



Reliability Improvements in Windows XP Professional

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Abstract

This document describes the enhancements to and new features of the Microsoft® Windows® XP Professional operating system that prevent problems from occurring on users' systems. It also discusses improvements that enable quick recovery from problems, thereby optimizing user productivity.

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Microsoft Corporation • One Microsoft Way • Redmond, WA 98052-6399 • USA

Contents

Acknowledgements.....	iv
Introduction.....	1
Improvements That Help Prevent Problems.....	2
Application Compatibility	2
Device and Hardware Support	3
Shared DLL Support	3
Shutdown Event Tracker	4
Closing Unresponsive Applications	4
Device Driver Resiliency Improvements.....	5
Windows Driver Protection	5
Device Driver Rollback	5
Installation, Update, and Repair Improvements.....	7
Windows Installer	7
Auto Update	7
Dynamic Update	7
Windows Update	7
Backup, Recovery, and Restore Improvements.....	9
Shadow Copy Integration with Backup	9
Last Known Good Configuration	9
Automated System Recovery	9
System Restore Enhancements	9
Support Improvements.....	12
Error Messaging and Product Support	12
Online Crash Analysis	12

Summary.....	13
Related Links.....	14

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Introduction

Computer system reliability and availability are critical considerations for businesses today. When Microsoft released the Windows® 2000 Professional operating system, it brought a new level of reliability to desktop computing. Windows XP Professional is built on the proven code base of Windows 2000, which features a 32-bit computing architecture, and a fully protected memory model. Windows XP offers several enhancements that make it the most reliable version of Windows yet.

Improvements That Help Prevent Problems

Windows XP features several enhancements that prevent problems from occurring with your system—thus averting downtime, and allowing you to maximize your productivity.

Application Compatibility

Whenever an operating system upgrade is announced, application compatibility becomes a pressing concern. Windows XP represents the convergence of the consumer line of Microsoft operating systems (Windows 95, Windows 98, and Windows Millennium) and the business line of Microsoft operating systems (Windows NT, Windows 2000), and as such, the new operating system offers extensive compatibility with third-party applications for both home and business users.

Windows XP is compatible with almost all of the top 1000 applications that ran under Windows 95, Windows 98, and Windows Me, and almost every application that ran under Windows 2000, with the exception of anti-virus programs, system utilities, and backup applications (for which, in most cases, updates will be available from their manufacturers when Windows XP is released).

For applications originally designed for earlier versions of Windows that do not work on Windows XP, users can take advantage of compatibility modes, a new feature included with Windows XP. This works by emulating the environment of most earlier versions of Windows. If an older application does not run as designed under Windows XP, users can easily choose to run it under a specific compatibility mode by using the Program Compatibility Wizard, shown below in Figure 1.

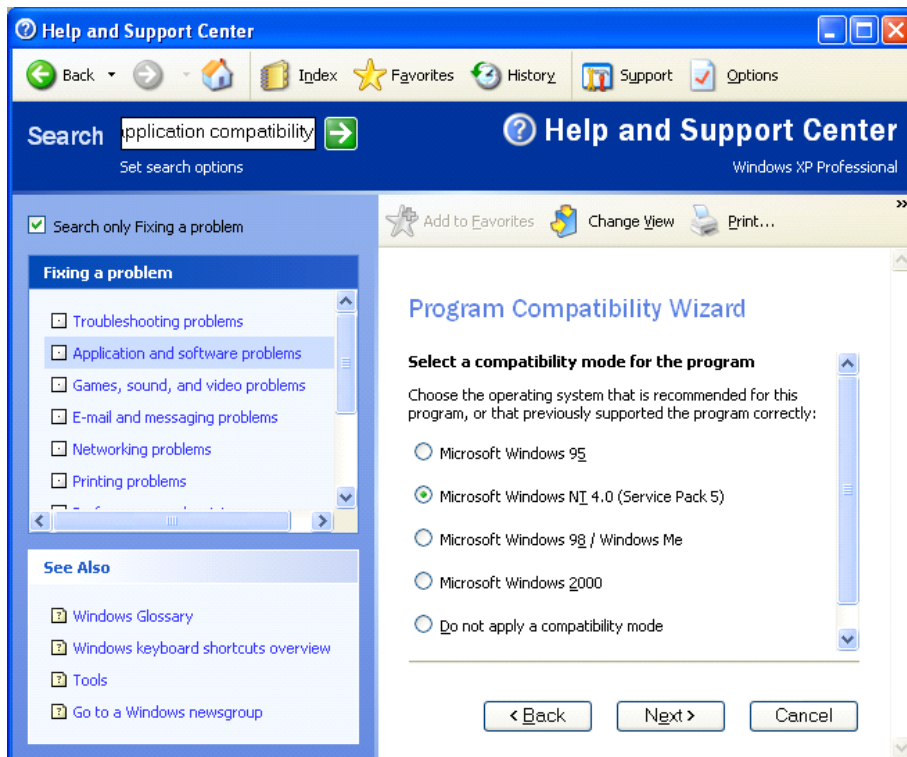


Figure 1. Program Compatibility Wizard.

