#)

System policies are used to restrict the desktop and network functionality on each client computer, including restricting Windows 95 features and capabilities that users may accidentally use — or deliberately misuse — to access information or damage data on their computers. For example, if you want to disable the ability to use peer resource sharing services or the ability to use the command prompt, system policies make it easy to do this from a central location for a large number of users.

Enabling policies involves creating a single file that resides on the server, and thus does not involve touching the client computer. In general, the policy file can be modified on the server after Windows 95 is installed, but, for some types of changes, such as adding group support or a nonstandard server path for product updates, configuration on the client computer is required. For details on the types of restrictions available and for information on how to implement system policies, see Chapter 15, "User Profiles and System Policies."

[Using User Profiles](#)

User profiles enable users to use personalized desktop settings each time they log

onto a computer. Multiple users sharing a single computer can customize their own desktops and load them at logon time. Conversely, a single user can move between computers using the same profile by storing the profile on the server. An administrator can also take advantage of profiles to require that a mandatory desktop configuration be loaded each time a user logs on. The ability to change profile settings can be controlled by the administrator. For information on how to use user profiles, see Chapter 15, "User Profiles and System Policies."

User profiles are not needed when only one person uses the computer or when a custom desktop adds no value. By not enabling user profiles, the logon process is shortened slightly, because the system does not need to locate and load the profile.

[Enabling Remote Administration](#)

To remotely administer a computer's Registry or policies, you must first enable this capability. This is done by installing the network services called Microsoft Remote Registry service (and the Microsoft Network Monitor agent) on the client computer. The remote service allows you to conduct a variety of tasks remotely over the network such as administer the file system, share or restrict directories, or query and make changes to the Registry. If you plan to do any of these tasks, be sure to enable this feature during Windows 95 installation.

You should not enable remote administration if you don't need these services, because doing so causes unnecessary, extra processes to run on the client computer and on the network. These extra remote services could then THEORETICALLY be used by individuals on the network — provided they knew the appropriate password — to access information on your clients. However, Windows 95 comes with security capabilities to protect against unauthorized use of the Remote Registry service. For more information, see Chapter 16, "Remote Administration."

[Using Batch Scripts for Windows 95 Setup](#)

Batch scripts allow you to predefine responses to prompts that appear during Windows 95 Setup. Batch scripts go hand-in-hand with push installations to completely automate the installation process. The choice to use a batch script is very straightforward. If you need to conduct a similar installation more than five times, you should use a batch script. Begin planning for batch scripts and push installations during this phase, as you are specifying the preferred client configuration. Ensure that you document each feature needed, so that you can automate the selection of these features. For more information, see Chapter 5, "Custom, Automated, and Push Installations."

[Using Push Installations for Windows 95 Setup](#)

You need to understand and plan in advance how the push installation process will work for a given computer. There are a number of alternatives for remotely initiating the installation, ranging from editing the client's logon script, to sending a link by electronic mail that contains a batch file to run Setup. You will want to consider how to push the installation for each computer and ensure that the client computers are configured to support this process.

For organizations with 50 or more computers, being physically present to install each client computer is not a viable option because of the cost. In that case, you may need to turn to an administrative software solution such as Microsoft Systems Management Server. When using administrative software tools, additional client-side software may be needed. Be sure to include this software in the installation plan.

For more information about using push installations, see Chapter 5, "Custom, Automated, and Push Installations."

[Using Peer Resource Sharing Services](#)

The peer resource sharing capability in Windows 95 allows your client computers to share files and printers directly from a local personal computer, instead of on a central server. Peer resource sharing may reduce the traffic and disk space required on central servers, because you are leveraging the power of each individual computer.

Security for peer resource sharing services may take the form of user-level security based on the user accounts on a Windows NT or NetWare network. If you don't have servers to provide security validation or don't want to use user-level security, you can use share-level security, with each individual implementing security and a password scheme on the local computer. Share-level security is set on a directory-by-directory basis.

If you do not want to use peer resource sharing services, and, in addition, want to disable the capability from each of your client computers, you can do so by selecting the appropriate option in system policies.

[Using User-Level Security](#)

User-level security is based on user account lists stored on Windows NT or Novell NetWare servers. The user accounts specify what access rights each user has to particular resources on the network or individual computers. Windows 95 passes on a user's request for access to the servers for validation.

Pass-through user-level security protects shared network resources by requiring that a security provider authenticate a user's request to access resources.

User-level security is required for remote administration of the Registry and for

network access to full user profiles.

For information on implementing security in Windows 95, see Chapter 14, “Security.”

The following features may be useful in your organization. Review the related discussion before making a decision.

[Using Microsoft Exchange Mail](#)

The new Microsoft Exchange feature in Windows 95 manages all messaging information in one place, with a single inbox for electronic mail, faxes, and other messages. In addition, Windows 95 comes with a complete small-business mail system — that is, a mail client and a post office — that allows users to exchange electronic mail through a single post office. This mail client integrates well into Microsoft Mail servers, and the post office can be upgraded to provide an enterprise mail system.

You can also use a variety of other mail or messaging systems through Microsoft Exchange as long as they use a MAPI 1.0 driver. If you have an existing mail system and don't have a MAPI 1.0 driver, you can continue to use your existing mail system and not install the Microsoft Exchange Mail capability. In this case, you'd install Microsoft Exchange only if you wanted to use other features such as the Microsoft Fax capability. When Microsoft Fax is in use, incoming faxes are collected by Microsoft Exchange. For more information, see Chapter 26, “Electronic Mail and Microsoft Exchange,” and Chapter 27, “Microsoft Fax.”

[Using Microsoft Fax](#)

Microsoft Fax gives Windows 95 a built-in fax capability that allows a computer running Windows 95 to send and receive faxes both as bitmap and as binary files without any additional software. If you have an existing fax software server in your organization, you should probably to continue to use that system for computers on the network. Microsoft Fax services would still be useful for portable computer users who travel. See Chapter 27, “Microsoft Fax.”

[Using Dial-Up Networking](#)

This built-in client software allows the computer to use popular, server-based dial-in packages such as Windows NT RAS, Novell Netware Connect, and Shiva Netmodem. Remote dial-up connections on the network require additional security — provided in Windows 95 — and some additional configuration of protocols and software. For more information, see Chapter 28, “Dial-Up Networking and Mobile

Computing.”

[Using The Microsoft Network](#)

The Microsoft Network is a Microsoft online service that offers chat capability, information bulletin boards, and electronic mail. This feature may be useful for select individuals in an organization who require support services. For more information, see Chapter 29, “The Microsoft Network.”

[Using Disk Management Tools](#)

Windows 95 ships with useful disk tools such as disk compression and defragmenting utilities that run from within Windows 95. The disk compression utility upgrades doublespace and drivespace programs from MS-DOS 6.2x. See Chapter 20, “Disks and File Systems.”

Conduct the Lab Test: The Details

This phase in the deployment process involves four significant efforts: preparing the site, conducting the installation, testing the installation, and restoring the system.

Preparing the site involves ensuring that the location of each computer, the computer itself, the hard disk, and the data are all ready for Windows 95 to be installed. In terms of the physical site, ensure that you have the appropriate network taps to connect to the network. You may require a power supply and surge protector, depending on the number of computers used for testing. Also, research and eliminate the potential for problems related to overheating or frequency distortion from the location.

In terms of the computer itself, ensure that it has the appropriate hard disk space, RAM (at least 4 MB, but 8 MB is recommended), and processor (386DX or better is recommended) to run Windows 95. To review the requirements for running a shared copy of Windows 95 from a server, see Chapter 4, “Server-Based Setup for Windows 95.”

In addition, run virus detection, disk scanning, and defragmentation programs on the computer to correct any problems prior to installation. Although the computer may appear to be operating properly, software upgrades often uncover hardware or software problems, because of the way they read and write data to the hard disk. Checking the computer before installing Windows 95 will help you better focus on issues related to installation.

Lastly, when preparing the site, be sure to back up critical data and configuration files for the system, in case the installation fails or you need to revert to the old system for some reason. This includes backing up INI files (such as WIN.INI and SYSTEM.INI), GRP files, AUTOEXEC.BAT, CONFIG.SYS, and all key data files. You should also create a Microsoft Diagnostics (MSD) report and copy it to a floppy disk by running MSD.EXE on the hard disk. If you need to automate the restoration, consider using a commercial backup program, instead of copying the files by hand.

Before setting up Windows 95 for the first time, verify that the computer's existing network is working properly. Then use Part 2, "Installation," in the WINDOWS 95 RESOURCE KIT to help you install and configure Windows 95 correctly. Chapter 5, "Custom, Automated, and Push Installations," includes instructions on how to automate the installation process using batch scripts. Take note of which options you want to predefine as entries for the MSBATCH.INF file used for the setup batch script.

After you've set up a computer with Windows 95, you'll need to run a variety of tests to ensure that it runs correctly on your network and that you can still perform all of your usual tasks. Use your own testing methodology or test the following to verify correct system operation:

n

Connect to and browse the network

n

Set up a printer and print both locally and on the network

n

Open, run, and close applications both on the client computer and the server

n

Shut down completely

In addition to ensuring that the preferred client configuration works as expected, you may also want to conduct additional testing of the optional software features and components in Windows 95. This can help you determine whether you are running Windows 95 optimally. For this kind of testing, conduct side-by-side evaluations on two computers, changing individual features on each one, to determine the following:

n

Performance in terms of responsiveness and throughput

n

Ease of use

n Stability

n Compatibility

n Functionality

To evaluate network client software for Novell NetWare, run your network performance tests in the following configurations:

n Windows 95 installed with an existing 16-bit, Novell-supplied workstation client (NETX), using ODI drivers

n Windows 95 added to an existing installation of Windows 3.x and NetWare, using Client for NetWare Networks and protected-mode networking

support components (NDIS adapter drivers)

n

Windows 95 as a new installation using all protected-mode components,

including both Client for NetWare Networks and Client for Microsoft Networks,
plus peer resource sharing support

Perform several common tasks such as connecting to the network, administering a remote NetWare server, and so on, to test for ease of use. Similarly, you'll want to run any business-specific NetWare applications under Microsoft Client for NetWare Networks to ensure that they run compatibly. Any stability issues should become apparent during this testing.

See Part 3, "Networking," in the WINDOWS 95 RESOURCE KIT to understand the differences in functionality between network clients.

Having thoroughly tested the preferred network client, completely restore one of the test computers to the previous client configuration and document the process. The degree to which you need to test and restore the computer depends on the tools at your disposal. Chapter 6, "Setup Technical Discussion," documents how to restore the previous operating system manually.

Plan the Pilot Rollout: The Details

This phase involves three major efforts: automating the installation, documenting the logistics of the pilot installation, and preparing the user training plan. These efforts are a combination of planning and lab-testing work.

Automating the installation consists of creating a batch script, setting up Windows 95 on the server, and creating a push installation process.

With a batch script you can perform a "hands-free" installation, so that the user need not respond to any prompts or even touch the computer during Windows 95 Setup.

Installing Windows 95 source files on the server is a separate and distinct process from the Windows 95 Setup program (SETUP.EXE) that you ran in the initial lab-

installation. Setting up the server requires the Server-Based Setup program (NETSETUP.EXE) from the Windows 95 compact disc.

When you run Server-Based Setup to install source files on the server, you also create a default setup script, and you can specify whether the Windows 95 source files on the server will be used to set up Windows 95 to run locally from a single computer or to run a shared copy from the server for client computers that require a shared installation.

In addition, you may want to manually add other files to the shared directory on the server, such as custom bitmaps for screens or a predefined WKGRP.INI file for workgroup organization, so that client computers are fully configured when Windows 95 is installed.

Creating a push installation process involves doing some final work on the server, such as editing the logon script for the user, or sending a link in electronic mail to a batch file that runs Windows 95 Setup, so that the user only needs to log on or double-click an icon to start the installation. System management software such as Microsoft Systems Management Server can also be used to start the installation centrally.

For more information, see Chapter 5, "Custom, Automated, and Push Installations."

This involves determining the timing and the process for pilot installation, choosing the pilot user group, and communicating to the group about the pilot rollout.

Even though you are just testing the installation process, the first pilot sets the tone and presents an example of the final rollout, so it is important that you are completely prepared with all aspects of the rollout. You'll need to determine the time it will take for installation, the personnel and tools needed to facilitate the process, and the overall schedule.

Estimates of the installation time should be based on an individual computer installation; be sure to schedule the downtime for each user. Also, in obtaining tools for the pilot rollout, you may want to include management or debugging software that can help automate the installation.

It's important to choose a pilot user group that is interested in and capable of being the first test case. For example, choosing a pilot group that is close to a schedule deadline on a project, or a group that is traditionally slow in adopting new technology is likely to increase the difficulty of the pilot installation.

Another step at this stage is informing users about the pilot rollout plan. You can use a videotape presentation, an interoffice memo, or a company meeting as the means for communicating with users about the rollout. But, regardless of the form used, the

message must explain the benefits to users in moving to Windows 95, and describe the overall plan and process by which each group or department will make the move. This makes it easier for your users to plan for and accept the migration to Windows 95 as part of their schedules.

The first steps in developing a training plan are to acquire a training lab, set up computers in the lab, and appoint a team member as instructor. (If in-house resources are not available, use a vendor to develop and conduct the training.) The instructor will be responsible for creating and testing the training program.

There are a number of training approaches and a variety of tools you can use. A recommended approach is to divide the training into sessions corresponding to three distinct topics: The Basics, Corporate-Specific Applications, and Customization.

The session entitled "The Basics" includes the top 10 functions any user needs to know to accomplish daily work. This includes the following:

Launch Start
progra button
ms,
load
docume
nts, find
a file

Change Control
settings Panel

Get F1 or
help on Help
a comma
specific nd
topic

Switch Taskba
betwee r
n
applicati
ons

Minimiz Windo
e, w
maximiz buttons
e, and
close

windows

Browse My
your Compu
hard ter and
disk Windo
ws
Explore
r

Connect Network
to a k
network Neighb
drive orhood

Print a Point
docume and
nt Print

The “Corporate-Specific Applications” session varies by the environment and the type of applications run on the network. This session should focus on the top 5 to 10 functions that will change because of the upgrade to Windows 95.

The “Customization” session is intended for more experienced users. The purpose of this session is to provide information and guidance that will help these users learn on their own after the training, and teach them how to work more productively with Windows 95. Some of these topics could include:

n

Adding items to the Start button

n

Adding items to the desktop (move, copy, shortcut)

n

Using options of the right mouse button

n

Adding a new device (for example, a printer)

n

Changing the desktop (for example, screen saver settings)

After creating and testing the program, schedule training sessions to occur immediately before the installation date, to ensure that users retain most of what they learn by putting it to use right away.

Similar to the training plan, the support plan must be ready to go online the first day you begin performing Windows 95 installations. Because the quality of support that's available during the pilot rollout will be seen as an indicator of the quality of the rollout as a whole, it is important that you plan carefully to ensure effective support.

Staff the Support team for your pilot rollout with some of your best technicians dedicated solely to the pilot group for the first few weeks. The assigned technicians should carry pagers or be available by phone at all times, to give immediate assistance to users.

And, to help users help themselves, edit Windows 95 Help with company-specific information on applications or features.

Conduct the Pilot Rollout: The Details

The key areas to focus on when conducting the installation are: simulating the final installation process; testing the capabilities and performance of the system; surveying user feedback; and making adjustments as needed.

The schedule for the pilot rollout should simulate — on a smaller scale — the schedule of the final rollout. As you conduct the pilot rollout, you may find that certain tasks take more or less time than expected, that some tasks need to be added, or that some tasks can be left out. Modify the pilot rollout schedule to account for such changes, and use the pilot schedule for projecting the final rollout timetable.

In addition to the technicians responsible for conducting the pilot installation, extra technicians should be assigned to measure, observe, and test the installation. By tracking the time per installation, handling problems that arise, and identifying areas for improvement or automation, these individuals help ensure the success of both the pilot and final rollouts by making the installation more efficient.

In addition, after Windows 95 is installed, these technicians test system capabilities, such as remote administration, for proper operation and monitor the client computers for performance, stability, and functionality, highlighting any inconsistencies with the lab configuration.

The final part of the pilot rollout involves surveying the users to gauge their satisfaction and proficiency with the new installation and to evaluate the level of training and support provided. Test users' proficiency by having them perform a few common tasks or use several of the new features in Windows 95 — for example, have these users register their survey results on the server.

Finalize the Rollout Plan: The Details

The official rollout plan is an extension of the pilot planning process, including the added steps of documenting, budgeting for, and carrying out the logistics. In addition to these steps, you'll want to update the policies and practices guidelines governing network and computer use in your organization, and create the REGISTRATION TEMPLATE for a central database that tracks specific configurations and uses of each network computer.

As you prepare for final rollout, estimate the length and scope of the overall installation process. Also plan for all tools needed to complete the process within the stated timeframe. If necessary, propose a formal budget for the company-wide implementation and present it to management for approval. Your budget should include the costs for personnel and additional resources, such as system-management software.

After obtaining approval (if necessary), purchase the resources required to facilitate the installation. If you need additional staff, be sure to hire experienced and qualified individuals for the team, and train them extensively before getting started.

Complete your training, communication, and staffing plans for the final rollout at this time.

Prior to final rollout, update all company policies regarding the use of the network and computers by employees. Be sure to cover items such as password length and expiration requirements, and the level of approval needed to obtain remote dial-up privileges.

In addition, update the corporate standards lists for software usage so that you can bring all computers up to compliance during the installation process. Because Windows 95 enables use of a host of new 32-bit applications and Plug and Play-compliant hardware, add these new products to the list, and delete their older counterparts.

A registration template is used to create a central database for monitoring the progress of the rollout and document any areas requiring further action. As you prepare for final rollout, create the template, using appropriate database-management software, include configuration information for every computer and user in the company, and place the template on the server. Then, as Windows 95 is installed during final rollout, the Installation team fills in the template for each computer and user, indicating if any additional upgrading is needed. The team can then use the template to track open items following the rollout and to measure actual progress against original objectives.

Roll Out Windows 95: The Details

Following weeks of planning, organization, testing, communication, and training, the deployment teams and your organization as a whole should be ready for full-scale

rollout of Windows 95. The extensive preparation for this event may make deployment seem almost routine for the teams involved; however, that's exactly the kind of uncomplicated rollout a systems administrator dreams of. And, soon after the installations, users may not know how they got their work done without Windows 95. If this happens in your company, then you know your rollout has been a success!

The information in this chapter has been provided to assist organizations in achieving a smooth migration with Windows 95. The remainder of this RESOURCE KIT contains information intended to illustrate other benefits and capabilities of your Windows 95 implementation. Following this Planning Guide, information is presented in these parts:

n

Part 2, Installation

n

Part 3, Networking

n

Part 4, System Management

n

Part 5, System Configuration

n

[Part 6, Communications](#)

n

[Part 7, Windows 95 Reference](#)

n

[Part 8, Appendix](#)

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 3 Introduction to Windows 95 Setup

This chapter presents installation requirements for installing Windows 95, provides an overview of the types of Windows 95 installations available, and presents a step-by-step description of running Windows 95 Setup to install Windows 95 to run on the local hard disk of a single computer.

Important — Before running Windows 95 Setup, read the notes in the SETUP.TXT file on Disk 1 of the Windows 95 floppy disks or on the compact disc for information about hardware and software that may already be installed on your computer.

Windows 95 Setup Overview

This section provides a brief summary of the installation steps in Windows 95 Setup, plus an overview of the new features in Windows 95 Setup.

This information is designed to provide a fundamental description of Setup for administrators who are responsible for installing Windows 95 on many computers. However, the information provided here will also help individuals who are installing Windows 95 on the local hard disk of their personal computers.

Note — In the WINDOWS 95 RESOURCE KIT, “local computer” refers to a personal computer with Windows 95 system files installed on the local hard disk; a local computer running Windows 95 can also include networking software.

The term “shared installation” is used to refer to a computer that runs a shared copy of Windows 95 from a network server, with few or no Windows 95 files installed on the local workstation.

These are the basic tasks you perform when installing Windows 95 on a computer for the first time:

1. Check the details in “Before Starting Windows 95 Setup” later in this chapter, and then start Windows 95 Setup.

— How you start Setup depends on whether you are running Setup from floppy disks, a CD-ROM compact disc, or a shared network directory. For details, see “Starting Windows 95 Setup” later in this chapter.

2. Choose the directory where the Windows 95 system files will be installed on the computer, as described in “Gathering Information” later in this chapter.
3. Choose the type of Setup — Typical, Compact, Portable, or Custom. For most users, Microsoft recommends Typical Setup, which installs standard options with

default settings. For information, see “Typical, Portable, Compact, or Custom Setup?” later in this chapter.

4. Provide identification information about your user name, computer name, and other identifiers. For details, see “Providing User Information” and “Specifying Computer Identification” later in this chapter.
5. If you choose Custom Setup, you must specify the options you want to install and make other choices about the system components, including networking. For details, see “Selecting Software Components,” “Selecting Network Components in Custom Setup,” and “Changing Computer Settings in Custom Setup” later in this chapter.
6. Create a startup disk for emergency recovery, as prompted by Windows 95 Setup. This is a highly recommended step. For details, see “Creating a Startup Disk” later in this chapter.
7. Restart the computer after Setup copies the required files. Then, depending on the type of installation, select the local time zone and complete other tasks for configuring certain devices and software. For details, see “Copying Files and Completing Setup” later in this chapter.

Windows 95 Setup automatically guides you through each of these tasks and provides Help for any step where you need assistance before proceeding.

Windows 95 Setup ensures easier installation and also offers greater flexibility and better customization options than earlier versions of Windows. Windows 95 Setup also allows easy customization of many installation steps and installation of custom components. The following summarizes these improvements.

A complete Windows-based setup process. Windows 95 Setup provides better visual feedback of configured options and greater flexibility for navigating through the setup process than was available for Windows 3.x. Windows 95 Setup runs entirely from within the Windows environment, even if an earlier version of Windows 3.x is not already on the computer. The Windows 95 wizards lead users through the process of choosing all configuration options at the beginning of Windows 95 Setup. Using the wizards, users can return to a previous screen to change options. After all choices have been made, Windows 95 Setup proceeds without further user actions.

Modular architecture for Setup. To make installation easier and more flexible, the Windows 95 development team completely rewrote the installation code. Because Windows 95 is a complete, integrated operating system, it is responsible for installing the disk operating system, the graphical user interface elements, and the networking functionality on the computer. Windows 95 also incorporates the use of safe defaults and mechanisms for automatically configuring or installing components with minimal user intervention.

Improved hardware device detection and configuration support. Windows 95 Setup detects the hardware devices and components configured on the computer and uses this information to install drivers and set Registry entries. Windows 95 provides more versatile detection and configuration for a wider range of devices than was available for Windows 3.x. For information, see “Safe Detection, Safe Recovery, and Verification” and “Hardware Detection Phase” in Chapter 6, “Setup Technical Discussion.”

Improved customization of installation. Windows 95 provides easier, more flexible customization of Setup than was available for Windows 3.x, giving administrators better control of configuration options for desktop settings, network adapters, and other hardware devices. System administrators can also add components to be installed during Windows 95 Setup. For information, see Chapter 5, “Custom, Automated, and Push Installations.”

Safe Recovery for Setup failures. Windows 95 Setup provides an improved recovery mechanism in the case of Setup failure, using a log that is maintained as setup operations are performed and hardware devices are detected. If Setup fails—for example, due to problems during hardware detection—the last entry in the Setup log identifies where the process was interrupted. When you rerun Windows 95 Setup, it uses the log to bypass the module where the problem occurred. For information, see “Safe Detection, Safe Recovery, and Verification” in Chapter 6, “Setup Technical Discussion.”

Built-in verification of installed components. During Setup (and during subsequent maintenance of Windows 95), Windows 95 creates and maintains a log of installed components. For information, see “Safe Detection, Safe Recovery, and Verification” in Chapter 6, “Setup Technical Discussion.”

Network installation and configuration integrated with other Windows 95 Setup components.—These elements are summarized in “Selecting Network Components in Custom Setup” later in this chapter. For more information, see Part 3, “Networking.”

Support for automated installation procedures. Windows 95 Setup supports an automated installation option using batch setup scripts. The system administrator can simplify installation for users by defining the settings that Setup needs, and specifying defaults for installing and configuring devices. Batch installation for Windows 95 is more flexible and full-featured than for Windows 3.x, and includes the option for hands free “push” installation with no user intervention. For information, see Chapter 5, “Custom, Automated, and Push Installations.”

Installation Requirements

There are requirements for running Windows 95 Setup in addition to the requirements for installing and running Windows 95 on a computer. This section lists

the following kinds of requirements:

n

Operating system requirements

n

Windows 95 Setup memory, disk space, and user information
requirements

n

Windows 95 hardware, disk space, partition, and other requirements

The retail version of Windows 95 must be installed as an upgrade over an existing operating system. Windows 95 can be installed over a number of different operating systems, including MS-DOS, Windows, and Windows for Workgroups. Windows 95 can also be installed over Novell® DR-DOS® (or Novell DOS™), PC-DOS, and OS/2, and as a dual-boot operating system with Windows NT. (In this chapter, “OS/2” is used to refer to both MS® OS/2 and IBM® OS/2®.)

The minimum operating system software required to install Windows 95 is any of the following:

n

MS-DOS version 3.2 or higher, or an equivalent OEM version that supports partitions greater than 32 MB

n

Windows 3.x

n

Windows for Workgroups 3.1x

n

Dual boot OS/2 (with MS-DOS)

n

Dual boot Windows NT (with MS-DOS)

[Tip for MS-DOS Versions and Windows 95 Setup](#)

Windows 95 Setup attempts to install Windows 95 on a computer with an OEM version equivalent to MS-DOS 3.2 only if that version can exceed the 32-MB partition limit (such as COMPAQ® version 3.31), because the operational disk space requirements for Windows 95 can exceed the 32-MB partition limitation.

The computer must have MS-DOS version 3.2 or later. Because there are many OEM variations of MS-DOS 3.2, Microsoft recommends you upgrade to Windows 95 from MS-DOS version 5.0 or later.

To check the MS-DOS version, type `ver` at the command prompt.

For information about how Windows 95 Setup treats disk partitions created under other operating systems, see “Partition Requirements” later in this chapter. For information about how Windows 95 Setup deals with the boot sector and installs files for dual-boot operation with other operating systems, see Chapter 6, “Setup Technical Discussion.”

Usually, you need to supply very little information during Windows 95 Setup for a successful Windows 95 installation. The unique information required for a typical installation consists of only the following (which can be predefined in a custom setup script):

n User name

n Computer and workgroup names, if the computer is connected to the
network

Windows 95 Setup needs at least 417K of conventional memory to run. The amount of disk space required for Windows 95 Setup varies. This may be due to the types of hardware on the computer and the drivers that need to be installed.

Approximate Disk Space Requirements for Windows 95

			1	
New	30	40		
installatio	M	M		
n	B	B		
Windows	20	30		
3.1	M	M		
upgrade	B	B		
Windows	10	20		
for	M	M		
Workgro	B	B		
ups 3.x				
upgrade				

1 You may not get typical functionality for all Windows 95 features (including networking) with a compact configuration.

Although Windows 95 Setup makes basic estimates of disk space requirements, actual Windows 95 disk space requirements vary with individual system resources that Windows 95 must support using drivers and other system components.

The following table describes the basic hardware requirements for running Windows 95 from the hard disk of a local computer. For information about the requirements for shared installations, see Chapter 4, "Server-Based Setup for Windows 95."

System Hardware Requirements for Windows 95 on a Local Computer

Co	386 (or
mp	higher)
ute	processor
r	with a
	mouse,
	high-density
	floppy disk
	drive, and
	hard disk
	drive1
	You
	cannot

install
Windows 95
on a 80386-
based
computer
that has a B-
step
processor
(that is, with
ID 0303).

Me 4 MB of
mo RAM
ry (minimum);
8 MB
(recommend
ed)

Vid VGA
eo (minimum);
dis Super VGA
pla (recommend
y ed)

Dis 30 MB of
k free hard-
sp disk space
ac is
e recommend
ed

The full
custom
installation
requires a
minimum of
19 MB. A
compact
installation
requires ??
MB of disk
space.

You will also
need a
certain
amount free
disk space

for a swap
file,
depending
on how
much RAM
your
computer
has. As a
guideline,
you need 14
MB of
memory,
which can
be divided
between
RAM and
disk space.
For
example:

n

If the
computer
has 4 MB of
RAM, you
need at
least 10 MB
of free disk
space for a
swap file

n

If the

computer
has 14 MB
of memory,
you will
require very
little disk
space for a
swap file

Op Modem (for
tio Dial-Up
nal Networking,
The
Microsoft
Network,
and so on)
CD-ROM
drive
Network
adapter
(required for
networking)
Sound card
Other
multimedia
hardware
components

1 Windows 95 is an operating system designed for computers that use Intel x86-based processors; it cannot be installed on any other processor. Windows 95 does not have Symmetric Multiple Processor (SMP) support and, therefore, cannot take advantage of multiple processors (as Windows NT does).

[Tips for Required Disk Space with Compressed Disks](#)

If you have disk compression software installed, the required amount of uncompressed disk space on the host drive before installing Windows 95 depends on several factors:

n

The type of compression used (Microsoft DriveSpace™ or DoubleSpace®,
STAC Electronics Stacker®, and so on)

n

The available free space on other drives

n

The existence of a permanent swap file (if any), and its location

n

The amount of available free space on other drives

If the computer does not have a swap file, you may have to resize the host drive to
accommodate the swap file requirements. For more information, consult your
compression software documentation.

Windows 95 Setup cannot install Windows 95 unless a file allocation table (FAT)
partition exists on the hard disk. It cannot install Windows 95 on a computer that has
only HPFS or NTFS partitions. Windows 95 Setup reads most partitioning schemes,
and writes to the master boot record, unless disk partitioning schemes from other

vendors are used.

The following table describes how Windows 95 Setup handles different types of disk partitions. For more information, consult the documentation for the related operating system.

MS Windows	
- 95 Setup	
DO recognizes	
S and begins	
(Fd installation	
isk over	
and existing	
thir MS-DOS	
d- FAT	
par partitions, if	
ty) the partition	
is large	
enough to	
accommod	
ate	
Windows	
95 files	
(including	
swap files).	
Windows	
95 supports	
MS-DOS	
Fdisk	
partitions	
on	
removable	
media	
drives such	
as the	
lomega®	
Bernoulli	
Box™	
drives.	
Windows	
95	
recognizes	
and	
translates	

third-party
disk
partitioning
schemes
including
Disk
Manager
DMDRVR.B
IN and
Storage
Dimensions
, Inc.
SpeedStor
®
SSTOR.SY
S.

Windows
95 cannot
recognize
information
on an NTFS
partition.
Windows
95 can be
installed on
Windows
NT multiple-
boot
systems if
enough disk
space is
available on
a FAT
partition.
On a
Windows
NT multiple-
boot
system,
Windows
95 Setup
can either
install
Windows
95 on an

existing FAT
partition
with
MS_DOS
and,
optionally,
Windows
3.x, or you
must
partition
and format
free space
on the hard
disk in a
FAT
partition,
then
perform a
fresh
installation
onto this
new FAT
partition.

OS You must
/2 run
Windows
95 Setup
from
MS_DOS. If
it is not
already
present on
the
computer,
you must
first install
MS_DOS
and
configure
the
computer
for dual-
booting
between
MS_DOS

and OS/2.

Windows 95 works with disk compression drivers, including those in the following list. For detailed information, see Chapter 20, "Disks and File Systems."

n

Microsoft DriveSpace and DoubleSpace

n

Stacker versions 3.0 and 4.x

n

AddStor® SuperStor™

If you use other disk compression software, see the README file with the Windows 95 product, or contact your product support representative to determine compatibility.

Options for Windows 95 Installations

As either an individual user or a network administrator, you can choose from various options for Windows 95 installations:

n

Run Windows 95 Setup from MS-DOS or Windows 3.x

n

Install a typical, compact, or custom version on a desktop computer, or
install Windows 95 for a portable computer

n

Install Windows 95 system files locally or run a shared copy from a server

n

Create customized and automated installations

n

Use Windows 95 features to maintain or update an installation

These options are described in the following sections:

Windows 95 Setup is a protected-mode, 16-bit, Windows-based application. There are two different scenarios in which Windows 95 Setup can be run:

n

From within Windows 3.1 or Windows for Workgroups 3.1x

n

From MS-DOS at the command prompt (not from the MS-DOS Prompt under Windows)

The preferred method for running Windows 95 Setup is from within Windows 3.1 or Windows for Workgroups. Run Windows 95 Setup from MS-DOS when Windows 3.1 or Windows for Workgroups is not installed on the computer, but MS-DOS, OS/2, or Windows 3.0 is installed. You should also run Windows 95 Setup from MS-DOS if Windows NT is installed on the computer.

If Windows 3.x is not installed on the computer, Windows 95 Setup first installs a “mini” version of Windows on the computer and uses these files to run Setup from the local computer.

By default, Windows 95 is always installed over an existing MS-DOS or Windows installation. Setup detects whether Windows 3.1 or Windows for Workgroups is installed on the computer, and offers to install in the same directory in order to upgrade the existing installation. In this case, Windows 95 Setup migrates the configuration settings stored in SYSTEM.INI, WIN.INI, and PROTOCOL.INI, plus file associations from the Windows 3.x Registry into the Windows 95 Registry, so all applications and networking settings will automatically work in the new Windows 95 environment. Also, Windows 3.x Program Manager groups are converted to folders in the Programs folder on the Windows 95 Start button. For more information, see Chapter 33, “Windows 95 Registry.”

Note — You can also choose to install Windows 95 in a new directory without migrating existing settings for applications or the desktop. In this case, you may have to reinstall your Windows-based applications before they can function properly

in the new environment. However, you must install Windows 95 in a new directory if you want to use dual-boot options to start your earlier version of MS-DOS, or if Windows NT is installed on your computer.

Dual-boot capabilities are not enabled by default. For information about installing Windows 95 on computers with other operating systems and for information about configuring dual-boot options for other operating systems, see Chapter 6, "Setup-Technical Discussion."

In Windows 95 Setup, you can choose from several types of installation. The choice of type defines the size of the Windows 95 installation on the computer (and, of course, the number of features installed), and specifies the amount of control the user has in customizing the installation.

Ty The default
pic option,
al recommend
Se ed for most
tup users with
desktop
computers.
Performs
most
installation
steps
automaticall
y for a
standard
Windows 95
installation
with minimal
user action.
You only
confirm the
directory
where
Windows 95
files will be
installed,
provide user
and
computer
identification

information,
and specify
whether to
create a
startup disk.

Po The
rta recommend
ble ed option for
Se mobile
tup users with
portable
computers.
Installs the
appropriate
set of files
for a
portable
computer.
This
includes
installing
Briefcase for
file
synchronizat
ion and the
supporting
software for
direct cable
connections
to exchange
files.

Co The option
mp for users
act who have
Se limited disk
tup space.
Installs the
minimum
files
required to
run
Windows
95.

Cu The option

sto for users
m who want to
Se select
tup custom
application
settings,
specify
network
components
to be
installed,
and confirm
the
configuratio
n settings
for devices.
Installs the
appropriate
files based
on user
selections.
This type of
Setup is
recommend
ed for
experienced
users who
want to
control
various
elements of
Windows 95
Setup.

The following table outlines the differences in components installed based on the installation type.

Components Installed by Installation Type

Accessories - -

nn

Audio Compression Codecs -

nn

Backup - -

nn

Briefcase - - -

n

Desktop Bitmaps -

nn

Dial-
Up
Netwo
rking

-



Direct
Cable
Conn
ection

-



Disk
Comp
ressio
n
Tools



Disk
Maint
enanc
e and
Repai
r
Tools



Docu
ment
Templ
ates

- -



Game - -
s

nn

Hyper -
Termi
nal

mm

Intern - - - -
et
Mail
Servic
e

Micro - - - -
soft
Excha
nge

Micro - - - -
soft
Fax

Multi -
media
Applic
ations

mm

Multi
media
Soun
d and
Video
Clips



Music
a
Soun
d
Sche
me



Netwo - - - -
rk
Admin
istrati
on
Tools

Onlin - - - -
e
User's
Guide

Paint - -



Quick
View



Screen
Saver
- - -



The
Micro
soft
Netwo
rk
- - - -

Video
Comp
ressio
n
Code
cs
- -



Windo
ws 95
Tour
- -



Word
Pad
- -



Windows 95 can run as the operating system on the local hard disk of a computer or as a shared copy on the server for network workstations.

[Windows 95 Setup for Local Computers](#)

Windows 95 files are distributed in three forms for installation on computers that already have other operating systems in place:

n

Windows 3.0 (or higher) upgrade on CD-ROM

n

Windows 3.0 (or higher) upgrade on 3.5-inch high-density disks

n

MS-DOS upgrade on 3.5-inch high-density disks

[To install Windows 95 on a local computer](#)

n

Insert the first floppy disk or compact disc into the drive and type *setup*

For a step-by-step description of the installation process, see “Starting Windows 95 Setup” later in this chapter.

Depending on the license agreement at your site, the administrator can also copy the Windows 95 source files to a shared network directory. Users can connect to this

directory and run Windows 95 Setup. For information, see Chapter 4, “Server-Based Setup for Windows 95.”

[Windows 95 Setup for Shared Installations](#)

You can install Windows 95 system files on a network server (using the Server-Based Setup utility, NETSETUP.EXE), and use that distribution point to install Windows 95 on workstations (using SETUP.EXE) in a number of different configurations:

n Install and run a shared copy of Windows 95 on a computer with a local hard disk, with all system files except the startup files stored on and running from the server.

n Install and run a shared copy of Windows 95 on a computer with only a floppy disk drive, with all system files except the startup files stored on and running from the server.

n Install and run a shared copy of Windows 95 from a Novell NetWare® server to support diskless workstations that remote boot from a Windows 95 boot image on the server.

In these cases, Windows 95 Setup creates a shared installation where most or all of the Windows 95 program files reside on the server instead of the workstation. Windows 95 Setup copies the files that are relevant to the user's computer and desktop preferences to the user's personal Windows directory. This directory can be

on the server (and must be on the server for computers that start from a floppy disk and for remoteboot workstations).

To configure each network workstation, Windows 95 Setup must run on the individual workstation. However, you can minimize the time spent at each workstation by running Setup from a setup script, either from the command line when you start Setup, from a network logon script, or using system administration software such as Microsoft Systems Management Server. Such setup scripts can list all preferences and answers to questions presented during Custom Setup and can include additional custom components defined by the administrator.

If Windows 95 Setup is run from a setup script and if the installation source files are on a server, Setup checks the setup script to see if the system files should be installed on the local hard disk, or if this is a shared server-based installation, or if either is allowed. If the script allows either kind, Windows 95 Setup prompts the user to choose whether a local or shared version of Windows 95 is to be installed.

You can also use the distribution point created using the Server-Based Setup utility to install Windows 95 to run on a local hard disk. For complete details about Server-Based Setup, see Chapter 4, "Server-Based Setup for Windows 95."

The system administrator can choose any combination of methods for configuring custom versions of Windows 95:

n

Create custom setup scripts based on the MSBATCH.INF format. Custom

setup scripts contain predefined settings for all Setup options, and can contain instructions for installing additional software.

n

Define WRKGRP.INI files to control users' choices for workgroups to join

on the network.

n

Enable user profiles and create system policies to restrict users' abilities to change the system configuration.

The administrator can use setup scripts to create an automated mandatory installation scheme for installing Windows 95 on multiple computers. This is a new feature that can be used for efficient installation of Windows 95. To use this method, the administrator sets up the Windows 95 source files on one or more servers, creates setup batch scripts, and then performs a push installation using one of the following options:

n

Use a logon script to run Setup from a setup batch script, automatically installing Windows 95 when each user logs on.

n

Use Microsoft Systems Management Server to run Windows 95 Setup with a setup batch script as a mandatory action.

n

Use network management software from another vendor to automatically install Windows 95 based on custom setup scripts.

For complete details, see Chapter 5, "Custom, Automated, and Push Installations."

MSBATCH.INF

[SECTION_NAME]

OPTION=VALUE

can be used to customize this option

[Tip for Planning Customized Setup Scripts](#)

In this chapter, notations in the margin (similar to the example shown beside this note) indicate the MSBATCH.INF section name and option that you can specify to customize a particular part of Setup in a script.

For specific information about setup script entries, see Appendix D, “MSBATCH.INF Parameters.”

If Setup encounters an error or stalls during hardware detection and you then run Windows 95 Setup again, the Safe Recovery option in Setup automatically skips previous problems so that Setup can be completed. Safe Recovery can also be used to repair damaged or corrupt installations. For more information, see “Beginning Windows 95 Setup and Safe Recovery” later in this chapter, and see also Chapter 6, “Setup Technical Discussion.”

If you run Windows 95 Setup after the operating system is successfully installed, you will be asked if you want to verify the existing installation. You can use this feature to verify or repair the files that make up the Windows 95 operating system.

Also, you can create an emergency startup disk during Windows 95 Setup, which you can use to start the computer in case of configuration problems. See “Creating a Startup Disk” later in this chapter.

Windows 95 provides a variety of maintenance applications for adding, removing, and configuring Windows 95 components. Some of these applications are summarized in the following table.

{	Ad	Install or
e	d/	remove
w	Re	application
c	mo	s; run
m	ve	Windows
s	Pro	95 Setup
d	gra	to add or
n	ms	remove
c		componen
d		ts; or

, create a
E startup
W disk. To
G run this
r wizard,
a click the
p Add/Remo
h ve
i Programs
c icon in
, Control
x Panel.
O
b
O
/
a
"
p
s
B
.
b
m
p
"}
{ Ad Install
e d hardware
w Ne device
c w drivers. To
m Ha run this
s rd wizard,
d wa click the
n re Add New
c Hardware
d icon in
, Control
E Panel.
W
G
r
a
p
h
i

c
,
x
0
b
1
/
a
"
p
s
B
.
b
m
p
"}
{

Dis Install and
e pla configure
wy display
c drivers. To
m run this
s option,
d click the
n Display
c icon in
d Control
, Panel.

E
W
G
r
a
p
h
i
c
,
x
0
b
2
/
a
"

p
s
B
.
b
m
p
"}

{ Pri Install and
e nte configure
wr printers.
c To run this
m wizard,
s click the
d New
n Printer
c icon in the
d Printers
, folder.

E
W
G
r
a
p
h
i
c

,
x
0
b
3
/
a
"

p
s
B
.
b
m
p
"}

{ Mo Install and

e de configure
w m modems.
c To run this
m wizard,
s click the
d Modems
n icon in
c Control
d Panel.

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Net Install and
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m ts. To run
s this option,
d click the
n Network
c icon in
d Control

, Panel.
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}

Before Starting Windows 95 Setup

Check the following questions before proceeding with Windows 95 Setup on an individual computer:

Is the hardware supported?

Check the README file provided on the Windows 95 installation disks for any notes related to your computer hardware. If any computer component is not specifically supported, Windows 95 selects a generic driver or uses the existing driver installed on your system. If you are manually installing support for a hardware component that doesn't appear in the installation dialog boxes, select the model that your hardware can emulate or that is of the closest type. (All supported hardware components are listed in the Select Device dialog boxes that appear when you run the Add New Hardware wizard, as described in Chapter 19, "Devices.")

Do the computer components meet the minimum requirements?

Read “Installation Requirements” earlier in this chapter, and check your computer hardware and software components. Verify that all components meet the minimum requirements.

Are all unnecessary TSRs and time-out features disabled?

Disable all TSRs and device drivers loaded in CONFIG.SYS or AUTOEXEC.BAT (or in any batch files called from AUTOEXEC.BAT) except those that are required for partition or hard disk control, network drivers, or any driver required for operation of a device (such as video, CD-ROM, and so on).

Some portable computers (such as the IBM ThinkPad®) will automatically suspend operation after a specified time-out interval, or when the cover is closed. You should disable this feature while Windows 95 Setup is running.

Is the installation drive checked and defragmented?

Windows 95 Setup will automatically run ScanDisk to check the integrity of the drive where Windows 95 will be installed. However, you may want to thoroughly check and defragment the hard disk drive before beginning Setup, using your usual defragmentation software.

Also, be sure to defragment all compressed drives, because a highly fragmented compressed drive reports more available disk space than is really available. If you use disk compression software other than DriveSpace or DoubleSpace, be sure to run the disk-checking utility provided with your compression software. For information, see the documentation for your compression software.

Tip — When you run Windows 95 Setup, ScanDisk performs a quick check of the hard disk. You can skip this quick check (for example, if the computer uses disk compression software from another vendor) by using the /i/q or /i/s switch with the setup command, as described in “Using Setup Command Line Switches” later in this chapter. If you choose to skip the automatic quick check with ScanDisk, be sure to use another utility to check the integrity of the hard disk before running Setup.

Are all key system files backed up?

The files you should back up before installing Windows 95 include the following:

n

All initialization (.INI) files in the Windows directory

n

All Registry data (.DAT) files in the Windows directory

n

All password (.PWL) files in the Windows directory

n

All critical real-mode drivers specified in CONFIG.SYS and

AUTOEXEC.BAT

n

CONFIG.SYS and AUTOEXEC.BAT in the root of the C drive

n

Proprietary network configuration files and logon scripts

n

All Program Manager Group (.GRP) files in the Windows directory

Any time you upgrade the operating system (not just with Windows 95), backing up critical business or personal data is a prudent precaution.

Does all network software work before starting Windows 95 Setup?

Make sure that the network software is running and working correctly before you start Windows 95 Setup. Windows 95 needs to inherit the settings from the existing configuration to provide support for those settings in Windows 95. Check the README file on the Windows 95 installation disks for additional notes related to your networking software.

Starting Windows 95 Setup

The Windows 95 Setup program (SETUP.EXE) is found on the Windows 95 installation disks or may be located on a shared network resource. For information about the installation media, see "Options for Windows 95 Installations" earlier in this chapter.

This section describes methods for starting Windows 95 Setup on computers that will run Windows 95 from the local hard disk after installation. For information about setting up a computer to run a shared copy of Windows 95, see Chapter 4, "Server-Based Setup for Windows 95."

Caution— Except for TSRs that are required for partition or hard disk control, network drivers, or device drivers such as CD-ROM, no TSRs or Windows-based applications should be running when you start Windows 95 Setup. Close any such applications before continuing with Setup.

[To start Windows 95 Setup from Windows 3.1 or Windows for Workgroups](#)

1. Start your computer in the usual way, and run Windows.

—— If you are setting up a network computer, you must also be sure any network software components are running before starting Windows 95 Setup.

2. If you are installing Windows 95 from floppy disks, insert Disk #1 in the drive and make that the active drive in File Manager.

—— Or ——

—— If you are installing Windows 95 from CD-ROM, put the compact disc in the drive and make that the active drive.

—— Or ——

—— If you are installing Windows 95 from source files on a network server, connect to that server and switch to the shared network directory that contains the Windows-95 source files.

3. Double-click SETUP.EXE in the directory of the Windows 95 installation files.

—— Or ——

—— From the File menu, choose Run, and then type *setup* and press ENTER.

—— Windows 95 Setup begins the initialization process.

4. Follow the instructions on-screen, as described in the following sections of this chapter.

[To start Windows 95 Setup from MS-DOS](#)

1. Start your computer in the usual way.

2. If you are installing Windows 95 from floppy disks, insert Disk #1 in the drive and make that the active drive. For example, type *a:* if the disk is in the A drive.

—— Or ——

—— If you are installing Windows 95 from CD-ROM, put the compact disc in the drive and make that the active drive.

—— Or ——

—— If you are installing Windows 95 from source files on a network server, connect to that server and switch to the shared network directory that contains the Windows-95 source files.

3. At the command prompt, type *setup* and press ENTER.

—— Windows 95 Setup begins the initialization process.

4. Follow the instructions on-screen, as described in the following sections of this chapter.

To start Windows 95 Setup with a script from a network computer

1. Log onto the network, running the existing network client.
2. Connect to the server that contains the Windows 95 distribution files.
3. At the command line, run Windows 95 Setup by specifying the batch file with the installation settings, using this syntax:

— setup msbatch.inf

— For example, type setup \\ntserver\win95\mybatch.inf to run Setup using a setup script named MYBATCH.INF that is stored in the WIN95 directory on a server named NTSERVER. For more information, see Chapter 5, “Custom, Automated, and Push Installations.”

Note — If Windows 95 is installed from a server, the location of that network directory is stored in the Registry. When you add a device or require additional support files to run Windows 95, Setup automatically attempts to get the files from that same location on the server, using the UNC path stored in the Registry. This eliminates the need to maintain a permanent network connection on the computer and makes it easier to modify the configuration of a computer in a networked environment.

Windows 95 Setup provides options to control the installation process. These options, or switches, are specified on the command line as arguments for the setup command (such as setup /d). Similar to MS-DOS command arguments, the specific option is preceded by a slash (/) character (not the backslash used to specify directory arguments).

Windows 95 Setup can be run using the following command-line switches.

Provides help for syntax and use of command-line switches.

Instructs Windows 95 Setup not to use the existing

version of
Windows for
the early
phases of
Setup. Use
this switch if
you have
problems
starting
Setup that
may be due
to missing or
damaged
supporting
files for
Windows.

Instructs
Windows 95
Setup not to
check for the
minimum
disk space
required to
install
Windows 95.

Instructs
Windows 95
Setup not to
perform the
ScanDisk
quick check
when
running
Setup from
MS-DOS.
You may
want to use
this switch if
you use
other
compression
software
than
DriveSpace
or

DoubleSpace.
e.

Instructs
Windows 95
Setup not to
run the
ScanDisk
quick check
when
starting
Setup from
Windows.
You may
want to use
this switch if
you use
compression
software
other than
DriveSpace
or
DoubleSpace.
e.

Instructs
Windows 95
Setup to
copy a
minimal
installation of
the required
Windows 3.x
DLLs used
by Windows
95 Setup,
and then to
exit to MS-
DOS without
installing
Windows 95.

Instructions
Windows 95
Setup to use
settings in
the specified
script to
automatically
install
Windows 95;
for example,
if `if` is used.
For more
information,
see Chapter
5, "Custom,
Automated,
and Push
Installations."

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As soon as you start Windows 95 Setup, the screen indicates that Setup is being initialized. During this earliest phase, several files needed to run Setup are copied to the local computer. When Windows 95 Setup begins, the license agreement appears, and then the Welcome message shows the estimated time that it will take to complete the process, plus the four basic phases of Windows 95 installation.

MSBATCH.INF

[setup]

express=1

bypasses this option

{ewc msdncd, EWGraphic, x0b 6 /a "psB.bmp"}

[To navigate in Windows 95 Setup](#)

n

Click the Next or Back buttons on the Setup screens to let Windows 95

Setup guide you through choosing installation options.

Clicking the Next button accepts the choices made on the current screen; clicking the Back button lets you return to a previous screen to make changes.

If a previous attempt to install Windows 95 has failed, Windows 95 Setup provides an option to use the Safe Recovery feature or to run a full new Setup process. If the Safe Recovery dialog box appears when you start Windows 95 Setup, you should select the Use Safe Recovery option. When you select this option, Windows 95 Setup can use built-in methods to avoid installation problems that occurred previously.

After you start Safe Recovery, the standard Welcome to Windows Setup screen appears. For more information about Safe Recovery, see Chapter 6, "Setup Technical Discussion."

MSBATCH.INF

[setup]

express=1

bypasses this option

{ewc msdn cd, EWGraphic, x0b 7 /a "psB.bmp"}

Running Windows 95 Setup

This section describes the procedures for installing Windows 95 on the hard disk of a computer that is not running a shared copy from a network server. The following topics are presented:

n

Gathering information

n

Providing user information

n

Analyzing the computer (hardware detection)

n

[Selecting components in Custom Setup](#)

n

[Selecting network components in Custom Setup](#)

n

[Specifying computer identification](#)

n

[Changing computer settings in Custom Setup](#)

n

[Creating a startup disk](#)

n

Copying files and completing Setup

Most information needed to install Windows 95 is gathered automatically by Windows 95 Setup before you are asked to do anything. The following series of tasks are presented by Windows 95 Setup to guide you through providing the information needed to install and configure the new operating system:

n

Choosing the Windows directory

n

Selecting the setup type

n

Checking disk space for Windows 95

[Choosing the Windows Directory](#)

This option is available for all Setup types

If a previous installation of Windows 3.1 or Windows for Workgroups 3.x exists, Windows 95 asks you to confirm the directory where Windows 95 will be installed. By default, the directory containing the existing Windows installation is selected.

For information to guide the decision about whether to install Windows 95 in a new directory, see "Run Setup from MS-DOS or Windows?" earlier in this chapter.

[To install Windows 95 into a new directory](#)

1. Click the Other Directory option, and then click the Next button.

```
——MSBATCH.INF  
  [setup]  
  InstallDir=DIRNAME  
  sets this value and bypasses confirmation  
  
——{ewc msdncd, EWGraphic, x0b 8 /a "psB.bmp"}
```

2. If you choose to change the directory where Windows 95 will be installed, the following dialog box appears so that you can specify the drive and directory. Type a new directory name, and then click the Next button.

```
——MSBATCH.INF  
  [setup]  
  ChangeDir=0  
  bypasses this option  
  
——{ewc msdncd, EWGraphic, x0b 9 /a "psB.bmp"}
```

If you choose to install Windows 95 in a new directory, you may need to reinstall Windows-based applications. This is because Windows 95 uses a different method from Windows 3.x for storing configuration information, and because application support files such as DLLs will be missing from the Windows 95 directory. Windows 95 Setup cannot transfer this information for applications if you choose another directory.

Note —— A common method that administrators used to migrate system settings and groups under Windows 3.1 and Windows for Workgroups 3.x —— copying all the GRP and INI files into the new installation directory —— does not work with Windows 95, because GRP files and INI entries cannot be used by Windows 95 unless Windows 95 Setup migrates this information to the Registry.

You must run Windows 95 Setup and install Windows 95 in the existing Windows directory to migrate GRP and INI information from Windows 3.x.

[Selecting the Type of Setup](#)

Windows 95 Setup asks you to select the type of setup you want. For a description

of these options and the decisions to be made, see “Typical, Portable, Compact, or Custom Setup?” earlier in this chapter. By default, the Typical Setup option is selected.

MSBATCH.INF

[setup]

express=0

bypasses this option:

InstallType=0, 1, 2, or 3 selects Compact, Typical, Portable, or Custom, respectively

{ewc msdncd, EWGraphic, x0b 10 /a "psB.bmp"}

[To specify Custom Setup](#)

n

In the Setup Type dialog box, click Custom, and then click the Next button.

In the following sections, the notations in the margins indicate the options that are available for all Setup types and those that are available only for Custom Setup.

[Checking Disk Space for Windows 95](#)

After you select the directory for Windows 95, Setup checks the hard disk, prepares the directory, and verifies that there is enough free disk space on the destination drive for Windows 95.

If there is insufficient space on the destination drive, Windows 95 Setup warns you about the lack of space, and shows the minimum and complete installation space requirements.

n

If Windows 95 Setup detects that there is insufficient disk space for a

normal upgrade of an existing version of Windows, you can choose to install a compact configuration of Windows 95.

n

If you continue when there is insufficient disk space, the installation may be incomplete.

You can disable the disk-space check by using `setup /id` to start Windows 95 Setup from the command prompt. You may want to do this if you are testing Setup or if you have a compressed drive, since your disk compression utility may not report an accurate amount of free space.

Caution—— Windows 95 Setup will fail in the middle of installation if it runs out of disk space and present an error message. If this happens, free additional disk space and then run Setup again.

This option is available for all Setup types

The information requested during this part of Setup is always required, no matter what Setup Type you specified (Typical, Portable, Custom, or Compact).

After completing the disk-space check, Windows 95 Setup asks you to type your name and company name. Windows 95 uses your name and company name to identify you for various operations. You must type and verify a response for Setup to continue.

MSBATCH.INF
[NameAndOrg]
name=VALUE
org=COMPANY
sets these values:
display=0
bypasses displaying this screen

{ewc msdncd, EWGraphic, x0b 11 /a "psB.bmp"}

Windows 95 Setup next requests a Product Identification number, which your technical support representative can use to identify your system. You must type and verify a response for Setup to continue. After Setup is complete, you can see this Product ID number by choosing the About command from the Help menu in My Computer. The Product ID dialog box might not appear if you are installing Windows

95 from the network, depending on the requirements at your site.

This option is available for all Setup types

After you complete the user information, Windows 95 Setup is ready to begin the hardware detection phase. Setup can automatically search for all basic system components such as disk drives and controllers, display devices, pointing devices, and keyboards.

For Typical Setup, you can choose to skip detection for certain hardware, such as CD-ROM or multimedia devices, depending on what Setup initially finds during its safe-detection examination of the hardware. If Setup proposes to skip detection of certain hardware, but you know that these types of devices are actually attached to the computer, you can override the proposal and have Setup detect the devices. Otherwise, skipping detection for the devices as proposed by Setup will save time during installation.

For Custom Setup, you can specify whether you want Setup to skip detecting any specific devices attached to your computer. Usually, you should let Windows 95 Setup detect the system hardware unless you know that the computer contains devices that cause problems during the hardware detection phase. For example, you should have Setup skip detection of a particular device if Setup failed previously while detecting that device, and if Safe Recovery does not automatically skip detecting that device when you run Setup again. For information about specific device types, see the HARDWARE COMPATIBILITY LIST, and see also the README files on the Windows 95 distribution media.

MSBATCH.INF

[setup]

detection=0

bypasses hardware detection

{ewc msdn cd, EWGraphic, x0b 12 /a "psB.bmp"}

[To have Windows 95 Setup attempt to detect all system hardware](#)

n

On the first Analyzing Your Computer screen, select the Yes option. Then

click the Next button.

[To modify the list of hardware that Windows 95 Setup will attempt to detect](#)

1. On the first Analyzing Your Computer screen, select the option named No, I Want To Modify The Hardware List. Then click the Next button.

— The second Analyzing Your Computer screen appears, with lists of the components that Windows 95 Setup proposes to detect.

2. To instruct Windows 95 Setup not to detect a specific class of hardware, click the check box next to that item in the Hardware Types list to clear the box.

3. To avoid detecting a specific manufacturer and model of hardware device (while detecting other devices in that class), make sure there is a check mark beside the related Hardware Type. Then click the item you want to skip in the Manufacturer And Model list, so that the related check box is cleared.

— Note — If the box beside a particular Hardware Type is shaded (but not checked), this indicates that you cannot modify how Windows 95 Setup will detect that class of hardware.

4. When the list of hardware types and related manufacturer and model names specifies only the devices that Windows 95 Setup should attempt to detect, click the Next button.

— MSBATCH.INF

does not provide for skipping selected parts of detection

— {ewc msdncd, EWGraphic, x0b 13 /a "psB.bmp"}

Note — The list of CD-ROM drives shows only proprietary drives that require special installation consideration. All other CD-ROM drives are detected automatically.

After you click the Next button, Windows 95 Setup begins the hardware detection process. This can take several minutes. The progress indicator shows what portion of hardware detection has been completed.

Notice that this is also the point at which Windows 95 Setup can stall if hardware detection fails for a particular system component.

[To continue with installation if Windows 95 Setup stalls during hardware detection](#)

1. Press F3 or click the Cancel button to quit Setup.

— If the computer does not respond to the Cancel button, restart the computer by turning your computer off and then back on again.

2. Run Setup again.

Setup will ask you whether you want to use Safe Recovery to recover the failed installation. Choose the Safe Recovery option and click the Next button. Repeat your installation choices. Hardware detection runs again, but skips the portion that caused the initial failure. In some computers, you might encounter additional failures during the hardware detection process.

3. If the computer stops again during the hardware detection process, restart Setup again, and repeat the process until the hardware detection portion of Setup completes successfully.

If you are running Typical Setup, the following dialog box appears so that you can specify whether you want to choose the accessories and other software that will be installed with Windows 95. If you choose the option for customizing the list of components to be installed, the Windows Components dialog box appears.

{ewc msdncd, EWGraphic, x0b 14 /a "psB.bmp"}

During Custom Setup, the Select Components dialog box appears automatically so that you can specify the Windows 95 components to be installed. Notice that to the right of each component is information about the disk space required for that component.

MSBATCH.INF

[OptionalComponents] can define the components to be installed

{ewc msdncd, EWGraphic, x0b 15 /a "psB.bmp"}

[To change whether any component is installed](#)

1. Select a category of options in the Components list, and then click the Details button.
2. In the Details dialog box, indicate which components in the selected category should be installed. When all items are checked or clear to indicate your preference, click OK.

n

To prevent a component from being installed, make sure the check box next to the component's name is cleared.

n

To add a component, make sure that a check mark appears in the box.

—{ewc msdncl, EWGraphic, x0b 16 /a "psB.bmp"}

3. Repeat the process for each category of options in the Components list on the Select Component Screen. When you have selected all the components to be installed, click the Next button.

For example, Microsoft Exchange and Internet Mail Service are not installed by default. You must select these to install them with Windows 95.

Note — You can install or remove any of these components after Windows 95 is installed by using the Add/Remove Programs option in Control Panel, as described in Chapter 22, "Application Support."

This option is available only for Custom Setup

Windows 95 Setup allows you to specify network components and settings. This section summarizes the options for modifying network settings during Windows 95 Setup. For detailed information about installing and configuring network components, see Chapter 7, "Introduction to Windows 95 Networking."

Note — Windows 95 Setup provides appropriate settings based on hardware and software detection for the network components installed in the computer and running when you started Setup. You should accept the default settings unless you know that particular settings need to be changed.

[To change network components](#)

1. In the Network Configuration dialog box, select any component you do not want to install, and click the Remove button.

—MSBATCH.INF

[setup]

network=0

bypasses this option; Part 3, "Networking," describes how to define network settings in setup scripts

===={ewc msdn cd, EWGraphic, x0b 17 /a "psB.bmp"}

2. To add a component, click the Add button in the Network Configuration dialog box. Select the type of component you want to add — Client, Adapter, Protocol, or Service. Then click the Add button in the Select Network Component Type dialog box.

===={ewc msdn cd, EWGraphic, x0b 18 /a "psB.bmp"}

—Note— If you are installing a network client from another vendor, the options for Adapter, Protocol, and Service are not available.

3. In the Select dialog box, click the vendor for the component in the Manufacturers list. Then click the appropriate version in the Models list.

4. Click OK. Then select the component in the list and click the Properties button to configure its settings.

—Windows 95 Setup uses default settings for all components, which you can usually rely on.

5. Repeat the process for each component you want to add.

6. After you have installed and configured all components, click the Next button.

The following sections summarize each type of network option.

[Selecting the Network Client](#)

If you choose to add a network client, Windows 95 Setup displays a list of supported networks. Windows 95 supports the following network types, although in most cases you also need to use supporting software from the network vendor:

n

Artisoft® LANtastic® version 5.0 and later

n

Banyan® VINES® version 5.52 and later

n

Beame and Whiteside BW-NFS version 3.0c and later

n

DEC™ Pathworks™ version 5.0 and later (installed as a protocol)

n

Novell® NetWare® version 3.11 and later

n

SunSelect PC-NFS® version 5.0 and later

n

TCS® 10-Net version 4.1 and later

Note — Artisoft LANtastic and TCS 10-Net cannot be used together with a 32-bit, protected mode networking client such as Client for Microsoft Networks. Either of these clients must be installed as the sole network client on the computer.

MSBATCH.INF

[network]

clients=VALUE

defines this option, where the value is a Device ID defined in NETCLI.INF or NETCLI3.INF

{ewc msdncd, EWGraphic, x0b 19 /a "psB.bmp"}

To use Windows 95 on a NetWare network, you must install supporting client software, as described in Chapter 9, "Windows 95 on NetWare Networks." If you install the Microsoft 32-bit, protected-mode Client for NetWare Networks, you can take advantage of complete Plug and Play support, automatic reconnection to servers, and client-side caching for network information, in addition to the improved performance of the protected-mode implementation. For any NetWare-supplied client that you install, you can browse NetWare computers using Network Neighborhood and use both NetWare and Microsoft networking commands. For information, see Chapter 11, "Logon, Browsing, and Resource Sharing."

To use Microsoft networking features, you must install the Client for Microsoft Networks. For information about configuring this client, see Chapter 8, "Windows 95 on Microsoft Networks." For information about installing and configuring network clients for other kinds of networks, see Chapter 10, "Windows 95 on Other Networks."

Tip—— If your computer is connected to a Windows NT domain, be sure to configure Client for Microsoft Networks to specify the correct domain for logon-validation. This will ensure that you can log onto your preferred domain, and ensure that your network printer selections will automatically be available.

[Selecting and Configuring a Network Adapter](#)

Windows 95 supports multiple network adapters (also called network interface cards, or NICs) in a manner similar to Windows for Workgroups 3.11 — that is, up to four network adapters can be supported in a single computer.

If you choose to add a network adapter, Windows 95 displays a list of supported network adapters. For information on technical issues for network adapters, see Chapter 12, "Network Technical Discussion."

MSBATCH.INF

[network]

netcards=VALUE

defines this option, where the value is a Device ID defined in the related INF file

{ewc msdncd, EWGraphic, x0b 20 /a "psB.bmp"}

[Selecting and Configuring the Network Protocols](#)

Windows 95 Setup automatically installs the appropriate protocol for the network client you select. Microsoft provides 32-bit, protected-mode versions of these protocols:

n

IPX/SPX-compatible protocol

n

Microsoft NetBEUI

n

Microsoft TCP/IP

Protocols to support other network clients are also provided with Windows 95. For information about technical issues for the three principal network protocols, see Chapter 12, "Network Technical Discussion."

MSBATCH.INF

[network]

protocols=VALUE

defines this option, where the value is a Device ID defined in NETTRANS.INF

`{ewc msdn cd, EWGraphic, x0b 21 /a "psB.bmp"}`

[Selecting and Configuring a Network Service](#)

Network services provide additional networking support, such as resource-sharing and remote administration capabilities.

MSBATCH.INF

[network]

services=VALUE

defines this option, where the value is a Device ID defined in the related INF file

{ewc msdncd, EWGraphic, x0b 22 /a "psB.bmp"}

Microsoft provides several supporting network services for Windows 95. Services included on the Windows 95 installation disks include peer resource sharing services (File and Printer Sharing for NetWare Networks or File and Printer Sharing for Microsoft Networks). These services allow other computers on the network to share file, printer, and CD-ROM resources on this computer. For detailed information about installing, configuring, and using these services, see Chapter 11, "Logon, Browsing, and Resource Sharing."

Additional network services, such as backup agents, an SNMP agent, the Microsoft Remote Registry agent, are also provided on the Windows 95 compact disc in the ADMIN directory.

This option is available for all Setup types

The Computer Identification dialog box allows you to specify how the computer is identified on the network.

MSBATCH.INF

[network]

display=0

bypasses displaying this screen

{ewc msdncd, EWGraphic, x0b 23 /a "psB.bmp"}

MSBATCH.INF

[network]

computername=VALUE

workgroup=VALUE

description=VALUE

define these options; a text file can be used to define Identification settings for multiple computers

n

The computer name must be unique on the network, and can be up to 15

characters long with no spaces (no blank characters). The name can contain only alphanumeric characters and the following special characters.

! @ # \$ % ^ & () _ ' { } . ~

n

The workgroup name is up to 15 characters long, using the same naming

conventions as the computer name. The workgroup is used to associate groups of computers together for more efficient browsing. The network administrator might provide guidelines for specifying the workgroup to select by using WRKGRP.INI, as described in Chapter 5, "Custom, Automated, and Push Installations."

n

The Computer Description can be up to 48 characters long, but cannot

contain any comma. This text appears as a comment next to the computer name when users are browsing the network, so you can use it to describe the department or location of the computer, or the type of information on it that is shared.

This option is available only for Custom Setup

Windows 95 Setup detects the hardware in your computer and determines appropriate default values for configuring the hardware. Usually, you should accept the values determined through hardware detection, unless you know that a manual

setting must be supplied.

Notice that all the hardware devices in your computer may not appear on this list. The devices on this list are only those required to start Windows 95 in a minimum configuration to complete installation and configuration activities.

Note Options can be selected on the Computer Settings screen for Power Management (an option on some portable computers), Regional Settings (the local language preference), and Windows User Interface (Windows 95 versus Program Manager).

[To configure system hardware options](#)

1. When the Computer Settings dialog box appears, select the item in the list, and then click the Change button, or double-click the item you want to change.

MSBATCH.INF
[system] entries
can define these settings:
display=0
bypasses displaying this screen

{ewc msdncd, EWGraphic, x0b 24 /a "psB.bmp"}

Windows 95 Setup displays a Select Device dialog box for the item you selected. This list by default shows the models that are identified as compatible for the hardware detected in your computer. You can also choose to display all the possible entries for that particular device type.

MSBATCH.INF
[system]
display=VALUE
defines this option; the value is a section name in that device's INF file

{ewc msdncd, EWGraphic, x0b 25 /a "psB.bmp"}

2. In the Select Device dialog box, select the model name that matches your device.

Or

If you want to display all possible entries for the selected device class, click the Show All Devices option, and then select the model that matches your device.

3. Click OK, and then use the device's property sheet to configure settings, as described in Chapter 19, "Devices."

The following chapters provide information about changing specific computer settings. You use the same procedures during Custom Setup to change settings as are used to change settings after Windows 95 is installed.

Display, mouse, and communications ports

Chapter 19,
“Devices”

Network Chapter
12,
“Network
Technical
Discussion”

Keyboard Chapter
34,
“International
Windows
95”

If Windows 95 does not have a new driver for your display adapter when upgrading over a previous version of Windows, it reports it as Standard Display Adapter (VGA) in the Computer Settings list, and later displays a message that your display driver is invalid. However, you can select your Windows 3.1 driver from the list and continue. Although you can install Windows 3.1 display drivers (as described in Chapter 19, “Devices”), Microsoft recommends that you upgrade to Windows 95 drivers wherever possible for improved performance and reliability.

This option is available for all Setup types

Windows 95 Setup offers to create an emergency startup disk that contains basic system files. This disk can be used to start Windows 95 when you cannot start the operating system from the hard disk. Creating the startup disk is the default option, but you can choose to bypass this step.

Important—— It is strongly recommended that you create a startup disk during Windows 95 Setup.

If you do not create a startup disk, or require a new disk after Windows 95 has been

installed, you can use the Add/Remove Programs option in Control Panel to create a new emergency startup disk.

MSBATCH.INF

[setup]

EBD=1

forces creation of a startup disk;

EBD=0

bypasses creating a startup disk

{ewc msdncd, EWGraphic, x0b 26 /a "psB.bmp"}

[To create a startup disk](#)

n

Click the option named Yes, I Want A Startup Disk. Then click the Next

button.

After hardware detection is complete and Windows 95 Setup has obtained all required information, the next phase of Windows 95 Setup begins, during which the base Windows 95 files and the files for supporting your system are copied to the destination drive and directory.

For more information about this phase, see Chapter 6, "Setup Technical Discussion."

{ewc msdncd, EWGraphic, x0b 27 /a "psB.bmp"}

If you chose to have Windows 95 Setup create a startup disk, Setup asks you to insert a floppy disk into drive A. The disk does not need to be either formatted or empty. After you insert the disk, click OK to begin creating the startup disk. Windows 95 Setup will format the disk and copy the appropriate files.

When the basic installation steps are completed, Windows 95 Setup asks you to remove any disks from the floppy disk drive. After you click OK, the computer is restarted, and the final phase of the installation process begins, which includes converting Windows Program Manager groups and migrating various system configuration settings to the Registry.

Near the end of the installation process, Windows 95 Setup asks you to complete several configuration options. These configuration options are referred to as Run-Once options, because after you have completed the installation steps for these options, that particular set of activities is not repeated again when you start the related wizard or choose the related option in Control Panel. Several Run-Once installation procedures are described in the following sections.

[Setting the Local Time Zone](#)

Setup offers you the opportunity to set the time zone for your work site. This is an important step for network computers that need to keep time stamps synchronized.

[To configure the local time zone](#)

n

Click your location on the map.

— Or —

Select your time zone from the list.

MSBATCH.INF

[install] sections can be used to define this and other Run-Once settings, as described in Chapter 5

{ewc msdncd, EWGraphic, x0b 28 /a "psB.bmp"}

[Installing and Configuring a Printer](#)

If you are installing Windows 95 in a new directory or on a computer that did not have a previous version of Windows, Windows 95 Setup automatically presents the Printer Installation Wizard the first time that Windows 95 is started after the basic installation is complete.

{ewc msdncd, EWGraphic, x0b 29 /a "psB.bmp"}

[To configure a printer during Windows 95 Setup](#)

n

In the Printer Installation Wizard, click the Next button and follow the instructions on screen.

Or

Click Cancel if you do not want to install a printer.

If you want to install or change a printer after Windows 95 is installed, click the Printers folder in Windows Explorer. For information about installing and managing printers in Windows 95, see Chapter 23, "Printing and Fonts."

If you are installing Windows 95 in the same directory as an earlier version of Windows, then your previous printer configuration is incorporated into Windows 95. The wizard for installing printers does not run during Setup.

[Completing Windows 95 Setup](#)

Depending on the options you selected during Setup, additional Run-Once options may be completed, such as the wizard for configuring MIDI devices. After all the Run-Once options are completed, all files are installed, and the computer is configured for running your applications.

For technical information about initialization of the operating system at the completion of Setup and for a detailed description of the system startup process, see Chapter 6, "Setup Technical Discussion."

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 4 Server-Based Setup for Windows 95

This chapter provides detailed information about the Server-Based Setup program, which includes installing Windows 95 source files on a server, plus preparing for and installing Windows 95 to run as a shared copy on a client computer.

Server-Based Setup: The Basics

The purpose of the Server-Based Setup (NETSETUP.EXE) program is to prepare the server to run Windows 95 Setup (SETUP.EXE) on network client computers. Server-Based Setup replaces *setup /a*, which was used in Windows 3.x and Windows for Workgroups for administrative setup. Windows 95 provides new and better support for installing and running a shared copy of Windows 95 from a server, including support for the following kinds of shared installations:

n Computers that start from the local hard disk and then run a shared copy of Windows 95 from the server.

n Computers with floppy disk drives that start locally from a floppy disk and then connect to a server to run a shared copy of Windows 95.

n Diskless workstations that remote boot (sometimes called RIPL or remote IPL) from Novell® NetWare® version 3.x and 4.0 servers and run a shared copy of Windows 95.

Currently, this option is available only for diskless workstations on Novell NetWare 3.x or 4.x networks. Support will also be available for remote boot of

Windows 95 workstations in upcoming releases of Windows NT. For information about Windows NT support, contact your sales support representative.

After installing Windows 95 source files on a server, administrators can create and manage one or more home directories for shared installations. Home directories contain the specific configuration information for the client computers.

Administrators can also use Server-Based Setup to create setup batch scripts to make it easy to automate all kinds of installations, as described in Chapter 5, “Custom, Automated, and Push Installations.” As part of the process of creating setup scripts, Server-Based Setup uses the System Policy Editor user interface so that you can predefine installation settings. You can also use a text editor to edit scripts.

Important — Server-Based Setup (NETSETUP.EXE and related files) is available in the ADMIN\NETTOOLS directory on the Windows 95 compact disc. You cannot run Server-Based Setup from the Windows 95 floppy distribution disks.

[To install Windows 95 source files on the network and set up batch scripts](#)

n

Run Server-Based Setup (NETSETUP.EXE) under Windows 95, and

follow the instructions to do the following:

n

Copy the Windows 95 source files onto the server, as described in

“Task 1: Copying Windows 95 Files to a Server” later in this chapter.

n

Optionally, for shared installations, create home directories for running a shared copy of Windows 95 from a server, as described in “Task 2: Creating Home Directories for Shared Installations” later in this chapter. This step is required for floppy disk-based and remoteboot installations.

n

Create setup batch scripts for automated installation on client computers, as described in “Task 3: Installing Windows 95 for Shared Installations” later in this chapter.

To set up a computer from network source files to run Windows 95 from the local hard disk

n

Run Windows 95 Setup as described in Chapter 3, “Introduction to Windows 95 Setup,” specifying the server name as the distribution source and, optionally, the filename for a setup batch script.

To set up a computer to run a shared copy of Windows 95 from the network

n

Run Windows 95 Setup as described in “Task 3: Installing Windows 95 for Shared Installations” later in this chapter.

Important— Server-Based Setup can only be run from a computer that is currently running Windows 95 or Windows NT. You cannot run Server-Based Setup from Windows 3.1, Windows for Workgroups, or MS-DOS.

If you want to use Server-Based Setup to create setup batch scripts or to create home directories for running shared copies of Windows 95, you must run Server-Based Setup under Windows 95. If you run Server-Based Setup under the Windows NT operating system, you can only use this program to install the Windows 95 source files in a shared directory.

[Installing Server-Based Setup on the Administrator's Computer](#)

Server-Based Setup is not installed automatically with Windows 95. The files that make up Server-Based Setup are uncompressed files in the ADMIN\NETTOOLS directory on the Windows 95 compact disc. The required files for Server-Based Setup are the following:

NETSETUP.ADM NETSETUP.LAY RPLIMAGE.EXE
NETSETUP.DLL NETSUSRC.INF SETUPX.DLL
NETSETUP.EXE POLEDIT.EXE SUWIN.INF
NETSETUP.INF

A network administrator can install Server-Based Setup on a local computer running Windows 95. To do this, insert the Windows 95 compact disc and switch to the ADMIN\NETTOOLS\NETSETUP directory on the CD-ROM drive. Then type `copy netsetup.* c:` at the MS-DOS Prompt.

The following illustration summarizes the main tasks that are performed with Server-Based Setup, as described in this chapter.

`{ewc msdn cd, EWGraphic, x0c 0 /a "psC.bmp"}`

Shared Installations: The Issues

This section provides some guidelines and summary information for planning the

installation process for computers that will run a shared copy of Windows 95 (referred to as “shared installations” in this chapter). This information supplements that planning and implementation information presented in Part 1 of the WINDOWS 95 RESOURCE KIT.

Preparing to use Windows 95 on networks where users will run shared copies of Windows 95 includes several planning tasks:

n

Planning for shared vs. private components

n

Planning the requirements for shared installations, including the memory

and hardware requirements for servers, the number of servers required, and the memory requirements for client computers in various configurations

n

Planning setup scripts for running Windows 95 Setup on client computers

This section includes information and guidelines for decision making and planning related to Server-Based Setup for running shared copies of Windows 95.

This section provides guidelines for placing files and configuring server and client computers for running a shared copy of Windows 95 on the network.

Running a shared copy of Windows 95 reduces the hardware requirements for the network computers and provides network administrators with a centralized location for managing users' system configurations. The trade-offs that guide decision

making for such system configuration relate to reliability, maintainability, and performance. The following summarizes the extreme ends of the possible range for where files are placed:

n

The most private configuration: All Windows 95 executable files and

applications are stored on the local hard disk and run locally. Swap files and TEMP files are also located on the local hard disk. The network is used only to store commonly used data.

Typically, such computers are used for personal workstations, portable computers that occasionally connect to the network, and workgroups that only share data and applications such as word processors (not operating system software).

n

The most shared configuration: All Windows 95 executable files and

applications run from the network. All data is saved on the network. Swap files and TEMP directories are placed on network drives.

Typically, such shared installations are used where there may be users who need to access various computers for tasks such as point-of-sale data entry. Shared installations are also typically used on enterprise networks with many thousands of similar computers.

The benefits of installing Windows 95 on the local hard disk of a computer include the following:

n

Performance is superior

n

The user can customize the system

n

The system can start and continue running whether or not the server is available

n

Less network traffic is generated

The benefits of a shared installation include the following:

n

Easier to customize and manage multiple desktops

n

More secure (each user has to log onto the network to use the computer)

n

Easier to upgrade, especially for multiple computers

n

Safer for novice users, because access to system files is controlled

n

Requires less local computer power and has other lower system requirements

Obviously, an entirely shared configuration makes it easy for the administrator to maintain the system and also requires less local disk space. However, a shared configuration also means more network traffic and requires larger servers.

This section presents information that will help you plan for shared installations based on the server and workstation requirements for running Windows 95 from a shared source.

[Server Requirements for Shared Installations](#)

Server-Based Setup operates on one server at a time. You specify a particular server where Windows 95 files will be installed, and you also specify where related home directories will be created for running a shared copy of Windows 95.

However, the home directories do not need to be created on the same server where the Windows 95 files are installed. In fact, to balance the network load, you may

prefer to designate specific servers to maintain the Windows 95 source files, and other servers to contain the home directories and logon scripts.

Typically you will want to make Windows 95 source files available for installation from multiple servers, both to provide fault tolerance and to reduce network traffic. This section provides some basic guidelines for deciding the number of servers, the hardware requirements, and other server specifications to support client computers running shared copies of Windows 95.

To be provided: hard disk size; how many servers needed per # users

[Workstation Requirements for Shared Installations](#)

The following summarizes the information known about the memory requirements for running Windows 95 at this writing.

Memory Requirements for Running Windows 95

	1	2	2	2
Local hard disk, local Windows 95				
Local hard disk boot				
, Windows 95 on a server				
Floppy disk boot				
,				

Win
dow
s 95
on a
serv
er

Re
mot
e
boot

,
Win
dow
s 95
on a
serv
er

-
- 1 Microsoft 32-bit, protected-mode network client (either Client for Microsoft Networks or Client for NetWare Networks)
 - 2 Third-party real-mode network clients
-

You can create default and custom setup batch scripts that predefine the settings for Windows 95 Setup. You will probably choose to use batch scripts at your site if you are installing Windows 95 on more than five computers. You will want to take advantage of the ease of use, manageability, and time savings that setup scripts provide.

Before users can run setup batch scripts to install Windows 95, the network administrator needs to do the following:

1. Install the Windows 95 source files in a shared directory, as described in "Task 1: Copying Windows 95 Files to a Server" later in this chapter, and create home directories for users, as described in "Task 2: "Creating Home Directories for Shared Installations" later in this chapter.
2. Create one or more automated setup batch scripts (MSBATCH.INF and variations), as described in "Task 1: Copying Windows 95 Files to a Server" later in this chapter.
3. Optionally, create policy files, user profiles, and WRKGRP.INI files, as described in Chapter 5, "Custom, Automated, and Push Installations."
4. Optionally, create logon scripts for mandatory automated setup, as described in Chapter 5, "Custom, Automated, and Push Installations."

Note — The tasks for planning setup scripts, customizing Windows 95, and using push installations apply for both local hard-disk and shared installations. Most information about these planning activities can be found in Chapter 1, “Corporate Deployment Guide,” and Chapter 5, “Custom, Automated, and Push Installations.”

After you have completed these preliminary tasks, then users can log onto the network and run Windows 95 Setup by specifying the batch file that contains the appropriate installation information or, optionally, by way of logon scripts.

Task 1: Copying Windows 95 Files to a Server

To place the Windows 95 source files on a server, you must run the Server-Based Setup program. This was formerly `setup /a` in Windows 3.x and Windows for Workgroups.

Note — The procedures for Task 1 are the only steps you need to complete if you want to install Windows 95 source files on a server for computers that will run Windows 95 from their local hard disks.

The server where you place the source files for installing Windows 95 from the network can be a server on a NetWare or Windows NT network or a server on one of these other networks: Artisoft® LANtastic® 5.x, Banyan® VINES® 5.52, DEC™ Pathworks™ 5.x, IBM® OS/2® LAN Server 1.2 or greater, Microsoft LAN Manager 2.x, Novell NetWare 3.x or 4.x, or SunSelect PC NFS® 5.0.

[To get ready to copy Windows 95 source files onto a NetWare server](#)

1. On the network administrator's computer, log onto the NetWare file server.

— This should be a network computer that can run Windows 95 from its local hard disk and that is used only by support personnel for network maintenance. Make sure you log on with security privileges that allow you to create directories and copy files.

2. On the administrator's computer, run `castoff all` (which is a NetWare-supplied utility) to make sure that server-to-workstation or workstation-to-workstation messages do not affect Server-Based Setup.

[To run Server-Based Setup](#)

1. Run Windows 95 or Windows NT.

— Important — If you plan to use Server-Based Setup to create setup scripts and user directories, you must run Windows 95.

2. Insert the Windows 95 compact disc in the CD-ROM drive, and make sure that it is the active drive.

For example, at the command prompt, type *f:* if the F drive is the CD-ROM drive, or switch to that drive in Windows Explorer or Network Neighborhood.

3. Switch to the ADMIN\NETTOOLS\NETSETUP directory.

4. At the command prompt, type netsetup and press ENTER.

—Or—

In Windows Explorer, double-click NETSETUP.EXE.

The Server-Based Setup dialog box appears so that you can begin installing source files and other tasks.

The following procedure summarizes the steps for Server-Based Setup.

To install Windows 95 source files on a server

1. In the Server-Based Setup dialog box, click the Change Path button and specify the server path in the Source Path dialog box.

2. Click the OK button. Server-Based Setup presents a dialog box (as described in the following sections) so that you can complete these actions:

n

Set the server path where the source files are to be installed

n

Specify whether you want to create a default setup script, and then

define the settings in the script, if you choose to create one

n

Specify how users can install Windows 95 from the server — on a local hard disk, as a shared copy, or as the user chooses

n

Provide a product identification number

n

Install Windows 95 source files in the shared directory you specify

The following sections provide details about the steps required to set up the server.

The first Server-Based Setup dialog box is used to specify a particular server, and to manage how users can set up Windows 95 from that server.

You cannot choose the Make Script, Add, or View buttons if you are running Server-Based Setup from Windows NT

{ewc msdn cd, EWGraphic, x0c 1 /a "psC.bmp"}

In the Server-Based Setup dialog box, the Set Server Install Path box shows the name of the selected server. If you are running Server-Based Setup from a directory where Windows 95 is already installed, this shows that path. Otherwise, this box displays the mapped drive or the UNC path to another network location that you specify.

[To change the server path](#)

1. Use your preferred method to connect to the server where you will install the Windows 95 source files. Then run Server-Based Setup.

2. In the Server-Based Setup dialog box, click the Change Path button if you need to specify a path to the server where you want to install Windows 95 source files.

{ewc msdncd, EWGraphic, x0c 2 /a "psC.bmp"}

3. Type the drive letter for a mapped drive or the UNC path to the server you want. Then click OK.

For example, if the server where you want to install the files is named NWSVR1, type:

\\nwsvr1

If you are running Windows 95 with a NetWare client installed, you can use NetWare syntax to specify a NetWare server.

If the directory does not already exist, Server-Based Setup asks if you want to create the directory, and then completes this action if you confirm the message.

If you have insufficient privileges for connecting to or creating a directory on the specified server, a message warns you. You can specify another server or quit Server-Based Setup and log on under an account that has sufficient privileges on the specified server.

When Server-Based Setup is set to a new path, it looks for the Registry file (NETSETUP.POL) that it uses to keep track of computers that have been set up. When you use Server-Based Setup to create a home directory, an entry is added to the file. (No entry is added when a user runs Windows 95 Setup from that shared directory.)

After you set the server name, you can install the Windows 95 source files on that server. You must specify the source and destination paths and set the installation policy for users who will install Windows 95 from this server. Optionally, you can specify that a default setup script should be created.

[To set the destination path and installation policy for a specified server](#)

1. In the first Server-Based Setup dialog box, click the Install button to display the Source Path dialog box.

{ewc msdncd, EWGraphic, x0c 3 /a "psC.bmp"}

2. In the Path To Install From box, type the path for the source of the Windows 95 distribution files.

The first time you install the source files, this is the path to the CD-ROM drive and directory that contains the Windows 95 compact disc.

If you are subsequently installing source files on other servers, you can specify the path to a shared directory that contains the Windows 95 source files.

3. In the Path To Install To box, type a path to the directory where the files will be installed.

This must be the directory on the previously specified server where you want to copy the source files. (Server-Based Setup will create the directory if it does not already exist on the server.)

Note In either of these boxes, you can either type a drive and directory path or specify a UNC path name.

4. Select an installation policy option as described in the following table, and then click OK to continue to the next part of Server-Based Setup.

Server-Based Setup displays the Create Default dialog box, as described in the following section.

The installation policy options specify whether users running Windows 95 Setup from this server are installing Windows 95 to run from their local hard disks or are preparing to run a shared copy of Windows 95 from the server, as described in the following list.

Serv	Allows only
er	shared
	installation
	of
	Windows
	95 (shared
	Windows
	95 files are
	stored on
	this
	server).
	Select this
	option if
	the source
	files on this
	server are
	to be used
	by client
	computers
	to run a
	shared

copy of
Windows
95.

Loc Allows
al installation
Har only on a
d local hard
Disk disk.
Select this
option if all
of the
Windows
95 files are
to be
stored on
each
client's
local hard
disk.

Use Prompts
r's the user to
Choi specify
ce either
shared or
local
installation.

Server-Based Setup stores the settings made in this dialog box in the MSBATCH.INF file it creates as part of the Server-Based Setup process.

Server-Based Setup can automatically create a default setup script. Server-Based Setup stores the setup options you specify in an MSBATCH.INF file, together with the Windows 95 source files on the server. This default setup script can be used to install Windows 95 on individual computers, or it can be used as a template to create other versions of the setup script.

Note—— This section summarizes the procedural steps related to creating a default script while installing Windows 95 source files on a server. For information about making a script based on choosing the Make Script button in the Server-Based Setup dialog box, see Chapter 5, "Custom, Automated, and Push Installations."

If you are running Server-Based Setup under Windows 95, when you click OK in the Install Server dialog box after specifying the destination path and installation policy option, Server-Based Setup automatically prompts you to specify whether a default setup batch script should be created. If you choose to create a default script, it will be saved as MSBATCH.INF on the server.

Note — You cannot create a setup script if you are running Server-Based Setup under Windows NT.

Your decision about whether to create a default setup script depends on the following:

n Principally, whether you want to control installation settings for users who install Windows 95 from this server.

n Whether you want to use the default settings to create custom scripts.

n Whether you previously created the setup script to be used and do not require a new default script.

[To continue with Server-Based Setup without creating a default script](#)

n

In the Source Path dialog box, click OK. Then, in the Create Default dialog box, click the Don't Create Default button to begin installing Windows 95 source files on the server.

To create a default script for automating Windows 95 Setup

1. In the Source Path dialog box, click OK.

===={ewc msdncd, EWGraphic, x0c 4 /a "psC.bmp"}

2. In the Create Default dialog box, click the Create Default button.

==== Server-Based Setup displays the Policies page (the same one you see when you run System Policy Editor) for creating an MSBATCH.INF file that contains the specific configuration settings.

3. Click options to check all the components you want to define in the setup script and, where required, type values in the Settings box. After you have defined all components for the script, click OK.

===={ewc msdncd, EWGraphic, x0c 5 /a "psC.bmp"}

Note ==== Although Server-Based Setup uses the System Policy Editor user interface, this procedure does not create system policies. Only a setup batch script is created.

For information about using System Policy Editor while creating a setup script, see the context-sensitive Help. For information about the specific settings saved in the MSBATCH.INF file on the server, see Appendix D, "MSBATCH.INF Parameters." See also Chapter 5, "Custom, Automated, and Push Installations."

After Server-Based Setup has the input it needs, it installs Windows 95 source files on the specified server, performing the following tasks:

n

Copies Windows 95 to the server using the same hierarchical directory structure used when files are copied to the hard disk, as summarized in the following.

n

Generates a default setup script (MSBATCH.INF) on the server, based on the default computer settings. This script is used whenever users run Windows 95 Setup from the shared directory on the server without specifying a particular setup script.

When Server-Based Setup is finished, the server should have the following directory structure (rather than the flat directory structure created by the Windows 3.x *setup /a* command):

- SUWIN\
- COMMAND\
- CONFIG\
- FONTS\
- INF\
- MEDIA\
- SYSTEM\
- COLOR\
- IOSUBSYS\
- VIEWERS\
- VMM32\

Task 2: Creating Home Directories for Shared Installations

When you run Windows 95 Setup to create a shared installation for a client computer, information is stored in the client computer's home directory. The home directory contains the following kinds of configuration information:

n

Appropriate initialization and configuration files (including WIN.INI and SYSTEM.INI)

n

SYSTEM.DAT and USER.DAT files that make up the Registry for the shared installation

n

Files that define the Desktop, Start menu directories, and other programs

n

The spool directory for printing

Task 2 using Server-Based Setup involves creating home directories. You must create home directories for floppy disk-based and remoteboot shared installations. Using home directories is optional for computers that have hard disks but are running a shared version of Windows 95.

You can set up the home directory for a single computer or specify the filename of a text file that you created previously to define home directories for multiple computer names.

[To define multiple home directories for multiple computers](#)

1. Create a text file that contains a list of computer names and the related location of the home directory that will contain computer-specific files for Windows 95.

The entry for each home directory in this text file should appear on a separate line, in the following format:

==

For example:

acct1,\\nwsvr1\netsetup\group1
acct2,\\nwsvr1\netsetyo\group2

2. Save the file in text-only (ASCII) format, using any filename and storing it in any shared directory.

Note Using a home directory is optional unless the user will be installing Windows 95 for a floppy disk-based computer or a remoteboot workstation.

[To create one or more home directories](#)

1. In the Server-Based Setup dialog box, click the Add button.

{ewc msdn cd, EWGraphic, x0c 6 /a "psC.bmp"}

2. In the Setup Machine dialog box, click an option to select the mode for installing Windows 95 on computers from the currently specified server.

n

If you want to add a single computer to the current server, click Setup

One Machine. Then specify the name of the computer and the path to its home directory.

n

If you want to add home directories in a batch, click Setup Multiple

Machines. Then type the path and filename of the text file that contains the

list of computer names and home directories. (This is the text file created in the previous procedure.)

— In this case, you can type the name of a directory on the current server or type the UNC path name to a directory on another server.

3. If you want Server-Based Setup to generate a setup batch script based on the values set in this dialog box, check the related Generate Setup Script check box.

— A setup script for each computer will be generated based on the default script created in Task 1, as described in “Creating a Default Setup Script” earlier in this chapter.

4. After you have specified all options for home directories, click OK.

After Server-Based Setup creates the specified home directories, it stores the setup batch script in each home directory, if you specify that a script should be created.

You can see a list of the home directories that have been created for the currently selected server.

[To view home directories for the current server](#)

n

In the Server-Based Setup dialog box, click the View button.

When you are done viewing home directories, click the Close button to return to the Server-Based Setup dialog box.

Task 3: Installing Windows 95 for Shared Installations

Setup batch scripts can be used to install Windows 95 on a computer's local hard disk, or to set up client computers to run a shared copy of Windows 95 from a server.

The setup script itself tells Windows 95 Setup what kind of installation is allowed, based on the installation policy specified by the administrator and stored in the script. The script can force a local hard-disk installation or a shared installation, or allow either. If the script is set to allow either, Setup asks the user to specify the type of installation the user wants.

This section provides specific information for using setup scripts to set up a shared

installation of Windows 95 on client computers.

Server-Based Setup supports creating a shared installation of Windows 95 for the following kinds of systems:

n

Remoteboot workstations

n

Computers with a single floppy disk drive

n

Computers with local hard disk drives

To configure each computer and complete the installation process, each computer starting from a hard disk or a floppy disk must run Windows 95 Setup. For remoteboot workstations, run Windows 95 Setup once for each class of similarly configured computers. Similar computers can then use their own home directories with the same source files to run Windows 95.

As described in Task 2, for shared installations the administrator can use MSBATCH.INF (the default setup script stored on the server) plus a list of computer names and home directories to generate a setup script for each computer. This results in a setup script for each client computer. The administrator can also create custom setup scripts using the MSBATCH.INF format.

Whatever method is used to create setup scripts, the scripts can be used in logon scripts for push installations. Also, by archiving the batch script, the network administrator can quickly run Setup again for a particular computer, if a failure occurs (for example, if the Registry becomes corrupted).

After you create the MSBATCH.INF file with appropriate settings, the location of the appropriate MSBATCH.INF file is specified as a command line parameter when running Windows 95 Setup.

You can use these basic approaches for installing Windows 95 with setup scripts:

n

Run Windows 95 Setup with a setup batch script from the command line

after connecting to the server, as described in this section.

n

Use a logon script to run Setup with a setup batch script, automatically

installing Windows 95 when each user logs on, as described in Chapter 5, “Custom, Automated, and Push Installations.”

n

Use Microsoft System Management Service (SMS) or other third-party

network management software to run Windows 95 Setup with a setup batch script. For information, see Appendix K, “Microsoft Systems Management Server.”

For information about creating and running custom setup scripts, see Chapter 5, “Custom, Automated, and Push Installations.”

Note — To customize Windows 95 Setup, you define settings in the setup batch script, rather than make changes to a series of INF files (as was done when customizing Windows 3.1). The format for the file used to customize Windows 95 Setup is described in Appendix D, “MSBATCH.INF Parameters.”

[How Windows 95 Setup Runs with a Setup Batch Script](#)

When Windows 95 Setup runs with a setup script, Setup performs the following for both local hard-disk and shared installations:

n

Looks for MSBATCH.INF in the current directory. If this file is found, Setup knows it is running from a server.

n

Runs detection and configures the hardware, storing the configuration in the home directory.

n

Prompts the user to specify or change any settings that are not defined in the setup script.

n

Copies MSBATCH.INF to the Windows directory to be used by Control Panel and the setup operations that run when Windows 95 is started for the first time.

For shared installations, Setup performs the following additional tasks:

n

Prompts the user for the path to the home directory, if it isn't specified in the script.

n

Formats the startup disk and then copies files to the startup disk.

n

If a protected-mode network client will be used to connect to the server, Setup configures the network for transition from the real-mode network, using settings from the setup script or by prompting the user.

Technical Notes for Shared Installations

Computers that run a shared copy of Windows 95 from a server can connect to network resources using the Map Network Drive dialog box, Open and Save As dialog boxes, and other methods that were commonly used in Windows 3.x. Also, computers can share resources such as printers and directories when protected-mode network support is installed, such as Microsoft Client for NetWare Networks.

Note — For earlier versions of Windows, network administrators created a server share with the complete Windows distribution (shared files) on it. Then, by running Windows Setup on each client, the administrator installed the real-mode network client software and configuration files specific to a computer, usually storing these configuration files in a directory on the network.

To run a shared copy of the operating system, Windows 95 uses the shared files on the server, startup files, plus the configuration files in the home directory.

There are some basic differences between installing Windows 95 to run a shared copy across the network, and running Windows 95 from a local hard disk on a computer that is connected to the network:

n

No hard disk on the local computer is required for shared installations.

n

Network logon is required before running Windows 95 on shared

installations, because network connectivity is required before Windows 95 can run across the network. This can be a general logon, rather than specific user logon.

n

Because most of the Windows 95 files are located on the server for

shared installations, the Windows 95 components must be loaded across the network before they can run, which increases network traffic.

n

Home directories are required for remoteboot workstations and computers

started from a floppy disk running a shared copy of Windows 95 from a server.
For shared installations:

n

On a remoteboot workstation, the home directory is created on the server. The network adapter is considered the boot device, and the real-mode operating system files are stored with the disk image in the home directory.

n

On a computer started from a floppy disk, the home directory is on the startup disk.

n

On a computer with a hard disk running shared Windows 95, the home directory is optional and can be on the local hard disk.

For shared installations, the first access to the network must occur in real mode. After Windows 95 is loaded, the protected-mode drivers take over if the computer is configured to use a protected-mode client such as Client for NetWare Networks.

Also, a real-mode version of the IPX/SPX or NetBEUI protocol is required to connect to the network. Not all supported protocols allow Windows 95 to connect to the network in real mode. For example, the Microsoft TCP/IP protocol in Windows 95 runs only in protected mode, so the computer must have IPX/SPX or NetBEUI protocols loaded to make the real-mode connection to the network. After the system loads and switches to protected mode, then Microsoft TCP/IP can be used.

For Microsoft networks, your network adapter must have both NDIS 3.1 and NDIS 2.x drivers. You can also use your existing NDIS 2.x or ODI drivers for support of networks from other vendors.

The startup disk contains a real-mode network that connects to the server. The real-mode software is small enough to fit on a floppy disk. This allows Windows 95 to start from a hard disk, floppy disk, or a remoteboot disk image in the case of a diskless workstation.

Client computers can run a shared copy of Windows 95 from a server using real-mode network software other than the Microsoft real-mode network software when protected-mode network support is not available.

For additional information about running Windows 95 with a specific network, see Chapter 10, "Windows 95 on Other Networks."

Network clients running a shared installation of Windows 95 can use protected-mode network software by making a transition from the Microsoft real-mode network to Client for Microsoft Networks or Client for NetWare Networks. Network clients that don't use the Microsoft real-mode network clients cannot use protected-mode network clients (such as Client for Microsoft Networks or Client for NetWare Networks) to connect to the shared installation.

The configuration information in setup scripts for shared installations includes adding entries to CONFIG.SYS and AUTOEXEC.BAT. For shared installations on all remoteboot client computers, the following line is also added to AUTOEXEC.BAT so that it points to the correct source for COMMAND.COM:

@set compspec= :command.com

where BOOTDRV is the startup disk. On a computer started from a hard disk, BOOTDRV is usually drive C. On a computer started from a floppy disk, BOOTDRV is drive A. On a remoteboot workstation, BOOTDRV is the RAM drive on the server.

The following sections describe the specific configuration changes made, depending on the type of computer that is set up for a shared installation.

[Configuring a Computer that Starts from a Hard Disk](#)

For a computer using a Microsoft network client, NETSTART.BAT is set up as follows for a shared installation on a computer with a local hard disk:

snapshot.exe
net start
net logon : /y

where REDIR is either basic or nwredir.

For Client for NetWare Networks, NETSTART.BAT is as follows:

snapshot.exe
net start
net use \\

The following shows an example of AUTOEXEC.BAT for a computer that starts from its local hard disk:

To be provided.

Setup creates the home directory unless it already exists, and copies appropriate files into those directories. The following files are copied to the home directory:

n

All initialization files, including WIN.INI and SYSTEM.INI

n

SYSTEM.DAT and USER.DAT (must be in the home directory for user profiles to work)

n

WIN.COM

Because all Windows 95 source files are on the server, Setup does not need to copy Windows 95 locally as it does for installation on a local hard disk. The File Copy step in Setup should only copy about 2 MB of files.

[Configuring a Computer that Starts from a Floppy Disk](#)

When running shared copies of Windows 95 on client computers started from a floppy disk, the client computer must be able to start Windows 95 and access the shared Windows 95 home directories, given limited file space on the floppy disk. Setup handles this problem by creating a “mini” Registry on the floppy disk.

The following shows an example of AUTOEXEC.BAT for a computer that starts from a floppy disk:

To be provided.

[Configuring a Remoteboot Workstation](#)

Windows 95 can be installed on remoteboot workstations that start from Novell NetWare 3.x and 4.0 servers. Remoteboot workstations contain a Remote Boot PROM that queries the network for instructions, creates a RAM drive, copies a disk image from the server to the RAM drive, and continues booting from the RAM drive. Windows 95 Setup creates this disk image.

When you run Windows 95 Setup on a remoteboot workstation, a mini Registry is created and copied to the startup disk, which is a RAM drive. When Setup is finished, it creates a file containing a disk image of the RAM drive on the server.

Windows 95 Setup assumes that the destination directory is the root of the RAM drive, and copies files to it just as it does in the installations from a floppy disk only. In addition to the usual files, Setup copies IO.SYS, RPLBOOT.SYS, BOOTDRV.COM, and NWRPLTRM to the root directory.

For remoteboot workstations, Setup adds the following line to CONFIG.SYS to create the RAM drive:

device=a:\ramdrive.sys : 1440

where RAMDRV is the drive letter to assign to the RAM disk (the first available non-local drive).

For remoteboot workstations, the following lines must be added to AUTOEXEC.BAT:

@mkdir : \
@copy a:\ : \
@set compspec= : \command.com

The following shows an example of AUTOEXEC.BAT for a remoteboot computer:

To be provided.

Novell specifies that to allow a remoteboot workstation to start from a Novell NetWare server, the following actions must be completed.

1. Create a boot disk, and then create a disk image file using the boot disk.
— Windows 95 Setup installs a new disk image file, as described later in this section.
2. Copy the remoteboot files to the server.
3. Create a BOOTCONF.SYS file.
4. Install the Enhanced Remote Boot PROM on the network adapter.
5. Install the network adapter in the remoteboot workstation.
6. Connect the remoteboot workstation to the network.

This section describes how Windows 95 Setup installs a new disk image file. It also provides information to help you create BOOTCONF.SYS file to support remoteboot workstations running a shared copy of Windows 95 from a NetWare server. For more information, see the Novell publication INSTALLING ENHANCED REMOTE BOOT PROMS ON NOVELL ETHERNET NETWORK INTERFACE CARDS. To obtain this document, contact your NetWare vendor.

When Windows 95 Setup is finished, it automatically creates a disk image on the server. This file contains a disk image of the RAM drive for the remoteboot workstation.

You can include the boot image filename plus the workstation's network address and node address in the BOOTCONF.SYS file on the NetWare server that is the repository for boot image files. BOOTCONF.SYS is stored in the SYS:LOGIN directory of the server, and is a text file that contains one record for each remoteboot workstation or group of workstations. Multiple workstations can be specified by using wild cards or question marks within the network address.

The following shows the format for each record in BOOTCONF.SYS. The parameters are defined later in this section.

0x[NETWORK_ADDRESS,]NODE_ADDRESS = IMAGE_FILENAME.sys [ack] [frame=FF] [gns] [noack] [nogns] [noprotect] [notro] [protect] [ps=SERVER] [tro] [wait time=sss]

Each record ends in a carriage return or linefeed character.

The NetWare server that contains the boot image files should have Novell RIPL.NLM loaded and bound to the appropriate network adapter. The following procedures summarize this process.

[To load RPL on a NetWare 3.x or 4.x server](#)

1. At the command prompt, type load rpl

2. Then type the following:

—bind rpl to BOARD [ack] [frame=FF] [gns], [nodefault], [protect], [ps=SERVER], [tro],
[wait time=sss]

The parameters for BOOTCONF.SYS records and for binding RPL are not case-sensitive. The parameters can be entered in any order, and can be separated by either blanks or commas. The following table briefly defines these parameters. For more information, see your Novell documentation on BOOTCONF.SYS.

Novell NetWare Parameters for BOOTCONF.SYS and BIND Commands

Requires a per-frame acknowledgment so slower workstations can pace RPL, when it sends frames in burst mode.

Binds RPL to a board configured for 802.2 frames. The board can be specified by the name of the network adapter board number.

a

r

d

— Configures
RBOOT to
use the
following
frame types:
_ (default), _
(Ethernet_II)
, or _.

f

— Causes the
workstation
to use a Get
Nearest
Server

request after
RBOOT is
downloaded.
Use this
parameter
when the
workstation
should find a
server other
than the one
containing
RPL.

- Causes RPL
to ignore
remoteboot
requests
when the
node
address is
not in
BOOTCONF
.SYS.
- Overrides ..
- Overrides _
specified
with BIND.
- Overrides _
with BIND.
- Adjusts
memory size
in BIOS data
area to
reflect the
amount of
memory
used by
RBOOT,
reducing
available
memory by
12K. Do not
use unless
absolutely

necessary.

Specifies
that RBOOT
attach to a
preferred
server other
than the
server where
RPL is
located.

e

r

v

e

r

Causes
bootstrap
program to
perform This
Ring Only
Count Of 3
on all
broadcast
frames.
Used in
source
routing
environment
s.

Specifies
how many
seconds
(0000 to
665535) the
workstation
waits before
selecting a
Disk Image
Name
automatically
, when
multiple
names are
specified in
BOOTCONF
.SYS.

S

MACHINES.DAT is a file on the server that, for each client, lists the location of the home directory and other drive letters to connect. Each computer has a section in the file with a section name that is the network adapter's node address. This section contains information similar to the following:

```
[426127491902438912]  
MachineDir=\\srv\shr  
c=\\srv1\shr1  
d=\\srv2\shr3  
e=\\srv3\shr3
```

In this example, the Machine directory is set to \\SRV\SHR, and drives C, D, and E are set to their respective network locations.

The following briefly summarizes the software portion of the startup process for a computer that starts from a floppy or hard disk to run a shared copy of Windows 95 from a server.

n

IO.SYS starts and reads the Registry to determine whether the computer is running Windows 95 over the network.

n

COMMAND.COM executes AUTOEXEC.BAT and NETSTART.BAT, which starts the network.

n

If the network is configured to log on users in real mode, it asks for a user name and password, and then logs on the user. If the network is configured to log on users in protected mode, the network uses a generic user name.

n

The network connects to the shared Windows directory and connects to the home directory using the path stored in SYSTEM.DAT, then sets an environment variable to HOMEDIR\SYSTEM.DAT.

n

IO.SYS starts Windows 95.

n

If the computer is running a protected-mode Microsoft network client, the real-mode network transitions to the protected-mode network.

For a general description of the Windows 95 startup process, see Chapter 6, "Setup Technical Discussion."

The full copy of the Registry for a shared installation exists on the network in the home directory. For shared installations that are not remoteboot workstations, Windows 95 Setup creates a startup floppy disk by modifying the boot sector and copying IO.SYS. For shared installations on computers with hard disks, Setup modifies the startup disk for Windows 95 by changing the boot sector and copying new IO.SYS, COMMAND.COM, and MSDOS.SYS files. The following files are copied.

Files on Startup Disk for Shared Installations on Hard-Disk Computers

AUT	IO.S	NET
OE	YS	H.MS
XE	MSD	G
C.B	OS.S	PRO
AT	YS	TMA
CO	NDIS	N.DO
MM	HLP.	S
AN	SYS	PRO
D.C	NET.	TMA
OM	EXE	N.EX
CO	NET.	E
NFI	MSG	SNA
G.S		PSH
YS		OT.E
HIM		XE
EM.		NDIS
SYS		2
IFS		adapt
HLP		er
.SY		driver
S		

The following table lists the files on the startup disk for a computer with only a floppy disk drive running a shared copy of Windows 95 from a server.

Files on Startup Disk for Shared Installations on Floppy-Disk Computers

AUT	MSD	PRO
OE	OS.S	TMA
XE	YS	N.DO
C.B	NDIS	S
AT	HLP.	PRO
CO	SYS	TMA
NFI	NET.	N.EX
G.S	EXE	E
YS	NET.	SNA
CO	MSG	PSH
MM	NET	OT.E
AN	H.MS	XE
D.C	G	NDIS
OM		2
HIM		adapt
EM.		er
SYS		driver
IFS		
HLP		
.SY		
S		
IO.S		
YS		

For remoteboot workstations, Windows 95 Setup copies the same files to the home directory as are copied in the case of floppy disk-based computers. In addition, Setup also copies the files listed in the following table.

Additional Startup Files for Remoteboot Installations

BOOT	RAMDR
DRV.C	IVE.SY
OM	S
NWRP	RPLBO
LTRM.	OT.SYS
COM	

The following notes apply for startup disks for shared installations:

n

The contents of the startup disk fit on a 1.2 MB floppy disk.

n

A startup floppy disk can be removed with no problems after Windows 95 starts.

n

One startup disk can be used for similar computers (computers with the same kinds of network adapters and settings). The same configuration can be used to run a shared copy of Windows 95 on remote workstations with similar hardware configurations.

n

The startup disk can be marked read-only. The software on the startup disk does not require writing information to the startup disk.

n

Files shared by clients are marked read-only.

Windows 95 files for a shared installation are stored in the locations described in the following table.

Start-up disk	Contains all the real-mode software necessary to start the computer and connect to the shared Windows directory. This can be a local hard disk, a floppy disk, or a remoteboot disk image stored on a server. For computers that start from a floppy disk or from a remoteboot server, there is a small copy of the computer's
---------------	--

SYSTEM.D

AT file on the startup disk that contains the information needed by IO.SYS and the real-mode network.

After connecting to the home directory, Windows 95 uses the full Registry stored there.

Home Contains files specific to a particular directory computer.

The home directory can exist on any network shared resource.

Share A central shared directory on a server that contains all the shared files. This directory is always marked read-only.

MS-DOS Mode is disabled for shared installations.

When the user starts a program that runs in MS-DOS Mode, Windows 95 shuts down and exits back to real-mode MS-DOS to run the program. When the program quits, Windows 95 starts again. This mode is available as a last resort mode for compatibility with existing software. Computers that run a shared version of Windows 95 lose their network when Windows 95 exits. Because of the related problems, MS-DOS Mode is not available for computers running Windows 95 over the network. When a user tries to run a program in this mode, Windows 95 warns that the mode has been disabled. For more information, see Chapter 22, "Application Support."

Hot docking for Plug and Play network adapters is not supported for shared installations.

When Windows 95 starts over the network, real-mode drivers control the network adapter. If the network adapter is a Plug and Play card, the driver is responsible for setting the computer to the active state. Computers that run over the network do not support hot Plug and Play disconnects, because the operating system is on the network.

Safe Mode system startup for network computers always runs configuration files.

To perform a Safe Mode system startup on a network computer, the network must be started. Thus, IO.SYS always runs AUTOEXEC.BAT, CONFIG.SYS, and NETSTART.BAT. This allows the network computer to detect the semaphores in the home directory that describe how and when to perform a Safe Mode startup.

Swap files for shared installations have special considerations.

For basic information about swap files, see Chapter 17, "Performance Tuning."

n

The swap file is stored on the local hard disk for a client computer that starts from the hard disk.

n

The swap file is stored in the home directory for a client computer that starts from a floppy disk and runs protected-mode network software.

Client computers that start from a floppy disk and run real-mode network software do not have a swap file.

{ewl msdncd.dll, ewcright, /c"Microsoft"}

Chapter 5 Custom, Automated, and Push Installations

This chapter provides detailed information about customizing Windows 95 installations and using logon scripts for automatic mandatory installation of Windows 95.

Custom Installations for Windows 95: The Basics

Administrators can also use the Server-Based Setup program to create setup batch scripts to make it easy to automate all kinds of installations. As part of the process of creating setup scripts, Server-Based Setup uses the same user interface as System Policy Editor to allow you to predefine installation settings. You can also use a text editor to customize setup batch scripts for your site.

[To install Windows 95 source files on the network](#)

n

Run Server-Based Setup (NETSETUP.EXE) under Windows 95, as

described in Chapter 4, "Server-Based Setup for Windows 95."

When users install Windows 95 from source files on a server, the administrator has several options for customizing the Windows 95 installation. These options include any combination of the following:

n

Create custom MSBATCH.INF files. The custom setup scripts contain

predefined settings for all the options that can be specified during Setup, and can contain instructions for installing additional software.

n

Define WRKGRP.INI files to control users' choices for workgroups to join on the network.

n

Create user profiles and system policies to restrict users' abilities to change the system configuration.

Issues for Custom Installations of Windows 95

The following notes summarize issues to consider in planning a custom Windows 95 installation:

n

To define custom setup scripts using the Make Script option in Server-Based Setup, you must run this program under Windows 95.

n

To take advantage of WRKGRP.INI for restricting workgroup choices, the file should be stored in the directory that contains the source files for installing Windows 95. For shared installations, WRKGROUP.INI should be stored in the shared Windows directory on the server.

n

To take advantage of user profiles, the client computers must be running a

32-bit, protected mode network client, such as Microsoft Client for NetWare Networks or Client for Microsoft Networks. Additional issues for using user profiles and system policies are described in Chapter 15, "User Profiles and System Policies."

n

The information in this chapter related to using other software for push

installation assumes the appropriate software is installed, configured, and tested on servers on your network. Information related to configuring such software is not provided here.

The following list summarizes the items that cannot be customized or screens that cannot be skipped during Windows 95 Setup.

Setup Components That Cannot be Skipped or Customized

MS_ This
DOS message
Unin appears if
stall Setup
mes detects
sage MS_DOS
Uninstall
informatio
n on the
computer.
You
cannot
turn off
this
display or
automate

a
response.

OS/ This
2 message
dete appears if
ction Setup
mes detects
sage that a
version of
OS/2 is
installed
on the
system.
You
cannot
turn off
this
display or
automate
a
response.

Quit This
All message
Win appears if
dow Setup
s detects
prog that other
ram application
mes s are
sage running.
You
cannot
turn off
this
display or
automate
a
response.

_ This
message
will always
appear if
Setup is
run using

a
Windows-
based
network
managem
ent tool
such as
Microsoft
Systems
Managem
ent Server.

Not This
Eno message
ugh appears if
Disk there is
Spa not
ce enough
mes free hard
sage disk space
to support
the
specified
installation
type. You
cannot
turn off
this
display
from a
batch
script.
However,
to avoid
this
message,
start
Windows
95 Setup
using the _
switch.

_ Setup
will fail
during
installation
if it runs

out of disk
space.

Che This
ckin informatio
g n
Your message
Hard always
Disk appears.
mes You
sage cannot
turn off
this
display,
but no
response
is
required.

Prep This
arin informatio
g n
Dire message
ctory always
mes appears.
sage You
cannot
turn off
this
display,
but no
response
is
required.

Anal This
yzin informatio
g n
Your message
Com always
pute appears.
r You
mes cannot
sage turn off
this
display,
but no

response
is
required.

Advanced Options This dialog box always appears during Custom Setup so the user can choose not to use the extended file system capabilities such as long filenames. You cannot turn off this display or automate a response.

Customizing Windows 95 with Setup Scripts

You can specify custom settings for Windows 95 installations by creating a custom file in MSBATCH.INF format and using this setup script for installation. The default setup script is stored with the source files on the server. Custom setup scripts can be stored in user's home directories.

There are two ways to create a custom setup script:

n

Use Server-Based Setup to specify custom settings

n

Edit an existing file in MSBATCH.INF format to specify custom settings

These methods are described in the following sections, together with details for how to install other software using custom setup scripts.

Tip — The WINDOWS 95 RESOURCE KIT files include four generic setup scripts that can be used to provide a partially automated, custom installation for each of the four installation types: TYPICAL.INF, PORTABLE.INF, COMPACT.INF, and CUSTOM.INF. The sample setup scripts contain entries that define the setup type and whether to create a Startup disk, and that specify that the computer be restarted automatically when Setup is complete. These scripts can be used as is or modified to automate Windows 95 Setup.

You can use the Make Script button in Server-Based Setup to create a custom batch script. This option is only available when running Server-Based Setup under Windows 95, and it can only be used to create a custom batch script, not to edit an existing script. To edit an existing script, you must use a text editor, as described in the following section.

[To create a custom setup script using the Server-Based Setup program](#)

1. Run Server-Based Setup from the ADMIN\NETTOOLS\NETSETUP directory on the Windows 95 compact disc.
2. In the Server-Based Setup dialog box, click the Make Script button.
3. In the Save As dialog box, specify the filename for this setup script, and specify the path where the script is to be stored, and then click OK.

~~~~~~{ewc msdn cd, EWGraphic, x0d 0 /a "psD.bmp"}~~~~~~

~~4. Use the Policies page (which resembles the System Policy Editor user interface) to specify custom settings, as summarized in the following table. For details about each of these options, see Appendix D, "MSBATCH.INF Parameters."~~

Server-Based Setup Options for Custom Scripts

---

[Setup]

Autom Express  
ated =[0 | 1]  
Install

Setup InstallTy  
Mode pe=[0 | 1  
| 2 | 3]

Create EBD=[0  
an | 1]  
Emerg  
ency  
Boot  
Disk

Install Verify=[0  
Verific | 1]  
ation

Enable PenWin  
Pen Warning  
Windo =[0 | 1]  
ws  
Warnin  
g

[Setup]

Install InstallDir  
Directo =  
ry

d

i  
r  
e  
c  
t

o

r

y

p

a

t

h

Server [Network  
based ]  
Setup

-----  
[NameA  
ndOrg]

Displa Display=  
y [0 | 1]  
name  
and  
organi  
zation  
page

Name Name=

N

a

m

e

Organi Organiz  
zation ation=

O

r

g

a

n

i



z

a

t

i

o

n

— [Network  
]

Display Display=  
y [0 | 1]  
network  
k  
screen  
s  
during  
custo  
m  
setup

Clients Clients=  
to  
Install

n

e

t

w

o

r

k

c  
li  
e  
n

# tlst

Hard Disk Boot  
HDBoot  
=[0 | 1]  
(for shared installations)

Remoteboot (RPL) Setup  
RPLSetup  
up=[0 | 1]

Workstation Workstat

ation ionSetup  
Setup =[0 | 1]

Displa Display  
y Workstat  
Workst ionSetup  
ation =[0 | 1]  
Setup

[Vredir]

Validat Validate  
ed dLogon=  
Logon [0 | 1]

Logon LogonD  
Domai omain=  
n

d

o

m

a

i

n

n

a

m

e

----- [Nwredir  
]  
Preferr Preferred  
ed dServer  
Server =

s

e



r

v

e

r

n

a

m

e

First FirstNet  
Network Drive=  
k Drive

d

r

i

v

e

l

e

t

t

e

r

Search Search  
Mode Mode=[0  
- 7]  
— [Network  
]

Protocols to Install  
Protocol s=

p

r

o

t

o

C  
O  
l  
li  
s

t

----- [Nwlink]  
Frame Type    FrameType=  
                  0 | 1  
                  | 2 | 3 |  
                  4]  
NetBIOS support    NetBIOS=  
                      0 | 1]  
----- [Mstop]  
DHCP    DHCP=[  
          0 | 1]  
IP Address    IPAddresses

ss=

I

P

a

d

d

r



e

s

s

Subnet Subnet  
Mask Mask=

I

P

a

d

d

r

e

s

s

WINS WINS=[  
0 | 1]

Primary Primary  
y WINS=  
WINS

I

P

a

d

d

r

e

s

s

Secon  
dary  
WINS

= I

P

a

d

d

r

e

s

s

Scope ScopeID  
ID =

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| Brows<br>e           | Browse<br>Master=[    |
| Master               | 0   1]                |
| -----                | [VServer<br>]         |
| LMAnn                | Announc               |
| ounce                | e=[0   1]             |
| Brows<br>e           | Browse<br>Master=[    |
| Master               | 0   1]                |
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## [Tip for Ensuring User Logon Capabilities in Setup Scripts](#)

By default, Windows 95 Setup will preserve the network identification information from the user's previous networking configuration, including the logon domain or preferred server. However, in cases where this configuration information is not already defined, you must specify settings in the setup script.

If users are installing Windows 95 from a server that requires logon validation, make sure the custom setup script defines the correct logon server. For a computer that will run Client for Microsoft Networks and use a Windows NT server for network logon validation, you should define values for *logonDomain=* and *ValidatedLogon=* in the [Vredir] section. For a computer that will run Client for NetWare Networks, define

a correct value for *PreferredServer* in the [Nwredir] section.

If the appropriate values aren't defined in a setup script for a Typical installation, the user may not have the validated access required to complete the final Setup steps for installing printers and other actions.

After you have used Server-Based Setup to create a default MSBATCH.INF file, you can edit and save this file with a text editor to create alternate custom setup scripts.

#### [To edit MSBATCH.INF](#)

1. Use a text editor such as Notepad to open the MSBATCH.INF file.
2. Edit the file, and save it in text-only format.

The following are the editing guidelines for MSBATCH.INF:

n

Section names must be unique within each version of MSBATCH.INF, and each section starts with a section name enclosed in brackets ([ ]).

n

Any sections other than those defined in Appendix D, "MSBATCH.INF Parameters," will not be evaluated by Windows 95 Setup.

n

Each section can contain one or more entries. The typical entry consists of a key and a value separated by an equal sign.



## n Keys within a section do not have to be unique, but each key and value should follow the guidelines defined for that key, as defined in Appendix D.

# n

A comment can be included anywhere on a line by starting the comment with a semicolon.

### Custom Options Available Only by Editing Setup Scripts

|  |                                                                                                                              |
|--|------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Specifies whether the user can customize the installation process, as described in the [Setup] section in Appendix D.</p> |
|  | <p>Specifies whether Setup should skip</p>                                                                                   |

hardware detection. If Setup is to skip detection, then the script should specify all hardware settings in the [System] section, as described in Appendix D.

---

Whether the user can select components can be defined in a script, but automating the selection of components must be done by editing the script, as described in the [OptionalComponents] section in Appendix D.

---

Whether the user

can select network components can be defined in a script, but automating the values for network components must be done by editing the script, as described in the [Network] section in Appendix D.

Whether the user can select drivers for computer hardware components can be defined in a script, but automating selection of components must be done by editing the script, as described in the [System] section in

## Appendix D.

Run All  
Once operations  
e that run  
optio the first  
ns time  
Windows  
95 starts,  
such as  
specifying  
the time  
zone or  
setting up  
a printer,  
can be  
automated  
, as  
described  
in  
“Defining  
Run-Once  
Actions in  
Custom  
Scripts”  
later in  
this  
chapter.

This section summarizes how to specify the settings for the built-in Run-Once operations that occur the first time that Windows 95 starts. Defining settings for a Run-Once operation includes adding these entries in a setup script:

n

AddDelReg= and AddReg= entries for the operation to the [Install] section

# n

Add sections to support the *DelReg=* and *AddReg=* entries in [Install] that defined the entries to be added and deleted in the Registry

The entries required for each built-in Run-Once operation are defined in the INF files, as summarized in Appendix C, "Windows 95 INF Files." An example will be provided in the final version of the WINDOWS 95 RESOURCE KIT.

---

*Important* — In order to create definitions for Registry entries to be added or deleted, you must copy the correct settings from a Registry which has the exact configuration you want to achieve with the setup script.

---

You can specify software to be installed in a custom setup script by providing values in the [Install] section in MSBATCH.INF and by making other modifications to the information files that Windows 95 Setup uses. This can include device drivers or other software from other vendors, in-house utilities and applications, supporting bitmap files, and custom batch files.

The files and directories you must provide or modify to support installation of other software with Windows 95 include the following:

# n

Copy any INF or DLL files or other files that support software installation to the same directory as PRECOPY\*.CAB on the server that contains the Windows 95 source files.

n

Copy any supporting INF files to the INF subdirectory on the server.

n

In the [Inf.files] and [Load\_inf] sections in SETUPPP.INF, add entries that list each supporting INF and DLL file.

n

At the end of the list of INFs in PRECOPY.INF, add entries for each supporting INF and DLL in the format FILENAME.EXT=.

n

In MSBATCH.INF (or a similar setup script), add entries in the [Install] section for each software component to be installed, following the generic format used for [Install] sections in INF files, as described in Appendix C, "Windows 95 INF Files."

The example in the following procedure makes available in Windows NT Setup all the network agents and services provided on the WINDOWS 95 RESOURCE KIT disk. The INFINST application provided on this disk can be used to automatically integrate a valid INF file into Setup.

You can follow a similar set of steps to customize Windows 95 Setup to include installation of other software used at your site.

To create a custom installation configuration for software from the Windows 95 compact disc

n

To be provided.

To install any of these agents or services with Windows 95

n

To be provided.

For a list of the device IDs for each service and software component provided in the ADMIN directory on the Windows 95 compact disc, see Appendix D, "MSBATCH.INF Parameters."

### *Customizing Windows 95 with WRKGRP.INI Files*

---

Windows 95 Setup can recognize an initialization file named WRKGRP.INI that administrators can use to specify a list of valid workgroups that users can choose to join. You can use WRKGRP.INI in these ways:

n

To help reduce the proliferation of workgroup names at your site

n

To control the workgroup choices that users can make

n

To specify defaults for the preferred server and domain on a per-  
workgroup basis.

The WRKGRP.INI file is stored in the Windows directory on the server that contains  
the Windows 95 source files.

Windows 95 Setup maps the workgroup to the proper logon domain, preferred  
server, and other values to values defined in WRKGRP.INI, and stores these values  
in the Registry. The same values are used to control the related options available in  
the Network option in Control Panel. The WRKGRP.INI file contains the following  
sections.

---

[O Specifies the  
pti recognized  
on options for  
s] using  
WRKGRP.IN  
I.

[W Contains a  
or list of  
kg workgroups  
ro from which  
up the user can  
s] choose.

In Windows 95, for each workgroup, administrators can specify the domain,  
preferred server, and so on, that everyone in a workgroup will use, depending on the  
network providers used. The entry that defines the network providers for each  
workgroup has the following format in the [Workgroups] section:



WORKGROUP\_NAME=MAPPING1,MAPPING2,MAPPING3,...

By default in Windows 95, workgroups can be mapped to both Windows NT domains and NetWare preferred servers. (This is because Windows 95 includes network providers for these two networks.) For example:

MktMain=MktDom1,master1

This example specifies that the workgroup named MktMain has these two mappings: MktDom1 is the logon domain for the Windows NT network, and Master1 is the preferred server for the NetWare network.

Administrators can specify the 32-bit, protected-mode network providers that can be mapped for a workgroup by setting the *Mapping=* parameter in the [Options] section of WRKGRP.INI. For example, if the network uses two network providers (MSNP32 for Microsoft networks and NWNP32 for NetWare networks), the following is defined in WRKGRP.INI:

[options]  
mapping=msnp32,nwnp32

If you use an additional network provider at your site, you can specify it by adding the network provider filename to the comma-separated list of *Mapping=* values. The *Mapping=* line specifies which network provider is related to a mapping and, the Registry key where it is stored, because the locations of domains, preferred servers, and so on, are stored under the network provider's key in the Registry. For example, domain names are stored in the following key:

Hkey\_Local\_Machine\System\CurrentControlSet\Services  
—\MSNP32\NetworkProvider\AuthenticatingAgent

You can also use the *Default=* line to specify a default mapping for workgroups that do not have an explicit mapping. This allows you to use an existing WRKGRP.INI created for Windows for Workgroups 3.11, and add one line to take advantage of Windows 95 functionality. For example, add the entry *Default=MktDom1,Master1* to use the servers described in the previous example as the default mapping.

If a WRKGRP.INI exists, the Workgroup field in Windows 95 Setup and the Network option in Control Panel shows all the workgroups listed in WRKGRP.INI. Users can choose a workgroup from the list or type one in. If *Required=true* in WRKGRP.INI, the user must choose from the list.

In WRKGRP.INI, *ForceMapping=* controls whether mapped values can be changed in the Windows 95 user interface. For example, if *ForceMapping=true* and the user selects a workgroup that is mapped to a domain, the value in the Logon Domain box in the Network option in Control Panel and in the logon dialog box is not available for the user to change.

The Network option in Control Panel always saves these parameters directly to the Registry, so canceling the Network property dialog box doesn't cancel related settings.

Note When Windows 95 Setup finds the WRKGRP.INI file in the Windows 95 source files, it copies the file to the shared Windows directory.

The format of the Windows 95 WRKGRP.INI is described in the following table.

## WRKGRP.INI Settings

|       |                                                                                                        |
|-------|--------------------------------------------------------------------------------------------------------|
| ----- |                                                                                                        |
| ----- |                                                                                                        |
| ----- | Specifies whether the workgroups need to be converted from an OEM character set to ANSI. Default is .. |
| ----- | Specifies whether users can type their own workgroup name or forces them to choose from those listed.  |
| ----- | Specifies whether users can                                                                            |

change values that are set by a mapping.

Specifies a comma-separated list of the network providers to which workgroups can be mapped.

Also specifies the order in which values will be listed in the [Workgroups] section.

Implicitly, this specifies where in the Registry to store settings.

This parameter is optional. By default, workgroups map

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Specifies the default mapping for workgroups listed in the [Workgroups] section that don't have a mapping defined. This allows administrators to add a single



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users  
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choose.

- 
- 1 Each name of a workgroup must be followed by an equal sign (=) for the workgroup name to be interpreted correctly.
-

You can predefine settings in user profiles and system policy files to control user actions. For example:

n

You can enforce a mandatory desktop configuration by installing a mandatory user profile (USER.MAN) in users' home directories. (On NetWare networks, this is the MAIL directory for each user.)

n

You can control the user's security privileges, network access, and desktop configuration if you install a master system policy file on the logon server. This is the PUBLIC directory on a NetWare server or the NETLOGON directory on the primary domain controller for a Windows NT domain.

To take advantage of these features in Windows 95, you must define the user profile and system policy settings to be used. Then place these files in the appropriate directories before users run Windows 95 Setup. When users first log onto Windows 95, the profiles and policies will be used automatically.

For information about creating and using user profiles and system policy files, see Chapter 15, "User Profiles and System Policies."

### *Running Custom Setup Scripts*

---

The following procedure describes how to run Windows 95 Setup from a setup script. This procedure assumes that the network administrator has created a special Upgrade user account and provided a logon script for this account that will automatically run a custom setup script to install Windows 95 with minimal user action.

#### *To run Windows 95 Setup using a setup script with minimal user action*

1. Start the computer running the existing network client software.
2. Log onto the network using an Upgrade account that has been provided with a

special upgrade logon script.

The client computer must already be connected to the network to run Windows 95 Setup from the shared directory.

3. Connect to the server that contains the Windows 95 source files.

The network administrator can include this step in the logon script to avoid user action.

4. Change to the shared resource (network drive and directory) where the Windows 95 Setup files are located. Then, at the command line, run Windows 95 Setup by specifying the batch file with the installation settings, using this syntax:

If MSBATCH.INF exists, Setup will use it by default. Otherwise, for example, type `setup e:\mybatch.inf` to run Setup using an INF file named MYBATCH.INF on drive E. Or, to use a script in the SCRIPTS directory on a server named NWSVR1, you could type `setup \\nwsvr1\scripts\mybatch.inf` (provided, of course, that your operating system software can interpret UNC path names).

Or

Include the entire statement for running Windows 95 Setup in the logon script, so that the user does not have to type anything at the command prompt.

When you run Windows 95 Setup in this way, Setup takes all settings from the custom script. After copying files, Windows 95 Setup restarts the computer and begins the setup operations that run the first time Windows 95 is started (printer setup, group conversions, and so on). When these operations are finished, Windows 95 is completely installed.

When the user quits Windows 95 Setup at this point, Setup writes all changes to the Registry. The user can restart the computer and log on with the usual logon name and password.

The network administrator can automate this process by providing each user with a floppy disk that contains the necessary files for starting the computer, connecting to the network, and running Windows 95 Setup with a custom setup script.

## Overview of Push Installations

---

You can take advantage of batch scripts to set up an automated, mandatory installation scheme for installing Windows 95 on multiple computers. This is a new feature that allows you to install Windows 95 remotely, without actually going to the computer being upgraded.

The new feature will help you to easily install Windows 95 throughout the enterprise. We believe that you will want to use this method if you are responsible for installing

Windows 95 on more than 50 computers.

After you set up the base files on one or more servers (using Server-Based Setup) and create setup batch scripts, you can perform push installations in three ways:

n

Use a logon script to run Setup with a setup batch script, automatically

installing Windows 95 when each user logs on. Details are provided in the following section.

n

Insert an object in an electronic mail message that will start Setup with a

setup batch script when the user clicks the object.

n

Use Microsoft Systems Management Service to run Windows 95 Setup

with a setup batch script as a mandatory job, as described in “Using Microsoft Systems Management Server for Push Installation” later in this chapter.

n

Use network management software from other vendors to automatically

install Windows 95 based on the setup scripts you created. Refer to the documentation for your network management software for information about performing remote installation of software.

The following sections describe how to use logon scripts and Microsoft Systems Management Server for push installations.

### *Using Logon Scripts for Push Installation*

---

This section describes how to prepare for and run Windows 95 Setup automatically from logon scripts, using the Windows 95 source files installed on a server.

A push installation uses Windows 95 Setup with a file in the format of MSBATCH.INF, plus components of the server on a NetWare or Windows NT network (the logon script and utility for managing user accounts). These are the basic steps for preparing to use push installations:

1. Install a shared copy of Windows 95 on the server, as described in Chapter 4, "Server-Based Setup for Windows 95."
2. Create the setup batch files for Windows 95 Setup to use and store these files in the appropriate directories on the server.
3. Create the logon scripts to start the installation process.
4. Create the user accounts to activate the logon scripts.

---

Tip—— Avoid using relative pathnames in logon scripts so that you can ensure the command is being run from the correct directory.

---

A push installation begins when the user logs onto the client computer. These cases are described here for pushing installation from logon scripts:

n

From a computer running Windows for Workgroups. This includes special steps that are described in the following section.

n

From a computer running MS-DOS with a real-mode network client that supports logon scripts.

# n

From a computer running Windows 3.1 with a real-mode network client that supports logon scripts.

---

Important—— If the logon script processor stays in memory after starting Windows 95, and if the computer is not correctly configured to use extended memory, then there may not be sufficient memory present to run Setup. However, the method presented in this section for using a STARTUP.GRP file with Windows for Workgroups will avoid memory problems in push installations.

---

If the network client used on a computer supports running logon scripts, you can use logon scripts to push the installation of Windows 95 on that computer.

Push installation from logon scripts can be used on MS-DOS —based computers, including computers running Windows 3.x, for the following real-mode network clients, which support running logon scripts:

# n

Windows for Workgroups Add-On for MS-DOS

# n

LAN Manager 2.x real-mode network client

# n

Novell® NetWare® 3.x real-mode network client (NETX)

# n

Windows for Workgroups real-mode network clients

To use push installation from logon scripts to upgrade Windows for Workgroups (for either protected mode or real-mode network clients), the administrator must create a STARTUP.GRP file that contains the command line for starting Windows 95 Setup, as described in the following section.

For a computer running MS-DOS or Windows 3.1 with a real-mode network client, the logon script should be similar to the following:

```
net start full  
net use-          :\\  
          :setup-  :
```

If the client computer is running on a LAN Manager or Windows for Workgroups network, the real-mode network client for Windows for Workgroups or Windows 3.1 requires the following to run logon scripts so that the full network redirector is loaded and the user is validated for network logon:

# n

The line *net start full* in the logon script



# n

The entry `lmlogon=1` in the [Network] section of SYSTEM.INI

---

Note — The examples in the following sections always refer to the MSBATCH.INF file, although the filename is arbitrary and can be any ASCII text file containing valid settings.

Also, the following examples describe using a common Upgrade account rather than changing every user's logon script. This avoids activating the Setup process again after Windows 95 has been installed. You can use other utilities that avoid this problem.

---

If you will be upgrading computers that are currently running Windows for Workgroups, you must create a special Startup group that is used just once to run the logon script.

The use of the Startup group is only mandatory when the user is running Windows for Workgroups 3.11 with logon validated performed by Windows NT Server. In this scenario, the user starts Windows for Workgroups, which loads the protected-mode protocols and processes the logon script. The logon script runs in a DOS VM, and Windows 95 Setup cannot usually run in that way. Using a modified STARTUP.GRP file with a pointer to SETUP.EXE causes Setup to run as a Windows-based application.

---

Note — Computers that use a real-mode network client can use logon scripts as usual without using STARTUP.GRP.

Only computers that use a protected-mode network client will need to use the STARTUP.GRP method to run Setup from within Windows for Workgroups.

---

[To prepare for push installations to upgrade earlier versions of Windows](#)

1. Run Windows for Workgroups on a computer.
2. If the Startup group is not present, in Program Manager, use the File New command to create a Windows for Workgroups Startup group.

3. In the Startup group, use the File New command to create an Upgrade icon that contains the following command line:

==

— For example:

— k:\setup k:\msbatch.inf

— Specify the same source drive used in the logon script statements, as described in the following sections on preparing the server for push installations.

4. Copy the STARTUP.GRP file to the shared directory on the server that contains the Windows 95 source files.
5. Delete the group or icon that you just created, so that it is no longer stored on the computer where you are working.
6. In the MSBATCH.INF file, add these sections to ensure that STARTUP.GRP is replaced after Setup:

— [install]

renfiles=replace.startup.grp

[replace.startup.grp]

startup.grp, startup.sav

[destinationdirs]

replace.startup.grp=10

This section summarizes the procedures for running logon scripts from a Windows NT server for push installations.

#### [To prepare the server for push installations](#)

1. Run Server-Based Setup, and install the Windows 95 source files in the shared directory on the Windows NT Server.

— You will need about 70 MB free on this drive. For more information about server requirements, see Chapter 4, "Server-Based Setup for Windows 95."

— For example, on the Windows NT Server named \\NTSERVER, create a shared directory named \\DISTSHARE.

2. Modify the MSBATCH.INF file to meet your installation requirements, and copy it into the Windows 95 source directory (\\NTSERVER\\DISTSHARE, in the example in the previous step).

— For more information, see Appendix D, "MSBATCH.INF Parameters."

3. Create the logon scripts as required for the type of network client you are installing.

— Details about the logon script are described after this procedure.

4. Using User Manager for Domains on a computer running Windows NT Server, create a user account named Upgrade, and specify *upgrade* as the password. Also, make sure the following options are selected for the Upgrade user account:

**n** User Cannot Change Password

**n** Password Never Expires

— By default, the user account is created in the domain where you logged onto the network. To create the user account in another domain, you must select that domain before creating the account. If your users log onto multiple domains, create the Upgrade user account in each domain.

5. Assign the logon script to the Upgrade user account. The logon script must be placed in the WINNT\SYSTEM32\REPL\EXPORT\SCRIPTS directory on the computer running Windows NT Server.

— The replication service replicates this from the export server to the import server, so the script ends up on WINNT\SYSTEM32\REPL\IMPORT\SCRIPTS.

The logon script for client computers running MS-DOS or Windows 3.1 must contain the following entries:

net use  
          :setup                  :

If this logon script will be used to upgrade computers that are currently running Windows for Workgroups, the logon script must contain the following lines:

net use  
rename          \startup.grp \*.sav

copy- \startup.grp- \startup.grp

Where:

n

SOURCE\_DRIVE maps a drive letter for the server containing the source

files. This must be the same drive letter as specified in the STARTUP.GRP file. Check the *lastdrive=* setting in CONFIG.SYS to make sure that the drive letter specified on the preceding command line is a valid logical drive letter. If it is not, the network connection will not be made, and the Setup process will fail.

n

\\NTSERVER\DISTSHARE specifies the Windows NT computer that

contains the Windows 95 source files.

n

WINDOWSDIR is the relative path to the user's Windows directory.

n

PATH is the path to the Startup group file.

# n

USER\_WINDOWS is the relative path to the user's Windows directory that

will contain STARTUP.GRP. Use the relative drive and directory designation (.)  
instead of hard-coding the Windows directory (for example, C:\WINDOWS). Do  
not use the WinDir environment variable, because WinDir is not an accessible  
environment variable in the script.

For information about creating the STARTUP.GRP file for Windows for Workgroups,  
see "Preparing a STARTUP.GRP File" earlier in this section.

For example, for a computer running Windows for Workgroups, the logon script  
could be similar to the following:

```
net use k: \\ntserver\distshare  
rename .\startup.grp *.sav  
copy \\winnt\system32\repl\input\scripts\startup.grp .\startup.grp  
exit
```

This section summarizes the procedures for running logon scripts from a NetWare  
server for push installations.

### [To prepare the server for push installations](#)

1. Run Server-Based Setup, and install the Windows 95 source files in the shared  
directory on the NetWare server. For example, on the server named  
NWSERVER, copy the files to a directory named DISTSHARE.

— You will need about 70 MB free on this drive. For more information about server  
requirements, see Chapter 4, "Server-Based Setup for Windows 95."

2. Modify the MSBATCH.INF file to meet your installation requirements, and copy it  
into the directory that contains the Windows 95 source files  
(NWSERVER/DISTSHARE, in the example in the previous step).

— For more information, see Appendix D, "MSBATCH.INF Parameters."

3. On the NetWare server, create a user account named Upgrade and specify  
upgrade1 as the password. Also, set the types of options for this account as  
described in the following list.

n

Allow User To Change Password = NO

n

Force Periodic Password Changes = NO

4. Assign the Upgrade user account to the preferred server that users have access to.

5. Create a logon script and assign it to the Upgrade user. The logon script must be placed in the appropriate directory on the server where users will log on.

The logon script for client computers running MS-DOS or Windows 3.1 must contain the following entries:

```
attach      /      :  
map        :  
            :setup    :
```

Where:

n

SOURCE\_DRIVE is the same drive letter as specified in the Startup group

# n

NWSERVER/DISTSHARE specifies the NetWare server that contains the

Windows 95 source files

For example, for a computer running MS-DOS or Windows 3.1 with a real-mode network client, the logon script could be similar to the following:

```
attach nwserver1/win95  
map k:nwserver1/win95  
k:setup k:msbatch.inf
```

Push installations from logon scripts are the same whether you are running a network client with Windows 3.1 or Windows for Workgroups. The following are the requirements:

# n

The Upgrade account has been created on the Windows NT domain or

NetWare server, with a corresponding Upgrade logon script, as described in the previous section.

# n

The Upgrade logon script contains these principal entries:

n

The *net use* statements to connect to the appropriate shared directory for the Windows 95 source files.

n

Statements to start Windows 95 Setup. These statements might involve renaming the user's Startup group and copying the alternate Startup group from the server, as described in "Preparing a STARTUP.GRP File" earlier in this chapter.

n

An *exit* statement, so that Setup can close the batch file and continue.

[To run a logon script for a push installation](#)

n

Tell users to log onto the network using the Upgrade user account and the *upgrade password*.

When a user logs on, the Windows 95 installation process begins automatically, using the settings in the MSBATCH.INF file specified in the logon script.

After copying files, Windows 95 restarts the computer and begins the Run-Once operations (group conversions, and so on). When the Run-Once operations are



finished, Windows 95 is completely installed.

When the user quits Windows 95 at this point, Setup writes all changes to the Registry. The user can restart the system and log on using the usual logon name and password.

### Using Microsoft Systems Management Server for Push Installation

---

Microsoft Systems Management Server is a set of Windows NT services that allow a system administrator to manage network computers remotely. This includes the following:

n

Collecting an inventory of the computers and software on the network

n

Distributing software

n

Troubleshooting hardware and software problems

n

Installing, configuring, and managing Windows 95

In the final version, this section will briefly describe how to use Microsoft Systems Management Server to manage installation of Windows 95. For more information, see Appendix K, "Microsoft Systems Management Server."

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 6 Setup Technical Discussion

This chapter provides information about Windows 95 Setup, including background information about Safe Recovery and detailed descriptions of the Setup and system startup processes. You will find this technical information helpful if you are responsible for troubleshooting Windows 95 at your site.

### *Phases of the Setup Process*

---

Windows 95 Setup is divided into these logical phases:

n

Startup and information gathering phase for getting the computer ready for

Windows 95 Setup

n

Hardware Detection phase

n

File Copy phase, for copying Windows 95 component files

n

Final System Configuration phase, for completing the final installation

The following sections provide technical details about what happens in each of these phases.

For complete information about the hardware that has been tested and shown to be compatible with Windows 95, see the [HARDWARE COMPATIBILITY LIST](#).

---

**Note** — If you have MS-DOS — based applications that require 100 percent access to system resources, see the information about using MS-DOS Mode in Chapter 22, “Application Support.”

---

The following occurs as soon as you start Windows 95 Setup:

1. If you started Windows 95 Setup from MS-DOS, Setup searches the local hard disks for previous versions of Windows. If a version of Windows is found, the program prompts you to quit and run Setup from Windows. However, you can bypass this warning.
2. Setup performs minimum system checks to confirm that the computer is capable of running Windows 95 (enough CPU, memory, and disk space; the correct version of MS-DOS; and so on). If there are insufficient resources, Setup stops and informs you of the problem. For a description of system requirements, see Chapter 3, “Introduction to Windows 95 Setup.”
3. If you started Windows 95 Setup from MS-DOS, Setup checks for an installed extended memory specification (XMS) provider and installs one if not present. Windows 95 Setup looks for existing disk caching and automatically loads SmartDrive if no other caching is found. The cache size varies, depending upon available XMS memory.
4. Setup checks for the existence of certain terminate-and-stay-resident (TSR) applications and device drivers that are known to cause problems. If any of these applications is currently running, Setup warns the user before proceeding.
5. If you started Windows 95 Setup from MS-DOS, Setup installs the minimal Windows 3.1 components and starts these components using the `shell=setup.exe` command.

— The Windows graphical user interface appears. In a normal installation, this is the first thing you see. Up to this point, the processor is operating in real mode.

6. If you started Windows 95 Setup from MS-DOS, Setup switches the processor to standard mode and makes extended memory available.

Windows 95 Setup begins gathering information needed to determine the components to be installed and to gather other installation information. The wizards in Windows 95 Setup simplify the information-gathering step and allow you to return to any screen where information may need to be altered. The information includes

the directory for Windows 95 files, user information, and specifics about the devices and software to be installed. For detailed information, see Chapter 3, “Introduction to Windows 95 Setup.”

During the Hardware Detection phase, Windows 95 Setup analyzes installed computer components, and detects installed hardware devices and connected peripherals. Windows 95 Setup also identifies the hardware resources that are available (for example, IRQs, I/O addresses, and DMA addresses), identifies the configuration of installed hardware components (for example, IRQs in use), and builds the hardware tree in the Registry. For information about the structure and content of the Windows 95 Registry, see Chapter 33, “Windows 95 Registry.”

Windows 95 Setup uses several mechanisms to detect installed hardware devices:

n

For a non-Plug and Play-compliant computer (called a legacy computer),

Windows 95 checks for known hardware devices by checking I/O ports and specific memory addresses to attempt to identify whether they are being used by known devices. Windows 95 also checks for Plug and Play peripherals connected to a legacy computer, which return their own device identification codes.

n

For a computer with a Plug and Play BIOS, Windows 95 queries the

computer for installed components and their configuration. Windows 95 also checks the computer for connected Plug and Play peripheral devices.

During this phase, Windows 95 Setup tries to identify hardware conflicts and provides a mechanism to resolve possible configuration conflicts.

Setup uses the Windows 95 Plug and Play hardware detection module to detect hardware components. If a Plug and Play device is detected, its configuration information is added to the Registry. Device drivers are installed based on the

Registry settings. Plug and Play ensures that the correct files are installed and that the configuration options are set properly each time Windows 95 is started.

For information about Plug and Play, see Chapter 18, "Introduction to System Configuration." See also Chapter 31, "Windows 95 Architecture."

After you identify and confirm the components to install, Windows 95 Setup begins copying files from the Windows 95 installation disks, compact disc, or network server (whichever was specified). If you selected the option to create a startup disk, this disk is created first.

After the necessary files are copied to the computer, Windows 95 Setup prompts you to remove any disks in floppy disk drives and then restarts the computer to proceed with the final phase of Setup. The following topics describe the critical elements that occur during the File Copy phase.

### [Creating the Startup Disk](#)

---

*Important* — Microsoft strongly recommends that a startup disk be created for each computer where Windows 95 is installed.

---

The startup disk is a bootable floppy disk that loads the operating system and presents an MS-DOS command line with utilities that can be used for troubleshooting a malfunctioning system. You can create a Windows 95 startup disk during the File Copy phase of Windows 95 Setup, or create or update a disk after Windows 95 has been installed by using the Add/Remove Programs option in Control Panel.

For information about using the startup disk, see Chapter 35, "General Troubleshooting."

The startup disk has the following limitations:

n

It does not provide access to a disk drive that requires a real-mode device

driver named ATDOSXL.SYS loaded from CONFIG.SYS to access it.

n

It does not provide access to the network.

n

It does not provide access to CD-ROM drives.

Windows 95 Setup performs these actions to create the startup disk:

n

Formatting the disk in drive A.

n

Copying the IO.SYS, MSDOS.SYS, and COMMAND.COM system files to the floppy disk in drive A.

n

Copying specific files to drive A. As of this writing, the following list describes the files copied to the startup disk.

---

ATT File  
RIB Attribute  
.EX utility  
E

CO Core  
MM operating  
AN system file  
D.C  
OM

DR Disk  
VS compressi  
PA on utility  
CE.  
BIN

EB Utility for  
D.S the startup  
YS disk

EDI Text editor  
T.C  
OM

FDI Disk  
SK. Partition  
EX utility  
E

FO Disk  
RM Format  
AT. utility  
CO  
M

IO. Core  
SY operating  
S system file

MS Microsoft  
D.E Diagnostic  
XE s



MS Core  
DO operating  
S.S system file  
YS

RE Registry  
GE Editor  
DIT.  
EX  
E

SC Disk  
AN Status and  
DIS Repair  
K.E utility  
XE

SC Disk  
AN Status  
DIS utility  
K.I configurati  
NI on file

SY System  
S.C Transfer  
OM utility

For recovery purposes, you may want to manually copy SYSTEM.DAT, CONFIG.SYS, AUTOEXEC.BAT, WIN.INI, and SYSTEM.INI onto this disk.

---

Note—— For server-based setup, Windows 95 Setup reads the value of the ebd= parameter in the [setup] parameter in the MSBATCH.INF file to determine whether to create a startup disk. For more information, see Appendix D, “MSBATCH.INF Parameters.”

---

### [Creating Directories and Copying Files](#)

Windows 95 Setup creates a list of files to copy, depending on the components selected during the information gathering phase. Then various Setup DLLs run, for installing the network and other components that were requested to be installed. These DLLs determine exactly which files should be copied from the installation source and which additional directories should be created.

### [Creating Registry Entries](#)

The Setup DLLs for installing various system components also create appropriate entries in the Registry and change INI file settings as required. (Creation of the complete Registry occurs during the Hardware Detection phase.) For more information about the Registry, see Chapter 33, "Windows 95 Registry."

During the final system configuration phase, Windows 95 Setup upgrades the existing configuration of Windows and replaces the existing version of MS-DOS with the new Windows 95 operating system. During this process, Setup restarts the computer running Windows 95.

After files are updated and the operating system is configured, Windows 95 Setup uses wizards to guide you through a process to configure peripheral devices such as printers connected to the computer. When this is complete, Windows 95 is ready to use. More files may also be copied here, and you may be asked to restart the computer again.

Upon completion of the final system configuration phases, Windows 95 Setup displays a message to indicate successful installation and asks you to restart the computer. After you click OK in this message, but before it restarts the computer, Setup modifies the boot sector of the boot drive by adding a new system file (IO.SYS) that takes the place of the MS-DOS files IO.SYS and MSDOS.SYS.

---

Note — The old files are not deleted but are renamed to IO.DOS and MSDOS.DOS.

---

### [Initializing the System after Setup](#)

After first restarting the computer during the Final System Configuration phase, Windows 95 Setup updates configuration files by performing the following steps:

n

WININIT.EXE processes three sections in WININIT.INI in order to combine

all the VxDs to create VMM32.VXD and to rename files initially used by Setup, including renaming ARIAL.WIN, USER32.TMP, and LOGO.SYS.

n

SYSTEM.DAT is copied to SYSTEM.DA0, and SYSTEM.NEW is copied to  
SYSTEM.DAT.

n

The Run-Once module is run to complete the initial configuration of  
PCMCIA and MIDI devices, set up printers (if you are not installing into an  
existing Windows directory), and to run custom hardware manufacturers' setup  
programs. For information about customizing what is run as part of the Run-Once  
operation, see Chapter 5, "Custom, Automated, and Push Installations."

—Important— If the system fails when running these first-time programs, you can  
restart Windows 95, rather than rerun Windows 95 Setup.

n

A flag is set in the Registry that indicates this is the first time Windows 95-  
is being run after a new installation. Hardware manufacturers can also add  
specific entries to the Run-Once Registry key.

n

The Program Group converter adds existing Windows 3.x GRP files to the  
Programs folder as group folders and renames the files using long filenames.  
Windows 95 installation is now complete.

### Modifying the Boot Drive after Setup

Windows 95 places the real-mode operating system files named IO.SYS, MSDOS.SYS, and COMMAND.COM in the root of the computer's boot drive. The real-mode files needed to connect to the network are also placed on the computer's boot drive or device. (These filenames vary, depending on the network you use.)

Windows 95 detects boot drives and compression drivers, and adjusts to drive-swapping by writing certain startup files to the boot device.

### Verifying the Installation

Setup has an option for verifying the installation, as described in "Safe Detection, Safe Recovery, and Verification" later in this chapter. So Windows 95 Setup can install files on your disk without actually having to transfer all of the file data from the floppy disk drive, network, or other source. As a part of this process, Windows 95 rebuilds VMM32.VXD or recopies any files it finds to be damaged.

For Safe Recovery, Windows 95 Setup places two lines in AUTOEXEC.BAT during installation:

```
@if exist c:\wininst0.400\suwarn.bat call C:\wininst0.400\suwarn.bat  
@if exist c:\wininst0.400\suwarn.bat del C:\wininst0.400\suwarn.bat
```

The SUWARN.BAT file is only run once after a failed installation. These lines are removed at the end of Windows 95 Setup.

### Safe Detection, Safe Recovery, and Verification

---

This section provides technical details about the features that ensure safe hardware detection, recovery from Setup problems, and configuration verification in Windows 95 Setup.

Devices and buses are grouped as classes in Windows 95 for purposes of detecting and installing device drivers and managing system resources. Windows 95 differentiates between devices and drivers that comply with the Plug and Play specification, and earlier versions of devices and drivers (which are referred to in the WINDOWS 95 RESOURCE KIT as legacy devices). Because of this differentiation, Windows 95 Setup detects hardware components and devices in two ways:

# n

Using Plug and Play detection to identify Plug and Play-compliant devices and peripherals

# n

Using an interactive query detection process for legacy devices and peripherals

After Setup detects the device, it adds configuration information to the Registry and installs the appropriate device drivers. The same procedures used during Setup for detecting Plug and Play or legacy hardware devices are also used to detect or configure new devices after Windows 95 is installed.

Windows 95 supports detection for base computer components such as communication ports and processor type, and provides more robust detection of computer devices including video display adapters, pointing devices, hard-disk controllers, floppy-disk controllers, and network adapters.

Windows 95 Setup also helps to detect any hardware resource conflicts early in the installation process. This helps to avoid the problems that occur when hardware resources such as IRQs, I/O addresses, or DMA addresses are used by more than one device.

To avoid computer failure during the detection process, Windows 95 uses a safe-detection method to search for hints from configuration files, read-only memory (ROM) strings, or drivers loaded in memory to determine whether the computer contains each class of hardware. If no such hints are found, the detection process skips detecting the entire class. If hints are found, then the detection process inquires for information from specific I/O ports.

Windows 95 automatically reads the command lines in CONFIG.SYS to find hints for device class detection. Then Windows 95 loads detection modules based on information in MSDET.INF, which lists the hardware to be detected and points to specific INF files for each device class (for example, SCSI.INF for SCSI host adapters). Device information from the INF files is written to the Registry. For more information about the format of these files, see Appendix C, "Windows 95 INF Files."

Windows 95 Setup asks you to confirm which classes should be skipped in the detection process. If you know that the computer has a device in one of those classes, Setup can be forced to detect that device class.

Windows 95 can also read a particular CONFIG.SYS *device=* line for resource information to be avoided (that is, protected) during the detection process. This is useful if Windows 95 Setup cannot detect or support a certain device when it's known that the detection process can cause such a device to fail. For example, the detection process could possibly render a fax modem inoperative because scanning the I/O port might confuse the device driver. Windows 95 can read the *device=* line in CONFIG.SYS for this model and protect the associated I/O region from other detection modules.

Safe detection exists for four classes of devices:

n Network adapters

n SCSI controllers

n Proprietary adapters for CD-ROM

n

Sound cards

### [Safe Detection for Network Adapters](#)

Windows 95 Setup performs these steps for safe detection of network adapters:

n

Find LSL.COM in memory and, if present, inquire for network adapter settings.

n

Find IPX.COM in memory and, if present, inquire for network adapter settings.

n

Search the Windows, Windows for Workgroups, and LAN Manager directories for PROTOCOL.INI; if present, read the file to find network adapter settings.

### [Safe Detection for SCSI Controllers](#)

When trying to detect SCSI adapters, Windows 95 Setup checks for device drivers in

CONFIG.SYS, and then scans ROM strings from the SCSI adapter for manufacturer names. If known drivers or known strings are found, then the corresponding detection procedure for that class is used; otherwise, the entire class is skipped. A list of the known strings and drivers that Windows 95 Setup checks is stored internally in a detection DLL. (For more information about the SCSI devices and drivers that Windows 95 supports, see the [HARDWARE COMPATIBILITY LIST](#).)

Different SCSI devices require different methods for safe detection. For example, a SCSI card is typically used with a combination of hard disks, CD-ROM, tape backup, scanners, and similar devices. For everything to work (except the hard disk), some sort of device driver must be loaded in CONFIG.SYS.

For hard disk drives, however, the driver is not usually loaded in CONFIG.SYS, but INT 13 ROM will be enabled. Therefore, safe detection for SCSI class devices looks for a ROM string with a manufacturer's name.

#### [Safe Detection for Proprietary Adapters for CD-ROM](#)

Windows 95 supports Mitsumi, SONY®, and Panasonic® proprietary adapters for CD-ROM. Because drivers for these devices are loaded in CONFIG.SYS, safe detection first scans CONFIG.SYS for the drivers that are present. If a *device=* line for such a driver is found, the corresponding detection module is loaded for that type of device.

#### [Safe Detection for Sound Cards](#)

Safe detection scans CONFIG.SYS and reads SYSTEM.INI for hints about sound cards. If known drivers are not found, the entire class is skipped.

If Windows 95 doesn't have detection code for certain hardware, the equipment manufacturer can force a device to be detected by adding information about it in MSDET.INF. Windows 95 detection behaves as if it has detected the device and installs the device according to the INF information provided by the equipment manufacturer.

Windows 95 Setup does not detect sound cards by scanning I/O ports and instead only checks CONFIG.SYS and SYSTEM.INI and performs detection prescribed in MSDET.INF. Detection of sound cards by scanning I/O ports can cause the computer to stall. This is because detection calls a driver specific to a device class to send a signal to an I/O port. The driver expects a predetermined response, such as a signature from the adapter's ROM. If the wrong driver sends a signal to an I/O port address occupied by a different device class, the computer can stall.



Windows 95 Setup creates several log files: BOOTLOG.TXT, DETLOG.TXT, and SETUPLOG.TXT, plus DETCRASH.LOG if Setup fails. The following sections describe these files.

Basically, there are three points at which the computer might stop or stall during Windows 95 Setup: before, during, or after hardware detection.

n

If Setup fails before hardware detection, Windows 95 Setup recovers by reading SETUPLOG.TXT to determine where the system stalled, what to redo, and what to skip.

n

If Setup fails during hardware detection, the DETCRASH.LOG file is created, containing information about the detection module that is running and the I/O port or memory resources it was accessing when the failure occurred.

When the detection process finds this file, it automatically goes into Safe Recovery mode to verify all the devices already in the Registry and then skips all detection modules up to the failed module. Safe Recovery also skips all the configuration that has been run for the failed module. It then continues normal detection after that failed module, in effect skipping the detection action that caused the failure and continuing from there. If the detection process is successfully completed, DETCRASH.LOG is deleted.

DETCRASH.LOG can only be read by Setup. The text equivalent of this information is available in DETLOG.TXT, as described later in this section.

n

Sometimes the detection process causes some devices to quit working (such as a CD-ROM drive or a network connection). If you rerun Setup, Safe

Recovery recognizes that the detection process has already been completed successfully, and assumes that all the necessary hardware information is in the Registry. Therefore, it skips the detection process totally at this point and continues the installation process.

### [SETUPLOG.TXT: The Setup Log File](#)

The SETUPLOG.TXT file is an ASCII text file that contains Windows 95 Setup information created during the installation process. While Windows 95 is being installed, corresponding entries are written to SETUPLOG.TXT, listing information about the specific steps, their sequence, and the error conditions encountered. This file is used by Setup for recovery in case of setup failure, and can also be used for troubleshooting errors that might occur during the installation process.

Setup uses the information in SETUPLOG.TXT to ensure that the installation does not fail twice because of the same problem. If you restart Windows 95 Setup after a setup process fails, Setup reviews the contents of SETUPLOG.TXT to determine which steps completed successfully. If SETUPLOG.TXT indicates that a process started but does not indicate that the process completed, then that part of the installation process is skipped and the next part is processed, so the same mistake is not made twice. Even if Setup encounters devices that cause several installation attempts, the installation process will always be progressing, skipping the detection module that failed.

SETUPLOG.TXT is stored on the computer's root directory. Information is added to the file in the order of the steps of the installation process. If an error occurs during installation, you can determine the probable cause of the error by examining the entries at the end of SETUPLOG.TXT.

Information in SETUPLOG.TXT is divided into the following basic categories:

n

Selected Setup sections, including the following:

[Optional Components]  
[System]  
[NameAndOrg]  
{                            };as specified in MSBATCH.INF

Tip— These sections can be copied from SETUPLOG.TXT on a computer with a complete installation of Windows 95 and then added to equivalent sections in MSBATCH.INF, as described in Chapter 5, “Custom, Automated, and Push

Installations.”

n

Setup of startup parameters

n

Directory selection

n

Beginning of installation process

n

Queuing of needed files

n

Copying of needed files

# n

## Preparation for restarting the system

The following table shows entries in SETUPLOG.TXT file to check for information about the Setup process. Because entries are added to SETUPLOG.TXT in the order the related actions occur during Setup, you may be able to find a probable cause of any error by examining the entries at the end of the file.

---

|                     |                         |
|---------------------|-------------------------|
| Inst<br>allTy<br>pe | Type of<br>installation |
|---------------------|-------------------------|

|                    |                                                     |
|--------------------|-----------------------------------------------------|
| Inst<br>allDi<br>r | Directory<br>where<br>Windows<br>95 is<br>installed |
|--------------------|-----------------------------------------------------|

|               |                     |
|---------------|---------------------|
| dete<br>ction | Detection<br>status |
|---------------|---------------------|

|                    |                                                    |
|--------------------|----------------------------------------------------|
| Run<br>ning<br>App | Application<br>s running<br>during<br>installation |
|--------------------|----------------------------------------------------|

|                                  |                                           |
|----------------------------------|-------------------------------------------|
| Root<br>Files<br>Ren<br>ame<br>d | Files renamed<br>in the root<br>directory |
|----------------------------------|-------------------------------------------|

|       |                                            |
|-------|--------------------------------------------|
| error | Errors<br>logged<br>during<br>installation |
|-------|--------------------------------------------|

|            |                                        |
|------------|----------------------------------------|
| faile<br>d | Failures<br>that<br>occurred<br>during |
|------------|----------------------------------------|

installation

[Optional component  
Components installed  
Optional components  
]

[System] System  
hardware  
configuration  
on

batc Installation  
h parameter  
settings (that is,  
MSBATCH  
.INF  
settings)

Registry Registry  
initialization  
status

f Verification  
that a  
specific file  
was  
loaded  
during  
installation

i

l  
e  
n  
a  
m



[Cho Location  
ose and type of  
Dire Windows  
ctor files  
y]

[File Files  
Cop copied  
y] during  
Setup

[Res Issues to  
tart] be  
completed  
after  
restart

### [Tip for Verifying System Files](#)

Under Windows 3.x, you could not easily recover a file if you accidentally deleted a component file or if a system file was corrupted. You either had to use the Expand utility to copy a known file, or you had to completely reinstall Windows 3.x to restore the lost file. SETUPLOG.TXT is part of the Windows 95 solution to this problem. The information in SETUPLOG.TXT can be used after Windows 95 is successfully installed to verify the integrity of installed components.

If you run Windows 95 Setup after Windows 95 is already installed, Setup asks whether to reinstall Windows 95 or simply to verify installed components. If you want to verify installed components, Setup examines SETUPLOG.TXT and reruns the installation process without completely copying all operating system components. Windows 95 verifies the integrity of files installed during Setup with the files on the Windows 95 installation disks. If the integrity check fails due to a missing or corrupted file on the computer, Setup automatically reinstalls that file.

This simplifies and reduces the time required to resolve missing files or corrupted configurations.

## DETLOG.TXT: The Hardware Detection Log File

The DETLOG.TXT file contains a record of whether a specific hardware device was detected and identifies the parameters for the detected device.

During Windows 95 Setup, after the Gathering Information phase, Setup begins hardware detection. Hardware detection can also occur when you use the Device Manager or Add New Hardware option in Control Panel to add a new device. Windows 95 automatically checks the Registry for detected devices. If you choose the Auto-Detect option, hardware detection runs and a new DETLOG.TXT file is created. Both Windows 95 Setup and Device Manager use SYSDETMG.DLL, which contains all the detection modules for each device class and specific devices.

Windows 95 loads detection modules based on information in MSDET.INF which points to specific INF files for each device class, from which information is retrieved and written to the Registry. The device class installers are DLLs that work with the Device Manager to install, configure, and remove devices or classes of devices in the system. The Device Manager generates a list of compatible drivers for the device from the appropriate INF file. For information about using Device Manager to add and configure device drivers, and for information about the device classes used to identify logical device types such as display, keyboard, and network adapters, see Chapter 19, "Devices."

The detection module tracks the devices detected and the I/O port addresses used by creating an updated DETLOG.TXT file every time the detection process runs. The previous DETLOG.TXT is saved to DETLOG.OLD. If the detection process causes Setup to stall or the computer to lock up, then a binary file named DETCRASH.LOG is created. DETLOG.TXT is an ASCII text file created only for users to read. Windows 95 Setup reads the binary information in DETCRASH.LOG. Any changes made to DETLOG.TXT are not passed to DETCRASH.LOG.

The DETLOG.TXT file can be found in the root directory of the startup drive after Windows 95 is installed. The entries in DETLOG.TXT are placed in the order of the hardware detection information discovered as each step of the detection process is carried out.

The following table briefly describes entries that appear in DETLOG.TXT.

### Summary of DETLOG.TXT Entries

---

|     |           |
|-----|-----------|
| Par | Shows the |
| am  | switches  |



eter specified in  
s="x the Setup  
xxx command  
xx" line (that is,

X

X

X

X

X



For  
example:

Parameters  
""  
Flags=010  
02233

Win Shows that  
Ver environme  
= nt detection  
### is run. The  
### MS\_DOS  
## version is  
in the high  
word and  
Windows  
version in  
the low  
word. For  
example:

WinVer=06  
14030b.

Avoi If present,  
dM indicates  
em the  
= address  
### range  
##h specified  
- as UMB  
### memory  
##h blocks,  
which  
detection  
avoids. For  
example:

AvoidMem

=cd4a0-  
cd50f

Det Indicates  
ect that  
Cla detection  
ss: found no  
Ski hints that  
p the  
Cla computer  
ss may have a  
Me particular  
dia device, so  
it skipped  
that class.

For  
example, \_  
\_ indicates  
that no  
sound  
entries  
appear in  
the  
configuratio  
n files, so  
detection  
skips all  
the sound  
card  
detection  
modules.

For \_\_\_\_\_,  
detection  
skips  
searching  
for  
proprietary  
CD\_ROM  
adapters  
such as  
Sony,  
Mitsumi,  
and  
Panasonic.

indicates

that  
detection  
was  
skipped for  
network  
adapters.

Det If one or  
ect more \_  
Cla entries  
ss appears in  
Ove DETLOG.T  
rrid XT, the  
e: Hardware  
Detection  
screen  
appears in  
Setup to  
confirm  
skipping  
those  
classes, so  
you can  
override  
the  
decision.  
Related \_  
lines  
appear in  
DETLOG.T  
XT for the  
classes  
checked.

Cus Describes  
tom your  
Mo selection  
de: for the  
devices  
you tell  
Windows  
95 not to  
detect. For  
example:

CustomMo  
de:

resetting  
class  
ADAPTER  
; Don't  
detect  
EtherLinkIII  
CustomMo  
de:  
DETECTE  
LNK3=0

Dev Indicates  
ices the number  
verif of devices  
ied verified  
= from the  
Registry. If  
the number  
is 0, it  
usually  
means  
there was  
no existing  
Registry or  
the  
Registry  
was empty.

---

Che Specifies  
ckin that  
g detection  
for: began  
looking for  
that device.  
The entry  
is followed  
by  
description  
of the  
device or  
class being  
sought.  
When

detection is checking for a device such as the Programmable Interrupt Controller, the \_entry is followed by a \_entry specifying the Caller, rcQuery, and I/O range checked. If a device is detected, then a \_entry is added, specifying the device resource information. For example:

Checking  
for:  
Programm  
able  
Interrupt  
Controller  
QueryIOMe  
m:  
Caller=DET  
ECTPIC,  
rcQuery=0  
IO=20-  
21,a0-a1  
Detected:  
\*PNP0000\  
0000 =  
[1]

Programm  
able  
Interrupt  
Controller  
IO=20-  
21,a0-a1  
IRQ=2

-----

Check This  
This section lists  
the  
for: attempts to  
detect  
network  
adapters.  
For  
example:

Checking  
for:  
Network  
Cards  
using  
Novell  
ODI  
Driver  
Checking  
for: EISA  
Network  
Cards

PR If detection  
OT finds  
OC PROTOCO  
OL.I L.INI, it  
NI saves the  
Sec  
tion

[ n

e

t

—

c

a



r

d ]

section in  
DETLOG.T  
XT. For  
example:

Checking  
for:  
Network  
Cards  
using

Microsoft  
Windows  
For  
Workgroup  
s  
: path to  
WFW  
protocol.INI  
WFW:  
path=d:  
\w311\proto  
col.ini  
.  
protocol.ini  
mac driver  
section  
Protocol.ini  
.  
[MS\$EE16]

Protocol.ini

.  
=  
DriverName  
e=EXP16\$

NC Indicates  
D: that  
det detection  
ecti has found  
ng a network  
net adapter  
wor using safe  
k detection  
ada (usually  
pter PROTOCO  
L.INI), but  
the system  
has  
information  
for verifying  
this  
adapter. If  
this  
adapter is  
verified, a \_  
line follows.  
For  
example:

NCD:  
detecting  
network  
adapter  
\*pnp812d  
QueryIOMe  
m:  
Caller=DET  
ECTWFW.  
rcQuery=0  
IO=300-30f

The hardware detection process continues examining computer hardware. In the following example, the | symbol in the IO= line (for example, IO=200-201 | 3e0-3e1) indicates a range of I/O entries checked during the detection process. In your DETLOG.TXT file, you will find a QueryIOMem: and an IO= line for each I/O address checked.

For most devices, multiple I/O addresses are checked, which can result in a detailed and redundant device detection list. The I/O address ranges checked during detection are grouped on one I/O line. Multiple addresses on an I/O line are separated by a comma. For example:

Checking for: ATI Ultra Pro/Plus (Mach 32) Display Adapter  
QueryIOMem: Caller=DETECTMACH32, rcQuery=0  
IO=3b0-3bb,3c0-3df  
QueryIOMem: Caller=DETECTMACH32, rcQuery=0  
Mem=a0000-affff

If the system stalls during hardware detection, you can determine the probable cause of the error by examining the last entries in DETLOG.TXT. You can use the information in this file to determine specific error conditions occurring in the hardware detection, and reconfigure or replace the specific adapter or device. The following table shows specific kinds of entries to check in DETLOG.TXT for information on the results of the hardware detection process.

#### DETLOG.TXT Entries to Check for Troubleshooting

---

dete Detected  
cted devices

Avoi Address  
dMe ranges of  
m Upper  
Memory  
Blocks  
avoided  
during  
detection

erro Errors  
r logged  
during  
system  
detection

Win Setup  
Flag mode used  
s

PR PROTOCO  
OT L.INI  
OC information  
OL.I that was  
NI saved

during  
system  
upgrade

Custom Hardware  
that was  
removed  
from  
detection  
in the  
custom  
Hardware  
Detection  
dialog box

Devices  
found in  
Registry; if  
the value is  
0, then  
there was  
no existing  
Registry or  
the  
Registry  
was empty

Some additional notes on DETLOG.TXT and hardware detection:

n

Detection does not detect enumerated devices such as ISA Plug and Play

devices, PCI devices, and PCMCIA devices. For information about these  
devices, see Chapter 18, "Introduction to System Configuration."

n

If the computer stalls during detection, and you rerun Windows 95 Setup

and choose Safe Recovery, new detection information is appended to the previous DETLOG.TXT file. The previous version of DETLOG.TXT is saved as DETLOG.OLD. Only one instance of the \*.OLD file is saved.

## *Windows 95 Startup Process*

---

Windows 95 includes new system files, Plug and Play mechanisms, and various options for starting the operating system. This section describes the Windows 95 system startup sequence.

During the real mode startup process, devices use only static configurations; that is, no dynamic resource allocation or arbitration is provided. When the system startup process switches to protected mode, the Configuration Manager ensures all devices are properly configured, as described in Chapter 31, "Windows 95 Architecture."

The system startup includes four phases:

n

Bootstrapping the system with BIOS in control

n

Loading MS-DOS drivers and TSRs for compatibility

n

Initializing static VxDs in real mode

# n

Putting the protected mode operating system in control and loading the remaining VxDs

Microsoft has worked with several hardware manufacturers to define a new Plug and Play BIOS specification, which defines the interactions among a Plug and Play BIOS, Plug and Play devices, and option ROMs (sometimes called adapter ROMs). The Plug and Play BIOS enables and configures Plug and Play boot devices. The Plug and Play BIOS also passes configuration information to the Configuration Manager for configuring the remaining adapters and devices.

### [Booting with a Legacy BIOS](#)

For legacy computers that do not have Plug and Play BIOS, the BIOS enables all devices on the ISA bus. A Plug and Play ISA card that has option ROM must start up at power-on with the option ROM enabled.

### [Booting with a Plug and Play BIOS](#)

A Plug and Play BIOS accesses non-volatile RAM to determine which Plug and Play ISA cards should be enabled, where their option ROMs should be mapped, and what I/O, direct memory access (DMA), and other assignments are to be given to the cards.

The BIOS then programs the Plug and Play cards before the power-on self-test (POST). All cards that do not have configurations stored in the BIOS are disabled completely, reducing the chance of a conflict.

The Plug and Play BIOS also configures all devices on the motherboard. Some devices may have been disabled or assigned to different I/O, IRQ, and so on, by the Configuration Manager.

After BIOS initialization, the operating system attempts to determine the current configuration, including whether the computer is a docking station. This is done

using a hardware profile that Windows 95 selects before CONFIG.SYS is processed. The hardware profile is built by a detection process that collects information about interrupt usage, BIOS serial and parallel ports, BIOS computer identification, Plug and Play BIOS docking station data, and, if possible, docking station data that is unique to each OEM. Then the detection process builds a 2-byte value known as the current hardware profile (or the current configuration).

Each hardware profile has a name that matches a top-level menu item in a multi-configured CONFIG.SYS file (that is, the long text in the menu, not the section name enclosed in square brackets). Windows 95 automatically selects that multi-configuration menu item and automatically processes the corresponding section of CONFIG.SYS.

CONFIG.SYS and AUTOEXEC.BAT are processed at this point. Although these files are not required for Windows 95, they are used for backward compatibility with applications created for MS-DOS or Windows 3.x. In Windows 95, CONFIG.SYS and AUTOEXEC.BAT are processed similarly to the way they are processed under MS-DOS 6.x. Drivers and TSRs specified in these files are loaded in real mode.

For more information, see "System Startup Files" later in this chapter.

---

Note — The real-mode MS-DOS errors are standard, as documented in the MS-DOS 6.0 PROGRAMMER'S REFERENCE.

---

Windows 95 supports static VxDs that load during system startup in the same way as Windows 3.x VxDs, and it also supports dynamically loaded VxDs. VMM32.VXD is the executable Virtual Machine Manager that is the Windows 95 VxD loader which contains the system VxDs combined during the installation process. Notice, however, that if a VxD file is in the Windows SYSTEM\VMM32 directory, Windows 95 loads it in addition to the combined VxDs in MRCI2.VXD.

---

Note — If you want to update a VxD that has been bound into the monolithic VMM32.VXD, place the VxD file in the SYSTEM\VMM32 directory. Windows 95 always checks that directory and uses any individual VxDs it finds instead of loading those bound in VMM32.VXD.

---

The following list describes the VxDs that are combined to create VMM32.VXD. These drivers used to be specified in the [386enh] section of SYSTEM.INI.

VxDs Combined to Create VMM32.VXD

\*bios \*reb \*vkd  
xlat oot

```

*confi *vca *vmc
gmg che pd

*dyna *vco *vmo
page mm use

*ebio *vco *vmp
s nd oll

*ifsm *vdd *vsd
gr

*int13 *vde *vtda
f pi

*ios *vfat *vwi
n32

*parit *vfb *vxdl
y acku dr
p

```

VMM32 loads VxDs in three distinct steps:

n

VMM32 loads base drivers specified in the Registry, which contains

entries for every VxD not directly associated with any hardware. VxDs are located in this branch of the Registry:

Hkey\_Local\_Machine\System\CurrentControlSet\Services\VxD

n

If VMM32 finds a value *StaticVxD=* in any Registry key, it loads that VxD

and runs its real-mode initialization. For example, the following entry loads \*V86MMGR:

SYSTEM\CurrentControlSet\Services\VxD\V86MemoryManger  
Description=MS-DOS Virtual 8086 Memory Manager



Manufacturer=Microsoft  
StaticVxD=\*V86MMGR  
EMMEXCLUDE=E000-EFFF

n

VMM32 loads static VxDs specified in *device=* lines in the [386enh]

section of SYSTEM.INI.

If a specific device conflicts with a device loaded from the Registry, the device specified in SYSTEM.INI takes precedence. However, if the device specified in SYSTEM.INI cannot be found, an error will occur.

Many Windows 95 driver models, such as IOS (for disk drivers) and the network, support dynamically loaded device drivers. These VxDs are not loaded by the VMM32 real-mode loader, but are loaded by a device loader that is responsible for loading and initializing the drivers at the correct time and in the correct order.

For example, for SCSI adapter miniport drivers, the device loader is \*IOS. The entries for a SCSI adapter are found in this Registry key:

Hkey\_Local\_Machine\System\CurrentControlSet\Services\Class

Because there is no *StaticVxD=xxx* line in this Registry entry, the VMM32 real-mode loader does nothing when Windows 95 identifies this device.

Configuration Manager attempts to find any device node that has a *DevLoader=* entry in the Registry. The device loader (in the previous example, \*IOS) examines the Registry, finds the *PortDriver=* entry, loads the driver and any associated support drivers, and initializes the adapter.

In the previous phase, these elements of the operating system were loaded:

n

WIN.COM, which controls the initial checks and loading of the core

## Windows 95 components

n

VMM32.VXD, which creates virtual machines and initiates VxD loading

n

SYSTEM.INI, which is read for entries that differ from Registry entries

After all static VxDs are loaded, VMM32.VXD switches the processor to operate in protected mode, and the last phase of the boot process begins. This phase involves loading the protected-mode components of the operating system.

### [Loading Protected-Mode VxDs at Startup](#)

The protected-mode Configuration Manager is initialized for importing configuration information from a Plug and Play BIOS (if available); otherwise, it develops the Plug and Play hardware tree by enumerating devices and loading dynamically loadable device drivers. These device drivers are identified by loading drivers from a specific directory.

The next phase resolves device resource conflicts for every device in the tree and then informs the devices of their configuration. When all devices have been enumerated, all conflicts have been resolved, and all devices have been initialized, Windows 95 is ready to be used.

### [Loading the Final System Components at Startup](#)

The remaining Windows 95 system components are loaded in the following sequence:

n

KRNL386.EXE provides the main operating system code.

n

GDI.EXE and GDI32 provide the graphic device interface code.

n

USER.EXE and USER32 provide the user interface code.

n

Associated resources, such as fonts, are loaded.

n

WIN.INI values are checked.

# n

The shell and desktop components are loaded.

At this point, a prompt appears so that you can log on by typing a user name and a password. After you log on, Windows 95 can process user-specific configuration information. If you do not log on, default settings are used to determine user preferences and so on. If Windows 95 is configured for network logon, the unified Windows 95 logon can be used to log onto the network during this process.

After Windows 95 is loaded and you log on, the Startup folder is processed.

## *System Startup Files*

---

This section describes the following files involved in Windows 95 system startup:

# n

IO.SYS, the real-mode operating system that replaces the MS-DOS

version

# n

MSDOS.SYS, which contains special information for Windows 95 and is

also created for compatibility with applications that require this file to be present before they can be installed

n

CONFIG.SYS and AUTOEXEC.BAT

n

SYSTEM.INI and WIN.INI

n

BOOTLOG.TXT, the log file that describes the system startup processes

The following table summarizes how Setup renames the system files for the previous operating system when Windows 95 is installed.

---

|        |        |
|--------|--------|
| AUTOE  | AUTOE  |
| XEC.B  | XEC.D  |
| AT     | OS     |
| COMM   | COMM   |
| AND.C  | AND.D  |
| OM     | OS     |
| CONFI  | CONFI  |
| G.SYS  | G.DOS  |
| IO.SYS | IO.DOS |
| (or    |        |
| IBMBI  |        |
| O.COM  |        |
| )      |        |
| MODE.  | MODE_  |

|           |           |
|-----------|-----------|
| COM       | DOS.COM   |
| MSDOS.SYS | MSDOS.SYS |

Windows 95 uses a new system file, IO.SYS, which replaces the MS-DOS system files (IO.SYS and MSDOS.SYS). This real-mode operating system file contains the information needed to start the computer. Your computer no longer needs CONFIG.SYS and AUTOEXEC.BAT to start the Windows 95 operating system (although these files are preserved for backward compatibility with certain applications and drivers).

---

Note — The Windows 95 IO.SYS file is renamed to WINBOOT.SYS when you start the computer using your previous operating system.

---

The drivers loaded by default in IO.SYS include the following:

n HIMEM.SYS

n IFSHLP.SYS

n SETVER.EXE

# n

DBLSPACE.BIN or DRVSPACE.BIN (if found on the hard disk)

Most of the common functionality provided by the various CONFIG.SYS file entries are now provided by default in IO.SYS. The following table lists the common entries in CONFIG.SYS that are now incorporated into IO.SYS, and shows the default values for Windows 95.

### Default CONFIG.SYS Settings Incorporated in Windows 95 IO.SYS

---

|                          |                                                                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dos<br>=hig<br>h,u<br>mb | Specifies<br>that MS-<br>DOS<br>should be<br>loaded in<br>the high<br>memory<br>area<br>(HMA).<br>This is the<br>default for<br>Windows<br>95.                             |
| him<br>em.<br>sys        | Enables<br>access to<br>the HMA.<br>This line<br>loads and<br>runs the<br>real-mode<br>Memory<br>Manager.<br>HIMEM.SY<br>S is loaded<br>by default<br>in<br>Windows<br>95. |

ifshl Installable  
p.sy File  
s System  
Helper,  
which  
loads  
device  
drivers.  
This allows  
the system  
to make  
file system  
calls. Until  
this is  
loaded,  
only the  
minimal  
file system  
from  
IO.SYS is  
used. After  
this point,  
the full file  
system is  
available.

setv Optional  
er.e TSR-type  
xe device. It  
is included  
for  
compatibili  
ty reasons.  
Some MS-  
DOS-  
based  
application  
s require a  
specific  
version of  
MS-DOS  
to be  
running.  
This file  
responds  
to



applications that query for the version number and sets the version number required.

files Specifies the number of file handle buffers to create. This is specifically for files opened using MS-DOS calls and is not required by Windows 95. It is included for compatibility with older applications.

lastdrive Specifies the last drive letter available for assignment. Again, this is not required for Windows 95 but is

included  
for  
compatibility with  
older  
applications. If  
Windows  
95 Setup  
finds this  
entry, it is  
moved to  
the  
Registry.

buff Specifies  
ers= the  
30 number of  
file buffers  
to create.  
This is  
specifically  
for  
applications  
using  
IO.SYS  
calls and is  
not  
required  
by  
Windows  
95.

stac Specifies  
ks=9 the  
,256 number  
and size of  
stack  
frames.  
This is not  
required  
for  
Windows  
95 but is  
included  
for  
compatibility

ty with  
older  
application  
s.

shell Indicates  
=co what  
mm command  
and. process to  
com use. The  
/p switch  
indicates  
that the  
command  
process is  
permanent  
and should  
not be  
unloaded.  
If the . is  
not  
specified  
in  
CONFIG.S  
YS, the  
command  
process  
can be  
unloaded  
when  
quitting the  
operating  
system.

fcbs Specifies  
=4 the  
number of  
file control  
blocks that  
MS\_DOS  
can have  
open at  
the same  
time. You  
should use  
a . line in  
CONFIG.S

YS only if  
you have  
an older  
program  
that  
requires  
such a  
setting.

[To override default values in Windows 95 IO.SYS](#)

n

Place an entry in CONFIG.SYS with the value you want.

The values in IO.SYS cannot be edited. If CONFIG.SYS contains switches or other parameters for any of the drivers or settings created by IO.SYS, the CONFIG.SYS entries override the IO.SYS defaults. Entries for `files=`, `buffers=`, and `stacks=` must be set in CONFIG.SYS to at least the default values in IO.SYS.

---

Note—— IO.SYS does not load EMM386.EXE. If any of your applications requires expanded memory, EMM386 must be defined in CONFIG.SYS. For details about settings values of `emm386=`, see Appendix A, “Command-Line Commands Summary.”

---

Windows 95 Setup creates a hidden, read-only system file named MSDOS.SYS in the root of the computer's boot drive. This file contains important paths used to locate other Windows files, including the Registry. MSDOS.SYS also supports an [Options] section, which you can add to tailor the startup process.

The following example shows a typical file with default values:

[Options]  
BootGUI=1

[Paths]  
WinDir=C:\WINDOWS

WinBootDir=C:\WINDOWS

HostWinBootDrv=C

The values in the [Options] section can be 1 (enabled) or 0 (disabled). The following table describes each entry in MSDOS.SYS.

MSDOS.SYS Values

---

Hos Defines the  
tWi location of  
nBo the boot  
otD drive root  
rv= directory.  
c

Win Defines the  
Boo location of  
tDir the  
= necessary  
startup  
files. The  
default is  
the  
directory  
specified  
during  
Setup; for  
example,  
C:  
\WINDOW  
S.

Win Defines the  
Dir location of  
= the  
Windows  
95 directory  
as specified  
during  
Setup.

---

Boo Sets the  
tDel initial

ay= startup  
delay to



seconds.  
The default  
is 2. \_\_\_\_  
disables  
the delay.  
The only  
purpose of  
the delay is  
to give the  
user  
sufficient  
time to  
press F8  
after the  
Starting  
Windows  
message  
appears.

Boo Specifies  
tFai whether to  
lSaf use Safe  
e=0 Mode for  
system  
startup.  
When the  
value is 0,  
this setting  
is disabled.  
(Used by  
equipment  
manufactur  
ers for  
installation.  
)

Boo Enables

tGU automatic  
l=1 graphical  
startup. 0  
disables  
this setting.

Boo Enables the  
tKe special  
ys= startup  
1 option keys  
(that is, F5,  
F6, and  
F8). Setting  
this value  
to 0  
prevents  
any startup  
keys from  
functioning.  
This setting  
allows  
system  
administrat  
ors to  
configure  
more  
secure  
systems.  
(These  
options are  
described  
in Chapter  
35,  
“General  
Troublesho  
oting.”)

Boo Specifies  
tMe whether the  
nu= Windows  
0 95 Startup  
menu  
appears by  
default.  
Setting this  
value to 0  
eliminates

the need to  
press F8 to  
see the  
menu.

Boo Sets the  
tMe default  
nu menu item  
Def on the  
ault Windows  
=# Startup  
menu; the  
default is 1  
if the  
system is  
running  
correctly, or  
3 if the  
system was  
previously  
stalled.

Boo Sets the  
tMe number of  
nu seconds to  
Del display the  
ay= Windows  
# Startup  
menu  
before  
running the  
default  
menu item.  
The default  
is 30.

Boo Specifies  
tMu dual-boot  
lti= capabilities.  
0 Setting this  
value to 1  
enables the  
ability to  
start  
MS\_DOS  
by pressing  
F4. This



option is disabled by default in Windows 95, and is not available when you press F8 to use the Start menu unless the value is set to 1.

Boo Enables the  
tWa Safe Mode  
rn= startup  
1 warning  
and menu.

Boo Specifies  
tWi whether  
n=1 Windows  
95 is the  
default  
operating  
system.  
Setting this  
value to 0  
disables  
Windows  
95 as the  
default; this  
is useful  
only with  
MS-DOS  
version 5 or  
6.x on the  
computer.

Dbl Specifies  
Spa automatic  
ce= loading of  
1 DBLSPACE  
.BIN.

Do Specifies

ubl whether a  
eBu SCSI  
ffer controller  
=0 needs a  
double-  
buffering  
driver  
loaded.  
Setting this  
value to 1  
enables  
double-  
buffering.

Drv Specifies  
Spa automatic  
ce= loading of  
1 DRVSPAC  
E.BIN.

Loa Specifies  
dTo whether to  
p=1 load  
COMMAND  
.COM or  
DRVSPAC  
E.BIN at  
the top of  
640K  
memory.  
Set this  
value to 0 if  
compatibilit  
y problems  
occur with  
Novell  
NetWare®  
or any  
software  
that makes  
assumption  
s about  
what is  
used in  
specific  
memory  
areas.

Log Specifies  
o=1 whether the  
animated  
logo is  
displayed.  
Setting this  
value to 0  
also avoids  
hooking a  
variety of  
interrupts  
that can  
create  
incompatibil  
ities with  
certain  
third-party  
memory  
managers.

Net Specifies  
wor whether  
k=0 Windows  
95 network  
software  
component  
s are to be  
installed. If  
set to 1,  
enables  
Safe Mode  
with  
Networking  
as a menu  
option.

### [Tip for Starting an Earlier Version of MS-DOS](#)

If you installed Windows 95 into its own directory, the earlier version of MS-DOS is preserved on your hard disk. If you set *BootMulti=1* under the [Options] heading in the Windows 95 version of MSDOS.SYS, you can start the earlier version of MS-DOS by pressing F4 when the Starting Windows message appears during system startup.

For Windows 95, both the content and method are changed for handling CONFIG.SYS and AUTOEXEC.BAT during system startup. Windows 95 automatically loads drivers and sets defaults by using IO.SYS, the Registry, and other mechanisms, rather than CONFIG.SYS and AUTOEXEC.BAT.

However, computers that require certain real-mode drivers or TSRs will continue to need those files to be loaded from these configuration files. Also, CONFIG.SYS and AUTOEXEC.BAT might be required to enable certain software options. However, some options, such as long command lines, can also be enabled by using the COMMAND.COM Program property sheet. For example, the following illustration shows how to run COMMAND.COM using the *shell* command.

