

COMPAQ

Integrating Compaq Insight Manager with Enterprise Management Platforms

Compaq TechNote

Includes information on:

- Network management and Compaq server management overview
- Managing Compaq servers with IBM NetView for AIX, SunNet Manager, and HP OpenView
- Using Compaq Insight Management MIBs
- Understanding Compaq Insight Agent Traps

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Integrating Compaq Insight Manager with Enterprise Management Platforms

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Contents

Chapter 1

About This TechNote

Chapter Organization	1-1
Notational Conventions	1-3
Additional Resources to Use	1-4

Chapter 2

Network Management

Network Management Terms	2-3
Discussion of Network Management	2-5
Standards-Based Network Management Model	2-6
Fault Management.....	2-7
Performance Management.....	2-7
Configuration Management.....	2-8
Security Management.....	2-8
Accounting Management.....	2-9
Network Management Standards	2-9
SNMP Standard.....	2-9
Methods of Managing Network Resources	2-13
In-Band Device Access	2-13
Out-of-Band Device Access	2-13
Online Management	2-14
Offline Management.....	2-15
Server Management as a Subset of Network Management.....	2-16
Desktop Management as a Subset of Network Management	2-18

Chapter 3

Compaq Management Technologies

- Compaq Server Management Technologies..... 3-2
 - Fault Prevention 3-3
 - Fault Tolerance 3-3
 - Rapid Recovery..... 3-4
 - Remote Maintenance..... 3-7
- Compaq Desktop PC Management Technologies 3-9
 - Intelligent Manageability..... 3-9
 - Inventory and Configuration Management..... 3-9
 - Fault Management.....3-10
 - Rapid Recovery.....3-11
 - Security Management.....3-12
 - PC LAN Management Software Support3-14
- Compaq Insight Manager Software3-16
 - Compaq Insight Manager3-16
 - Compaq Insight Management Agents3-19
 - Compaq Management Information Base.....3-19
- Integration with Operating System Management3-21
- Network Management Interoperability3-22



Chapter 4

Integration with IBM NetView for AIX

Feature Summary	4-1
Adding Compaq Server Support	4-2
Transferring MIB Files to the NetView for AIX Console.....	4-2
Loading the MIB Files.....	4-3
Discovering or Adding Compaq Servers to the Submap.....	4-4
Adding a New Subclass to the Computer Class.....	4-7
Adding Custom Applications.....	4-18
Adding the Compaq Query Files.....	4-19
Slot Configuration Information.....	4-20
Getting Contact Information From an Offline Device	4-23
Using the Information	4-29
Browsing the MIB	4-29
Predefined and Custom Monitor Applications	4-32
Event Monitoring	4-33
Handling Traps.....	4-34
Setting Up Compaq Traps	4-35
Troubleshooting	4-36
Integration to Other Systems	4-37
Event Notification via E-Mail	4-37

Chapter 5

Integration with SunNet Manager

- Feature Summary 5-1
- Integration Environment..... 5-2
- Preinstallation Considerations 5-3
 - Network Operation Considerations 5-3
 - SunNet Manager Console Considerations 5-4
 - Setting Up Your View Hierarchy.....5-10
- Adding Compaq Server Support5-12
 - MIB Files and Schema Files5-13
 - Transferring the MIB Files to SunNet Manager5-13
 - Compiling the MIB Files5-14
 - Copying the Schemas to the Proper Directory.....5-16
 - Adding the Compaq Servers to the Database5-17
 - Associating the Appropriate Schemas.....5-18
 - Adding a New Managed Device Type5-20
 - Creating an Icon File5-22
 - Adding the Final Touches.....5-25
- Customizing the Schemas.....5-26
 - Consolidating Several Schema Files Into One5-26
 - Modifying the Enumeration Strings5-28
 - Modifying the Insight Agents Name and Description.....5-29
 - Additional Customization.....5-29



Integration with SunNet Manager *continued*

Using the Information	5-30
Producing a Quick Dump	5-30
Requesting a Data Report	5-32
Requesting an Event Report	5-34
Performing a Set Request	5-35
Using Automatic Management	5-37
Handling Traps.....	5-38
Processing Traps	5-39
Troubleshooting	5-42
Integration to Other Systems	5-43
Event Notification via E-Mail	5-43
Setting Up the Gateway.....	5-44

Chapter 6

Integration with HP OpenView

Feature Summary	6-1
Adding Compaq Server Support	6-2
Transferring MIB Files to the HP OpenView Console	6-3
Loading the MIB Files.....	6-5
Discovering or Adding Compaq Servers to the Submap.....	6-6
Adding a New Subclass to the Computer Class.....	6-8
Adding the Final Touches.....	6-19
Adding Custom Applications.....	6-20
Adding the Compaq Query Files.....	6-21
Slot Configuration Information.....	6-22
Getting Contact Information From an Offline Device.....	6-25

Integration with HP OpenView *continued*

Using the Information	6-31
Browsing the MIB	6-31
Predefined and Custom Monitor Applications	6-34
Event Monitoring	6-35
Handling Traps.....	6-36
Setting Up Compaq Traps	6-37
Troubleshooting	6-39
Integration to Other Systems	6-39
Event Notification via E-Mail	6-40

Appendix A

Using the Compaq MIB Information

Organization of Compaq Insight MIBs	A-1
Key MIB Information.....	A-4
Configuration	A-5
Operating Statistics	A-10
Condition Attributes	A-19
Using the MIB Information	A-24

Appendix B

Trap Overview

Appendix C

Multivendor Integration from Compaq

Pricing	C-1
How to Order	C-1
Current TechNotes	C-2

Glossary

Index

Figures

2-1	Typical network configuration	2-1
2-2	Relationship of network management terms	2-4
2-3	Server management.....	2-17
2-4	Desktop management.....	2-18
3-1	Compaq server management framework	3-1
3-2	Compaq Full-Spectrum Fault Management	3-3
3-3	Rapid Recovery Engine flowchart.....	3-5
3-4	Internet naming tree with Compaq Enterprise ID (232)	3-20
4-1	Bitmap for a Compaq server (38 x 38 pixels)	4-12
4-2	Bitmap mask for a Compaq server (38 x 38 pixels)	4-13
4-3	Building an application for EISA configuration information	4-22
4-4	Contact information application	4-28
4-5	Browsing the Compaq MIB subtree	4-30
4-6	Setting MIB values	4-31
4-7	Setting up a Compaq IDA trap definition	4-36
4-8	Configuring an event to send mail.....	4-38
5-1	Example hierarchy of views in SunNet Manager.....	5-10
5-2	Associating the appropriate schemas	5-19
5-3	Using the icon editor to create an icon for a Compaq server.....	5-23
5-4	Compaq server iconmask example	5-24
5-5	Requesting a quick dump for EISA configuration information	5-31
5-6	Sample quick dump report	5-32
5-7	Requesting a data report for logical drive information on a drive array	5-33
5-8	Requesting an event report for trap log index changes.....	5-35

Figures *continued*

5-9	Performing a set request to change the contact name.....	5-36
5-10	Receiving SunNet Manager events in Microsoft Mail	5-45
6-1	Bitmap for a Compaq server (38 x 38 pixels)	6-13
6-2	Bitmap mask for a Compaq server (38 x 38 pixels)	6-14
6-3	Building an application for EISA configuration information	6-24
6-4	Contact information application	6-30
6-5	Browsing the Compaq MIB subtree	6-32
6-6	Setting MIB values	6-33
6-7	Setting up a Compaq IDA trap definition	6-38
6-8	Configuring an event to send mail.....	6-41

Tables

1-1	Notational Conventions.....	1-3
2-1	Network Management Terminology.....	2-3
3-1	Critical Errors	3-7
3-2	New Deskpro Family Security Features	3-13
3-3	Most Current MIBs	3-20
A-1	Compaq Insight Management MIBs.....	A-2
A-2	General System Description Items	A-5
A-3	Hardware Asset Descriptions	A-6
A-4	Compaq Software Inventory Items	A-7
A-5	Operating System Configuration Items.....	A-8
A-6	Hardware Configuration Items	A-9
A-7	Hard Drive Read/Write/Seek Items	A-11
A-8	Hard Drive Error Items	A-12
A-9	Tape Drive Read/Write Items	A-13
A-10	SCSI Tape Drive Error Items	A-14
A-11	NIC Information Items.....	A-15
A-12	Operating System Resource Usage Items	A-16
A-13	Hardware Utilization Items	A-17

Tables *continued*

A-14	Fault Identification Items	A-18
A-15	Drive Array Status Items.....	A-19
A-16	SCSI Disk Status Items	A-20
A-17	SCSI Tape Drive Status Items	A-21
A-18	System Environment Status Items	A-22
A-19	Fault and Recovery Features Status Items	A-23
B-1	Drive Array Traps.....	B-2
B-2	SCSI Traps.....	B-9
B-3	System Health Traps	B-11
B-4	Storage Systems Traps	B-15
B-5	User Threshold Traps	B-17
B-6	Uninterruptible Power Supply Traps	B-17
B-7	Standby Recovery Server Traps	B-19
B-8	Server Manager/R Traps	B-20
C-1	Compaq TechNotes.....	C-3

Chapter 1

About This TechNote

This TechNote provides Compaq server management integration guidelines, based on our testing of hardware and software products from Compaq and other vendors. The management platforms that Compaq selected to test might not be the same as your configuration. However, this TechNote provides guidelines that you can use to integrate with any SNMP-compliant management platform.

This TechNote also provides the following:

- Network management overview, terminology, and standards.
- Discussion about Compaq Insight Management Agents and how they easily integrate with other management platforms.
- Information on how to use the Compaq Insight Management MIBs in SNMP-compliant platforms.

Chapter Organization

This chapter is intended to help you use this TechNote; therefore, a brief summary of each chapter follows:

Chapter 1 -- Introduces the TechNote with a brief summary of each chapter, general information about the conventions used, and a bibliography you can use to find more information on Enterprise management platforms.

Chapter 2 -- Provides a network management overview that includes terminology, standards, and a discussion of the complexity of network management.

Chapter 3 -- Describes the Compaq Management Technology framework that includes Compaq management hardware and software products.

Chapter 4 -- Discusses integrating Compaq Insight Management Agents with the IBM NetView for AIX (from IBM) network management platform.

Chapter 5 -- Discusses integrating Compaq Insight Management Agents with the SunNet Manager (from SunConnect) network management platform.

Chapter 6 -- Discusses integrating Compaq Insight Management Agents with the HP OpenView (from Hewlett-Packard Company) network management platform.

Appendix A -- Describes Compaq Insight Management MIBs and the information they provide to help you diagnose and solve Compaq server-related problem scenarios.

Appendix B -- Provides a listing of traps generated by Compaq Insight Agents to assist you in translating trap variables.

Appendix C -- Provides information on how to order individual Compaq TechNotes, including pricing information, 1(800) telephone numbers, obtaining TechNotes from the Internet, and a list of available TechNotes.

Glossary -- List of words describing server management and related networking terms.

Notational Conventions

This TechNote uses the following conventions to distinguish elements of text:

Table 1-1
Notational Conventions

Convention	Use
Set, Get	Screen button labels appear in bold initial caps.
ENTER	Keys on your keyboard appear in boldface and uppercase, not a sequence of keys to press.
Enter	When instructed to enter information, type the information and press the ENTER key.
"new terms" and "prompts"	The first occurrence of a technical term, prompts, and references to a word other than a command appears in quotes.
Key + Key	When you see a plus sign between two keys, hold down the first key while you simultaneously press the second key. For example, "Press the CTRL + Z keys" means to press the CTRL key while you simultaneously press and release the Z key.
Select <i>item</i> → <i>item</i>	Items separated by arrows indicate items you select in a sequence.
<i>screen selections and variables</i>	These items appear in italics in all chapters of this TechNote.
<i>file names and directories</i>	These items appear in lowercase italics in the UNIX environment.
user input, screen display	Information you type exactly as it appears, and information that displays on the screen displays in lowercase and in a different typeface in the UNIX environment.
commands, options, programs, utilities	These items appear in lowercase boldface in the UNIX environment.

continued

Notational Conventions *Continued*

USER INPUT	Information you type exactly as it appears is shown in uppercase and in a different typeface in the DOS and Windows NT environments.
<i>FILENAMES</i>	Names of files appear in uppercase italic in the DOS and Windows NT environments.
PROGRAMS, COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These items appear in uppercase in the DOS and Windows NT environments.
! IMPORTANT	Presents clarifying or specific points of information.
NOTE	Presents commentary, sidelines, or interesting points of information.

Additional Resources to Use

The following references were used in the development of this TechNote:

Compaq TechNote, *Configuration and Tuning of Microsoft SQL Server for Windows NT on Compaq Servers*, P/N 184207-002
Compaq Computer Corporation, April 1995.

Compaq Insight Manager User Guide, P/N 133394-006
Compaq Computer Corporation, February 1995.

Compaq Insight Management Agents User Guide,
Compaq Computer Corporation, February 1995.

SCO UNIX IP Routing Over X.25 Networks TechNote, P/N 145711-001
Compaq Computer Corporation, April, 1993.

Release Notes for Microsoft Windows NT Advanced Server,
Microsoft Corporation, March 1993.

HP OpenView Windows User's Guide,
Hewlett-Packard Company, 1992.

HP OpenView Network Node Manager 3.0 Administrator's Reference,
Hewlett-Packard Company, 1992.

HP OpenView Network Node Manager 3.0 User's Guide,
Hewlett-Packard Company, 1992.

SunNet Manager 2.0 Reference Guide,
Sun Microsystems, Inc., 1992.

SunNet Manager 2.0 User's Guide,
Sun Microsystems, Inc., 1992.

The Simple Book: An Introduction to Management of TCP/IP-based Internets.
Marshall T. Rose. Englewood Cliffs, New Jersey: Prentice-Hall, 1991.

Troubleshooting Internetworks: Tools, Techniques, and Protocols.
Mark A. Miller. San Mateo, California: M&T Books, 1991.

McGraw-Hill's Compilation of Open Systems Standards.
Ed. Harold C. Felts. New York: McGraw-Hill, 1989.

The Basic Reference Model of Open Systems Interconnection (OSI),
ISO 7498 - Part 4

PC Systems Standard MIF Definition, Desktop Management Task Force (DMTF).
Release Version 1.2, February 1995.

The Internet

To access the Compaq home page on the Internet, enter:

<http://www.compaq.com>

Chapter 2

Network Management

This TechNote is intended for network administrators who need to know the critical success factors for integrating the management technologies and tools of Compaq servers and client desktop PCs into a broader network management environment. Compaq servers support Compaq developed, SNMP-based management agents running under network operating systems such as NetWare, Microsoft Windows NT, SCO UNIX, UnixWare, and IBM OS/2 to provide management of the hardware. The New Compaq Deskpro Family supports “Intelligent Manageability”. Intelligent Manageability moves many Compaq server management technologies to the desktop. Compaq Desktop Management Solution Partners access these Intelligent Manageability features.

The typical network configuration can include devices such as routers, bridges, gateways, and other SNMP-host computers. Figure 2-1 is an example of such a network.

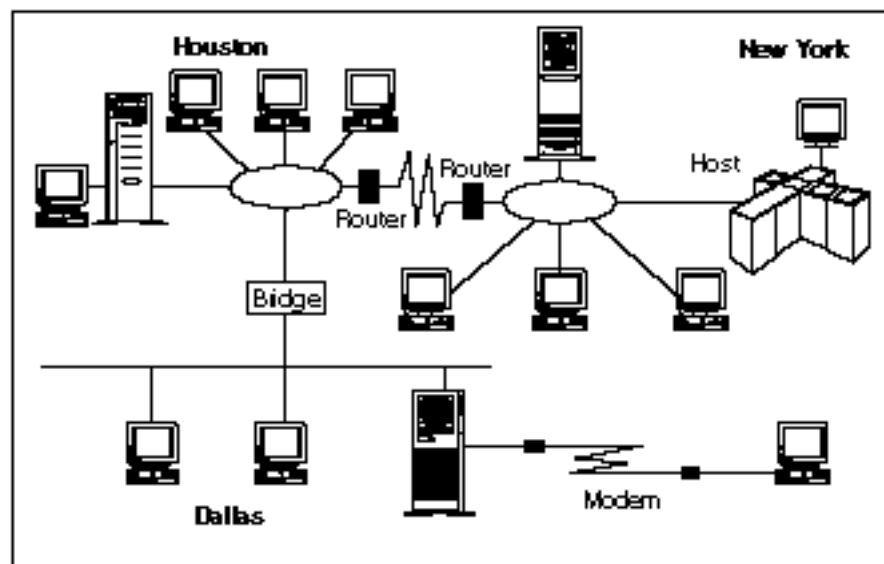


Figure 2-1. Typical network configuration

.....

2-2 Network Management

Managing a multivendor, multioperating system environment, similar to the typical network configuration illustrated in Figure 2-1, is a complex process. However, such networks are not uncommon in many organizations and might resemble your own.

Compaq provides you with tools for managing Compaq servers and desktops. These tools build upon the functionality and features engineered into the servers and desktops. The tools, used in combination with tools specific to your network operating system, can provide you with cost-effective methods to manage your network.

Compaq server management technologies, desktop Intelligent Manageability, and tools adhere to popular network management standards such as:

- Simple Network Management Protocol (SNMP)
- Point-to-Point Protocol (PPP)
- Internet Protocol (IP)
- Internet Packet Exchange (IPX)
- Telnet
- Windows Internet Name Service (WINS)
- Domain Name System (DNS)
- American Network Standards Institute (ANSI) terminal emulation

The Compaq commitment to standards assures you the flexibility and cost-effectiveness of an open, industry-standard solution.

Network Management Terms

Table 2-1 contains a list of network management terms and definitions associated with computing devices, infrastructure devices, and network protocols. In this TechNote, the *first reference* of the network management term is used to introduce a term and the *second reference* is used for the remainder of the document.

Table 2-1
Network Management Terminology

First Reference	Second Reference	Definition of Term
Attribute	Attribute	Characteristics of the object provided to a network administrator (for example fault, performance, and configuration information).
Element Manager	Element Manager	Application that manages a device or a subsystem.
Managed Device	Device	Computing and infrastructure devices that are manageable (for example, servers and routers that run management agents and therefore are manageable).
Managed Object	Object	Component of a device that is manageable (for example, network interface, storage subsystem, operating system, active applications, or hardware configuration).
Management Agent	Agent	Software or firmware installed and running in a managed device that provides attribute information to an element manager.
SNMPv1	SNMP	Industry-standard protocol for the exchange of management data between management applications and management agents.
Subsystem	Subsystem	Major components of a device (for example, disk subsystem, storage subsystem, memory subsystem, and processor subsystem).

Figure 2-2 illustrates the relationship between the network management terminology described in Table 2-1.

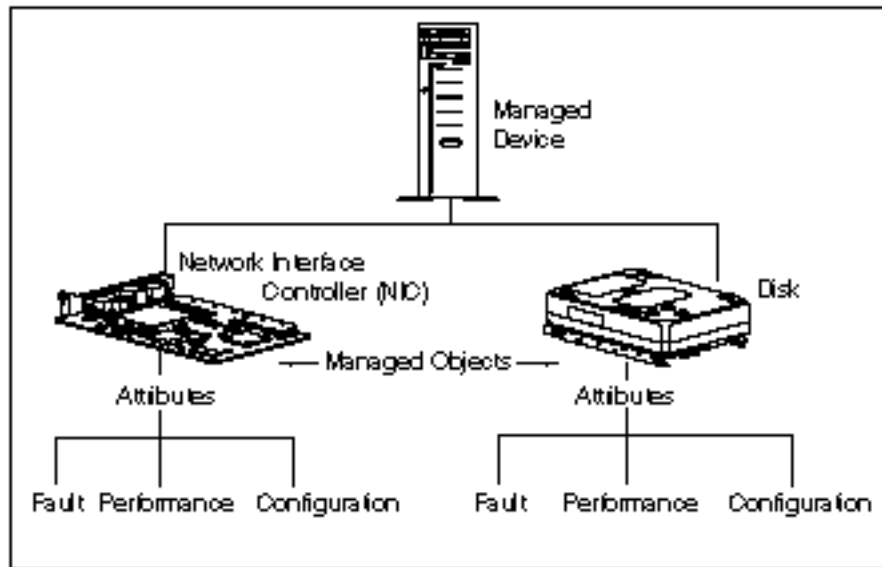


Figure 2-2. Relationship of network management terms

In summary, every managed device:

- Possesses a set of managed objects that correspond to hardware subsystems and software components.
- Possesses a number of attributes that describe the objects. The attributes of the managed device are *readable* and might be *writable* by a management application.
- Sends notification of changes in operating status and information about a failure condition to a management application.

Discussion of Network Management

Network management enables the monitoring, analysis, and control of computing and infrastructure devices, as well as the network protocols.

Managed devices can comprise of the following devices:

- Computing devices -- servers, desktops, workstations, hosts, and mainframes
- Infrastructure devices -- bridges, routers, gateways, and hubs

Today, management applications exist that allow you to monitor the status of attributes, analyze their condition, and perform a resulting action on a managed device. For example, you might choose to reset a port on a hub when the device attached to that port generates an excessive number of network errors.

A benefit of network management is that it allows you to provide acceptable service levels to your users in the most cost-effective manner. This service, in turn, depends on several issues such as:

- How critical is uptime to your network?
- How much do you want to restrict access to the network?
- What level of performance do you expect to achieve?
- What does it cost to manage your network effectively?

Network management often requires you to balance several objectives that could be contradictory. For example, two of your requirements might be to reduce costs and reduce downtime. However, the cost of 100-percent uptime is often prohibitive.

The following is a sample of the factors that contribute to the complexity of network management:

- Networks containing a variety of devices.
- Varying requirements from one user organization to another; each organization perceives its needs to be unique.
- Users have a sharply different perception and expectation than network administrators and MIS management within an organization. This problem becomes more complicated because of the growing influence of new technology and the need for businesses to rightsize their computing environments.
- Lack of easy to use, broad-based solutions.
- The focus of many management solutions today is to manage a single-network element such as a bridge, a router, or a server. For PC-based networks, some solutions specialize in certain areas of network management such as configuration or performance monitoring. Management solutions that can manage several network devices and support multiple functional areas of network management typically require additional systems integration.

Standards-Based Network Management Model

The International Standards Organization (ISO) has formulated a network management framework because the scope of network management is so broad. This management framework is a document that provides a reference for coordinating development of management standards. *The Basic Reference Model of Open Systems Interconnection (OSI), ISO 7498 — Part 4* describes the functional areas of network management. This reference document supplements the ISO Open Systems Interconnection (OSI) model. The OSI model describes the seven protocol layers (that is, physical through application layer) and the activities necessary, at each layer, for systems to interconnect over communications media such as a telephone line, a serial cable, or a coaxial cable.

The ISO network management model identifies five functional areas of management. They are:

- Fault Management
- Performance Management
- Configuration Management
- Security Management
- Accounting Management

There are several publications, as well as the ISO standard itself, that can provide you with complete details on each of these management areas. The following is just a brief overview of the typical requirements in each area.

Fault Management

Detecting faults and notifying administrators of a fault occurrence is an intrinsic function of network management. This function becomes critical in a distributed networking environment, particularly in an economic climate where shrinking budgets force MIS departments to automate remote fault detection and resolution. Compaq recognizes the importance of this category by providing devices that provide a wide array of fault tolerant features, and monitorable error indicator attributes, and "fault prediction" attributes. With fault prediction attributes, you can proactively manage the devices to predict faults and provide maximum server uptime.

Performance Management

Performance management allows you to monitor, analyze, and tune devices and network operation. This function is important in a distributed networking environment where the application or network uptime is mission critical. With performance data available, you can do capacity planning to enable the cost-effective growth of your ever-changing network.

Configuration Management

New devices such as servers, workstations, printers, routers, and specialized high-speed links are constantly added to networks as the prices of computing resources drop. The term *network* takes on new meaning when you consider devices such as laptops, that at times are not connected to the network. With configuration management you can effectively monitor the existence and configuration of the computing assets deployed on your network.

Security Management

There are two facets to security management. They are:

- Allowing legitimate users access to information relevant to their job function
- Restricting unauthorized users

Under no circumstances should all users automatically get rights to access all information. Access rights must be set up in a consistent manner, so you can quickly track access violations.

As your organization grows, it might become necessary to separate your network into smaller workgroups, each part of a logical domain such as Sales, Marketing, Engineering, and so on. You need to control intra-domain access in a way that makes it easy for your users to share information, while preventing abuse. Similar, though more restrictive, access applies to exchanging information with external sources such as your suppliers, customers, consultants, and so on. Another concern is physical security (access to the hardware), as well as operating system security and network security (access to data).

Accounting Management

Today, networks can offer a variety of services from video conferences, to e-mail, to file sharing. It is often necessary to monitor the usage of these services so you can distribute the costs equitably and charge back to individual cost centers. Knowledge of usage patterns can also assist you in capacity planning and in redeploying network resources to serve changing needs.

Network Management Standards

As discussed earlier, managing a network is complex. Management becomes even more complicated without standards. When an organization purchases multiple management tools, each with a different method of managing a particular hardware or software product, it must then maintain and train administrators in different tools. This is expensive and inefficient. Consequently, standards committees have developed protocols for network management.

SNMP Standard

The Internet Engineering Task Force (IETF), the standards rating body for the world-wide Internetwork, has defined a management protocol. The Simple Network Management Protocol (SNMP) has garnered a major share of the market and has the support of over 20,000 different products. SNMP has its roots in the Internet community — the complexity of large international TCP/IP networks provided the necessary impetus to develop a standard method of managing devices on the network.

Within the SNMP framework, manageable network devices (routers, bridges, servers, and so on) contain a software component called a management agent. The agent monitors the various subsystems of the network element and stores this information in a management information base (MIB). Conceptually, the MIB is a database readable and writable by a management application using the SNMP protocol.

There are two types of MIBs:

- Internet Management MIBs -- These MIBs include MIB-II, RMON, and others. These MIBs, standardized by the Internet community, represent the core objects that are common across the widest range of network devices implementing the Internet protocols. Examples of these objects include network protocols such as TCP/IP and network devices such as Ethernet network interfaces.
- Vendor MIBs -- These MIBs represent objects that are unique to an individual vendor's product or product line. Over 500 vendors and organizations have created their own vendor MIBs. Compaq was the first personal computer company to develop a MIB that enabled SNMP management of server hardware.

The majority of vendors of internetworking devices have embraced the SNMP standard, including:

- Bay Networks Incorporated
- Cisco Systems Incorporated
- Cabletron
- 3Com Corporation

SNMP has also gained acceptance among vendors who have developed compliant management platforms, including:

- ManageWise (Novell and Intel)
 - HP OpenView (Hewlett-Packard Company)
 - NetView for AIX (IBM)
 - SunNet Manager (SunConnect -- a Sun Microsystems, Inc. Business)
-

Among server vendors, Compaq offers SNMP-compliant management agents that provide specific Compaq device information. These include:

- Compaq Insight Management Agents for NetWare
- Compaq Insight Management Agents for Microsoft Windows NT
- Compaq Insight Management Agents for UnixWare
- Compaq Insight Management Agents for SCO UNIX
- Compaq Insight Management Agents for IBM OS/2

SNMP often uses the network for sending and receiving management information. This is called "in-band" management, however, SNMP is not limited to in-band management. In-band management is discussed in more detail later in this chapter.

SNMP supports both read and write operations (GET and SET) commands on attributes. Some vendors do not support the SET command because of the potential to allow an unauthorized person to alter critical parameters on a network element. Insight Agents support the SNMP community string and a command line argument to control SET operation behavior of non-critical parameters. For more detailed information, refer to your *Compaq Insight Management Agents User Guide*.

NOTE: Some users of SNMP have expressed concern over the low level of security mechanisms employed. In response to that concern, the Internet community has recently completed SNMPv2. SNMPv2 is the next version of the Simple Network Management Protocol that includes improvements to SNMP in the areas of performance, security, confidentiality, and manager-to-manager communications. At this time, SNMPv2 has not been implemented by vendors of network devices.

SNMP is associated with TCP/IP and monitoring devices on Ethernet networks because of its long association with the Internet. However, you can use SNMP over other protocols such as IPX and AppleTalk. For example, the Compaq Insight Manager application supports SNMP over IPX and IP.

NOTE: For an in-depth discussion of SNMP, refer to *The Simple Book - An Introduction to Management of TCP/IP-based Internets* by Marshall T. Rose (Prentice-Hall).

The SNMPv1 management protocol specifies four operations that a management application can use to manage information *known* to the agent. These are the GET, GET-NEXT, SET, and TRAP operations, all briefly described below:

■ GET and GET-NEXT

The management application uses the GET and GET-NEXT (read) commands to acquire the data, the MIB variables, that provide the mechanism for monitoring. The Compaq Insight MIBs, included with the Compaq Insight Agents, describe the MIB variables.

■ SET

The SET (write) operation allows the management application to set or change a variable value that is known to the agent.

■ TRAP

The management agents can send asynchronous trap messages or unsolicited information when they determine that a significant fault or performance event has occurred. All traps generated by Insight Agents are Compaq enterprise traps.

Methods of Managing Network Resources

There are two different methods to access your network resources. Your management PC can access the managed device(s) "in-band" using the network or "out-of-band" through a point-to-point connection such as a modem link. The operational status of your network device(s) influence the actions that you perform at the management PC. The element is either "online," providing its network services (such as routing packets or sharing files), or "offline," *not* providing network services due to routine maintenance or catastrophic failure.

In-Band Device Access

Regardless of the operational status of the device, in-band access requires an operational network link between the device and management PC. In-band management is useful for local access or even remote access when you are confident of your LAN and WAN infrastructure.

Out-of-Band Device Access

In contrast to in-band device access, out-of-band access does not require an operational network. You can remotely access a device using out-of-band management when access does not exist to a LAN or WAN, either by design or due to the failure of a network link. Typically, you would establish an out-of-band device access to provide a point-to-point connection between a management console and the managed device. For example, you might use out-of-band management when the remote office is not on the network.

Online Management

Online management refers to the management of an operational network device. The following sections discuss online in-band and online out-of-band management.

Online In-Band Management

This is the most common management model, since most network administrators are confident of their LAN and WAN infrastructure. The management actions between the management application and the managed device occur within the network. These actions include reading and writing attributes. The network carries regular data as well as management data. This model is very cost-effective because management data typically uses only a small percentage of overall network bandwidth, and you do not need an alternate network to carry the data. However, overloading the network with management data can cause network performance degradation.

Online Out-of-Band Management

This management model is less common, but can be useful for branch office environments. In contrast to in-band management, the management actions between the application and the managed device occur outside a network, usually via an asynchronous or modem connection. Otherwise, all capabilities are the same as online in-band management.

You can use two standard transport protocols to perform out-of-band SNMP management:

- Serial Line Internet Protocol (SLIP)
- Point-to-Point Protocol (PPP) (PPP)

In addition to SLIP and PPP, many vendors use proprietary protocols to perform out-of-band management.

Offline Management

When you need to perform an operation such as recovery of a failed network device, one that no longer provides services to the network, the operation is usually considered maintenance. In general, offline maintenance tasks require the use of recovery tools, as well as the replacement of failed components. Typically, this management style requires a remote login to the failed device to perform recovery operations such as diagnostics, configuration, or firmware update.

Offline In-Band Management

Applications to perform offline in-band management include:

- NetWare Virtual Terminal (NVT) over IPX
- Telnet over IP

Offline Out-Of-Band Management

Local terminals (or via modem) with ANSI and VT100 terminal emulation capabilities perform offline out-of-band management.

In addition to Telnet, ANSI, and VT100 many vendors use proprietary protocols and applications to perform offline management.

Server Management as a Subset of Network Management

LANs are strategic resources for the development and deployment of critical applications. Businesses are increasingly deploying LANs to rightsize their operations and capitalize on improved economic results. Consequently, the cost associated with hiring, training, and keeping skilled network administrative personnel to support a growing and complex LAN environment continues to increase. LAN management tools help control the rising costs of LAN administration while increasing the dependability of network environments.

Network administrators have sophisticated management tools for network resources such as bridges, routers, and concentrators, as well as network protocols. However, to manage servers, a key network resource, administrators have typically used simple tools. The comprehensive manageability of servers and sophisticated server management tools are essential requirements for PC networks. As shown in Figure 2-3, these server management requirements include in-depth monitoring, analysis, and control of the performance, fault, and configuration aspects of the server operation.

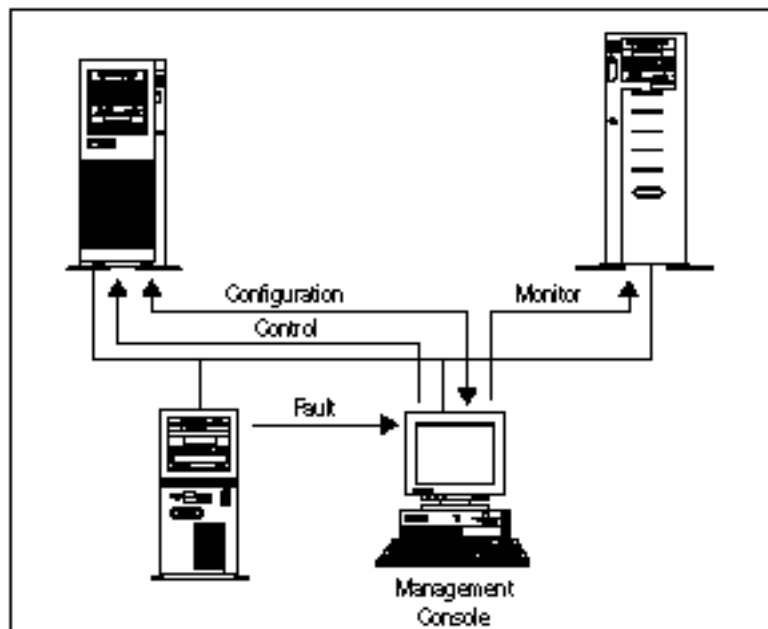


Figure 2-3. Server management

Effective server management requires:

- Built-in capabilities to the server and options
- Strict adherence to popular network management standards for communication protocols and data interchange
- Tools that operate within the customer's preferred environment

The combination of these capabilities allows you to manage the server to ensure that it is one of the most reliable resources in the network.

Desktop Management as a Subset of Network Management

The increasing emphasis on PC LANs has made manageability of PC networks a key customer need. Many businesses are increasing their dependence on PC networks. Large businesses are installing increasingly larger and more complex PC networks; therefore, customers are now demanding significant network dependability.

To meet these customer needs, Compaq has forged close alliances with leading vendors of PC LAN management applications. In conjunction with this effort, Compaq has also implemented desktop PC management capabilities called Intelligent Manageability.

These comprehensive management capabilities make network PCs easier to manage and less expensive to maintain. Figure 2-4 illustrates an example of today's typical data flow when managing a PC network.

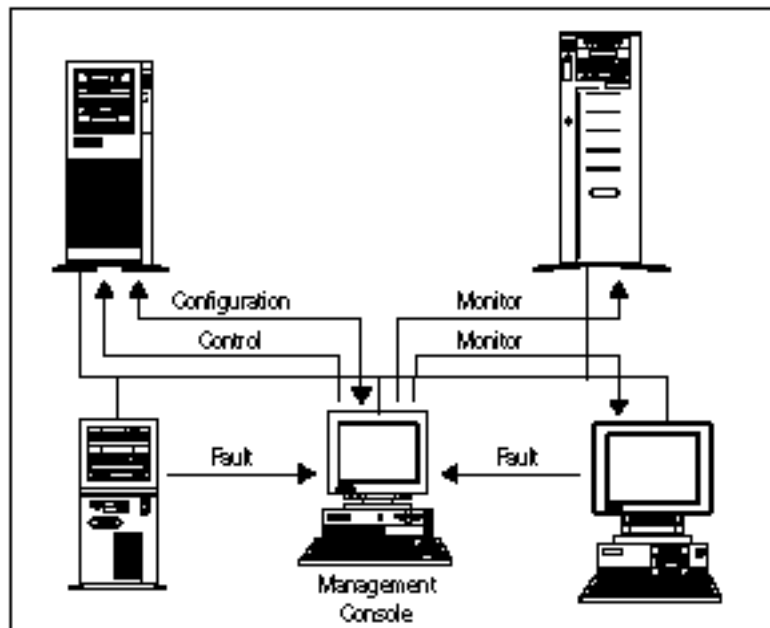


Figure 2-4. Desktop management

Effective desktop management requires:

- Enhanced desktop hardware features that provide a rich set of management capabilities, including Asset and Fault Management
- Close integration of hardware, operating systems, and management software
- Support for a wide range of network management standards
- Fault management of client PCs through standard management products

All of these Intelligent Manageability features are designed to provide manageable PCs that work in any customer's strategic environment. No matter what scale of management a customer uses, the New Compaq Deskpro Family has features that add value in the realm of managing networks.

Chapter 3

Compaq Management Technologies

Compaq integrates hardware management features and complementary management tools to provide a complete server and desktop PC management solution for the network administrator.

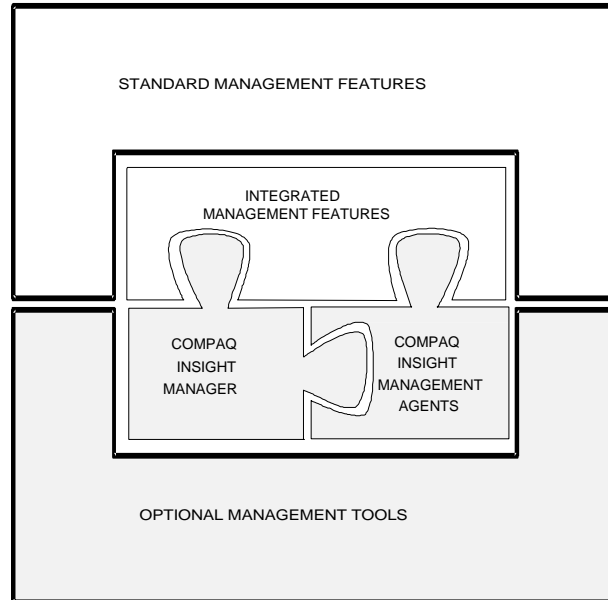


Figure 3-1. Compaq server management framework

The technology framework focuses on hardware management and Compaq Insight Management software that ensures dependable, easy-to-manage computers. The following sections provide a detailed overview of the components of the framework:

- Compaq Server Management Technologies
- Compaq Desktop PC Management Technologies
- Compaq Insight Manager Software
- Integration with Operating System Management
- Network Management Interoperability

Compaq Server Management Technologies

The ability to manage server fault conditions, using advanced technologies, is a significant aspect in any server operation. Every hardware subsystem (such as the hard drive, system memory, and system processor) in Compaq servers has a robust set of management capabilities, designed-in, that address one or more of the fault, performance, and configuration management aspects of server operation.

Network dependability is enhanced by delivering timely information on the operational status of critical server subsystems. Using this information to manage faults is the focus of a comprehensive design approach to server and network uptime. Compaq refers to this design as "Full-Spectrum Fault Management." These fault management technologies provide you with the ability to prevent faults before they happen, keep the system up and running in case of an unlikely failure, or deliver rapid recovery to normal operation after a fault condition.

Full-Spectrum Fault Management is built into Compaq servers. Figure 3-2 illustrates the fault management process.



Figure 3-2. Compaq Full-Spectrum Fault Management

Fault Prevention

Server Parameter Tracking forms the foundation of Compaq server management. Server Parameter Tracking combines hardware, firmware, and industry-standard management software. It provides timely fault, performance, and configuration information for the critical processor, memory, and I/O (storage and network interface) server subsystems and server environment.

Server Parameter Tracking immediately notifies you of impending component failures, enabling preventive maintenance that avoids server failures and maximizes network uptime. For example, predictive storage subsystem tracking warns you of impending failure, allowing you to replace the hard drive or disk controller prior to failure.

Fault Tolerance

Compaq servers also provide a set of fault-tolerant features designed to keep the server up and running if a failure occurs. Compaq ProLiant servers come standard with the "Hot-Pluggable Drive" capability. This feature allows you to replace hard drives without interrupting server operation, thereby maximizing server availability.

Compaq ProLiant servers can also include an "Off-Line Backup Processor." The Offline Backup Processor automatically reboots to a second processor if the first processor fails.

