

WHITE PAPER

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Compaq Computer Corporation

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Intelligent Manageability for Deskpro PCs

Intelligent Manageability is Compaq's management solution that make desktop and portable PCs easier to manage and less expensive to own. This white paper discusses the full set of Intelligent Manageability features incorporated into the Compaq Deskpro family of commercial desktops, including the latest features added to the Deskpro 4000 and Deskpro 6000.

Beginning with the introduction of the Compaq Deskpro in March 1995, Compaq responded to the customer's need for easy-to-manage desktops through its industry-leading implementation of desktop management, called Intelligent Manageability. As part of this program, hardware and software features were added to the Deskpro and made available over the network through the Compaq Desktop Management Solutions Partners Program. In addition, Compaq took a strong position in the Desktop Management Task Force (DMTF) by joining as a Steering Committee Member and leading the industry with official DMI Compliant certifications for the Deskpro XL, Deskpro, and ProLinea. The result of these Intelligent Manageability activities made the Deskpro easy to inventory, easy to troubleshoot, easy to protect and easy to deploy and maintain.

Now, Compaq has strengthened the Intelligent Manageability solution by incorporating desktop management features across all of its commercial desktop products. Also, new, industry-leading features have been added to the Deskpro 4000 and Deskpro 6000, including a Smart Cover Sensor, IntelliSafe (SMART) SCSI hard drives, Proactive PD-CD Backup, a PD-CD Media Lock, and an Integrated Power Supply Surge Protector. In addition, Support Software Management has been greatly enhanced with the addition of World Wide Web access and key new features called The Locator and Decision Support. All these additions make Compaq the recognized leader in the industry providing desktop products that are easy to manage and less expensive to own.

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Intelligent Manageability for Deskpro PCs

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DESKTOP MANAGEABILITY TRENDS

Desktop computers have undergone momentous changes over the last several years. Performance, memory, storage capacities, and features continue to increase at a breathtaking pace while PC prices continue to plummet. PCs are going center stage as companies increasingly downsize from mainframes to client-server computing. Gartner Group states, "No longer are PCs regarded as islands of productivity in most corporations. Rather, PCs have evolved into ubiquitous appliances representing the cornerstone of not just personal productivity but also enterprise productivity, competitiveness and critical internal as well as external communications."

With this broader role, PCs are increasingly viewed as critical assets. Gartner Group recommends that "PCs should be managed as such throughout their life cycle and should be managed in the context of total cost of ownership. IS organizations must dispel the popular misconception that PCs are commodities, that any box or vendor will do or that price is the only differentiator." For example, with effective desktop management that includes the "right" management-enabled hardware, management tools, and policies and procedures, Forrester estimates savings of over \$1,000 per PC per annum. Based on these estimates, savings could add up to over \$15 million for a network of 5,000 workstations over a three-year period.

However, costs associated with the PC remain subtle, hard to track, and excessive. Forrester predicts that unmanaged desktops will prevent companies from building reliable, effective, new world applications. To help alleviate these desktop cost and management conditions, the key challenges that must be addressed include inventory management, fault management, security management and support software management:

Inventory Management—IDC research shows that "asset management and inventory are critical areas for most IS managers, especially in larger corporations that have made heavy IT investments." IDC estimates that "businesses spent \$54 million on asset management in 1994, a figure that will grow to \$213 million by 1998." Stories abound about otherwise well-managed companies that find that after doing an inventory, they have thousands more systems than they knew about—or thousands less. Even when this number is in control, keeping track of hardware configurations and software versions is difficult.

As companies plan for a 32-bit OS migration in the next twelve months, Gartner Group suggests that "there is a clear opportunity to place inventory management at the forefront of the IS manager's agenda. Without adequate inventory management, the costs associated with a Windows 95-based environment could increase by 15% to 35%."

Fault Management—Forrester estimates that companies spend \$3,830 annually to manage each PC. About 17% of this figure is attributed to disaster management costs such as prevention and recovery. As the desktop PC becomes more important in the business environment, protecting the end-user from data loss and downtime becomes essential. For example, the ability to proactively monitor a PC's health is becoming more important because component failures can be predicted and recovery plans initiated with minimal impact on the end-user.

Security Management—Having downsized from the mainframe/minicomputer environment, IS managers increasingly expect mainframe-like security features from their client-server environment. Unauthorized access to critical data and theft of key components, such as memory and processors, are just two reasons why security management features have become a necessity in the typical distributed computing enterprise.

Support Software Management—For the next twelve months, many customers will be transitioning to new operating systems or operating system revisions. During that time, some customers will replace the OS that arrives on newly purchased desktop with their OS of choice. In this changing environment, it is more important than ever for customers to have easy and smart

access to device drivers, utilities, and agents. To date, however, many report that finding the right drivers or updates is very difficult. And, determining the changes made from version to version is nearly impossible.

DESIGNED FOR DESKTOP MANAGEABILITY—THE COMPAQ DESKPRO WITH INTELLIGENT MANAGEABILITY

Against this backdrop, Compaq introduced the Deskpro with Intelligent Manageability in March 1995. Intelligent Manageability was Compaq's "brand" of desktop management that set the standard for the computer industry by making PCs easy to inventory, easy to troubleshoot, easy to protect, and easy to maintain. Intelligent Manageability makes networked PCs easier to manage and less expensive to own.

Compaq made the Deskpro easier to manage and less expensive to own by:

- ❑ Enhancing the PC's hardware with AssetControl, fault prediction and security features to provide the richest set of management capabilities.
- ❑ Working closely with leading management vendors to provide a tight integration of hardware, operating systems, and management software that ensured the Deskpro delivered the industry's best desktop management solution.
- ❑ Enhancing Compaq Insight Manager to include client management features, thus allowing centralized management of both Compaq servers and desktops.
- ❑ Developing a CD and World Wide Web site to intelligently distribute support software and related information.

Intelligent Manageability was focused on four areas of primary concern to today's businesses:

- ❑ **Inventory Management**—to efficiently inventory PC hardware and software assets.
- ❑ **Fault Management**—to minimize downtime and data loss from hardware failures.
- ❑ **Security Management**—to protect critical data from unauthorized access.
- ❑ **Support Software Maintenance**—to ensure that customers are getting the latest device drivers, utilities, flashable ROM images, and other software from Compaq when needed.

Today, with the introduction of the new Deskpro 2000, Deskpro 4000 and Deskpro 6000 families, Compaq is continuing to set the standard for the industry through new desktop manageability solutions:

- ❑ First, a core set of Intelligent Manageability features is now available across the entire Deskpro product line making the Deskpro easier to manage and less expensive to own. For example, AssetControl features, DMI Compliance, Desktop Management Solutions Partners integration, IntelliSafe (SMART) hard drives, Proactive Backup and a full set of security features are now standard features on all Deskpro computers.
- ❑ In addition, new Intelligent Manageability features have been added to the Deskpro 4000 and Deskpro 6000 models, making these systems easier to troubleshoot and easier to protect. These new features include IntelliSafe (SMART) SCSI hard drives, Proactive PD-CD Backup, Integrated Power Supply Surge Protectors and Smart Cover Sensors.
- ❑ Support Software Management has been enhanced, not only for Deskpro 2000, Deskpro 4000 and Deskpro 6000 products, but also for older Deskpro, Deskpro XL, and ProLinea products. Now, device drivers, utilities, flash ROM images and more for all recent Compaq desktops are available via monthly CDs and the World Wide Web. New, easy-to-use tools also make finding, evaluating, deploying, and maintaining this software easier than ever.