```
{ewc msdncd, EWGraphic, x0e 0 /a "psE.bmp"}
```

### [CONFIG.SYS Processing](#)

CONFIG.SYS defaults are implemented by IO.SYS, as described in the previous section. On a new installation, Windows 95 Setup does not create a CONFIG.SYS file, except in special cases, such as in a computer that requires double-buffering. However, CONFIG.SYS can contain application-specific entries in addition to information stored in IO.SYS. These are processed in the sequence they are listed. After the base CONFIG.SYS file has been read, all devices are loaded, and COMMAND.COM is running.

Windows 95 loads memory managers supplied by other vendors if they are present in CONFIG.SYS; however, some may cause errors. Similarly, Windows 95 allows the use of third-party command shells, but, for example, long filenames are disabled. This may indicate that other problems can occur using these command shells.

### [CONFIG.SYS Changes for Windows 95](#)

Windows 95 has predefined settings built in for most common CONFIG.SYS settings, so Windows 95 Setup removes many of these lines if they are set to the default values, by using REM to comment out the line.

### [Tips for Editing CONFIG.SYS](#)

If you edit CONFIG.SYS in Windows 95, observe these basic guidelines:

n

Do not include the *smartdrv* command. Windows 95 includes built-in disk caching, and double buffering is now provided by DBLBUFF.SYS.

n

Remove any *mouse=* device lines. Windows 95 includes built-in mouse support.

The following tables describe the changes that Setup makes to CONFIG.SYS.

*Device Entries Deleted from CONFIG.SYS if Found*

|       |       |       |
|-------|-------|-------|
| ifshl | share | smart |
| p.sy  | .exe  | drv.s |
| s     |       | ys    |
|       | share |       |
| fast  | .com  | smart |
| ope   |       | drv.e |
| n     | share | xe    |
| fast  |       |       |
| ope   |       |       |
| n.ex  |       |       |
| e     |       |       |

*Lines Removed from CONFIG.SYS for Non – MS-DOS Operating Systems*

|      |        |        |
|------|--------|--------|
| delw | lock.  | script |
| atch | exe    | .exe   |
| .exe |        |        |
|      | login. | super  |
| delp | exe    | pck.e  |
| urge |        | xe     |
| .exe | mem    |        |
|      | max.   | task   |
| disk | exe    | max.   |
| map  |        | exe    |
|      | pass   |        |

.exe word. touch  
exe .exe  
disk  
opt. pckwi xdel.  
exe k.sys exe  
  
em rendi xdir.e  
mx r.exe xe  
ma.  
sys  
  
fast  
ope  
n.ex  
e  
  
hido  
s.sy  
s

Lines Removed from CONFIG.SYS That Start Disk Caches

---

cach Golden  
e- Bow  
at.sy Systems  
s software  
  
cach Golden  
e- Bow  
em.s Systems  
ys software  
  
cach Disk cache  
e.ex utility  
e  
  
fast5  
12.s  
ys  
  
flash Flash disk  
.exe cache  
utility  
  
hype Hyper disk  
r286 cache  
.exe utility

hype Shareware  
r386 disk cache  
.exe

hype Hyper disk  
rdkc. cache  
exe utility

hype Hyper disk  
rdke cache  
.exe utility

hype Hyper disk  
rdkx. cache  
exe utility

ibmc  
ache  
.sys

icac  
he.s  
ys

mca Paul Mace  
che. utilities  
sys

ncac Norton  
he.e Utilities®  
xe disk cache  
utility

pc- PC  
cach Tools™  
e.co disk cache  
m utility

pc- PC-Kwik  
kwik disk cache  
.exe utility

pck Multisoft  
win. Super PC-  
sys Kwik  
Windows  
driver

qcac 386MAX®  
he.e disk cache

xe utility  
  
 qcac 386MAX/  
 he.w BlueMAX  
 in <sup>TM</sup> disk  
     cache  
     utility  
  
 scpl SpeedCac  
 us.e he for  
 xe disks and  
     CD-ROM  
  
 supe Batch file  
 ron. which  
 bat turns on  
     Super PC-  
     Kwik  
  
 supe Multisoft  
 rpck. Super PC  
 exe Kwik disk  
     cache  
  
 zcac Zenith  
 he.s Data  
 ys Systems  
     OEM disk  
     cache from  
     DOS 3.3  
     and 4.01

Lines Removed from CONFIG.SYS for Previous Versions of OEM-DOS

---

astc AST® 3.30  
 ach  
 e.sy  
 s  
  
 cach COMPAQ  
 e.sy ® 3.20,  
 s Dell® 3.30  
  
 cach AST 3.30,  
 er.sy Olivetti®  
 s 3.30



cem MS-DOS  
m.e 3.20, 3.21,  
xe 3.30, 3.31,  
4.00

cem MS-DOS  
mp. 3.20, 3.21,  
exe 3.30, 3.31,  
4.00,  
COMPAQ  
5.00

enh COMPAQ  
disk. 3.20, 3.31,  
sys 4.00

em NCR®  
mdr 3.30  
v.sy  
s

fast AST 3.30  
disk.  
sys

hard HP® 3.20,  
rive. 3.30, 4.00  
sys

hpd HP 4.0  
cach  
e.sy  
s

kbo Toshiba®  
ard. 3.20  
sys

mlp Tandy®  
art.s 3.20, 3.30  
ys

olica Olivetti  
che. 3.30  
sys

shell NCR 3.30  
drv.s  
ys

```

spo Tandy
oler. 3.20, 3.30
sys

xdis Unisys®
k.sy 3.20
s

xma MS-DOS
2em 4.00
s.sy
s

xma MS-DOS
em. 4.00
sys

zspo Zenith
ol.sy Data
s Systems
3.20, 3.21

```

### [AUTOEXEC.BAT Processing](#)

AUTOEXEC.BAT is not required for Windows 95, but it is included for compatibility purposes. If the computer has an AUTOEXEC.BAT file, each line is processed in sequence during system startup. AUTOEXEC.BAT can contain additional application-specific entries that are run in the sequence they are listed.

Windows 95 passes the initial environment to COMMAND.COM with the correct Windows and Windows COMMAND directories already in the path and with the environment variables PROMPT, TMP, and TEMP already set. (TEMP= and TMP= indicate locations for temporary directories; both are specified for compatibility reasons.)

The following AUTOEXEC.BAT commands have equivalent default settings created in IO.SYS for Windows 95.

### *AUTOEXEC.BAT Equivalents for Windows 95 IO.SYS Default Settings*

---

```

net Binds the
sta real-mode
rt network
components
and
validates the

```

binding. Any errors received are placed in the NDISLOG.TXT file. (SYSINIT or COMMAND.COM performs the necessary ..)

set Sets the path as h specified.

The default Windows 95 environment includes the following:

tmp=c:\windows\temp  
temp=c:\windows\temp  
prompt=\$p\$g  
path=c:\windows;c:\windows\command  
comspec=c:\windows\command\command.com

[AUTOEXEC.BAT Changes for Windows 95](#)

Windows 95 Setup makes the following basic changes to AUTOEXEC.BAT:

n

Update PATH statement

n

Use *rem* to comment out incompatible TSRs

# n

Delete any WIN statement (or equivalent) and SHARE.EXE

# n

Copy the original AUTOEXEC.BAT to AUTOEXEC.DOS

# n

Set Temp directory

For diskless workstations, if the TEMP and TMP environment variables are not set, Windows 95 Setup creates a TEMP directory in the home directory (which can be on the local hard disk or on the network), and adds *set tmp=* and *set temp=* entries in AUTOEXEC.BAT that point to the new directory.

[Tips for Editing AUTOEXEC.BAT in Windows 95](#)

If you edit AUTOEXEC.BAT, observe these basic guidelines:

# n

Do not include other versions of Windows in your path.

n

Start the path with C:\WINDOWS;C:\WINDOWS\COMMAND (using the name for the Windows 95 directory on your hard disk).

n

Windows 95 Setup leaves your previous MS-DOS directory on the path.  
Do not change this.

n

Do not add SmartDrive or other disk caches. Windows 95 includes built-in caching.

n

Do not include any statements for loading mouse support software.  
Windows 95 includes built-in mouse support.

n

If it is necessary to connect to a network server when you start Windows

95, create a batch file, and run it from the Startup folder, rather than placing an entry in AUTOEXEC.BAT.

The following tables describe changes that Setup makes to AUTOEXEC.BAT. For entries that are removed, Setup uses *rem* to comment out the line.

Commands Removed from AUTOEXEC.BAT

|      |       |      |
|------|-------|------|
| doss | win   | UnSe |
| hell |       | t=co |
|      | setcf | mspe |
| fast | g     | c    |
| ope  |       |      |
| n    |       | =asc |
|      |       | si   |
| shar |       |      |
| e    |       |      |

Commands Removed from AUTOEXEC.BAT for Non – MS-DOS Operating Systems

|      |       |        |
|------|-------|--------|
| disk | lock  | script |
| opt  |       |        |
|      | login | task   |
| delq |       | max    |
|      | mem   |        |
| delp | max   | touch  |
| urge |       |        |
|      | pass  | xdel   |
| delw | word  |        |
| atch |       | xdir   |
|      | rendi |        |
| disk | r     |        |
| map  |       |        |
|      |       |        |
| eraq |       |        |

Lines Removed from AUTOEXEC.BAT That Start Disk Caches

---

|     |          |
|-----|----------|
| CAC | Golden   |
| HE- | Bow      |
| AT  | Systems  |
|     | software |

|     |          |
|-----|----------|
| CAC | Golden   |
| HE- | Bow      |
| EM  | Systems  |
|     | software |

CAC

HE

FAS

T51

2

FLA Flash disk

SH cache  
utility

HYP Hyper disk

ER2 cache

86 utility

HYP Shareware

ER3 disk cache

86

HYP Hyper disk

ERD cache

KC utility

HYP Hyper disk

ERD cache

KE utility

HYP Hyper disk

ERD cache

KX utility

IBM

CAC

HE

ICA

CHE

MC Paul Mace

ACH utilities

E

NCA Norton

CHE Utilities

disk cache

utility

PC- PC Tools

CAC disk cache

HE utility

PC- PC-Kwik

KWI disk cache  
K utility

PCK Multisoft  
WIN Super PC-  
Kwik  
Windows  
driver

QC 386MAX  
ACH disk cache  
E utility

SCP SpeedCac  
LUS he for  
disks and  
CD-ROM

SM Microsoft  
ART SmartDrive  
DRV disk utility

SUP Batch file  
ER which  
ON turns on  
Super PC-  
Kwik

SUP Multisoft  
ERP Super PC-  
CK Kwik disk  
cache

ZCA Zenith  
CHE Data  
Systems  
OEM from  
DOS 3.3  
and 4.01

This section describes changes made by Windows 95 Setup to SYSTEM.INI and WIN.INI. Mappings for other changes between Windows 3.x and Windows 95 are described in Chapter 33, "Windows 95 Registry."

[Changes to SYSTEM.INI](#)



Most configuration options for Windows 95 are now stored in the Registry and are no longer required in SYSTEM.INI. The following options have been moved to the Registry or are no longer valid in Windows 95.

n

All parameters are moved from the [Network drivers] section of  
SYSTEM.INI to the Registry.

n

The lanabase= parameter is moved from the [nwnblink] section of  
SYSTEM.INI to the Registry.

The following tables describe other changes made in SYSTEM.INI.

Entries Added to the [Boot] Section of SYSTEM.INI

```
com gdi.e user.  
m.dr xe=g exe=  
v=c di.ex user.  
om e exe  
m.dr soun  
v d.dr  
dibe =sou  
ng.d nd.dr  
rv=d v  
iben  
g.dll
```

Entries Added to the [386Enh] Section of SYSTEM.INI

```
devi devic  
ce=* e=*in  
vsha t13  
re devic  
devi e=*d  
ce=* ynap
```

vcd age

Entries Deleted in the [386Enh] Section of SYSTEM.INI

devi devic devic  
ce=\* e=lpt. e=isa  
vfd 386 pnp.3  
devi devic 86  
ce=\* e=pa devic  
confi gfile e=ws  
gmg .386 hell.3  
devi timer 86  
ce= critic  
seri alsec  
al.3 tion=  
86

Entries Moved from the [386Enh] Section of SYSTEM.INI to the Registry

Net Seco V86  
work ndNe Mode  
= t= LAN  
Net Tran As=  
work sport  
3= =

Entries Moved from the [Network] Section of SYSTEM.INI to the Registry

Audi FileS Pass  
tEna harin word  
bled g= Cach  
= LAN ing=  
Audi As= Print  
tEve LMA Shari  
nts= nnou ng=  
Audi nce= Resh  
tLog LMLo are=  
Size gon= Slow  
= Logo Lana  
Auto nDisc s=  
Log onne Winn  
on= cted= et=  
Com Logo Work  
men nDo grou  
t= main p=  
Com =  
pute Logo

rNa nVali  
me= dated  
Dire =  
ctHo Multi  
st= net=  
Ena  
bleS  
hari  
ng=

The following summarizes where you should set the related parameters using Windows 95 tools:

n

Set all memory-related parameters using the System option in Control

Panel. For information, see Chapter 17, "Performance Tuning."

n

Set parameters for hardware devices using Device Manager in the System

option in Control Panel. For information, see Chapter 19, "Devices."

n

Set all networking and resource sharing parameters using the Network

option in Control Panel. For information, see Part 3, "Networking."

### [Changes to WIN.INI](#)

The font and desktop information in WIN.INI is transferred to the Registry, as described in the following lists.

Entries Moved from the [Windows] Section of WIN.INI to the Registry

Bee Keyb Mous  
p oard eSpe  
Bord Dela ed  
erWi y Scre  
dth Keyb enSa  
Curs oard veAct  
orBli Spee ive  
nkR d Scre  
ate Mous enSa  
Dou eThr veTi  
bleC eshol meO  
lickS d1 ut  
pee Mous Swap  
d eThr Mous  
eshol eButt  
d2 ons

Entries Moved from the [WindowMetrics] Section of WIN.INI to the Registry

Bord MinA Scroll  
erWi rrang Heig  
dth e ht  
Capt MinH Scroll  
ionH orzG Widt  
eigh ap h  
t MinV SmC  
Capt ertGa aptio  
ion p nHei  
Widt Min ght  
h Widt SmC  
Men h aptio  
uHei nWid  
ght th  
Men  
uWi  
dth

In addition, Setup always adds `ATMWorkaround=1` to the [Pscript.Drv] setion in WIN.INI.

The following summarizes where you should set the related parameters using Windows 95 tools:

# n

Set all mouse parameters using the Mouse option in Control Panel. For information, see Chapter 19, "Devices."

# n

Set parameters for the keyboard using the Keyboard option in Control Panel. For information, see online Help.

# n

Set all screen and window display parameters using the Display option in Control Panel. For information, see Chapter 19, "Devices."

The BOOTLOG.TXT file contains a record of the current startup process for starting Windows 95. This file is created during Setup when the Windows 95 operating system is first started from Windows 95 Setup. This file shows the Windows 95 components and drivers loaded and initialized, and the status of each.

When you use the F8 option for interactive system startup, you can choose to create a boot log during system startup. You can also use the /b switch to create a boot log when running WIN.COM from the command line to isolate configuration problems. For information, see Chapter 35, "General Troubleshooting."

The information in BOOTLOG.TXT is written in sequence during startup, in roughly five major sections. Depending upon a specific error condition, you may need to examine multiple sections. The following table shows the sections to examine, and describes the possible errors and methods for correcting those errors.

## BOOTLOG.TXT Sections for Determining Errors

---

No Verify that  
XMS the  
mem section  
ory contains  
this entry:

loadsucc  
ess=c:  
\windows\  
himem.sys  
s

If not,  
verify the  
file and  
entry in  
CONFIG.  
SYS

Incorr If this  
ect error  
MS- appears  
DOS when  
versio loading  
n drivers or  
(mes programs  
sage that  
appe worked  
ars before,  
when verify that  
driver the  
loads section  
) contains  
this entry:

loadsucc  
ess=c:  
\windows\  
setver.exe  
e.

Wind Verify that  
ows the

95 section  
does contains  
n't this entry:  
start  
on a loadsucc  
SCSI ess=c:  
hard \windows\  
drive dblbuff.sys  
s

IFSH Verify that  
LP.S the  
YS section  
mess contains  
age this entry:  
occur  
s loadsucc  
ess=c:  
\windows\  
ifshlp.sys

Verify the  
loading,  
system,  
and  
device  
initializati  
on of all  
VxDs by  
checking  
the  
section  
for these  
entries:

loading  
vxd = ios  
loadsucc  
ess = ios

Cann Verify that  
ot the  
acces section  
s D?? contains  
SPAC this entry:  
E  
drives loadsucc

ess = c:  
\dblspc  
.bin

Shari May be  
ng due to  
violati failure of  
ons the  
occur Vshare  
VxD to  
load. The  
section  
might  
contain  
an entry  
such as:

loadfailed  
= vshare

Syste Verify that  
m- this  
critica section  
l contains  
initiali entries  
zation such as:  
error  
occur syscritinit  
s =ios  
syscritinit  
success=i  
os

Verify that  
the  
section  
contains  
entries  
such as:

deviceinit  
=ios  
deviceinit



success=  
OS

Verify that  
the  
section  
contains  
entries  
such as:

initcompl  
ete=ios  
initcompl  
etesucce  
ss=ios

The following table shows the kinds of entries in BOOTLOG.TXT to examine for information about the system startup process.

---

|                                 |                                        |
|---------------------------------|----------------------------------------|
| Error                           | Errors that were logged during startup |
| Fail                            | Failures that occurred during startup  |
| Dynami<br>c load<br>succes<br>s | Dynami<br>cally<br>loaded<br>VxDs      |
| INITCO<br>MPLET<br>ESUC<br>CESS | Loaded<br>VxDs                         |
| LoadSt<br>art,<br>LoadS         | Indicatio<br>n of<br>loading           |

uccess, process  
Loadin es  
g  
Device,  
Loadin  
g Vxd

LoadFa Indicatio  
iled n that  
compon  
ent  
failed to  
load

SYSC System  
RITINI initializa  
T, tion  
SYSC actions  
RITINI  
TSUC  
CESS

DEVIC Device  
EINIT, initializa  
DEVIC tion  
EINITS actions  
UCCE  
SS

Dynami Dynami  
c load c  
device, loading  
Dynami and  
c init initializa  
device tion of  
devices

Initing, Initializa  
Init tion  
Succes actions  
S,  
INITCO  
MPLET  
E, Init,  
InitDon  
e

Status Current

status  
indicator

For example, if you see an entry such as *DynamicInitDevice=PPPMAC* but there is no matching entry such as *DynamicInitSuccess=PPPMAC*, then that VxD failed to load.

The following shows a sample BOOTLOG.TXT file:

Loading Device = C:\WINDOWS\HIMEM.SYS  
LoadSuccess = C:\WINDOWS\HIMEM.SYS  
Loading Device = C:\WINDOWS\EMM386.EXE  
LoadSuccess = C:\WINDOWS\EMM386.EXE  
Loading Device = C:\WINDOWS\SETVER.EXE  
LoadSuccess = C:\WINDOWS\SETVER.EXE  
Loading Device = C:\WINDOWS\COMMAND\ANSI.SYS  
LoadSuccess = C:\WINDOWS\COMMAND\ANSI.SYS  
Loading Device = C:\WINDOWS\IFSHLP.SYS  
LoadSuccess = C:\WINDOWS\IFSHLP.SYS  
Loading Vxd = VMM  
LoadSuccess = VMM  
Loading Vxd = nwlink.vxd  
LoadSuccess = nwlink.vxd  
Loading Vxd = vnetsup.vxd  
LoadSuccess = vnetsup.vxd

## Windows 95 Setup with Other Operating Systems

---

This section presents technical details related to installing Windows 95 over an existing operating system, including changes made to system files by Windows 95 Setup and configuring for dual-booting with the previous operating system.

The following table summarizes some of the available options for upgrading with Windows 3.x, MS-DOS, and Windows NT, and how you should install Windows 95 to take advantage of these options.

### Upgrade versus New Installation Options

Migr -  
ate  
exist  
ing  
Win  
dow  
s  
appli  
cation  
n  
setti  
ngs  
and  
files

n

Dual -  
boot  
Win  
dow  
s 95  
and  
MS-  
DOS

n

Dual -  
boot  
Win  
dow  
s 95  
and  
Win  
dow  
s  
NT1

n

---

1 Windows 95 and Windows NT can work properly together if the computer is currently configured for dual booting between MS-DOS and Windows NT. However, you must install Windows 95 in a new directory.

---

The issues discussed in this section include the following:

# n

Installing Windows 95 over Windows 3.x, plus installing for dual booting with Windows 3.x

# n

Installing Windows 95 over MS-DOS, including running on multiple-configuration computers

# n

Installing Windows 95 over Windows NT

# n

Installing Windows 95 over DR-DOS

# n

Installing Windows 95 over OS/2

If you have Windows 3.x or Windows for Workgroups 3.x, you can either upgrade your current installation to Windows 95 (the preferred method) or install this version of Windows 95 in a new directory.

If you choose to upgrade your existing Windows installation, Windows 95 Setup uses existing configuration information to set installation defaults and to set other configuration options. Windows 95 Setup converts all Windows 3.x Program Manager groups to folders inside the Programs folder on the Windows 95 Start button. These folders can be opened or explored to find the applications previously contained in them. Windows 95 automatically creates a shortcut for each original icon you had, for each application under your previous version of Windows.

Windows 95 Setup checks for the following files to determine whether the current installation is an upgrade to Windows 3.x: WINVER.EXE, USER.EXE, WIN.COM, SYSTEM.INI, and WINI.INI, plus PROTOCOL.INI for Windows for Workgroups 3.x. When searching for these files, Windows 95 Setup also checks the files for version information. (False files with the same name won't work.)

#### [To upgrade from Windows 3.1 or Windows for Workgroups to Windows 95](#)

1. Start Windows 3.1 or Windows for Workgroups on your computer.
2. Insert the first Windows 95 Setup floppy disk or the compact disc in the appropriate disk drive. Or, connect to the shared network resource that contains the Windows 95 source files.
3. From File Manager, select the disk drive you used in step 2.
4. From the File menu, choose run and type *setup*

All of your current system settings (such as program groups) are automatically moved to Windows 95. Windows 95 Setup also saves settings so that you can continue to use the network configurations that you had previously.

#### [To upgrade from Windows 3.0](#)

1. Start your computer with MS\_DOS. Do not run Windows 3.0.
2. Insert the first Windows 95 Setup floppy disk or the compact disc in the appropriate disk drive. Or, connect to the shared network resource that contains the Windows 95 source files.
3. Switch to the directory that contains the Windows 95 source files. At the command prompt type *setup* and follow the directions on-screen.

To install Windows 95 with dual boot capabilities for MS\_DOS, the computer must

already be running version 5.x or 6.x of MS-DOS or PC-DOS.

---

*Important* — In order to take advantage of the Windows 95 dual-boot capabilities, the entry `BootMulti=1` must be set in the MSDOS.SYS file in the root directory. For more information, see “MSDOS.SYS: Special Startup Values” earlier in this chapter.

---

*To set up dual-boot capabilities for a new installation of Windows 95*

n

During Windows 95 Setup, when you are installing Windows 95 for the

first time, make sure you specify a new directory that does not already have another version of Windows in it.

Windows 95 Setup makes all of the necessary changes to preserve your existing version of MS-DOS, Windows 3.x, or Windows for Workgroups 3.x, and your current AUTOEXEC.BAT and CONFIG.SYS files.

If you have already installed Windows 95 without dual-boot capabilities, you can follow these steps to allow MS-DOS to dual boot with Windows 95. However, you will not be able to dual boot with your previous version of Windows.

*To set up dual-boot capabilities after Windows 95 has been installed without configuring dual boot*

1. On a bootable floppy disk that starts MS-DOS 5.0 or greater, rename the IO.SYS and MSDOS.SYS files on the disk to IO.DOS and MSDOS.DOS. Then copy these files to the root directory of your boot drive (usually drive C).

— These files are usually marked with the Hidden, System, and Read-Only attributes, so you may need to use the MS-DOS `attrib` command on these files while they are on the floppy disk, to view and copy them (for example, type `attrib -h -s -r io.sys`).

— *Caution* — You must rename the MS-DOS versions of these files before copying them to your root directory. Otherwise, you will destroy your Windows 95 installation.

— There are no restrictions on where these files should be placed or on the allocations associated with these files, as long as they are from MS-DOS version 5.0 or later.

2. On a bootable floppy disk that starts MS-DOS 5.0 or greater, rename the COMMAND.COM file on the disk to COMMAND.DOS. Then copy this file to the root directory of your boot drive.
3. Use a text editor to create CONFIG.DOS and AUTOEXEC.DOS files that are appropriate for the MS-DOS version that you are using.

---

Note—— If you are using disk compression software, you need to copy IO.DOS, MSDOS.DOS, COMMAND.DOS, CONFIG.DOS, and AUTOEXEC.BAT to your host drive as well.

---

Now you are ready to start the computer using Windows 95 or the earlier version of MS-DOS in the usual way.

The versions of MS-DOS supported for installing Windows 95 are versions 3.2 or greater (for partitions that are greater than 32 MB), 4.x, 5.x, and 6.x.

#### [Tip for Running MS-DOS after Windows 95 Is Installed](#)

If you install Windows 95 in a different directory from the one containing your previous Windows 3.x version, you can start the computer using the previous version of MS-DOS. To do this, make sure *BootMulti=1* in MSDOS.SYS, then you can press F8 during system startup and choose the related option.

During Setup, Windows 95 preserves the following MS-DOS files by renaming them for future use:

---

|       |       |
|-------|-------|
| COMM  | COMM  |
| AND.C | AND.D |
| OM    | OS    |

|       |       |
|-------|-------|
| CONFI | CONFI |
| G.SYS | G.DOS |

|       |       |
|-------|-------|
| AUTOE | AUTOE |
| XEC.B | XEC.D |
| AT    | OS    |

When you press F8 at system startup and choose the option for starting the previous version of MS-DOS, the files in the preceding table are renamed back to their original MS-DOS filenames, and the Windows 95 versions of the files are renamed as shown in the following table.



---

|       |       |
|-------|-------|
| COMM  | COMM  |
| AND.C | AND.W |
| OM    | 40    |

|       |       |
|-------|-------|
| CONFI | CONFI |
| G.SYS | G.W40 |

|       |       |
|-------|-------|
| AUTOE | AUTOE |
| XEC.B | XEC.W |
| AT    | 40    |

### [Files Deleted by Windows 95 Setup](#)

This section lists MS-DOS and other files that are deleted by Windows 95 Setup. Notice, however, that these files are only deleted from the old MS-DOS directory if you upgrade by installing Windows 95 in the existing Windows 3.x directory. Otherwise, the old MS-DOS files are all preserved so that you can start the computer using the older version of MS-DOS.

The Windows 95 command-line commands are stored in the Windows COMMAND directory. Deleting the related MS-DOS command file will not affect your ability to use the command under Windows 95. The versions that are deleted by Setup are known to be incompatible with Windows 95; for example, many of these MS-DOS commands do not support long filenames.

### [MS-DOS Files Deleted by Windows 95 Setup](#)

|      |      |      |
|------|------|------|
| ANS  | FAST | MOR  |
| I.SY | OPE  | E.CO |
| S    | N.EX | M    |
| ATT  | E    | MSC  |
| RIB. | FC.E | DEX. |
| EXE  | XE   | EXE  |
| CHK  | FDIS | NLS  |
| DSK  | K.EX | FUN  |
| .EX  | E    | C.EX |
| E    | FIND | E    |
| CO   | .EXE | PRIN |
| MM   | FOR  | T.EX |
| AND  | MAT. | E    |
| .CO  | COM  | QBA  |
| M    | GRA  | SIC. |
| CO   | PHIC | EXE  |
| UNT  | S.CO | QBA  |
| RY.  | M    | SIC. |

SYS GRA HLP  
DEB PHIC REP  
UG. S.PR LAC  
EXE O E.EX  
DIS KEY E  
KC B.CO RES  
OPY M TOR  
.EX KEY E.EX  
E BOA E  
DIS RD.S SHA  
PLA YS RE.E  
Y.S LAB XE  
YS EL.E SOR  
DO XE T.EX  
SKE LCD. E  
Y.C CPI SUB  
OM LOA ST.E  
DRI DFIX XE  
VER.CO SYS.  
.SY M COM  
S MEM XCO  
EDI .EXE PY.E  
T.C XE  
OM  
EDI  
T.HL  
P  
EGA  
.CPI  
EXP  
AND  
.EX  
E

Compaq DOS 5.0 Files Deleted by Windows 95 Setup

CAC DOS HEL  
HE. 5HEL P.EX  
EXE P.CH E  
CE D TU.E  
MM. FAST XE  
EXE ART. UPC  
CE EXE U.EX  
MM FSE E  
P.E DIT.E  
XE XE

Non – MS-DOS Operating System Files Deleted by Windows 95 Setup

DEL LOGI TAS  
PUR N.EX KMA  
GE. E X.EX  
EXE MEM E  
DEL MAX. TAS  
WAT EXE KMA  
CH. PAS X.INI  
EXE SWO TOU  
DIS RD.E CH.E  
KM XE XE  
AP. REN UNIN  
EXE DIR. STAL  
DIS EXE .EXE  
KOP SET XDE  
T.EX UP.E L.EX  
E XE E  
DO SYS. XDIR  
SBO COM .EXE  
OK.  
EXE  
HID  
OS.  
SYS  
LOC  
K.E  
XE

Pre – MS-DOS 5.0 Files Deleted by Windows 95 Setup

APP GDU. MVB  
END EXE UILD  
.CO GRA .EXE  
M FTAB PAM  
ASG L.EX COD  
NPA E E.CO  
RT. GRA M  
CO PHIC PAMI  
M S.EX NST  
BAC E L.CO  
KUP HAR M  
.EX DRIV PAR  
E E.SY T.EX  
BO S E  
OTF HPC PAS  
.CO ACH SWO

M E.CO RD.E  
CAC M XE  
HE. HPD PRE  
SYS CAC P.EX  
CE HE.C E  
MM. OM PRIN  
EXE IFSF T.EX  
CE UNC. E  
MM EXE REC  
P.E INDS OVE  
XE KBIO R.EX  
CHK .SYS E  
DSK INST RES  
.EX ALL. TOR  
E EXE E.EX  
CM KEY E  
PQA B32. SEL  
DAP COM ECT.  
.CO KEY COM  
M BCH SEL  
CO F.CO ECT.  
MPA M DAT  
CT. KEY SEL  
EXE BCH ECT.  
CO G.C EXE  
NFI OM SEL  
GU KEY ECT.  
R.C BDA. HLP  
OM COM SEL  
DEB KEY ECT.  
UG. BFR. PRT  
EXE COM SEL  
DET KEY ECT  
ECT BFR. 1.DA  
.CO EXE T  
M KEY SEL  
DIS BGK. ECT  
KC COM 2.DA  
OM KEY T  
P.E BGR. SET  
XE COM UP.E  
DIS KEY XE  
KC BGR. SHE  
OPY EXE LL.C  
.EX KEY LR  
E BIT.C SHE

DIS OM LL.H  
KINI KEY LP  
T.C BIT.E SHE  
OM XE LL.M  
DIS KEY EU  
KINI BNO. SHE  
T.EX COM LLB.  
E KEY COM  
DO BSP. SHE  
SUT COM LLC.  
IL.M KEY EXE  
EU BSV. TRE  
DSK EXE E.EX  
SCA KEY E  
N.E BSW. VDIS  
XE COM K.SY  
DSK KEY S  
SET BUK. XMA  
UP. COM EM.S  
CO KEY YS  
M BUK. ZCA  
EDL EXE CHE.  
IN.E KEY SYS  
XE BUS. ZSP  
EM COM OOL.  
M38 LAB COM  
6.S EL.E  
YS XE  
ENH MOD  
DIS E.EX  
K.S E  
YS  
FAS  
TOP  
EN.  
EXE  
FAS  
TAR  
T.EX  
E  
FDI  
SK.  
CO  
M  
FILE  
SYS

.EX  
E  
FOR  
150.  
EXE  
FOR  
MAT  
.EX  
E

### [System Startup with MS-DOS Multiple Configurations](#)

Windows 95 supports multiple configurations for the same computer, and dynamically determines which configuration is being used. If Windows 95 cannot determine the specific configuration used during system startup before processing CONFIG.SYS, then it presents a menu of available configurations as listed in the Registry, and prompts you to select the configuration you want.

If you have a multiple configuration established in CONFIG.SYS, that menu is presented next. However, if you use a multiple configuration to switch between different versions of Windows, you must manually edit CONFIG.SYS to repair this configuration after Windows 95 is installed. For information about how to create multiple configurations for the same computer under Windows 95, see Chapter 19, "Devices."

You can install Windows 95 to dual boot with Windows NT on a computer. This section provides some notes for installing Windows 95 with Windows NT.

---

Important— In order to take advantage of the Windows 95 dual-boot capabilities, the entry *BootMulti=1* must be set in the Windows 95 version of MSDOS.SYS file in the root directory of your startup drive. For more information, see "MSDOS.SYS: Special Startup Values" earlier in this chapter.

---

### [To install Windows 95 to dual boot with Windows NT](#)

1. Ensure that the computer is configured to dual boot between Windows NT and MS-DOS. Check your Windows NT documentation for details.
2. Start the computer using the MS-DOS operating system.
3. Remove the read-only attribute from the BOOTSECT.DOS and BOOT.INI files in the root directory, by typing the following:

attrib -r bootsect.dos  
attrib -r boot.ini

4. Copy the BOOTSECT.DOS file to BOOTSECT.SAV/
5. Run Setup, as described in Chapter 3, "Introduction to Windows 95 Setup."
6. Install Windows 95 into an existing Windows 3.x directory or into its own directory, but not into a directory that contains Windows NT system files. For example:

n

If there is a SYSTEM32 subdirectory in the Windows directory on the computer, then Windows NT was installed in the same directory as an earlier version of Windows. In this case, you cannot upgrade this configuration to Windows 95. You must install Windows 95 in a new directory.

n

If a computer running Windows NT 3.1 does not already have Windows installed, Windows 95 must be installed into an empty directory.

7. Remove the read-only attribute from the BOOTSECT.DOS file in the root directory.
8. Rename the BOOTSECT.DOS and BOOTSECT.SAV files by typing the following:

ren bootsect.dos bootsect.w40  
ren bootsect.sav bootsect.dos

9. Use a text editor to modify the BOOT.INI file to add Windows 95. For example:

[boot loader]  
timeout=30  
default=c:\winnt

[operating systems]  
c:\winnt="Windows NT"  
c:\bootsect.dos="MS-DOS v6.22" /win95dos  
c:\bootsect.w40="Windows 95" /win95

At system startup, the Windows NT dual-boot menu appears, where you can select Windows 95 as a startup option.

---

Caution—— If you install Windows NT 3.5 in the same directory where Windows 95 is already installed, you will not be able to run Windows 95. Windows NT 3.5 replaces DLLs in the SYSTEM directory with earlier Windows 3.x DLLs. Without its own versions of these DLLs, Windows 95 cannot start.

---

Remember that if your computer has any NTFS partitions, these are not available locally from within Windows 95.

For more information about the Windows NT operating system and about running computers with Windows 95 on a Windows NT network, see Chapter 8, "Windows 95 on Microsoft Networks."

DR DOS is a disk operating system manufactured by Novell®. Novell DOS™ version 7 is the latest version, as of this writing. (This procedure applies to both operating systems.)

Windows 95 Setup checks for the following DR DOS files that could cause conflicts.

*DR DOS Files That Cause Conflicts*

|      |      |      |
|------|------|------|
| DEL  | LOC  | SUP  |
| WAT  | K.EX | ERP  |
| CH.  | E    | CK.E |
| EXE  |      | XE   |
|      | MEM  |      |
| DEL  | MAX. | TAS  |
| PUR  | EXE  | KMA  |
| GE.  |      | X.EX |
| EXE  | PAS  | E    |
|      | SWO  |      |
| DIS  | RD.E | TOU  |
| KM   | XE   | CH.E |
| AP.  |      | XE   |
| EXE  | REN  |      |
|      | DIR. | XDE  |
| DIS  | EXE  | L.EX |
| KOP  |      | E    |
| T.EX | SCRI |      |
| E    | PT.E |      |
|      | XE   |      |
| FAS  |      |      |
| TOP  |      |      |



EN.  
EXE

DR DOS is upgraded in the same way as versions of MS-DOS (as described earlier in this section). These additional changes are made during Windows 95 Setup:

n

Some DR-DOS utilities can cause compatibility problems with the

Windows 95 real-mode kernel; Windows 95 Setup uses *rem* to comment out any command lines in the configuration files that start such utilities.

n

If you use DR-DOS password protection, Windows 95 Setup warns that

this should be removed; otherwise, Windows 95 Setup cannot use the protected volume.

Installing Windows 95 on a computer running any version of OS/2 is supported by the Windows 95 Setup as long as a FAT partition is available. If your computer has any HPFS partitions, these partitions are not available from within Windows 95. Setup reminds you of this when it detects an HPFS partition.

The following notes apply to installing Windows 95 on a computer running OS/2:

n

You must install Windows 95 in a new directory, rather than installing in

any existing directory.

# n

Windows 95 Setup cannot migrate desktop or other settings from OS/2.

# n

You may have to reinstall your Windows-based applications to run under

Windows 95.

Windows 95 Setup cannot run from within OS/2 or OS/2 for Windows. You must start the computer from MS-DOS and then run Windows 95 Setup from an MS-DOS command prompt. If your OS/2 system is not configured to dual boot with MS-DOS, it is recommended that you first configure your computer to dual boot with MS-DOS. Then start Windows 95 Setup from MS-DOS.

If your computer has OS/2 Boot Manager, a message warns you that continuing with Windows 95 Setup will disable Boot Manager. If you choose to continue, Windows 95 Setup removes the OS/2 Boot Manager partition information, because Windows 95 Setup cannot determine which operating system or configuration Boot Manager will use to restart the computer, so Windows 95 Setup disables Boot Manager to ensure that Windows 95 starts during the installation process.

Windows 95 Setup leaves all other OS/2 files intact and does not remove any files from the OS/2 directory.

### [Tip for Restoring Boot Manager after Windows 95 Is Installed](#)

After Windows 95 is installed, you can make Boot Manager active again by using the OS/2 boot disk to run the OS/2 Fdisk utility. Windows 95 runs normally in this environment.

### *Removing Windows 95 from a Computer*

---

Windows 95 can be removed from your computer with the following steps. If you have configured your computer for dual booting, you will be left with your previous versions of MS-DOS and Windows 3.x intact. If you upgraded Windows 3.x, then,

after following these instructions, you will need to reinstall Windows 3.x to return to your previous configuration.

The recommended method for removing Windows 95 is to start the computer to a command line, using the F8 key as described in the following procedure. When this is done, real-mode Windows 95 operating system files start the computer. If you encounter problems starting Windows 95 in this way, start your computer from the previous operating system.

Before you begin this process, make sure you have a system startup disk that contains an earlier version of MS-DOS and the SYS.COM file. The Windows 95 startup files (real-mode operating system files) must also be deleted, so the process for removing Windows 95 makes your hard disk temporarily unbootable.

---

Note — The MS-DOS 6.x disk #1 is bootable, but the retail MS-DOS 5.0 disk #1 is not, and OEM versions may vary.

---

#### *To remove Windows 95 when the computer is started to the command line*

1. Start the computer and press the F8 key when you see the Starting Windows message. Then choose the Command Prompt Only options.

— If you have problems starting the computer in this way, you can use the procedure entitled “Removing Windows 95 with Your Previous Operating System,” described later in this section.

2. To make it easier to delete files and directories, copy the Windows 95 version of DELTREE.EXE to the boot drive. At the command-line prompt, type the following:

— copy \windows\command\deltree.exe c:\

3. To use the Windows 95 version of ScanDisk to clear invalid entries and long filenames, copy the ScanDisk files from the Windows COMMAND directory to the root directory using the following commands:

— copy \windows\command\scandisk.\* c:\

4. Use Notepad or a similar text editor to edit SCANDISK.INI in the Windows directory. Change the entries controlling whether ScanDisk will look for invalid characters in filenames and volume labels.

— edit scandisk.ini

n

Set `labelcheck=on` to specify whether ScanDisk should check volume labels for invalid characters.

n

Set `spacecheck= on` to specify whether ScanDisk should check for invalid spaces in filenames.

For complete information on the entries in SCANDISK.INI, see that file in the Windows directory.

5. To remove all entries that your earlier version of MS-DOS may see as invalid, at the command prompt, type `scandisk` followed by the letter identifying the drive containing the Windows 95 installation. For example:

`scandisk c:`

If you receive error messages during the ScanDisk process, refer to the online Help for information to help you resolve the error.

**Caution**— In the following step, all subdirectories of the Windows 95 directory will be deleted. Before performing this step, make sure that the Windows 95 directory tree does not contain any critical data that has not been backed up.

This step will also require that you reinstall all Windows-based programs at the end of this procedure, so that the correct drivers and settings will be available in the restored Windows directory.

6. To delete the Windows 95 directory, type the following from the root directory of the drive containing the Windows 95 installation:

`deltree`

In this command, `WINDOWS` is the name of the directory containing the Windows 95 files.

7. To delete the Windows 95 CONFIG.SYS and AUTOEXEC.BAT files, type the following from the root directory of the boot drive:

`deltree config.sys`

deltree autoexec.bat

8. Delete the WINBOOT.INI file and the WINBOOT directory, if present, by typing the following:

—deltree winboot.\*

9. At the command line, use *attrib -h -s -r* to change the file attributes for SETUPLOG.\*, BOOTLOG.\*, DETLOG.\*, IO.SYS, MSDOS.SYS, D??SPACE.BIN, and COMMAND.COM. Then delete the Setup, Boot, and Detection log files by typing the following:

—deltree setuplog.\*

deltree bootlog.\*

deltree detlog.\*

10. To delete the real-mode operating system files IO.SYS and MSDOS.SYS, type the following from the root directory of the boot drive (or from the root directory of the host drive, if the boot drive is compressed) :

—deltree io.sys

deltree msdos.sys

11. If you are using STAC Electronics Stacker® version 3.1, either skip this step or back up the STAC DBLSPACE.BIN file before completing this step.

—To delete the Windows 95 compression drivers (DBLSPACE.BIN and DRVSPACE.BIN), if present, type the following from the root directory of the boot drive (or from the root directory of the host drive, if the boot drive is compressed) :

—deltree d??space.bin

12. To delete the Windows 95 command processor (COMMAND.COM), type the following from the root directory of the boot drive (or both from the C drive and from the root of the host drive, if the boot drive is compressed):

—deltree command.com

13. Put a bootable floppy disk with your earlier version of MS-DOS into drive A, and then restart the computer. After the computer starts from the floppy disk, put your earlier version of MS-DOS back on the boot drive (or the host drive, if the C drive is compressed) by typing *sys* followed by the letter identifying the drive and a colon. For example:

—sys c:

14. If you have MS-DOS version 6.0 and are using compression, copy DBLSPACE.BIN from the DOS directory to the root directory of the boot drive. Also, for all versions of MS-DOS, if you have a *shell=* statement referencing COMMAND.COM from a different directory, copy COMMAND.COM to the root directory. Then remove the floppy disk, and restart the computer from the hard disk.

If you removed Windows 95 from a dual-boot installation, Windows 95 will be completely removed, and the computer will start the same way it did before installing Windows 95.

If you removed Windows 95 from an upgraded Windows 3.x installation, drivers that were located in the Windows directory (such as HIMEM.SYS, IFSLHLP.SYS, and EMM386.EXE) will be missing until you reinstall Windows 3.x in the Windows directory. After you have reinstalled Windows 3.x, the computer will start the same way it did before Windows 95 was installed.

You may need to reinstall your previous version of MS-DOS, if needed files were removed by Windows 95 Setup.

Use this procedure if you cannot start your computer in Windows 95 real mode, as described in the preceding section.

Before you begin this process, make sure you have a bootable floppy disk that contains an earlier version of MS-DOS and the SYS.COM file. The process for removing Windows 95 makes your hard disk temporarily unbootable, and the Windows 95 startup files (real-mode operating system files) must also be deleted.

---

Note — The MS-DOS 6.x disk #1 is bootable, but the retail MS-DOS 5.0 disk #1 is not, and OEM versions may vary.

---

#### [To remove Windows 95 when the computer is started with the previous operating system](#)

1. Start the computer and press the F8 key when you see the Starting Windows message, and choose the option named Previous Version of MS-DOS.
2. To make it easier to delete files and directories, copy the Windows 95 version of DELTREE.EXE to the boot drive. At the command-line prompt, type the following:  
— copy \windows\command\deltree.exe c:\
3. Copy the Windows 95 version of ScanDisk files from the Windows COMMAND directory to the root directory, using the following commands:  
— copy \windows\command\scandisk.\* c:\
4. Edit SCANDISK.INI to change the entries controlling whether ScanDisk looks for invalid characters in filenames and volume labels:

n

Set `labelcheck=on` to specify whether ScanDisk should check volume labels for invalid characters.

n

Set `spacecheck=on` to specify whether ScanDisk should check for invalid spaces in filenames.

5. To remove all entries that your earlier version of MS-DOS may see as invalid, at the command prompt, type `scandisk` followed by the letter identifying the drive containing the Windows 95 installation. For example:

`scandisk c:`

If you receive error messages during the ScanDisk process, refer to the online Help for information to help you resolve the error.

6. To delete the Windows 95 directory, type the following from the root directory of the drive containing the Windows 95 installation, where `WINDOWS` is the name of the directory containing the Windows 95 files:

`deltree`

**Caution**—All subdirectories of the Windows 95 directory will be deleted by this command. Before performing this step, make sure that the Windows 95 directory tree does not contain any critical data that has not been backed up.

7. Delete the Windows 95 real-mode operating system file named `WINBOOT.SYS`, which was renamed from `IO.SYS` when you started the computer with your previous operating system. Type the following command from the boot drive (or from the root directory of the host drive, if the boot drive is compressed):

`deltree winboot.*`

8. Delete the Windows 95 files `MSDOS.W40`, `COMMAND.W40`, `CONFIG.W40`, and `AUTOEXEC.W40`. (The renaming of these operating system files occurred when you used F8 to start the previous operating system.) To do this, type this command at the command prompt (if the boot drive is not compressed):

`deltree *.w40`

— If the boot drive is compressed, you must delete MSDOS.W40 from the root directory of the host drive and COMMAND.W40 from the root directories of both the host drive and the boot drive.

9. At the command line, use `attrib -h -s -r` to change the file attributes for `SETUPLOG.*`, `BOOTLOG.*`, `DETLOG.*`, `IO.SYS`, `MSDOS.SYS`, `D??SPACE.BIN`, and `COMMAND.COM`. Then delete the Setup, Boot, and Detection log files by typing the following from the root directory of the boot drive:

— `deltree setuplog.*`  
`deltree bootlog.*`  
`deltree detlog.*`

10. To delete the Windows 95 compression drivers (`DBLSPACE.BIN` and `DRVSPACE.BIN`), if present, type the following from the root directory of the boot drive (or from the root directory of the host drive, if the boot drive is compressed):

— `deltree d??space.bin`

— If you are using Stacker version 3.1, either skip this step or back up the `STAC-DBLSPACE.BIN` file before completing this step.

11. Put a bootable floppy disk with your earlier version of MS-DOS into drive A, and then restart the computer. After the computer starts from the floppy disk, put your earlier version of MS-DOS back on the boot drive (or the host drive, if the C drive is compressed) by typing `sys` followed by the letter identifying the drive and a colon. For example:

— `sys c:`

12. If you have MS-DOS version 6.0 and are using compression, copy `DBLSPACE.BIN` to the root directory of the boot drive. Also, for all versions of MS-DOS, if you have a `shell=` statement referencing `COMMAND.COM` from a different directory, copy `COMMAND.COM` to the root directory. Then remove the floppy disk, and restart the computer from the hard disk.

If you removed Windows 95 from a dual-boot installation, Windows 95 will be completely removed, and the computer will start the same way it did before installing Windows 95.

If you removed Windows 95 from an upgraded Windows 3.x installation, you may need to reinstall your previous version of MS-DOS, if needed files were removed by Windows 95 Setup. Drivers which were located in the Windows directory (such as `HIMEM.SYS`, `IFSLHLP.SYS`, and `EMM386.EXE`) will be missing until you reinstall Windows 3.x into the Windows directory. After you have reinstalled Windows 3.x, the computer will start the same way it did before Windows 95 was installed.

### [To remove Windows 95 from a computer with Windows NT installed](#)

1. Follow the preceding steps for removing Windows 95.



2. Use the Windows NT Setup Disk #1 to restart your computer.
3. Choose Repair.
4. When prompted, insert the Windows NT Emergency Repair Disk and choose the option to repair the boot files.
5. Restore your original MS-DOS and Windows 3.x configuration.

---

### *Troubleshooting Setup and System Startup*

---

This section provides information for solving problems that may occur during Setup or system startup. For specific information about troubleshooting procedures and the tools provided with Windows 95 (including details about using the Startup menu and Safe Mode for troubleshooting), see Chapter 35, "General Troubleshooting."

This section describes Setup problems and how to diagnose and correct them.

---

*Note* — You can get useful troubleshooting information from the SETUPLOG.TXT log file that Setup creates in the root directory of your startup drive, as described earlier in this chapter.

---

If Setup fails, attempt to restart it, using the following procedure.

#### *To restart Setup after a failure*

1. Press F3 or click the Exit button.  
— If the system does not respond, restart the computer by pressing CTRL+ALT+DEL. If this fails, turn off the computer, wait 10 seconds, and then turn it on again.
2. Start Setup again. Setup prompts you to use Safe Recovery to recover the failed installation. Choose the Safe Recovery option and click the Continue button. Hardware detection will skip the portion that caused the initial failure.
3. If the computer stops again during the hardware detection process, restart Setup again, and repeat the process until the hardware detection portion of Setup is completed. After Setup is complete and Windows 95 is running, you can use the information in SETUPLOG.TXT and DETLOG.TXT to check for the device or devices that caused the problems.

The following sections describe specific setup problems and how to resolve them.

Setup fails to start.

The basic options are to check memory, check for hardware detection conflicts, and check the access to the source for the Windows 95 installation files. Use the following checklist and procedures to find a solution.

n

Check for sufficient conventional memory.

Windows 95 requires 420K. If this is not available, check for unnecessary drivers or TSRs. If too many drivers or TSRs are loaded, remove unnecessary drivers and TSRs, and then try again. See “Removing Unnecessary Drivers” in Chapter 35, “General Troubleshooting.”

n

Check the RAM configuration in CONFIG.SYS.

For MS-DOS 4.x or earlier, settings should contain the following:

DEVICE=HIMEM.SYS

For MS-DOS 5 or later, settings should contain the following:

DEVICE=HIMEM.SYS

DEVICE=EMM386.EXE NOEMS

DOS=HIGH,UMB

Note — The path to these drivers is not specified in the preceding example. If you don't specify the path, you need to copy the drivers to the root of the startup drive. Using EMM386 and DOS=HIGH,UMB enables UMBs but is optional.

n

Check for adequate XMS memory. Windows 95 requires at least 3 MB of

XMS. If using MS-DOS 6.xx, at the Starting MS-DOS message, press F8 and choose Step-by-Step Confirmation to verify that HIMEM.SYS is loading. If not, verify the file and startup file syntax.

n

At the command prompt, use `mem /c /p` to check for free conventional and

XMS memory.

n

If installing from a floppy disk or compact disc, check access to the drive.

See “Setup Requests a New Source Path” later in this chapter.

Setup starts but an error is reported during the installation process.

n

Verify that all system and networking components function normally before

beginning installation.

n

Check the content of the error message. Windows 95 Setup errors contain

additional information about the condition causing Setup to fail. Examine the device or condition which the error describes.

n

Restart Windows 95 Setup and use Safe Recovery.

n

Check the SETUPLOG.TXT or DETLOG.TXT files. See “Safe Recovery with Setup Log Files” earlier in this chapter.

n

Verify system hardware is compatible. If Setup repeatedly fails, or if you suspect hardware conflicts with the Setup process, verify that the system components are listed on the Windows 95 HARDWARE COMPATIBILITY LIST. You may want to skip hardware detection. To do this, see “Setup Stops During Hardware Detection” later in this section.

n

Check for a missing or damaged file. If a driver or system component file is referenced in the error, check to see if the file exists, if it is in the expected location, and if it has the correct file size, date, and version. See “Checking for Missing System Files” in Chapter 35, “General Troubleshooting.”

*You cannot access the server, when installing from the network.*

n

Verify that the network domain is validating the user account.

n

Check the user name, password, and access rights.

n

Check basic network functionality.

n

Check conventional and XMS memory.

n

Check for and remove unnecessary drivers and TSRs.

n

If using a logon script, check logon script execution.

For detailed instructions, see “Basic Troubleshooting of Network Installations” in Chapter 7, “Introduction to Windows 95 Networking.”

*The network connection fails when you are installing from the network.*

n

Try to reconnect to the network share.

n

If you cannot reconnect, restart the system, and retry.

n

Verify the installation server is working with another computer on the

network.

# n

Check basic network connection.

Setup stops during hardware detection.

When Setup stalls during detection, you may need to disable the specific hardware detection for a device or class of devices. Before restarting and deselecting the device detection, wait until at least three minutes have passed with neither disk nor screen activity (that is, the mouse pointer cannot be moved). Some detection routines take long enough that the computer may appear to stop temporarily.

[To skip hardware detection in order to avoid problems](#)

1. Run Windows 95 Setup from MS-DOS and skip hardware detection.
2. If this is not the first attempt to install, select Safe Recovery.
3. To disable the specific device detection during Setup, in the Hardware Detection dialog box, click No, I Want To Specify Hardware Devices To Detect to clear the check box next to the specific device.

Setup cannot communicate with a device.

If Setup cannot communicate with a specific hardware device on the system during the installation of Windows 95, a message states that Setup has found a hardware device on your computer that is not responding and prompts you to try this device again. For persistent problems, the message provides instructions on how to exit Setup and restart the computer.

This error message can be caused by one of the following:

# n

The network has stopped responding

n

A CD-ROM drive has stopped responding

n

A floppy disk drive has stopped responding

n

You can no longer access the hard drive to complete the installation

process

Follow the recommendation in the message to turn your computer off, turn it back on, and then rerun Setup with Safe Recovery. If the problem persists, identify the problem from the preceding list and correct it.

Setup fails with error B1.

A B1 error message indicates that Setup has detected an older 80386 processor that is not supported and instructs you to upgrade your processor. Intel® 80386 microprocessors dated before April 1987 are known as B1 stepping chips. These chips introduce random math errors when performing 32-bit operations, thus making them incompatible with Windows 95. If your 80386 chip was manufactured before April 1987 or has a label on it that reads "For 16-bit operations only," contact your hardware manufacturer about an upgrade.

Problems occur during the Copy Files phase of Setup.

If this occurs, exit Setup, restart your computer, and then rerun Setup. When asked if you want to use Safe Recovery, select the Safe Recovery option and click Continue.



The installation process should complete at this point.

If your computer stalls after all files have been copied, or if you receive an error at this point, it may be due to virus protection software. Some computers have virus protection built into the ROM BIOS. You should disable the virus protection software or run your computer's configuration program to disable virus checking and then restart Setup. Select the Safe Recovery option, and the installation process should complete at this point.

*An "Incorrect MS-DOS version" error message appears.*

When starting Setup from MS-DOS, you may receive the error "Incorrect MS-DOS version. MS-DOS 3.1 or greater required." MS-DOS versions earlier than 3.1 are not compatible with Windows 95.

This error can also occur when starting Setup from MS-DOS if you are using the 386MAX software utility. If this error occurs, temporarily disable the 386MAX commands from the startup files, and then run Setup again.

*A "Standard Mode: Fault in MS-DOS Extender" error message appears.*

When running Windows 95 Setup from MS-DOS you may receive the error "Standard Mode: Fault in MS-DOS Extender." If you receive this error, there may be a conflict in the upper memory region. To resolve this, either disable UMBs or remove EMM386 statements from CONFIG.SYS and rerun Setup, or run Setup from Windows 3.x.

*A "Cannot open file \*.INF" error message appears.*

If you receive the error "Cannot open file \*.INF" occurs during Setup, you may need to free memory by disabling SmartDrive in AUTOEXEC.BAT, or by closing any running applications in Windows.

*Setup requests a new source path.*

If this occurs, check the file source (the floppy disk drive or the CD-ROM drive).

n

In Windows File Manager, click the floppy disk drive, and verify that the

drive and files are accessible by viewing directories and loading readable text files.

— Or —

At the MS-DOS command prompt, use *dir* and *type* to verify that the drive and files are accessible by viewing directories and loading readable text files.

n

If the floppy disk drive is inaccessible, try reading a different disk. If that

doesn't work, shut down and restart the computer. Press F8 and choose option 6, Safe Mode Command Prompt Only. Check CMOS settings for the floppy disk drive using the hardware manufacture's diagnostic routine (consult your hardware documentation).

n

If installing from a compact disc, verify that MSCDEX and the CD-ROM

drivers are loaded and properly configured.

*Setup is unable to find a valid boot partition.*

A valid MS-DOS partition must exist in order for Setup to install Windows 95. If Windows 95 Setup is unable to find a valid boot partition during installation, it displays the message, "Setup unable to find valid Boot Partition." If you receive this message, there may be an actual partition error, but it is more likely that disk compression software or network components are mapping over the boot drive. This might occur if you are mapping a network drive to E, but E is the hidden host drive for your disk compression software, or you are using a LANtastic network and drive C is being mapped or shared.

To resolve the invalid partition error:

n

Verify the drive is not mapped over (or logically remapped).

n

Verify a valid, active partition using Fdisk. If no valid partition exists, take appropriate drive or data recovery efforts. If no active partition exists, use Fdisk to mark an appropriate partition as active.

n

Remove interfering drivers from the startup, and run Setup again.

n

If you are using disk compression software, ensure that none of your mapped network drive letters conflict with the host drive for your disk compression.

Setup finds insufficient disk space.

If Setup does not find sufficient space to install Windows 95, check for space on the destination and boot drives, and if using compression, check actual free space.

Setup error occurs on a computer running Windows NT.

Setup does not run under Windows NT, and you need to start to MS-DOS and then run Windows 95 Setup. This type of installation also has other contingencies:

n

If you are multibooting between MS-DOS and Windows NT, start the

system running MS-DOS, and run Setup from either MS-DOS or Windows 3.x. You cannot install Windows 95 in a directory with a shared Windows 3.x and Windows NT configuration. You need to install Windows 95 into a different directory.

n

If you are not multibooting between MS-DOS and Windows NT, configure

your computer to start multiboot MS-DOS and Windows NT first, and then follow the previous instructions.

n

If you start MS-DOS from a floppy disk and run Setup, you will no longer

be able to start Windows NT. (However, you can restore Windows NT by using the Windows NT emergency repair disk and selecting the Repair option).

n

If you are using a Window NT multiboot configuration with Windows 95

dual-boot, you may experience problems. If you are having problems using F4 to start MS-DOS, there may be 0-byte IO.SYS and MSDOS.SYS hidden files in the

root of your boot drive (which should be removed).

Windows 95 can dual boot with Windows NT, provided you install the operating systems in different directories. Windows 95 cannot be upgraded over a Windows version 3.x if it contains a SYSTEM32 subdirectory (which is created by Windows NT). To start the computer running MS-DOS from the Windows NT Boot Loader, you must select Boot To MS-DOS, and then press F4. (For this to work, the value `BootMulti=1` must be defined in the Windows 95 version of MSDOS.SYS.)

Setup error occurs on system with OS/2.

Setup disables OS/2 Boot Manager to ensure that Windows 95 can restart the computer and complete its installation. Therefore, if you are using OS/2 Boot Manager to choose operating systems at startup, OS/2 Boot Manager must be reset to use OS/2 after Windows 95 is installed. Boot Manager can be reactivated by starting with an OS/2 boot disk and using the OS/2 Fdisk utility.

If you are not using Boot Manager, you should configure your computer to use Boot Manager, and then follow the preceding instructions. If you start MS-DOS from a floppy disk and run Setup, you will no longer be able to start OS/2 after Windows 95 has been installed. To avoid this, rename or delete the AUTOEXEC.BAT and CONFIG.SYS files that OS/2 uses before running Windows 95 Setup.

General Protection Fault occurs in Setup on startup disk creation.

This may be due to a VxD installed by Norton Utilities in SYSTEM.INI.

[To prevent a general protection fault on Startup disk creation](#)

n

Restart Setup and choose not to create a Startup disk. (You can use the

Add New Hardware option in Control Panel to create a Startup disk after Setup is complete.)

— Or —

— Remove the following line from the [386enh] section of SYSTEM.INI

— device=symevnt.386

Setup fails automated installation.

If the automated installation fails:

n

Verify the basic network connection.

n

Check errors messages, if any.

n

Check the MSBATCH.INF file contents and syntax.

n

Check the domain validation.

n

Check for enough memory.

# n

Check for and remove unnecessary drivers and TSRs.

# n

If using a logon script, verify that the script ran properly.

This section describes specific conditions which may interfere with starting a Windows 95 computer and how to fix them.

*Windows 95 stalls during first restart after installation.*

If your computer does not start after you install Windows 95, you may need to disable the ISA enumerator. This software detects a new type of adapter which can be configured from the operating system. The detection sequence requires the ISA enumerator for I/O processes on some ports. Although every effort has been made to avoid ports commonly in use, you may have hardware which is also trying to use these I/O ports.

[To disable the ISA enumerator](#)

# n

Remove the following line from the [386Enh] section of SYSTEM.INI:

——device = ISAPNP.386

Bad or Missing file error occurs on startup.

If you receive a “Bad or missing FILENAME” message when the system is starting, where FILENAME may contain HIMEM.SYS, IFSHLP.SYS, and so on:

n

Check the syntax of the entry in the CONFIG.SYS or other startup file.

n

Verify the existence, location, version, and integrity of the file.

If the filename to which the message refers is a device driver the computer needs for accessing the drive where Windows 95 is installed, you need to move the device= line that contains the device driver to the beginning of CONFIG.SYS to allow the drive access when CONFIG.SYS tries to load files from the Windows directory.

Windows 95 has damaged or missing core files.

When Windows 95 loads, it counts on key files being available and undamaged. If a system file is damaged or missing, it may prevent loading or normal operation. If VMM32.VXD or other core files are missing or damaged, you may need to run Windows 95 Setup and select the Verify option in Safe Recovery to replace the files.

System Registry file is missing.

The Windows 95 system Registry file is required for operation. This file is contained in SYSTEM.DAT and USER.DAT and is backed up as .DA0 files. If only the SYSTEM.DAT Registry file is missing, Windows 95 does one of the following:



n

Windows 95 automatically replaces SYSTEM.DAT from the backup

Registry .DA0

Or

n

Windows 95 automatically uses Safe Mode to start Windows 95 and

displays the Registry Problem dialog box. Click the Restore From Backup And Restart button to restore the Registry, which copies SYSTEM.DA0 and USER.DA0 to .DAT files.

If both SYSTEM.DAT and SYSTEM.DA0 are missing (or if the WinDir= entry in MSDOS.SYS is not set), a message informs you that the Registry file is missing and that Registry services are not available for this session. (This means that most operations in Windows 95 will fail). After this message appears, Windows 95 automatically starts in Safe Mode and displays another message offering an option to restore the Registry. However, if there is no .DA0 file, the Registry cannot be restored. To resolve this problem, either restore SYSTEM.DAT from backup or run Windows 95 Setup.

#### [To rebuild a missing or damaged Registry](#)

1. Run Setup, select Safe Recovery, and select the option to verify system files.
2. Restart the computer. Press F8 and choose the Safe Mode option for system startup.
3. Import the Registry from an exported Registry file that is a backup for this specific computer.

For information about backing up the Registry, see Chapter 33, "Windows 95 Registry."

BIOS or a BIOS setting is incompatible.

A ROM BIOS setting may prevent Windows 95 from installing or loading, because some computers have a feature that prevents applications from writing to the boot sector. This is usually in the form of anti-virus protection set through your computer's CMOS. If this is enabled, Windows 95 is not able to complete the installation or it is unable to load properly.

If boot sector protection is enabled in the computer's BIOS, one of the following symptoms occurs:

n

Windows 95 stalls during Setup.

n

Windows 95 stalls while loading.

n

The screen prompts you to overwrite the boot sector. Choosing Yes may

allow you to complete the Setup procedure, but Windows 95 stalls when it attempts to load.

To correct this problem, disable the Boot Sector protection feature through your computer's CMOS, then reinstall Windows 95. For detailed instructions in disabling this feature, consult your hardware documentation or service center.

VxD error returns you to the command prompt.

If a VxD is missing or damaged, Windows 95 displays an error message informing you of which VxD is involved. If the VxD is critical to the operation of Windows 95, then Windows 95 does not start and the screen displays the command prompt. You may need to run Windows 95 Setup and select Verify or Safe Recovery to replace

the missing VxD.

In addition, there are provisions for selectively overriding a VxD that is included within VMM32.VxD. If the same VxD is loaded twice, the second instance intercepts all the calls to that particular VxD. There are two ways to override this:

n

Copy the file related VXD file into the Windows VMM32.VXD directory.

n

Edit the SYSTEM.INI to add the entry `device= filename.vxd` in the

[386enh] section.

*Dual boot to previous operating system doesn't work.*

To take advantage of the dual boot support in Windows 95, you cannot install Windows 95 into an existing Windows 3.x directory, and the value `BootMulti=1` must be defined in the Windows 95 version of MSDOS.SYS.

DR DOS, OS/2, and versions of MS-DOS earlier than 5.0 do not support Windows 95 dual boot functionality. To return to your previous operating system, you have to remove Windows 95, and reinstall your previous operating system, as described earlier in this chapter.

*"Previous MS-DOS files not found" message appears.*

When trying to dual boot to the previous version of MS-DOS, you may receive the error message, "Your previous MS-DOS files not found." It is probable that either the files are missing, or your previous version of MS-DOS was not version 5.0 or higher.

You must have MS-DOS 5.0 or higher in order to start to a previous version of MS-DOS. Any version of MS-DOS earlier than 5.0 looks for the first three sectors of the IO.SYS file in the first three sectors of the data area of the drive. In MS-DOS 5.0 or higher, IO.SYS is designed to allow itself to be located outside the first three sectors of a drive's data area. In this situation, the only way to start to a version of MS-DOS

prior to 5.0 is from a startup floppy disk.

Drivers loaded when you start the computer using the earlier version of MS-DOS, such as DBLSPACE.SYS, may not be available.

*Required real-mode drivers are missing or damaged.*

The previous operating system may have required certain real-mode drivers (compression, partitioning, hard disk drivers, and so on), and does not start correctly without them.

n

At system startup, press F8 and choose the option named Step-By-Step

Confirmation to verify the correct loading of all specified drivers.

n

Verify that any drivers required to support your hardware are all specified

in the appropriate startup file.

*Windows 95 doesn't recognize a device.*

In some cases Windows 95 is unable to recognize an installed device, and the device resources are unavailable to Windows 95. If Windows 95 doesn't recognize an installed device, perform the following procedures.

#### *To check devices in Device Manager*

1. In the System option in Control Panel, click the Device Manager tab.

— For information about using Device Manager, see Chapter 19, "Devices."

2. Click the + sign next to the device.

3. Double-click the specific device to display the related properties.

n

Verify drivers are loaded and hardware resources do not conflict.

n

Check SYSTEM.INI for third-party VxDs loaded to support the device.

If the device is using the real-mode drivers provided by the manufacturer, verify that the device works using its default drivers.

In some cases, the drivers provided by the manufacturer prevent correct device configuration by Windows 95. If a device failure prevents Windows 95 operation, try removing all real-mode drivers for the device and then reinstall Windows 95.

*Installing drivers causes Windows 95 system startup to fail.*

If you try to install third-party drivers for Windows over Windows 95 (Creative Technology, Ltd. Sound Blaster™ or video drivers, for example), running the provided installation program can cause Windows 95 to fail to start or operate correctly.

[To recover, when using a device that is supported by Windows 95](#)

1. Remove all entries in SYSTEM.INI that were added by the third-party installation software.
2. Delete the device in Device Manager in the System property sheets, as described in Chapter 19, "Devices."
3. Shut down and restart Windows 95.
4. Use the Add New Hardware option in Control Panel to reinstall the device using the Windows 95 drivers.

*The wrong applications run after Windows 95 starts.*

n

In Windows Explorer, double-click the Windows folder, and then double-click the Start Menu folder. Delete any items that you do not want to run when Windows 95 starts.

n

If the programs that are running do not appear in the Start Menu folder in

Windows Explorer, run Registry Editor and find this key:

— HKey\_Current\_User\Software\Windows\CurrentVersion\Explorer  
— \Shell Folders

— The value of Startup= should be windows\Start Menu\Program\Startup, where windows is the drive and directory containing the Windows 95 files.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Chapter 7 Introduction to Windows 95 Networking

This chapter provides an overview of Windows 95 networking, including a discussion of compatibility and operational improvements introduced with Windows 95, streamlined steps for network configuration, and a summary of Plug and Play networking support.

### *Windows 95 Networking: The Basics*

---

The Windows 95 operating system includes built-in networking support with a wide range of specific improvements over earlier versions of Windows.

*Built-in, native support for popular networks, plus an open, layered networking architecture.* The built-in networking components include support for a wide range of network transports (such as TCP/IP and IPX/SPX), industry-wide communications protocols (such as RPC, NetBIOS, and named pipes), and existing network device standards (such as NDIS and ODI). Because of the open architecture, other network vendors can easily integrate or add network connectivity enhancements and application support, and network administrators can mix and match components at every layer. For information, see Chapter 32, "Windows 95 Network Architecture."

The supported networks include the following:

n

Artisoft® LANtastic® version 5.0 and greater

n

Banyan® VINES® version 5.52 and greater

n

Beame and Whiteside BW-NFS version 3.0c and greater

n

DEC™ Pathworks™ version 4.1 and greater, or version 5.0 and greater

(installed as a protocol)

n

Microsoft LAN Manager, Windows for Workgroups 3.x, and Windows NT

n

Novell® NetWare® version 3.11 and greater

n

SunSelect PC-NFS® version 5.0 and greater





TCS® 10-Net version 4.1 and greater

*Robust networking components using no conventional memory.*

The protected-mode clients provided with Windows 95, Microsoft Client for NetWare Networks and Client for Microsoft Networks, use only 32-bit, protected-mode protocols, drivers, and supporting files. On large block transfers over the network, these protected-mode clients are up to 200 percent faster than real-mode clients under Windows 3.x. Windows 95 also includes new 32-bit drivers for network protocols and adapters, plus a new implementation of TCP/IP.

*Easy, graphical configuration for all networking components.*

All network clients, adapter drivers, protocols and services are installed and configured using the Network option in Control Panel rather than by manually editing configuration files. All configuration values for protected-mode components are stored in the Registry.

*Automatic setup of Windows 95 on network workstations.*

This includes installing Windows 95 using custom setup scripts and setting up to run Windows 95 from a shared network copy on a server. For information, see Chapter 4, "Server-Based Setup for Windows 95," and Chapter 5, "Custom, Automated, and Push Installations."

*Peer resource sharing with protected-mode network clients.*

Any computer running the protected-mode Microsoft Client for NetWare Networks or Client for Microsoft Networks can be set up to serve as a file and printer server for other computers on the network. Resources can be protected with user-level security on NetWare or Windows NT networks, using existing user account databases. On Windows networks, resources can be protected with share-level security.

*Simultaneous connection to multiple networks on a single computer.*—The number of network connections allowed on a computer running Windows 95 depends on the limits of your networking software. (Windows 3.x supported connection to only one network. Windows for Workgroups 3.11 allowed simultaneous connection to only two networks.) For information, see Chapter 32, "Windows 95 Network Architecture."

*Plug and Play networking support.*

You can use hot docking on a computer that has a PCMCIA network adapter, and use warm docking with a network adapter that has an NDIS 3.1 driver. If you disconnect the network cable from a computer running Windows 95 with Plug and Play components, the system continues to function. With most real-mode network clients, this causes the system to stall. This enhancement is described in “Plug and Play Networking Overview” later in this chapter.

#### *Unified logon, logon script processing, and resource browsing.*

You can use the Windows 95 unified user logon and password caching to log onto Windows NT, Novell NetWare, and other networks. Automatic logon script processing is provided for Microsoft networks and NetWare networks. Users can access network resources using Network Neighborhood or common dialog boxes such as the Open or Save As dialog boxes. For details, see Chapter 11, “Logon, Browsing, and Resource Sharing.”

#### *Automatic reconnection for lost server connections.*

When servers are available again after the loss of a network connection, Windows 95 reconnects automatically and rebuilds the user’s environment, including connection status, drive mappings, and printer connections.

Client-side caching of network information with protected-mode clients. — The protected-mode redirector is a file system driver, so it uses the same 32-bit cache used by all Windows 95 file system drivers, so it can cache network data for quick access. This feature is available when running Microsoft Client for NetWare Networks or Client for Microsoft Networks. For more information, see Chapter 20, “Disks and File Systems.”

#### *Long filenames for network resources.*

Computers running Windows 95 can recognize and use long filenames on other computers running Windows 95 and on Windows NT servers and on NetWare 3.x and 4.x volumes that have been configured to use the OS/2 namespace. For more information, see Chapter 20, “Disks and File Systems.”

#### *Support for the Win32 WinNet interface.*

This is an API that allows developers to create applications that run unmodified on different networks. The Win32 WinNet interface in Windows 95 supports 16-bit and 32-bit applications (as opposed to the WinNet interface in Windows 3.x, which supports only 16-bit applications). For information, see Chapter 32, “Windows 95 Network Architecture.”

#### *User profiles and system policies for automatic configuration.*

To take advantage of system policies, the computer must be running a protected-mode network client such as Microsoft Client for NetWare Networks or Client for

Microsoft Networks. For information, see Chapter 15, "User Profiles and System Policies."

*Agents for network backup and remote management.*

Windows 95 includes backup agents for Cheyenne ARCserve and Arcada Backup Exec, and an agent for Simple Network Management Protocols (SNMP). For information about setting up these network backup agents, which is done in the Network option in Control Panel, see Chapter 16, "Remote Administration."

*Dial-up networking for remote access.*

Windows 95 supports several protocols for remote access, including IPX/SPX and PPP. For information about remote access protocols and connection types, see Chapter 28, "Dial-Up Networking and Mobile Computing."

### Issues for Windows 95 Networking

---

The correct network client is installed automatically during Windows 95 Setup if the real-mode network is running when the user starts Setup. This is the recommended method for installing networking support in all cases. When Setup detects existing network components, it automatically installs appropriate supporting software and moves configuration settings to the Registry, wherever possible.

If Windows 95 Setup detects that NetWare networking components are present, it will automatically install the new protected-mode client, Microsoft Client for NetWare Networks, and the supporting protected-mode protocol and adapter drivers. To maintain the existing real-mode client and support configuration, you must run Setup in Custom mode and manually select the Novell NetWare client. For related details, see Chapter 9, "Windows 95 on NetWare Networks."

Microsoft recommends using the 32-bit, protected-mode networking components wherever possible. With protected-mode networking components, all configuration settings are stored in the Registry, so you do not have to maintain configuration files such as AUTOEXEC.BAT, PROTOCOL.INI, or NET.CFG. The protected-mode networking components also allow you to take advantage of the many related benefits such as:

n

Performance and reliability

# n

Peer resource sharing capabilities

# n

Use of system policies for administrative control, remote administration of

the Registry, and use of the network agents, such as Network Monitor and Remote Registry service, available in the ADMIN\NETTOOLS directory on the Windows 95 compact disc.

If you must run a real-mode client, networking settings are required in AUTOEXEC.BAT, plus a NETSTART.BAT file may be required to start the network during system startup. Configuration settings are maintained in PROTOCOL.INI or a similar file, depending on the particular network.

Issues related to running Windows 95 on specific networks are provided in the following chapters:

# n

Chapter 8, "Windows 95 on Microsoft Networks"

# n

Chapter 9, "Windows 95 on NetWare Networks"

# n

Chapter 10, "Windows 95 on Other Networks"

## *Network Configuration Overview*

---

All networking options for Windows 95 can be installed and configured automatically or by manual choices made during Windows 95 Setup. You can also install and configure networking support after Windows 95 is installed by using the Network option in Control Panel.

From the Network property sheets, you can set properties for the following:

# n

Configuration of network clients, adapters, protocols, and services

# n

Identification of the computer on the network

# n

Access control, to specify how other users can access this computer

In the procedures presented in the following sections, it is assumed that Windows 95 and the appropriate networking hardware have already been installed on your

computer. You only need to configure security for computers running Client for NetWare Networks, Client for Microsoft Networks, Dial-Up Networking, or the Microsoft Remote Registry service. For information about settings on the Security tab, see Chapter 14, "Security."

---

Tip—— To quickly display the Network option in Control Panel, right-click the Network Neighborhood icon on the desktop, and then click Properties on the context menu.

---

The recommended method for installing networking components for Windows 95 is to ensure that the existing real-mode networking components are running when you start Windows 95 Setup. In this case, Setup detects the existing components and automatically installs corresponding support for Windows 95 and, wherever possible, migrates configuration settings to the Registry. These steps are summarized in Chapter 3, "Introduction to Windows 95 Setup."

This section summarizes two other methods for installing networking support:

n

Using the Network option in Control Panel after Windows 95 is installed

n

Installing networking components using custom setup scripts

Specific issues for installing various network components are discussed in the other chapters in this part of WINDOWS 95 RESOURCE KIT. The following procedures describe the general steps that are required for installing any network component.

[To install network components after Windows 95 is installed](#)

1. Double-click the Network icon in Control Panel.

===={ewc msdncd, EWGraphic, x0f 0 /a "psF.bmp"}

2. On the Configuration property sheet, click the Add button.

3. In the Select Network Component Type dialog box, double-click the kind of component to be installed, as described in the following list.

===={ewc msdncd, EWGraphic, x0f 1 /a "psF.bmp"}

---

CI Select to  
ie install client  
nt software for  
the various  
types of  
networks to  
which the  
computer is  
connected.  
You can  
use either a  
32-bit  
network  
client,  
which  
needs no  
real-mode  
component  
s, or older  
real-mode  
networking  
clients.  
There is no  
limit to the  
number of  
32-bit  
network  
clients you  
can install,  
but you can  
have only  
one real-  
mode  
network  
client  
installed at

a time.  
Some  
networks  
are  
supported  
only as  
primary  
networks.  
For  
information,  
see  
Chapter 32,  
“Windows  
95 Network  
Architecture  
.”

A Select to  
d install  
a drivers for  
pt the network  
er adapters in  
the  
computer.  
You can  
select the  
type of  
driver to  
use  
(enhanced-  
mode  
NDIS, real-  
mode  
NDIS, or  
ODI),  
specify the  
resources  
the  
adapters  
you are  
using (such  
as I/O, IRQ,  
and  
transceiver  
type), and  
define other



options for  
the adapter.  
For  
information,  
see  
Chapter 12,  
“Network  
Technical  
Discussion.”

P Select to  
ro install  
to network  
c protocols  
ol and set  
related  
options. For  
information,  
see  
Chapter 12,  
“Network  
Technical  
Discussion.”

S Select to  
er specify the  
vi types of  
c peer file  
e and printer  
sharing  
services  
you want to  
run and to  
install other  
types of  
network  
services,  
such as  
backup  
agents,  
additional  
print  
services,  
Remote  
Registry,

and  
Network  
Monitor.

4. In the Select dialog box, select the name of the component manufacturer in the Manufacturers list, and then select the specific component in the Models list. Then click OK.

Some components are static and require that you shut down and restart the computer after installing that component.

You can install and configure networking components using custom batch scripts, as described in Chapter 4, "Server-Based Setup for Windows 95."

#### [To install networking components in custom setup scripts](#)

1. In MSBATCH.INF (or a similar file), specify settings for each required value in the [Network] section to define the client, protocols, network adapters, and services, plus the identifying computer name and workgroup.
2. Specify the appropriate parameters for configuring the network adapter driver in the related [NETCARD\_ID] section.
3. Specify the appropriate parameters for configuring the installed protocols in the [MSTCP] and [NWLINK] sections.
4. Specify the appropriate settings for configuring the installed network clients in the [NWREDIR] and [VREDIR] sections.
5. Specify the appropriate settings for the peer resource sharing service in the [NWSERVER] or [VREDIR] sections, if this service is installed.

For information about specific settings and examples, see Appendix D, "MSBATCH.INF Parameters."

Windows 95 requires that you define a workgroup and computer name for each networked computer, independent of the type of networking software you use. This information is required if you install networking software during Windows 95 Setup. You can also change the computer name or workgroup after Setup is complete.

#### [To specify the computer name, workgroup, and description for a computer](#)

1. In the Network option in Control Panel, click the Identification tab.

—{ewc msdncd, EWGraphic, x0f 2 /a "psF.bmp"}

2. Type values for the computer identification settings as defined in the following list.

---

C The  
o computer  
m name must  
p be unique  
ut on the  
er network. It  
N can be up  
a to 15  
m characters  
e long, with  
no blank  
spaces.  
The  
computer  
name can  
contain only  
alphanumeric  
ic  
characters,  
plus the  
following  
special  
characters:

! @ # \$ % ^  
& ( ) - ' \_  
{ } . ~

W The  
or workgroup  
k name does  
gr not need to  
o be unique,  
u but it uses  
p the same  
naming  
conventions  
as the  
computer  
name. For  
information  
about using

WRKGRP.I  
NI to set  
administrati  
ve  
guidelines  
for  
specifying  
the  
workgroup  
that can be  
selected,  
see  
Chapter 5,  
“Custom,  
Automated,  
and Push  
Installations  
.”

D Information  
e typed in this  
s box is  
cr displayed  
ip as a  
ti comment  
o next to the  
n computer  
name when  
users are  
browsing  
the  
network.

[To configure the network identification settings in custom batch scripts](#)

n

In MSBATCH.INF (or similar file), specify values for computername=, description=, and workgroup= in the [Network] section.

## *Plug and Play Networking Overview*

---

The networking components in Windows 95 are designed for dynamic Plug and Play operation with ISA, EISA, PCI, and PCMCIA network adapters. (Support for IBM® Micro Channel adapters is not yet available, at this writing.) To take advantage of these features, the computer must be running all protected-mode networking components, including client, protocols, and network adapter drivers.

The NDIS 3.1 specification supports adding and removing Plug and Play network adapters dynamically while the system is running. As NDIS 3.1 protocols, all three protocols included with Windows 95 (IPX/SPX, TCP/IP, and NetBEUI) are Plug and Play-enabled. This means that if the network is unavailable either due to undocking a portable computer, or removal of a PCMCIA network adapter, the protocol stacks will unload themselves. Additionally, this also means protocols can automatically be loaded.

The built-in Plug and Play support for networking means that if you add a Plug and Play network adapter to a computer, the following will occur:

n

The operating system will detect the presence of the network adapter.

n

The system will automatically configure the required resources and protocols, using default settings.

n

A message will ask you to restart the computer.

# n

After you restart the computer, you will have fully operational networking capabilities, with no additional configuration actions required.

As one example of what Plug and Play networking capabilities provide as a benefit, for PCMCIA cards, you can click the PCMCIA icon on the taskbar to remove the card without shutting down Windows 95 or turning off the computer. Using the PCMCIA icon causes the operating system to perform an orderly shutdown. Windows 95 notifies applications that the network is no longer available and automatically unloads any drivers or protocols.

As another example, if a portable computer supports hot docking, Plug and Play support means that you automatically have access to docking station resources as soon as you dock. All related software (including drivers and protocols) is automatically loaded. If, for example, the portable computer uses Dial-Up Networking with a modem card, after docking, this card can be ejected and a network adapter inserted while the computer is running. The previous supporting software components are automatically unloaded, and the drivers required for the new configuration are automatically loaded.

To help mobile users who may need to change adapters in their hardware, Windows 95 supports hot removal and insertion of PCMCIA cards, including network adapters, through built-in Card and Socket Services. Support for hot and warm docking means that users do not have to restart their systems each time they make a change to the configuration. For information about using and configuring PCMCIA cards, see Chapter 19, "Devices."

Network Plug and Play support in Windows 95 includes application-level support. An application that is network-aware understands whether the network is available. Therefore, if a network adapter is removed, for example, the application automatically puts itself into "offline" mode to allow the user to continue to work, or it shuts down gracefully.

## *Troubleshooting Network Installation*

---

This section provides basic troubleshooting information for installing network components with Windows 95. Additional troubleshooting information for particular networks is provided in each chapter in Part 3, "Networking." For information about troubleshooting procedures and the supporting tools provided with Windows 95, see Chapter 35, "General Troubleshooting."

To troubleshoot network problems, start by verifying the network operations status prior to and during the error condition. To evaluate the network problem, check these factors:

n

Did the network work before? If so, what has changed?

— If any hardware or software has been added or removed, reset original network hardware or software, and try again.

n

Was the third-party network previously installed and working?

— If not, reinstall the third-party network. Verify that the network operates correctly. Reinstall Windows 95.

n

Has any network cable been moved or added?

— Check cables, connections, and terminators.

n

Have any protocols been added or removed?

Check protocol settings, protocol bindings, and the compatibility of the protocol with the network.

n

Are the network adapter settings correct?

Check network adapter settings. Consult documentation or the network administrator for the correct settings. Reset the adapter settings to the correct values if necessary. Restart the computer and try again.

n

Has any network adapter been moved or added?

Check the adapter connection, and check any other working adapter.

n

Are the network connections live?

To check whether the network connection is live, with the network cable attached, look at the status lights on the back of the network adapter, or on the media attachment unit. If the status lights show activity, the connection is live. If there is no activity on the status lights, disconnect and reconnect the network cable and check for activity (blinking lights). If the adapter has no lights, try a different network outlet.

### [Checking Domain Validation](#)

Verify that the network domain is validating the user account. If the logon isn't validated, connections to required servers cannot be made, logon scripts won't run, and so on. If the network domain doesn't validate the account, perform each of the following procedures.



### [To check the logon setting](#)

1. In the Network option in Control Panel, double-click the network client (for example, Client for NetWare Networks or Client for Microsoft Networks).
2. Click the General tab of the network client property sheet, and verify that logon validation is enabled and that the correct domain name or preferred server is shown.

### [To check the user and workgroup names](#)

n

In the Network option in Control Panel, click the Identification tab. Check the computer name and workgroup name.

Also check basic logon requirements. For example, verify with the network administrator that the user password and the domain or preferred server account are correct, and test basic network functionality, such as viewing or connecting to other servers.

### [Checking Connections to Network Resources](#)

Determine whether domains, workgroups, and workstations appear in Network Neighborhood. If these appear, try connecting to a specific server or workstation. If these do not appear, then verify that at least one server exists on the local network and that client services and protocols are installed. Also check cable termination.

If you cannot connect to the server or workstation you want, review the error messages. Verify that you can connect to at least one server and workstation. If you cannot connect to any server or workstation, then check workgroup assignment, domain assignment, domain logon, and basic network operations.

If, after checking these, you still cannot connect, determine whether you can connect to a server from another computer. If this doesn't work, it probably indicates a problem with the server you are trying to connect to, or with the cabling or routing to that server.

### [Checking that Peer Resource Sharing Is Enabled](#)

Verify the File and Printer Sharing settings to ensure that sharing is enabled.

### [To verify File and Printer Sharing settings](#)

1. In the Network option in Control Panel, click the File and Print Sharing button.
2. In the File and Print Sharing dialog box, verify that both check boxes are checked if this computer is to allow other users access to its files and to any locally connected printer.

### [Checking Network Components](#)

The following procedures describe how to troubleshoot network setup by checking the settings of network adapters, drivers, protocols, and bindings.

---

Note — If the network adapter is not terminated, Windows 95 stalls upon startup (similar to Windows for Workgroups 3.11). To test whether this is causing a computer to stall, try directly terminating the network adapter.

---

### [To check the network adapter settings](#)

1. In the Network option in Control Panel, double-click the entry for the network adapter in the list of installed components.
2. Click the Advanced tab.
3. Verify that each property setting has an appropriate Value setting, as described in your hardware documentation.
4. Click the Resources tab, and verify that the configuration type, I/O address range, and IRQ are correct. Again, refer to your hardware documentation.

### [To check the network adapter drivers](#)

n

On the property sheet for the network adapter, click the Driver Type tab.

Verify that the appropriate driver type is selected. (If you are using a protected-mode network client, the default is an Enhanced Mode NDIS Driver.)

### [To check the bindings for network adapters](#)

# n

Click the Bindings tab, and make sure that there is a check mark beside each protocol. If the protocol is not checked, that protocol is not providing network functionality using that adapter.

### [To check the selected protocols](#)

1. In the Network option in Control Panel, double-click the entry for a protocol in the list of installed components.
2. Click the Bindings tab, and ensure that the protocol is bound to the network client. If there is no check mark beside an installed client, that client does not provide network functionality using that protocol.
3. Review the other property settings for the protocol with the network documentation or administrator.
4. Repeat these steps for each installed protocol.

### [Checking Real-Mode Network Components](#)

To check basic network communications, you can use *net diag* with a second computer connected to the same local network. As a diagnostic tool, *net diag* is designed to assist you in troubleshooting network connectivity problems by establishing a diagnostic server and then verifying that the local computer can connect to this server.

### [To establish a diagnostic server on a second local computer](#)

1. From a command prompt, type *net diag*
2. When a message appears showing the protocols in use, select one of the letters indicated in the message to specify the protocol to test.
3. When asked whether a diagnostic server exists, respond No, which makes this computer the diagnostic server.

### [To verify that the diagnostic server is detected in a Windows 95 DOS VM](#)

1. At the first computer (the one that requires troubleshooting), repeat steps 1 and 2 from the previous procedure.

2. Review the resulting message to verify that the diagnostic server is detected.

The following table describes commands that check other real-mode network information operations.

---

|    |                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------|
| -- | Displays network information.                                                                                      |
| -- | Displays the NetBIOS computer name.                                                                                |
| -- | Stops the network, but retains real-mode drivers.<br>Run Windows to verify it runs with real-mode network drivers. |

[To check the network adapter in real mode](#)

1. From MS-DOS or a Windows 95 VM, type the following:

—net diag /status

2. Press ENTER to examine the local network adapter status.

3. Select the LANA number on which to test the adapter (0 for the default protocol).

4. Check the adapter status display for errors.

[To check that the real-mode network client works](#)

1. Restart the computer, and press F8 to start Windows.

2. Select option 4, Step-By-Step Confirmation, to start Windows.

3. Select not to run WIN.COM.

4. At the command line, type net start basic

— If the network operates correctly, try reinstalling the protected-mode drivers.

#### [To reinstall the protected-mode drivers in Windows 95](#)

1. In the Network option in Control Panel, make note of each component that is installed.
2. Select all components and click the Remove button.
3. Click the Add button, and reinstall all components.

#### [Checking PROTOCOL.INI for Real-Mode Networking](#)

The PROTOCOL.INI file stores settings for real-mode networking components. Because Windows 95 is just loading the NDIS 2.0 driver, the only sections being read are [PROTMAN\$], [NETCARD], and [NDISHLP\$].

For details about the content of PROTOCOL.INI, see Chapter 8, “Windows 95 on Microsoft Networks.”

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## *Chapter 8 Windows 95 on MS Networks*

Computers running Windows 95 can communicate and share resources with other computers running Windows 95, Windows for Workgroups, Windows NT, and LAN Manager on Microsoft networks. This chapter presents procedures and technical information for using Windows 95 on Microsoft networks.

### *Windows 95 and Microsoft Networking: The Basics*

---

Client for Microsoft Networks is the 32-bit, protected-mode network client for Windows 95 that provides the redirector and other software components for Microsoft networking. Client for Microsoft Networks also supports limited interoperability with other Microsoft-compatible server message block-based (SMB) servers such as IBM® LAN Server, DEC™ Pathworks™, AT&T® StarLAN, and LAN Manager for UNIX® Systems local area network software.

Client for Microsoft Networks can be installed to serve as the sole network support for Windows 95 or to coexist with Client for NetWare Networks or clients from other network vendors, as described in Chapter 10, "Windows 95 on Other Networks." For technical information about these optional configurations, see Chapter 32, "Windows 95 Network Architecture."

The following summarizes key features of Client for Microsoft Networks.

#### *Automatic setup for Windows 95 with networking capabilities.*

For both Windows-based and MS-DOS-based computers, Setup automatically upgrades the network software to Client for Microsoft Networks and supporting protected-mode components, based on information detected about any existing Microsoft networking components. Setup also supports automated installation and customizing Windows 95 during installation from scripts, and setting up Windows 95 from a server to run from a local hard disk or from a shared network copy. For information, see Chapter 4, "Server-Based Setup for Windows 95," and Chapter 5, "Custom, Automated, and Push Installations."

#### *Complete networking capabilities integrated in the Windows 95 user interface.*

You can use the Windows 95 unified user logon and password caching to log onto a Windows NT domain (for either version 3.1 or 3.5). Users can access Windows NT resources using Network Neighborhood or common dialog boxes such as the Open or Save As dialog boxes. For details, see Chapter 11, "Logon, Browsing, and Resource Sharing."

#### *A high-performance, robust system using no conventional memory.*

Client for Microsoft Networks uses only 32-bit, protected-mode supporting networking components. This includes 32-bit versions of NetBEUI, Microsoft TCP/IP,

and the Microsoft IPX/SPX-compatible protocol and NDIS 3.1-compliant network adapter drivers. This protected mode client is designed to be used in a multitasking environment, providing robust performance and using no MS-DOS conventional memory space. For information about supporting protocols and network adapter drivers, see Chapter 12, "Network Technical Discussion."

#### *Client-side caching.*

The redirector in Client for Microsoft Networks is implemented as a file system driver and shares the common cache (VCACHE) used by all Windows 95 file system drivers. Files read across the network are copied to the RAM cache and are made available to applications much faster than they would be rereading the file across the network. For a given file request, the cache is checked for the needed data before checking the network. For more information, see Chapter 20, "Disks and File Systems."

#### *Complete Plug and Play support.*

You can use hot docking on a computer that has a PCMCIA network adapter, and use warm docking with a network adapter that has an NDIS 3.1 driver.

#### *Protected-mode peer resource sharing services.*

Computers running Client for Microsoft Networks as the Primary Network Logon client can be configured to provide peer server capabilities using File and Printer Sharing for Microsoft Networks (the Windows 95 SMB-based server, VSERVER.VXD). With peer resource sharing, other users on the network can access shared file resources and use Point and Print with shared printer. On a Windows NT network, shared resources can be protected with user-level security. For information, see Chapter 11, "Logon, Browsing, and Resource Sharing."

#### *Automatic reconnection for lost server connections.*

When servers are available again after the loss of a connection, Windows 95 reconnects automatically and rebuilds the user's environment, including connection status, drive mappings, and printer connections.

#### *Long filenames for network resources.*

Computers running Windows 95 can recognize and use long filenames on Windows NT servers.

#### *Dial-Up Networking.*

Windows 95 supports several protocols for remote network access, including TCP/IP, IPX/SPX, and PPP. For information about remote access protocols and connection types, see Chapter 28, "Dial-Up Networking and Mobile Access."

User policies for automatic desktop configuration.

To take advantage of user profiles on Microsoft networks, the computer must be running Client for Microsoft Networks. For information, see Chapter 15, "User Profiles and System Policies."

Remote boot from a Windows NT server.

At this writing, this includes support for floppy-disk startup when running a shared network copy of Windows 95. Support for booting diskless workstations will be available in Windows NT update releases. For information about shared installations, see Chapter 4, "Server-Based Setup for Windows 95."

Backup agents for Cheyenne ARCserve and Arcada Backup Exec.

For information about setting up these network backup agents in the Network option in Control Panel, see Chapter 16, "Remote Administration."

Agents for Simple Network Management Protocols (SNMP) and Network Monitor.

These agents are available in the ADMIN\NETTOOLS directory of the Windows 95 compact disc. You can use a service such as HP® Open View or Microsoft Systems Management Server to manage workstations remotely. For information about remote administration, see Chapter 16, "Remote Administration."

Issues for Windows 95 Networking

---

This section summarizes that issues should be considered in planning for Windows 95 on Microsoft networks.

Client for Microsoft Networks must be configured as the Primary Network Logon client in these cases:

n

If you want to use logon validation when user accounts are maintained on

a Windows NT network



n

If you want to configure the computer to use File and Printer Sharing for Microsoft Networks

n

If you want to take advantage of user profiles for configuring or managing custom desktops on a Microsoft network

n

If you want to install the Microsoft Remote Registry agent for remote administration of the computer's Registry (this service requires user-level security)

When you are using a real-mode client for another network, Client for Microsoft Networks must also be configured as one of the network clients on the computer in these cases:

n

If you want to take advantage of the Windows 95 unified logon and user interface for navigating the network, and you want to use the Windows 95 network management tools

# n

If you want to take advantage of long filenames, client-side caching, automatic reconnections, and other performance enhancements provided in Client for Microsoft Networks

Client for Microsoft Networks cannot use a LAN Manager domain controller for logon validation. To take advantage of the user-level security support on Microsoft networks, the user must have an account on a Windows NT domain.

On a Windows NT network, the Windows NT server must be configured to support Point and Print, as described in Chapter 23, "Printing and Fonts."

To share resources with computers running other Microsoft networking products, the computers must be running a common protocol.

## *Installing Client for Microsoft Networks*

---

In Windows 95, Client for Microsoft Networks provides the redirector (VREDIR.VXD) to support all Microsoft networking products that use the SMB protocol. This includes support for connecting computers running Windows 95, LAN Manager, Windows NT, Windows for Workgroups, and Workgroup Add-on for MS-DOS networking software for personal computers running MS-DOS.

Because Windows 95 network redirectors are implemented as file system drivers, Client for Microsoft Networks provides mechanisms for locating, opening, reading, writing, and deleting files, submitting print jobs, and making available application services such as named pipes and mailslots.

If a previous Microsoft network is running when Windows 95 Setup is started, then Client for Microsoft Networks is installed automatically, as described in Chapter 3, "Introduction to Windows 95 Setup." You can add Client for Microsoft Networks after Setup in addition to other network clients that may be running, or if network hardware is added to the computer.

## *To install Client for Microsoft Networks*

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button.
2. In the Select Network Component Type window, double-click Client.

3. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and then click Client for Microsoft Networks in the Network Clients list. Click OK.  
{ewc msdncd, EWGraphic, x0g 0 /a "psG.bmp"}

### Configuring Client for Microsoft Networks

---

Configuring Client for Microsoft Networks consists of specifying three options:

n

Whether Client for Microsoft Networks is the Primary Network Logon client

n

Whether users log onto a Windows NT domain for pass-through security validation

n

Whether persistent connections to network drives will be restored when the user logs onto Windows 95 or only when the resource is used

This section describes these options and how to configure the network client.

Setting Client for Microsoft Networks as the Primary Network Logon client means that the Microsoft network is used for validating and establishing primary network connections when the user logs onto the network. This include the following:

n

The Microsoft network can be used to download system policies and user profiles.

n

For this computer, logon scripts run from a Windows NT Server computer.

n

Users can be authenticated by a Windows NT Server domain controller to log onto the network.

*To make Client for Microsoft Networks the Primary Network Logon client*

1. In the Network option in Control Panel, click the Configuration tab.
2. In the Primary Network Logon list, select Client for Microsoft Networks.

The Client for Microsoft Networks property sheet allows you to specify Microsoft Windows NT validation and network resource connection options. This section describes how to configure these options.

Logon Validation automatically validates the user on the specified Windows NT domain during the process of logging onto Windows 95. If logon validation is required on your network and this option is not configured, you will not be able to access most network resources. If this option is configured and you (or another user) does not provide a correct password, you may not notice anything about Windows 95 operation, except that you won't have access to network resources.

Notice also that Logon Validation can be configured by the network administrator using system policies. With system policies, the administrator can also set options that prevent the user from access resources on the local computer if the correct logon password is not provided. For information, see Chapter 15, "User Profiles and System Policies."

#### [To configure logon validation for Client for Microsoft Networks](#)

1. On the Configuration property sheet in the Network option in Control Panel, double-click Client for Microsoft Networks in the list of network components.
2. On the General property sheet, check the Log On To Windows NT Domain option if you want to automatically log onto a Windows NT domain when starting Windows 95.

— If you do not want to log onto a domain when starting Windows 95, make sure this option is cleared.

3. If you select logon validation, you must also specify the domain to be used for validation by typing or selecting a name in the Windows NT Domain box.

— You can specify a Windows NT domain name or the name of a Windows NT domain controller (version 3.1 or 3.5) where you have a user account.

— {ewc msdncl, EWGraphic, x0g 1 /a "psG.bmp"}

---

Note — The user's user name and password must be specified in a user account on the specified Windows NT domain for logon validation to work.

Also, Windows 95 does not support using a LAN Manager domain controller as a security provider.

---

You can also specify whether Windows 95 should automatically establish a connection for each persistent connection or verify whether to reestablish connections at system startup.

#### [To configure how persistent connections are restored for Client for Microsoft Networks](#)

# n

On the General property sheet for Client for Microsoft Networks, click

Quick Logon if you want to log onto the network without establishing a session for each persistent network connection.

Or

Click the Logon And Restore Network Connections option if you want Windows 95 to verify each persistent network connection at startup by establishing a session for each persistent connection.

Quick Logon works in essentially the same way that Ghosted Connections worked under Windows for Workgroups 3.11. That is, Windows 95 initializes data structures for mapping local drives and local printer ports to network resources, but does not physically attach to the network resource until the user tries to access the resource.

When you use Quick Logon (which is the default), Windows 95 can start up and return control of the user interface faster than if the physical connections are actually made. Because your computer may not be physically attached to the resource when you click a drive icon for the first time (for example, in My Computer), you might see a slight delay before the directory for that network drive is displayed. This delay is balanced against a possibly long startup time, depending on the number of persistent network connections you maintain.

## *Running Windows 95 in a Mixed Microsoft Network Environment*

---

This section presents some technical notes for consideration if your network includes computers running Windows NT earlier versions of Microsoft networking products in addition to computers running Windows 95.

Microsoft Windows NT Server networks provide both client-server and peer-networking with user-level security using a domain structure. You can run Windows 95 on a Windows NT network, and you can install Windows 95 for dual-booting on computers running Windows NT 3.1 or Windows NT 3.5.

The following chapters present additional details related to Windows 95 on Windows NT networks:

n

Chapter 4, “Server-Based Setup for Windows 95,” for information about setting up a Windows NT Server with Windows 95 source files for shared and local installation of Windows 95

n

Chapter 5, “Custom, Automated, and Push Installations,” for information about installing Windows 95 from logon scripts using Windows NT Server

n

Chapter 11, “Logon, Browsing, and Resource Sharing,” for a description of the support for running logon scripts from Windows NT Server

n

Chapter 12, “Network Technical Discussion,” for a description of the support available through Windows NT for DHCP and WINS servers

n

Chapter 14, "Security," for a detailed description of user-level security in

Windows 95 using Windows NT for pass-through validation

For information about installing Windows 95 as a dual-boot operating system with Windows NT, see Chapter 6, "Setup Technical Discussion." The following notes summarize important issues for this configuration:

n

Windows 95 and Windows NT versions 3.1 or 3.5 can be installed on the

same computer, but should not be installed in the same directory.

n

You cannot run Windows 95 Setup from within Windows NT 3.1. You must

run Setup from MS-DOS, Windows 3.1, or Windows for Workgroups.

n

If your computer has any NTFS partitions, these are not available while

running Windows 95. That is, any data or programs on those partitions cannot be seen or accessed from Windows 95 running on the local computer.

[Running Windows 95 in a Mixed Environment with Windows NT](#)



In Windows 95, computers are logically grouped in workgroups, where each computer in the workgroups maintains its own security system for validating local user logon and access to resources. Computers in workgroups do not share security with other computers, and do not rely on other computers to provide security. On Windows NT networks, computers can be grouped in domains, which allow multiple servers and workstations to be grouped for unified administration. With Windows NT domains, centralized user accounts are used to validate user logon and access to resources.

For purposes of browsing network resources, Windows 95 and Windows NT use the same workgroup model, so computers running File and Printer Sharing for Microsoft Networks can appear in the same workgroup as computers running Windows NT. Computers running Windows NT will be favored in Browse Master elections, because of the higher version number of the browser software.

Users running Client for Microsoft Networks can access the shared resources on a computer running Windows NT if both computers are using a common protocol. For resources protected with user-level security, the user running Windows 95 must have been granted access to those resources. Conversely, a user running Windows NT can connect to the shared resources on a computer running Windows 95 if the same conditions are met.

#### [Notes on Windows NT Server Benefits](#)

The Microsoft Windows NT Server operating system is the high-end member of the family of Microsoft Windows operating systems, providing a powerful, reliable, and scalable operating system to support the demands of client-server computing. Also, on a peer-to-peer network where the computers are running Client for Microsoft Networks, Windows NT can be added to the network without changing the networking software on the existing computers.

Windows NT Server provides the ideal platform for the server backbone in a mixed-network environment. It is especially versatile and powerful for enterprise networks made up of LANs that use a variety of network types and require dial-in support for network access.

Windows NT Server is designed to support complex business applications with the following features:

*Networking and workgroup support.*— Windows NT Server provides built-in file and printer sharing capabilities for workgroup computing, and an open network system interface that includes built-in support for IPX/SPX, TCP/IP, NetBEUI, and other protocols. Windows NT Server provides administrative tools for controlling network services, auditing system events, changing hardware configuration and system performance, managing and backing up disks, and more. Windows NT also provides robust support for server-based and client-server applications.

Interoperability.— Windows NT Server is compatible with networks such as Windows 95, Banyan® VINES®, Novell® NetWare®, UNIX®, LAN Manager 2.x, and Microsoft Windows for Workgroups. Windows NT Server can immediately add value to your current network environment without disruption. Even though networks and interoperability are complicated, a Windows NT network is easy to use and reliable, with automatic configuration provided wherever possible, and remote administration ensured for most administration tasks.

A single network logon. Users can access network resources, including client-server applications, using one user account and one password per user.

Centralized management of user accounts.— The administrator can work from a single computer across divisions, departments, and workgroups.

Advanced data protection features.— These include disk mirroring, disk striping with parity (RAID 5), and uninterruptible power supply support.

Remote Access Service.— Users can access network resources, whether off-site, traveling, or working at home. Users can dial in over asynchronous telephone lines or Integrated Services Digital Network (ISDN) lines to access the network from computers running Windows 95, MS-DOS, Windows for Workgroups, or Windows NT operating systems. Windows NT RAS also supports X.25 networks.

Access to Apple® Macintosh® resources.— When Services for Apple Macintosh is installed on a Windows NT Server, Macintoshes and computers running Windows 95 can work together to share files, printers, and client-server applications. Macintosh users can access resources on a computer running Windows NT Server, similar to any other AppleShare® server.

Either Windows 95 or Windows NT can be installed as upgrades for all versions of LAN Manager and IBM® OS/2® LAN Server, depending on the role you want that computer to serve on the network. Microsoft recommends that you upgrade such servers, rather than maintain these legacy systems on your network.

A workgroup in Windows 95 is analogous to a LAN Manager domain in that it's a logical grouping of workstations. However, a workgroup in Windows 95 does not share any of the advanced security features offered as part of a LAN Manager domain. Windows 95 does not support using a LAN Manager domain controller as a security provider, so only share-level security can be used for computers running Windows 95 on LAN Manager networks. (User-level security requires a Windows NT domain.)

[To ensure that computers running Windows 95 can see LAN Manager servers](#)

# n

Make sure that at least one computer running Windows 95 on the network

sets its workgroup name to the name of the LAN Manager domain.

After a computer running Windows 95 becomes a member of the LAN Manager domain, this computer can distribute the names of LAN Manager servers in that domain to other computers running Windows 95 on the network. The configuration must be duplicated for each LAN Manager domain to support viewing of LAN Manager servers by all computers running Windows 95.

[To ensure that LAN Manager workstations can see and access resources on computers running File and Printer Sharing Services for Microsoft Networks](#)

1. Make sure that all the computers are using a common protocol.
2. Make sure that users running LAN Manager clients have been granted access to the resources on the computers running Windows 95.
3. Set the value of the LMAnnounce property to Yes on each computer running Windows 95 with File and Printer Sharing services, as described in “Configuring File and Printer Sharing for Microsoft Networks” in Chapter 11, “Logon, Browsing, and Resource Sharing.”

The LMAnnounce setting ensures that the computer running Windows 95 peer resource sharing services announces its presence to LAN Manager workstations and servers. Notice that, by default, the LMAnnounce property is set to No to reduce broadcast traffic on the network.

[Tips for LAN Manager Variations](#)

IBM OS/2 LAN Server supports a domain model and is equivalent to LAN Manager for interoperating with Windows 95. Just as with Windows for Workgroups, the Client for Microsoft Networks in Windows 95 does not support LAN Server aliases.

DEC Pathworks is a LAN Manager-compatible network, but does not support a domain model for browsing servers and shared resources. DEC Pathworks servers will not appear in Network Neighborhood, but users running Windows 95 can access the servers and resources by using the Map Network Drive dialog box and specifying a server's UNC name.

For more information about both of these networks, see Chapter 10, “Windows 95

on Other Networks.”

Windows 95 uses the same workgroup model as Windows for Workgroups. Because of this, computers running File and Printer Sharing for Microsoft Networks can be seen by computers running Windows for Workgroups. The Windows 95 computers will be favored in Browse Master elections, because of the higher version number of the browser software.

Users who are running Client for Microsoft Networks can access the shared resources on a computer running Windows for Workgroups if both computers are using a common protocol.

Users running Windows for Workgroups can connect to the shared resources on a computer running File and Printer Sharing for Microsoft Networks if the following conditions are true:

n

The computers must be using a common protocol.

n

The user running Windows for Workgroups must have been granted

access to the resources on the computer running Windows 95.

Computers running File and Printer Sharing for Microsoft Networks can appear in the same workgroup as a computer running the peer server supported in Workgroup Add-on for MS-DOS. There must be at least one computer in the workgroup configured as Browse Master that is running Windows 95, Windows for Workgroups, or Windows NT for a list of servers to be available in the workgroup. A computer running Workgroup Add-on for MS-DOS cannot be a browse server.

Users running Client for Microsoft Networks can access the shared resources on a

computer running Workgroup Add-on for MS-DOS if both computers are using a common protocol. The user on a computer running Workgroup Add-on for MS-DOS can access resources on a computer running File and Printer Sharing for Microsoft Networks if both computers are using a common protocol, and if the user has been granted access to the shared resources.

---

### *PROTOCOL.INI: Real-Mode Network Initialization File*

---

For real-mode networking, Windows 95 uses a file called PROTOCOL.INI in the Windows directory to determine the parameters for the protocol and network adapter drivers. PROTOCOL.INI is created and modified by Setup from information in INF files if any real-mode networking components are installed, such as NDIS 2.x adapter drivers.

If you typically run Client for Microsoft Networks, the PROTOCOL.INI file on your computer is used to support Safe Mode Command Prompt Only with networking for system startup.

---

*Important* — Do not modify PROTOCOL.INI unless absolutely necessary. Windows 95 relies on the format and configuration information present in PROTOCOL.INI to run and to install other network components—inadvertent errors in PROTOCOL.INI can damage the integrity of the Windows 95 environment.

---

PROTOCOL.INI also contains network adapter configuration information, such as the I/O address, DMA, and IRQs. The PROTOCOL.INI file contains sections for [network.setup], [protman], and separate sections for each configured network adapter and network protocol.

### *Tip for Configuring Adapters with Real-Mode Networking*

When multiple hardware adapters are used on a computer, some entries in PROTOCOL.INI, such as interrupt settings and shared memory addresses, may need adjustments to avoid hardware conflicts. Because Windows 95 Setup cannot anticipate every possible conflict, watch for error messages when you start the computer in the real-mode networking.

For example, if a network adapter and a video controller adapter both try to use the same memory address, you must adjust one of the adapters to a different address, either using the setup software for the adapter or the switches on the adapter (or both, which is necessary in most cases). The PROTOCOL.INI entries must agree with the jumper setting on each adapter.

[\[network.setup\]](#)

This section provides information from Setup for the network installation.

---

- Current network software version.
  - The network adapter driver name for each adapter that is used in the computer.
  - The name of the network transport driver protocol.
- [lan](#) Identifies the binding between the network adapter and the network protocol, as configured by Setup.

The [network.setup] entries are shown in the following example:

```
[network.setup]
version= 0x400
netcard= ms$ee16, 1, MS$EE16
transport= ms$netbeui, MS$NETBEUI
lana0= ms$ee16, 1, ms$netbeui
```

[\[protman\]](#)

This section provides the settings for the Protocol Manager. The following list shows the format for this section.

---

The  
PROTMAN  
\$ entry  
defines the  
driver  
name for  
the  
Protocol  
Manager.

The priority  
entry  
determines  
the order in  
which  
incoming  
frames are  
processed.  
If used, the  
highest  
priority is  
given to the  
first  
protocol  
stack,  
MS\$NETB  
EUI

The following shows an example of entries in this section for a computer configured with NetBEUI:

[protman]  
drivename= PROTMAN\$  
priority= MS\$NETBEUI

[\[netcard\]](#)

This section lists the set of parameters for an NDIS network adapter. A [NETCARD] section is present for each network adapter configured in the computer, and the specific entries present in this section will vary depending on the network adapter installed. The following shows an example of entries in this section for an Intel® EtherExpress™ 16 or 16TP adapter:

[ms\$ee16]  
drivename= EXP16\$  
IOADDRESS=0x300  
IRQ=5  
IOCHRDY=Late  
TRANSCEIVER=Thin Net (BNC/COAX)

### [protocol]

This section defines the settings used by a network protocol. A [PROTOCOL] section is present for each network transport protocol installed on the computer, and the specific entries present in this section will vary depending on the protocol installed. The following list shows the format for entries common to each configured protocol.

prot  
oco  
!

---

The entry indicates the network adapter drivers to which each transport protocol binds. The

n  
e



t

c

a

r

d

name for  
the network  
adapter  
driver and  
protocol  
must

appear in  
the \_entry  
for at least  
one of the  
protocol  
drivers.  
The \_entry  
may  
specify one  
or more

[n

e

t

c

a

r

d]

sections  
(separated  
by  
commas).

— The entry  
defines the  
first LANA  
number the  
protocol is  
to accept.  
Refer to

[/ana#](#)

in the  
[network.se

tup]  
section.

The following is an example of the entries present in this section for the Microsoft NetBEUI protocol:

[MS\$NETBEUI]  
drivename= NETBEUI\$  
sessions= 10  
NCBS= 32  
bindings= MS\$EE16  
lanabase= 0

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Chapter 9 Windows 95 on NetWare Networks*

This chapter presents information for configuring and integrating Windows 95 on Novell® NetWare® networks.

The following chapters include additional specific information for using Windows 95 on NetWare networks:

n

Chapter 4, “Server-Based Setup for Windows 95,” describes how to set up

master source files for Windows 95 on a NetWare server and install a shared copy of Windows 95 on NetWare workstations.

n

Chapter 5, “Custom, Automated, and Push Installations,” provides specific

instructions for automatically installing Windows 95 on NetWare workstations using logon scripts and other methods.

n

Chapter 11, “Logon, Browsing, and Resource Sharing,” describes how to

configure and use logon validation for Windows 95 users on NetWare networks, and how to connect to and browse NetWare servers using Windows 95 tools. This chapter also describes how to configure and manage Microsoft File and Printer Sharing for NetWare Networks for peer resource sharing.

n

Chapter 14, “Security,” provides configuration and management information for pass-through and user-level security for Windows 95 on NetWare networks.

n

Chapter 23, “Printing and Fonts,” describes how to use the Win32-based PSERVER software, available in the ADMIN\NETTOOLS\PRINTAGENT directory on the Windows 95 compact disc, to despool print jobs from NetWare print queues to printers connected to computers running Client for NetWare Networks.

n

Chapter 28, “Dial-Up Networking and Mobile Computing,” describes how to configure and manage remote network access for computers running Windows 95 on NetWare networks.

---

Note — For more information about configuring Novell-supplied components and running NetWare utilities, consult your NetWare documentation.

---

---

### *Windows 95 on NetWare Networks: The Basics*

---

Windows 95 runs on NetWare workstations that use Novell NetWare versions 2.15 and later, 3.x, and 4.x servers. You have several choices for the networking client to use, as described later in this section:

n

The new 32-bit, protected-mode Microsoft Client for NetWare Networks

n

Novell NetWare 3.x real-mode networking client (NETX)

n

Novell NetWare 4.x real-mode networking client (VLM)

---

Note — In the WINDOWS 95 RESOURCE KIT, “NETX” is used to refer to the Novell NetWare workstation shell for NetWare version 3.x; VLM is used to refer to the NetWare workstation shell for version 4.x.

---

Whichever client you choose, you can use the built-in features and commands in Windows 95 to perform most common network operation and administration tasks. Microsoft Client for NetWare Networks can process logon scripts, and also supports the 16-bit NetWare 3.x and 4.x command-line utilities for both users and administrators, so that you can use these utilities in the same way as with NETX or VLM clients running under MS-DOS or an earlier version of Windows.

Windows 95 provides complete 32-bit, protected-mode software for running on Novell NetWare networks, including a network client (sometimes called the redirector or requestor), an IPX/SPX-compatible protocol, network adapter drivers, and administrative tools. With the Microsoft Client for NetWare Networks in Windows 95, users can access NetWare server services, browse and connect to NetWare servers, and queue print jobs using the Windows 95 network user interface or Novell NetWare utilities.

## *Issues for Windows 95 on NetWare Networks*

---

This section describes the different features available, depending on whether you choose to run Windows 95 using the Microsoft Client for NetWare Networks or using a Novell-supplied NETX or VLM client.

---

*Important* — In most cases, Windows 95 Setup will automatically install Microsoft Client for NetWare Networks if it detects NetWare networking components on the computer. To install Windows 95 with Novell-supplied networking support, you must use a custom setup script that specifies the network client you want, or manually choose the Custom setup type and then select a Novell-supplied network client. For instructions on how to install Windows 95 with a Novell-supplied client, see “Using a Novell NetWare Client” later in this chapter.

---

Whichever network client you use, the following features are available in Windows 95 to support computers running on NetWare networks:

*Automatic setup for Windows 95 on NetWare workstations.*

This includes preparing for automatic installation and customizing Windows 95 as part of installation, and setting up to run Windows 95 from a local hard disk or running a shared network copy from a server. For information, see Chapter 4, “Server-Based Setup for Windows 95,” and Chapter 5, “Custom, Automated, and Push Installations.”

*Remote boot from a NetWare server.*

This includes support for startup of diskless workstations running a shared network copy of Windows 95. For information about remoteboot workstations and shared installations, see Chapter 4, “Server-Based Setup for Windows 95.”

*Full integration in the Windows 95 user interface.*

You can use the Windows 95 unified logon and password caching to log onto a NetWare server running version 2.15 and above, 3.x, or 4.x. Users can access NetWare server resources using Network Neighborhood or common dialog boxes such as the Open or Save As dialog boxes. For details, see Chapter 11, “Logon, Browsing, and Resource Sharing.”

However, the first release of Windows 95 does not support the use of NetWare domains or the distributed name server called NetWare Naming Service (NNS). NNS is installed as an add-on product that is supported by NetWare 3.x servers. NNS uses a domain model for NetWare servers by grouping them and distributing the domain’s account list to all servers in the domain. Users running a NetWare-compatible client can log onto servers that run NNS, but cannot use NNS tools while running Windows 95.



*Printing to NetWare print queues using Point and Print.*

A computer configured with any NetWare-compatible network client can be configured to print to a NetWare print queue using the Point and Print features in Windows 95.

*Microsoft print agent for NetWare networks.*

The utilities available in the ADMIN\NETTOOLS directory on the Windows 95 compact disc include a Win32-based PSERVER capability that can despool print jobs from NetWare print queues to printers connected to computers running Microsoft Client for NetWare Networks. For details, see Chapter 23, "Printing and Fonts."

*Backup agents for Cheyenne ARCserve and Arcada Backup Exec.* — For information about setting up these network backup agents, which is done in the Network option in Control Panel, see Chapter 16, "Remote Administration."

*Agent for Simple Network Management Protocols (SNMP).*

You can use a server service such as HP® Open View or the Novell NMS software to manage workstations remotely. The Microsoft SNMP agent can run over IPX. For information about remote administration, see Chapter 16, "Remote Administration."

If you are installing Windows 95 to run on a NetWare network, Microsoft recommends that you use the Microsoft Client for NetWare Networks, which provides a 32-bit, protected-mode redirector. Client for NetWare Networks can be installed to coexist with Client for Microsoft Networks, or it can be used as the sole network support for Windows 95. For technical information about these optional configurations, see Chapter 32, "Windows 95 Network Architecture."

`{ewc msdncd, EWGraphic, x0h 0 /a "psH.bmp"}`

Using Client for NetWare Networks provides the following benefits:

*A high-performance, robust system using no conventional memory.* — Client for NetWare Networks uses only 32-bit protocols, drivers, and supporting files. This client is designed to be used in a multitasking environment and provides the robust performance available for all protected-mode components in Windows 95, using no MS-DOS conventional memory space. On large block transfers over the network, Client for NetWare Networks is up to 200 percent faster than Windows 3.x with the VLM client. For most network operations that are a mix of reading and writing, Client for NetWare Networks is 50 to 200 percent faster, depending upon the mix of I/O operations.

Interoperation and logon with Novell NetWare 2.15, 3.x, and 4.x servers.— This includes support for running NetWare logon scripts. Client for NetWare Networks can access servers running NetWare 2.15 and above, NetWare 3.x servers (which are bindery-based), and NetWare 4.x servers using bindery emulation. Windows 95 provides a script processor for running logon scripts.

Complete Plug and Play support. You can use hot docking on a computer that has a PCMCIA network adapter, and use warm docking with a network adapter that has a Network Device Interface Specification (NDIS) 3.1 driver. If you disconnect the network cable from a computer running Windows 95 with Plug and Play components, the system continues to function. With most real-mode network clients, this causes the computer to stall. For more information, see Chapter 7, “Introduction to Windows 95 Networking.”

Protected-mode peer resource sharing services. To use Microsoft File and Printer Sharing for NetWare Networks, the computer must be running Client for NetWare Networks as the Primary Network Logon client. For more information, see Chapter 11, “Logon, Browsing, and Peer Resource Sharing.”

Client-side caching for network information. Because the Client for NetWare Networks redirector is a file system driver, it uses the same 32-bit cache used by all Windows 95 file system drivers, so it can cache network data for quick access. For more information, see Chapter 20, “Disks and File Systems.”

Automatic reconnection for lost server connections. When servers are available again after the loss of a NetWare Core Protocol (NCP) connection, Windows 95 reconnects automatically and rebuilds the user’s environment, including connection status, drive mappings, and printer connections. (Novell-supplied AUTO.VLM only reconnects servers.) This also means that the client is not affected if the server is down or the network cable is not working.

Support for all documented MS DOS APIs defined by Novell. This includes support for all NetWare 3.x APIs defined in the Novell NetWare Client SDK. NetWare-aware applications that use only these documented APIs are compatible with Client for NetWare Networks. For more information, see “Client for NetWare Networks Technical Notes” later in this chapter.

Long filenames. Computers running Windows 95 can recognize and use long filenames on NetWare 3.x and 4.x volumes that have been configured to use the OS/2 namespace, which emulates an HPFS volume. For more information, see “Configuring NetWare Servers to Support Windows 95” later in this chapter.

Remote network access. Windows 95 supports several protocols for remote access to NetWare networks, including IPX/SPX and PPP. For information about remote access protocols and connection types, see Chapter 28, “Dial-Up Networking and Mobile Access.”

User profiles and system policies for system configuration. To take advantage of

user profiles on NetWare networks, the computer must be running Client for NetWare Networks. For information, see Chapter 15, "User Profiles and System Policies."

Support for packet-burst protocol for faster data transfer. Client for NetWare Networks supports burst-mode NCPs, a sliding window implementation.

Large Internetwork Packet (LIP) protocol support. LIP works to increase the speed of data transmission when communication occurs over a router. Previously, if a server identified a router between itself and the client, the packet size was set to 576 bytes (including 64 bytes of header information). Using LIP, the client and server can negotiate the packet size used when communication occurs through a router. With LIP, the packets can be set to a maximum of 4202 bytes, based on the maximum physical packet size of the server. LIP is enabled between computers running Client for NetWare Networks and NetWare 3.12 – 4.x servers or any computer running Microsoft File and Printer Sharing for NetWare Networks.

When should Novell-supplied clients be used instead of Microsoft Client for NetWare Networks?

You might choose not to use Client for NetWare Networks in these cases:

n

If you want to take advantage of NetWare NCP Packet Signature for

enhanced protection of servers and client computers using NCP, then you must use VLM, because Client for NetWare Networks does not support this feature.

n

If your site needs to use NetWare IP, you should use NETX or VLM. Client

for NetWare Networks does not support NetWare IP, and you cannot use Microsoft TCP/IP to communicate with NetWare servers using NetWare IP.

n

If you use 3270 emulators that rely on DOS helper TSRs or need 3270 emulation for applications in MS-DOS sessions, you should use NETX or VLM.

n

If your site needs to use NetWare Directory Services (NDS), you should use VLM. Microsoft Client for NetWare Networks does not support this feature.

n

If you are using custom VLM components such as PNW, you should use VLM.

Windows 95 can be installed to use Client for Microsoft Networks in conjunction with a NETX or VLM client, or a Novell-supplied network client can be used as the sole network support in Windows 95. For technical information about these optional configurations, see "Using a Novell NetWare Client" later in this chapter.

`{ewc msdncd, EWGraphic, x0h 1 /a "psH.bmp"}`

Windows 95 provides new and improved support over Windows 3.x when you are using NetWare clients supplied by Novell, including the following.

Improved network adapter driver support. Windows 95 networking components can be installed to work with Open Datalink Interface (ODI) network adapter drivers. This is the preferred configuration with a Novell-supplied NetWare client, and is also supported with Client for NetWare Networks. You can install Windows 95 to run with the IPX monolithic protocol stack (IPX.COM), although it is strongly recommended

that you upgrade to a newer NetWare version using ODI drivers. Windows 95 can also run on NetWare networks using Datapoint Corporation ArcNet® network adapters.

*Protected-mode IPX/SPX-compatible protocol.* You can use the Microsoft implementation of this protocol for network connectivity to other computers running the IPX/SPX protocol with Windows 95, Windows NT, or MS-DOS operating systems. Windows 95 also provides protected-mode NetBIOS over IPX to support NetBIOS-compliant applications, providing better performance and reduced network traffic. Alternatively, you can use the real-mode Novell-supplied driver, NETBIOS.EXE, in conjunction with the Novell-supplied real-mode client.

*Compatibility with native NetWare services and commands.* Users can run native NetWare services and commands without special configuration changes in Windows 95. This includes support for NDS, NetWare IP, NCP packet signatures, 3270 emulators, TSRs, and NetWare logon scripts.

When should Client for NetWare Networks be used instead of a Novell-supplied network client?

You might choose not to use the Novell-supplied client and instead use Client for NetWare Networks in these cases:

n

You want the performance advantages of 32-bit, protected-mode network clients and network adapter drivers, including complete Plug and Play support.

n

You want to take advantage of the Windows 95 unified logon and user interface for navigating the network, plus the Windows 95 network management tools.

n

You want to take advantage of long filenames, client-side caching, automatic reconnections, and other performance enhancements provided in Client for NetWare Networks.

n

You want to take advantage of user profiles for management of desktop configuration.

n

You want to use Windows 95 peer resource sharing without running another network client.

If you are administering a NetWare network, the move to Windows 95 will involve incremental planning, testing, and gradual implementation of Windows 95 on many computers on the network. Typically, the administrator will take several months to complete these tasks:

1. Install Windows 95 on a single workstation, and experiment with various configuration alternatives, including the following:

n

Windows 95 protected-mode network client vs. Novell real-mode client

n

Protected-mode NDIS 3.1-compliant network adapter drivers vs. real-mode Open Datalink Interface (ODI) drivers

n

Protected-mode IPX/SPX-compatible protocol vs. existing IPX

n

Using a sole client vs. adding Client for Microsoft Networks

— This task includes experimenting with the typical applications used at your site, such as working over the network to assess the performance, reliability, and robustness provided by Windows 95.

2. Conduct an inventory per user, per computer, and per workgroup. This is needed to build an implementation strategy, as summarized in Chapter 1, “Corporate Deployment Guide.”
3. Test the selected configuration of network clients, protocols, and drivers on a small network. This could include any combinations of the following:

n

Windows 95 installed over an existing 16-bit, Novell-supplied workstation client, using ODI drivers.

n

Windows 95 added to an existing Windows 3.x and NetWare installation, using Client for NetWare Networks and protected-mode network components.

n

Windows 95 as a new installation using all protected-mode components, including both Client for NetWare Networks and Client for Microsoft Networks, plus peer resource sharing support.

4. Create default user profiles, set up batch scripts, and perform other customization tasks for automatic installation, based on the inventory and implementation strategy.
5. Test automatic installation on a small network.
6. Prepare and implement the strategy for rollout on the larger network.

For a complete guideline to planning for Windows 95 on the corporate enterprise network, see Part 1, "Corporate Planning Guide."

---

Note—— Windows 95 does not include any Novell NetWare components. For information about obtaining updates for Novell-supplied files, see "Obtaining Current Novell-Supplied Files" later in this chapter.

---



Windows 95 Setup automatically detects the hardware on a computer and also detects any network software that is running when you start the Setup program. For details about how detection works in Windows 95 Setup, see Chapter 6, "Setup Technical Discussion."

To support Novell NetWare integration with Windows 95, the computer on which you are installing Windows 95 should be properly configured to connect to a NetWare server, and the NetWare network should be running when you start Windows 95 Setup. This requires that the computer be configured with either an ODI driver (recommended) or the monolithic IPX driver, in addition to either NETX or VLM to access resources on a NetWare server.

Windows 95 Setup detects whether a Novell NetWare workstation shell is running on the computer. If Setup finds at least version 3.26 of NET\*.COM, it automatically configures networking for NetWare networks. During the detection phase, Windows 95 Setup also tries to determine whether the computer is using real-mode TSRs that cannot be replaced (such as DOSNP.COM, TCP/IP client software, or 3720 emulators).

After detection is complete, Windows 95 Setup prepares to upgrade to protected-mode networking support based on Client for NetWare Networks, unless detection has found incompatible software components or the user specifies that network support should be based on Novell-supplied components.

Windows 95 Setup will automatically upgrade the network software to use the new Windows 95 protected-mode components unless detection finds the following:

n

The computer is using VLM with NetWare 4.x NDS. In this case, Setup

leaves all existing networking components in place.

n

Certain TSRs are present that require real-mode IPX or ODI. In this case,

Setup installs Client for NetWare Networks, but configures it to run over ODI.

n

Certain TSRs are present that are not compatible with Client for NetWare Networks. In this case, Setup leaves all existing networking components in place. To upgrade the computer to use Client for NetWare Networks and other protected-mode networking components, Setup may perform the following actions:

n

Remove certain NetWare-related TSRs from AUTOEXEC.BAT that are not required with Client for NetWare Networks.

n

Move certain TSRs from AUTOEXEC.BAT to WINSTART.BAT so that this software will be loaded at the appropriate time during system startup.

n

Install new 32-bit, protected-mode versions of networking components such as transport protocols and network adapter drivers.

n

Remove entries from SYSTEM.INI that are not required when using protected-mode networking components.

n

Configure settings in the Registry related to support for NetWare networks.

The steps for both software detection and actions for upgrading to Client for NetWare Networks are defined in a file named NETDET.INI, which lists the TSRs to be detected and the actions to be taken if a particular TSR is found. At this writing, actions for upgrading network components are defined in NETDET.INI for the software listed in the following table.

---

|      |            |
|------|------------|
| Btri | Installs   |
| eve  | Client for |
| ®    | NetWare    |
| (BR  | Networks,  |
| EQ   | with all   |
| UE   | protected- |
| ST.  | mode       |
| EX   | component  |
| E)   | s.         |

|     |             |
|-----|-------------|
| DO  | Keeps the   |
| SN  | real-mode   |
| P.E | IPX         |
| XE  | protocol in |
|     | place.      |

|      |            |
|------|------------|
| LAN  | Installs   |
| Wor  | Client for |
| kpla | NetWare    |
| ce®  | Networks,  |
|      | but keeps  |
|      | the real-  |

mode ODI  
network  
adapter  
and IPX  
protocol in  
place.

Novell  
Netware  
BIOS  
Support  
Tool  
R  
Installs the  
Microsoft  
IPX/SPX-  
compatible  
protocol  
and  
enables  
NetBIOS  
support.

NA  
CS/NA  
SI  
(NA  
SI.E  
XE)  
Retains all  
existing  
Novell-  
supplied  
networking  
component  
s.

NE  
TV.  
EX  
E  
Keeps the  
real-mode  
IPX  
protocol in  
place.

Netware  
Ware  
e/IP  
(N  
WIP  
.EX  
E)  
Retains all  
existing  
Novell-  
supplied  
networking  
component  
s.

Rea  
chO  
ut/  
Net  
wor  
k  
Keeps the  
real-mode  
IPX  
protocol in  
place.

(RC  
HIP  
X.E

XE)

RC Keeps the  
HN real-mode  
ETB IPX  
.EX protocol in  
E place.

RC Keeps the  
HB real-mode  
AN IPX  
V.E protocol in  
XE place.

RIC Keeps the  
HS real-mode  
AP. IPX  
EX protocol in  
E place.

VP Keeps the  
CT real-mode  
CP IPX  
protocol in  
place.

Win Keeps the  
Fax real-mode  
Pro IPX  
for protocol in  
Net place.

work  
ks  
(NE  
TW.  
EX  
E)

Windows 95 Setup automatically configures settings for network adapters and protocols required to support computers running Windows 95 on NetWare networks. The specific issues for configuring drivers and protocols depend on whether you are using Client for NetWare Networks or a Novell-supplied workstation shell, as described later in this chapter.

For information about network adapters and about installing, configuring, and using specific protocols, see Chapter 12, "Network Technical Discussion." For configuration details related to the specific network client you are using, see "Configuring Microsoft Client for NetWare Networks" or "Configuring Network

Adapter Drivers for Novell NetWare Clients” later in this chapter.

## Configuring NetWare Servers to Support Windows 95

---

This section contains the following topics:

n

Installing Windows 95 source files on NetWare servers

n

Automating Setup for NetWare workstations

n

Supporting long filenames on NetWare servers

n

Placing user profiles and system policy files on NetWare servers

The Windows 95 master files can be placed on a NetWare server to be used as source files for installing Windows 95 locally on NetWare workstations, or to be used as a shared copy for running Windows 95 across the network. To create a directory

structure and place the Windows 95 source files on a server, you must run Server-Based Setup (NETSETUP.EXE), the administrative setup program provided on the Windows 95 compact disc. (This is roughly equivalent to *setup /a* in Windows 3.x and Windows for Workgroups.)

#### [To set up Windows 95 source files on a NetWare server](#)

1. On the network administrator's computer, log onto the NetWare file server where you want to place the Windows 95 source files.

— This should be a network computer that can run a local copy of Windows 95 and that is used only by support personnel for network maintenance. Make sure you log on with security privileges that allow you to create directories and copy files to the file server.

2. On the administrator's computer, run *castoff all* to ensure that server-to-workstation or workstation-to-workstation messages do not affect Setup.
3. Follow the procedures for copying Windows 95 source files to a server in Chapter 4, "Server-Based Setup for Windows 95."

You can create automatic installation procedures for installing Windows 95 on multiple workstations. The steps include the following:

# n

Creating setup scripts for installing Windows 95 on computers connected to NetWare networks

# n

Defining user and computer settings for batch setup of specific NetWare workstation configurations

# n

Creating logon scripts to set up Windows 95 on NetWare workstations

when users log on

For a complete description of the procedures for preparing and managing automatic installation of Windows 95 on multiple computers, see Chapter 5, "Custom, Automated, and Push Installations."

Computers running Windows 95 can use long filenames on NetWare 3.x and 4.x volumes that have been configured to use the OS/2 namespace, which emulates an HPFS volume. Filenames on NetWare HPFS-emulation volumes have a maximum filename length of 254 characters and use the 8.3 truncation on the first instance of the filename. For example:

longfilenameold.tst --> LONGFILE.TST  
longfilenamew.tst --> LONGFIL0.TST

*To enable long filenames on a NetWare volume*

1. At the NetWare server console prompt, type the following lines:

—load os2  
add name space os2 to volume sys

2. Then add the following line to the STARTUP.CNF file:

—load os2

3. Shut down the file server. Then copy the file OS2.NAM from the NetWare distribution disks or compact disc to the same disk and directory that contains SERVER.EXE on the NetWare file server.

4. Restart the NetWare file server.

If you have any problems, contact Novell for more information.

You can use user profiles with Windows 95 on a NetWare network if the computer is configured to use Microsoft Client for NetWare Network. When a user account is



created on a NetWare server, a subdirectory of the MAIL directory is automatically created for that user. Because a Mail directory is always available for a user with an account on a NetWare network, Windows 95 uses this directory for user profiles for that user. If you are using user profiles to enforce a mandatory desktop or to ensure that roving users have access to their personal desktop configurations, place the related USER.DAT file in the users' MAIL directories.

If you are using system policies, the appropriate CONFIG.POL must be stored in the policy directory on each NetWare server. Windows 95 will automatically download this file for all Windows 95 users accessing a particular server. The CONFIG.POL settings will automatically override any settings on the local computer. For more information about using user profiles or creating a master system policy, see Chapter 15, "User Profiles and System Policies."

### Using Microsoft Client for NetWare Networks

---

This section contains the following topics:

n

Setting up Client for NetWare Networks

n

Configuring Client for NetWare Networks

n

Client for NetWare Networks technical notes

---

Note—— The redirector in Client for NetWare Networks (NWREDIR.VXD) is a file system driver that supports the NCP file sharing protocol for NetWare 2.15 and

above, NetWare 3.x, and NetWare 4.x. Client for NetWare Networks also supports Microsoft File and Printer Sharing for NetWare Networks (NWSERVER.VXD, the NCP peer server provided with Windows 95). For the architectural details of this configuration, see Chapter 32, "Windows 95 Network Architecture."

---

For information about logging onto a NetWare server, browsing NetWare resources, and using File and Printer Sharing for NetWare Networks, see Chapter 11, "Logon, Browsing, and Resource Sharing."

When using Client for NetWare Networks, you do not need to load any Novell-supplied drivers or components. This client runs with the Microsoft IPX/SPX-compatible protocol and NDIS-compliant, protected-mode drivers, which Windows 95 Setup installs automatically when you select this client.

When Windows 95 is installed with Client for NetWare Networks, because Windows 95 Setup automatically moves any relevant NET.CFG settings to the Registry. You can configure the related settings using the Network option in Control Panel. You can also configure the network adapter driver and the IPX/SPX-compatible protocol, as described in Chapter 12, "Network Technical Discussion."

If you did not install Client for NetWare Networks during Windows 95 Setup, you can switch to this client any time after Windows 95 is installed on your computer, as described in the following procedure.

---

Tip—— To quickly display the Network property sheets without opening Control Panel, right-click the Network Neighborhood icon on the desktop. Then click Properties on the context menu.

---

### [To use Client for NetWare Networks](#)

1. In the Network option in Control Panel, click the Configuration tab.
  2. Select the currently installed NetWare Workstation Shell client, and click the Remove button.
  3. Click the Add button, and then double-click Client in the Select Network Component dialog box.
  4. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and then click Client for NetWare Networks in the Network Clients list.
- {ewc msdncd, EWGraphic, x0h 2 /a "psH.bmp"}
5. Click OK, and then click OK in the Network property sheet. Then shut down and restart the computer.

---

Note — When you install Client for NetWare Networks, Windows 95 Setup adds the value *lastdrive=32* to the parameters for the network client in the Registry. This value makes room for entries in a table to store drive information. For Microsoft networking, the last drive would be set to Z (or 26), but NetWare allows six additional entries in its drive table. The extra drives are used only by NetWare-aware applications; these drives are not available to users.

---

You can also install Client for NetWare Networks and configure related options when installing Windows 95 using custom setup scripts, as described in Chapter 5, “Custom, Automated, and Push Installations.”

*To specify Client for NetWare Networks support in a custom setup script*

1. In the [Network] section of MSBATCH.INF, specify the following:

—— Clients=nwredir  
netcards=  
protocols=nwlink

2. Specify appropriate configuration values in the [NWLINK] and [NWREDIR] sections, as described in Appendix D, “MSBATCH.INF Parameters.”

This section presents information for configuring and using Microsoft Client for NetWare Networks, including the following topics:

n

Configuring protected-mode network adapter drivers for Client for  
NetWare Networks

n

Configuring Client for NetWare Networks with ODI network adapter drivers

# n

Setting options for Client for NetWare Networks, including designating a preferred server

# n

Running NetWare utilities with Client for NetWare Networks

### [Configuring Protected Mode Network Adapter Drivers for Client for NetWare Networks](#)

When you install Client for NetWare Networks, a 32-bit, protected-mode, NDIS 3.1-compliant network adapter driver is also installed automatically. If you instead configure Client for NetWare Networks to use ODI drivers, you can switch to the protected-mode drivers at any time.

Although it is possible to run Client for NetWare Networks over ODI drivers, Microsoft recommends that you install a 32-bit, protected-mode network adapter driver to take advantage of the performance improvements offered by these drivers, as described in Chapter 12, "Network Technical Discussion."

---

Note — Depending on when you install Client for NetWare Networks, you may have to install the 32-bit, protected-mode network adapter driver before you can install the network client. Setup will prompt you to do this if it is necessary.

---

### [To switch to a 32-bit, protected-mode network adapter driver](#)

1. In the Network option in Control Panel, click the Configuration tab, and then double-click the network adapter in the list of installed network components.
2. On the property sheet for the adapter, click the Driver Type tab.
3. Click the option titled Enhanced Mode (32 Bit And 16 Bit) NDIS Driver.

4. Click OK, and then click OK on the Network property sheet. Then shut down and restart the computer.

For more technical information about NDIS network adapters, see Chapter 12, "Network Technical Discussion."

### *Configuring Client for NetWare Networks with ODI Network Adapter Drivers*

You may choose to keep existing ODI drivers when using Client for NetWare Networks. The best reason for doing this is if your users need to run a TSR that requires IPX/SPX support and that is used by applications created for both Windows and MS-DOS. (Notice that in this case, the TSR should be loaded by placing an entry just after the IPXODI statement in AUTOEXEC.BAT.)

Using an ODI driver instead of an NDIS 3.1 driver with Client for NetWare Networks has the following drawbacks:

n

There is some use of conventional memory, and overall performance on the network is not as good as can be realized with NDIS 3.1 drivers.

n

There are no Plug and Play capabilities for the networking components.

However, you do retain the following benefits from using an ODI driver with Client for NetWare Networks instead of a real-mode network client:

n

Support for long filenames

# n

Automatic reconnection for lost server connections

# n

Dial-up networking for remote access

# n

Client-side caching for network information

If you want to use the current ODI driver instead of an Windows 95 NDIS network adapter driver, you can select that driver using the Network option in Control Panel.

### *To use ODI drivers with Client for NetWare Networks*

1. In the Network option in Control Panel, click the Configuration tab, and then double-click the network adapter in the list of installed network components.
2. On the property sheet for the adapter, click the Driver Type tab.
3. Click the option titled Real Mode (16-bit) ODI Driver, and click OK. Then shut down and restart the computer.

For more information about using ODI drivers, see “Configuring Windows 95 with ODI Drivers” later in this chapter. For information about the related files, see “Obtaining Current Novell-Supplied Files.”

### *Setting Options for Client for NetWare Networks*

This section, and following sections, describe the procedures for configuring Client for NetWare Networks, including the following topics:

n

Specifying whether Client for NetWare Networks is the Primary Network

Logon client

n

Specifying the preferred server, the first network drive, and whether to use

logon scripts

Setting Client for NetWare Networks as the Primary Network Logon client means the following:

n

Users will be prompted to log onto a NetWare server for validation when

Windows 95 starts.

n

For this computer, logon scripts will run from a NetWare server.

# n

System policies and user profiles will be downloaded from NetWare servers.

## [To make Client for NetWare Networks the primary client for network logon](#)

1. In the Network option in Control Panel, click the Configuration tab.
2. In the Primary Network Logon box, select Client for NetWare Networks, and then click OK.

{ewc msdncd, EWGraphic, x0h 4 /a "psH.bmp"}

---

Tip When you start Windows 95 with Client for NetWare Networks configured as the Primary Network Logon client, you will automatically be prompted to provide logon information such as your password on the NetWare server.

You never need to run the Novell-supplied LOGIN.EXE utility from a batch file or at the command prompt when you are using Client for NetWare Networks.

---

The following procedure describes how to configure the properties for Client for NetWare Networks.

## [To configure Client for NetWare Networks](#)

1. In the Network option in Control Panel, click the Configuration tab, and then double-click Client for NetWare Networks.

{ewc msdncd, EWGraphic, x0h 5 /a "psH.bmp"}

2. On the General sheet, set values for the configuration options, as described in the following table.

---

Pr Designates  
ef the name of  
er the  
re NetWare



d server that  
S will appear  
er automatical  
vely in the  
r Windows  
95 logon  
dialog box.

Fi Specifies  
rs the first  
t drive letter  
N that will be  
et assigned to  
w the first  
or network  
k connection.  
Dr  
iv  
e

E Specifies  
n whether  
a users on  
bl this  
e computer  
L can use  
o NetWare  
g logon  
o scripts  
n during  
S system  
cri startup.  
pt  
Pr  
oc  
es  
si  
n  
g

If Client for NetWare Networks is designated as the Primary Network Logon client, you must specify a preferred NetWare server. Windows 95 uses the preferred server to validate user logon credentials and to find user profiles and system policy files. You can change the preferred NetWare server at any time.

Based on the value specified for the preferred NetWare server, Client for NetWare Networks attempts to connect to that server rather than the first server that responds

to the Get Nearest Server broadcast. Client for NetWare Networks also attempts a number of server connections in case the client computer can't establish a connection with the specified server.

---

Note — The following procedure shows how to select a preferred server if you are running Client for NetWare Networks. If you use a NETX or VLM client, you can configure these settings using NET.CFG or using the /ps option in STARTNET.BAT, AUTOEXEC.BAT, or wherever you run NETX or VLM. For more information, consult your Novell documentation.

---

#### *To specify a preferred NetWare server for Client for NetWare Networks*

1. In the Select Preferred Server box on the General property sheet for Client for NetWare Networks, select a server from the list provided, or type the name of a NetWare server directly into the box.

— The name that you type in this dialog box is the name of the NetWare server that appears automatically in the Windows 95 logon dialog box.

— In this box (and elsewhere in Windows 95), you can use either the NetWare syntax for server names (SERVER/VOLUME) or UNC names (\\SERVER\\SHARE).

— Note — The Preferred Server setting is for the computer, not for individual users.

2. Click OK. If your password on the NetWare server is different from that on the computer running Windows 95, type your NetWare password when prompted, and then click OK.

The next time you log on, Windows 95 connects to the specified NetWare server. For more information about logon and the related passwords, see Chapter 11, "Logon, Browsing, and Resource Sharing."

This section presents some technical topics you should be aware of when using Client for NetWare Networks. These topics include the following:

# n

Summary of settings for Client for NetWare Networks

n

[Required support files for Client for NetWare Networks](#)

n

[Client for NetWare Networks configuration notes](#)

n

[NetWare API support in Client for NetWare Networks](#)

n

[Running NetWare utilities with Client for NetWare Networks](#)

### [Summary of Settings for Client for NetWare Networks](#)

[The following table lists the required and possible settings for CONFIG.SYS and AUTOEXEC.BAT files if you install Client for NetWare Networks.](#)

#### [Configuration File Settings for Client for NetWare Networks](#)

---

|       |      |
|-------|------|
| AUTO  | None |
| EXEC. |      |
| BAT   |      |

START None  
NET.B  
AT

CONFI None  
G.SYS

Notice that LOGIN.EXE is not loaded from a configuration file. Windows 95 Setup removes this automatically. If LOGIN.EXE is run from AUTOEXEC.BAT or another batch file, then Client for NetWare Networks will not load.

The following table summarizes the minimum settings that you should see in the Network option in Control Panel if you install Client for NetWare Networks.

Required Network Settings for Client for NetWare Networks<sup>1</sup>

---

Client for logging  
onto  
for NetWare  
Net servers,  
Windows Client for  
NetWare  
Net Networks  
work should be  
selected in  
the Primary  
Network  
Logon box.

On the  
General  
property  
sheet for  
Client for  
NetWare  
Networks,  
Preferred  
Server  
should  
show the  
name of the  
NetWare  
server to be  
used for  
initial logon.  
If logon

scripts are used, the option that enables logon scripts should be checked.

Net On the  
wor General  
k property  
ada sheet for  
pter the adapter,  
the driver  
type should  
be  
Enhanced  
Mode (32-  
Bit and 16-  
Bit) NDIS.1

IPX On its  
/ Advanced  
SP property  
X- sheet, the  
co Frame Type  
mp should be  
atib Auto. If any  
le network  
prot applications  
oco at your site  
l require  
support for  
NetBIOS  
over IPX,  
that option  
should be  
checked on  
the  
NetBIOS  
property  
sheet.

---

1 You can also specify 16-bit ODI drivers. You do not need to load such drivers from CONFIG.SYS or another configuration file.

---

## [Required Support Files for Client for NetWare Networks](#)

The following table summarizes the support files required for Client for NetWare Networks. For more information about these components, see Chapter 32, "Windows 95 Network Architecture."

### Required Files for Client for NetWare Networks<sup>1</sup>

---

NE Emulates a  
TW WinNet  
AR driver  
E.D required by  
RV some  
NetWare-  
aware  
applications  
that check  
for this file,  
such as  
Lotus  
Notes®.

NW Provides  
LIN the  
KV IPX/SPX-  
XD compatible  
protocol.

NW Provides  
NE common  
T3 NetWare  
2.D networking  
LL functions  
for the  
32\_bit  
network  
provider  
and print  
provider  
(NWNP32.  
DLL and  
NWPP32.D  
LL).

NW Provides  
NP access to  
32. NetWare

DL network  
L resources  
using the  
Windows  
95 user  
interface  
(Windows  
Explorer,  
Network  
Neighborho  
od, and so  
on). This is  
the 32-bit  
network  
provider for  
NetWare  
networks,  
which is the  
service  
provider  
interface to  
the Multiple  
Provider  
Router.

NW Provides  
PP the print  
32. provider  
DL interface to  
L the print  
router in  
SPOOLSS.  
DLL. This is  
the 32-bit  
print  
provider  
that  
provides  
the ability to  
print to  
NetWare  
printing  
resources.

NW Provides a  
RE 32-bit file  
DI system

R.V driver  
XD (redirector)  
to support  
applications  
that use the  
NCP file  
sharing  
protocol.

---

1 These files are all supplied on the Windows 95 product disks. The NETWARE.DRV file in this configuration is a replacement for an identically named Novell-supplied file.

---

Optionally, NWLOGIN3.EXE and LSCON.EXE provide the 32-bit logon script processor and console used by Client for NetWare Networks. For information about logon scripts, see Chapter 11, "Logon, Browsing, and Resource Sharing."

#### [Client for NetWare Networks Configuration Notes](#)

Some configuration notes for Client for NetWare Networks:

**n** When Windows 95 attempts to connect to a NetWare server, it first silently tries to use the user's logon name and password to make the connection. If you use system policies, you can set a policy that turns off this behavior for Client for NetWare Networks. For information, see Chapter 15, "User Profiles and System Policies."

**n** Client for NetWare Networks is always bound only to the IPX/SPX-compatible protocol. This is the only protocol this network client can use. If you require an additional protocol for your network, such as TCP/IP, you must install an additional network client, such as Client for Microsoft Networks.

Notice, however, that you can install Microsoft TCP/IP to connect to the Internet.



You do not need an additional network client in this case.

n

Windows 95 automatically provides a real-mode NetWare-compatible network client for use in emergency startup and recovery situations. It is not a full-featured, robust network client and, therefore, does not support features such as long filenames, automatic reconnection to servers, and the packet-burst (burst mode) protocol.

To use this real-mode networking client, press F8 during system startup, and choose the Command-Line Start option. Then type *net start* at the command prompt. For more information, see Chapter 35, “General Troubleshooting.”

n

With Client for NetWare Networks, you cannot map drives for individual VM sessions; drive mappings are always global. This is the equivalent of the behavior specified in earlier versions of Windows by the SYSTEM.INI setting *NWShareHandles=True* (when using NETX or VLM).

n

The NWPopUp messaging utility is not supported by Client for NetWare Networks. You can use Winpopup for the same functionality, as described in Chapter 7, “Introduction to Windows 95 Networking.”

#### [NetWare API Support in Client for NetWare Networks](#)

Client for NetWare Networks includes built-in support for MS-DOS—based APIs defined by Novell for NetWare 3.x. These APIs are summarized in the following table.

---

INT Used by  
21 applications  
H for NetWare  
information,  
bindery  
services,  
and so on

INT Used by  
64 applications  
to submit  
IPX/SPX  
requests

INT Used for the  
7A ECB  
interface  
(used by  
NETX to  
submits  
NCPs)

Client for NetWare Networks supports all known and documented MS-DOS — based API calls. If problems occur with applications that make proprietary or undocumented API calls, then you should use a real-mode Novell-supplied client. Also, please report this problem to both Microsoft and your application vendor.

The Windows 3.x APIs for NetWare consist of a series of DLLs provided by Novell with the version 3.x WinNet16 driver for the VLM client. The 16-bit Novell-supplied DLLs for Windows can run with Client for NetWare Networks. This ensures that Windows-based applications and utilities that are NetWare-aware will run with Microsoft Client for NetWare Networks.

If any of your applications requires one or more of these DLLs when running on a Novell-supplied client (NETX or VLM), then you must also run the same DLLs when using that application under Client for NetWare Networks.

The NetWare DLLs are described in the following list.

---

N APIs for  
W NCP  
CA communicat  
LL ion between  
S. the file  
DL server and  
L the client

computer

N NetWare  
W Graphical  
GD Device  
I.D Interface  
LL

N APIs for  
WI IPX/SPX  
PX communicat  
SP ion  
X.  
DL  
L

N APIs for  
WL localization  
OC of  
AL applications  
E.  
DL  
L

N Network  
W API support  
NE for NDS  
T.D  
LL

N Print server  
WP services  
SR APIs  
V.D  
LL

These Novell-supplied DLLs are not provided with Windows 95. They are provided by Novell with NetWare versions 3.12 and 4.x, and are updated on CompuServe® and other electronic forums. Also, these files must be installed following the directions provided in your Novell documentation. For information about obtaining the most recent files, see “Obtaining Current Novell Supplied Files” later in this chapter.

### [Running NetWare Utilities with Client for NetWare Networks](#)

In addition to the 32-bit, protected-mode graphical tools built into Windows 95, you can use the 16-bit command-line utilities provided with NetWare for managing and

sharing resources.

With Microsoft Client for NetWare Networks, you can run all NetWare 3.x utilities that reside on the NetWare server, such as SYSCON. You can run most NetWare 4.x utilities when you are using Client for NetWare Networks, except those that require NDS, such as NWADMIN, CX, and NETADMIN. You can also run NetWare 2.x file and printer utilities.

---

Tip—— To use Novell-supplied utilities such as SYSCON, map the SYS:PUBLIC directory in the logon script.

---

#### [To run NetWare 3.x utilities in Windows 95](#)

1. Map a drive to the volume containing the NetWare utilities by using the Map Network Drive dialog box.  
Make this a persistent connection by clicking the Reconnect At Logon box.
2. From the Start button, choose Programs, then click MS-DOS Prompt to start an MS-DOS session.
3. Switch to the mapped network drive, and then run the utilities in the usual way.

---

Note—— You cannot use the VLM NWUSER utility with Client for NetWare Networks.

---

#### [Using a Novell NetWare Client](#)

---

Windows 95 can run with the NetWare NETX and VLM client software. Before installing Windows 95, you should make sure that you have the necessary Novell-supplied files for Windows support, which can be obtained from Novell.

---

Caution—— Novell-supplied components for using the NetWare client with Windows 95 require that you log onto the appropriate NetWare server before starting Windows 95. As with earlier versions of Windows, you should not log onto a NetWare server from within Windows 95.

Instead, log onto the server from AUTOEXEC.BAT or from a batch file that is called from AUTOEXEC.BAT. You should also continue to load the necessary MS-DOS — based TSR programs using AUTOEXEC.BAT or STARTNET.BAT.

For information about where a logon command should be placed in system startup files, see Chapter 11, “Logon, Browsing, and Resource Sharing.”

---

This section describes how to set up and use Windows 95 with a Novell-supplied

client. The following topics are provided:

n

Setting up Windows 95 with a Novell-supplied NetWare client

n

Configuring network adapter drivers for Novell NetWare clients

n

NETX technical notes

n

VLM technical notes

In most cases, Windows 95 Setup automatically installs the Microsoft Client for NetWare Networks if it detects Novell networking software on the computer. The following sections describe how to install Windows 95 to work with a Novell-supplied client.

For specific information related to your Novell-supplied workstation shell, see “NETX Technical Notes” or “VLM Technical Notes” later in this chapter. For information about required files, see “Obtaining Current Novell-Supplied Files” later in this

chapter.

---

Important — To help you ensure successful installation of Windows 95, make sure that the Novell-supplied NetWare client software is running before you start Windows 95 Setup. To verify that the Novell-supplied software is running, make sure you can successfully connect to and use resources on a NetWare server. Running the Novell-supplied software helps to ensure that Setup can properly detect the network configuration for successful installation of Windows 95.

Also, if you currently use IPX.COM, you should upgrade to the latest versions of NetWare client software that use ODI drivers before installing Windows 95. For information about using ODI drivers versus monolithic IPX.COM, see “Configuring Network Adapter Drivers for Novell NetWare Clients” later in this chapter.

---

### [Installing Windows 95 with a Novell NetWare Client](#)

This section presents these procedures for installing Windows 95 to run with a Novell-supplied client, depending on various installation situations:

n

Installing Novell-supplied NetWare client support during Windows 95

Setup

n

Installing Client for Microsoft Networks in addition to a Novell-supplied

NetWare client

---

Note — The method for installing VLM support is different, as described in “VLM Technical Notes” later in this section.

Also notice that, if the NetWare client software is not running at the time Windows 95 is installed, you must manually configure Windows 95 after Setup to work in

conjunction with the NetWare client software.

---

By default, Windows 95 Setup upgrades the network client to Microsoft Client for NetWare Networks if it detects NetWare software. You can select the Custom setup type and specify that the Novell-supplied software be retained during Setup.

[To specify the Novell-supplied network client support in a custom setup script](#)

n

In the [Network] section of MSBATCH.INF, specify the following:

client=NETWARE;for NETX support

Or

client=NETWARE4;for VLM support

Windows 95 will use the existing networking configuration specified in NET.CFG for protocols, adapter drivers, and other values.

[To select the Novell-supplied NETX client support during Windows 95 Setup](#)

1. Start the computer as usual, making sure that the Novell-supplied network software is running. Then run Windows 95 Setup, and select Custom as the Setup type.
2. When the Network Configuration dialog box appears, select Client for NetWare Networks in the list of components, and click the Remove button.
3. Click the Add button, and then double-click Client in the Select Network Component Type dialog box.
4. In the Select Network Client dialog box, click Novell in the Manufacturers list, and click Workstation Shell 3.X [NETX] in the Network Clients list. Click OK.

{ewc msdncd, EWGraphic, x0h 6 /a "psH.bmp"}

5. Click the Next button in the Network Configuration dialog box.

If you want to use only the NETX client, you do not need to specify settings for your network adapter driver or protocols. Setup adds support for the ODI adapter and IPXODI automatically by reading settings from NET.CFG.

If you want to also use Client for Microsoft Networks, follow the steps in the next procedure.

## 6. Continue with Windows 95 Setup.

---

Note — You cannot install Client for Microsoft Networks as an additional networking client if you are installing Windows 95 to run with an IPX monolithic configuration.

---

### [To install Client for Microsoft Networks with a Novell NetWare client](#)

1. In the Network Configuration dialog box, click the Add button, and then double-click Client.
2. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and click Client for Microsoft Networks in the Network Clients list. Click OK, and then click Close in the Network Options dialog box.

### [To determine whether the correct adapter driver is installed](#)

1. In the Network option in Control Panel, click the Configuration tab, and then double-click the network adapter in the list of components.
2. On the property sheet for the network adapter, click the Driver Type tab.
3. Make sure the Real Mode (16 bit) ODI driver is selected, and then click OK.
4. If you have made any changes in your network configuration, you must shut down and restart the computer.

### [Switching Back to NETX from Client for NetWare Networks](#)

If you install the protected-mode Client for NetWare Networks and later decide to return to your original Novell NetWare NETX configuration, follow these steps. For details about adding or returning to VLM, see “VLM Technical Notes” later in this section.

### [To return to NETX after installing Client for NetWare Networks](#)

1. In the Network option in Control Panel, click the Configuration tab.
2. Select the IPX/SPX-compatible protocol, and click the Remove button. Then select Client for NetWare Networks, and click the Remove button.
3. Click the Add button, and then double-click Client.
4. In the Select Network Client dialog box, click Novell in the Manufacturers list, and click Workstation Shell 3.X [NETX] in the Network Clients list, and then click OK.

— Windows 95 automatically installs IPXODI support.

5. On the Configuration property sheet, double-click the network adapter in the list



of components.

6. On the property sheet for the network adapter, click the Driver Type tab. Select the Real Mode (16 bit) ODI driver, and then click OK.
7. Click OK on the Network property sheet, and provide a disk or a location for any files that Windows 95 requests to complete the installation. Then shut down and restart the computer.

---

*Important*—— You will typically have to reinstall Novell-supplied files at this stage, because Windows 95 Setup previously replaced these files with versions required by Client for NetWare Networks. You must also make sure that NET.CFG is present and contains correct settings, and that the required settings are present in CONFIG.SYS and AUTOEXEC.BAT. See your Novell documentation for information about these required settings.

---

This section presents some technical information related to the network adapter drivers used when configuring Windows 95 to run with Novell-supplied network clients. The topics include the following:

n

Configuring Windows 95 with ODI drivers

n

Setting network adapter options in NET.CFG

# n

[Configuring Windows 95 for monolithic IPX](#)

# n

[Configuring Windows 95 with ArcNet network adapters](#)

# n

[Setting other NET.CFG options](#)

---

*Note* — NET.CFG, the Novell NetWare configuration file, is an ASCII text file that specifies various settings for the adapter, protocol, and client. For information about the format and contents of NET.CFG, consult your NetWare documentation.

---

### [Configuring Windows 95 with ODI Drivers](#)

The Open Datalink Interface (ODI) specification was defined by Novell, Incorporated and Apple Computer, Incorporated to provide a protocol and a consistent API for communicating with a network adapter driver, and to support the use of multiple protocols by a network adapter driver.

---

*Tip* — To ensure the most flexibility in Windows 95 for supporting other protocols along with NetWare integration, Microsoft recommends that you use ODI drivers when running Windows 95 with a Novell-supplied network client. Novell also recommends using ODI-based client software rather than monolithic IPX drivers.

---

{ewc msdncd, EWGraphic, x0h 7 /a "psH.bmp"}

ODI consists of the following components.

*An ODI-compliant version of the IPX/SPX protocol.*

This component provides the network protocol for communicating between a NetWare client and a NetWare server. With NETX or VLM clients, this must be the Novell-supplied IPXODI.COM (you can also use the Microsoft IPX/SPX-compatible protocol for other network clients).

*The Link Support Layer (LSL).*

This component, provided in the Novell-supplied LSL.COM file, sets the foundation for network adapter drivers to communicate with multiple protocol drivers, and for protocol drivers to communicate with multiple network adapter drivers.

*The ODI driver.*

Also called the Multiple Link Interface Driver (MLID), the ODI-compliant network adapter driver is created by the adapter manufacturer. This component usually identifies the name of the supported adapter in the filename, such as NE2000.COM for the Novell NE-2000 adapter, 3c5x9.COM for the 3Com® EtherLink® III adapter, and EXP16ODI.COM for the Intel® EtherExpress™ 16 adapter. Windows 95 supports using such drivers, but these drivers are not included with Windows 95.

For information about required files, see “Obtaining Current Novell-Supplied Files” later in this chapter.

### [Tips for Installing Windows 95 with ODI Drivers](#)

n

Before you install Windows 95 on a computer, the real-mode IPXODI-

network should be configured and working properly using your Novell-supplied installation program. Test to confirm that there are no errors when loading the Novell-supplied files LSL.COM, IPXODI.COM, the ODI driver, and NETX.EXE, or when accessing resources on NetWare servers. If the Novell-supplied ODI drivers are installed and running on the computer when Windows 95 is installed, Windows 95 Setup detects the drivers, identifies the network adapter, and automatically configures Windows 95 to run with the ODI drivers.

# n

If Windows 95 Setup cannot identify the ODI driver being used, you may

have to manually configure the network adapter driver. In this case, choose the Have Disk button in the Select Network Adapter dialog box. You must provide the file for the appropriate IPXODI support driver to match the type of network adapter used, using files supplied by Novell or the adapter manufacturer.

### [Setting Network Adapter Options in NET.CFG](#)

Because an ODI computer can have multiple ODI drivers and multiple protocols loaded and bound, ODI uses NET.CFG to identify the network adapters, protocol configuration, and binding information.

Monolithic IPX does not require a settings file because there is only one protocol and one network adapter driver bound together in a specific way. The IPX.COM file contains the network adapter configuration information, including the interrupt and base memory address used by the adapter.

NET.CFG is responsible for configuring the network environment for a Novell-supplied client, and is used to configure custom parameters for NETX, IPX, NetBIOS, or the general NetWare environment. To configure any options, edit NET.CFG as described in your NetWare documentation.

NetWare began using SHELL.CFG as the configuration filename with monolithic IPX and is now using NET.CFG for ODI. NET.CFG is the preferred file to use and has some specific uses for ODI. Neither SHELL.CFG nor NET.CFG is required for a NetWare client computer. If these files do not exist, default settings are used. If both SHELL.CFG and NET.CFG exist, both are processed (first SHELL.CFG, then NET.CFG). Any NET.CFG settings duplicated from SHELL.CFG are ignored.

When only the Novell-supplied IPXODI driver is loaded, the default binding is to the first ODI driver loaded.

If you are using ODI drivers, the Novell-supplied LSL.COM file uses information from NET.CFG to configure the ODI driver before the NETX workstation shell does. LSL will look for NET.CFG in the current directory or in the same directory as NETX.EXE. To override this default behavior, run NETX.EXE (or the IPX protocol driver) with the /C=DRIVE:PATH\FILENAME command-line switch, which loads only the single .CFG file specified. For example:

netx /c=d:\netstuff\net.cfg

---

Note — The LSL driver loads and initializes information contained in NET.CFG, which should reside in the same directory as LSL.COM and the Novell-supplied NETX.EXE network client.

LSL must find the proper NET.CFG file. To verify that you do not have more than one NET.CFG file present on your computer, type `dir /s net.cfg` at the command prompt (or from the Start button, click Find and search for NET.CFG).

---

Network adapter configuration information is contained in a *Link Driver* section in NET.CFG, where you can specify the network adapter's interrupt, I/O address, memory address, frame types, and protocols.

For example, the following shows NET.CFG entries for an SMC® Ethercard Plus Elite 16 adapter:

```
show dots=on  
file handles=60  
preferred server=nw_311  
link driver smc8000  
— int 5  
— port 240  
— mem d000  
— frame ethernet_802.3
```

The following table describes selected information commonly found in NET.CFG under the *Link Driver* section. For information not found in NET.CFG, default settings for the network adapter are assumed. For information, consult your Novell documentation.

#### Network Adapter Driver Settings in NET.CFG

---

|   |             |
|---|-------------|
| D | DMA         |
| M | channel     |
| A | number.     |
|   | Can assign  |
|   | up to two   |
|   | DMA         |
|   | channels by |
|   | designating |
|   | them DMA    |
|   | #1 x and    |
|   | DMA #2 y.   |

FR Alternate

A MAC layer  
M frame  
E encapsulations for the network adapter. The default is ETHERNET\_802.2 if not specified. Frame types are:

ETHERNET\_802.ETHERNET\_SNAP  
ETHERNET\_802.TOKEN\_RING  
ETHERNET\_

TOKEN\_RING\_SNAP

INT IRQ number.  
T Can assign up to two IRQs by designating them IRQ #1 x and IRQ #2 y.

MEM Memory address in upper memory area (UMA). Can assign up to two UMA addresses by designating them MEM

#1 x and  
MEM # y.

N New 12-digit  
O MAC  
DE address  
AD assigned to  
D the network  
RE adapter.  
SS

P I/O port  
O address.  
RT Can assign  
up to two I/O  
port  
addresses  
by  
designating  
them PORT  
#1 x and  
PORT #2 y.

PR Protocols to  
OT be used with  
O ODI drivers.  
C You do not  
OL need to  
specify this  
in NET.CFG  
if NETX is  
only running  
IPX and no  
other  
protocol. If  
other  
protocols  
are running,  
you must  
specify the  
protocol,  
protocol ID,  
and the  
frame type.

SL Network  
OT adapter slot  
number

(MCA,  
EISA).

[Configuring Windows 95 for Monolithic IPX](#)

{ewc msdncd, EWGraphic, x0h 8 /a "psH.bmp"}

---

Caution— Although the monolithic IPX legacy configuration is supported in Windows 95, Novell recommends that the ODI client software be used instead of dedicated IPX drivers. Microsoft strongly recommends upgrading to 32 bit, protected mode software for a computer running Windows 95 on NetWare networks. Notice particularly the following exceptions for monolithic IPX:

n

— If you want to install Windows 95 with monolithic support, all networking components must be installed and working before you install Windows 95.

n

— If you want to use Client for NetWare Networks with ODI drivers, you should first upgrade your Novell-supplied networking software to a recent version of the ODI client software.

n

— You cannot install Client for Microsoft Networks as an additional networking client if you are using the IPX monolithic configuration.





— You cannot install monolithic support under Windows 95 if the workstation has Novell-supplied VLM software installed.

---

The monolithic implementation of the IPX protocol, IPX.COM, includes a single driver file that contains both the IPX/SPX protocol stack and the network adapter driver for communicating with the network adapter. IPX.COM must be configured for each individual computer based on the individual network adapter and its hardware configuration (IRQ, I/O address, RAM address in the upper memory area, and DMA channel). IPX.COM is generated from the IPX.OBJ file and a particular network adapter driver file (NETCARD.OBJ) using the NetWare SHGEN or WSGEN programs.

Remember that this is not a recommended configuration. If you must use Windows 95 on monolithic IPX, then configure the real-mode monolithic IPX network and verify that it is working properly before installing Windows 95. Test to confirm that there are no errors when loading IPX.COM and NETX.EXE or when accessing resources on NetWare servers.

#### [To set up Windows 95 with monolithic IPX](#)

1. In the Network option in Control Panel, select all installed networking components. Then remove them by clicking the Remove button.
2. Click the Add button and then double-click Adapter in the Select Network Component Type dialog box.
3. From the Manufacturers list in the Select Network Adapters dialog box, click Novell. From the Network Adapters list, click Novell IPX Monolithic Driver. Then click OK.
4. Shut down and restart the computer for the changes to take effect.

For information about required files, see “Obtaining Current Novell-Supplied Files” later in this chapter.

#### [Configuring Windows 95 with ArcNet Network Adapters](#)

Windows 95 supports connectivity to Novell NetWare servers and other computers running Windows 95 over an ArcNet network. When you configure Windows 95 to support NetWare integration over ArcNet, you cannot use real-mode IPX without NetBIOS on ArcNet network adapters. This is true whether you are using a

monolithic IPX driver or an ODI ArcNet driver.

If the ArcNet driver and NetWare workstation shell are running when Windows 95 is installed, Windows 95 Setup detects the configuration and automatically installs the proper components. However, if you are using a generic ArcNet driver or if Windows 95 is unable to detect that you are using an ArcNet driver, you may have to manually configure Windows 95 to run on a ArcNet configuration. You will also need to install the ODI ArcNet Support transport with NetBIOS. If Windows 95 Setup can detect your configuration properly, this network protocol is installed automatically for an ODI ArcNet driver.

This is similar to configuring Windows 95 to run with a monolithic IPX driver, except that Novell-supplied ODI drivers are used. The drivers used in this configuration include the following files, which must all be supplied by Novell: SMC8000.COM (ODI driver), LSL.COM, IPXODI.COM, NETWARE.DRV, NETX.EXE, VNETWARE.386, and VIPX.386.

This section describes specific notes related to using the Novell-supplied NetWare 3.x client software with Windows 95. The following topics are included:

n

Using NETX with Client for Microsoft Networks

n

Using NETX as the sole client

n

Specifying the *LastDrive=* parameter



## Setting Show Dots and file access limits

### [Using NETX with Client for Microsoft Networks](#)

When running NETX with Windows 95, you keep all the same functionality that you had when running with MS-DOS or Windows 3.x. You also gain the features described in “Issues for Windows 95 on NetWare Networks” earlier in this chapter.

If you are using NETX as the network client, you might also choose to install the 32-bit, protected-mode Client for Microsoft Networks if you want to connect to other Microsoft network computers, such as computers running Windows 95, Windows for Workgroups 3.x, LAN Manager, or Windows NT.

When you run the NetWare NETX client with Windows 95 in this configuration, you should continue to load the necessary Novell-supplied client components and MS-DOS-based TSR programs (LSL, ODI driver, IPXODI, and NETX) in AUTOEXEC.BAT or STARTNET.BAT, just as you did with MS-DOS or Windows 3.1. Windows 95 Setup automatically adds the configuration lines if they are not present. For information about required configuration lines, see your Novell documentation.

*Architecture for Novell-supplied NETX with Client for Microsoft Networks*  
*Components shown in bold are supplied by Novell.*

```
{ewc msdncd, EWGraphic, x0h 9 /a "psH.bmp"}
```

In this configuration, the Novell-supplied version of NETWARE.DRV is installed and loaded only for applications that call it directly. Because this driver is not used by Windows 95, all access to NetWare resources occurs by using the Windows 95 user interface, not the NETWARE.DRV dialog boxes provided by Novell. NW16.DLL translates 32-bit network calls to 16-bit network calls that can be passed to VNETWARE.386.

---

*Note* — You cannot install Client for Microsoft Networks as an additional networking client if you are using the IPX monolithic configuration.

---

### [Using NETX as the Sole Client](#)

This configuration is for use in either of these cases:

n

The IPX monolithic configuration is used.

n

You do not need to connect to other computers running Windows 95,

Windows for Workgroups 3.x, LAN Manager, or Windows NT.

To use only NETX client support, use the Network option in Control Panel to remove Client for NetWare Networks and Client for Microsoft Networks, if either of these clients is installed. Then add the Novell NetWare (Workstation Shell 3.X [NETX]) client, as described in "Installing Windows 95 with a Novell NetWare Client" earlier in this chapter.

*Architecture for Novell-supplied NETX as the sole client*  
*Components shown in bold are supplied by Novell.*

{ewc msdncd, EWGraphic, x0h 10 /a "psH.bmp"}

The following table lists the required and optional settings for CONFIG.SYS and AUTOEXEC.BAT files if you use NETX as the sole network client.

Configuration File Settings for NETX as the Sole Client

---

CO LASTDRIV

NFI E=

G.S

YS

AU LSL.COM

TO ODI driver

EX IPXODI.CO

EC. M

BA NETX.EXE

T1 Q; that is,  
LASTDRIV

E+1  
LOGIN  
C:

---

1 Or this could be the name of a batch file called from AUTOEXEC.BAT.

---

The following table summarizes the minimum settings that you should see in the Network option in Control Panel if you use NETX as the sole client.

Network Settings for NETX as the Sole Network Client

---

Net If logging  
Wa onto  
re NetWare  
(W servers,  
ork Novell  
stat NetWare  
ion (Workstatio  
Sh n Shell 3.X  
ell [NETX])  
3.X should be  
[NE selected in  
TX] the Primary  
) Network  
Logon box.  
All other  
settings are  
configured  
in  
NET.CFG.

Net On the  
wor General  
k property  
ada sheet for  
pter the adapter,  
the option  
named  
Real Mode  
(16 Bit) ODI  
Driver  
should be  
checked.

No Settings are  
vell configured

IPX in  
OD NET.CFG.  
I

### [Setting the LastDrive Parameter for NETX](#)

Windows 95 uses the value of the *LastDrive*= entry in the Registry (or CONFIG.SYS) to allocate enough storage space in the internal memory structures to recognize drive letters for devices. For example, a setting of *LastDrive*=Z tells Windows 95 to recognize drive letters from A to Z.

Windows 95 uses all drive letters up to the letter assigned as the last drive. NetWare servers use all the drive letters. For example, if *LastDrive*=P is specified, you can assign drive letters D through P for networks other than NetWare (assuming drive C is the only physical hard disk drive in the system). In this same example, NetWare begins mapping NetWare volumes with Q.

### [Setting Show Dots and File Access Limits](#)

A NetWare file server does not include the directory entries dot (.) and double dot (..) as MS-DOS and Windows 95 do. However, the NetWare workstation shell version 3.01 or later can emulate these entries when applications attempt to list the files in a directory.

### [To turn on the Show Dots feature](#)

n

If you have problems listing files or deleting directories, add the following

line to the beginning of NET.CFG:

show dots=on

By default, NetWare client software allows you access to only 40 files at a time. When you are running applications under Windows 95, you can exceed this limit rather quickly. If you do, you might see unexpected error messages.

### [To increase the file access limit](#)

1. Add the following line to the beginning of NET.CFG:

—file handles=60

2. Add the following to CONFIG.SYS for the local computer:

—files=60

VLM stands for Virtual Loadable Module, the network client provided with Novell-  
NetWare version 4.x. You should choose to run VLM rather than Client for NetWare-  
Networks in these cases:

n

If you need to run Novell NWAdmin or NetAdmin utilities.

n

If you need NetWare Directory Services (NDS) support. When using VLM,

you can access NDS using the Novell-supplied NWUSER utility and the  
WinNet16 dialog boxes.

n

If you need to run VLM services such as PNW that are not supported

under Client for NetWare Networks.

# n

If you experience incompatibilities in a NetWare-aware application when running Client for NetWare Networks.

When you use VLM with Windows 95, the behavior of the NetWare workstation shell is the same as it is with MS-DOS or Windows 3.1. You should still load the Novell-supplied client components and TSR programs, and log on from either AUTOEXEC.BAT or STARTNET.BAT. Logon scripts also work in the same way as they do with MS-DOS and Windows 3.1. After Windows 95 starts, you can use the Windows 95 user interface to make drive and printer connections, or you can run NetWare utilities by running NWUser or by typing commands at the command prompt. Notice, however, that you cannot use NDS names in Windows 95 dialog boxes.

---

Note — Installing Windows 95 with the VLM client requires special steps. For information, see the steps in this section.

---

This section describes specific notes related to using the Novell-supplied NetWare 4.x client software along with Windows 95. The following topics are presented:

# n

Setting up Windows 95 with VLM

# n

Using VLM with Client for Microsoft Networks



# n

Using VLM as the sole client

# n

Specifying the *LastDrive=* parameter for VLM

### [Setting Up Windows 95 with VLM](#)

If you install Windows 95 into the existing Windows directory on a computer where VLM is already configured to run with an earlier version of Windows, then installing VLM support follows the steps provided in “Installing Windows 95 with a Novell NetWare Client” earlier in this chapter.

However, if you are installing Windows 95 into another directory, or if you are installing it on a computer that currently has only the MS-DOS operating system, you must follow special steps to set up the system properly. This is because Windows support for VLM requires software supplied only through the Novell-supplied VLM installation program. Follow the instructions under the procedure in this section that most closely describes your configuration.

Windows 95 Setup tries to detect VLM by looking for an NLS directory. If NLS is present, it begins the process of installing Windows 95 for VLM. If the NLS directory is not present but you select the VLM client to install in Setup, Windows 95 Setup asks you to first install VLM using the Novell installation program. Then you can continue with Windows 95 Setup.

---

**Important**—— Automatic logon from AUTOEXEC.BAT needs to be configured before running Windows 95 Setup, or the network will not be available under Windows 95.

---

[If you already run VLM with Windows 3.x and upgrade Windows 95 over Windows 3.x](#)

# n

Start the computer as usual, and make sure that the Novell software is running. Then run Windows 95 Setup and choose support for Novell NetWare 4.0, as described in “Installing Windows 95 with a Novell NetWare Client” earlier in this chapter.

— Or —

1. After Setup is complete, in the Network option in Control Panel, select Client for NetWare Networks (if this has been installed), and click the Remove button.
2. Click the Add button, and then double-click Client.
3. In the Select Network Client dialog box, click Novell in the Manufacturers list, and click the option named Novell NetWare (Workstation Shell 4.0 and above [VLM]) in the Network Clients list. Then click OK.

— {ewc msdn cd, EWGraphic, x0h 11 /a "psH.bmp"} —

4. If you want to install Client for Microsoft Networks at this time, you can repeat the steps in the Select Network Client dialog box to install it. Then shut down and restart the computer.

[If you already run VLM with Windows 3.1 and install Windows 95 in a new directory—](#)  
[Or— If you are running VLM with MS-DOS](#)

1. Start the computer as usual, making sure that the Novell-supplied network software is running. Then run Windows 95 Setup, and select Custom as the Setup type.
2. When the Network Configuration dialog box appears, select Client for NetWare Networks in the list of components, and click the Remove button.
3. Click the Add button, and then double-click Client in the Select Network Component Type dialog box.
4. In the Select Network Client dialog box, click Novell in the Manufacturers list, and click Novell NetWare (Workstation Shell 4.0 And Above [VLM]) in the Network Clients list. Then click OK.

— Setup will partially configure Windows 95, and then present a message that asks you to run the Novell Workstation Shell Install program after Windows 95 has been installed.

— Caution — You should run the Novell Workstation Shell Install program when

Windows 95 starts for the first time after you run Windows 95 Setup, that is, after the Copying Files phase is complete, when Setup asks you to remove all disks and restart the computer.

5. As soon as the Starting Windows 95 message appears when computer is restarted during Setup, press F8. From the Startup menu, and then choose option 5, Command Prompt Only.
6. From the command prompt, run the Novell Workstation Shell Install program to install the Novell-supplied support for Windows.
7. Restart the computer again, and let Windows 95 start normally.
8. In the Network option in Control Panel, install Novell NetWare (Workstation Shell 4.0 And Above [VLM]) as described in the previous procedure.
9. From the Configuration property sheet in the Network dialog box, click Add again. Then double-click Adapter in the Select Network Components dialog box, and install support for your network adapter.

The information from NET.CFG is used to automatically configure the other supporting network components with Windows 95.

For information about required files, see "Obtaining Current Novell-Supplied Files" later in this chapter.

### [Using VLM with Client for Microsoft Networks](#)

If you are using VLM as the network client, you might also choose to install the 32-bit, protected-mode Client for Microsoft Networks if you want to connect to other Microsoft networking computers, such as computers running Windows 95, Windows for Workgroups 3.x, LAN Manager, or Windows NT. The following illustration describes this configuration.

*Architecture for Novell-supplied VLM with Client for NetWare Networks*  
*Components shown in bold are supplied by Novell.*

`{ewc msdncd, EWGraphic, x0h 12 /a "psH.bmp"}`

In this configuration, the Novell-supplied version of NETWARE.DRV is not used by Windows 95. It is installed and loaded only for applications that call it directly. All access to NetWare resources is through the Windows 95 user interface, not the NETWARE.DRV dialog boxes. The NWUSER utility calls NETWARE.DRV directly, to bring up the central NetWare Version 3.0 WinNet16 dialog box.

### [Using VLM as the Sole Client](#)

This configuration can be used if you do not need to connect to other computers that are running Windows 95, Windows for Workgroups 3.x, LAN Manager, or Windows-

NT. (Of course, you can connect to a Windows 95 computer running Microsoft File and Printer Sharing for NetWare.)

To get VLM client support, you must add the Novell NetWare (Workstation Shell 4.0 and above [VLM]) client using the Network option in Control Panel, as described earlier in this section. With this configuration, you will see only VLM listed in the Network option in Control Panel. No network adapter or protocol will be listed.

The following illustration summarizes this configuration.

*Architecture for Novell-supplied VLM as the sole client.  
Components show in bold are supplied by Novell.*

{ewc msdncd, EWGraphic, x0h 13 /a "psH.bmp"}

The following table lists the required settings for CONFIG.SYS and AUTOEXEC.BAT files if you use VLM as the sole network client.

Configuration File Settings for VLM as the Sole Client

---

|     |                   |
|-----|-------------------|
| CO  | <u>LASTDRIV</u>   |
| NFI | <u>E=drive</u>    |
| G.S | <u>letter</u>     |
| YS  |                   |
| AU  | <u>STARTNET</u>   |
| TO  | <u>.BAT</u>       |
| EX  |                   |
| EC. |                   |
| BA  |                   |
| T   |                   |
| ST  | <u>LSL.COM</u>    |
| AR  | <u>ODI driver</u> |
| TN  | <u>IPXODI.CO</u>  |
| ET. | <u>M</u>          |
| BA  | <u>VLM.EXE</u>    |
| T   | <u>F ; that</u>   |
|     | <u>is, First</u>  |
|     | <u>Network</u>    |
|     | <u>Drive in</u>   |
|     | <u>NET.CFG</u>    |
|     | <u>LOGIN</u>      |
|     | <u>C:</u>         |

The following table summarizes the minimum settings that you should see in the

Network option in Control Panel if you install Windows 95 with VLM as the sole client.

Network Settings for VLM as the Sole Client

---

Net If logging  
Wa onto  
re NetWare  
(W servers,  
ork Novell  
stat NetWare  
ion (Workstatio  
Sh n Shell 4.X  
ell [VLM])  
4.X should be  
[VL selected in  
M]) the Primary  
Network  
Logon box.  
All other  
settings are  
configured  
in  
NET.CFG.

Net On the  
wor General  
k property  
ada sheet for  
pter the adapter,  
the Real  
Mode (16  
Bit) ODI  
Driver  
option  
should be  
checked.

No Settings are  
vell configured  
IPX in  
OD NET.CFG.  
I

[Setting the LastDrive Parameter for VLM](#)

Windows 95 uses the value of the *LastDrive=* entry in the Registry to allocate enough storage space in the internal memory structures to recognize drive letters for devices. For example, a setting of *LastDrive=Z* tells Windows 95 to recognize drive letters from A to Z.

The Novell-supplied NetWare 4.x redirector handles the *LastDrive=* entry the same way that Windows 95 does. That is, both the NetWare 4.x redirector and Windows 95 allow drive letters to be used to connect to redirected network drives up through the drive letter specified by the *LastDrive=* entry. By default, Windows 95 sets the entry to read *LastDrive=Z* when the NetWare 4.x workstation shell is selected as the additional network.

The NetWare 4.x redirector uses the *First Network Drive=* entry in the NET.CFG file to identify the first network drive that can be mapped. For more information about this setting, consult your NetWare documentation.

#### Technical Notes for Windows 95 on NetWare Networks

---

This section contains the following topics:

n

Obtaining current Novell-supplied files

n

Using Microsoft IPX/SPX-compatible protocol on NetWare networks

n

Using Microsoft TCP/IP on NetWare networks

If your computer is not configured with the necessary NetWare software, or if you don't have the support files that Windows 95 Setup requires to properly configure your computer, several sources are available for these files.

---

Important — Use the latest available version of Novell-supplied driver files.

---

[To obtain current NetWare software files](#)

n

Check with your NetWare network administrator or your local Novell-

representative to see if the latest client files are available locally.

— Or —

— Over the Internet, obtain files from [ftp.novell.com](ftp://ftp.novell.com).

— Or —

— Check the Novell Files forum on CompuServe by typing [go novfiles](#) at a system prompt. Novell posts the latest revisions of NetWare client software and drivers on this forum. Alternatively, check the Novell Library forum by typing [go novlib](#) at a system prompt.

[Required NETX Support Files for Windows 95](#)

In addition to the base Novell-supplied NetWare client software required to communicate with a NetWare server (that is, the NetWare redirector and IPX protocol), some additional NetWare support files are necessary for the Novell-supplied components to work properly in the Windows 95 environment. The required NetWare files provided by Novell are shown in the following list.

---

NE Windows-  
TW compatible  
AR network  
E. driver and  
DR associated  
V help file to  
NE provide

TW access to  
AR network  
E. redirector  
HL functionality  
P from 16-bit  
applications.  
(Notice that  
this must be  
the version  
2.x  
WinNet16  
driver for  
the NETX  
client.)

N NetWare  
W messaging  
PO utility. Used  
PU to receive  
P.E messages  
XE and alerts  
from a  
NetWare  
server.

VN Virtual  
ET device  
WA driver  
RE providing  
.38 virtualization  
6 services for  
the NetWare  
redirector in  
the  
Windows 95  
environment  
and across  
VMs.

VI Virtual  
PX device  
.38 driver  
6 providing  
virtualization  
services for  
the NetWare  
IPX protocol



for the  
Windows 95  
environment  
and across  
VMs.

When Windows 95 is configured to support a Novell NetWare client, Setup checks to see if these files are in the Windows directory. If the files are not in the Windows directory, Setup asks for a disk or network drive location for these files.

#### [Required VLM Support Files for Windows 95](#)

As with NETX, some additional NetWare support files are necessary for the Novell-supplied VLM components to work properly in the Windows 95 environment. These required supporting files are shown in the following list (in addition to those listed in the previous section).

---

NE Windows-  
TW compatible  
AR network  
E. driver and  
DR associated  
V help file to  
NE provide  
TW access to  
AR network  
E. redirector  
HL functionality  
P from 16-bit  
applications.  
(Notice that  
this must be  
the version  
3.x  
WinNet16  
driver for  
the VLM  
client.)

N A thunk  
W1 layer for  
6.D passing 32-  
LL bit calls to  
16-bit NETX

APIs.

N A stub  
W program  
US that the  
ER VLM client  
.E uses to  
XE display  
version 3.x  
WinNet16  
dialog  
boxes. This  
stub also  
calls  
NETWARE.  
DRV  
functions  
that call  
these DLLs:  
NWCALLS.  
DLL,  
NWGDI.DLL  
,  
NWIPXSPX.  
DLL,  
NWLOCAL  
E.DLL,  
NWNED.DL  
L, and  
NWPSRV.D  
LL.

#### [Required Support Files for ODI Drivers](#)

A computer using ODI and the IPX/SPX protocol has entries for the following Novell-supplied files in its AUTOEXEC.BAT before Windows 95 is installed: LSL.COM, IPXODI.COM, NETX.EXE, and a network adapter driver such as NE2000.COM.

ODI with Novell-supplied clients. If you choose to keep Novell-supplied drivers when installing Windows 95 on a NetWare network, the following drivers are used:

n

Windows 95 drivers: VNETBIOS.386

n

Novell-supplied drivers:

n

For NETX: IPXODI.COM, LSL.COM, NETWARE.DRV,

NETWARE.HLP, NETX.EXE, NWPOPUP.EXE, VIPX.386, VNETWARE.386,  
and a network adapter driver such as NE2000.COM

n

For VLM: Version 4.0 or later of the NETX.VLM, and version 1.02 or

later of the other VLM client supporting files.

ODI with Client for NetWare Networks.

If you install Client for NetWare Networks to work with existing ODI drivers, the  
following drivers are used to support NetWare connectivity:

# n

Windows 95 drivers: MSODISUP.VXD, NDIS.VXD, NWLINK.VXD,

NWNBLINK.VXD, NWNET32.DLL, NWNP32.DLL, NWREDIR.VXD,  
ODIHLP.EXE, and VNETBIOS.386

MSODISUP.VXD is the ODI support layer that maps NDIS 3.1 protocols to an  
ODI driver, and ODIHLP.EXE is the real-mode stub that allows LSL to complete  
its binding process in real mode.

# n

Novell-supplied drivers: LSL.COM and a network adapter driver such as

NE2000.COM.

### [Required Support Files for Monolithic IPX](#)

After Windows 95 is installed on a monolithic IPX configuration, the required drivers  
include the following files, which must all be supplied by Novell: IPX.COM,  
NETWARE.DRV, NETWARE.HLP, NETX.EXE, VNETWARE.386, and VIPX.386.

The Microsoft 32-bit IPX/SPX-compatible protocol is an NDIS 3.1-compliant,  
routable protocol that conforms to the IPX specification, which requires routable  
datagram packets. This protocol can use Novell NetWare servers configured as  
routers (and other IPX routers) to transfer packets across LANs to access resources  
on other computers running an IPX/SPX protocol.

The IPX/SPX-compatible protocol is a 32-bit, protected-mode protocol that is Plug  
and Play-aware. With the Microsoft IPX/SPX-compatible protocol, it is not necessary  
to load the Novell-supplied VIPX.386 driver.

---

Note—— You can install both protected-mode and real-mode IPX drivers on the  
same adapter running ODI or NDIS. Notice, however, that you cannot install or use  
the IPX/SPX-compatible protocol to run over an IPX monolithic configuration.

---

The Microsoft IPX/SPX-compatible protocol is installed automatically if you install Client for NetWare Networks. However, if you configure Windows 95 to maintain the existing NetWare client and protocol software, you can later try using the protected-mode protocol provided with Windows 95. For details about installing and configuring the IPX/SPX-compatible protocol and NetBIOS over IPX, see Chapter 12, "Network Technical Discussion."

Client for NetWare Networks does not support NetWare IP. The protected-mode network client can use only the IPX/SPX-compatible protocol.

Microsoft TCP/IP is fully compliant with the standard RFCs specifying TCP/IP. NetWare IP uses other protocol implementations for IP functionality, so that the two protocol suites cannot communicate with each other.

Although Microsoft TCP/IP cannot be used as the supporting protocol for Client for NetWare Networks or for Novell-supplied networking clients, Microsoft TCP/IP can be installed to support other networking clients on the same computer. Use this configuration when TCP/IP-based communications are used on the internetwork. To connect to the Internet using Microsoft TCP/IP, you do not have to install another network client in addition to Client for NetWare Networks.

Many applications, when started, also open a number of other files (such as overlay files and data files) that are used as application resources. To find these files, older NetWare-aware applications, such as the FILER NetWare utility, look for files in NetWare search drives in two ways:

n

Using the PATH to search for executable files

n

Using a NetWare search mode to find supporting files such as required data files

Under Windows 95, the search mode defines how files are found, depending on the network client you use, as described in the following table.

---

| Search mode                  | Search mode                  | Search mode                  |
|------------------------------|------------------------------|------------------------------|
| from a drive                 | from any local drive         | from any network drive       |
| mapped to the server         | mapped to the network drive  | mapped to the network drive  |
| where the utility is stored. | where the utility is stored. | where the utility is stored. |

You know that the search mode is not set properly, or that you are not opening the application from the correct place, if you see an error message that a supporting file could not be found. For example, in FILER, the message may be: "System message library file SYSSMSG.DAT could not be opened."

#### [To set the search mode in Windows 95](#)

1. From the File menu in System Policy Editor, click Open Registry. Then click the icon for Local Computer.

For more information about using System Policy Editor in Registry mode, see Chapter 15, "User Profiles and System Policies."

2. Click Network, and then click Microsoft Client for NetWare Networks, and select Search Mode.

3. Specify a setting based on the table following this procedure. Then shut down and restart the computer.

The network administrator can also use system policies to define the search mode for multiple computers.

Search Mode has five settings: Modes 1, 2, 3, 5, and 7. (Modes 4 and 6 are not currently used.) Check your application documentation to determine whether the application only reads its supporting files, or reads and writes to them. The search mode applies to all applications that use it, so select the mode that works for most programs.

- 
- 1 Uses the default search mode. Client for NetWare Networks will look in the search drives only when no path is specified in the application and after the default directory has been searched.
  - 2 Causes Client for NetWare Networks not to look in any search drives to find supporting files. The application will behave as if you were running

it without networking. If the application has a defined directory path for searching and opening files, the application searches for the files in that path. NetWare refers to this mode as "Do not search."

- 3 The same as Mode 1, except that if the application has no defined directory path to search and open files, Client for NetWare Networks looks in the search drives only if the open request is a read-only request. NetWare calls this "Search on Read-Only opens with no path."

- 5 Causes Client for NetWare



Networks to always look in the search drives, even if the application specifies a path. NetWare refers to this mode as "Search on all opens."

- 7 The same as Mode 5, except that Client for NetWare Networks looks in the search drives only if the open request is a read-only request. NetWare calls this mode "Search on all Read-Only opens."

### *Troubleshooting Windows 95 on NetWare Networks*

---

This section presents troubleshooting tips for some common problems that might occur, depending on whether you are running Microsoft Client for NetWare Networks or a Novell-supplied network client.

This section discusses some common problems that might occur while installing, configuring, or using Microsoft Client for NetWare Networks.

No network is available after Windows 95 starts.

Verify that Client for NetWare Networks is installed. Use the Network option in Control Panel to view a list of installed clients, protocols, and services.

Make sure that you did not replace the VxD that Windows 95 uses (NWREDIR) with the original Novell-supplied NetWare VxD.

The NetWare logon drive cannot be accessed after installation.

If you cannot access the logon drive after installing Windows 95, this may be due to the LastDrive setting. The Windows 95 default LastDrive setting is P, so the Novell logon drive is Q, which may conflict with logon scripts that expect the logon drive to be drive F. Consult your Novell documentation or network administrator for information about changing the logon drive.

NetWare servers can't be found.

You may not be able to see NetWare servers if you are using an incorrect frame type for the servers. To verify that you are using the correct frame type for the server, use the Network option in Control Panel to see the frame type you have set for your adapter.

Client for NetWare Networks supports NetWare 4.x bindery emulation. Be sure that the bindery context you set for your NetWare server directory includes the Windows 95 users who should have access to the servers. You can view and set your bindery context on NetWare 4.x servers by loading the SERVMAN NetWare loadable module (NLM) and then viewing and setting the SET BINDERY CONTEXT parameter. Or, you can type set at the command prompt to view the Miscellaneous SET parameters. For more information, see your NetWare 4.x server documentation.

Client for NetWare Networks asks for a password at each logon.

Client for NetWare Networks prompts for a Windows 95 password after you log onto the network because the user name and password for your NetWare preferred server differs from your Windows 95 password. If you don't want to be prompted for a second password, make the passwords the same for the NetWare preferred server and Windows 95.

Access to NetWare servers is denied.

By default, Client for NetWare Networks uses the credentials provided for preferred server authentication to access other NetWare servers. To see files on NetWare servers for which you have access, synchronize your credentials on all the NetWare

servers. You can synchronize your credentials on NetWare servers using the `setpass` command at the command prompt, or you can change the password on your computer and simultaneously synchronize your credentials on all NetWare servers to which you are attached.

This section describes some common problems that might occur when running a Novell-supplied client with Windows 95. The following lists some information to verify when troubleshooting Windows 95 using NETX or VLM:

n

Check the version numbers of all Novell-supplied NetWare workstation

shell components, including IPX, NETX, VLM, LSL, IPXODI, and the ODI driver file. Make sure the latest versions are being used.

To get the version number for the Novell-supplied software you are using, run `DRIVER_NAME /i` or `DRIVER_NAME /?` at the command prompt. For example, type `netx /i` to get the version number for the Novell-supplied NET\*.COM or NET\*.EXE file.

If you are not using the latest software, upgrade as described in “Obtaining Current NetWare Clients and Support Files” earlier in this chapter.

n

Check for multiple instances of the NetWare files, specifically the ODI

driver and NET.CFG. Use the Network button in MSD to verify which one is being used by LSL.

For information about using MSD, see Chapter 35, “General Troubleshooting.”

If there are multiple instances, remove all but the most recent version.

n

Verify that IPXODI is binding to the network adapter, using the same settings as the NET.CFG and the same [link driver: ODI\_DRIVER] name. (The link driver line will usually match.)

If IPXODI is not bound to the network adapter, change the entries in NET.CFG to correct this problem.

n

For a monolithic configuration, verify that the configuration does not use the /o# switch on IPX.COM or the config option= statement in SHELL.CFG.

n

If the user is running a shared copy of Windows 95, verify that the home directory and shared Windows directory are the first two items in the path.

*Setup requires Novell Workstation Shell Installation Program.*

If, during installation, Setup fails to load Novell drivers and displays a message that it requires the Novell Workstation Shell Install Program for installing the VLM network client with Windows 95, follow the instructions presented in "VLM Technical Notes" earlier in this chapter.

*You cannot attach to the NetWare file server after installing Windows 95.*

Verify the frame type being used by the NetWare server. If the NetWare server is using a different frame type from the one configured for the computer running Windows 95, and if there is not a PROTOCOL entry in the NET.CFG, the user cannot see the server. The Novell-supplied IPXODI protocol binds only to the first

logical board, which is the first frame type in the *link driver*\_ODI\_DRIVER section in NET.CFG.

To correct this problem, manually edit NET.CFG so that the correct frame type is first in the *link driver*\_ODI\_DRIVER section. Or use the Network option in Control Panel to configure the IPX/SPX-compatible transport to change the frame type.

*Computer stalls when running a NetWare logon script.*

If running logon scripts when using Novell NETX or VLM network clients causes the computer to stall, verify that CONFIG.SYS contains the following entry. If this entry is not present, add it:

shell=c:\windows\command.com /p /k /d

Also check the logon script for valid logon drive references.

*Can see other computers running Windows 95, but cannot see the NetWare server.*

n

Verify that all four frame types are listed in NET.CFG. You should see the

following, indented with a space or a tab character under the *link driver*\_ODI\_DRIVER section:

FRAME ETHERNET\_802.3

FRAME ETHERNET\_802.2

FRAME ETHERNET\_II

FRAME ETHERNET\_SNAP

n

Verify that the correct NET.CFG is being processed by LSL.COM. To do

this, check the local drive for other NET.CFG files. There should only be one, and it should be in the same directory as the NetWare driver files. If you are loading these files from AUTOEXEC.BAT or another batch file, modify the batch file to change to this directory, run the necessary ODI drivers, and change back to the

directory you want. This ensures that the current directory is the same as the location of the LSL.COM file when it is being loaded.

n

Verify that you are running the very latest version of the Novell-supplied

ODI drivers and support files. Check with your network adapter manufacturer to determine whether a newer ODI driver is available.

n

Verify that both client computers are running the same protocols. If the

client computers are on different sides of a router, make sure that the IPX/SPX-compatible protocol is being used on both computers.

*You cannot see NetWare servers or other computers running Windows 95.*

To determine if it is an ODI driver issue, configure Windows 95 to use the NDIS drivers, if available, and see if the client computers can communicate using these drivers. If so, it is possible that the ODI driver or the ODI support files need to be updated to newer versions. Or switch permanently to Windows 95 NDIS drivers.

*You cannot access the logon drive after installing Windows 95.*

A common misconception is that users must log onto their NetWare server using the drive letter F. However, this is not true. For a client computer using the NETX workstation shell, the NetWare logon drive is the next drive letter available after the LastDrive= statement in the Registry. When installing support for Novell NetWare, Windows 95 Setup updates the LastDrive= statement and sets it to the letter P. This sets the logon drive to Q. You can alter the LastDrive= statement to change the logon drive, but you must leave enough drives before the LastDrive= that Windows 95 can use for its own connections. (Change LastDrive= or the entry on the property sheet for Client for NetWare Networks in the Network option of Control Panel, depending on the type of client.)

Computer using NETX and ODI stalls during system startup.

If you run the Novell NETX client with an ODI driver and no other networking client, the computer may stall on startup due to the ODIHLP driver in AUTOEXEC.BAT (this is not required for the NETX/ODI-only configuration). This error is specific to NETX and ODI drivers (not monolithic IPX or VLM).

To correct this, start the computer and press SHIFT+F5 for Safe Mode Command Prompt Only. Edit AUTOEXEC.BAT, typing *rem* in front of the ODIHLP.EXE entry. Save the file, and restart the computer.

Computer doesn't run after installing VLM support under Windows 95.

If a message says that the system cannot find a device file needed to run Windows, make sure the PATH statement in AUTOEXEC.BAT points to the directory that contains VNETBIOS.386. The operating system automatically looks in the Windows VMM32 directory. Also, be sure that the VLM client has been installed using the Network option in Control Panel. This step ensures that the correct VLM information is placed in SYSTEM.INI. (The Novell-supplied installation program for VLM sets the path in SYSTEM.INI to the Windows SYSTEM directory rather than VMM32.)

Also, you must install a network adapter in addition to the VLM client support. Start the computer in Safe Mode by pressing F5 when the Starting Windows 95 message appears. Then use the Network option in Control Panel to configure the correct network components, including ensuring that the correct drivers are installed for the network adapter. On the General property sheet for the adapter, the Real Mode (16-Bit) ODI Driver option should be checked.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Chapter 10 Windows 95 on Other Networks

This chapter provides details about installing and running Windows 95 on other networks. This chapter also includes information about mainframe connectivity for Windows 95.

---

Note — Be sure to read the notes on networking in the Windows 95 Beta Release Notes on the Windows 95 disks. Also check the Microsoft WinNews forums for specific information about your network and about the particular network adapters used on computers where Windows 95 will be installed.

---

### *Windows 95 on Other Networks: The Basics*

---

Integrated networking support is a key feature of Windows 95. The new architecture that supports multiple network providers mean that it's easier to install and manage support for a single network or multiple networks simultaneously using Windows 95 than in earlier versions of Windows. Windows 95 can simultaneously support up to ten 32-bit, protected-mode network clients and one 16-bit, real-mode client using the Network Provider Interface of Windows 95.

Windows 95 includes two protected-mode network clients (Client for Microsoft Networks and Client for NetWare Networks), plus built-in support for the following types of 16-bit, real-mode network clients. In most cases, you also need to use supporting software from the network vendors:

n

Artisoft® LANtastic® version 5.0 and later

n

Banyan® VINES® version 5.52 and later



n

Beame and Whiteside BW-NFS version 3.0c and later

n

DEC™ Pathworks™ version 5.0 and later

n

IBM® OS/2® LAN Server

n

Novell® NetWare® version 3.11 and later

n

SunSelect PC-NFS® version 5.0 and later

# n

TCS® 10-Net version 4.1 and later

## [Tip for Using Protected-Mode Network Clients from Other Vendors](#)

The Network Provider Interface defines a set of APIs used by Windows 95 to access the network for actions such as logging onto the server, browsing and connecting to servers, and so on. Microsoft has made this set of APIs widely available to network vendors so that they can develop new protected-mode network providers that are compatible with Windows 95.

For example, when a Banyan® VINES® 32-bit network provider becomes available, then Windows 95 can support Microsoft networks, Novell NetWare, and Banyan-VINES connectivity at the same time through the Network Neighborhood.

Contact your network vendor to determine when protected-mode software for Windows 95 will be available for your network.

Multiple network support in Windows 95 consists of these components:

# n

Win32 WinNet API

# n

Multiple provider router and service provider interface

n

Network providers (including the WinNet16 interface, as described later in this chapter)

For detailed information about the system components that provide multiple network support, see Chapter 32, “Windows 95 Network Architecture.” For detailed information about networking printing and support for printing when using a 16-bit network client, see Chapter 23, “Printing and Fonts.”

#### *Issues for Windows 95 on Other Networks*

---

Although you can simultaneously run up to ten 32-bit network clients, you can only run a single 16-bit, real-mode network client.

The network software should be installed and running on the workstation when you start Windows 95 Setup to install Windows 95, so that Setup can detect the network and install support for it automatically.

If your network vendor does not provide a 32-bit, protected-mode client that is compatible with Windows 95, and if you don't (or can't) run Client for Microsoft Networks in addition to your other network client, you cannot take advantage of the protected-mode networking features of Windows 95. For example:

n

You won't gain the performance advantages of 32-bit, protected-mode network components, including Plug and Play networking support, long filenames, client-side caching, automatic reconnections, and other performance enhancements.

n

You can't take advantage of the Windows 95 unified logon and user interface for navigating the network, or use the Windows 95 network management tools.

n

You can't take advantage of user profiles for management of desktop configurations, or use Windows 95 File and Printer Sharing services.

Specific issues for particular 16-bit network clients are presented in the section for that network later in this chapter — including whether support for a particular network includes browsing in Network Neighborhood and whether you can also use a 32-bit, protected-mode client such as Client for Microsoft Networks simultaneously with that network.

### *Installing Support for Other Networks: An Overview*

---

This section describes how to install Windows 95 with network support from another vendor. For installation details related to your specific network, see the section for that network later in this chapter.

If you want to install Windows 95 on a computer that already has networking support from a network vendor other than Microsoft or Novell NetWare, you should be sure the network client from that vendor is correctly installed under MS-DOS, Windows version 3.1, or Windows for Workgroups.

The network software should be running when you start Windows 95 Setup. If Setup detects a network adapter but the computer is not running network software when you install Windows 95, then Setup installs Client for Microsoft Networks by default. Although the Network option in Control Panel provides the same controls for adding and removing networking components after Windows 95 Setup is complete, Microsoft recommends that you install networking support during Windows 95 Setup.

### [To add a network client while running Windows 95 Setup](#)

1. Be sure the network client from your vendor is already installed under MS-DOS, Windows 3.1, or Windows for Workgroups. The network software should be running when you start Windows 95 Setup.
2. Start Windows 95 Setup as described in Chapter 3, "Introduction to Windows 95 Setup," and choose Custom as the Setup Type.
3. When the Network Configuration screen appears during Setup, your network client should appear in this list automatically, because Setup should detect the network you are running. If the list is correct, click OK to continue with Setup.  
— If you need to add the network client manually, click the Add button. Then double-click Client in the Select Network Component Type dialog box. In the Select Network Client dialog box, click the appropriate network vendor in the Manufacturers list, and click the name of the client in the Network Clients list. Then click OK.
4. Because the network clients keep track of the network adapter and protocols, no protocols or adapters should be listed in the Network Configuration dialog box.
5. If you want to install Client for Microsoft Networks in addition to the network client from your vendor, follow the steps "Installing Client for Microsoft Networks with Other Networks" later in the chapter. Otherwise, click the Next button and continue with Windows 95 Setup.
6. After Windows 95 is installed, check the AUTOEXEC.BAT file to ensure that all commands point to the correct directory for your network software.

In Windows 95, all real-mode networking components, including PROTOCOL.INI, are located in the root directory. The settings in PROTOCOL.INI only affect real-mode network components. Changing these values has no effect on the protected-mode network. If you need to change any settings in PROTOCOL.INI, use the Network option in Control Panel to make changes whenever possible. For details about PROTOCOL.INI entries, see Chapter 8, "Windows 95 on Microsoft Networks."

All the Setup options for installing and configuring network support described in this chapter can be defined in custom setup scripts for automatic installation. To install Windows 95 using setup scripts, the Windows 95 source files must be placed on a server using Server-Based Setup, and custom setup scripts must be created.

### [To install Windows 95 source files on a server for other networks](#)

n

Follow the instructions in “Task 1: Copying Windows 95 Files to a Server”

in Chapter 4, “Server-Based Setup for Windows 95.”

Chapter 4 also contains information about installing and running a shared copy of Windows 95 on network workstations.

[To install support for another network in custom setup scripts](#)

n

Specify one or more network device IDs as the value for *Client=* in the

[Network] section of MSBATCH.INF (or similar file), as described in Chapter 5, “Custom, Automated, and Push Installations.”

For example, to install support for both Banyan VINES (using a 16-bit, real-mode client) and for a NetWare network (using a 32-bit, protected-mode client), add the following statements to the [Network] section of MSBATCH.INF:

[Network]  
client=nwredir,vines552

The value for *Client=* must be the device ID for the network client as specified in the Windows 95 INF files named NETCLI.INF and NETCLI3.INF. The following list shows the valid device ID values for networks supported in Windows 95.

---

10 TCS 10-Net  
NE version 4.1  
T4  
1

10 TCS 10-Net  
NE version 4.1A  
T4  
1A

10 TCS 10-Net  
NE version 4.2  
T4  
2

10 TCS 10-Net  
NE version  
T4 4.1MS  
2M  
S

10 TCS 10-Net  
NE version 5.x  
T5  
0A

B Beame and  
W Whiteside  
NF NFS 3.0 and  
S3 greater  
0

DL IBM OS/2  
R1 LAN Server  
3 version 1.2,  
1.3

DL IBM OS/2  
R1 LAN Server  
3C version  
SD 1.3CSD

DL IBM OS/2  
R2 LAN Server  
0 version 2.x

LA Artisoft  
NT LANtastic  
5 version 5.x  
and 6.x

M Microsoft  
SN MS-Net –  
ET compatible  
network

NE Novell  
T NetWare  
W version 3.x

AR  
E3  
  
NE Novell  
T NetWare  
W version 4.x  
AR  
E4  
  
N Client for  
W NetWare  
RE Networks  
DI  
R  
  
PC Sun® PC-  
NF NFS version  
S5 5.x and  
0 greater  
  
PA DEC  
TH Pathworks  
W  
RK  
S4  
0  
  
VI Banyan  
NE VINES  
S5 version 5.52  
52 and greater  
  
VR Client for  
ED Microsoft  
IR Networks

If you want to install the 32-bit, protected-mode Client for Microsoft Networks in addition to a network client from another vendor, follow these steps. For information about configuring and using this network client, see Chapter 8, "Windows 95 on Microsoft Networks."

---

Note — Artisoft LANtastic cannot be used together with a 32-bit, protected-mode networking client such as Client for Microsoft Networks. This client must be installed as the sole network client on the computer.

---



### To install Client for Microsoft Networks after another network has been installed

1. Start Windows 95 Setup as described in Chapter 3, "Introduction to Windows 95 Setup," and choose Custom as the Setup Type.

— Or —

— After Setup, double-click the Network option in Control Panel.

2. In the Network Configuration dialog box, click the Add button. In the Select Network Component Type dialog box, double-click Client.
  3. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and click Client for Microsoft Networks in the Network Clients list. Click OK.
  4. Usually hardware detection detects the correct network adapter and selects the corresponding driver. If you must add a network adapter, click the Add button and double-click Adapter in the Select Network Components Type dialog box. In the Select Network Adapter dialog box, click the name of your adapter vendor in the Manufacturers list, and click the name of the adapter in the Network Adapters list. Click OK.
  5. In the Network Configuration dialog box, double-click the network adapter in the list of components. Verify the settings on the property sheets for the network adapter. Then click OK. For information, see Chapter 12, "Network Technical Discussion."
- Setup automatically installs a protected-mode version of any protocol that the installed network clients are using. If you need to install another protocol, follow the steps in Chapter 12, "Network Technical Discussion"; see also the documentation for your network adapter to verify its software settings.
6. Click Next to continue with Setup.

— Or —

— If you are adding support after Windows 95 has been installed, you must shut down and restart the computer.

### Using Real-Mode WinNet16 Drivers

---

```
{ewc msdn cd, EWGraphic, x0i 0 /a "psl.bmp"}
```

In addition to multiple 32-bit Windows 95 network providers, Windows 95 can also support a single 16-bit WinNet driver. This is the basic configuration that must be used for a network product that does not offer a 32-bit network provider.

If the 16-bit network provider from another network vendor does not provide a browsing scheme, Network Neighborhood will be empty in Windows 95, indicating that this is not a browsable network. You must use the Map Network Drive dialog box for network access. Also, notice that a drive connected through the Windows 95 user

interface is accessible in all VDMs. A connection made at an MS-DOS Prompt, however, will be available in that VDM only and will not be available throughout the Windows 95 user interface.

The following list summarizes the components for the 16-bit real-mode network drivers.

---

WI Provides a  
NN 32-bit to 16-  
ET bit thunk  
16. and  
DL translation  
L between the  
32-bit  
Windows 95  
Network  
Provider  
Interface  
(NPI) and  
the 16-bit  
WinNet API.

A 16-bit  
Windows  
3.x network  
driver that  
provides a  
basic Map  
Network  
Drive dialog  
box.

W  
i

n

n  
e  
t  
1  
6

.D  
RV

A Windows  
3.x virtual  
device  
driver that  
allows  
virtualized  
access to  
the real-  
mode  
network  
software for  
all virtual  
machines  
(including  
the

n  
e  
tw  
i  
n  
o

m

le

.V  
XD  
(or  
.38  
6)

t

1

6.D

RV in the  
Windows  
system VM  
and VDMs).

Re This can

al- include  
mo proprietary  
de network  
net adapter  
wo drivers,  
rk protocol  
sof drivers,  
tw client  
are (redirector),  
and network  
utilities  
loaded  
through  
CONFIG.SY  
S and  
AUTOEXEC  
.BAT (or  
other batch  
file).

In Windows 95, some networks (such as LAN Manager 2.x) can use the 16-bit WinNet client called the Real Mode MS-Net — Compatible client. You can install the real-mode MS-Net — Compatible Client as part of Windows 95 Setup, or you can add this client later.

#### [To add Microsoft real-mode MS-Net compatible client support](#)

1. In the the Network option in Control Panel, click the Configuration tab, and then click the Add button.
2. In the Select Network Components Type dialog box, double-click Client.
3. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and then click Real Mode MS-Net — Compatible in the Network Clients list. Click OK.

—{ewc msdncd, EWGraphic, x0i 1 /a "psl.bmp"}

4. You must shut down and restart the computer for the changes to take effect.

---

Note — The *net* command options for the real-mode MS-Net — Compatible Client are the same as Windows for Workgroups 3.11, except that *net start nwlink* can be used to load the IPX/SPX-compatible protocol. For a list of the *net* commands, see Appendix A, "Command-Line Commands Summary."

---

*{ewc msdncd, EWGraphic, x0i 2 /a "psl.bmp"}*

Windows 95 can be installed to run with Artisoft LANtastic version 5.x. or later client software.

LANtastic servers will not appear in Network Neighborhood. You can connect to servers at the command prompt.

---

Note — Artisoft LANtastic can be configured only as the Primary Network Logon.

Additional 32-bit network providers, such as Client for Microsoft Networks or Client for NetWare Networks, are not possible in this case.

---

#### [To set up Windows 95 with an Artisoft LANtastic real-mode network client](#)

1. Make sure the LANtastic server is not running. The LANtastic server cannot be run during Windows 95 Setup.
2. Ensure the LANtastic client is already installed under MS-DOS, Windows 3.1, or Windows for Workgroups. The network software should be running when you start Windows 95 Setup. Then follow the steps in "Installing Support for Other Networks: An Overview" earlier in this chapter. No other steps are required.

—{ewc msdncd, EWGraphic, x0i 3 /a "psl.bmp"}

#### [To connect to a LANtastic server when running Windows 95](#)

# n

You must type the complete server name and share name in a Map

Network Drive dialog box or at the MS-DOS Prompt.

#### Banyan VINES

---

*{ewc msdncd, EWGraphic, x0i 4 /a "psl.bmp"}*

Windows 95 can be installed and run with Banyan VINES version 5.52(5) or later. Banyan VINES servers do not show up in Network Neighborhood. You can use the Map Network Drive dialog box in Windows 95 to connect to servers.

Banyan Vines as the primary network.

If Banyan is installed using a Banyan LAN driver, Windows 95 can support Banyan as the primary network.

*Banyan Vines as an additional 16-bit Windows 95 client.*

If Banyan is installed with an NDIS 2 network adapter driver, then Banyan can be installed as an additional 16-bit network client, and you can install 32-bit, protected-mode clients such as Client for Microsoft Networks or Client for NetWare Networks.

[To set up Windows 95 with Banyan VINES real-mode network client support](#)

n

Ensure that the Banyan VINES client is already installed under MS-DOS,

Windows 3.1, or Windows for Workgroups. The network should be running when you start Windows 95 Setup. Then follow the steps in "Installing Support for Other Networks: An Overview" earlier in this chapter. No other steps are required.

{ewc msdncd, EWGraphic, x0i 5 /a "psl.bmp"}

---

Note — If you have Banyan VINES version 5.53(6) or 5.52(5), and are having problems with the Banyan popup dialog box the first time Windows 95 starts, you can edit the VINES.INI file in your Windows directory so that it contains these entries:

[newrev]

dontcopy=1

vines.version=5.53 (6) US; or vines.version=5.52(5) USA

windows.version=3.95

---

*Beame and Whiteside NFS*

---

{ewc msdncd, EWGraphic, x0i 6 /a "psl.bmp"}

Windows 95 can be installed and run with Beame and Whiteside version BW-NFS-3.0c. BW-NFS servers will not appear in Network Neighborhood. You can connect to servers at the command prompt.

*BW-NFS as the primary network.*



If BW-NFS is installed using a BW-NFS LAN driver, Windows 95 can support BW-NFS as the primary network. BW-NFS uses NDIS packet drivers or ODI network adapter drivers.

*BW-NFS as an additional 16-bit Windows 95 client.*

If BW-NFS is installed with an NDIS 2 network adapter driver, then BW-NFS can be installed as an additional 16-bit network client, and you can install 32-bit, protected-mode clients such as Client for Microsoft Networks or Client for NetWare Networks.

[To set up Windows 95 with BW-NFS real-mode network client support](#)

n

Ensure that the Beame and Whiteside BW-NFS network client is already

installed under MS-DOS, Windows 3.1, or Windows for Workgroups. The network should be running when you start Windows 95 Setup. Then follow the steps in "Installing Support for Other Networks: An Overview" earlier in this chapter. No other steps are required.

—{ewc msdncd, EWGraphic, x0i 7 /a "psl.bmp"}

DEC Pathworks

---

Windows 95 can be installed and run with DEC Pathworks version 5.x. You must install Client for Microsoft Networks plus the DEC Pathworks protocol provided by DEC (there is no DEC Pathworks 5.x client). DEC Pathworks uses NDIS 2 network adapter drivers.

After Windows 95 is installed, you can use Network Neighborhood to browse DEC Pathworks servers running version 5.x. You can also use the standard Windows 95 methods for connecting to printers.

---

Note — DEC Pathworks users must install DEC Pathworks support for Windows for Workgroups 3.x before running Windows 95 Setup. This software is available on the DECPCI forum on CompuServe®.

---

[To set up Windows 95 with DEC Pathworks 5.x real-mode network support](#)

1. Ensure that DEC Pathworks support is already installed under Windows for

Workgroups. The network should be running when you start Windows 95 Setup.

2. Run Windows 95 Setup and choose Custom Setup.
3. In the Network Configuration dialog box, click the Add button, and then double-click Client in the Select Network Component Type dialog box.
4. In the Select Network Client dialog box, click Microsoft in the Manufacturers list, and click Client for Microsoft Networks in the Clients list. Click OK.
5. In the Network Configuration dialog box, click the Add button again, and then double-click Protocol in the Select Network Component Type dialog box.
6. In the Select Network Transport dialog box, click DEC in the Manufacturers list, and click a DEC Pathworks 5.x protocol in the Network Protocols list. Click OK.
- Note— For DEC Pathworks 5.x, you can use a DECnet™ protocol, or you can use NetBEUI or Microsoft TCP/IP.
7. Click the Next button to continue with Setup.

The Windows 95 AUTOEXEC.BAT file must contain the following line to refer to the batch file that is used to start DEC Pathworks:

startnet.bat

---

Tip— Supporting software for the DEC print monitor is available on the Windows 95 compact disc in the ADMIN\PRTOOLS\DECPSMON directory.

---

### IBM OS/2 LAN Server

---

{ewc msdncd, EWGraphic, x0i 8 /a "psl.bmp"}

Windows 95 can be installed and run with these versions:

n

IBM OS/2 LAN Server version 1.3 CSD

# n

IBM OS/2 LAN Server version 2.0

# n

IBM OS/2 LAN Server versions 1.2 and 1.3

---

Note—— If OS/2 LAN Server is installed using a OS/2 LAN Server LAN driver, Windows 95 can support OS/2 LAN Server as a primary network only. You cannot install Client for Microsoft Networks as an additional network client.

---

OS/2 LAN Server servers will appear in Network Neighborhood. Users can also connect to servers using the Map Network Drive dialog box or command prompt.

[To set up Windows 95 with IBM OS/2 LAN Server real-mode network client support](#)

# n

Ensure the OS/2 LAN Server client is already installed under MS-DOS,

Windows 3.1, or Windows for Workgroups. The network should be running when you follow the steps in “Installing Support for Other Networks: An Overview” earlier in this chapter. No other steps are required.

{ewc msdncd, EWGraphic, x0i 9 /a "psl.bmp"}

---

Important—— Windows 95 does not support installation of IBM DOS LAN Requestor. To access an IBM LAN Server, install Client for Microsoft Networks. Then all networking operations should be successful with the LAN Server.

You must remove all references to DOS LAN Requestor from CONFIG.SYS and AUTOEXEC.BAT before starting Windows 95.

---

### SunSelect PC-NFS

---

`{ewc msdncd, EWGraphic, x0i 10 /a "psl.bmp"}`

Windows 95 can be installed and run with SunSelect PC-NFS version 5.0. SunSelect servers will not appear in Network Neighborhood. You can use the Map Network Drive dialog box to connect to servers.

#### Sun PC-NFS as the primary network.

If Sun PC-NFS is installed using a Sun PC-NFS LAN driver, Windows 95 can support Sun PC-NFS as the primary network. Additional 32-bit network providers are not possible in this case.

#### Sun PC-NFS as an additional 16-bit Windows 95 client.

If Sun PC-NFS is installed with an NDIS 2 network adapter driver or with an ODI driver, then Sun PC-NFS can be installed as an additional 16-bit network client, and you can install 32-bit, protected mode clients such as Client for Microsoft Networks or Client for NetWare Networks.

#### [To set up Windows 95 with SunSelect PC-NFS real-mode network client support](#)

n

Ensure the SunSelect PC-NFS client is already installed under MS-DOS,

Windows 3.1, or Windows for Workgroups. The network should be running when you follow the steps in "Installing Support for Other Networks: An Overview" earlier in this chapter. No other steps are required.

`{ewc msdncd, EWGraphic, x0i 11 /a "psl.bmp"}`

### TCS 10-Net

---

`{ewc msdncd, EWGraphic, x0i 12 /a "psl.bmp"}`

Windows 95 can be installed and run with these versions of TCS 10-Net:

n

TCS 10-Net version 4.1x with DCA 1M

n

TCS 10-Net version 4.1x

n

TCS 10-Net version 4.2 and above

n

TCS 10-Net version 5.0

TCS 10-Net servers will appear in Network Neighborhood, so users can browse and connect to resources.

TCS 10-Net as the primary network.

If TCS 10-Net is installed using a TCS 10-Net LAN driver, Windows 95 can support TCS 10-Net as the primary network.

TCS 10-Net as an additional 16-bit Windows 95 client.

If TCS 10-Net is installed with an NDIS 2 network adapter driver, then TCS 10-Net can be installed as an additional 16-bit network client, and you can install 32-bit, protected-mode clients such as Client for Microsoft Networks or Client for NetWare.

## Networks.

### [To set up Windows 95 with TCS 10-NET real-mode network client support](#)

n

Ensure that the TCS 10-Net client is already installed under MS-DOS,

Windows 3.1, or Windows for Workgroups. The network should be running when you start Windows 95 Setup. Then follow the steps in “Installing Support for Other Networks: An Overview” earlier in this chapter. No other steps are required.

{ewc msdncl, EWGraphic, x0i 13 /a "psl.bmp"}

## Mainframe Connectivity and Windows 95

---

The common network protocols used to support mainframe connectivity include the following:

### IPX/SPX.

The IPX/SPX-compatible protocol provided with Windows 95 is compatible with Novell NetWare IPX/SPX, and can also be installed to support mainframe connectivity.

### NetBEUI.

The NetBIOS extended user interface (NetBEUI) protocol provided with Windows 95 supports a NetBIOS programming interface and conforms to the IBM NetBEUI specifications. It also includes performance enhancements related to NetBIOS 3.0. Microsoft NetBEUI can be installed on computers running Windows 95 to provide NetBIOS support for mainframe connectivity.

### DLC.

Data Link Control (DLC) protocol is used primarily to access IBM mainframe computers. This protocol isn't used for general networking with Windows 95.

For information about installing and using the IPX/SPX-compatible protocol and Microsoft NetBEUI, see Chapter 12, “Network Technical Discussion.”

This section provides the following topics:

# n

Microsoft DLC for mainframe connectivity

# n

Gateways for connectivity

If you want to connect to and communicate with a mainframe computer that uses DLC, the Microsoft DLC protocol must be installed on the computer running Windows 95. The Microsoft DLC protocol allows computers running Windows 95 to connect to IBM mainframes using 3270 emulators. You can also connect to IBM AS/400® computers using 5250 emulators. The DLC protocol works with either token ring or ethernet media access control (MAC) drivers. The 16-bit DLC protocol works only with 16-bit Windows-based applications.

[To obtain the software for Microsoft DLC](#)

# n

To be provided in the final version.

Microsoft DLC is also used to provide connectivity to local area printers connected directly to the network. For example, DLC can be used to print to a printer such as a Hewlett-Packard HP® LaserJet® 4Si that uses an HP JetDirect® network adapter to connect directly to the network, instead of to a port on a print server. The DLC protocol must be installed and running on the print server for the printer. Computers sending print jobs to a print server for a DLC network printer do not need the DLC protocol — only the print server requires DLC. To take advantage of the DLC

protocol device driver, you must create a network printer in the Printers folder. For information, see Chapter 23, "Printing and Fonts."

You install Microsoft DLC using the Network option in Control Panel.

#### [To install the Microsoft DLC protocol on a computer running Windows 95](#)

1. In the Network option in Control Panel, click the Configuration tab, and click the Add button.
2. In the Select Network Component Type dialog box, double-click Protocol.
3. In the Select Network Transport dialog box, click Have Disk. Then provide the path to the Microsoft DLC files, and follow the instructions on-screen.
4. On the Network Configuration property sheet, double-click the network adapter in the list of installed components.
5. On the Driver Type property sheet for the network adapter, click the option to configure the driver as a real-mode 16-bit NDIS 2 driver. Then click OK.
6. Edit PROTOCOL.INI to remove or comment out the *lanabase=* line, and then save PROTOCOL.INI.
7. Shut down and restart the computer.

---

Note — Each time you change a setting such as configuring a network adapter driver, check PROTOCOL.INI to be sure that *lanabase=* is commented out.

---

The following sections provide details for configuring Windows 95 for direct DLC connections.

#### [Real-Mode DLC with ODI Network Adapter Drivers](#)

This configuration allows you to connect the real-mode DLC driver from the Windows for Workgroups Connection to ODI driver, which is an NDIS 2.0-compliant driver. To connect to NDIS 3.1 drivers, you need to include ODIHLP.EXE, which is the real-mode component that connects to the MSODISUP.VXD driver.

#### *Architecture for real-mode DLC with ODI network adapter drivers*

{ewc msdn cd, EWGraphic, x0i 14 /a "psl.bmp"}

The AUTOEXEC.BAT file should contain the following entries:

```
net init  
isl  
.com
```



odinsup.exe ;Novell-supplied component  
msdlc.exe  
net start netbind  
odihip.exe ;Microsoft component

### [Real-Mode DLC with All NDIS 2 Drivers](#)

This configuration allows you to connect a real-mode DLC driver to NDIS 2 network adapter drivers. This assumes you also want to connect to other NDIS 3.1 drivers.

The AUTOEXEC.BAT file should contain the following entries:

net init  
msdlc.exe  
net start netbind

The PROTOCOL.INI file should contain the following entries:

[msdlc\$]  
DriverName=msdlc\$  
Bindings=

### [Real-Mode DLC with NDIS 2.0 Network Adapter and IBM LanSupport Program](#)

This allows you to connect to the mainframe using your current configuration of DXMAOMOD.SYS and DXMCOMOD.SYS drivers from IBM.

The AUTOEXEC.BAT file should contain the following entries:

net init  
LS  
LANSU ; Novell-supplied component

The CONFIG.SYS file should contain the following entries:

dxmaomod.sys  
dxmcomod.sys

ODIHELP.EXE should be installed if you need to communicate with NDIS 3.1 protocols, plus DXMAOMOD.SYS and DXMCOMOD.SYS.

Architecture for real-mode DLC with NDIS 2.0 network adapter and IBM LanSupport

{ewc msdncd, EWGraphic, x0i 15 /a "psl.bmp"}

A client computer can use any protocol that the gateway supports, and in turn the gateway can connect directly to the mainframe or FEP.

This section summarizes these configurations:

n

SNA Server 2.0

n

SNA Server 2.1

n

AS/400 connections with Microsoft DLC

### [SNA Server 2.0](#)

In this configuration, you can use the 16-bit network client to connect to a server running Microsoft SNA Server version 2.0. Notice, however, that you cannot use Windows NT for this, because the network client makes only Windows-specific calls.

The following shows the correct configuration file entries for SNA Server 2.0:

[Wnap]  
WBinPath=C:\SNA.WIN  
Remote=\\MYSNA-CORP3  
NosType=LANMAN  
NosSetup=LANMAN  
NetSetup=NO

[SnaServerWin3270]  
WindowLeft=80  
WindowTop=88  
WindowRight=560  
WindowBottom=409  
ShowWindow=1  
WindowMaxX=-1  
WindowMaxY=-1  
LUOrPoolName=BLUEBIRD

### [SNA Server 2.1](#)

SNA Server 2.1 supports Microsoft NetBEUI, TCP/IP, IPX/SPX, and Banyan IP protocols and the following gateways:

n NetWare SAA

n Eicon gateway

n WallData™ Rumba® gateway

# n

Attachmate gateway

## [AS/400 Connections with Microsoft DLC](#)

The following shows the AUTOEXEC.BAT entries to support an AS/400 connection with Microsoft DLC and IBM personal computer support:

msdlc.exe

starttrr

pcswin.com

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```

## *Chapter 11 Logon, Browsing, and Resource Sharing*

This chapter describes how to configure and use the Windows 95 logon process, browse network resources, and use the peer resource sharing capabilities.

### *Logon, Browsing, and Resource Sharing: The Basics*

---

This section summarizes key Windows 95 features that you can take advantage of to make network logon, resource browsing, and peer resource sharing easier and more secure for computers running Windows 95 on your network.

Windows 95 offers a consistent user interface for logging onto and validating access to network resources. The first time the user logs onto Windows 95, logon dialog boxes appear for each network client on that computer and for Windows 95. If the user sets identical passwords for each network and for Windows 95, then the next time the user logs on, only the logon prompt for the network appears, as long as the passwords do not change. This means that, for users, network logon is simplified in that a single logon dialog box is presented each time the operating system starts. For network administrators, it means they can use existing user accounts to validate access to the network for users running Windows 95.

In particular, for NetWare networks, Windows 95 provides graphical logon to Novell® NetWare® versions 3.x or 4.x using the NetWare Bindery, plus a NetWare-compatible logon script processor. This means that if you are using Microsoft Client for NetWare Networks, Windows 95 can process NetWare logon scripts. If drive mappings and search drives are specified in a logon script, then under Windows 95 the same user configuration is used for network connections as was specified under the previous operating system, with no administrative changes necessary.

For Microsoft networks, Windows 95 supports network logon using Windows NT user accounts, plus logon script processing (as supported by LAN Manager version 2.x and Windows NT).

Network Neighborhood is the central point for browsing in Windows 95, offering the following benefits:

n

Users can browse the network as easily as browsing the local hard disk.

n

Users can create shortcuts to network resources on the desktop.

n

Users can easily connect to network resources by clicking the Map

Network Drive button that appears on most toolbars.

n

Users can open files and complete other actions using new common

dialog boxes in applications. This new standard provides a consistent way to  
open or save files on both network and local drives.

n

The network administrator can customize Network Neighborhood using

system policies, as described in Chapter 15, "User Profiles and System Policies."

A custom Network Neighborhood can include shortcuts to commonly used resources, including Dial-Up Networking resources.

The two peer resource sharing services in Windows 95 — Microsoft File and Printer Sharing for NetWare Networks and File and Printer Sharing for Microsoft Networks — are 32-bit, protected-mode networking components that allow users to share directories, printers, and CD-ROM drives on computers running Windows 95 with other users on the network. File and Printer Sharing services work in concert with existing servers to add complementary peer resource sharing services.

For example, a NetWare network and its users will realize the following benefits by using File and Printer Sharing for NetWare Networks:

n

Users can share files and printers without running two network clients.

This saves memory, improves performance, and reduces the number of protocols running on your network. (Under Windows for Workgroups, Novell users had to also run a Microsoft network client to take advantage of peer resource sharing.)

n

Security is user-based, not share-based. You can administer user

accounts, passwords, and group lists in one place (on the NetWare server), because File and Printer Sharing for NetWare Networks uses the NetWare server's authentication database.

n

Users running VLM or NETX clients can access shared resources on a

computer running Windows 95. The computer running Windows 95 looks as if it is just another NetWare server (although it uses browse services rather than routing tables). The computer providing File and Printer Sharing services can handle up to 253 concurrent connections.

n

You can add secure storage space and printing to the network

inexpensively, while using familiar NetWare tools to manage these resources. You can reduce the load and improve the performance of NetWare servers by moving selected shared resources to one or more computers running File and Printer Sharing services. This allows you to manage load balancing for users without adding a new NetWare server.

n

You get a scalable, high-performance 32-bit peer server that uses multiple

32-bit threads, the new Windows 95 VFAT 32-bit file system, 32-bit NDIS drivers, 32-bit IPX/SPX-compatible protocol, and the burst-mode protocol.

Similar benefits are available when you use File and Printer Sharing for Microsoft Networks. You can also use either share-level security or, on a Windows NT network, user-level security to protect access to peer resources.

### [Sharing Resources on a NetWare Network: An Example](#)

During the beta test phase for Windows 95, one system administrator found the peer resource sharing service to be an administrative lifesaver. The vice president of Finance at the company had CD-ROM hardware problems on a Windows for Workgroups computer, just when the VP needed immediate access to a tax program that was available only on compact disc.

The quick-thinking administrator, who was testing Windows 95 on a computer that had a CD-ROM drive, installed File and Printer Sharing for NetWare Networks. After setting up a Novell group and assigning the group access to the resources on that computer, the administrator added the vice president to the group and, on the vice president's computer, mapped the drive for the local CD-ROM to instead access the



computer running Windows 95.

The Windows 95 peer resource sharing service allowed the administrator to provide an immediate software solution to a hardware problem that would have taken much longer to solve.

### *Issues for Logon, Browsing, and Resource Sharing*

---

This section summarizes issues you need to consider when planning to take advantage of logon, browsing, and resource sharing features in Windows 95.

The issues related to network logon include the following:

n

A logon server (such as a Windows NT domain controller or a NetWare preferred server) must be available on the network and contain user account information for the user in order for unified logon to be used (unless, of course, the user is logging on as a guest).

n

The Windows 95 logon processor can parse any statements in the

NetWare logon scripts. However, any statements loading TSRs must be removed from the scripts and loaded from AUTOEXEC.BAT. This is because the Windows 95 logon processor operates in protected mode, so it is not possible to load TSRs for global use from the logon script. These TSRs should be loaded from AUTOEXEC.BAT before protected-mode operation begins, or using other methods described in “Using Logon Scripts” later in this chapter.

In some cases, logon scripts load backup agents as TSRs. In such cases, protected-mode equivalents built into Windows 95 can be used, making it unnecessary to load these TSRs.

The issues related to network browsing include the following:

n

You can plan ahead to configure workgroups for effective browsing by using WRKGRP.INI to control the workgroups that people can choose. For information about configuring WRKGRP.INI, see Chapter 5, "Custom, Automated, and Push Installations."

n

If your enterprise network based on Microsoft networking is connected by a slow-link wide area network (WAN) and includes satellite offices with only Windows 95, then workstations in the satellite cannot browse the central corporate network. Consequently they can connect to computers outside of their workgroups only by typing the computer name in a Map Network Connection dialog box. To provide full browsing capabilities, the satellite office must have a Windows NT server.

The issues related to resource sharing include the following:

n

If you want to configure a computer to share its files or printers, the choice of which File and Printer Sharing service you install depends on whether users who will be browsing for shared resources are running Microsoft or NetWare network clients.

n

If you want to use File and Printer Sharing for NetWare Networks, there

must be a NetWare server available on the network. This peer resource sharing service uses only user-level security, not share-level security, so a NetWare server must be available to validate user accounts. Also, the NetWare server must include a Windows Passthru account (with no password) in its user accounts database.

n

If you plan to use File and Printer Sharing for Microsoft Networks with

user-level security, then a Windows NT server or domain must be available to validate user accounts.

n

If you plan to use NetWatcher to remotely monitor connections on a

computer running File and Printer Sharing services, that computer must have the Microsoft Remote Registry service installed. The same condition is true if you want to use Registry Editor or System Policy Editor to change settings on a remote computer. For information, see Chapter 16, "Remote Administration."

n

If you are configuring a user's workstation to act as a peer server, you may

also want to specify that this computer cannot run MS-DOS Mode applications (which take exclusive control of the operating system, shutting down File and

Printer Sharing services). To do this, you can set the system policy named Disable Single-Mode MS-DOS Applications.

## Overview of Logging Onto Windows 95

---

There can be two levels of system logon on Microsoft or NetWare networks:

n

Log onto Windows 95 using a user name and a password that is cached locally

n

Log onto a NetWare network or a Windows NT domain for validation, as described later in this chapter

When other network vendors make 32-bit, protected-mode networking clients available, network logon will automatically be available for those networks, because of the Windows 95 Network Provider Interface, as described in Chapter 32, “Windows 95 Network Architecture.”

Windows 95 provides a single unified logon prompt. This prompt allows the user to log onto all networks and Windows 95 at the same time. The first time a user starts Windows 95, there are separate logon prompts for each network, plus one for Windows 95. If these passwords are the identical, the logon prompt for Windows 95 is not displayed again.

Logging onto Windows 95 unlocks the password cache file (.PWL) that caches encrypted passwords. This is the only logon prompt that appears if no other network clients are configured on that computer.

[To log onto Windows 95 when no other network logon is configured](#)

# n

When the Welcome to Windows dialog box appears after starting

Windows 95 for the first time, specify the user name and password.

—{ewc msdncd, EWGraphic, x0j 0 /a "psJ.bmp"}

Windows 95 uses this logon information to identify the user and to find any user profile information for that user. User profiles define user preferences, such as the fonts and colors used on the desktop, and access information for the user. (For more information, see Chapter 15, "User Profiles and System Policies.")

### [To log onto Windows 95 on a Windows NT network](#)

1. When the Enter Network Password dialog box appears after starting Windows 95 for the first time, specify the user name and password.
2. For network logon on a Windows NT network, type the name of the Windows NT domain or computer that contains the related user account.

—This dialog box appears for logging onto Windows NT networks

—{ewc msdncd, EWGraphic, x0j 1 /a "psJ.bmp"}

—After the user name and password pair are validated by the network server, the user is allowed to use resources on the network. If the user is not validated, the user cannot gain access to network resources.

3. The first time Windows 95 starts, the Welcome to Windows dialog box appears, prompting you to type the user name and password defined for Windows 95.

### [To log onto Windows 95 on a NetWare network](#)

1. To log onto a NetWare network, type the name of the network logon server, with is the preferred server where the related user account is stored.

—This dialog box appears for logging onto NetWare networks

—{ewc msdncd, EWGraphic, x0j 2 /a "psJ.bmp"}

—After the user name and password pair are validated by the network logon server, the user is allowed to use resources on the network. If the user is not validated, the user will be prompted to enter a password when connecting to a NetWare server during this work session.

2. The first time Windows 95 starts, the Welcome to Windows dialog box appears,

prompting you to enter the user name and password defined for Windows 95. Type this information and click OK.

The next time this computer is started, Windows 95 displays the name of the last user who logged on and the name of the domain or preferred server used for validation. If the same user is logging on again, only the password for the network server or domain needs to be entered. If another user is logging on, that user's unique user name and password must be entered. If the passwords are the same for the network and Windows 95, the second dialog box for logging onto Windows 95 does not appear again.

### *Configuring Network Logon*

---

If you install either Client for Microsoft Networks or Client for NetWare Networks, you can configure a computer running Windows 95 to participate on a Windows NT or NetWare network.

Notice, however, that before you can use network logon on a computer running Windows 95, you must have a Windows NT domain controller or NetWare logon server on the network, which contains user account information for the Windows 95 user. For more information about setting up permissions for a Windows NT or NetWare server, see the administrator's documentation for the server. For related information, see Chapter 8, "Windows 95 on Microsoft Networks" and Chapter 9, "Windows 95 on NetWare Networks."

The following sections provide information about configuring network logon for computers on Windows NT and NetWare networks when using a 32-bit, protected-mode network client. You can also use system policies to control network logon options, as summarized at the end of this section. For information about enforcing logon password requirements, see Chapter 14, "Security."

---

*Tip*—— To require validation by a network logon server before allowing access to Windows 95, you must use system policies, and enable the option named Require Validation By Network For Windows Access. For information, see Chapter 15, "User Profiles and System Policies."

Notice, however, that Windows 95 security cannot prevent a user from starting the computer using Safe Mode or a floppy disk. If you require complete user validation before starting the computer in any way, use Windows NT as the operating system.

---

When the computer is configured to use Client for Microsoft Networks as the Primary Network Logon client, you can specify Microsoft Windows NT logon options in the Network option in Control Panel. This section describes how to configure these

options.

Network logon automatically validates the user on the specified Windows NT domain during the process of logging onto Windows 95. If this option is not configured, the user cannot access most network resources. If this option is configured and the user does not provide a correct password, Windows 95 operation may seem normal, but the user won't have access to most network resources.

When you configure network logon options, you can specify whether you want to automatically establish a connection for each persistent connection to a network resources or verify whether to reestablish connections at system startup. You can also specify basic network logon options in custom setup scripts used to install Windows 95.

[To enable Windows NT network logon in custom setup scripts](#)

n

When Client for Microsoft Networks is being installed, specify

`ValidatedLogon=1` and `LogonDomain=DOMAIN_NAME` in the [vredir] section of MSBATCH.INF (or an equivalent file).

For complete procedures for configuring network logon and persistent connections for Client for Microsoft Networks, see Chapter 8, "Windows 95 on Microsoft Networks." For more information about creating custom setup scripts, see Chapter 5, "Custom, Automated, and Push Installations."

---

Note——"Logon validation" as specified in the Client for Microsoft Network property sheet only controls user access to network resources, not access to running Windows 95. To require validation by a Windows NT server before allowing access to Windows 95, you must use the system policy named Require Validation By Network For Windows Access.

---

Each Windows 95 user must have an account on the NetWare server before being able to use its files, applications, or print queues. The NetWare server account contains user credentials (user names and passwords).

With Client for NetWare Networks, there is no real-mode logon before Windows 95

starts, just the single, unified logon prompt for Windows 95 that allows users to log onto the system and to all networks at the same time. The first time a user starts Windows 95, there are two separate logon prompts — one for Windows 95 and one for the NetWare preferred server. As long as the two passwords are the same, the second logon prompt for Windows 95 is not displayed again.

For Windows 95 on a NetWare network, the validation of a user's password at system startup is not required for later accessing network resources during that work session. However, system startup is the only time the logon script can run — which ensures that network drives are properly mapped — and it is the only time at which user profiles and system policies can be downloaded on the local computer. Therefore, for users who will use resources on the NetWare network, proper network logon can be extremely important.

#### [To use a Novell NetWare server for network logon](#)

1. On the Configuration property sheet in the Network option in Control Panel, double-click Client for NetWare Networks.
2. On the General property sheet, specify the name of the Preferred Server and the letter of the First Network Drive, as described in Chapter 9, "Windows 95 on NetWare Networks."
3. If logon scripts are used for this computer, check Enable Logon Script Processing. Then click OK. Shut down and restart the computer for the changes to take effect.

You can also specify basic network logon options in custom setup scripts used to install Windows 95.

#### [To enable NetWare network logon in custom setup scripts](#)

n

For Client for NetWare Networks, you must specify the value for

*preferredServer=SERVERNAME* in the [nwredir] section of MSBATCH.INF (or an equivalent file).

For more information about creating custom setup scripts, see Chapter 5, "Custom, Automated, and Push Installations."

#### [Tip for Passwords on Windows 95 and NetWare Servers](#)



After you log onto the network and are validated by a NetWare server, Windows 95 automatically supplies the same user name and password for logging onto Windows 95. You are asked to supply your user name and password to log onto Windows 95 only if the user name or password is different from your NetWare user account. Therefore, you may want to keep your user name and password the same for both the Windows 95 and the NetWare networks.

Administrators may want to recommend this tip to users, because maintaining the same user name and password also makes it easier for network administrators to coordinate user accounts. For more information about passwords, including brief information on changing passwords on a NetWare server, see Chapter 14, "Security."

With NETX and VLM client, however, the logon prompt for Windows 95 will always appear, because the unified logon process is not available. For these clients, logon happens in real mode during system startup.

The network administrator can define system policies to enforce requirements for network logon.

For network logon in general, use these policies:

n

Logon Banner, to specify a caption and other text to be displayed in a

Logon banner.

n

Require Validation By Network For Windows Access, to specify that each

logon must be validated by a server before access to Windows is allowed.

For Microsoft Client for NetWare Networks, use these policies:

n

Disable Automatic NetWare Login, to specify that when Windows 95

attempts to connect to a NetWare server, it does not automatically try to use the user's network logon name and password, and the Windows logon password to make the connection.

For Client for Microsoft Networks, use these policies:

n

Log On To Windows NT, to specify that this computer can participate in a

Windows NT domain.

n

Display Domain Logon Validation, to display a message when the domain

controller has validated user logon.

n

Disable Caching Of Domain Password, to specify that no caching is used

for the network password.

For information about these policies and others that enforce password requirements, see Chapter 15, "User Profiles and System Policies." Chapter 15 also describes how to install and use System Policy Editor and how to implement system policies.

If a computer has the Microsoft Remote Registry agent installed, you can use System Policy Editor to remotely set network logon options on individual computers without using system policies. This is useful in cases where you have not previously enforced logon requirements using system policies, but you want to make sure network logon is properly configured on a specific computer.

### *Using Logon Scripts*

---

This section summarizes some information about using logon scripts on Windows NT and NetWare networks.

For details about using logon scripts for push installation of Windows 95, see Chapter 5, “Custom, Automated, and Push Installations.”

This section summarizes how to use logon scripts for Windows 95 on Windows NT networks.

Logon scripts are batch files or executable files that run automatically when a user logs onto a computer running either Windows NT, Windows 95, or MS-DOS. Logon scripts are often used to configure users' working environments by making network connections and starting applications.

There are several reasons you may want to use logon scripts:

n

Because you want to manage part of the user environment (such as network connections) without managing or dictating the entire environment.

n

Because you want to use logon scripts to create common network connections for multiple users.

n

Because logon scripts are easy to create and maintain.

n

Because you already have LAN Manager 2.x running on your network,

and you want to continue to use logon scripts you created for that system.

To assign a user a logon script, simply designate the path name of the logon script file in the user's account on the server. Then, whenever that user logs on, the logon script is downloaded and run. You can assign a different logon script to each user or create logon scripts for use by multiple users.

To create a batch-file logon script, simply create an MS-DOS batch file. (For more information on creating batch files, see the WINDOWS NT SERVER SYSTEM GUIDE or your MS-DOS documentation.) There are several special parameters you can use when creating logon scripts, as shown in the following table.

#### Special Logon Script Parameters

---

%H The local  
OM drive letter  
ED for the  
RIV network  
E% connection  
1 to the home  
directory, if  
the home  
directory is  
not located  
on the  
user's  
workstation

%H The full

OM path name  
 EP of the  
 AT user's  
 H% home  
 1 directory  
  
 %H The UNC  
 OM name of the  
 ES shared  
 HA directory  
 RE containing  
 %1 the user's  
 home  
 directory  
  
 %O The  
 S% operating  
 system of  
 the user's  
 workstation  
  
 %P The  
 RO processor  
 CE type (such  
 SS as 80386)  
 OR of the  
 % user's  
 workstation  
  
 %U The domain  
 SE containing  
 RD the user's  
 OM account  
 AIN  
 %  
  
 %U The user  
 SE name of the  
 RN user  
 AM  
 E%

---

1 On Windows NT networks, you can use three special replaceable parameters for home directories — %HOMEDRIVE%, %HOMEPATH%, and %HOMESHARE% — when setting up logon scripts or other batch files, or when you specify application path names or working directories for application icons in the Start button.

---

~~A logon script is always downloaded from the server that validates a user's logon~~

request. For users with accounts on Windows NT Server domains that have one or more backup domain controllers and a primary domain controller, any one of the domain controllers can authorize a user's logon attempt. So, to ensure that logon scripts always work for users, you should be sure that logon scripts for all user accounts in a domain exist on every primary and backup domain controller in the domain. The best way to do this is to use the Windows NT Replicator service, as described in the WINDOWS NT SERVER SYSTEM GUIDE.

Home directories on Windows NT networks are used to store user profiles and can also serve as private storage spaces for users. Normally, users also control access to their home directories and can restrict or grant access to other users.

If your network workstations have little spare hard-disk space, you may want to assign each user a home directory on a server. You can also assign users home directories on their own workstations (although this means that users won't have access to their user profiles from other computers); you may want to do this if a user's workstation has enough hard-disk space for the user's data but you don't want the user to be able to access the files and directories on the rest of the workstation.

Whenever a user starts a command prompt, the user's home directory is set as the default directory. The user's home directory is also set as the working directory for all applications the user starts, except for applications that have a program item that specifies a different working directory. If the home directory is on a computer other than the user's own workstation, a connection is automatically made to the home directory every time the user logs on.

This section provides guidelines for running logon scripts with Windows 95 on NetWare networks.

On NetWare networks, the system logon script, NET\$LOG.DAT, is stored in the PUBLIC directory on the server. Individual user scripts are stored in their MAIL subdirectories. The network administrator can use SYSCON (or NWADMIN for VLM) to edit logon scripts, for any NetWare-compatible client running under Windows 95.

If a computer is running the Novell-supplied NETX or VLM networking client, logon scripts are processed as they were before Windows 95 was installed. If the computer is running Client for NetWare Networks, the special Windows 95 logon processor runs the logon script after the user completes entries in the network logon dialog box during system startup. The issues related to running logon scripts depend on whether the computer is configured with Client for NetWare Networks or uses a Novell-supplied network client.

[Running Logon Scripts with Client for NetWare Networks](#)

The Windows 95 logon script processor runs NetWare 3.x system and user logon scripts, using commands in these scripts, such as MAP and CAPTURE, to make global changes to the system environment. For example, a script might include a PATH statement to specify search drives or SET statements.

#### The Logon Script Processor window