These features complement additional capabilities such as Error Checking and Correcting (ECC) Memory and the Compaq SMART SCSI Array Controller to maintain a high level of server availability and ensure data integrity.

Rapid Recovery

Compaq servers offer another important built-in capability to manage faults. If a critical server failure occurs, the server can automatically recover. The "Compaq Rapid Recovery Engine" is engineered into Compaq ProLiant servers to diagnose and rapidly return the server to full operation. You can use the Rapid Recovery Engine independently of other server management products or you can use it with Compaq server management tools.

The Rapid Recovery Engine performs several functions that can intelligently and automatically restart the server without user intervention, including:

- Server Health Logging
 - Capturing snapshots of the subsystem parameters that indicate failure and placing them into nonvolatile health logs and history tables.
 - Automatic Server Recovery-2 (ASR-2)
 - Restarting the server and resetting all option boards.
 - Using the nonvolatile logs to recover, reconfigure, and automatically correct failures to the processor and cache, memory failures, and software errors.
-

Figure 3-3 illustrates how the Rapid Recovery Engine process detects and resolves critical errors in your Compaq server.

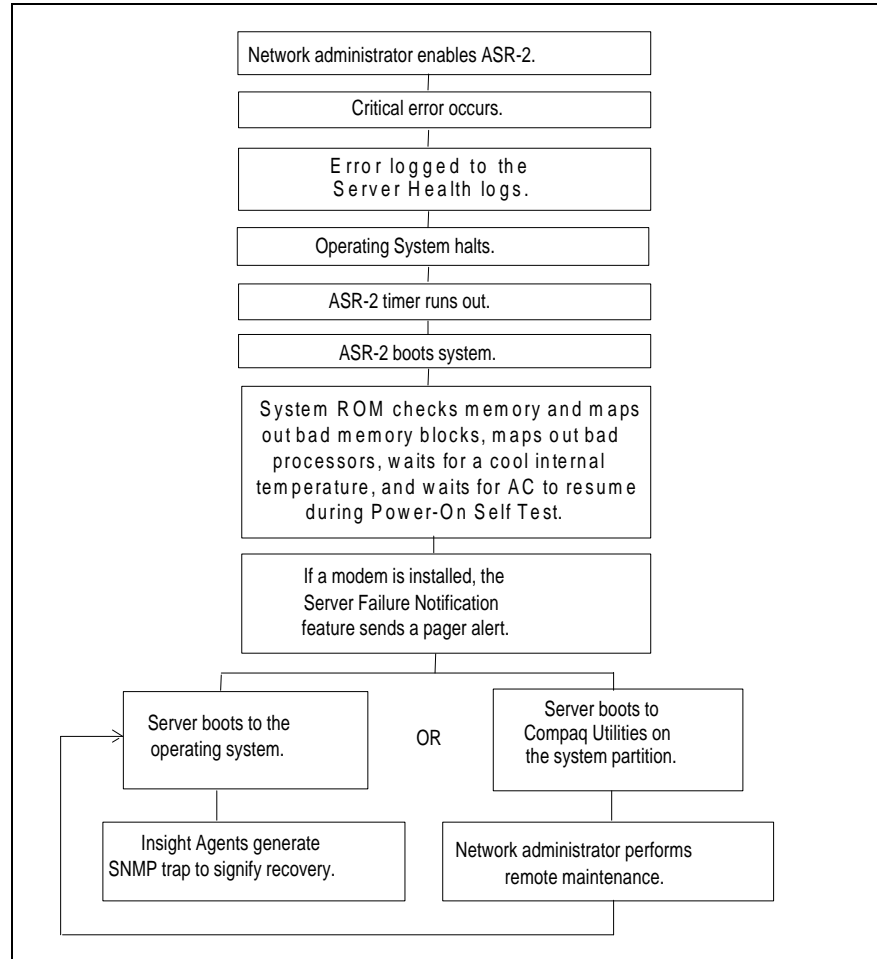


Figure 3-3. Rapid Recovery Engine flowchart

Server Health Logs

Server Health Logs store error information in nonvolatile memory so that Compaq Utilities and network administrators can retrieve and analyze the data later. You can view the Server Health Log contents using the Compaq Inspect Utility or Compaq Insight Manager. By analyzing the data from the Server Health Logs, you can increase your efficiency in resolving current server problems as well as prevent future server errors. The Compaq Diagnostics software also uses the data from the Server Health Logs to streamline its testing and quickly pinpoint problems.

The Server Health Logs include the Critical and Corrected Error Log, Power-On Error Log, and the Revision History Table. A description of each follows:

- **Critical Error Log** -- records catastrophic errors, such as noncorrectable memory, expansion board, and expansion bus arbitration errors. After a critical error occurs, the system ROM indicates on bootup that an error has occurred and prompts you to run Compaq Utilities. The Critical Error Log contains the time, date, and frequency of errors logged. When a critical error is logged, the server can notify you when it reboots.
- **Corrected Error Log** -- contains the date, time, frequency, and unique information about errors that the various subsystems have automatically corrected, such as ECC Memory errors.
- **Power-On Error Log** -- records any errors that occur during Power-On Self-Test (POST).
- **Revision History Table** -- stores board revision information in nonvolatile memory. It logs the system board revision first and then logs other boards that support the Revision History Table, such as the Compaq SMART SCSI Array Controller, Compaq NetFlex-2 Controller, Compaq Fast-SCSI-2 Controller, Compaq NetFlex Controller, and Compaq IDA-2 Controller. When you upgrade your server or when you add new expansion boards, the Revision History Table logs this information. As you troubleshoot server problems, you can use this information to determine if a change to the server configuration has caused the server problem.

Refer to the appropriate Compaq server user's guide for a more detailed description of the Server Health Logs.

Automatic Server Recovery-2

Automatic Server Recovery-2 (ASR-2) intelligently restarts the server, analyzes the server health logs, and automatically corrects many errors such as processor, memory, server environment failures, and software errors. ASR-2 also informs network administrators by accessing a telephone pager to notify them that a failure has occurred and that it has been corrected.

Table 3-1 describes the critical errors detected by ASR-2.

Type	Description
Software Errors	Catastrophic software errors that cause the server to cease operation, such as operating system abnormal termination or "hung" application software.
Memory Errors	Memory errors that cannot be corrected and cause the server operating system to cease operation.
Server Environment Errors	Internal server temperature that exceeds the factory preset threshold. AC power failure (requires Compaq UPS).
Processor Board Errors	Catastrophic failure of the system processor board.

Remote Maintenance

The Remote Maintenance feature allows you to diagnose errors and configure the server from any location, either on the network or via modem. This option is necessary only if the ASR-2 process cannot perform an automatic recovery. During the initial system configuration process, these utilities are copied to a special system utility partition on the hard drive.

Using remote maintenance requires:

- An operating system with ASR-2 support.
- Compaq System Configuration Utility and Diagnostics utilities installed locally on the system partition of the hard drive.
- ASR-2 configured to load the Compaq Utilities after the server restarts.

Using a Modem Connection

If you choose to perform remote maintenance using a modem, you must have:

- A Hayes-compatible modem with the auto-answer feature installed in the server. Compaq ProLiant servers have a management modem slot that allows you to perform remote maintenance over the phone without using an EISA slot.
- A local terminal with VT100 or ANSI terminal capabilities or management PC configured with Compaq Insight Manager 2.0 or greater.

This arrangement provides the following capabilities:

- Your server can send notification to your pager.
- You can dial-in to your server to perform remote control of Compaq Utilities running at the server.

Using a Network Connection

If you choose to perform remote maintenance over a network, you must have:

- An IPX or IP connection between the server and the management PC.
 - Compaq Insight Manager 2.20 or greater, or an NVT or Telnet terminal emulator running on the network.
 - Your network connection enables you to perform remote control of Compaq Utilities running on the server.
-

Compaq Desktop PC Management Technologies

Compaq has forged close alliances with leading vendors of PC LAN management applications and has leveraged server management technology developed in the Compaq Systems Division. These relationships and expertise have enabled Compaq to create hardware designs and management tools to manage the new Compaq Deskpro Family of PCs installed on networks.

Intelligent Manageability

Intelligent Manageability is the Compaq industry-leading desktop management strategy that makes networked PCs easier to manage today and tomorrow. Compaq is making enhancements to the basic PC hardware to ensure that the PC is easier to inventory, to troubleshoot, and to protect.

These hardware enhancements are then complemented by a wide range of PC LAN management software. Because this software is integrated and compatible with Intelligent Manageability, it ensures that customers can easily manage Compaq PCs over the network using the customer's preferred PC LAN management products.

Inventory and Configuration Management

Computing devices (PCs, servers, printers) and internetworking devices (routers and bridges) are routinely added to the network to satisfy changing business needs. The dynamic nature of these computing environments requires customers to maintain an accurate inventory of the network and to configure the devices rapidly for optimal operation.

Inventory Management

Inventory management is a set of capabilities that provide comprehensive hardware and software component identification and configuration reporting to enable inventory and accounting procedures. This component identification (inventory data) is also a prerequisite to distributing data files and software, troubleshooting remote systems, and managing geographically dispersed assets.

The new Deskpro Family has integrated AssetControl features which allow administrators to maintain an accurate, up-to-date and centralized inventory of desktop PCs and their components. These features enable businesses to maintain control of their PC assets and allow for effective and accurate software distribution. The features also help streamline service calls because the administrator can provide the service person with fast access to the PC's configuration and history.

Asset Information

The new Deskpro Family features used in conjunction with a Compaq Desktop Management Solutions Partner application make a wealth of useful asset information available to the user and the network administrator. The available information includes:

- The manufacturer, model, and serial number of the PC system, monitor, and hard drive.
- An asset tag and the revision levels of the system board and system ROM.

Fault Management

Fault management is a set of capabilities that provide an early warning of impending component or subsystem failure. This enables the user to perform preventive maintenance before the failure.

The current Compaq Fault Management implementation includes provisions for IntelliSafe Hard Drives, environmental fault prevention tracking, and network performance monitoring.

IntelliSafe Hard Drive

An IntelliSafe Hard Drive is the next generation IDE/ATA drive that was co-designed by Compaq and Conner, Quantum, and Seagate (leading drive manufacturers). IntelliSafe Hard Drives contain enhanced firmware that predicts an impending drive failure. System software, working in conjunction with the IntelliSafe hard drive, can notify users and LAN administrators of the impending drive failure. When a failure is predicted, the hard drive can be backed up automatically, either locally or over the network (with Windows 95).

Environmental Fault Prevention Tracking

This is a hardware and software feature which tracks the internal temperature of the PC and alerts the user and/or network administrator of excessively high internal temperature. This alert enables the user to take action before damage occurs to data or internal components. Detection of system-damaging internal temperatures automatically shuts off the power to the PC when the temperature climbs far past the point when the initial warning occurred.

Network Performance Monitoring

By using Compaq Insight Manager, a network administrator can monitor and detect performance degradation of the integrated Network Interface Controller (NIC).

NOTE: Network performance monitoring is only available in a Microsoft Windows 95 operating environment.

Rapid Recovery

Rapid Recovery is a set of capabilities that provide notification, rapid identification of faults, and automated restart of failed systems or subsystems so that unplanned downtime is minimized. The current Compaq Fault Management implementation includes provisions for proactive tape backup, flashing of ROM BIOS, and availability of accurate contact information.

Proactive Tape Backup

This feature provides added data protection from hard drive failure by automatically backing up the PC hard drive contents to a server tape drive when an impending failure is detected.

NOTE: This feature is only available in a Windows 95 operating environment.

Flash ROM BIOS

This allows quick updating of the system ROM without removing the PC cover. If a system error requires an update of the system ROM, the flash ROM capability of the new Deskpro Family provides for a fast recovery by allowing the ROM to be quickly updated via a diskette utility.

Accurate Contact Information

Accurate desktop PC information provided by AssetControl features allows the network administrator to coordinate service responses for maximum efficiency. When a hardware failure occurs, the AssetControl features enable the network administrator to provide the service person with key information such as:

- The location of the PC
- The contact person
- The model and revision level of the PC and components
- The specific problem, in some cases.

Security Management

Networked PC computing has increased the quantity of easily accessible information that a corporation maintains. Ensuring that this information is accessed only by authorized personnel and that the integrity of the information and PC is maintained is critical in the information age. Security Management is concerned with these issues and is comprised of capabilities to safeguard and protect business-critical data and the PC.

Table 3-2 describes the comprehensive security features to protect critical and confidential data and computing resources.

Table 3-2
New Deskpro Family Security Features

Feature	Function
Power-on Password	Prevents unauthorized person from booting up the PC.
Setup Password	Prevents unauthorized change of system configuration.
QuickLock/QuickBlank	Allows user to lock keyboard and/or blank screen.
Keyboard Password	Allows PC to boot up but prevents data input until the password is entered.
Network Server Mode	Allows hard drive or network restart while keyboard is disabled.
Diskette Boot Control	Prevents PC from being booted from a floppy diskette.
Diskette Write Control	Prevents unauthorized writing of data to floppy diskette.
Flash ROM Lock	Uses the Setup Password to prevent unauthorized changes to the system ROM.
Parallel Interface Control	Prevents transfer of data through the parallel interface connector.
Serial Interface Control	Prevents transfer of data through the serial interface connector.
Diskette Drive Control	Allows disabling of the diskette drive.
Fixed Disk Drive Control	Allows disabling of the hard drive.
U-bolt/Cable Lock Provision	Allows user to secure PC hardware and protect against theft.

NOTE: All security management features will be maintained under Windows 95.

PC LAN Management Software Support

Compaq is taking a proactive initiative to ensure the compatibility and integration of PC hardware enhancements for manageability with the leading vendors of PC LAN management products. This initiative is called the Compaq Desktop Management Solutions Partners Program. The Solution Partners' products deliver features demanded by network administrators such as server and client monitoring, network protocol analysis, software distribution, and software and hardware inventory.

Compaq Desktop Management Solutions Partners Program

Compaq has worked closely with leading management software vendors to provide remote access to the Intelligent Manageability capabilities of the new Deskpro Family. The broad vendor support ensures that Compaq customers can easily manage Compaq PCs using their choice of tools.

Vendors currently participating in the Compaq Desktop Management Solutions Partners Program include:

- **Cheyenne Software Inc.**
 - **Frye Computer Systems Inc.**
 - **Intel Corp.**
 - **McAfee Associates Inc.**
 - **Microsoft Corp.**
 - **Network Computing Inc.**
 - **Novell Inc.,**
 - **Saber Software Corp.**
 - **Symantec Corp.**
 - **Tally Systems Corp.**
-

Solutions Partners Operating System Support

The Solutions Partners' products provide remote AssetControl support across a wide range of operating environments. This increases the probability that one of the Solutions Partners will have a solution to meet the customer's needs.

Support is available for client PCs using Windows 3.1, OS/2, Windows NT, and (in the future) Windows 95. These clients are supported across a wide range of network operating systems, including NetWare, Windows NT, LAN Manager, LAN Server, and Banyan VINES. Customers must contact specific Solutions Partners to determine the range of support in their particular environment.

Compaq Insight Manager and the Desktop Management Solutions Partners Program

When used with the new Deskpro Family, Compaq Insight Manager and the Solutions Partners products are complementary. Compaq Insight Manager functions primarily as the remote hardware and fault management tool. The Solutions Partners' products handle remote inventory management, software distribution, and so on.

Although Insight Manager does provide access to all of the new Deskpro Family AssetControl information, Insight Manager is primarily a fault management tool providing both IntelliSafe hard drive and thermal monitoring and alerting. Insight Manager will initially be the only product capable of remote alerting for IntelliSafe hard drive or thermal failures. Insight Manager is designed to monitor Compaq hardware only.

The Solutions Partners' products are primarily asset management tools which can provide asset management reports for a range of hardware. The products also might include features such as software distribution, software license metering, and remote workstation control. Although the Solutions Partners' products are designed to manage almost any PC hardware, only the new Deskpro Family provides detailed asset information such as serial numbers and monitor information.

NOTE: Customers must contact specific vendors to gain an up-to-date status on individual product capabilities.

Compaq Insight Manager Software

The Compaq Insight Manager Software architecture is typical of other SNMP-management software and comprises the Compaq Insight Management Agents, and the manager software, Compaq Insight Manager.

Agent software executes on a manageable device such as a server that monitors the fault and performance aspects of the device. These monitored statistics, along with device configuration information, provide data to a management application using the SNMP protocol.

Manager software, such as Insight Manager, provides the user interface to the management features in Compaq servers. You can integrate the Insight Management Agents with SNMP-based management platforms to manage Compaq servers.

Compaq Insight Manager

Compaq developed Insight Manager to make the overwhelming task of server monitoring and server management easy. Insight Manager delivers intelligent monitoring and alerting, remote maintenance, and visual control of the servers in *your* network environment. In the unlikely event of server failures, Insight Manager provides a full spectrum of remote maintenance and control facilities such as system rebooting, system configuration, and system diagnostics.

Insight Manager provides timely server status and the means for remotely controlling servers through the following key features:

- Server Task List

A list providing easy access to management tasks.

- Viewing Server Data

Compaq Insight Manager allows you to take an in-depth look at the system hardware. You can view data on items such as the drive subsystem, recovery options, system configuration, system board, option boards, NICs, and system usage.

- Remote Maintenance

You can perform remote maintenance operations across networks and modem links with this feature; therefore, giving yourself active control of your network servers.

- Set - Allows you to update server parameters while the server is online
- Remote Server Restart - Allows you to bring down the server, then reboot it to the operating system or Compaq Utilities
- Remote Console - Provides a virtual server console under Insight Manager

- Asynchronous Management

When the network is down, you still have the ability to communicate with a server to perform management functions by establishing a point-to-point protocol (PPP) dial-up connection using the Asynchronous Management feature.

- Version Control

This feature queries your server(s) for the software version levels, then it compares the findings with a database of Compaq software products provided on the Compaq SmartStart CD, the Compaq Support Software CD, or SoftPaq number SP0965.

- Paging

If a server goes down, the paging feature within Compaq Insight Manager notifies you immediately via a pager that an event has taken place. This built-in feature allows you to focus on other aspects of managing a network instead of being tied to your console monitoring the network.

- Drive Array

This allows the user to take an in-depth look at Compaq Drive Arrays. You can view the physical location of each drive and see the volume in which it belongs to. You can also verify the RAID level of each drive array (for example, No-fault tolerance, drive mirroring, data guarding, or distributed data guarding).

Additional Compaq Insight Manager features include:

- Ability to configure the primary UPS server with the network address of secondary servers so if an impending power outage occurs all server gracefully shutdown.
- Support for tape drive management on NetWare 3.12 and 4.x as well as Microsoft Windows NT 3.5 and 3.51.
- Ability to recover information from a primary server in the event of a server failure. This feature is known as Standby Recovery Server.
- Support for Windows Internet Naming Service (WINS) and Domain Naming Service (DNS).

Insight Manager adheres to the following standards:

- Management Protocol -- SNMPv1 running over IPX, IP, or PPP
- Compaq Insight Management MIB -- all possible manageable objects specific to Compaq hardware
- Standard Internet MIBs -- support information from MIB-II, Token Ring MIB, and Ethernet MIB

Additionally, Insight Manager stores gathered object information in a Btrieve database. You can retrieve this information using Insight Manager or one of several commercially available applications that can access Btrieve data.

Compaq Insight Management Agents

Insight Agents consist of server and desktop software that integrates Compaq manageability into SNMP-based management environments. Insight Agents perform in-depth monitoring of the fault and performance aspects of the key server subsystems: storage, memory, system processor, network interface, and the environment. Insight Agents provide this information, along with server configuration, to SNMP-compliant management applications such as Insight Manager. In addition, Insight Agents can generate traps to notify the administrator of significant changes in the fault or performance aspects of the computer operation. With these traps, you can proactively manage the computer, minimize unplanned downtime, and maximize performance.

Insight Agents support NetWare, Microsoft Windows NT, SCO UNIX, UnixWare, and IBM OS/2. Insight Agents include the Compaq Insight Management MIBs, ready for compilation in your SNMP management platform. For more information about the Insight Agents for a particular operating system, refer to the appropriate *Compaq Insight Management Agents User Guide*.

Compaq Management Information Base

A management information base (MIB) is a description of a set of manageable objects. A manageable device can implement one or more MIBs, depending on its function. A Simple Network Management Protocol (SNMP) MIB, which Compaq fully supports, is very similar to a database schema in that it describes both the structure and format of a set of data. The Internet-assigned Compaq enterprise ID is 232.

Figure 3-4 shows the location of the Compaq enterprise ID in context within the Internet Naming Tree.

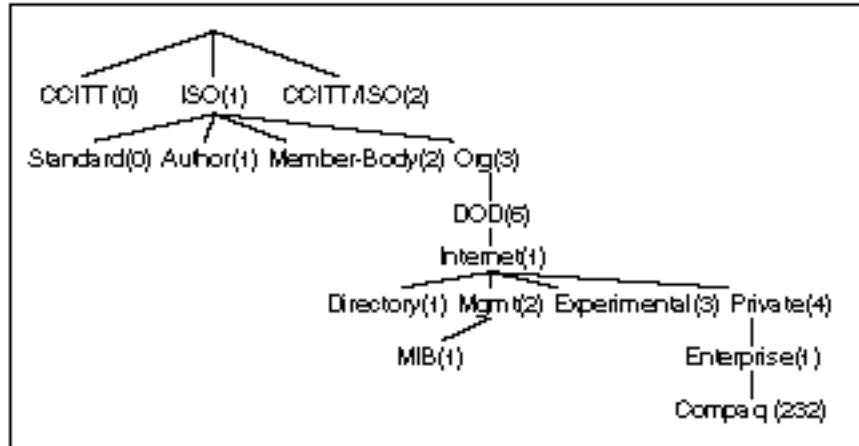


Figure 3-4. Internet naming tree with Compaq Enterprise ID (232)

The Compaq enterprise ID (232) specifies the location of the Insight MIBs within the Internet Naming Tree. The Insight MIBs are modular, with each subbranch from the Compaq enterprise ID representing a distinct function or subsystem supported by the Insight Agents.

Due to the constant changing, updating, or adding of Insight MIBs, Table 3-3 shows a list of the most current MIBs to date:

Table 3-3
Most Current MIBs

MIB	Describes . . .
Standard PC Equipment Configuration	Information that can be configured on an ISA or EISA system
System Information	Specific Compaq features such as security, asset management, and so on
Intelligent Drive Arrays	The Compaq Drive Array Controllers

continued

Most Current MIBs *continued*

MIB	Describes . . .
SCSI Devices	The Compaq SCSI interface products
Server Health	The features that monitor server health, such as thermal sensing
Drive Storage Systems	The Compaq ProLiant Storage System
Management Engine	Software components to track statistics, generate alarms, and more
Host OS Information	Generic host OS information, for example, system processor utility, file system information, and so on
Uninterruptible Power Supply Information	The Compaq UPS

Although the Insight MIBs are organized according to subsystem, your management application can organize the display of the data from the managed devices to convey the most usable presentation. Refer to Appendix A, "Using Compaq Insight MIB Information," of this TechNote, for more detailed information about Insight MIBs.

Integration with Operating System Management

A complete, SNMP-based, server management solution necessitates developing capabilities that provide server hardware and software management for operating systems and applications. Insight Agents take advantage of the extensible SNMP agents provided by Novell, Microsoft, the Santa Cruz Operation (SCO), and IBM. Developing agents according to the extensible agent specification ensures that Compaq hardware management technologies integrate with the server and desktop software management.

Network Management Interoperability

Delivering hardware management technologies that *integrate* with your SNMP-management environment is as important as building the management technologies themselves. Compaq servers can satisfy your management interoperability requirements.

Compaq servers and Compaq Insight Management Software integrate within your preferred management environment. Compaq adheres to network management standards.

Compaq servers provide an extensive MIB which can be used in a full range of environments from a one-server LAN to a globally dispersed enterprise. Because the information is available through SNMP, it is available to point solutions on the LAN for small installations all the way up to complex WAN/LAN enterprises. As your single network LANs grow into larger routed LANs and then into internetworked WANs, you can be sure that Compaq information will grow with you and support your management needs.

Chapter 4

Integration with IBM NetView for AIX

This chapter discusses the integration of Compaq server management information into IBM NetView for AIX. The information is based on tests with version 2.0 performed in the Compaq Integration Lab using a test network.

NOTE: In this chapter, several examples involve IP addresses. These addresses are denoted in the examples as X.Y.<number>.<number>, where X.Y. represents a Class B network address and <number> is a value from 0 to 255.

Feature Summary

IBM NetView for AIX is an internetwork and enterprise-wide management platform that provides a network management solution for multivendor devices and open networks requiring SNMP. The following are some key features of IBM NetView for AIX:

- A distributed management infrastructure that supports various management protocols such as SNMP and CMIP.
- Management services such as event management services and object recognition services. You can use Application Program Interfaces (APIs) to access some of these services.
- An X Windows- and Motif-based management application that manages a variety of devices such as hubs, bridges, routers, and servers. The platform architecture allows integration of applications from IBM and third parties.

The following are some key features of the standard management application:

- A Management Information Base (MIB) load utility that lets you add MIB definitions for new device types in your network.
- Node discovery that can seek out, identify, and display managed IP devices.
- A graphical map representing the topology and status of managed devices.
- MIB browsing and results graphing tools.
- Methods to integrate new applications without programming.

Adding Compaq Server Support

Adding support for Compaq servers into NetView for AIX consists of the following steps:

1. Transfer the MIB files to the NetView for AIX console.
2. Load the MIB files into NetView for AIX.
3. Add a new managed device type for a Compaq server.
4. Create an icon for a Compaq server.
5. Discover or add your servers to the network map.

The following sections discuss each of these steps in detail.

Transferring MIB Files to the NetView for AIX Console

Compaq includes Insight MIB files with the Insight Agents for your operating system. These files define the information structure that the NetView for AIX console requires to retrieve information from the agents. The file names are *CPQ?????.MIB* where *?????* denotes four or five unique characters. Two optional MIBs, *ETHER.MIB* and *TOKEN.MIB*, are included on this diskette.

There are several ways to transfer the Insight MIB files from the Compaq Insight Management MIBs diskette to your NetView for AIX console. You can use the **dosread(1)** command to copy the files directly from the diskette. Consult the AIX documentation for the details of using this command.

Another method to transfer the files is to use the File Transfer Protocol (FTP). The default path that NetView for AIX uses for MIBs is */usr/OV/snmp_mibs*.

NOTE: FTP is available with Windows NT, SCO UNIX, UnixWare, and IBM OS/2 installations. For NetWare, you must transfer the files from a NetWare client that has TCP/IP support using software such as LAN Workplace for DOS. Be sure to choose ASCII file transfer mode.

The following is an example of a typical FTP transfer.

```
D:\users\default>ftp hostname
Connected to hostname
220 hostname FTP server ready.
User (hostname:): root
331 Password required for root.
Password:
230 User root logged in.
ftp> send

200 PORT command successful.

X.Y.24.20,1031).
226 ASCII Transfer complete.
128553 bytes sent in 8.21 seconds (15.67 Kbytes/sec)
ftp> quit
221 Goodbye.
D:\users\default>
```

In the example above, the file was transferred from the diskette in drive A to the directory `/usr/OV/snmp_mibs` on the target system.

Loading the MIB Files

Once you have the MIB files on your NetView for AIX console, follow this procedure to load them into your NetView for AIX configuration:

1. Select the *Option Load/Unload MIBs: SNMP...* menu item. A dialog box displays that lists the currently loaded MIBs.
2. Click on the *Load* button. A dialog box displays listing the MIB files in the default directory. If you transferred the Insight MIBs to this directory, they should be listed here (otherwise, specify the pathname where you put the files).
3. Highlight the desired MIB file and select *Load....* The Insight MIB automatically loads and the *Load/Unload MIBs* dialog box redisplay. Repeat this step until you load all the Insight MIB files.

4. Select the *Close* button to exit.

The Insight MIB files should compile without any errors. If the console displays error messages, do the following:

- ❑ Check the messages to determine which line(s) in the file contain the error(s).
- ❑ Check your file transfer procedure to verify that you transferred the file without problems. For example, you might have transferred them in binary format rather than in ASCII. In this case you must convert the DOS file formats to UNIX formats. Refer to your UNIX documentation for the appropriate command and syntax.

Refer to the *NetView for AIX User's Guide* under the topic "Loading and Unloading MIBs" for additional information.

NOTE: NetView for AIX ships with several preloaded MIBs (both enterprise and standard). These MIBs are in the default directory `/usr/OV/snmp_mibs`.

Discovering or Adding Compaq Servers to the Submap

You can add Compaq servers to your database manually or automatically by using the Discover tool. The following sections contain instructions for both methods.

Automatic Discover Tool

The NetView for AIX **netmon** process discovers (and subsequently polls for status) new managed devices on the network. Typically, this process does not require your intervention except to ensure that the routing tables at the NetView for AIX console are set up properly with the default gateway enabled.

The initial management region contains only the networks directly connected to the management station. You can expand this region two ways:

- Interactively expand the management region using the graphical map's *Options Manage Objects* operation.
- Provide a "seed file" that contains the IP addresses of SNMP-based routers on your network.

For further details, refer to the **netmon** Reference Page (man page) or to the *NetView for AIX User's Guide* under the topic "Using a Seed File to Control Network Discovery."

As the **netmon** process executes, it automatically adds new managed devices to the appropriate submaps. For instance, when you install Compaq servers on the network, the Discover tool automatically adds symbols to the view representing them as managed devices. This assumes that the servers are operational and configured to use IP, SNMP, and the Insight Agents.

If the new device appears in the */etc/hosts* file, NetView for AIX translates the IP addresses of the servers to hostnames. Otherwise, the symbol label on screen contains only the IP address.

The **netmon** process uses, by default, the file named */usr/OV/conf/oid_to_type* to determine the topological role of the discovered managed devices (gateway, bridge, hub, and so on). The **netmon** process queries the SNMP MIB-II variable *system.sysObjectID* to find a match between the value returned by the SNMP agent running on the managed device and an entry in the file. If there is a match, the symbol on the submap displays with the proper icon representing the properties (gateway, bridge, hub, and so on). If there is no match, the discovery process tries to classify the discovered managed devices into generic symbol classes representing computers, connectors, network devices and so on.

NOTE: Each symbol class has subclasses that provide further description. For example, the Computer class can have subclasses that describe PCs, workstations, minis, and mainframes.

The discovery process automatically represents Compaq servers on screen as a square symbol. This is a *generic* subclass of the Computer class. Details on modifying the subclass to a Compaq server are provided later in this chapter.

Manual Discovery

You can manually add a symbol representing a Compaq server using the *Edit Add Object...* command. Temporarily create a symbol representing a generic subclass in the Computer class, and change the subclass after you create a subclass specifically for a Compaq server (this is described later). To add a symbol, add the object first (an on-screen representation of the object). Refer to the *NetView for AIX User's Guide* under the topic "Adding Objects and Symbols."

Changing the Subclass Icon

You can change the subclass to represent servers and clients accurately. For the servers, you must create the subclass first (discussed later in this section). For clients, you can change the subclass type from generic to a PC. NetView for AIX ships with a subclass icon representing a PC. To change the subclass icon, perform the following procedure:

1. Select the object for which you want to change the icon subclass.
 2. Select *button 2* to bring up the symbol pop-up menu.
 3. From the pop-up menu, select *Edit Change Symbol Type...*
The Change Symbol Type dialog box appears.
 4. Select a new symbol subclass.
 5. Click *OK*. The dialog box closes and the symbol changes to the chosen symbol type.
-

Adding a New Subclass to the Computer Class

Adding a new subclass for a Compaq server involves:

- Modifying Field Registration files
- Creating bitmap files to represent Compaq Servers
- Defining a Symbol Subclass in the Symbol Registration file
- Modifying the configuration files

Each of these processes is discussed in detail.

Modifying Field Registration Files

NetView for AIX extensively uses field definitions, stored in Field Registration files. You can find these files in the directory */usr/OV/fields/\$LANG*, where *\$LANG* represents language-specific information. For default installations, *\$LANG* is defined as "C". You can usually find the Field Registration files in the directory */usr/OV/fields/C*. The two Field Registration files of interest are *ovw_fields* and *snmp_fields*.

The ovw_fields File

This defines the overall field definitions used by the NetView for AIX. Edit this file to update the vendor enumeration listing by adding "Compaq" to the list as follows:

```
Field "vendor" {
  Type Enumeration;
  Flags capability, general, locate;
  Enumeration "Unset",
    "Hewlett-Packard",
    "ACC",
    "Cayman",
    "cisco Systems",
    "CMC",
    "Compaq", ← Add this line.
    "Data General",
    "DEC",
    <other names follow here>
    "Xyplex"
  ;
}
```

Edit the file by adding a new field called *isCpqInsight*, signifying whether a given managed device is running the Insight Agents. Append the following to the end of the file:

```

/****
***
*   This field defines if the server is running
*           Compaq Insight Management Agents
***
****/
Field "isCpqInsight" {
    Type Boolean;
    Flags capability, locate;
}

```

The snmp_fields File

This contains various SNMP-related fields. Update the SNMP Agent enumeration listing by adding "Compaq Insight Management Agents" to the list as follows:

```

Field "SNMPAgent" {
    Type Enumeration;
    Flags capability, general, locate;
    Enumeration
        "Unset",
        "HP 3000/XL",
        <various HP agents follow here>
        "ACC 4140 Bridge/Router",
        "cisco Gateway Server",
        "cisco Terminal Server",
        "cisco T-Router",
        "cisco Protocol Translator",
        "Cayman GatorSystem",
        "CMC",
        "Compaq Insight Management Agents", ← Add this line.
        "DECstation",
        "DG Aviiion",
        <other vendor agent names follow>
        "Xyplex Remote Ethernet Bridge",
        "4BSD ISODE";
}

```

Incorporating the Changes

After making your changes, verify them as follows:

```
nv6000 -verify
```

The screen scrolls with the verified items, until it displays a "Verification complete" message.

To prevent the screen from scrolling by too fast for you to read the messages, use the **more** command:

```
nv6000 -verify | more
```

If you have any errors, correct them and try again. When you have no errors, you can add the new fields to the database by entering the following command:

```
nv6000 -fields
```

This verifies the field syntax for fields that exist in the database and adds the new fields. For further details, refer to the *NetView for AIX Programmer's Guide* under the topic "Creating Fields."

Creating Bitmap Files to Represent Compaq Servers

NetView for AIX represents objects as symbols. Each symbol has a class (such as Computer) and a subclass (such as PC). The class has a shape associated with it. For example, computers are represented as squares, networks as circles, and so on. Within each class, the subclass has a bitmap representation, enclosed by the class shape. A PC bitmap surrounded by a square represents a PC on-screen, denoting that it is a member of the Computer class. To define a new subclass for a Compaq server, you must create bitmap files of the proper size.

Bitmap files are always in pairs, containing the bitmap and a bitmap mask used as a stencil. These files follow the name syntax:

filebase.size.type

Where *filebase* is the name of the subclass, *size* is the size in pixels, and *type* denotes if this is a bitmap or a bitmap mask. The *type* is always a "p" for bitmaps or an "m" for masks.

You can find bitmap files in the directory */usr/OV/bitmaps/\$LANG*, where *\$LANG* represents language-specific information. For default installations, *\$LANG* is defined as "C". You can usually find the Field Registration files in the directory */usr/OV/bitmaps/C*.

Compaq provides bitmap files that represent Compaq servers in the *\HP_OV* directory of the Compaq Insight Management MIB diskette. Refer to the *README.TXT* file on the diskette for more information. You can transfer these files to your NetView console by using one of the methods described previously in this chapter. If you use these files on the Compaq Insight Management diskette, the procedure to create bitmaps manually is *not* required.

You can use the icon or bitmap editor program supplied with your system to create the icon files and their masks. The following figures illustrate the bitmap and its corresponding mask for a Compaq server with a size of 38 x 38 pixels.

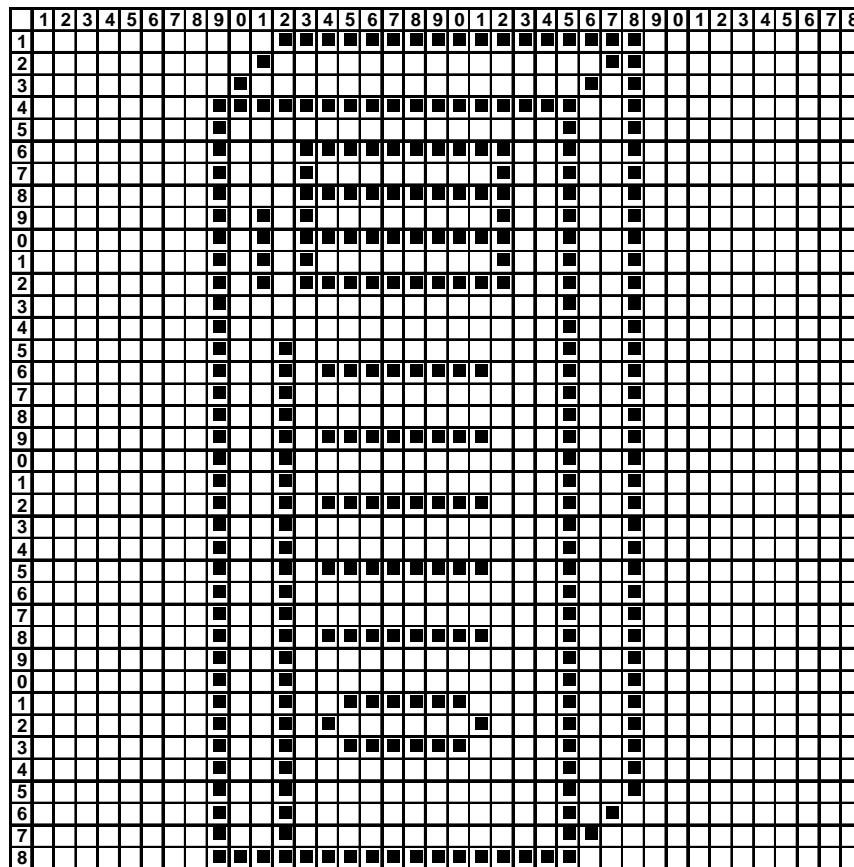


Figure 4-1. Bitmap for a Compaq server (38 x 38 pixels)

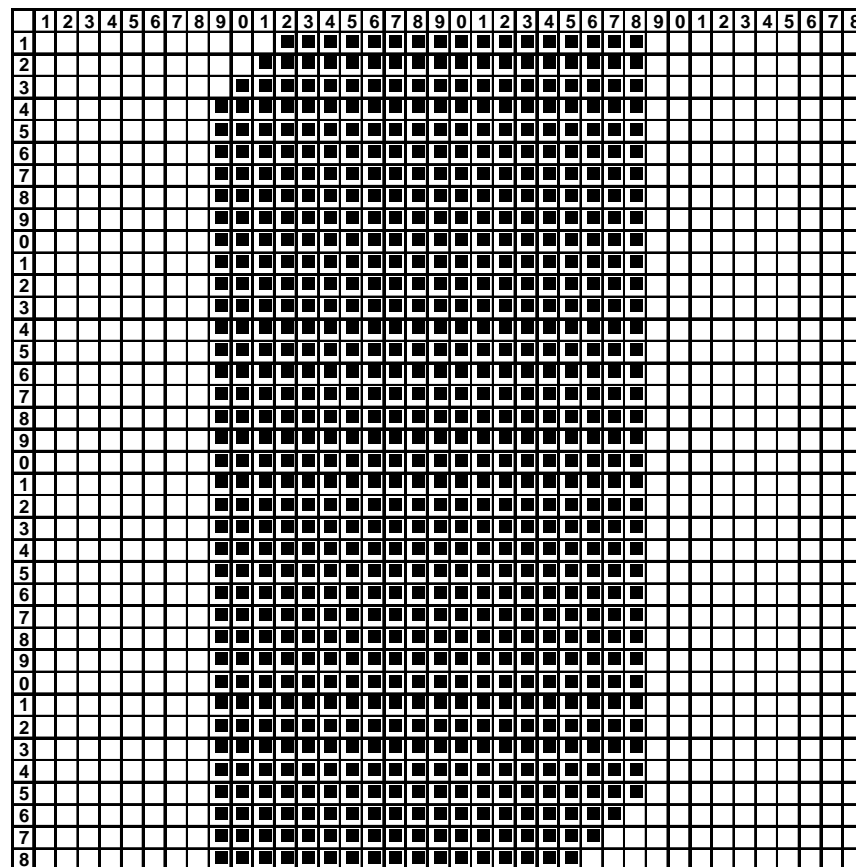


Figure 4-2. Bitmap mask for a Compaq server (38 x 38 pixels)

NOTE: IBM recommends defining bitmap files with the following sizes (in pixels): 20 x 20, 26 x 26, 32 x 32, 38 x 38, 44 x 44, and 50 x 50. You must have at least one pair of bitmap files (icon and mask file) of a particular size.

