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Prepared by OS Integration Group

Compaq Computer Corporation

Contents

History of Innovation and Value-Add in Compaq Server Families

Abstract: Compaq systems offer features that differentiate them from the competition. This trend was already well established when Compaq introduced the first server-class systems and has continued since then. The number and variety of options and features available for Compaq servers has grown rapidly. Though most of the features described in this paper are OS independent, not all of the features are available on every OS. This white paper is intended to help you understand the various options and features available on Compaq servers. This document provides information about Compaq server products and the options available for Compaq servers. It also provide historical reference to features found in previous generations of Compaq server to communicate the rich heritage of Compaq innovation and leadership in industry standards.

This document supercedes and updates previous white papers entitled *Compaq Value Add Features and Server Families.*

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Notice

History of Innovation and Value-Add in the Compaq Server Families
White Paper prepared by Windows NT Integration Group

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Overview

Compaq products have always provided customers with innovations designed to enhance the quality, reliability, maintainability, performance, and Total Cost of Ownership (TCO). These innovations are evident in the hardware, software and service products that Compaq offers. Even the Compaq quality pledge reflects the commitment to listen to customers in order to deliver the highest quality products, services, and solutions that ensure value and contribute to your success.

Compaq products pioneer new technologies that are subsequently adopted as industry standards. Features such as Automatic Server Recovery once found only on Compaq servers, are now tauted by several vendors. Recently, Compaq engineered PCI Hot Plug technology, which has since been adopted as an industry standard.

Compaq also enhances products through partnerships with leading software companies. Compaq has developed strategic relationships with these industry leaders to provide total solutions that offer the highest level of service and support.

This document examines the tangible and intangible features that make Compaq servers and workstations the number one choice for customers who demand quality and reliability. Included within these pages are descriptions of features and the server families and server options that support them. This document is intended as a reference aid for those who need to understand how Compaq adds value to products.

High Availability Features

Compaq understands that customers utilize systems to perform mission-critical functions. Such functions are central to the success of business operations, and any loss of availability translates into a loss of time and money. To protect the customer from such losses, Compaq offers many features that ensure Compaq servers provide maximum uptime with minimal maintenance requirements.

High availability involves providing three major classes of functionality:

- Features that work around any failures without interruption of service (*Non-Stop Computing*)
- Features designed to reduce the time it takes to recover from failures (*Rapid Recovery*)
- Features designed to prevent problems from occurring (*Fault Prevention*)

Non-Stop Computing Features

Non-stop computing technologies provide a first line of defense against failures. These technologies enable you to route around potential faults and continue operating with little or no interruption of service. In many cases, non-stop computing features incorporate some degree of redundancy. The features listed in Table 1 enable Compaq systems to work around potential failures without requiring immediate intervention.

Table 1: Non-Stop Computing Features

Feature	Description
Advanced Network Control Utility	Merges two similar network controllers into a controller pair allowing failover if a fault occurs.
Cluster Verification Utility	Helps determine whether a configuration is suitable for use with Microsoft Cluster Service.
On-Line Recovery Server	Allows two servers to act as a redundant pair while handling two separate workloads.
Online Storage Controller Recovery	Merges matched SMART-2 controllers into controller pairs, providing controller redundancy.
Redundant Fans	Ensures proper airflow around temperature-sensitive components if a fan fails.
Redundant Hot Plug Power Supply	Allows power supplies to be added or replaced without shutting down the server.
Redundant Power Modules	Enables Power Safe Modules to act as hot spares if the primary power module fails.
Redundant Power Supplies	Ensures that the server continues operating even when a power supply fails.
Standby Recovery Server	Allows two servers to act as a redundant pair, one acting as the hot spare for the active server.
Storage Automatic Reconstruction	Reconstructs data automatically to an online spare drive or a replacement drive if a drive fails.

Rapid Recovery Features

The features listed in Table 2 provide the ability to recover from server or component failure with the least possible impact on uptime. Several of the features listed here enable recovery from component failures without shutting down the server.

Table 2 : Rapid Recovery Features

Feature	Description
Automatic Server Recovery-2 (ASR-2)	Allows the server to reboot, call the administrator, and report critical problems.
Fan Detect and Shutdown	Allows the operating system to detect failure of the fan(s) and invoke automatic shutdown.
Hot Pluggable Drives	Permits you to plug and unplug SCSI drives from the system while the system is running.
Hot Plug Fans	Allows replacement of fans without shutting the system down.
Hot Plug Keyboards	Provides the ability to replace keyboards on a server without the need to restart the system.
PCI Hot Plug	Allows removal and replacement of PCI controllers without shutting down the system.
Server Failure Notification	Sends a pager alert to notify a system administrator of a server malfunction.
Server Recovery Notification	Sends a pager alert to notify a system administrator of recovery from a server malfunction.
Temperature Detect and Shutdown	Detects when the temperature of the system exceeds the caution level and invokes shutdown.
Windows NT HAL Recovery	Replaces the Windows NT HAL should the HAL become corrupted.

Fault Prevention Features

One of the most obvious ways to improve the availability of a server is to include features that enable the system to avoid problems. Such features involve forward-looking technologies that anticipate the likelihood of a situation and prevent the situation from becoming a problem. Table 3 lists features that improve uptime by preventing server failures.

Table 3 : Fault Prevention Features

Feature	Description
ECC Memory	Enables detection and correction of all single-bit memory errors.
Memory Deallocation	Tests all memory; automatically deallocates any bad memory blocks that it finds.
Intelligent Power Switch	Allows administrative control of power switch function through software-configurable switches.
Power Safety Interlock	Turns system power off automatically when the case cover is removed.
Pre-Failure Warranty	Identifies potential problems and provides replacement for critical components before they fail.

Life-Cycle Cost Reduction

The most significant portion of the costs for owning a system usually comes from maintaining and expanding systems. Many of the features Compaq incorporates into server products extend the useful life of the products and reduce the maintenance effort and cost. Features that reduce the life cycle costs are:

- Server Maintenance
- Remote Capabilities
- Investment Protection

In this section, we will examine the features that fall into these categories and show how they protect Compaq customer investments in hardware, software, and especially in the time and efforts of the people who use, manage, and service the systems.

Server Maintenance

Server maintenance involves tracking system parameters, maintaining the various subsystems, expanding capacity as needed, and monitoring the status of the systems. Table 4 lists features that enable many of the functions of server maintenance to be carried out while the system is operating.

Table 4 : Online Server Maintenance Features

Feature	Description
Asset Tag Number	Allows storage of company-specific asset numbers in a firmware repository for easy tracking.
Board Release Levers	Provides quick access to modular, removable components that slide out easily.
Corrected Error Log	Allows quick determination of the type and frequency of corrected errors.
Integrated Management Display	Provides a view of information in the Integrated Management Log and other user-defined text.
Power Line Monitoring	Tracks fluctuations in external power line connections.
RAID Online Expansion	Allows adding a new disk to a RAID array without destroying the data held in the array.
Survey Parameter Capture	Captures system parameters, compares with previous captures, and delivers a comprehensive view of the server and any differences between captures.
System Partition Admin. Utility	Accesses and updates the System Partition online.
System Serial Number	Contains the system serial number in an EEPROM that is burned at the factory when the system is built.
Temperature Monitor via I_2C	Utilizes the Intelligent Interface Control to pass temperature information.
Voltage/Current Monitor	Tracks voltage and amperage fluctuations through the power supplies.

Some server-maintenance features are implemented during power-up or involve shutting down the system. These off-line server maintenance features are listed in Table 5.

Table 5 : Off-Line Server Maintenance Features

Feature	Description
Boot Block ROM	Allows the system to boot over the network.
CDROM Boot	Provides the option of booting from the CDROM.
Configurable Boot Order	Determines which mass storage controller services the boot device.
Critical Error Logging	Records catastrophic errors.
DOS CPR	Installs MS-DOS on a FAT partition with Microsoft Windows NT already installed.
Drive Firmware Upgrade	Provides the ability to upgrade drive firmware with software available over the Internet.
Failure/Status LED	Indicates device status and alerts the customer of any device failure.
Fibre Fault Isolation Utility	Verifies installation and operation of Fibre Channel Storage System.
Flashable ROM	Used to apply software updates from the integration server to the production servers.
Integrated Management Log	Provides a log of system events, including Power-On Self Test (POST) results.
Power Down Manager	Gives the administrator an advanced level of flexibility in configuring the behavior of I^2C power switches.
PCI Plug and Play	Supports the Plug and Play standard for PCI devices.
Power-On Error Log	Records errors that occur during Power-On Self Test (POST).
Revision History Table	Stores board revision information in non-volatile memory.
SmartStart	Simplifies configuration and installation of Compaq servers and options.
System Partition	Contains diagnostic tools and utilities, including the System Configuration Utility.

Remote Capabilities

Table 6 lists features that perform functions via network or modem on a server without actually being at the machine. Also included are features that communicate with the system administrator via pager to announce problems or changes.

Table 6 : Remote Capability Features

Feature	Description
Compaq Insight Manager	Delivers fault, performance, and configuration management for servers and desktop clients.
Insight Manager Alerts	Sends alerts to designated pager numbers in case of an impending problem with a server.
Graphical Remote	Enables a graphical view of the Windows NT console to be displayed on the remote console.
Info Messenger	Notifies via email the availability of new information or software pertinent to you.
Integrated Remote Console (IRC)	Allows out-of-band management capabilities such as remote console and remote reset.
Power Supply Viewer	Views information about I_2C power subsystems remotely.
Remote Alpha/Numeric Paging	Sends alpha/numeric pager alert text via Remote Insight/Insight Manager when problems are detected.
Remote Asset Management	Allows collection or setting of asset management information remotely by way of Insight Manager.
Remote Diagnostics	Analyzes the condition of the server remotely using Insight Manager.
Remote Insight	Offers the most complete, out-of-band server management solution.
Remote NT SSD Upgrades	Enables system administrators to apply Windows NT SSD upgrades to systems over the network.
Remote Threshold Settings	Sets alert threshold parameters remotely.
SmartStart Integration Management	Allows manual upgrade or installation of Compaq products via Integration Server or CD.
Software Upgrades via Internet	Software updates are available for many operating systems via easy to navigate web pages.

Investment Protection

Compaq protects the customer's investment in several ways. Compaq systems provide features that enable the systems to grow as the demands on the equipment grow.

Compaq products incorporate industry-standard components, which can be reused and moved between systems.

Compaq provides continued feature updates for outdated versions of popular operating systems. This offers customers who cannot upgrade to current versions of the operating systems to take advantage of many of the latest advances in Compaq technology. The commitment to providing on-going support of outdated operating environments gives Compaq customers the ability to decide when upgrades are necessary—based upon their own business requirements—which protects the customer's investment in outdated environments.

Table 7 : Investment Protection Features

Feature	Description
Long OS Support Life	Provides continued feature updates for less recent versions of supported operating systems.
New OS Support for Older Servers	Supports older server platforms with new operating system support software releases.
Pre-Failure Warranty	Protects your investment by replacing components prior to complete component failure.
Industry-Standard Components	Ensures that standard components, such as, memory and disks, are interchangeable between platforms.

Performance Tracking and Optimization

Table 8 lists features that provide information needed to evaluate system performance metrics and allow for tuning and optimization of Compaq systems.

Table 8 : Performance Analysis and Information Features

Feature	Description
EISA Bus Utilization Monitor	Tracks and graphs utilization of the EISA bus.
Memory Fault Recovery Tracking	Tracks operations of the memory subsystem for uncorrectable errors.
NIC Fault Recovery Tracking	Tracks over twenty failure indications of Ethernet and Token Ring network interfaces.
PCI Bus Utilization Monitor	Tracks and graphs utilization of the PCI bus(es).
Server Parameter Tracking	Provides timely fault, performance, and configuration information about critical server subsystems.
Storage Fault Recovery Tracking	Tracks failure parameters of mass storage controllers and attached hot-pluggable drives.

Security

Compaq servers offer many features that enhance physical and logical security. Table 9 lists security features, broadly defined as features that provide controls over physical access, remote access over the network or modem, and access by other software methods.

Table 9 : Security Features

Security Feature	Description
Administrative Password	Prevents changes to the configuration unless the password is entered.
CD Lock	Disables access to the CDROM drive.
Configuration (NVRAM) Lock	Prevents non-volatile memory modifications and disallows configuration changes.
Diskette Drive Control	Enables and disables the diskette drive. No read, write, or boot functions are available.
Diskette Write Control	Enables and disables diskette write functions. Boot and read functions are still available.
Front Bezel Key Lock	Locks the front portion of the server protecting the removable media components.
Keyboard Password	Locks out the keyboard to prevent unauthorized access to Compaq servers.
Network Server Mode	Allows system startup from hard disk or network server while the keyboard and mouse are disabled.
Power Down Lock	Disables the power switch to prevent accidental shutdown.
Power On Password	Prevents use of the computer unless the password is entered.
Protected Power Switch	Prevents accidental server shutdown due to incidental contact with the power switch cover.
QuickLock	Disables the keyboard and pointing device without exiting the application.
Serial Parallel Interface Control	Prevents unauthorized transfer of data through the integrated serial and parallel ports.

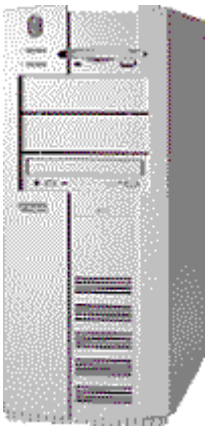
Server Families

In this section we will examine the Compaq server families and outline their hardware configurations and features.

ProLiant Family

The ProLiant family represents the premier family of Compaq servers, offering the latest reliability and performance enhancements.

ProLiant 800 (announced January, 1997)



The Compaq ProLiant 800 Server combines the latest performance-enhancing technologies into an affordable workgroup server. The ProLiant 800 Server provides the latest Pentium II processors, ECC Memory, 100 MHz system bus, and an integrated dual-channel Wide-Ultra SCSI-3 Controller to meet the performance requirements of the most demanding networks. With four internal and four external drive bays, six total available PCI slots, and dual-processor capability, the ProLiant 800 offers the expandability to grow with your business. In addition, with such features as Compaq Insight Manager, Integrated Remote Console, ASR-2, and a Pre-Failure Warranty, the ProLiant 800 maintains the standard of reliability and manageability unique to Compaq.

The ProLiant 800 delivers exceptional performance with up to two 350-MHz, 400-MHz or 450-MHz Pentium Pro processors with 512-KB second-level (L2) cache. 64 MB of ECC memory is standard and can be expanded to 1 GB using industry-standard DIMMs. The system is equipped with SmartStart and a CDROM drive to make configuration and software installation faster, easier, and more reliable.

