DMI In Action

Accelerating Growth,
Increasing Complexity—
Why We Need Manageable
PCs and Networks

The PC industry is growing at a phenomenal rate, encompassing an ever-larger number of users, more sophisticated technologies and increasing levels of complexity. The emphasis on networking has made the PC environment even more complex. As a result, the gains in the reduced cost of hardware and software have been offset by the increased cost of support. The bulk of this can be attributed directly to the burden of managing PCs and PC networks.

The need for managing information, computing resources and networked systems has never been greater. Network managers are seeing their LANs grow at alarming rates, both in the number of workstations attached to the network and in the types of applications being deployed. At the same time, low-cost gateways and bridges have spurred rapid growth in LAN/WAN connectivity. Since these branch offices rarely have their own administrators, support for them falls back on the host site administrator (Figure 1).

A new breed of network management is needed to deal with this crisis. LAN administrators need hardware and software products that integrate seemlessly and work as manageable, cohesive units. They need systems that can self-configure, self-adjust and communicate with the user.

Integrated Management Needs

Despite different structures and configurations of local networks, the need for PC LAN management remains consistent. These environments need a way to integrate desktop-level information, such as resources and configuration, into the network foundation. Necessary functionality includes centralized management, remote control support, and asset management.

When the PC was designed, no standard was founded for uniformly identifying, installing, or integrating hardware and software into the platform. Consequently, the PC is essentially non-exclusive, open and flexible.

Because the corporate world lacks a common, comprehensive method for managing PCs, and peripherals, LAN administrators have had to bear the burden of managing the network, the desktop systems it links and the assets of those systems. They've also found it extremely difficult to configure and troubleshoot networked PCs, especially remotely. With most management systems available today, even knowing what software and hardware resides on a given system is difficult.

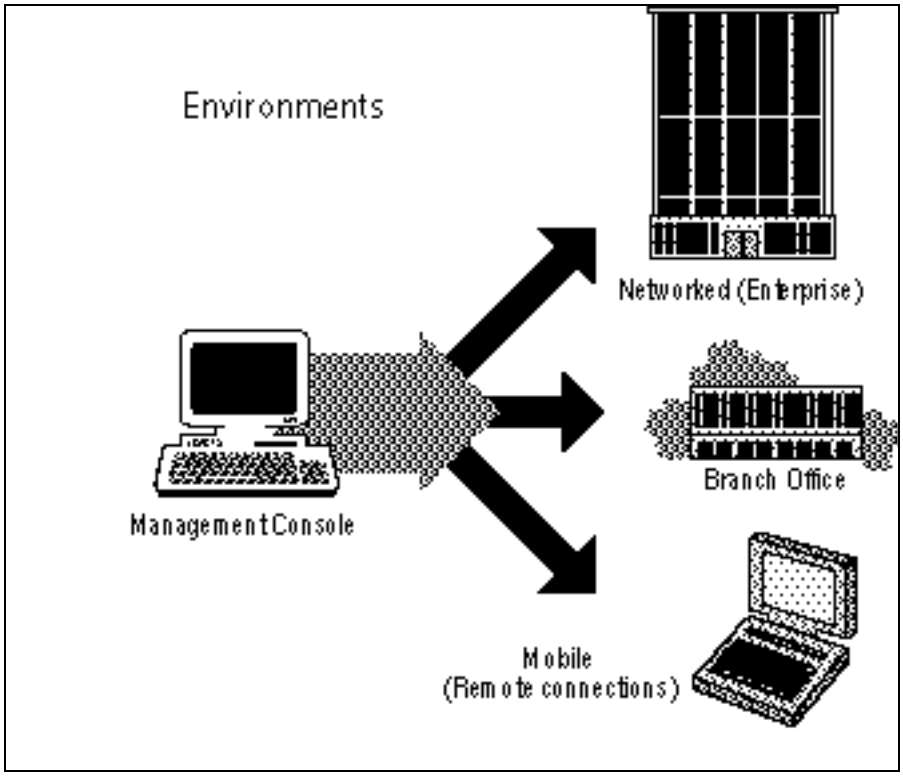

Figure 1. Support for managing computing resources across the enterprise falls on the host-site administrator.