This white paper will discuss the details behind the entire set of Intelligent Manageability features, with particular attention focused on new features. Inventory Management features will be presented first, followed by Fault Management, Security Management, and Support Software Management.

EASY TO INVENTORY WITH INVENTORY MANAGEMENT

All Deskpro 2000, Deskpro 4000, and Deskpro 6000 are easy to inventory because hardware, firmware, Compaq Insight Manager, and Solutions Partner software have been added to the core product that enable a network or PC administrator to track the system, monitor, and hard drive over the network from a central management console. The benefits of this include the ability to track Deskpro assets accurately at a reduced cost. Also, customers can utilize the PC LAN management utility of their choice (for example, Microsoft SMS or Intel LanDesk Management Suite) to extract Deskpro information over the network, thus maximizing the value of existing investments in tools and training while providing the flexibility to change over time. Finally, Deskpro Inventory Management features provide the necessary “who, what, and where” foundation required for effective network troubleshooting. That is, remote problem diagnosis is made more effective because the LAN administrator can determine where a PC is located and how it is configured.

AssetControl

Compaq designed 12 AssetControl features into the Deskpro 2000, Deskpro 4000, and Deskpro 6000 hardware specifically to store information about the system that make it easier to inventory. These AssetControl features include the following:

System Serial Number—When the factory builds the computer and assigns its serial number, the serial number is automatically stored in the Deskpro hardware.

System Manufacturer and Model—At the same time that the serial number is burned into the Deskpro hardware, system manufacturer and model information is also stored.

Asset Tag—The Asset Tag is intended to be used by customers as a repository for storing company-specific property asset numbers for easy tracking and is initially set equal to the system serial number. The Asset Tag is stored in a protected section of non-volatile memory which can be accessed and modified with the F10 Setup program.

System Board Revision Level—The AutoRev feature first implemented in Compaq servers has been added to the Deskpro system boards. This feature allows management software to read the revision level of the system board. When the factory builds a new system board, the revision level is digitally encoded into the hardware and cannot be modified thereafter.

ROM Revision Levels—System ROM revision levels are identified by the date of release. Each time a new ROM revision is flashed onto the system boards, the ROM revision level is updated. The ROM revision date is stored in an industry-standard memory location so that management software applications can poll this location and report the information as required.

Hard Drive Manufacturer, Model, and Serial Number—Hard drive manufacturer, model, and serial number is stored in the hard drive firmware.

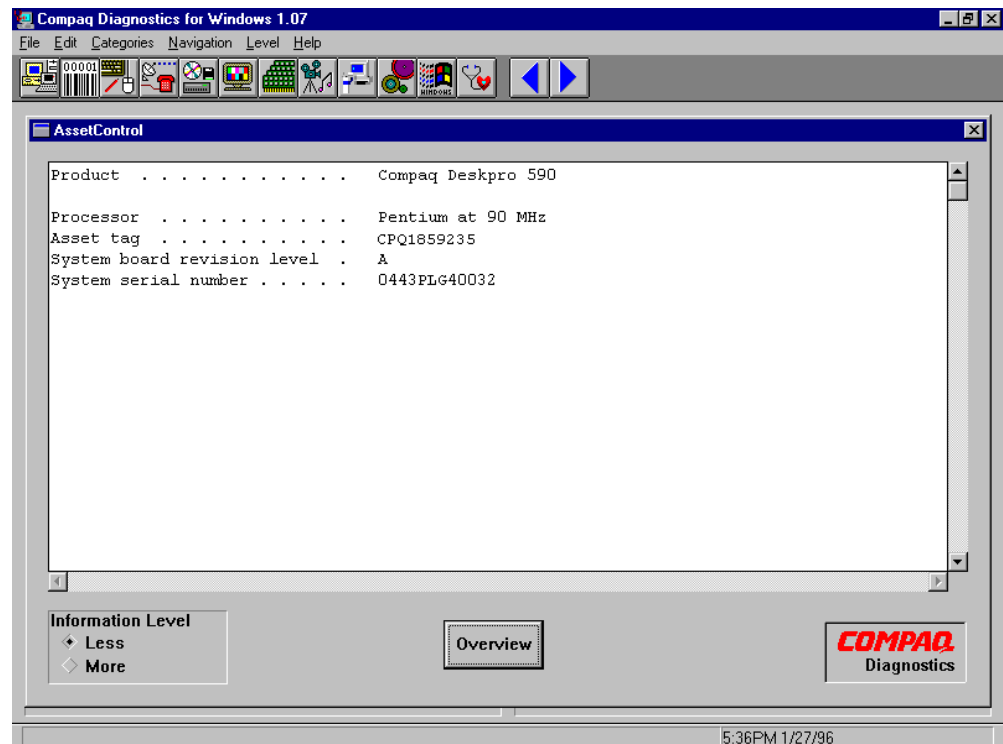
Monitor Manufacturer, Model, and Serial Number—Compaq’s AssetControl Monitors have been designed to conform with VESA’s Display Data Channel (DDC) specification. This data channel provides a way for the monitor to automatically communicate configuration and asset information to the desktop computer. The asset information is contained in an Extended Display ID (EDID) file stored within the monitor. Compaq monitors support both DDC1 and DDC2B communication protocols standards but use DDC2B, the faster protocol, for AssetControl.

Local Asset Management Software Solutions

Under Microsoft Windows 3.1, local access to the AssetControl features is provided through the pre-installed Diagnostics for Windows application located in the Compaq Utilities Group Window. Under Microsoft Windows 95 and Windows NT Workstation, local access is provided through pre-installed Compaq Insight Personal Edition. In both cases, Compaq extended these utilities with screens that present AssetControl information. These screens are the AssetControl screen, the Video screen, and the Storage screen.

The AssetControl Screen

The AssetControl screen provides the user with product information detailing the manufacturer, model, and processor as well as serial number and Asset Tag information for their computer. The Asset Tag is an administrator-controlled identifier that is intended to match the capital asset number used by financial cost accounting in capital asset registers. As initially shipped, the Asset Tag contains the system serial number. Once the customer has assigned an internal Asset Tag number, this field may be changed to match the internal Asset Tag number. The system board revision level provides the user with the revision level of the system board. This is derived from the AutoRev design on the system board. The system serial number corresponds to the unit serial number as well as the serial number on the rear of the computer.



Note: Under Windows 95, this capability is known as Compaq Insight Personal Edition.

The Video and Storage Screens

The Video and Storage screens are similar in format to the AssetControl screen shown previously. In particular, the Video screen displays the monitor manufacturer, model, and serial number as well as the video resolution and graphics controller. The Storage screen displays information about the diskette and hard drives. This screen presents the manufacturer, model, and serial number of all IntelliSafe (SMART) hard drives. Also, information is presented about the hard drive controller and the controller driver. Finally, the "IntelliSafe Status" is shown (discussed in a later section).

Remote Asset Management Software Solutions

In addition to local management of the AssetControl information, two methods are available for managing this information over the network:

- Through Compaq Insight Manager 2.6, or later.
- Through products associated with the Compaq Desktop Management Solutions Partners Program.

Compaq Insight Manager Client Management Features

Using the SNMP protocol found in Windows 95 and Windows NT Workstation, Compaq has achieved world-class client-server management tools by enhancing Compaq Insight Manager. In October 1995, Compaq announced Compaq Insight Manager 2.6 and its support of Intelligent Manageability desktop features. This extension of Compaq Insight Manager provided the LAN administrator with the remote viewing tools necessary to manage PCs on a network. Today, later versions of Insight Manager allow the LAN administrator to remotely view asset data, configuration data, NIC performance data, and contact information. The tool also provides access to the Fault Management features of the Deskpro (discussed later).