Application fixes included in Windows XP help resolve application compatibility problems, such as those that occur when applications incorrectly detect the operating system version or when they reference memory after it has been freed. Fixes are invoked automatically by the operating system to make otherwise incompatible applications function; no user intervention is required.

In addition, as new applications appear or new fixes become available, application updates can be downloaded automatically from the Windows Update Web site using the Automatic Update feature (introduced with Windows Me). (For more information on Windows Update, see below.)

Note: For more information about application compatibility technologies in Windows XP, see <http://www.microsoft.com/windowsxp/pro/techinfo/howitworks/appcompat/default.asp>.

Device and Hardware Support

Device and hardware support has been improved in many ways for Windows XP, which brings together the respective advantages of the Windows 2000 and Windows Me product lines for greater system stability and device compatibility. Windows XP includes Plug and Play support for hundreds of devices not covered by Windows 2000, and enhanced support for Universal Serial Bus (USB), the high-speed bus known as IEEE 1394, Peripheral Component Interconnect (PCI), and other buses. Plug and Play itself has been improved for Windows XP, resulting in streamlined usability and performance, particularly in the device installation process. The driver models are largely unchanged from Windows 2000, so most of the devices that worked with Windows 2000 will work with Windows XP without loading a new device driver.

Note: For more information about hardware compatibility improvements in Windows XP, see <http://www.microsoft.com/windowsxp/pro/techinfo/howitworks/hardware/default.asp>.

Shared DLL Support

Because many Windows-based applications perform similar functions with Windows (for example, saving files), they often share operating system components like dynamic link libraries (DLL). Sharing these components can sometimes cause problems if these applications rely on different versions of the components. To offset the negative effects of sharing, Windows XP supports the safe sharing of components, referred to as *side-by-side* (or “SxS”) *component sharing*.

Instead of having a single version of a component that assumes backward compatibility, side-by-side component sharing enables multiple versions of a Component Object Model (COM) or Win32® application programming interface (API) component to run at the same time. With Windows XP, some of the key system components that are more likely to compromise stability are available as side-by-side components.

Windows XP allows Win32 components and applications to use the exact version of Microsoft components with which they are tested without being affected by other application or operating system updates. It does this by relying on XML files that contain metadata about application configuration such as COM classes, interfaces, and type libraries.

Shutdown Event Tracker

Windows XP now includes a utility called Shutdown Event Tracker, which provides a simple and standard mechanism you can use to consistently document the reasons for shutting down or restarting your computer. You can then use this information to analyze the root causes of shutdowns and develop a more complete understanding of your system environment.

To record the reason for a shutdown or restart, you can enter it into the **Shut Down Windows** dialog box. The **Shut Down Windows** dialog box is displayed as part of the shutdown sequence, or when restarting a system after a sudden shutdown. Windows provides a predefined set of reasons from which to choose. You can also stipulate your own reasons for shutting down the system. The information you provide here is recorded in the system log in Event Viewer. By default, Shutdown Event Tracker is disabled for Windows XP.

In addition to tracking reasons for shutdowns, Shutdown Event Tracker also takes a snapshot of the system state before shutdown, identifying system resource limits that are being approached or exceeded just before you initiate a system restart. It captures a number of parameters about each process running on the system, each page file on the system, each disk on the system, and overall system resource usage. You can later review the reasons for shutting down in the system log together with the corresponding system states, and analyze this information. This information is critical to understanding the root cause for system performance degradations and the performance problems that necessitate restarts. This can help improve the way you use your computer—for example, you may discover the advantage of reducing the number of applications running simultaneously—and as a result, improve system uptime.

Note: The Shutdown Event Tracker is not active by default in Windows XP Professional.

