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2005 North American Linux and Windows TCO Comparison, Part 1

Decision Point:	Best Practices: Making the Right Linux/Windows Migration Decisions
The Bottom Line:	A majority of SMB and enterprise corporations rate the performance and reliability of Windows Server 2003 equal to or better than Linux. Microsoft also made significant improvements to Windows security. The driving issues that impact TCO are the applications, third-party tools and services associated with individual operating systems, rather than the NOS itself.
Who Should Read:	SMBs, enterprises, business decision influencers and purchasing managers, vendors, CEOs, CIOs, CTOs

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Executive Summary

An overwhelming 88% of corporations report that Microsoft's Windows Server 2003 operating system provides performance and reliability that are equal to or better than Linux in comparable usage scenarios.

Those are the results of Yankee Group's independent, non-sponsored 2005 North American Linux and Windows TCO Comparison Survey. *The results indicate that Microsoft's continued attention to hardening the core Windows operating system yielded tangible performance improvements. The 88% of corporate customers who rated Windows performance equal to or better than Linux is a 12% increase from the 76% of customers who ranked Windows on par with Linux in the Yankee Group* 2004 Linux, UNIX and Windows TCO Comparison Survey.

The survey also showed that Linux and Windows each have specific strengths, weaknesses, opportunities and threats that can affect a corporation's TCO and ROI, positively or negatively. To achieve optimum results and avoid undue deployment problems and expenses, corporations must perform a thorough cost, performance and risk analysis to determine the right technology option. Any business that does not know or cannot determine the key costs associated with its software infrastructure risks making the wrong technology decision. Such a mistake may adversely affect the TCO of its respective environment for years.

Yankee Group's March 2005 survey of 550 North American users indicates there is no universal clear-cut TCO basis to compel the corporate masses to do a wholesale switch from Windows to Linux as there is for a migration from UNIX to Linux. And there is no indication that users are replacing Windows with Linux. The majority of wholesale Linux defections continue to come at the expense of mid-range UNIX installations, although many organizations are installing Linux as a complementary OS to existing Windows servers. The survey found that from 2004 to 2005, Linux maintained—but did not expand—its healthy 15% market share—compared to 73% market share for various versions of Windows servers (see Exhibit 1).

However, the survey emphasizes that businesses continue to expand the ways they use Linux. More than 50% of corporations now use Linux as a multipurpose server performing a variety of functions, including web server, e-mail server and specialized application server.

Perhaps the most startling revelation in the Yankee Group 2005 North American Linux and Windows TCO Comparison Survey *was the fact that more than 50% of the respondents said they had performed a thorough TCO analysis. But when asked to calculate their specific Linux and Windows capex and maintenance costs, on average 75% could not answer explicit questions. Businesses lack crucial TCO information such as the cost of a Linux or Windows server upgrade and what they're spending on network management, third-party applications, tools and utilities, ongoing maintenance, security, systems downtime, calls to the help desk and hardware and software break/fixes. The absence of such crucial financial information makes it difficult for corporations to make informed purchasing decisions and it heightens risks when choosing technologies that are ill suited to their business needs.*

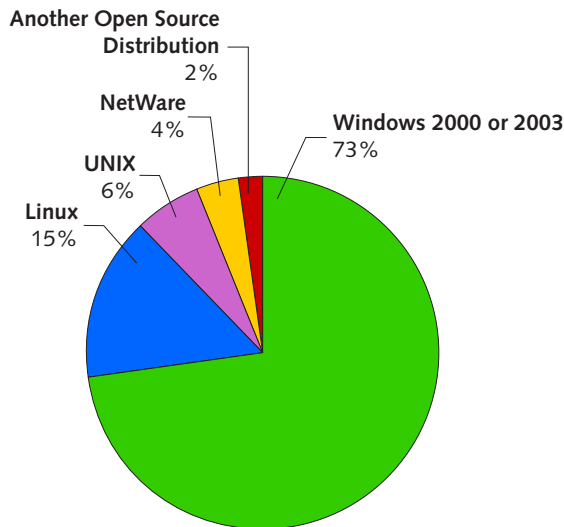*The survey yielded other surprises as well. Among the highlights:*

- *Users rated the security of Linux and Windows servers nearly equal.*

- *Windows servers recover 30% faster from security attacks than Linux servers.*

- *Patch management woes lessen for Windows, but are on the rise for Linux.*

Overall, the Yankee Group 2005 North American Linux and Windows TCO Comparison Survey *shows that Microsoft clearly and convincingly corrected its most severe technical customer concerns. It must now maintain that vigilance. The survey responses also show that Linux is no longer the pristine environment it once was. The increasing popularity and deployment of Linux and open source are making them prey to the same TCO issues that have long plagued Microsoft Windows. Additionally, current and prospective corporate Linux users will have to contend with integration and interoperability issues. These concerns invariably will arise as a direct consequence of the many dueling Linux and open source distributions, as well as integration concerns between Linux and rival operating system platforms.*

Exhibit 1.
Windows Server Maintains Dominance
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

What is your organization's primary enterprise network operating system (NOS)?

Another Open Source Distribution 2%
NetWare 4%
UNIX 6%
Linux 15%
Windows 2000 or 2003 73%

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I. Introduction

The Yankee Group *2005 North American Linux and Windows TCO Comparison Survey* provides specific data that compares and contrasts total cost of ownership metrics in the Linux and Windows operating system environments. Its intent was to broaden and deepen the research presented in the Yankee Group report, *Linux, UNIX and Windows TCO Comparison, Part 1*. Yankee Group doubled the number of questions from 25 in the original survey to 50 in the current poll. The additional 25 queries focused on quantifying the specific cost metrics that constitute TCO.

The survey asked a variety of North American users ranging from small and midsize businesses (SMBs) to large enterprises with more than 100,000 employees to quantify software and hardware infrastructure costs, including:

- Capex outlays for hardware and software

- Downtime costs for Linux and Windows file servers, database servers and web servers

- Linux and Windows deployment costs

- Linux and Windows migration costs for business applications, technical service and support, training and labor, testing and purchasing third-party tools and utilities

- Recovery time and costs for Linux and Windows servers following a security incident

- Detailed look at the help desk issues including the number of monthly calls and the cost and the amount of time it takes to resolve problems

Survey Methodology

The purpose of this Yankee Group study is to determine the true TCO and ROI of Linux compared with Windows in specific corporate user scenarios. To provide our customers with the most unbiased, accurate and reliable information, Yankee Group accepted no vendor sponsorship money for any of the research surveys done in connection with this project. Additionally, none of the more than two dozen enterprise users interviewed by Yankee Group received any remuneration.