```
{ewc msdncd, EWGraphic, x0j 3 /a "psJ.bmp"}
```

Any kinds of NetWare or MS-DOS commands can go into a logon script except those that load TSRs. The Windows 95 logon processor operates in protected mode, so loading real-mode TSRs from a logon script is not possible, because logon scripts are run after all real-mode actions are completed at system startup. Any TSR that is run from a logon script is loaded in a single DOS VM, which is subsequently shut down when logon script processing is completed. In these cases, the logon script processor displays an error message.

For loading components such as backup agents, protected-mode equivalents in Windows 95 can be used instead of running TSRs. If you need to run a TSR to support an application, use one of the options described in the following table.

#### Loading TSRs with Client for NetWare Networks

---

|                                                                                               |                                                |
|-----------------------------------------------------------------------------------------------|------------------------------------------------|
| All applicat<br>ions created<br>for MS_D<br>OS or Windo<br>ws, without<br>IPX/SP<br>X support | AUTOE<br>XEC.BA<br>T                           |
| All Windo<br>ws-based applicat<br>ions                                                        | WINST<br>ART.BA<br>T in the Window<br>director |

that y  
require  
IPX/SP  
X  
support  
1

Any Load  
MS\_D the  
OS – TSR at  
based the  
applicat MS\_DO  
ion that S  
require Prompt  
s before  
IPX/SP running  
X the  
support applicat  
2 ion

All After  
applicat the  
ions entry  
created loading  
for IPXODI  
MS\_D in  
OS or AUTOE  
Windo XEC.BA  
ws, T  
with  
IPX/SP  
X  
support

---

1 The IPX/SPX-compatible protocol (NWLINK) is loaded after real mode is complete, but before logon scripts are processed. So this protocol is available for TSRs loaded from WINSTART.BAT.

2 The TSR must be loaded in each separate DOS VM for each application that requires that TSR, before the application is loaded. This can be done in a batch file used to run the application.

---

The network administrator may want to warn users that the logon script processor can display special windows and messages, and that this is not an error condition.



Specifically:

n

When the logon script runs, a message announces that the operating system is processing logon scripts. The user can click a button to see details. However, if any statement in the script writes to the screen or if there is a PAUSE statement, the Logon Script Processor window appears and displays all subsequent statements as they run.

n

If any #DOS\_COMMAND statement is included in the script, a special DOS VM is used to process the command; an MS-DOS Prompt window will appear while the command is running and then closes automatically when the command is complete.

The following list presents some tips for testing and running logon scripts with Client for NetWare Networks:

n

In your testing laboratory, run the logon script on a NETX computer and check the drive mappings and printer capture statements. Then run the script under Client for NetWare Networks and make sure the results are the same.

n

Insert PAUSE statements frequently in the scripts you are testing, so that

you can study each screenful of information as it appears in the Logon Script Processor window.

n

While testing scripts, check carefully for script errors that appear in the

Logon Script Processor window.

n

Insert PAUSE statements following any text that you want the user to read

during system logon.

---

Note — The Windows 95 logon script processor can handle any documented NetWare logon script commands. Any undocumented variations on NetWare commands may not be processed as legal statements.

---

You can make persistent connections (using the same drive letter each time) to NetWare volumes and directories by using the Windows 95 user interface. Using persistent connections eliminates the need for some NetWare MAP commands in logon scripts. For information about making persistent connections, see “Connecting to Drive and Printer Resources” later in this chapter.

Client for NetWare Networks also differs from NETX and VLM in that it does not map the first network drive to the logon directory of the preferred server. All subsequent connections to NetWare servers must be made using Windows 95 tools.

### [Running Logon Scripts with Novell-Supplied Clients](#)

With NETX or VLM, logon scripts are run during system startup after real mode at the MS-DOS Prompt before Windows 95 switches to protected mode. Therefore, all statements and TSRs will run as expected and be available globally for all applications created for Windows or MS-DOS.

Notice that this means that users should log onto the NetWare server before running Windows 95. If a user instead logs on at an MS-DOS Prompt while already running

Windows 95, then all the drive mappings created by the logon scripts will be local to that DOS VM and will not show up in the My Computer window.

### *Technical Notes for the Logon Process*

---

The notes in this section provide a brief overview of the logon process in Windows 95.

If user profiles are enabled (using the Passwords option in Control Panel or by setting the related system policy), then a logon dialog box will always appear at system startup, even if the user's password is blank. This is because the user must be identified so the operating system can load the correct profile.

If user profiles are not enabled, then what happens in the logon process depends on the setting specified in the Primary Network Logon box in the Network option in Control Panel. If the Primary Network Logon setting is for a network provider such as Client for NetWare Networks or Client for Microsoft Networks, then an Enter Network Password dialog box will always be displayed if the network is active. These network providers cannot allow an automatic logon without the user entering a password, because the provider does not know which network password you want to use.

On a portable computer that has a network adapter that can be changed (for example, using the adapter on a docking station versus using a PCMCIA card), the logon dialog box appears when there is an active network. Only the Windows 95 system logon dialog box appears when the network is not active.

If the user selects Windows Logon as the value in the Primary Network Logon box on the Network Configuration property sheet, then the Windows system logon dialog box will appear first, followed by logon dialog boxes for any other network providers. In this case, if the Windows password and the passwords for any other network providers are all blank, then Windows 95 can attempt an automatic logon (sometimes called a "silent" logon) by attempting to open the user's password file with a blank password.

You might choose this configuration, for example, for servers that are physically secure from user access when you want such servers to be able to automatically recover from power outages or other failures without user intervention.

---

Note — The administrator can use system policies to restrict users' access to the Passwords option in Control Panel or to require a minimum password length to prevent automatic logon using blank passwords.

---

### *Browsing Overview*

---

This section discusses how Windows 95 makes browsing networks easy.

independent of the network provider (such as Windows NT Server, Novell NetWare, or Windows 95 itself).

Users can browse network resources to access information or connect to resources available on the network. For example, users on NetWare networks can see NetWare servers and printers, plus computers running File and Printer Sharing for NetWare Networks. Users on Microsoft networks can find network resources by scrolling through a list of available workgroups, a list of available computers in a given workgroup, and a list of available resources on a given computer.

This section contains the following topics:

n

Using Network Neighborhood

n

Browsing in common dialog boxes

n

Connecting to drive and printer resources

n

Browsing with the *net view* command

Two sections later in this chapter, “Browsing on Microsoft Networks” and “Browsing

on NetWare Networks,” provide technical details related to network computing with Windows 95 on those specific networks.

The Network Neighborhood on the desktop is the primary means by which users can browse the network. In both the Network Neighborhood and Entire Network views, you can access shared resources on a server without having to map a network drive. Browsing and connecting to the resource consist of a single step: clicking an icon.

For information about what happens internally when Network Neighborhood is used to browse multiple networks, see the description of the Multiple Provider Router in Chapter 32, “Windows 95 Network Architecture.”

### [Workgroups in Windows 95](#)

On Microsoft networks, computers are logically grouped in workgroups, where each computer in the workgroup maintains its own security system for validating local user logon and access to local resources. Computers in workgroups do not share security with other computers, and do not rely on other computers to provide security. Workgroups are mainly used to associate groups of computers for convenient browsing of network resources.

NetWare networks do not use the workgroup concept, and computers running Windows 95 with VLM or NETX clients cannot be members of workgroups. However, computers running File and Printer Sharing for NetWare Networks with Workgroup advertising enabled, can appear in workgroups for browsing by other Windows 95 users.

To set the workgroup for a computer, use the Identification tab in the Network option in Control Panel.

### [To use Network Neighborhood](#)

1. Double-click Network Neighborhood on the desktop.

— If you open Network Neighborhood when you are running VLM or NETX on a NetWare network, you can see NetWare servers that you are connected to. You can double-click any of these icons to access the resources on those servers.

— If you are running Client for Microsoft Networks, you can see the computers in your workgroup, whether the computers are running Windows 95, Windows NT, or Windows for Workgroups. You can double-click any of these computers.

— {ewc msdn cd, EWGraphic, x0j 4 /a "psJ.bmp"}

2. Double-click the Entire Network icon.

The contents of the list that appears depends, of course, on the kind of network.

n

For Microsoft networks, the Entire Network list shows all the Microsoft network domains and workgroups on your network, plus servers (and peer servers) in your workgroup.

n

For NetWare networks, the list shows the NetWare servers on your network. If your computer has both Client for Microsoft Networks and Client for NetWare Networks installed, the list of NetWare servers is at the end of the list of workgroups and domains.

3. Double-click any resource in the Entire Network window to access that resource. Right-click a server or workgroup icon to see a context menu that shows what you can do.

`{ewc msdncd, EWGraphic, x0j 5 /a "psJ.bmp"}`

#### [To create a shortcut on the desktop to a network resource](#)

1. Browse Network Neighborhood until you find the network resource you want.
2. Press the right mouse button, and drag and drop the icon for that resource onto the desktop.
3. In the context menu, click Create Shortcut Here.
4. Close the Network Neighborhood window.
5. Double-click the shortcut to view the contents of the network folder in a new window. This shortcut is available every time you start Windows 95.

The administrator can use system policies to create a custom Network Neighborhood for individuals or multiple users. Other system policies can be set to control users' access to browsing.

### To create a custom Network Neighborhood

1. Create a folder that will contain the Custom Network Neighborhood, and place it in a central location if multiple users will access it, or place it in this location on a local computer:

c:\windows\profiles\username\nethood

2. In the Custom Network Neighborhood, place any shortcuts that you want. Make sure that the path specified in the Target box on the Shortcut property sheet is a UNC name, rather than a mapped directory. Otherwise, the users who will access resources using these shortcuts must have the same drives mapped in their logon scripts.

Caution— Do not place folders in the custom Network Neighborhood. Windows 95 does not support this feature, and unpredictable results can occur.

3. In System Policy Editor, enable the policy named Custom Network Neighborhood.

n

You can use Registry mode to enable this option on a local or a remote computer.

n

You can use Policy mode to create or modify a policy file for one or more users.

The next time the user logs on, the Custom Network Neighborhood will appear on the desktop, instead of the default Network Neighborhood.

---

Tip— You can also create shortcuts for Dial-Up Networking connections as part of the Custom Network Neighborhood provided using system policies.

---

You can set the following system policies to control users' access to built-in Windows 95 browsing features:

n

Hide Network Neighborhood, to prevent access to Network Neighborhood.

n

No Entire Network In Network Neighborhood, to prevent access to the  
Entire Network icon in Network Neighborhood.

n

No Workgroup Contents In Network Neighborhood, to prevent workgroup  
contents from being displayed in Network Neighborhood.

For information about specific policies and about using System Policy Editor, see  
Chapter 15, "User Profiles and System Policies."

The new common dialog boxes such as File Open and File Save are standard in  
applications that use the Windows 95 user interface, providing a consistent way to  
open or save files on network resources and local drives. Also, the Network  
Neighborhood can be browsed directly from the new common dialog boxes and  
most basic file management tasks can be performed while working in a common  
dialog box.

---

Note — Windows-based applications created for earlier versions of Windows do  
not use the new common dialog boxes.

---

In Windows 95, you can create new folders when you are saving a document (unlike  
Windows 3.1 where you had to start File Manager or exit to the MS-DOS command



prompt), as shown in the following procedure for an application that uses the common networking dialog boxes in Windows 95.

*To create a new folder from within a common dialog box—an example*

1. From the Start menu, click Programs and Accessories, and then click Paint.
2. From the File menu, click Open and then click the Look In list, which provides access to the entire system, including Network Neighborhood.

—{ewc msdncl, EWGraphic, x0j 6 /a "psJ.bmp"}

3. Connect to another network resource in Network Neighborhood.
4. Click File Save As, and click the Create New Folder icon.

— Notice that the new folder is created on the network resource.

For technical notes about how browsing works in Windows 95, see “Browsing on Microsoft Networks” later in this chapter.

*Connecting to Drive and Printer Resources*

{ewc msdncl, EWGraphic, x0j 7 /a "psJ.bmp"}

The toolbar available in every window includes the Map Network Drive button, which displays the Map Network Drive dialog box, where you can type the name of a network server and shared directory using the UNC name. For example, to connect to the server CORP and the shared directory DOCS, the UNC name to specify is \  
\CORP\DOCS.

You can make any drive mapping persistent (that is, stored and automatically reconnected at startup) by checking the Reconnect At Logon check box in any Map Network Drive dialog box. Persistent connections are restored to the same drive letters each time Windows 95 is started.

You can display this dialog box by right-clicking the Network Neighborhood icon.

{ewc msdncl, EWGraphic, x0j 8 /a "psJ.bmp"}

Shared printer resources on a network can be specified during the installation of a new printer using the UNC syntax of \\SERVERNAME\PRINT\_SHARE\_NAME or using the Point and Print method for installing a printer driver. For example, for the shared printer named HP III on the server CORP, the network path in UNC syntax is \  
\CORP\HP III. For more information about Point and Print, see Chapter 23, “Printing and Fonts.”

Browsing network resources at the MS-DOS prompt is handled by the real-mode networking components. The *net view* command is used to request a list of computers present in a given workgroup. Unlike a browsing request from one of the Windows 95 user interface components such as Network Neighborhood, the *net view* command requests a list of computers directly from the master browse server.

---

Note — Specific notes for using the *net* commands on NetWare networks are provided in “Browsing on NetWare Networks” later in this chapter.

---

*To display a list of computers with shared resources in a workgroup*

n

At the command prompt, type *net view* and press ENTER.

The following summarizes the syntax for the *net view* command.

#### Net View Syntax

*net view* [*\\COMPUTERNAME*]

—Or—

*net view* [*/workgroup:WORKGROUPNAME*]

#### Net View Parameters

COMPUTERNAME

Specifies the name of the computer with shared resources you want to view.

*/workgroup*

Specifies that you want to view the names of the computers that shares resources in another workgroup.

WORKGROUPNAME

Specifies the name of the workgroup that has computer names you want to view.

## *Browsing on Microsoft Networks*

---

The Windows 95 browsing scheme for Microsoft networks is based on the scheme currently used for Windows NT and Windows for Workgroups. The Windows 95 browse service attempts to minimize the network traffic related to browsing activity, while also providing an implementation that scales well to support both small and large networks.

This section describes how the browse service designates browse servers and maintains the browse list.

The Windows 95 browse service uses the concept of a master browse server and a backup browse server to maintain the browse list. There is only one master browse server for a given Windows 95 workgroup for each protocol used in the workgroup; however, there may be one or more backup browse servers for each protocol for a given workgroup.

The master browse server is responsible for maintaining the master list of workgroups, domains, and computers in a given workgroup. To minimize the network traffic that the master browse server may be subjected to when handling browsing services, backup browse servers can be designated in a workgroup to help off-load some query requests. Usually there is one browse server for every 15 computers assigned to a given workgroup.

When Windows 95 is started on a computer, the computer first checks to see if a master browse server is already present for the given workgroup. If a master browse server doesn't exist, the computer starts an election to serve as the master browse server for the workgroup.

If a master browse server already exists, Windows 95 detects the number of computers in the workgroup, and the number of browse servers present. If the number of computers in the workgroup exceeds the defined ratio of browse servers to computers in a workgroup, an additional computer in the workgroup may become a backup browse server.

The Browse Master parameter in the Advanced property sheet for File and Printer Sharing for Microsoft Networks provides a mechanism for controlling which computers can become browse servers in a workgroup. If this parameter is set to Automatic, the master browser can designate that computer as a backup browse server when needed. For information about configuring this parameter, see "Using File and Printer Sharing for Microsoft Networks" later in this chapter.

[Tip for Using the Net View Command to Check the Browse Server](#)

The *net view* command is a valuable troubleshooting tool if you suspect the browse list maintained by a backup browse server is incomplete or inaccurate. You can use the *net view* command to get the list of known computers directly from the master browse server. The request is not handled by a backup browse server.

If the list of computers returned by a master browse server is inaccurate, you could reset this computer by quitting Windows 95 at that computer. Another computer will then be promoted to become the designated master browse server for the workgroup.

In Windows 95, the browse service maintains an up-to-date list of domains, workgroups, and computers, and provides this list to applications when requested. The user sees the list in the following types of circumstances:

n

If a Windows 95 user requests a list of computers in a workgroup, the

browse service on the local computer randomly chooses one of the browse servers it is aware of and sends the request.

n

If a user selects a workgroup to which the computer does not belong,

Windows 95 requests a list of computers defined in the selected workgroup from a browse server in the selected workgroup.

The selected browse server also sends a list of other workgroups it knows about, that are defined on the network, along with a list of computers in the workgroup to which the user belongs.

The browse list is displayed in Map Network Drive and Connect Network Printer dialog boxes, or anywhere that Windows 95 presents lists of resources that can be browsed. The browse list can also be displayed using the *net view* command. The list can contain the names of domains, workgroups, and computers running the File and Printer Sharing service, including the following:

n

Computers running Windows 95, Windows for Workgroups, and Windows NT Workstation

n

Windows NT Server domains and servers

n

Workgroups defined in Windows 95, Windows for Workgroups, and Windows NT

n

Workgroup Add-On for MS-DOS peer servers

n

LAN Manager 2.x domains and servers

[Adding New Computers to the Browse List](#)

When a computer running Windows 95 is started on the network, it announces itself to the master browse server for its workgroup, and the master browse server adds that computer to the list of available computers in the workgroup. The master browse server then notifies backup browse servers that a change to the browse list is available. The backup browse servers then request the new information to update their local browse lists. Notice that it may take as long as 15 minutes before a backup browse server receives an updated browse list, so a new computer on the network may not show up in a user's request for a browse list until this period of time has elapsed.

### *Removing Computers from the Browse List*

When a computer shuts down properly (for example, when a user shuts down Windows 95 rather than powering off the computer or restarting the computer without exiting), the operating system sends an announcement to the master browse server to inform it that the computer is shutting down. The master browse server then notifies backup browse servers that a change to the browse list is available. The backup browse servers request the changes to the browse list.

If a user turns off the computer without shutting down, the computer does not get a chance to send a message to the master browse server informing it that Windows 95 is shutting down. If the master browse server does not receive notification that the Windows 95 has shut down, the computer name may continue to appear in the browse list until the name entry times out, which can take up to 45 minutes.

n

The Windows 95 browser has been updated to support browsing across

TCP/IP subnetworks. To take advantage of this, the network must use a WINS server or you must use #DOM entries in LMHOSTS files. For information about creating LMHOSTS files, see Appendix G, "HOSTS and LMHOSTS Files for Windows 95."

n

Microsoft LAN Manager-compatible networks such as IBM® LAN Server and Microsoft LAN Manager for UNIX® support browsing of servers and shares using the Windows 95 user interface or *net view*.

n

DEC™ Pathworks™ is an example of a Microsoft LAN Manager-compatible network that does not support browsing. AT&T® StarLAN is an example of a Microsoft Network-compatible network that is not based on Microsoft LAN Manager and that does not support remote browsing of servers and shares. These servers do not show up in Network Neighborhood; but with Windows 95, users can still access the servers and shares through a network connection dialog box.

n

When a known slow network connection is used (for example, the remote access driver), Windows 95 is automatically configured not to designate that computer to be a browse server for the network connection. The *SlowLanas=* parameter in the Registry identifies the network LANA numbers for which the local computer will not serve as a browse master. However, the user can still request a list of available workgroups and computers on the network across the slow network connection.

### Browsing on NetWare Networks

---

The Windows 95 user interface includes support for browsing and connecting to network resources on Novell NetWare and other networks. This support is the same whether you use Client for NetWare Networks or the Novell-supplied NETX or VLM client. After you connect to a NetWare volume or a computer running File and Printer

Sharing for NetWare Networks, you can drag and drop directories and files to move and copy them between your computer and the NetWare server or the shared resource.

This section contains the following topics:

n

Using Network Neighborhood on NetWare networks

n

Making drive connections to NetWare servers

n

Making connections at the command prompt

n

Connecting to NetWare resources through Windows NT



n

Technical issues for browsing NetWare networks

For information about printer connections, see Chapter 23, "Printing and Fonts."

Network Neighborhood is the primary means by which you can browse the network. When you open Network Neighborhood on a computer running a NetWare-compatible networking client, the following can happen:

n

All the NetWare bindery-based servers to which your computer is connected are displayed.

n

Clicking the Entire Network icon displays a list of all NetWare servers on the network. You can view the contents of a server without having to map a network drive.

If your computer has both Client for Microsoft Networks and Client for NetWare Networks installed, then you will also see a list of computers running Windows for Workgroups, Windows 95, and Windows NT. The list of NetWare servers is at the beginning of the list of workgroups or domains in the Entire Network window.

# n

In both Network Neighborhood and Entire Network views, you can open a

server to access its contents without having to map a network drive. You will be asked for security information, if necessary, and you can choose to save your password in the password cache so that you will not have to type it again.

In Windows 95, drive mappings are limited to the available drive letters. However, Windows 95 supports unlimited UNC connections.

### [To connect a NetWare drive in Network Neighborhood](#)

1. Right-click a NetWare server in Network Neighborhood.
2. In the context menu, click Attach As. Then type a user name and password, and click OK.

{ewc msdncd, EWGraphic, x0j 9 /a "psJ.bmp"}

---

Tip — You can also create a shortcut to frequently used resources, as described in "Using Network Neighborhood" earlier in this chapter. When you double-click a shortcut, you only have to supply a password to connect to it.

---

{ewc msdncd, EWGraphic, x0j 10 /a "psJ.bmp"}

The toolbar on every window includes the Map Network Drive button, which you can use to specify the name of a NetWare server and volume (or directory) that you want to map to a drive letter.

### [To connect to a NetWare drive using the Map Network Drive button](#)

1. Click the Map Network Drive button in Network Neighborhood (or on any toolbar where it appears).
2. In the Path box of the Map Network Drive dialog box, select or type a network path using either UNC path names or NetWare syntax. Be sure to preface the server name with two backslashes (\\) if you use UNC path names. For example, if you want to connect to the server CORP, volume DOCS, directory WORD, subdirectory Q1, the following can be used:

n

The UNC name is \\CORP\DOCS\WORD\Q1.

n

The NetWare name is CORP/DOCS:WORD\Q1. (In the NetWare environment, “/” and “\” are treated the same.)

— Or —

— If you have connected to the volume or directory before, select the path from the list displayed in the Path box. The Path box displays the previous ten paths.

3. Click OK.

— The NetWare server validates your user name and password before it displays directories in a NetWare volume you select. If the NetWare server cannot validate your credentials, Windows 95 displays the Enter Network Credentials dialog box.

---

Note — Windows 95 does not support the NetWare 4.0 naming convention of \\NWSERVER\_SYS\DIRECTORY\_PATH\FILENAME.EXT where \\NWSERVER\_SYS is the name of the NDS server volume object.

---

You can also use the equivalent of the NetWare MAP ROOT command when connecting to a network directory.

[To connect to a directory as the root of the drive](#)

1. In Network Neighborhood, right-click a directory on a NetWare server, and click Map Network Drive in the context menu.
2. In the Map Network Drive dialog box, click the option named Connect As Root Of The Drive, and then click OK.

— {ewc msdn cd, EWGraphic, x0j 11 /a "psJ.bmp"}

With this option enabled, if you switch to this mapped directory in a VM window, you will see the prompt as DRIVE:\> (not DRIVE:\DIRECTORY>). You cannot go farther back

up the directory tree from the command prompt.

You can use the context menu for a NetWare server to show everything you can do with the related server, volume, or directory.

[To view the context menu for a NetWare server](#)

n

In Network Neighborhood, right-click a NetWare server.

The following shows information about the context menu for a NetWare server.

---

Op Connects to  
en that server.

Ex Shows the  
plo resources  
re available on  
that server  
without  
making a  
connection.

Wh Specifies  
o whether the  
Am user is  
l logged on or  
attached to  
the server; if  
a user is  
logged on  
and the  
computer is  
attached,  
specifies  
that user's  
name.

Lo Logs the  
g user off the  
Ou

t server.

Att Presents a  
ac dialog box  
h for typing a  
As password to  
log onto the  
server. This  
dialog box  
allows the  
user to  
connect to  
the server  
using a  
different  
user name  
from the  
one used to  
log onto the  
network.

Ma Presents a  
p dialog box  
Ne for mapping  
tw a network  
ork drive to a  
Dri drive letter.  
ve

Cr Creates a  
eat shortcut on  
e the desktop  
Sh for the  
ort selected  
cut server.

Pr Shows the  
op properties  
erti for the  
es server.  
Notice that  
listing the  
properties of  
a NetWare  
server  
creates an  
attachment  
without

logging on,  
thereby  
using up  
one of the  
allowable  
connections

If a computer running File and Printer Sharing for NetWare Networks has been configured to allow remote administration, and if you have the authority to administer that server, you can use the administration options on the computer's property sheet. To do this, in Network Neighborhood, right-click the computer's icon, and then click Properties on the context menu. Click the Tools tab on the property sheet, and use the buttons to run Net Watcher or System Monitor, or to administer the file system.

*{ewc msdncd, EWGraphic, x0j 12 /a "psJ.bmp"}*

For more information about preparing computers for remote administration under Windows 95, and about using Net Watcher and other tools, see Chapter 16, "Remote Administration."

Client for NetWare Networks is different from NETX and VLM in that it does not map the first network drive to the logon directory of the preferred server as do NETX and VLM. All subsequent connections to NetWare servers must be made in the Windows 95 user interface.

With Client for NetWare Networks, you can manage connections to the NetWare network using Network Neighborhood and common network connection dialog boxes such as the Open and Save dialog boxes (the same techniques used for Microsoft networks).

With Client for NetWare Networks, you can define persistent connections (which use the same drive letter each time the computer starts) to NetWare volumes and directories. Using persistent connections eliminates the need for NetWare MAP commands in logon scripts. You simply indicate, when you create network connections in the Map Network Resource dialog box, that they are to be restored at system startup.

Remember, however, that you can still use MAP, ATTACH, and other commands at the command prompt or in logon scripts, as described in the following section.

If you are running Client for NetWare Networks, all NetWare commands run in the same way as they do for a Novell-supplied networking client. The ATTACH and SLIST commands provided with Windows 95 use the same syntax and work in exactly the same way as the counterparts provided by Novell.

The following should be noted about certain Novell-supplied commands:

n

For the ATTACH command, configure the networking client to use SAP-

Browsing.

n

It is recommended that you do not use the LOGIN utility to create an

attachment to a computer running File and Printer Sharing for NetWare Networks. Use the ATTACH command instead.

n

For the MAP command, drive mappings in Windows 95 are global to all

sessions.

You can also use the Microsoft networking *net* commands at the command prompt or in logon scripts to manage connections on NetWare networks. For example, the *net use* command can be used to do the following:

# n

Perform the same functions as the NetWare ATTACH and MAP commands.

# n

Supply similar functionality to the CAPTURE utility for printing when applications require printing to a specific port.

The Windows 95 *net view* command can be used to perform the same function as the NETX SLIST or VLM NLIST SERVER commands.

The following brief procedures show built-in Windows 95 commands that can be used at the command prompt or in scripts to manage resource connections.

[To view NetWare servers](#)

# n

At the command prompt, type *net view*

For example:

D:\WIN\COMMAND>net view  
NetWare Servers

\\386  
\\SHRIKE  
\\WRK

[To view volumes on a server](#)



# n

Use `net view \\SERVERNAME`

For example:

D:\WIN\COMMAND>net view \\shrike

Shared resources at \\shrike

| <u>Sharename</u> | <u>Type</u> | <u>Comment</u> |
|------------------|-------------|----------------|
|------------------|-------------|----------------|

|            |             |  |
|------------|-------------|--|
| <u>SYS</u> | <u>Disk</u> |  |
|------------|-------------|--|

|               |             |  |
|---------------|-------------|--|
| <u>PUBLIC</u> | <u>Disk</u> |  |
|---------------|-------------|--|

The `net view` command creates an attachment without logging on. Viewing a NetWare server or a computer running File and Printer Sharing for NetWare Networks does not show print queues. However, viewing a computer running File and Printer Sharing for Microsoft Networks shows both drive and printer shares.

Use the `network` parameter, to specify the volumes on the particular network you want to view. For example:

`net view \\NWSERVER_NAME /network:nw`

[To create a drive connection](#)

# n

Use `net use DRIVE: \\SERVERNAME\VOLUME`

For example:

D:\WIN\COMMAND>net use I: \\shrike\sys

The password is invalid for \\SHRIKE\SYS.

Enter user name for server SHRIKE:joed

Enter the password for user JoeD on server SHRIKE:

The `net use` command is equivalent to `MAP DRIVE:=SERVERNAME\VOLUME:` and it maps only to the root of the volume.

---

Tip—— To use the next available drive letter when connecting to the volume, replace the drive letter with an asterisk (\*).

---

By typing the *net use* command without parameters, you can list the current network connections. For example:

---

| St | Lo | Remote | Netwo |
|----|----|--------|-------|
| at | ca |        | rk    |
| us | l  |        |       |

---

|    |    |       |       |
|----|----|-------|-------|
| == | E: | \     | Net   |
| == |    | \NW4\ | War   |
| =  |    | SYS   | e     |
| O  | F: | \     | Micr  |
| K  |    | \WIN  | osoft |
|    |    | DOW   |       |
|    |    | S\DR  |       |
|    |    | OOT   |       |
| == | H: | \     | Net   |
| == |    | \NET  | War   |
| == |    | WAR   | e     |
|    |    | E40\T |       |
|    |    | HOR\  |       |
|    |    | APPS  |       |

[To delete a drive connection](#)

n

Use *net use* *DRIVE:* /d

—— For example:

—— D:\WIN\COMMAND>net use I: /d

The /d switch and the NetWare command MAP DEL *DRIVE* are equivalent.

[To create a print connection](#)

# n

Use `net use _PORT: \\SERVERNAME\QUEUE_NAME`

For example:

D:\WIN\COMMAND>net use lpt3: \\shrike\pscript1

This is equivalent to `CAPTURE L=_PORT S=SERVERNAME Q=QUEUE_NAME`.

[To delete a print connection](#)

# n

Use `net use _PORT: /d`

For example:

D:\WIN\COMMAND>net use lpt3: /d

This is equivalent to `ENDCAP L=_PORT#`.

The `net` command in Windows 95 does not support the following:

# n

The functionality of the NetWare MAP ROOT command or search drive mappings.

# n

Any of the command-line options of the CAPTURE command, except the equivalents for specifying port, server name, and queue name. To use specific CAPTURE options, use the Novell CAPTURE command.

# n

The functionality of the Novell NetWare print job designations (the J=JOBNAME parameter for the CAPTURE command).

---

Note — You can still use the NetWare commands SLIST (instead of *net view*), MAP (instead of *net use*), or CAPTURE (instead of *net use* to connect to a printer).

---

If your site includes both a Novell NetWare network and a Windows NT Server network, computers using Microsoft networking will need to communicate and share resources with the NetWare network.

For Microsoft networking clients that need access to NetWare resources but cannot use multiple protocols, you can configure a computer running Windows NT Server 3.5 as a file or print gateway that can connect to and share NetWare resources. A gateway is also useful for Microsoft networking clients using Windows NT Remote Access Service, or on networks where you are migrating to TCP/IP or you want to limit IPX/SPX traffic.

Windows NT Gateway Service for NetWare acts as a translator between the SMB protocol used by Microsoft networks and the NCP protocol used on NetWare networks. Administrators can control which users can establish a gateway and the resources that are shared over the gateway.

`{ewc msdn cd, EWGraphic, x0j 13 /a "psJ.bmp"}`

All file access over the gateway is done by sharing drives redirected to NetWare volumes or directories. The file gateway uses a NetWare account on the Windows

NT Server computer to create a validated connection to the NetWare server, which then appears on the Windows NT Server computer as a redirected drive. When the administrator shares the redirected drive, it looks similar to any other shared resource on the Windows NT Server computer.

A print gateway functions in much the same way as the file gateway: the NetWare printer appears on the Windows NT network as if it were any other shared printer. Print jobs sent to the print gateway are redirected to the corresponding NetWare print queue. For example, if the print queue is shared on a Windows NT Server computer named WIN\_NT under the share name HP4SI, users can specify \\win\_nt\\hp4si in the Connect To Printer dialog box. Users can also browse for the printer, which is listed by its UNC name in the Shared Printers box.

Because requests from Microsoft networking clients are processed through the Windows NT Server, access over the gateway is slower than direct access from the client. For computers running Windows 95 that require frequent access to NetWare resources, Client for NetWare Networks is a better solution.

For information about setting up a Windows NT Server computer with Gateway Service for NetWare, see WINDOWS NT SERVER SERVICES FOR NETWARE NETWORKS in the Windows NT Server 3.5 documentation set.

### Overview of Peer Resource Sharing

---

When a computer is running File and Printer Sharing services, other users running the same network client can connect to shared printers, volumes, CD\_ROM drives, and directories on that computer using the standard techniques for connecting the network resources, as described in "Browsing on NetWare Networks" and "Browsing on Microsoft Networks" earlier in this chapter.

Using computers running Windows 95 as peer servers allows you to add secure storage space and printing to the network at a low cost. The peer service is based on a 32-bit, protected-mode architecture, which means all the Windows 95 benefits for robust, high performance are available. In addition, administrators can take advantage of features provided with Windows 95, such as Net Watcher and system policies, to centrally administer peer servers. In addition, user-level security is available, as an additional enhancement beyond the peer server capabilities built into Windows for Workgroups.

This section presents the following topics:

# n

Installing peer resource sharing services

# n

Overview of security for peer resource sharing

If you use custom setup scripts or choose the Custom option as the Setup Type in Windows 95 Setup, you can specify that File and Printer Sharing services be installed with Windows 95. Otherwise, you can add the service later using the Network option in Control Panel.

This section also describes how to enable peer resource sharing in custom setup scripts, and how to control user's access to resource sharing capabilities by defining values in system policy files.

---

Tip — For a computer that will share resources with other users on the networks, choose which File and Printer Sharing service to install based on what other users require:

# n

— If most users who need to share these resources are running NETX,

VLM, or Client for NetWare Networks, then install File and Printer Sharing for NetWare Networks.

# n

—If most users who need to share these resources are running Client for Microsoft Networks, Windows NT, Windows for Workgroups, or Workgroup Add-on for MS-DOS, then install File and Printer Sharing for NetWare Networks.

---

[To install File and Printer Sharing after Setup](#)

# n

In the Network option in Control Panel, click the File And Print Sharing button on the Configuration property sheet.

—Or—

1. In the Network option in Control Panel, click the Add button.
2. In the Select Network Component Type dialog box, double-click Service.
3. In the Select Network Service dialog box, click Microsoft in the Manufacturers list. Then from the Network Service list, click the File and Printer Sharing option for your Primary Network Logon client:

# n

Select File and Printer Sharing for Microsoft Networks if Client for Microsoft Networks is your Primary Network Logon client.

# n

Select File and Printer Sharing for NetWare Networks if Client for NetWare Networks is your Primary Network Logon client.

[To enable File and Printer Sharing in custom setup scripts](#)

# n

In the [network] section of MSBATCH.INF (or an equivalent file), specify one of the following values:

# n

service=nwserver (to install File and Printer Sharing for NetWare Networks)

# n

service=vserver (to install File and Printer Sharing for Microsoft Networks)

[To control file and printer sharing capabilities using system policies](#)



n

Use System Policy Editor to set the values you want in a policy file:

n

To prevent specific users from configuring peer resource sharing services, turn on Disable File Sharing Controls or Disable Print Sharing Controls.

n

To prevent specific computers from having peer resource sharing services installed, turn on Disable File Sharing or Disable Print Sharing.

For information, see Chapter 15, "User Profiles and System Policies."

For File and Printer Sharing for Microsoft Networks (but not NetWare), Windows 95 supports share-level security similar to the security provided with Windows for Workgroups. This level of security associates a password with a shared disk directory or printer. Share-level security for peer resource sharing can be implemented in a Windows 95-only peer-to-peer network or on a network supported by Windows NT or other Microsoft Windows network-compatible servers.

For File and Printer Sharing services on both Windows NT and NetWare networks, Windows 95 supports user-level security by linking a peer server directly to a server for user account validation. For network administrators, the user account list is centrally controlled at the Windows NT domain controller or NetWare server. The resources on the Windows 95 peer server can only be accessed by users with accounts in the central database. Users can also be assigned specified access

rights in Windows 95 for particular resources. For information about using and managing security, see Chapter 14, "Security."

The 32-bit, protected mode network client (VREDIR.VXD or NWREDIR.VXD) and the File and Printer Sharing service (VSERVER.VXD or NWSERVER.VXD) are separate network processes, but they share connection information and pass requests to each other when validating a user-level security request.

For user-level security on a computer running either version of File and Printer Sharing service, you specify the server that contains the database of user accounts that are allowed to connect to this peer resource sharing server. You can do the following to customize access to a shared resource.

n

You can use the Windows 95 user interface to specify which users can

access the shared resources, and which rights they have. For details, see "Sharing a Directory on a Microsoft Network" or "Controlling Access to Peer Server Resources on NetWare Networks" later in this chapter.

n

For File and Printer Sharing on NetWare Networks, you can also set up

user rights remotely on the computer running Windows 95 using NetWare utilities such as FILER.

n

For File and Printer Sharing on Microsoft Networks, you can also set up

user rights remotely using User Manager for Windows NT.

When a user requests access to a shared resource under user-level security, Windows 95 checks for the user's logon name against the list of user accounts

maintained on the server. If this is a valid user logon name, Windows 95 then checks whether this user has access privileges for this resource. If the user has access privileges, then the connection is established.

---

Tip—— Using the NetWatcher tool, a network administrator can remotely monitor connections to any resource on any computer running File and Printer Sharing services if remote administration has been enabled that computer. The network administrator can disconnect users, change access rights, and administer the file system for users on a particular computer. For more information, see Chapter 16, “Remote Administration.”

---

For an example of how pass-through validation works with peer resource sharing, see Chapter 14, “Security.”

### Using File and Printer Sharing for Microsoft Networks

---

File and Printer Sharing for Microsoft Networks is the 32-bit, protected-mode Windows 95 SMB server (VSERVER.VXD), which supports all Microsoft networking products that use the SMB file-sharing protocol, including Windows for Workgroups, Windows NT, LAN Manager, LAN Manager for UNIX, AT&T StarLAN, IBM LAN Server, 3Com® 3+Open® and 3+Share®, and DEC Pathworks. Windows 95 enhances the features of Windows for Workgroups peer services by providing administrative control over whether peer services are enabled and by adding user-based security capabilities.

The following summarizes some requirements for File and Printer Sharing for Microsoft Networks:

n

The computer must use Client for Microsoft Networks.

n

File and Printer Sharing for Microsoft Networks cannot run at the same

time as NCP-based File and Printer Sharing for NetWare Networks.

The default settings for File and Printer Sharing are correct for most installations. You should only need to change these settings in the following circumstances:

n

If you need to set Browse Master properties, as described in “Browsing on Microsoft Networks” earlier in this chapter

n

If you want LAN Manager 2.x clients on your network to use resources on a computer running File and Printer Sharing for Microsoft Networks

Use the Network option in Control Panel to configure the Browse Master and LMAnnounce parameters for the File and Printer Sharing service. For information about configuring security on the Access Control property sheet, see Chapter 14, “Security.”

#### [To configure File and Printer Sharing for Microsoft Networks](#)

1. In the Network option in Control Panel, double-click File and Printer Sharing for Microsoft Networks on the Configuration property sheet.
2. On the Advanced property sheet, set values for BrowseMaster and LMAnnounce parameters, as described in the following procedures.
3. Click OK, and then click OK in the Network option in Control Panel. Then shut down and restart the computer.

{ewc msdn cd, EWGraphic, x0j 14 /a "psJ.bmp"}

#### [To specify Browse Master settings](#)

1. In the Advanced property sheet for File and Printer Sharing for Microsoft Networks, select Browse Master in the Property list.
2. Select a setting in the Value list, as described in the following table.

---

A Specifies  
ut that this  
o computer  
m will maintain  
at the browse  
ic list if  
Windows 95  
determines  
that it is  
necessary.  
This is the  
default.

Y Specifies  
e that this  
s computer is  
to be used  
to maintain  
the browse  
list for  
computers  
in this  
workgroup.

N Specifies  
o that this  
computer is  
never used  
to maintain  
the browse  
list. Use this  
setting if the  
computer  
has little  
free  
memory or  
is  
connected  
by a slow  
link (such  
as a dial-up  
connection),  
or if other  
conditions

create  
special  
performanc  
e problems.

At least one computer in the workgroup must have the value of Automatic or Yes for this parameter to ensure the browse list is available to network computers. This parameter is the equivalent of the *MaintainServerList*= entry in the [network] section of SYSTEM.INI in Windows for Workgroups 3.11.

The LMAnnounce property controls whether a computer running File and Printer Sharing for Microsoft Networks can be seen by LAN Manager 2.x clients.

[To specify LMAnnounce settings](#)

1. Select LMAnnounce in the Property list in the Advanced property sheet for File and Printer Sharing for Microsoft Networks.
2. Select a setting in the Value list. This value should be No unless there is a LAN Manager 2.x domain on your network, as summarized in the following table.

---

Y Specifies  
e that you  
s want this  
computer to  
announce  
its presence  
to other  
Microsoft  
networking  
computers  
in the  
workgroup,  
because  
there is a  
LAN  
Manager  
2.x domain  
on the  
network.  
This value  
must be set  
to Yes if  
other

computers  
in your  
workgroup  
need to see  
this  
computer  
when  
browsing  
the network.

- N Specifies
- o that you do not want this computer to broadcast its presence to other computers. Setting this value to No minimizes the level of network traffic. Other users can still connect to this computer by specifying its UNC name in a Map Network Drive dialog box, but the computer will not appear in browse lists.

This parameter is the equivalent of the *LMAnnounce=* entry in the *[network]* section of SYSTEM.INI in Windows for Workgroups 3.11.

A LAN Manager 2.x domain is known by browse servers in a workgroup only if at least one computer running Windows 95 (or Windows NT in the domain) is a member of that LAN Manager 2.x domain.

[To make a Windows 95 computer a member of a LAN Manager 2.x domain](#)

n

Set the workgroup name for the computer to be the same as the LAN

Manager 2.x domain name.

You can share a directory (or other resource) by selecting it in Windows Explorer or in My Computer and then configuring the related options. The following procedure describes how to share a directory on a computer where user-level security has been specified in the Network option in Control Panel.

The steps for sharing resources with share-level security are similar, except that you do not select specific users, but rather specify the type of access and define a password for the shared resource.

[To share a directory with user-level security](#)

1. From Windows Explorer, right-click the icon for the directory you want to share. When the context menu appears, click Sharing.

2. Click the Sharing tab, and type a share name for the directory.

—Tip— If you add a dollar sign (\$) to the end of the share name, the resource will not appear in Network Neighborhood or elsewhere when people browse network resources.

—{ewc msdn cd, EWGraphic, x0j 15 /a "psJ.bmp"}—

3. Click the Add button, and use the Add Users dialog box to specify which users can access the directory. For information about how to use this dialog box, see the online Help.

You can also use the Edit button on the Sharing property sheet to specify whether a selected user can have Read Only, Full, or Custom access. For information, see Chapter 14, "Security."



For File and Printer Sharing for NetWare Networks:

n

The computer must use Client for NetWare Networks, rather than Novell-supplied client software.

n

Only user-level security (not share-level security) is available.

n

The service cannot run on the same computer as SMB-based File and Printer Sharing for Microsoft Networks.

n

For pass-through validation when user-level security is enabled, there must be a Windows Passthru account (with no password) on the NetWare server used as the security provider.

A computer configured with File and Printer Sharing for NetWare Networks uses the NCP file-sharing protocol to share resources with MS-DOS — based Novell NetWare computers, computers running Windows NT, and computers that have Client for NetWare Networks installed.

Similar to File and Printer Sharing for Microsoft Networks (which is an SMB-based peer resource sharing service), File and Printer Sharing for NetWare Networks supports long filenames and is Plug and Play aware. This new implementation differs from peer resource sharing in Windows for Workgroups 3.1x in two fundamental ways:

n

File and Printer Sharing for NetWare Networks uses the NCP protocol

instead of the SMB protocol. This means that any NetWare client (Client for NetWare Networks, NetWare NETX, or NetWare VLM) can connect to a computer running File and Printer Sharing for NetWare Networks.

n

File and Printer Sharing for NetWare Networks uses user-level security.

Access to a shared resource is based on the user's identity, instead of being based on a password associated with that resource. The user database for verifying user identity is the bindery on a specified NetWare server.

When File and Printer Sharing for NetWare Networks is running on a computer, how that peer server appears to users browsing on the network depends on how the peer server advertises itself, as described in "Configuring Browsing for Resource Sharing on NetWare Networks" later in this chapter. In brief:

n

For another computer running Microsoft Client for NetWare Networks, the

resources on the peer server appear exactly as any shared resources on the network. If the peer server is using Workgroup advertising, it appears in a workgroup. A peer server using SAP advertising won't appear in a workgroup.

# n

For a computer running NETX or VLM, any shared directories on a peer

server that uses SAP advertising appear the same as volumes on any server.  
Any shared printers will appear as print queues. Most NetWare administrative  
commands work as expected, including RIGHTS, FILER, SYSCON, MAP, SLIST,  
VOLINFO, PCONSOLE, and CAPTURE. If the peer server is using Workgroup  
advertising, then users running NETX or VLM cannot see or connect to the peer  
server when browsing the network.

This section contains the following topics in relation to File and Printer Sharing for  
NetWare Networks:

# n

Sharing resources on a NetWare network

# n

Using bindery emulation for pass-through security on NetWare 4.x-

networks

# n

Connecting to NetWare volumes and files

# n

## Using NetWare utilities

To allow NETX and VLM clients on the network to access resources on the peer sharing server, you must enable SAP Browsing in the properties for File and Printer sharing for NetWare Networks. Then this computer will appear as a server in SLIST listings, and users can map drives to connect to this computer. To see a list of volumes, users can use the VOLINFO command.

---

Note — Administrative control over File and Printer Sharing for NetWare Networks is coupled with the printer sharing control — the option controlling the user's ability to share a local printer. If the administrator has specified that printer sharing is not allowed (by setting the related option in a policy file), then File and Printer Sharing for NetWare Networks cannot load and the related options are not available.

---

To add to the list of users who can access the resources of the peer server, add the users to the NetWare server specified in the Access Control properties for File and Printer Sharing for NetWare Networks. Then these users can be given specific access to the peer server by adding them on the Sharing property sheet associated with the shared resource.

The following sections provide these specific procedures:

# n

## Configuring browsing for resource sharing on NetWare networks

# n

Controlling access to peer server resources on NetWare networks

## [Configuring Browsing for Resource Sharing on NetWare Networks](#)

After you install File and Printer Sharing for NetWare Networks, you need to choose the method that computers browsing on the network will use to find this computer. You can browse using two options:

# n

Workgroup Advertising, using the same broadcast method as used by

workgroups on Microsoft networks.

# n

Service Advertising Protocol (SAP, the NetWare broadcasting protocol),

used by Novell NetWare 2.15 and above, 3.x, and 4.x servers to advertise their presence on the network. You must enable this option if you want the shared resources to be available to computers running NETX or VLM.

---

Note—— SAP browsing has a theoretical limit of 7000 systems for browsing, and a practical limit of about 1500 systems. Therefore, SAP browsing will not work in a peer networking environment that consists of a larger number of computers. For a large peer network, use Workgroup Advertising.

---

For a general discussion of browsing when using NetWare-compatible clients, see “Browsing on NetWare Networks” earlier in this chapter.

To specify the browsing preference

1. In the Network option in Control Panel, double-click File and Printer Sharing for NetWare Networks in the list of installed components.

{ewc msdncd, EWGraphic, x0j 16 /a "psJ.bmp"}

2. On the Advanced property sheet, select Workgroup Advertising to define how you want computers running Client for NetWare Networks to see and connect to this peer server:

---

Di This  
s computer  
a will not be  
bl added to  
e the browse  
d list, and  
cannot be  
seen by  
other  
members of  
the  
workgroup  
using any  
method for  
browsing  
network  
resources.

E This  
n computer is  
a added to  
bl the browse  
e list and can  
d: be  
M promoted to  
a browse  
y master if  
B the  
e Preferred  
M Master is  
a not  
st available.  
er

E This

n computer is  
a the  
bl designated  
e browse  
d: master for  
P the  
re workgroup.  
fe  
rr  
e  
d  
M  
a  
st  
er

E This  
n computer is  
a added to  
bl the browse  
e list by the  
d: master  
W browser,  
ill but cannot  
N be  
ot promoted to  
B browse  
e master.  
M  
a  
st  
er

For more information about browse master elections, see “Building the Browse List for Microsoft Networks” earlier in this chapter.

*Note* If Workgroup Advertising is used, each workgroup must have a designated Browse Master at all times to track names and addresses for computers in the workgroup.

3. Select SAP Advertising if you want NETX and VLM clients to be able to connect to this peer server.

---

Di This  
s computer

a will not  
bl advertise its  
e presence,  
d and NETX  
or VLM  
clients  
cannot see  
it using  
SLIST or  
other  
browsing  
options,  
and  
connect  
connect to.  
Users  
running  
Client for  
NetWare  
Networks  
can see it if  
Workgroup  
Advertising  
is enabled  
on the peer  
server.

E This  
n computer  
a will  
bl advertise its  
e presence to  
d other  
computers.  
Users  
running  
VLM,  
NETX, and  
Client for  
NetWare  
Networks  
can see it  
using any  
browsing  
methods,  
and can



connect in  
the same  
way as they  
connect to  
any server.

By default, computers running File and Printer Sharing for NetWare Networks are placed in and browsed by workgroup. You can use the Identification property sheet in the Network option in Control Panel to specify the workgroup and computer name for the computer.

If the appropriate advertising option is not set as required for the network, the computer will not be visible to users browsing the network. However, users can still connect to the shared resource by typing the UNC \\SERVER\SHARE name or SERVER/VOLUME name in a Map Network Resource dialog box.

Although computers that use SAP advertising appear in the list of NetWare servers, you cannot use them in all the same ways that you use NetWare servers.

n

When using NETX, you cannot log onto a computer running Windows 95

at the command line, although you can attach to one and map drives to its directories.

n

When using VLM, you cannot log onto a computer running Windows 95 at

the command line, but you can run a `login /ns` command, and use the Login button in the NWUSER utility.

# n

If you run SYSCON on a NetWare server, you can change the server to one of the computers running Windows 95. However, the computer running Windows 95 does not have a bindery, so when you display all the users (or groups) in SYSCON, you will see the user list (or group list) from the NetWare server that was selected as the user-level security provider.

# n

If you run VOLINFO on a NetWare server, you can select one of the computers running Windows 95 and display its volume information (if you are attached to it). This shows all the available shared disk resources for the computer running Windows 95.

In Windows 95, you can do the same things to resources on computers running File and Printer Sharing for NetWare Networks as you can to any other network resource. For example, when you open the icon to view its contents, you will see only shared resources that you have rights to see. You can also create a link to the computer or map a drive to its shared directories, and so on.

How a computer running File and Printer Sharing for NetWare Networks appears in Network Neighborhood depends on whether it has been configured for Workgroup or SAP advertising.

# n

If the computer is configured to use Workgroup advertising, it appears in the workgroup to which it belongs.

# n

If the computer is configured for SAP advertising, it appears after the list of workgroups in the Entire Network window, with the other Novell NetWare servers on the network.

If a particular workgroup contains computers running only File and Printer Sharing for NetWare Networks, but one or more computers is running Client for Microsoft Networks, then you can use system policies to define an Alternative Workgroup that allows users to see computers in other workgroups that are running File and Printer Sharing for Microsoft Networks. For information, see Chapter 15, "User Profiles and System Policies."

---

Note — Each computer configured with File and Printer Sharing for NetWare Networks logs onto the NetWare server providing security, to get access to the bindery, using the Windows Passthru account. This logon process happens in the background, without user intervention. One constant connection to that NetWare server is needed for each computer running File and Printer Sharing for NetWare Networks.

If a connection already exists, Windows 95 uses that connection and only makes a new connection when required.

NetWare is sold in user packs (such as 10-user or 25-user packs) that limit the number of concurrent connections. So, for example, for a NetWare 3.x 20-user server, only 20 computers configured with File and Printer Sharing for NetWare Networks can maintain a connection at the same time.

---

### [Controlling Access to Peer Server Resources on NetWare Networks](#)

You can add to the list of users allowed access to resources on the peer server. To do this, just add the users to the NetWare server specified in the Access Control properties in the Network option in Control Panel. Then these users can be given specific access to the peer server by adding them to the Sharing property sheet associated with the shared resource.

Passwords for resources on the peer server will be the same as those for the server specified on the Access Control property sheet. Passwords must be changed at that server, as described earlier in this chapter.

[To ensure all users have the required server access](#)

n

Make sure that one NetWare server on the network has the accounts for

all users or all servers, and then set that server as the security provider for every computer configured with File and Printer Sharing for NetWare Networks.

— If server access is not properly set, the message “The pass-through server has not been specified” appears each time the computer running Windows 95 is started.

[To share a directory and specify users on a NetWare network](#)

1. In Windows Explorer, right-click the directory you want to share, and click Sharing on the context menu.

2. On the property sheet, click the Sharing tab, and type a share name for the directory.

— Tip — If you add a dollar sign (\$) to the end of the share name, the resource will not appear in Network Neighborhood elsewhere when people browse network resources.

3. Then click the Add button to display the Add Users dialog box. Select the user name in the list on the left, and then click the related button to specify the kind of access that user is allowed.

— For details about using this dialog box, see online Help.

— {ewc msdn cd, EWGraphic, x0j 17 /a "psJ.bmp"}

Notice in the illustration that the list of users shown in the Add Users dialog box is from the SHRIKE server's bindery. This means two things:

n

All user management is done in the name space of the existing NetWare

server. The NetWare server is administered using all the same tools that are currently in place; Windows 95 has not added another name space to administer.

# n

Only valid user accounts and groups can be specified for shared resources on the peer server.

When the computer running Windows 95 receives a connection request from a user attempting to access a shared device, Windows 95 uses the NetWare server to validate the user name or group membership. If the name or group membership is validated, then Windows 95 checks to see if this validated name or group has been granted access rights to the shared resource, and then grants or denies the connection request.

### [Share Names vs. NetWare Volume Names](#)

When you share resources on a local hard disk drive using File and Printer Sharing for NetWare Networks, the share name associated with the shared directory structure becomes a volume name in the Novell designation SERVER/VOLUME: or the UNC designation \\SERVER\VOLUME.

You can use the UNC designation with *net* commands to connect to and disconnect from either Microsoft networking \\SERVER\SHARENAME shares or NetWare SERVER/VOLUME shares.

Windows 95 does not make this distinction between shares and volumes, because all shares and volumes appear as folders. This distinction becomes important when you use NETX or VLM and NetWare utilities. NetWare does not use or understand the concept of share names. NetWare uses volumes for drive resources and print queue names for print resources.

Therefore, for a shared drive or printer resource to be available to all the different types of clients, when a computer configured with File and Printer Sharing for NetWare Networks shares a drive resource, the share name becomes equivalent to a NetWare volume. When this same computer shares a printer resource, the share name becomes equivalent to the NetWare print queue.

DIRECTORY SHARE NAME ---- VOLUME  
PRINTER SHARE NAME ----- PRINT QUEUE

When Windows 95 shares a printer, it shares the Windows SYSTEM directory with the shared resource named PRINTER\$ for Point and Print support. This share is now a volume that is visible to real-mode NetWare clients and NetWare utilities.

File and Printer Sharing for NetWare Networks grants access to printers and folders on a per-user basis, which requires the name of the server to retrieve the names of users on a network. For NetWare version 2.15 and above and version 3.x servers, all the information for users, groups, passwords, and rights is stored in a database on the server called the bindery. NetWare 4.x servers can appear to have a bindery using bindery emulation, which is enabled by default. Windows 95 can use the bindery of one NetWare server.

Usually, companies have multiple NetWare servers for different departments, and individual users log onto a different server by department. Problems occur when the list of accounts differs between NetWare servers. For example, AnnieP and YusufM log onto the SALES server, and KrisI is on the R&D server. AnnieP can only select one server for pass-through validation, so she must select the SALES server, because that's where this account is located for logon. She can grant access to YusufM, but not to KrisI.

### *Troubleshooting for Logon, Browsing, and Peer Resource Sharing*

---

This section provides some general actions for troubleshooting.

*Setup doesn't run logon script.*

If the network logon server or domain controller is not validating the user account, the logon script will not run. Do the following:

n

Check the network connection.

n

Check the user name.

n

Check the user password.

n

Check the basic network functionality.

n

Check the domain validation.

If the network logon server or domain controller is validating the user account, do the following:

n

Check the network connection.

n

Verify that the logon script is present in the home directory (on a Windows NT network) or in the user's mail directory (on a NetWare network).

n

Check for enough memory on the client computer.

n

Check for and remove unnecessary drivers and TSRs, and then try again.

*You cannot browse to find Windows-based servers in the workgroup.*

There may be no SMB-based servers in the workgroup (computers running Windows NT, LAN Manager, or File and Printer Sharing for Microsoft Networks). Windows 95 does not support browsing in a workgroup that does not contain an SMB-based server. The following presents a minimal solution.

*To ensure there is an SMB-based server in the workgroup*

n

On a computer running File and Printer Sharing for Microsoft Networks,

make sure the service is configured as the Master Browser.

— Or —

— Make sure that a Windows NT server computer is a member of the workgroup (domain).

*Access to an NCP-based server changes if SAP advertising is defined.*

Where you access an NCP-based peer resource server in Network Neighborhood can change, depending on whether the server is configured for Workgroup



advertising or SAP advertising.

n

If the computer running File and Printer Sharing for NetWare Networks is configured for Workgroup advertising, that peer server appears as a computer in its workgroup.

n

If the File and Printer Sharing server is configured for SAP advertising, it appears at the end of the list of workgroups in the Entire Network window of Network Neighborhood with the other Novell NetWare servers.

To set SAP or Workgroup advertising, following the directions in “Configuring Browsing for Resource Sharing on NetWare Networks” earlier in this chapter.

User cannot connect to any network resource.

n

Check workgroup assignment.

n

Check domain or preferred server assignment for the protected mode network client.

n

Check rights for the user as defined on the domain or preferred server.

n

Check basic network operations.

n

Use *net view* \\COMPUTER NAME to view shared resources.

n

Check for termination of the local network cable.

*Others cannot connect to my shared resources.*

n

In the Network option in Control Panel, click the File And Print Sharing button. Then verify that both options are checked in the dialog box that appears.

n

Make sure other users are running a common protocol.

*Network Neighborhood doesn't show servers.*

n

Verify that at least one active server is on the local network.

n

Verify that the proper network clients are installed and, if necessary,  
reinstall them.

n

Verify that the user is logged onto the particular network.

n

Check network protocol settings.

n

Check that the IPX Frame Type is set to Auto or to the same type as the server.

n

Check the network cable termination.

*You can't connect to a specific server.*

n

Check error message details, if available.

n

Verify that you can connect to any server.

n

Verify that you can connect to a specific server from other computers. If you cannot connect to the specific server from other systems, it probably

indicates a problem with that server or the cabling or routing to it. Also verify termination of the local network cable.

*The network redirector or server is not responding.*

If the computer running Windows 95 is not properly responding as a client or server, use System Monitor to view statistics about the activity of the installed network servers and redirectors. If there is no activity, remove the client or server, and then reinstall and try again.

*You cannot see computers running Windows 95 on the other side of a router on a Novell network.*

This may be related to the IPX network number. An IPX client (such as a computer running Client for NetWare Networks) determines its network number by sending Routing Information Protocol (RIP) requests to the nearest IPX router. If the router is misconfigured, all IPX clients on that network can be adversely affected. Network numbers are assigned in the server's AUTOEXEC.NCF file when the network adapter drivers are loaded and IPX is bound to the logical adapter.

*Access denied for Windows for Workgroups users trying to connect to shared resources on a computer running File and Printer Sharing for Microsoft Networks.*

If the user with the Windows for Workgroups client computer is logging onto a different domain from the computer running File and Printer Sharing services (the peer server), then Windows 95 cannot confirm logon validation for access to shared resources. To solve this problem, do one of the following:

n

Upgrade the Windows for Workgroups clients to Windows 95-

(recommended).

n

Set the LMAnnounce to Yes in the Advanced property sheet for File and-

Printer Sharing for Microsoft Networks on the peer server.

n

Switch to share-level security on the peer server.

n

Change the logon domain for the Windows for Workgroups clients.

This problem will not occur in these cases: if the client computers are running Windows 95 or Windows NT; if the peer server uses share-level security; or if the same domains are used for the client computer's logon domain and the domain specified for pass-through validation on the peer server's Access Control property sheet.

*A user is incorrectly denied access to resources on a peer server on a Windows NT network.*

If a user is denied access to resources on a computer running File and Printer Sharing for Microsoft Networks with user-level security, you should first determine which security provider is specified for the peer server. Then, see if the client can be validated by that security provider directly without going through the peer server.

n

If successful, verify that the user is on the access control list for the shared

resource on the peer server. Remove that user from the list of users and then add the name back.

# n

If unsuccessful, reconfigure the peer server to use another security provider that you know can validate the user.

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```

## Chapter 12 Network Technical Discussion

This chapter describes technical issues related to network adapters and protocols for Windows 95, and also presents some technical notes and tips for networking.

### Network Adapter Drivers and Protocols: The Basics

---

A network adapter (sometimes called a network interface card, or NIC) is a hardware card that is installed in a computer so it can function on a network. The network adapter provides one or more ports for the network cable to physically connect to, and it physically transmits data from the computer onto the network cable and vice-versa.

Every network computer must have a network adapter driver, which is the software that controls the network adapter. Each network adapter driver is specifically configured to run with a certain type of network adapter.

In addition to the network adapter and its driver, a network computer must also have a protocol driver (sometimes called a transport protocol or just a protocol). The protocol driver works between the upper-level network software and the network adapter to package data that is to be sent on the network in a way that computers on the receiving end can understand. The process of associating a protocol driver with the network adapter and establishing a communication channel between the two is called BINDING.

For two computers to communicate on a network, they must use identical protocols. Sometimes, a computer is configured to use multiple protocols. In this case, two computers only need to have one protocol in common to communicate. For example, a computer running File and Printer Sharing for Microsoft Networks that uses both NetBEUI and TCP/IP can communicate with computers using only NetBEUI and with computers using only TCP/IP.

In Windows 95, all network adapter drivers and protocols are installed and configured using the Network option in Control Panel, rather than by manually editing configuration files. Configuration values are stored in the Registry.

Windows 95 supports the Network Device Interface Specification (NDIS) versions 2.x and 3.1 protocol and adapter drivers, and provides an NDIS 3.1 replacement for every version 3.0 driver. This section summarizes the benefits gained from NDIS drivers in Windows 95.

By using NDIS 3.1 drivers, Windows 95 can support a wide range of network media including Ethernet, Token Ring, and ArcNet®. The NDIS 3.1 specification accommodates Plug and Play features, so that in many cases network adapters can



be added and removed dynamically while the computer is running. The related features and benefits are summarized in the following discussion.

*Plug and Play support for network protocols and adapters.*

Because of Plug and Play enhancements to the Protocol Manager and Media Access Control (MAC) layer, the operating system can automatically determine which adapters the protocol should bind to. If a Plug and Play event occurs, such as removing a PCMCIA network adapter from a portable computer, the NDIS 3.1 protocols and network adapter drivers remove themselves from memory automatically. (This Plug and Play capability is supported for most PCMCIA adapters, but not for most ISA adapters.)

*New NDIS mini-driver model, dividing the MAC layer into two halves.*

The minidriver provided by the adapter manufacturer implements only the half of the MAC layer that is specific to the network adapter, which includes establishing communications with the adapter, turning on and off electrical isolation for Plug and Play, providing media detection, and enabling any value-added features the network adapter may contain.

The NDIS wrapper provided in Windows 95 implements the half of the MAC functionality that is common to all NDIS drivers. The new minidrivers are faster and are roughly 40 percent smaller than earlier versions of NDIS 3.x network adapter drivers. The Windows 95 minidrivers are also binary-compatible with Windows NT 3.5 minidrivers, which means they can be used without recompiling. (You can recognize a minidriver by its .VXD or .SSS filename extension.)

For NDIS 2.x protocols under Windows 95:

n

An NDIS 2.x protocol driver must use an NDIS 2.x network adapter driver.

Both protocol drivers and network adapter drivers must load and bind in real mode before launching Windows 95. Windows 95 uses values in PROTOCOL.INI to load the real-mode drivers, as described in Chapter 8, "Windows 95 on Microsoft Networks."

# n

When you run the real-mode network (for example, when using Safe-

Mode with Networking for system startup), Windows 95 uses NDIS 2 versions of NetBEUI and IPX/SPX protocols. These protocols are not intended for everyday use since Windows 95 supplies faster protected-mode versions of these protocols. Real-mode NDIS 2 NetBEUI and IPX/SPX-compatible protocols are provided for client computers that start from a floppy disk and run a shared copy of Windows 95 from a server.

Windows 95 also supports ODI drivers with Novell® NetWare® compatible network clients. For information, see Chapter 9, "Windows 95 on NetWare Networks."

Protocols for networking components in Windows 95 are implemented as 32-bit, protected-mode components. Windows 95 can support multiple protocols simultaneously. Protocol stacks can be shared among the networks that are installed. For example, the Microsoft IPX/SPX-compatible protocol can serve both the needs of the Microsoft Client for NetWare Networks and Client for Microsoft Networks. These standard protocols are included with Windows 95:

### Microsoft IPX/SPX-compatible protocol.

This is the new default protocol for Windows 95 and is compatible with the Novell NetWare IPX/SPX implementation. This protocol can be used to communicate with servers on NetWare and Windows NT Server 3.5 networks. This protocol is routable and runs on most network bridges, routers, and so on, that are designed for IPX/SPX routing. The IPX/SPX-compatible protocol also supports for packet-burst mode to offer improved network performance, and supports both the Windows Sockets and NetBIOS programming interface.

### Microsoft TCP/IP.

This protocol is a 32-bit VxD that offers high performance and uses no conventional memory. This is a full TCP/IP implementation that includes several of the more commonly used command line utilities, which include TELNET, FTP, ARP, PING, ROUTE, NETSTAT, NBSTAT, IPCONFIG, and TRACERT. Microsoft TCP/IP supports a NetBIOS programming interface and both 16-bit and 32-bit Windows Sockets for compatibility with Windows Sockets applications. Windows 95 also provides DHCP and WINS clients, to take advantage of the Dynamic Host Configuration Protocol (for automatic TCP/IP configuration using Windows NT DHCP servers) and Windows

Internet Naming Service (for automatic IP-address-to-computer name resolution using Windows NT WINS servers).

Microsoft NetBEUI.

This protocol is compatible with existing networks that use NetBEUI, including Windows for Workgroups peer networks, Windows NT Server, LAN Manager, and other networks. A NetBIOS programming interface is also supported.

All three protocols are Plug and Play-compliant. This means, for example, that if the network is unavailable either due to undocking a portable computer, or removal of a PCMCIA network adapter, Windows 95 continues to run. The protocol stacks unload themselves after having notified any dependent applications that they will be unloaded from the system. This also means protocols can automatically be loaded. For example, if a mobile user goes from a network attached to an infrared (IR) line-of-sight network, TCP/IP can be unloaded and the appropriate IR protocol loaded automatically.

Other protocols that appear under the Microsoft list in the Select Network Protocol dialog box have specific uses. The Microsoft DLC protocol is described in Chapter 10, "Windows 95 on Other Networks."

---

### *Issues for Network Adapters and Protocols*

---

Windows 95 does not support NDIS 3.0 protocol drivers, because Windows 95 uses new conventions for calling drivers that match those used in Windows NT. Windows 95 includes an NDIS 3.1 replacement for all 3.0 drivers.

This section provides specific guidelines for choosing network adapter drivers and for choosing protocols to support your networking needs.

When setting up Windows 95 for networking, you must choose which types of network adapter drivers and protocols to use. Because Windows 95 has an open architecture, you have a lot of flexibility in this decision. Windows 95 supports both the Network Driver Interface Specification (NDIS) and Transport Driver Interface (TDI) standards. These standards allow Windows 95 to communicate with many other networking products and make it possible for you to choose from a variety of network adapters and protocols for the network.

---

Tip—— Network adapters have become exceptionally reliable and inexpensive. The low costs of Ethernet adapters, including new Plug and Play hardware, means the most cost effective way to improve network performance is usually to replace an older network adapter with a new model. The cost for the new hardware is almost

immediately offset by savings in support time and improved performance.

In choosing a new network adapter, you should also consider buying an adapter that matches the computer bus. For example, PCI network adapters are available for use in PCI computers.

---

### [Choosing Separate Protocol and Adapter Drivers](#)

With some networks, each computer's network adapter driver and protocol are separate pieces of software. With other networks, a single piece of software called a monolithic protocol stack performs the functions of both the network adapter driver and the protocol. Microsoft recommends that you choose separate 32-bit protected-mode protocols and drivers rather than monolithic stacks that combine the protocol and adapter driver, because monolithic software runs only in real mode.

Windows 95 includes mapping technology for users who continue to use real-mode NDIS 2.x or ODI network adapter drivers.

### [Choosing NDIS Drivers](#)

Windows 95 supports NDIS versions 2.x and 3.1 (as described in "NDIS Driver Basics" earlier in this chapter), which lets you use separate protocols and network adapter drivers. All network adapter drivers and protocols shipped with Windows 95 conform to NDIS. You can use any combination of one or more protocol drivers that conform to NDIS along with any network adapter driver that conforms to NDIS.

It is probable that the computers on your network have different types of network adapters and thus require different network adapter drivers. Because of NDIS, you can use exactly the same protocol driver with each of these workstations and are not required to have a different version of the protocol for each type of network adapter, as would be required if you were using monolithic protocol stacks.

Also, NDIS allows multiple protocols to use a single network adapter. Usually, when you use a monolithic protocol, it monopolizes the network adapter, preventing you from using other protocols with that adapter.

### [Choosing ODI Adapters](#)

The Open Datalink Interface (ODI) specification was defined by Novell and Apple Computer to provide a protocol and a consistent API for communicating with a network adapter driver, and to support the use of multiple protocols by a network adapter driver.

To ensure the most flexibility in Windows 95 for supporting other protocols along with NetWare integration, Microsoft recommends that you use NDIS 3.1 drivers whenever

possible if you are running Windows 95 on NetWare networks and using a Microsoft-supplied network client. If you are using a Novell-supplied network client, Novell recommends using ODI-based client software rather than monolithic IPX drivers. For information about ODI drivers, see Chapter 9, "Windows 95 on NetWare Networks."

Windows 95 is based on the NDIS architecture and can support multiple network protocols simultaneously as described in Chapter 32, "Windows 95 Network Architecture." Protocol software can be shared among the network providers that are installed. The protected-mode protocols included with Windows 95 are the Microsoft implementation of the IPX/SPX-compatible protocol, Microsoft TCP/IP, and NetBEUI, which are all separate virtual device drivers (VxDs). The real-mode protocols included with Windows 95 are IPX/SPX-compatible and NetBEUI. Technical details about each of the three protocols are provided in the following sections.

The protocols provided with Windows 95 (sometimes called protocol stacks) can be shared among the installed networks. For example, a single implementation of the IPX/SPX-compatible protocol can serve the needs of both Client for Microsoft Networks and Client for NetWare Networks.

Notice, however, that when choosing the network protocol, you can use more than one protocol on the network to ensure communication compatibility with all systems in the enterprise. However, multiple protocols can mean more network traffic and noise, more memory used on the local workstations, and more network delays. You may want to establish a single, standard protocol for use wherever possible.

All protected-mode protocols provided with Windows 95 are Plug and Play-compliant. This means that if the network is unavailable, either due to an undocking procedure or removal of a PCMCIA card, the operating system continues to run. The protocol software can unload itself after having notified any dependent applications that the protocol will be unloaded. Conversely, docking or adding a PCMCIA network adapter will cause the system to dynamically load the protocols.

The following sections discuss uses, advantages, and disadvantages of each protocol provided with Windows 95.

### [Choosing IPX/SPX-Compatible Protocol](#)

Microsoft provides an NDIS-compliant version of the Internetwork Packet Exchange (IPX/SPX) protocol that is used on Novell NetWare networks. This protocol appears in the Network option in Control Panel as IPX/SPX-Compatible Protocol.

This protocol is compatible with the Novell NetWare IPX/SPX protocol, and it provides 32-bit, protected-mode support for protected-mode network clients such as Microsoft Client for NetWare Networks and Client for Microsoft Networks. The

IPX/SPX-compatible protocol in Windows 95 supports NetBIOS and Windows Sockets, but does not support TDI.

The IPX/SPX-compatible protocol provides the following benefits:

n

Provides support for any Novell NetWare-compatible network client

n

Provides 32-bit, protected-mode protocol for use with any 32-bit, protected mode network client

n

Allows a single protocol in combined NetWare and Windows NT network environments

n

Provides a routable protoco

### [Choosing TCP/IP](#)

TCP/IP stands for Transmission Control Protocol/Internet Protocol. It was developed in the late 1970s, as the result of work by the Defense Advanced Research Projects Agency (DARPA) on network interconnection. The major advantages of TCP/IP are

that it is a standard, routable protocol, and it is the most complete and accepted protocol available. It provides communication across interconnected networks with different operating systems and hardware architectures, such as UNIX®, mainframes, and Microsoft networks.

TCP/IP also provides compatibility with the Internet, the collection of networks and gateways linking together many worldwide universities, corporations, government offices, and military installations.

Microsoft TCP/IP supports the Windows Sockets 1.1 interface, a cross-platform client-server framework that is ideal for developing client-server applications that can run with Windows Sockets-compliant stacks from other vendors. Microsoft TCP/IP uses the NetBIOS interface commonly known as NetBIOS over TCP/IP. Several TCP/IP utilities are also installed when you install Microsoft TCP/IP.

Microsoft TCP/IP provides the following benefits:

n

Provides connectivity across operating systems and hardware platforms

n

Provides Internet connectivity

n

Provides a routable protocol

# n

Includes Windows Sockets 1.1 support

TCP/IP is generally known to require careful planning and management of the IP address space. However, this problem is vastly reduced when Windows NT DHCP servers are in place on the network to manage IP address assignment.

### *Choosing Microsoft NetBEUI*

NetBIOS extended user interface (NetBEUI) was first introduced by IBM in 1985. It is a small, efficient, and fast protocol.

When NetBEUI was developed in 1985, it was assumed that LANs would be segmented into workgroups of 20 to 200 computers and that gateways would be used to connect one LAN segment to other LAN segments or to a mainframe. NetBEUI is optimized for very high performance when used in departmental LANs or LAN segments. For traffic within a LAN segment, NetBEUI is the fastest of the protocols shipped with Windows 95. The version of NetBEUI shipping with Windows 95 is completely self-tuning and provides much better performance over slow links than did previous versions of NetBEUI.

Because NetBEUI is very fast for small LAN communications but is not a routable protocol, one recommended method for setting up a network is to use both NetBEUI and another protocol, such as TCP/IP, on each computer that may need to access computers across a router or on a WAN.

When you install both protocols on each computer and set NetBEUI as the first protocol to be used, Windows 95 uses NetBEUI for the communication between computers within each LAN segment, and uses TCP/IP for communication across routers and to other parts of your WAN.

### *Installing Drivers and Protocols*

---

Windows 95 supports up to four network adapters in a single computer. (Network adapters are also called network interface cards, or NICs.) Windows 95 Setup automatically detects most network adapters, installs the appropriate driver for the adapter, and provides appropriate default settings to configure the adapter.



When you install a network adapter in a computer, you can install the appropriate driver using the Network option in Control Panel. The network adapter driver is automatically bound to all NDIS protocols currently running on the computer, and if any protocols are added later, they will also be bound automatically to the network adapter driver. When you choose to add a network adapter, Windows 95 displays a list of supported network adapters.

For specific information about PCMCIA adapters, see Chapter 19, "Devices."

#### [To add a driver for a network adapter](#)

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button. Double-click Adapter.
2. In the Manufacturers list in the Select Device dialog box, select a network adapter manufacturer.
3. In the Models list, select the appropriate model, and then click OK.

===={ewc msdncd, EWGraphic, x0k 0 /a "psK.bmp"}

The following procedure shows how to add a network protocol provided by Microsoft. This procedure assumes that Windows 95 has already been installed with networking support, and that you need to add an additional protocol or want to change the protocol used on a particular computer.

#### [To add a network protocol provided by Microsoft](#)

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button.
2. In the Select Network Component Type dialog box, double-click Protocol.
3. In the Select Network Protocol dialog box, select Microsoft in the Manufacturers list. From the Models list, select the protocol you want. Then click OK.

===={ewc msdncd, EWGraphic, x0k 1 /a "psK.bmp"}

You can specify the network adapter drivers and protocols to be installed with Windows 95 in a custom setup script, as described in Chapter 5, "Custom, Automated, and Push Installations." You can also specify configuration parameters in scripts for specific network adapter drivers and for Microsoft TCP/IP and the IPX/SPX-compatible protocols.

#### [To install network adapter drivers and protocols in custom setup scripts](#)

# n

In the [network] section of MSBATCH.INF, specify the values that define the network adapter drivers and protocols to be used, as described in the following list.

---

Specify a comma-separated list of protocols to be loaded, from the following values:

\_ (for Microsoft NetBEUI)

\_ (for the IPX/SPX-compatible protocol)

\_ (for Microsoft TCP/IP)

Specify a comma-separated list of network device IDs, as specified in the Windows 95 INF

file.

Specify a value of . if you do not want Windows 95 Setup to detect the computers network adapters. In this case, Setup will use the value of ..

The following shows an example of a statement that installs the IPX/SPX-compatible protocol with an Intel® EtherExpress™ network adapter, without detecting the network adapter during Setup:

[network]  
netcards=  
protocols=nwlink  
IgnoreDetectedNetcards=1

Some network adapter drivers have parameters that can be configured, as defined in the INF file for that network adapter driver. You can use the same syntax and values defined in the INF file to set values in a custom setup script. INF file contains the master information for detecting and configuring network adapters.

[To configure network adapter drivers in custom setup scripts](#)

# n

In the related [NETCARD\_ID] section in MSBATCH.INF, add statements to

define configuration values for the network adapter installed in a netcard= entry in the [network] section.

For example, the following shows the entries for the COMPAQ® Elite Ethernet Controller (\*CPQA060 is the device ID for this adapter):

```
[*CPQA060]  
IRQConfig=3,5,9,10,11  
IOConfig=10@200-3FF%FFF0(3FF::)
```

For a list of entries for common network adapters, and information about how to find values for a specific adapter, see Appendix D, “MSBATCH.INF Parameters.”

[To configure Microsoft TCP/IP in custom setup scripts](#)

# n

In the [MSTCP] section of MSBATCH.INF, define values for this protocol's parameters, as summarized in Appendix D, “MSBATCH.INF Parameters.”

For example, if your network uses DHCP to configure TCP/IP parameters, and uses WINS but not DNS, add the following section to MSBATCH.INF:

```
[mstep]  
dhcp=1  
wins=dhcp
```

[To configure the IPX/SPX-compatible protocol in custom setup scripts](#)

# n

In the [NWLINK] section of MSBATCH.INF, define values for this protocol's parameters, as summarized in Appendix D, “MSBATCH.INF Parameters.”

For example, if your network uses 802.3 frames and must support NetBIOS applications over IPX, add the following section to MSBATCH.INF:

```
[nwlink]  
frame_type=0
```

netbios=1

## *Network Adapters and Windows 95*

---

This section provides technical details for the following topics:

n Configuring network adapters

n Setting LAN adapter numbers

n Technical notes on network adapters

The following procedures show how to configure various properties of a network adapter driver.

[To configure properties for network adapter drivers](#)

# n

In the Network option in Control Panel, click the Configuration tab. Then select the driver in the list and click the Properties button.

[To specify the driver type for a selected network adapter](#)

1. On the property sheet for the network adapter, click the Driver Type tab.
2. Click one of three options (if available for the specific adapter), as described in the following table.

`{ewc msdncl, EWGraphic, x0k 2 /a "psK.bmp"}`

---

Enhanced mode  
Installs an NDIS  
(32-bit and 16-bit)  
3.1-compliant driver.  
NDIS driver

Real-mode  
Installs an NDIS  
2.x-compliant driver.

Real-mode  
Installs a real-mode  
(16-bit) driver  
ODI created driver to  
support

## ODI for Windows 3.1.

### [Binding Network Adapter Drivers to Protocols](#)

For a protocol to communicate with each network adapter on your computer, the network adapter driver must be bound to the protocol. The bindings define the relationships between networking software components. Windows 95 automatically binds the appropriate protocols to the network adapter.

You can change the bindings if, for example, you do not want to use a specific protocol with a particular network adapter. Or, as another example, if the computer is on a local area network and is also connected to the enterprise internetwork, you may not want your peer resource sharing services to be seen on the internetwork. In that case, you will want to disable the binding between the related network client and the adapter that connects the computer to the internetwork.

### [To configure bindings for protocols](#)

1. On the property sheet for the selected network adapter, click the Bindings tab.  
In the list, the protocols that are bound to the selected adapter are checked. If a particular protocol does not appear in the list, check that it is correctly installed by returning to the Configuration property sheet and reinstalling it.
2. In the list of protocols, click a protocol so that it is not checked, if you do not want this network adapter to be bound to the selected protocol.

In this example, the IPX/SPX compatible and NetBEUI protocols are bound to the driver for the Intel EtherExpress 16 or 16TP adapter.

`{ewc msdn cd, EWGraphic, x0k 3 /a "psK.bmp"}`

### [Configuring Network Adapter Resource Settings](#)

Windows 95 can determine hardware settings for most network adapters. When you install a network adapter, you should accept the proposed settings unless you are absolutely sure they are incorrect.

Most devices cannot share IRQ settings, memory buffer addresses, or ROM addresses. Where possible, Windows 95 identifies and resolves conflicts. However, if one of the supported devices does not seem to work, the problem may be the particular hardware configuration. Make sure there are no conflicts among network adapters or other peripherals, or between the system board and adapters. Sometimes these settings are set with software, sometimes with jumpers or switches

on the hardware (refer to your hardware documentation for specific details). If settings for a network adapter can be configured through software, you can configure settings using the Network option in Control Panel.

#### [To configure hardware resources for a selected network adapter](#)

1. On the property sheet for the network adapter, click the Resources tab.
  2. If you are installing a new adapter and are unsure about the actual settings for this hardware, click the option titled Configure Hardware Settings Later.
- Or —
- Click the option titled Use These Hardware Settings, and confirm values for the listed settings.
3. To see and select from the available values for a setting, click the arrow beside the setting's current value.

n

If the displayed value is the current setting, it is preceded by a hash (#) character.

n

If the value is preceded by an asterisk (\*) character, there is a conflict with another device in the system. You should reconfigure one of the devices.

{ewc msdn cd, EWGraphic, x0k 4 /a "psK.bmp"}

The possible settings displayed depend on the type of network adapter. The following table describes typical settings.

#### [Sample Hardware Resource Settings for Network Adapters](#)

---

Co Specifies a  
nfig logical  
urat configuratio



ion n type.  
 Typ Each  
 e configuratio  
 n type  
 refers to a  
 hardware  
 configuratio  
 n for the  
 adapter  
 (rather than  
 software  
 settings for  
 the driver).  
 For some  
 adapters,  
 one logical  
 configuratio  
 n choice  
 may be to  
 use shared  
 RAM. For  
 more  
 information  
 about  
 Configurati  
 on Types,  
 see the  
 discussion  
 following  
 this list.

I/O Specifies  
 Ad the memory  
 dre address  
 ss range  
 Ra reserved for  
 nge the network  
 adapter to  
 use for  
 temporary  
 storage of  
 input and  
 output data,  
 expressed  
 as a  
 hexadecim

al value.

Intel Specifies  
the  
hardware  
(IR line over  
Q) which the  
device can  
send  
interrupts  
(requests  
for service)  
to the  
computer's  
microproce  
ssor.

Alternate Configuration Types for a network adapter consist of the possible sets of hardware settings defined for the adapter by the manufacturer. For legacy network adapters, the settings that appear in the property sheet are only the possible settings for the adapter's driver. However, many adapters have additional hardware settings that are programmed by running a configuration utility from the adapter's manufacturer or by setting jumpers on the adapter itself. Although some of these settings do not appear in the adapter's property sheet, the resources used could cause conflicts with other system components.

This also means that configuring most legacy network adapters in Windows 95 consists only of specifying the preprogrammed values for the adapter hardware. Changing values for most network adapters in the Network property sheets does not reprogram the adapter itself. At this writing, the Intel EtherExpress is the only adapter that is automatically reprogrammed to match the Registry settings.

The only ways you can verify hardware settings for network adapters are to run the hardware configuration program to view settings, or check the actual jumpers set on the adapter.

#### [To reprogram adapter settings](#)

1. Use the configuration disk that came with your adapter to reprogram it.
2. Write down the settings made so that you can refer to them in the following step.
3. In the Network option in Control Panel, change the settings to the ones you noted, and then shut down and restart the computer.

#### [Configuring Advanced Properties for Network Adapters](#)

The options available on the Advanced property sheet vary, depending on the type of network adapter. For information about specific settings that appear for a selected network adapter, see the documentation provided by the manufacturer for the adapter and driver. The manufacturer will also provide guidelines for when to change the default values for advanced configuration options.

[To specify advanced settings for the network adapter](#)

1. On the property sheet for the selected network adapter, click the Advanced tab.
2. To change these values, select an item in the Property list, and then select the value in the Value box.
3. Click the OK button and restart the computer for the changes to take effect.

—This example shows the advanced options for an Intel EtherExpress network adapter.

—{ewc msdncd, EWGraphic, x0k 5 /a "psK.bmp"}

The following examples show some typical settings for general types of network adapters. For an explanation of the specific settings, see the documentation provided by the adapter manufacturer.

---

Tran The  
sceiv transceive  
er r is the  
Type device  
(cabl that  
e connects  
conn a  
ector computer  
) to the  
network,  
defined as  
one of the  
following  
values.

Thick Net,  
for an AUI  
or  
DEC/Intel/  
Xerox  
(DIX)  
connectio

n.

Thin Net,  
for a BNC  
or coaxial  
(COAX)  
connectio  
n.

Twisted  
Pair, for a  
TPE  
connectio  
n.

Netw By default,  
ork hardware  
Addr detection  
ess uses the  
network  
address  
burned  
into the  
adapter.  
To use  
another  
network  
address,  
type the  
network  
address in  
hexadeci  
mal form,  
in the  
following  
format:

XX-XX-  
XX-XX-  
XX-XX

For  
example,  
01-02-03-  
4E-2D-1F

For example, some Token Ring network adapters can use a “local addressing” feature with Windows 95, which allows the network adapter’s internal network address to be bypassed and defined manually. To set the I/O address of an IBM® 4/16 Token Ring adapter, select either Primary or Secondary as the value for I/O Port Base Address on the adapter’s Advanced property sheet. In this case, the driver ignores the I/O settings on the Resource property sheet.

As described in Chapter 32, “Windows 95 Network Architecture,” NetBIOS defines the interface between the network client and the protocol layers through set of function calls that allow an application to use the services of a Transport-layer service provider. Because many network applications use NetBIOS to send commands to the protocol driver, the NetBIOS interface is supported by all three protocols provided with Windows 95.

Each combination of a NetBIOS network protocol and a network adapter forms a logical network over which computers can communicate with each other. For example, a computer can have a Token Ring adapter and an Ethernet adapter, and might use NetBEUI on the Token Ring network and both NetBEUI and TCP/IP on the Ethernet network. In this case, the computer is connected to three logical networks, each of which is assigned a NetBIOS LAN adapter (LANA) number that Windows 95 uses to communicate with them.

When Windows 95 uses multiple protocols, it transmits data first using one protocol, then again using the next protocol, and so on. When you install multiple protocols on a computer, you designate the order in which the computer will use them. The first protocol in this series is sometimes called the primary protocol.

On a computer running Windows 95, each binding of a protocol to a network adapter has a LAN adapter number assigned to it. (For example, one protocol bound to two network adapters requires two LAN adapter numbers; two protocols each bound to two adapters requires four LAN adapter numbers.)

In Windows 95, LANA numbers are assigned dynamically in sequence of binding order for the protocols, beginning with 7 and working downward. This accommodates dynamic Plug and Play events such as removing a network adapter while the computer is running. If you are running Windows 95 in such a dynamic environment, Windows 95 cannot guarantee that a given protocol will receive the same LANA number each time the system is started, although, if the computer’s network hardware never changes, the LANA numbers may not change at each startup. Also, the default protocol is always LANA 0.

You need to change a LAN adapter number only if you have a NetBIOS application that needs to know the LANA number. For example, Lotus Notes® requires that you enter the LANA number that Lotus Notes will use. To configure Windows 95 to use Lotus Notes, set the default protocol to be the NetBIOS-based protocol on which you

want to run Lotus Notes. (Setting the default protocol makes it LANMAN 0.) This protocol can be NetBEUI, IPX/SPX-compatible with NetBIOS support, or TCP/IP with NetBIOS support.

[To select a default protocol for LANMAN settings](#)

1. In the Network option in Control Panel, click the Configuration tab.
2. Double-click the protocol you want to be the default.
3. On the property sheet, click the Advanced tab.
4. Click the option named Set This Protocol To Be The Default Protocol so that the check box is checked. Then click OK, and shut down and restart the computer for the changes to take effect.

This section provides some technical notes for specific network adapters and briefly describes changes to network adapter driver support from support provided under Windows for Workgroups 3.11.

As described earlier in "NDIS Driver Basics," NDIS 3.0 network adapter drivers that worked with Windows for Workgroups 3.11 do not work under Windows 95. You must use an NDIS 2.x real-mode driver, an ODI driver, or an updated NDIS 3.1 protected-mode driver for your network adapter, plus a Windows 95 INF file. There are many real-mode drivers, updated protected-mode drivers, and supporting INF files included with Windows 95.

If your network adapter does not appear in the list of adapters in the Network option in Control Panel, you can use information for a Windows 3.x adapter to install it under Windows 95. If you have an OEMSETUP.INF file created for an earlier version of Windows to describe a network adapter driver, you can use that INF file by clicking the Have Disk button in the Select Network Adapter dialog box for installing network adapter drivers.

The major reason that the INF file format has changed for all types of Windows 95 network adapter drivers is that INF files are now used to add information to the Windows 95 Registry. The INF files created for earlier versions of Windows do not contain this kind of information. For information about INF files for network adapter drivers, see Appendix C, "Windows 95 INF Files."

The following table provides technical notes for the few network adapters that have been tested and shown to require special consideration under Windows 95.

*Network Adapters that Require Special Consideration under Windows 95*

---

DEC  
™

Ethe  
rwor  
ks 2  
(DE  
CPA  
)

3Com® This  
m® adapter  
Ethe uses  
rLink shared  
II®-1 RAM.  
6

3Com  
m  
Ethe  
rLink  
® III

HP®  
Ethe  
rtwis  
t®

IBM  
Token  
n  
Ring  
card

NE2 This  
000+ adapter  
can use  
shared  
RAM, but  
its shared-  
RAM  
mode is  
not  
supported  
under  
Windows  
95.

Ung

erma  
nn-  
Bass

### *IPX/SPX-Compatible Protocol*

---

Internet Packet Exchange/Sequential Packet Exchange (IPX/SPX) is a small, fast protocol that is routable and best suited for small to medium-sized LANs. The IPX/SPX-compatible protocol (NWLINK.VXD) is compatible with Novell NetWare IPX/SPX.

The Microsoft IPX/SPX-compatible protocol supports the 32-bit Windows Sockets programming interface, so that any Win32-based Windows Socket application can run on IPX/SPX with Windows 95. (There are no 16-bit Windows Sockets applications using IPX/SPX, so backward compatibility for 16-bit sockets for IPX/SPX is not an issue.)

The IPX/SPX-compatible protocol can be used by Client for NetWare Networks to communicate with NetWare 2.x, 3.x, or 4.x servers or a computer running File and Printer Sharing for NetWare Networks. IPX/SPX can also be used by Client for Microsoft Networks to communicate with computers running Windows for Workgroups 3.11 or Windows NT with the IPX/SPX-compatible protocol.

The Microsoft IPX/SPX-compatible protocol uses the NWNBLINK.VXD module to support computers that use NetBIOS over IPX and to support the NetBIOS programming interface.

The Microsoft IPX/SPX-compatible protocol is NDIS 3.1-compliant, allowing computers running Windows 95 to communicate over a routable IPX-compatible protocol. This protocol can use Novell NetWare servers configured as routers (and other IPX routers) to transfer its packets across LANs to access resources on other computers running Windows 95.

The IPX/SPX-compatible protocol is a 32-bit, protected-mode protocol that is Plug and Play-compliant. Because the IPX/SPX-compatible protocol provides virtualized services to all DOS VMs and applications, the Novell-supplied VIPX.386 driver is not needed.

The Microsoft IPX/SPX-compatible protocol is installed if you also install Client for NetWare Networks during Windows 95 Setup. You can also install this protocol to support other network clients, including Client for Microsoft Networks.

For information about installing and configuring this protocol in custom setup scripts,



see “Installing Drivers and Protocols in Custom Setup Scripts” earlier in this chapter.

[To configure the IPX/SPX-compatible protocol](#)

1. On the Configuration sheet in the Network option in Control Panel, double-click IPX/SPX Compatible Protocol for Windows.

—If your computer has multiple network adapters, there will be an instance of the IPX/SPX-compatible protocol for each network adapter. You must configure each adapter with its own settings.

2. Click the Advanced tab.

—{ewc msdn cd, EWGraphic, x0k 6 /a "psK.bmp"}

3. Most values have correct defaults in typical installations. If you need to change a value for a particular purpose, select the item in the Property list, and specify a value in the Value list, based on the settings in the following table.

---

|                                                            |                                                                                                                                            |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Forc<br>e<br>even<br>-<br>lengt<br>h<br>IPX<br>pack<br>ets | Enabled<br>only for<br>Ethernet<br>802.3 on<br>monolithic<br>implemen<br>tations<br>that<br>cannot<br>handle<br>odd-<br>length<br>packets. |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|

|                   |                                                                                                                                                           |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fra<br>me<br>type | Specifies<br>the frame<br>type<br>based on<br>detection.<br>1 This<br>value is<br>used for<br>network<br>adapters<br>that<br>support<br>multiple<br>frame |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

types.  
The  
possible  
values  
are:

n

Auto-  
detect  
(recommen-  
ded)

n

Ethernet  
802.2  
(default  
for  
NetWare  
3.12 and  
later)

n

Ethernet  
802.3

# n

Ethernet\_  
II

# n

SNAP

(Token  
Ring  
networks  
can use  
the  
Regular  
or SNAP  
value.)

Maxi Specifies  
mum the  
conn maximum  
ectio number of  
ns connectio  
ns that  
IPX will  
allow.  
Configure  
d  
dynamical  
ly.

Maxi Specifies  
mum the  
sock maximum  
ets number of  
IPX

sockets  
that IPX  
assigns.  
Configured  
dynamically.

Network Specifies  
the IPX  
address network  
address  
as a four-  
byte  
value.  
Configured  
dynamically.

Source Specifies  
the cache  
size to  
use with  
source  
routing2.  
This  
parameter  
is used  
only on  
Token  
Ring  
networks,  
where it is  
used to  
turn on  
source  
routing.

Cache  
size is  
determined  
by entry  
count, not  
byte  
count.  
The

recommended  
value of  
16 is the  
most  
efficient  
and best  
setting for  
most  
installations.

- 
- 1 Each time you start the computer, Windows 95 detects the frame type by sending a general RIP request in each frame format. Based on the responses received from routers, Windows 95 determines the most prevalent frame type used and sets that as the default frame type for the IPX/SPX-compatible protocol.
  - 2 Source routing is a method of routing data across source-routing bridges. For NetWare networks, this means forwarding of NetWare frames across an IBM Token-Ring bridge. With NDIS protocols, source routing is done by the network protocol. (If you use Novell-supplied ODI-based protocols, source routing is configured with the network adapter driver.)
- 

You should not need to change bindings in most circumstances. However, you can disable the bindings for the protocol if you do not want other computers using that protocol to see this computer. At least one protocol, however, must be bound to the network client for the computer to be able to communicate with the network.

#### [To change bindings for the IPX/SPX-compatible protocol](#)

1. On the property sheet for IPX/SPX-Compatible Protocol, click the Bindings tab.

—{ewc msdncl, EWGraphic, x0k 7 /a "psk.bmp"}

2. Click any network component to change its bindings.

—If the option is checked, it is bound to the protocol. If it is not checked, that network component is not using the IPX/SPX-compatible protocol. For more information, see "Configuring Network Adapters" earlier in this chapter.

—Note — Microsoft Client for NetWare Networks is always bound only to the IPX/SPX-Compatible Protocol. This network client cannot use another protocol.

NetBIOS is a high-level interface used by network applications to communicate with other NetBIOS-compliant applications. The NetBIOS interface is responsible for the following:

# n

Establishing logical names on the network

# n

Establishing connections (called sessions) between two logical names on the network

# n

Transmitting data between network computers

Windows 95 provides a 32-bit, protected-mode NetBIOS driver to support NetBIOS services over IPX (NWNBLINK.VXD, which complements NWLINK). NetBIOS over IPX is compatible with the Novell NetBIOS support driver. Performance enhancements include acknowledgment of previous frames in response frames (called PiggyBackAck), plus a “sliding window” acknowledgment mechanism. These NetBIOS enhancements are used only when communicating with other computers using IPX over NetBIOS, such as other computers running Windows 95, Windows NT, or NetWare when running Lotus Notes or other NetBIOS applications.

Novell provides a TSR NetBIOS driver named NETBIOS.EXE, which is a Level 1 NetBIOS provider that consumes about 40K of conventional memory. This driver acknowledges each frame received, thus increasing the amount of traffic generated when NetBIOS is used. With the Microsoft implementation of NetBIOS over IPX, the real-mode NETBIOS.EXE TSR should be removed from the system.

NetBIOS over IPX is not necessary for computers running Windows 95 to communicate with each other. The redirector and server networking components in Windows 95 communicate with the IPX protocol directly without NetBIOS. NetBIOS over IPX is commonly required only when using any NetBIOS applications on a NetWare (or IPX) server, such as Lotus Notes.

---

Note — A computer running Windows 95 that uses IPX without NetBIOS can connect to a Windows NT 3.5 server that uses IPX without NetBIOS. However, the Windows NT 3.5 workstation service (not Windows NT Workstation) can only connect to a computer running File and Printer Sharing for Microsoft Networks when the computer running Windows 95 is using NetBIOS over IPX.

---

[To use the IPX/SPX-compatible protocol with NetBIOS on a computer](#)

n

In the property sheet for the IPX/SPX-compatible protocol, click the

NetBIOS tab. Then click the option named I Want To Enable NetBIOS Over IPX/SPX.

Or

In the Network option in Control Panel, click the Add button, and double-click Protocol. In the Manufacturers list in the Select dialog box, select Microsoft, and in the Models list, select the option named NetBIOS Support For IPX/SPX-Compatible Protocol. Then click OK.

n

There is no need to enable Source Routing on Token Ring networks if the communication is on the same ring, even if one computer has it enabled.

n

SPX-II is a protocol definition for windowing and transmitting large packets

over SPX. You can run any SPX-II application under Windows 95 using the IPX/SPX-compatible protocol. The related Novell-supplied DLL to support SPX-II must be available on the computer.

n

The IPX/SPX-compatible protocol in Windows 95 uses NET.CFG

parameters for NetBIOS over IPX. However, configuring these parameters should not be necessary because most parameters are dynamic and self-adjusting. (When you install Windows 95, any NET.CFG and SHELL.CFG parameters are moved to the Registry.)

n

To determine the network ID (which is the network address in IPX

packets), Windows 95 checks the wire for RIP packets and chooses the most likely ID. The network ID is dynamic and will change when a new network ID becomes more prevalent.

n

All Transport Layer Interface (TLI) libraries can run on the IPX/SPX-

compatible protocol in Windows 95. TLI is similar to TDI in Microsoft networking as a layer between the protocol and network adapter driver; this implementation is similar to STREAMS and provides a STREAMS environment for NetWare, but Windows 95 uses the Windows Sockets specification instead.

## *TCP/IP Protocol*

---

Transmission Control Protocol/Internet Protocol (TCP/IP) is a networking protocol that provides communication across interconnected networks made up of computers with diverse hardware architectures and various operating systems. TCP/IP can be



used to communicate with computers running Windows 95, with devices using other Microsoft networking products, or with non-Microsoft systems, such as UNIX.

The TCP/IP protocol family is a standard set of networking protocols. TCP/IP is used to connect to the Internet. These same protocols can be used in private internetworks that connect several local area networks.

The Microsoft implementation of TCP/IP in Windows 95 enables enterprise networking and connectivity on computers running the TCP/IP protocol. Adding TCP/IP to a computer running Windows 95 offers the following advantages:

n

A standard, routable enterprise networking protocol that is the most

complete and accepted protocol available. All modern operating systems support TCP/IP, and most large networks rely on TCP/IP for much of their network traffic.

n

A technology for connecting dissimilar systems. Many standard

connectivity utilities are available to transfer data between dissimilar systems, including File Transfer Protocol (FTP) and Terminal Emulation Protocol (Telnet).

With TCP/IP as a connectivity protocol, computers running Windows 95 can communicate with many non-Microsoft systems, including Internet hosts, Apple® Macintosh® systems, IBM mainframes, UNIX systems, and Open VMS™ systems.

n

A robust, scalable, cross-platform client-server framework. TCP/IP in

Windows 95 supports the Windows Sockets 1.1 interface, which is ideal for developing client-server applications that can run Windows Sockets-compliant stacks from other vendors. Many public-domain Internet tools also use the

Windows Sockets standard.

n

Client for Dynamic Host Configuration Protocol (DHCP), for dynamic resolution of IP addresses to host names on networks that have DHCP servers.

n

Client for Windows Internet Name Resolution (WINS), for dynamic resolution of IP addresses to computer names on networks that have WINS servers.

n

Point-to-Point protocol for asynchronous communication, as described in Chapter 28, "Dial-Up Networking and Mobile Computing."

Microsoft TCP/IP provides all the following elements necessary to implement these protocols for networking:

n

Core TCP/IP protocols, including the Transmission Control Protocol (TCP), Internet Protocol (IP), User Datagram Protocol (UDP), Address Resolution Protocol (ARP), and Internet Control Message Protocol (ICMP). This suite of Internet protocols provides a set of standards for how computers communicate and how networks are interconnected.

n

Support for application interfaces, including Windows Sockets for network programming and NetBIOS for establishing sessions on the network.

n

Basic TCP/IP connectivity applications, including *ftp* and *telnet*. With these utilities, users can interact with and use resources on non-Microsoft hosts, such as UNIX workstations.

n

TCP/IP diagnostic tools to detect and resolve TCP/IP networking problems, including *arp*, *nbtstat*, *netstat*, *route*, and *tracert*.

For information about installing and configuring this protocol in custom setup scripts, see “Installing Drivers and Protocols in Custom Setup Scripts” earlier in this chapter. For a summary of the command-line options for TCP/IP utilities, see Appendix A, “Command-Line Commands Summary.”

In an effort to make the implementation of the TCP/IP protocol more manageable, Microsoft, working with other industry leaders, has created a mechanism called Dynamic Host Configuration Protocol (DHCP) for the automatic allocation of IP addresses. DHCP is not a Microsoft standard, but a public Request for Comments (RFC) that Microsoft has implemented.

DHCP allows a network management utility to centrally establish a range of IP addresses per subnet. An individual IP address from the range is assigned to any Microsoft TCP/IP client requesting an address. DHCP also allows the network

management utility to centrally establish a lease time or how long the allocated IP address is to remain valid.

A DHCP server runs as a process on a Windows NT 3.5 Server. Using DHCP company-wide, it is possible to move from subnet to subnet and always have a valid IP address. Microsoft TCP/IP includes a utility, IPCONFIG, that allows a user or administrator to quickly examine the current IP address allocated to the computer, the IP address lease time and other useful data about the DHCP allocation for troubleshooting purposes.

DHCP support can be specified during installation, or enabled using the Network option in Control Panel. If you want, a manually entered IP address can be used, and DHCP support can be disabled.

#### *To use DHCP for automatic configuration of TCP/IP settings*

1. On the Network property sheet, click the Configuration tab, and double-click Microsoft TCP/IP.

—Note— If your computer has multiple network adapters, there will be an entry for TCP/IP for each network adapter. You must configure each adapter with its own TCP/IP settings.

2. On the Microsoft TCP/IP property sheet, click the IP Address tab.

3. Click the option named Obtain An IP Address From A DHCP Server, and then click OK.

---

Tip— When the IP address for your computer is configured using DHCP, you can use *ipconfig* at the MS-DOS Prompt to see the currently assigned IP address.

---

If Microsoft TCP/IP is configured to obtain an IP address from a DHCP server when a DHCP server is not available on the network, the next time Windows 95 starts, an error message announces that the DHCP client could not obtain an IP address from a DHCP server. To solve this problem, use the procedure described in the following section to configure TCP/IP manually.

---

Note— A computer running Windows 95 cannot be a DHCP server. A computer running Microsoft Windows NT 3.5 Server can act as both a DHCP and a WINS server.

---

If you cannot use DHCP for automatic configuration, the network administrator must provide these values so that individual users can configure TCP/IP manually:

n

The IP address and subnet mask for each network adapter installed on the computer. For more information, see Chapter 30, “Internet Access.”

n

The IP address for the default gateways (IP routers).

n

Whether the computer will use Domain Name System (DNS) and, if so, the IP addresses of the DNS servers on the internetwork.

n

WINS server addresses, if WINS servers are available on your network.

The following procedure describes the basic configuration options for TCP/IP. If you want to configure the computer to use WINS or DNS for name resolution, see the procedures in “Using WINS for Name Resolution” and “Using DNS for Name Resolution” later in this chapter.

[To configure the TCP/IP protocol manually](#)

1. In the Network option in Control Panel, click the Configuration tab, and double-click Microsoft TCP/IP.

Note If your computer has multiple network adapters, there will be an instance of TCP/IP for each network adapter. You must configure each adapter with its own TCP/IP settings.

2. On the Microsoft TCP/IP property sheet, click the IP Address tab.

*{fewc msdn cd, EWGraphic, x0k 8 /a "psK.bmp"}*

3. Type an IP address and subnet mask in the respective boxes.

The network administrator must provide these values for individual users, based on the network ID and the host ID plan for your site.

n

The value in the IP Address box identifies the IP address for the local computer or, if more than one network adapter is installed in the computer, for the network adapter selected in the Adapter box.

n

The value in the Subnet Mask box identifies the network membership for the selected network adapter and its host ID. This allows the computer to separate the IP address into host and network IDs. The subnet mask defaults to an appropriate value, as shown in the following list.

---

|         |       |
|---------|-------|
| CI 1–   | 255.  |
| as 126  | 0.0.0 |
| s       |       |
| A       |       |
| CI 128– | 255.  |
| as 191  | 255.  |
| s       | 0.0   |
| B       |       |
| CI 192– | 255.  |
| as      | 255.  |

s 223 255.  
C 0

4. To view or specify which network clients (redirectors) are bound to the TCP/IP protocol, click the Bindings tab.

n

To keep a network client from using the TCP/IP protocol, click the client to remove the selection.

n

If the network client for which you want to use TCP/IP does not appear in this list, that client is not bound to the TCP/IP protocol.

{ewc msdncd, EWGraphic, x0k 9 /a "psK.bmp"}

For information, see "Configuring Network Adapters" earlier in this chapter.

Note — The only network client provided with Windows 95 that can use Microsoft TCP/IP is the Client for Microsoft Networks. The Client for NetWare Networks does not use Microsoft TCP/IP.

NetWare/IP from Novell allows the NCP request to be sent over an IP header. You can only use NetWare/IP with a Novell-provided, real-mode client.

5. Click the Gateway tab, and then type at least one IP address for the default gateway (IP router) on the network.

{ewc msdncd, EWGraphic, x0k 10 /a "psK.bmp"}

6. To specify an IP address for an additional gateway, type the IP address in the New Gateway box, and then click the Add button.

Up to 7 additional gateways can be specified to facilitate a connection to a computer that is not reachable through the default gateway. Windows 95 will attempt to connect to a remote computer using the default gateway, and then each additional gateway specified. Additional gateways also provide fault management in case the default gateway becomes inoperable.

The first gateway in the list is the default gateway. Gateway addresses can be

prioritized by dragging the IP address in the list of Installed Gateways.

7. Click OK, and then restart the computer for changes to take effect.

For more information about IP addresses on TCP/IP networks, see Chapter 30, "Internet Access."

For TCP/IP and the Internet, the computer name is the globally known system name plus a DNS domain name. On the local network, the computer name is the NetBIOS name that was defined during Windows 95 Setup.

Computers use IP addresses to identify each other, but users usually find it easier to work with computer names. A mechanism must be available on a TCP/IP network to resolve names to IP addresses. To ensure that both the name and the address are unique, the computer using Microsoft TCP/IP registers its name and IP address on the network during system startup. Computers running Microsoft TCP/IP on the network can use one or more of the following methods to ensure accurate name resolution in TCP/IP internetworks:

#### Broadcast name resolution

Computers running Microsoft TCP/IP can also use broadcast name resolution, which is a NetBIOS over TCP/IP mode of operation defined in RFC 1001/1002 as b-node. This method relies on a computer making IP-level broadcasts to register its name by announcing it on the network. Each computer in the broadcast area is responsible for challenging attempts to register a duplicate name and for responding to name queries for its registered name.

#### LMHOSTS or HOSTS files

An LMHOSTS file specifies the NetBIOS computer name and IP address mappings; a HOSTS file specifies the DNS name and IP address. On a local computer, the HOSTS file (used by Windows Sockets applications to find TCP/IP host names) and LMHOSTS file (used by NetBIOS over TCP/IP to find Microsoft networking computer names) can be used to list known IP addresses mapped with corresponding computer names. LMHOSTS is still used for name resolution in Windows 95 for small-scale networks or remote subnets where WINS is not available.

# n

The HOSTS file is used as a local DNS equivalent to resolve host names.



to IP addresses.

# n

The LMHOSTS file is used as a local WINS equivalent to resolve NetBIOS

computer names to IP addresses.

Each of these files is also known as a HOST TABLE. Sample versions of LMHOSTS (called LMHOSTS.SAM) and HOSTS files are added to the Windows directory when you install Windows 95 with TCP/IP support. These files can be edited using any ASCII editor, such as WordPad or Edit. For information about setting up and using HOSTS and LMHOSTS files, see Appendix G, "HOSTS and LMHOSTS Files for Windows 95."

### Windows Internet Name Service

Computers running Microsoft TCP/IP can use WINS if one or more Windows NT Server computers configured as WINS servers are available, and those computers contain a dynamic database for mapping computer names to IP addresses. WINS can be used in conjunction with broadcast name resolution for an internetwork, where other name resolution methods are inadequate. WINS is a NetBIOS-over-TCP/IP mode of operation defined in RFC 1001/1002 as p-node. Notice that WINS replaces the functionality of the LMHOSTS file.

### DNS name resolution

The Domain Name System (DNS) provides a way to look up name mappings when connecting a computer to foreign hosts using NetBIOS over TCP/IP or Windows Sockets applications such as FTP. DNS is a distributed database designed to relieve the traffic problems that arose with the exploding growth of the Internet in the early 1980s. A DNS name server must be configured and available on the network. Notice that DNS replaces the functionality of the HOSTS file by providing a dynamic mapping of IP addresses to host names used by TCP/IP applications and utilities. For more information, see "Using DNS for Name Resolution" later in this chapter.

Windows 95 provides support for multiple DNS servers and up to two WINS servers. Support for either service can be configured in Windows 95 Setup or added later using the Network option in Control Panel.

WINS provides a distributed database for registering and querying dynamic

computer name-to-IP address mappings in a routed network environment. If you are administering a routed network, WINS is your best choice for name resolution, because it is designed to solve the problems that occur with name resolution in more complex internetworks.

WINS reduces the use of local broadcasts for name resolution and allows users to easily locate computers on remote networks. Furthermore, when dynamic addressing through DHCP results in new IP addresses for computers that move between subnetworks, the changes are automatically updated in the WINS database. Neither the user nor the network administrator needs to make manual accommodations for name resolution in such a case.

The WINS protocol is based on and is compatible with the protocol defined for WINS server in Requests for Comments (RFCs) 1001 and 1002, so it is interoperable with any other implementations of these RFCs. A WINS server is a Windows NT Server 3.5 computer with WINS server software installed. When Microsoft TCP/IP is installed, WINS client software is installed automatically.

This section provides an overview of how WINS and name query broadcasts perform name resolution on Windows networks.

WINS consists of two components: the WINS server, which handles name queries and registrations, and the client software (NetBIOS over TCP/IP), which queries for computer name resolution.

Windows networking clients that are WINS-enabled (computers running Windows NT 3.5 or Windows 95) can use WINS directly. Non-WINS computers on the internetwork that are b-node — compatible, as described in RFCs 1001 and 1002, can access WINS through proxies, which are network WINS-enabled computers that listen to name query broadcasts and then respond for names that are not on the local subnet or are p-nodes.

On a Windows network, users can browse transparently across routers. To allow browsing without WINS, the network administrator must ensure that the users' primary domain has Windows NT Server computers on both sides of the router to act as master browsers. These computers need correctly configured LMHOSTS files with entries for the domain controllers across the subnet.

With WINS, such strategies are not necessary because the WINS servers and proxies transparently provide the support necessary for browsing Windows NT domains across routers. For a technical discussion of how WINS works and how it can be set up on the network, see WINDOWS NT SERVER 3.5 TCP/IP in the Windows NT Server 3.5 documentation set.

If there are WINS servers installed on your network, you can use WINS in combination with broadcast name queries to resolve NetBIOS computer names to IP addresses. If you do not use this option, Windows 95 uses name query broadcasts (b-node mode of NetBIOS over TCP/IP) plus the local LMHOSTS file to resolve

computer names to IP addresses. Broadcast resolution is limited to the local network, as described earlier in this chapter.

`{ewc msdn cd, EWGraphic, x0k 11 /a "psK.bmp"}`

#### [To configure a computer to use WINS for name resolution](#)

1. In the Network option in Control Panel, double-click Microsoft TCP/IP.
2. Click the WINS Configuration tab.
3. If a WINS server is not available, select Disable WINS Resolution.

— Or —

— If a WINS server is available (or a secondary WINS server), select Enable WINS Resolution and type the IP addresses of the Primary and Secondary WINS servers. These values should be provided by the network administrator, based on the IP addresses assigned to these Windows NT Server computers.

4. If WINS is enabled, in the Scope ID box, type the computer's scope identifier, if required on an internetwork that uses NetBIOS over TCP/IP.

— Usually this value is left blank. Scope IDs are used only for communication based on NetBIOS over TCP/IP. In such a case, all computers on a TCP/IP internetwork must have the same scope ID. A scope ID may be assigned to a group of computers if those computers communicate only with each other and not with computers outside the group. Such computers can find each other if their scope IDs are identical.

5. If a DHCP server that is configured to provide information on available WINS servers is available, select Use DHCP for WINS Resolution.

If DHCP is used for automatic configuration, these parameters can be provided by the DHCP server.

The Domain Name System (DNS) is a distributed database, providing a hierarchical naming system for identifying hosts on the Internet. The specifications for DNS are defined in Requests for Comments (RFCs) 1034 and 1035.

Although DNS may seem similar to WINS, there is one major difference: DNS requires static configuration of IP addresses for name-to-address mapping. WINS can provide name-to-address mapping dynamically and requires far less administration.

The DNS database is a tree structure called the domain name space, where each node or domain is named and can contain subdomains. The domain name identifies

the domain's position in the database in relation to its parent domain, with a period (.) separating each part of the name for the network nodes of the DNS domain.

The root of the DNS database is managed by the Internet Network Information Center. The top-level domains were assigned organizationally and by country. These domain names follow the International Standard (ISO) 3166. Two letter and three-letter abbreviations are used for countries, and various abbreviations are reserved for use by organizations, as shown in the following example.

---

co Commercial  
m (for  
example,  
microsoft.c  
om)

edu Educational  
(for  
example,  
mit.edu for  
Massachus  
etts  
Institute of  
Technology  
)

gov Governmen  
t (for  
example,  
nsf.gov for  
the National  
Science  
Foundation)

org Noncomme  
rcial  
organizatio  
ns (for  
example,  
fidonet.org  
for FidoNet)

net Networking  
organizatio  
ns (for  
example,  
nsf.net for  
NSFNET)

DNS uses a client-server model, where the DNS servers contain information about a portion of the DNS database and make this information available to clients, called RESOLVERS, that query the name server across the network. DNS NAME SERVERS are programs that store information about parts of the domain namespace called ZONES. The administrator for a domain sets up name servers that contain the database files with all the resource records describing all hosts in their zones. DNS resolvers are clients that are trying to use name servers to gain information about the domain namespace.

Microsoft TCP/IP includes the DNS resolver functionality used by NetBIOS over TCP/IP and Windows Sockets connectivity applications such as *ftp* and *telnet* to query the name server and interpret the responses.

The key task for DNS is to present friendly names for users and then resolve those names to IP addresses, as required by the internetwork. Name resolution is provided through DNS by the name servers, which interpret the information in a fully qualified domain name (FQDN) to find its specific address. If a local name server doesn't contain the data requested in a query, it sends back names and addresses of other name servers that could contain the information. The resolver then queries the other name servers until it finds the specific name and address it needs. This process is made faster because name servers continuously cache the information learned about the domain namespace as the result of queries.

All the resolver software necessary for using DNS on the Internet is installed with Microsoft TCP/IP.

Although TCP/IP uses IP addresses to identify and reach computers, users typically prefer to use host names. DNS is a naming service generally used in the UNIX networking community to provide standard naming conventions for IP workstations. TCP/IP utilities, such as *ftp* and *telnet*, can also use DNS, in addition to the HOSTS file, to find computer when connecting to foreign hosts or computers on your network.

The network administrator must determine whether users should configure their computers to use DNS. Usually you will use DNS if you are using TCP/IP to communicate over the Internet or if your private internetwork uses DNS to distribute host information.

Microsoft TCP/IP provides a DNS client for resolving Internet or UNIX system names. Microsoft Windows networking provides dynamic name resolution for NetBIOS computer names using WINS servers and NetBIOS over TCP/IP, as described in the previous section.

If you choose to use DNS, you must configure how the computer will use DNS and the HOSTS file. TCP/IP must be installed to manually set up the DNS connectivity options. DNS configuration is global for all network adapters installed on a computer.

If DHCP is used for automatic configuration, these parameters can be provided by

the DHCP server.

`{ewc msdn cd, EWGraphic, x0k 12 /a "psK.bmp"}`

### [To configure a computer to use DNS for name resolution](#)

1. In the Network option in Control Panel, double-click Microsoft TCP/IP, and then click the DNS Configuration tab.
2. If a DNS server is not available, click Disable DNS.

— Or —

— If a DNS server is available, click Enable DNS. Then specify a host name and complete the other configuration information, as described in the following procedure.

The host name is used to identify the local computer by name for authentication by some utilities. Other TCP/IP-based utilities can use this value to learn the name of the local computer. Host names are stored on DNS servers in a table that maps names to IP addresses for use by DNS.

### [To set the host name for DNS](#)

n

Type a name in the Host Name box.

— The name can be any combination of the letters A–Z, the numerals 0–9, and the hyphen (-), plus the period (.) character used as a separator. By default, this value is the Microsoft networking computer name, but the network administrator can assign another host name without affecting the computer name.

---

Note — Some characters that can be used in computer names, especially the underscore, cannot be used in host names.

---

The TCP Domain Name is used with the host name to create a fully qualified domain name (FQDN) for the computer. The FQDN is the host name followed by a period (.), followed by the domain name. For example, this could be *johndoe.microsoft.com*, where *johndoe* is the host name and *microsoft.com* is the domain name.

During DNS queries, the local domain name is appended to short names. A short name consists of just a host name, such as *janedoe*. When querying the DNS server

for the IP address of *janedoe*, the domain name is appended to the short name and the DNS server is actually asked to resolve the FQDN of *janedoe.microsoft.com*. Notice that the FQDN of Jane Doe at Microsoft (*janedoe.microsoft.com*) is not the same as her Internet electronic mail address of *janedoe@microsoft.com*.

#### [To set the DNS domain name](#)

n

Optionally, type a name in the Domain Name box.

— This is usually an organization name followed by a period and an extension that indicates the type of organization, such as *microsoft.com*. The name can be any combination of the letters A–Z, the numerals 0–9, and the hyphen (-), plus the period (.) character used as a separator.

---

Note — A DNS domain is not the same as a Windows NT or LAN Manager domain. A DNS domain is a hierarchical structure for organizing TCP/IP hosts and provides a naming scheme used in UNIX environments. A Windows NT or LAN Manager domain is a grouping of computers for security and administrative purposes.

---

You can add up to three IP addresses for DNS servers. For a given DNS query, Windows 95 attempts to get DNS information from the first IP address in the list. If no response is sent, Windows 95 goes to the second server in the list, and so on. To change the order of the IP addresses, you must remove them and retype them in the order that you want the servers to be searched.

#### [To set the DNS server search order](#)

1. In the Domain Name System (DNS) Search Order box, type the IP address of a DNS server that will provide name resolution. Then click the Add button to add the IP address to the list.

— The network administrator should provide the correct values for this parameter, based on the IP address assigned to the DNS server used at your site.

2. To remove an IP address from the list, select it and click the Remove button.

The Domain Suffix Search Order specifies the DNS domain suffixes to be appended to host names during name resolution. You can add up to five domain suffixes. Domain suffixes are placed in the list in alphabetic order.



### [To set the domain suffix search order](#)

1. In the Domain Suffix Search Order box, type the domain suffixes to add to your domain suffix search list, and then click the Add button.
2. To remove a domain name from the list, select it and click the Remove button.

When attempting to resolve a fully qualified domain name (FQDN) from a short name, Windows 95 will first append the local domain name. If not successful, then Windows 95 will use the Domain Suffix list to create additional FQDNs and query DNS servers in the order listed.

### *Microsoft NetBEUI Protocol*

---

Windows 95 provides the NetBIOS extended user interface (NetBEUI) protocol for compatibility with existing networks that use NetBEUI, including Windows for Workgroups, Windows NT, LAN Manager, Microsoft Workgroup Add-On for MS-DOS, and other networks. NetBEUI is a small, efficient protocol designed for small networks of 20 to 200 computers, and is nonroutable. It is ideal for large I/O requirements such as copying files from network servers or launching applications from network servers. For enterprise-wide networks that require a routable protocol, TCP/IP or the IPX/SPX-compatible protocol should be used.

NetBEUI in Windows 95 supports a NetBIOS programming interface, conforms to the IBM NetBEUI specifications, and includes several performance enhancements.

The NetBEUI protocol is implemented as both a real mode and a protected mode protocol. The NetBEUI module, NETBEUI.VXD, is accessible through the NetBIOS interface.

### [To manually configure NetBEUI](#)

1. In the Network option in Control Panel, click the Configuration tab. Then double-click Microsoft NetBEUI.

— If your computer has multiple network adapters, there will be an instance of NetBEUI for each network adapter. You must configure each adapter with its own settings.

— The Bindings tab shows which clients and services are currently using the NetBEUI protocol. For information about configuring bindings, see “Configuring Network Adapters” earlier in this chapter.

— {ewc msdncd, EWGraphic, x0k 13 /a "psK.bmp"}

2. Click the Advanced tab to modify settings for Maximum Sessions and NCBs for the real mode NetBEUI. (The real mode network runs, for example, when you use Safe Mode for system startup.)



---

M Used to  
a identify the  
xi maximum  
m number of  
u connections  
m to remote  
S computers  
e that can be  
s supported  
si from the  
o redirector.  
n Equivalent  
s to the \_  
parameter  
formerly  
specified in  
PROTOCO  
L.INI.

N Used to  
C identify the  
B maximum  
S number of  
( NetBIOS  
n commands  
et that can be  
w used.  
o Equivalent  
rk to the \_  
c parameter  
o formerly  
nt specified in  
r PROTOCO  
ol L.INI.  
bl  
o  
c  
k  
s)

~~Protected-mode NetBEUI dynamically sets Maximum Sessions and NCBs, and therefore does not use these settings.~~

3. Click OK. Then shut down and restart the computer.

You can use WinPopup to send a message to one person or to a whole workgroup. WinPopup can also display a message from someone else on your network or from a printer when your print job is done.

With WinPopup on your computer, you can send and receive messages and alerts from LAN Manager, Windows NT, and Windows 95 servers and clients.

On a NetWare network, you can also use WinPopup to send a message to a user on a computer running a Novell-supplied client if the targeted user is attached to your preferred server.

n

If you are running a NetWare-compatible client, you can receive pop-up

messages from the server you are attached to, plus messages from other users running Novell-supplied network clients, if the message is sent to you on the server using NetWare utilities.

n

You can use WinPopup to send a message to a user on a computer

running Client for NetWare Networks or a Novell-supplied client if that user is attached to your preferred server.

n

If you are running both Client for NetWare Networks and Client for

Microsoft Networks, and if the message reaches the specified computer or user

through Windows 95 networking, the message will not also be sent through the NetWare server.

You can install WinPopup from the ADMIN directory on the Windows 95 compact disk

#### [To install WinPopup](#)

1. In the Add/Remove Programs option in Control Panel, click the Install/Uninstall tab.
2. Use the Install Program wizard to connect to the Windows 95 compact disk. You will find WinPopup in the ADMIN\APPTOOLS\WINPOPUP directory.

#### [To configure WinPopup on a client computer](#)

1. Place WINPOPUP.EXE in the Startup folder on each computer that you want to receive messages.
2. On each computer, use the Options command on the Messages menu to specify choices for how WinPopup will present messages.

===={ewc msdncd, EWGraphic, x0k 14 /a "psK.bmp"}

#### [To send a message using WinPopup](#)

1. Click the Send button on the toolbar.  
==== Or, from the Messages menu, click Send.
2. Click an option to specify whether the message will be sent to a specific user or computer, or to a workgroup. Then type the name for where the message is to be sent.
3. Type a message, and click OK.

===={ewc msdncd, EWGraphic, x0k 15 /a "psK.bmp"}

As an example of how this might be used in a workgroup, you might want to run WinPopup on a computer running File and Printer Sharing services. Every other computer in the workgroup that uses shared files and printers on this computer can also run WinPopup. On each client computer, WinPopup can report messages from the printer (such as notification that a print job has been completed). Or administrators can send messages to users and computers in the workgroup with pop-up notification.

This section contains information for troubleshooting problems related to network

protocols. For general information about troubleshooting network installation, see Chapter 7, "Introduction to Windows 95 Networking." For information about troubleshooting procedures and tools provided with Windows 95, see Chapter 35, "General Troubleshooting."

*You cannot connect using NetBEUI.*

n

Use NET DIAG to test for NetBIOS connectivity over the LANA which

NetBEUI is using. If it fails, check the transceiver type, cabling, and adapter.

n

Check the NetBEUI Protocol bindings.

n

Verify that routing is not involved.

NetBEUI is a nonroutable protocol which cannot cross routers, though it can cross bridges and source routing bridges. NetBEUI can also cross properly configured routers (bridging routers).

*A NetBIOS application fails to start.*

If a NetBIOS-based network application is not working, this may be because it is hard-coded to use the protocol on LANA 0 (such as Lotus Notes). You can force a particular protocol to always occupy LANA 0 by selecting it as the default protocol, as described in "Setting LAN Adapter Numbers" earlier in this chapter.

You cannot connect using the IPX/SPX-compatible protocol.

Check the following:

n

Check the Bindings tab on the protocol's property sheet.

n

Check the Frame Type on the Advanced property sheet for the protocol.

Verify that both computers trying to connect are using the same frame type. The AUTO frame type only checks SAP broadcast traffic on the network and may be selecting an incorrect frame type in a mixed frame-type environment.

#### [To check IPX Frame Type](#)

1. In the Network option in Control Panel, double-click the IPX/SPX-compatible protocol, and then click the Advanced tab.
2. Verify or set the Frame Type. (The recommended setting is Auto.)
3. Check Type 20 Packets (NetBIOS packets) and IPX Routers.

When using IPX over NetBIOS, the IPX packet type is set to 14h (decimal 20). Manufacturers of routers may consider all NetBIOS traffic as being nonroutable LAN traffic even though it is being carried over the routable IPX protocol, and so, by default, will not pass Type 20 NetBIOS IPX packets. To enable NetBIOS over IPX connectivity, Type 20 packet passing must be enabled on the router.

4. Check that Token Ring Source Routing is enabled, and set a cache size if needed.

#### [To check whether Token Ring Source Routing is enabled](#)

1. In the Network option in Control Panel, double-click the IPX/SPX-compatible protocol, and then click the Advanced tab.
2. Verify the Source Routing Cache Size is set.

3. Check the option named Force Even Length Packets.

NetWare servers with older NetWare Ethernet drivers or older IPX routers may require even-sized packets. Change this setting to make sure the computer only transmits even-length IPX frames.

4. Use *net diag* to test for IPX connectivity over the LANA used by IPX over NetBIOS (NWNBLINK).

5. Use System Monitor to view statistics on the IPX/SPX-compatible protocol. Then retry network operation and check the activity. If there is none, remove and reinstall the protocol, and then retry and retest the operation.

*You cannot connect using TCP/IP.*

Use the TCP/IP diagnostic utilities included with Windows 95 TCP/IP to isolate network hardware problems and incompatible configurations. The following list describes which utility helps to identify problems.

---

- Check host  
name, host  
IP address,  
and TCP/IP  
configuration  
; verify  
physical  
connection  
and remote  
TCP/IP  
computer

- Detect  
invalid  
entries in the  
ARP table  
on the local  
computer

- Display,  
update, or  
release  
TCP/IP  
configuration  
values

- Check the  
state of

NetBIOS  
over TCP/IP  
connections,  
update  
LMHOSTS  
cache, and  
determine  
registered  
name and  
scope ID

– Display  
statistics  
and state of  
current  
TCP/IP  
connections

– Check the  
route to a  
remote  
computer

### [To test TCP/IP using ping](#)

Check the loopback address by typing *ping 127.0.0.1* and pressing ENTER at the command prompt. The computer should respond immediately. (If using DHCP, use IPCONFIG to find the IP address.) To determine whether you configured IP properly, use *ping* with the IP address of your computer, your default gateway, and a remote host.

If you cannot use *ping* successfully at any point, verify:

n

The computer was restarted after TCP/IP was installed and configured.

n

The local computer's IP address is valid and appears correctly in the TCP/IP Configuration dialog box.

n

The IP address of the default gateway and remote host are correct.

n

IP routing is enabled on the router and the link between routers is operational.

If you can use *ping* to connect to other computers running Windows 95 on a different subnetwork but cannot connect through Windows Explorer or with *net use* \\\SERVER\SHARE, verify that:

n

The correct computer name was used.



n

The target host uses NetBIOS. If not, you must use FTP or Telnet to make a connection; in this case, the target host must be configured with the FTP server daemon or Telnet daemon, and you have correct permissions on the target host.

n

The scope ID on the target host is the same as the local computer.

n

A router path exists between your computer and the target computer.

n

LMHOSTS contains correct entries, so the computer name can be resolved.

n

The computer is configured to use WINS, the WINS server addresses are correct, and WINS servers are functioning.

*The "Unable to connect to a server" message appears.*

This message appears if name resolution fails for a particular computer name. If the computer is on the local subnetwork, confirm that the target server name is spelled correctly and that the target server is running TCP/IP. If the computer is not on the local subnetwork, be sure that its name and IP address mapping are available in the LMHOSTS file or the WINS database. If all TCP/IP elements appear to be installed properly, use *ping* with the remote computer to be sure that its TCP/IP software is working.

Use the *nbtstat -n* command to determine what name (or names) the server registered on the network. The *nbtstat* command can also display the cached entries for remote computers from either #PRE entries in LMHOSTS or recently resolved names. If the remote computers are using the same name for the server, and the other computers are on a remote subnetwork, be sure that they have the computer's mapping in their LMHOSTS files.

*IP address connects but host names do not.*

Verify that the appropriate HOSTS file and DNS setup have been configured for the computer by checking the host name resolution configuration using the Network option in Control Panel and then choosing the DNS Configuration tab in the TCP/IP Properties.

n

If you are using a HOSTS file, verify that the name of the remote computer

is identical — especially in terms of spelling and capitalization — to the name in the file and the application using it.

n

If you are using DNS, verify that the IP addresses of the DNS servers are

correct and in proper order. Use *ping* with the remote computer and type both the host name and IP address to determine if the host name is resolved properly.

Use the *netstat -a* command to show the status of all activity on TCP and UDP ports

on the local computer. A good TCP connection is usually established with 0 bytes in the send and receive queues. If data is blocked in either queue or if the state is irregular, there is probably a problem with the connection. If not, you are probably experiencing network or application delays.

*Connect times are long after adding to LMHOSTS.*

You may experience long connect times with a large LMHOSTS file if there is an entry at the end of the file. If so, mark the entry in LMHOSTS as a preloaded entry by following the mapping with the #PRE tag. Then use the `nbtstat -r` command to update the local name cache immediately, or place the mapping higher in the LMHOSTS file. The LMHOSTS file is parsed sequentially to locate entries without the #PRE keyword. You should place frequently used entries near the top of the file and place the #PRE entries near the bottom.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Chapter 13 Introduction to System Management

Windows 95 offers administrators a system architecture that supports security and centralized system management, plus tools to monitor and configure remote computers on the network. This chapter summarizes the features that support system management in Windows 95.

### *System Management with Windows 95*

---

Since corporations began downsizing from mainframes to LANs, network administrators have faced the formidable task of managing a growing base of computing assets spread across the enterprise. This becomes a major problem as organizations move mission-critical software for production, decision support, accounting, and other applications to LAN-based personal computers.

The system management tools and agents provided with Windows 95 support system management for three management areas:

n

Hardware, including the computer's motherboard, add-in cards, hard disk and CD-ROM drives, monitors, tape drives, pointing devices, and keyboards.

n

Operating system software, including drivers, system services, and user interface components. These require system software distribution, system and user configuration management, security, and data backup.

n

Application software. These must be licensed and installed, and their use

must be monitored.

Windows 95 supports automatic installation of Windows 95 with specific support for multiple computers. After Windows 95 is installed, there is Registry-based support for remote management of Registry settings for hardware and software settings—either on individual computers or (through system policies) on multiple computers on the network. In addition, the Windows 95 compact disc includes agents for remote-system administration using other management software.

The following summarizes the important features in Windows 95 that support system management on corporate networks.

#### Security for system logon and resource access.

The administrator can take advantage of centralized user accounts on Windows NT or Novell® NetWare® networks to restrict network logon and access to shared resources on computers running Windows 95. Windows 95 provides password-caching to make it easier for users to manage connections to password-protected resources, yet also allows network administrators to restrict users' capabilities and, consequently, enforce strict security policies. For information, see Chapter 14, "Security."

#### User profiles.

When user profiles are enabled, individual users can configure their own settings and preferences, including Windows 95 settings, network settings, and application settings. This solution permits multiple users to share one computer, and "roving" users to log onto other computers on the network and still maintain their personal settings. Administrators can also enforce a "mandatory" user profile, which can be useful for managing a common desktop for novice users. For information, see Chapter 15, "User Profiles and System Policies."

#### System policies.

Use system policies to restrict network access, security privileges, and computer and user settings from a convenient central location, and to specify various configuration settings. Policies can be specified for groups, for specific users, and for multiple computers. System policies provide administrators with significant control over a user's ability to configure computer and desktop settings. For information, see Chapter 15, "User Profiles and System Policies."

#### Remote administration.

The built-in remote administration capabilities of Windows 95 enable administrators to better manage all the computers on the network from one computer. This reduces the burden of supporting system configuration and troubleshooting on the corporate network. For information, see Chapter 16, "Remote Administration."

### Backup capabilities.

The backup capabilities built into Windows 95 perform network-based backup to ensure user's data is fully protected. Windows 95 includes two network backup agents from Arcada and Cheyenne. For information, see Chapter 16, "Remote Administration."

### System administration agents.

Windows 95 also includes agents for integrated use with systems management products. Windows 95 can be used with administration applications from various vendors, including Microsoft Systems Management Server, HP® Openview, Intel® LANDesk™, IBM® LAN NetView®, Sun® NetManager, and Novell NMS. For information, see Chapter 16, "Remote Administration."

The tools and agents that network administrators can use for system management are available from various sources.

When you install Windows 95 from the installation disks (either floppy disks or compact disc), the following administrative tools are installed automatically with the system files:

 Registry Editor

 Microsoft System Diagnostics (MSD)

The following tools can optionally be installed from the installation disks:

n

Disk Defragmenter, DriveSpace, and ScanDisk, as described in Chapter 20, "Disks and File Systems."

n

Microsoft Backup

n

NetWatcher, as described in Chapter 16, "Remote Administration."

*{ewc msdncd, EWGraphic, x0l 0 /a "psL.bmp"}*

The following tools are available only in the ADMINAPPTOOLS directory on the Windows 95 compact disc. You can either run these tools directly from the compact disc, or install them on a local computer using the Add/Remove Programs option in Control Panel:

n

Password List Editor (in the PWLEDIT subdirectory)

n

System Policy Editor (in the POLEDIT subdirectory)

n

WinPopup (in the WINPOPUP subdirectory)

When you install Windows 95 from the installation disks (either floppy disks or compact disc), the following administrative tools can be installed optionally, by installing the service using the Network option in Control Panel:

n

Arcada Software Backup Exec agent

n

Cheyenne Software ARCserve agent

The following agents and services are available only in the ADMIN\NETTOOLS directory on the Windows 95 compact disc. You can install them on a local computer using the Network option in Control Panel:\*



n

Hewlett-Packard JetAdmin and JetAdmin for NetWare (in the HPJETADM subdirectory)

n

Microsoft Network Monitor agent (in the NETMON subdirectory)

n

Microsoft Print Agent for NetWare networks (in the PRTAGENT subdirectory)

n

Microsoft Remote Registry service (in the REMOTREG subdirectory)

n

Microsoft SNMP agent (in the SNMP directory)

If you want to make any of these utilities, services, or agents available for installation from a shared network directory, or if you want to install any of these features-

automatically in custom setup scripts, the following procedures describe how to do this.

*To set up files from the ADMIN directory for installation over the network*

1. To be provided.

*To install a program from ADMIN\APPTOOLS using a setup batch script*

n

Add a value identifying the program in the [OptionalComponents] section of MSBATCH.INF (or similar file), as described in Appendix D, "MSBATCH.INF Parameters."

*To install a service from ADMIN\NETTOOLS using a setup batch script*

n

Add a value for services= in the [Network] section of MSBATCH.INF (or similar file), as described in Appendix D, "MSBATCH.INF Parameters."

In addition to its set of system management applications, Windows 95 includes an intelligently designed management infrastructure. In Windows 95, the system management infrastructure collects information about the hardware, operating system, and applications. This information, which is stored in the Windows 95 Registry, is made available to system management applications.

`{ewc msdncd, EWGraphic, x0l 1 /a "psL.bmp"}`

The Windows 95 Registry is a single, structured database where Windows 95 consolidates configuration and status information for most hardware and software components. Because the Windows 95 Registry APIs are can be used remotely by

means of Remote Procedure Calls (RPCs), system administrators can view and modify Registry information from remote computers over the network, using System Policy Editor and the Registry Editor tool.

The Registry is logically one data store, but physically it consists of two different files, for network configuration flexibility:

n

User-specific information (as reflected in user profiles discussed in

Chapter 15, “User Profiles and System Policies”) is contained in USER.DAT.

n

Hardware-specific and computer-specific settings (reflected in computer

profiles) are contained in SYSTEM.DAT.

These separate Registry files also make it possible, for example, for two or more users to share one computer while maintaining separate user configuration information (such as logon information and desktop preferences) for each user.

In addition to these two Registry files, system policy (POL) files provide user-specific and computer-specific information (overriding the USER.DAT and SYSTEM.DAT files). If system policies are provided, these are used to update Registry settings each time the user logs onto Windows 95.

Because Registry information is in separate files, the user portion of the Registry can be located on a network drive. For example, suppose some users in your organization move from computer to computer on the network. By including SYSTEM.DAT and other Windows 95 system files on the hard disk of each computer, but placing a copy of each user’s USER.DAT in that user’s logon directory of the network server, the administrator can ensure the unique network privileges and desktop configuration for a particular user, wherever that user logs on.

---

Note — A copy of USER.DAT always exists locally. When USER.DAT is placed in the user’s logon directory on a server, a copy of that file is made on the user’s local computer when the user logs on.

---

For a more complete discussion of the Registry, see Chapter 33, "Windows 95 Registry."

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 14 Security

This chapter presents an overview of the security features provided with Windows 95 and describes how to use them in a networking environment.

### *Windows 95 Security: The Basics*

---

Windows 95 security can be used to prevent unauthorized access to the network and to shared resources on network computers. The following security features are built into Windows 95.

#### *Unified logon prompt.*

With Windows 95, users can log onto all networks and Windows 95 at the same time. The first time a user starts Windows 95, logon dialog boxes appear for Windows 95 and for each network client on that computer. For networks other than your primary logon network, you can choose to save the logon passwords. Windows 95 stores them in a password cache. Logging on with your Windows 95 logon password unlocks the cache and allows you to connect to other networks without having to type additional passwords. After you log onto Windows 95 the first time, you can change the Windows 95 logon password to be the same as your primary network logon in the Passwords option in Control Panel. If you make these passwords the same, then only the network logon dialog box will appear when you start Windows 95. For more information, see “Using the Windows 95 Logon Password” later in this chapter.

#### *Windows 95 logon security.*

With system policies, you can prevent users from logging onto Windows 95 if their Windows NT or Novell® NetWare® network logon is not validated. To require validation by a Windows NT domain controller or NetWare server before allowing access to Windows 95, you must use system policies to enable Require Validation By Network For Windows Access. For more information, see Chapter 15, “User Profiles and System Policies.”

#### *User-level or share-level security for peer resource sharing.*

When a computer is running Windows 95 with File and Printer Sharing services, other users can connect to shared printers, volumes, directories, and CD ROM drives on that computer. To protect these shared resources, Windows 95 provides user-level and share-level security.

# n

User-level security is based on user account lists stored on Windows NT

or Novell NetWare servers, specifying valid user names and passwords. When a user attempts to access a shared resource on a computer running Windows 95 which is protected by user-level security, Windows 95 passes on the user's name and password to the security provider for authentication. The types of rights a user has to the resource (for example, the ability to read or write to files) is defined on the computer running Windows 95.

# n

Share-level security allows passwords to be assigned to individual

resources, such as directories or printers, when creating shared resources on a peer-to-peer network running Windows 95 only or on other Microsoft networks. Share-level security is not available for NetWare networks.

### *Password caching.*

Windows 95 creates an encrypted password list in a file (SHARE.PWL), containing the names and passwords of network resources, including passwords for the following:

# n

Resources protected by share-level security

n

Password-protected applications such as mail

n

Windows NT computers that don't participate in a domain, or the Windows NT logon password if it isn't the Primary Network Logon.

n

User names and passwords for individual NetWare servers.

When a user first types a password to connect to a password-protected resource, and saves the password, Windows 95 caches it in the SHARE.PWL file. Logging on with a Windows 95 password unlocks the password list file and associates those passwords with the Windows 95 password. To the user, it seems as if the passwords to Windows 95 and to password-protected resources are the same. If password caching is disabled, users must type the correct password each time they connect to a password-protected resource.

Password List Editor (PWLEDIT).

This tool allows network administrators to view and delete the contents of users' password list files.

Password controls in system policies.

A network administrator can use system policies to enforce a password policy with greater restrictions, including the following:

n

Disable password caching

n

Require alphanumeric Windows 95 logon password

n

Minimum Windows 95 logon password length.

#### Other System Policies.

A network administrator can define policies to prevent specific users from enabling peer resource sharing services and to enforce other security components, such as preventing users from configuring system components. For more information, see Chapter 15, "User Profiles and System Policies." See also "Using System Policies to Enforce Password Policy" later in this chapter.

#### Windows 95 Security: The Issues

---

Before you integrate Windows 95 security into your network security model, you should decide the following issues:



n

What kind of logon security you need. Do you want to require that users log onto Windows 95 and the network with the same password? Do you want to require alphanumeric or minimum length passwords for the Windows 95 logon password? Do you want to require that users be validated by the network security provider before being able to log onto Windows 95?

n

For both NetWare and Windows NT networks, the first time users log onto Windows 95 and the network, both prompts are displayed. After that, only the network logon dialog box will be displayed if the passwords are the same.

n

For both Windows NT and NetWare networks, you can use system policies to require validation by a Windows NT or NetWare server before allowing access to Windows 95 and to specify other Windows 95 password restrictions.

n

What kind of resource protection you need on Microsoft networks. If you allow users to enable peer resource sharing, then you must decide whether users can protect those resources with share-level or user level security. User-level security provides greater security because the network security provider

must authenticate the user name and password before access to the resource is granted. (Share-level security is not available for File and Printer Sharing for NetWare networks.)

n

What kinds of access rights users will have to resources protected by

user-level security. Users can specify the types of rights users or groups of users have to resources using the Access Control property sheets in the Network option in Control Panel. For example, they can restrict other users to read-only access to files or give them read and write access to files.

n

How you want to enable user-level security. You can enable security in a

setup script, in the Network option in Control Panel, or in system policies. If you enable user-level security in either a setup script or in the Control Panel, then Remote Administration is enabled by default for domain administrators on a Windows NT network and for supervisors on a NetWare network. If you do not want this behavior, you can enable user-level security in system policies. If you use system policies, you must enable remote administration in the Passwords option in Control Panel on each computer running Windows 95.

n

Whether to disable password caching for password-protected resources.

With system policies, you can disable password caching, thus requiring users to type a password each time they access a password-protected resource.

n

Whether you want users to be able to configure system components, their desktops, applications, or network connections in Control Panel. You can use system policies to restrict users' ability to configure Windows 95 components.

n

Whether you need to control access to a computer's hard disk drive.

Because Windows 95 uses network-based security instead of workstation security, an individual computer running Windows 95 is vulnerable to someone accessing data stored on the hard disk by starting the computer using Safe Mode or a floppy disk. If specific computers require greater levels of security, Windows NT Workstation is recommended because it provides a means to protect resources on a hard disk based on a user's identity.

### Windows 95 Network Security Overview

---

Windows 95 provides two ways to protect shared resources on computers running Windows 95 with File and Printer Sharing services.

n

Share-level security protects shared network resources on the computer

running Windows 95 with individually assigned passwords. For example, you can assign a password to a directory on an individual computer or a locally attached printer. If other users want to access it, they need to type in the appropriate password. If you do not assign a password to a shared resource, every user with access to the network can access that resource. (This option is not supported with File and Printer Sharing service for NetWare Networks.)

# n

Pass-through user-level security protects shared network resources by

requiring that a security provider authenticate a user's request to access resources. The security provider, such as a Windows NT domain controller or Novell NetWare server, grants access to the shared resource by verifying that the user name and password are the same as those on the user account list, which is stored on the network security provider. Because the security provider maintains a network-wide list of user accounts and passwords, each Windows 95 desktop does not have to store a local list of accounts.

---

Note — If you are running File and Printer Sharing for Microsoft Networks, the security provider must be the name of a Windows NT domain controller or Windows NT computer.

If you are running Microsoft File and Printer Sharing for NetWare Networks, the security provider must be either a NetWare server or a NetWare 4.x server running bindery emulation.

---

```
{fewc msdncd, EWGraphic, x0m 0 /a "psM.bmp"}
```

# n

If a user tries to access a shared resource on a computer running

Windows 95 when pass-through user-level security is enabled, a request is passed to the security provider to verify the user's identity.

# n

The security provider sends a verification to the computer running

Windows 95 if the user name and password combination is valid.

# n

Windows 95 grants access to the shared resource, and gives permission to use the resource according to rights assigned to the user in the Access Control property sheet (in the Network option in Control Panel) for that Windows 95 resource. The user's rights are stored on the computer running Windows 95.

Planning and implementing security in a Windows 95 networking environment requires the following basic steps:

# n

Defining user accounts and permissions on a network server or domain controller for user-level security. For more information, see the documentation for the software on the network security provider.

# n

Optionally, installing File and Printer Sharing services and enabling user-level or share-level security. For more information, see Chapter 11, "Logon, Browsing, and Resource Sharing."

# n

Optionally, making the Windows 95 logon password and network logon password the same. For more information, see "Using the Windows 95 Password Cache" later in this chapter.

# n

Optionally, disabling password caching. For more information, see “Using the Windows 95 Password Cache” later in this chapter.

# n

Defining system policies to restrict users’ ability to configure the system or shared resources, and to enforce password policies. For information, see Chapter 15, “User Profiles and System Policies.”

For more information on deploying Windows 95 in your corporate environment, see Part 1, “Corporate Planning Guide.”

## Setting Up Security for Shared Resources

---

Before a user can share a specific resource on a computer running Windows 95, the computer must be configured for share-level or user-level security and File and Printer Sharing services must be installed using the Network option in Control Panel. Configuring share-level or user-level security is described briefly in the following sections, and in more detail in Chapter 11, “Logon, Browsing, and Resource Sharing.”

---

Note — Share-level security is not available on computers running Microsoft File and Printer Sharing for NetWare.

---

### [To set up share-level security for a single computer](#)

1. Install File and Printer Sharing for Microsoft Networks, as described in Chapter 11, “Logon, Browsing, and Resource Sharing.”
2. In the Network option in Control Panel, click the Access Control tab, and then click Share-Level Access Control.

### [To set up user-level security on a computer on a NetWare Network](#)

1. Install File and Printer Sharing services for either Microsoft Networks or NetWare Networks, as described in Chapter 11, "Logon, Browsing, and Resource Sharing."
2. In the Network option in Control Panel, click the Access Control tab, and then click User-level Access Control.
3. In the User-level Access Control box, type the name of the NetWare server, and then click OK.

*To set up user-level security on a computer on a Microsoft Network*

1. Install File and Printer Sharing services for either Microsoft Networks or NetWare Networks, as described in Chapter 11, "Logon, Browsing, and Resource Sharing."
2. In the Network option in Control Panel, click the Access Control tab, and then click User-level Access Control.
- \_\_\_\_\_ {ewc msdn cd, EWGraphic, x0m 1 /a "psM.bmp"}
3. Type the name of the Windows NT domain, and then click OK.

You can define whether a computer will use share-level or user-level security with a custom setup script.

*To specify user-level or share-level security in setup batch scripts*

1. Specify a value for UserSecurity in the [Network] section of the user's setup script (MSBATCH.INF), as described in the following list.

---

0 Share-level  
security

d User-level  
o security  
m passing to a  
a Windows  
i NT domain  
n

m User-level  
s security  
s passing to a  
e Windows  
r NT server  
v

e  
r  
  
n User-level  
w security  
s passing to a  
e NetWare  
r server  
v  
e  
r

2. If you specify a value other than 0, you must also specify a value for *PassThroughAgent*, in the [Network] section of the setup script. This will be the authentication server that validates users.

— For example:

— *Security=mydomain*

— *PassThroughAgent=mydom1svr*

For more information, see Appendix D, “MSBATCH.INF Parameters.”

You can use System Policy Editor to change Registry settings for user-level and other security options. For more information, see Chapter 15, “User Profiles and System Policies.”

#### [To set user-level security using System Policy Editor](#)

1. From the System Policy Editor File menu, select Open Registry and then click Default Computer.
2. Click Network, click Access Control, and click the User-level Access Control check box.
3. Under Authenticator Name, type in the name of the server, or the name of the domain to be used to access the user list, and under Authenticator Type, select the type of server (Windows NT or NetWare 3.x or 4.x) or domain (Windows NT).

#### [To restrict users from changing their security options using System Policy Editor](#)

1. From the System Policy Editor File menu, select Open Registry and then click Default User.
2. Click Network, and then click the Restrict Network Control Panel and the Hide Security Page check boxes.



## Using Share-Level Security

---

You can restrict access to a shared directory or printer by either defining it as read-only or assigning a password to it.

---

Note — With Windows 95, each time users log on, they can be automatically reconnected to the shared resources they were connected to in the previous Windows 95 session.

---

### To share a directory or printer with share-level security

1. In Windows Explorer or My Computer, right-click the icon for the directory or printer you want to share and, in the context menu, click Sharing.
2. Click the Sharing tab. Then click Share As, and type the computer name and the resource's share name.

— Network users will type this same name when they want to access this resource.

— {ewc msdn cd, EWGraphic, x0m 2 /a "psM.bmp"}

3. Specify whether you want users to have read-only or full access to this resource.
4. Type the password (or passwords) for read-only or full access, and click OK.

---

Tip — You can share a directory but hide it from the Network Neighborhood browsing list by adding a dollar-sign character (\$) to the end of its share name (for example, KEITHW\$).

---

## Using User-Level Security

---

For each network resource or service governed by user-level security, there is a list of users and groups that can access that resource. For each user, there is a set of rights assigned for a resource. The kinds of rights that you assign depend on the kind of resource you are securing:

# n

For shared directories, you can allow a user to have read-only access, full

access, or custom access. Within custom access, you can grant the user any or all of the following rights: read, write, create, list, delete, change file attributes, and change access rights.

n

For shared printers, a user either has the right to access the printer or not.

n

For remote administration, a user either has the right to be an

administrator or not as defined in the Passwords option in Control Panel.

Permissions are enforced for a resource as follows:

n

If the user has explicit rights to the resource, then those rights are

enforced.

n

If the user does not have explicit rights to the resource, then the

permissions are determined by taking all of the rights of each group to which the user belongs.

# n

If none of the groups to which the user belongs has any rights for that resource, then the user is not granted access to the resource.

When you do not explicitly assign access rights for a file or directory, Windows 95 uses implied rights. Implied rights are those assigned to a file or directory's nearest parent directory. If none of the parent directories (up to and including the root directory of the drive) have explicit rights, no access is allowed.

The following sections provides details about specifying permissions for directories and describe how to manage user-level security.

Access rights specify what a given user can do in a directory protected by user-level security. The access rights you define for a directory apply to all of its subdirectories. You cannot, however, assign permissions to individual files in Windows 95. (Both Windows NT and NetWare allow you to assign permissions to files.)

For each directory, you can assign read-only, full, or custom access. (Read-only and full access are equivalent to the same values used by Windows for Workgroups with share-level security.) Custom access allows you to further specify exactly what each user or group can do in the directory, as specified in the following list.

---

Read from a closed file

See a file name

Search for files

Write Write,  
to a create,  
close delete,  
d file change  
file  
attributes

Run Read, list  
an files  
execu  
table  
file

Creat Create  
e and files  
write  
to a  
file

Copy Read, list  
files files  
from  
a  
direct  
ory

Copy Write,  
files create,  
to a list files  
direct  
ory

Make Create  
a new files  
direct  
ory

Delet Delete  
e a files  
file

Remo Delete  
ve a files  
direct  
ory

Chan Change  
ge file  
direct attributes

ory or  
file  
attribu  
tes

Rena Change  
me a file  
file or attributes  
direct  
ory

Chan Change  
ge access  
acces control  
s  
rights

#### [To define custom access](#)

1. In Windows Explorer or My Computer, right-click the shared directory and, in the context menu, click Sharing.
2. In the directory's property sheet, click the Add button.
3. In the Add Users dialog box, click a user or group from the Name list, and then click Custom.
4. In the Change Access Rights dialog box, click the type of rights the user or group of users can have in the directory, and then click OK.

 {ewc msdncl, EWGraphic, x0m 3 /a "psM.bmp"}

Windows 95 user-level security depends on a list of accounts and groups that is located on a security provider. You cannot add or remove users and groups from the security provider list using Windows 95 tools. You can do this by running User Manager for a Windows NT domain, SYSCON for NetWare 2.x or 3.x, and NETADMIN for NetWare 4.x. in a NetWare bindery environment. Running these tools allows network administrators to further manage users and groups. You can use these tools on a computer running Windows 95.

Under Windows 95, you can change the local access control list to restrict access to specific resources.

#### [To add or remove users from the local access control list](#)

1. In the property sheet of the user-level protected directory, click the Sharing tab.
2. In the Sharing dialog box, the access control list shows the name and access rights of each user and group of users with permission to access the directory. Click Add, Remove, or Edit to change the access control list.

For more information about changing a user's rights to use the resource, see "Specifying Directory Access Rights in User-Level Security" earlier in this chapter.

---

Note — Although Windows NT networks allow multiple domains, a computer running Windows 95 can specify only one domain for user-level security. To use a trust relationship to access multiple domains, the administrator should consult the WINDOWS NT SERVER 3.5 CONCEPTS AND PLANNING GUIDE that is part of the Windows NT Server documentation set.

---

NetWare 2.x and 3.x servers store all the information on users, groups, passwords, and rights in a database stored on the server called the BINDERY. NetWare 4.x servers can appear to have a bindery through bindery emulation, a feature which is enabled by default. There is a separate bindery for each NetWare server. Windows 95 can use the bindery of only one NetWare server as the security provider.

It is common for a company to have one or more NetWare servers per department, where users log onto the server for their department. This scenario can pose a problem when the list of accounts differs from one NetWare server to another.

For example, Sue and Bob log onto the SALES server and Fred logs onto the R&D server. Because Sue is running Windows 95 and can specify only one server for pass-through validation, she specifies SALES (the server she uses for logon). She can now grant access to shared resources on her computer to Bob but cannot grant access to Fred.

The only workaround to this problem is to include all user accounts for all servers on one NetWare server. This server should be specified as the security provider for every computer running Windows 95 with File and Printer Sharing for NetWare Networks.

---

Note — User-level security in Windows 95 currently does not support the use of NetWare domains and the NetWare Name Service (NNS), an Add-On service for NetWare 4.x servers to obtain user lists. Windows 95 does support NetWare 4.x with bindery emulation to obtain user lists.

---

Using the Windows 95 Password Cache

---

Keeping track of multiple passwords can be a problem for users. Often, they either forget the passwords or write them down and post lists of passwords near their computers. When this happens, the security policy is no longer doing the job it was meant to do — to allow access to those who should have it and to deny access to those who shouldn't.

Windows 95 solves this problem by storing passwords for resources in a password cache (SHARE.PWL). The password cache stores passwords for the following network resources:

n

Resources on a computer running Windows 95 protected by share-level security.

n

Applications that are password-protected. These applications must be specifically written to the Master Password API. (For more information, see the WINDOWS 95 SOFTWARE DEVELOPMENT KIT.)

n

Windows NT computers that don't participate in a domain, or the Windows NT logon password if it isn't the Primary Network Logon.

n

User names and passwords for individual NetWare servers.

The password cache stores these passwords in the Windows directory on the local computer in an encrypted file (SHARES.PWL) of resources and passwords. Each resource typically has its own password. If there are 30 shared resources, for example, there will be 30 passwords stored in the password cache. Passwords are encrypted using the Data Encryption Standard (DES) algorithm. An unencrypted password is never sent across the network.

---

Caution — If you delete the \*.PWL files, you will lose all previously listed passwords. You will need to retype each password.

---

Password caching is enabled by default when you install Windows 95. When you access a password-protected resource for the first time, you can check Save This Password In Your Password List to save the password to the password cache.

*{fewc msdncd, EWGraphic, x0m 4 /a "psM.bmp"}*

You can disable password caching by using System Policy Editor, or you can change a password in the Passwords option in Control Panel to require users to type it each time they access the resource.

---

Note — If, during logon, you click the Cancel button to bypass the logon screen, the cache will not be opened and you will be prompted for a password each time you attempt to use a protected device.

---

#### [To disable password cache using system policies](#)

1. In System Policy Editor, click Default Computer.
2. In Default Computer, click Network, and then click Passwords.
3. Under Passwords, click the Disable Password Caching option.

— For more information, see Chapter 15, "User Profiles and System Policies."

#### Using Password List Editor

---

If password caching is enabled, the password list file caches passwords when a user connects to a password-protected network resource. Password List Editor (PWLEDIT) allows a network administrator to view the resources listed in a user's password list file (.PWL). It does not allow you to view the actual passwords, but to remove specific password entries if problems are encountered using a cached password.

Password List Editor can be found in the ADMIN\APPTOOLS\PWLEDIT directory on the Windows 95 compact disc.



### [To install Password List Editor](#)

1. In Add/Remove Programs in Control Panel, click the Windows Setup tab, and then click the Browse button.
2. Type the path name to \ADMIN\APPTOOLS\PWLEDIT\PWLEDIT.EXE.
3. Double-click the setup folder.

### [To run Password List Editor](#)

n

In the Accessories menu, select Systems Tools and double-click the

PWLEDIT icon.

— Or —

— From the Start menu Run command, type pwledit.

— {ewc msdn cd, EWGraphic, x0m 5 /a "psM.bmp"}

### [Using the Windows 95 Logon Password](#)

---

With Windows 95, users can log onto all networks and Windows 95 at the same time. The first time a user starts Windows 95, logon dialog boxes appear for Windows 95 and for each network client on that computer. This is useful for network administrators because they can use existing user accounts on a network security provider to validate access to the network for users running Windows 95. For more information, see Chapter 11, "Logon, Browsing, and Resource Sharing."

For networks other than your primary logon network, you can choose to save the logon passwords. Windows 95 stores them in a password cache. Logging on with your Windows 95 logon password unlocks the cache and allows you to connect to other networks without having to type additional passwords.

After you log onto Windows 95 the first time, you can change the Windows 95 logon password to be the same as your primary network logon in the Passwords option in Control Panel. If you make these passwords the same, then only the network logon dialog box will appear when you start Windows 95.

You can also use the Passwords option in Windows 95 to change other network resources to use the same password as the Windows 95 logon password.

### [To change a Windows 95 password to be the same as passwords for other network resources](#)

1. In Control Panel, click the Passwords icon, and then click the Change Windows Password button.
2. In the Change Windows Password dialog box, check the other passwords you would like to change to use the same password as the Windows 95 password, and then click OK.

— To appear in this list, the related software must include a function that allows its password to be changed.

— {ewc msdn cd, EWGraphic, x0m 6 /a "psM.bmp"}

3. In the second Change Windows Password dialog box, type in the current (old) password, and then the newly selected password. Verify the new password. Click OK.

---

Note — The Windows Screen Saver passwords option will only show up here if the Windows screen saver has been turned on and the password-protected option has been selected.

---

You can maintain separate passwords for a network resource, thus requiring users to type a password each time they access it.

### [To change a password to a network resource](#)

1. In Control Panel, click the Passwords icon, and then click Change Other Passwords.
2. In the Select Password dialog box, click the password you want to change, and then click Change.
3. In the Change Password dialog box, type a new password, and then retype it to confirm it. Click OK.

— You now must type a separate password to access the resource.

### [Using Windows 95 with NetWare Passwords](#)

To log onto a NetWare network, you must type the name of the preferred server where the related user account is stored. After the user name and password pair are validated by the network server, the user is allowed to use resources shared on that server. If the user is not validated, the user will be prompted to enter a password whenever connecting to a NetWare server during this work session.

The first time a user attempts to connect to a NetWare server other than the preferred server, the NetWare server searches the Windows 95 password cache for

a user name and password to that server. If the user name and password pair do not work, NetWare displays a dialog box for the user to type a user name and password. If there is no NetWare user name and password in the password cache, NetWare tries using the Windows 95 logon password. You can disable this automatic attempt to log onto NetWare resources.

#### *To avoid use of automatic NetWare logon*

# n

Use system policies to enable the policy named Disable Automatic

NetWare Login.

#### *To change your password on a NetWare server*

1. At the command prompt, use the *net use* command to connect to the NetWare server's SYS volume. For example, for a server name NWSVR2, you would type *net use \* \\nwsvr2\sys*
2. At the command prompt, change to the drive for the NetWare server, and then make the PUBLIC directory the current directory. For example, if the drive is mapped to N, type *n:* and then type *cd \public*.

—Note— If you want to change your password on more than one server, connect to all affected servers before running the *setpass* command.

3. At the command prompt, type the *setpass* command. If the server on which you want to change your password is different from the one on the current drive, type *setpass* and the server name.

—For example, to change your password on the server named NWSERVE1, type:

—*setpass nwserve1*

4. When you are prompted, type your old password, then type and confirm the new password.
5. If you are connected to other NetWare servers that also use your old password, these servers are listed, and you are asked if you want to change your password on these servers also.

—To change the additional passwords, press Y. Or, to leave the passwords as they are, press N.

## *Using System Policies to Enforce Password Security*

---

You can use system policies to enforce a greater degree of security by forcing users to follow specific password guidelines. Using system policies, you can enforce the following password policies:

n

Require Validation By Network For Windows Access, to specify that each

logon be validated by a server before access to Windows is allowed. This applies to Windows NT and NetWare networks.

n

Disable Automatic NetWare Login, to specify that when Windows 95

attempts to connect to a NetWare server, it does not automatically use the user's logon name and password or the password cache.

n

Minimum Windows Logon Password Length, to control the minimum

number of characters accepted for a Windows 95 logon password.

n

Require Alphanumeric Windows Logon Password, to force a Windows 95

logon password to be a combination of numbers and letters.

n

Hide Share Passwords With Asterisks, to cause asterisks to replace password that users type when accessing a shared resource. This setting applies only to share level and is enabled by default.

n

Disable Passwords Control Panel, to prevent access to the Passwords option in Control Panel.

n

Hide Change Passwords Page, to hide this property sheet in the Passwords option in Control Panel.

n

Disable Password Caching, to prevent saving of passwords for share-level resources, applications, and for NetWare passwords.

n

Disable Caching of Domain Password, to prevent caching of the network password.

For more information, see Chapter 15, “User Profiles and System Policies.”

### *Guidelines for Setting Password Policy*

---

A good password policy helps users protect their passwords from other individuals. This helps to reduce the probability of someone logging on with another user’s password and gaining unauthorized access to data.

The following guidelines should help you create a basic security policy:

n

Tell users not to write down their passwords.

n

Tell users not to use obvious passwords such as their name, their spouse’s name, the names of their children, and so forth.

n

Do not distribute user accounts and passwords in the same

communication. For example, if administrators are sending a new user's account name and password in writing, send the user name and the password at different times.

The following Windows NT and NetWare security features can be used to enhance Windows 95 security:

n

Enforce a reasonable minimum password length and, hence, increase the

number of permutations needed to randomly or programmatically guess someone's password. Additionally, you can enforce an alphanumeric password combination to achieve the same security.

n

Enforce maximum and minimum password age. A maximum password

age protects against the possibility that someone may be looking over a person's shoulder over a period of time and learn the password by remembering the keystrokes. A minimum password age prevents a user from immediately reverting back to a previous password after a change.

n

Enforce password uniqueness and maintain password history. This

prevents users from toggling between their favorite passwords. Administrators can specify the number of unique passwords that a user must have before that user can use a password that has previously been used.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 15 User Profiles and System Policies

This chapter describes how to use user profiles to allow users to maintain their own preferences, network settings, and application settings when logging onto a workstation. This chapter also describes how to use system policies to control what users can and cannot do on the desktop and on the network. These features can help decrease the cost of managing numerous computers by allowing network administrators to manage configurations remotely.

### *User Profiles and System Policies: The Basics*

---

A user profile consists of user-specific information contained in the file USER.DAT, which is one of the files that makes up the Windows 95 Registry, and can optionally contain certain special Windows 95 directories.

Benefits of using user profiles include the following:

n

Multiple users can use a single computer and retain their personal

settings. If the computer is running a Windows 95 32-bit, protected-mode network client, then “roving” users can log onto the network anywhere and work with the same desktop settings.

n

Windows 95 performs all the work automatically for maintaining each

user’s profile, whether profiles are stored locally or on the network. The administrator needs only to enable user profiles for the computers where they will be used.



# n

If mandatory profiles are used, the administrator can centrally enforce a consistent desktop for all users. This is useful for novice users who cannot manage their own desktop settings, supporting increased user productivity and easing the burden of training and support for system managers.

System policies allow an administrator to override local Registry values for user or computer settings. Policies are defined in a policy (.POL) file, usually called CONFIG.POL. When a user logs on, system policy settings overwrite default USER.DAT and SYSTEM.DAT settings in the Registry. System policies can also contain additional custom settings specific to the network as established by the network administrator. Unlike SYSTEM.DAT and USER.DAT, CONFIG.POL is not a required component of Windows 95 Setup and, when implemented, is stored on the logon server, not the local computer.

Benefits of using system policies include the following:

# n

Network administrators can centrally restrict what users are allowed to do from the desktop and what they are allowed to configure using Control Panel.

# n

The administrator can centrally configure network settings, such as the network client configuration options and the ability to install or configure File and Printer Sharing services.

n

The administrator can centrally customize certain parts of the desktop, such as Network Neighborhood and the Programs folder.

n

The administrator can use System Policy Editor to easily change many important Registry settings — either locally or remotely by directly making changes on individual computers, or for multiple computers by making changes to the system policy file.

n

Group policies can be used to define a specific set of policies to be applied on the basis of membership in the groups already defined on a NetWare or Windows NT network. Group policies make computer management on the corporate network easier by leveraging the current administrative organization of users.

Windows 95 provides a set of policies that administrators can use to specify settings for their users. Administrators can also add other Registry settings to this existing set of policies or modify policy templates to create new custom policies for any applications that know how to use the Windows 95 Registry.

### *Issues for User Profiles and System Policies*

---

System policies and mandatory user profiles are both ways to enforce user settings. Administrators will usually choose to use one or the other, but not both. The two features differ in the following ways:

n

System policies let the administrator mandate user-specific and computer-specific settings. Mandatory user profiles let the administrator mandate only user-specific settings.

n

System policies let the administrator selectively determine a subset of user settings to control, and let the user control the remaining settings. Mandatory user profiles always control every user-specific setting.

Before implementing user profiles, decide on the following issues:

n

Do you want to use system policies for user settings?

To use system policies to define user settings, user profiles must be enabled on the computer.

n

What do you want to include in user profiles?

For example, you might choose to include the Desktop, Start menu, or Network Neighborhood in the user profile.

n

Do you want user profiles to work across the network, to be available for “roving” users?

If so, the computers must be running a 32-bit, protected mode network client. Also, you must make sure that each user has a home directory on the network.

n

Should mandatory user profiles be used?

A mandatory user profile forces users to use a specific set of preferences determined by the network administrator. Using a mandatory user profile requires an administrator to copy the necessary files to each user’s network directory.

If you want to make user profiles available on the network (rather than just locally at individual computers), you must perform the following preliminary steps:

n

Install and run a 32-bit, protected mode networking client (such as Client for NetWare Networks or Client for Microsoft Networks) on the computers.

n

Ensure that the server supports long filenames for full user profile

functionality. If the server doesn’t support long filenames, only USER.DAT will follow a user around the network. No other folders (such as those that support

Start Menu and Network Neighborhood configuration) can be downloaded.

n

For Microsoft networks, ensure that a network home directory exists for each user, because this is where user profiles are placed on the network. (On Novell® NetWare® networks, profiles are placed in the Mail/USER\_ID directory, which always exists.)

n

Assign the same names on all computers for the directory and the hard disk drive in which Windows 95 is installed. If Windows 95 is in C:\WINDOWS on computer A and in C:\WIN95 on computer B, certain components of a user profile cannot be transferred between the two computers. This is also true if Windows 95 is on different hard disks on different computers (for example, C:\WINDOWS on one computer, and D:\WINDOWS on another).

Before implementing system policies, decide on the following issues:

n

What types of restrictions and settings would you like to define and manage centrally?

For example, depending on the types of users on your network, you might want to limit access to the MS-DOS Prompt and other applications or to Control Panel options, or you might want to implement a standard desktop for all users.

n

What type of network architecture do you have? How many servers are in

use? How many users are supported? What is the typical logon process?

Issues to consider include whether you use one set of standard settings for all users and computers, whether you customize settings by groups of users, and whether you want to maintain individual settings for users and computers.

Typically, you customize settings by groups, where you have the majority of users under groups such as Accounting, Marketing, and so on, and a small group of individuals such as administrators, who require special privileges.

n

Will you be using any user system policies (as opposed to only defining

computer policies)?

If so, user profiles must be enabled on the computers running Windows 95, which in turn requires that the computers use 32-bit, protected-mode network clients.

n

Do system policies in Windows 95 meet your system administration

needs, or do you need a more sophisticated system?

This decision determines how much time you need to spend understanding System Policy Editor. If you need a high level of administrative control, consider using a more sophisticated management software tool such as Microsoft Systems Management Server. For information, see Appendix K, "Microsoft Systems Management Server."

To take advantage of system policies, perform the following preliminary steps:

n

On the administrator's computer, install System Policy Editor from the ADMIN\APPTOOLS\POLEDIT directory on the Windows 95 compact disc. Decide which users can install and have access to this tool for modifying policies. For most client computers, you probably will not install System Policy Editor.

n

On client computers, enable user profiles to ensure full support for system policies. If user profiles are not enabled, only the computer settings in any system policy will be written to the Registry.

n

Install support for group policies on the client computers if your site will use these, as described in "System Policy Editor" later in this chapter.

See also "Preparing to Use System Policies on the Network" later in this chapter.

### User Profiles Overview

---

The built-in management of user configurations in Windows 95 is controlled through user profiles that contain configuration preferences and options for each specific user. User profiles are particularly useful in situations where individuals are encouraged to customize their computing environment, yet are forced to share computers with others also attempting to customize. User profiles also are a great feature for network administrators or help desk personnel who typically roam around, accessing the network from a variety of locations. Such users can work anywhere, as if they were sitting at their own desks.

User profile settings include everything in the Hkey\_Current\_User section of the

Windows 95 Registry, such as the following:

n

Control Panel settings and preferences for the Windows 95 user interface

(shell). These include settings for desktop layout, background, font selection, colors, shortcuts on the desktop, the Start menu, and so on.

n

Settings for persistent network connections, plus information for recently

used resources, including documents, Find Computer results, installation locations for setup, and printer ports.

n

Application settings (for applications that can write directly to the Windows

95 Registry). These include settings for the accessories and applications installed with Windows 95, menu and toolbar configurations, fonts, and so on.

Each profile includes several parts: a USER.DAT file, a backup USER.DA0 file, a Desktop folder, a Recent folder, and a Start Menu folder, plus the Programs folder under Start Menu. These are stored within the user's folder in Windows 95 Profiles, as shown in the following illustration.

*{ewc msdn cd, EWGraphic, x0n 0 /a "psN.bmp"}*

With user profiles enabled, users get their own configuration when logging on, including desktop settings, color schemes, custom font choices, and server connections. Network administrators can allow users to define their own user preferences by enabling user profiles and then letting users customize their desktop. Alternatively, administrators can define a standard user profile for use across the network or for a set of specific users.



Each user's preferences are saved to a user profile which Windows 95 uses to configure the desktop each time that user logs on. When a second user logs onto the same computer with a different user name, Windows 95 creates a separate user profile for that user. A roving user's profile is stored on a network server and downloaded to any computer on the network to which the user logs on. This occurs automatically on a NetWare and a Windows NT network. However, although Windows 95 offers the ability for roving users to move from one computer running Windows 95 to another, it does not offer the ability to move between a computer running Windows NT and one running Windows 95.

---

Important— Although a user profile is based on the USER.DAT file that makes up part of the Windows 95 Registry, this file cannot be edited with a text editor. To define and manage user profiles, you must use the Windows 95 tools such as Control Panel for setting configuration options, and perform the procedures described in the following sections.

---

In the Windows PROFILES directory, a folder is created for each user that has a profile on that computer. Each user folder under PROFILES contains the following:

n

USER.DAT contains the user portion of the Registry

n

USER.DA0 contains the backup for USER.DAT

n

The Desktop folder is the contents of Desktop

n

The Recent folder is the contents of the Documents option on the Start menu

n

The Start Menu folder is the contents of the Start menu, and includes the Programs folder

#### [How Do User Profiles Work?](#)

Windows 95 stores user profiles in the Windows 95 Profiles folder of the computer. When user profiles are enabled, Windows 95 automatically creates a separate user profile for each user who logs onto the computer. In addition, on Windows NT or NetWare networks, copies of user profiles are maintained on the server. Windows 95 automatically synchronizes the copies of these profiles each time the user logs on and logs off the system.

Each time the user logs on, Windows 95 searches the Registry under the following key for that user's user profile:

Hkey\_Local\_Machine\Software\Microsoft\Windows\Current Version  
—\Profile List

When the user logs on, Windows 95 first checks for the user profile on the on the server and on the local computer. Windows 95 copies the latest version locally for use during the current session, and loads the settings in this local copy into the Registry. If no local user profile exists, Windows 95 copies the server version to the local computer. If no profile is found, Windows 95 creates a new user profile on the local computer using default settings.

Both the local and network copies of the user profile are automatically updated with current settings when the user logs off.

#### [Enabling User Profiles](#)

---

You can enable user profiles after Windows 95 is installed, either individually or for multiple computers.

An administrator can avoid having to go to each computer to enable user profiles by creating a system policy that can be downloaded automatically when the initial Windows 95 installation is complete.

[To enable user profiles centrally on multiple computers](#)

n

Create a system policy file with user profiles enabled. Place this file in the

appropriate network location for automatic downloading when the user logs on.

For more information, see "System Policies Overview" later in this chapter.

[To enable user profiles on an individual computer after setup](#)

1. In the Passwords option in Control Panel, click the User Profiles tab.
2. Click the option named Users Can Customize Their Preferences And Desktop Settings.

===={ewc msdn cd, EWGraphic, x0n 1 /a "psN.bmp"}

3. Check the options for User Profile Settings that describe what should be included as part of the user profile. Then shut down and restart the computer.

---

Inclu Desktop  
de shortcut  
deskt s and  
op the  
icons Network  
and Neighbo  
Netw rhood  
ork are  
Neigh included  
borho .  
od

Inclu Custom

de settings  
Start for the  
menu Start  
and menu  
progr and the  
am related  
group program  
s groups  
are  
included

.

[To disable user profiles on a local computer](#)

n

Click the User Profiles tab in the Passwords option in Control Panel. Then

select the option named All Users Of This PC Use The Same Preferences And Desktop Settings.

After user profiles are enabled on a computer, each time a user logs onto that computer, Windows 95 creates a new user profile, or uses an existing user profile to define settings for the desktop, network, and applications.

When the user logs off, Windows 95 saves the local copy of the user profile, then copies the local profile to the user's network directory on the server. Each time the roving user logs on from a new computer, Windows 95 looks on the local computer and then in the specific user's network directory on the server for the most recent copy. If the network copy is more recent, it is copied locally. If the local copy is more recent, then the local profile is copied to the server at this time. That is, when the user logs on, Windows 95 synchronizes copies in both locations; when the user logs off, Windows 95 copies the local version to the network directory.

---

Tip—— If you include Desktop icons in your user profile, only the shortcuts (icons that represent links) will be available when you log onto the network from another computer. Actual files and folders on your desktop are part of your local profile only.

---

The following section describes how to set up user profiles on a Windows NT or a Novell NetWare network. In addition to the support for user profiles on Windows NT or NetWare networks, other network vendors also can include support for home directories in their 32-bit network providers for Windows 95.

You can use user profiles with Windows 95 on a Windows NT network if the computer is configured to use Client for Microsoft Networks.

---

Note — Windows 95 does not use the PROFILES directory on a Windows NT server; that directory is used only for Windows NT profiles.

---

#### [To set up user profiles for a Windows NT network](#)

1. For each computer, make sure that user profiles are enabled, as described in the previous section. Also, ensure Client for Microsoft Networks is selected as the Primary Network Logon client.
2. On the Windows NT server, ensure each user is properly set up and has an assigned home directory on the Windows NT network. (Windows NT administrators can use the User Manager tool to create this directory.)

When the computer is started for the first time after user profiles are enabled, Windows 95 automatically places the related user profile files on the local computer. When the user logs off, Windows 95 automatically places an updated copy of the user profile in the user's assigned home directory on the Windows NT network, in the following path.

\

You can use user profiles with Windows 95 on a NetWare network if the computer is configured to use Microsoft Client for NetWare Networks.

When a user account is created on a NetWare server, a subdirectory of the MAIL directory is automatically created for that user. Windows 95 uses this directory to store user profiles.

#### [To set up user profiles for a Novell NetWare network](#)

1. For each computer, make sure that user profiles are enabled, as described in the previous section. Also, ensure Client for NetWare Networks is selected as the Primary Network Logon client.

## 2. Ensure each user has an established Mail directory.

When the computer is started for the first time after user profiles are enabled, Windows 95 automatically places the related user profile files on the local computer. When the user logs off, Windows 95 automatically places an updated copy of the user profile in the user's assigned Mail directory on the NetWare network, as indicated in the following. (The user's 8-digit ID can be determined using the NetWare SYSCON utility.)

H \sys\mail\

In Windows 95, you can create mandatory user profiles for use on Windows NT or NetWare networks. This is done by creating a USER.DAT file with the settings you want, and then saving it as USER.MAN and placing it in the network directory for each user you want to use that profile. The network directory is either the user's home directory (on a Windows NT network) or mail directory (on a NetWare network). This makes the entire profile mandatory.

If USER.MAN is present when the user logs on, Windows 95 uses this mandatory copy to load settings into the Registry, rather than any previous local user profile. Even if the user makes changes manually to the desktop configuration during the work session, these changes are not saved to the master copy in the user's network directory when the user logs off.

Network administrators can take advantage of this feature to create a standard user profile for each computer and ensure it is implemented at every logon.

### [To create a mandatory user profile that remains constant](#)

1. Enable user profiles. (See "Enabling User Profiles" earlier in this chapter.)
2. From any computer running Windows 95, customize the desktop as you plan to have it for the mandatory user profile.
3. Copy the required files for the user profile to the home directory for Windows NT or to the Mail directory for NetWare, as described in "User Profiles Overview" earlier in this chapter.
4. Rename USER.DAT to USER.MAN.

Notice that this requires a network administrator to copy the required files to each user's network directory. Windows 95 does this automatically for normal user profiles, but not for a mandatory user profile.

---

Important — System administrators should make some decisions about the default set of system policies before installing Windows 95. For information, see Part 1, “Corporate Planning Guide.”

Also, you do not need to use a 32-bit, protected mode client to take advantage of system policies. However, if you want to define user settings, you must enable user profiles.

---

System policies offer a powerful mechanism that network administrators can use to increase control and manageability of desktops across the enterprise. With system policies, administrators can do the following:

n

Restrict access to options in Control Panel

n

Restrict what users can do from the desktop

n

Customize certain parts of the desktop

n

Configure certain network settings

For example, an administrator might preset a user's environment so that the MS-DOS Prompt or unapproved applications are not available. Administrators can choose from the set of system policies offered by Windows 95 or create custom system policies.

The system policy entries you set through System Policy Editor are reflected in the policy file (CONFIG.POL), which overwrites default USER.DAT and SYSTEM.DAT settings in the Registry when the user logs on.

n

Desktop settings modify the Hkey\_Local\_User portion of the Registry,

which in turn defines the contents of USER.DAT. All policy settings affecting USER.DAT are defined for a specific user or for the Default User.

n

Logon and network access settings modify the Hkey\_Local\_Machine key-

in the Registry, which in turn defines the contents of SYSTEM.DAT. All policy settings affecting SYSTEM.DAT are defined for a specific computer or for the Default Computer.

*{ewc msdncd, EWGraphic, x0n 2 /a "psN.bmp"}*

The following files are required to take advantage of system policies:

n

These files must be installed from ADMINTOOLS\APPTOOLS\POLEDIT-

to run System Policy Editor: ADMIN.ADM, POLEDIT.EXE, and POLEDIT.INF.

ADMIN.ADM is placed in the Windows INF directory to provide the template to use with System Policy Editor as the source for creating a CONFIG.POL file. Any custom templates that you create also use the .ADM filename extension.



# n

To take advantage of group policies, GROUPOPOL.DLL must be placed in the Windows SYSTEM directory of each client computer. In addition, some Registry changes must be made on each computer in order to use GROUPOPOL.DLL, as described in "System Policy Editor" later in this chapter.

# n

CONFIG.POL, in a secure network location, is the policy file that contains all entries for both user and computer settings.

---

Important — System policies are based on the content of the Registry and cannot be edited with a text editor. To define and manage system policies, you must use System Policy Editor and other supporting tools, following the procedures described in this section.

However, the template files used by System Policy Editor can be edited by a text editor, as described later in this chapter.

---

### [How Do System Policies Work?](#)

When the user logs on, the Windows 95 logon process checks the user's configuration information for the location of the policy file, and then downloads the policies and copies the information into the Registry using the following process:

1. Windows 95 checks for a user policy to match the user name. If one exists, Windows 95 applies the user-specific policies and then applies the computer policies as described in the next step. Group policies are not applied when there is a policy for a specific user. If no specific user policy is available, Windows 95 applies the Default User policies. If group policies are used, then Windows 95 checks to see if the user is registered as a member of any groups. If so, group policies are downloaded in order from the lowest priority group to the highest priority group. For all groups the user belongs to, all group policies are processed. The group with the highest priority is processed last, so any settings in that group's policy file are applied that differ from those in lower priority

groups. The settings downloaded in step 1 are copied into the USER.DAT portion of the Registry.

2. Windows 95 checks for a computer policy to match the computer name. If one exists, Windows 95 applies these computer-specific policies to the user's desktop environment. If a policy for that computer name doesn't exist, Windows 95 applies the default computer policies. This data is copied into the SYSTEM.DAT portion of the Registry.

By default, Windows 95 automatically attempts to download computer and user policies from the NETLOGON directory on a Windows NT server or the PUBLIC directory on a NetWare server. This default location can be overridden in a policy file setting. If no server is present, Windows 95 uses the settings currently on the computer.

You can only take advantage of user settings in system policies if the target computer has user profiles enabled, as described earlier in this chapter. In System Policy Editor (as described later in this section), the property sheet for Default User is used to define the default policies in the following basic areas:

#### Control Panel.

Set policies to prevent the user from accessing Control Panel features. This would prevent users from making changes such as changes to network, password, or system settings that can cause problems.

#### Desktop.

Set policies to use standard wallpaper and color schemes.

#### Network.

Set policies to provide restrictions to file and printer sharing.

#### Shell.

Set policies to customize folders on the desktop and to restrict changes to the user interface. It is recommended that administrators add a few key restrictions for most users. (The recommended CONFIG.POL file is discussed later in the chapter.)

#### System.

Set policies to restrict the use of Registry editing tools, applications, and MS-DOS-based applications. This is required to help prevent users from inadvertently using these tools or applications.

These policies can be applied to the default user, to specific named users, or to groups of users. The settings for each of these categories are described in “System Policy Settings Summary” later in this chapter.

#### Property sheet for Default User

`{ewc msdn cd, EWGraphic, x0n 3 /a "psN.bmp"}`

System Policy Editor can be used to define settings for the Default Computer (the policies used when any new user logs onto the local computer that doesn't have individual policies assigned). System Policy Editor can also be used to define policies for specific, named computers.

Computer settings in system policies prevent users from modifying the hardware and environment settings for the operating system, ensuring that Windows 95 starts up in a predictable way. You can set options to restrict access to computer-specific system and network features, as described in “System Policy Settings Summary” later in this chapter.

#### Policy sheet for Default Computer

`{ewc msdn cd, EWGraphic, x0n 4 /a "psN.bmp"}`

#### System Policy Editor

---

Caution—— System Policy Editor is a powerful tool; its use should be restricted to network administrators only. To avoid unauthorized use, do not install this tool on users' computers, and restrict access to the source files, so that users cannot install this tool.

---

System Policy Editor is the tool administrators use to create system policies. With System Policy Editor you can do the following:

n

Set entries for the default computer and user policy entries (using the

Default Computer and Default User icons). This creates a default policy file for all users and computers, which is downloaded at logon.

# n

Create entries for individual users, individual computers, or groups of users (through the Edit menu, by clicking Add New User, Add Computer, or Add Group). By default, these include the policy entries you defined for Default User and Default Computer.

# n

Specify whether and in what manner you want policies downloaded from a centralized server or specify whether you want to have policies downloaded from other specific locations for all or certain types of users.

This section describes how to install System Policy Editor, and how to use it to edit the Registry or to create system policies.

System administrators can install and use System Policy Editor from the ADMIN folder on the Windows 95 compact disc.

#### [To install System Policy Editor](#)

1. In the Add/Remove Programs option in Control Panel, click the Install/Uninstall tab.
2. Use the Install Program wizard to connect to the Windows 95 compact disc. You will find the System Policy Editor in the ADMIN\APPTOOLS\POLEDIT directory.

#### [To run System Policy Editor](#)

# n

From the Start menu, choose Programs, then Accessories, and then

System Tools. Click System Policy Editor.

Or

In the Start menu, click Run, and type *poledit*

To use group policies, you must install that capability on each computer running Windows 95, either when you install Windows 95 using a custom setup script, or by using the Add/Remove Programs option in Control Panel.

[To set up capabilities for group policies using Add/Remove Programs](#)

1. In the Add/Remove Programs option in Control Panel, click the Install/Uninstall tab, and then click the Install button, and then click the Next button.
2. Type the path to the System Policy Editor files that are provided in the ADMIN\APPTOOLS\POLEDIT directory on the Windows 95 compact disc, and then click OK.

{ewc msdn cd, EWGraphic, x0n 5 /a "psN.bmp"}

3. In the PolEdit window, double-click the icon for GROUPOPOL.REG.

This places the GROUPOPOL.DLL file in the Windows SYSTEM directory on the client computer and makes the required Registry changes.

You can use System Policy Editor in two different modes: Registry mode and Policy File mode:

# n

In Registry mode, you can edit the Registry of the local or remote

computer. Using this mode, you directly edit the contents of the Registry and changes are reflected immediately. For more information about editing the

Registry for a remote computer, see Chapter 16, "Remote Administration."

n

In Policy File mode, you can create and modify system policy files (.POL)

for use on other computers. In this mode, the Registry is edited indirectly.  
Changes are reflected only after the policy is downloaded at user logon.

[To use System Policy Editor in Registry mode](#)

n

From the File menu in System Policy Editor, click Open Registry. Then you

can click the appropriate User or Computer icon, depending on what part of the  
Registry you want to edit. After you make changes, you must shut down and  
restart the computer for the changes to take effect.

*System Policy Editor in Registry mode*

*Notice that the title bar shows "Local Registry"*

*{ewc msdn cd, EWGraphic, x0n 6 /a "psN.bmp"}*

---

*Important* — Use Registry mode only when direct changes to the Registry are  
required. The recommended method for changing most system settings is to use the  
Control Panel options and other tools provided with Windows 95, rather than directly  
editing the Registry.

---

[To use System Policy Editor in Policy File mode](#)

# n

From the File menu, click New or Open to open a policy file.

## System Policy Editor in Policy File mode

The title bar shows "Untitled" if you haven't yet saved a new policy file, or it displays the policy filename

{ewc msdncd, EWGraphic, x0n 7 /a "psN.bmp"}

When you edit settings in Policy File mode, clicking a Registry option sets one of three possible states: checked, cleared, or filled. Each time you click an option, the display cycles to show the next possible state. This is different from clicking a standard check box, which only set an option to on or off.

---

Caution—— When you define policy options, make sure you have set the proper state for the option. If you set an option by checking it, and then change your mind and clear the option (rather than leaving it filled), you can inadvertently destroy the user's previous configuration.

For example, you might check the option to specify Microsoft Client for NetWare Networks, and then click again to clear that option. When the user logs on and the policy is downloaded, this setting would wipe out the user's current configuration that specifies Client for NetWare Networks.

If you decide not to set a particular policy option, make sure that option is filled (grayed), so that the user's previous configuration for that setting will be used.

---

The following summarizes the three possible states for options in a policy file.

---

```
Ch {ewc
ec msdncd,
ke EWGraphic,
d x0n 8 /a
  "psN.bmp"}
```

This policy  
will be  
implemented  
, changing  
the state of

the user's computer to conform to the policy when the user logs on. If the option was previously checked the last time the user logged on, Windows 95 makes no changes.

```
Cl {ewc  
ea msdncd,  
re EWGraphic,  
d x0n 9 /a  
"psN.bmp"}
```

The policy will not be implemented . If it was implemented previously (either through a policy setting or the user's configuration settings), the previously specified settings are removed from the Registry.

```
Fill {ewc  
ed msdncd,  
EWGraphic,  
x0n 10 /a  
"psN.bmp"}
```

The setting



is  
unchanged  
from the last  
time the user  
logged on,  
and  
Windows 95  
will make no  
related  
modification  
s to the  
system  
configuration  
.

The filled  
state  
ensures that  
Windows 95  
provides  
quick  
processing  
at system  
startup,  
because it  
does not  
need to  
process  
each entry  
each time a  
user logs on.

If a setting requires additional information, then an edit control appears at the bottom of the property sheet so that you can define the additional information. For example, if Wallpaper is checked in the Desktop settings, the following dialog box appears.

*{ewc msdncd, EWGraphic, x0n 11 /a "psN.bmp"}*

A few policies may not behave as expected if the box is cleared. Usually, if a policy had been checked, and you no longer want to enforce it, you should clear the box to undo the policy. However, policies might behave differently from the way you expect in the cases:

n

The policy setting contains an edit box that must be completed (as opposed to a simple check box)

n

The policy setting can also be set by users using Control Panel

For these policies, you should consider filling (graying) the check box when you no longer want to enforce them, rather than clearing the check box.

Following is a list of such policies, and how they behave.

Wal  
lpa  
per

n

Checking it  
forces the  
specified  
wallpaper to  
be used

n

Clearing it

removes  
the  
wallpaper  
(the user  
will not  
have any  
wallpaper)

n

Filling it  
means that  
the user  
can choose  
wallpaper in  
the Display  
option in  
Control  
Panel

Client  
for  
Net  
Ware  
Net  
works:

n

Checking it  
Pre sets the  
Preferred  
Server  
Server

n

Clearing it  
deletes the  
Preferred  
Server from  
the  
computer's  
Registry

n

Filling it  
means that  
the user  
can specify  
the  
Preferred  
Server in  
the Network  
option in  
Control  
Panel

Client  
for  
Microsoft  
Networks:  
Checking it  
Do sets the  
main Windows  
NT Logon  
Domain

n

n

Clearing it  
deletes the  
Domain  
setting from  
the  
computer's  
Registry

n

Filling it  
means that  
the user  
can specify  
the Domain  
in the  
Network  
option in  
Control  
Panel

Client  
for  
Microsoft  
Network

n

works: Checking it  
Works: sets the  
Workgroup  
Workgroup for that

computer

n

Clearing it  
deletes the  
Workgroup  
setting from  
the  
computer's  
Registry

n

Filling it  
means that  
the user  
can specify  
the  
Workgroup  
in the  
Network  
option in  
Control  
Panel

### *Preparing to Use System Policies on the Network*

---

System policies can be downloaded from the network in two ways — manually or automatically.

# n

Manual downloading is an option for network administrators to point

Windows 95 to a special location from which to download a .POL file.

# n

Automatic downloading means Windows 95 automatically looks in the

proper directory on the network to locate the CONFIG.POL file and downloads its policy settings in the Registry of the local computer at logon.

---

Note — Automatic downloading is supported for Windows NT and NetWare networks in the first release of Windows 95. The 32-bit, protected-mode network clients subsequently made available for other networks may also provide support for automatic downloading.

Also, automatic downloading only works if the filename for the policy file is CONFIG.POL.

---

This section provides more information about how to prepare for using system policies on the network.

The following procedures describe how to prepare for automatic downloading of system policies on Windows NT and NetWare networks if the computer was not already set up for system policies during Windows 95 installation.

If you created a .POL file, Windows 95 automatically downloads this file from the NETLOGON directory on a Windows NT network or from the PUBLIC directory on a NetWare network.

[To set up for automatic downloading on Windows NT networks](#)

1. In the Network option in Control Panel, make sure that Client for Microsoft Networks is specified as the Primary Network Logon client, and that the domain-

is defined. For more information, see Chapter 11, "Logon, Browsing, and Resource Sharing."

2. Create a policy file to be downloaded and save it in the following location:

—— \\primary domain controller\netlogon\config.pol

#### [To set up for automatic downloading on NetWare networks](#)

1. In the Network option in Control Panel, make sure that Microsoft Client for NetWare Networks is specified as the Primary Network Logon client, and that a Preferred Server is specified on the property sheet for the network client. For more information, see Chapter 9, "Windows 95 on NetWare Networks."

2. Create a policy file to be downloaded and save it in the following location:

—— \\                      \sys\public\config.pol

For NetWare networks, the client computers must be running Microsoft Client for NetWare Networks. If the client computers are using NETX or VLM, then policies must be downloaded manually, as described in the following section.

---

**Important** —— Be sure to place system policy files on the user's preferred server. Policy files are not available if they are stored on other NetWare servers or on computers running File and Printer Sharing for NetWare Networks.

---

If you use the Remote Update policy, you can configure Windows 95 to manually download policy files (even when they are stored locally) by indicating a separate network or local computer location. Manual downloading overrides automatic downloading and gives network administrators the flexibility to determine where a user's policies should be stored.

You must set up the individual computers to allow manual downloading of system policies.

It's possible to set up each computer for manual downloading individually, but this is a time-consuming alternative. If possible (that is, when client computers use 32-bit, protected-mode network clients), it's better to set up each computer for automatic downloading, and then use the Remote Update policy to point specific computers to other servers as appropriate for your environment and users.

However, for real-mode network clients such as Novell NETX or VLM, you must enable manual downloading on each computer. After you configure the client computer, the system policy file will be downloaded the next time the user logs on.



### [To configure a computer for manual downloading of policies](#)

1. In System Policy Editor, click Open Registry from the File menu, and then click Local Computer.

— Or —

From the File menu, click Connect and specify which computer you want to configure remotely. Then click the Computer icon for that computer.

Note — The remote computer must be running the Microsoft Remote Registry service, Remote Administration must be enabled, and user-level security must be enabled.

2. Under Network, click Update, and click Remote Update so that this policy is checked.

3. In the Settings for Remote Update, click Manual, and type the UNC path and filename for the system policies file you want to download. Be sure this file exists in the location you specify. (Otherwise, an error will result.)

Optionally, you can check whether to display error messages or use load balancing.

Note — If the client computer uses NETX or VLM, the policy file must be placed on a mapped drive.

*Be sure to type the UNC path and the filename in the Path For Manual Update box*

*{ewc msdncd, EWGraphic, x0n 12 /a "psN.bmp"}*

On Windows NT or NetWare networks where you are using automatic downloading of policies, you can set a system policy to allow manual downloading. This option works only after system policies have been downloaded automatically the first time after Windows 95 is installed. The first automatic downloading includes information in the system policies that defines the location to be used subsequently for manual downloading.

### [To define the location of policies for manual downloading](#)

1. From the File menu in System Policy Editor, click CONFIG.POL and click the Default Computer icon.

2. Click Network, then click Update, and complete the procedure in steps 2 and 3 in the previous procedure.

Windows 95 automatically downloads system policies from the NETLOGON directory of a Windows NT server. On large networks, when thousands of users log on at the same time, all accessing the same policy file, you could potentially experience slow network performance.

To avoid a bottleneck, Windows 95 offers load balancing on Windows NT networks. With load balancing enabled, policies are taken from the logon server (which can be a domain controller or a backup domain controller) rather than the primary domain controller. This spreads the load over a number of servers but does require that an administrator replicate the policy file on each server.

[To enable load balancing for policy downloading](#)

n

From System Policy Editor, check the Remote Update option, as shown in

the previous procedure. Then check the Load Balance option in the Settings For Remote Update box.

If you want to use load balancing, make sure it is enabled on each client computer. Also, make sure you have a current policy file on each server that will potentially participate in load balancing, including all Windows NT domain controllers and servers. One convenient way to implement load balancing is to set this policy in the CONFIG.POL file that is on the primary domain controller. As each client computer downloads this policy, it will then subsequently look for CONFIG.POL on the logon server.

### Creating System Policies

---

This section describes procedures for creating system policies.

To take advantage of automatic downloading discussed earlier, it's best to create a policy file containing both user, computer, and group entries to reside in the NETLOGON directory of a Windows NT server or the PUBLIC directory of a NetWare server. Based on the client selected, Windows 95 automatically looks in one of these locations to pull down your newly created system policy.

[To view or edit default system policies](#)

1. In System Policy Editor, click New from the File menu to create a new policy file.

—A new file appears as "Untitled" in the title bar.

—{ewc msdn cd, EWGraphic, x0n 13 /a "psN.bmp"}

2. Double-click either the Default User icon to define the default settings for user-specific policies. Double-click the Default Computer icon to define the settings for

computer-specific policies.

3. Click the policies you want to put in place.

Clicking a policy places a check mark next to it. Clicking it again clears the check mark.

The following sections describe procedures for modifying the default system policies to do the following:

# n

Creating policies for individual users or computers

# n

Creating group policies

This section describes how to create a system policy for a single user or computer.

---

*Tip*—— To reduce the management load, minimize the number of specific user and specific computer entries in system policy files. Consider first creating one standard system policy for all users by editing default settings, and then create settings for individuals on an exception basis. For an example, see the STANDARD.POL example in “System Policy Examples.”

---

*To create system policies for a new user or computer*

1. From the Edit menu in System Policy Editor, click Add User or Add Computer, and then type the name of the user or computer to be added.
2. Check or clear policies by clicking the policy name.

An icon is added in System Policy Editor for each computer, user, or group that you add.

### [To edit existing system policies](#)

n

In System Policy Editor, click the icon of the user or computer with policies you want to edit. Then check or clear policies by clicking the policy name.

Group policies are supported for both Windows NT and NetWare networks. Creating policies for groups is similar to the process described in the previous section.

You must first ensure that GROUPPOL.DLL, which supports group policies, has been successfully installed on each client computer as described in “System Policy Editor” earlier in this chapter.

Notice, also, that you cannot create new groups using System Policy Editor; you can only use existing groups on the NetWare or Windows NT network. To create a new group, use the tools provided with your network administrative software.

### [To create system policies for groups](#)

1. From the Edit menu in System Policy Editor, click Add Group. You can either type in the name of the group or browse to find the group.

— Notice that the Browse button appears so that you can browse for groups if user-level security is enabled.

2. Check or clear policies by clicking the policy name.

Group policies are downloaded in order from the lowest priority group to the highest priority group. All groups are processed. The group with the highest priority is processed last, so any of its settings are applied that differ from those defined in the other group policies. You can use one policy file for each group, even if some of the client computers in the group don't have support installed for group policies. Client computers that aren't configured for using group policies will just ignore group policy files.

---

**Important** — If a policy exists for a specific named user, then group policies are not applied for that user.

---

### To set priority levels for groups

1. Open the CONFIG.POL file. Add groups as appropriate, and specify the policy settings you want.
2. Select Options, and click Group Priority. Use the Move Up and Move Down buttons to place each group into its relative priority as indicated in the following illustration.

====={ewc msdn cd, EWGraphic, x0n 14 /a "psN.bmp"}

The administrator can define five system policies to create a custom desktop. These policies use custom folders, created by the administrator, which contain the specific settings for the customized desktop. The following list summarizes the policies used to create a custom desktop.

---

Custo Shortcuts  
m that  
Progr appear in  
ams the  
Folde Programs  
r group on  
the Start  
menu

Custo Shortcuts  
m to  
Netw resources  
ork that  
Neigh appear in  
borho Network  
od Neighbor  
hood,  
including  
shortcuts  
to shared  
printers  
and files

Custo Shortcuts  
m that  
Deskt appear  
op on the  
Icons desktop

Custom Shortcuts  
and other  
Start menu options  
that appear  
on the  
Start  
menu, as  
defined  
using the  
Taskbar  
command  
from the  
Settings  
menu

Custom Programs  
or batch  
Start files that  
appear in  
the  
Startup  
group on  
the Start  
menu

### [To create a custom desktop using system policies](#)

1. Define the contents of the custom desktop by creating custom folders and placing them in a central location, as described in the following procedure.
2. In the system policy file, check the related policies and specify the path to the folders' location.

===={ewc msdncd, EWGraphic, x0n 15 /a "psN.bmp"}

3. If you checked the Custom Programs Folder policy, also check the Hide Start Menu Subfolders policy to enable it.

— Otherwise, multiple Programs entries will appear on the user's Start menu — one for the location of the Custom Program Folder, and one for the default location (the Windows Profiles\UserName\Start Menu\Programs directory).

If the custom folders will not be stored in the directories where Windows 95 automatically looks for custom folders, then you must specify another location when you specify the Custom Folder policies. For example, you might want to create these folders where the system policy files are located on the server.

The following list shows the default locations where Windows 95 looks for custom folders.

n

Custom Program folders:

c:\windows\profiles\username\start menu\programs

n

Custom desktop icons:

c:\windows\profiles\username\desktop

n

Custom Startup folder:

c:\windows\profiles\username\start menu\programs\startup

n

Custom Network Neighborhood:

c:\windows\profiles\username\nethood

# n

Custom Start menu:

c:\windows\profiles\username\start menu

*To define custom folders for use with policy files*

1. Create and place the custom folders in a central location where users have Read access.

Any names can be used for the actual folders you create. Windows 95 uses the path defined for the related policy to find the folder.

*Note* To prevent accidental removal or unauthorized changes, custom folders should be stored in directories where users are restricted to Read-Only access.

2. Place the custom set of files and shortcuts you want in each folder.

# n

Any kinds of files can be placed in the custom folders — executables files, batch files, and documents.

# n

For shortcuts, make sure that the path specified in the Target box on the Shortcut property sheet is a UNC name, rather than a mapped directory. Otherwise, the users who will access resources using these shortcuts must have the same drives mapped in their logon scripts.

---

*Caution* Do not place folders in the custom Network Neighborhood. Windows 95 does not support this feature, and unpredictable results can occur.

---



## System Policy Examples

---

This section provides some examples for how you might use specific policies in your organization.

To help network administrators who are beginning to implement system policies, here are two examples of recommended configurations. STANDARD.POL, a recommended policy file for defining a standard desktop, and MAXIMUM.POL, the recommended policy file for maximum security and control, are included with the WINDOWS 95 RESOURCE KIT utilities. You can use these policy files "as is" or with further customization.

The following illustrations show the impact of implementing controls defined in system policies such as STANDARD.POL and MAXIMUM.POL:

n

When a user tries to access a disabled Control Panel, a message from the

administrator such as the following appears to indicate that the Network option in Control Panel has been disabled.

===== {ewc msdncd, EWGraphic, x0n 16 /a "psN.bmp"}

n

When a user tries to access disabled file sharing controls, a property

sheet such as the following appears. Notice that after sharing controls are turned off, an extra Sharing tab is no longer available to the user.

===== {ewc msdncd, EWGraphic, x0n 17 /a "psN.bmp"}

The following sections summarize the settings in these sample policy files.

The STANDARD.POL system policy file is an example of settings that allow administrators to implement a recommended level of control over users' desktop functionality while allowing specific corporate customization. STANDARD.POL

includes the following recommended restrictions and additions.

STANDARD.POL Restrictions

Restrict  
Network  
Control Panel  
access<sup>1</sup>

Restrict Printer  
Control Panel  
access<sup>1</sup>

Restrict  
System Control  
Panel access<sup>1</sup>

Restrict  
Passwords  
Control Panel  
access<sup>1</sup>

Hide Settings  
page of  
Display Control  
Panel (users  
can customize  
the  
environment  
but cannot use  
advanced  
display control  
settings)

Disable File  
and Printer  
Sharing<sup>2</sup>

Disable  
Registry  
Editing tools<sup>2</sup>

Disable Dial-  
Up  
Networking<sup>2</sup>

---

1 Restricting these four Control Panels completely is highly recommended; average users should have no need to modify these settings.

2 Disabling these features is a standard safety precaution for most corporate environments.

---

STANDARD.POL Additions

Add Custom  
Desktop  
Icons1

Add Custom  
Programs  
Folder1

Add Custom  
Startup  
Folder1

Add Custom  
Network  
Neighborhood1

Add Custom  
Start Menu1

Enable Hide  
Start Menu  
Subfolders

Enable User  
Profiles (users  
can change  
background  
colors, fonts,  
and so on)

Enable User-  
level Security

Add Logon  
Banner

Require  
Validation by  
Network for  
Windows  
Access

Require  
Minimum  
Windows  
Password  
Length (a

standard  
corporate  
security  
measure)

Determine  
Logon Domain  
and Workgroup  
for Microsoft  
Network Client  
– Or –  
Determine  
Preferred  
Server for  
NetWare Client

---

1 The five Add Custom options provide an opportunity for corporate customization, such as defining a program group containing corporate applications, applications that run at system startup, a custom Network Neighborhood, or a custom Start menu with standard choices.

---

To implement the custom settings specified in this policy file, make sure you define the UNC path addresses for the custom settings. Also be sure to place the customized folders for Programs, Startup, Network Neighborhood, and Start Menu in a secure network location, as described in “Managing Custom Folders for Use with System Policies” earlier in this chapter.

To customize STANDARD.POL, you must also specify this additional information:

n

For User-Level Access Control, specify the authenticator name and type.

n

For Logon Banner, type the text that is to appear when the user logs onto the network.

# n

For logon validation for the network client, specify the domain name or preferred server.

# n

Define the workgroup name and password length, depending on your administrative guidelines.

The system policy defined in MAXIMUM.POL is useful if you have an environment where you need to have as much control as possible over the users' computing environment. The following sample policy file will assist you in establishing the highest possible level of control.

MAXIMUM.POL is based on the STANDARD.POL file, as described in the previous section, with the following additional restrictions.

### MAXIMUM.POL Restrictions

Remove Run  
command from  
the Start  
Menu1

Remove  
Folders from  
Settings on  
Start Menu2

Remove  
Taskbar from  
Settings on  
Start Menu

Remove Find

command from  
the Start  
Menu<sup>3</sup>

Hide All Items  
on the  
Desktop<sup>4</sup>

Disable Shut  
Down  
command

- 
- 1 This prohibits users from running applications using the Run command in the Start menu.
  - 2 This prevents users from making any changes to Control Panel or Printer settings.
  - 3 This prohibits users from searching for files, folders, or computers.
  - 4 This hides all icons on the desktop, providing access only to the Start button, where you can add or control key applications.
- 

### *System Policy Settings Summary*

---

This section summarizes the policy options that can be set with the set of policy options provided by default in Windows 95. These options are determined by a template (ADMIN.ADM), which can be modified as discussed in “System Policy Templates” later in the chapter. You may find it helpful to run System Policy Editor while you study these options.

These policies are described in the order that they appear in System Policy Editor. For each category, the option that appears in bold type must be clicked to display the related policies that can be defined for that category.

When you click the Default User icon in System Policy Editor, a list of Control Panel, desktop, network, shell (user interface), and system settings is provided so that you can predefine or restrict access to settings that will apply when the user logs onto the system.

#### [Restricting Access to Control Panels](#)

The following table describes the system policies you can apply to restrict access to settings in the Display, Network, Printers, System, and Passwords options of Control Panel.

## User Policies for Restricting Access to Control Panel Options

---

### Restrict Display Control Panel

When you check this box, the following system policy options are displayed:

Disa Prevents  
ble access to  
Displ the Display  
ay option in  
Cont Control  
rol Panel,  
Pan displaying  
el an  
explanatio  
n in a  
dialog box.

Hide Hides the  
Back Backgroun  
grou d property  
nd sheet of  
Pag the Display  
e option in  
Control  
Panel.

Hide Hides the  
Scre Screen  
en Saver  
Save property  
r sheet of  
Pag the Display  
e option in  
Control  
Panel.

Hide Hides the  
App Appearance  
eara e property  
nce sheet of  
Pag the Display  
e option in  
Control  
Panel.

Hide Settings page  
Hides the property sheet of the Display option in Control Panel.

### Restrict Network Control Panel

When you check this box, the following system policy options are displayed:

Disable Network Control Panel  
Prevents access to the Network option in Control Panel.

Hide Identification page  
Hides the Identification property sheet of the Network option in Control Panel.

Hide Access Control page  
Hides the Access Control (user level vs. share level) property sheet of the Network option in Control Panel.



## Restrict Passwords Control Panel

When you check this box, the following system policy options are displayed:

Disa Prevents  
ble access to  
Pass the  
word Passwords  
s option in  
Cont Control  
rol Panel.  
Pan  
el

Hide Hides the  
Cha Change  
nge Passwords  
Pass property  
word sheet of  
s the  
Pag Passwords  
e option in  
Control  
Panel.

Hide Hides the  
Rem Remote  
ote Administrat  
Admi ion  
nistr property  
ation sheet of  
Pag the  
e Passwords  
option in  
Control  
Panel.

Hide Hides the  
User Profiles  
Profil property  
es sheet of  
Pag the  
e Passwords  
option in  
Control  
Panel.

### Restrict Printers Settings

Hide Gen eral and Details property sheets for this Printer.  
Pages

Disable Deletion of current installed printers.  
Printers

Disable Addition of new printers.  
of Printers

### Restrict System Control Panel

Hide Device Manager property sheet from the System option in Control Panel.

Hide Hardware Profiles property sheet from the System option in Control

Panel.

Hide File System button from the Performance page in the System option in Control Panel.

Hide Virtual Memory button from the Performance page in the System option in Control Panel.

### [Defining User Policies for Desktop Settings](#)

Within this category of options, you can predefine settings or restrict users from defining wallpaper and color scheme settings, as listed in the following table:

### *User Policies for Wallpaper and Color Scheme Settings*

---

|                |                                                                                              |
|----------------|----------------------------------------------------------------------------------------------|
| Wallpaper Name | When checked, the user will automatically "receive" the specified bitmap as it is downloaded |
|----------------|----------------------------------------------------------------------------------------------|

d at logon.

Tile When  
Wall checked,  
pape the  
r wallpaper  
file will be  
tiled in the  
backgroun  
d of the  
desktop.

Colo When  
r checked,  
Sche the user  
me will  
automatica  
lly see the  
specified  
color  
scheme.

### [Restricting Access to Network Settings](#)

Within this category of options, you can restrict the user's ability to share files and printers. You might typically want to set these policies to apply when File and Printer Sharing services are installed, but you do not want users to change which resources are shared on their computers.

### *User Policies for Restricting Access to File and Printer Sharing*

---

Disa When set,  
ble removes  
File the  
Shar Sharing  
ing property  
Cont sheet from  
rols directories  
in  
Windows  
Explorer.

Disa When set,

|       |             |
|-------|-------------|
| ble   | removes     |
| Print | the         |
| Shar  | Sharing     |
| ing   | property    |
| Cont  | sheet from  |
| rols  | the Printer |
|       | folder.     |

### [Restricting Access to Shell Settings](#)

The following table describes the system policies you can apply to folders and user interface options.

#### *User Policies for Restricting Access to Shell Settings*

|      |             |
|------|-------------|
| Cust | Used to     |
| om   | customize   |
| Prog | the         |
| rams | contents of |
| Fold | the         |
| er   | Program     |
|      | folder. You |
|      | must also   |
|      | type a path |
|      | for the     |
|      | directory   |
|      | containing  |
|      | complete    |
|      | files       |
|      | or .LNK     |
|      | files that  |
|      | define the  |
|      | Programs    |
|      | folder      |
|      | items.      |

|      |             |
|------|-------------|
| Cust | Used to     |
| om   | customize   |
| Desk | desktop     |
| top  | icons. You  |
| Icon | must also   |
| s    | type a path |
|      | for the     |

directory  
containing  
complete  
files  
or .LNK  
files that  
define the  
Desktop  
shortcuts.

Hide Check this  
Start when you  
Menu use a  
user custom  
Startup Programs  
older folder.  
s Otherwise,  
two  
Programs  
entries will  
appear on  
the user's  
Start  
menu.

Custom Used to  
customize  
Startup the  
contents of  
the Startup  
folder. You  
must also  
type a path  
for the  
directory  
containing  
complete  
files  
or .LNK  
files that  
define the  
Startup  
folder  
items.

Custom Used to  
customize

Netw the  
ork contents of  
Neig Network  
hbor Neighborh  
ood ood. You  
must also  
type a path  
for the  
directory  
containing  
complete  
files  
or .LNK  
files that  
define the  
Network  
Neighborh  
ood items.

Cust Used to  
om customize  
Start what is  
Men listed on  
u the Start  
menu. You  
must also  
type a path  
for the  
directory  
containing  
complete  
files  
or .LNK  
files that  
define the  
Start menu  
items.

---

Rem Prevents  
ove access to  
Run the Run  
com command  
man from the  
d Start  
menu;

displays an  
explanatio  
n in a  
dialog box.

Rem Prevents  
ove access to  
Fold any item  
ers listed  
Fro under  
m Settings on  
Setti the Start  
ngs menu;  
On displays  
Start explanatio  
Men n in a  
u dialog box.

Rem Prevents  
ove access to  
Task the Task  
bar Bar item  
Fro listed  
m under the  
Setti Settings on  
ngs the Start  
on menu;  
Start displays  
Men explanatio  
u n in a  
dialog box.

Rem Prevents  
ove access to  
Find any of the  
Com items listed  
man under Find  
d on the  
Start  
menu;  
displays  
explanatio  
n in a  
dialog box.

Hide Prevents  
Driv access to  
es In My



My Computer.  
Computer

Hide Prevents  
Network access to  
Network  
Neighborhood.  
Neighborhood

No Prevents  
Entire access to  
the Entire  
Network Network  
icon in  
Network  
Neighborhood.  
Neighborhood

No Prevents  
Workgroup workgroup  
contents  
from being  
displayed  
in Network  
Neighborhood.  
Neighborhood

Hide Prevents  
All access to  
Items all items  
on the  
Desktop desktop.  
Desktop

Disable Prevents  
Shut the Shut  
Down Down  
command

Command on the Start menu; displays explanation in a dialog box.

Don't Prevent settings from being written to the file system.  
Exit

### [Restricting Access to System Settings](#)

The system policies in this category restrict the use of Registry editing tools, applications, and MS-DOS – based applications. The following table describes the policies you can set within this category.

#### *User Policies Restricting Access to System Settings*

---

Disable Registry Editor; displays an explanation in a dialog box.

Only Prevent users from running any Windows-based application except those that are listed.

Click Show  
to define  
the  
allowed  
application  
s.

Disa Prevents  
ble access to  
MS- the MS-  
DOS DOS  
Pro command  
mpt prompt.

Disa Prevents  
ble users from  
Singl running  
e- MS-DOS  
mod based  
e application  
MS\_ s in MS-  
DOS DOS  
Appli Mode.  
catio  
ns

This section presents a list of the system policy options for settings that apply to the computer, rather than to individual users.

### [Restricting Access to Computer-Specific Network Settings](#)

This category of options includes system policy settings for the following:

# n

Enabling user-level security

n

Logon dialog box settings

n

Client for Microsoft (Windows) Networks settings

n

Microsoft Client for NetWare Networks settings

n

Password settings

n

Dial-Up Networking settings

n

Sharing settings

n

Simple Network Management Protocol (SNMP) settings

n

Update settings for policy downloading

These system policies are applied for the computer (that is, the settings are stored in SYSTEM.DAT), rather than for users. The following table describes the system policies you can set within this category.

Computer Policies Restricting Access to Network Settings

---

|  |       |            |
|--|-------|------------|
|  | User- | When       |
|  | level | checked,   |
|  | Acce  | enables    |
|  | ss    | user-level |
|  | Contr | security   |
|  | ol    | on the     |
|  |       | local      |
|  |       | computer   |
|  |       | through    |
|  |       | pass-      |

through  
logon  
validation  
by a  
Windows  
NT or a  
NetWare  
server.  
You must  
specify  
the server  
and the  
type of  
authenticator for  
validation.

Logo When you  
n check this  
Banner option,  
er you can  
type  
values for  
a caption  
and other  
text to be  
displayed  
in a  
Logon  
banner.

Require When you  
ire check this  
Validation option,  
ation each  
by logon  
Network must be  
ork validated  
for by a  
Windows server  
ows before  
Access access to  
ss Windows

is  
allowed.

---

When checked,  
you can specify  
the name of the  
NetWare network  
server used by  
this computer  
as the first  
server logged  
onto.

When checked,  
supports long  
filenames.

Sets NetWare  
search mode (the  
value is 0  
– 7).

By default,  
when Windows  
NetW 95  
attempts  
to connect  
to a  
NetWare  
server, it  
will first

(silently)  
use the  
user's  
logon  
name and  
password.  
This  
policy  
disables  
that  
behavior.

---

Log If  
on to checked,  
Wind this  
ows computer  
NT can  
participate  
in a  
Windows  
NT  
domain.  
Type the  
name of  
the  
domain. If  
this option  
is  
checked,  
the next  
two  
options  
are also  
available.

Displ If  
ay checked,  
Dom displays a  
ain message  
Logo when the  
n domain  
Valid controller  
ation. has



validated  
user  
logon.

Disable If  
checked,  
Caching no  
ing of caching is  
Domain used for  
ain the  
Password network  
word password.

Workgroup If  
checked,  
p this  
computer  
can  
participate  
in a  
workgroup  
p. Type  
the name  
of the  
workgroup  
p.

Alter If your  
native workgroup  
e p does  
Work not have  
group any  
p computer  
s running  
File and  
Printer  
Sharing  
for  
Microsoft  
Networks  
(that is,  
they all  
run File  
and  
Printer  
Sharing  
for

NetWare), but the computer runs a Microsoft network client, then an Alternate Workgroup must be defined to see Microsoft peer servers in other workgroups. The workgroup specified should include at least one computer running File and Printer Sharing for Microsoft Networks.

---

|            |            |
|------------|------------|
| Hide       | Uses       |
| Share      | asterisks  |
| password   | to replace |
| words that | password   |
| s          | s that     |
| With       | users type |
| Asterisks  | when       |
|            | accessing  |
|            | a shared   |

resource.  
Applies to  
share-  
level  
security  
only; this  
setting is  
on by  
default.

Disa Prevents  
ble saving  
Pass password  
word s.  
Cach  
ing

Requ Requires  
ire that the  
Alph Windows  
anu password  
meric contain a  
Wind combinati  
ows on of  
Pass letters  
word and  
numbers.

Mini Requires  
mum that the  
Wind Windows  
ows logon  
Pass password  
word has at  
Leng least the  
th specified  
number of  
character  
s.

---

Disa Prevents  
ble dial-in  
Dial- connectio  
in ns to the

computer.

Disa Prevents  
ble sharing of  
File files over  
Shari a network.  
ng

Disa Prevents  
ble sharing of  
Print printers  
Shari over a  
ng network.

Com Specifies  
munit one or  
ies more  
groups of  
hosts to  
which this  
computer  
belongs  
for  
purposes  
of  
administra  
tion using  
the SNMP  
service.  
These are  
the  
communiti  
es that  
are  
allowed to  
query the  
SNMP  
agent.

Perm Specifies  
itted IP or IPX  
Man addresses  
ager allowed to  
s obtain

information from an SNMP agent. If this policy is not checked, any SNMP console can query the agent.

Traps for Public Community Specifies

T

r

a

p  
D  
e  
s  
ti

n  
a  
t  
i  
o  
n



or IP

or IPX  
addresses  
of hosts in  
the public  
communit  
y to which  
you want  
the SNMP  
service to  
send  
traps.

If you  
want to  
send  
traps to  
other  
communiti  
es, see  
the  
informatio  
n about  
SNMP in  
Chapter  
16,  
“Remote  
Administr  
ation.”

Inter net Allows  
you to



MIB specify  
(RFC the  
1156) contact  
name and  
location if  
you are  
using  
Internet  
MIB.

Rem Defines  
ote how  
Upda system  
te policies  
will be  
updated.  
When  
checked,  
the  
following  
options  
appear.

Upda Determine  
te s if  
Mod system  
e policies  
are  
download  
ed  
automatic  
ally (the  
default) or  
manually.

Path Specifies  
for the UNC  
Man path and  
ual filename  
Upda for  
te manual  
downloadi  
ng of  
system

policies.

|                       |                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------|
| Display Error Message | When a user logs on, if the system policy file is not available, displays an error message. |
|-----------------------|---------------------------------------------------------------------------------------------|

|              |                                                                                     |
|--------------|-------------------------------------------------------------------------------------|
| Load Balance | For Windows NT networks, allows Windows 95 to look for policy files on that server. |
|--------------|-------------------------------------------------------------------------------------|

### [Restricting Access to Computer-Specific System Settings](#)

This category of options includes system policy settings for the network path for setup and user profiles. The following table describes the system policies you can set within this category.

#### *Computer Policies for System Settings*

---

|                      |                                                   |
|----------------------|---------------------------------------------------|
| Enable User Profiles | When checked, this setting enables user profiles. |
|----------------------|---------------------------------------------------|

|                  |                                 |
|------------------|---------------------------------|
| Network Location | Defines the network location of |
|------------------|---------------------------------|

Pat the  
h Windows  
for 95 Setup  
Wi program  
ndo and files.  
ws You must  
Set also type a  
up UNC path  
for the  
setup  
directory.

Ru Defines  
n applications  
and utilities  
to run at  
logon. Click  
Show to  
specify  
items to  
run.

Ru Defines  
n applications  
On and utilities  
ce to run once  
at logon.  
Click Show  
to specify  
items to  
run.

Ru Defines  
n services to  
Ser run at  
vic system  
es startup.  
Click Show  
to specify  
items to  
run.

### System Policy Templates

---

When you run System Policy Editor, Windows 95 opens the default policy template, containing existing policies that the administrator can enable or modify. A template is

a listing of the possible policies that administrators can use for their environment. By default, this template file is named ADMIN.ADM and is stored in the Windows INF directory.

This section describes how a network administrator can create custom system policy templates (.ADM file) and switch between multiple templates in System Policy Editor. For detailed examples showing how to create custom templates, see the online examples provided with the WINDOWS 95 RESOURCE KIT utilities.

For example, it may be helpful to have system policy settings for corporate-specific applications, such as an in-house database, custom front end or electronic mail package. After a template has been customized, administrators can then load the template and use it to set values in the Registry.

---

Note — If you want to define system policies for applications, the applications must be able to read the Windows 95 Registry.

---

Creating your own template is helpful when you want to define a specific set of Registry settings in your system policies, including settings not definable by default through System Policy Editor. As shown in the following illustration, the template defines the policies you can set through System Policy Editor. Changes you make there are reflected in the policy file (shown here as CONFIG.POL), which in turn updates the Registry when the user logs on.