For further details, refer to the *NetView for AIX Programmer's Guide* under the topic "Creating Bitmaps for AIX NetView for AIX Symbols."

Defining a Symbol Subclass in the Symbol Registration File

NetView for AIX extensively uses field definitions, stored in Symbol Registration files. You can find these files in the directory `/usr/OV/symbols/$LANG`, where `$LANG` represents language-specific information. For default installations, `$LANG` is defined as "C". You can usually find the Symbol Registration files in the directory `/usr/OV/symbols/C`.

You can find several files for symbol classes here, including one for the Computer class. Edit the Computer Symbol Registration file to add the following subclass definition:

```
SymbolType "Computer" : "Cpqsvr"
{
  Filebase "cpqsvr";
  CursorSize 38;
  Capabilities {
    isPC = 1;
    isCpqInsight = 1;
  }
}
```

NOTE: The **filebase** name must match the **filebase** name of the bitmap files you created earlier.

Incorporating the Changes

After making your changes, verify them by entering the following command:

```
nv6000 -verify
```

The screen scrolls with the verified items, until it displays a "Verification complete" message.

To prevent the screen from scrolling by too fast for you to read the messages, you can use the **more** command:

```
nv6000 -verify | more
```

If you have any errors, fix them and try again. You can also compile your previously defined bitmap files by entering the following command:

```
nv6000 -config
```

For further details, refer to the *NetView for AIX Programmer's Guide* under the topic "Defining Symbol Subclasses."

Modifying the Configuration Files

NetView for AIX uses configuration files to map the SNMP MIB-II *system.sysObjectID* variable to symbol types. The two configuration files of interest are *oid_to_sym* and *oid_to_type*. Read the *NetView for AIX Installation and Configuration Guide* under the topic "Editing the *oid_to_sym* file" and "Editing the *oid_to_type* file" for more details of the contents of the files. Before editing these files, ensure that the NetView for AIX End User Interface (EUI) is not running.

! **IMPORTANT:** Compaq servers without Insight Agents and other manufacturer's servers running SNMP agents that return MIB-II information, incorrectly identify themselves as Compaq servers with Insight Management capabilities. This occurs because the *system.sysObjectID* returned by the agent is network operating system dependent, not hardware dependent. For such servers, you must manually modify their symbols to represent computers with no Insight Management capabilities. This affects only new servers you add to the network after making changes.

The oid_to_sym File

This file is in the *\$LANG* subdirectory under the directory */usr/OV/conf*, where *\$LANG* represents a language-specific configuration. By default, the file *oid_to_sym* is in the directory */usr/OV/conf/C*.

The NetView for AIX process **ipmap** uses this file to match against the *system.sysObjectID* returned by an agent. Because Insight Agents are based on the network operating system, you must add entries for each operating system that has Insight Agents available. For example, for NetWare, Windows NT, SCO UNIX, UnixWare, and OS/2, you must edit the file and append these entries:

```
1.3.6.1.4.1.23.1.6:Computer:Cpqsrvr           # NetWare
1.3.6.1.4.1.23.1.6.3.11:Computer:Cpqsrvr      # NetWare 3.11
1.3.6.1.4.1.23.1.6.3.12:Computer:Cpqsrvr      # NetWare 3.12
1.3.6.1.4.1.23.1.6.4.10:Computer:Cpqsrvr      # NetWare 4.10
1.3.6.1.4.1.311.1.1.3.1:Computer:Cpqsrvr      # Windows NT
1.3.6.1.4.1.232:Computer:Cpqsrvr             # SCO UNIX
1.3.6.1.4.1.23.1.13.2:Computer:Cpqsrvr        # UnixWare 2.10
1.3.6.1.4.1.2.6.46:Computer:Cpqsrvr           # OS/2
```

NOTE: The field *Cpqsrvr* must match the new symbol type defined earlier.

The oid_to_type File

This file is in the `/usr/OV/conf` directory. The NetView for AIX process **netmon** uses it to match against the `system.sysObjectID` returned by an agent. Because Insight Agents are based on the network operating system, you must add entries for each operating system that has Insight Agents available. For example, for NetWare, Windows NT, SCO UNIX, and OS/2, you must edit the file and append these entries:

```
1.3.6.1.4.1.23.1.6:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.3.11:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.3.12:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.4.10:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.311.1.1.3.1:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.232:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.13.2:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.2.6.46:Compaq:Compaq Insight Management Agents
```

NOTE: The fields *Compaq* and *Compaq Insight Management Agents* must match the vendor and SNMP agent field enumerations defined earlier in the Field Registration files.

Incorporating the Changes

After you make the changes, reinitialize NetView for AIX to startup. The changes that you made are now incorporated into your NetView for AIX configuration. For each Compaq server, change the symbol subclass to represent the server bitmap defined earlier. If you have not done so, change any generic computer symbols to represent any PC clients in your network.

Adding Custom Applications

Through the use of registration files, you can add items to the NetView for AIX menus which can display and graph collected information to suit your needs. Applications can design simple on-screen reports or more sophisticated reports that place specific information in a window. You can also build MIB applications for on-screen reporting using the Application Builder or use the Application Registration files for complex operations that require other background processes to run.

Some examples are given in the following sections. One example uses the Application builder, the other uses the Application Registration file. You can use these as sample applications to build your own.

In addition, Compaq has included several Application Registration files on the Compaq Insight Management MIB diskette. When integrated into the NetView for AIX system, these files gather and display important information about your Compaq servers.

Adding the Compaq Query Files

Compaq includes some pre-defined Application Registration files on the Compaq Insight Management MIB diskette. These files implement queries for the data that is described in Appendix A, "Using the Compaq MIB Information." An explanation of data contained in these items is given in this Appendix.

There are several ways to transfer the Insight MIB files from the Compaq Insight Management MIB diskette to your NetView for AIX console. First, you can use the **dosread(1)** command to copy the files directly from the diskette. Consult the AIX documentation for the details of using the command.

Another method to transfer files is to use the File Transfer Protocol (FTP). The details of using FTP to transfer the files are given in the section "Transferring MIB Files to the NetView for AIX Console" earlier in this chapter.

The files on the MIBs diskette are named *<filename>.ARF* where *<filename>* denotes an MS-DOS filename base. The path that NetView for AIX uses to store Application Registration files is */usr/OV/registration/C*.

After you copy the MIB Query Application Registration Files to the NetView for AIX console, you must restart the NetView for AIX application to activate the files. When NetView for AIX restarts there are many new menu items under the *Monitor Compaq Server* menu item.

To use the queries, select a Compaq server from a map then choose an item from the *Monitor Compaq Server* menu. A window displays the information in a labeled table that corresponds to the item you selected. The menu items correspond with the various categories of information described in Appendix A, "Using the Compaq MIB Information".

If you choose not to use the query files, the following sections provide examples of obtaining the information manually.

Slot Configuration Information

One common requirement is to obtain configuration information on your Compaq server; for example, information on the controllers you installed in a server. Because the Insight Agents provide you with EISA slot information, it is easy to build an application that retrieves the configuration information and displays it as a table. To do this, follow these steps:

1. Select *Tools Application Builder: SNMP ...* from the Main menu bar. The MIB Application Builder dialog box appears.

2. Type the name of the application in the *Application ID* field:

Compaq.SlotCfg

The information is stored in this file.

3. Select *Table* from the choices displayed to specify the application type.

4. Enter a suitable title for your application, such as:

EISA Slot Configuration

5. Select the *Add* button. The MIB Application Builder/Add MIB Objects dialog box displays.

6. Navigate the MIB tree to select elements from the appropriate table. The path to the information is:

```
Private
  Compaq
    Standard Equipment
      Component
        EISA NVRAM
          EISA Slot Table
            EISA Slot Entry
```

7. Select the following fields from the table:

EISA Slot Index
EISA Slot Board ID
EISA Slot Board Name

These fields identify the slot number, EISA ID, and board description respectively. For each highlighted field, select *Apply*. This adds the field to the Display Fields list. (You have the option to edit the label and width fields to suit your needs.)

8. Specify the menu path using " " to create cascading menus. For instance:

Monitor Compaq EISA Slot Configuration

9. Enter the selection rule to determine the conditions for highlighting menu items that are available to the user to execute. The default is:

(isSNMPSupported) || (isSNMPProxied)

You can override this to specify only servers with Insight Agents as in:

(isSNMPSupported) && (isCpqInsight)

10. You can also add help text to provide assistance for using this application. When completed, you should see a window similar to Figure 4-3:

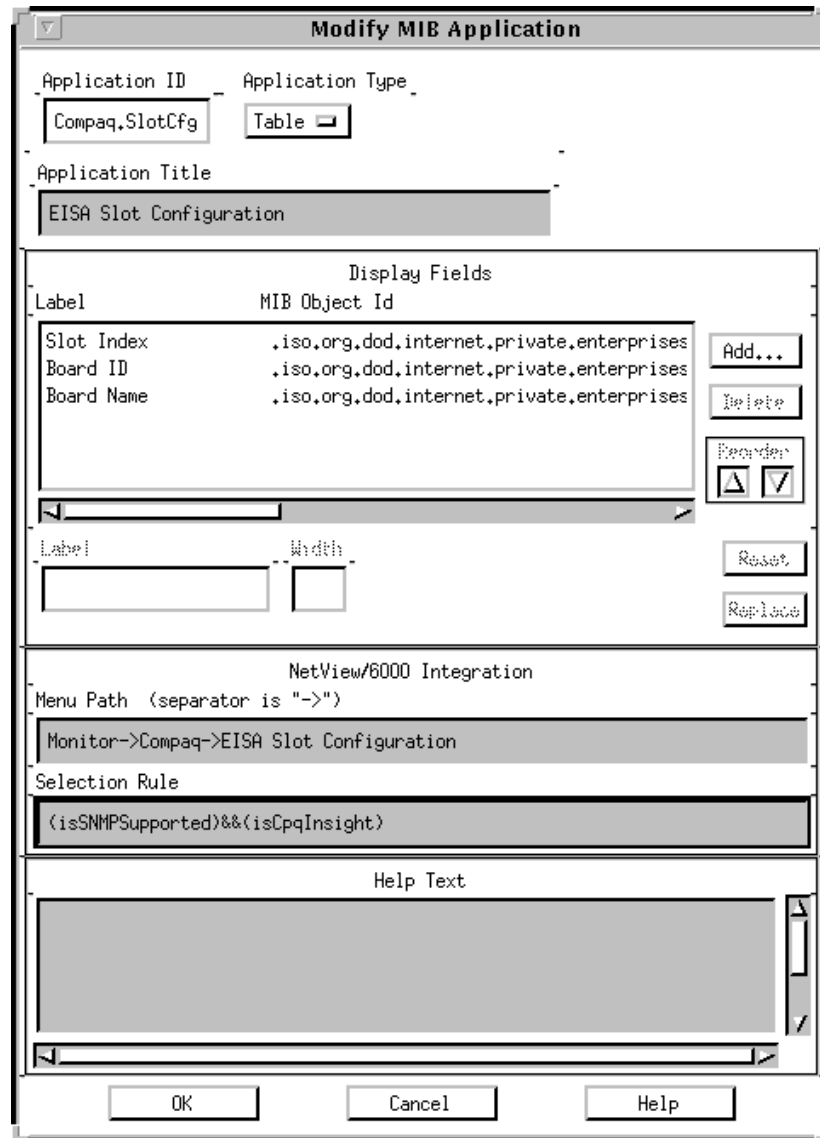


Figure 4-3. Building an application for EISA configuration information

11. Click on the *OK* button to add the application.

12. Return to the menu bar to view the application menu choice in the path set up in step 8 of this procedure.
13. Highlight a Compaq server and execute the application to verify the application. You should see a display similar to the following.

Slot Ind	Board ID	Board Name
0	CPQ0109	COMPAQ SYSTEMPRO System Board (ASSY # 001981)
1	CPQ4001	COMPAQ 32-Bit Intelligent Drive Array Controller
2	NVL0701	Novell NE3200 Bus Master Ethernet
3		(Empty)
4		(Empty)
5		(Empty)
6		(Empty)
7	CPQ6100	COMPAQ 32-Bit NetFlex Controller
8	CPQFA0D	COMPAQ 32-Bit 4-Socket System Memory Board
9		(Empty)
10		(Empty)
11	CPQ9999	COMPAQ 486/33 System Processor Board used as Primary

Getting Contact Information From an Offline Device

Another common requirement is the need to retrieve node contact information on an offline device, such as location, contact person, and so on. SNMP MIB-II compliant agents provide this information, which you can easily retrieve when the managed device is online. However, this method does not work when the device is offline.

NetView for AIX provides a solution: The NetView for AIX IP Topology database contains information, on a per-object basis, of the IP address, contact name, location, and so on. This database continually updates, even if a particular managed device is offline. You can print out the corresponding object information based on the last time NetView for AIX established contact to that device. You can "dump" out the contents of the database for any object by using the **ovtopodump** command as follows:

```
ovtopodump -l <object name> | more
```

You should see a display similar to the following (example shows only the first few lines):

```
HOSTNAME: test311
NODE ID: 569
CREATE TIME: 05/20/93 11:55:40
MODIFIED TIME: 06/07/93 09:16:24
SYMBOL CHANGE TIME: 06/04/93 12:34:00
STATUS: Up
FLAGS:
DESCRIPTION: Novell NetWare v3.11 (250 user) 2/20/91
DESCRIPTION: Compaq DeskPro 386, 16 MHz, 8 Meg
LOCATION: Room 69
LOCATION: 1234 Main Street
LOCATION: City, State, Country
LOCATION: The Universe
CONTACT: Jane Doe
CONTACT: 1.555.1234
CONTACT: jane.doe@company.com
SNMP OBJECT ID: 1.3.6.1.4.1.23.1.6
```

The database dump provides you with useful contact information when the managed device is offline. You can now build an application to do the following:

- Redirect the output to a temporary file.
- Filter out selected information to a second temporary file.
- Put up an X Window with the contents of the second file.
- Wait for user input to clear the window.
- Clean up the temporary files.

To build this application, you must first "register" the application with NetView for AIX. NetView for AIX stores Application Registration files in the directory `/usr/OV/registration/$LANG`, where `$LANG` represents a language-specific configuration. By default, these files are in the directory `/usr/OV/registration/C`.

For details on building Application Registration Files and integrating applications to the NetView for AIX menu bar, refer to the *NetView for AIX Programmer's Guide* under the topic "Understanding Application Registration Files."

The following list illustrates an Application Registration File:

```
/*
**
** NetView for AIX Node Information
**
** @(#)Revision: 1.0 $
*/
Application "NetView for AIX Node Information"
{
  Version "Revision 1.0";
  Description {
    "Dump the topo database information for the selected node."
  }
  Copyright {
    "(c)Copyright 1994 Compaq Computer Corp."
  }
}
/*
** Monitor
*/
MenuBar "Monitor"
{
  "Node Info" f.action "Topo Dump";
}
Action "Topo Dump"
{
  MinSelected 1;
  MaxSelected 1;
  SelectionRule isNode;
  Command 'xterm -bg cyan -geo 115x20 \
-sb -title "$OVwMenuItem - (${OVwSelection1})" -e sh -c \
"/usr/OV/bin/ovtopodump -l ${OVwSelection1} > /tmp/topo.dmp;\
awk -f /usr/OV/bin/node /tmp/topo.dmp;more /tmp/topo.prn;\
rm /tmp/topo.* > /dev/null;read x";
} }
```

This application lets you select a Compaq server, even one that is offline, and view the contact information for that server. The application uses an AWK (programming language) script file to include only required information in the file *topo.prn*. The following list contains script for the "node" file. Include this file in the directory */usr/OV/bin*:

```
BEGIN {
print " " > "/tmp/topo.prn"
eof = getline
while (eof > 0)
{
if ($1 == "HOSTNAME:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "STATUS:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "DESCRIPTION:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "LOCATION:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "CONTACT:")
{ print $0 > "/tmp/topo.prn" }
| if ($1 == "NODE")
{
if ($2 == "LABEL:")
{ print $0 > "/tmp/topo.prn" }
if ($2 == "AGENT:")
{ print $0 > "/tmp/topo.prn" }
if ($2 == "VENDOR:")
{ print $0 > "/tmp/topo.prn" }
}
if ($1 == "SUPPORTS")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "NUMBER")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "INTERFACE:")
{ print $0 > "/tmp/topo.prn" }
}
```

continued

```
if ($1 == "IP" )  
  { print $0 > "/tmp/topo.prn" }  
if ($1 == "PHYSICAL" )  
  { print $0 > "/tmp/topo.prn" }  
if ($1 == "LAST" )  
  { print $0 > "/tmp/topo.prn" }  
if ($1 == "CONSECUTIVE" )  
  { print $0 > "/tmp/topo.prn" }  
eof = getline }
```

Figure 4-4 illustrates a sample output from the application.

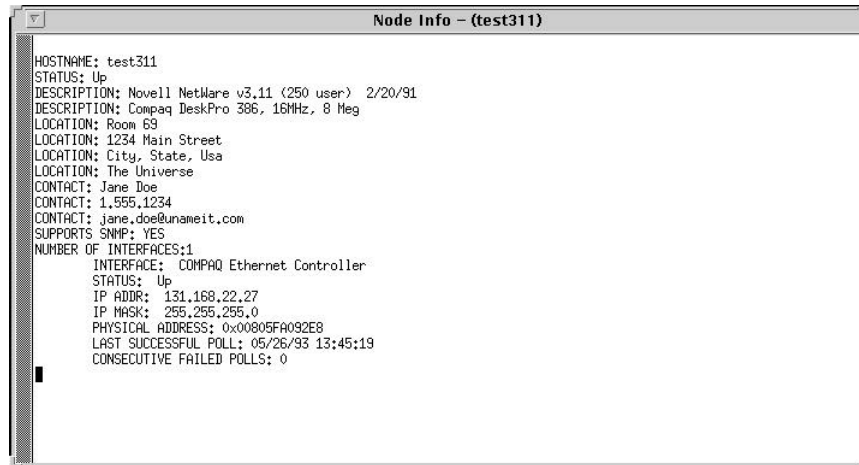


Figure 4-4. Contact information application

Using the Information

Once you integrate the Insight MIBs and build your applications with NetView for AIX, you can manage your Compaq servers in the same manner as your other managed devices.

NetView for AIX provides the following methods to obtain and use the information in the MIBs:

- Browsing the MIB
- Predefined and custom monitor applications
- Event configuration and monitoring

The following sections describe each of these methods in detail.

Browsing the MIB

NetView for AIX provides a quick method of browsing up and down the MIB tree. To invoke the MIB browser, select the *Tools Browse MIB: SNMP...* menu item. Start at the root, traversing up and down any branch until you get to a MIB variable of interest. Select the *Start Query* button to retrieve information about that variable.

NOTE: Once you load the Insight MIB files, the MIB values are available for any selected Compaq server with the Insight Agent operational.

Figure 4-5 displays available Insight MIBs (the exact screen content depends on your installation):

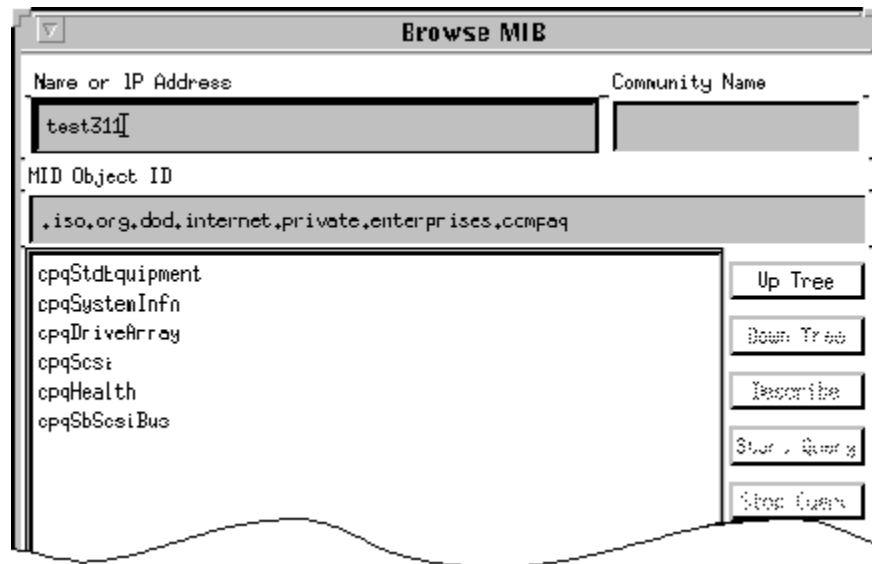


Figure 4-5. Browsing the Compaq MIB subtree

NOTE: You can SET Insight MIB variable values when browsing the MIB subtree.

! **IMPORTANT:** Insight Agents for each operating system might have different levels of SET support. Refer to the appropriate *Compaq Insight Management Agents User Guide* for more information.

For example, select the subtree and start a query to retrieve the existing value to update the contact information. Select the value you want to change, then enter a new value. When you click on the *Set* button the MIB value updates. Figure 4-6 illustrates an example.

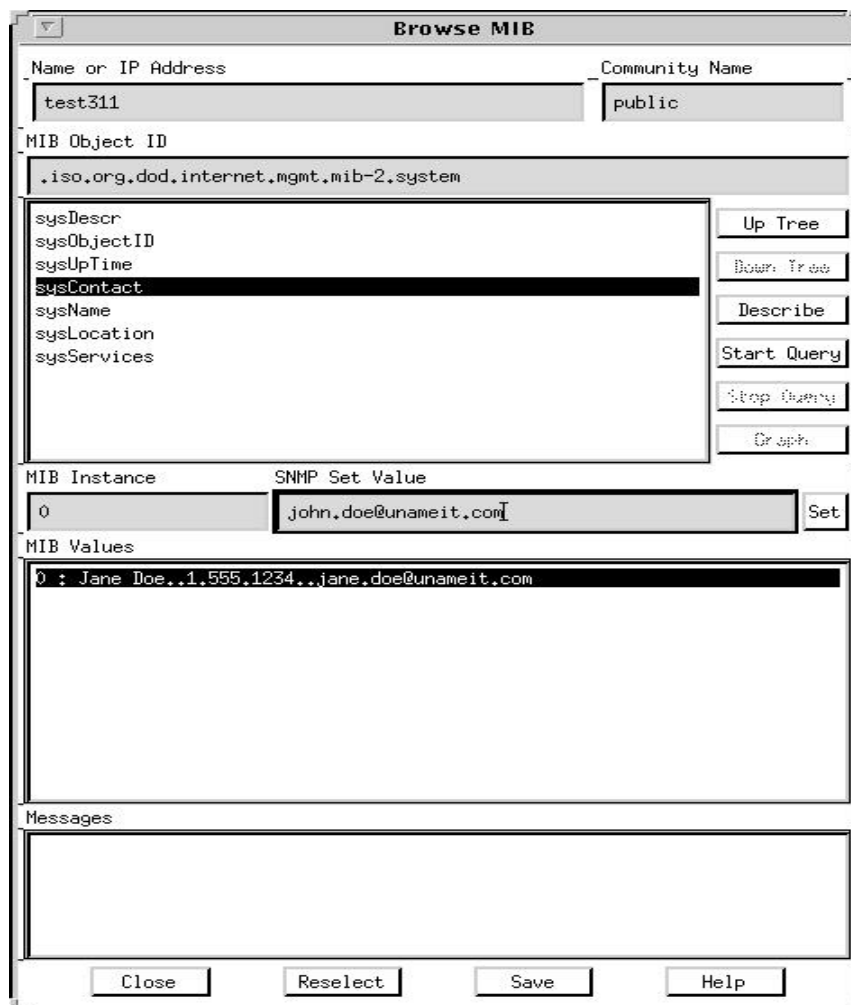


Figure 4-6. Setting MIB values

For details on browsing the MIB and setting values, see the *NetView for AIX User's Guide* under the topic "Browsing MIBs."

Predefined and Custom Monitor Applications

Browsing MIB values is just one example of the predefined applications available to you on the Monitor menu of the NetView for AIX menu bar. In addition, Compaq has included several custom MIB query files on the Compaq Insight Management MIB diskette which provide important configuration, statistical, and condition information.

As discussed in "Adding Custom Applications" of this chapter, you can further enhance the predefined suite of applications by building your own.

Applications on the Monitor menu not only provide you with on-screen reports, they can also graph trends in MIB variables. For example, to monitor the traffic of a particular network interface controller in a server:

1. Highlight the server symbol on the map.
2. Select *Monitor Network Activity Interface: Traffic ...* from the menu bar. When the data processing completes, a window displays the network traffic graph.

For more details on using these applications, refer to the *NetView for AIX User's Guide* under the topic "Using NetView for AIX Predefined Applications."

Event Monitoring

An event is a notification of a change in your network. NetView for AIX categorizes events into:

- Threshold Events
- Network Topology Events
- Error Events
- Status Events
- Node Configuration Events
- Application Alert Events
- All of the above

You can use the Event Notification window to view selectively a particular category of events, or all events. You can further narrow your selection to a particular highlighted symbol (for example, a specific Compaq server).

You can proactively monitor the health of your network using events. This TechNote does not include a detailed discussion of event monitoring. For guidelines on establishing baselines, monitoring trends, setting up thresholds on MIB values, and so on, refer to the *NetView for AIX User's Guide* under the topic "Working with Events and Event Filters."

Handling Traps

Traps are a method of reducing network traffic. An agent can send information to a management PC when requested, or unsolicited. Traps, unsolicited information, indicate that something changed at the agent which requires attention.

If you do not specify the NetView for AIX console as a trap destination, the traps remain locally at the agent. This means that the NetView for AIX console does not know about an impending problem until it polls the agent about the specific problem area. Excessive polling generates heavy network traffic and degrades performance. Therefore, Compaq strongly recommends that you set up at least one trap destination at each critical server as the IP address or hostname of your NetView for AIX console.

Trap IDs have a generic part and a specific part. The generic part of a Compaq trap is always six (for Enterprise-Specific traps), and zero through five are used as part of the SNMP definition for other trap types. The specific part depends on the type of error.

Setting Up Compaq Traps

Compaq provides two files, *TRAPHDR.CPQ* and *TRAPD.CPQ*, on the Compaq Insight Management MIB diskette. These files are provided to help you configure NetView for AIX to receive and process Compaq traps. Refer to the *README.TXT* file on the diskette for more information.

NOTE: If you use the files on the Compaq Insight Management MIB diskette, the following steps are *not* required.

To set up Compaq traps manually, perform the following steps:

1. Select Options→Trap Customization: SNMP...
2. Select the *Add New Enterprise* dialog box button in the dialog box.
3. Add a new enterprise for Compaq, using the following ID:
Compaq 1.3.6.1.4.1.232
4. Add the generic trap ID (six) and specific trap IDs you want for each enterprise. For details on Compaq trap IDs, refer to Appendix A, "Using the Compaq MIB Information."

Insight Agents version 1.x defines one enterprise per subsystem, for example, Compaq-IDA = 1.3.6.1.4.1.232.3, Compaq-SCSI = 1.3.6.1.4.1.232.5, and so on. Insight Agents version 2.x defines a single enterprise, for example, Compaq = 1.3.6.1.4.1.232, and the specific ID of the trap type defines the subsystem, for example, 30xx for IDA, 50xx for SCSI.

! **IMPORTANT:** For compatibility with older systems, you must configure your NetView for AIX console to handle traps from both the older and newer NetWare Agents. Windows NT, SCO UNIX, UnixWare, and IBM OS/2 agents follow the Compaq Insight Manager 2.x format.

Figure 4-7 illustrates an example configuration for a Compaq Intelligent Drive Array enterprise ID, and a specific trap ID of four, implying that the physical drive threshold was exceeded.

NOTE: This example displays an Insight Agent version 1.x trap.

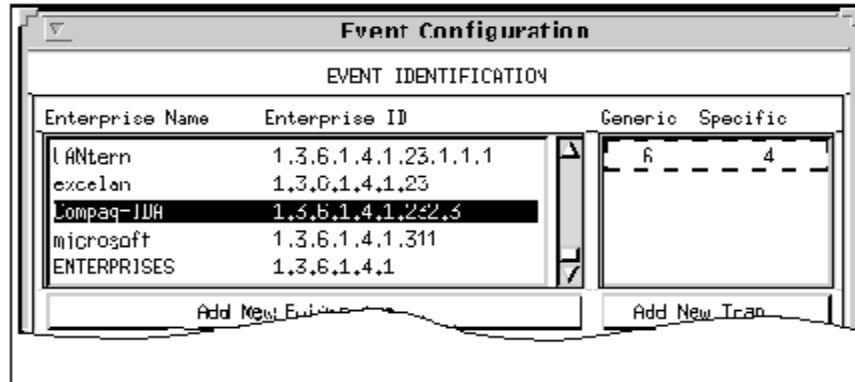


Figure 4-7. Setting up a Compaq IDA trap definition

Once the trap definitions are set up, you can view new traps through the Events Notification window, similar to other events. The following displays a sample event list with Compaq IDA traps.

NOTE: The following example illustrates a version 1.x trap.

```

A Trap #6, specific: 4, args (1):
A [1] cpqDaPhyDrvEntry.cpqDaPhyDrvThresh
Passed.1.4 (Integer): 2
A Trap #6, specific: 4, args (1):
A [1] cpqDaPhyDrvEntry.cpqDaPhyDrvThresh
Passed.1.3 (Integer): 2
    
```

Troubleshooting

If you do not receive traps at your NetView for AIX console when your network is operational, check the following:

- Verify the configuration of the managed devices to ensure they are forwarding traps to your NetView for AIX console.
- Verify the read and read-write community settings.

Integration to Other Systems

IBM and other third party systems provide NetView for AIX platform support with products in several areas of network management such as problem solving, configuration management, capacity planning, trouble ticketing, and so on. For details about additional products, contact:

NetView Association from IBM and Digital
3039 Cornwallis Rd.
Research Triangle Park, NC 27709

You can also build custom applications using the NetView for AIX APIs. This TechNote does not discuss these techniques in detail. However, you can integrate NetView for AIX to other systems with limited programming. For example, sending e-mail messages from NetView for AIX as a result of receiving a trap from a Compaq server.

Event Notification via E-Mail

Significant events often require some action from an administrator. One way to notify an administrator is to send a message to the administrator's mailbox.

To set up NetView for AIX to send e-mail messages, ensure that:

- Your domain name is set correctly and matches the domain name of other computers on the network. The following is an example format of domain name: *Yourcompanyname.com*.
- You can send e-mail. As a test, try to send mail to your login ID at the NetView for AIX console. If you logged in as root, use root as the mail ID.

For each event that you forward to the mail gateway, you must set up the *Optional Command and Argument Format* field on the Event Configuration screen as follows (replace the "Admin@Sysmgtpo" with your own mail address):

```
/usr/local/bin/mailevent "Compaq IDA trap received from node: $A with $# args:\n$*" "Admin@Sysmgtpo"
```

Figure 4-8 shows an example of configuring an event to send mail:

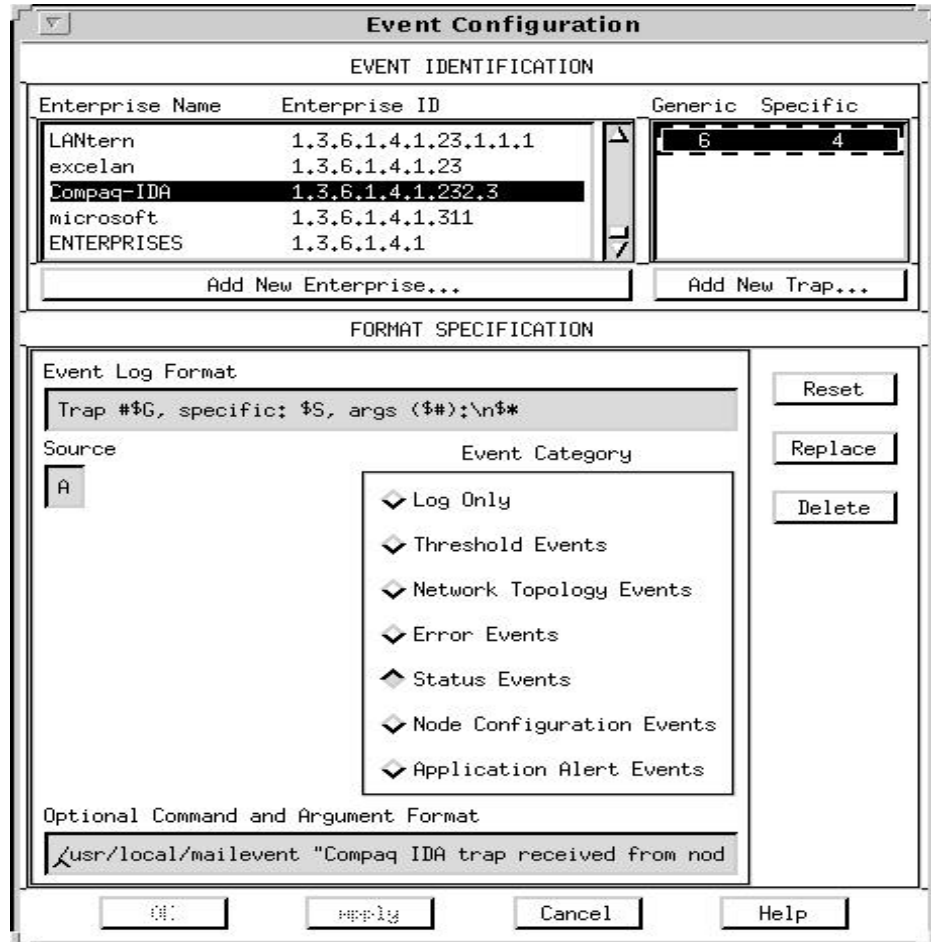


Figure 4-8. Configuring an event to send mail

When the event occurs, it invokes the **mailevent** script, sending the mail message. The contents of the **mailevent** script include:

```
MSG=$1
TO=$2
echo "${MSG}" | /usr/lib/sendmail "${TO}"
```

Refer to the NetView for AIX the online help for the *Options Event Configuration: SNMP...* screen for details on the \$A, \$#, and \$* parameters in the trap notification message.

Some points regarding setting up events:

- Choose events carefully. Do not flood the administrator's mailbox with an e-mail message for every event occurring in the network.
- Try to route different classes of events to different people. For instance, one person might be notified about critical events for routers, another might be notified only of server events, and so on.

Chapter 5

Integration with SunNet Manager

This chapter discusses the integration of Compaq server management with SunNet Manager from SunConnect (a Sun Microsystems, Inc. Business). The information is based on tests performed in the Compaq Integration Lab using a test network.

NOTE: In this chapter, several examples involve IP addresses. IP addresses are denoted for example purposes as X.Y.<number>.<number>, where X.Y. represents a Class B network address, and <number> is a value from 0 to 255.

Feature Summary

SunNet Manager is an internetwork and enterprise-wide management platform that manages a variety of devices such as hubs, bridges, routers, and servers.

The following are some key features of SunNet Manager:

- Support of industry-standard protocols such as SNMP, TCP/IP, and RPC. This includes tools such as a MIB compiler that translates MIB definitions into schemas used by SunNet Manager.
- Communication capability with private network management protocols through a proxy agent. SunNet Manager provides manager and agent services and topology map APIs.
- Node discovery that can seek out, identify, and display managed TCP/IP devices.
- Results browsing and graphing tools.
- Auto-management feature that lets you set up predefined events that start up automatically for specific elements on your network.

Integration Environment

Compaq tested the SunNet Manager integration using the following hardware and software configuration:

- Sun SPARCstation 1+ with 32 megabytes of memory, an external 600-megabyte disk drive, a CD-ROM drive, and a mouse.
- SunOS, Version 4.1.3, configured with Sun OpenWindows, Version 3.0 (also known as Solaris Version 1.1).
- SunNet Manager, Version 2.0.

NOTE: For specific hardware and software requirements, consult your SunConnect representative.

Preinstallation Considerations

Review the information in this section if you are installing SunNet Manager for the first time. If you are an experienced user of SunNet Manager, proceed to the section, "Adding Compaq Server Support."

Network Operation Considerations

Before you install SunNet Manager, perform the following procedure:

1. Ensure that your network and servers are operational.
 - a. Verify that your server supports IP on the segment between the server and SunNet Manager.
 - b. Verify successful connectivity between the workstation and servers by using the **ping** utility.
 - c. Verify connectivity by selecting the critical servers on specific subnets or network segments. If you are unable to connect, check the following items:
 - Physical connections and operation of your servers
 - Hubs, bridges, and routers
 - TCP/IP configurations including subnet masks
 - Routing tables at the routers
2. Ensure that you have successfully installed the Insight Agents for the appropriate operating system and the agents are operational on each server. Also verify that you specified the SunNet Manager as one of the trap destinations for each server. For details on how to configure your server to send traps, refer to the appropriate *Compaq Insight Management Agents User Guide*.

NOTE: Compaq Insight Management Agents are licensed software. You need a separate license for each server you wish to manage.

SunNet Manager Console Considerations

Check the following items before performing the next procedure:

1. Verify your network configuration at the SunNet Manager console.

Enter the **ifconfig** command at the SunOS prompt, as shown in the following example:

```
ifconfig le0
```

NOTE: **le0** is the Ethernet network adapter interface defined under SunOS. Your interface name might be different.

This command produces a display similar to the following:

```
le0: flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>  
inet X.Y.24.41 netmask fffff00 broadcast X.Y.24.0  
ether 8:0:20:a:b3:2a
```

NOTE: The information actually displays on two lines.

This display illustrates the configuration for the network adapter interface:

- IP address X.Y.24.41
 - Subnet mask ff.ff.ff.0 (255.255.255.0)
-

2. Verify that you have mapped the proper hostname to the correct IP address.

For example, the SunNet Manager console on the Test Network has the IP address of X.Y.24.51 and a hostname. To resolve a hostname to an IP address, you must either have a Domain Name Service (DNS) or a host file. In either case, you must confirm that the names of the SunNet Manager console and all the servers in your network map their IP address to their appropriate names. SunNet Manager uses these names, rather than IP addresses, to describe events such as alarms.

NOTE: Some installations, particularly those running SunOS, might use the Network Information Service (NIS). NIS also resolves IP addresses -- the specific mechanism depends on the installation. NIS and DNS can coexist on the same network.

You can choose any meaningful name for the hostname (specific implementations might impose certain limitations on the length and the characters allowed in the hostname). Network management applications such as SunNet Manager use these names, rather than IP addresses, to describe events such as alarms.

3. Verify that you can **ping** other servers by address and by hostname. The following is an example commands and system responses:

```
ping ctc_as
```

```
ctc_as is alive
```

```
ping X.Y.109.16
```

```
X.Y.109.16 is alive
```

NOTE: The hostname and IP address depend on your installation.

4. Verify that your host file contains the name of the SunNet Manager.

This file should have the *loghost* entry as shown in the following sample lines of */etc/hosts*:

```
#
# Sun Host Database
#
# If the NIS is running, this file is only consulted when booting
#
127.0.0.1    localhost
#
X.Y.24.41  hostname loghost hostname.compaq.com
#   SunNet Manager
#
# Hosts file for compaq.com domain
#
```

5. Verify that the SNMP daemon (the process) started successfully.

If you have root privileges, enter the following command to verify the processes running on your system:

```
ps -aux | more
```

You should see a display similar to the following:

USER	PID	%CPU	%MEM	SZ	RSS	TT	STAT	START	TIME	COMMAND
root	1591	38.5	1.6	228	472	p2	R	12:48	0:00	ps -aux
root	1	0.0	0.0	52	0	?	IW	Apr 29	0:00	/sbin/init -
root	2	0.0	0.0	0	0	?	D	Apr 29	0:00	pagedaemon
root	104	0.0	0.0	80	0	?	IW	Apr 29	0:00	/usr/etc/snmpd
								/etc/s		
root	53	0.0	0.0	56	0	?	IW	Apr 29	0:12	portmap
root	133	0.0	0.0	4340	0	co	IW	Apr 29	14:42	
								usr/openwin/bin/xnews :		

Where the **snmpd** process is the SNMP daemon.