Yankee Group conducted three independent, non-sponsored vendor surveys of corporate users in February and March 2005. They included two separate, self-selecting web-based surveys. The Yankee Group *2005 North American Linux and Windows TCO Comparison Survey* polled 550 North American users to obtain specific broad and deep TCO metrics. Respondents were asked to rate and compare the cost of deployment and migration, licensing indemnification, performance and reliability, the cost of downtime, time to recover from security attacks and the number and severity of help desk calls in both Linux and Windows environments. The second web-based survey (*2005 to 2006 Software Deployment Trends and Timetables*) polled 1,000 enterprises worldwide and queried them on general deployment timetables, trends and IT capex budgets for 2005 to 2006. The third component of the *2005 North American Linux and Windows TCO Comparison Survey* consisted of in-depth telephone and in-person interviews with two dozen corporate customers to elicit anecdotal case study data and delve more deeply into TCO and ROI issues.

All of the aforementioned issues and items factor into a company's decision to remain with its current infrastructure or migrate away from UNIX and Windows and adopt Linux. Yankee Group will present the data derived from these interviews in a separate report that focuses on specific corporate user case studies and the motivation behind individual business and technology decisions. These case studies are varied, and corporate customers from a variety of vertical and horizontal markets will be represented.

All three surveys equally represented SMBs and large corporate enterprises across a variety of vertical market industries including academic, government, banking and finance, insurance, healthcare, legal, media and retail.

Survey Findings

In addition to querying enterprises on demographics, deployment trends, timetables, pricing and the migration experience, the *2005 North American Linux and Windows TCO Comparison Survey* focused on very specific TCO issues, including:

- Specific Windows and Linux migration costs

- Hourly cost of downtime in Windows and Linux environments

- Number of calls to the help desk with a breakdown of cost and percentage of calls that were Tier 1, Tier 2 and Tier 3 in both the Linux and Windows environments

- Ratio of help desk technicians for Windows and Linux users

- Time to recover from security outages for specific Linux and Windows servers for five different server categories—file servers, database servers, domain controllers, application servers, web servers—plus a sixth category that addressed end-user client desktop systems

- The average number of software changes, hardware changes and time to complete and perform repairs on an annual basis

- Number of packaged applications versus custom applications

- Specific IT salaries

- Information on the number of reboots per week required by Windows desktops and servers and Linux desktops and servers

- The useful financial lifecycles of desktops and servers, actual lifecycle of desktops and servers, and desired lifecycle of desktops and servers

The results provided valuable insights regarding actual and potential deployment trends as well as the business and technical factors that influence TCO and ROI and motivate businesses to make specific purchasing and upgrade decisions.

It's clear that Linux servers are legitimate contenders in the corporate enterprise. But Linux desktops have yet to make a perceptible impact or gain traction in mainstream enterprise accounts.

It's also clear that Microsoft recognizes the challenge posed by Linux servers and it has responded positively and aggressively to meet the challenge. The survey responses and customer interviews illustrate that some remain skeptical of Microsoft and its motives. However, the majority of corporate users generally view Microsoft in a much more positive light than they did even a year ago.

The survey responses indicate that Microsoft has largely corrected its security and patch management issues. Additionally, Microsoft's ongoing efforts to revamp its Licensing 6.0 program—offer better business value via a variety of free and discounted services and special promotional pricing offers—is reaping dividends (see Exhibit 2). Yankee Group's second web survey (*2005 to 2006 Software Deployment Trends and Timetables*) indicates for the first time that nearly two-thirds of respondents—62%—found that their costs either remained the same or decreased under Licensing 6.0. Microsoft clearly made these moves to blunt the threat of Linux and break the inertia caused by a 3-year downturn when nearly all software vendors suffered a marked decline in revenue from new software licensing sales.

Exhibit 2.
Two-Thirds of Corporate Users Report Microsoft Licensing 6.0 Is Economical
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey
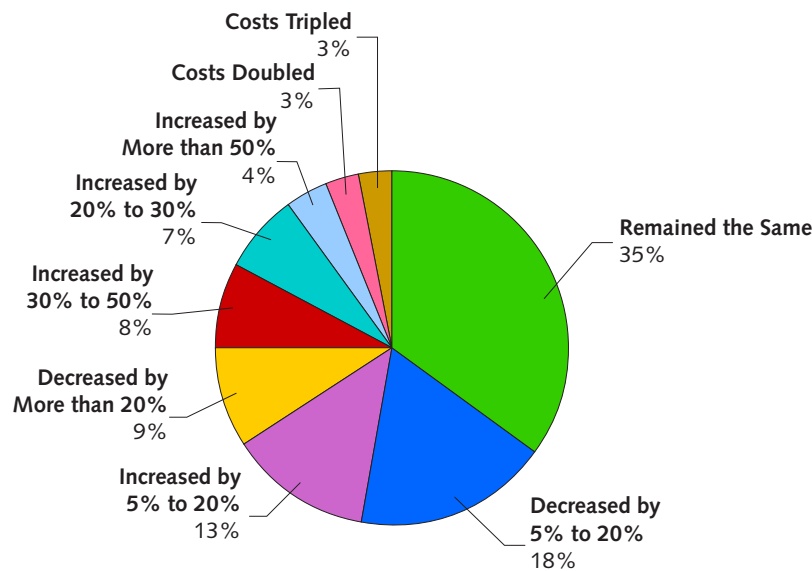
Additional Survey Highlights

- **Microsoft mends Windows patch management.** Respondents reported that they reduced the time spent on Windows patch management by an average of 50% to 80% at no incremental cost. This is due to Microsoft's decision to ship patches on a monthly rather than weekly basis and provide the Windows Server Update Services (WSUS) free. Conversely, survey respondents reported that the time they spend performing patch management tasks in the Linux and open source environment grew commensurately from 2004 to the present as companies installed more open source and the Linux vendors released updates and patches.

- **Windows server downtime costs companies two to three times as much as Linux server downtime.** This is not due to any inherent flaws in the Windows Server OS, but rather reflects the crucial nature of the data and applications running on Windows servers. Windows application servers racked up the biggest downtime expenses: $5,624 per hour versus $1,168 in hourly downtime costs for comparable Linux application servers.

- **Linux servers take nearly 4 hours or 30% longer to recover from a security attack than a similar Windows server.** The respondents revealed that it took 17 hours on average for their Linux servers to recover from a security attack compared to an average recovery time of 13.2 hours for Windows servers. Corporate users reported the lengthier recovery time was due primarily to poor documentation. Currently, there are few aggregate security sites that provide customers with a list of known cross-platform issues and fixes. Consequently, administrators spend more time researching and fixing problems, resulting in longer downtime.

- **Linux maintains strong server presence.** Nearly two-thirds of those polled—60%— said they have Linux servers installed somewhere in the organization. This figure is unchanged from the 60% of businesses that had Linux servers installed, according to 2004 survey results.

- **Linux desktops are no threat to Windows XP's dominance.** Although 49% of businesses have some Linux clients in their organizations, only 1% use Linux as their primary corporate-wide desktop.