ProLiant 850R (announced May, 1997)

The Compaq ProLiant 850R is the first low-profile server to combine affordability and a unique space saving design tailored exclusively for rack environments.

The ProLiant 850R features up to two 200-MHz Pentium Pro processors and the latest technology in network and disk controllers in a 3U rack-mount form factor. This server has been designed for medium-to-large businesses requiring an affordable, space-efficient rack-mount solution for communications, Internet/Intranet, gateway or file and print applications.

The expansion bus provides two PCI slots, one ISA slot, and one shared PCI/ISA slot. The chassis provides five bays, three of which are available for hard drives. The integrated Wide-Ultra SCSI-3 Controller provides data transfer rates up to 40 MB/s, doubling the transfer data rates of the Fast-Wide SCSI-2 Controllers for higher performance. The integrated 10/100 TX UTP controller provides high-performance connectivity that autosenses both 10 Mb/s and 100 Mb/s for maximum performance and has ports for both UTP and coax cable connections. Integrated Remote Console delivers seamless remote console and full remote-server-reboot capabilities with the addition of a modem. The system ships with 32 MB of EDO memory, which can be expanded up to 512 MB using industry-standard unbuffered DIMMs.

SmartStart and the standard CDROM drive make configuration and software installation faster, easier, and more reliable. The server comes standard with Compaq Insight Manager.

ProLiant 1000 (Discontinued; announced September, 1993)

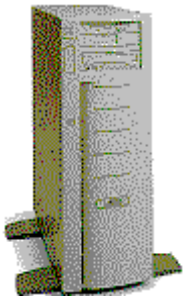
The first member of the ProLiant family, the ProLiant 1000 was built upon the EISA bus architecture and provided eight expansion slots, consisting of seven 8/16/32-bit EISA bus master expansion slots and one management modem slot. The system board provided an integrated Fast-SCSI-2 Controller, as well as integrated SVGA video controller. The system shipped with 16 MB of RAM, expandable to 144 MB (Pentium models) or 128 MB (486 models) using industry-standard SIMMs. The system included a pre-installed NetFlex-2 Ethernet controller and CDROM drive. The chassis provided space for eight total internal storage device bays, of which six were internal hot-pluggable drive bays.

ProLiant 1200 (Discontinued; announced November, 1997)

The Compaq ProLiant 1200 used the Intel Pentium II 233-MHz processor with 512 KB Level-2 ECC cache memory. Base memory was 32 MB, with eight memory slots allowing expansion up to 512 MB (a limitation of the Pentium II processor). The system architecture was based on Dual Peer PCI buses. Integrated Remote Console delivered seamless remote console and full remote server reboot capabilities by adding a modem.

Up to three 1.6-inch hot plug drives could fit in the case. The integrated Cirrus 54M30 video controller with 1 MB of video RAM provided 1024x768 resolution with 256 colors. The network interface was the Netelligent 10/100 TX PCI UTP controller, which occupied one of the PCI slots. The ProLiant 1200 provided an integrated Wide-Ultra SCSI-3 Controller that offered data transfer rates up to 40 MB/s. The system was I_2O capable with I_2O Look Aside Connector. The system supported an optional Integrated Management Display.

ProLiant 1500 (Discontinued; announced February, 1995)



FlexSMP System Architecture allowed the ProLiant 1500 to upgrade to dual processing. A 6/200 FlexSMP Dual Processor Board was available to expand to a second 200-MHz Pentium Pro processor. 512 KB secondary write-back cache provided enhanced system performance. 32 MB of ECC memory was located on the processor board, and was expandable up to 256 MB.

The ProLiant 1500 system board had an integrated 32-bit Fast-Wide SCSI-2 Controller connected to a cage with five hot-pluggable SCSI drive bays. Eight total expansion slots (five EISA, two PCI, and one shared EISA/PCI) were provided, one of which was consumed by the pre-installed NetFlex-3/P Controller. A quad-speed CDROM drive was standard and was connected to an integrated EIDE interface on the system board. A redundant power supply upgrade was available.

ProLiant 1600 (announced November, 1997)

The new Compaq ProLiant 1600 is the ultimate workgroup server combining high performance and availability features critical to maximizing server uptime.

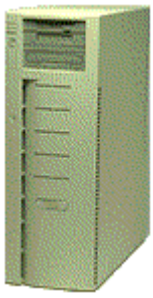
The Compaq ProLiant 1600 is a high-performance server for workgroup and remote-office application with uptime features unmatched in its class. A state-of-the-art Pentium II 350-MHz, 400-MHz or 450-MHz processor with 512 KB second level ECC cache, the 100-MHz GTL bus design, and dual-processing capability provide exceptional performance. The integrated dual channel Wide-Ultra SCSI-3 Controller offers 80 MB/s aggregate performance, with plenty of headroom for growing network demands. The system comes standard with 64 MB of EDO ECC memory and is expandable to 1 GB using 100-MHz registered SDRAM DIMMs. The system supports up to five one-inch hot-plug hard drives, providing 63.7GB of internal storage capacity. The ProLiant 1600 incorporates Highly Parallel System Architecture, providing improved system bandwidth. It comes standard with an I_2O Connector and Integrated Remote Console. A pre-installed 24X MAX IDE CDROM is part of the standard configuration. The system can be ordered with an optional Integrated Management Display.

The system is equipped with a hot pluggable power supply and can be ordered with an optional redundant hot plug power supply to enhance system availability. The ProLiant 1600 is protected by a three-year on-site limited warranty and the Compaq Pre-Failure Warranty.

ProLiant 1850R (announced August, 1998)

The Compaq 1850R is a space-saving, 3U, high performance, full-featured rack server designed to meet the needs of ISPs, corporate data centers, and remote sites. The new 450-MHz Pentium II processor is incorporated into this design to offer customers state-of-the-art performance in a rack-optimized server. In addition to enhanced performance, this server maintains all the features of the existing ProLiant 1850R. Features include dual-processor capability, 100-MHz GTL bus architecture, 100-MHz, registered ECC SDRAM DIMM memory, integrated Dual Channel Wide-Ultra SCSI-3 Controller, seven total drive bays, four full-length slots, and accessibility to major components without tools or removing the system from the rack. Moreover, Compaq manageability makes it an unbeatable platform for file/print, Windows NT Server, Web mail, or small database applications.

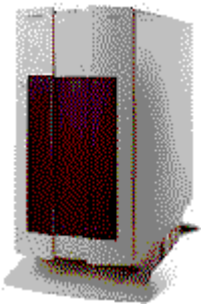
ProLiant 2000 (Discontinued; announced September, 1993)



The ProLiant 2000 offered the option of running from one to four processors, using the FlexSMP System Architecture. The system board provided eight EISA bus master expansion slots, one of which was consumed by the pre-installed NetFlex-2 Ethernet or Token Ring controller. The system board sported an integrated Fast-SCSI-2 Controller in addition to an EIDE controller that serviced the standard CDROM drive. The base system included 32 MB of advanced ECC RAM standard, and could be expanded to 512 MB using industry-standard SIMMs.

The chassis had eight total internal storage device bays, of which five were hot-pluggable drive bays. An optional redundant power supply was also available for the system.

ProLiant 2500 (Discontinued; announced October, 1996)



The ProLiant 2500 provided full support for dual processing, using up to two Pentium Pro processors for high performance in departmental and Internet/Intranet applications. The system board was equipped with an integrated Wide-Ultra SCSI controller, and an integrated high-performance network interface that autosensed both 10 Mb/s and 100 Mb/s modes. In addition, the Integrated Remote Console delivered seamless remote console and full remote-server-reboot capabilities with the addition of a modem. The system shipped with 32 MB of ECC memory and supported up to 1 GB using industry-standard DIMMs.

The chassis provided improved serviceability and flexibility for rack mounting, and some models included an Integrated Management Display that delivered fault-tolerant service and configuration information on an easy-to-use LCD panel.

SmartStart and an 8X CDROM drive were standard, making configuration and software installation faster, easier, and more reliable. In addition, the system came standard with Compaq Insight Manager, Automatic Server Recovery-2, and the Compaq Pre-Failure Warranty to improve system availability.

Some of the other server management features of the ProLiant 2500 included Server Health Logging, Revision History Table, Off-Line Backup Processor, and the Compaq Remote Insight Board (optional).

Security

MultiLock security features included power-on password, keyboard password, diskette drive control, diskette boot control, network server mode, security provision, parallel and serial interface control, administrator's password, and disk configuration lock.

ProLiant 3000 (announced November, 1997)

The Compaq ProLiant 3000 delivers performance and expandability levels that customers will not outgrow. This high performance server uses the latest in processor and system architecture technology to deliver best-in-class performance while providing increased expansion capabilities to meet the ever-increasing requirements of high-volume file services or entry-level applications. Additionally, the Compaq ProLiant 3000 includes advanced fault-tolerant capabilities and rapid recovery features providing maximum uptime and reliable server operation while lowering total cost of ownership.

ProLiant 3000 systems are available in tower or rack-mount (3000R) form factors and feature up to two Pentium II 400-MHz or 450-MHz CPUs with 512-KB Level-2 cache. It uses the new Highly Parallel System Architecture that includes dual-memory controller and Dual Peer-PCI buses. The new Dual Channel Wide-Ultra SCSI-3 Controller provides support for up to six 1.6-inch or eight 1.0-inch hot plug SCSI drives, offering an internal storage capacity of 109.2 GB. This system provides a hot-pluggable 750-watt power supply with optional redundant power supply. There are eight expansion slots, of which five are PCI, and three are shared PCI/EISA. The system is equipped with a standard 24X MAX IDE CDROM drive.

The system also includes an integrated Cirrus 54M30 video controller. The Netelligent 10/100 TX PCI UTP Network Interface Controller comes standard and uses a PCI slot. The system can be equipped with optional redundant fans. The Integrated Remote Console and Integrated Management Display are standard features of the ProLiant 3000. In addition, the system offers

support for network controller pairing, and SMART-2 Array Controller pairing, providing a very high degree of fault tolerance for mission critical applications.

The system ships with 128-MB memory standard, expandable to 4 GB using 100 MHz SDRAM. The ProLiant 3000 is I_2O capable and comes equipped with an I_2O Look Aside Connector. It is protected by a three-year, on-site limited warranty and extended Pre-Failure Warranty that covers Pentium Pro processors, memory, and disk drives.

ProLiant 4000 (Discontinued; announced September, 1993)

ProLiant 4000 servers offered highly extensible performance by allowing up to four system processor boards to be installed, using the FlexSMP system architecture. The I/O board included an integrated Fast-SCSI-2 Controller and provided eight 8/16/32-bit EISA bus master expansion slots. ProLiant 4000 shipped with a standard 64 MB of Advanced ECC memory, expandable to 512 MB. In addition, the ProLiant 4000 was equipped with a pre-installed NetFlex-2 ENET-TR Controller, a CDROM drive, and SmartStart

ProLiant 4500 (Discontinued; announced February, 1996)

ProLiant 4500 provided up to four processors, including support for an offline back-up processor with automatic processor recovery. The I/O board included an integrated Fast-Wide SCSI-2 Controller and offered eight 8/16/32-bit EISA bus master expansion slots. The system shipped with 64 MB (32 MB in Model 1) of advanced ECC RAM, expandable to 1 GB using industry-standard SIMMs. The system included a pre-installed NetFlex-3 controller and CDROM drive. The chassis provided seven storage device bays, of which four were internal hot-pluggable drive bays. Some models were equipped with an optional redundant power supply. A 2-MB Transaction Blaster option was available for customers interested in running high-end, multiprocessing applications.

ProLiant 5000 (Discontinued; announced June, 1996)

The award winning ProLiant 5000 systems utilized 166-MHz or 200-MHz Pentium Pro processors with integrated 256-KB or 512-KB Level-2 (L2) cache. The system had a 4-GB memory capacity with industry-standard DIMMs. The system included ECC-protected processor-memory data bus and Level-2 cache. An optional Redundant Processor Power Module provided continued availability if one power module failed. Support for optional off-line backup processors allowed near-maximum availability in case of processor failure. Dual Peer PCI buses delivered an aggregate 267 MB/s for improved system throughput.

The ProLiant 5000 was equipped with a Netelligent 10/100 TX PCI UTP Network Interface Controller. Customers could install additional redundant Netelligent 10/100 Ethernet NIC for maximum system reliability.

The Compaq Pre-Failure Warranty covered the Pentium Pro processor as well as hard drive(s) and memory. Optional SMART-2 Array Controllers provided multiple RAID protection levels. Compaq Insight Manager and SmartStart, industry-leading management and integration tools, were standard on every server.

A three-year, on-site warranty was included. Upgrade and trade-in programs were available.

ProLiant 5500 (announced November, 1997)

The ProLiant 5500 combines next-generation multiprocessing and I/O capabilities to deliver industry-leading performance. From its advanced multi-processing capability and support for Compaq next-generation storage technology down to the Netelligent 10/100 Mb/s Ethernet controller with support for redundant failover NICs, this server delivers best-in-class performance and value. This enterprise-class server is specifically designed to support increased computing power while requiring the least amount of space in the server or data center. The ProLiant 5500 combines all of these features with excellent expansion and legendary fault tolerance and management capabilities to deliver outstanding value, while lowering ownership costs for enterprise computing environments.

The ProLiant 5500 Pentium II Xeon supports up to four 400-MHz Pentium II Xeon processors with 100-MHz front-side bus and full-speed cache. Older models supported up to four Pentium Pro 200-MHz/512-KB cache processors. The dual peer PCI architecture means there is no need to balance I/O. The system ships with 128 MB of ECC EDO memory that can be expended to 4 GB using industry standard DIMMs. There are seven expansion slots, including six PCI and one share PCI/ISA slot. It is protected by a three-year on-site limited warranty and extended Pre-Failure Warranty that covers processors, memory and disk drives.

It comes in either tower or rack-mount (5500R) models. The system utilizes Highly Parallel System Architecture for improved system bandwidth and provides dual-memory controllers and Dual Peer PCI buses for improved throughput to I/O devices resulting in increased overall system performance. The system is equipped with an integrated dual-channel Wide-Ultra SCSI-3 Controller that provides support for up to either six 1.6 inch or eight 1.0-inch hot-plug SCSI drives, with data transfer rates of up to 40 MB/s on each channel.

The ProLiant 5500 also includes a 750-watt hot-plug power supply, with an optional redundant power supply. It comes standard with the Integrated Management Display LCD panel. In addition, the system offers support for redundant fans, network controller pairing, and SMART-2 Array Controller pairing, providing a very high degree of fault tolerance for mission-critical applications.