Client List Screen

Compaq Insight Manager manages the Deskpro that is associated with particular servers on a network. In the following example screen, the server name is Juliet, and the clients are Bill Cash, Bill Justice, Daniel Garza, etc. Selecting a client from this screen allows the LAN administrator to view individual client information.



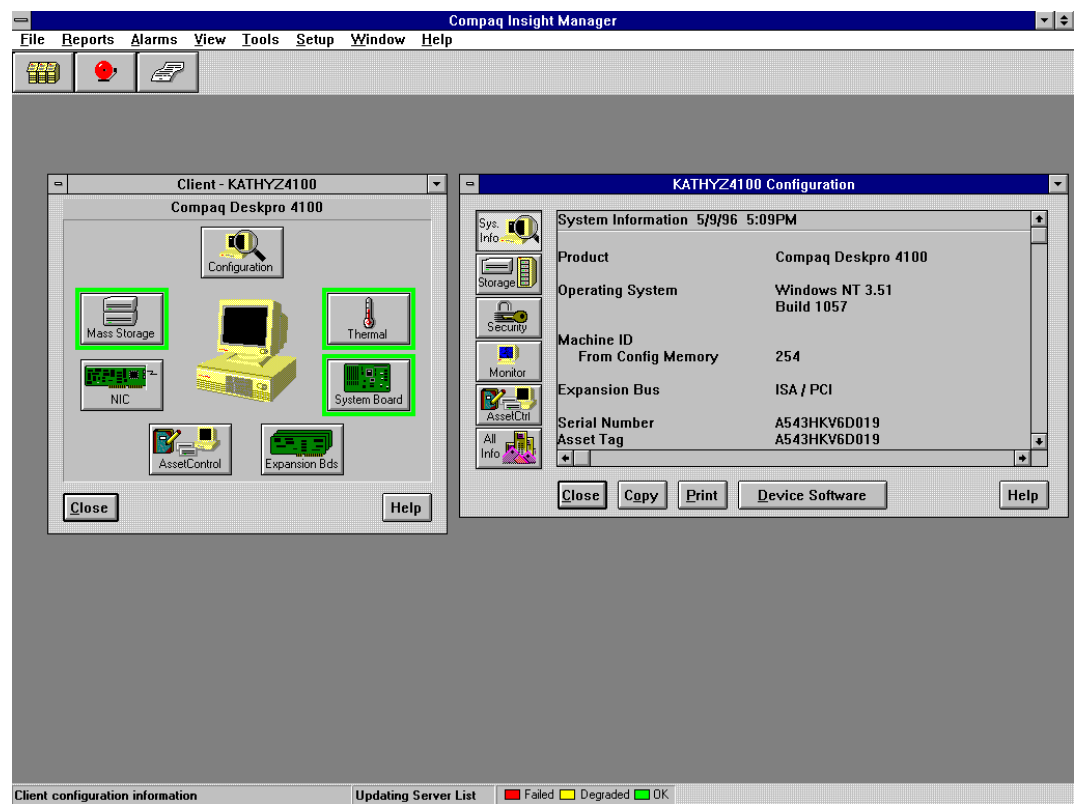
Client Screens

To view information about a Deskpro, the administrator double clicks on the desired client shown in the client list. For example, if the administrator scrolled down the client list shown previously, found the machine called "KATHYZ4100" and double clicked on that machine name, a Window like following on the left would pop up. Depicted here is a graphic of a Deskpro surrounded by several buttons that allow the administrator to extract information from the system. Clicking the

“Configuration” button at the top of the window causes the screen on the right to pop up. This configuration screen presents a scrolling list of AssetControl and other information. Notice in particular, the Deskpro manufacturer, model, and serial number as well as the Asset Tag. Also presented is processor type, operating system, system board ID, type of expansion bus, floppy drive data and hard drive data.

Other buttons on the main screen cause other data to be extracted from the Deskpro and similar windows to pop up:

Thermal Button—This button provides a simple windowed message indicating the thermal state of the remote PC. In addition, thermal device software can be listed detailing thermal device drivers and SNMP agents, their revision levels and release dates.



System Board Button—Clicking on this button will bring up a window containing the full set of information describing the Deskpro system board. Information displayed includes system name, ROM version, bus type, board revision level, processor type, cache memory size, and main memory size.

Expansion Board Button—Selecting the expansion board screen allows the administrator to view and identify the boards in each expansion slot as well as identify which slots are empty. IRQ and DMA maps are also presented.

AssetControl Button—The AssetControl button calls up a screen presenting all the AssetControl data including manufacturer, model, and serial number for the system, monitor and hard drive. Also the ROM revision, Asset Tag and system board revision are shown.

NIC Button—Selecting the NIC button allows the administrator to identify the kind of NIC installed in the Deskpro as well as the hardware and software settings of the NIC. In addition, the administrator may view detailed NIC performance data that can be useful for resolving network issues. The NIC performance data includes the number of packets received and packets transmitted over various time intervals.

Mass Storage Button—The Mass Storage button allows the administrator to view disk controller information as well as hard drive manufacturer, model, serial number, firmware version, drive type, capacity, and other technical parametric data.

The Compaq Desktop Management Solutions Partners Program

Compaq delivers desktop management solutions today under Microsoft Windows 3.1, Windows 95, and Windows NT Workstation through the Compaq Desktop Management Solutions Partners Program. This program is a Compaq initiative to ensure compatibility and integration of Intelligent Manageability features with products from leading PC LAN management vendors. These products provide remote access to the AssetControl features so that LAN and PC administrators can manage Deskpro 2000, Deskpro 4000, and Deskpro 6000 information from a central location. The partnership ensures that the benefits of Intelligent Manageability are accessible through a broad range of vendors so that customers can use their tool of choice to remotely manage their Deskpro PCs more confidently and cost effectively.

In developing this program, Compaq worked extensively with Solutions Partners to support their development and integration efforts. In particular, Compaq provided each partner with specifications and technical guidance regarding how to extract and present AssetControl information. Compaq also provided each of the partners with Compaq hardware and allowed them to test their products in the Compaq Desktop Management Lab. Initially, the Compaq Solutions Partners developed their applications for Windows 3.1. However, most partners have already released or are planning to release full 32-bit Windows 95 applications. Most also provide client support for Windows NT Workstation, and several support OS/2.

Compaq Desktop Management Solutions Partners

- ASI (AssetPRO)
- BindView (NCS)
- Intel (LANDesk Management Suite)
- McAfee Associates (LAN Inventory)
- McAfee Associates (Saber LAN Workstation)
- Microsoft Corporation (Systems Management Server)
- Novell (ManageWise)
- Seagate (Frye LAN Directory)
- Seagate (LANAlert)
- Symantec (Norton Administrator for Networks)
- Tally Systems (NetCensus)

An Example Of Managing AssetControl Information Over The Network

The following screens show one Solutions Partner's implementation for managing AssetControl information over the network. Most Solutions Partner products present AssetControl information in a similar fashion except each has its own user interface look and feel. In this case, McAfee's LAN Inventory software presents the Deskpro AssetControl data interspersed among other standard pieces of information. For example, notice the system manufacturer and model as well as the BIOS revision shown in the upper right-hand corner. Then, a few lines down, below CPU and clock frequency information, the system serial number and the system board revision level are displayed. Also, notice the Asset Tag shown on the left near the middle of the screen.

