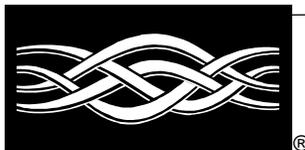




Microsoft®

Microsoft®
Windows NT Server

Server Operating System



White Paper

**Microsoft Windows NT Server and
Compaq ProLiant/ProSignia Servers:
A Partnership in Advanced Distributed Computing**

Microsoft® **Windows NT® Server**

**Microsoft Windows NT
Server and Compaq
ProLiant/ProSignia
Servers:
A Partnership
in Advanced Distributed
Computing**

Microsoft and Compaq have established a Frontline Partnership to support the development and implementation of distributed client/server applications based on Microsoft® Windows NT® Server and Compaq ProLiant and ProSignia server hardware. This paper details the tremendous benefits that these products and this partnership are now delivering to customers. In the pages that follow, you will learn how Windows NT Server combined with the Compaq servers provides a powerful, scaleable, flexible, and easy-to-use platform that is robust enough for the most demanding mission-critical tasks.

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INTRODUCTION

Information system managers in major organizations face a daunting array of tough challenges. They have to make sure that users get the resources they need, keep servers running, meet Service Level Agreements and up-time commitments, manage desktops efficiently to keep total cost of ownership down, advise upper management on new technologies, develop new applications, and so on.

Microsoft Corporation, the world's largest software company, and Compaq Computer, the leading maker of powerful distributed servers, recognize the challenges of running a large IS organization. They also recognize that distributed computing based on outdated architectures is too expensive and complex for today's highly competitive and rapidly evolving business environment. That's why the two companies have combined their expertise, as evidenced by their Frontline Partnership, to support the development and implementation of distributed client/server applications based on Microsoft Windows NT Server and Compaq ProLiant/ProSignia server hardware.

Windows NT Server combined with the Compaq servers provides a powerful, scalable, flexible, and easy-to-use platform that is robust enough for the most demanding mission-critical tasks. They are designed for implementing and accessing the latest computing technologies, including the Internet and corporate intranets, while letting users benefit from the most popular applications. At the same time, the platform seamlessly integrates with legacy systems, including mainframe and RISC/UNIX architectures, providing ready access to all the data on the enterprise. Compaq's ProLiant/ProSignia servers—based on Intel's Pentium and Pentium Pro processors—deliver superior, cost-effective computing power while maintaining the benefits of an open architecture.

Together, Microsoft and Compaq deliver complete Windows NT-based solutions for distributed applications, Intranet applications, and the World Wide Web. With this powerful combination of products, IS managers can implement affordable, easy-to-manage systems that meet the needs of the enterprise—now and in the future.

THE NEXT WAVE OF DISTRIBUTED COMPUTING

Client/server computing has garnered wide-spread acceptance through its ability to deliver more computing power for less money—using solutions based on the deployment of multiple, high-performance, low-cost servers that store and process data and applications.

Until recently, RISC/UNIX vendors have dominated the server side of client/server architectures, even though RISC/UNIX systems are as difficult to administer and manage as mainframe systems. The reason? RISC/UNIX systems have offered significantly better price/performance than mainframes.

Unfortunately, “RISC/UNIX” exists in several very different implementations; leading RISC/UNIX vendors consolidate hardware with their own versions of UNIX under one brand. This results in dependency on a single vendor, applications that are expensive and complex to develop and implement, costly upgrades for equipment, and highly technical installation and administration. Alternatives and adjuncts to RISC/UNIX have been used for tasks such as departmental file and print operations, but they lack key features for many mission-critical, enterprise-wide computing requirements.

When examined against the full set of requirements for a client/server implementation, RISC/UNIX systems fall short of the superior alternative available through the combination of Windows NT Server and high-performance Intel-based servers, such as Compaq’s ProLiant/ProSignia servers.

The combined Microsoft and Compaq-based Windows NT Server platform provides IS managers with an excellent solution: a powerful, scaleable, open, and cost-effective operating system for the entire enterprise. It is fast and robust enough for the most demanding mission-critical tasks—such as on-line transaction processing, large database management, and SAP implementation—providing IS managers with the assurance that the system will be up and running when it needs to be. The price/performance benchmarks of Windows NT Server on Compaq systems also make it more cost-effective than RISC/UNIX. Windows NT Server integrates seamlessly with other platforms, including clients running Windows NT Workstation, Windows 95, Windows 3.x, Macintosh, UNIX, OS/2, and MS-DOS®, and provides strong file and print services. This interoperability protects the investments that companies have in other systems, and it makes application development easier.