The ProLiant 5500 has an integrated Cirrus 54M30 video controller. A Netelligent 10/100 TX PCI UTP Network Interface Controller ships standard with the ProLiant 5500 and occupies a PCI slot. The ProLiant 5500 is I_2O capable with an I_2O Look-Aside Connector standard. It is protected by a three-year, on-site, limited warranty and extended Pre-Failure Warranty that covers Pentium Pro processors, memory, and disk drives.

ProLiant 6000 (announced May, 1997)

The ProLiant 6000 delivers breakthrough enterprise performance and the highest levels of expansion for the best value in business-critical environments. The ProLiant 6000 offers up to four 400 MHz Pentium II Xeon processors, plus support for future Pentium II Xeon processor technology. Older models could be configured with up to four 200-MHz Pentium Pro processors. The ProLiant 6000 provides leadership performance and unparalleled expansion in an easy-to-service, industry-standard platform.

The system comes standard with 128 MB or 256 MB of ECC EDO DIMM memory, expandable to 8 GB. Up to two redundant power supplies are standard, depending on

the model. The new Pentium II Xeon system has ten expansion slots, including five 64-bit PCI slots, four 32-bit PCI slots and one ISA modem slot. All expansion slots use board release levers for quick access to modular, removable components.

The system board provides integrated Dual Channel Wide-Ultra SCSI-3 Controller, providing two SCSI channels that transfer data at rates up to 40 MB/s per channel, doubling the data transfer rates of Fast-Wide SCSI-2. A dual-port 10/100 auto-sensing Ethernet controller comes standard providing a high degree of network reliability. The integrated PCI-based video controller (Cirrus 5430) has 512 KB of video RAM, expandable to 1 MB. The server includes Integrated Management Display and Integrated Remote Console, which makes the server easier to manage and service.

ProLiant 6000 supports SmartStart, Compaq Insight Manager, redundant NIC fail-over, and Integrated Remote Console. The system is covered by a three-year on-site limited warranty. The Compaq Pre-Failure Warranty is extended to support Pentium II Xeon processors, memory and disk drives.

The system offers easy conversion to 19-inch rack mount, using 14U per server and allowing three to be installed in a 42U rack, which maximizes configuration flexibility. An optional hot plug redundant power supply is available on base models, offering N+1 redundancy support for maximum load configuration. The system supports up to six 1-inch drives and four 1.6-inch drives on each backplane, with a maximum of three SCSI backplanes. Duplexing can be accomplished by adding a second SCSI backplane.

New replicated installation from SmartStart and the standard CDROM drive deliver quicker and easier enterprise rollouts. Compaq Insight Manager support is included, as is support of enhanced event logs with 32 KB of NVRAM supported. Optional Integrated Management Display is available.

ProLiant 6500 (announced August, 1997)

Compaq delivers the most trusted standards-based server for 7x24 multi-server environments, now with breakthrough performance. Now featuring the Pentium II Xeon processor, the ProLiant 6500 offers superior performance and high-availability features to keep your business running 24 hours a day, 7 days a week. You can trust your most critical database, OLTP, messaging, and web hosting needs to the latest in high-availability technology including PCI Hot Plug. The ProLiant 6500 also meets the needs for flexibility and space efficiency desired in modular rack environments. The ProLiant 6500's slim 7U profile makes it ideal for multi-server and external storage implementations, such as clusters or server farms. And with leading server management, legendary Compaq quality, and comprehensive services, Compaq and the ProLiant 6500 provide you with superior Total Cost of Ownership.

ProLiant 6500 systems can be configured with up to four Pentium II Xeon processors, providing the performance necessary for the most demanding applications. Older models could be configured with up to four Pentium Pro 200-MHz processors with either a 512 KB or a 1 MB Level-2 cache. The system comes standard with 256 MB of EDO Buffered DIMM memory technology expandable to 4 GB. ProLiant 6500 set new standards for system availability by introducing the first industry-standard PCI Hot Plug bus. The chassis of the new Pentium II Xeon system offers six 64-bit PCI Hot Plug slots and two shared PCI/EISA (non-hot-plug) slots. It comes with modular drive bays (five 1.6-inch or seven 1-inch hot-plug drive bays), one 3.5-inch floppy, one CDROM, two half height devices, an integrated parallel port, two serial ports, a mouse, and keyboard.

The system contains two 750-watt redundant hot-plug power supplies. ProLiant 6500 also offers new enhanced system management features (Integrated Remote Console, Integrated Management Display LCD, Enhanced Event logs). The system includes a single integrated Dual-Channel Wide Ultra SCSI-3 Controller, providing a data transfer rate up to 40 MB/s on each of the two channels. It is protected by CompaqCare, including a limited three-year parts, labor, and on-site warranty with optional 4-hour response. Pre-Failure Warranty and Compaq Service and Support Programs are available on a worldwide basis.

ProLiant 7000 (announced August, 1997)

The ProLiant 7000 is the ultimate standards-based server, delivering the most scalable performance and highest levels of availability and expansion for 7x24 environments. The ProLiant 7000 offers up to four 400-MHz Pentium II Xeon processors with support for future Pentium II Xeon processor technology and planned upgrades to eight processors. Older models of the ProLiant 7000 could be configured with up to four Pentium Pro processors. Combined with the latest high-availability features, including PCI Hot Plug, the ProLiant 7000 offers superior investment protection for your most demanding business-critical applications.

The system is equipped with 256 MB of ECC EDO DIMM memory standard, expandable to 8 GB. A Smart Array 3100ES Controller, standard on Pentium II Xeon models, provides three channel RAID support for all of the internal hot plug drive cages, offering up to 218.4 GB internal storage. The system offers ten expansion slots. The Pentium II Xeon model provides five 64-bit PCI slots, four 32-bit PCI slots, and one ISA modem slot. All slots use board release levers for quick access to modular, removable components. Pre-installed internal cabling provides improved reliability and manageability. A dual-port auto-sensing 10/100 network interface in included, which supports redundant NIC fail-over in PCI Hot Plug slots. Integrated Remote Console and Integrated Management Display are standard with the ProLiant 7000. The system is protected by a three-year on-site limited warranty, as well as the Compaq Pre-Failure warranty, which is extended to support Pentium II Xeon processors.

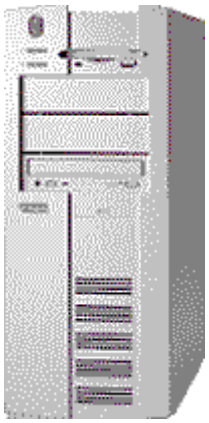
ProSignia Family

The ProSignia system architecture built upon the success of the Systempro family, while providing more compact packaging.

ProSignia (Discontinued)

The original ProSignia utilized the EISA-bus architecture with several integrated components that left the expansion slots available to answer customer requirements. The system supported up to eight mass storage devices internally, allowing a full complement of SCSI disks to be attached to the integrated Fast-Wide SCSI Controller. ProSignia came standard with an IDE CDROM attached to the integrated EIDE bus, plus the SmartStart CDROM package to assist customers in getting the system up and running. The ProSignia was the first Compaq server to offer Compaq Insight Manager standard.

ProSignia 200 (announced January, 1997)



The Compaq ProSignia 200 delivers high performance and true server functionality at a desktop price. This server, which is simple to buy and easy to own, was designed for small and medium-sized businesses requiring an inexpensive, feature-rich workgroup server. Compaq advantages include quick, easy and reliable server set-up with SmartStart, Wide-Ultra SCSI support and 512-KB cache for enhanced file and print performance in server environments.

The ProSignia 200 offers powerful uniprocessor performance in an aggressively priced package. The system uses the PCI System Architecture, which maximizes server performance of PCI systems. The system board offers integrated 32-bit Enhanced IDE, upgradeable to Wide-Ultra SCSI-2 (standard on M1 SCSI). It comes standard with 16 MB EDO memory and supports up to 128 MB using industry-standard SIMMs (upgradeable to ECC).

The ProSignia 200 offers and integrated Netelligent 10/100 PCI UTP/Coax Controller, which delivers reliable, high-performance network throughput. As with all Compaq servers, the system includes Automatic Server Recovery-2 and Compaq Insight Manager. In addition, SmartStart and the standard 8X CDROM drive make configuration and software installation faster, easier, and more reliable.

The most recent models of the ProSignia 200 are equipped with Intel Pentium II processors operating at 233 MHz, 266 MHz and 300 MHz with 512-KB second-level (L2) cache. The system board offers three PCI expansion slots—one populated with video, one shared PCI/ISA slot and one ISA slot. A 32-bit Wide-Ultra SCSI-3 Controller is available pre-installed in a PCI slot, providing data transfer rates up to 40MB/s. Also integrated on the system board is a Netelligent 10/100 PCI UTP/Coax Controller, which delivers a reliable, high-performance network throughput. A 1024x768 video controller is provided with 1 MB of video memory, upgradeable to 2 MB.

The system ships with 32 MB of 32-bit EDO memory, expandable to 192 MB using industry-standard EDO SIMMs, or up to 384 MB using optional Fast Page Mode (FPM) ECC kits from Compaq. ProSignia 200 comes in tower configuration only and includes a 16X-CDROM drive.

ProSignia 300 (Discontinued; announced February, 1995)

The ProSignia 300 offered integrated 32-bit Fast-SCSI-2 Controller and an integrated 32-bit Ethernet controller that deliver faster response time when users access files from the server. Instead of a computer optimized for running Windows desktop applications, the ProSignia 300 was optimized for running network operating systems like NetWare. Users found true server features, such as, Automatic Server Recovery and ECC memory that desktop computers lacked, and made the ProSignia 300 a more dependable server platform.

The ProSignia 300 supported the Standby Recovery Server and Online Recovery Server, which added even more fault management to ProSignia 300 servers. With this option, one ProSignia server acted as a standby for another, taking over in the unlikely event of a hardware or software failure. For an even more cost-effective solution, Compaq now allows a ProSignia server to act as the idle server for a ProLiant server in the standby or online mode.

Compaq Insight Manager and SmartStart were standard, increasing the dependability and manageability of the server. SmartStart builds a tested and reliable platform for the server while Compaq Insight Manager makes the server easy to manage, across the network or from remote locations.

A rack-mounting kit was available as an option, allowing customers to install ProSignia 300 servers in rack enclosures.

ProSignia 500 (Discontinued; announced November, 1994)

The ProSignia 500 provided a robust and expandable platform which was board and chip upgradeable, offering uniprocessor and dual-processor configurations using the FlexSMP architecture. The system offered 256 KB of shared secondary write-back cache. The system board included an integrated 32-bit NetFlex-L Ethernet controller, integrated 32-bit Fast-SCSI-2 Controller, and integrated 1024x768 video graphics. The ProSignia 500 contained six total expansion slots, including one processor expansion slot, three EISA slots, one shared EISA/PCI, and one PCI slot.

ProSignia 500 came standard with 16 MB of ECC memory, expandable to 208 MB using industry-standard SIMMs. The chassis provided eight total storage device bays allowing internal storage expandability up to 30.1 GB. The system was equipped with a pre-installed CDROM drive.

ProSignia 500 shipped standard with the Compaq SmartStart integration tool, Compaq Insight Manager, Automatic Server Recovery (ASR), and Server Health Logs.

Prosignia Server 720 (announced November, 1998)

The Compaq server for small businesses that allows you to increase business efficiency and still meet a demanding budget. Prosignia servers are easy to use and maintain. From purchase to use, the choice is easy. Specially designed to match the computing needs and budgets of growing businesses, these value-priced servers will meet your file and print, database and communications needs right now, and expand with your business needs. The Prosignia Server 720 utilizes Pentium II processors running at speeds of 350 MHz and 400 MHz, providing the performance and power needed to serve your most demanding applications. The processors are equipped with 100MHz Front Side Bus and 512 KB of Level 2 cache. The system offers six total expansion slots, including three PCI, one ISA, one shared PCI/ISA and one AGP. As with all Compaq servers, Prosignia Server 720 supports Compaq Insight Manager and Automatic Server Recovery-2 (ASR-2).

Prosignia Server 720 ships with 64 MB of SDRAM DIMM and can be upgraded to 384 MB. The server offers integrated Netelligent 10/100 TX network interface and an integrated Wide Ultra2 SCSI controller that provides a blistering 80 MB/s throughput when used with Ultra2 SCSI drives. The integrated video controller provide 1024x768 resolution with 256 colors. The chassis utilizes service-friendly tool-free design, allowing for quick and easy removal of all mass storage devices via the new Compaq Drivelock mechanism. Prosignia Server 720 is protected by a three-year limited warranty.

Prosignia Server 740 (announced November, 1998)

The Prosignia Server 740 allows you to extend server performance to meet business growth. It utilizes Pentium II processors running at speeds of 350 MHz, 400 MHz, and 450 MHz providing the performance and power needed to serve your most demanding applications. The processors are equipped with 100MHz Front Side Bus and 512 KB of Level 2 cache. The system offers six total expansion slots, including two PCI and four shared PCI/ISA. As with all Compaq servers, Prosignia Server 740 supports Compaq Insight Manager and Automatic Server Recovery-2 (ASR-2).

Prosignia Server 740 ships with 64 MB of SDRAM DIMM and can be upgraded to 384 MB. The server offers integrated Netelligent 10/100 TX network interface and an integrated Wide Ultra2 SCSI controller that provides a blistering 80 MB/s throughput when used with Ultra2 SCSI drives. The integrated video controller provide 1024x768 resolution with 256 colors. The chassis utilizes service-friendly tool-free design, allowing for quick and easy removal of all mass storage devices via the new Compaq Drivelock mechanism. Prosignia Server 740 is protected by a three-year limited warranty.

ProSignia VS (Discontinued; announced March, 1994)

The ProSignia VS was one of the first members of the ProSignia family. The system was designed to utilize the 486 processor to produce a highly serviceable design. The system board offered integrated 32-bit Fast-SCSI-2 Controller and an integrated NetFlex-L Ethernet controller. There were five EISA bus-master slots. The ProSignia VS came standard with 16 MB of RAM, which was expandable to 128 MB using industry-standard SIMMs. The chassis provided room for five mass storage bays.

ProSignia VS was among the first servers to come standard with Automatic Server Recovery (ASR).

Systempro Family

The Systempro family represented the first Compaq server family. Innovative features, such as, eight standard internal drive bays and the FlexSMP multiprocessor architecture laid the foundation upon which the Compaq server products were built.

Systempro (Discontinued)

The original Systempro provided the ability to configure server-class systems using Intel processors. Systempro was designed using the FlexSMP architecture, enabling dual-processor configurations. The chassis provided space for eleven devices, including up to eight disk devices. The system board offered integrated EIDE and SVGA video.