The DMI—The Light at the End of the Tunnel

The Desktop Management Interface (DMI) takes an important step towards bringing PC LAN management out of its current state of havoc. The DMI is an open architecture standard for managing desktop computers, servers, hardware and software products, and peripherals.

The DMI standard was developed by the Desktop Management Task Force (DMTF), a consortium of computing

industry leaders that includes Digital Equipment Corporation, Hewlett-Packard Company, IBM Corp., Intel Corp., Microsoft Corp., Novell Inc., SunConnect and Bay Networks. In addition to those eight charter members, the DMTF also includes more than 300 participating members.

The DMI can be implemented in hardware, software, or a peripheral attached to a desktop computer or network server, enabling that product to become manageable and intelligent. A DMI-enabled component or application can communicate its system resource requirements with a DMI-management application and coexist in a manageable network and PC system.

Because it's an open standard, the DMI also guarantees vendors a common strategy for designing supportability and manageability into all of their products. Vendors can take advantage of the DMI technology as a reliable mechanism for building easy to use, manageable and interoperable products, including: hard disks, word processors, CD-ROM drivers, printers, motherboards, operating systems, graphics cards, sound cards, modems and network adapters.

By making the DMI available for implementation, the DMTF provides the industry with a flexible and comprehensive structure to manage systems and products throughout the intrinsically open PC LAN environment.

Various multi-vendor groups are cooperatively defining standard DMI Management Information Format (MIF) files, which facilitate implementation by describing manageable attributes for certain product types. The status of these groups is as follows:

- Product groups that have completed standard MIF files include
  - PC Systems
  - LAN Adapters
  - Software
- Product groups that have standard MIF files in progress include
  - Large mailroom operations
  - Printers
  - Servers
- Product groups that are expected to develop standard MIF files in the future include
  - Modems and faxmodems
  - Sound cards
  - PCMCIA products
  - SNMP agents
  - UPSs (uninterruptible power supplies)

The DMI also provides network managers real-time information for managing assets across the entire enterprise as well as the ability to become more proactive concerning network reappropriations and the future. With the manageability enabled by the DMI and products that implement it, network managers can plan for growth and change.

The Structure of DMI

The DMI is structured with multiple communication levels, which provide the inherent manageability of all DMI-enabled products. These communication levels include the Service Layer, the Management Interface and the Component Interface (Figure 2).

The Service Layer is a local program that gathers information from DMI-enabled products. It then manipulates that information in a MIF database and transfers the information to independent management applications as requested. The Service Layer handles communication between itself and management applications by means of the Management Interface (MI), and handles communication between itself and manageable products via the Component Interface (CI).

The MI allows a management application to query for lists of manageable products, access specific components and obtain and set specific attributes. Additionally, the MI allows a management application to tell the Service Layer to send information about details from DMI-enabled products.

Simply put, the MI provides for management applications to access, manage and control desktop systems, components and peripherals.

The CI provides the ability for components to be seen and managed by applications that interface with the DMI in a standard way. This saves component vendors from having to make decisions about management applications, protocols and operating systems, and allows them to focus on providing competitive management for their products.

As mentioned earlier, a product's manageable attributes are described in a language called the Management Information Format, or MIF, which has a

defined grammar and syntax. A MIF file is a simple ASCII text file that describes a product's manageable attributes, grouped in ways that make sense. Each product has its own MIF file. The simplest MIF file contains only the Component ID group, but MIFs can become as complex as needed for any given group.

The cornerstone of the DMI is the MIF database, an accumulation of all available MIF files located on the system or network. Each manageable product provides information to the MIF database by means of a MIF file that contains the pertinent management information for that product. Once installed, DMI-enabled products communicate with the Service Layer through the CI. They receive management commands from the Service Layer and return information about their status to the Service Layer.

When a manageable product is initially installed on the system or network, the information in its MIF file is added to the MIF database. That information is then available to the Service Layer, and thus to management applications.