WINDOWS NT SERVER: INTRANET AND INTERNET READY

Innovations in Windows NT Server underscore Microsoft's commitment to helping organizations build intranets and access the Internet, with features geared specifically for implementing corporate intranets and easily accessing the World Wide Web and other Internet resources.

Windows NT Server includes a completely integrated Internet application platform: Microsoft Internet Information Server (IIS). IIS includes a high performance Web server, an application development environment, integrated full-text searching, multimedia streaming, and site management extensions. Because it is integrated with Windows NT Server, it is extremely easy to set up and administer, so your Web site can be up and running in minutes. And the security infrastructure is totally integrated with Windows NT Server, enabling you to easily maintain a highly secure Web environment.

Internet Information Server is ideal for both high performance Internet and intranet sites, and scales to meet the needs of the largest sites on the Internet. In an intranet, integration means that there is only one infrastructure to manage for all file, print, Web, and application servers.

IIS includes:

- Active Server Pages, an open, compile-free application environment that lets organizations combine HTML, scripts, and ActiveX™ server components for building powerful Web-based applications.
- Microsoft Index Server, an integrated search engine that provides full-text indexing and querying of documents in any format. It includes built-in support for HTML, text, and Microsoft Office documents.
- Microsoft NetShow™, which provides streaming audio and video support for IIS. NetShow enriches one-to-many communications through your Web sites using live and stored multimedia content. It provides live multicasting of audio and on-demand streaming of stored audio, illustrated audio (audio synchronized with images), and video.
- Microsoft FrontPage™ 97 Server Extensions, which integrate IIS with the award winning Web suite for easy creation and management of professional quality Web sites.
- Crystal Reports, a visual reporting tool for IIS that lets you create presentation quality reports and integrate them into database applications.
- Server administration from any Web browser.
- Easy migration from UNIX systems with support for NCSA and CERN-style map files.
- Support for logging server traffic to NCSA Common Log File format and any ODBC database.
- The Key Manager Tool, which makes it easier to install SSL security.
- Supports for HTTP byte-range enabling browsers to begin receiving data from any part of a file for enhanced performance.

Windows NT Server incorporates Microsoft Internet Explorer, the award-winning Web browser, with support for advanced Web features such as online video and electronic commerce. Internet Explorer, which has won nine out of

ten comparative reviews of browsers in leading computer publications, is now available for Windows 3.1, Macintosh, and UNIX platforms in addition to Windows NT and Windows 95 operating systems.

Windows NT Server also includes Microsoft FrontPage Web authoring and management software, which enables the quick and easy creation and management of professional Web sites. Designed for non-programmers, FrontPage does not force users to learn HTML. Yet it is robust enough for even experienced Web site developers.

The Dynamic Host Configuration Protocol (DHCP), Windows Internet Name Service (WINS), and Domain Name System (DNS) server features in Windows NT Server make TCP/IP addresses easy to manage, and give users quick, transparent access to network resources.

For communications, Windows NT Server includes built-in Remote Access Services (RAS); RAS Multilink channel aggregation, which enables clients to combine multiple dial-up lines for higher transfer speeds and near-LAN performance; Point-to-Point Tunneling Protocol (PPTP), which enables users to outsource dial-up access and use public networks such as the Internet to create virtual private networks; and MultiProtocol Router, a service for smaller to medium sized businesses that want to use Windows NT Server as a low-cost LAN-to-LAN or LAN-to-WAN routing solution.

**COMPAQ
PROSIGNIA/PROLIANT
SCALABLE SERVER
FAMILY**

To help eliminate some of the complexity of choosing servers, Compaq has developed a line of servers that meets many different sets of priorities, from affordably priced, high-performance servers to models that rival midrange platforms for power and throughput.

ProSignia 200

Now, growing departments and businesses don't have to compromise features to get a server they can afford. The ProSignia 200 gives first-time buyers outstanding technology and Compaq quality at the price of a desktop computer.

ProSignia 300

The ProSignia 300 provides growing businesses and workgroups with great manageability and availability, along with plenty of room for future growth.

ProLiant 800

The ProLiant 800 is designed to protect your server investment over the years with breakthrough price/performance and a host of expandable components that grow with your business.

ProLiant 2500

Besides having exceptional price/performance, the ProLiant 2500 is the most flexible server you can buy for departmental and remote office environments. Its modular chassis makes servicing and swapping components easy, and doesn't require any tools.

ProLiant 5000

For the most demanding environments, the ProLiant 5000 offers performance that rivals that of proprietary midrange servers, but with industry-standard flexibility and value—one of the many reasons it is winning awards like Web Server Editor's Choice from *Computer Reseller News*.

