

THE SEARCH FOR MAINFRAME CLASS PERFORMANCE

White Paper

UNiSYS

**UNIX vs. Windows NT/2000
January 1999**

CONTENTS

<i>1</i>	<i>Executive Summary</i>
<i>2</i>	<i>Why the Debate?</i>
<i>2</i>	<i>The Evolution of UNIX</i>
<i>3</i>	<i>Is the Battle for the Desktop Over?</i>
<i>4</i>	<i>The Evolution of Windows NT/2000</i>
<i>7</i>	<i>NT vs UNIX</i>
<i>12</i>	<i>The Reality: Windows NT 4.0 is a Proven Infrastructure Core Platform</i>
<i>13</i>	<i>Windows NT/2000 Challenges</i>
<i>14</i>	<i>Unisys and Windows NT/2000</i>

FIGURES

<i>6</i>	<i>Windows 2000 Positioning</i>
<i>13</i>	<i>Consolidation Challenges</i>
<i>15</i>	<i>Unisys Servers</i>

TABLES

<i>9</i>	<i>Integrated Operating System Differences</i>
----------	--

Executive Summary

1999 promises to be a year of change for enterprise computing. There is much discussion over which "integrated operating system" and hardware platforms are best suited to meet the challenges of enterprise computing in the 21st century. The purpose of this white paper is to give an objective overview of the robust platform technologies available for enterprise computing.

Through a historical overview, and direct comparison, this white paper concludes that Unisys and Windows NT/2000 is the choice for mainframe class enterprise computing entering this new millennium.

This white paper includes the following sections:

- **Why the Debate?**
Setting the stage with a little history and an interesting analogy.
- **The Evolution of UNIX**
The challenge to find a replacement for mainframe computing isn't new.
- **Is the Battle for the Desktop Over?**
Will Linux challenge NT for desktop space?
- **The Evolution of Windows NT/2000**
NT was born out of necessity.
- **NT vs. UNIX**
What are the real differences?
- **The Reality: Windows NT 4.0 is a Proven Infrastructure Core Platform**
NT is already quite accomplished.
- **Windows NT/2000 Challenges**
Is Windows NT/2000 ready to clear these hurdles?
- **Unisys and Windows NT/2000**
Why Unisys and Windows NT/2000 are the choice for enterprise computing entering this new millennium.

With a single operating system across the enterprise – presentation, application and database layers, the RPC feature of NT can be fully explored for maximum performance and reduced TCO. In addition, the interoperability of the Windows NT/2000 Network, Data, Application and Management (NDAM) layers helps the coexistence / migration strategies with UNIX, AS/400 and mainframes. NDAM helps guarantee end-to-end Quality-of-Service (QoS).

Why the Debate?

According to the famous mathematician John Von Neumann, subjects that end with 'Science', such as Political Science, Behavioral Science, Computer Science etc., are philosophies rather than true science like Math, Physics and Chemistry. Philosophies are prone to hot debates. When philosophies are debated in a competitive business environment the heat gets turned up a few notches.

Let's set the stage for the debate with a quick historical overview. Modern computer operating systems are based on concepts set forth by Charles Babbage in the early 1830s. It took more than a century for Babbage's dreams to bear fruit. Finally, in the early 1950s, computer hardware and operating systems began to evolve quickly into useable business tools. In this evolution, mainframes proved to be the most robust systems. Mainframes define the benchmark for computing excellence. Alternate systems are trying to imitate mainframe quality at reduced costs.

An analogy can be drawn in the motion picture industry. Long ago the "Silver Screen" theater experience set the gold standard for motion picture performance. Television and home theater components are continually refined, striving to reach "Silver Screen" quality for the home enthusiast. Today the technology of home theater has come close enough to the "Silver Screen" experience to satisfy all but the toughest critics.

Currently, UNIX and Windows NT are the two top operating systems that promise mainframe quality with reduced costs. Is it fair to compare UNIX or Windows NT to mainframe systems? A look at the evolution of these operating systems helps answer the question.

The Evolution of UNIX

The search for an alternative to mainframe computing has always been challenging.

1969 - At Bell Labs Ken Thompson developed the first version of UNIX. Dennis Ritchie, the inventor of C (based on BCPL), helped enhance this first version and the UNIX OS was born. Running on PDP-7 it was significant in that only 3% of the code was hardware dependent.

1976 - After further enhancements, Bell Labs released UNIX Version 6 (V6) as the first release version. V6 was well received by many universities and research centers. Portability became the significant design goal for UNIX. Hardware dependency remained minimal, making UNIX OS attractive to the minicomputer community.

1978 - Unix V7 is released, and within a year three major UNIX variants begin to evolve.

1980's (early) - By now the three major branches of the UNIX tree are easily identified.

- Unix System III from Bell Lab's UNIX Support Group (USG)
- Unix Berkeley Distribution (BSD) from University of California at Berkeley
- Microsoft's Xenix, a version of UNIX that ran on the x86 processor family

1980's (later) - There was an explosion of UNIX based operating systems. This explosion caused fragmentation of the UNIX market. The UNIX market witnessed several splits and reunions that multiplied the UNIX variants. The variation resulted in many interface schemes, making it difficult to port from one UNIX platform to another.