Systempro LT (Discontinued)

Systempro LT provided a lower cost member of the Systempro family in a uniprocessor configuration. The chassis provided the same number of storage device bays, and the system board included the integrated EIDE, SVGA video, and Fast SCSI-2 Controllers.

Systempro XL (Discontinued)

The Systempro XL enhanced the Systempro family by providing improved processor options, including 486DX2 and Pentium processors, available in either uniprocessor or dual-processor configurations. Built within the Systempro chassis, the XL provided eleven storage device bays, of which eight are available for internal SCSI devices. The system board included integrated EIDE, SVGA video, and Fast-Wide SCSI-2 Controllers, leaving the EISA expansion slots available for customer use.

Features Supported by Option Families

Fibre Channel Storage Systems

Fibre Channel is the next generation in storage technology combining the reliability and low latency of a serial channel with the flexibility and connectivity of a network. The result is a 100 MB/s storage network that supports simultaneous transfer of many different data protocols, including SCSI, IPI and IP. Compaq is one of the sponsors of the American National Standards Institute committee responsible for developing the Fibre Channel standards. Over two-thirds of the storage industry have adopted these new standards as an enabling technology for high-availability storage networks and server clusters.

With Compaq Fibre Channel Storage Systems, customers can build highly scalable and modular storage architectures using Compaq Fibre Channel Host Controllers, Fibre Channel Arrays, and Fibre Channel Hub 7 Modules. The Fibre Channel Host Controller is the Fibre Channel Arbitrated Loop (FC-AL) host interface enabling users to attach multiple storage devices to a single PCI or EISA host slot. The RAID functionality and disk drives are contained in the Fibre Channel Arrays. This provides simultaneous scalability of capacity, processing power, and cache. The Fibre Channel Hub 7 Module can connect multiple devices to the FC-AL, providing a very high degree of connectivity and simplicity of storage growth.

Fibre Channel Storage Hub 7

The Compaq Fibre Channel Storage Hub 7 is a seven port hub that creates a 100-MB/s Fibre Channel Arbitrated Loop (FC-AL) through its internal wiring and logic. With the use of the Fibre Channel Storage Hub 7, a Fibre Channel Host Controller occupying a single expansion slot can control up to six Fibre Channel Arrays for a total storage capacity of 873.6 GB.

Fibre Channel Host Controller

The Compaq Fibre Channel Host Controller is a high-speed interface that provides connectivity between the server and up to six Fibre Channel Arrays. It is available in either PCI or EISA versions. The Fibre Channel Host Controller/P is a PCI bus master device. The Fibre Channel Host Controller/E is for use in servers equipped with only EISA expansion slots, or with a server that has a majority of EISA bus slots. It takes advantage of the EISA architecture by performing 32-bit bus-mastering burst transfers. Both the PCI and EISA versions require installation of a gigabit-interface converter (GBIC) to the I/O port before the multi-mode fiber is connected.

Fibre Channel Arrays

A Fibre Channel Array is an external drive enclosure containing a Fibre Channel Array Controller, disk drive housing, fan assemblies and a power supply. A single Fibre Channel Array accommodates up to eight 1.6-inch or twelve 1.0-inch Wide-Ultra SCSI-3 drives. As Table 10 shows, an individual Fibre Channel Array can provide a total capacity of 145.6 GB.

Table 10 : Individual Fibre Channel Array Capacities

Maximum Number of Drives	Drive Size (in inches)	Native Capacity per Drive (Gigabytes)	Maximum Total Capacity (Gigabytes)		
			RAID 0	RAID 1	RAID 4 or 5
8	1.6	18.2	145.6	72.8	127.4
8	1.6	9.1	72.8	36.4	63.7
12	1.0	9.1	109.2	54.6	100.1
12	1.0	4.3	51.6	25.8	47.3

Fibre Channel Array Controllers

The Fibre Channel Array Controller is an intelligent Fibre-Channel-to-SCSI array controller integrated into the Fibre Channel Array. The controller is based on the Compaq SMART-2 Array Controller technology, and comes with two Wide-Ultra SCSI-3 channels. Each channel can transfer data at 40 MB/s for 80 MB/s combined potential throughput. The Fibre Channel Array Controllers are capable of utilizing Wide-Ultra SCSI-3 drives, Fast-Wide SCSI-2 drives, or Fast SCSI-2 drives, which allow customers to configure their storage subsystem using existing drives.

All of the features listed below for the SMART and SMART-2 Array Controllers are also available on Fibre Channel Array Controllers.

SMART and SMART-2 Array Controllers

The SMART (SCSI Managed Array Technology) and SMART-2 Array Controllers are comprehensive PCI or EISA intelligent array controllers that combine configuration flexibility and intelligent storage management to ensure continuous high-performance access to network data.

Smart Array 3100ES

Max storage numbers for Smart 3100 ES are based on the use of 4.3-GB drives for the SMART controller and 18.2- GB drives for the SMART-2 controllers.

The ProLiant 7000 Pentium II Xeon model now includes the Smart Array 3100ES Controller - providing both high performance and ease-of-use features. The Smart Array 3100ES controller offers 3 Wide Ultra SCSI-3 channels, allowing a single controller to support all 3 internal hot plug hard drive cages in the new ProLiant 7000 and ProLiant 6000 models. Since all three drive cages run off the same RAID engine, all 18 internal hot plug hard drives can be configured as one 218GB array.

Additionally, the Smart Array 3100ES includes a design that is optimized for new models of the ProLiant 7000 and 6000. The new design allows the Wide Ultra SCSI-3 hard drive cages to be directly connected to the I/O board itself, not the array controller, without the use of interconnect cables. This means much easier PCI Hot Plug usage, and the elimination of cumbersome loop back cables used on earlier ProLiant 7000 and 6000 servers. Finally, with a robust 64MB of read/write cache, the new controller offers higher performance than the SMART-2DH. The Smart Array 3100ES is a standard feature on the new ProLiant 7000 Pentium II Xeon model.

Smart Array 3200

The Smart Array 3200 Controller marks the introduction of 80 MB/s Wide Ultra2 SCSI protocol into the Compaq server family. Compaq increases the performance of this new array controller by increasing the on-board accelerator cache from 16 MB to 64 MB. When used with Compaq Wide-Ultra2 internal hard drives, the Smart Array 3200 Controller can attain maximum data

transfer rates of up to 80 MB/s per channel, or 160 MB/s total. The Smart Array 3200 controller is compatible with Compaq PCI servers.

The Smart Array 3200 Controller continues to deliver the data availability and management features required to increase business productivity and lower the customer's total cost of ownership. The controller supports up to 15 disks per channel, enabling higher capacities with future high-density enclosures. The Smart Array 3200 Controller is based on the field proven SMART-2 intelligent architecture which enables truly breakthrough capabilities for managing high performance storage.

Table 11 lists the SMART and SMART-2 Array Controllers and some of their hardware features.

Table 11 : Compaq Array Controller Comparison

Controller Name	Bus	Cache	Max Drives	SCSI Support	Max Storage	RAID levels
SMART	EISA	2 MB Mirrored (4 MB total), write only, battery backed	14	Fast SCSI-2	60 GB	0,1,4,5
SMART-2/E	EISA	4 MB ECC memory read/write, battery backed	14	Fast-Wide SCSI-2	254 GB	0,1,4,5
SMART-2/P	PCI	4 MB ECC memory read/write, battery-backed	14	Fast-Wide SCSI-2	254 GB	0,1,4,5
SMART-2DH	PCI	16 MB ECC memory read/write, battery-backed	14	Wide-Ultra SCSI-3	254 GB	0,1,4,5
SMART-2SL	PCI	6 MB ECC memory read-only (4 MB accessible)	7	Wide-Ultra SCSI-3	127 GB	0,1,5
Smart Array 3100ES	PCI	64 MB ECC memory read/write, battery-backed	18	Wide Ultra SCSI-3	218 GB	0,1,4,5
Smart Array 3200	PCI	64 MB ECC memory read/write, battery-backed	28	Wide Ultra2	510 GB	0,1,4,5

Array Accelerator Cache

Array Accelerator Cache is disabled when implementing Recovery Server Option or Online Storage Controller Recovery Option in order to preserve data integrity during failover events.

A write cache on the SMART family of controllers improves performance when writing to the drive array. The cache can accept data from the server at maximum PCI or EISA bus burst rates while writing to the array(s). The size of the cache varies from 4 MB to 64 MB, depending on the specific model of the controller. This cache has parity check bits added to ensure integrity, and battery backup protects the cache on the controller. Fully charged batteries will preserve data in the cache for up to 96 hours.

Array Accelerator Tracking

Monitors the Array Accelerator Cache battery status and memory integrity.

Array Performance Monitor

Monitors key parameters and provides information for proactive system planning.

Automatic Data Recovery (Storage Automatic Reconstruction)

After you replace a failed drive in a RAID 1, RAID 4 or RAID 5 array, Automatic Data Recovery reconstructs the data and places it on the replaced drive. This allows a rapid recovery to full operational performance without interrupting normal system operations. This feature is implemented at the hardware level and operates independent of the operating system.

Auto Reliability Monitoring (ARM)

ARM is a background process that scans hard drives for bad sectors in fault-tolerant logic drives. ARM also verifies the consistency of parity data in drives with Data Guarding (RAID 4) and Distributed Data Guarding (RAID 5). This process assures that you can recover all data successfully if a drive failure occurs in the future. ARM operates only when you select Drive Mirroring, Data Guarding, or Distributed Data Guarding.

Bus Master Transfers to System Memory

The SMART controllers are bus master devices that take control of the EISA or PCI bus during high-speed transfers. This allows the system process to handle application processing or other types of tasks while data transfer is in process. The Intelligent Array Engine on the controller buffers the data from the drives before transferring it to system memory. Bus master high-speed transfers are particularly important when the supported models are used in conjunction with multiple expansion boards, such as network interface controllers.

Concurrent I/O Request Servicing

SMART Controllers use Intelligent Array Engines (IAE) to service multiple requests concurrently. The first IAE provides parallel control and data access to multiple drives. High-speed transfers are routed directly to main system memory to improve overall performance. During this time the second IAE optimizes the order in which instructions execute. For example, if a user requests data that resides on the first drive and another user requests data that resides on the second drive, the controller can deliver both pieces of data concurrently.

Data Striping

Data striping is a customized data distribution process that optimizes the storing arrangement of data across multiple physical disk drives organized into a logical drive. Data striping enhances the way the operating system requests data.

Drive Parameter Tracking

Drive Parameter Tracking monitors more than 15 operational parameters and functional tests on the drives. This includes parameters, such as, read, write, and seek errors; spin-up time; and "cable off." Functional tests, such as, track-to-track seek time, one-third stroke, and full-stroke seek time are also performed. Drive Parameter Tracking allows you to detect drive problems before they cause the drive to fail.

Drive Roaming

Groups of drives representing arrays maybe moved to other systems without regard to drive sequence installation.

Dual-Channel Capabilities

Dual-channel SMART Array Controllers (SMART, SMART-2/E, SMART-2/P, and SMART-2DH) contain two SCSI buses (ports) that support up to seven drives each. The internal and external connectors reside on separate SCSI buses.

Dynamic Sector Repairing

Dynamic Sector Repairing is the process by which the controller automatically remaps any bad sectors it detects, either during normal operation or during Auto Reliability Monitoring.

Intelligent Array Engines

Processing tasks are divided between two engines; working simultaneously, one engine generates fault tolerance information and manages data flow while the other prepares and sorts array storage commands.

Interim Data Recovery

If one of the drives in a RAID 1, RAID 4, or RAID 5 array fails, the server continues to operate in interim data recovery mode. While operating in this mode, the server continues to process I/O requests, but at a reduced performance level. This feature allows the server to remain functional until the failed drive can be replaced and fault tolerance restored.

Online Capacity Expansion

Simplifies storage management by allowing online addition of more storage in RAID configurations. This allows system administrators to extend the capacity of their arrays without the need to back up, reconfigure, and restore during the expansion.

Online Spares

Online Spare drives allow SMART controllers to automatically recover from drive failure in RAID 1, RAID 4, and RAID 5 arrays. When one of the drives in an array fails, the controller replaces the failed drive with the online spare and routes all data bound for the failed drive to the spare.

Optimized Request Management

SMART controllers reorganize the I/O request queues to optimize performance.

Performance Tuning Tool (PTT)

Aids the MIS professional to adjust array stripe size and cache memory allocation to optimize and tailor performance for an application.

ProLiant Storage System

The ProLiant Storage System is a drive-expansion enclosure that offers higher storage density, high-availability and selective fault tolerance. This product is intended for systems running business-critical applications that require high availability, excellent serviceability, and large storage capacity. Table 12 lists the ProLiant Storage Systems and some of their hardware features.

Table 12: ProLiant Storage Systems Compared

Product Name	Max Drives	SCSI Support	Max Storage	Hot-Pluggable Components
ProLiant Storage System	7	Fast-Wide SCSI-2	63.7GB	Drives
ProLiant Storage System /F	7 (single bus) 8 x 1.6" (dual bus) 12 x 1" (dual bus)	Fast-Wide SCSI-2	127GB (single bus) 145GB (dual bus) 72.8GB (dual bus)	Drives Fans Power Supply
ProLiant Storage System /U	7 (single bus) 8 x 1.6" (dual bus) 12 x 1" (dual bus)	Wide-Ultra SCSI-3	127GB (single bus) 145GB (dual bus) 72.8GB (dual bus)	Drives Fans Redundant Power Supplies

Automatic SCSI Identification

Automatically sets the SCSI ID on each drive to prevent SCSI ID conflicts.

Internal Duplexing (optional)

This feature allows the SCSI bus within a ProLiant Storage System to be divided into two short buses, providing the ability to support connections from two mass storage controllers. This improves system reliability if a drive or controller fails.

Keylock

Secures physical access to the disks in a ProLiant Storage System and protects critical data.

Thermal Tracking

Thermal tracking notifies the user when the temperature inside the ProLiant Storage System reaches 50°C. The warning is passed on to the operating system by the controller. If the user does not act, the 60°C thermal-protection circuitry causes the power supply to shut down.

Appendix A - Glossary

In this section, the features and options are listed alphabetically. Detailed feature descriptions are provided in this section.

Administrative Password

Prevents changes to the configuration unless the password is entered.

Advanced Network Control Utility

The Advanced Network Control Utility provides the ability to merge two similar network controllers into a controller pair. In such a pair, one controller is the active controller, and the other remains in standby mode. If the active controller fails, all network traffic is switched to the backup controller. In systems that support PCI Hot Plug technology, a failed controller can be replaced and the controller pair restored to complete redundancy without shutting down the system.