```
{ewc msdncd, EWGraphic, x0n 18 /a "psN.bmp"}
```

#### [To use a template other than the default template](#)

1. In System Policy Editor, make sure all policy files are closed.
2. From the Options menu, click Template.
3. Click Open Template, and select another .ADM file to be your template to begin setting system policies. Click Open.
4. Verify the new template is indicated in the Active Template list. Click Close to return to System Policy Editor.

You can create your own templates that can be read in by System Policy Editor. Users can then load the template and use it to set values in the Registry.

#### [To create a template](#)

# n

Use a text editor such as WordPad to edit or write an .ADM file. You can

open the default template named ADMIN.ADM in the Windows INF folder as an  
example to use as a starting point.

A template uses several key words, syntaxes, and symbols, as summarized in the  
following list.

# n

Class:

—CLASS category\_type

# n

Category:

—CATEGORY  
—[KEYNAME] }  
—[...]  
—END CATEGORY

# n

Policy:

—POLICY

```

[KEYNAME
[...
END POLICY

```

# n

## Part:

```

PART name part_type
type-dependent data
[KEYNAME key_name]
VALUENAME value_name
END PART

```

The following table briefly describes the keywords in system policy templates. Following this table are detailed lists of the controls and values that can be defined in templates.

### System Policy Template Key Words

---

|    |              |
|----|--------------|
| CL | Defines the  |
| AS | key of the   |
| S  | Registry     |
|    | that will be |
|    | edited; the  |
|    | value must   |
|    | be USER      |
|    | or           |
|    | MACHINE,     |
|    | correspondi  |
|    | ng to        |
|    | Hkey_Curr    |
|    | ent_User     |
|    | and          |
|    | Hkey_Local   |
|    | _Machine,    |
|    | respectively |
|    | , in the     |
|    | Registry.    |
| CA | Defines a    |
| TE | category in  |

GO the System  
RY Policy  
Editor.  
Category  
names that  
contain  
spaces  
must be  
enclosed in  
quotes. A  
category  
definition  
statement  
cannot  
appear  
more than  
once for the  
same  
category  
name.

m

e

EN Defines the  
D end of a  
CA category  
TE and all of  
GO its policies.  
RY

PO Defines a  
LIC policy  
Y within a  
category  
that can be

set. Policy  
names that  
contain  
spaces  
must be  
enclosed in  
quotes.

n

a

m

e

EN Defines the  
D end of a  
PO policy and  
LIC all its parts.  
Y

PA Defines a  
RT control or  
controls  
that can be  
used to set  
the values  
of a policy.  
Part names



that contain  
spaces  
must be  
enclosed in  
quotes.  
Policy part  
types and  
type-  
dependent  
data are  
discussed  
in the  
following  
tables.

m

e

EN Defines the  
D end of the  
PA control list.  
RT

VAL Setting to  
UE give the  
ON value when  
the policy is  
checked.

VAL Setting to  
UE give the  
OF value when

F it is not checked.

Specifies the full path of the Registry key name.

This is an optional Registry key name to use for

the category or policy. If there is a key name specified, this will be used by all child

categories, policies, and parts, unless they specifically provide a key name

of their own.

A

M

E

Defines the  
Registry  
section  
value entry  
name.

V

A

L

U  
E  
N  
A  
M

E

Specifies  
the  
Registry  
value to set  
to a

V

V

A

A

L

L

U

EU

E

N

A

M



.

!! Indicates a string value.

[string] Defines a section of string values.

A system policy template uses the following part control indicators.

*System Policy Template Part Control Indicators*

---

CH Displays a  
EC check box.  
KB The value  
OX is nonzero  
if checked  
by the  
user, and  
its entry is  
deleted if it  
is  
unchecked

.

NU Displays  
ME an edit  
RIC field with  
an optional  
spin  
control that  
accepts a  
numeric  
value.

EDI Displays  
TTE an edit  
XT field that  
accepts  
alphanumeric  
text.

CO Displays a  
MB combo  
OB box, which  
OX is an edit  
field plus a  
drop-down  
list box for  
suggested  
values.

TEX Displays a  
T line of  
static  
(label) text.  
There is no  
associated  
Registry  
value with  
this part  
type.

DR Displays a  
OP drop-down  
DO list control.  
WN The user  
LIS can only  
T choose  
from one of  
the entries  
supplied.  
The main  
advantage  
of a drop-  
down  
combo box  
is that,  
based on  
the user's  
selection, a  
number of



extra  
arbitrary  
Registry  
edits can  
be  
performed.

LIS Displays a  
TB list box  
OX with Add  
and  
Remove  
buttons.  
This is the  
only part  
type that  
can be  
used to  
manage  
multiple  
values  
under one  
key.

A system policy template uses the following type-specific information.

*System Policy Template Type-Specific Information*

---

DEF Causes the  
CH check box  
EC to be  
KE initially  
D checked.

VAL If specified,  
UE overrides  
ON the default  
“on”  
behavior of  
the check  
box. For  
example:  
VALUEON  
“On” writes

“On” to the  
Registry.

VAL If specified,  
UE overrides  
OFF the default  
“off”  
behavior of  
the check  
box.  
Example:  
VALUEOF  
F “Off”  
writes “Off”  
to the  
Registry.

ACT Specifies  
ION optional  
LIS action list  
TO to be taken  
N if check  
box is “on.”

ACT Specifies  
ION optional  
LIS action list  
TOF to be taken  
F if check  
box is “off.”

DEF Specifies  
AUL initial  
T numeric  
value for  
the edit  
field. If this  
statement  
is not  
specified,  
the edit  
field is  
initially  
empty.

a

l

u

e

MIN Specifies  
minimum  
value for  
number.  
Default  
value is 0.

v

a

l

u

e

MA Specifies  
X maximum  
value for  
number.  
Default  
value is  
9999.

v

a

l

u

e

SPI Specifies  
N increments  
to use for  
spin  
control.  
v Specifying  
SPIN 0  
removes  
the spin  
control.  
SPIN 1 is  
the default.

a

l

u

e

RE If specified,  
QUI causes  
RE System  
D Policy  
Editor not  
to allow a  
policy  
containing  
this part to  
be enabled  
unless a  
value has  
been

entered for  
this part.

TXT Writes  
CO values as  
NV REG\_SZ  
ERT strings  
("1","2","12  
8") rather  
than binary  
values.

DEF Specifies  
AUL initial string  
T to place in  
the edit  
field. If this  
is not  
specified,  
the field is  
initially  
empty.

a

I

u

e

MA Specifies  
XLE maximum  
N length of  
string.  
String is  
limited to  
this length  
in the edit  
field.

v

a

l



u

e

RE If specified,  
QUI causes the  
RE System  
D Policy  
Editor not  
to allow a  
policy  
containing  
this part to  
be enabled  
unless a  
value has  
been  
entered for  
this part.

Accepts all  
the key  
words that  
EDITTEXT  
does, plus  
SUGGEST  
IONS.

SU Begins a  
GG list of  
EST suggestion  
ION s to be  
S placed in

the drop-down list. Suggestions are separated with spaces and can be enclosed by quotes. The list is terminated with END SUGGESTIONS. For example:

SUGGEST  
IONS  
Alaska  
Alabama  
Mississippi  
"New York"  
END  
SUGGEST  
IONS

Contains no type-specific data.

RE If specified,  
QUI causes the  
RE System  
D Policy  
Editor not  
to allow a  
policy  
containing  
this part to  
be enabled  
unless a  
value has  
been  
entered for

this part.

ITE Begins a  
MLI list of the  
ST items in the  
drop-down  
list. The  
end of the  
list must be  
terminated  
by END  
ITEMLIST.  
Each item  
in the list is  
specified  
as follows:

NAME  
VALUE  
[ACTIONLI  
ST\_]  
...

n

a

m

e

is the text  
to be  
displayed  
in the drop-  
down list  
for this  
item.

v

a

l

u

e

is the value  
to be  
written for  
the part's  
value if this  
item is  
selected.  
Values are  
assumed  
to be  
strings,  
unless they  
are  
preceded  
by the key  
word  
NUMERIC.  
For  
example:

VALUE  
"Some  
value"  
VALUE  
NUMERIC  
1

If the  
VALUE key  
word is  
followed by

the  
DELETE  
key word  
(that is,  
VALUE  
DELETE),  
then this  
Registry  
value/value  
name pair  
will be  
deleted.

a  
c  
ti  
o

n

li

s

t

is an

optional list  
to be used  
if this value  
is selected.

VAL Cannot be  
UE used with  
NA the list box  
ME type,  
because  
there is no  
single  
value

name associated with this type. By default, only one column appears in the list box, and for each entry a value is created with an identical value name and value data. For instance, an entry "List Entry" in the list box would create a value named "List Entry" containing "List Entry" as data.

VAL Defines the  
UE prefix to be  
PR used in  
EFI determinin  
X g value  
names. If a  
prefix is  
specified,  
then this  
prefix plus  
"1", "2",  
and so on  
will be  
used



instead of  
the default  
value  
naming  
scheme  
listed  
earlier in  
this table.  
The prefix  
can be  
empty (""),  
which will  
cause the  
value  
names to  
be "1", "2",  
and so on.  
A prefix of  
"SomeNam  
e" will  
generate  
value  
names  
"SomeNam  
e1",  
"SomeNam  
e2", and so  
on.

X

EXP Makes the  
LICI user  
TVA specify not  
LUE only the  
value data,

but also  
the value  
name. The  
list box  
shows two  
columns  
for each  
item, one  
for the  
name and  
one for the  
data. This  
key word  
cannot be  
used with  
the  
VALUEPR  
EFIX key  
word.

AD If specified,  
DITI values set  
VE in the list  
box are  
added to  
whatever  
values  
exist in the  
target  
Registry.  
Existing  
values are  
not  
deleted;  
the default,  
the content  
of list  
boxes will  
“override”  
whatever  
values are  
set in the  
target  
Registry.  
Specifically  
, a control

value is inserted in the policy file which causes existing values to be deleted before the values set in the policy file are merged.

!! Indicates a string value. For example:

!!StrConst

[ Defines a section of string values; the values are defined in the following format:

For example:

StrConst="  
Control  
Name"

r  
i  
n  
g  
s

]

Co Can be  
mm added by  
ents preceding  
the line

with a  
semicolon  
(;).

### *Troubleshooting with System Policy Editor*

---

Following are some common problems that you may encounter when implementing system policies plus suggestions for fixing those problems.

---

Tip—— For troubleshooting system policies, it is useful to turn on error messages; this can be done from the Remote Update policy, as explained in “Setting Up for Manual Downloading of System Policies” earlier in this chapter. The result is that an error message will be displayed when policies cannot be downloaded correctly; the error message can help identify the problem.

---

*When a user logs in to Windows 95, the system does not seem to be picking up the policies set for that particular user, or for the Default User.*

Make sure that user profiles is enabled on the computer. This is configured on the Profiles property sheet in the Passwords option in Control Panel..

*A computer seems to be picking up some of the policies, but not all of them.*

In this case, the computer running Windows 95 does not pick up any policies for Default User or for a particular user; it only picks up policies set for Default Computer or for a particular computer.

If this occurs, make sure that user profiles are enabled on that computer. Check this option on the Profiles property sheet in the Passwords option in Control Panel.

*A computer does not seem to be picking up policies from a CONFIG.POL file on the Windows NT domain.*

n

Make sure that there is a CONFIG.POL file in the NETLOGON directory

on the Primary Domain Controller on the Windows NT network.

n

Make sure that the client computer has its domain set properly on the property sheet for Client for Microsoft Networks in the Network option in Control Panel.

n

Make sure that the client computer is successfully logging onto that domain.

n

Make sure that the client computer is configured for automatic policy downloading. This is set using the Remote Update policy, as described in “Setting Up for Manual Downloading of System Policies” earlier in this chapter. Notice, however, that Windows 95 is configured for automatic policy downloading by default.

n

Enable error messages on the client computer and see if an error message is displayed.

*A computer running Microsoft Client for NetWare Networks does not seem to be picking up the policies from a CONFIG.POL file on the NetWare server.*

n

Make sure that there is a CONFIG.POL in the PUBLIC directory on the SYS: volume of a NetWare 3.x or 4.x server. You cannot put the CONFIG.POL file on a computer running Windows 95 with File and Print Sharing for NetWare Networks.

n

Make sure that the client computer has its Preferred Server set to the NetWare server that contains CONFIG.POL. This setting is located on the property sheet for Client for NetWare Networks in the Network option in Control Panel.

n

Make sure that the client computer is successfully logging onto that Preferred Server.

n

Make sure that the client computer is configured for automatic policy downloading. This is set using the Remote Update policy, as described in “Setting Up for Manual Downloading of System Policies” earlier in this chapter.

n

Enable error messages on the client computer and see if an error message is displayed.

*A computer running a Novell-supplied VLM or NETX client does not seem to be picking up the policies from the CONFIG.POL on the NetWare server, even though the file is in SYS:PUBLIC.*

Automatic downloading of system policies on a NetWare server only works when the client computer is running Microsoft Client for NetWare Networks. If the computer is running the Novell-supplied VLM or NETX client, then you must use manual downloading from a mapped drive. For information, see "Setting Up for Manual Downloading of System Policies" earlier in this chapter.

*The client computer is set for manual downloading, but it is not picking up the policies.*

n

Make sure that the path specified for manual downloading includes the name of the policy file itself.

n

Make sure that the directory in which you placed the policy file can be accessed by the user that is logging onto the computer running Windows 95.

*You have implemented a policy, and then cleared this policy, but it appears still to be in effect, or does not do what you thought it would do.*



Does the policy have an edit box that needs to be filled in? For example, do you need to specify the wallpaper or workgroup name? If so, then by clearing the policy, you are actually deleting the Registry setting for that value. For example, by clearing the wallpaper policy, the wallpaper Registry setting is made to be blank, and thus the user will have no wallpaper.

For all policies that involve settings that users can manipulate by using an option in Control Panel, the best way to stop enforcing that policy is to fill (gray) the policy setting, in order to allow the users to make their own choices. These policies are listed in “Using System Policy Editor” earlier in this chapter.

You have set up group policies, but one or more of the users do not get these group policies when they log on.

n

Is there a policy for that particular user? If so, then group policies are

ignored, by design. This allows an administrator to make exceptions to group policies for particular users.

n

Make sure that the client computer is set up for group support.

n

Make sure that the user or users are really members of that group.

n

Make sure that user profiles are enabled on the client computer.

*You tried the policy named Only Run Allowed Windows Applications, but then you were not able to turn off this policy because you forgot to include POLEDIT.EXE in the list*

n

Did you set this policy for all users? If not, then log on as another user,

and run System Policy Editor to cancel this policy.

n

If you can run Registry Editor, go to the following key and delete the

RestrictRun entry:

Hkey Current User\Software\Microsoft\Windows\CurrentVersion\Policies  
\Explore

n

If you previously set this policy for the Default User and, as a result, no

user can run System Policy Editor or Registry Editor, then try the following:

n

If possible, disable user profiles in the Passwords option in Control Panel. Then you should be able to log on and run System Policy Editor. Then undo the policy and re-enable user profiles.

n

If you cannot disable user profiles because the Passwords option in Control Panel has been disabled, you must either reinstall Windows 95 (so that user profiles will not be enabled). Or use the Windows 95 startup disk and run the real-mode Registry Editor to disable user profiles.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Chapter 16 Remote Administration*

This chapter describes the Windows 95 management features that allow you to manage network computers from your own computer. This chapter also includes information about administration applications and network backup agents from other vendors.

### *Remote Administration: The Basics*

---

This chapter presents the following specific information to help you remotely administer computers on your network.

The key remote management tools provided with Windows 95 are System Policy Editor, Registry Editor, System Monitor, and Net Watcher. These utilities are designed to make it easier for an administrator or a help desk technician to remotely identify and repair problems encountered by users, ultimately saving time and the cost of dispatching support engineers to the remote site. The following describes the benefits of using these remote administration tools.

#### *System Policy Editor.*

With System Policy Editor, network administrators or help desk technicians can edit Registry entries in real time for remote computers, to reduce the time spent troubleshooting user problems and the cost of support. They can also create, edit, and manage system policies remotely, to efficiently control how systems policies are implemented across the network. For information, see Chapter 15, "User Profiles and System Policies."

#### *Registry Editor.*

With Registry Editor, network administrators can directly read and write values that are contained in the Windows 95 Registry. Administrators are able to read current settings, make modifications, create new keys, or delete existing keys. Although Registry Editor should only be used by administrators with appropriate access rights, it is useful for identifying and correcting a problem remotely, without having to send a support engineer to the user's computer.

#### *System Monitor.*

With System Monitor, network administrators can quickly troubleshoot performance problems by monitoring virtual device drivers across the network. System Monitor can provide performance information from many parts of the system, including those for the file system and network redirectors.

#### *Net Watcher.*

With Net Watcher, network administrators who use File and Printer Sharing services

can use Net Watcher to perform remote network administration functions such as creating, adding, and deleting shared resources, and monitoring users connected to shared resources, making changes as required. This is especially useful when an administrator needs to know not only who is connected but also which files are currently open.

Windows 95 also allows a network administrator to remotely manage file systems, by browsing the specific user computers in Network Neighborhood, as described in “Using Network Neighborhood for Remote Administration” later in this chapter.

Windows 95 also provides agents for remote administration, including an agent for Microsoft Network Monitor and an SNMP agent for administration with Simple Network Management Protocol (SNMP) systems management products, as described in “Using Remote Administration Tools from Other Vendors” later in this chapter.

### *Issues for Remote Administration*

---

You need to understand the following significant aspects of your networking and administrative needs before using the remote administration features.

To take advantage of the remote capabilities of Windows 95:

n

Each computer that will be administered remotely must have remote

administration and user-level security enabled. If you want to remotely administer a computer using Registry Editor, System Monitor, or System Policy Editor, then the Microsoft Remote Registry service must be installed.

Optionally, the SNMP agent or the Microsoft Network Monitor agent should be installed if required for your administrative tools. For information, see “Setting Up for Remote Administration” later in this chapter.

n

Run a common network protocol, such as the Microsoft versions of the

IPX/SPX-compatible protocol, TCP/IP, or NetBEUI.

n

If help desk personnel will be using System Monitor, they should

understand what each measurement provided by System Monitor means and what course of action is required. For information, see Chapter 17, "Performance Tuning."

n

Train help desk personnel on what problems can be identified and

repaired using System Policy Editor versus Registry Editor.

Both Registry Editor and System Policy Editor allow an administrator to access a remote computer's Registry. However, System Policy Editor only exposes a subset of keys, whereas Registry Editor allows access to the entire Registry. Registry Editor requires significantly more training on how it should be used. Also, it's important to understand that some changes made while remotely connected to a user's computer with either System Policy Editor or Registry Editor require the user to shut down and restart the computer, although some changes take effect immediately.

### Setting Up for Remote Administration

This section provides details on how to set up remote administration after Windows 95 is installed.

The following table shows the general requirements for remote administration, depending on the administrative task.

---

|  |                  |
|--|------------------|
|  | Browse           |
|  | Enable           |
|  | and user-        |
|  | manag level      |
|  | e security,      |
|  | shared remote    |
|  | resourc administ |
|  | es on a ration,  |
|  | remote and File  |

computer and  
Printer  
using Sharing  
Net services  
Watchdog ; grant  
remote  
administrator  
privilege  
to the  
network  
administrator

Browse Enable  
the file user-  
system level  
of a security  
remote and  
computer remote  
er administrator;  
grant  
remote  
administrator  
privilege  
to the  
network  
administrator

Edit a Enable  
remote user-  
computer level  
er's security  
Registry and  
y using remote  
Registry administrator,  
y and  
Editor install  
or Microsoft  
System Microsoft  
Policy ft  
Editor Remote  
Registry  
services

Monitor Enable  
perform user-  
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of a security  
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Monitor install  
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Remote  
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services

Granting remote administration privilege gives the person full access to all shared resources on the system (including the ability to add and remove other remote administrators). Granting or removing access to remote administration capabilities for a user does not take effect until the user next connects to the computer running Windows 95.

When remote administration is enabled on a computer, two special shared resources are created:

**n** ADMIN\$ gives administrators access to the file system on the remote computer.

**n** IPC\$ provides an interprocess communication (IPC) channel between the two computers.

The following procedures present the steps required to enable remote administration of a computer running Windows 95.



---

Important — If you enable user-level security using the Network option in Control Panel or in a setup batch script, remote administration is enabled automatically for the Supervisor account on a Novell® NetWare® network or for the Domain Administrator group on a Windows NT domain.

If you want to enable user-level security without automatically enabling remote administration, then you can use system policies to enable the option named User-level Access Control. In this case, you must manually enable remote administration on each individual computer.

---

[To enable user-level security and automatically enable remote administration](#)

n

In the Network option in Control Panel, click the Access Control tab. Select

User Level Access Control, and type the name of the server or domain where user lists are maintained. Click OK, and then shut down and restart the computer. For more information, see Chapter 14, "Security."

[To enable remote administration manually](#)

1. In the Passwords option in Control Panel, click the Remote Administration tab.
2. Make sure there is a check in the box named Enable Remote Administration Of This Server.
3. If the computer is configured for share-level access control, then type the password for remote administration.

— This dialog box is available only when share-level security is enabled.

— {ewc msdn cd, EWGraphic, x0o 0 /a "psO.bmp"}

— If the computer is configured for user-level access control, then click the Add button, and add the appropriate list of administrators. Click OK.

— This dialog box is available only when user-level security is enabled.

— {ewc msdn cd, EWGraphic, x0o 1 /a "psO.bmp"}

[To install Microsoft Remote Registry services](#)

1. In the Network option in Control Panel, click the Add button. In the Select Network Component Type dialog box, double-click Service.
2. From the Select Network Service dialog box, click the Have Disk button.
3. In the dialog box, specify the path to the ADMIN\NETTOOLS\REMOTREG directory on the Windows 95 compact disc, and click OK.
4. In the Models list, select Microsoft Remote Registry, and click OK.

[To install the Microsoft Remote Registry service from a setup script](#)

n

Add the following entries in the [Network] section of MSBATCH.INF.

security=domain | nwserver  
PassThroughAgent=  
services=remotereg

Notice that whether you specify the value *domain* or *nwserver* depends on whether the user will log onto a Windows NT or a NetWare network. For more information, see Chapter 5, "Custom, Automated, and Push Installations."

[Technical Notes on the Microsoft Remote Registry Service](#)

n

You must also install the Remote Registry service on the administrator's

computer to ensure that the WINREG.DLL file is in the Windows SYSTEM directory on that computer.

# n

Make sure that both the administrator's and user's computers have at

least one protocol in common. That can be either Microsoft NetBEUI, Microsoft TCP/IP, or the IPX/SPX-compatible protocol (with or without NetBIOS).

## *Managing Remote Registries with System Policy Editor*

---

When you run System Policy Editor in Registry Mode, you have direct access to the Registry for a local or remote computer. This section discusses how to access the Registry on a remote computer using System Policy Editor. For information about installing and using System Policy Editor, see Chapter 15, "User Profiles and System Policies."

As with Registry Editor, most of the changes you make with System Policy Editor in Registry mode modify the remote Registry as soon as you save the changes. These Registry changes apply to the user or to the computer. Some changes require the user to log off and then log back on.

---

Note — To use System Policy Editor to connect to a remote computer, the Microsoft Remote Registry service must be installed on the remote computer, as described in "Setting Up for Remote Administration" earlier in this chapter.

---

### *To remotely edit a computer's Registry using System Policy Editor*

1. From the Start button, click Run. Then type *poledit*
2. From the File menu in System Policy Editor, click Connect.
3. In the Connect dialog box, type the name of the computer you want to remotely administer, using the computer name for that computer as it appears in the Network option in Control Panel. Windows 95 connects to the Registry on the computer specified (assuming you have appropriate permissions).
4. Make changes, using the methods described in Chapter 15, "User Profiles and System Policies."

— The title bar of System Policy Editor shows whether you are viewing a local or a remote Registry.

— {ewc msdncd, EWGraphic, x0o 2 /a "psO.bmp"}

The following example shows how to edit a remote Registry with System Policy Editor to control whether the user has access to the Run command. This may come in handy for users who are inadvertently accessing an MS-DOS prompt or are running applications not on the company's standard list.

[To remove the Run command from the Start menu: an example](#)

1. In System Policy Editor, double-click the Local User icon.
2. From the Properties for Local User, click Shell, and then click Restrictions.
3. Make sure the option named Remove Run Command is checked. Click OK. Then from the File menu, click Save.

—{ewc msdncd, EWGraphic, x0o 3 /a "psO.bmp"}

The next time this user logs on, the Start menu will no longer display the Run command.

*Managing Remote Registries with Registry Editor*

---

Caution — Registry Editor is a powerful tool that should not be used by anyone other than an authorized network administrator. Most changes made take immediate effect, although some changes require the user to shut down and restart the computer.

For detailed information about the Registry and about using Registry Editor, see Chapter 33, "Windows 95 Registry."

---

Network administrators may have occasion to edit the Registry to solve a particular user problem on a remote computer running Windows 95. Network administrators or help desk technicians may need to access the entire Registry for a particular computer. In this case, the tool to use is Registry Editor, because System Policy Editor allows access to only a subset of Registry settings.

Note — To use Registry Editor to connect to a remote computer, the Microsoft Remote Registry service must be installed on the remote computer, as described in "Setting Up for Remote Administration" earlier in this chapter.

---

[To remotely edit the Windows 95 Registry on another computer](#)

1. From the Start button, click Run, and then type *regedit*
2. From the Registry menu in Registry Editor, click Connect Network Registry.
3. In the Connect Network Registry dialog box, type the name of the computer you

want to remotely administer.

4. Windows 95 changes the contents of Registry Editor to include the local Registry on top and the remote Registry on the bottom, as shown in the following example. You can use the usual methods to change Registry values.

—{ewc msdncd, EWGraphic, x0o 4 /a "psO.bmp"}

The following example shows how to edit a remote Registry with Registry Editor to change a persistent network connection.

#### [To change a persistent network connection on a remote computer: an example](#)

1. Connect to the user's computer as described in the previous procedure.
2. Click Hkey Current User, click Network, and then click Persistent.

—As shown in the following figure, the user has three drives currently associated as persistent network connections. In this example, drive F is a persistent connection to the shared network resource named \\PYR\MKTG; however, the connection that is wanted is to a shared network directory named \\PYR\USER.

—{ewc msdncd, EWGraphic, x0o 5 /a "psO.bmp"}

3. Double-click Remote Path. When the Edit String dialog box appears, type in the new path of \\PYR\USER, and then click OK.

—The next time the user logs onto Windows 95, drive F will be a persistent connection to \\PYR\USER.

—{ewc msdncd, EWGraphic, x0o 6 /a "psO.bmp"}

---

Note — For this procedure to work when user profiles are enabled, the user whose settings are being edited must be logged on at the time the computer is being administered. If the user is logged off, only the default profile is changed. The settings under Hkey\_Local\_Machine will be the same for all users on that computer.

---

#### *Viewing a Remote Computer with System Monitor*

---

System Monitor is a tracking tool that monitors the real-time performance of various computer components, functions, and behaviors and displays the results in graphs or charts. This information is useful in locating bottlenecks and solving other performance problems.

With the appropriate administrative privileges, you can use System Monitor over the network to track the performance of remote computers. To monitor more than one computer simultaneously, simply launch multiple instances of System Monitor and connect to the appropriate computers.

For more information about installing and using System Monitor, see Chapter 17, "Performance Tuning."

---

Note — To use System Monitor to connect to a remote computer, the Microsoft Remote Registry service must be installed on the remote computer.

---

[To remotely view performance data with System Monitor](#)

1. From the Start button, click Run, and then type `sysmon`
2. From the File menu in System Monitor, click Connect. Then type the name of computer, and click OK.
3. From the Edit menu, click Add Item, and then click the category you want to monitor (for example, 32-bit file system), and then click the item (for example, bytes read per second and bytes written per second). Click OK.

You are now ready to monitor the read activity on the remote computer. As the remote computer reads and writes to the disk, you can easily monitor the exact performance from your computer running Windows 95 as shown in the following example.

```
{ewc msdn cd, EWGraphic, x0o 7 /a "psO.bmp"}
```

---

Using Net Watcher for Remote Administration

---

Net Watcher is a Windows 95 tool for creating, controlling, and monitoring remote shared resources. This is a very useful and efficient way to manage the built-in peer services in Windows 95.

---

Note — If you are not using File and Printer Sharing services, skip this section.

---

Net Watcher includes a set of icons that make it easy to do the following:

n

Add a shared resource or stop sharing a resource

# n

Show all shared resources, connected users, and open files

# n

Close files users have opened

# n

Disconnect a user

`{ewc msdn cd, EWGraphic, x0o 8 /a "psO.bmp"}`

[To use Net Watcher with a remote computer](#)

1. From the Start button, click Run, and then type *netwatch*
2. From the Administer menu, click Select Server, and then type the name of the computer you want to connect to.
3. When prompted, type the password for remote administration on the computer you are connecting to.

The password depends on the type of security used on the remote computer:

# n

Under share-level security, the password is the Remote Administration

password specified in the Passwords option in Control Panel on the remote

computer.

n

Under user-level security, the password is the one for an Administrator

account specified in the Passwords option in Control Panel on the remote  
computer.

The following constraints apply for using Net Watcher to view a remote computer:

n

A computer using share-level security with File and Printer Sharing for

Microsoft Networks can only use Net Watcher to connect to other computers that  
use share-level security.

n

A computer using user-level security with File and Printer Sharing for

Microsoft Networks can use Net Watcher to connect to any other remote  
computers running File and Printer Sharing for Microsoft Networks — it doesn't  
matter whether the remote computer is using user-level or share-level security.  
The pass-through server or domain does not have to be the same for the two  
computers.

n

Computers running File and Printer Sharing for NetWare Networks can

only use Net Watcher to connect to other computers running File and Printer



Sharing for NetWare Networks. The pass-through server does not have to be the same for the two computers.

The following examples show how to remotely create a shared resource using Net-Watcher. A local resource is usually shared by specifying options on the property sheet for that resource, as described in Chapter 11, "Logon, Browsing, and Resource Sharing."

#### [To share a resource remotely using Net-Watcher: an example](#)

1. After connecting to the remote computer in Net-Watcher, click the Show Shared Folders icon. Then click the Add Share icon.

— This icon is not available unless you first click the Show Shared Folders icon.

2. In the Enter Path dialog box, type the drive and complete path of the resource that you want to share, and click OK. Then complete the Sharing property sheet in the usual way.

— This example shows the shared directories on a remote computer running File and Printer Sharing for Microsoft Networks.

— {ewc msdn cd, EWGraphic, x0o 9 /a "psO.bmp"}

#### Using Network Neighborhood for Remote Administration

---

Another way to use System Policy Editor, Registry Editor, Net-Watcher, or System-Monitor remotely is to right-click the remote computer from within Network-Neighborhood.

#### [To remotely manage computers in the local workgroup using Network Neighborhood](#)

1. In Network Neighborhood, right-click the icon of the computer you want to administer. Then click Properties in the context menu, and then click the Administration Tools tab.

— {ewc msdn cd, EWGraphic, x0o 10 /a "psO.bmp"}

2. Click the button for the remote management tool you want to use, as described in the following list.

---

W Runs the  
at Net  
ch-Watcher  
S tool and  
er automatical

vely connects  
r to the  
specified  
computer.

M Runs the  
on System  
ito Monitor  
r tool and  
C automatical  
o ly connects  
m to the  
pu specified  
te computer.  
r

A Opens a  
d folder on  
mi the  
ni administrat  
st or's  
er desktop for  
Fil the  
e specified  
S remote  
ys computer  
te with access  
m to the  
remote  
computer's  
hard disk  
drive.

### *Using Network Backup Agents*

---

Administrators can remotely back up user data using either of the two network-based backup agents included in Windows 95. These backup agents, from Arcada Software and Cheyenne Software, enable computers to be backed up to a tape drive on a network server. You must have the corresponding server-based network backup software from either Arcada or Cheyenne. For information about contacting these vendors, see the following sections.

The following sections describe how to install these backup agents on an individual computer, with a summary of the steps for running network-based backup when the agent is installed.

To use the Arcada agent, you must have the following components:

n

Arcada backup agent (included with Windows 95). The agent includes

BKUPAGNT.EXE, BKUPNET.DLL, and BKUPPROP.DLL.

n

Arcada Backup Exec for NetWare®, Enterprise Edition or Single Server

Edition, version 5.01. To obtain this software, please contact Arcada directly at (800) 327-2232.

To back up a computer running Windows 95 with the Arcada agent, you must first enable the Arcada agent. If you didn't already do this during Setup, you can install and enable the Arcada agent using the Network option in Control Panel. After you install the backup agent, the computer will automatically run the agent in the background when you start Windows 95.

#### [To install and enable the Arcada backup agent](#)

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button.
2. In the Select Network Component dialog box, double-click Service.
3. In the Select Device dialog box, click Arcada Software in the Manufacturers list, click Arcada Software Backup Exec Agent in the Models list, and then click OK.

#### [To run Arcada network-based backup on a computer running Windows 95](#)

1. Run Arcada Backup Exec (NetWare Enterprise Edition or Single Server Edition). See the Arcada Backup Exec product documentation for further information and instructions.
2. Using the Backup Exec software, the computer will be listed as a backup source. Find the computer in the list of backup sources by looking for the name that was

given to the computer in the Arcada tool.

3. Follow the instructions provided in the Backup Exec documentation from Arcada for backing up a computer running Windows 95.

*To install the Arcada backup agent from a setup script*

n

Add `services=bkupagent` as a value in the [Network] section of

MSBATCH.INF (or similar file). For more information, see Appendix D, "MSBATCH.INF Parameters."

To use the Cheyenne agent, you must have the following components:

n

Cheyenne backup agent, included with Windows 95. The agent requires

two files, ARCSRV32.EXE and CHEYPROP.DLL.

n

Cheyenne ARCserve for NetWare (version 5.01).

# n

New versions of Cheyenne NLMs, which have been specifically updated

for Windows 95. These include the APROCESS.NLM, ARCOPY.NLM, and WSTAPE.NLM files. To obtain these, contact Cheyenne directly at (800) 243\_9832.

To back up a computer running Windows 95 with the Cheyenne agent, you must first install and enable the Cheyenne agent. This is done through the Network option in Control Panel, if it was not already done during Setup. After you install the backup agent, the computer will automatically run the agent in the background when you start Windows 95.

#### [To install and enable the Cheyenne agent](#)

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button.
2. In the Select Network Component dialog box, double-click Service.
3. In the Select Device dialog box, click Cheyenne Software in the Manufacturers list, and click Cheyenne Software ARCserve Agent in the Models list. Then click OK.

#### [To run Cheyenne network-based backup on a computer running Windows 95](#)

1. Run Cheyenne ARCserve for NetWare. See the Cheyenne ARCserve product documentation for further information and instructions.
2. Find the computer in the list of computer clients by looking for the network address found in the agent log file. The computer is shown in the list of clients, as are computers running MS-DOS and Windows 3.1.
3. Follow ARCserve instructions for backing up a computer running Windows 95.

#### [To install the Cheyenne agent from a setup script](#)

# n

Add `services=cheyagnt` as a value in the [Network] section of MSBATCH.INF (or similar file). For more information, see Appendix D, “MSBATCH.INF Parameters.”

## *Preparing for Microsoft Network Monitor*

---

Microsoft Network Monitor is a component of the Microsoft Systems Management Server that is used by network administrators to detect and troubleshoot problems on LANs or on WANs running the Microsoft Remote Access Service (RAS).

To use Network Monitor with computers running Windows 95, you must install the Microsoft Network Monitor agent. This allows Microsoft Network Monitor to conduct remote captures of network traffic to and from the computer running Windows 95.

### *To install the Microsoft Network Monitor agent on a single computer*

1. In the Network option in Control Panel, click Add, and then double-click Service in the Select Network Component dialog box.
2. In the Select Device dialog box, click the Have Disk button.
3. In the dialog box, specify the path to the ADMIN\NETTOOLS\NETMON directory on the Windows 95 compact disc, and click OK.
4. In the Models list, select Microsoft Network Monitor Agent, and click OK.

### *To install the Microsoft Network Monitor agent from a setup script*

# n

Add `services=netmon` as a value in the [Network] section of MSBATCH.INF (or similar file). For more information, see Appendix D, “MSBATCH.INF Parameters.”

For more information about Network Monitor, see Appendix K, “Microsoft Systems

Management Server.”

### Using Remote Administration Tools from Other Vendors

---

You can also remotely administer computers running Windows 95 using other system management tools provided by Microsoft or other vendors. The following list shows some of the system management tools that can be used to manage computers running Windows 95.

n

Microsoft Systems Management Server

n

Microsoft Windows NT Server

n

Novell NMS

n

HP® Open View for Windows

n Intel® LANDesk™

n IBM® LAN NetView®

n Sun® NetManager

For networks that use SNMP for system management, Windows 95 includes an SNMP agent which conforms to the SNMP version 1 specification. This agent allows you to monitor remote connections to computers running Windows 95, from an SNMP console. After this agent is installed, no other modifications to client computers are required to use SNMP.

The SNMP agent is implemented as a Win32-based service and works using Windows Sockets over both TCP/IP and IPX. The extension agents are implemented as Win32 DLLs. (For more information about writing SNMP MIBs under Windows 95, see the WINDOWS 95 SOFTWARE DEVELOPMENT KIT.)

The configuration information for the RFC 1156 extension agent is placed in the Registry under the following key:

Hkey\_Local\_Computer\System\CurrentControlSet\Services\SNMP\Parameters

#### [To install the Microsoft SNMP agent](#)

1. In the Network option in Control Panel, click the Configuration tab, and then click the Add button.



2. In the Select Network Component dialog box, double-click Service.
3. In the Select Device dialog box, click the Have Disk button. Provide the path to the ADMIN\NETTOOLS\SNMP directory on the Windows 95 compact disc, and click OK.
4. In the Models list, select Microsoft SNMP Agent, and click OK.

[To install the Microsoft SNMP agent from a setup script](#)

n

Add services=snmp as a value in the [Network] section of MSBATCH.INF (or similar file). For more information, see Appendix D, "MSBATCH.INF Parameters."

When the computer is restarted after the SNMP agent is installed, SNMP automatically starts in an MS-DOS window. You can minimize this window to keep it out of the way while working.

[To configure the SNMP agent](#)

n

Use System Policy Editor to set the following policies for the computer:

---

Co Specifies  
mm one or  
unit more  
ies groups of  
hosts to  
which this  
computer  
belongs  
for

purposes  
of  
administr  
ation  
using the  
SNMP  
service.  
These are  
the  
communiti  
es that  
are  
allowed to  
query the  
SNMP  
agent.

Per Specifies  
mitt IP or IPX  
ed addresse  
Ma s allowed  
nag to obtain  
ers informatio  
n from an  
SNMP  
agent. If  
this policy  
is not  
checked,  
any  
SNMP  
console  
can query  
the agent.

Tra  
ps  
for  
Pu  
blic  
Co  
mm Specifies  
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s of hosts  
in the  
public  
communit

y to which  
you want  
the SNMP  
service to  
send  
traps.

Inte Allows  
rnet you to  
MI specify  
B the  
(RF contact  
C name and  
115 location if  
6) you are  
using  
Internet  
MIB.

### *Removing Remote Agents*

---

After an agent such as Microsoft Remote Registry service or the SNMP agent has been installed, it can only be removed by modifying the Registry.

For a single computer, you can do this using either Registry Editor or System Policy Editor. The keys listing these services in the Registry are the following:

Hkey\_Local\_Machine\Software\Microsoft\Windows\CurrentVersion\RunServices  
Hkey\_Local\_Machine\Software\Microsoft\Windows\CurrentVersion\Run

You can use System Policy Editor to turn off services by setting system policies, or by using Registry mode to modify a single computer's Registry. Under Computer policies, click System. Then delete the services that you no longer want that are listed under the Run and Run Services policies.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 17 Performance Tuning

Windows 95 provides the easiest methods and best defaults ever offered for configuring system memory and ensuring good performance on an x86-based computer. For better performance, Windows 95 uses improved addressing for accessing physical memory and uses an improved swap file implementation for virtual memory. This chapter summarizes system features related to performance and describes tools for monitoring and managing system performance.

---

Note — This chapter in particular represents work in progress. More details and tips for performance tuning will be made available in the final edition.

---

### *Windows 95 Performance Tuning: The Basics*

---

The architectural design of Windows 95 includes several improvements over earlier versions of Windows. These changes, which strongly impact most areas of system performance, include the following:

n

Fully integrated 32-bit, protected-mode operating system, eliminating the need to run MS-DOS separately

n

Preemptive multitasking, and multithreading support, providing improved system responsiveness and smooth background processing, plus improved system capacity, allowing multiple applications and system tasks to run well concurrently

# n

Complete 32-bit kernel, providing improved memory management and process scheduling, plus improved system-wide robustness and improved cleanup after an application ends or fails, delivering a more stable and reliable operating environment

# n

32-bit installable file systems to support better performance and long filenames, and provide an open architecture for future growth

# n

32-bit device drivers available throughout the system, delivering improved performance and better resource management

# n

More dynamic environment configuration, reducing the need for users to adjust their systems

The following section summarizes the built-in self-tuning features in Windows 95 and the built-in tools for tuning performance. The end of this section summarizes the improvements in system resource availability under Windows 95.



Many Windows 95 features, including self-tuning features in the operating system, are designed to improve performance and reduce support costs.

*Significant increase in resources available to applications.*

Windows 95 provides a significant increase in the system resources available to Windows-based applications over what was available under earlier versions of Windows. The net result for users is that they can count on more system resources to be available for running five or more applications simultaneously, creating windows, using fonts, and so on. For information, see “System Resource Capacity in Windows 95” later in this chapter.

*Dynamic caching using VCACHE.*

Windows 95 uses a dynamic cache for file and network access. This cache can grow or shrink, depending on the computer's memory configuration and the demand for memory from the applications that are running. This relieves users or administrators from having to change the cache parameters as new memory or new applications are added. Windows 95 can automatically take advantage of new memory and automatically expand the file and network cache. Windows 95 also automatically reduces the cache based on demand when applications are unloaded. For more information about VCACHE, see Chapter 20, “Disks and File Systems.”

*Protected-mode drivers increase performance and reliability.*

Wherever possible, always use protected-mode device drivers. Windows 95 provides protected-mode drivers for most devices, including video, network, disk, and so on.

A real-mode driver runs in virtual 8088 mode on x86-based CPUs and must be loaded before Windows 95 switches into protected mode. After Windows 95 switches into protected mode, any time there is an I/O operation using a device controlled by a real-mode driver, the computer has to switch from protected mode to virtual 8088 mode. This is a very expensive operation in terms of CPU cycles and typically has to be done several times during a single I/O operation, adversely impacting performance.

*32-bit disk and file access for fast hard-disk access.*

The 32-bit file and disk access mechanism allows Windows 95 to access the hard disk or file system directly, bypassing the computer's BIOS. Using 32-bit file and disk access improves performance and allows Windows 95 to handle BIOS requests in protected mode, rather than in real mode.

*Background print rendering.*

For a computer that has sufficient memory to take advantage of it, background print rendering is available automatically to reduce the return-to-application time for

printing. With this feature, Windows 95 first writes an Enhanced Metafile Format (EMF) file, which is a device-independent rendering of the print job that is much faster to produce than a device-specific rendering. In the background, Windows 95 uses the EMF file to create the device-dependent rendering while the user continues to work using the application.

#### *Automatic system adjustments during Windows 95 Setup.*

During installation, Windows 95 Setup makes decisions about certain operating system features based upon the hardware configuration. For example, in a computer with low memory, Windows 95 turns off background print rendering, because this feature increases the operating system working set that is loaded into memory and cannot be paged out to the swap file.

Windows 95 provides better system capacity than Windows 3.1 for running Win16-based and MS-DOS — based applications, so that system resources are not quickly depleted.

Windows 3.1 maintained 64K regions of memory HEAPS for use by the graphics device interface (GDI) and USER system components. These heaps stored GDI or memory object information allocated when an application called a Windows API function. The amount of space available in the combination of these two heaps is identified as a percentage of system resources that are free (that percentage appears in the Help About dialog box in My Computer and other Windows-based applications). Under Windows 3.1, when the calculated amount of free space dropped to a low number, the system often reported that it was out of memory even though the amount of free memory shown in the About box was still quite high. This was often due to low memory in either the GDI or the USER heap, or both.

In Windows 95, to help reduce the system resource limitation, many data structures formerly stored in the 16-bit GDI and USER heaps are now stored in 32-bit heaps. This provides more room for the remaining data elements to be created. The net result for users is that they can count on more system resources to be available for running applications, creating windows, using fonts, and so on.

The following table shows the system limits in Windows 95, as compared to the constraining limits under Windows 3.1. For information about the supporting architecture, see Chapter 31, “Windows 95 Architecture.”

#### *Windows 95 System Limits*

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Menu  
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per  
listb  
ox

Dat 64K Unli  
a mited  
per  
listb  
ox

Dat 64K Unli  
a mited  
per  
edit  
cont  
rol

Regi All in Unli  
ons 64K mited  
segm  
ent

Phy All in Unli  
sical 64K mited  
pen segm  
s, ent  
brus  
hes,  
and  
so

on

Logi All in All in  
cal 64K 64K  
pen segm segm  
s, ent ent  
brus  
hes,  
and  
so  
on

Logi All in 750 –  
cal 64K 800  
font segm  
s ent

Inst 250 – 1000  
alle 300  
d (best  
font case)  
s

Devi 200 16K  
ce (best  
cont case)  
exts

---

1 System-wide, unless noted otherwise.

2 Limits for GDI objects in Windows 3.1 are not exact because all regions, physical objects, logical objects, device contexts (DCs), and installed fonts had to fit in a single 64K segment. Because many of these have been moved into the 32-bit heap, Windows 95 provides much more room for those remaining items such as logical pens, brushes, and so on. The remaining items in the Windows 95 local heap are all less than 10 – 20 bytes each.

---

[To assess performance of key system resources](#)

n

In System Monitor, define and track the settings for processor usage and

threads under the Kernel category, as summarized in “Identifying Performance

Problems with System Monitor” later in this chapter.

This section summarizes tools in Windows 95 that can be used to adjust or monitor system performance.

#### System Monitor.

This tool can be used to track the performance of key system components, as described in “Tracking Performance with System Monitor” later in this chapter.

#### System option in Control Panel.

The Performance tab provides settings for tuning and troubleshooting. For information, see “Configuring Swap Files” and “Using the Disk Cache” later in this chapter.

#### DriveSpace.

Users should use the protected-mode DriveSpace driver that is installed by default, because this driver is much faster than the earlier real-mode driver and uses only an additional 10 or 15 percent overhead. If you are using other real-mode disk compression utilities other than DriveSpace or DoubleSpace, plan to switch to a protected-mode version. Contact the manufacturer to determine availability of protected-mode drivers that are compatible with Windows 95.

#### Disk Defragmenter.

To improve file access time, you can use the Disk Defragmenter utility to defragment your uncompressed FAT drives and compressed DriveSpace or DoubleSpace drives. Fragmentation occurs over time, as programs read from and write to the hard disk, so that files are stored in noncontiguous sectors on a disk. Fragmentation doesn't affect the validity of the information, but it takes much longer for the computer to read and write fragmented files.

For more information about DriveSpace and Disk Defragmenter, see Chapter 20, “Disks and File Systems.”

### Issues for Performance Tuning

---

This section summarizes performance issues related to computer hardware.

#### 486 versus 386 processors.

Windows 95 uses more 32-bit code than Windows 3.1, so it benefits more than Windows 3.1 did from a 486-based processor, because the 486-class chip is better

optimized for 32-bit code than the 386-class chip. For a given clock rate, if you ran a 16-bit performance benchmark on a 386-based versus a 486-based computer, the 486-based computer would outperform the other computer. If you ran the same benchmark using 32-bit code, the 486-based computer would outperform by an even greater margin. Therefore, because Windows 95 makes extensive use of 32-bit code, you will see significant performance improvements by running on a 486-based processor.

#### *Hard disk speed.*

Hard disk speed affects Windows 95 more than Windows 3.1. In order to support many applications running at once, Windows 95 implements advanced operating features such as demand paging. With demand paging, applications are paged out to the swap file when there is more demand for memory than what is physically available. This is a very efficient mechanism for running many applications in a constrained memory environment. With this feature, the operating system will access the hard disk to page this information into and out of memory. Thus, Windows 95 performance can be greatly enhanced by installing a faster hard disk. Hard disk speed will also have a great effect on performance when running File and Printer Sharing services.

#### *Processor and bus speed.*

In Windows 95, processor and bus speed have a greater impact on video performance than in Windows 3.1. Windows 3.1 display performance was affected by inefficiencies in the monolithic display drivers and typically poor bus throughput (mostly ISA), so the CPU would typically encounter bottlenecks when writing to the display in either the bus or monolithic driver. With PCI and the miniport driver model under Windows 95, CPUs can effectively send data as fast as they can down the PCI bus and through the miniport driver without hitting a bottleneck. This means that CPU performance can greatly affect video performance in Windows 95.

#### *Miniport drivers for display adapters.*

The new display drivers in Windows 95 have been optimized for enhanced display speed and improved graphics performance. Microsoft created a new universal driver with a better mechanism for manipulating memory bitmaps, which provides fast, reliable graphics support. Microsoft provides miniport drivers for most current display adapters, and these new drivers should be used whenever possible. Contact the hardware manufacturer to obtain new drivers if the correct driver is not provided with Windows 95.

#### *Added memory.*

Unlike Windows 3.1, caching in Windows 95 is dynamic, which means that Windows 95 performs better than Windows 3.1 when you increase the amount of system memory. Also, under Windows 95 you do not have to reconfigure the operating system when you change the memory configuration; Windows 95 reconfigures itself

automatically.

Low memory (4 MB) computers.

Most of the tuning necessary for a computer with low memory happens automatically, but there are a few suggestions that can help reduce the size of the Windows 95 working set and give the maximum amount of memory to applications.

n

Run only one network client, if possible. For example, configuring a

computer with both the Client for Microsoft Networks and Microsoft Client for NetWare Networks requires more memory than running a single client.

n

Run a single network protocol. For example, running Microsoft TCP/IP,

NetBEUI, and the IPX/SPX-compatible protocol requires a larger working set than running a single protocol.

n

Run the fewest possible network services. Running File and Printer

Sharing services, the Microsoft SNMP agent, and so on, all require memory and increase the working set of Windows 95.

Enhanced Communication Port (ECP) for printers.

For locally attached printers, or for computers acting as a print server, it's helpful to use a computer that supports the ECP specification. This ensures better print throughput and bidirectional communications.

For information about performance related to network adapters, see "Optimizing Network Performance" later in this chapter.

---

Tip — Don't assume that running an MS-DOS-based application in MS-DOS Mode provides better performance. When an application runs in MS-DOS Mode, Windows 95 and all of its protected-mode drivers are unloaded, so the application is running in real mode with exclusive use of the computer's resources. Although this may help with a few applications that cannot run in standard mode, it does not benefit performance overall because the application doesn't get the benefit of protected-mode drivers, VCACHE, 32-bit disk access, and so on.

---

## *Performance Tuning Overview*

---

In Windows 95, many of the data structures previously stored in the 16-bit GDI and USER heaps are now stored in 32-bit heaps. This implementation greatly reduces the system resource limitations that many users experienced with Windows 3.1. Windows-based applications that are especially graphics-intensive gain even greater benefits from the 32-bit implementation for the GDI heap.

Windows 95 also cleans up unfreed resources in the system to help reduce system resource limitations. When Windows 95 determines that an application that owned certain resources no longer needs those resources in memory, it deallocates left-over data structures, freeing the resources for use elsewhere in the system.

Windows 95 uses the 32-bit capabilities of x86-based computers to support a flat, linear memory model for 32-bit operating system functionality and Win32-based applications. A linear addressing model simplifies application development, removes performance penalties that applications suffered under the old 16-bit segmented memory architecture, and provides access to a virtual address space for up to 4 GB of memory. Windows 95 uses this linear memory model for its internal 32-bit components and virtual device drivers.

```
{fewc msdncd, EWGraphic, xOp 0 /a "psP.bmp"}
```

---

Tip — Click the Performance tab and the Device Manager tab in the System option in Control Panel, and ensure that Windows 95 protected-mode components are being used. (A Windows 95 driver has a .VXD filename extension; a Windows 3.x driver has a .386 filename extension.) If real-mode components are being used for any device — and especially for disk drivers — solve all the problems that are preventing protected-mode drivers from loading. For information, see Chapter 19, “Devices.”

---

The following sections summarize the methods for managing and monitoring resource use in Windows 95:



n

Optimizing the swap file

n

Using the disk cache

n

Optimizing printing

n

Optimizing network performance

n

Tracking performance with System Monitor

*Optimizing the Swap File*

---

Windows 95 uses a special file on your hard disk called a virtual memory SWAP FILE.

(or paging file). With virtual memory under Windows 95, some of the program code and other information are kept in RAM while other information is temporarily swapped to virtual memory. When that information is required again, Windows 95 pulls it back into RAM and, if necessary, swaps other information to virtual memory. This activity is invisible, although you might notice that your hard disk is working. The resulting benefit is that you can run more programs at one time than your system's RAM would usually allow.

On Windows 3.x, users could enhance performance by changing virtual memory settings. However, in Windows 95, this is much more likely to decrease performance. By default, the swap file on a computer running Windows 95 combines the best features of the old temporary and permanent swap files used in Windows 3.1, and uses improved virtual memory algorithms and access methods for better performance.

A Windows 95 swap file is dynamic, so it can shrink or grow based on the operations performed on the system and based on available disk space. A dynamic swap file is usually the most efficient use of resources. The swap file can also occupy a fragmented region of the hard disk with no substantial performance penalty.

Under Windows 95, the swap file can reside on a compressed drive if a protected-mode driver (that is, DRVSPACE.VXD) controls the compressed drive. DriveSpace marks the swap file as uncompressible and, to reduce the risk of fragmentation, places the swap file as the last file in the sector heap, which allows room for the swap file to grow.

[To determine swap file performance](#)

n

In System Monitor, define and track the settings for the swap file under the

Memory Manager category, as summarized in “Identifying Performance Problems with System Monitor” later in this chapter.

Although the system defaults will usually provide the best performance, you can adjust the parameters used to define the swap file. You can change the size of the virtual-memory paging file or create additional paging files on other local hard disk drives by using the System option in Control Panel.

---

**Caution**—— Completely disabling virtual memory may cause your computer to stop operating properly. You may not be able to restart your computer, or system

performance may be degraded. Do not disable virtual memory unless instructed to do so by a technical support representative.

---

To optimize swap file performance on a computer with multiple hard disk drives, you may want to override the default location of the Windows 95 swap file. The swap file should be placed on the drive with the fastest performance (unless that disk is overused). For example, if a user primarily loads all of the software from the same drive in a computer that has multiple drives, performance may be boosted by placing the swap file on one of the drives that is not as busy.

#### [To adjust the virtual memory swap file](#)

{ewc msdncd, EWGraphic, x0p 1 /a "psP.bmp"}

1. In the System option in Control Panel, click the Performance tab.
2. On the Performance property sheet, click the Virtual Memory button.
3. To specify a different hard disk or set limits on the minimum or maximum reserved space, click the option named Let Me Specify My Own Virtual Memory Settings. Then specify the new disk in the Hard Disk box or type values (in kilobytes) in the Minimum or Maximum boxes. Then click OK.

===={ewc msdncd, EWGraphic, x0p 2 /a "psP.bmp"}

#### [Tips for Swap Files with Share Installations](#)

To be provided.

#### [Optimizing File System Performance](#)

---

In Windows 95, the disk cache is dynamic. You do not need to configure its size as part of system configuration. Because of this, the following types of settings used for Windows 3.x are not required in Windows 95 and can be removed from the configuration files.

---

AUT SHARE  
OEX SMARTDR  
EC. V settings  
BAT Any entries  
for other  
disk cache  
software1  
  
CO SMARTDR  
NFI V settings

G.S (double-  
YS buffer  
driver)  
Any entries  
for other  
disk cache  
software

---

1 For a list of the disk caching software that is removed by Windows 95 Setup, see Chapter 6, "Setup Technical Discussion."

---

The overall performance, for example, of an 8-MB computer is better under Windows 95 than under Windows 3.1. However, the amount of paging may be more under Windows 95 for several reasons:

**n** Windows 95 aggressively writes the contents of dirty memory pages

(pages that contain changes) during system idle time, even if it doesn't need the memory at that time. This causes more idle-time disk activity but improves overall performance.

**n** Much more of Windows 95 is pageable than Windows 3.1. That's why it's

even possible to still run applications on low-memory computers when Windows 95 requires a working set of 4 MB. However, the working set isn't the amount of memory you need to hold all your code and data; it's just the amount of memory you need to avoid an unacceptable amount of paging.

Changing the cache size (even if you could) probably wouldn't have much effect on paging. Paging through the cache would quickly overwhelm it and make it useless for other file I/O. Although swap file I/O operations don't go through the cache, memory-mapped files and executable files do. The cache, however, is designed to make sure it doesn't get overwhelmed by such I/O operations.

The cache grows and shrinks as needed. If the system begins to page a lot, the

cache automatically shrinks. However, often people think they are seeing a lot of paging, but they are really seeing other disk activity, such as the Windows 95 shell building its icon cache or the cache lazy writing.

However, if your paging is really extreme, to the point where system performance is poor, then you probably have a hard disk that requires a real-mode device driver. If Windows 95 needs to use MS-DOS for its disk I/O operations, then a lot of code has to be locked down that would otherwise be pageable, and your working set increases significantly. Paging through a real-mode driver does increase paging, but on an 8-MB computer, it shouldn't cause unacceptable performance.

### [To determine file system performance](#)

n

In System Monitor, define and track the settings under the File System

category, as summarized in "Identifying Performance Problems with System Monitor" later in this chapter.

In Windows 95, file system and disk performance can be controlled based on how the computer is used in most situations.

### [To optimize hard disk performance](#)

1. On the Performance tab in the System option in Control Panel, click the File System button.
2. On the General tab, click the list named Typical Role Of This Machine, and click the most common use for this computer. Then click OK.

By default, the following options can appear in the Typical Role list:

n

Desktop, for a normal computer acting primarily as a network client or an

individual computer

# n

Portable, for portable computers

# n

File Server, for computers that are primarily used as peer servers for file or printer sharing

`{fewc msdn cd, EWGraphic, x0p 3 /a "psP.bmp"}`

---

*Tip*— The 32-bit disk access feature is always turned on in Windows 95 unless Windows 95 detects a real-mode disk driver that doesn't have a protected-mode replacement. This could be, for example, an older Stacker® driver or a hard-disk security or encryption driver for a disk drive. To prevent the performance loss that occurs when Windows 95 is forced to use a real-mode disk driver, upgrade to a protected-mode replacement for that driver. If you need to determine why a Windows 95 real-mode disk driver was installed, check the IOS.LOG file. For more information, see Chapter 19, "Devices."

---

The CD-ROM cache is separate from the cache used for disk file and network access, because the performance characteristics of the CD-ROM are very different. This cache is pageable (while the file and network cache is not), which reduces the working set for Windows 95 but still allows for better CD-ROM performance. When Windows 95 is retrieving data from the compact disc, it is still faster to read a record from the cache even if it's been paged to disk, because the disk access time is much faster than the compact disc access time. For information about configuring the CD-ROM cache to match the characteristics of your CD-ROM drive, see Chapter 20, "Disks and File Systems."

## Optimizing Printing

---

Printing to a printer attached to a file or print server behaves differently, depending upon the server's operating system. If you print to a server running Windows 95, the rendering from the Enhanced Metafile Format (EMF) to the printer-specific language happens on the server computer. This means that there is less work performed on

the workstation, giving the user better performance.

When you print to NetWare or Windows NT servers, the rendering from the EMF format to the printer-specific format happens on the client computer. Although this happens in the background, it still makes for more work performed on the client computer. Printing to a printer attached locally causes both the EMF rendering and the device-specific rendering to happen on the computer. For more information, see Chapter 23, "Printing and Fonts."

You also need to decide on the trade-off between disk use and return-to-application time when configuring Windows 95 printing.

#### [To define spool settings for print performance](#)

1. In the printer's property sheet, click the Details tab, and then click the Spool Settings button.
2. In the Spool Setting dialog box, specify whether you want spooling to occur later or sooner.

===={ewc msdn cd, EWGraphic, x0p 4 /a "psP.bmp"}

This setting affects when the print spooler will take the EMF file to render it into the specific printer format:

# n

If you click Despool Later So Printing is Faster, the return-to-application

time is faster, but requires more disk space and increases the total print time. This is because the second rendering does not start until the entire file is written to the EMF file, thus decreasing the amount of work performed on the computer as you print but increasing the disk space, because the entire file has to be written before the second rendering starts.

# n

If you click Despool Sooner So Less Disk Space Is Used, the second

rendering happens simultaneously with the writing of the EMF file. This reduces the total print time and disk space required, but makes the return-to-application

time longer.

## *Optimizing Network Performance*

---

Windows 95 automatically adjusts system parameters to accommodate user demands and various network configurations. For example, it alters the size of the system paging file and cache buffer as memory requirements change, and automatically tunes network time-out values to fit varying LAN topologies.

With a few exceptions, manual tuning of operating system parameters is not required to improve network performance. However, there are several other steps you can take, such as reconfiguring or changing hardware components, that can increase file-sharing performance. This section discusses these steps.

n

Use a 32-bit, protected-mode network client.

For example, the Microsoft Client for NetWare Networks significantly outperforms the VLM or NETX version of the NetWare client. On large block transfers over the network, Client for NetWare Networks is up to 200 percent faster than Windows 3.x with the VLM shell, based on benchmarks performed by testers. The protected-mode networking client can take advantage of caching and other automatic tuning features. With a real-mode client, you are limited to the same performance tuning capabilities that were available under Windows 3.x.

n

Use new NDIS 3.1 network adapter drivers provided with Windows 95.

n

Install a new network adapter, because the new adapters that are



currently available provide markedly better performance than earlier models. If possible, select an adapter that matches the computer bus. For more information, see Chapter 12, “Network Technical Discussion.”

Network adapters have become exceptionally reliable and inexpensive. The low costs of Ethernet adapters, including new Plug and Play hardware, means the most cost-effective way to improve network performance is usually to replace an older network adapter with a new model. The cost for the new hardware is almost immediately offset by savings in support time and improved performance.

The following steps can help you obtain the best performance from computers that provide File and Printer Sharing services:

n

Let Windows 95 determine the right size for the swap file.

n

Make sure the computer has enough memory, depending on the size of your network and the number of users who will be accessing the peer server.

n

Install a high-performance network adapter on the peer server. If the computer uses an 8-bit adapter, you can significantly increase performance by replacing it with a high-performance 16-bit or 32-bit adapter.

# n

Disable rarely used network adapters. This improves overall network

performance by decreasing the number of broadcast packets on the network. Each broadcast packet must be processed by every active adapter on the network. High broadcast rates adversely affect LAN performance by increasing network connection time. You can disable a network adapter by disabling its binding to protocols in the Network option in Control Panel.

# n

Use multiple network adapters. Windows 95 supports multiple adapters for

a given protocol and multiple protocols for a given adapter. Although this configuration can create distinct networks that cannot communicate with each other, it is a way to increase file-sharing throughput.

# n

Install faster hard disks or disk controllers (or both). Typically, when setting

up peer servers, you will want to choose computers configured with the best-performing hardware.

## *Tracking Performance with System Monitor*

---

System Monitor is a Windows 95 tool that you can use to measure the performance of hardware, software services, and applications to help determine the root cause of any problems on a local or remote computer. When you make changes to the system configuration, System Monitor shows the effect of your changes on overall system performance. System Monitor can also be used to show why the system behaves the way it does and to justify hardware upgrades.

Before making major configuration changes, use System Monitor to evaluate your

current configuration; this can help you determine if a particular system or network component is acting as a performance bottleneck.

#### [To run System Monitor](#)

`{ewc msdncd, EWGraphic, x0p 5 /a "psP.bmp"}`

n

From the Start button, click Run, and then type `sysmon`

If the Microsoft Remote Registry service is installed, you can use System Monitor to monitor remote computers, as summarized in Chapter 16, "Remote Administration."

#### [To use System Monitor to monitor remote computers](#)

1. From the File menu, click Connect.
2. In the Connect dialog box, type the computer name of the computer you want to monitor, and then click OK.

---

Tip—— You can add System Monitor to your desktop by right dragging the icon for SYSMON.EXE from Windows Explorer to the desktop.

---

System Monitor uses the dynamic data information present in the Registry to report on the state of processes. System Monitor can be used to do the following:

n

Monitor real-time and historical system performance

n

Identify trends over time

n

Identify bottlenecks

n

Monitor the effects of system configuration changes

n

Determine system capacity

#### [To use System Monitor to track performance problems](#)

1. From the Edit menu in System Monitor, click the Add Item command, or click the Add Item button on the button bar.

—To see more information about a selected resource, click the Explain button.

—{ewc msdn cd, EWGraphic, x0p 6 /a "psP.bmp"}

2. In the Add Item dialog box, select the category of the resource you want to monitor.

—The categories for a particular computer typically include the file system, the system kernel, the network redirectors and protocols, and the Virtual Memory

Manager, depending on the computer's configuration.

3. In the Item list, select one or more resources that you want to monitor.

—To select more than one item, press CTRL or SHIFT while clicking the item you want to select.

4. After you select all the resources that you want to monitor, click OK.

—To change the view of the data from a line chart to a bar chart or a numeric listing, click the related button on the button bar.

—{ewc msdn cd, EWGraphic, x0p 7 /a "psP.bmp"}

Use the menu commands in System Monitor to configure the charts:

n

Click Chart on the Options menu to configure the update interval.

n

Click Edit Item on the Edit menu to configure the color and scaling for a selected item.

n

Use the commands on the View menu to control the display of the toolbar, status bar, and title bar.

---

Note — Because System Monitor uses Registry information, drivers can be written to report additional information in System Monitor. For information about creating such drivers, see the WINDOWS 95 DRIVER DEVELOPMENT KIT.

---

Performance can be defined as the time used per transaction. Performance is affected by two major factors:

n

Devices required to perform the transaction

n

Activities involved in the transaction

Demanding, mission-critical applications may require multiple devices to perform a specific transaction. Each device takes a certain amount of time to perform its part of the transaction. Poor performance results when one of these devices requires noticeably more CPU time than the others, creating a performance bottleneck. When this happens, you must identify the device that is taking the greatest amount of time to process the transaction and tune the performance of this device to optimize the overall performance for the transaction.

When you are monitoring a system, you are monitoring the behavior of the objects that Windows 95 uses to identify and use system resources. Objects represent, for example, sections of shared memory and individual processes such as applications. Every process consists of an executable program, a set of virtual memory addresses, and at least one thread. Threads are objects within processes that execute program instructions. They allow concurrent operation within a process and enable one process to execute different parts of a program on different processors simultaneously.

The following example shows System Monitor statistics for the number of reads per second and the amount of dirty (changed) data processed by the 32-bit file system.

```
{ewc msdncd, EWGraphic, x0p 8 /a "psP.bmp"}
```

System Monitor tracks functionality for the following categories:

n

File system

n

IPX/SPX-compatible protocol

n

Kernel

n

Memory Manager

n

Microsoft Client for NetWare Networks and Client for Microsoft Networks



## Microsoft File and Printer Sharing for Microsoft Networks

---

Note — By using the System Monitor extensible interface, other vendors can add their own categories and data items.

---

The following tables describe the possible settings for the built-in categories.

### File System

---

|                                        |                                                                              |
|----------------------------------------|------------------------------------------------------------------------------|
| Byte<br>s<br>read<br>per<br>seco<br>nd | The<br>number of<br>bytes read<br>from the<br>file system<br>each<br>second. |
|----------------------------------------|------------------------------------------------------------------------------|

|                                               |                                                                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------|
| Byte<br>s<br>writt<br>en<br>per<br>seco<br>nd | The<br>number of<br>bytes<br>written to<br>the file<br>system<br>each<br>second. |
|-----------------------------------------------|----------------------------------------------------------------------------------|

|               |                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dirty<br>data | The<br>number of<br>bytes<br>waiting to<br>be written<br>to the disk.<br>Dirty data<br>is stored in<br>cache<br>blocks, so<br>the number<br>reported |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------|



may be  
larger than  
the actual  
number of  
bytes  
waiting.

Reads per second The number of read operations delivered to the file system each second.

Writes per second The number of write operations delivered to the file system each second.

### IPX/SPX-Compatible Protocol

---

IPX Packets Lost Per Second The number of IPX packets received from an IPX network that were ignored.

IPX Packets Received Per Second The number of IPX packets received from an IPX

Per network  
Sec each  
ond second.

IPX The  
Pack number of  
ets packets  
Sent sent to an  
Per IPX  
Sec network  
ond each  
second.

Ope The  
n number of  
Sock free  
ets sockets.

Rout The  
ing number of  
Tabl IPX  
e interworkin  
Entri g routes  
es known.

SAP The  
Tabl number of  
e service  
Entri advertisem  
es ents  
known.

SPX The  
Pack number of  
ets packets  
Rec received  
eive from an  
d SPX  
Per network  
Sec each  
ond second.

SPX The  
Pack number of  
ets packets  
Sent sent to an  
Per SPX  
Sec network

ond each  
second.

### Kernel

---

Proc The  
esso approximat  
r e  
Usa percentage  
ge of time the  
(%) processor  
is busy.

Thre The current  
ads number of  
threads  
present in  
the system.

Virtu The current  
al number of  
Mac virtual  
hine machines  
s present in  
the system.

### Memory Manager (VMM32)

---

Alloc The total  
ated amount of  
mem allocated  
ory memory in  
bytes.

Disc The  
ards number of  
pages  
discarded  
each  
second.

Disk Cac he Size The current size of the disk cache in bytes.

Free Mem ory The total amount of free memory in bytes.

Insta nce Fault s The number of instance faults each second.

Lock ed Mem ory The amount of allocated memory that is locked.

Maxi mum Disk Cac he Size The largest size possible for a disk cache.

Mini mum Disk Cac he Size The smallest size possible for a disk cache.

Othe r Mem ory The amount of allocated memory that is not stored in the swap file; for example, memory

mapped  
files,  
nonpageable  
memory,  
and disk  
cache  
pages.

Pag The  
e number of  
Fault page faults  
s each  
second.

Pag The  
e-ins number of  
pages  
swapped  
into  
memory  
each  
second.

Pag The  
e- number of  
outs pages  
swapped  
out of  
memory  
each  
second.

Swa The  
pfile number of  
Defe bytes in the  
ctive swap file  
that are  
found to be  
physically  
defective  
on the  
swap  
medium.  
Because  
swap file  
frames are  
allocated in  
4000-byte

blocks, a single damaged sector causes the whole block to be marked as defective.

Swapfile In Use The number of bytes being used in the current swap file.

Swapfile Size The size of the current swap file in bytes.

Swapfile Memory Locked The number of bytes allocated from the swap file. Locked pages still count for the purpose of this metric.

#### Microsoft Client for NetWare Networks

---

Burst Packets Dropped Number of burst packets lost in transit.

Burst Interpacket Time gap for

Receive Traffic, in  
Microseconds.

Interpacket  
Gap for  
Outgoing  
Traffic, in  
Microseconds.

Out of  
Cache, in  
bytes,  
currently  
cached by  
the  
redirector.

Bytes read  
from the  
redirector  
per  
second.

Bytes  
written to  
the  
redirector  
per  
second.

Amount of  
dirty data,  
in bytes,  
currently  
cached by  
the  
redirector  
and waiting  
to be  
written.

Number of

Pack regular  
ets NCP  
Drop packets  
ped lost in  
transit.

Req Number of  
uest requests  
s waiting to  
Pen be  
ding processed  
by the  
server.

Microsoft Network Client (Client for Microsoft Networks)

---

Byte The  
s number of  
Rea bytes read  
d from the  
Per redirector  
Sec each  
ond second

Byte The  
s number of  
Writ bytes  
e written to  
Per the  
Sec redirector  
ond each  
second

Num Number of  
ber networks  
of currently  
Nets running.

Ope Number of  
n open files  
Files on the  
network.

Res Number of  
ourc resources.  
es



Sess Number of  
ions sessions.

Tran The  
sacti number of  
ons SMB  
Per transaction  
Sec s managed  
ond by  
redirector  
each  
second.

Microsoft Network Server (File and Printer Sharing for Microsoft Networks)

---

Buff The  
ers number of  
buffers  
used by  
the server.

Byte The total  
s number of  
Rea bytes read  
d from a  
disk.

Byte The total  
s number of  
Writt bytes  
en written to a  
disk.

Mem The total  
ory memory  
used by  
the server.

NBs Server  
network  
buffers.

Serv The current  
er number of  
Thre threads  
ads used by

the server.

|      |              |
|------|--------------|
| Byte | The total    |
| s/   | number of    |
| Sec  | bytes read   |
| ond  | from, and    |
|      | written to a |
|      | disk.        |

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Chapter 18 Introduction to System Configuration*

This chapter presents overview information about configuring hardware and software for use with Windows 95. It also provides some background information about device support and Plug and Play features within Windows 95.

### *System Configuration Overview*

---

Windows 95 includes several tools and internal features that make it easy to configure the hardware and software you use on your computer.

#### *Automatic hardware detection.*

Hardware designed to work with Windows 95 is virtually self-configuring. When you run Windows 95 Setup, an automatic hardware detection routine searches your computer to determine the hardware components that are installed. For components that are Plug and Play-compliant, and for many older legacy components, Windows 95 automatically detects and configures them. Windows 95 Plug and Play features are described in “Plug and Play Overview” later in this chapter. For more information about hardware detection during Setup, see Chapter 6, “Setup Technical Discussion.”

#### *Transfer of Windows 3.x or Windows for Workgroups settings.*

When you upgrade to Windows 95 from an earlier version of Windows, system configuration settings (such as those in SYSTEM.INI and CONFIG.SYS) are automatically updated and moved to the Registry for configuring Windows 95. For information, see Chapter 6, “Setup Technical Discussion.”

#### *Configuration wizards.*

Windows 95 includes online wizards for installing new hardware, adding modems, adding printers, and installing applications. These tools lead you through all the steps you need to configure the new component on a computer.

#### *Point and print.*

When you copy a printer icon from the server's window to your own Printers window or desktop, Windows 95 automatically installs the correct printer driver and configures the network connection to a network printer.

#### *Control Panel options for system configuration.*

The Control Panel includes several tools for configuring various parts of your system. The following table describes some of the Control Panel tools for system configuration.

---

{ Accessibility  
e Options. Use  
w this tool to  
c adjust  
m keyboard,  
s sound,  
d display,  
n mouse, and  
c general  
d options to  
, make  
E Windows 95  
Weasier to use  
G for individuals  
r with  
a disabilities.  
p For  
hi information,  
c, see Appendix  
x I,  
O "Accessibility."  
q  
O  
/  
a  
"  
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s  
Q  
.  
b  
m  
p  
"}  
  
{ Add New  
e Hardware.  
w Use this  
c wizard to  
m configure  
s newly  
d installed  
n hardware  
c through  
d autodetection  
, or by

E selecting the  
Wcorresponding  
G driver from a  
r list. For  
a information,  
p see Chapter  
hi 19, "Devices."

C,

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{ Add/Remove  
e Programs.

w Use this

c wizard to

m install a

s program from

d a setup disk.

n You can also

c remove any

d application

, installed with

E this tool, add

Wcomponents

G from the

r Windows 95

a setup disks,

p or create a

hi new startup

c, disk. For

x information,

O see Chapter

q 22,

2 “Application  
/ Support.”

*a*  
”

*p*

*s*

*Q*

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*b*

*m*

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”}

{ Display. Use  
e this tool to  
w change  
c background  
m and screen  
s saver  
d choices.  
n Modify  
c settings for  
d on-screen  
, fonts, colors,  
E color palette,  
W and so on.  
G For  
r information on  
a configuring  
p the display,  
hi see Chapter  
c, 19, “Devices.”

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*a*

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{ Fonts. Use  
e this tool to  
w view installed  
c fonts or install  
m new fonts. For  
s more  
d information,  
n see Chapter  
c 23, "Printing  
d and Fonts."

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E

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{ Keyboard.  
e Use this tool  
w to change  
c options for the  
m style of  
s keyboard you  
d use and for  
n the rate at  
c which the  
d characters

, you type are  
E displayed. For  
Winformation,  
G see online  
r Help.

a  
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hi  
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{

Modems. Use  
e this wizard to  
w add a new  
c modem. You  
m can also use  
s this tool to  
d configure or  
n diagnose  
c installed  
d modems. For  
, more  
E information,  
Wsee Chapter  
G 25, "Modems  
r and  
a Communicati  
p on Tools."  
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c,  
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*m*  
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*{* Mouse. Use  
*e* this tool to  
*w* change  
*c* mouse or  
*m* pointer  
*s* options. For  
*d* information,  
*n* see Chapter  
*c* 19, "Devices."  
*d*

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*E*  
*W*  
*G*  
*r*  
*a*  
*p*  
*hi*  
*c,*  
*x*  
*0*  
*q*  
*7*  
*/*  
*a*  
*"*  
*p*  
*s*  
*Q*  
*.*  
*b*  
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{

Multimedia.  
e Use this tool  
w to change  
c options for  
m audio  
s playback and  
d recording,  
n MIDI output  
c and schemes,  
d and CD  
, playback  
E volume. Use  
Wthe Advanced  
G property  
r sheet to  
a install or  
p configure  
hi multimedia  
c, hardware,  
x drivers, and  
O codecs. For  
q information,  
8 see Chapter  
/ 21,  
a "Multimedia."  
"

*p*  
*s*  
*Q*

*.*  
*b*  
*m*  
*p*  
"}  
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Printers. Use  
e this tool to  
w configure  
c existing  
m printers or  
s add new  
d printer. For  
n more  
c information,

*d* see Chapter  
, 23, "Printing  
*E* and Fonts."

*W*

*G*

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*a*

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*hi*

*c,*

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*a*

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*p*

*s*

*Q*

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*b*

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*{* Sound. Use  
*e* this tool to  
*w* create or  
*c* modify sound  
*m* schemes.  
*s* (Available to  
*d* users who  
*n* have sound  
*c* cards on their  
*d* computers.)  
, For  
*E* information,  
*W*see online  
*G* Help.

*r*

*a*

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*hi*

*c,*

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System. Use  
e this tool to  
w view general  
c information  
m about your  
s computer.  
d Use Device  
n Manager to  
c list or  
d configure  
, hardware  
E properties.  
WList, copy, or  
G rename  
r hardware  
a profiles. For  
p information,  
hi see Chapter  
c, 19, "Devices."

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## *Improved Device Support in Windows 95*

---

Windows 95 provides improved support for hardware devices and peripherals including disk devices, video display adapters, pointing devices, modems and other communication devices, and printers. This section summarizes the improved device support.

### *Minidriver architecture for reliable drivers.*

Windows 95 extends the minidriver architecture for printer drivers used in Windows 3.1 throughout the operating system to the architecture for drivers of other system components, resulting in increased driver stability and forward compatibility. Although it is still possible to write and use monolithic drivers in Windows 95, Microsoft recommends that hardware manufacturers use the minidriver model.

### *Improved support through Plug and Play.*

Plug and Play is designed so that adding a device, either permanently or dynamically, requires nothing more than taking it out of the box and plugging it in. The computer and operating system seamlessly adjust to the new configuration. When using Plug and Play-compliant hardware, users will no longer be required to manually set jumpers and switches to redirect IRQs, DMA channels, or I/O port addresses. This saves time and expense in supporting service calls related to hardware configurations.

Plug and Play also benefits users who install Plug and Play-compliant devices into older, legacy computers. Components using the Plug and Play architecture can accommodate the lack of device-reporting mechanisms in devices which are not Plug and Play-compliant. Information about these devices is stored centrally in the Registry, and devices that cannot be reconfigured by the software receive first priority when resources are allocated.

### *The Registry and Device Manager for resource management.*

To properly manage resources such as IRQs, I/O addresses, and DMA addresses, Windows 95 uses the Registry to track devices and resources allocated for both Plug and Play-compliant devices and legacy devices. The Registry provides a centralized, dynamic data store for all Windows settings, with a "current configuration" branch that stores information on a per-configuration basis. For example, the Desktop option in Control Panel stores per-configuration information

about video resolution changes and Print Manager stores per-configuration information about the default printer.

Device Manager — which is available from the System icon in Control Panel — provides a graphical representation of devices configured in Windows 95, and allows properties used by these devices to be viewed and, as appropriate, changed. Device Manager also shows resources allocated for the configured devices. Through the resource configuration information maintained in the Registry, Windows 95 is able to automatically identify and resolve device resource conflicts for Plug and Play-compliant devices. For legacy devices, Device Manager helps users quickly identify and resolve conflicting resources and devices in the system.

Virtual device drivers.

Windows 95 uses virtual device drivers (VxDs) where possible to provide improved performance. VxDs replace the real-mode MS-DOS device drivers used in previous versions of Windows for the following:

n MS-DOS FAT file system

n SmartDrive

n CD-ROM file system

n

Network drivers and network transport protocols

n

Network client and peer resource sharing server

n

Mouse driver

n

MS-DOS file sharing and locking support (SHARE.EXE)

n

Disk device drivers, including support for SCSI devices



## DriveSpace (and DoubleSpace) disk compression

Windows 95 provides device driver and TSR functionality as protected-mode components that reside in extended memory, avoiding context switches when running 32-bit applications. Use of VxDs also improves system stability and reliability over using the MS-DOS device driver counterparts.

### PCMCIA support.

Through the Plug and Play architecture, Windows 95 delivers power, compatibility, ease of installation, and dynamic card insertion and removal to PCMCIA users. PCMCIA drivers in Windows 95 are robust, 32-bit, dynamically loadable virtual device drivers with zero-memory footprint. Windows 95 includes an updated version of Card and Socket services to support PCMCIA. The Windows 95 compatibility testing program ensures compatibility with these standards.

To install a PCMCIA device, just insert the card in the computer. For example, when you plug in a PCMCIA network adapter, Windows 95 detects the network adapter, loads the network drivers, and establishes a network connection. Then the user interface is updated to show that the mapped network drives are now active. With earlier versions of Windows or other operating systems, you had to shut down and restart the computer to begin using the device.

### Hot docking support.

Microsoft forged partnerships with leading portable vendors such as Toshiba and COMPAQ, and BIOS vendors such as Phoenix Technologies to achieve a high level of integration between hardware and software. On the hardware side, new docking stations support docking and undocking operations without turning the computer off. On the software side, Windows 95 detects the changes in configuration and anticipates the changes in hardware, manages any conflicts (such as open files on an external hard drive or network), and loads the hardware drivers appropriate to the new configuration.

Instead of changing configuration files and restarting the computer, users now just choose Eject PC from the Start menu. Windows 95 checks for potential problems before undocking, and the system undocks (without powering down, if the user chooses). After the computer is undocked, the operating system automatically reconfigures to support the different hardware, and continues running. For example, Windows 95 might change video resolution to 640x480 to match the resolution of the



built-in display on the portable computer “on the fly”.

Windows 95 supports internal messages that alert applications and device drivers to changes in the hardware, including notification of docking actions, power management, PCMCIA device changes, and insertion of new devices, a serial mouse, or a parallel cable. For example, the applications provided with Windows 95 use the message that announces configuration changes in the following ways:

n

The Briefcase uses it to try to start updating

n

The print spooler uses it to print all deferred print jobs

n

Microsoft Exchange uses it to try to reestablish a network connection.

### Windows 95 Device Classes

---

Devices and buses are grouped as classes in Windows 95, for purposes of installing and managing device drivers and allocating resources. The Registry contains a subkey for every class of device supported, and the hardware tree (as described in the following section) is organized by device class. Windows 95 uses class installers to install drivers for all hardware classes. The Device Manager, for example, sends messages to the various class installers to tell them to add, remove, or configure specific hardware.

The following are some examples of class names defined in Windows 95:

Adapter

Cdrom  
Display  
EISADevices  
FDC  
HDC  
Keyboard  
MCADevices  
Media  
Modem  
Monitor  
Mouse  
MTD  
Net  
NetService  
Nodriver  
PCMCIA  
Ports  
Printer  
SCSIAdapter  
System

The Windows 95 hardware tree is a record created in RAM at system startup of the current system configuration, based on the configuration information for all devices in the hardware branch of the Registry. The hardware tree is created each time the system is started or whenever a dynamic change occurs to the system configuration.

Each branch in the tree defines a device node with the following requirements for configuration:

**n** Unique identification code, or device ID

**n** List of required resources, including the resource type (such as IRQ and memory range) and constraints on specific resources (such as a COM port that requires IRQ3)

n

List of allocated resources

n

Indication that the device node is a bus, if applicable (each bus device has additional device nodes under it in the tree)

#### [Tip for Viewing the Hardware Tree](#)

Most information in the Windows 95 hardware tree can be seen by using the Device Manager, which you can display by choosing the System option in Control Panel. The Device Manager is described in Chapter 19, "Devices."

You can also see the information in the hardware tree in the Hkey\_Dyn\_Data\Dynamic\Enum section of the Windows 95 Registry.

The configuration process in Windows 95 uses the device nodes to identify the devices and resource requirements for establishing the working system configuration. For information about the components that work together in Windows 95 to configure the system, see "Configuration Manager" in Chapter 31, "Windows 95 Architecture."

#### *Plug and Play Support in Windows 95*

---

Plug and Play is an independent set of computer architecture specifications that hardware manufacturers use to produce computer devices that can be configured with no user intervention. The system determines the optimal configuration, and applications automatically adjust to take full advantage of the new configuration.

The Plug and Play capabilities in Windows 95 have been widely described as key benefits to moving to Windows 95, because of the related reduction in hardware and software support costs. When Windows 95 detects the presence of a Plug and Play-compliant device, its device driver can be loaded and configured dynamically, requiring little or no user input. After the device and driver are installed, the driver

reacts to system messages when a device is inserted or removed.

Because Windows 95 provides a complete Plug and Play operating system, you can add Plug and Play-compliant devices on legacy computers and still gain many of the benefits of automatic detection and configuration. This choice for adding devices is recommended over continuing to add non-Plug and Play devices to legacy computers. To use all Plug and Play features, however, your system must include a Plug and Play BIOS (the motherboard), devices (buses), and an operating system (Windows 95).

For Plug and Play-compliant devices, installation consists of plugging in the device and turning on the computer. For example, a user can do the following:

**n** Insert and remove Plug and Play-compliant devices such as PCMCIA-cards with automatic configuration.

**n** Connect to a docking station or network without restarting the computer or changing configuration parameters.

**n** Add a new monitor by plugging it in and turning it on.

The following describes Plug and Play requirements and benefits.

Support for automatic installation of new devices.

Plug and Play-compliant devices must be able to identify themselves and specify their capabilities and resource requirements. The operating system uses this information to establish a working configuration for all devices and load the

appropriate device drivers without user intervention. Installing a new device consists of plugging it in, turning on the computer, and, if necessary, inserting a floppy disk when requested by the system. If the driver is already present on the computer, the last step is not required.

#### *Support for dynamic configuration changes.*

Plug and Play allows “hot docking” (that is, docking with the device powered on) and insertion of devices. This means that when a device is inserted, the operating system recognizes the new device, its capabilities, and its requirements, and loads the appropriate driver without requiring the user to restart the system unless the required resources are not available to the new device. Applications are notified about dynamic events, so they can take advantage of the new functionality or stop attempting to use unavailable devices.

#### *Compatibility with existing systems and peripherals.*

Plug and Play is compatible with the installed base of legacy computers and peripherals that lack device-reporting mechanisms used for Plug and Play. Information about such devices is stored in the system, and devices that cannot be software-configured receive first priority in resource allocation. When unresolvable conflicts occur between devices, the system guides the user through device-configuration options.

#### *Independence of operating systems and hardware.*

The Plug and Play architecture is independent of specific operating systems and hardware implementations. The architectural components are based on published interfaces and accommodate different bus and device architectures. Plug and Play supports existing classes of devices and can be extended to new classes of devices that may be developed in the future.

#### *Reduced complexity and increased flexibility of hardware.*

Plug and Play reduces hardware complexity and increases hardware flexibility by providing hardware manufacturers with specific design guidelines and standard interfaces between system components.

---

Note—— You can obtain the Plug and Play specifications from the PLUGPLAY forum on CompuServe®.

---

The following table compares the Plug and Play implementation in the Windows 95 operating system against other implementations.

#### *Plug and Play in Windows 95 versus Other Implementations*

---

Dynamically loads, initializes, and unloads DOS-based drivers in protected mode. CONFIG.SYS.

Supports a wide range of device types (as described in the following section).

Provides robust detection on for devices, which is critical for Plug and Play on legacy computers.

Notifies Configu  
other re  
drivers device  
and IRQ  
applica settings  
tions and so  
when a on, but  
new the  
device burden  
is of  
availab installati  
le for on falls  
use. on the  
Windo user.  
ws 95  
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s an  
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tion  
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ure to  
ensure  
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drivers  
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robust, reliable.  
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ss  
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on  
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h the  
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ion of  
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subsys  
tems  
and the  
startup  
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Provid In real  
es an mode,  
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cture provide  
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and ture.  
bus  
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e for all  
device  
s.

For additional details about the supporting internal structures, see Chapter 31, "Windows 95 Architecture."

### *Plug and Play Device Types*

---

A variety of devices are compliant with Plug and Play, but the degree of compliance varies by type of device. The following sections describe the types of devices and provide details for Plug and Play versus legacy devices.

Industry Standard Architecture (ISA) bus design is the architecture specified for the IBM® PC/AT®. Plug and Play ISA devices can run on existing computers, because the specification does not require any change to ISA buses. For automatic configuration of Plug and Play ISA devices, the system performs the following actions:



n

Identifies and configures the devices using I/O ports, which enables the Plug and Play logic on the card.

n

Isolates each card and assigns a unique device ID and serial number.

n

Reads the resource requirements and capabilities stored on each card.

n

Allocates resources to each card, which reserves these resources so that other Plug and Play cards in the computer cannot be assigned these resources.

n

Activates the Plug and Play ISA cards.

For legacy devices, standard ISA cards can coexist with Plug and Play ISA cards on the same computer. Windows 95 determines the type of hardware and its

configuration during Setup, either by polling the hardware or asking the user to supply values. This configuration information is stored as static values in the Registry, and cannot be changed dynamically, but it is used to determine resource assignments for Plug and Play-compliant devices.

Enhanced Industry Standard Architecture (EISA) is a bus design for x86-based computers, specified by an industry consortium. EISA devices use cards that are upwardly compatible from ISA. EISA devices use standard software mechanisms for identification and configuration. As such, they meet most of the Plug and Play requirements. Windows 95 includes a bus enumerator that makes configuration information from these devices accessible to the operating system. This means that Windows 95 does not reconfigure EISA cards, but simply uses the information that hardware detection derives from the EISA nonvolatile RAM storage to know what resources are used.

Small Computer Standard Interface (SCSI) is a multiple-device chained interface used in many devices such as hard disks and CD-ROM drives. Plug and Play SCSI devices support dynamic changes to the adapter and automatic configuration of device ID and termination.

Configuration of a SCSI system can be separated into two distinct processes:

n

Configuring the SCSI bus itself, such as terminating both ends of the SCSI bus and setting device IDs.

n

Configuring the SCSI host adapter, such as assigning an IRQ channel, DMA channel, and so on.

Configuring a SCSI bus that is not Plug and Play-compliant is difficult for most users.  
The list of issues related to configuring a SCSI bus is long, including:

n

SCSI device ID assignment

n

Termination

n

SCSI parity

n

Command sets

n

Disk geometry and software

For example, the SCSI-2 specification does not define an automated ID assignment

mechanism, so the user is responsible for making sure that no two SCSI devices on the same SCSI bus share the same SCSI ID. Also, you can replace a SCSI host adapter with one from another company and find it doesn't work due to differences in disk geometries or the way devices are mapped to INT 13 parameters.

For more information about SCSI devices and drivers, see Chapter 20, "Disks and File Systems."

The Personal Computer Memory Card International Association (PCMCIA) created the standard for the credit card-sized interface cards in portable computers and other small computers. PCMCIA technology provides all Plug and Play functionality. Windows 95 provides automatic installation and drivers for Intel-compatible and Databook-compatible PCMCIA sockets. Windows 95 also supports real-mode and protected-mode PCMCIA system software drivers (card services) from other vendors, but some of the Plug and Play capabilities will not be available, such as hot swapping of network adapters and automatic installation.

Windows 95 supports hot or warm docking for a PCMCIA device. The device's configuration information is saved under a unique identifier in the hardware tree (as described later in this section) so it can be used for dynamic configuration.

Depending on how the hardware manufacturer uses the Plug and Play standard, a PCMCIA device driver might be combined with an ISA or an EISA driver for the card, or the system's generic driver can be used.

To take advantage of Plug and Play, a card must contain information that Windows 95 can use to create a unique device ID for the card. Device drivers can be implemented under three possible schemes, depending on how complete the Card Information Structure (CIS) is on the card, whether the driver requires memory services, and whether the drive is bus-sensitive:

n

A standard Plug and Play device driver for PCMCIA (the preferred driver)

can handle dynamic configuration and removal, and receive configuration information from the operating system without knowledge of the card in the PCMCIA bus. The recommended choices are NDIS 3.x drivers for network adapters and Windows NT miniport drivers for SCSI cards, which do not require PCMCIA-specific services such as memory buffers.

# n

Generic Windows 95 device drivers are supported automatically for

devices such as modems and disk drives. If the card contains complete configuration information, the operating system initializes the device and passes configuration information to the driver.

# n

Manufacturer-supplied drivers are required for device classes such as

network or SCSI adapters that require specific PCMCIA functions, such as memory-mapped I/O or memory window operations. Windows 95 supports these operations through the standard card services API.

For information about configuring PCMCIA devices, see Chapter 19, “Devices.”

The Video Electronic Standards Association (VESA) Local (VL) bus standard allows high-speed connections to peripherals. VL bus devices are not totally Plug and Play-compliant. Because a VL bus device is an ISA child bus, VL devices can work similarly to ISA devices. The same modifications are required as for ISA; otherwise, the VL device is treated as a legacy device in Windows 95. The VL bus is used especially to support high-performance video cards.

The Peripheral Component Interconnect (PCI) local bus is a standard used in most Pentium™ computers and in the Apple® PowerPC™ Macintosh® and is likely to be the successor to VL. Windows 95 does not reconfigure PCI cards, but simply uses the information that hardware detection derives from the PCI nonvolatile RAM storage to know what resources are used. The PCI bus architecture meets most Plug and Play requirements, and PCI devices use standard mechanisms for identifying themselves and declaring resource requirements.

---

Note — PCI is usually a secondary bus. If its primary bus is not Plug and Play-compliant, the PCI bus cannot use Plug and Play functions.

---

Other device types can take advantage of Plug and Play if they provide mechanisms for identification and configuration. These include IDE controllers, Extended Capabilities Ports (ECP), and communications ports.

Parallel ports, also known as LPT ports, can also take advantage of Plug and Play. The most common parallel port type is the Centronics® interface. Plug and Play parallel ports meet Compatibility and Nibble mode protocols defined in IEEE P1284. Compatibility mode provides a byte-wide channel from the computer to the peripheral. Nibble mode provides a channel from the peripheral to the host through which data is sent as 4-bit nibbles using the port's status lines. These modes provide two-way communication between the host and the peripheral. Nibble mode is also used to read the device ID from the peripheral for device enumeration.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 19 Devices

This chapter presents an overview of issues related to Windows 95 support for both Plug and Play-compliant and legacy devices. It also provides specific details for installing and configuring devices, including PCMCIA cards, display adapters, the mouse, and communications ports.

### *Devices: The Basics*

---

These key features (and related benefits) result from the Windows 95 system design changes (as described in Chapter 18, “Introduction to System Configuration”):

**n** Automatic installation for new Plug and Play devices, allowing the user to just start working without configuring or, usually, without restarting the computer.

**n** Centralized places to configure legacy devices and set preference for resources in the Registry and the Device Manager.

**n** Enhanced support for PCMCIA adapters, portable computers, and docking stations.

Windows 95 includes several tools to help install, configure, and manage hardware devices:

# n

The Add New Hardware option in Control Panel is a wizard that guides you through the steps required to install and configure drivers for legacy devices. For information, see the summary later in this section, plus “Installing New Devices” later in this chapter.

# n

You can view the hierarchy of devices in the system and print various reports on system settings using Device Manager in the System option in Control Panel. For information, see the summary later in this section, plus “Changing Settings with Device Manager” later in this chapter.

# n

You can use the Display and Mouse options in Control Panel to install and configure all device driver and user preference settings related to the video display and pointing devices. For information, see the summary later in this section, plus “Configuring the Display” and “Configuring the Mouse” later in this chapter.

For other devices, such as modems, Windows 95 provides installation and configuration wizards. For more information, see the chapters related to specific devices.

You can also use the wizards created for installing modems, faxes, printers, multimedia and sound devices. For information about using these specific tools, see the related chapters in the WINDOWS 95 RESOURCE KIT.

This section summarizes improvements in support for these device types:



# n

Display adapters and monitors

# n

Mouse and pointing devices

# n

Communications ports

*Improved display adapter and monitor support.*

Windows 95 Setup automatically detects the video display adapter and installs the appropriate display driver. The Windows 95 video drivers are stringently tested to ensure greater reliability and stability than drivers for Windows 3.1.

Also, Windows 95 includes mechanisms to ensure that bad or incompatible video drivers cannot keep you from starting and using the system. If a video driver fails to load or initialize when Windows 95 is started, Windows 95 uses the generic VGA video driver. Benefits of the new display driver support in Windows 95 include the following:

# n

More stable and reliable video display adapter drivers using the minidriver

architecture, with support for many more video cards

n

Support for new features, including the ability to change video resolution without needing to restart Windows 95

n

Video driver support for mobile computing, providing functionality to switch automatically between video cards in a portable computer and a docking station

n

Consolidated installation and configuration of display drivers and display properties such as colors, wallpaper patterns, and screen saver in a single Control Panel icon

n

Image Color Matching (ICM) support for device-independent color usage (this is offered through an agreement between Microsoft and Kodak)

n

Support for new generation of hardware and device functionality such as

Energy Star Monitors conforming to the VESA Display Power Management Signaling (DPMS) specification, and detection of monitor properties such as maximum resolution supported when used in conjunction with monitors that support the VESA Display Data Channel (DDC) specification

Windows 95 includes drivers for nearly all popular graphics accelerators, and has been shown to benchmark faster than Windows 3.1 on the following models and chip sets:

n

ATI Ultra (mach8), Ultra Pro (mach32), Ultra Pro Turbo (mach64)

n

Cirrus Logic 5426/28/29/34

n

COMPAQ® Qvision®

n

S3 911, 924, 801, 805, and 928

n

Tseng Labs ET4000 W32i

n

Western Digital™ 90C31/33

n

IBM® XGA® and XGA/2

*Improved mouse and pointing device support.*

As with other device drivers, the minidriver architecture of Windows 95 simplifies mouse driver development and improves virtualization in a protected-mode mouse driver to better support MS-DOS—based applications in the Windows environment. Windows 95 includes the following improvements to mouse support over Windows 3.1:

n

Smooth, reliable input support through the use of protected mode drivers

n

Easy installation for mouse and pointing devices, including Plug and Play support

n

A single mouse driver, eliminating the need to use separate mouse drivers for MS-DOS and Windows, which increases robustness and saves conventional memory

n

Support for connecting a mouse after Windows 95 has started — to assist mobile computer users who forget to connect a mouse before turning on the computer

n

Consolidated mouse configuration and customization support in a single Control Panel option

n

Improved device support to allow the use of serial ports COM1 through COM4 for connecting a mouse or other pointing device

*Improved communications hardware support.*

Windows 95 provides improved communications device and hardware support over Windows 3.1. A few areas of improvement include the following:

n

16550A UART FIFO support. Windows 95 provides robust, high-quality performance at high baud rates for MS-DOS—based and Windows-based communications applications using local serial ports with 16550A compatible UARTs. Communications support in Windows 95 should alleviate the need for other vendors to replace communications driver components.

n

More ports supported. The Windows 95 communication APIs support the same number of logical ports as MS-DOS: 128 serial ports and 128 parallel ports. This enhanced limit allows use of multiport serial devices. The actual

limitations to the number of ports usable is still based on the physical number of ports available to the computer.

n

Support for future parallel modems. Windows 95 also provides support for

enhanced capabilities ports (ECP) to facilitate higher speed communications than is possible over a serial device. This support allows the use of parallel port modems in the future.

### *Issues for Devices*

---

Check the HARDWARE COMPATIBILITY LIST and the Readme file provided with Windows 95 for information related to the specific devices you are responsible for administering.

If you try to install other vendors' device drivers created for Windows 3.x over Windows 95, you can damage your Windows 95 configuration. If the device is supported under Windows 95, the best way to recover is to do the following.

#### *To recover from faulty installation of a Windows 3.x driver*

1. Restart the computer, pressing F8 when the Starting Windows 95 message appears, and then choosing the Safe Mode option.
2. Remove all entries added to SYSTEM.INI by the Windows 3.x driver installation program.
3. Remove the device in Device Manager, as described in "Changing Settings with Device Manager" later in this chapter.
4. Restart Windows 95 in the usual way.
5. In Control Panel, double-click the Add New Hardware icon to reinstall the device using the Windows 95 drivers, as described in "Installing New Devices" later in this chapter.

If the device is not supported under Windows 95, follow the first four steps in the previous procedure. Contact the device manufacturer to determine when drivers compatible with Windows 95 will be available.

### *Devices Overview*

---

Windows 95 handles the installation and configuration of Plug and Play-compliant devices automatically. Microsoft recommends that, whenever possible, you choose new Plug and Play-compliant devices, even for a legacy computer which does not have a Plug and Play BIOS.

Windows 95 uses a large number of subsystems to control various classes of devices that identify logical device types such as the display, keyboard, and network. Each subsystem uses a different driver architecture, and offers different user options and compatibility constraints, so different installation mechanisms are required for each class. For many devices, you must use Device Manager in the System option in Control Panel for configuration if you must make manual changes.

The following table lists the default classes and shows where you can find the installation tools for changing the device driver.

---

|                                                                           |                                                                                                                                    |
|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Disk<br>clas<br>s:<br>Disk<br>driv<br>es<br>and<br>ada<br>pter<br>s       | Disk Property<br>sheet for<br>specific<br>devices<br>displayed<br>under<br>related<br>disk<br>controllers<br>in Device<br>Manager. |
| Disp<br>lay<br>clas<br>s:<br>Vide<br>o<br>displ<br>ay<br>ada<br>pter<br>s | Display<br>Adapter<br>property<br>sheet in<br>Device<br>Manager.<br>See<br>“Configurin<br>g the<br>Display” in<br>this<br>chapter. |
| Key<br>boar<br>d<br>clas<br>s:<br>Key                                     | Keyboard<br>option in<br>Control<br>Panel. See<br>the<br>Keyboard                                                                  |



board topics in  
d Help.  
devices

Modem  
em option in  
class Control  
s: Panel. See  
Data Chapter  
and 25,  
fax "Modems  
mod and  
ems Communications  
Tools."

Mouse  
se option in  
class Control  
s: Panel. See  
Mouse the Mouse  
se topics in  
device Help. See  
also  
"Configuring the  
Mouse" in  
this  
chapter.

Multimedia  
med option in  
ia Control  
class Panel. See  
s: the related  
Multimedia  
med devices in  
ia Device  
device Manager  
ces for game  
ports; see  
also  
Chapter  
21,  
"Multimedia."  
a."

Net Property  
work sheet for  
clas the  
s: network  
Net adapter  
work under the  
ada Network  
pter option in  
s Control  
Panel. See  
Chapter  
12,  
“Network  
Technical  
Discussion  
.”

PC Specific  
MCI device's  
A property  
clas sheet in  
s: Device  
PC Manager.  
Car See  
d “Enabling  
sock PCMCIA  
ets Cards” in  
this  
chapter.

Port Ports  
s property  
clas sheet in  
s: Device  
Port Manager.  
s See  
“Configurin  
g  
Communic  
ations  
Ports” in  
this  
chapter.

Print Print  
er Manager  
clas (no class

s: installer).  
Print See  
ers Chapter  
23,  
“Printing  
and Fonts.”

Syst Installation  
em handled by  
clas the  
s: system.  
Syst Configure  
em using the  
devi device’s  
ces property  
sheet in  
Device  
Manager.

Unk Add New  
now Hardware  
n icon in  
clas Control  
s: Panel. See  
Dete “Installing  
cted New  
devi Devices” in  
ces this  
with chapter.  
no  
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er  
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s 95

### [How Windows 95 Installs a New Device: An Overview](#)

Windows 95 Setup performs an inventory of all devices on the computer and records the information about those devices in the Registry. Setup gets configuration information from device INF files. To maintain compatibility, Setup also checks entries in WINI.INI, SYSTEM.INI, and CONFIG.SYS.

When a new device is installed, Windows 95 uses the device ID to search INF files for an entry for that device. Windows 95 uses this information or a default driver to

create an entry for the device under the Hkey\_Local\_Machine branch in the Registry, and it copies the drivers needed. Then the Registry entries are copied from the INF file to the driver's Registry entry, including the DevLoader=, PortDriver=, and DriverDesc= values for the Driver entry and the Driver= and ConfigFlags= values for the Enum entry.

---

Tip—— If you use custom setup scripts to install Windows 95, you can include the setting `devicepath=1` in the [Setup] section to specify that Windows 95 should check a source installation path to find INF files, rather than looking only in the Windows INF directory when installing devices. When you use this parameter in setup scripts, you can later add INF files to a single network source location to ensure that up-to-date drivers are used any time a new device is installed on computers running Windows 95. For information about creating and using setup scripts, see Chapter 5, “Custom, Automated, and Push Installations.”

---

### *Installing New Devices*

---

When you need to install a new device, you should first rely on Windows 95 to detect and configure the device.

#### [To install a new Plug and Play-compliant device](#)

1. Insert the device.

—— Whether you need to turn off the power before inserting the device depends on the type of device. Check the documentation for your new device.

2. Windows 95 notifies you that it has identified a new card. If there is no driver already provided on the system, it asks you to insert a disk that contains a driver that was developed for Windows 95.

3. For PCMCIA cards, after Windows 95 identifies and loads the appropriate driver, the computer emits a beeps when the new device is configured.

—— You can begin working with the device immediately. Windows 95 notifies other drivers and applications that the device is available.

For legacy devices, you must run the Add New Hardware wizard in order for Windows 95 to detect the device. If your computer uses PCMCIA cards or other Plug and Play cards and if a driver is not available for the new device, Windows 95 prompts you for a driver file to begin the new device installation procedure.

#### [To install a legacy device](#)

# n

If Windows 95 detects the presence of a new device but does not have a driver, it automatically asks for a disk that can be used to install and configure a driver.

Or

{ewc msdncd, EWGraphic, x0r 0 /a "psR.bmp"}

1. In Control Panel, double-click the Add New Hardware icon.
2. When the Add New Hardware wizard appears, follow the instructions on-screen to install drivers and to configure the device driver.

{ewc msdncd, EWGraphic, x0r 1 /a "psR.bmp"}

## Changing Settings with Device Manager

---

For Plug and Play-compliant devices, there are no true default settings. Instead, Windows 95 evaluates the devices and their resource requests, and then arbitrates settings among the devices. If no other device requests the same resources, the settings should not change from manual settings. If another device requests the resources, the settings may change to accommodate the request. Consequently, you should never change device's resource settings for a Plug and Play-compliant device unless absolutely necessary, because doing so will fix its settings, making it impossible for Windows 95 to arbitrate among devices that might request the resources it is using.

All legacy devices have fixed resource settings, which are defined either during Windows Setup from a previous configuration, or afterward in the Add New Hardware wizard in Control Panel.

Certain circumstances may require users to change the resource settings after they have been configured by the Add New Hardware wizard or by Plug and Play arbitration. For example, Windows 95 may be unable to configure one device without creating conflicts with another device. In such a case, a message usually appears to explain what is happening and what you can do about the problem — turn off a device to make room for the new device, disable the new device, or reconfigure a legacy device to make room for the new device.

Your best place for resolving conflicts is the Hardware Conflict Troubleshooter in Windows 95 Help. For more information, see "Troubleshooting Device Configuration" later in this chapter.

When you must manually change the system configuration, you can use Device Manager in the System option in Control Panel to examine and change the configuration of devices on the computer. Using Device Manager will help you to avoid the errors that can occur if you attempt to edit Registry entries directly.

If you need to or want to resolve device conflict manually, you can use Device Manager and try the following strategies:

n

Identify a free resource, and assign the device to use that resource

n

Disable a conflicting Plug and Play-compliant device to free its resources

n

Disable a legacy device by removing the legacy device card and not loading the device drivers

n

Rearrange resources used by another device or other devices to free resources needed by the device with a conflict

# n

Change jumpers on your hardware to match the new settings

---

Caution—— Changing default settings using either Device Manager or Registry Editor can cause conflicts that make one or more devices unavailable on the system.

Device Manager and Registry Editor are provided as configuration tools for the advanced user who understands configuration parameters and the ramifications of changing settings.

---

### [To use Device Manager](#)

{ewc msdncd, EWGraphic, x0r 2 /a "psR.bmp"}

1. In the System option in Control Panel, click the Device Manager tab.

—— Or ——

—— Right-click My Computer, click Properties from the context menu, and then click the Device Manager tab.

—— {ewc msdncd, EWGraphic, x0r 3 /a "psR.bmp"}

2. Double-click the device type in the list to display the specific devices of that type on your computer.

3. Double-click the device you want to configure. Or select the device, and then click the Properties button to view or change its settings.

### [To change the device driver using Device Manager](#)

1. In Device Manager, double-click the related device type.

2. Double-click your current device to display its property sheet.

3. Click the Driver tab.

—— The Driver property sheet shows the driver files and current driver setup for that device.

—— {ewc msdncd, EWGraphic, x0r 4 /a "psR.bmp"}

4. Click the Change Driver button.

—— {ewc msdncd, EWGraphic, x0r 5 /a "psR.bmp"}

5. In the Select Device dialog box, the Show Compatible Devices option is checked to show you a list of drivers that Windows 95 has identified as compatible for your device.

— Or —

Click Show All Devices to see a list of all the drivers available in Windows 95.

*Important*—Great care should be taken in selecting a driver in the Show All Devices list.

You should select a driver from the Show All Devices list only when you know that you are selecting a driver that is compatible with the device.

6. In the Models list, select the driver you want to use, and then click OK.

7. If requested, follow the instructions on screen to provide a disk or a path to a directory that contains the display driver.

The following sections describe system configuration tasks using Device Manager and other configuration tools.

### [Tips for Changing Settings with Registry Editor](#)

You can use Registry Editor to change specific values for devices. To run Registry Editor, click Run from the Start menu, and type *regedit*

Use Registry Editor to change system settings in the following cases:

n

When directed to make specific changes by a product support representative.

n

When you know the correct Registry key, value settings, and editing restrictions for a specific device



# n

When you cannot successfully change the value using Device Manager or other built-in tools.

When you make changes in Registry Editor, always make one change at a time, and then test the system for the results. If you have problems with the system after making a change, restart the computer and press F8 when the Starting Windows 95 message appears, then choose the Safe Mode option. Then you can change the setting back to its previous value.

You can also use the Connect command in Registry Editor to connect to and view the Registry on a remote computer if that computer has the Microsoft Remote-Registry service installed. For information about using either Registry Editor or System Policy Editor to change Registry values on a remote computer, see Chapter 16, "Remote Administration."

## *Enabling PCMCIA Cards*

---

To enable Windows 95 Plug and Play support for the PCMCIA socket, you must run the PCMCIA wizard. The PCMCIA wizard comments out the real-mode drivers in the AUTOEXEC.BAT and CONFIG.SYS files and enables the PCMCIA socket. In some cases, Windows 95 disables Plug and Play PCMCIA support if there is a risk of incompatibility.

Windows 95 supports many PCMCIA cards including modems, network adapters, SCSI cards, and others. If Windows 95 includes supporting drivers for the PCMCIA card and for the socket, then installation and configuration should be automatic. This section provides some guidelines for enabling Windows 95 enhanced PCMCIA support when automatic detection and configuration aren't available for your card.

First, if your PCMCIA card is not listed on the HARDWARE COMPATIBILITY LIST, you should contact the vendor and request a Windows 95-compatible installation disk before enabling the Windows 95 enhanced PCMCIA support.

Also, see these Help topics:

# n

"Setting Up Other Hardware," if you added a PCMCIA socket after setting up Windows 95

# n

"If You Have Trouble Using a PCMCIA Card"

---

Important — Your PCMCIA socket driver and network driver both must be Plug and Play-compliant drivers (that is, developed for Windows 95 and NDIS 3.1-compliant) or both must be real-mode drivers. If these drivers are of mixed types, the computer may stall or the network may not work.

---

Windows 95 Setup automatically detects the presence of a PCMCIA socket, but to enable it, you must run the PCMCIA wizard.

[To verify that Windows 95 has properly detected your PCMCIA socket](#)

1. In the System option in Control Panel, click the Device Manager tab.
2. Look for a PCMCIA Socket listing.

{ewc msdncd, EWGraphic, x0r 6 /a "psR.bmp"}

If Windows 95 has not detected a PCMCIA socket, your socket controller may not be supported by Windows 95.

[To find out if a PCMCIA socket is supported](#)

1. In Control Panel, double-click the Add New Hardware icon.
2. On the first screen in the Add New Hardware wizard, click the Next button, and then select the Install Specific Hardware option.
3. In the Hardware Types list, select PCMCIA Socket, and then click the Next button.

4. Select the manufacturer for your device, and examine the Models list.

— If your socket does not appear in the list, you should contact the manufacturer to see if new drivers are available.

[To enable support for PCMCIA by running the PCMCIA wizard](#)

n

In Control Panel, double-click the PCMCIA icon.

— Or —

— Double-click the PCMCIA controller in the Device Manager.

— Or —

— Go to Enable Support For under the PCMCIA topic in the Help file.

[To find out if Windows 95 has activated enhanced PCMCIA support](#)

1. In the System option in Control Panel, click the Device Manager tab. Then select your PCMCIA controller, and click the Properties button.

2. Click the General tab.

— If a hardware profile in the Device Usage box is checked, then PCMCIA support is enabled.

If you have the correct drivers and enhanced PCMCIA support is activated, but the device is still not available, your computer is probably using the wrong memory window for the device. Windows 95 selects a default set of commonly supported settings. Your socket may not support certain interrupt settings, so you might be able to get a PCMCIA socket to work by changing the IRQ. Similarly, your socket may not work on certain memory windows, and changing the memory window may solve your problem.

[To change the memory window for a PCMCIA device](#)

1. In the System option in Control Panel, click the Device Manager tab. Then select your PCMCIA socket, and click the Properties button.

2. Click the Global Settings tab on the PCMCIA controller property sheet.

3. Make sure that the Automatic Selection check box is not checked.

4. Change the Start address based on information from your hardware manual.

—Typically, selecting a Start value higher than 100000 will work.

5. Restart Windows 95.

#### [To change the interrupt for a PCMCIA device](#)

1. In the System option in Control Panel, click the Device Manager tab. Then select your PCMCIA socket, and click the Properties button.

2. Change the IRQ from its default to a value that doesn't conflict with other IRQ settings used on your computer.

—Typically, selecting a Start value higher than 100000 will work.

3. Restart Windows 95.

If Windows 95 still doesn't detect your PCMCIA cards, you should disable the Windows 95 enhanced PCMCIA support.

#### [To disable the enhanced PCMCIA support](#)

1. In the System option in Control Panel, click the Device Manager tab. Then select your PCMCIA controller, and click the Properties button.

2. Click the General tab, and in the Device Usage box, click to clear the check beside the hardware profile.

Windows 95 automatically disables enhanced PCMCIA support if it detects the presence of previous PCMCIA drivers, because it cannot automatically remove these drivers. Running the PCMCIA wizard removes old PCMCIA drivers from CONFIG.SYS and other configuration files.

If you must use old drivers, Windows 95 should work well with your previous PCMCIA drivers, although some Plug and Play capabilities such as automatic installation and friendly device names, will not be available.

#### [Using Hardware Profiles for Alternate Configurations](#)

---

Windows 95 uses hardware profiles to determine which drivers to load when the system hardware changes. When you start Windows 95, you are prompted to select the hardware profile to be used for system startup. Windows 95 loads only the device drivers for those hardware devices that are enabled in the profile you select.

This is an especially important feature for portable computers that can be docked. For example, Windows 95 uses one hardware profile to load drivers when the portable is docked, and another profile when the portable is undocked.

---

Note — Two hardware profiles are unnecessary for Plug and Play — ortable computers because they automatically know when they are docked or undocked.

---

#### [To create a hardware profile](#)

1. In the System option in Control Panel, click the Hardware Profiles tab.
2. Click the name of the hardware profile you want to base the new hardware profile on, and then click Copy.
3. Type a name for the hardware profile you are creating.
4. Change which hardware is enabled or disabled in this profile by using the Device Manager, as described in the following procedure.

---

Tip — If you have a hardware profile named the same as a Windows 95 Startup Menu item, the corresponding menu item will be run automatically when you use that hardware profile for system startup.

---

#### [To enable or disable hardware in a hardware profile](#)

1. In Device Manager, click the plus sign next to the hardware type, and then double-click the hardware.
2. In the Device Usage box, click to place a check mark next to each hardware profile in which you want to enable the hardware, or to clear the check box to disable the hardware for that hardware profile.
3. If you see a message prompting you to restart your computer, click Yes.

#### [To delete or rename a hardware profile](#)

1. In the System option in Control Panel, click the Hardware Profiles tab.
2. Click the name of the hardware profile you want to change.
3. If you want to remove this profile, click Delete.

— Or —

— If you want to change the name of the profile, click Rename, and then type a new name.

Configurations are created when Windows 95 queries the BIOS for a dock serial ID and then assigns a name for the docked and undocked configuration. Windows 95 then stores the hardware and software associated with this configuration. Applications access and store information for each of the different hardware configurations that the mobile user uses. The Registry support enables applications

to adapt gracefully to different hardware configurations.

### *Configuring the Display*

---

Windows 95 consolidates display properties in the Display option in Control Panel, so you can easily customize display adapter settings. Using the Display option in Control Panel in Windows 95, you can do the following:

n

Change the display type or driver.

n

Change video resolution and color palette without restarting the computer when using display drivers and display adapters that support this functionality.

n

Change color schemes and text styles in all screen elements, including changing fonts used in dialog boxes, menus, and title bars.

n

View changes in colors, text, and other elements of display appearance before the changes are applied.

---

Tip—— To set display options quickly, right-click the desktop background, and then click Properties. Click the Help icon to get context-sensitive Help for setting display properties.

---

Windows 95 provides enhanced functionality and easy configuration for display drivers, in addition to resolving many problems inherent in Windows 3.1 display drivers. By using a minidriver architecture for display adapter drivers, Windows 95 provides better support for a wide range of video hardware and provides more stable and reliable drivers.

Windows 95 Setup automatically detects the video display adapter in the computer and installs the correct display driver, upgrading to a new VDD if a new version is available. Windows 95 Setup also removes all standard-mode grabbers, because Windows 95 does not use standard mode.

Windows 95 provides a universal driver to support device-dependent code in a display minidriver and to support the device-independent code and functionality usually handled by a monolithic video display driver. The minidriver uses the graphics device-independent bitmap (DIB) engine in Windows 95, providing a better mechanism for manipulating memory bitmaps. The new 32-bit DIB engine is optimized to provide fast, robust drawing for high resolution and frame buffer-based display adapters.

To ensure broad support for display adapter devices in Windows 95, Microsoft developed many of the display drivers in cooperation with the major display-controller hardware manufacturers. The Microsoft development team also worked closely with hardware manufacturers to write additional display drivers and assisted in optimizing drivers to enhance display speed for improved graphic performance.

Windows 95 also includes mechanisms to ensure that incompatible display drivers cannot prevent a user from accessing the system. If a display driver fails to load or initialize when Windows 95 is started, Windows 95 automatically uses the generic-VGA display driver. This ensures that you can start Windows 95 to fix a display-related problem.

Plug and Play does not allow for “hot” attachment of display adapters. This is because the display VxDs are static and too many conflicts exist for memory and I/O port addresses among different display adapters.

Display features not included in Windows 95 are dynamic color depth, generic-16-color (planar) drivers, Super VGA minidrivers, and DIB-engine drivers.

For video displays, colors are described in bits per pixel (bpp). The following table lists the bpp-to-colors conversion.

---

|    |              |
|----|--------------|
| 1  | Monochrom    |
| bp | e            |
| p  |              |
| 4  | 16 colors    |
| bp |              |
| p  |              |
| 8  | 256 colors   |
| bp |              |
| p  |              |
| 15 | 32,768       |
| bp | (32K) colors |
| p  |              |
| 16 | 65536 (64K)  |
| bp | colors       |
| p  |              |
| 24 | 16.7 million |
| bp | (16.7M)      |
| p  | colors       |
| 32 | 4.2 billion  |
| bp | (4G) colors  |
| p  |              |

Resolutions are described in horizontal number of pixels multiplied by (x) vertical number of pixels.

---

|     |             |
|-----|-------------|
| Sta | 640x480;    |
| nda | colors:     |
| rd  | monochrom   |
| Gra | e and 16    |
| phi | colors      |
| cs  |             |
| Ad  |             |
| apt |             |
| er  |             |
| (V  |             |
| GA  |             |
| )   |             |
| Su  | 640x480;    |
| per | colors: 16, |



VG 256, 64K,  
A and 16.7M  
800x600;  
colors: 16,  
256, and  
64K  
1024x768;c  
olors: 256

ATI 640x480;  
VG colors: 16,  
A 256, 64K,  
Wo and 16.7M  
nde 800x600;  
r colors: 16,  
256, and  
64K  
1024x768;  
colors: 256

ATI 640x480;  
Ma colors: 16  
ch and 256  
8 800x600;  
colors: 16  
and 256  
1024x768;  
colors: 256

ATI 640x480;  
Ma colors: 16,  
ch 256, 64K,  
32 and 16.7M  
800x600;  
colors: 16,  
256, 64K,  
and 16.7M  
1024x768;  
colors: 16,  
256 and  
64K  
1280x1024;  
colors: 16,  
256, and  
64K

ATI 640x480;  
Ma colors: 16,

ch 256, 64K,  
64 16.7M, and  
4G  
800x600;  
colors: 16,  
256, 64K,  
16.7M, and  
4G  
1024x768;  
colors: 16,  
256, 64K,  
16.7M, and  
4G  
1280x1024;  
colors: 16,  
256, and  
64K

Chi 640x480;  
ps colors: 16  
& and 256  
Tec 800x600;  
hno colors: 16  
logi and 256  
es 1024x768;  
Su colors: 256  
per  
VG  
A

Chi 640x480;  
ps colors: 16,  
& 256, 64K,  
Tec and 16.7M  
hno 800x600;  
logi colors: 16,  
es 256, 64K,  
Acc and 16.7M  
eler 1024x768;  
ator colors: 16,  
256, and  
64K  
1280x1024;  
colors: 256

Cirr 640x480;  
us colors: 16,

Log 256, 64K,  
ic and 16.7M  
800x600;  
colors: 16,  
256, 64K,  
and 16.7M  
1024x768;  
colors: 16,  
256, and  
64K  
1280x1024;  
colors: 256

Cirr 640x480;  
us colors: 16  
Log and 256  
ic 800x600;  
Lap colors: 16  
top and 256  
1024x768;  
colors: 256  
1280x1024;  
colors: 256

Cirr 640x480;  
us colors: 16,  
Log 256, 64K,  
ic and 16.7M  
542 800x600;  
9/5 colors: 16,  
434 256, 64K,  
and 16.7M  
1024x768;  
colors: 256,  
64K, 16.7M  
1280x1024;  
colors: 256

CO 640x480;  
MP colors: 16,  
AQ 256, 64K,  
Qvi 4G  
sio 800x600;  
n colors: 16,  
256, 64K  
1024x768;  
colors: 256

64K  
1280x1024;  
colors: 256

CO 640x480;  
MP colors: 16,  
AQ 256  
Adv 800x600;  
anc colors: 16  
ed  
VG  
A  
(AV  
GA  
)

Oa 640x480;  
k colors: 16  
Tec and 256  
hno 800x600;  
log colors: 16  
y and 256  
1024x768;  
colors: 256

S3 640x480;  
Inc. colors: 16,  
911 256, and  
/92 64K  
4 800x600;  
colors: 16,  
256, and  
64K  
1024x768;  
colors: 256

S3 640x480;  
Inc. colors: 16,  
801 256, 64K,  
/92 and 16.7M  
8/9 800x600;  
64 colors: 16,  
256, 64K,  
and 16.7M  
1024x768;  
colors: 16,  
256, 64K,  
and 16.7M

1280x1024;  
colors: 16,  
256, 64K,  
and 16.7M  
1600x1200;  
colors: 256

Trid 640x480;  
ent colors: 16  
Mic and 256  
ros 800x600;  
yst colors: 16  
em and 256  
s 1024x768;  
colors: 256

Tse 640x480;  
ng colors: 16,  
Lab 256, 64K,  
s and 16.7M  
ET 800x600;  
400 colors: 16,  
0 256, and  
64K  
1024x768;  
colors: 256

Tse 640x480;  
ng colors: 16,  
Lab 256, 64K,  
s and 16.7M  
w3 800x600;  
2 colors: 16,  
256, 64K,  
and 16.7M  
1024x768;  
colors: 16  
and 256  
1280x1024;  
colors: 256

Vid 640x480;  
eo colors: 16  
Sev and 256  
en 800x600;  
™ colors: 16  
VR and 256  
AM 1024x768;

/ colors: 256

VR

AM

II /

102

4i

We 640x480;

ster colors: 16,

n 256, 64K,

Digi and 16.7M

tal 800x600;

colors: 16,

256, 64K,

and 16.7M

1024x768;

colors: 16

and 256

1280x1024;

colors: 256

XG 640x480;

A colors: 16,

256, and

64K

1024x768;

colors: 16

and 256

XG 640x480;

A/2 colors: 16,

256, and

64K

800x600;

colors: 256

1024x768;

colors: 16

and 256

You can select or install another display driver using the Display option in Control Panel or using Device Manager.

---

*Caution*—Some monitors can be physically damaged by incorrect video settings. Carefully check the manual for your monitor before choosing a new setting.

---

### [To change the display driver using Device Manager](#)

1. In the System option in Control Panel, click the Device Manager tab. Then double-click Display.
2. Double-click your current display adapter.
3. Click the Driver tab, and click the Change Driver button.

—{ewc msdn cd, EWGraphic, x0r 7 /a "psR.bmp"}—

4. In the Select Device dialog box, click the Show Compatible Devices option to see a list of drivers that Windows 95 has identified as compatible with your display adapter.

— Or —

— Click Show All Devices to see a list of all the display drivers available in Windows 95.

— Important — You can safely select any driver in the Show Compatible Devices list.

— Select the Show All Devices option only if you know that you need to select a driver from the Models list that also supports your display. You must be careful to select a driver that you know to be compatible with your display adapter.

5. In the Models list, select the driver you want to use, and then click OK.

— If prompted, follow the instructions on-screen to provide a disk or path to a directory that contains the display driver.

### [To change the display driver using the Display option in Control Panel](#)

{ewc msdn cd, EWGraphic, x0r 8 /a "psR.bmp"}

1. In Control Panel, double-click the Display icon.

— Or —

— Right-click the desktop, and then select Properties from the context menu.

2. On the Display property sheet, click the Settings tab.
3. On the Display Settings sheet, click the Change Display Type button.

—{ewc msdn cd, EWGraphic, x0r 9 /a "psR.bmp"}—

4. Click the Change button, and then follow steps 4 and 5 in the previous procedure.

---

Tip — The [boot] section of the SYSTEM.INI file should contain the following line for any Windows 95 version of a display driver:

display.driv=pnpdrrr.driv.

The actual video driver is loaded from the Registry. This allows support for dockable personal computers that have different adapters for the portable computer versus the docking station.

---

For display drivers that do not appear in the Select Device dialog box (that is, those that are not provided with Windows 95), the Windows Driver Library (WDL) provides support for drivers from other vendors. For information about the WDL, see Appendix J, "Windows 95 Resource Directory."

You can also install Windows 3.x display drivers if required. However, Microsoft strongly recommends that you upgrade to Windows 95 display drivers so you can take advantage of the Windows 95-specific display drivers that provide new features and functionality. For example, many display adapters and drivers support Plug and Play detection and "on-the-fly" resolution changes; these features are not supported by Windows 3.1 drivers.

#### [To install Windows 3.1 display drivers](#)

1. In the Display option in Control Panel, click the Settings tab. Then click Change Display Type.
  2. Click the Change button next to Adapter Type, and then click the Have Disk button.
  3. Specify the path to the disk or directory containing the Windows 3.1 drivers you want to use.
  4. Select the correct driver to use from the list that appears, and click OK to install.
- Old drivers appear in the Select Device dialog under the manufacturer type Windows 3.x Drivers, when Show All Devices is selected in the Select Device dialog box.

Notice that some Windows 3.1 drivers require the screen resolution to be specified in the [boot.description] section of SYSTEM.INI. For example:

display.driv=Acme Inc. 640x480 256 colors

You can configure the display resolution and color palette choices for your video display or customize the font size used using the Display option in Control Panel.

After making these kinds of changes, you must shut down and restart the computer unless you are using a Plug and Play-compliant display adapter and driver that support on-the-fly changes.



[To configure your display resolution](#)

1. In the Display option in Control Panel, click the Settings tab.

`{ewc msdn cd, EWGraphic, x0r 10 /a "psR.bmp"}`

2. On the Display property sheet, use the options described in the following table to change your display settings.

---

Co Select  
lor from this  
Pa list the  
lett number of  
e colors you  
want for  
your  
display  
adapter.  
The larger  
the  
number,  
the greater  
the  
number of  
colors.

De Drag the  
skt slider bar  
op to change  
Ar the visible  
ea screen  
area used  
by the  
display.  
The larger  
the  
desktop  
area, the  
smaller  
everything  
looks on  
your  
screen.

Fo Select  
nt from this

Size list one of the font sizes for your display type. Typically, the selections will be Small Fonts and Large Fonts. To set the font used in dialog boxes, see “Configuring Display Appearance” later in this chapter.

Click to change the size of the text that Windows 95 displays, as described in the following procedure.

Click to display a dialog box for selecting another adapter type or monitor

type. For information, see "Changing the Display Type and Driver" earlier in this section.

Note Sometimes a larger number of colors requires you to have a smaller desktop area, and vice versa. This is due to a limitation of the display adapter. Extra large sizes may adversely affect the display in some applications.

#### [To customize display of fonts in dialog boxes](#)

1. On the Display property sheet, click the Custom button.

{ewc msdn cd, EWGraphic, x0r 11 /a "psR.bmp"}

2. Drag the controls until the sample shows the size that you want, and then choose OK.

For non-Plug and Play devices, you must shut down and restart Windows 95 for the changes to take effect.

Setting the monitor type in the Display properties sheet does not affect the refresh-rate output of your display adapter. To change this, you must run a utility supplied by your display adapter manufacturer or computer manufacturer. Some display utilities must be run in the AUTOEXEC.BAT file; however, on other computers, display type is set in BIOS configuration programs. Some examples of such utilities are described in the following list.

---

ATI INSTALL.E  
XE

Cirr MONTYPE  
us .EXE,  
Logi CLMODE.  
c EXE

Dia STLMODE  
mon .EXE  
d  
Stea

lth  
Tse VMODE.E  
ng XE  
Lab  
s  
Wes VGAMOD  
tern E.EXE  
Digit  
al

You can use the Display option in Control Panel to set the screen saver and the background pattern used on the desktop. (These options replace Desktop options in the Windows 3.x Control Panel.)

You can also use settings on the Screen Saver property sheet to take advantage of Energy Star Monitor support in Windows 95 if your hardware supports this feature. This is similar to the standby mode commonly used in portable computers to save power. Windows 95 can support screen saver power management if both of the following conditions are true for your computer:

n

In the Change Display Type dialog box, the option named Monitor Is

Energy Start Compliant is checked.

This option is checked automatically if, during Setup, hardware detection determined that the monitor supports the VESA DPMS specification. You can also check this option manually.

n

The device driver for this display uses either the Advanced Power

Management (APM) 1.1 BIOS interface with support for device "01FF" (which is

not supported by every APM 1.1 BIOS), or the VESA BIOS Extensions for Power Management. For information about whether your display adapter supports these BIOS interfaces, see the documentation for your device driver.

The video display monitor is typically one of the most “power-hungry” components of a computer. Manufacturers of newer display monitors have incorporated energy-saving features into their monitors based on the VESA Display Power Management Signaling (DPMS) specification. Through signals from the video display adapter, a software control can place the monitor in standby mode or even turn it off completely, thus reducing the power the monitor uses when inactive. To do this, Windows 95 extends the screen saver capabilities to provide both a time-delay setting that allows the user to put the display monitor in a low-power standby mode, and a delay setting to turn the monitor off completely.

#### [To configure the background pattern and wallpaper](#)

1. In the Display option in Control Panel, click the Background tab.

===={ewc msdncd, EWGraphic, x0r 12 /a "psR.bmp"}

2. From the Pattern list, select the pattern to use on the desktop background.

3. From the Wallpaper list, select the wallpaper you want to use, and then click Tile or Center to specify how you want the wallpaper to be displayed.

====The Wallpaper list shows all the bitmap (.BMP) files on the system. Use the Browse button to find bitmap files that use other filename extensions.

4. The selected options appear immediately on the sample display in the box. Choose the Apply Now button to apply the current settings.

#### [To configure a screen saver](#)

1. In the Display option in Control Panel, click the Screen Saver tab.

===={ewc msdncd, EWGraphic, x0r 13 /a "psR.bmp"}

2. In the Show list, select the screen saver you want to use.

3. If the screen saver requires it (for example, for the scrolling marquee screen saver), click the Settings button and complete the options for configuring that type of screen saver.

4. In the Wait list, specify the interval of inactivity before the screen saver appears.

5. If you want to protect access to the computer by using a password with the screen saver, make sure the Password Protected box is checked. Then click the Change button to specify the password.

6. Click the Preview button to test the screen saver, and click Apply Now to begin using the selected screen saver when all options are configured as you want.

them.

If your computer can use Energy Star power consumption features, additional options appear in the Screen Saver property sheet. To take advantage of these features, both the display adapter and monitor must meet the Energy Star specifications. Also, the display driver must support the extensions needed to control the monitor. Several hardware providers currently manufacture monitors designed to support the Energy Star goals.

[To use Energy Star power consumption features](#)

n

On the Display property sheet, click the Screen Saver tab and specify the

time intervals for when to use lower power standby and when to shut off power.

For example, you may want to set these options:

n

Display a specific screen saver after 5 minutes of inactivity

n

Set the computer to standby after the screen saver has displayed for 10

minutes

# n

Turn off the monitor after 15 minutes of standby

## [To configure the appearance of display colors and type styles](#)

1. In the Display option in Control Panel, click the Appearance tab.

——{ewc msdn cd, EWGraphic, x0r 14 /a "psR.bmp"}

2. In the Scheme list, select the color and text configuration you want.

—— Or ——

—— Click an element in the sample window, and use the controls to specify the color and font styles you want. Use the context-sensitive help for guidelines in specifying settings for each of the options. You can click the Save As button to save a scheme.

3. Click the Apply Now button to use the selected scheme.

## Configuring the Mouse

---

Mouse drivers based on the Windows 95 minidriver architecture are protected-mode drivers that provide better support for MS-DOS — based applications in the Windows 95 environment. Windows 95 makes mouse configuration and customization easier by providing a single Control Panel option for mouse settings.

Windows 95 Setup detects Microsoft and Microsoft-compatible mouse device drivers, and then replaces these with new VxDs and removes any related TSRs from the system configuration files.

Windows 95 provides the following improvements in mouse and pointing device support:

n

Supports Plug and Play for easy installation of pointing devices. For example, the VxD VMOUSE driver interface supports Plug and Play.

n

Provides smooth, reliable input when using the new protected-mode drivers.

n

Includes more drivers for more devices.

n

Eliminates the need to use MS-DOS — based mouse drivers.

Windows 3.1 provided support for using the system mouse in an MS-DOS — based application when running the application in a window. However, support for using a mouse in full-screen mode required loading an MS-DOS — based mouse driver before starting Windows.

The protected-mode Windows 95 VxD mouse driver provides mouse support for Windows-based applications, MS-DOS — based applications running in a window, and MS-DOS — based applications running in full-screen mode. These improvements result in zero use of conventional memory for mouse support in the Windows 95 environment. (However, most legacy real-mode drivers will run in Windows 95.)



In addition to better mouse services, Windows 95 allows the use of serial ports COM1 through COM4 for connecting a mouse or other pointing device.

[To see the improvements in mouse driver support](#)

1. Be sure the real-mode mouse driver from such entries as MOUSE.COM or MOUSE.SYS has been removed from CONFIG.SYS or AUTOEXEC.BAT.
2. Restart the computer and run an MS-DOS — based application that supports the use of a mouse.

— For example, use an application such as Edit and try the MS-DOS — based application both in a window and in full-screen mode.

— Notice that the mouse is available in both modes, and use the *mem /c* command at the command prompt to verify that the mouse driver is not loaded in real mode.

Windows 95 does not include VESA video cursor interface support. Also, you will not receive notification for a missing mouse, and there is no mouse-change message support for applications.

The Mouse option in Control Panel provides customization options, including setting the behavior of the mouse buttons and the mouse pointer. You can use either the Mouse option or Device Manager to change drivers for a pointing device.

[To change the mouse driver using Device Manager](#)

1. In the System option in Control Panel, click the Device Manager tab. Then double-click Mouse.
2. Select your current pointing device, and click the Properties button.
3. Click the Driver tab, and then click the Change Driver button.
4. Select the new driver to be used, as described earlier in “Changing Settings with Device Manager.”

— {ewc msdncd, EWGraphic, x0r 15 /a "psR.bmp"}

[To change the driver using the Mouse option in Control Panel](#)

{ewc msdncd, EWGraphic, x0r 16 /a "psR.bmp"}

1. In Control Panel, double-click the Mouse icon.
2. On the Mouse property sheet, click the General tab.

3. Click the Change button.

4. In the Select Device dialog box, select the new driver to be used, as described earlier in "Changing Settings with Device Manager."

For pointing device drivers that do not appear in the Select Device dialog box (that is, those that are not provided with Windows 95), the Windows Driver Library (WDL) provides support for additional third-party drivers. For information about the WDL, see Appendix J, "Windows 95 Resource Directory."

The Mouse option in Control Panel is used for configuring button action, customizing mouse cursor appearance, setting mouse speed, and other functions. This section briefly describes these functions. Different functions may be available, depending on the pointing device used with your computer.

[To specify mouse behavior](#)

n

In the Mouse option in Control Panel, click the tab for the behavior you

want to set, as described in the following illustrations. After changing the settings to the ones you want, click the Apply Now button.

Click the Buttons tab to specify the primary button and the speed for double-clicks.

{ewc msdn cd, EWGraphic, x0r 17 /a "psR.bmp"}

Click the Pointers tab to customize the pointers that appear in relation to specific actions.

{ewc msdn cd, EWGraphic, x0r 18 /a "psR.bmp"}

Click the Motion tab to specify whether you want to use pointer trails and to specify pointer speed, which defines how fast the pointer moves as you drag.

{ewc msdn cd, EWGraphic, x0r 19 /a "psR.bmp"}

Configuring Communications Ports and Printer Ports

---

A COMMUNICATIONS RESOURCE is a physical or logical device that provides a single,

asynchronous data stream. Serial ports, parallel ports, fax machines, and modems are examples of communications resources. In Windows 95, VCOMM is the communications VxD that manages all access to communications devices. Port drivers use VCOMM to register themselves and manage access to communications devices.

Two types of ports appear in Device Manager:

n

Communications ports, also known as COM ports, serial ports, or RS-232

ports, are used to connect RS-232-compatible serial devices such as modems and pointing devices to the computer.

n

Printer ports, also known as LPT ports or parallel ports, are used to

connect parallel devices such as printers to the computer. For more information about configuring printer ports, see Chapter 23, "Printing and Fonts."

Communications ports listed in the Device Manager may be one of several types:

n

Plug and Play-compliant serial ports, also known as RS-232 COM ports,

to which external serial devices can be attached. These usually require a 9-pin or 25-pin plug. Plug and Play ports must support baud rates up to 115.2K. Typically, Plug and Play-compliant serial ports use the 16550A buffered UART, which has a 16-byte FIFO that gives the CPU more time to serve other processes and that can serve multiple characters in a single interrupt routine.

# n

An internal modem adapter. In addition to being installed in Device Manager, internal modems should also be installed and configured in the Modems option in Control Panel. For more information, see Chapter 25, "Modems and Communications Tools."

# n

A PCMCIA modem card, if it is using PCMCIA socket drivers designed for Windows 3.1 instead of Windows 95-compatible PCMCIA drivers. In this situation, a PCMCIA modem card is treated as if it were an internal modem adapter, that is, it must be installed both as a COM port and as a modem.

When you install a communications device, Windows 95 automatically assigns COM names to communication ports, internal modem adapters, and PCMCIA modem cards according to their base I/O port addresses as shown in the following list:

# n

Basic Configuration 0: COM1 at 3F8 (Input/Output Range)

# n

Basic Configuration 2: COM2 at 2F8

# n

## Basic Configuration 3: COM2 at 3E8

# n

## Basic Configuration 4: COM3 at 2E8

If a device has a nonstandard base address or IRQ, or if all four standard ports have been assigned to devices, Windows 95 automatically assigns the modem to COM5 port or higher. Some Windows 3.1 applications might not be able to access ports higher than COM4. Consequently, you must adjust the base address in Device Manager in the Systems option in Control Panel, or delete other devices to make a lower COM port available.

In addition, if some of the devices installed on a computer are not Plug and Play-compliant, you may have to change resource settings for their communications ports. You can easily change communications port settings by using Device Manager.

---

Tip—— You may want to record for future reference the settings that appear on the Resources sheet for each communications port.

---

### [To configure a communications port](#)

1. In the System option in Control Panel, click the Device Manager tab. Then double-click Ports.

—— The tree expands to show the types of ports available on the computer.

2. Double-click the port you want to configure to display the property sheet.

3. On the Communications Port property sheet, click the Resources tab.

—— {ewc msdn cd, EWGraphic, x0r 20 /a "psR.bmp"}

—— Notice also that the Conflicting Devices List shows any conflicting values for resources used by other devices.

4. In the Resource Type list, select the setting you want to change, for example, the Input/Output Range, and then click the Change Setting button.

{ewc msdncd, EWGraphic, x0r 21 /a "psR.bmp"}

The resulting dialog box shows the various settings that the device supports. Notice that, in the Edit Input/Output Range box, any interrupt marked with an asterisk (\*) will conflict with an existing device.

When you clicked the Change Setting button, you may have received an error message saying "This resource setting cannot be modified." If this is the case, you must choose a different basic configuration until you find one that allows you to change resource settings.

5. Type a setting that does not conflict with any other devices, and then click OK.

6. Shut down and restart Windows 95. Then verify that the settings are correct for the communications port.

#### *Real-Mode Drivers and the IOS.INI Safe Driver List*

---

Microsoft strongly recommends that you use 32-bit, protected-mode drivers wherever possible. With protected-mode drivers, configuration information is stored in the Registry, rather than in CONFIG.SYS or other files.

The following shows the general guidelines for device entries in CONFIG.SYS, and whether such entries are required or can be removed under Windows 95:

n

When you use only protected-mode drivers, the only configuration

information the operating system needs to know for system startup is the location of the Windows 95 system files and the directory for the swap file. You do not need to load drivers in CONFIG.SYS or AUTOEXEC.BAT.

n

Any boot device in your computer that needs real-mode support does not

require an entry in CONFIG.SYS. In the unusual case that the CD-ROM is part of

system startup, entries for this device must be included in CONFIG.SYS.

n

If your computer requires any real-mode drivers, an entry for loading the

driver must be included in CONFIG.SYS and AUTOEXEC.BAT, as was true under earlier versions of MS-DOS.

Windows 95 automatically unloads any real-mode drivers for which it has protected-mode drivers to provide the same functionality. For example, the real-mode DBLSPACE.BIN driver is unloaded and the protected-mode DBLSPACE.VXD driver takes over. However, the protected-mode device driver should take over only when it guarantees similar functionality to the real-mode driver, not merely because it can drive the hardware.

---

Tip—— To determine whether a particular driver is running in real-mode versus 32-bit, protected mode, check the Performance property sheet in the System option in Control Panel.

---

Real-mode drivers that can be safely replaced are identified in the safe driver list, which identifies drivers and TSRs that Windows 95 can replace with corresponding protected-mode drivers. The safe driver list (IOS.INI in the Windows directory) includes the following information:

n

Name of the driver or TSR, using the same name as used in

CONFIG.SYS or AUTOEXEC.BAT

n

Driver requirements

n

Whether the driver hooks INT 13

n

Whether the driver monitors INT 13 (regardless of whether I/O is  
controlled by a protected-mode driver)

n

Whether the driver accesses hardware directly

Windows 95 does not store the version number of the driver or TSR in the list, so the  
vendor must change the name of the driver if a future version is enhanced so that  
the driver is safe or unsafe.

By default, the following drivers are considered safe:

n

MS-DOS 5.0-compatible real-mode block device drivers



n

INT 13 monitors (hooks INT 13 for monitoring I/O but does not access hardware directly or modify the I/O buffer)

n

INT 13 hooker (hooks INT 13 for altering I/O but does not access hardware directly)

n

INT 13 driver (provides INT 13 functionality and directly accesses hardware)

n

ASPI Manager (implements the Advanced SCSI Programming Interface for MS-DOS specification)

n

CAM Manager (implements MS-DOS Common Access Method

specification)

A real-mode driver is considered UNSAFE if it implements functionality that is not provided by protected-mode drivers. For example, a real-mode IDE or ESDI driver that uses dynamic encryption is an unsafe driver because Windows 95 does not support encryption. Windows 95 protected-mode drivers do not implement the following functions, so if a real-mode driver uses any of the following functions it is considered unsafe and should not be added to the safe driver list:

n

Data compression (other than DriveSpace-compatible compression)

n

Data encryption

n

Disk mirroring

n

Bad sector mapping

n

Fault tolerance (maintaining ECC correction on a separate disk)

n

IOCTLS defined or extended by the vendor

If Windows 95 provides an appropriate protected-mode driver, you should only use the real-mode driver in these cases:

n

If the real-mode driver is used for a boot device.

n

If an MS-DOS Mode application uses the driver's device, in which case

the protected-mode driver must be unloaded in order to load the real-mode driver.

#### [Tip for Using Real-Mode versus Safe Protected-Mode Drivers](#)

If a real-mode driver provides better performance or provides some functions not present in the Windows 95 protected-mode driver, you should remove the real-mode driver from the safe driver list, so that Windows 95 uses real mode to access the driver. Similarly, if a real-mode driver can be safely taken over by protected-mode

drivers, add the real-mode driver to the safe driver list.

To determine whether you can use a protected-mode driver, you will have to test the equivalent functionality provided from the protected-mode driver versus your existing real-mode driver.

The following is the syntax of the safe driver list in IOS.INI:

FILENAME, QUALIFIER\_STRING ; COMMENTS

The QUALIFIER\_STRING can be one shown in the following list.

---

— Indicates that it is acceptable to load the protected-mode driver and not use the mapper for this real-mode driver because it doesn't matter whether it sees any I/O requests. This is the default.

— Implies that the device driver or TSR is safe, but it has an INT 13 hook that needs to see INT 13 requests. In this case, the protected-mode drivers are loaded but

the system routes the logical requests through the real-mode mapper and then switches back to protected-mode at the end of the INT 13 chain.

Implies that the driver is safe as long as it does not see any INT 13 requests. In this case, the protected-mode drivers are loaded and the real-mode mapper is not used.

Indicates a driver that controls a device that is not a disk, such as Interlnk. IOS issues INT 25 calls to all logical volumes in the system and

determines whether the request is mapped to INT 13, ASPI, or CAM. If the request is not mapped, then this is a monolithic driver, as is the case for Interlnk. Adding \_ prevents IOS from considering Interlnk in its safe driver processing.

Similar to ...  
Any driver that is monolithic and safe must have this qualifier set to indicate to IOS that the protected-mode port drivers can be loaded and the driver's entry point can be handled to prevent contention.

~~IOS.INI also contains an Unsafe CD section in IOS.INI. Adding a driver to this section indicates that this CDFS will not be loaded on the CD drives that this driver~~

controls.

The following is an example of some IOS.INI entries.

386max.sys — ; Qualitas  
4dos.com — ; 4DOS shell program  
ad-dos.com — ; Afterdark  
ad\_wrap.com — ; Afterdark  
adi2.com — ; Afterdark  
aspi3x90.sys — ; DTC SCSI no PM driver

...

[CDUnsafe]  
drd600.sys — ; Pioneer 60X series CDROM  
drd60asp.sys — ; Pioneer 60X series CDROM  
drd60ps.sys — ; Pioneer 60X series CDROM

### [Tip for Troubleshooting Protected-Mode Drivers](#)

If you believe that a protected-mode driver should be controlling a device, but the device appears with a real-mode driver in the System option in Control Panel, you can check entries in IOS.LOG. The IOS.LOG file in the Windows directory is created when a protected-mode driver is not available or if the operating system detects that an unknown device driver is controlling a device.

The first line in IOS.LOG states why the protected-mode driver was not loaded. If IOS.LOG does not state why an available protected-mode driver is not used, the problem could be related to a virus.

### [Troubleshooting Device Configuration](#)

---

This section describes specific problems in device configuration and how to correct them. For information about general procedures and Windows 95 tools that can be used in troubleshooting, see Chapter 35, "General Troubleshooting."

Your first and best resource for diagnosing problems due to changing device settings is the Hardware Conflict Troubleshooter in Windows 95 Help.

### [To use the Hardware Conflict Troubleshooter](#)

1. In the Help Topics window, click the Contents tab.

— Or —

— In any Help window, click the Contents button.

2. Click Troubleshooting, and click the option named If You Have A Hardware Conflict. Then follow the instructions on-screen.

The video display doesn't work correctly.

n

Start the computer and press F8 when the Starting Windows 95 message appears. Choose option 3, Safe Mode, which uses the standard VGA (640x480x16-color) driver. If this resolves the video problem, then the display driver is probably involved. Try replacing the driver with a newer version, or reinstall the driver from original disks. (See "A Video Driver Fails To Work" later in this section.)

n

Try adding add the line `SafeMode=1` to the [windows] section of WIN.INI, and restart Windows 95. If the problem still occurs, try adding `SafeMode=2`.

A video error occurs at a specific display resolution.

If your computer is having problems with the video display, determine whether the problems persist when you use lower video resolutions with the video driver.

[To see if the video error changes with resolution](#)

1. In the Display option in Control Panel, click the Settings tab.
2. In the Color Palette box, click the box that displays available resolutions.
3. If the selection is other than 16-color, then select 16-color.
4. Click the Apply button. Then shut down and restart the computer.
5. Retest the condition that was causing the video error. If the error does not recur, you may want to temporarily operate at a lower resolution until you can upgrade the video driver to a version that functions without error.

A video driver fails to work.

If the video driver fails (and changing resolutions doesn't resolve it), you should



check or replace the current video driver.

#### [To check the video drivers](#)

1. In Device Manager, click the plus sign next to Display Adapter.
2. Double-click the specific display adapter shown (for example, Cirrus Logic).
3. On the property sheet, click the Driver tab.
4. Click each file shown in the Driver Files box. The File Version appears in the File Details box, if available (some vendor's video drivers may not contain version information).
5. Check displayed file versions for compatibility. Windows 95 video driver files have version numbers starting at 4.00 or higher.
6. If you have an incompatible driver, you can reinstall the original driver from the Windows 95 disks, or get new drivers from the Microsoft Download Service (MSDL) as described in Appendix J, "Windows 95 Resource Directory." If Microsoft drivers do not support the display adapter, contact the display adapter vendor for updated drivers.

#### [To check where the driver is loading from](#)

n

Check the [boot] section of SYSTEM.INI for this entry, to ensure that a

Windows 95 version of the display driver is installed:

display.driv=pnpdrrr.driv

If this entry is specified, the video entries in SYSTEM.INI are ignored, and the video drivers are loaded from the Registry. If the entry specifies any driver other than PNPDRVR.DRV, the video drivers are loaded from SYSTEM.INI.

#### *The video adapter is not recognized.*

If the VGA video adapter is not recognized by Windows 95, try using the basic VGA drivers (a generic 640x480, 16-color driver). If you have a vendor-supplied driver disk for the video adapter, you can install the OEM drivers. If the drivers do not support Windows 95, some advanced video features are disabled.

*Errors occur when initializing the video adapter.*

If a message appears while Windows 95 is loading, indicating that an error occurred during video adapter initialization, this causes the computer to stall. You must press CTRL+ALT+DEL to restart the computer.

This problem may occur if you are using a video accelerator card and you change the display from the default setting (640x480, 16 colors) to 1024x768, 256 colors in the Display properties dialog box. Although Windows 95 may accept the changes, the error still results. The Super VGA (SVGA) driver (1024x768) included with Windows 95 is designed for nonaccelerated SVGA video adapters only. To correct this problem, change the video driver back to the default VGA setting.

[To change your video driver back to VGA](#)

1. Restart the computer. Press F8 and choose Safe Mode.
2. In the Display option in Control Panel, click the Settings tab.
3. Click the Change Display Type button, then click the Change button for the Adapter Type.
4. Click Show all Devices, click Generic Display Drivers, and then click OK. When asked whether to use the current driver or a new driver, click Current.

If you want to use a high-resolution video driver with Windows 95, consult your video adapter manufacturer for the proper driver to use.

*A Windows 3.1 video driver doesn't support advanced features.*

Windows 95 cannot support the advanced Windows 95 video features when a Windows 3.1-compatible driver is being used. If you are using a Windows 3.x-compatible video driver with Windows 95, some advanced features (such as dynamic resolution changes, font smoothing, and automatic fallback to VGA) will not work.

Some Windows 3.1 drivers require the screen resolution to be specified in the [boot.description] section of the SYSTEM.INI.

*A Windows 3.1 video driver is ignored during installation.*

Some Windows 3.x video drivers are incompatible with Windows 95 and are replaced with the standard VGA driver during installation. The incompatible driver list is contained in the [display.update.force] section of MSDISP.INF, and lists Windows 3.x video drivers that are removed. Windows 95 Setup forces the upgrade to Windows 95 standard VGA if one of these Windows 3.1 drivers is installed. The following is a sample of the [display.update.force] section:

[display.update.force]  
mga8.drv,\*,\* ; Matrox  
\*,vddagx.386,\* ; IIT AGX (e.g. Hercules Graphite)  
wspdsf.drv,\*,\* ; IBM ThinkPad 486/50  
vgap.drv,\*,\* ; Pen Windows 3.1 VGA driver  
sspro16.drv,\*,\* ; SpeedStar Pro 16 colors  
p9100\_16.drv,\*,\* ; Weitek 9100 16bpp  
\*,v98032.386,\* ; Appian Renegade

*A SCSI device fails to work.*

The SCSI and CD-ROM support built into Windows 95 requires that CD-ROM drives provide SCSI parity to function properly. For many drives, this is a configurable option or is active by default. Examples of drives that do not provide or support SCSI parity are the NEC® CDR-36 and CDR-37 drives.

If you have trouble with a SCSI drive, make sure the SCSI bus is set up properly (refer to your hardware documentation for specific details).

In some cases, adding or removing a SCSI adapter may prevent your computer from starting correctly. Check the following:

n

The ends of the SCSI bus must have terminating resistor packs (also

called terminators) installed.

If you have only internal or only external SCSI devices, the ends of the bus are probably the SCSI adapter and the last device on the cable. If you have both internal and external SCSI devices, the adapter is probably in the middle of the bus and should not have terminators installed. If you disconnect a device that has terminators installed (such as an external CD-ROM drive), be sure to install terminators on whatever device then becomes the last one on the bus. One of the devices on the SCSI bus (usually the adapter) should be configured to provide termination power to the bus.

# n

Removable media must be mounted on the drive before running Setup.

If you have a SCSI hard disk drive that uses removable media, such as a cartridge drive, make sure that media are mounted on the drive before running Setup. If no media are on the drive, errors may occur during Setup that prevent installation of Windows 95.

*Setup doesn't recognize the correct SCSI CD-ROM drive.*

If you have two CD-ROM devices connected to the same SCSI host adapter, Windows 95 Setup does not necessarily use the CD-ROM drive that contains the higher SCSI ID. If, for example, using one CD-ROM drive results in Setup displaying the message "Please insert the CD-ROM into the CD-ROM drive," remove the compact disc and try the other CD-ROM drive. Setup chooses one CD-ROM drive and refers to it as the primary CD-ROM drive.

*A SCSI drive does not show up in My Computer.*

This probably indicates that there is something wrong with the SCSI drivers in CONFIG.SYS and AUTOEXEC.BAT, or that the protected-mode SCSI drivers fail to load. Look for an IOS.LOG file and check its entries, as described in "Real-Mode Drivers and the IOS.INI Safe Driver List" earlier in this chapter.

*Running the DIR command on the SCSI drive produces strange characters.*

If typing `dir` results in strange characters appearing on the screen instead of the directory listing, the hard disk may be a SCSI drive that requires double buffering which is not loaded. Verify that the MSDOS.SYS file has `DoubleBuffer=1` entry in the [Options] section. (However, if you start the computer using MS-DOS version 6.0 or higher, double buffering is provided when SMARTDRV.EXE loaded in the CONFIG.SYS.)

*The system stalls when accessing CD-ROM.*

After you press CTRL+ALT+DEL to restart the computer, Windows 95 may be unable to find the CD-ROM or stall when trying to access the drive; sometimes, pressing CTRL+ALT+DEL will not reset the computer. This might occur if Windows 95 is relying on real-mode drivers for the Sound Blaster™ or Media Vision™ Pro-

Audio-proprietary CD-ROM drive. If this is the case, you cannot access anything on the CD-ROM because its drivers cannot load. If this happens, turn off and then restart the computer. Use the Add New Hardware option to install the protected-mode drivers provided with Windows 95 for the specific CD-ROM device.

.WAV files cannot be played.

If Windows 95 cannot recognize the sound card, you may not be able to play .WAV files.

To verify sound card settings

1. In Device Manager tab, click the Sound controller.
2. Double-click the specific sound card, and then on the card's property sheet, click the Drivers tab so you can verify the drivers.
3. Click the Resources tab, and Verify Port and IRQ settings.
4. Check the Conflicting Device List, and verify that no conflicts for the sound card settings appear in the list.

Video is jerky during playback.

n

Use Add New Hardware in Control Panel to verify the appropriate video-driver is installed for the video card you are using.

n

Check to see if MSCDEX is installed. If so, remove it and use Windows 95 CD-ROM File System (CDFS) drivers.

n

If the problem occurs for MS-DOS-based applications, check and maximize available XMS memory in the DOS VM.

*An input device fails.*

n

Check the physical connection.

n

In Device Manager, check the driver used for the device.

n

Check for conflicts with the I/O and IRQ resources used.

n

Check for conflicting drivers or applications.

The mouse moves erratically or keyboard input fails.

n

In Device Manager, check the mouse and keyboard drivers, replacing them if necessary.

n

In the Mouse option of Control Panel, check Motion configuration for pointer speed.

n

Check the port used for mouse.

n

Check the physical connection of the mouse and keyboard.

n

Make sure there are no entries for real-mode mouse drivers in CONFIG.SYS, AUTOEXEC.BAT, WIN.INI, and SYSTEM.INI.

# n

When the Starting Windows 95 message appears, press F8 and choose option 2, Logged. Check the BOOTLOG.TXT and verify that the mouse driver is loading.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*



## Chapter 20 Disks and File Systems

This chapter introduces Windows 95 disk and file system support. It describes how to use Windows 95 utilities to partition and format disks and describes how to use Fdisk, Format, DriveSpace, Disk Defragmenter, and ScanDisk to manage disks and data. This chapter also discusses how to manage long filenames.

### *Disks and File Systems: The Basics*

---

The new 32-bit, protected-mode file system support in Windows 95 allows optimal access to hard disks, CD-ROM drives, and network resources. The new file system support means faster, better performance for all file I/O operations.

Because of enhancements to the file systems, there is no longer the eight-character limit on filenames that was imposed by the FAT file system under MS-DOS. You can use long file and directory names in Windows 95 and in any applications that support long filenames.

The enhanced FAT file system in Windows 95 also permits exclusive access to a disk device for file system utilities. File system utilities, such as ScanDisk, require exclusive access to the file system to ensure data integrity in a multitasking environment. For example, if a user saves a file on the disk while another task is accessing the information or writing information to disk at the same time, data corruption could occur without exclusive access to the disk.

Exclusive disk access means you can now run disk management and optimization utilities without quitting Windows. You can even complete tasks such as disk defragmentation without stopping work in other applications. The exclusive access support is used by the disk utilities provided with Windows 95 and can be used in Windows-based disk management utilities from any vendors that take advantage of the related API in their utilities.

The disk utilities provided with Windows 95 include the following.

#### *Fdisk and Format.*

Used to partition and format disks. These utilities behave exactly as their counterparts in earlier versions of MS-DOS 6.x. You can use a graphical form of Format by right-clicking a drive icon in Windows Explorer.

#### *DriveSpace (DBLSPACE).*

Used to compress data and free space on disk drives. The built-in support for DriveSpace disk compression is completely compatible with DoubleSpace and DriveSpace disk compression provided with MS-DOS 6.x. Windows 95 provides base compression in the form of a 32-bit virtual device driver that delivers improved performance over previously available real-mode compression drivers, and frees

conventional memory for use by MS-DOS-based applications. Existing users of DoubleSpace and DriveSpace will not need to change the compressed volume file (CVF) that they are presently using, and thus will not need to take any special actions when they install Windows 95.

### Disk Defragmenter.

Used to defragment information on a disk (also called an optimizer). Using Disk Defragmenter regularly helps to minimize the area of your disk in which Windows 95 needs to look to load information.

### ScanDisk.

Used to analyze and repair disks. This graphical disk checking and repair tool runs under Windows 95 to help users check the integrity of disks and to remedy problems detected. Users can choose to scan the computer's files and folders for errors, or to perform a more thorough scan which also includes scanning the disk surface for errors.

## Issues for Disks and File Systems

---

You should use disk and file management utilities designed specifically for use with Windows 95. This way, you can avoid losing long filenames and data. In some cases (as described later in this chapter), you can use the LFNBK utility to remove and later restore long filenames on a disk so that a utility not compatible with long filenames can be run.

Ensure disk integrity by putting ScanDisk in the Startup group so that it runs each time the computer is powered on. This guards against possible catastrophic disk errors. Also, back up critical files once a week to ensure data security, and run Disk Defragmenter on your disk at regular intervals to optimize disk I/O performance.

For easily-readable filenames, use long filename support. However, Windows 95 file systems and OS/2 HPFS each have slightly different ways of defining 8.3-style aliases for long filenames. If you are using a mixed network environment, be sure to understand the differences (as described in this chapter). Then define and publish a file naming policy designed to help minimize any naming conflicts, as described later in this chapter.

## Partitioning Hard Disks

---

This section describes how to use the Fdisk program to configure a hard disk. For example, if you want to combine several partitions into one large partition, you must use Fdisk; there is no method for automatically combining partitions.

---

Caution—— If you are using certain types of partitions, such as those created by Ontrack Computer Systems Disk Manager®, Storage Dimensions SpeedStor®, Priam®, or Everex™ partitioning programs, which replace the BIOS in interactions between MS-DOS and the hard-disk controller, do not repartition the hard disk by using Fdisk. Instead, use the same disk-partitioning program you originally used to partition the disk. For example, if you use SpeedStor on a computer that has more than 1024 cylinders, do not carry out the following procedures.

To determine whether you have a partition created using one of these disk-partitioning programs, search for the following files: DMDRVR.BIN (Disk Manager), SSTOR.SYS (SpeedStor), HARDRIVE.SYS (Priam), and EVDISK.SYS (Everex). Usually, you will find *device=* entries that load these files in CONFIG.SYS. If you need help repartitioning the hard disk or are unsure whether the BIOS is being replaced, contact the manufacturer of the original disk-partitioning program.

---

To configure a hard disk, you must do the following, as described in the following sections:

n

Create a startup disk using the Add/Remove Programs option in Control Panel.

n

Back up the files on the hard disk.

n

Repartition the hard disk by using Fdisk.

# n

Format the hard disk.

# n

Restore the backed-up files.

If you want to repartition a hard disk into one large drive, you must first delete all existing partitions and logical drives, and then create a new primary partition and make it active. You can also repartition a hard disk so that it has more than one logical drive.

Fdisk is an MS-DOS-based application. Under Windows 95, however, it can run in a window (a DOS-VM).

---

Note — Although Windows 95 replaces MS-DOS, the partitions that Fdisk creates are still called DOS partitions.

The Windows 95 Startup disk contains a copy of Fdisk, which you can use if something happens to make your hard disk unreadable.

---

To configure a hard disk by using Fdisk, complete these tasks:

# n

Delete DOS partitions, logical drives, the extended DOS partition, and the primary DOS partition.

# n

Create a new primary DOS partition.

# n

Create an extended partition and logical drives, if you want any.

---

Caution—— If you use Fdisk to repartition a hard disk, all the files on the original partitions will be deleted. Be sure to back up all data files on a partition before using Fdisk.

---

[To start Fdisk](#)

# n

At the command prompt, type *fdisk*

—— If you are starting Fdisk from a startup disk, make sure the disk is in drive A, and then restart the computer by pressing CTRL+ALT+DEL. Then type the following at the command prompt:

—— a:fdisk

—— The Fdisk Options screen appears, where you can choose to do the following:

# n

Create a partition or logical drive

# n

Set the active partition

# n

Delete a partition or logical drive

# n

Display partition information

If the computer has two or more hard disks, Fdisk displays a fifth option on the Fdisk Options screen, named Change Current Fixed Disk Drive. You can switch to another disk drive by choosing this option. Changing the current hard disk drive while using Fdisk doesn't change the current drive when you return to the command prompt.

Each Fdisk screen displays a Current Fixed Disk Drive line, followed by a number. If the computer has only one hard (fixed) disk drive, the number is always 1. If the computer has more than one hard disk drive, the number shows which disk Fdisk is currently working with. The first hard disk drive on the computer is 1, the second is 2, and so on. The Current Fixed Disk Drive line refers only to physical disk drives.

---

Note—— If you installed a disk compression program from Microsoft or another

vendor, Fdisk displays the uncompressed, not the compressed, size of the drives. Also, Fdisk might not display information about all the drives used by a disk-compression program from another vendor.

---

### [Deleting Partitions and Logical Drives](#)

---

Important — Back up your files before deleting partitions.

If you have a non-DOS partition on a hard disk, copy the data files on the partition to floppy disks or a network drive, to back them up. For more information, see the documentation that came with your non-MS-DOS operating system or your disk-partitioning program from another vendor.

---

You can use Fdisk to delete partitions before creating a new primary partition. You must delete partitions in the following order:

n

Any non-DOS partitions

n

Any logical drives in the extended DOS partition

n

Any extended DOS partition

# n

The primary DOS partition

## [To delete a partition or logical drive](#)

1. From the Fdisk Options screen, press 3, and then press ENTER. The Delete DOS Partition Or Logical DOS Drive screen appears.
2. Press the number as shown on the screen for the kind of partition you want to delete, and then press ENTER.
3. Follow the directions on the screen, and repeat the steps for deleting any additional partitions or logical drives.

---

Note — If Fdisk cannot delete a certain non-DOS partition, quit Fdisk, delete the non-DOS partition by using the software used to create it, and then restart Fdisk.

---

## [Creating a Primary MS-DOS Partition](#)

After you have deleted a primary DOS partition, you can create a new primary DOS partition.

## [To create a primary DOS partition](#)

1. In the Fdisk Options screen, press ENTER. The Create DOS Partition or Logical DOS Drive screen appears.
2. Press ENTER. The Create Primary DOS Partition screen appears.
3. If you want the partition to be the maximum size, press ENTER. Then insert a startup disk in drive A, and press any key.  
— If you don't want the partition to be the maximum size, press N, and then press ENTER. Another Create Primary DOS Partition screen appears.
4. Follow the instructions on-screen to specify the partition size you want, and then press ENTER.  
— You can specify the partition size as a percentage of disk space or in megabytes of disk space. If you specify a percentage of disk space, include a percent (%) sign after the number.



5. Press ESC to return to the Fdisk Options screen, then follow the instructions on-screen to make the primary DOS partition active, and then return to the Fdisk Options screen.

— If you have not allocated all the space on a disk drive to the primary DOS partition, you can create an extended DOS partition and logical drives by choosing the Create Extended DOS Partition in Fdisk. You specify the partition size you want as a percentage or number of megabytes of disk space.

— If you don't want to create an extended partition, press ESC to quit Fdisk. Then insert a startup disk in drive A, and press any key.

You cannot format a hard disk using Windows 95 Setup. The hard disk must be formatted already before you can run Windows 95 Setup. However, if Windows 95 is already installed, you may need to reformat the hard disk, as described in the following procedure.

---

Note — If the disk was compressed using DriveSpace, instead of using the following procedure, you must use the Format option within DriveSpace to format the compressed drive.

---

#### [To format the drive\(s\) on a hard disk](#)

n

Right-click the icon for that disk, then click Format on the context menu.

— You cannot use this method on a hard disk containing open files, including the drive where Windows 95 resides.

— {ewc msdncl, EWGraphic, x0s 0 /a "psS.bmp"}

#### [To format a hard disk using the Windows 95 startup disk](#)

1. Make sure a startup disk is in drive A. Then at the command prompt, type the following:

— format

— For DRIVE, type the letter of the drive you want to format.

— If you are formatting drive C, copy system files to the hard disk by typing the following at the command prompt:

— format c: /s

— When the warning message appears, proceed with formatting by pressing Y, and then press ENTER.

2. When formatting is complete, type a volume label if you want one, and then press ENTER.

3. If you have any other drives to format, repeat Steps 1 and 2.

4. Remove floppy disks from all floppy disk drives, and then restart the computer by pressing CTRL+ALT+DEL.

### [To assign a drive letter to a shared folder](#)

*{ewc msdncd, EWGraphic, x0s 1 /a "psS.bmp"}*

1. Right-click My Computer or Network Neighborhood, then click Map Network Drive.

2. Click the Path box, and then type the path to the resource you want in the following form:

— \\COMPUTERNAME\FOLDERNAME

— If a password is required, Windows 95 prompts you to type one.

---

Tip — To select a resource you have mapped before, click the arrow to the right of the Path box to display the list of recently mapped resources, and then click the one you want.

If the toolbar is not visible, click the View menu, and then click Toolbar.

---

Whenever a removable media device is present, the new Windows 95 volume tracker is enabled to ensure that the correct media is in the device and to detect and report improper media removal or insertion.

The volume tracker keeps track of removable media in two ways:

# n

On non — write-protected floppy disks, the volume tracker writes a unique ID in the disk's FAT header. This ID is different from the volume serial number.

# n

On write-protected floppy disks, the volume tracker caches each disk's label, serial number, and BIOS parameter block.

Windows 95 supports existing removable media with MS-DOS — compatible partitions, which are usually created using Fdisk utilities from other vendors. As with previous versions of MS-DOS, Fdisk for Windows 95 can be used to create partitions on INT 13-based removable media, as described earlier in this chapter.

### [Identifying Volumes on Removable Media](#)

Windows 95 does not perform volume tracking based on the volume serial number, because all removable media do not have serial numbers or may have duplicate serial numbers, as with bulk-formatted floppy disks. Therefore, the file system driver must assign unique serial numbers to removable media the first time there is a request to mount the specific media, unless unique numbers have already been written to the media. These unique numbers identify the media for volume tracking.

---

Note — For volume tracking with NEC floppy disk change detection, if the system detects a change line on a volume, the change line is used for subsequent I/O requests to the media.

---

### [Assigning Drive Letters for Removable Media](#)

You can control the number of drive letters that will be reserved for each of the removable media drive during system initialization.

### [To reserve drive letters for removable media](#)

1. In the System option in Control Panel, click the Device Manager tab.
2. Double-click the option in the hardware tree that represents the removable device.
3. Click the Settings tab.
4. Under the Reserved Drive Letters option, select a letter in the Start Drive Letter list to define the first drive to be assigned to this device. In the End Drive Letter list, select the last drive to be assigned to this device
5. Click OK and close the System property sheet. Then shut down and restart the computer for the changes to take effect.

The *MaxRemovableDrivePartition* entry in the Registry allocates the drive letters to be used by partitions on removable media. If this entry is not present in the Registry, the number of drive letters to be assigned is based on the number of partitions on the media present when the system starts. If no media are present at startup, Windows 95 reserves one drive letter for each of the removable media.

To support variable-sized disks and partitions, the I/O Supervisor recalculates the disk geometry every time a media change is detected. If you insert media with more partitions than specified by the *MaxRemovableDrivePartition* entry in the Registry, a message warns you that some partitions on the media are not accessible in the current configuration and prompts you to increase the value of *MaxRemovableDrivePartition*.

---

### *Disk Management Overview*

---

Windows 95 includes several tools that you can use to manage and protect data and improve performance. To keep your computer in good working order, use these programs on a regular basis. To determine which tasks are necessary to manage your computer, consider the following.

---

|         |           |
|---------|-----------|
| Space   | Use       |
| is      | various   |
| availab | tips for  |
| le on   | freeing   |
| the     | disk      |
| hard    | space,    |
| disk    | and use   |
|         | disk      |
|         | compres   |
|         | sion. For |
|         | details,  |
|         | see       |
|         | "Managi   |

ng the  
Recycle  
Bin to  
Free  
Disk  
Space”  
and  
“Using  
Disk  
Compre  
ssion  
with  
Window  
s 95” in  
this  
chapter.

|                                                            |                                                                                                                             |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Files<br>aren't<br>lost if<br>the<br>hard<br>disk<br>fails | Run _ or<br>a<br>network<br>backup<br>agent.<br>For<br>details,<br>see<br>Chapter<br>16,<br>“Remote<br>Administ<br>ration.” |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|

|                                                                                 |                                                                                                                            |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| The<br>compu<br>ter can<br>access<br>files<br>quickly<br>and<br>efficien<br>tly | Defragm<br>ent the<br>hard<br>disk. For<br>details,<br>see<br>“Defrag<br>menting<br>Disks”<br>later in<br>this<br>chapter. |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|

|                        |                          |
|------------------------|--------------------------|
| Files<br>are<br>stored | Run<br>ScanDis<br>k. For |
|------------------------|--------------------------|

correct details,  
ly, lost see  
cluster "Using  
s don't ScanDis  
take k" later  
up in this  
space chapter.  
on a  
disk, or  
the  
hard  
disk is  
not  
damag  
ed

The routine for managing a computer's hard disks should include automatically running ScanDisk when starting the computer to check the integrity of the hard disk, backing up files once a week, and occasionally using the Disk Defragmenter to defragment the hard disk. No matter what your computer management plan, carry it out at regular intervals.

---

Note — For best results, do not run other programs while running either Disk Defragmenter or ScanDisk. Although you can use your computer for other tasks while running either of these utilities, each time you write to the disk, the utility automatically reinitiates itself to work with the current view of the disk.

---

### [About Volume Locking for Disk Utilities](#)

Windows 95 provides volume-locking APIs that applications such as disk utilities can use to control direct disk access when the computer uses the Windows 95 32-bit file system. (In Windows for Workgroups 3.11, VFAT generated an error whenever a disk utility tried to access the drive in protected mode.)

Disk utilities usually make absolute INT 25 and INT 26 disk calls, which do not require file system drivers. Instead of calling INT 21 and INT 13 to access the disk, the application calls INT 25 for reads and INT 26 for writes.

When an application is going to change the disk structure (such as a disk utility preparing to defragment the disk), it should use the volume-locking APIs to lock that volume or drive before making any disk calls, so that no other application can write to that volume and interfere with its operations. When the application has completed its work, it must unlock the volume before the system can resume normal operation.

If a utility does not use volume locking before it attempts to read from or write to the

disk, Windows 95 returns an error and causes it to fail. All utilities included with Windows 95, such as the Disk Defragmenter and ScanDisk, use volume locking. Such utilities cannot be used with Windows NT, because Windows NT does not allow utilities to make direct calls to the hardware.

### *Managing the Recycle Bin to Free Disk Space*

---

```
{ewc msdncd, EWGraphic, x0s 2 /a "psS.bmp"}
```

When you delete a file or directory, it goes into the Recycle Bin, but it still takes up space on the hard disk. You can use one of these methods to ensure disk space is not being used by the contents of the Recycle Bin:

n

Avoid moving items to the Recycle Bin by pressing SHIFT when you use the mouse or keyboard to delete items.

n

Avoid moving items to the Recycle Bin by configuring it so that items are removed from the disk immediately when you delete them.

n

Empty the Recycle Bin regularly.

You can also configure the Recycle Bin to use a small amount of space so that you are prompted to empty the bin more often.

[To empty the Recycle Bin](#)

# n

Right-click the Recycle Bin icon on the desktop, and then click Empty Recycle Bin.

### [To configure the Recycle Bin](#)

1. Right-click the Recycle Bin icon, and then click Properties in the context menu.

— Notice that you can configure properties for each hard disk drive on your computer.

— {ewc msdn cd, EWGraphic, x0s 3 /a "psS.bmp"}

2. If you want deleted items to be removed from the Recycle Bin immediately, click the Do Not Move... option to mark the check box.

3. If you want the Recycle Bin to use less hard disk space, drag the slider bar to the left so that it uses a smaller percentage of the disk.

4. When all properties are as you want, click OK.

### [Using Disk Compression with Windows 95](#)

---

With Windows 95 DriveSpace, you can compress drives and manage drives compressed with DriveSpace or DoubleSpace. (You can even have drives of both compression types on your computer.)

This section presents these topics:

# n

Overview of compressed volume files and host drives



# n

## Using DriveSpace for disk compression

---

Note — The Registry can reside on compressed drives that were created by “preload” compression software such as STAC Electronics Stacker® 4, DoubleSpace, DriveSpace, and AddStor® SuperStor®/DS.

The swap file can reside on a compressed drive if a protected-mode driver controls the compressed drive. More information is provided later in this section.

---

A compressed drive is not a real disk drive, although to most programs, it appears to be. Instead, a compressed drive exists on the hard disk as a COMPRESSED VOLUME FILE (CVF). A CVF is a file with Read-Only, Hidden, and System attributes, which contains a compressed drive. Each CVF is located on an uncompressed drive, which is referred to as the CVF's HOST DRIVE. A CVF is stored in the root directory of its host drive and has a filename such as DRVSPACE.000 or DBLSPACE.000.

Most CVFs can store more data than the space they use on their host drives; for example, a typical CVF might use 100 MB of space on its host drive but contain 200 MB of compressed data. DriveSpace assigns a drive letter to the compressed volume so that you can use it as a disk drive and can access the files it contains. The host drive will have a separate drive letter (although it may be hidden).

---

Caution — Do not tamper with a CVF. If you do, you might lose all the files on the compressed drive.

---

Let's discuss a relationship between a compressed drive and a host drive: drive C, which is compressed, and drive H, which is uncompressed. The `dir /c` command can be carried out on compressed drive C. This command lists the files in the current directory and displays the compression ratio of each file. Drive C contains several directories plus `COMMAND.COM`, `AUTOEXEC.BAT`, and `CONFIG.SYS`.

The `dir /a` command can be carried out on drive H. This command lists the files in the current directory, including any files that have the Hidden attribute. Drive H contains several files, including the compressed volume file for drive C, `DBLSPACE.000`.

Compressed drive C is contained in the compressed volume file DBLSPACE.000, which is located on uncompressed drive H. Drive C's compressed volume file uses a substantial amount of space on drive H. However, drive C provides far more storage capacity than the space it uses on drive H.

---

Note — When DriveSpace runs on any drive containing open files, it has to restart the computer and run the operation under an environment that looks similar to earlier versions of Windows (the same subset of Windows that Windows 95 Setup uses). To do this, a directory named FAILSAVE.DRV is created that contains the system files required for this operation.

---

Using DriveSpace, you can compress and uncompress data on floppy disks, removable-media drives, or hard disk drives. DriveSpace frees space on disks by compressing the data that is on them. The first time you use DriveSpace to compress data or space on a drive, the disk will have 50 to 100 percent more free space than it did before.

#### [Tip for Swap Files on Compressed Drives](#)

Windows 95 allows you to store a swap file on a DriveSpace or DoubleSpace drive. DriveSpace marks the swap file as uncompressible and, to reduce the amount of fragmentation, places the swap file as the last file in the CVF. (Locating the file there also allows for expansion.)

If you want to change the size of the drive and if DriveSpace or a defragmentation utility detects a swap file at the end of the sector heap, you will be prompted to restart the computer.

When you choose to compress a drive, the drive you specify is compressed and contains more free space than it did before. You can use the compressed drive just as you did before compressing it. In addition, DriveSpace creates a new uncompressed drive, called the host drive, where it stores the CVF. If the host drive contains any free space in addition to the CVF, you can also use it to store files that must remain uncompressed.

---

Note — The version of DriveSpace included with the base Windows 95 product can create a virtual drive of up to 512 MB. If your disk is very large, you may not be able to compress it as a single volume.

---

Alternately, on an uncompressed drive that is part of a nonremovable hard disk, you can create a new compressed drive from its free space. After compression, you'll notice that the uncompressed drive contains less free space than it did before. This

space is now being used by the new compressed drive, which is stored in a hidden file with a filename such as DBLSPACE.001.

Consider this scenario: Suppose you have a 200 MB hard disk with 100 MB of data on it. Uncompressed, this disk has 100 MB of free space. You can increase the amount of disk space in either of two ways:

n

If you compress this drive, DriveSpace compresses both the data and the

free space on the disk. Then, because DriveSpace reports file sizes of compressed files as though they were uncompressed, you will see that the disk is now a 400 MB disk with 100 MB of data and 300 MB of free space.

n

If you instead create a new compressed drive from the hard disk's free

space (by choosing the Create Empty option), DriveSpace will report that you have two drives, one with 200 MB of free space and the other with 100 MB of data (and no free space). Notice that you can also create an empty drive using only part of the available free space.

Although the option to compress a drive provides more usable space, the process takes longer than creating a new compressed drive, because it compresses both the data and the free space on the drive. Creating a new compressed drive simply involves using the free space to create an empty CVF.

---

Important — Before you use DriveSpace to compress a drive, you should back up the files the drive contains.

---

For information about using the command-line equivalent commands for DriveSpace, see Appendix A, "Command-Line Commands Summary."

### [To compress a drive](#)

1. From the Start button, choose Programs, then choose Accessories, and then choose System Tools. Click DriveSpace.

2. In the Disk Compression window, click the drive you want to compress.

—{ewc msdn cd, EWGraphic, x0s 4 /a "psS.bmp"}

3. From the Drive menu, click Compress.

—Windows 95 displays the Compress A Drive dialog box, listing the drive it is about to compress.

—{ewc msdn cd, EWGraphic, x0s 5 /a "psS.bmp"}

4. Click the Options button if you want to specify the drive letter or free space to leave available for the host drive, and whether the host will be hidden.

—{ewc msdn cd, EWGraphic, x0s 6 /a "psS.bmp"}

—Note — By default, DriveSpace hides the host if the amount of free space is less than 2 MB. You can clear the Hide Host Drive check box to make this drive visible.

—Make modifications in the Compression Options dialog box as needed, and then click OK.

5. Click Start to continue.

—DriveSpace prompts you to back up your files. If you want to back them up at this time, click Back Up Files.

6. Click Compress Now to continue. As the compression progresses, DriveSpace displays a status bar.

DriveSpace checks the drive for disk errors, and then compresses the drive. This process can take from several minutes to several hours, depending on the speed of the hard disk and processor and on the amount of data the hard disk contains. Because DriveSpace checks and rechecks the validity of the data as it compresses files, the process is very safe. In fact, if the compression process is accidentally interrupted (for example, by a power outage), DriveSpace will recover and continue without losing any data.

If any files are open on the drive, DriveSpace will prompt you to close them. For drives that always have files opened (such as the drive containing Windows 95 or the drive containing a swap file), DriveSpace will restart the computer, using a limited version of Windows in place of Windows 95 while it compresses the drive. After compression, your computer will restart again, this time with Windows 95. When the compression is completed, DriveSpace Setup shows how much free space is available on the drive.

---

Caution — Do not tamper with the hidden files on the new host drive. If you change or delete these files, you might lose all the files on the drive you compressed.

---

### [To create a new compressed drive](#)

1. In DriveSpace, select the drive that has free space you want to use to create the new compressed drive.
2. From the Advanced menu, click Create Empty.  
— {ewc msdn cd, EWGraphic, x0s 7 /a "psS.bmp"}
3. Specify a smaller amount of free space in the Using box if you want to leave some free space on the original drive. When you change the value in the Using box, DriveSpace automatically adjusts the estimated free space values shown in the last two text boxes.
4. Click Start.

### [To uncompress a drive](#)

1. Select a drive to uncompress.  
— If there isn't enough space on the host drive to contain the uncompressed files, DriveSpace displays a warning.
2. From the Drive menu, click Uncompress.  
— {ewc msdn cd, EWGraphic, x0s 8 /a "psS.bmp"}
3. Click Start.  
— DriveSpace prompts you to back up files, and shows the status of the process as it progresses.
4. When the process is completed, click Close.

---

Note — If you try to change the size of a drive that was mounted with a real-mode DriveSpace or DoubleSpace driver, you will be prompted to restart the computer so that the drive can be remounted under Windows 95. This will also occur for other operations using the real-mode DriveSpace driver.

---

### [Using DriveSpace with Floppy Disks](#)

You can use DriveSpace to increase the storage capacity of floppy disks. After compressing a floppy disk, you can use it to store data or to transfer data from one computer to another; both computers must be using Windows 95 DriveSpace or MS-DOS 6.x DoubleSpace. After DriveSpace finishes compressing the floppy disk:

# n

The floppy disk contains more free space than it did before. You use the floppy disk just as you did before you compressed it.

# n

The computer has a new drive letter. This new drive letter represents the compressed floppy disk's host drive, which contains the floppy disk's CVF. Although both the new drive letter and the original drive letter refer to the same physical floppy disk drive, only the original can be used to access the disk drive.

In general, you use a compressed removable disk just as you do an uncompressed floppy disk.

By default, DriveSpace automatically mounts a compressed floppy disk when you try to use that disk. This makes it possible to use the disk as if it were an uncompressed floppy disk.

### [To disable Automounting](#)

1. From the Advanced menu, click Options.
2. Make sure the Automatically Mount... option is checked, and click OK.

`{ewc msdn cd, EWGraphic, x0s 9 /a "psS.bmp"}`

---

Note Before it is mounted, a compressed floppy disk appears full. If you have turned off the Enable Automounting option, change to the floppy disk drive, and carry out the *dir* command, the system usually lists one file: a text file named READTHIS.TXT, which briefly explains how to mount the floppy disk. The *dir* command usually reports that the floppy disk contains no free space, because all of the space is used by the CVF. The CVF is a file usually named DBLSPACE.000 with Hidden, Read-Only, and System attributes.

---

If Automounting is disabled, you can still use compressed floppy disks, but you must mount them yourself.

### [To mount a compressed floppy disk](#)

1. Insert the compressed floppy disk in a drive.
2. In the Disk Compression window, click the drive you want to mount.
3. From the Advanced menu, click Mount.

Windows 95 displays a message telling you when the disk has been mounted.

The compressed floppy disk remains mounted and the files on it remain available until you change floppy disks or restart the computer.

### [Changing Free Space and the Estimated Compression Ratio of a Compressed Drive](#)

On an uncompressed drive, free space indicates how much additional data you can store on that drive. For example, if a drive has 2 MB of free space, you can expect to fit 2 MB of data on it. However, the free space on a compressed drive is only an estimate of how much data you can fit on that drive.

When you store a file on a compressed drive, DriveSpace compresses the file so that it takes up as little space as possible. Some files can be compressed more than others; for example, a bitmap file can be compressed much more than a program file. DriveSpace cannot detect the compressibility of files you haven't stored yet, so it can only estimate a compressed drive's free space.

DriveSpace estimates a drive's free space by using the ESTIMATED COMPRESSION RATIO, which you can set to specify the compressibility of the files you plan to store. For example, if the estimated compression ratio is 3 to 1, DriveSpace calculates the drive's free space based on the assumption that each file you will store can be compressed to one-third its original size.

Usually, the best compression estimate to use is the actual compression ratio for the files already stored on the drive. Sometimes you might want to reset the estimated compression ratio of each drive to match that drive's actual compression ratio.

You might want to change the estimated compression ratio if it differs greatly from the actual compressibility of the files you plan to store. For example, if you plan to store extremely compressible files, such as bitmap files, you might want to specify a higher estimated compression ratio. Or, if you plan to store files that will not compress much further, you might specify a lower ratio.

Changing a drive's estimated compression ratio does not affect how much DriveSpace actually compresses the files on that drive; it changes only the way DriveSpace estimates the free space on the compressed drive.

### [To change the estimated compression ratio](#)

1. Click the compressed drive you want to change. Then, from the Advanced menu, click Change Ratio.
2. Type a new ratio in the Estimated Compression Ratio box (or drag the slider bar). Click OK.

===={ewc msdncd, EWGraphic, x0s 10 /a "psS.bmp"}

You can also adjust the amount of free space for a compressed drive or its host drive. This is equivalent to changing the size of the compressed drive and its CVF. When you increase free space on a compressed drive, you decrease it on its host, and vice versa.

#### [To change the amount of free space on a drive](#)

1. From the Drive menu, click Adjust Free Space.
2. Using either the right or left Free Space field, or the slider bar, adjust the amount of free space available on the compressed and host drives. Click OK.

===={ewc msdncd, EWGraphic, x0s 11 /a "psS.bmp"}

---

Tip — If the free space is highly fragmented, the usable free space may be less than what DriveSpace estimates. In some cases, you may not be able to store files on that drive, even though there appears to be plenty of space. To avoid this problem, run Disk Defragmenter regularly on compressed drives.

---

#### Defragmenting Disks

---

Over time, as programs read from and write to your disk, information that is stored on the disk can become fragmented. Fragmentation occurs when a file is stored in noncontiguous sectors on a disk. Fragmentation doesn't affect the validity of the information — the files are still complete when they are opened. But it takes much longer for the computer to read and write fragmented files than it does to read and write unfragmented files.

To improve file access time, you can defragment your uncompressed drives and compressed DriveSpace or DoubleSpace drives.

---

Notes — The Disk Defragmenter will not work with compressed drives created with most compression software from other vendors (such as those compressed with SuperStor), read-only drives, locked drives, network drives, FFS drives, or drives created with ASSIGN, SUBST, or JOIN.

---

#### [To defragment a disk drive](#)



1. From the Start button, choose Programs, then choose Accessories, and then choose System Tools. Click Disk Defragmenter.

2. In the Select Drive dialog box, specify the drive that requires defragmentation and click OK.

— The Disk Defragmenter displays a dialog box telling you whether defragmentation is recommended for your disk or not. If your disk has low fragmentation, the Disk Defragmenter will not recommend defragmentation.

3. Click the Advanced button if you want to do any of the following:

**n** Specify a defragmentation method (all files and free space, files only, or free space only). Depending on how badly defragmented the disk is, you can reduce the amount of time required to defragment a disk by choosing to defragment only files or only free space.

**n** Specify whether or not the drive should be checked for errors.

— You can check the option to save these optimization preferences for use each time you use Disk Defragmenter.

— Click OK.

— {ewc msdn cd, EWGraphic, x0s 12 /a "psS.bmp"}

4. In the Disk Defragmenter window, click Start to begin defragmenting the drive.

---

Tip — Showing details while the Disk Defragmenter runs causes it to take longer than it does when showing summary information or running minimized. For quickest performance, minimize the Disk Defragmenter window while the utility is running.

---

[To see defragmentation information for a particular drive](#)

# n

Right-click that drive's icon, then click Properties. The Tools property sheet

shows the number of days since the last complete defragmentation process ran on the drive. You can also run Disk Defragmenter from this property sheet.

You can also use the command-line equivalent command, *defrag*, in a batch file. For more information about this command, see Appendix A, "Command-Line Commands Summary."

## *Using ScanDisk*

---

ScanDisk is a full-featured disk analysis and repair program. ScanDisk automatically runs when you start the Windows 95 Setup program. After Windows 95 is installed, ScanDisk can work on both uncompressed and compressed drives. ScanDisk checks compressed drives created with compression software from other vendors, but only checks these drives as if they were uncompressed. ScanDisk, however, can provide a detailed analysis of compression structures on DoubleSpace and DriveSpace drives.

---

Note — Windows 95 provides two versions of ScanDisk: a new graphical Windows-based version that you can run from the Start menu or from Windows Explorer, and an MS-DOS-based version that is contained on the Windows 95 startup disk. For information about running ScanDisk from the command line or in batch files, see its entry in Appendix A, "Command-Line Commands Summary."

---

ScanDisk checks and fixes problems on hard disk drives, floppy disk drives, RAM drives, and memory cards in the following areas:

# n

File allocation table (FAT)

n

Long filenames

n

File system structure (lost clusters, cross-linked files)

n

Directory tree structure

n

Physical surface of the drive (bad sectors)

n

DriveSpace or DoubleSpace volume header, volume file structure,  
compression structure, and volume signatures

---

Note—— ScanDisk cannot find or fix errors on CD-ROM drives, network drives, or drives created by using ASSIGN, SUBST, JOIN, or INTERLNK.

---

ScanDisk can check and repair mounted DriveSpace or DoubleSpace drives and unmounted CVFs. If you run ScanDisk on a mounted or unmounted compressed drive, by default, ScanDisk will check the host (physical) drive first. In general, you should allow it to do so, since an error on the host drive could cause problems with the compressed drive.

#### To run ScanDisk

1. From the Start button, choose Programs, then choose Accessories, and then choose System Tools. Click ScanDisk.

—Note— See the following procedure to run ScanDisk on unmounted CVFs.

—{ewc msdncd, EWGraphic, x0s 13 /a "psS.bmp"}

2. Select the drive you want to analyze or repair. Then select Standard or Thorough.

n

A Standard scan checks the files and folders on the selected drive for errors.

n

A Thorough scan checks files and folders for errors, and also checks the physical integrity of the disk's surface.

3. If you do not want ScanDisk to prompt you before repairing each error it might find, make sure the Automatically Fix Errors option is checked.

4. If you are running a thorough test, click the Options button to specify which areas of the disk to check or which type of processing to perform. Then select the options you want to use, and click OK.

—{ewc msdncd, EWGraphic, x0s 14 /a "psS.bmp"}

5. Click Advanced to set advanced options as needed, and click OK. Then click Start to begin testing the disk.

—{ewc msdncd, EWGraphic, x0s 15 /a "psS.bmp"}

ScanDisk begins checking the first selected drive. If you do not click the Automatically Fix Errors option and if ScanDisk finds any problems, ScanDisk displays a dialog box explaining the problem.

#### [To run ScanDisk on unmounted CVFs](#)

n

Type one of the following commands in the Run dialog box:

scandisk drvspace.

Or

scandisk dblspace.

where NNN is a number. This starts an MS-DOS session and runs ScanDisk on the corresponding DriveSpace or DoubleSpace CVF.

#### [Tips for Running ScanDisk](#)

n

Consider putting ScanDisk in the Startup folder to run it each time you start your computer.

n

You can also run ScanDisk from a drive's Tools property sheet. To do this, right-click that drive's icon, click Properties, and then click the Tools tab. Click the Check Now button for the error-checking status to begin running ScanDisk.

# n

You can use the command-line equivalent command, *scandiskw*, in a batch file. For more information about this command, see Appendix A, “Command-Line Commands Summary.”

## *File Systems Overview*

---

With the Windows 95 installable file system, multiple file systems can coexist on the computer. Windows 95 includes the following file systems.

### VFAT.

In Windows 95, the 32-bit virtual File Allocation Table file system is the primary file system and cannot be disabled. VFAT can use 32-bit protected-mode drivers or 16-bit real-mode drivers. Actual allocation on disk is still 12-bit or 16-bit (which depends on the size of the volume), so FAT on the disk uses the same structure as previous versions of this file system. VFAT handles all hard disk drive requests. VFAT was first introduced in Windows for Workgroups version 3.11 as an optional FAT file system that processed file I/O in protected mode. VFAT uses 32-bit code for all file access for hard-disk volumes.

### CDFS.

The virtual CD-ROM file system has the same responsibilities for a CD-ROM device as VFAT has for a standard hard disk. If a CD-ROM device is detected, the CDFS driver loads dynamically. When CDFS is installed, the standard disk type-specific device and Disk SCSI translator are replaced with CD-ROM versions. The CDFS driver is a protected-mode version of MSCDEX.EXE, providing the interface from the CD-ROM device to the operating system, as described later in this chapter and in Chapter 21, “Multimedia.”

### Network redirectors.

A network redirector (such as Microsoft Client for NetWare Networks or Client for Microsoft Networks) accesses the network file system. Windows 95 supports multiple network redirectors simultaneously, as described in Chapter 32, “Windows 95 Network Architecture.”

All these file systems support long filenames, as described later in this chapter, and can use the protected-mode cache (VCACHE) for read-ahead. VFAT also supports lazy write throughput, so applications can write immediately to the cache, and VFAT

can write the information to disk later.

Other software vendors might also implement file systems. For example, a vendor might provide a file system that allows a computer running Windows 95 to connect to a different operating system (for example, Macintosh® or UNIX®) to share files.

As described in Chapter 31, “Windows 95 Architecture,” the Installable File System Manager receives all INT 21 calls and determines which file system driver should receive the call to process it. The Installable File System Manager uses a real-mode stub named IFSHLP.SYS to send INT 21 calls back to the Installable File System Manager.

File system drivers manage the high-level I/O requests from applications. The file system driver processes requests from applications and initiates low-level I/O requests through the I/O Supervisor.

Protected-mode disk compression is not integrated into the file system, but is supported by a layer in the I/O subsystem. Windows 95 supports disk compression software created for earlier versions of MS-DOS, using their real-mode driver loaded from CONFIG.SYS.

### *Using Long Filenames*

---

For MS-DOS version 6.22 and earlier, filenames cannot exceed eight characters and filename extensions cannot exceed three characters in length (“8.3 filenames”). The period character (.) could be used only to separate the filename from the filename extension. With long filename support enabled, these 8.3 filename constraints are gone in Windows 95.

For all Windows 95 file systems, users can specify filenames that are up to 255 characters long and can contain more than one period. These long filenames are any names that exceed 8.3 characters in length or contain any lowercase character or any character that is not valid in the 8.3 namespace.

The following sections present information about these topics:

# n

Overview of long filename support in Windows 95

# n

[Recommendations for supporting long filenames in a mixed environment](#)

# n

[Using the LFNBK utility for temporary compatibility](#)

# n

[Creating long filenames at the MS-DOS Prompt](#)

# n

[Disabling the long-filename capability in Windows 95](#)

# n

[Discussion of long filenames and network compatibility](#)

[For every long filename, an alias entry is automatically generated that complies with](#)



the 8.3 filename rules for backward compatibility. Automatically generated aliases are composed of the first six characters of the filename plus ~N and the first three characters after the last period. So the filename ThisIsALong.File.Name is associated with the automatically generated alias THISIS~1.NAM. If the alias name already exists, the algorithm increments N, where N begins with 2 until the system can find a unique filename.

Neither the user nor an application can control the name created by the automatic alias process. Related issues are discussed in the following sections.

For the filename to comply with the 8.3 filename rules, it must use only the valid characters for an alias and it must be all uppercase. Short filenames are converted to uppercase by the Installable File System Manager before being passed to the file system driver.

Valid characters for 8.3 filenames (and aliases) can be any combination of letters A—Z and digits 0—9, a blank (ASCII 20H), ASCII characters greater than 127, and the following special characters:

\$ % ' \_ @ ~ ` ! ( ) ^ # &

The following additional characters are valid in long filenames, but are not valid in alias names or 8.3 filenames:

+ , ; = [ ]

The following rules also apply for Windows 95 file systems:

n

Maximum filename component length is 256 characters, including NULL.

n

Maximum path length is 260 characters, including NULL (compared to 80 characters for a short name).

# n

The OEM character set can be specified by an application if the application is written for that character set.

# n

The long-filename directory entries use the Unicode character set to store the names.

The filename and the alias are the same if the filename meets 8.3 filename rules (that is, if it contains only valid characters for an alias and it is all uppercase). This implies that a filename using only valid characters for an alias and following the 8.3 filename format is still not the same as the alias name if it contains lowercase characters. However, in this case the alias is the uppercase version of the filename. For example, if the long filename of a file is Examples.Txt, its alias is EXAMPLES.TXT. The case is preserved in the long filename. (Notice, though, that searches in the Windows 95 file system are not case-sensitive. So a search of the form “examples.txt” or “Examples.Txt” will find the same files.)

---

Tip — To see the alias for a file, right-click the file in any shell program such as Windows Explorer and then select Properties from the context menu. The value for MS\_DOS Name on the General property sheet shows the alias assigned to this file.

---

If you are supporting long filenames at a site with many users, the following issues must be considered:

# n

If you back up files to a server that does not support Windows 95 long filenames, use the LFNBK utility to save and restore long filenames. For information, see “Using the LFNBK Utility for Temporary Compatibility” later in this section.

# n

Be aware of utilities that will not work with the new Windows 95 directory entries for long filenames. Some virus scanning programs, disk repair utilities, disk optimizers, and other programs depend on the FAT file system and may not work with the long filename system. If you are unsure whether a utility is compatible with the long filename system, check with the manufacturer. If you must use an incompatible program, be sure to turn off long filenames using the LFNBK utility before proceeding.

# n

Do not use filenames that are more than 50 to 75 characters long.

Although filenames can be up to 255 characters, the full path name cannot be more than 260 characters. To save room for moving a file from one directory to another, use filenames shorter than the limit. Besides, filenames that are too long can make browsing a list difficult.

# n

Publish a naming convention for your site, so that users are aware of

naming considerations and can prevent problems with the long filenames they use. For example, your policy could recommend making the first three or four letters significant, so that the 8.3 alias names can be easily distinguished from each other. The following example shows the alias names for some long filenames:

— Status Report for Oct -> — STATUS~1.TXT

— Status Report for Nov -> — STATUS~2.TXT

— Status Report for Dec -> — STATUS~3.TXT

— Naming the files in this example “Oct Status Report,” “Nov Status Report,” and “Dec Status Report” results in “OCTSTA~1.TXT,” “NOVSTA~1.TXT,” and “DECSTA~1.TXT.”

— You could also recommend that users give files a short filename as part of the long filename. For example, “Mktg\_rpt – Marketing Report for our new project” would result in an alias name of MKTG\_R~1.TXT, which is easy to match to the long filename.

— As part of the naming convention, recommend that users check the properties for files to ensure that the alias (the MS-DOS Name on the property sheet) is what they expect it to be.

### [Tip for Long Filenames in the Root Directory](#)

Usually, it is best to store files in a directory beneath the root directory. This is especially true for files with long filenames. Files with long filenames use more directory entries than files with 8.3 filenames. Because the number of entries in the root is limited to 512, the root directory can fill up with fewer files if long filenames are used.

Notice that typing the command `mkdir Examples` creates a long filename directory entry that contains the name Examples to preserve the case, plus an 8.3 alias entry with the name EXAMPLES for compatibility. In this example, two directory entries are used.

### [Using the LFNBK Utility for Temporary Compatibility](#)

Most hard disk utility programs released before Windows 95 require updating to work correctly with Windows 95. If you use a hard disk utility that is not compatible with Windows 95, you may lose long filenames and you are at risk of losing data. Examples of such programs include the following:

n

Norton Utilities® by Peter Norton Computing

n

PC Tools™ by Central Point Software

n

Microsoft Defragmenter for MS-DOS version 6.0, 6.2, 6.21, or 6.22

In special cases, you may need to run backup or disk management utilities created for older versions of Windows or MS-DOS that are not compatible with the extended file system capabilities of Windows 95. Or you may need occasionally to run an application that is not compatible with long filenames. In such cases, you can use the LFNBK utility to remove (and later restore) long filenames on a disk.

The LFNBK utility is provided on the Windows 95 compact disk in the OTHER\LFNBK directory. This utility is also available on CompuServe and on the Windows 95 supplemental disk that contains MS-DOS utilities.

---

Caution—— The LFNBK utility is intended for use only by experienced Windows 95 users with special needs for compatibility with older disk utilities. It is not intended for everyday use by average users.

Microsoft recommends that users rely on the disk management utilities included with Windows 95 or use Windows 95-compatible utilities from other vendors, rather than attempt to use older utilities that are not compatible with Windows 95.

Notice also that the DriveSpace utility included with Windows 95 is compatible with long filenames, and can be used to manage compressed disks that were created with older versions of DriveSpace or DoubleSpace without using LFNBK.

---

### To use LFNBK

1. Copy LFNBK.EXE from the source files (as described earlier in this section) to the Windows directory.
2. Close all other applications. LFNBK cannot rename files that are currently open.
3. At the MS-DOS prompt, run LFNBK using this syntax:  
—lfnbk [/v] [/b | /r | /p] [        ]  
—/v means verbose (report actions on the screen). Back up and remove long filenames on the disk.  
—/r means restore previously backed-up long filenames.  
—/p means find long filenames, but do not convert them to 8.3 filenames. This reports the existing long filenames, along with the associated dates for file creation, last access, and last modification of the file.
4. Restart your computer.
5. Run your disk utility. If it is an MS-DOS — based utility, run it in MS-DOS Mode. For a Windows-based utility, run it in the usual way.
6. Run LFNBK again to restore long filenames on the disk.

The LFNBK utility actually renames each file with a long filename to its associated alias. The filename changes are stored in the LFNBK.DAT file in the root of the drive where you are running LFNBK. This file is used to restore long filenames (when you run LFNBK with the /r switch).

The following provides some brief notes for using the LFNBK utility:

n

LFNBK cannot be used to repair long filename problems.

n

LFNBK may not be able to rename files with exact matches to long-filename aliases for long filenames in which the first seven characters are identical.

n

After you run LFNBK and then restart Windows 95, the default Start menu will appear, rather than your custom Start menu. When you run *lfnbk /r* to restore long filenames, your custom Start menu will also be restored.

n

If the directory structure changes after your run *lfnbk /b*, then long-filenames cannot be restored with *lfnbk /r*. For example, if you run a disk utility that prunes or removes subdirectories, LFNBK cannot subsequently restore the long filenames within those subdirectories.

### [Creating Long Filenames at the MS-DOS Prompt](#)

At an MS-DOS prompt or when Windows 95 is started to only the command prompt (from the F8 Startup menu), the keyboard buffer's ability to create long filenames is limited to 127 characters. This is because the default command-line character limitation is 127 characters. In the default configuration, the MS-DOS environment will not let more than 127 characters exist in a given command line. (However, in batch files, or for environment variables and other DOS VM elements, the long-filename support is 244 characters.)

You can increase the global command-line character limit for the keyboard buffer to its maximum by placing the following line in CONFIG.SYS:

shell=c:\windows\command.com /u:255

If the *shell* command is already present with the */u* switch, increase the value to 255.

This command will affect all DOS VMs and the Windows 95 command line.

With the command-line character limit set to its maximum of 255 characters, filenames are limited to 255 characters minus the contents of the command line. For example, the command line might contain the following:

copy con "long filename"

In this case, the maximum length of the long filename is 244 characters (255 minus the 11 characters of the command).

---

Note — It is only necessary to put the filename in quotation marks on the command line if the filename contains special characters such as spaces.

---

Notice, however, MS-DOS—based applications configured to run in MS-DOS Mode use only the real-mode FAT file system. Because of this, long filenames created in a Windows environment are not visible when the system exits to MS-DOS Mode; only the 8.3 alias names are visible.

The same is true of files with long filenames that are copied to a floppy disk subsequently used by a down-level FAT file system. (Down-level file systems are systems that support the earlier MS-DOS FAT file system, such as those included with MS-DOS 6.0, Windows 3.1, OS/2 2.11, Windows NT 3.1, and so on.) On down-level file systems, only the 8.3 alias name is visible on the floppy disk, even if it contains long filenames created in Windows 95.

### [Disabling Long Filenames](#)

In extremely rare instances, you may determine that you need to turn off the extended file system features in Windows 95. In this case, you can enable the Windows 3.1 file system by changing the Registry. However, this is not a recommended option.

Using the older Windows 3.1 file system affects many of the features available under Windows 95. Also, the Windows 3.1 file system was not extensively tested under Windows 95 in the same way as the new file system. You can expect the following results if you enable the Windows 3.1 file system:



n

No support is provided for long filenames.

n

No extended file information is available, such as creation date and time,  
and last access date.

n

Folders cannot be included with user profiles.

You should also remove long filenames from the hard disk before switching to the  
Windows 3.1 file system, as described in “Using the LFN BK Utility for Temporary  
Compatibility” earlier in this section.

[To enable the Windows 3.1 file system](#)

n

In Registry Editor, set the value of *Win31FileSystem* to 1 in the following

Registry key. Then shut down and restart the computer.

Hkey\_Local\_Machine\System\CurrentControlSet\Control\FileSystem

As with Windows for Workgroups, Windows 95 can access files on HPFS or NTFS partitions from remote drives. However, there is currently no support for adding either of these file systems as another installable file system running in Windows 95, so Windows 95 cannot access either a HPFS or NTFS partition on a local disk drive using the file system drivers provided with Windows 95. (Other vendors, however, can add HPFS support.)

Please note the following interoperability exceptions for other file systems:

n

NTFS, the Windows NT file system supports long filenames, but includes

architecture for security that Windows 95 does not use. Windows NT 3.5 supports long filenames on FAT drives and uses the same algorithm for aliases as used in Windows 95. However, Windows NT 3.1 doesn't recognize long filenames on FAT drives and removes them.

n

HPFS file system supports long filenames with aliases similar to the

method used in Windows 95.

n

CDFS also supports long filenames.

The following sections provide details about long filename support on various networks.

#### [Long Filenames with Windows 95 Protected-Mode Clients](#)

Windows 95 protected-mode network clients (Client for Microsoft Networks and Client for NetWare Networks) include long filename support. If the network server

that the computer is connected to supports long filenames, then Windows 95 can read, create, and copy local long filename files on the network share. On some servers, the length of filenames, restricted characters, and the algorithm for creating 8.3 filenames from long filenames may differ from those under Windows 95.

Long filenames on computers running File and Printer Sharing are fully supported and can be viewed on computers using protected-mode Windows 95 network clients. Real-mode Windows 95 clients can only see the 8.3 filename aliases.

If Windows 95 has been configured with File and Printer Sharing for NetWare, any MS-DOS—based NetWare clients using NETX or VLM will see the 8.3 filename. Computers using Client for NetWare Networks can see long filenames.

---

Note—— Older Microsoft or Microsoft-compatible clients (for example, LAN Manager, Workgroup Add-on for MS-DOS, Windows for Workgroups, and so on) cannot use shared folders with long filenames. These older network clients may have problems connecting to and using a shared directory with a long filename as the directory name. Having a short share name does not correct this problem.

---

#### [LAN Manager with HPFS and HPFS/386 Volumes](#)

HPFS and HPFS/386 partitions on LAN Manager OS/2-based computers have a maximum filename length of 254 characters and use the 8.3 truncation on the first instance of the filename. For example:

longfilenameold.tst --> longfile.tst  
longfilenamew.tst --> longfil0.tst

Long filenames on a LAN Manager server with HPFS or HPFS/386 partitions are fully supported and viewable by protected-mode Windows 95 network clients. Real-mode Windows 95 clients can only see the 8.3 filename aliases.

LAN Manager computers with HPFS or HPFS/386 cannot see Windows 95 long filenames. The LAN Manager workstation software has no awareness of the long filename-over-FAT file scheme used by Windows 95.

#### [Windows NT 3.1 with HPFS or NTFS Volumes](#)

Support for long filenames on FAT volumes is identical in Windows NT 3.5 to the support in Windows 95. Therefore, on a computer with dual-boot capabilities for Windows NT 3.5 and Windows 95, long filenames on local FAT volumes can be seen by both operating systems.

Windows NT 3.1 does not support long filenames on FAT volumes.

HPFS partitions exist on Windows NT computers only in the case of an upgrade over OS/2. Filenames on Windows NT 3.1 HPFS partitions have a maximum filename length of 254 characters and use the 8.3 truncation on the first instance of the filename. For example:

longfilenameold.tst --> longfile.tst  
longfilenamenew.tst --> longfil0.tst

Filenames on Windows NT 3.1 NTFS partitions have a maximum filename length of 255 characters and use the 8.3 truncation on the first instance of the filename. For example:

longfilenameold.tst --> longfi~1.tst  
longfilenamenew.tst --> longfi~2.tst

Long filenames on shared Windows NT 3.1 HPFS and NTFS partitions are fully supported and viewable by protected-mode Windows 95 network clients. Real-mode Windows 95 network clients can only see the 8.3 filename aliases.

Windows NT 3.1 computers cannot see Windows 95 long filenames. Windows NT 3.1 has no awareness of the long filename over FAT file scheme used by Windows 95.

### Technical Notes on Disk Device Support

---

Windows 95 uses layered block device drivers to manage input and output to block devices such as disks and CD-ROM drives. A BLOCK DEVICE is a device such as a disk drive that moves information in groups of bytes (blocks) rather than one byte at a time. Layered block device drivers are 32-bit, flat-model device drivers that run in protected mode. These drivers support conventional and SCSI disk drives, plus partitioned and unpartitioned removable media. Windows 95 also uses layered block device drivers to manage Windows 3.x FastDisk drivers, MS-DOS-based real-mode device drivers, and Windows NT miniport drivers.

Each layered block device driver can be loaded dynamically, so the appropriate driver can be loaded or unloaded as needed, without restarting the computer. Although the drivers are virtual device drivers (VxDs), they do not use the standard virtual device services and APIs. Instead, the I/O Supervisor provides the services and functions the device drivers need to complete their tasks.

Specifically, the block I/O subsystem in Windows 95 provides the following:

n

Architecture to support all Plug and Play features

n

Support for miniport drivers that are compatible with Windows NT

n

Compatibility support for Windows 3.1 FastDisk drivers and MS-DOS real-mode disk device drivers

n

Protected-mode drivers that take over real-mode MS-DOS device drivers when it is safe to do so

For more information about the block I/O subsystem, see Chapter 31, “Windows 95 Architecture.”

Windows 95 provides better disk device support than Windows 3.1, but also ensures compatibility with existing MS-DOS — based and Windows-based disk device drivers. In addition, the disk device drivers in Windows 95 are compatible with Windows NT miniport drivers.

Windows 95 also provides enhanced support for large media using logical block addressing, including hard drives with more than 1024 cylinders. Extensions to the INT 13 disk controller support are provided in the protected-mode disk handler drivers for this support. (Windows 3.1 did not provide this support in its 32-bit disk access drivers.)

Windows 95 supports the following hard disk drive types:

ESDI  
Hardcards  
IDE  
IDE LBA  
MFM

In addition, Windows 95 supports these bus adapter types:

EISA  
ISA  
MCA  
PCI  
PCMCIA  
RLL  
SCSI  
SCSI 2  
VL bus

The following sections describe support in Windows 95 for IDE, SCSI, high-speed floppy disk, and removable media devices. Information about SCSI and non-SCSI port drivers is also included.

---

Note — Windows 95 provides 32-bit disk driver support for ESDI controllers in addition to supporting IDE and SCSI disk devices.

---

### [IDE Drives and Controllers](#)

Windows 95 provides the following improved support for IDE drive configurations:

*Support for large IDE disk drives.*

IDE drives are currently available that support a logical block addressing (LBA) scheme, allowing them to exceed the 0.5 GB (528 MB) size limitation. Windows 95 provides protected-mode support for IDE disk drives larger than 504 MB. The primary partition and the logical drives in an extended partition are each limited to 2 GB, but multiple 2-GB logical drives can be created in an extended partition.

*Support for alternate IDE controllers.*

Windows 95 provides protected-mode support for the use of two IDE controllers in a computer, or the combination of an IDE controller in a portable computer and an alternate controller in a docking station (available, for example, in some COMPAQ® portable computer/docking station combination products). IDE controllers provide support for multiple disk drives.

Support for IDE-based CD-ROM drives.

Currently, most disk devices in personal computers use an IDE-based hard disk controller. Adding a CD-ROM drive typically requires adding an additional controller card to provide either SCSI or a proprietary interface for connecting to the CD-ROM drive. Windows 95 supports new, inexpensive CD-ROM drives that connect to IDE-compatible disk controllers.

Any IDE device that includes mechanisms for identification and declaration of resource requirements can take advantage of Plug and Play.

### [SCSI Devices and Drivers](#)

Windows 95 provides support for SCSI disk devices, which was not available in Windows 3.1. SCSI support in Windows 95 includes disk SCSI translator drivers, the SCSI Port Manager, and SCSI miniport drivers.

n

The disk SCSI translator (also called a SCSI'izer) drivers are responsible

for constructing SCSI Command Descriptor Blocks for a specific device class and carrying out device-level error recovery and logging. There are two of these drivers (one for each class): one for SCSI hard disk devices and one for CD-ROM devices.

n

SCSI Manager is responsible for managing the interaction between the

SCSI'izer and a SCSI miniport driver, initializes the miniport driver, converts the I/O request format, and provides other services for the miniport driver.

n

The SCSI miniport driver is responsible for detecting and initializing a specific set of SCSI adapters. The driver also handles interrupts, transmits I/O requests to the device, and carries out adapter-level error recovery and logging.

Support in Windows 95 for SCSI devices includes the following:

n

Broad support for popular SCSI controllers

Windows 95 includes 32-bit disk device drivers for popular SCSI controllers from Adaptec™, Future Domain®, and other manufacturers.

n

ASPI/CAM compatibility for MS-DOS-based applications and drivers, and

16-bit and 32-bit ASPI for Windows-based clients and applications

Support for the Advanced SCSI Programming Interface (ASPI) and Common Access Method (CAM) allows application and driver developers to submit I/O requests to SCSI devices. This allows existing MS-DOS-based applications and drivers that use the ASPI or CAM specification to work properly under Windows 95. Windows 95 also includes 16-bit and 32-bit drivers to support Windows-based ASPI clients and applications.





## Compatibility with Windows NT miniport drivers

Windows 95 supports the use of Windows NT miniport SCSI drivers without modification or recompiling. Compatibility with Windows NT-based miniport drivers ensures broad device support for disk devices under Windows 95, while simplifying the driver development efforts for hardware manufacturers.

Although Windows 95 can use Windows NT miniport drivers, the best choice for a SCSI driver is one that complies with Plug and Play. Most Windows NT miniport drivers ignore configuration information from the SCSI Manager and check I/O ports to identify hardware. Miniport drivers in Windows 95 must honor configuration information without scanning for other adapters if the configuration information is not the default configuration. This is because many adapters supported under Windows 95 have port ranges that conflict with other adapters and are adversely affected by scanning. For example, Artisoft® LANtastic® network adapters occupy a range of port addresses used by Adaptec 154X adapters, and accessing these ports will cause the system to lock up.

Windows 95 provides several .MPD files with Plug and Play capabilities, including the ability to transition from protected mode to real mode (to support MS-DOS — based applications that must run in MS-DOS Mode) and to accept configuration information from the SCSI Manager for dynamically loading and unloading drivers.

### [High-Speed Floppy Disk Driver](#)

Windows 95 provides protected-mode support for communicating with floppy disk controllers. Windows 95 provides INT 13 hard disk controller support as 32-bit device drivers, which results in improved performance, stability, and system robustness. Windows 95 provides floppy disk controller support as a 32-bit device driver, and offers improved performance for file I/O to floppy disk drives, plus improved reliability of the system.

You can now format a disk or copy files to and from a disk while performing other tasks.

### [Removable Media and Docking Devices](#)

Windows 95 provides protected-mode support for the following removable media devices with MS-DOS — compatible partitions, among others:

# n

Floppy disk drives and controllers

# n

Bernoulli drives

# n

CD-ROM

Windows 95 allows the system to lock or unlock the device to prevent the media from being removed prematurely.

Windows 95 also supports an eject mechanism for devices that support it, so that users can use software control to eject media from a device (for example, new floppy disk drives that support software-based media ejection).

DOCKING refers to the insertion or removal of a device in the system. Devices that can be docked include almost anything, depending on the hardware — monitors, network access, removable hard disk drives, or any removable resource. A DOCKING STATION is a base unit into which you can insert the portable hardware and which includes drive bays, expansion slots, and additional ports. Port replicators can also be used as docking station substitutes that provide extra functionality not available in the portable docking device.

If a docking change occurs in the computer configuration during operation, such as the insertion of a portable computer into the docking station, the system is notified so that the new device can be configured and applications can be notified of the change.

Windows 95 supports three types of docking:

n

Cold docking, where the device must be powered off or restarted before the device can be docked or undocked. This is how legacy portable computers work.

n

Warm docking, where the device can be docked or undocked when it is in a reduced-power mode (for example, standby or “sleep”).

n

Hot docking, where the device can be docked or undocked while running at full power.

In addition, some devices require certain preliminary steps before they can be docked or undocked. For example, if you have a file open and decide to remove the hard disk, the file must be closed. To handle these situations, Windows 95 supports different undocking systems, depending on the type of hardware:

n

Auto-ejection, which is a software interface that operates a VCR-type ejection mechanism, allowing Windows 95 to request user action to resolve any open resources. The user can save files and so on before the system ejects the dockable resource.

# n

Manual ejection, where the user undocks the resource without using any software interface. Because the system cannot be notified when this occurs, any closing of files or other actions must be performed by the user to prevent loss of data.

### Non-SCSI Port Drivers

A non-SCSI port driver usually works with a specific adapter, so the driver is retained in memory only if the related adapter is present in the system. Windows 95 includes, for example, port drivers for IDE, ESDI, or NEC® floppy disk drives.

A port driver provides the same functionality as the SCSI Manager and miniport driver, but these drivers are monolithic and are not portable to Windows NT. A port driver manages and controls the adapter for a given block device. The port driver detects and initializes the adapter, handles interrupts, transmits I/O requests to the device, and carries out adapter-level error recovery and logging.

---

Important — Do not use a device= entry in SYSTEM.INI to load a port driver. The I/O Supervisor loads appropriate drivers from the Windows SYSTEM\IOSUBSYS subdirectory.

---

The 32-bit VFAT works in conjunction with a 32-bit protected-mode cache driver (VCACHE), and replaces and improves on the 16-bit real-mode SmartDrive disk cache software provided with MS-DOS and Windows 3.1. The VCACHE driver uses an improved caching algorithm over SmartDrive to cache information read from or written to a disk drive, and results in improved performance for reading information from cache. Also, the VCACHE driver is responsible for managing the cache pool for the CD-ROM File System (CDFS), and the 32-bit network redirectors.

Another big improvement in VCACHE over SmartDrive is that the memory pool used for the cache is dynamic and is based on the amount of available free system memory. Users no longer need to statically allocate a block of memory to set aside as a disk cache; the system automatically allocates or deallocates memory used for the cache based on system use. The performance of the system also scales better than earlier versions of Windows, due to the intelligent cache use.

The 32-bit protected-mode CD-ROM file system (CDFS) implemented in Windows 95 provides improved CD-ROM access performance over the real-mode MSCDEX driver in Windows 3.1 and is a full 32-bit ISO-9660 CD file system. The CDFS driver replaces the 16-bit real-mode MSCDEX driver, and features 32-bit protected-mode caching of CD-ROM data. If MSCDEX is specified in the user's AUTOEXEC.BAT, the 32-bit CDFS driver is used instead.

CDFS has a larger and smarter cache than MSCDEX, optimized just for CD-ROMs and separate from VCACHE. The CDFS driver cache is dynamic and shares the cache memory pool with the 32-bit VFAT driver, requiring no configuration or static allocation on the part of the user.

CDFS reads ahead in parallel with the application so that multimedia presentations play back more smoothly than with earlier versions of Windows. Because CDFS uses a separate cache, the cache memory can be swapped out to the hard disk when CD-ROM activity pauses. This gives applications more room to run and protects the main hard disk cache from being flushed out whenever a very large multimedia stream is played back.

The supplemental cache size for CDFS is used to hold path table, directory, and file information. This particular cache is used to improve CD streaming and to reduce seek latency as effectively as possible with a moderately sized cache. This means that the cache is more complex, using smart priority-based caching schemes to achieve results optimized for CD-ROMs.

---

*Tip* — A small CD-ROM cache makes a big difference in streaming performance, but a much larger cache does not pay off as significantly, unless the cache is quite large — big enough to contain entire multimedia streams.

---

#### [To set the supplemental cache size for CDFS](#)

1. From the System option in Control Panel, click the Performance tab, and then click the File System button.
2. Click the General tab, and under the CD-ROM Optimization options, drag the slider bar to set the supplemental cache size.

— The text displayed beneath these options indicates the cache size selected.

— {ewc msdn cd, EWGraphic, x0s 16 /a "psS.bmp"}

3. In the Optimize Access Pattern list, select a setting based on the size of your computer's RAM. The following list shows recommended settings related to RAM size and the size of the cache that's created.

8 Singl 64K  
MB e-  
or spee  
les d  
s drive  
s

8 Doub 626  
MB le- K  
to spee  
12 d  
MB drive  
s

12 Quad 1238  
MB spee K  
or d or  
mo highe  
re r

4. Click OK. Then shut down and restart the computer.

### *Troubleshooting File and Disk Problems*

---

This section describes how to troubleshoot file system errors, problems with disk utilities, and problems with long filenames.

To determine what is causing file system errors, you generally need to isolate the specific subsystem or component involved. One place to start troubleshooting file system error conditions is through the System Performance Troubleshooting property sheet:

#### [To start the System Performance Troubleshooter](#)

1. From the System option in Control Panel, click the Performance tab, and then click the File System button.
2. Click the Troubleshooting tab.

The following options are disabled by default. To enable any, click the check box to the left of the option:

n

Disable new file sharing and locking semantics.

n

Disable long-name preservation for old programs.

n

Disable protected-mode hard disk interrupt handlers.

n

Disable 32-bit, protected-mode disk drivers.

n

Disable write-behind caching for all drives.

To use these options in troubleshooting, enable the functionality which seems most related to the type of error condition you are seeing. (For example, if files are not being completely closed or data is lost upon saving the file, try disabling write-behind caching for all drives, and then retest to see if the error condition recurs.)

If you are not sure which option may be causing a conflict, do the following:

n

Deselect all the check boxes, and retest to see if the error condition recurs.

n

If the condition goes away, reselect each option one at a time and retest. Repeat until the problem returns — then you'll know you have isolated the problem.

n

Disable the option that caused the problem and restart the computer. Then, to avoid seeing the same error, be sure not to enable this option in the future.

Disk utilities fail on Windows 95 volume.

Disk utilities that are not revised for the Windows 95 VFAT file system can unexpectedly find values in fields that were once reserved for MS-DOS. Use disk utilities designed for Windows 95 instead. You may be able to use some earlier utilities by first running LFNBK, as described earlier in this chapter.

Problems occur with shortcuts after compressing the Windows 95 volume with Stacker.



If you compress your Windows 95 volume using the Stacker DOS compression program, your desktop shortcuts will need to be manually repaired. You will also need to move USER.DAT and USER.DA0 from the host volume to your compressed volume. When using Stacker, do not run DriveSpace or DoubleSpace.

*Filename are lost or changed.*

Errors using long filenames may occur when transferring files to or from file systems that do not support long filenames, when running file searches, or when using certain disk utilities.

### [Long-Filename Troubleshooting Tips](#)

n

Long filenames can cause problems for some disk utilities. Be sure to use

disk utilities that are long filename-aware. If you are not sure whether your utility is long filename-aware, consult your disk utility documentation. If it is not mentioned, then your utility probably does not support long filenames.

n

Using a down-level file system command (such as *copy* or *rename*) rather

than the Windows 95 equivalent will destroy a long filename.

n

Because the root directory is limited to 512 entries, the root directory can

be filled with fewer files that have long filenames, because each name takes more than one entry in the directory.

# n

Although you can use the File System Compatibility switch during Setup to disable the creation of long filenames, this should only be used if error conditions warrant it and if other troubleshooting efforts have failed.

*The 8.3 filename alias was changed.*

This can happen when you use options such as Copy, Backup, or Restore. For example, if a file with the name LongFileName is associated with an alias LONGFI~2, and this file is copied to a different directory using the following:

copy LongFileName \TMP\LongFileName

Then the alias associated with this file can become LONGFILE, if such an alias is not present in the target directory. The long filename is preserved in this case.

*The long filename was destroyed.*

This can happen when you use when you use older versions of utilities that do not support long filenames. For example, if a file with the name LongFileName.Txt is associated with an alias LONGFI~1.TXT, and this file is copied to a different directory using an older version of Xcopy that is not aware of long filenames, then when you type the following:

xcopy LONGFI~1.TXT \TMP\LONGFI~1.TXT

This causes the destination file in the target directory to be associated only with the filename and alias of LONGFI~1.TXT. The destination file will not have the filename LongFileName.Txt.

*A long filename was lost after the file was edited on another computer.*

This occurs because down-level file systems are not aware of the long filename extensions to the FAT file system.

*Errors occur while creating files or folders in the root directory.*

This happens when all 512 root directory entries have been used. This problem can

occur with fewer than 512 files and subdirectories in the root, because Windows 95 uses additional directory entries to store long filenames.

First, try reorganizing your files in more subdirectories. Also try the following procedure to free root directory entries.

#### [To free root directory entries](#)

1. Right-click the drive's icon, and then click Properties in the context menu.
2. Click the Tools tab, and then in the Error-Checking Status box, click Check Now.
3. Select the Automatically Fix Errors option.
4. Click Advanced, and then within the Check Files For box, select Invalid Filenames. Click OK.
5. Click Start to run ScanDisk.
6. After scanning the disk, rename any files or subdirectories (folders) in the root using only uppercase 8.3-compliant file or subdirectory names. Move some files or directories to subdirectories, or delete unnecessary files and directories.

*Hard disk device drivers cause the computer to stall.*

The I/O Supervisor, which loads hard disk (block) device drivers, requires the driver's files (having filename extensions: PDR, MPD, VXD, and 386) to be located in the SYSTEM\IOSUBSYS directory.

If the computer locks up during startup or hardware detection, try the following:

# n

Check for Windows NT miniport drivers (.SYS files in the IOSUBSYS

directory). These drivers detect the I/O ports and may cause computer lock ups. Replace the Windows NT driver with either a Windows 95 miniport or a real-mode driver.

n

Check the IOS.INI file for drivers not replaced by protected-mode drivers.

n

When loading protected-mode drivers, the real-mode driver generally remains loaded in memory even though the protected-mode driver “takes over.” If you suspect a conflict, type *rem* at the beginning of the line in CONFIG.SYS which calls the real-mode driver.

n

Users may have problems with devices (such as tape backups) that use ASPI drivers. Try using only real-mode drivers, then only protected-mode drivers.

n

If an application stalls when launched, check its Program Properties for MS-DOS Mode.

*Virus-detection utilities don't remove a virus.*

In general, virus-detection utilities can detect but not clean viruses from Windows 95. This is because virus-detection utilities use low-level writes to repair the disk. MS-DOS—based utilities can still be run using the Lock command.

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```

## Chapter 21 Multimedia

This chapter describes the multimedia architecture and features in Windows 95.

### *Multimedia: The Basics*

---

For the past year, multimedia titles have been one of the fastest-growing segments of the software industry. A large and increasing number of the personal computers being sold come with the equipment that makes great multimedia applications possible — notably CD-ROM drives, sound subsystems, system power, and local-bus video.

Installing Windows 95 gives users an immediate multimedia upgrade. Windows 95 includes built-in support for multimedia. Its streamlined architectures for digital video, digital audio, MIDI, and file handling subsystems allow for very high-quality sound, video, and animation effects. These streamlined architectures mean:

n

Users can enjoy smoother playing applications and games that have richer sound, animation, and color.

n

Authors can add more advanced and varied effects in their titles and can work more efficiently to create titles.

n

Media professionals can use Windows 95 for studio-quality development of sound and video.

The 32-bit Windows 95 architecture provides for vastly improved multimedia performance from computers, so Windows 95 multimedia titles can include digital video and sound that is bigger and bolder than ever before.

### *Issues for Windows 95 Multimedia*

---

Consider what multimedia jobs your users will be doing to determine what extra hardware you'll need. For details, see "Buying a Multimedia Computer" later in this chapter.

Windows 95 includes some basic audio recording, audio playback, and video playback tools, but your users may need more features than these tools offer to do their jobs. Consider which additional multimedia software tools and codecs (described later in this chapter) you may need to purchase.

To use the audio capabilities described in this chapter, you'll need a sound card.

Although it is possible to play video clips over the network, unless you have a network that guarantees a continuous data stream, playback will probably appear somewhat jerky.

If you're creating CDs, use the AutoPlay capability of Windows 95 to initiate your application automatically, as soon as the user inserts the disc in the CD-ROM drive.

### *Multimedia Overview*

---

Because Windows 95 is a 32-bit multitasking operating system, multimedia applications run more smoothly than with previous versions of Windows. Multimedia authors can write programs that use multiple threads, which help to avoid problems such as jerky animation, sound clips that halt during a game or video, and long waits between interactive sequences while the next sequence of data is loaded. The multitasking capabilities of Windows 95 also allow authors to use the computer for other tasks, even when a huge compression operation is under way.

The following is a simplified view that shows the key components in Windows 95 for capturing, editing, and playing back multimedia applications.

