

COMPAQ

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Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

Compaq TechNote

Includes information on:

- Connecting a Compaq server network with Windows NT LAN/WAN networking services
- Network management and Compaq Insight Management technologies
- Network planning and preinstallation considerations
- Installing and configuring DHCP and WINS on the network
- Configuring Compaq Insight Manager with Windows NT RAS
- Compaq tested LAN/WAN network configurations

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Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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Chapter 1

About This TechNote

This Compaq TechNote is intended for systems professionals (managers, engineers, and administrators) who need to know how to optimally configure and implement Local Area Network (LAN) and Wide Area Network (WAN) protocols on Compaq servers running Microsoft Windows NT Server 3.5 and greater. This TechNote also provides valuable network management information to help you plan and manage network servers in this environment.

Planning and implementing a LAN or WAN network can be a complex task and the computing decisions you make are critical to your organization. Compaq specializes in providing innovative solutions for businesses to handle data more efficiently. Compaq ProLiant servers provide scalable dependable mission-critical support to your network that you can count on.

In addition, the server management features built into Compaq servers ensure exceptional server availability and protect the data integrity of your system. Compaq Insight Management software provides you with tools to monitor server functions anywhere on your network from a remote location.

Compaq and Microsoft maintain a strong industry partnership that focuses on the compatibility of your hardware and software components and optimal network performance. Before you can determine the right solution for your installation and begin configuring your network, you must carefully examine your users' requirements and prepare an installation strategy. This TechNote provides guidelines to help you plan and implement that strategy.

Prerequisites and Assumptions

Systems professionals using this TechNote should have a basic knowledge of the Microsoft Windows NT Server operating system, Compaq server hardware, and Compaq Insight Manager Software. The configurations discussed in this TechNote also include Cisco routers. Microsoft Systems Management Server is discussed as an optional component, but not included in the networks configured for this TechNote.

The information in this TechNote assumes that you are familiar with LAN and WAN terms, the Open System Interconnection (OSI) Reference Model, and network protocols such as:

- IPX — Internetwork Packet Exchange
- NetBIOS — Network Basic Input/Output System
- NetBEUI — (Network Basic Input/Output System) Extended User Interface
- TCP/IP — Transmission Control Protocol/Internet Protocol
- SNMP — Simple Network Management Protocol

This TechNote also assumes that you can manage and configure routers, bridges, and WAN links as a part of your network configuration.

Internet IP Registration

Network implementations that include TCP/IP and Internet connectivity will need an IP address or range of addresses. You can obtain an IP address by contacting your Internet provider. If you require a Class B or multiple Class C licenses and your Internet provider cannot provide that service, you can contact:

Internic Registration Services
505 Hunmar Park Drive
Herndon, Virginia 22070

Phone: 703-742-4777

TechNote Content Summary

This TechNote provides Compaq server management integration guidelines, based on Compaq integration 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 information that you can use to integrate with any SNMP-compliant management platform.

This section is intended to help you use this TechNote. A summary of each chapter follows:

- **Chapter 1** — Introduces the TechNote with a brief summary of each chapter. Provides general information about the conventions used, and additional resources you can use to find more information on the configurations tested in this TechNote. Many of the resources listed were used to develop this TechNote.
- **Chapter 2** — Provides a brief overview of Microsoft Windows NT Server 3.5 and 3.51. The discussion includes new features, architecture, and hardware requirements. This chapter also provides a brief discussion about the role of Windows NT domains in your network strategy and how to monitor them.
- **Chapter 3** — Provides an overview of the networking protocols and services supported by Windows NT. This includes both industry-standard protocols and those protocols and services developed by Microsoft for Windows NT.
- **Chapter 4** — Provides a network management overview that includes terminology, standards, and a discussion of the complexity of network management. It also discusses how Compaq management technologies integrate into the broader network management environment.
- **Chapter 5** — Provides an overview of the Compaq server management technology framework, which includes Compaq server management hardware and software products, and an overview of Compaq desktop Intelligent Manageability.
- **Chapter 6** — Provides planning strategies for the Microsoft Windows NT Dynamic Host Configuration Protocol (DHCP) and Windows Internet Name Service (WINS). It also provides basic installation and configuration considerations for DHCP and WINS.
- **Chapter 7** — Provides preinstallation, installation, and configuration information for using or implementing Windows NT Remote Access Service (RAS) with Compaq Insight Manager, Insight Management Agents, and Asynchronous Management software.

- **Chapter 8** — Provides background information about the integration configurations that Compaq engineers set up and tested to assist you in integrating Microsoft Windows NT 3.51 on a Compaq server network with multiple LAN/WAN protocols.
- **Appendix** — Provides information about the TechNote program, how to order more TechNotes, and a TechNote order form.
- **Glossary** — Provides definitions of terms that relate to the hardware, software, and network management functions discussed in this TechNote.

Notational Conventions

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

Table 1-1
Notational Conventions

Convention	Use
Enter	When instructed to enter information, type the information in using your keyboard.
<i>FILENAMES</i>	Names of files appear in uppercase italic in the DOS and other environments.
<i>items of importance</i>	Presents important or specific points of information. These items appear in italics in all chapters of this TechNote.

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.
Keys	Keys on your keyboard appear in boldface.

continued

Notational Conventions *continued*

Convention	Use
"new terms" and "prompts"	The first occurrence of a technical term, prompts, or references to a word other than a command appears in quotes.
PROGRAMS, COMMANDS, UTILITIES, DIRECTORY NAMES, and DRIVE NAMES	These items appear in uppercase in the DOS and other environments.
Select <i>item</i> → <i>item</i>	Items separated by arrows indicate items you select in a sequence.
Set, Get	Screen button labels appear in bold initial caps.
<i>screen selections</i> and <i>variables</i>	These items appear in italics in all chapters of this TechNote.
user input and screen display	Information you type exactly as it appears on the screen.
USER INPUT	Information you type exactly as it appears is shown in uppercase.
CAUTION	Indicates that failure to follow directions could result in damage to equipment or loss of information.
IMPORTANT	Presents clarifying or specific points of information.

Additional Resources to Use

Use the following list of resources, which are used throughout this TechNote. The listed resources can provide you with more information on Microsoft Windows NT Server, Compaq Insight Manager, Compaq Insight Management Agents for Windows NT, and other network management technologies.

- Compaq TechNote, *Integrating Compaq Insight Manager with Microsoft Systems Management Server*, P/N 184720-001

This TechNote provides Compaq server management integration guidelines for Microsoft Systems Management Server, based on Compaq testing of hardware and software products from Compaq and other vendors.
- Compaq TechNote, *Migrating from Microsoft Windows NT Advanced Server 3.1 to Microsoft Windows NT Server 3.5*, P/N 184669-001

This TechNote provides four migration scenarios, including migrating with Compaq SmartStart.
- Compaq TechNote, *Configuration and Tuning of Microsoft SQL Server for Windows NT on Compaq Servers*, P/N 184207-001

This TechNote provides configuration and tuning guidelines for managing Compaq servers with Microsoft SQL Server for Windows NT.
- *Compaq Insight Manager User Guide*, P/N 133394-008

This document explains how to install, configure, and use Compaq Insight Manager. There is also a discussion of Compaq Insight Asynchronous Management guidelines, server discovery process, and alarms.
- *Compaq Insight Management Agents for Microsoft Windows NT User Guide*, P/N 145891-005

This document explains how to install, use and, troubleshoot Compaq Insight Management Agents for Microsoft Windows NT. It also discusses Compaq Insight Asynchronous Management guidelines.

- Compaq Support Software for Microsoft Windows NT 3.5, Version 1.05 or later, P/N 196045-00X
- *Microsoft Windows NT Resource Kit, For Windows NT Workstation and Windows NT Server Version 3.5, (Volumes 1-4)*

The Windows NT Resource Kit is designed for users and system administrators who need to know the intricacies of Microsoft Windows NT Workstation and Microsoft Windows NT Server.

- *Microsoft Windows NT Server Installation Guide Version 3.5, Microsoft Corporation, 1995.*

This installation guide provides the information you need to know to perform a basic installation of the Windows NT Server 3.5 operating system. Use this installation guide in conjunction with *the Microsoft Windows NT Resource Kit*.

- *Microsoft Windows NT Server Hardware Compatibility List Version 3.5, Microsoft Corporation, 1995.*

This document provides a list of the hardware that has been tested and certified compatible with the Windows NT Server 3.5 or greater operating system.

- *Microsoft Windows NT Server Update Information for Version 3.51, Microsoft Corporation, 1995.*

This document is a supplement to the Windows NT Server Version 3.5 documentation set. It discusses new features, changes to existing features, and provides additional information.

- *Microsoft Systems Management Server for Windows NT Administrator's Guide, Document No. SY57246-10/94*

This document explains how to plan, install, and configure Microsoft Systems Management Server system. It also tells you how to use Systems Management Server to manage software for servers and clients, to provide direct support to users with the remote troubleshooting utilities, to analyze network protocols, and to monitor the Systems Management Server system itself using alerts and events.

- *Cisco Systems Product Catalogue*, Cisco Systems, Inc., Order No. DOC-CAT2

This catalogue describes all the internetworking products offered by Cisco Systems.

- *The Simple Book - An Introduction to Internet Management*. Marshall T. Rose. Englewood Cliffs, NJ: Prentice-Hall, 1994.

This book explains the technology used to manage large internets, which includes wide and local area networks. It also discusses managing of internets using Simple Network Management Protocol (SNMP) and SNMPv2.

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

This document is the result of the PC Systems Working Committee efforts to define a standard set of attributes for major system components of a basic personal computer system. Each component has a corresponding Management Information Format (MIF) file.

- *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.

This document describes the activities necessary for systems to interwork using communication media. Additionally, it provides supplemental information on the framework and structure of OSI Management.

- *Compaq Hardware Reference* documentation

This documentation can help isolate a problem to a certain computer component or cable segment. Some network problems occur because of malfunctioning hardware; check the documentation that came with the hardware involved.

■ Microsoft FastTips

This is an electronic service provided by Microsoft to receive automated answers to common questions and access a library of technical notes, which are delivered by recording or fax.

To access FastTips, call (800)936-4400 on a touch-tone telephone.

■ CompuServe

This service is available to interact with other users and support engineers or to get product information.

- To access Compaq on CompuServe: at any ! prompt, type **go compaq** to access Compaq forums.
- To access Microsoft on CompuServe: at any ! prompt, type **go microsoft** to access Microsoft forums, or type **go mskb** to access the Microsoft Knowledge Base.

■ Internet

This service is available to interact with other users and support engineers or to get product information.

- To access the Compaq home page on the Internet, type:
http://www.compaq.com
- To access the Microsoft home page on the Internet, type:
http://www.microsoft.com

Chapter 2

Microsoft Windows NT Server Overview

This chapter provides a brief overview of the features of Microsoft Windows NT Server 3.5 and 3.51. If you would like a detailed discussion about the Windows NT operating system, refer to the *Microsoft Windows NT Resource Kit* and the documentation set provided with the operating system before installing Windows NT.

Windows NT is a 32-bit preemptive multitasking operating system based on modular design principles. The Windows NT open architecture provides the flexibility to use many of the current industry computing standards; its extensible modular design provides the ability to add modules at several levels of the operating system.

Some new features and enhancements included are:

- Simplified setup capabilities with an in-place upgrade from Windows NT Advanced Server 3.1 and Windows NT Server 3.5
- Better performance and ease-of-use in TCP/IP networks
- Simplified address management in TCP/IP networks with Dynamic Host Configuration Protocol (DHCP)
- Remote Boot (RIPPL) support for diskless Windows and DOS clients
- Improved support for remote clients with Remote Access Services (RAS)
- Improved interoperability with NetWare servers through Gateway Services for NetWare
- Expanded support for graphics and multimedia
- Better networking and security management
- New application and file system support
- User Manager for domains
- User Profile Editor
- Expanded printing and font capabilities

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The Windows NT Server operating system provides improved wide-area networking tools, a powerful client-server platform, and reduced memory requirements in comparison to Windows NT Advanced Server 3.1.

Refer to the *Microsoft Windows NT Server - Update Information for Version 3.51* guide for more information.

Windows NT Server Architecture

Windows NT is designed so that each subsystem and application can run in user mode, meaning each subsystem and application runs in its own protected address space. This design structure simplifies the base operating system and improves reliability because the applications, the environment subsystems, and the executive are protected from each other.

The following briefly describes the Windows NT architecture:

- *Hardware Abstraction Layer (HAL)*— a layer of platform-specific code that separates the operating system kernel and the executive from the hardware platform. Because Windows NT is designed to use a platform-specific HAL, the operating system can be ported to another platform by simply using that platform-specific HAL.
- *Kernel*— a small, well-contained body of code approximately 60 kilobytes in size. It is responsible for thread scheduling and dispatching, multiprocessor synchronization, exception and interrupt handling, and implementation of low-level machine-dependent functions.
- *Executive* — a collection of kernel-mode modules that provides a set of common services that interface between the kernel and each of the environment subsystems. Each component or module manages a different system service. The following is a list of the Executive components:
 - Object Manager
 - Virtual Memory Manager
 - Process Manager

- Local Procedure Call Facility

- ❑ I/O Manager
- ❑ Security Reference Monitor

The Executive provides a set of common services that all environment subsystems can use.

- *Environment Subsystems* — processes that emulate different operating system environments. Environment subsystems run as separate user-mode processes. Windows NT provides protected environment subsystems for:

- ❑ MS-DOS VDM(Virtual DOS Machine
- ❑ Win16 VDM (Virtual DOS Machine
- ❑ OS/2 subsystem
- ❑ Portable Operating System Interface (POSIX) subsystem
- ❑ Win32 subsystem

The environment subsystem builds on the services of the Executive and creates an environment that meets the specific needs of a client application.

Security Architecture

The Security subsystem, the logon process, and the Security Reference Monitor represent the Windows NT security architecture. Before gaining access to a Windows NT server, a user must be authenticated by the logon process and the Security subsystem. Once authenticated, the user shell is tagged with an access token; then the Security Reference Monitor performs a validation routine against the access token for each process the user initiates. It is possible to track any security-related event that the user initiates. The Windows NT security design meets the requirements of the U.S. Department of Defense for a Class C2-level rating. A Class C2-level rating requires that the computer system meet a set of standards for security policy, accountability, assurance, and documentation. Refer to the Microsoft documentation set for more information.

Minimum Hardware Requirements

Table 2-1 identifies the minimum hardware requirements for running Windows NT Server 3.5 and greater.

Table 2-1
Recommended Windows NT Server Hardware Requirements

Category	Requirements
Servers with the following minimum components:	
<ul style="list-style-type: none"> ■ Processor 	32-bit X86-based microprocessor (80386/25 or higher)
<ul style="list-style-type: none"> ■ Hard drive(s) 	One or more hard drives, with a minimum of 90 MB free hard drive space on a partition to contain the Windows NT Server system files.
<ul style="list-style-type: none"> ■ Diskette drives 	A high-density 3.5-inch diskette drive or a 5.25-inch diskette drive. (See Note)
<ul style="list-style-type: none"> ■ Network Interface Controller(s) (NIC) 	One or more NICs
<ul style="list-style-type: none"> ■ Memory 	16 MB RAM recommended minimum for x86-based systems
Monitor	VGA, or higher resolution, video display adapter

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2-6 *Microsoft Windows NT Server Overview*

Optional components:	Mouse or other pointing device
CD-ROM drive (optional)	CD-ROM drive is the preferred method to install software and information, but optional.

NOTE: If your computer has only a 5.25-inch diskette drive, you must install the operating system over the network or use a CD-ROM. If you have a 3.5-inch diskette drive, you can order the diskettes from Microsoft, but CD-ROM is the preferred installation method.

Workgroups and Domains

Windows NT provides the network administrator with the ability to configure the network users into workgroups or domains or a combination of both. The following section briefly describes the differences between a workgroup structure and domain structure as implemented in a Windows NT network. This information is included because it is an important part of the Windows NT network planning strategy.

Windows NT Workgroups

A workgroup is a logical collection of computers, grouped together for a common purpose such as sharing departmental resources, but the computers in the workgroup are not members of a domain. Members of a workgroup can see and access resources shared by other computers in the group on a peer-to-peer level. Each computer in the workgroup has an account database, which defines the users allowed to logon to that computer. Each workgroup on the same network has a unique name.

The workgroup structure is a reliable network consideration for small groups of computers requiring limited network administration and does not include Windows NT domain servers.

Windows NT Domains

A domain is a collection of servers and workstations that share a replicated user accounts database and a common security policy. In a domain the user accounts database is centrally administrated. The servers in the domain basically function as a single system. One server functions as the Primary Domain Controller (PDC), controlling the central user accounts database for the entire domain. Other servers in the domain perform the functions of Backup Domain Controller (BDC) and can authenticate domain logon requests.

Domains and workgroups can interoperate with each other and are identical when monitored by the Browser.

Server Installation Considerations

Before installing the server software, decide what role that the server will play in the network. You must decide whether the server will function as a PDC, a BDC, or as an additional non-designated server in a domain.

- A Windows NT server can be installed as a Primary Domain Controller.

Within a domain one server must act as the PDC. The PDC is the Windows NT server that contains the master user account database. Within this domain a user can logon with a single account and password for all servers in the domain.

- A Windows NT server can be installed as a Backup Domain Controller.

A domain can have one or more BDCs. A BDC, as the name implies, maintains a backup copy of the user accounts database. The BDC can provide user logon and security validation if the PDC is busy or unavailable.

- A Windows NT server can be installed as a server.

This server is a standalone server that does not share user account and password information. For a user to gain access to its resources, you must set up an account specifically for that user. The administration of workgroups becomes more complex as the network grows, since accounts and passwords have to be distributed to more users.

When you set up a domain controller during the initial installation, you can add accounts through the administration of a single user database. You can add servers to the domain by implementing a trust relationship between the server and the PDC. A trust relationship is an administration and communications link between two Windows NT server domains.