Every Compaq server offers a range of advanced fault management features that help you minimize downtime — the most costly aspect of network ownership. Compaq' exclusive Pre-Failure Warranty provides protection for server disk drives, ECC memory, and Pentium Pro processors before they fail. In addition, a host of high availability features protect your data and productivity every day. The following table provides a summary.

High Availability Features

ProSignia 200	ProSignia 300	ProLiant 800	ProLiant 2500	ProLiant 5000
Auto Server Recovery - 2	Auto Server Recovery - 2	Auto Server Recovery - 2	Auto Server Recovery - 2	Auto Server Recovery - 2
Optional ECC Memory	Recovery Server Option	Off-Line Backup Processor	Optional Redundant NIC	ECC Host Bus
Pre-Failure Warranty	Pre-Failure Warranty	Integrated Remote Console	Off-Line Backup Processor	Optional Redundant NIC
		Recovery Server Option	Hot-Plug Drives	Opt. Redundant Power Supply
		Pre-Failure Warranty	Recovery Server Option	Opt. Redundant CPU Power Modules
			Integrated Remote Console	Hot-Plug Drives
			Pre-Failure Warranty	Recovery Server Option
				Pre-Failure Warranty

The ProLiant 2500 and ProLiant 5000 are all easily converted from a tower form factor to a rack-mounted system to help economize on floor space and use resources wisely. Compaq racks provide a consolidated solution with systems for ventilation, cable management, and electricity management. Plus, with Compaq Rack Builder you can design and configure your ideal rack solution at your computer—before you even buy hardware.

SUPERIOR MANAGEABILITY AND TOOLS

Both Windows NT Server's and Compaq's server platforms include a set of enhanced management features designed to reduce the frustration and workload of system administrators, and to greatly improve the daily productivity of end-users.

The cornerstone of Windows NT Server's management infrastructure is the Windows NT Directory Service. Windows NT Directory Service provides the capabilities that end users and administrators need to efficiently use and manage their networks. The single network logon allows users to log on once to gain access to all servers and all services, including applications such as e-mail and databases. The centralized user database makes it easy for administrators to manage user accounts. Enter a user once and it is valid for all servers and all services on the network. And replication of the user database ensures there is no single point of failure on the network.

In addition, both Windows NT Server and Windows NT Workstation incorporate the consistent, easy-to-use graphical user interface of Windows 95. Windows NT Server incorporates management tools for running the entire network. These include:

- **Network Monitor**, a comprehensive network diagnostic tool based on the same technology included in Microsoft Systems Management Server. Administrators can monitor the network data stream, troubleshoot performance and watch for problems such as cross-router traffic. Network Monitor supports the most popular protocols, including NetBIOS (NetBEUI), IPX, SPX, and many TCP/IP-related protocols.
- **System Policy Manager**, which lets administrators control what actions users can perform on network workstations. It also provides profiles of user-specific desktop settings that are applied wherever a user logs on to a workstation.
- **Task Manager**, newly revised for Windows NT Server, provides extensive information on applications, CPU, and memory use, making it easier to check system status. System managers with RISC/UNIX or mainframe familiarity will especially welcome the added control.
- **Web Administration**, which lets most common administrative functions, such as adding a user or sharing a directory, to be performed from any Web browser on any platform.
- **Administrative Wizards**, which guide system operators through eight common server operations such as adding users, adding/removing programs, connecting modems, and administering printers.
- **Diagnostic Tools** that are part of an improved diagnostics program for getting information on device drivers and hardware—BIOS information, video resolution, network information such as transports, configuration settings and statistics, and system resources such as IRG, DMA, and IO addresses.

Windows NT Server was also designed with the understanding that much enterprise data still resides on mainframes. To access this data, IS managers can deploy Microsoft SNA Server in tandem with Windows NT Server. SNA

Server efficiently integrates legacy applications and data with modern network systems and applications, making host connectivity easy and economical. It integrates the familiar desktop computer environment with the IBM host system to support applications such as online transaction processing, decision support, intranet and Internet access, and terminal emulation. Microsoft SNA Server 3.0 offers advanced tools for easy system setup and centralized graphical administration, and supports every major personal computer and network operating system, LAN type, SNA host, and connection type. When combined with Windows NT Server, SNA Server offers a thoroughly integrated distributed computing solution.

To further enhance its integration into the enterprise, Windows NT Server also features the Component Object Model (COM) tool, which allows software developers to create component applications, and Distributed COM (DCOM), which extends COM to allow components to communicate across networks. For example, a DCOM application could be a stock quote server object running on Windows NT Server and sending quotes to multiple Windows NT Workstation clients. DCOM provides the infrastructure for connecting the objects on the two workstations and supports communication between the objects so a user can receive the stock quotes. DCOM uses the same tools and technologies as COM, thereby preserving investments in training and software.