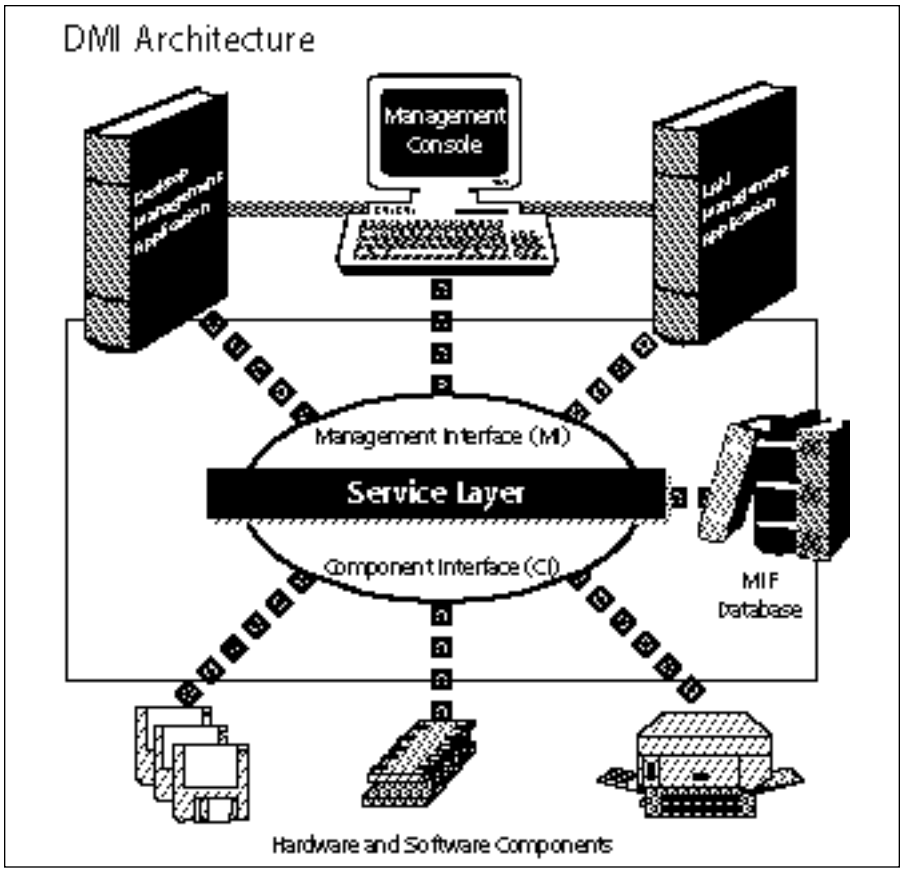

Figure 2. The structure of DMI.

The DMI can be adapted for all protocols, platforms, and peripheral systems, complimenting existing network management standards such as SNMP (Simple Network Management Protocol). The DMI extends network manageability from the backbone (where SNMP primarily focuses) down to the PC. However, the DMI is not a product that a user installs on a computer or a component that a LAN manager adds to the network directly. Instead, it is an enabling technology embedded in products by OEM. It provides a standard framework for unifying systems and network management, bringing systems administration and network administration together as one.

Once a DMI-enabled product is installed, its information becomes available to management applications, such as Intel's LANDesk™ Management Suite. It's DMI Control Panel helps LAN administrators identify and manage activities at PC nodes and peripherals, making it easier for them to integrate all the pieces into a cohesive management strategy.

With a click of a mouse, the LAN administrator can inventory, diagnose, troubleshoot, configure or test any DMI-enabled component on the network, including motherboards, chips, LAN adapters and printers. The DMI provides a standard way for all enabled products on the market—now and in the future—to be integrated, centrally managed and controlled.

LAN Adapters	Accton, Asante, DCA, D-Link, Eagle Technology, IBM, ***Intel***, Proteon, SMC and 3Com.
Modems	Hayes, ***Intel***, Telebit and UDS/Motorola.
Printers	Adobe Systems Inc., Hewlett-Packard Corp., IBM-Pennant Systems, ***Intel***, Lexmark, Microsoft Corp., Okidata, QMS, Tektronix, Texas Instruments, Unisys and Xerox
Servers	AST Research, AT&T, Compaq Computer Corp., Dell Computer Corp., Digital Equipment Corp., Gateway 2000, Hewlett-Packard Company, IBM Corp., ***Intel***, NEC, Novell Inc., TriCord and Tulip Computers.
Software Applications	AST Research, ***Intel***, McAfee Assoc., Microsoft Corp., Novell Inc., WordPerfect.
PC Systems	AST Research, AT&T, Compaq Computer Corp., Dell Computer Corp., Digital Equipment Corp., Gateway 2000, Hewlett-Packard Company, IBM Corp., ***Intel***, Magee, Microsoft Corp., NEC, NetLabs, Novell Inc., Olivetti, Palm Associates, Phoenix Technologies, Reliability Systems Inc., SunSoft, Tally Systems, and Tulip Computers

Table 1. DTMF working committees.