Closing Unresponsive Applications

The application window has been improved in Windows XP to allow you to easily close applications that are unresponsive. In previous versions of Windows, there was no easy way to close unresponsive applications: You were required to open Task Manager, select the application, and then click a button to close it. In Windows XP, you can still access the window of the unresponsive application. The top bar of the application window informs you that the current application is not responding, but you can now close the application by clicking the application's **Close** button. Clicking the close button is equivalent to launching Task Manager and ending an unresponsive application.

Device Driver Resiliency Improvements

Installing a new device can sometimes be problematic. Windows XP has two improvements that significantly reduce the problems caused by defective device drivers: Windows Driver Protection and Driver Rollback.

Windows Driver Protection

Windows Driver Protection is a new feature that keeps you from installing and loading defective device drivers—that is, drivers that cause the system to stop functioning indefinitely (“hang”) or shutdown unexpectedly (“blue-screen”). A database of known defective drivers, maintained by Microsoft, is used to determine which device drivers should not be installed or loaded. An updated database is available to users through Windows Update (see *Windows Update*, below).

If you attempt to install a new device with the Add Hardware Wizard, and the driver for that device is defective, a dialog box appears telling you that the driver was not installed because it will cause your system to malfunction. This dialog box also contains a link to a Web page that gives you more information as well as driver updates, if available.

If you use another process to install the driver—whether by using the CreateService API set or by directly writing keys into the registry—and it is later found through the use of the Windows Update Web site to be defective, the driver loading process stops the driver from being loaded. A new icon appears in the notification area indicating that some devices and applications may not work due to defective drivers. When you click on the icon, Help and Support Center displays specific details about any devices, associated drivers, or applications that were disabled. The page in the Help and Support Center presents a list of the drivers that have been blocked since the last time the system was started. For each driver, its name, associated application or device are displayed. It also provides a link to appropriate Help content (local or remote depending on network connectivity) that tells you how to get a newer version of the driver that will work correctly.

Automated, remotely administered (“headless”), or Telnet logins will not receive any notifications that drivers or applications are disabled other than the event log entry. Each event log entry contains a link to the Windows Update Web page to give you more information and possible updates to the driver.

Device Driver Rollback

Driver Rollback helps ensure system stability, much like the Last Known Good Configuration option first available in Windows 2000 Safe Mode. When you update a driver, a copy of the previous driver package is automatically saved in a special subdirectory of the system files (for every driver that you back up, a new value is added to the Backup keys located in the appropriate section of the registry). If the new driver does not work properly, you can restore the previous driver by accessing the **Driver** tab for the device in the Device Manager, and clicking **Roll Back Driver** as in Figure 2 below. Driver Rollback permits only one level of rollback (only one prior driver version can be saved at a time); this feature is available for all device classes, except printers.

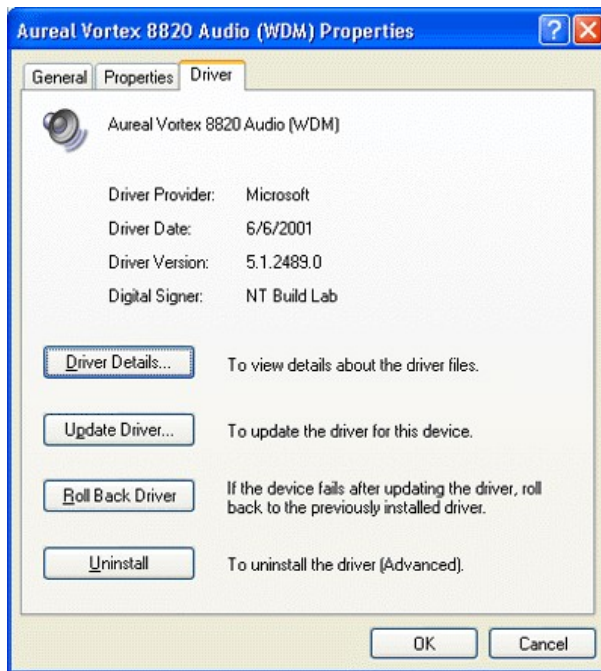


Figure 2. The Driver tab in the Properties dialog box for a device provides several options for managing drivers.

Installation, Update, and Repair Improvements

On occasion, you may need to repair your applications or operating system files, or install updates or service packs. Windows XP includes several improvements that make this process faster and easier, maximizing your productivity.

Windows Installer

Windows Installer in Windows XP improves the performance and reliability of repairs and installations, making it faster and easier for you to keep your systems running efficiently, and to repair them if something goes wrong. The number of files that need to be copied is reduced, resulting in improved performance of reinstallations and repairs, and improved reliability due to the decreased downtime during the installation/repair process.