SMARTSTART

Compaq SmartStart is the intelligent integration tool for Compaq systems, allowing IS managers to build proven and reliable server platforms with Windows NT Server. SmartStart 3.20 also supports the integration of new Cheyenne products from Compaq with Windows NT Server (versions 3.51 and 4.0).

With release 3.0 of SmartStart for servers, Compaq introduced Integration Management, a process designed to assist the enterprise in managing software and configurations on distributed systems. Integration Management, based on functionality delivered through SmartStart and Compaq Insight Manager, gives organizations the ability to deploy and maintain distributed systems with efficiency and consistency. At the heart of Compaq's Integration Management capabilities is the Integration Server. An Integration Server is a dedicated or multi-function server that acts as a repository for the specific versions of software that's tested and approved for deployment on other network servers. An Integration Server can be selected as the source for software during SmartStart setup of new servers and can be the focal point for software updates.

Beginning with SmartStart 3.20, Compaq will modify the way it delivers SmartStart-enabled Software Product CDs with servers. Compaq recognizes the need to lower the cost of software distribution, the increased use of volume licensing agreements, and the key differences between the software required to support Enterprise class and entry class servers. Customers can be assured that Compaq will deliver, via SmartStart, maximum integration value at the lowest cost to the customer. With SmartStart 3.x, Compaq introduced a more open architecture that gives customers the flexibility to install software from Compaq Software Product CDs, an Integration Server, and a select group of standard off-the-shelf vendor products.

COMPAQ INSIGHT MANAGER

Today's networks are growing at a rapid pace, and network administrators need the right tools to manage this rapidly expanding environment. Compaq Insight Manager 3.20 combines outstanding scalability with the most robust feature set in the industry to allow administrators greater control and flexibility.

With Compaq Insight Manager 3.20, Compaq improves on the industry-leading Compaq Insight Manager, with new features designed to provide more robust configuration management, remote management, asset management and fault management, all on a 32-bit Windows console that lets users manage hundreds of server and desktop clients centrally. Only Insight Manager provides this level of flexibility without sacrificing features. Compaq Insight Manager includes Microsoft Windows 95 support; an enhanced user interface with the Insight Device Explorer, which brings the ease of use of the Windows 95 Explorer interface to the Compaq device list; and Alarm Log Enhancements, which let you export the console alarm log for access by productivity tools such as Microsoft Excel and Microsoft Word.

To control support costs, IS managers must have a means to track and update configurations throughout the distributed enterprise. To address this need, Compaq Insight Manager and the SmartStart Integration Server are combined to provide a unique means of tracking and updating firmware, drivers, and system partition utilities. Complementing Insight Version Control, the Integration Server Maintenance function lets users download updated support software via the Internet or local CD-ROM drive, and then make the chosen update available on their Integration Server.

Compaq Insight Manager 3.20 builds on Compaq's commitment to superior systems management capabilities, delivering leadership management products that provide unparalleled fault, configuration, performance, and remote management capabilities for clients and servers. And because Compaq Insight Manager and Insight Management Agents are based on industry standards, they easily integrate with leading management environments, including HP OpenView, IBM NetView AIX, SunNet Manager, Cabletron Spectrum, Microsoft Systems Management Server, BMC Patrol, Boole and Babbage Ensign, Seagate Nervecenter Pro, and Tivoli TME10.

COMPAQ INFO MESSENGER

Compaq understands that customers have a huge number of distributed enterprise systems, and therefore must manage overwhelming amounts of product information. They spend significant time, effort, and resources searching for critical information that may affect their environments. Timely information is instrumental in keeping mission-critical systems available at optimum performance, reducing total cost of ownership.

Compaq Info Messenger is a proactive Compaq Internet service that addresses this need by providing customers with the latest information that is relevant to their specific computing environments. Compaq Info Messenger searches the Compaq Web site, collects the information that customers want, and alerts them that it is available on a customized Web page on Compaq Online.

Compaq Info Messenger is accessed from a button on Compaq Online (www.Compaq.com). Compaq Info Messenger users register with Compaq, and then tailors hardware and software profiles for each of their Compaq product environments; choosing what Compaq product, support, and technical information they want, and whether they want to be notified of new information via e-mail. Compaq uses these profiles to match Compaq information to users' needs.