The Main LAN Inventory Screen

The screenshot shows a software window titled "Site: CM_TEST - Last Updated: 2/22/95". It contains several sections of information:

- Equipment Identifier:** Type: WKST, Location: Net Test Lab, Name: CN=supervisor.O=Compaq, Department: SW Test Dev., Asset Tag: CPQ_WS_3.
- Computer Information:** Bios D: 02/10/95, Brand: Compaq Deskpro 5100, Bus: ISA, CMOS: OK, Clk Freq: 100.00 Mhz, CPU: PENTIUM (Flaw), Mainboard Revision: A, Sys Serial: 0432plg50021, SysBoard Rev: A, System Serial No: 0432pln50021.
- Mass Storage:** FDD #1: A: 1.44 M, HDD #1: IDE Size: 694 M, Hard Disk #1 Free Space: 6.
- Keyboard / Display:** Keybd: 101 Key, Mon #1: Compaq 1024 C, Vid #1: VGA Color.
- Ports:** IRQ #00: Timer handled, IRQ #01: Keyboard hand, IRQ #02: Cascade hand, IRQ #03: COM2/COM4.
- Network Adapter:** Net No.: 00008022, Node Ad.: 00805F84BA2C, IPX/SPX: IPX:3.30 - SPX:3.30, NetWare Shell Version: 4.00 A.
- Memory:** Base: 640 K, Expanded: 0 K, Extended: 15360 K.

At the bottom, there are buttons for "Software Applications", "Misc. Equipment", "System Files", "Notes", "OK", "Cancel", "Add...", and "Print".

Double clicking on "HDD #1" on the left below the Asset Tag will bring up the following screen, which presents some information about the hard drive. Notice the manufacturer, model and serial number shown on the left.

The Hard Drive Screen

The screenshot shows a software window titled "Equipment Component" with the following details:

- Component Information:** Category: PC Hardware, Class: Hard Disk #1, Manufacturer: (blank), Description: IDE Size: 694 MB Type: 65 Partitions: 2 Bios: Cyl:707 Hd:32 Sec:63, Model: QUANTUM LIGHTNING 730.
- Purchasing Information:** Serial No.: 327416631086, Component Tag: (blank), Internal ID: (blank), Price / Date: \$0.00 02/22/95, Cost Center: (blank), Vendor: (blank).
- Maintenance Information:** Maint. Contract: (blank), Contract Type: (blank), Maint. Vendor: (blank), Warranty Length: 0, Warranty Start: 02/22/95, Warranty End: 02/22/95, Period Cost: \$0.00, To-Date Cost: \$0.00.
- Comments:** (blank text area).

At the bottom, there are buttons for "OK", "Cancel", "Additional Application Info...", and "Delete".

Double clicking on “MON #1” near the middle of the Main Screen will bring up the following screen that presents some information about the monitor. Notice, here too, the manufacturer, model and serial number shown on the left.

The Monitor Screen

The screenshot shows a dialog box titled "Equipment Component". It is divided into several sections:

- Component Information:**
 - Category: PC Hardware
 - Class: Monitor #1
 - Manufacturer: (empty field)
 - Description: Compaq 1024 Color
 - Model: (empty field)
- Purchasing Information:**
 - Serial No.: 451BB02CA005
 - Component Tag: (empty field)
 - Internal ID: (empty field)
 - Price / Date: \$0.00, 02/22/95
 - Cost Center: (empty field)
 - Vendor: (empty field)
- Maintenance Information:**
 - Maint. Contract: (empty field)
 - Contract Type: (empty field)
 - Maint. Vendor: (empty field)
 - Warranty Length: 0
 - Warranty Start: 02/22/95
 - Warranty End: 02/22/95
 - Period Cost: \$0.00
 - To-Date Cost: \$0.00
- Comments:** (empty text area)

At the bottom of the dialog box are four buttons: "OK", "Cancel", "Additional Application Info...", and "Delete".

One fact that should be clear from viewing these screens is that our Solutions Partners products are able to extract and present a wealth of information about the Deskpro in addition to AssetControl information. In fact, information such as CPU type, IRQ maps, and memory configurations is available from the Deskpro and all other PCs because this data is stored in standardized, well-known locations in the hardware or firmware. Compaq believes, however, that this unique AssetControl information provides the key information that helps make the Deskpro easier to inventory. That is, tracking Asset Tags, model information and serial numbers allows a PC administrator to know where specific systems and components are located. The ability to track this information accurately and at reduced cost over the network using the PC LAN management tool of choice is the principal advantage. Also, matching AssetControl information with other configuration data allows a service technician to arrive at a PC site with the right replacement parts should hardware problems require attention.

Other Capabilities

In addition to presenting Deskpro 2000, Deskpro 4000, and Deskpro 6000 AssetControl information, the products associated with the Desktop Management Solutions Partners Program provide many other valuable capabilities. For instance, many of these products can remotely inventory the software installed on networked PCs. Also, several applications include remote control, software distribution, software metering and software licensing capabilities. All of these features allow PC and LAN administrators to control and manage networked PCs more effectively.

EASY TO TROUBLESHOOT WITH FAULT MANAGEMENT

Deskpro 2000, Deskpro 4000, and Deskpro 6000 PCs are easy to troubleshoot because hardware, firmware and partnerships have been added to the core products that avoid failures and allow for rapid recovery if problems do occur. The fundamental benefits of this include the ability to protect data and minimize end-user downtime, thus increasing the productivity of both the end-user and the PC administrator. End-users will feel more secure knowing that their systems and data are protected by an “insurance policy” while the PC administrator will enjoy smoother and faster service calls afforded by the proactive fault prediction and prevention capabilities found in Deskpro products. For organizations with limited PC management resources, smoother and faster service calls could be a significant benefit over time.

IntelliSafe (SMART) Hard Drives

More than a year ago, Compaq developed the original IntelliSafe specification defining a technology that allowed hard drives to monitor their own health and to raise flags if imminent failures were predicted. Compaq then worked with IDE hard drive vendors Quantum, Seagate, and Conner to implement the technology on Deskpro PCs.

Today, IntelliSafe IDE hardware and firmware technology has been endorsed by IBM Storage Products Division and Western Digital. Also, it has been adopted as industry standard by the AT Attachment and Small Form Factors committees of ANSI known as “SMART” (Self Monitoring Analysis and Reporting Technology). Finally, Compaq has worked with SCSI hard drive vendors to bring this important technology to SCSI environments. All Deskpro 2000, Deskpro 4000, and Deskpro 6000 PCs include IntelliSafe (SMART) hard drives. SCSI SMART hard drives are included in Deskpro 6000 models.

The IntelliSafe (SMART) hard drive is designed to constantly monitor its activity and to predict failures before they occur. The drive tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count and calibration retry count. If the drive determines that an aspect of its operation has degraded to the point where failure is imminent, then it will pass this information to management software which generates a fault alert. The IntelliSafe hard drive, installed in all Deskpro PCs, is designed to raise a flag up to 72 hours before an actual failure occurs.

By helping users avoid actual hard drive failures, IntelliSafe (SMART) hard drives act as “insurance” against unplanned user downtime and potential data loss from hard drive failure.

Thermal Sensor

In addition to the IntelliSafe hard drives, all Deskpro 4000 and Deskpro 6000 PCs have a thermal sensor that monitors the temperature within the chassis. The Deskpro can experience three operational states related to temperature conditions: normal operation under normal temperature ranges, alerted operation when abnormally high temperatures are detected, and shutdown because of excessive temperatures. While the last state will automatically shut down the PC without warning before hardware component damage occurs, the second state will display a pop-up screen so that appropriate action can be taken to avoid the last state or provide for a smoother system shutdown.