In a small network (one or two servers) the creation of the domain controller is not necessary. However, assigning a server as a domain controller provides you with the flexibility to add servers in the future without reconfiguring a standalone server into a domain controller. If you are planning a large network that will contain more servers in the future, decide which of the four basic domain models best meets your current and future network requirements. Install the first server with your future networking requirements in mind. The following section discusses the four basic domain models.

NOTE: Once you install a computer as a standalone server, you must completely reinstall the operating system if you want to redefine it as a PDC or BDC. It is important that you carefully plan your domain strategy before you install the Windows NT Server software.

Chapter 8, "Compaq Integration Test Configurations," describes the two test configurations set up in the Compaq Integration Lab to develop this TechNote. Each test configuration uses a different domain model based on the size and requirements of the network configuration.

Types of Domain Models

This section describes the most common domain models. The domain model you select for your configuration depends on the size of your network and administrative resources available.

■ Single Domain

This configuration consists of only one domain with one PDC and one or more BDCs. All users are defined in this domain and all resources are located in this domain.

■ Master Domain

In the master domain model, one server acts as the PDC. All user accounts and groups are defined in the PDC. Other servers in the model contain only resources such as files and printers. The user security access token that maps the user ID to the resource server, passes from the PDC to the resource domain for validation before permitting access to a resource.

■ Multiple Master Domain

In the multiple master domain, there are several domains, each with a PDC, which contain user account and group definitions. A trust relationship is established between each of the servers. This trust relationship allows a single administrator to manage all the domains. The resource servers must have a one-way trust relationship with each of the account servers.

A trust relationship allows security validation to pass from one domain to another. There are two types of trust relationships:

❑ Trusting Domain

The trusting domain contains resources that require validated access permissions. It sends the user validation queries to the trusted domain.

❑ Trusted Domain

The trusted domain contains the user and group account database and is responsible for validating user account information. If the trusted domain approves the user account information, the user can use the resource in the trusting domain.

■ Multiple Trust

This model is also known as a complete trust. In this model there are several domains, each having an account server, all of which have a two-way trust defined between every other server. A two-way trust relationship exists between each domain in the network. Because of the established two-way trust between every domain, the network administrators can define resources in any domain and give permissions to resources in any domain. However, as the numbers of domains grow, the numbers of two-way trust relationships rapidly grow.

NOTE: Microsoft does not recommend using the multiple trust model if there are more than five domains.

Master Browser and Browsing

The Windows NT browser system maintains a list of all domains and servers accessible on the network. This list is called a browse list. Clients that need to know which domains and computers are accessible from their computer use this list. The Windows NT browser system consists of a master browser, backup browsers, and client systems.

In a Windows NT Server domain, every Windows NT computer is a browser. If the domain has a PDC, the PDC is the server that acts as the master browser; the other Windows NT Servers are backup browsers.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

Role of the Master Browser

The master browser maintains a browse list of all the servers in the domain of the master browser or workgroup and a list of all domains and workgroups on the network. For domains that span more than one subnetwork in a TCP/IP only network, the master browser maintains the browse list for the portion of the domain on its subnetwork, thus a master browser is needed for each subnetwork. On networks using NetBEUI or NWLink IPX/SPX protocol, name queries are sent across routers, so there is only one master browser for each domain.

Every domain or workgroup is required to force an election of a master browser at some point. The master browser is chosen from domain servers and workgroup servers through an election algorithm. The server meeting the majority of the following conditions is elected as the master browser. The criteria for electing servers are as follows:

The server:

- Having the highest election criteria within the domain. A Windows NT Server will be elected over a Windows for Workgroups computer.
- Having the longest uptime.
- With the lowest alphabetical computer name.
- Configured as the preferred master browser.

NOTE: In a workgroup with Windows NT workstations there is always one master browser. If there are two Windows NT workstations in the workgroup, there is also one Backup Browser. For every 32 Windows NT workstations in the workgroup, there is an additional backup browser.

When a server first becomes a master browser, it can force all servers to register if the browse list is empty. To force registration, the master browser sends a *RequestAnnouncement datagram*. All servers that receive the datagram must respond by sending a *server announcement* to the master browser at a randomly generated time within 30 seconds following the request.

Role of the Backup Browser

Backup browsers call the master browser every fifteen minutes to get the latest copy of the browse list as well as a list of domains. If the backup browser cannot find the master browser, it forces an election.

LMHOSTS Files and Browsing

You can use the *LMHOSTS* file to browse. The *LMHOSTS* file must contain a NetBIOS name to allow a computer to browse for servers and clients located on different subnetworks. This file provides a means to map IP addresses on computers that are not on the same local subnetwork as the master browser.

WINS resolves NetBIOS names to IP addresses for computers that are WINS enabled. Implementing WINS eliminates the need to configure the *LMHOSTS* file and enable UDP Port 137 (NetBIOS Name Service Broadcasts). Clients that do not have WINS implemented require the *LMHOSTS* file to browse outside their local subnetwork.

How Servers Announce Themselves

When a server is started, it announces itself by sending a server announcement to the master browser every minute. As the server continues running, the time increments lengthen until the announcements become once every twelve minutes.

Domain Announcements

When a backup browser becomes a master browser, it broadcasts a *DomainAnnouncement* datagram every minute for the first five minutes, then once every fifteen minutes thereafter. Master browsers on other domains receive these *DomainAnnouncement* datagrams and add the specified domain to the browse list. If a domain has not announced itself for three consecutive announcement periods, the domain is removed from the browse list.

Connecting the Servers in Domains

Once you have determined the domain structure of your network, you can plan the connectivity requirements that are appropriate for your environment. You will most likely want servers in one domain to access information on servers in other domains. Connectivity can be within a local LAN or over a WAN. Chapter 3, "Protocols and Services" discusses connectivity options with Windows NT Server.

Chapter 3

Protocols and Services

The Windows NT Server operating system includes support for most industry-standard protocols. Microsoft has also designed several protocols and services into the operating system to support Microsoft-based protocol connectivity. This chapter provides an overview of networking protocols and services supported by Windows NT Server 3.5 or greater. The protocols and services discussed in this chapter are included in the test configurations that Compaq set up in the Integration Lab to produce this TechNote.

The following protocols and services are covered in this chapter:

- Transmission Control Protocol/Internet Protocol (TCP/IP)
- Dynamic Host Configuration Protocol (DHCP)
- Windows Internet Name Service (WINS)
- Remote Access Service (RAS) and Point-to-Point Protocol (PPP)

Microsoft designed RAS, DHCP, and WINS for the Windows NT operating system to provide internet connectivity in Microsoft-based operating systems. These protocols and services are compatible with other industry-standard protocols including TCP/IP and PPP.

Microsoft TCP/IP for Windows NT

TCP/IP interconnects diverse computer hardware and operating systems, providing a communication link across networked computers that cannot otherwise communicate with each other.

Microsoft TCP/IP is included with the Windows NT operating system. TCP/IP provides communication with devices that use other Microsoft networking products and with those that use other operating systems such as NetWare and UNIX. TCP/IP enables enterprise networking and connectivity on Windows NT computers.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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3-2 Protocols and Services

Microsoft TCP/IP is a routable enterprise networking protocol that offers the following advantages:

- File Transfer Protocol (FTP) and Telnet utilities are supported on TCP/IP providing connectivity to platforms running different operating systems. For example, if you have TCP/IP configured, the FTP utility available in Windows NT can connect to a UNIX system and complete a file transfer.
- A powerful, scalable cross-platform client-server framework. Microsoft TCP/IP supports the Windows Sockets 1.1 interface. Windows Sockets applications can take advantage of other networking protocols such as NWLink IPX/SPX, which is the Microsoft implementation of the protocols used in NetWare networks. NWLink is the Microsoft implementation of IPX/SPX.
- TCP/IP offers the technology necessary for Windows NT to connect and use the global Internet services.

The TCP/IP suite includes:

- Transmission Control Protocol (TCP)
- Internet Protocol (IP)
- User Datagram Protocol (UDP)
- Address Resolution Protocol (ARP)
- Internet Control Message Protocol (ICMP)

This suite of internet working protocols provide a set of standards for how computers communicate and how networks are interconnected. TCP/IP also supports PPP and Serial Line IP (SLIP), which are protocols used for dial-up access to TCP/IP networks.

Each computer running TCP/IP requires a unique TCP/IP address, subnet mask, and default gateway to identify itself. This address management and tracking requires a significant administrative effort in large corporate environments. The TCP/IP address information must be continuously maintained and updated. Some corporations use the Domain Name System (DNS) that provides a server-based host table of information. The user needs only to enter the address of the DNS server to receive a TCP/IP address, but the address information on the server still requires manual updating by a system administrator. Once the correct address is entered the user can be assigned an alias.

The Windows NT operating system design includes DHCP and WINS to help alleviate some TCP/IP administrative requirements. A discussion of these protocols follows.

Dynamic Host Configuration Protocol

DHCP was established to relieve administrative overhead for the systems administrators responsible for network connections. DHCP simplifies assigning and maintaining the IP address information and databases. DHCP provides the following advantages:

- Provides a safe, reliable, and simple TCP/IP network configuration
- Ensures that address conflicts do not occur
- Helps conserve the use of IP addresses through centralized management of address allocation
- Allows dynamic configuration of IP addresses for any computer connected to the network

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3-4 Protocols and Services

DHCP is a client-server model and is based on leases for IP addresses. During system startup the following processes occur:

1. A DHCP client computer sends a discover message that is broadcast to the local network. The discover message can be relayed to all DHCP servers on the network.
2. Each DHCP server that receives the discover message responds with an offer message containing an IP address and valid configuration information for the client sending the request.
3. The client collects the configuration offerings from the servers.
4. The client chooses one of the configurations and sends a request message that identifies the DHCP server it chose for the selected configuration.
5. The selected DHCP server sends a DHCP acknowledgment message containing the address first sent during the discovery stage, plus a valid lease for the address and the TCP/IP network configuration parameters for the client.
6. After the client receives the acknowledgment, it enters a bound state and can then participate on the TCP/IP network and complete its system setup.

Client computers that have a local hard drive save the received address for use during subsequent system startups. As the lease approaches its expiration date, the client attempts to renew its lease with the same DHCP server. The DHCP server begins the discovery process again to assign a new address only if the current IP address lease cannot be renewed. DHCP can also lease addresses on a permanent or reserved basis for specific computers.

Figure 3-1 provides a summary diagram of the tasks involved in implementing DHCP services.

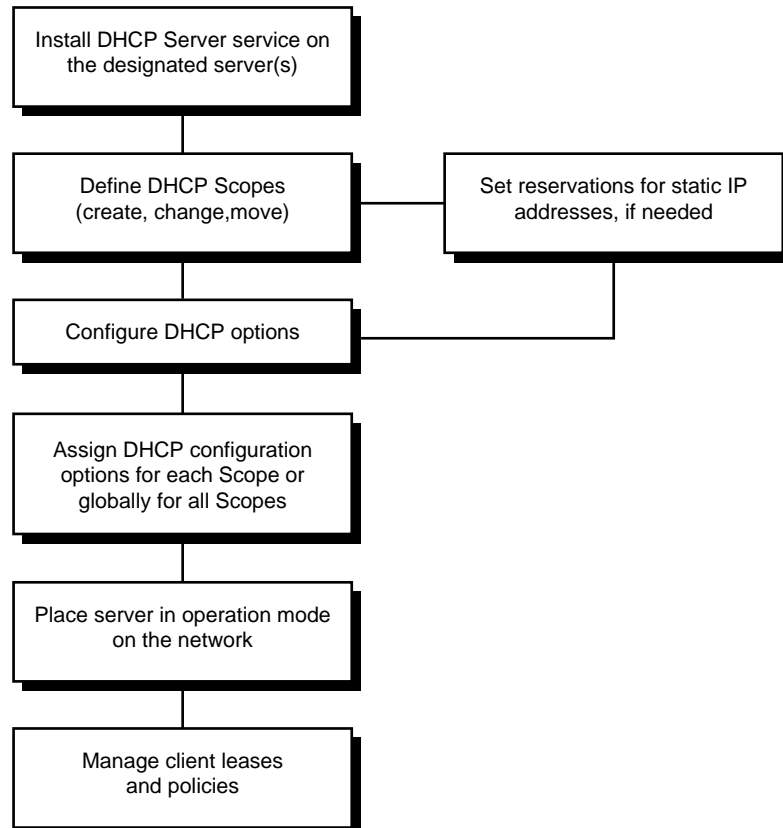


Figure 3-1. DHCP installation and configuration process

The procedures to install and configure DHCP in a Windows NT system are included in Chapter 6, "Configuring the Network with DHCP and WINS," of this TechNote.

Windows Internet Name Service

WINS provides a distributed database for registering and querying dynamic computer names to IP address mappings in a routed network environment. WINS reduces the use of local broadcasts for name resolution and allows users to locate systems on remote networks. Furthermore, when dynamic addressing through DHCP results in new IP addresses for computers that are moved between subnetworks, the changes are automatically updated in the WINS database.

A WINS server is a Windows NT server running Microsoft TCP/IP and the WINS server software. WINS servers maintain a database that maps computer names to IP addresses, allowing users to communicate with other computers on other subnets while gaining all the benefits of TCP/IP. WINS consists of two components, the WINS server and the client software.

WINS servers provide the following benefits:

- Dynamic database maintenance to support computer name registration and name resolution. WINS also provides a NetBIOS namespace, making it more flexible than DNS for name resolution.
- Centralized management of the computer name database and the database replication policies, alleviating the need for managing the *LMHOSTS* files.

NOTE: Microsoft LAN Manager and Windows NT networks use *LMHOSTS* files to locate remote computers by mapping IP addresses to NetBIOS and Windows NT computer names. You can edit *LMHOSTS* files with any text editor; however, you must follow the *LMHOSTS* rules for file structure and content. Refer to Volume 2 of the *Windows NT Resource Kit* for more information about *LMHOSTS* rules and keywords.

- Reduction of IP broadcast traffic in Microsoft internetworks, while allowing client computers to easily locate remote systems across LAN or WAN networks.

- The ability for clients on a Windows NT server network to browse domains on the far side of a router without a local domain controller having to be present.
- A scalable design, making it an excellent choice for name resolution for medium to very large networks.

Figure 3-2 illustrates the process of implementing WINS on a Windows NT server.

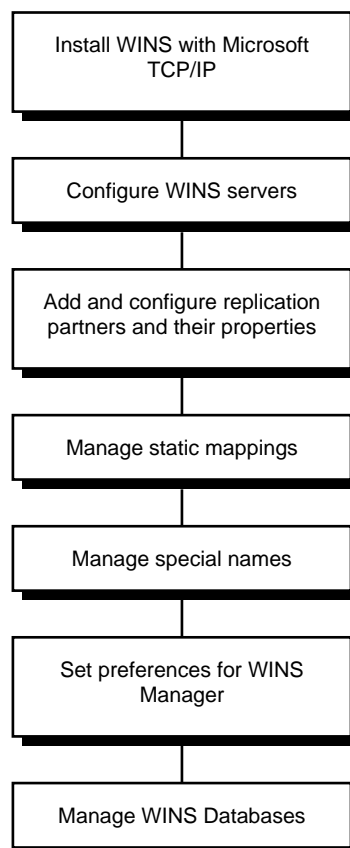


Figure 3-2. WINS installation and configuration process

Remote Access Service

RAS provides remote networking capabilities to Windows NT users who need to communicate, monitor, and manage servers at multiple offices. RAS users can maintain all the benefits of TCP/IP networking, including access to the WINS and DHCP capabilities of Microsoft TCP/IP. RAS users on a Windows NT computer can dial-in to remotely access their networks for services such as file and printer sharing, electronic mail, scheduling, and SQL Server database access.

Windows NT RAS and IP routing to a RAS server provide RAS clients access to TCP/IP networks. RAS also works with IPX routing for clients that use NetWare networks. Windows NT uses the industry standard PPP and SLIP protocols. These standards ensure that Windows NT is interoperable with third-party remote access servers and client software. RAS clients use DNS and WINS for name resolution services and can create TCP sessions with systems on the local network.

The RAS server provides a pool of IP addresses that are reserved for static configuration during RAS installation. The IP addresses are automatically assigned to RAS clients using PPP when they dial-in.

RAS clients can connect to multiple TCP/IP networks that are logically joined (but physically separate) networks sharing the same address space. When using multiple connections, the RAS client can still use DNS and WINS for name resolution.

Users with RAS client computers can use the Remote Access program to enter and maintain names and telephone numbers of remote networks. RAS clients can connect to and disconnect from these networks. You can also use the RAS Phone Book application to select the network protocol to use for a specific Phone Book entry. If TCP/IP is installed, the Phone Book automatically selects TCP/IP over PPP as the protocol.

If a RAS client computer has a serial COM port, you can use the RAS Phone Book application to configure SLIP for use with a selected Phone Book entry. If you configure a RAS client computer to use the SLIP option, the terminal screen appears when you dial-in for a connection to the selected Phone Book entry. You can then begin an interactive session with a SLIP server. When you use SLIP, RAS Phone Book bypasses user authentication.

NOTE: SLIP provides a connection between the local RAS network computer and the remotely connected RAS client, not the entire network.

Figure 3-3 illustrates the installation process for Microsoft TCP/IP with RAS on a Windows NT computer.