- **Red Hat is the number one Linux distribution vendor.** Red Hat continues to maintain a convincing 45% market share compared to 26% market share for its nearest competitor, Novell SUSE. Red Hat continues to strengthen its position as the top Linux distributor in North America. The company's latest quarterly financials indicate that Red Hat shipped 175,000 Linux units compared with 21,000 units for its nearest competitor Novell's SUSE Linux. Red Hat's latest quarterly revenue of nearly $58 million also far outpaced Novell SUSE's latest $15 million quarterly sales.

- **Approximately 20% of businesses that currently use or plan to deploy Linux will purchase outside indemnification.**

- **One-third of businesses using Linux have provided no Linux training for their IT staff.**

- **Slightly more than one-third of companies—35%—will use only in-house resources for Linux migrations, compared with 44% of Windows customers that use in-house resources only.**

II. Data and Analysis

The Price of Linux

Linux is not free. There are costs associated with Linux as there are with any software. However, the costs will vary according to particular distributions and customer implementations.

The mainstream Linux distributions—Red Hat, Novell SUSE, Debian, JBoss, Mandrakesoft and Turbolinux—are being scrutinized more closely. Contrary to popular belief, these mainstream Linux distributions are not free. Vendors such as Red Hat and Novell levy licensing fees and charge for support for their enterprise products. Customers that purchase the enterprise versions of these products and don't alter the code are eligible for either product warranty assurance or limited indemnification against intellectual property (IP) suits brought by third parties. Users who alter the core Linux OS kernel forfeit product warranty and indemnification protection from their Linux vendor and will be required to purchase such protection from a third-party provider such as Open Source Risk Management (OSRM).

Such premiums can be pricey and substantially increase the TCO of Linux in the enterprise. However, companies that have a low risk tolerance level may decide that such protection is well worth the price. For example, OSRM requires customers to purchase a minimum of $5 million in IP protection, charging 3% of the value of the contract.

Not every business will need indemnification protection. The chances that a small or midsize organization will find itself the target of a third-party IP infringement case—such as the one The SCO Group filed against IBM and Red Hat—are very small.

Like their Macintosh, NetWare, Windows and UNIX counterparts, corporate Linux users will have to include other incremental costs such as:

- Third-party tools and utilities
- Management products
- Cost to retrain existing IT staff or hire skilled Linux administrators
- Cost to build customized applications (where necessary)
- Testing applications and recertifying drivers
- Cost of hiring external systems integrators or consultants
- Price of premium-level support from established vendors such as IBM and HP

Taken in this context, Linux is decidedly not free. Companies must:

1. Perform a thorough inventory of existing software infrastructure
2. Do a complete estimate of *all* the components needed to make their Linux infrastructures comparable to an existing Windows or UNIX installation
3. Weigh the anticipated ROI gains to determine whether a wholesale or partial Linux migration or remaining with Windows is right for the organization
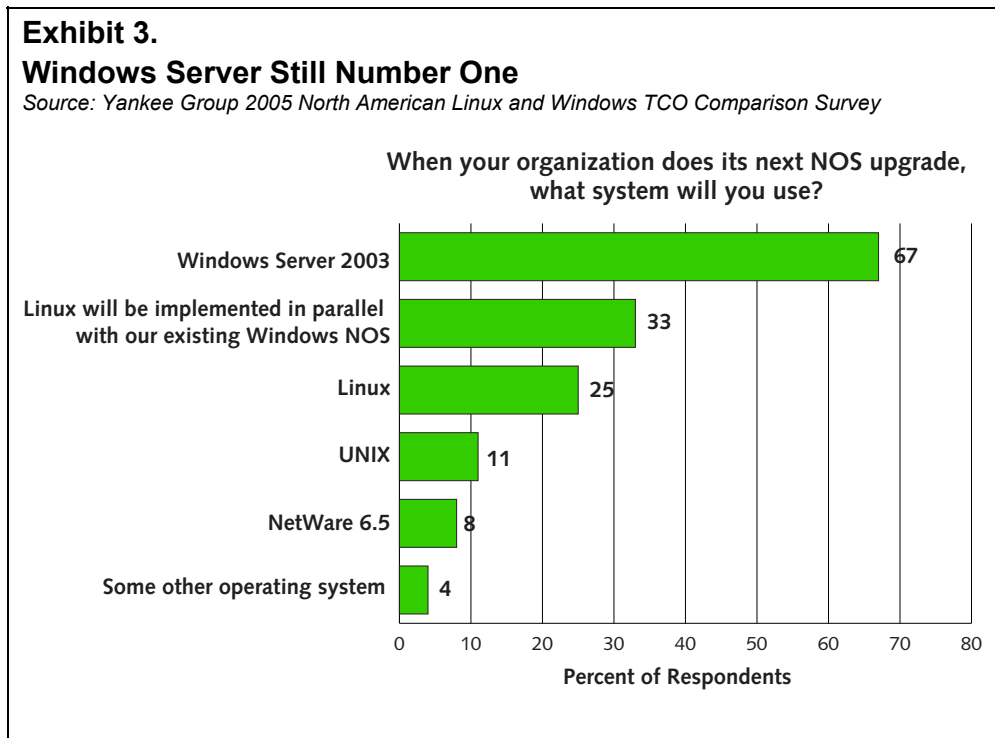
However, we reiterate the conclusion from the *2004 Linux, UNIX and Windows TCO Comparison Survey*: large enterprises with 10,000-plus end users and a significant investment in the Windows architecture would most likely see their TCO costs rise and ROI delayed with few tangible performance benefits were they to do a wholesale conversion to Linux.

Corporations Need a Reason for a Wholesale Conversion to Linux

The ironic thing is that the success of Linux has had a positive impact on Windows. Faced with its fiercest competitor in the last decade, Microsoft responded with a series of aggressive moves. Competition creates a win/win situation for everyone. Corporate customers get better products, services and more competitive pricing as Microsoft, Sun Microsystems and the various Linux distributors compete for their business. Rival vendors improve the inherent performance, reliability, security and scalability of their core offerings.

The results of the Yankee Group *2005 North American Linux and Windows TCO Comparison Survey* suggest that the tangible performance, reliability and security improvements Microsoft has made—taken in context with looming issues and incremental expenses on the Linux side—give corporations a great deal to consider in advance of any network upgrades. Planned server operating system migrations will require companies to practice extreme due diligence.

The TCO case for a wholesale replacement of Windows with Linux is nowhere near as clear-cut as the case for swapping out legacy UNIX networks to run Linux on cheaper, commodity Intel-based hardware. Consequently, Yankee Group's survey showed no indication that Linux will erode the Windows installed base or market share percentage during the next 12 to 18 months (see Exhibit 3).

Exhibit 3.
Windows Server Still Number One
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

When your organization does its next NOS upgrade, what system will you use?