Integrated Power Supply Surge Protector

Integrated within the power supply of every new Deskpro 4000 and Deskpro 6000 is a surge protector that provides an additional level of reliability when hit with an unpredictable power surge. The power supply is rated and certified to withstand a power surge of up to 2000 volts without incurring any system downtime or data loss.

Software Infrastructure

Three basic software elements take hardware alerts from the IntelliSafe (SMART) hard drive and thermal sensor and translate them into information for the end-user and the PC administrator: Instrumented Device Drivers, Insight Management Agents, and Management Applications.

Instrumented Device Drivers—The instrumented device driver is an extension of the traditional device driver. In addition to providing the normal device driver functionality, the instrumented device driver also maintains management information (inventory/configuration and fault) about the device's operation.

Insight Management Agent—The Insight Management Agent takes the management information from hardware, ROM, and instrumented device drivers and delivers it to the management application using local Windows messages and the SNMP management protocol.

Management Application—The management application is the user interface and viewing tool like Compaq Insight Manager. It provides the monitoring, analysis, and control of the management features in the computer.

Interaction between Hardware and Software Infrastructure

EXAMPLE: Hard Drive Fault Prediction

Hard drives are mechanical devices—they have components that move and spin. An IntelliSafe (SMART) hard drive contains firmware that performs periodic analysis to determine how well the drive is operating at any given time. For instance, key hard drive information such as irregular seek and spin-up times are monitored. If the analysis determines that an aspect of the drive's operation has degraded to the point that there is an impending failure, then the drive will pass this information to its instrumented device driver. The instrumented device driver passes the failure indication and other management information (either acquired from the drive or maintained by the driver) to the management agent. The agent then sends a Windows message to the local video monitor alerting the end-user about the impending failure. The agent also stores the management information in a database-like structure called a MIB (Management Information Base) and uses the MIB data to send an SNMP message over the network. SNMP-based management applications like Compaq Insight Manager, HP OpenView, and IBM NetView then receive the SNMP message and alert the administrator by way of a pop-up window, audio tone, and error log entry that the user's hard drive is likely to fail.

Local Fault Management Software Solutions

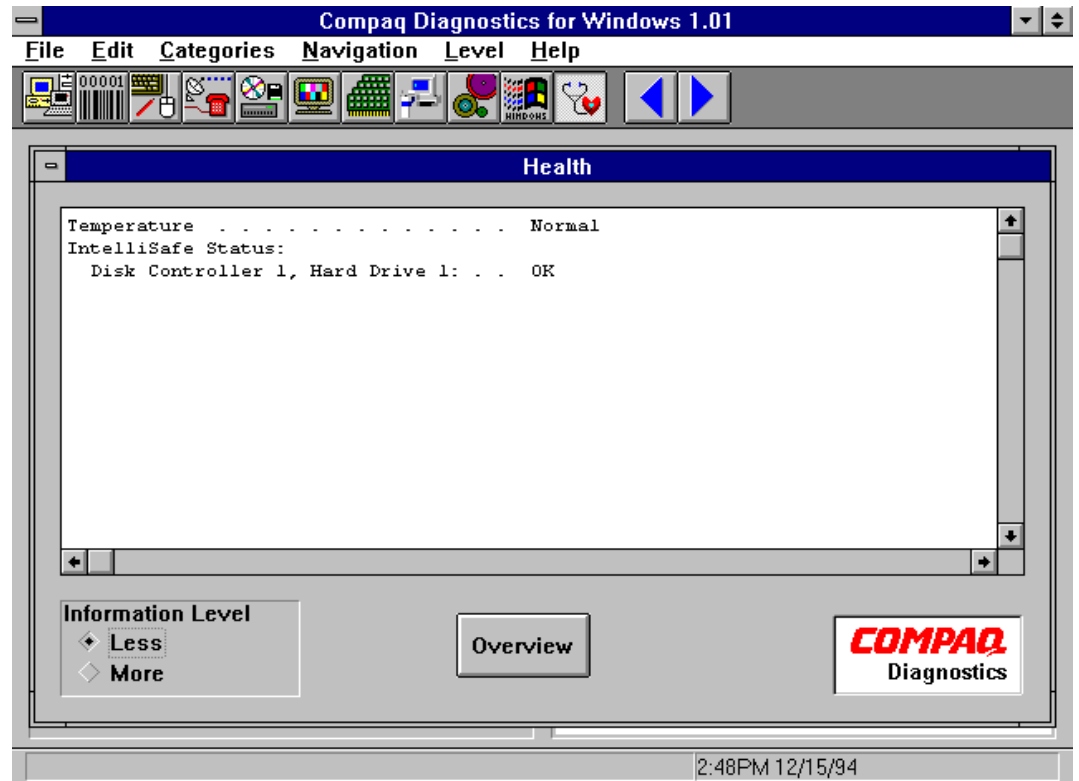
End-users are alerted to imminent hard drive and excessive temperature conditions in three ways: during boot-up, through Diagnostics for Windows or Compaq Insight Personal Edition and through a local Windows pop-up screen. Once an alert has occurred, Compaq also provides a local proactive backup solution that prevents data loss for the end-user and a Pre-Failure Warranty that replaces the hard drive.

Boot-Up

Each time a Deskpro is booted, the IntelliSafe hard drive and thermal sensor are polled through the management agents and instrumented device drivers. If either report a problem, then the end-user is issued a warning.

Compaq Insight Personal Edition and Diagnostics for Windows

In Windows 3.1 environments, the end-user or visiting PC technician can check the health of the IntelliSafe hard drive and thermal sensor through Diagnostics For Windows, while in Windows 95 and Windows NT Workstation, the end-user or visiting PC technician can use Compaq Insight Personal Edition. Each time either application is started, the hard drive and thermal sensor are polled and their status reported through the Health Screen shown as follows.

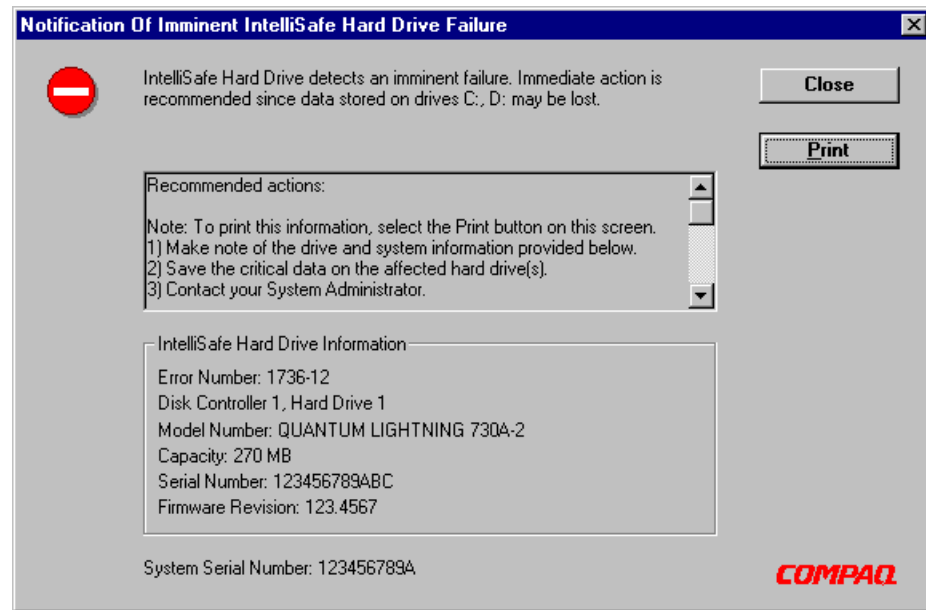


Local Pop-Up

Under Windows 95 and Windows NT Workstation, alert pop-up screens are added to Compaq Insight Personal Edition that alert the user to impending hard drive failures or thermal management problems. These alert screens provide an early warning of impending fault problems and allow the user to take the appropriate steps to avoid catastrophic loss of important data. In the case of a hard drive alert, the user can close all applications and manually backup data to the network or locally to tape before the hard drive fails. The hard drive can then be replaced and data restored without loss. In the case of a thermal fault alert, the user is warned to close all applications because temperatures are exceeding operating thresholds. After this warning, if the temperature in the unit continues to rise (and reaches a pre-determined threshold), the unit will shut itself down automatically.