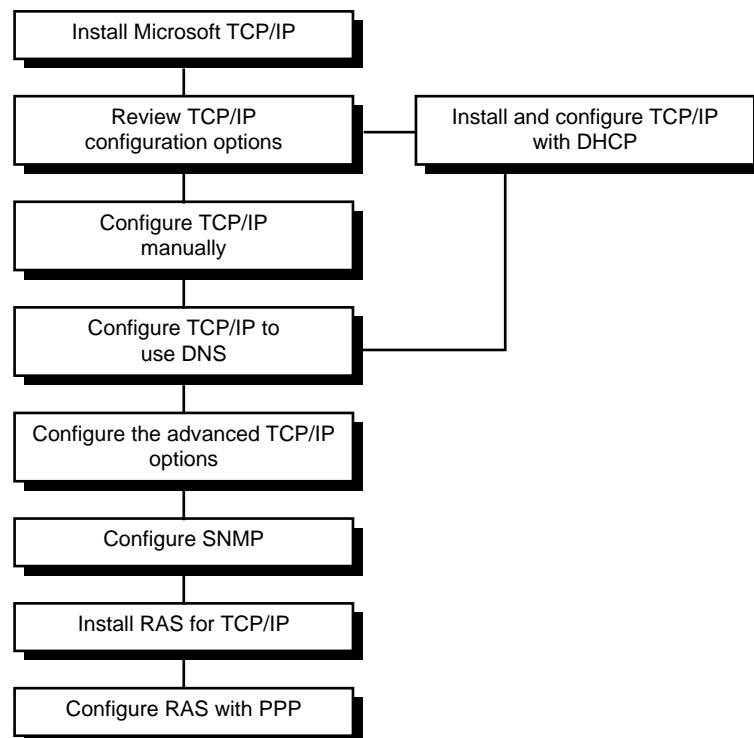


Figure 3-3. Microsoft TCP/IP and RAS installation and configuration process

RAS connects users over telephone, X.25, or Integrated Services Digital Network (ISDN) lines to a Windows NT network. Once the connection is made, users can access all network resources as if they were at a local computer.

Windows NT Server RAS features include support for:

- Multiple interfaces
- Simultaneous connections
- Extensive WAN connections
- Topology-independence and protocol-independence
- Advanced modem functionality

RAS Administration

The administrative interface allows administrators to monitor RAS clients on a domain and on RAS ports of a specific server. The Remote Access Administration utility allows the administrator to disconnect and send messages to RAS clients. The administrator can start, stop, pause, and continue the Remote Access Service on a RAS server. The administrator can grant and revoke RAS permissions. You can also grant and revoke RAS permissions by using the User Manager for Domain utility.

Integrated Domain Security with RAS

After passing RAS authentication and establishing the RAS connection, users must log on to Windows NT. RAS uses the same account database as a Windows NT Server. This provides for easier administration, because all users use the same accounts as direct connections. All authentication and logon information is encrypted when transmitted over the phone lines.

RAS Client User Interface

The RAS client interface consists of windows-based or character-based utilities that provide RAS users with access to connect, disconnect, and status reporting.

This client interface creates and maintains a phone book that contains user entries such as phone numbers and connection parameters. The RAS client provides an optional modem feature support and enhanced X.25 support.

RAS also provides security for the server and client through callback at a user-specified number, a preset number, or no callback. You can provide access to the entire network or restrict RAS clients to only the RAS server. As illustrated in Figure 3-4, there are five logon security steps that every user call must pass through.

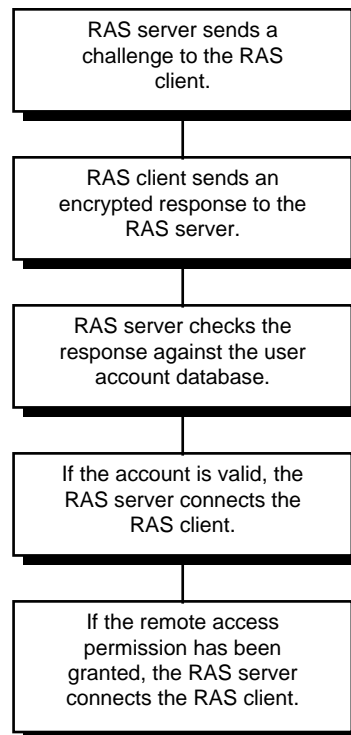


Figure 3-4. RAS logon security process

After the above steps are completed and if callback is enabled, the RAS server calls the RAS client back and the above steps are repeated.

Chapter 4

Network Management

This chapter provides 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 4-1 is an example of such a network.

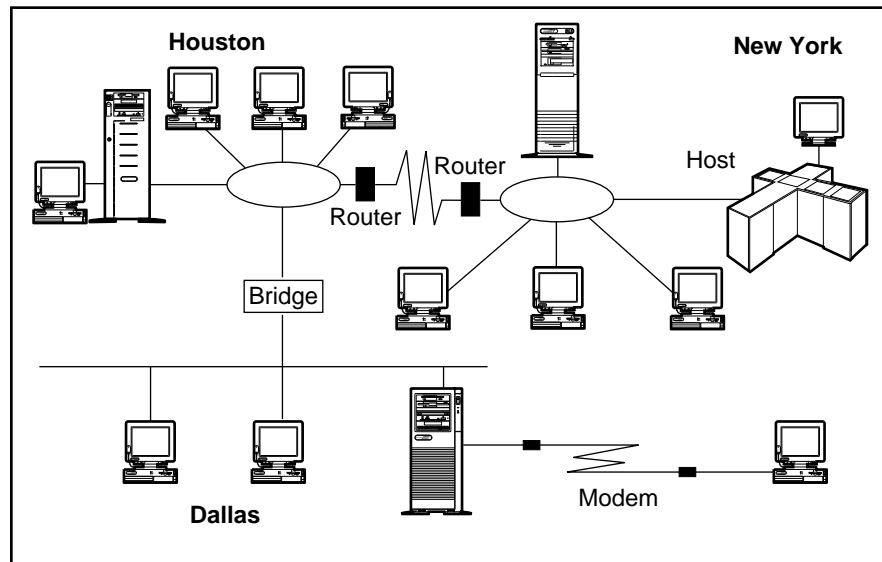


Figure 4-1. Typical network configuration

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4-2 Network Management

Managing a multivendor, multioperating system environment, similar to the typical network configuration illustrated in Figure 4-1, 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)
- Transmission Control Protocol and Internet Protocol (TCP/IP)
- Internet Packet Exchange (IPX)
- Telnet
- Windows Internet Name Service (WINS)
- Dynamic Host Configuration Protocol (DHCP)
- 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 4-1 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 TechNote.

Table 4-1
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.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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4-4 *Network Management*

Subsystem	Subsystem	Major components of a device (for example, disk subsystem, storage subsystem, memory subsystem, and processor subsystem).
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Figure 4-2 illustrates the relationship between the network management terminology described in Table 4-1.

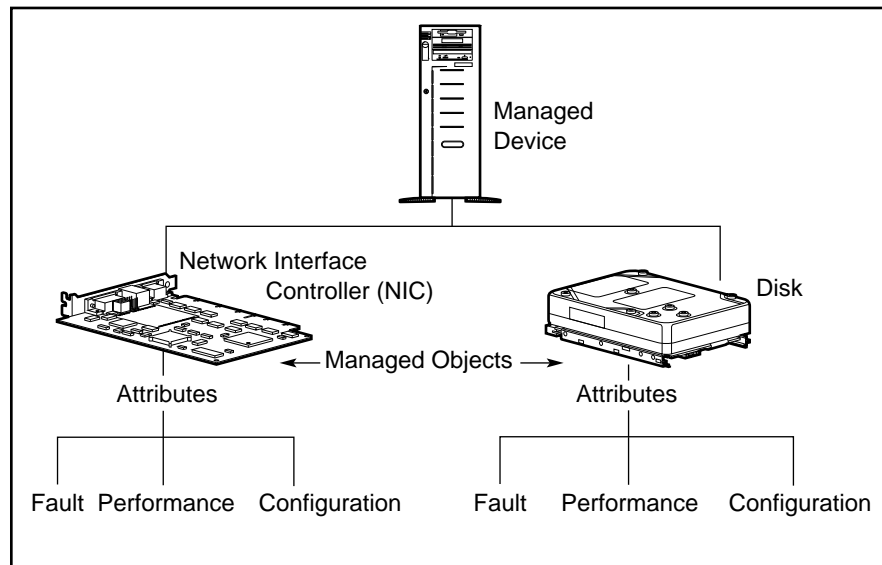


Figure 4-2. Relationship of network management terms

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.

Network Management Overview

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

Managed devices can be:

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

Today, management applications 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. Management applications provide you with these capabilities.

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.

A few factors that contribute to the complexity of network management are:

- 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.

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4-8 Network Management

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 standard.

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 the appropriate *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 specified 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 Internet Management* by Marshall T. Rose (Prentice-Hall).

SNMP 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 as follows:

■ 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) influences 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:

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

In addition to PPP and SLIP, 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 4-3, these server management requirements include in-depth monitoring, analysis, and control of the performance, fault, and configuration aspects of the server operation.

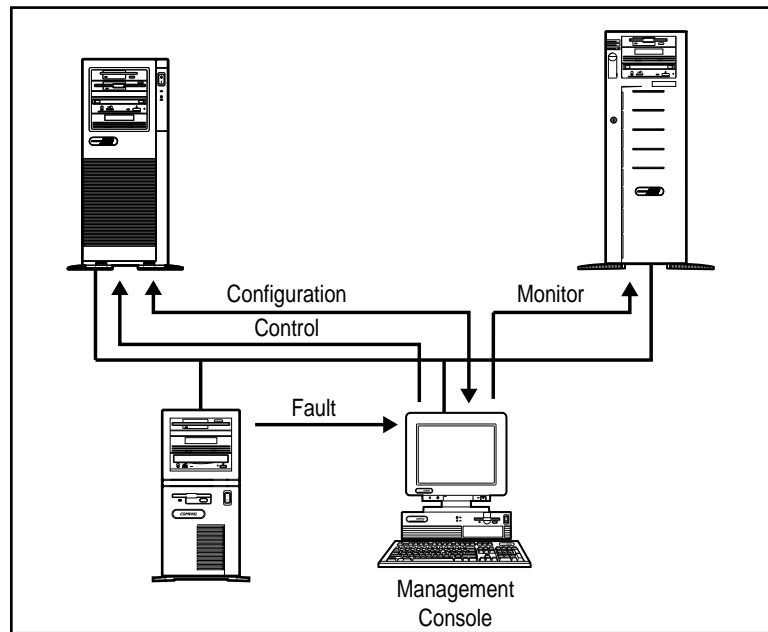


Figure 4-3. Server management data flow

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 4-4 illustrates an example of today's typical data flow when managing a PC network.

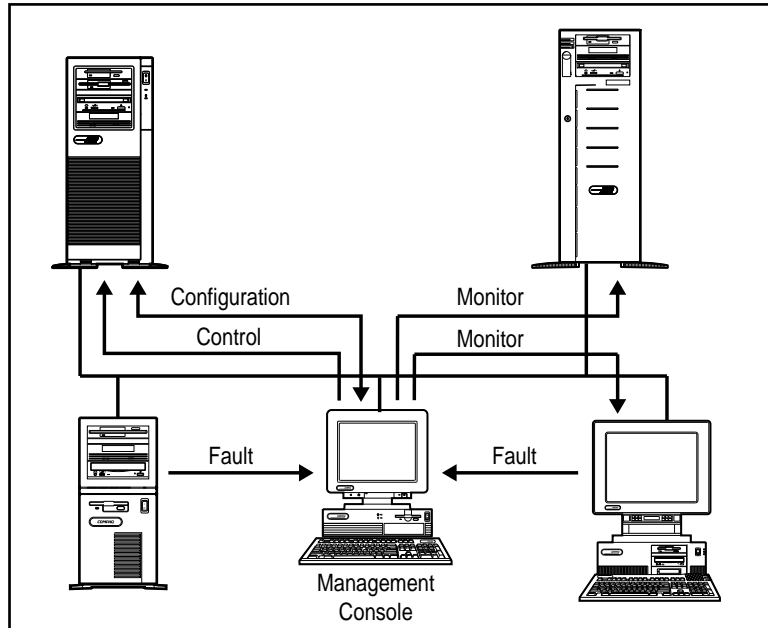


Figure 4-4. Desktop management data flow

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 Compaq Deskpro Family has features that add value in the realm of managing networks.

Chapter 5

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.

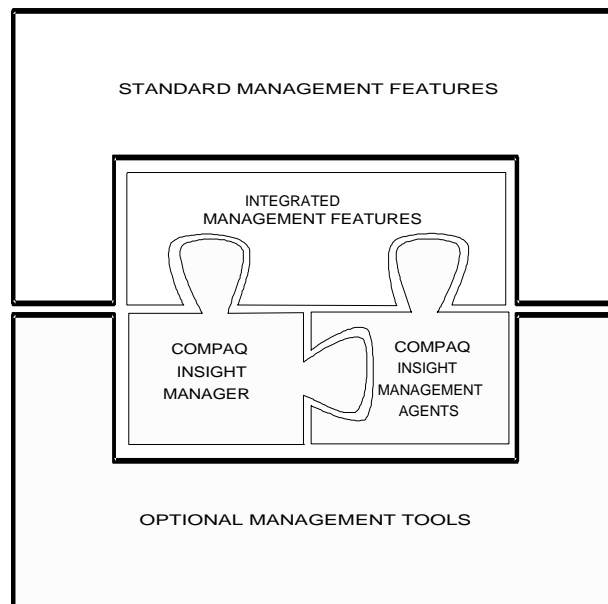


Figure 5-1. Compaq server management framework

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 a 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 5-2 illustrates the fault management process.

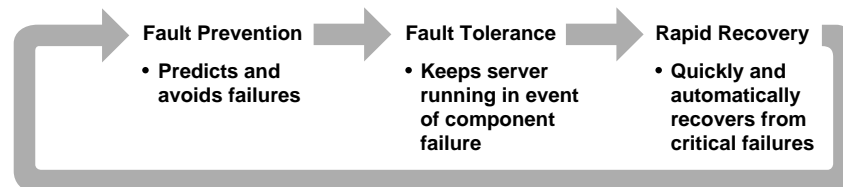


Figure 5-2. Compaq full-spectrum fault management process

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.

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5-4 Compaq Management Technologies

Compaq ProLiant servers 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 Advanced 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 5-3 illustrates how the Rapid Recovery Engine process detects and resolves critical errors in your Compaq server.

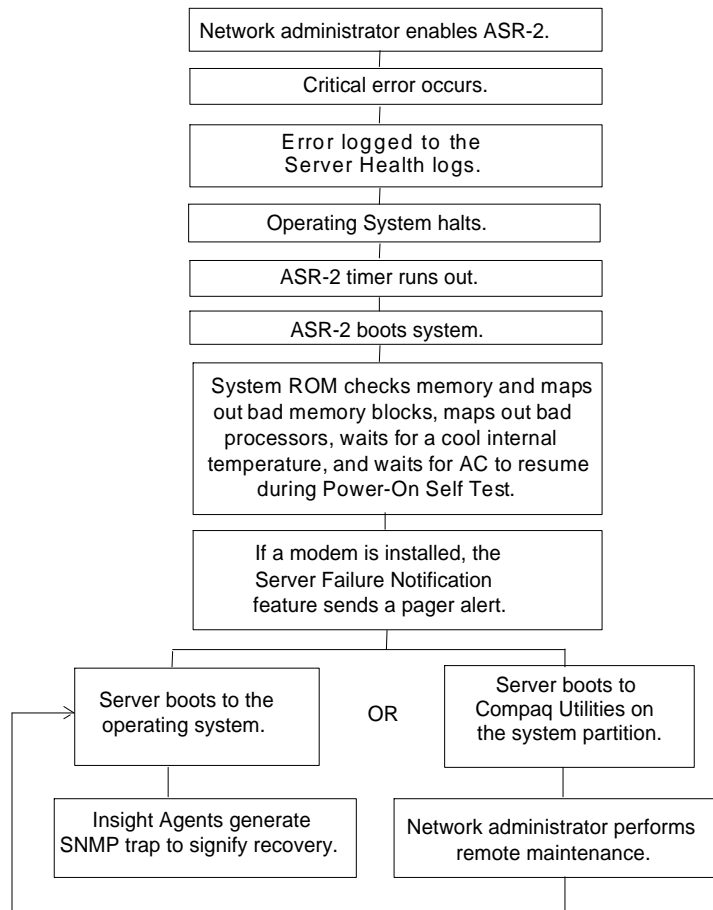


Figure 5-3. Rapid Recovery Engine flowchart

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 includes:

- **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 5-1 describes the critical errors detected by ASR-2.

Table 5-1
ASR-2 Critical Errors

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.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

Using remote maintenance requires:

- An operating system with ASR-2 support.
- Compaq System Configuration Utility 2.2 or greater 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 NVT over IPX or Telnet over IP connection between the server and the management PC.
- An NVT over IPX or Telnet over IP configured and enabled on the server system utility partition.
- Compaq Insight Manager 2.20 or greater, an NVT over IPX or Telnet over IP 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.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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 distribution of software. The features also help streamline service calls because the administrator can quickly provide PC configuration and history to the service provider.

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 Microsoft Windows 95).

Environmental Fault Prevention Tracking

This is a hardware and software feature that 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.

NOTE: Environmental Fault Prevention Tracking is only available in a Windows 95 operating environment.

Network Performance Monitoring

By using Compaq Insight Manager, a network administrator can predict failure of the integrated Network Interface Controller (NIC) by monitoring and analyzing NIC performance data.

NOTE: Network performance monitoring is only available in a 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.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

Table 5-2 describes the comprehensive security features to protect critical and confidential data and computing resources.

**Table 5-2
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/Quick Blank	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 the 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, Windows NT, OS/2, and Windows 95. These clients are supported across a wide range of network operating systems, including Windows NT, LAN Manager, NetWare, 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 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 that 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.

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5-18 *Compaq Management Technologies*

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 and monitor the health of the system hardware. You can view data such as drive subsystem, recovery options, system configuration, system board, option boards, and NICs, and system utilization.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

■ 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 Reboot — 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 can 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 and the Compaq Support Software CD.