1987 - In an attempt to stop the confusion The X/OPEN Portability Guide is published by X/OPEN, a group of mostly European UNIX vendors.

1988 - In another attempt to stop the confusion a group of UNIX vendors working through IEEE formulated the API standard called POSIX 1003.1.

UNIX Today

UNIX vendors differentiate their offerings with proprietary interfaces, applications and architecture. There are several dozen widely used versions today, with the largest market share belonging to Sun's Solaris, Hewlett Packard's HP-UX, and IBM's AIX.

Having looked at the evolution of UNIX and the variation that continues to exist, an observation is made that systems management across these heterogeneous systems can be a nightmare. Furthermore, interoperability and manageability of applications over these platforms becomes a major concern that consumes increasing amounts of capital and time for growing enterprises. The result of the concern for applications and platform management is loss of focus on the core *business* challenges of the enterprise.

The Search Continues...

The maintenance of applications across different UNIX versions is frustrating for vendors. Customers are looking for one-stop shopping on solutions to avoid maintenance and support headaches.

There were some successes in the effort to satisfy the need for UNIX consistency. One of the success stories was CTOS, the Convergent Technology Operating System (later known as Client-To-Server). In 1979, exactly one decade after the invention of UNIX, a group of Intel engineers formed Convergent Technologies Inc. Convergent Technologies Inc. designed an operating system that could deliver POSIX, micro-kernel, and networking features out of the box. CTOS became popular because of its modularity, multi-user support, multi-tasking capabilities, micro-kernel features, network-readiness, remote-booting, ease-of-use command forms, forms-based and single-key function applications, among other desirable attributes.

Though CTOS is a perfect server-side solution, security concerns and the lack of bit-map support for the client-side hindered it from taking center stage in client/server computing. Another downside of CTOS is that, like the Mac OS, it is based on the Pascal language and the vast majority of developers were looking for C based systems.

Is the Battle for the Desktop Over?

The desktop operating system started with PC DOS in late 1981. DOS was designed basically for personal computing. DOS runs primarily on Intel based systems.

The Macintosh desktop system was designed with rich graphics for publishing and demanded a higher price.

With advances in microprocessor design and manufacture, Intel and other x86 vendors provided affordable personal computers. Over time, the software industry exploded with thousands of applications for home and office. While UNIX and OS/2 were struggling to define the desktop standard for the enterprise, Windows made a big breakthrough and entered into desktop computing for home and office. With network advances in LAN/WAN, The Windows OS has become the number one selling platform with countless available applications.

Macintosh became a publishing standard for educational institutions while Windows becomes the standard for home and office. Windows NT workstation started replacing the UNIX workstation for high-level computing on desktops. With Windows 9x, Microsoft

dominated the desktop market. Windows 2000 professional (the new name for Windows NT workstation) is expected to replace Windows 9x for corporate desktop computing.

Recent advances in LINUX (another low-cost UNIX), prove that UNIX is ready to fight for desktop space. But LINUX is crippled by the lack of features such as Plug-and-Play and Win32 support. It may be a couple of years before LINUX can catch up with Windows 2000 professional.

The Evolution of Windows NT/2000

The Pre-NT Environment:

A look at the computing environment prior to the birth of NT makes it easier to see why the opportunity for NT existed.

While UNIX vendors were focusing on alternatives to mainframe and enterprise computing, Novell focused on the networking side of the enterprise and released Netware. With its IPX protocol for routable networks, NetWare emerged as the standard infrastructure component for print and file services.

At one point in time, three operating systems were well positioned with clearly defined roles:

- UNIX for applications
- Windows for the desktop
- NetWare for the enterprise network.

However, after the confusion created by UNIX fragmentation, customers felt compelled to look for a single vendor operating system to address all the enterprise needs.

IBM and Microsoft, with LAN manager architecture based on the non-routable NETBUEI protocol, were battling with Novell's NetWare to move from the desktop dominant workgroup to the enterprise space.

With the Intel's success offering low-cost microprocessors, the PC had become an affordable desktop machine, running several hundred applications on an x86 chip.

In mid 80's, microprocessors gained 32-bit addressing and workstations were quick to take advantage of this capability.

Because of the very large installed base of PCs running desktop applications, it was not feasible to roll in a new 32-bit computer and then recompile and relink all the application software. End users of PCs simply didn't have the source code for their programs, and they demanded binary forward and backward compatibility.

NT (New Technology) Is Born

In October of 1988, David Cutler from Digital Equipment Corp., joined Microsoft to form a group to design an operating system for the 1990s through 2000.

The goals for the OS included portability, security, POSIX compliance, compatibility, scalable performance (multi-processor support), extensibility, and ease of internationalization. To avoid the recompilation and relink of thousands of applications that exist on the desktops, it was equally important to support a single interface for DOS/Win16, OS/2, WIN32 and POSIX. The ability to take advantage distributed network resources would become the heartbeat of this operating system (Unisys played a major roll here - Unisys Federal Systems Group, having previous experience in CTOS, was the key resource that proved Windows NT POSIX compliance).