```
{ewc msdn cd, EWGraphic, x0t 0 /a "psT.bmp"}
```

The next several sections describe these key components.

The Media Control Interface (MCI) provides Windows 95 applications with device-independent capabilities for controlling media devices such as audio hardware.

video disc players, and animation players. This interface works with MCI device drivers to interpret and run MCI commands such as *pause*, *play*, and *stop*.

MCI provides a set of core commands for a broad range of media devices. For example, MCI uses the same command to begin playback of a waveform audio file, a video disc track, and an animation sequence. MCI also provides extended commands for using particular device types with unique capabilities, such as using a frame-based time format for animation. For more information about MCI drivers and commands, see the MICROSOFT WINDOWS 95 DEVICE DRIVER KIT.

When an application requests that the multimedia subsystem play back a multimedia title, the file system retrieves the file to be processed by the subsystem. Usually multimedia files are maintained in one of the following formats:

---

Digital .AVI  
video  
format

Audio .WAV  
format

MIDI .MID  
format

Multimedia files are stored on a compact disc, a local hard disk drive, a network file server, or another storage medium. The playback quality is constrained by the amount of data that the storage medium can supply to the file system continuously.

A multimedia data stream (such as an .AVI file) generally contains multiple components, such as digital video data, audio data, text, and perhaps other data (such as hot-spot information, additional audio tracks, and so forth). As multimedia information is read from the CD-ROM drive, the multimedia subsystem determines what the data stream contains, and then separates and routes the data accordingly.

### [CD-ROM File System](#)

The trend toward faster CD-ROM drives (double-speed and triple-speed) is important for multimedia computing. To get the best possible performance from these new devices, Windows 95 includes a new, 32-bit, CD-ROM file system (CDFS) for reading files from CD-ROM drives as quickly and efficiently as possible.

Faster reading of CD-ROM data helps to make video and audio playback from CD-ROM drives look and sound better. This is an important component of the



overall performance enhancements to multimedia in Windows 95.

In addition, CDFS reads data asynchronously, so that users see much smoother playback of CD-ROM data.

For more information about the CDFS, see Chapter 20, "Disks and File Systems" and Chapter 31, "Windows 95 Architecture."

---

Note — CDFS replaces most Windows version 3.1 MSCDEX drivers. For more information about MSCDEX, see the MICROSOFT WINDOWS RESOURCE KIT VERSION 3.1 and the MICROSOFT WINDOWS FOR WORKGROUPS RESOURCE KIT VERSION 3.1.

---

WINMM.DLL and MMSYSTEM.DLL are the central components in the multimedia subsystem. WINMM.DLL is the 32-bit component that provides services for capturing, editing, and playing back video, audio, and image data. MMSYSTEM.DLL is the equivalent 16-bit component.

When an application sends a call to play a multimedia file, WINMM (or MMSYSTEM) works with device mappers to determine which hardware devices are capable of fulfilling the request. For MIDI and WAV device types, Windows 95 supports separate device mappers. The device mapper selects the device to perform the action needed and passes the information to its corresponding device driver. (For more information about device mappers and device drivers, see Chapter 19, "Devices" and Chapter 31, "Windows 95 Architecture.")

Digitized full-color graphics, animation, and sound each take a lot of storage space. Therefore, in most cases, digital video and digital audio are stored in a compressed form. As a result, before it can be seen or heard, this data must be decompressed. Unless there is hardware support available on the graphics adapter or sound card for all or part of the decompression work, this work is handled by components called COMPRESSION MANAGERS.

The multimedia subsystem includes two compression managers, one for audio and one for video and image data, which, in turn, work with various technologies called codecs, for compressing and decompressing specific types of data. (CODEC is short for compression/decompression.) These two components act as extensions of WINMM or MMSYSTEM:

# n

Audio Compression Manager (ACM) uses audio codecs to compress and decompress audio data. ACM also provides support for filtering audio data. The wave mapper device uses ACM to transform the WAV data as a part of the mapping process.

# n

Video Compression Manager (VCM) uses video codecs to compress, decompress, and filter video data. Its functions are similar to those of ACM. VCM acts as the intermediary between the application and the video codec driver, which actually compresses and decompresses individual frames of data.

The multimedia subsystem allows installable codecs (compression/decompression systems). Windows 95 ships with a set of useful software-only codecs for both video and audio, but you are not limited to these. As new codecs become available for particular audio and digital video needs, they can be added to the multimedia subsystem. For example, you may want to install Motion JPEG, a useful codec for multimedia authoring, if you have a capture card with JPEG support.

### [To install a codec](#)

*{ewc msdn cd, EWGraphic, x0t 1 /a "psT.bmp"}*

1. In Control Panel, double-click the Add New Hardware icon to start the Add New Hardware Wizard. Click Next.
2. Click Install A Specific Device, and in the list, click Sound, Video, and Game Controllers. Click Next.

*{ewc msdn cd, EWGraphic, x0t 2 /a "psT.bmp"}*

3. In the Manufacturers list, click either Microsoft Audio Codecs or Microsoft Video Codecs, as appropriate. Then select a codec from the Models list.

4. Click Next, and then click Finish.

#### [To configure a codec](#)

*{ewc msdncd, EWGraphic, x0t 3 /a "psT.bmp"}*

1. In Control Panel, double-click the Multimedia icon.

2. Click the Advanced tab.

n

Click the plus sign next to Video Compression Codecs to see a list of video codecs installed on your computer.

n

Click the plus sign next to Audio Compression Codecs to see a list of audio codecs.

3. Click the codec you want to configure, and then click the Properties button.

*{ewc msdncd, EWGraphic, x0t 4 /a "psT.bmp"}*

4. Use the property sheet to configure options for the codec. For example, the following shows the property sheet for the GSM codec.

*{ewc msdncd, EWGraphic, x0t 5 /a "psT.bmp"}*

5. For certain codecs, you'll be able to define compression and decompression rates. Click Settings (if available) to do this. A dialog box such as the following appears. Use the drop-down lists to choose the compression and decompression rates.

*{ewc msdncd, EWGraphic, x0t 6 /a "psT.bmp"}*

You can click the Auto-Configure button to let Windows 95 determine best-fit compression and decompression rates for your computer. When you do this, it leaves half of the system processing power free for other processes to use. This is a handy option to choose if you want to use your computer to do other tasks while you compress data.

## Audio Codecs

Full CD-quality, uncompressed stereo audio contains a lot of data — about 150K for every second of sound. An entire CD-ROM can contain only a little over an hour of music. Windows 95 includes both music-oriented and voice-oriented sound codecs. Music-oriented codecs (such as IMA ADPCM or Microsoft ADPCM) are included to allow close to CD-quality sound to be compressed to about one-quarter of its original size. Voice-oriented codecs (such as Truespeech™ or GSM) are included to allow very efficient compression of voice data.

Windows 95 includes support for the sound codecs described in the following table.

### Windows 95 Sound Codecs

---

DS Offers good  
P compression  
Gr for voice-  
ou oriented  
p, sound, but is  
Inc not a good  
. option for  
Tru sound other  
es than voice.  
pe Truespeech  
ec offers a  
h better data  
™ rate than  
GSM, the  
other voice-  
oriented  
codec  
provided  
with  
Windows 95.  
This makes  
Truespeech  
a good  
option for  
users who  
want to  
record notes  
in their  
documents  
or  
spreadsheet  
s, store

voice mail on  
their  
computers,  
and so on.  
Truespeech  
does not  
offer real-  
time  
compression  
rates, but  
does offer  
real-time  
decompressi  
on rates,  
making this  
codec a  
good  
alternative  
for use with  
modems and  
networks.

Mi Offers real-  
cro time  
sof compression  
t (so long as  
GS the hardware  
M is fast  
6.1 enough to  
0 support it),  
Au making this  
dio codec a  
good option  
for recording  
voice with  
Sound  
Recorder.  
GSM is the  
codec which  
conforms to  
the  
European  
Telecommun  
ications  
Standards  
Institute —

Groupe  
Spécial  
Mobile  
recommenda  
tion 6.10.  
GSM allows  
you to select  
from among  
a range of  
sampling  
rates.

Mi Provided for  
cro compatibility  
sof with  
t telephony  
CC standards for  
IT Europe and  
T North  
G. America.  
71 This codec is  
1 supported by  
A- many  
La hardware  
w configuration  
an s and offers  
d a 2 – to – 1  
u- compression  
La ratio (from  
w 16 bits to 8  
bits per  
sample).

IM Defined by  
A the  
AD Interactive  
PC Multimedia  
M Association  
for multiple  
hardware  
platforms;  
similar to  
Microsoft  
ADPCM.  
Offers real-  
time  
compression

.  
Mi Offers both  
cro real-time and  
sof non-real-  
t time  
AD compression  
PC . When  
M authors  
choose the  
latter option,  
the  
compression  
process  
takes longer  
but authors  
can create  
better-  
sounding  
audio files.  
Microsoft  
ADPCM is  
the codec  
used for  
Microsoft  
Encarta™  
multimedia  
encyclopedia  
and other  
CD-based  
publications.

Mi Included for  
cro use with  
sof Sound  
t Blaster™  
PC and other 8-  
M bit sound  
co cards. With  
nv this codec,  
ert 8-bit cards  
er can play 16-  
bit samples  
by reducing  
the quality of  
the audio  
produced to

match the card's capabilities. Similarly, you can use this converter to play a sample at one kilohertz rate on a card that supports another rate.

### [Video Codecs](#)

Full-color video, which requires 3 bytes per pixel, at 640x480 resolution equals nearly 1 MB of digital data per frame. This means that a developer could easily use up 1 GB of hard disk space by storing less than one minute of uncompressed digital video information.

Windows 95 includes support for the video codecs described in the following table.

#### Windows 95 Video Codecs

---

|         |                                                                                                                                                                                                       |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cinepak | Licensed from Supremac, provides good-looking video quality with good playback performance, typically 320x240 images at 15 frames per second or better. Compression times are very long, typically 12 |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



to 16 hours  
for 10  
minutes of  
finished  
video.  
Cinepak is a  
common  
video codec  
for CD-ROM  
titles for both  
Windows  
and the  
Apple®  
Macintosh®.  
It is the  
codec used  
on Microsoft  
Dinosaurs  
and  
Cinemanía®.

Ind Developed  
eo by Intel,  
™ offers good  
video quality  
and  
playback  
performance  
(typically  
320x240  
images at 15  
frames per  
second or  
better), and  
faster  
compression  
. Intel sells  
an  
inexpensive  
video  
capture  
adapter with  
built-in  
hardware  
compression  
for real-time

capture and  
compression  
. Similar to  
Cinepak,  
Indeo is a  
common  
video codec  
for both  
Windows  
and the  
Macintosh. It  
is the codec  
used on  
Microsoft  
Ancient  
Lands and  
Dangerous  
Creatures.

Mi Intended for  
cro compressing  
sof clean  
t graphic  
Ru images,  
n- such as  
Le bitmaps  
ngt created in  
h Paintbrush™  
En , and for  
co animating  
din bar charts. It  
g has a low  
(R CPU  
LE overhead,  
) but does not  
handle rapid,  
complex  
scene  
changes  
well.

Mi Compresses  
cro data quickly,  
sof has a low  
t CPU  
Vid overhead,  
eo and is good

- 1 for full motion, moderate-quality video. Although RLE is a good tool to use for low-detail graphics, Video 1 is best to use for compressing digitized photographs.

You can also install other video and image codecs such as JPEG for image data and Motion JPEG for video data.

---

Tip—— If you intend to use Motion JPEG to capture digital video, look for a multimedia computer with a sustainable hard disk I/O rate of 3 MB per second to support JPEG's real-time compression rate. For example, if you want to capture full-color (3 bytes), 640x480-resolution video at a rate of 30 frames per second, the resulting data stream is 27 MB per second. A Motion JPEG data capture card provides real-time compression of data at a ratio of about 10 to 1, meaning that instead of 27 MB of data per second, the system generates 2.7 MB of compressed data per second. Thus, if your hard disk I/O can sustain a transfer rate of 3 MB per second, it can easily accommodate data at the rate it is compressed by the Motion JPEG data capture card.

---

## MPEG

MPEG (which stands for Motion Pictures Experts Group) is a popular codec for squeezing full-screen, VHS-quality digital video into a small data stream so that it can be played from a CD-ROM drive.

Together with the Open Computer MPEG Consortium, Microsoft has defined an industry standard for MPEG board and chip manufacturers who want to ship MPEG devices for Windows 95. This standard allows applications to incorporate MPEG-video without worrying about precisely which vendor's MPEG device is present to decompress it.

MPEG is a computationally intense and thorough way of compressing data. It allows for VHS-quality digital video playback using a 640x480 frame at the rate of 30-

frames per second. A double-speed CD-ROM would be sufficient for playback of this quality of video.

The Display Control Interface (DCI) is a new display driver interface created jointly by Microsoft and Intel. DCI-compliant drivers provide a fast, direct way for games and digital video in Windows 95 to write to the video frame buffer. It also enables digital video playback to take advantage of several specific kinds of hardware support included on advanced graphics adapters. For example, with the stretching hardware feature, users can scale up the size of a digital video clip with virtually no additional CPU. Color space conversion support in hardware can reduce the amount of work a codec must perform by up to 30 percent, allowing substantially better video playback.

DCI enables video cards to include hardware features, such as the following, for improved video playback:

n

Stretching hardware. With this feature included on the video card, the

CPU needs to do no additional work to make the video appear bigger. It simply passes the same number of pixels to the video card and the video hardware adjusts the size of the image. Notice that the card manufacturer must supply a level-2 DCI driver with the card to take advantage of stretching.

n

Color space conversion, or YUV-to-RGB conversion. This is a method of

color management that provides for better video playback.

Computer monitors display colors in combinations of red, green, and blue (RGB), but the human eye perceives colors differently. For example, most people perceive red more strongly than blue, and most perceive a difference in brightness more readily than a difference in hue. The YUV color standard is based on this understanding of color perception. (Similar to RGB, YUV is a color standard, but the letters "YUV" are not an acronym for anything.) In the

compression process, RGB color is translated to YUV, then compressed. During decompression at playback, the reverse happens. If the video card contains a chip with this conversion capability, a lot of CPU time is saved. This way, you can play much bigger and more colorful videos at a faster frame rate.

n

Double buffering. This means including more memory on the video card to

allow for video techniques such as page flipping. Instead of having one memory space on your video hardware to draw a frame or an image, there would be two. The first might be the one currently used for display on the screen. Meanwhile, the second would be used to draw the next frame in a sequence before it is displayed. This advanced processing makes videos and game animation playback very smoothly.

n

Chroma key. This facilitates the merging of video data streams, so that a

particular color can be treated as “transparent” in the merge operation.

n

Overlay. This speeds display of partly concealed objects.

n

Asynchronous drawing. This, along with double buffering, provides a faster

method for “drawing” into off-screen memory space.

For more information about DCI and creating DCI drivers, see the DCI LEVEL 2 SPECIFICATION. This specification is available through the Microsoft Developer Network; to obtain it, call (800) 759-5474; or, from outside the United States and Canada, call (402) 691-0173.

Windows 95 includes built-in support for common multimedia authoring devices such as laser discs and video cassette recorders (VCRs). This makes it easy to set up a computer for "step capture," a process in which the author captures digital video data one frame at a time, usually to be compressed later. This is a slow process, but it is absolutely the best way to get the best possible quality of digital video.

Frame-accurate control of the VCR is also important for recording broadcast-quality special effects to use in commercials, movies, television programs, music videos, and so on.

Windows 95 provides VCR control services through the MCI VISCA device driver, which is based on the MCI command set for VCRs. This device driver is used with a video capture or overlay card to control SONY® VISCA-compatible videotape recorders, such as the CVD-1000 Vdeck. The VISCA-compatible driver controls the parts of the VCR, including the tape transport, channel tuners, and VCR input and output channels.

To play the contents of a videotape on your computer, you must connect the video and audio outputs from your VCR to the video capture or overlay card of your computer, and to the audio inputs of your computer. You might also need to install an MCI digital-video device driver.

### *Recording, Editing, and Playing Audio*

---

Windows 95 multimedia services provide extensible, device-independent audio support. Windows 95 features services for sound control, and for waveform, MIDI, and mixer devices.

---

*Note* — To use Windows 95 sound capabilities, you must have a sound card installed.

---

With audio support in Windows 95, you can do the following:

n

Use the Sound option in Control Panel to assign sound clips to play each time a specific event occurs.

n

Use CD Player to play audio CDs while you work.

n

Use Sound Recorder to record sound.

n

Use built-in Windows 95 OLE support to copy or link audio clips in other documents, as described in Chapter 22, "Application Support."

You can use the Sound option in Control Panel to assign waveform sounds to actions such as opening an application or quitting Windows.

[To assign a sound to an event](#)

1. In Control Panel, double-click the Sounds icon.

== {ewc msdn cd, EWGraphic, x0t 7 /a "psT.bmp"}

2. Click the event you want to associate with a sound, and then click the sound. Repeat for other events and sounds.
3. To save your choices as a new sound scheme, select the name of the scheme from the Schemes list, and then click Save As.

Windows 95 includes a versatile tool called CD Player so that you can play audio CDs while you work. CD Player works in the same way as a standard CD player. Its controls look like those of a regular CD player, and it supports many of the same features you find in advanced CD players, such as random play and programmable playback order. With CD Player, you can save programs so that you don't have to recreate your play list each time you pop in a CD.

*{ewc msdn cd, EWGraphic, x0t 8 /a "psT.bmp"}*

#### [To play a CD](#)

1. Place the CD in the CD-ROM drive.
2. From the Start button, choose Programs, then choose Accessories, choose Multimedia, and click CD Player.
3. In CD Player, click the Play button.

#### [To define a play list for your CD](#)

1. From Disc, select Edit Play List.
2. Use the Add and Remove buttons to specify the play list.

*{ewc msdn cd, EWGraphic, x0t 9 /a "psT.bmp"}*

---

Note—— You can also use this dialog box to maintain a list of what's on the CD by typing the name of the artist, title, and songs in the Artist, Title, and Play List areas.

---

Musical Instrument Digital Interface, or MIDI, is a serial interface standard that allows for the connection of music synthesizers, musical instruments, and computers. The MIDI standard is based partly on hardware and partly on a description of the way in which music and sounds are encoded and communicated between MIDI devices.

MIDI is used as a development tool for musicians. Virtually all advanced music equipment today supports MIDI, and MIDI offers a convenient way to control the



equipment very precisely.

MIDI is similar to the electronic equivalent of sheet music. In real life, there are two ways you can listen to a piece of music. One way is to buy a CD that contains a lot of data about a specific recording of a particular performance of that piece of music with all of the instruments and parts predefined. This method requires no interpretation at all — it's straightforward playback. A way to use less data to listen to the same piece of music is to buy the sheet music and have someone play it. This method requires very little data but, depending on the quality of the instruments and the interpreter (for example, the pianist), you may get a good or bad version of that piece of music.

Windows 95 supports the GENERAL MIDI SPECIFICATION to request particular instruments and sounds. This specification is an industry standard that defines how MIDI should be used and is supported by Microsoft and most MIDI sound card manufacturers.

Windows 95 comes with the best ever implementation of MIDI from Microsoft, including a new technology called MIDI STREAMS support. This technology is used in advanced sound cards to play very complex MIDI sequences with light CPU use. Support for this technology allows Windows 95 to communicate multiple MIDI instructions simultaneously within a single interrupt. The result of this change is that playing MIDI files now requires even less computing power than it did before, and allows developers to process MIDI instructions, graphics, and other data even more successfully.

#### [To play a MIDI sound file](#)

1. From the Multimedia menu, click Media Player.
2. From the Device menu, click Microsoft MCI MIDI Sequencer.
3. From the dialog box that appears, choose the file you want to play.
4. Click the Play button.

===={ewc msdncl, EWGraphic, x0t 10 /a "psT.bmp"}

If you have a microphone connected to your computer, you can record sound using Sound Recorder.

---

Note — You must use a real-mode compression codec with Sound Recorder. If you use the GSM codec, you can turn on voice compression when recording so that your file is compressed in real time.

---

### [To record sound from a microphone](#)

1. From the Start button, choose Programs, then choose Accessories, choose Multimedia, and click Sound Recorder.
  2. Click the microphone button and record.
- ```
{ewc msdn cd, EWGraphic, x0t 11 /a "psT.bmp"}
```
3. Click the Stop button to end recording.
  4. From the File menu, click Save As and type a filename for this .WAV file.

You can also record sound from a CD player or other component that you connect to your sound card's Line In.

### [To record sound from Line In](#)

1. Use the Volume Control tool to turn on Line In and turn off the microphone input. (See the following section for information on how to do this.)
2. From Sound Recorder, click the microphone button and record.

Windows 95 also includes a Volume Control tool that provides audio line routing services to manage the different audio lines installed on a computer. An audio line consists of one or more channels of audio waveform data coming from one origin or system resource. For example, a stereo audio line has two data channels, yet is considered a single line. Each audio line also has zero or more mixer controls associated with it. A mixer control can take on a number of different characteristics, such as controlling volume, depending on the characteristics of the associated audio line.

The number of lines you can mix using Volume Control depends on the number of audio source lines your computer has, and whether you are using Volume Control for input or output. The following illustration shows the Media Control tool for a computer with four audio source lines:

n

Vol controls the audio levels from all sources, including wave sound, MIDI

sound, sound from Line In, and so on. This is the master control switch for your computer.

# n

Line controls sound from Line In. (Or, in the case of playback, this controls output to the speakers.)

# n

Wave controls wave sound.

# n

Synth controls MIDI sound.

*{ewc msdn cd, EWGraphic, x0t 12 /a "psT.bmp"}*

The horizontal slider bars control the right and left speaker balance. The vertical slider bars control the volume level.

For the master volume control, click the Mute button at the bottom of the volume control to mute all sound. (When you do this, its name changes to Unmute.) Click the Unmute button to restore sound. (The name will change back to Mute.)

For individual controls, when the check box at the bottom of the Line, Wave, or Synth control is checked, this control is not muted. When the check box is cleared, the control is muted.

### [To mix sound from two or more audio input lines](#)

1. From Start, choose Programs, then choose Accessories, choose Multimedia, and click Volume Control.
2. If only the master control (Vol) is displayed, right-click the icon in the upper-left corner of the Volume Control window and select Expand.

3. Check the check boxes for the audio input lines from which you want to receive sound; clear the others.
4. Adjust the volume and balance on each input line that you have checked.

#### [To set recording controls](#)

1. From Volume Control, right-click the icon in the upper-left corner of the Volume Control window, and select Recording Controls.
2. Click the option button for the input source you want to use for recording.

#### *Playing and Recording Digital Video*

---

Windows 95 video services provide the resources for capturing video clips, compressing the content, and controlling playback.

---

Note — Windows 95 provides the software to support video playback. Additional software and hardware are needed to capture and compress digital video.

---

Displaying digital video involves moving and processing huge streams of data continuously and efficiently.

In the past, the process of displaying digital video relied on a series of 16-bit systems — from reading data from the disk, to decompressing the video data, to displaying it on the screen. One key design goal of Windows 95 was to upgrade this architecture to 32 bits, and with this upgrade, the difference is dramatic. For multimedia users, installing Windows 95 will be the quickest and cheapest multimedia upgrade available. Without adding any hardware, Windows 95 users can display bigger, smoother, and more colorful digital video than ever before.

It's also important to notice that Windows 95 multimedia is fully compatible with 16-bit multimedia titles. Early testing has shown that the 32-bit improvements in file access speed and stream handling results in performance gains, even for 16-bit multimedia applications — the biggest gains, of course, will be realized in the new generation of 32-bit titles that will be designed for Windows 95.

#### [To tell in what format an existing video clip was authored](#)

# n

Run Media Player, then select Configure from the Device menu. The information in the Information Frame tells you about the format.

Or

1. Right-click the icon for the audio-video file and choose Properties.
2. Click the Details tab. This property sheet lists information about the audio and video formats used for the file, the length of the clip, any copyright information, and any additional information the author included about the clip, such as the subject description shown in this illustration.

{ewc msdncd, EWGraphic, x0t 13 /a "psT.bmp"}

[To play a video clip](#)

# n

From the File menu in Media Player, click Open and type the name of the video file. Then click the Play button.

Instead of having separate windows for Media Player and for the video clip, you can combine them.

[To add Media Player controls to the bottom of the video playback window](#)

# n

Double-click the Media Player window title bar. A window similar to the following results:

——{ewc msdn cd, EWGraphic, x0t 14 /a "psT.bmp"}

[To separate the two windows again](#)

n

Double-click the video playback window title bar.

---

Note Although it is possible to play digital video clips over the network, you will probably see some amount of performance degradation due to network traffic and dropped frames. If your network does not have a lot of traffic and is one that guarantees a continuous data stream (for example, ATM or Isochronous Ethernet), playback over the network and local playback performance will be similar.

---

### Customizing CDs with AutoPlay

---

Windows 95 includes a feature called AutoPlay that allows software developers to make their products easier for customers to install and run. AutoPlay is functionality enabled by the new 32-bit, protected-mode driver architecture in Windows 95.

Because Windows 95 is able to detect when a user inserts a disc into a CD-ROM drive, the operating system automatically checks the disc for a file named AUTORUN.INF each time a new disc is inserted.

The AUTORUN.INF file needs to contain a minimum of three lines of text:

```
[autorun]
open=      \      .exe
icon=      .ico
```

The open= statement can name any executable file to be run when the disc is inserted. Usually this line runs a small, quick-loading program that introduces the CD program, rather than the program itself, so that the user receives virtually instantaneous feedback upon inserting the disc. For example, you can use this statement to run a program you created which includes an introductory screen and Play and Cancel buttons. This program can run while your main CD program is loading.

From the introductory screen, users will usually click Play to run the program. In anticipation of this fact, you can take advantage of threading under Windows 95 to

begin loading your application into memory in the background even before the user clicks Play. This significantly reduces the perceived load time for your application.

The *icon=* line specifies an icon to represent the AutoPlay-enabled CD in the Windows 95 user interface. This feature makes it easy for users to identify the contents of the CD-ROM drive without having to pull out the disk to look. When the drive does not contain an AutoPlay-enabled CD, the system uses a default icon in its place. You can also specify a .BMP, .EXE, or .DLL file on the *icon=* line. If a file contains more than one icon, specify the icon number that you want. For example, *icon=cd app.exe,1* would display the second icon from an executable file called CD\_APP.EXE. (The first icon is number 0.)

---

Note — The *icon=* line of AUTORUN.INF always runs relative to the directory where AUTORUN.INF is located; if you want to specify an absolute path location for an icon, use the syntax *defaulticon=PATH*.

---

When users point to an icon in the Windows 95 user interface and click the right mouse button, Windows 95 presents a shortcut menu for that icon. If AUTORUN.INF is present on a CD-ROM, Windows 95 automatically adds *AutoPlay* to the shortcut menu, and sets it as the default behavior — double-clicking the icon will run whatever is specified on the *open=* line.

In addition to the three required lines, you can include other lines. For example, to add other shortcut menu items for your CD by adding them to the AUTORUN.INF file, use the following syntax:

```
shell\      \      =      .exe  
shell\      =
```

MENU ITEM NAME is the shortcut menu item that users will see. It can contain spaces and uppercase and lowercase letters. To set a keyboard accelerator for the menu item, precede any letter with an ampersand. Use VERB to associate the command and executable file using a short name without spaces. Users will not see VERB unless you omit MENU ITEM NAME from AUTORUN.INF.

For example, to add an *AutoPlay* command to the shortcut menu for your product, include the a line similar to the following in AUTORUN.INF:

```
shell\readit\command=notepad open\readme.txt  
shell\readit=Auto&Play
```

Normally, AutoPlay is the default menu item defined for any AutoPlay-enabled disc. If you would like to set a different verb as the default, add the following line to AUTORUN.INF:

```
shell=
```

When the user double-clicks on the icon for your disc, the command associated with VERB is run.

---

Notes — AutoPlay can be suppressed by holding down the SHIFT key when inserting a CD. This will prevent AUTORUN.INF from being parsed and run.

Because AUTORUN.INF is simply ignored by MS-DOS and Windows 3.1, there is no harm in putting it on titles that may be used on multiple platforms.

---

### *Buying a Multimedia Computer*

---

When you're ready to purchase a great multimedia system, there are lots of features to try out and compare. The following list provides a few guidelines for what to look for in a great multimedia system. The following sections provide more specifics for overall sound components, MIDI components, mixing capabilities, and video components.

n

A balanced computer. Balance beats horsepower. Multimedia playback

places heavy demands on many parts of the computer, from the CD-ROM (for reading data), to the hard disk (for writing data), to the CPU (for decompressing), and to the video and audio subsystems (for playing). A fast CPU does not guarantee a great playback system. In fact, multimedia playback on most of today's high-end PCs is not constrained by the CPU.

n

Local-bus video. The performance of a computer with a local bus is about

ten times better than one without a local bus, assuming everything else on the computers is equal. Without local-bus video, a computer will not be able to keep up with the amount of video data that consumer multimedia titles and games released in 1995 will attempt to display continuously. Preferably, your system should include a PCI bus.



n

A 24-bit display monitor. This is required for TrueColor support.

n

Double-speed CD-ROM or better. Titles written in 1995 assume double-speed data rate.

n

SVGA (800x600) or better with 16-bit color. Because multimedia applications use a lot of colors, and tend to compete for access to the system palette, it's important to have support for more than 256 colors.

n

16-bit audio and MIDI. The installed base of sound cards that can interpret MIDI is now large enough to be tempting to game and title developers.

Here are some key features to look for when you want to purchase a multimedia computer with great sound support:

# n

Although you can use an 8-bit sound card with Windows 95, the quality will not be great. Instead, choose a sound card with a 16-bit digital-to-analog converter (DAC) for playback, and for developers, a 16-bit analog-to-digital converter (ADC) for recording.

# n

Look for a CD-ROM drive with double-speed or triple-speed capabilities and “multisession” support.

# n

Look for a system that supports stereo sound and 8, 11, 22, and 44 kilohertz (kHz) waveforms. CD-quality sound uses 44 kHz. The 11 kHz and 22 kHz waveforms are fractions of 44 and often used for compressed waveforms meant to save CPU processing. The 8 kHz waveform is used for a new capability in Windows 95 called Truespeech compression. It is also used for telephony (as described in Chapter 25, “Modems and Communication Tools”) and voice coding.

# n

Developer systems should also include full-duplex support to record and play sound at the same time.

Microsoft recommends that sound cards for both consumer and developer systems include the following:

n

General MIDI support. General MIDI refers to a system of assigning

numbers to each kind of instrument, so that instrument 12 on one computer is the same as instrument 12 on all others.

n

POLYPHONY, which means the ability to play multiple sounds at the same

time. Consumer systems should include 16-voice polyphony; developer systems should include at least 20-voice polyphony. Support for more concurrent sounds means a fuller-sounding playback.

n

MIDI streams. This is a very efficient new capability included in Windows

95 whereby a sound card receives and batch-processes multiple MIDI messages (such as Note On and Note Off). This is useful because many things happen simultaneously in music. By building MIDI-stream sound support into your sound subsystem, you liberate your CPU from managing those messages individually. This offers virtually flawless playback, even when the CPU is being heavily taxed by large-frame video playback, for example.

n

Sampled sound rather than waveform synthesis. Waveform synthesis

uses a mathematical approximation of a sound, such as a piano. Sampled sound is an actual recording of the piano, and sounds much better. (MIDI really shows the difference in quality between sound cards.)

n

Standard MIDI port. Consumers and developers use this port to plug in

MIDI devices such as piano-style keyboards. It also supports joysticks.

A good multimedia system for either a user or a developer should have mixing capabilities. Look for the following features:

n

The mixer should mix input from four sources (WAV, MIDI, Redbook, AUX)

and present the output as a stereo, line-level audio signal at the back panel of the computer. Each input should have at least a 3-bit volume control (8 steps) with a logarithmic taper.

n

Make sure that all sources are sourced with -10 dB (consumer line level 1-

milliwatt into 600 ohms, 0 dB), and without attenuation. This will ensure that the mixer will not clip, meaning that if a sound peaks, the audio clicks instead of playing that sound. It also ensures that the mixer will output between 0 dB and +3 dB.

n

It's very helpful to find a system which has individual audio source and master digital volume control registers and extra line-level audio sources.

Here are some key features to look for when you want to purchase a multimedia computer with great video support:

n

When talking about quality of data, there are many places on a system that could potentially impede playback of a multimedia title. A computer might not have enough space on the CD-ROM or hard disk. The driver for the CD-ROM or hard disk might not be able to retrieve data fast enough to play back well. A CPU might not have enough power to handle the decompression of the video. The bus on your video display card might not be fast enough to move all of the data to the screen. Look for a balanced system where each of these elements has sufficient power.

n

Bare-bones resolution for a multimedia computer is VGA, which provides a 640x480 image, and 256 colors, which is also expressed as 8 bits per pixel (bpp). Microsoft recommends that a consumer system includes at least a Super VGA display. Super VGA provides 800x600 resolution with 64K colors (16 bpp).

There may be times when you'll need more than 256 colors. For example, suppose you are playing a video segment with a shaded maroon background that includes one underwater scene, followed by a skydiving scene, followed by a city-street scene. Each scene and its background will have very different color qualities. At least one of these scenes or the background will look odd if you translate this full-color clip to a 256-color display.

n

Look for a video card with a DCI provider for better performance.

n

Look for a computer with a double-speed or better CD-ROM drive, which

reads data from the CD-ROM at a rate of about 300K per second. This is the rate needed to have good-looking 320x240 digital video clips playing at a reasonable frame rate with no undue screen compression. (Screen compression changes resolution, causing the image to be somewhat grainier. At extreme compression, for example, an image of a person might look instead like a bunch of blocks.)

### *Troubleshooting Multimedia Software Problems*

---

This section describes how to identify and resolve multimedia software problems.

For help troubleshooting related hardware problems, see the Troubleshooting section at the end of Chapter 19, "Devices."

#### *A .WAV driver is not installed.*

If you start Sound Recorder and there is no Wave driver installed, you will receive an error message telling you so. This condition may result in the inability to play .WAV files.

If Sound Recorder says that there is no Wave driver installed, check to see if the Wave driver is listed under Multimedia in Control Panel. If the sound card is Sound Blaster-compatible, try using the Sound Blaster driver that ships with Windows 95. If

the correct driver for the type of sound card being used is not listed, try using the Windows 3.1 drivers for the specific card.

[To enable the wave audio media control device](#)

1. In the Multimedia option in Control Panel, click the Advanced tab.
2. From the list, click Media Control Devices, then double-click Wave Audio Devices.
3. In the property sheet, click the option named I Want To Use This Media Control Device, if it is not already selected.

Media Player cannot play MIDI files.

n

Verify that the sound card is correctly installed by reviewing the card's

properties. From the System option in Control Panel, click Device Manager, click Sound, Video, And Game Controllers, click the specific sound card, and then click Properties. Check the following:

n

Click the Drivers tab and verify the drivers.

n

Click the Resources tab and Verify Port and IRQ settings.

n

Check the Conflicting Device List to ensure it tells you that there are no conflicts with other hardware.

n

Verify that the MIDI driver is properly installed. Make sure the sound card settings do not conflict with other hardware. Use the Add New Hardware icon in Control Panel to detect your hardware, which will determine if you have any hardware for which the appropriate driver is not yet installed. Verify Port and IRQ settings.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*



## Chapter 22 Application Support

With Windows 95, you can run Win32-based, Win16-based, and MS-DOS—based applications. Most MS-DOS—based applications can even run in a Windows 95 window as other applications do. This chapter describes some restrictions and offers some tips for making applications run well under Windows 95. This chapter also describes how OLE documents containing multiple data types can be created.

### *Application Support: The Basics*

---

Under Windows 95, you can run new Win32-based applications and existing applications created for Windows and MS-DOS. Windows 95 provides optimized operating environments, with default settings, for each of these types of applications. Windows 95 provides complete support for the new OLE technology, including OLE Controls and OLE Automation for Windows-based applications that use the new technology, plus support for applications that use earlier versions of OLE.

Because of the default settings and other support in Windows 95, you are not required to have CONFIG.SYS, AUTOEXEC.BAT, and INI files to run Win16-based and MS-DOS—based applications, although you can still use settings from these files. Also, when you upgrade by installing Windows 95 in the same directory as Windows 3.1, the current settings for your installed applications are automatically migrated to the Registry for use with Windows 95.

To get the best possible performance and to ensure that your applications take advantage of the many new supporting features in Windows 95, you should upgrade to new versions created specifically for Windows 95 whenever possible. Applications written specifically for Windows 95 carry the “Designed for Windows 95” logo.

For Win16—based and MS-DOS—based applications that are known to need special parameters to run, Windows 95 includes an APPS.INF file that defines the special parameters per application. If you run one of these applications, Windows 95 uses its settings from APPS.INF, saving these settings in a PIF file and in the Registry. You can also change application settings using the application’s property sheet (rather than in PIF Editor, as in Windows 3.1).

Windows 95 includes an Add/Remove Programs option in Control Panel that makes it easy to install applications. For new applications that support the Windows 95 uninstall feature, you can use this option to easily remove applications and their related files from your computer.

Windows 95 includes many improvements for MS-DOS—based applications. Most applications can now run in a window. For MS-DOS—based applications that do not run well under Windows, you can run the application in an exclusive MS-DOS Mode, which makes all system resources available to that application, as described later.

Other system improvements provide the following benefits for running MS-DOS — based applications in the Windows 95 environment:

n

Improved robustness for MS-DOS — based applications, including better virtualization for computer resources, such as support for timers and sound devices.

n

Improved support for highly graphical MS-DOS — based applications. This allows you to run video-mode style programs in a window rather than in a full-screen.

n

Improved memory protection. Windows 95 includes a global memory-protection attribute on the property sheet that allows the MS-DOS system area to be protected from errant MS-DOS — based applications.

n

User-scalable windows with support for TrueType® fonts in DOS virtual-memory (VM).

# n

Local environmental settings for DOS VMs. Windows 95 allows a batch file to be specified in the property sheet to customize the VM environment.

For information about the improved printing and font support for MS-DOS-based applications, see Chapter 23, "Printing and Fonts."

## *Issues For Application Support*

---

Before you install and configure applications for use with Windows 95, you should decide:

# n

Which applications do you want to install on multiple computers? Rather than installing each application on each computer one by one, you can install applications automatically when you use custom setup scripts to install Windows 95. For information, see Chapter 5, "Custom, Automated, and Push Installations."

# n

How do you want the desktop to appear by default? Do you want to modify the Start menu or add shortcuts to the desktop? For information about customizing the desktop as part of Setup, see Chapter 5, "Custom, Automated, and Push Installations." For information about customizing based on user profiles, see Chapter 15, "User Profiles and System Policies."

n

Do you want users to have access to the Windows 3.1 Program Manager, rather than the new Windows 95 interface? For information, see “Using the Windows 3.x Program Manager with Windows 95” later.

n

Do the default settings for MS-DOS—based applications work well for each of your applications? You can use the application’s property sheets to modify settings as needed, as described in “Configuring MS-DOS—Based Applications” later in this chapter.

n

Do your users use Network DDE to share OLE objects over the network? If so, be sure to install Clipbook Viewer and the related support from the OTHER\CLIPBOOK directory on Windows 95 compact disc.

n

Do you need to restrict users from running MS-DOS-based applications? Or do you want to allow only certain Windows-based applications to run on a computer? For computers that will run File and Printer Sharing services where access to the shared resources is critical to other users, you may want to restrict the ability to switch to MS-DOS Mode in order to ensure that shared resources are always available. For information about using system policies to restrict access to MS-DOS Mode or define the applications that can run on a computer,

see Chapter 15, “User Profiles and System Policies.”

---

Note — When an MS-DOS — based application checks for the version of the operating system, the version of MS-DOS reported is 7.0. This is true regardless of the mode in which the application is run. An error may be reported for applications that are version-specific.

---

### *Application Support Overview*

---

In addition to applications based on Win32 APIs that are written specifically for Windows 95, you can run many applications written for Windows version 3.1, Windows NT, and MS-DOS in Windows 95.

n

Win32-based applications receive the full benefit of the performance

enhancement features in Windows 95. Such applications each run in a separate memory space and can take complete advantage of the preemptive multitasking capabilities of Windows 95.

n

Win16-based applications written for Windows 3.1 run in Windows 95

without modification, but these applications run in a shared memory space and cannot take advantage of preemptive multitasking. However, they do benefit from improvements incorporated into the Windows 95 subsystem.

n

MS-DOS — based applications can take advantage of improved memory

management and increased system resources made possible under the new

system architecture. Windows 95 also includes improved printing performance and font support for such applications.

The following sections describe how to install and remove applications to run under Windows 95. For technical information about the Windows 95 support for running Win32-based, Win16-based, and MS-DOS — based applications in Windows 95, see “Technical Notes on Application Support” later ; see also Chapter 31, “Windows 95 Architecture.”

### *Installing Applications*

---

When you use the Add/Remove Programs option in Windows 95 to install an application, Windows 95 adds information about the application to the Registry. If an application was created for Windows 95, it will also add information such as which parameters to use to run the application and which files to delete when removing the application from the computer.

If you upgrade by installing Windows 95 in the Windows 3.x directory, Setup will automatically move information about currently installed applications to the Registry. If you install Windows 95 in a separate directory, you can use the Add/Remove Programs option in Control Panel to reinstall your applications. (Simply copying their initialization files and other supporting files to the Windows 95 directory is probably not sufficient.)

#### [To install applications on Windows 95](#)

1. Insert the installation disk for your application in the appropriate drive, or connect to a network drive that contains the source files for the application.
2. In Control Panel, double-click the Add/Remove Programs icon.
3. Click the Install/Uninstall tab and then click the Install button. The wizard leads you through the steps to install the application on your computer.

When you install an MS-DOS — based application, the Add/Remove Programs option lets you choose an icon for the application. It copies information about the application from the APPS.INF file to the application's PIF file. (If no information for the application is found in APPS.INF, Windows 95 uses default settings instead.)

---

Note — Windows 95 has no separate PIF Editor. All application configuration formerly done through PIF Editor is now done using the application's property sheets, which you can view by right-clicking the application's executable file in My Computer and then choosing Properties in the context menu.

---

You can use custom setup scripts to automatically install applications when Windows 95 is installed. This is a convenient alternative for administrators who want to install

the same set of applications on multiple computers.

[To automatically install applications from custom setup scripts](#)

n

In MSBATCH.INF or equivalent file, add entries for all applications to be

installed in the [OptionalComponents] section, as described in Appendix D,  
“MSBATCH.INF Parameters.”

### Removing Applications

---

With applications created for Windows 95, you can easily remove (or “uninstall”) the  
application. Any applications that you install with the Add/Remove Programs option  
can be safely removed using the same option. Because the application’s  
components are tracked through the Registry, Windows 95 deletes all the  
application’s files unless those files are also being used by another installed  
application. Shared files are retained on the hard disk.

[To remove an application installed using the Add/Remove Programs option](#)

1. In Control Panel, double-click the Add/Remove Programs icon, and then click the  
Install/Uninstall tab. A list of applications installed with this option and which  
include an uninstall program appears in the window.

— Notice that applications you installed by other means will not be listed here and  
cannot be removed with this option.

2. Select the application you want to remove.

— If a check mark appears in the box to the left of the program icon, click on it to  
clear the mark. Otherwise, the program will be removed from your computer.

3. Click Remove.

---

Note — To appear in the uninstall list, an application must provide an uninstall  
program. Only newer applications, created specifically for Windows 95, will include  
this functionality.

---

With a Win16-based or MS-DOS — based application, removing the application is not  
always straightforward. You can delete the directory in which the program resides

but, especially in the case of Win16-based applications, the application often places other files in the Windows or the Windows SYSTEM directory. Often, there is no way to determine which applications placed certain files in these directories, so some of the application's files can be left behind on your hard disk.

Conversely, if you try to delete all of the files installed by the application from the Windows or the Windows SYSTEM directory, you might end up deleting a system file that is used by other applications. If this happens, that other application will not run properly and must be reinstalled.

### *Running Applications*

---

Windows 95 offers several methods for running applications:

n

Right-click the application's icon, then click Open in the context menu.

n

In Windows Explorer, double-click the application's icon.

n

Choose the Run command from the Start menu, and then type the application's path name.



n

Choose the Run command from the Start menu, and then drag and drop a .EXE file from My Computer or Network Neighborhood into the Run dialog box.

n

Choose the application's icon from the Start menu.

n

Create and use a shortcut icon on the desktop.

n

Use the Windows 3.1 Program Manager to run applications.

#### *To bring a running application to the foreground*

1. On the taskbar, click the button for the application, or press ALT+TAB to display the icons for the active tasks.
2. While holding down the ALT key, press TAB to highlight the icon for the application you want, and then release the ALT key.

The following sections describe options for associating a file type with a program, closing failed programs, and customizing the desktop to make it easy to run the applications you want to use. The following topics are included:

# n

Associating a file type with a program

# n

Closing failed programs

# n

Adding an application to the Start menu

# n

Creating shortcuts and defining working directories

# n

Using the Windows 3.x Program Manager with Windows 95

For an application to run when you double-click a related document file, the related

file type must be defined in the Registry.

[To define the program that runs when you double-click a filename](#)

1. In My Computer or Windows Explorer, click the View menu and then click Options.

2. Click the File Types tab.

——{ewc msdncl, EWGraphic, x0u 0 /a "psU.bmp"}

3. In the list of file types, click the file type to change.

——The file types that appear in this list are based on Registry values for Windows-based applications and programs provided with Windows 95.

——The settings for the selected file type are shown in the File Type Details box.

4. Click the Edit button to display the Edit File Type dialog box.

5. In the Edit File Type dialog box, select Open in the Actions list, and click the Edit button.

6. In the Editing Action For File Type dialog box, specify the program you want to use to open files that have this extension and include the complete path to the executable file. Click OK.

---

Tip —— If you drag and drop a .EXE file into the Run dialog box on the Start menu, the filename (including the path or UNC name) are appended to Open in the Actions list.

---

You can also click the New Type button on the File Types property sheet to define a new type of program to be used to run files with a certain filename extension.

If an application fails — that is, it stalls or crashes, or other parts of the system such as the keyboard, mouse, or display no longer function correctly — you can end the process or application that is not working correctly without quitting Windows 95 or quitting other applications. This ability to recover from problems related to a specific application — even Win16-based applications that do not run in a separate memory space — ensures real robust performance in Windows 95.

[To end a failed process or stalled application](#)

1. Press CTRL+ALT+DEL.

——Windows 95 displays a list of all running processes so you can specify which you want to end. If Windows 95 detects that any application is not responding to

messages from the system (which would indicate that the application has failed), the text “not responding” appears after the related process in the list.

2. In the Close Program dialog box, select the application you want to close, and click the End Task button.

With some applications, several processes may be running, such as the executable application and spooler for a mail applications. If a single process fails and you close that process, the rest of the application may continue to run.

### [Tip for Quitting Windows 95 with CTRL+ALT+DEL](#)

Under Windows 95, after you use the Cancel or End Task button to close the Close Program dialog box, the next time you press CTRL+ALT+DEL, the Close Program dialog box appears again; the computer is not restarted. If you want to press CTRL+ALT+DEL to restart the computer, you must press the keys again while the Close Program dialog box is displayed.

If at all possible, however, you should use the Shut Down button in the Close Program dialog box or the Shut Down command on the Start menu to quit Windows 95. This ensures that all current information is saved in the Registry and that each application is closed correctly before quitting the operating system. Shutting down correctly is especially important if the computer is running File and Printer Sharing services, so that no user connected to a shared resources loses data.

To prevent the desktop from becoming cluttered with application shortcut icons, Windows 95 allows you to change the application icons on the menus that appear when you click the Start button.

### [To add an application's icon to the Start menu or other menu](#)

1. From the Start button, choose Settings, and then click Taskbar.
2. Click the Start Menu Programs tab and then click the Add button.
3. In the Create Shortcut dialog box, type the command line for the program you want to add.
4. Click Next, then on the diagram shown, click the appropriate folder icon to specify where, on the menu structure, you want to add the application's icon. (For example, to add it to the Start menu, click the Start folder icon.) Click Next.
5. Follow the instructions provided by the wizard to change the icons that appear on the menu you have selected.

### [To add a new folder to the Start menu or other menu](#)

1. Click the Start Menu Programs tab and then click the Advanced button.
2. Click the appropriate folder icon under which you want to add a new menu.
3. From the File menu, choose New, and then click Folder.
4. Type the new folder's name next to its icon. Click Next.
5. Type the name that will appear on the menu (and if prompted, choose an icon). Click Finish. Your application's icon will be added to the menu structure.

Shortcuts provide easy access to the programs and files you use most often. For example, suppose you keep track of your time in a document called Timecard. You can place a shortcut to Timecard on your desktop. You can then open Timecard by double-clicking its shortcut icon. A shortcut does not change the document's location; it just lets you open it more quickly.

### [To create a shortcut](#)

n

Right-click the icon for your application, and then click Create Shortcut

and drag the shortcut icon to the desktop or other folder window of your choice.

— Or —

Right-drag the icon for your application to the desktop or other folder window. When you release the icon, a context menu appears. Click Create Shortcut(s) Here.

— Or —

Right-click the desktop. Then click New in the context menu and choose the kind of new document you want. Windows 95 places a shortcut on the desktop for running the related application with a new document.

In general, Windows 95 doesn't allow you to specify a working directory in the property sheet of a Win16-based application. This is because the program file has links assigned to it that rely on unchanging data. However, you can specify a working directory for shortcuts.

### To specify a working directory for a Win16-based application

1. Create a shortcut for the application. Then right-click the shortcut icon and click Properties in the context menu.
2. Click the Shortcut tab and type the name of the working directory in the Start In box.

Some users may not feel comfortable moving to the new Windows 95 interface as soon as you upgrade their computers from Windows 3.x. For those people who would like a more gradual transition, Windows 95 offers the ability to install a Windows 3.x-style Program Manager on the desktop.

When you install Windows 95 over Windows 3.x, you can choose to include the Program Manager from your former version of Windows on your Windows 95 desktop. Because this Program Manager is not a new Windows 95 option (but instead one from your old version of Windows), certain Windows 95 functionality is not available in Program Manager:

n

You cannot drag an item from a Program Manager group to the Windows

95 desktop, and you cannot copy the My Computer, Network Neighborhood, Control Panel, or Printers folders to a Program Manager group. The Microsoft Exchange folder can be copied to the group, but it does not work properly because of an Invalid Path error.

The folders created when you install Windows 95 are not designed to work with Program Manager. Program Manager recognizes files only. This is expected behavior for Windows 95; therefore, there is no workaround.

n

When you use the mouse to drag a link from the Windows 95 desktop to a

Program Manager group, the item description is truncated to eight characters.

Program Manager uses the filename minus the extension when you take

advantage of the drag-and-drop capability to create an icon. For example, if you drag the MS-DOS Prompt link from the Desktop to a Program Manager group, the MS-DOS Prompt description is shortened to MS-DOSPR. This occurs because the MS-DOS Prompt link uses the MS-DOS name MS-DOSPR.LNK. To work around this issue, manually edit the description of the item by choosing the item and then clicking Properties from the File menu on the Program Manager menu bar.

n

When you copy a link or item from the desktop to Program Manager, the item's icon is lost.

This occurs when the icon created in the Program Manager group is referencing a file with an .LNK extension. Program Manager has no knowledge of such an extension; therefore, you get a generic icon. Use the Properties command in the Program Manager File menu to assign an icon, using the same methods as under Windows 3.1.

---

Tip—— To read information about how to use the new Windows 95 features in comparison to the Windows 3.x Program Manager and File Manager, see the topic “If You’ve Used Windows Before” in the Windows 95 online Help.

---

[To make Windows 3.1 Program Manager available in Windows 95 Setup](#)

n

During Windows 95 Setup, choose Custom as the Setup Type. Then, on the Computer Settings dialog box, make sure the option named Windows 3.1 Style Interface is checked.

After users work with and learn the Windows 95 user interface (even for just a few days), you should expect that they will prefer to use the tools for running programs and managing files built into Windows 95. You can remove the ability to run Program Manager automatically at any time.

### To remove Program Manager on a local computer

1. Click the Start menu, and then choose Taskbar under the Settings option.
2. In the Taskbar property sheets, click the Start Menu Programs tab, and then click Remove.
3. In the Remove Shortcuts/Folders dialog box, click the Start Menu icon, and then click Program Manager and the Delete button.

### Configuring MS-DOS - Based Applications

---

When you run an MS-DOS — based application, Windows 95 first checks the APPS.INF file to see if the application is listed there. If it is, the settings found in APPS.INF are used to run the application. Otherwise, the default settings are used. These settings are reflected in the application's PIF file. Similarly, when you right-click the icon for an MS-DOS — based application and change its properties, those changes are reflected in the PIF file.

Windows 95 provides a flexible environment for running MS-DOS — based applications, even those applications that must have exclusive access to system resources. MS-DOS — based application compatibility is improved in Windows 95 so almost all MS-DOS — based applications should run under Windows 95. For those that cannot run in a DOS VM, Windows 95 offers two other options:

n

With Exclusive Mode, you can allocate more resources for the MS-DOS —

based application running in the foreground than for other applications running in the background.

n

With MS-DOS Mode, you can run MS-DOS — based applications that

cannot be run in a normal DOS VM or in Exclusive Mode because they need sole access to computer resources.

When an MS-DOS — based application is started in MS-DOS Mode, Windows 95—



removes itself from memory, except for a small stub, and provides the application with full access to all the resources in the computer. Before running an application in this mode, Windows 95 ends all running tasks, loads a real-mode copy of MS-DOS, and uses customized versions of CONFIG.SYS and AUTOEXEC.BAT to run the application. After the user quits the MS-DOS-based application, Windows 95 restarts and returns to the Windows 95 user interface.

This section describes how to set properties for MS-DOS-based applications and describes the APPS.INF file.

### *Tip for Running MS-DOS-Based Games*

Most games currently available are written to run under MS-DOS. In most cases, your MS-DOS-based games will run with no special adjustments under Windows 95. Most popular games have listings in the Windows 95 APPS.INF file. Games that include a Windows 3.1 PIF file should also continue to perform well. Certain PIF settings are now obsolete, however, and will have no effect. Those settings include: foreground and background priorities, exclusive priority, video memory usage, and video port monitoring. Windows 95 manages those settings automatically.

When you run a game that uses graphics modes but Windows 95 failed to autoconvert the program to run in a full-screen window, press ALT+ENTER to force it to run in a full-screen window. (Alternatively, from the Screen property sheet, select Full Screen.) Then adjust settings to improve performance as necessary. See “Setting Properties for MS-DOS-Based Applications” later for details.

For example, the following are three progressive steps you can try for better performance when running an MS-DOS-based game. If the first doesn't improve performance, then try the second. If not the second, then the third.

n

From the application's Memory property sheet, increase or limit the

amount of memory available to the game, or disable certain audio or visual effects within the game itself.

# n

From the Advanced Settings dialog box, select MS-DOS Mode.

# n

If the game continues to perform badly because of insufficient memory or

a lack of appropriate drivers (for example, EMS driver, mouse driver, or disk cache), from the Advanced Settings dialog box, click Configuration, and create a custom startup configuration. (Alternatively, use an editing tool to modify CONFIG.SYS and AUTOEXEC.BAT.)

In Windows 95, the property sheets replace PIF Editor, which was used in earlier versions of Windows to optimize the settings for running MS-DOS — based applications.

*To view or modify the property settings for an MS-DOS — based program*

1. Right-click the icon for the program and choose Properties. (If the program's icon is not on the Windows 95 desktop, use Windows Explorer to find the program, then right-click the icon in Windows Explorer.) This displays the property sheets for the program.
2. Click the tab you want to use and change the options as appropriate. (See the following section for information on all of these options.)
3. Do the same for all other options and tabs, and then click OK.

MS-DOS — based programs have six property sheets — General, Program, Font, Memory, Screen, and Misc.

Use the General property sheet to see information about the type, size, and location of the MS-DOS — based application. From this property sheet, you can turn on and off the Read Only, Archive, Hidden, and System attributes, which have the same meaning as with MS-DOS.

---

Caution — Do not change file attributes unless you are absolutely sure of what you are doing.

---

General property sheet for an MS-DOS – based application

{ewc msdncd, EWGraphic, x0u 1 /a "psU.bmp"}

Use the Program property sheet to identify details about how the program will be run.

Program property sheet for an MS-DOS – based application

{ewc msdncd, EWGraphic, x0u 2 /a "psU.bmp"}

---

(Fil Include the  
en filename for  
am the  
e) application.

Co Type the full  
m command  
ma line,  
nd including the  
Lin correct drive,  
e path name,  
and options,  
to run this  
application.

Wo Specify the  
rki working  
ng directory.

Bat Type the  
ch name of a  
Fil batch file  
e you want to  
run before  
the program  
starts.

Hot Specify the  
Ke key  
y combination  
(if any) that  
you want to

use to  
quickly  
switch to this  
application.

Ru Choose  
n whether to  
run the  
program in a  
normal-sized  
window, a  
maximized  
window, or a  
minimized  
window.

Clo Check this  
se box if you  
on want the  
Exi window to  
t close once  
the MS-DOS  
– based  
program has  
ended.

Use the Advanced command button to specify information about the mode in which  
your program will run.

*{ewc msdncd, EWGraphic, x0u 3 /a "psU.bmp"}*

---

MS Check this  
- box to run  
DO this program  
S in exclusive  
Mo MS-DOS  
de mode. No  
other  
processes  
are allowed  
to run  
simultaneou  
sly if you  
use this  
option.  
(When you

choose this option, Run Windows Programs is unavailable.)

Run Check this box to allow Windows other applications to run Programs concurrently with this MS-DOS – based application. (When you choose this option, other options are unavailable.)

Disable Disables the automatic warning that MS is presented - when Windows 95 is about to run an application that requires MS-DOS Mode and must shut down all other applications. If this option is checked, Windows 95 will begin the shutdown process without warning the

user.

CO Type any  
NFI lines you  
G. want to add  
SY to  
S CONFIG.SY  
S to allow  
this  
application  
to run  
properly.  
This version  
of  
CONFIG.SY  
S is used  
only for the  
MS-DOS  
Mode  
session in  
which this  
application  
runs.

AU Type any  
TO lines you  
EX want to add  
EC. to  
BA AUTOEXEC  
T .BAT for this  
application.  
This version  
of  
AUTOEXEC  
.BAT is used  
only for the  
MS-DOS  
Mode  
session in  
which this  
application  
runs.

---

Note — As shown in the preceding table, you can set the path for a specific MS-DOS — based application that runs in MS-DOS Mode in the AUTOEXEC.BAT box. For MS-DOS based applications that don't run in MS-DOS Mode, you can only

set a working directory. You can set a global path for all MS-DOS-based applications by adding a path statement in AUTOEXEC.BAT by running SYSEDIT in Windows 95. You can also write a batch file that sets a path for an MS-DOS – based application, for example:

path=%path%;c:\utils;c:\norton.

After you write the batch file, create a shortcut to your MS-DOS application, and specify the batch file's path and name in the Batch file field of the Program page in the property sheets for the application.

---

From the Font property sheet, you can specify the font size and type to be used as the MS-DOS – based program runs. From this property sheet, you can also preview how the program window and the font will appear.

*Font property sheet for an MS-DOS – based application*

*{fewc msdncd, EWGraphic, x0u 4 /a "psU.bmp"}*

From the Memory property sheet, you can define memory allocation options for:

n

Conventional memory, which consists of the first 640K of memory

available on your computer.

n

Extended memory, which is essentially a seamless upward extension of

the original 1-MB address space available in the memory of 80286 and 80386 computers. Extended memory always starts at exactly 1024K, where the upper memory area ends.

# n

Expanded memory, which can be installed as an expanded memory card

or emulated by an expanded memory manager (EMM). EMM software maps pages of expanded memory onto the system's upper memory area.

Windows 95 automatically provides expanded memory for MS-DOS — based applications that require it to run. It cannot provide this memory, however, if you include a statement in CONFIG.SYS that loads EMM386.EXE with the *noems* parameter. Use the *ram* parameter when loading EMM386.EXE in CONFIG.SYS, or use the *x=MMMM-NNNN* statement to allocate enough space in the upper memory area for Windows 95 to create an EMS page frame.

Using Upper Memory Blocks (UMBs) and High Memory Area (HMA) are two ways to free conventional memory for use by MS-DOS — based applications, and thus improve performance. In conventional memory, UMBs are the unused part of upper memory from 640K to 1 MB, where information can be mapped to free memory below 640K. HMA is the first 64K of extended memory, where drivers can be loaded to free conventional memory.

Memory property sheet for an MS-DOS – based application

`{ewc msdncd, EWGraphic, x0u 5 /a "psU.bmp"}`

From the Screen property sheet, you can specify options for how the application will be displayed on the screen.

Screen property sheet for an MS-DOS – based application

`{ewc msdncd, EWGraphic, x0u 6 /a "psU.bmp"}`

---

Us Specify  
ag whether the  
e application  
will run in a  
window with  
an initial size  
you can  
specify, a  
full-screen  
window, or a  
window with



a size  
automaticall  
y determined  
by the  
graphic  
mode it  
uses.

Wi Choose  
nd whether to  
ow display a  
s toolbar or to  
preserve the  
previous  
Windows 95  
window  
settings.

Per Choose  
for Dynamic  
ma Memory  
nc Allocation to  
e use the  
Windows 95  
video ROM-  
handling  
capabilities.  
Choose Fast  
ROM  
Emulator to  
enable VxD  
emulation of  
selected  
video ROM  
services and  
to speed up  
video  
operations,  
particularly  
text output.

From the Misc property sheet, you can specify details about running your program in the foreground and in the background. You can specify whether your program must have exclusive access to the system when it is in the foreground and whether running a screen saver is allowed when the program is active. You can also specify whether the program must be suspended when it is in the background.

In addition, you can specify preferences for mouse, idle sensitivity, Windows hot keys, and other options.

```
{ewc msdn cd, EWGraphic, x0u 7 /a "psU.bmp"}
```

APPS.INF contains a section called [PIF95], which acts as a master list of MS-DOS-based applications for which this file contains information. Each of these lines corresponds to a subsequent entry in APPS.INF which details information for running a specific application.

Each entry in the [PIF95] section uses the following syntax:

APP FILE=%TITLE%, ICON FILE, ICON NUM, SET WORKING, SECTION, OTHER FILE, SET PIF

---

The  
filename,  
with  
extension,  
for the  
application's  
executable  
file.

p

p

f  
i  
l  
e

The string identifier of the name that will appear in the application's title bar; the identifier must appear in the [Strings] section of the INF file, set to the quoted name of the application.

title

The  
■ filename  
from which  
to extract  
the program  
icon.

c

o

n

f

i

l

e

■ The number  
from the  
icon  
extraction  
table. The  
default is .

c

o

n

n

u

m

s  
The event  
setting for  
allowing the  
computer to  
automaticall  
y set the  
working  
directory, or  
for  
preventing it  
from doing  
so: (the  
default)  
allows it,  
prevents it.

t



w

o

r

k

i

n

g

The name of  
the  
correspon  
S di ng section in  
APPS.INF  
containing  
details about  
this  
application.

e

c

t

i

o

n

The key file  
within a  
directory for  
this  
application,  
used when  
two

o

ta

hp

ø

rfi

|

fe

entries are  
identically  
named.

i

|

e

The value  
allowing or  
preventing  
creation of a  
PIF file for  
this  
application:  
(the default)  
allows  
creation;  
prevents it.

e

t

# p i f

Each section following the [PIF95] section includes entries to define any parameters used to run a specific application, any memory options or other options required, and options to enable or disable.

The *Enabled=* and *Disabled=* entries use the following abbreviations.

|   |       |    |       |   |
|---|-------|----|-------|---|
|   | -     | -  | -     | - |
| a | ALT+  | e  | EMS   |   |
| e | ENT   | ml | mem   |   |
| n | ER    |    | ory   |   |
|   |       |    | locke |   |
|   |       |    | d     |   |
| a | ALT+  | e  | EMS   |   |
| e | ESC   | m  | mem   |   |
| s |       | s  | ory   |   |
| a | Allow | e  | Emul  |   |
| f | fast  | mt | ate   |   |
| p | paste |    | ROM   |   |
| a | ALT+  | ex | Exclu |   |

p PRIN c sive  
s TSC mode  
REE  
N

a ALT+ g Globa  
s SPA m l  
p CE p mem  
ory  
prote  
ction

a ALT+ h Use  
t TAB m HMA  
a a

a Auto Im Low  
w matic l mem  
c windo ry  
w locke  
conv d  
ersio  
n

b Back m Mous  
g groun se e  
d d

c CD- ne Netw  
d ROM t ork  
r

c CTRL ps PRIN  
e +ES c TSC  
s C REE  
N

c Close rv Retai  
w on m n  
e exit video  
mem  
ory

d Detec rw Run  
it t idle p Wind  
time ows  
progr  
ams



|   |      |    |       |
|---|------|----|-------|
| d | Real | wi | Run   |
| o | mode | n  | in a  |
| s |      |    | windo |
|   |      |    | w     |
| d | Disk | x  | XMS   |
| s | lock | ml | mem   |
| k |      |    | ory   |
|   |      |    | locke |
|   |      |    | d     |

### *Technical Notes on Application Support*

---

This section summarizes technical information about how Windows 95 runs Win32-based, Win16-based, and MS-DOS — based applications. It also presents some information about how Windows 95 works around known application problems. For information about the supporting system components, see Chapter 31, “Windows 95 Architecture.”

Applications that use Win32 APIs and are designed to run under Windows 95 can take full advantage of all of the Windows 95 performance enhancement features. Win32-based applications feature several benefits over Win16-based applications, including preemptive multitasking, Win32 APIs, long filename support, separate message queues, flat address space, and memory protection. In addition, each Win32-based application runs in its own fully protected, private address space, preventing it from causing the operating system or other applications to fail and preventing interference from errors generated by other applications.

To support preemptive multitasking, the Windows 95 Kernel schedules the time allotted for running applications in the system. This results in smoother concurrent processing and prevents any one application from using all system resources without permitting other tasks to run. (An exception to this is when you choose to run an MS-DOS — based application in MS-DOS Mode, because this mode requires exclusive use of system resources.) Win32-based applications can optionally implement threads to improve the level of detail at which they can take advantage of multitasking.

Under Windows 3.1, the operating system passes control to another task, allowing that task to be scheduled cooperatively, at the point when an application checks the system message queue. In this case, if an application doesn't check the message queue on a regular basis, or the application stops and thus prevents other applications from checking the message queue, the system keeps the other tasks in the system suspended until the errant application is ended. Under Windows 95,

each Win32-based application has its own message queue and thus is not affected by how other tasks access message queues.

*{ewc msdncd, EWGraphic, x0u 8 /a "psU.bmp"}*

Resources allocated for each Win32-based application tracked on a per-thread basis are automatically freed when the application ends. If an application stalls, the user can perform a local reboot by pressing CTRL+ALT+DEL to end the stopped application without affecting other running tasks.

To make the most of Windows 95, the applications you run should:

n

Be Win32-based applications

n

Be OLE-compliant to allow for data sharing with other applications

n

Use Remote Procedure Call (RPC) for networked NetBIOS applications

n

Use Windows Sockets for networked non-NetBIOS applications

Win32-based applications that run under Windows NT will run well under Windows

95 as long as the application does not use any Windows NT-specific APIs (such as those for security) and it has been designed to run under both Windows 95 and Windows NT.

---

Tip—— You can manage files from the Open dialog box of 32-bit applications. For example, in Notepad or Wordpad, you can choose File Open, and then use drag and drop and the full range of right-mouse option on any file or directory you are browsing.

---

Win16-based applications written for Windows 3.1 run in Windows 95 without modification. Windows 95 ensures that any Win16-based application will run as well or better on a 4-MB or 8-MB computer (or greater) than with Windows 3.1. In addition, the performance of a Win16-based application is improved because it can use operating system services provided by the 32-bit system components of Windows 95, including 32-bit device driver components and 32-bit subsystems.

Windows 95 provides the same system resources to both Win32-based and Win16-based applications but Win16-based applications cannot take advantage of preemptive multitasking. Win16-based applications share memory, a common input queue, and a common message queue, and their processes are scheduled cooperatively.

Win16-based applications, however, benefit from the preemptive multitasking of other system components including the 32-bit print and communications subsystems, and the improvements made in system robustness and protection from the Windows 95 system kernel.

Because all Win16-based applications run in the same virtual machine, an errant application can cause other Win16-based applications to fail as well, but shouldn't adversely affect Win32-based applications. However, the improvements made to overall system-wide robustness significantly increase the system's ability to recover from an errant application, and improved cleanup of the system lessens the likelihood of application errors. Windows 95 tracks resources allocated by Win16-based applications and uses the information to clean up the system after an application exits or ends abnormally, thus freeing up unused resources for use by the rest of the system. If an application does fail, the user can press CTRL+ALT+DEL to stop the process, as described in "Closing Failed Programs" earlier.

Windows 95 includes many improvements over Windows 3.1 for running MS-DOS-based applications, including better printing support and improved capabilities for

running hardware-intensive applications such as games.

As with Windows 3.1, each MS-DOS — based application runs in its own DOS virtual machine (VM), which allows multiple 8086-compatible sessions to run on the CPU, which in turn allows existing MS-DOS — based applications to run preemptively with the rest of the system. The use of virtual device drivers (VxDs) provides common-regulated access to hardware resources, thereby making each application running in a VM think it's running on its own individual computer; this allows applications not-designed for multitasking to run concurrently with other applications.

DOS VMs are protected from one another, and from other applications running on the system. This prevents errant MS-DOS — based applications from being able to overwrite memory occupied or used by system components or other applications. If an MS-DOS — based application attempts to access memory outside of its address-space, the system notifies the user and the MS-DOS — based application is ended.

One of the major difficulties MS-DOS — based applications had in the VMs under earlier versions of Windows was insufficient conventional memory space. By the time MS-DOS — based device drivers, TSR programs, and networking components were loaded with Windows, there often wasn't enough conventional memory left to allow the MS-DOS — based application to load or run. Windows 95 provides 32-bit, protected-mode driver components that replace many of the 16-bit, real-mode device driver and TSR counterparts, improving overall system performance and using no conventional memory. The memory savings with protected-mode components can be significant. For example, a computer using only Windows 95-protected-mode components would save more than 225K of conventional memory over the amount used by real-mode networking software, drivers for a mouse and SCSI CD-ROM drive, and SMARTDrive.

For information about the improved printing and font support for MS-DOS — based applications, see Chapter 23, "Printing and Fonts."

Some Windows-based and MS-DOS — based applications may not run well under Windows 95 because they were written to take advantage of characteristics of older operating systems not found in Windows 95. For example, certain applications use a portion of the title bar to include items other than the title, such as a Quick Help button. Because Windows 95 title bars are not formatted in the same way as Windows 3.x title bars, some information may be overwritten when you run these old applications.

In addition, some applications use interrupts that are not automatically supported by Windows 95. Others do not handle long filenames well or check for the operating system version number incorrectly. The following sections describe how Windows 95 works with these applications, to try to accommodate them.

---

Notes — Although many programming tools that are not specifically designed to run under Windows 95 may run satisfactorily under Windows 95, the corresponding debugging tools usually will not. Be sure that both the programming and debugging tools you use are specifically written to run under Windows 95.

Some Win16-based and MS-DOS — based disk utilities must be run with special care. In addition, some disk utilities do not perform correctly with long filenames. For more information about using Win16-based and MS-DOS — based disk utilities with Windows 95, see Chapter 20, “Disks and File Systems.”

---

### [Running TSRs](#)

Some older TSRs rely on DOS interrupts to monitor everything that happens on the system. However, because of its protected-mode file system, Windows 95 doesn't use DOS interrupts. If Windows 95 detects that a TSR is trying to monitor these interrupts, it will readjust itself to accommodate the program and will send all system information through DOS interrupts. This way, the TSR can monitor system events successfully. However, doing this will cause the performance of the operating system to slow significantly.

The IOS.INI file, as described in Chapter 19, “Devices,” includes a list of “safe” drivers and programs. If Windows 95 finds the program listed in IOS.INI, it will not send system events through the DOS interrupts, thus avoiding decreased performance.

### [Fixing Version-Checking Errors](#)

Some applications do not check the version of Windows 95 correctly. Incorrect version-checking techniques sometimes invert the two bytes that record the version number, thus, version 3.10 would be reported as 10.3. Windows 95 tries to accommodate this possible version-checking error by reporting 3.95 as the version. This way, if an application looks for a version greater than 3.10 or its inverse, 10.3, the new Windows 95 version will prove to be greater.

If the application looks for an exact match for the version number, such as Windows version 3.10, it may not run on Windows 95. To fix this situation, you must edit the [Compatibility] section of WIN.INI to include the following line:

compiled\_module\_name=0x00200000

The compiled module name is the one contained in the DOS header. For example, the following entry is for cc:Mail™:

[Compatibility]  
CCMAIL=0x00200000

---

Note — The Windows 95 WIN.INI file includes fixes for many applications known to have this problem.

Do not, however, add a permanent entry to WIN.INI for a program called SETUP. Install your application first, and then edit WIN.INI for the application module name.

---

### [Running Applications That Replace System DLLs](#)

Older versions of Windows allowed applications to redistribute parts of the system with no ill effects. For example, an application might overwrite a system file with no adverse consequences.

Windows 95 has reorganized some of the system files, including the functionality of what used to be multiple files into one large file in order to expedite the boot process. Therefore, if an application tries to overwrite a system file that is no longer used, Windows 95 simply ignores the attempt.

If your application must run with a replacement file, to be sure it runs properly, you can add that file to the Windows SYSTEM\MM32 directory (which is empty for newly installed systems).

### [Sharing Data Between Applications Using OLE](#)

---

Windows 95 includes built-in OLE functionality that allows you to share data between OLE-compliant applications. Using applications that take advantage of OLE technology, you can create OLE documents that contain multiple types of data and that allow you (or other users) to edit or display that data without running other applications.

OLE is a technology built into Windows 95 that is an improvement to the OLE 1.0 standard. It provides services for sharing OLE objects, which are units of data and the related functions needed to manipulate that data. In Windows 95, STORAGE.DLL manages OLE documents.

Under Windows 95, applications that use OLE technology can use new OLE objects, and new OLE applications can use OLE 1.0 objects. However, in each case, functionality is limited to OLE 1.0. For example, OLE 1.0 does not include in-place interaction, so when you double-click an object in an OLE 1.0 application, the source application starts and the object is displayed in another window.

The new OLE technology provides a way of communicating between a container application and object applications. A CONTAINER APPLICATION maintains OLE documents, and OBJECT APPLICATIONS act as servers to provide various data objects (such as text, bitmaps, spreadsheets, spreadsheet cells, or sound clips) to be

included in the OLE document. The container application does not need to know anything about the object application or its specific data type to communicate with it.

*{fewc msdncd, EWGraphic, x0u 9 /a "psU.bmp"}*

This newsletter has an embedded photograph, and an embedded map of England. The map of England was created in GST DesignWorks, a graphics application with OLE capabilities. Then, the native DesignWorks graphic was directly embedded into the newsletter, which was created in Microsoft Word.

Windows 95 keeps track of OLE objects by keeping an entry for each OLE object in the Registry. That entry includes a unique identification tag for the object and a program identifier. The program identifier is also used as a class name when OLE objects are placed in OLE containers. For example, "Word.Document.6" is the program identifier for a Word 6.0 document.

---

Note With Clipboard Viewer, an OLE application located in the OTHER\CLIPBOOK directory on the Windows 95 compact disc, you can share OLE objects for use in documents across the network. For more information, see the online information provided with the Windows 95 compact disc.

---

OLE objects can be VISUALLY EDITED, meaning that users can activate objects and edit, play, or otherwise manipulate them in the same window in which they are contained.

To enable Visual Editing, both the container application and the object application must be OLE-compliant and both must support the OLE visual editing interface. If either the container or object application (or both) meets only the OLE 1.0 specification, then the object application will be launched in its own window for editing. For example, Corel® Draw 4.0 implements some features of OLE which do not include the visual editing interface, so when a Corel Draw 4.0 object is opened for editing, the Corel Draw 4.0 application will start in its own window.

If an embedded object has a filename extension that is not associated with any application, you may not be able to successfully activate it. You must associate the file type with an executable file, as described in "Running Applications" earlier.

OLE Drag and Drop can be used to move or copy an object from one container to another. You can use the following key combinations for OLE Drag and Drop actions.

---



Drag and drop  
Determined by target and source; usually Move

SHIFT+drag and drop  
Move the object

CTRL+drag and drop  
Copy the object

~~SHIFT+CTRL+drag and drop~~

Link the object from the source to the container

~~For OLE-compliant applications, when an object is dragged between documents, it automatically becomes an embedded object in the destination document, unless both the source and destination applications understand the data type. In that case, the information is merely placed as native data.~~

### *Troubleshooting Applications*

---

~~If you upgrade your existing Windows 3.1 or Windows for Workgroups directory to Windows 95, then you do not need to reinstall your applications. If you install Windows 95 to a new directory, then you must reinstall all of your Windows-based applications. Copying files from your Windows 3.1 directory to Windows 95 is not sufficient.~~

~~For information about whether a specific application runs under Windows 95, check the Windows 95 Readme files, and check with your application vendor.~~



Hot keys from desktop shortcuts fail to start applications.

Windows 95 doesn't support using shortcut hot keys to launch applications from the desktop. You can use shortcut hot keys to launch only those items located in the Programs folder. You can double-click the application's shortcut icon on the desktop to run the application. Or, you can move or copy the shortcut to the Programs folder, then launch it using its assigned hot keys.

You cannot create a shortcut.

If you try to add an application to the Start menu by dragging the application's icon and dropping it on the Start button, you may see a message that tells you cannot create a shortcut here and prompting you to place it on the desktop. This message appears if the Start Menu directory is corrupted or deleted.

[To fix a corrupted or missing Start Menu directory](#)

1. Shut down and restart the computer to create a new Start Menu folder.
2. If the Start menu still doesn't behave correctly, delete the Start Menu directory, then repeat Step 1.

.LNK extensions are never displayed.

This is not an error. When viewing a shortcut file from Windows Explorer, the .LNK extension is never displayed. This doesn't change even if you choose the Show All Files option in the View menu in Windows Explorer, or the File Types option in File Manager.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## *Chapter 23 Printing and Fonts*

This chapter describes the Windows 95 printing subsystem and explains how to set up printers with Windows 95. It also describes font support in Windows 95.

### *Windows 95 Printing and Fonts: The Basics*

---

Windows 95 includes several significant improvements for printing over Windows version 3.x. These include the following changes.

#### *A new 32-bit print subsystem.*

The Windows 95 print subsystem is compatible with the Windows NT print subsystem, including monitors that facilitate bidirectional communications with printers.

#### *Quicker “return to application” time.*

Background spooling and the use of enhanced metafile (EMF) spooling can significantly decrease the time it takes to return control to the application, depending on job content.

#### *Better conflict resolution.*

Spooling from MS-DOS — based applications solves conflicts when multiple applications, or applications based on both MS-DOS and Windows, are trying to print at the same time.

#### *Point and Print support.*

Windows 95 provides hands-free printer installation. In addition, users can use Point and Print with Windows 95, Windows NT, and Novell® NetWare® printers.

#### *PSERVER Capability for NetWare print queues.*

Windows 95 includes a PSERVER, which can despool print jobs from NetWare queues to printers connected to computers running Windows 95. Using the PSERVER, a NetWare server printer queue can direct print jobs to a printer attached to a computer running Windows 95.

#### *Image Color Matching.*

Windows 95 supports Image Color Matching (ICM), which allows applications to better match the color of images displayed on the screen with those generated by an output device.

#### *Deferred Printing.*

Deferred printing allows mobile and other users to generate print jobs when they are not connected to a printer. The print jobs are stored on their computer until a printer becomes available. Windows 95 detects the connection and automatically spools the print jobs as a background process.

#### Extended Capabilities Port.

Windows 95 provides support for a parallel extended capabilities port (ECP). An ECP parallel port supports high-speed printing and ECP devices. Even if you do not have an ECP device, using an ECP parallel port will improve I/O performance.

#### Font storage in the Registry.

Because the fonts are stored in the Registry, there is no limit on the number of TrueType® fonts that can be installed. Similarly, there is no limit on the number of fonts that can be used simultaneously, and no limit on the number of fonts that can be printed in the same document.

As with earlier versions of Windows, Windows 95 offers key font support features such as: support for raster, vector, and TrueType fonts; the ability to handle downloadable soft fonts; and font substitution capabilities. Windows 95 also provides several enhancements for handling fonts, including the following:

n

Better integration of font handling with the Windows 95 user interface,

optimized for the 32-bit environment.

n

Enhanced rasterizer for rendering and generating TrueType fonts. This 32-

bit component delivers greater accuracy from the mathematical representation to the generated bitmap.

n

Smoother-looking on-screen TrueType fonts. By using a method called anti-aliasing, characters no longer appear slightly jagged when displayed in large sizes. Anti-aliasing support for smoother font images requires a 256-color display mode (or higher).

### *Issues for Printing and Fonts*

---

Before you configure your printers and install fonts in Windows 95, you should consider the following issues:

#### *General Issues*

n

When purchasing new printers, consider those with bidirectional communication support and extended capabilities port support.

n

Extended capabilities ports (ECP) are not automatically configurable. If your computer includes an ECP port, follow the procedure to enable ECP support.

n

If your printer uses font cartridges, you will also need to install the fonts on your computer.

### NetWare Printers

n

To take advantage of the Win32-based NetWare PSERVER capability, the computer must use Microsoft Client for NetWare Networks. However, the computer does not need to run File and Printer Sharing services.

n

If you are using printers connected to NetWare servers, be sure to configure the server to store Point and Print information for use by Windows 95 users. For information, see “Using a NetWare Print Server” later.

### Microsoft Networks

To share a printer, the computer must be running a 32-bit, protected-mode client, and File and Printer Sharing services must be enabled, as described in Chapter 11, “Logon, Browsing, and Resource Sharing.”

### Windows 95 Printing Support Overview

---

In Windows 3.1, print spooling functionality was handled by Print Manager and was supported by code in several different Windows-based components. In Windows 95, the print spooler is implemented as a series of 32-bit virtual device drivers and DLLs.

and consolidates the spooler functionality into a single architecture.

The new spooler provides smooth background printing. Unlike Print Manager in Windows 3.1, which passed a fixed amount of information to the printer whether the printer was ready to receive it or not, the Windows 95 spooler passes data to the printer only when the printer is ready to receive more information, by using background thread processing. This helps to reduce what seemed to be jerky processing under Windows 3.1 Print Manager.

The new spooler provides quick return-to-application time is much more powerful and flexible. It allows the user to select printer attributes on a per-printer basis, instead of requiring global printing attributes as in Windows 3.1. For example, each printer can have a different separator page and each can specify whether jobs will be printed directly or using a queue.

The following diagram illustrates how Windows 95 prints documents. For flow diagrams showing specific printer configurations with Windows 95 as a client to other networks, see the "Printing Flowcharts" section later.

`{ewc msdncd, EWGraphic, x0v 0 /a "psV.bmp"}`

For information about enhanced metafiles, printer drivers, extended capabilities ports, and other components of the printing subsystem, see "Technical Notes on Windows 95 Printing" later. The following sections describe how to install and share printers and how to use print servers on Windows NT and NetWare networks.

### *Installing a Printer*

---

If you upgrade to Windows 95 from an earlier version of Windows, Setup will automatically migrate your previous printer selections to Windows 95. If no printer was previously installed, the Add Printer wizard runs automatically to let you install a printer. If you need to install a printer after Setup, everything you need to install a printer — whether you are installing a local or remote printer, manipulating a print job, or managing a printer — is all conveniently located in one place: the Printers folder.

You can access the Printers folder from several places:

n

From the setting menu in the Start button

# n

From My Computer

# n

From the Printers icon in Control Panel

===={ewc msdn cd, EWGraphic, x0v 1 /a "psV.bmp"}

Windows 95 uses a new INF format for printer installation. Although the previous OEMSETUP.INF file format is still supported for compatibility with previous versions of Windows, the new format offers added functionality, including supports for installation of print subsystem components such as the print driver and port monitor.

If the printer is Plug and Play-compliant, it reports its device ID to Windows 95 during installation. Windows 95 searches INF files to find the ID that matches the ID values reported by the printer. If multiple matches are found, Windows 95 checks for a driver which exactly matches the device, or for a compatible driver, if one is available. If an exact match is found, Windows 95 automatically installs the correct printer support. If an exact match is not found, but a compatible driver is found, Windows 95 displays a dialog indicating the device was found and a compatible driver is available. The user may then provide a diskette containing a Windows 95 driver which is an exact match, and either tell Windows 95 to install the compatible driver it has found, or tell Windows 95 not to install a driver at all. If multiple compatible drivers are found, Windows automatically determines the best one to use.

[To set up a new printer](#)

# n

From the Printers folder, double-click the Add Printer icon. The Add Printer wizard leads you through the process of setting up and configuring a printer.

Some printers take advantage of the built-in bidirectional communications ability (as described later ) and initially configure device driver settings such as available fonts and the amount of installed memory, without any user intervention.

The Add Printer Wizard provided in Windows 95 makes it easy to find the correct printer to install. The printer model choice provided in the Add Printer Wizard are grouped by manufacturer. When you select a printer manufacturer on the left side of the dialog box, the list of available printer models is displayed on the right.

### [To install a local printer using the Add Printer Wizard](#)

1. When the Add Printer Wizard prompts you to select your printer, in the Manufacturer's list click the manufacturer's name. Then, in the Printer lists, double-click the model you want to install, or select the model and click Next.

—{ewc msdncl, EWGraphic, x0v 2 /a "psV.bmp"}

2. If the printer you are installing is not Plug and Play-compliant, the wizard prompts you for the port that you want to use with your printer. Next, you can choose to configure that port if necessary, as in the case of COM ports, where you may need to select the appropriate baud rate.
3. When the Add Printer Wizard prompts you for a "friendly" printer name, you can type a name that people, not just computers, find useful. For example, if you plan to share this printer with others on your network, it's a good idea to have the printer name reflect information users may need to know in order to use this printer properly, such as its physical location.
4. Click Finish. Windows 95 begins copying the necessary files. If you already have all of the files needed to install the printer, you can either use the files you already have or you can choose to install new files. You can install new files from the Windows 95 source files or from a disk supplied by your manufacturer.

When installation is complete, you can print a test page to ensure that the printer is functioning properly.

### [To print a test page](#)



1. Right-click on a printer icon in the Printers folder, and then click Properties.
2. In the property sheet for the printer, click the Print Test Page button.

### *Sharing a Printer*

---

For information about using File and Printer Sharing services for either Microsoft or NetWare networks, see Chapter 11, "Logon, Browsing, and Resource Sharing."

#### *To share a locally installed printer with other users*

1. From the Printers folder, right-click the icon of the printer you want to share, and then click Sharing in the context menu.
2. From the Sharing property sheet, specify the options you want.

---

Tip—— You can use WinPopup to send a message from a printer that a print job is done. The Microsoft Network must be running first. For information about how to use WinPopup, see Chapter 12, "Network Technical Discussion."

---

### *Connecting to a Remote Printer*

---

The easiest way to set up a remote printer is simply to print to it. Windows 95 supports Point and Print to any Windows 95 printer and to printers managed by Windows NT, NetWare, or another network server.

The Windows 95 Point and Print feature allows you to do the following:

n

Install the driver for a printer over the network automatically.

---

To do this, drag the network printer icon from the server's shared resource window to the Printer window or to the desktop. This works for printers on Windows 95, Windows NT, and NetWare networks.

# n

## Print to a networked printer.

To print an open document, select Print from the File menu and specify a network printer. To print an unopened document, drag and drop the document's icon on the icon of the printer you want to use. In either case, Windows 95 determines the printer name and automatically loads the driver across the network to the local hard disk and configures the printer on the user's system.

---

Tip — If you double-click a networked printer's icon, Windows 95 automatically installs the printer driver (prompting you for information, if needed) and adds the printer to your Printers folder.

---

Point and Print functionality means Windows 95 attempts to identify the printer you want to install and to copy the driver and any printer-specific information from either the server or an alternate location on the network. If some of the information is not available, Setup prompts you for any missing information or, if the printer driver is not found locally, for a location of the printer driver.

What information is available and how Windows 95 determines the correct information depends on which print provider is used and how much information the provider can determine about the print device. The files needed to set up a Point and Print network printer are the printer drivers specified in the Windows 95 INF files.

If the print server you're using doesn't support Point and Print, you can use the Add Printer Wizard to select the printer driver you want to install. The only difference between setting up a remote printer and a local printer when using the Add Printer Wizard is that you will need to specify the name of the print server for a remote printer.

When you install a local printer under Windows 95, all of the information about the installed printer is stored in the Windows 95 Registry. If your computer is running File and Printer Sharing for Microsoft Networks or File and Printer Sharing for NetWare Networks, you don't need to do anything other than share your printer and grant appropriate sharing permissions to configure Point and Print. When a user wants to set up and connect to your printer, the client computer asks for information about the installed printer from the peer server, and the peer server responds with the appropriate information. The printer driver is also copied from the server and installed on the local computer.

On a computer running Windows 95 and using user-level security, there are some

additional steps you must take to enable Point and Print support.

[To enable Point and Print with user-level security](#)

1. From Windows Explorer, locate the Windows SYSTEM directory, and right-click its icon. Then click Properties.
2. Click the Sharing tab, and then click Add.
3. In the Add Users dialog box, add all users who should have access your printer, and assign them read-only access. Click OK.

——Note—— It is not necessary to share the directory, just add the permissions.

4. When Windows 95 offers to share the directory after you add the permissions, click No.

Printing a document in Windows 95 has been made as easy as possible.

---

Tip—— For easy access to a printer, use the right mouse button to drag the printer's icon from the Printers folder to the desktop, and then click Shortcut on the popup menu that appears. Then you can quickly print a document by dragging the document's icon onto the printer icon.

---

[To print a document](#)

n

If the document is open, from the File menu, click Print.

——Or——

—— If the document is not open, drag and drop the document onto the printer icon for either a locally installed printer or a network printer.

[To view documents waiting to be printed](#)

# n

Double-click the icon for the printer.

— This displays the print queue containing print jobs.

If you have administrative privileges for the printer, you can use the printer queue dialog box to manage the printer queue and print jobs remotely. For example, administrators can pause and purge printer queues.

[To change printer settings](#)

# n

Right-click the printer icon, and then click Properties in the context menu.

— The settings you can change depend on the type of printer you have.

---

Tip — If you print a document to a file, you can change it to print to a printer in MS-DOS. At the MS-DOS prompt, type `copy filename.ext/b prn`.

---

With the Microsoft network clients and networks from other vendors supporting UNC paths, you no longer need a physical redirection to a printer to print. Instead, as soon as you double-click the installed network printer or drop a document onto a network printer in your Printers folder, the connection is automatically made for you.

---

Tip — You can quickly locate a printer on a particular server by choosing Run from the Start button, and then typing the server name (for example, `\\myserver`). You will be logged onto the server and prompted for a password, if needed. Then a Windows Explorer window appears so you can select the printer.

---

If you use a network client that does not support UNC connections, or if you need to have a redirected LPT port to support printing from a particular application, you can

still make a connection to a printer by using the appropriate network commands (such as `net use lpt1: \\SERVER\PRINTER` or `capture lpt1:`).

### Using a NetWare Print Server

---

If you are using Client for NetWare Networks and are logged onto a server for which you have administrative privileges, you can configure a NetWare server to store Point and Print information in the NetWare Bindery.

#### [To configure the NetWare server to store Point and Print information](#)

1. Right-click Network Neighborhood, and then click Find Computer.
  2. In the Find Computer dialog box, type the name of the print server, and then click its icon in the name list box when it is found.
  3. In the window for that server, double-click the icon for the printer. The print queue for that printer appears.
  4. In the print queue for the NetWare server, click Point and Print Setup.
  5. In the context menu, click Set Printer Model.
  6. In the Select dialog box, click the printer manufacturer in the Manufacturers list, and the printer in the Models list. Click OK.
  7. Right-click the NetWare printer queue again and, from the context menu, click Set Driver Path.
  8. Type the UNC path (in the form `\\SERVER\VOLUME\DIRECTORY`) for the driver files. For example:
  9. `\\NOVSVR\SYS\DRIVERS\EPSON24`
- Copy the appropriate files (as specified in MSPRINT.INF) to the printer path.

#### [To use Point and Print to connect to a NetWare printer](#)

1. From Network Neighborhood, double-click the NetWare server icon.
2. Drag and drop the print queue from the NetWare server window to your Printer Folders window, as shown here:  
— {ewc msdncd, EWGraphic, x0v 3 /a "psV.bmp"}
3. Follow the online instructions. The Add Printer Wizard prompts you to type a name for this printer.  
— Windows 95 automatically copies the files for the printer driver (including .DRV, .DLL, .HLP, and other files, as needed) to the Windows SYSTEM directory.

## Using Microsoft Print Services for NetWare

---

Windows 95 includes a Win32-based PSERVER capability in Microsoft Print Services for NetWare (MSPSRV.EXE), which can despool print jobs from NetWare queues to printers connected to computers running Windows 95. This means that a NetWare server (running NetWare version 2.15 or later) printer queue can direct print jobs to a printer attached to a computer running Windows 95 with Microsoft Client for NetWare Networks.

Notice that the computer running Windows 95 does not need to run File and Printer Sharing for NetWare.

Although a normal PSERVER on a NetWare network must be a dedicated computer and can spool jobs to as many as 16 printers, the computer running Windows 95 with Microsoft Print Server for NetWare can despool jobs from the NetWare print queue while it performs other tasks.

{ewc msdn cd, EWGraphic, x0v 4 /a "psV.bmp"}

When Microsoft Print Server for NetWare is set up, it tries to log onto the NetWare file server for which it is managing the queue. It can service one queue for printing to a single printer, locally attached to the computer running Windows 95.

Print Server for NetWare is not dedicated — it runs in the background, using no resource except for data packet polling at a set interval. This means it won't interfere with other things the user wants to do. (This is a configurable setting.)

Microsoft Print Server for NetWare uses the queue management services (QMS) API for queue services. It logs onto the NetWare print server, attaches to the print queue, and gets a handle. Then it polls the NetWare print server and receives a header that includes information about how to complete the print job. For example, the header might include information about whether to use a banner, how many copies to print, and other information about printing the job. Next, Microsoft Print Server for NetWare reads data from the job in the queue and uses Win32 calls to print to the printer. When the job is printed, it returns a call to the NetWare print server.

The PSERVER capability is provided on the Windows 95 compact disc in the ADMIN\NETTOOLS\PRTAGENT directory.

### To install NetWare PSERVER

1. In the Network option in Control Panel, click Add.
2. In the Select Network Component Type dialog box, click Service, and then click Have Disk and type the path name to the ADMIN\NETTOOLS\PRTAGENT directory.

### To enable the Microsoft Print Server for NetWare

1. Before you set up Microsoft Print Server for NetWare, check the NetWare print server and the MS-DOS computer configured as the PSERVER to make sure they are both working correctly.

— If you see the following message, you will know that the NetWare print server isn't configured correctly:

— Cannot determine print queue name.

2. In the Printers folder on the Windows 95 computer, right-click the printer to which the NetWare print queue will direct jobs. Then click Properties in the context menu.

3. From the Printer Server property sheet, click Enable Microsoft Print Server For NetWare.

— {ewc msdn cd, EWGraphic, x0v 5 /a "psV.bmp"}

4. From the list of servers, select the NetWare server on which the queue resides from the list.

— Note — You must have access to this server; only those NetWare servers to which you have access are listed. Access is determined by the user account under which you logged onto the network.

— When a NetWare server is selected, the available print server appears in the Print Server list.

5. As appropriate, adjust the time interval for polling the print queue. This setting can be adjusted as high as 15 seconds for maximum print server performance, or as low as 3 minutes for increased local performance. The default is 30 seconds. Click OK.

### Using DEC PrintServer Software for Windows 95

---

Digital Equipment Corporation (DEC®) PrintServer Software for Windows 95 provides support for printing directly to Digital PrintServer printers from a computer running Windows 95. This software allows extensive bidirectional communication, which allows printers to communicate both job and printer status in real time.

Also, PrintServer Software for Windows 95 systems lets you choose the best way to print your file. You can select the input and output trays; choose to print either duplex (double-sided) or simplex (single-sided); and print to any PrintServer printer anywhere on the network. PrintServer Software for Windows 95 provides automatic recovery in case of a printer jam so that pages are never lost.

DEC PrintServer Software for Windows 95 is provided on the Windows 95 compact disc in the ADMIN\PRTOOLS\DECPSMON directory.

### To install PrintServer Software for Windows 95

1. In the Add Printer option in Control Panel, click the Add Printer icon.
2. Use the Add Printer Wizard to connect to the Windows 95 compact disc. You will find PrintServer Software for Windows 95 in the ADMIN\PRTOOLS\DECPSMON directory.

For more information about the product, see the online Help file in the ADMIN\PRTOOLS\DECPSMON directory.

### Using the Hewlett-Packard JetAdmin Utility

---

The HP® JetAdmin Utility is an administrative tool used to install and configure Hewlett-Packard® printers connected to a network using an HP JetDirect print server (network interface). The HP JetAdmin utility operates as a Microsoft Windows utility and can be used for networking when a Novell NetWare server is available or when the Novell NetWare file server (peer-to-peer) is not available.

From the HP JetAdmin main window you can:

n

Select New to set up a new interface and printer.

n

Select Modify to change an existing configuration.

n

Select Properties to modify printer settings.



# n

Select Filter to determine which printers are shown in the list.

# n

Select Sort to choose the order in which the printers are shown in the list.

From the New or Modify window you can:

# n

Configure the HP JetDirect interface and printer.

# n

Add or remove print queues.

# n

Select Drivers to install and assign Windows printer drivers to a network  
printer.

n

Select notification to enable notification of printer error conditions to users or groups of users.

n

Select the printer operating mode.

n

Set or change the printer description.

The HP Jet Admin utility is provided on the Windows 95 compact disc in the ADMIN\NETTOOLS\HPJETADM directory. For more information about this product, see the Help file in that directory.

[To install the HP Jet Admin Utility](#)

1. In the Network option in Control Panel, click Add.
2. In the Select Network Component Type dialog box, click Service, and then click Have Disk and type the path name to the ADMIN\NETTOOLS\HPJETADM directory.

*Technical Notes on Windows 95 Printing*

---

This section presents technical information about the following features of the Windows 95 printing subsystem:

n

Enhanced metafile spooling

n

Bidirectional communication support

n

Printer driver support

n

Extended capabilities port support

n

Improved printing support for MS-DOS — based applications

# n

Support for deferred printing

# n

Image Color Matching support

Many changes to Windows 95 affect printing. The most noticeable of these is that all output to non-PostScript® printers will spool as enhanced metafiles (EMFs), instead of raw printer data as in Windows 3.1. When you direct an application to print, it prints more quickly (as much as twice as fast as Windows 3.1), so you can resume work much more quickly.

The following diagram shows how Windows 95 spools EMFs when printing from Windows-based applications. EMFs include instructions for how the document is to be printed. For example, if a document contains a solid black rectangle, the EMF would contain a command to draw a rectangle with the given dimensions, fill it in with a solid color, using the color black.

```
{ewc msdncl, EWGraphic, x0v 6 /a "psV.bmp"}
```

Instead of the raw printer data being generated by the printer driver, EMF information is generated by the Graphical Device Interface (GDI) before spooling. After the EMF is created, control is returned to the user, and the EMF is interpreted in the background on a 32-bit print subsystem spooler thread and sent to the printer driver. This results in control being returned to the user in significantly less time than having to wait for the print calls to be fully interpreted by the printer driver directly.

### [To disable enhanced metafile spooling](#)

1. From the Start menu, choose Settings, and then click Printers.
2. Right-click the icon for your printer, and then click Properties.

3. Click the Detail tab, and then click Spool Settings.

4. In the Spool Settings dialog box, select RAW from the Spool Data Format list. Click OK.

`{ewc msdncl, EWGraphic, x0v 7 /a "psV.bmp"}`

Windows 95 detects Plug and Play-compliant printers that return device ID values (as described in the IEEE 1284 specification) through BIDIRECTIONAL PARALLEL COMMUNICATION. This feature is of benefit to applications because they can use it to query the printer directly to find out about its physical attributes.

Bidirectional communication allows for the following:

n

Accurate identification of attached devices

n

Improved ease of use when installing new components

n

Optimized performance by enabling intelligent communication between  
host and peripheral

# n

## Dynamic event notification in real time

One of the immediate benefits of bidirectional communication is being able to initially configure device driver settings on the server without user intervention. The printer driver can automatically determine how much memory the printer has, what device fonts are available, and so on.

Bidirectional communication also allows printers to send unsolicited messages to Windows 95 and to applications. For example, the printer might send an “out of paper” or “printer offline” message. Bidirectional communication enables much more detailed status reporting on a wider variety of information such as toner low conditions, paper jams, maintenance needs, and so on.

The Windows 95 device driver model includes two parts, a universal driver and a minidriver. This device driver model makes it easier for printer manufacturers to create drivers for their printers. Windows 95 provides the universal printer driver which communicates with other parts of the operating system and includes information pertinent to all printers. The minidriver provided by the printer manufacturer communicates with this universal driver and with the printer itself. Windows 95 also provides a PostScript® minidriver.

---

Note — Minidrivers written for Windows 95 also work with the Windows NT 3.5 universal printer driver.

---