Auto Update

Auto Update is an option for updating your computer without interrupting your Web experience. You don't have to visit special Web pages, interrupt your Web surfing to allow data to be downloaded, or remember to periodically check for new updates. The size of the download files is kept small in order to minimize the impact on network responsiveness; the download process is automatically resumed if the system is disconnected before an update is fully downloaded. Once the update has been downloaded to the PC you can then choose to install it.

Dynamic Update

Dynamic Update enhances system reliability by providing application and device compatibility updates, driver updates, and emergency fixes for setup or security issues—when you run Setup in the course of upgrading or performing a new installation of the operating system. This is useful if you install Windows XP some time after it has been released. If you choose the Dynamic Update option in Setup, Setup downloads the updates for devices and applications from the Windows Update site instead of the original files from the installation CD.

Further, IT administrators can download a Dynamic Update package, which may include an application compatibility or security fix for the computers on their networks. They can use the Dynamic Update package to ensure that all users who install the operating system get these updated files.

Windows Update

Windows Update is an online extension of Windows XP. The Windows Update Web site provides a central location for product enhancements, such as Service Packs, device drivers, application compatibility updates and system security updates. You can install or update drivers from the Windows Update Web site. When you access Windows Update, Microsoft ActiveX® controls compare the drivers installed on the your system with the latest updates available. If newer drivers are found, Windows Update downloads and installs them automatically if you so choose. Businesses can also override or turn off this function and restrict use of Windows Update to system administrators, who have a section of Windows Update dedicated to searching, collecting, and downloading updates that can then be distributed as necessary.

Windows Update has sites for both consumer and corporate users:

- **Windows Update consumer site**, which is located at <http://windowsupdate.microsoft.com>. It contains an

ActiveX control that automatically detects devices on your system and offers new or updated drivers. Windows Update detects the devices and existing drivers on your computer and offers only matching drivers that are newer than the ones currently on the system.

- **Windows Update Corporate site**, which is located at <http://corporate.windowsupdate.microsoft.com>. It allows IT professionals to search for the drivers that are relevant to their corporation and download an assembled package. These downloaded packages can then be distributed throughout enterprise networks. The Corporate site does not perform automatic device driver detection.

Backup, Recovery, and Restore Improvements

Sometimes application compatibility problems, hardware compatibility errors, or power outages can result in improperly functioning systems. When this happens, you may need to restore the system or back up your system. Several improvements have been made to Windows XP that enable you to recover from problems quickly.

Shadow Copy Integration with Backup

Windows XP introduces to Backup a technology called a *Shadow Copy*, which produces exact, point-in-time copies of files, including all open files. Volume snapshots allow users or applications to continue working without interruption while a backup is made. Thus applications can continue to write data to the volume during a backup, and files that are open are no longer omitted during a backup. Further, new APIs allow applications to register and coordinate with Shadow Copy Backups.

Last Known Good Configuration

In Windows 2000, the Last Known Good Configuration option enabled you to start the operating system using essential registry information that Windows saved the last time it shut down correctly. In Windows XP, it also restores the device drivers of the "last known good" configuration. This enables you to recover from problems caused by newly installed, defective device drivers without reinstalling the original, working device drivers. You can start Windows XP with the Last Known Good Configuration option by using the Advanced Startup Menu Options screen, which appears when you press the F8 function key at the beginning of the startup process.

Automated System Recovery

Windows XP introduces Automated System Recovery (ASR), an advanced option of the Backup tool (NTBackup.exe). ASR provides the ability to save and restore applications, the system state, and critical files on the system and boot partitions. ASR replaces the Emergency Repair Disk used with Windows 2000 and Windows NT 4.0. This feature also provides the Plug and Play mechanism required by ASR to back up Plug and Play portions of the registry and restore that information to the registry. This is useful in a variety of disaster recovery scenarios—for example, if a hard disk fails and loses all configuration parameters and information, ASR can be applied and the backup of the system data is restored.

System Restore Enhancements

System Restore is a feature first introduced with Windows Me that automatically monitors and records key system changes on your computer. When you make system changes that may have caused problems, you can undo the change or even revert to a configuration that existed when the system was performing optimally. System Restore helps you keep your computer running smoothly and may reduce the need for calls to support services or business help desks.