The first step was to move applications from DOS, OS/2, Windows etc. to the NT platform. Windows NT kept the LAN manager topology, and introduced a new security model called *domains*.

1993 - The first release, Windows NT 3.1, proved not to be ready for the enterprise, but did prove to be a robust departmental platform.

1994 - With the acceptance of IPX as routable protocol, Windows NT earned a reputation as a print and file server. Windows NT 3.5 took a dramatic turn as the best print and file server. In fact one of the NT betas had IPX as the primary protocol.

1995 - At TechEd 95, Microsoft demonstrated its commitment to TCP/IP. Windows NT 3.51 was accepted as an application server and many vendors signed up to develop applications for Win32. Microsoft showed how DHCP/WINS played an important role in reducing network traffic over TCP/IP. Some analysts were surprised at NT's exponential growth.

1996 - As the Internet took center stage, Microsoft gave NT a facelift. Windows NT 4.0 incorporated the desktop interface of Window 95. The movement of the desktop interface to the kernel space dramatically improved the performance of applications. NT 4.0 included many components that incorporated Internet services. The development cycle was faster than any operating system known to this point.

1997 - Shipments of NT exceed shipments of all UNIX flavors combined. NT becomes a robust desktop standard as well. While UNIX development is in the hands of standards committees, NT is developed from the suggestions of user communities. NT benefits from the input of over 250,000 beta sites. Microsoft continues to incorporate user suggestions and implements standards for interoperability with UNIX.

In 1997, moving NT closer to an enterprise solution, Microsoft tuned the operating system to boost scalability and released the 'Enterprise Edition' of Windows NT. In addition to the support of 8-way systems, it gives the user space to scale up to 3GB RAM.

NT simplifies the implementation of device drivers. The common code for device drivers is the part of the NT kernel. NT supports thousands of hardware devices.

With the support of hundreds of hardware vendors and the system services, NT has become the operating system with the largest installed base.

Introducing Windows 2000

With wide acceptance and vast applicability, NT is the most widely installed operating system ever known to the industry.

Windows NT currently exists in the following forms:

- Windows NT workstation
- Windows NT Server/Standard Edition
- Windows NT Server/Enterprise Edition
- Windows NT Server/Terminal Server Edition

In addition, BackOffice Standard and BackOffice Enterprise are bundled with Windows NT Server/Enterprise Edition and includes Exchange Server, SQL Server, SNA Server, SMS Server, Site Server and Proxy Server.

Microsoft has announced the Windows 2000 family:

- Windows 2000 Professional - formerly known as Windows NT workstation
- Windows 2000 Server - formerly known as Windows NT Server

- Windows 2000 Advanced Server - formerly known as Windows NT Server, Enterprise Edition
- Windows 2000 Datacenter – the new kid on the block

Windows 2000 Datacenter Server supports up to 16-way SMP and up to 64GB of physical memory, depending on system architecture. Like Windows 2000 Advanced Server, it provides both clustering and load balancing services as standard features. Microsoft designed this product especially for large data warehouses, econometric analysis, large-scale simulations in science and engineering, online transaction processing and server-consolidation projects.

In addition, the BackOffice products are tightly integrated with Windows 2000 core functionality.

Windows 2000 code exceeds 35 million lines. The micro-kernel architecture allows invoking and configuring only the services needed for a particular installation. This means that only the code for that installation is memory resident.

Figure 1 illustrates Windows 2000 positioning throughout the enterprise.