```
{ewc msdn cd, EWGraphic, x0v 8 /a "psV.bmp"}
```

### [Universal Printer Driver](#)

The Windows 95 universal printer driver supports mainstream page description languages, including HP® PCL®, Epson® ESC P/2, Canon® CaPSL, Lexmark PPDS, monochrome HP GL/2, and most of the older dot matrix technologies. Almost all non-PostScript printer drivers provided with Windows 95 are based on universal driver technology.

The universal printer driver has full support for device-resident Intellifont and TrueType® scalable device fonts. It also supports downloading of TrueType outlines.

to PCL printers with TrueType rasterizers.

The universal printer driver includes the following:

n

Full 600 dots per inch (dpi) support. Changes allow future expandability to higher resolutions.

n

Support for downloading TrueType outlines to PCL printers with TrueType rasterizers. Enhancements offer support for downloading unbound TrueType outlines and of character sets with more than 256 characters.

n

Monochrome HP GL/2 support, providing full LaserJet® 4 functionality.

n

Generic Text support using TTY.DRV.

n

Support for ESC P/2 raster graphics directly through the universal driver,  
rather than through minidrivers.

n

Easy-to-use property sheets for configuring printer driver settings.

#### [PostScript Minidriver](#)

Microsoft developed a PostScript minidriver by working closely with Adobe. This  
minidriver offers the following features:

n

PostScript Level 2 support. This feature is automatically enabled for  
printers reporting as Level 2 from their PPD.

n

Additional support for Image Color Matching (ICM). The PostScript driver  
allows the server to offload ICM to the PostScript processor to improve  
performance. This flexibility allows you to take advantage of color raster  
enhancements on either the printer or the server.



n

Control over output data format. The PostScript minidriver supports

CTRL+D handling, Binary Communications Protocol (BCP) and Tagged Binary Communications Protocol (TBCP), and pure binary (8-bit) channels (AppleTalk®).

n

Support for version 4.2 PPD files. These are converted to driver-readable

format. WPD files are still supported for compatibility.

n

Tracking of PostScript virtual memory availability in the printer. This allows

you to print more complex documents than you could with Windows 3.1. However, if the printer sends a message saying it can't print because it doesn't have enough virtual memory, you can work around the problem by changing the PostScript options settings from Optimize for Speed to Optimize for Portability.

n

Easy-to-use property sheets for configuring printer driver settings.

# n

Support for installable device options, as described in the .PPD file,  
through the user interface.

An extended capabilities port (ECP) provides high-speed printing and support for  
ECP parallel ports and ECP devices is included in Windows 95. If you have an ECP  
parallel port, you can connect either ECP or non-ECP devices to the port. In either  
case, using an ECP parallel port will improve I/O performance, although ECP  
devices will show the greatest I/O gains.

An ECP parallel port has five possible configurations (defined on the port's  
Resources property sheet) as shown in the following list:

Basic Standard  
c I/O ranges  
Conf for LPT  
igur ports only  
atio  
n 0

Basic Standard  
c I/O ranges  
Conf for LPT  
igur ports and  
atio any IRQ  
n 1

Basic Standard  
c I/O ranges  
Conf for LPT  
igur ports, IRQ,  
atio and any  
n 2 DMA  
setting

Basic Any I/O  
c ranges for  
Conf LPT ports  
igur

atio only  
n 3

Basi Any I/O  
c ranges for  
Conf LPT ports  
igur and any  
atio IRQ setting  
n 4

### [To enable ECP support in Windows 95](#)

1. Consult your computer (or add-in card) manual to determine the IRQ and DMA settings selected for each of the ECP ports you want to use. You'll need this information to enable ECP support.
2. In the System option in Control Panel, click the Device Manager tab.
3. Click Ports (COM & LPT), and then select the Extended Capabilities Port entry. (Notice that you will only see this entry if an Extended Capabilities port was detected on your computer. If you have multiple ECP ports, you must repeat Steps 6 through 10 to configure each port's DMA and IRQ values.)
4. Click the Properties button in the dialog box, and then click the Resources tab. This property sheet shows an I/O range that has automatically been detected.
5. In the Settings Based On field, select Basic Configuration 2. (See the previous table for a description of possible settings for this field.)
6. In the Resource Settings list, click Interrupt Request, and then click Change Settings.
7. In the Edit Interrupt Request dialog box, type the IRQ value you noted in step 1. Click OK.
8. In the Resources property sheet, click Direct Memory Access.
9. In the Edit Direct Memory Access dialog box, type the DMA value you noted in step 1. Click OK.
10. Shut down and restart Windows 95 for the changes to take effect. After restarting, you can take advantage of fast I/O capabilities offered by the ECP port.

With Windows 3.1, users printing from MS-DOS—based applications could not take advantage of the Windows-based spooling functionality offered by Print Manager, and encountered device contention issues when trying to print from MS-DOS—based applications at the same time as printing from Windows-based applications.

Windows 95 addresses the print issues in Windows 3.1 by incorporating the functionality for an MS-DOS — based application to spool directly to the 32-bit Windows 95 print spooler. This support is integrated into a print spooler virtual device, which takes the output destined for a printer port and first places it in the Windows 95 print spooler before sending the data to the printer. This functionality works with all existing MS-DOS — based applications, and results in quicker return-to-application time through the use of the spooling mechanism. Although MS-DOS — based applications do not benefit from EMF spooling (which is supported only for printing from Windows-based applications), users won't encounter device contention issues, and will instead experience smoother background printing and improved printing performance in Windows 95. The print spooling support for use with MS-DOS — based applications is automatically installed and configured. Handling is transparent to the user.

The Windows 95 print subsystem also features support for deferred printing. This capability allows users not connected to a printer to generate print jobs, which are stored on their local computers for later printing. This feature is handy for users working in a location away from the printer, and for users in the office who temporarily lose printer connections because of network or printer problems, for example. Users can create print jobs from Win16-based, Win32-based applications, or MS-DOS — based applications while on the road, and then print on a physical printer upon returning to the home or office. Items not immediately printed are held in the print queue until the user reconnects to a printer.

#### [To create a deferred print job](#)

1. In Control Panel, double-click the Printers folder, and then click a printer.
2. From the File menu in the Printers dialog box, click Work Offline. The printer will be dimmed in the Printers folder.

Windows 95 includes Image Color Matching (ICM) support, enabling applications to offer better consistency between the color of images displayed on the screen and the color of images generated by an output device.

Using technology licensed from Eastman Kodak, Windows 95 includes Image Color Matching (ICM) support for display and printer drivers. ICM provides consistent, predictable color rendering from input, through monitor preview, to output. Applications that use ICM functionality enable portability of color information across applications, manipulating the graphic information; across users, to provide consistent use of colors; and across platforms, allowing color information to be easily moved to different systems where the ICM technology has been implemented.

Because Windows 95 includes ICM support as part of the operating system, application vendors can integrate ICM functionality into their applications, and thus take advantage of this new system service. To provide support for device-independent color matching, colors used in applications are tied to international (CIE-based) colorimetric standards, rather than in device-dependent form to specific hardware devices. The operating system then performs the appropriate color transformations to map the device-independent color representations to the colors supported by the physical device.

The key to ICM support is the use of a PROFILE, which represents the color properties of a monitor, printer, or scanner device. The ICM profile, provided as part of the software for the particular monitor, printer, or scanner by its vendor, resides in the Windows SYSTEM\COLOR directory. The profile format used by the ICM support in Windows 95, is the result of an industry consortium called INTERCOLOR 3.0 and is made up of many industry hardware vendors (including Kodak, Microsoft, Apple Computer, Sun Microsystems, and Silicon Graphics, among others) and industry standard-setting bodies. The InterColor efforts provide for a consistent cross-platform color standardization process that will result in industry-wide standards for defining ICM properties of output and display devices.

### *Windows 95 Fonts Overview*

---

Fonts are used to print text, display text on screen, and send text to other output devices. The Windows 95 operating system provides a set of Win32-based functions that developers can use to install, select, and query different fonts.

Windows 95 provides three basic kinds of fonts, which are categorized according to how the fonts are rendered for screen or print output:

n

TrueType fonts are stored as mathematical models which define the

outline of each character. They are much easier to work with than vector fonts because they appear in the same way on the screen and as on the printed page. TrueType fonts can be scaled and rotated.

n

Raster fonts are stored in files as bitmaps and are rendered as an array of dots for displaying on the screen and printing on paper. Raster fonts cannot be cleanly scaled or rotated.

n

Vector fonts are rendered from a mathematical model, where each

character is defined as a set of lines drawn between points. Vector fonts can be scaled to any size or aspect ratio, but are much more limited than TrueType fonts. They are provided in Windows 95 to ensure backward compatibility with plotter devices.

Raster and vector font files have .FON filename extensions. TrueType font files have .TTF filename extensions.

---

Note — In Windows 95, there is a single .TTF file, and the pointer information is in the Registry as described in “Loading Fonts in Windows 95” later . For TrueType fonts in Windows 3.1, there were two files for each font: the .FOT file contains a relatively short header with pointer information and the .TTF file contains the actual font data.

---

TrueType fonts are shapes that are described by their outlines. Instead of being composed of bitmaps (as raster fonts are) or lines (as vector fonts are), TrueType fonts consists of a series of contours.

The TrueType downloadable fonts included with Windows 95 support the Arial, Courier, Symbol, and Times New Roman font families. The following table shows TrueType files included with Windows 95.

---

|     |     |     |     |    |
|-----|-----|-----|-----|----|
| Ari | AR  | AR  | AR  | A  |
| al  | IAL | IAL | IAL | RI |

.TT BD BL AL  
 F .TT TT I.T  
 F F TF  
  
 Co CO CO CO C  
 urie UR UR UR O  
 r .TT BD BL U  
 Ne F .TT TT RI.  
 w F F TT  
 F  
  
 Tim TI TI TI TI  
 es ME ME ME M  
 Ne S. SB SB E  
 w TT D. I.T SI.  
 Ro F TT TF TT  
 ma F F  
 n  
  
 Sy SY N/ N/ N/  
 mb MB A A A  
 ol OL  
 .TT  
 F  
  
 Wi WI N/ N/ N/  
 ngd NG A A A  
 ing DI  
 NG  
 .TT  
 F

---

Note — The Courier New TrueType Font also ships with the OEM character set to support use of Courier New TrueType fonts in MS-DOS-based applications.

---

TrueType has many benefits over other kinds of Windows 95 fonts:

n

What you see is really what you get, because Windows 95 uses the same font for both screen and printer. You don't have to think about whether you have a specific point size for a particular printer or for your display.

n

You can scale and rotate TrueType fonts, and they look good in all sizes and on all output devices that Windows 95 supports.

n

Your document will look the same when printed on different printers. And any printer that uses a Windows 95 universal driver can print TrueType fonts.

n

Your document will look the same if you move it across platforms. For example, the text you format in Microsoft Word for Windows 95 will look the same if you open the same document in Word for the Macintosh®.

n

Each TrueType typeface requires only a .TTF file to create fonts in all point sizes at all resolutions for all output devices. (Raster fonts need separate files for each point size, resolution, and display device).



# n

TrueType is integrated with the operating environment, so all Windows 95 applications can use TrueType fonts like they do other Windows 95 raster fonts without changes or upgrades.

In many applications, TrueType fonts appear in the Fonts dialog box with a “TT” logo beside the typeface name. Typefaces that are device fonts have a printer icon beside their names in the list.

### [How TrueType Works](#)

TrueType fonts are stored as a collection of points and “hints” that define the character outlines. When a Windows 95 application requests a font, TrueType uses the outline and the hints to render a bitmap in the size requested. Hints are the algorithms that distort the scaled font outlines to improve how the bitmaps look at specific resolutions.

Each time you run Windows 95, the first time you select a TrueType font size, TrueType renders a bitmap of the selected characters for display or printing. Because of this, the initial font generation may be slower than with Windows 95 raster fonts. However, Windows 95 stores the rendered bitmaps in a font cache, so each subsequent time the font is used during that Windows 95 session, display or printing will be just as fast as for a Windows 95 raster font.

Windows 95 users can choose any of the following methods for printing TrueType fonts on PCL printers:

*Download TrueType as outline soft fonts.*

Windows 95 downloads the TrueType font as a scalable outline font. The printer performs all rasterization. This option is available only on PCL printers which can rasterize TrueType fonts, for example, HP LaserJet 4 printers.

*Download TrueType as bitmap soft fonts.*

Windows 95 downloads the TrueType font as a bitmap soft font. Each set of characters for each font size used is rasterized by Windows 95, then sent to the printer as a separate bitmap font. This is the default method used for PCL printers that cannot rasterize TrueType fonts, for example, HP LaserJet II and III series printers.

### Print TrueType as graphics.

Windows 95 rasterizes a whole page of TrueType fonts as a graphic before sending it to the printer. This option is used for PCL printers which cannot accept the format used for downloading TrueType as bitmap soft fonts, for example, the original HP LaserJet and LaserJet Plus printers. This option is also used sometimes for troubleshooting printing problems.

Raster fonts are bitmaps supplied in different sizes for specific video display resolutions. The Windows 95 fonts MS Serif, MS Sans Serif, Courier, System, and Terminal are raster fonts.

A raster font file contains data that describes all the characters and style of a typeface for a specific display device. Windows 95 provides several raster font sizes for various display devices. For example, MS Serif comes in point sizes 8, 10, 12, and 14 for CGA, EGA, VGA, and 8514 display devices.

Windows 95 can scale raster fonts to even multiples of their supplied sizes. For example, MS Serif can be scaled to 16, 20, 24, and so on. Bold, italic, underline, and strikethrough styles can also be generated from a standard raster font, but if you try to scale them too far from their original size or style, they become jagged.

Six resolutions of raster screen fonts are shipped with Windows 95. If used for printing, raster fonts print text and graphics as bitmaps or raster lines. The resolutions are identified by a letter appended to the filename of the font as described in the following table.

### Raster Font Files

|        | <u>x</u> | <u>y</u> |
|--------|----------|----------|
| B EG   | 1.3      | 96 72    |
| * A    | 3:1      |          |
| * dis  |          |          |
| pla    |          |          |
| y      |          |          |
| C Prin | 1:1      | 60 72    |
| * ter  | .2       |          |
| *      |          |          |
| D Prin | 1.6      | 12 72    |
| * ter  | 6:1      | 0        |
| *      |          |          |

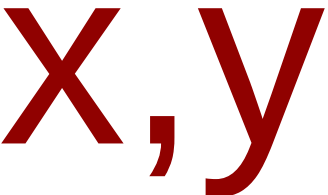
E VG 1:1 96 96

A  
dis  
pla  
y

F 851 1:1 12 120

4 0  
dis  
pla  
y

---

\*  indicates the height/width aspect ratio, in pixels per inch.

\*\* These fonts are not included on the Windows 95 installation disks.

---

The letter that identifies the resolution is appended to the raster font filenames. For example, the files for the 8514 raster fonts are COURF.FON, SSERIFF.FON, SERIFF.FON, SMALLF.FON, and SYMBOLF.FON.

---

Co CO AN Fixe  
uri UR SI d-  
er x.F widt  
ON h  
with  
serif  
s

M SS AN Prop  
S ERI SI ortio  
Sa Fx. nal-  
ns FO widt  
Se N h  
rif sans  
serif

M SE AN Prop  
S RIF SI ortio  
Se x.F nal-  
rif ON widt

|     |     |    |        |
|-----|-----|----|--------|
|     |     |    | h      |
|     |     |    | serif  |
| S   | SM  | AN | Prop   |
| m   | AL  | SI | ortio  |
| all | Lx. |    | nal    |
|     | FO  |    | smal   |
|     | N   |    | l size |
| Sy  | SY  | Sy | Math   |
| m   | MB  | mb | sym    |
| bo  | OL  | ol | bols   |
| I   | x.F |    |        |
|     | ON  |    |        |

Raster fonts can also be printed if their resolution and aspect ratio are close to what your printer requires. If you do not see raster fonts for your printer in a Fonts dialog box, check your printer's horizontal and vertical resolution and compare it with the table above. If there is a close match, choose the Fonts icon in Control Panel and make sure the appropriate font set is installed. If there is no close match, you cannot print the Windows 95 raster fonts on your printer. You might be able to print raster fonts in a different resolution, if the other resolution has an aspect ratio that matches your printer. Some printer drivers cannot print raster fonts, regardless of the aspect ratio.

You can also purchase raster fonts as both screen and printer fonts that work with Windows 95. Font vendors include Bitstream® Fontware™, Hewlett-Packard Type Director, Adobe® Type Library, and SoftCraft WYSIfonts!®

Vector fonts are a set of lines drawn between points, like a pen plotter drawing a set of characters. They can be scaled to virtually any size, but generally they do not look as good as raster fonts in the sizes that raster fonts are specifically designed for.

Vector fonts are stored in Windows 95 as collections of GDI calls and are time-consuming to generate. But these fonts are useful for plotters and other devices where bitmapped characters can't be used. Before TrueType, vector fonts were also used in some applications to create large characters or characters that were rotated or distorted from the baseline.

Some Windows 95 applications automatically use vector fonts at larger sizes. Some applications allow you to specify at what point size you want to use vector fonts. For example, the "Vector Above" setting in Aldus® PageMaker® specifies the point size at which PageMaker will switch to vector fonts.

The Windows 95 fonts Roman, Modern, and Script are vector fonts. Although the

vector fonts use the ANSI character set, they are marked internally as an OEM character set. The three vector font files are ROMAN.FON, SCRIPT.FON, and MODERN.FON.

Besides the font-rendering mechanism (that is, raster, vector, or TrueType), Windows 95 fonts are described according to the output device:

n

Screen fonts are font descriptions that Windows 95 uses to represent characters on the display devices. (TrueType fonts, as listed in the following screen display, act as both screen and device fonts.)

n

Printer fonts are the font descriptions used by the printer to create a font.

`{ewc msdn cd, EWGraphic, x0v 9 /a "psV.bmp"}`

Windows 95 applications can use three kinds of printer fonts:

n

Device fonts are fonts that actually reside in the hardware of your printer. They can be built into the printer itself or can be provided by a font cartridge or font card.

n

Printable screen fonts are Windows 95 screen fonts that can be translated for output to the printer.

n

Downloadable soft fonts are fonts that reside on your hard disk and are sent to the printer when needed.

Not all printers can use all three types of printer fonts. Plotters, for example, cannot use downloadable soft fonts.

The user interface in Windows 95 relies on TrueType fonts. However, three fonts — System, Fixed, and OEM (or Terminal) — are installed to support display and output devices to support other applications that may require these fonts. Each of these fonts supports two display types — 8514/a (1024x768) resolution and VGA (640x480) resolution.

n

System is a proportional font used by default to draw menus, dialog box controls, and other text in Windows 95.

n

Fixed is a fixed-width font used in Windows 2.x and earlier versions as the system font (for menus and dialog boxes).

n

OEM font (also known as the Terminal font for U.S. and Europe) is a fixed-width font used, for example, to display the OEM text in the Windows 95-ClipBook Viewer. The OEM font also provides an OEM character set used by some Windows-based applications.

The system, fixed, and OEM fonts provided with Windows 95 are listed in the following table.

---

|     |       |       |
|-----|-------|-------|
| Sys | 8514  | VGA   |
| tem | SYS.  | SYS.  |
|     | FON   | FON   |
| Fix | 8514  | VGA   |
| ed  | FIX.F | FIX.F |
|     | ON    | ON    |
| OE  | 8514  | VGA   |
| M   | OEM.  | OEM.  |
|     | FON   | FON   |

Windows 95 also provides a set of fonts for displaying MS-DOS—based applications running in a window. By default, code page 437 (U.S.) fonts are installed. Other font files are included for international language support and are identified by the code page number appended to the filename.

The following font files are provided with the associated code page translation table files.

---

CGA40 43 U.S.

WOA.F 7  
ON,  
CGA80  
WOA.F  
ON,  
DOSAP  
P.FON,  
EGA40  
WOA.F  
ON,  
EGA80  
WOA.F  
ON

APP85 85 U.S.  
O.FON 0

CGA40 85 Multi  
850.FO 0 lingu  
N, al  
CGA80  
850.FO  
N,  
EGA40  
850.FO  
N,  
EGA80  
850.FO  
N,  
VGA85  
O.FON

VGA86 86 Port  
O.FON 0 ugu  
ese

VGA86 86 lcela  
1.FON 1 ndic

VGA86 86 Fren  
3.FON 3 ch  
Can  
adia  
n

VGA86 86 Nor  
5.FON 5 wegi  
an/



---

Note The TrueType fonts included on the Windows 95 compact disc contain approximately 650 characters that cover all the European languages. For more information about installing multilanguage support in Windows 95, see Chapter 34, "International Windows 95."

---

### *How Fonts Are Matched in Windows 95*

---

When an application requests characters to print or display, Windows 95 must find the appropriate font to use from among the fonts installed on your computer. Finding the font can be complex because, for example, your document may contain fonts that aren't available on the current printer, or there may be more than one font with the same name installed on your computer.

The basic rules that Windows 95 uses for matching a font are:

n

If the font is a TrueType font, then TrueType renders the character and the result is sent to the display or to the printer.

n

If the font is not a TrueType font, then Windows 95 uses the font mapping table to determine the most appropriate device font to use.

When Windows 95 uses the font mapping table to match screen fonts to printer fonts, the characteristics used to find the closest match are, in descending order of importance: the character set, variable versus fixed pitch, family, typeface name, height, width, weight, slant, underline, and strikethrough. The Windows 95 search algorithm for finding fonts is the same as the one in Windows 3.1. If the necessary size and bitmap are available, the algorithm proceeds as follows:

1. Use the font found in the printer's ROM.

2. Use the font found in the printer's cartridge slot.
3. Use the downloadable soft font.
4. Use the TrueType font.

You can also choose from among fonts by comparing similar ones in the Fonts folder.

#### [To manually match fonts](#)

1. Double-click the Fonts folder in Control Panel.
2. In the Fonts folder, choose List Fonts By Similarity from the View menu.

If you choose almost any TrueType font, Windows 95 sorts the list of fonts in descending order with the least similar font listed last.

The following table shows the types of Windows 95 fonts that can be printed on different kinds of printers.

---

|     |    |    |    |     |
|-----|----|----|----|-----|
| D   | Ye | Ye | No | Yes |
| ot  | s  | s  |    |     |
| m   |    |    |    |     |
| at  |    |    |    |     |
| rix |    |    |    |     |
| H   | Ye | No | Ye | Yes |
| P   | s  |    | s  |     |
| P   |    |    |    |     |
| C   |    |    |    |     |
| L   |    |    |    |     |
| P   | Ye | No | Ye | Yes |
| os  | s  |    | s  |     |
| tS  |    |    |    |     |
| cri |    |    |    |     |
| pt  |    |    |    |     |
| Pl  | Ye | No | Ye | No  |
| ott | s  |    | s  |     |
| er  |    |    |    |     |

#### Loading Fonts in Windows 95

---

Windows 95 no longer checks the [fonts] section in WIN.INI to load fonts. The locations for all fonts are stored only in the Registry and are automatically moved

when a legacy application installs a new font in the [fonts] section of WIN.INI.

When Windows 95 starts, it loads both the raster fonts and the TrueType fonts listed in the Registry.

n

The raster fonts are resolution-dependent and are listed in the Registry

key named Hkey\_Current\_Config\Display\Fonts. (This supports multiple docking scenarios for portable computers where there can be a different resolution on the LCD screen vs. the docking station.) The master list of all possible resolutions for raster fonts is stored in the Registry under the following key:

Hkey\_Local\_Machine\Software\Microsoft\Windows\CurrentVersion\FontSize

n

The TrueType fonts are loaded from the location specified in the key:

Hkey\_Local\_Machine\Software\Microsoft\Windows\CurrentVersion\Fonts

Printer drivers, when they are loaded later in the startup process, look in WIN.INI to load any possible soft fonts for enumeration to applications.

---

Notes — Because the fonts are stored in the Registry, there is no limit on the number of TrueType fonts that can be installed. In addition, almost 1000 fonts can be used simultaneously and the same number can be printed in the same document.

In Windows 95, the Enable TrueType Fonts option is no longer available, because the user interface depends heavily upon TrueType. The font installer is a special directory in the folder.

---

### *Installing Additional Fonts*

---

In Windows 95, fonts can be installed in your computer in several ways:

n

Windows 95 installs TrueType and its screen fonts automatically during installation. When you specify a printer and other options in the Printer Setup dialog box, Windows 95 includes information about font cartridges and built-in fonts for your printer.

n

Install more TrueType fonts from disks.

n

Install soft fonts from other vendors on your hard disk by using the utility supplied by the manufacturer. Then use the Fonts tool in Control Panel to install the fonts for Windows 95.

n

Install a new font cartridge in your printer.

For more information about using the Font Installer, see online Help.

[To install new fonts on Windows 95](#)

1. From the Control Panel, double-click the Fonts icon.
2. From the File menu, choose Install New Font.

3. Use the Directories and Drives fields to specify the location of the font file.
4. Select the font you want to install and click OK.

---

Note—— If a TrueType font becomes corrupted, Windows 95 detects this and marks that font as unavailable during the remainder of that Windows session and prevents it from being rendered any longer. You can choose to uninstall the font at that point.

---

[To install cartridge fonts available to Windows-based applications](#)

n

Use the installation program that came with the cartridge.

—— Or ——

1. If you are using an HP LaserJet or DeskJet® PCL printer, right-click the printer's icon and click Properties in the context menu.
2. From the printer's Fonts property sheet, click the Install Printer Fonts button.
3. In the HP Font Installer dialog box, select the cartridge fonts you want to install, and then click Exit. Click OK.

If you use the Install Printer Fonts button to install fonts, they will appear in the Cartridge list in the printer's Fonts property sheet. If you use another installation program, they will not appear in this list, but will still be available for use with Windows-based applications.

[To make installed cartridge fonts available to Windows-based applications](#)

1. Make sure that the font cartridge is inserted properly in the printer.
2. Right-click the printer's icon and click Properties in the context menu.
3. From the printer's Fonts property sheet, select the cartridge fonts you want to use.

*Troubleshooting Printing Problems*

---

This section describes how to identify and resolve printing problems.

Windows 95 provides an online Print Troubleshooter. Use this tool first to try to solve printing problems you may have. Check the following troubleshooting procedures in this section for additional help on resolving printing problems.

*To get online Help for printing*

1. Click the Desktop and press F1 to start Windows 95 Help.
2. Click Index and type *printing*

*To use the Print Troubleshooter*

1. In Windows 95 Help, click Troubleshooting.
2. Click If You Have Trouble Printing. Print Troubleshooter asks a series of questions.
3. Click on the answers that apply and try the suggested steps to fix the problem.

This section describes conditions which may interfere with installing a printer, and how to fix them.

*No printers are listed in the Print dialog box.*

If you cannot select a specific model (because no list appears), verify that the printer INF file exists. The PRTUPD.INF file in the Windows INF directory stores the information displayed in the Manufacturer and Model lists.

*Setup is unable to find printer driver files.*

If the Add Printer Wizard cannot find or access the needed printer driver files, it checks the installation drive and directory. If it cannot locate needed files, a dialog box prompts you to specify the path to the required printer driver files. To continue, either type the location of the printer driver files (installation source directory), or click Browse to select the drive and directory location.

*File Copy error occurs during printer installation.*

If an error occurs during the installation process, the Add Printer Wizard displays the specific error information including the source and destination paths and filenames it was trying to copy when the error occurred. To continue, verify the location of the

specified files, and retry the installation.

This section describes problems or errors that may happen when printing and explains how to fix them.

*Cannot print to a local printer.*

n

Clear the print buffer. Turn the printer's power off, wait about five seconds, then turn the printer on, and try printing again.

n

Try printing a test page as described earlier.

n

Verify that there is paper in the printer, that the printer is not jammed, and that there are no problems with the printer cartridge or toner.

n

Trying printing to a file.

# n

If you can print to a file, try copying the file to the printer port.

— To copy a file to a printer port (assuming a printer output filename of TEST.PRN):

— copy /b test.prn lpt1:

— If copying the file to the printer port prints the document correctly, the problem is in the communication between Windows 95 and the printer. Check the following (and consult your printer's documentation as needed for further information):

# n

Check the printer, making sure it is plugged in, turned on, and online.

# n

Check the printer's self-test program.

# n

Check the printer connection and printer cable.



n

Check the printer configuration.

n

Check the printer driver. (See the procedure following this list.) Try to print using the Generic/Text Only or Generic Laser Printer driver. If this works, check the driver version, and either reinstall or upgrade the driver.

n

Start the computer by pressing F8 and choosing the Command Prompt Only option. Check printing from real mode and check printer memory allocation. If you can print from real mode, run *msd*.

n

On the Utilities menu select Test Printer, and try printing.

— If, at this point, you still can only print by starting the computer with SHIFT+F5:

n

Try temporarily renaming SYSTEM.DAT to SYSTEM.ORG.

n

Copy a backup SYSTEM.DAT to the Windows directory and restart the  
computer.

n

Reinstall the printer driver, and retry the printing operation.

n

If the printing operation fails, delete SYSTEM.DAT from the Windows  
directory.

n

Rename the SYSTEM.ORG back to SYSTEM.DAT.

n

Try to print again.

n

Check for conflicting applications. If you can print using a different application, check the failing application's configuration, and reinstall the application if needed.

n

Try disabling all spooling and retry. (See the procedure named "To Clear Residual Spool Files" later .)

n

Try disabling Enhanced Metafile spooling, as described earlier , which is enabled by default for all non-PostScript printers and retry.

[To check the printer driver](#)

1. Right-click on the printer's icon and click Properties.
2. Click the Details tab and verify the driver name is correct.
3. Click the Device Options tab, and then click the About button. Verify the driver version.

*To disable all spooling and print directly to the port*

1. Right-click on the printer's icon and click Properties.
2. Click the Details tab and click Spool Settings.
3. Click Print Directly To The Printer So That No Disk Space Is Used.

*Graphic images don't print correctly or output is garbled.*

n

Press F8 and choose option 3, Safe Mode, to start the computer. Then  
retry printing.

n

Try disabling Enhanced Metafile spooling (as described earlier ).

n

Try printing to a PostScript driver if supported by the printer (if this prints,  
then the problem is a UNIDRV.DLL error).

n

If PostScript fails, there's either a problem with the graphic device  
interface (GDI) or with the application. If it's an application problem, try to print  
another file or try to print from another application.

n

Try printing shorter jobs, or fewer jobs at a time. If you are printing a long document or several documents, the spooler may be printing one page over another.

*The printer outputs partially printed pages.*

n

If the printed page is missing part of a graphic image, this may mean that the printer has insufficient memory. To check for insufficient printer memory, try reducing print resolution.

n

Try printing the same graphic image from a different document and application.

n

Check the printable region by running a print test from the printer.

n

If the printed page is missing a section of text, check the font that is used, and verify that the font is valid, and correctly installed (check the Fonts folder).

n

Try printing from a different document with the same font.

n

Try printing from the same document with a different font.

n

Try enabling Print TrueType as Graphics.

*Printing is slower than normal.*

n

Press F5 to start the computer in Safe Mode and then retry printing.

n

Right-click on the printer's icon and click Properties. Click the Details tab and click Spool Settings. In the Spool Settings dialog box, verify that Spool Data Format lists EMF. (If set to RAW, change it to EMF.)

n

Also try the following:

n

Use the Disk Defragmenter utility to check for excessive hard disk fragmentation, and defragment the hard disk drive.

n

Check for available disk space for temporary files.

n

Check for available system resources.

n

Check the printer driver and reinstall, if necessary.

n

Right-click the printer icon and click Properties, then click Fonts, and then

click Download TrueType As Bitmap Soft Fonts to disable printing TrueType as graphics.

[To disable Print TrueType as Graphics](#)

1. Right-click on the printer's icon and click Properties.
2. Click the Fonts tab and click Download True Type as Bitmap Soft Fonts, if Print TrueType Fonts As Graphics are currently in use.

Computer stalls while printing.

[To troubleshoot a computer that stalls while printing to a local printer](#)

n

Restart the computer, and press F5 to start the computer in Safe Mode.



n

Retry printing.

n

Check the printer driver version and reinstall the printer driver if needed as described earlier n this section.

n

Check the video driver and reinstall the video driver if needed.

n

Check for adequate free disk space on the TEMP drive.

n

Delete residual spool files and retry. (See “To clear residual spool files” later.)

[To troubleshoot a computer that stalls while printing to a network printer](#)

1. Restart the computer, and press F6 to start the computer in Safe Mode with Network Support.
2. Complete steps 2 through 6 of the preceding procedure.

*You send a document to print, but nothing comes out at the printer.*

When you send a document to print, but nothing comes out at the printer, you may need to disable Enhanced Metafile spooling (an option available for UNIDRV and DeskJet printers). You should also ensure that the spooler has cleared the unprinted spool file.

#### *To clear residual spool files*

1. Delete spool jobs if no output occurs from the print job (.SPL files in the Windows SYSTEM\POOL\PRINTERS directory).
2. Check the TEMP directory and delete all .TMP files. Then restart the computer and retest printing.
3. Check that the system has enough free hard disk space.

---

Note — An error message may appear, although it may be hidden behind other windows, when you print from a Win32-based application. Press ALT+TAB to bring this message box to the foreground of your desktop.

---

#### *Troubleshooting Font Errors*

---

This section describes problems with fonts that may occur, and describes how to correct them.

*Fonts do not print correctly.*

Double-click the Fonts icon in Control Panel and ensure that the font you were trying to print is installed. Then double-click the font's icon, and then click the Print button to print the font. If the Font icon has a small arrow in the lower-left corner, it is not resident in the FONTS directory.

Also try the following:

n

Print using a different font.

n

Print a different document using the same font.

n

Print with a different application using the same font.

n

Print to a different printer using the same font.

n

Verify the printer driver version, size, and date.

# n

Print to a file and then copy the file to a port to see if the driver is creating

the correct output, to help delimit whether the spooler is causing the problem or if the driver output is failing. For example:

copy test.prn /b lpt1:

# n

If the printer supports PostScript and PCL, try printing in each format.

# n

If it is a TrueType font, enable Print TrueType as Graphics.

# n

Print with a different minidriver, such as the Generic/TTY.

# n

Try using a different code path (UNIDRV, PostScript, and DeskJet color).

When printed, fonts appear distorted or unreadable.

n

In the application, change to Print Preview mode to see if the fonts appear correct on-screen.

n

Change the font size to see if the problem recurs with a larger or smaller size font.

n

Use a different font to see if the original font is corrupted or bad.

n

Cut and paste the formatted text into another application and print it. If the font errors still occur, the problem may be related to the specific font.

n

Load a PostScript driver and select Download as TrueType. If the job

prints correctly, the problem was with the printer driver or UNIDRV.DLL. Otherwise, the problem is probably in the GDI.

n

For a laser printer, right-click the printer's icon and click Properties. In the

Fonts property sheet, click Send Fonts As. In the Send TrueType Fonts As list box, select Bitmaps. Click OK.

n

Check printer memory. If the image is large, you may need more memory.

*When printed, fonts overlap.*

n

Try different resolutions, using the same printer. If a higher or lower print

resolution works, the printer driver is probably at fault. Try using another printer driver.

—Note— If the problem persists with more than one printer driver, the problem is likely to be at the GDI level.

n

For a laser printer, right-click the printer's icon and click Properties. In the

Fonts property sheet, click Send Fonts As. In the Send TrueType Fonts As list

box, select Bitmaps. Click OK.

n

Try printing the same information with a different font.

*Fonts do not print properly when underlined or strikethrough text is selected.*

n

If strikethrough or underlined text prints incorrectly, try a different  
application with the same font.

n

Print in a different orientation (that is, if portrait, change to landscape).

n

For a laser printer, right-click the printer's icon and click Properties. In the  
Fonts property sheet, click Send Fonts As. In the Send TrueType Fonts As list  
box, select Bitmaps. Click OK.

*Fonts are clipped when printed.*

n

Recheck the printable region by running a print test from the printer.

(Usually, there is a test button on the printer; press this to run a test.) Adjust the paper orientation if you can.

n

For a laser printer, right-click the printer's icon and click Properties. In the

Fonts property sheet, click Send Fonts As. In the Send TrueType Fonts As list box, select Bitmaps. Click OK.

n

Check the printer memory settings for the driver and printer. If you are

printing large images, the printer memory may be insufficient; try printing small images.

*Some parts of a TrueType font are rotated, but other parts are not.*

n

If this occurs because the printer can only print 180-degree and 90-degree

rotation (not odd-degree rotations), redefine the degrees of rotation for the image.



n

For a laser printer, right-click the printer's icon and click Properties. In the Fonts property sheet, click Send Fonts As. In the Send TrueType Fonts As list box, select Bitmaps. Click OK.

n

If the problem is font-related, try using another character set. Or, download TrueType fonts to the printer and try again.

*TrueType fonts do not display in an MS-DOS window.*

Sometimes changing the displayed font to a TrueType font in an MS-DOS window does not change the font on the screen. TrueType fonts cannot be displayed in an MS-DOS window if the MS-DOS program is running in graphics mode. To work around this problem, run the MS-DOS application in text mode and use bitmap fonts in the MS-DOS window.

[To change the font used in an MS-DOS window](#)

1. In the MS-DOS window, click on the MS-DOS icon in the upper-left corner of the window (or press ALT + SPACEBAR.)
2. Click Properties, and then click the Font tab.
3. Under Available types, click Both Font Types.
4. Click the Font size you want to display, and then click OK.

You can distinguish TrueType fonts by the "TT" designation; fonts without this designation are bitmap fonts.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Chapter 24 Introduction to Windows 95 Communications

This chapter describes how changes to the communications subsystem in Windows 95 have resulted in improved communications capabilities. It also briefly presents the new communications features that will be explained in other chapters in this section, and provides an overview of mobile computing features in Windows 95.

### *Overview of Communications in Windows 95*

---

The Windows 95 communications subsystem allows users to make simultaneous connections to a variety of communications services, including electronic mail, fax, and online services. With the Windows 95 user interface, connecting to another communication service is as easy as connecting to your network.

Windows 95 provides the following communications features:

*Easy modem installation and operation.*

{ewc msdncd, EWGraphic, x0w 0 /a "psW.bmp"}

Users can select and configure a modem just once and it will work for all applications created for Windows 95. The Modem option in Control Panel provides a central place for modem installation, or users can install a modem in an application created for Windows 95 the first time the application is run. After the modem is configured, any communications application that supports Telephony Application Programming Interface (TAPI) services can interact with it. Two other communications tools facilitate modem calling: HyperTerminal (an upgrade of Windows 3.1 Terminal) connects to and transfers files between computers, and Phone Dialer allows your computer to dial voice telephone calls. For information, see Chapter 25, "Modems and Communications Tools."

*Electronic mail and Microsoft Exchange.*

{ewc msdncd, EWGraphic, x0w 1 /a "psW.bmp"}

Microsoft Exchange is a universal information client built into the Windows 95 user interface that can read and send electronic mail from any message application that supports Messaging Application Programming Interface (MAPI) services. This includes LAN-based mail systems such as Microsoft Mail, Internet mail, or online mail systems from services such as CompuServe® or The Microsoft Network. It can also send and receive faxes and other remote messages. With Microsoft Exchange, network administrators can set up a separate postoffice for each workgroup and create profiles for each mail user. Users can easily move messages and documents between folders and documents, store address information in a Personal Address Book, and store messages and documents in a Personal Information Store. For information, see Chapter 26, "Electronic Mail and Microsoft Exchange."

### Microsoft Fax.

{ewc msdncd, EWGraphic, x0w 2 /a "psW.bmp"}

Microsoft Fax provides all the capabilities of a fax machine to a computer with a modem. With Microsoft Fax, users can exchange faxes and files as easily as printing a document or sending a mail message. Users can send a fax by composing a Microsoft Exchange message, or by using the Send option in a MAPI-compatible applications, such as Microsoft Word, or by printing to a fax printer. For information, see Chapter 27, "Microsoft Fax."

### Dial-Up Networking and mobile computing.

{ewc msdncd, EWGraphic, x0w 3 /a "psW.bmp"}

Dial-Up Networking and other Windows 95 mobile computing features provide remote users with complete network capabilities, including downloading and browsing electronic mail, accessing shared files, or running a client-server application. With Dial-Up Networking, mobile users can dial into remote access servers, such as a Windows 95 Dial-Up server, Shiva® Netmodem, Novell® NetWare® Connect and Windows NT servers, using the same network protocols and security features as their desktop computers. Other mobile computing features include Briefcase, which keeps documents up-to-date on two computers; Direct Cable Connection, which connects two computers for sharing resources; deferred printing capability, which lets you generate print jobs from a remote site and print them when you return to the office; and remote mail using the Microsoft Mail client that comes with Microsoft Exchange. For information, see Chapter 28, "Dial-Up Networking and Mobile Computing" and Chapter 26, "Electronic Mail and Microsoft Exchange."

### The Microsoft Network.

{ewc msdncd, EWGraphic, x0w 4 /a "psW.bmp"}

The Microsoft Network is a new online service that offers affordable and easy-to-use access to electronic mail, bulletin boards, chat rooms, file libraries, and Internet news groups. Around the world, Windows 95 users can access The Microsoft Network with a local phone call. It offers a wide range of information and services and is the single best place to get information and support for Microsoft products. For information, see Chapter 29, "The Microsoft Network."

### Internet Access.

{ewc msdncd, EWGraphic, x0w 5 /a "psW.bmp"}

Windows 95 provides all the basic protocols and utilities you need to connect a computer to a server that has access to the Internet. The chapter describes how to use Dial-Up Networking and the Network option in Control Panel to configure your

hardware and Windows 95 to access an Internet server. Basic tips for browsing and downloading information from the Internet are also offered. For information, see Chapter 30, "Internet Access."

### *Improved Communications in Windows 95*

---

The new Windows 95 new communications subsystem allows applications to transmit data quickly and reliably and to cooperatively share communications devices. The new kernel and communications architecture in Windows 95 provide the following benefits:

#### *Improvements over Windows 3.1.*

Windows 95 replaces the monolithic communications driver architecture of Windows 3.1 with a modular driver model to allow other software and communications device manufacturers to easily plug in new communications device drivers.

#### *High-speed reliability.*

Windows 95 supports reliable, high-speed communications because it keeps up with data coming in from the communications port, thus resulting in no lost characters due to interrupt latency. To quicken communications, the amount of code in the kernel that can only be used by one process at a time (critical sections) has been reduced. In addition, the network architecture and the 32-bit, protected mode file system of the communications subsystem reduce required mode transitions and interrupt latency. The baud rate in Windows 95 is limited only by the hardware characteristics of the computer, such as the processor speed and type of communications port.

#### *Higher data throughput.*

The 32-bit communications subsystem takes advantage of the preemptive multitasking architecture of Windows 95 to provide better responsiveness to communications applications, thus supporting higher data throughput. Consequently, communications transfers in Win32-based applications are not as affected by other tasks running in the system as were Win16-based applications under Windows 3.1.

#### *Support for time-critical protocols.*

The Windows 95 communications architecture supports time-critical protocols and controls real-time serial devices.

#### *Plug and Play support for communications devices.*

Plug and Play support simplifies installation and configuration of modems and other communications devices, and also detects existing modems.

Support for more robust communications devices.

Windows 95 supports communications devices with higher transmission speeds than base RS-232 devices. For example, it supports Integrated Services Digital Network (ISDN) cables, which can communicate at speed of 64 or 128 kilobits per second, if an ISDN vendor provides a driver.

Device sharing among communications applications.

Through the use of TAPI, Windows 95 provides consistent device-independent access to control communications devices for operations such as dialing and answering incoming calls. TAPI also arbitrates among applications that want to share the same communications ports and devices. For example, while Dial-Up Networking waits for an incoming call, Microsoft Fax can send an outgoing fax without a user first terminating Dial-Up Networking.

### Communications Architecture

---

Windows 3.1 used a monolithic communications driver, COMM.DRV, that provided an API for Windows-based applications to interact with communications devices and the code that served as the communications port driver. The monolithic approach made it necessary to completely replace the Windows communications driver if new functionality was required by a hardware device.

Windows 95 provides a more flexible communications architecture by separating communications operations into three primary areas: Win32-based communication APIs and TAPI, the universal modem driver, and communications port drivers.

{ewc msdncd, EWGraphic, x0w 6 /a "psW.bmp"}

The previous figure shows the relationship between the VCOMM communications driver and the port drivers that communicate with hardware devices. VCOMM is a new layer that provides protected-mode services that allow Windows-based applications and device drivers to use ports and modems. To conserve system resources, communications device drivers are loaded into memory only when in use by applications. Also, VCOMM uses the new Plug and Play services in Windows 95 to assist with configuration and installation of communications devices.

The flow path for a Win16-based application is also illustrated in the previous figure to show how compatibility is maintained for existing Windows-based applications. Compatibility is maintained for hardware and software vendors that replace the Windows 3.1 COMM.DRV driver; however, the vendor-specific communications driver communicates directly with the I/O port, rather than going through VCOMM.

The following describes the primary areas that make up the architecture.

Win32-based communications APIs and TAPI.

The Win32 communications APIs in Windows 95 provide an interface for using modems and communications devices in a device-independent fashion. Applications call the Win32-based communication APIs to configure modems and perform data-I/O through them. Through TAPI, applications can control modems or other telephony devices for operations such as dialing, answering, or hanging up a connection.

#### Universal modem driver.

Also new in Windows 95 is the universal modem driver, UniModem, which is a layer for providing services for data and fax modems, and voice so that users and application developers will not have to learn or maintain difficult modem "AT" commands to dial, answer, and configure modems. Rather, UniModem does these tasks automatically, using minidrivers written by modem hardware vendors. Application developers can use TAPI to perform modem control operations in a modem-independent manner.

UniModem is both a VCOMM device driver and a TAPI service provider. This driver supports data transmission by modem and implements several basic telephony functions to work with AT-command modems. Other service providers (for example, those supporting other devices, such as an ISDN adapter, a telephone on a PBX system, or an AT-command modem) can also be used with TAPI.

#### Port drivers.

Port drivers are specifically responsible for communicating with I/O ports, which are accessed through the VCOMM driver. Port drivers provide a layered approach to device communications. For example, Windows 95 provides a port driver to communicate with serial communications and parallel ports, and other vendors can provide port drivers to communicate with their own hardware adapter such as multiport communications adapters. With the port driver model in Windows 95, it will no longer be necessary for vendors to replace the communications subsystem as they did in Windows 3.1.

#### Windows Telephony API.

TAPI-aware communications applications no longer need to provide their own modem support list because interaction with a modem is now centralized by Windows 95. All communications services provided with Windows 95 use these services.

TAPI services arbitrate requests from communications applications to share communication ports and devices in a cooperative manner. Win32-based applications can use TAPI functionality to make outgoing calls while others are waiting for inbound calls. Of course, only one call can be performed at a time, but users no longer have to terminate other applications using a communications port to run a different communications applications.



TAPI consists of two interfaces: an API with which developers write applications and the service provider interface (SPI). The SPI is used to establish the connection to the specific telephone network. This model is similar to the computer industry model whereby printer manufacturers provide printer drivers for Windows-based applications. The following figure shows the relationship between the front-end TAPI and the back-end SPI.

*{ewc msdncd, EWGraphic, x0w 7 /a "psW.bmp"}*

TAPI provides a standard way for communications applications to control telephony functions for data, fax, and voice calls. TAPI manages all signaling between a computer and a telephone network. This includes such basic functions as establishing, answering, and terminating a call. It also includes supplementary functions, such as hold, transfer, conference, and call park found in PBXs, ISDNs, and other phone systems. TAPI also provides access to features specific to certain service providers, with built-in extensibility to accommodate future telephony features and networks as they become available.

### Windows 95 Mobile Computing

---

Windows 95 makes using a computer away from the desk easier and more powerful than before. The mobile computing features of Windows 95 were designed to solve the following problems:

#### Getting the most out of your portable computer.

Windows 95 eliminates many of the hardware and software configuration steps previously required when switching to or from a portable computer. Before, you usually had to change the portable computer's video resolution, pointing device, and network configuration every time you undocked. In addition, you had to modify configuration files, contend with error messages, and repeatedly restart the computer.

The Plug and Play feature of Windows 95 allows "hot docking," that is, docking or undocking without turning off the computer. When you dock, Windows 95 recognizes the capabilities and requirements of the portable computer and loads the appropriate driver without you having to restart. Windows 95 notifies applications about the new hardware configuration, so that they can take advantage of the portable computer's functionality or stop attempting to use it when it is unavailable. For more information about hot docking and other Plug and Play features, see Chapter 19, "Devices."

Windows 95 helps you deal with a portable computer's limited battery power with its Power Management capabilities, and manage the portable computer's limited disk space with disk compression and file viewer capabilities.

n

Windows 95 provides a battery indicator on the taskbar and a Suspend command on the Start menu that you can use to save power without turning off your computer. For more information, see Chapter 28, "Dial-Up Networking and Mobile Computing."

n

With DriveSpace, users can free space on their portable computer's hard disk drive and floppy disks by compressing them. For more information, see Chapter 20, "Disks and File Systems."

n

With Microsoft Exchange, users can view the headers of mail messages before deciding to download, preventing unnecessary messages from taking up disk space. For more information, see Chapter 26, "Electronic Mail and Microsoft Exchange."

n

With Quick View, users can view the contents of a file in Windows Explorer by right-clicking a file icon.

*Staying in touch.*

Staying in touch with the corporate network or to a desktop computer is easy with



communications tools such as:

n

Dial-Up Networking for dialing into your desktop computer or the network.

After you connect, you can share the resources of the desktop computer or the network, including accessing electronic mail and fax services.

n

Microsoft Exchange (with Dial-Up Networking) for sending and receiving

electronic mail, without requiring any additional client software or special gateway server.

n

Microsoft Fax (with Dial-Up Networking) for sending and receiving faxes

from a portable computer by accessing a shared fax modem on the network or a corporate fax server. For information, see Chapter 27, "Microsoft Fax."

n

Direct Cable Connection for connecting two computers through a modem

for purposes of transferring files.

n

Phone Dialer for using a computer to dial phone numbers for voice-  
telephone calls.

n

HyperTerminal for connecting to a computer bulletin board through a  
modem and for transferring files to or from the bulletin board.

For information on Direct Cable Connection and Dial-Up Networking, see Chapter  
28, "Dial-Up Networking and Mobile Computing." For information on Phone Dialer  
and HyperTerminal, see Chapter 25, "Modems and Communications Tools."

*Staying organized on the road.*

Mobile users must work with limited disk storage and battery power, maintain two  
versions of the same set of files, transfer or fax files over the phone lines, and delay  
printing. The Windows 95 features designed to keep the mobile user as functional as  
possible at a remote site include:

n

Briefcase, which allows users to keep documents up to date between the  
portable and desktop computers

# n

Deferred printing, which allows a user to generate a print job on a portable computer and print it when the computer is docked

For more information about Briefcase and deferred printing, see Chapter 28 “Dial-Up Networking and Mobile Computing.”

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 25 Modems and Communications Tools

This chapter describes how to install and use modems with Windows 95, how to configure HyperTerminal to connect two computers, and how to configure Phone Dialer to dial voice telephone calls with a computer.

### *Modems and Communications Tools: The Basics*

---

Windows 95 improves the ease of using modems by making it possible to install and configure a modem once for all Windows 95 communications applications just as you would a printer. This provides the following benefits:

**n** Centralized modem and COM port configuration for all Windows 95 communications applications through the Modems option in Control Panel.

**n** Integration with Telephony API (TAPI) and Win32 Communications APIs.

**n** Support for hundreds of brand-name modems

**n** Modem connections and configuration using point-and-click instead of AT-

commands.

---

Note — For earlier applications running under Windows 3.1 or MS-DOS, you still need to define the serial port, modem type, and other modem settings within each application.

---

Windows 95 includes two other tools to expand your communications capabilities:

n

HyperTerminal offers the same base communications capabilities as

Terminal in Windows 3.1, but has been better integrated into the Windows 95 user interface. HyperTerminal allows you to connect two computers through a modem and TAPI for purposes of transferring binary files. For example, HyperTerminal can be used to connect a computer to a computer bulletin board in order to download files. However, HyperTerminal, unlike Terminal, also includes autodetection of data bits, stop bits, and parity.

n

Phone Dialer allows you to use a computer to dial phone numbers for

voice telephone calls. It includes a telephone dial pad, user-programmable speed dials, and a call log.

With Windows 95, you can:

n

Select and configure a modem just once for all Windows 95 applications in

the Modems option in Control Panel, or in a Windows 95 communications application such as HyperTerminal when you run it for the first time. If you have not yet installed a modem, it prompts you to do so. In each case, Windows 95

launches the Install New Modem wizard, which automatically detects the type of modem and selects its default settings. If it does not detect a modem, it allows you to select one from a list and define its settings.

---

Note — The modem settings that the Install New Modem wizard defines or that you manually define are then used by all Windows 95 communications applications. However, you can further adjust them, if necessary, from within a specific Windows 95 application.

---

n

Send and receive faxes over a modem using Microsoft Fax. For more information, see Chapter 27, “Microsoft Fax.”

n

Configure HyperTerminal to predefine computers to which your computer can connect. Use HyperTerminal to transfer and receive binary files between computers and online services such as CompuServe®.

n

Configure Phone Dialer to make voice telephone calls.

n

Define the location of your computer in one place within Windows 95 — the Dialing Properties dialog box. After you define your location, all Windows 95

communications tools, such as Phone Dialer or HyperTerminal, reference that location when dialing out. The Dialing Properties dialog box can be found in Phone Dialer, HyperTerminal, and the Modems option in Control Panel.

n

Manually dial a phone call or bring up a terminal window before or after dialing. For more information, see “Using Dialing Properties” later.

n

Connect to a remote computer using Dial-Up Networking. For more information, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

### *Issues for Modems and Communications Tools*

---

Before you install and configure a modem for use with Windows 95, you should decide the following:

n

How many users need modems installed on their computers and what are the locations to which and from which they will be calling.

n

What kind of security restrictions to apply to modems installed on individual computer, as described in Chapter 14, “Security.”

n

How you want your modem to perform when it makes a connection, as described in “Setting Modem Properties” later.

---

Note — In Windows 95, you cannot connect to a modem installed on another computer on the network. You can, however, share a fax modem over the network. For details, see Chapter 27, “Microsoft Fax.”

---

### *Overview of Modems and Communications Tools*

---

Through the Windows 95 Telephony API (TAPI) in the communications subsystem, a computer can simultaneously run several communications applications that ask for access to a modem or telephone device. For example, a computer can be waiting to receive a fax through Microsoft Fax, while HyperTerminal is dialing out. TAPI arbitrates multiple requests for the same device, allowing applications to share a communications device in a cooperative manner. For more information about the architecture of TAPI and how it fits within the Windows 95 communications subsystem, see Chapter 24, “Introduction to Windows 95 Communications.”

### *Setting Up a Modem*

---

You can install a new modem in one of three ways:

n

Using the Modems option in Control Panel.



# n

Running a communications program before you have installed a modem.

Windows 95 prompts you to install a modem at that time.

# n

Adding a modem through the Add New Hardware option in Control Panel.

In all cases, the Install New Modem wizard appears and asks if you want Windows 95 to automatically detect the modem, or if you want to manually select a modem from the list of known manufacturers and modem models. If you choose the detection option, the wizard detects and then queries the modem to configure it. If it cannot detect the modem, it prompts you to manually select a modem.

When the proper modem has been selected, you can, if necessary, adjust its properties, such as the volume for the modem speaker, the time to wait for the remote computer to answer the call, and the maximum baud rate to use.

Depending on the type of modem you have, installing and configuring it up may vary slightly as follows:

# n

If you install an internal legacy (non-Plug and Play) modem adapter, its

built-in COM port must be configured by the Add New Hardware Wizard before it is installed in the Modems option in Control Panel. In most cases, the Install New Modem wizard will do this automatically for you. However, on some computers, you may also need to run the Add New Hardware wizard.

# n

If you are using Windows 95 PCMCIA drivers, then Windows 95 will detect

and configure PCMCIA modem cards automatically when they are first inserted. Otherwise, you may need to run the Add New Hardware wizard in Control Panel to configure the card's built-in COM port. Then, you should install the modem card in the Modems option in Control Panel. For more information, see Chapter 19, "Devices."

### [To install a new modem through the Modems option in Control Panel](#)

1. In Control Panel, double-click the Modems icon.
2. If no modem is currently installed on your computer, the Install New Modem wizard starts automatically to lead you through the steps to install a modem. Follow the online instructions.

— Or —

— If you are installing a second modem, click Add to start the Install New Modem wizard.

— {ewc msdncl, EWGraphic, x0x 0 /a "psX.bmp"}

In most cases, it's best to let the Install New Modem wizard detect the modem for you. If it cannot detect the exact manufacturer and model, the wizard picks a standard configuration that is usually compatible. Your modem will still function at its maximum speed and according to factory default settings. A few, more advanced features may be disabled, such as enabling and disabling compression, error control, and flow control.

For information on installing a modem if your modem is not detected or listed, or finding a better match than the standard modem, see the "Troubleshooting Communications Problems" section later.

Windows 95 automatically assigns COM names to communications ports, internal modem adapters, and PCMCIA modem cards according to their base I/O port addresses as shown in the following list:

n

Basic Configuration 0: COM1 at 3F8 (Input/Output Range)

n

Basic Configuration 2: COM2 at 2F8

n

Basic Configuration 3: COM2 at 3E8

n

Basic Configuration 4: COM3 at 2E8

If a modem has a nonstandard base address or IRQ, or if all four standard ports have been assigned to devices, Windows 95 automatically assigns the modem to COM5 port or higher. Some Windows 3.1 applications might not be able to access ports higher than COM4. Consequently, you must adjust the base address in Device Manager in the Systems option in Control Panel, or delete other devices to make a lower COM port available.

For information about adjusting COM port configurations, see Chapter 19, "Devices."

The first time you set up a modem, the Install New Modem wizard prompts you for

information about the location you will usually be calling from (the Default Location), including your area code and country code. This information is stored in Dialing Properties, a communications utility that is accessible from all Windows 95 communications applications and the Modems option in Control Panel.

#### [To type dialing location information](#)

n

Run the Install New Modem wizard, and then type area code and country

code information in the Location Information dialog box.

{ewc msdncl, EWGraphic, x0x 1 /a "psX.bmp"}

After modem installation, more specific location information, such as calling card numbers or the number you must dial to access an outside line, can be entered into the My Locations dialog box in Dialing Properties. For information, see "Using Dialing Properties" later.

#### *Setting Modem Properties*

---

In the Modems option in Control Panel, you can globally change default modem settings for all Windows 95 communications tools and applications. For example, if you do not want to listen to the modem speaker, you can turn off that feature in the Modems option for all tools and applications that use that modem. You can also adjust these settings within each application.

Note For Windows 3.1 or MS-DOS – based applications, you need to configure the modem settings within each application.

---

#### [To view general properties for a modem](#)

1. In the Modems option in Control Panel, click a modem, and then click the Properties button.
2. On the property sheet for the selected modem, click the General tab to view the properties. These are the default settings for the modem in all Windows 95 applications.

{ewc msdncl, EWGraphic, x0x 2 /a "psX.bmp"}

---

Port A port is either a COM or LPT port to which an external modem is attached, or a COM port name which identifies an internal or PCMCIA modem for purposes of accessing it. Windows 95 automatically assigns a port name (COM1, COM2, COM3, or COM4) to any device it detects. Usually, the name is only adjusted if you move an external modem from one COM port to another. For PCMCIA modem cards, the port cannot be changed.

Speaker Sets the volume for the telephone speaker, which

m broadcasts  
e the dial tone,  
modem  
connection,  
and voices, if  
applicable,  
on the other  
end. To  
change the  
volume, use  
the mouse to  
move the  
slider bar to  
the right or  
left.

M This is the  
axi baud rate at  
m which  
u Windows 95  
m communicat  
Sp es with the  
ee modem. It is  
d limited by  
the CPU  
speed of the  
computer  
and the  
speed  
supported by  
the  
communicati  
ons port.  
Windows 95  
picks a  
conservative  
default  
speed, so  
that slower  
computers  
don't lose  
data during  
transfers.  
Set the baud  
rate lower if  
the faster

rate causes data errors. Set it higher for faster performance if you are using a computer with a 80486 or a Pentium™ processor. For example, 57600 may work better than the Windows 95 default setting of 38400 for v.32bis (14400 bps) modems on fast computers. If applications report data errors, then step down the modem's maximum speed (for example, from 38400 to 19200 for v.32bis modems).

---

Tip — If you have a slower, older computer and an external modem, you can purchase and install a 16550A UART — based COM port adapter. It allows higher speeds for slower computers. Some internal modems have an integrated 16550A UART adapter.

---

[To change or view the connection properties](#)

# n

In the Properties for Modems dialog box, click the tab of the Connection folder. The settings for connection preferences are displayed.

{ewc msdncd, EWGraphic, x0x 3 /a "psX.bmp"}

---

Co Connection  
nn settings  
ect usually  
ion correspond  
Pr to what the  
ef computer on  
er the other  
en end is using.  
ce Therefore,  
s do not  
change  
connection  
settings  
using the  
Modems  
option in  
Control  
Panel.  
Rather, use  
a specific  
tool or  
application,  
such as  
HyperTermin  
al, to change  
these  
settings on a  
connection-  
by-  
connection  
basis.

Us Clear this  
e field if you



To are using a  
ne local phone  
Di line or  
ali system that  
ng doesn't  
support  
touch tone.

W Clear this if  
ait you are  
for making calls  
Di from a  
al.. country other  
. than where  
your modem  
was  
purchased  
and your  
modem fails  
to properly  
detect the  
dial tone.

Ca Change the  
nc number of  
el seconds  
th listed in this  
e field if, for  
Ca some  
ll... reason,  
connections  
are taking a  
long time to  
make; for  
example,  
this may  
occur when  
you are  
making an  
international  
call and  
there are  
long delays  
before the  
call is  
connected.

You can also specify settings for data bits, parity, and stop bits in the Connection property sheet. For information about these values, see the Windows 95 Help file.

[To view or change advanced connection properties](#)

n

Click the Advanced button in the Connections folder to display the

Advanced Connection Settings dialog box. In this box you can set error control, flow control, and modulation, and audit the modem operations.

`{ewc msdncd, EWGraphic, x0x 4 /a "psX.bmp"}`

---

Us Check this to  
e boost file  
Err transfer  
or speeds by  
Co eliminating  
ntr errors  
ol caused by  
noise on the  
telephone  
line. This  
feature is  
available on  
most newer  
modems.  
When this  
feature is  
enabled,  
modems  
sometimes  
have trouble  
connecting.  
If this is true,  
clear the  
check box  
and try  
again.

Re Choose this

qui if you don't  
re ever want  
d your modem  
To to connect  
Co with another  
nn modem  
ect unless there  
is error  
control  
enabled on a  
call. This is  
useful in  
areas with  
very noisy  
phone lines.  
In these  
cases,  
connecting  
at a slower  
baud rate  
may actually  
improve data  
throughput.

Co Check this to  
m boost  
pr transmission  
es speeds by  
s compressing  
Da data  
ta between the  
modems.  
This feature  
is available  
on most  
modems.  
When this  
feature is  
enabled,  
modems  
sometimes  
have trouble  
connecting.  
If this is true,  
clear the  
check box.

Using  
modem  
compression  
can  
sometimes  
reduce  
performance  
if data being  
sent is  
already  
compressed  
by the  
application.

Use Check this  
when you  
want your  
modem to  
use special  
protocols  
designed to  
reduce  
errors over  
cellular  
connections.  
You may  
want to clear  
this if you  
are making a  
call on a  
normal  
noncellular  
telephone  
line.

Use Check this  
for all  
modems to  
avoid loss of  
data.  
Whether to  
use  
hardware or  
software flow  
control  
depends on  
your modem

cable. If your modem cable has RTS and CTS wires connected, you can use hardware flow control.

Lo Check this if w- you are Sp having ee problems d when M making an od international ula call.  
tio Windows 95 n provides Se three ttin possible gs settings: Bell 103 and 212A, A (for calls in the United States), ITU-TV V.21 and V.22 (for international calls), and ITU-TV V.23 (for French Minitel calls)

Re Check this to co record rd commands a and Lo responses to g and from the Fil modem in e the MODEMLOG.TXT file in the Windows

directory.  
Reading this  
file along  
with a  
modem  
manual can  
help you  
solve  
problems.  
After you  
identify the  
problem, you  
can adjust  
the  
appropriate  
modem keys  
in the  
Registry.  
Only  
advanced  
users should  
use this  
feature.

Ex Check this  
tra field to type  
Se modem  
ttin commands  
gs that  
Windows 95  
will include  
in its  
initialization  
sequence  
sent to the  
modem  
before  
dialing. Do  
not include  
the "AT"  
prefix in this  
box. The  
Extra  
Settings field  
is intended  
only for

debugging  
purposes,  
and should

O  
n  
ly

be used by  
experienced  
modem  
users.

Windows 95 allows you to manually dial your modem if you are having difficulty making an international call or other connection. To manually dial your modem, you need a separate telephone headset and keypad. You can request manual dialing, using slightly different procedures from within any Windows 95-based communications applications, such as HyperTerminal, Dial-Up Networking, and Microsoft Fax. The following procedure uses Dial-Up Networking as its example.

[To manually control modem dialing](#)

1. In Dial-Up Networking, right-click a connection icon, and then click Properties.

2. Click the Configure button, and then click the Options tab.
- `{fewc msdncd, EWGraphic, x0x 5 /a "psX.bmp"}`
3. Click the Operator Assisted or Manual Dial option, and then click OK.
4. Double-click the connection icon in Dial-Up Networking, and then click Connect.
5. When instructed, pick up the phone and dial the number.
6. When you hear the other computer answer, click the Connect button and hang up.

Windows 95 allows you to bring up a terminal window before or after dialing to type AT modem commands if a connection requires them. A terminal window can be used to logon for security purposes, to establish connections with servers that require a specific logon procedure, and for other reasons.

#### [To bring up a terminal window before or after dialing](#)

1. In Dial-Up Networking, right-click a connection icon, and then click Properties.
2. Click the Configure button, and then click the Options tab.
3. Click the Bring Up Terminal Window Before Dialing option, or the Bring Up Terminal Window After Dialing option, and then click OK.

#### Modem Registry Keys

---

The following section describes information stored in specific modem Registry keys that might help advanced users debug and correct problems with the commands that Windows 95 uses to control a modem. To identify modem problems, you can enable Windows 95 to create a MODEMLOG.TXT file (as described in "Setting Modem Properties" earlier ), which records responses to and from a modem when a connection is being made. The MODEMLOG.TXT file might indicate when Windows 95 is sending an incorrect command string to a modem, or when a response code is not being correctly interpreted. After consulting the documentation for the modem, you might be able to adjust the modem's Registry keys to restore proper operation.

Modem registry keys are stored under the following key:

Hkey\_Local\_Machine\System\CurrentControlSet\Services\Class\

Windows 95 creates one Registry key (starting with \0000) for each installed modem, additional subkeys, which contain AT commands that Windows 95 uses to initialize, dial, and answer the modem, plus other entries that communications and modem drivers use.



Some of the more important entries that you can use to correct or optimize modem operation are described in the following sections. The full set of modem Registry keys and INF file format is documented in the WINDOWS 95 DEVICE DEVELOPMENT KIT (DDK).

The multiple, modem-command string entries in the Init Key initialize the modem before Windows 95 uses it. The name of each entry is its sequence number, starting with "1", and its data is the command which is sent to the modem. Usually, the Init key entry "1" is "AT<cr>", which is sent to the modem to start it. Init entry "2" usually contains "&F" or a similar command to restore the modem to its default settings. Subsequent Init key entries contain miscellaneous commands to configure the modem to be compatible with Windows 95.

The Responses key contains strings that the modem might report to Windows in response to a command, or during the connection process. The name of each subkey is the text of a single modem response, and its data is a 10-byte binary value, specifying the meaning of the response to Windows in a coded format. The first two characters (byte 0) specify the meaning of the response code, using one of the following values:

---

0 OK The  
0 modem  
accepted  
the  
previous  
command.  
d.

0 Neg Status  
1 otati informati  
on on about  
Prog a new  
ress connectio  
n is being  
reported.

0 Con A call is  
2 nect connecte  
d; the  
modem  
is data

mode.

0 Erro The  
3 r modem  
rejected  
the  
previous  
comman  
d.

0 No The call  
4 Carri was  
er disconne  
cted.

0 No No dial  
5 Dial tone is  
Tone present.

0 Bus The  
6 y dialed  
modem  
is busy.

0 No The  
7 Ans dialed  
wer modem  
did not  
answer.

0 Ring There is  
8 an  
incoming  
call.

The second two characters (byte 1) specify information about a connection that is being made. It is only used for response codes of type Negotiation Progress or Connect, and is one of the following values:

---

0 No No No  
0

0 No Yes No  
1

0 Yes No No  
2

|   |     |     |     |
|---|-----|-----|-----|
| 0 | Yes | Yes | No  |
| 3 |     |     |     |
| 0 | No  | No  | Yes |
| 8 |     |     |     |
| 0 | No  | Yes | Yes |
| 9 |     |     |     |
| 0 | Yes | No  | Yes |
| A |     |     |     |
| 0 | Yes | Yes | Yes |
| B |     |     |     |

The next eight characters (bytes 2 — 5) specify the modem-to-modem line speed negotiated in bits per second (bps). The characters represent a 32-bit integer, double-word format (byte and word reversed). Common examples for this value include:

---

|      |          |
|------|----------|
| 2400 | 60 09 00 |
|      | 00       |
| 9600 | 80 25 00 |
|      | 00       |
| 1440 | 40 38 00 |
| 0    | 00       |
| 1920 | 00 4b 00 |
| 0    | 00       |
| 2880 | 80 70 00 |
| 0    | 00       |

The last eight characters (bytes 6 — 9) indicate that the modem is changing to a different port (or “DTE”) speed. Usually, this field is not used, because modems make connections at a “locked” port speed, regardless of the modem-to-modem (or “DCE”) speed. However, for modems that only support “direct” modes, you can lower the DTE speed by specifying a negotiated DTE speed for a response code, using the same format as the DCE speed described in the preceding table.

The Settings key commands configure various modem settings. After the Init subkey commands are sent, Windows 95 builds a dynamic configuration command string by concatenating various entries which are shown in the following table. The command

string depends on the settings selected in the modem's property sheets.

---

Pref Configur A  
ix ation T  
comman  
d prefix

Ter Configur <c  
min ation r>  
ator comman  
d suffix

Dial Dial D  
Pref comman  
ix d prefix

Dial Use P  
\_Pu pulse  
lse dialing

Dial Use tone T  
\_To dialing  
ne

Blin Detect X  
d\_O dial tone 4  
ff before  
dialing

Blin Do not X  
d\_O detect 3  
n dial tone  
before  
dialing

Call Specify S  
Set call 7  
upF setup =  
ailTi time-out <  
meo #  
ut >

Inac Specify S  
tivit inactivity 30  
yTi time-out =  
meo <  
ut #  
>

Spe Low L1  
aker speaker  
Volu volume  
me\_  
Low

Spe Medium L2  
aker speaker  
Volu volume  
me\_  
Med

Spe High L3  
aker speaker  
Volu volume  
me\_  
Hig  
h

Spe Speaker M  
aker always 0  
Mod off  
e\_  
ff

Spe Speaker M  
aker on 1  
Mod during  
e\_D dial and  
ial negotiati  
on

Spe Speaker M  
aker always 2  
Mod on  
e\_  
n

Spe Speaker M  
aker on only 3  
Mod during  
e\_S negotiati  
etup on

Flo No flow &  
wC control K  
ontr 0  
ol\_

Off

Flo Hardwar &  
wC e flow K  
ontr control 1  
ol\_  
Har  
d

Flo Software &  
wC flow K  
ontr control 2  
ol\_  
Soft

Erro Error  
rCo control  
ntrol disabled  
\_Off (normal  
mode,  
not  
direct)

Erro Error  
rCo control  
ntrol enabled  
\_On (auto  
reliable)

Erro Error  
rCo control  
ntrol required  
\_Fo to  
rced connect  
(reliable)

Erro Cellular  
rCo protocol  
ntrol enabled  
\_Ce  
llula  
r

Co Compre  
mpr ssion  
essi enabled  
on\_  
Off

Co Compre  
mpr ssion  
essi disabled  
on\_  
On

Mod Use B  
ulati CCITT 0  
on\_ modulati  
CCI ons for  
TT 300 and  
1200  
bps

Mod Use Bell B  
ulati modulati 1  
on\_ ons for  
Bell 300 and  
1200  
bps

Spe Connect N  
edN only at 0  
egot default  
iatio modem  
n\_O speed,  
ff do not  
fall back

Spe Use N  
edN lower 1  
egot DCE  
iatio speed to  
n\_O connect,  
n if  
necessa  
ry

### *Using HyperTerminal*

---

You can use HyperTerminal with a modem to connect two computers for purposes of sending and receiving files or connecting to computer bulletin boards and other information programs. For example, you can use HyperTerminal to connect to an online service, and then, when you're ready, use HyperTerminal to download files from a bulletin board on the online service. You can also use HyperTerminal to connect a computer directly to another computer, for example, to a debugging terminal.

The easiest way to install HyperTerminal is to choose Custom Setup Type during Windows 95 installation and then perform the following procedure. You can also install it after Windows 95 installation in the Add/Remove Programs option in Control Panel.

#### [To install HyperTerminal during Window 95 installation](#)

1. Choose Custom Setup Type, and in the Select Components screen, click Communications, and then click the Details button.
2. In the Details dialog box, click HyperTerminal.

---

Note — HyperTerminal uses TAPI and the modem to communicate with another computer, whereas Dial-Up Networking uses TAPI and the modem to communicate with a network. For more information, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

---

#### [To create a new HyperTerminal connection](#)

1. From the Start button, select Programs, then Accessories, and then click HyperTerminal Connections.
  2. Double-click New HyperTerminal Connection.
- {ewc msdnecd, EWGraphic, x0x 6 /a "psX.bmp"}
3. In the Connection Description dialog box, type the name of the connection and select an icon to associate with it. Click OK.
  4. In the Phone Number dialog box, specify the country code, area code, phone number, and modem for this connection. Click OK.

When you start HyperTerminal, if you haven't previously installed a modem, you will be prompted to do so. For more information, see “Setting Up a Modem” earlier.

5. When the Dial dialog box appears, click Dial to begin a phone session, or click Dialing Properties to change your calling card or location information, and how you dial from this location. For more information about Dialing Properties, see “Using Dialing Properties” later.

{ewc msdnecd, EWGraphic, x0x 7 /a "psX.bmp"}

6. If you chose to dial with a calling card in Dialing Properties, the Change Calling Card dialog box asks for the name and number of your calling card. If you click the Advanced button, the Dialing Rules dialog box appears. For more information about the Dialing Rules dialog box, see “Defining Calling Card Rules” later.
7. When you close the session, HyperTerminal prompts you to save your session definition. Click Yes and you'll see an icon for the new connection in the



## HyperTerminal window.

### [To dial up a remote computer using HyperTerminal](#)

1. Run HyperTerminal, and then double-click the icon of the connection you want to make.
2. Click Dial. When the connection is made, the computer you are dialing will display its own access screen or prompt.
3. When you are done using the connection, from the Call menu, click Disconnect.

### [To edit HyperTerminal properties for the current session](#)

1. From HyperTerminal, click the File menu, and then click Properties.
2. Use the Phone Number property sheet to correct the country code, area code, phone number, or modem information. Use the Configure button to update modem settings.
3. Use the Settings property sheet to specify preferences for keyboard functions, emulation, and backscroll buffer. Click OK.

### [To transfer files to another computer using HyperTerminal](#)

1. When the other computer indicates that it is ready to receive the file, click the Transfer menu, and then click Send File.  
===={ewc msdn cd, EWGraphic, x0x 8 /a "psX.bmp"}
2. Specify the filename to send, or click Browse to find the file.
3. In the Use Protocol list box, select the protocol to use in transferring the file. Both computers must be using the same protocol. For details about supported protocols, see "File Transfer Protocols" and "Terminal Emulation Types" later.
4. Click Send to begin the file transfer.

### [To receive binary files from another computer using HyperTerminal](#)

1. When the other computer indicates that it is ready to send the file, click the Transfer menu, and then click Receive File.  
===={ewc msdn cd, EWGraphic, x0x 9 /a "psX.bmp"}
2. Specify the destination directory for the file, or click Browse to find the appropriate directory.
3. In the Use Receiving Protocol list box, select the protocol to use in transferring the file. Both computers must be using the same protocol.

4. Click OK to begin the file transfer.

HyperTerminal supports the following file transfer protocols:

---

X The most  
m common  
od error-  
e correcting  
m data  
communications protocol.  
Most  
communications  
packages  
support (and  
some only  
support)  
Xmodem.  
This protocol  
is also  
supported by  
most online  
services.  
Xmodem is  
slower than  
other  
protocols  
(for  
example,  
Zmodem).

1K A variant of  
X traditional  
m Xmodem,  
od which sends  
e data in 1K  
m (1024-byte)  
blocks  
instead of  
128-byte  
blocks. On  
some

bulletin  
boards, this  
protocol is  
called  
Ymodem.

Y A faster  
m version of  
od Xmodem,  
e transferring  
m data in 1K  
blocks.

Y A variant of  
m Ymodem  
od designed for  
e use with  
m- modems that  
G support  
hardware  
error control.  
If you cannot  
transfer files  
using  
Ymodem-G,  
your modem  
may not  
support error  
control. Use  
Ymodem  
instead.

Z The fastest  
m data transfer  
od protocol, and  
e the primary  
m choice of  
most bulletin  
board users.  
Zmodem  
dynamically  
changes its  
block size  
based on  
line  
conditions,  
and is

extremely  
reliable.

Kermit is extremely  
flexible  
protocol,  
found most  
often on  
DEC™  
VAX™  
computers,  
IBM®  
mainframes,  
and other  
minicomputers.  
However,  
Kermit is  
quite slow,  
and should  
not be used  
if faster  
options are  
available on  
the other  
computer.

---

Note — You can choose a file transfer protocol to use to send or receive a file in the Send or Receive File options in the Transfer menu as described in the preceding procedures.

---

HyperTerminal supports the following terminal emulation types:

ANSI Viewdata  
(for  
the  
United  
Kingdom)

Minitel DEC VT  
(for

France) 100™

Auto VT 52  
Detect

TTY

#### [To choose a terminal emulation type](#)

1. Right-click a connection icon, and then click Properties.
2. In the property sheets, click the Settings tab, and then select the emulation type.  
===={ewc msdncd, EWGraphic, x0x 10 /a "psX.bmp"}

#### [Using Phone Dialer](#)

---

The Phone Dialer application that comes with Windows 95 allows you to use a computer to make voice telephone calls, using calling card and location information defined in Dialing Properties. It also stores frequently dialed numbers, dials stored phone numbers, and logs telephone calls.

The easiest way to install Phone Dialer is to choose Custom Setup Type during Windows 95 installation and then follow the following procedure. You can also install it after Windows 95 installation in the Add/Remove Programs option in Control Panel.

#### [To install Phone Dialer during Window 95 installation](#)

1. Click Custom Setup Type, and in the Select Components screen, click Communications, and then click the Details button.
2. In the Details dialog box, click Phone Dialer.

With Phone Dialer, you can dial phone numbers in a number of different ways:

# n

By clicking a speed-dial phone number (as described in “Storing Phone Numbers with Phone Dialer” later.)

# n

By typing the number, and then clicking Dial

# n

By clicking the digits on the Phone Dialer numeric keypad to indicate the phone number you want to dial, and then clicking Dial

# n

By selecting from a list of most recently used numbers

### [To start Phone Dialer](#)

1. From the Start button, select Programs, and then Accessories.
2. Click the Phone Dialer icon. The Phone Dialer dialog box appears with a telephone pad and speed-dial buttons.
3. To make a call, type a phone number either from your keyboard or use the Phone Dialer numeric keypad.

—{ewc msdn cd, EWGraphic, x0x 11 /a "psX.bmp"}

When you dial a number with Phone Dialer, it is automatically stored in a list of your most recently used telephone numbers. All local, domestic long-distance, or international telephone numbers are stored when you type all the digits needed to dial in the Number To Dial text box. You can also store phone numbers as speed-dial numbers.

---

Important — The Number To Dial text box can hold as many as 40 digits. Therefore, you can type a local, domestic long-distance, or international long-distance phone number in this text box. The same is true when you create speed-dial numbers.

---

If you type the area code and local telephone number, Phone Dialer automatically precedes the dialed number with a “1” if you have typed this information in the My Locations folder in the Dialing Properties dialog box. Dialing Properties is a separate communications tool described in “Using Dialing Properties” later.

If you type non-numeric characters (such as a hyphen or a parenthesis) in a phone number, Phone Dialer ignores the non-numeric character. An exception is when you type a plus sign (+) at the beginning of your number, which is international format. If you type a number in international format, you must put parentheses around the area code, for example, +1 (206) 882-8080.

#### [To create a speed-dial phone number](#)

1. Run Phone Dialer.
2. In the Phone Dialer dialog box, click the Speed Dial button you want to configure.  
{ewc msdn cd, EWGraphic, x0x 12 /a "psX.bmp"}
3. Type the name that will appear on the button and the phone number, then click Save. The name now appears on the selected button.

#### [To change or remove speed-dial settings:](#)

1. In the Phone Dialer dialog box, click Speed Dial from the Edit menu.
2. Click the speed-dial button you wish to change.
3. In the Program Speed Dial dialog box, change or delete the information in the Name and Number fields, and then click the Save button.

According to the North America Dialing Plan (a standard set of procedures that telephone companies in North America use), you must dial a “1,” followed by a three-digit area code, followed by a seven-digit local phone number to make a long-distance call. There are a few cases where local phone companies have not

followed this rule by allowing you to omit the initial "1" for certain numbers in adjacent area codes. Thus, the number you dial is 10 digits, not 11.

#### *To dial long-distance calls without a "1" prefix*

1. From the Tools menu in Phone Dialer, click Dialing Properties. (For more information about this tool, see "Using Dialing Properties.")
2. Verify that the area code listed here is correct for your location. (Change it if necessary.) Click OK.
3. Using any method you prefer for storing phone numbers, type the phone number as a 10-digit number, omitting the "1" prefix.

The Windows 95 telephony number translation function sees the local area code in both the location and in the destination number, and assumes it should only dial the local number. For example, suppose you are dialing from area code 905 and can dial phone numbers with area code 416 without the "1" prefix. You would store those numbers as +1 (905) 416xxxxxxx where xxxxxxxx is the local phone number.

#### *Using Dialing Properties*

---

Dialing Properties is a utility that has been integrated with Phone Dialer, HyperTerminal, Dial-Up Networking, and other Windows 95 communications applications.

The options you set with Dialing Properties are stored in the TELEPHON.INI file (instead of the Registry) to ensure backward compatibility with older 16-bit Windows telephony-enabled applications.

With Dialing Properties, you can

n

Specify the location from which you are calling, or define a new location



# n

Specify the area code and the country code

# n

Specify in-house dialing rules

# n

Define calling card rules

In Windows 95, you can access Dialing Properties from the Tools menu in Phone Dialer, or by clicking the Dialing Properties button when you make a new connection in HyperTerminal. For purposes of discussion, procedures in this section describe accessing Dialing Properties from Phone Dialer.

A LOCATION is information that Dialing Properties uses to analyze telephone numbers in international format, and to determine the correct sequence of numbers to be dialed. It need not correspond to a particular geographic location, but it usually does. For example, a location could specify the procedures needed to dial calls from your office, or from a room in a hotel. You can name locations anything you choose to help you remember and select them later. Dialing Properties allows you to add new locations, edit existing locations, and remove locations you no longer need.

### *To define a location in Dialing Properties*

1. From the Start button, select Programs, select Accessories, and then click the Phone Dialer button.

2. In the Phone Dialer dialog box, click the Tools menu and select Dialing Properties.

{ewc msdn cd, EWGraphic, x0x 13 /a "psX.bmp"}

3. When the My Locations property sheet appears, type information about where you are calling from, including

n

Name of your location, (for example, home or office)

n

Area code

n

Name of country

n

Information about how you dial, including

n

Access number required to make a local or long distance call

n

Whether you use a calling card to make calls. If you want to change calling card information, click the Change button. For more information about calling cards, see the "Defining Calling Card Rules" later.

n

Whether your phone has call waiting and if it should be disabled

n

Whether your phone uses pulse or tone dialing

A CALLING CARD is information that Dialing Properties uses to create the sequence of numbers to be dialed on a particular call. The calling card may include a calling card number which can be dialed at a specified time during call placement. However, the calling card does not have to specify a card number (in other words, calling cards can also be used to define alternative procedures for direct dialing without a calling card number). To help you remember them, you can name calling cards anything you choose.

Dialing Properties includes predefined settings for several popular calling cards used in the United States, including AT&T®, Sprint, MCI, British Telecom, France Telecom-Mercury, Telecom New Zealand, and others. You can modify and use these directly or copy them to create your own calling cards. Dialing Properties allows you to add new calling cards, edit existing calling cards, and remove calling cards you no longer need.

The information stored in a calling card includes the name, card number, and the dialing rules, as explained in this section, for local, long-distance and international calls.

#### [To specify that you are using a calling card](#)

1. In the My Locations folder in the Dialing Properties dialog box, check the Dial Using Calling Card check box.

—{ewc msdn cd, EWGraphic, x0x 14 /a "psX.bmp"}

2. In the Change Calling Card dialog box, select your calling card type from the list (for example, AT&T), and then type your calling card number. Click OK.

You can also customize Dialing Rules by clicking the Advanced button in the Change Calling Card dialog box. The following two examples illustrate how you might use dialing rules.

Suppose you are making a calling card phone call from outside the United States and do not want Windows telephony applications to automatically add a "0" prefix to the number you are calling. You can do this by preceding the phone number with another numeric code (such as "144" in the following example).

#### [To redefine numbers that automatically precede the phone number](#)

1. In the Change Calling Card dialog box, click the New button, then select the name of the calling card and type the card number, and then click the Advanced button.

—{ewc msdn cd, EWGraphic, x0x 15 /a "psX.bmp"}

2. In the Dialing Rules dialog box, complete the dialing rule fields. Insert a comma to include a fixed two-second pause; use multiple commas to increase the time. Use the following codes as appropriate:

—E Country code

—F Area code

—G Destination local number

—H Calling card number

—W Wait for a second dial tone

- @ — Wait for a ringing tone followed by five seconds of silence
- \$ — Wait for a calling card prompt tone (if your modem supports it)
- ? — Display an on-screen prompt to the user to continue dialing

— For example, if you are using a British Telecom card and need to precede the number you dial with “144,” complete the fields as follows:

---

Calls 144,H,G  
withi  
n the  
same  
area

Long 144,H,0  
- FG  
dista  
nce  
calls

Inter 144,H,0  
natio 0EFG  
nal  
calls

3. Click OK, and then click OK again. In the My Locations property sheet, remove the leading zero from your area code (for example, “71” or “81” in London). Click OK.
4. Using Phone Dialer or HyperTerminal (or another tool), store your destination number in international format with only the country code (44), area code (without the leading 0), and local number (+44(71)5551212).

— When you choose the Dial option from Phone Dialer or HyperTerminal, the tool you are using automatically expands this number to include “144” and the card number, plus the pause codes.

In another scenario, suppose your organization in the United States uses a PBX system and you need to omit the “1” prefix before the area code. Create a calling card as in the following example:

#### [To omit the “1” prefix with a PBX system](#)

1. In the Change Calling Card dialog box, click New.
2. In the Create New Calling Card dialog box, type a name for your calling card, such as “Direct Dial Through PBX.” Click OK.

3. In the Change Calling Card dialog box, click Advanced.

4. In the Dialing Rules dialog box, complete the text boxes and then click OK.

---

Calls G  
within  
the  
same  
area

Long- FG  
distan  
ce  
calls

Intern 011EFG  
ationa  
l calls

There are several ways to add telephony drivers from other vendors, if necessary. Some telephony drivers work over the network and consist of software only. If this is the case, the software could be installed through the Add/Remove Programs option in Control Panel.

Hardware drivers could be installed through the Add/New Hardware option in Control Panel, unless the hardware requires its own class installer. If this is the case, it would come with a standard Setup program to install it.

The Telephony Control Panel, available in the WINDOWS 95 SOFTWARE DEVELOPMENT KIT, facilitates installation of telephony drivers from other vendors.

---

Note — If you previously installed the Telephony Control Panel on your Windows 3.1 system, and you upgrade to Windows 95, you will receive the Windows 95 Telephony Control Panel.

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### Troubleshooting Communications Problems

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This section describes how to solve problems with installing modems, making connections, and with using applications to access the modem. A general modem diagnostic tool is located in the Modems option in Control Panel.

[To use the Modems Diagnostics Tool](#)

1. Double-click the Modems icon in Control Panel, and click Diagnostics.
2. In the Diagnostics property sheet, click the More Info button to find out additional configuration information about a modem, such as UART, Registry identifier, and what it supports.

— In the More Info property sheet, the Port Information box displays the modem's port assignment, IRQ, I/O address, UART, and highest baud rate. The Modem box displays its device identification and the modem's response to AT commands.

This section describes conditions which may interfere with installation of a modem, and how to fix them.

*The Install New Modem Wizard detected the modem as a Standard Modem.*

This does not indicate a problem. Rather, it means that Windows 95 was unable to detect the exact make and model of a modem. Most communications applications work correctly with the Standard Modem option, that is, connections can be made successfully using the modem's factory default settings. However, advanced control of some features, such as speaker volume, error control (for example, V.42 protocol), and compression (for example, V.42bis protocol) will be disabled in the modem's property sheet.

If you don't want to use the Standard Modem option, you can run the Install New Modem wizard to select a specific type of modem which is similar to the modem you are using. If you specify another, similarly named model from the same manufacturer — for example, if you configure the modem as a Practical Peripherals PM9600HC when a Practical Peripherals PM9600FX modem is actually installed — Windows 95 usually treats the models as being identical and the specified configuration will probably work well. To determine if other modem models are compatible with the one you're using, check the modem manual. Many modems are compatible with Hayes®, Microcom®, Rockwell, or U.S. Robotics models.

*The Install New Modem wizard did not detect any new modems.*

n

Make sure the modem doesn't already appear in the list of installed

modems. Windows will not redetect modems that are already installed.

n

Make sure no other programs are running which might be using the modem or its COM port.

n

If the modem is external, check the connection between it and your computer, and reset it by turning it off and on again.

n

If the modem is internal, make sure that its built-in COM port has been configured properly in Device Manager in the System option in Control Panel. If it does not appear, run the Add New Hardware wizard to allow Windows 95 to detect and configure it.

n

Make sure the modem's COM port is active and has a correct IRQ by checking its Resources configurations in Device Manager in Control Panel. Make sure the IRQ does not conflict with one in use by another device. For details, see Chapter 19, "Devices".

If the Install New Modem wizard still does not detect a modem, then there is probably a problem with the port, the cable, or the modem itself. Try the modem with an MS-DOS based communications program, or with another computer, if possible.



The Install New Modem wizard does not detect a PCMCIA modem.

If the Windows 95 PCMCIA drivers are loaded, then Windows 95 should automatically detect and configure a PCMCIA modem when it is installed. Use the PCMCIA option in Control Panel to check the configuration of a PCMCIA socket driver.

If the Windows 95 PCMCIA drivers are NOT being used, then the modem card must be configured as a COM port before the Install New Modem wizard can detect and configure it as a modem.

[To detect and configure a PCMCIA modem when Windows 95 PCMCIA drivers are not used](#)

1. Configure the modem according to the instructions that came with your original PCMCIA driver software.
2. Run the Add New Hardware wizard to detect and configure the card as a COM port.
3. Run the Install New Modem wizard to detect and configure the card as a modem.

For more information about PCMCIA devices, see Chapter 19, "Devices."

This section describes basic steps for troubleshooting communications and explains specific communications errors or problems and how to correct them.

Modem won't dial or won't answer.

If your modem is not set up correctly, communications features may not function properly. The following procedures list steps in verifying the correct operation of your modem and the Windows 95 communications subsystem.

Because some communications programs designed for Windows 3.1 install incompatible driver files, which may cause COM ports and modems to stop working, start by verifying that the correct Windows 95 files are being loaded.

[To verify that the required communications files are present](#)

1. Verify file sizes and dates of COMM.DRV and SERIAL.VXD in the SYSTEM directory against the original versions from the Windows 95 floppy disks or compact disc.
2. Confirm that the following lines are present in SYSTEM.INI:

[boot]  
comm.drv=comm.drv  
[386enh]  
device=\*vcd

3. To revert to the default communications drivers for Windows 95, delete communications port entries in Device Manager.
4. Run the Add New Hardware wizard in Control Panel to detect and install the Windows 95 drivers.

---

Note—— Windows 95 does not load the SERIAL.VXD driver in SYSTEM.INI. Rather, Windows 95 loads it on demand using the Registry. Also, there is no corresponding file for the \*vcd entry in SYSTEM.INI. This is an internal file built into VMM32.VXD.

---

#### [To verify the modem configuration](#)

1. From Control Panel, double-click the Modems icon.
2. Verify that the manufacturer and model for your modem is correct. If not, you might have changed the modem and failed to reconfigure it. In this case, run the Install New Modem wizard to detect the modem and confirm it with the current Registry configuration.
3. If your modem does not appear in the list of installed modems, click Add, and then select the appropriate modem.
4. If the manufacturer and model are not correct and are not available from the list, try the Hayes-compatible option or the Generic Modem driver option, set to the maximum baud rate supported by the modem, and click OK to accept the settings.
5. Try removing any other modem entries in the list to eliminate any conflicts.

#### [To verify that the modem is enabled](#)

1. Double-click the System icon in Control Panel, and then click the Device Manager tab.
2. Select your modem from the list and click Properties.
3. Click The Device Is Present, Please Use It, if this is not already selected.

#### [To verify that the port is correct](#)

1. Double-click the Modems icon in Control Panel.
2. Select your modem, and then click the Properties button.
3. On the General property sheet, verify that the listed port is correct. If not, select

the correct port. Click OK.

*To determine if a serial port I/O address and IRQ settings are properly defined*

1. Double-click the System icon in Control Panel.
2. Click the Device Manager tab, and then click Ports.
3. Select a specific port (such as COM2), and click the Properties button.
4. Click the Resources tab to display the current resource settings (IRQ, I/O) for that port. To find out the correct settings, consult the modem manual.
5. In the Resources dialog box, check the Conflicting Devices List to see if the modem is using resources in conflict with other devices.
6. If the modem is in conflict with other devices, click the Change Setting button, and then click a Basic Configuration that does not have resource conflicts.

---

Note — Do not try to use a modem on COM3 if there is a serial mouse or other device on COM1. Usually, COM1 and COM3 ports use the same IRQ, meaning that they cannot be used simultaneously on most computers. The COM2 and COM4 ports have the same problem. If possible, change the COM3 or COM4 port to an IRQ setting that is not in conflict. Also, some display adapters have an address conflict with COM4 ports. The best way to work around this conflict is to use another COM port, or, replace your graphics adapter.

---

*To check the port settings*

1. In the Modems option in Control Panel, click a modem, and then click Properties.
2. In the modem's property sheets, click the Connection tab to check the current port settings, such as bits per second (baud rate), data bits, stop bits, and parity.  
Click the Advanced button to check error control and flow control. If you are using Win16-based applications, turn off these advanced features.
3. Verify the UART type.  
Data transmission problems may occur when a baud rate greater than 9600 is selected on a slower 80386-based computer not equipped with a 16550 UART, or when performing other tasks during a file download. If problems or errors occur during transmission, try lowering the baud rate. Attempting to use baud rates greater than 9600 on computers equipped with 8250 or 16450 UARTs will probably result in dropped characters.

*To check modem baud rate*

1. Double-click the Modems icon in Control Panel.

2. Select the specific modem, and click the Properties button.
3. Click the General tab.
4. Set the baud rate to the correct speed. Lower speeds may work, especially when using an older, slower computer.
5. Click Only Connect At This Speed if it is not already selected.

---

Note — If the host system you are calling cannot communicate at the initial baud rate, it may or may not be able to negotiate a slower baud rate.

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Tip — To optimize communications performance, you can set the baud rate higher if your computer has an 80486 or a Pentium™ processor.

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[To disable hardware flow control if your modem cable doesn't support it](#)

1. Double-click the Modems icon in Control Panel.
2. Click a modem, and then click the Properties button.
3. Click the Connection tab, and then click the Advanced button.
4. If a check appears in the Use Flow Control check box, click the box to clear it.

[To remove VxDs from other vendors which may be interfering with modem operation](#)

n

Search for and comment out (type a semicolon as the first character of the line) any related entries in the SYSTEM.INI file. When commenting out a line in the SYSTEM.INI file, it is useful to add a comment line denoting this.

The initialization (dialing) string is improper for the modem.

If the modem won't pick up the line and dial, it may be due to an improper initialization string. Typically, the manufacturer's recommended dial command string is loaded from the corresponding modem INF file; however, if your modem driver was not available and you selected a compatible modem, the dial command string may not work correctly. Try using the modem types, and retest the modem dialing

the selected number.

*The modem repeatedly drops the connection.*

1. Check for a bad or loose serial cable to the modem. If all connections are tight, test for a faulty cable by replacing it with a working cable, and retest the modem communications.
2. Check the connection between the RJ-11 phone outlet and the modem. Verify that the connection is firmly plugged in and well connected.
3. Try using a different phone line. If you have ruled out other factors, consistent modem errors may be due to problems in the telephone line used for communication.
4. Disable call waiting, if it is in use. The call waiting feature can interfere with remote connections and file transfers. If you use this feature regularly, only disable it temporarily, during the time the modem is in use.
5. Check communications with host. The communications problems may be due to the host computer not connecting or repeatedly dropping the line.
6. Try using a lower speed in the modem property sheets in the Modem option in Control Panel.

*The COM Ports remain in Device Manager after the modem is removed.*

After installing an internal modem and assigning it to a COM port that does not physically exist on your computer, the port appears in the Device Manager. After removing this adapter, you may also need to manually remove the port in Device Manager.

1. Double-click the System icon in Control Panel.
2. Click the Device Manager tab, and then click Ports.
3. Click the Communications Port you want to remove, and then click the Remove button.

*You are unable to dial international calls*

Windows 95 allows you to set specific modem properties that assist you when making international calls over your modem. You set these properties in Dial Up Networking, Dialing Properties, and in the modem property sheets.

[To check location and calling card settings](#)

1. In Phone Dialer, click Tools and select Dialing Properties.

2. In the My Location folder, verify that your calling location and calling card settings are correct.

*To disable dial-tone detection if your modem fails to detect a dial tone*

1. Double-click the Modem option in Control Panel, and then click the Connection tab.
2. In the Call Preferences field, click to clear the check box next to the Use Dial Tone option.

*To increase the time between dialing if connections are taking a long time*

1. Double-click the Modem option in Control Panel, and then click the Connection tab.
2. In the Call Preferences field, increase the number of seconds in the Cancel the Call If Not Connected Within option.

*To manually control modem dialing*

1. In all Windows 95 communications applications, right-click a connection icon, and then click Properties.
2. Click the Configure button, and then click the Options tab.
3. Click the Operator Assisted or Manual Dial option, and then click OK.
4. Double-click the connection icon, and then click Connect.
5. When instructed, pick up the phone and dial the number.
6. When you hear the other computer answer, click the Connect button and hang up.

*To bring up a terminal window to type AT commands before or after dialing*

1. In all Windows 95 communications applications, right-click a connection icon, and then click Properties.
  2. Click the Configure button, and then click the Options tab.
  3. Click the Bring Up Terminal Window Before Dialing option, or the Bring Up Terminal Window After Dialing option, and then click OK.
- When you make a connection for this number, a terminal window appears in which you can type AT commands.

*You can't send or receive binary files using HyperTerminal.*

1. Make sure that both computers are using the same file transfer protocol (that is, Xmodem, 1K Xmodem, Ymodem, Ymodem-G, Zmodem, or Kermit).
2. If you are using the Ymodem-G file transfer protocol, ensure that your modem supports hardware error control. If it doesn't, try using Ymodem instead.
3. If you are trying to use an alternative protocol such as Kermit and encounter transmissions errors, try Xmodem instead. Most communications packages, bulletin boards, and online services support Xmodem.

*You cannot dial with Phone Dialer.*

1. From Phone Dialer, click the Tools menu, and select Dialing Properties.
2. Make sure your area code and country code are correct.
3. For each access number you want to use for calling out, specify, at a minimum, the country code, area code, and telephone number.
4. Verify basic modem and port configuration.

*Win16-based applications can't access the modem, but MS-DOS - based or Windows 95-based applications can.*

Make sure the communications driver for Windows 3.1 applications is COMM.DRV in the SYSTEM.INI file. Some applications replace this driver for various reasons.

*MS-DOS -based applications can't access the modem (especially PCMCIA modems), but all Windows-based applications can.*

1. If possible, adjust the IRQ setting in the MS-DOS — based application according to the application's documentation.
2. If the MS-DOS application's IRQ settings cannot be adjusted, adjust the IRQ settings for the modem COM port as described earlier in this section.

*MS-DOS - based and Windows 3.1-based applications can't access the modem, but Windows 95-based applications can.*

Make sure that Microsoft Exchange Remote Mail, Microsoft Fax, and Dial-Up Networking are not waiting for incoming calls. If they are, older applications cannot access the modem.

*Errors occur during MS-DOS - based applications communications sessions, especially file transfers.*

Increase the COMxBuffer setting in the SYSTEM.INI file in the 386 Enhanced section. The default value is 128 bytes.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*



## Chapter 26 Electronic Mail and MS Exchange

This chapter describes the electronic mail and messaging features of Windows 95 including the Microsoft Exchange client. It describes how Microsoft Exchange provides a central place for sending and receiving messages within a workgroup and from other information services, such as electronic mail, faxes, and online services.

### *Microsoft Exchange: The Basics*

---

Windows 95 includes the Microsoft Exchange client, an advanced messaging client that retrieves messages into one universal inbox from many kinds of information services, including Microsoft Mail, Microsoft Fax, Internet Mail, The Microsoft Network, and CompuServe® Mail Services. It has also been integrated with Microsoft Fax software, enabling you send rich-text documents as faxes or mail messages. Microsoft Exchange also provides effective ways to organize, sort, and filter messages.

With Microsoft Exchange, you can:

n

Send or receive electronic mail to members of your Windows 95 workgroup

n

Include files and objects created in other applications in your messages

n

Ensure that messages arrive at the right place by using your Personal Address Book to select recipient names

n

Create folders where you can store related messages, files, and other items

n

View information in folders in a variety of ways

n

Send and receive mail from the Internet, CompuServe, The Microsoft Network, Microsoft Mail postoffices, and other systems (if vendors provide Messaging API (MAPI) drivers)

n

Send and receive faxes from Microsoft Fax

As a universal messaging client, Microsoft Exchange gives you the ability to communicate with a number of electronic mail systems, including Microsoft Mail. Windows 95 includes a complete Microsoft Mail workgroup postoffice, but that is just one of many electronic mail systems that Microsoft Exchange can communicate with.

Microsoft Exchange connects to Microsoft Mail through Messaging API (MAPI) drivers that are provided with Windows 95. Other MAPI drivers provided with Windows 95 allow Microsoft Exchange to connect to other information services, such

as the Internet. Connecting to such services is as easy as selecting printer drivers to connect to different printers in a network environment. For more information about the Windows 95 messaging subsystem, see “How Microsoft Exchange and the Windows 95 Messaging Subsystem Work” later in this chapter.

### *Issues for Microsoft Exchange*

---

Before installing and configuring electronic mail on a network, you should decide the following issues:

**n** What electronic mail system will you use? Do you want to communicate with others in a workgroup, or with people on the Internet or other online services? For communicating within a workgroup, Windows 95 provides a complete Microsoft Mail workgroup postoffice and a wizard for setting it up. For communicating between workgroups, you will need to upgrade to Microsoft Mail Server as described in “Upgrading to a Full Microsoft Mail Server” later in this chapter. For communicating to external electronic mail systems, such as The Microsoft Network or CompuServe, you will need to obtain accounts from those services.

**n** If you use the built-in Microsoft Mail postoffice, where will it be located, and who will administer it? Windows 95 provides a wizard in Control Panel for configuring the Microsoft Mail postoffice. The postoffice, which is a database stored on a shared hard disk, can reside on any computer in the workgroup. For best results the computer should have ample hard disk space to contain message files and should be accessible at all times to users.

— You should allow approximately 2 MB of storage on the mail server to start. As the number of users and the size of mail messages being stored increases, you will need to increase storage for the postoffice. For more than 20 users, consider using a dedicated computer as a mail server. Finally, the computer should have more than the recommended memory minimum (4 MB) for running Windows 95 because sharing message files uses system resources.

Be sure to determine the location of the postoffice before you configure Microsoft Exchange. If you choose Microsoft Exchange during Custom Setup, the Microsoft Exchange Setup wizard is launched at the end of Setup. However, if you have not yet created a postoffice, the wizard does not let you fully configure Microsoft Exchange. Launch the Microsoft Mail Postoffice Admin wizard, and afterward, run Microsoft Exchange to launch the Microsoft Exchange Setup wizard. For information, see “Using Microsoft Exchange with Microsoft Mail” later in this chapter.

n

What types of information services, such as Microsoft Fax, Internet Mail,

and Microsoft Mail, do users need to connect to? You specify these preferences in a Microsoft Exchange Profile which is created when you run the Microsoft Exchange Setup wizard. A profile contains default settings for how messages are delivered to and from a mailbox. After Microsoft Exchange setup, profiles can be modified or new profiles created in the Mail and Fax option in Control Panel or from within Microsoft Exchange. For details, see “Configuring Profiles” later in this chapter.

n

Do you want users to connect to other online or remote messaging

services, such as the Internet, from their individual computer or from the network? If they connect from their computers, they each need a modem, Dial-Up Networking, phone line, and an Internet access provider account. For details, see Chapter 30, “Internet Access.” If you want users to connect through a gateway on a network server, you must upgrade Microsoft Mail to Microsoft Mail Server, and purchase a gateway. For details, see “Upgrading to a Full Microsoft Mail Server” and “Microsoft Mail Gateways” later in this chapter.

n

Which mobile users will need Dial-Up Networking to connect to Microsoft

Exchange? For those users who need remote mail, you should create a Microsoft Exchange profile which includes Microsoft Mail configured to work from a remote site, and you should create a Dial-Up Networking connection to the postoffice. For details, see “Accessing Your Microsoft Mail Postoffice Remotely” later in this chapter.

n

What kind of remote access server will you use to provide Dial-Up

Networking access to your Microsoft Mail postoffice? The server can be a computer running Windows 95 with dial-up server capabilities installed, or a Windows NT Server with its built-in RAS service, or a dedicated device such as a Shiva® LanRover. For more information, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

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Note—— Microsoft Exchange will require 4 MB of RAM on a computer running Windows 95. However, for the Beta version, 6 MG is recommended.

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### Microsoft Exchange and Windows 95 Messaging Overview

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The Microsoft Exchange client is an advanced messaging and workgroup client that is built directly into Windows 95. It can communicate with any electronic mail system or information service that has appropriate MAPI drivers — including Microsoft Mail. Microsoft Exchange works equally well whether connected over the local area network, or by way of a Dial-Up Networking connection. The Microsoft Exchange client includes an OLE-compatible rich-text editor used for composing and reading messages, for powerful custom views, and for searching and filtering capabilities.

Windows 95 provides the following messaging components if you choose to install Microsoft Exchange:

MAPI.

The core messaging subsystem connects messaging client applications, such as electronic mail, to MAPI drivers, which in turn connect to information services, such as the Internet.

#### MAPI drivers.

The MAPI drivers that come with Windows 95 include drivers for connecting to Microsoft Mail, Microsoft Fax, Internet Mail, The Microsoft Network, and CompuServe Mail Services. Vendors can provide additional MAPI drivers to connect to other information services.

#### Microsoft Mail Workgroup Postoffice.

A workgroup edition of the Microsoft Mail Server is included with Windows 95. In a workgroup, one computer typically hosts the postoffice, and the other users access that postoffice to send and receive mail. The Windows 95 workgroup postoffice provides the same feature set as the full Microsoft Mail Server, with the following exceptions:

n

Routing limited to a single postoffice

n

No access to Microsoft Mail gateways

n

Simplified administration tools

#### Personal Address Book.

A common address book, which is a built-in feature of Microsoft Exchange, that

contains not only electronic mail addresses, but names, phone and fax numbers, mailing addresses, and other personal contact information. Individual users set up and maintain their own Personal Address Books (PAB). Through the open MAPI interfaces, a PAB is accessible from a wide variety of applications. The Windows 95 PAB can store addresses for multiple electronic mail systems at the same time.

#### Personal Information Store (.PST).

A sophisticated local database that stores messages, forms, documents, and other information in folders. The Personal Information Store's extensive organizing capabilities include using long filenames, plus sorting and filtering on various fields of the stored objects. Individual users set up and maintain their own Personal Information Store, and can create and save any number of custom views of their data. Personal Information Stores also functions as the user's local mailbox — including a universal inbox and outbox that work with any connected information services, such as CompuServe or the Internet.

#### Microsoft Mail MAPI Drivers.

Microsoft Exchange uses these to connect to either the workgroup postoffice built into Windows 95, or a full Microsoft Mail Server (acquired separately).

#### Internet Mail MAPI Drivers.

Microsoft Exchange uses these to send and receive mail directly on the Internet, using the built-in TCP/IP and PPP protocols provided with Windows 95.

#### Microsoft Fax MAPI Drivers.

Microsoft Exchange uses these to send and receive faxes in the same way as electronic mail. Faxes are received in the same universal inbox as your mail, and the same PAB is used for both mail and fax recipients.

#### CompuServe Mail MAPI Drivers.

Microsoft Exchange uses these to send and receive mail from CompuServe Mail.

#### The Microsoft Network MAPI Drivers.

Microsoft Exchange uses these to send and receive mail on The Microsoft Network, an online service accessible from the Windows 95 desktop.

---

Important — Microsoft Exchange allows individual users to directly connect their client to other messaging services, such as the Internet, through MAPI drivers. For security purposes, a network administrator may want to restrict individual users' ability to communicate to other messaging services. In that case, a network administrator would upgrade to MS Mail Server to enable them to set up a gateway on a server. Users could then only connect to the message service through the

server.

---

### Installing the Microsoft Exchange Client

---

Installation and configuration of Microsoft Exchange consists of three basic steps:

**n** Choose the electronic mail systems to which you will connect Microsoft Exchange

**n** Set up the built-in Microsoft Mail postoffice, if you decide to use that as your electronic mail system. If you are not upgrading from previous Windows for Workgroups Mail or Microsoft Mail 3.2 postoffices, you will not need to set up a Microsoft Mail postoffice.

**n** Define a user profile by running the Microsoft Exchange Setup wizard

The easiest way to install Microsoft Exchange is during Custom Setup of Windows 95. You can also install it after Windows 95 installation in the Add/Remove Programs option in Control Panel.

#### [To install Microsoft Exchange during Window 95 installation](#)

1. Choose the Custom Setup Type, and in the Select Components screen, click Microsoft Exchange.
2. Click the Detail button to install Internet Mail and CompuServe Mail Services.



When the Microsoft Exchange Setup wizard runs at the end of Windows 95 Setup, the wizards for configuring and adding these information services to your Microsoft Exchange Profile also run.

3. At the end of Windows 95 Setup, the Microsoft Exchange Setup wizard guides you in configuring Microsoft Exchange on your computer.

#### *To install Microsoft Exchange after Setup*

1. In Control Panel, double-click the Add/Remove Programs icon.
2. In the Properties for Add/Remove Programs dialog box, click the Windows Setup tab. A list of applications appears in the Components window.
3. Click the box next to the Microsoft Exchange icon and then click the Details button.
4. In the Microsoft Exchange dialog box, click Internet Mail and CompuServe Mail Services if you want to add these to your Microsoft Exchange Profile, and then click OK.
5. The Microsoft Exchange Setup wizard guides you through the configuration steps.

After the wizard is finished, shut down and restart Windows 95 for the changes to take effect.

---

*Note* If a Microsoft Mail or another postoffice has not yet been set up when a user runs the Microsoft Exchange Setup wizard, Microsoft Exchange can only be partially configured. After setup, the postoffice administrator can configure the Microsoft Mail postoffice in the Microsoft Mail option in Control Panel. When other users within the Windows 95 workgroup run Microsoft Exchange for the first time, it will prompt them for the postoffice location.

---

After you set up Microsoft Exchange, you can add other information services to your profile in the Mail and Fax option in Control Panel. For more information, see "Adding Information Services to an Existing Microsoft Exchange Profile" later in this chapter.

#### *Using Microsoft Exchange with Microsoft Mail*

This section describes how to set up a Microsoft Mail postoffice to run with Microsoft Exchange. Other sections later in this chapter describe how to set up Exchange to receive mail from the Internet, CompuServe, and The Microsoft Network. The first time you start Microsoft Exchange on your computer, you'll be asked the location of your postoffice. Microsoft Exchange will only be partially configured if you have not yet set up a postoffice. Consequently, you should set up a Microsoft Mail postoffice before you run Microsoft Exchange.

If you install Windows 95 in the directory formerly used by Windows or Windows for Workgroups, Microsoft Exchange automatically upgrades the Windows for Workgroups Mail or the Microsoft Mail 3.2 Windows client to the Windows 95 Microsoft Mail client. Microsoft Exchange reads any existing MSMAIL.INI file to determine what mail files to delete and copy. All .MMF files are automatically converted to a Personal Information Store (.PST) format, the format readable by Microsoft Mail in Windows 95. For information about converting any additional .MMF files you might have stored on your hard disk, see “Personal Information Stores” later in this chapter.

If you upgraded from Windows for Workgroups to Windows 95, your workgroup postoffice is retained for use with Windows 95. The mail postoffice for Windows for Workgroups and for Windows 95 is identical, so any users using Windows for Workgroups can still share the postoffice. The Windows 95 Microsoft Mail postoffice can't exchange messages with other Microsoft Mail postoffices. To do this, you must upgrade your postoffice to a full Microsoft Mail Server postoffice, as described in “Upgrading to a Full Microsoft Mail Server” later in this chapter.

Setting up a Microsoft Mail Postoffice consists of:

n

Deciding the location for the postoffice

n

Deciding who will administer the postoffice

# n

## Sharing the postoffice with all users in the workgroup

### [To set up a Microsoft Mail Postoffice](#)

1. In Control Panel, click the Microsoft Mail Postoffice icon. A wizard now guides you through setting up a postoffice.

===={ewc msdncd, EWGraphic, x0y 0 /a "psY.bmp"}

2. In the Microsoft Workgroup Postoffice Admin dialog box, click Create A New Workgroup Postoffice, and then specify where you want the workgroup postoffice to be located. Click Next.

====For information about how much memory is required for the computer where the postoffice is located, see "Microsoft Exchange: The Basics" earlier in this chapter.

3. In the Administrator Account Details dialog box, type information about the postoffice administrator, including name and mailbox name, and a password to restrict administration of the postoffice to the administrator. Click Next to finish creating the postoffice.

===={ewc msdncd, EWGraphic, x0y 1 /a "psY.bmp"}

---

Important==== Create only one postoffice for your workgroup, or your users will not be able to send mail to each other.

---

To allow users within a workgroup to access the Microsoft Mail postoffice, you must share the directory where the postoffice resides. Sharing the directory is done through Windows Explorer.

### [To share a workgroup postoffice](#)

1. Open Windows Explorer and click the folder for your workgroup postoffice.
2. From the File menu, click Properties, and then click the Sharing tab.
3. In the Sharing folder, click Shared As and verify the name of the postoffice in the Share Name field. You can also add a comment in the Comment field. Other people will see the comment when they look at a list of computers on the network.

===={ewc msdncd, EWGraphic, x0y 2 /a "psY.bmp"}

4. Under Access Type in the Sharing folder, be sure to click Full Access if you want all users in your workgroup to access the postoffice.
5. To restrict access to the postoffice by requiring a password, click Depends on Password, and then type a password in the Full Access Password field.

When you configure Microsoft Mail using the Microsoft Exchange setup wizard, Microsoft Exchange saves your password to the Microsoft Exchange profile and automatically enters it when you start mail. This means that someone else using your computer will be able to access your mail. You can change your mailbox password and require that Microsoft Mail ask for your password each time you log onto Windows 95.

### [To change your mailbox password](#)

---

Note — This procedure is for users to change their mailbox passwords on the built-in Microsoft Mail postoffice. If you are using the Microsoft Exchange client with another electronic mail system, the exact procedure will vary.

---

n

In Microsoft Exchange, click the Tools menu, and then choose Tools for

Microsoft Mail and Change Mailbox Password.

{ewc msdn cd, EWGraphic, x0y 3 /a "psY.bmp"}

### [To require that Microsoft Mail prompt you for a password](#)

1. Click the Mail and Fax icon in Control Panel, and then click the Properties button for your Microsoft Exchange Profile. The default profile is Microsoft Exchange Settings.
2. In the Services dialog box, click Microsoft Mail, and then click Properties.
3. In the Microsoft Mail dialog box, click Logon.
4. In the Logon dialog box, click the When Logging On, Automatically Enter Password option to clear the check mark.

A Microsoft Mail postoffice is a temporary database, or message store. The

postoffice holds a message until a user retrieves it. Microsoft Mail is efficient because it stores only one copy of each mail message, even when a message is addressed to multiple recipients. A message sent to multiple recipients has a reference count in it. The count is decremented each time a recipient retrieves the message, and the message itself is removed when the reference count drops to 0.

The postoffice is simply a directory structure. All subdirectories must be present for the Microsoft Mail system to function correctly. The following lists each subdirectory of the Microsoft Mail postoffice and describes its purpose:

---

AT Encrypted  
T file  
attachments.

C Schedule+  
AL calendar  
files.

F Shared and  
OL private  
D folders (with  
E a filename  
R extension  
S of .FLD) for  
use by MS-  
DOS  
workstations  
. (Folders on  
Windows for  
Workgroups  
workstations  
are located  
in  
their .MMF  
files on the  
workstations  
.)

GL Global  
B system files  
for Mail.  
These files  
contain local  
user logon  
information  
and control  
files to

generate  
mail files.

HL Help files.  
P

IN These two  
F subdirectories  
TP s contain file  
L information  
relating to  
postoffice-  
defined  
templates.  
INF contains  
information  
files and TPL  
contains  
templates.  
ADMIN.INF  
and  
ADMIN.TPL  
contain  
template  
information  
for local  
postoffice  
users.

KE Index files  
Y that contain  
pointers to  
header  
records in  
the mailbag  
(.MBG) files.

M Mail  
AI messages  
stored in  
encrypted  
form until the  
recipients'  
workstations  
retrieve  
them.

M Mail headers  
B that point to  
G the mail  
(.MAI) files.  
For each file  
in this  
directory,  
there is a  
matching  
index (.KEY)  
file.

M A list of the  
E postoffice's  
M members.

M Mail  
M message  
F files.

N Pointer files  
M for the name  
E alias  
address  
lists.  
ADMIN.NME  
and  
ADMINSHD.  
NME list  
members of  
the  
postoffice  
address list.

P1 Temporary  
storage for  
external  
programs.

G These  
R subdirectorie  
P s are useful  
LO only if you  
G decide to  
U upgrade to a  
S multiple  
R postoffice  
XT configuration

N s. This can be done with the Microsoft Mail Extensions for Windows 95. In that case, USR is used to list user names and group names for the other network and XTN is used to list other external information. LOG contains output log files. GRP contains public and private group pointer files.

The workgroup postoffice administrator is responsible for creating and managing the postoffice. The only difference between the administrator and other mail users is that the administrator can perform the following tasks:

n

Back up the postoffice, which should be done on a regular basis



# n

Add users to the postoffice

# n



Change user information, including replacing forgotten passwords

# n

Check the status of shared folders

The workgroup postoffice manager library, WGPOADMN.DLL, is the software component that supports administrative functions such as adding or deleting users and changing passwords.

### [To administer a postoffice](#)

1. Click the Microsoft Mail Postoffice Icon, and click the Administer an Existing Workgroup Postoffice option.
2. In the space provided, type the password assigned to the administrator during setup of the postoffice, and then click Next.  
The image shows a close-up of a password input field in a software dialog box. The field contains the text "{ewc msdn cd, EWGraphic, x0y 4 /a "psY.bmp"}".
3. In the Postoffice Manager dialog box, click Add to add users to your postoffice, or select a name from the list box, and then click Details to change user information, such as a telephone number or a password.  
The image shows a close-up of the Postoffice Manager dialog box. It displays a list of names in a list box, and the 'Details' button is visible at the bottom.
4. In the Postoffice Manager dialog box, click the Shared Folders button to find out the status of shared folders.

## Setting Up Microsoft Exchange for a User

---

Microsoft Exchange maintains one or more separate profiles for each user. A profile contains default settings for how messages are delivered to and from your mailbox. Individual users create a profile by defining these preferences when they configure Microsoft Exchange for the first time. Other profiles can be added later. There are several ways to start Microsoft Exchange.

### [To start the Microsoft Exchange client](#)

1. Double-click the Inbox on the Windows 95 desktop.
2. From the Start button, select Programs, and then select Microsoft Exchange.
3. When mail arrives, users are notified by an envelope icon on the Windows 95 taskbar. Double-clicking this icon will take you directly into your Inbox.

Before users can work in Microsoft Exchange, they must have a profile. A profile specifies the location of a user's postoffice, Personal Address Book, and Personal Information Store, and the types of information services, such as Microsoft Mail or CompuServe, to which a user is connected. The Microsoft Exchange Setup wizard guides a user in creating a profile when they run Microsoft Exchange for the first time.

Generally, this is the only profile users will need. If they use Microsoft Exchange at home or on the road, you may need to create additional profiles for them. If more than one person uses the same computer, each person should have a unique profile.

### [To create a Microsoft Exchange Profile](#)

1. Double-click the Microsoft Exchange icon on the Windows 95 desktop.

===={ewc msdn cd, EWGraphic, x0y 6 /a "psY.bmp"}

2. When prompted, type the following information: postoffice location, name, and password. This information will vary, depending on which information services you add to your profile.

====If you have already created a postoffice and shared it with all users on the network, its name and location will be automatically entered. In this way, users can configure Microsoft Exchange without having to set up a separate postoffice.

Using Microsoft Exchange profiles allows several users, each with an individual set of preferences, to share the same computer to send and receive mail. It also allows a single user to easily switch between multiple profiles, for example, between a profile for on-site and off-site. In addition, if a user is accessing multiple messaging services, such as the Internet or CompuServe, a profile securely stores any required passwords, allowing for a single logon to multiple mail systems.

The following illustration shows four profiles for three people sharing the same computer. One person has two profiles — one for use on the road and one for the office.

*{ewc msdncd, EWGraphic, x0y 7 /a "psY.bmp"}*

Most Windows 95 mail settings are stored in a messaging profile, including all settings that are specific to a particular user. Some settings, however, apply to the entire Exchange client and these are stored in EXCHNG32.INI. There are also settings for backward compatibility — for example, if you previously used Microsoft Mail 3.2 — which remain in MSMAIL.INI as before.

If you share your computer with another user, or if you use one messaging profile for the office and another for at home or on the road, you can select the profile you want to use.

#### [To add a Microsoft Exchange profile](#)

n

In Control Panel, click the Mail and Fax icon, and then click Add. This

starts the Microsoft Exchange Setup Wizard, which leads you through the steps to create a profile.

#### [To view messaging profiles for your computer](#)

n

In Control Panel, double-click the Mail and Fax icon. The Microsoft

Exchange Profiles dialog box displays the names of all the profiles defined on your computer.

===={ewc msdncd, EWGraphic, x0y 8 /a "psY.bmp"}

---

Note — You can view profiles from within Microsoft Exchange by choosing Options on the Tools menu.

---

#### [To choose which profile to use at startup](#)

1. In Microsoft Exchange, from the Tools menu, choose Options.

===={ewc msdncd, EWGraphic, x0y 9 /a "psY.bmp"}

2. In the When Starting Microsoft Exchange area, click the Pick The Profile That Will Be Used option if you want to choose a profile each time you start Microsoft Exchange.

3. Click the Always Use Which Profile option if you want to specify a default profile.

---

Note — To switch between profiles when you are running Microsoft Exchange, you must exit Microsoft Exchange and then choose a new profile when restarting it.

---

#### *Adding Information Services to an Existing Messaging Profile*

---

Through Microsoft Exchange, you can access multiple information services such as Microsoft Mail, Microsoft Fax, Internet Mail, and CompuServe Mail. Each information service that you connect to is listed in your messaging profile. After you connect, you can send and receive electronic messages to and from these services.

MAPI drivers make it possible to connect Windows 95 to external information services. A MAPI DRIVER is similar to a personal gateway. It specifies all the connection and addressing settings needed to communicate with a network on one end and with Windows 95 on another end. Windows 95 includes the following MAPI drivers:

n

The Microsoft Mail MAPI driver connects to Microsoft Mail Server

postoffices that you may have on a Windows NT or Novell®NetWare® server, or the built-in Windows 95 workgroup postoffice. See the previous sections for

details on configuring and using the Microsoft Exchange client with a Microsoft Mail postoffice.

n

The Internet Mail MAPI driver enables you to send and receive mail

directly on the Internet or other networks based on Simple Mail Transport Protocol (SMTP). SMTP and POP3 protocols over TCP/IP are built into Windows 95. For details, see “Installing and Configuring Internet Mail” later in this chapter.

n

The Microsoft Fax MAPI driver enables you to send and receive electronic

faxes as if they were mail messages. For more information, see Chapter 27, “Microsoft Fax.”

n

The CompuServe Mail MAPI driver enables you to send and receive mail

using the CompuServe Mail Services. It supports Windows 95 TAPI for dialing directly into Compuserve.

n

The Microsoft Network MAPI driver enables you to send and receive mail

directly to The Microsoft Network. For details, see “Using The Microsoft Network” later in this chapter and Chapter 29, “The Microsoft Network.”

---

Note—— You will also be able to add a Microsoft Exchange Server MAPI driver to connect your Windows 95 Microsoft Exchange clients to the next generation Microsoft Exchange Server, a client-server messaging system, currently in development, that runs on Windows NT Server.

---

Messaging systems other than the four that come with Windows 95 must supply their own MAPI drivers in order to connect to Microsoft Exchange. For example, if your organization uses Novell MHS, obtain a MAPI driver for HMS from Novell.

You can add information services to a profile in the Mail and Fax option in Control Panel, or with the Option item under the Microsoft Exchange Tools menu.

#### [To add an information service to a profile](#)

1. Click the Mail and Fax option in Control Panel, and then select the profile to which you want to add an Information Service.

——Or

Click Options on the Tool menu in Microsoft Exchange, click the Services tab, and then begin at Step 3.

2. Select the Properties button. The following dialog box appears and lists those information services which are included with Windows 95.

——{ewc msdncd, EWGraphic, x0y 10 /a "psY.bmp"}

3. Click Add and specify the information service you want to add.

——The service you select determines what specific DLLs are loaded when Microsoft Exchange is started. For example, if the Microsoft Mail service is added, the MSFS32.DLL file is copied to the Windows SYSTEM directory. (To find out which DLLs are loaded for a service, click the name of that service, then click About.)

——The information services each provide a setup wizard which prompts you for any required configuration information.

4. If you want to configure a service manually, click the name of a service, and then click Properties.

---

Tip—— When you're troubleshooting Windows 95 mail issues, first remove additional information service drivers (except Personal Address Book and Personal Information Store) and then add back each information service, one at a time.

---

You can use Internet Mail to communicate with anyone on the Internet and on other networks. The Internet Mail service is a set of MAPI drivers that allows you to send

and receive mail on the Internet by connecting a computer running Windows 95 and Microsoft Exchange to a server with access to the Internet.

Microsoft Internet Mail is compliant with Multipurpose Internet Mail Extensions (MIME), which allows you to send messages containing sound, images, video, and other attachments over the Internet. Internet Mail's MIME capabilities vastly improve the plain-text mail messages typically sent on the Internet.

Most servers that provide access to the Internet run a combination of Simple Mail Transport Protocol (SMTP), or Post Office Protocol version 3 (POP3). SMTP is used to send Internet messages from the Internet Mail to the final destination. POP3 is used to retrieve messages sent to you from a POP3 account mailbox.

To successfully connect to a POP3 or an SMTP server, you must add Internet Mail to a Microsoft Exchange Profile and configure bind the Microsoft TCP/IP protocol to use either a network adapter or the Microsoft Dial-Up adapter. For more information about installing and binding these protocols, see Chapter 12, "Network Technical Discussion" and Chapter 30, "Internet Access."

To run Internet Mail, you need the following information from your Internet service provider. Be sure to have this information before you add Microsoft Internet Mail to your Microsoft Exchange Profile:

n

Internet Mail Server (POP3) account name and password

n

Your IP address on your Internet Mail (POP3) Server. If you have a DHCP

server that maps the Domain Name System (DNS) to IP addresses, you do not need an IP address. If you have a DHCP server, disable DNS in TCP/IP setup in the Network option in Control Panel. If DNS is not enabled, then the IP address must be entered. For more information, see Chapter 12, "Network Technical Discussion" and Chapter 30, "Internet Access."

# n

Your electronic mail address, that is, your host name (computer name)

followed by the at symbol and domain names (joellen@microsoft.com). This is used to address replies to any messages that you have sent.

The easiest way to install Internet Mail is during Custom Setup of Windows 95. You can also install it after Windows 95 installation with the Add/Remove Programs option in Control Panel.

### [To install Internet Mail during Window 95 Setup](#)

1. Select Custom Setup Type, and in the Select Components screen, click Microsoft Exchange, and then click the Change Option button.
2. In the Details dialog box, click Internet Mail.

### [To install Internet Mail after Windows 95 Setup](#)

1. Click the Add/Remove Programs option in Control Panel, and then click the Windows Setup tab.
2. In the Components list, click Microsoft Exchange, and then click the Details button.
3. In the Microsoft Exchange dialog box, click Internet Mail, and then click OK.

After you install Internet Mail, you must add it as an information service to a Microsoft Exchange profile.

### [To add Internet Mail to a Microsoft Exchange Profile and configure it](#)

1. Double-click the Mail and Fax icon in Control Panel, and then click a profile.  
— Or —  
— In Microsoft Exchange, choose Options from the Tools menu, and then click Services.
  2. In the Services dialog box, click the Add button.
  3. In the Add Service to Profile dialog box, click Internet Mail, and then click OK.
- {ewc msdn cd, EWGraphic, x0y 11 /a "psY.bmp"}



4. In the Personal Information box on the screen that appears, type your full name (Joellen Smith) and your electronic mail name (Joelle@microsoft.com) in the Personal Information box.
5. In the Mailbox Information box, type the following information:
  - Internet Mail Server: The IP address of your Internet mail server, for example 22.3.44.567. This is the server where POP3 is running. If the server is different from the one running SMTP, type the POP3 server name here and then type the SMTP server in the Advanced Options dialog box as described in the next step. If you have a DNS server, type a friendly domain name, such as microsoft.com, which is mapped to the IP address.
  - Account Name: Your electronic mail POP3 account name.
  - Account Password: Your mailbox password.
6. Click the Advanced Options button if the POP3 server is different from the SMTP server.
7. In the Advanced Options dialog box, type the name of the SMTP server that is used to send outbound messages, and then click OK. If you have a DNS server, you can type a domain name. If you don't, you must type an IP address.
8. In the General property sheet, click the Message Format button to specify the character sets and format of outgoing messages as follows:

n

Click MIME if you want to send messages in a standardized format, messages with embedded or attached files, or anything beyond unaccented characters.

n

Click UUENCODE if you want to send plain text messages only.

n

Click Character Sets to select the outbound character format for MIME or Text.

9. Click the Connection tab, and define whether the computer connects to the Internet server through a LAN connection or a modem connection through Dial-Up Networking.

10. If you are using a modem, click the Add Entry button to define a new Dial-Up Networking connection to the POP3 or SMTP server.

11. Click the Message Transfer information to specify how messages are transferred, as follows:

n

The Automatic option delivers all new messages.

n

The Selective Using The Remote Previewer option loads message headers only.

12. In the Connection property sheet, click Transfer Options to set up a log file for your sessions and to set the time interval for message delivery.

Windows 95 provides a wizard to install CompuServe Mail Service, which allows you to customize how the CompuServe MAPI driver makes a CompuServe connection and to choose the times your CompuServe MAPI driver will connect to CompuServe for the exchange of mail.

### [To install CompuServe Mail Service](#)

1. In the Add Services to Profile dialog box, click CompuServe Mail Service.
2. In the CompuServe Mail Transport Settings dialog box, click the CompServe Dir button to define the directory where CompuServe connection information (CIS.INI) will be located, and then click OK.

===={ewc msdncd, EWGraphic, x0y 12 /a "psY.bmp"}

3. Click the Communications button and, in the Setup Session Settings dialog box that appears, type the CompuServe connection information such as User ID number, password, telephone number, and so on. Click OK.

===={ewc msdncd, EWGraphic, x0y 13 /a "psY.bmp"}

4. Click the Connection Times button and, in the CompuServe Mail Session Setup dialog box that appears, type the time you want Windows 95 to connect to CompuServe Mail.

====If you click the Exit of Mail option, CompuServe mail will only sent when you exit Microsoft Exchange. Click OK.

===={ewc msdncd, EWGraphic, x0y 14 /a "psY.bmp"}

### [To install a CompuServe Address Book](#)

1. In the Add Services to Profile dialog box, click CompuServe Address Book.

===={ewc msdncd, EWGraphic, x0y 15 /a "psY.bmp"}


2. In the Select Address Book Location dialog box, type the directory where you will store your address book. Click Save.

An address book defines the destination of electronic messages. With an address book, you can select recipients while composing a message, create and modify lists of recipients, and modify directories of user names.


If you are on a corporate network, you typically can access one or more server-based postoffice address books and your own Personal Address Book (PAB). For example, with Microsoft Mail, you can use the Microsoft Mail postoffice address book, which is maintained by the administrator on the workgroup mail server, and create your own PAB. Users can copy addresses from the postoffice address book to their own PAB.

Microsoft Exchange creates two address books when you create your first profile: a Personal Address Book (PAB) and a Post Office Address List, maintained by the postoffice administrator.

### [To specify the address book you want to use](#)

1. In Microsoft Exchange, you can select an address book from either the Tools menu in Microsoft Exchange, or from the Compose menu on the toolbar of a new electronic mail message.
  2. From the Tools menu, click the Address Books option.
  3. In the Address Book dialog box, click the name of the address book you want to use in the list box named Show Names From The. The names in the address book you selected are displayed in the list box to the left.
- 
4. To find a name in the list, type it in the blank box above the list, and click the Find button.
  5. In the File menu, click the Add to Personal Address Book option to add it to your PAB.
  6. Click the New Message button to create a new electronic mail message that's pre-addressed to the selected people.

### [To select a name from an address book within a message](#)

1. In Microsoft Exchange, click the Compose menu, and then click New Message.
  2. In the new message form, click the Select Names button on the toolbar.
- 
3. In the Select Names dialog box, the names of all the people in the selected address book appear in a list box. Double-click the name you want, and then click OK to address the message.

You can add a name to your PAB from either the Select Names dialog box, or the Address Book dialog box.

### [To maintain a Personal Address Book](#)

1. In the Select Names dialog box, click a name and then click the Properties button.
2. In the Properties for that name dialog box, click the Personal Address Book button.

A Personal Information Store is a database on your computer where mail messages, forms documents and other information are stored in folders. The Personal Information Store functions as your universal inbox and outbox for sending and

receiving messages from various information services, such as the Internet, CompuServe, and Microsoft Mail.

All message (.MMF) files from your Windows for Workgroups Mail or Microsoft Mail 3.2 are automatically converted to an Exchange .PST format when you upgrade to Windows 95 as described in “Upgrading from Windows for Workgroups” earlier in this chapter. If you have additional .MMF files that were not converted during Setup, Windows 95 provides a Message File Conversion wizard to accomplish this.

*To convert additional .MMF files*

1. In Accessories, click System Tools, and then click the Mail File Converter icon.
2. Type the following information when the Message File Conversion wizard prompts you for it:

n

Path to your old .MMF files

n

Name of the profile in which you want to create a new Personal Information Store

n

Path to the new Personal Information Store

n

Name for the new .PST file

—{ewc msdncd, EWGraphic, x0y 18 /a "psY.bmp"}

The wizard leaves your original .MMF files intact and copies the messages into the new Personal Information Store. The wizard allows you to add a store to an existing profile, or to create a new profile for it.

You can add as many Personal Information Stores as you need. For example, you might want to create one Personal Information Store for archived messages and one for current messages. Or you could choose to have one Personal Information Store for messages from a specific information service, such as CompuServe. However, no matter how many information services you add to your profile, you only need one Personal Information Store.

#### [To add a Personal Information Store:](#)

1. In the Microsoft Exchange Tool menu, click Options.
2. Click the Services tab, and then click the Add button.
3. In the Add Service to Profile dialog box, click Personal Information Store, and then click OK.

—{ewc msdncd, EWGraphic, x0y 19 /a "psY.bmp"}

4. In the Create/Open Personal Information Store dialog box, type a name for the store with a .PST extension, and then click Open.

—{ewc msdncd, EWGraphic, x0y 20 /a "psY.bmp"}

5. In the Create Microsoft Personal Information Store dialog box, click the type of encryption you want and a password, and then click OK.

—The Personal Information Store supports encryption and password protection to maintain the privacy of your electronic mail. If your .PST file is stored on a drive compressed with DriveSpace, you should choose the Compressible Encryption option for the best performance.

A Personal Information Store is a file in a directory which can be copied in the same way as any other file in Windows 95. You may decide to copy a Personal Information Store in order to back up the information it contains.

### [To back up a Personal Information Store](#)

1. Exit Microsoft Exchange.
2. In My Computer, find the MAILBOX.PST file in the Exchange folder.
3. Drag and drop the file to a new folder in My Computer.

The Microsoft Exchange client provides a number of flexible ways to view and manage electronic mail messages and other information. When you first use Microsoft Exchange, you'll see messages arranged in these fields: From (sender's name), Subject, and Received (date and time). You can reorganize the way you view the contents of a single folder or all your folders by redefining the view you use.

You can define a view to sort and organize messages in several different ways:

n

Create a series of folders to keep groups of messages in each.

n

Sort messages within a folder by category, such as the message subject title, the sender's name, and so on.

n

Redefine which columns of information you want to see for each message.

n

Group messages by category and by subcategory.

n

Define filters to list only specific types of messages.

n

Combine all of your organizational features into a view, which you can save, and apply at any time.

The following sections provide procedures for sorting messages.

[To move a message to another folder](#)

n

In the Microsoft Exchange Inbox, drag the message to the new folder.

— Or —

Select the message, and choose Move Item or Copy Item from the File menu, and then specify the destination folder.

— Or —

Right-click the message and select Move Item or Copy Item, and then specify the



destination folder.

When you use a double-pane view, drag the message from the right pane to a folder in the left pane.

#### [To sort messages in a folder](#)

1. From the View menu in Microsoft Exchange, click Sort.
2. From the Sort Items By list, select the field to be used for sorting. Click OK.

===={ewc msdncd, EWGraphic, x0y 21 /a "psY.bmp"}

==== Or

==== Click a field name shown at the top of a message. For example, click the Subject bar to sort by subject.

#### [To view additional information about your messages](#)

1. From the View menu, click Columns.
2. Use the Add and Remove buttons to specify the columns you want displayed.

===={ewc msdncd, EWGraphic, x0y 22 /a "psY.bmp"}

---

Note ==== Some of the values shown in the preceding figure are electronic mail values and some are OLE values from OLE-compatible document files. Not every message includes all these values.

---

#### [To define how messages will be grouped](#)

1. From the View menu, click Group By.

==== You can group your messages according to four levels of a hierarchy that you define. For example, the following illustration shows a folder with messages grouped hierarchically by Subject, From, Received, and Importance. This is referred to as a CATEGORIZED view. The "+" to the left of the subject name indicates that this category can be expanded or collapsed to reveal its contents.

===={ewc msdncd, EWGraphic, x0y 23 /a "psY.bmp"}

2. From the lists, select fields by which you would like your messages grouped. You can specify up to four levels of hierarchy.

===={ewc msdncd, EWGraphic, x0y 24 /a "psY.bmp"}

3. Use the Sort box to specify the field on which to sort. Then click OK.

### [To define a filter](#)

1. From the View menu, click Filter.

—— A FILTER lists only those messages which meet a certain set of criteria. For example, you can define a filter to show all of the messages from Anne Miller, or all the messages on which you were listed on the “Cc” line.

2. Specify the criteria you want to use to filter messages.

——{ewc msdncd, EWGraphic, x0y 25 /a "psY.bmp"}

3. Click Advanced to filter by size, date, importance, or sensitivity. You can also use this dialog box to filter unread messages, messages with attachments, or messages that do not meet the criteria you specified.

——{ewc msdncd, EWGraphic, x0y 26 /a "psY.bmp"}

4. When you're finished defining the filtering method, click OK.

After you have created an organization that suits the way you work, you can save it as a view. You can also switch between predefined views, to see information about your messages in a variety of ways.

### [To switch to another predefined view](#)

1. From the View menu, click Folder View or Common View.

2. Click the name of the view you want to use.

### [To define a custom view](#)

1. Organize the folder to show information the way that you want it.

2. From the View menu, click Define View.

3. Click Current View.

4. Click New and type a name for the view.

——{ewc msdncd, EWGraphic, x0y 27 /a "psY.bmp"}

5. Click either Folder View (for use with the current folder) or Common Views (for use with any folder). Click OK.

---

Note—— When you choose to sort messages by subject, Microsoft Exchange ignores “FW:” and “RE:” in the subject line, and groups all messages on the same topic together.

---

A message finder is a separate window that works in the same way as a filter to find messages that meet a particular set of criteria. When set up, a finder can run continuously, alerting you when matching messages arrive.

#### [To display a message finder window](#)

1. From the Tools menu, click Find
2. Specify the criteria you want to use to find messages. Click Advanced to find by size, date, importance, or sensitivity.

---

Note — The selection criteria for finding messages are the same as for filtering messages.

---

When you attach the same document to multiple electronic mail messages, you can unnecessarily use a large amount of disk space on your network. Microsoft Exchange allows you to include a pointer in your mail message that tells others where to find a document on your network. Attaching a pointer to a mail message is called a message link.

---

Note — To attach a message link to a file, the file must be in a shared folder on a computer on a network.

---

#### [To create a message link](#)

1. In Microsoft Exchange, click the File menu, and then click Insert.  
{ewc msdncd, EWGraphic, x0y 28 /a "psY.bmp"}
2. Double-click a shared folder, and then click the file for which you want to create a message link.
3. Click the Link Attachment to Original File option, and then click OK.

You can use the built-in OLE capabilities of Windows 95 to drag messages to drives, folders, or documents. You can also drag documents into messages.

# n

If you drag a message from a Microsoft Exchange folder to an icon for a drive or to a directory in My Computer, Windows 95 saves it as an .MSG file.

# n

If you drag files into Microsoft Exchange folders, you can use the Custom Views and Group By options to organize them, especially if the files support OLE document properties.

---

*Tip*— You can use Microsoft Exchange folders as an alternate way to store and sort files. Consider creating a hierarchy of folders, perhaps with separate views, to store and categorize files which would create a personalized document library. Microsoft Exchange folders allow you to create more elaborate and customized views than are possible in the regular Windows 95 file system.

---

All Microsoft Office products, such as Microsoft Word and Microsoft Excel, include Summary Info dialog boxes as shown in the following figure. The information in this dialog box is maintained with the document as OLE properties. When you drag one of these documents into a Microsoft Exchange folder, these OLE document properties automatically become available as fields in the folder. You can add these fields to the columns you wish to view, or you can sort, filter, and search on these fields (in addition to the normal messaging properties). For more information about OLE in Windows 95, see Chapter 22, "Application Support."

`{ewc msdncd, EWGraphic, x0y 29 /a "psY.bmp"}`

This capability is supported by the Personal Information Store in Windows 95. In addition, some server-based information stores, such as Microsoft Exchange Server, also support shared or replicated sets of folders to let large groups of people easily share documents and messages, and create rich views on them.

---

### Customizing Microsoft Exchange

---

You can customize the way the Microsoft Exchange client works for you with the

following features:

n

Add custom commands to Microsoft Exchange menus.

n

Add custom message types to define and install customized forms.

n

Add custom menus to the Microsoft Exchange menu bar. You can use

these menus to group custom commands and messages under a single, distinctive menu item.

You can install custom commands, message types, and menus on local computers for individual users, or on a network server for many users. For information about customizing Microsoft Exchange, please see the online documentation on the WINDOWS 95 RESOURCE KIT disc.

### Accessing Your Microsoft Mail Postoffice Remotely

---

You don't have to be at your office to use Microsoft Exchange. When working at home or on the road, you can read and reply to mail offline. Then, if you have a modem and access to a telephone line, you can establish a remote connection to your organization's network or to your computer, and send and receive electronic mail as if you were at your office.

The Microsoft Exchange client is designed to provide the benefits of remote mail, WITHOUT requiring any additional client software, or a special gateway to dial into. When you are at a remote site, you can easily send and receive electronic mail with

the following features.

#### Remote preview.

Using the built-in Microsoft Mail drivers, you can dial into your network and preview just the headers of your new mail messages. That is, you can see who has sent you a message, the subject of the message, the size of the message, and the estimated time it will take to download it. This saves you time when you are away from the office and don't want to download unnecessary files.

#### Selective download.

After the headers are retrieved, you can mark which messages you would like to download, and which you would like to delete without downloading. You can either stay on the line after retrieving the headers, or make another call later to download selected messages.

#### Dial-Up Networking.

Rather than using a specialized electronic mail gateway for remote mail, Microsoft Exchange relies on the Dial-Up Networking tool that's built into Windows 95. Since Windows 95 supports standard network protocols, such as TCP/IP, IPX/SPX, and NetBEUI, you can use Dial-Up Networking to dial into many types of remote access servers to access your postoffice. The types of remote access servers you can dial into include another computer running Windows 95, Windows NT Server, Shiva®-LanRover, Novell NetWare, and others. For details, see Chapter 28, "Dial-Up Networking and Mobile Computing."

#### Offline use.

You can compose mail while OFFLINE, that is, while you're not connected to a network. For example, while you're at the airport, you can download new messages, read your mail and compose replies, and then send your responses automatically the next time you dial in from the hotel. Messages are queued up in the outbox until the next time you're connected to the appropriate mail service.

#### Scheduled connections.

You can dial in as needed to retrieve mail remotely, or you can set up SCHEDULED CONNECTIONS to dial in at a specific time, or on a regular basis (for example, if you work permanently at a remote site).

#### Modem Sharing Through TAPI.

Microsoft Exchange uses the Windows 95 TAPI facilities to dial and retrieve mail remotely, which allows applications to share a modem. For example, you can set your modem to listen for incoming faxes, but still make a call to get your electronic mail — TAPI effectively arbitrates modem resources among applications. Microsoft

Exchange also uses the TAPI Dialing Properties tool to easily handle multiple locations, hotel dialing prefixes, and credit card calls. For more information about Dialing Properties, see Chapter 25, "Modems and Communications Tools."

This section describes remote access configuration procedures for the Microsoft Mail service which is built into Windows 95. Other mail services, such as CompuServe may also have remote functionality; however, the remote access configuration procedures will differ.

When you configure Microsoft Mail for remote access, you need to specify:

**n** That you want Microsoft Mail to remotely connect to your postoffice with a modem.

**n** A Dial-Up Networking connection to that postoffice. The Dial-Up Networking New Connection wizard is launched when you define a new remote connection during the remote access configuration process.

**n** Whether or not you want remote preview of mail messages.

n

When you want to initiate and terminate a remote session.

n

Whether or not you want to schedule an automatic connection time.

---

Note—— You can create two Microsoft Exchange Profiles, one for remote access and one for LAN access to your postoffice, or you can create one profile and choose to use remote access when not connected to your server.

---

[To configure Microsoft Exchange for remote access](#)

1. In Control Panel, double-click the Mail and Fax icon.
2. In the Microsoft Exchange Profiles dialog box, click the name of your primary profile to either modify it for remote use, or copy and rename it as a second profile for remote use, and then click Properties.
3. In the Properties dialog box, click Microsoft Mail, and then click Properties.
4. In the Microsoft Mail dialog box, click the Connection tab, and then click the Remote Using A Modem And Dial-Up Network option.

——{ewc msdncd, EWGraphic, x0y 30 /a "psY.bmp"}

——If you want to work offline to compose or read mail messages before or after making a remote connect, click Offline.

5. Click the Remote Configuration tab, and check Use Remote Preview to view your headers before you download them.

——{ewc msdncd, EWGraphic, x0y 31 /a "psY.bmp"}

6. Click the Remote Session tab and specify whether you want a remote session to start and end when you open and close Microsoft Mail, or to do so under other conditions.

——{ewc msdncd, EWGraphic, x0y 32 /a "psY.bmp"}



7. Click the Dial-Up Network tab and specify the Dial-Up Networking connection to be used when you start a remote access session. To define a new connection, click Add. The Dial-Up Networking New Connection wizard prompts you for the necessary information.

=={ewc msdn cd, EWGraphic, x0y 33 /a "psY.bmp"}

You can schedule a remote session with Microsoft Mail to occur in the future by specifying a time and connection method. The scheduled sessions are stored in the messaging profile. You can specify up to 16 scheduled sessions, including:

n

Sessions at a specific date and time

n

Sessions at prescribed intervals

n

Sessions at specific times on specific days of the week

#### [To define a scheduled session](#)

1. Double-click the Mail and Fax icon in Control Panel, click a profile, and then click Properties.
2. Click Microsoft Mail, and then click Properties.
3. In the Microsoft Mail dialog box, click the Remote Session tab, and then click the

Schedule Item Delivery button.

Or

Click the Tools menu in Microsoft Exchange, select Microsoft Mail Tools, and then click Schedule Remote Mail Delivery.

4. In the Remote Scheduled Sessions dialog box, click the Dial-Up Networking connection you want to use to establish the remote connection, and then click Add.

{ewc msdn cd, EWGraphic, x0y 34 /a "psY.bmp"}

5. Specify the time at which you want to schedule a session. If you choose Every, then you must specify a prescribed time interval at which you want Microsoft Mail to attempt a connection.

{ewc msdn cd, EWGraphic, x0y 35 /a "psY.bmp"}

Notice that if you click Weekly On, the dialog box contents change so you can specify a date and time.

{ewc msdn cd, EWGraphic, x0y 36 /a "psY.bmp"}

After you review your headers in remote preview, you can mark messages for selective downloading.

### [To mark messages](#)

1. In Microsoft Exchange, click the Remote Preview option on the Tools menu.

2. In the Remote Preview for Microsoft Mail dialog box, click the messages you want to preview.

3. Click the Edit menu, and then click Mark to Retrieve.

### *How Microsoft Exchange and the Windows 95 Messaging Subsystem Work*

The Windows 95 Messaging subsystem architecture provides power and flexibility while the details of its design remain virtually invisible to the user. The subsystem provides an abstraction layer between user tools and applications, and various message delivery components (called MAPI DRIVERS), including drivers for mail delivery and fax delivery.

The Messaging subsystem divides messaging components into three types:

n

Messaging client applications

n

MAPI core

n

MAPI drivers

*{ewc msdncd, EWGraphic, x0y 37 /a "psY.bmp"}*

The core of the messaging subsystem is a Messaging API (MAPI) layer. With MAPI, the subsystem enables you to create mix-and-match messaging applications that can each access multiple messaging systems. For example, messaging client applications, such as Microsoft Exchange, that use MAPI can communicate with different messaging systems, such as Microsoft Mail, the Internet, and Novell MHS, as long as the appropriate MAPI drivers are installed. MAPI can manage multiple service drivers simultaneously, so clients can call for services from two or more messaging systems using the same code, making it extremely efficient and providing a single, unified interface.

### [Messaging Clients](#)

Messaging client applications communicate with MAPI drivers through the MAPI core. Each MAPI driver interacts with a specific underlying messaging service, such as Microsoft Mail.

Messaging client applications can be divided into three general categories:

n

Messaging-aware applications. These include messaging functions as an added but not required feature, supporting the application's main purpose. An example of a messaging-aware application is Microsoft Word, which can add messaging functions by adding a Send Message command to its File menu.

n

Messaging-enabled applications. These require some form of messaging functionality in order to meet the application's main purpose. Examples of messaging-enabled applications are the Microsoft Exchange client, Microsoft Mail, and cc:Mail™.

n

Messaging-based workgroup applications. These are more complex types of applications which go beyond basic electronic mail. They require full access to all the messaging services, including the message store, address book, and message transport functions. An example of this type of application is Microsoft Schedule+, or the Public Folders on a Microsoft Exchange Server.

For information about creating a messaging client, see the WINDOWS 95 SOFTWARE DEVELOPMENT KIT.

### [MAPI Core](#)

The MAPI core consists of several DLLs and the message spooler. Its function is to coordinate MAPI-compatible client applications with MAPI-compatible service drivers. The subsystem includes two major functional interfaces — the client interface and the service driver interface.

The message SPOOLER queues outgoing messages and routes incoming messages to the proper message store folder. A MAPI driver can include multiple message stores, address books, and transport drivers. The MAPI core selects between message store and messaging transport drivers as necessary and merges the address books presented to it, so the client application sees one combined address book interface.

Windows 95 contains the modules for three separate Messaging APIs: Simple MAPI, Extended MAPI, and Common Messaging Calls or CMC.

Simple MAPI contains 12 basic messaging functions. Its main purpose is for use in MESSAGING-AWARE APPLICATIONS. These are applications with a main function, which is usually something completely separate from messaging, such as graphing or word processing, but which also contain messaging features. This added messaging capability enables users to send their documents to others directly from the application, without stopping to run a separate mail application. Simple MAPI allows applications to send and receive messages, access address books, and attach and embed objects using OLE.

Extended MAPI is designed for complex messaging applications. This module provides advanced function calls for mail applications, workflow development, and forms distribution and management. It includes Simple MAPI, and provides the tools to access and manipulate message stores and address books through the Service Provider Interface.

Common Messaging Calls is an API layer defined by the XAPIA (X.400 API Association) which also allows applications to use advanced functions to gain messaging capabilities. The difference between CMC and MAPI is that MAPI works only under Windows-based operating systems. CMC is designed to be platform-independent. Simple MAPI and CMC calls are functionally equivalent, but if you are developing a cross-platform messaging application, you should use CMC.

### [MAPI Drivers](#)

MAPI defines three basic driver types:

n

Message store drivers supply message storage, organization, and retrieval facilities for a messaging system.

n

Address book drivers supply message addressing and distribution list facilities to the messaging client.

n

Messaging transport drivers move messages between messaging clients.

---

Note — Other vendors can add or replace MAPI drivers to enable the Microsoft Exchange client to work with their mail systems.

---

### Upgrading to a Full Microsoft Mail Server

---

With Windows 95, you can support all the users in your workgroup on a single Microsoft Mail postoffice. Performance will vary depending on your postoffice computer, but for best results, no more than 100 users should be supported by this postoffice. If your organization grows larger, you can upgrade your postoffice to a full Microsoft Mail Server postoffice by installing the Microsoft Mail PostOffice Upgrade product.

The Windows 95 and Microsoft Mail Server postoffices are identical, except for the following:

n

No executable files or Help files are in the workgroup postoffice structure.

Microsoft Mail Server does include these files in its postoffice.

n

The postoffice in Windows 95 doesn't support connections to external postoffices or gateways.

n

Microsoft Mail Server includes an ADMIN account not created in Windows 95 mail.

n

Default ADMIN.TPL and ADMIN.INF files are created in Microsoft Mail Server to add the predefined extended user information in the workgroup postoffice structure.

n

Microsoft Mail Server includes an administration utility (ADMIN.EXE) that is used to administer and configure the postoffice from any workstation on the network.

n

Microsoft Mail Server includes support files for external postoffice mail transfer through a network or modem.

n

Microsoft Mail Server includes a routing program, EXTERNAL.EXE, that routes mail between multiple postoffices and gateways.

n

Microsoft Mail Server includes client software for Windows 3.1, MS-DOS, and Apple® Macintosh® operating systems.

You can upgrade your Windows 95 postoffice to a full Microsoft Mail Server postoffice by using the MICROSOFT MAIL POST OFFICE UPGRADE product. The product package includes software, documentation, and licensing to extend the connectivity of your workgroup. It includes the following software components:

n

Software to upgrade your workgroup postoffice to a full Microsoft Mail Server postoffice.



n

Additional server software:

n

Advanced administration tools, including tools for routing, directory synchronization, network group names, user access privileges, mail log files, and for deleting old mail and old Mail accounts.

n

The Message Transfer Agent (external) component, which provides the process to connect postoffices (by means of a physical or asynchronous link) with the platform for remote access.

n

Windows 3.1, MS-DOS, Macintosh, and IBM® OS/2® Mail client software for people on your network who may not use Windows 95.

If you want to set up a Windows 95 workgroup mail server to route mail between two or more postoffices, you need to:

n

Purchase the Microsoft Mail Post Office Upgrade for EACH workgroup post office you want to connect, and then follow the detailed directions that come with the Microsoft Mail Post Office Upgrade.

n

Set up a dedicated MS-DOS computer to act as the “router”. It will be running the EXTERNAL.EXE program included in the Post Office Upgrade. Notice that this MS-DOS computer needs networking software to connect to your postoffice servers. If the postoffices are stored on computers running Windows 95, then the MS-DOS computer needs a copy of Microsoft Windows for Workgroups Add-On for MS-DOS. If your postoffices are on Novell NetWare servers, then your MS-DOS computer needs Novell client software for MS-DOS.

n

If the postoffices are not on the same LAN, then you need a dedicated MS-DOS computer to run EXTERNAL.EXE IN EACH SITE, plus a modem for communicating to the other sites. Note that Microsoft also offers versions of EXTERNAL.EXE that run on OS/2 or Windows NT servers as an option.

### Upgrading to Microsoft Exchange Server

---

Microsoft has announced a next-generation, client-server messaging system known as Microsoft Exchange Server. Expected to be available in 1995, Microsoft Exchange Server provides advanced electronic mail, scheduling, groupware applications, and custom application development capabilities. Microsoft Exchange Server includes MAPI drivers that allow the Windows 95 Microsoft Exchange client to access much more than just mail messages. For example, when the Microsoft Exchange is connected to an Exchange Server, you can access replicated “public

folder” databases, create custom forms and shared documents, schedule meetings with others, manage your time and tasks, and create custom electronic forms for use in your business.

Microsoft Exchange Server will require a computer running Windows NT Server, version 3.5 or higher. Contact your Microsoft representative for more information on Microsoft Exchange Server.

### *Microsoft Mail Gateways*

---

Almost all large organizations have multiple electronic messaging systems. In your organization, you may need to communicate with workgroups or organizations using electronic mail systems other than Windows 95 mail, such as cc:Mail, HP® Openmail, or IBM PROFS®. Microsoft offers a complete line of advanced gateways which provide reliable and sophisticated connectivity between Microsoft Mail Server for PC networks and virtually any other electronic mail system within your organization.

GATEWAYS ensure that messages always get across to their intended recipients. Addressing messages remains an easy process because people using other mail systems will be listed in your Microsoft Mail global address list — all you need to know is the name of the person you need to communicate with.

Microsoft offers gateways for the following:

X.40 IBM SNA  
0 PRO DS  
FS

SMT MHS AT&T  
P Easy  
ink™

MCI Fax  
MAI  
L

---

Note — Microsoft Exchange Server will provide native support X-400 and Internet Mail (SMTP). Users who upgrade to Microsoft Exchange Server will not need to purchase gateways for X-400 or SMTP.

---

Microsoft gateways support key features such as messaging backboning and message encapsulation.

n

MESSAGING BACKBONING lets organizations leverage their existing

messaging resources by using these systems as high-performance bridges — or  
messaging backbones — between multiple Microsoft Mail sites.

n

MESSAGE ENCAPSULATION in Microsoft gateways makes it possible for

users to place graphics, charts, sound, and video objects directly in their mail  
messages for richer communication. Moreover, these complex messages can be  
sent across messaging backbones between distant sites without any loss of data  
integrity.

To connect a workgroup postoffice to another workgroup postoffice, you must  
purchase Microsoft Mail Postoffice Upgrade for each postoffice. To connect to  
another message system, such as X.400 or SMTP, you'll need to install both  
Microsoft Mail Postoffice Upgrade plus the appropriate gateway software.

---

Note — You will need at least one dedicated computer to act as the mail router, or  
the EXTERNAL.EXE program. Some gateways may require additional dedicated  
computers to connect to host systems. Before proceeding, you should determine  
your requirements by obtaining gateway datasheets.

---

Each message system can connect to the workgroup postoffice by using one or  
more specific gateways. The following table is a partial list of the Microsoft gateways  
needed for various message systems. If you use one of the message systems listed  
in this table, you need to purchase the appropriate gateway.

Microsoft Mail Gateways For Message Systems

---

ARC X.400  
OM  
400  
Swis

s  
PTT

AT& X.400  
T®  
Eas  
mlink  
Serv  
ices

AT& X.400 or  
T AT&T  
Mail Gateway

Atla X.400 (NF  
s mark from  
400 Afrnor)

Ban MHS or  
yan X.400  
®  
Mail

Bey MHS  
ond  
Mail

cc:M X.400,  
ail MHS,  
SMTP, or  
Office  
Vision

Com SMTP or  
puS MHS  
erve

The MHS  
Coor  
dinat  
or

Data X.400  
Gen  
eral  
®  
CEO

DaVi MHS  
nci

Syst  
ems  
™

DEC X.400,  
™ PROFS,  
All- SNADS, or  
In-1 SMTP  
™

DEC X.400 or  
VMS SNADS  
™

Mail

Dutc X.400  
h  
PTT

Env X.400  
oy  
100/  
Gem  
des

Fax Fax

Fisc X.400 or  
her SNADS  
Inter  
natio  
nal  
EM  
C2

Gold X.400  
400  
UK

Higg MHS  
ins

IBM SNADS, or  
AS/4 through  
00® PROFS  
Offic Distribution  
e Manager, if  
you have a  
VM host

IBM PROFS/  
Syst OV  
em/  
36™

IBM PROFS  
CM  
S  
NOT  
ES

IBM SNADS  
DIS  
OSS

IBM SNADS, or  
Offic through  
eVisi PROFS  
on/ Distribution  
MVS Manager, if  
™ you have a  
VM host

IBM PROFS  
PRO  
FS

Com X.400  
pute  
r  
Scie  
nces  
Info  
net®

Inter SMTP  
net

Lotu MHS, or  
s® the MS  
Note Mail-Notes  
s® Gateway  
by  
Corporate  
Software

Micr Microsoft  
osoft Mail  
Mail connection

for  
Appl  
eTal  
k®

NCR X.400, or  
® in some  
Corp cases, the  
orati AT&T  
on Gateway

Nov MHS  
ell  
Net  
War  
e

Reti X.400  
x®

Soft- SNADS  
Swit  
ch  
Cent  
ral

Spri X.400  
nt  
Tele  
Mail

Tele X.400  
box  
400  
Ger  
man  
PTT

Touc X.400  
h

Unis X.400  
ys®

UNI SMTP1  
X®  
SMT  
P

UUC SMTP2



P

Veri SNADS  
mati  
on  
Me  
mo

WA MHS,  
NG X.400, or  
® PROFS  
Offic  
e

---

1 SMTP is a part of TCP/IP, not a part of UNIX. You can also have SMTP origination to a VAX or IBM host.

2 Requires connectivity to an SMTP host which acts as a router to UUCP.

---

The following sections summarize the features and benefits of Microsoft gateway products.

Using Microsoft Gateway to Fax, you can send several types of items — such as electronic mail messages, text files, and graphic attachments — in a single fax. You can use this product to transmit attachments in any of three different formats: ASCII (text), black and white .PCX, or .DCX (graphics).

Microsoft Gateway to Fax includes the following features:

n

Ability to view incoming fax messages, scaling them to one-eighth of their

full-sized view, and rotating pages 90 or 180 degrees.

n

Easy setup and administration.

n

Improved error reporting and support for the high performance

GammaFax board, in addition to the Intel® SatisFAXtion® and Connection Coprocessor boards.

n

Verification of file type attachments before transmitting outgoing faxes,

ensuring their format is supported by the fax board (ASCII, .PCX, or .DCX). If not, the message is returned to the sender.

MHS is a messaging system commonly found in Novell NetWare networks. With Microsoft Mail Gateway to MHS, users can route mail between Microsoft Mail postoffices and sites using MHS. Encapsulation technology preserves the following across the MHS backbone:

n

Address information

n OLE objects

n Binary file attachments

The Microsoft Mail Gateway to MHS includes the following features:

n Address mail routed to MHS mail users in a familiar Microsoft Mail format.

n Add individual MHS users to the Microsoft Mail Personal Address Book.

n Send or receive an unlimited number of attachments in one message and  
the attachments can be any type of text or binary files.

n

Address MHS users and add them to personal address lists without calling on system administration resources.

n

Support error logging for MHS activity.

n

Provide compatibility with most popular MHS mail systems, including DaVinci Systems Mail version 1.8, The Coordinator version II, Lotus® cc:Mail version 3.2, and any fully MHS 1.5-compatible system, such as Novell Global Messaging.

Microsoft Mail Gateway to X.400 offers transparent backboning using an X.400 network. It links geographically dispersed local area networks into a single mail network. It connects local area networks, mainframes, minicomputers, and microcomputers with X.400. This gateway uses the X.400 gateway to connect to an unlimited number of message transfer agents (MTAs) and functions as a relay between them. This gateway also provides X.400 over an 802.x LAN.

Microsoft Mail Gateway to X.400 includes the following features:

n

Provides OSI LAN connectivity, eliminating the need for costly additional software, hardware, or communications lines.

n

Supports multiple simultaneous active sessions for higher overall throughput and accepts up to two incoming calls while sending a message.

n

Accepts local area and wide area network connections simultaneously for more flexibility.

n

Uses encapsulation, or “tunneling,” to exchange messages containing text, multimedia objects, binary files, and directories with other Microsoft Mail users across X.400 backbones without losing information or data integrity.

n

Provides easy configuration and maintenance with a new full-screen utility,

which administrators can use to view and print log files and configuration parameters.

n

Assign users arbitrarily — even multiple X.400 addresses — without

shutting down the gateway with Advanced Address Mapping.

n

Adds new address simply by filling out the address template provided.

Reads friendly names on mail from other X.400 systems instead of lengthy X.400 O/R addresses. X.400 addresses can be added to the Microsoft Personal Address Book.

Microsoft Mail Gateway to X.400 complies with international X.400 standards in the following ways:

n

Acting as a fully functional CCITT 1984 X.400 MTA and being able to

communicate with 1988-compliant MTAs

n

Supporting NIST, ENV 41202 (A/311) X.400 profiles

n

Conforming to OSTC

n

Having Afnor Certification

The gateway offers the following bodypart support:

n

Supports bodypart 0 (IA5), including translation tables for Norwegian,

German, and Swedish, in addition to standard International Reference Version (IRV), for improved interoperability between European X.400 systems.

n

Supports bodypart 5 (T.61/Teletex) for extended character support.

n

Includes new bodypart 13 support (ISO 6937), to seamlessly carry text in attached files with accented characters not supported through the standard IA5-text character set.

n

Supports binary attachments using bodypart 14, so attachments can be sent to other systems without losing any information.

With Microsoft Mail Gateway to SMTP, users can send and receive Simple Mail Transfer Protocol (SMTP) messages as easily as Microsoft Mail.

This gateway is easy to maintain. Administrators can use the standard Microsoft Mail administration program to control access to the gateway and to use the full traffic and error-logging support, to isolate problems and optimize routing. Global directory synchronization provided by the product can reduce directory maintenance by automatically updating Microsoft Mail directories with user addresses from other electronic mail systems in the organization.

You can link Microsoft Mail systems transparently using SMTP. Encapsulation lets users send mail messages containing text, binary files, multimedia objects, and directory updates over a messaging backbone without any loss of data integrity. This gateway automatically encapsulates all binary file attachments and messages with extended characters.

Microsoft Mail Gateway to SMTP supports the following major standards:



n TCP/IP

n RFC 821 SMTP

n RFC 822 ARPA Internet Text Messaging Standard

n RFC 1154 Encoding Header Field for Internet Messages

n Incoming and outgoing encapsulated attachments

With this gateway, PROFS and OfficeVision users send mail to Microsoft Mail users

using standard PROFS and OfficeVision, or CMS NOTE addressing formats. Users on PROFS and OfficeVision systems can respond to a message from either system using the Reply option and receive automatic acknowledgment of registered mail delivery.

Microsoft Mail IBM PROFS and OfficeVision Gateway includes the following features:

n

Flexible and reliable architecture to improve connectivity. A mainframe

component creates a virtual machine (VM) and identifier for the Remote Spooling Communication Subsystem (RSCS). A standard Network Job Entry (NJE) RSCS link connects Mail to the VM. Multiple LANs can be connected to single or multiple VM nodes.

n

Transparent exchange of scheduling information. When PROFS and

OfficeVision users receive meeting requests or meeting notes from Microsoft Schedule+, they appear as familiar PROFS and OfficeVision meeting requests and vice versa. Free and busy times of PROFS and OfficeVision users can be periodically downloaded to the LAN for scheduling purposes.

n

Extensive file support between systems to help mainframe and personal

computer users work together more effectively. VM users can send files to Microsoft Mail users using SENDFILE, DISK DUMP, PUNCH, and PRINT formats. In addition, Microsoft Mail attachments appear as files in the VM user's Virtual READER.

# n

Generic Routing Facility (GRF) to make the gateway easy to administer

and troubleshoot. All Microsoft Mail users appear to PROFS and OfficeVision users as if they are on a single VM node. (The ability to define a VM node per Microsoft Mail postoffice still exists, even if GRF is being used.) Using message size restrictions, administrators can limit the size of messages transmitted.

# n

Distribution Manager to add document exchange features and links

Microsoft Mail to a variety of host systems. It offers the ability to exchange messages and documents with other messaging systems that use the Document Interchange Architecture (ZIP packet protocol), such as OfficeVision/MVS, OfficeVision/400™, PS/CICS, System/36, remote PROFS and OfficeVision using DISOSS, and (through gateways) DEC® All-In-1, WANG Office, and Verimation Memo.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 27 MS Fax

This chapter describes how to use Microsoft Fax software to send and receive facsimiles and editable files (files that can be changed) from your computer.

### *Microsoft Fax: The Basics*

---

For computers that run Windows 95 and include fax modems, Microsoft Fax provides all the capabilities of a fax machine. Microsoft Fax allows users to exchange facsimiles and editable files (files that can be changed) as easily as they print a document or send an electronic mail message. Microsoft Fax is compatible with the millions of traditional Group 3 fax machines worldwide, yet provides advanced security and Binary File Transfer features that make sharing information by means of a fax easier and more powerful.

Microsoft Fax is a MAPI provider (or service) that has been integrated into the Microsoft Exchange universal inbox. You can send a fax by composing a Microsoft Exchange message, or using the Send option on the File menu of a MAPI-compatible application (such as Microsoft Excel or Word). In addition, Microsoft Fax provides a fax printer driver so that users can print to a fax machine from within any Windows-based application.

You can send a fax in the following ways:

n

Attach documents to Microsoft Exchange mail messages which the

recipient can then open in the application in which they were created and change them. The Binary File Transfer (BFT) capability of Microsoft Fax allows these original, editable documents to be sent over a fax connection.

n

Send a traditional Group 3 facsimile (fax) to a fax machine. These faxes

are referred to in this chapter as rendered (printed) faxes. These cannot be changed by the recipient.

For example, you can attach a Microsoft Word document to a Microsoft Exchange message which is addressed to a fax number. If the fax is received by Microsoft Fax, the original Word document can be opened by clicking the Word icon embedded in the mail message.

If, however, the recipient is a Group 3 fax machine, Microsoft Fax will render (print) the Word document as a Group 3 fax image. Microsoft Fax will use the highest transmission speed and image compression supported by the recipient fax machine when transmitting the fax.

Microsoft Fax provides the following key features:

**n** Sends faxes from the Windows 95 desktop by clicking Compose New Fax in Accessories.

**n** Sends and receives faxes from the Microsoft Exchange universal inbox, a central place to send and receive messages from multiple information services, such as the Internet.

**n** Sends faxes using the Send option in the File menu from within Windows-based and MAPI-enabled applications such as Microsoft Excel and Word.

n

Sends editable documents (as opposed to printed documents) to users of Windows 95, Windows for Workgroups 3.11, and other Microsoft At Work™-enabled platforms by attaching them to Microsoft Exchange mail messages.

n

Securely exchanges confidential documents using public key encryption developed by RSA Inc., password encryption, or digital signatures.

n

Provides compatibility with any Class 1 and Class 2 fax modems, and support for high-speed fax communications (V.17, V.29, and V.27).

n

Sends and receives faxes through a shared fax modem within a workgroup on a designated computer running Windows 95.

n

Sends faxes by printing a document to the Microsoft Fax printer, a printer driver that supports resolutions up to 300 dpi.

n

rowse multipage faxes with the Fax Queue Viewer, which allows you to see thumbnails or full page views.

n

Creates new fax cover pages with a cover page designer that lets you incorporate graphics and text, or customize one of the predefined cover pages included with Microsoft Fax.

n

Connects easily to fax-on-demand systems using a built-in, poll-retrieve feature that allows you to retrieve rendered faxes or editable documents from a fax information service to your desktop.

### *Microsoft Fax: The Issues*

---

Before you install and configure Microsoft Fax on the network, you will need to decide the following:

n

Whether to install fax modems on individual computers or to designate a computer running Windows 95 to host a Microsoft Fax shared fax service for other members of a workgroup.

n

Which computer within your workgroup will host the Microsoft Fax shared fax service. If the computer will also be used as a workstation, then a 80486-based computer with at least 12 MB of RAM is recommended. If the computer will be a dedicated fax server, then at least 8 MB of RAM is recommended. A high-speed (14.4 kbps) fax modem is mandatory. Depending upon fax volumes, a shared fax service with this configuration should support up to 25 network fax users.

—Note— When the computer hosting the shared fax modem receives faxes, Microsoft Fax does not automatically route them to individual inboxes. The workgroup administrator must use Microsoft Exchange to send a received fax to the recipient's Microsoft Exchange inbox.

n

Whether you want to control or restrict access to the shared fax service.

You can control access by defining a shared fax password, as described in "Sharing a Fax Modem" later in this chapter.



# n

Whether your workgroup's fax needs may be better served by a LAN fax

server or commercial fax service. This depends on whether your organization has high fax volumes and inbound routing requests, and needs more detailed cost tracking and management, and electronic mail integration. Microsoft is working with many vendors of high-performance fax server platforms to ensure their products are well-integrated with Windows 95.

## *Overview of Microsoft Fax*

---

Microsoft Fax can be configured in a few steps. After Microsoft Fax is configured, users can easily exchange rendered faxes and binary files. Because Microsoft Fax is provided with Windows 95 as a basic service, it is always available from within applications created for Windows 95 or through the Microsoft Exchange inbox. Faxes may be transmitted using Microsoft Exchange, or by printing a document to the Microsoft Fax printer. Faxes are always received in a user's Microsoft Exchange inbox.

As a 32-bit application, Microsoft Fax works smoothly with other applications created for Windows 95 through its support for the Messaging API (MAPI), Telephony API (TAPI), and OLE. The Send option in the File menu within any MAPI-enabled application (for example, Microsoft Excel or Word) will activate the Microsoft Exchange Send dialog box. The fax user will see the document attached as an icon to the electronic mail message.

### *Fax at your fingertips.*

With Microsoft Fax, sending traditional faxes to Group 3 fax machines is as easy as printing a document. You can send the document to the Microsoft Fax printer by either dragging and dropping the document onto the fax printer icon on the Windows 95 desktop, or by choosing the Print option in the File menu of an application created for Windows 95. Either action launches the New Fax wizard, which prompts you for the address of the fax recipient, and then transmits the fax.

### *Integration with Microsoft Exchange.*

Microsoft Fax has been integrated with Microsoft Exchange, allowing it to use the Microsoft Exchange universal inbox, rich message creation, common address book, and browsing capabilities.

### *Delivery by address type.*

The MAPI service provider architecture allows the user to mix different types of recipients in the SAME message. For example, it is possible to send a message simultaneously to Microsoft Mail, CompuServe®, Internet, and Microsoft Fax users as long as profiles for these destinations have been defined within Microsoft Exchange. A recipient's fax address can be selected from the Microsoft Exchange Personal Address Book, or the fax can be addressed using a one-off address such as [fax:555-1212].

### *Binary File Transfer.*

Microsoft Fax supports Microsoft At Work Binary File Transfer (BFT), which makes it possible to attach an editable document to a Microsoft Exchange mail message, and then open the document within an application created for Windows 95.

### *Security.*

Microsoft Fax protects valuable and confidential documents through encryption and digital signatures. Any security specified by the user is applied before the message is passed to the modem or connected fax device.

### *Shared fax service.*

You can install a fax device in one computer and share it with other users on the same network. Individual computers can have their own fax devices installed and also use the shared fax device.

### *The Fax Queue Viewer.*

The Microsoft Fax Queue Viewer displays outgoing fax messages that have been queued to a local fax modem, or to a Microsoft Fax shared fax service. The Fax Queue Viewer provides information about the current set of messages that are queued for transmission, and allows the user to cancel or reschedule their own faxes.

### *"Best available" fax format.*

When you make a fax connection in Windows 95, Microsoft Fax queries and exchanges its fax capabilities with the recipient. This exchange of capabilities determines whether the recipient is a traditional Group 3 fax machine, which can only receive rendered faxes, or if the recipient has Microsoft Fax capabilities, and can receive editable files. Windows 95, Windows for Workgroups 3.11, and Microsoft At Work fax platforms are all capable of receiving binary files and traditional faxes.

n

If the receiving fax device supports Microsoft Fax capabilities and an editable document is attached to a Microsoft Exchange message, then the file is transferred in its native format, in the same way as electronic mail.

n

If the receiving fax device is a traditional Group 3 fax machine then Microsoft Fax converts the document to the most compressed type of fax supported by the machine (MH, MR or MMR compression type) and transmits the image using the best available communications protocol supported by the mutual connection (that is, V.17, V.29 or V.27).

n

If Microsoft Fax sends a noneditable fax to another Microsoft Fax user, then the fax is transmitted using the Microsoft At Work rendered fax format. This special format is much more compressed, on average, than Group 3 MMR. Therefore, the exchange of noneditable faxes between Microsoft Fax users is always faster than between Group 3 fax machines.

Microsoft delivered the first Microsoft Fax desktop fax capability with Windows for Workgroups 3.11. This large installed base, along with the installed base of millions of Group 3 fax machines, has made compatibility a priority for fax capabilities in Windows 95.

To ensure connections with the widest variety of fax applications, fax machines, and fax modems, Microsoft Fax in Windows 95 supports the following international standards for fax communications:

n

ITU (International Telecommunications Union, formerly the CCITT) T.30

standard for Group 3 fax. Microsoft At Work capabilities such as BFT are implemented as T.30 NSF (nonstandard facilities), thereby maintaining compatibility with the installed base of Group 3 fax machines.

n

ITU V.17, V.29 and V.27ter standards for high-speed fax communications

(up to 14.4kbps).

n

Class 1 and Class 2 fax modems. A Class 1 modem, or a Class 2 modem

is required for Microsoft At Work BFT and security. Fax rendering to traditional Group 3 fax devices is available on both Class 1 and 2 modems. Microsoft is working directly with fax modem manufacturers to ensure excellent compatibility. Microsoft intends to support fax modems based on the Class 2.0 standard, as these become available.

n

MH, MR and MMR compression for Group 3 fax communication.



Microsoft At Work fax platforms.

Microsoft worked closely with fax modem manufacturers to test international Class 1 and Class 2 fax modems to ensure they worked well with Windows 95. Fax modems that were INCOMPATIBLE with Microsoft Fax are presented in the following table. If a specific fax modem is not listed, then it will probably work well with Microsoft Fax. However, because a large number of fax modems are manufactured internationally, it is possible that not all modems were tested. In addition, not all modems implement the Class 1 or Class 2 specifications in the same manner, which may make them incompatible.

Incompatible Fax Modems

---

|           |                                            |                                       |
|-----------|--------------------------------------------|---------------------------------------|
| U<br>S    | AT&T<br>®<br>Para<br>dyne                  | Keep<br>in<br>Touch<br>Card<br>3761   |
| U<br>S    | Best<br>Com<br>muni<br>catio<br>ns<br>Inc. | 14496<br>EC                           |
| Ita<br>ly | BIT<br>MX-6,<br>XM124<br>S                 |                                       |
| U<br>S    | Cardi<br>nal                               | 14400<br>V.32bis<br>,<br>MB229<br>6SR |
| G         | CPV                                        | F-1114                                |

er Date HV,  
m nsyst StarLin  
an eme e  
y

G CTK- CTK  
er Syste V.32  
m me  
an  
y

U Datat Discov  
S ronic ery  
s 2496C  
X

U DIGI SNM2  
S COM 8,  
SNM4  
1PC

U Digic Scout  
S om Plus  
Syste  
ms,  
Inc.

U E- E1414  
S Tech MX  
Rese  
arch

G EEH Elink  
er Gmb 301  
m H  
an  
y

G ELSA MicroLi  
er nk,  
m MicroLi  
an ne  
y

U Gate Telepat  
S way h  
PM144

Ja Hide 14400

pa m      Fax  
n

G Korte KX  
er x      PRO  
m          2400  
an  
y

LCE   MiniMo  
dem  
23

U Macr   Maxfax  
S onix,   9624s,  
Inc.      VOMA  
X 2000

U Mega P22  
S hertz Pocket  
Fax  
Mode  
m

U Multi MT932  
S Tech ba  
Syste  
ms

Ja Natio TyIN  
pa nal   2000  
n Semi  
cond  
uctor

G Neuh Fury  
er aus   2400  
m Mikro  
an elektr  
y onik

Fr PNB TT962  
an      4  
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U Practi PM240  
S cal    0  
Perip FX96S  
heral A, V.32

s Pocket  
Quick Sprint  
Com II V.32  
m Fax  
U Sysn SMF44  
S et Fax  
TeleJ TeleJet  
et 14400  
U US Sportst  
S Robo er 28.8  
tics V.FC,  
Sportst  
er  
9600  
G Woerl M288  
er ein Fax  
m Gmb  
an H  
y  
U Zoom FC  
S Telep 96/24,  
honic VFX  
s 28.8

## *Configuring Microsoft Fax*

---

To configure Microsoft Fax, you must:

n

Install and configure a modem for sending and receiving faxes. For more information, see Chapter 25, “Modems and Communications Tools.”



# n

Install Microsoft Exchange and Microsoft Fax software. The Microsoft Exchange Setup wizard will guide you through a simple installation procedure.

# n

Add Microsoft Fax to a Microsoft Exchange Profile.

The easiest way to install Microsoft Fax is to choose the Custom Setup Type during Windows 95 installation. You can also it after Windows 95 installation in Add/Remove Programs in Control Panel.

[To install Microsoft Exchange and Microsoft Fax during Window 95 installation](#)

# n

Choose Custom Setup Type, and in the Select Components screen, click Microsoft Fax and Microsoft Exchange.

[To configure Microsoft Fax](#)

1. In Control Panel, click the Mail and Fax icon.

—— Or ——

—— In the Microsoft Exchange Tools menu, choose Options.

2. Choose a profile to which you want to add Microsoft Fax capabilities, and then click the Properties button.

3. In the Services dialog box, click the Add button.

—— {ewc msdn cd, EWGraphic, x0z 0 /a "psZ.bmp"}

4. In the Add Service to Profile dialog box, click Microsoft Fax, and then click OK. A Microsoft Fax warning message asks if you want to type your name, fax number, and fax device modem. Click OK.

—{ewc msdn cd, EWGraphic, x0z 1 /a "psZ.bmp"}

5. In Microsoft Fax Properties, click the Message, Dialing, Modem, and User tabs, and type the appropriate information.

—If you have installed a modem, Windows 95 automatically enters that information in the Modem folder. If you have not installed a modem, or want to select a different modem for sending faxes, click the Add button in the Modem folder to launch the Install New Modem wizard.

After you have configured Microsoft Fax, you can change its properties by clicking the Setup option in the Fax menu in Microsoft Exchange.

---

Note — The information you type in the User folder automatically appears on the cover page of faxes you send in Microsoft Fax.

---

## Sending Faxes

---

You can use Microsoft Fax to send and receive faxes by using a fax modem attached to your computer or on a network. Faxes are mail messages that are sent over the phone lines. Incoming faxes appear in your Microsoft Exchange inbox in the same way as mail messages. Microsoft Fax shares the Personal Address Book with Microsoft Exchange and other MAPI providers.

---

Note — The only difference between a mail message and a fax, from a Microsoft Exchange user's perspective, is the format of the recipient's address. Each Microsoft Exchange information service, such as Internet, CompuServe, or Microsoft Fax, has its own format for a recipient's address.

---

There are four easy ways to send faxes from within Windows 95:

n

Use the Windows Explorer to drag and drop a document onto a Microsoft Fax printer icon on the Windows 95 desktop.

# n

Use Microsoft Exchange to create an electronic mail message and fax its contents to a recipient. If the message recipient is also using Windows 95, the message can include binary files and editable documents. Otherwise, the message will be “rendered” and sent as a facsimile.

# n

Use the Send option in the File menu of a MAPI mail-enabled application such as Microsoft Word or Microsoft Excel to activate Microsoft Exchange.

# n

Print a document to the fax printer driver. If you select Microsoft Fax as the target printer for the document, and then choose the Print option in the File menu, you will launch the New Fax wizard.

### [To create a shortcut to the Microsoft Fax printer](#)

1. In Control Panel, click the Printers icon to display the currently installed Printers.
2. Right-click the Microsoft Fax printer icon and then drag it to a convenient place on the Windows 95 desktop.

### [To send a fax using Windows Explorer](#)

1. Open Windows Explorer by right-clicking My Computer.
  2. Right-click the document you want to fax and drag it to the Microsoft Fax printer.
- Dropping the document onto the fax printer launches the New Fax wizard, which prompts you for information required for the successful transmission of a fax.

—{ewc msdn cd, EWGraphic, x0z 2 /a "psZ.bmp"}

—The application that created the original document starts so that document can be printed (rendered). After it is rendered, the application closes.

---

Note — You can also send a fax from within Windows Explorer by right-clicking a document icon in My Computer. In the context menu, select the Send To option, and then the Fax Recipient option to launch the New Fax wizard.

---

#### [To send a fax from Microsoft Exchange](#)

1. From the Fax menu, choose Compose New Fax to launch the New Fax Wizard.
2. In the New Fax Wizard dialog box, select the fax recipient's name and number from your Microsoft Exchange Personal Address Book, or create a new name, and then click OK.
3. Click the Options button to include a fax cover page with your message, and then click OK.
4. In the Fax Microsoft Exchange dialog box, compose your message and insert a binary file or object using the Insert menu.

#### [To send a fax from the application's Start button](#)

n

Click the Fax icon in Accessories to launch the New Fax wizard.

#### [To send a fax using the Print option in the File menu of a MAPI-enabled application](#)

1. In the Printers Option in Control Panel, set the Microsoft Fax printer as the default printer.
2. In the File menu of any MAPI-enabled application, select the Print option to launch the New Fax wizard.

#### [Using Cover Pages](#)

---

With Microsoft Fax, you can attach a cover page to a fax by selecting from four

predefined cover pages, or by creating a custom cover page for each recipient. The predefined cover pages are named Urgent!, Confidential!, For Your Information, and General Purpose (default). You can also customize predefined cover pages as described in the following procedure.

With the Microsoft Fax Cover Page Editor, you can also design a unique cover page for each recipient. The Cover Page Editor allows you to incorporate rich text, graphics, logos, and information from the Microsoft Exchange Personal Address Book into a cover page.

---

Note — All cover pages contain recipient information that you first entered in the Microsoft Exchange Personal Address Book. Microsoft Fax inserts this information each time you send a fax.

---

#### [To attach a predefined cover page to a fax message](#)

1. In the Microsoft Exchange Fax menu, click Compose New Fax.
2. In the New Fax wizard dialog box, click Options.
3. In the Message Properties dialog box, click cover page, and then choose the type of cover page.

#### [To customize predefined cover pages](#)

1. In the Accessories menu, click Fax, and then click Cover Page Editor.
2. In the Cover Page Editor File menu, click the Open option to choose one of the four predefined cover pages (Confidential!, For Your Information, General Purpose, or Urgent!).
3. If you Click Save in the File menu, you can choose the cover page the next time you launch the New Fax wizard.

#### [To create a custom cover page](#)

1. In Cover Page Editor, click the Insert menu, and then choose the information you want to appear on the cover page including Recipient Name, Recipient Fax Number, Sender Name, Sender Telephone Number, Message Subject, Number of Pages, Time and Date of Transmission, and so on.

===={ewc msdncd, EWGraphic, x0z 3 /a "psZ.bmp"}

2. In the Insert menu, click Objects to insert graphics, such as logos or pictures.



===={ewc msdncd, EWGraphic, x0z 4 /a "psZ.bmp"}

With Microsoft Fax, users within a workgroup defined in Windows 95 can share a fax modem that is installed on one of the computers within the workgroup. After the fax modem has been shared, all other users within the workgroup can send and receive faxes through it. The computer which contains the shared fax modem is called the fax server.

The Microsoft Exchange inbox of the fax server receives all faxes for the workgroup. The administrator for the server uses Microsoft Exchange to route faxes to their intended recipients in the workgroup. Received faxes appear in the Microsoft Exchange inbox, identified as a fax by a special, folded page icon. If the icon represents a rendered fax, double-clicking it launches the Microsoft Fax viewer application. Otherwise, Microsoft Exchange opens the fax as if it were an electronic mail message. You can forward and reply to faxes in the same way you would a Microsoft Exchange mail message.

Before you configure a computer running Windows 95 as a shared fax server, make sure it has enough memory and that you have a compatible modem. For memory requirements, see "Microsoft Fax: The Issues" earlier in this chapter. For modem compatibility requirements, see "Compatible Fax Modems and Fax Machines" earlier in this chapter.

#### [To configure a computer as a fax server](#)

1. In Microsoft Exchange Tools menu, click the Tools for Microsoft Fax, and then click Setup.
2. In the Microsoft Fax Properties dialog box, click the Modem tab.  

3. In the Modem Properties dialog box, click the Let Other People On The Network Use My Modem To Send Faxes option.
4. In the Share name field, type the shared directory's name, such as NETFAX, and then click the Properties button.  

5. In the shared directory's dialog box, define who will have access to the shared fax service and whether a password is required to connect to it.  
— If you choose Full access, all users within the Windows 95 workgroup can send faxes using the shared fax service. By default, all users can send faxes.
6. Click OK to enable the Microsoft Fax shared fax server.

---

Note — Other users in the Windows 95 workgroup must know the fax server's full network name in order to access it. The name is formed by joining the server's computer name (found in the Network option in Control Panel) with the shared directory name, for example, \\JOELLEN\\NETFAX.

---

### To configure a computer as a client to the fax server

1. In Microsoft Exchange Tools menu, click the Tools for Microsoft Fax, and then click Setup.
2. In the Microsoft Fax Properties dialog box, click the Modem tab.
3. In the Modem Properties dialog box, click the Add button.  
===={ewc msdn cd, EWGraphic, x0z 7 /a "psZ.bmp"}
4. In the Add a Fax Device dialog box, select Network Fax Server option, and then click OK.  
===={ewc msdn cd, EWGraphic, x0z 8 /a "psZ.bmp"}
5. In the Path field, type the network name of the Microsoft Fax shared fax server, and then click the Reconnect At Logon option check box to make sure you connect each time that Microsoft Exchange is started.
6. Click OK to confirm your choice.
7. In the Microsoft Fax Properties dialog box, click the server name, and then click the Set as Active Fax Device button.

### Security

---

Microsoft Fax protects valuable and confidential documents through encryption and digital signatures. An encrypted fax cannot be read by anyone except the intended recipient, who has a set of keys to unlock the fax. A digitally signed fax allows a recipient to verify that the purported sender of the fax is the actual sender.

You can encrypt a fax, or binary file, using either a simple password, or using a public or private key pair. When you establish security, Microsoft Fax assigns you two security keys, a private key and a public key. You can exchange public keys with anyone you choose.

When you send a key-encrypted message, Microsoft Fax uses the recipient's public key and your private key to encrypt the message. When the message is received, Microsoft Fax uses your public key and the recipient's private key to decrypt it. Using your own private key ensures that the message could only have been sent by you. Using the recipient's public key ensures that only the recipient can unlock the message. You can store and maintain the public keys you receive from other users in your Microsoft Exchange Personal Address Book.

---

Note Microsoft Fax only applies security to faxes that have been sent as editable files. Rendered faxes cannot be secured.

---

The first step in using encryption or digital signatures is establishing security.

#### [To establish security](#)

1. In Microsoft Exchange, click the Tools for Microsoft Fax in the Tool menu, and then click Advanced Security.

===={ewc msdn cd, EWGraphic, x0z 9 /a "psZ.bmp"}

2. In the Advanced Fax Security dialog box, click the New Key Set button.

===={ewc msdn cd, EWGraphic, x0z 10 /a "psZ.bmp"}

3. In the Fax Security – New Key Set dialog box, type a password, and then click OK. This password will be used for sending and receiving both key-encrypted and digitally signed faxes.

— Microsoft Fax automatically creates a public and private set of keys for you, and then displays the Advanced Fax Security dialog box.

4. Click Change Password to change your fax security password, but keep the same key set.

5. Click New Key Set to create a new fax security key set.

To use the key set to send and receive secured faxes, you must exchange public keys. To exchange public keys, you must save your public keys to a file that you can send to other users, or add other users' public keys to your address book.

#### [To exchange a public key with another user](#)

1. Click the Tools For Microsoft Fax, and then click the Advanced Security menu option.

2. In the Advanced Security dialog box, click the Public Keys button.

===={ewc msdn cd, EWGraphic, x0z 11 /a "psZ.bmp"}

3. In the Managing Public Keys dialog box, click Save.

4. In the Save Public Keys dialog box, click the public keys that you want in the listbox, and then click the To: button to identify the folder where you want to save these keys. Type a name for the public keys with the file extension .AWP, and then click OK.

If you receive a public key from another user, you will need to import the .AWP key file into Microsoft Fax.

#### [To import an .AWP file into Microsoft Fax](#)



# n

After you and your recipient have exchanged public keys, you will be able to exchange secured faxes.

Microsoft Fax allows you to secure a fax on a per-message basis.

### [To send a secured fax](#)

1. In the Compose New Fax Wizard, click the Options button, and then click the Security button.

—{ewc msdncl, EWGraphic, x0z 12 /a "psZ.bmp"}

2. In the Message Security Options dialog box, click the Key-Encrypted option to encrypt your fax using RSA public key encryption.

—Key encryption is the greatest level of security provided by Microsoft Fax. Before you can encrypt the fax, you must have created your own public key. Before a recipient can open your key-encrypted fax, you must send your public key to your recipient, so that they can import your key.

3. Click Password to choose password encryption.

—Password encryption is a simpler security method that scrambles the fax based on the password you specify. The fax recipient can only unscramble the fax if they know the password. Password encryption does not require the exchange of public keys with your recipient, but you will need to tell them the password you used to secure the fax.

### *Fax-on-Demand Features*

---

Microsoft Fax provides the capability to retrieve information from fax information services. With Microsoft Fax you can retrieve documents, software updates, binary files, and fax images from fax-on-demand systems and fax machines that support the Group 3 poll-retrieve capability.

With Microsoft Fax, a user connects a computer to a fax-on-demand server, and using its poll retrieve capability, requests the name of a binary file. The server responds to the Microsoft Fax poll request by downloading a facsimile or editable

document to the computer. This exchange can be accomplished on a single fax call to the fax-on-demand system.

[To retrieve information using the Microsoft Fax poll retrieve](#)

n

In Microsoft Exchange Tools menu, click the Tools for Microsoft Fax, and

then click Retrieve File From a Fax Service.

===={ewc msdncd, EWGraphic, x0z 13 /a "psZ.bmp"}

### Technical Notes for Microsoft Fax

---

This section describes technical information for using Microsoft Fax, including:

n

Microsoft Fax architecture

n

Microsoft Fax Registry entries

You can send faxes either using the Mail client or the Microsoft Fax printer driver. In each case, the message is sent to the Microsoft Fax service provider by means of the MAPI interface. If you sent the message from a mail client, it may contain text, embedded OLE formats, and attachments. If you sent it using the Microsoft Fax print driver, the mail message will contain a rendered format of the file as an attachment.

to the mail message.

The MAPI interface allows messages to be preprocessed based on the transport protocol used to send them. The transport protocol chooses the correct modem connection, uses TAPI to create a dial string, and sends the message to that recipient.

The preprocessor determines whether to render the message into a facsimile form to be printed by a fax machine. The rendered format is attached to the original message as a message property and is deleted either when the message is sent or when the transport protocol tries to send the message but determines it cannot.

If the message doesn't have to be rendered, the message is converted from its original binary format to a line image (also called a linearized form), and then compressed.

After the message is submitted, the transport protocol determines what type of recipient the message is intended for as follows:

n

If it is a traditional fax recipient and the user has selected printed form or

"best available," Microsoft Fax will render the document into the standard Group 3 image format. This can be used by standard fax machines and software. If the user selects editable form, an error message is returned.

n

If the recipient is a Microsoft At Work-enabled recipient and the user has

selected printed form, then it will render the document into the Microsoft Fax-rendered format. This format provides high quality images of smaller size than standard Group 3, and is used between Microsoft At Work devices including fax machines and printers.

n

If the recipient is a Microsoft Fax recipient and the user has selected  
editable form, no rendering is required.

n

If there is a mix of recipients, and the user has selected “best available,”  
then Group 3 and editable versions of the document are packaged in the  
message.

n

If the capabilities of the recipient are unknown, Microsoft Fax creates  
multiple formats to be sure that the proper format is available upon connect.

Facsimile form messages sent to Microsoft At Work devices will be sent using BFT  
with the resource-based rendering of the message sent as an attachment.

This section discusses Registry entries that are specific to Microsoft Fax in Windows  
95. For more information about the Registry, see Chapter 33, “Windows 95 Registry.”

The Registry keys for a fax modem are found in:

Hkey\_Local\_Machines\Software\Microsoft\At Work Fax\Local Modems

For each local modem that has been installed by Windows 95, information is stored  
in the key named TAPI\NNNNNNNNN where NNNNNNNNN is an arbitrary number assigned  
by Telephony API (TAPI).

For each local modem that has been installed by Windows 95, there will be a TAPI subtree with the following subkey values (all subkeys are of type REG\_SZ):

n  
Subkey

n  
Default

n  
Description

The following table lists the modem command strings used to reset the modem whenever Microsoft Fax acquires it from TAPI.

Resetting the Modem When Acquired From TAPI

---

|   |             |         |
|---|-------------|---------|
|   | Reset       | Typical |
|   | Command     | AT      |
|   | and         | &       |
|   | (depends on | FS0=    |
|   | modem       | 0E0V    |
|   |             | 1Q0     |
|   | )           |         |
| * | Load        | Typical |
|   | Factory     | Load    |
|   | Default     | &F      |
|   | s           |         |

- \* Disable Typically  
auto lly  
answer S0=0
- \* Echo Typically  
OFF lly E0
- \* Verbose Typically  
e ON lly V1
- \* Quiet Typically  
OFF lly Q0

The following table lists the setup modem command string used to set up the modem before dialing or answering.

*Setting Up the Modem Before Dialing or Answering*

- 
- Setu Typically  
p lly  
Com ATS7=  
man 255&  
d D3&K  
(dep 4  
ends  
on  
mod  
em)
  - \* Maxi Typically  
mu lly  
m S7=25  
dial 5  
tone  
time  
-out
  - \* Tie Typically  
DTR lly  
drop &D3  
to  
rese  
t
  - \* XON Varies  
/  
XOF

F  
flow  
cont  
rol

Exit Emp Issued  
Co ty to  
mm mode  
and m  
after  
hangu  
p and  
just  
before  
releasi  
ng the  
port

Fix 192 Port  
Seri 00 speed  
alS  
pee  
d

Pre Emp This  
Ans ty mode  
wer m  
Co comm  
mm and  
and string  
is  
issued  
to the  
mode  
m just  
before  
issuin  
g the  
ATA  
(answ  
er)  
comm  
and  
(after  
issuin  
g the  
setup

comm  
and  
and  
the  
comm  
and to  
go to  
the  
appro  
priate  
Fax  
class)

|      |     |        |
|------|-----|--------|
| Pre  | Emp | This   |
| Dial | ty  | mode   |
| Co   |     | m      |
| mm   |     | comm   |
| and  |     | and    |
|      |     | string |
|      |     | is     |
|      |     | issued |
|      |     | just   |
|      |     | before |
|      |     | issuin |
|      |     | g an   |
|      |     | ATD    |
|      |     | (dial) |
|      |     | comm   |
|      |     | and    |
|      |     | (after |
|      |     | issuin |
|      |     | g the  |
|      |     | setup  |
|      |     | comm   |
|      |     | and    |
|      |     | and    |
|      |     | the    |
|      |     | comm   |
|      |     | and to |
|      |     | go to  |
|      |     | the    |
|      |     | appro  |
|      |     | priate |
|      |     | Fax    |
|      |     | class) |

Hig 0 The



|                          |                                                                                                                                                       |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| highest<br>Send<br>Speed | highest<br>speed<br>to try<br>sending a<br>fax, in<br>bits<br>per<br>second. A<br>value<br>of 0<br>indicates<br>use<br>highest<br>available<br>speed. |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

|                         |                                                                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lowest<br>Send<br>Speed | The<br>lowest<br>speed<br>to try<br>sending a<br>fax, in<br>bits<br>per<br>second; a<br>value<br>of 0<br>indicates<br>use<br>lowest<br>available<br>speed |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

|                        |                                               |
|------------------------|-----------------------------------------------|
| Enable<br>V.17<br>Send | If 0,<br>will<br>disable<br>use<br>of<br>V.17 |
|------------------------|-----------------------------------------------|

|                                 |                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------|
|                                 | (14.4K<br>,short<br>train)<br>for<br>send                                                          |
| Ena 1<br>ble<br>V17<br>Rec<br>v | If 0,<br>will<br>disabl<br>e use<br>of<br>V.17<br>(14.4K<br>,short<br>train)<br>for<br>receiv<br>e |

### Troubleshooting Microsoft Fax

---

This section presents a list of the online troubleshooting topics for Microsoft Fax and references chapters where more information can be found. To start the online troubleshooting guide, click Help, and then click Microsoft Fax. The following topics are displayed:

Faxes are not being sent or received.

n

Check the modem connections.

n

Check the modem settings, including auto-answer mode.

n

Check modem drivers for a particular modem model.

For more information about modem configuration and troubleshooting, see Chapter 25, "Modems and Communications Tools."

*Dialing doesn't work correctly.*

This may be because:

n

The fax recipient's number was not dialed.

n

The wrong number was dialed for the fax recipient.

n

The calling card call did not complete properly.

n

There was an error message from the operator.

For more information about setting calling parameters in Dialing Properties, see Chapter 25, "Modems and Communications Tools."

*Problems occur with cover pages.*

n

Some of the fields on my cover page appear blank.

n

I thought I sent a cover page with my fax but the recipient didn't get one.

n

The wrong cover page was sent with my fax.

For more information about defining cover pages, see "Using Cover Pages" earlier in this chapter.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Chapter 28 Dial-Up Networking and Mobile Computing

This chapter describes how to use Dial-Up Networking to access a network from a remote location. It also describes how other Windows 95 mobile computing tools, such as Briefcase and Direct Cable Connections, can be used to connect to desktop computers or the network.

---

*Important* — The portions of this chapter that cover the Windows 95 dial-up server are provided for testing purposes for this beta release of Windows 95. To install Windows 95 dial-up server functionality, you must download files from the WinNews forum on CompuServe®. The names of the files and instructions for installing them will be posted in that forum.

---

### Dial-Up Networking and Mobile Computing: The Basics

---

Dial-Up Networking allows mobile users to work as if they are connected directly to the network. Establishing a network connection with Dial-Up Networking works the same as establishing a network connection in the office — the user simply double-clicks a network object. Similarly, if the user double-clicks on Mail, a remote connection is automatically established.

*{ewc msdncd, EWGraphic, x0aa 0 /a "psAA.bmp"}*

The Windows 95 Dial-Up Networking application allows mobile users to designate a computer running Windows 95 as a dial-up client or server. From a remote site, you can use Dial-Up Networking to connect the dial-up client to a Windows 95 dial-up server or other remote access servers, such as Shiva® Netmodem, Novell® NetWare® Connect, and Windows NT 3.1 or 3.5 Remote Access Server (RAS). If the client and server are running the same network protocols, the dial-up client can connect to the network to access its resources.

Windows 95 provides the following tools to help users stay as functional as possible with the limited resources of a mobile site.

#### Remote Mail.

The Windows 95 Microsoft Exchange client allows mobile users to dial into the network to send and receive electronic mail, without requiring any additional client software or a special gateway server to dial into. To send and receive mail, mobile users make a Dial-Up Networking connection to another computer running Windows 95, or another remote access server connected to their workgroup postoffice. After connecting, they use Microsoft Exchange to send and receive their mail.

#### Direct Cable Connection.

This tool allows you to quickly and easily establish a connection between two

computers using a parallel cable or null-modem serial cable. After the connection is established, Direct Cable Connection facilitates the transfer of all types of files between two computers, establishing one as the “host” (server) and the other as the “guest” (client). The host can act as a gateway to a network for the guest.

### Windows 95 Briefcase.

This file synchronization tool minimizes the task of keeping track of the relationships between files on a portable computer and on a desktop computer. With Briefcase, a user can simultaneously update related files.

### Deferred Printing.

Windows 95 supports deferred printing, which allows mobile users to generate print jobs when they are not connected to a printer. The print jobs are stored by the system until a printer becomes available to that computer. Windows 95 detects the connection and automatically spools the print jobs as a background process.

### Dial-Up Tools From Other Vendors.

This chapter describes how to use Dial-Up Networking with Windows NT, Shiva, and NetWare remote access servers. For information about using Windows 95 Dial-Up Networking to dial into other remote access servers, or using other remote access software to dial into Windows 95, contact your network vendor or software supplier.

### Issues For Dial-Up Networking

---

To use Dial-Up Networking to connect to the network, you need the following hardware:

n

One or more compatible modems. (See the HARDWARE COMPATIBILITY

LIST for a complete list of compatible modems. This list is available when you set up a modem with Windows 95 Setup.)

n

Enough available hard disk space to install Dial-Up Networking. It

currently requires about 2 to 3 MB of free disk space to install the client, server, and administration portions of Dial-Up Networking.

To use Dial-Up Networking to connect to the network, you will need to decide the following:

n

Which computers on the network will function as Windows 95 dial-up

servers.

n

Whether or not you want users to have access to the network through a

Windows 95 dial-up server.

n

What kind of remote access server, other than a Windows 95 dial-up

server, remote users will connect to. For example, a Windows 95 dial-up server only allows one remote connection at a time, whereas Windows NT 3.5 remote access servers allows 256 connections. Depending on the size and needs of your network, you might configure a Windows 95 dial-up client to connect to a Windows NT 3.5 server or other remote access server. For a list of the types of remote access servers that a Windows 95 dial-up client can be configured to

connect to, see “Dial-Up Clients and Servers” later in this section.

n

What type of connection protocol your dial-up client will use to connect to

the remote access server. Windows 95 provides support for Point-to-Point protocol (PPP), RAS for Windows for Workgroups 3.11 and Windows NT 3.1, NetWare Connect, and Serial Line Internet Protocol (SLIP). The dial-up client and the remote access server must both be running the same connection protocol. For a complete list of protocol types, see “Remote Access Protocols” later in this chapter.

---

Note—— Windows 95 only supports SLIP as a client. The SLIP client software is provided on the Windows 95 compact disc in the ADMIN\APPTOOLS\SLIP directory. To install this software, use the Add/Remove Programs option in Control Panel.

---

n

What kind of local area network protocol to install on the dial-up client and

server to connect the client to the network. Windows 95 supports IPX/SPX, TCP/IP, and Microsoft NetBEUI protocols. For more information about network protocols and Dial-Up Networking, see “Local Area Network Protocols” later in this chapter.

n

Whether you want to share the resources of a Windows 95 dial-up server.

To enable a dial-up client to access files and printing capabilities of a dial-up server, you must install File and Printer Sharing services in the Network option in Control Panel, and also enable Allow Caller Access when configuring either user-level or share-level security on the dial-up server. For more information, see “Configuring a Windows 95 Dial-Up Server” and “Using Security with Dial-Up



Networking” later in this chapter.

n

What level of security you need for dial-up servers. You can enable either

user-level or share-level security on a Windows 95 dial-up server. Both types of security provide password protection for the dial-up process, but do not support callback authentication. A Windows 95 dial-up client does support callback authentication when connected to a remote access server, such as a Windows NT Server, that supports callback authentication. For more information, see “Using Security with Dial-Up Networking” later in this chapter.

n

Whether you need additional security. Windows 95 support hardware

security tools from other vendors for dial-up access, plus authentication protocols such as CHAP and SPAP.

---

Note — To run Dial-Up Networking you must have a protected-mode client, that is, one that can use the Windows 95 protected-mode transports, or others that use NDIS and provide appropriate PPP drivers. This means that you cannot use a Novell real-mode client over Dial-Up Networking, but you can use a Microsoft Client for NetWare networks.

---

### Overview of Windows 95 Dial-Up Networking

---

With Dial-Up Networking, you can connect to another computer or to a network from a remote site. After you connect to a Windows 95 dial-up server, you can share its resources if the Microsoft File and Printer Sharing service has been enabled. You can share the resources of the network if the Windows 95 dial-up server is running the appropriate network protocols.

`{ewc msdn cd, EWGraphic, x0aa 1 /a "psAA.bmp"}`

A Windows 95 dial-up server provides an easy-to-use, single-port host that supports IPX, NetBEUI, and TCP/IP using industry-standard PPP over the wire. To ensure

security, this server can also use pass-through user-level security, or share-level security as described in “Using Security with Dial-Up Networking” later in this chapter. An administrator can use system policies and other methods to disable dial-in access so users cannot dial into a particular desktop computer. For information, see “Disabling Dial-Up Server Support” later in this chapter. If the user chooses to dial into a host system such as Windows NT, Shiva Netmodem, LanRover, or NetWare Connect, Windows 95 offers full connectivity.

As with other Windows 95 communications tools, Dial-Up Networking uses the TAPI and VCOMM communications drivers to communicate through a modem to the network. It initializes the modem, determines device status, and dials the phone number by using the modem configuration extensions (MCX) and the UniModem driver. For more information about the Windows 95 communications subsystem, see Chapter 24, “Introduction to Windows 95 Communications.” For more information about the Dial-Up Networking architecture, see “How Dial-Up Networking Works” later in this chapter.

A Windows 95 Dial-Up Networking configuration includes these components as described in the following sections:

n

Dial-up clients and servers

n

Remote access protocols

n

Network (LAN) protocols and network servers

# n

Security options

With Dial-Up Networking, you can configure a remote computer running Windows 95 as a dial-up client to dial into a Windows 95 dial-up server or other remote access servers. A dial-up client, running the appropriate remote access protocol, can connect to many types of remote access servers.

A Windows 95 dial-up client can connect to the following kinds of remote access servers:

# n

Windows 95 dial-up server

# n

Windows NT 3.5 workstation and server

# n

Windows NT 3.1, or higher, and Windows for Workgroups 3.11

n

NetWare Connect

n

Shiva LanRover and other dial-up routers

n

Any UNIX® server that runs SLIP or PPP

n

Any TCP/IP server that runs PPP

Remote access protocols control the transmission of data over the wide-area network (WAN). A Windows 95 dial-up client can use the following remote access protocols to connect to a remote access server:

n

Point-to-Point Protocol (PPP)

n

Novell NetWare Connect

n

Windows NT 3.1 or Windows for Workgroups RAS (Asynchronous  
NetBEUI)

n

Serial Line Internet Protocol (SLIP)

The type of remote access protocol you choose depends on the server you are connecting to. Some remote access protocols support a subset of the common network protocols. For example, PPP allows you to connect to a network server or a computer running Windows 95 with TCP/IP, IPX/SPX-compatible, or NetBEUI network protocols. The recommended remote access protocol is PPP because it supports multiple protocols in an extensible fashion and is an industry standard.

The following is a summary of remote access protocols:

Point-to-Point Protocol (PPP).

PPP has become the standard for remote access. Microsoft recommends that you use PPP because of its flexibility and its role as an industry standard, and for future flexibility with client and server hardware and software. If a dial-up client is running PPP, it can connect to a network running IPX, TCP/IP, or NetBEUI protocols. PPP is the default protocol for the Microsoft Dial-Up adapter. For more information, see "PPP Architecture" later in this chapter.

#### *Novell NetWare Connect.*

NetWare Connect is a proprietary connection protocol that allows a Windows 95 client to dial into a NetWare server. The NetWare Connect connection type allows a computer running Windows 95 to directly connect to a NetWare Connect server and, if running a NetWare-compatible network client, connect to NetWare servers. Windows 95 can only act as a client for connecting to a NetWare Connect server. NetWare Connect clients themselves cannot connect to a Windows 95 dial-up server directly through dial-up.

#### *RAS for Windows NT 3.1 and Windows for Workgroups 3.11 (Asynchronous NetBEUI).*

This protocol is used to connect computers running Windows 95 to remote access servers running Windows NT 3.1 or Windows for Workgroups 3.11, or to connect computers running Windows for Workgroups 3.11 or Windows NT 3.1 to a Windows 95 dial-up server. For more information about RAS, see Chapter 12, "Network Technical Discussion."

#### *Serial Line Internet Protocol (SLIP) .*

SLIP is an older remote access standard than PPP and is typically used by UNIX remote access servers. Use SLIP only if your site has an older UNIX system configured as a SLIP server for Internet connections.

A SLIP server is not provided with Windows 95. SLIP is for dial-out only in Windows 95. Support for SLIP can be found on the Windows 95 compact disc in the ADMIN\APPTOOLS\SLIP directory. You can install SLIP in the Add/Remove Programs option in Control Panel. After installing it, you can enable a dial-up client to connect to any remote access server using the SLIP standard.

Windows 95 makes it easy to configure dial-up clients and servers to access a network. When you install Dial-Up Networking, any protocols already installed on the computer are automatically enabled for Dial-Up Networking. Windows 95 has built-in support for TCP/IP, IPX/SPX, and NetBEUI network protocols. To configure the Windows 95 dial-up server to act as a gateway to a network, you must ensure that it and the dial-up client are running the same network (LAN) protocol as your existing network.

The following table presents the combinations of protocols you would use to run either Windows Sockets or NetBIOS applications on a network.

1

---

|                                                                            |                                                                                                                   |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| NetWare<br>Connect                                                         | IPX/<br>SPX<br>(Windows<br>Sockets<br>/NETBIOS)                                                                   |
| PPP                                                                        | TCP/IP<br>(Windows<br>Sockets<br>/NetBIOS)<br>IPX/SPX<br>(Windows<br>Sockets<br>/NetBIOS)<br>NetBEUI<br>(NetBIOS) |
| RAS<br>for<br>Windows NT<br>3.1 or<br>Windows<br>for<br>Workgroups<br>3.11 | NetBEUI<br>(NETBIOS)                                                                                              |
| SLIP                                                                       | TCP/IP<br>(Windows<br>Sockets<br>/NetBIOS)                                                                        |

S)

---

## 1 Dial-Up Networking protocol

---

Note — You do not install any network protocols when you install Dial-Up Networking; NetBEUI and the IPX/SPX-compatible protocol are automatically installed and bound to the Microsoft Dial-Up Adapter.

---

### *Installing Dial-Up Networking*

---

When you install Dial-Up Networking, you are installing all the components you need to connect to a network. For example, installing Dial-Up Networking also installs the Microsoft Dial-Up Adapter, other network adapters, and remote access and network protocols.

Before you dial up a remote connection using a modem and Dial-Up Networking, you need to make sure all the appropriate network protocols are bound to the Microsoft Dial-Up Adapter or a network adapter. The easiest way to install Dial-Up Networking is during installation of Windows 95. If you didn't choose it during Setup, you can do it afterward.

#### [To install Dial-Up Networking during Window 95 installation](#)

1. Choose the Custom Setup Type, and in the Select Components screen, click Communications, and then click the Details button.
2. In the Details dialog box, click Dial-Up Networking.

---

Note — If you are currently using Windows for Workgroups 3.11 with RAS, Dial-Up Networking will be automatically installed when you upgrade to Windows 95.

---

#### [To install Dial-Up Networking after you run Setup](#)

1. In Control Panel, double-click the Add/Remove Programs icon.
2. Click the Windows Setup tab.
3. In the Components list, click to check the Dial-Up Networking check box, and then click OK.

— An icon for Dial-Up Networking appears in My Computer. Double-click the icon to run Dial-Up Networking.

---

Note — You can also install Dial-Up Networking by installing the Microsoft Dial-Up Adapter in the Network option in Control Panel.

---



## *Configuring Dial-Up Networking Clients and Servers*

---

Configuring computers as Dial-Up Networking clients or servers consists of four tasks:

**n** Installing the appropriate network protocols and making sure they are bound to the Microsoft Dial-Up Adapter. All network protocols installed before you install Dial-Up Networking are automatically bound to the Microsoft Dial-Up Adapter when you install Dial-Up Networking.

**n** Running the New Connection Wizard in Dial-Up Networking to set up connections to a remote access server for the dial-up client.

**n** Configuring the dial-up client in Dial-Up Networking by selecting the remote access server type it will connect to, and by choosing whether to access the network after connecting to the remote access server. Selecting the server type automatically enables the correct remote access protocol, such as PPP or SLIP.

**n** Optionally, configuring a computer running Windows 95 as a dial-up server

in the Dial-Up Server menu in Dial-Up Networking.

Windows 95 automatically binds the default network protocols to the Microsoft Dial-Up Adapter when you install Dial-Up Networking. For most networks, these typically are the IPX/SPX-compatible and NetBEUI protocols. You can install other network protocols, such as TCP/IP, in the Networks option in Control Panel. For information about adding protocols, see Chapter 12, "Network Technical Discussion."

[To make sure the correct protocols are bound to the Microsoft Dial-Up Adapter or other network adapter](#)

1. Double-click the Network icon in Control Panel, and then double-click the Microsoft Dial-Up Adapter.

2. Click the Bindings tab on the adapter's property sheet.

— Every installed protocol is listed. If the protocol is checked, then it is bound to the Microsoft Dial-Up Adapter.

— If there are no check marks, clicking the protocol's checkbox and then clicking OK will bind it to the adapter or network adapter.

Windows 95 guides you through making a new remote connection when you first run Dial-Up Networking. Before creating a new Dial-Up Networking connection, you should install a modem. The Make New Connection wizard prompts you to do so, or you can install it separately by using the Install New Modem wizard in the Modems option in Control Panel. For more information on modem installation and configuration, see Chapter 25, "Modems and Communications Tools."

[To create a Dial-Up Networking connection using the Make New Connection wizard](#)

1. From My Computer, click the Dial-Up Networking icon.

2. In the Dial-Up Networking window, double-click the Make New Connection icon.

— {ewc msdncl, EWGraphic, x0aa 2 /a "psAA.bmp"}

3. The Make New Connection wizard prompts you for the information needed to define a connection, including a name for the computer you are dialing, modem type, area code, telephone number, and country code.

— You need to provide this information only once for each connection you define.

— *Note* — You can adjust the dialing string in Dialing Properties for different locations from which you may dial out, for example, you can change the country

and area code. In Dial-Up Networking, Dialing Properties is accessed in the Properties option in the File menu for each connection.

===={ewc msdn cd, EWGraphic, x0aa 3 /a "psAA.bmp"}

4. After you have typed the connection information, the Make New Connection wizard asks if you want to save this connection. Click OK. The new icon for your connection appears in the Dial-Up Networking window.

When a user connects to a remote server, a terminal window can be displayed to support an interactive logon session with the server. After a connection is established, remote network access becomes transparent to the user.

#### [To bring up a terminal window before or after dialing](#)

1. Click a connection icon, click the File menu, and then click Properties.
2. In the General property sheet, click the Configure button, and then click the Options tab.
3. In the Options dialog box, click the Bring Up Terminal Window Before or After Dialing options.

#### [Tip for Using Dialing Properties to Change Location Information](#)

Dial-Up Networking is a TAPI-enabled application. This means that Dial-Up Networking can offload the work of matching the correct phone dialing string from the location to the TAPI components designed for that role. When you attempt a Dial-Up Networking connection, you can choose to edit your calling location by using the Dialing Properties utility.

With Dialing Properties, you can specify area code, special numbers needed to reach an outside line, and calling card information you may need for the connection number. The Windows 95 TAPI services will then automatically adjust the dial string it sends to your modem. For more information about using Dialing Properties, see Chapter 25, "Modems and Communications Tools."

#### [Predefining Dial-Up Networking Connections for Users](#)

The configurations you set up for each connection are stored in the Registry under

Hkey\_Current\_User\RemoteAccess\Addresses\

Dial-Up Networking connection definitions can be included as part of a user profile. Because of this, different users sharing the same computer can use separate dialing configurations. For more information about user profiles, see Chapter 15, "User Profiles and System Policies."

### [To create predefined connections](#)

n

To be added.

You configure the Windows 95 dial-up client for each dial-in connection you define in Dial-Up Networking. Configuration consists of selecting the remote access server type to connect to and choosing whether to access the network after connecting to the remote access server. In addition, you can require an encrypted password to connect to a remote access server and check to see if the correct network protocols are installed on the dial-up client.

Windows 95 automatically selects the appropriate remote access protocol when you select the remote access server type for each Dial-Up Networking connection.

### [To select a server type on the Windows 95 dial-up client](#)

1. In Dial-Up Networking, click a connection icon, and in the File menu, select the Properties option.

2. In the General property sheet, click the Server Type button.

—{ewc msdn cd, EWGraphic, x0aa 4 /a "psAA.bmp"}

3. In the Server Types dialog box, select the correct remote access server type.

—The default server type for a Windows 95 dial-in client is PPP: Windows 95, Windows NT 3.5, Internet. Selecting this option allows Windows 95 to automatically detect and connect to other remote access servers that are running TCP/IP over PPP.

4. Click the Log On To Network option to allow access to the network after connecting to the remote access server.

—If you choose this option, Windows 95 displays a network logon prompt after you connect to the remote access server. The type of prompt depends on what type of network client the computer is running and whether the password for the network client matches your Windows 95 logon password. For more information, see Chapter 11, "Logon, Browsing, and Peer Resource Sharing" and "Using Security with Dial-Up Networking."

5. Click the Require Encrypted Password option to require the user to type in an

encrypted password before accessing the dial-up server. For more information, see “Using Security with Dial-Up Networking” later in this chapter.

6. Click OK.

---

*Tip*—— If users are having trouble making remote access connections, check to see if a specific server type was selected. When a specific connection type is selected, Windows 95 will not attempt to connect using any other server type.

---

---

*Note*—— SLIP will not appear in the list of server types unless you install it from the ADMIN\APPTOOLS\SLIP directory on the Windows 95 compact disc.

---

After you have defined a remote connection with the New Connection Wizard, you can make a connection in two ways:

n

Double-click a connection icon in the Dial-Up Networking.

n

Connect to a remote network resource when you are working in an

application other than Dial-Up Networking. If you cannot find the resource on the current network, Windows 95 responds by automatically activating Dial-Up Networking.

After establishing or ending a connection, you do not need to restart the computer or restart Windows 95. When you attempt to perform the following tasks, Windows 95 launches Dial-Up Networking:

n

When you try to access a network resource and your computer is not connected to any network

n

When your application specifies a UNC name (which uses the form \  
\SERVERNAME\SHARENAME) that can't be accessed by means of the local area network

n

When you double-click a link that points to a remote network object, for example:

n

When an application attempts to connect to a named pipe or file (such as mail)

# n

When you reconnect to a remote OLE object

When you choose a remote connection, Windows 95 retrieves the server information from the addresses stored in the Registry. If the information is not available, you are asked to select a server from the connection icons in Dial-Up Networking, or type a new server name.

If Dial-Up Networking cannot find the network resource, it displays a net error message. If the connection is successful, Windows 95 remembers the connection for the future.

You can disable the prompt that asks if you want to use Dial-Up Networking when attempting to connect to a network resource.

#### [To disable the Dial-Up Networking prompt](#)

1. In Dial-Up Networking, click the Connection menu, and then click Settings.

——{ewc msdncl, EWGraphic, x0aa 5 /a "psAA.bmp"}

2. Click the Don't Prompt To Use Dial-Up Networking option.

With Dial-Up Networking, you can configure a computer running Windows 95 to be a remote access server for dial-up clients running Windows 95, Windows for Workgroups, or Windows 3.1. The Windows 95 dial-up server can act as a gateway to a network, or as a server to the client, sharing its file and printing resources with one dial-up client at a time.

---

Note—— The functionality for the Windows 95 dial-up server is provided with this beta release of Windows 95 for testing purposes only. To install Windows 95 dial-up server functionality, you must download files from the WinNews forum on CompuServe. The names of the files and instructions for installing them will be posted in that forum.

---

A Windows 95 dial-up server differs from the Windows NT 3.5 dial-up server in the following ways:

n

Windows NT 3.5 Server can act as an IP router and Windows 95 cannot.

IP router capabilities permit accessing a TCP/IP network, such as the global Internet. Windows 95 provides all the protocols you need to connect to the Internet, but cannot act as an IP router. Consequently, you need to connect a computer running Windows 95 to a server with IP router capabilities in order to connect to the Internet.

n

Windows NT 3.5 supports 256 remote connections, whereas Windows 95

provides one remote connection.

n

Windows NT 3.5 allows you to remotely administer the remote access

server, whereas Windows 95 requires you to use system policies to remotely administer the server. For more information about system policies, see Chapter 15, "User Profiles and System Policies."

The Windows 95 dial-up server supports the following remote access clients:

n

Windows 95 dial-up client



# n

Windows for Workgroups

# n

Windows 3.1 RAS client

# n

Clients running PPP

A Windows 95 dial-up server with the appropriate network protocols installed can act as a NetBIOS gateway.

For more information about connectivity options of a Windows 95 dial-up server, see “Overview of Dial-Up Networking” earlier in this chapter.

Configuring a computer running Windows 95 to be a dial-up server consists of the following steps:

# n

Enabling File and Printer Sharing services for either Microsoft or NetWare

networks on the dial-up server. For information, see Chapter 11, “Logon, Browsing, and Resource Sharing.”

# n

Enabling user-level or share-level security on the dial-up server. For

information, see Chapter 11, “Logon, Browsing, and Resource Sharing” and  
“Using Security with Dial-Up Networking” later in this chapter.

# n

Configuring dial-up server capabilities in Dial-Up Networking. For

information, see the following procedure.

### *To configure a computer as a Dial-Up Server*

1. From the Connections menu in the Dial-Up Networking window, click Dial-Up Server.
2. In the Dial-Up Server dialog box, click Allow Caller Access. The Dial-Up Server dialog box will vary depending on whether you have enabled user-level or share-level security for the computer.
3. Optionally, click Change Password to define a call-in password for Dial-Up Networking clients, then click OK.

—— Or ——

—— If you are using user-level security for peer resource sharing, select the users who have access to this dial-up server. Then click OK.

4. Click the Server Type button and select the server type.

—— If you select the Default server type, the dial-up server will, for incoming calls, automatically start in PPP mode and switch to RAS for Windows NT 3.1 and Windows for Workgroups mode if the PPP negotiation fails. For information on PPP negotiation, see “PPP Dial-Up Sequence” later in this chapter.

—— {ewc msdn cd, EWGraphic, x0aa 6 /a "psAA.bmp"}

5. Click OK and the dial-up server will be ready to answer incoming calls.

Notice that changes to the server type do not apply to a connection that is currently open. Changes will apply to any future connections made to this computer.

[To disconnect any users who are currently connected to this computer through Dial-Up Networking](#)

n

Click the Disconnect User button in the Dial-Up Server dialog box.

---

Note — Windows 95 Dial-Up Networking can only use one modem at a time to dial up a server. You can select multiple modems at any one time, but only one modem can answer the call.

---

You can prevent users from remotely accessing computers even if a remote connection has been previously established. You can restrict access by using System Policy Editor to create a policy file or by making direct changes to a computer's dial-up support capabilities.

[To disable the Dial-Up Server on a single computer](#)

1. From the Connections menu in the Dial-Up Networking window, click Dial-Up Server.
2. In the Dial-Up Server dialog box, select the No Caller Access option.

— Disabling dial-up support using system policies can be done on each computer or on a system-wide basis through System Policy Editor. System Policy Editor allows you to run Registry Editing mode for changing a single computer's Registry, or for defining policies that can be shared by multiple computers. For more information, see Chapter 15, "User Profiles and System Policies."

[To disable dial-up support using System Policy Editor](#)

1. Run System Policy Editor, as described in Chapter 15, "User Profiles and System Policies."
2. In System Policy Editor File menu, select Open, and then double-click the Local Computer icon.
3. In the Registry, click Network, and then click Dial-Up Networking.

— {ewc msdn cd, EWGraphic, x0aa 7 /a "psAA.bmp"}

4. Check the Disable Dial-in box, and then click OK.

5. From the File menu, click Save.

The Dial-Up Server menu option still appears on the Connections menu after dial-up support has been disabled, but no dialog box for setting up the dial-up server will appear. For more information about implementing system policies, see Chapter 15, "User Profiles and System Policies."

Dial-Up Networking gives network administrators the option of requiring a password to connect to the remote access server. To provide this additional level of security, you need to decide whether to provide the Windows 95 dial-up server with share-level or user-level security.

n

Share-level security assigns a password to the Windows 95 dial-up server.

When a user dials in, they must provide the password before gaining access to the server. After the connection is established, the user can browse the resources on the dial-up server, subject to whatever level of security has been applied to them. Users can also log onto the network after connecting to the dial-up server if logging onto the network is enabled on both the dial-up server and client.

n

User-level security restricts access to a network resource until a security

provider, such as a Windows NT domain controller or Novell NetWare server, authenticates the request. The security provider authenticates the user by verifying that the user name and password match. You can require that a user's logon password to remote access server be the same as the network and Windows 95 logon passwords. For more information, see Chapter 14, "Security."

[Using User-Level Security With Dial-Up Networking](#)

When the remote access server is part of a Windows NT or Novell NetWare network, you can provide the dial-up server with user-level security. With user-level security, the remote access server queries the user account database stored on the network security provider before allowing access to its resources. When the user logs on, the following security measures are applied:

n

The network security provider validates the user's logon name and

password. If the user is not authenticated, Windows 95 will not allow dial-up access to the server.

n

When the user accesses shared resources on the dial-up server or other

computers on the network running Windows 95, Windows 95 controls what rights a user has to the shared resources, such as whether the user has read-only access or full access to files. Access rights are specified in the Network option in Control Panel for each resource protected by user-level security.

#### [To configure the dial-up server to use user-level security](#)

1. Enable user-level security by using System Policy Editor to edit the Registry and enable File and Printer Sharing services for Microsoft or NetWare networks in the Networks option in Control Panel. For more information, see Chapter 15, "User Profiles and System Policies" and Chapter 11, "Logon, Browsing, and Resource Sharing."
2. In the Dial-Up Networking Connections menu, select Dial-Up Server.
3. In the Dial-Up Server property sheet, check the Allow Caller Access option, and then click Add.  
===={ewc msdn cd, EWGraphic, x0aa 8 /a "psAA.bmp"}
4. In the Add Users dialog box, specify those users who will have permission to access the dial-up server, and then click OK.
5. In the Dial-Up Server property sheet, click the Server Type button, and make sure the Require Encrypted Password option is checked if your Dial-Up client

supports encrypted passwords.

—{ewc msdn cd, EWGraphic, x0aa 9 /a "psAA.bmp"}

—Require encrypted password means that the client must send an encrypted as opposed to a text version of a password. Some clients only support text passwords; however, encrypted passwords are preferred. Clearing this option doesn't disable password protection.

### [Using Share-Level Security With Dial-Up Networking](#)

With share-level security, you can assign a password to a dial-up server which users must type before connecting to the resources on the dial-up server. Because users can distribute passwords, this method is less secure than user-level security. You can, however, use share-level security to restrict dial-in access to only the dial-up server as opposed to the network. If a user only needs to access a desktop computer, this is an appropriate level of security. You can also allow a user to access the network after connecting to the dial-up server, if necessary.

#### [To configure the dial-up server to use share-level security](#)

1. Disable user-level security, if enabled, by using System Policy Editor to edit the Registry and enable File and Printer Sharing services for Microsoft or NetWare networks in the Networks option in Control Panel. For more information, see Chapter 15, "User Profiles and System Policies" and Chapter 11, "Logon, Browsing, and Resource Sharing."
2. In Dial-Up Networking, choose Dial-Up Server from the Connections menu.
3. In the Dial-Up Server property sheet, click to check the Allow Caller Access option, and then type a password.

—{ewc msdn cd, EWGraphic, x0aa 10 /a "psAA.bmp"}

4. Click the Server Types button, and then click to check the Log On To Network option to enable logging onto the network after connecting to the dial-up server.
5. In the Server Types dialog box, click to check the Require Encrypted Password option to enable password encryption, and then click OK.

To improve the throughput and transfer times when using Dial-Up Networking, Windows 95 supports dynamic compression of information when connected to another computer that also understands compression, for example, a computer running Windows 95 or Windows NT.

You can choose to use either software compression (specified through the Dial-Up

Server dialog box) or hardware compression. SOFTWARE COMPRESSION is performed by the remote access software; HARDWARE COMPRESSION is performed by the modem.

Choosing software compression specifies that your computer will try to compress information before sending it. Compression will occur only if the computer you are connecting to is using a compatible compression program.

---

Note — Software compression is only supported in PPP mode, and not in RAS, NetWare Connect, or SLIP modes. Software compression is enabled by default in PPP mode and is preferred over hardware compression because it reduces the amount of information that needs to be transmitted over the modem.

---

#### [To choose software compression](#)

1. From the Dial-Up Networking Connections menu, click Dial-Up Server.
2. In the Dial-Up Server dialog box, click the Server Type button.
3. In the Server Types dialog box, make sure the Enable Software Compression option is checked.

---

Note — The software compression option is not available when connecting to a Windows NT 3.1 or Windows for Workgroups 3.1 remote access server.

---

Hardware compression is available on most newer modems at higher connection speeds. For example, V.42bis is an industry standard which allows modems to do data compression on all the data sent through them “on the fly.”

#### [To choose hardware compression](#)

1. In the Modems option in Control Panel, click the Properties button, and then click the Connection Tab.
2. In the Connection dialog box, click the Advanced button and then click the Error Control box.
3. Click the Compress Data option to enable the modem to compress data.

You should leave both software and hardware compression enabled unless you are certain that the server supports software compression. In that case, hardware compression should be disabled because the extra overhead is not efficient. When you use either type of compression on data that is already compressed, you won't see any transfer time improvement. If the computer you are connecting to doesn't support compression, these settings are ignored and data is sent uncompressed over the wire.

Connecting to a Windows NT remote access server is the same as connecting to a Windows 95 Dial-Up Networking server. All you need is the phone number of the Windows NT server when creating a connection. Dial-Up Networking negotiates the proper protocols and server connection type. You don't need to specify a default server type.

Windows NT 3.5 Server supports PPP, RAS, and SLIP clients. PPP is the recommended protocol. Windows NT 3.5 supports IPX/SPX, NetBEUI, and TCP/IP network protocols and can function as a NETBIOS gateway, IPX router, and IP router simultaneously.

---

Note—— Windows NT 3.1 only supports the RAS protocol, which is a proprietary protocol that only supports NetBEUI. It is a fast connection type, but does not allow for multiple protocols over the connection. RAS in Windows NT 3.1 cannot support the IPX/SPX or TCP/IP protocols.

Microsoft recommends that you upgrade Windows NT Remote Access Server to Windows NT Server 3.5, which provides many additional benefits, including PPP support.

---

A Windows NT 3.1 or 3.5 remote access server provides several features that a Dial-Up Networking server does not. For an explanation of these differences, see “Configuring a Windows 95 Dial-Up Server” earlier in this chapter.

### Remote Clients.

Windows NT RAS supports the following types: Windows NT, Windows for Workgroups, Windows 95, MS-DOS, and LAN Manager RAS clients. Clients can also be any PPP client.

### Remote Access Protocols.

Windows NT RAS supports the following types: PPP protocol, enabling any PPP client to use TCP/IP, IPX/SPX, or NetBEUI; SLIP protocol to access the older UNIX networks; Microsoft RAS protocol, allowing any Microsoft RAS client to dial in.

### Wide Area Networks (WAN) connections.

Windows NT supports clients dialing in over standard telephone lines, a modem or modem pool, ISDN, X.25, or an RS-232C null modem.

### Security Options.

Windows NT supports sophisticated security options, including Windows NT logon and domain security, support for security hosts, data encryption, and callback



provide secure network access for remote clients.

### Multiple Connections.

Windows NT permits up to 256 remote clients to dial in. The RAS server can be configured to provide access to an entire network or to restrict access to the RAS server only.

### Network Protocols.

Windows NT supports IP protocols to permit accessing a TCP/IP network, such as the global Internet. IPX protocol support enables remote clients to access NetWare servers and printers. You can also use NetBIOS applications over IPX, TCP/IP, or NetBEUI. Windows Sockets applications over TCP/IP or IPX, named pipes, Remote Procedure Call (RPC), and the LAN Manager API are supported.

The following illustrates all Windows NT 3.5 remote access features and possible configurations. Actual implementations and configurations will vary.

`{ewc msdncd, EWGraphic, x0aa 11 /a "psAA.bmp"}`

Windows NT 3.5 RAS server can act as a NetBIOS, TCP/IP, or IPX/SPX (NWLINK) gateway, depending on the protocols installed on the Windows NT server. This allows a dial-up client running any of these protocols to connect through the gateway to a remote server that might have been running TCP/IP or NWLINK.

For more information about Windows NT remote access servers, see the Windows NT Server REMOTE ACCESS SERVER GUIDE.

If the Windows NT 3.5 RAS server has a network adapter installed, the NetBIOS gateway and routers are enabled by default. Although this allows RAS clients to access resources on the remote network over all supported RAS protocols, there are limitations. By default, the RAS IPX and TCP/IP routers do not forward broadcast packets to the remote network because it reduces network traffic across the router. Because broadcast packets are the primary method of name resolution for these protocols, this limits a RAS client's access to the remote network with these protocols.

Windows 95 Dial-Up Networking supports connecting to Novell NetWare resources in two ways:

# n

Connecting directly to a Novell NetWare Connect server

# n

Using a computer running Windows 95 or Windows NT 3.5 as a gateway

into a local area network, where NetWare servers are connected.

NetWare Connect allows a Windows 95 client to dial into a NetWare server running NetWare Connect 1.0.

---

Note — Windows 95 can only act as a client for connecting to a NetWare Connect server. NetWare Connect clients themselves cannot dial up a Windows 95 Dial-Up Server.

---

The NetWare Connect connection type allows a Windows 95 client to directly connect to a NetWare Connect server and connect to NetWare servers on the connected local area network.

### [Configuring Dial-Up Networking for NetWare Connections](#)

To use Dial-Up Networking to connect to a NetWare Connect server, you must specify NetWare Connect as the server type in a connection's property sheets. You will also need to use the Network option in Control Panel to make sure the following are enabled on a Windows 95 dial-up client or server:

# n

Microsoft Client for NetWare NetWorks.

n

File and Printer Sharing Services for NetWare Networks on the dial-up server

n

IPX/SPX-compatible protocol bound to the Microsoft Dial-Up Adapter driver.

If you use Dial-Up Networking to access NetWare resources, you can access data remotely, but cannot control a computer remotely, as you can with the NetWare Connect client software supplied by Novell.

### Connecting to Shiva Servers

---

You do not need to configure Dial-Up Networking in any special way to connect a dial-up client to a Shiva LanRover or NetModem/E families (Shiva) of remote access servers.

The Shiva LanRover family includes LanRover and LanRover/PLUS remote access servers, both of which are available in rack-mountable Ethernet or Token Ring models. The LanRover is a multiport, multiprotocol remote access server with built-in serial ports; the LanRover/PLUS is a multiport, multiprotocol remote access server with configurable ports for integrated V.34 modems or high-speed asynchronous serial links, such as ISDN terminal adapters. The Shiva NetModem/E 28.8 is a single-port remote access server that features a built-in Ethernet connector and integrated V.34 modem.

With a Windows 95 dial-up client, you can dial into a Shiva remote access server and connect to IPX, NetBEUI, and TCP/IP services on a network. A dial-up client connected to a Shiva server can access any network resources that a computer on the local area network can, including all other computers running Windows 95, NetWare servers, electronic mail, client-server applications, and the Internet.

Shiva remote access servers fully support the following capabilities of the Windows 95 dial-up client:

n

Dial-in support for IPX, NetBEUI, and TCP/IP network protocols using PPP

n

Unique name and password for each dial-in user

n

Callback authentication

n

Modem hardware compression standards such as V.42bis

n

Novell NetWare bindery support for user authentication

n

Password encryption

n

Activity logging

n

Microsoft Remote Access API support

In addition, Shiva remote access servers offer the following capabilities:

n

Centralized management of multiple Shiva remote access servers from  
one computer

n

IPX, TCP/IP, and AppleTalk® routing

n

Apple® Remote Access dial-in support (Ethernet only)

n

LAN-to-LAN remote routing capabilities for IPX, TCP/IP, and AppleTalk-  
(Ethernet only) protocols to enable branch office connectivity

n

LAN-to-LAN remote routing capabilities for IPX, TCP/IP, and AppleTalk-  
(Ethernet only) protocols to enable branch office connectivity

n

Dynamic Host Configuration Protocol (DHCP) support for IP address-  
assignments during TCP/IP dial-in

n

Support for Security Dynamics ACE/Server and TACACS centralized-  
authentication

n

Integrated ISDN support

n

Shared dial-out, or modem pooling, for computers on the local network for access to bulletin boards or online information services

#### [Configuring A Shiva Server for Windows 95 Dial-Up Clients](#)

If you have a Shiva remote access server running on your network, you do not need to make any configuration changes to enable dial-up clients. Shiva remote access servers running release 3.5 and above are fully compatible with Windows 95 dial-up clients.

If you are installing a new Shiva remote access server, there are a few simple steps to configure it to support dial-up clients. You can configure all dial-in parameters for a Shiva remote access server with the Shiva Net Manager for Windows-based applications on a computer running Windows, Windows for Workgroups, or Windows 95, or with the Shiva Net Manager for Macintosh application.

Before configuring the Shiva remote access server for Windows 95 dial-up clients, you should do the following:

n

Ensure that you have properly installed and connected the Shiva remote access server to an Ethernet or Token Ring network.

n

Connect your modem to the serial port of your LanRover and to the telephone line, or connect the telephone line directly to the LanRover/PLUS with integrated modem or NetModem/E.

n

Install Shiva Net Manager for Windows on a computer that is attached to the Ethernet or Token Ring network. Shiva Net Manager for Windows requires either IPX or TCP/IP on the personal computer.

n

Make sure that dial-in access for a particular protocol or protocols is enabled.

n

Follow the directions provided by the manufacturer for installing Shiva NetManager for Windows 95.

[To configure the Shiva remote access server with Shiva Net Manager for Windows 95](#)

1. Run Shiva Net Manager by double-clicking the SNM icon, and then double-click the name of the Shiva remote access server you want to configure in the Shiva Net Manager Device List dialog box.



2. In the Shiva remote access server Configuration dialog box, click the General configuration page from the Configure menu.

3. Check the Dial-In function to enable it, and then check the protocols that you want to enable for Windows 95 Dial-Up Networking: IP, NetBEUI, or IPX.

===={ewc msdncd, EWGraphic, x0aa 12 /a "psAA.bmp"}

4. In the Configuration dialog box, click the Ports configuration page, and then check that all ports with modems are enabled and properly configured with modem strings.

5. If you are enabling TCP/IP dial in, click the IP configuration page from the Configure menu, and then type the IP address of the Shiva remote access server. For information about assigning IP addresses, see the procedure later in this section.

===={ewc msdncd, EWGraphic, x0aa 13 /a "psAA.bmp"}

6. If you are enabling NetBEUI dial in on a Token Ring network, click the Bridging configuration page from the Configure menu, and then type the ring numbers required for source routing.

7. To save your configuration, select the Set Configuration command from the Actions menu.

You will need to create a user name and password for each dial-up user.

#### [To store user names and password using the internal user list of the Shiva remote access server](#)

1. In the Shiva Net Manager Device List dialog box, click the name of the Shiva remote access server for which you want to create a dial-up user list.

2. From the Security menu, click the Get User List command.

===={ewc msdncd, EWGraphic, x0aa 14 /a "psAA.bmp"}

3. In the User List dialog box, click the Add button.

4. Type a user name and password for each dial-up user. Make sure that dial-up access is enabled for the user, and click OK.

5. Save the user list for the Shiva remote access server by choosing the Set User List command from the Security menu.

#### [Assigning TCP/IP Address to Dial-Up Clients With Shiva Remote Access](#)

To connect a dial-up client to TCP/IP network services, the client must have an IP address. Shiva remote access servers provide four different ways to assign IP addresses to dial-up clients.

# n

You can assign a unique IP address to each Shiva remote access server

port. Every time a user dials into a Shiva remote access server port, the dial-up client determines its IP address of the port by using the Reverse Address Resolution Protocol (RARP). Because every port has a unique IP address, there is no possibility of IP address conflicts between dial-in users.

# n

A centralized Windows NT Dynamic Host Configuration Protocol (DHCP)

server can tell the Shiva remote access server which IP address to assign to the dial-up client. Every time a dial-up client dials into a Shiva remote access server, the server sends a request to a DHCP server for an IP address. When the Shiva remote access server receives an IP address from the DHCP server, it assigns that address to the dial-up client. Because the DHCP server manages the assignment of all IP addresses, there is no possibility of IP address conflicts between dial-in users.

# n

You can assign an IP address to every dial-up client. When a user dials in,

the Shiva remote access server assigns the IP address based on the user name. As a result, a user is always assigned the same IP address. Of course, this method takes up many more IP addresses and can cause conflicts when more than one personal computer dials in with the same user name.

# n

The remote user can tell the Shiva remote access server what IP address to use for the dial-up client. If a user tries to obtain an illegal IP address, the Shiva remote access server allows it, but the connection fails. You should use this method only in cases where the remote users are very knowledgeable about the IP addresses on the network.

[To configure the Shiva remote access server to assign IP addresses to dial-up clients](#)

# n

If you want the Shiva remote access server to assign IP addresses by port, select Ports from the Configure menu. Assign a unique Dial-Up IP address to every port that you have enabled for dialing in.

# n

If you want the Shiva remote access server to use a centralized DHCP server: To be provided.

# n

If you want the Shiva remote access server to receive an IP address from the dial-up client computer, select the Allow User-Specified IP Address On Dial-In check box on the IP configuration page.

n

If you wish to assign an IP address to every dial-up user, you will need to type an IP address as part of the user profile when you create a user name and password.

### [Security Options with Shiva Remote Access Servers](#)

Shiva remote access servers provide several security options that prevent unauthorized access to your corporate network. You can choose the method, or combination of methods, that works best for your organization — from passwords to security devices from other vendors. Here are some of the methods that Shiva uses to provide a high level of security:

n

User Lists. Shiva remote access servers can store user names and passwords, allowing you to control dial-up access to the remote access server, and thus the network. When you add users to the Shiva remote access server user list, they can dial into the network, but still require the appropriate access privileges to access any server or host on that network.

n

NetWare Bindery. If your organization uses NetWare Bindery security features from Novell, you may not want to maintain an additional user list for a remote access server. Shiva remote access servers allow you to use the NetWare Bindery account database to provide centralized authentication services for dial-up access. You manage only one database of authorized user lists.

# n

Security Devices from other vendors. You may use additional security

devices to protect the highly sensitive data that resides on your corporate networks. Security devices from other vendors provide excellent challenge/response capabilities, which eliminate unauthorized access to the network. Shiva remote access servers are compatible with most popular security devices, so you can evaluate and choose the security method that is appropriate for your organization.

# n

Security Dynamics ACE/Server. This security solution uses a UNIX server

to maintain the centralized database of dial-up user privileges. In order to access resources on an ACE/Server-protected dial-up network, a user must provide not only a predetermined token or password, but also a time-synchronized token that is only available through Security Dynamics SecurID cards. Shiva remote access servers support ACE/Server authentication.

# n

TACACS. This is a centralized security solution that uses a UNIX server to

maintain the centralized database of user privileges. Shiva remote access servers support authentication of dial-in users using TACACS.

## *How Dial-Up Networking Works*

---

The Dial-up Networking client connects to a broad set of networks because support is included for IPX/SPX, NetBEUI, and TCP/IP network protocols, using PPP, NetWare Connect, or RAS for Windows NT or Windows for Workgroups over a modem, or SLIP over a modem to older UNIX networks.

---

Notes — Because the Microsoft Dial-Up Adapter driver is primarily an NDIS 3.1 network driver, it is important to note which protocols are bound to the Dial-Up driver (PPPMAC.VXD). Different protocols, when used in combination with other Dial-Up Networking connection choices, affect which features you can use.

---

## PPP Architecture

---

When Dial-Up Networking tries to establish a connection, it first tries to use PPP by default, because PPP provides more flexibility than other remote access protocols. Unlike SLIP, PPP provides the following:

n

A method for encapsulating datagrams over serial links, based on the ISO-

High-level Data-Link Control (HDLC) protocol.

n

A Link Control Protocol (LCP) for establishing, configuring, authenticating,

and testing the data-link connection.

n

A family of Network Control Protocols for establishing and configuring

different Network Layer protocols.

—{ewc msdn cd, EWGraphic, x0aa 15 /a "psAA.bmp"}

PPP is designed to work with a variety of hardware, including any asynchronous or synchronous, dedicated or dial-up, full-duplex bit serial circuit. It can employ any common serial communications protocol, including EIA-232-E (formerly, RS-232-C), EIA-422, EIA-423, EIA-530, and CCITT V.24 and V.35. PPP does not place any

particular restriction on the type of signaling, type of transmission speed, or use of modem control signals.

When a user dials into a PPP-compatible server, three things happen:

1. The Data Link Control Layer (HDLC) defines how data is encapsulated before transmission on the WAN. By providing a standard framing format, PPP ensures that various vendors' remote access solutions can communicate and distinguish data packets from each other. PPP uses HDLC framing for serial, ISDN, and X.25 data transfer.

— The PPP Data Link Control layer is a slightly modified version of the HDLC layer. The HDLC format, extensively used by IBM and others for synchronous data transfer, was modified by adding a 16-bit protocol field that allows PPP to multiplex traffic for several Network Control Protocol layers. This encapsulation frame has a 16-bit checksum, but the size of this field can be negotiated.

2. Link Control Protocol (LCP) establishes, configures, and tests the integrity of the data-link connection. LCP also negotiates authentication, and determines whether compression is enabled and which IP addresses will be used. When LCP negotiates authentication of protocols, it determines what level of security validation the remote access server can perform and what the server requires.

— LCP can negotiate with any of these authentication protocols:

n

Password Authentication Protocol (PAP) uses a two-way handshake

for the peer to establish its identity. This handshake occurs only when the link is initially established. Using PAP, passwords are sent over the circuit in text format, which offers no protection from playback.

n

Shiva Password Authentication Protocol (SPAP) offers encryption of

PAP passwords and Novell NetWare bindery access for user account information. When Windows 95 is set up for user-level security using a

NetWare server account list, this is the security type used for remote access clients.

n

Challenge-Handshake Authentication Protocol (CHAP) periodically

verifies the identity of the peer, using a three-way handshake. The authenticator sends a challenge message to the peer, which responds with a value using a one-way encryption. The authenticator then checks this response and, if the values match, the authentication is acknowledged; otherwise, the connection is ended. CHAP provides protection against playback attack, because the challenge value changes in every message. Because the password is never sent over the link, it is virtually impossible to learn it. CHAP allows different types of encryption algorithms to be used such as DES (MS-CHAP) and MD5 (MD5-CHAP). Windows 95 doesn't support ongoing challenges with CHAP, but does implement MS-CHAP, as does Windows NT.

3. Network Control Protocols establish and configure different network protocol parameters. The type of Network Control Protocol that PPP selects depends on which protocol (NetBEUI, TCP/IP, or IPX) is being used to establish the Dial-Up Networking connection. Windows 95 supports the following:

n

NetBIOS Frames Control Protocol (NBF CP) is used to configure,

enable, and disable the NetBEUI protocol modules on both ends of the link. NBF CP is a Microsoft-proposed protocol for NetBEUI configuration. NBF CP is currently in "draft" status with the Internet Engineering Task Force (IETF). Windows 95 provides implementations for the current draft of NBF CP (as of March 1994).



n

Internet Protocol Control Protocol (IPCP), defined in RFC 1332, is used to configure, enable, and disable IP Protocol modules at both ends of the link.

n

Internet Packet eXchange Control Protocol (IPXCP), defined in RFC 1552, is used to configure, enable, and disable IPX protocol modules on both ends of the link. IPXCP is widely implemented by PPP vendors.

You can record how the PPP layers process a call by enabling the PPPLOG file. This file contains some of the basic layers and points of any Dial-Up Networking session, and is especially useful for monitoring PPP sessions. It is recorded and stored in the Windows directory.

#### [To enable PPP logging](#)

1. In the Network option in Control Panel, double-click Microsoft Dial-Up Adapter from the list of installed network components.
2. Click the Advanced tab. In the Property list, click Record A Log File, and in the Value list, click Yes. Then click OK. Shut down and restart a computer for this option to take effect.

The following is sample content of a PPPLOG.TXT file:

#### Sample PPPLOG.TXT

09-01-1994 18:14:22 -- Remote access driver log opened.  
09-01-1994 18:14:22 -- Server type is PPP (Point to Point Protocol).  
09-01-1994 18:14:22 -- CCP : Layer initialized.  
09-01-1994 18:14:22 -- NBFCP : Layer initialized.  
09-01-1994 18:14:22 -- FSA : Control protocol 2180 will not be

negotiated.  
09-01-1994 18:14:22 - IPXCP : Layer initialized.  
09-01-1994 18:14:22 - FSA : Encrypted Password required.  
09-01-1994 18:14:22 - LCP : Layer initialized.  
09-01-1994 18:14:22 - LCP : Will try to negotiate callback.  
09-01-1994 18:14:22 - LCP : Layer started.  
09-01-1994 18:14:22 - LCP : Received and accepted ACCM of 0.

### Overview of Windows 95 Mobile Computing Features

---

Windows 95 mobile computing tools allow users to be as productive as possible away from the office. In the following ways, Windows 95 mobile computing tools solve the problems of working at a remote site:

n

Updating of documents on a portable computer with source documents on a desktop computer or network by using Briefcase

n

Remote access to electronic mail by using Microsoft Exchange

n

Ability to send and receive faxes by using Microsoft Fax

# n

Deferred printing when a physical printer is not available

# n

Direct connection of a portable computer to a desktop computer to  
synchronize files and share other resources by using Direct Cable Connection

## *Configuring Portable Computers*

---

The following scenario briefly demonstrates how to configure a portable computer to  
maintain full workgroup capabilities. For more complete procedures, see the  
referenced chapters or sections in this chapter.

Before you leave the office to work on a portable computer, you need to:

# n

Install Windows 95 on a portable computer by choosing Portable as the  
Setup Type during installation.

# n

Configure the portable computer to access a desktop computer or the

network.

n

Copy files you will work on into Briefcase on the portable computer.

n

Undock your portable computer or disconnect it from the network.

### *Installing Portable Windows 95*

You can configure Windows 95 to run smoothly on your portable computer if you choose Portable as the Setup Type during Windows 95 Setup. Portable Setup installs the Windows 95 mobile computing tools you need to be productive at a remote site, including:

n

Power Management

n

Briefcase

n

Dial-Up Networking

n

Quick Viewer

n

PCMCIA support

n

Direct Cable Connection

Portable Setup does not install WordPad, Image Color Matching support, Microsoft Exchange, or multimedia drivers (unless it detects a multimedia device).

[To install Portable Windows 95 on a portable computer](#)

# n

Click Portable in the Setup Type screen during Windows 95 Setup.

[To set up a portable computer automatically from batch scripts](#)

# n

In the [setup] section of MS-BATCH.INF, specify *InstallType=2*.

[Configuring Remote Access To a Desktop Computer or the Network](#)

Depending on whether you want to stay connected to a desktop computer or the network, you need to configure a portable computer slightly differently.

To configure a portable computer to access a desktop computer, you must do the following:

# n

For both configurations, if PCMCIA cards are used, PCMCIA support must be enabled in Control Panel. For more details, see Chapter 19, "Devices."

# n

Install PPP on the portable and desktop computers. PPP is automatically enabled if you select the Default Server or Windows 95 server in the Server Type

dialog box in Dial-Up Networking. For more details, see “Overview of Windows 95 Dial-Up Networking” earlier in this chapter.

n

Bind the appropriate network protocol, such as TCP/IP, to the Dial-Up

Adapter. For more details, see “Overview of Windows 95 Dial-Up Networking” earlier in this chapter.

n

Run Dial-Up Networking on the desktop computer to configure it as a dial-

up server. For more details, see “Configuring a Windows 95 Dial-Up Server” earlier in this chapter.

n

Enable File and Printer Sharing services on a desktop computer in the

Network option in Control Panel.

To configure a portable computer to access the network, you must do the following:

n

If PCMCIA cards are used, PCMCIA support must be enabled in Control

Panel. For more details, see Chapter 19, “Devices.”

n

Install the same remote access protocols (PPP, SLIP, Novell Netware

Connect, or Microsoft NetBEUI) on the portable and desktop computers as described in “Overview of Windows 95 Dial-Up Networking” earlier in this chapter.

n

Bind the appropriate network protocol to the Dial-Up Networking Adapter

and network adapter as described in “Overview of Windows 95 Dial-Up Networking” earlier in this chapter.

n

Run Dial-Up Networking on your desktop computer to configure it as a

dial-up server.

### [Using Briefcase to Keep Files Up-To-Date](#)

To continue working on certain files while away from your desk, you can copy them from a desktop or the network into your Briefcase on the portable computer.

Briefcase remembers where the original document came from. You can now make changes to the files inside your Briefcase or to the original files. When you return to the office, you can synchronize files on the portable computer with those on the desktop or network.

### [Undocking Your Portable Computer](#)

If your portable computer has a Plug and Play BIOS, you don't have to shut it down



to eject it from its docking station if the portable supports hot docking.

### [To undock a portable computer](#)

n

Click the Eject PC icon on the taskbar.

Choosing Eject PC sends a message to Windows 95 that you're about to undock. Windows 95 responds by changing to a lower resolution suitable for your built-in panel display. It also sends a message to every application on the system. This enables applications to take action when the configuration changes.

Your portable computer has just been comprehensively reconfigured. You do not need to create any CONFIG.SYS or AUTOEXEC.BAT files and you don't need to turn off the computer. Windows 95 loads the network services and recognizes that your external monitor, keyboard, and mouse are gone. For more information about Windows 95 automatic detection of devices, see Chapter 19, "Devices."

To work on a portable computer from a remote site, Dial-Up Networking provides a consistent way to access desktop or network resources through a modem. After you connect, you can send and receive mail, access files on a desktop or network server, and send files to a printer. You can also use a fax modem to send and receive faxes. If a printer is unavailable, you can use Windows 95 deferred printing to send a job to the print queue. When a printer becomes available, Windows 95 automatically sends the print job.

To have workgroup capabilities from a remote site, you must do the following:

n

Create a Dial-Up Networking Connection to dial into a desktop or the

network. For more details, see "Defining a New Dial-Up Networking Connection" earlier in this chapter.

n

Configure Microsoft Exchange for remote access to mail. For more details, see Chapter 26, “Electronic Mail and Microsoft Exchange.”

n

Enable deferred printing on a portable computer. For more details, see “Using Deferred Printing” later in this chapter.

When you return to your office, Windows 95 creates a smooth transition between mobile and office computing. When you dock your portable computer:

n

Windows 95 automatically detects the configuration changes.

n

Print Manager prompts you to start the printer if you sent documents to be printed while away from the office.

# n

You can open Briefcase and synchronize documents.

## *Direct Cable Connection*

---

Direct Cable Connection is a tool that enables you to quickly and easily establish a direct serial or parallel cable connection between two computers in order to share each other's resources. If the other computer is connected to a network, you can also access the network. For example, if you have a portable computer, you can use a cable to connect it to your work computer and network. To establish a LOCAL CONNECTION between two computers, you need a compatible serial or parallel null-modem cable.

---

Note — This capability is similar to that available with Interlink for MS-DOS 6.x, which allowed users to transfer data through the serial port between two personal computers.

---

Before you install and configure Direct Cable Connection, you need to decide:

# n

What kind of file access does the guest computer need? Does the guest

computer only need to transfer files that are on the host computer, or does it need full network access through the host computer?

# n

What remote access and network protocols do you need to install on the

guest and host computers? They must both be running the same protocols in order to connect.

# n

What kind of cable do you need? Direct Cable Connection works with serial and parallel cables. For details, see "Cables Compatible With Direct Cable Connection" later in this section.

To install Direct Cable Connection, you must choose Custom as the Setup Type during installation of Windows 95. You can install it afterward using the Add/Remove Programs option in Control Panel.

#### [To install Direct Cable Connection during Window 95 installation](#)

1. Choose Custom Setup Type. In the Select Components screen, click Communications, and then click the Change Option button.
2. In the Details dialog box, click Direct Cable Connection.

The following procedure describes how to use Direct Cable Connection to connect two computers.

#### [To make a local connection](#)

1. Connect both computers with a null-modem serial or parallel cable.
2. From the Accessories menu on the host computer, click the Direct Cable Connection icon.

—The host computer is the computer that has the resources that you want to access.

3. When the Direct Cable Connection wizard appears, click the Host option. (When you follow this procedure again to set up the guest computer, click Guest instead.)

—{ewc msdncl, EWGraphic, x0aa 16 /a "psAA.bmp"}

4. Specify the port to which the cable is connected on the host computer.
5. The wizard asks if you want to use password protection. If yes, check the Use Password Protection box and specify a password.

—Notice that you can't set up user-level security choices when using Direct Cable

### Connection.

The host computer then displays a status message saying it is waiting for the guest computer to connect.

6. Repeat this procedure on the guest computer.

{ewc msdn cd, EWGraphic, x0aa 17 /a "psAA.bmp"}

---

Note Before you can transfer files from the host to the guest computer, the files must be shared in Windows Explorer, and File and Printer Sharing services for either Microsoft or NetWare networks must be enabled in the Network option in Control Panel.

---

### To share files on the host computer protected by user-level security

1. In My Computer, click the folder you want to share, and then right-click to bring up the Windows Explorer menu.

2. Click Sharing, and then in the Properties dialog box, click the Sharing Tab.

3. Click Shared As, type the share name, and click the Add button.

4. In the Add Users dialog box, click the people or workgroups you want to add, and then click Full Access to give them access to the files in the folder.

Windows 95 supports a serial null-modem standard (RS-232) cable and the following parallel cables:

n

Standard or Basic 4-bit cable, including LapLink and InterLink cables

available before 1992.

n

ECP cable. This type of cable works on a computer with ECP-enabled

parallel ports, which must be enabled in BIOS. Of the three kinds of parallel cables, this type allows the fastest data transfer between two computers.

n

Universal Cable Module (UCM) cable. This cable supports connecting

different types of parallel ports.

Parallel cables transmit data simultaneously over multiple lines, making it the faster of the two connection methods, but only works over short distances. Serial cables transmit data sequentially over one pair of wires, and are slower than parallel cables, but can transmit over long distances, including phone lines.

### *Using Remote Mail With Microsoft Exchange*

---

You don't have to be at your office to use Microsoft Exchange. When working at home or on the road, you can read and reply to mail offline. Then, if you have a modem and access to a telephone line, you can establish a remote connection to your organization's network, and send and receive electronic mail as if you were at your office. You can also create copies of private folders that you can work with offline.

To access Microsoft Exchange from a remote site, you need to do the following:

n

Configure Microsoft Mail to remotely connect to your postoffice with a

modem.

n

Create a Dial-Up Networking connection to that postoffice. The Dial-Up

Networking New Connection Wizard is launched when you define a new remote connection during the remote access configuration process.

n

Decide whether you want remote preview of mail messages.

n

Decide when you want to start and terminate a remote session.

n

Decide whether you want to schedule an automatic connection time.

For additional information, see Chapter 26, “Electronic Mail and Microsoft Exchange.”

### *Using Microsoft Fax*

---

Microsoft Fax allows a portable computer with a modem to send and receive messages as faxes or as electronic mail messages with attached documents. From a remote site, you can send fax messages using Microsoft Exchange or, from within another MAPI-compatible application such as Word, as easily as printing a document to a printer or sending an electronic mail message. For more information, see Chapter 27, “Microsoft Fax.”

### *Using Deferred Printing*

---

The Windows 95 print subsystem supports a deferred printing capability which allows users not connected to a printer to generate print jobs and store them on their local computers. This feature is handy for users working in a location away from the

printer, and for users in the office who temporarily lose printer connections because of network or printer problems. Even without a printer connection, you can generate print jobs from within applications based on Win16, Win32, or MS-DOS. Windows 95 stores the print jobs in a print queue until you reconnect to a printer.

#### [To create a deferred print job](#)

1. In Control Panel, double-click the Printers folder, and then click a printer.
2. From the Printers File menu, click Work Offline. The printer appears dimmed in the Printers folder.

===={ewc msdn cd, EWGraphic, x0aa 18 /a "psAA.bmp"}

#### *Using Briefcase for File Synchronization*

---

Portable computer owners who also have a desktop computer, or who are connected to a network, constantly work to keep the most up-to-date files on the computer they are currently using. Windows 95 Briefcase minimizes this task by keeping track of the relationships between files on two or more computers.

For example, a salesperson might need to collect data in certain files during a business trip. Before departure, the salesperson drags relevant files into Briefcase, and then adds new data to the files while on the road. On returning, the salesperson can update the original files on the desktop computer with the files in the Briefcase.

With Briefcase, you can:

n

Create a Briefcase folder

n

Add files to Briefcase



# n

Check the status of files in Briefcase and their related files

# n

Update related files, either individually or all at once

# n

Split related files to maintain them separately

Windows 95 provides a set of OLE interfaces that allow applications to bind reconciliation handlers to it, track the contents of Briefcase, and define the outcome of any reconciliation on a class-by-class basis. For example, when both the file in Briefcase and its synchronized copy outside have changed, Windows 95 calls the appropriate reconciliation handler to merge the two files. This could be handy when several users are simultaneously updating one large document.

Windows 95 automatically configures Briefcase and installs it on your Windows 95 desktop if you choose it during Custom Setup of Windows 95, or if you choose the Portable Setup Type. If you do not choose either of these Setup options, you can install Briefcase afterward in the Add/Remove Programs option in Control Panel.

#### [To install Briefcase during Windows 95 installation](#)

1. Choose Custom Setup Type. In the Select Components screen, click Communications, and then click the Change Option button.
2. In the Details dialog box, click Briefcase.

If you install Briefcase, it appears as an icon on your Windows 95 desktop. To run Briefcase, double-click its icon.

When the user updates files using Briefcase, Windows 95 automatically replaces unmodified files with modified files. If both files have changed, Windows 95 calls the appropriate application (if available) to merge the disparate files. Before you leave the office, you can copy files from your desktop to Briefcase, and then load Briefcase onto your portable computer.

#### [To update files using Briefcase and a floppy disk](#)

1. Insert a floppy disk in the computer you are using.
2. Copy to Briefcase any files or folders you want to work on.  
===={ewc msdn cd, EWGraphic, x0aa 19 /a "psAA.bmp"}
3. Move Briefcase to the floppy disk.
4. Take the floppy disk to a portable or other computer and work on the files in Briefcase.
5. When you return to the office, insert the floppy disk containing Briefcase in the computer with the original files.
6. Double-click the My Briefcase icon.  
===={ewc msdn cd, EWGraphic, x0aa 20 /a "psAA.bmp"}
7. Click the files you want to update and click the Briefcase menu. From the menu, click Update All or Update Selection.

---

Tip==== You can put Briefcase files on a hard disk of a second computer for faster editing by dragging the files from the floppy disk to the second computer's hard disk. When you are done editing the files on the desktop computer, choose Update All from Briefcase on the floppy disk. When you return to the original computer, choose update again to replace the unmodified files on this first computer.

---

Instead of using a floppy disk with Briefcase, you can use Direct Cable Connection to connect two computers running Windows 95, and then use Briefcase to synchronize their files. For example, you can connect your portable computer to your home or office computer with Direct Cable Connect and then update the desktop computer files to match the portable files.

For more information on Direct Cable Connection, see the earlier section "Direct Cable Connection" in this chapter.

### [To update files using Briefcase and two connected computers](#)

1. Copy to Briefcase any files or folders you want to work on.
2. Make changes to the files either in their original location or in Briefcase.
3. Connect the computers with Direct Cable Connection, and double-click My Briefcase.
4. Click the files you want to update.
5. On the Briefcase menu, click Update All or Update Selection.

---

Note—— You can also use Briefcase to synchronize files between a portable computer and a network if the portable has a network connection.

---

When you open the Briefcase folder, you can check the status of any file in Briefcase to find out if it has been synchronized with its original. You can also split files from their originals if you decide to maintain them separately.

### [To separate files inside Briefcase from files outside Briefcase](#)

1. In Briefcase, click the file you want to split.
  2. On the Briefcase menu, click Split.
- After you split a file, it is labeled Orphan and will not be updated.

### [To check the status of a file or folder in Briefcase](#)

1. In Briefcase, click the file or folder needing a status check.
2. On the File menu, click Properties.
3. Click the Update Status tab.

---

Tip—— To find the copy of the file that is outside Briefcase, click Find Original in the Update Status dialog box.

---

---

Note—— Briefcase will automatically update files when you dock your portable computer if you are using a Plug and Play BIOS docking station. For more information about docking your portable computer, see Chapter 19, “Devices.”

---

## Troubleshooting Dial-Up Networking

---

This section describes problems which you may encounter in using Dial-Up Networking and how to resolve them.

You can monitor any Dial-Up Networking session for possible problems by enabling the Record a Log File option. This produces a PPLOG.TXT file in the Windows directory, which you can reference to find out the cause of a problem. For more information, see “PPP Log File” earlier in this chapter.

You cannot access the Dial-Up Networking Server.

### [To set Dial-Up Networking Server to allow caller access options](#)

1. In the Dial-Up Networking folder, click the Connections menu.
2. Click the Dial-Up Server option, and then click Allow Caller Access, if this is not already selected.
3. View the User name list to ensure the user's name appears.

The User name list only appears if you have chosen user-level security for the dial-up server. The type of security is selected in the Network option in Control Panel.

### [To verify Dial-Up Server and compression options](#)

1. In the Dial-Up Networking Connections menu, click the Dial-Up Server.
2. Click the Server Type button and verify that the correct type of dial-up server is selected.
3. Check that Enable Software Compression is selected. Compression will occur only if the dial-up client and server have enabled it.

The modem is dialing but not connecting.

# n

Check the modem configuration; select a correct configuration if necessary.

n

Verify all parameters, such as access codes, area code, and country code.

n

Try choosing the driver for Generic Modem Drivers.

n

If using an external modem, check the cable and verify correct connection.

n

Check the COM port configuration in Device Manager.

For more information, see the troubleshooting section in Chapter 25, “Modems and Communications Tools.”

*Dial-Up Networking Server is not answering incoming calls.*

n

Disable Allow Caller Access and shut down the computer. Turn off the computer to reset the COM port. If the modem is external, turn off the modem. Turn the computer back on and reconfigure the Dial-Up Networking server, and then try again.

n

If these steps fail, disable Allow Caller Access and see if any modem software can manually answer the incoming call.

n

If using an external modem, check the cable and verify it is connected correctly.

n

If using an internal modem with a nonstandard IRQ selection, use Device Manager to check the IRQ setting for the COM port and change it, if necessary.

# n

On the user's system, try choosing the Generic Modem Drivers.

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```

## Chapter 29 The MS Network

This chapter describes how to install and sign up for The Microsoft Network. This chapter also briefly describes the features of this new online service from Microsoft.

### *The Microsoft Network: The Basics*

---

The Microsoft Network offers you access at any time to the rapidly expanding world of electronic information and communication. You can use The Microsoft Network to conduct business transactions, communicate with different people, groups, or organizations around the world, and find out information on subjects you're interested in — all from the Windows 95 desktop, if you have a modem and a phone line.

You can become a member of The Microsoft Network from within Windows 95 by clicking The Microsoft Network Signup icon, which is installed during Setup. After you set up your account, you can connect to The Microsoft Network by clicking its icon on the Windows 95 desktop.

At this writing, The Microsoft Network offers the following list of features. New features and services will be added regularly.

n

Electronic mail. Send and receive electronic mail to and from other

members of The Microsoft Network, or anyone with an electronic mailbox on the Internet.

n

Bulletin boards. Join in-depth discussions on a variety of topics, including

hardware or software from computer companies.



n

Chat rooms. Converse in real time with other members of The Microsoft

Network by sending and receiving messages. After you find a Chat room with a discussion that interests you, you can observe the conversation or send a comment for other members to see immediately.

n

File Libraries. Easily connect to file libraries to download graphics, applets,

product support information, and article archives to your hard disk.

n

The Internet. Connect to the Internet for electronic mail and “newsgroup”

bulletin boards. You can use Microsoft Exchange to send mail to other people on the Internet, and post and reply to messages in Internet newsgroups in the same way as you would on other BBS's. At this writing, Microsoft is working with Spyglass, Inc. and NCSA to integrate Mosaic software in The Microsoft Network. With Mosaic, members of The Microsoft Network will be able to access Internet World Wide Web sites. For more information, see Chapter 30, “Internet Access.”

n

Microsoft Information. Connect to Microsoft customer service to obtain

product information and technical support.



Information Services. Connect to information services that provide news,

sports, stock and weather reports, product and product support information, and special-interest group information.

The Microsoft Network offers the following benefits:

#### *Ease in startup.*

Connecting to The Microsoft Network is a feature of Windows 95. First you need a modem and phone line to connect to The Microsoft Network. With the Install New Modem wizard, it's easy to install and configure a modem. Then, all you have to do is choose to install The Microsoft Network before or after Windows 95 Setup, and then click the Signup for The Microsoft Network icon in the Accessories menu.

#### *Ease of use.*

The Microsoft Network is tightly integrated into Windows 95, both in terms of functionality and look. Because its shell is consistent with Windows 95, you will find it easy to navigate The Microsoft Network. You won't need to learn any new concepts or commands. For example, The Microsoft Network services can be browsed using the Windows Explorer or by clicking icons in windows in The Microsoft Network. You can create Windows 95 shortcuts to specific areas within The Microsoft Network and store those shortcuts as folders in directories. Actions such as downloading files are as simple as using drag and drop to copy the files. And you can open Microsoft Exchange within The Microsoft Network to send and receive mail.

#### *Multitasking*

The Microsoft Network takes advantage of multitasking and of the multithreaded design, provided in Windows 95. This means that several different tasks in The Microsoft Network tasks can run at the same time. As a result, while a file is downloading, you can browse, read electronic mail, participate in a chat room, or do anything else on The Microsoft Network.

#### *World Wide Access*

The Microsoft Network is available around the world. Local dial-up access will be available in over 40 countries, and The Microsoft Network application will be localized into many different languages. In the United States, close to 100 percent of Windows 95 users are within a local call to a network Point of Presence (POP) server; outside of the United States, between 60 percent and 100 percent of the

Windows 95 user population will be available by local phone call, depending on the country.

### *Issues for The Microsoft Network*

---

Before you install The Microsoft Network, you should decide the following issues.

n

Customizing Dial Helper. If you need to change the access number, set

Dialing Properties options, or Modem settings in the Calling Problem Dialog box. The Microsoft Network automatically chooses a local access number based on your telephone number, so you don't need to worry about incurring long-distance charges.

n

Payment Method Dialog.

—To be added.

n

Microsoft Network Password and User Name. Whether you want to invent

a nickname and a password to protect your identity and access to The Microsoft Network. You can use the same password as your network logon password, or create a different one. It is not possible to pass through an electronic mail name and password from the Windows 95 Registry.

### *Becoming a Member of The Microsoft Network*

---

Becoming a member of The Microsoft Network requires two easy steps:

# n

Choosing The Microsoft Network before or after Windows 95 Setup

# n

Clicking The Microsoft Network icon in the Accessories menu to start sign-

up

The Microsoft Network software is automatically installed if you choose the icon during Windows 95 installation.

The easiest way to install Microsoft Fax is to choose the Typical or Portable Setup Types during Windows 95 installation. You can also it after Windows 95 installation with the Add/Remove Programs option in Control Panel.

[To install The Microsoft Network Fax during Window 95 installation](#)

# n

Choose Typical or Portable Setup Types, and in the Select Components

screen, click The Microsoft Network.

[To become a member of The Microsoft Network](#)

1. In the Accessories menu, click the Sign Up For The Microsoft Network icon.

===={ewc msdncd, EWGraphic, x0ab 0 /a "psAB.bmp"}

2. In The Microsoft Network dialog box, click OK.

3. The next signup box presents the three steps for signing up with The Microsoft Network. Click each one and type the appropriate information.

—{ewc msdn cd, EWGraphic, x0ab 1 /a "psAB.bmp"}

4. In the user information sign-up box, type your name, address, and phone number.

—{ewc msdn cd, EWGraphic, x0ab 2 /a "psAB.bmp"}

5. In the billing information sign-up box, type

—To be added.

In Member Services on The Home Page, The Microsoft Network presents the rules and etiquette for participating in The Microsoft Network. Forum and chat hosts are responsible for monitoring the behavior of members while they are participating in BBS's or chat rooms. Forum hosts are responsible for administering specific services within The Microsoft Network. Chat hosts are responsible for controlling the behavior and participation rights of members in a live conversation in a chat room. For more details about chat hosts, see "Chat Rooms" later in this chapter.

If your company decides to become an Information Provider on The Microsoft Network, you will need to provide a forum host for your service area. Microsoft provides information about the responsibilities of a forum host with other information about becoming an Information Provider. For more information, see "Becoming an Information Provider" later in this chapter.

## Security

---

The Microsoft Network security service performs two basic functions: authentication and protection. Authentication positively identifies users and distinguishes between valid and invalid users. It grants or denies your request to log on and to use different areas of the service based on the rights you have been assigned by The Microsoft Network database. Protection means establishing and managing policies that govern what actions users may perform.

The security service meets the following goals:

n

Protects the confidentiality of data and the value of transactions in The

Microsoft Network

n

Meets United States government standards for export to any country where members reside

n

Supports multiple users simultaneously logging onto and off from The Microsoft Network

When you sign up for The Microsoft Network, you choose a user ID and a password. If you feel you need to protect your identification, you can choose a user ID that is different from your own name. The user ID must be unique to The Microsoft Network. After a membership is terminated, The Microsoft Network does not reissue that member's user ID for 12 months to prevent cases of mistaken identity.

The Microsoft Network maintains a Client Negation which is a list of users who have been denied access for reasons of bad credit, repeated violations of The Microsoft Network rules, and so on. When you sign up, The Microsoft Network accounts database verifies that you are not on this list before approving your user ID and password.

### *Navigating The Microsoft Network*

---

Browsing The Microsoft Network is as easy as browsing through a local area network in Windows 95, because you use the same navigational tools for both. To move from service to service within The Microsoft Network, you double-click icons or use Windows Explorer.

The primary way to enter The Microsoft Network is through The Home Page (described in the following section), which is the highest level of the content tree. The content tree is how The Microsoft Network structures the large body of information it presents to you. The content tree enables you to quickly find services within The Microsoft Network and, based on your membership privileges, to view, subscribe, or access specific information, applications, and services.

All the services and content provided by The Microsoft Network are stored in

distributed SQL databases in a Microsoft-owned data center. Initially, The Microsoft Network will have a single data center in the Seattle area, but plans are in place to provide several data centers around the world.

Windows Explorer and The Microsoft Network Directory Service map the database onto a hierarchical folder structure, which is the content tree. The content tree is organized so that broad categories of information are stored at the highest level, with folders at successive levels containing progressively more detailed information. The top folder in the content tree is called the Categories folder, and the contents of this folder will rarely, if ever, change.

Your main doorway into The Microsoft Network is the Home Page. This is what you see when you click the icon for The Microsoft Network. From The Home Page, you can choose the following services or tools:

n

On-Line Today. Tells you what new information has been added to the

service or what special events are occurring on The Microsoft Network on a daily basis. You can click on their corresponding icons to go directly to them.

n

Electronic Mail. Clicking this icon starts Microsoft Exchange, allowing you

to send mail to and receive mail from other members of The Microsoft Network, other members of your Windows 95 workgroup, and people on the Internet.

n

Favorite Places. You can move icons from your favorite bulletin boards

and chat rooms to this area. Clicking on the Favorite Places icon opens a Favorite Places folder where the icons are stored.

n

Categories. This folder contains all the icons for the different FORUMS

offered by The Microsoft Network, such as Arts and Entertainment, Sports, and so on. A forum is a collection of services that include bulletin boards, chat rooms, and others. Clicking on a forum icon opens a folder where you will see all the services that are part of the forum collected in one place, including:

n

Bulletin Boards to read and post messages

n

Chats to carry on live conversations

n

Kiosks to locate the subject matter of a forum, identify the forum

manager, and obtain the Go word, calendars, and other information.



n

File Libraries to download files

n

Member Services. This contains a folder with Help for The Microsoft

Network, plus your membership agreement, information about The Microsoft Network for new members, and other information.

You can navigate down The Microsoft Network content tree to any of the services offered in a forum in many different ways, including;

n

Double-clicking an icon

n

Right-clicking an icon to open the Windows Explorer menu (context menu), and clicking Open.

n

Double-clicking a shortcut in a Windows 95 directory, in an electronic mail message, or in a BBS in The Microsoft Network. For details, see “Shortcuts” later in this chapter.

n

Using the Go command. For details, see “Go Commands” later in this chapter.

n

Double-clicking an icon in the list of results of a topic search. For details, see “Searching” later in this chapter.

n

Double-clicking an icon in Favorite Places. For details, see “Shortcuts” later in this chapter.

Windows Explorer is a powerful way to navigate The Microsoft Network content tree, and it will probably be preferred by experienced users. The forum window which contains folders is the same as any Windows Explorer window in Windows 95. If you right-click any of the folders or icons in the window, the Windows Explorer context

menu pops up.

[To open a folder or service with Windows Explorer](#)

n

Right-click the icon, and then click Explore from the context menu.

[Properties](#)

In The Microsoft Network, the Windows Explorer Properties option defines a set of properties that apply to all services, such as Name, Category, Rating, and Size. An Information Provider for The Microsoft Network can decide which properties can function as KEYWORDS. Keywords are a means of tagging content, which allows you to search for information within the service. For example, the forum host could decide that People was a keyword within the Arts and Entertainment forum. You could then search for specific people in a service.

[To view the properties for each service](#)

n

Right-click the icon for a service, and then click Properties.

[Shortcuts](#)

Shortcuts immediately take you to specific areas within The Microsoft Network. They are a special version of a Windows 95 OLE object and look like any other Windows 95 shortcut. You can drag and drop the shortcut to any Windows 95 folder, a word processing file, a Bulletin Board message, or any other OLE-compatible application. Double-clicking the shortcut will launch The Microsoft Network, log you on, and take you to the service that your shortcut referred to.

For information on creating shortcuts in Windows 95, see INTRODUCING MICROSOFT WINDOWS 95.

### [To add a shortcut to Favorite Places](#)

n

From The Microsoft Network toolbar, click an icon, and then click the “Add to Favorite Places” button.

Or

Right click an icon, and click Add to Favorite Places.

You can quickly navigate to a specific service, if you know its Go word, a unique identifier of a service in The Microsoft Network. Go words are defined in two places: in a Kiosk or in the property sheet for a service.

### [To determine a service's Go word](#)

1. Right-click an icon for a specific service, and from the Explorer menu, click Properties.
2. In the Properties dialog box for that service, click the General tab. The Go word appears at the top of the General property sheet.

### [To navigate to a service using a Go command](#)

1. From the File menu in the window for any service, click the Go To option.

{ewc msdn cd, EWGraphic, x0ab 3 /a "psAB.bmp"}

2. In the Go To Service dialog box, type the Go word, and then click OK.

### [Using Bulletin Boards \(BBS's\)](#)

---

A bulletin board (BBS) provides a place to exchange messages. Most bulletin boards are public, which means any member of The Microsoft Network can read them. Each BBS has a topic, such as scuba diving, computer graphics, or current events. You post messages about the topics to:

n

Ask or answer questions

n

Offer opinions, ideas, or suggestions

n

Share facts and exchange information

n

Distribute files for other people to copy to their computers

Individual bulletin boards are also called NEWSGROUPS. Newsgroups are Microsoft Exchange public folders, which contain THREADS. A thread is a collection of messages organized chronologically and hierarchically to reflect the flow of the discussion. A MESSAGE is an individual posting to the bulletin board (with or without attachments).

Messages appear in a BBS in three possible views:

n

List View lists all messages similarly to how mail messages are presented in Microsoft Exchange.

n

Conversation View lists all original messages and their replies and is organized according to a conversation thread, as described earlier. To read replies, click the + icon; to read individual messages, double-click a message.

n

Attachment View lists only those messages with attached files. This is an effective way of seeing information that pertains to files rather than messages.

[To navigate through The Microsoft Network content tree to a BBS](#)

1. On The Home Page, click Categories.
2. In the Categories window, choose a topic by double-clicking its icon.
3. Continue to double-click icons to select subcategories until you are in the forum containing the BBS that interests you.
4. In the topic's windows, double-click the BBS folder to see current messages.

[To change the view of messages](#)

n

In the BBS, click the View menu, and then click List, Conversation, or Attachment.

#### [To sort messages within a BBS](#)

n

In the BBS, click the Subject, Author, or Date buttons beneath the toolbar to sort accordingly.

File libraries are read-only BBS's. This means that only an information provider who owns the BBS can post messages and files there. You can read and download files in file libraries and files attached to messages in file libraries in the same way you would in a standard BBS. File attachments can be graphics, software, articles, product support information, and more.

#### [Downloading](#)

Before you download a file, you can view its size, price, and how much time it will take to download. When you download it, you specify the file's destination on the hard disk in the File Transfer Manager.

The File Transfer Manager mediates file movement between the server and the client. It allows you to view and control how the file downloads. The File Transfer Manager is active whenever a file is placed in the transfer queue by an application such as a BBS. The File Transfer Manager can transfer files in the background while you continue to browse through The Microsoft Network.

#### [To download an attached file](#)

1. Double-click the file's icon which is attached to a message in the BBS.

2. In the Properties dialog box for that message, examine the file's size, download time, price, and whether the forum host has approved it, and then click the Queue for Download button.

==={ewc msdn cd, EWGraphic, x0ab 4 /a "psAB.bmp"}

3. In Windows Explorer, click the folder on your hard disk where you want the file to be saved, and then click Save to download the file.

When files are queued, File Transfer Manager checks them for error conditions, such as not enough disk space or invalid destination, and provides a corresponding error message. File Transfer Manager then provides an opportunity to fix an error before the file is transferred.

In the File Transfer Panel, the percentage of file downloaded, the time remaining, and the file's destination are displayed. You can download as many files as you want.

==={ewc msdn cd, EWGraphic, x0ab 5 /a "psAB.bmp"}

Some files may be attached using PKZIP, or another file compression program. The File Transfer Manager automatically determines if a file is compressed and, if necessary, automatically decompresses it if the "Automatically unpack compressed files" option is turned on.

#### [To check whether automatic decompression is enabled](#)

1. In File Transfer Manager, click the Setting menu, and then click Preferences.

2. In the Preference Setting dialog box, make sure the "Automatically unpack compressed files" is turned on.

A Chat room enables you to carry on a live conversation with other Microsoft Network members on your computer. A chat session on The Microsoft Network is similar to a conference call. However, instead of speaking out loud, you type your comments and The Microsoft Network displays them on screen for other people to read. To participate in a chat room, you should know the following:

# n

Each member in the chat session is either a participant or spectator

according to how the host defines the participation rules. A chat session may



have one or more hosts. To become a host you have to be one of the designated owners of the chat.

n

A host can control the participation rights of members in a conversation.

The host uses the Host Control dialog box to change the status of a member from a participant to a spectator and vice versa.

n

There are several types of conversations, from one-on-one conversations

to large “talk shows” in which there are a few participants and numerous spectators.

n

To join and send messages in a chat room, you must have the necessary

security privileges the conversation must not have exceeded its capacity, that is, the maximum number of members allowed in the conversation.

n

Before you contribute to the conversation, you can observe it for awhile to

see if you’d like to join in. When you’re ready and if you have participant status, you can send a question, answer, or comment to the other members.

# n

You can view information about a member in the Member Settings option under the View menu, if the member completed a member profile in Microsoft Exchange. For details, see “Using Microsoft Exchange with The Microsoft Network” later in this chapter.

# n

You can download a conversation history, which is a record of all messages sent to the conversation from the time a participant joined it.

### [To join a chat room](#)

1. In a forum’s window, double-click the Chat icon.

— The Microsoft Network informs other participants that you have joined the conversation.

2. Type a message in the lower box and then click Send.

— Pressing the ENTER key also sends text and, therefore, cannot be used within a message. However, you can press the CTRL + ENTER key to insert a return in your message.

3. To exit, click the File menu, and then click Exit.

### *Using Microsoft Exchange with The Microsoft Network*

---

The Microsoft Network has been integrated with the Microsoft Exchange client, the universal information client included with Windows 95. All electronic mail messages sent to or from other members of The Microsoft Network appear in the same mailbox as messages from other electronic mail (such as LAN mail) or information services (such as the Internet).

All features of Microsoft Exchange are available to you when you run The Microsoft Network. Since both Microsoft Exchange and The Microsoft Network support binary file transfers and OLE, you can attach spreadsheets, graphics files, word processing

documents, or almost any other kind of electronic file to a mail message.

Before you send and receive mail in The Microsoft Network, you must complete the following steps:

n

Install and configure Microsoft Exchange in Windows 95

n

Connect to The Microsoft Network

For more information about setting up Microsoft Exchange, see Chapter 26, “Electronic Mail and Microsoft Exchange.”

[To send or receive mail within The Microsoft Network](#)

n

Click Electronic Mail on The Home Page to open Microsoft Exchange.

---

Note — When you sign up for The Microsoft Network, your primary Microsoft Exchange Profile will be updated so that The Microsoft Network is included as both an information service and an address book provider. You can send and receive mail on The Microsoft Network mail without further configuring Microsoft Exchange or The Microsoft Network.

---

[To send and receive mail to and from the Internet](#)

n

To be added.

[To choose to download mail from The Microsoft Network at startup of Microsoft Exchange](#)

1. In Control Panel, click the Microsoft Exchange Profile.
2. In the Microsoft Exchange Profile box, click the profile to which you want to add The Microsoft Network, and then click Properties.
3. In the Properties dialog box for that profile, click The Microsoft Network, and then click Properties.

===={ewc msdncd, EWGraphic, x0ab 6 /a "psAB.bmp"}

4. In the Settings for Microsoft Exchange dialog box, click Download at Startup.

===={ewc msdncd, EWGraphic, x0ab 7 /a "psAB.bmp"}

Now, every time you run Microsoft Exchange, The Microsoft Network connection box will be displayed. You can cancel the connection and choose to download your mail from The Microsoft Network at a later time from within Windows 95 or from within The Microsoft Network.

[To download mail from The Microsoft Network after Microsoft Exchange startup](#)

1. In Microsoft Exchange, click the Tools menu, and then click the Download Mail Now option.
2. In The Microsoft Network connection box, click Connect to retrieve your mail.

The Microsoft Network maintains an ADDRESS BOOK on The Microsoft Network servers that include the name and electronic mail address of each member of The Microsoft Network. You can access the address book in Microsoft Exchange, or in the Member Services section of The Microsoft Network for purposes of sending mail messages. The Microsoft Network address book is only available when you are connected to The Microsoft Network because it is too large to copy onto a local computer.

The Microsoft Network provides separate address books for each major region in the United States, Europe, Australia, and other countries. All members can access all of these address books. All address books appear in the drop-down list box of address

books in the Microsoft Exchange Address Book window.

For more information about using address books in Microsoft Exchange, see Chapter 26, “Electronic Mail and Microsoft Exchange.”

#### [To find out member information](#)

1. In Microsoft Exchange, open The Microsoft Network address book, and then double-click a member's name.
2. In the User Information dialog box, view information about the member, such as such as city, birth date, comments, and so on.

#### *Billing*

---

To be added.

#### *Becoming an Information Provider*

---

The Microsoft Network provides a way for other companies to become Information Providers on The Microsoft Network. Becoming an Information Provider allows companies to sell products and services in a worldwide electronic marketplace, which is accessible from the Windows 95 desktop.

The Microsoft Network business model for participating in The Microsoft Network is based entirely on transactions. Information Providers aren't limited in the ways in which they realize revenues for their services. Variable revenue and pricing models such as subscriptions, online transactions, advertising subsidies, and ticketed events are available at the provider's discretion. Providers retain the majority of the revenues that their content and service generate. Transactions can be:

n

Electronic files that can be downloaded

n

Chat rooms with cover charges

n

Forums with cover charges

n

Monthly subscription fees for certain areas of a forum

n

Sales of advertising and sponsorships

To obtain information about becoming an Information Provider, call (800) 4MSNFAX (or (800) 467-6329) and you will receive by fax a summary of The Microsoft Network, a guide to formatting your business proposal, and a nondisclosure agreement. If you would like this information mailed to you, please write:

The Microsoft Network  
Department MSN19  
One Microsoft Way  
Redmond, WA 98052-6399

{ewl msdncd.dll, ewcright, /c"Microsoft"}

## Chapter 30 Internet Access

This chapter describes how to configure Windows 95 to access the Internet, and also offers some basic tips for browsing and accessing information on the Internet.

### *Internet Access: The Basics*

---

The latest figures indicate that over 20 million people are now connected to the Internet, a worldwide collection of networks and gateways linked, in most cases, with the TCP/IP suite of protocols. The Internet allows a broad spectrum of business people, academics, government users, and others to exchange ideas and information in a new way. Windows 95 offers you three ways to connect to the Internet:

n

By signing up for The Microsoft Network online service from the Windows

95 desktop, you can send and receive mail on the Internet and access Internet newsgroups. For more information, see Chapter 29, "The Microsoft Network."

n

By installing TCP/IP and Dial-Up Networking, both of which are provided

with Windows 95, you can connect to Internet access providers. You connect to an access provider by using Dial-Up Networking to dial into their UNIX PPP or UNIX SLIP servers, which are directly connected to the Internet.

n

By installing TCP/IP and a network adapter, you can connect to a

company's network server which is directly connected to the Internet.

Windows 95 supports all the protocols you need to connect to an Internet access provider, including a 32-bit implementation of TCP/IP, and Point-to-Point Protocol (PPP) or Serial Line Internet Protocol (SLIP). In addition, Windows 95 provides FTP and Gopher clients, which can be used to browse the Internet and download files from Internet servers.

```
{ewc msdn cd, EWGraphic, x0ac 0 /a "psAC.bmp"}
```

To connect a computer running Windows 95 to an Internet access provider, you need:

n A modem, if you dial into the Internet; or a network adapter, if you have a direct network connection to the Internet.

n TCP/IP installed, configured, and bound to the Microsoft Dial-Up Adapter or a network adapter.

n A Microsoft Dial-Up Networking connection to an Internet access provider.

n An Internet account with an Internet access provider. This is provided automatically if your company has a direct connection to the Internet.



Before you connect, you need to decide what kinds of information you want to provide or exchange on the Internet. The most common tools for finding and exchanging information and the most common sources of information are described briefly in the following and in more detail in “Navigating the Internet” later in this chapter.

### *Sending and receiving mail.*

You can send and receive mail to other individuals on the Internet or join an Internet mailing list. There are servers around the world that maintain and manage Internet mailing list communities. To join a mailing list, you send an electronic mail message to the list server.

You can use Windows 95 Internet Mail service in Microsoft Exchange to send and receive mail messages on the Internet. Most servers that provide access to the Internet run a combination of Simple Mail Transport Protocol (SMTP), or Post Office Protocol version 3 (POP3). SMTP is used to send Internet messages from Internet Mail service to the final destination. POP3 is used to retrieve messages sent to you from a POP3 account mailbox. Internet Mail Service allows you to connect to both types of servers.

Furthermore, Internet Mail service is MIME-compliant, which means you can attach images, video, sounds and other types of files to Internet mail messages, vastly improving the text-only mail typically sent on the Internet. For more information about the Internet Mail service, see Chapter 26, “Electronic Mail and Microsoft Exchange.”

### *USENET Newsgroups.*

Newsgroups, maintained on NNTP servers around the world, share information and commentary on defined topics. Each newsgroup is a bulletin board where members post and reply to messages. To connect to a newsgroup, you need an NNTP reader and access to an NNTP server.

### *Searching the Internet.*

A variety of tools have been developed to help you find the information you need on the Internet, including:

n

World Wide Web (WWW), a network of servers that uses hypertext links to find and access files.

n

FTP, a file-sharing protocol that allows you to find and connect to servers, and then transfer text and binary files between a host computer and a computer.

n

Archie is a database and a system for locating files on FTP servers.  
FTP sites are indexed by title and keyword and Archie searches these indexes for the file you want.

n

Gopher, a search tool that presents information in a hierarchical menu system similar to a table of contents.

n

Veronica searches for text that appears in Gopher menus.

n

WAIS (Wide-Area Information Service), software that indexes large text

files, documents, and periodicals. You can search WAIS indexes for most of the information you want.

### *Downloading Information.*

After you locate information, you can download it to a computer using FTP (file transfer protocol), which allows you to copy files from a host to a remote server.

### *Publishing Information on the Internet.*

You can provide information to the Internet by publishing it using either Gopher or World Wide Web. Gopher servers publish only text; whereas WWW servers publish text, graphics, and sound.

For more information about accessing and using the Internet, the following books are recommended:

n

Baczewski, P.; Bang, S.; Barnett, J. THE INTERNET UNLEASHED.

Indianapolis, IN: Sams Publishing, 1994.

n

Braun, E. THE INTERNET DIRECTORY. New York, NY: Fawcett

Columbine, 1994.

n

Dougherty, D.; Koman, R. THE MOSAIC HANDBOOK: FOR MICROSOFT

WINDOWS. Sebastapol, CA: O'Reilly, 1994.

n

Falk, B. THE INTERNET ROADMAP. Alameda, CA: SYBEC Inc., 1994.

n

Gilster, P. THE INTERNET NAVIGATOR. New York, NY: Wiley, 1994.

n

Hahn, H., Stout, R. THE INTERNET COMPLETE REFERENCE. Berkeley, CA. Osborne McGraw-Hill, 1994.

n

Hahn, H.; Stout, R. THE INTERNET YELLOW PAGES. Berkeley, CA. Osborne McGraw-Hill, 1994.

n

Kehoe, B. ZEN AND THE ART OF THE INTERNET: A BEGINNER'S GUIDE. Englewood Cliffs, NJ: PTR Prentice Hall, 1994.

n

Krol, E. THE WHOLE INTERNET USER'S GUIDE & CATALOG.

Sebastapol, CA: O'Reilly & Associates, 1992.

n

Lynch, D.; Rose, M. INTERNET SYSTEM HANDBOOK. Reading, MA:

Addison-Wesley, 1993.

n

Notess, G. INTERNET ACCESS PROVIDERS: AN INTERNATIONAL

RESOURCE DIRECTORY. Westport, CT: Mecklermedia, 1994.

n

Randall, N. THE WORLD WIDE WEB UNLEASHED. Indianapolis, IN:

Sams Publishing, 1994.

n

Smith, R.; Gibbs, M. NAVIGATING THE INTERNET. Carmel, IN: Sams

Publishing, 1993.

n

Tennant, R.; Ober, J.; Lipow, A. CROSSING THE INTERNET

THRESHOLD: AN INSTRUCTIONAL HANDBOOK. Berkeley, CA: Library Solutions Press, 1993.

n

Tolhurst, W., Pike, M.; Blanton, K. USING THE INTERNET. Indianapolis,

IN: Que, 1994.

### *Connecting to the Internet*

---

Connecting a computer running Windows 95 to the Internet consists of the following steps:

n

Installing and configuring a modem.

n

Obtaining an Internet PPP or SLIP account from an access provider. PPP

is a newer standard and offers faster authentication.

n

Obtaining account information (such as the user name and password) from the access provider; this is needed to connect to their server.

n

Installing TCP/IP in the Network option in Control Panel.

n

Typing the account information obtained from the access provider information into the TCP/IP property sheets.

n

Installing Dial-Up Networking and defining a Dial-Up Networking connection to the Internet, or installing a network adapter and defining an IP address in the network adapter's TCP/IP property sheets.

n

Connecting to the Internet.

# n

Browsing the Internet with FTP, Gopher, Mosaic, or another utility.

---

Note — The files that provide support for SLIP in Windows 95 can be found on the Windows 95 compact disc in the ADMIN\APPTOOLS\SLIP directory. You can install them with the Add/Remove Programs option in Control Panel. For more information, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

---

Windows 95 supports a wide variety of modems for dial-in access. You do not need to perform any more steps to configure a modem to connect to the Internet than you do to make any other dial-in connection. For information about installing and configuring modems, see Chapter 25, “Modems and Communications Tools.” Windows 95 automatically assigns a port name to a modem when you install one with the Modems option in Control Panel. For more information about configuring communications ports, see Chapter 19, “Devices.”

Most users connect to the Internet by dialing into an Internet access provider's server that is directly connected to the Internet. An Internet access provider is a company or institution that provides access to the Internet for a fee. The list of providers is long and growing.

According to the Internet Network Information Center (InterNIC), there are over 160 commercial Internet access providers around the country. Access providers offer a range of services and charge for them in a variety of ways.

The best way to find an access provider is on the Internet or through an online service such as America Online® or CompuServe®. You can obtain a list of access providers from:



n

InterNIC, by using FTP to access the [is.internet.net](http://is.internet.net) server. On the server,

the list is in the following document:

[/infoguide/getting--connected/united-states](#) (the INTERNIC LONG file)

n

PDIAL list, by sending electronic mail to [info\\_deli\\_server@netcom.com](mailto:info_deli_server@netcom.com);

n

America Online or CompuServe PCWorld forums.

In deciding which access provider to use, you should ask the following questions:

n

Does the provider offer full Internet access?

n

Does the provider offer technical support?

n

What kind of connection speeds does the provider support?

n

Does the provider have adequate phone lines and a large enough pipe to provide good response time?

n

What range of services, such as mail, does the provider offer, and at what charge?

When you've chosen a provider, obtain the following information from the provider when you establish a PPP or a SLIP account. You need this information in order to configure Windows 95 to access the Internet:

n

Access phone number, preferably local

n Logon name

n Logon password

n If electronic mail is part of your connection services, your host (computer) name (for example, joellen), and domain (access provider domain) name (for example, @microsoft.com)

n Domain Name System (DNS) server and IP address

If your access provider uses a dynamic host configuration protocol (DHCP) server, it most likely assigns you an IP address and subnet mask each time you connect to the Internet. If your access provider does not have a DHCP server, it probably gives you:

n

Assigned TCP/IP address

n

IP subnet mask

n

Gateway IP address

More information is provided about these settings in the following sections and in Chapter 12, “Network Technical Discussion.”

Connecting the millions of computer networks on the Internet would not be possible without a standard set of protocols. Each Internet standard is described in a document called a request for comment (RFC). TCP/IP (Transmission Control Protocol/Internet Protocol) is the standard used on the Internet because it combines a number of different protocols which make it possible to communicate across interconnected networks which have diverse hardware and operating systems.

To connect to the Internet, you must install TCP/IP. Windows 95 will automatically allow (bind) TCP/IP to work on your network adapter or Microsoft Dial-Up Adapter. You can install TCP/IP when you run Custom Setup of Windows 95, or if you run a different Setup Type, when you click the Network option in Control Panel.

#### [To install TCP/IP](#)

1. In Control Panel, click the Network icon, and then click the Add button.

2. In the Select Network Component dialog box, double-click Protocol.
3. In the Select Network Protocol dialog box, click Microsoft from the manufacturers list and Microsoft TCP/IP from the network protocol list, and then click OK.

*To verify that TCP/IP is bound to the Microsoft Dial-Up Adapter or a network adapter*

1. In the Network option in Control Panel, click the Configuration tab, and then double-click either the installed network adapter or the Microsoft Dial-Up Adapter.
2. In the Properties for Microsoft Dial-Up Adapter dialog box, click the Bindings tab.
3. In the Bindings property sheet, make sure that the Microsoft TCP/IP protocol is checked. If not, click the related check box.

When you install Dial-Up Networking or another network adapter, Windows 95 automatically binds TCP/IP to the adapters if it has been previously installed. If your computer has multiple network adapters, there will be an entry for TCP/IP for each network adapter. You must configure each adapter with its own TCP/IP settings.

For more information about installing and configuring TCP/IP, see Chapter 12, "Network Technical Discussion."

The Internet uses the Domain Name System (DNS) to translate IP addresses into domain names that are easier to remember. DNS is a distributed database that maps domain names to IP addresses as specified by network administrators. The DNS organizes the names of hosts in a hierarchical fashion, similar to a file system. For more information, see Chapter 12, "Network Technical Discussion."

Before you can use TCP/IP to connect to the Internet, you need to configure a DNS server IP address, IP Address and subnet mask, and Gateway IP address in the TCP/IP property sheets in the Network option in Control panel. You define these values differently based on whether your site has a Dynamic Host Configuration Protocol (DHCP) server. A DHCP server can dynamically assign you an IP address each time you connect to the Internet; consequently, if you have a DHCP server, you don't have to specify one in the TCP/IP property sheets. If your Internet access provider doesn't have a DHCP server, the provider will assign you a DNS value, IP address, and subnet mask to type in the TCP/IP property sheets.

For more information about DNS and WINS name resolution, see Chapter 12, "Network Technical Discussion."


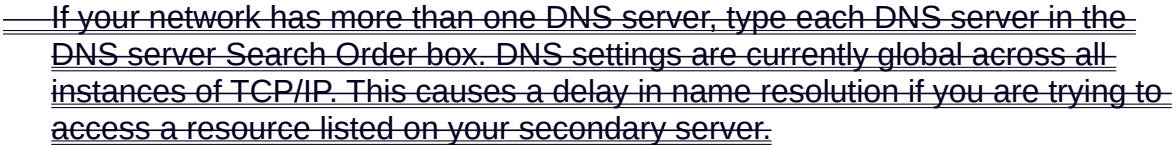
---

**Note**—— The following procedures assume that your computer has Microsoft TCP/IP installed as a network protocol. If your site uses another vendor's version of

TCP/IP, you must configure the protocol as recommended by the protocol vendor.

---

[To set the DNS IP address if your site does not have a DHCP server](#)

1. In the Network option in Control Panel, double-click Microsoft TCP/IP in the network component list.
2. In the Properties for Microsoft TCP/IP dialog box, click the DNS Configuration tab.  

3. Click the Enable DNS option, and then type your host name and domain name in the available spaces. These names identify you on the Internet, for example, joellen @microsoft.com.
4. If your site has a direct Internet connection, then specify the address of the DNS server on your local area network.  

5. Type DNS TCP/IP addresses in the DNS server Search Order box, and click the Add button after typing each value. The first server listed is the first one searched.


TCP/IP relies on three pieces of information-IP address, subnet mask, and default gateway (IP routers) to receive and deliver data packets between hosts. You provide this information when you configure TCP/IP in the Network option in Control Panel.

---

Important — Because IP addresses identify nodes on an interconnected network, each host on the internetwork must be assigned a unique IP address, valid for its particular network.

---

[To define your IP address if your site does not have a DHCP server](#)

1. In the Properties for Microsoft TCP/IP dialog, click the IP Address tab, and then click the Specify An IP Address option.  

2. Type your IP address first and your subnet mask, which should be provided automatically after you type your IP address, and then click OK.

If you have a DHCP server, you will be assigned an IP address each time you dial in. To do this, you must configure Windows 95 to obtain an IP address from the DHCP server. Selecting this option automatically sets your IP address to 0.0.0.0, which tells your access provider to dynamically assign you an IP address when you dial in.

[To enable a DHCP server to dynamically assign you an IP address](#)

1. In the Properties for Microsoft TCP/IP dialog box, click the IP Address tab.
2. In the IP Address dialog box, click the Obtain IP address from a DHCP server option, and then click OK.

For more information about assigning DNS and IP addresses, see “Technical Notes for IP Addresses on TCP/IP Networks” later in this chapter and Chapter 12 “Network Technical Discussion.”

Now that you have installed and configured TCP/IP, you need to define a dial-up connection to an Internet access provider in Dial-Up Networking. You can install Dial-Up Networking during Custom Setup of Windows 95, or if you use a different Setup Type, when you click the Add/Remove Programs option in Control Panel.

You define the Dial-Up Networking connection depending on the kind of Internet server to which you are connecting. To connect through a Windows NT RAS server or a UNIX® server that supports the Password Authentication Protocol (PAP) or the Challenge Handshake Authentication Protocol (CHAP), all you have to do is click the appropriate Dial-Up Networking connection icon and type your password in the logon dialog box. For more information about Dial-Up Networking, PAP, and CHAP, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

If, however, you connect to a UNIX system using a terminal logon, or through a remote access server that does not support PAP or CHAP, you need to further configure your Dial-Up Networking connection depending on whether you are connecting to a UNIX PPP server, or a UNIX SLIP server as described in the following procedures.

---

**Note**—— The files that provide support for SLIP in Windows 95 can be found on the Windows 95 compact disc in the ADMIN\APPTOOLS\SLIP directory. After you install it, SLIP will appear as an option in the Server Types dialog box in Dial-Up Networking. For more information, see Chapter 28, “Dial-Up Networking and Mobile Computing.”

---

[Connecting to a UNIX PPP Server](#)

A UNIX PPP server may require that you perform a terminal logon before you start a PPP session. If this is the case, you need to specify in Dial-Up Networking that a terminal window should be displayed after dialing.

In addition, the UNIX PPP server might not support the Password Authentication Protocol (PAP) or the Challenge-Handshake Authentication Protocol (CHAP). In Dial-Up Networking, you can require encrypted password options in place of PAP or CHAP by turning off the logon to the network.

#### [To create a terminal logon after dialing](#)

1. In Dial-Up Networking, right-click the connection icon for Internet, and click Properties.
2. In the Properties dialog box, click the Configure button, and then click the Options tab.

===={ewc msdncd, EWGraphic, x0ac 3 /a "psAC.bmp"}

3. In the Options dialog box, click the "Bring Up Terminal Window After Dialing" check box, and then click OK.

#### [To require encrypted passwords](#)

1. In Dial-Up Networking, right-click the connection icon for Internet, and then click Properties.
2. In the Properties dialog box, click the Server Types button.

===={ewc msdncd, EWGraphic, x0ac 4 /a "psAC.bmp"}

3. In the Server Types dialog box, click Require Encrypted Password.

You are now ready to connect to an Internet access provider. Double-click the Dial-Up Networking connection you created for the Internet, type your password in the space provided, and click the Connect button.

---

Note—— Windows 95 does not provide any scripting mechanisms to automate the terminal window logon process.

---

#### [Using UNIX SLIP](#)

Serial Line Internet Protocol (SLIP) is an older remote access standard typically used by UNIX remote access servers. Windows 95 Dial-Up Networking clients support SLIP and can connect to any remote access server using the SLIP standard. However, SLIP is only available on the Windows 95 compact disc. After you install SLIP, you can connect a computer running Windows 95 to the large installed base of UNIX servers. For information on installing SLIP, see Chapter 28 "Dial-Up



## Networking and Mobile Computing.”

There are two types of SLIP accounts, uncompressed SLIP (SLIP) and compressed SLIP (CSLIP). If you have an uncompressed SLIP account, you need to change an option for the Dial-Up Adapter.

### *To connect to an uncompressed SLIP account*

1. In the Network option in Control Panel, click Dial-Up Adapter, and then click the Advanced tab.
2. Click the Use IP Header Compression check box, and then change the Value field to Not.
3. Shut down and restart Windows 95 for the change to take effect.

Compressed SLIP accounts should be set to Yes, which is the default setting. If your provider autodetects whether you are using uncompressed or compressed SLIP, then the provider should use whatever SLIP account you have set.

---

Note — If you are having trouble running TCP/IP applications after connection, you might need to change the IP header compression setting.

---

If you are using the SLIP protocol to connect to a computer that is not running Windows NT, you need to configure your Dial-Up Networking Internet connection to bring up a terminal window after dialing. Because SLIP does not have the capability to negotiate your TCP/IP address, you must first log onto the server that connects you to the Internet. You do this in the terminal logon window in which you type your user name and password.

### *To connect to UNIX SLIP server*

1. In Dial-Up Networking, specify that you want to create a terminal logon after dialing as described in the earlier procedure.
2. In the Dial-Up Networking connection's General property sheet, click the Server Types button.
3. In the Server Types dialog box, click SLIP UNIX Connection, and then click OK.  
— You can also click the Log On to Network check box to clear this option, because most UNIX SLIP servers only allow logon using a terminal session. Notice that the only protocol allowed is TCP/IP.
4. Double click the Dial-Up Networking connection and type your password in the password space provided, and then click Connect.
5. After the modem establishes a connection, a terminal window appears for you to log onto the SLIP server and receive your TCP/IP address. Press F7 to continue.

6. After the SLIP server has assigned your TCP/IP address, another dialog box appears. Type the address and click OK to connect.

---

Tip — Using an Internet access provider by way of remote access is a fairly inexpensive way to reach the Internet, but its effectiveness is limited by the speed of the connection and the modem. For a good modem and a normal phone line, this speed tends to be roughly 14.4K baud.

---

This section provides details about IP addresses and subnet masks.

Every host interface, or node, on a TCP/IP network is identified by a unique IP address. This address is used to identify a host on a network; it also specifies routing information in an internetwork. The IP ADDRESS identifies a computer as a 32-bit address that is unique across a TCP/IP network. An address is usually represented in dotted decimal notation, which depicts each octet (eight bits, or one byte) of an IP address as its decimal value and separates each octet with a period. An IP address looks like this:

102.54.94.97

### [Network ID and Host ID](#)

Although an IP address is a single value, it contains two pieces of information: the network ID and the host (or system) ID for your computer.

n

The NETWORK ID identifies a group of computers and other devices that

are all located on the same logical network, which are separated or interconnected by routers. In internetworks (networks formed by a collection of local area networks), there is a unique network ID for each network.

# n

The HOST ID identifies your computer within a particular network ID. (A

host is any device that is attached to the network and uses TCP/IP.)

Networks that connect to the public Internet must obtain an official network ID from the InterNIC to guarantee IP network ID uniqueness. The InterNIC can be contacted by electronic mail at [info@internic.net](mailto:info@internic.net) (for the United States, ((800) 444-4345 or, for Canada and overseas, (619) 455-4600). Internet registration requests can be sent to [hostmaster@internic.net](mailto:hostmaster@internic.net). You can also use FTP to connect to [is.internic.net](ftp://is.internic.net), then log on as *anonymous*, and change to the /INFOSOURCE/FAQ directory.

After receiving a network ID, the local network administrator must assign unique host IDs for computers within the local network. Although private networks not connected to the Internet can choose to use their own network identifiers, obtaining a valid network ID from InterNIC allows a private network to connect to the Internet in the future without reassigning addresses.

The Internet community has defined address CLASSES to accommodate networks of varying sizes. Each network class can be discerned from the first octet of its IP address. The following table summarizes the relationship between the first octet of a given address and its network ID and host ID fields. It also identifies the total number of network IDs and host IDs for each address class that participates in the Internet addressing scheme. This sample uses w.x.y.z to designate the bytes of the IP address.

## IP Address Classes

$$\frac{1}{2}$$

A 1- w x.y 12 16,  
12 .z 6 77  
6 7,2  
14

B 12 w. y.z 16 65,  
8— x ,3 53  
19 84 4  
1

|      |      |       |
|------|------|-------|
| C 19 | w. z | 2, 25 |
| 2-   | x.y  | 09 4  |
| 22   |      | 7,    |
| 3    |      | 15    |
|      |      | 1     |

- 
- 1 Inclusive range for the first octet in the IP address.
  - 2 The address 127 is reserved for loopback testing and interprocess communication on the local computer; it is not a valid network address. Addresses 224 and above are reserved for special protocols (IGMP multicast and others), and cannot be used as host addresses.
- 

A network host uses the network ID and host ID to determine which packets it should receive or ignore and to determine the scope of its transmissions (only nodes with the same network ID accept each other's IP-level broadcasts).

Because the sender's IP address is included in every outgoing IP packet, it is useful for the receiving computer to derive the originating network ID and host ID from the IP address field. This is done by using subnet masks, as described in the following section.

### [Subnet Masks](#)

Subnet masks are 32-bit values that allow the recipient of IP packets to distinguish the network ID portion of the IP address from the host ID. Similar to an IP address, the value of a subnet mask is frequently represented in dotted decimal notation. Subnet masks are determined by assigning 1s to bits that belong to the network ID and 0s to bits that belong to the host ID. When the bits are in place, the 32-bit value is converted to dotted decimal notation, as shown in the following table.

#### Default Subnet Masks for Standard IP Address Classes

---

|    |          |      |
|----|----------|------|
| C  | 11111111 | 255. |
| a  | 1        | 0.0. |
| s- | 000000   | 0    |
| A  | 00       |      |
|    | 000000   |      |
|    | 00       |      |
|    | 000000   |      |
|    | 00       |      |
| C  | 11111111 | 255. |
| a  | 1        | 255. |
| s- | 11111111 | 0.0  |
| B  | 1        |      |

```

000000
00
000000
00

CI 1111111 255.
as 1      255.
s- 1111111 255.
C 1      0
   1111111
   1
   000000
   00

```

The result allows TCP/IP to determine the host and network IDs of the local computer. For example, when the IP address is 102.54.94.97 and the subnet mask is 255.255.0.0, the network ID is 102.54 and the host ID is 94.97.

Although configuring a host with a subnet mask might seem redundant after examining the previous tables (since the class of a host is easily determined), subnet masks are also used to further segment an assigned network ID among several local networks.

For example, suppose a network is assigned the Class-B network address 144.100. This is one of over 16,000 Class-B addresses capable of serving more than 65,000 nodes. However, the worldwide corporate network to which this ID is assigned is composed of 12 international LANs with 75 to 100 nodes each. Instead of applying for 11 more network IDs, it is better to use subnetting to make more effective use of the assigned ID 144.100. The third octet of the IP address can be used as a subnet ID, to define the subnet mask 255.255.255.0. This splits the Class-B address into 254 subnets: 144.100.1 through 144.100.254, each of which can have 254 nodes. (Host IDs 0 and 255 should not be assigned to a computer; they are used as broadcast addresses, which are typically recognized by all computers.) Any 12 of these network addresses could be assigned to the international LANs in this example. Within each LAN, each computer is assigned a unique host ID, and they all have the subnet mask 255.255.255.0.

The preceding example demonstrates a simple (and common) subnet scheme for Class-B addresses. Sometimes it is necessary to segment only portions of an octet, using only a few bits to specify subnet IDs (such as when subnets exceed 256 nodes). Each user should check with the local network administrator to determine the network's subnet policy and the correct subnet mask. For all systems on the local network, the subnet mask must be the same for that network ID.

---

**Important** — All computers on a logical network must use the same subnet mask and network ID; otherwise, addressing and routing problems can occur.

---

This section provides some tips to help you find and access information on the Internet after you have connected, including the following topics:

# n

Navigating the Internet with FTP

# n

Accessing online services using the Internet

# n

Browsing the Internet with public domain tools

Windows 95 provides a variety of TCP/IP utilities for copying files, initiating host sessions with other servers, and checking the status of your IP configuration. For detailed information about these tools, see Appendix A, "Command-Line Commands Summary." The troubleshooting section of Chapter 12, "Network Technical Discussion," includes specific steps for using TCP/IP utilities such as *ping* to verify your connection.

FTP is a file-sharing protocol that allows transfer of text and binary files between a host computer and a computer. FTP requires that you log onto the remote host for user authentication, but anonymous FTP can be used to acquire various free software and documentation through the Internet. Some FTP servers have a limit to the number of anonymous users they can handle at any one time, so you may need to attempt to connect more than once to get a connection.

You can use FTP to access the Microsoft FTP server to get troubleshooting help and other information. This support service uses anonymous FTP to provide documentation, utilities, updated drivers, and other information for many Microsoft systems products.

### [To get support from Microsoft using the Internet](#)

1. Make sure you are connected to your Internet provider as described earlier in this chapter.
2. Start FTP and connect to `FTP.MICROSOFT.COM`
3. When you are asked for a User Name, type *anonymous*
4. Type your Internet account name (your electronic mail name) as your password, using the format `USERID@HOSTNAME.DOMAIN`.

— Don't worry if you don't see any characters appear on the screen as you type in this information. This is a security measure to protect your password.

You are now connected to the root directory of the Microsoft FTP site. After typing your password, you will see a short logon message, and then the following appears:

ftp>

For information about navigating and downloading files, see the following section.

This section describes how to see a listing of directories and files at an FTP site, with specific information about how to change directories and download files. Most FTP sites are organized into a series of directories and files. Most FTP servers have text files that describe the layout of their entire directory structure so that you don't have to go wandering blindly. For example, the file on `FTP.MICROSOFT.COM` is `DIRMAP.TXT`. If you are in the root directory, type `/s` to find the file.

### [To see what is available at an FTP site](#)

n

At the ftp> prompt, type `/s`

This command gives you a simple listing of directory and folder names.

[To get more details on the current directory](#)

# n

At the ftp> prompt, type `ls -l`

This command provides a detailed listing similar to the following:

```
dr- 1o gr 0 A 1 advs  
xr- w o ug 6: ys  
xr- ne u 23 2  
x r p 3  
  
dr- 1o gr 0 A 5: desk  
xr- w o ug 3 apps  
xr- ne u 24 7  
x r p  
  
dr- 1o gr 0 A 1 deve  
xr- w o ug 0: looper  
xr- ne u 24 5  
x r p 2  
  
-r- 1o gr 41 S 7: dirm  
xr- w o 61 ep 4 ap.tx  
xr- ne u 19 3 t  
x r p  
  
-r- 1o gr 71 A 1 discl  
xr- w o 2 ug 5: aime  
xr- ne u 25 0 r.txt  
x r p 7  
  
-r- 1o gr 86 S 8: inde  
xr- w o 0 ep 4 x.txt  
xr- ne u 1 0  
x r p  
  
-r- 1o gr 52 S 0: LS-  
xr- w o 20 ep 1 LR.Z  
xr- ne u 31 21 7 IP  
x r p  
  
dr- 1o gr 0 A 1 MSE
```



xr- w o ug 2: DCe  
xr- ne u 24 3 rt  
x r p 6

dr- 1 o gr 0 A 1 MSF  
xr- w o ug 6: T  
xr- ne u 22 2  
x r p 4

-r- 1 o gr 28 N 1 MSN  
xr- w o 16 ov 9 BRO  
xr- ne u 0 29 9 .DO  
x r p 3 C

-r- 1 o gr 22 Fe 9: MSN  
xr- w o 64 b 5 BRO  
xr- ne u 1 8 8 .TXT  
x r p

dr- 1 o gr 0 A 1 pero  
xr- w o ug 5: psys  
xr- ne u 24 0  
x r p 9

dr- 1 o gr 0 S 1 Softli  
xr- w o ep 6: b  
xr- ne u 19 0  
x r p 1

-r- 1 o gr 50 O 1 supp  
xr- w o 95 ct 9 ort-  
xr- ne u 20 9 phon  
x r p 3 e#.tx  
t

dr- 1 o gr 0 A 1 Tech  
xr- w o ug 6: Net  
xr- ne u 22 3  
x r p 8

-r- 1 o gr 80 A 8: Wha  
xr- w o 2 ug 0 tHap  
xr- ne u 25 9 pene  
x r p d.txt

In this listing:

n

The symbols in the left column indicate whether this is a file (r) or a directory (dr).

n

The fifth column (right after the “group” column) indicates the byte size of each file, which is useful to know when you begin transferring files from the Internet to your computer. (The bigger the file, the longer it takes to transfer.)

n

The last column describes the name of the file, directory, or link.

The following table translates some of the symbols in the detailed listing.

*Symbols in FTP Detailed Directory Listings*

---

|           |                  |
|-----------|------------------|
| <u>d</u>  | Directory        |
| <u>-</u>  | A file that can  |
| <u>(h</u> | be viewed        |
| <u>yp</u> |                  |
| <u>he</u> |                  |
| <u>n)</u> |                  |
| <u>1</u>  | A link to a file |
|           | or directory     |
|           | somewhere        |
|           | else on this     |
|           | FTP site         |

(similar to a shortcut to a folder or file in Windows 95).

## [Changing Directories with FTP](#)

### [To change directories](#)

n

At the ftp> prompt, type `cd DIRECTORY_NAME`

For example, to get more information about desktop applications, type `cd DESKAPPS`

At the ftp> that appears, type `ls` or `ls -l` again to see what resides in this directory.

### [To go back to the previous directory](#)

n

At the ftp> prompt, type `cd`

If you have navigated through many directories and want to go back to the beginning, instead of typing `cd ..` again and again, you can type `cd /` to return to the root directory of this host.

---

*Tip* Notice that the forward slash “/” is used (as opposed to the backslash “\” that MS\_DOS and Windows users are accustomed to). On most UNIX computers, the way to change directories is with the forward slash. Currently, most FTP servers you access only understand that particular command, so the forward slash will always work. However, if you dial into a computer running Windows NT, such as FTP.MICROSOFT.COM, it understands both the forward slash and the backslash.

---

To download files from the Internet, you must indicate whether the file is an ASCII or a binary file. By default, when you begin using FTP, you are working in ASCII mode. To transfer text files, it is not necessary to change; however, you cannot transfer a binary file while you are in ASCII mode.

---

Tip—— Most text-based FTP clients are case-sensitive, so be sure to use the correct case when you attempt to transfer resources from these FTP sites.

---

[To switch from ASCII to binary transfer mode](#)

n

At the ftp> prompt, type *binary*

—— The message 200 Type set to I appears to confirm the change to binary transfer mode.

[To switch back to ASCII](#)

n

At the ftp> prompt, type *ASCII*

—— The message 200 Type set to A appears to confirm the change to ASCII.

[To transfer a file to your computer](#)

# n

At the ftp> prompt, type *get* FILENAME

For example, type *get dirmap.txt* to get the directory map on the Microsoft FTP server. To place the file on a computer with a name other than the one it had on the server, type

*get* FILENAME NEWNAME

As the file is being downloaded, you see something similar to the following (the actual numbers may be different):

200 PORT command successful.

150 Opening ASCII mode data connection for dirmap.txt.

226 Transfer complete.

— 4161 bytes received in 0.32 seconds (13.21 Kbytes/sec)

If there is an error, remember that you are using software that is case-sensitive, so make sure you typed the word *dirmap.txt* exactly.

When you see the ftp> prompt again, look in Windows Explorer for the DIRMAP.TXT file and open it using a text processor such as WordPad.

[To disconnect from your host](#)

# n

At the ftp> prompt, type *disconnect*

[To stop using FTP](#)

# n

At the ftp> prompt, type quit

## Browsing the Internet with Public Domain Tools

---

In addition to the tools provided with Windows 95, there are a variety of graphical applications which you can use to access and peruse the Internet more easily and with greater capabilities. These include Mosaic, Gopher, and Wide-Area Information Server, to name a few. The following sections provide information about these applications.

### Using Mosaic

NCSA Mosaic is a graphical network navigational tool that provides users access to networked information on the Internet and the World Wide Web (WWW) distributed information system. NCSA Mosaic gives the user a mechanism to retrieve and display a wide variety of data types, including text, image, video, and audio. It uses a hypertext user interface similar to Windows Help files, so you can click on a word or image of interest, and Mosaic connects you to the appropriate resource. There are now numerous versions of Mosaic available.

### To access Mosaic

1. Connect to ftp.ncsa.uiuc.edu;
2. At the prompt, type cd /Web.
3. Read the FAQ.TXT file in this directory for more information. This file discusses exactly what you need to download from this FTP site, and what you need on your computer to install Mosaic correctly.
4. After you install Mosaic, click in the text box labeled Document URL: and type http://www.microsoft.com

— This connects you to the Microsoft World Wide Web server. Rather than typing commands to change directories, just position your cursor over any of the highlighted words. When you click on them, the appropriate screens will come to the forefront.

### Using Windows Gopher

Gopher is a tool that offers menu-based access to Internet information. Using Gopher, the intricacies of FTP on the Internet are hidden from the user, bypassing complicated TCP/IP addresses and connections. Users can choose the information from a list of menus, and Gopher makes the connections necessary in order to retrieve the files.

---

Tip — Public-domain Windows-based utilities such as LPR and Gopher can be obtained on the Internet using [ftp.cica.indiana.edu](ftp:cica.indiana.edu) in the /pub/pc/win3/nt or /pub/win3/winsock directory, or using the same directories on FTP.CDROM.COM.

Also, a list of Internet sources for Windows Sockets applications is available by electronic mail from [info@lcs.com](mailto:info@lcs.com).

---

### [To access Gopher](#)

1. Type [gopher](#)
2. Log on as GOPHER
3. Gopher offers a menu of choices. Choose the number that corresponds to the selection you want to make, as described in the following list.

- 
- 1 Information about Gopher.
  - 2 Computer information/
  - 3 Discussion groups/
  - 4 Fun and games/
  - 5 Internet file server (ftp) sites/
  - 6 Libraries <TEL>
  - 7 News/
  - 8 Other Gopher and

information  
servers <?>

9 Phone  
books/

1 Detailed  
0 search  
resources at  
the  
University of  
Minnesota  
<?>

1 University of  
1 Minnesota  
campus  
information/

Notice the symbol after each menu choice:

n

A forward slash (/) after any listing (the most common) indicates that choosing that particular selection brings you to another directory or menu of choices.

n

A period (.) after the menu choice indicates you have reached a file. If you select one of these file choices, you can read it in your Gopher client or choose to download it to your computer. Most Gopher clients even let you press *m* for mail, and then let you pass that article along to anyone with an Internet address (in the format `USERID@ HOSTNAME.DOMAIN`).



# n

A question mark (<?>) indicates that a search will take place if this is selected. In the preceding Gopher example, if you choose number 8, you can search on keywords in which you are interested. Gopher searches using Archie or WAIS, and then displays another menu consisting of the results.

# n

The <TEL> symbol stands for Telnet. With this choice, you temporarily leave the user interface for the Gopher application, and a Telnet session begins. After you have finished working inside Telnet, you automatically return to your Gopher application.

### [Using Archie](#)

Archie is a server that supports a database of anonymous ftp sites and their contents. It was created by the Archive Group at McGill University in Montreal where it is maintained. Archie stores the contents, descriptions, and filenames about a great number of ftp sites.

### [To access Archie on the Internet using telnet](#)

1. Type [archie.ans.net \(147.225.1.2.\)](#)
2. At the logon, type [archie](#).

### [Using Wide-Area Information Server](#)

Wide-Area Information Server (WAIS) provides an organized way to peruse the hundreds of databases and library catalogs you can access on the Internet. WAIS searches the contents of documents based on any word you type as opposed to other search tools that just look at the titles. In response, WAIS displays a list of relevant documents. Depending on your search, this list may be extremely large, so WAIS organizes the documents by sorting them based on how many times your keyword was mentioned in the document. Also, if the list is very large, you can choose a

few of the documents that suit your needs, and tell WAIS to find more documents in those related categories.

[To access WAIS](#)

n

If your Internet access provider doesn't offer a WAIS client program, start

a Telnet session and connect to *bbs.oit.unc.edu*.

WAIS displays a list of databases you can access and simple directions for navigating, because you have to select your sources before you actually begin your search. The screen shows the following:

n

The number of database sources available

n

The Internet address for the databases

n

The actual names of the databases, and the cost of use

[To select the database you want to use and begin searching](#)

1. Press the space bar next to the appropriate sources. An asterisk appears next to the selected databases.
  2. To type key words in the area at the bottom of the screen, press ENTER. Then begin typing.
- WAIS begins searching the contents of all of your sources, and returns with a sorted list of possibilities.

When WAIS displays this list, the article with the most occurrences of your key words appears at the top. You can read any of the listed files.

[To regain access to the keyword list](#)

n

Press *w* to alter the list and then run the search again.

—Or—

—Press *s* to change your previously selected databases and search again.

### Configuring a Gateway Server

---

If your site can afford a dedicated connection to the Internet, you can choose this option over connecting through a modem and telephone line to an Internet access provider. The advantages of this include improved performance and potentially reduced costs, depending on your use. You'll need to set up hardware and obtain a domain name for the connection.

You will need to set up a dedicated computer which acts as the router or gateway server to the Internet. This server should use a high-speed connection, such as a T1 line. The T1 line connects to the computer using a special network adapter. The T1 connection offers a high throughput rate of information, but costs roughly \$5000 per month.

After you set up the gateway server, you need to obtain a domain name so that others can send information to your gateway easily.

Networks that connect to the public Internet must obtain an official network ID from the InterNIC to guarantee IP network ID uniqueness. The InterNIC can be contacted using electronic mail at [info@internic.net](mailto:info@internic.net) ((800) 444-4345 in the United States or, for Canada and overseas, call (619) 455-4600). Internet registration requests can be

sent to *hostmaster@internic.net*. You can also use FTP to connect to *is.internic.net*, then log on as *anonymous*, and change to the */INFOSOURCE/FAQ* directory.

After receiving a network ID, the local network administrator must assign unique host IDs for computers within the local network.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 31 Windows 95 Architecture

This chapter provides a brief review of the Windows 95 architecture to assist you in understanding how the key operating system components function and interrelate.

### Windows 95 Architecture Components

---

With Windows 95, you can run Windows 16-bit and MS-DOS — based applications in addition to Windows 32-bit applications. (Windows 32-bit applications are also called Win32-based applications; Windows 16-bit applications are called Win16-based applications.)

Windows 95 features a new device driver model, a new file system, a new 32-bit graphics engine, and new 32-bit print, communications, and multimedia subsystems. Windows 95 is a 32-bit operating system with built-in connectivity support. It provides high performance, robustness, and complete backward compatibility.

All of these features are supported by the modular design shown in the following diagram.

```
{ewc msdncd, EWGraphic, x0ad 0 /a "psAD.bmp"}
```

This chapter describes the key components that make up the Windows 95 architecture beginning with its central information store, the Registry, and proceeding from bottom to top.

### [Summary of Improvements over Windows 3.1](#)

Although its architectural design is based on Windows version 3.1, Windows 95 includes several improvements over the earlier operating system:

n

A fully integrated 32-bit, protected-mode operating system, which eliminates the need for a separate copy of MS-DOS.

n

Preemptive multitasking and multithreading support, which improves system responsiveness and offers smooth background processing.

n

32-bit installable file systems including VFAT, CDFS, and network redirectors. These support better performance, use of long filenames, and an open architecture to support future growth.

n

32-bit device drivers, available throughout the system, which deliver improved performance and intelligent memory use.

n

A complete 32-bit kernel, including memory management and process scheduling and management.

n

Improved system-wide robustness and cleanup after an application ends or fails. This delivers a more stable and reliable operating environment.

n

More dynamic environment configuration, which reduces the need for users to adjust their systems.

n

Improved system capacity, which allow multiple applications and system tasks to run well concurrently.

### Windows 95 Registry

---

The central information database for Windows 95 is called the Registry. This hierarchical database both simplifies the operating system and makes it more adaptable. The Registry simplifies the operating system by eliminating the need for AUTOEXEC.BAT, CONFIG.SYS, and INI files (except when legacy applications require them). It makes the operating system more adaptable by storing per-user and per-configuration information so you can share one computer among multiple users and you can have more than one configuration (such as in the office and on-the-road configurations) for each computer.

The Registry is structured as a hierarchical database of KEYS, where each key can contain a VALUE, or can even contain other keys (subkeys), as shown in the following example:

```
{ewc msdn cd, EWGraphic, x0ad 1 /a "psAD.bmp"}
```

The Registry stores both binary and text values, supports keys that can have more than one value and can also support data of different types.

Logically, the Registry is a single information store. Physically, it is made up of two data (.DAT) files — SYSTEM.DAT contains computer-specific information and USER.DAT contains user-specific information. By storing user information in a separate file, an administrator can maintain a master copy of this information on a centralized server so that it can be downloaded to whatever computer on the network the user happens to use for logon. (For more information about user profiles, see Chapter 15, “User Profiles and System Policies.”)

Windows 3.1 used initialization (INI) files to store system-specific or application-specific information on the state or configuration of the system. For example, the WIN.INI file stored information about the appearance of the Windows environment, the SYSTEM.INI file stored system-specific information on the hardware and device-driver configuration of the system, and various INI files (such as MSMAIL.INI, and WINWORD6.INI) stored application-specific information.

With several applications and system components on your computer, it was common to have 15 or 20 INI files to manage. Remembering which information was in which file was not always easy. The Registry remedies this situation by providing a single location for a computer's configuration information.

The following table shows other difficulties or limitations caused by using INI files that are overcome by using the Registry.

---

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Notes When you upgrade from Windows 3.1 to Windows 95, system-specific information such as the static reference to loading virtual device drivers is moved, as appropriate, from the SYSTEM.INI file to the Registry.

For backward compatibility, Windows 95 does not ignore AUTOEXEC.BAT, CONFIG.SYS, and INI files. Rather, it still recognizes these files as needed because many Win16-based applications still use them. For example, Windows 95 allows Win16-based applications to use INI files for the parameters, device drivers, and so on, that the applications need to run. In addition, Windows 95 continues to examine the [386Enh] section of SYSTEM.INI at startup to check for virtual device drivers.

---

One advantage of the Registry for Win32-based applications is that many of the Win32-based Registry APIs can be used remotely through the remote procedure call (RPC) mechanism in Windows 95 to provide access to Registry information across a network. This means that network administrators can use system management tools to access the contents of the Registry for any computer on the network. (Of course, the remote computer must be configured to allow remote administration. Also, the accessing computer must have user-level security.)

With the Windows 95 remote administration mechanism, industry management mechanisms such as Simple Network Management Protocol (SNMP) can easily be integrated into Windows 95, simplifying the management and support burden of the network administrator.

For more information, see Chapter 16, “Remote Administration.”

A primary role of the Registry in Windows 95 is to serve as a central repository for hardware-specific information for use by the Plug and Play system components. Windows 95 maintains information about hardware components and devices that have been identified through an enumeration process in the hierarchical structure of the Registry. (This process is described later in the “Configuration Manager” section.) When new devices are installed, the system checks the existing configuration in the Registry to determine the hardware resources (for example, IRQs, I/O addresses, DMA channels, and so on) that are not being used, so the new device can be properly configured without conflicting with a device already installed in the system.

### *Device Drivers*

---

Windows 95 features improved support for hardware devices and peripherals including disk devices, video display adapters, mice and other pointing devices, modems, fax machines, and printers.

In Windows 3.1, device drivers were, for the most part, monolithic and complex to develop. Windows 95 uses a universal driver/minidriver architecture which makes it easier for hardware vendors to provide device-specific code for their hardware.

A UNIVERSAL DRIVER includes most of the code necessary for devices in a particular class of devices (such as printers or modems) to communicate with the appropriate operating system components (such as the print or communications subsystem). A mini-driver is the relatively small and simple driver that contains any additional instructions needed by a specific device. In many cases, however, the universal driver for a particular category of devices also includes the code needed to operate devices designed to the most common standard for that category. (For example, the Unimodem driver works with all modems supporting AT commands.)

### *Virtual Device Drivers*

A VIRTUAL DEVICE DRIVER (VxD) is a 32-bit, protected-mode driver that manages a system resource, such as a hardware device or installed software, so that more than one application can use the resource at the same time. VxD refers to a general virtual device driver—the x represents the type of device driver. For example, a virtual device driver for a display device is known as a VDD, a virtual device driver for a timer device is a VTD, a virtual device driver for a printer device is a VPD, and so forth.

With Windows 3.1, VxDs were statically loaded and took up a lot of memory space.

Windows 95 dynamically loads VxDs — only those that are needed at any given time are loaded into memory.

VxDs support all hardware devices for a typical computer, including disk controller, serial and parallel ports, keyboard and display devices, and so on. If the state of the hardware device can be disrupted by switching between multiple applications, the device must have a corresponding virtual device and VxD. The virtual device keeps track of the state of the device for each application and ensures that the device is in the correct state whenever an application continues.

Although most virtual devices manage hardware, some manage only installed software, such as an MS-DOS device driver or a terminate-and-stay-resident (TSR) program. Such virtual devices contain code to emulate the software or ensure that the software uses data that applies only to the currently running application. Also, VxDs are often used to improve software performance.

(Windows 95 virtual device driver files have a filename extension of .VXD; Windows 3.1 drivers used an extension of .386.)

## Configuration Manager

---

Today's personal computers consist of many bus and device architectures coexisting on a single system. A bus is the mechanism that allows information to be transferred between the computer and the device.

More than one device type might use the same bus architecture. For example, both a mouse and a keyboard can use the same keyboard controller bus; both a CD-ROM drive and a hard disk drive might use the same SCSI bus. Each device type has a separate set of configuration requirements.

To support Plug and Play functionality, the Windows 95 architecture includes a new component called the Configuration Manager which orchestrates the configuration process. As shown in the following illustration, this component works with a number of subcomponents to identify each bus and each device on the system, and to identify the configuration settings for each device. Configuration Manager ensures that each device on the computer can use an IRQ, I/O port addresses, and other resources without conflict with other devices.

*{ewc msdncd, EWGraphic, x0ad 2 /a "psAD.bmp"}*

The Configuration Manager also helps monitor the computer for changes in the number and type of devices present and manages the reconfiguration of the devices, as needed, when changes take place. As these events occur, the Configuration Manager communicates the information to applications.

To perform its role, Configuration Manager (implemented as part of the Virtual Memory Manager, VMM32) calls on the bus enumerators to identify all the devices

on their specific buses and their respective resource requirements.

BUS ENUMERATORS are new drivers that are responsible for creating the hardware tree on a Plug and Play-compliant computer. A HARDWARE TREE is the hierarchical representation of all the buses and devices on a computer. Each bus and each device is represented as a NODE. The following is a graphical representation of a hardware tree.

*{ewc msdncd, EWGraphic, x0ad 3 /a "psAD.bmp"}*

During the device enumeration process, the bus enumerator locates and gathers information from either the device drivers or BIOS services for that particular device-type. For example, the SCSI bus enumerator calls the SCSI drivers to gather information. (Some bus enumerators may instead check the hardware directly.)

For each device, a driver is loaded. When loaded, the driver waits for the Configuration Manager to assign specific resources (such as IRQs) to the device.

Configuration Manager calls on RESOURCE ARBITRATORS to allocate resources for each device. Resource arbitrators also resolve conflicts among devices that request identical resource assignments. Windows 95 provides arbitrators for the standard I/O, memory, hardware interrupt, and DMA channel resources. (The arbitrators are separate components, rather than a part of Configuration Manager, to ensure future extensibility to new types of resources, such as power allocation or automatic SCSI IDs.)

To complete the configuration process, Configuration Manager informs the device drivers about the device configuration. This process is repeated when the BIOS or one of the other bus enumerators informs Configuration Manager about an event that requires a change to the system configuration, such as the removal or insertion of a Plug and Play-compliant PCMCIA card.

For more information about Plug and Play, see Chapter 18, "Introduction to System Configuration."

### *Virtual Machine Manager*

---

While Configuration Manager provides for all resources needed by each device on the computer, another component, Virtual Machine Manager, provides for resources needed for each application and system process running on the computer. Virtual Machine Manager creates and maintains the virtual machine environments in which applications and system processes run.

A VIRTUAL MACHINE (VM) is an environment in memory that, from the application's perspective, looks as if it is a separate computer, complete with all of the resources available on the physical computer that an application needs to run. The Virtual Machine Manager provides each application with the system resources it needs.