■ Paging

In the event 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. You can also verify the RAID level of each drive array (for example, no-fault tolerance, drive mirroring, data guarding, distributed data guarding, or no fault tolerance).

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 Microsoft Windows NT 3.5 and 3.51 and NetWare 3.12 and 4.x.
- 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 Name Service (WINS) and Domain Name System (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 Microsoft Windows NT, NetWare, 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 5-4 shows the location of the Compaq enterprise ID in context within the Internet Naming Tree.

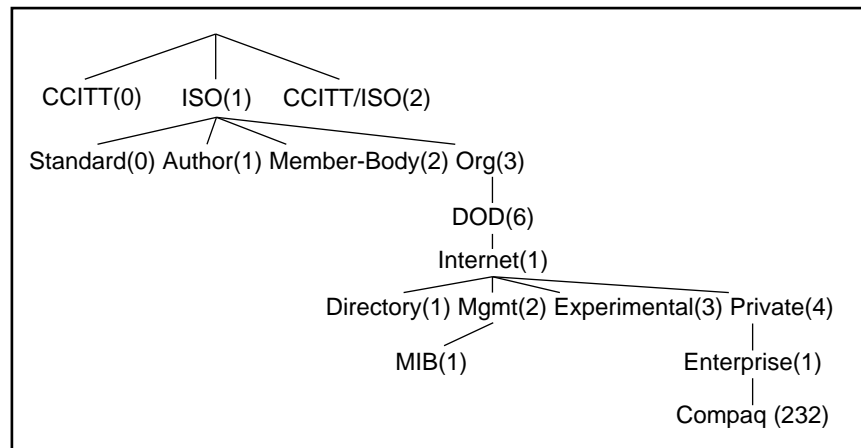


Figure 5-4. Internet naming tree with Compaq Enterprise ID (232)

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, the following list only comprises the most current MIBs:

Table 5-3
Most Recent MIBs

MIB	Describes . . .
Standard PC Equipment Configuration	Information that can be configured on an PCI ISA or EISA system
System Information	Specific Compaq features such as security, asset management, and so on
Intelligent Drive Arrays	Compaq Drive Array Controllers
SCSI Devices	Compaq SCSI interface products
Server Health	The features that monitor server health, such as thermal sensing
Drive Storage Systems	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	Compaq Uninterruptible Power Supply

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 the *Integrating Compaq Insight Manager with Microsoft Systems Management Server* TechNote, for more detailed information about integrating 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 Microsoft, Novell, 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 Microsoft Systems Management Server or your preferred management environment. Compaq adheres to network management standards.

Compaq servers provide an extensive set of MIBs that 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.

Microsoft Systems Management Server

Microsoft Systems Management Server operates in a systems management environment for networks and can compose one or more LANs. Systems Management Server works with your existing networked environment to provide a complete resource management solution. It can operate with many different networked environments such as Windows NT, LAN Manager 2.x, NetWare 3.1x and 4.x, Macintosh and/or a combination of environments.

Systems Management Server features include:

- Maintains an inventory of the hardware, software, and configuration of computers across a network
- Distributes, installs, and updates software and files
- Manages network applications
- Provides integrated support utilities that enable you to view diagnostic information for remote clients and take direct control of clients
- Provides an integrated network monitor utility that enables you to monitor network data flow

Using Compaq Insight Manager with Systems Management Server

Once Compaq Insight Manager has been installed, it can run either separately or in conjunction with Systems Management Server. This feature allows you to leave Insight Manager running even while Systems Management Server is not running. Insight Manager will continue to provide you with real time information on all servers in the Responsible Server list.

Running Insight Manager with Systems Management Server is like any other stand-alone operation. Insight Manager can be launched by its icon within each Personal Computer Properties window of Systems Management Server, or if Insight Manager is already running. The server that is currently selected in Systems Management Server displays in Insight Manager. This allows you to use Systems Management Server to find specific information about Compaq servers. You can then launch Insight Manager to respond to the information that Systems Management Server provided you for the Compaq servers.

Compaq Inventory Collector Program

The *COLLECTOR.EXE* is an executable file known as the Compaq Inventory Collector for Systems Management Server. The Inventory Collector program is written for Microsoft Windows NT 3.5 or greater. This program is designed to work with the Compaq Insight Management Agents for Microsoft Windows NT 2.30 or greater and Systems Management Server 1.0 or greater.

The Inventory Collector program executes as part of the Systems Management Server logon script file and adds Compaq tables to the Systems Management Server database. These tables can be used in queries and reports generated from the queries.

This TechNote does not cover Integrating Compaq Insight Manager with Systems Management Server and the Compaq Inventory Collector Program. Refer to the Microsoft Systems Management Server documentation, and *Integrating Compaq Insight Manager with Microsoft Systems Management Server* TechNote for more information.

Chapter 6

Configuring the Network with DHCP and WINS

Before you can install and configure DHCP and WINS services, you must clearly identify your network connectivity requirements. This chapter provides planning strategies, preinstallation requirements, and installation and configuration information for DHCP and WINS.

Planning Strategy for DHCP and WINS Servers

If you are planning a strategy for a small network that does not include routers and subnetting, a single server can probably meet the requirements of the DHCP and WINS server.

Planning any network that includes DHCP and WINS requires determining the following:

- The hardware requirements for the DHCP server
- The servers that will become DHCP clients and use dynamic IP addressing
- The clients that need to keep a static IP address
- The DHCP options and their values for each scope and clients within that scope

Planning a strategy for a large scale network includes the following considerations:

- Compatibility of hardware and software routers with DHCP
- Planning the physical subnetting of the network and relative placement of DHCP and WINS servers. This includes planning for placement of DHCP and WINS servers among subnets in a way that reduces b-node broadcasts access across routers.

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Installing DHCP Server Services

The Windows NT Server software provides you with the option of performing either an Express or a Custom method of installation. The following section provides instructions to install DHCP Server services using two different installation methods. Select the one that suits your configuration requirements.

NOTE: Before you begin installing DHCP, be sure that you installed TCP/IP during the initial Windows NT installation.

After an Express Setup of Windows NT Server

The following section addresses installing and configuring DHCP Server services after an Express installation of Windows NT Server.

Perform the following steps to install DHCP Server after an Express installation of Windows NT.

1. Select *Control Panel* → *Network* from the Main Menu. The Network Setting screen is displayed.
2. Select the *Add Software* option. When the Add Network Software screen is displayed, press the down arrow to display a list of Network Software.
3. Select the *TCP/IP Protocol* and the *Related Components* option, then select *Continue*.

The Windows NT TCP/IP Installation Options screen is displayed.

4. Select *DHCP Server Service*, then select *Continue*.
5. Enter the path from which you want to install DHCP Server software when prompted by Windows NT Setup.

The default is the Windows NT installation path. Select *Continue* to accept the path designation or enter the path of your choice.

6. Verify that *Microsoft DHCP Server* is included in the list of Installed Network Software, then select *OK*.

The Network change screen is displayed.

7. Restart the server to enable all DHCP Server Services.

During a Custom Setup of Windows NT Server

If you select the Custom Setup option, Setup displays the TCP/IP products list.

1. Select the *DHCP Server* from the TCP/IP product list.
2. Enter the path from which you want to install DHCP Server, when prompted by Windows NT Setup.

The default is the Windows NT installation path. Select *Continue* to accept the path designation or enter the path of your choice.

After the software is installed restart the computer to start the DHCP Services.

Configuring DHCP Server Services

The following section provides instructions to configure DHCP Server services by creating scopes and defining several configuration options.

Creating DHCP Scopes

Now that you have installed DHCP Server, you can create DHCP scopes. Scopes provide a way to group computers administratively that run the DHCP Client Service. You can create scopes for each subnet on the network. When the server restarts, perform the following steps to configure the DHCP server:

1. Select *DHCP Manager* from the Network Administration Group.
2. Select *Server* → *Add*. This displays the Add DHCP Server to Server List screen.

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6-4 Configuring the Network with DHCP and WINS

3. Enter the IP Address of the DHCP Server, for example:

X.Y.200.204

select *OK*. The IP address of the DHCP server is displayed.

The screenshot shows the 'Create Scope - (Local)' dialog box. The 'IP Address Pool' section has 'Start Address' set to 150.200.200.202, 'End Address' set to 150.200.200.255, and 'Subnet Mask' set to 255.255.0.0. The 'Exclusion Range' section has empty 'Start Address' and 'End Address' fields, with 'Add ->' and '<- Remove' buttons. The 'Lease Duration' section has the 'Limited To' radio button selected, with values of 3 Day(s), 00 Hour(s), and 00 Minutes. The 'Name' field contains 'Descriptive name' and the 'Comment' field is empty. The 'OK', 'Cancel', and 'Help' buttons are at the bottom.

Figure 6-1. Creating DHCP scopes

4. Select *Scope* → *Create* to define the scope of IP addresses. The Create Scope screen displays. The DHCP server will be responsible for a pool of IP addresses.
5. Enter the following information, then select *OK*.

IP Address Pool
Exclusion Range
Lease Duration
Name of Scope
Comment

NOTE: Compaq recommends that you use the default subnet mask (for Class A addresses 255.0.0.0, for Class B addresses 255.255.0.0, and for Class C addresses 255.255.255.0).



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6-6 Configuring the Network with DHCP and WINS

In this chapter, TCP/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.

6. Set the lease duration for the scope. The default is three days and DHCP will try to lease the same address to each computer if it is not being used.

NOTE: You must define a separate scope for each IP network that you would like this DHCP server to assign addresses to, for example:

Class B address	
X.W.0.0	Mask 255.255.0.0
X.Y.0.0	Mask 255.255.0.0
X.Z.0.0	Mask 255.255.0.0

Defining DHCP Options for Reservations

Perform the following procedure to configure reservations for specific IP addresses at the server console. Configure reservations for specific addresses, only if you want to lease addresses to specific computers.

Before you can reserve an IP address, you must know the following information about the client computer:

1. Client computer address. Type at the DOS prompt:

```
ipconfig /all
```

This will display the physical address of the client computer. It will look similar to this:

```
Physical Address: 00-80-3F-65-82-F3-C2
```

2. Unique hex identifier. This number is engraved on the network interface controller.

Once you have identified the required client information you can continue.

1. Select *Scope* → *Add Reserved Clients*, to reserve IP addresses within a Scope. This displays the Add Reserved Clients screen.
2. Windows NT automatically fills in the default part of the address:
XXX.YYY.
Enter the lease address in dotted decimal notation:
111.222.
3. Enter the hex identifier of the client computer.
4. Enter the *Client Name* and *Comments* associated with the address.
5. Select *Close* when you finish entering the reservation information.

Repeat these steps if you want to reserve additional addresses.

NOTE: If you are going to use DHCP to configure your Compaq Insight Manager Asynchronous Network IP address, reserve the needed address at this point. Use the "Insight Asynchronous Management Worksheet" to gather this information. The worksheet is provided at the back of this TechNote.

Assigning DHCP Configuration Options

Besides the IP address information, you can define options globally for specific selected scopes, all scopes on a server, or individual DHCP clients.

The following is an example of how to set up a router for a DHCP server. Refer to the *Microsoft Windows NT Resource Kit* for more information on configuring DHCP. Specifically, refer to Chapter 13 "Installing, and Configuring DHCP Servers," in the *Windows NT Networking Guide*.

1. Select *DHCP Options* → *Scope* to display a list of Unused Active Options.

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2. Select option *003 Router* for each scope. This scope passes the default gateway IP address back to the client with the IP address.
3. Select *Value*, the screen displays 0.0.0.0 until you change it.

4. Select *Edit Array* → *Add*. The IP Address Array Editor screen is displayed.
5. Enter the *New IP address* of the Router that you chose as the default gateway for this scope, then select *OK* to add the new address to the Active Options list.

For example:

150.200.200.201

6. Select *Activate* from the Scope menu to start a DHCP scope, then select *OK* → *Yes* to activate the scope.
7. Select *Close* and return to the Main Menu.

DHCP Router Configuration Considerations

DHCP is defined in *Requests for Comments (RFCs) 1533, 1534, 1541, and 1542*. If the DHCP Server is to allocate addresses to more than one network, the router must support RFC 1541. If you are using a router manufactured by Cisco Systems, it must support Cisco Software Release 10.0 or later.

NOTE: If your DHCP servers are all in the same physical network and they will not be leasing addresses to other segments or subnets, you do not need to configure routers.

The following list contains parameters that you must configure for a router allocating addresses to more than one network.

- Configure the router to support forwarding of the User Datagram Protocol (UDP) as follows, by using the global command:

IP Forward-Protocol UDP ##

(where ## is the port number for BootP which is 67)

- If you do not provide a port number, all UDP datagrams are forwarded for each interface on the router that must support DHCP:

Interface ethernet #/#

(where #/# is the number of the interface) or Interface token-ring #/#

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IP Helper_address ###.###.###.###
(where # is the IP address of the DHCP Host in dotted decimal notation)

Installing WINS Servers

The following procedure describes installing a WINS server after you have successfully installed the Windows NT Server operating system with TCP/IP services. You must log in as a member of the Administrators Group to install a WINS server.

Perform the following WINS server installation after installing Windows NT Server:

1. Select *Control Panel* → *Network options* from the Main Program Group.
2. Select *Add Software* to display the Add Network Software option when the Network Settings screen displays.
3. Select *TCP/IP Protocol And Related Components* from the *Add Network Software list*, then select *Continue*.
4. Select the appropriate options when the *Windows TCP/IP Options* list is displayed, including *WINS Server Service*, then select *OK*.
5. Enter the full path to the Windows NT Server distribution files. After you enter the path, then select *Continue*.

The Network Settings screen is displayed.

6. Complete all the required changes, then select *Close* and restart the computer.

Configuring WINS Servers and Replication Partners

Compaq recommends that you refer to the *Windows NT Networking Guide (Volume 2)* of the *Microsoft Windows NT Resource Kit* or the *Microsoft Windows NT Administrator's Guide* before configuring WINS servers and replication partners.

! **IMPORTANT:** How you configure your WINS servers depends on the size of your network and the requirements of your installation. The WINS installation and configuration process requires you to make some important implementation decisions before you begin the implementation process.

In a large network where you are configuring multiple WINS servers on your network, you provide the network users with increased availability while balancing the load of database updates between servers.

Servers configured as WINS servers function as *replication partners*, also referred to as *push partners* and as *pull partners*. A WINS server that pulls in replicas of database entries from its partner is a pull partner. A WINS server that sends update messages to its partner is a push partner. Each WINS server configuration should include a push and pull partner designation.

To configure a WINS server:

1. Select *Control Panel* → *WINS Manager* from the Main Program Group. When the WINS Manager screen displays, select *Server* → *Configuration*.
2. Select *Advanced*, to view all the available options.

At this point, refer to your Microsoft documentation set for a discussion about Advanced WINS Server Configuration options.

To configure replication partners:

1. Select *Control Panel* → *WINS Manager* from the Main Program Group.
2. Select *Server* → *Replication Partners* when the WINS Manager screen displays.

At this point you can perform the following options:

- Replicate WINS servers
 - Add a replication partner
 - Delete replication partners
- Configure replication partner properties
 - Define pull partner properties
 - Define push partner properties
- Trigger replication between partners
 - Send a replication trigger
 - Start a replication immediately

Refer to your Microsoft documentation set for more information on configuring WINS replication partners.

Other WINS Configuration Options

Once you set up your WINS servers as replication partners and configure their properties you can continue with other configuration options. The following is a list of the other options available with a brief description of each.

- **Manage Static Mappings** — These are permanent lists of computer name-to-IP address mappings that cannot be questioned or deleted, except by the administrator. The Static Mappings command is used to add, edit, import, or delete static mappings for non-WINS clients on the network.

- **Managing Special Names** — WINS recognizes and manages special names for normal groups, multihomed devices, and Internet groups. WINS accomplishes this by appending a 16th byte to the computer name or domain name.
- **Setting Preferences for WINS Managers** — This is accomplished by selecting *WINS Manager* → *Options* → *Preferences* from the Windows NT Control Panel. The Preferences screen offers you the ability to set a number of different settings.
- **Managing the WINS Database** — The WINS database provides the tools you need to maintain the database. The WINS database requires periodic cleaning or *scavenging* and backing up. The scavenging process occurs automatically over defined preset Renewal and Extinct intervals. You can also clean the databases manually.

Windows NT RAS

To properly implement Windows NT Server in a connected networking environment, you must also include RAS as part of your network connectivity solution. Compaq chose Insight Manager as the application configured to run over RAS in the development of this TechNote. Insight Manager is an important aspect of any Compaq server networking strategy.

RAS planning, installation, and configuration procedures are provided in Chapter 7, “Configuring Insight Manager and Asynchronous Management with RAS.” To integrate RAS and Insight Manager optimally, Compaq recommends planning these network functions as one strategy.

Chapter 7

Configuring Insight Manager and Asynchronous Management with RAS

Compaq servers have a robust set of management capabilities. Insight Manager software provides the user interface to the management features in Compaq servers. Using the Insight Manager software, you can monitor the hardware components in Compaq servers such as the environmental systems, hard drive storage, and system memory.

The Insight Agents software executes on a manageable device, such as a server. The monitored statistics and device configuration information generated provide valuable information to management applications using the SNMP protocol. Properly configuring the Insight Agent software can be complicated, but when configured correctly Insight Agents can provide the network administrator with many options. This TechNote focuses on configuring RAS, Insight Manager, and Insight Agents with Insight Asynchronous Manager in a Compaq server network.

Installing and configuring RAS and the Insight Manager software requires planning and a careful review of your installation objectives. RAS provides several protocol installation options for the Insight Manager and Insight Agents software. Compaq recommends that you carefully consider your configuration options and follow the procedures and recommendations included in this chapter.