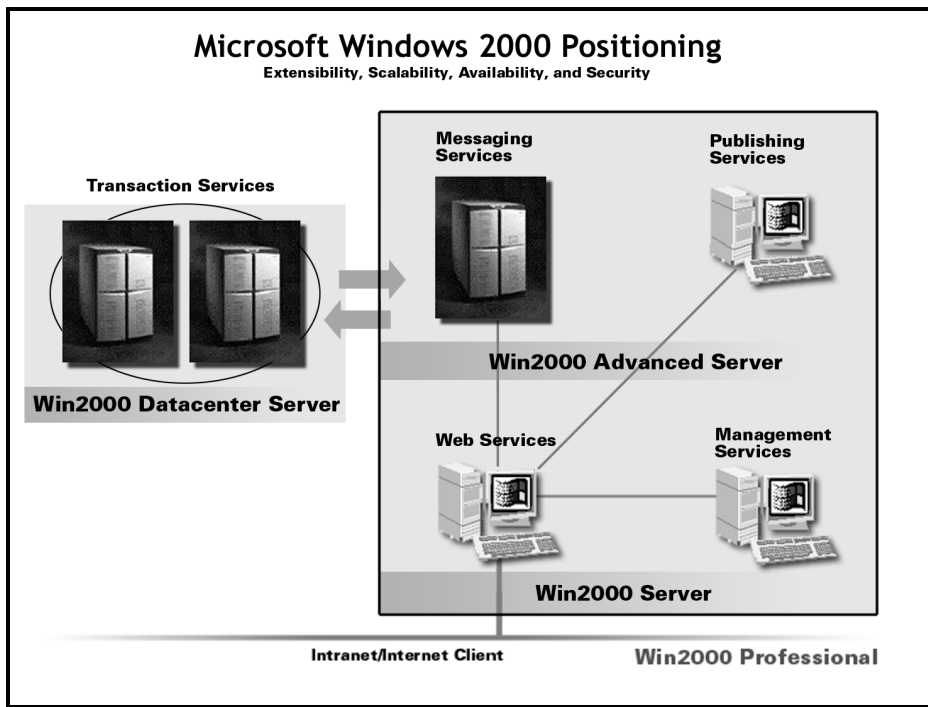


Figure 1.
Windows 2000 Positioning

For further information, visit Microsoft at:

<http://www.microsoft.com/ntserver/windowsnt5/default.asp>

NT vs UNIX

Traditional operating systems are based on the three major components of Babbage's model:

- Processor management
- Memory management
- I/O management

Today's 'Integrated operating systems' offer more than that out of the box:

- UNIX under went major changes after it realized the success of NT. Micro-kernel, Common Desktop Function (CDF), security, among other features, were added. After loosing the battle on desktops, major UNIX vendors started concentrating on enterprise servers.
- Microsoft, being strong on desktops and networking, introduces the Windows NT/ 2000 operating system as the primary vehicle for enterprise computing.

The basic differences between NT and UNIX

User mode and Kernel mode

The major difference between UNIX and NT architecture is UNIX does not incorporate its windowing subsystem – the subsystem that manages GUI resources for applications – into kernel mode, as does NT 4.0. Instead, the UNIX windowing system, mostly MIT's X-windows, is an add-on user-mode application. This does not help much for a server centric application but does help for client applications. Moving the GUI interface to kernel mode in NT 4.0 boosted the performance of NT 4.0 workstation.

Another difference between the OS architectures is that UNIX applications can call kernel functions, or system calls, directly. In NT, applications call APIs that the OS environment to which they are coded (DOS/WIN16, OS/2, WIN32 and POSIX) exports. If the application is written in WIN32 API (native NT system calls), performance is better than any interface.

Process Management

NT and UNIX are time-sharing OSs that divide CPU time fairly between applications competing for CPU time (or CPU resources) between multiple active applications. Neither OS is suitable for environments that have strict application-responsiveness guarantees. Process management in most modern UNIX systems is similar to NT process management. The differences between NT's and UNIX's process management involve differing priority schemes and subtleties in scheduling algorithms. One notable difference is that NT boosts the priorities of dynamic threads in response to events such as input, whereas UNIX depresses dynamic threads' priorities as the threads consume the CPU. Both OSs try to treat CPU-bound and I/O-intensive threads fairly with respect to other threads, but each OS goes about this task differently.

Both NT and UNIX support symmetric multi-processing (SMP). In SMP processors, all CPUs are identical and have equal access to memory and I/O peripherals. Internal data structures limit NT 4.0 to using a maximum of 32 processors with 32-bit processors. Most modern UNIX variants support more than 64 processors with 64-bit processors. Windows 2000 will run on 64-bit machines.

Memory Management

The basic principles for memory management are the same for both NT and modern UNIX. NT's Memory Manager defines a 32-bit virtual address map that spans 2GB to 4GB. The space is split between user-mode application code and data and kernel-mode code and data. However, in NT enterprise edition there is support for a 3GB user space and a 1GB kernel space.

UNIX memory managers differ from the NT Memory manager in that they manage memory globally – they do not constrain individual applications to specific upper and lower limits. In addition, when a UNIX application accesses code or data that must be brought into memory, the memory manager uses a clock algorithm or a close variation to find data or code that belongs to any application performing the access – to replace the code or data it maps to memory. This policy lets memory-intensive UNIX applications starve other programs, which can lead to a performance bottleneck known as thrashing. To combat trashing, most UNIX variants have a swapper – a background process that can send entire applications out of memory.

Security

UNIX was originally designed for terminals. Hence there was clear text transmission for decades. However, modern OS must provide protection to users, not only for access control but also encryption over the wire.

NT's security (based on challenge and response) capabilities have earned it a C2-capable rating (as a standalone non-networked system), which the industry considers the minimum level required for a modern OS. A powerful aspect of the NT security model is that server applications can maintain security information for their privately defined objects and can use security APIs to validate client access to the objects.

The traditional UNIX security model is much less powerful. Similar to NT, UNIX can assign users group membership, but UNIX groups have no security privileges. Instead, UNIX relies on a special user account, or root, that can bypass all security settings. Because UNIX does not employ application-accessible security, UNIX applies security only to files. The lack of ACLs and auditing prevent traditional UNIX from achieving a C2-capable security rating. This situation has led virtually every major UNIX vendor to create a proprietary UNIX version that implements these features, mirroring NT's security model.