Compaq Info Messenger provides the following benefits to customers:

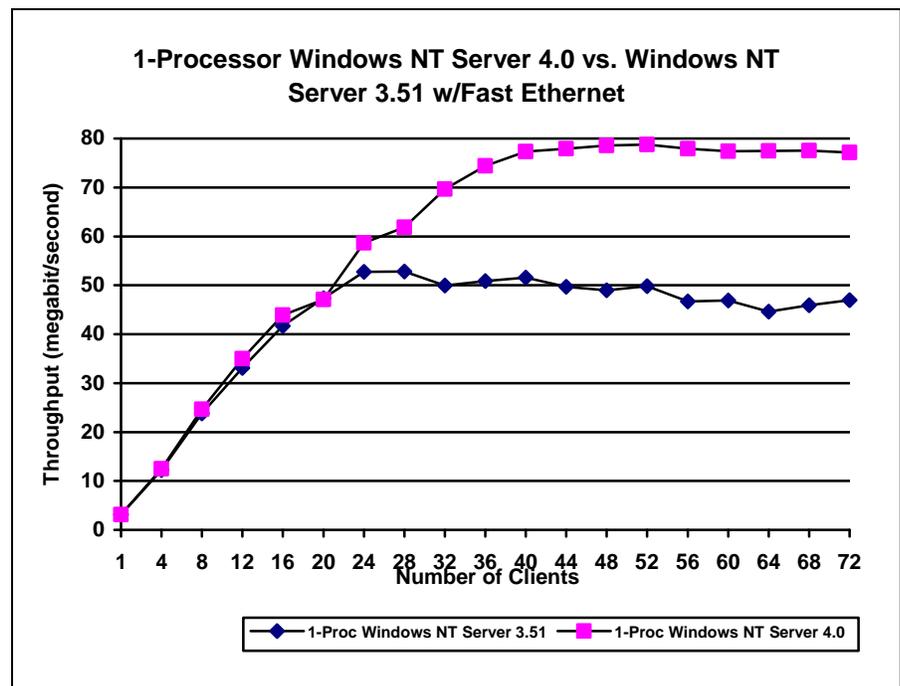
- Captures critical information.
- Saves valuable time by reducing manual searching.
- Improves system availability through better maintenance planning.
- Reduces Total Cost of Ownership.

SUPERIOR PERFORMANCE AND SCALABILITY

The enhanced tools and administrative functions in Windows NT Server are just part of a bigger picture. Windows NT Server offers the best performance and scalability of any server operating system on the market. Administrators can use it to deploy current technology such as Fast (100 megabit) Ethernet, and can easily integrate emerging technologies as they grow in importance.

An operating system's performance is clearly critical to the smooth functioning of a network. Benchmark tests have demonstrated that Windows NT Server delivers significantly enhanced performance, whether for file and print operations, application service, or Web and related Internet hosting.

For example, a NetBench test for file sharing operations compared Windows NT Server 4.0 to Windows NT Server 3.51.



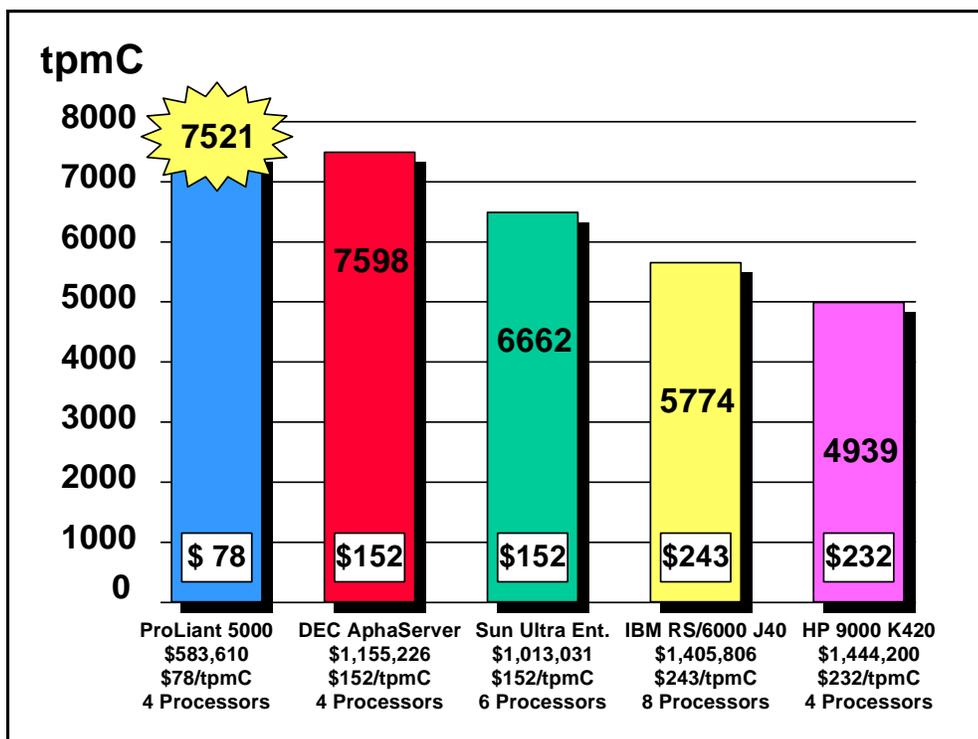
The hardware was a Compaq ProLiant 5000 server equipped with a single Pentium Pro 166 processor, 128MB RAM, a 4x2GB disk array, and a Fast Ethernet network interface card. Each test used up to 72 clients running Windows 95. The client machines were Pentium 100s with 16 MB of RAM. Windows NT Server 4.0 achieved a throughput of 77.12 megabits/second at 72 clients, an increase in file and print performance of more than 60 percent over Windows NT Server 3.51.