Product	DMI-MIF	Implementation Date	LANDesk Integration	LANDesk Alerts	LANDesk Services
StorageExpress™ Backup Server	Yes	Q1 1995	Yes	Yes	Yes
NetportExpress™ Print Server	Yes	Q1 1995	Yes	Yes	no
NET SatisFAXtion™ Fax Server	Yes	Q1 1995	Yes	Yes	Yes
LANDesk™ Management Suite	Yes	Q1 1995	N/A	Yes	Yes
LANDesk Response	Yes	Q1 1995	Yes	Yes	Yes
LANDesk Virus Protect	Yes	Q1 1995	Yes	Yes	Yes
EtherExpress™ PRO/10 and PRO/100 and TokenExpress™ PRO LAN Adapters	Yes	Present	Yes	no	no
LANDesk Personal Conferencing Manager	Yes	Present	Yes	no	no
ProShare™ Personal Conferencing Software V1.8	Yes	Present	Yes	no	no

Table 2. Intel's DMI implementation.

DMI in the Industry

The DMTF has sponsored a number of working committees that focus on the common goal of making PCs self-configuring and identifiable to a wide range of management applications. Some of the existing working committees and their members are listed in Table 1.
As illustrated in Table 1, Intel Corp. is one of the DMI's strongest supporters. A charter member of the DMTF, Intel believes that simplifying network management is crucial to the growth and development of the networking industry.

Intel's expertise in PC technology enables the company to take an active role in the implementation and continuing enhancement of DMI standards. Intel intends to integrate the DMI with its knowledge of desktop PCs and proven network management schemes to develop comprehensive, node-level solutions.

All of Intel's networking products are scheduled to be DMI-enabled in 1995. In addition, many of Intel's business communication products—including its ProShare™ Personal Conferencing family and its ISDN (integrated services digital network) cards—will offer DMI compliance as well in 1995. Several of Intel's networking and business communication products seemlessly integrate with the LANDesk Management Suite. This includes the ability of common alert management, and set up of appropriate responses such as performing a backup, sending a fax or email, or eradicating a virus (Table 2).

Complementing Existing Standards

The DMI was designed with an open architecture that allows it to coexist with proven industry standards, such as Plug-n-Play and SNMP. The DMI complements and enhances these already existing standards by working cohesively with them.

The Plug-n-Play standard is an important part of automating and simplifying how PCs are used. Plug-n-Play focuses primarily on the physical attributes of a PC's components—specifically, add-in boards and the installation and/or configuration of hardware. The DMI complements Plug-n-Play by drawing Plug-n-Play information into the standard MIF for PC platforms (defined recently by the PC Systems Working Committee).

Because the DMI is independent of operating systems and processor, it enables the development of manageable PC products and applications across platforms. The relationship between the DMI and the SNMP network management standard provides an example of manageability across multiple protocols.

The DMI allows MIF files to be mapped to SNMP MIB (Management Information Base) files, which enables SNMP-based consoles to access the desktop in an organized fashion. In this manner, the DMI MIFs and SNMP work together as an integrated, cohesive solution to deliver information to the network manager.