6. If you plan to use the SunNet Manager Discover tool to identify managed devices automatically, verify the accuracy of the routing tables at your console. The Discover tool extensively uses the routing tables to identify active managed devices.

To view your routing tables, enter the following command:

```
netstat -rn
```

Your display should look similar to the following (the actual display depends on your installation):

Routing tables	Destination	Gateway	Flags	Refcnt	Use	Interface
127.0.0.1	127.0.0.1					
default	X.Y.24.51					
X.Y.24.0	X.Y.24.41					
X.Y.25.0	X.Y.24.51					
X.Y.109.0	X.Y.24.42					

NOTE: The example that follows refers to the setup used for test purposes.

In this example, there are three subnets:

- ❑ X.Y.24 is the subnet where the SunNet Manager console is located. This forms the Development Network portion of the test network. Addresses on this subnet are routed through the IP address of the local network controller **le0** (X.Y.24.41).
- ❑ X.Y.25 is the X.25 portion of the test network. IP addresses for this subnet are routed through the UNIX router (X.Y.24.51) via the local network controller **le0** (X.Y.24.41).
- ❑ X.Y.109 is the Token Ring backbone of the test network. Addresses on this subnet are routed through the NetWare router (X.Y.24.42) via the local network controller **le0** (X.Y.24.41).

The routing tables illustrate properly configured gateways and routers, so that the SunNet Manager can reach all the elements on these subnets. The routing tables reference subnets with a 0 in the last byte. For example, subnet X.Y.24 displays as X.Y.24.0 in the table.

NOTE: The Discover tool finds only managed TCP/IP devices in the primary subnet connected to the SunNet Manager console. The Discover tool can build views for other networks. However, if you wish to add elements to other networks, you must select the view that specifically corresponds to a network and run the tool again. For more details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topic "Letting the Discover Tool Build Your Database."

7. If you plan to use the "Send Mail" feature of SunNet Manager (to send mail to notify recipients of events), you must set up your mail domain name to match the domain specified by your network administrator.

To verify your existing domain name, enter the following command:

```
domainname
```

You should see a display similar to the following:

```
┌───────────────────────────────────────────────────────────────────────────────────┐  
│ Yourcompanyname.com                                                             │  
└───────────────────────────────────────────────────────────────────────────────────┘
```

If the display is incorrect, you can override the name by entering the command again, followed by the domain name.

```
domainname Yourcompanyname.com
```

You can set this permanently by editing the *defaultdomain* file located in the */etc* directory. Use the UNIX *vi* editor or the Sun OpenWindows Text Editor tool to edit this file.

8. For additional setup considerations and procedures, refer to the *SunNet Manager 2.0 User's Guide*, Appendix A, "Installing SunNet Manager."

Verify your installation as suggested in Appendix A. The installation process creates a sample database file containing the name of your SunNet Manager console.

For detailed installation file and directory pathnames, refer to the *SunNet Manager 2.0 Reference Guide*, Chapter 1, "Introduction," under the topic "SunNet Manager Directories and Files." You must use these directories and files to customize your environment and to add Compaq server support.

Once you have verified the installation, you can start SunNet Manager to initialize with the sample file by entering the command:

```
snm -i /usr/snm/db/hostname.db &
```

Where hostname is the name of your SunNet Manager console.

The & sign at the end of the command starts SunNet Manager as a separate process, so you can return to your UNIX shell window under Sun OpenWindows and continue other tasks.

NOTE: Once you successfully install and initialize SunNet Manager, you can start SunNet Manager with your last successful launch and without reinitializing, by omitting the **-i** parameter.

For example, by entering the command:

```
snm &
```

you can launch SunNet Manager with your previous settings.

Setting Up Your View Hierarchy

In SunNet Manager, you look at the network through "views." Views are snapshots of the network containing a group of elements or other views. The console displays the "Home" view when you start up SunNet Manager. The Home view is like the root of the tree, which can have many branches. You traverse the branches searching for a view that contains elements grouped according to a particular category.

NOTE: In SunNet Manager, any view other than the Home view is a "subview."

An element grouping can be anything appropriate to your setup and your management plans. For example, you can group elements by location such as Houston, New York, and Chicago (physically), or by device type such as bridges, routers, and servers (logically). You can also have groups within groups. For example, the Houston subview could show separate subviews for routers and servers. The following figure shows an example hierarchy.

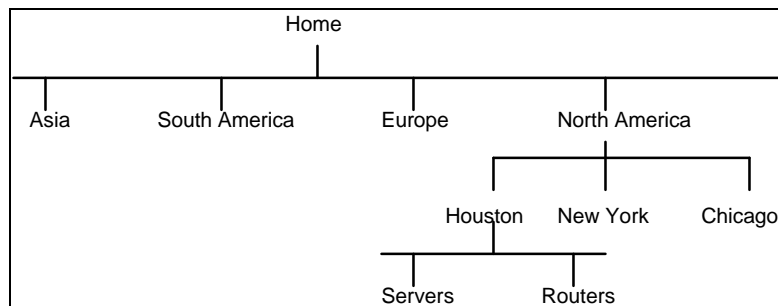


Figure 5-1. Example hierarchy of views in SunNet Manager

When you use the Discover tool to find managed devices, the process creates a minimum of three subviews for your Home view. The SunNet Manager console screen displays each subview as a cloud, called a "glyph." The three glyphs represent:

- SunNet Manager Hosts representing computers running the Sun Operating System (SunOS). These are Sun Microsystem servers and workstations, or compatibles. This includes your SunNet Manager console.
- SNMP Devices representing devices that support SNMP.
- A subview named for your network (using the IP address) containing all the devices found on the IP network at the location of your SunNet Manager console.

For example, if your SunNet Manager console has the IP address of X.Y.50.100, your network address would be X.Y.50.0. After node discovery, you see a cloud glyph titled X.Y.50.0 on your screen.

A managed device can display in more than one subview. For example, your SunNet Manager console could display in the SNM Hosts subview and in the SNMP Hosts subview.

For further details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database." The relevant sections are "Letting the Discover Tool Build Your Database" and "Traversing the View Hierarchy."

You can store this hierarchy in a management database file. The sample database created during the installation is a simple instance of the hierarchy -- the Home view containing one element, your SunNet Manager console. You can use the sample database to verify your installation.

Adding Compaq Server Support

This section assumes that your SunNet Manager console is running successfully. If this is a new installation, you can use a copy of your sample database to add Compaq servers. If you are an experienced SunNet Manager user, you can begin with a database of other managed devices displayed on the screen.

Adding a Compaq server comprises the following steps:

1. Transfer the MIB or schema to the SunNet Manager.
2. Compile the Insight MIB files into schemas that SunNet Manager can use.

NOTE: Skip this step if you use the predefined schemas supplied by Compaq. Refer to the Note at the end of this procedure for more details.

3. Copy the schema to the proper directory.
4. Discover or add your servers to the SunNet Manager network subview.
5. Associate the proper schema with your servers.
6. Add a new managed device type for a Compaq server.
7. Create an icon for a Compaq server.
8. Add the final touches (format or clean up the display)

The following sections discuss each of these steps in detail.

NOTE: The Compaq Insight Management MIBs diskette includes a sample file called *COMPAQ.SCH*. This file defines schemas you can use directly with SunNet Manager. Refer to the *README.TXT* file on the diskette to use these predefined schemas. If you choose to use the predefined schemas, you can skip the step titled "Compiling the MIB Files."

MIB Files and Schema Files

The Compaq Insight Management MIBs diskette contains the Insight MIB files. Compiled MIB files, called schemas, define the information structure that the SunNet Manager console requires to retrieve the agents.

Transferring the MIB Files to SunNet Manager

Transfer the Insight MIB files from the Compaq Insight Management MIBs diskette to your SunNet Manager.

NOTE: Alternately, you can use the predefined schemas on the diskette, and transfer *COMPAQ.SCH* rather than the MIB files. To integrate the sample files, refer to the *README.TXT* file on the Compaq Insight Management diskette.

There are several ways to transfer the Insight MIB files in the PC file format and convert them to the Sun file format. If your Sun workstation can read DOS file formats directly, you can copy the files from the diskette to your SunNet Manager. Another method is to use the File Transfer Protocol (FTP) supported with most TCP/IP installations.

NOTE: FTP is available with Windows NT, SCO UNIX, and IBM OS/2 installations. For NetWare, you must transfer the files from a NetWare client that has TCP/IP support using software such as LAN Workplace for DOS. Ensure that you choose the ASCII file transfer mode.

The following is a display of a sample FTP transfer:

```
D:\users\default>ftp hostname
Connected to hostname.
220 hostname FTP server (SunOS 4.1) ready.
User (hostname:): root
331 Password required for root.
Password:
230 User root logged in.
ftp> send

(remote-file) /usr/snm/cpqmibs/CPQIDA.MIB
200 PORT command successful.
150 ASCII data connection for /usr/snm/cpqmibs/CPQIDA.MIB (X.Y.24.20,1031).
226 ASCII Transfer complete.
128553 bytes sent in 8.21 seconds (15.67 Kbytes/sec)
ftp> quit
221 Goodbye.
D:\users\default>
```

In the above example, the file was transferred from the diskette in drive A to the */usr/snm/cpqmibs* directory on the Sun.

Compiling the MIB Files

The following procedure is *not* required if you use the predefined schemas on the diskette.

1. Enter the **mib2schema** command to compile the Insight MIBs:

```
mib2schema CPQIDA.MIB
```

This command causes the following to display:

```
Translating ....
Translation Complete.
Schema file in "CPQIDA.MIB.schema"
Oid file in "CPQIDA.MIB.oid"
Traps in "CPQIDA.MIB.traps"
```

This example compiles the Insight MIB file for the following Compaq products:

- Compaq SMART SCSI Array Controller
- Compaq Intelligent Drive Array-2 (IDA-2) Controller
- Compaq Intelligent Drive Array (IDA) Controller
- Compaq 32-Bit Intelligent Array Expansion Controller

2. Check for messages.

The Insight MIB files should compile without any errors. If the console displays error messages, check them to determine the line(s) in the file containing the error(s). Also, check your file transfer procedure to verify that you transferred the file without problems.

For example, you might have transferred the files in binary format rather than ASCII. Use the **dos2unix** command (refer to your UNIX documentation for the proper syntax) to convert DOS file formats to UNIX formats, once you have the files on the UNIX system.

3. Repeat the **mib2schema** procedure for all Insight MIBs. Ensure that you provide the correct MIB file names.

Copying the Schemas to the Proper Directory

Copy the schemas to the directory referenced by SunNet Manager to load the schemas. The default directory is `/usr/snm/agents`. The following example illustrates this procedure. However, create a new directory for schemas created for local devices and add this new directory name to the search path for schema files.

NOTE: This prevents schema file loss when you update SunNet Manager to the next version.

The SunNet Manager automatically loads the new schemas when you bring up SunNet Manager for initialization with the `-i` option:

```
snm -i /usr/snm/db/compaq.db &
[1] 282
Copyright (c) 1989,1992 Sun Microsystems, Inc.
snm:      loading /usr/snm/struct/snm.glue
snm:      loading /usr/snm/struct/elements.schema
snm:      loading /usr/snm/struct/cpqsvr.schema
snm:      loading /usr/snm/agents/diskinfo.schema
snm:      loading /usr/snm/agents/etherif.schema
snm:      loading /usr/snm/agents/hostif.schema
snm:      loading /usr/snm/agents/hostmem.schema
snm:      loading /usr/snm/agents/hostperf.schema
snm:      loading /usr/snm/agents/iostat.schema
snm:      loading /usr/snm/agents/ippath.schema
snm:      loading /usr/snm/agents/iproutes.schema
snm:      loading /usr/snm/agents/layers.schema
snm:      loading /usr/snm/agents/lpstat.schema
snm:      loading /usr/snm/agents/ping.schema
snm:      loading /usr/snm/agents/rpcnfs.schema
snm:      loading /usr/snm/agents/sample.schema
snm:      loading /usr/snm/agents/snmp-mibll.schema
snm:      loading /usr/snm/agents/snmp.schema
snm:      loading /usr/snm/agents/sun-snmp.schema
snm:      loading /usr/snm/agents/sync.schema
snm:      loading /usr/snm/agents/traffic.schema
snm:      loading /usr/snm/agents/compaq.schema
snm:      loading /usr/snm/additions/struct/sun-system.schema
snm:      loading /usr/snm/db/compaq.db
```


Adding the Compaq Servers to the Database

You can add the Compaq servers to the database manually or automatically with the Discover tool. The sections that follow contain instructions for both processes.

Using the Discover Tool

You can use the Discover tool to add Compaq servers to a network subview. For details on this tool, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topic "Letting the Discover Tool Build Your Database."

The Discover tool adds new elements to the view. Glyphs representing Compaq servers are automatically added to the view if you just installed the servers on the network. This assumes that:

- The servers are operational and configured with TCP/IP, SNMP, and the Insight Agents.
- The SunNet Manager can translate the IP addresses of the servers to hostnames, either through a DNS or from the host's file.

As the Discover tool runs, it places each element into one of three categories: servers, workstations, or routers. The tool automatically selects appropriate glyphs for each category.

! **IMPORTANT:** In this context, the terms *server* and *workstation* apply to computers based on the SunOS platform, *not* on the IBM PC architecture.

Because the Discover tool cannot distinguish computers based on the PC architecture, it associates the workstation glyph with any Compaq servers or clients on your network.

Adding a Server Manually

You can manually create a glyph representing a Compaq server using the **Create** command from the Edit menu. Temporarily create a glyph representing a PC and change it after you create a new managed device specifically for a Compaq server (discussed later in this chapter). To create a glyph, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topic "Creating Elements."

Changing the Glyph Type

You can change the glyphs to represent PC servers and clients accurately on the screen. For servers, you can change the glyph type after you create the glyph. For clients, you can change the glyph type from a workstation to a PC. SunNet Manager includes a glyph representing a PC client. To change the glyph type, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topic "Changing Element Types."

NOTE: The glyph type only represents an element; it does not affect how you manage the element. For example, you can represent a particular PC client on screen as either a workstation or as a PC. In either case, you manage it as you would any other element. When you change the glyph type, only the screen representation and some description fields change.

Associating the Appropriate Schemas

To associate the appropriate schemas with your Compaq servers, you must modify the properties associated with the glyphs representing them. When you bring up the properties window for a glyph, the middle portion of the window contains a list of the schemas recognized by SunNet Manager. This should include the Compaq schemas you added.

SunNet Manager Console: ctc_as (component.cpqsrvr)

Name: ctc_as

IP Address: X.Y.109.16

User: Joe Administrator

Location: Corporate Technology Center

Description: Windows/NT Advanced Server

Server Type:

SNMP RdCommunity: public

<input type="checkbox"/>	EthernetInfo	_____	RFC 1398 Ethernet MIB
<input checked="" type="checkbox"/>	TokenRingInfo	_____	RFC 1231 Token Ring MIB
<input checked="" type="checkbox"/>	cpqHealth	_____	Compaq Server Health Information
<input checked="" type="checkbox"/>	cpqHostOS	_____	Compaq Host O.S. Information
<input checked="" type="checkbox"/>	cpqIDA	_____	Compaq Drive Array Information
<input type="checkbox"/>	cpqSCSI	_____	Compaq SCSI Device Information
<input type="checkbox"/>	cpqServerMgrR	_____	Compaq Server Manager/R Informat
<input checked="" type="checkbox"/>	cpqStdEquip	_____	Compaq Standard Equipment Inform
<input type="checkbox"/>	cpqStorageSys	_____	Compaq Storage Systems Informati
<input checked="" type="checkbox"/>	cpqSystemInfo	_____	Compaq System Information

Red: 150

Green: 200

Blue: 150

Apply Reset

Browse

Figure 5-2. Associating the appropriate schemas

For details on setting and modifying properties, refer to the *SunNet Manager User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topics "Creating Elements" and "Modifying Element Properties."

1. Verify your setup by running "quick dump" reports on the Insight MIB attribute groups associated with your Compaq servers. For details on this report, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 3, "Requesting Data from Agents," under the topic "Making a One-Time Request for Data." If your configuration is successful and the Insight Agents run on the servers, you should see a window on your console containing the MIB attribute group variables and their current values.
2. Save your current configuration in a management database file and exit the console before the next step. For details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," under the topics "Saving the Management Database" and "Quitting the Console."

! **IMPORTANT:** If you started with the sample database, save the file under a new name to avoid overwriting the original.

Adding a New Managed Device Type

The *elements.schema* file contains the element types recognized by SunNet Manager. You can usually find this in the */usr/snm/struct* directory. To add a new managed device type, you must provide an appropriate schema.

Though you can edit *elements.schema* to add a new element, we recommend that you create a separate file in the same directory. For example, to define a Compaq server type, create a file named *cpqsrvr.schema*. The following example shows the typical contents of this file.

```
record component.cpqsvr ( # Compaq Server
  string[64]  Name

  string[40]  User
  string[40]  Location
  string[80]  Description

  int        SNMP_Timeout
)
instance elementGlyph(
  ( component.cpqsvr      cpqsvr.icon))
```

Each of the fields defined in the *record component.cpqsvr* definition displays when you bring up the properties window of a glyph representing a Compaq server. Certain fields, such as the IP address field included for convenience, cannot be used to manage the device.

You can customize the field definition to include useful fields. For example, to include a phone number, modify the record definition to add the appropriate string. The display shows that the phone number string is now part of the field definition.

```
record component.cpqsvr ( # Compaq Server
  string[64]  Name

  string[40]  User
  string[40]  Location
  string[80]  Description
  string[20]  Phone
)
)
```

For a detailed description on element type definition, refer to the *SunNet Manager 2.0 Reference Guide*, Chapter 6, "Management Database," under the topic "Element Type Definition."

In the description above, you associate a glyph with the element by including the *instance elementGlyph* statement in the *cpqsrvr.schema* file. This assumes that you have an icon file that you can use to display as the glyph. The following section explains how to create the icon file.

Creating an Icon File

In SunNet Manager, glyphs represent elements. A glyph has an associated icon file. To create an icon file for a Compaq server, you can either create it on a PC and import it, or you can create an icon on the SunNet Manager console using the Icon Editor tool. The following applies to the icon files used by SunNet Manager:

- Icons are black and white. SunNet Manager can color the corresponding glyphs by applying a *mask*, as discussed later.
 - The icon size can be 32, 48, or 64 pixels wide and any reasonable height. Typically, 32 x 32, 32 x 64, 64 x 32, or 64 x 64 pixel sizes are used.
 - The file format must be compatible with X Windows. If you create the file on a PC, you need an appropriate conversion utility to generate the proper format.
-

You can use the Icon Editor tool to create the icon file. A quick way is to modify an existing icon file and save it with the new name *cpqsrvr.icon*. Figure 5-3 illustrates how to use the Icon Editor to create an icon for a Compaq server.

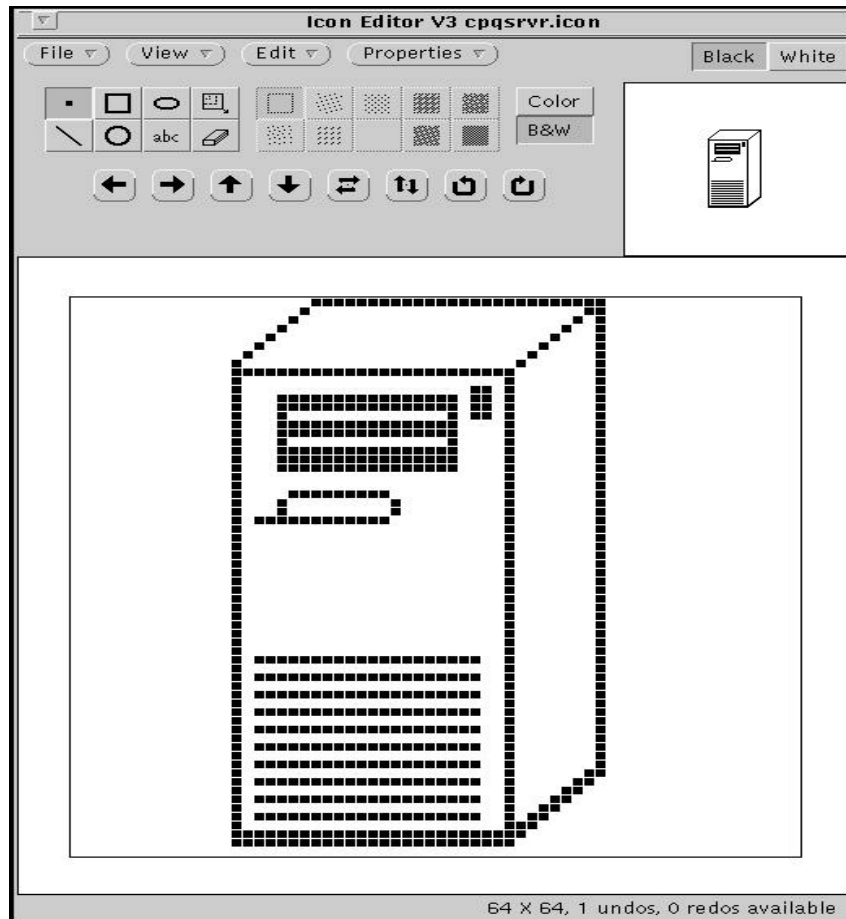


Figure 5-3. Using the Icon Editor to create an icon for a Compaq server

You can also create an icon mask file and use it as a stencil for coloring or inverting an icon. This is useful when you want the glyph to dim or blink on the screen when a significant event occurs. You must save the mask file with the same name as the original, but with an iconmask extension. For a Compaq server, create an icon mask file called *cpqsrvr.iconmask*.

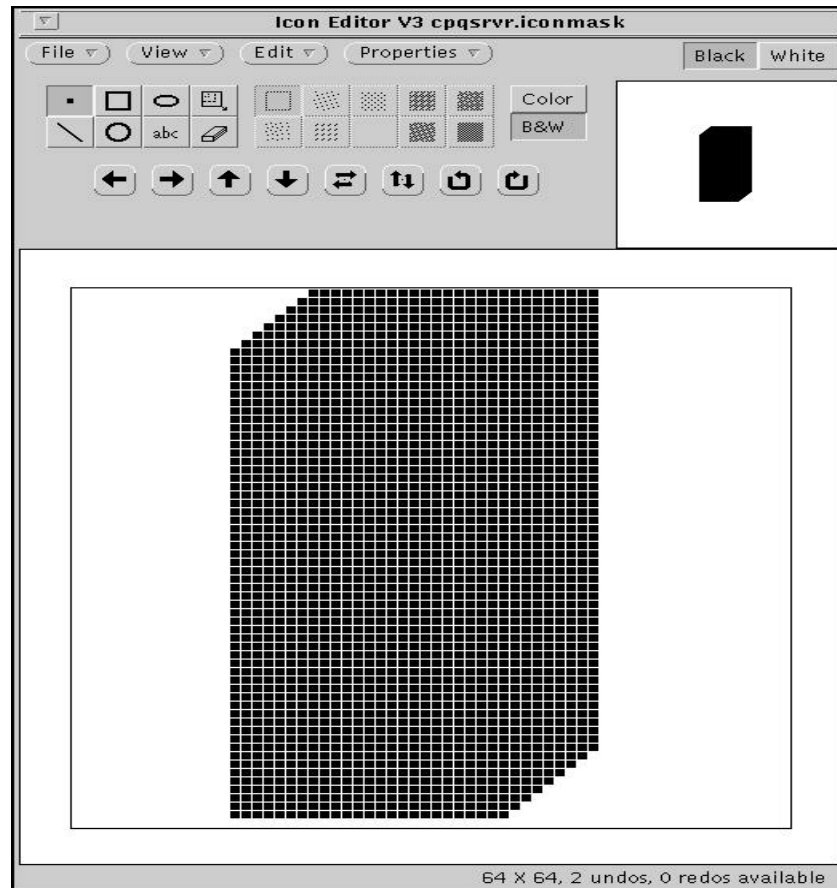


Figure 5-4. Compaq server iconmask example

For details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 8, "SunNet Manager Examples," under the topic "Creating a New Glyph for an Element Type."

Adding the Final Touches

Once you create a new element type and an icon to represent a Compaq server, you can bring up your previously saved database and add some of the final touches to make it visually appealing. Perform the following procedure:

1. Invoke SunNet Manager to load your database file by entering a command similar to the following:

```
snm -i /usr/snm/db/compaq.db &
```

2. Change the element type of the glyph to *cpqsrvr* for each Compaq server. If you have not done so, change any workstation glyphs to PC glyphs to represent any PC clients in your network.

NOTE: Optionally, you can change the properties of the glyph to a new color. For example, use a simple color-coding scheme to categorize servers by application or by operating system such as red for NetWare servers, blue for Windows NT or OS/2 servers, yellow for SCO UNIX servers, and so on.

3. Move the glyphs around, add connections, and create subviews as appropriate. Save the database file when completed. Refer to the *SunNet Manager 2.0 User's Guide*, Chapter 2, "Creating and Modifying the Management Database," for complete details.
4. Use a text editor to edit your saved database file to include background images for your views. Add an instance *viewBackground* record for each event view with a background, enclosing view names in quotation marks if they contain spaces:

```
instance viewBackground (  
  ( Home world.im1)  
  ("Houston Servers" texas.im1)  
)
```

Customizing the Schemas

Although the schemas generated by the **mib2schema** compiler are adequate for most installations, you can modify them to suit your needs. The following discusses some possible modifications.

! **IMPORTANT:** Modifying schemas requires a thorough understanding of the layout and Abstract Syntax Notation One (ASN.1) format.

NOTE: The Compaq Insight Management MIBs diskette includes some of the following customization tips in the predefined schemas. Consult the documentation and the files to determine if they suit your needs before making any changes.

Consolidating Several Schema Files Into One

Compaq supplies several Insight MIB files that relate to the general information about the server. These are:

- *CPQSINFO.MIB* -- provides system information specific to Compaq servers
- *CPQSTDEQ.MIB* -- provides EISA configuration information
- *CPQHLTH.MIB* -- provides server health information such as memory error

You might want to combine the equivalent schemas into a single schema called *CPQSRVINFO.MIB.schema*. (This schema name is provided only as an example.)

! **IMPORTANT:** Compaq does not recommend editing or modifying the Insight MIB files. If you must make changes, make changes to the schemas and *not* to the MIB files.

Because the schemas are regular text files, you can use a text editor to combine them. A schema file has a layout quite similar to a MIB definition file.

```
# Proxy name and description
# Enumerations
# Group and table declarations
# Trap definitions
# Agent errors
```

When combining schema files, you must repeat the *Enumerations*, *Group and table declarations*, and *Trap definitions* for each Insight MIB that you wish to consolidate into a single schema. However, you have only one section for *Proxy name and description* and *Agent errors*.

Using the above example, the layout of the combined file might look similar to the following display:

```
proxy CompaqServerInformation
description "Compaq Server Information"
serial 2
rpcid 100122
(
## Enumerated Type Definitions
## Standard Equipment
    <enumerations for Standard Equipment follow>
## System Info
    <enumerations for System Information follow>
## Health
    <enumerations for Health follow>
## Group and Table Declarations
## Standard Equipment
    <declarations for Standard Equipment follow>
## System Info
    <declarations for System Information follow>
## Health
    <declarations for Health follow>
## Traps
## Health
    <declarations for Health follow>
## Agent errors
    <agent errors follow>
## End of Agent Definitions
```

Modifying the Enumeration Strings

To modify the enumeration strings to your preference, edit them to the new, more readable, values. For example, when you compile the file *CPQSINFO.MIB*, the corresponding schema file has the following enumeration for memory board type:

```
enum      cpqSiMemModuleTypeE (  
1         "other"  
2         "board"  
3         "cpqSingleWidthModule"  
4         "cpqDoubleWidthModule"  
5         "simm"
```

You can change these enumerations to:

```
enum      cpqSiMemModuleTypeE (  
1         "Other"  
2         "Board"  
3         "Compaq Single Width Module"  
4         "Compaq Double Width Module"  
5         "SIMM"  
)
```



IMPORTANT: Modify *only* the enumeration strings, *not* the attribute name.

Modifying the Insight Agents Name and Description

As you did with enumeration strings, you might want to change the default values from the MIB compilation to suit your preference to enhance readability. You can change them by editing the file to the new strings, as in the following example.

The following display shows the header of the *CPQSINFO.MIB.schema* file created from the **mib2schema** program (some lines have been omitted for clarity):

```
## THIS FILE WAS GENERATED BY MIB2SCHEMA
proxy Compaq-SYSTEM-INFO
description "Compaq-SYSTEM-INFO agent"
serial 2
rpcid 100122
```

You can edit this header to look like the following:

```
## THIS FILE WAS GENERATED BY MIB2SCHEMA
proxy CompaqInfo
description "Compaq System Information agent"
serial 2
rpcid 100122
```

Additional Customization

For additional tips and ideas on customization, refer to the *SunNet Manager 2.0 Reference Guide*, Chapter 7, "SNMP Support."

Using the Information

Once you integrate the Insight MIBs and the corresponding schemas with SunNet Manager, you can manage your Compaq servers in the same manner as your other managed devices. SunNet Manager provides you with various reporting methods to obtain and use the information in the Insight MIBs. This includes:

- Quick dump
- Data report
- Event report
- Set request
- Automatic management

The following sections provide detailed descriptions of these reporting methods.

Producing a Quick Dump

Quick dump displays all the values in an attribute group or table. The attribute group or table must be part of a schema, and you must have associated the schema with the target Compaq server you wish to manage. If the agent is running on the server and the network is operational, a window should display on your SunNet Manager console with the appropriate information.

To retrieve the EISA configuration information for a particular server:

1. Select the glyph representing the server and bring up its glyph menu.
 2. Select the schema containing the EISA Slot Table configuration information such as *Compaq StdEquip*.
-

3. Highlight the EISA configuration attribute table, and make your request. Figure 5-5 displays a list of schemas containing EISA information.

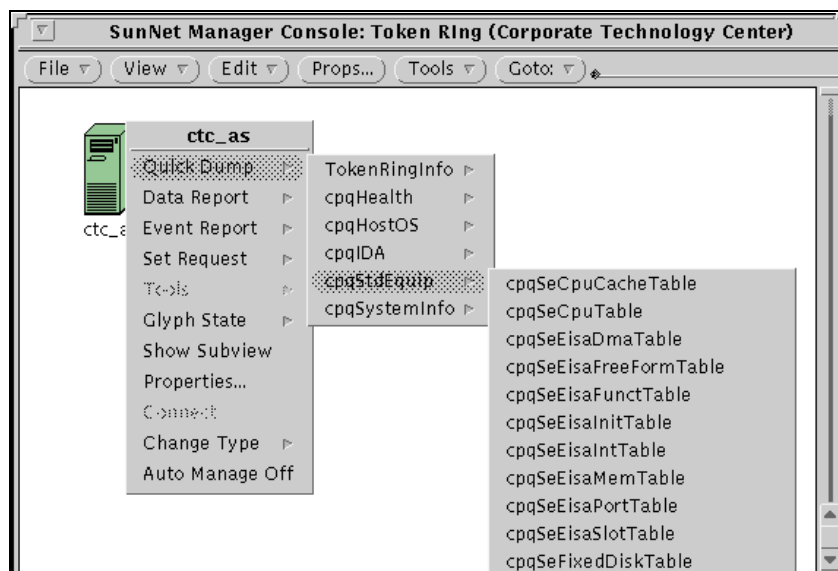


Figure 5-5. Requesting a quick dump for EISA configuration information

If your request is successful, your screen should look similar to Figure 5-6 (only a portion of the screen is shown):

SunNet Manager Console Quick Dump Report - ctc_as			
1993 [ctc_as] : Quick Dump: cpqStdEquip.cpqSeEisaSlotTable			
Index	cpqSeEisaSlotRaw	cpqSeEisaSlotBoardId	cpqSeEisaSlotBoardName
0	0010012F0000205F0E111501	CPQ1501	COMPAQ SYSTEMPRO/XL PC Server
1	0000012F00000C4F0E114002	CPQ4002	COMPAQ Intelligent Drive Array Controller-2
2	830000000000000000000000		(Empty)
3	830000000000000000000000		(Empty)
4	0080012F000002010E116100	CPQ6100	COMPAQ 32-Bit NetFlex Controller
5	0000012F000002000E116100	CPQ6100	COMPAQ 32-Bit NetFlex Controller
6	830000000000000000000000		(Empty)
7	0000012F000007770E113001	CPQ3001	COMPAQ Advanced VGA
8	830000000000000000000000		(Empty)
9	0040012F0000025F0E119281	CPQ9281	COMPAQ 486/50 System Processor Board used as Primary
10	830000000000000000000000		(Empty)
11	830000000000000000000000		(Empty)
12	0050012F000004410E114401	CPQ4401	COMPAQ Integrated SCSI-2 Options Port

Figure 5-6. Sample quick dump report

For further details about requesting quick dumps, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 3, "Requesting Data from Agents," under the topic "Making a One-Time Request for Data."

Requesting a Data Report

A Data Report collects periodic information about a specific attribute group or table. The attribute group must be part of a schema, and you must have associated the schema with the target Compaq server you wish to manage. Unlike a quick dump report that gives you *all* the attributes in a group, a Data Report lets you specify the ones you need and how often you want them.

Once you receive the information, you can view it in several ways. This includes a Results Grapher that lets you view the values of a specified attribute. You can graph either absolute or relative values to look at the trends.

If the Insight Agents are running on the server and the network is operational, you can use the View menu to retrieve the Data Report. For example, you can retrieve the Logical Drive information about a drive array for a particular server.

For this example, only the following items are of interest:

- Fault Tolerance
- Drive Status
- Drive Size
- Physical Drive IDs (mapping to a single Logical Drive)
- Logical Drive Condition

Perform the following steps:

1. Select the glyph representing the particular server and bring up the glyph menu for the server.
2. Select the schema containing the drive array logical drive information such as *Cpq-IDA*.
3. Highlight the Logical Drive attribute group and make your request for the specific attributes of your interest. The following figure illustrates this example.

SunNet Manager Console Data Request: ctc_as.cpqIDA.cpqDaLogDrvTable

Name: Test Request

Proxy System: localhost

Interval: 0

Count: 0

Key:

Restart:

Defer Reports:

On Completion: Delete Request

Options:

Log to File:

To Program:

Attributes:

- cpqDaLogDrvStatus
- cpqDaLogDrvSize
- cpqDaLogDrvPhyDrvIDs
- cpqDaLogDrvCondition

Attribute: cpqDaLogDrvStatus

Data Log: True

Indicator:

Strip Chart: None

Graph Task: None

Start Hold Reset Apply Reset Delete

Drive Array Logical Drive Table. Attribute cpqDaLogDrvCondition added.

Figure 5-7. Requesting a data report for logical drive information on a drive array

If your request is successful, you can retrieve a report similar to the following display.

```
Mon May 10 13:44:02 1993 [ ctc_as ] Data: cpqIDA.LogicalDriveTable
cpqLogDrvFaultTol cpqLogDrvStatus cpqLogDrvSize cpqLogDrvPhyDrvids cpqLogDrvCondition
None           OK           1295           01020304           OK
```

For further details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 3, "Requesting Data from Agents," under the topics "Requesting Periodic Data" and "Viewing Incoming Data."

Requesting an Event Report

You can request an event report periodically to monitor an attribute value or when you want notification of a change. The attribute group must be part of a schema, and you must have associated the schema with the target Compaq server you wish to manage.

Like a data report, you can use the event report to specify which attributes you want to monitor. You can also specify up to two thresholds for each attribute. When the event occurs, you can specify several actions that should take place. If the agent is running on the server and the network is operational, you can go to the View menu and retrieve the event report.

For example, the event report notifies you when an error condition occurs on one of your servers. When an error condition occurs at the server, the Insight Agents send the trap to the specified destination and log the information in a trap log file. The values of the log file index change when the traps occur. You can monitor for this change and request that an e-mail message be sent to you.

The following figure illustrates a typical example.

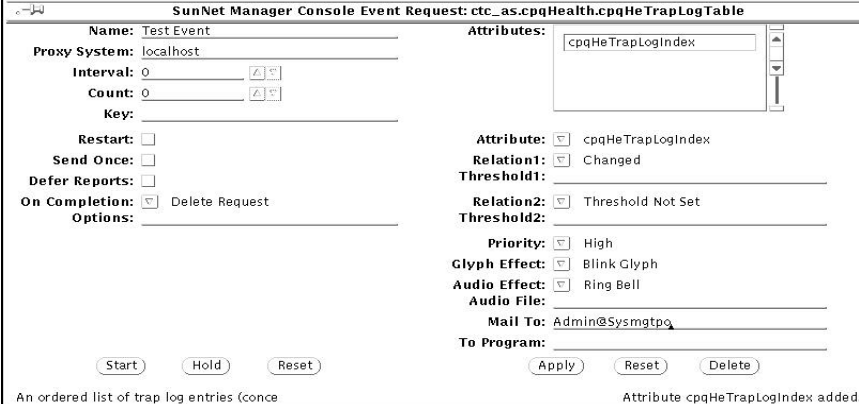


Figure 5-8. Requesting an event report for trap log index changes

The glyph representing the server blinks according to the specified action in your request when the event occurs. The event also sends an e-mail message to the specified address. This address can be an e-mail gateway, as discussed in the "Integration to Other Systems" section later in this chapter. For further details, refer to the *SunNet Manager 2.0 User's Guide*, Chapter 4, "Specifying Events," under the topics "Specifying an Event" and "Checking the Cause of an Event."

Performing a Set Request

For SNMP devices, you can perform a **Set Request** to modify SNMP attribute groups. The attribute group must be part of a schema, and you must have associated the schema with the target Compaq server you want to manage.

! **IMPORTANT:** Insight Agents for each operating system may have differing levels of SET support. Refer to the appropriate *Compaq Insight Management Agents User Guide* for more information.

For example, to modify the contact information for a server, you need to include a phone number. Select the server, then use your mouse to select the *snmp-mibII* schema and the *system* group within that schema. If the agent is running on the server and the network is operational, you should see a window similar to the one in the following figure.

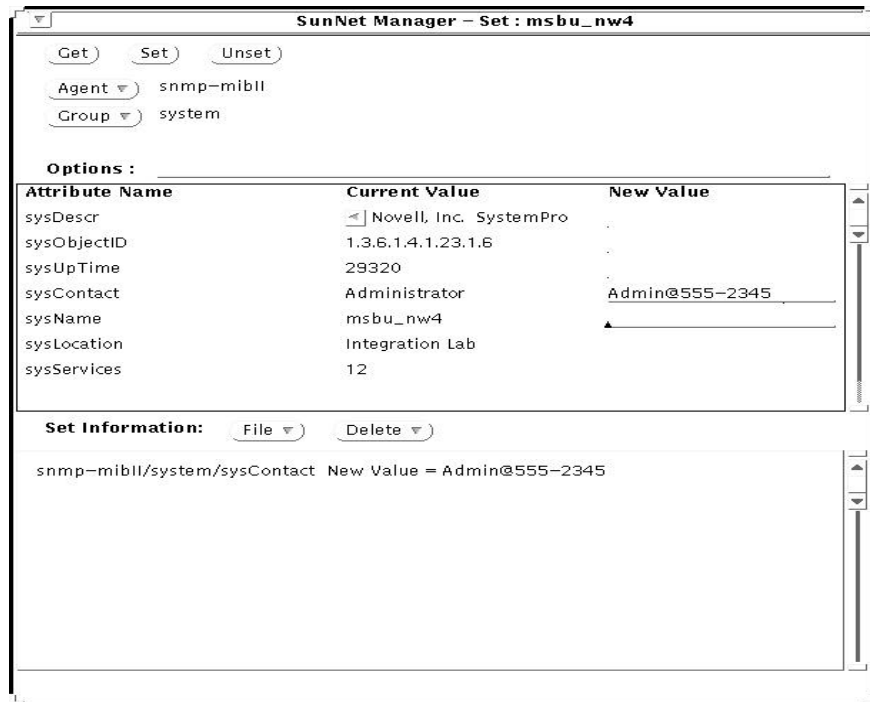


Figure 5-9. Performing a set request to change the contact name

You can change the contact name as shown in the previous figure and then press the **Set** button to execute your request. To verify that the change was successful, retrieve the information again by pressing the **Get** button. You should see the updated information.