Array Configuration Utility

The Array Configuration Utility is a graphical user interface that simplifies array configuration and facilitates online capacity expansion. There are two versions of the Array Configuration Utility; one is run from bootable diskettes and the other is run online from the operating system. Each offers the ability to manage the arrays for any of the SMART, SMART-2 and Smart Array controllers.

Asset Tag Number

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

Automatic Server Recovery (ASR)

In case of a critical hardware or software error, Automatic Server Recovery allows the server to

1. reboot to either the operating system or Compaq utilities installed on the fixed disk *System Partition*
2. call the administrator
3. report the problem

ASR provides a cost-effective means of minimizing unplanned downtime since automatic reboot of the server brings users back on line with minimal interruption of service.

The Automatic Server Recovery feature consists of three elements:

- Hardware integrated onto the system board that, with the assistance of an operating system driver, detects when a server has malfunctioned and consequently resets the system.
- Server failure notifications that send a pager alert to notify a system administrator of a server malfunction.

- Remote capability to reboot to the operating system or to Compaq utilities in order to run diagnostics and reconfigure remotely.

Automatic Server Recovery-2 (ASR-2)

ASR-2 is a superset of the functionality provided by ASR. ASR-2 adds the environmental recovery features: thermal shutdown and UPS shutdown.

Board Release Levers

Board Release Levers are used to secure and release adapters, allowing quick access to modular, removable components without the need for tools. When opened, the levers disable the power to the associated slot.

Boot Block ROM

A read-only section of the ROM, which has a fail safe code, to make sure you can always boot a minimum system—even when the ROM code becomes corrupted. It ensures that you can always boot to a ROMPaq diskette to restore the ROM.

CD Lock

CD Lock provides a means of disabling CDROM access. This enables the administrator to inhibit the use of the CDROM for unauthorized software loading.

CDROM Boot

Many Compaq servers provide the option of booting from the CDROM, which greatly simplifies the process of initial software load by eliminating the need to use floppy diskettes.

Compaq Insight Manager

Compaq Insight Manager is an intuitive systems management tool delivering fault, performance, and configuration management for Compaq servers and desktop clients. The management software consists of Insight Manager, which runs on the management console and the operating system specific Insight Agent, which runs on the server or managed desktop client.

The optional Compaq Remote Insight Board provides an OS-independent remote connection to a managed server, allowing a remote PC to display all phases of server activity (including POST sequences and OS load) without loss of connection. In addition, the administrator can use the Remote Insight Board to perform remote reboots and to obtain alphanumeric or digital pages when an alert occurs.

Compaq Insight Management software follows a client-server architecture. The "front-end" management application, such as Insight Manager, delivers management capabilities to the user in an intuitive, easy-to-use manner. Meanwhile, the "back-end" software, Compaq Insight Management Agent, runs on the server providing access to the advanced hardware technologies that make server management possible.

Insight Agents check fault and performance indicators for the server hardware and options, providing the information in the form of a Management Information Block (MIB). Insight Agents also collect asset information and component failure information, making these available to administrators even when the server is down or otherwise inaccessible to the network.

Management information is passed to Insight Manager through the Simple Network Management Protocol (SNMP), the industry standard for management information communication. This

standards-based management scheme also allows SNMP-based management platforms to monitor Compaq Server Management data.

Cluster Verification Utility

Aids administrators in diagnosing their setup to determine if it is suitable for use with the Microsoft Cluster Service (MSCS).

Configurable Boot Order

Compaq servers provide the option of setting a system configuration parameter that determines which mass storage controller services the boot device. The *Controller Order* parameter, which is available for every mass storage controller installed in a server, is accessible through the Compaq System Configuration Utility.

Configuration (NVRAM) Lock

When locked, non-volatile memory cannot be modified, which disallows configuration changes.

Corrected Error Log

Contains the date, time, frequency, and unique information about errors that have automatically been corrected by various server subsystems. It allows quick determination of the type and frequency of corrected errors. For ProLiant 1500s, this log contains error information about corrected ECC memory errors, including which SIMM is producing the errors. This log is readable through Compaq Insight Manager and Diagnostics.

Critical Error Logging

Critical Error Logging records catastrophic errors, such as non-correctable memory, expansion board and expansion bus attribution errors. After a critical error occurs, the system ROM indicates on boot up that a critical error has occurred, and prompts you to run Compaq Utilities. The critical error log contains the time and date of the error. When a critical error is logged, the server can notify you when it reboots. The critical error log allows quick correlation of server errors and their causes.

Diskette Drive Control

Enables and disables the diskette drive(s). No read, write or boot functions are available when the diskette drive is disabled.

Diskette Write Control

Enables and disables diskette write functions. Boot and read functions are still available when diskette writing is disabled.

DOS CPR Utility

Installs minimal MS-DOS on a FAT-formatted partition with Microsoft Windows NT already installed and without disabling the Windows NT boot environment.

Drive Firmware Upgrade

To keep drives operating at peak capabilities; Compaq introduced Drive Firmware Upgrades as a means of allowing administrators to install the latest firmware revisions on their Compaq disk drives.

ECC Memory

Error Checking and Correcting (ECC) memory enables detection and correction of all single-bit memory errors, and the detection of all 2-bit and 3-bit memory errors, and most 4-adjacent-bit memory errors. This ensures that common memory errors can be corrected without interrupting system operation. More severe errors, such as, the loss of an entire 4-bit DRAM are detected quickly.

EISA Bus Utilization Monitor

Tracks and graphs utilization of the EISA bus.

Failure/Status LEDs

Most Compaq hardware products include LEDs used to indicate device status and to alert the customer of any device failure. Some examples of the products that incorporate these LEDs are server systems, storage systems, disk drives, network interface cards, and even PCI Hot Plug slots. In general, a solid green LED indicates normal operation, flashing green indicates a change of status or activity, solid yellow indicates that some attention is required, and red indicates device failure.

Fan Detect and Shutdown

This feature of ASR-2 allows the operating system to detect when the fan(s) of the system fail. In order to prevent a potentially serious degradation of thermally sensitive components, the server may be shut down automatically. Accompanying data in the log indicates whether an auto-shutdown sequence is invoked by the operating system.

Fibre Fault Isolation Utility

Verifies the installation and operation of a new or existing Fibre Channel Storage System. The utility displays all of the devices that are properly logged onto the fibre channel arbitrated loop and tests for link errors within the loop.

Flashable ROM

Flashable ROMs are included in all of the newer Compaq servers. They allow the customer to download and install the latest versions of firmware (ROMPaqs) at no cost. This ensures that customers have access to the latest enhancements without the need for service calls.

Front Bezel Key Lock

The external key lock protects the removable media components of the server and provides an additional layer of security for the internal components, such as, the memory and CPU(s).

Graphical Remote

Graphical remote enables a graphical view of the Windows NT console to be displayed on the remote console when accessing the Remote Insight Board in a Windows NT server. This feature requires the use of graphical remote console software such as Carbon Copy and pcAnywhere32.

Hot-Plug Fans

Hot-plug fans offer Compaq customers the ability to replace a fan without shutting the system down.

Hot-Pluggable Drives

Many Compaq servers are equipped with hot-pluggable SCSI drive cages, which permit you to insert and remove SCSI drives from the system while the system is running. This allows you to replace failed drives in RAID disk arrays without shutting down the server.

Hot-Plug Keyboard

Hot-plug keyboards provide the ability to add or replace a keyboard without the need to reboot.

Info Messenger (Spinner)

Compaq Info Messenger is a proactive Compaq Internet service that provides customers the latest information that is relevant to their specific computing environments. Compaq Info Messenger searches the Compaq website, collecting the information that the customer wants and alerting them via e-mail that it is available on a customized web page on Compaq Access.

Insight Manager Auto Alerts

With Compaq Insight Manager, you can designate who will be "on call" for any Compaq server or subsystem performance issue. If Insight Manager detects an unacceptable operating parameter, it sends out pager alerts to those you specify who, in turn, access the analysis capability of Compaq Insight Manager to obtain a diagnosis and recommendation. The system administrators can respond to and resolve your server issue, even before you know it exists. This feature is part of Compaq Insight Manager 2.0 or later.

Integrated Management Display (IMD)

The integrated LCD panel is installed on many of the latest Compaq servers. The management display provides information about events stored in the Integrated Management Log that occur during Power-On Self Test (POST), as well as system events during normal operation. In addition to event-specific information, the system can be configured to display administrative contact information, as well as system name and address, which are entered through the Integrated Management Display Utility.

Integrated Management Log (IML)

The contents of the log are accessible through the Integrated Management Log Viewer (IMLV), found as an applet in Control Panel and as an application within the Compaq System Management Tools folder. The Compaq Integrated Management Log Viewer allows you to view the IML of any machine that is running the Compaq Remote Monitor Service.

Integrated Remote Console (IRC)

Compaq developed Integrated Remote Console to allow out-of-band management capabilities—remote console and remote reset—independent of the state of the network operating system. With the IRC function, an administrator has full-text-mode video and keyboard access even if the OS is down. The administrator has the ability to access the server, perform diagnostics, reset the system, watch the reset process remotely, and view ASR reset sequences—regardless of whether the server OS is online or offline.

IRC complements Insight Asynchronous Management by providing an easy-to-use remote console feature while the OS is up. IRC interfaces with Insight Asynchronous Management so that both capabilities are available to the customer in an out-of-band, online situation.

IRC gives a customer the ability to access remote servers, monitor and diagnose problems and protect data with security features, through its combination of hardware and firmware integrated onto the server motherboard. The seamless hardware-based remote console, hardware-based remote reset, and reset-sequence replay features are available to the customer—whether the servers are in multiple remote locations or grouped in a centralized site, yet still away from the administrator. These features, discussed more fully in the IRC feature section, are independent of the state of the OS.

However, some customers may need even more capabilities than are present with the new IRC function. Compaq also offers the optional Compaq Remote Insight Board for customers that require access and alerting at all times, regardless of the state of the server hardware or OS.

Integration Maintenance Utility

The Compaq Integration Maintenance Utility for NetWare is a tool designed to add or update the latest revisions of software and Compaq utilities on a NetWare server without having to reboot. The Integration Maintenance Utility eases the administrative task of keeping software on the server consistent across the network. It allows software installs and updates from either the integration server on the network or from CDs provided by Compaq.

Intelligent Power Switch

The Intelligent Power Switch gives the user an advanced level of flexibility in powering down the server. Intelligent Power Switch is configured using the Compaq Power Down Manager utility, and can be configured to behave in one of three ways:

1. Do nothing when the power switch is turned off (Power Down Lock)
2. Power down as soon as the power switch is turned off
3. Graceful shutdown of the operating system when the power switch is turned off

The utility can also be used to set a delay in seconds between the time the power switch is turned off and the time the configured action occurs.

Keyboard Password

The keyboard password is used to lock out the keyboard to prevent unauthorized access to Compaq servers. This effectively prevents logins or command entry until the proper password is entered.

Long Operating System Life Support

Compaq understands that customers cannot always upgrade all of their servers to the latest release of operating systems as soon as they become available. To support those customers, Compaq continues to release support software and driver updates for less recent versions of operating systems, such as Windows NT 3.51, long after the newer versions are released. This provides customers with the assurance that they can take advantage of the most recent advances in the drivers, firmware, and support utilities that Compaq releases.

Memory Deallocation

For unattended recovery, ASR-2 logs the error information to the Critical Error Log, resets the server, tests all memory, and automatically deallocates any bad memory blocks that it finds.

Memory Fault Recovery Tracking

This feature tracks the operations of the memory subsystem for uncorrectable errors and enables rapid recovery from actual memory failures.

Monitor Utility for Smart Array (NWPA)

Monitor Utility for Smart Array is a server utility that continuously displays the physical drive status for drives connected to one or more Compaq array controllers. It also provides an audible notification when a drive failure is detected. The audible signal will continue until a key is pressed on the keyboard. This utility works in conjunction with the NWPA driver. The utility detects hot-plugged drives and other changes to array configurations.

Network Interface Fault Recovery Tracking

This feature tracks over 20 failure indication parameters, such as, alignment errors, lost frames, and frame copy errors of Ethernet and Token Ring network interfaces. The information decreases downtime by enabling diagnosis of network interface failures and is available via Compaq Insight Manager.

Network Server Mode

Network server mode allows system startups from hard disk or network server while the keyboard and pointing device are disabled. This provides security if the server operates unattended. In Network Server mode, the system will boot without asking for the Power-On Password. The Power-On Password must be enabled before you can enable Network Server Mode. The Power-On Password will remain in effect until Network Server Mode is deleted or disabled. If you attempt to boot from a diskette while Network Server Mode is enabled, you must enter the Power-On Password.

Online Configuration Utility for NetWare

Used to configure SMART-2 and Fibre Channel Array controllers

On-Line Recovery Server

On-Line Recovery Server is the implementation of the Recovery Server Option (RSO) in which two servers are paired and connected to a pair of independent storage environments. If one of the servers fails, the other server inherits the storage environment and workload of the failed server. For more information on Online Recovery Server, refer to the white paper entitled *Compaq On-Line Recovery Server* (document number ECG027/0598).

Online Storage Controller Recovery Option (OSCRO)

Online Recovery Server cannot be implemented in conjunction with Online Storage Controller Recovery Option (OSCRO), as both utilize the same type of switched interfaces to the storage environment, and the cable configurations are not compatible.

Compaq Online Storage Controller Recovery Option is the implementation of Recovery Server Option (RSO) that provides mass storage controller redundancy by merging two matched SMART-2 controllers into a controller pair. In such a pair, one controller is active, and the other remains in standby mode. Should a problem occur with the active controller, the I/O traffic switches to the standby controller without loss of data or interruption of service. Working in conjunction with RAID technology, OSCRO provides extended fault tolerance for mission critical servers. OSCRO is a natural partner for PCI Hot Plug technology. Together, OSCRO and PCI Hot Plug offer a means of keeping a server running and maintaining the fault tolerant status of the server without shutting the server down.

PCI Bus Monitor

Tracks and graphs utilization of the PCI bus(es). Part of the Compaq Insight Manager product.

PCI Hot Plug

PCI Hot Plug technology defines a new standard for high availability in Compaq servers by allowing removal and replacement of PCI controllers without shutting down the system. PCI Hot Plug is an extension of the *PCI Local Bus Specification.* Compaq PCI Hot Plug hardware isolates each hot plug slot from all other devices on the PCI bus. By offering slot-level control, Compaq provides great flexibility. Slot level isolation eliminates interruption to other components and applications using those components, enabling the system to continue performing useful work throughout the hot replacement.

PCI Plug and Play

Many Compaq products now support the Plug and Play standard for PCI devices, which offers a means of identifying a PCI device and the system resources it requires through the use of a ROM on the device.