Enhancements to Windows NT Server have resulted in significant improvements in file-sharing operations on 100-megabit networks, including reduction of up to 30 percent in network frames transmitted, reductions of up to 25 percent in bytes written to the disk, and improved cache flushing.

But Windows NT Server goes well beyond solid file-sharing capability: it also has the architecture and power to run high-end applications. To determine

its scalability, Windows NT Server has been benchmarked numerous times in Transaction Processing Council Benchmark C (TPC-C) tests. TPC-C is an online transaction processing benchmark that simulates computer activity in transaction-intensive businesses and services such as order entry, record payments, checking the status of deliveries or back orders, and monitoring inventory. TPC-C results come in two parts: the number of transactions per minute (tpmC) and the cost per transaction per minute.

In November of 1996, Microsoft and Compaq set a new performance record on Intel-based servers with the first TPC-C price/performance record below \$100 per tpmC. In December, they improved on that record when Microsoft SQL™ Server 6.5, running on a Compaq ProLiant 5000 server with four 200MHz Pentium Pro processors, achieved 7521.13 tpmC and \$78 per tpmC using a Web-based front end. The test, which simulated a load of 6,500 concurrent users, set an industry standard for a symmetric multiprocessor system, using a Web-based benchmark.



On October 9, 1996 Compaq won an unprecedented 21 AIM Hot Iron Awards in the latest performance and price/performance benchmarks conducted by AIM Technology, a leading independent performance testing service. In AIM's first competition for Windows NT benchmarks, Compaq secured eight of 12 awards handed out by Microsoft Chairman and CEO Bill Gates. Compaq won awards that represented both absolute performance and price/performance superiority. AIM Technology has a complete list of awards at <http://www.aim.com>.

Web and Internet hosting performance under Windows NT Server is equally

impressive. Microsoft Internet Information Server (IIS), part of Windows NT Server, is the fastest Web server, with consistently high performance and the ability to support extremely heavy loads. In a September issue of Computer Reseller News, Compaq ProLiant 5000 servers outpaced the competition in the client-based Webstone 2.01 benchmarks. Compaq servers achieved more connections per second on Microsoft Windows NT Server 4.0 with Internet Information Server than competitors, surpassing IBM RS/6000 Internet Power Solution, Digital Internet Alpha Server 1000A 5/300 and Sun Netra I 1/140 servers. Even when stressed with up to 200 clients, Compaq with IIS had faster throughput than Apple, IBM and Sun combined.

An excellent demonstration of the scalability of Windows NT Server and Internet Information Server on Compaq ProLiant's can be found on Microsoft's Web site (www.microsoft.com), which services more than 49 million hits a day from more than 450,000 unique visitors.

The content on the site is comprised of more than 200,000 files and 160 database applications. Fourteen Compaq ProLiant 5000 series computers serve as **Error! Bookmark not defined.** the Microsoft.com Web servers. Each computer has four Intel P6 processors and 512MB RAM. Microsoft's Web site content consists of 8GB of HTML, Microsoft Office documents, and free downloads. The 14 servers are on two FDDI LANs (100 megabits per second), which are connected to the Internet via eight DS3 circuits (45 Megabits per second). The servers each run Windows NT Server 4.0 and Internet Information Server 3.0. Three servers are reserved for general site searching and for searching the Microsoft Knowledge Base. These servers are Compaq ProLiant series 4500 machines with four Intel Pentium 166 processors and 512MB RAM. They use Microsoft Index Server, version 1.1, and each server receives an average of 150 search requests per minute.