	Percent of Respondents
Windows Server 2003	67
Linux will be implemented in parallel with our existing Windows NOS	33
Linux	25
UNIX	11
NetWare 6.5	8
Some other operating system	4

However, Linux does continue to make some significant inroads into enterprises as a complementary NOS to Windows. Reports from the field show that users are generally impressed with Linux's ease of use, performance and reliability. Although Linux usage within organizations continues to grow—one-third of respondents said they would install Linux servers to complement their Windows servers and another 25% said they would add Linux servers—67% of companies reported they will upgrade to Windows Server 2003. Hence, there is no indication that users will totally rip out and replace Windows in favor of Linux.

Performance and Reliability

Corporations such as the Chicago Mercantile Exchange and Bank of America are in the process of migrating away from Sun Solaris UNIX in favor of Red Hat Enterprise Linux. The bulk of the wholesale defections to Linux have come at the expense of midrange UNIX and not Microsoft Windows 2000 Server or Windows Server 2003. The survey respondents gave no indication that this would change in the near or intermediate term. In fact, the opposite is true. Microsoft's improvements to core technical components of its Windows Server 2003 OS kernel—particularly with respect to performance, reliability, application integration and security—bolster the TCO of Windows and strengthen the business case justification for remaining with the Microsoft server and desktop operating system platforms.

Given the complexity and sheer amount of planning, testing, staff and capex associated with any significant software or hardware network upgrade, it's an accepted fact that corporations need no persuasion to remain with legacy platforms. However, companies do demand tangible and business case justification to upgrade from one version of software to another or to switch vendors and platforms.

The Yankee Group *2005 North American Linux and Windows TCO Comparison Survey* responses convincingly demonstrate that Microsoft continues to improve the performance and reliability of Windows Server 2003. An overwhelming 88% of respondents rate Windows Server 2003 performance and reliability equal to or better than Linux in comparable usage scenarios. For the purposes of this survey, Yankee Group defined reliability by the number of unnecessary reboots required because of inherent flaws in the core server operating system that caused a server slowdown, freeze or complete outage.

It's important to note that other factors also will have a direct impact on the performance and reliability of the Linux, Windows and Sun Solaris operating systems. These factors include the age and configuration of the server and desktop hardware, the amount and type of storage (legacy tape backup or network-attached storage [NAS] device), bandwidth, WAN links, directory services replication, the amount and type of data traversing the network, and the physical segmentation of the network. Any one issue or any combination of these issues can positively or adversely affect OS performance and reliability. Corporations should perform a thorough assessment of all these factors and include them as part of an overall TCO analysis before deciding on a migration strategy.

Security and Patch Management

Specific security queries yielded the biggest surprises. User respondents gave Windows surprisingly high marks for security, patch management and recovery time. Users scored Microsoft security substantially higher in this year's survey than in the *2004 Linux, UNIX and Windows TCO Comparison Survey*. In 2004, users gave Windows XP, Windows 2000 Server and Windows Server 2003 security an average rating of 3 or 4 on a scale of 1 to 10, with 1 being the least secure and 10 representing the most secure.

In 2005, Windows achieved an average security rating of 7.6 and substantially narrowed the gap between itself and Linux, which had an average rating of 8.3 (see Exhibit 4). Linux's security ranking slipped from an average 9.2 rating from last year's survey. The latter result reflects increased use of Linux and the increasing number of Linux and open source specific hacks in the past 12 months.
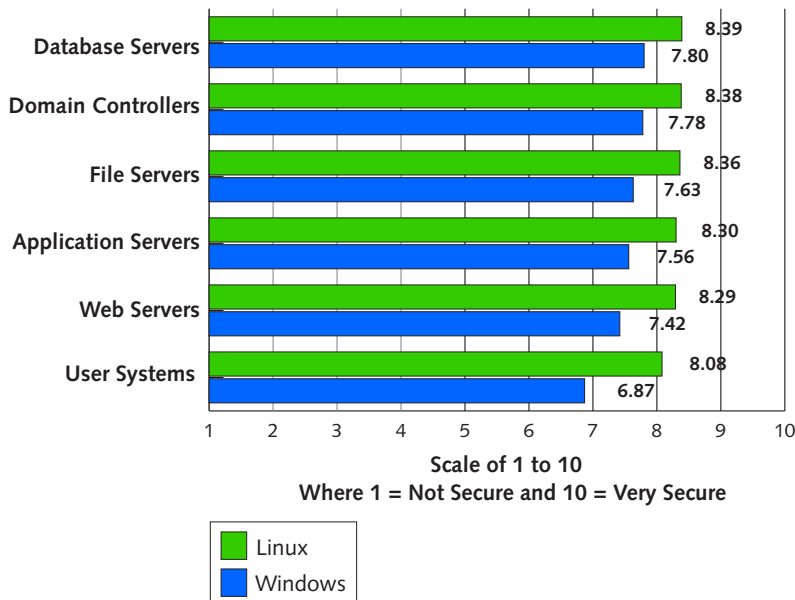
However, no vendor—particularly Microsoft, which is the number one target for hackers—can ever declare victory in the ongoing security war. Microsoft will always have to maintain its vigilance and continue to invest in security. However, Microsoft's security initiatives are having a positive net impact. They include the now 2-year-old Trustworthy Computing Initiative to harden the core OS kernel, Microsoft's decision to release patches on a monthly rather than weekly basis (which is more manageable for IT administrators), and the decision to provide the WSUS free of charge.

Exhibit 4.
Users Rate Linux and Windows Server Security Nearly Equal
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

How secure are the following Linux and Windows systems in your organization against internal and external security attacks?

System	Linux	Windows
Database Servers	8.39	7.80
Domain Controllers	8.38	7.78
File Servers	8.36	7.63
Application Servers	8.30	7.56
Web Servers	8.29	7.42
User Systems	8.08	6.87

Scale of 1 to 10
Where 1 = Not Secure and 10 = Very Secure

Windows Systems Recover More Quickly from Security Attacks

In yet another surprise, respondents indicated that network administrators were able to restore Windows servers about 30% more quickly following a security attack than their Linux counterparts (see Exhibit 5).

Yankee Group asked survey respondents to quantify the amount of time it took IT administrators to restore operations among Linux and Windows file servers, application servers, database servers, domain controllers, web servers and user systems. In every instance save one—domain controllers—the restoration process was quicker for Windows servers than Linux servers. The disparity was most apparent in file servers and web servers.