This chapter provides:

- Hardware and software requirements for Insight Manager and Insight Agents for Windows NT
- Preinstallation requirements for:
 - RAS
 - Systems Management Server Launch Support with Insight Manger
 - Asynchronous Management and Insight Agents for Asynchronous Management

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- Installation procedures for:
 - RAS and the RAS Phone Book
 - Insight Manager with Systems Management Server Launch Support
 - Insight Asynchronous Management with Insight Agents for Windows NT

Hardware and Software Requirements

The following tables provide the basic hardware and software requirements to install and configure Insight Manager and Insight Agents for Windows NT. As hardware and software components are added to your network these requirements might change. Refer to the documentation provided with the hardware and software before you begin your configuration.

Table 7-1 lists the requirements to install Insight Manager on a management PC:

Table 7-1 Hardware and Software Requirements to Install Insight Manager on a Management PC Running Windows NT	
Category	Minimum Requirements
Hardware	
Hard drive space	27 MB of reserved hard drive space (8 MB for programs and 19 MB for databases)
Network Interface Controller	Any NIC supported by Windows NT
Hayes-compatible modem	For asynchronous management, remote console, or alarm forwarding

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Software	
Protocol software	SNMP and TCP/IP protocol stack properly installed. Refer to the <i>Microsoft Windows NT TCP/IP</i> manual for more information.

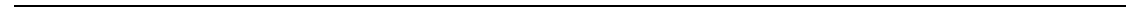


Table 7-2 lists the requirements to install Insight Agents on the server:

Table 7-2
Hardware and Software Requirements to Install
Insight Agents for Windows NT on a Compaq Server

Category	Minimum Requirements
Hardware	
System Processor	386-based processor, operating at 25 MHz
Memory	12 MB of RAM for Windows NT 16 MB of RAM for Windows NT Server
Hard Drive Space	More than one MB of reserved hard drive space
Software	
Operating System	Windows NT or Windows NT Server from Compaq
Drivers	Compaq Windows NT Software Support Diskette (SSD)

NOTE: Install the Windows NT SSD by running the Setup program located on the SSD. This diskette contains the Compaq specific drivers for Windows NT. See the SSD Readme file for further details on the SSD installation.

Preinstallation Requirements

The following sections discuss the preinstallation requirements for each software installation presented in this chapter. Reviewing these prerequisites before attempting to install the software will save you time and ease the installation process.



7-6 Configuring Insight Manager and Asynchronous Management with RAS

Windows NT RAS

The RAS installation provides you with the option of connecting to remote users with more than one transport protocol. If your remote server(s) or workstation(s) are functioning as Insight Manager stations, you have several protocol installation options.



Before installing RAS to support Insight Manager, Insight Agents, and Asynchronous Agents you must:

- Install and configure Windows NT Server with the protocols and services that meet your network requirements.
- Define RAS network connectivity requirements for users at your LAN/WAN remote site(s).
- Define your network management requirements before installing and configuring Insight Manager software for the server and management PC.
- Make the computer a remote access server, selecting one of the following a connectivity options.

The following simplified examples of PPP connectivity are provided to help you decide which option is right for your business environment. Refer to the your software documentation for a complete set of connectivity features.

- *Compaq Insight Manager Point-to-Point (PPP)* — The Insight Manager software includes a PPP transport mechanism. The remote user is provided with access to all virtual addresses assigned to the RAS server that provides them with a RAS connection. In other words, access is provided to a particular segment of the network. This type of connection might be established for a single purpose, such as allowing a remote management PC to monitor a network server after regular business hours.
- *Windows NT RAS Point-to-Point (PPP)* — The RAS software also includes a PPP transport mechanism. However, RAS PPP was designed to provide Windows NT computers remote access across the network. RAS PPP provides the remote user, if granted permission by the network administrator, access to all other servers, operating systems, printers, and devices on the network.

When a computer is configured with RAS PPP, it can dial into remote networks over any server that complies with the PPP standard, including servers using NetBEUI, IPX, and TCP/IP. This type of connection provides the remote user with internetwork connectivity. The remote user can function as a management PC, as well as access the network and other local workstations on the network.

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7-8 Configuring Insight Manager and Asynchronous Management with RAS

- Assign a dedicated pool of IP addresses, or let DHCP Services assign the addresses.
- Configure a DNS system on the network.
- Install the appropriate communication hardware on the server that will be providing access to the remote site(s). This can be either PSTN or X.25 network adapters.

The flexibility of the Internet PPP and IP protocol standards allows you to set up many different configurations for a combination of servers and management PCs running a variety of operating systems.

NOTE: Compaq has spent an extensive amount of time testing interoperability issues and has developed default values for many different environments. Compaq recommends using these default values and the instructions provided in this TechNote to minimize the complexity associated with this feature.

Systems Management Server with Compaq Insight Manager

The following section provides the basic requirements that you must consider if you want to add Systems Management Server support to your network platform. However, this TechNote does not include all the information necessary to integrate Systems Management Server with Insight Manager.

Refer to the Microsoft Systems Management Server documentation set provided with the Microsoft for Systems Management Server software. Compaq also recommends that you refer to *Integrating Compaq Insight Manager with Microsoft Systems Management Server* TechNote for more information on this subject.

1. Install and configure Microsoft Windows NT Server 3.5 or greater and SQL Server 4.2 or greater on the network. This includes planning which site will be the primary and secondary sites Systems Management Server. Refer to the documentation provided with the software for specific configuration information.

2. Install Insight Manager on a Systems Management Server central or primary site. Insight Manager will not integrate with a Systems Management Server secondary site.
3. Install and configure properly the TCP/IP protocol stack. This requires knowing the IP address of the Systems Management Server computer, the subnet mask, and the IP address of the default gateway.
4. Install and configure properly the SNMP Service. This requires configuring the password and trap destination for SNMP traps.
5. Install and configure properly the NWLink IPX/SPX Protocol Service if you are managing NetWare servers. This requires selecting the proper frame types to use and configuring an internal network number for the server.
6. Install Insight Agents for the appropriate operating system on each server being managed and be sure the agents are fully operational.
7. Specify the correct IPX or IP address of the Systems Management Server computer in the *TRAPTARG.CFG* file to receive SNMP TRAPS or alarms from all managed NetWare servers. The *TRAPTARG.CFG* file is located on all NetWare servers in the *SYS:SYSTEM/ETC* directory.

This allows Insight Manager in Windows NT to communicate with the NetWare servers. See the User's Guide for *Compaq Insight Agents for Windows NT* to configure trap destinations for other Insight Agents.

Asynchronous Management

This TechNote contains a worksheet to help you gather information during the installation and configuration process of Asynchronous Management. Having this information handy will ease the configuration process, regardless of the operating system. Before you begin, pull out the "Insight Asynchronous Management Worksheet" provided at the back of this TechNote. Then perform the following steps:

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- **Verify modems are working**

Verify the modems are dialing and answering correctly. Refer to the documentation that came with your modem for verification procedures.

- **Determine phone numbers**

You must assign a phone number to each server and management PC that you are configuring. Gather the phone numbers and enter them in the worksheet.

- **Determine security information**

Select the System ID/User Name and Password used on the management PC. This ID and password are for security authentication of dial-in connections to the server. The ID must be a valid Windows NT account with appropriate RAS authorization. The System ID/User Name and Password used on the management PC must match those used on the server.

- **Gather IP addresses**

You must assign a unique TCP/IP address to each server and management PC.

- Determine the IP addresses needed and enter them into the provided worksheet, for example: X.Y.1.1.
- The IP address associated with the Virtual Asynchronous Management interface and the IP address associated with the NIC must be on different network segments.

For example, if your NIC has an IP address of A.B.1.1 and the subnetwork mask is 255.255.0.0, then your Asynchronous Management interface must be on a network segment other than A.B.1.2 (where A.B represents the network segment).

Figure 7-1 illustrates using both Asynchronous IP address assignments and PPP Virtual Asynchronous addresses assignments with Insight Manager.

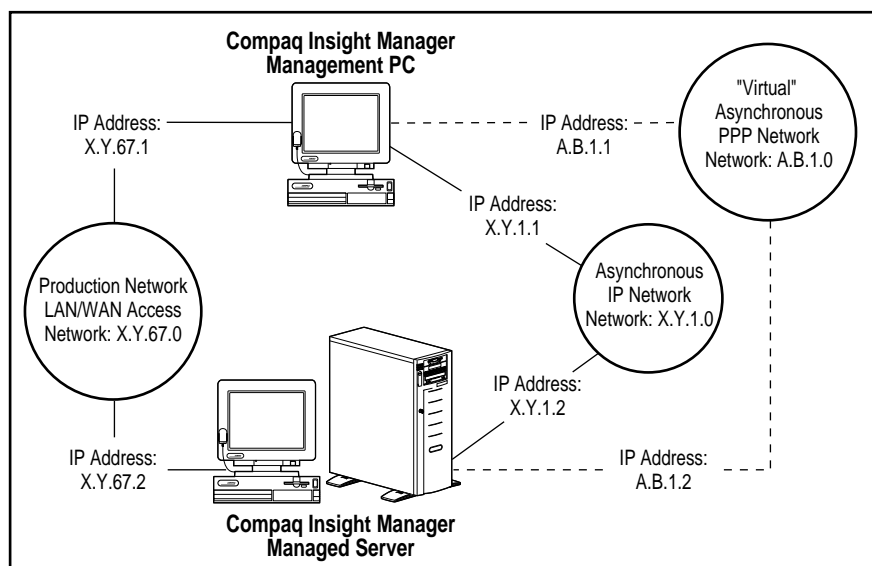


Figure 7-1. IP addressing of Asynchronous Management using Insight Manager

- ❑ The IP addresses you assign to the management PC and the server for Asynchronous Management must be on the same network segment.

For example, if your Asynchronous Management interface on the management PC has an address of X.Y.1.1 and the subnetwork mask is 255.255.0.0, then your Asynchronous Management interface on the server must have an IP address of X.Y.1.2 (where X.Y represents the network segment).

NOTE: If you configured your connection using Insight Manager PPP as the protocol, then the IP address used for Asynchronous Management is required only for the dial-in connection. This IP address does need to be consistent with addresses normally used by your organization.

- Verify that you have:
 - A licensed copy of the Insight Agents installed on each server that you want to manage.
 - The alert destinations, configured to the IP address of the management PC, for each managed server.
 - The community strings for each managed server.
 - The IP address for each managed IP server.

Insight Agents for Asynchronous Management

Before you can install and configure Insight Agents on a monitored server, you must have met the following preinstallation requirements.

- Installed all the TCP/IP software and configured the SNMP community name for trap destinations under Community Names. Enter the IP address of the Insight Manager workstation for trap destination to identify the community name. The community name must be the same on the server and the management station.
- Installed SNMP and TCP/IP on your server before you can install the Insight Agents. If you have just installed SNMP and TCP/IP on the computer, restart your server before trying to install the Insight Agents.

NOTE: If you install TCP/IP or SNMP support after you install the Insight Agents, you must reinstall the Insight Agents.

- Installed TCP/IP support for Windows NT

TCP/IP support is included in the base Windows NT product. You can install the TCP/IP protocol by selecting *Add Software* from the Network Control Panel screen. Refer to the Windows NT documentation for further instructions.

- Installed SNMP support for Windows NT

SNMP support is included in the base Windows NT product. You can install the SNMP service by selecting *Add Software* from the Network Control Panel menu screen. Refer to the Windows NT documentation for further instructions.

Insight Agents monitor the state of your servers by collecting server parameters and measuring those values for proper operational status. The Insight Agents use values called "thresholds," which set minimum, maximum, or specific values for a given server parameter.

As your server operates, the Insight Agents check the value of server parameters against their thresholds. If the parameter value of the server falls outside these thresholds, the Insight Agents generate an alarm that Insight Manager can display or forward to your pager.

Although some server parameters are predefined by Compaq, there are thresholds you can set. For example, you can set thresholds on the percentage of used space for a file system partition. If a file system exceeds that percentage, Insight Manager notifies you with an alarm. This type of monitoring supports proactive management of your servers. Refer to the *Compaq Insight Manager User Guide* for more information.

Installing Windows NT RAS

Configure Windows NT RAS on all Windows NT network servers and all remote workstations that will function as remote management PCs before you install Insight Manager and the Insight Agents.

NOTE: You must install the software on each server and client workstation that you want to run Insight Manager and the Insight Agents.

Perform the following procedures to install RAS and select TCP/IP as the transport protocol.

1. Open the Windows NT Control Panel and select the *Network* option.

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2. Select the *Add Software* option to display the *Add Network Software* screen.

3. Select *Remote Access Service* from the drop-down list then select *Continue*.
4. Enter the location of the Windows NT CD-ROM when prompted by Setup. If you installed from CD-ROM, the default location is entered for you; when the correct location is entered, select *Continue*.

The Remote Access Setup screen displays and RAS is installed.

Configuring Windows NT RAS for PPP and IP Connectivity

Perform the following procedures to add options and configure RAS.

1. Open the Control Panel application and select the *Network* option to configure RAS.
2. Select *Remote Access Service* from the list of installed Network Software, then select *Configure*.
3. Select a port entry from the list, then select *Configure*.

You can now specify and configure the modems that Insight Manager and RAS will use.

4. Specify the type of modem that you are using, if you have not already done so. You must configure the Port Usage section to *Dial out and receive calls*.

Remote Access Setup displays a message indicating that it will look for a modem or you have the option of selecting one from the drop-down list.

NOTE: If you are installing RAS to provide service to more than four ports, you must have a multi-port serial NIC installed in your server. For a complete list of these NICs, refer to *Microsoft Windows NT Hardware Compatibility List*.

5. From the Configure Port screen specify the type of port you are using, and select *Settings* or *Detect* to perform further port configuration.

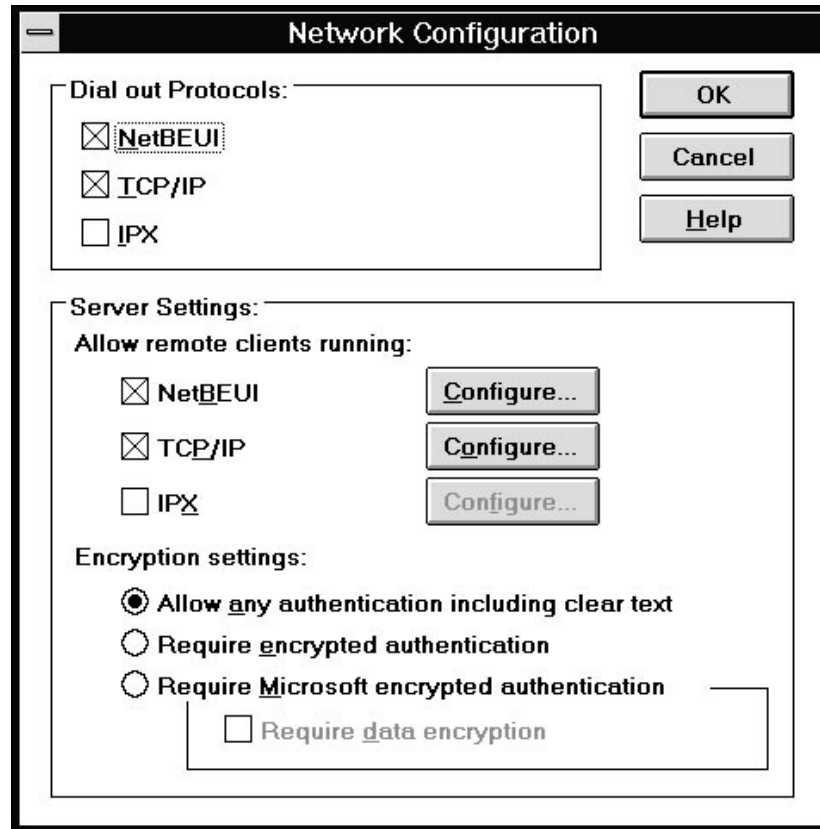


Figure 7-2. Configure the network protocols

6. Select *Network* to display the Network Configuration screen.
 - a. Select the *TCP/IP* protocol in the Dial Out Protocols section.
 - b. Select the *TCP/IP* protocol in the Server Settings section.
 - c. Change the Encryption Settings to *Allow any authentication including clear text*.

NOTE: If you do not need IPX for NetWare servers on your network, you can disable the IPX protocol.

- d. Select *Configure* next to the TCP/IP protocol option, then select *OK* to continue.

The RAS Server TCP/IP Configuration screen is displayed.

7. On the RAS Server TCP/IP Configuration screen, set the access rights for the entire network.

Figure 7-3. Configure TCP/IP for the network

8. Select one of the following options.
- If you have DHCP Services enabled, then select the following option:

- Use DHCP to assign remote TCP/IP client addresses

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- If you are not using DHCP Services and want to set up a static IP Address pool for RAS to use, then select the following option.

Use static address pool

NOTE: The address pool should consist of a Begin and End range of at least two addresses.

The Begin IP address specified is the IP address assigned to the PPP port. Configure this address as a trap destination address for all the servers that send remote alerts to this computer through Insight Asynchronous Management.

NOTE: The IP addresses that you enter will depend on whether your network is a Virtual Asynchronous Management PPP network or an Asynchronous Management IP network.

Refer to addresses that you entered as the *Asynchronous IP Address* and the *Second Asynchronous Address* in the Insight Agents Information section of the "Insight Asynchronous Management Worksheet."

9. Specify the following option to enable clients to request predetermined IP addresses:

Allow remote clients to request a predetermined IP address

10. Select *OK* when you have specified all your selections to exit TCP/IP Configuration. The RAS configuration is now complete.
11. Select *OK* to exit Network Configuration.
12. Select *Continue* to exit the Remote Access Setup screen.
13. Identify the location of the software, when prompted by the Windows NT Setup screen. Setup defaults to the directory where Windows NT is installed, then select *OK* to continue.
14. Select *OK* at the Network Setting screen. Setup will then configure the network with your selections.

15. Select *Don't Restart Now* when Setup requests a next action.

Granting RAS User Permissions

After RAS is installed the administrator must grant users permission to use RAS through the Remote Access Administrator utility.