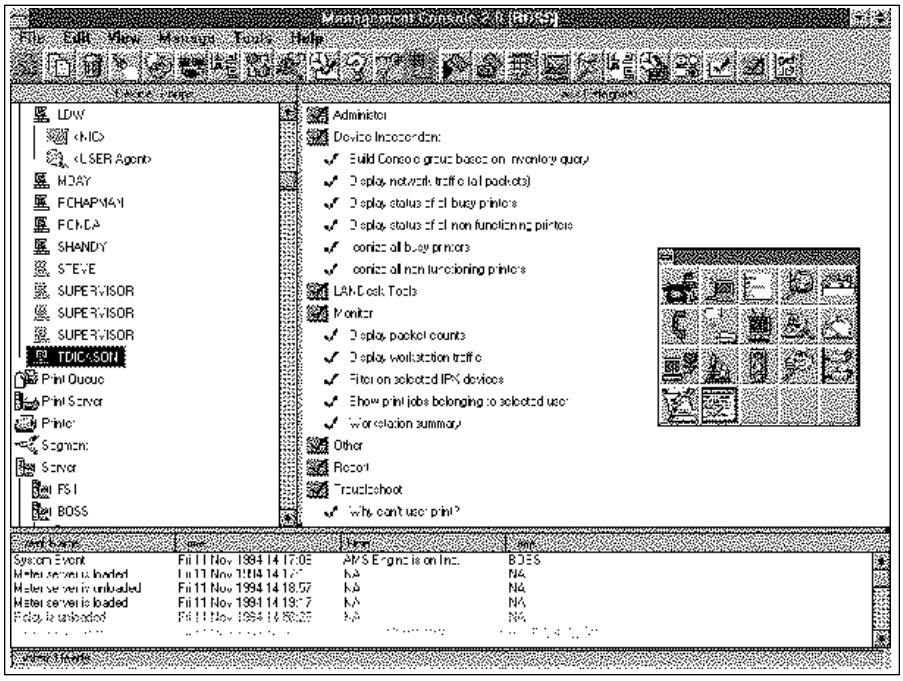

Figure 3. LANDesk Management Suite console.

DMI in Action: Management Applications

The DMI enables manageability by allowing applications that call the DMI to access MIF information. This paves the way for the development of new kinds of powerful management software.

A DMI-enabled application can be in charge of any number of responsibilities. It can be a local diagnostics or installation program, or it can be a simple browser that walks through the MIF database on the local system. It can also be a networked agent supporting a standard protocol (such as SNMP) on a management console, or any other agent that redirects information form the DMI over a network.

DMI-compli ant management applications access the DMI's Service Layer through the MI. Intel's LANDesk Management Suite is an example of a management application that calls the DMI.

The LANDesk Management Suite is the cornerstone product of Intel's network management solutions, which focus on the management of workstations, servers and services on to the network (Figure 3). The tasks involved in this include managing applications, product accounting, securing data, tracking assets, configuring/updating changing environments and controlling end nodes from a single location.

The LANDesk Management Suite delivers DMI compliance in multiple areas. A DMI Control Panel enables the LAN administrator to read all the compo-

nents on the network and on the individual user PCs. It provides the ability to inventory, remotely control and run diagnostics combined with reading DMI MIF files into the inventory database, produces DMI MIF files based upon what would be sent to inventory, and offers substantial reporting capabilities. Further, the LAN administrator can script small applications and custom interfaces that read the DMI files, thereby adding value to a network configuration and tracking system.

For example, a LAN administrator who is installing software for the first time at a users workstation can write a small script that issues management interface calls to query the DMI's MIF database. The query determines whether the user's PC has the minimum system requirements (e.g., Intel486™ DX processor with 8MB RAM) and configuration to load the software. This custom management application then can retrieve the system requirements information and report it in customized formats, such as "You need 8MB addition RAM to install this program."

A second example shows how scripting can make it easier to manage a printer that goes off-line or needs to be manually reset. The LAN administrator can write a small script that will query messages sent by the DMI-enabled printer, interpret the code, and then automatically reset the printer when the need arises. The management application uses the DMI to determine the nature of an end system, including all of its DMI-compliant assets, and the set it up for remote control and management.

DMI in Action: LAN Adapters

One of the first MIFs adopted by the DMTF defined a set of standard attributes for LAN adapters. The adapter component MIF ensures that LAN adapter-derived management is integrated into the overall desktop management solution.

The access rights specified in each attribute value is the minimum access that should be provided by any adapter vendor implementing the DMI. An access right can be changed from Read-Only to Read-Write if necessary, but the contrary is not allowed. Based on this definition, the standard MIF for LAN adapters has specific assets that meet the above criteria. They are:

- Component ID
- System Resources Description
- System Resources
- Network Adapter Port
- 802 Alternate Address Group
- Network Adapter Driver Group
- Network Adapter Hardware Group
- Operational State
- Field Replaceable Unit Group
- Boot ROM
- Boot ROM Capabilities

DMI compliance in network adapters offers a number of benefits. These include adapter performance and monitoring; local monitoring of network-dependent applications; local network configuration; and inventory control and management.