Refer to the *SunNet Manager 2.0 User's Guide*, Chapter 7, "Managing SNMP Devices," under the topics "Using the Set Tool to Retrieve SNMP Attribute Values" and "Using the Set Tool to Change SNMP Attribute Values" for details.

Using Automatic Management

Automatic management is a method you can use to set up predefined event requests for elements in your management database. The default setting for automatic management is OFF, because frequent polling imposes network traffic when your SunNet Manager console polls the elements for events. However, under certain circumstances, you might want to enable this feature for your critical servers.

Because the Insight Agents support SNMP MIB-II, the Automatic management feature creates predefined events for each Compaq server that monitors the *sysUpTime* variable. This variable indicates how long the agent has been up. If this variable does not increase by more than eight minutes (a value computed from the default settings), the event condition becomes TRUE. Once created and started, you can modify an automatic event request just like any other.

When you enable the Automatic management feature, SunNet Manager creates predefined events for every element in your database that supports one of the following:

- SNMP
- hostperf
- ping

You might not want to have predefined events for certain managed devices. You can select the glyph menu for these elements and turn off the Automatic management feature.

! **IMPORTANT:** Do not enable too many requests with Automatic management. Each request causes your SunNet Manager console to poll the agent to check status. Excessive requests and polling can affect your network performance. The default interval is ten minutes.

For further details, refer to the *SunNet Manager 2.0 Reference Guide*, Chapter 3, "Console Configuration," under the topic "Automatic Management."

Handling Traps

Traps are a method of reducing network traffic. An agent can send information to a management PC either when requested or unsolicited. Unsolicited information is known as a *trap*; this is an indication that something has changed and the server requires attention.

If you do not specify the SunNet Manager console as a trap destination of the Insight Agents, it is unaware of an impending problem until it polls the agent for the specific problem area. Frequent polling can generate excessive network traffic and degrade performance. Therefore, Compaq strongly recommends that you set up at least one trap destination at each of your critical servers as the IP address or hostname of your SunNet Manager console. Refer to your *Compaq Insight Management Agents User Guide* to set up trap destinations. For details on Compaq Traps, refer to Appendix A of this TechNote, "Using the Compaq MIB Information."

Insight Agents version 1.x defines one enterprise per subsystem, for example, Compaq-IDA = 1.3.6.1.4.1.232.3, Compaq-SCSI = 1.3.6.1.4.1.232.5, and so on.

Insight Agents version 2.x defines a single enterprise, for example, Compaq = 1.3.6.1.4.1.232, and the specific ID of the trap type defines the subsystem, for example, 30xx for IDA, 50xx for SCSI.

! **IMPORTANT:** For compatibility with older systems, you must configure your SunNet Manager console to handle traps from both the older and newer NetWare agents. Windows NT, SCO UNIX, and IBM OS/2 agents follow the Compaq Insight Manager 2.x format.

Processing Traps

The SunNet Manager trap daemon processes traps in the following order:

1. SunNet Manager looks in the SNMP hosts file called *snmp.hosts* to find a match for the managed device name generating the trap. You can usually find the *snmp.hosts* file in the */var/adm/snm* directory.

NOTE: This directory is often linked through SunOS to another directory, for example */usr/snm/db*.

2. If the SunNet Manager finds a match, it consults the trap file specified in *snmp.hosts* to translate trap type numbers to meaningful strings.
3. If the SNMP hosts file does not contain an entry, or the entry name does not specify a trap file, the daemon defaults to the default trap file called *snmp.traps*. You can find this file in the */var/adm/snm* directory.

To integrate trap types from your Insight Agents with SunNet Manager, edit your default trap file to include the agents from Compaq. Be sure to combine the various trap files generated as a result of the **mib2schema** compilation into a single file and append it to your existing *snmp.traps* file. The following display shows a typical *snmp.traps* file (some lines have been removed for clarity).

NOTE: *COMPAQ.TRP* is a sample trap file provided on the Compaq Insight Management MIBs diskette. Look in the *README.TXT* file for complete instructions on integrating this file with an existing SNMP trap file.

```
#
# snmp.traps - per-enterprise SNMP traps
# Copyright (c) 1989-1992 by Sun Microsystems Inc
#
### THIS FILE WAS GENERATED BY MIB2SCHEMA
enterprise 1.3.6.1.4.1.232

    3001 cpqDa2LogDrvStatusChange
    3002 cpqDa2SpareStatusChange
    3003 cpqDa2PhyDrvStatusChange
    3004 cpqDa2PhyDrvThreshPassedTrap
    3005 cpqDa2AccelStatusChange
    3006 cpqDa2AccelBadDataTrap
    3007 cpqDa2AccelBatteryFailed
    6001 cpqHeCorrectableMemoryError
    6002 cpqHeCorrectableMemoryLogDisabled
    6004 cpqHeThermalTempDegraded
    6005 cpqHeThermalTempOk
    6006 cpqHeThermalSystemFanFailed
    6007 cpqHeThermalSystemFanDegraded
    6008 cpqHeThermalSystemFanOk
    6009 cpqHeThermalCpuFanFailed
    6010 cpqHeThermalCpuFanOk
    6011 cpqHeAsrConfirmation
    6012 cpqHePostError
```

! **IMPORTANT:** Do not include more than one trap definition per trap.

If you want the trap daemon to discard certain trap types, include the word *discard* on the line that defines the trap type. For example, you can modify your trap file to include the following lines if you do not want to receive traps for system reboots (cold starts):

```
# Generic traps
enterprise 0
    0 cold-start discard
```

To override the default trap file for some critical devices, include the trap handling for those devices in the *snmp.hosts* file. Because the trap daemon searches the *snmp.hosts* file before the default trap file, any devices defined in the hosts file are processed first.

! **IMPORTANT:** Be sure that your *snmp.hosts* and *snmp.traps* files are configured properly to receive events and trap notifications. If you have problems receiving notifications, refer to the online reference (man pages) for instructions on configuring these files.

Once you enable the traps, you should see an indication of an incoming trap on the console. Typically, this is a blinking glyph. You can go to the View Menu to look up a trap report. The following display shows a typical report.

```
Tue May 18 09:46:53 1993 [ primary_as ] : Trap:
sequence=2
receive-time= Tue May 18 09:46:53 1993
version=0
community=public
enterprise=compaq.cpqDriveArray
source-time=176:28:04.91
trap-type=cpqDaPhyDrvStatus Change

KEY=1.2
cpqDaPhyDrvStatus=Failed
```

For additional information, refer to the *SunNet Manager Reference Guide*, Chapter 7, "SNMP Support," under the topic "Asynchronous Event Reports (Traps)."

Troubleshooting

If you do not receive traps at your SunNet Manager console when your network is operational, check the following items:

- Verify the configuration of the managed devices to ensure that they are forwarding traps to your SunNet Manager console.
- Verify the read and read-write community settings.
- Verify the location and content of the *snmp.hosts* and *snmp.trap* files.
- Edit the */etc/snm.conf* file to ensure that the **na.snmp-trap.rendez** parameter configuration forwards traps to the Event Dispatcher running on your SunNet Manager console. For example:

```
na.snmp-trap.rendez localhost
```

Integration to Other Systems

Many vendors support SunNet Manager with network management products in areas such as problem solving, configuration management, capacity planning, trouble ticketing, and so on. SunConnect provides a "SunNet Manager Solutions Portfolio" that categorizes the various products and services offered by companies for the SunNet Manager platform. Contact your Sun Microsystems representative at 1-800-241-CONX (U.S. only) for details. Outside the U.S., call 1-415-960-1300.

You can also build custom applications using SunNet Manager APIs. A detailed discussion of these techniques is beyond the scope of this TechNote. However, you can integrate SunNet Manager to other systems without programming. A specific example is sending mail messages from SunNet Manager to your LAN-based e-mail application. The following discussion uses Microsoft Mail as an example.

NOTE: You can replace Microsoft Mail with your own e-mail application, as long as it supports a Simple Mail Transfer Protocol (SMTP) gateway.

Event Notification via E-Mail

To set up SunNet Manager to send e-mail messages, you do not need a special configuration. You must, however, make certain that:

- Your domain name is set correctly and matches the domain name of other computers on the network. The following is an example format of domain name *Yourcompanyname.com*.
- You can send e-mail. As a test, try to send mail to your login ID at the SunNet Manager console. If you are logged in as root, use root as the mail ID.

- You set up the event properties to send mail to an address for every event that you want to notify via e-mail. Use the Internet addressing format, such as:

`YourName@Yourorganization.OrganizationType`

- If you must specify more than one recipient, separate each recipient with spaces. You could also include group names (for example, user lists) if your gateway supports them.

When setting up events, choose your events with care. Do not flood the administrator's mailbox with an e-mail message for every event occurring in the network.

Select how many times you want to send the message, including sending it only once. Try to route different classes of events to different people. For instance, one person might receive notification about critical events for routers, while another might look only at server events.

Once you have set up SunNet Manager, you must set up a gateway from your LAN-based e-mail to SMTP. The integration lab set up at Compaq involved a Microsoft Mail SMTP gateway. The following steps are provided using Microsoft Mail as an example (your implementation might be slightly different).

Setting Up the Gateway

1. Set up a DOS-based computer with LAN connectivity and TCP/IP utilities loaded. For Microsoft Mail, this can be Microsoft LAN Manager configured for TCP/IP. Check your mail gateway documentation to ensure that you are using the proper version of the networking software.
 2. Verify that the IP address, subnet mask, and default gateway values are configured properly.
 3. Set up the *AUTOEXEC.BAT* file to load the STREAMS protocol (this is often required by the gateway).
 4. Install the gateway computer on the network so that it has access to the local postoffice.
-

5. Run the installation program to set up the gateway computer. Using the mail administration program, configure mail for the gateway. In particular, be sure to provide information to map an Internet domain name to a local postoffice. This domain name must match the domain name specified on the SunNet Manager console.
6. Start your gateway and verify that it is functioning properly.
7. Generate a test event to send e-mail to your gateway at your SunNet Manager console. If your setup is functioning properly, log into your LAN based e-mail system, and see the event as an e-mail message.

Figure 5-10 illustrates an example of a message.

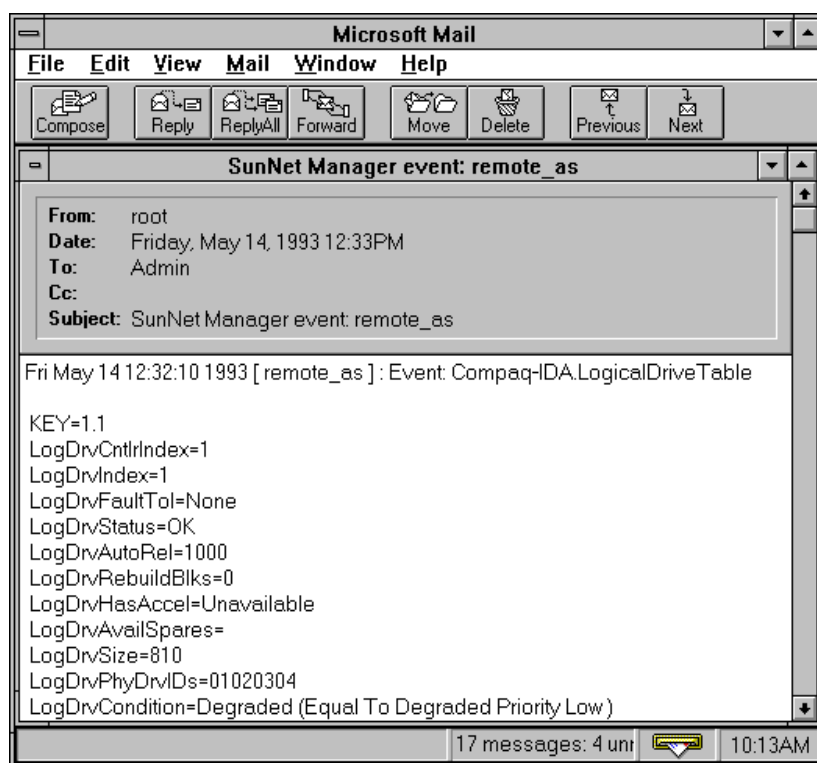


Figure 5-10. Receiving SunNet Manager events in Microsoft Mail

Chapter 6

Integration with HP OpenView

This chapter discusses the integration of Compaq server management information into Hewlett-Packard (HP) OpenView Network Node Manager. The information is based on tests performed with version 3.0 and 3.3 using the Compaq test network.

NOTE: Several examples in this chapter involve IP addresses. These examples denote the addresses as X.Y.<number>.<number>, where X.Y. represents a Class B network address, and <number> is a value from 0 to 255.

Feature Summary

The Hewlett-Packard Company markets HP OpenView products for UNIX and DOS environments. In the UNIX environment, HP OpenView runs either on HP hardware under HP-UX or on Sun hardware under Solaris or SunOS. In the DOS environment, HP OpenView runs under Microsoft Windows.

NOTE: This chapter describes integration with the UNIX product only.

HP OpenView provides a management platform for managing devices that use the Internet Protocol (IP) suite. The key features of HP OpenView include:

- A distributed management infrastructure that supports various management protocols such as SNMP, CMIP, and CMOT. (For a brief explanation of these protocols, see Chapter 2, “Overview”.)
- Network Node Manager (NNM) -- a management application used to manage a variety of devices such as hubs, bridges, routers, and servers. The platform architecture allows HP and/or third parties to add other management applications. For example, HP OpenView Windows for UNIX provides a graphical user interface.
- Management services such as event management services and object recognition services. You can use Application Program Interfaces (APIs) to access some of these services.

The following are some key features of HP OpenView NNM:

- Support for industry-standard protocols such as Simple Network Management Protocol (SNMP) and IP. This includes a Management Information Base (MIB) load utility that lets you add MIB definitions for new device types in your network.
- Node discovery that can seek out, identify, and display managed IP devices.
- A graphical map representing the topology and status of the managed devices.
- MIB browsing and results graphing tools.
- Methods to integrate new applications without programming.

Adding Compaq Server Support

This section presumes that your HP OpenView console is running successfully.

Adding a Compaq server requires the following steps:

1. Transfer the MIB files to the HP OpenView console.
2. Load the MIB files into HP OpenView.
3. Discover or add your servers to the HP OpenView network map.
4. Add a new subclass to the Computer class for a Compaq server.
5. Add the final touches.

The following sections discuss each of these steps in detail.

Transferring MIB Files to the HP OpenView Console

Compaq includes Insight MIB files with the Insight Agents for your operating system. These files define the information structure that the HP OpenView console requires to retrieve information from the agents. The file names are *CPQ?????.MIB* where *?????* denotes four or five unique characters. Two optional MIB files, *ETHER.MIB* and *TOKEN.MIB*, are included on the same diskette.

There are several ways to transfer the Insight MIB files from the Compaq Insight Management MIB diskette to your HP OpenView console. If your system has a UNIX command(s) to read DOS-formatted diskettes, you can copy the files directly from the diskette. Consult the documentation for your UNIX system for the details on using the command. Make sure to convert the files from DOS format to UNIX format after copying them.

Another method to transfer the Insight MIB files is to use the File Transfer Protocol (FTP) which most UNIX systems support. The default path that OpenView uses for MIBs is */usr/OV/snmp_mibs*.

NOTE: FTP is available with Windows NT, SCO UNIX, UNIXWare, and IBM OS/2 installations. For NetWare, you must transfer the files from a NetWare client that has TCP/IP support using software such as LAN Workplace for DOS. Be sure to choose ASCII file transfer mode.

6-4 Integration with HP OpenView

The following is an example of a typical FTP transfer. This example transfers a file from the diskette in drive A to the directory */usr/OV/snmp_mibs* on the target UNIX system.

```
D:\users\default>ftp hostname
Connected to hostname
220 hostname FTP server ready.
User (hostname:): root
331 Password required for root.
Password:
230 User root logged in.
ftp> send

200 PORT command successful.

X.Y.24.20,1031).
226 ASCII Transfer complete.
128553 bytes sent in 8.21 seconds (15.67 Kbytes/sec)
ftp> quit
221 Goodbye.
D:\users\default>
```

Loading the MIB Files

Once you have the MIB files on your HP OpenView console, you can load them from the OpenView Menu by following these steps:

1. Select the *Option Load/Unload MIBs: SNMP...* menu item. A dialog box displays listing the currently loaded MIBs.
2. Click on the *Load* button. A dialog box displays listing the MIB files in the default directory. If you transferred the Insight MIBs to this directory, they are listed here (otherwise, specify the pathname where you put the files).
3. Select the desired MIB file, then click *OK*. The Insight MIB automatically loads and the Load/Unload MIBs dialog box redisplay. Repeat this step until you load all the Insight MIB files.
4. Select the *Close* button to exit.

The Insight MIB files should compile without any errors. If the console displays error messages, perform the following steps:

- (a) Check the messages to determine which line(s) in the file contain the error(s).
- (b) Check your file transfer procedure to verify you transferred the file without problems. For example, you might have transferred them in binary format rather than in ASCII. In this case you must convert the DOS file formats to UNIX formats. Refer to your UNIX documentation for the appropriate command and its syntax.

Refer to the *HP OpenView Network Node Manager Administrator's Reference*, Chapter 4, "Troubleshooting," under the topic "Loading MIBs" for additional information.

NOTE: HP OpenView NNM ships with several preloaded MIBs (both enterprise and standard). These MIBs are in the default directory */usr/OV/snmp_mibs*.

Discovering or Adding Compaq Servers to the Submap

You can add Compaq servers to your database manually or automatically with the Discover tool. The following sections contain instructions for both methods.

Using the Discover Tool

The HP OpenView NNM **netmon** process discovers (and subsequently polls for status) new managed devices on the network. Typically, this process does not require your intervention except to ensure that the routing tables at the HP OpenView console are set up properly with the default gateway enabled.

The initial management region contains only the networks directly connected to the management station. You may expand this region two ways:

- Interactively expand the management region using the graphical map's *Options Manage Objects* operation.
- Provide a "seed file" containing the IP address of SNMP-based routers on your network.

For further details, refer to the **netmon** Reference Page (man page) or to the *HP OpenView Network Node Manager Administrator's Reference*, Chapter 3, "Configuration," under the topic "Configuring netmon."

As the **netmon** process executes, it automatically adds new managed devices to the appropriate submaps. For instance, when you install Compaq servers on the network, the tool automatically adds symbols to the view representing them as managed devices. This assumes that the servers are operational and configured to use IP, SNMP, and the Insight Agents.

If the new device appears in the */etc/hosts* file, the tool translates the IP addresses of the servers to hostnames. Otherwise, the symbol label on screen contains only the IP address.

The **netmon** process uses, by default, the file `/usr/OV/conf/oid_to_type` to determine the topological role of the discovered managed devices (gateway, bridge, hub, and so on). The **netmon** process queries the SNMP MIB-II variable `system.sysObjectID` to find a match between the value returned by the SNMP agent running on the managed device and an entry in the file. If there is a match, the symbol on the submap displays with the proper icon representing the properties (gateway, bridge, hub, and so on). If there is no match, the discovery process tries to classify the discovered managed devices into generic symbol classes representing computers, connectors, network devices, and so on.

NOTE: Each symbol class has subclasses that provide further description. For example, the Computer class can have subclasses that describe PCs, workstations, minis, and mainframes.

The discovery process automatically represents Compaq servers on screen as a square symbol. This is a *generic* subclass of the Computer class. Details on modifying the subclass to a Compaq server are provided later in this chapter.

Using Manual Discovery

You can manually add a symbol representing a Compaq server using the `Edit Add Object...` command. Temporarily create a symbol representing a generic subclass in the Computer class, and change the subclass after you create a subclass specifically for a Compaq server. This is described in the section, "Adding a New Subclass to the Computer Class." To add a symbol, add the object first (an on-screen representation of the object). Refer to the *HP OpenView Network Node Manager User's Guide*, Chapter 3, "Managing Network and System Configuration," under the topic "Adding a Node Object."

Changing the Subclass Icon

You can change the subclass to represent servers and clients accurately. For the servers, you must create the subclass first (discussed in the next section). For clients, you can change the subclass type from generic to a PC. HP OpenView NNM ships with a subclass icon representing a PC. To change the subclass icon, refer to the *HP OpenView Windows User's Guide*, Chapter 4, "Managing Your Network," under the topic "Changing the Symbol Type."

Adding a New Subclass to the Computer Class

To add a new subclass for a Compaq server, you must perform the following:

- Modify Field Registration files
- Create bitmap files to represent Compaq Servers
- Define a Symbol Subclass in the Symbol Registration file
- Modify the configuration files

The following sections discuss each of these tasks in detail.

Modifying Field Registration Files

HP OpenView Windows extensively uses field definitions, stored in Field Registration files. You can find these files in the `/usr/OV/fields/$LANG` directory, where `$LANG` represents language-specific information. For default installations, `$LANG` is defined as "C". You can usually find the Field Registration files in the directory `/usr/OV/fields/C`. The two Field Registration files of interest are `ovw_fields` and `snmp_fields`.

The *ovw_fields* File

This defines the overall field definitions used by the HP OpenView NNM. Edit this file to update the vendor enumeration listing by adding "Compaq" to the list as follows:

```
Field "vendor" {
  Type Enumeration;
  Flags capability, general, locate;
  Enumeration "Unset",
    "Hewlett-Packard",
    "ACC",
    "Cayman",
    "cisco Systems",
    "CMC",
    "Compaq",      ← Add this line.
    "Data General",
    "DEC",
    <other names follow here>
    "Xyplex"
  ;
}
```

Edit the file by adding a new field called *isCpqInsight*. This field signifies if a given managed device is running the Insight Agents. Append the following to the end of the file:

```
/*****
***
*   This field defines if the server is running
*   Compaq Insight Management Agents
***
*****/
Field "isCpqInsight" {
  Type Boolean;
  Flags capability, locate;
}
```

The snmp_fields File

This file contains various SNMP-related fields. Update the SNMP Agent enumeration listing automatically, adding "Compaq Insight Management Agents" to the list as follows:

```
Field "SNMPAgent" {
  Type Enumeration;
  Flags capability, general, locate;
  Enumeration
  "Unset",
  "HP 3000/XL",
    <various HP agents follow here>
  "ACC 4140 Bridge/Router",
  "cisco Gateway Server",
  "cisco Terminal Server",
  "cisco T-Router",
  "cisco Protocol Translator",
  "Cayman GatorSystem",
  "CMC",
  "Compaq Insight Management Agents", ← Add this line
  "DECstation",
  "DG Aviion",
    <other vendor agent names follow>
  "Xyplex Remote Ethernet Bridge",
  "4BSD ISODE";
}
```

Incorporating the Changes

After making your changes, verify them by entering the following command:

```
ovw -verify
```

The screen scrolls with the verified items, until it displays a "Verification complete" message.

To prevent the screen from scrolling by too fast for you to read the messages, use the **more** command:

```
ovw -verify | more
```

If you have any errors, correct them and try again. When you have no errors, you can add the new fields to the database by entering the following command:

```
ovw -fields
```

This command verifies the field syntax for fields that already exist in the database, and adds the new ones. For further details, refer to the *HP OpenView Network Node Manager Administrator's Reference*, Appendix B, "Creating and Using Application Registration Files."

Creating Bitmap Files to Represent Compaq Servers

HP OpenView Windows represents objects as symbols. Each symbol has a class (such as Computer) and a subclass (such as a PC). The class has a shape associated with it. For example, computers display as squares, networks as circles, and so on. Within each class, the subclass has a bitmap representation, enclosed by the class shape. A PC bitmap surrounded by a square represents a PC, denoting that it is a member of the Computer class.

Bitmap files are always in pairs, containing the bitmap and a bitmap mask used as a stencil. These files follow the name syntax:

filebase.size.type

Where *filebase* is the name of the subclass, *size* is the size in pixels, and *type* denotes if this is a bitmap or a bitmap mask. The *type* is always a "p" for bitmaps or an "m" for masks.

You can find bitmap files in the directory */usr/OV/bitmaps/\$LANG*, where *\$LANG* represents language-specific information. For default installations, *\$LANG* is defined as "C". Typically, you can find the Field Registration files in the directory */usr/OV/bitmaps/C*.

Compaq provides bitmap files that represent Compaq servers in the directory *\HP_OV* on the Compaq Insight Management MIB diskette. Refer to the *README.TXT* file on this diskette for more information. You can transfer these files to your OpenView console by using one of the methods described previously in this chapter.

NOTE: If you use these files on the Compaq Insight Management diskette, the following procedure to create bitmaps manually is *not* required.

You can use the icon or bitmap editor program supplied with your UNIX system, such as **bitmap(1)**, to create the icon files and their masks. Consult the documentation for your UNIX system for the details using the utility. The following figures illustrate the bitmap and its corresponding mask for a Compaq server with a size of 38 x 38 pixels.

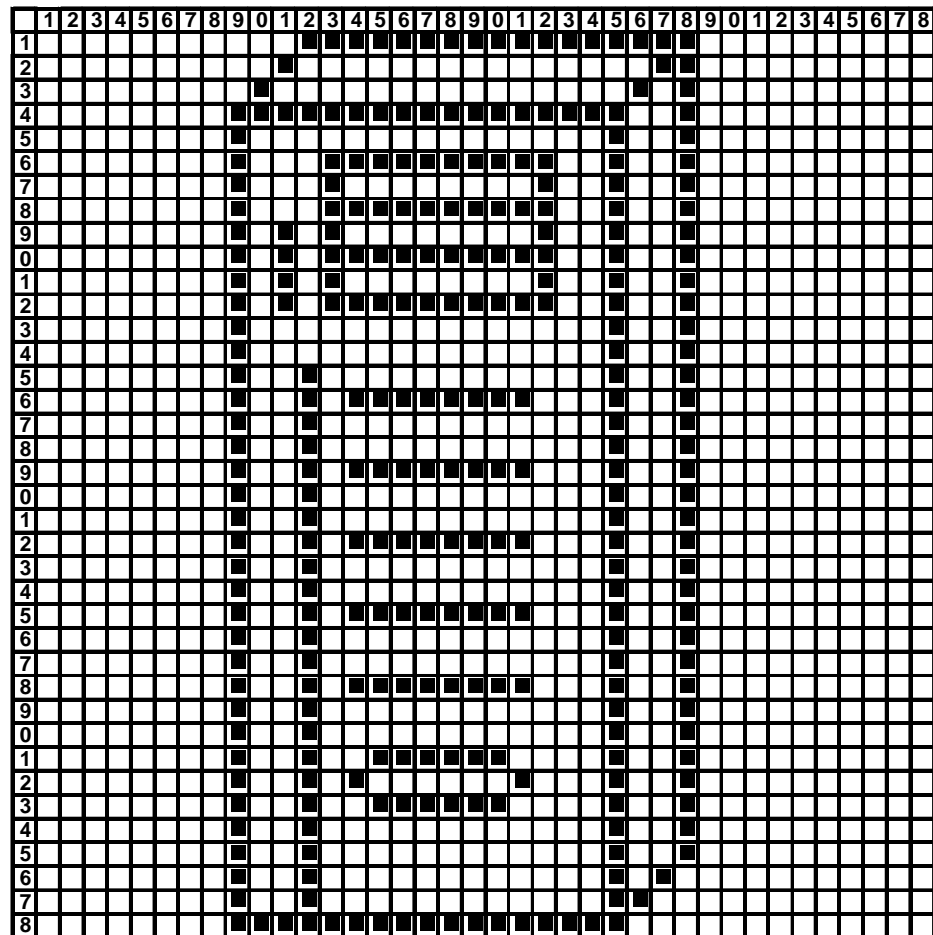


Figure 6-1. Bitmap for a Compaq server (38 x 38 pixels)

Defining a Symbol Subclass in the Symbol Registration File

HP OpenView Windows extensively uses field definitions, stored in Symbol Registration files. You can find these files in the directory `/usr/OV/symbols/$LANG`, where `$LANG` represents language-specific information. For default installations, `$LANG` is defined as "C". You can usually find the Symbol Registration files in the directory `/usr/OV/symbols/C`.

You can find several files for symbol classes here, including one for the Computer class. Edit the Computer Symbol Registration file to add the following subclass definition:

```
SymbolType "Computer" : "Cpqsvr"
{
  Filebase "cpqsvr";
  CursorSize 38;
  Capabilities {
    isPC = 1;
    isCpqInsight = 1;
  }
}
```

NOTE: The **filebase** name must match the **filebase** name of the bitmap files you created earlier.

Incorporating the Changes

After making your changes, verify them by entering the following command:

```
ovw -verify
```

The screen scrolls with the verified items, until it displays a "Verification complete" message.

To prevent the screen from scrolling by too fast for you to read the messages, you can use the **more** command:

```
ovw -verify | more
```

If you have any errors, fix them and try again. You can also compile your previously defined bitmap files by entering the following command:

```
ovw -config
```

For further details, refer to the *HP OpenView Network Node Manager Administrator's Reference*, Appendix B, "Creating and Using Application Registration Files" in the "Defining Symbol subclasses" section.

Modifying the Configuration Files

The following section presumes that you know the *system.sysObjectID* values of the Insight Agents for the various operating systems running on your servers. You can determine these values quickly by using the **snmpwalk** utility provided with HP OpenView NNM. Use this utility to query a server that you know is running the agents for a specific operating system.

For example, enter:

```
snmpwalk unix1 | more
```

Your results should be similar to the following display:

```
system.sysDescr.0 : DISPLAY STRING- (ascii):  
SNMPD Version 3.0 For SCO UNIX  
system.sysObjectID.0 : OBJECT IDENTIFIER:  
iso.org.dod.internet.private.enterprises.32.1.0
```

! **IMPORTANT:** When editing files, replace the *iso.org.dod.internet.private.enterprises* portion of the *sysObjectID* with the numeric value 1.3.6.1.4.1.

HP OpenView Windows uses configuration files to map the SNMP MIB-II *system.sysObjectID* variable to symbol types. You can find configuration files in the directory */usr/OV/conf*.

The two configuration files of interest are *oid_to_sym* and *oid_to_type*. Before editing these files, ensure that HP OpenView NNM is not active. Carefully read the procedures to edit the files in the *HP OpenView Network Node Manager Administrator's Reference*, Chapter 3, "Configuration," under the topic "Configuring the Mapping from sysObjectID to Types."

The following changes presume that you have Compaq servers on your network running Insight Agents for various operating systems.

! **IMPORTANT:** Compaq servers without Insight Agents and other manufacturer's servers running SNMP agents that return MIB-II information, incorrectly identify themselves as Compaq servers with Insight Management capabilities. This occurs because the *system.sysObjectID* returned by the agent is network operating system dependent, not hardware dependent. For such servers, you must manually modify their symbols to represent computers with no Insight Management capabilities. This affects only new servers you add to the network after making changes.

The oid_to_sym File

This file is in the *\$LANG* subdirectory under the directory */usr/OV/conf*, where *\$LANG* represents a language-specific configuration. By default, the file *oid_to_sym* is in the directory */usr/OV/conf/C*.

The HP OpenView NNM **ipmap** process uses this file to match against the *system.sysObjectID* returned by an agent. Because Insight Agents are based on the network operating system, you must add entries for each operating system that has Insight Agents available. For example, for NetWare, Windows NT, SCO UNIX, UNIXWare, and OS/2 you must edit the file as follows to append the entries:

1.3.6.1.4.1.23.1.6:Computer:Cpqsrvr	# NetWare
1.3.6.1.4.1.23.1.6.3.11:Computer:Cpqsrvr	# NetWare 3.11
1.3.6.1.4.1.23.1.6.3.12:Computer:Cpqsrvr	# NetWare 3.12
1.3.6.1.4.1.23.1.6.4.10:Computer:Cpqsrvr	# NetWare 4.10
1.3.6.1.4.1.311.1.1.3.1:Computer:Cpqsrvr	# Windows NT
1.3.6.1.4.1.232:Computer:Cpqsrvr	# SCO UNIX
1.3.6.1.4.1.23.1.13.2:Computer:Cpqsrvr	# UNIXWare 2.10
1.3.6.1.4.1.2.2.1.2.2:Computer:Cpqsrvr	# OS/2

NOTE: The field *Cpqsrvr* must match the new symbol type defined earlier.

The oid_to_type File

This file is in the directory */usr/OV/conf*. The HP OpenView NNM **netmon** process uses it to match against the *system.sysObjectID* returned by an agent. Because agents are based on the network operating system, you must add entries for each operating system that has Insight Agents available. For example, for NetWare, Windows NT, SCO UNIX, UNIXWare, and OS/2 you must edit the file as follows and append the entries:

1.3.6.1.4.1.23.1.6:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.3.11:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.3.12:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.6.4.10:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.311.1.1.3.1:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.232:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.23.1.13.2:Compaq:Compaq Insight Management Agents
1.3.6.1.4.1.2.6.46:Compaq:Compaq Insight Management Agents

NOTE: The fields *Compaq* and *Compaq Insight Management Agents* must match the vendor and SNMP agent field enumerations defined earlier in the Field Registration files.

Incorporating the Changes

After you make the changes, reinitialize HP OpenView NNM to startup. Refer to the *HP OpenView Network Node Manager Administrator's Reference*, Chapter 3, "Configuration," under the topic "Configuring the Mapping from sysObjectID to Types" for details.

Adding the Final Touches

Once you make the changes described above, you can bring up HP OpenView NNM and add some final touches to make it visually appealing. Perform the following procedure:

1. Change the symbol subclass for each Compaq server to represent the server bitmap defined earlier. If you have not done so, change any generic computer symbols to represent any PC clients in your network.
2. Partition your network, as appropriate, into submaps. For more details, refer to the *HP OpenView Network Node Manager User's Guide*, Chapter 3, "Managing Network and System Configuration."
3. Go to the Edit menu and choose *Submap Description* to include background images for your submaps. Add the full pathname of the graphic file in the Background Graphic field. OpenView Windows supports the following formats for backgrounds:
 - GIF -- CompuServe Graphics Interchange Format
 - XBM -- X11 monochrome bitmap format

For more details, refer to the *HP OpenView Windows User's Guide*, Chapter 5, "Maps, Submaps and Snapshots," under the topic "Adding a Background Graphic."

Adding Custom Applications

Through the use of registration files, you can add items to the OpenView menus which can display and graph collected information to suit your needs. Applications can design simple on-screen reports or more sophisticated reports that place specific information in a window. You can also build MIB applications for on-screen reporting using the Application Builder or use the Application Registration files for complex operations that require other background processes to run.

Some examples are given in the following sections. One example uses the Application builder, the other uses the Application Registration file. You can use these as sample applications to build your own.

In addition, Compaq has included several Application Registration files on the Compaq Insight Management MIB diskette that, when integrated into the OpenView system, gather and display important information about your Compaq servers.

Adding the Compaq Query Files

Compaq includes Application Registration files on the Compaq Insight Management MIB diskette. These files implement queries for the data that is described in Appendix A, "Using the Compaq MIB Information." An explanation of data contained in these items is given in that Appendix.

There are several ways to transfer the Application Registration files from the Compaq Insight Management MIBs diskette to your HP OpenView console. If your system has a UNIX command(s) to read DOS formatted diskettes, you can copy the files directly from the diskette. Another method to transfer the files is to use the File Transfer Protocol (FTP) that most UNIX systems support. The details of using FTP to transfer the files are given earlier in this chapter, in the section "Transferring MIB Files to the HP OpenView Console."

The files on the MIBs diskette are named `??????.ARF` where `??????` denotes a seven character name. The default path that OpenView uses for MIB query application registration files is `/usr/OV/registration/C`.

After you copy the MIB Query Application Registration Files to the OpenView console, you must restart the OpenView application to activate the files. When OpenView restarts, you see many new menu items under the *Monitor Compaq Server* menu item.

To use the queries, select a Compaq server from a map then choose an item from the *Monitor Compaq Server* menu. A window displays the information in a labeled table that corresponds to the item you selected. The menu items correspond with the various categories of information described in Appendix A, "Using the Compaq MIB Information."

If you choose not to use the query files, the following section provide examples of obtaining the information manually.

Slot Configuration Information

One common requirement is to add the configuration information on your Compaq server -- what controllers have you installed in any given server? Because the Insight Agents provide you with EISA slot information it is easy to build an application that retrieves the configuration information and displays it as a table. The steps are described below:

1. Select *Option Application Builder: SNMP ...* from the menu bar in the HP OpenView Windows. The MIB Application Builder dialog box displays.
2. Click on the *Add* button and type the name of the application in the *Application ID* field:

Compaq.SlotCfg

The information is stored in this file.

3. Select *Table* from the choices displayed to specify the application type.
4. Enter a suitable title for your application, such as:

EISA Slot Configuration

5. Click on the *Add* button. The MIB Application Builder/Add MIB Objects dialog box displays.
6. Navigate the MIB tree to select elements from the appropriate table. The path to the information is:

Private
 Compaq
 Standard Equipment
 Component
 EISA NVRAM
 EISA Slot Table
 EISA Slot Entry

7. Select the following fields from the table:

EISA Slot Index
EISA Slot Board ID
EISA Slot Board Name

These fields identify the slot number, EISA ID, and board description, respectively. For each field selected, click on the **Apply** button. This adds the field to the Display Fields list. (Optionally, you can edit the label and width fields to suit your needs.)

8. Specify the menu path using " " to create cascading menus. For example:

Monitor→Compaq→EISA Slot Configuration

9. Enter the selection rule to determine the conditions for highlighting menu items that are available to the user to execute. The default is:

(isSNMPSupported) || (isSNMPProxied)

10. You can override this to specify only servers with Insight Agents as in:

(isSNMPSupported) && (isCpqlInsight)

11. You can also add help text to provide assistance for using this application. When completed, you should see a window similar to Figure 6-3.

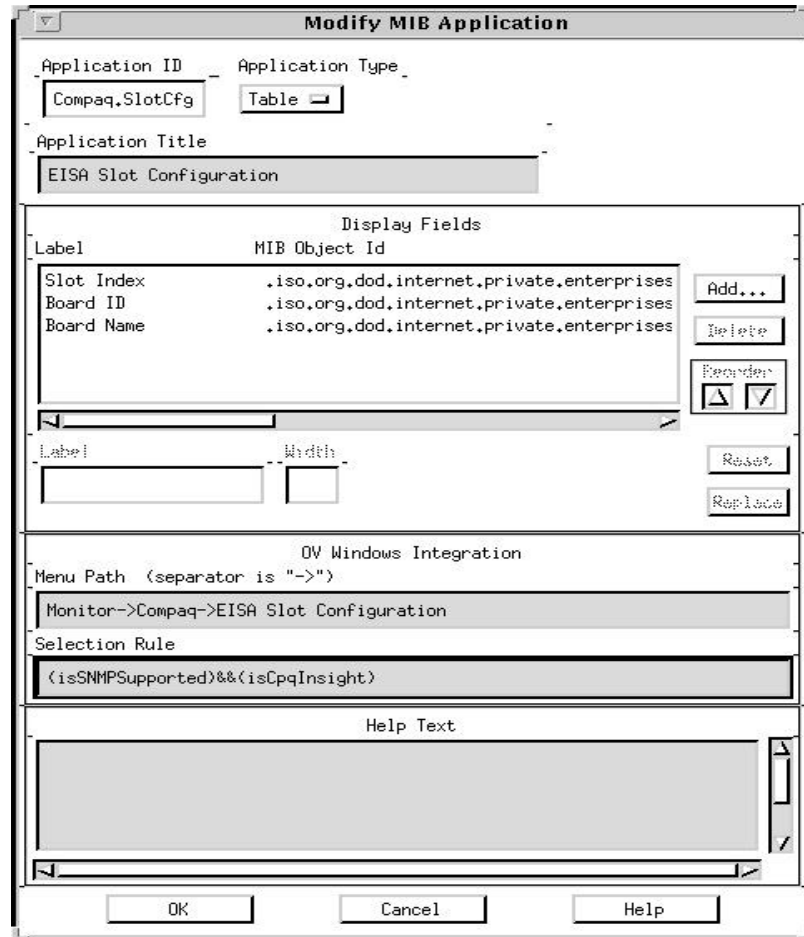


Figure 6-3. Building an application for EISA configuration information

12. Click on the *OK* button to add the application.
13. Return to the menu bar to view the application menu choice in the path set up in step 8 of this procedure.