1. Select the *Services* option in the Control Panel.
2. Select *Remote Access Server* from the list of installed Services.
3. Select *Startup* and change the *Startup Type* to Automatic if it is not already selected.
4. Select *OK* to exit the Service screen, then select *Close* to exit the Services Control Panel.
5. Select the *Remote Access Admin* application. This application resides in the Remote Access Service group.
6. Select *Users* → *Permissions* from the Main Menu. This displays the Remote Access Permissions screen.

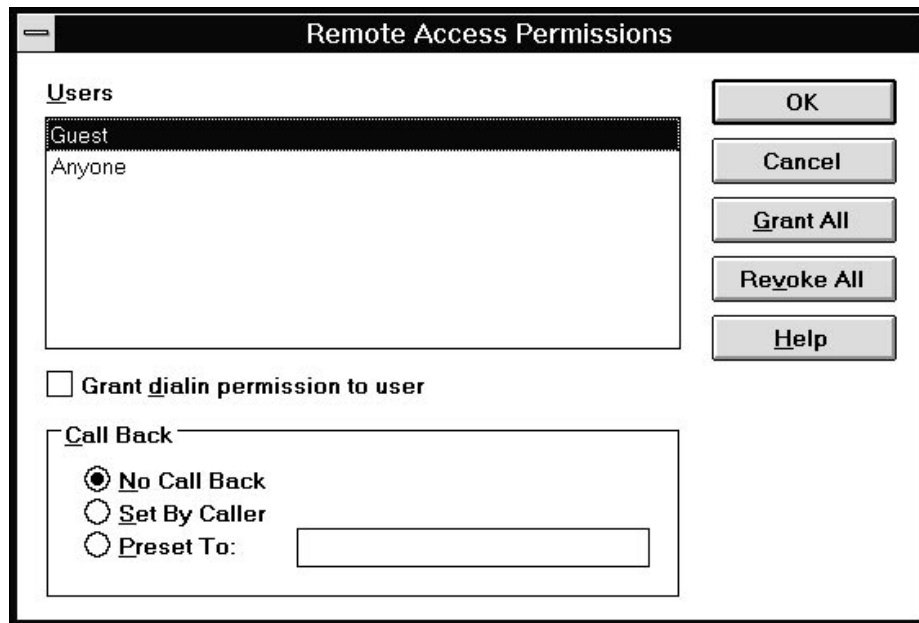


Figure 7-4. Setting up remote access permissions

7. Select the user account you want the management PC to use to connect to the server using Asynchronous Management.

Refer to the *System ID/User Name* in the Insight Agent Information section of the "Insight Asynchronous Management Worksheet."

8. Enable the following option:

Dialin Permission to User

9. Set the Call Back option to:

No Call Back

10. Select *OK* to close the window. Exit the Remote Access Admin application.
11. Shutdown and restart the computer by selecting *File* → *Shutdown* from Program Manager. RAS automatically starts each time you start the management PC.

Setting Up the RAS Phone Book

After you install RAS, you must create a phone book with the Remote Access application before you can use Insight Asynchronous Management. Insight Manager gets a list of servers that support Insight Asynchronous Management from this phone book.

1. Open the Remote Access application. This application resides in the Remote Access Service group or you can launch it from the Insight Manager button bar.

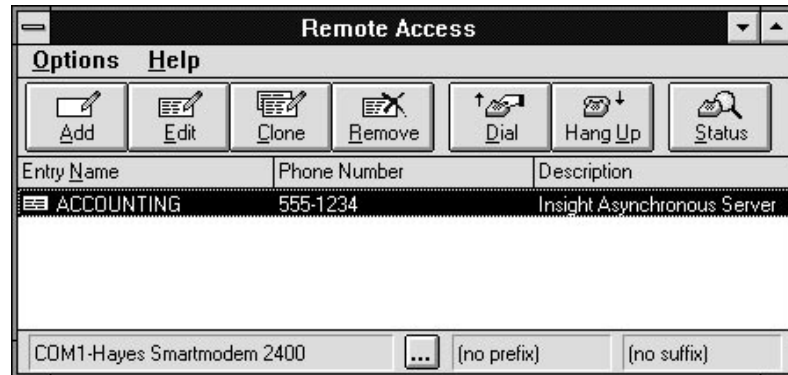


Figure 7-5. Remote Access Service screen

2. Enter a phone book entry if you have not already done so.
3. Select the *Add* button to create a new entry, if you already have entries in the phone book. The Edit Phone Book Entry screen displays.

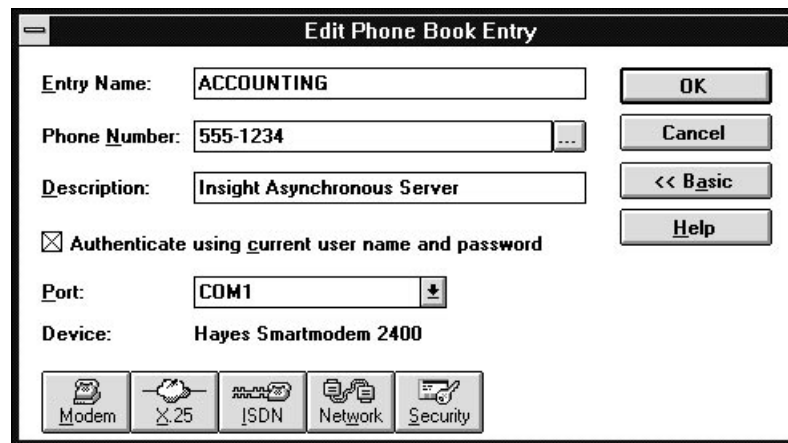


Figure 7-6. Editing the RAS Phone Book

4. Enter the server name in the Entry Name field; do not use any spaces. Spaces prevent Insight Manager from recognizing the server entry.

Refer to the *Server Name* in the Insight Agent information section of the "Insight Asynchronous Management Worksheet" for this value.

5. Enter the Phone Number that RAS will use to dial this server. You can also enter a descriptive name for this server.

Refer to the *Phone Number* in the Insight Agent information section of the "Insight Asynchronous Management Worksheet" for this value.
6. Ignore the *Authenticate using current user name and password* option. Insight Manager does not use this setting.
7. Select *Advanced >* to display the advanced options for Windows NT servers.
8. Select the *Network* icon. The Network Protocol Settings screen displays.

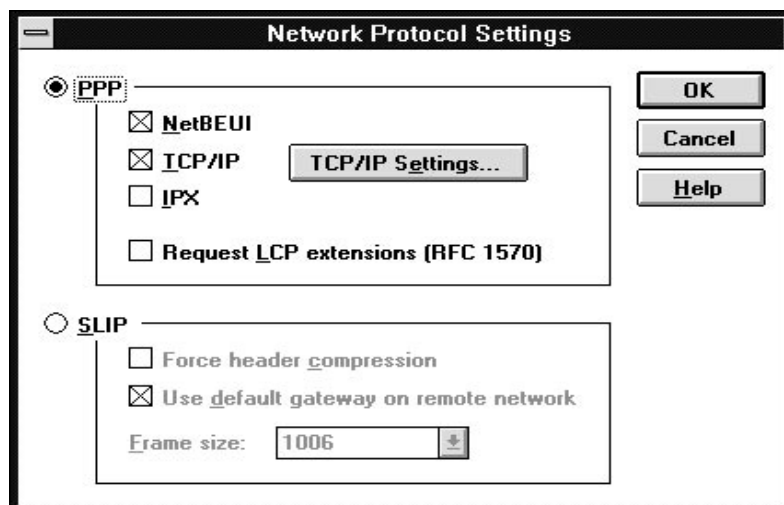


Figure 7-7. Selecting the network protocol settings for PPP

9. Enable the *PPP* option and the *TCP/IP* protocol.
10. Disable the *Request LCP extension (RFC 1570)* option.

11. Select *TCP/IP Settings...* The PPP TCP/IP Settings screen displays.

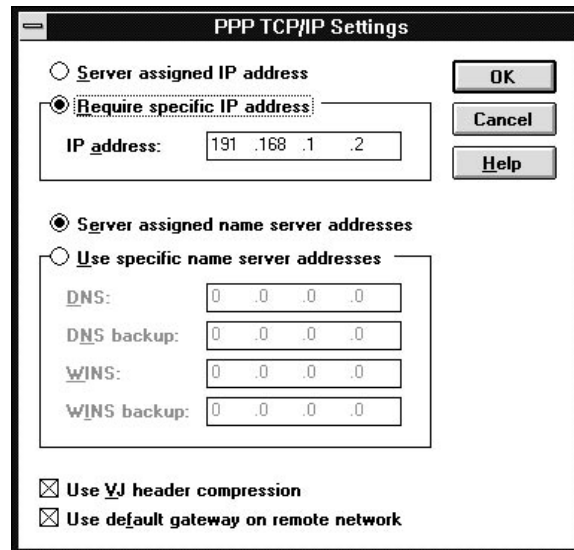


Figure 7-8. Configuring PPP and TCP/IP settings

12. Select the *Require specific IP address* option.
13. Enter an IP address.

NOTE: This IP address should be the same as the Begin address of the IP address pool that you specified on the "Insight Asynchronous Management Worksheet," specifically, the Asynchronous IP address in the management PC information section.
14. Enable the *Server assigned name server addresses* option.
15. Enable the *Use VJ header compression* option.
16. Enable the *Use default gateway on remote network* option.
17. Select *OK* to exit the PPP TCP/IP Settings screen.
18. Select *OK* to exit the Network Protocol Settings screen.

19. Select *Security*. The Security Settings screen displays.

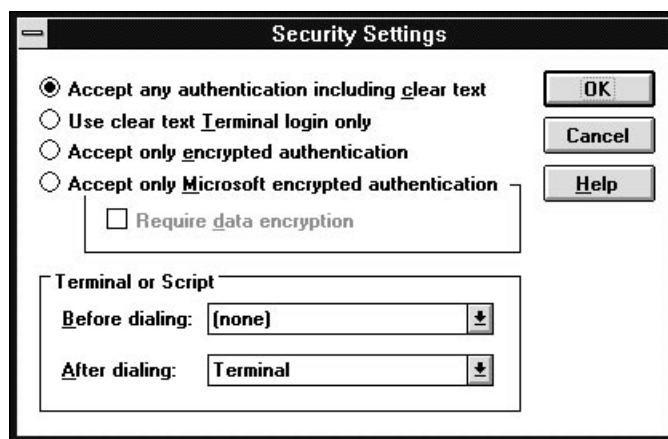


Figure 7-9. Configuring RAS Phone Book security settings

20. Enable the *Accept any authentication including clear text* option.

21. Select *OK* to exit the Security Settings screen.

22. Select *OK* to exit the Edit or Add Phone Book Entry screen.

Setting the Domain for a RAS Phone Book Entry

Before configuring Windows NT user accounts in a RAS Phone Book, it is necessary to specify the name of the domain in which each user account exists for Insight Manager. You can also specify the domain name in Insight Manager.

1. Open the Remote Access application.
2. Select the desired server entry and select *Edit*.
3. Disable the *Authenticate using current user name and password* option if a different name and password are required.
4. Select *OK* to close the dialog box.

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5. Select *Dial* with the desired server entry still selected.

6. Enter the following information:

User Name
Password
Domain

7. Enter the desired domain name and a user name. Select *OK* to continue.
8. Select *Cancel* when the Connect to Server dialog box displays.

The domain is now included in the RAS Phone Book. You can continue entering more server user information or exit the RAS application.

Installing Insight Manager

Perform the following steps to Install Insight Manager. The sections that follow provide instructions to install support for additional features, such as Systems Management Server and Asynchronous Management for Windows NT 3.5 or greater.

IMPORTANT: Perform the steps in the "Installing Windows NT RAS" section of this chapter to install and configure RAS and the RAS Phone Book before performing these procedures. If you reinstall RAS, you must also reinstall Insight Manager.

1. Logon to Windows NT at the management PC.
2. Place the SmartStart CD into the CD-ROM drive or the Insight Manager Diskette #1 into the diskette drive.
3. Select *Run* from the Program Manager File menu.
4. Type [cd drive]:\CIM\INSTALL\SETUP or [diskette drive]:\SETUP and select *OK*. After a few seconds of initialization, a registration window displays.
5. Fill in the registration information and select *Continue*.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

6. Confirm the registration information, by selecting *OK* on the confirmation window.

Select *Retry* to change the registration information.

7. Select *OK* to continue with the installation and upgrade your previous version, or *Cancel* to quit the installation, exit, and preserve your old version before installing this version.
8. Select any combination of installation options and tailor the installation to your needs. By default, the first option is enabled. You can choose any combination of installation options and tailor the installation to your needs.

Setup displays the following installation options.

- | |
|---|
| <ul style="list-style-type: none"><input type="checkbox"/> Install Compaq Insight Manager 2.xx<input type="checkbox"/> Install Systems Management Server Launch Support<input type="checkbox"/> Install Asynchronous Management Windows NT 3.51 |
|---|

If you want to install:

- Compaq Insight Manager — the previous version of the software will be upgraded.

NOTE: If you have a previous version of Insight Manager installed, you are prompted that the old version exists and it will be inaccessible if you continue.

- Systems Management Server Launch Support — you must have Microsoft SQL Server 4.21 installed on your server.

NOTE: Microsoft SQL Server 4.21 is not covered in this TechNote, refer to the Microsoft Systems Management Server documentation set and the *Integrating Compaq Insight Manager with Microsoft Systems Management Server* TechNote for complete installation and configuration information.

- ❑ Asynchronous Management for Windows NT 3.5 or greater — to connect to a remote management PC with RAS over a modem.

NOTE: You must have RAS already installed to complete this step. If you have not installed Windows NT RAS, do not check this box. Continue with the Setup process, install RAS, then return to Setup and select the box to install Asynchronous Management.

10. Select *OK* to continue.
11. A screen displays and prompts you for the directory where you want to install Insight Manager 2.50. Enter the information and select *OK* to continue.

Systems Management Server Launch Support

NOTE: If you selected Install Systems Management Server Launch Support, continue with the procedures in this section. Otherwise, skip to the next section.

The steps described in this section only cover installing Systems Management Server Launch Support as part of the Insight Manager installation process. If you plan to include Systems Management Server as part of your installation, be sure to refer to *the Microsoft Systems Management Server Administrator's Guide* and *Integration Compaq Insight Manager with Systems Management Server TechNote*.

During the installation of Systems Management Server support, Setup:

- Copies the appropriate Systems Management Server specific files to your Systems Management Server Administrator console directory:

```
ADDCIM.SQL
DELCIM.SQL
CIM_SMS.DLL
```

.....

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- Invokes the *ISQL.EXE* utility with the *ADDCIM.SQL* script, adding the Insight Manager entry to the Systems Management Server database.

IMPORTANT: You must install Insight Manager with Systems Management Server Launch Support on your Primary Site server before you can install Insight Manager onto other Systems Management Server Administrator consoles.

Setup assumes that the installation is occurring on the Systems Management Server Primary Site server and that Microsoft SQL Server Tools have been installed.

NOTE: If this is not the case, the files are copied but the Insight Manager entry is not added to the Systems Management Server database.

Installing Systems Management Server Launch Support

At this point, you can begin installing Insight Manager with Systems Management Server Launch Support. Setup prompts you for the location of the Systems Management Server executable files (for example *SMS.EXE*), usually located in the C:\SMS\SITE.SRV\X86.BIN directory.

1. Enter the path of the executable files and select *OK* to continue, or *Cancel* to abort the Systems Management Server installation.
2. Enter the following Systems Management Server information when prompted:
 - Administrative account name
 - Administrative account password

Select *OK* to continue. The Compaq Insight Manager screen is displayed.

IMPORTANT: Do not confuse the administrative account name and password for the Systems Management Server database with the administrative account/password for the Windows NT administrator.

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NOTE: Selecting *Cancel* will abort the Systems Management Server installation.

3. Enter the required Insight Manager information. Select *OK* to continue.

NOTE: Setup copies two files (*ADDCIM.SQL* and *DELCIM.SQL*) to your Systems Management Server directory and invokes the **ISQL** utility to insert Insight Manager launch information into the Systems Management Server database. In the future, if you need to uninstall Insight Manager from Systems Management Server, use the *DELCIM.SQL* query script with the **ISQL** utility. This removes the Insight Manager information from Systems Management Server.

4. Write down any instructions given on the Compaq Insight Manager screen so that you can follow them after Setup is completed.
5. Select *OK* to continue.

Updating the Windows NT PATH Variable

To update the PATH variable in Windows NT, follow these steps:

1. Select *Control Panel* from the Windows NT Main screen. The Control Panel screen is displayed.
2. Select the *System* icon from the Control Panel screen. The System screen is displayed.
3. Select the line beginning with *Path=* from the System Environment Variable section of the System screen.
4. Select the text in the Variable box and press the *End* key.
5. Type a semicolon (;) followed by the full path for Insight Manager and select the *Set* button on the System screen.

;C:\WINNT34\IDW;C:\CIM25
6. Select *OK* on the System screen. The Control Panel is displayed.
7. Close the Control Panel.

The path is now set for the current version of Insight Manager.

NOTE: You must restart the management PC before running Insight Manager for the first time.

If you have a *HOSTS* file, see the following section for procedures on how to have Insight Manger use a *HOSTS* file.

Setting Up Insight Manager to Use a *HOSTS* File

To setup Insight Manager to use a *HOSTS* file, follow these steps:

1. Restart the management PC before running Insight Manager.
2. Start Insight Manager.
3. Select *Server List* from the Setup menu. The Server List Setup screen is displayed.
4. Select the *IP Server List* button when displayed. The Server List screen is displayed.
5. Select the *Update from HOSTS File* button from the Update List from *HOSTS* File screen. Insight Manager prompts you for a path and name for the *HOSTS* file.
6. Enter the path and name for the *HOSTS* file and select *OK*. The IP Server List is updated with servers in the *HOSTS* file.