It took administrators 18.3 hours to restore a Linux file server following a security incident compared to a recovery time of just more than 12 hours to bring a Windows server back online. On the client side, administrators needed 17.1 hours to restore Linux desktops versus 12.7 hours to fix a Windows desktop system. Domain controllers were the one device in which Linux servers came back more quickly than Windows—an average of 13.2 hours compared to 13.5 hours for Windows.
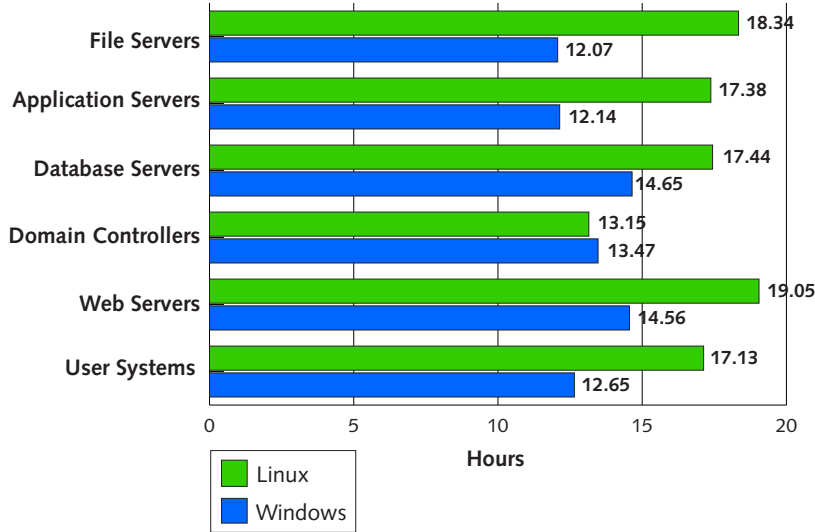
Time to recover from a security attack is not necessarily reflective of inherent flaws in the core Linux kernel. Corporate customers said that in many instances, the extra time needed to restore Linux servers was attributable to poor documentation of Linux security flaws. This necessitates that Linux administrators spend more time searching for the appropriate documentation and available security patches to restore a Linux server. By contrast, customers can check Microsoft's knowledge base and regularly updated list of security alerts and available patches.

In the rare instance when it took a firm longer to restore a Windows file server from a security attack than from a Linux server, the primary reason was that the Linux server environment was newer and frequently contained more robust network equipment. One administrator told Yankee Group that his Linux file servers came online more quickly because of the NAS devices, while his Windows servers used the older tape backup equipment, which takes longer to restore than NAS.

Exhibit 5.

Windows Servers Recover from Security Attacks 30% Faster than Linux
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

**What is the average time, in hours, to recover from a
security attack for each of these Linux and Windows systems?**

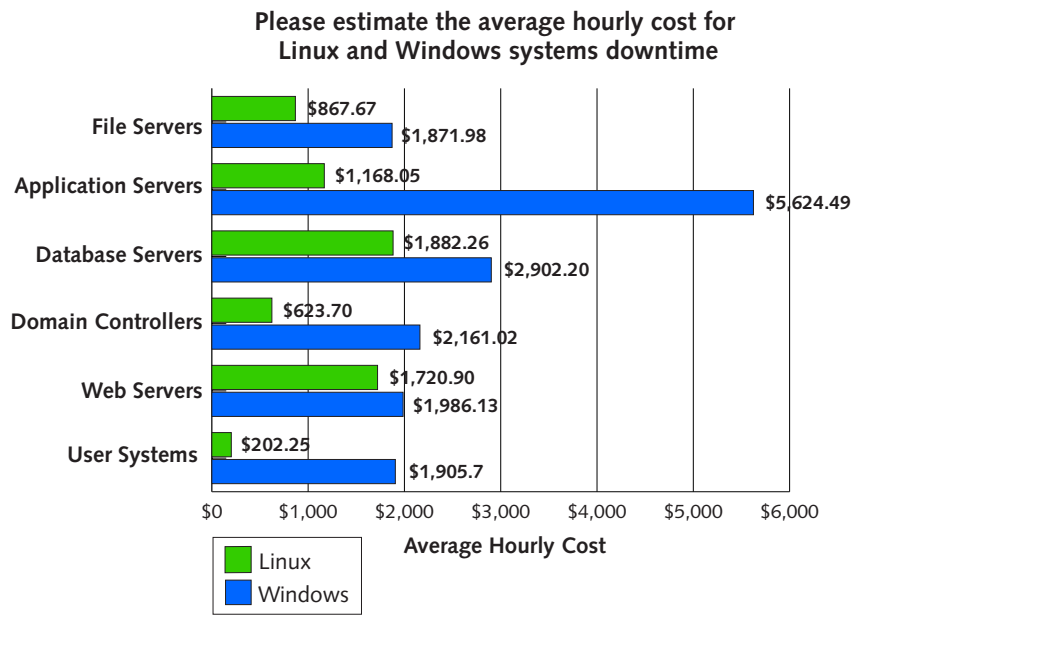| System	Linux	Windows
File Servers	18.34	12.07
Application Servers	17.38	12.14
Database Servers	17.44	14.65
Domain Controllers	13.15	13.47
Web Servers	19.05	14.56
User Systems	17.13	12.65

Hours

Linux
Windows

Cost of System Downtime

Not surprisingly, users said the cost of Windows server downtime was substantially (three or four times) higher than the average hourly cost of comparable Linux server downtime. Once again, this statistic is not indicative of any flaws in the underlying server operating system. It is directly attributable to the fact that Windows servers constitute 70% to 80% of the server population and those Windows servers typically carry more of the sensitive corporate data than their Linux counterparts do. This reinforces Yankee Group's premise that the organization's TCO is largely influenced by the services and applications associated with the core server OS.

The two categories that showed the largest disparity were the cost of downtime among application servers and users' desktop systems. The average cost of an hour's worth of downtime for a Windows application server such as SQL Server or Exchange Server was $5,624 compared to $1,168 for a comparable Linux application server (see Exhibit 6). The downtime cost associated with a Linux desktop was $202 per hour versus $1,905 for a similar Windows client machine. The high rate of hourly Windows downtime reflects both the number of Windows servers and the larger amounts of data they typically carry compared to Linux.

Exhibit 6.

