

Windows NT vs. Linux

A Digital-Age Old Questions

By Robert K. Hiltbrand Spring 2000

Windows NT vs. Linux

This document discusses the differences between Microsoft's Windows NT operating system and the open source-code operating system known as Linux. The discussion will toggle between the server and desktop environments and their corresponding operating systems. Some of the areas covered in this document include –

- Background
- Architecture
- Stability Network Services
- Application Support/Availability
- Security Performance
- Total Cost of Ownership
- Scalability
- Technical Support

BACKGROUND

Windows NT

Windows NT is a full 32-bit operating system that provides ease of use, productivity, and compatibility. There are two distinct versions, Server and Workstation. The Server version offers print & file services, as well as security, scalability, and application support. The Workstation version is for use on portable and desktop PCs.

In the early 1990's Microsoft released version 3.0 of its windows Operating System (OS) which gained a large user base, and it was at this point that Microsoft and IBM's split started as the two companies disagreed on the future of their Operating Systems. IBM viewed Windows as a stepping-stone to the superior OS/2, where as Microsoft wanted to expand Windows to compete with OS/2. So they split, with IBM's OS keeping the name OS/2 and Microsoft changing the name from OS/2 NT to Windows NT. The first version of Windows NT (3.1) was released in 1993 and had the same GUI as the normal Windows Operating System, however it was a pure 32 bit OS and provided the ability to also run older DOS and Windows apps, as well as character mode OS/2 1.3 programs. Microsoft hired Dave Cutler (who also designed Digital's VMS) to head the team for the New Technology Operating System NT). Originally the new OS was to be called OS/2 NT.

Linux

Linux is a free UNIX-type operating system that was originally created by Linus Torvalds with the assistance of developers all over the world. Linux is developed under the GNU General Public License and the source code for Linux is freely available to everyone. Linux runs successfully on most computers, laptops, and platforms, including most PC based CPUs, Sun SPARC, Digital Alpha, and Macintosh. Linux is an independent Portable Operating System Interface for Computer Environments (POSIX) implementation and includes true multitasking, virtual memory, shared libraries, demand loading, proper memory management, TCP/IP networking, and other features consistent with Unix-type systems.

There are several different distributions of Linux. ("*Distribution*" means the compiled source code, usually bundled with a few extras or modifications.) Some distributions are free and can be downloaded, while others are available at a low cost.

The Linux community claims that a machine, running Linux, can function as either a workstation or a server. Obviously, a server would need more storage space for data and some additional hardware, but the operating system itself is essentially the same.

ARCHITECTURE

Linux

- Application program (Word Perfect)
- Utility program (shell, editors, etc.)
- System interface library (open, close, etc.)
- Linux kernel
- Hardware (CPU, memory, hard disk, etc.)

Windows NT

- Code is modular
- Majority of code is written in C and C++
- Does not allow an individual application to access hardware directly (Hardware Abstraction Layer)
- Does not allow an individual application to access the OS' kernel
- Compatibility with IBM's OS/2, DOS, and IEEE's POSIX

STABILITY

Stability refers to how often does the OS crash and guaranteed uptime.

Linux

Linux has no OEM guaranteed uptime. There is also a lack of an enterprise clustering system for service and application availability. Linux also falls short because it has not been fully tested for compatibility across all components and applications currently available on the market. Linux also lacks a journaling file system. This means that the file system may not recover after an unplanned downtime.

Windows NT

There are a number of OEM's offering 99.9% uptime. There is support for high availability application clustering and TCP/IP-based load balancing. There is also a journaling file system for file-level reliability and recoverability.

NETWORK SERVICES

Network Services refers to the ability of the OS to operate in a network environment. This can mean something as simple as "*What network protocol does Linux support?*" "*What about Windows NT?*"

Available networking protocols –

Protocol	Linux	Windows NT
TCP/IP	Yes	Yes
SMB	Yes	Yes
NFS	Yes	No
NetBEUI	Yes	Yes
AppleTalk	Yes	Yes
IPX/SPX	Yes	Yes
ISDN	Yes	Yes
PPP	Yes	Yes
PPTP	Yes	Yes
SLIP	Yes	No
TOKEN-Ring	Yes	Yes
Ethernet	Yes	Yes
FDDI	Yes	Yes
DHCP	Yes	Yes
Bootp	Yes	No
ATM	Yes	No
DLC	Yes	Yes
IP-Masquerading	Yes	No
X.25	Yes	No
IP-Firewalling	Yes	No
IPV6	Yes	No
PLIP	Yes	No

Linux offers two very nice features – Network File System (NFS) and Network Information Service (NIS). Network File System (NFS) allows for file sharing to be transparent across a Linux network by rendering access to remote files as if they are stored on the client machine's local hard drive. Network Information Service (NIS) allows a client machine to automatically obtain information on user accounts, groups, and access privileges from different file servers. NFS and NIS together on a network enable the clustering of Linux servers to act as a single, coherent entity. For file and print services, there is the need for the addition of the SAMBA package. SAMBA allows Windows client machines to browse and access files through the Windows Explorer and File Manager.