Intel's EtherExpress™ and TokenExpress™ LAN adapters (for Ethernet and token ring environment, respectively) already comply with the DMI standard. Intel will continue to support full DMI compliance each time it delivers a new release of the products.

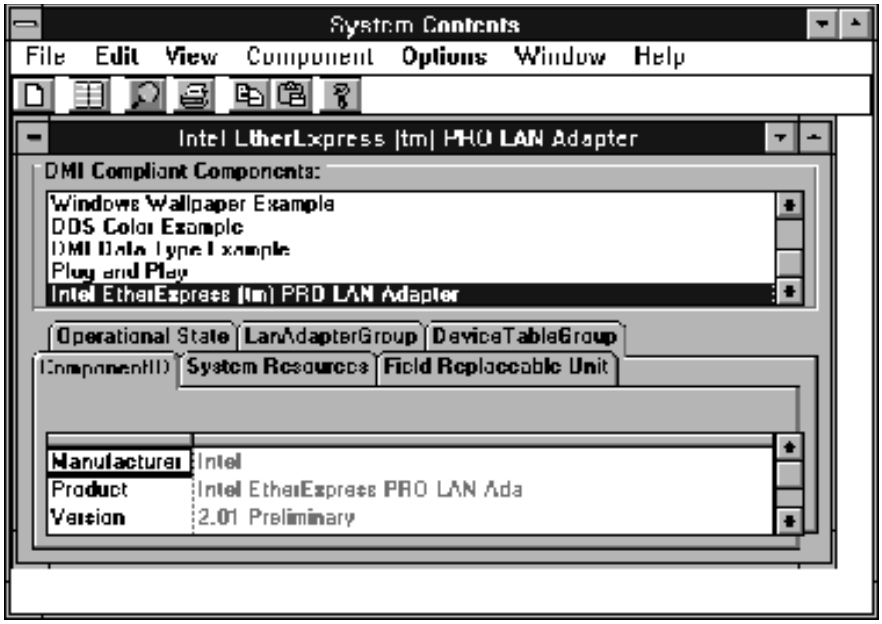

Figure 4. LANDesk Management Suite DMI Control Panel viewing the contents of EtherExpress PRO/10 LAN Adapter MIF.

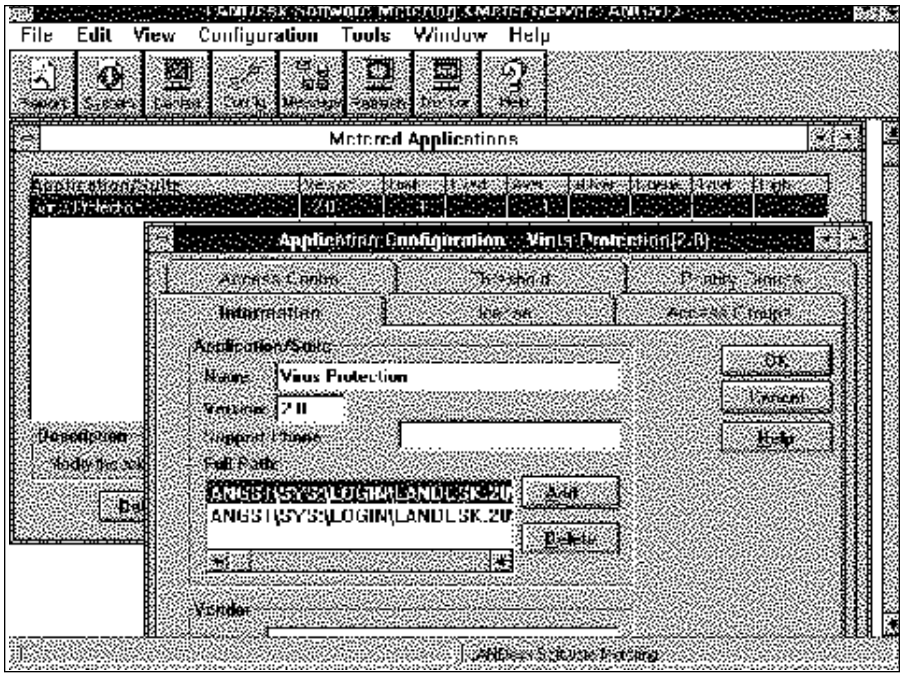

Figure 5. LANDesk Management Suite Applications Metering Tool configuring execution of LANDesk Virus Protect Software 2.0.