Cost of Windows Server Downtime Far Exceeds Linux Downtime Cost

Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

Please estimate the average hourly cost for Linux and Windows systems downtime

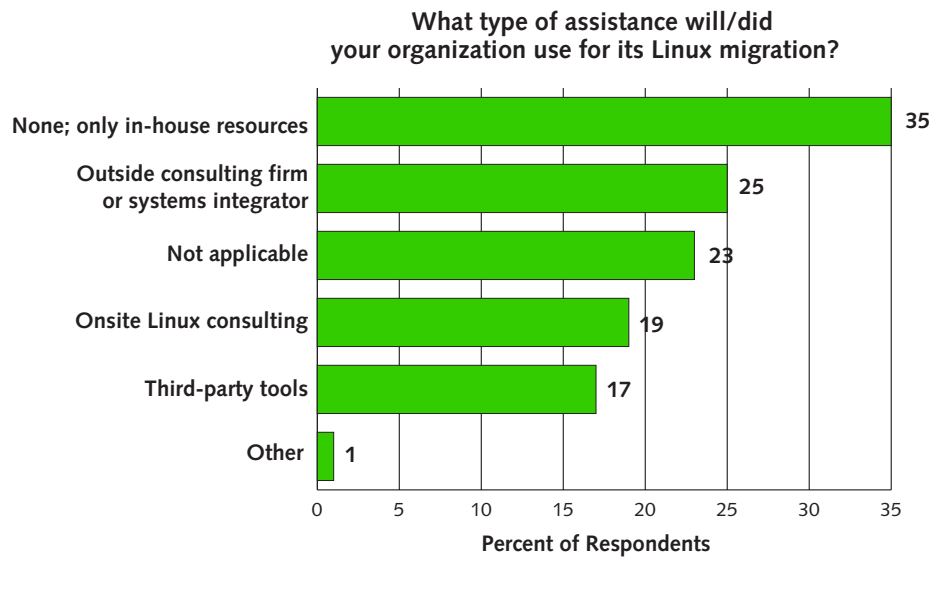| Category	Linux	Windows
File Servers	$867.67	$1,871.98
Application Servers	$1,168.05	$5,624.49
Database Servers	$1,882.26	$2,902.20
Domain Controllers	$623.70	$2,161.02
Web Servers	$1,720.90	$1,986.13
User Systems	$202.25	$1,905.7

Average Hourly Cost

Linux
Windows

Third-Party Tools and Utilities

More than one-third of customers—35%—will use only in-house resources when they migrate to Linux (see Exhibit 7). This practice may be acceptable among smaller SMBs with 200 or fewer users, or in corporations where there is a high degree of technical expertise. However, larger businesses should use the appropriate third-party tools, contract with external systems integrators or engage the services of a global services and support organization to assist in the Linux upgrade. This will add upfront TCO costs but ultimately save the business incalculable downtime and the necessity of delaying or derailing a migration due to largely preventable upgrade issues.

Exhibit 7.

One-Third of Linux Users Shun Migration Aids

Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

**What type of assistance will/did
your organization use for its Linux migration?**

Category	Percent
None; only in-house resources	35
Outside consulting firm or systems integrator	25
Not applicable	23
Onsite Linux consulting	19
Third-party tools	17
Other	1

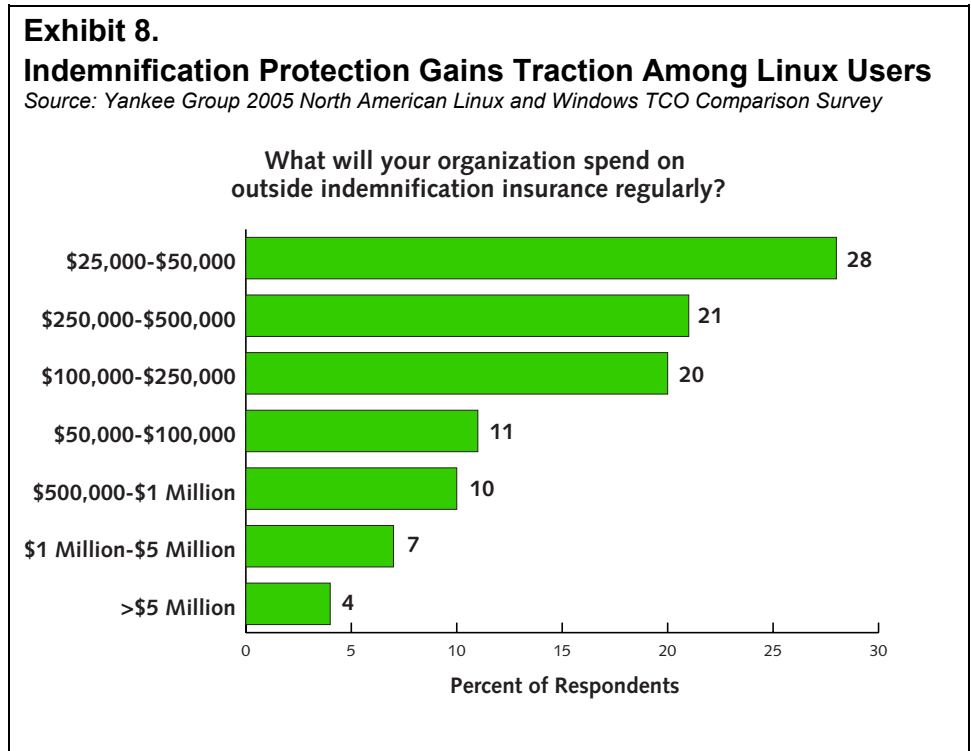**Percent of Respondents**

Indemnification

The decision of whether to purchase outside indemnification or to do without is something each firm will have to decide for itself. The survey data suggests that indemnification is becoming more of an issue. Approximately 20% of the respondents that presently use or plan to deploy Linux said they will purchase third-party indemnification to protect their assets.

Of the 20% of businesses that plan to purchase outside indemnification protection, nearly 40% will spend an incremental $25,000 and $100,000 annually (see Exhibit 8). Another 20% will spend $100,000 to $250,000 on annual indemnification premiums. Of the remaining 20%, 4% will spend more than $5 million annually on such protection.

A company that spends $1 million or more annually on Linux indemnification protection most likely negates any real or perceived cost savings over the cost of a Microsoft licensing agreement. In early 2003, Microsoft quietly revamped its licensing provisions and removed the liability cap on its indemnification protection. It also extended the indemnification coverage to consumers as well as corporate users and increased the product warranty period from 90 days to 1 year. Microsoft licensing customers pay more, but Microsoft provides higher intrinsic indemnification protection and business value in its proprietary software contracts. Microsoft can afford to do so because it owns and controls the core Windows source code. By contrast, the Linux source code is open source—meaning that although there are thousands of contributors to various components of the core OS kernel, no single vendor owns the code. This makes open source indemnification trickier and subject to specific conditions.

Any organization contemplating the purchase of outside indemnification should have their in-house legal counsel review the specific terms and conditions (T&Cs) of the indemnification protection contract to determine what is covered and where gaps may exist in the Linux indemnification coverage. Likewise, Microsoft licensing customers are advised to thoroughly review the specific T&Cs in contracts and check for special circumstances or exclusions.

The subject of indemnification or vendor warranty protection against third-party IP infringement suits (e.g., copyright, theft of trade secret or patent infringement) first came to the forefront as an issue for Linux and open source software 2 years ago. In March 2003, The SCO Group filed a multibillion-dollar lawsuit against IBM, alleging that Big Blue illegally violated SCO's UNIX System V copyright and inserted that code directly into Linux.

Exhibit 8.