An example of the IntelliSafe (SMART) alert pop-up screen is shown in the following. The thermal alert screen looks very similar. In either case, the recommended actions boxes within the pop-ups may be customized to include corporate guidelines or other instructions pertinent to resolving the fault.

Local IntelliSafe Alert Pop-Up



Local Proactive Backup

Proactive Backup functionality initiates an automatic backup of the Deskpro IntelliSafe (SMART) hard drive (both SCSI and IDE) when an imminent failure is predicted. As part of the Desktop Management Solutions Partners Program, Cheyenne developed its Backup (formerly ArcSolo) software to monitor the Deskpro for IntelliSafe alert Windows messages and to automatically backup the hard drive data to a local tape device when they are detected. Similarly, Arcada developed its Backup Exec software to perform this same capability. Local Proactive Backup solutions further prevent data loss and end-user down time due to a failing hard drive. These solutions are available for both Windows 95 and Windows NT Workstation environments.

Local Proactive PD-CD Backup

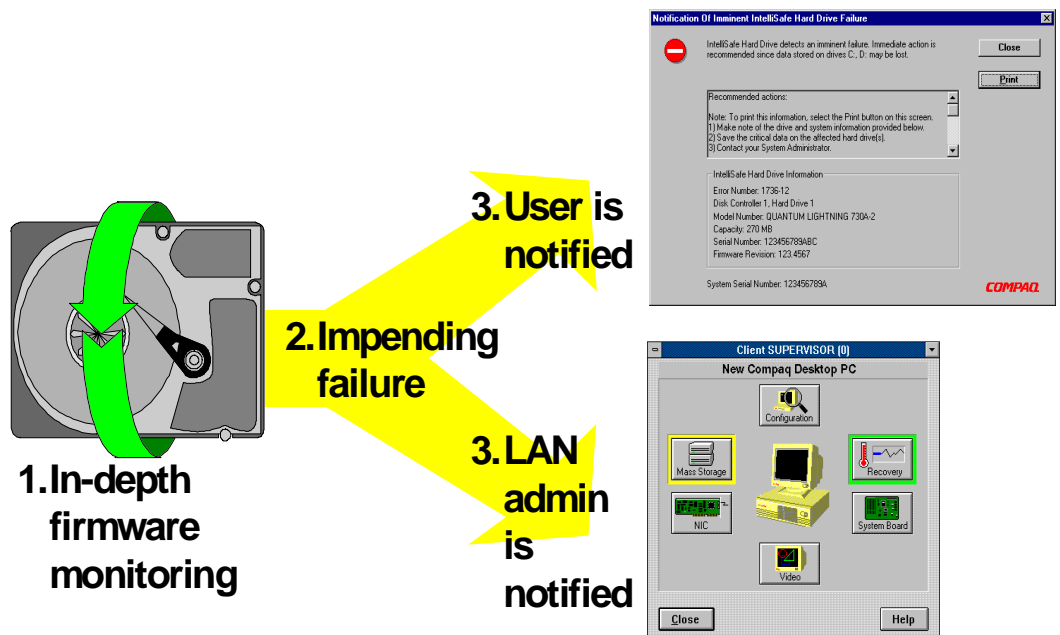
New Deskpro 6000 PCs with a PD-CD Drive are able to automatically back up a failing IDE or SCSI IntelliSafe (SMART) hard drive to a local PD-CD device. Compaq again worked closely with Arcada to enable this functionality. Customers buying a PD-CD Drive as an option for other Deskpro PCs will be able to configure Proactive Backup capabilities as long as the Deskpro is running the Insight Management Agent and either Microsoft Windows 95 or Windows NT Workstation.

Remote Fault Management Software Solutions

SMART hard drive and thermal sensor faults can be managed over the network using Compaq Insight Manager or other SNMP-based management application. Also, SMART hard drive alert messages can trigger remote Proactive Backups of failing hard drives to prevent data loss and minimize downtime.

Compaq Insight Manager

Compaq Insight Manager remotely notifies the PC administrator when an end-user's IntelliSafe hard drive is about to fail or when an excessive thermal condition is detected. As indicated previously, the management agent running on the Deskpro detects when an IntelliSafe hard drive is about to fail and sends an SNMP message over the network where it is received by Compaq Insight Manager. Compaq Insight Manager notifies the network administrator by beeping, by displaying a pop-up window message, by adding a visual alert by the client name on the client master list (for example, the green dot turns red), and by adding the client name to an alert log.



These alert mechanisms enable the administrator to act on the problem before it becomes critical. Downtime can be minimized by proactively backing up the data and replacing the user's drive. And perhaps best of all, Compaq will replace the IntelliSafe hard drive at no charge under its three-year Pre-Failure Warranty. The drive doesn't even need to actually fail to be covered by the warranty.

Remote Proactive Backup

Similar to the Local Proactive Backup capabilities described previously, Remote Proactive Backup capabilities initiate an automatic backup of the Deskpro IntelliSafe (SMART) hard drive (both SCSI and IDE) when an imminent failure is predicted. As part of the Desktop Management Solutions Partners Program, Seagate (Arcada) developed its Backup Exec software to monitor the network for SNMP-based IntelliSafe alerts and to automatically backup the hard drive data over the network to a network-based tape or PD-CD device when these alerts are detected. Remote Proactive Tape or PD-CD Backup capabilities are available for Microsoft Windows 95 and Windows NT Workstation environments.

EASY TO PROTECT WITH SECURITY MANAGEMENT

The proliferation of PC LANs and WANs has given more people greater access to critical business information. This access has provided tremendous benefits to companies making end-users more productive and efficient, but at the same time, this access has created new and serious security issues. Today, businesses are vulnerable to costly security violations from disgruntled employees, industrial espionage, and hackers via modem. DataPro's 1993 Computer Security Issues survey indicates that unauthorized access is the number-one concern of security professionals, with security breaches costing \$100,000 or more per incident. A *PC Week* article dated August 1, 1994 stated that "losses due to computer fraud, hacking, sabotage, and other security breaches are estimated at \$5 billion a year in the United States."

Standard Security Features

Compaq has actively addressed these customer concerns by including 12 security features on Deskpro 2000, Deskpro 4000, and Deskpro 6000 systems. These security features, ranging from physical protection to Diskette Boot Control, allow companies to tailor their level of security to meet the requirements of the end-user's environment.

- Physical security provisions such as the cable lock provision helps prevent access to expensive internal components such as processor and memory, and it helps prevent theft of the actual PC unit.
- Features such as the power-on password helps prevent unauthorized access to the PC and thus unauthorized access to information stored on the PC or the network.
- Drive security features control access to the information stored on the PC and can prevent unauthorized transfer of data to a floppy or PD-CD drive. Drive security also helps prevent software piracy.
- The ability to disable serial or parallel ports can prevent unauthorized transfer of material over devices such as modems or file transfer devices.