14. To verify the application, highlight a Compaq server and execute the application. You should see a display similar to the following.

Slot Ind	Board ID	Board Name
0	CPQ0109	COMPAQ SYSTEMPRO System Board (ASSY # 001981)
1	CPQ4001	COMPAQ 32-Bit Intelligent Drive Array Controller
2	NVL0701	Novell NE3200 Bus Master Ethernet
3		(Empty)
4		(Empty)
5		(Empty)
6		(Empty)
7	CPQ6100	COMPAQ 32-Bit NetFlex Controller
8	CPQFA0D	COMPAQ 32-Bit 4-Socket System Memory Board
9		(Empty)
10		(Empty)
11	CPQ9999	COMPAQ 486/33 System Processor Board used as Primary

Getting Contact Information From an Offline Device

Another common requirement is the need to contact node information on an offline device, such as location, contact person, and so on. SNMP MIB-II compliant agents provide this information, which you can easily retrieve when the managed device is online. However, this method does not work when the device is offline.

Unfortunately, in this situation you must retrieve the information so you can notify the contact person to investigate the failure.

HP OpenView NNM provides a way to solve this problem: the OpenView IP Topology database contains information, on a per-object basis, of the IP address, contact name, location, and so on. This database continually updates, even if a particular managed device is offline. You can print out the corresponding object information based on the last time HP OpenView NNM established contact to that device. You can "dump" out the contents of the database for any object by using the **ovtopodump** command as follows:

```
ovtopodump -l <object name> | more
```

You should see a display similar to the following (this example shows only the first few lines):

```
HOSTNAME: test311
NODE ID: 569
CREATE TIME: 05/20/93 11:55:40
MODIFIED TIME: 06/07/93 09:16:24
SYMBOL CHANGE TIME: 06/04/93 12:34:00
STATUS: Up
FLAGS:
DESCRIPTION: Novell NetWare v3.11 (250 user) 2/20/91
DESCRIPTION: Compaq DeskPro 386, 16 MHz, 8 Meg
LOCATION: Room 69
LOCATION: 1234 Main Street
LOCATION: City, State, Country
LOCATION: The Universe
CONTACT: Jane Doe
CONTACT: 1.555.1234
CONTACT: jane.doe@company.com
SNMP OBJECT ID: 1.3.6.1.4.1.23.1.6
```

The database dump provides you with useful contact information when the managed device is offline. You can now build an application to do the following:

- Redirect the output to a temporary file.
- Filter out selected information to a second temporary file.
- Put up an X Window with the contents of the second file.
- Wait for user input to clear the window.
- Clean up the temporary files.

To build this application, you must first "register" the application with HP OpenView. HP OpenView stores Application Registration files in the directory `/usr/OV/registration/$LANG`, where `$LANG` represents a language-specific configuration. By default, these files are in the directory `/usr/OV/registration/C`.

For details on building Application Registration files and integrating applications to the HP OpenView Windows menu bar, refer to the *HP OpenView Network Node Manager Administrator's Reference*, Appendix B, "Creating and Using Application Registration Files."

The following list illustrates a sample Application Registration File:

```
/*
**
** OpenView Windows Node Information
**
** @(#)Revision: 1.0 $
*/
Application "OpenView Windows Node Information"
{
  Version "OpenView 3.1";
  Description {
    "Dump the topo database information for the selected node."
  }
  Copyright {
    "(c)Copyright 1993 Compaq Computer Corp."
  }
}
/*
** Monitor
*/
MenuBar "Monitor"
{
  "Node Info" f.action "Topo Dump";
}
Action "Topo Dump"
{
  MinSelected 1;
  MaxSelected 1;
  SelectionRule isNode;
  Command 'xterm -bg cyan -geo 115x20 \
-sb -title "$OVwMenuItem - (${OVwSelection1})" -e sh -c \
"/usr/OV/bin/ovtopodump -l ${OVwSelection1} > /tmp/topo.dmp;\
awk -f /usr/OV/bin/node /tmp/topo.dmp;more /tmp/topo.prn;\
rm /tmp/topo.* > /dev/null;read x";
} }
```

This application lets you select a Compaq server, even one that is offline, and view the contact information. The application uses an AWK (programming language) script file to include only required information in the file *topo.prn*. The following list contains script for the "node" file. Include this file in your directory */usr/OV/bin*:

```

BEGIN {
print " " > "/tmp/topo.prn"
eof = getline
while (eof > 0)
{
if ($1 == "HOSTNAME:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "STATUS:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "DESCRIPTION:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "LOCATION:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "CONTACT:")
{ print $0 > "/tmp/topo.prn" }
| if ($1 == "NODE")
{
if ($2 == "LABEL:")
{ print $0 > "/tmp/topo.prn" }
if ($2 == "AGENT:")
{ print $0 > "/tmp/topo.prn" }
if ($2 == "VENDOR:")
{ print $0 > "/tmp/topo.prn" }
}
if ($1 == "SUPPORTS")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "NUMBER")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "INTERFACE:")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "IP")
{ print $0 > "/tmp/topo.prn" }
if ($1 == "PHYSICAL")
{ print $0 > "/tmp/topo.prn" }
}
}

```

continued

```
if ($1 == "LAST")  
  { print $0 > "/tmp/topo.prn" }  
if ($1 == "CONSECUTIVE")  
  { print $0 > "/tmp/topo.prn" }  
eof = getline }
```

Figure 6-4 illustrates a sample output from the application.

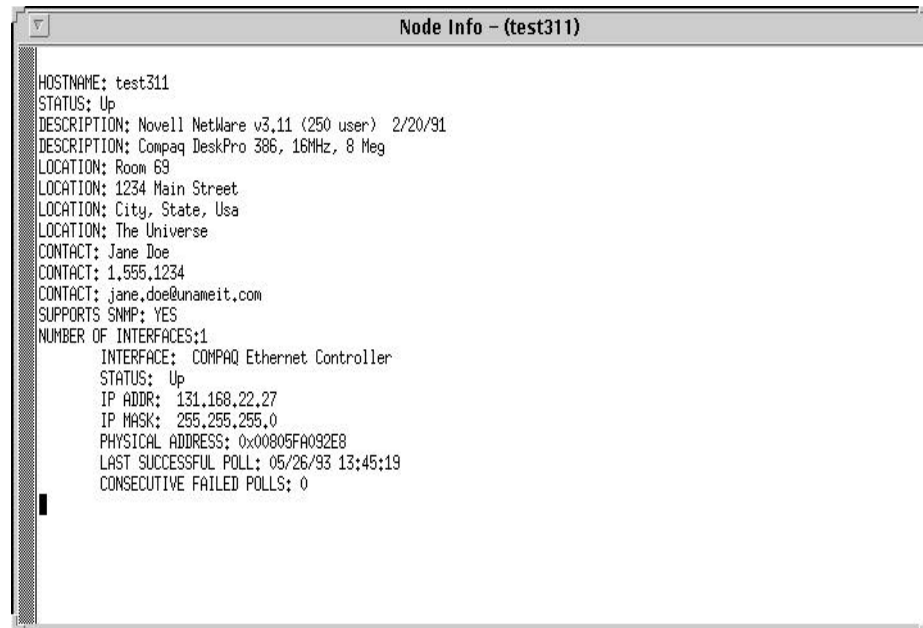


Figure 6-4. Contact information application

Using the Information

Once you integrate the Insight MIBs and build your applications with HP OpenView NNM, you can manage your Compaq servers in the same manner as your other managed devices.

HP OpenView provides various methods to obtain and use the information in the MIBs. They are:

- Browsing the MIB
- Predefined and custom monitor applications
- Event configuration and monitoring

The following sections describe each of these in detail.

Browsing the MIB

HP OpenView Windows provides a quick method of browsing up and down the MIB tree. To invoke the MIB browser, select the *Monitor MIB Values Browse MIB: SNMP...* menu item. Start at the root, traversing up and down any branch until you get to a MIB variable of interest. Click on the *Start Query* button to retrieve information about that variable.

NOTE: Once you load the Insight MIB files, the MIB values are available for any selected Compaq server with the Insight Agent operational.

Figure 6-5 displays available Insight MIBs (the exact screen content depends on your installation):

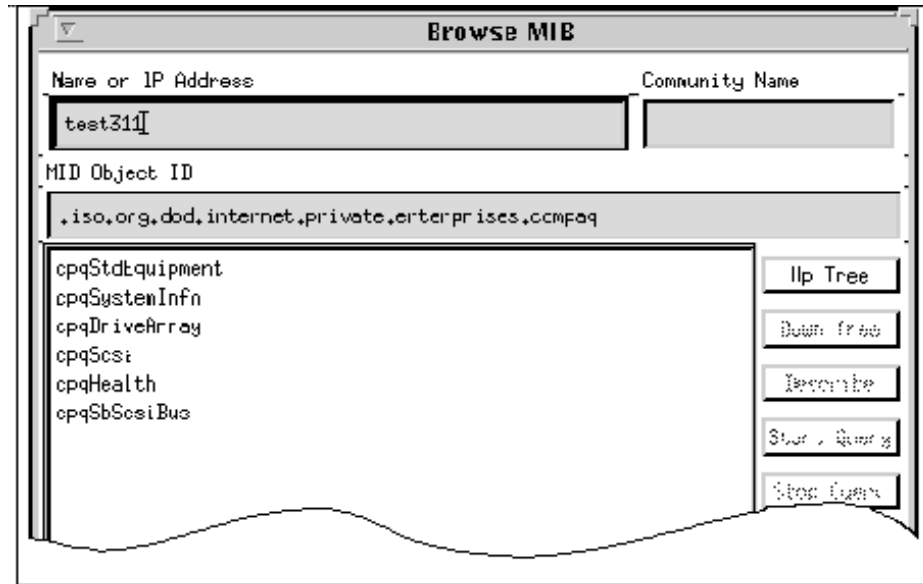


Figure 6-5. Browsing the Compaq MIB subtree

You can also SET Insight MIB variable values when browsing the MIB subtree.

! **IMPORTANT:** Insight Agents for each operating system might have different levels of SET support. Refer to the appropriate *Compaq Insight Management Agents User Guide* for more information.

For example, select the subtree and start a query to retrieve the existing value to update the contact information. Select the value you want to change, and enter a new value. When you click on the *Set* button, the MIB value updates. Figure 6-6 illustrates an example.

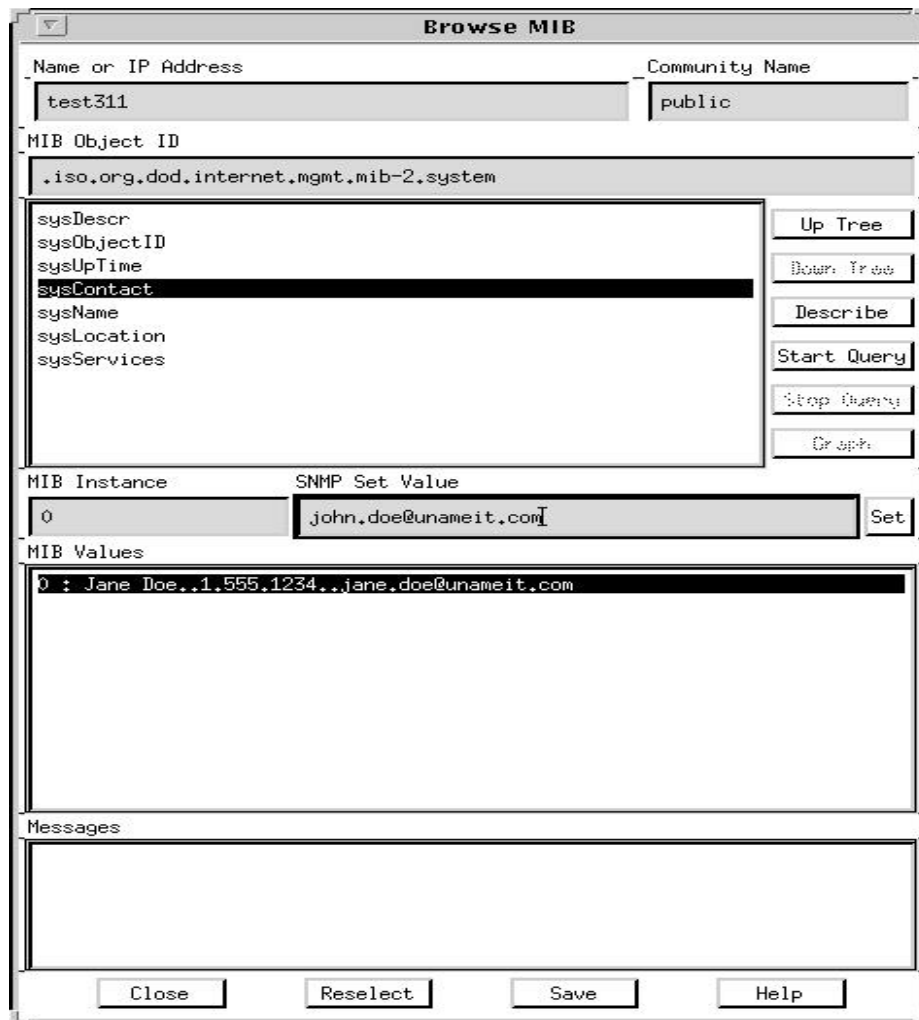


Figure 6-6. Setting MIB values

For details on browsing the MIB and setting values, see the *HP OpenView Network Node Manager User's Guide*, Chapter 6, "Using Network Node Manager Operations," under the topics "Viewing MIB Values" and "Setting MIB Values."

Predefined and Custom Monitor Applications

Browsing MIB values is just one example of the many predefined applications available to you on the Monitor menu of the HP OpenView Windows menu bar. Compaq has included several custom MIB query files on the Compaq Insight Management MIBs diskette which provide important configuration, statistical, and condition information.

As discussed in "Adding Custom Applications" of this chapter, you can further enhance the predefined suite of applications by building your own.

Applications on the Monitor menu only provide you with on-screen reports. They can also graph trends in MIB variables. For example, to monitor the traffic of a particular network interface controller in a server, follow these steps:

1. Highlight the server symbol on the map.
2. Select *Monitor Network Activity Interface: Traffic ...* from the menu bar. When the data processing completes, a window displays the network traffic graph.

For more details on using these applications, refer to the *HP OpenView Network Node Manager User's Guide*, Chapter 6, "Using Network Node Manager Operations."

Event Monitoring

An event is a notification of change in your network. HP OpenView NNM categorizes events into:

- Threshold events
- Network topology events
- Error events
- Status events
- Node configuration events
- Application alert events
- All of the above

You can use the Event Notification window to view selectively a particular category of events, or all events. You can further narrow your selection to a particular highlighted symbol (for example, a specific Compaq server).

You can proactively monitor the health of your network using events. This TechNote does not include a detailed discussion of event monitoring. For guidelines on establishing baselines, monitoring trends, setting up thresholds on MIB values, and so on, refer to the *HP OpenView Network Node Manager User's Guide*, Chapter 4, "Monitoring Your Network."

Handling Traps

Traps are a method of reducing network traffic. An agent can send information to a management PC when requested, or unsolicited. Traps, unsolicited information, indicate something changed at the agent that requires attention.

If you do not specify the HP OpenView console as a trap destination, the traps remain locally at the agent. This means that the HP OpenView NNM does not know about an impending problem until it polls the agent about the specific problem area. Excessive polling generates heavy network traffic and degrades performance. Therefore, Compaq strongly recommends that you set up at least one trap destination at each critical server to the IP address or hostname of your HP OpenView NNM console.

Trap IDs have a generic part and a specific part. The generic part of a Compaq trap is always six (for Enterprise-Specific traps). Zero through five are used as part of the SNMP definition for other trap types. The specific part depends on the type of error.

Setting Up Compaq Traps

Compaq provides files on the Compaq Insight Management MIBs diskette that enable OpenView to save Compaq enterprise traps to the OpenView event log. These files also include trap descriptions for each of the traps. Refer to the *README.TXT* file on the diskette for more information.

NOTE: If you use the files on the Insight Management MIBs diskette, the following steps are *not* required.

If you wish to set up Compaq traps manually, perform the following steps:

1. Select *Options Event Configuration: SNMP*.
2. Press the *Add* button in the dialog box.
3. Add a new enterprise for Compaq, using the following ID:

Compaq	1.3.6.1.4.1.232
--------	-----------------
4. For each enterprise, add the generic trap ID (six) and specific trap IDs that you want. For details on Compaq trap IDs, refer to Appendix A, "Using the Compaq MIB Information."

Insight Agents version 1.x defines one enterprise per subsystem, for example, Compaq-IDA = 1.3.6.1.4.1.232.3, Compaq-SCSI = 1.3.6.1.4.1.232.5, and so on.

Insight Agents version 2.x defines a single enterprise, for example, Compaq = 1.3.6.1.4.1.232, and the specific ID of the trap type defines the subsystem, for example, 30xx for IDA, 50xx for SCSI.

! **IMPORTANT:** For compatibility with older systems, you must configure your HP OpenView console to handle traps from both the older and newer NetWare Agents. Windows NT, SCO UNIX, and OS/2 agents follow the Compaq Insight Manager 2.x format.

The following figure illustrates a sample configuration for a Compaq Intelligent Drive Array enterprise ID, and a specific trap ID of four, implying that the physical drive threshold was exceeded.

NOTE: Figure 6-7 displays an Insight Agent, version 1.x trap.

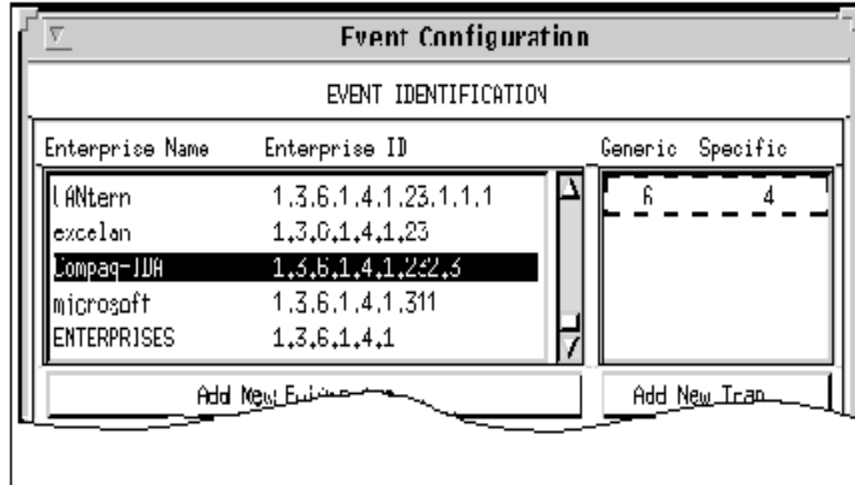


Figure 6-7. Setting up a Compaq IDA trap definition

Once the trap definitions are set up, you can view new traps through the Events Notification window, similar to other events. The following displays a sample event list with Compaq IDA traps.

NOTE: The following example illustrates a version 1.x trap.

```

Trap #6, specific: 4, args (1):
[1] cpqDaPhyDrvEntry.cpqDaPhyDrvThresh
    Passed.1.4 (Integer): 2

Trap #6, specific: 4, args (1):
[1] cpqDaPhyDrvEntry.cpqDaPhyDrvThresh
    Passed.1.3 (Integer): 2
    
```

Troubleshooting

If you do not receive traps at your HP OpenView console when your network is operational, check the following:

- Verify the configuration of the managed devices to ensure they are forwarding traps to your HP OpenView console.
- Verify the read and read-write community settings.

Refer to the *HP OpenView Network Node Manager Administrator's Reference*, Chapter 4, "Troubleshooting," under the topic "Configuring Events" for more troubleshooting tips.

Integration to Other Systems

Hewlett-Packard and other third parties provide HP OpenView platform support with products in several areas of network management such as problem solving, configuration management, capacity planning, trouble ticketing, and so on. For details about additional products, contact:

Hewlett-Packard Company
3404 East Harmony Road
Fort Collins, CO 80525 USA

You can also build custom applications using the HP OpenView APIs. This TechNote does not discuss these techniques in detail. However, it is possible for you to integrate HP OpenView NNM to other systems with limited programming. For example, sending e-mail messages from HP OpenView NNM as a result of receiving a trap from a Compaq server.

Event Notification via E-Mail

Significant events often require some action from an administrator. One way to notify an administrator is to send a message to the administrator's mailbox.

To set up HP OpenView NNM to send e-mail messages, ensure that:

- Your domain name is set correctly and matches the domain name of other computers on the network. The following is an example format of domain name: *Yourcompanyname.com*.
- You can send e-mail. As a test, try to send mail to your login ID at the HP OpenView console. If you logged in as root, use root as the mail ID.

For each event that you forward to the mail gateway, you must set up the optional command argument field on the Event Configuration screen as follows (replace the "Admin@Sysmgtpo" with your own mail address):

```
/usr/local/bin/mailevent "Compaq IDA trap received from node: $A with $# args:\n$*" "Admin@Sysmgtpo"
```

Figure 6-8 shows an example of configuring an event to send mail:

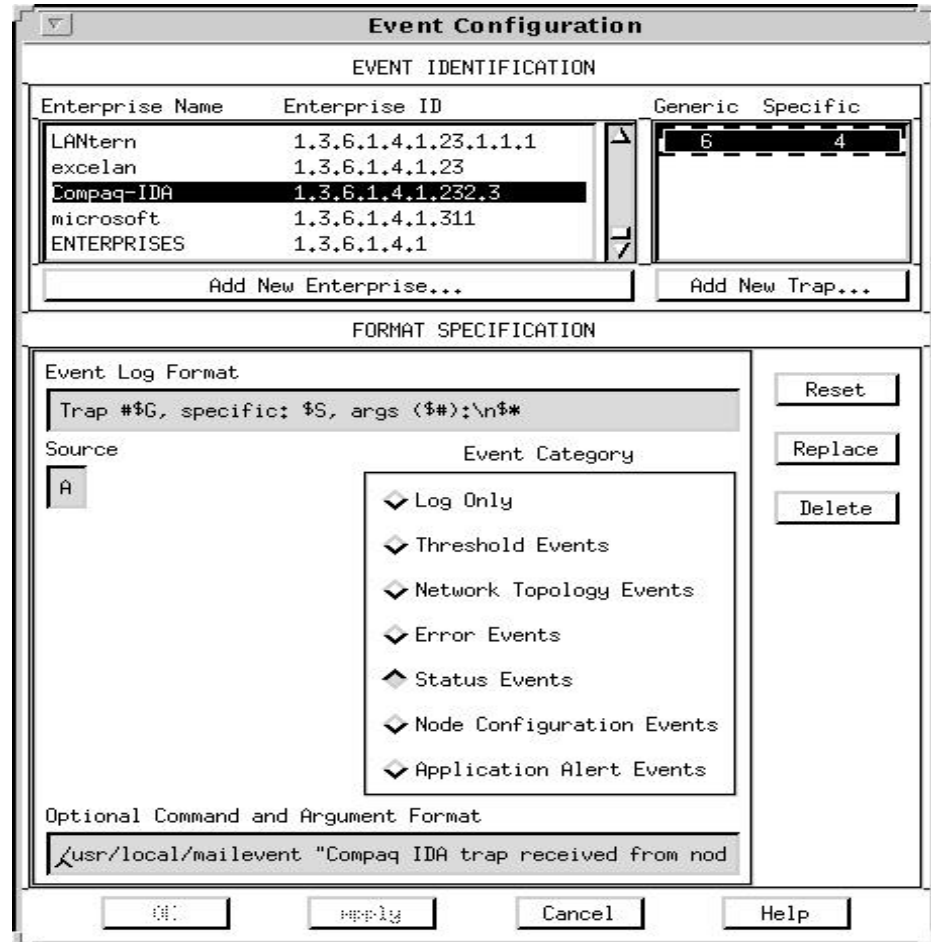


Figure 6-8. Configuring an event to send mail

When the event occurs, it invokes the **mailevent** script, sending the mail message. The contents of the **mailevent** script include:

```
MSG=$1  
TO=$2  
echo "${MSG}" | /usr/lib/sendmail "${TO}"
```

For further details on configuring, refer to the *HP OpenView Network Node Manager 3.0 User's Guide*, Chapter 4, "Monitoring Your Network," under the topic "Setting up Event-Triggered Actions." Refer to HP OpenView online help for details on the *\$A*, *\$#*, and *\$** parameters in the trap notification message.

Some points about setting up events:

- Choose the events carefully. Do not flood the administrator's mailbox with an e-mail message for every event occurring in the network.
 - Try to route different classes of events to different people. For instance, one person might be notified about critical events for routers, another might be notified only of server events, and so on.
-

Appendix A

Using the Compaq MIB Information

This appendix provides you with information that will help you use Insight MIBs in your SNMP environment. It includes an overview of the Insight MIBs organization and identifies and describes categories of information contained within the MIBs. This information provides common types of information that you may want to know about the servers in your network.

Organization of Compaq Insight MIBs

As stated in Chapter 3 of this TechNote, “Compaq Server Management Technology,” Compaq fully supports the SNMP standard. The assigned enterprise ID for Compaq is 232. Therefore, all MIB variables maintained by Compaq begin with the ASN.1 syntax 1.3.6.1.4.1.232.

Compaq has defined several MIBs in the Compaq enterprise. The MIBs are classified, where appropriate, according to the subsystem of a Compaq server.

The following table lists all the current Insight MIBs and a description of each.

Table A-1
Compaq Insight Management MIBs

MIB Name:	Standard Equipment
Object ID:	1.3.6.1.4.1.232.1
MIB File Name:	<i>CPQSTDEQ.MIB</i>
Purpose:	Contains information that is available on any ISA or EISA system, including system processor, memory, ISA CMOS, EISA NVRAM, serial port, parallel port, ROM, diskette drives, and IDE-compatible hard drive information.

MIB Name:	System Information
Object ID:	1.3.6.1.4.1.232.2
MIB File Name:	<i>CPQSINFO.MIB</i>
Purpose:	Contains information about Compaq specific features, including Compaq security features, memory module information, board revision information, asset management information, and other system board specific information.

MIB Name:	Intelligent Drive Array
Object ID:	1.3.6.1.4.1.232.3
MIB File Name:	<i>CPQIDA.MIB</i>
Purpose:	Contains information about the Compaq Drive Array Controllers and drives connected to these controllers, including the SMART Controller, IDA-2 Controller, IDA Expansion Controller, and IDA Controller.

MIB Name:	Server Manager
Object ID:	1.3.6.1.4.1.232.4
MIB File Name:	<i>CPQSRVMN.MIB</i>
Purpose:	Contains information about the Compaq Server Manager/R board.

MIB Name:	SCSI Device System
Object ID:	1.3.6.1.4.1.232.5
MIB File Name:	<i>CPQSCSI.MIB</i>
Purpose:	Contains information about the Compaq SCSI interface products, including SCSI drives and generic SCSI device and controller information. This MIB also includes SCSI tape and CD-ROM information. It does <i>not</i> include SMART controller information, which is incorporated into the Intelligent Drive Array MIB.

continued

Compaq Insight Management MIBs continued

MIB Name: Health
Object ID: 1.3.6.1.4.1.232.6
MIB File Name: *CPQHLTH.MIB*

Purpose: Contains information about system health features, including Critical Error Log, Correctable Error Log, ASR feature, Thermal (temperature and fan) sensing features, POST Message tracking, System lifetime, and EISA bus utilization.

MIB Name: SCSI Storage System
Object ID: 1.3.6.1.4.1.232.8
MIB File Name: *CPQSTSYS.MIB*

Purpose: Contains information about the Compaq ProLiant Storage System.

MIB Name: Threshold Management
Object ID: 1.3.6.1.4.1.232.10
MIB File Name: *CPQTHRSH.MIB*

Purpose: Contains information about the Insight software components that can generate alarms based on user defined thresholds and can track statistics on attributes based on user input.

MIB Name: Host Operating System
Object ID: 1.3.6.1.4.1.232.11
MIB File Name: *CPQHOST.MIB*

Purpose: Contains information about host operating system information. This information includes host OS identification information, system processor utilization information, file system information, NIC interface to hardware mapping information, and loaded modules information.

MIB Name: UPS
Object ID: 1.3.6.1.4.1.232.12
MIB File Name: *CPQUPS.MIB*

Purpose: Contains information about the Compaq Uninterruptible Power Supply (UPS) product.

MIB Name: Recovery
Object ID: 1.3.6.1.4.1.232.13
MIB File Name: *CPQRECOV.MIB*

Purpose: Contains information about the Compaq Recovery Server option.

NOTE: Object IDs 232.7 and 232.9 are not currently in use.

Key MIB Information

The Insight MIBs contain many attributes that provide you with a comprehensive picture of the configuration, operating statistics, and general status aspects of the operation of your Compaq servers. However, since there are several hundred MIB attributes, the following discussion focuses on several categories which contain key attributes on major subsystems within your servers. Once you identify a potential problem area, you can retrieve additional information to assist you with a specific problem resolution.

The key MIB information falls into the following general categories:

- Configuration
- Operating Statistics
- Condition Attributes

The following sections describe each general category and provide detailed subsets within each main category. Detailed information about each item is found in the referenced MIB file for each item. The MIB files are on the Compaq Insight Management MIBs diskette.

These items are provided to enable you to construct queries which will provide specific details in monitoring your systems. Compaq has included files on the Compaq Insight Management MIBs diskette for HP OpenView and IBM NetView for AIX which implement queries based upon these items. Refer to Chapter 6 for instructions on how to integrate the query files into HP OpenView. Refer to Chapter 4 for instructions on how to integrate the query files into IBM NetView for AIX.

Configuration

The MIB items in the following configuration categories describe information that is determined at system configuration or operating system load time. They typically do not change as a result of ongoing operation of the hardware or software. MIB items in these categories provide you with information about the static configuration of the hardware and software of your system.

General System Description

The items in this category describe several items which come from the standard SNMP MIB-II (RFC1213) that are of interest in generally identifying the system. Consult this MIB, which is included with your management console software, for more information on these items.

Table A-2
General System Description Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
System Name	sysName	1.5	<i>RFC1213</i>
System Description	sysDesc	1.1	<i>RFC1213</i>
System Contact	sysContact	1.4	<i>RFC1213</i>
System Location	sysLocation	1.6	<i>RFC1213</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.2.1. to construct the full ASN.1 number for the item.

Hardware Asset Descriptions

The items in this category describe items of a general hardware inventory nature. Consult the referenced MIB file(s) for more information on these items.

Table A-3
Hardware Asset Descriptions

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Total System Memory	cpqSeTotalMem	1.2.3.2	<i>CPQSTDEQ.MIB</i>
Keyboard Description	cpqSeKeyboardDesc	1.2.7.1	<i>CPQSTDEQ.MIB</i>
Video System Description	cpqSeVideoDesc	1.2.8.1	<i>CPQSTDEQ.MIB</i>
Product Name	cpqSiProductName	2.2.4.2	<i>CPQSINFO.MIB</i>
System Serial Number	cpqSiSysSerialNum	2.2.2.1	<i>CPQSINFO.MIB</i>
CPU Index	cpqSeCpqUnitIndex	1.2.2.1.1.1	<i>CPQSTDEQ.MIB</i>
CPU Name	cpqSeCpuName	1.2.2.1.1.3	<i>CPQSTDEQ.MIB</i>
CPU Speed	cpqSeCpuSpeed	1.2.2.1.1.4	<i>CPQSTDEQ.MIB</i>
Floppy Disk Type	cpqSeFloppyDiskType	1.2.11.1.1.2	<i>CPQSTDEQ.MIB</i>
IDE/ESDI Disk Size(s)	cpqSeFixedDiskCapacity	1.2.12.1.1.6	<i>CPQSTDEQ.MIB</i>
SCSI Disk Size(s)	cpqScsiPhyDrvSize	5.2.4.1.1.7	<i>CPQSCSI.MIB</i>
Drive Array Disk Size(s)	cpqDaPhyDrvSize	3.2.5.1.1.45	<i>CPQIDA.MIB</i>
SCSI Tape Type(s)	cpqTapePhyDriveType	5.4.1.1.1.4	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Compaq Software Inventory

The items in this category provide information about the Compaq device drivers, Insight agents, and system utilities installed on your system. Consult the referenced MIB file(s) for more information on these items.

Table A-4
Compaq Software Inventory Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Software Type	cpqHoSwVerType	2.7.2.1.3	CPQHOST.MIB
Software Name	cpqHoSwVerName	2.7.2.1.4	CPQHOST.MIB
Software Version	cpqHoSwVerVersion	2.7.2.1.8	CPQHOST.MIB
Software Description	cpqHoSwVerDescription	2.7.2.1.5	CPQHOST.MIB
Software Location	cpqHoSwVerLocation	2.7.2.1.7	CPQHOST.MIB
Software Status	cpqHoSwVerStatus	2.7.2.1.2	CPQHOST.MIB

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.11. to construct the full ASN.1 number for the item.

Operating System

The items in this category provide general information about the operating system (OS) running on your system. Consult the referenced MIB file(s) for more information on these items.

Table A-5
Operating System Configuration Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
OS Name	cpqHoName	2.2.1	<i>CPQHOST.MIB</i>
OS Version	cpqHoVersion	2.2.2	<i>CPQHOST.MIB</i>
OS Description	cpqHoDesc	2.2.3	<i>CPQHOST.MIB</i>
File System Description	cpqHoFileSysDesc	2.4.1.1.2	<i>CPQHOST.MIB</i>
Total File Space	cpqHoFileSysSpaceTotal	2.4.1.1.3	<i>CPQHOST.MIB</i>
Total File Names	cpqHoFileSysAllocUnitsTotal	2.4.1.1.6	<i>CPQHOST.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.11. to construct the full ASN.1 number for the item.

Detailed Hardware Configuration

The items in this category provide detailed information about the hardware configuration of your system. Consult the referenced MIB file(s) for more information on these items.

Table A-6
Hardware Configuration Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Total System Memory	cpqSeTotalMem	1.2.3.2	<i>CPQSTDEQ.MIB</i>
System ROM Version	cpqSeSysRomVer	1.2.6.1	<i>CPQSTDEQ.MIB</i>
CPU Name	cpqSeCpuName	1.2.2.1.1.3	<i>CPQSTDEQ.MIB</i>
CPU Speed	cpqSeCpuSpeed	1.2.2.1.1.4	<i>CPQSTDEQ.MIB</i>
Floating Point Co-processor Name	cpqSeFpuName	1.2.2.2.1.4	<i>CPQSTDEQ.MIB</i>
Floating Point Co-processor Speed	cpqSeFpuSpeed	1.2.2.2.1.5	<i>CPQSTDEQ.MIB</i>
CPU Cache Index	cpqSeCacheLevelIndex	1.2.2.3.1.2	<i>CPQSTDEQ.MIB</i>
CPU Cache Size	cpqSeCpuCacheSize	1.2.2.3.1.3	<i>CPQSTDEQ.MIB</i>
CPU Cache Speed	cpqSeCpuCacheSpeed	1.2.2.3.1.4	<i>CPQSTDEQ.MIB</i>
CPU Cache Status	cpqSeCpuCacheStatus	1.2.2.3.1.5	<i>CPQSTDEQ.MIB</i>
Serial Port Address	cpqSeSerialPortAddr	1.2.9.1.1.2	<i>CPQSTDEQ.MIB</i>
Serial Port Description	cpqSeSerialPortDesc	1.2.9.1.1.3	<i>CPQSTDEQ.MIB</i>
Parallel Port Address	cpqSeParallelPortAddr	1.2.10.1.1.2	<i>CPQSTDEQ.MIB</i>
Parallel Port Description	cpqSeParallelPortDesc	1.2.10.1.1.3	<i>CPQSTDEQ.MIB</i>
Floppy Disk Type	cpqSeFloppyDiskType	1.2.11.1.1.2	<i>CPQSTDEQ.MIB</i>

Continued

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A-10 Using the Compaq MIB Information

Hardware Configuration Items continued

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
IDE/ESDI Disk Size	cpqSeFixedDiskCapacity	1.2.12.1.1.6	<i>CPQSTDEQ.MIB</i>
SCSI Disk Model	cpqScsiPhyDriveModel	5.2.4.1.1.4	<i>CPQSCSI.MIB</i>
SCSI Disk Firmware Revision	cpqScsiPhyDrvFWRev	5.2.4.1.1.5	<i>CPQSCSI.MIB</i>
SCSI Disk ID	cpqScsiPhyDrvScsiID	5.2.4.1.1.8	<i>CPQSCSI.MIB</i>
SCSI Disk Size	cpqScsiPhyDrvSize	5.2.4.1.1.7	<i>CPQSCSI.MIB</i>
SCSI Tape Model	cpqTapePhyDrvType	5.4.1.1.1.5	<i>CPQSCSI.MIB</i>
SCSI Tape Magazine Size	cpqTapePhyDrvMagSize	5.4.1.1.1.7	<i>CPQSCSI.MIB</i>
Drive Array Disk Model	cpqDaPhyDrvModel	3.2.5.1.1.3	<i>CPQIDA.MIB</i>
Drive Array Disk Firmware Revision	cpqDaPhyDrvFWRev	3.2.5.1.1.4	<i>CPQIDA.MIB</i>
Drive Array Disk Size	cpqDaPhyDrvSize	3.2.5.1.1.45	<i>CPQIDA.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Operating Statistics

The MIB items in the following operating statistics categories describe the ongoing operation of your system hardware and software.

Hard Drive Read/Write/Seek

The items in this category provide information about the number of read, write and seek operations that are occurring on your system. This information is available for SCSI, IDA, IDA-2 and SMART devices. Over time, this information can be used to determine rates of hard drive usage. Consult the referenced MIB file(s) for more information on these items.

Table A-7
Hard Drive Read/Write/Seek Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Drive Array Drive Index	cpqDaPhyDrvIndex	3.2.5.1.1.2	<i>CPQIDA.MIB</i>
Drive Array Sectors Read (high)	cpqDaPhyDrvHReads	3.2.5.1.1.10	<i>CPQIDA.MIB</i>
Drive Array Sectors Read (low)	cpqDaPhyDrvReads	3.2.5.1.1.11	<i>CPQIDA.MIB</i>
Drive Array Sectors Written (high)	cpqDaPhyDrvHWrites	3.2.5.1.1.12	<i>CPQIDA.MIB</i>
Drive Array Sectors Written (low)	cpqDaPhyDrvWrites	3.2.5.1.1.13	<i>CPQIDA.MIB</i>
Drive Array Seeks (high)	cpqDaPhyDrvHSeeks	3.2.5.1.1.14	<i>CPQIDA.MIB</i>
Drive Array Seeks (low)	cpqDaPhyDrvSeeks	3.2.5.1.1.15	<i>CPQIDA.MIB</i>
SCSI Drive Index	cpqScsiPhyDrvIndex	5.2.4.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Drive Sectors Read (high)	cpqScsiPhyDrvHighRead Sectors	5.2.4.1.1.11	<i>CPQSCSI.MIB</i>
SCSI Drive Sectors Read (low)	cpqScsiPhyDrvLowRead Sectors	5.2.4.1.1.12	<i>CPQSCSI.MIB</i>
SCSI Drive Sectors Written (high)	cpqScsiPhyDrvHighWrite Sectors	5.2.4.1.1.13	<i>CPQSCSI.MIB</i>
SCSI Drive Sectors Written (low)	cpqScsiPhyDrvLow WriteSectors	5.2.4.1.1.14	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Hard Drive Errors

The items in this category provide information about a variety of errors that can occur in the SCSI, IDA, IDA-2 or SMART disk subsystems. This information can be used to pinpoint errors that may occur in the ongoing operation of your system. Consult the referenced MIB file(s) for more information on these items.