Indemnification Protection Gains Traction Among Linux Users

Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

**What will your organization spend on
outside indemnification insurance regularly?**

Range	Percent of Respondents
$25,000-$50,000	28
$250,000-$500,000	21
$100,000-$250,000	20
$50,000-$100,000	11
$500,000-$1 Million	10
$1 Million-$5 Million	7
>$5 Million	4

Many of the mainstream Linux distributors such as Red Hat, Novell and JBoss sell support agreements to help corporations troubleshoot their specific Linux distribution software when problems arise. However, in contrast to Microsoft, which has provided corporate and consumer customers with unlimited indemnification protection since 2003, Linux vendors such as Novell have placed a cap on liability. In Novell's case, this is limited to $1.5 million per company; other firms such as JBoss recently upgraded their indemnification protection. It is possible for individual companies to negotiate for better terms and conditions.
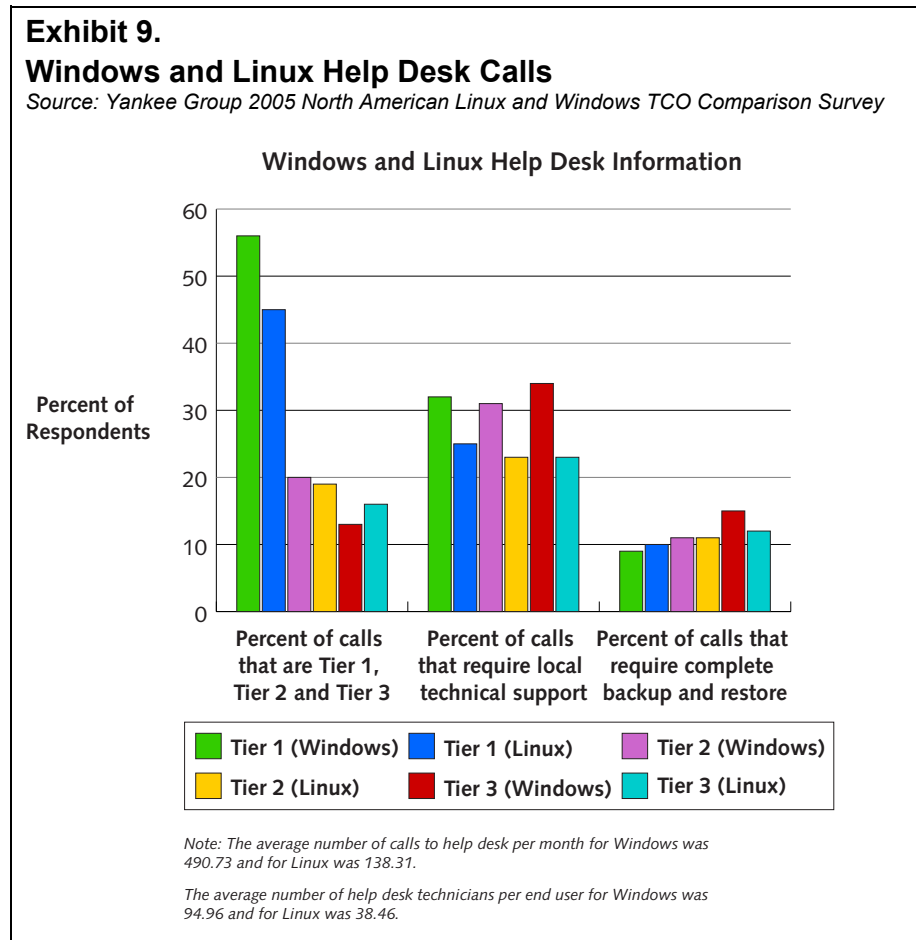
Check the vendor's web site to see a list of the available tools. For example, a list of all of the service-level agreements available from Red Hat can be found at www.redhat.com/support/service/sla. Additionally, corporations looking for a broader, more comprehensive list of Linux resources can go to www.linux.org/docs.

Help Desk Calls

One area of particular interest and inevitable impact on an organization's TCO is the number of calls to the help desk. Yankee Group delineated Linux and Windows help desk responses according to both the amount and the severity of technical issues. Tier 1 calls were defined as the simplest and quickest to resolve, Tier 2 calls were somewhat more complicated and Tier 3 calls were the most involved and most serious, and typically took the longest to resolve.

It's not surprising that the larger and more mature Windows networks register nearly four times as many help desk calls each month as their Linux counterparts. On average, businesses reported that their Windows help desk technicians responded to 491 calls per month compared with 138 Linux help desk calls (see Exhibit 9).

Exhibit 9.
Windows and Linux Help Desk Calls
Source: Yankee Group 2005 North American Linux and Windows TCO Comparison Survey

Windows and Linux Help Desk Information

Legend:
- Tier 1 (Windows)
- Tier 1 (Linux)
- Tier 2 (Windows)
- Tier 2 (Linux)
- Tier 3 (Windows)
- Tier 3 (Linux)

Note: The average number of calls to help desk per month for Windows was 490.73 and for Linux was 138.31.

The average number of help desk technicians per end user for Windows was 94.96 and for Linux was 38.46.

The larger complement of Windows systems means that the ratio of help desk technicians per user is 2.5 times greater than in the Linux environment. A single Windows help desk technician supports 95 users compared to the 38 users supported by a single Linux help desk administrator.

The average cost breakdown for each help desk call, including labor, is:

- **Tier 1:** $26
- **Tier 2:** $90
- **Tier 3:** $143

The maturity, experience and superior documentation of the Windows environment is particularly proven by the fact that although Windows servers outnumber Linux servers by an approximate 10-to-1 margin, in most companies the percentages of the more complex Tier 2 and Tier 3 Windows and Linux help desk calls are nearly equal. In fact, in the Linux environment, a slightly larger percentage of help desk calls are Tier 3 compared to 13% of Windows help desk calls that are Tier 3.

Most significant is the percentage of help desk calls in the Windows and Linux environments that require a complete backup and restore, which is the lengthiest and costliest procedure. There is relative parity among the percentage of these Tier 3 Windows and Linux help desk calls in the backup and restore category.

We draw two conclusions from the help desk data:

- **The relative immaturity of the Linux market has resulted in a disproportionately higher percentage of Linux help desk calls compared to the actual number of Linux servers.** Although there are on average 10 times as many Microsoft servers as Linux servers, Windows help desk technicians respond to only four times as many calls per month as Linux administrators.

- **The rapid increase in Linux deployments must be matched by a commensurate rise in readily available Linux documentation and skilled administrators within the next 12 to 15 months.** Otherwise, companies can expect the cost of maintaining and troubleshooting Linux networks to be an average 25% higher than the corresponding Windows network help desk costs.

III. Conclusions

Microsoft has made great strides in addressing and correcting the most severe technical user concerns: security and patch management. Microsoft has also added more business value to Licensing 6.0. Collectively, these Microsoft initiatives lowered the TCO of the Windows desktop and server platforms and delivered near immediate ROI. By virtue of the vast resources and technical expertise at Microsoft's disposal, Windows is an enterprise-class desktop and server operating system. However, Microsoft must remain vigilant and not relax or rest on its laurels, especially in regard to security.