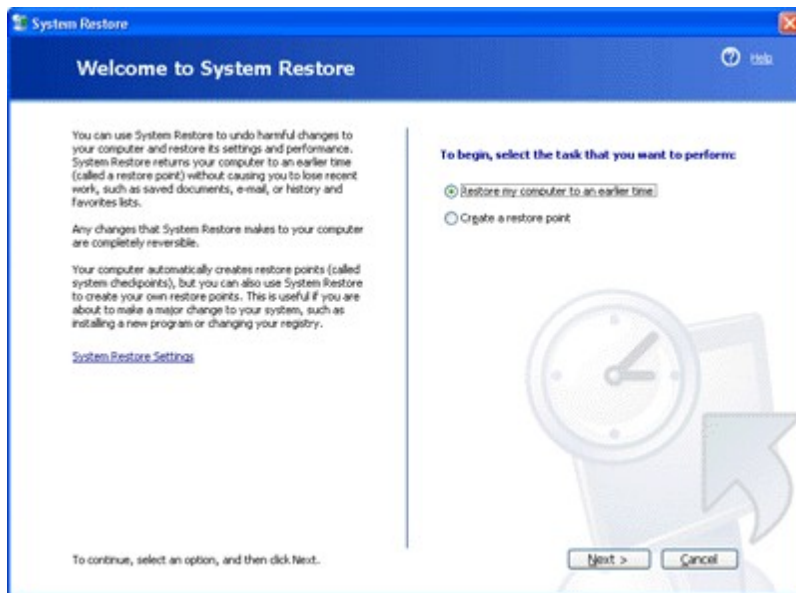


Figure 3. System Restore.

System Restore makes no changes to your personal data files such as documents, drawings, or e-mail. It actively monitors changes to your system and to certain application files, and automatically creates easily identifiable restore points. Windows XP creates these restore points once each day by default, as well as at the time of significant system events such as application or device driver installation. You can also create and name your own restore points at any time. System Restore does not monitor changes to or recover your personal data files.

System Restore in Windows XP offers several key enhancements:

- Improved performance
- Data store per drive
- Configurable size per drive
- Selective drive monitoring (include/exclude drive)
- Data store access to virus checkers
- Greater disk space efficiency
- Smart backup (one copy per restore point)
- Support for NTFS compression
- Group Policy applied to System Restore configuration settings
- Better integration with Disk Clean-up Utility
- Warning message when drive gets full
- System Restore space reclaimable—all but the latest restore point can be removed

For more information about System Restore, see

<http://msdn.microsoft.com/library/default.asp?URL=/library/techart/windowsxpsystemrestore.htm>.

Support Improvements

When you experience system problems and can't resolve them on your own, you may need to rely on Microsoft Product Support Services (PSS) to help. Microsoft has made several improvements in the error reporting and resolution process that help reduce the time and effort required to solve problems.

Error Messaging and Product Support

Windows XP now offers better, more meaningful error messages that allow you to better understand the errors that you encounter and help you take specific, appropriate action to resolve them. The new error messages can help you resolve system problems yourself more often, and in less disruptive ways than restarting the system. They also help Microsoft Product Support Services offer better, more efficient support, by providing the information support engineers need to focus on the specific problem. As a result, both users and PSS support engineers save valuable time in troubleshooting. And with Windows Messenger and Remote Assistance, you can now share control of your system with Microsoft support engineers for online troubleshooting and problem resolution.

Online Crash Analysis

New to Windows XP is the Online Crash Analysis feature. With Online Crash Analysis, if you experience a system failure such as a "blue screen" crash event, or Stop error, the next time you run Windows XP, you can easily use a browser to upload the system log details associated with the shutdown event to the Microsoft Product Support Services Web site. Microsoft will analyze the report and send the results back to you by e-mail within 24 hours. If a resolution to the error is known, you will receive a list of actions and/or files to resolve the problem. In cases where Microsoft cannot provide a solution for your particular Stop error, all information that you submit is used to further improve the quality and reliability of Windows. You can check the status of your reported event at any time at the Microsoft Online Crash Analysis site:

<http://oca.microsoft.com/welcome.asp>.

Summary

Windows 2000 represented an important milestone in operating system reliability and availability, due in large part to its 32-bit computing architecture and fully protected memory model. With Windows XP, Microsoft builds on that foundation by adding features and improvements, such as better application and hardware compatibility, and new features like shared DLL support, system restore, and device driver rollback. The benefits to home users and system administrators alike are clear: Fewer critical problems occur, problem resolution is faster and easier, and personal computing is a more reliable and productive experience.

Related Links

For the latest information on Windows XP, check out our Web site at <http://www.microsoft.com/windowsxp>.