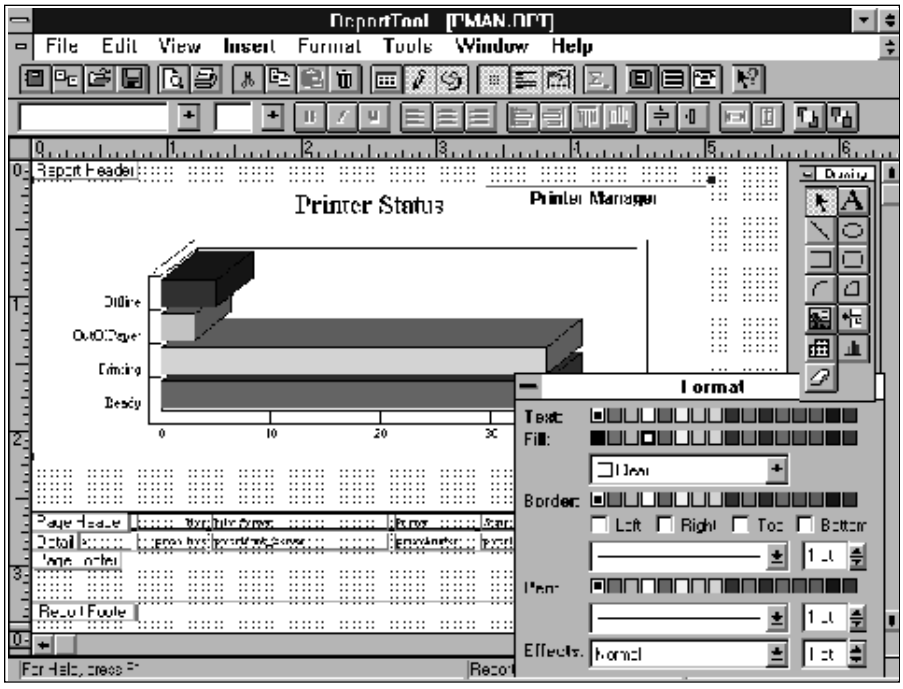

Figure 6. LANDesk Management Suite Reporting Tool graphically illustrating Printer Status.

Specifically, DMI-compliant EtherExpress LAN Adapters include code that informs the LAN administrator of the card's IRQ, (interrupt request lines) and I/O settings, as well as card performance and error information. Figure 4 is an illustration of LANDesk Management Suite's DMI Control Panel viewing a DMI-enabled EtherExpress LAN Adapter.

DMI in Action: A Glimpse at the Future

PC viruses present a serious and common problem in the industry today. In light of this threat, consider the scenario of a DMI-compliant application that could use the DMI to proactively determine whether a virus needed to be eradicated from a workstation.

For example, a DMI-enabled component, such as Intel's LANDesk Virus Protect Software, can initiate an action when an unwanted event occurs, in this case detecting a virus. The component builds this information together and passes it to the Service Layer. The Service Layer passing the information gathered from the component to a specified entry in a registered management application, such as Intel's LANDesk Management Suite. The management application can then log that a virus has occurred, alert the LAN administrator and invoke LANDesk Virus Protect Software to eradicate the virus. Using the DMI to automate the step of manual virus eradication would significantly enhance the software's existing

ability to inform the LAN administrator of a virus (Figure 5).

Implementing and using the DMI could conceivably extend the advantages of centralized management to other network services as well, such as shared printing, data protection and network faxing.

In the arena of network printing, for example, LAN administrators will be able to remotely manage DMI-compliant printers and print servers such as Intel's NetportExpress™ Print Server. The DMI-components then can relay information such as "Off-line," "Paper Out," "Paper Low," "Toner Low," and messages about other print job obstacles, thus eliminating many potentially confusing printing diagnosis (Figure 6).