Power Down Lock

Disables the power switch to prevent the server from being taken down accidentally. This feature is part of the Intelligent Power Switch functionality.

Power Down Manager

Allows you to define the behavior of the I_2C power switch of a server locally or remotely. Options include disabling the power switch and imposing a fixed delay between the pressing of the power switch and actual shutdown.

Power Line Monitoring

Provides information about voltage and current levels in Compaq power supplies.

Power-On Password

Prevents use of the computer unless the password is entered. (See also Network Server Mode.) During Automatic Server Recovery (ASR), the system will not prompt for the Power-On Password, allowing ASR to perform the necessary reboots in an unattended fashion.

Power-On Error Log

Records errors that occur during Power-On Self Test (POST). It allows quick determination of the cause of a server's failure to reboot. (See also Rapid Recovery Services)

Power Safe Modules

Power Safe Modules (DC to DC converters) ensure that proper voltage is delivered to critical operational components, including the processors, the I/O boards, and the PCI buses. There are two types of power safe modules: CPU board converters and I/O system board converters.

Power Safety Interlock

All ProLiant servers have a built-in interlock switch that automatically turns system power off when the case cover is removed. In addition to protecting the safety of customers by preventing

access to high energy components, this feature also protects thermally sensitive components by ensuring ideal air flow throughout the server. Although the Interlock switch does prevent access to the power supply, CPU, memory and some expansion slots, it does not prevent access to hot pluggable devices.

Power Subsystem Utility

The Power Subsystem Utility is a new system management driver user interface utility for NetWare that displays a redundant power subsystem status. In addition, the utility incorporates the Compaq Power Down Manager that allows configuration of the intelligent power switch.

Power Supply Viewer

Allows you to locally or remotely view redundancy information of I_2C power subsystems and statistics of individual power supplies.

Pre-Failure Warranty

Compaq Server products using Compaq Insight Manager 2.0 or greater are covered by the Compaq Pre-Failure Warranty. The Pre-Failure Warranty extends the advantage of the Compaq three-year limited warranty by providing coverage on many critical components, such as hard drives used in conjunction with SMART Array Controller, memory, and Pentium Pro processors before they actually fail. The Pre-Failure Warranty ensures that when customers receive notification from their monitoring software that a critical server component may fail, the component is replaced free of charge under the warranty. With the Pre-Failure Warranty, system administrators can proactively schedule downtime for maintenance and not interrupt critical business operations that rely on these enterprise servers.

Protected Power Switch

The protected power switch prevents the server from accidental shutdown due to incidental contact with the power switch cover. The switch is an oval, and in the center is a round second switch. The whole assembly can be popped out and rotated 180 degrees, making it so that only the inside switch can be operated.

QuickLock

Using the QuickLock hot key combination (**Ctrl+Alt+L**) disables the keyboard and pointing device without exiting the application. The application remains in view on the monitor screen, but you cannot access it. You can change the QuickLock hot key combination if the default combination conflicts with your application software.

RAID Online Expansion

RAID Online Expansion provides the ability to increase the size of a RAID array by adding a new disk to the array without destroying the data held in the array. RAID Online Expansion is an integral function of the Array Configuration Utility that is used to manage the arrays attached to SMART-2 Array Controllers.

Redundant Fans

Some of the newest Compaq servers are equipped with redundant fans that ensure proper airflow around temperature sensitive components in case of a single fan failure.

Redundant Hot Plug Power Supply

Newer Compaq servers have the option of being equipped with redundant hot pluggable power supplies. These servers can accept up to three power supply units. While all units are functioning, the power supplies work together, balancing the load between the active units. If a power supply fails, the remaining unit(s) pick up the load and continue operating. The system administrator can then replace the failed power supply without shutting down the server or impacting the other power supplies.

Redundant Power Modules

Up to three CPU board converters (Power Safe Modules) can be installed on each CPU board. This allows for two independent CPU board converters to service two independent CPUs, with the third acting as a redundant converter which operates only when one or both of the other two converters fails.

Up to two I/O system board converters (Power Safe Modules) may be installed on the system board. Both converters should be installed at all times to provide redundancy.

Redundant Power Supply

Some Compaq servers are equipped with multiple power supplies to ensure that the server continues operating even when a power supply fails.

Remote Alerts

Sends a pager alert to a designated individual via Insight Manager, ASR-2 or Remote Insight Board if potential problems are detected.

Remote Alpha/Numeric Paging

Sends alpha pager alert text to a designated pager number via Remote Insight/Insight Manager if problems are detected.

Remote Asset Management

Allows collection or setting of asset management information remotely by way of Insight Manager.

Remote Threshold Setting

Allows the system administrators to remotely set alert thresholds. These thresholds are used by Insight Manager and ASR-2 to determine when to send alert messages indicating that a problem is occurring with a server.

Remote Diagnostics

Analyze the condition of the server remotely, using Compaq Insight Manager or Remote Insight Board.

Remote Insight Board

Remote Insight Board offers complete hardware independence from the server, as it is essentially a "computer within a computer." Because the board has its own processor, memory, and battery backup, it can continue operating should the server have a hardware fault or lose power.

Because of the on-board battery back-up, the enhanced alerting features of Remote Insight Board (alphanumeric paging, Insight Manager alerts) are available at all times, even in the case of power outages.

Remote Insight provides seamless PPP integration so that the customer can move between Insight Manager/SNMP management and the resident remote console application without any loss of connection, regardless of server condition.

In addition, Remote Insight captures critical information through enhanced video sequence replay, which includes failure sequences as well as reset sequences. The enhanced abilities allow two generations of reset sequence data to be stored and preserved by the on-board battery during power outages.

The optional Remote Insight board offers the most complete out-of-band server management solution. If a server goes down due to a hardware fault, software fault, or even a power outage, the administrator can be alerted and can access Remote Insight to bring the server back up. More complete information about Remote Insight Board is available in the technology brief titled *Compaq Remote Insight Product Overview.*

Remote Updates to Compaq Support Software for Microsoft Windows NT

The Windows NT SSD version 2.01 (and later versions) for Microsoft Windows NT 4.0 Setup utility features two new interfaces with the ability to perform remote driver and utility installations, updates, removals, and configurations across a network. The Remote Setup feature uses a "push" implementation in which drivers and utilities are "pushed" from the local computer to the remote computer. This "push" implementation allows administrators to configure one or more remote computers connected to a network.

The two new types of interfaces and their features are the following:

- **Graphical User Interface (GUI)** provides a visual representation of NT SSD software components relative to hardware present in the system. The GUI allows you to install, update, and remove components through either an Express or Custom setup process. Custom is the default setup configuration. You can also perform both local and remote component modifications, however, only one computer at a time can be modified.
- **Command Line Interface (CLI)** allows you to install, remove, and update Windows NT SSD components via the command line. The CLI is useful for silent and batch installations or updates to software components. The batch ability allows for simultaneous update of software components on several computers. Command line activities are reported to a log file instead of to the screen.

The new Windows NT SSD Setup v2.01 is no longer constrained to the local machine. The options available for local setup are also available for remote setup. For more information, refer to the white paper entitled *Remote Driver and Utility Installation with Compaq Support Software for Microsoft Windows NT 4.0 (SSD) Version 2.01* (ECG031/0298).

Revision History Table

Stores board revision information in non-volatile memory. It logs the system board revision first, then logs other boards that support the Revision History Table, such as the SMART-2 Array Controller, Fast-Wide SCSI-2 Controller, and NetFlex-2 ENET-TR Controller. When you upgrade your server or add new expansion boards, the revision history table records 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.

Serial Parallel Interface Control

Unauthorized transfer of data through the integrated serial and parallel ports is blocked by this feature.

Server Failure Notification

Server failure notification, part of the ASR and ASR-2 functionality, sends a pager alert to notify a system administrator of a server malfunction.

Server Recovery Notification

Server recovery notification, part of the ASR-2 functionality, sends a pager alert to notify a system administrator of a server malfunction recovery.

SmartStart Compaq Integration Maintenance Utility

With SmartStart 3.0 Compaq introduced a new set of functionality, called Integration Maintenance, for effective setup and maintenance of Novell intraNetWare (NetWare 4.11), NetWare, and Microsoft Windows NT servers. Through Integration Maintenance, system administrators set up a server to act as the Integration Server that services the production servers.

The Compaq Integration Maintenance Utility is used to apply software updates from the Integration Server to the production servers.

SmartStart

SmartStart is the server configuration and software integration tool from Compaq that aids in the installation of Compaq servers by simplifying the process of loading the operating system and installing any specialized device drivers and support utilities.

Software Updates via Internet

Compaq offers updates of Compaq software to customers at no cost through easily navigated web pages. These updates are available for all of the operating systems Compaq supports. The web pages are updated regularly, ensuring Compaq customers always have access to the software and firmware needed to keep their Compaq systems running at peak effectiveness.

Standby Recovery Server

Standby Recovery Server cannot be implemented in conjunction with Online Storage Controller Recovery Option (OSCRO).

Standby Recovery Server is an implementation of the Recovery Server Option (RSO). With Standby Recovery Server, two servers are paired and connected to a single storage environment, and one of the servers is active while the other remains in standby mode. If the active server fails, the standby takes the place of the active server. For more information on Standby Recovery Server, refer to the white paper *Compaq Standby Recovery Server* (ECG026/0598).

Storage Automatic Reconstruction

Storage Automatic Reconstruction automatically reconstructs data to an online spare drive or a replacement drive if a drive failure occurs. To use the reconstruction feature you must have your drive configured for Drive Mirroring (RAID 1) or Distributed Data Guarding (RAID 5). Reconstruction reduces downtime by allowing rapid recovery to full system operation if a drive fails.

Storage Fault Recovery Tracking

Storage Fault Recovery Tracking tracks over twelve failure parameters—timeouts, spin-up, and self test errors—of the SMART-2 Array Controller, the Fast-Wide SCSI-2 Controller, and their attached hot pluggable drives. These parameters are used to accurately pinpoint failed storage subsystem components. They enable rapid recovery from controller or hard drive failures.

Support Software Update Utility

The Support Software Update utility is a new client/server application that will update NSSD drivers to a NetWare server. The CPQNSSU has the ability to gather a list of Compaq drivers loaded on the server, the built-in intelligence to decide if those drivers are current, and the option to update those drivers, local or remote. Currently the Compaq Support Software Utility does not support the installation of Novell SSD from diskette media.

Survey Utility

Survey Utility builds upon the service tool known as Inspect. Inspect has long been used from a service aspect to capture comprehensive hardware configuration information. The key advantage of Compaq Survey Utility over Inspect, however, is that it takes this comprehensive reporting functionality and now delivers it in an on-line format. The on-line capability means that customers with servers running business-critical applications will no longer be required to take their server off-line to collect the critical information needed during a service call. Not only can Compaq Survey Utility be run while the server is on-line, but also can be initially installed without ever having to reboot the server. This makes it truly an on-line service tool.

Compaq Survey Utility not only captures most of the hardware information that is gathered today by Inspect, but it goes a step further and gathers details about the operating system parameters (including NetWare NLMs loaded, NT Services running, and others). By combining hardware and software configuration capture, Compaq Survey Utility delivers a comprehensive view of the server with the ease and simplicity of a single tool.

Another key benefit of Compaq Survey Utility is its ability to identify recent configuration changes. Each time a configuration snapshot is taken it is stored in a file on the server. At the next snapshot interval, this latest file is automatically compared to the baseline configuration. Any significant changes that have occurred are highlighted and the output file is automatically updated to reflect the latest configuration, as well as differences relative to the baseline. Recent configuration changes are often the source of the problems that manifest on the server. The ability to quickly generate comprehensive configuration snapshot and highlight specific changes enables problem resolution time to be significantly reduced.

The information gathered by Compaq Survey Utility is accessible locally at the host server console. From the console, the administrator can initiate an updated snapshot, view the Survey Utility file online, and generate a new output file based on comparing different saved sessions. The output file can also be printed. In addition to user-initiated snapshots, the Survey Utility tool automatically generates and stores updated snapshots upon server reboot as well as at user specified time intervals. This automatic update mechanism helps to ensure that the latest information and change histories are always recorded and available when needed.

System Partition

The System Partition is a special partition created on Compaq disks by SmartStart. This partition contains diagnostic tools and utilities, including the System Configuration Utility. The System Partition varies in size from 2 MB up to about 36 MB, and is not directly accessible from

operating systems, such as Windows NT, without the use of the System Partition Administration Utility.

System Partition Administration Utility

The System Partition Administration Utility accesses and updates the System Partition.

System Serial Number

Compaq designed the backplane of the computer with an additional serial EEPROM. When the factory builds the computer, it is assigned the serial number. The factory burns the serial number into the EEPROM. The system serial number can be obtained during asset queries, both local and remote.

System Uptime Monitor (SUM)

Tracks the availability statistics of the system.

Temp Detect and Shutdown

This feature of ASR-2 allows the operating system to detect when the temperature of the system exceeds the caution level. Accompanying data in the log notes whether an auto-shutdown sequence is invoked by the operating system.

Temperature Monitor via I_2C

Utilizes Inter-Integrated Circuit (I_2C) bus technology to report temperature events for critical components.

Voltage/Current Monitoring

Tracks voltage and current changes with Compaq power supplies.

UnixWare NonStop Clustering

A highly-scalable clustered operating environment that enables a group of servers to operate as a single, robust computing resource. Its single system image (SSI) capability allows a cluster of servers to appear as if it is one single system, greatly improving manageability by allowing transparent access to all cluster resources. SSI also significantly reduces downtime as applications are automatically migrated among nodes, without disruption, when a node failure occurs.

Windows NT HAL Recovery

The NT SDD for Microsoft Windows NT 4.0 includes—as one of the available features—the ability to retain a redundant copy of the Windows NT Hardware Abstraction Layer (HAL) that is used if the default HAL becomes corrupt. This provides a means of recovering from what would otherwise be a catastrophic corruption problem without the need to re-install the operating system.

Appendix B - Industry Partnerships

Operating System Vendor Partnerships

Compaq has forged partnerships with the leading operating system vendors to provide customers with the assurance that the quality and features of Compaq products are fully integrated with the most popular operating systems. In this section we will examine the OS vendor partnerships and examine the ways those partnerships benefit Compaq, the OS vendor, and ultimately the customers.

Compaq/Microsoft Frontline Partnership

The principle goal of the Frontline Partnership has been to formalize the existing relationship that has existed for more than a decade between Compaq and Microsoft. This relationship enables both companies to expand joint efforts to accelerate the development of new technology and bring our customers and the computing industry to new levels of ease of use and integration.