The installation is complete. Refer to *Integrating Compaq Insight Manager with Microsoft Systems Management Server* TechNote for instructions on using these applications together.

Installing Insight Asynchronous Management

The following section describes the steps necessary to install Insight Asynchronous Management software. In the sections that follow instructions to install support features are provided, such as selecting alarms from Windows NT and setting up modems.

IMPORTANT: Perform the steps in "Installing Windows NT RAS" section of this chapter. You must install and configure RAS and the RAS Phone Book before you can perform these procedures. If you reinstall RAS, you must also reinstall Insight Manager.

Adding an Insight Asynchronous Management Server

The following procedure describes how to add an Insight Asynchronous Management server to the Responsible Server List.

1. Start Insight Manager.
2. Select *Setup* → *Server List* from the menu bar.
3. Select *PPP Server List* from the Server List Setup dialog box. The PPP Server List dialog box shows a list of all servers that are entered in the RAS Phone Book. Refer to "Setting Up the RAS Phone Book" described earlier in this chapter.
4. Select *Login Options*. In the PPP Login Options for Windows NT dialog box, you can set up the Login Name and optional Password used to authenticate the Insight Asynchronous Management connection.

NOTE: Manually enter the Login Name and Password or deselect the check box labeled *Use Current NT User Name and Password*.

5. Select *OK* to close the dialog and keep the entries.

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6. Select one or more servers from the list box to add Insight Asynchronous Management server(s) to the list. All selected servers are added to the Responsible Server List. The selected servers are added and the Server List Setup screen is displayed.
7. Select *OK* to close the dialog box.

Refer to the *Compaq Insight Management Agents for Microsoft Windows NT User Guide* to set up the servers to send traps via Asynchronous Management to the management PC.

Accepting Alarms from Windows NT Servers

Once you have added the server(s) to the Responsible Server List, you can perform the following procedures.

IMPORTANT: The servers must be added to the Responsible Server List, before you can continue. Perform the steps in, "Asynchronous Management Server Setup" section, if you have not already done so.

Perform the following steps to enable your server(s) to accept alarms from Windows NT.

1. Add the server to the IP Server List as described in the *Compaq Insight Manager User Guide*, under "Modifying the IP Server List."
2. Select an IP address based on the network type:
 - Virtual Asynchronous Management PPP networks
Use the IP address of the NIC on the server. If the server has more than one NIC, use the adapter to which the IP address is bound first. You can determine this on the server by selecting the *Network* option from the Control Panel and configuring the TCP/IP protocol.
 - Asynchronous Management IP networks

Use the second address reserved in the IP Pool, this address should be consistent with other addresses on the network. If you are using DHCP Services, refer to the reserved address that you entered on the "Insight Asynchronous Management Worksheet."

3. Select *Server Setup* from the Task List.
4. Enable *PPP* or *IP* as the Network Transport Protocol and select *OK*.

Configuring Insight Agents for Asynchronous Management

Before you can configure Insight Asynchronous Management support for Insight Agents, you must have:

- Installed and configured the RAS on the Windows NT server console
- Installed Insight Agents on the Windows NT server

Refer to the *Compaq Insight Management Agents Windows NT User Guide* for the installation procedure.

Selecting a Modem for the Insight Agents

NOTE: Compaq recommends that both the server and management PC use the same type of modem (model number and manufacturer).

1. Start the Compaq Insight Management Agents Control Panel. Select *Advanced*.
2. Select *Enable Asynchronous Management Traps*.
3. Fill in the information for the remote Management PC.

This information includes the phone number plus a user name and password to use when connecting. You have the option to configure the name of the domain on which the user account exists and the number of retries that should occur if the line is busy.

Refer to *Phone Number*, *System ID/User Name*, and *Password* in the Management PC Information section of the "Insight Asynchronous Management Worksheet."

4. Exit the application when complete.
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Chapter 8

Compaq Integration Test Configurations

Compaq planned, implemented, and tested two configurations to produce this TechNote. Earlier chapters in this TechNote provide the planning, installation and configuration background information for these test configurations. These configurations demonstrate how Compaq servers with built-in manageability easily integrate with Windows NT Server to provide a scalable, robust combination of hardware and software to handle mission-critical business needs.

The Compaq integration configurations provide examples of several LAN and LAN/WAN network configurations in a Windows NT connected environment. Compaq integration engineers configured and tested two networking solutions in the Integration Lab. Some or all the characteristics of the test configurations presented in this TechNote might be similar to your networking environment.

The network configurations include:

- Windows NT Server 3.5 and greater as the operating system with networking services such as RAS, DHCP, and WINS running on Compaq servers and client workstations.
- Cisco System routers providing internetwork connectivity across LAN segments via industry-standard transport protocols such as TCP/IP, SNMP, and IPX.
- Built-in Full-Spectrum Fault Management capabilities on every ProLiant server providing exceptional server availability. Insight Manager, Insight Agents, and Insight MIBs provide dependable network management tools.

This chapter provides descriptions and illustrations of the tested configurations. It also includes planning and implementation considerations, and installation and configuration information applicable to the types of configurations that Compaq tested.

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Both of the networks configured for this TechNote include connecting to remote environments. However, the networks differed in size and operating system mix.

The two Integration Lab configurations are as follows:

- A Windows NT Server LAN network connected in a multi-operating system environment with Novell NetWare and SCO UNIX servers
- A Windows NT Server LAN and WAN networking environment with remote PSTN and X.25 connectivity

X.25 and PSTN Connectivity

The Compaq test configurations included connectivity provided via the X.25 transport protocol and dial-in access via Public Switch Telephone Network (PSTN) from remote sites.

- X.25 communication — the protocol used on most of the public data networks. The data is put into packets and routed between two X.25 (Packet Assembler/Disassembler) PADs. X.25 transports data regardless of the content or structure of the data in the packet. This transport protocol is widely used because it can encapsulate other protocols allowing different systems to use the same connection.
- PSTN communication — refers to the access provided over a public switch telephone line.

Routing Technology and Equipment

This section describes Cisco router equipment and how Compaq Integration engineers used these routers in the Integration Lab test configurations. The Cisco routers met the LAN and WAN connectivity requirements of the integration test configurations. A feature description of the Cisco 2500 and Cisco 7000 series follows. Cisco is a world-wide company with locations around the world.

If you would like more information about Cisco Routers, you can write to them at their corporate headquarters or call:

Cisco Systems, Inc.	Tel: (415) 326-1941
P.O. Box 3075	Tel: (800) 553-6387
1525 O'Brien Drive	Fax: (415) 326-1989
Menlo Park, CA 94026	

Cisco 2500 Router

The Cisco 2500 router series (Model 2502) illustrated in Figure 8-2 provides economical internetwork connectivity to small businesses, such as commercial retail establishments or regional sales offices. The Cisco 2500 series also provides software imaging tailored to meet the needs of small business applications. The Model 2502 comes standard with one Token Ring and two serial interfaces.

Cisco 7000 Router

The Cisco 7000 router also illustrated in Figure 8-2 is a member of the Cisco modular router family. Cisco modular routers provide the ability to customize your system with a choice of interface controllers. This high-end router provides the following functionality:

- The option of using serial, Ethernet, Token Ring, High Speed Serial Interface, or a Fiber Distributed Data Interface (FDDI) network interface controller.
- Network interfaces residing on modular interface processors, which provide a direct connection between the high-speed Cisco Extended Bus and the external network.
- Five slots available for modular interface processors.

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8-4 Compaq Integration Test Configurations

- Online insertion and removal to allow you to add, replace, or remove Cisco Extended Bus Interface Processors with minimum interruption to the network.
- Standard flash memory.

The Cisco 7000 router is configured in the Compaq Integration Lab with three six-port Ethernet (AUI) 10 Mbps controller boards and one serial interface controller.

Multi-Operating System Test Environment

The following section describes a small to medium size Windows NT Server 3.5 or greater network on a single 10BaseT LAN segment with two regional office dial-up connections, using Windows NT RAS and PPP.

This network configuration demonstrates:

- A multiple trust model with two servers, both functioning as account domains, allowing logon without establishing a remote connection.
- Connectivity to a NetWare file server via Gateway Service for NetWare.
- Connectivity to a SCO UNIX server via the Windows NT built-in TCP/IP protocols to provide network support for existing UNIX applications.

Along with the network servers, this LAN is supported by two Insight Manager workstations. A local management PC on the network and a remote management PC running Windows 3.1 with the ability to dial-in and receive alerts through the Insight Manager PPP software interface. The remote workstation provides off-site support to the network administrator away from the home office.

In this test configuration, illustrated in Figure 8-1, Accounting-S1 and Engineering-S1 are Windows NT Server 3.5 or greater servers. Accounting-S2 is a NetWare file server providing file and print services transparent to the Windows NT servers and clients on the network. Engineering-S2 is a SCO UNIX server executing UNIX programs and utilities via a Telnet hookup. Sales-S1 is a PDC at a regional office location that accesses the home office through a PPP and RAS dial-up connection.

Figure 8-1 illustrates this test configuration.

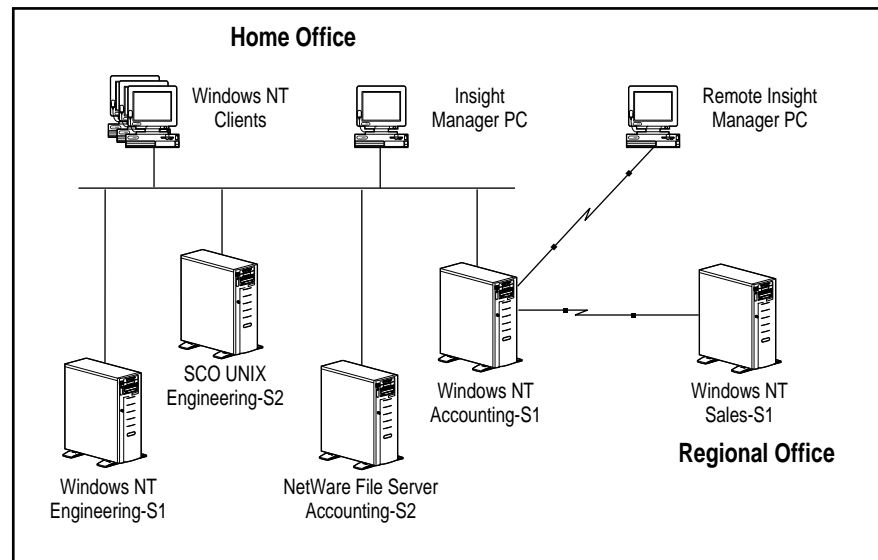


Figure 8-1. Small to medium mixed network operating system environment

Compaq Servers in a Multi-Operating System Environment

Table 8-1 provides a list of the servers and a server description of each Compaq server provided in the test configuration.

Table 8-1
Multi-Operating System Test Configuration

Name Location, and Server Model	OS, Protocols, and Services	Purpose
Accounting-S1 (Home Office) ProLiant 2000	Windows NT Server 3.5 or greater TCP/IP, WINS, DHCP, and DNS	This is the designated PDC. It shares a two-way trust relationship with another PDC, Sales-S1, in the regional sales office.
Accounting-S2 ProLiant 1000	NetWare 3.12 file server	Configured to provide transparent file and print services to Windows NT servers and workstations on the network.
Engineering-S1 ProLiant 1000	Windows NT Server 3.5 or greater, TCP/IP, and DNS	Configured as a BDC with an Insight Manager station.
Engineering-S2 ProLiant 1000	SCO UNIX server	Configured to provide program execution and file handling via Telnet sessions to the Windows NT servers and workstations on the network.
Sales-S1 (Regional Sales Office) ProLiant 1000	Windows NT Server 3.5 or greater, TCP/IP, and DNS	Configured to have a two-way trust relationship with Accounting-S1.

The following sections describe each LAN segment, each LAN's function in the network, and the relationship of each segment to the other segments.

Accounting-S1 Configuration (ProLiant 2000)

This section identifies the hardware components configured on Accounting-S1, a ProLiant 2000 server, and provides a discussion about the role of the server in the network.

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Five 1.05-gigabyte hot-plug drives (internal)
- ❑ Two Pentium 66-MHz system processor boards
- ❑ NetFlex-2 ENET-TR Controller
- ❑ 64 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

The Accounting-S1 LAN configuration provides services to other LANs in the home office and at the regional sales office, as well as to the Accounting users. During the initial network installation, Accounting-S1 was assigned an IP address along with the Cisco routers that provide connectivity between LAN segments. This server was selected to administer DHCP and WINS services and provide RAS and PPP connectivity to the network. This Accounting-S1 is the designated primary domain controller (PDC).

Accounting S-1 provides TCP/IP support to the other servers on the network through the DHCP and WINS services. DHCP assigns IP addresses, defines parameters for reserved clients, and automatically reconfigures TCP/IP when client computers move between segments. The WINS service maintains a database of computer names mapped to the IP addresses, allowing users to easily communicate with other computers on the network. The DHCP and WINS features of Windows NT automate the IP addressing requirements of TCP/IP support.

By adding the RAS feature of Windows NT, the domain server establishes a dial-in and dial-out connection to a regional office location. RAS allows a single network server to provide transparent network access to remote users. This connectivity enables an Insight Manager remote management PC to receive server status. RAS also provides multi-protocol routing on the test network via PPP support.

Chapter 6, "Configuring the Network with DHCP and WINS" includes installation and configuration information for the protocols and services described in this network configuration.

Accounting-S2 Configuration (ProLiant 1000)

This section identifies the hardware components configured on Accounting-S2, a ProLiant 1000 server, and discusses the role of the server in the network. This is a NetWare 3.12 server, configured to provide file and print services for the other servers and clients on the network.

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05-gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

Windows NT Gateway Service for NetWare provides transparent communication to the Windows NT users. Windows NT users can access applications specifically designed to run on NetWare without logging into another network. The network administrator needs only to maintain one database on the Windows NT Server domain controller. Gateway Service for NetWare not only provides a Windows NT Server computer with access to file and print services, but also share resources with Windows-based networking clients that do not have NetWare connectivity software.

For a complete description of setting up the connectivity or gateway software, see the Microsoft Users Guide for *Client and Gateway Service for NetWare*.

Users on Windows NT networks can view all available network resources through a process called browsing. The Windows NT browser system maintains a list of all the domains and servers available on a network when domains span more than one segment. Servers announce themselves to the master browser and the users can see these resources by using programs such as File Manager when the *Connect Network Drive* dialog box is displayed.

Engineering-S1 Configuration (ProLiant 1000)

This section identifies the hardware components configured on Engineering-S1, a ProLiant 1000 server and describes the role of the server in the network. This is a Windows NT Server 3.5 or greater, configured as a Backup Domain Controller (BDC).

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05 Gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

This server is a BDC configured to run in an IP environment. The IP address for this server was allocated by DHCP and set up on Accounting-S1. An Insight Manager management PC is located on the Engineering segment of the network. In addition, Engineering-S1 has RAS enabled for reporting to and receiving calls from an Insight Manager management PC running under Windows 3.1. The same capabilities are demonstrated using a Windows NT workstation with the Insight Manager software installed.

Engineering-S2 Configuration (ProLiant 1000)

This section identifies the hardware components configured on Engineering-S2, a ProLiant 1000 server, and discusses the role of the server in the network. Windows NT Server TCP/IP connectivity allows the network administrator access to the UNIX server and clients. In this configuration, the UNIX LAN can provide program execution and file handling to the Windows NT server and workstations on the network.

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05-gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

Windows NT Terminal accessories include a TCP/IP Telnet utility. Telnet provides Windows NT clients with character-oriented terminal access to UNIX computers via TCP/IP. Windows NT supports character and graphic terminal emulation, advanced file transfer and data emulation, distributed processing support, and application portability with UNIX systems.

Sales-S1 Configuration (ProLiant 1000)

This section identifies the hardware components configured on Sales-S1, a ProLiant 1000 server, and discusses the role of the server in the network. This Windows NT server is located in a regional sales office. Sales-S1 is configured to have a two-way trust relationship with the domain controller Accounting-S1.

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05-gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

This server is not dependent on the home office server for its IP address. Sales-S1 is configured for one remote connection using the PPP protocol in RAS and is set to reestablish connection if that connection is lost. This configuration option is turned off when the regional sales office is closed to allow the dial-up communication hardware and software of Insight Manager to send alerts during off-hour conditions. Sales-S1 is also configured as a DHCP and WINS server and as a RAS server with one remote dial-in and dial-out connection. The remote Insight Manager management PC could also use the communications hardware and software to perform maintenance while the offices are closed.

The home office clients used LAN Manager 3.0 software configured for TCP/IP protocol and could access Sales-S1 when connection to Accounting-S1 is active since a trust relationship is established between the servers. This is an example of a Complete Trust model. Accounting-S1 and Sales-S1 must act as account domains to allow logon without the remote connection established.

LAN/WAN Test Environment Using Remote X.25 and PSTN

Compaq configured a medium to large Windows NT Server 3.5 or greater network implementation using both X.25 and PSTN technology to provide remote WAN connectivity. This network comprises four Windows NT servers in a Multiple-Master Domain model. Since there were two geographical locations, each location is configured with a PDC and a two-way trust relationship exists between them.

In this test environment three of the servers, Accounting-S1, Engineering-S1, and Marketing-S1 are connected to Ethernet LAN segments and Sales-S1 is connected on a Token Ring LAN segment. Accounting-S1 is the designated PDC, sharing a trust relationship with Sales-S1, the PDC on the remote WAN network. The trust relationship allows both the home office and the regional office administrators to maintain user and group account databases. Only one copy of each user account is needed in the domain where each PDC is geographically located. This network configuration is illustrated in Figure 8-2.