Smart Cover Sensor

In addition to the previously highlighted features designed to address customers growing concern about asset security, the new Deskpro 4000 and Deskpro 6000 have incorporated the Smart Cover Sensor. The Smart Cover Sensor is actually a hardware- and software-based hood removal sensor which, when configured by the PC administrator, alerts the end-user and network administrator that the PC hood has been removed. The intent of this feature is to assist the end-user and network administrator with asset security and control.

For example, consider an end-user who decided to add a joystick controller to the Deskpro or transfer some memory to another machine without proper authorization. When the machine is booted following such activities, the administrator will receive a message through Compaq Insight Manager (like the SMART drive and thermal popups) that something has been changed on that system. A variety of actions can be taken at this time, but the point is that the administrator will no longer be oblivious when the end-user alters Deskpro 4000 or Deskpro 6000 hardware configurations.

The Smart Cover Sensor is an electronic switch residing inside the PC which can be set to any one of three modes depending on the amount of control desired.

- **DISABLED.** Used when the network administrator does not want to be made aware of Deskpro hood removal.
- **NOTIFY USER.** Deskpro set to notify network administrator the hood has been removed, but no administrator action required before re-booting the PC.
- **SETUP PASSWORD.** Deskpro set to notify network administrator the hood has been removed and administrator password is required before re-booting the PC.

Smart Cover Sensor solutions are available for Windows 95 and Windows NT Workstation environments.

EASY TO MAINTAIN WITH SUPPORT SOFTWARE MANAGEMENT

Managing PC support software such as device drivers, utilities, and flashable ROM images has always been a difficult and labor-intensive art. Over the next 12 to 18 months, this task will get even more complex as customers transition to Windows 95, Windows NT Workstation, or new revisions of either one. The task of locating, evaluating, and deploying the latest versions of support software for these operating systems will become even more important. Also, this task will continue to be important for those customers who replace the pre-installed OS with a preferred OS or version because deployment of the right device drivers and other support software ensures that all Deskpro features and components run efficiently. Finally, the task will be important for customers interested in increasing system performance, compatibility, or reliability because they must determine if support software has been updated and why.

To address these problems, Compaq created Support Software Management. Now the latest support software and information is available on both CD-ROM and through the Compaq World Wide Web site (www.compaq.com).

Included on the Support Software CD for Compaq Desktop Products and on the Compaq WWW site is *The Locator*—device drivers, utilities, and flashable ROM images categorized by operating system, desktop family, and model for easy retrieval. Support software is provided for all Deskpro XL, Deskpro, and ProLinea products manufactured in the past three years. And Support Software is provided for these operating systems: Windows 3.1 and MS-DOS, Windows 95, Windows NT Workstation, and IBM OS/2.

Also available on the CD and WWW site is *Decision Support* providing detailed information about each piece of support software. The information includes descriptions, features, enhancements, dependencies, and update criticalities. This helps the administrator determine which drivers or utilities are needed.

While the World Wide Web provides immediate, on-line access to the latest support software, CD-ROMs provide convenient, proactive access. Customers receiving CDs in the mail, for instance, are proactively notified of revisions while WWW users must remember to periodically check for updates. Either way, customers will locate and retrieve the latest support software and information via a WWW browser because both the CD and WWW site contain HTML pages with The Locator and Decision Support.

To facilitate viewing of the HTML-based Locator and Decision Support, each CD will contain a copy of the Microsoft Internet Explorer. However, the HTML pages on the CD can be viewed by any browser.

Customers can purchase the Support Software CD for Compaq Desktop Products individually or as an annual subscription.

SUMMARY—THE COMPAQ DESKPRO WITH INTELLIGENT MANAGEABILITY

With Intelligent Manageability, Compaq has revolutionized the way IS managers and network administrators manage and support desktops on a network. It raises control to an unprecedented level while lowering the overall cost of PC ownership.

- Asset Management—Efficiently inventory PC hardware and software assets.
- Fault Management—Minimize downtime and data loss from hardware failures.
- Security Management—Protect desktops and critical data from unauthorized access.
- Support Software Management—Better manage software drivers, utilities, and Flash ROM images.

Compaq's commitment to open standards includes official DMI compliance and joint development with the widest range of industry partners, making Intelligent Manageability easy to integrate into any network.

Easy to inventory. Easy to troubleshoot. Easy to protect. Easy to maintain. Safe investment. The Compaq Deskpro. After all, it's a computer that constantly checks its own pulse.

For more information on Compaq's full line of Compaq desktop PCs, contact your authorized Compaq Reseller, call us at 1-800-345-1518, or reach us on the Web at www.compaq.com. In Canada, you can reach us at 1-800-567-1616.

QUESTIONS AND ANSWERS

Q1. What is Intelligent Manageability?

A1. Intelligent Manageability is Compaq's revolutionary desktop management solution that sets the standard for the computer industry by making PCs easy to inventory, easy to troubleshoot, easy to protect, and easy to deploy and maintain. In addition, Intelligent Manageability makes networked PCs easier to manage and less expensive to own.

Intelligent Manageability is focused on four areas of primary concern to today's businesses:

- Inventory Management**—to efficiently inventory PC hardware and software assets
- Fault Management**—to minimize downtime and data loss from hardware failures
- Security Management**—to protect critical data from unauthorized access
- Support Software Maintenance**—to ensure that customers are getting the latest device drivers, utilities, flashable ROM images, and other software from Compaq as needed

Q2. How is Intelligent Manageability implemented?

A2. Compaq made the Deskpro easier to manage and less expensive to own by:

- Enhancing the PC's hardware with AssetControl, fault prediction and security features to provide the richest set of management capabilities.
- Working closely with leading management vendors to provide a tight integration of hardware, operating systems, and management software that ensured the Deskpro delivered the industry's best desktop management solution.
- Enhancing Compaq Insight Manager to include client management features, thus allowing centralized management of both Compaq servers and desktops.
- Developing a CD and WWW site to intelligently distribute support software and related information.

Q3. What specific features are available on the Deskpro 2000?

A3. A core set of Intelligent Manageability features is now available across the entire Deskpro product line, including the Deskpro 2000, making all Deskpro models easier to manage and less expensive to own. For example, AssetControl features, DMI Compliance, Desktop Management Solutions Partners compatibility, IntelliSafe (SMART) hard drives, Proactive Backup and a full set of security features are now standard features on all Deskpro 2000, Deskpro 4000, and Deskpro 6000 computers.

Q4. Are additional features available on the Deskpro 4000 and Deskpro 6000?

A4. Yes. New Intelligent Manageability features have been added to the Deskpro 4000 and Deskpro 6000 PCs, making these systems easier to troubleshoot and easier to protect. These new features include IntelliSafe (SMART) SCSI hard drives, Proactive PD-CD Backup, Integrated Power Supply Surge Protectors and Smart Cover Sensors.

Q5. What else is new?

A5. Support Software Management has also been enhanced, not only for Deskpro 2000, Deskpro 4000, and Deskpro 6000 products, but also for older Deskpro, Deskpro XL, and ProLinea products. Now, device drivers, utilities, flash ROM images and more for all recent Compaq desktops are available via monthly CDs and the World Wide Web. New, easy-to-use tools also make finding, evaluating, deploying, and maintaining this software easier than ever.

Q6. Which Intelligent Manageability features come ready to run?