Windows 2000 will implement a more robust security model in the Active Directory (AD) that can interoperate with Novell's NDS that has been supported by many UNIX implementers. Sun has introduced the 'Sun Directory Services (SDS)' and IBM recently announced 'Meta Directory' to embrace AD, NDS and Lotus Notes Directory Services.

I/O

The I/O subsystem plays major role in determining an OS's scalability and performance. NT bases its I/O model on the file object that is based on the layered model. Typically three drivers work together to process a file-system level. This design was considered to make NT more extensible.

The majority of UNIX implementations do not support a layered driver model (UNIX sometimes supports layered I/O in a specialized network driver model it calls STREAMS). Traditional UNIX supports only synchronous I/O, and UNIX drivers process all levels of abstraction. Several modern UNIX variants, including the leading commercial offerings, extend the traditional I/O model to achieve asynchronous I/O processing capability.

Other major differences

NT and UNIX differ in file system types. NT can support FAT, FAT32, NTFS, HPFS etc. NT supports Winsocks where as UNIX supports socket API. RPC is well implemented in NT from desktop to the enterprise. However, there is no RPC between UNIX and NT.

With the developments toward Windows 2000 Datacenter, NT will be taking center stage for enterprise computing. Table 1 outlines the differences between Windows 2000 and other major UNIX vendor operating systems.

Table 1
Integrated Operating System
Differences

Feature	Windows 2000 <i>(subject to change)</i>	Solaris 7	HPUX 11	AIX 4.0
Supported Platforms	open X86/Pentium, Proprietary Alpha	X86/Pentium, Proprietary SPARC	Proprietary PA-RISC	Proprietary PowerPC
Platform Architecture	IA32, IA64, Microkernel	64-bit HPC 2.0	32-bit, 64-bit	32-bit, 64-bit
Component Architecture	DCOM	CORBA	CORBA	CORBA
Solution Architecture	Strong Distributed & good centralized*	Strong Centralized	Strong Centralized	Strong Centralized
GUI interface	Windows	X-windows	X-windows	X-windows
H/W peripherals support	unlimited	limited	limited	limited
S/W vendors	unlimited, WIN32 apps	very limited	very limited	very limited
Plug & play	yes	no	no	no
Choice as a Single vendor	Yes. Presentation, App & Database	Database & Apps	Database	Database
IPC	RPC, streams/sockets	streams/sockets	streams/sockets	streams/sockets
File system	NTFS, FAT, HPFS	UNIX	UNIX	UNIX
Network Transports	TCP/IP, SPX, NETBUEI, AppleTalk, Vines	TCP/IP, SPX	TCP/IP, SPX	TCP/IP, SPX
NFS	third party	yes	yes	yes
DFS	yes	third party	third party	third party
DNS	included	third party	third party	third party
SAN support	yes	yes	yes	yes
Internet ready	IIS included	optional	optional	optional
Sys. Mgmt. Interface	RPC, agents, SNMP, MMC	Agents, SNMP	Agents, SNMP	Agents, SNMP
Network device OS homogeneity	No. Soon with embedded NT	Yes, UNIX kernel	Yes, UNIX kernel	Yes, UNIX kernel
UNIX Integration	NT-UNIX tools available	N/A	N/A	N/A
NT integration	N/A	poor	excellent	good

*limited by
hardware platform

Feature	Windows2000 <i>(subject to change)</i>	Solaris 7	HPUX 11	AIX 4.0
Messaging integration	Excellent	poor	good	good
Publishing integration	Excellent	Excellent	poor	good
e-commerce	Excellent	Excellent	good	very good
Novell Integration	Excellent	good	poor	poor
Price	Excellent	good	good	poor
Maturity	5 years	15 years	15 years	15 years
Supported Databases	SQL Server			
	ORACLE	ORACLE	ORACLE	DB2
	INFORMIX	INFORMIX	INFROMIX	ORACLE
	DB2	DB2	DB2	SYBASE
	SYBASE	SYBASE	SYBASE	
	PROGRESS	PROGRESS	PROGRESS	
	INGRES	INGRES		
Thin Client Technologies	Terminal Services, Active-X, Java	Java	Java	Java
OS features	Active Directory (AD)	SDS	needs Novell NDS	Meta Directory
	MMC	SysMon (optional)	OpenView (optional)	TIVOLI (optional)
	App. Install Services	yes	yes	yes
	WBEM	yes	yes	yes
	Windows Scripting Host (WSH)	no	no	no
	Group Policy Editor			
	Microsoft IntelliMirror			
	Application Installation Service	no	no	no
	Disk Duplication	yes	yes	yes
	Advanced System Recovery (ASR)			
	Remote Storage Service(RSS)	yes	yes	yes
	Removable Storage Manager(RSM)	yes	yes	yes
	File Encryption	third party	third party	third party
	Disk Quotas	no	no	no
	Enhanced Backup Utility	third party	third party	third party