DMI compliance also has strong potential in the area of network data integrity. A DMI-enabled backup solution, for example, would allow more focus to be placed on client-level backup. In such an implementation, the DMI could be used to determine whether a user's station needed backing up, or to inform the backup server system that such a backup should occur.

DMI compliance will add new levels of automation to the backup model. The concept of event-driven backup can be illustrated using Intel's StorageExpress™ Backup Server as a potential DMI implementation. In such a scenario, if a user attaches a laptop to the network, the DMI sends a message to the StorageExpress System notifying it of the connection. Then, if the StorageExpress System determined that the laptop had not been backed up for several days, it sends a message asking permission to launch a backup. The user would have the option to respond with a yes or a no (Figure 7).

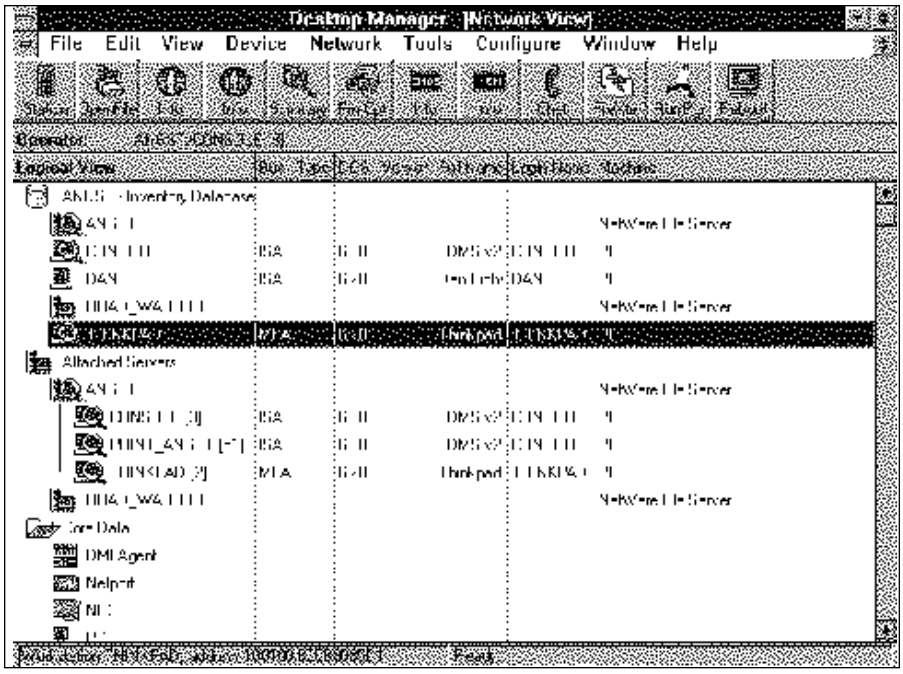

Figure 7. LANDesk Management Suite Desktop Manager Console (Network View) illustrating an attached laptop.

Such a process occurs automatically in the event that the user is away from the system. If the StorageExpress System determines via the DMI that the laptop is idle and that the actual CPU utilization is low, it launches a backup without user intervention.

Intel is committed to pursuing this model of Event-Driven Backup.

The DMI and Intel's Networking Strategy:

Intel's networking strategy is to provide a comprehensive end to end management solution by focusing on PC LAN management that is smart, simple and standard. Mapping its products to the DMI helps Intel achieve this objective.

Intel believes that with full DMI deployment, the entire PC industry—from the enterprise to the desktop—will enjoy unprecedented ease of use and manageability in the next generation of PC systems and products.

Intel is committed to advancing the growth of the industry, both by taking an active part in developing standards and by playing a leadership role in implementation.

Call Intel today to receive detailed information about our DMI-enabled products.

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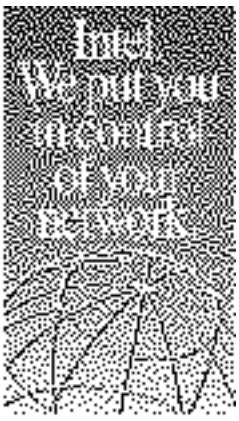

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