A6. Out of the box, the Deskpro comes configured with many value-added features that make it easier to manage and less expensive to own. For instance, Compaq Insight Personal Edition or Diagnostics For Windows provides the end-user or PC technician with access to the AssetControl Inventory Management information. Also, the Insight Management Agents provide popups when hard drive or thermal problems are detected and the Power Supply Surge Protector automatically protects Deskpro 4000 and Deskpro 6000 models from power spikes. All Deskpro products are DMI compliant out of the box, and all Deskpro products include core Security Management features such as Diskette Boot Control, a Setup Password, and a Flash ROM Lock. Support Software Management can be accessed directly via the Compaq World Wide Web site or a Support Software CD subscription can be purchased separately. Finally, Proactive Backup capabilities are available with a little configuration work. "Out-of-the-box" management capabilities like these are crucial for end-users who have to work directly with the support staff or call the help desk to report problems, or when the PC is not connected to the network.

Q7. What is the Compaq Desktop Management Solutions Partners Program?

A7. Compaq's reputation is built upon compatibility and quality. The Compaq Desktop Management Solutions Partners Program moves those two elements of our success into the management domain. The program is a Compaq initiative to ensure compatibility and integration of Intelligent Manageability with the leading PC LAN management vendors. Now, the benefits of Compaq's Intelligent Manageability are accessible to our entire customer base. The broad vendor support ensures that our customers can easily manage Compaq PCs using their choice of tools, and they can do so more confidently and cost effectively than with other PCs.

Q8. Which vendors are participating in the Compaq Desktop Management Solutions Partners Program?

A8. Currently, the participating vendors are ASI, BindView, Cheyenne, Intel, McAfee Associates, Microsoft, Novell, Seagate, Symantec, and Tally Systems. This includes industry consolidations in 1995 such as Frye's acquisition by Seagate and Saber's acquisition by McAfee. These partners account for over 95% of the LAN management software market. In 1996, Compaq plans to continue to work closely with existing partners while expanding partners where appropriate.

Q9. When will these vendors' products support Intelligent Manageability?

A9. The following vendors are currently shipping Windows 3.1 and Windows 95 products that support Intelligent Manageability:

ASI AssetPRO, BindView (NCS), Seagate (Arcada) Backup Exec, Cheyenne Backup for Windows 95, Intel LANDesk Management Suite, McAfee Associates LAN Inventory, McAfee (Saber) LAN Workstation, Microsoft Systems Management Server (SMS), Novell ManageWise, Seagate (Frye) LAN Directory, Seagate LANAlert, Symantec Norton Administrator for Networks, and Tally Systems NetCensus

In addition, several vendors are either providing or planning to provide Windows NT Workstation software. Some either provide or plan to provide OS/2 support. For the latest information about product, version, OS support, and availability, please contact the vendor directly.

Q10. Why is the Compaq Desktop Management Solutions Partners Program necessary?

A10. Rather than market technologies that provide minimal benefits at this time, Compaq worked with the PC LAN management vendors to provide customers with viable solutions today. The Compaq Desktop Management Solutions Partners Program lets customers focus on using their networks to solve business problems, thereby reaping the benefits of lower cost of ownership via these well-integrated products.

Q11. Does Compaq support the Desktop Management Task Force (DMTF)?

A11. Yes. Compaq is a DMTF Steering Committee member and fully supports the DMTF's efforts to create standards for the management of networked PCs. The Desktop Management Task Force has made great strides to develop technology that provides a standard framework to manage desktop PCs and a definition of DMI compliance. However, several key requirements for success still need to be met. These include broad support by operating system vendors, standardization on a remote management protocol, and broad support by management tool providers.

Regarding OS support, for example, Compaq still awaits a Microsoft OS DMI implementation. As soon as DMI is incorporated into Windows 95 for example, Compaq plans to pre-install the OS and implement DMI in this industry-standard way. At that time, competitive products with proprietary service layers will need to be swapped out.

Q12. What does DMI compliant mean?

A12. The DMTF has defined DMI compliance with two main aspects. For products providing and consuming DMI management services, such as operating systems and management applications, they must adhere to the Management Interface (MI) definition of the DMI specification. This means that management applications must use the MI to request information about DMI manageable products and that operating systems must expose DMI information to management applications through the MI.

Component products such as PCs, adapter cards, printers and software that are to be managed by DMI compliant management applications, must adhere to the DMTF Standard Group Compliance Rules by supporting the "Component ID" standard group and by following the established implementation structure for other standards groups that are supported. Component products must at least be able identify themselves to the DMI Service Layer and follow the procedure for supporting other Standard Groups as defined in DMTF Management Information Format (MIF) file specifications.

Q13. Are Compaq Deskpro PCs with Intelligent Manageability DMI compliant?

A13. Yes. Compaq has a DMTF-signed DMI-compliance certificate for the Compaq Deskpro family of personal computers including the Deskpro 2000, Deskpro 4000, and Deskpro 6000.

Q14. Are any Compaq PCs besides the Compaq Deskpro DMI compliant?

A14. Yes. Compaq has a DMTF-signed DMI-compliance certificate for Compaq's entire commercial desktop product line. This includes the Deskpro XL, Deskpro, and ProLinea family of personal computers.

Q15. Are Compaq monitors DMI compliant?

A15. Yes. Compaq commercial monitors also received official DMI certification. Compaq's entire commercial line of desktop systems are officially DMI compliant. This includes the Compaq family of commercial monitors.

Q16. Does SNMP (Simple Network Management Protocol) have any relationship to DMI?

A16. No. SNMP is a well-established network management protocol that was developed to provide protocol support for managing networked devices on the Internet. The DMI will use RPC as its management protocol.

Q17. Hewlett-Packard is delivering DMI technology today. What does this mean?

A17. HP chose to be first to market with technology, not solutions. The customer's issue really is "How many of today's PC LAN management products can be used with the HP implementation?" The answer is two: Intel's LANDesk Management Suites 2.0 and, now, Symantec Norton Administrator for Networks. In contrast, Compaq is pursuing a more pragmatic approach to satisfying the customer's need for manageability. Compaq focused on integrating Intelligent Manageability with all of today's leading PC LAN management products. When the DMI becomes a standard and integrated component of desktop operating systems, Compaq will deliver DMI-enabled PCs and continue to work with the members of the Compaq Desktop Management Solutions Partners Program to ensure tight integration and compatibility with these vendors' products.

Q18. Which third-party products will deliver remote management applications for DMI compatible products like the Compaq Deskpro?

A18. The Compaq Desktop Management Solutions Partners Program has developed significant third-party support for remote desktop management without using the DMI. For applications that are written specifically for DMI, Intel (a DMTF steering committee member) and Symantec have incorporated DMI support into their products—LANDesk Management Suite and Norton Administrator for Networks, respectively.

Q19. Does Compaq plan to support Intelligent Manageability for its portable PCs?

A19. Yes. Compaq recently announced that the LTE 5000 will incorporate features equivalent to the Compaq Deskpro Intelligent Manageability in 3Q96. This includes AssetControl information available from a docked portable connected to the network and Fault Management capabilities such as IntelliSafe hard drives. Security Management features already exist with Compaq portables.

Q20. Is the Asset Tag for the CPU controlled by the administrator password?

A20. Yes. If an administrator password is set, the asset tag cannot be changed unless the administrator password is invoked.

Q21. Is there an Asset Tag for the monitor in addition to its serial number?

A21. No. The monitor asset tag is assumed to be the serial number of the monitor.

Q22. Using third-party management software, does the administrator have the ability to download software directly to the managed desktop PC?

A22. Yes. Third-party management software can download software updates directly to the managed desktop PC.