Table 1
Continued

Table 1
Continued

Feature	Windows 2000 <i>(subject to change)</i>	Solaris 7	HPUX 11	AIX 4.0
	Disk Defragmentation Utility	third party	third party	third party
	Distributed File System (DFS)	third party	third party	third party
	Transaction Services	third party	third party	third party
	Message Queuing	third party	third party	third party
	Web App. Services	yes	yes	yes
	Web Publishing Serv	no	no	no
	Index services	third party	third party	third party
	Internet Printing Protocol	no	no	no
	Ent. Mem. Arch	yes	yes	yes
	Cluster Services	yes	yes	yes
	I2O	n/a	n/a	n/a
	Client-side caching	no	no	no
	security			
	- SCE	no	no	no
	- Kerberos Authen.	yes	yes	yes
	- Public Key Cert. Ser	no	no	no
	- PPTP, IPSEC	IPSEC	IPSEC	IPSEC
	- Encript. File System	yes	yes	yes
	QoS	no	no	no
Network & comm	ATM, Fiber channel,	yes	yes	yes
	NAT, IP Telephony	no	no	no
	MAC services	no	no	no
	RRAS	no	no	no
	I2 and IP6 ready	yes	yes	yes

Platforms

One of the major driving forces for NT is its diverse support of x86 and Pentium based platforms. Though previous NT versions supported Alpha, PowerPC and MIPS based systems, NT 4.0 is now limited to the Intel/x86 and Alpha. Analysts believe that Windows 2000's primary focus will be the Intel/x86 platform.

One of the major challenges for Windows NT's scalability is the maturity of supporting hardware platforms. NT is mostly designed for distributed architecture. It can scale well horizontally with 4-way systems. However, in recent packaged core business solutions like SAP, PeopleSoft, etc., database servers demand vertical scalability for more capacity.

With the help of Intel's tremendously powerful Xeon 400MHz and 450MHz processors and the future road map for powerful 64-bit processors, Windows NT/2000 has once again gained momentum in the enterprise. Unisys's 4-way Xeon-based server, QS/2 has made headlines by superseding previous performance by any 4-way UNIX systems.

The Reality: Windows NT 4.0 is a Proven Infrastructure Core Platform

Publishing Services

Windows NT 4.0 is the leading print/file platform with Microsoft Office as the front-end publishing tool. With Internet Information Server (IIS), active server pages, and the popular FrontPage publishing tool, Windows NT has become the most desirable and leading web publishing platform. Additionally, the latest web server, Zeus WebServer v3, will be available in 2Q99.

Messaging Services

Windows NT 4.0 is the leading and most desirable platform ever known to date for groupware services. Microsoft Exchange, Lotus Notes and Novell's Groupwise are the leading products on the NT platform.

Management Services

Today, the top three management solutions, CA-TNG, HP-Openview, and IBM's TME-10 are poised to perform on the NT platform. Windows 2000 itself includes the MMC and WBEM tools to tightly integrate various third party tools in one common framework. Microsoft SMS will enable server-side management of desktops. In addition, the application management tools for BackOffice 4.5 components like 'AppManager' from NetIQ will be available with MMC interface. All the network management vendors are now porting their tools to Windows 2000 MMC and WBEM framework. The network management tools from CISCO, 3COM and others, can be easily integrated to MMC and WBEM.

Core Business Solutions

The results of benchmarks such as TCP-C, TCP-D, SpecWeb, among others clearly establish Windows NT as the price/performance leader for core business solutions.

SAP, PeopleSoft, Oracle and others are now offering ERP, HRMS, Financial solutions etc. on the Windows 2000 platform. In fact, SAP's 65% implementation is on Windows 2000. Unisys set record Benchmarks with Enterprise-class servers in 1998:

- SAP benchmark - On September 14 1998 Unisys Corporation announced that its Enterprise-class Windows NT QS/2 servers have set a new SAP R/3 standard application benchmark record for Windows NT platforms using the SQL Server 7.0 database environment. The systems delivered record support for 2,400 sales and distribution (SD) benchmark users with an average dialog response time of 1.91 seconds. These results represent a high water mark in the SD benchmark test, one of the most demanding system tests available for SAP R/3 integrated enterprise requirements planning (ERP) software. To read the entire press release visit <http://corp2.unisys.com/AboutUnisys/PressReleases/1998/sep/09146550.html>
- PeopleSoft Benchmark - The EDL Engineering Competency Center (ECC) recently published the benchmark results of the Aquanta HR/6, which demonstrate the best performance of all NT servers certified by PeopleSoft today. The results of the Xeon (QS/2) server far exceed any benchmark data produced to date by a factor of three on an Intel-based system. Using the Xeon systems as the database server, the high-water benchmark was reached at 6000 users. To read the entire report visit <http://pdt.unisys.com/briefs/0921peop.htm>

Proven Desktop Standard

The proven success of Windows NT 4.0 Workstation as a "well connected desktop" makes Windows 2000 Professional the easy choice for the enterprise desktop. It is highly integrated

to the Windows 2000 Server line, and it provides plug-and-play capability. Customers benefit by having one class of operating system throughout the organization.