Both Windows NT and Linux Servers can be configured for use as file/print servers, Internet/Intranet servers, WAN/gateway server, and database servers.

APPLICATION SUPPORT/AVAILABILITY

Application support/availability refers to the availability of OS-integrated applications that can reduce the cost of deploying and managing business solutions.

Windows NT

An advantage in application availability and support for Windows NT is that its manufacturer, Microsoft, also develops applications. Some of the most popular desktop applications in the World have been developed by the Microsoft Corporation, so when they were developed, they were made to run on PCs running the Windows NT workstation 4 desktop operating system. Microsoft's Office 2000 is an office suite that includes word processing, spreadsheet, database, and presentation applications and is perhaps the most well known application in the World. Another important advantage for Windows NT applications is their graphical user interface (GUI). A simple GUI can allow even the most rudimentary of users to produce work using an application.

Linux

As of the time of this documentation, there are not many well-known applications available for use with Linux. The best known is Corel's Word Perfect. Linux applications not developed by commercial software companies (such as Microsoft, or Adobe) fall under the GNU Public License and are free. One good note about applications running on Linux is that they can take advantage of its memory management. This allows multiple copies to run on the same machine, serving multiple users. This might be advantageous for shift work. One of Linux's disadvantages is a lack of applications with a GUI. This is a very important point because the GUI on today's PCs allows accessing for more people to the PC and the Internet.

SECURITY

Security refers to the ability of the network and desktop operating systems to provide an entity with a secure network environment.

Linux

Linux inherits some of its protection mechanisms from UNIX, so most security features (and also "holes") also apply to Linux. Security is provided through the login procedure (username and password). If you have an account on the network, Linux grants the user permission to use network resources and access files.

Linux has three different levels of file permissions --

- Owner permissions (you created it, you own it)
- Group permissions (sales group has access)
- Permissions for everyone (default settings)

Windows NT uses two groups --

- Local group – created on the local machine (no rights granted to access network resources);
- Global group – created on the primary domain controller (grants rights to network and local resources).

Windows NT 4.0 Server offers a single, secure sign-on across multiple network servers. Plus the system services run in a secure context providing higher levels of security for multiple-user services. Some other security features of Windows NT include –

- Security reference monitor
- Access tokens
- Owner and group identifiers
- System access / Directory access control lists

PERFORMANCE

The following is a brief summary of several benchmark tests run using both Windows NT 4.0 Server and Linux Server

Test type	<i>Windows NT</i>	<i>Linux</i>
<ul style="list-style-type: none"> • TCP-C is the most widely recognized benchmark for measuring database performance (i.e. online transaction processing); • TCP-C reports transactions per minute (tpmC); • TCP-C reports the overall cost per transaction (\$/tpmC); 	<ul style="list-style-type: none"> • Results from most major Windows NT Server database vendors; • Top TCP-C results on quad, dual, and single processor servers; • Top 10 TCP-C price performance solutions; 	Linux has not submitted any TCP-C results.
<ul style="list-style-type: none"> • SpecWeb is a benchmark for measuring the static performance capabilities of a Web server 	<ul style="list-style-type: none"> • Best dual & quad processor results; • Results from most major server hardware vendors. 	None – Linux has yet to post SpecWeb results.
<ul style="list-style-type: none"> • NetBench is a portable benchmark program that measures how well a file server handles file I/O requests from 32-bit Windows clients (submit requests to server for network file operations) • NetBench reports throughput in megabits per second and client response time measurements. 	330 mbps (from PC Week) 286 mbps (from Mindcraft)	195 mbps (from PC Week) 114 mbps (from Mindcraft)
<ul style="list-style-type: none"> • WebBench measures Web server performance for static, dynamic, mix (of the two), and SSL workloads. • WebBench also reports the number of client requests per second. 	Static – 4000 (PC Week) Mix – 2250 requests per second (PC Magazine) SSL – 250 requests per second (PC Magazine)	Static – 2100 (PC Week) Mix – 300 requests per second (PC Magazine) SSL – 250 requests per second (PC Magazine)

COST

Cost, or total cost of ownership (also known as TCO) refers to the cost of deploying and maintaining the OS.

Windows NT

The retail price for one copy (with corresponding license) of Windows NT 4 workstation is \$269.95. The cost is \$649.95 for Windows 4.0 NT server with 5 clients and service pack 4. Obviously, this is a substantial up front cost. For each workstation that has NT loaded on it, there had better be a corresponding license purchased. If not, Microsoft and the Software Police will fine the offending party.