Table A-8
Hard Drive Error Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Drive Array Drive Index	cpqDaPhyDrvIndex	3.2.5.1.1.2	<i>CPQIDA.MIB</i>
Drive Array Hard Read Errors	cpqDaPhyDrvHardReadErrs	3.2.5.1.1.16	<i>CPQIDA.MIB</i>
Drive Array Recovered Read Errors	cpqDaPhyDrvRecvReadErrs	3.2.5.1.1.17	<i>CPQIDA.MIB</i>
Drive Array Recovered Write Errors	cpqDaPhyDrvRecvWriteErrs	3.2.5.1.1.19	<i>CPQIDA.MIB</i>
Drive Array Seek Errors (high)	cpqDaPhyDrvHSeekErrs	3.2.5.1.1.20	<i>CPQIDA.MIB</i>
Drive Array Seek Errors (low)	cpqDaPhyDrvSeekErrs	3.2.5.1.1.21	<i>CPQIDA.MIB</i>
Drive Array Data Request Timeout	cpqDaPhyDrvDrqTimeouts	3.2.5.1.1.26	<i>CPQIDA.MIB</i>
Drive Array Other Timeouts	cpqDaPhyDrvOtherTimeouts	3.2.5.1.1.27	<i>CPQIDA.MIB</i>
Drive Array Format Errors	cpqDaPhyDrvFormatErrs	3.2.5.1.1.31	<i>CPQIDA.MIB</i>
Drive Array POST Errors	cpqDaPhyDrvPostErrs	3.2.5.1.1.32	<i>CPQIDA.MIB</i>
Drive Array Not Ready Errors	cpqDaPhyDrvNotReadyErrs	3.2.5.1.1.33	<i>CPQIDA.MIB</i>
Drive Array Spin Up Errors	cpqDaPhyDrvSpinUpErrs	3.2.5.1.1.42	<i>CPQIDA.MIB</i>

Continued

Hard Drive Error Items continued

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Drive Array Bus Faults	cpqDaPhyDrvBusFaults	3.2.5.1.1.46	<i>CPQIDA.MIB</i>
Drive Array Accelerator Index	cpqDaAccelCntlrIndex	3.2.2.2.1.1	<i>CPQIDA.MIB</i>
Drive Array Accelerator Read Errors	cpqDaAccelReadErrs	3.2.2.2.1.7	<i>CPQIDA.MIB</i>
Drive Array Accelerator Write Errors	cpqDaAccelWriteErrs	3.2.2.2.1.8	<i>CPQIDA.MIB</i>
SCSI Drive Index	cpqScsiPhyDrvIndex	5.2.4.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Drive Hard Read Errors	cpqScsiPhyDrvHardReadErrs	5.2.4.1.1.15	<i>CPQSCSI.MIB</i>
SCSI Drive Hard Write Errors	cpqScsiPhyDrvHardWriteErrs	5.2.4.1.1.16	<i>CPQSCSI.MIB</i>
SCSI Drive Seek Errors	cpqScsiPhyDrvSeekErrs	5.2.4.1.1.20	<i>CPQSCSI.MIB</i>
SCSI Drive Timeouts	cpqScsiPhyDrvTimeouts	5.2.4.1.1.23	<i>CPQSCSI.MIB</i>
SCSI Drive POST Errors	cpqScsiPhyDrvPostErrs	5.2.4.1.1.24	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Tape Drive Read/Write Items

The items in this category provide information about the number of bytes that have been read or written to the tape device(s) on your system. Consult the referenced MIB file(s) for more information on these items.

Table A-9
Tape Drive Read/Write Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
SCSI Tape Index	cpqTapeCountersScsildIndex	5.4.2.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Tape Read/Write Bytes	cpqTapeCountersTotalBytes	5.4.2.1.1.9	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

SCSI Tape Drive Errors

The items in this category provide information about a variety of errors that can occur in the SCSI tape subsystems. This information can be used to pinpoint errors that might occur in the ongoing operation of your system. Consult the referenced MIB file(s) for more information on these items.

Table A-10
SCSI Tape Drive Error Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
SCSI Tape Index	cpqTapeCountersScsildIndex	5.4.2.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Tape Re-Writes	cpqTapeCountersReWrites	5.4.2.1.1.5	<i>CPQSCSI.MIB</i>
SCSI Tape Re-Reads	cpqTapeCountersReReads	5.4.2.1.1.6	<i>CPQSCSI.MIB</i>
SCSI Tape Total Errors	cpqTapeCountersTotalErrors	5.4.2.1.1.7	<i>CPQSCSI.MIB</i>
SCSI Tape Uncorrectable Errors	cpqTapeCountersTotalUncorrectable	5.4.2.1.1.8	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Network Interface Card

The items in this category provide information about the operation of the network interface cards (NICs) in your system. Over time, these can be used to determine rates of use and to identify potential network problems. The items in this category are from the standard MIB RFC1213 (MIB-II) which is included with your management console software. Consult this MIB for further information on these items.

Table A-11
NIC Information Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Interface Index	ifIndex	2.2.1.1	<i>RFC1213</i>
Bytes Received	ifInOctets	2.2.1.10	<i>RFC1213</i>
Bytes Transmitted	ifOutOctets	2.2.1.16	<i>RFC1213</i>
Broadcast Packets Received	ifInNUcastPkts	2.2.1.12	<i>RFC1213</i>
Broadcast Packets Transmitted	ifOutNUcastPkts	2.2.1.18	<i>RFC1213</i>
Packets Received with Errors	ifInErrors	2.2.1.14	<i>RFC1213</i>
Packets Transmitted with Errors	ifOutErrors	2.2.1.20	<i>RFC1213</i>
Received Packets Discarded	ifInDiscards	2.2.1.13	<i>RFC1213</i>
Transmitted Packets Discarded	ifOutDiscards	2.2.1.19	<i>RFC1213</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.2.1. to construct the full ASN.1 number for the item.

Operating System Resource Utilization

The items in this category provide information about operating system resource usage of several key system components. Consult the referenced MIB file(s) for more information on these items.

Table A-12
Operating System Resource Usage Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
CPU Index	cpqHoCpuUtilUnitIndex	2.3.1.1.1	CPQHOST.MIB
CPU Utilization - One Minute	cpqHoCpuUtilMin	2.3.1.1.2	CPQHOST.MIB
CPU Utilization - Five Minute	cpqHoCpuUtilFiveMin	2.3.1.1.3	CPQHOST.MIB
CPU Utilization - Thirty Minute	cpqHoCpuUtilThirtyMin	2.3.1.1.4	CPQHOST.MIB
CPU Utilization - One Hour	cpqHoCpuUtilOneHour	2.3.1.1.5	CPQHOST.MIB
File System Description	cpqHoFileSysDesc	2.4.1.1.2	CPQHOST.MIB
File System Size	cpqHoFileSysSpaceTotal	2.4.1.1.3	CPQHOST.MIB
File System Space Used (MB)	cpqHoFileSysSpaceUsed	2.4.1.1.4	CPQHOST.MIB
File System Space Used (%)	cpqHoFileSysPercentSpaceUsed	2.4.1.1.5	CPQHOST.MIB
Total Files Allowed	cpqHoFileSysAllocUnitsTotal	2.4.1.1.6	CPQHOST.MIB
Total Number of Files	cpqHoFileSysAllocUnitsUsed	2.4.1.1.7	CPQHOST.MIB

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.11. to construct the full ASN.1 number for the item.

Hardware Utilization

The items in this category provide information about the utilization of the system hardware resources. Consult the referenced MIB file(s) for more information on these items.

Table A-13
Hardware Utilization Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
System Lifetime Power On Time	cpqHeSysUtilLifetime	2.8.1	<i>CPQHLTH.MIB</i>
EISA Bus Utilization - One Minute	cpqHeSysUtilEISABusMin	2.8.2	<i>CPQHLTH.MIB</i>
EISA Bus Utilization - Five Minute	cpqHeSysUtilEISABusFiveMin	2.8.3	<i>CPQHLTH.MIB</i>
EISA Bus Utilization - Thirty Minute	cpqHeSysUtilEISABusThirtyMin	2.8.4	<i>CPQHLTH.MIB</i>
EISA Bus Utilization - One Hour	cpqHeSysUtilEISABusHour	2.8.5	<i>CPQHLTH.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.6. to construct the full ASN.1 number for the item.

Fault Identification

The items in this category provide the information recorded by the fault recording features of your system. Consult the referenced MIB file(s) for more information on these items.

Table A-14
Fault Identification Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Critical Error Type	cpqHeCriticalErrorType	2.2.4.1.3	<i>CPQHLTH.MIB</i>
Critical Error Description	cpqHeCriticalErrorDesc	2.2.4.1.6	<i>CPQHLTH.MIB</i>
Correctable Memory Error Description	cpqHeCorrMemErrDesc	2.3.4.1.6	<i>CPQHLTH.MIB</i>
POST Error Code	cpqHePostMsgCode	2.7.2.1.2	<i>CPQHLTH.MIB</i>
POST Error Description	cpqHePostMsgDesc	2.7.2.1.3	<i>CPQHLTH.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.6. to construct the full ASN.1 number for the item.

Condition Attributes

To help you focus on the important factors that ensure reliable operation of your server, Compaq has developed *condition* MIB attributes. These attributes are a composite of several other attributes related to a specific subsystem. If you monitor the condition variables, they reveal an accurate picture of the health of your server. The following sections describe these condition attributes.

Drive Array

The items in this category provide information about the general condition of your Compaq Drive Array Subsystem. When one of these status items becomes set to “Degraded” or “Failed,” you should then query the items specified in the “Hard Drive Errors” section in this appendix to pinpoint the error. Consult the referenced MIB file(s) for more information on these items.

Table A-15
Drive Array Status Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Drive Array Index	cpqDaCntlrIndex	2.2.1.1.1	<i>CPQIDA.MIB</i>
Controller Condition	cpqDaCntlrCondition	2.2.1.1.6	<i>CPQIDA.MIB</i>
Drive Array Accelerator Index	cpqDaAccelCntlrIndex	2.2.2.1.1	<i>CPQIDA.MIB</i>
Drive Array Accelerator Condition	cpqDaAccelCntlrCondition	2.2.2.1.9	<i>CPQIDA.MIB</i>
Spare Drive Controller Index	cpqDaSpareCntlrIndex	2.4.1.1.1	<i>CPQIDA.MIB</i>
Spare Drive Index	cpqDaSparePhyDrvIndex	2.4.1.1.2	<i>CPQIDA.MIB</i>
Spare Drive Condition	cpqDaSpareCondition	2.4.1.1.6	<i>CPQIDA.MIB</i>
Drive Controller Index	cpqDaPhyDrvControllerIndex	2.5.1.1.1	<i>CPQIDA.MIB</i>
Drive Index	cpqDaPhyDrvIndex	2.5.1.1.2	<i>CPQIDA.MIB</i>
Drive Condition	cpqDaPhyDrvCondition	2.5.1.1.37	<i>CPQIDA.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.3. to construct the full ASN.1 number for the item.

SCSI Disk

The items in this category provide information about the general condition of the SCSI disks attached to the SCSI channel(s) of your system. When one of these status items becomes set to “Degraded” or “Failed,” you should then query the items specified in the “Hard Drive Errors” section in this appendix to pinpoint the error. Consult the referenced MIB file(s) for more information on these items.

Table A-16
SCSI Disk Status Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
SCSI Controller Index	cpqScsiCntlrlIndex	2.2.1.1.1	<i>CPQSCSI.MIB</i>
SCSI Controller Bus Index	cpqScsiCntlrlBusIndex	2.2.1.1.2	<i>CPQSCSI.MIB</i>
SCSI Controller Status	cpqScsiCntlrlStatus	2.2.1.1.7	<i>CPQSCSI.MIB</i>
SCSI Controller Condition	cpqScsiCntlrlCondition	2.2.1.1.12	<i>CPQSCSI.MIB</i>
SCSI Drive Controller Index	cpqScsiPhyDrvCntlrlIndex	2.4.1.1.1	<i>CPQSCSI.MIB</i>
SCSI Bus Index	cpqScsiPhyDrvBusIndex	2.4.1.1.2	<i>CPQSCSI.MIB</i>
SCSI Drive Index	cpqScsiPhyDrvIndex	2.4.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Drive Status	cpqScsiPhyDrvStatus	2.4.1.1.9	<i>CPQSCSI.MIB</i>
SCSI Drive Condition	cpqScsiPhyDrvCondition	2.4.1.1.26	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.5. to construct the full ASN.1 number for the item.

SCSI Tape Drive

The items in this category provide information about the general condition of the SCSI tape drive(s) attached to the SCSI channel(s) of your system. When one of these status items becomes set to “Degraded” or “Failed,” you should then query the items specified in the “SCSI Tape Drive Errors” section in this appendix to pinpoint the error. Consult the referenced MIB file(s) for more information on these items.

Table A-17
SCSI Tape Drive Status Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
SCSI Controller Index	cpqTapePhyDrvCntlrIndex	5.4.1.1.1.1	<i>CPQSCSI.MIB</i>
SCSI Tape ID	cpqTapePhyDrvScsildIndex	5.4.1.1.1.3	<i>CPQSCSI.MIB</i>
SCSI Tape Drive Condition	cpqTapePhyDrvCondition	5.4.1.1.1.6	<i>CPQSCSI.MIB</i>

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

System Environment

The items in this category provide information about the general condition of the environment associated with your system and external storage system. Consult the referenced MIB file(s) for more information on these items.

Table A-18
System Environment Status Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Overall Thermal Condition	cpqHeThermalCondition	6.2.6.1	CPQHLTH.MIB
System Temperature Status	cpqHeThermalTempStatus	6.2.6.3	CPQHLTH.MIB
System Fan Status	cpqHeThermalSystemFanStatus	6.2.6.4	CPQHLTH.MIB
CPU Fan Status	cpqHeThermalCpuFanStatus	6.2.6.5	CPQHLTH.MIB
Storage System Type	cpqSsBoxType	8.2.1.1.3	CPQSTSYS.MIB
Storage System Index	cpqSsBoxBusIndex	8.2.1.1.2	CPQSTSYS.MIB
Storage System Fan Status	cpqSsBoxFanStatus	8.2.1.1.7	CPQSTSYS.MIB
Storage System Temperature Status	cpqSsBoxTempStatus	8.2.1.1.9	CPQSTSYS.MIB
Storage System Side Panel Status	cpqSsBoxSidePanelStatus	8.2.1.1.10	CPQSTSYS.MIB

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232. to construct the full ASN.1 number for the item.

Fault Identification and Recovery

The items in this category provide information about the general condition of the fault identification and recovery features of your system. The logs that record any events are described by the items in the “Fault Identification” section in this appendix. Consult the referenced MIB file(s) for more information on these items.

Table A-19
Fault and Recovery Features Status Items

Data Item Description	MIB Item Name	ASN.1 No.	MIB File Name
Automatic Server Recovery Status	cpqHeAsrCondition	2.5.17	CPQHLTH.MIB
POST Error Message Recording Status	cpqHePostMsgCondition	2.7.1	CPQHLTH.MIB
Correctable Memory Log Status	cpqHeCorrMemLogCondition	2.3.2	CPQHLTH.MIB
Critical Error Log Condition	cpqHeCritLogCondition	2.2.2	CPQHLTH.MIB

NOTE: The ASN.1 numbers should be prefixed by 1.3.6.1.4.1.232.6. to construct the full ASN.1 number for the item.

Using the MIB Information

The primary usage of the condition attributes is to provide a high-level status of major subsystems within your system. You can monitor these items on a periodic basis. Any change in status from “OK” indicates that you should investigate the subsystem further. The following sections provide some examples of the kinds of activities that can be supported by using the information provided by the MIBs.

Environment

The environment condition items provide information about the environmental conditions in and around your system. If one of them becomes set to “Degraded” or “Failed,” you should examine the conditions surrounding your system for a lack of cool air flow or a possible failure of a cooling fan.

System Performance

You can use the items in the Hard Drive Read/Write/Seek and Network Interface Card categories to monitor general system usage. Since many of these items are counts, you may want monitor them on a periodic basis and convert them to rates to better use this information. If you notice continuous high rates, it may be an indication of a potential system overload.

Resource Usage

The usage of system resources can be seen by monitoring the Operating System Resource Utilization and Hardware Utilization categories. If you notice that the operating system file system usage is approaching your acceptable minimum for available space, you may want to plan to archive some files, examine the file systems for unused files that might be candidates for deletion, or consider adding more physical disk drives to increase disk space.

Appendix B

Trap Overview

Insight Agents generate traps to notify you of events that require action. Some traps enable you to be proactive by warning you of status changes or degraded states. Others require immediate attention.

Depending on the version of Insight Agents loaded on a particular server, you could receive a version 1.x type trap or a version 2.x type trap.

The version 1.x traps defined in the MIBs have a different base identifier, called the *enterprise ID*, for each MIB file (Intelligent Drive Array, SCSI Devices, and so on). The MIB enterprise IDs are the “Object ID” items in the descriptions of the MIBs shown in Table 4-1. For example, the version 1.x trap for Intelligent Drive Array is 1.3.6.1.4.1.232.3. The version 2.x traps have the same enterprise ID (1.3.6.1.4.1.232) for all traps defined in all of the MIBs.

The enterprise ID combined with the specific trap ID uniquely identify the trap.

Each trap message lists the trap name, the identification number, the description, and the values for the trap variables. The trap variables appear in alphabetical order with a descriptive title indicating an important event has occurred. Immediately following the title is the numerical equivalence for the trap variable listed. By providing you with this message, you can quickly and easily translate the trap variables you receive from your management platform to determine if the trap requires immediate attention.

NOTE: Insight Agents for NetWare (versions 1.0, 1.1, and 1.2) generate version 1.x traps. Insight Agents for NetWare (above version 1.2), Windows NT, SCO UNIX, UnixWare, and OS/2 generate version 2.x traps.

The Compaq traps described in the following tables are grouped by subject as well as Trap IDs.

Table B-1
Drive Array Traps

Trap Name: cpqDa2LogDrvStatusChange

Trap ID: 3001

Description:

A logical drive status change has occurred. The current status is indicated by the included status variable.

“Bad Connection” status (9) - The physical drive in a Compaq Drive Array is not responding to commands from the array controller. Several causes are possible:

- A drive was removed from the system.
- The data cable connecting the drive to the array has failed.

IMPORTANT: Do not attempt to re-seat any cables while the server is on. Damage to the drives or array controller will result.

- The cable connecting the drive to the array has become loose at either end and must be reseated.
 - The cable connecting an external storage subsystem to the server has become loose.
 - The power to the drive has been interrupted. This can be caused by a loosened drive power supply cable or a failed power supply in the server or disk subsystem.
-

continued

Drive Array Traps *Continued*

“Failed” status (3) - One or more physical drives have failed. Data is no longer protected on the drive array.

“OK” status (2) - This alarm is typically issued upon completion of repairs to a Compaq Drive Array logical drive. This alarm occurs whenever the logical drive status has returned to a normal state from any other state. In fault tolerant configurations, it is issued following the resolution of the Drive Array Logical Drive Status Change - Rebuilding alarm. In non-fault tolerant configurations, it is issued following the Drive Array Logical Drive Status Change - Failed alarm, after the failed drive has been replaced.

“Overheating” status (10) - The temperature inside an external drive array enclosure has risen above factory preset levels. If the temperature continues to rise, damage to the drives within the enclosure may result. Elevated temperatures may cause erratic operation of a physical drive within the array, causing data loss. This alarm may be caused by the removal of the enclosure cover, which impairs the cooling system performance significantly, or by a cooling fan failure in the drive array enclosure.

NOTE: Do not operate Compaq server and storage products with the chassis covers removed. Airflow inside the unit is interrupted, and proper cooling is not possible. Removing the chassis covers also violates the FCC certification and UL listing.

“Ready for Rebuild” status (6) - A failed drive has been replaced, and the system is ready to begin Automatic Data Recovery on the logical drive. This alarm is issued after a failed drive has been replaced or if a drive that previously failed appears to work again after the power is turned on.

NOTE: The system is ready to begin Automatic Data Recovery. Perform an orderly shutdown of the operating system and server, and turn the server off. Turn it on again to begin Automatic Data Recovery.

“Rebuilding” status (7) - Automatic Data Recovery is underway.

“Recovering” status (5) - A physical drive failed within the Compaq Drive Array. The drive array is in a recovery mode. No data has been lost, due to the fault tolerant mode currently in use.

NOTE: At the first available opportunity, replace the failed drive.

continued

Drive Array Traps *Continued*

“Shutdown” status (11) - The external drive array has stopped operating because of elevated temperatures. Do not attempt to operate the disk storage subsystem while temperatures are elevated. Severe damage to the disk drives will occur. Elevated temperatures will cause erratic operation of a physical drive within the array, causing data loss. The elevated temperatures can cause physical changes to a hard drive, leading to data corruption. This alarm may be caused by the removal of the enclosure cover, which impairs the cooling system performance significantly, or by a cooling fan failure in the drive array enclosure.

IMPORTANT: If a logical drive shuts down due to high temperatures, data may no longer be available from the server or storage subsystem containing the logical drive. In this case, you may need to physically examine the server or storage subsystem to understand the cause of the alarm. Do not operate Compaq server and storage products with the chassis covers removed. Airflow inside the unit will be interrupted, and proper cooling is not possible. Removing the chassis covers also violates the FCC certification and UL listing.

“Wrong Drive” status (8) - During remedial hardware maintenance, the incorrect physical drive was replaced in an array.

IMPORTANT: Do not return the removed drive or the drive indicated as “wrong” for repair. Perform an orderly shutdown of the system, and run Compaq Drive Array Advanced Diagnostics if you need further assistance in identifying failed drives and/or drives installed in the wrong location. You must bring the system down, turn it off, and return the removed drive to its original location. Turn the system back on. After you reinstall the removed drive, identify the correct failed drive.

continued

Drive Array Traps *Continued*

“Inactive” status (4) - This alarm signifies that the spare is in a ready state. This alarm is typically issued if you install or replace a spare drive in a Compaq Drive Array. It is issued after you replace a failed spare drive with a new one. This alarm may also occur when a drive fails and the spare becomes active, the failed drive is replaced, and the spare eventually becomes inactive again. In fault tolerant configurations, when a drive fails and a spare drive is available, the storage subsystem begins building data onto that spare. If the failed drive is replaced before restoration has completed, the process halts and the data is restored to the replacement drive instead. If the failed drive is replaced after the build process is complete, the system reconstructs the data to the replacement drive, and the spare will revert to its original inactive state. This keeps a spare drive available. If you have installed or replaced a failed drive in the drive array, this alarm is to be expected.

Trap Name: cpqDa2PhyDrvStatusChange

Trap ID: 3003

Description:

A physical drive status change has occurred. The current status is indicated by the included status variable.

“Failed” status (3) - A physical drive has failed in a mass storage subsystem. In configurations that are not fault tolerant, this alarm is critical. The mass storage subsystem failed, and server operation stopped. You must replace the failed drive before system operation can begin again. In a fault tolerant configuration, the overall system condition is degraded, but still operational. You may receive additional alarms, such as Drive Array Logical Drive Status Change - Recovering, or Drive Array Spare Drive Status Change - Active.

“OK” status (2) - This alarm indicates an improving condition. This alarm is issued after a physical drive fault has been corrected or when you add a new hot pluggable physical drive.

continued

Drive Array Traps *Continued*

Trap Name: cpqDa2PhyDrvThreshPassedTrap

Trap ID: 3004

Description:

The server issuing this alarm has a drive that exceeded one or more factory preset thresholds for functional degradation. Many Compaq high performance drive array hard drives are "stamped" by the drive manufacturer with minimum functional characteristics. As a result of normal wear and tear, the operation of a hard drive may gradually deteriorate. If certain thresholds are exceeded, the drive may not perform to specified levels, and may be subject to hardware failure sometime in the future. Drives that exceed these thresholds are considered "failed," although true catastrophic failure has not yet occurred. Compaq will replace drives that have exceeded these thresholds if these drives are still under warranty.

Trap Name: cpqDa2AccelStatusChange

Trap ID: 3005

Description:

This trap indicates a status change event concerning the drive array accelerator. The current status is indicated by the included status variable.

"Enabled" status (3) - This alarm typically occurs when a Compaq Array Accelerator battery set has fully recharged from a discharged condition. The array accelerator is ready to accept posted writes.

"Permanently Disabled" status (5) - The write cache operations of the Array Accelerator are permanently disabled. Consult the cpqDaAccelErrCode MIB item for further information about why this trap occurred. You can perform an orderly shutdown, and run Compaq Drive Array Advanced Diagnostics if you need further information.

"Temporarily Disabled" status (4) - The Array Accelerator on the drive array controller has been temporarily disabled, due to one of the following reasons:

- The accelerator is holding data, and is configured for a different Drive Array Controller. Make sure the accelerator is installed on the original controller.
- Battery charge level is below 75 percent.
- Sufficient resources to perform posted writes are not available. This may be due to a current rebuilding process.
- The accelerator has failed or has been detached from the IDA-2 Controller.
- The host operating system has temporarily disabled posted writes.

Consult the cpqDaAccelErrCode MIB item for further information about why this trap occurred.

continued

Drive Array Traps *Continued*

Trap Name: cpqDa2AccelBadDataTrap

Trap ID: 3006

Description:

This trap indicates an event concerning the contents of the drive array accelerator. The current accelerator data status is indicated by the included status variable.

“None” status (2) - A power loss to the server occurred. The battery-backed Array Accelerator functioned properly and saved all data stored in the cache. When the system is restarted, the stored data will be written to disk.

“Possible” status (3) - When the system was powered up, the battery set was not sufficiently charged. When the batteries are not sufficiently charged, and the system resumes power, the board does not retain stored data. If no data was stored, no data was lost.

Several causes of this alarm are possible:

- If the system was without power for eight days, and the battery packs were on (battery sets activate only if the system loses power unexpectedly), any data stored in the cache was lost.
- The battery set may have a problem. Check the Battery Status for more information.
- The Array Accelerator board has been replaced with a new board that has discharged batteries. No data is lost, and the Array Accelerator will automatically be enabled when the batteries reach full charge.

Trap Name: cpqDa2AccelBatteryFailed

Trap ID: 3007

Description:

This trap signifies that the Insight Agent has detected a battery status change associated with the array accelerator. The current battery status is indicated by the included status variable.

“Charging” status (3) - The battery set power is below 75% of nominal and is being charged.

Drive Array Traps *Continued*

“Degraded” Status (5) - The battery set in the Array Accelerator is operating, but one of the batteries has failed to recharge correctly. This condition jeopardizes the integrity of the battery-backed cache. Replace the Array Accelerator as soon as possible. If allowed to continue, the battery set might fail, and the drive array controller will no longer write data to the Array Accelerator. Server performance may be affected during this time. After the Array Accelerator is replaced, the Drive Array Accelerator Battery Status - Recharging alarm is issued. Once recharged, the alarm Drive Array Accelerator Battery Status - OK is issued, indicating that the array accelerator subsystem is operational.

“Failed” Status (4) - The Array Accelerator can no longer protect data in the cache in the event of a power interruption to the server. Replace the Array Accelerator as soon as possible. The replaced Array Accelerator batteries must reach full charge before the controller will allow data to be written to the Array Accelerator subsystem. Server performance may be affected during this time.

“OK” status (2) - The battery set has reached a fully charged condition.

Table B-2
SCSI Traps

Trap Name: cpqScsi2CntlrStatusChange

Trap ID: 5001

Description:

A SCSI controller status change has occurred. The current status is indicated by the included status variable.

“Failed” status (3) - A SCSI Controller failed. This alarm may be issued with physical drive alarms if the controller cannot communicate with the system.

“OK” status (2) - A SCSI Controller has been replaced. This alarm indicates an improving condition.

continued

SCSI Traps *Continued*

Trap Name: cpqScsi2LogDrvStatusChange

Trap ID: 5002

Description:

A logical drive status change has occurred. The current status is indicated by the included status variable.

“BadConnect” status (9) - Indicates that a physical drive is not responding. Check the cables connected to it.”

“Failed” status (3) - Indicates that more physical drives have failed than the fault tolerance mode of the logical drive can handle without data loss.

“OK” status (2) - Indicates that the logical drive is in normal operation mode. No user action is required.

“ReadyRebuild” (6) - Indicates that the logical drive is ready for Automatic Data Recovery. The physical drive that failed has been replaced, but the logical drive is still operating in Interim Recovery Mode.

“Rebuilding” status (7) - Indicates that the logical drive is currently doing Automatic Data Recovery. During Automatic Data Recovery, fault tolerance algorithms restore data to the replacement drive.

“Recovering” status (5) - Indicates that the logical drive is using Interim Recovery Mode. In Interim Recovery Mode, at least one physical drive has failed, but the logical drive’s fault tolerance mode lets the logical drive continue to operate with no data loss. You should replace the failed drive as soon as possible.

“Unconfigured” status (4) - Indicates that the logical drive is not configured. Insure all of the drive switches are properly set and run the Compaq Configuration Utility.

“WrongDrive” status (8) - Indicates that the wrong physical drive was replaced after a physical drive failure. You need to return the drive incorrectly replaced and replace the failed drive.

continued

SCSI Traps *Continued*

Trap Name: cpqScsi2PhyDrvStatusChange

Trap ID: 5003

Description:

A status change has occurred to a physical drive attached to the SCSI controller. The current status is indicated by the included status variable.

“Failed” status (3) - A physical drive failed in a SCSI mass storage subsystem. Replace the drive.

“OK” status (2) - This alarm indicates an improving condition. When a physical drive error is corrected, this alarm is issued.

“Removed while Failed” status (7) - A SCSI drive installed in the mass storage subsystem has been removed. The removed drive has failed and must be replaced to restore the system to its original configuration. This alarm may be issued if the removed drive was not replaced prior to the time the status was polled by the software.

“Removed while OK” status (6) - A SCSI drive installed in the mass storage subsystem has been removed while operating properly. If the drive was inadvertently removed, return it to its original position.

Trap Name: cpqTapePhyDrvStatusChange

Trap ID: 5004

Description:

A status change has occurred to a tape drive attached to the SCSI controller. The current status is indicated by the included status variable.

“Degraded” status (3) - This alarm indicates that a reread or rewrite threshold has been exceeded; backup integrity might have been compromised. Follow steps listed under “Failed” status.

“Failed” status (4) - A SCSI tape drive failed. For additional details, check the error status of the backup application. Follow these steps:

1. Clean the tape drive head and try the backup again (refer to your tape hardware user manual for more details on this procedure).
2. If step #1 fails, replace the tape media with new tape media and try the backup again.
3. If step #2 fails, cycle the power on the tape drive and try the backup again.
4. If the above steps fail, replace the drive.

“OK” status (2) - A SCSI tape drive has been replaced. This alarm indicates that the tape drive is now ready for operation.

continued

Table B-3
System Health Traps

Trap Name: cpqHe2CorrectableMemoryError

Trap ID: 6001

Description:

This alarm indicates that a block of memory has failed or is failing and must be replaced soon. This condition is not generally critical since the memory controller is able to correct the problem; however, an error of this type indicates that a memory component is failing or has failed in the server issuing the alarm. The system continues to correct any errors it can. Correct the problem as soon as possible. Further degradation of the memory components may occur, and then errors may no longer be correctable.

Trap Name: cpqHe2CorrectableMemoryLogDisabled

Trap ID: 6002

Description:

Correctable memory error tracking has been disabled due to excessive alerts. Logging of correctable memory errors ceases when the error count exceeds a factory preset value since continuing to log errors after the preset number is reached affects performance of the server. This alarm indicates a failing or failed memory module. Though this alarm is not critical, an error of this type indicates that a memory component is failing or has failed in the server issuing the alarm. The system continues to correct any errors it can.

Trap Name: cpqHeThermalTempFailed

Trap ID: 6003

Description:

The temperature status has been set to "Failed." The server will be gracefully shut down. You should monitor the room temperature and air conditioning. Verify that the covers to the servers are properly installed as this ensures proper air flow within the server box. Verify that all fans within the server unit are operational.

continued

System Health Traps *Continued*

Trap Name: cpqHeThermalTempDegraded

Trap ID: 6004

Description:

The temperature status has been set to "Degraded." The server's temperature is outside of the normal operating range. The included status variable indicates how the system will react to this temperature degradation.

"Continue" status (2) - The system is configured to continue operation when this alarm is received. **NOTE:** If the system continues to operate in this degraded condition, the hardware may initiate an immediate and unexpected shutdown.

"Shutdown" status (3) - The system has been configured to initiate a system shutdown when this alarm is received to protect hardware and data from damage or loss.

Trap Name: cpqHeThermalTempOk

Trap ID: 6005

Description:

Previously abnormal temperatures have returned to a normal state. This is an improving condition.

Trap Name: cpqHeThermalSystemFanFailed

Trap ID: 6006

Description:

A required system fan status has been set to "Failed." The included status variable indicates how the system will react to this failure.

"Continue" status (2) - The system is configured to continue operation when this alarm is received.

NOTE: If the system continues to operate in this degraded condition, the hardware might initiate an immediate and unexpected shutdown.

"Shutdown" status (3) - The system has been configured to initiate a system shutdown when this alarm is received to protect hardware and data from damage or loss.

continued

System Health Traps *Continued*

Trap Name: cpqHeThermalSystemFanDegraded

Trap ID: 6007

Description:

The system fan status has been set to "Degraded." An optional system fan is not operating properly.

Trap Name: cpqHeThermalSystemFanOk

Trap ID: 6008

Description:

A system fan returned to a normal state from a failed state. This alarm is to be expected after you replace a failed system fan.

Trap Name: cpqHeThermalCpuFanFailed

Trap ID: 6009

Description:

A system CPU fan failed. The system is configured to continue operation when this alarm is received.

Trap Name: cpqHeThermalCpuFanOk

Trap ID: 6010

Description:

The CPU fan status has been set to OK. Any previous non-operational processor fans have returned to normal operation.

Trap Name: cpqHeAsrConfirmation

Trap ID: 6011

Description:

This alarm indicates a return to normal operation. Automatic Server Recovery (ASR) shut the system down and then restarted the server, which has returned to normal operation. Other alarms that were issued before this alarm may require action.

NOTE: An ASR reboot does not mean the system is free of faults. The server may be running in a degraded condition, and must be corrected soon to prevent the fault condition from escalating into a critical event. If the fault is not corrected, expect another Automatic Server Recovery reboot at any time.

continued

System Health Traps *Continued*

Trap Name: cpqHeThermalConfirmation

Trap ID: 6012

Description:

This alarm is issued when server temperature has returned to acceptable levels, and the server automatically resumed operation. Ensure that you have corrected the problem that caused the elevated temperature.

Trap Name: cpqHePostError

Trap ID: 6013

Description:

A Power-On Self Test error occurred during a reboot of the server. This error may have been noted during the Automatic Server Recovery reboot. The subsystem responsible for the error may also be responsible for the ASR reboot. The error might include non-correctable memory errors, fatal hard drive and/or controller failures, and system board failures. It may not be possible to view the server issuing the alarm, as the network operating system may have failed to load properly.

Trap Name: cpqHeFitToIPwrSupplyDegraded

Trap ID: 6014

Description:

The redundant power supply subsystem has become degraded. Although the server will continue to operate, take corrective action soon to restore power redundancy.

Table B-4
Storage Systems Traps

Trap Name: cpqSs2FanStatusChange

Trap ID: 8001

Description:

The status of a storage system fan has changed. The current status is indicated by the included status variable.

“Failed” status (3) - The storage subsystem’s internal fan(s) failed. The temperature may soon rise beyond factory preset levels. The storage system may shut down automatically to prevent damage to hardware and data loss.

“OK” status (2) - This alarm is issued when a change occurs in the operating condition of a monitored server’s external storage system fan. A fan has been replaced, or has otherwise returned to normal operation. This alarm typically follows the Storage System Fan Status Change - Failed alarm.

Trap Name: cpqSsTempFailed

Trap ID: 8002

Description:

The internal temperature has risen beyond factory preset levels and the storage system may shut down automatically to prevent damage to hardware and data loss. One or more fans may have failed, or a cover is off the storage system issuing the alarm.

NOTE: This alarm is unlikely to occur. If temperatures rise beyond factory preset safety levels, the storage system may shut down. In this case, no data is available to view.

Trap Name: cpqSsTempDegraded

Trap ID: 8003

Description:

The temperature inside a storage subsystem is outside normal operating range. A fan may have failed. If a fan failed, an additional alarm, Storage System Fan Status Change - Failed may also be issued. The storage subsystem is operating without the proper cooling capacity, and internal unit temperatures may soon rise beyond safe levels.

continued

Storage Systems Traps *Continued*

Trap Name: cpqSsTempOk

Trap ID: 8004

Description:

Previously abnormal temperatures inside a storage subsystem returned to a normal state. This is an improving condition, and generally requires no further action.

Trap Name: cpqSsSidePanelInPlace

Trap ID: 8005

Description:

The side panel status has been set to "In Place." The storage system's side panel has returned to a properly installed state.

Trap Name: cpqSsSidePanelRemoved

Trap ID: 8006

Description:

The side panel status has been set to "Removed." The storage system's side panel is not in a properly installed state. This situation may result in improper cooling of the drives in the storage system due to air flow changes caused by the missing side panel.

Trap Name: cpqSsPwrSupplyDegraded

Trap ID: 8007

Description:

The storage system redundant power supply subsystem has become degraded. Although the storage system will continue to operate, take corrective action soon to restore power redundancy.

Table B-5
User Threshold Traps

Trap Name: cpqMeRisingAlarm

Trap ID: 10001

Description:

Rising Threshold passed. One of the monitored objects has passed the rising threshold. The instances of those objects contained within the variable list are those of the alarm entry that generated this trap.

Trap Name: cpqMeFallingAlarm

Trap ID: 10002

Description:

Falling threshold passed. One of the monitored objects has passed the falling threshold. The instances of those objects contained within the variable list are those of the alarm entry that generated this trap.

Table B-6
Uninterruptible Power Supply Traps

Trap Name: cpqUpsLineFailed

Trap ID: 12001

Description:

The AC power has failed. Once this alarm is issued, power to the server is provided by the Compaq Uninterruptible Power Supply (UPS). Depending on the capacity, the load, and the battery charge level of the UPS, the amount of time the UPS can supply conditioned AC power will vary. If you have enabled Automatic Shutdown, the UPS support software will begin an automatic orderly shutdown of the system when the UPS batteries reach the Shutdown Threshold limit. At this time, the UPS Shutdown in Progress alarm is issued to indicate the shutdown process has begun. If Automatic Shutdown is not enabled, the UPS continues to operate until the power returns or the battery power is exhausted.

continued

Uninterruptible Power Supply Traps *Continued*

Trap Name: cpqUpsLineOk

Trap ID: 12002

Description:

The AC line is now active. All electrical devices previously supported by the Compaq Uninterruptible Power Supply (UPS) are now reconnected to the main AC line. The Compaq UPS indicates that it is no longer operating on internal batteries.

Trap Name: cpqUpsShutdown

Trap ID: 12003

Description:

This alarm is the result of an extended power loss. The Compaq Uninterruptible Power Supply (UPS) is about to shut down. If the operating system is configured for automatic shutdown, this process has begun and should be inspected to make sure it will complete prior to the shutdown of the UPS.

Trap Name: cpqUpsConfirmation

Trap ID: 12004

Description:

The Compaq Uninterruptible Power Supply (UPS) has returned to normal operation. A power failure occurred, and the system was shut down. Commercial power was restored, and the network operating system restarted.

Trap Name: cpqUpsBatteryLow

Trap ID: 12005

Description:

The battery set in the UPS is getting low.

Table B-7
Standby Recovery Server Traps

Trap Name: cpqRsPartnerFailed

Trap ID: 13001

Description:

The Recovery Agent reports that the partner server has failed. This server has taken over the operations of the partner server.

Actions

One of the two servers of a Recovery Server pair has failed. The surviving server has assumed the role of the failed server. A service event should be scheduled to repair the failed server and to restore the Recovery Server pair to its original configuration.

Trap Name: cpqRsStandbyCableFailure

Trap ID: 13002

Description:

The Primary server in a Standby Recovery Server configuration has detected a cable fault condition. This can be caused by disconnecting the serial interconnect cable from the Primary server. Other causes may include failure of the serial port in the Primary server.