```
{ewc msdn cd, EWGraphic, x0ad 4 /a "psAD.bmp"}
```

Windows 95 has a single VM called the System VM, in which all system processes run. In addition, all Win32-based and Win16-based applications run in this VM. Each MS-DOS-based application runs in its own DOS VM. (For information on the DOS VM and System VM, see “Core System Components” later.)

The Virtual Machine Manager is responsible for three key areas of services:

n

Process scheduling

n

Memory paging

n

MS-DOS Mode support for MS-DOS-based applications that must have exclusive access to system resources

The following sections discuss these three areas of service.

---

Note — Virtual Machine Manager replaces WIN386.EXE in Windows 3.1.

---

The Process Scheduler is the component responsible for providing system resources to the applications and other processes you run, and for scheduling processes to allow multiple applications to run concurrently.

The Process Scheduler also schedules processes in a way that allows multiple applications and other processes to run concurrently. Windows 95 uses two methods for concurrent process scheduling — cooperative multitasking and preemptive multitasking.

With Windows 3.1, applications ran concurrently through a method known as COOPERATIVE MULTITASKING. Using this method, the operating system required an application to check the message queue periodically and to relinquish control of the system to other running applications. Applications that did not check the message queue frequently would effectively “hog” CPU time and prevent the user from switching to another application. For compatibility reasons, Windows 95 cooperatively multitasks Win16-based applications.

Windows 95 uses PREEMPTIVE MULTITASKING for Win32-based applications. This means that the operating system takes control away from or gives control to another running task, depending on the needs of the system.

Unlike Win16-based applications, Win32-based applications do not need to yield to other running tasks to multitask properly. Win32-based applications can take advantage of MULTITHREADING, a mechanism that Windows 95 provides to facilitate the ability to run applications concurrently. A Win32-based application running in the system is called a PROCESS in terms of the operating system. Each process consists of at least a single thread of execution that identifies the code path flow as it is run by the operating system. A THREAD is a unit of code that can get a time slice from the operating system to run concurrently with other units of code, and must be associated with a process. However, a Win32-based application can initiate multiple threads for a given process to enhance the application for the user by improving throughput, enhancing responsiveness, and aiding background processing. Because of the preemptive multitasking nature of Windows 95, threads of execution allow code to be smoothly processed in the background.

For example, a word processing application (process) can implement multiple threads to enhance operation and simplify interaction with the user. The application can have a separate thread that responds to keys typed on the keyboard by the user to place characters in a document, while another thread performs background operations such as spelling checking or paginating, and while a third thread spools a document to the printer in the background.

---

Note — Some Win16-based applications may have provided functionality similar to this; however, because Windows 3.1 didn't provide a mechanism for supporting multithreaded applications, it was up to application vendors to implement their own threading schemes. The use of threads in Windows 95 makes it easy for application vendors to add asynchronous processing of information to their applications.

---



Windows 95, similar to Windows NT, uses a demand-paged virtual memory system. This system is based on a flat, linear address space accessed using 32-bit addresses.

Each process is allocated a unique virtual address space of 4 GB. This virtual address space is divided into equal blocks, or PAGES.

DEMAND PAGING refers to a method by which code and data are moved in pages from physical memory to a temporary paging file on disk. As the information is needed by a process, it is paged back into physical memory.

The Memory Pager maps virtual addresses from the process's address space to physical pages in the computer's memory. In doing so, it hides the physical organization of memory from the process's threads. This ensures that the thread can access its process's memory as needed, but not the memory of other processes. Therefore, as shown in the following illustration, a thread's view of its process's virtual memory (as depicted on the left) is much simpler than the real arrangement of pages in physical memory.

*{ewc msdncd, EWGraphic, x0ad 5 /a "psAD.bmp"}*

### [32-Bit Address Space](#)

To support a 16-bit operating environment including Windows 3.1 and MS-DOS, the Intel® processor architecture uses a mechanism called a SEGMENT. Segments reference memory by using a 16-bit segment address, and a 16-bit offset address within the segment. A segment is 64K in size, and both applications and the operating system suffer a performance penalty for accessing information across segments.

Windows 95 addresses this issue by using the 32-bit capabilities of the 80386 (and above) processor architecture to support a flat, linear memory model for 32-bit operating system functionality and Win32-based applications. A LINEAR ADDRESSING MODEL simplifies the development process for application vendors, and removes the performance penalties imposed by the segmented memory architecture.

With this addressing model, Windows 95 allows full use of the 4 GB of addressable memory space for all 32-bit operating system components and applications. Each 32-bit application can access up to 2 GB of addressable memory space, which is large enough to support even the largest desktop application.

While most MS-DOS — based applications run well in Windows 95 and can run concurrently with other Win32-based and Win16-based applications, a small number of MS-DOS — based applications require exclusive access to system resources to

run. In this case, it is the Virtual Memory Manager that creates this exclusive operating environment for the application called MS-DOS MODE. When an MS-DOS—based application runs in MS-DOS Mode, no other applications or processes are allowed to compete for system resources—all resources are at the exclusive access of the MS-DOS—based application. For related information, see Chapter 22, “Application Support.”

## *Installable File Systems*

---

Windows 95 features a layered file system architecture that supports multiple file systems, including VFAT and CDFS.

The new file system architecture makes the computer easier to use and improves file and disk I/O performance. Features of the new file system architecture include long filename support and a dynamic system cache for file and network I/O.

Long filename support improves ease of use because users no longer need to reference files by the MS-DOS 8.3 filename structure. Instead, users can specify up to 255 characters to identify their documents. In addition, filenames seem less cryptic and thus easier to read because Windows 95 hides the filename extensions from users.

Windows 95 I/O performance is dramatically improved over Windows 3.1. This is because Windows 95 features 32-bit protected-mode code for reading information from and writing information to the file system, and for reading information from and writing information to the disk device. It also includes 32-bit caching mechanisms, and a full, 32-bit code path is available from the file system to the disk device.

Windows 95 includes an open file system architecture for future system support. It also provides disk device driver compatibility with Windows NT.

The following figure shows the file system architecture used by Windows 95.

`{ewc msdn cd, EWGraphic, x0ad 6 /a "psAD.bmp"}`

The Windows 95 file system architecture is made up of the following components:

n

Installable File System (IFS) Manager. The IFS Manager is responsible for

arbitrating access to different file system components.

# n

File system drivers. The file system drivers layer includes access to FAT-based disk devices, CD-ROM file systems, and redirected network device support.

# n

Block I/O subsystem. The block I/O subsystem is responsible for interacting with the physical disk device.

The following sections describe these components.

Under MS-DOS and Windows 3.1, INT 21 provided access to the file system to manipulate file information on a disk device. To support redirected disk devices (for example, a network drive, or a CD-ROM drive), other system components such as the network redirector would hook the INT 21 function so that it could examine the file system request to determine whether it should handle the file I/O request, or let the base file system handle it. Although this mechanism provided the ability to add on more device drivers, some add-on components ran improperly and interfered with other installed drivers.

Another problem with the MS-DOS — based file system was the difficulty in loading multiple network redirectors to provide concurrent access to different network types.

Windows for Workgroups provided support for running the Microsoft Windows Network redirector at the same time as an additional network redirector such as Novell® NetWare®, Banyan® VINES®, or Sun® PC-NFS®; however, support for running more than two network redirectors at the same time was not supported.

In Windows 95, the key to access of disk and redirected devices is the Installable File System (IFS) Manager. The IFS Manager arbitrates access to file system devices, and other file system device components.

With Windows 3.1, file system drivers were supported by MS-DOS. With Windows 95, file system drivers are Ring 0 components of the operating system. Windows 95 includes support for all of the following file systems (others can be added by third-party vendors):

n

32-bit FAT (VFAT) driver

n

32-bit CD-ROM file system (CDFS) driver

n

32-bit network redirector for connectivity to Microsoft Network servers like

Windows NT Server, along with a 32-bit network redirector to connect to Novell NetWare servers

For information about network redirectors, see Chapter 32, "Windows 95 Network Architecture."

### [VFAT File System](#)

The 32-bit VFAT driver provides a 32-bit, protected-mode code path for manipulating the file system stored on a disk. Because it is reentrant and multithreaded, it provides smoother multitasking performance.

The 32-bit VFAT driver interacts with the block I/O subsystem to provide disk access to more device types than are supported by Windows 3.1. Windows 95 also supports mapping to any real-mode disk drivers that a user may have installed. The

combination of 32-bit file access and 32-bit disk access drivers results in significantly improved disk and file I/O performance.

Benefits of the 32-bit file access driver over MS-DOS — based driver solutions include the following:

n

Dramatically improved performance and real-mode disk caching software

n

No conventional memory used — real-mode SmartDrive has been replaced

n

Better multitasking when accessing information on disk — no blocking

n

Dynamic cache support

Both MS-DOS and Windows 3.1 used 16-bit real-mode code to manipulate the file allocation table (FAT) and to read and write information to the disk. Being able to manipulate the disk file system from protected mode removes or reduces the need to switch to real mode to write information to the disk through MS-DOS, thus resulting in a performance gain for file I/O access.

The 32-bit VFAT works with a 32-bit, protected-mode cache driver (VCACHE). This driver replaces the 16-bit, real-mode SmartDrive disk cache software provided with MS-DOS and Windows 3.1. The VCACHE driver features more intelligent caching algorithms than SmartDrive, to cache information read from or written to a disk drive. The VCACHE driver also manages the cache pool for the CD-ROM File System (CDFS) and the 32-bit network redirectors that are provided with Windows 95.

Another big improvement in VCACHE over SmartDrive is that the memory pool used for the cache is dynamic and is based on the amount of available free system memory. Users no longer need to statically allocate a block of memory to set aside as a disk cache. The system automatically allocates or deallocates memory used for the cache based on system use.

For example, as you perform a large number of activities on the network, Windows 95 increases the size of the network cache. As network activity decreases and more applications are started, Windows 95 decreases the network cache size to make room in memory for the applications.

### [CD-ROM File System](#)

The 32-bit, protected-mode CD-ROM File System (CDFS) implemented in Windows 95 provides improved CD-ROM access and performance over the real-mode MSCDEX driver in Windows 3.1. (CDFS conforms to the ISO 9660 standard.) The CDFS driver cache is dynamic and shares the cache memory pool with the 32-bit VFAT driver, requiring no configuration or static allocation on the part of the user.

Benefits of the new 32-bit CDFS driver include the following:

n

No conventional memory used — real-mode MSCDEX has been replaced

n

Improved performance over MS-DOS — based MSCDEX and real-mode

cache

n

Better multitasking when accessing CD-ROM information — no blocking

n

Dynamic cache support to provide a better balance between providing

memory to run applications versus providing memory to serve as a disk cache

Use of MSCDEX is no longer necessary under Windows 95, and is automatically removed by Setup. If MSCDEX is specified in the user's AUTOEXEC.BAT, the 32-bit CDFS driver is used instead.

The block I/O subsystem in Windows 95 improves upon the 32-bit disk access "FastDisk" device architecture used in Windows 3.1 to enhance performance for the entire file system and provides a broader array of device support.

`{ewc msdncd, EWGraphic, x0ad 7 /a "psAD.bmp"}`

As shown in this diagram, the block I/O subsystem includes these components:

Input/Output Supervisor (IOS).

This component provides services to file systems and drivers. The IOS is responsible for the queuing of file service requests and for routing the requests to the appropriate file system driver. The I/O Supervisor also provides asynchronous notification of file system events to drivers that are installed. This component is described further in the following section.

Port Driver.

This is a monolithic, 32-bit, protected-mode driver that communicates with a specific disk device such as a hard disk controller. This driver is Windows 95-specific and resembles the 32-bit disk access (FastDisk) driver used in Windows 3.1 (for example, WDCTRL for Western Digital™-compatible hard disk controllers). In

Windows 95, the driver that communicates with IDE or ESDI hard disk controllers and floppy disk controllers is implemented as a port driver. A port driver provides the same functionality as the combination of the SCSI manager and the miniport driver.

### SCSI Layer.

This component applies a 32-bit, protected-mode, universal driver model architecture for communicating with SCSI devices. The SCSI layer provides all the high-level functionality that is common to SCSI and similar devices, and then uses a miniport driver to handle device-specific I/O calls. The SCSI Manager is also part of this system and provides the compatibility support for using Windows NT miniport drivers.

### Miniport driver.

The Windows 95 miniport driver model makes it easier for a hardware disk device vendor to write a device driver. Because the SCSI stub provides the high-level functionality for communicating with SCSI devices, the hardware disk device vendor only needs to create a miniport driver that is tailored to the vendor's own disk device. The Windows 95 miniport driver is 32-bit protected-mode code, and is binary-compatible with Windows NT miniport drivers. Binary compatibility with Windows NT results in a more stable and reliable device driver, because the hardware vendor needs to only maintain one code base for device support, and Windows 95 users can benefit from the fact that many miniport drivers are already available for Windows NT.

---

Note — Older miniport drivers written for Windows NT do not include Plug and Play information and, therefore, will not perform well on Windows 95, if they work at all.

---

In addition to these other layers, the Block I/O subsystem provides a real-mode mapping layer. This layer provides compatibility with real-mode, MS-DOS — based device drivers for which a protected-mode counterpart does not exist. This layer allows the protected-mode file system to communicate with a real-mode driver as if it were a protected-mode component. The layers above and the real-mode mapper are protected-mode code, and the real-mode mapper translates file I/O requests from protected mode to real mode, such that the MS-DOS — based device driver can perform the appropriate operation to write or read information to or from the disk device. For example, the real-mode mapper is used when real-mode disk compression software is running and a protected-mode disk compression driver is not available.

---

Note — Using MS-DOS — based device drivers can be a potential bottleneck because all I/O must be serialized. Also, because all of these VxDs must be page-locked, this increases the working set used by the operating system.

---



### I/O Supervisor and Driver Loading

The I/O Supervisor is a required system VxD that carries out all control and management tasks for the protected-mode file system and block device drivers in Windows 95. The I/O Supervisor loads and initializes protected-mode device drivers and provides services needed for I/O operations.

The I/O Supervisor receives requests from VFAT and CDFS file systems and loads the drivers for accessing local disk devices and drives, including SCSI and IDE. It supports WD1003-compatible drivers, takes control of real-mode drivers, and provides a mapper for real-mode drivers.

The real-mode mapper in the I/O Supervisor provides compatibility with real-mode MS-DOS device drivers for which protected-mode counterparts do not exist. For example, the real-mode mapper goes to work when real-mode disk compression software is running and a protected-mode disk compression driver is not available. This component ensures binary compatibility with existing MS-DOS-based disk device drivers in Windows 95.

The I/O Supervisor was first implemented in Windows 3.x as \*BLOCKDEV, and in Windows 95 it also provides \*BLOCKDEV services for older 32-bit disk access drivers. New responsibilities for the I/O Supervisor include:

n

Registering drivers

n

Routing and queuing I/O requests, and sending asynchronous

notifications to drivers as needed

# n

Providing services that drivers can use to allocate memory and complete

## I/O requests

Windows 95 loads and initializes the I/O Supervisor as specified in a *device=* entry in SYSTEM.INI. The I/O Supervisor has a low value for its initialization order, so it is initialized before clients and virtual device drivers, such as APIX and \*INT13, so clients and virtual device drivers can call services in the I/O Supervisor to register and carry out tasks.

To load and initialize port drivers, miniport drivers, and value-added drivers, the I/O Supervisor requires the files for these drivers to be stored in the SYSTEMIOSUBSYS directory with the following filename extensions.

---

PD Port drivers,  
R such as  
SCSIPT,PT,  
ESDI\_506,  
and NEC

MP Miniport  
D drivers

38 Value-  
6 added  
or drivers,  
VX such as the  
D volume  
tracker and  
vendor-  
supplied  
drivers

The SYSTEMIOSUBSYS directory is reserved for device drivers specifically designed to be used with the I/O Supervisor. Other clients or virtual device drivers should be stored in other directories and explicitly loaded using *device=* entries in SYSTEM.INI.

The I/O Supervisor initializes device drivers (as described in the following sections) from the bottom layer upwards, so port drivers are initialized before vendor-supplied

drivers, vendor-supplied drivers before type-specific drivers, and so on. Value-added drivers are initialized in groups, layer by layer, with all drivers in one layer initialized before drivers in the next layer. The initialization order within a layer is not defined, so you cannot depend on the drivers in a group being initialized in a specific order or even that the order remains between startup operations.

For Plug and Play detection, the I/O Supervisor loads a specific port or miniport driver only if the Configuration Manager requests that the driver be loaded after hardware detection locates an adapter.

## Core System Components

---

Similar to Windows version 3.1 and Windows for Workgroups version 3.1, Windows 95 includes a core composed of three components — User, Kernel, and graphical device interface (GDI).

*{ewc msdncd, EWGraphic, x0ad 8 /a "psAD.bmp"}*

Each of these components includes a pair of DLLs — one 32-bit and one 16-bit — which provide services for the applications you run. Windows 95 is designed to use 32-bit code wherever it significantly improves performance without sacrificing application compatibility. Windows 95 retains existing 16-bit code where it is required to maintain compatibility or where 32-bit code would increase memory requirements without significantly improving performance. All of the Windows 95 I/O subsystems (such as networking and file systems) and device drivers are fully 32-bit, as are all the memory management and scheduling components, including the Kernel and Virtual Memory Manager.

As shown in the following illustration, the lowest-level services provided by the Windows 95 Kernel are provided as 32-bit code to ensure a high-performance core. Most of the remaining 16-bit code consists of hand-tuned assembly language, delivering performance that rivals some 32-bit code used by other operating systems available on the market today.

*{ewc msdncd, EWGraphic, x0ad 9 /a "psAD.bmp"}*

Many functions provided by the GDI — which are mostly complex, CPU-intensive functions — are now rewritten as 32-bit code to improve performance. Much of the window management code in the User components — which are small, fast functions — remains 16-bit, thus retaining application compatibility.

Windows 95 also improves on the MS-DOS and Windows 3.1 environments by implementing many device drivers as 32-bit, protected-mode code. Virtual device drivers (VxDs) in Windows 95 assume the functionality provided by many real-mode MS-DOS-based device drivers, eliminating the need to load them in MS-DOS. This results in a minimal conventional memory footprint, improved performance, and improved reliability and stability of the system over MS-DOS-based device drivers.

The following sections describe the services provided by these core components.

The User component manages input from the keyboard, mouse, and other input devices and output to the user interface (windows, icons, list boxes, menus, and so on). It also manages interaction with the sound driver, timer, and communications ports.

Windows 95 uses an asynchronous input model for all input to the system and applications. As the various input devices generate interrupts, the interrupt handler converts these interrupts to messages and sends the messages to a raw input thread area, which in turn passes each message to the appropriate message queue. (Although each Win32-based application has its own message queue, all Win16-based applications share a common message queue.)

The Kernel provides base operating system functionality including file I/O services, virtual memory management, and task scheduling. When a user wants to start an application, the Kernel loads the EXE and DLL files for the application.

Exception handling is another service of the Kernel. EXCEPTIONS are events that occur as a program runs and that require software outside of the normal flow of control to be run. For example, if an application generates an exception, the Kernel is able to communicate that exception to the application to perform the necessary functions to resolve the problem.

The Kernel also allocates virtual memory, resolves import references, and supports demand paging for the application. As the application runs, the Kernel schedules and runs threads of each process owned by an application. The Kernel also offers debugging services.

The Kernel provides services to both 16-bit and 32-bit applications by using a translation process called THUNKING to map between 16-bit and 32-bit formats. Thunking converts a 16-bit value to its 32-bit equivalent, as illustrated in the following:

`{ewc msdn cd, EWGraphic, x0ad 10 /a "psAD.bmp"}`

### [Virtual Memory Management](#)

VIRTUAL MEMORY is a term that refers to the fact that the operating system can actually allocate more memory than the computer physically contains. Each process is allocated a unique virtual address space, which is a set of addresses available for

the process's threads to use. This virtual address space appears to be 4 GB in size — 2 GB reserved for program storage and 2 GB reserved for system storage.

The following diagram illustrates where Windows 95 system components and applications reside in virtual memory.

*{ewc msdncd, EWGraphic, x0ad 11 /a "psAD.bmp"}*

From top to bottom, here's where system and application components reside in virtual memory:

n

The Windows 95 core components and all Ring 0 components reside in the address space above 3 GB.

n

Win32-based applications reside between 4 MB and 2 GB. Each Win32-based application has its own address space, which means that other programs cannot corrupt or otherwise hinder the application, or vice versa.

n

Shared DLLs reside in the shared address space between 2 GB and 3 GB. This makes them available to all applications.

### [Windows 95 Swap File](#)

Windows 95 improves on the virtual memory swap file implementation provided in Windows 3.1, to address the problems and limitations imposed in Windows 3.1.

Under Windows 3.1, users were faced with a myriad of choices and configuration

options when it came to setting up a swap file to support virtual memory. They had to decide whether to use a temporary swap file or a permanent swap file, how much memory to allocate to the swap file, and whether to use 32-bit disk access to access the swap file or not. Users benefited from a temporary swap file in that the swap file did not need to be contiguous, and Windows allocated space on the hard disk when the user started Windows, and freed up the space when the user exited Windows. A permanent swap file provided the better performance; however, it required a contiguous block of space, had to be set up on a physical hard disk, and was statically specified by the user, so that it did not free up space when the user exited Windows.

The swap file implementation in Windows 95 simplifies the configuration task for the user and combines the best of a temporary swap file and a permanent swap file, due to improved virtual memory algorithms and access methods. The swap file in Windows 95 is now dynamic, and can shrink or grow, based on the operations that are performed on the system. The swap file can also occupy a fragmented region of the hard disk, with no substantial performance penalty hit. (The swap file can also reside on a compressed volume.)

You can still adjust the parameters used for defining the swap file in Windows 95; however, the need to do this is reduced by using system defaults. For information about swap file configuration options, see Chapter 17, "Performance Tuning."

*{ewc msdn cd, EWGraphic, x0ad 12 /a "psAD.bmp"}*

The Graphical Device Interface (GDI) is the graphical system that manages what appears on the screen. It also provides graphics support for printers and other output devices. It draws graphic primitives, manipulates bitmaps, and interacts with device-independent graphics drivers, including those for display and printer output device drivers.

### [Graphics Subsystem](#)

The graphics subsystem is a significant improvement over Windows 3.1 and provides graphics support for input and output devices.

To gain reliability and better performance, Microsoft developed a new 32-bit graphics engine (also known as the Device Independent Bitmaps, or DIB, engine). This engine directly controls graphics output to the screen, which results in more reliable system performance. It also provides a set of optimized generic drawing functions for monochrome, 16-color, 16-bit high color, 256-color, and 24-bit true color graphic devices, and supports Bézier curves and paths.

The graphics subsystem supports Image Color Matching for better color matching

between display and color output devices. With Image Color Matching in Windows 95, users can see a better match between the colors displayed on the screen and the colors printed on a color printing device. Image Color Matching is implemented as a service within Windows 95. Applications can use the corresponding APIs and DLL to take advantage of Image Color Matching features.

As with other parts of the operating system, the Windows 95 graphics subsystem includes a universal driver/minidriver model. As illustrated in the following, display drivers for Windows 3.1 included hardware-specific instructions, in addition to general instructions for the operating system. Now, all instructions about drawing to the screen or output device, and so on, are included in the universal display driver. Minidrivers for Windows 95 define only hardware-specific instructions. Minidrivers are available for most leading Super VGA adapters and graphics accelerators, including S3, ATI, Tseng, Paradise, Western Digital, and Cirrus Logic.

*{ewc msdn cd, EWGraphic, x0ad 13 /a "psAD.bmp"}*

### [Print Subsystem](#)

The 32-bit Windows 95 print subsystem improves performance through smoother background printing and faster return-to-application time. The Windows 95 spooler passes data to the printer as the printer is ready to receive more information, by using background thread processing.

Windows 95 spools enhanced metafile format (EMF) files, rather than raw printer data, to ensure quick return-to-application time (as much as two times faster than with Windows 3.1). When spooled, the EMF information is interpreted in the background, and the output is sent to the printer.

The print subsystem supports Point and Print. When users browse the network to choose the printers they want to use, Windows 95 automatically installs the appropriate printer driver from the Windows 95 or Windows NT server.

Another feature of the Windows 95 print subsystem is deferred printing. If no printing device is available where a user is working (for example, on an airplane), the user can still "print" the job. Windows 95 generates the print job, then saves it for output to the print device when one is available. Then, when the user docks the portable computer after returning to the office, the print job that was "printed" on the airplane begins generating pages at the print device.

The print subsystem also provides system-level support of bidirectional communication protocols for printers adhering to the Extended Communication Port (ECP) printer communication standard, developed by Microsoft and Hewlett-Packard. This capability allows printers to send unsolicited messages to Windows 95 and to applications. For example, the printer might send an "out of paper" or "printer offline" message. Bidirectional communication enables much more detailed status reporting on a wider variety of information, such as information telling

you the toner is low, details about a paper jam, instructions related to maintenance needs, and so on.

## User Interface

---

Windows 95 features a 32-bit user interface shell, based on Windows Explorer. This shell contains several desktop tools, including Network Neighborhood. As shown in the following figure, these tools run at the same level as other Win32-based, Win16-based, and MS-DOS — based applications.

```
{ewc msdncd, EWGraphic, x0ad 14 /a "psAD.bmp"}
```

All applications and tools can take advantage of the common controls offered by the shell, such as common dialog boxes, tree views, and list views.

## Application Support

---

Windows 95 supports Win32-based, Win16-based, and MS-DOS — based applications.

```
{ewc msdncd, EWGraphic, x0ad 15 /a "psAD.bmp"}
```

As illustrated here, Win32-based and Win16-based applications run in the System-VM. Win32-based applications each run in a separate address space, while Win16-based applications run together in a shared address space. Each MS-DOS — based application runs in its own VM.

For details about using Win32-based, Win16-based, and MS-DOS based applications in Windows 95, see Chapter 22, “Application Support.” For more information about VMs, see “Virtual Machine Manager” earlier.

```
{ewl msdncd.dll, ewcright, /c"Microsoft"}
```



## Chapter 32 Windows 95 Network Architecture

This chapter presents specific information about the architecture for the networking components in Windows 95.

### Windows 95 Network Architecture Overview

---

Windows 95 provides multiple, simultaneous connections to a variety of networks (Windows NT, Novell® NetWare®, and others) and a variety of resources (files, programs, printers, host systems, and mail systems) over most popular media (Ethernet, Token Ring, X.25, ISDN) from almost any location (office, home, or hotel).

Windows 95 networking capabilities are implemented using a high-performance, reliable, and open architecture based on the Windows Open Services Architecture (WOSA) specification. This approach provides users with a consistent interface to different services on the front end, while giving system administrators the flexibility to mix and match multiple services on the back end.

The modular networking architecture of Windows 95 is based on two industry standard models for a layered networking architecture, namely the International Organization for Standardization (ISO) model for computer networking, called the Open Systems Interconnect (OSI) Reference Model, and the Institute of Electrical and Electronic Engineers (IEEE) 802 model. Windows NT and Windows for Workgroups are also designed according to these standard models. The ISO OSI and IEEE 802 models define a modular approach to networking, with each layer responsible for some discrete aspect of the networking process.

The OSI model describes the flow of data in a network, from the lowest layer (the physical connections) up to the layer containing the user's applications. Data going to and from the network is passed layer to layer. Each layer is able to communicate with the layer immediately above it and the layer immediately below it. This way, each layer is written as an efficient, streamlined software component. When a layer receives a packet of information, it simply checks the destination address, and if its own address is not there, it passes the packet to the next layer.

When two computers communicate on a network, the software at each layer on one computer assumes it is communicating with the same layer on the other computer. For example, the Transport layer of one computer communicates with the Transport layer on the other computer. The Transport layer on the first computer has no regard for how the communication actually passes through the lower layers of the first computer, across the physical media, and then up through the lower layers of the second computer.

The OSI Reference Model includes seven layers:

{ewc msdncl, EWGraphic, x0ae 0 /a "psAE.bmp"}

n

The APPLICATION LAYER represents the level at which user applications access network services. This layer represents the services that directly support the user applications such as software for file transfers, database access, and electronic mail.

n

The PRESENTATION LAYER translates data from the Application layer into an intermediary format. This layer also manages security issues by providing services such as data encryption, and compresses data so that fewer bits need to be transferred on the network.

n

The SESSION LAYER allows two applications on different computers to establish, use, and end a session. This layer establishes dialog control between the two computers in a session, regulating which side transmits, plus when and how long it transmits.

n

The TRANSPORT LAYER handles error recognition and recovery. It also repackages long messages when necessary into small packets for transmission and, at the receiving end, rebuilds packets into the original message. The

receiving Transport layer also sends receipt acknowledgments.

n

The NETWORK LAYER addresses messages and translates logical

addresses and names into physical addresses. It also determines the route from the source to the destination computer and manages traffic problems, such as switching, routing, and controlling the congestion of data packets.

n

The DATA LINK LAYER packages raw bits from the Physical layer into

frames (logical, structured packets for data). This layer is responsible for transferring frames from one computer to another, without errors. After sending a frame, it waits for an acknowledgment from the receiving computer.

n

The PHYSICAL LAYER transmits bits from one computer to another and

regulates the transmission of a stream of bits over a physical medium. This layer defines how the cable is attached to the network adapter and what transmission technique is used to send data over the cable.

The following diagram shows the layered components that make up the Windows 95 networking model.

*Layers in the Windows 95 networking model*

`{ewc msdncd, EWGraphic, x0ae 1 /a "psAE.bmp"}`

The following sections describe these elements of the Windows 95 network architecture.

A network redirector provides mechanisms to locate, open, read, write, and delete files and submit print jobs. It also makes available application services such as named pipes and mail slots. When an application needs to send or receive data from a remote device, it sends a call to the redirector. The redirector provides the functionality of the Application and Presentation layers of the OSI model. The redirector works with IFS Manager to map local names into network devices and decides whether the application needs access to a local or remote device.

The redirectors are included in the Windows 95 network client software as the following file system drivers:

n

In Client for Microsoft Networks (VREDIR.VXD), the redirector supports all

networks based on Microsoft networking, which use the Server Message Block (SMB) file sharing protocol.

n

In Microsoft Client for NetWare Networks (NWREDIR.VXD), the redirector

supports NetWare networking products, which use the NetWare Core Protocol (NCP) file sharing protocol.

Windows 95 also supports network redirectors from other network vendors.

Because each protected-mode redirector is implemented in Windows 95 as a file system driver, the redirector is managed by the Installable File System (IFS) Manager. The IFS Manager controls file I/O transfers for all the installable file systems in Windows 95. For more information about IFS Manager, see Chapter 31, "Windows 95 Architecture."

Client for Microsoft Networks (the redirector for Microsoft networks) formats an application's request into data packet SMBs and submits the packet to the Transport Driver Interface (described in the following section). Microsoft Client for NetWare Networks (the NetWare redirector) formats requests into NCP packets. The data packet is passed by the protocol to the Protocol Manager.

The Windows 95 server side at this layer of the networking model supports peer resource sharing. Windows 95 provides two server services for peer networking:

n

File and Printer Sharing for Microsoft Networks (the Windows 95 SMB-

based server, VSERVER.VXD), which supports resource sharing among all computers on the network that use the SMB file-sharing protocol.

n

File and Printer Sharing for NetWare Networks (the Windows 95 NCP-

based server, NWSERVER.VXD), which supports resource sharing among all computers on the network that use the NCP file-sharing protocol.

To communicate with a network device, the redirector makes a call using the Transport Driver Interface to the protocol by passing a data packet to the Protocol Manager. The protocol and the network adapter driver add header information to the packet, and the network adapter driver places the packet on the network itself. This interface provides a uniform set of commands for requesting the lower-level network services. It provides interaction with the network in the same way that the BIOS provides for interaction with local hardware.

*{ewc msdn cd, EWGraphic, x0ae 2 /a "psAE.bmp"}*

### [Transport Driver Interface](#)

For communication between the Session and Transport layers of the OSI Reference Model, Microsoft developed and supports the Transport Driver Interface (TDI). On a computer running Windows 95, the server and redirector processes communicate with protocols through the TDI. TDI makes networking on Windows 95 more versatile by making it possible for different protocols and upper-level networking components to communicate using a common interface. Different protocols that conform to TDI can work with different upper-level components that also support TDI. When a

redirector or server makes a call to a protocol, it uses the TDI for the call and thus does not have to know anything about the protocols being used.

The TDI support in Windows 95 means that alternate protocols or even alternate redirectors or servers written by other network vendors that conform to TDI, will work with Windows 95. The Transport Driver Interface supports interprocess communications (IPC) mechanisms used in distributed computing, as described in “IPC and Windows 95” later.

### *Protocol Manager*

The Protocol Manager is responsible for sending information to the appropriate protocol. The protocol, in turn, manages both the quality of service and the accuracy of information. It provides a network message standard used to translate messages into information that the system recognizes.

Windows 95 can accommodate multiple protocols on a single computer and is designed to be protocol-independent, so it works the same, regardless of the protocol being used. For information about using NetBEUI, IPX/SPX, and TCP/IP with Windows 95, see Chapter 12, “Network Technical Discussion.”

### *Multiple Network Support*

---

Enterprise networks are often a conglomeration of many different types of networks and are becoming more interconnected all the time. Companies are linking their Windows-based computers to multiple PC-based network servers, mainframes and minicomputer host systems, UNIX® computers, and even a variety of services such as the Internet. The desktop operating system must meet this challenge and provide support for the disparate connectivity needs on the network.

The Windows 95 modular Network Provider Interface, as described in this section, supports concurrent communication with several different networks. For example, a computer can have connections to computers running Windows 95 peer resource-sharing services, to servers for Windows NT and NetWare networks, and to the Internet, all at the same time.

In addition to the Windows 95 network client and peer sharing components, Windows 95 supports the following network clients from other vendors:

n

Artisoft® LANtastic® version 5.0 and greater

n

Banyan® VINES® version 5.52 and greater

n

Beame and Whiteside BW-NFS 3.0c and greater

n

DEC™ Pathworks™ version 4.1 and greater (installed as a protocol)

n

DEC Pathworks version 5.0 and greater (installed as a protocol)

n

Novell® NetWare® version 3.11 and greater

n

SunSelect PC-NFS® version 5.0 and greater

n

TCS® 10-Net version 4.1 or greater

Most network clients can be installed along with any Microsoft networking component. Windows 95 does not include the supporting files for these networks; you must obtain them from the network vendor. For information about using these network clients and the required supporting files, see Chapter 10, "Windows 95 on Other Networks."

Windows 95 does include the support necessary to work with networking components from other network vendors. The network software should be installed and running before installing Windows 95, so that Windows 95 Setup can detect the network and install support for it by default. You can check this on the Network Options screen during Custom Setup.

Multiple network support in Windows 95 consists of these components, as described in the following sections:



n

Win32 WinNet API

n

Multiple provider router and service provider interface

n

Network providers (including the WinNet16 interface)

Components of multiple network support in Windows 95

`{ewc msdncl, EWGraphic, x0ae 3 /a "psAE.bmp"}`

The Win32 WinNet interface in Windows 95 provides an API that software developers can use to create single versions of applications that run unmodified on different networks. The Win32 WinNet interface is the successor to the WinNet16 interface introduced in Windows 3.0 and enhanced in Windows 3.1.

The WinNet interface is set of network-independent APIs implemented by a driver supplied by the network vendor. In Windows 95, the expanded WinNet API set includes the following:

n

Support for the Win32 WinNet APIs as defined in Windows NT. This set of functions and the other Win32 APIs provides all the commonly used capabilities required by applications.

n

An interface that allows browsing of network resources (directories, printers, and other resources). This includes consistent handling of authentication requirements across multiple networks and support for the NetWare server security model.

n

Backward compatibility with Windows for Workgroups 3.11 and support for networks that use a WinNet16 network driver.

The Multiple Provider Router in Windows 95 exports the Win32 WinNet APIs to applications. It provides seamless access to network services and resources, and it supports a way to access a single WinNet16 network driver. It routes incoming network requests to the appropriate network provider, using the same interface whether one or more network providers are installed.

Features common to all networks are implemented once in the Multiple Provider Router, which reduces the code base for each network provider and ensures common behavior among networks. For example, network providers do not implement persistent connections — this feature is implemented in the Multiple Provider Router and is entirely transparent to a network provider.

Windows 95 uses an open, modular service provider interface (SPI) to allow multiple 32-bit network providers to be installed in Windows 95 simultaneously. The service provider interface is a single, well-defined set of APIs used by Windows 95 to request network services to browse servers, connect to and disconnect from servers, and so on. The Multiple Provider Router communicates with the network providers using the service provider interface.

The service provider interface provides the needed network services to honor a Windows 95 request for network-specific services. This model is similar to the Windows 95 design for various device driver interfaces: a well-defined set of interfaces used by the operating system, with services provided by a device driver (often written by another vendor) to honor requests. These requests are then passed to the network providers.

The service provider interface enables Microsoft or any other network provider to integrate varied network services seamlessly into Windows 95. The service provider interface ensures that all supported networks are identically accessed and managed through Network Neighborhood and other user interface components.

The service provider interface consists of two parts, the service provider API and the network providers, as described in the following section.

Windows 95 uses an open, modular network provider interface to allow multiple network support simultaneously. Key benefits of the network provider interface architecture are the following:

n

An open interface allowing any network vendor to supply tightly integrated support for Windows 95.

n

Identical access and management of network resources and components through the Windows 95 user interface, including Network Neighborhood and the

### Network option in Control Panel.

The network provider interface consists of two parts—the Win32 APIs used by network providers and the network providers themselves. The network provider API calls are used by applications to request network services. When Windows 95 receives a network provider call, it passes the call to the appropriate network provider, which then supplies the requested network service.

The network provider is a network-specific driver that implements the service-provider interface call from the Multiple Provider Router. The functions provided include authenticating users when they access a network server, managing passwords, adding or removing server connections, and browsing network resources.

Windows 95 includes the following network providers:

n

MSNP32.DLL for Microsoft networks

n

NWNP32.DLL for NetWare networks

n

A network provider to support a single 16-bit network provider that uses the WinNet16 driver (WINNET16.DLL)

Windows 95 also supports any number of other 32-bit network providers. Such network providers must be supplied by other network vendors.

The Windows 95 system logon is an example of a network service provided by the network provider interface. Each network provider can provide a unique logon dialog

box to suit the needs of its network server security model. After the logon is validated by the requested server, this is passed back to Windows 95, which can then use this password to unlock any network resource linked to the logon validation. In this way, Windows 95 can accommodate the various ways that network servers provide their services, yet still offer a consistent user interface.

The following summarizes the internal processes when, for example, a user double-clicks the Entire Network icon in Network Neighborhood:

1. The Windows 95 user interface generates a Win32-based network API call to enumerate servers and resources on the network.
2. The Multiple Provider Router receives the API call and submits a service provider interface call to all the available network providers.
3. Each network provider browses its individual networks and returns the list to Windows 95, which displays all the networks and their hierarchies in the Entire Network window.

Because of the network provider support in Windows 95, users can specify server name strings in a drive connection dialog box using the syntax to which they are accustomed. A network provider knows how to correctly interpret the syntax of its own server name strings. The server name string is the syntax used by a particular network operating system to specify a shared disk resource. Microsoft network-compatible networks use the UNC format (\\SERVER\_NAME\SHARE\_NAME).

However, because the network provider knows how to interpret server name strings, users who are accustomed to using the NetWare server syntax (SERVER\_NAME/VOLUME\_NAME:DIRECTORY\_NAME) can type such server names wherever required in Windows 95 to access NetWare server resources. The Windows 95 user interface and the *net* command also support UNC names for connecting to NetWare resources.

### [Network Provider for NetWare Networks](#)

The network provider that supports NetWare networks (NWNP32.DLL and its support library, NWNET32.DLL) provides access to NCP-based NetWare network resources using Windows Explorer, Network Neighborhood, and Control Panel, and other 32-bit Windows-based applications.

#### *Basic architecture for network provider for the NetWare networks*

*{ewc msdncd, EWGraphic, x0ae 4 /a "psAE.bmp"}*

The network provider supports these functions on NetWare networks:

n

Browsing NetWare networks. Bindery-based NetWare networks (versions 2.15 and above, 3.x, and 4.x with bindery emulation) use a Server-Volume-Directory hierarchy.

n

Logging onto and off from a NetWare network, providing dialog boxes for network logon, and performing attachments to bindery-based servers.

n

Adding and removing connections, allowing remote drive and printer connections using the NetWare format (SERVER/VOLUME:) and the UNC connections to NCP-based network resources (mapped drive or printer port, and \\SERVER\SHARE).

### [Network Provider for Microsoft Networks](#)

The network provider that supports Microsoft networks (MSNP32.DLL) provides access to SMB-based Microsoft network resources using the Windows 95 user interface, such as Windows Explorer, Network Neighborhood, and Control Panel, and other 32-bit Windows-based applications.

MSNP32.DLL provides the Microsoft network-specific dialog boxes (such as the Windows NT domain logon dialog box) and code to resolve a service provider interface call from the Multiple Provider Router to a call to VREDIR (Client for Microsoft Networks).

Windows 95 architecture for the network provider for Windows networks

```
{ewc msdn cd, EWGraphic, x0ae 5 /a "psAE.bmp"}
```

Notice that there are two arrows, one going through IFS Manager and one going directly to Client for Microsoft Networks (VREDIR.VXD).

n

When a network request is for a generic function such as adding a connection, the call is submitted to the IFS Interface.

n

When a network request is specific to a redirector, such as logging on or browsing a server, the call is sent to VREDIR.VXD.

The network provider supports these functions in Windows networks:

n

Browsing Microsoft networks. Microsoft networks use either a Workgroup-Computer-Share hierarchy (for Windows for Workgroups or Windows 95 networks), or a Domain-Computer-Share hierarchy (for LAN Manager or Windows NT Server networks).

n

Logging onto and off from a Windows NT domain. The Microsoft network provider provides authentication services for validation by a Windows NT domain controller, plus the ability to change the domain password using the Passwords

option in the Windows 95 Control Panel.

n

Adding or removing connections. The Microsoft network provider allows

mapped drive and printer connections plus UNC connections to SMB-based network resources.

The WinNet16 interface is the earlier set of network-independent APIs introduced with Windows 3.0 and enhanced in Windows 3.1. WinNet16 provides simple functionality such as connecting to a drive letter or redirecting a printer port to a network printer. Windows 95 provides support for using a single WinNet16 driver.

If a network vendor provides a WinNet16 network driver developed for Windows 3.1 and has not written a 32-bit network provider and file system driver for Windows 95, using the WinNet16 interface and WINNET16.DLL is the only way to support that network in Windows 95. The WinNet16 driver that currently works with Windows 3.1 can be used without modification under Windows 95, using the WINNET16.DLL.

If Windows 95 Setup detects a Windows 3.x installation that uses a WinNet16 network driver and there is no 32-bit network provider available, Windows 95 Setup keeps the 16-bit network driver in place and provides network functionality with the 16-bit network driver installed as the primary network.

In the following example, the user has installed two Windows 95 network clients (Client for Microsoft Networks and Client for NetWare Networks) and also has installed Banyan VINES support using a WinNet16 driver.

Banyan VINES uses the StreetTalk™ syntax (FILE-SERVICE@GROUP@ORGANIZATION) to specify server names. In trying to resolve the request to connect to Docs@Marketing@Corp from a network drive connection dialog box in Windows 95, the Multiple Provider Router submits the request to all installed network providers. WINNET16.DLL receives the call and passes it on to VINES.DRV, which submits the drive connection request to the Banyan real-mode networking software through VVINESD.386.

*This example shows a network drive connection request with multiple networks*



installed.

{ewc msdncd, EWGraphic, x0ae 6 /a "psAE.bmp"}

## NDIS Protocol Overview

---

Windows 95 supports the Network Device Interface Specification (NDIS) 2.x and NDIS 3.1 protocol drivers. This section provides some technical background information about NDIS support in Windows 95.

An NDIS 2.x protocol driver must use an NDIS 2.x network adapter driver. Both protocol drivers and network adapter drivers must load and bind in real mode before launching Windows 95.

### Windows 95 architecture for NDIS 2 protocols

{ewc msdncd, EWGraphic, x0ae 7 /a "psAE.bmp"}

For NDIS 3.1 protocol drivers, the minidriver divides the existing NDIS media access control (MAC) layer into two halves and implements only the half specific to the network adapter. These include specific details such as establishing communications with the adapter, turning on and off electrical isolation for Plug and Play, providing media detection, and enabling any value-added features the adapter may contain. The NDIS wrapper implements the other half of the MAC functionality that remains common to all NDIS drivers. In earlier releases of NDIS, each adapter driver carried all this redundant code, so minidrivers are faster and are roughly 40 percent smaller than existing NDIS 3.x network adapter drivers.

### Windows 95 architecture for NDIS 3.1 protocols

{ewc msdncd, EWGraphic, x0ae 8 /a "psAE.bmp"}

## Architecture for Network Protocols

---

Windows 95 includes support for IPX/SPX-compatible protocols and NetBEUI and TCP/IP. The following sections describe how support for each type of protocol is implemented in Windows 95.

The Microsoft IPX/SPX-compatible protocol uses the NWNBLINK.VXD module to support computers that use NetBIOS over IPX and to support the NetBIOS programming interface.

### Windows 95 architecture for IPX/SPX-compatible protocol

*{ewc msdncd, EWGraphic, x0ae 9 /a "psAE.bmp"}*

The Microsoft IPX/SPX-compatible protocol is NDIS 3.1-compliant, allowing computers running Windows 95 to communicate over a routable IPX-compatible protocol. This protocol can use Novell NetWare servers configured as routers (and other IPX routers) to transfer its packets across LANs to access resources on other computers running Windows 95.

The NetBEUI protocol is implemented as both a real-mode and protected-mode protocol. The NetBEUI module, NETBEUI.VXD, is accessible through the NetBIOS-interface.

Windows 95 architecture for NetBEUI protocol

*{ewc msdncd, EWGraphic, x0ae 10 /a "psAE.bmp"}*

TCP/IP is a popular routable protocol for wide-area networks. The TCP/IP module, VTCP.VXD, is accessible through the Windows Sockets interface or through the NetBIOS interface. (Windows Sockets and NetBIOS interprocess communication mechanisms are described later.)

Windows 95 architecture for Microsoft TCP/IP

*{ewc msdncd, EWGraphic, x0ae 11 /a "psAE.bmp"}*

Architecture for Windows 95 Networking Clients

---

You can install either or both of the 32-bit, protected-mode networking clients, Client for NetWare Networks and Client for Microsoft Networks. The following sections describe the architecture for these two clients, plus the architecture for the MS-Net-compatible client for real-mode networks.

Architecture for Client for NetWare Networks with Client for Microsoft Networks

*{ewc msdncd, EWGraphic, x0ae 12 /a "psAE.bmp"}*

Windows 95 provides a 32-bit protected mode file system driver (VREDIR.VXD) to support all Microsoft networking products that use the SMB file sharing protocol. This includes LAN Manager, Windows NT, Windows for Workgroups 3.x, Workgroup Add-

On for MS-DOS, and Windows 95. Network products from other vendors using the Microsoft network standard are also supported, such as LAN Manager, IBM® LAN Server, and 3Com® 3+ Open.

Windows 95 architecture for Windows networking

{ewc msdncd, EWGraphic, x0ae 13 /a "psAE.bmp"}

NetBIOS interface.

Client for Microsoft Networks supports connectivity over any NDIS protocol that supports a NetBIOS interface and is accessible through VNETBIOS.386. The protected-mode protocols shipped with Windows 95 that support a NetBIOS interface are:

n

NetBEUI using NETBEUI.VXD.

n

NetBIOS over TCP/IP using VNBT.VXD and the TCP/IP components,

VTCP.VXD and VIP.VXD.

n

NetBIOS over IPX/SPX using NWNBLINK.VXD and NWLINK3VXD.

IPX/SPX connectivity.

Client for Microsoft Networks also supports connectivity over IPX/SPX using NWLINK.VXD without the NetBIOS interface.

You can use just Client for NetWare Networks in an environment where all that is needed is a 32-bit client to connect to existing NetWare servers (for example, if there is no need for SMB-based peer resource sharing services).

#### Architecture for Client for NetWare Networks as the sole client

{ewc msdncd, EWGraphic, x0ae 14 /a "psAE.bmp"}

For details about the architecture for Windows 95 with Novell-supplied network clients, see Chapter 9, "Windows 95 on NetWare Networks."

Windows 95 also includes a 16-bit client to support connectivity to MS-Net — compatible real-mode networks.

#### Windows 95 architecture for the real-mode MS-Net – Compatible Client

{ewc msdncd, EWGraphic, x0ae 15 /a "psAE.bmp"}

#### Real-mode redirector.

The network client supports making drive and print connections, plus named pipes, mailslots APIs, and the ability to log onto a Windows NT domain.

#### Protocols.

The real-mode redirector can work over any NDIS real-mode protocols that support a NetBIOS interface, including NetBEUI and TCP/IP. The real-mode MS-Net — Compatible Client does not support connectivity over real-mode DLC. (DLC does not support a NetBIOS interface, so the redirector cannot use DLC directly.)

#### IPX connectivity.

The redirector supports direct connectivity using the IPX/SPX-compatible protocol provided with Windows 95. NetBIOS over IPX is not required.

The MS-Net — Compatible Client uses real-mode NDIS 2 protocols for NetBEUI and IPX/SPX, and network adapter drivers use PROTOCOL.INI to store values.

#### Architecture for Peer Resource Sharing

---

Windows 95 includes components to support file and printer sharing from Microsoft networks and from NetWare networks. The following sections describe these components.

When File and Printer Sharing for Microsoft Networks is installed, the Windows 95 SMB server (VSERVER.VXD) is added to the computer's configuration. This component supports all Microsoft networking products that use the SMB file-sharing protocol.

The following illustration shows the basic supporting files for File and Printer Sharing for Microsoft Networks in the Windows 95 networking architecture.

#### *Architecture for File and Printer Sharing for Microsoft Networks*

When File and Printer Sharing for NetWare Networks is installed, Client for NetWare Networks (NWREDIR.VXD) is used to get NetWare server connection information and to enable user-level security based on a NetWare server's user accounts. The following illustration shows the supporting files for File and Printer Sharing for NetWare Networks in the Windows 95 networking architecture.

#### *Architecture for File and Printer Sharing for NetWare Networks*

`{fewc msdncd, EWGraphic, x0ae 16 /a "psAE.bmp"}`

In this configuration, the NetWare Security Provider (NWSP.VXD) assists in validating user access when sharing a resource and in retrieving a user list when administrating the server. The network component NWAB32.DLL translates the account lists from the NetWare server and provides the Add Users dialog box for selecting which users get access rights.

#### *IPC and Windows 95*

---

Windows 95 includes several mechanisms that support distributed computing. Typically, distributed computing means that a computing task is divided into two parts. The first part runs on the client computer and requires minimal resources. The other part of the process runs on the server and requires large amounts of data, number crunching, or specialized hardware.

Another type of distributed computing spreads the work among multiple computers. For example, one computer can work on a complex math problem that would take a month to complete. But with distributed computing, 50 computers could work on the math problem simultaneously so it could be completed in a less than a day.

In both cases, a connection between computers at a process-to-process level allows data to flow in both directions. Windows 95 includes the following interprocess communication (IPC) mechanisms to support distributed computing.

### NetBIOS.

Provides backward compatibility for existing NetBIOS applications. NetBIOS provides a protocol-independent way of creating sessions, datagrams, and name-resolution and management over multiple protocols. NetBIOS is supported by all three protocols in Windows 95.

### Windows Sockets.

A Windows implementation of the widely used UC Berkeley Sockets programming interface. Windows Sockets was originally designed as a vendor-independent way of accessing datagram and session services over TCP/IP and has been extended in Windows 95 to support TCP/IP and IPX/SPX.

### Named pipes.

Provides backward compatibility with existing LAN Manager installations and applications.

### Mailslots.

Provides backward compatibility with existing LAN Manager installations and applications.

### Remote Procedure Calls (RPCs).

Compatible with the Open Software Foundation (OSF) Data Communication Exchange (DCE) specification for remote procedure calls.

The following sections provide details about these IPC implementations in Windows 95.

Although TDI is the interface in Windows 95 for communication between protocols and upper-level software such as the redirector and server service, NetBIOS is also supported. The additional NetBIOS driver and DLL enable Windows 95 to be compatible with NetBIOS applications and to run software that specifically requires NetBIOS. The NetBIOS software is used only for these situations.

NetBIOS defines the interface between the redirector and the protocol layers. SMBs are passed to components at the OSI Transport layer using the NetBIOS interface. The NetBIOS interface is a set of function calls that allow an application (such as the redirector in the Windows 95 protected-mode network client) to use the services of a Transport-layer service provider. The NetBEUI protocol driver is an example of such a service provider. The protocol driver contains the actual program code that implements the service requested by the NetBIOS "command" or API call. The

NetBIOS specification also defines a protocol that can be implemented by a protocol driver to provide the services requested by applications using the NetBIOS interface (the interface between the Windows 95 redirector and one or more protocol drivers).

Many network applications use NetBIOS to send commands to the protocol driver. As long as a protocol driver recognizes NetBIOS commands issued by an application, that protocol driver can be used with any NetBIOS application. The NetBIOS interface in Windows 95 is supported by all three protocols shipped with Windows 95.

n

NETBIOS.DLL provides support for Win32-based applications that call the

NetBIOS API.

n

VNETBIOS.386 implements the NetBIOS interface for 16-bit Windows-

based applications so that computers running Windows 95 can concurrently run network-aware Windows-based and MS-DOS—based applications that use NetBIOS to communicate.

The architecture for NetBIOS over the various protocols is described with the respective protocols earlier.

Windows Sockets is a Windows implementation of the widely used UC Berkeley Sockets API, the DE FACTO standard for TCP/IP networking. Non-NetBIOS applications must be written to the Sockets interface to access Microsoft TCP/IP protocols. Applications written to the Sockets interface include FTP, SNMP, and the NetBIOS name service.

Windows Sockets in Windows 95 is a protocol-independent networking API tailored for use by programmers using the Windows family of products. Windows Sockets is a public specification that aims to do the following:

n

Provide a familiar networking API to programmers using Windows or UNIX

n

Offer binary compatibility between heterogeneous Windows-based TCP/IP stack and utility vendors

n

Support both connection-oriented and connectionless protocols

Sockets have these benefits over a NetBIOS protocol:

n

Portability. A sockets-based network application on one computer can communicate with any other computer that supports sockets.

n

Reduced overhead. Non-NetBIOS native protocols such as TCP/IP and IPX/SPX require a NetBIOS interface and mapping layer. This extra NetBIOS



software adds processing time and also adds a header to the data frame sent on the wire. A good example is NetBIOS over TCP/IP. When the NetBIOS interface is used, a NetBIOS header is added to the frame before the TCP and IP headers. Stations running just native TCP/IP cannot see this frame. When sockets are used, the frame is sent using native TCP/IP without the addition of a NetBIOS header.

In TCP/IP, the Internetwork Address is the IP address of the station and the software process address is the port number. Source and destination IP address and port numbers are fields in the TCP/IP packet structure. In IPX/SPX, the Internetwork Address is the combination of the IPX Network ID and the media access control (MAC) address of the network adapter, and the software process address is the IPX Socket number. Source network, destination network, node, and socket numbers are fields in the IPX/SPX packet structure.

---

Note — IPX Sockets are not the same as Windows Sockets. Novell uses the term “socket” to identify the individual software process address.

---

For a bidirectional path, a Windows Sockets application specifies the following, depending on the protocol.

---

TCP IP address  
/IP and port  
bidir number of  
ecti the source  
onal  
path

IPX/ Network  
SPX ID, MAC  
bidir address of  
ecti the  
onal network  
path adapter,  
IPX socket  
number

The following table describes the supporting files for 16-bit and 32-bit Windows Sockets over TCP/IP and 32-bit Windows Sockets over IPX/SPX.

### Windows Sockets Supporting Files

---

|                  |              |
|------------------|--------------|
| WI 16-<br>NS bit | Provid<br>es |
|------------------|--------------|

O Wind backw  
CK ows ard  
.D Sock compa  
LL ets tibility  
with  
existin  
g 16-  
bit  
TCP/IP  
Windo  
ws  
Socket  
s  
applica  
tions  
such  
as -

W Virtu Suppor  
SO alize ts 16-  
CK d bit  
.V Wind Windo  
XD ows ws  
Sock Socket  
ets s and  
32-bit  
TCP/IP  
and  
IPX/SP  
X  
Windo  
ws  
Socket  
s

W Wind Suppor  
ST ows ts 16-  
CP Sock bit  
.V ets Windo  
XD over ws  
TCP/ Socket  
IP1 s and  
32-bit  
TCP/IP  
Windo  
ws  
Socket

s

W 32- Suppor  
SO bit ts 32-  
CK Wind bit  
32. ows TCP/IP  
DL Sock Windo  
L et ws  
Socket  
applica  
tions  
such  
as  
and  
32-bit  
IPX/SP  
X  
Windo  
ws  
Socket  
applica  
tions

W Wind Suppor  
SI ows ts 32-  
PX Sock bit  
.V ets IPX/SP  
XD over X  
IPX/ Windo  
SPX ws  
2 Socket  
s

- 
- 1 Windows Sockets over TCP/IP are STREAMS-based over TCP and datagram-based over UDP.
  - 2 Windows Sockets over IPX/SPX are STREAMS-based over SPX and datagram-based over IPX.
- 

Most users will use programs that comply with Windows Sockets, such as *ftp* or *telnet*. If you are interested in developing a Windows Sockets 1.1 application, specifications for Windows Sockets are available on the Internet from [ftp.microsoft.com](http://ftp.microsoft.com), on CompuServe® in the MSL library, and in the MICROSOFT WIN32-SOFTWARE DEVELOPMENT KIT.

[To get a copy of the Windows Sockets specification using anonymous ftp](#)

1. Make sure you have write permission in your current working directory.

2. Start *ftp* and connect to *ftp.microsoft.com* (or *198.105.232.1*).
3. Log on as *anonymous*.
4. Type your electronic mail address for the *PASSWORD*.
5. Type *cd \advsys\winsock\spec11* and press ENTER.
6. Use the *dir* command to see the list of available file types. If you want binary data such as in the Microsoft Word version, type *bin* and press ENTER.
7. Determine the format you want for the file (for example, ASCII (TXT), PostScript® (.PS), or Microsoft Word (.DOC)), and then type *get winsock.EXT* where *EXT* is the format that you want, such as *winsock.doc* for the Microsoft Word version.

[To get a copy of the Windows Sockets specification from CompuServe](#)

1. Type *go msl* and press ENTER.
2. Browse using the keywords *windows sockets*.
3. Choose the format you want for the file (ASCII (.TXT), PostScript (.PS), or Microsoft Word for Windows (.DOC)), and then type *get winsock.EXT*.

There is also an electronic mailing list designed for discussion of Windows Sockets programming.

[To subscribe to the Windows Sockets mailing list](#)

n

Send electronic mail to *listserv@sunsite.unc.edu* with a message body

that contains *subscribe winsock USER'S EMAIL ADDRESS*.

You can use the same procedure to subscribe to two mailing lists called *winsock-hackers* and *winsock-users*.

As with Windows for Workgroups 3.11, Windows 95 supports client-side named pipes for other networks such as NetWare and VINES. Server-side named pipes are not supported.

VREDIR (Client for Microsoft Networks) makes the Named Pipes API available for

applications that use named pipes for IPC. However, VREDIR does not provide named pipes support for other networks such as Novell NetWare and Banyan VINES. A user who needs Novell NetWare or Banyan VINES named pipes support must use the real-mode TSRs and network components provided by Novell or Banyan.

Named pipes provide an easy-to-access conduit for a one-to-one, reliable, connection-oriented data transfer between two processes. These two processes are normally differentiated as a client process and a server process. The term “server” as applied to the server process in a named-pipe application does not refer to the “server service” that is a component of the network operating system, although the server service may be (but is not necessarily) involved in making the pipe available to other stations.

n

The named-pipe server process creates the pipe and manages access to

it. The resources that make up the pipe are owned by the server process and physically exist on the station where the server process is running.

n

The named-pipe client process uses the services of the underlying

network protocols to access the remote pipe resources.

Although named pipes are usually used bidirectionally, the pipe can be configured to allow communication in only one direction, such as from server to client.

A common use for named pipes is in client-server applications based on SQL. The SQL client application can be run on a computer running Client for Microsoft Networks. The Microsoft SQL Server application, however, must be set up on a LAN Manager, Windows NT, or other named-pipes server.

Mailslot APIs in Windows 95 and Windows NT are a subset of the APIs in Microsoft OS/2 LAN Manager. VREDIR (Client for Microsoft Networks) makes the Mailslots

API available for applications that use mailslots for interprocess communication.

A mailslot is similar to a named pipe except that named pipes can only be used for one-to-one communication. Mailslots can be used for one-to-one, one-to-many, many-to-one, or many-to-many communication. A mailslot can be created on any network station. When a message is sent to a mailslot, the sending application specifies in the mailslot message structure whether the message is to be sent using first-class or second-class delivery.

First-class delivery is a session-oriented, guaranteed data transfer for one-to-one or one-to-many communication. Messages designated as first-class delivery can only be sent to a mailslot that was created on a server. (Notice that Windows 95 does not use first-class messaging.)

Second-class delivery is a datagram, unguaranteed data transfer for one-to-one, many-to-one, one-to-many, and many-to-many communication. Messages designated as second-class delivery can be sent to a mailslot that was created on any station, or even on multiple stations, if the message size is 400 bytes or less.

Windows 95 and Windows NT implement only second-class mailslots, which are most useful for identifying other computers or services on a network and for wide-scale identification of a service. Windows 95 uses second-class mailslots for WinPopup messages and browsing.

Much of the original design work for an RPC facility was started by Sun Microsystems and continued by OSF as part of the overall DCE standard. The Microsoft RPC facility is compatible (but not compliant) with the OSF/DCE standard RPC. (Compliance in this case means starting with the OSF source code and building on it.) The Microsoft RPC facility is completely interoperable with other DCE-based RPC systems such as those for HP and IBM AIX® systems.

The RPC mechanism is unique because it uses other IPC mechanisms to establish communications between the client and the server. RPC can use named pipes, NetBIOS, or Windows Sockets to communicate with remote systems.

RPC is based on the concepts used for creating structured programs, which can be viewed as having a “backbone” to which a series of “ribs” can be attached. The backbone is the mainstream logic of the program, which should rarely change. The ribs are the procedures that the backbone calls on to do work or perform functions.

In traditional programs, these ribs are statically linked. By using DLLs, structured programs can dynamically link the ribs. With DLLs, the procedure code and backbone code are in different modules. The DLL can thus be modified or updated without changes to the backbone. RPC means that the backbone and the ribs can exist on different computers, which is important for distributed applications.

As shown in the following, Windows 95 provides RPC client support over the NetBIOS, named pipes, and Windows Sockets interfaces.

#### RPC client support in Windows 95

{ewc msdncd, EWGraphic, x0ae 17 /a "psAE.bmp"}

The following diagram shows how Windows 95 provides RPC server support over NetBIOS and Windows Sockets. There is no server support for RPC over named pipes. With a named pipes RPC application, the named pipes client can be run on the computer running Windows 95 but the named pipes server must be set up on a LAN Manager server or Windows NT computer.

#### RPC server support in Windows 95

{ewc msdncd, EWGraphic, x0ae 18 /a "psAE.bmp"}

{ewl msdncd.dll, ewcright, /c"Microsoft"}

## Chapter 33 Windows 95 Registry

This chapter describes the Windows 95 Registry and presents background information about the structure and contents of the Registry, how to use the information in the Registry for troubleshooting and configuration maintenance, and how values in INI files and other configuration files are stored in the Registry.

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**Caution**—Wherever possible, use the Windows 95 Control Panel tools and other administrative tools such as System Policy Editor to make configuration changes, rather than using Registry Editor. Using the administrative tools is safer because these applications know how to properly store values in the Registry. If you make errors while changing values with Registry Editor, you will not be warned, because Registry Editor does not understand or recognize errors in syntax or other semantics.

---

### *Windows 95 Registry Overview*

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Every system administrator is challenged with the huge task of managing hardware, operating systems, and applications on networked computers. The Windows 95 Registry helps simplify the support burden by providing a unified database that stores configuration data in a hierarchical form, so that system administrators can easily provide local or remote support, using the administrative tools in Windows 95.

The Windows 95 Registry is a centralized repository of information needed to set up and configure the computer. It is no longer necessary to configure the computer with the AUTOEXEC.BAT, CONFIG.SYS, and INI files.

The Registry is analogous to the INI files used under Windows 3.x, with each key in the Registry similar to a bracketed heading in an INI file, and entries under the heading similar to values in the Registry. However, Registry keys can contain subkeys, although INI files do not support nested headings. Registry values can also consist of binary data, rather than the simple strings representing values in INI files. And individual preferences for multiple users of the same computer can be stored in the Registry, which is not possible with INI files.

Although Microsoft discourages using INI files in favor of Registry entries, some applications (particularly 16-bit Windows-based applications) will continue using INI files for the time being. Windows 95 supports INI files solely for compatibility with those applications and related tools (such as setup programs). Some form of the files AUTOEXEC.BAT and CONFIG.SYS also still exist to provide compatibility with applications created for MS-DOS and Windows 3.1. New applications written for Windows 95 can store initialization information in the Registry.

The Registry provides the following in Windows 95:



n

Provides a single source for configuration information.

n

Enumerates, tracks, and configures the hardware, applications, device drivers, and operating system control parameters.

n

Allows users and administrators to configure computer options by using a standardized set of Control Panel tools and other administrative tools, reducing the likelihood of syntactic errors in configuration information.

n

Separates information related to users, applications, and computers, so that specific data for multiple users can be maintained on a single computer.

n

Provides a set of network-independent functions for setting and querying

configuration information, enabling direct examination of configuration data over a network.

n

Provides storage of system configuration information that is recoverable after system failures.

---

### *Getting Started with Registry Editor*

---

To get the most out of the material, you will want to run Registry Editor so that you can see the contents of the Registry for your computer. By default, the Registry Editor does not appear in any menu or on the desktop.

---

*Tip*—— You can add the Registry Editor icon to your desktop by right-dragging the icon from Windows Explorer to the desktop.

---

#### *To run Registry Editor*

1. Double-click the Registry Editor icon (from your desktop or from the Windows 95 directory in Windows Explorer or the My Computer window).

—— Or ——

—— From the Start menu, select Run and type *regedit*

2. When Registry Editor starts, double-click any folder icon for a Registry key to display the contents of that key.

Most simply, the Registry is a database, and Registry Editor displays the six subtrees used to access the contents of the database. The hierarchical structure that appears in Registry Editor is similar to how Windows Explorer displays hierarchical directory structures.

In this chapter, the Registry keys are described in the order that they appear in the Registry Editor windows, with an emphasis on the parts of the Registry where a system administrator might want to view or change entries. Some information is provided merely to explain what is stored in certain keys.

The contents or location of a specific Registry key may differ from what is described in this RESOURCE KIT, depending on which services and software are installed. However, the general organization described will help you understand how to

navigate the Registry.

---

Note — Most Registry entries that you might need to examine or edit are found under Hkey\_Local\_Machine\System\CurrentControlSet, described later in this chapter.

---

### How Windows 95 Components Use the Registry

---

Under versions of Windows for Workgroups 3.x, the processes of starting the computer, connecting to the network, and running applications involve multiple configuration files with some form of synchronization between them. With Windows 95, the operating system stores and checks the configuration information at only one location — the Registry.

The following figure shows how various Windows 95 components and applications use the Registry. The explanations that follow this illustration provide details.

{ewc msdncd, EWGraphic, x0af 0 /a "psAF.bmp"}

n

Whenever you run Windows 95 Setup or other setup programs for

applications or hardware, the Configuration Manager places hardware configuration data in the Registry. This information includes a list of hardware detected in your system.

n

Each time you start, dock or undock, or remove or add a Plug and Play

device on a computer running Windows 95, new configuration data is added to the Registry. For example, new information is added when you install a PCMCIA modem or change the settings for your video display.

# n

Device drivers send and receive load parameters and configuration data

from the Registry. This data is similar to what you might find on the *device=* lines in the CONFIG.SYS file under MS-DOS. A device driver must report system resources that it uses, such as hardware interrupts and DMA channels, so that the system can add this information to the Registry. Applications and device drivers can read this Registry information.

# n

System policies, user profiles, and administrative tools in Windows 95,

such as those provided in Control Panel, can be used to modify configuration data. The Registry Editor is helpful for viewing and occasionally making detailed changes to the system configuration.

A set of Registry APIs makes Registry information available through Remote Procedure Calls (RPCs) to standard Windows 95 and management tools and utilities from other vendors. This permits administrators to remotely view and modify configuration information for hardware and software components which store their information in the Registry. Notice that the Registry APIs are remotely accessible using named pipes (client-side only), NetBIOS over NetBEUI, Windows Sockets on IPX, and Windows Sockets on IP.

Because user-specific Registry information can be maintained on a central network server, a user can move from one computer to another within the workgroup and maintain all the same settings (such as desktop and network access settings). This makes the administrator's job easier because access permissions can be set once for each person, regardless of the computer used.

## *Registry Structure*

---

This section describes the hierarchical organization of the Registry and defines the overall structure of keys and value entries. Details are also provided about specific Registry keys.

The Registry is structured as a set of six subtrees of keys that contain databases specific to the computers and to the users. The computer-specific information includes information about hardware and software installed on the specific computer. The user-specific information includes the information in user profiles, such as desktop settings, individual preferences for certain software, and personal printer and network settings. In versions of Windows 3.x, computer-specific information was saved in WIN.INI and SYSTEM.INI files, but it was not possible to save separate information for individual users.

In the Windows 95 Registry, each individual key can contain data items called VALUE ENTRIES and can also contain additional SUBKEYS. In the Registry structure, keys are analogous to directories, and the value entries are analogous to files.

*{ewc msdncd, EWGraphic, x0af 1 /a "psAF.bmp"}*

The following describes the Windows 95 Registry subtrees.

#### Hkey Local Machine.

This key contains specifications for the computer, drivers, and other system settings. This is computer-specific information about the type of hardware installed, how ports are mapped, how the software is currently configured, and other information. This information is used for all users who log onto this computer.

#### Hkey Classes Root.

This key contains the same data as it did in Windows 3.1. The key contains essential information about OLE and association mappings that allow Windows 95 to support drag-and-drop operations, Windows 95 "shortcuts" (which are, in fact, OLE links), and core aspects of the new Windows 95 user interface.

#### Hkey Users.

This key contains information about all the users who log onto the computer. This key includes both user-specific information and generic user information. The generic system settings are available to all the users of the computer. The information is made up of default settings for applications, event schemes, desktop configurations, and so on.

#### Hkey Dyn Data.

This key contains the dynamic status information for various devices. It is used as part of the Plug and Play information. This information may change as new devices are added to or removed from the system. The information included for each device is the associated hardware key, any problems, and the current status of the device. This key contains subkeys for each user that logs onto this computer.

### Hkey Current Configuration.

This key points to a branch of Hkey\_Local\_Machine\Config that contains information about the current configuration of the hardware attached to the computer.

### Hkey Current User.

This key points to a branch of Hkey\_Users for the user who is currently logged on.

Each of these subtrees is described in detail later . Each of the root key names begins with "Hkey " to indicate to software developers that the key is a handle that can be used by a program. A HANDLE is a value used to uniquely identify a resource so that a program can access it.

Registry data is maintained as value entries under the Registry keys. As shown in the following figure, Registry Editor displays data in two panes. The value entries in the right pane are associated with the selected key in the left pane.

{ewc msdn cd, EWGraphic, x0af 2 /a "psAF.bmp"}

A value entry has three parts: the data type of the value, the name of the value, and the value itself, which can be data of any length. The icon beside the value name in Registry Editor shows the data type.

A value entry cannot be larger than about 64K.

The following table lists the data types currently used by the system.

---

|     |                                                                                                                                        |
|-----|----------------------------------------------------------------------------------------------------------------------------------------|
| Bin | Binary data.                                                                                                                           |
| ary | Most hardware component information is stored as binary data, and can be displayed in Registry Editor in binary or hexadecimal format: |
| Int | 13: 01                                                                                                                                 |

String A sequence  
of  
characters  
representing  
human-  
readable  
text.

BitsPerPixel  
: "8"

The Registry is logically one data store, but physically it consists of two different files to allow maximum network configuration flexibility:

n

User-specific information is contained in USER.DAT. The information in

this file is reflected in user profiles. (For more information about user profiles, see Chapter 15, "User Profiles and System Policies.")

n

Hardware-specific and computer-specific settings are contained in

SYSTEM.DAT. This information is reflected in computer profiles.

Aside from these two Registry files, system policies information (which overrides the previous two and provides user-specific and computer-specific information) is contained in .POL files and is placed in the Registry as each user logs on.

Because Registry information is in separate files, Registry components can be located in physically different locations. For example, suppose some users in your organization move from computer to computer on the network. By including SYSTEM.DAT and other Windows 95 system files on the hard disk while USER.DAT is located on the user's logon directory of the network server, a "roving" user can maintain unique network privileges and desktop configurations wherever the user

logs on. Also, by having a centrally located CONFIG.POL file, administrators can manage user privileges and configurations for an entire network.

In Windows 95, data is only written to the Registry when a FLUSH occurs — that is, when something happens after changed data has aged more than a few seconds, or when an application intentionally flushes the data to the hard disk.

Each time Windows 95 successfully starts, the operating system backs up the Registry by copying the current SYSTEM.DAT and USER.DAT files to SYSTEM.DA0 and USER.DA0, respectively. If Windows 95 fails to start, the backed-up Registry from the last successful startup can be copied over the current Registry. This method recovers the last successful settings after a system failure.

By default, these files are stored in the system subdirectory. The USER.DAT and USER.DA0 can be stored in other locations.

### *Registry Editor Advanced Features*

---

Registry Editor provides advanced features to access a remote Registry over a network and to back up and restore the Registry.

Registry Editor can be used to view or modify a Registry over a network. The remote computer requires the Microsoft Remote Registry service to enable remote Registry access. This service can be added through the Network option in Control Panel. When the remote computer is ready, the Connect Network Registry feature can be used to connect to the remote Registry. If the connection was successful, the remote computer's Registry appears.

The Registry can be saved using the Export Registry feature in Registry Editor. This saves a specific branch or the entire Registry. The exported file is saved in text format. Later, the Registry can be restored using the Import Registry feature. This rebuilds a branch or the entire Registry from an exported Registry file.

If the Registry is corrupted or the system no longer starts, Registry Editor can be run from real mode to diagnose and correct the problem. The Registry can be exported, imported, or created using Registry Editor. Examples are listed in the following table.

---



— Exports  
the entire  
Registry  
to the file

e  
e

x  
x

p  
p  
o  
o

r  
r

tt.

.r

re

eg

g

— Exports  
the key  
Hkey\_Loc  
al\_Machin  
e\System

and all its  
subkeys  
into the  
file

export  
prior

tt.

.r

re

eg

g

— Imports  
the  
Registry  
file

æ

xx

pp

oo

rr

tt.

.r

re

eg

g

— Replaces  
the  
Registry  
with  
contents

of the file

ee

xx

pp

oo

rr

tt.

.r

re

eg

g

---

Caution—Use the *regedit /c* option with extreme care, and only when you are sure that the .REG file specified contains a complete image of the Registry. The *regedit /c* option completely replaces the entire contents of the Registry.

---



In rare circumstances when the Registry is badly corrupted, you can start the computer using the Windows 95 startup disk. Then you can use the real-mode REGEDIT.EXE utility found on the startup disk to import a .REG file, or to edit a .REG file in real-mode using a text editor. The WINDOWS 95 RESOURCE KIT does not provide sufficient information to guide you through this process, so it is recommended that you undertake editing a .REG file only under the guidance of your product support representative.

### Hkey\_Local\_Machine

---

Hkey\_Local\_Machine contains the configuration data for the local computer. The information in this database is used by applications, device drivers, and Windows 95 to determine configuration data for the local computer, regardless of which user is logged on and what software is in use.

Hkey\_Local\_Machine contains seven subkeys, as listed briefly in the following table. The rest of this section describes these keys.

---

Har Information  
dw about serial  
are ports and  
modems  
used with  
the  
Terminal  
program.

Co A collection  
nfig of  
configuratio  
ns for the  
local  
computer.

En Information  
um about  
hardware  
devices on  
the system.

Net Current  
wor network  
k options.

Sof The  
twa computer-

re specific software database. This key contains data about software installed on the local computer, along with various items of miscellaneous configuration data.

Sys The system database that controls system startup, device driver loading, Windows 95 services, and operating system behavior.

The Hkey\_Local\_Machine\Hardware subtree contains information about serial ports and modems for use with the Terminal program.

The Registry can contain information about several configurations and several users. For example, it can contain information about multiple configurations which each apply to the computer at different times, such as when the computer is connected to a TCP/IP network, when it is connected to a NetBEUI network, when it

is docked, when it is undocked, and so forth.

Because Windows 95 includes an autodetection feature for Plug and Play and other hardware devices, Windows 95 automatically detects and identifies most hardware as it is added to or removed from the system. When Windows 95 encounters a new hardware configuration, it asks the user to provide a name for that configuration and adds the configuration to a configuration-mapping table. When Windows 95 checks the hardware configuration, one of three things occurs:

n

In most situations, the configuration ID is mapped to a unique configuration and Windows 95 selects the appropriate one automatically.

n

If the user is starting the computer with a new docked or undocked configuration for the first time, then Windows 95 creates a new configuration for the new configuration ID.

n

If the configuration ID is mapped to more than one configuration (for example, because Windows 95 cannot distinguish between two configurations), Windows 95 asks the user which one to use.

Hardware devices can automatically place information into the Registry using the Plug and Play interfaces. Software applications can place information in the Registry by writing to standard APIs.

Windows 95 introduces a new software device called a bus enumerator. Bus-

enumerators are responsible for building the hardware tree. The critical function of a bus enumerator is to assign an identification code to each device on its bus. The only requirement for the code is that it be unique and consistent. In addition, bus enumerators are expected to retrieve the device configuration information either directly from the device or from the Registry. The following table shows what some typical subkeys enumerate.

---

|      |             |
|------|-------------|
| ES   | Fixed disk  |
| DI   | devices     |
| FLO  | Floppy disk |
| P    | devices     |
| ISA  | Plug and    |
| PN   | Play        |
| P    | devices on  |
|      | an ISA bus  |
| Mon  | Monitor     |
| itor | devices     |
| Net  | Network     |
| wor  | devices     |
| k    |             |
| Roo  | Legacy ISA  |
| t    | devices     |

The Network enumerator does not actually enumerate network adapters, but rather the protocols and services, and the bindings between them.

For more information about bus enumeration, see Chapter 31, "Windows 95 Architecture" and Chapter 18, "Introduction to System Configuration."

Each time a user logs onto a specific computer that resides on a network, certain information regarding the network is created. This information includes the user name, logon domain, primary network provider, and whether the logon was validated by a server. All of this information exists under this subkey in the Registry.

The Hkey\_Local\_Machine\Software subtree contains specific configuration information about software on the local computer. The entries in this key, which apply for anyone using this particular computer, show which software is installed on

the computer. This key also defines file associations and OLE information. The Hkey\_Classes\_Root key is an alias for the subtree rooted at Hkey\_Local\_Machine\Software\Classes.

This key contains, for example, the information you add when registering an application to a specific filename extension, information added during installation for specific Windows-based applications, and information about applications installed with Windows 95.

The Hkey\_Local\_Machine\Software subtree contains several subkeys including the Classes and Microsoft subkeys, plus general information about the various DESCRIPTION subkeys that might appear in a Registry.

### [Classes Subkey](#)

The Classes subkey defines types of documents, providing information on filename-extension associations and OLE information that can be used by Windows 95 and OLE applications. Hkey\_Classes\_Root displays the same information as is stored under this subkey.

The Classes subkey contains two types of subkeys:

n

Filename-extension subkeys, which specify the class-definition associated with files that have the selected extension.

n

Class-definition keys, which specify the shell and OLE properties of a

class (or type) of document. These subkeys can describe shell and protocol properties for each class of document. If an application supports Dynamic Data Exchange (DDE), the Shell subkey can contain Open and Print subkeys that define DDE commands for opening and printing files, similar to the OLE and DDE information stored in the Registry database under earlier versions of Windows. In the following example, c:\windows\notepad.exe %1 is the print command, and the %1 parameter stands for the selected filename in Windows Explorer when

the command is carried out.

```
{ewc msdn cd, EWGraphic, x0af 3 /a "psAF.bmp"}
```

### Description Subkeys

The various Hkey\_Local\_Machine\Software\DESCRIPTION subkeys contain the names and version numbers of the software installed on the local computer. User-specific information about the configuration of an application is stored at the same relative path under Hkey\_Current\_User.

During installation, applications record this information in the following form:

Hkey\_Local\_Machine\Software\

The key Hkey\_Local\_Machine\Software\Microsoft and its subkey named Windows\CurrentVersion are of particular interest. These subkeys contain information about software that supports services built into Windows 95, and data about the version and type of the current release.

*Important*—The information in each subkey is added by the related application. Do not edit entries in these subkeys unless directed to do so by your application vendor.

All startup-related data that must be stored (rather than created during startup) is saved in SYSTEM.DAT. The data in Hkey\_Local\_Machine\System is organized into control sets that contain a complete set of parameters for devices and services as described in this section.

The following sections describe the Hkey\_Local\_Machine\System subkeys.

~~CurrentControl/Set Subkey~~

All of the data required to control startup is gathered into one subtree called a control set in the Registry. The control set has two parts:

n

The Control key contains various data items used to control the system, including the computer's network name and the subsystems to start.

n

The Services key contains a list of drivers, file systems, user-mode service programs, and virtual hardware keys. Its data controls the services (drivers, file systems, and so forth) to be loaded and their load order. The data in the Services key also controls how the services call each other.

#### [Control Subkey](#)

The Control subkey contains startup parameters for the system, including information about the subsystems to load, computer-dependent environment variables, the size and location of the paging files, and so forth. The following table describes the contents of some typical subkeys.

---

|         |                                                                                               |
|---------|-----------------------------------------------------------------------------------------------|
| Control | The computer's network name. This name should be set using the Network icon in Control Panel. |
|---------|-----------------------------------------------------------------------------------------------|

|             |                                           |
|-------------|-------------------------------------------|
| File System | The type and settings of the file system. |
|-------------|-------------------------------------------|

IDC The  
onfi identificatio  
gDB n and  
settings for  
the current  
configurati  
on.

Key The DLLs  
boar for the  
d keyboard  
layo language  
uts used as  
the default  
layout, plus  
the  
DosKeybC  
odes  
subkey that  
lists other  
available  
keyboard  
layouts.  
Settings for  
keyboard  
layout  
should be  
set using  
the  
Internation  
al icon in  
Control  
Panel.

Med Subkeys  
ia that  
Res contain  
ourc description  
es s and  
drivers for  
multimedia  
component  
s of the  
system.

Net The names  
wor of the keys



kPr under the  
ovid Services  
er key that  
describe  
the  
network  
providers.

Nls Information  
on national  
language  
support in  
three  
subkeys:  
CodePage,  
Language,  
and  
OEMLocal  
e.  
Preference  
s about  
language  
and locale  
in Windows  
95 should  
be set  
using the  
Internation  
al icon in  
Control  
Panel.

Perf Statistics  
Stat gathered  
s from  
various  
component  
s of the  
system.

Prin Information  
t about the  
current  
printers  
and  
printing  
environme

nt,  
contained  
in several  
subkeys:

n

Environme  
nts, which  
contains  
subkeys  
defining  
drivers and  
print  
processors  
for system  
environme  
nts.

n

Monitors,  
which can  
contain  
subkeys  
with data  
for specific  
network  
printing  
monitors.

# n

Printers,  
which can  
contain  
subkeys  
describing  
printer  
parameters  
for each  
installed  
printer.

# n

Providers,  
which can  
contain  
subkeys  
describing  
DLLs for  
network  
print  
services.

Ses Global  
sion variables  
Man used by  
ager Session  
Manager  
and these  
keys:

# n

CheckVerDLLs, which defines the directories and filenames for DLLs that might need an update.

# n

KnownDLLs, which defines the directories and filenames for all the Session Manager DLLs. These values should be maintained only by the system.

# n

Known16DLLs, which defines the directories and filenames for all Session Manager Win16-based DLLs.

Time zone information form . These settings should be set using the Date/Time icon in Control Panel.

Value indicating if Windows 95 was installed over an earlier version of Windows.

[Services Subkey for CurrentControlSet](#)

The Services subkey in CurrentControlSet lists all of the Kernel device drivers, file system drivers, and Windows 95 service drivers that can be loaded at startup. The Services subkey also contains subkeys that are static descriptions of hardware to which drivers can be attached. This table shows some typical Services subkeys for a computer running Windows 95.

---

|    |                                                                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ar | All the bit information required to manage resources between competing devices. Common arbitrators include: address, direct memory access, input/output, and interrupt request arbitrators. |
| CI | A subkey for as every class s of device the operating system supports.                                                                                                                      |
| V  | A subkey for                                                                                                                                                                                |
| x  | each virtual                                                                                                                                                                                |
| D  | device driver.                                                                                                                                                                              |

---

**Caution**—— Do not change these value entries. These settings should be maintained only by the system.

---

Settings for the drivers that appear under the Services subkeys can be changed using the Network or System icons in Control Panel, or using system policies.

The Setup subkey under Hkey\_Local\_Machine\Software\Microsoft\Windows\CurrentVersion is used internally by Windows 95 for the Setup program.

## Hkey\_Classes\_Root

---

Hkey\_Classes\_Root points to a branch of Hkey\_Users that contains information about file associations and OLE. This is the same data as in the Classes subkey under Hkey\_Local\_Machine\Software.

The sole purpose for Hkey\_Classes\_Root is to provide compatibility with the Windows 3.x registration database.

## Hkey\_Current\_User

---

Hkey\_Current\_User contains the database that describes the user profile for the user who is currently logged onto the local computer. A user profile contains information that defines the appearance and behavior of the individual user's desktop, network connections, and other environment settings. A user profile ensures that the user interface and operation of Windows 95 will be the same on any computer where that user logs on, if that person's profile is available at that computer.

Hkey\_Current\_User contains all the information necessary to set up a particular user environment on the computer. Information such as application preferences, screen colors, and security access permissions is included. Many of these settings are the same kind of information that was stored in WIN.INI file under Windows 3.x.

Hkey\_Current\_User includes the default subkeys described in the following table. For details about managing user profiles, see Chapter 15, "User Profiles and System Policies."

---

Ap Subkeys that  
pE contain the  
ve path and  
nt filename of a  
s system  
sound file  
that plays  
when a  
specific  
system  
event  
occurs.

Co Subkeys  
ntr containing  
ol Control  
Pa Panel  
ne settings.

I This includes information that was previously stored in WIN.INI and CONTROL.INI under Windows 3.x.

Ke The value  
yb entry that  
oa gives the  
rd current  
lay active  
ou keyboard  
ts layout. This value should be set by using the Keyboard icon in Control Panel.

Ne Subkeys that  
tw describe the  
or current state  
k of the  
network.

Ru Subkeys that  
n form a list of  
M the most  
R recently  
U used  
applications.

So Subkeys  
ftw describing  
ar the current  
e user's  
settings for  
installed  
software.  
This



information  
has the  
same  
structure as  
Hkey\_Local\_  
Machine\Software and  
contains  
application-  
specific  
information  
previously  
stored in  
WIN.INI or  
private  
initialization  
files under  
Windows  
3.x.

Str Subkeys for  
each of the most  
common recently  
used  
documents.  
User

Whenever similar data exists in Hkey\_Local\_Machine and Hkey\_Current\_User, the data in Hkey\_Current\_User takes precedence, as described earlier, in "Hkey\_Local\_Machine." The most significant example is environment variables, where variables defined for the user who is currently logged on take precedence over system variables, as defined by using the System option in Control Panel.

### Hkey\_Users

---

Hkey\_Users contains all actively loaded user profiles. Hkey\_Users has at least one subkey: the .Default subkey. The information in this subkey is used to create the user profile for a user who logs on without a personal user profile.

The .Default subkey contains the AppEvents, Control Panel, Keyboard layouts, Network, RunMRU, Software, and StreamMRU. To add or delete user profiles, use System Profile Editor.

### Hkey\_Current\_Config

---

This key points to the current system configuration in the collection of configurations stored in Hkey\_Local\_Machine\Config.

### Hkey\_Dyn\_Data

---

Some information in Windows 95 requires fast modification and retrieval that cannot wait for the Registry to flush to the hard disk. For this reason, some information must be stored in RAM. All this data can be found under Hkey\_Dyn\_Data.

The Hkey\_Dyn\_Data\Configuration Manager subkey, sometimes referred to as the hardware tree, is a record in RAM of the current system configuration. The information is drawn from the devices that are currently installed and loaded, or that failed loading. The hardware tree is created every time the system starts and updates whenever a change occurs to the system configuration. The information that appears in Registry Editor is provided when this key is displayed, so it is never out of date.

Hkey\_Dyn\_Data also contains statistics gathered for various network components in the system. These reside under Hkey\_Dyn\_Data\PerfStats.

### Network Settings in the Registry

---

The Registry trees for networking components are divided into network hardware, network software, and driver nodes. Windows 3.x network drivers found their parameters in either SYSTEM.INI under the [Network] section, in a private section in SYSTEM.INI, or in a private section in PROTOCOL.INI. Windows 95 is designed to allow applications to store all such settings in the Registry.

The following sections describe the general organization and content of the software and service registration information for network components, and then conclude with information about bindings for network components and dependency handling.

---

Note — The information in this section is provided for informational purposes, so that you can easily find entries in the Registry. All changes to settings for network adapters and supporting software should be made by choosing the Network option in the Control Panel, not by directly editing values in the Registry.

---

The following table describes the network component types.

---

|    |            |
|----|------------|
| Ad | A piece of |
| ap | hardware   |

ter

Dri A software  
ve component  
r associated  
directly with  
a piece of  
hardware

Tr A software  
an component  
sp used by  
ort services

Se A software  
rvi component  
ce providing  
capability  
directly to  
user  
applications

Ba A token used  
sic to represent  
a  
fundamental  
class name  
(that is, a  
class with no  
parent)

Cli A software  
en component  
t providing  
client  
support

Se A software  
rv component  
er providing  
server  
support

Each type of network component requires a subkey for both software and services.  
Therefore, the installation of a single network adapter will usually result in the  
creation of these distinct subkeys in the Registry:

n

The software registration key for a real-mode driver, found in

Hkey\_Local\_Machine\Software\COMPANY\PRODUCTNAME\Version.

n

The service registration key for the driver, found in

Hkey\_Local\_Machine\System\CurrentControlSet\Services\Class\Net.

n

The service registration key for the network adapter, found in

Hkey\_Local\_Machine\System\Enum\Root for a legacy adapter, or  
Hkey\_Local\_Machine\System\Enum\ISAPnP for a Plug and Play adapter.

Nodes are created in the Registry for the actual hardware device drivers under  
Hkey\_Local\_Machine\Enum. They are stored under either the \Root or \ISAPnP  
nodes, depending on whether they are legacy or true Plug and Play network  
adapters. These hardware nodes, in turn, point to corresponding nodes under  
Hkey\_Local\_Machine\System\CurrentControlSet\Services\Class\Net.

The System nodes residing under \Net contain loading and driver information for  
Configuration Manager plus configuration and binding information for the drivers.  
These driver nodes are named from \0000 upwards, in installation order; the  
numbering has no other meaning.

Devices and buses are grouped as classes by Plug and Play. The following table  
identifies those classes and indicates the node (of the  
System\CurrentControlSet\Services\Class node) under which driver information is  
stored. Plug and Play Networking defines classes for the following.

---

Net MAC  
drivers

Net Transport  
Tra protocols  
ns (for  
example,  
NetBEUI  
and IPX)

Net Redirectors  
Red  
ir

Net Servers  
Ser  
ver

Net Other  
Ser network  
vice services  
(such as  
Sockets  
and RPC  
runtime)

The entire structure of buses and devices is built in this way. Nodes under \Enum indicate devices or buses (real or virtual) and point to nodes under System\CurrentControlSet\Services\Class where configuration, driver, and binding information reside. The binding information may, in turn, point back to \Enum for the next level.

Information about network software devices is similar to that for network hardware and resides in Enum\Network. However, the network software device enumerator creates Registry entries during device load time, compared to the network device installer that adds entries during Setup. Each hardware entry points to its own driver section which resides under the \System\Curr\Services\Class subkey.

Windows 95 uses Class Installers to install drivers for all hardware classes. The system Plug and Play and the Device Manager send messages to the various class installers to tell them to add, remove, or configure specific hardware. The network class installer (NETDI.DLL) is provided by Windows 95 to install all network-related hardware and software components. The network installer also allows an individual driver to have its own private installer function — so that when messages are sent from the system to the network class installer, the network class installer can in turn

send specific messages to individual network driver installers. The messaging interface between the network class installer and the network driver installers is called NDI.

Each network driver resides in a subkey under the class to which it belongs. The Registry section is initially populated based on the driver install section of the INF file describing the driver. The driver subkey contains the name of the device loader for the Configuration Manager. Currently, NDIS.386 is the device loader for all network driver nodes. The device loader uses the static VxD and dynamic VxD values in determining what devices to load. If the driver has a Bindings subkey, then NDIS.386 also registers itself as an enumerator for the device and creates the new entry for the subkeys under \Bindings.

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er describe  
des s the  
cript driver.  
ion/

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i

v

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D

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S

C

A VxD  
that is  
the  
device  
loader  
for this  
node.

The  
driver  
should  
be  
NDIS.386  
unless  
your  
device  
has a  
different  
device  
loader.

+

vd



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Se

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d

e

r

/ A  
driv comma-  
er separat  
list/ ed list of  
VxDs,  
loaded  
in the  
order  
listed.

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/ The  
filen  
ame  
/

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h value is  
maintain  
ed by  
NDI and  
should  
not be  
specifie  
d in the  
INF file.

/ The  
devi device  
ce ID for  
id/ this  
driver.

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v

i

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num  
ber/  
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ae

xt

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sa

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as

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class  
only. For  
multiple-  
instance  
transport  
s,  
specifie  
s the  
maximu  
m  
number  
of  
instance  
s that  
can be  
created.

c



e

s

/ The  
dllName custom  
ame NDI  
,pro procedu  
cna re for  
me/ this  
driver.  
The  
dllName  
is  
required  
the  
default  
procna  
me is  
NdiInsta  
ller if  
none is  
specifie  
d.

i

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n  
s  
t  
a

l  
l  
e  
r

/ The  
sect  
ion  
nam  
e/

nn

ff

ss

ee

cc

tt

ii

oo

nn

value is  
maintain  
ed by  
NDI and  
should  
not be

specified in the  
INF file.

/ help  
text/

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The

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l e

pl

Trp

eT

xe

tx

t

value is  
shown  
in the  
Network  
option in  
Control  
Panel.

/ A  
driv comma-  
er separat  
list/ ed list of  
VxDs  
that are  
loaded  
staticall  
y by the  
Configur  
ation  
Manage  
r.

s  
t  
a  
t  
i



C

V

X

D

1

---

1 Statically loaded VxDs must also be stored under a

VXDNAM



subkey (where the key name is the name of the driver, usually based on the base name of the VxD file). The subkey is found under the \CurrentControlSet\Services\VxD.

---

Any number of software parameters may be saved under the driver's Registry key (for NDIS2 drivers, these are also saved in PROTOCOL.INI). The parameter descriptions are saved under the Ndi\Params subkey; their current values are saved at the root of the driver key.

The Hkey\_Local\_Machine\System\CurrentControlSet\Services subkey is the service registration area that contains the information used to load a network component into memory. These subkeys contain certain required information, such as the location of the executable file, the service type, and its start criterion.

Each network component's software registration information (as described in the previous section) contains the name of the service corresponding to the network component. This name acts as a symbolic link to the CurrentControlSet\Services parameters.

Some network components are actually sets of services, each of which has its own subkey in the Services subkey. There is usually a "main" service, with the other services listed as its dependencies.

TCP/IP and the IPX/SPX-compatible protocol (NWLink) can have multiple network address interfaces. Such protocols are installed as two separate instances in the Network subkey. In this way, two interfaces can have independent, upper-level bindings to the redirectors, servers, and sockets.

The network driver installer uses upper and lower interfaces to describe the possible relations between the layered drivers in the network system. The lower interface is the software or hardware interface with which the driver communicates. For example, a network adapter driver might talk to ethernet or tokenring. The upper interface is the software interface that the driver provides. For example, an NDIS 3.1 network adapter driver provides ndis3 as an upper interface; an NDIS 3.1 transport

driver has ndis3 as a lower interface and might provide netbios or ipx as its upper interface.

The following interface names are predefined to cover the most common interfaces; however, any string of alphanumeric characters is a legal interface name.

---

eth Lower edge  
ern for an  
et Ethernet  
network  
adapter

tok Lower edge  
enri for a Token  
ng Ring  
network  
adapter

seri Lower edge  
al for a serial  
network  
adapter

fddi Lower edge  
for an FDDI  
network  
adapter

bas Lower edge  
eba for a  
nd baseband  
network  
adapter

bro Lower edge  
adb for a  
and broadband  
network  
adapter

arc Lower edge  
net for a  
DataPoint  
ArcNet  
network  
adapter

odi ODI

|            |                                                                            |
|------------|----------------------------------------------------------------------------|
| ndis2      | NDIS 2.1                                                                   |
| ndis3      | NDIS 3.X                                                                   |
| netbios    | NetBIOS                                                                    |
| ipx        | IPX                                                                        |
| tcp        | TCP/IP                                                                     |
| winsock    | Windows Sockets interface                                                  |
| winnet31   | Upper edge for a Windows 3.1 compatible WinNet driver                      |
| multinet31 | Upper edge for a Windows for Workgroup's multinet-compatible WinNet driver |
| winnet4    | Upper edge for a Windows 95 network provider                               |

NDI matches the upper and lower interfaces of a driver to validate bindings between drivers. In addition, NDI also checks for other required or excluded interfaces down the chain of bound drivers and in the entire network subsystem.

The binding information, contained in a \Bindings subkey from each of the driver nodes, points back to one or more protocol buses, under Hkey\_Local\_Machine\Enum\Network. This is a private area in the Registry for all

networking virtual buses and devices, but is otherwise analogous to Hkey\_Local\_Machine\Enum\Root or \ISAPnP.

### *Initialization Files and the Registry*

---

Although the Registry replaces the INI files used in versions of Windows 3.x, some INI files still appear in the Windows 95 system directory. Also, applications created for 16-bit Microsoft Windows must still be able to read and write INI values that previously were stored in WIN.INI or SYSTEM.INI. For information about how Windows 95 uses MS-DOS configuration files, see Chapter 6, "Setup Technical Discussion."

When you install a Win16-based application, the application's Setup program creates its own INI file or creates entries for the WIN.INI or SYSTEM.INI file in the same way that it does for any versions of Windows for MS-DOS. These entries are not updated in the Registry, because these applications do not know how to access the Windows 95 Registry. For this reason, basic SYSTEM.INI, WIN.INI, and WINFILE.INI files appear in the Windows 95 directory.

If you install Windows 95 as an upgrade over Windows 3.1, some of the settings from various initialization files are copied into the Registry, including CONTROL.INI, PROGMAN.INI, SYSTEM.INI, WIN.INI, and others. Some INI file entries are not migrated into the Registry, but continue to reside in the INI file for compatibility with applications written for earlier versions of Windows. All of these entries are manipulated through graphical tools provided with Windows 95. This allows INI entries to change without editing the INI file.

In addition, some INI file entries are not migrated into the Registry and cannot be set using the Windows 95 user interface. These entries are required for some applications to function properly, but should not ever need direct modification from a user.

The following sections include tables that show where system settings are saved in the Registry, in comparison to initialization files used with Windows 3.1 for MS-DOS.

Windows 95 migrates settings from configuration files into the Registry during Setup. The following table describes WIN.INI entries migrated to the Registry.

#### *Registry Paths for Migrated WIN.INI Sections*

---

[d Grid \Control  
es Gra Panel\D  
kto nula

p] rityesktop

[d Patt \Control  
es ern Panel\D  
ktoesktop  
p]

[d Tile \Control  
es Wall Panel\D  
kto papesktop  
p]er

[W Scre \Control  
ind enS Panel\D  
ow aveesktop  
s] Acti  
ve

[W Scre \Control  
ind enS Panel\D  
ow aveesktop  
s] Tim  
eout

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un ents\Sc  
ds] hemes\  
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Applets  
\Hearts

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e

The following tables describe WIN.INI entries retained for compatibility with applications written for earlier versions of Windows.

[Intl] Entries in WIN.INI Retained and Supported in the User Interface<sup>1</sup>

iC iM s23 sList  
ou ea 59  
ntr sur  
y e

iC iNe sCo sSh  
urr gC untr ortD  
Di urr y ate  
git



s

iC iTi sCu sLo  
urr me rren ngD  
en cy ate  
cy

iD iTL sLa sTh  
at Zer ngu ous  
e o age and

iDi s11 sDe sTi  
git 59 cim me  
s al

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Ze  
ro

---

1 Registry Path = Hkey\_Current\_User\Control Panel\International

---

Entries in WIN.INI Retained and Supported in the User Interface

[fonts  
]  
secti  
on:

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[port  
s]  
secti  
on:

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[Print  
erPor  
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[Win  
dows  
]  
secti  
on:

Curs Dou Mou  
orBli bleCl seSp  
nkRa ickS eed  
te peed

Devi Keyb Mou  
ce oard seTr  
Dela ails  
y

Doub Keyb Swa  
leClic oard pMo  
kHei Spee useB  
ght d utton  
s

Doub  
leClic  
kWid  
th

Entries in WIN.INI Retained but Not Supported in the User Interface

[embeddin  
g] section:

# O

b

j

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c

t

[FontSubst  
itute]  
section:

f

o

n

t-

n



a

m

e

=

f

o

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n

a

m

e

[Mail]  
section:  
MAPI

[mci  
extensions  
] section:

e

x

t  
e  
n  
s  
i

O

n

[Windows]  
sections:  
Load and  
Run

The following table describes SYSTEM.INI entries migrated to the Registry.

Registry Paths for Migrated SYSTEM.INI Entries

---

Main ...  
tainS \Services\  
erver VxD\VNET  
List SETUP1

Rec ???  
onne  
ct

Res ???  
hare

Logo \Network\L  
nDo ogon  
main

Logo \Network\L  
nVali ogon  
date  
d

Com ...  
ment \Services\  
VxD\VNET  
SETUP1

LMA ...  
nnou \Services\  
nce VxD\VNET  
SETUP1

User Hkey\_Loc  
nam al\_Machin  
e e\  
Network\L  
ogon

Wor ...  
kGro \Services\  
up VxD\VNET  
SETUP1

Ena ...  
bleS \Services\  
harin VxD\VNET  
g SETUP1

Com ...  
puter \Control\C  
Nam omputerN  
e ame\Com  
puterNam  
e

—

Tran ...  
sport \Services\  
SETUP1

VxD\ t

r

a

n

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p

o

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n

t

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y<sup>1</sup>

Netw ...  
ork \Services\  
VxD\VNET  
SETUP1

---

1 Full Registry path = Hkey\_Local\_Machine\Software\Microsoft\Windows\Current  
Version

---

The following tables describe SYSTEM.INI entries retained for compatibility with  
applications written for earlier versions of Windows.

SYSTEM.INI Entries Retained and Supported in the User Interface

AlIEMS KeyPast  
Locked eSkipCo  
unt

AlIXMS KeyPast  
Locked eTimeo  
ut

AltKey MaxDM  
Delay APGAd  
dress

AltPast MaxPag  
eDelay ingFileS  
ize

DMAB MinUser  
ufferSi DiskSpa  
ze ce

Display Mouse

DOSPr Paging  
omptE  
xitInstr  
uctions

Keybo Paging  
ard Drive

KeyPa ScrollFr  
steCR equency  
SkipCo  
unt

KeyPa  
steDel  
ay

—

DISPL SOUND  
AY.DR .DRV  
V

KEYB NETWO  
OARD. RK.DRV  
DRV

MOUSE.DRV

CommandEnvironmentSize

Entries in SYSTEM.INI Retained but Not Supported in the User Interface

NetAsyncTimeout

D

e

v

i

c

e

=

f

i

l  
e  
n  
a  
m

e

Local NetAsyn  
chFallba  
ck

Local NetDMA  
Reboot Size

Messa KeybdP  
geBac asswd  
kColor

Messa  
geText  
Color

386gra languag  
bbe e.dll=

rli

=b

fr

ia

lr

ey

nr

an

na

em

e

comm. oemfont  
drv= s.font=

f f



i il

l e

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na

am

ne

e

drivers shell=

=f

fil

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ln

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nm

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m

e

fixedfo system.  
n.fon= drv=

ff

i il

l e

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na

am

ne

e

fonts.fo TaskMa  
n= n.Exe=

ff

i il

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*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Chapter 34 International Windows 95*

This chapter summarizes information about local editions and multilanguage support for Windows 95, and provides technical details about defining regional settings in setup scripts.

### *Overview of Windows 95 Local Editions*

---

Windows 95 is being made available in at least the following local versions: German, French, Spanish, Swedish, Dutch, Italian, Norwegian, Danish, Finnish, Portuguese, Japanese, Chinese, Korean, Russian, Czech, Polish, Hungarian, Turkish, Greek, Arabic, Basque, Hebrew, Thai, Indonesian, and Catalan, and several variations of these languages.

For information about ordering a local edition of Windows 95, ask your software vendor, or contact your local Microsoft subsidiary office.

The WINDOWS 95 SOFTWARE DEVELOPMENT KIT and the Microsoft Developer Network provide complete information about the architecture, application programming interfaces (APIs), and other support for developers who are creating or modifying applications to run under local editions of Windows 95. For information about joining the Microsoft Developer Network, see Appendix J, "Windows 95 Resource Directory."

The WINDOWS 95 RESOURCE KIT is being made available in at least the following local versions: Croatian, French, German, Italian, Japanese, Portuguese, Slovenian, Spanish, and Swedish. For information about ordering a local edition of this book, ask your local bookseller, or contact your local Microsoft subsidiary office.

Another publication from Microsoft Press, DEVELOPING INTERNATIONAL SOFTWARE FOR WINDOWS 95, by Nadine Kano, provides details about using the Windows 95 NLS APIs and other information about developing software for use in multiple locales. To order this publication (ISBN 1-55615-840-8), contact your local bookstore. You can also order it directly in the United States by calling (800) 677-7377 or through CompuServe® (GO MSP).

### *Overview of International Language Support*

---

Windows 95 offers international language support at the operating system level for users, and at the API level for software developers to provide solutions to problems using software and exchanging documents among different locales and languages. This section summarizes the built-in international support for using Windows 95 on a worldwide basis, and the special provisions that Windows 95 provides for enhancing existing or new applications for use in different parts of the world.

Easy to use multiple language fonts and keyboard layouts.

It's easy to use multiple language fonts and character sets, and easy to switch between the different keyboard layouts required to support them. With Windows 95, users can easily switch between all available languages and corresponding keyboard layouts configured on their system by using a key combination. In turn, this makes it easy for users to integrate information into a multilingual document. The Keyboard icon in Control Panel can be used to configure Windows 95 to support preferred keyboard layouts, and the common Choose Font dialog box in applications created for Windows 95 includes a list box that shows the character set scripts (such as "Greek") supported by a particular font. For more information, see "Using Multilingual Fonts" and "Using Alternate Keyboards" later in this chapter.

*Substitution for unavailable fonts when switching languages.*

When switching between different languages in a document, Windows 95 substitutes matching fonts for the new language if the original font is not available. Users can read and use the text for a similar character set, even if they don't have the font in which the information was originally created.

*Preservation of language-specific attributes by Clipboard.*

Windows 95 provides additional services for application vendors to easily exchange information between internationally-aware applications, while preserving all language formatting characteristics.

*Easy addition of multilanguage support for software developers.*

Developers can use the Win32 National Language Support (NLS) APIs for sorting, searching, and manipulating information in a locale-independent way. NLS services in Windows 95 ensure that information is handled properly for the given culture or locale by providing generic support for date, time, calendar, number, and currency formats, plus sorting, character typing, and character mapping. The correct national format for information such as date format or sorting sequence is supplied automatically, based on the settings specified in the Regional Settings option in Control Panel. Win32-based applications can use Windows 95 services to automatically switch between the proper fonts and keyboard layouts as users navigate through a multilingual document. For more information, see "Using Windows 95 Multilingual Support" later in this chapter.

*Proper sorting and formatting rules for the current locale.*

Different locales and cultures have different rules for interpreting information, such as algorithms for sorting or searching, and formats for time and dates. Software developers can use the Win32 NLS APIs to check and use the user's default locale settings or to use a specific locale setting, without using proprietary sorting methods or parsing the WIN.INI file or Registry, and without locale-specific coding. This allows users to easily exchange information on a global basis, while preserving the integrity of the information. For example, the multilingual support in Windows 95 can be used in applications to account for these kinds of differences among language rules:

n

In French, diacritics are sorted from right to left instead of from left to right as in English.

n

In Norwegian, some extended characters follow the Z character as they are considered unique characters rather than characters with a diacritic.

n

In Spanish, CH is a unique character between C and D, and Ñ is a unique character between N and O.

### *Specifying Regional Settings*

---

During Windows 95 Setup, the operating system is configured for a default locale, either based on settings that Setup detects from the previous operating system or based on options that the user chooses. Windows 95 Setup also copies most international information for all other supported locales onto the user's hard disk drive, where applications can access them. The exception is the code page conversion tables, which are large. Setup only copies code page conversion tables for the initial default code page. Additional code pages are installed if the user installs alternate keyboards, as described later in this chapter.

The following sections describe how to specify regional settings and multilingual support in Setup, and how to change settings after Windows 95 is installed. This section also describes how to define locale-specific settings in custom setup scripts.

There are several points in Windows 95 Setup at which you can define locale-specific settings and multilingual support for Windows 95:

n

If you choose to select the Windows 95 components to be installed,

instead of accepting the default, you can choose to install Multilingual Support by selecting this component under the Accessories options on the Select Components screen. This feature is described in “Using Windows 95 Multilingual Support” later in this chapter.

n

If you are running Custom Setup, you can specify the following settings on

the Computer Settings screen:

n

Keyboard Layout, for selecting the default keyboard to be used with

Windows 95, based on local requirements.

==>{ewc msdncd, EWGraphic, x0ag 0 /a "psAG.bmp"}

n

Regional Settings, for specifying the local language and, in turn, the

local conventions for other settings such as date, time, and currency formats.

==>{ewc msdncd, EWGraphic, x0ag 1 /a "psAG.bmp"}

Each of these settings can be changed after Windows 95 is installed, or can be configured by defining options in custom setup scripts, as described in the following sections.

If user profiles are enabled (as described in Chapter 15, "User Profiles and System Policies), the regional settings preferences in Windows 95 can be saved in each user's profile. In this case, if a single computer is used by multiple users, each user can select a different default locale.

To change any locale preferences after Windows 95 is installed, use the Regional Settings option in Control Panel.

*{ewc msdncd, EWGraphic, x0ag 2 /a "psAG.bmp"}*

The Regional Settings option in Control Panel (equivalent to country settings in earlier versions of Windows) sets the default user formats for date, time, currency, and numbers. Users can also customize these formats. The language setting defined on the Regional Settings tab determines the ACP (the local Windows code page), OEMCP (the MS-DOS — based code page), case conversion tables, and sorting tables.

The Windows 95 keyboard layout setting is made using the Keyboard option in Control Panel, as described in "Using Alternate Keyboards" later in this chapter.

#### [To change regional settings in Windows 95](#)

*{ewc msdncd, EWGraphic, x0ag 3 /a "psAG.bmp"}*

1. Double-click the Regional Settings icon in Control Panel.
2. Click a tab to define settings for that property, as summarized in the following list. When all settings are as you want them, click OK.

---

R Specifies  
eg the locale  
io you want,  
na to  
l automatical  
Se ly define  
tti how dates,  
ng times,  
s currency,

and  
numbers  
are  
displayed  
and sorted.

N Specifies  
u how  
m numbers  
be are  
r displayed,  
including  
the decimal  
character  
used, how  
digits are  
grouped,  
how  
negative  
numbers  
are shown,  
and the  
measurem  
ent system  
used.

C Specifies  
urr how  
en currency is  
cy displayed,  
including  
the decimal  
character  
used, how  
digits are  
grouped,  
and how  
negative  
values are  
shown.

Ti Specifies  
m how time is  
e displayed,  
the hour  
and minute  
separator,

and how  
morning  
and  
afternoon  
times are  
designated  
.

D Specifies  
at the  
e calendar  
type, how  
short and  
long dates  
are  
displayed,  
and the  
character  
used as  
the  
separator  
between  
the day,  
month, and  
year.

===={ewc msdncd, EWGraphic, x0ag 4 /a "psAG.bmp"}

You can specify values in the [System] section of a custom setup script (such as MSBATCH.INF) to define regional settings other than the default for batch installations.

To specify the regional setting in MSBATCH.INF, set */locale=* in [System] to a value listed in the [LocaleList] section of LOCALE.INF. The following table shows the values for regional settings that are available in the United States edition of Windows 95. For localized editions of Windows 95, check LOCALE.INF entries for Eastern European, Far Eastern, Middle Eastern, and Thai values.

---

|       |   |         |    |
|-------|---|---------|----|
| Afrik | L | Fren    | L1 |
| aans  | 0 | ch      | 40 |
|       | 4 | (Luxe C |    |
|       | 3 | mbou    |    |
|       | 6 | rg)     |    |



Basq L Germ L0  
 ue 0 an 40  
 4 (Stan 7  
 2 dard)  
 D

Catal L Germ L0  
 an 0 an 80  
 4 (Swis 7  
 0 s)  
 3

Dani L Germ L0  
 sh 0 an C  
 4 (Aust 07  
 0 rian)  
 6

Dutc L Germ L1  
 h 0 an 00  
 (Stan 4 (Luxe 7  
 dard) 1 mbou  
 3 rg)

Dutc L Germ L1  
 h 0 an 40  
 (Belg 8 (Liec 7  
 ian) 1 htens  
 3 tein)

Engli L Icela L0  
 sh 0 ndic 40  
 (Unit 4 F  
 ed 0  
 State 9  
 s)

Engli L Indon L0  
 sh 0 esian 42  
 (Briti 8 1  
 sh) 0  
 9

Engli L Italia L0  
 sh 0 n 41  
 (Aust C (Stan 0  
 ralian 0 dard)  
 ) 9

Engli L Italia L0  
sh 1 n 81  
(Can 0 (Swis 0  
adian 0 s)  
) 9

Engli L Norw L0  
sh 1 egian 41  
(New 4 (Bok 4  
Zeal 0 mal)  
and) 9

Engli L Norw L0  
sh 1 egian 81  
(Irela 8 (Nyn 4  
nd) 0 orsk)  
9

Engli L Portu L0  
sh 1 gues 41  
(Sout C e 6  
h 0 (Braz  
Afric 9 ilian)  
a)

Finni L Portu L0  
sh 0 gues 81  
4 e 6  
0 (Stan  
B dard)

Fren L Span L0  
ch 0 ish 40  
(Stan 4 (Trad A  
dard) 0 itiona  
C I  
Sort)

Fren L Span L0  
ch 0 ish 80  
(Belg 8 (Latin A  
ian) 0 Amer  
C ican)

```

Fren L Span L0
ch 0 ish C
(Can C (Mod 0
adian 0 ern A
) C Sort)

Fren L Swed L0
ch 1 ish 41
(Swis 0 D
s) 0
C

```

Values listed in the [LocaleList] section of MULTILING.INF specify the particular keyboard for a regional setting. Use one of the following strings to define the keyboard=VALUE in the [System] section of MSBATCH.INF (or a similar file).

---

## Belgian

```

KEY
BOA
RD_
0000
080C

```

```

Brazil KEYBOA
ian RD_0000
0416

```

```

Britis KEYBOA
h RD_0000
0809

```

```

Cana KEYBOA
dian RD_0003
Multil 0C0C
ingua
l

```

```

Dani KEYBOA
sh RD_0000
0406

```

```

Dutc KEYBOA
h RD_0000
0413

```

```

Finni KEYBOA

```

sh RD\_0000  
040B

Fren KEYBOA  
ch RD\_0000  
040C

Fren KEYBOA  
ch RD\_0000  
Cana 0C0C  
dian

Germ KEYBOA  
an RD\_0000  
0407

Icela KEYBOA  
ndic RD\_0000  
040F

Italia KEYBOA  
n RD\_0000  
0410

Latin KEYBOA  
Amer RD\_0000  
ican 080A

Norw KEYBOA  
egian RD\_0000  
0414

Portu KEYBOA  
gues RD\_0000  
e 0816

Span KEYBOA  
ish RD\_0000  
0C0A

Swed KEYBOA  
ish RD\_0000  
041D

Swis KEYBOA  
s RD\_0000  
Fren 100C  
ch

Swis KEYBOA

s RD\_0000  
Germ 0807  
an  
  
Unite KEYBOA  
d RD\_0000  
State 0409  
s  
  
Unite KEYBOA  
d RD\_0002  
State 0409  
s-  
Dvor  
ak  
  
Unite KEYBOA  
d RD\_0001  
State 0409  
s-  
Inter  
natio  
nal

For more information about creating custom setup scripts, see Chapter 5, “Custom, Automated, and Push Installations.”

### *Using Windows 95 Multilingual Support*

---

This section describes how to install and use the multilingual support in Windows 95, with specific information about how to use alternate keyboards, plus details about support for local conventions in Windows 95. The topics include the following:

n Using multilingual fonts

# n

Using alternate keyboards

# n

Using Windows 95 support for local conventions

# n

Searching and sorting with multilingual support

For users such as translators who create or edit multilingual content in their documents, a Win32-based application that uses the international services in Windows 95 can automatically activate the correct fonts and corresponding keyboard layouts for editing specific text within a document.

Win32-based applications can indicate the language used in chunks of text in a document by tagging the text with a locale ID. For example, Word will automatically use the spelling checking, thesaurus, hyphenation engine, and grammar checking programs associated with the language of the text it is checking, if they are available. Word also formats dates according to the language of the text. Applications that use locale IDs can determine date, time, currency, and number formats, and sorting behavior, and can use these locale IDs to determine which keyboard layout and fonts to use for entering and displaying text in a particular language.

To take advantage of the multilingual font capabilities in Windows 95:

# n

Make sure your application uses the Win32 NLS APIs. For information, check you application documentation or contact the software manufacturer.

# n

Install multilingual support under Windows 95, as described in this section.

# n

Use the application's dialog boxes for selecting language-related font attributes and for specifying the language attributes of selected information.

You can install multilingual support during Setup, as described earlier in this chapter, or you can install it later using Control Panel. For information about creating a document that contains multilingual text, see "Using Alternate Keyboards."

### [To install multilingual support](#)

1. In the Add/Remove Programs option in Control Panel, click the Windows Setup tab.
2. In the Components list, click Accessories, and then click the Details button.
3. In the Components list in the Accessories dialog box, click Multi-Language Support, and then click OK. You must restart your computer for this option to take effect.

The Windows 95 compact disc includes TrueType fonts that contain characters for all the Western European and Eastern European languages. After you install multilingual TrueType font support, you can access the complete set of 652 characters in applications that support these fonts, such as WordPad. This allows for

proper presentation of fonts for a given language.

An application that uses the common Choose Font dialog box can allow users to select from all the character sets and fonts configured in the system. The Script box in this common dialog box allows the user to choose the characteristics related to the language of the text being formatted. For example, depending on the character set and the locales available on a particular computer, the Script box could allow the user to choose from Western, Greek, Cyrillic, or Turkish characteristics for the selected typeface. Of course, the user must choose the appropriate keyboard for using related text characters, as described in the following section.

#### [To access multilingual TrueType fonts in WordPad](#)

1. In the Format menu in your application, click Font.
2. In the Font dialog box, select a font characteristic for the language in the Scripts box, and then click OK.

—{ewc msdncd, EWGraphic, x0ag 5 /a "psAG.bmp"}

If you are using an application that supports tagging text for alternate locales or languages, you can use alternate keyboards to easily create documents that contain more than one language. The following are the key features you use to take advantage of multilingual support in documents:

n

The Keyboard option in Control Panel, where you define the alternate

keyboards you want to make available from the desktop

n

The keyboard icon on the Windows 95 taskbar



# n

The language tagging feature in your application

## [To select the alternate keyboards you want to use in Windows 95](#)

1. In the Keyboard option in Control Panel, click the Language tab.
2. To add another keyboard, click the Add button.
3. In the Add Language dialog box, select the alternate keyboards that you want to install, and click OK.

===={ewc msdncd, EWGraphic, x0ag 6 /a "psAG.bmp"}

4. Optionally, if you need to change the default language, select the one you want in the Language list, and click the Set as Default button.

5. To specify the key combination that you will use to switch between keyboards, click one of the Switch Languages options.

===={ewc msdncd, EWGraphic, x0ag 7 /a "psAG.bmp"}

When you want to switch keyboards while working in an application such as WordPad that can take advantage of multilingual support, use the key combination specified in the Keyboard option in Control Panel. Or you can use the Windows 95 taskbar.

## [To switch keyboard using the Windows 95 taskbar](#)

1. Click the keyboard icon on the taskbar.
2. In the menu that appears, click the language you want to use.
3. Continue typing using the selected language. Use the same process to return to your default keyboard or to switch to another keyboard.

The icon for switching keyboard layouts appears at the right end of the taskbar.

{ewc msdncd, EWGraphic, x0ag 8 /a "psAG.bmp"}

If your application uses the NLS API, you may be able to specify that rules for sorting, searching, spelling, and other actions be used for the portion of text entered using that language. Applications that use the NLS API can distinguish between the default locale the user has set for Windows 95 and the language of text in a

document. For example, Microsoft Word 6.0 for Windows makes language a text property. Just as users can format selected text as bold, italic, or double spaced, they can format selected text as being in a specific language, as shown in the following illustration.

*The Tools Language dialog box in Microsoft Word 6.0 for Windows*

*{ewc msdncd, EWGraphic, x0ag 9 /a "psAG.bmp"}*

Windows 3.x provided 22 pieces of locale-related information in the [Intl] section of WIN.INI. The Windows 95 Registry, which contains more than 90 locale-related strings, is far more comprehensive. In addition, the Win32 NLS API allows each application to request information for any locale, whereas Windows 3.x limited all applications running on the system to the settings of the current default locale.

Cultural conventions are ways of formatting information specific to a language, local dialect, or geographic location. Examples are currency symbols, date formats, calendars, numerical separators, and sorting orders. A great deal of linguistic research went into creating the collection of locale information in the Windows 95 Registry and into creating the algorithms and tables used by the NLS API, including support for local formats for date, time, calendars, currency, and numbers.

The Windows 95 default date or time formats are the most commonly used formats for each locale, but applications can provide support for other local conventions. For example, some languages, such as German, Polish, Russian, or Finnish have several forms for each noun. Windows 95 carries both the nominative and genitive forms of Russian and Polish month names; the form changes depending on the month name's position in the string relative to the day name. Windows 95 only carries one form of each month or day name for all other languages.

*The Insert Date and Time dialog box from WordPad*

*{ewc msdncd, EWGraphic, x0ag 10 /a "psAG.bmp"}*

Most locales use the Gregorian calendar, but some editions of Windows 95 also support Japanese, Taiwanese, Korean, Hijri (Middle East), and Thai calendars. (Windows 95 will add support for more calendars in the future as necessary.) Although calendars in the United States list Sunday as the first day of the week, calendars in other countries, such as Germany, list Monday as the first day of the week. Similarly, not all cultures assume that the week containing January 1 is the first week of the year. The calendar type that Windows 95 assigns to each locale accommodates such cultural preferences.

Currency and number formats also vary among locales. Reformatting a number based on the locale involves more than changing the currency symbol or the decimal

separator. A currency symbol may come before the numerical quantity or it may come after. It may or may not be separated from the number by spaces. The currency symbol may be one, two, or more characters. In addition, if a currency amount is negative, Windows 95 may format it in one of 16 different ways.

As an example of how developers of applications created for Windows 95 can take advantage of multilingual support, the designers of the 32-bit full-text search engine for Microsoft WinHelp created global code for parsing, searching, and sorting data using the NLS APIs. The engine manipulates data in Unicode.

*The Microsoft WinHelp full-text search window*

`{ewc msdncd, EWGraphic, x0ag 11 /a "psAG.bmp"}`

The WinHelp search engine compares a word or phrase typed by the user against all the words contained in a set of articles, which it lists in sorted order. It also lists the topics of the articles that include the key word or phrase typed by the user. In creating the sorted lists, the engine's first task is to lexically analyze the text of the articles and break it down into words that can be used to construct a sorted index.

In most languages, words consist of characters and numbers separated by white space and punctuation. Rather than calling Windows 95 repeatedly as it analyzes each letter in the data, the search engine builds tables at startup indicating which characters can be interpreted by the user's operating environment and whether these characters are letters, numbers, or punctuation.

If the user is running WinHelp on an double-byte character set (DBCS) system (Japanese, Chinese, Korean, or Taiwanese Windows 95, for example), the search engine also creates a table of all legal two-byte characters. The WinHelp engine parses the text in each document character by character using these tables. It throws out punctuation and white spaces if appropriate and creates a list of words. After it has determined a list of words, it is ready to sort them using a sort key. The sort key is a numerical representation of a sort element based on locale-specific sorting rules, which consist of several weighted components that represent a character's script, diacritic markings, case, and so on.

Applications traditionally display the contents of lists in dialog boxes in sorted order so that users can easily find individual items. International users, however, represent a wide variety of expectations when it comes to sorting. Not only does each language have its own basic arrangement for its alphabet, but conventions used in dictionaries and phone books can be quite different. The French language compares words that are the same except for diacritics starting with the rightmost characters instead of the leftmost characters. Swedish sorts characters with diacritic marks after Z. Other languages include characters outside the Latin script. For example, the Icelandic character ð sorts between D and E.

Win32 provides basic support for sorting strings. Windows 95 supports at least one sorting algorithm each for a variety of languages that include standard options such as case-insensitive comparison. The order in which the search engine displays words and phrases varies depending on the system locale. Each component of the sort key has a different weight depending on the sorting rules associated with the locale. Elements are sorted based on script (that is, all Greek characters sort together, as do Cyrillic and Kanji characters), alphanumeric and symbolic characters, diacritics, case, and other special characteristics, such as whether two characters should be sorted as a single character (for example, the Spanish CH or the Danish AE). Currently, except for the Far East locales, Windows 95 only associates one sorting algorithm with each locale.

After the search engine has a sorted list of words, it can quickly look for matching strings using a binary search algorithm. Using sort keys is very convenient, because they automatically take care of language-specific behavior, such as matching ligatures (in English, /E = AE, but this is not true in Danish) and distinguishing between single letters and two-character combinations (in some Spanish locales, I and II are separate letters). The WinHelp engine, for example, uses sort keys to match substrings that fall either at the beginning of a word or at the end. For example, a prefix search would match "car" with "caring." A suffix search would match "ring" with "caring."

The engine makes substring searching considerably faster by defining upper and lower sort key boundaries for each search. The prefix search for the word "car" tests all sort keys greater than or equal to "car" but less than "cas." The suffix search for the word "ring," which compares sort keys from right to left, tests all sort keys greater than or equal to "gnir" but less than "gnis." The engine creates key boundaries based on the sorting rules of the user's default locale.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Chapter 35 General Troubleshooting

This chapter provides information on troubleshooting for Windows 95. The chapter offers a basic approach to the troubleshooting process, describes built-in Windows 95 features for correcting problems, and includes specific procedures for identifying and correcting problems.

---

Note — This information provides a general guide to troubleshooting. See also the specific troubleshooting notes provided in other chapters of the WINDOWS 95 RESOURCE KIT.

---

### *Troubleshooting Strategy*

---

To troubleshoot problems with Windows 95, start by gathering information about the nature and scope of the problem, then develop a strategy to minimize the operational impact, and finally resolve or work around the technical problem. After gathering information, establish your troubleshooting strategy by following these basic steps.

n

Analyze symptoms and develop a strategy for correcting them.

n

Check to see if the problem is a common issue.

n

Evaluate the operational effects of the problem.

n

Isolate the error conditions.

n

Test troubleshooting modifications and document testing results.

n

Consult technical support resources.

Start by making a basic technical assessment, analyzing the symptoms to determine the approach for resolving the problem. Under what conditions does the problem occur and not occur? Which aspects of the operating system control those conditions? Is the problem specific to a subsystem (networks, video, and so on)?

Make modifications to Windows 95 or the application, and test for the problem again. Minimize the number of things you change between tests. If you find that the problem goes away, reset each original entry until you find the cause of the problem.

To begin resolving a problem using Windows 95, you need to make some kind of technical assessment, determining the general nature of the problem.

Consider the following:

n

Has the system or configuration ever worked? If so, what changed?

n

Is the error condition reproducible or random?

n

Is the error specific to a particular system, configuration, or application?

n

What specific hardware and firmware is involved?

n

Are any non-Windows 95 device drivers or TSRs loaded?

n

Does the order of driver or application startup make a difference?

n

Does the error still occur with Safe Mode startup for Setup on an individual

computer, or Safe Mode with Networking for Setup with networking? (These startup options are described later in this chapter.)

n

Can you see any error message after you press F8 to start Windows and

select the Step-By-Step Confirmation option?

Check to see if the problem is a common issue by reviewing the online Help, the related chapters in this book, or any .TXT or .DOC files included on the Windows 95 distribution disks. For example, check SETUP.TXT and README.TXT.

For general information about the problems listed in the following table, see the related chapter in the WINDOWS 95 RESOURCE KIT.

---

|                           |                                         |
|---------------------------|-----------------------------------------|
| Cannot install Windows 95 | Chapter 6, "Setup Technical Discussion" |
|---------------------------|-----------------------------------------|



Computer won't start or Windows 95 won't run Chapter 6, "Setup Technical Discussion"

Network connectivity problem Chapter 7, "Introduction to Windows 95 Networking"

Local or network printing problem Chapter 23, "Printing and Fonts"

Application error or general protection fault Chapter 22, "Application Support"

When you have a basic idea of the nature of the problem, you should also make some kind of assessment of the impact on your business operations. The following questions are an example of the kinds of issues you want to examine to establish the scope and impact of the problem:

n

How many computers are affected? Does it occur on just one computer or device?

n

Is mission-critical data at risk? Is any data at risk?

n

Are backups of critical data available? If not, can you back up the data now?

n

What are the primary and secondary effects that the computer being down has upon your operations?

n

What are the costs of the computer being down?

n

Does the problem prevent necessary tasks from being completed?

n

Are effective workarounds or alternatives available?

While you are in the process of determining the technical nature of the error, evaluate methods to reduce to the operational impact and cost of resolution. To limit the operational impact of the error condition:

n

Back up important data. Of course, you should have procedures in place

for systematically creating regular backups of critical files.

n

Quickly determine the scope and nature of the problem, computers

involved, data at risk, and implications for mission-critical applications and processes.

n

Evaluate symptoms, hardware and software involved, technical workarounds, and determine the most effective solution path.

n

If computer operation is blocked, evaluate alternative work paths to accomplish necessary tasks while issues are being resolved.

Eliminating variables helps determine the cause of an error condition. Try to isolate the specific cause of the error by removing unnecessary lines in your CONFIG.SYS and AUTOEXEC.BAT files. Remove only the lines that are not necessary to access your hard disk drive or run Windows 95 setup.

Try to isolate the specific cause of the error by changing a specific value, and testing for whether the error condition is corrected or altered. For instance, if you suspect a damaged Registry, you could restore the Registry files (SYSTEM.DAT and USER.DAT) from backup files, and retest.

If a component fails after upgrading to a new driver, replace it with the original driver and retest, or if Windows 95 startup stalls on a real-mode device driver, or if any device driver is suspect in causing an error condition, you can test the effect of not loading a particular device driver by pressing F8 when the Starting Windows message appears and then choosing the Step-By-Step Confirmation option. (This process is described in detail in "Safe Mode and Step-by-Step Confirmation" later in this chapter.)

Test each modification individually to see if it fixed the problem. Make note of all symptoms, causes, and solutions. This provides you with the information you need if you have to contact product support personnel and provides an excellent reference for future troubleshooting.

For persistent problems, you may want to post the problem on the appropriate online forum. Other users may have already discovered, reported, and found workarounds for your problem. Suggestions from others may save you time tracking down the source of the problem and give you ideas that can help you.

For information about Microsoft TechNet and how to get help from product support using online resources such as The Microsoft Network, see Appendix J, "Windows 95 Resource Directory."

## Windows 95 Troubleshooting Aids

---

Windows 95 contains log files and includes programs that can assist you in correcting problems that occur during the setup or startup processes. The following sections describe these built-in troubleshooting aids.

Safe Recovery is the Windows 95 mechanism that Setup uses to determine what caused the failed installation. Safe Recovery uses the information available in DETCRASH.LOG, for example, to avoid performing detection on the same device where Setup last failed.

### [To take advantage of Safe Recovery when Setup fails](#)

1. Run Setup again.
2. When the Safe Recovery screen appears, click the option to use Safe Recovery.

You can also read the SETUPLOG.TXT, DETLOG.TXT, and BOOTLOG.TXT files in the root directory of the boot drive. These text files contain, respectively, the Safe Recovery and hardware detection information in a readable form, plus a log of system startup actions. SETUPLOG.TXT, for example, will show the point at which Setup stalled.

To automatically scan these log files for errors in installation or detection, you can use the following MS-DOS commands in a batch file. Run this batch file from the root directory of the boot drive (C:\) after Setup.

```
@echo off  
echo "Entries found in Setuplog.txt" > log.txt  
find /i /n "installtype" setuplog.txt >> log.txt  
find /i /n "installdir" setuplog.txt >> log.txt  
find /i /n "detection" setuplog.txt >> log.txt  
find /i /n "runningapp" setuplog.txt >> log.txt  
find /i /n "rootfilesrenamed" setuplog.txt >> log.txt  
find /i /n "error" setuplog.txt >> log.txt
```

```
find /i /n "failed" setuplog.txt >> log.txt  
echo "Entries found in Bootlog.txt" >> log.txt  
find /i /n "fail" bootlog.txt >> log.txt  
find /i /n "error" bootlog.txt >> log.txt  
find /i /n "dynamic load success" bootlog.txt >> log.txt  
find /i /n "initcomplete success" bootlog.txt >> log.txt  
echo "Entries found in Detlog.txt" >> log.txt  
find /i /n "avoidmem" detlog.txt >> log.txt  
find /i /n "detected" detlog.txt >> log.txt  
find /i /n "error" detlog.txt >> log.txt  
cls  
type log.txt |more
```

For more information about how Safe Recovery and hardware detection work, and about the contents of the log files, see Chapter 6, "Setup Technical Discussion."

Windows 95 has an option to verify installed components when Setup detects a complete Windows 95 installation. When Verify is selected, Setup reads SETUPLOG.TXT for the installed components and reruns the Setup process to verify all system components. If Verify fails as a result of either a missing or damaged file on the computer, Setup automatically reinstalls the file. As a part of this verification process, Setup rebuilds VMM32.VXD and recopies any required files.

The Windows 95 startup disk is a bootable floppy disk that loads the operating system and displays an MS-DOS command line. The startup disk also contains utilities that can be used for troubleshooting a malfunctioning operating system. You can create a startup disk during Windows 95 Setup, or you can create or update a startup disk after installation.

---

**Caution**—— It is strongly recommended that you create a startup disk as part of Windows 95 Setup, and that you maintain an updated copy of the startup disk each time you change the system configuration after installing Windows 95.

---

If you did not create a startup disk during Setup, you can create one using a single floppy disk.

[To create a startup disk after Windows 95 is installed](#)

n

In the Add/Remove Programs option in Control Panel, click the Startup

Disk tab. Then click the Create Disk button, and follow the instructions on-screen.

You can start the computer and use the Windows 95 Startup menu to choose from various options for starting Windows 95.

[To display the Windows 95 Startup menu](#)

n

Restart the computer. When the Starting Windows 95 message appears,

press F8.

The Windows 95 Startup menu appears automatically if the Registry is missing important keys (for example, SYSTEM) or if the previous system startup failed (for example, if a WNBOOTNG.STS signature file still exists in the Windows directory). In these cases, a message describes the cause of the problem and prompts you to choose Safe Mode to start Windows 95 using a minimal set of drivers.

The following table describes the options typically found in the Windows Startup menu. The contents of this menu can vary, depending on options specified in MSDOS.SYS.

- 
- |    |                                               |
|----|-----------------------------------------------|
| 1. | Start                                         |
|    | Normal Windows                                |
| l  | Startup, loading all normal startup files and |

Registry values.

2. Runs system startup creating a startup log file. For information about using BOOTLOG.TXT, see Chapter 6, "Setup Technical Discussion."
3. Start Windows, bypassing startup files and using only basic system drivers. Same as pressing F5 or typing \_ at the command prompt.
4. Start Windows,



with bypassin  
Netwo g startup  
rk files and  
Suppo using  
rt only  
basic  
system  
drivers,  
including  
basic  
networki  
ng.  
Same as  
pressing  
F6 or  
typing \_  
at the  
comman  
d  
prompt.

5. Start  
Step- Window  
By- s,  
Step confirmi  
Confir ng  
mation startup  
files line  
by line.  
Same as  
pressing  
F8 when  
the  
Startup  
menu is  
displaye  
d. For  
more  
informati  
on, see  
“Step-  
By-Step  
Confirm  
ation for  
System  
Startup”

later in  
this  
chapter.

6. Starts  
Comm the  
and operatin  
Promp g  
t system,  
Only1 displayin  
g only  
the  
comman  
d  
prompt.

7. Starts  
Safe the  
Mode operatin  
Comm g system  
and in Safe  
Promp Mode  
t and  
Only1 displays  
only the  
comman  
d  
prompt,  
bypassin  
g startup  
files.  
Same as  
pressing  
SHIFT+  
F5.

8. Starts  
Previo the  
us version  
versio of MS-  
n of DOS  
MS\_D previousl  
OS y  
installed  
on this  
compute  
r. Same

as  
pressing  
F4. This  
option is  
only  
available  
if \_ in  
MSDOS.  
SYS.2

- 
- 1 When you start the computer at the command prompt, you can use switches with the \_ command to control Windows 95 startup for troubleshooting purposes, as described in “WIN.COM Switches” later in this chapter.
  - 2 For information about the options in MSDOS.SYS, see Chapter 6, “Setup Technical Discussion.”
- 

---

Tip—— Windows 95 uses entries in MSDOS.SYS to control Startup menu options, automatic loading of certain drivers, and path statements for system files. If Windows 95 does not start as expected, check the entries in MSDOS.SYS.

---

Startup option keys can be pressed when the Windows 95 Startup menu is displayed, or a startup option key can be used when the Starting Windows 95 message appears. Most startup option keys are listed at the bottom of the Startup menu screen. The following table summarizes all the startup option keys.

---

---

F5 Starts  
Windows  
95 in Safe  
Mode,  
bypassing  
startup files  
and loading  
minimal  
drivers.

SHI Starts  
FT Windows  
+F 95 in Safe  
5 Mode  
Command  
Line Only,  
bypassing  
startup files.

CT Runs

- RL Windows
- +F 95 in Safe
- 5 Mode,  
bypassing  
both startup  
files and  
compression  
drivers.
- F4 Starts the  
computer  
using the  
previous  
version of  
MS-DOS, if  
... in the  
Windows  
95 version  
of  
MSDOS.SYS.
- F6 Starts  
Windows  
95 in Safe  
Mode with  
Networking.
- F8 Displays  
the  
Windows  
95 Startup  
menu.
- SHI If the
- FT Windows
- +F 95 Startup
- 8 menu is  
already on-  
screen,  
displays  
line-by-line  
confirmation  
of startup  
files.

The following sections describe how to use Safe Mode to run Windows 95 for

troubleshooting problems with system startup or other operating system components.

Safe Mode bypasses the startup files and provides you with access to the Windows 95 configuration files when Windows 95 fails to start normally.

Safe Mode should be the first option you try if your computer fails to correctly load Windows 95. You can make whatever configuration changes are necessary and then restart Windows 95 normally. Windows 95 automatically initiates Safe Mode if it detects that system startup has failed, if the Registry is corrupted, or if an application requests Safe Mode.

[To use Safe Mode for system startup](#)

n

When the Starting Windows message appears, press F5.

— Or —

Press F8, and then from the Startup Menu choose the Safe Mode option.

When you run Safe Mode, a message appears to indicate that Windows 95 is bypassing the startup files. The Windows 95 desktop also shows that you are running in Safe Mode.

The following are examples of when to use Safe Mode for system startup:

n

If Windows 95 fails to start after the Starting Windows 95 message appears.

n

If Windows 95 seems to stall for an extended period.

n

If Windows 95 doesn't work correctly or has unexpected results.

n

If you cannot print to a local printer after attempting other troubleshooting steps.

n

If your video display doesn't work correctly.

n

If your computer stalls repeatedly.

n

If your computer suddenly slows down.

n

If you need to test an intermittent error condition.

When starting Windows 95 in Safe Mode, only the mouse, keyboard, and standard VGA device drivers are loaded. This makes Safe Mode useful for isolating and resolving error conditions caused by both real-mode and Windows drivers. This option is identical to typing *win /d:m* at the command line, as described in “WIN.COM Switches” later in this chapter.

Each Safe Mode key disables a different portion of the startup process, as shown in the following table.

---

|      |         |   |
|------|---------|---|
| Proc | ·       |   |
| ess  | — — — — |   |
| CON  |         |   |
| FIG. |         |   |
| SYS  |         |   |
| and  |         |   |
| AUT  |         |   |
| OEX  |         |   |
| EC.B |         |   |
| AT   |         |   |
| Load | · · ·   | · |
| HIM  | — —     |   |
| EM.S |         |   |
| YS   |         |   |
| and  |         |   |
| IFSH |         |   |
| LP.S |         |   |
| YS   |         |   |

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Wind — —  
ows  
95  
WIN.  
COM

Load . —  
all — — —  
Wind  
ows  
drive  
rs

Load . — — — .  
netw  
ork  
drive  
rs

Run — — — — .  
NET  
STA



RT.B  
AT

The following sections describe the Safe Mode options.

### [Safe Mode Command Prompt Only](#)

Safe Mode Command Prompt Only bypasses the startup files and starts the operating system to the MS-DOS command line; when selected, this option does not load HIMEM.SYS, IFSHLP.SYS, or Windows 95.

### [To use Safe Mode Command Prompt Only](#)

n

When the Starting Windows 95 message appears, press F8 and choose the Safe Mode Command Prompt Only option from the Startup menu.

The following are examples of when to use Safe Mode Command Prompt Only:

n

If Windows 95 fails to start, even with the Safe Mode option

n

If you want to use command-line options (such as using a *win /d:x* switch)

n

If you want to use command line tools (such as editing CONFIG.SYS)

n

If you want to avoid loading HIMEM.SYS or IFSHLP.SYS

#### *Safe Mode Without Compression*

Safe Mode without compression bypasses the startup files, and compression is not loaded. The computer starts at the real-mode command prompt.

The following are examples of when to use Safe Mode without compression:

n

If the computer stalls when accessing a compressed drive

n

If a Corrupt CVF error occurs during system startup

n

If Windows 95 fails to start, and both Safe Mode (F5) and Safe Mode-  
Command Prompt Only (SHIFT+F5) are unsuccessful

n

If you want to bypass compression drivers

#### [Safe Mode with Networking](#)

In networking environments users may require network connectivity to recover from a system problem, and for this Windows 95 provides the Safe Mode with Networking recovery mechanism.

If the operating system starts with Safe Mode but not with Safe Mode with Networking, the network configuration probably requires further adjustment.

#### [To use Safe Mode with Networking](#)

n

When the Starting Windows 95 message appears, press F.

Or

Press F8 and choose the Safe Mode with Networking option from the Startup menu.

When you use Safe Mode with Networking, the following system startup steps are completed:

n

HIMEM.SYS and IFSHLP.SYS are loaded, irrespective of CONFIG.SYS settings

n

Registry information is processed

n

DoubleSpace or DriveSpace drivers are loaded (if present)

n

Windows 95 is loaded

n

NETSTART.BAT runs (if required for real-mode networking from another vendor)

# n

Basic network drivers are loaded

Safe Mode with Networking does not process CONFIG.SYS and AUTOEXEC.BAT, but does load COMMAND.COM. Safe Mode with Networking only processes AUTOEXEC.BAT if no Windows 95 version of MSDOS.SYS is present, or if the [Paths] section is invalid and no valid WinDir= entry is present in MSDOS.SYS.

If the [Paths] section and the WinDir= variable are not defined in MSDOS.SYS when you use Safe Mode with Networking, NETSTART.BAT does not run; only AUTOEXEC.BAT runs, and Windows 95 fails to load.

The following scenarios are supported for using Safe Mode with Networking.

---

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er e e F82  
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---

1 Protected-mode networks cannot be supported if Safe Mode is used when the Registry is corrupted, because the Registry is used to load drivers for the protected-mode network.

2 Safe Mode requires F8 at startup when using a real-mode network client from

another vendor, because Windows 95 cannot start the network so the user must specify which drivers to load.

3 A local computer has a full copy of Windows 95 on the local hard disk; a shared installation runs a shared copy of Windows 95 from a server.

---

Most existing real mode networks run from the startup files, and Safe Mode bypasses these files. The NETSTART.BAT file in the Windows directory contains commands for starting Microsoft or NetWare networks. NETSTART.BAT allows Windows 95 to start most real mode networks on individual computers without running AUTOEXEC.BAT and CONFIG.SYS.

#### [To troubleshoot system startup for a network that does not run from NETSTART.BAT](#)

1. When the Starting Windows message appears, press F8 and select the Step-By-Step Confirmation option. (For more information, see the following section.)
2. Answer Yes when prompted to process startup device drivers (CONFIG.SYS) and the startup command file (AUTOEXEC.BAT).
3. Answer Yes to process all network driver lines.

#### [Step-By-Step Confirmation for System Startup](#)

From the Windows 95 Startup menu, select the Step-By-Step Confirmation option to start Windows 95 and confirm each line of the startup files. You can also press SHIFT+F8 while the Startup menu is displayed to use this option.

The following are examples of when to confirm the startup files line by line:

n

If the startup process fails during loading of the startup files

n

If any real mode drivers must be loaded to run Windows 95 successfully

n

If you need to check for Registry failure messages

n

If you need to verify that the expected drivers are being loaded

n

If you need to temporarily disable a specific driver or set of drivers

n

If you need to check for errors in startup files

When you choose to confirm system startup line by line, the following prompts appear. You can press ENTER to confirm or ESC to skip that part of system startup.

n

Load DoubleSpace (or DriveSpace) driver?



n

Process the system Registry?

n

Create a startup log file (BOOTLOG.TXT)?

n

Process your startup device drivers (CONFIG.SYS)?

Each line from CONFIG.SYS is displayed with the [Enter=Y,Esc=N] prompt. You can press TAB when the first CONFIG.SYS prompt appears to accept all options automatically.

n

Process your startup command file (AUTOEXEC.BAT)?

Each line from AUTOEXEC.BAT is displayed with the [Enter=Y,Esc=N] prompt. You can press TAB when the first AUTOEXEC.BAT prompt appears to accept all options automatically.

n

Run WIN.COM to start Windows 95?

n

Load all Windows drivers?

If you press ENTER to answer Yes to each prompt, the result is the same as starting Windows 95 normally except that the logo does not appear. Answering No to “Load All Windows Drivers?” runs Windows 95 in Safe Mode.

For information on using this option for system startup with real-mode network clients, see “Safe Mode with Networking” earlier in this chapter.

The following switches are available to start Windows 95 from the command prompt when you need to isolate an error condition:

win [/d:[f][m][n][s][v][x]]

The /d: switch is used for troubleshooting when Windows 95 does not start correctly. The switches in the following table can be used with the /d: switch.

---

|  |                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | Turn off 32-bit disk access. Try this if the computer appears to have disk problems, or if Windows 95 stalls. This is equivalent to ___ in |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|

## SYSTEM.INI.

Starts  
Windows 95 in  
Safe Mode.

Starts  
Windows 95 in  
Safe Mode  
with  
Networking.

Specifies that  
Windows 95  
not use ROM  
address space  
between  
F000:0000  
and 1 MB for  
a break point.  
Try this if  
Windows 95  
stalls during  
system  
startup. This is  
equivalent to  
\_\_\_ in  
SYSTEM.INI.

Specifies that  
the ROM  
routine should  
handle  
interrupts from  
the hard disk  
controller. Try  
this if  
Windows 95  
stalls during  
system startup  
or disk  
operations.  
This is  
equivalent to  
\_\_\_ in  
SYSTEM.INI.

Excludes all of

the adapter area from the memory that Windows 95 scans to find unused space. This is equivalent to \_\_\_ in SYSTEM.INI.

### Troubleshooting Procedures

---

This section provides basic instructions for troubleshooting problems that may occur when running Windows 95.

#### [Tips for Keeping Backup Configuration Files](#)

Create and keep a startup disk, and verify that it works before you need it.

Always make backup copies of configuration files (especially SYSTEM.DAT and USER.DAT). To copy the .DAT files, you need to use the *attrib* command to remove the System and Hidden attributes. A particularly good time for backing up files and updating the startup disk is after you install new devices and applications, when you have a good working configuration.

Windows 95 offers general troubleshooting techniques in online Help to assist you in determining the cause of possible problems encountered during startup.

#### [To get troubleshooting assistance from Windows 95 Help](#)

1. From the Start button, click Help.
2. At the Contents tab, click Troubleshooting.

For example, click If You Have Trouble Starting Windows to find help for the following categories.

# n

[Creating a startup disk](#)

# n

[Starting Windows in Safe Mode](#)

# n

[Starting your computer without starting Windows](#)

# n

[Confirming Windows startup line by line](#)

# n

[Starting Windows without logging onto the network](#)

[Loading a specific driver in CONFIG.SYS, AUTOEXEC.BAT, or Windows 95 Registry](#)

may cause the computer to stall. This could be due to a hardware or software (device driver or TSR) conflict.

*To determine whether hardware or software is stalling the computer*

1. Press F8 at the Starting Windows 95 message, and choose Safe Mode-Command Prompt Only from the menu. If this option prevents the computer from stalling on startup, a device driver or TSR is a likely cause of the problem.
2. Restart the computer, and press F8 again, and then choose the Step-by-Step Confirmation option to check for TSRs that are loading and may be causing the problem.
3. If you use disk compression and the computer still stalls after using Safe Mode-Command Prompt Only to start the computer, press CTRL+F5 during system-startup to use Safe Mode without compression.
4. Check the CMOS settings in the computer's BIOS configuration menus, making sure the settings match your installed hardware.
5. Check the hardware installation and the manufacturer's documentation to verify that all devices are correctly installed.
6. Check your logical hardware installation, and make sure no conflicts exist in the IRQ, I/O address, DMA channels, and memory addresses used. Compare your actual installation with your hardware documentation for inconsistencies in the settings used.

*To check whether a specific driver is stalling the computer*

n

Restart the computer. Press F8 and select the Logged (BOOTLOG.TXT)-

option. Then examine the BOOTLOG.TXT file to find errors. For information about this file, see Chapter 6, "Setup Technical Discussion."

In Windows 95, you can view the property sheet for any file to see the version number and other file information. You can use this information to determine exactly what a DLL or other supporting file is used for and when it was created.

### [To see the version and other information of a system file](#)

1. In Windows Explorer, right-click the file name, and then click Properties in the context menu.
2. For a supporting or executable file, click the Version tab. Use the Other Version Information list to see details about the file.

—{ewc msdncl, EWGraphic, x0ah 0 /a "psAH.bmp"}

A missing operating system file prevents the startup process from continuing. If Windows 95 does not start, press F8 at the Starting Windows 95 message and choose Safe Mode Command Prompt Only for system startup. If you can start the computer using this option, check drivers loaded in CONFIG.SYS and AUTOEXEC.BAT (and any batch files called from them).

Windows 95 uses the same names for the real-mode operating system files as MS-DOS does (IO.SYS, MSDOS.SYS, and COMMAND.COM). However, to support dual-boot, the MS-DOS versions of these files are renamed with a .DOS extension when installing Windows 95 or when starting Windows 95 after you have started the computer with the previous operating system.

If COMMAND.COM is missing, a message indicates this and prompts you to type the path for the file.

### [To restore COMMAND.COM using Windows Explorer](#)

1. Restart the computer and press F8 at the Starting Windows 95 message, then choose the Safe Mode option.
2. Insert the startup disk into the floppy disk drive.
3. Using Windows Explorer, find COMMAND.COM on the floppy disk drive, and then drag the file from the floppy disk to the root of the boot drive.

### [To restore COMMAND.COM using command-line commands](#)

1. Insert the startup disk into the floppy disk drive.
2. At the command prompt, type the following:

—attrib -r -s -h c:\command.com  
copy a:\command.com c:\

If the Windows 95 MSDOS.SYS file is missing, a blue screen presents a message: "Invalid Vxd dynamic link call from IFSMGR (03)." This is followed by an error initializing IFSMGR, and system startup stops.

If errors appear during system startup related to the Registry, XMS, and IFSMGR errors, these are all caused by invalid syntax in the specification of the [Paths] section of MSDOS.SYS or the WinDir= entry. Setting the WinDir= value causes IO.SYS to use that value to set the following environment variables:

tmp=WinDir  
temp=  
path=            :            \command  
comspec=            \command.com

If no valid WinDir= entry is found in MSDOS.SYS, the path defaults to C:\WINDOWS, and COMSPEC defaults to C:\COMMAND.COM.

If IO.SYS is missing, the computer stalls before the Starting Windows 95 message appears, displaying a message that the system disk is invalid and prompting you to replace it. A bootable Windows 95 disk (such as the startup disk) is required to start the computer. You will then need to reinstall the real-mode operating system files on drive C as described in the following procedure.

#### [To replace or reinstall the real-mode operating system files on drive C](#)

1. Start the computer using the Windows 95 startup disk in drive A.
2. At the command prompt for drive A, type sys c: to copy IO.SYS, MSDOS.SYS, DRVSPACE.BIN, and COMMAND.COM to drive C. This rewrites the boot sector.
3. Remove the floppy disk, and restart the computer.

To determine which drivers should be removed so that they will not be loaded, first try temporarily disabling the drivers using interactive startup before removing the unnecessary (or problematic) drivers from the CONFIG.SYS and AUTOEXEC.BAT (and .BAT files called from the AUTOEXEC.BAT).

#### [To determine which drivers can be removed](#)

n

From the Startup menu, select the Step-By-Step Confirmation option.

Temporarily remove specific drivers or prevent TSRs from loading by means of the startup files and retry.



Some computers contain devices that require a specific driver in the CONFIG.SYS in order to correctly complete the startup process, such as drivers used for partitioning, compression, video, hard disks, and so forth.

### *To check for missing drivers*

1. Press F8 when the Starting Windows 95 message appears, and select the Step-By-Step Confirmation option.
2. Respond Yes to all prompts during loading. For any error messages that appear, make note of the driver involved, its location, and the specific wording of the error message. Verify that the specified driver exists in the specified location.

### *Required System Drivers for System Startup*

Do not remove any hard disk drivers, disk partitioning drivers, or disk compression drivers when starting Windows 95 using the Step-By-Step Confirmation option or while editing startup files. The following is a partial list of drivers that should not be removed.

n

#### Hard disk drivers:

|                     |                    |                      |
|---------------------|--------------------|----------------------|
| <u>AH1544.SYS</u>   | <u>NONSTD.SYS</u>  | <u>SQY55.SYS</u>     |
| <u>ASPI4DOS.SYS</u> | <u>SCSIDSK.EXE</u> | <u>SSTBIO.SYS</u>    |
| <u>ATDOSXL.SYS</u>  | <u>SCSIHA.SYS</u>  | <u>SSTDRIIVE.SYS</u> |
| <u>ILM386.SYS</u>   | <u>SKYDRVI.SYS</u> |                      |

n

#### Partitioning drivers:

|                    |                     |                   |
|--------------------|---------------------|-------------------|
| <u>DMDRVR.BIN</u>  | <u>FIXT_DRV.SYS</u> | <u>LDRIVE.SYS</u> |
| <u>ENHDISK.SYS</u> | <u>HARDRIVE.SYS</u> | <u>SSTOR.SYS</u>  |
| <u>EVDR.SYS</u>    |                     |                   |

# n

Compression drivers:

|                     |                     |                    |
|---------------------|---------------------|--------------------|
| <u>DBLSPACE.BIN</u> | <u>DRVSPACE.BIN</u> | <u>SSWAP.COM</u>   |
| <u>DEVSWAP.COM</u>  | <u>SSTOR.EXE</u>    | <u>STACKER.COM</u> |

The CONFIG.SYS and AUTOEXEC.BAT startup files contain the system startup drivers, settings, and paths, and you may need to verify the accuracy of these entries. To view and select each driver to load, use F8 at the Starting Windows 95 message and select the Step-By-Step Confirmation option.

Perform the following steps to check entries in CONFIG.SYS:

# n

Check environment variables including COMSPEC (use SET at the command prompt).

# n

Verify that paths are valid.

# n

Verify that only necessary drivers are loading.

n

Check for invalid syntax.

n

Check for upper memory area conflicts. If you suspect an upper memory conflict, use *win /d:x* to start Windows 95.

n

Check if Safe Mode resolves the problem. To check if loading minimal drivers will resolve the problem, use F5 or *win /d:m* to start Windows 95.

n

Check for conflict with 32-bit disk access. If you don't want to load 32-bit disk access, use *win /d:f* to start Windows 95.

n

Check for hard disk I/O conflicts. If you want to force *VirtualHDIRQ=Off*, use *win /d:v* to start Windows 95.

n

Check for and remove unnecessary drivers and TSRs, and retry.

n

Check for device conflicts using Device Manager or Microsoft Diagnostics, as described in the following sections.

Sometimes errors are caused by conflicts between devices that are trying to use the same resources, and it is a useful troubleshooting step to verify that devices involved with the error are configured correctly and are not in conflict with another device.

*To check device configuration for potential resource allocation conflict*

1. In the System option in Control Panel, click the Device Manager tab.
  2. Click the + (plus) symbol to the left of the device class for the device that may be causing a conflict.
  3. Double-click the specific device to display its Property sheet. Then click the Resources tab. Check the Conflicting Device List for conflicts with another device.
-

Note—— For network adapters, the device resource information is provided in the Network option in Control Panel, not Device Manager.

Also, if you use multiple configurations, you need to first select the appropriate configuration using the list on the device's Resource property sheet.

---

If hardware devices conflict over resource allocation, and if the BIOS and operating system software are unable to arbitrate the resource conflict, a computer can stall at a variety of points throughout the startup process.

*To check hardware resource allocation in real mode*

1. Use F8 with the Safe Mode Command Prompt Only option to start the computer.
2. Run the Microsoft Diagnostics (MSD.EXE) from the startup disk or from the command prompt in the Windows COMMAND directory.
3. Check hardware resource allocation including memory, IRQ status, and ports.

To check hardware resource allocation in Windows 95, use the procedure described in "Check Device Configuration" earlier in this chapter.

In addition to installation problems in low disk space situations, a variety of operational errors (printing, and so on) can be caused by the computer running out of needed space on the disk drive used for TEMP files and the swap file.

To check for free space, try the following:

n

Use the `chkdsk DRIVE` command at the command prompt to display the

available disk space in the Bytes Available on Disk line.

# n

Use the `dir DRIVE` command at the command prompt to view the bytes free at the end of the DIR display.

# n

After starting Windows 95, right-click the drive icon in Windows Explorer, and select Properties from the context menu. The General tab presents graphical and numeric displays of used and free disk space.

### [To check the virtual memory allocation on the disk](#)

1. In the System option in Control Panel, click the Performance tab, and then click the Virtual Memory button.

—Important— By default, Windows manages your virtual memory settings. This is the recommended setting. Be aware that changing these settings may adversely affect system performance.

2. Click the option named Let Me Specify My Own Virtual Memory Settings. Check the text in the Hard Disk list box. The box contains the drive used for the swap file and the amount of remaining free space on the drive.
3. Click Cancel to dismiss the dialog box without making changes.

You may want to reset the maximum size of the swap file to free up additional space for other temporary files (such as printer spool files).

### [To change the swap file size](#)

1. In the System option in Control Panel, click the Performance tab, and then click the Virtual Memory button.

—Important— By default, Windows manages your virtual memory settings. This is the recommended setting. Changing these settings can adversely affect system performance.

2. Click the option named Let Me Specify My Own Virtual Memory Settings. Check

the text in the Hard Disk list box. The box contains the drive used for the swap file and the amount of remaining free space on the drive.

3. Select the hard disk drive from the list. You may want to specify a different drive for the swap file or for the TEMP variable, if insufficient free disk space is available on this drive.

— You should keep at least 2 to 10 MB of disk space free on the TEMP drive (or more if large files, especially PostScript, are being printed).

4. Set Minimum and Maximum size of the swap file, and click OK.
5. Shut down and restart the computer for the changes to take effect.

#### [To check for lost allocation units from a command line](#)

1. Press F8 when the Starting Windows 95 message appears and choose the Safe Mode Command Prompt Only option.
2. Run ScanDisk from the Windows COMMAND directory.

— ScanDisk detects lost allocation units, and prompts you to recover them.

#### [To check for lost allocation units from within Windows 95](#)

1. In a Windows Explorer window, right-click a drive, and select Properties from the context menu.
2. Click the Tools tab. In the Error-Checking Status box, click the Check Now button.

#### [To check the TEMP variable](#)

1. Use the SET command at a command prompt to display the TEMP variable.
2. Verify the TEMP variable points to a valid drive and directory.

— Check for free disk space on the TEMP drive as described in a previous procedure. If you are printing multiple copies of a document or printing large documents using PostScript®, increase the minimum available free disk space.

3. You can also check the TEMP variable from the command prompt by switching to the Windows COMMAND directory (or from drive A while using the startup disk) and typing *msd*. Microsoft Diagnostics checks for an incorrect TEMP setting each time it runs, and displays a message showing the TEMP setting if it is invalid.

To determine what is causing file system errors, you generally need to isolate the specific subsystem or component involved. One place to start troubleshooting file

system error conditions is through the System option in Control Panel.

*To use the options for troubleshooting the file system*

1. In the System option in Control Panel, click the Performance tab.

2. Click the File System button, and then click the Troubleshooting tab.

The following options are not selected by default but can be enabled by clicking the check box beside each option:

n

Disable new file sharing and locking semantics

n

Disable long name preservation for old programs

n

Disable protected-mode hard disk interrupt handlers

n

Disable 32-bit, protected-mode disk drivers



# n

## Disable write-behind caching for all drives

To use these switches in troubleshooting, select the functionality that seems most related to the type of error condition you are seeing. For example, if files are not being completely closed or data is lost upon saving the file, try disabling write-behind caching for all drives, and then retest to see if the error condition recurs.

---

Important — Do not check any of these options unless advised to do so by your product support representative. Each of these options will degrade system performance.

---

If the system startup software or operating system data on the disk has become corrupted, it is likely to prevent the computer from starting. Key operating system data structures that prevent system startup if damaged are: the master boot record, the boot sector, the file allocation table, and the core operating system files.

---

Caution — Do not run any disk utilities that are not specifically designed for Windows 95. Earlier versions of disk repair utilities may not work properly with Windows 95. To prevent possible data loss, use a disk utility such as ScanDisk in your Windows COMMANDS directory, which is specifically designed for Windows 95. For details, see Chapter 20, "Disks and File Systems."

---

### [To check for disk corruption with Safe Mode Command Prompt Only](#)

1. Shut down and restart the computer. Press F8 and choose the Safe Mode Command Prompt Only option.
  2. Run ScanDisk from the Windows COMMAND directory.
- This method will also check and repair the file allocation table.

### [To check for disk corruption in Windows 95](#)

1. In Windows Explorer, right-click a drive icon and select Properties from the context menu.

2. Click the Tools tab. In the Error Checking Status box, click the Check Now button.

If corruption is detected, you may need to replace system files and structures.

---

Caution—— You should back up key data files before performing any disk repair operations.

---

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Appendix A Command-Line Commands Summary

Windows 95 retains and enhances most of the functionality of MS-DOS and LAN Manager. This appendix lists and briefly describes all the command-line commands available in Windows 95. The list includes commands you can use to modify CONFIG.SYS files, write batch programs, and change international settings.

For information about a specific command, use command-line help, which provides syntax, notes about how the command works, and examples of how to use it.

[To get information about a command by using command-line help](#)

# n

At the command prompt, type the command name followed by a space

and /?

For example, for information about the *dir* command, type *dir /?* at the command prompt.

### Command Syntax

---

SYNTAX is the order in which you must type a command and the elements that follow the command. Commands have up to four elements: COMMAND NAME, PARAMETERS, SWITCHES, and VALUES. In the following illustration, the first example lists all hidden files in the C:\LETTERS directory. The second example allows up to 10 users to connect to the C:\USERS\PUBLIC directory.

```
{ewc msdn cd, EWGraphic, x0ai 0 /a "psAI.bmp"}
```

Besides these four elements, command symbols can be used to direct the output. Each element is explained below.

#### Command Name

States the action you want Windows 95 to carry out. Some commands (such as the *cls* command, which clears the screen) consist only of a command name. Most commands require more than a name. For all network commands, type *net* followed by a space and the command name, as in the following:

*net config*

## Parameter

Defines or creates the object you want Windows 95 to act on. Windows 95 sometimes requires additional information, which you specify in one or more parameters after the command name. For example, the *del* command requires a parameter that is the name of the file you want to delete. Some commands require more than one parameter. For example, to rename a file by using the *rename (ren)* command, you must include the original name of the file in addition to the new name. The following command renames LETTER.TXT to MEMO.TXT:

*ren letter.txt memo.txt*

---

Caution— Some commands accept semicolons to separate parameters. For example, if you wanted to delete all files on drive A and typed *del a:|\*. \** by mistake, Windows 95 would erase the file A in the current directory and all files in the root directory of the current drive.

---

Position in the syntax line determines how a command works and whether a parameter is a SOURCE (first) or a DESTINATION (second). In the example above, the source, LETTER.TXT, specifies the location of data to be transferred or used as input to a command. The destination, MEMO.TXT, specifies a location to which the data specified by source is to be transferred.

## Switches

Modify how a command performs a task. A switch is a forward slash (/) or a hyphen (-), usually followed by words, letters, or numbers. Some commands do not have switches, whereas others have several. If a command has more than one switch, you type them one after the other, separated with a space. Switches can be in any position or order after the command name. Some commands accept more than one switch after a forward slash. Other commands, such as TCP/IP utilities, accept a hyphen (-) instead of the forward slash.

---

Tip— The terms “parameter” and “switch” are often interchanged, since both elements follow the command name. The only meaningful difference between a switch and parameter is the presence of a forward slash or hyphen to indicate a switch and the parameter position in the syntax line to indicate whether the parameter is a source or a destination. The term “argument” is also used to refer to parameters or switches.

---

With some network commands for real-mode networking, Windows 95 presents a prompt that requires a user response before a task can be completed. You can append the */yes (/y)* or */no (/n)* switch to a command to force a Yes or No answer for all responses. For example, stopping the workstation service causes Windows 95 to stop dependent services; Windows 95 prompts you before stopping each dependent service unless the */yes* switch is included, as in the following:

net stop workstation /y

### Value

Determines how a switch works. A value is a colon (:), or an equal sign (=), followed by a word, letter, or number and must immediately follow the switch it modifies without a space. The following example of the `format` command contains two values—the file system to use (VFAT in the following example) and a volume label (Backup2):

format d: /fs:vfat /v:backup2

Check the syntax for the specific command in online Help to determine whether the command you want to use requires an equal sign or a colon.

### Using Special Characters in Commands

In a command, the computer name, share name, user name, or group name can contain special characters (for example, PROFIT&LOSS).

To type a parameter with a special character, type the escape character (^) before the special character.

For example, type `net use g: \\profit^&loss\reports`

### Command Symbols

Direct the input or output of a command and permit conditional execution of a command. Used with commands and filter commands, the command symbols are powerful tools.

- 
- > Redirects output.
  - >> Appends redirected output to existing data.
  - < Redirects input.
  - | Pipes output.
  - || Runs the

command  
following the  
symbol only  
if the  
command  
preceding  
the symbol  
fails.

& Separates  
multiple  
commands  
on the  
command  
line.

& Runs the  
& command  
following the  
symbol only  
if the  
command  
preceding  
the symbol  
is  
successful.

( ) Groups  
commands.

^ Allows input  
of command  
symbols as  
text. Escape  
character.

; Separates  
or parameters.

,

~~Sort, more, and find are the native filter commands that work in the same way as command symbols, to allow you to sort input and output, cause output to the screen to be displayed one screen at a time, and search for specified text in a file.~~

### Using the Command Prompt

---

This section explains how to:

n

Simplify entry of repetitive commands.

n

Pause or cancel execution of a command.

n

Cut and paste information to or from a command prompt window.

Windows 95 provides Doskey to give you quick access to your most recent commands and enable you to assign frequently used commands to a single keystroke. Doskey is also available for character-based programs that accept buffered input. Doskey allows you to assign multiple commands to a single key or a typed alias. In addition to Doskey, several editing keys allow you to use and edit the last command you typed, as described in the following table.

#### Keys for Editing at the Command Prompt

---

UP Cycles  
AR through  
RO commands  
W previously  
or entered.  
DO

W  
N  
AR  
RO  
W

F7 Displays all  
of the  
previous  
commands  
in a list.  
Press F9  
and then  
choose a  
number  
from the list,  
and press  
ENTER (or  
press  
ESCAPE to  
cancel).

---

F1 Displays the  
last  
command  
one  
character at  
a time.

F3 Displays the  
entire  
command.

BA Moves the  
CK cursor in a  
SP command.

AC  
E  
or  
LE  
FT  
AR  
RO  
W

IN Toggles



S between  
insert and  
overwrite  
mode.

You can pause or stop the output of a command.

[To pause the output of a command](#)

n

Press CTRL+S or PAUSE.

Press any key except PAUSE to restart the output of the command. You can stop and restart the output of a command as many times as you want.

[To stop Windows 95 from completing a command](#)

n

Press CTRL+BREAK or CTRL+C.

---

Important — Any action Windows 95 carried out before you pressed CTRL+BREAK or CTRL+C cannot be undone.

---

You can transfer information to or from the command prompt. The following topics describe how to do this using the Edit buttons in a window or using QuickEdit mode in a window or in full-screen mode.

In full-screen mode, you can also use the Edit menu commands to copy and paste

information in any window, not just command-prompt windows. The data is transferred as text or as a bitmap to the Clipboard depending on how it was copied.

---

Tip—— To quickly switch a command prompt or MS-DOS—based application between a full screen and a window, press ALT+ENTER.

---

### [Copying and Pasting Information Using Edit Buttons](#)

When running MS-DOS Prompt or an MS-DOS—based application in a window, you can use the Edit buttons to copy and paste text at the command prompt.

#### [To select and copy text at the command prompt](#)

1. Click the Mark button, and then select the text you want to copy, either using the mouse or the arrow keys.

===={ewc msdncd, EWGraphic, x0ai 1 /a "psAI.bmp"}

2. Click the Copy button.

===={ewc msdncd, EWGraphic, x0ai 2 /a "psAI.bmp"}

====This places the selected text on the Clipboard, so you can paste it anywhere, not just at the command line.

#### [To paste text at the command prompt](#)

1. Make sure the text you want is on the Clipboard.

====This text can come from any source, not just from the command line.

2. Place the insertion point where you want to paste it, and then click the Paste button.

===={ewc msdncd, EWGraphic, x0ai 3 /a "psAI.bmp"}

### [Copying and Pasting Information Using QuickEdit Mode](#)

QuickEdit mode allows you to copy and paste text in command-prompt windows using only the mouse, bypassing the Edit commands. QuickEdit mode copies data only when the command prompt is running as a window; however, you can paste text either in a window or a full screen.

---

Note—— When QuickEdit mode is on, the mouse works as usual in MS-DOS—based applications that are running in a full screen; the mouse does not work when such applications run in a window if QuickEdit mode is on. Use the *start* command to retain use of the mouse when starting a program from a command-prompt window.

---

with QuickEdit mode enabled.

---

### To copy and paste text at the command prompt using QuickEdit mode

1. If necessary, turn on QuickEdit mode in the property sheet for the window.
2. Position the pointer at the beginning of the text you want to copy. Press the left mouse button. Keeping the left mouse button depressed, drag the cursor to the last character of the section you want to copy and release the left mouse button. The portion of the screen you want to copy is highlighted.
3. Press the right mouse button to copy the highlighted area to the Clipboard. The highlight will disappear.
4. Press the right mouse button to copy the contents of the Clipboard to the command prompt cursor. If you copy more than one line, a carriage return (CR) is added at the end of each line.

— You must still use the Paste command from the Edit menu to paste the contents of the Clipboard into Windows-based applications.

### Native Windows 95 Commands

---

A NATIVE command takes advantage of the 32-bit operating system. Most commands familiar to MS-DOS users are now native Windows 95 system commands.

Some commands, such as *dir* and *chdir*, are INTERNAL, meaning the command resides in memory at all times. Internal commands can be run at the command prompt and in batch files.

Other commands, such as *drvspace* and *xcopy*, are EXTERNAL, meaning the command is stored in its own file and loads from disk when you use the command. External commands can be run at the command prompt, from Windows Explorer, from the Run command, or from the Start menu, and can also be run in batch files. Batch commands are for use in batch programs only, as described later in this appendix.

The following tables summarize the commands included with Windows 95. Unless otherwise specified, you can type these commands at the command prompt.

### Internal1 and External2 Commands

---

- 2 Displays or changes file attributes.
- 1 Sets or

clears  
extended  
CTRL+C  
checking.

- 1 Displays the name of the current directory or changes the current directory.
- 1 Displays the number of the active character set (code page). You can also use this command to change the active character set for all devices that support character-set switching.
- 1 See the command.
- 2 Checks the status of a disk and displays a status report. Can also fix disk errors. However, Windows ScanDisk (-) is the recommended command

for repairing disks.

- 1 Clears the screen.
- 2 Starts a new instance of the command interpreter.
- 1 Copies one or more files to the location you specify.
- 1 Changes the terminal device used to control the computer.
- 1 Displays the date and prompts you to change the date, if necessary.
- 2 Compresses hard disk drives or floppy disks, and configures drives that were compressed by using DriveSpace or DoubleSpace. This is a Windows-based utility; for

information,  
see the  
syntax  
description  
later in this  
appendix.

- .2 Starts the  
Debug  
program,  
which you  
can use to  
test and  
debug  
executable  
files.
- .2 Reorganizes  
the files on a  
disk to  
optimize disk  
performance  
. This is a  
Windows-  
based utility;  
for  
information,  
see the  
syntax  
description  
later in this  
appendix.
- .1 Deletes the  
files you  
specify.
- .2 Deletes a  
directory and  
all the files  
and  
subdirectorie  
s that are in  
it.
- .1 Displays a  
list of the  
files and

subdirectories that are in the current or specified directory.

- 2 Copies the entire contents of one floppy disk to another floppy disk.
- 2 Loads the Doskey program into memory. The Doskey program recalls command-line commands, and it enables you to edit command lines and create and run macros. Doskey loads by default.
- 2 Starts a text editor you can use to create and edit ASCII text files.
- 2 Enables or disables EMM386 expanded-memory support. Also

provides support for loading real-mode device drivers in the upper memory area if both EMM386.EXE and HIMEM.SYS are loaded with the commands in CONFIG.SYS.

- 1 See the command.
- 1 Quits the command interpreter (COMMAND.COM) and returns to the program that started the command interpreter, if one exists.
- 2 Decompresses a compressed file.
- 2 Compares two files and displays the differences between them.
- 2 Starts the Fdisk



program,  
which  
configures a  
hard disk for  
use with  
Windows 95.  
Although  
you can run  
this  
command at  
the  
command  
prompt, you  
cannot use it  
while  
running  
Windows 95  
on the drive  
that contains  
the Windows  
system files.

- 2 Searches for  
a specific  
string of text  
in a file or  
files.
- 2 Runs a  
specified  
command  
for each file  
in a set of  
files.
- 2 Formats a  
disk for use  
with  
Windows 95  
or MS-DOS.  
You can  
right-click a  
drive icon in  
Windows  
Explorer to  
use a  
Windows-

based  
version of  
this  
command.

2 Starts the  
Keyb  
program,  
which  
configures a  
keyboard for  
a specific  
language.

2 Creates,  
changes, or  
deletes the  
volume label  
(name) of a  
disk.

1 See the  
command.

2 Ensures that  
a program is  
loaded  
above the  
first 64K of  
conventional  
memory.

1 Loads a  
program into  
upper  
memory.

1 Creates a  
directory or  
subdirectory.

2 Displays the  
amount of  
used and  
free memory  
on the  
computer.

1 See the

command.

- 2 Configures a printer, serial port, or display adapter; sets the typematic rate; redirects printer output from a parallel port to a serial port; prepares, selects, refreshes, or displays the numbers of the character sets (code pages) for parallel printers or the keyboard and screen; displays the status of all the devices installed on the computer.
- 1 Displays one screen of output at a time.
- 2 Moves one or more files to the location you specify. Can also be used

to rename  
files and  
directories.

- .2 Starts the  
Microsoft  
Diagnostics  
program,  
which  
provides  
detailed  
technical  
information  
about the  
computer.
- .2 Starts the  
Nlsfunc  
program,  
which loads  
country-  
specific  
information  
for national  
language  
support  
(NLS).
- .1 Indicates  
which  
directories  
the  
operating  
system  
should  
search for  
executable  
files  
(programs).
- .1 Changes the  
appearance  
of the  
command  
prompt.
- .1 Deletes  
(removes) a

directory.

- .1 Changes the name of the file or files you specify.
- .1 See the command.
- .1 See the command.
- .2 Checks disks and the file system for damage, and repairs them, if needed.  
Windows ScanDisk (.) is the recommended command for repairing disks, as described later in this appendix.
- .1 Displays, sets, or removes environment variables.
- .2 Displays the version table.  
Reports a version number to programs or device drivers designed for

earlier  
versions of  
MS-DOS.

- 2 Starts or  
configures  
SMARTDrive,  
which  
creates a  
disk cache in  
extended  
memory.

- Under  
Windows 95,  
do not place  
the  
command in  
AUTOEXEC.  
BAT.  
Windows 95  
uses another  
method of  
disk caching.

- 2 Reads input,  
sorts data,  
and writes  
the results to  
the screen, a  
file, or  
another  
device.

- 2 Allows you  
to run a  
Windows-  
based  
program  
from the  
command  
line and wait  
for it. For  
information  
about other  
switches that  
can be used  
with -, see

the online  
Help for the  
command.

- 2 Associates a path with a drive letter.
- 2 Creates a startup disk by copying hidden Windows 95 system files and the command interpreter (COMMAND.COM) to the disk.
- 1 Displays the system time or sets the computer's internal clock.
- 1 Displays the contents of a text file.
- 1 Displays the operating system version number.
- 1 Directs the operating system to verify that files are written correctly to a disk, and displays the status of

verification.

- 1 Displays the volume label and serial number for a disk, if the disk has them.
- 2 Copies directories, their subdirectories, and files (except hidden and system files). For details, see the syntax description later in this appendix.

- 
- 1 Internal commands can be used in batch files and at the command prompt.
  - 2 External commands can be run from the command prompt or in batch files, or can be run from Windows Explorer, the Run command, or other parts of the Windows 95 user interface.
- 

The following networking commands can be used at the command prompt, in batch files, and in configuration files such as AUTOEXEC.BAT. Some commands are applicable only in real mode, such as before Windows 95 starts, or if your computer uses only real-mode networking.

---

- Displays the controllable services that are running.

- Runs the



Microsoft  
Network  
Diagnostic  
program to  
display  
diagnostic  
information  
about your  
network.

or Provides a  
list of  
network  
commands  
and topics  
you can get  
help with, or  
provides  
help with a  
specific  
command or  
topic.

1 Loads  
protocol and  
network  
adapter  
drivers  
without  
binding them  
to the  
Protocol  
Manager.  
This may be  
necessary  
for network  
adapter  
drivers from  
other  
vendors. You  
can bind  
them using ..

1, Breaks the

2 connection between your computer and the network resources to which it is connected.

1, Identifies  
2 you as a member of a workgroup.

2, Changes  
3 your logon password.

2 Displays or controls print jobs.

1 Starts a service or displays a list of started services.

1 Stops a network service.

Synchronize the computer's clock with that of a server or domain, or displays the time for a server or domain.

Connects a computer to or

disconnects  
it from a  
shared  
resource, or  
displays  
information  
about  
computer  
connections.

-- Displays the  
type and  
version  
number of  
the network  
redirector  
you are  
using.

-- Displays a  
list of  
servers or  
displays  
resources  
being shared  
by a server.

- 
- 1 This command is available only in real mode, and cannot be used in an MS\_DOS window.
  - 2 This command is not supported for NetWare NCP servers.

3 The form **name** or **name**

# server

can be used in an MS\_DOS

window. However, the standard form of \_ is available only in real mode, and cannot be used in an MS\_DOS window.

---

You can use the commands listed in the following table in CONFIG.SYS files.

---

- Sets or clears extended CTRL+C checking. You can use this command at the command prompt or in a batch file.
- Allocates memory for a specified number of disk buffers when the computer starts. You can use this command only in CONFIG.SYS.
- Enables the operating system to

use country-specific conventions for displaying dates, times, and currency; for determining the order by which characters are sorted; and for determining which characters can be used in filenames. You can use this command only in CONFIG.SYS.

---

Loads the device driver you specify into memory. You can use this command only in CONFIG.SYS.

---

Loads the device driver you specify into upper memory. You can use this command only in CONFIG.SYS.

- Specifies that the operating system should maintain a link to the upper memory area (UMA), load part of itself into the high memory area (HMA), or both. You can use this command only in CONFIG.SYS.

- Defines parameters for devices such as disk and tape drives when you start the operating system. You can use this command only in CONFIG.SYS.

- Specifies the number of file control blocks (FCBs) that the operating system can have open at the same time. You

can use this command only in CONFIG.SYS.

- Specifies the number of files that the operating system can access at one time. You can use this command only in CONFIG.SYS.

- Includes the contents of one configuration block within another. You can use this command only in CONFIG.SYS.

- Loads a memory-resident program into memory. You can use this command only in CONFIG.SYS.

- Specifies the maximum number of drives you can access.

You can use this command only in CONFIG.SYS.

— Sets the text and background colors for the startup menu. You can use this command only within a menu block in CONFIG.SYS.

— Specifies the default menu item on the startup menu and sets a time-out value, if desired. You can use this command only within a menu block in CONFIG.SYS.

— Defines up to nine items on the startup menu. You can use this command only within a menu block in



## CONFIG.SYS.

- Specifies whether the NUMLOCK setting on the numeric keypad is set to ON or OFF. You can use this command only within a menu block in CONFIG.SYS.
- Enables you to include comments (remarks) or prevent commands in a batch program or CONFIG.SYS from running.
- Specifies the name and location of the command interpreter you want Windows 95 to use. You can use this command only in CONFIG.SYS.
- Supports the dynamic use

of data  
stacks to  
handle  
hardware  
interrupts.  
You can use  
this  
command  
only in  
CONFIG.SYS.

- Defines an item on a startup menu that, when selected, displays another set of choices. You can use this command only within a menu block in CONFIG.SYS.
- Specifies special options. Used only in CONFIG.SYS.

The following device drivers can be loaded in CONFIG.SYS using a *device=* statement.

---

- Enables you to display international character sets on EGA, VGA,

and LCD monitors. This device driver must be loaded by a \_ or \_ command in CONFIG.SYS.

- Creates a logical drive that you can use to refer to a physical floppy disk drive. This device driver must be loaded by a \_ or \_ command in CONFIG.SYS.

- Provides support for loading real-mode device drivers in the upper memory area if both EMM386.EXE and HIMEM.SYS are loaded with \_ commands in CONFIG.SYS.

- Himem is an extended-memory manager —

a program that coordinates the use of your computer's extended memory, including the high memory area (HMA), so that no two applications or device drivers use the same memory at the same time. This device driver must be loaded by a command in CONFIG.SYS, and the command line must come before any commands that start applications or device drivers that use extended memory.

---

Enables the operating system to use a keyboard other than the standard

U.S.  
QWERTY  
keyboard  
layout. You  
can use this  
command  
only in  
CONFIG.SYS.

— Provides  
access to  
CD-ROM  
drives.

Batch programs (also called batch files) allow you to simplify routine or repetitive tasks. A BATCH PROGRAM is an unformatted text file that contains one or more commands and has a .BAT or .CMD filename extension. When the filename is typed at the command prompt, the commands in the file are run sequentially.

Any command can be included in a batch file. In addition, several commands allow conditional processing of the commands in the batch file. For example, the *if* command carries out a command based on the results of a condition. Other commands allow you to control input and output and to call other batch programs. You can use the following commands in batch programs.

#### Commands for Use in Batch Files

---

— Calls one  
batch  
program  
from another  
without  
causing the  
first batch  
program to  
stop.

— Prompts the  
user to make  
a choice in a  
batch  
program.

Displays a specified prompt and pauses for the user to choose from among a specified set of keys.

- Displays or hides the text in batch programs when the program is running. Also indicates whether command-echoing is on or off.

- Runs a specified command for each file in a set of files. You can use this command in batch programs or at the command prompt.

- Directs the operating system to a line in a batch program that is marked by a label you specify. You can use this

command  
only in batch  
programs.

Performs  
conditional  
processing  
in batch  
programs.  
You can use  
this  
command  
only in batch  
programs.

Suspends  
processing  
of a batch  
program and  
displays a  
message  
that prompts  
you to press  
any key to  
continue.  
You can use  
this  
command  
only within  
batch  
programs.

Enables you  
to include  
comments  
(remarks) or  
prevent  
commands  
in a batch  
program or  
CONFIG.SY  
S from  
running.

Changes the  
position of  
replaceable  
parameters

in a batch  
program.  
You can use  
this  
command  
only in batch  
programs.

You can use the following commands to change international settings such as country codes, keyboard layouts, and character sets (code pages):

- - -  
- -

The following commands are not included with the basics Windows 95 files:

- - - -  
- \_1 - -  
- - - -  
- - 1 -  
- - - -  
\_1 - \_1 -  
- - - -  
- \_1 -  
- - - -  
- - 1

---

1 This command is available on the Windows 95 compact disk.

---

### Command-Line Switches for Specific Commands

This section describes command-line switches for certain commands or executable files that are of particular interest in Windows 95. These include the following:



n emm386

n Windows Explorer

n xcopy

This section provides correct syntax and other details for using EMM386 command-line switches.

### [EMM386](#)

Enables or disables EMM386 expanded memory support.

The EMM386 device driver, EMM386.EXE, provides expanded memory support and also provides access to the upper memory area. For information about EMM386.EXE, see its entry later in this appendix.

### Syntax

emm386 [on|off|auto] [w=on|w=off]

To display the current status of EMM386 expanded memory support, type emm386- at the command prompt:

## Parameters

on|off|auto

Activates the EMM386 device driver (if set to *on*), or suspends the EMM386 device driver (if set to *off*), or places the EMM386 device driver in auto mode (if set to *auto*). Auto mode enables expanded-memory support only when a program calls for it. The default value is *on*.

w=on|w=off

Enables (if set to *w=on*) or disables (if set to *w=off*) Weitek coprocessor support. The default value is *w=off*.

## Notes on emm386

### Installing the EMM386.EXE device driver.

To use the *emm386* command, you must also install the EMM386.EXE device driver by using the *device* command in CONFIG.SYS.

### Reactivating EMM386 expanded-memory support

If EMM386 was loaded when the DOS VM was started but is not currently in use, the *on* parameter reactivates expanded-memory support.

### Suspending EMM386 expanded-memory support

If EMM386 expanded-memory support is currently active, handle 0 is the only handle allocated, and EMM386 is not providing access to the upper memory area. The *off* parameter suspends EMM386 expanded-memory support. When EMM386 expanded-memory support is off, the EMM386.EXE device-driver header is changed so that programs cannot use expanded memory. This enables you to run programs that do not comply with the Virtual Control Program Interface (VCPI).

## [EMM386.EXE](#)

---

**Caution**— Use EMM386.EXE parameters carefully. You can make the computer inoperable if you use them incorrectly.

---

Provides access to the upper memory area and uses extended memory to simulate expanded memory. This is for MS-DOS—based applications that need expanded memory. The EMM386.EXE device driver must be loaded by a *device* command in CONFIG.SYS. EMM386 uses extended memory to simulate expanded memory for

programs that can use expanded memory. EMM386 also makes it possible to load programs and device drivers into upper memory blocks (UMBs).

---

Note — The EMM386.EXE device driver is different from the EMM386 command used to enable expanded memory support.

---

## Syntax

device=[DRIVE:][PATH]emm386.exe [on|off|auto] [MEMORY] [min=SIZE] [mx|frame=ADDRESS/pMMMM] [pn=ADDRESS] [x=MMMM-NNNN] [i=MMMM-NNNN] [b=ADDRESS] [L=MINXMS] [a=ALTREGS] [h=HANDLES] [d=NNN] [ram=MMMM-NNNN] [noems] [novcpi] [highscan] [verbose] [win=MMMM-NNNN] [nohi] [rom=MMMM-NNNN] [nomovexbda] [altboot]

## Parameters

[DRIVE:PATH]

Specifies the location of the EMM386.EXE file.

on|off|auto

Activates the EMM386 device driver (if set to *on*), or suspends the EMM386 device driver (if set to *off*), or places the EMM386 device driver in auto mode (if set to *auto*). Auto mode enables expanded-memory support and upper memory block support only when a program calls for it. The default value is *on*. Use the *emm386* command to change this value after EMM386 has started.

MEMORY

Specifies the maximum amount of extended memory (in kilobytes) that you want EMM386 to provide as expanded/Virtual Control Program Interface (EMS/VCPI) memory. This amount is in addition to the memory used for UMBs and EMM386 itself. Values for MEMORY are in the range 64 through the lesser of either 32768 or the amount of extended memory available when EMM386 is loaded. The default value is the amount of free extended memory. If you specify the *noems* switch, the default value is 0. EMM386 rounds the value down to the nearest multiple of 16.

## Switches

min=SIZE

Specifies the minimum amount of EMS/VCPI memory (in kilobytes) that EMM386 will provide, if that amount of memory is available. EMM386 reserves this amount of extended memory for use as EMS/VCPI memory when EMM386 is loaded by

device=emm386.exe in CONFIG.SYS. EMM386 may be able to provide additional EMS/VCPI memory (up to the amount specified by the MEMORY parameter) if sufficient XMS memory is available when a program requests EMS/VCPI memory. Values are in the range 0 through the value specified by the MEMORY parameter. The default value is 256. If you specify the noems switch, the default value is 0. If the value of min is greater than the value of MEMORY, EMM386 uses the value specified by min.

mx

Specifies the address of the page frame. Valid values for x are in the range 1 through 14. The following list shows each value and its associated base address in hexadecimal format:

1 5 9 12  
=> => => =>  
C0 D0 E0 880  
00 00h 0h 0h  
h

2 6 10 13  
=> => => =>  
C4 D4 800 8C0  
00 00h 0h 0h  
h

3 7 11 14  
=> => => =>  
C8 D8 840 900  
00 00h 0h 0h  
h

4 8  
=> =>  
CC DC  
00 00h  
h

frame=ADDRESS

Specifies the page-frame segment base directly. To specify a specific segment base address for the page frame, use the frame switch and specify the address you want. Valid values for ADDRESS are in the ranges 8000h through 9000h and C000h through E000h, in increments of 400h. To provide expanded memory and disable the page frame, you can specify frame=none; however, this may cause some programs that require expanded memory to work improperly.

/pMMMM

Specifies the address of the page frame. Valid values for MMMM are in the ranges 8000h through 9000h and C000h through E000h, in increments of 400h.

*p*N=ADDRESS

Specifies the segment address of a specific page, where N is the number of the page you are specifying and ADDRESS is the segment address you want. Valid values for N are in the range 0 through 255. Valid values for ADDRESS are in the ranges 8000h through 9C00h and C000h through EC00h, in increments of 400h. The addresses for pages 0 through 3 must be contiguous in order to maintain compatibility with version 3.2 of the Lotus/Intel/Microsoft Expanded Memory Specification (LIM EMS). If you use the *mx* switch, the *frame* switch, or the */pMMMM* switch, you cannot specify the addresses for pages 0 through 3 for the */pMMMM* switch.

*x*=MMMM-NNNN

Prevents EMM386 from using a particular range of segment addresses for an EMS page or for UMBs. Valid values for MMMM and NNNN are in the range A000h through FFFFh and are rounded down to the nearest 4-kilobyte boundary. The *x* switch takes precedence over the *i* switch if the two ranges overlap.

*i*=MMMM-NNNN

Specifies a range of segment addresses to be used (included) for an EMS page or for UMBs. Valid values for MMMM and NNNN are in the range A000h through FFFFh and are rounded down to the nearest 4-kilobyte boundary. The *x* switch takes precedence over the *i* switch if the two ranges overlap.

*b*=ADDRESS

Specifies the lowest segment address available for EMS “banking” (swapping of 16-kilobyte pages). Valid values are in the range 1000h through 4000h. The default value is 4000h.

*L*=MINXMS

Ensures that the specified amount (in kilobytes) of extended memory will still be available after EMM386 is loaded. The default value is 0.

*a*=ALTREGS

Specifies how many fast alternate register sets (used for multitasking) you want to allocate to EMM386. Valid values are in the range 0 through 254. The default value is 7. Every alternate register set adds about 200 bytes to the size in memory of EMM386.

*h*=HANDLES

Specifies how many handles EMM386 can use. Valid values are in the range 2 through 255. The default value is 64.

d=NNN

Specifies how many kilobytes of memory should be reserved for buffered DMA. Discounting floppy-disk DMA, this value should reflect the largest DMA transfer that will occur while EMM386 is active. Valid values for NNN are in the range 16 through 256. The default value is 16.

ram=MMMM-NNNN

Specifies a range of segment addresses to be used for UMBs and also enables EMS support. If you do not specify a range, EMM386 uses all available adapter space to create UMBs and a page frame for EMS.

noems

Provides access to the upper memory area but prevents access to expanded memory.

novcpi

Disables support for VCPI applications. This switch must be used with the noems switch. If you specify the novcpi switch without specifying the noems switch, EMM386 does not disable VCPI support. If you specify both switches, EMM386 disregards the MEMORY parameter and the min switch. Disabling support for VCPI applications reduces the amount of extended memory allocated.

highscan

Specifies that EMM386 use an additional check to determine the availability of upper memory for use as UMBs or EMS windows. On some computers, specifying this switch may have no effect or cause EMM386 to identify upper memory areas as available when they are not. As a result, the computer might stop responding.

verbose

Directs EMM386 to display status and error messages while loading. By default, EMM386 displays messages only if it encounters an error condition. You can abbreviate verbose as V. (To display status messages without adding the verbose switch, press and hold ALT while EMM386 starts and loads.)

win=MMMM-NNNN

Reserves a specified range of segment addresses for Windows instead of for EMM386. Valid values for MMMM and NNNN are in the range A000h through FFFFh and are rounded down to the nearest 4-kilobyte boundary. The x switch takes

precedence over the *win* switch if the two ranges overlap. The *win* switch takes precedence over the *ram*, *rom*, and *i* switches if their ranges overlap.

*nohi*

Prevents EMM386 from loading into the upper memory area. Normally, a portion of EMM386 is loaded into upper memory. Specifying this switch decreases available conventional memory and increases the upper memory area available for UMBs.

*rom=MMMM-NNNN*

Specifies a range of segment addresses that EMM386 uses for shadow RAM — random-access memory used for read-only memory (ROM). Valid values for MMMM and NNNN are in the range A000h through FFFFh and are rounded down to the nearest 4-kilobyte boundary. Specifying this switch may speed up the system if it does not already have shadow RAM.

*nomovexbda*

Prevents EMM386 from moving the extended BIOS data from conventional memory to upper memory.

*altboot*

Specifies that EMM386 use an alternate handler to restart the computer when you press CTRL+ALT+DEL. Use this switch only if the computer stops responding or exhibits other unusual behavior when EMM386 is loaded and you press CTRL+ALT+DEL.

Notes on emm386.exe

Must install HIMEM.SYS before EMM386.EXE.

You must include a device command for the HIMEM.SYS device driver in CONFIG.SYS before the device command for EMM386.EXE.

Using EMM386 memory switches.

Unless you want to use EMM386 to provide access to the upper memory area, you need not specify memory switches on the device command line. EMM386 usually runs properly with the default values. In some cases, however, you might want to control how EMM386 uses memory. For example, you can control where EMM386 puts the EMS page frame or which segments it uses for EMS pages. You can use as many of these memory switches as you want, in any order you want.

Using EMM386 to provide access to the upper memory area.

In addition to providing access to expanded memory, EMM386 provides access to

the upper memory area, which you can use to load certain programs and device drivers. You must use either the *ram* or *noems* switch to provide access to the upper memory area.

To give the operating system access to the upper memory area but not to expanded memory, use the *noems* switch. To give the operating system access to both the upper memory area and expanded memory, use the *ram* switch. The *ram* switch provides access to less of the upper memory area for running device drivers and programs than does the *noems* switch. In either case, you must include the *dos=umb* command in CONFIG.SYS. The *device* command for EMM386.EXE must precede any *devicehigh* commands.

### EMM386.EXE Examples

To start EMM386 as an expanded memory emulator, using the default values, add the following lines to CONFIG.SYS:

device=himem.sys  
device=emm386.exe

Because no location is specified, MS-DOS searches for the EMM386.EXE file in the root directory of the startup drive.

To specify that EMM386 allocate a maximum of 4096K of memory and a guaranteed 256K of memory (the default value), and to specify that the EMM386.EXE file is located in the DOS directory on drive C, add the following line to CONFIG.SYS:

device=c:\dos\emm386.exe 4096

To emulate expanded memory, specify the segment base address D000h for the EMS page frame, and allocate 512K of memory to EMM386, use one of the following commands:

device=emm386.exe 512 frame=d000  
device=emm386.exe 512 p0=d000 p1=d400 p2=d800 p3=dc00

Suppose that, in addition to specifying the conditions set in the preceding commands, you want to prevent EMM386 from using the segment addresses E000h through EC00h. To do this and to specify that EMM386 can use 127 handles, add the following line to CONFIG.SYS:

device=emm386.exe 512 frame=d000 x=e000-ec00 h=127

To provide access to the upper memory area but not provide EMS/VCP memory, add the following line to CONFIG.SYS:

device=emm386.exe noems novcpi



To provide access to the upper memory area and provide EMS/VCPI memory, add the following line to CONFIG.SYS:

device=emm386.exe ram

You can use the command-line switches for Windows Explorer in shortcut links or batch files, for example, to run Windows Explorer with a specified file selected.

### Syntax

explorer [-/n] [-/e] [/root,OBJECT] [/select],SUBOBJECT

### Parameters

/n

Always open a new window (even if the specified folder is already open).

/e

Use Windows Explorer view. The default is Open view.

/root,OBJECT

Specify the object in the normal namespace that will be used as the root of this Windows Explorer Folder. The default is to just use the normal namespace root (the Desktop).

SUBOBJECT

Specify the folder to receive the initial focus unless /select is used. The default is the root.

/select

Specifies that the parent folder is opened and the specified object is selected.

### Windows Explorer Examples

To open a window rooted at \\myserver so you can easily browse the whole server, but nothing else:

explorer /e,/root,\\myserver

To open a folder window on C:\WINDOWS (or make an open window active) and select CALC.EXE, use:

explorer /select,c:\windows\calc.exe

This command is used to copy files and directories, including subdirectories.

### Syntax

xcopy SOURCE [DESTINATION] [/w] [/p] [/c] [/v] [/q] [/f] [/l] [/d[:DATE]] [/u] [/l] [/s] [/e] [/t] [/k] [/r] [/h] [/a] [/m] [/n] [/exclude:FILENAME]

### Parameters

#### SOURCE

Specifies the location and names of the files you want to copy. SOURCE must include either a drive or a path.

#### DESTINATION

Specifies the destination of the files you want to copy. DESTINATION can include a drive letter and colon, a directory name, a filename, or a combination.

#### /w

Displays a message asking you to press a key to begin copying files, and waits for your response before starting to copy files.

#### /p

Prompts you to confirm whether you want to create each destination file.

#### /c

Ignores errors.

#### /v

Verifies each file as it is written to the destination file to make sure that the destination files are identical to the source files. This switch is ignored because the functionality is inherent to the Windows 95 operating system. The switch is accepted only for compatibility with previous versions of MS-DOS.

/q

Suppresses display of xcopy messages.

/f

Displays source and destination filenames while copying.

/l

Does not copy files, only displays (lists) files that would be copied.

/d[:DATE]

Copies only source files changed on or after the specified date. If the DATE value is missing, xcopy copies all SOURCE files that are newer than the time of existing DESTINATION files. This option allows you to update only files that have changed. Notice that dates in the twenty-first century must be specified using four digits (for example, /D:1-1-2001 if M-D-Y is the date format). That is, /D:1-1-01 is interpreted as 1 January 1901 rather than 1 January 2001.

/u

Copies (updates) only files from SOURCE that exist on DESTINATION.

/i

If SOURCE is a directory or contains wildcards, and DESTINATION does not exist, xcopy assumes DESTINATION specifies a directory name and creates a new directory and then copies all specified files into the new directory. By default, xcopy prompts you to specify whether DESTINATION is a file or directory.

/s

Copies directories and subdirectories, unless they are empty. If you omit this switch, xcopy works within a single directory.

/e

Copies all subdirectories, even if they are empty. Used with the /s and /t switches.

/t

Copies only subdirectory structure (tree), not files. To copy empty directories, you must include the /e switch.

/k

Copies files and retains the read-only attribute on destination files if present on the

source files. By default, the read-only attribute is removed.

/r

Copies over read-only files.

/h

Copies files with the hidden and system file attributes. Xcopy will not copy hidden or system files by default.

/a

Copies only source files that have their archive file attributes set. This switch does not modify the archive file attribute of the source file. For information about how to set the archive file attribute, see the online Help for the attrib command.

/m

Copies source files that have their archive file attributes set. Unlike the /a switch, the /m switch turns off archive file attributes in the files specified in source. For information about how to set the archive file attributes, see the online Help for the attrib command.

/n

Copies using aliases (short file or directory names). This switch is required when copying files or directories from a VFAT volume to a FAT volume or when the 8.3 file naming convention is required on the destination volume.

/exclude:FILENAME

Excludes the files listed in the specified file from the copy operation. The exclusion file can have a list of exclusion patterns (one per line, no wild card characters are supported). If any exclusion pattern in the file matches any part of the path of a subject file, that file is not copied.

Notes on xcopy

Default value for destination.

If you omit DESTINATION, the xcopy command copies the files to the current directory.

Specifying whether destination is a file or directory.

If DESTINATION does not contain an existing directory and does not end with a backslash (\), xcopy prompts you with a message in the following format:

Does destination specify a file name  
or directory name on the target  
(F = file, D = directory)?

You can avoid this prompt by using the /i switch, in which case xcopy assumes the  
destination is a directory if the source is more than one file or a directory.

Xcopy sets an archive attribute for destination files.

Xcopy creates files with the archive attribute set, whether or not this attribute was set  
in the source file. For information, see the online Help for attrib command.

Xcopy vs. diskcopy.

If you have a disk that contains files in subdirectories and you want to copy it to a  
disk that has a different format, you should use the xcopy command instead of  
diskcopy. The diskcopy command copies disks track by track; it requires that your  
source and destination disks have the same format. Xcopy has no such requirement.  
In general, use xcopy unless you need a complete disk image copy.

Xcopy exit codes.

The following list shows each exit code and a brief description of its meaning:

0Files were  
copied without  
error.

1No files were  
found to copy.

2The user  
pressed  
CTRL+C to  
terminate ..

4Initialization  
error occurred.  
There is not  
enough  
memory or disk  
space, or you  
entered an  
invalid drive  
name or invalid  
syntax on the  
command line.

5Disk write error  
occurred.

You can use the *errorlevel* parameter on the *if* command line in a batch program to process exit codes returned by *xcopy*:

### *Xcopy Examples*

To copy all the files and subdirectories (including any empty subdirectories) from the disk in drive A to the disk in drive B, type:

*xcopy a: b: /s /e*

To include any system or hidden files in the previous example, add the */h* switch when typing:

*xcopy a: b: /s /e /h*

To update files in the REPORTS directory with the files in the directory RAWDATA that have changed since December 29, 1993, type:

*xcopy \rawdata \reports /d:12/29/93*

To update all the files that exist on \REPORTS in the previous example, regardless of date, type:

*xcopy \rawdata \reports /u*

To obtain only a list of the files that would be copied for the previous command, without copying the files, type:

*xcopy \rawdata \reports /d:12/29/93 /l > xcopy.out*

The file XCOPY.OUT lists every file that would be copied.

To copy the \CUSTOMER directory and all subdirectories, including empty directories, to the directory \PUBLIC\ADDRESS on network drive H and retain the read-only attribute, while being prompted when a new file will be created on H, type the following:

*xcopy \customer h:\public\address /s /e /k /p*

To issue the previous command and ensure *xcopy* creates the directory \ADDRESS if it does not exist, without prompting, add the */i* switch:

*xcopy \customer h:\public\address /s /e /k /p /i*

You can create a batch program to perform xcopy operations and use the batch if command to process the exit code in case an error occurs. For example, the following batch program uses replaceable parameters for the xcopy SOURCE and DESTINATION parameters:

```
@echo off  
rem COPYIT.BAT transfers all files in all subdirectories of  
rem the source drive or directory (%1) to the destination  
rem drive or directory (%2)  
xcopy %1 %2 /s /e  
if errorlevel 4 goto lowmemory  
if errorlevel 2 goto abort  
if errorlevel 0 goto exit  
:lowmemory  
echo Insufficient memory to copy files or  
echo invalid drive or command-line syntax.  
goto exit  
:abort  
echo You pressed CTRL+C to end the copy operation.  
goto exit  
:exit
```

To use this batch program to copy all files in the C:\PRGMCODE directory and its subdirectories to drive B, type the following command:

copyit c:\prgmcode b:

The command interpreter substitutes C:\PRGMCODE for %1 and B: for %2, then uses xcopy with the /e and /s switches. If xcopy encounters an error, the batch program reads the exit code and goes to the label indicated in the appropriate if-errorlevel statement. Windows 95 displays the appropriate message and exits from the batch program.

---

### *Command-Line Switches for Disk Utilities*

This section describes the commands that can be used from the command line to run the Windows-based versions of the ScanDisk, DriveSpace, and Defrag disk utilities. These commands are provided to allow these disk utilities to be run from batch files.

---

Note—— To provide compatibility with existing batch files, Windows 95 provides a start command to allow synchronous use of Windows-based programs from the command line. To run a Windows-based program from the command line and wait for it, use this syntax:

start /W -"PROGRAM\_NAME ARGUMENTS"

---

This command controls Windows Defragmenter. For more information about this utility, see Chapter 20, “Disks and File Systems.”

### Syntax

defrag [DRIVE: | /all] [/F | /U | /Q] [/noprompt] [/concise | /detailed]

### Parameters

DRIVE:

Drive letter of the disk to be optimized.

/all

Defragment all local, nonremovable drives.

/F

Defragment files and free space.

/U

Defragment files only.

/Q

Defragment free space only.

/concise

Display the Hide Details view (default).

/detailed

Display the Show Details view.

/noprompt

Unattended mode; do not stop and display confirmation messages.

This command controls Windows DriveSpace at the command line, and can be used with either DblSpace or DrvSpace drives. These command switches are maintained



for use in batch files and for compatibility with the compression utilities provided in MS-DOS version 6 and higher. Each switch performs the indicated operation, without asking for any additional input before beginning.

Additionally, the `/interactive` switch can be added to any command line to have DriveSpace ask for any missing parameters, and the `/noprompt` switch can be added to any syntax except the `/info` and `/settings` command lines. The `/noprompt` switch prevents any confirmation dialog boxes from appearing (except for error messages). Notice that there is no way to prevent error messages from being displayed.

When you run DriveSpace without command-line arguments, the DriveSpace Manager appears, with menu commands for selecting the operations to perform. For more information about this utility, see Chapter 20, "Disks and File Systems."

## Syntax

`drvspace /compress` `—D:` `[/size=N]` `/reserve=N]` `[/new=E:]`  
`drvspace /create` `D:` `[/size=N | /reserve=N]` `[/new=E:]` `[/cvf=NNN]`  
`drvspace /delete` `D:\d??space.NNN`  
`drvspace /format` `D:\d??space.NNN`  
`drvspace /host=E:` `D:`  
`drvspace [/info]` `D:`  
`drvspace /mount` `{[/=NNN] D: | D:\d??space.NNN}` `[/new=E:]`  
`drvspace /move` `D:` `/new=E:`  
`drvspace /ratio[=N]` `D:`  
`drvspace /settings`  
`drvspace /size[=N]` `/reserve=N]` `D:`  
`drvspace /uncompress` `D:`  
`drvspace /unmount` `D:`

## Parameters

`d??space.NNN`

The filename of the hidden compressed volume file on the host drive, which can be either `DRVSPACE.NNN` or `DBLSPACE.NNN`, where `NNN` represents the actual filename extension.

The following sections provide details for these switches.

If you add switches or parameters to the `drvspace` command, the operating system carries out the requested task without starting the DriveSpace program. The command syntax differs from task to task, as summarized in the following list.

a hard  
disk drive  
or floppy  
disk.

Create a  
new  
compress  
ed drive in  
the free  
space on  
an  
existing  
drive.

Delete a  
compress  
ed drive.

Format a  
compress  
ed drive.

Display  
informatio  
n about a  
compress  
ed drive.

Mount a  
compress  
ed volume  
file (CVF).  
When  
DriveSpac  
e mounts  
a CVF, it  
assigns it  
a drive  
letter; you  
can then  
use the  
files that  
CVF  
contains.

Change  
estimated

compressi  
on ratio of  
a  
compress  
ed drive.

Change  
the size of  
a  
compress  
ed drive.

Uncompre  
ss a  
compress  
ed drive.

Unmount  
a  
compress  
ed drive.

### Notes on drvspace

#### Fixing problems with drives compressed using DriveSpace.

DriveSpace no longer provides a Chkdsk command as in earlier versions. Instead, Windows 95 includes the new ScanDisk program, a full-featured disk analysis and repair utility. ScanDisk can check and repair both uncompressed drives and DriveSpace or DoubleSpace drives. It can even check and repair unmounted DriveSpace or DoubleSpace compressed volume files. For more information, see the scandisk command.

#### DBLSPACE.BIN, DRVSPACE.BIN, and DRVSPACE.SYS.

DBLSPACE.BIN or DRVSPACE.BIN is the part of the system that provides access to the compressed drives. When you start the computer, the operating system loads D??SPACE.BIN along with other operating system functions, before carrying out the commands in CONFIG.SYS and AUTOEXEC.BAT. D??SPACE.BIN initially loads in conventional memory, since it loads before device drivers that provide access to upper memory. Normally, if the hard disk drive has been compressed using DriveSpace, D??SPACE.BIN is loaded even if you press F8 and choose an alternate startup option.

DRVSPACX.VXD is the protected-mode driver for DriveSpace. This driver takes over from the real-mode D??SPACE.BIN driver when Windows 95 switches to protected mode. The real-mode driver is required for starting the computer, but after the

system switches to protected mode, DRVSPACX ensures that you have 32-bit, protected-mode performance, and the memory used by the real-mode driver is reclaimed.

The DBLSPACE.SYS device driver does not provide access to compressed drives; it simply determines the final location of D??SPACE.BIN in memory. When loaded with a device command, the DBLSPACE.SYS device driver moves D??SPACE.BIN from the top to the bottom of conventional memory. When loaded with a devicehigh command, DBLSPACE.SYS moves D??SPACE.BIN from conventional to upper memory, if available. Whenever possible, DBLSPACE.SYS moves a portion of D??SPACE.BIN into the HMA.

*How DriveSpace assigns drive letters.*

When you compress a drive using DriveSpace, it creates a new drive and assigns a drive letter to that drive. DriveSpace skips the first four available drive letters and assigns the next available drive letter to the new drive. For example, if the computer has only drives A, B, and C, DriveSpace skips letters D, E, F, and G, and assigns drive letter H to the new drive.

When assigning letters to additional drives (for example, if you compress another drive), DriveSpace works backwards from the first drive letter it assigned. In the example above, DriveSpace would next assign the letter G.

DriveSpace attempts to avoid drive-letter conflicts with drives created by fdisk, RAMDrive, networks, or other installable device drivers that assign drive letters. However, if a drive-letter conflict does occur, DriveSpace resolves the conflict by reassigning its drive letters.

### [Drvspace /Compress](#)

Compresses the files and free space on an existing hard disk drive, floppy disk, or other removable media. Compressing an existing drive makes more space available on that drive.

---

Note — DriveSpace cannot compress a drive that's completely full. To compress the startup hard disk drive, the drive must contain at least 2 MB of free space. Other hard disk drives and floppy disks must contain at least 768K of free space. (DriveSpace cannot compress 360K floppy disks.)

---

### Syntax

drvspace /compress DRIVE1: [/new=DRIVE2:] [/reserve=SIZE]

## Parameters

DRIVE1:

Specifies the existing drive you want to compress.

## Switches

/compress

Compresses the hard disk drive or floppy disk specified by the drive parameter. This switch can be abbreviated to /com.

/new=DRIVE2:

Specifies the drive letter for the uncompressed (host) drive. After DriveSpace compresses an existing drive, the system will include both the existing drive (now compressed) and a new uncompressed drive. If you omit the /new switch, DriveSpace assigns the next available drive letter to the new drive.

/reserve=SIZE

Specifies how many megabytes of space to leave uncompressed. Because some files do not work properly when stored on a compressed drive, you may want to reserve some uncompressed space. The uncompressed space will be located on the new uncompressed drive. This switch can be abbreviated to /reser.

## Drvspace /Compress Examples

To compress drive D, type the following command:

drvspace /compress d:

On drives larger than 256 MB, more space will be left on the host (because D?? Space drives cannot be larger than 512 MB). Because this command does not specify how much space to leave uncompressed, DriveSpace leaves 2 MB of uncompressed space (the default). Because the command does not specify a drive letter for the uncompressed drive, DriveSpace assigns the next available drive letter to the new uncompressed drive (the host drive).

To direct DriveSpace to compress drive E, assign the drive letter F to the new uncompressed drive (the host drive), and leave 4 MB of uncompressed space on drive F, type the following command:

drvspace /compress e: /new=f: /reserve=4

## [Drvspace /Create](#)

Creates a new compressed drive by using free space on an uncompressed drive. The new compressed drive will provide more storage capacity than the amount of space it uses.

### Syntax

drvspace /create DRIVE1: [/new=DRIVE2:] [/size=SIZE | /reserve=SIZE] [/cvf=NNN]

### Parameters

DRIVE1:

Specifies the uncompressed drive that contains the space you want to use to create the new drive.

### Switches

#### /create

Creates a new compressed drive by using free space on the uncompressed drive specified by DRIVE1. This switch can be abbreviated to /cr.

/new=DRIVE2:

Specifies the drive letter for the new compressed drive. The /new switch is optional; if you omit it, DriveSpace assigns the next available drive letter to the new drive.

/reserve=SIZE

Specifies how many megabytes of free space DriveSpace should leave on the uncompressed drive. To make the compressed drive as large as possible, specify a size of 0.

You can include either the /reserve switch or the /size switch, but not both. If you omit both switches, DriveSpace uses all but 2 MB of free space. The /reserve switch can be abbreviated as /reser.

/size=SIZE

Specifies the total size, in megabytes, of the compressed volume file. (This is the amount of space on the uncompressed drive that you want to allocate to the compressed drive.) You can include either the /reserve switch or the /size switch, but not both.

/cvf=NNN

Reports extension of the CVF file.

### Drvspace /Create Examples

To create a new compressed drive that uses all available space on uncompressed drive E, type the following command:

drvspace /create e: /reserve=0

To create a new compressed drive by using 10 MB of space on uncompressed drive E, type the following command:

drvspace /create e: /size=10

To create a new compressed drive by using space on uncompressed drive D, and to direct DriveSpace to leave 2.75 MB of free space on drive D, type the following command:

drvspace /create d: /reserve=2.75

The following command creates a new compressed drive by using all but 2 MB of the space on drive D:

drvspace /create d:

Because the command includes neither the /reserve switch nor the /size switch, DriveSpace uses the default value for the /reserve switch and leaves 2 MB of space on drive D.

### Drvspace /Delete

Deletes the selected compressed drive and erases the associated compressed volume file.

---

Caution—— Deleting a compressed drive erases the entire drive and all the files it contains.

---

### Syntax

drvspace /delete \_D:\d??space.###

### Parameters

D:\d??space.###

Specifies the drive you want to delete. (DriveSpace will not allow you to delete any drive containing open files, including the drive containing Windows 95.)

Switch

/delete

Deletes the specified drive. This switch can be abbreviated as /del.

Drvspace /Delete Example

The following command directs DriveSpace to delete the compressed volume for drive C:

drvspace /delete h:\dblspace.###

DriveSpace then deletes the compressed volume file for drive C. This completely erases the compressed drive and all the files it contains.

[Drvspace /Format](#)

Formats the selected compressed drive.

---

Caution—— Formatting a compressed drive deletes all the files it contains. You cannot unformat a drive that has been formatted by using *drvspace /format*.

---

Syntax

drvspace /format D:\d??space.###

Parameters

D:\d??space.###

Specifies the drive you want to format. (DriveSpace will not allow you to format any drive containing open files, including the drive containing Windows 95.)

Switch

/format



Directs DriveSpace to format the specified compressed drive. This switch can be abbreviated as /f.

### *Drvspace /Format Example*

The following command directs DriveSpace to format compressed drive E:

drvspace /format h:\dblspace.###

DriveSpace then formats compressed drive E, which completely erases all the files on it.

### *Drvspace /Info*

Displays information about the selected drive's free and used space, the name of its compressed volume file, and its actual and estimated compression ratios. You can use this command while Windows is running.

### *Syntax*

drvspace [/info] [DRIVE:]

### *Parameters*

DRIVE:

Specifies the compressed drive about which you want information. If you don't specify a drive letter, DriveSpace displays information about the current drive.

### *Switch*

/info

Directs DriveSpace to display information about the selected drive. This switch is optional and can be omitted as long as you specify a drive letter.

### *Drvspace /Info Examples*

The following command displays information about the current drive:

drvspace /info

The following command displays information about drive C:

drvspace /info c:

The following command displays information about drive E:

drvspace e:

### [Drvspace /Mount](#)

Establishes a connection between a compressed volume file (CVF) and a drive letter so that you can use the files the CVF contains. DriveSpace usually mounts CVFs automatically. You need to mount a CVF only if you previously unmounted it.

### Syntax

drvspace /mount[=NNN] DRIVE1: [/new=DRIVE2:]  
drvspace /mount\_D:\d??space.### [/new=DRIVE2:]

### Parameters

DRIVE1:

Specifies the drive that contains the compressed volume file you want to mount. You must specify a drive letter.

### Switches

/mount=NNN

Directs DriveSpace to mount the compressed volume file with the filename-extension specified by the NNN parameter. For example, to mount a CVF named DBLSPACE.001, you would specify /mount=001. If you omit the NNN parameter, DriveSpace attempts to mount the compressed volume file named DBLSPACE.000.

/new=DRIVE2:

Specifies the drive letter to assign to the new drive. This switch is optional; if you don't specify a drive letter, DriveSpace assigns the new drive the next available drive letter.

### Drvspace /Mount Examples

To mount a compressed floppy disk in drive A, type the following:

drvspace /mount a:

To mount the compressed volume file DBLSPACE.001 located on uncompressed drive D, type the following:

drvspace /mount=001 d:

### [Drvspace /Ratio](#)

Changes the estimated compression ratio of the selected drive. DriveSpace uses this ratio to estimate how much free space the drive contains. You might want to change the estimated compression ratio if you plan to store new files with a compression ratio that differs greatly from the current ratio.

### Syntax

drvspace /ratio[=R.R] [DRIVE:]

### Parameters

DRIVE:

Specifies the drive for which you want to change the estimated compression ratio. If you do not specify a drive, DriveSpace changes the estimated compression ratio for the current drive.

### Switch

/ratio=R.R

Changes the estimated compression ratio of the specified drive. To change the ratio to a specific number, specify the ratio you want. You can specify a ratio from 1.0 to 16.0. However, not all drives can accept values in this entire range. If you don't specify a ratio, DriveSpace sets the drive's estimated compression ratio to the average actual compression ratio for all the files currently on the drive. This switch can be abbreviated as /ra.

### Drvspace /Ratio Examples

To change the estimated compression ratio of the current drive to match that drive's actual compression ratio, type the following command:

drvspace /ratio

To change the estimated compression ratio for drive D so that it is 3.2 to 1, type the following:

drvspace /ratio=3.2 d:

To change the estimated compression ratio of the current drive to 6 to 1, type the following:

drvspace /ratio=6

### [Drvspace /Size](#)

Enlarges or reduces the size of a compressed drive. You might want to enlarge a compressed drive if its host drive contains plenty of free space. You might want to reduce its size if you need more free space on the host drive.

### Syntax

drvspace /size[=SIZE1 +/reserve=SIZE2] DRIVE:

### Parameters

DRIVE:

Specifies the drive you want to resize.

### Switches

/size=SIZE1

Changes the size of the specified drive. You can specify the new size of the drive by using the SIZE1 parameter. The size of the drive is the number of megabytes of space that the drive's compressed volume file uses on the uncompressed (host) drive.

You can specify the drive's new size by using either the SIZE1 parameter or the /reserve switch, but not both. If you include neither the SIZE1 parameter nor the /reserve switch, DriveSpace makes the drive as small as possible.

/reserve=SIZE2

Specifies how many megabytes of free space you want the uncompressed (host) drive to contain after DriveSpace resizes the drive. The /reserve switch can be abbreviated as /reser.

You can specify the drive's new size by using either the /reserve switch or the size1 parameter of the /size switch, but not both. If you include neither the /reserve switch nor the size1 parameter, DriveSpace makes the drive as small as possible.

### Drvspace /Size Examples

To change the size of drive C so that its compressed volume file uses 60.5 MB of space on drive D, type the following command:

drvspace /size=60.5 c:

To change the size of drive E so that its host drive, drive D, contains 20 MB of free uncompressed space, type the following command:

drvspace /size /reserve=20 e:

To change the size of drive C so that it is as large as possible, type the following command:

drvspace /size /reserve=0 c:

### [Drvspace /Uncompress](#)

Uncompresses a drive that was compressed by using DriveSpace.

### Syntax

drvspace /uncompress DRIVE:

### Parameter

DRIVE:

Specifies the drive you want to uncompress.

### Switch

/uncompress

Uncompresses the specified drive.

### Notes on Drvspace /Uncompress

### Backing up before uncompressing.

Before uncompressing the drive, you should back up the files it contains. If you include the /interactive switch, DriveSpace will prompt for this.

### Invalid pathnames after uncompressing.

When you uncompress a drive, DriveSpace either changes that drive's letter or the letter of its host drive (depending on how the compressed drive was originally created). DriveSpace shows how the drive letters will change when it uncompresses the drive. Some programs have settings that include explicit pathnames and drive letters. If a program's settings specify a drive that is no longer valid after uncompressing, the program will probably display an error message or be unable to find one of its components or data files. In that case, you need to correct the drive letter specified by that setting.

### Disk space.

You can uncompress a drive only if the data it contains will fit on the host drive. If you use the drvspace /uncompress command, and DriveSpace indicates the drive will not have enough free disk space, delete unnecessary files or move them to another drive.

### Duplicate filenames on compressed and host drives.

If the root directories of the compressed and host drives contain files or directories with identical names, DriveSpace cannot uncompress the compressed drive. If this happens, DriveSpace displays an error message. Remove or rename one copy of each file, and then try uncompressing the drive again.

### Uninstalling DriveSpace.

When you uncompress the last mounted compressed drive, DriveSpace first uncompresses the drive, and then prompts you to remove the DrvSpace driver from memory.

### Drvspace /Uncompress Example

To uncompress drive E, type the following command:

drvspace /uncompress e:

### [Drvspace /Unmount](#)

Breaks the connection between the selected drive's compressed volume file and its drive letter. Unmounting a drive makes it temporarily unavailable.

You cannot unmount a drive containing open files, including the drive containing Windows 95.

### Syntax

drvspace /unmount [DRIVE:]

### Parameters

DRIVE:

Specifies the drive you want to unmount. This parameter is optional; if you omit it, DriveSpace unmounts the current drive.

### Switch

/unmount

Unmounts the specified compressed drive.

### Drvspace /Unmount Example

To unmount compressed drive E, type the following command:

drvspace /unmount e:

This command syntax controls Windows ScanDisk. For more information about this utility, see Chapter 20, "Disks and File Systems."

---

Note — At the command prompt (for example, when you use F8 to start only the command prompt), you can use scandisk with the same switches to run the MS-DOS-based equivalent for this command. At the command prompt, type scandisk /? for more information.

---

### Syntax

scandiskw [DRIVE:] [/A] [/N] [/P]  
scandisk DRIVE:\dblspace.NNN  
scandisk DRIVE:\drvspace.NNN

## Parameters

DRIVE:

Specifies one or more drives to be checked.

/A or /All

Checks all local, nonremovable hard disk drives.

/N or /NonInteractive

Starts and closes ScanDisk automatically. However, this switch does not prevent ScanDisk from stopping to report errors found on the drive.

/p or /PREVIEW

Runs ScanDisk in Preview mode, where it reports and — seems to correct errors that it finds, but it does not actually write changes to the disk.

---

Important — When running scandiskw in Preview mode, it appears as though ScanDisk is fixing errors, but it is not. Also, notice that unlike other settings in ScanDisk, the /PREVIEW switch is not saved in the Registry, so the next time you run ScanDisk, it is no longer in Preview mode.

To determine whether ScanDisk is running in Preview mode, look for the tag “(Preview)” in the caption of the main ScanDisk window.

---

dblspace.NNN or drvspace.NNN

Checks the specified unmounted DoubleSpace or DriveSpace compressed volume file, where NNN is the filename extension for the hidden host file.

The following table describes the codes provided when ScanDisk finished running.

---

|    |                                           |
|----|-------------------------------------------|
| 0x | Drive                                     |
| 00 | checked, no errors found                  |
| 0x | Errors found,                             |
| 01 | all fixed                                 |
| 0x | Check could                               |
| FA | not start — cannot load or find DSKMAINT. |



## DLL

0x Check could  
FB not start —  
insufficient  
memory

0x Errors found,  
FC but at least  
some were  
not fixed

0x At least one  
FD drive could  
not be  
checked

0x Check was  
FE canceled

0x Check was  
FF terminated  
because of  
an error

You can capture the exit code in a batch file to define an action to take in the event of particular exit code. For example:

```
start /w scandisk c: d: /n  
if errorlevel          goto
```

In this sample, start /w forces the batch file to stop and wait for scandisk to finish (otherwise, because it is a Windows-based program, the batch file would continue as soon as scandisk had been launched). Also in this example, if the actual exit code is greater than or equal to the exit code specified by EXITCODE, the batch file runs the specified COMMAND; otherwise, it continues to the next line in the batch file. The goto-COMMAND entry could specify any command you want.

## TCP/IP Utilities

The TCP/IP utilities offer network connections to non-Microsoft hosts such as UNIX® system computers. You must have the TCP/IP network protocol installed to use the TCP/IP utilities. These tools are installed automatically when you install Microsoft TCP/IP.

---

- Displays and modifies the IP-to-Ethernet address translation tables.

- Transfers files to and from a node running service; similar to ..

- Displays all current TCP/IP network configuration values.

- Displays protocol statistics and current TCP/IP connections using NetBIOS over TCP/IP.

- Displays protocol statistics and current TCP/IP connections .

- Verifies connections to a remote host or hosts.

- Manually controls network routing tables.
- Determines the route taken to a destination.

---

Note—— Switches used in the syntax for any TCP/IP are case-sensitive. For example, for the *nbtstat* command, the switch *-R* has a different effect from the *-r* switch.

---

[To get help on TCP/IP utilities](#)

n

At the command prompt, type *-?* followed by a space and the command name. For example, type *ping -?* to get help on the *ping* command.

---

Important—— The *ftp* and *telnet* utilities rely on password authentication by the remote computer. Passwords are not encrypted before being sent over the network. This allows another user equipped with a network analyzer on the same network to steal a user's remote account password. For this reason, it is strongly recommended that users of these utilities choose different passwords for their workgroup, computer, or domain from the passwords used when connecting to computers that are not on Microsoft networks.

---

The following presents a complete reference for the TCP/IP commands included with Windows 95.

This diagnostic command displays and modifies the IP-to-Ethernet or Token Ring address translation tables used by the address resolution protocol (ARP).

## Syntax

arp -a [INET\_ADDR] [-N [IF\_ADDR]]  
arp -d INET\_ADDR [IF\_ADDR]  
arp -s INET\_ADDR ETHER\_ADDR [IF\_ADDR]

## Parameters

-a

Displays current ARP entries by querying TCP/IP. If INET\_ADDR is specified, only the IP and physical addresses for the specified computer are displayed.

-d

Deletes the entry from the ARP cache table that is specified by INET\_ADDR.

-s

Adds an entry in the ARP cache to associate the IP address INET\_ADDR with the physical address ETHER\_ADDR. The physical address is given as 6 hexadecimal bytes separated by hyphens. The IP address is specified using dotted decimal notation. The entry is permanent, that is, it will not be automatically removed from the cache after the timeout expires.

-N [IF\_ADDR]

Displays the ARP entries for the network interface specified by IF\_ADDR.

ETHER\_ADDR

Specifies a physical address.

IF\_ADDR

Specifies, if present, the IP address of the interface for which the address translation table should be modified. If not present, the first applicable interface will be used.

INET\_ADDR

Specifies an IP address in dotted decimal notation.

This connectivity command transfers files to and from a computer running an FTP service. The ftp command can be used interactively or by processing ASCII text files.

## Syntax

*ftp* [-v] [-n] [-i] [-d] [-g] [HOST] [-S: FILENAME]

## Parameters

-v

Suppresses display of remote server responses.

-n

Suppresses autologon upon initial connection.

-i

Turns off interactive prompting during multiple file transfers.

-d

Enables debugging, displaying all *ftp* commands passed between the client and server.

-g

Disables filename globbing, which permits the use of wildcard characters in local file and path names. (See the FTP *glob* command.)

HOST

Specifies the host name or IP address of the remote host to connect to.

-S: FILENAME

Specifies a text file containing *ftp* commands; the commands will automatically run after *ftp* starts. Use this switch instead of redirection (>).

## To run ftp

n

At the command prompt, type *ftp* plus any desired switches and press

ENTER.

For example, you might type `ftp -s:myfile.scr`

The following table shows the `ftp` commands available when Microsoft TCP/IP is installed on a computer.

*FTP Commands in Microsoft TCP/IP*

---

|  |                                                                                                    |
|--|----------------------------------------------------------------------------------------------------|
|  | Runs the specified command on the local computer.                                                  |
|  | Displays descriptions for commands. Identical to ..                                                |
|  | Appends a local file to a file on the remote computer, using the current file type setting.        |
|  | Sets the file transfer type to ASCII, the default.                                                 |
|  | Toggles a bell to ring after each file transfer command is completed. By default, the bell is off. |
|  | Sets the file transfer type                                                                        |

to binary.

- Ends the FTP session with the remote computer and exits ..

- Changes the working directory on the remote computer.

- Ends the FTP session with the remote server and returns to the command interpreter.

- Toggles debugging. When debugging is on, each command sent to the remote computer is printed, preceded by the string --->. By default, debugging is off.

- Deletes files on remote computers.

- Displays a list of a

remote  
directory's  
files and  
subdirectorie  
s.

— Disconnects  
from the  
remote  
computer,  
retaining the  
prompt.

— Copies a  
remote file to  
the local  
computer,  
using the  
current file  
transfer  
type.

— Toggles  
filename  
globbing.  
Globbing  
permits use  
of wildcard  
characters in  
local file or  
path names.  
By default,  
globbing is  
on.

— Toggles  
hash-mark  
(#) printing  
for each  
2048 bytes  
data block  
transferred.  
By default,  
hash-mark  
printing is  
off.

— Displays



descriptions  
for  
commands.

- Changes the  
working  
directory on  
the local  
computer.  
By default,  
the current  
directory on  
the local  
computer is  
used.

- Sends  
arguments,  
verbatim, to  
the remote  
FTP server.  
A single FTP  
reply code is  
expected in  
return.

- Displays an  
abbreviated  
list of a  
remote  
directory's  
files and  
subdirectorie  
s.

- Deletes  
multiple files  
on remote  
computers.

- Displays a  
list of a  
remote  
directory's  
files and  
subdirectorie  
s. Allows you  
to specify

multiple files.

- Copies multiple remote files to the local computer using the current file transfer type.
- Creates a remote directory.
- Displays an abbreviated list of a remote directory's files and subdirectories.
- Copies multiple local files to the remote computer, using the current file transfer type.
- Connects to the specified FTP server.
- Toggles prompting. During multiple file transfers, provides prompts to allow you to selectively

retrieve or  
store files;  
and transfer  
all files if  
prompting is  
turned off.  
By default,  
prompting is  
on.

- Copies a  
local file to  
the remote  
computer,  
using the  
current file  
transfer  
type.

- Prints the  
current  
directory on  
the remote  
computer.

- Ends the  
FTP session  
with the  
remote  
computer  
and exits ..

- Sends  
arguments,  
verbatim, to  
the remote  
FTP server.  
A single FTP  
reply code is  
expected in  
return.  
Identical to ..

- Copies a  
remote file to  
the local  
computer,  
using the

current file  
transfer  
type.  
Identical to ..

- Displays  
help for  
remote  
commands.
- Renames  
remote files.
- Deletes a  
remote  
directory.
- Copies a  
local file to  
the remote  
computer,  
using the  
current file  
transfer  
type.  
Identical to ..
- Displays the  
current  
status of  
FTP  
connections  
and toggles.
- Toggles  
packet  
tracing;  
displays the  
route of  
each packet  
when  
running an  
command.
- Sets or  
displays the  
file transfer  
type.

- Specifies a user to the remote computer.

- Toggles verbose mode. If on, all responses are displayed; when a file transfer completes, statistics regarding the efficiency of the transfer are also displayed. By default, verbose is on.

This diagnostic command displays all current TCP/IP network configuration values for any computer running Microsoft TCP/IP. The *ipconfig* command is of particular use on systems running Dynamic Host Configuration Protocol (DHCP), allowing users to determine which TCP/IP configuration values have been configured by DHCP. With no parameters, *ipconfig* displays all of the current TCP/IP configuration values, including IP address and subnet mask.

### Syntax

*ipconfig* [/all] [/renew] [/release]

### Parameters

#### *all*

Produces a full display. Without this switch, *ipconfig* displays only the IP address,

subnet mask, and default gateway values for each network adapter.

*renew*

Renews DHCP configuration parameters for all network adapters on the local computer. This option is available only on DHCP clients.

*release*

Releases a DHCP configuration. This option disables TCP/IP on the local computer and is available only on DHCP clients.

This diagnostic command displays protocol statistics and current TCP/IP connections using NetBIOS over TCP/IP.

*Syntax*

*nbtstat [-a REMOTENAME] [-A IP\_ADDRESS] [-c] [-n] [-R] [-r] [-S] [-S] [INTERVAL]*

*Parameters*

*-a*

Lists the remote computer's name table given its host name.

*-A*

Lists the remote computer's name table given its IP address specified in dotted decimal notation.

*-c*

Lists the contents of the NetBIOS name cache, with the IP address of each name.

*-n*

Lists local NetBIOS names. In this listing, "Registered" indicates that the name has been registered on this network node, either by b-node broadcast or by a WINS server.

*-R*

Reloads the LMHOSTS file after purging all names from the NetBIOS name cache.

-r

Lists name resolution statistics for Windows networking. On a computer configured to use WINS, this option returns the number of names resolved and registered broadcast or WINS.

-S

Displays both workstation and server sessions, listing the remote hosts by IP address only.

-S

Displays both workstation and server sessions. It attempts to convert the remote host IP address to a name using the HOSTS file.

INTERVAL

Redisplays selected statistics, pausing INTERVAL seconds between each display. Press CTRL+C to stop redisplaying statistics. If this parameter is omitted, *nbtstat* prints the current configuration information once.

### Notes on nbtstat

The column headings generated by the *nbtstat* utility have the following meanings.

#### Input

Number of bytes received.

#### Output

Number of bytes sent.

#### In/Out

Whether the connection is from the computer (outbound) or from another system to the local computer (inbound).

#### Life

The remaining time that a name table cache entry will live before it is purged.

#### Local Name

The local NetBIOS name associated with the connection.

#### Remote Host

The name or IP address associated with the remote host.

### Type

This refers to the type of name. A name can either be a unique name or a group name.

<03>

Each NetBIOS name is 16 characters long. The last byte often has special significance, because the same name can be present several times on a computer. This notation is simply the last byte converted to hexadecimal. For example, <20> is a space in ASCII.

### State

The state of NetBIOS connections as shown in the following list:

---

Ac An inbound  
ce session is  
pti currently  
ng being  
accepted  
and will be  
connected  
shortly.

As A  
so connection  
cia endpoint  
te has been  
d created and  
associated  
with an IP  
address.

Co The session  
nn has been  
ect established.  
ed

Co The session  
nn is in the  
ect connecting  
ing phase  
where the  
name-to-IP



address  
mapping of  
the  
destination  
is being  
resolved.

Di The local  
sc computer  
on has issued  
ne a  
cte disconnect,  
d and it is  
waiting for  
confirmation  
from the  
remote  
computer.

Di A session is  
sc in the  
on process of  
ne disconnecti  
cti ng.  
ng

Idl This  
e endpoint  
has been  
opened but  
cannot  
receive  
connections  
.

In An inbound  
bo session is in  
un the  
d connecting  
phase.

Lis This  
te endpoint is  
nin available for  
g an inbound  
connection.

Ou A session is

tb in the  
ou connecting  
nd phase  
where the  
TCP  
connection  
is currently  
being  
created.

Re A session is  
co trying to  
nn reconnect if  
ect it failed to  
ing connect on  
the first  
attempt.

This diagnostic command displays protocol statistics and current TCP/IP network connections.

### Syntax

netstat [-a] [-ens] [-p PROTOCOL] [-r] [INTERVAL]

### Parameters

-a

Displays all connections; server connections are usually not shown.

-e

Displays Ethernet statistics. This may be combined with the -s option.

-n

Displays addresses and port numbers in numerical form (rather than attempting name look-ups).

-s

Displays per-protocol statistics. By default, statistics are shown for TCP, UDP, ICMP,

and IP; the `-p` option may be used to specify a subset of the default.

`-p` `PROTOCOL`

Shows connections for the protocol specified by `PROTOCOL`; `PROTOCOL` may be `tcp` or `udp`. If used with the `-s` option to display per-protocol statistics, `PROTOCOL` may be `tcp`, `udp`, `icmp`, or `ip`.

`-r`

Displays the contents of the routing table.

`INTERVAL`

Redisplays selected statistics, pausing `INTERVAL` seconds between each display. Press CTRL+C to stop redisplaying statistics. If this parameter is omitted, `netstat` prints the current configuration information once.

### Notes on netstat

The `netstat` utility provides statistics on the following network components.

---

Fo The IP  
rei address and  
gn port number  
Ad of the  
dr remote  
es computer to  
s which the  
socket is  
connected.  
The name  
correspondin  
g to the IP  
address is  
shown  
instead of  
the number  
if the  
HOSTS file  
contains an  
entry for the  
IP address.  
In cases  
where the  
port is not

yet  
established,  
the port  
number is  
shown as an  
asterisk (\*).

Lo The IP  
cal address of  
Ad the local  
dr computer,  
es and the port  
s number the  
connection  
is using. The  
name  
correspondin  
g to the IP  
address is  
shown  
instead of  
the number  
if the  
HOSTS file  
contains an  
entry for the  
IP address.  
In cases  
where the  
port is not  
yet  
established,  
the port  
number is  
shown as an  
asterisk (\*).

Pr The name of  
ot the protocol  
o used by the  
connection.

(st Indicates the  
at state of TCP  
e) connections  
only. The  
possible

states are:

CLOSED  
FIN\_WAIT\_1  
SYN\_RECEI  
VED  
CLOSE\_WAI  
T  
FIN\_WAIT\_2  
SYN\_SEND  
ESTABLISH  
ED  
LISTEN  
TIMED\_WAI  
T  
LAST\_ACK

This diagnostic command verifies connections to one or more remote hosts.

### Syntax

ping [-t] [-a] [-n COUNT] [-l LENGTH] [-f] [-i TTL] [-v TOS] [-r COUNT] [-s COUNT] [-j HOST-  
LIST] [-k HOST-LIST] [-w TIMEOUT] DESTINATION-LIST

### Parameters

-t

Pings the specified host until interrupted.

-a

Specifies not to resolve addresses to host names.

-n COUNT

Sends the number of echo packets specified by COUNT. The default is 4.

-l LENGTH

Sends echo packets containing the amount of data specified by LENGTH. The default is 64 bytes; the maximum is 8192.

-f

Sends a Do Not Fragment flag in the packet. The packet will not be fragmented by gateways on the route.

-i TTL

Sets the Time To Live field to the value specified by TTL.

-V TOS

Sets the Type Of Service field to the value specified by TOS.

-r COUNT

Records the route of the outgoing packet and the returning packet in the Record Route field. A minimum of 1 to a maximum of 9 hosts must be specified by COUNT.

-S COUNT

Specifies the time stamp for the number of hops specified by COUNT.

-j HOST-LIST

Routes packets by means of the list of hosts specified by HOST-LIST. Consecutive hosts may be separated by intermediate gateways (loose source routed). The maximum number allowed by IP is 9.

-k HOST-LIST

Routes packets by means of the list of hosts specified by HOST-LIST. Consecutive hosts may not be separated by intermediate gateways (strict source routed). The maximum number allowed by IP is 9.

-W TIMEOUT

Specifies a time-out interval in milliseconds.

DESTINATION-LIST

Specifies the remote hosts to ping.

### Note on ping

The ping command verifies connections to remote host or hosts, by sending Internet Control Message Protocol (ICMP) echo packets to the host and listening for echo reply packets. Ping waits for up to 1 second for each packet sent and prints the number of packets transmitted and received. Each received packet is validated

against the transmitted message. By default, four echo packets containing 64 bytes of data (a periodic uppercase sequence of alphabetic characters) are transmitted.

You can use the *ping* utility to test both the host name and the IP address of the host. If the IP address is verified but the host name is not, you may have a name resolution problem. In this case, be sure that the host name you are querying is in either the local HOSTS file or in the DNS database.

The following shows sample output for *ping*:

C:\>ping ds.internic.net

Pinging ds.internic.net [192.20.239.132] with 32 bytes of data:

Reply from 192.20.239.132: bytes=32 time=101ms TTL=243

Reply from 192.20.239.132: bytes=32 time=100ms TTL=243

Reply from 192.20.239.132: bytes=32 time=120ms TTL=243

Reply from 192.20.239.132: bytes=32 time=120ms TTL=243

This diagnostic command manipulates network routing tables.

### Syntax

route [-f] [COMMAND [DESTINATION] [MASK NETMASK] [GATEWAY]]

### Parameters

-f

Clears the routing tables of all gateway entries. If this parameter is used in conjunction with one of the commands, the tables are cleared prior to running the command.

COMMAND

Specifies one of four commands.

---

-  
Prints a  
route

-  
Adds a  
route

- Deletes a route
- Modifies an existing route

#### DESTINATION

Specifies the host to send COMMAND.

#### MASK

Specifies, if present, that the next parameter be interpreted as the NETMASK parameter.

#### NETMASK

Specifies, if present, the subnet mask value to be associated with this route entry. If not present, this parameter defaults to 255.255.255.255.

#### GATEWAY

Specifies the gateway.

This connectivity command starts terminal emulation with a remote system running a Telnet service. Telnet provides DEC VT 100, DEC VT 52, or TTY emulation, using connection-based services of TCP.

To provide terminal emulation from a Windows 95 computer, the foreign host must be configured with the TCP/IP program, the Telnet server program or daemon, and a user account for the computer running Windows 95.

---

Note — Microsoft does not provide the Telnet server daemon (telnetd).

---

#### Syntax

telnet [HOST [PORT]]

#### Parameters

##### HOST



Specifies the host name or IP address of the remote system you want to connect to, providing compatibility with applications such as Gopher and Mosaic.

port

Specifies the remote port you want to connect to, providing compatibility with applications such as Gopher and Mosaic. The default value is specified by the *telnet* entry in the SERVICES file. If no entry exists in the SERVICES file, the default connection port value is decimal 23.

### *Notes on telnet*

The Telnet application is found in the Accessories program group if you install the TCP/IP connectivity utilities. Telnet is a Windows Sockets-based application that simplifies TCP/IP terminal emulation with Windows 95.

### To use Telnet

1. At the command prompt, type *telnet*
2. From the Connect menu in the Telnet window, choose Remote System.
3. In the Connect dialog box, type the host name you want to connect to, and then choose the Connect button.
- A connection is made, and you can begin a work session.
4. To end a session, choose the Disconnect command from the Connect menu.

You can specify your preferences for items such as emulation options, the screen font, and color by choosing Preferences from the Terminal menu. You can also use commands from the Edit menu to select, copy, and paste text from the Clipboard. For information about Telnet options, see the online Help.

This diagnostic utility determines the route taken to a destination by sending Internet Control Message Protocol (ICMP) echo packets with varying Time-To-Live (TTL) values to the destination. Each router along the path is required to decrement the TTL on a packet by at least 1 before forwarding it, so the TTL is effectively a hop count. When the TTL on a packet reaches 0, the router is supposed to send back an ICMP Time Exceeded message to the source system. *Tracert* determines the route by sending the first echo packet with a TTL of 1 and incrementing the TTL by 1 on each subsequent transmission until the target responds or the maximum TTL is reached. The route is determined by examining the ICMP Time Exceeded messages sent back by intermediate routers. Notice that some routers silently drop packets with expired TTLs and are invisible to *tracert*.

## Syntax

tracert [-d] [-h MAXIMUM\_HOPS] [-j HOST-LIST] [-w TIMEOUT] TARGET\_NAME

## Parameters

-d

Specifies not to resolve addresses to host names.

-h MAXIMUM\_HOPS

Specifies maximum number of hops to search for target.

-j HOST-LIST

Specifies loose source route along HOST-LIST.

-w TIMEOUT

Waits the number of milliseconds specified by TIMEOUT for each reply.

TARGET\_NAME

Specifies the host name of the destination computer.

## Notes on tracert

The following shows sample output for tracert. The first column is the hop number, which is the Time To Live (TTL) value set in the packet. Each of the next three columns contains the round-trip times in milliseconds for an attempt to reach the destination with that TTL value. An asterisk (\*) means that the attempt timed out. The fourth column is the host name (if it was resolved) and IP address of the responding system.

C:\>tracert ds.internic.net

Tracing route to ds.internic.net [198.49.45.10]  
over a maximum of 30 hops:

|   |        |        |       |                                                 |
|---|--------|--------|-------|-------------------------------------------------|
| 1 | <10 ms | <10 ms | *     | [131.107.1.100]                                 |
| 2 | 10 ms  | <10 ms | 10 ms | seattle1-gw.nwnet.net [192.80.12.82]            |
| 3 | *      | 10 ms  | 10 ms | enss143-enet.nwnet.net [192.35.180.2]           |
| 4 | 20 ms  | *      | 10 ms | t3-3.seattle-cnss8.t3.ans.net [140.222.88.4]    |
| 5 | 30 ms  | 30 ms  | 20 ms | t3-0.los-angeles-cnss8.t3.ans.net [140.222.8.1] |
| 6 | 70 ms  | 70 ms  | 80 ms | t3-0.new-york-cnss24.t3.ans.net [140.222.24.1]  |
| 7 | 80 ms  | 81 ms  | 80 ms | t3-0.denver-cnss40.t3.ans.net [140.222.40.1]    |

~~8 100 ms 91 ms 90 ms t3-1.new-york-cnss32.t3.ans.net [140.222.32.2]~~  
~~9 90 ms 90 ms 91 ms mf-0.new-york-cnss36.t3.ans.net [140.222.32.196]~~  
~~10 100 ms 90 ms 91 ms t1-0.enss222.t3.ans.net [140.222.222.1]~~  
~~11 140 ms 191 ms 100 ms ds.internic.net [198.49.45.10]~~

Trace complete.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Appendix B Windows 95 System Files*

This appendix provides an overview of information about the system files supplied with Windows 95. In the final version, this appendix will include information about the basic files installed for various Windows 95 configurations. Also, a text file on the WINDOWS 95 RESOURCE KIT disk will describe specific files provided with Windows 95.

### *Windows 95 Distribution Disk Storage Overview*

---

Windows 95 is stored on the distribution disks as cabinet files (\*.CAB). When the Windows 95 disks are created, files are compressed into folders. The Windows 95 files are read in and written as one, continuous byte stream, which compresses the entire stream and divides it into folders as appropriate. Folders can fill one or more cabinets. The following defines the terms used to describe the distribution files.

#### *Cabinet.*

A normal file that contains pieces of one or more files; usually compressed.

#### *Folder.*

A decompression boundary. Large folders enable higher compression, because the compressor can refer back to more data in finding patterns. However, to retrieve a file at the end of a folder, the entire folder must be decompressed.

#### *File.*

A file to be placed in the layout.

The Windows 95 distribution disks use distribution media format (DMF), which is a special read-only format for 3.5-inch floppy disks that permits storage of 1.7 MB of data (a 17.7 percent increase over the standard 1.44-MB format). This is achieved by reducing the inter-sector gap and adding three sectors per track. DMF does not affect the ability of any floppy drive to read the disk, because the magnetic recording density has not been changed. However, due to this reduced inter-sector gap, there is not enough room between sectors to allow a floppy disk drive to reliably write to a DMF disk.

### *Using the Extract Program to Extract Files*

---

**Important** — The information in this section is provided for use if your product support representative indicates that you should use the Extract program to extract a compressed file from the Windows 95 cabinet files.

In general, you should use the Add/Remote Programs or Network options in Control

Panel to install applications and supporting software from the Windows 95 disks.

If system files are missing or damaged, run Windows 95 Setup from the Windows 95 disks (or network distribution source), and choose the option to validate and restore files.

---

The Extract program supports command-line extraction of files from the cabinet (\*.CAB) storage format on disk. Extract does not support any other compression system (that is, it is not backward-compatible with any previous Microsoft disk utilities).

The Extract program (EXTRACT.EXE) can be found in the Windows COMMAND directory, or on the Windows 95 disks.

### Syntax

extract [/y] COMPRESSED\_FILE [DESTINATION\_FILE]

—Or—

extract [/y] [/A] [/D] [/E] [/L LOCATION] CABINET\_FILE [FILE\_SPECIFICATION ...]

### Parameters

/A

Process all files in a cabinet set, starting with the CABINET\_FILE.

/D

Provide only a directory listing (do not extract).

/E

Force extraction.

/L LOCATION

Use the directory specified by LOCATION, instead of the current directory, as the default location to place extracted files.

/Y

Overwrite files in the destination without prompting. The default is to prompt the user if the destination file already exists, and allow one of the following:

n

Overwrite the file

n

Skip the file

n

Overwrite this file and all subsequent files that may already exist

n

Exit

#### COMPRESSED\_FILE

This is a cabinet file that contains a single file (for example, FILE1.EX\_ , which contains FILE1.EXE). If destination\_ file is not specified, then the file is extracted and given its original name in the current directory.

#### DESTINATION\_FILE

This can be either a relative path (.:, ..., C:FILE1, and so on) or a fully qualified path. This can specify either a file (or files, if wild cards are included) or a directory. If a directory is specified, then the filename stored in the cabinet is used. Otherwise, destination\_ file is used as the complete filename for the extracted file.

## CABINET\_FILE

This is a cabinet file that contains two or more files. If no file\_specification parameter is specified, then a list is displayed of the files in the cabinet. If one or more file\_specification parameters are specified, then these are used to select the files to be extracted from the cabinet. Wild cards are allowed to specify multiple cabinets.

## FILE\_SPECIFICATION

This specifies files to be extracted from the cabinets. This can contain the ? and \* wild cards. Multiple file\_specification values can be supplied.

The following table provides some examples.

---

Assuming

ffi

il

le

e

m

æ

mm

ee

ee



XX

— contains  
just the  
single file  
FOO.EXE,  
then

fi

l

e

n

a

m

e

.

e

x

e

is extracted  
and placed  
in the  
current  
directory.

Assuming

ffi

il

l

æ

m

æ

mm

æ

œ

xx

— contains  
just the  
single file

f fi

i il

l e

en

2a

.exe

m

e.

e

x

e,

then

fi

|

e

n

a

m

e

e



x

e

is extracted  
and placed  
in the  
current  
directory in  
the file

fi

|

e

2.

e

x

e.

Assuming

CC

æ

bb

ii

nn

ee

tt.

.1

1  
contains multiple files, then a list of the files stored in that cabinet is displayed.

cab Extracts  
net. all .EXE  
1 files from  
\*.ex  
e

C

a

b

i

n

e

t.

# 1

and places them in the current directory.

## *Setup Files Overview*

---

The following table describes the key files used for Windows 95 Setup.

---

SE The real-  
TU mode Setup  
P.E component  
XE that  
initializes  
Windows 95  
Setup. If this  
file is started  
from MS-  
DOS, it calls  
the Real-  
Mode Stub.  
If started  
from within  
Windows, it  
is a 16-bit  
Windows  
Stub.

SU The  
WI protected-  
N. mode Setup  
EX components  
E responsible  
for calling all  
other DLLs  
used in

Setup.

SE The primary  
TU DLL used  
PX during the  
.D Copy Files  
LL phase to  
perform  
most of the  
installation  
procedures.  
It is  
responsible  
for reading  
INF files,  
handling  
disks, and  
copying  
files.

NE The module  
TD called early  
I.D in the Setup  
LL process to  
install  
networking  
services.

Also, the WININSTx.400 directory is created at the beginning of the Windows 95 Setup process. This directory contains a minimal set of files used during setup and requires about 6 to 7 MB of free disk space. This directory is removed upon successful completion of Windows 95 installation.

### Directory File Structure and File Locations

---

The following shows the typical default directory structure created for Windows 95.

Windows  
— Command  
— Config  
— Desktop  
— Fonts  
— Help  
— Hypertrm  
— Inf  
— Media

- Msremote.sfs
- Pif
- Printers
- Recent
- Sendto
- Spool
- Start Menu
- Programs
- Accessories
- Games
- Multimedia
- System
- Startup
- Sysbackup
- System
- Color
- losubsys
- Viewers
- Vmm32
- Temp

The following table lists the directories where various types of Windows 95 system files and supporting files are stored.

### Key Paths to Windows 95 Files

1

Core Window  
Windo s  
ws 95  
files

Shortcu Window  
ts to s  
applicat PROG  
ions RAMS

MS- Window  
DOS s  
comma COMM  
nds AND

Printer Window  
drivers s



|                                                  |                                        |
|--------------------------------------------------|----------------------------------------|
|                                                  | PRINT<br>ERS                           |
| Help<br>files                                    | Window<br>s HELP                       |
| Font<br>files                                    | Window<br>s<br>FONTS                   |
| Setup<br>and<br>device<br>installat<br>ion files | Window<br>s INF                        |
| PIF<br>files                                     | Window<br>s PIF                        |
| Drivers                                          | Window<br>s<br>SYSTE<br>M              |
| VxDs                                             | Window<br>s<br>SYSTE<br>M              |
| I/O<br>Subsys<br>tem                             | Window<br>s<br>SYSTE<br>M\IOSU<br>BSYS |
| Viewer<br>s                                      | Window<br>s<br>SYSTE<br>M\VIE<br>WERS  |
| VxDs<br>added<br>after<br>installat<br>ion       | Window<br>s<br>SYSTE<br>M\VMM<br>32    |

---

1 “Windows” refers to the directory that is specified during the installation process to contain the Windows 95 files.

---

The following table shows where key Windows 95 files are stored, depending on whether Windows 95 is installed on the local hard disk of a computer or is installed on a server for a network client computer to run a shared copy.

Location of Key Windows 95 Files

---

|            |         |
|------------|---------|
| Real IO.   | Root    |
| - SY       | directo |
| mod S      | ry of   |
| e          | startu  |
| oper       | p drive |
| atin       |         |
| g          |         |
| syst       |         |
| em         |         |
| and        |         |
| syst       |         |
| em         |         |
| dete       |         |
| ction      |         |
| Com CO     | Root    |
| man MM     | directo |
| d- AN      | ry of   |
| line D.C   | startu  |
| proc OM    | p drive |
| esso       |         |
| r          |         |
| Real WIN   | Windo   |
| - .CO      | ws      |
| mod M      |         |
| e          |         |
| stub       |         |
| to         |         |
| start      |         |
| Win        |         |
| dow        |         |
| s 95       |         |
| Prot VM    | Local1  |
| ecte M32 : |         |
| d- .VX     | Windo   |
| mod D      | ws      |
| e          | SYST    |
| Virtu      | EM      |

|      |       |
|------|-------|
| al   | Share |
| Mac  | d1:   |
| hine | Share |
| Man  | d     |
| ager | Windo |
| (VM  | ws    |
| M)   |       |

|      |     |         |
|------|-----|---------|
| Regi | SY  | Local:  |
| stry | STE | Windo   |
|      | M.D | ws      |
|      | AT  | Share   |
|      |     | d:      |
|      |     | Home    |
|      |     | directo |
|      |     | ry      |

|      |     |         |
|------|-----|---------|
| Regi | SY  | Local:  |
| stry | STE | Windo   |
| curr | M.D | ws      |
| ent  | A0  | Share   |
| back |     | d:      |
| up   |     | Home    |
|      |     | directo |
|      |     | ry      |

|       |     |         |
|-------|-----|---------|
| Regi  | SY  | Local:  |
| stry  | STE | Windo   |
| wh    | M.N | ws      |
| n     | EW  | Share   |
| first |     | d:      |
| crea  |     | Home    |
| ted   |     | directo |
| by    |     | ry      |
| Setu  |     |         |
| p     |     |         |

|      |     |         |
|------|-----|---------|
| User | US  | Local:  |
| Regi | ER. | Windo   |
| stry | DAT | ws      |
|      |     | Share   |
|      |     | d:      |
|      |     | Home    |
|      |     | directo |
|      |     | ry      |

|      |     |        |
|------|-----|--------|
| User | US  | Local: |
| Regi | ER. | Windo  |

stry NE ws  
first W Share  
crea d:  
ted Home  
by directo  
Setu ry  
p

User PO Local:  
polic LIC Windo  
ies Y.D ws  
file AT PROF  
ILES\

u

s

e

r

Share

d:  
Distrib  
uted  
share

Log SET Root  
of UPL directo  
the OG. ry of  
Setu TXT startu  
p p drive  
proc  
ess

Har DE Root  
dwa TLO directo  
re G.T ry of  
dete XT startu  
ction p drive  
log

Log BO Root  
of OTL directo  
Win OG. ry of  
dow TXT startu  
s 95 p drive  
start  
up  
proc  
ess

Real PR Local:  
- OT Windo  
mod OC ws  
e OL.I Share  
netw NI d:  
ork Share  
confi d  
gura Windo  
tion ws

---

1 A local installation has all the Windows 95 system files installed on the local hard disk; a shared installation runs a shared copy of Windows 95 from a server. For more information, see Chapter 4, "Server-Based Setup for Windows 95."

---

If you install Windows 95 on a compressed drive, Windows 95 Setup will place the

following files on the boot drive:

```
AUT WIN BOO
OEX A20. TLO
EC. 386 G.PR
BAT AUT V1
CO OEX BOO
NFI EC.D TLO
G.S OS G.TX
YS CON T1
CO FIG. DET
MM DOS LOG.
AND TXT1
.CO COM
M MAN MSD
D.DO OS.--
IO.S S -1
YS1 IO.D SET
MS OS* UPL
DO OG.T
S.S MSD XT1
YS1 OS.D
OS1 SUH
DBL DLO
SPA NET G.DA
CE. LOG. T1
BIN TXT
1 SYS
TEM.
DRV 1ST1
SPA
CE.
BIN
1
DRV
SPA
CE.I
NI1
```

---

1 Indicates a hidden file.

---

The WIN386.SWP is added to the host drive by Windows 95 Setup. Although the host drive is usually the same as the boot drive, it doesn't have to be. For example, if part of drive D is used to create the compressed drive H, then D is the host for H, but C is the host drive. Therefore, WIN386.SWP will be placed in the root of D if

Windows is installed on drive H. The remaining Windows 95 files are placed on the compressed drive in the specified Windows directory.

Windows 95 Setup adds the same files as listed earlier in this section to the boot drive when installing Windows 95 on an uncompressed drive that is not the boot drive. The only difference is that WIN386.SWP will be placed on the same drive as the Windows directory. For example, if you have drives C and D, and if you install Windows 95 on D:\WINDOWS, then WIN386.SWP will be on the root of D. Otherwise, it will be placed as described earlier for compressed drives.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Appendix C Windows 95 INF Files

This appendix describes the structure for the information files (INF) used to configure devices and networking components in Windows 95.

This information is of particular use if you are creating custom setup files. This description of the INF file format will help you read the information in the Windows 95 INF files to find the values to be provided in MSBATCH.INF. The general format is also used for statements in the [Install] section of MSBATCH.INF.

### Windows 95 Device Information Files Overview

---

Device information (INF) files provide information used by Windows 95 to install software that supports a given hardware device. When IHVs introduce new products, they must create INF files to explicitly define the resources and files required for each class of device.

The format of the INF files is based on Windows 3.x INF files:

n

Section names are enclosed in brackets ([ ]) and must be unique within an

INF file.

n

Keys within a section do not have to be unique, but the order of keys

within a section is significant.

n

Private sections in an INF file are not evaluated by Windows 95.



Using the Plug and Play enumerators, the operating system detects the unique ID of each device installed. For the device identified, a specific section of the INF file provides information on that class of device; the following describes the information contained in a typical INF file section.

### General INF File Format

---

An INF file is organized in several sections which define information that Setup and the hardware detection process use to determine the resource needs of the hardware device and to install software for that device. An INF file is organized by hardware, with each class of device described in its own section. Within each device section, the following general organization applies.

#### [Version] section

Contains a simple header that identifies the INF and the class of device this INF supports.

#### [Manufacturer] and [MANUFACTURER NAME] sections

Lists all the individual manufacturers of the devices identified in this file and lists all the devices built by that manufacturer. These entries are displayed directly to the user and used to generate the appropriate Registry entries. There must always be at least one manufacturer section.

#### [INSTALL] section

Describes the device driver and physical attributes of the hardware device. It also identifies the names of all the [INSTALL] sections that contain information and instructions for installing this device.

#### [ClassInstall] section

Defines a new class for this device. Optional.

#### [Modules] section

Defines detection DLLs for the hardware devices supported by this INF file.

#### [Strings] section

Defines all localizable strings used in the INF file.

Each section contains one or more entries. The typical entry consists of a key and a value separated by an equal sign. Keys within a section do not have to be unique, but the order of keys may be significant depending on the purpose of the section. An INF file can include comments — any string of text, up to the end of the line, that

starts with a semicolon. A comment can start anywhere on a line. For example:

Key=value ; comment

Many of the fields defined in the sections of the INF are written into the Registry. Because much of the Registry is binary data and the INF file is purely text, the INF permits "ASCII binary" values, that is, values that are stored as text but represent binary data in Intel byte order. It is not possible to predict the kinds of data that will be stored in the Registry; this method permits any binary data to be represented in the file and moved directly to the Registry.

For complete details about the syntax and use of statements in Windows 95 INF files, see the WINDOWS 95 SOFTWARE DEVELOPMENT KIT.

### [Version] Section

---

#### Syntax

[Version]

Signature="\$WINDOWS 95\$"

InfVersion=00.00.00

Class=CLASS-NAME

LayoutFile=FILENAME.INF

Provider =%MSFT%

The [Version] section defines the standard header for all Windows 95 INF files.

#### CLASS-NAME

Defines the class in the Registry for any device installed from this INF. The following are some examples of class names:

```
Ad hdc Mo PC
apt Key nito MC
er boa r IA
Cd rd Mo Por
ro MC use ts
m AD MT Prin
Dis evic D ter
pla es Net SC
y Me Net SIA
El dia Ser dap
SA Mo vice ter
de de No Sys
vic m driv tem
```

es er  
fdc

#### FILENAME.INF

Names the INF file that contains the layout information (source disks and files) required for installing this driver software. Typically, for Windows 95 components, this is LAYOUT.INF. This line is optional. If not given, the [SourceDisksNames] and [SourceDisksFiles] sections must be given in this INF.

This example shows a typical [Version] section:

[Version]  
Signature="\$WINDOWS 95\$"  
Provider=%MSFT%  
Class=Adapter  
LayoutFile=LAYOUT.INF

#### [Manufacturer] Section

---

#### Syntax

##### [Manufacturer]

MANUFACTURER-NAME | %STRINGS-KEY% = MANUFACTURER-NAME-SECTION

The [Manufacturer] section identifies the manufacturer of the device and specifies the name of the [MANUFACTURER-NAME] section that contains additional information about the device driver.

##### MANUFACTURER-NAME

Name of the manufacturer. This name can be any combination of printable characters, but must uniquely identify the manufacturer and must be enclosed in double quotation marks.

##### STRINGS-KEY

Name of a string as defined in a [Strings] section.

##### MANUFACTURER-NAME-SECTION

Name of the [MANUFACTURER-NAME] section. This name can be any combination of printable characters, but must uniquely identify the manufacturer name.

The following example shows a typical [Manufacturer] section in which a string key, %M1%, is used to identify the manufacturer. In this example, the [MANUFACTURER-

NAME] section is APEXD.

[Manufacturer]

%M1%=APEXD ; Strings key for this manufacturer

## [Manufacturer Name] Section

---

### Syntax

[MANUFACTURER-NAME]

DEVICE-DESCRIPTION=INSTALL-SECTION-NAME[,COMPATIBLE-DEVICE-ID]...

The [MANUFACTURER NAME] section gives the device description and identifies the [INSTALL] section for this device. The MANUFACTURER-NAME-SECTION name must be defined in the [Manufacturer] section.

DEVICE-DESCRIPTION

Description of the device to install. This can be any combination of printable characters or a strings key.

INSTALL-SECTION-NAME

Name of the [INSTALL] section for this device.

COMPATIBLE-DEVICE-ID

Identifier of a compatible device. More than one compatible device identifier can be given, but each must be preceded by a comma.

The following example shows a typical [MANUFACTURER NAME] section. The name of the [INSTALL] section for this device is SuperSCSI. Compatible device identifiers are \*PNPA000 and \*PnPA001.

[APEXD]

%DevDesc1% = SuperSCSI, \*PNPA000, \*PnPA001

For each driver installed using this INF file, Setup uses the information in these [MANUFACTURER NAME] sections to generate Driver Description, Manufacturer Name, DeviceID, and Compatibility list entries in the Registry.

## [Install] Section

---

### Syntax

[INSTALL-SECTION-NAME]

LogConfig = LOG-CONFIG-SECTION-NAME[, LOG-CONFIG-SECTION-NAME]...

Copyfiles=FILE-LIST-SECTION[, FILE-LIST-SECTION]...

Renfiles=FILE-LIST-SECTION[, FILE-LIST-SECTION]...

Delfiles=FILE-LIST-SECTION[, FILE-LIST-SECTION]...

UpdateInis=UPDATE-INI-SECTION[, UPDATE-INI-SECTION]...

UpdateIniFields=UPDATE-INIFIELDS-SECTION[, UPDATE-INIFIELDS-SECTION]...

AddReg=ADD-REGISTRY-SECTION[, ADD-REGISTRY-SECTION]...

DelReg=DEL-REGISTRY-SECTION[, DEL-REGISTRY-SECTION]...

Ini2Reg=INI-TO-REGISTRY-SECTION[, INI-TO-REGISTRY-SECTION]...

UpdateCfgSys=UPDATE-CONFIG-SECTION

UpdateAutoBat=UPDATE-AUTOEXEC-SECTION

Reboot|Restart

The [INSTALL] section identifies the additional sections in the INF file that contain descriptions of the device and instructions for installing files and information needed by the device drivers. The INSTALL-SECTION-NAME must be defined in a [MANUFACTURER NAME] section and consist of printable characters.

Not all entries in this section are needed or required. If an entry is given, it must specify the name of a section. (An exception to this is the CopyFiles entry.) More than one name can be given for each entry, but each additional name must be preceded by a comma. The exact format and meaning of the corresponding entry depends on the entry type and is described in later SECTIONS. Each [INSTALL] section should include the creation date of the driver set.

The Reboot or Restart entries can be added to the [INSTALL] section to force the system to either restart or to reboot the machine after performing the commands in the [INSTALL] section.

This example shows a typical [INSTALL] section. It contains a LogConfig entry that identifies two logical configuration sections for this device. It also contains Copyfiles and AddReg entries that identify the sections containing information about which files to install.

[SuperSCSI]

; Apex Drivers Model 01 - SuperSCSI+

Log Config = With Dma, WithoutDMA

Copyfiles=MoveMiniPort, @SRSutil.exe

AddReg=MOD1

The CopyFiles entry provides a special notation that allows a single file to be copied directly from the copy line. An individual file can be copied by prefixing the file name with an @ symbol. The destination for any file copied using this notation will be the DefaultDestDir as defined in the [DestinationDirs] section. The following example shows how to copy individual files:

CopyFiles=FileSection1,@myfile.txt,@anotherfile.txt,LastSectionName

### Syntax

[LOG-CONFIG-SECTION-NAME]  
ConfigPriority =\_PRIORITY-VALUE  
MemConfig =\_MEM-RANGE-LIST  
I/OConfig =\_IO-RANGE-LIST  
IRQConfig =\_IRQ-LIST  
DMAConfig =\_DMA-LIST

A [LOGICAL CONFIGURATION] section defines configuration details, such as IRQs, memory ranges, I/O ports, and DMA channels. An INF file can contain any number of [LOGICAL CONFIGURATION] sections, as many as are needed to describe the device dependencies. However, each section must contain complete details for installing a device. The LOG-CONFIG-SECTION-NAME must be defined by the LogConfig entry in the [INSTALL] section.

Not all entries are needed or required. If an entry is given, it must be given appropriate values as described in the subsequent SECTIONS.

Each entry can specify more than one resource. However, during installation only one resource from an entry is used. If a device needs multiple resources of the same type, multiple entries must be given. For example, to ensure two IRQs for a device, two IRQConfig entries must be given. If a device does not require an IRQ, no IRQConfig entry should be given. For each entry, Setup builds binary logical configuration records and adds these to the driver section of the Registry.

For examples of these settings for common network adapters described in network device INF files, see "Windows 95 Network Adapter INF Summary" in Appendix D, "MSBATCH.INF Parameters."

### Syntax

[UPDATE-AUTOEXEC-SECTION]  
CmdDelete=COMMAND-NAME  
CmdAdd=COMMAND-NAME[, "COMMAND-PARAMETERS"]  
UnSet=ENV-VAR-NAME  
PreFixPath=\_LID[, \_LID]  
RemOldPath=\_LID[, \_LID]

TmpDir=LDID[,SUBDIR]

The [UPDATE AUTOEXEC] section provides commands to manipulate lines in the AUTOEXEC.BAT file. The UPDATE-AUTOEXEC-SECTION name must appear in an UpdateAutoBat entry in the [INSTALL] section.

Not all entries are needed or required. The section can contain as many CmdAdd, CmdDelete, and UnSet entries as needed, but only one entry for PreFixPath, RemOldPath, and TmpDir can be used per file. For more information about the entries, see the subsequent sections.

Setup processes all CmdDelete entries before any CmdAdd entries.

### Syntax

[UPDATE-CONFIG-SECTION]

DevRename=CURRENT-DEV-NAME,NEW-DEV-NAME

DevDelete=DEVICE-DRIVER-NAME

DevAddDev=DRIVER-NAME,CONFIGKEYWORD[,FLAG][,PARAM-STRING]

Stacks=DOS-STACKS-VALUES

Buffers=LEGAL-DOS-BUFFER-VALUE

Files=LEGAL-DOS-FILES-VALUE

LastDrive=LEGAL-DOS-LASTDRIVE-VALUE

The [UPDATE CONFIG] section provides commands to add, delete, or rename commands in CONFIG.SYS. The UPDATE-CONFIG-SECTION name must appear in an UpdateCfgSys entry in the [INSTALL] section.

Not all entries are needed or required. This section may contain as many DevRename, DevDelete, and DevAddDev entries as needed, but the other commands may only be used once per section. When processing this section, Setup processes all DevRenames entries first, all DevDelete commands second, and all DevAddDev commands last. For more information about these entries, see subsequent sections.

### Syntax

[UPDATE-INI-SECTION]

INI-FILE, INI-SECTION, [OLD-INI-ENTRY], [NEW-INI-ENTRY], [FLAGS]

=====

====  
====  
====

Replaces, deletes, or adds entries in the given INI file. This is similar to the INF support in Windows 3.1. The UPDATE\_INI\_SECTION name must appear in an *UpdateInis* entry in the [INSTALL] section. The optional action FLAGS can be one of these values:

0Default.  
Matches Value  
of

ol

d

-

in



i-

e

nt

ry

Key, ignores its  
value. If Key is  
present,  
replaces with

n

e

w

-

in

i-

e  
nt  
ry  
ol  
d

. If

-

in

i-

e

nt

ry

is NULL, the

n

e

w

-

in

i-

e

nt

ry

is added  
unconditionally.  
If

n

e

w

-

in

i-

e

nt

ry

is NULL, the

ol



d

-

in

i-

e

nt

ry

is deleted.

1Matches both  
Key and Value  
of

ol

d

-

in

i-

e

nt

ry

. Update is  
done only if  
both Key and  
Value match.

2Conditional

and matches  
only the Key of

ol

d

-

in

i-

e  
nt  
ry  
ol  
d

. If Key in

-

in

i-

e

nt

ry

already exists,  
do not replace  
with

n

e

w

-

in

i-

e

nt

ry

3Conditional  
and matches  
both Key and  
Value of



ol

d

-

in

i-

e  
nt  
ry  
K  
e

. If the

y =

v

al

u

e of

ol

d

-

in

i-

e

nt

ry

exists, do not  
replace with

n

e

w

-

i  
n

i  
-

e

# nt ry

The wildcard character (\*) can be used in specifying the Key and Value, and they will be interpreted correctly.

The INI FILE name can be a string or a strings key. A strings key has the form %STRKEY% where STRKEY is defined in the [Strings] section in the INF file. In either case, the name must be a valid filename.

The name should include the name of the directory containing the file, but the directory name should be given as a logical directory identifier (LDID) rather than an actual name. Setup replaces an LDID with an actual name during installation.

An LDID has the form %LDID% where LDID is one of the predefined identifiers or an identifier defined in the [DestinationDirs] section. For LDID\_BOOT and LDID\_BOOTHOST, the backslash is included in the LDID, so %30%boot.ini is the correct way to reference BOOT.INI in the root of the boot drive.

The following examples illustrate entries in this section:

%11%\sample.ini, Section1, Value1=2 ; adds new entry

%11%\sample.ini, Section2, Value3=\*, ; deletes old entry

%11%\sample.ini, Section4, Value5=1, Value5=4 ; replaces old entry

## Syntax

[UPDATE-INIFIELDS-SECTION]

INI-FILE, INI-SECTION, PROFILE-NAME, [OLD-FIELD], [NEW-FIELD]

Replaces, adds, and deletes fields in the value of a given INI entry. Unlike the [UPDATE INI] section, this section replaces, adds, or deletes portions of a value in an entry rather than the whole value. The UPDATE-INIFIELDS-SECTION name must appear in an *UpdateIniFields* entry in the [INSTALL] section. For more information about specifying the INI filename, see the “[UPDATE INI] Section” earlier in this appendix.

Any previous comments in the line are removed because they might not be applicable after changes. When looking in the INI file for fields in the line, spaces, tabs, and commas are used as field delimiters. However, a space is used as the separator when the new field is appended to the line.

### Syntax

[ADD-REGISTRY-SECTION]

REG-ROOT-STRING, [SUBKEY], [VALUE-NAME], [FLAG], [VALUE]

====.  
====.  
====.

Adds subkeys or value names to the Registry, optionally setting the value. The ADD-REGISTRY-SECTION name must appear in an *AddReg* entry in the [INSTALL] section.

### Syntax

[DEL-REGISTRY-SECTION]

REG-ROOT-STRING, SUBKEY, [VALUE-NAME]

====.  
====.  
====.

Deletes a subkey or value name from the Registry. The DEL-REGISTRY-SECTION name must appear in an *DelReg* entry in the [INSTALL] section. This section can contain any number of entries. Each entry deletes one subkey or value name from the Registry.



## Syntax

[INI-TO-REGISTRY-SECTION]

INI-FILE, INI-SECTION, [INI-KEY], REG-ROOT-STRING, SUBKEY, FLAGS

====.  
====.  
====.

Moves lines or sections from an INI file to the Registry, creating or replacing an entry under the given key in the Registry. The INI-TO-REGISTRY-SECTION name must appear in an Ini2Reg entry in the [INSTALL] section.

## Syntax

[DestinationDirs]

FILE-LIST-SECTION=LDID[,SUBDIR]

====.  
====.  
====.

DefaultDestDir=LDID[,SUBDIR]

The [DestinationDirs] section defines the destination directories for the given [FILE-LIST] sections and optionally defines the default directory for any [FILE-LIST] sections that are not explicitly named.

FILE-LIST-SECTION

Name of a [FILE-LIST] section. This name must have been defined in a Copyfiles, RenFiles, or DelFiles entry in the [INSTALL] section.

LDID

A logical disk identifier (LDID). Can be one of these values:

0 Null LDID; this  
0 LDID can be  
used to create  
a new LDID

0 Source drive:\  
1 pathname

0 Temporary  
2 setup

directory; this  
is valid only  
during  
Windows 95  
setup

0 Uninstall or  
3 Backup  
directory

0 Not used  
4

1 Windows  
0 directory

1 SYSTEM  
1 directory

1 IOSUBSYS  
2 directory

1 COMMAND  
3 directory

1 Control panel  
4 directory

1 Printers  
5 directory

1 Workgroup  
6 directory

1 INF directory  
7

3 Root directory  
0 of the boot  
drive

3 Root directory  
1 for host drive  
of a virtual  
boot drive

3 Old Windows  
2 directory if it  
exists

3 Old MS-DOS

3directory if it  
exists

#### SUBDIR

Name of the directory, within the directory named by LDID, to be the destination directory.

The optional *DefaultDestDir* entry provides a default destination for any *Copyfile* entries that use the direct copy notation (@filename) or any [FILE-LIST] section not specified in the [DestinationDirs] section. If *DefaultDestDir* is not given, the default directory is set to LDID\_WIN.

This example sets the destination directory for the MoveMiniPort section to the Windows IOSUBSYS directory, and sets the default directory for other sections to be the BIN directory on the boot drive:

#### [DestinationDirs]

MoveMiniPort=12 \_\_\_\_\_ ; Destination for MoveMiniPort Section is  
\_\_\_\_\_; windows\iosubsys  
DefaultDestDirs=30,bin \_\_\_\_\_ ; Direct copies go to Boot:\bin

A [FILE-LIST] section lists the names of files to be copied, renamed, or deleted. Entries in this section have three forms, depending on the type of entry in the [INSTALL] section that defines the section name.

A [FILE-LIST] section for a *CopyFiles* entry has this form:

#### [FILE-LIST-SECTION]

DESTINATION-FILE-NAME,[SOURCE-FILE-NAME],[TEMPORARY-FILE-NAME]

The FILE-LIST-SECTION name must appear in the *CopyFiles* entry.

#### DESTINATION-FILE-NAME

Name of the destination file. If no source filename is given, this is also the name of the source file.

#### SOURCE-FILE-NAME

Name of the source file. Required only if the source and destination names are not the same.

#### TEMPORARY-FILE-NAME

Name of the temporary file for the copy. Setup copies the source file but gives it the temporary filename. The next time Windows 95 starts, it renames the temporary file to the destination filename. This is useful for copying files to a destination that is currently open or in use by Windows.

The following example copies three files:

[CopyTheseFilesSec]

file11\_\_\_\_\_ ; copies file11

file21, file22, file23 \_\_\_\_\_ ; copies file22, temporarily naming it file23

file31, file32 \_\_\_\_\_ ; copies file32 to file31

A [FILE-LIST] section for a *RenFiles* entry has this form:

[FILE-LIST-SECTION]

NEW-FILE-NAME, OLD-FILE-NAME

\_\_\_\_\_.

\_\_\_\_\_.

\_\_\_\_\_.

The FILE-LIST-SECTION name must appear in the *RenFiles* entry.

This example renames the files FILE42, FILE52, and FILE62 to FILE41, FILE51, and FILE61, respectively:

[RenameOldFilesSec]

file41, file42

file51, file52

file61, file62

A [FILE-LIST] section for a *DelFiles* entry has this form:

[FILE-LIST-SECTION]

FILENAME

\_\_\_\_\_.

\_\_\_\_\_.

\_\_\_\_\_.

The FILE-LIST-SECTION name must appear in the *DelFiles* entry.

This example deletes three files:

[DeleteOldFilesSec]

file1

file2

file3

In the preceding examples, the given filenames are assumed to have been defined

in the [SourceDisksFiles] section and the logical disk numbers that appear in this section have been defined in the [SourceDisksNames] section.

### Syntax

#### [SourceDisksFiles]

FILENAME=DISK-NUMBER

=====.

=====.

=====.

Names the source files used during installation and identifies the source disks that contain the files. The ordinal of the source disk defined in DISK-NUMBER must be defined in the [SourceDiskNames] section.

This example identifies a single source file, SRS01.386, on the disk having ordinal 1:

#### [SourceDisksFiles]

SRS01.386 = 1

### Syntax

#### [SourceDisksNames]

DISK-ORDINAL="DISK-DESCRIPTION",DISK-LABEL,DISK-SERIAL-NUMBER

Identifies and names the disks used for installation of the given device drivers.

This example identifies one source disk and assigns it ordinal 1. The disk description is given as a strings key:

#### [SourceDisksNames]

1 = %ID1%, Instd1, 0000-0000

### [ClassInstall] Section

---

### Syntax

#### [ClassInstall]

Copyfiles=FILE-LIST-SECTION[,FILE-LIST-SECTION]...

AddReg=ADD-REGISTRY-SECTION[,ADD-REGISTRY-SECTION]...

The [ClassInstall] section installs a new class for a device in the [Class] section of the Registry. Every device installed in Windows 95 has a class associated with it (even if the class is "UNKNOWN"), and every class has a class installer associated with it. Setup processes this section if one of the devices defined in this INF file is about to be installed and the class is not already defined. Not all entries are needed or required.

The following example specifies the class entry for Setup to create in the Registry (AddReg=SampleClassReg), and specifies a normal [INSTALL] section in [SampleClassReg]. In this example, the Class description is required, and the relative key (HKR) denotes the class section. This example creates the class Sample and registers the description, installer, and icon for the class:

```
[ClassInstall]  
Addreg=SampleClassReg  
CopyFiles=@Sample.cpl  
  
[SampleClassReg]  
HKR,,,%SampleClassDesc%  
HKR,,Installer,,Sample.cpl  
HKR,,Icon,HEX,00,00
```

## [Modules] Section

---

### Syntax

[Modules]  
DETECT=DETMOD.DLL | \$ | \*

The [Modules] section defines the detection modules used to detect the hardware described in the INF file. This section lists the detection DLLs and identifies the [DETECTION] section for each.

DETECT

Name of the [DETECTION] section for this DLL.

DETMOD.DLL

Name of the detection DLL.

\$

Indicates a Microsoft-supplied detection module built into SYSDETMG.DLL.

\*  
=

Indicates a Setup option physically located in SETUP.INF.

### Syntax

```
[DETECT]  
N=CLASS,DEVINF[,DETINFO]  
=====  
=====  
=====
```

The [DETECTION] section identifies the functions in the DLL that can be used to detect hardware. The section specifies the class of device the given function detects and other useful information. The DETSECT name must be defined in a [Modules] section.

N

Entry point ordinal for the function in the corresponding DLL.

CLASS

Class of device the DLL can detect.

DEVINF

Name of the INF file that contains the device information.

DETINFO

Name of the [DETECTION INFORMATION] section in this INF file that defines the dangerous I/O ports or IRQs associated with this device.

### Syntax

```
[DETINFO]  
DangerI/O=DET-IO-RANGE[,DET-IO-RANGE]  
DangerMem=DET-MEM-RANGE[,DET-MEM-RANGE]
```

The [DETECTION INFORMATION] section identifies the I/O ports and IRQs typically used by this hardware or class of hardware and that will stall the computer if accessed.

The `DETINFO` name must be defined in a `[DETECTION]` section.

The `DET-IO-RANGE` has the form: `START-END[([DECODE-MASK]:[ALIAS-MASK])]`.

### Syntax

`[DEVICE-ID.LogConfig]`

The `[DEVICEID.LogConfig]` section describes the hardware Registry entry for a legacy device, that is, a non-Plug and Play device detected by Windows 95 hardware detection modules. When a legacy device is found, the system creates a hardware entry in the root of the Registry by using information in this and other sections. The system looks for a `DEVICE-ID.DeviceDesc` entry in the `[Strings]` section and writes this as the device description in the Registry. It looks for the `Class` entry in the `[Version]` section and writes it to the Registry as the device class.

### Syntax

`[DEVICE-ID.Det]`

`LogConfig = LOG-CONFIG-SECTION-NAME[LOG-CONFIG-SECTION-NAME]...`

The `[DEVICEID.Det]` section defines the logical configuration for devices that have been enumerated by detection. This section is typically used in place of the `[DEVICEID.LogConfig]` section for devices that need multiple logical configurations or to save typing in the case that there are multiple `[DEVICEID.Det]` sections which all point to the same logical configuration.

The `LogConfig` entry is identical to that described for the `[INSTALL]` section.

### [Strings] Section

---

### Syntax

`[Strings]`

`STRINGS-KEY=VALUE`

====.  
====.  
====.



The [Strings] section defines one or more strings keys. A strings key is a name that represents a string of printable characters. Although the [Strings] section is generally the last section in the INF files, a strings key defined in this section may be used anywhere in the INF file that the corresponding string would be used. Setup expands the strings key to the given string and uses it for further processing. Using a strings key requires that it be enclosed in percent signs (%). The [Strings] section makes localization easier by placing all localizable text in the INF file in a single section. Strings keys should be used whenever possible.

#### STRINGS-KEY

A unique name consisting of letters and digits.

#### VALUE

A string consisting of letters, digits, or other printable characters. It should be enclosed in double quotation marks if the corresponding strings key is used in an entry that requires double quotation marks.

The following example shows the [Strings] section for a sample INF file.

```
[Strings]  
MSFT="Microsoft"  
M1="APEX DRIVERS"  
DevDesc1=APEX DRIVERS SCSI II Host Adapter  
ID1="APEX DRIVERS SuperSCSI Installation disk"
```

#### Sample INF File

---

This example assumes a fictitious piece of hardware, a SCSI II Host Adapter built by a company named Apex Drivers. The board requires four I/O ports that can be based at 180H, 190H, 1A0h, or 1B0h. The board requires one exclusive IRQ chosen from 4,5,9,10, or 11. The board can use a DMA channel if one is assigned.

```
;SCSI.INF  
;  
;  
; Standard comment
```

```
[Version]  
Signature="$WINDOWS 95$"  
Provider=%MSFT%  
HardwareClass=SCSIAdapter
```

```
[Manufacturer]  
%M1%=APEXD _____ ; Strings key for this manufacturer
```

[APEXD]

%DevDesc1% = SuperSCSI, \*PNPA000, \*PnPA001

[SuperSCSI]

; Apex Drivers Model 01 - SuperSCSI+

Log\_Config = With\_Dma, WithoutDMA

Copyfiles=MoveMiniPort, @SRSutil.exe

AddReg=MOD1

[With\_DMA]

; Primary Logical Configuration

ConfigPriority = NORMAL

I/OConfig = 4@180-1B3%fff0(3:0:) ; Allocate 4 ports at base 180,190,1A0 or 1B0, device decodes

; 10bits of I/O address and uses no Aliases.

IRQConfig = 4,5,9,10,11 ; Allocate Exclusive IRQ 4, 5, 9, 10 or 11

DMAConfig = 0,1,2,3 ; Allocate DMA Channel 0, 1, 2 or 3

[Without\_DMA]

; Secondary Logical Configuration

ConfigPriority = SUBOPTIMAL

I/OConfig = 4@180-1B3%fff0(3:0:)

IRQConfig = 4,5,9,10,11

[MOD1]

HKR,,DevLoader,,I/Os

HKR,,Miniport,,SRSmini.386

[DestinationDirs]

MoveMiniPort=12 ; Destination for MoveMiniPort Section is

; windows\iosubsys

DefaultDestDirs=30,bin ; Direct copies go to Boot:\bin

[SourceDiskSFiles]

SRS01.386 = 1

[SourceDisksNames]

1 = %ID1%, Instd1, 0000-0000

[MoveMiniPort]

SRS01.386

[Strings]

MSFT="Microsoft"

M1="APEX DRIVERS"

DevDesc1=Apex Drivers SCSI II Host Adapter

ID1="Apex Drivers SuperSCSI Installation disk"

{ewl msdncd.dll, ewcright, /c"Microsoft"}

## Appendix D MSBATCH.INF Parameters

Windows 95 Setup can be run with batch scripts to automate the installation process, so the network administrator can define the options and parameters to be installed on users' computers. Setup scripts are used only at installation time, but some of these parameters are also available in System Policy Editor for modification using policy files after installation.

For information about the procedures for creating and using setup scripts, see Chapter 5, "Custom, Automated, and Push Installations."

### Setup Batch Script Parameters

---

This section describes the parameters that can be used in setup batch scripts.

#### Setup-Related Parameters

[Set  
up]  
para  
met  
ers:

Dete Instal Prod  
ction IDir uctID  
Devi Instal Syste  
cep IType m  
ath Pen Verify  
EBD Win  
Expr Warn  
ess ing

[Na  
meA  
ndO  
rg]  
para  
met  
ers:

Nam Org Displ  
e ay

[Opti  
onal  
Com  
pon  
ents

] parameters:  
List of descriptions

[System] parameters:

Disp Mach Pen  
lay ine Wind  
Disp Monit ows  
lCha or Powe  
r Mous r  
Key e Table  
boar t  
d  
Loc  
ale

[Inst  
allLo  
catio  
nsM  
RU]  
parameters:  
List of paths

### Network-Related Parameters

[Network]  
parameters

ers:

Client Services  
Network Security  
Connectivity  
Network Valid  
me NetC ateN  
Des ards etcar  
cripti Pass dRes  
on Thro ource  
Disp oughA s  
lay gent Work  
Disp Proto group  
lay cols Work  
Wor Rem statio  
kstat oveB nSet  
ionS indin up  
etup g  
HDB RPL  
oot Setu  
p

[ Possible  
entries  
depend  
on  
speci  
fications  
in  
the  
INF  
file  
for  
the  
netw  
ork  
adap  
ter

t  
c  
a  
r  
d

\_ID]  
para  
met  
ers:  
[MS

TCP

]

para

met

ers:

DH Gate Scop

CP ways elD

DNS Host Seco

DNS nam ndary

Serv e WIN

ers IPAd S

Dom dress Subn

ain LMH etMa

Dom ostP sk

ainO ath WIN

rder Prim S

aryW

INS

[NW Fram NetBI

LIN e\_Ty OS

K] pe

para

met

ers:

[NW First Sear

RED NetD chMo

IR] rive de

para Prefe

met rredS

ers: erver

[NW Brow Use\_

SER seMa SAP

VER ster

]

para

met

ers:

[VR Logo Valid

EDI nDo atedL

R] main ogon

para

met

ers:



[VS Anno Brow  
ERV unce seMa  
ER] ster  
para  
met  
ers:

The setup batch script parameters are not case-sensitive. They are also not required; if they don't appear in a batch script, Windows 95 Setup just uses default values.

Display of most Setup dialog boxes can be disabled in the setup batch script so that users cannot change any setting. If the dialog boxes are not disabled, sources of information for parameters are given the following priority:

n

Information specified in the batch script

n

User input

n

Detection information

In this section, the descriptions for an option can contain any of six possible entries, as described in the following table. For an example of the resulting file, see "MSBATCH.INF Sample File" later in this appendix.

---

Bat The name

ch of the  
par parameter  
am as it  
ete appears in  
r a batch  
script.

Bat The values  
ch that can be  
val assigned to  
ues the  
parameter  
and what  
they mean.

Sy Specifies  
ste whether  
m there is a  
poli correspondi  
cy ng  
parameter  
in System  
Policy  
Editor. If no  
entry  
appears,  
there is no  
system  
policy.

Def The built-in  
ault value that is  
used if no  
other value  
is provided.

~~This section sets parameters for control of the Setup process.~~

### Detection

~~This parameter specifies whether to skip hardware detection.~~

---

Bat 0 = Do not

```
ch run
val hardware
ues detection
    1 = Run
    hardware
    detection

Def 1
ault
```

### Device Path

This parameter specifies whether Windows 95 should check a source installation path to find INF files, rather than looking only in the Windows INF directory when installing devices. If this parameter is set to 1, network administrators can later add INF files to a single source location to ensure that up-to-date drivers are installed any time a new device is installed on computers running Windows 95. However, set this value to 1 only if the installation source files are in a network directory (not floppy disks or CD).

---

```
Bat 0 = Do not
ch add source
val directory
ues path for
    INFs
    1 = Add
    installation
    source
    directory to
    path for
    finding INFs

Def 0
ault
```

### Emergency Startup Disk

This parameter specifies whether to create the emergency Startup Disk during Setup (the command-line override for this is /ie).

---

```
Bat 0 = Do not
ch create an
val emergency
```

ues Startup Disk  
1 = Create  
an  
emergency  
Startup Disk

Def 1  
ault

### Express

This parameter specifies whether the user can provide input during Setup. If `express=1`, then Windows 95 Setup uses only the settings specified in `MSBATCH.INF` and does not ask the user to confirm or provide input. This setting disables a significant portion of the user interface for Setup.

---

Bat 0 = Allow  
ch user input  
val 1 = Run  
ues Setup using  
using  
values in  
`MSBATCH.I`  
`NF`

Def 1  
ault

### Install Type

This parameter specifies the type of installation for Windows 95 Setup.

---

Bat 0 =  
ch Compact  
val 1 = Typical  
ues 2 = Portable  
3 = Custom

Def 1  
ault

### Installation Directory

This parameter specifies the directory where Windows 95 is to be installed or the home directory for server-based installations that will run a shared copy of Windows 95.

---

Bat directory  
ch name  
val  
ues  
  
Def Windows  
ault directory, if  
present

### Pen Windows Warning

This parameter specifies whether to display a warning if an unknown version of Pen Windows is installed.

---

Bat 0 = Do not  
ch display the  
val warning  
ues 1 = Display  
the warning  
  
Def 1  
ault

### Product ID

This parameter specifies the product ID for your site, which is printed on the Windows 95 installation disks.

---

Bat string  
ch  
val  
ues  
  
Def none  
ault

### Verify

This parameter specifies whether to run Windows 95 Setup in Verify mode, to check the integrity of system files that have already been installed on the computer. (This switch is provided by Setup for original equipment manufacturers.)

---

Bat 0 = Do not  
ch run in Verify  
val mode  
ues 1 = Run in  
verify mode

Def 0  
ault

This section defines the name and organization for Windows 95 Setup, and specifies whether the user is to be shown the Name and Organization dialog box.

### Name

This parameter specifies the full user name for this installation.

---

Bat String  
ch  
val  
ues

Def None  
ault

### Organization

This parameter specifies the registered organization for this installation.

---

Bat String  
ch  
val  
ues

Def None  
ault

## Display

This parameter specifies whether the Name and Organization dialog box appears during Windows 95 Setup.

---

Bat 0 = Do not  
ch display  
val name and  
ues organization  
1 = Display  
name and  
organization

Def 1  
ault

This section contains the descriptions that appear in the Optional Components dialog box in Windows 95 Setup.

To create entries for this section, type the description enclosed in double-quotation marks. Each description is followed by a 1 (install) or 0 (do not install). The strings that specify the optional components to install are defined in INF files.

Another way to define entries for this section is to copy the [OptionalComponents] section in SETUPLOG.TXT from a computer that already has all the optional components installed that you want defined in the setup script. For an example, the entries to install Briefcase and Net Watcher are as follows:

[OptionalComponents]  
"Briefcase"=1  
"Net Watcher"=1

The following lists show the strings for the optional components defined in the Windows 95 standard INF files. Additional strings can be defined by other application developers. These lists are organized in the order they appear in the Optional Components screen in Windows 95 Setup.

---

Acc Gam Scroll  
esso es ing  
ries Multi- Marq  
Acc Lang uee  
essi uage Blank

bility Supp Scre  
Opti ort en  
ons Net Curv  
Brief Watc es  
case her and  
Calc Obje Color  
ulat ct s  
or Pack Mysti  
Cha ager fy  
ract Onlin Your  
er e Mind  
Map User' Flyin  
Clip s g  
boar Guid Thro  
d e ugh  
Vie Paint Spac  
wer Quic e  
Des k Syste  
ktop View m  
Wall Scre Monit  
pap en or  
er Save Wind  
Doc rs ows  
ume 95  
nt Tour  
Tem Word  
plat Pad  
es  
Extr  
a  
Curs  
ors

---

Com Direc Phon  
mun t e  
icati Cabl Diale  
ons e r  
Dial- Conn  
Up ectio  
Net n  
work Hype  
ing rTer  
minal



---

Disk Defra  
Tool g  
s (disk  
Bac defra  
kup gmen  
ter)  
Disk  
Com  
press  
ion  
Tools

---

Microsoft Exchange  
Compuserve Mail Services

Inter  
net  
Mail  
Micr  
osof  
t  
Fax

---

Multi Musi Soun  
med ca d  
ia Soun Reco  
Audi d rder  
o Sche Utopi  
Com me a  
pres Natur Soun  
sion e d  
CD Soun Sche  
Play d me  
er Sche Vide  
Med me o  
ia Robo Com

Play tz press  
er Soun ion  
d Volu  
Sche me  
me Contr  
Soun ol  
d and  
Vide  
o  
Clips

---

The  
Micr  
osof  
t  
Net  
work

This section sets parameters for modifying the system settings, based on classes. For more information about these classes and the related INF settings, see Chapter 6, "Setup Technical Discussion," and Appendix C, "Windows 95 INF Files."

The following entries are based on INF section names:

n

Locale=INF\_SECTION\_NAME in LOCALE.INF (see also Chapter 34,

"International Windows 95")

n

Machine=INF\_SECTION\_NAME in MACHINE.INF

n

PenWindows=INF\_SECTION\_NAME in PENWIN.INF

n

Power=INF\_SECTION\_NAME

n

Tablet=INF\_SECTION\_NAME

The following entries use INF descriptions. The choice must be in the list of compatible devices for that class.

n

Display=INF\_DESCRIPTION in MSDISP.INF or a similar file

For example, from the description %SuperVGA.DriverDesc%=SVGA for Super

VGA, the entry in MSBATCH.INF would be *display=svga*.

n

*Keyboard=INF DESCRIPTION in KEYBOARD.INF (see also Chapter 34,*

*“International Windows 95”)*

n

*Monitor=INF SECTION NAME in MONITOR.INF*

n

*Mouse=INF SECTION NAME in MSMOUSE.INF or a similar INF file*

### *Display Characteristics*

*This parameter sets the initial video display characteristics.*

---

Bat  
ch  
val  
ues

C

O

I

O

r

D

e

p

t

h

,

$x$

,

$y$

where:

$C$

$O$

I  
o  
r  
D  
e



p

t

h =

bits per  
pixel

X =

horizontal  
resolution

y =

vertical  
resolution

Def 4,640,480  
ault

This section specifies a list of paths to add to the list of directories that the user can choose when Windows 95 Setup prompts for a path. For example, this section could appear as follows to specify a network file location:

[InstallLocationsMRU]  
mru1=a:\  
mru2=c:\  
mru3=\\winserver\source

This section specifies the parameters and options for installing networking components. The categories for these parameters include the following:

n Installation parameters

n Computer identification parameters

# n

Shared installation parameters

# n

Security parameters

# n

User interface options

## [Installation Parameters in \[Network\]](#)

### [Clients](#)

This parameter specifies the network clients to be installed. It is a list of the device IDs used in the INF files. These IDs are not limited to those in the Windows 95 INF files. A site that has an INF file from another vendor can use any device IDs listed in it.

Specify multiple networks in a comma-separated list. If the list contains two network clients, or lists multiple networks with a primary-only network (such as TCS® 10-Net), Windows 95 Setup presents an error message and displays the Network Configuration property sheet for changing the selection. The verification checks that occur in Setup still take place.

---

Bat Comma-  
ch separated  
val list of client

ues device IDs  
(see the  
following  
table)

Def Defaults in  
ault NETDEF.IN  
F

The following table shows the valid device IDs for network clients as specified in  
NETCLI.INF and NETCLI3.INF (which are Windows 95 INF files).

---

10 TCS 10-Net  
NE version 4.1  
T4  
1

10 TCS 10-Net  
NE version  
T4 4.1A  
1A

10 TCS 10-Net  
NE version 4.2  
T4  
2

10 TCS 10-Net  
NE version  
T4 4.1MS  
2M  
S

10 TCS 10-Net  
NE version 5.x  
T5  
0A

BW Beame and  
NF Whiteside  
S3 NFS 3.0  
0 and greater

DL IBM®  
R1 OS/2® LAN  
3 Server  
version 1.2,

### 1.3

DL IBM OS/2  
R1 LAN Server  
3C version  
SD 1.3CSD

DL IBM OS/2  
R2 LAN Server  
0 version 2.x

LA Artisoft®  
NT LANtastic®  
5 version 5.x  
and 6.x

MS Microsoft  
NE MS-NET  
T

NE Novell®  
TW NetWare®  
AR version 3.x  
E3

NE Novell  
TW NetWare  
AR version 4.x  
E4

N Client for  
W NetWare  
RE Networks  
DI  
R

PC Sun® PC-  
NF NFS®  
S5 version 5.x  
0 and greater

PA DEC™  
TH Pathworks  
W™  
RK  
S4  
0

VI Banyan®  
NE VINES®

S5 version  
52 5.52 and  
greater

VR Client for  
ED Microsoft  
IR Networks

### Ignore Detected NetCards

This parameter specifies whether Setup will use the detected information to configure network adapters or use values specified by the NetCards parameter in the setup script.

---

Bat 1 = Ignore  
ch the  
val detected  
ues network  
adapters  
and use the  
values  
specified for

d

e

v

i

c

e

i

# D

0 = Do not  
ignore  
detected  
adapters

Def 0  
ault

## Network Card Drivers

This parameter specifies the drivers to be installed for network adapters as a list of the device IDs used in the INF files. These IDs are not limited to those included in the Windows 95 INF files. A site that has an INF file from another vendor can use any device IDs listed in that file.

When a network adapter is listed, the usual verification takes place. Windows 95 Setup chooses an NDIS 3.1 driver, if available; otherwise, it uses an NDIS 2.x.

---

Bat Comma-  
ch separated  
val list of  
ues network  
adapter  
device IDs

Def Results of  
ault detection

## Protocols

This parameter specifies the protocols to be installed as a list of the device IDs used in the INF files. These IDs are not limited to those in the Windows 95 INF files. A site that has an INF file from another vendor can use any device IDs listed in that file.

Setup verifies these settings, so it is possible to specify only the network clients and



let Windows 95 Setup choose the protocols. For example, if you specify  
Clients=pcnfs50, then Windows 95 Setup adds NFSLINK.

---

Bat Comma-  
ch separated  
val list of  
ues protocol  
device IDs,  
as  
described in  
the  
following  
table

Def Defaults in  
ault NETDEF.IN  
F

The valid device IDs for protocols in the Windows 95 INF file (NETTRANS.INF) are  
the following.

---

DE DECnet™  
C4 version 4.1  
0 Ethernet  
protocol

DE DECnet  
C4 version 4.1  
0T Token Ring  
protocol

DE DECnet  
C5 version 5.0a  
0 Ethernet  
protocol

DE DECnet  
C5 version 5.0a  
0T Token Ring  
protocol

IP Novell-  
XO supplied  
DI IPXODI  
protocol

MS Microsoft  
TC TCP/IP  
P

ND Banyan  
IS VINES  
BA NDIS  
N protocol

NE Microsoft  
TB NetBEUI  
EU  
I

NF Sun PC-  
SLI NFS  
NK protocol

N IPX/SPX-  
WL compatible  
IN protocol  
K

N NetBIOS  
W support for  
NB IPX/SPX-  
LIN compatible  
K protocol

### Remove Binding

This parameter removes the binding between the two devices. This parameter is used to tune bindings in a setup script.

---

Bat Device ID,  
ch device ID  
val  
ues

Def None  
ault

### Services

This parameter specifies the network services to be installed as a list of the device

IDs used in the INF files. These IDs are not limited to those in the Windows 95 INF files. A site that has an INF file from another vendor can use any device IDs listed in that file. When a service is listed, the usual verification still takes place.

---

Bat Comma-  
ch separated  
val list of  
ues service  
device IDs,  
as  
described in  
the  
following  
table

Def Normal  
ault Windows 95  
Setup  
defaults

The valid device IDs are defined in several different INF files. The following

---

|           |      |
|-----------|------|
| BK Arcada | BK   |
| UP Backup | UPA  |
| A Exec    | GN   |
| G agent1  | T.IN |
| NT        | F    |

|           |      |
|-----------|------|
| C Cheyen  | CH   |
| H ne      | EYE  |
| EY ARCser | NN   |
| A ve      | E.IN |
| G agent1  | F    |
| NT        |      |

|             |      |
|-------------|------|
| JE HP®      | HP   |
| TA Network  | NET  |
| D Printer   | PR   |
| MI service1 | N.IN |
| N           | F    |

|           |      |
|-----------|------|
| N Microso | NM   |
| M ft      | AG   |
| A Network | ENT  |
| G Monitor | .INF |
| E         |      |

NT agent1

N File and NET  
W Printer SR  
SE Sharing VR.I  
R for NF  
VE NetWar  
R e  
Network  
s

PS Microso MS  
E ft Print PS  
R Service RV.I  
VE for NF  
R NetWar  
e  
Network  
s1

R Microso RE  
E ft GS  
M Remote RV.I  
O Registry NF  
TE service1  
R  
E  
G

S Microso SN  
N ft SNMP MP.I  
M agent1 NF  
P

VS File and NET  
E Printer SR  
R Sharing VR.I  
VE for NF  
R Microso  
ft  
Network  
s

---

1 Available in the ADMIN directory of the Windows 95 compact disc. For information, see Chapter 13, "Introduction to System Management."

---

## Computer Name

This parameter sets the computer's network name.

---

Bat String  
ch (following  
val Windows 95  
ues rules for  
computer  
names)

Def Generated  
ault from the  
first eight  
characters  
of the user  
name

## Description

This parameter is the description for the computer (mainly used by peer servers such as File and Printer Sharing for Microsoft Networks).

---

Bat String  
ch  
val  
ues

Sy Yes  
ste  
m  
poli  
cy

Def User name  
ault from  
licensing  
information

## Workgroup

This parameter sets the workgroup for the computer.

---

Bat String  
ch  
val  
ues

Sy Yes  
ste  
m  
poli  
cy

Def Generated  
ault from user  
licensing  
information  
by taking  
the first 15  
characters  
of the  
organization  
name. For  
example, an  
organization  
name of  
"Microsoft  
Corporation  
" results in  
"MicrosoftC  
orpo" as the  
default  
workgroup.

### [Shared Installation Parameters in \[Network\]](#)

#### Hard Disk Boot

This parameter specifies whether, for a client computer running a shared copy of Windows 95 from a server, Setup should configure Windows 95 so that it boots from the hard disk but runs from a shared network copy.

---

Bat 1 = Boot  
ch from the  
val hard disk  
ues and run

from the  
network  
0 =  
Standard

Def 0  
ault

The following table shows the settings for this parameter and the RPLSetup parameter, depending on how the computer runs Windows 95.

---

|                                                           |   |   |
|-----------------------------------------------------------|---|---|
| Local                                                     | 1 | 0 |
| hard<br>disk<br>boot,<br>Windo<br>ws 95<br>on a<br>server |   |   |
| Flopp                                                     | 0 | 0 |
| y<br>boot,<br>Windo<br>ws 95<br>on a<br>server            |   |   |
| Remot                                                     | 0 | 1 |
| e<br>boot,<br>Windo<br>ws 95<br>on a<br>server            |   |   |

### Remoteboot (RPL) Setup

This parameter specifies that Setup should create a disk image on the network server for a remoteboot workstation during Workstation Setup. This parameter is ignored if a corresponding Workstation Setup value is not defined. (Therefore, setting RPLSetup=1 does not automatically set WorkstationSetup=1.)

---

Bat 1 = Do a

```
ch remoteboot
val setup
ues 0 =
    Standard
    (don't do a
    remoteboot
    setup)

Def 0
ault
```

### Workstation Setup

This parameter specifies whether Setup configures a client computer to run Windows 95 locally or as a shared copy from a server. If this parameter is set to No (0), Windows 95 Setup runs normally. If this parameter is set to Allow (1) and if Setup is running from a server, Setup asks if the user wants to install Windows 95 as a shared copy or on the local hard disk. For more information details, see Chapter 4, "Server-Based Setup for Windows 95." See also the table for the *HDBoot* parameter earlier in this section.

---

```
Bat 0 = Allow a
ch standard
val setup (local
ues files)
    1 = Allow a
    shared
    workstation
    setup (run
    from a
    server)

Def 0
ault
```

### Display Workstation Setup

This parameter specifies whether the Setup user interface appears during installation of Windows 95 on a workstation that will run a shared copy of Windows 95. Setting this value to 0 forces the value defined for *WorkstationSetup* in the script.

---

```
Bat 0 = Do not
ch display user
```



val interface  
ues 1 = Display  
user  
interface

Def 0  
ault

### [Security Parameters in \[Network\]](#)

#### User Security

This parameter specifies the security model to be used and, for user-level security, the type of pass-through agent. A client with a security provider must be installed for these values to have an effect.

---

Bat share =  
ch share-level  
val security  
ues domain =  
user-level  
security  
passing to a  
Windows  
NT domain  
msserver =  
user-level  
security  
passing to a  
Windows  
NT server  
nwserver =  
user-level  
security  
passing to a  
NetWare  
server

Sy Yes  
ste  
m  
poli  
cy

Def share

ault

### Pass-Through Agent

This parameter specifies the pass-through agent for user-level security. This value is ignored in share-level security.

---

Bat Server or  
ch domain  
val name  
ues

Sy Yes  
ste  
m  
poli  
cy

Def The value  
ault of \_\_, \_\_\_, or  
none. Set to  
the value of  
\_\_ if the  
value of  
Security is  
set to \_\_. It  
defaults to  
\_\_ if Security  
is set to \_\_.  
Otherwise,  
there is no  
default.

### User Interface Options for [Network] Parameters

#### Display

This parameter controls whether any of the Network Options dialog boxes appear in Custom Setup.

---

Bat 0 = Do not  
ch display

val 1 = Display  
ues  
  
Def 1  
ault

### Validate NetCard Resources

This parameter specifies whether to display a dialog box to resolve resource conflicts if a partial configuration is detected or if there is an IRQ conflict for a network adapter.

---

Bat 1 = Display  
ch a wizard  
val page to  
ues resolve  
resource  
conflicts  
0 = Do not  
display a  
wizard page  
  
Def 1  
ault

The actual name for this section is the identifier for the network adapter, as defined in the related INF file. This section sets parameters for a specific network adapter, as defined in the [NDI] sections of the network device INF files provided with Windows 95.

All entries in this section depend on the specific adapter. The actual parameters and settings for a specific network adapter can be found in that adapter's INF file in the Windows INF directory.

For a list of settings for some common network adapters, see "Windows 95 Network Adapter INF Summary" later in this appendix.

---

**Important**—The possible parameters and their names vary, depending up on the specific network adapter and upon how they are defined in the corresponding INF file. For example, for 3Com® network adapters, the setting names are *irqconfig*, *dmaconfig*, and *ioconfig*.

Check the INF file for the specific network adapter to determine the exact parameter names.

---

This section sets parameters for Microsoft TCP/IP. For more information about these parameters as defined using the Network option in Control Panel, see Chapter 12, "Network Technical Discussion."

### DHCP

This parameter specifies whether TCP/IP is configured to use DHCP for dynamic TCP/IP configuration.

---

Bat 1 = Enable  
ch DHCP  
val 0 = Don't  
ues enable  
DHCP

Def 1  
ault

### DNS

This parameter enables DNS name resolution.

---

Bat 1 = Enable  
ch DNS  
val 0 = Disable  
ues DNS

Sys Yes  
tem  
poli  
cy

Def 0  
ault

### DNS Servers

This parameter is a list of the DNS servers to use in the order to try them.

---

Bat Comma-  
ch separated  
val list of DNS  
ues server  
names

Def None  
ault

### Domain

This parameter sets the DNS domain that this computer is in.

---

Bat String  
ch  
val  
ues

Def None  
ault

### Domain Order

This parameter sets a list of DNS domains for host name resolution in the order to try them.

---

Bat Comma-  
ch separated  
val list of  
ues domains

Def None  
ault

### Gateways

This parameter lists the IP gateways (sometimes called IP routers) in the order they are to be used.

Bat Comma-  
ch separated  
val list of IP  
ues addresses

Def None  
ault

### Hostname

This parameter sets the DNS hostname for this computer (usually the same value as ComputerName).

---

Bat String  
ch  
val  
ues

Def None  
ault

### IP Address

This parameter sets the computer's IP address if DHCP is not enabled.

---

Bat Internetwor  
ch k (IP)  
val address  
ues (###.###.##  
#.###)

Def None  
ault

### LMHOST File Path

This parameter sets the path and filename of the LMHOST file.

---

Bat Path  
ch  
val

ues  
Def None  
ault

### Primary WINS Server

This parameter sets the primary WINS name server.

---

Bat IP address  
ch (###.###.##  
val #.###)  
ues  
  
Sy Yes  
ste  
m  
poli  
cy  
  
Def None  
ault

### Secondary WINS Server

This parameter sets the secondary WINS name server.

---

Bat IP address  
ch (###.###.##  
val #.###)  
ues  
  
Sy Yes  
ste  
m  
poli  
cy  
  
Def None  
ault

### Scope ID

This parameter sets the scope ID.

---

Bat String  
ch  
val  
ues

Sy Yes  
ste  
m  
poli  
cy

Def None  
ault

### Subnet Mask

This parameter sets the IP subnet mask for TCP/IP if DHCP is not enabled.

---

Bat IP address  
ch (###.###.##  
val #.###)  
ues

Def None  
ault

### WINS

This parameter enables WINS for NetBIOS computer name resolution.

---

Bat 1 = Enable  
ch WINS  
val resolution  
ues DHCP =  
Enable  
WINS but  
get  
parameters  
from DHCP  
server  
0 = Disable



## WINS

Sy Yes  
ste  
m  
poli  
cy

Def 1  
ault

The parameters in this section specify settings for the IPX/SPX-compatible protocol and are valid only if *Protocols=NWLINK* is also specified in the batch script. For more information about these parameters as defined using the Network option in Control Panel, see Chapter 12, "Network Technical Discussion."

### Frame Type

This parameter specifies the default frame type for IPX.

---

Bat 0 = 4=A  
ch 802. uto  
val 3 5=To  
ues 1 = ken  
802. Ring  
2 6=To  
2 = ken  
Eth Ring  
ern SNA  
et II P  
3 =  
SN  
AP

Def 4  
ault

### NetBIOS

This parameter specifies whether NetBIOS support for IPX/SPX should be installed.

---

Bat 1 = Install  
ch NWNBLINK  
val 0 = Don't  
ues install  
NWNBLINK

Def 0  
ault

For more information about these values for Client for NetWare Networks as specified using the Network option in Control Panel, see Chapter 9, "Windows 95 on NetWare Networks."

### *First Network Drive*

This parameter specifies the first network drive to which to attach in logon scripts for Client for NetWare Networks.

---

Bat Drive letter  
ch ("A" or "A:")  
val are  
ues equivalent)

Sy Yes  
ste  
m  
poli  
cy

Def F:  
ault

### *Preferred Server*

This parameter specifies the NetWare preferred server.

---

Bat String  
ch  
val  
ues

Sy Yes  
ste  
m  
poli  
cy  
  
Def None  
ault

### Search Mode

This parameter specifies the NetWare search mode. The values correspond exactly to the values specified in NET.CFG for Novell NetWare.

---

Bat 0 – 7  
ch  
val  
ues  
  
Sy Yes  
ste  
m  
poli  
cy  
  
Def 0  
ault

For more information about these values for File and Printer Sharing for NetWare Networks (NWSERVER) as specified using the Network option Control Panel, see Chapter 11, “Logon, Browsing, and Resource Sharing.”

### Browse Master

This parameter specifies whether a computer configured with File and Printer Sharing for NetWare Networks can be elected browse master.

---

Bat 2 = This  
ch computer is  
val the  
ues preferred

browse  
master  
1 = This  
computer  
can be a  
browse  
master  
0 = This  
computer  
cannot be a  
browse  
master

Sy Yes  
ste  
m  
poli  
cy

Def 1  
ault

### SAP Browsing

This parameter specifies whether a computer configured with File and Printer Sharing for NetWare Networks uses Server Advertising Protocol (SAP) browsing. Enabling SAP browsing allows a computer with File and Printer Sharing for NetWare Networks to be seen by any NetWare client, but the computer does not appear in a workgroup in the Network Neighborhood.

---

Bat 1 = Use  
ch SAP style  
val browsing  
ues 0 = Disable  
SAP  
browsing  
(use  
workgroup  
style  
browsing)

Sy Yes  
ste  
m  
poli

cy  
Def 0  
ault

For more information about these values for Client for Microsoft Networks as specified using the Network option in Control Panel, see Chapter 8, "Windows 95 on Microsoft Networks."

### Validated Logon

This parameter specifies whether logons are validated on a Windows NT domain.

---

Bat 1 = Validate  
ch logon  
val 0 = Don't  
ues validate  
logons  
  
Sy Yes  
ste  
m  
poli  
cy  
  
Def 0  
ault

### Logon Domain

This parameter specifies the Windows NT domain to use for logon validation. It can be set even if *ValidatedLogon=0*.

---

Bat String  
ch  
val  
ues  
  
Sy Yes  
ste  
m

poli  
cy

Def value of \_ in  
ault [network]

For more information about these values for File and Printer Sharing for Microsoft Networks (VSERVER) as specified using the Network option in Control Panel, see Chapter 11, "Logon, Browsing, and Resource Sharing."

### Announce

This parameter specifies whether the computer configured with File and Printer Sharing for Microsoft Networks announces its presence to LAN Manager computers on the network. Setting this value to 1 increases network traffic but makes browsing faster.

---

Bat 1 =  
ch Announce  
val VSERVER  
ues to network  
0 = Don't  
announce  
VSERVER  
to the  
network

Sy Yes  
ste  
m  
poli  
cy

Def 1  
ault

### Browse Master

This parameter specifies how the computer configured with File and Printer Sharing for Microsoft Networks behaves in a browse master election.

---

Bat 1 = This  
 ch computer  
 val can be a  
 ues browse  
 master  
 0 = This  
 computer  
 cannot be a  
 browse  
 master

Sy Yes  
 ste  
 m  
 poli  
 cy

Def 1  
 ault

This section sets parameters for copying additional files as part of Windows 95 installation. The format for this section is identical to the format for the [Install] section in general INF files, as defined in Appendix C, "Windows 95 INF Files."

The following example shows how to configure an [Install] section for a Microsoft Mouse. The comments indicate where you can find the related information in Appendix C.

```
[MSMFG]_____ ;[ ]section
%MSANY = MSAny_____ ;
[MSAny]_____ ;[ ]section
DelReg=Prev.DelReg_____ ;[ ]section
AddReg=Std.AddReg_____ ;[ ]section
CopyFiles=MS.Copy
UpdateInis=MS.Ini_____ ;[ ]section
UpdateCfgSys=Update_config.sys_____ ;[ ]section
UpdateAutoBat=Update_autoexec.bat ;[ ]section
```

[MS.Copy]  
mouse.drv  
msmouse.vxd

```
[MS.Ini]_____ ;[ ]section
system.ini,boot.description,,"mouse.drv=%MSMouse%"
```

system.ini,boot,,"mouse.drv=mouse.drv"  
system.ini,386Enh,,"mouse=\*vmouse, msmouse.vxd"

### MSBATCH.INF Sample File

---

This section shows a sample MSBATCH.INF script.

[Setup]  
Express=0 ; allows user input  
InstallType=1 ; Typical Setup  
EBD=1 ; create startup disk  
InstallDir=C:\WINDOWS  
Verify=0  
Detection=1  
PenWinWarning=1  
ProductID=999999999

[NameAndOrg]  
Name="User One"  
Org="Your Company Name"  
Display=1 ; User Information dialog box is displayed

[OptionalComponents]  
"Accessories"=1  
"Communications"=1  
"Disk Tools"=1  
"Multimedia"=1  
"Screen Savers"=1  
"Disk compression tools"=1  
"Paint"=1  
"HyperTerminal"=1  
"Defrag"=1  
"Blank Screen"=1  
"Scrolling Marquee"=1  
"Calculator"=1  
"Object Packager"=1  
"Backup"=1  
"Phone Dialer"=1  
"Clipboard Viewer"=1  
"The Microsoft Network"=0  
"Audio Compression"=1  
"Video Compression"=1  
"Sound Recorder"=0  
"Volume Control"=0  
"Media Player"=1  
"Microsoft Exchange"=0



"Briefcase"=0  
"Document Templates"=1  
"WordPad"=1  
"Dial-Up Networking"=0  
"Direct Cable Connection"=0  
"Extra Cursors"=1  
"Quick View"=1  
"Windows 95 Tour"=1  
"Online User's Guide"=1  
"Desktop Wallpaper"=1  
"System Monitor"=1  
"Net Watcher"=1  
"Character Map"=1  
"Curves and Colors"=0  
"Mystify Your Mind"=0  
"Flying Through Space"=0  
"Games"=0  
"Microsoft Fax"=0  
"Accessibility Options"=1  
"Internet Mail"=0  
"CompuServe Mail Services"=0  
"Sound and Video Clips"=0  
"Musica Sound Scheme"=0  
"Nature Sound Scheme"=0  
"Robotz Sound Scheme"=0  
"Utopia Sound Scheme"=0  
"CD Player"=0  
"Multi-Language Support"=0

[System]

"Display"="Tseng Labs ET4000"  
"Keyboard"="Standard 101/102-Key or Microsoft Natural Keyboard"  
"SelectedKeyboard"="Keyboard\_00000409"  
"Machine"="MS\_CHICAGO"  
"Monitor"="NEC MultiSync 2A"  
"Mouse"="Standard Serial Mouse"  
"Power"="No APM"  
"Locale"="L0409"  
"UI Choice"="Win95UI"

[InstallLocationsMRU]

MRU1=C:\WINDOWS  
MRU2=C:\User  
MRU3=\\win\_svr\source files\home\_dir

[Network]

Display=0\_\_\_\_\_ ; Network Options do not appear in Setup  
ComputerName=W95\_1  
Workgroup=test\_group  
Description="This is a lab test computer"  
Clients=vredir,nwredir  
Security=Domain  
PassThroughAgent=Test\_domain  
WorkstationSetup=0\_\_\_\_\_ ; not a shared installation of Windows 95  
HDBoot=1  
=  
[VREDIR]  
ValidatedLogon=\_\_\_1  
LogonDomain=test\_domain

### Windows 95 Network Adapter INF Summary

---

This section presents details about the settings for common network adapters, as defined in the [LOGICAL CONFIGURATION] sections of the network device INF files provided with Windows 95. Other adapters are also listed; their settings can be found in the appropriate file in the Windows INF directory. The NET.INF file contains the master information for detecting and configuring network adapters. The specific INF files for network adapters include the following:

NET NET NET  
3CO HP.I PRO  
M.IN NF T.INF  
F NETI NET  
NET BM.I RAC  
AMD NF AL.IN  
.INF NET F  
NET MAD NET  
FLE GE.I SMC.  
X.IN NF INF  
F NET NET  
NET NCR. SMC  
CAB INF TR.I  
LE.I NET NF  
NF NICE NET  
NET .INF TCC.  
DEC NET INF  
.INF NOV NET  
NET EL.I TULI  
EE1 NF P.INF  
6.IN NET NET  
F OLI.I UB.I

NET NF NF  
CPQ NET NET  
.INF PPP.I XIR.I  
NET NF NF  
GEN  
.INF

To find the description of a particular network adapter in an INF file, look for the following syntax:

CardBrand=BRAND OF NETWORK ADAPTER

INFFile=FILE WHERE THESE SETTINGS CAN BE FOUND

This information is followed by the specific settings, using this format:

;NETCARD MODEL

[ADAPTER.LogConfig]

ACTUAL SETTINGS OF ADAPTER

3COM

Cardbrand=3COM

INFFile=NET3COM.INF

;3Com EtherLink II or IITP (8 or 16-bit)

[\*PNP80F3.LogConfig]

ConfigPriority=HARDRECONFIG

IOConfig=250-25F(3FF::),280-28F(3FF::),2A0-2AF(3FF::),2E0-2EF(3FF::),  
300-30F(3FF::),310-31F(3FF::),330-33F(3FF::),350-35F(3FF::)

IRQConfig=3,4,5,9

;3Com EtherLink 16

[\*PNP80F6.LogConfig]

ConfigPriority=HARDRECONFIG

IOConfig=10@200-3FF%FFF0(3FF::)

The following adapters also have settings in the file NEC3COM.INF:

TokenLink

3Com EtherLink Plus®

3Com EtherLink III®

NCR® WaveLAN AT

NCR Token-Ring 4 Mbs ISA

NCR Token-Ring 16/4 Mbs ISA

NCR StarCard

Digital Equipment Corporation

Cardbrand=Digital Equipment Corp.

INFFile=NETDEC.INF

;DEC DEPCA

[\*PNP80E7.LogConfig]

ConfigPriority=HARDRECONFIG

IOConfig=200-20F(3FF::),300-30F(3FF::)

IRQConfig=3,4,5,7,9

MemConfig=8000@C0000-E8FFF%FFFF8000

;DEC (DE201) EtherWorks Turbo/TP

[\*PNP80EB.LogConfig]

ConfigPriority=HARDRECONFIG

IOConfig=200-20F(3FF::),300-30F(3FF::)

IRQConfig=5,9,10,11,15

MemConfig=c0000-ffff,c8000-ffff,d0000-dfff,d8000-dfff,

—e0000-ffff,e8000-ffff

The following adapters also have settings in the file NETDEC.INF:

DEC (DE211) EtherWorks MC/TP

DEC (DE212) EtherWorks MC/TP\_BNC

DEC (DE100) EtherWorks LC

DEC (DE200) EtherWorks Turbo

DEC (DE101) EtherWorks LC/TP

DEC (DE202) EtherWorks Turbo/TP\_BNC

DEC (DE102) EtherWorks LC/TP\_BNC

DEC EE101 (Built-In)

DECpc 433 WS (Built-In)

DEC Ethernet (All Types)

DEC (DE210) EtherWorks MC

Intel

Cardbrand=Intel

INFFile=NETINTEL.INF

;Intel Etherexpress 16 or 16TP

[\*PNP812D.LogConfig]

IRQConfig=3,4,5,9,10,11

IOConfig=200-20F(3FF::),210-21F(3FF::),220-22F(3FF::),230-23F(3FF::),

—240-24F(3FF::),250-25F(3FF::),260-26F(3FF::),270-27F(3FF::),

—300-30F(3FF::),310-31F(3FF::),320-32F(3FF::),330-33F(3FF::),

—340-34F(3FF::),350-35F(3FF::),360-36F(3FF::),370-37F(3FF::)

The following adapters also have settings in the file NETINTEL.INF:

Intel® EtherExpress™ PRO  
Generic 595  
Intel EtherExpress 16 (MCA)

### IBM

Cardbrand=IBM  
INFFile=NETIBM.INF

:IBM Token Ring  
[\*PNP80C9.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=A20-A23,A24-A27

:IBM Token Ring II  
[\*PNP80CA.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=A20-A23,A24-A27

The following adapters also have settings in the file NETIBM.INF:

IBM Token Ring 4/16Mbs  
IBM Token Ring II/Short  
IBM Token Ring (All Types)

### MADGE

Cardbrand=MADGE  
INFFile=NETMADGE.INF

:Madge Networks Smart 16/4 PC Ringnode  
[MDGPC.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=A20-A2F(3FF::),1A20-1A2F(3FF::),2A20-2A2F(3FF::),  
— 3A20-3A2F(3FF::)  
IRQConfig=3,5,7,9  
DMAConfig=0

:Madge Networks Smart 16/4 ISA Client Ringnode  
[MDGISAC.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=A20-A2F(3FF::),1A20-1A2F(3FF::),2A20-2A2F(3FF::),  
— 3A20-3A2F(3FF::)  
IRQConfig=3,5,7,10,11,12,15,9

DMAConfig=0

The following adapters also have settings in the file NETMADGE.INF:

Madge Networks Smart 16/4 Ringnode (All ISA Types)

Madge Networks Smart 16/4 AT Ringnode

Madge Networks Smart 16/4 AT/P Ringnode

Madge Networks Smart 16/4 ISA Client Plus Ringnode

Madge Networks Smart 16 Ringnode

Novell

Cardbrand=Novell

INFFile= NETNovell.INF

;Zenith Data Systems NE2000 Compatible

[\*pnp820a.LogConfig]

IRQConfig=3,9,10,11,12,15

IOConfig=20@300-37F%FFE0(3FF::)

;Novell/Anthem NE1000

[\*pnp80d3.LogConfig]

IRQConfig=3,4,5,9

IOConfig=20@300-37F%FFE0(3FF::)

;Novell/Anthem NE2000

[\*pnp80d4.LogConfig]

IRQConfig=3,4,5,9

IOConfig=20@300-37F%FFE0(3FF::)

;Novell compatible ne2000

[\*pnp80D6.LogConfig]

IRQConfig=3,4,5,6,7,8,9,10,11,12,13,14,15

IOConfig=20@200-3FF%FFE0(3FF::)

The following adapters also have settings in the file NETNovell.INF:

National Semiconductor Ethernode \*16AT

National Semiconductor AT/LANTIC Ethernode 16-AT3

NE1000 Compatible

Artisoft AE-1

Novell Ne2000 Plus

Artisoft AE-2 or AE-3

Proteon

Cardbrand=Proteon  
INFFile=NETPROT.INF

;Proteon Token Ring (P1392)  
[\*pnp81eb.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=10@A20-FE2F%FC00  
IRQConfig=3,4,5,6,7,9,10,11,12  
DMAConfig=5,6,7,0

The following adapters also have settings in the file NETPROT.INF:

Proteon Token Ring (P1392+)  
Proteon Token Ring (P1390)  
Proteon ISA Token Ring (1347)  
Proteon ISA Token Ring (1346)  
Proteon ISA Token Ring (1340)  
Proteon ISA Token Ring (1342)  
Proteon ISA Token Ring (1340)

### Racal

Cardbrand=Racal  
INFFile=NETRACAL.INF

;Racal NI6510  
[\*pnp8113.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=18@300-37F%FFE0(3FF::)

The following adapter also has settings in the file NETRACAL.INF:

Racal NI5210/8 or NI5210/16

### SMC

Cardbrand=SMC  
INFFile=NETSMC.INF

;SMC9000  
[\*Smc9000.ndi]  
[Smc9000.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=20@200-3ef%FFE0(3FF::)  
IRQConfig=9,3,10,11

;SMC 3000 Series  
[SMC3000.LogConfig]  
ConfigPriority=HARDRECONFIG  
IOConfig=10@200-3EF%FFE0(3FF::)  
IRQConfig=3,4,5,7,9,10

The following adapters also have settings in the file NETSMC.INF:

ArcNet Compatible  
Pure Data PDI508+ (ArcNet)  
Pure Data PDI516+ (ArcNet)  
SMC® ArcNet PC600W,PC650W  
SMC ArcNet PC120,PC220,PC260  
SMC ArcNet PS110,PS210  
SMC ArcNet PC270/E  
SMC ArcNet PC130/E  
SMC EtherCard™ PLUS 16 With Boot ROM Socket (WD/8013EBT)  
SMC ArcNetPC  
SMC ArcNet PC100,PC200  
SMC ArcNet PC110,PC210,PC250  
SMC EtherCard PLUS TP (WD/8003WT)  
SMC EtherCard PLUS With Boot ROM Socket (WD/8003EBT)  
SMC EtherCard PLUS (WD/8003E)  
SMC StarCard PLUS With On Board Hub (WD/8003SH)  
SMC StarCard PLUS (WD/8003S)  
SMC EtherCard (All Types except 8013/A)  
SMC EtherCard PLUS 10T/A (MCA) (WD 8003W/A)  
SMC StarCard PLUS/A (MCA) (WD 8003ST/A)  
SMC EtherCard PLUS/A (MCA) (WD 8003E/A or 8003ET/A)  
SMC EtherCard PLUS With Boot ROM Socket (WD/8003EB)  
SMC EtherElite Ultra 16  
SMC EtherElite Ultra 16 Tiger  
SMC EtherCard PLUS Elite (WD/8003EP)  
SMC EtherCard PLUS Elite 16 (WD/8013EP)  
SMC EtherCard PLUS Elite 16T (WD/8013W)  
SMC EtherCard PLUS Elite 16 Combo (WD/8013EW or 8013EWC)  
SMC TokenCard Elite

Thomas-Conrad

Cardbrand=Thomas-Conrad  
INFFile=NETTCC

;Thomas-Conrad (All Arcnet Types)  
[\*pnp8326.LogConfig]  
ConfigPriority=HARDRECONFIG



IRQConfig=3,4,5,7,9,10,11,12,13,14,15  
MemConfig=4000@C0000-DFFFF%FFFFC000

The following adapters also have settings in the file NETTCC.INF:

TC6245  
TC6145  
TC6045  
Thomas-Conrad TC6242  
Thomas-Conrad TC6142  
Thomas-Conrad TC6042  
Thomas-Conrad (All Arcnet Types)  
Thomas-Conrad TC4035  
Thomas-Conrad TC4045

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *Appendix E Network Configuration Settings*

In the final edition, this appendix will list typical configuration file settings for various networks with Windows 95.

---

Note This appendix is not available in this beta draft.

---

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## Appendix F Macintosh and Windows 95

This appendix describes how you can integrate Apple® Macintosh® computers and computers running Windows 95 on the same network using the Windows NT Services for Macintosh, and offers tips for users who are switching from Apple Macintosh to Windows 95.

### *Windows NT Services for Macintosh*

---

Microsoft Windows NT Server Services for Macintosh is a thoroughly integrated component of Microsoft Windows NT Server, making it possible for computers running Windows 95, MS-DOS, Windows, Windows for Workgroups, Windows NT, and Apple Macintosh to share files and printers.

After Services for Macintosh is set up on a computer running Windows NT Server, that computer can function as an AppleTalk® router. Routing capability is supported for AppleTalk Phase 2.

With Services for Macintosh, Macintosh computers need only the Macintosh operating system software to function as workstations; no additional software is required. You can, however, set up the optional user authentication module, which is software that provides a secure logon to the computer running Windows NT Server.

When you set up Services for Macintosh on a computer running Windows NT Server, the AppleTalk Protocol, File Server for Macintosh, and the Print Server for Macintosh are started, or enabled. An explanation for each of these follows.

n

The AppleTalk Protocol is the layer of AppleTalk Phase 2 protocols that

delivers data to its destination on the network. The AppleTalk Protocol can be configured through the Network icon in Control Panel on the Windows NT Server computer.

n

File Server for Macintosh, also called MacFile, allows you to designate a

directory as a Macintosh-accessible volume, ensures that Macintosh filenames are legal NTFS names, and handles permissions. When set up, File Server for Macintosh commands appear in the Windows NT Server File Manager and Server Manager under the MacFile menu.

n

Print Server for Macintosh, also called MacPrint, allows all network users

to send print jobs to a spooler on the computer running Windows NT Server and continue to work, rather than wait for their print jobs to complete. Windows-based users can also review the print jobs in Print Manager.

Setting up Services for Macintosh creates an icon in Control Panel on the Windows NT Server computer, which gives you the same server administration capabilities as the MacFile menu, excluding volume management, for the local computer.

For complete information, including guidelines for planning the network and administering Services for Macintosh, see the WINDOWS NT SERVER SERVICES FOR MACINTOSH documentation.

### *Tips for Switching From an Apple Macintosh to Windows 95*

---

The following section offers tips to Apple Macintosh users who are new to Windows 95.

#### *How different is the Windows 95 desktop?*

Your drives are not on the desktop but are easily accessible by double-clicking My Computer. Then double-click the drive with contents you want to view.

You can put shortcuts to programs and documents directly on the desktop for easy access. Shortcuts are like aliases on the Macintosh. You can remove a shortcut from the desktop without removing the actual program or document. To create a shortcut, right-click a folder, and then choose the Shortcut option.

Deleted files are temporarily moved to the Recycle Bin. You can double-click the Recycle Bin icon to see its contents (and restore any contents). To permanently delete a file or program, open the File menu, and then click Empty Recycle Bin.

#### *Why does the mouse have two buttons?*

Use the left button — the main button — for most tasks unless the right button is

specified in a Help procedure. If you click an item using the right button, a menu is displayed containing commands specific to the item.

### *How do I find documents?*

Documents are stored in folders. To view the folders on your computer, double-click My Computer, and then double-click a drive. Double-click a folder to see its contents.

### *How do I start a program?*

All programs are on the Start menu. Just click the Start button, point to Programs, point to the program folder, and then click the program name.

### *How can I switch between programs?*

A program button is added to the taskbar at the bottom of the desktop each time you open a program. The taskbar works in a manner similar to the Application menu, but instead of opening a menu, you click the button on the taskbar to switch between programs. You can drag the taskbar to the top or to either side of the desktop.

### *How do I save a document?*

You can save a document by using the Save command on the File menu. You can save it to any folder on any drive, and change which folder you save it to in the Save dialog box. Here are a few things you need to know when saving documents.

n

In Windows 95, the hard disk drive and floppy drives are identified by a

letter. Most hard disk drives are assigned the letter C. Usually, the floppy drives are A and B.

n

A path tells you where the document is located. It contains the drive letter

and folder names in which the file is stored. For example, a path could be: C:\JUNE\WORK\SCHEDULE. This tells you that the SCHEDULE document is located on the C drive in a folder named WORK that is in the JUNE folder.

How do I open a menu?

Click once to open the menu, and then click your selection. You no longer need to press and hold the mouse button to keep the menu open.

How do filenames differ between systems?

In Windows 95, you can now use long filenames (up to 256 characters). Each file has a three-character filename extension ("filename.ext") to identify the file type and sometimes the program that created the file. Filename extensions are not included when documents are listed on the Start menu or displayed in My Computer.

What are the three icons in the upper-right corner?

The three icons in the upper right corner of the desktop window are used as follows:

`{ewc msdn cd, EWGraphic, x0an 0 /a "psAN.bmp"}`

n

Use this icon to reduce the window to a button on the taskbar. Click the taskbar button to open the window again.

`{ewc msdn cd, EWGraphic, x0an 1 /a "psAN.bmp"}`

n

Use this icon to enlarge the window so that it covers the entire desktop (except for the taskbar).

`{ewc msdn cd, EWGraphic, x0an 2 /a "psAN.bmp"}`

n

Use this icon to close the window.

Where do I find the items from the Macintosh menu?

The following procedures are used to find programs and documents in Windows 95:

n

Click the Start menu to see most items on the Macintosh menu.

n

Open programs by pointing to Programs, and then pointing to the program folder.

n

Customize system settings by pointing to Settings.

n

Point to Documents to see a list of the documents you recently opened.

n

Use Shut Down to exit Windows 95.

How can I use the Windows online Help to learn more?

To view a list of Help topics or search for a topic using the Help index, open Help from the Start menu.

For help on specific items in a window, click the question mark in the upper-right corner of the dialog box, and then click the item to find out about it.

### Exchanging Mail Between Windows 95 and Apple Macintosh

---

Upgrading a Windows 95 postoffice to a full Microsoft Mail Server postoffice with the MICROSOFT MAIL POST OFFICE UPGRADE product offers the capability of allowing clients running MS-DOS, Windows, Windows for Workgroups, Windows 95, Windows NT, Macintosh, and OS/2 to exchange mail.

However, before Macintosh clients can use the MS Mail Server, you need a file server capable of sharing files for both Intel-compatible computers and Macintosh computers. Windows 95 File and Print Sharing services do not work with Macintoshes. Therefore, you need to install the Microsoft Mail Server on a Windows NT or a Novell® NetWare® server.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`



## Appendix G HOSTS and LMHOSTS Files for Windows 95

This appendix describes how to modify HOSTS and LMHOSTS files to support address-to-name resolution in Windows 95 networking.

n

The HOSTS file is used as a local Domain Name System (DNS)

equivalent to resolve host names to IP addresses.

n

The LMHOSTS file is used for name resolution when a Windows

Internetwork Name Service (WINS) server is not available to resolve NetBIOS computer names to IP addresses.

Each of these files is also known as a HOST TABLE. Sample versions of LMHOSTS (called LMHOSTS.SAM) and HOSTS files are added to the Windows directory when you install Windows 95 with TCP/IP support. These files can be edited using any ASCII editor, such as WordPad or Edit.

### Setting Up HOSTS Files

---

Microsoft TCP/IP can be configured to search the local host table file, HOSTS, for mappings of remote host names to IP addresses. The HOSTS file format is the same as the format for host tables in the 4.3 Berkeley Software Distribution (BSD)-UNIX /ETC/HOSTS file. For example, the entry for a computer with an address of 192.102.73.6 and a host name of TREY.RESEARCH.COM looks similar to this:

192.102.73.6 ——— trey.research.com

Edit the sample HOSTS file that is created when you install TCP/IP to include remote host names and their IP addresses for each computer with which you will communicate. This sample file also explains the syntax of the HOSTS file.

Host names are used in virtually all TCP/IP environments. A host name always corresponds to an IP address that is stored in a HOSTS file or on a DNS server and

is assigned by an administrator to identify a TCP/IP host or default gateway. A host name can be used in place of an IP address when using PING or other TCP/IP utilities.

Host names are not used in the Windows 95 network user interface, such as Network Neighborhood or NET.EXE. The only time a host name is used to access a Windows-based computer is when *ping* or *ftp* or another TCP/IP utility is used. In this case, the host name and corresponding IP address must be stored in a HOSTS file.

The HOSTS file is a static file used to map host names to IP addresses. This file provides compatibility with the UNIX HOSTS file. The following describes HOSTS file entries:

n

A single entry consists of an IP address corresponding to one or more host names.

n

Entries are case sensitive. Therefore, it is a good idea to assign multiple host names with different cases.

For example, to connect to the UNIX host ARCHIVE.RESEARCH.COM at the IP address 144.3.56.200, make two entries in the HOSTS file:

144.3.56.200 — ARCHIVE.RESEARCH.COM  
144.3.56.200 — archive.research.com

This way, a user can connect to ARCHIVE using a utility, whether or not the CAPS-LOCK is enabled.

A HOSTS file must reside on each system. By default, the host name *localhost* is an entry in the HOSTS file with the loopback address 127.0.0.1.

The HOSTS file is parsed whenever a host name is referenced. Names are read in a linear fashion. The most commonly used names should be near the beginning of the

file. HOST file entries do not replace or interact with Windows-based NetBIOS computer names in any way.

The following shows the default HOSTS file provided with Windows 95.

```
# Copyright (c) 1994 Microsoft Corp.  
#  
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows 95  
#  
# This file contains the mappings of IP addresses to host names. Each  
# entry should be kept on an individual line. The IP address should  
# be placed in the first column followed by the corresponding host name.  
# The IP address and the host name should be separated by at least one  
# space.  
#  
# Additionally, comments (such as these) may be inserted on individual  
# lines or following the computer name denoted by a '#' symbol.  
#  
# For example:  
#  
# 102.54.94.97 rhino.acme.com # source server  
# 38.25.63.10 x.acme.com # x client host  
127.0.0.1 localhost
```

### Setting Up LMHOSTS Files

---

When you use Microsoft TCP/IP on a local network with any combination of computers running Windows 95, Windows NT, LAN Manager, or Windows for Workgroups, server names are automatically matched to their corresponding IP addresses. However, to match server names across remote networks connected by routers (or gateways), you can use the LMHOSTS file if WINS servers are not available on the network. The LMHOSTS file is commonly used to locate remote computers for Microsoft networking file, printer, and remote access services, and for domain services such as logon, browsing, replication, and so on.

Microsoft TCP/IP loads the LMHOSTS file into memory when the computer is started. The LMHOSTS file is a text file in the Windows directory that lists the IP addresses and computer names of remote Windows networking servers that you want to communicate with. The LMHOSTS file should list all the names and IP addresses of the servers you regularly access.

For example, the LMHOSTS table file entry for a computer with an address of 192.45.36.5 and a NetBIOS computer name of Finance1 looks like this:

```
192.45.36.5 finance1
```

The format for the LMHOSTS file is the same as the format for host tables in 4.2-MSD UNIX systems. The computer name is optionally enclosed in quotation marks (this is necessary for computer names that contain spaces).

#### *To create an LMHOSTS file*

1. Use a text editor to create a file named LMHOSTS, or edit the default file named LMHOSTS.SAM in the Windows directory and then save this file as LMHOSTS.
2. In the LMHOSTS file, type the IP address and the host name of each computer that you want to communicate with. Separate the items with at least one space.

Entries in the LMHOSTS file are not case-sensitive.

You will want to use LMHOSTS for smaller networks or to find hosts on remote networks that are not part of the WINS database (because name query requests are not broadcast beyond the local subnetwork). If WINS servers are in place on an internetwork, users do not have to rely on broadcast queries for name resolution, because WINS is the preferred method for name resolution. Therefore, with WINS servers in place, LMHOSTS may not be necessary.

However, the LMHOSTS file is read when WINS or broadcast name resolution fails, and resolved entries are stored in a system cache for later access. When the computer uses the replicator service and does not use WINS, LMHOSTS entries are required on import and export servers for any computers on different subnetworks participating in the replication.

The LMHOSTS file used by Windows 95 contains mappings of IP addresses to Microsoft networking computer names (which are NetBIOS names). Microsoft LAN Manager 2.x TCP/IP LMHOSTS files are compatible with Microsoft TCP/IP.

You can use Notepad or any other text editor to edit the sample LMHOSTS.SAM file that is automatically installed in the Windows directory.

The following topic provides some basic rules and guidelines for LMHOSTS. The remaining topics in this chapter provide technical details about using LMHOSTS in an enterprise network.

The following rules apply for entries in LMHOSTS:

n

Each entry should be placed on a separate line.

n

The IP address should begin in the first column, followed by the  
corresponding computer name.

n

The address and the computer name should be separated by at least one  
space or tab.

n

The # character is usually used to mark the start of a comment. However,  
it can also designate special keywords, as described in this section.

The keywords listed in the following table can be used in LMHOSTS using Microsoft  
TCP/IP. Notice, however, that LAN Manager 2.x treats these keywords as  
comments.

LMHOSTS Keywords

---

#PR Added  
E after an

entry to  
cause that  
entry to be  
preloaded  
into the  
name  
cache. By  
default,  
entries are  
not  
preloaded  
into the  
name  
cache but  
are parsed  
only after  
WINS and  
name  
query  
broadcasts  
fail to  
resolve a  
name.  
#PRE  
must be  
appended  
for entries  
that also  
appear in  
#INCLUDE  
statements  
;  
otherwise,  
the entry in  
#INCLUDE  
is ignored.

#DO Added

M: after an  
entry to  
associate  
that entry  
with the  
domain  
specified  
by

æd

œ

mm

æ

ii

# m

This keyword affects how the Browser and Logon services behave in routed TCP/IP environments. To preload a #DOM entry, you must also add the #PRE keyword to the line.

#IN Forces the CLU system to DE seek the specified

# f fi



il

le

en

ræ

am

re

and parse  
it as if it  
were local.  
Specifying  
a Universal  
Naming  
Conventio  
n (UNC)

e

fi

l

e

n

a

m

e

allows you to use a centralized LMHOSTS file on a server. You must add a mapping for the server before its entry in the #INCLUDE section

and also  
append  
#PRE to  
ensure that  
it is  
preloaded  
(otherwise,  
the  
#INCLUDE  
will be  
ignored).

#BE Used to  
GIN group  
\_AL multiple  
TER #INCLUDE  
NAT statements  
E . Any  
single  
successful  
#INCLUDE  
statement  
causes the  
group to  
succeed.

#EN Used to  
D\_A mark the  
LTE end of an  
RNA #INCLUDE  
TE grouping.

\0x Support for  
nonprinting  
characters  
in NetBIOS  
names.  
Enclose  
the  
NetBIOS  
name in  
double  
quotation  
marks and  
use  
\0x

# m

# n

hexadecimal notation to specify a hexadecimal value for the character. This allows custom applications that use special names to function properly in routed topologies. However, LAN Manager TCP/IP does not recognize the hexadecimal format, so you surrender backward

compatibility if you use this feature.

Notice that the hexadecimal notation applies only to one character in the name. The name should be padded with blanks so the special character is last in the string (character 16).

The following example shows how all of these keywords are used:

```
102.54.94.98      localsrv    #PRE  
102.54.94.97      trey        #PRE    #DOM:networking    #net group's PDC  
102.54.94.102    "appname        \0x14"        #special app server  
102.54.94.123    popular        #PRE                #source server  
#BEGIN_ALTERNATE  
#INCLUDE \\localsrv\public\lmhosts    #adds LMHOSTS from this server  
#INCLUDE \\trey\public\lmhosts        #adds LMHOSTS from this server  
#END_ALTERNATE
```

In the preceding example:

n

The servers named *localsrv* and *trey* are preloaded so they can be used

later in an #INCLUDE statement in a centrally maintained LMHOSTS file.

n

The server named "appname \0x14" contains a special character

after the 15 characters in its name (including blanks), so its name is enclosed in double quotation marks.

n

The server named popular is preloaded, based on the #PRE keyword.

### [Guidelines for LMHOSTS](#)

When you use a host table file, be sure to keep it up to date and organized. Follow these guidelines:

n

Update the LMHOSTS file whenever a computer is changed or removed

from the network.

n

Use #PRE statements to preload popular entries into the local computer's

name cache and to preload servers that are included with #INCLUDE statements.

# n

Because LMHOSTS files are searched one line at a time from the

beginning, place frequently used servers near the top of the file, then less frequently used servers, followed by remote #INCLUDE statements. Finally, the #PRE entries should be left for the end of the file, because these are preloaded into the cache at system startup time and are not accessed later. Any comment lines will add to the parsing time, because each line is processed individually. This increases the speed of searches for the entries used most often.

On networks that do not use WINS, the b-node broadcast name resolution method used by computers on Microsoft networks provides a simple, dynamic mechanism for locating resources by name on a TCP/IP network.

LMHOSTS can be used with or without WINS. You will want to use LMHOSTS for smaller networks or to find hosts on remote networks that are not part of the WINS database (because name query requests are not broadcasted beyond the local subnetwork).

Because broadcast name resolution relies on IP-level broadcasts to locate resources, unwanted effects can occur in routed IP topologies. In particular, resources located on remote subnetworks do not receive name query requests, because routers do not pass IP-level broadcasts. For this reason, in Windows 95 you can manually provide computer name-to-IP address mappings for remote resources using LMHOSTS.

For information about how the LMHOSTS file can be used to enhance Windows 95 on a routed Windows NT network, see WINDOWS NT SERVER 3.5 TCP/IP in the Windows NT 3.5 documentation set.

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*



## *Appendix H Shortcuts for Windows 95*

This appendix summarizes the shortcuts that are built into Windows 95 for using the keyboard and mouse to quickly accomplish common actions.

### *Shortcuts for Objects, Folders, and Windows Explorer*

---

The following brief procedures and tables summarize the standard shortcuts for working with objects in the Windows 95 user interface, including folders on the desktop and Windows Explorer.

#### [To copy a file](#)

n

Press CTRL while you drag the file to a folder.

#### [To create a shortcut](#)

n

Press CTRL+SHIFT while you drag the file to the desktop or a folder.

#### [To close the current folder and all its parent folders](#)

n

Press SHIFT and click the Close button on the folder.

To tab through pages in property sheets

n

Press CTRL+TAB or CTRL+SHIFT+TAB.

To bypass Auto-Run when inserting a compact disc

n

Press SHIFT while inserting the compact disc.

Shortcuts for a Selected Object

---

F2 Rename

F3 Find

CT Cut

RL

+X

CT Copy

RL

+C

CT Paste

RL

+V

DE Delete

L

key

SHI Delete

FT immediately

+D without

EL putting the

file in  
Recycle Bin

AL Display  
T+ property  
EN sheet  
TE  
R

AL Display  
T+ property  
dou sheet  
ble-  
clik  
k

CT Put  
RL alternative  
+rig verbs on  
ht- the context  
clik menu  
k (Open With)

SHI Explore an  
FT object; if the  
+do object does  
ubl not have an  
e- Explore  
clik command,  
k this starts  
the default  
action  
(usually the  
Open  
command)

### Shortcuts for Managing Folders and Windows Explorer

---

F4 In Windows  
Explorer,  
display the  
combo box  
and moves  
the input  
focus to the

list

F5 Refresh  
display

F6 In Windows  
Explorer,  
move the  
focus  
between  
panes

CT In Windows  
RL Explorer,  
+G choose the  
Go To  
command

CT Undo  
RL  
+Z

CT Select All  
RL  
+A

BA Go to the  
CK parent  
SP folder  
AC  
E

### Shortcuts in the Windows Explorer Tree

---

\* Expand  
on everything  
nu under the  
mer selection  
ic  
key  
pad

+ Expand the  
on selection  
nu  
mer

ic  
key  
pad

- on Collapse  
nu the  
mer selection  
ic  
key  
pad

RI Expand the  
GH current  
T selection if  
AR it is not  
RO expanded;  
W otherwise,  
go to the  
first child

LE Collapse  
FT current  
AR selection if  
RO it is  
W expanded;  
otherwise,  
go to the  
parent

CT Scroll  
RL without  
+ar moving the  
row selection  
key

### Shortcuts in the Common Open and Save dialog boxes

---

F4 Display the  
Look In list

F5 Refresh the  
view

BA Go to the  
CK parent  
SP folder if the

AC focus is on  
E the View  
window

### General Keyboard-Only Commands

---

The following table shows commands for completing actions from the keyboard.

### General Keyboard-Only Commands

---

F1 Start Help

F10 Go to menu  
mode

SHI Display  
FT context  
+F menu for  
10 selected  
item

CT Display  
RL Start menu  
+E and move  
SC the focus to  
the taskbar

CT Move the  
RL focus on  
+E the taskbar  
SC, so you can  
ES use TAB  
C and then  
SHIFT+F10  
for context  
menu, or  
use TAB  
and arrow  
key to  
change  
tasks, or  
use TAB to  
go to the  
desktop

|    |              |
|----|--------------|
| AL | Switch to    |
| T+ | the next     |
| TA | running      |
| B  | application  |
| AL | When the     |
| T+ | focus is on  |
| M  | the taskbar  |
|    | or desktop,  |
|    | minimize all |
|    | windows      |
|    | and move     |
|    | the focus to |
|    | the desktop  |
| AL | When no      |
| T+ | windows      |
| S  | are open     |
|    | and no       |
|    | items are    |
|    | selected on  |
|    | the          |
|    | desktop,     |
|    | display the  |
|    | Start menu;  |
|    | then use     |
|    | arrow keys   |
|    | to select    |
|    | menu         |
|    | commands     |

### Accessibility Shortcuts

---

The following table summarizes the Windows 95 shortcuts for Accessibility features. For information about these features, see Appendix I, "Accessibility."

### Accessibility Shortcuts

---

|         |          |
|---------|----------|
| Tap     | Toggle   |
| SHIFT   | StickyKe |
| 5 times | ys on    |
|         | and off  |
| Press   | Toggle   |
| RIGHT   | FilterKe |

SHIFT ys on  
for 8 and off  
second  
s

Press Toggle  
NUML ToggleK  
OCK eys on  
for 5 and off  
second  
s

LEFT Toggle  
ALT+L MouseK  
EFT eys on  
SHIFT and off  
+NUM  
LOCK

LEFT Toggle  
ALT+L HighCon  
EFT trast on  
SHIFT and off  
+PRIN  
TSCR  
EEN

### Microsoft Natural Keyboard Keys

---

The following table summarizes the shortcut keys that can be used on the Microsoft Natural Keyboard™.

### Microsoft Natural Keyboard Keys

---

WI Display  
N+ Run dialog  
R box  
  
WI Minimize All  
N+  
M  
  
SHI Undo  
FT Minimize All  
+W



IN+  
M  
  
WI Start Help  
N+  
F1  
  
WI Start  
N+ Windows  
E Explorer  
  
WI Find files or  
N+ folders  
F  
  
CT Find  
RL computer  
+W  
IN+  
F  
  
WI Cycle  
N+ through  
TA taskbar  
B buttons  
  
WI PSS hot  
N+ key to  
BR display  
EA System  
K Properties  
dialog box

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## Appendix I Accessibility

This appendix describes the new features in Windows 95 that support enhanced accessibility. This appendix also provides information about other Microsoft products and services, which make Windows 95 more accessible for people with disabilities.

### Accessibility in Windows 95: Overview

---

Microsoft is committed to making computers easier to use for everyone, including individuals with disabilities. In recent years Microsoft has established close relationships with users who have disabilities, organizations representing disabled individuals, workers in the rehabilitation field, and software developers who create products for this market. Based on their combined input, Microsoft has defined specific design goals for Windows 95:

n

Integrate and improve the features from the accessibility product Access-

Pack for Microsoft Windows that compensate for difficulties some individuals have using the keyboard or the mouse

n

Make the visual user interface easier to customize for people with limited

vision

n

Provide additional visual feedback for users who are deaf or hard-of-

hearing

n

Provide new API and “hooks” for ISVs developing accessibility aids,  
including those that allow blind individuals to use Windows

n

Make information on accessibility solutions more widely available and  
increase public awareness of these issues

Windows 95 offers several enhancements designed to meet these accessibility  
goals. The primary improvements in accessibility for Windows 95 are:

n

Scalable user interface elements

n

Features that compensate for difficulties in using the keyboard

n

Keyboard emulation of the mouse

n

Support for alternative input devices that emulate the keyboard and mouse

n

Visual cues to tell the user when the application is making sounds

n

Notification to other applications when the user has limited vision, needs additional keyboard support due to difficulty using a mouse, or wants visual captions to be displayed for speech or other sounds

n

Notification to other applications when they should modify behavior to be compatible with accessibility software utilities running in the system

n

Optimized keyboard layouts for users who type with a single hand, a

single finger, or a mouthstick

n

Audible prompts during Setup for users who have low vision

n

Color schemes that are optimized for users with low vision

n

Documentation that includes accessibility information

*Windows 95 Accessibility Features*

---

Windows 95 accessibility features fall into the following categories:

n

General accessibility features

n

Features for users with limited vision

n

Features for users who have difficulty using a keyboard or mouse

n

Features for users who are hearing-impaired

n

Features supporting the use of alternate input devices

n

Features supporting the development of accessible software

This section describes general enhancements to the operating system that support

accessibility. These include:

n

Online Help

n

Control Panel support for accessibility features

n

Emergency hot keys

n

Accessibility time-out

n

Accessibility status indicator

[Online Help](#)

An Accessibility section in the Windows 95 Help contents and index provides a quick reference and pointer to topics that can help adjust the behavior of the system for people with disabilities.

### [Control Panel Support for Accessibility Features](#)

The Accessibility Options icon in Control Panel controls most of the accessibility features in Windows 95. With Accessibilities properties, users can turn the accessibility features on or off, customizing keyboard, sound, display, and mouse operation for their own particular needs.

#### *The Accessibility property sheet in Control Panel*

{ewc msdncd, EWGraphic, x0aq 0 /a "psAQ.bmp"}

### [Emergency Hot Keys](#)

The emergency hot keys provide an alternate method of activating accessibility features, for persons who could not use the computer without first having accessibility features in effect. Also known as shortcuts, the emergency hot keys allow the user to temporarily turn on the specific needed feature. Then, after a feature has been turned on, the user can navigate to Control Panel and adjust the feature to the user's own preferences, or turn the feature on permanently. The same hot key temporarily turns off the feature, if it gets in the way, or if another person wants to use the computer without this feature.

Hot keys are designed to be unique key combinations that should not conflict with keys used by applications. If such a conflict does arise, the hot keys can be disabled, and the user can still use the feature or not, as needed.

As a precaution against accidental use, pressing an emergency hot key causes special tones to sound (a rising siren tone for on, and a falling siren tone for off), and causes a confirmation dialog box to appear, briefly explaining the feature and how it was activated. If the user pressed the hot key unintentionally, the user can cancel the feature's activation at this time. The confirming dialog box also provides a quick path to more detailed help and to the Control Panel settings for the hot key feature, in case the user wants to disable the hot key permanently.

The following table shows how the hot keys work.

---

|         |            |
|---------|------------|
| StickyK | SHIFT      |
| eyes    | five times |
| Mouse   | Left ALT   |



Keys + left  
SHIFT +  
NUM  
LOCK

FilterK Right  
eys, SHIFT  
with and  
default hold it  
setting down  
s for eight  
active seconds

FilterK Right  
eys SHIFT  
with and  
SlowK hold it  
eys down  
and for 12  
Repeat sections  
Keys  
set to  
the  
most  
conser  
vative  
values

FilterK Right  
eys SHIFT  
with and  
Bounc hold it  
eKeys down  
and for 16  
Repeat seconds  
Keys  
set to  
the  
most  
conser  
vative  
values

Toggle NUM  
Keys LOCK  
and  
hold it  
down

for five  
seconds

### [Accessibility Time-out](#)

The time-out feature of the Accessibility property sheet turns off accessibility functionality after the computer has been idle for a certain period of time. It returns the operating system to its default configuration. This feature is useful on computers shared by multiple users.

### [Accessibility Status Indicator](#)

While an accessibility feature is in use, Windows 95 can display an optional visual indicator that tells the user which accessibility features are turned on. This helps users unfamiliar with the accessibility features to identify which ones are in effect. The indicator also provides feedback on the keys and mouse buttons currently being "held down" by the StickyKeys and MouseKeys features. The status indicator can appear on the system taskbar, or as a free-floating window; users can choose the displayed size from a range of different sizes.

#### [Accessibility Status Indicator Window](#)

```
{ewc msdncd, EWGraphic, x0aq 1 /a "psAQ.bmp"}
```

In the preceding illustration, the three rectangles represent the left SHIFT, CTRL, and ALT keys. As each modifier key is held down by the StickyKeys feature, the corresponding rectangle appears filled.

The mouse in the Accessibility status indicator window may show either the left or the right button shaded, depending on which is selected. Pressing 5, +, or INS is equivalent to using that button. If you have selected working with both buttons (equivalent to using the middle button on a three-button mouse), both buttons are shaded. If you lock down one or more mouse buttons using the INS key, the status indicator shows those buttons as being filled, rather than shaded. (To release them, press DEL.)

The stop watch indicates that the keyboard response is being affected by SlowKeys, BounceKeys, or RepeatKeys features.

This section describes the specific accessibility features that Windows 95 provides to users with limited vision, including:

A large, bold, red lowercase letter 'n'.

Scalable user interface elements

A large, bold, red lowercase letter 'n'.

A customizable mouse pointer

A large, bold, red lowercase letter 'n'.

High-contrast mode

### [Scalable User Interface Elements](#)

Users who have limited vision or who suffer eyestrain during normal use of a video display can now adjust the sizes of window titles, scroll bars, borders, menu text, and other standard screen elements. These sizes are completely customizable using the Appearance property sheet in the Display option of Control Panel. Users can also choose between two sizes for the built-in system font.

### [Customizable Display for Mouse Pointer](#)

Users who have difficulty seeing or following the mouse pointer can now set the following characteristics, to improve visibility of the mouse pointer:

A large, bold, red lowercase letter 'n'.

Pointer size

A large, bold, red lowercase letter 'n'.

Pointer color

A large, bold, red lowercase letter 'n'.

Speed of the pointer

A large, bold, red lowercase letter 'n'.

Visible trails of pointer movement

A large, bold, red lowercase letter 'n'.

Animation of the pointer

Customizable mouse pointer display schemes are loaded automatically when you install Windows 95 from the compact disc, using Typical setup. If another setup type is used, install the schemes after Setup is run, using the Add/Remove Programs icon in Control Panel. After installation, the user can select, through the Mouse option in-

Control Panel, a small, medium, or large mouse pointer scheme on a monochrome display.

In addition, with the Windows 95 compact disc, the user can install color schemes and select from red, gray, yellow, green, or violet 16-color schemes for the mouse pointer. Settings for pointer speed and for showing pointer trails (of user-specified lengths) are also available.

---

Note — Not all displays support mouse pointer color schemes.

---

Windows 95 features an animated hourglass pointer for better viewing.

### [High-Contrast Color Schemes](#)

Windows 95 color schemes allow users to choose from several well-designed sets of screen-color options, designed both to match users' individual tastes and to meet their visual needs. The new color schemes in Windows 95 include high-contrast colors, such as white text on a black background, or black text on a white background. These high-contrast color schemes optimize the visibility of screen objects, making it easier for users with visual impairments.

### [High-Contrast Mode](#)

Many users with low vision require a high degree of contrast between foreground and background objects, in order to distinguish the objects. For example, some users may not be able to easily read black text on a gray background, or text drawn over a picture. By setting a global flag, users can now instruct Windows 95 and applications to display information with a high degree of contrast. Activating high-contrast mode automatically selects the user's preferred color scheme.

Users can activate high-contrast mode using Accessibility Options in Control Panel, or using an emergency hot key sequence (pressing left-ALT, left-SHIFT, and PRINT SCREEN keys simultaneously).

This section describes accessibility features that assist users who may have difficulty using the keyboard or the mouse.

### [StickyKeys](#)

Many software programs require the user to press two or three keys at one time. For people who type with a single finger or a mouthstick, that isn't possible. StickyKeys allows users to press one key at a time and instructs Windows to respond as if they

had been pressed simultaneously.

When StickyKeys is on, pressing any modifier key (that is, CTRL, ALT, or SHIFT) latches that key down until the user releases the mouse button or press a key that is a not a modifier key. Pressing a modifier key twice in a row locks the key down until it is tapped a third time.

Users can adjust StickyKeys functionality in Control Panel, or turn the feature on or off using an emergency hot key (pressing the SHIFT key five consecutive times).

### [FilterKeys](#)

The sensitivity of the keyboard can be a significant problem for some individuals, for example, if they often press keys accidentally because of a tremor, or because they cannot remove their fingers from keys quickly. Windows 95 includes a series of features designed to work either individually or in combination to compensate for problems in keyboard usage. These features are called SlowKeys, RepeatKeys, and BounceKeys.

SlowKeys instructs Windows to disregard keystrokes that are not held down for a minimum period of time. This allows a user to brush against keys without any effect, and when the user gets a finger on the proper key, the user can hold the key down until the character appears on the screen.

RepeatKeys lets users adjust the repeat rate or disable the key repeat function on their keyboards. Most keyboards allow users to repeat a key just by holding it down. Although this feature can be convenient for some users, it poses a problem for individuals who can't lift their fingers off the keyboard quickly.

BounceKeys is useful for persons with tremors whose fingers tend to bounce on the keys when pressed or released. When BounceKeys is turned on, this feature instructs your computer to ignore unintended keystrokes.

Users can adjust FilterKeys functionality using the Accessibility Options icon in Control Panel, or turn on or off the specific FilterKeys feature using an emergency hot key. Holding down the right SHIFT key for eight seconds causes a single sound to play and activates this group of features with the user's default settings. If those settings are not appropriate, holding down the key for 12 seconds causes two quick beeps to sound, and turns on the BounceKeys and RepeatKeys features, with their most conservative settings. Holding down the key for 16 seconds causes three quick beeps to sound, and turns on the SlowKeys and RepeatKeys features with their most conservative settings.

### [MouseKeys](#)

This feature lets individuals control the mouse pointer using the keyboard. Although

Windows 95 is designed to allow the user to perform all actions without a mouse, some applications may still require one, and a mouse may be more convenient for some tasks. MouseKeys is also useful for graphic artists and others who need to position the pointer with great accuracy. Users do not need to have a mouse to use this feature.

When MouseKeys is on, use the following keys to navigate the pointer on the screen:

n

Press one of the numbered keys (also called the arrow keys) on the

numeric keypad — except 5 — to move the pointer in the direction indicated in the following figure.

*Keys on the numeric keypad that control the mouse pointer*

```
{ewc msdncd, EWGraphic, x0aq 2 /a "psAQ.bmp"}
```

n

Use the 5 key for a single mouse button click and the PLUS SIGN (+) key

for a double click.

n

To drag and release an object, place the pointer on the object and press

INS to begin dragging. Move the object to its new location and press DEL to release it.

n

Select the left, right, or both mouse buttons for clicking by pressing the forward slash (/) key, the minus sign (-) key, or the asterisk (\*) key, respectively.

n

Hold down the CTRL key while using the arrow keys (numeric keys, except for 5) to cause the pointer to “jump” across large sections of the screen.

n

Hold down the SHIFT key while using the arrow keys to move the mouse a single pixel at a time for greater accuracy.

Users can adjust MouseKeys in Control Panel, or turn the feature on or off using an emergency hot key (pressing the left ALT, left SHIFT, and NUM LOCK keys simultaneously).

### [ToggleKeys](#)

ToggleKeys provides audio cues — high and low beeps — to tell the user whether a toggle key is active or inactive. It applies to the CAPS LOCK, NUM LOCK, and SCROLL LOCK keys.

Users can adjust ToggleKeys in Control Panel, or turn the feature on or off using an emergency hot key (holding down the NUM LOCK key for eight seconds).



ShowSounds and SoundSentry provide visible feedback in place of audible signals or speech, to users who have hearing disabilities or who work in extremely noisy conditions.

### [ShowSounds](#)

This is a global flag that instructs applications to provide visible feedback—in effect asking the applications to be “closed-captioned.”

### [SoundSentry](#)

SoundSentry tells Windows to send a visual cue, such as a blinking title bar or a screen flash whenever there is a system beep. This allows users to see the message that may not have been heard.

### [Chat](#)

The Chat utility provided in the OTHER\CHAT directory of the Windows 95 compact disc enables you to have an electronic conversation with up to seven other people who are using Windows 95. Unlike an electronic mail message that you compose, save, and then send to another person, a Chat message is visible to others as you type it.

This utility is appropriate to install on all computers running Windows 95 in an environment that includes users who are deaf or hard of hearing. Chat is the best alternative form of communication when an interpreter or a text telephone (called a “TT” or “TDD”) is not available.

If Windows 95 is installed on a computer that did not previously have Windows for Workgroups installed, you can install Chat from the Windows 95 compact disc.

### [To install Chat on a computer running Windows 95](#)

1. In the Add/Remove Programs option in Control Panel, click the Install/Uninstall tab.
2. Insert the Windows 95 compact disc in the CD-ROM drive. Then click the Install button and follow the directions on screen for installing Chat.

You must also install and enable Network DDE on all computers that will use Chat.

### [To install Network DDE](#)

1. In the Network option in Control Panel, click the Add button on the Configuration sheet.

2. In the Select Network Component Type dialog box, double-click Service.
3. In the Select Network Service dialog box, click Microsoft in the Manufacturers list, and then click the Have A Disk button.
4. Insert the Windows 95 compact disc in the CD-ROM drive. Then follow the directions on-screen for installing Network DDE.

If Windows 95 users previously ran Chat under Windows for Workgroups, and upgraded to Windows 95 in their previous Windows directory, Chat is still available on their computers. However, these users must enable Network DDE in order to use Chat under Windows 95.

#### [To enable Network DDE on a computer running Windows 95](#)

1. To be provided.

#### [To make a call or add a person to a call](#)

1. On the toolbar in Chat, click the Dial button. Or choose Dial from the Conversation menu.
2. In the Select Computer dialog box, type the computer name of the person you want to chat with, and then choose the OK button.

—The message in the status bar informs you if the person answers.

You can type your message in the Chat window before calling someone. The top window displays what you type. The bottom window displays what the other person is typing. Each time you add a person to your conversation, a new window opens. If there are six people in a conversation, there are six windows open.

Only the person who initiates the call can add another person to the conversation or end the conversation.

When a person is added, that person can view the typed conversation that has already taken place. The names of the people in the conversation appear in the title bar and the status bar.

To move between the windows, click the window you're moving to, or press F6.  
When you finish your conversation, hang up.

When someone calls you, you answer the call to begin your conversation. If Chat is running, a sound is emitted, and a message appears in the status bar. If Chat is not running, it starts as an icon on your desktop.

#### [To answer a call](#)

n

If the Chat window is open, click the Answer button on the toolbar. Or choose Answer from the Conversation menu.

If Chat is running as an icon, double-click the icon, or select it and then press ENTER.

After you answer the call, you can start typing your message.

When you finish your conversation, hang up to disconnect from other participants' computers.

[To hang up](#)

n

On the toolbar, click the Hang Up button. Or choose Hang Up from the Conversation menu. Or quit Chat; it will hang up for you.

You can choose to have your computer ignore incoming calls unless Chat is running.

[To prevent incoming calls](#)

1. From the Options menu, choose Preferences.

2. Clear the Autostart Chat When Called check box, and then click OK.

Use the commands on the Options menu to control preferences for window styles, background color, and fonts, and to control the display of the tool bar and status bar. You can also use the Options menu to control whether Chat rings when there is a call.

[To turn the sound on or off](#)

# n

From the Options menu in Chat, choose Sound.

A check mark next to the Sound command indicates that sound is on.

If you have a sound card, you can change the sound of the incoming or outgoing ring by using the Sound option in Control Panel.

This section describes Windows 95 support for the use of alternative input devices.

### [SerialKeys](#)

This feature, in conjunction with a communications aid interface device, allows the user to control the computer using an alternative input device. Such a device needs only to send coded command strings through the computer's serial port to specify keystrokes and mouse events, which are then treated as if they were normal keyboard or mouse input.

### [Support for Multiple Pointing Devices](#)

The new Plug and Play architecture in Windows 95 inherently supports multiple pointing devices working in combination. This allows seamless addition of alternative pointing devices, such as head pointers or eye-gaze systems without the need to replace or disable the normal mouse.

This section describes how the design of Windows 95 makes it easier for software developers to make their products accessible to individuals with disabilities.

### [Accessibility Guidelines for Software Developers](#)

Windows 95 contains many built-in accessibility features. To make a computer running Windows 95 truly accessible, application developers must provide access to their applications' features, taking care to avoid incompatibilities with accessibility aids.

As part of the SOFTWARE DEVELOPMENT KIT FOR WINDOWS 95 and USER INTERFACE DESIGN GUIDELINES FOR WINDOWS 95, Microsoft has provided developers with documentation which not only outlines these important concepts, but provides technical and design tips to help ISVs produce more accessible applications. Most of these tips will mean very little additional work to the designer, as long as the application designer is aware of the issues and incorporates accessibility into the application design at an early stage. By providing this information to application developers, Microsoft hopes to increase the general level of accessibility of all software running on the Windows platform.

### [Methods for Simulating Input](#)

Windows 95 now allows developers of voice-input systems and other alternative input systems to easily simulate keyboard and mouse input using fully documented and supported procedures.

### [New Common Controls](#)

Many accessibility aids have difficulty working with applications that implement nonstandard controls. Windows 95 introduces a whole new set of controls available for mainstream software developers, and these standardized implementations are designed to cooperate with accessibility aids.

`{ewc msdn cd, EWGraphic, x0aq 3 /a "psAQ.bmp"}`

To see how the accessibility features in Windows 95 make it easy to customize the appearance and behavior of the computer, try them out, using the following procedures.

### [To perform mouse actions from the keyboard](#)

n

Press the left ALT, the left SHIFT, and the NUM LOCK keys simultaneously.

You'll be able to drag and drop, and click or double-click both the primary and secondary mouse buttons by using your keyboard's numeric keypad.

For more information, see "MouseKeys" earlier in this appendix.

### [To perform an ALT+TAB action with a pencil](#)

1. Press a SHIFT key five consecutive times to start StickyKeys. When StickyKeys is activated, press the ALT key and see what happens. Press TAB and you'll have just typed two keys at once with a single finger.
2. Press the ALT key twice, then press TAB a few times to see the ALT+ TAB window and cycle through all the tasks you have running. When you're satisfied, press ALT one more time to release it.
3. When you're ready to move on, turn off this feature by pressing two keys at the same time. Don't forget to watch the status indicator on the system taskbar.

— This feature is helpful to users who type with only one finger or who use a mouthstick.

### [To get accessibility support for MS-DOS-based applications](#)

n

Start an MS-DOS application and try StickyKeys or MouseKeys. These

features are available whenever you need them, regardless of what you may be doing, even when you're running MS-DOS-based applications.

### [To improve on-screen readability](#)

n

Press left ALT + left SHIFT + PRINT SCREEN and try to find a screen

appearance that's better suited to your needs.

— This feature is useful for individuals who can't read black text on a gray background because all the lines blur together.

### [Microsoft Services for People Who Are Deaf or Hard-of-Hearing](#)

---

Through a text telephone (TT/TDD) service, Microsoft provides people who are deaf or hard-of-hearing with complete access to Microsoft product and customer services.

You can contact Microsoft Sales and Service on a text telephone by dialing (800)-892-5234 between 6:30 A.M. and 5:30 P.M. Pacific time. For technical assistance you can contact Microsoft Product Support Services on a text telephone at (206)-635-4948 between 6:00 A.M. and 6:00 P.M. Pacific time. Microsoft support services are subject to Microsoft prices, terms, and conditions in place at the time the service is used.

### *Keyboard Layouts for Single-Handed Users*

---

Microsoft distributes Dvorak keyboard layouts that make the most frequently typed characters on a keyboard more accessible to people who have difficulty using the standard "QWERTY" layout. There are three Dvorak layouts: one for two-handed users, one for people who type with the left hand only, and one for people who type with the right hand only. The left-handed or right-handed keyboard layouts can also be used by people who type with a single finger or a wand. You do not need to purchase any special equipment in order to use these features.

Microsoft Windows already supports the two-handed Dvorak layout, which can be useful for coping with or avoiding types of repetitive-motion injuries associated with typing. To get this layout, choose the International icon from Control Panel. The two layouts for people who type with one hand are distributed as Microsoft Application Note GA0650. It is also contained in file GA0650.ZIP on most network services or GA0650.EXE on the Microsoft Download Service. For instructions on using Microsoft Download Service to obtain this application note, see Appendix J, "Windows 95 Resource Directory."

### *Microsoft Documentation on Audiocassettes and Floppy Disks*

---

People who have difficulty reading or handling printed documentation can obtain most Microsoft publications from Recording for the Blind, Inc. Recording for the Blind distributes these documents to registered members of their distribution service either on audiocassettes or on floppy disks. The Recording for the Blind collection contains more than 80,000 titles, including Microsoft product documentation and books from Microsoft Press. You can contact Recording for the Blind at the following address or phone numbers:

Recor Pho (80  
ding ne : 0)  
for the Pho 221  
Blind, ne -  
Inc. outsi 479  
20 de 2  
Rosze the (60  
l Road U.S.: 9)  
Prince Fax: 452

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|-------|-----|
| ton,  | -   |
| NJ    | 060 |
| 08540 | 6   |
|       | (60 |
|       | 9)  |
|       | 987 |
|       | -   |
|       | 811 |
|       | 6   |

Windows 95 documentation is available online in the CD-ROM version of Windows 95. This is also available from Recording for the Blind, Inc..

### Accessibility-Enhancing Utilities from Other Vendors

---

A wide variety of hardware and software products designed to help people with disabilities use personal computers are currently available from other vendors. Among the different types of products available for the MS-DOS, Microsoft Windows, and Microsoft Windows NT operating systems are:

n

Programs that enlarge or alter the color of information on the screen for people with visual impairments.

n

Programs that describe information on the screen in braille or in synthesized speech for people who are blind or have difficulty reading.



n

Hardware and software utilities that modify the behavior of the mouse and keyboard.

n

Programs that enable users to “type” using a mouse or their voice.

n

Word or phrase prediction software that allows one to type more quickly and with fewer keystrokes.

n

Alternate input devices, such as single switch or puff and sip devices, for those who cannot use a mouse or a keyboard.

For more information on these types of products, see the following section.

*Getting More Information on Accessibility*

---

For more information on Microsoft products and services for people with disabilities, contact Microsoft Sales Information Center at the following address:

Micros Voic (800

oft e )  
Sales tele 426-  
Inform pho 940  
ation ne: 0  
Center Text (800  
One tele )  
Micros pho 892-  
oft ne: 523  
Way Fax: 4  
Redm (206  
ond, )  
WA 635-  
98052- 610  
6393 0

The Trace R&D Center at the University of Wisconsin–Madison produces a book and a compact disc that describe products that help people with disabilities use computers. The book, titled TRACE RESOURCE BOOK, provides descriptions and photographs of about 2,000 products. The compact disc, titled CO-NET CD, provides a database of more than 18,000 products and other information for people with disabilities. It is issued twice a year.

You can contact the Trace R&D Center at the following address or telephone numbers:

Trace Voic (608  
R&D e )  
Center tele 263-  
S-151 pho 230  
Waism ne: 9  
an Text (608  
Center tele )  
1500 pho 263-  
Highla ne: 540  
nd Fax: 8  
Avenu (608  
e )  
Madis 262-  
on, WI 884  
53705- 8  
2280

For general information and recommendations on how computers can help specific people, consult a trained evaluator who can best match your needs with the available solutions. An assistive technology program in your area will provide referrals to programs and services that are available to you. To locate the assistive

technology program nearest you, contact:

Nation Voice/  
al text (80  
Inform telepho 3)  
ation ne 777  
Syste inside -  
m the 443  
Center U.S.: 4  
for Voice/te (80  
Develo xt 3)  
pment telepho 777  
al ne -  
Disabil outside 622  
ities the 2  
Benso U.S.: (80  
n Fax: 3)  
Buildin 777  
g -  
Univer 605  
sity of 8  
South  
Caroli  
na  
Colum  
bia,  
SC  
29208

{ewl msdncd.dll, ewcright, /c"Microsoft"}

## Appendix J Windows 95 Resource Directory

This appendix provides information on obtaining additional support and information for Windows 95. This appendix also discusses the different Microsoft sources for support and assistance to help you get the most out of using Microsoft products. These sources include Microsoft TechNet, the Microsoft Developer Network, Microsoft Solution Providers, the Microsoft Certified Professional program, and Microsoft Consulting Services.

### Online Information About Windows 95

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For Windows 95 information, see the WinNews file sections on most major online services and networks.

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FTP Type \_\_\_\_  
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the  
Intern  
et

World Wide Web Type \_\_\_\_  
dwid  
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web  
on  
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Intern  
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The Microsoft Network From the Windows 95 desktop, click the Microsoft Network icon. Then click Microsoft and, in the Microsoft menu, select Windows

95. Click  
WinNews.

Com Type \_  
puSe  
ve®

Prodi Type \_  
gy™

Amer Use the  
ica keyword \_  
Onlin  
e®

GEni Download  
e™ files from  
the  
WinNews  
area  
under the  
Windows  
95 RTC

As an alternative to these online sources, the biweekly WINNEWS ELECTRONIC NEWSLETTER is available. Subscribers receive this newsletter by mail, eliminating the need for regularly checking the WinNews servers for updates. To subscribe, type an Internet mail message addressed to [enews@microsoft.nwnet.com](mailto:enews@microsoft.nwnet.com) with the words *subscribe winnews* as the only text in your message.

### Getting Answers to Your Technical Questions

---

For answers to your questions and help with technical problems regarding Windows 95:

n

First, check online Help (press the F1 key), the printed documentation set, and the information in the SETUP.DOC, README.DOC, NETWORKS.DOC, and PRINTERS.DOC.

n

For fast answers to common questions and a library of technical notes

delivered by recording or fax, call Microsoft FastTips for Windows 95 at (800) 936-4200, available seven days a week, 24 hours a day, including holidays. Microsoft FastTips is an automated system, accessible by touch-tone phone.

n

Use CompuServe to interact with other users and Microsoft Product

Support Services (PSS) engineers, or to access the Microsoft Knowledge Base for product information. For CompuServe members, type *go mswrkgrp* to access the forum for Windows 95, or type *go mskb* to access the Microsoft Knowledge Base at any ! prompt.

For an introductory CompuServe membership kit, call (800) 848-8199 and ask for operator 463. For information about CompuServe or Knowledge Base, see "Microsoft CompuServe Forums" and "Microsoft Knowledge Base," later in this appendix.

n

Use the Microsoft Download Service (MSDL) to access the latest technical

notes on common support issues for Windows 95 and to access the Windows Driver Library by modem. The MSDL is available by modem at (206) 936-6735, seven days a week, 24 hours a day, including holidays. For more information, see "Microsoft Download Service" and "Obtaining Windows 95 Drivers," later in this appendix.

n

Contact a Microsoft Solution Provider for installation services and follow-

up product support. These companies have individuals who have been qualified as Microsoft Certified Professionals on Windows 95. For a referral to a Microsoft Solution Provider in your area, please call Microsoft at (800) SOLPROV ((800) 765-7768). For more information, see "Microsoft Solution Providers," later in this appendix.

n

Get technical support from a Microsoft engineer. Support is available for-

no charge from a Microsoft PSS engineer, by means of a toll line, for the first 90 days of using Windows 95. The 90-day period begins the day of your first call. Call (206) 637-7098 between 6:00 A.M. and 6:00 P.M. Pacific time, Monday through Friday, excluding national holidays. For support outside the United States, contact your local Microsoft subsidiary.

After the initial 90-day free period has expired, support is available from a Microsoft PSS engineer and charged by the length of time used or by the occurrence. Call (900) 555-2000 (\$2 per minute, \$25 cap) or (800) 936-5700 (\$25 per incident). For support outside the United States, contact your local Microsoft subsidiary.

Support for Microsoft TCP/IP for Windows 95 is not available from the standard Windows 95 PSS phone lines. To request TCP/IP support for Windows 95, please contact a Microsoft Solutions Provider or enroll in one of the Microsoft fee-based support plans. For further information, call Microsoft Inside Sales at (800) 227-4679.

Microsoft Text Telephone (TT/TDD) services are available for people who are hearing-impaired or hard of hearing. Using a special TT/TDD modem, dial (206) 635-4948, between 6:00 A.M. and 6:00 P.M. Pacific time, Monday through Friday. For more information about the accessibility of Microsoft products and services to the hearing-impaired, see Appendix I, "Accessibility."

Microsoft makes available a list of hardware which has been demonstrated to be compatible with Windows 95. This list is based on results submitted to Microsoft Compatibility Labs by individual manufacturers of computers and peripherals, using Windows 95 software. This does not constitute a full list of machines which currently run Windows 95.

A current list appears in Library 6 of the WINBTU forum (*go winbtu*) on CompuServe.

### *Windows 95 SDK Information*

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Information on developing applications that use Windows 95 functionality directly is available as part of the Windows 3.1 SDK Addendum. The Windows 3.1 SDK addendum is only available in electronic form in the Windows Extensions forum on CompuServe. The Windows Extensions forum can be found by typing *go winext* at a system prompt. The Windows 3.1 SDK Addendum for Windows 95 covers information on the Windows 95 API calls including Network DDE and MAPI. Sample programs and the necessary SDK files are also available in the forum library.

### *Microsoft TechNet*

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Microsoft TechNet is the comprehensive source of technical information for implementing and supporting Microsoft-based solutions. Microsoft TechNet is designed for those who support or educate users, administer networks or databases, create automated solutions, and recommend or evaluate information technology solutions. This worldwide information service is available on an annual subscription basis and is delivered through CD-ROM technology, with information also provided using a dedicated CompuServe forum and the Worldwide Web.

TechNet benefits include the following.

#### *Monthly Issues on CD.*

Each month, TechNet subscribers receive a Microsoft TechNet CD and a Supplemental CD. The Microsoft TechNet CD (disc 1), which is updated monthly includes the Microsoft Knowledge Base, Resource Kits, educational materials, information on migration, customer solution profiles, conference session notes, and more. The Supplemental CD (disc 2) provides up-to-date drivers, utilities, macros, and patches from the Microsoft Software Library.

More information about the Microsoft Software Library appears later in this appendix.

#### *Dedicated CompuServe Forum.*

The Microsoft TechNet forum on CompuServe (*go technet*) gives you up-to-the-minute news flashes, online connections to the Microsoft TechNet community, and the ability to download the latest technical information from Microsoft. You can also



exchange information with other experts and peers across the country and around the world. TechNet also includes WinCIM, a Windows-based front-end application for easy access to CompuServe forums. This greatly simplifies the logon, viewing, and download process.

Microsoft TechNet comes with a 90-day, money-back guarantee. To subscribe in the United States and Canada, using your credit card, call (800) 344-2121, weekdays, between 6:30 A.M. and 5:30 P.M. (Pacific time). For international orders, call (303) 684-0914 (in the United States) for contacts in your area.

### *Microsoft Developer Network*

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The Microsoft Developer Network is the most extensive source of development toolkits (SDKs and DDKs), Windows and Windows NT Workstation operating systems, and development-related technical, strategic, and resource information for developers who write applications for the Windows or Windows NT operating systems. The Developer Network is an annual membership program supplying developers with up-to-date toolkits and information. Two levels of membership are available.

Level 1 members receive the following benefits.

*Four quarterly updates to the Development Library.*

The Development Library contains more than 1500 sample applications, development tools and utilities, the latest technology specs, and complete issues of MICROSOFT SYSTEMS JOURNAL for developers of Microsoft Windows and Windows NT operating systems.

*Six bimonthly issues of the Developer Network News.*

The DEVELOPER NETWORK NEWS delivers up-to-the-minute information about Microsoft's systems strategy and development products.

*CompuServe Forum.*

The Developer Network forum on CompuServe (*go msdn*) provides you with all the latest technical articles and sample code which can be easily downloaded.

*Special privileges.*

Level 1 members receive a \$20 (one-time) credit on CompuServe connect charges, a 20 percent discount on Microsoft Press books, and invitations to Developer Network special events at shows.

Level 2 membership delivers all the Level 1 membership benefits, plus four quarterly updates to the Development Platform and accompanying support. The Development

Platform delivers the latest released versions of Microsoft software development kits, device driver kits, operating systems, both domestic and international versions, all on CD.

To join the Developer Network in the United States and Canada, call (800) 759-5474, 6:30 A.M. to 5:30 P.M. For local contacts outside North America, call (303) 684-0914.

### *Microsoft Solution Providers*

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Microsoft Solution Providers are independent organizations that provide consulting, integration, development, training, technical support, or other services with Microsoft products. Microsoft Solution Providers implement business solutions for companies of all sizes and industries by taking advantage of today's microcomputer technology for graphical and client-server applications. Microsoft equips Solution Providers with information, business development assistance, and tools that help create additional value with Microsoft-based software technology.

To locate a Microsoft Solution Provider in your area, or for more information on the Microsoft Solution Provider program in the United States, call Microsoft at (800) SOLPROV ((800) 765-7768). In Canada, call (800) 563-9048.

### *Microsoft Certified Professional Program*

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Under the Microsoft Certified Professional program, individuals can authoritatively establish that they possess the skills and knowledge to implement and support solutions with Microsoft products. To become a Microsoft Certified Professional, individuals must pass a series of rigorous standardized certification exams. On certification as a Microsoft Certified Professional, individuals receive benefits including access to technical information, use of the Microsoft Certified Professional logo, and special invitations to Microsoft conferences and technical events.

For more information on the Microsoft Certified Professional program, call Microsoft at (800) 636-7544 in the United States and Canada. In other countries, contact the local Microsoft subsidiary. Ask for the Microsoft Education and Certification Roadmap, an online guide to Microsoft Education and Certification. Or see E&CMAP.ZIP from Library 5 of the Solution Provider forum on CompuServe (go msedcert).

### *Microsoft Technical Education*

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Microsoft Official Curriculum materials provide computer professionals with the knowledge required to expertly install and support Microsoft solutions. Courses are developed by Microsoft product and technical support groups and include in-depth, accurate information and hands-on labs. Microsoft courses are designed to help

prepare individuals for Microsoft Certified Professional exams.

For full course descriptions and referral to a Microsoft Authorized Technical Education Center, call (800) SOLPROV ((800) 765-7768) in the United States and Canada. In other countries, contact your local Microsoft subsidiary office. Ask for the Microsoft Education and Certification Roadmap, an online guide to Microsoft Education and Certification. Or see E&C.MAP.ZIP from Library 5 of the Solution Provider forum on CompuServe (go msedcert).

### *Microsoft Consulting Services*

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Microsoft Consulting Services (MCS) has helped hundreds of organizations worldwide to build information technology solutions. With over 400 consultants based in 13 countries, MCS provides services that enable corporations, governments, and other institutions worldwide to design and build client-server applications that fully leverage Microsoft technology. MCS consultants are experienced in designing custom solutions such as order entry, executive information systems, payroll systems, document management, investment bank trading systems, and sales force automation. These solutions draw on the latest and most powerful technologies available from Microsoft, including Windows 95. For more information, please call (800) 426-9400 or the Microsoft Consulting Services office nearest you.

### *Microsoft Solutions Framework*

---

The Microsoft Solutions Framework (MSF) is a reference guide for building and deploying distributed enterprise systems based on Microsoft tools and technologies. MSF contains practical information to guide organizations through each stage of application development and deployment, covering key topics such as building software, planning architecture, and deploying infrastructure.

For more information about the Microsoft Solutions Framework, including training, consulting, and a CD-ROM title, call Microsoft Consulting Services at (206) 703-4MSF ((206) 703-4673 in the United States), or call the Microsoft Canada Customer Support Centre at (905) 712-0333, extension 7291.

### *Microsoft Knowledge Base*

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Microsoft Knowledge Base (KB) is a primary source of product information for Microsoft support engineers and customers. This comprehensive collection, which is updated daily, contains more than 56,000 detailed how-to articles, plus answers to technical support questions, bug lists, fix lists, and documentation corrections.

Knowledge Base articles are available online from CompuServe (type go mskb or go mdkb for Developer Knowledge Base), the Internet, and from other sources.

### Microsoft Download Service.

Use your modem to call Microsoft Download Service at (206) 936-6735. MSDL may have the articles you want in Help file format or in Application Notes. To find out what files are available, search the Knowledge Base for Microsoft Software Library files using the *kbfile* and *help* keywords. For more information about MSDL, see "Microsoft Download Service" later in this appendix.

### CD-ROM.

You can get the Knowledge Base on CD by subscribing to either the Microsoft Developer Network (MSDN) or Microsoft TechNet. Each of these services offers the complete Knowledge Base, in addition to many other information resources. For information, see "Microsoft TechNet" and "Microsoft Developer Network" in this appendix.

### Microsoft FastTips.

Microsoft FastTips is available 24 hours a day, 7 days a week, from a touch-tone telephone. To obtain a list of the articles available from Microsoft FastTips, call one of these numbers:

Advanc (800)  
ed 936-  
system 4400  
s:

Develo (800)  
pment 936-  
tools: 4300

Deskto (800)  
p 936-  
applica 4100  
tions:

Person (800)  
al 936-  
operati 4200  
ng  
system  
s:

### [To find articles on the Internet](#)

1. Connect to the Internet as described in Chapter 30, "Internet Access."
2. Type *cd* followed the name of the directory that contains the group for the type of

information you want.

The following table shows the available groups for Microsoft products.

---

|                                                                           |
|---------------------------------------------------------------------------|
| Advanced systems, such as Windows NT or SQL Server™                       |
| Desktop applications, such as Microsoft Excel or Word for Windows         |
| Development tools and languages                                           |
| Personal operating systems, such as Windows 95 and Windows for Workgroups |

For example, type *cd peropsys* to change to the PEROPSYS directory.

3. From the group directory, type *cd* followed by the name of the subdirectory containing the information you want.

For example, type *cd windows* to change to the WINDOWS subdirectory under PEROPSYS.

4. At the FTP prompt, type the following:

*get readme.txt*  
*get index.txt*

README.TXT contains important information about Knowledge Base articles.  
INDEX.TXT contains a list of article titles and Knowledge Base article IDs for each article. You need the article ID to download the article.

— A typical article ID might be Q104322. When used in a get command to download the article, you need to change the format of the article ID and add a .TXT file extension. Therefore, the article ID Q104322 would appear as Q104/3/22.TXT in the command line.

— The final two digits plus the .TXT file extension represent the filename (22.TXT), the digit preceding this is the subdirectory location (3), and the three digits preceding the subdirectory indicate the group directory (104).

5. Type *get* and the article ID with the slashes and the .TXT file extension, followed by the filename you want the article to have on your hard drive.

— Here is an example:

— *get q104/3/22.txt q104322.txt*

— The “Q104322.TXT” part of the command is the destination filename for the file, when transferred to your hard disk drive.

— Use Q94671 as a keyword to find the article “Knowledge Base Categories and Keywords for All Knowledge Base Articles.” Use the name of the product and the *kbkeyword* keyword in the Knowledge Base to find product-specific keywords.

6. Disconnect from the Internet as described in Chapter 30, “Internet Access.”

### [To contribute to the Knowledge Base](#)

1. Compose an article that is fully tested and includes all the following information:

n

Names of the authors, contributors, and technical reviewers, and a

telephone number for a contact

n

Product names, version numbers, and operating systems

# n

A short summary of the information

2. Submit your article by electronic mail.

— On the Internet, please send mail to [y-kbfeed@microsoft.com](mailto:y-kbfeed@microsoft.com)

— Or —

— In CompuServe Mail, put [y-kbfeed@microsoft.com](mailto:y-kbfeed@microsoft.com) in the TO: line of your message.

## *Microsoft Software Library*

---

The Microsoft Software Library (MSL) is a collection of files pertaining to all Microsoft products, including drivers, utilities, Help files, and Application Notes. Microsoft Software Library files are available from CompuServe, the Internet, and other sources.

### *Microsoft Download Service.*

Use your modem to call Microsoft Download Service at (206) 936-6735. The MSDL may have the articles you want in Help file format or in Application Notes. To find out what files are available, search the Knowledge Base for Microsoft Software Library files using the *kbfile* and *help* keywords. For more information about MSDL, see “Microsoft Download Service” later in this appendix. For instructions on searching in Knowledge Base, see “Microsoft Knowledge Base” earlier in this appendix.

### *CD-ROM.*

You can get the Microsoft Software Library on CD by subscribing to either the Microsoft Developer Network (MSDN) or Microsoft TechNet. Each of these services offers the complete Microsoft Software Library, in addition to many other information resources. For information, see “Microsoft TechNet” and “Microsoft Developer Network” in this appendix.

[To get MSL Files on CompuServe](#)



At any CompuServe prompt type `go msl`

#### [To find MSL files on the Internet](#)

1. Log onto your Internet account as described in Chapter 30, "Internet Access."
2. Change to the subdirectory containing MSL files by typing `cd softlib/mslfiles`

#### Microsoft Download Service

---

Microsoft Download Service (MSDL) operates in the same manner as any MS-DOS-based computer bulletin board system (BBS). MSDL contains Application Notes from Microsoft Product Support Services (PSS), and driver files and other types of support files for download.

To use the MSDL, you must have a computer with a modem and a terminal package. Any terminal package, such as Microsoft Works, Windows Terminal, Procomm, or Crosstalk™, will work with the MSDL. If you experience difficulty while you are working with the MSDL, try calling a local BBS so you can avoid paying long-distance charges while trying to determine the cause of the problem. Technical support is not available on the MSDL.

MSDL supports 1200, 2400, 9600, and 14,400 baud rates (V.32 and V.42), with 8 data bits, 1 stop bit, and no parity. After you have chosen these settings, you can begin the session as follows.

#### [To connect to Microsoft Download Service](#)

1. Call the MSDL at (206) 936-6735.
2. Type your full name and the location you are calling from.
3. At the MSDL Main Menu, type the number of the option you want.

You can download files, search the file index, view instructions on using MSDL, obtain a Windows driver library update, and obtain other information from this menu.

#### Microsoft CompuServe Forums

---



In addition to forums offered for Microsoft TechNet and Microsoft Knowledge Base, Microsoft sponsors a variety of other forums on CompuServe; these forums are known collectively as the Microsoft Connection. Topics for some of these forums include information on Microsoft Corporation, Microsoft services, desktop and development applications, personal and advanced operating systems, shareware for Windows-based products, and vendors of Windows-based products.

n

For access to the Microsoft Connection, type *go microsoft* at any

CompuServe command prompt.

n

For information on Windows 95, type *go mswrkgrp* at any CompuServe

command prompt.

### Obtaining Drivers and Information Electronically

---

The Windows Driver Library (WDL) is a collection of new and updated printer, display, sound, and network drivers for use with Microsoft Windows. Network drivers on the WDL include NDIS 2 and NDIS 3 drivers for network adapters not included in the Windows 95 retail package. As new and updated files become available, they are added to the WDL.

If you have a modem, the drivers are available electronically for download at no charge on services such as The Microsoft Network, Microsoft Download Service, CompuServe, and GENie. However, notice that standard connect time fees and long-distance telephone charges, if any, apply when you download files. When you connect to any of these services, please read the WDL.TXT for a complete list of the devices the WDL supports.

If you do not have access to a modem, you can obtain an individual driver from the WDL on a disk by calling Microsoft Product Support Services at (206) 637-7098.

When searching for a WDL or WNTDL driver, you can use any of these keywords:

— — —

m

a

n

u

f

a

c

t

u

r

e

r

n

a

# m

# e

## [To download a file from the Windows Driver Library](#)

1. Locate the device in the WDL.TXT file. Make note of the name of the file listed next to the device. You need to download this file from your download service.
2. If you are downloading to a floppy disk, you need to have a formatted blank disk. If you are downloading to your hard disk, create a new subdirectory in which you will place the files.

—Important— Do not download files directly into your Windows directory. Doing so could overwrite files essential to the proper operation of your system.

3. Follow the downloading procedure used by your downloading service. The file you download is the executable (.EXE) file that you identified in step 1. This file contains all the files you need to support your device.

—Download the .EXE file to your floppy disk or to the new subdirectory you created on your hard disk.

4. Change to the floppy disk drive (or the subdirectory on your hard disk) that contains the .EXE file. At the MS-DOS prompt, type the filename and then press ENTER.

When the .EXE file finishes running, all the files you need to support your device—such as a .DRV (WDL) file and the OEMSETUP.INF file, are set up. You also have a .TXT file that contains instructions for installing the device drivers (or other software) and a licensing agreement.

If you have problems extracting files, try downloading the files again.

#### [To access the WDL from The Microsoft Network](#)

1. Connect to The Microsoft Network.
  2. From the Database Menu, select the Select DB option.
  3. Choose the Software Library option.
  4. From the Software Library option, select the Host Items option.
  5. In the Query box type WDL to review the whole WDL list or type a keyword to view a specific file.
- To get more information on a specific file, highlight the filename with the cursor and press ENTER. This brings up more details about the file.

#### [To access the WDL from Microsoft Download Service](#)

1. Log onto MSDL as described in “Microsoft Download Service” earlier in this appendix.
2. From the main menu, press F for File index.
3. Select 1 for Windows & DOS.
4. Select 2 for Windows 3.1 Driver Library.
5. Select L to list the whole WDL list or E to examine a specific file.

#### [To access WDL from CompuServe if you are using WinCIM](#)

1. From the Services Menu type go.
2. Type msl in the GO Dialog box.
3. Select 2 to scan.
4. Search for WDL to view the whole WDL list or search for another keyword to view specific files.

#### [To access WDL from CompuServe if you are not using WinCIM](#)

1. Log onto CompuServe and type go msl
2. Follow steps 3 and 4 listed in the preceding procedure.

#### [To access the WDL from GENie](#)

1. Log onto GENie.
2. From the main menu select option 5 for Computing Services.
3. From the Computing Services menu, select option 6 for IBM PC or Tandy

roundtables.

4. From the IBM PC/Tandy Roundtables menu, select option 3 for software libraries.
5. From the Software Libraries menu select option 3 to search a file directory.
6. Type WDL as the search string to view the whole WDL list or type any keyword to view a specific file.

#### Resources for ICM

---

Eastman Kodak, the supplier of the default color-matching method for ICM in Windows 95 has a wide array of advanced color management technology and products including device profiles which can be used to optimize your system. To get more information, call (800) 752-6567. You can also write to Eastman Kodak, Color Management Group, 164 Lexington Road, Billerica, MA 01821.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## *Appendix K MS Systems Management Server*

This appendix provides information Microsoft Systems Management Server. In the final version, this appendix will also include information about how Systems Management Server can be used to install and maintain Windows 95 on networked computers.

For more information about Microsoft Systems Management Server, contact your Microsoft sales support representative.

### *Microsoft Systems Management Server Overview*

---

Microsoft Systems Management Server provides the most comprehensive solution for centralized management of computers in an enterprise network.

Microsoft Systems Management Server is a key component of the Microsoft solution for enterprise distributed systems management. Extending the capabilities built into Windows NT, Systems Management Server provides network administrators with a flexible method for centrally managing software and hardware on their corporate networks. This is an easy-to-use, integrated system that performs the following services:

#### *Hardware and software inventory.*

Automatically collects detailed configuration information about all personal computers on the network. Determine how many copies of a software package are installed in an organization, which personal computers need hardware upgrades, or which personal computer has a specific network address.

#### *Software distribution and installation capabilities.*

Makes it easy to install commercial or internally developed applications, patches, or virus-checking software ONCE on a personal computer, then automatically distribute it to other personal computers on the local network and at remote sites.

#### *Managing applications that run from servers.*

Gives users a standard set of applications from any personal computer anywhere on the network. Systems Management Server makes it easier to use application-metering packages and match the number of users of an application to the number of software licenses.

#### *Remote control and troubleshooting.*

Allows a central help desk to take control of a personal computer running MS\_DOS or Windows 95 from across a local or wide area network. It can even give you a real-time memory map of the remote personal computer.



### Network protocol analysis.

Allows administrators to look at the details of network packets, perform remote captures on a packet anywhere on the network, and gather network statistics about a group of personal computers.

### Integration with Windows NT tools.

Gives access to User Manager, Server Manager, Performance Monitor, event logs, and more — all from a single, consistent management environment.

Systems Management Server is a client-server system that enables administrators to perform these key management functions for distributed computers from a central location. This removes the need for someone to physically touch a computer to count it, configure it, or diagnose what's wrong with it.

Systems Management Server works with existing network environments to provide a complete resource management solution. Systems Management Server supports the environments listed in the following table.

---

Protocols supported under Windows NT, including: TCP/IP, IPX, NetBEUI, SNA, Remote Access Service (ISDN, X.25, ASYNC)

Networks supported: Windows NT, LAN Manager, Novell® NetWare®, and other systems

S

3.x and

4.x (in 3.x  
compatibilit  
y mode),  
LanServer  
3.x, DEC™  
Pathworks  
™

Client Windows  
nt 95, MS-  
work DOS 5.x or  
later,  
Windows  
s 3.x,  
Windows  
for  
Workgroup  
s 3.x,  
Windows  
NT 3.x,  
Apple®  
Macintosh  
® (System  
7), IBM®  
OS/2® 1.x  
and 2.x,  
IBM AIX®,  
HP-UX®,  
OSF/1,  
DEC  
Ultrix™,  
DEC  
VMS™,  
Sun®  
Solaris

Microsoft Network Monitor is a component of the Microsoft Systems Management Server that enables network administrators to detect and troubleshoot problems on LANs or on WANs running Microsoft Remote Access Service (RAS).

---

Note — To use Network Monitor with computers running Windows 95, you must install the Microsoft Network Monitor agent on the client computers. The Network Monitor agent is provided in the ADMIN\NETTOOLS\NETMON directory on the Windows 95 compact disc. For more information, see Chapter 16, “Remote Administration.”

---

With Network Monitor, you can:

n

Capture frames (also called packets) directly from the network.

n

Display and filter captured frames.

n

Edit and transmit captured frames onto the network to test network resources or to reproduce network problems.

n

Capture frames from a remote computer, and display the capture statistics

on the local computer at intervals that you specify.

A protocol is a set of rules or standards designed to enable computers to connect with one another and to exchange information. Network Monitor supports the following protocols:

AAR MSR RIPX  
P PC

AFP NBIP RPC  
X

ARP NBP RPL  
\_RA  
RP

ASP NBT RTM  
P

ATP NCP SAP

BO NDR SMB  
NE

BPD NetBI SNA  
U OS P

BR NFS SPX  
OW  
SER

DDP NMPI TCP

DH NSP TEL  
CP NET

DNS NWD TMA  
P C

FTP OSP TRM  
F P

ICM PAP UDP  
P

IP PPP XNS

LAP PPP ZIP  
CHA  
P

## LCP RIP

Network Monitor monitors the network DATA STREAM, which consists of all of the information transferred over a network at any given time. Prior to transmission, this information is divided by the networking software into smaller segments, called FRAMES or PACKETS. Each frame contains the following information:

n

The source address of the computer that sent the message, which is a unique hexadecimal (or base-16) number that identifies the computer on the network

n

The destination address of the computer that received the frame

n

Headers from each protocol used to send the frame

n

The data or a portion of the information being sent

Except in a Token Ring or a subnetted environment, every computer on the network is exposed to all network activity. However, the network adapter typically passes on to the networking software only the frames addressed to the destination computer. A

network adapter that passes to the networking software all the frames that pass over the network is said to be in promiscuous mode. Network Monitor, when used with a network adapter that supports promiscuous mode, copies all the frames it detects to its capture buffer, which is a resizable storage area in memory. The process by which Network Monitor copies frames is referred to as CAPTURING.

---

*Important*—— To use Network Monitor, you need a network adapter that supports PROMISCUOUS MODE, a state in which the network adapter can be directed by a device driver to pass on to the operating system all the frames that pass over the network. To determine if your adapter supports promiscuous mode, see the documentation that accompanies the adapter.

---

If your network adapter does not support promiscuous mode, you can still use Network Monitor. To capture frames using a network adapter that does not support promiscuous mode, connect to a Network Monitor agent running on a computer that does support promiscuous mode, and use the Network Monitor agent to capture; this process is called REMOTE CAPTURING.

Although the amount of information Network Monitor can capture is limited only to the amount of memory available on your computer, you usually need to capture only a small subset of the frames traveling on the network. To single out a subset of frames, design a capture filter, which functions in the same manner as a database query to single out the information that you specify. You can filter on the basis of source and destination addresses, protocols, and protocol properties, or by specifying a pattern offset.

If you want a running capture to respond to events on your network as soon as they are detected, design a capture trigger. A capture trigger performs a specified action, such as starting an executable file, when Network Monitor detects a particular set of conditions on the network.

For more information about using Network Monitor, see its documentation in the Microsoft Systems Management Service software package.

---

### *Managing Windows 95 Clients with Systems Management Server*

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In the final version, this section will provide an overview of how you can use Systems Management Server to manage computers running Windows 95.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## *Introduction*

May 17, 1995

### Welcome!

Thanks for taking a minute to browse through this Windows 95 Preview Program sampling of content from the Microsoft TechNet monthly CD subscription product. If your job involves answering tough technical questions or making technology decisions that affect users in your company, I invite you to read on. The few minutes you spend here learning more about Microsoft TechNet could turn out to be the best time you spend today.

We designed Microsoft TechNet specifically for technical professionals who administer enterprise applications and networks, integrate products and platforms, support and train users, or evaluate and decide on new technology directions. If you fall into one or more of these categories, Microsoft TechNet could become one of your most valuable tools. These two CDs contain the most up-to-date support, strategy, training, and software information available from Microsoft. Imagine a library of over 1 gigabyte of easily accessible technical information updated and delivered to your desk every month.

For instance, TechNet includes all available Microsoft product resource kits and their utilities. Resource kits include detailed product architecture as well as implementation and support information to help deploy Microsoft applications in the enterprise. TechNet contains the resource kits for Microsoft Windows 95, Microsoft Windows NT, Microsoft SQL Server, Microsoft FoxPro, Microsoft Word, Microsoft Windows for Workgroups, Microsoft Windows, Microsoft LAN Manager and MS-DOS.

TechNet also contains the entire Microsoft Knowledge Base: thousands of technical articles covering all Microsoft products, developed and used by Microsoft's own product support engineers. It contains quick how-to instructions, configuration information, work-arounds, and direct access to the software updates, drivers and patches available on TechNet.

Moreover, the monthly Microsoft TechNet CD offers easy access to the latest conference notes, technical white papers, product information, technical overviews, integration information, case studies and technology backgrounders everything you need to make the important decisions that affect you and your company.

Using TechNet to make informed decisions can save you time and money. In fact:

n

Based on a \$299 list price, the break-even point for TechNet occurs in just

3.4 weeks

n

93% of TechNet users save \$36/task using TechNet over alternate

methods

n

On average, TechNet users save 13 hours/month using TechNet over

alternate methods

n

On average, TechNet users save more than \$12,000/year using TechNet

over alternate methods

n

TechNet users reduce their phone calls to Product Support Services by



more than 50%

Members of the TechNet team are in contact with people from Microsoft's product and support groups every day, working to make sure that the most valuable technical information from Microsoft is delivered to you in the most timely manner possible. We work hard to make your job easier.

I invite you to take a tour of the subset of Windows 95 Preview Program content from the TechNet CD we've provided here. Simply double click on a topic in the left pane, and the article will appear in the right pane. Or click on the Find button on the Toolbar to perform a full-text search of the contents. You'll be impressed by the breadth and depth of what you see.

Our collection of information on Windows 95 is growing rapidly. The only way to be sure you have the most complete and up-to-date support and strategy information on a wide range of Microsoft products is to let us deliver our two CD-ROMs to your desktop every month. Simply contact your authorized reseller or call 1-800-344-2121 dept 3092. See "How to Subscribe" for details.

Thanks again for taking a look at Microsoft's TechNet CD.

Harry Miller  
Editor in Chief  
Microsoft TechNet

*{ewl msdn.cd.dll, ewcright, /c"Microsoft"}*

## Masthead

{ewc msdn cd, EWGraphic, zz0ag 0 /a "tnintroAG.bmp"}

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Charles  
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Teresa  
Fagan

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Circul Tim  
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ment

Manager

Customer Service  
Brian Arnot

Microsoft TechNet CD  
June 1995  
Volume 3, Issue 6

*{ewl msdncd.dll, ewcright, /c"Microsoft"}*

## *For New Subscribers*

Welcome to the Microsoft® TechNet CD! This compact disc provides comprehensive information for technical professionals who are looking for all kinds of information on how to plan, implement, integrate, train, and support Microsoft products.

You can now point and click to read hundreds of technical articles and strategic papers on Microsoft products written by Microsoft employees and industry experts. — In addition you have access to the Microsoft Product Support KnowledgeBase, resource kits. You can view technical presentations and learn about available training, service, and support opportunities.

You can navigate through the disc using a Windows-based application with three main windows.

n

The Contents window lists the contents of the CD, organized by source.

You can use the Contents window to browse and select articles or books you would like to view.

n

The Search window lets you look for specific information on the CD.

n

The Viewer window lets you view and annotate topics, copy text, and print information.

Survey Form

---

Enclosed in your Welcome Kit is a customer profile survey. We would greatly appreciate your setting aside some time to complete it, as it will allow us to service your information needs more effectively in the future. Thank you.

### *How to Send Us Feedback*

---

You can help us improve the content and functionality of the Microsoft® TechNet CD by sending us your comments and suggestions. Here's how you can reach us:

Co TechNet Forum  
m - GO  
pu TECHNET  
Se or email:  
rv >INTERNET:Te  
e: chNet@microsoft.com

Int TechNet@microsoft.com  
ne  
t:

Fa 206-936-7329  
x: (be sure to  
mark Attn:  
TechNet)

M Microsoft  
ail: TechNet, One  
Microsoft Way,  
Redmond, WA  
98052-6399

{ewl msdn.cd.dll, ewcright, /c"Microsoft"}

## *Common TechNet Questions*

### *General Questions*

#### *What is TechNet?*

Microsoft TechNet is the front-line resource of fast, complete answers to technical questions for people who install, configure and support Microsoft desktop and system products.

#### *Who uses it?*

Support professionals, systems integrators and administrators, and MIS managers. If you support or educate end users, administer networks or databases, create automated solutions, or evaluate and recommend information technology solutions, TechNet is the tool you need.

#### *What are the subscription benefits?*

n

12 monthly updates of CD 1 containing domestic and international

information including: the complete Microsoft Knowledge Base, resource kits, evaluation and reviewers guides, training materials, conference session notes, customer solution profiles, strategic information, and third-party integration studies.

n

12 monthly updates of CD 2 containing drivers and patches.



n

Dedicated MS CompuServe forum and forum map. Members also receive

WinCIM, a Windows based front-end for accessing CompuServe.

*How much does TechNet cost?*

The annual subscription fee is \$295 (\$395 CAN) per user. Additional single user licenses are \$40 (\$50 CAN) per user. A Single Server - Unlimited Users License is \$695 (\$945 CAN).

*Is the fee just for the CDs, or does it include general use of the CompuServe forum?*

The \$295 fee includes the two monthly TechNet CDs. The CompuServe Forum is available to anyone who wishes to log on, TechNet member or not.

*What are the system requirements for the TechNet CD?*

n

A personal computer with an 80386 or higher processor (80386DX at 20-

MHz or higher recommended), 4 MB of RAM (6-8 MB recommended), a hard disk with 2 MB of free disk space (6 MB or more recommended), and a VGA or higher resolution graphics adapter and compatible monitor.

n

A CD-ROM drive compatible with MPC Level 1 specifications.

n

Microsoft Windows version 3.1 or Windows for Workgroups version 3.1, or  
Windows NT 3.1 or higher.

n

Any of the following systems running Windows NT: Intel, MIPS, R4000, or  
DEC Alpha AXP.

n

MS-DOS version 3.1 or later (version 6.2 recommended).

n

Microsoft Compact Disc Extensions (MSCDEX) version 2.2 or later and  
compatible CD-ROM driver.

n

A mouse or equivalent pointing device compatible with Windows.

n

A printer compatible with Windows (optional).

*TechNet Components*

What does TechNet CD 1 contain?

n

Microsoft Knowledge Base lets you answer support questions using the

same extensive library of technical support information Microsoft Product Support Specialists use every day. No need to call, no need to download; the Knowledge Base saves you time and money.

n

Resource kits packed with technical references, troubleshooting

information, utilities and accessories aid in installing and supporting Microsoft products. Would you like to know the optimal configuration for your network? The resource kits provide you with the answer.

n

Technical information tells you how you to get the most out of products.

Microsoft products are designed to be powerful and easy to use; TechNet gives you the "how to" information you need to increase your productivity.

n

Migration information helps you move people in an organization from one product to another or from one environment to another. What issues are involved in migrating from a mainframe-based email system to a LAN-based one? TechNet tells you.

n

Product facts and features help you evaluate Microsoft products and compare versions of products to better understand the advantages of upgrading.

n

Educational materials such as tutorials, conference session slides with notes, and Windows NT training materials are included.

n

Customer solution profiles detail how your colleagues solve real information technology problems. See how the Orlando Health Care Group developed a central database repository for access by 1800 PCs using a client-server architecture. Or find out how the insurance and legal industries are creating state of the art solutions.

n

Strategic information on technologies keeps you up to date on the

direction Microsoft and its products are taking now and will take in the future. If you want to know more about such topics as multimedia, ODBC, MAPI, or OLE, TechNet is the place to look. Complete press releases.

n

Software library provides a collection of sample files, patches, and drivers.

n

Session notes from key Microsoft conferences provide timely information

straight from the technical professionals themselves.

n

Interactive titles let you follow your interest through large topics. Included

are the Windows NT Evaluation Guide, Ultimate Printer Manual, Excel Function Reference, Using OLE and Word, Microsoft Publisher Q&A, Windows 3.1 and Networks, Word for Windows Printing Guide, Word Setup and Troubleshooting Guide, Works Troubleshooting Guide, and Word Basic Help.

*Is information provided about products other than Microsoft's?*

Information on other industry vendor products is included, but only in the context of their use with Microsoft products and solutions strategies. You can find this

information spread throughout the TechNet categories. For example, Migration: Moving to Microsoft Excel (containing information on moving from Lotus 1-2-3 to Excel) is under MS Excel in the MS Office and Desktop Applications category; the Windows Resource Kit (providing information on setting up Windows in a NetWare environment) is under MS Windows in Personal Systems. TechNet's full-text search capability makes it easy to track down any kind of information you need.

*What information is on the Drivers and Patches CD?*

Using CD 2, you can access printer, video, audio, storage, pen or network drivers as well as install the Windows NT patches. Also included are the Access Service Pack, third party working model applications, software updates, operating system upgrades, Windows for Workgroups PPP server software, and patches for LAN Manager. Future CDs will include the Windows NT 3.5 Service Packs, the European Windows Drivers Library, NT 3.1 Resource Kit and more third party working model applications.

*What will I receive every month?*

Each month, you receive updated issues of both TechNet CDs.

*TechNet and other Microsoft Programs*

*What is the difference between TechNet and Microsoft Developer Network?*

Microsoft Developer Network provides information to help developers and programmers build products; Microsoft TechNet provides technical and troubleshooting information to help support professionals and systems administrators get those products up, running and working with other products.

*Does TechNet membership include the quarterly Developer Network CDs?*

No, they are two separate programs.

*TechNet Forum on CompuServe*

*What is the dedicated TechNet CompuServe Forum?*

You can type "Go TechNet" or navigate through the Microsoft Connection to enter the dedicated TechNet CompuServe forum. Within the TechNet Forum, you can find out about new TechNet offerings, discuss technical matters with peers from around the world, and download technical information.

*What is WinCIM?*

WinCIM is a Windows-based front end to CompuServe. It features a simplified interface to help you speed up navigation and content searches, reducing your connect-time charges.

## *Enrollment*

### *How can I get TechNet?*

Call 1-800-344-2121 to enroll or send payment (including sales tax and shipping fee) to:

### *Where can I get information about joining TechNet outside the US?*

The services of Microsoft TechNet vary by country. To join Microsoft TechNet outside the US, and Canada, contact the appropriate subsidiary:

Franc 05 90 59  
e 04 (toll-  
free)

Germ 0130 81  
any 02 11  
(toll-free)

The 06 022 24  
Nethe 80 (toll-  
rlands free)

Unite 0800 96  
d 02 79  
Kingd (toll-free)  
om

Any +31 10  
other 258 88 64  
countr  
y in  
Europ  
e

Argen 54-1-814-  
tina 5105 / 54-  
1-814-  
4807 / 54-  
1-814-  
4808

Brazil (5511)  
725-3711

Austr 61 2 870  
alia 2100

India 91 - 11 -  
646 0694

Japan (81) (1)  
5600-  
5036

Mexic (52) (5)  
o 325-0911

Moroc 212-247-  
co 1072

New 0-9-308  
Zeala 9318  
nd

Repu 86-01-  
blic of 8492148  
China

Russi 7-095-  
a 244-3474

Singa (65) 738-  
pore 7300

South 27 11 445  
Africa 0000

South 82 2 531-  
Korea 4500

Taiwa (886) (2)  
n 504-3122

Turke 90- 212-  
y 258 59 98

Unite 971 4  
d 513888  
Arab  
Emira  
tes

Venez 58-2-993-  
uela 1929

Every 402-691-  
where 0173  
else



Are Purchase Orders accepted?

Yes, but only from approved accounts that have previously used purchase orders with Microsoft. Approved accounts, just like individual customers, are encouraged to send checks or place credit card orders via phone. Please do not submit purchase orders for the TechNet program in combination with other Microsoft products.

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P.O. Box 51812  
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Microsoft TechNet CD

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## *Microsoft and Computer Accessibility for Individuals with Disabilities*

ABSTRACT: An introduction to disabilities and computer accessibility as well as Microsoft's accessible products and services.

### *Overview*

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A personal computer can be a powerful tool for enabling people to work, create and communicate in ways that might otherwise be difficult or impossible. But this vision can only be realized if those individuals with disabilities have access to the powerful world of personal computing.

The issue of computer accessibility in the home and workplace for people with disabilities is becoming increasingly important. It is estimated that there are over 30 million people in the United States alone who have disabilities that can be affected by computer design.<sup>1</sup> In addition, between 7 and 9 out of every 10 major corporations employ people with disabilities who may need to use computers as part of their jobs<sup>2</sup>. As the population ages and more people experience functional limitations, computer accessibility will become increasingly important to the population as a whole.

Legislation, such as the Americans with Disabilities Act, which currently affects private businesses with more than 15 employees and Section 508 of the Rehabilitation Act, which addresses government spending, is also bringing accessibility issues to the forefront in government businesses and organizations that receive government funding.

This overview is designed to answer questions about computer accessibility for people with disabilities as well as Microsoft's participation in this important area.

### *What are Disabilities?*

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Individuals are not disabled. Rather, people have difficulties performing certain tasks, such as using a keyboard in a certain way. These difficulties are referred to as "disabilities." Disabilities can be divided into four general categories. These categories describe groups of disabilities covering a broad range of people with widely different levels of needs.

Ranges from slightly reduced visual acuity to total blindness. Those with reduced visual acuity may only need images on a computer screen to be reasonably sized or specially enlarged, while users with more severe impairments may require output to be translated into spoken text or Braille.

Some individuals do not notice beeps or recognize spoken words. These users may require a program to prompt them in a different manner, such as a screen flash or displaying spoken messages as text.

Some users may be unable to perform certain manual tasks. These can range from difficulty holding a book to the inability to type two keys at the same time. Other individuals may have a tendency to hit multiple keys, “bounce” keys when pressing or releasing them, or be unable to manipulate a mouse. These individuals may require keyboards and mouse functions to be adapted to their requirements.

Cognitive Impairments take many forms, including retardation, short and long term memory impairments, perceptual differences and language impairments. Proper software design can help increase the number of people with mild cognitive impairments who can use computers.

### *What is Accessibility?*

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Accessibility means making computers accessible to a wider range of users than would otherwise be the case.

Special needs can be addressed in several ways:

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New features that are built into hardware and operating systems that help

make them accessible to users with and without specialized needs. These are often referred to as “electronic curb cuts.” This solution is preferred because the features are available on all workstations and can be used with all applications.



n

Utilities which modify the system to help make it more usable by more people, but are not practical to install on all machines. Examples of utilities include Braille output systems for people who are blind or modifications of the keyboard and mouse.

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Specialized applications, such as a word processor designed to integrate voice and text to help individuals with limited reading and writing skills.

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Usability features that can be built into mainstream applications, making them easier to use for people with disabilities. Examples include customizable colors and keyboard accelerators. In many cases these features also benefit people who do not have disabilities.

### What is Microsoft Doing Today?

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Microsoft has several programs in place to help users with disabilities access computers and related materials.

Through a text telephone (TT/TDD) service, Microsoft provides people who are deaf or hard-of-hearing with complete access to Microsoft® product and customer support services.

You can contact the Microsoft Sales Information Center on a text telephone by

dialing (800) 892-5234 between 6:30 A.M. and 5:30 P.M. Pacific time. For technical assistance you can contact the Microsoft Support Network on a text telephone at (206) 635-4948 between 6:00 A.M. and 6:00 P.M. Pacific time. Microsoft support services are subject to Microsoft prices, terms, and conditions in place at the time the service is used.

You can also contact the Microsoft corporate switchboard on a text telephone by dialing (206) 936-5066 between 6:00 A.M. and 6:00 P.M. Pacific time.

Individuals who have difficulties reading or handling printed materials can obtain many of Microsoft's publications from Recording for the Blind, Inc. RFB distributes these documents to registered members of their distribution service in the form of text files on floppy disks. These files can be read by most text editors and Braille or voice output systems. Some titles may also be available on audio-cassette. RFB's collection includes a wide array of Microsoft product documentation as well as books from Microsoft Press.

Access Pack for the Microsoft Windows™ operating system is a software utility that provides features which make it easier for users with movement or hearing disabilities to use Microsoft Windows 3.x. Access Pack for Microsoft Windows is discussed in greater detail below.

Access Pack for the Microsoft Windows NT™ operating system is a software utility that provides features which make it easier for users with movement or hearing disabilities to use Microsoft Windows NT version 3.5. It is discussed in greater detail below.

AccessDOS is a software utility that provides features which make it easier for users with movement or hearing disabilities to use applications written for the Microsoft MS-DOS® operating system. AccessDOS is discussed in greater detail below.

Microsoft distributes Dvorak keyboard layouts that make the most frequently typed characters on a keyboard more accessible to people who have difficulty using the standard "QWERTY" layout. These layouts are discussed in greater detail below.

In order to make sure that vital information can be found by people who need it, most Microsoft products include an appendix on Accessibility for Persons with Disabilities in their standard printed and on-line documentation. These sections list available resources and describe features in the product that are useful for people with disabilities.

There are many ways you can adjust the appearance and behavior of Microsoft Windows to suit varying vision and motor abilities without requiring any additional hardware or software. Application notes are available that describe the specific methods available for each operating system.

For more information see "Customizing Microsoft Windows," later in this document.

Microsoft has established this group to make computers easier to use for people with special accessibility needs. This group works to make Microsoft products and services more accessible as well as promote accessibility throughout the computer industry. It also supports the development of a rich variety of third-party accessibility aids.

### *Third Party Products and Services*

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A wide variety of third party hardware and software products designed to help people with disabilities use personal computers are currently available. Among the different types of products available for both MS-DOS and Microsoft Windows operating system are:

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Programs that enlarge or alter the color of information on the screen for people with visual impairments.

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Programs that describe information on the screen in Braille or synthesized speech for people who are blind or have difficulty reading.

n

Hardware and software utilities that modify the behavior of the mouse and keyboard.

n

Programs that enable users to “type” using a mouse or their voice.

n

Word or phrase prediction software that allows typing more quickly with fewer keystrokes.

n

Alternate input devices, such as single switch or puff and sip devices, for those who cannot use a mouse or a keyboard.

## Getting More Information

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For more information about Microsoft's products and services, customers can contact the Microsoft Sales Information Center at (800) 426-9400. For those with hearing impairments, the text telephone number is (800) 892-5234.

For information on software development of accessible products, developers can contact:

Accessibility and Disabilities Group  
Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6933  
(206) 882-8080 (voice telephone)  
(206) 936-5066 (text telephone)  
Fax (206) 936-7329

For more information on Recording for the Blind, customers can contact:

Recording for the Blind, Inc.  
20 Roszel Road  
Princeton, NJ 08540  
(800) 221-4792  
Fax (609) 987-8116

The Trace R&D Center at the University of Wisconsin-Madison produces a book and a compact disc that describe products that help people with disabilities use computers. The book, titled TRACE RESOURCEBOOK, provides descriptions and photographs of about 2,000 products. The compact disc, titled CO-NET CD, provides a database of more than 18,000 products and other information for people with disabilities. It is issued twice a year and should be available in many public libraries by early 1993.

Trace R&D Center  
S-151 Waisman Center  
1500 Highland Avenue

Madison, WI 53705-2280  
(608) 263-2309 (voice telephone)  
(608) 263-5408 (text telephone)  
Fax (608) 262-8838

For general information and recommendations about how computers can help specific individuals, customers should consult a trained evaluator who can best match the individual's needs with the available solutions. An assistive technology program in your area will be able to provide referrals to programs and services available to you. To locate the assistive technology program nearest your location, you may contact:

National Information System  
Center for Developmental Disabilities  
University of South Carolina  
Benson Building  
Columbia, SC 29208  
(803) 777-4435 (voice or text telephone inside the United States)  
(803) 777-6222 (voice or text telephone outside the United States)  
Fax (803) 777-6058

### Access Pack for Microsoft Windows

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#### Making it easier for people with disabilities to access the power of Windows

The Microsoft Windows family of products is designed to make PC's easier to use for everyone, from PC professionals to average users, including those users with disabilities. To meet this goal, Microsoft provides Access Pack for Microsoft Windows. Access Pack for Microsoft Windows is a set of utilities that make it easier for users with motion related disabilities to use the keyboard and mouse. Users that desire visual feedback rather than sounds will also find Access Pack valuable. A PC with Access Pack installed is ideal for settings where computers are used by multiple people, such as public or workgroup machines. Machines with Access Pack can easily be used by both those individuals that require its additional features and those that do not.

Access Pack for Microsoft Windows was developed through a cooperative effort with the Trace R&D Center at the University of Wisconsin-Madison with funding from the National Institute on Disability and Rehabilitation Research.

Access Pack for Microsoft Windows contains the following features that make the Windows operating system more accessible for those with motion and hearing-related disabilities.

### [StickyKeys](#)

Many software programs require the user to press two or three keys at one time. For people who type with a headstick or mouthstick, that just isn't possible. StickyKeys allows users to press one key at a time and instructs Windows to respond as if they had been pressed simultaneously.

### [SlowKeys](#)

For some individuals, the sensitivity of the keyboard can be a major problem, especially if they hit keys accidentally. SlowKeys instructs Windows to disregard keystrokes that are not held down for a certain period of time.

### [RepeatKeys](#)

Most keyboards allow users to repeat a key just by holding it down. For people, who can't lift their fingers off the keyboard quickly enough, this convenience can be a major annoyance. RepeatKeys lets users adjust the repeat rate or disable it altogether to best customize their environment.

### [BounceKeys](#)

For users that "bounce" keys, resulting in double strokes of the same key or other similar errors, BounceKeys instructs Windows to ignore unintended keystrokes.

### [MouseKeys](#)

This feature lets individuals control the mouse from the keyboard. Users can enjoy the flexibility of moving a mouse around the screen, selecting menus and other convenient mouse functions from the keyboard. MouseKeys can also help give users finer control than can be achieved with a standard mouse. A mouse is not required for this feature to work.

### [ToggleKeys](#)

ToggleKeys provide audio cues, high and low beeps, to tell the user whether a toggle key is active or inactive. It applies to the Caps Lock, Num Lock and Scroll

## Lock Keys:

## [SerialKeys](#)

This feature, in conjunction with a communications aid interface device, allows the user to control the computer using alternative input devices as if they were using a standard keyboard and mouse.

## [SoundSentry](#)

Windows beeps when it wants to signal the user, but this is not useful for users with a hearing impairment or who work in a noisy environment. SoundSentry tells Windows to send a visual cue, such as a blinking title bar or screen flash in addition to a beep. The user can then see the message that may not have been heard.

## [TimeOut](#)

TimeOut turns off Access Pack's functionality after the system has been idle for a certain period of time. It returns the system to its default configuration. This feature is useful on machines shared by multiple users.

The above features can be used alone or in combination to best suit a user's needs and environment. The features can also be customized to create a personalized desktop that allows individuals to be their most productive. In addition, once the Access Pack has been installed, an individual requiring a feature can access it without special assistance. When all features are turned off an individual who does not require the functionality should not notice that Access Pack is installed.

With Access Pack for Windows and third-party products that make Windows accessible to people with visual impairments and Microsoft's documentation in electronic form, Windows meets recommendations in the Government Services Administration guidelines relating to software accessibility. These guidelines were developed in response to section 508 of the Rehabilitation Act. This law was written to ensure accessibility for government employees with disabilities. Access Pack for Windows can also help employers accommodate individuals with disabilities, as required under the Americans with Disabilities Act.

Access Pack consists of three keyboard drivers and a mouse driver that replace the standard Windows drivers. In addition, it includes:



n

Access Utility (ACCESS.EXE) for controlling and customizing the Access-  
Pack functions

n

Complete on-line documentation in both Microsoft Windows Write and  
formatted text file formats

n

On-line help

The Access Pack software is fully compatible with most systems running Microsoft-  
Windows 3.0 or 3.1, or Windows™ for Workgroups 3.1 or 3.11. It is compatible with  
keyboards supported by those operating systems. It can also be used with a  
Microsoft Mouse, an IBM® PS/2® mouse or no mouse. It does not support  
enhanced features provided by Microsoft Mouse version 9.x or the Microsoft  
BallPoint® mouse.

Access Pack for Microsoft Windows is available on the Microsoft Windows Driver-  
Library as ACCP.EXE. If you have a modem, you can download this file from  
network services, including CompuServe® (GO MSL), GENie™, Microsoft On-line,  
various user-group bulletin boards, including BBSs on the Association of PC User-  
Groups or APCUG network, and the electronic download service maintained at  
Microsoft (phone (206) 936-6735). The electronic download service is open 7 days

a week from 2:30 A.M. to 1:00 A.M. Modem settings are 1200,n,8,1 or 2400,n,8,1 or 9600,n,8,1 or 14000,n,8,1. It supports V.32 and v.42 standards.

This file is also available on the Internet in /softlib/mslfiles at FTP.MICROSOFT.COM or WWW.MICROSOFT.COM

Customers within the United States who do not have a modem can obtain disks by calling the Microsoft Sales Information Center (800) 426-9400. Customers who are deaf or hard-of-hearing can call the text telephone (TT or TDD) number at (800) 892-5234. Customers outside of the United States should contact the Microsoft subsidiary in their country.

### Access Pack for Microsoft Windows NT

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#### Making it easier for people with disabilities to access the power of Windows NT

The Microsoft Windows family of products are designed to make PC's easier to use for everyone, from PC professionals to average users, including those users with disabilities. To meet this goal, Microsoft has developed Access Pack for Microsoft Windows NT. This kit provides access to features in the Microsoft Windows NT operating system that make it easier for users with motion related disabilities to use the keyboard and mouse. Users that desire visual feedback rather than sounds will also find these features valuable. Access Pack can be installed on any computer running Windows NT version 3.5, which can then be used by both those individuals that require its additional features and those that do not. A PC with Access Pack installed is ideal for settings where computers are used by multiple people, such as public or workgroup machines.

Access Pack for Microsoft Windows NT is based on work done by Trace Trace R&D Center at the University of Wisconsin-Madison, whose original research was funded by the National Institute on Disability and Rehabilitation Research.

Access Pack for Microsoft Windows NT contains the following features that make the Windows NT operating system more accessible for those with motion and hearing-related disabilities.

#### [StickyKeys](#)

Many software programs require the user to press two or three keys at one time. For people who type with a headstick or mouthstick, that just isn't possible.

StickyKeys allows users to press one key at a time and instructs Windows NT to respond as if they had been pressed simultaneously.

### [SlowKeys](#)

For some individuals, the sensitivity of the keyboard can be a major problem, especially if they hit keys accidentally. SlowKeys instructs Windows NT to disregard keystrokes that are not held down for a certain period of time.

### [RepeatKeys](#)

Most keyboards allow users to repeat a key just by holding it down. For people, who can't lift their fingers off the keyboard quickly enough, this convenience can be a major annoyance. RepeatKeys lets users adjust the repeat rate or disable it altogether to best customize their environment.

### [BounceKeys](#)

For users that "bounce" keys, resulting in double strokes of the same key or other similar errors, BounceKeys instructs Windows NT to ignore unintended keystrokes.

### [MouseKeys](#)

This feature lets individuals control the mouse from the keyboard. Users can enjoy the flexibility of moving a mouse around the screen, selecting menus and other convenient mouse functions from the keyboard. MouseKeys can also help give users finer control than can be achieved with a standard mouse. A mouse is not required for this feature to work.

### [ToggleKeys](#)

ToggleKeys provide audio cues, high and low beeps, to tell the user whether a toggle key is active or inactive. It applies to the Caps Lock, Num Lock and Scroll Lock Keys.

### [SerialKeys](#)

This feature, in conjunction with a communications aid interface device, allows the user to control the computer using alternative input devices as if they were using a standard keyboard and mouse.

### [SoundSentry](#)

Windows beeps when it wants to signal the user, but this is not useful for users with a hearing impairment or who work in a noisy environment. SoundSentry tells Windows NT to send a visual cue, such as a blinking title bar or screen flash in addition to a beep. The user can then see the message that may not have been heard.

### [ShowSounds](#)

Allows you to request applications to caption any speech or other information they would normally present by sound alone.

### [TimeOut](#)

TimeOut turns off Access Pack's functionality after the system has been idle for a certain period of time. It returns the system to its default configuration. This feature is useful on machines shared by multiple users.

The above features can be used alone or in combination to best suit a user's needs and environment. The features can also be customized to create a personalized desktop that allows individuals to be their most productive. In addition, once Access Pack has been installed, an individual requiring a feature can access it without special assistance. When all features are turned off an individual who does not require the functionality will not notice that Access Pack is installed.

With Access Pack for Windows NT and third-party products that make Windows NT accessible to people with visual impairments and Microsoft's documentation in electronic form, Windows meets recommendations in the Government Services Administration guidelines relating to software accessibility. These guidelines were developed in response to section 508 of the Rehabilitation Act. This law was written to ensure accessibility for government employees with disabilities. Access Pack for Windows NT can also help employers accommodate individuals with disabilities, as required under the Americans with Disabilities Act.

Access Pack contains the following components:

n

Access Utility (ACCESS.EXE) for controlling and customizing the Access Pack functions

n

Complete on-line documentation in both Microsoft Windows Write and formatted text file formats

n

On-line help

The Access Pack is compatible with all systems running Microsoft Windows NT Workstation or Windows NT Server version 3.5. It does not require specific mouse or keyboard drivers.

Access Pack for Microsoft Windows NT is included with Microsoft Application Note WN0789, and distributed as WN0789.EXE. If you have a modem, you can download this file from network services, including CompuServe (GO MSL), GENie, Microsoft On-line, various user-group bulletin boards, including BBSs on the Association of PC User Groups or APCUG network, and the electronic download service maintained at Microsoft (phone (206) 936-6735). The electronic download service is open 7 days a week from 2:30 A.M. to 1:00 A.M. Modem settings are 1200,n,8,1 or 2400,n,8,1 or 9600,n,8,1 or 14000,n,8,1. It supports V.32 and v.42 standards.

This file is also available on the Internet in /softlib/mslfiles at FTP.MICROSOFT.COM or WWW.MICROSOFT.COM.

Customers within the United States who do not have a modem can obtain disks by calling the Microsoft Sales Information Center (800) 426-9400. Customers who are deaf or hard-of-hearing can call the text telephone (TT or TDD) number at (800) 892-5234. Customers outside of the United States should contact the Microsoft subsidiary in their country.

## AccessDOS

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Making it easier for people with disabilities to access their personal computer

Microsoft is committed to making all of our products easier to use for everyone, from PC professionals to average users, including those users with disabilities. To meet this goal, Microsoft provides AccessDOS. AccessDOS is a software utility that make it easier for users with motion related disabilities to use the keyboard and mouse. Users that desire visual feedback rather than sounds will also find AccessDOS valuable. A PC with AccessDOS installed is ideal for settings where computers are used by multiple people, such as public or workgroup machines. Machines with AccessDOS can easily be used by both those individuals that require its additional features and those that do not.

AccessDOS was developed by the Trace R&D Center at the University of Wisconsin-Madison with support from IBM and the National Institute on Disability and Rehabilitation Research.

AccessDOS contains the following features that make the MS-DOS operating system more accessible for those with motion and hearing-related disabilities.

### [StickyKeys](#)

Many software programs require the user to press two or three keys at one time. For people who type with a headstick or mouthstick, that just isn't possible. StickyKeys allows users to press one key at a time and instructs the application to respond as if they had been pressed simultaneously.

### [SlowKeys](#)

For some individuals, the sensitivity of the keyboard can be a major problem.

especially if they hit keys accidentally. — SlowKeys causes applications to disregard keystrokes that are not held down for a certain period of time.

### [RepeatKeys](#)

Most keyboards allow users to repeat a key just by holding it down. — For people, who can't lift their fingers off the keyboard quickly enough, this convenience can be a major annoyance. — RepeatKeys lets users adjust the repeat rate or disable it altogether to best customize their environment.

### [BounceKeys](#)

For users that “bounce” keys, resulting in double strokes of the same key or other similar errors, BounceKeys causes applications to ignore unintended keystrokes.

### [MouseKeys](#)

This feature lets individuals control the mouse from the keyboard. — Users can enjoy the flexibility of moving a mouse around the screen, selecting menus and other convenient mouse functions from the keyboard. — MouseKeys can also help give users finer control than can be achieved with a standard mouse.

### [ToggleKeys](#)

ToggleKeys provide audio cues, high and low beeps, to tell the user whether a toggle key is active or inactive. — It applies to the Caps Lock, Num Lock and Scroll Lock Keys.

### [SerialKeys](#)

This feature, in conjunction with a communications aid interface device, allows the user to control the computer using alternative input devices as if they were using a standard keyboard and mouse.

### [SoundSentry](#)

Many applications beep when they want to signal the user, but this is not useful for users with a hearing impairment or who work in a noisy environment. — SoundSentry allows the user to choose a visual cue, such as a flashing symbol or screen flash in addition to a beep. — The user can then see the message that may not have been heard.

## TimeOut

TimeOut turns off AccessDOS's functionality after the system has been idle for a certain period of time. It returns the system to its default configuration. This feature is useful on machines shared by multiple users.

The above features can be used alone or in combination to best suit a user's needs and environment. The features can also be customized to create a personalized desktop that allows individuals to be their most productive. In addition, once the AccessDOS has been installed, an individual requiring a feature can access it without special assistance. When all features are turned off an individual who does not require the functionality should not notice that AccessDOS is installed.

With AccessDOS and third party products that make the system accessible to people with visual impairments and Microsoft's documentation in electronic form, Microsoft MS-DOS meets recommendations in the Government Services Administration guidelines relating to software accessibility. These guidelines were developed in response to section 508 of the Rehabilitation Act. This law was written to ensure accessibility for government employees with disabilities. AccessDOS can also help employers accommodate individuals with disabilities, as required under the Americans with Disabilities Act.

AccessDOS is of a memory-resident software utility which also provides an integrated user interface for controlling and customizing AccessDOS functions.

In addition, it includes:

n

Complete on-line documentation in formatted text file format



n

[On-line help](#)

n

[A memory-resident utility to enable AccessDOS's mouse features on PS/2 machines without physical mice](#)

[The AccessDOS is fully compatible with most systems running MS-DOS 3.3 or higher.](#)

[In order to use the mouse emulation features you must have a Microsoft or IBM serial or PS/2 style mouse. AccessDOS does not support the Microsoft BallPoint® Mouse at this time. On an IBM PS/2 you can also use these features with no mouse attached.](#)

[AccessDOS will require 11KB of conventional memory \(25KB if the SerialKeys feature is required\).](#)

[AccessDOS is available on the Microsoft MS-DOS Supplemental disks.](#)

[If you have a modem, you can download DOS62SP.EXE or DOS62S.EXE from network services, including CompuServe \(GO MSDOS\), GENie, Microsoft On-line, various user-group bulletin boards, including BBSs on the Association of PC User Groups or APCUG network, and the electronic download service maintained at Microsoft \(phone \(206\) 936-6735\). The electronic download service is open 7 days a week from 2:30 A.M. to 1:00 A.M. Modem settings are 1200,n,8,1 or 2400,n,8,1 or 9600,n,8,1 or 14000,n,8,1. It supports V.32 and v.42 standards.](#)

[This file is also available on the Internet in /softlib/mslfiles at FTP.MICROSOFT.COM or WWW.MICROSOFT.COM, and in the Microsoft Windows NT Resource Kit.](#)

Customers within the United States who do not have a modem can obtain disks by calling the Microsoft Sales Information Center (800) 426-9400. Customers who are deaf or hard-of-hearing can call the text telephone (TT or TDD) number at (800) 892-5234. Customers outside of the United States should contact the Microsoft subsidiary in their country.

## Dvorak Keyboard Layouts

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Making it easier for people to type with two hands, one hand or one finger

Microsoft distributes Dvorak keyboard layouts that make the most frequently typed characters on a keyboard more accessible to people who have difficulty using the standard "QWERTY" layout. There are three Dvorak layouts: one for two-handed users, one for people who type only with their left hand, and one for people who type only with their right hand. The left- or right-hand keyboard layouts can also be useful for people who type with a wand. You do not need to modify your hardware keyboard to use these layouts.

These layouts are available for Microsoft MS-DOS versions 5.0 and higher, Microsoft Windows 3.1, Windows for Workgroups 3.1 or higher, and Microsoft Windows NT 3.1 or higher.

A keyboard layout is a map or a definition of how keys are laid out on your keyboard. The keyboard layout you use is determined by software in your computer. The letters on your keys indicate the standard layout for your keyboard. There are many different keyboard layouts in use throughout the world. The one you ordinarily use depends on the country you are in or the language you use.

Dvorak keyboard layouts are based on designs created by August Dvorak, a professor at the University of Washington during the 1930s and 1940s. Dr. Dvorak studied the way people type standard English, and determined the most common letter combinations. He then designed new keyboard layouts to speed up typing and reduce fatigue. These layouts, now called Dvorak or simplified keyboard layouts, were initially developed for two-handed typists. Following World War II, Dvorak layouts were developed for typists who use the right or left hand alone.

Dvorak layouts reduce the amount of motion required to type common English text. This may help avoid some types of repetitive strain injuries associated with typing. Studies have also shown an increase in typing speed and accuracy when using the Dvorak layout for two hands.<sup>3</sup>

Dvorak keyboard layouts are available in the file GA0650.EXE. If you have a modem, you can download these files from network services, including CompuServe (GO MSL), GENie, Microsoft On-line, various user group bulletin boards, including BBSs on the Association of PC User Groups or APCUG network, and the electronic download service maintained at Microsoft (phone 206-936-6735). The electronic download service is open 7 days a week from 2:30 A.M. to 1:00 A.M. Modem settings are 1200,n,8,1 or 2400,n,8,1 or 9600,n,8,1 or 14000,n,8,1. It supports V.32 and v.42 standards.

This file is also available on the Internet in /softlib/mslfiles at FTP.MICROSOFT.COM or WWW.MICROSOFT.COM.

Customers within the United States who do not have a modem can obtain disks by calling the Microsoft Sales Information Center at (800) 426-9400. Customers who are deaf or hard-of-hearing can call the text telephone (TT or TDD) number at (800) 892-5234. Customers outside of the United States should contact the Microsoft subsidiary in their country.

*{ewc msdn cd, EWGraphic, zy0cy 0 /a "tnnwfeatCY.bmp"}*

*Figure 1 Standard QWERTY layout*

*{ewc msdn cd, EWGraphic, zy0cy 1 /a "tnnwfeatCY.bmp"}*

*Figure 2 Dvorak layout for the right hand*

*{ewc msdn cd, EWGraphic, zy0cy 2 /a "tnnwfeatCY.bmp"}*

*Figure 3 Dvorak layout for two hands*

*{ewc msdn cd, EWGraphic, zy0cy 3 /a "tnnwfeatCY.bmp"}*

*Figure 4 Dvorak layout for the left hand*

## Customizing Microsoft Windows

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Adjusting Microsoft Windows, Windows for Workgroups and Windows NT to meet the needs of individuals with disabilities

There are many ways you can customize you adjust the appearance and behavior of

Microsoft Windows to suit varying vision and motor abilities without requiring any additional software or hardware. These include ways to adjust the use of color and size of some screen elements, make it easier see the mouse pointer and select objects using the mouse, adjust the keyboard speed, and automating common tasks.

The specific methods available depend on which operating system you are using, so Microsoft provides application notes describing the specific methods available for each operating system.

For information relating to customizing Windows 3.0 for people with disabilities, see Application Note WW0786; for Windows 3.1, Application Note WW0787; for Windows for Workgroups NT 3.1, Application Note WG0788; for Windows NT 3.1, Application Note WN0789.

The Application Note WN0789, "Customizing Windows NT for Individuals with Disabilities", also includes Access Pack for Microsoft Windows NT, a utility which allows the user to configure features in the operating system that make it easier for individuals who have difficulty using a keyboard or mouse, or who are deaf or hard of hearing.

If you have a modem, you can download the application note files WW0786.TXT, WW0787.TXT, WG0788.TXT and WN0789.EXE from network services, including CompuServe (GO MSL), GENie, Microsoft On-line, various user group bulletin boards, including BBSs on the Association of PC User Groups or APCUG network, and the electronic download service maintained at Microsoft (phone 206-936-6735). The electronic download service is open 7 days a week from 2:30 A.M. to 1:00 A.M. Modem settings are 1200,n,8,1 or 2400,n,8,1 or 9600,n,8,1 or 14000,n,8,1. It supports V.32 and v.42 standards..

These files are available on the Internet in /softlib/mslfiles at FTP.MICROSOFT.COM or WWW.MICROSOFT.COM.

Customers can receive these application notes by fax through the Microsoft Fast Tips Service at (800) 936-4200. You must use a touch-tone phone to use this service.

Customers within the United States who do not have a modem can the application notes by calling the Microsoft Sales Information Center at (800) 426-9400. Customers who are deaf or hard of hearing can call the text telephone (TT or TDD) number at (800) 892-5234. Customers outside of the United States should contact the Microsoft subsidiary in their country.

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Last revised on November 21, 1994.

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1 — Trace Research and Development Center at the University of Wisconsin-Madison.

2 — Trace Research and Development Center at the University of Wisconsin-Madison.

3 — “A Practical Experiment in Simplified Keyboard Retraining”, U.S. Navy, July 1944.

`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

## *Secondary Mousing Ain't No Piece of Cheese in Windows 95*

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Note — The tasks and features discussed in the following paper are based on a beta release of the Windows 95 operating system. Any and all information in this article is subject to change in the released version of the product.

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While I was working on a document in Word 6 for Windows a couple months back, an office mate of mine leaned over and said, "Try selecting some text, moving over to the left margin, and clicking the right mouse button." I did, and to my surprise, a drop-down menu appeared from which I could cut, copy, paste, or reformat the selected text. Finally, something useful from what seemed like a vestigial artifact. The right mouse button, or more accurately, the secondary mouse button, has long had functionality, but that has not been widely known, so its use has seemed to be a power-user community secret. (Note: The right mouse button is called the secondary mouse button because users may switch their primary button from the customary left one to the right one). Usability tests conducted for Windows 95, for example, revealed that right-clicking was either overlooked or forgotten by most novice users.

Windows 95 user interface (UI) designers aimed to change this by making the secondary mouse button so useful and thoroughly documented that new users would get used to it and make it an integral part of their working method. The rest of this article gives you a preview of the useful functions built into that nifty little button—that, until now, you'd ignored.

### *Closing Tasks and Disconnecting From Servers*

---

If you work on different projects over the course of a day, you may cram the Windows 95 Taskbar full of applications, utilities, and unused windows. By mid-afternoon most days, my Taskbar is a hodgepodge of all sorts of stuff. Instead of using 'Alt-Tab' or clicking Taskbar buttons to open and close each task, application or window, you can now use the Windows 95 secondary mouse button to open a new POPUP MENU. (See Figure 1.)

*{ewc msdncd, EWGraphic, zy0bp 0 /a "tnnwfeatBP.bmp"}*

#### *Figure 1 Popup Menu on Taskbar*

From this menu you can instantly close any task on the Taskbar. Like all of the other menus in Windows 95, this one does not require you to hold down the mouse button as you select an option. To minimize, cascade, or tile all available windows, you can secondary mouse click a blank section of the Taskbar to bring up a popup menu listing these options.

In increasingly common client-server environments, connecting to and disconnecting from a multitude of server locations is commonplace. Documents, applications,

tools—you're sure to find yourself grabbing things you need from all over the network. Windows 95 streamlines this sequence in several ways. For one thing, you can disconnect from a server location as simply as you can close a task: with one, secondary mouse click. When you have what you want from the server, click on the server location in the Windows Explorer and select Disconnect from the popup menu, presented to the right of the object. The mouse can help you create shortcuts to servers and other directories too.

### Accessing Object Properties and Creating Shortcuts

---

Need quick, convenient access to object information? Windows 95's secondary mouse button lets you assess a document's size or read/write status with a single click. Figure 2 shows how 'secondary clicking' makes available the Properties and Create Shortcut options.

{ewc msdncd, EWGraphic, zy0bp 1 /a "tnnwfeatBP.bmp"}

#### Figure 2 Expanding Menu Revealed by Secondary Mouse Clicking

Selecting the HTM file titled KBSEARCH in Figure 2 and then the Properties option opens a window showing the file's type, location, size, MS-DOS name, date created, date modified, date last accessed, and attributes. If you work with lots of files, you'll find that this feature saves you some effort and time by alleviating the need to select a file and then drop down the File menu to select Properties.

You can use the same steps to find the specific properties of a networked computer or folder. For example, before you place some large files on a server, secondary mouse clicking the specific server location and selecting properties from the popup menu would enable you to make sure sufficient resources were available. The properties sheet displayed (see Figure 3) includes a handy pie chart of the server's used and available space.

{ewc msdncd, EWGraphic, zy0bp 2 /a "tnnwfeatBP.bmp"}

#### Figure 3 Properties Sheet for a Server

Another new feature for the Windows 95 secondary mouse button is the ability to create a shortcut to a disk drive, application, folder, or network location then double click to access it from the desktop or from within an application.

If you work in a client-server environment, you surely find yourself routinely connecting to colleagues' computers. Let's say you're collaborating on some WWW files with an Online Program Manager, who prefers to keep the files on her local hard drive. You could create a shortcut, and relocate it on the desktop, to the network folder (in this case, a network folder called Msclient) where she keeps the files by secondary mouse clicking on the network folder's location icon in Windows Explorer, dragging the icon (see Figure 4) to the desktop, and selecting Create Shortcut Here.



{ewc msdn cd, EWGraphic, zy0bp 3 /a "tnnwfeatBP.bmp"}

#### Figure 4 Shortcut to Networked Msclient Folder on Another Computer

On the desktop, this shortcut would be readily available from whatever application you were using. You wouldn't have to browse or map any drives; you could simply double-click the shortcut to bring up a window that presented the networked folder's files. If you wanted to, you could rename this shortcut, and if the Online Program Manager renamed the folder, the shortcut would continue to work.

You can create shortcuts for most objects. On my desktop, for example, I've created them for several servers I frequently use, a few random applications I can't do without (Netscape, Hyperterminal, and Winword) and my CD player, which is essential equipment around here. Shortcuts are just another means provided by Windows 95 for customizing your work environment. You may prefer to keep the desktop free of them, relying instead on customizing the Start button's Start Menu programs. On the other hand, you may go crazy and create shortcuts to everything from your nightly grocery list to the game DOOM. A little experimentation will show you what works best for you.

#### Clicking for Help

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If you have read TechNet News' previous feature article on Windows 95 you'll probably remember that its new Help is highly intuitive, with task-oriented instructions and embedded shortcuts that take you directly to specific dialog boxes. But even Help can be jazzed up with the secondary mouse button.

If you take a close look at any of the Control Panel Tools in Windows 95 you'll notice that each Tool dialog box has a ? button in the top right hand corner. When you click it, the pointer changes to a question mark, and context-sensitive Help concerning specific sections of the dialog box is displayed. That's pretty quick, but if it is still too slow for you, click the secondary mouse button on sections of the dialog box that puzzle you. (See Figure 5-).

{ewc msdn cd, EWGraphic, zy0bp 4 /a "tnnwfeatBP.bmp"}

#### Figure 5 Secondary Mouse Clicking for Context Sensitive Help

Another handy Help trick with the secondary mouse button is to click in open Help dialog boxes. Rather than selecting the Options button each time you want to copy Help text to another document or print Help information, simply secondary mouse-click anywhere inside it. The popup menu, as presented in Figure 6, enables single-click annotating, copying, printing, and a host of other handy features.

{ewc msdn cd, EWGraphic, zy0bp 5 /a "tnnwfeatBP.bmp"}

#### Figure 6 Help Popup Menu Displayed with Secondary Mouse Click



Again, this is designed to save you time and effort. Personally, I find it easier to click anywhere in a dialog box than to aim for a button. Maybe you have a better aim.

### Quick Secondary Clicking Shortcuts Reference

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Thus far I've highlighted some of the major tasks secondary clicking facilitates. The following table will give you a quick glance at these tips as well as offer some other shortcuts you're sure to find handy:

---

|                                            |                                                               |
|--------------------------------------------|---------------------------------------------------------------|
| Close a task                               | Task's Taskbar button and select close.                       |
| Disconnect from a server                   | Server's location icon in the Explorer and select disconnect. |
| Minimize, cascade or tile all open windows | Blank space on the Taskbar and select the appropriate option. |
| View an object's properties                | Object and select Properties .                                |
| Create an object shortcut                  | Object and select Create Shortcut.                            |
| View context-sensitive                     | Spot in the respective                                        |

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the desktop to a specific locale, like a 3 1/2" floppy or 5 1/4" floppy and choose the appropriate option.

### Versatility and Choice

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One of the primary motivations in developing Windows 95 was to allow you to carry out tasks in as many different ways as possible: one of the many choices is sure to suit your working habits. The Taskbar, the Explorer, shortcuts, and the backwards compatibility, which maintains such features as 'Alt-Tabbing' and the File Manager, all are examples of how the Windows 95 team is serving to its diverse, multi-talented user base. The secondary mouse button is just one more feature that narrows the gap between the power user and the beginner, allowing us all to work more efficiently and confidently.

Michael Meulemans  
Associate Editor

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`{ewl msdncd.dll, ewcright, /c"Microsoft"}`