With a single operating system across the enterprise – presentation, application and database layers, the RPC feature of NT can be fully explored for maximum performance and reduced TCO. In addition, the interoperability of Windows NT/2000 Network, Data, Application and Management (NDAM) layers helps the coexistence / migration strategies with UNIX, AS/400 and mainframes.

Windows NT/2000 Challenges

Windows 2000 Datacenter is clearly positioned for core business solutions in large enterprises. The operating system is enhanced to support high volume and high performance solutions. Windows 2000 needs an enterprise-class platform for high availability, high capacity and extensible hardware.

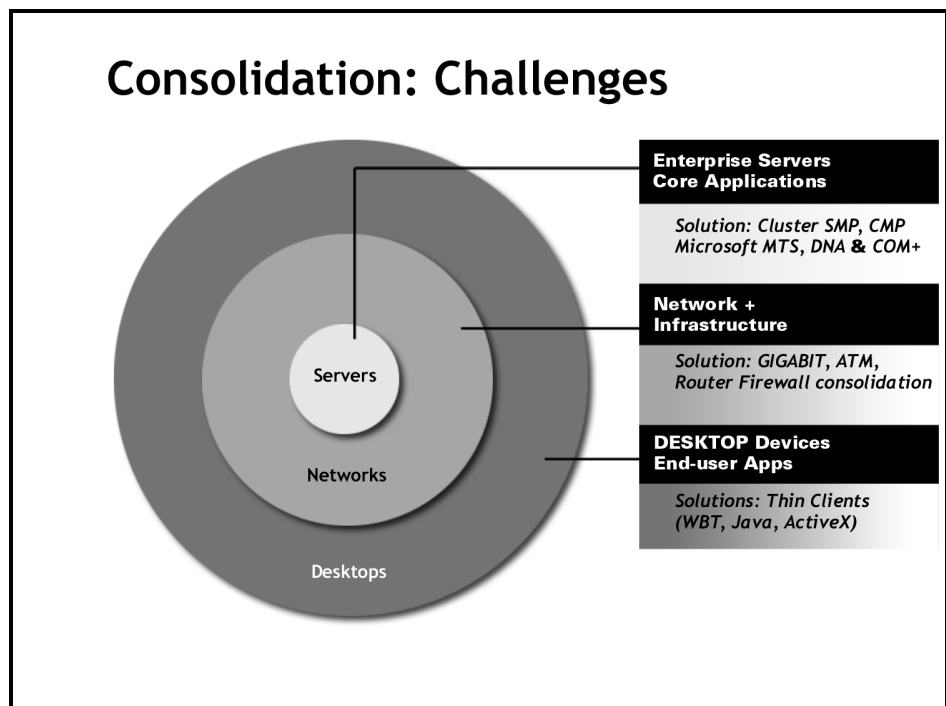
One of the greatest challenges in this kind of “broad-band open” system that embraces the applications from the legacy desktop applications like “DOS” to the enterprise class of core business applications, is its limit in SMP performance. Tuning by knowledgeable experts will improve performance, but the whole solution still needs a powerful SMP platform.

Recent results of Xeon based systems tests show that Windows NT 4.0 outperforms UNIX in 4-way SMP systems. Windows 2000 may boost this vertical scalability with high-end 8-way and 16-way systems which are in development today.

With guaranteed performance on 4-way to 8-way systems, Windows 2000 clustering and load-balancing face new challenges in the industry. Windows 2000 needs a mainframe class of platform for demanding computing needs. Unlike legacy systems where ascii/ebisc data-streams take minimal resources, today’s global communications and collaborative computing over the Internet/Intranet demands not only object-based data-streams, but also audio and video streams.

Another challenge for Windows 2000 is to address the ‘consolidation’ call from the industry. This consolidation call is for all levels – servers, applications, networks and desktops. Figure 2 outlines these consolidation challenges.

Figure 2.
Consolidation Challenges



Security is a growing concern. More powerful encryption of data-streams demand more powerful processors.

Response time with large data objects becomes more critical to overall communication topologies right from system-bus, I/O devices, to network devices that connect the end-user.

Knowledge is the powerful tool of human beings. With improving standards of modern business and personal interaction with the digital nervous system (DNS), the number of software products available for the Windows NT platform are growing exponentially. The right solution set is very critical to the growing business. The high level consulting in Windows 2000 is also a growing challenge. Industry is looking for the right service partner.

Last, but not least, is Quality of Service (QoS). Windows 2000 based solutions have multi-vendor products ranging from server-based applications, networks to desktops. QoS is a growing concern to ensure end-to-end delivery.

Unisys and Windows NT/2000

Unisys is well positioned to address Windows NT/2000 challenges. With its “mainframe class” of Enterprise NT servers, Unisys addresses Windows NT/2000’s platform needs with clustering SMP today, and CMP (Cellular Multiple Processor) architecture for the future.

With Services for network enabling technologies, consulting for business solution sets, key partnerships, and OneCALL support, Unisys addresses the total solution to ensure quality of service for Windows NT/2000.