Linux

Any person that has access to the Internet can download a copy of Linux for free. No cost. If someone prefers something simpler, they can purchase a copy of Red Hat Linux 6.1 standard from a local retailer for \$29.95. This is the desktop operating system (the Linux community claims that there are only minor differences between the Linux OS for server and workstation).

On its surface, the choice is obvious, Linux. But one should not judge a book by its cover. How much time does the end user spend trying to use the OS? How much time does your technical support have to spend troubleshooting problems relating to the OS?

One advantage that Windows NT has is its centralization. There is only one Microsoft, so there is ultimately only one vendor to go to with a complicated technical problem. This feature is very appealing to a business owner or manager that requires accountability.

SCALABILITY

Scalability refers to the ability to grow and support more users and more demanding workloads. This feature is specific to the server OS.

Windows NT

Advantages - Supports 3 gigabytes of RAM by default and up to 4 gigabytes of RAM is available for memory intensive applications such as databases.

Linux

Disadvantages - Linux has a limit of 2 gigabytes of physical memory in addition to a 2 gigabyte file size. There is also a lack of kernel-level threading model for more efficient application processing.

TECHNICAL SUPPORT

Technical Support refers to the ability to obtain expertise and quick solutions as technical problems arise.

Windows NT

There are a reported 350,000 Microsoft trained professionals, in addition to 160,00 Microsoft Certified System Engineers, so finding IT personnel with knowledge of Windows NT is quite easy.

Windows NT is, as mentioned before, a product from the Microsoft Corporation. Microsoft offers its customers support, but for a fee if you wish to speak directly to their technical support staff. Their web site has a Knowledge Base that answers general technical questions. There is also a Tech Net section of the web site that answers more specific technical questions. A subscription to Tech Net can be purchased. This subscription will include Microsoft sending the subscriber several CDs with patches, documentation, and utilities that can be used with Microsoft products.

There are numerous web sites that offer "*technical support*" for free to their users. The quality of this information varies and there are no guarantees.

Linux

Part of Linux's strength is also its weakness. Because it is open source-code, it is constantly changing. However, with commercial vendors such as Red Hat and Caldera offering support as part of their packaged versions of Linux, more businesses will migrate towards this OS (because of its up front lower cost). The Linux community claims that there is a vast amount of "technical support" for Linux on the Internet. This means that there is no formalized field training. That is changing and certification programs are now going on to certify IT personnel in Linux. However, business managers and company owners don't want to place their information systems into unknown hands. It will be up to companies such as Red Hat and Caldera to prove that they can support Linux in today's business environment. As the saying goes, "*You'll never get fired for buying Microsoft.*" This demonstrates the business community's trust in Microsoft support as well as products. Why? Because it is a known quantity and most business people don't like to take chances that they don't want to take.

Summary

I would like to take this opportunity to express my personal opinion regarding this debate. Since I am an Information Technology professional, I feel that I have a sense of what works and doesn't in the business environment. Windows is King. There is no doubt about that. Whenever a business owner or manager is in the process of hiring a person in today's job market, one of the first questions asked of that person is, "What computer skills do you have?" And the vast majority of people today know Windows. The end user is the most important person in this debate because he/she is the primary user of the OS. So until Linux creates a GUI that is as simple as Windows, has useful applications, and has support in the IT community like NT, Windows will be King. Now that is on the desktop side. As far as servers go, Linux can, and will, be giving Windows NT a run for its money. It allows greater control of network resources and the server itself. However, it does require a very knowledgeable network administrator, and they cost money (and a lot of it).

*Robert K. Hiltbrand
Spring 2000*

BIBLIOGRAPHY

1. <http://www.microsoft.com>
2. <http://www.ptsoftware.com>
3. <http://www.hex.net/~cbbrowne>
4. <http://www.windows2000advantage.com>
5. NT Beats Linux..., by Steven J. Vaughan-Nichols (zdnet), 4/15/996. <http://www.pcworld.com>
7. <http://www.linux.com>
8. <http://www.zdnet.com>
9. <http://www.pcconnection.com>
10. <http://www.redhat.com>
11. <http://www.caldera.com>
12. <http://www.linux.org>
13. Linux in a Nutshell, 2nd Ed., by Ellen Sieyer and Andy Oram, February 1999, O'Reilly & Associates; ISBN: 1565925858.
14. Linux, DOS and Windows. . . A How to build Yourself a 95/NT, 2000 Microsoft Active Directory Clone now with NDS Networking, by Reginald P. Burgess, April 1999, American Group Publishing; ISBN: 1891950037
15. Windows NT Workstation 4, 2nd Ed., by Mark Minasi and Todd Phillips, 1999, Sybex, Inc.; ISBN: 1782124917