One SQL Server currently handles all SQL applications on www.microsoft.com. The SQL Server has more than 750 SQL-based applications and is running Windows NT Server 4.0 and SQL Server 6.5. There is an average of 300 SQL connections to this SQL server at any point during peak business hours. The SQL server is a Compaq series 4500 with four Intel Pentium 166 processors with 512MB RAM, and is connected to the Web servers via a DS3 circuit.

Because Internet Information Server is integrated into the server operating system, it eliminates the increased overhead and performance penalties of other Web servers that must duplicate operating system services. Windows NT Server's high performance and open extensibility make it the best Web solution for both corporate intranets and the busiest sites on the Internet.

WINDOWS NT AND PROLIANT SERVERS: READY FOR MISSION-CRITICAL APPLICATIONS

Mission-critical robustness was once the domain of RISC/UNIX-based systems: this is no longer the case. Microsoft and Compaq have demonstrated that Windows NT Server, used in conjunction with Compaq's server hardware, can provide a reliable, stable computing environment for virtually any task.

A key component of Microsoft's commitment to enterprise computing needs is its clustering strategy. Microsoft is working with Compaq to develop systems that provide greater availability and scalability through *clustering*: the technology that lets customers connect a group of servers to enhance data availability, server manageability, and performance. Regardless of how many servers are connected, a workstation treats the cluster as a single server. Clustering helps avoid costly "downtime"—estimated by the Financial Times of London to cost U.S. businesses about \$4 billion a year—by keeping networks running in the event of a single system failure. Clustering also adds scalability. When the overall load exceeds the capabilities of the systems in the cluster, additional systems can be added to the cluster to meet overall processing power requirements.

To accommodate the business-critical client/server network requirement, Compaq has developed a multi-server or clustering strategy that allows a customer to obtain high levels of system availability while having the flexibility to grow their computing platforms in the most cost-effective way. Compaq calls this family of high-availability, high-performance clustering solutions Server Arrays. Through the company's alliances with Microsoft and Tandem, these solutions are setting a new industry standard for Windows NT Server clustering. And through the support of other key industry players, the market will begin seeing new cluster-aware applications taking advantage of the Windows NT Server clustering platform.

Compaq's goal has been to implement its clustering strategy in phases. The first one began with the introduction of the Recovery Server Option in the second quarter of 1995. On-Line Recovery Server, the second of the Recovery Server Options, is Compaq's first clustering solution that lets customers set up a branch office or replicated-site configuration for their business-critical applications. Operating under Microsoft Windows NT Server, this failover implementation pairs two interconnected Compaq ProSignia or ProLiant servers to provide backup services for each other. The servers don't need to have identical hardware configurations since during normal operation, they work independently and typically have ProLiant Storage Systems that are not shared between them. However, in the event of a server failure, the surviving server must be able to accommodate the load of the failed server in addition to its own work load. The storage system attached to the failed server must also be accessible by the client. This switchover is done automatically without administrator intervention.

Many clustering solutions have been offered to networks, but they typically are complex, difficult to configure, and built using expensive proprietary hardware. In 1997, Microsoft—working with other industry leaders such as Compaq—is rolling out a phased approach to clustering that is based on open

specifications, industry-standard hardware, and ease-of-use. This technology, code-named "Wolfpack," will result in multiple benefits for enterprise customers, including:

- Improved reliability, so if one server in a cluster fails, cluster software will recover and disperse the work elsewhere. Users will not be aware of the failure.
- Easier manageability that includes using point-and-click to move applications from one server to another for load balancing and planned maintenance.
- Enhanced performance through additional processing power for the cluster, which is achieved by adding more servers.

Microsoft will also provide tools for application developers to create and manage enterprise applications that take advantage of clustering for Windows NT Server.

Compaq's goal is complimentary to Microsoft's Wolfpack development efforts: to provide a complete high-availability solution. The company's thorough investigation of clustering technologies meeting these requirements culminated with the selection of Tandem's ServerNet technology for the standard server interconnect and Fibre Channel for communication between clusters and shared storage devices.

ServerNet meets Compaq's core requirements with the following features:

- Availability-transparent client re-connect, hardware failure recovery, and preservation of transaction state where any data in transit at the time a server fails will be preserved.
- Scalability-support for multiple I/O data paths to allow for a scalable bandwidth as more connections are added.
- Performance-high bandwidth (aggregate of 100 MB/s) and low latency
- Reliability-fault resiliency that includes error checking and redundant connection.