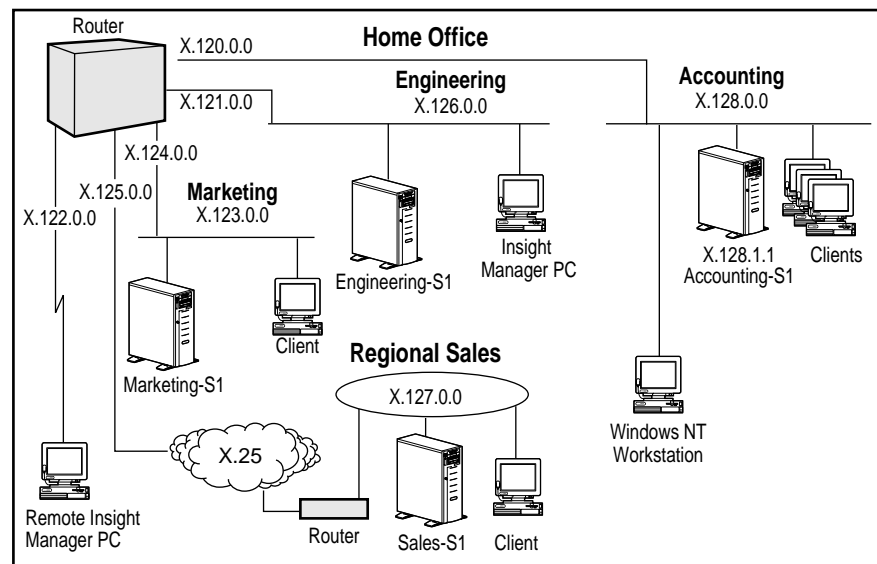


Figure 8-2. Windows NT Server network with remote X.25 and PSTN WAN connectivity

Compaq Servers in the LAN/WAN Network

Table 8-2 provides a list of the servers along with a service description of each Compaq server provided in the test configuration.

Table 8-2
Compaq Servers in a Windows NT LAN/WAN Network
Test Configuration

Name, Location, and Server Model	OS, Protocols and Services	Purpose
Accounting-S1 (Home Office) ProLiant 2000	Windows NT Server 3.5 or greater TCP/IP, WINS, DHCP, and DNS	This is the designated PDC. It shares a two-way trust relationship with another PDC, Sales-S1, in the regional sales office.
Engineering-S1 ProLiant 1000	Windows NT Server 3.5 or greater, TCP/IP, and DNS	Configured as a BDC with an Insight Manager station.
Marketing-S1 ProLiant 1000	Windows NT Server 3.5 or greater, TCP/IP, and DNS	Configured as BDC.
Sales-S1 (Regional Sales Office) ProLiant 1000	Windows NT Server 3.5 or greater, TCP/IP, and DNS	This is the designated PDC, Sales-S1 is configured to have a two-way trust relationship with Accounting-S1.

The following sections describe each LAN segment, the function of each LAN in the network, and the relationship of each segment to the other segments.

Accounting-S1 Configuration (ProLiant 2000)

The following section identifies the hardware components configured on Accounting-S1, a ProLiant 2000 server. It also discusses the services that Accounting-S1 provides to the accounting users in the LAN, the other LANs in the home office, as well as the server and clients at the regional sales office.

During the initial network installation, Accounting-S1 was assigned an IP address along with the Cisco routers that provide connectivity between LAN segments. Accounting-S1 is designated to administer DHCP and WINS services and provide RAS and PPP connectivity to the network. The Accounting-S1 LAN is the designated PDC.

The installed hardware components include:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Five 1.05-gigabyte hot-plug drives (internal)
- ❑ Two Pentium 66-MHz system processor boards
- ❑ NetFlex-2 ENET-TR Controller
- ❑ 64 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

This server provides TCP/IP support to the other servers on the network through the DHCP and WINS services. DHCP assigns IP addresses, defines parameters for reserved clients, and automatically reconfigures TCP/IP when client computers move between subnets. The WINS service maintains a database of computer names mapped to the IP addresses, allowing users to easily communicate with other computers on the network. The DHCP and WINS features of Windows NT automate the IP addressing requirements of TCP/IP support.

By adding the RAS feature of Windows NT, the domain server established a PSTN dial-in and dial-out connection to a regional office location. RAS allows a single network server to provide transparent network access to remote users. This connectivity enables an Insight Manager remote management PC to receive server status. RAS also provides multi-protocol routing on the test network via PPP support.

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

Marketing-S1 Configuration (ProLiant 1000)

The following section identifies the hardware components configured on Marketing-S1, a ProLiant 1000 server running Windows NT Server 3.5 or greater, and configured as a BDC.

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05-gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

This server is configured to run in an IP environment. The IP address of the server is allocated by the DHCP Services set up on Accounting-S1.

Since this server is a member of the home office domain, the user accounts and permissions are maintained in one database on the PDC. User access to the regional office is also controlled at this location. Users from the Trusted Domain in the home office are given rights and permissions to the Sales-S1 server, just as if they were members of the Trusting Domain in the regional office. Since this is a two-way trust, users in the regional office have permissions and rights to the home office even though their accounts are on the remote server. Windows NT 3.5 or greater uses *Pass-through Authentication* to allow users to logon to remote servers when the local server cannot authenticate the user account itself. Since the regional sales office is a PDC, users at that office can still have access to local services if the communication link is broken.

Users on Windows NT networks can view all available network resources through a process called browsing. The Windows NT browser system maintains a list of all the domains and servers available on a network when domains span more than one segment. Servers announce themselves to the master browser and the users can see these resources by using programs such as File Manager when the *Connect Network Drive* dialog box is displayed.

Engineering-S1 Configuration (ProLiant 1000)

The following section identifies the hardware components configured on Engineering-S1, a ProLiant 1000 server running Windows NT Server 3.5 or greater, and configured as a BDC.

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05 Gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

This server is configured to run in an IP environment. The IP address for this server was allocated by DHCP Services on Accounting-S1.

Sales-S1 Configuration (ProLiant 1000)

The following section identifies the hardware components configured on Sales-S1, a ProLiant 1000 server. Sales-S1 is also configured as a PDC in a two-way trust relationship with Accounting-S1. This is the only Token Ring segment in the network and it comprises the following components:

- ❑ Compaq SMART SCSI Array Controller
- ❑ Three 1.05 Gigabyte hot-pluggable drives
- ❑ One 486/66-MHz system processor board
- ❑ NetFlex-2 ENET Controller
- ❑ 32 Megabytes of RAM
- ❑ CD-ROM drive
- ❑ 3.5-inch diskette drive

The regional sales office had the IP addresses for the server assigned in case the WAN connection is disrupted. It is also possible for the DHCP server to assign these addresses over the WAN connection.

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8-18 *Compaq Integration Test Configurations*

An Insight Manager management PC is located on the Engineering segment of the network. In addition, Accounting-S1 had RAS enabled for reporting to and receiving calls from an Insight Manager management PC running under Windows 3.1. The same capabilities are demonstrated using a Windows NT workstation with the Insight Manager software installed.

In Summary

Compaq provided these examples of Compaq and Microsoft integrated network configurations to assist you in planning and implementing your networking needs. These configurations are presented as examples of networking solutions, and are not the only possible solutions. After you review the requirements of your installation you can determine the solution that best meet your business requirements.

Appendix A

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.

You can obtain a copy of a particular TechNote in electronic format by:

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Current TechNotes

Table A-1 lists the current TechNotes available online and in print.

**Table A-1
Compaq TechNotes**

TechNote Name	Available on SmartStart	Part Number
<i>Compaq Insight Management</i>		
Integrating Compaq Insight Management with Enterprise Management Platforms (8/95)	√	145806-003
Integrating Compaq Insight Management with Microsoft Systems Management Server (8/95)	√	184720-001
Integrating Compaq Insight Management 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

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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A-4 *Multivendor Integration from Compaq*

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 (11/94)	√	181152-001

continued

Compaq TechNotes *continued*

TechNote Name	Available on SmartStart	Part Number
NetWare (continued)		
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
Microsoft		
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 (7/94)		184207-001
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 RAS, DHCP, and WINS on Compaq Servers

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A-6 *Multivendor Integration from Compaq*

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers (8/95)	184488- 001
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continued

Compaq TechNotes *continued*

TechNote Name	Available on SmartStart	Part Number
UNIX		
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
IBM		

Implementing Microsoft Windows NT Server RAS, DHCP, and WINS on Compaq Servers

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A-8 *Multivendor Integration from Compaq*

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. <i>See also</i> Trap.
Alarm Log	List of all the alarms received at this workstation. If the Alarm Log is full and another alarm occurs, Compaq Insight Manager adds the latest alarm to the Alarm Log and deletes the oldest entry from the list.
American National Standards Institute (ANSI)	An organization that acts as the national clearing house and coordinator for voluntary standards in the United States. ANSI is the organization representing the United States to the International Standards Organization (ISO). <i>See also</i> ISO.
ANSI	<i>See</i> American National Standards Institute.
ASR	<i>See</i> Automatic Server Recovery.
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.

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G-2 Glossary

Asynchronous Management	Management by way of modems and Point-to-Point Protocol (PPP) to communicate with a management PC. For instance, Compaq Insight Manager can use PPP to dial into a server and manage it as if it were part of a local network. The Compaq Insight Management Agents can be configured to send traps through a point-to-point connection allowing complete remote management.
Attribute	Characteristics of the managed object provided to a network administrator (for example fault, performance, and configuration information).
Automatic Server Recovery (ASR)	Feature designed to restart your 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 pages you. <i>See also</i> Server Health Logs.
Automatic Server Recovery-2 (ASR-2)	Feature designed to restart your 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 pages you. <i>See also</i> Server Health Logs.
Bridge	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.
Client	A computer or software program that requests services from a server.
Community String	A password-like string with a 32-character maximum that is to be used for read/write access to the SNMP attributes.
Compaq Insight Management Agents	Compaq specific 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</i> MIB.
Consultative Committee For International Telegraph and Telephone	An international organization that develops communications standards such as recommendation X.25.
Corrected Error Log	A log 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. This file is stored in non-volatile RAM.
Corrected Memory Log	A list of corrected memory errors that is stored in non-volatile RAM.
Critical Error Log	A log file that records catastrophic errors, such as non-correctable memory, expansion board, and expansion bus arbitration errors. This file is stored in non-volatile RAM.
Corrected Error Log	A log 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.

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G-4 Glossary

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.
DHCP	<i>See</i> Dynamic Host Configuration Protocol.
Dynamic Host Configuration Protocol (DHCP)	A client-server model that simplifies assigning and maintaining the IP address information and databases. It provides a reliable TCP/IP network configuration, ensures address conflicts do not occur, helps conserve the use of IP addresses through a centralized management address allocation, and allows dynamic configuration of IP addresses for any computer connected to the network.
DNS	<i>See</i> Domain Name System.
Domain Name System (DNS)	An e-mail addressing system used in networks such as the Internet. It converts an e-mail address, such as joe@clc.com to the Internet address (IP) for transmission.
ECC	<i>See</i> Advanced Error Checking and Correcting Memory.
EISA	<i>See</i> Extended Industry Standard Architecture.
Element Manager	MA software component that monitors and controls a particular type of device on the network, such as a hub.
End-User Desktop Management	Tools which allow a user to view critical system information at the desktop (on the PC).
Enterprise MIB	<i>See</i> Vendor MIB.
Enterprise Management	Management of a geographically distributed network containing a wide range of network devices such as computers, bridges, routers, gateways, and modems.

Enterprise Management Platform	A program designed to manage the infrastructure of large corporate networks that have an extensible database and Application Programmers Interface so independent software vendors can write applications to provide enhanced device management.
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. Ensures that common memory errors, including the failure of an entire DRAM, can be corrected without interrupting system operation.
Ethernet	Network cabling and signaling scheme with the 10 megabits per second rate that works over a wide variety of cabling.
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.
File Sharing	The ability to share parts (or all) of a local file system(s) with remote computers.
Gateway	Computer that controls the exchange of information between a LAN and a "foreign" computing environment such as a mini-computer or mainframe.
Hub	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 Manageability	Compaq's industry-leading desktop management strategy enabling desktop PC management capabilities that make networked PCs easier to manage today and tomorrow.

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.
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 that coordinates national standards bodies to promote standardization worldwide. It develops and publishes international standards. The United States representative to the ISO is ANSI. This organization is also called the International Organization for Standardization.
Internet	The world's largest internetwork, connecting thousands of computer networks worldwide.
Internet Engineering Task Force (IETF)	The standards oriented group which under the direction of the Internet Architecture Board develops the specifications that become Internet standards.
Internet Engineering Task Force (IETF)	The primary team of the Internet Activities Board developing new TCP/IP standards for the Internet.
Internet Packet Exchange (IPX)	NetWare LAN communication protocol; which 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.
LANdesk Desktop Manager	A comprehensive set of desktop management tools that enable you to control and monitor desktops that are attached to the network. These management tools are part of the ManageWise product and reside on the console.
LANdesk Inventory	A ManageWise component that resides on the server that maintains the inventory database and the client inventory scanning components.
LANdesk Inventory Manager	A ManageWise component that resides on the console that displays, queries, and modifies hardware and software inventory information.
LANdesk Virus Protect	A ManageWise component that prevents viruses from being introduced into NetWare servers and desktop PCs. It provides continuous and on-demand scanning on both file server and local desktop drives.
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.
MAU	<i>See</i> Multi-Access Unit.
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	Server with the Compaq Insight Management Agents installed.

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G-8 Glossary

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 monitored items that management applications and management agents use to monitor, analyze, and control the operation of managed devices.
Management PC	A 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, NetWare ManageWise, Management System, HP OpenView, and NetView for AIX, HP OpenView, and SunConnect SunNet Manager.
Management Protocol	Set of rules for the network that defines a format and procedures for data transfer.
MAU	<i>See</i> Multi-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 or, I/O Bus Utilization.
Multi-Access Unit (MAU)	A central hub in a token ring local area network. <i>See also</i> Hub.

Naming Service	Software that converts a name into a physical address on a network, providing logical to physical conversion. Names can be user names, computers, printers, services or files. The transmitting station sends a name to the server containing the naming service software, which sends back the actual address of the user or resource.
NetBEUI transport	NetBIOS (Network Basic Input/Output System) Extended User Interface. The primary local area network transport protocol in Windows NT. <i>See</i> NetBIOS.
NetBIOS interface	A programming interface that allows I/O requests to be sent to and received from a remote computer. It hides networking hardware from applications.
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	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.
NVT	<i>See</i> NetWare Virtual Terminal.
OSI	<i>See</i> Open Systems Interconnection.
Open Systems Interconnection (OSI)	The only internationally accepted framework of standards for communication between different systems made by different vendors. OSI was developed by the International Standards Organization.

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G-10 *Glossary*

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.
PCI	<i>See</i> Peripheral Component Interconnect.
Peripheral Component Interconnect (PCI)	A system bus architecture specification that supports 32-bit bus-mastered data transfer. It is designed to support plug-and-play configuration of optional peripherals.
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 negotiates operation over asynchronous over synchronous serial links.
PPP	<i>See</i> Point-to-Point Protocol.
POST	<i>See</i> Power-On Self-Test.
Power-On Error Log	A log file that records any errors that occur during Power-On Self Test (POST). 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.
Protocol	A set of rules and conventions that govern how devices on a network exchange information.
Rapid Recovery Engine	The term used to describe the diagnostic and recovery capabilities built into Compaq servers and some Compaq desktops.

Remote Monitoring	A term used to describe a computer that monitors others computers using management software such as Compaq Insight Manager and Insight Management Agents from a local or remote site.
Revision History Table	Board revision information stored 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.
SAP	<i>See</i> Service Advertising Protocol.
Server	A computer running administrative software that controls access to all or part of the network and its resources.
Snap-In Application	Third-party management application that integrates with a management platform.
Simple Network Management Protocol (SNMP)	Industry-standard protocol for the exchange of management data between management applications and management agents.
SNMP	<i>See</i> Simple Network Management Protocol.
SNMP Trap	<i>See</i> Trap.
Subnetwork	Term sometimes used to refer to a segment on a network. In IP networks, the term refers to a network sharing a particular subnet address.
Subsystem	Major components of a device (for example, disk subsystem, storage subsystem, memory subsystem, and processor subsystem).
TCP	<i>See</i> Transmission Control Protocol.
Telnet	Standard Internet terminal emulation protocol.

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G-12 Glossary

Terminate-and-Stay-Resident (TSR)	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.
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; stations can send data only when they have the token.
Topology	The physical layout of network components (cables, stations, gateways, hubs, etc.). 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.
Transmission Control Protocol and Internet Protocol (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.
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.

Version Control	A database of Compaq software products provided on the Compaq SmartStart CD and the Compaq Support Software CD. The code queries servers for the software version levels to see if an upgrade is needed.
WAN	<i>See</i> Wide Area Network.
WINS	<i>See</i> Windows Internet Name Service.
Wide Area Network (WAN)	Network of LANs connected by routers or bridges, usually covering a large geographic area.
Windows Internet Name Service (WINS)	Dynamic database maintenance that supports computer name registration and name resolution.
Workgroup	A collection of computers running an operating system such as Windows NT or Windows for Workgroups group together to share and browse information.
X.25	Network that implements the internationally accepted CCITT standard governing the operation of packet-switching networks.

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Insight Asynchronous Management Worksheet

Management PC information:

Gather the following information for each management PC on your Asynchronous Management network.

Phone Number: _____

Asynchronous IP Address: _____

Second Asynchronous IP Address:
(required for Windows NT console only)

System ID/User Name:
(required for Windows NT console only)

Password:
(required for Windows NT console only)

Insight Agent information:

Gather the following information for each server on your Asynchronous Management network.

Server Name: _____

Phone Number: _____

Asynchronous IP Address: _____

Second Asynchronous IP Address:
(required for Windows NT servers only)

(DHCP reserved address)

System ID/User Name: _____

Password: _____