The mission now, with 50+ years enterprise experience, is to deliver “mainframe class” platform and services to address the growing needs of enterprise customers. Windows 2000 Server's terminal services makes the platform well set to deliver mainframe class performance. Unisys will also ensure quality of service to guarantee end-to-end flow of data. The industry momentum is towards consolidation. With Intel's promise of bigger and better processor power and higher system bus speeds, and with Microsoft's Windows 2000 Datacenter computing for 4-way and above systems, *Unisys server program for consolidation is the best industry solution for high availability, scalability and extensibility.*

Today Unisys addresses the consolidation challenge in two ways:

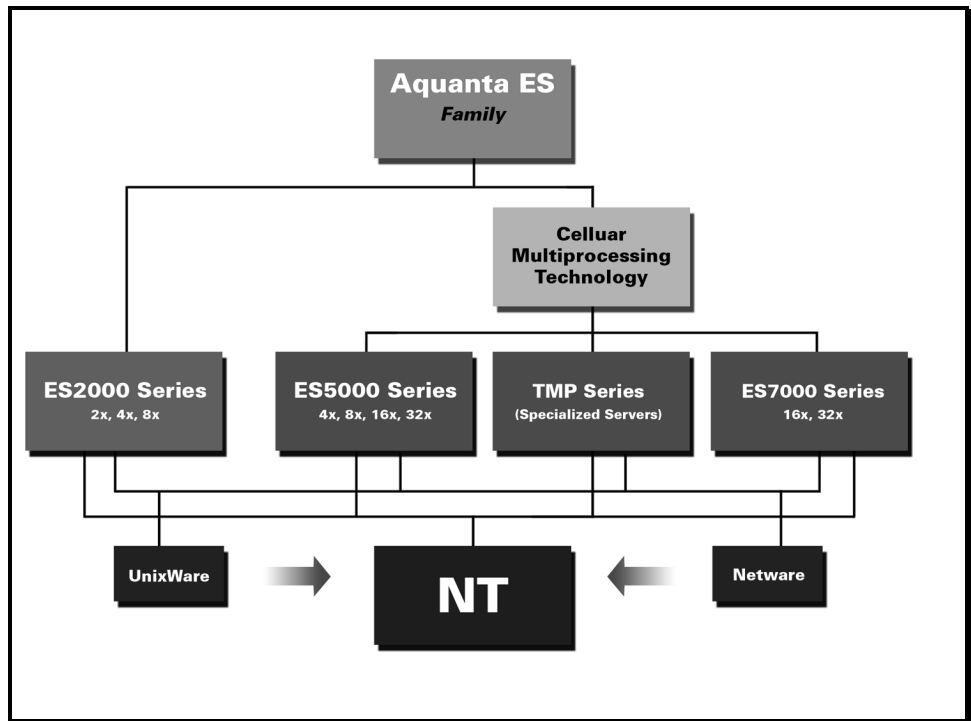
- The Unisys Servers for Thin Clients program consolidates desktop applications to an enterprise Terminal Server on Aquanta Servers.
- Datacenter-ready optimized mail server consolidation solutions, including extensive services to minimize risk and disruption to business critical operations.
- Optimized for high-performance within Windows NT environments, Unisys consolidation solutions offer robust enterprise servers employing Intel Pentium Xeon processors – the most advanced processing technology available. They also provide a full suite of complementary products and services to facilitate global deployment and administration.

For more information about the Unisys enterprise NT server program, which includes server consolidation, see the Unisys web site at:

<http://www.unisys.com/ent>

Figure 3 shows an overview of Unisys servers ready for these challenges.

Figure 3.
Unisys Servers



For more information

<http://www.marketplace.unisys.com/ent/library.html>

<http://www.marketplace.unisys.com/ent/idc.html>

<http://www.marketplace.unisys.com/ent/thinclient.html>

Also, read what analysts say about Unisys at:

<http://www.marketplace.unisys.com/analyst/mid98/my98-cs.html>

<http://www.marketplace.unisys.com/giga/index.html>

The benchmarks

QS/2 benchmarks:

<http://corp2.unisys.com/AboutUnisys/PressReleases/1998/jun/06296512.html>

SAP: <http://www.marketplace.unisys.com/sap/benchmark.html>

PeopleSoft: <http://pdt.unisys.com/briefs/0921peop.htm>

TPC-C: http://www.tpc.org/new_result/ttpc.idc

References

NT vs UNIX – Dr. Mark Russinovich, Windows NT Magazine, December 1998

Exploring CTOS, Edna Miller, et al – Prentice Hall, 1991

Inside Windows NT – Helen Custer, Microsoft Press 1992.

An Introduction to UNIX, <http://www.unix-wizards.com/unix.html>

Windows NT interoperability:

<http://www.microsoft.com/technet/interop/ntunx2/ntunx26.htm>

UNISYS

Specifications are subject to change without notice.

Unisys is a registered trademark of Unisys Corporation.
All other brand names are the exclusive property of their respective owners.