The Fibre Channel technology, an IEEE standard for providing high-speed data transfer among computer devices, removes the limitations of today's server-to-storage interconnect solutions, such as insufficient capacity per server, limited interconnect redundancy and shared storage capabilities, and inability to hot-plug boxes. With Fibre Channel, a customer has vast storage capabilities that meet high-availability criteria with:

- greater connectivity.
- full redundancy and sharing.
- dynamic storage attachment.
- high performance (100 MB/s interconnect).

Because of their unlimited growth and performance capabilities and their high levels of fault tolerance, ServerNet and Fibre Channel technologies will ride the crest of the wave for distributed processing in business-critical, enterprise-wide environments.

Last December, Compaq became the first company to demonstrate failover

capabilities for SAP's R/3 using a preliminary version of the Microsoft Wolfpack clustering extensions. The demonstration took place at the SAP/Microsoft Technical Education Conference in Los Angeles, where Compaq is the primary platform provider.

COMPAQ AND WINDOWS NT SERVER: INNOVATIONS FOR THE ENTERPRISE

Building upon core strengths, Compaq delivers industry-leading products for the distributed enterprise. These include Compaq's ProLiant family of servers, which complement Windows NT Server's role in mission-critical environments with a suite of features and services offered. For example, Compaq's On-Line Recovery Server is a cost-effective way of increasing capacity and availability of critical applications and Compaq's first step in a clustering strategy for Windows NT Server. This feature pairs two independent Compaq servers as on-line partners; should one fail, the other automatically takes over the workload.

Full Spectrum Fault Management is enhanced by other optional fault-tolerant features, including:

- Server Recovery, which will power down the server in the event of a processor failure and then power the server back up, reconfiguring the system to run on the remaining processors. Redundant network interface cards (NICs), which provide an additional level of fault tolerance for the networking system, keep data flowing in the event that a NIC is no longer able to communicate with the network.
- Redundant power supplies.
- Pre-fail Warranty, which monitors disk drives and other hardware to determine if a part is about to fail or has gone past its expected life span. This feature sends out an administrative alert through Compaq's InSight Manager, part of an SNMP-based delivery system for alerts and remote administration.

Compaq's high availability features are backed by the high performance of the ProLiant line, which is used by Microsoft for internal deployment of Microsoft Exchange, for Microsoft Network (MSN) traffic, and for Microsoft's customer registration base. Compaq's flagship server, the ProLiant 5000, can be equipped with up to four 166- or 200-Mhz Pentium Pro processors, up to 2GB of ECC memory, and has a dual-peer PCI bus and an ECC-protected system bus. Its high performance disk subsystem includes a SMART-2/P Array Controller, with support for RAID 0, 1, and 5.

The powerful design of Compaq servers provide organizations with industry-leading price/performance ratios for Windows NT Server-based applications. The TPC-C results cited previously are just one example of Compaq's leadership role in raising the bar for server performance, both against Windows NT and Intel-based competitors and against RISC/UNIX systems, including Sun, DEC, IBM, and Hewlett-Packard.

WINDOWS NT SERVER AND COMPAQ: COMPLETE SOLUTIONS

The Frontline Partnership between Microsoft and Compaq is the formal name for an ongoing effort to accelerate the development of new technology and bring customers to new levels of ease of use and integration. Through their combined effort, the two industry leaders can offer enterprise powerful and affordable networking solutions that are easy to implement and manage.

Microsoft Windows NT Server together with Compaq servers are the cornerstone of Microsoft and Compaq's commitment to reducing customer's "total cost of ownership" because it greatly simplifies the tasks associated with managing a network environment. Its GUI—identical to the ones used in Windows 95 and Windows NT Workstation—provides a consistent user interface across all 32-bit Windows platforms, resulting in reduced training and easier user migration within the Windows family of operating systems. Compaq servers complement Windows NT Server with an extended product line that includes easy-to-maintain and affordable components.

The Frontline Partnership extends to international programs that include joint sales and marketing to cooperative efforts between Compaq's Enterprise Consulting Services and Microsoft Consulting Services. For example, if customers call Compaq about a server-related issue, Compaq's expertise in Windows NT Server will be used to tackle the issue. If necessary, Compaq will call in Microsoft to determine the best course for the customer.

Through their Frontline Partnership, Compaq and Microsoft meet critical customer needs by enabling end-to-end management of their networks, bringing in excellent partner solutions, and providing tested and proven solution integration. Through close cooperation, Microsoft and Compaq are developing innovative solutions that deliver record-breaking performance and value.

For more information

For the latest information on Windows NT Server, check out our World Wide Web site at <http://www.microsoft.com/ntserver> or the Windows NT Server Forum on the Microsoft Network (GO WORD: MSNTS).