The Frontline Partnership extends far beyond the walls of both companies' headquarters. Some of the key areas that the Frontline Partnership focuses on include:

- ***Joint Development****:* Compaq and Microsoft continue to work together closely in the development of innovative new solutions that deliver record-breaking performance and value.
- ***Technical Support****:* By providing joint training, technical tools, information databases and dedicated personnel, Compaq and Microsoft provide superior customer service and support to our mutual customers.
- ***Joint Marketing****:* Through joint seminars, shows, account briefings, communications and messaging, the Frontline Partnership marketing programs help communicate the value of the partnership to our customers.
- ***Joint Testing****:* Compaq and Microsoft solutions are tested extensively to ensure performance and reliability and offer our customers confidence in their choice of a Compaq/Microsoft solution.
- ***Joint Training****:* Compaq and Microsoft personnel are provided with sales and technical training to insure the proper level of expertise in communicating the advantages of our joint solutions. This training is provided to groups ranging from corporate technical support teams to field sales and engineering as well as our resellers and solution providers.

Compaq Novell Enterprise Computing Partnership

In 1989, Compaq created the market for networks by introducing the industry's first network operating system (NOS): Novell NetWare, and the first PC server: the Compaq Systempro. The integration of these two powerful, evolving technologies still dominates the marketplace today. Building on this foundation, Compaq and Novell are using standard Internet technology to turn traditional networks into powerful, easily manageable Intranets.

Compaq and Novell also have joined forces in a worldwide alliance that provides one of the most responsive, integrated approaches to technical support in the industry. Over the last decade, we have continually refined our escalation methodology and enhanced the reciprocal training of technical support staff. This ensures efficient resolution of compatibility issues, reduces

duplication of effort, and speeds issue resolution. The bottom line: when you need answers fast, Compaq and Novell deliver them.

Enterprise computing is entering a new era, and Compaq and Novell are engineering the shape of tomorrow today. With projects that support open solutions, interoperability and high availability, we will deliver solutions that are not yet possible with existing technology.

- Compaq and Novell support the JavaSoft initiative by Sun Microsystems. Novell provides a Java execution environment for intraNetWare and will enable NDS for the Internet so you will be able to reap the additional benefits of open standards technology.
- Compaq is driving the development of an open standards specification of PCI Hot Plug technology, which has brought to market the industry's first open, recognized hot-pluggable network and I/O controller boards. Novell fully supports this effort, which is based on open standards and will dramatically increase uptime for mission-critical environments.
- Compaq and Novell are working together to bring you clustering solutions that deliver unprecedented levels of scaleable performance and high availability.

Compaq and Novell have a long history as engineering and marketing partners, some of the more visible examples are:

- Joint development of SFT III introduces the first high availability solution
- SmartStart integration of NetWare 3.x, NetWare 4.x, and NetWare 5.x
- NetWare for Small Business 4.2 bundle
- NHA-S
- Novell is first to market with support for PCI Hot Plug
- Joint Marketing Funds

Table 13 : Compaq Novelll Partnership Engineering Milestones

Dates	Engineering Milestones
1988 – 1989	▪ EISA Solutions (NE3200, Drive Array, OS Configurations, >16MB RAM, etc.) ▪ Expanded Disk Capacity for NetWare 3.x
1989 – 1990	▪ Disk Optimizations and Fault Tolerance Options ▪ Hardware striping for optimization ▪ Software mirroring ▪ Highly optimized, modular SCSI software architecture
1990 – 1991	▪ Server Fault Tolerance Features and High Speed Mirrored Server Link ▪ Asynchronous Point to Point Protocol Solution ▪ Automatic Server Recovery ▪ SmartStart Novell NetWare Products ▪ Networking devices characterization and optimization for Compaq drivers and Novell ODI stack
1994 – 1996	▪ Multiprocessing Architecture & Optimizations ▪ Hardware assisted tool for optimization analysis
1996 - Ongoing	▪ Hot Plug PCI, I_2O, Clustering

Compaq SCO Partnership

Compaq understands that many customers have a significant investment in UNIX that requires continued support and expansion. The Compaq SCO Partnership enables Compaq to work closely with the industry leading Intel-based UNIX developer to ensure that the latest Compaq products and features are made available to UNIX environments. Through close cooperation with SCO,

Compaq has even released some product enhancements in the UNIX environment before they became available in any other environments.

The Compaq SCO Partnership is committed to providing customers with all the benefits of a flexible, easily deployed, enterprise-level UNIX system on industry-standard servers at price points significantly lower than those of RISC UNIX systems.

The relationship between Compaq and SCO includes several key initiatives that benefit customers, including:

- **Joint marketing:** Combines worldwide joint marketing funds to deliver joint seminars, trade show participation, account briefings, communications, and more. For example, Compaq sponsored SCO's Quarterly Business Briefing seminars focusing on Oracle database solutions for VARs. This program covered 28 cities in the summer of 1998.
- **Joint engineering and development:** Focuses on strategic planning and development of integrated solutions with faster time to market, easier implementation and maintenance, enhanced availability, manageability and scalability, and improved price-performance. For example, SmartStart allows customers to get their SCO UNIX systems up and running quickly and effortlessly; and Insight Manager controls hundreds of server parameters and alerts customers to potential system failures. In addition, Compaq and SCO are working together on such leading technologies as PCI Hot-Plug, UNIXware clustering, and intelligent I/O.
- **Joint service and support programs:** Dedicated personnel at Compaq and SCO share technical tools and information to better help customers with technical issues. Compaq and SCO joint solutions are supported through their Technical Support Alliance, Engineering Services Agreement, and Service and Support Programs provided by the Compaq worldwide network of service partners. On March 25, 1998, Compaq received Novell's first annual Support Connection Service Excellence Awards that recognizes Novell's allies who have made service excellence an integral part of their business. Compaq was the only OEM provide of the 18 recipients.
- **Joint testing:** Establishes a program in which SCO and Compaq solutions are tested extensively in a laboratory environment before customer delivery, ensuring that customers get highly integrated, fully tuned solutions that meet their business needs.

Compaq is the largest supplier of SCO UNIX systems, with a greater than 30 percent share of the worldwide SCO UNIX market. SCO has a 41 percent share of the worldwide UNIX server market and over 80 percent of the UNIX on x86 worldwide server market.

Application Vendor Partnerships

Compaq understands that applications are the elements that make computers useful. Compaq has formed partnerships with strategic applications vendors to provide customers with a high degree of support and reliability when implementing those applications on Compaq products. In this section we examine some of those partnerships and see how they benefit customers.

Compaq Baan Partnership

Compaq Computer Corporation has partnered with the Baan Company to deliver an industry-standard Enterprise Resource Planning (ERP) solution for the Microsoft Windows NT Server environment. This solution features performance with new levels of integration, affordability and ease of implementation. Through committed resources and joint engineering efforts, Compaq and

Baan have produced a predefined, integrated solution that is tested, optimized and ready to go--increasing your return and decreasing your costs of ownership substantially.

Compaq combines high availability, record TPC-C benchmark numbers, and tools for intelligent integration, management and security. Compaq and Baan are closely aligned to deliver a tightly integrated BAAN IV solution optimized for the Compaq platform. Compaq products and tools and the support of dedicated, highly trained channel partners are focused on making the Compaq Baan solution work for you.

Compaq and Baan have joined forces to ensure customers receive optimized enterprise computing solutions. Some of the highlights of the partnership include:

- Compaq Baan International Competency Center in Barneveld, the Netherlands is exclusively focused on the Windows NT Server platform and provides the following services:
    - reference platform definition, validation and certification
    - platform integration engineering, performance testing and benchmarking
    - platform sizing, configuration and installation tools
    - proof-of-concept or custom platform testing
    - pre-sales consulting and engagement support
- Compaq, Baan and Microsoft are working closely together to provide customers with Baan software solutions that are optimized for the Windows NT environment running on Compaq servers.
- Systems management tools like Compaq SmartStart, Compaq Insight Manager and Integration Server provide enterprise class manageability.
- Compaq servers have been designated the Windows NT development and deployment platform of choice for Baan, the official reference platform for Intel certification for BAAN IV, and the sole development platform for Baan's NT clustering.
- Unified global support from employees who have been cross-trained on Compaq platforms and Baan applications for improved customer satisfaction.

The Compaq Baan partnership is committed to providing customers with proven solutions that offer the reliability and affordability needed in today's ever-changing computing environments.

Compaq Cheyenne Partnership

Building upon the significant success of the existing OEM relationship between Compaq and Cheyenne, the companies have announced an Enterprise Storage Management Alliance. This strategic alliance aims at providing customers with the power of seamlessly integrated and optimized enterprise storage and storage management solutions.

Compaq and Cheyenne will provide robust storage management solutions with manageability, automation, scalability, availability and performance characteristics that will enable customers to migrate from proprietary systems to standards-based open systems. The two companies will provide integrated "end-to-end" storage solutions for workstations and servers in the emerging distributed enterprise. Jointly targeting the market for application storage management, Compaq and Cheyenne will deliver storage and storage management solutions that are vertically integrated with databases, applications, web servers and messaging systems.

Compaq Lotus Partnership

Lotus, provider of the world's most popular groupware products, and Compaq, the leading provider of server platforms in the Lotus environment, work together to optimize industry-standard Web-based technologies. Through cooperative testing and engineering, these industry leaders provide the proven solutions to businesses' Internet and intranet needs.

- Exceptional compatibility, reliability and performance of combined hardware/software offerings through cooperative development, testing and certification programs.
- Low total cost of ownership through fast, easy deployment, integration management, high availability and scalability.
- Unparalleled performance and reliability, as demonstrated daily in thousands of customer sites around the world.
- Industry-standard solutions that easily integrate with existing systems.

Compaq servers are the leading platforms for Lotus installations. They also deliver the lowest cost per user and support the greatest number of mail users.

Compaq Netscape Partnership

Netscape, a pioneer and market leader in software for the Internet, provides proven solutions for Web hosting, e-mail, and collaborative communications. Together with Compaq, they offer powerful, integrated Internet and intranet solutions for the fast and transparent exchange of information. This partnership fully leverages the power and flexibility of industry standards and delivers solutions that easily integrate into existing systems.

Compaq Oracle Partnership

Compaq and Oracle have been working together since 1989 to deliver high performance solutions by optimizing Oracle databases for Compaq platforms. The results of this work are apparent today as evidenced by the just-released world record TPC-D performance benchmark achieved by the recently introduced Compaq ProLiant 6000 server running Oracle Enterprise Server 7.3.3 on Microsoft's Windows NT. Compaq is the only vendor with two 100GB TPC-D results under $1,000,000 and is the only vendor to have two 100GB TPC-D results using Windows NT. This performance demonstrates that Compaq servers running Oracle for Windows NT provide an ideal solution for companies implementing data marts.

Compaq, the leading server provider, and Oracle, the leading database provider, work together to develop low-cost, high-performance, highly available database solutions that you can deploy with confidence. A major investment was made with the creation of joint products division to better address the customer needs. The Compaq/Oracle products division is comprised of engineers, technical analysts and performance experts to provide a streamlined solution, jointly developed, tested and optimized for easy deployment.

Compaq and Oracle offer unified worldwide customer support for their products. Support analysts from both companies are cross-trained on each other's products. This allows customers to deploy Compaq/Oracle solutions with the confidence of knowing that these products are jointly supported. Last year, Compaq and Oracle reinforced this commitment by signing a Global Technical Support Agreement (GTSA), designed to meet customers' growing distributed enterprise computing needs by allowing them to confidently deploy mission critical applications for high availability.

Compaq SAP Partnership

Compaq and SAP work closely together to offer a tightly-integrated, tested and optimized R/3 platform. Compaq R/3 solutions offer customers a low TCO with a high level of service and support.

Compaq delivers all the components -- powerful ProLiant platforms, strategic alliances and programs with SAP and Microsoft, and customizable service and support programs -- necessary to meet the most demanding business-critical requirements of customers deploying R/3 solutions on Windows NT.

- ***Competency Centers***: Located in Houston, Walldorf, Munich and Tokyo, Compaq SAP Competency Centers are dedicated to testing, piloting and optimizing R/3 on Windows NT solutions. Compaq has also supplied systems and expertise to assist its partners worldwide in establishing their own SAP Competency Centers, including the new Microsoft/SAP Competency Center in Redmond, WA.
- ***Customized Service and Support***: To maximize application availability, Compaq provides world-class service and support programs that customers can tailor to their server environment and specific business needs. Services include vendor management for R/3 environments, 7x24 on-site response, system health check services, remote management services, enhanced hardware/software technical support, and on-site or local spare parts inventories. Compaq also works with resellers, systems integrators, consultants and service providers to provide each with the tools and resources needed to optimize, integrate and fully implement R/3 solutions for Compaq servers and Windows NT.
- ***Technology Leadership***: Compaq was the first company to demonstrate failover capabilities for SAP's R/3 using a preliminary version of the Microsoft Wolfpack clustering extensions, which occurred at the SAP/Microsoft Technical Education Conference in December. Compaq was also the first company to support failover capability in R/3 and Windows NT environments with Compaq Online Recovery Server and Standby Recovery Server.
- ***SAP certification***: Compaq received the SAP 1995 Award of Achievement and was the first hardware vendor to be certified for R/3 Windows NT. Because of its reliable platform, proven engineering expertise, and success and credibility in the market, Compaq has been approved by SAP to perform its own self-certification for future platforms.

Compaq Seagate Software Partnership

Compaq, a worldwide market leader in LAN Server storage subsystems and Seagate Software, a market leader of storage management software, formed a global Storage Management Development Agreement. This agreement is devoted to delivering "best in breed", enterprise-wide, storage management solutions to help customers effectively meet the data explosion challenge.

The Compaq Seagate Software partnership agreement simplifies the process of implementing reliable, high-performance data management solutions that maximize the capabilities of both hardware and software across multiple platforms. It provides compatibility, ease-of-management and integration advantages not found in other products. Customers can be assured the Compaq Seagate Software solution is dedicated to providing:

- World class, current and next-generation storage management hardware and software based on a thorough understanding of enterprise storage requirements.

- Well tested, integrated and highly reliable storage solutions from the exchange of dedicated resources and joint engineering efforts between the two companies
- A lower total cost of ownership resulting from the enhanced manageability, scalability, reliability and performance integration of Compaq and Seagate Software technologies.
- Easy deployment and operability of the solution from the development of specific systems management tools and innovative product integration efforts with Microsoft Windows NT and Novell NetWare.
- Expertise in storage management software and hardware solutions for Microsoft Windows NT environments based on market leadership and knowledge

Compaq and Seagate Software are committed to providing the best possible storage solutions for business-critical environments. Through the global Storage Management Development Agreement, Compaq and Seagate Software will develop industry leading solutions for information availability in accessing, protecting and managing corporate enterprise wide data for client/server platforms.