By virtue of their status as UNIX derivatives, the various Linux distributions—most notably Red Hat Enterprise Linux—are also enterprise-worthy server operating systems. To date, the various Linux and open source distributions have not made a perceptible impact as a client operating system. This will not change in the next 2 years.

There is no such thing as a one-size-fits-all operating system that is right for every scenario in every environment. Depending on individual corporations' business needs, current and planned technology infrastructure and capital expenditure budgets, either Windows, Linux or some combination of the two may be appropriate.

Pros and Cons for Microsoft and Linux

The Windows and Linux environments each come with specific advantages and disadvantages.

Microsoft Pros

- Improved performance, reliability, security and patch management
- Licensing enhancements provide more value and stabilize or reduce corporate licensing costs
- Unlimited indemnification and 1-year product warranty
- Extensive third-party application and device support
- Superior documentation speeds troubleshooting
- Plethora of embedded management, performance enhancement tools and utilities
- Active Directory

Microsoft Cons

- Remains number one hacker target
- Still has monopolistic image
- Delayed shipment of Windows storage system has left the door open for Linux appliances
- Client access licenses are expensive, particularly for SQL

Linux Pros

- High performance, reliability and stability

- Free or less expensive licenses compared to Windows and Office

- Ability to customize the core OS kernel

Linux Cons

- Corporations are complacent regarding security.

- Vertical and niche market application support and availability are sporadic.

- Limited or lack of IP indemnification can represent a substantial incremental capex investment to those companies that determine their business model requires indemnification protection.

- Businesses that customize the OS kernel forfeit indemnification and product warranty assurance.

- Documentation is currently poor, which makes troubleshooting difficult.

- The "forking" of the Linux market due to multiple distribution vendors may potentially lead to integration and interoperability concerns, particularly among those businesses that significantly alter or modify the Linux kernel.

- Large enterprises will have to purchase a substantial number of third-party management tools and utilities, which can increase TCO by 15% to 35% depending on specific user scenarios.

- Skilled Linux administrators can command 10% to 20% salary premiums compared to Macintosh, Windows and UNIX managers.

IV. Recommendations

To achieve the highest TCO and fastest ROI, corporations must perform a thorough analysis of current operating system infrastructure and identify specific costs associated with purchases and management tasks. This will enable the organization to discern the strengths and weaknesses of its environment. Individual business needs, goals and budgets will vary. There is no one-size-fits-all TCO model that will work for all businesses.

When determining whether Linux, Windows or UNIX is the most appropriate primary platform—or, alternatively, which combination of server operating systems and applications is most appropriate—corporations should:

- **Construct a detailed list of tactical and strategic goals.** This includes making a list of criteria for achieving TCO and ROI and rates. Include the factors (e.g., capex outlay, performance, specific features) that will influence your decision in order of importance.

- **Make a list of top TCO expenditures.** Every organization regardless of size or vertical market should be able to answer basic questions that will determine TCO and ROI. Without this knowledge, organizations will not achieve optimal TCO and ROI.

- **Review your budget.** If Windows is currently your primary platform, how and where can you save money by switching to Linux? What does your organization spend on hardware, software licenses and third-party tools? If you switch to Linux and spend less on licenses, will you have to spend more on indemnification, product warranties and third-party tools in the Linux environment?

- **Assess your IT staff.** Determine your organization's expertise in existing OS management and the amount of time and budget necessary to retrain or certify in-house staff on Linux or to hire skilled Linux administrators or third-party outsourcers. There are fewer skilled Linux administrators available; the greater their proficiency, the higher their salary premium. This situation will change over time, but don't expect it to ease perceptibly in the next 12 to 15 months.

- **Assess your security.** To date, Windows networks took the brunt of the hack attacks. But Linux-specific hacks increased sharply in the last 6 months. When assessing the organization's security TCO, include security practices and policies as well as the current level of security training of existing staff. Before undertaking any type of upgrade or migration, perform a risk analysis and assessment of your present environment, eliminate the vulnerabilities and reduce your risks.

- **Review your application infrastructure.** Is the majority of your application environment off-the-shelf or customized? If your current Windows or UNIX infrastructure mainly consists of off-the-shelf applications, are these same applications available in the Linux environment? If not, do you have the expertise and the budget to replicate a customized version in Linux in a reasonable time frame? How much will it cost?

- **Consider the costs of indemnification and product warranty.** For small or midsize companies, risk of litigation or liability as a result of IP trade secret, copyright or patent infringement is much lower than that of an enterprise. However, TCO may still be affected by event-driven indemnification, or lack thereof. If your organization is committed to a significant Linux deployment, it would be wise to lobby long and hard for better indemnification and product warranty terms.

- **Consider premier technical services and support.** For large enterprises implementing a significant Linux deployment, premium technical service and support offerings from Avaya, HP, IBM, EDS, CSC and others is a must-have. These support services carry a price premium and will add an estimated 20% or more to the overall TCO, but they are worth it. Comparison shop—don't hesitate to ask for discounts or special deals. HP and IBM want to see Linux grow, so the chances are good that your firm can get a good deal.

- **Use third-party tools.** Linux is not yet as mature as UNIX or Windows. The baseline operating system offerings may not incorporate all of the embedded performance and management capabilities of those OS environments. This may require your organization to purchase and install several third-party tools at an incremental cost. These packages may range from simple utilities to more complex management functions, and this could potentially raise the cost of your initial capital expenditure outlay by 10% to 35% depending on the size and scope of your organization. Customers considering a Novell SUSE and Ximian Linux implementation should check with Novell, which has a slew of add-on products, such as ZENworks and eDirectory from its legacy NetWare environment. These same products may be available for the SUSE and Ximian offerings. If so, customers are urged to lobby for their inclusion into a new Novell SUSE Linux contract.

It's incumbent on individual organizations to determine which operating system or combination thereof best suits their firm's technology needs, budget and business goals. With proper planning, training and due diligence, Linux, Windows or UNIX can provide the best TCO and fastest ROI. Companies that fail to perform due diligence are buying blind and will almost surely suffer the consequences.

V. Further Reading

Yankee Group Reports

Indemnification Becomes Open Source's Nightmare and Microsoft's Blessing, November 2004

Linux, UNIX and Windows TCO Comparison, Part 2, June 2004

Linux, UNIX and Windows TCO Comparison, Part 1, May 2004

Enterprises Worldwide Finally Plan to Increase IT Spending on Long-Overdue Software Upgrades, March 2004

Yankee Group DecisionNotes

Linux Is a Strong Contender, but Windows Is Still the Number-One Server OS, April 2005

How SMBs Should Choose Between Linux and Windows, March 2005

Think Before You Migrate: Due Diligence Required for OS Migration, March 2005

Windows Small Business Server 2003 Is Top Software Server Choice for SMBs, June 2004

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