Disconnecting the serial cable from the Primary server will cause loss of the heartbeat message at the recovery server. The loss of heartbeat will cause the recovery server to assume that the Primary server has failed. The recovery server will then switch the disks from the Primary server to the recovery server. The recovery server will then boot from the disks. In anticipation of this event, the Primary server operating system will be shutdown in an orderly fashion to prepare for the switchover to the recovery server. A service event should be scheduled to repair the failure and to restore the Recovery Server pair to its original configuration.

continued

Standby Recovery Server Traps *Continued*

Trap Name: cpqRsStandbyFailure

Trap ID: 13003

Description:

The Recovery Server Option Driver reports that the Standby server has failed or the serial interconnect cable to the Standby server is not connected.

Actions:

This trap indicates that the Primary server is no longer receiving an acknowledgment message from the Standby server. This error indicates one of the following possible conditions:

- A. The recovery server has failed.
- B. The recovery server has been powered off.
- C. The serial interconnect cable has been disconnected from the recovery server.

A service event should be scheduled to repair the failure condition and to restore the Recovery Server pair to its original configuration.

Table B-8
Server Manager/R Traps

Trap Name: cpqSmBoardFailed

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 1

Description:

Server Manager/R board failure. Schedule maintenance time to run Compaq Diagnostics to determine the problem.

continued

Server Manager/R Traps *Continued*

Trap Name: cpqSmBoardReset

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 2

Description:

Server Manager/R board reset. If the board and the software were not able to recover, schedule maintenance time to run the Compaq EISA Configuration Utility to ensure the proper board configuration.

Trap Name: cpqSmServerManagerAlert

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 3

Description:

Threshold exceeded on Server Manager/R monitored item. Monitor which threshold is exceeded to determine what actions to take.

Trap Name: cpqSmCommFailed

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 4

Description:

Server Manager/R asynchronous communications failure.

Trap Name: cpqSmBatteryFailed

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 5

Description:

Server Manager/R battery failure. Schedule maintenance time to replace the failed battery or to replace the board.

Server Manager/R Traps *Continued*

Trap Name: cpqSmBoardTimeout

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 6

Description:

Server Manager/R board time-out. If the problem persists, run Compaq Diagnostics at the next scheduled maintenance down time.

Trap Name: cpqSmAlertDestinationBlacklisted

Enterprise ID: 1.3.6.1.4.1.232.4

Trap ID: 7

Description:

The Server Manager/R is unable to complete a call to a designated alert phone number. Verify the proper Server Manager/R alert configuration.

NOTE: Server Manager/R trap IDs 1 - 7 apply only to Insight Agents for NetWare.

For more details on traps, refer to the *READMIB.TXT* file included on the Insight Agents diskette for the appropriate server operating system.

Appendix C

Multivendor Integration from Compaq

To help you successfully integrate and optimize your network or multivendor system, Compaq has developed a library of systems integration TechNotes for the NetWare, Microsoft Windows NT, SCO UNIX, and OS/2 operating system environments. TechNotes provide you with important information on topics such as network performance management, server management, and operating system interconnectivity.

Pricing

Compaq TechNotes U.S. \$15 (CND \$20)*

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Current TechNotes

The current TechNotes available are listed in the following tables.

Table C-1
Compaq TechNotes

TechNote Name	Available on SmartStart	Part Number
<i>Compaq Insight Manager</i>		
Integrating Compaq Insight Manager with Enterprise Management Platforms (8/95)	√	145806-003
Integrating Compaq Insight Manager with Microsoft Systems Management Server (8/95)	√	184720-001
Integrating Compaq Insight Manager with ManageWise (8/95)	√	182074-001
<i>NetWare</i>		
Performance Management in a NetWare v3.1x Environment (4/93)		133399-002
NetWare Tape Backup Management Using ARCserve from Compaq (4/93)	√	137535-001
NetWare 4 Performance Management (7/94)	√	137989-001
ORACLE Server Planning in a NetWare v3.11 Environment (5/93)		145143-001
NetWare Server Management (9/92)		145231-001
Compaq IDA-2 Configuration for NetWare (12/92)		145536-001
Compaq ProSignia Configuration Guidelines for NetWare v3.x (12/92)		145537-001
Compaq Answers to Technical Support Questions for NetWare Environments (2/95)		145710-002
NetWare SFT III v3.11 Installation (9/93)		145905-001
NetWare Migration from 2.x to 3.12 (6/94)	√	181069-001
NetWare Migration from 3.12 to 4 (3/95)	√	181152-001

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C-4 Multivendor Integration from Compaq

Compaq TechNotes *Continued*

TechNote Name	Available on SmartStart	Part Number
<i>NetWare (continued)</i>		
SYBASE SQL Server 4.2.2 for NetWare: Tuning and Performance (2/95)	√	184429-001
Performance of Lotus Notes 3.1 on Compaq ProLiant Servers with NetWare 3.1x (2/95)		184430-001
Configuration and Tuning of Oracle7 for NetWare on Compaq Servers (11/94)	√	Not available in bound format
<i>Microsoft</i>		
Implementing Lotus Notes on Compaq Servers with Microsoft LAN Manager (9/92)		145201-001
Microsoft SQL Server and Novell NetWare Requester for OS/2 (9/92)		145376-001
Drive Subsystem Performance with Microsoft LAN Manager 2.1 (11/92)		145517-001
Configuration and Tuning of Microsoft SQL Server for Windows NT on Compaq Servers (4/95)		184207-002
Migrating from Microsoft Windows NT Advanced Server 3.1 to Microsoft Windows NT Server 3.5 (2/95)		184669-001
Compaq Backup and Recovery for Microsoft SQL Server (3/95)		184489-001
Implementing Microsoft Windows NT Server Using LAN/WAN Protocols and Services (8/95)		184488-001

Compaq TechNotes *Continued*

TechNote Name	Available on SmartStart	Part Number
<i>UNIX</i>		
SCO UNIX in an SNA Environment Using CLEO DataTalker U/X (5/92)		145081-001
SCO UNIX in an SNA Environment Using Computone LYNX (7/92)		145116-001
SCO UNIX Database Servers in Novell Networks (10/92)		145402-001
Printing in SCO UNIX and NetWare Integrated Environments (3/93)		145538-001
SCO UNIX Connectivity to SNA Environments Over X.25 Networks (1/93)		145583-001
Disk Mirroring with VERITAS VxMirror (12/93)		145656-001
SCO UNIX IP Routing Over X.25 Networks (4/93)		145711-001
Performance Tuning for SCO UNIX on Compaq Systems (5/93)		145730-001
Configuration and Tuning of Oracle7 for SCO UNIX on Compaq Servers (11/94)	√	184329-001
The Compaq, SCO UNIX, and ORACLE7 Database Server (9/93)		195818-001
<i>IBM</i>		
Compaq Answers to Technical Support Questions for OS/2 Environments (11/94)	√	Not available in bound format
Performance of Lotus Notes 3.1.5 on Compaq ProLiant Servers with OS/2 2.11 (3/95)		184655-001
<i>Technology Overview</i>		
Configuring Compaq RAID Technology for Database Servers (7/94)	√	184206-001

Glossary

Agent	A software component that prepares, accumulates, and remotely communicates information to a management software component.
Alarm	Notification that Compaq Insight Manager displays when certain events happen. For instance, if a monitored item changes, Insight Manager displays an alarm to notify you of the change. Insight Manager stores alarms in the Alarm Log. Alarm is synonymous with Trap.
Alarm Forwarding Destination	The pager that you configured to receive the alarms using the alarm forwarding feature. The alarm forwarding feature sends Compaq Insight Manager alarms to an alarm forwarding destination pager.
Alarm Log	A log file of all the alarms received at this workstation. If the Alarm Log is full and another alarm occurs, Compaq Insight Manager adds the alarm to the Alarm Log and deletes the oldest entry from the list.
American National Standards Institute (ANSI)	An organization that acts as a national clearing house and coordinator for voluntary standards in the United States.
ANSI	<i>See</i> American National Standards Institute.
ASR-2	<i>See</i> Automatic Server Recovery-2.
AssetControl	Comprehensive set of hardware and software component information reported through integrated hardware, firmware, software, and third-party management tools. AssetControl provides detailed component information including manufacturer, model, and serial number for system, monitor, and hard drive(s). Also provides revision level information for system board, system ROM, Compaq option ROM, and device drivers developed by Compaq.

Asynchronous Management	The use of modems and Point-to-Point Protocol(PPP) to communicate with a management PC. Compaq Insight Manager can use PPP to dial into a server and manage it as if it were part of the local network. The Compaq Insight Management Agents can be configured to send traps through a modem to allow complete remote management.
Automatic Server Recovery-2 (ASR-2)	Feature designed to restart a server automatically after a critical hardware or software error has occurred. If a critical error occurs, the server records the error in the Server Health Logs, reboots the system, and issues a pager message.
Bridge	A device that connects LANs with compatible addressing scheme, which usually means LANs of the same technology type; for example, Ethernet-to-Ethernet, Token Ring-to-Token Ring, Ethernet-to-Token Ring.
Btrieve	A key-indexed record management system designed for high-performance data handling and improved programming productivity. It allows your application to retrieve, insert, update, or delete records either by a key value or by sequential or random access methods.
CCITT	<i>See</i> Consultative Committee For International Telegraph and Telephone.
Consultative Committee For International Telegraph and Telephone	An international organization that develops communications standards such as recommendation X.25.
Community String	A string similar to a password, offering a limited amount of protection for the server's SNMP data.
Compaq Insight Management Agents	Software that can query a manageable device and provide information that responds to SNMP requests for data. <i>See also</i> SNMP.

Compaq Insight Management MIB	Vendor MIB that describes the fault, performance, and configuration aspects of Compaq products. <i>See also MIB.</i>
Corrected Memory Log	A list of corrected memory errors which is stored in non-volatile RAM.
Critical Error Log	A file of catastrophic errors, such as noncorrectable memory, expansion board, and expansion bus arbitration errors. This file is stored in non-volatile RAM.
Corrected Error Log	A file that contains the date, time, frequency, and unique information about errors that the various subsystems have automatically corrected, such as Advanced ECC Memory errors errors. This file is stored in non-volatile RAM.
Data Link Layer	Packages the data for transmission that appears error free to the network layer. Defines the addressing scheme for point-to-point messaging.
ECC	<i>See</i> Error Checking and Correcting Memory.
EISA	<i>See</i> Extended Industry Standard Architecture.
End-User Desktop Management	Tools which allow a user to view critical system information at the desktop (on the PC).
Enterprise Management	Management of a geographically distributed network containing a wide range of network devices such as computers, bridges, routers, gateways, and modems.
Element Manager	A software component that monitors and controls a particular type of device on the network, such as a hub.

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G-4 Glossary

Enterprise MIB	<i>See</i> Vendor MIB.
Error Checking and Correcting Memory (ECC)	A fault tolerance feature that detects and corrects all single-bit memory parity errors, as well as detecting 2-bit and 3-bit memory errors. Ensure that common memory errors including the failure of an entire DRAM can be corrected without interrupting system operation.
Ethernet	Network technology consisting of the CSMA/CD network access method and a bus network topology.
Extended Industry Standard Architecture (EISA)	Open extension to the industry-standard expansion bus architecture, allowing the use of 8-/16-bit peripherals as well as 32-bit devices.
Gateway	Computer that controls the exchange of information between a LAN and a "foreign" computing environment such as a mini-computer or mainframe.
Hub	A device used to connect several network interface controllers (NICs) to a network. The hub is also called a Multi-Access Unit (MAU).
IDA	<i>See</i> Intelligent Drive Array.
IETF	<i>See</i> Internet Engineering Task Force.
Intelligent Drive Array (IDA)	Compaq Drive Array Controllers, including the Compaq 32-Bit Intelligent Drive Array Controller-2, the Compaq 32-Bit Intelligent Drive Array Controller, and the Compaq 32-Bit Intelligent Drive Array Expansion Controller.
Intelligent Manageability	Compaq implementation of desktop PC management; provides AssetControl, fault management, and security management features. <i>See also</i> AssetControl.

IntelliSafe Hard Drives	Compaq hard drives which use a combination of hardware and firmware to predict hard-drive failures before they occur. These drives issue a warning to the user when a drive is likely to fail.
International Organization for Standardization	<i>See</i> International Standards Organization.
International Standards Organization (ISO)	An organization which coordinates national standards bodies to promote standardization worldwide. ISO develops and publishes international standards.
Internet Engineering Task Force (IETF)	The standards-oriented group which, under the direction of the Internet Architecture Board, develops the specifications which become Internet standards.
Internet Packet Exchange (IPX)	NetWare LAN communication protocol; moves data between server and/or workstation running on different network nodes.
Internet Protocol (IP)	The connectionless datagram delivery protocol used by the upper layers of the suite of Internet protocols.
IP	<i>See</i> Internet Protocol.
IPX	<i>See</i> Internet Packet Exchange.
ISO	<i>See</i> International Standards Organization.
LAN	<i>See</i> Local Area Network.
Local Area Network (LAN)	A communications network that serves users within a confined geographical area. A LAN can consist of servers, workstations, a network operating system, and a communications link.

Managed Device	Any network device (router, hub, server) that provides management data; typically one or more management agents execute on the device.
Managed Object	Component of a device that is manageable (for example, network interface, storage subsystem, operating system, active applications, or hardware configuration).
Managed Server	A server with the Compaq Insight Management Agents installed.
Management Agent	Software (for example, Compaq Insight Management Agents) that executes on the managed device, which allows management information to be retrieved or modified by a management application.
Management Application	Software (for example, Compaq Insight Manager) that executes within the context of a management platform, or the native operating system of the management PC, that interacts with management agents.
Management Information Base (MIB)	A set of items that management applications and management agents use to monitor, analyze, and control the operation of managed devices.

Management PC	Network device on which a management platform and management applications execute.
Management Platform	Software providing an open environment for multiple management applications to execute simultaneously; for example, NetView for AIX, HP OpenView, and SunConnect SunNet Manager.
Management Protocol	A set of rules for the network that defines a format and procedures for data transfer.
MAU	<i>See</i> Multistation Access Unit.
MIB	<i>See</i> Management Information Base.
Monitored Item	A unique attribute that describes a fault, performance, configuration, or security aspect of a component of the managed device, for example, Read Error Count, I/O Bus Utilization, and so on.
Multistation Access Unit (MAU)	A central hub in a token ring local area network. <i>See</i> Hub.
Network Interface Controller (NIC)	A controller installed in a PC, workstation, or server that allows the PC or workstation to communicate with other devices connected to the same network. This term usually implies a local area network (LAN) controller.
Network Management	A term describing the monitor and control of the network infrastructure (wire and internetwork devices).
Network Transport Protocol	The network protocol used for communicating management information.
NIC	<i>See</i> Network Interface Controller.
Object	An item (whose structure is defined by its architecture) stored in the site database. For example, a Compaq computer is an object with the Personal Computer architecture. <i>See also</i> Architecture.

OSI	<i>See</i> Open Systems Interconnection.
Open Systems Interconnection (OSI)	An internationally accepted framework of standards for communication between different systems made by different vendors. OSI was developed by the International Standards Organization.
Out-of-Band	Refers to the capacity to deliver information via a modem or other asynchronous connection.
Packet-Switching Network	Group of interconnected computers acting as packet switches and routing packets from sender to receiver.
Physical Layer	Hardware, wiring, and cabling that connects devices on the network.
Point-to-Point Protocol (PPP)	A set of industry standard framing and authentication protocols which operate over asynchronous or synchronous serial links.
PPP	<i>See</i> Point-to-Point Protocol.
POST	<i>See</i> Power-On Self-Test.
Power-On Error Log	A file that records any errors that occur during Power-On Self Test (POST) errors. This file is stored in non-volatile RAM. <i>See also</i> Power-On Self-Test.
Power-On Self-Test (POST)	A set of tests that compares hardware versions of the server and its options to the stored configuration. POST runs each time the server is turned on.
Proactive Tape Backup	Tape backup that is initiated by a hard drive failure alert.
Rapid Recovery Engine	The term used to describe the diagnostic and recovery capabilities built into Compaq servers and some Compaq desktop units.

Revision History Table	Stores board revision information in nonvolatile memory. It logs the system board revision first and then logs other boards that support the Revision History Table.
Router	Interconnecting device that selects the appropriate communication path and routes a message accordingly. The router examines the destination address and determines the most efficient route.
Serial Line IP (SLIP)	A simple form of encapsulation for IP datagrams on serial lines.
Simple Network Management Protocol (SNMP)	Industry-standard protocol for the exchange of management data between management applications and management agents.
SLIP	<i>See</i> Serial Line IP.
SQL	<i>See</i> Structured Query Language.
Snap-In Application	Third-party management applications.
SNMP	<i>See</i> Simple Network Management Protocol.
SNMP Trap	<i>See</i> Trap.
Subsystem	Major components of a device (for example, disk subsystem, storage subsystem, memory subsystem, and processor subsystem).
Terminate-and-Stay-Resident	A term for loading a software program in an MS-DOS computer in which the program loads into memory and is always ready for running by using a combination of keys.
TCP/IP	Protocol that manages the transmission of packets on a network and checks for errors. This protocol includes the Internet connection-based (TCP) and connectionless (IP) protocol.

Threshold	A limit that you can set to produce an alarm if it is reached or exceeded.
Token Ring	Networking topology that uses a token-passing scheme. A logical token passes from a station to its nearest neighbor; and stations may send only data when they have the token.
Topology	The physical layout of network components (cables, stations, gateways, hubs, and so on). The three basic interconnection topologies include star, ring, and bus networks. On a star network, workstations are connected directly to a file server but not to each other. On a ring network, the file server and workstations are cabled in a ring; however, a workstation's messages might have to pass through several other workstations before reaching the file server. On a bus network, all workstations and the file server are connected to a central cable, usually called a trunk or bus.
Trap	Unsolicited message generated by the management agent that indicates that an important event has occurred; either a monitored item exceeded a set threshold or changed status. Trap is synonymous with alarm. <i>See also</i> Alarm.
TSR	<i>See</i> Terminate-and-Stay-Resident.
Vendor MIB	Management objects that are unique to an individual vendor's product or product line.
WAN	<i>See</i> Wide Area Network.
Wide Area Network (WAN)	Network of LANs connected by routers or bridges, usually covering a large geographic area.
X.25	Network that implements the internationally accepted CCITT standard governing the operation of packet-switching networks.

Index

A

Access rights, discussion 2-8
 Accounting management, ISO
 model discussed 2-9
 Adding Compaq server support
 HP OpenView 6-2
 IBM NetView for AIX 4-2
 SunNet Manager 5-12
 Alarms, with SunNet Manager 5-5
 ANSI protocol 2-15
 ANSI standard, with remote control
 network management 2-2
 API *See* Application
 Program Interface
 Application builder 4-18, 6-21
 Application Program Interfaces
 4-1, 6-1
 Application registration file, sample 4-
 26, 6-28
 Asynchronous Management,
 point-to-point protocol (PPP) 3-17
 Attributes, Insight MIBs A-4
 Automatic management, using in
 SunNet Manager 5-37
 Automatic Server Recovery-2
 See also Remote maintenance
 critical errors, described 3-7
 illustration with Rapid
 Recovery Engine 3-5
 server integrated management
 feature 3-4
 AWK (programming language)
 4-27, 6-29

B

Background images, supported graphic
 formats 6-19
 Benefits, network management 2-5
 Bitmap editor program 6-12
 Bitmap files
 Compaq server bitmaps 4-11
 Compaq server bitmaps,
 directory location 6-12
 creating 4-11, 6-12
 Hewlett-Packard size
 recommendation 6-14
 IBM size recommendation 4-13
 syntax 4-11, 6-12
 Bitmap for Compaq server, illustration
 4-12, 6-13
 Bitmap mask for Compaq server,
 illustration 4-13, 6-14
 bitmap(1) program 6-12
 Browsing MIBs
 in HP OpenView 6-31
 in IBM NetView for AIX 4-29
 Btrieve database, object
 information stored by Compaq
 Insight Manager 3-18

C

CMIP protocol 4-1, 6-1
CMOT protocol 6-1
Compaq Desktop Management Solution
Partners 2-1
Compaq Insight Management
Agents
for IBM OS/2 B-1
for Microsoft
Windows NT B-1
for NetWare B-1, B-23
for SCO UNIX B-1
for UnixWare B-1
MIB diskette
COMPAQ.SCH, sample
schemas 5-12
COMPAQ.TRP
sample file 5-39
CPQSINFO.MIB 5-29
Insight MIB files 5-13
README.TXT file
5-13, 6-12, 6-37
TRAPD.CPQ file
6-12, 6-37
TRAPHDR.CPQ file
6-12, 6-37

MIB files

adding Compaq product
support 5-15, 6-2
compiling 5-14
CPQHLTH.MIB 5-26
CPQIDA.MIB 5-14
CPQSINFO.MIB 5-26
CPQSTDEQ.MIB 5-26
described 6-3
key attributes A-4
transferring to HP OpenView
6-3
transferring to NetView for AI
X 4-2
transferring to SunNet Manager
5-12
software
Compaq Insight Manager 3-16
Insight Agents 3-16
network management
interoperability 3-22
traps, described B-1
Compaq Insight Management Agents
application registration files 6-30
custom MIB query files 6-34
defining traps manually 4-35, 6-37
described 3-19
discovery process 4-5, 6-6
discussed 5-3, 5-32, 6-17
enterprise definitions, discussed 4-
35, 5-38, 6-37

- Compaq Insight Management Agents
 - continued*
 - for IBM OS/2
 - 2-11, 3-19, 4-17, 6-18
 - for Microsoft Windows NT
 - 2-11, 3-19, 4-17, 6-18
 - for NetWare 2-11, 3-19, 4-17, 6-18
 - for SCO UNIX
 - 2-11, 3-19, 4-17, 6-18
 - for UnixWare 2-11
 - installing the EISA configuration information 4-20, 6-22
 - integrating trap types with SunNet Manager 5-39
 - MIB diskette, application registration files included on 6-20
 - MIB files 6-3
 - described 4-2
 - transferring to NetView for AIX 4-2
 - MIB schemas and 5-13
 - modifying name and description 5-29
 - SET support, levels of 4-30, 5-36, 6-32
 - SNMP MIB-II, support 5-37
 - SNMP protocol and 2-11
 - trap log file and 5-34
- Compaq Insight Manager
 - features, described 3-16
 - standards, support for 3-18
- Compaq Inspect Utility, using to view Server Health Log contents 3-6
- Compaq ProLiant servers
 - See also* Compaq servers
 - Hot-Pluggable Drives 3-3
 - Offline Backup Processor 3-4
 - Rapid Recovery Engine 3-4
- Compaq schemas
 - COMPAQ.SCH 5-12
 - consolidating files 5-26
 - copying to SunNet Manager directory 5-16
 - customizing 5-26
- Compaq servers
 - adding support
 - in HP OpenView environment 6-2
 - in IBM NetView for AIX environment 4-2
 - in SunNet Manager environment 5-12
 - Compaq SMART Controller 3-4
 - Error Checking and Correcting Memory 3-4
 - fault management 2-7
 - fault prevention, Server Parameter Tracking 3-3
 - fault tolerance, features 3-3
 - Full-Spectrum Fault Management, defined 3-2
 - Insight MIB attributes A-4
 - management capabilities 3-2
 - management technology 3-1
 - network management, interoperability 3-22
 - operating system integration 3-21
 - SNMP-based management agents, support for 2-1
 - tools from Compaq for managing 2-2

- Compaq SMART Controller 3-4
- Compaq System
 - Configuration Utility 3-8
- Computing (managed) devices, 2-5
- Configuration management, ISO model discussed 2-8
- Conner (hard drive manufacturer) 3-10
- Contact node information, retrieving 6-25
- Copying, schemas to SunNet Manager directory 5-16
- Corrected Error Log 3-6
- Create command, using to create glyphs 5-18
- Critical Error Log 3-6
- Custom applications, adding 4-18, 6-20

D

- Data Report, requesting with SunNet Manager 5-32
- Desktop management
 - illustration 2-18
- Desktop management on PC networks 2-18
- Device access
 - in-band 2-13
 - out-of-band 2-13
- Diagnostics software, Server Health Logs and 3-6
- Diagnostics utilities 3-8

- Discover tool
 - adding Compaq servers to submap 4-4, 6-6
 - adding Compaq servers to subview 5-17
 - categorizing elements 4-5, 5-17, 6-6
- Domain Name Services
 - resolving IP addresses 5-5
- Domain Naming Service
 - Insight Manager support 3-18
- dosread(1) command 4-2, 4-28
- Drive manufacturers 3-10

E

- EISA slot information
 - building application to retrieve information 6-22
- End User Interface (EUI) 4-15
- Enumeration strings, modifying 5-28
- Error Checking and Correcting Memory 3-4
- ETHER.MIB 4-2, 6-3
- EUI
 - See* End User Interface
- Event
 - monitoring
 - in HP OpenView 6-35
 - in IBM NetView for AIX 4-33
 - notification
 - setting up 4-39, 5-43, 6-42
 - using traps B-1
 - report requesting 5-34

F

- Fault management, ISO model discussed 2-7
- Fault prevention
 - See also* Compaq servers
 - Server Parameter Tracking 3-3
- Fault tolerance
 - Compaq server, features 3-3
 - MIBs and A-4
 - value in proactive monitoring 2-7
- Field registration files
 - modifying 4-7, 6-8
 - ovw_fields file 4-8, 6-9
 - snmp_fields file 4-9, 6-10
- File locations
 - See* Important directories
- File Transfer Protocol
 - availability with operating systems 4-2, 6-3
 - transferring files 4-2, 6-3, 6-30
 - using in HP OpenView environment 6-4
 - using in IBM NetView for AIX environment 4-3
 - using in SunNet Manager environment 5-13
- Full-Spectrum Fault Management
 - discussed 3-2
 - illustrated 3-3

G

- GET, SNMP operating command and support 2-12
- GET-NEXT, SNMP operating command and support 2-12
- GIF (CompuServe Graphics Interchange Format) 6-19
- Glyphs
 - changing properties 5-25
 - changing types 5-18
 - creating icons and 5-22

H

- Hard drives, Hot-Pluggable Drives on Compaq ProLiant servers 3-3
- Hewlett-Packard Documents
 - HP OpenView Network Node Manager Administrator's Reference 6-6, 6-11, 6-16, 6-19, 6-27, 6-39
 - HP OpenView Network Node Manager User's Guide 6-7, 6-19, 6-34, 6-35, 6-42
 - HP OpenView Windows User's Guide 6-7
- Hot-pluggable drives 3-3
- HP OpenView
 - adding
 - Compaq query files 6-21
 - custom applications 6-20
 - slot configuration information 6-22
 - subclass icon 6-8

HP OpenView *continued*

- application registration files,
 - building and integrating 6-26
- bitmap
 - directory location of bitmap files 6-12
 - illustrated 6-14
 - program to create icon files 6-12
- creating bitmap files for
 - Compaq servers 6-12
- default path for MIBs 6-3
- discover tool 6-6
- integrating with other systems 6-39
- integration, discussed 6-1
- IP Topology database 6-26
- key features 6-1, 6-2
- loading Insight MIB files 6-5
- modifying configuration files 6-16
- modifying field registration files 6-9
- monitoring events 6-35
- more command, using 6-11, 6-15
- netmon process, using 6-6, 6-18
- Node discovery, TCP/IP devices 6-2
- ovtopodump command, using 6-26
- predefined and custom applications 6-34
- symbol registration files, directory location 6-15
- symbol subclasses, defining 6-15
- HP-UX operating system 6-1

I

IBM documents

- NetView for AIX Installation and Configuration Guide 4-15
- NetView for AIX Programmer's Guide 4-10, 4-13, 4-15, 4-24
- NetView for AIX User's Guide 4-4, 4-32

IBM NetView for AIX

- adding
 - Compaq query files 4-29
 - custom applications 4-18
 - slot configuration information 4-20
- bitmap
 - illustrated 4-13
 - program to create icon files 4-11
- creating bitmap files for
 - Compaq servers 4-11
- default path for MIBs 4-2
- directory location of
 - preloaded MIBs 4-4
- discover tool 4-4
- integrating with other systems 4-37
- integration, discussed 4-1
- IP Topology database 4-24
- key features 4-1
- loading Insight MIB files 4-3
- modifying field
 - registration files 4-7
- monitoring events 4-33
- more command, using 4-10, 4-15
- netmon process, using 4-5, 4-17

- IBM NetView for AIX *continued*
 - node discovery, IP devices 4-1
 - ovtopodump command, using 4-24
 - predefined and custom applications 4-32
 - symbol subclasses, defining 4-14
- IBM OS/2, Insight Agents for 3-19, B-1
- IETF
 - See* Internet Engineering Task Force
- Important directories
 - copying schemas as directed by SunNet Manager
 - /usr/snm/agents 5-16
 - location of application registration files
 - /usr/OV/registration/\$LANG 4-25, 6-27
 - location of bitmap files
 - /usr/OV/bitmaps/\$LANG 4-11, 6-12
 - location of default snmp.traps file
 - /var/adm/snm 5-39
 - location of elements.schema file
 - /usr/snm/struct 5-20
 - location of field registration files
 - /usr/OV/fields/\$LANG 4-7, 6-8
 - location of oid_to_sym file
 - /usr/OV/conf 4-16, 6-17
 - location of symbol registration files
 - /usr/OV/symbols/\$LANG 4-14, 6-15
- In-band management
 - device access 2-13
 - discussed 2-11
- Infrastructure devices, described 2-5
- Inspect utility 3-6
- Integrated server management features
 - See also* Rapid Recovery Engine
 - Automatic Server Recovery 3-4
 - remote maintenance, described 3-7
 - Server Health Logging 3-4
 - Server Health Logs
 - Corrected Error Log 3-6
 - Critical Error Log 3-6
 - Power-On Error Log 3-6
 - Revision History Table 3-6
- Intelligent manageability 2-1
- Intelligent Manageability features 2-19
- IntelliSafe Hard Drives 3-10
- Internet Engineering Task Force 2-9
- Internet Management MIB, discussed 2-10
- IP addresses
 - contained in OpenView IP Topology database 6-26
 - Domain Name Services, using 5-5
 - explanation of TechNote examples 4-1, 6-1
 - mapping considerations 5-5
 - Network Information Services, using 5-5
 - seed file of SNMP-based routers 4-5, 6-6

IP devices

- managing with HP OpenView 6-1
- managing with IBM NetView for AIX 4-1
- managing with SunNet Manager 5-1

IP protocol 2-12, 2-15

ipmap process 4-16, 6-17

IPX protocol 2-12, 2-15

ISO model

- configuration management 2-8
- fault management 2-7
- framework for network management 2-6
- performance management 2-7
- security management 2-8

L

LAN Workplace for DOS 4-2, 6-3

Laptops, consideration as a network asset 2-8

Logical domains, separating network into 2-8

M

Managed devices

- discussed 2-5
- displaying on SunNet Manager console 5-11

Management agents

- Insight Agents 2-12
- software component explanation 2-9

MIB

browsing 4-1, 4-29, 6-2, 6-31

Compaq software inventory A-7

definition of two

- existing types 2-10

drive array status A-19

fault and recovery

- features status A-23

fault identification A-18

file names

CPQHLTH.MIB

- A-17, A-18, A-22, A-23

CPQHOST.MIB

- A-7, A-8, A-16

CPQIDA.MIB

- A-6, A-10, A-12, A-19

CPQSCSI.MIB

- A-6, A-10, A-13, A-14, A-20

CPQSTINFO.MIB A-6

CPQSTDEQ.MIB A-6, A-9

CPQSTSYS.MIB A-22

RFC1213 A-5, A-15

general system description A-5

hard drive errors A-12

hard drive read/write/seek A-10

hardware

- asset description A-6

- configuration A-9

- utilization A-17

information, using A-24

key information A-4

loading for IBM NetView for AIX 4-3

loading from HP OpenView 6-5

- NIC information A-15
 - operating system
 - configuration A-8
 - resource utilization A-16
 - SCSI disk status A-20
 - system environment status A-22
 - transferring
 - to HP OpenView Console 6-3
 - to IBM NetView for AIX Console 4-2
- mib2schema program, using 5-29
- Microsoft Windows NT, Insight Agents for 3-19, B-1
- Modem connection, remote maintenance, using 3-8
- Modem link, using to access managed elements (out-of-band) 2-13
- Modifying
 - enumeration strings 5-28
 - field registration files 4-7, 6-9
 - Insight Agent name and description 5-29

N

- netmon process 4-5, 4-17, 6-6, 6-18
- NetWare
 - Insight Agents for 3-19, B-1, B-23
- NetWare Virtual Terminal (NVT) protocol 2-15

- Network
 - elements, online and offline 2-13
 - remote console maintenance 3-17
 - remote maintenance,
 - connecting 3-8
 - typical configuration, illustrated 2-1
- Network Information Service, resolving IP addresses 5-5
- Network management
 - accounting 2-9
 - ANSI standard 2-2
 - Compaq tools and 2-2
 - configuration 2-8
 - factors, complexity of 2-5
 - fault detection 2-7
 - issues for providing acceptable service levels 2-5
 - methods for
 - managing resources 2-13
 - OSI model, discussed 2-6
 - overview 2-5
 - performance 2-7
 - protocols 2-9
 - security 2-8
 - server management 2-16
 - SNMP standards 2-2
 - terms
 - defined 2-3
 - relationship of, illustrated 2-4

- Network Node Manager
 - described 6-1
 - directory location of
 - preloaded MIBs 6-5
- Network resources, methods of managing 2-13
- New Compaq Deskpro Family 2-1, 2-19
- NIS
 - See* Network Information Service
- NNM
 - See* Network Node Manager
- O**
- Offline
 - Backup Processor 3-4
 - device, getting contact information 4-23, 6-25
 - in-band management 2-15
 - out-of-band management 2-15
- Offline management 2-15
- Online
 - in-band management 2-14
 - out-of-band
 - management 2-14
 - PPP protocol, using 2-14
 - SLIP protocol, using 2-14
- Out-of-band
 - device access 2-13
 - management, discussed 2-13
- ovtopodump command, using to dump database object 6-26

P

- Performance management
 - application to
 - network operation 2-7
 - ISO model discussed 2-7
- Performance monitoring
 - using Insight Agents 3-19
 - using Insight MIBs A-4
- Point-to-Point protocol 2-14
- Power-On Error Log 3-6
- Protocol layers, OSI model and 2-6
- Protocols
 - AppleTalk 2-12
 - CMIP 4-1, 6-1
 - CMOT 6-1
 - FTP 4-2, 6-30
 - IP 2-12, 2-15, 6-1
 - IPX 2-12, 2-15
 - NVT 2-15
 - PPP 2-14
 - SLIP 2-14
 - SNMP 4-1, 6-1
 - Telnet 2-15
 - X.25 5-7

Q

- Quantum (hard drive manufacturer) 3-10
- Query files
 - adding to HP OpenView 6-21
 - adding to IBM NetView for AIX 4-19
- Quick Dump
 - illustrated 5-32
 - producing in
 - SunNet Manager 5-30

R

- Rapid Recovery Engine
 - See also* Compaq ProLiant servers
 - Automatic Server Recovery-2,
 - integrated feature 3-4
 - flowchart 3-5
 - Server Health Logging,
 - integrated feature 3-4
- README.TXT file 4-11, 6-12
- Remote control management, Compaq
 - server management 2-2
- Remote maintenance
 - Automatic Server Recovery support
 - 3-8
 - Compaq utilities 3-8
 - using modem connection 3-8
 - using network connection 3-8
- Remote Server Restart 3-17
- Revision History Table, described 3-6

S

- SCO UNIX
 - Insight Agents for B-1
- SCO UNIX, Insight Agents for 3-19
- Seagate (hard drive manufacturer) 3-10
- Security management, ISO
 - model discussed 2-8
- Serial Line Internet protocol 2-14
- Server Health Logging,
 - integrated feature 3-4
- Server Health Logs
 - Corrected Error Log 3-6
 - Critical Error Log 3-6
 - Power-On Error Log 3-6
 - Revision History Table 3-6

- Server management, illustration 2-17
- Server parameter tracking,
 - discussed 3-3

SET

- Insight Agents, support for 2-11
- SNMP operating command
 - and support 2-12
- SNMP support 2-11
- Set Request, performing on
 - SNMP devices 5-35
- SET, Insight MIB variables
 - 4-30, 6-32
- SNMP
 - Compaq support for agents under
 - specific operating systems 2-1
 - compliant management platforms,
 - vendors of 2-10
 - daemon 5-6
 - devices, performing
 - Set Request 5-35
 - hosts file, discussed 5-39
 - MIB-I 6-16
 - MIB-II 4-23, 5-37, 6-7, 6-25
 - operating command
 - GET 2-12
 - GET-NEXT 2-12
 - SET 2-12
 - TRAP 2-12
 - protocol
 - discussed 2-9, 6-1
 - management platforms 2-10
 - MIBs and 2-9
 - reference book specified for
 - in-depth discussion 2-12
 - standards, for online network
 - management 2-2

- SNMPv2 2-11
 - snmpwalk utility 6-16
 - Solaris operating system 6-1
 - Solution partners, list 3-14
 - Standards, network management 2-9
 - Standby Recovery Server 3-18
 - Subclass Icon, changing 6-7
 - SunNet Manager
 - automatic management, using 5-37
 - changing glyphs 5-18
 - configuration of test environment 5-2
 - console considerations 5-4
 - creating file for Compaq server type 5-21
 - creating icon files, applying masks 5-24
 - Data Report, requesting 5-32
 - Discover tool
 - adding Compaq servers to subview 5-17
 - categorizing elements 5-17
 - routing tables 5-7
 - element grouping 5-10
 - elements.schema, adding managed device types 5-20
 - enumeration strings, modifying 5-28
 - event notification 5-43
 - Event Report
 - requesting 5-34
 - gateways, setting up 5-44
 - glyphs
 - changing properties 5-25
 - displaying subviews 5-10
 - i option, to load schemas 5-16
 - SunNet Manager *continued*
 - icon editor screen, illustrated 5-24
 - ifconfig command 5-4
 - Insight MIB files, transferring 5-12
 - integrating with other systems 5-43
 - integration, discussed 5-1
 - key features 5-1
 - preinstallation considerations 5-3
 - processing traps 5-39
 - Quick Dump
 - producing 5-30
 - running report 5-20
 - reports, discussed 5-30
 - schemas, associating with Compaq servers 5-19
 - using leo 5-7
 - views, setting up a hierarchy 5-10
 - SunOS 6-1
 - Symbol registration files
 - modifying 4-15, 6-15
 - oid_to_sym file 4-16, 6-17
 - oid_to_type file 6-18
 - oid_to-type file 4-17
- ## T
- TCP/IP, SNMP and 2-12
 - TechNote
 - chapter summary 1-1
 - intended audience 2-1
 - Telnet protocol 2-15
 - Terms, defined for network management 2-3
 - TOKEN.MIB 4-2, 6-3
 - Tools, supplied by Compaq to manage Compaq servers 2-2
 - Transferring, Insight MIB files from diskette 5-13
-

TRAPD.CPQ 4-35

TRAPHDR.CPQ 4-35

Traps

corrective action B-1
destination setting, recommendation 5-38

discussed 4-34, 5-38, 6-36

integrating with

SunNet Manager 5-39

processing in

SunNet Manager 5-39

setting up in HP OpenView 6-36

setting up in IBM NetView
for AIX 4-34

troubleshooting with

4-36, 5-42, 6-39

Troubleshooting, using traps

4-36, 5-42, 6-39, B-1

U

UNIX

bitmap program 4-11, 6-12

commands

dos2unix, using to convert DOS
files 5-15

ifconfig, using to

configure adapter 5-4

mib2schema, using to compile

Insight MIBs 5-14

more, using to view screen
information

4-10, 4-15, 6-11, 6-15

ovtopodump, using to dump

database object 4-24, 6-26

utilities

ping 5-3

snmpwalk 6-16

vi editor, using to edit file 5-8

UnixWare, Insight Agents for B-1

User network access, security
management and 2-8

Utilities, 3-17

Utilities, Compaq 3-6, 3-8

V

Vendor MIBs 2-10

Version Control 3-17

W

Windows Internet Naming
Service (WINS) 3-18

X

X.25 protocol 5-7

XBM (X11 monochrome
bitmap format) 6-19