Compaq Siebel Partnership

Compaq, the world's leading server and desktop computer company, and Siebel Systems, Inc., the worldwide leader in sales information systems, have formed a global partnership to provide integrated enterprise solutions for automating sales, telemarketing and call-center information systems. As part of the alliance, Siebel has selected Compaq as its software development and preferred deployment platform for Microsoft Windows NT and Compaq has selected Siebel as its preferred sales automation solutions partner. The companies will participate in joint testing, performance optimization and technology sharing, as well as coordinate field sales and support activities. This partnership will allow customers to rapidly and cost-effectively develop and deploy customized sales information systems worldwide, based on Compaq platforms and Siebel Systems software.

This partnership will allow customers to build powerful, flexible, standards-based solution packages that provide distributed access to business-critical sales information across the largest enterprises. Compaq and Siebel have the resources to deliver tightly integrated, optimized and low total-cost-of-ownership sales information systems for global customers.

Within the framework of this global partnership, Compaq and Siebel will work together to deliver Siebel-ready solutions that include portables, desktops, servers, networking products and services for customers and Compaq partners. The companies will leverage each others' technologies and partnerships to optimize the use of Siebel applications on Compaq products. Compaq and Siebel will also create strategic account programs and provide joint training for their respective organizations and Compaq resellers to help ensure customers take full advantage of the alliance's benefits.

The partnership will include the creation of a Compaq Siebel International Competency Center at Siebel headquarters in San Mateo, CA. The competency center will be used to conduct performance and benchmark tests, offer customers pre-sales system sizing, integration and optimization services as well as post-sales service and support. To meet enterprise class requirements for manageability and high availability, the companies will also use the center to test and integrate systems management software and utilities for interoperability with all Compaq and Siebel solution packages.

In addition, the companies will cooperate on technical white papers and system sizing tools to help customers and resellers worldwide obtain optimum performance, reliability and scalability

for Compaq Siebel solutions. To familiarize customers and resellers with the benefits of this alliance, Compaq and Siebel cooperate on joint sales and marketing programs including advertising, sponsorship of executive seminars, collateral development and participation in trade shows and key industry events.

Service and Support

Compaq solutions are backed by the extensive worldwide network of Compaq resellers and service providers. These service partners can tailor support offerings ranging from installation and systems maintenance to integration and consulting services for any size computing environment. Compaq Service and Support Offerings (CSSO) are also available for Compaq solutions. These globally available offerings provide enhanced levels of service and support for enterprise environments including: 7x24 hardware and software services, remote management services, system health check services and comprehensive systems management. Compaq provides these services worldwide for customers with global operations through its Global Services and Support Provider (GSSP) agreement with Digital Equipment Corporation's Multi-vendor Customer Services (MCS).

Management Partnerships

Compaq continues to drive up the functionality curve, delivering more management capabilities to customers who are downsizing their operations from proprietary midrange and mainframe environments. The Compaq Systems Management Partnerships are another example of how we are delivering new levels of management to our customers.

Re-engineered organizations deploying mission-critical applications to distributed systems require the same level of systems management as they have known on midrange and mainframe systems. In addition, they need the systems management functionality to deal with the challenges unique to a distributed environment. Systems management tools from leading vendors are able to provide a broad range of centralized functionality to manage multiple technologies in a heterogeneous distributed environment. To enable customers to confidently deploy Compaq systems for business-critical distributed systems, Compaq is partnering with the leaders in systems management to enable their products to easily manage Compaq servers.

Several factors are contributing to the increasing use of Compaq systems for mission-critical applications. First, powerful processors such as Pentium and Pentium Pro are providing performance that is on par with midrange-level systems. Secondly, the increased sophistication of Windows NT has allowed it to become more accepted as an alternative to Unix. Finally, Compaq is taking an important step in delivering a broad range of systems manageability for Compaq systems. This is being accomplished through partnerships with leading systems management software vendors. This series of partnerships will enable customers a broad range of central management functionality for their mission-critical Compaq systems within the enterprise tools of their choice. Compaq can therefore deliver midrange-level performance and manageability at a lower cost, giving customers the confidence to deploy mission-critical applications on Compaq systems.

The goal of Compaq Systems Management Partnerships is to facilitate the optimum integration and use of Compaq systems event, performance, and configuration information into partners' tools. This information is available from Insight Agents installed on Compaq systems. Compaq has integrated this information into HP OpenView, IBM NetView, Sun NetManager, Microsoft SMS, and Novell ManageWise. New partnerships and products include BMC (Patrol), Boole &

Babbage (Ensign, Command Post), Cabletron (Spectrum), Seagate (Nervecenter), and Tivoli (TME).

These new partnerships are initially focused on meeting customers' most pressing need: enterprise event management for Compaq systems. Event management ensures that systems are running by providing customers proactive notification of problems when they happen, or before they happen. After solving the event management problem, further integration with these partners and additional partner applications will provide a broad range of systems management functionality for Compaq systems in other areas that include performance management, change management, production control, help desk operations, and security.

BMC Software

BMC Software is a worldwide developer and vendor of Cooperative Enterprise Management Solutions that automate application and data management across traditional midrange and mainframe environments.

Compaq has teamed with BMC Software, a leading application and data management software vendor, to provide you with a greater level of management capabilities. BMC Software has extended its popular PATROL product family to enable Compaq systems to be efficiently managed in large distributed environments.

Boole and Babbage

Compaq and Boole & Babbage have joined forces to provide you with an end-to-end, enterprise-wide availability management solution. With its COMMAND/Post enterprise management and automation product, Boole & Babbage is delivering the integration you need to enhance Compaq server availability within a distributed enterprise.

Boole & Babbage is widely known for its ability to automate the entire distributed enterprise, helping customers to achieve higher availability and reduce overall computing costs. COMMAND/Post provides centralized command and control for availability, fault management, and automated operations of multi-vendor environments. The product employs a combination of message- and agent-based technology and interoperability with leading management frameworks. COMMAND/Post can alert operations staff to problems and respond automatically to systems and network events before users even become aware of them.

Compaq Tivoli Partnership

Compaq, with the most manageable systems in the distributed enterprise, has teamed with Tivoli Systems, a leading systems management software vendor, to provide you with a greater level of systems management capabilities. Tivoli Systems is enabling the Insight Agents to be monitored by TME 10 (Tivoli Management Environment), an object-oriented framework and set of management applications.

Tivoli Systems, an IBM company, provides an open, end-to-end management solution from mainframes to the desktop, spanning network and systems management. Tivoli's object-based technology for distributed systems management is used to manage open, heterogeneous, rapidly changing client/server environments reliably and efficiently.

Tivoli has linked Insight Agents to TME 10 through its Tivoli/Sentry and Tivoli/Enterprise Console (T/EC) applications. The T/EC is a powerful automation application that provides rules-based event correlation for integrating network, systems, database, and applications management. Tivoli/Sentry manages distributed resources by configuring and monitoring parameters and automatically initiating corrective actions.

A Compaq-oriented Sentry monitoring collection has been developed to watch more than forty critical performance and system status parameters on each Compaq server managed. When a performance threshold is exceeded, an alert is sent to the T/EC for action.

Appendix C - Server Family Supported Features

	Systempro	Systempro LT	Systempro XL	ProSignia	ProSignia 200	ProSignia 300	ProSignia 500	Prosignia Server 720	ProSignia Server 740	ProSignia VS	ProLiant 800	ProLiant 850R	ProLiant 1000	ProLiant 1200	ProLiant 1500	ProLiant 1600	ProLiant 1850R	ProLiant 2000	ProLiant 2500	ProLiant 3000	ProLiant 4000	ProLiant 4500	ProLiant 5000	ProLiant 5500	ProLiant 5500 Xeon	ProLiant 6000	ProLiant 6000 Xeon	ProLiant 6500	ProLiant 6500 Xeon	ProLiant 7000	ProLiant 7000 Xeon
High Availability																															
Non-Stop Computing Features																															
Advanced Network Control Utility				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Cluster Verification Utility				NT	NT	NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Hot Spare CPU			√												√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
On-Line Recovery Server Option					√	√	√							√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Online Storage Controller Recovery Option					NT	NT	NT				NT	NT		NT	NT	NT	NT		NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT
Redundant Fans																				√			√	√	√	√	√	√	√	√	√
Redundant Hot Plug Power Supply														√		√	√			√			√	√	√	√	√	√	√	√	√
Redundant Power Modules																				√			√			√	√	√	√	√	√
Redundant Power Supply														√	√	√	√			√			√	√	√	√	√	√	√	√	√
Standby Recovery Server Option					√	√	√				√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Rapid Recovery Features																															
ASR			√	√		√	√						√					√			√									
ASR-2					√					√	√	√		√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√
Fan Detect and Shutdown					√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Hot Pluggable Drives												√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√
Hot Plug Fans																												√	√	√	√
Hot Plug Keyboard														√		√	√		√	√				√	√	√	√	√	√	√	√
PCI Hot Plug																												√	√	√	√
Server Failure Notification			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Server Recovery Notification			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Temperature Detect and Shutdown					√						√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Windows NT HAL Recovery					√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fault Prevention Features																															
ECC Memory			√		√	√	√				√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Power Down Manager																										NT	NT	NT	NT	NT	NT
Memory Deallocation			√	√									√		√						√	√									
Power Safe Modules																							√	√	√	√	√	√	√	√	√
Power Safety Interlock													√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Pre-Failure Warranty					√	√	√				√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

	Systempro	Systempro LT	Systempro XL	ProSignia	ProSignia 200	ProSignia 300	ProSignia 500	Prosignia Server 720	Prosignia Server 740	ProSignia VS	ProLiant 800	ProLiant 850R	ProLiant 1000	ProLiant 1200	ProLiant 1500	ProLiant 1600	ProLiant 1850R	ProLiant 2000	ProLiant 2500	ProLiant 3000	ProLiant 4000	ProLiant 4500	ProLiant 5000	ProLiant 5500	ProLiant 5500 Xeon	ProLiant 6000	ProLiant 6000 Xeon	ProLiant 6500	ProLiant 6500 Xeon	ProLiant 7000	ProLiant 7000 Xeon
Life Cycle Cost Reduction																															
Online Server Maintenance																															
Asset Tag Number	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Board Release Levers																										√	√	√	√	√	√
Correctable Logging			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√
Online Configuration Utility for NetWare				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Power Line Monitoring																										NT	NT	NT	NT	NT	NT
RAID Online Expansion	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
RTC Battery Monitor															√				√				√	√	√	√	√	√	√	√	√
Survey Parameter Capture	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
System Partition Administration Utility				NT	NT	NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
System Serial Number			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Temperature Monitor via I_2C																			√						√	√	√	√	√	√
Voltage/Current Monitoring																			NT						NT	NT	NT	NT	NT	NT
Off-line Server Maintenance																															
Boot Block ROM																															
CDROM Boot				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Configurable Boot Order				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Critical Error Logging			√	√	√	√	√			√	√	√	√		√		√	√	√		√	√	√	√	√	√	√	√	√	√
DOS CPR				NT	NT	NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Drive Firmware Upgrade				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Failure/Status LEDs													√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√
Fibre Fault Isolation Utility				NT	NT	NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Flashable ROM			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Intelligent Power Switch																										NT	NT	NT	NT	NT	NT
PCI Plug and Play					√	√	√				√	√		√	√	√	√		√	√			√	√	√	√	√	√	√	√	√	√
Power On Error Log														√		√	√		√	√						√	√	√	√	√	√	√
Revision History Table					√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
SmartStart	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
System Partition	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

	Systempro	Systempro LT	Systempro XL	ProSignia	ProSignia 200	ProSignia 300	ProSignia 500	Prosignia Server 720	Prosignia Server 740	ProSignia VS	ProLiant 800	ProLiant 850R	ProLiant 1000	ProLiant 1200	ProLiant 1500	ProLiant 1600	ProLiant 1850R	ProLiant 2000	ProLiant 2500	ProLiant 3000	ProLiant 4000	ProLiant 4500	ProLiant 5000	ProLiant 5500	ProLiant 5500 Xeon	ProLiant 6000	ProLiant 6000 Xeon	ProLiant 6500	ProLiant 6500 Xeon	ProLiant 7000	ProLiant 7000 Xeon
Life Cycle Cost Reduction (continued)																															
Remote Capabilities																															
Compaq Insight Manager			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Insight Manager Alerts	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Info Messenger	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Integrated Management Display														√		√			√	√				√	√	√	√	√	√	√	√
Integrated Management Log														√		√			√	√				√	√	√	√	√	√	√	√
Integrated Remote Console					√						√	√		√		√			√	√				√	√	√	√	√	√	√	√
Remote Alpha/Numeric Paging			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Remote Diagnostics	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Remote Insight					√	√	√				√	√		√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Remote NT SSD Upgrade				NT	NT	NT	NT				NT	NT		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Remote Threshold Setting			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
SmartStart Integration Management Utility				NT	NT	NT	NT				NT	NT		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Software Updates via Internet	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Investment Protection																															
Long Operating System Life Support	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Industry Standard Components	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Ultra Wide SCSI-3					√						√	√		√		√	√			√			√	√	√	√	√	√	√	√	√
Performance Tracking and Information																															
EISA Bus Monitor													√	√		√	√	√	√	√	√	√	√	√							
Memory Fault Recovery Tracking					√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Monitor Utility for Smart Array				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
NIC Fault Recovery Tracking					√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PCI Bus Monitor														√		√	√			√			√	√	√	√	√	√	√	√	√
Storage Fault Recovery Tracking			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

	Systempro	Systempro LT	Systempro XL	ProSignia	ProSignia 200	ProSignia 300	ProSignia 500	Prosignia Server 720	Prosignia Server 740	ProSignia VS	ProLiant 800	ProLiant 850R	ProLiant 1000	ProLiant 1200	ProLiant 1500	ProLiant 1600	ProLiant 1850R	ProLiant 2000	ProLiant 2500	ProLiant 3000	ProLiant 4000	ProLiant 4500	ProLiant 5000	ProLiant 5500	ProLiant 5500 Xeon	ProLiant 6000	ProLiant 6000 Xeon	ProLiant 6500	ProLiant 6500 Xeon	ProLiant 7000	ProLiant 7000 Xeon
Life Cycle Cost Reduction (continued)																															
Security																															
Administrative Password			√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CD Lock				NT	NT	NT	NT			NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Configuration (NVRAM) Lock	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Diskette Drive Control	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Diskette Write Control	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Front Bezel Keylock											√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Keyboard Password				√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Network Server Mode	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Power On Password	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Power Down Lock																										NT	NT	NT	NT	NT	NT
Protected Power Switch					√							√	√																		
QuickLock	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Serial/Parallel Interface Control	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√