

# Linux, UNIX and Windows TCO Comparison, Part 2

## Executive Summary

*"What does a move to Linux buy me?" That question, posed by the CIO of a large healthcare facility in New York State is the crux of the Linux versus UNIX and Windows migration debate.*

*If you cannot answer that basic question, then it may be in the best interests of your company to simply stay put. A corporation should delay a Linux migration—or any software migration—until it can satisfactorily answer how a software operating system migration, upgrade or wholesale switch to another platform can deliver tangible technology benefits, better ROI and improve the total cost of ownership (TCO).*

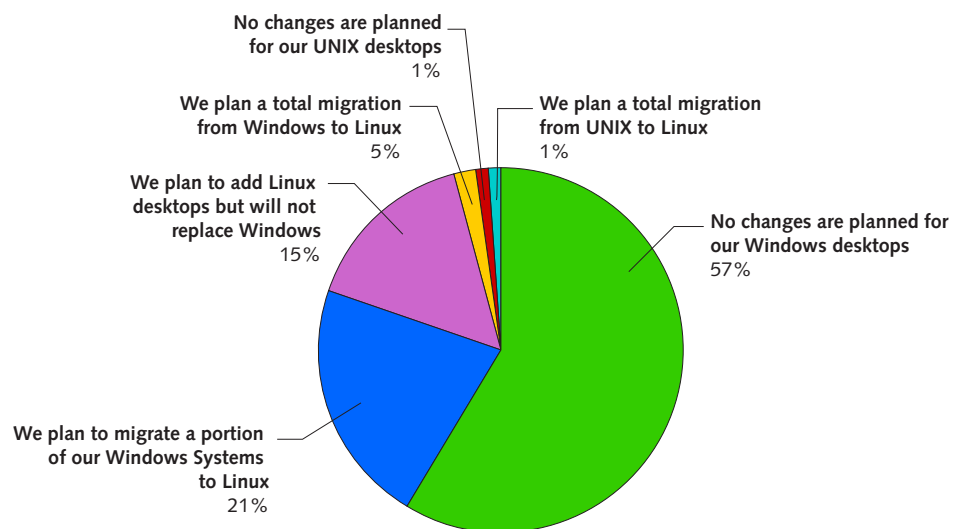
*In this, the second part of the Yankee Group's two-part report comparing the TCO of Linux, Windows and UNIX, we profile individual companies that have already gone through the process. The Yankee Group interviewed 24 IT managers and c-level executives at small, mid-size and large enterprises ranging from 50 to more than 100,000 employees. The case study subjects include businesses in myriad vertical markets such as academic, healthcare, legal, insurance, scientific/engineering and retail. The size and revenue of each of these firms were as varied as their businesses. However, they all have one thing in common: each organization's technology decision—whether it was to migrate to Linux or remain with Windows or UNIX technology—was driven by sound business principles. In addition, the company made the decision after each firm individually performed a thorough TCO and ROI analysis. And that is the best recipe for success.*

### Exhibit 1

### Companies Like Linux but Will Stay the Course with Windows and UNIX

Source: The Yankee Group, 2004

What changes if any will your company make to its desktop OS environment?



Note: No respondents answered We plan to add Linux desktops but will not replace UNIX



Our customer case study conversations elicited many anticipated and some unexpected responses.

It came as no surprise that all the corporations interviewed are being fiscally cautious with their respective IT budgets. Eight out of 10 organizations, according to Yankee Group survey data, will undertake a software upgrade from 2004 to 2005. However, these upgrades will be shaped by the reality of the protracted economic downturn of the last 3 years. Companies told the Yankee Group they want tangible TCO and fast ROI. All of the firms would like to reduce the amount of upfront capital expenditure dollars they spend on expensive Windows and UNIX software licenses and client access licenses. However, they also recognize that in certain instances a wholesale or significant switch to Linux might reduce upfront costs but result in higher overall costs.

All of the firms said Linux makes a good bargaining chip, or as the MIS manager at a mid-sized retail firm noted, “We have no intention of switching to Linux, but we do find it useful as a stone to throw at Microsoft.”

Customers also praised Windows—especially Windows Server 2003 and Windows XP—for noticeable improvements in performance, reliability and even security. In addition, many of the Windows users expressed enthusiasm for the premium features, remote management capabilities and collaboration facilities in Office 2003. Several users mentioned the added flexibility and business benefits that Microsoft’s new OneNote package will provide to their businesses. OneNote has the ability to capture, prioritize, rearrange and manage data across PCs, laptops and tablet PCs. In addition, OneNote’s ability to incorporate hand written text and drawings is not available in the Linux environment.

Firms with a strong UNIX presence universally praised the maturity, security and robustness of the OS. Additionally, Windows and UNIX users interviewed by the Yankee Group noted that skilled network administrators for these platforms were in plentiful supply.

The maturity of UNIX and the ready availability and abundance of utilities makes UNIX much more cost effective to manage than Linux, according to an IT manager at a Midwest engineering firm. “Linux support people end us doing twice as much work as those supporting a commercial UNIX distribution such as AIX or HP-UX,” the manager said.

By contrast, the establishments that have or are seriously considering Linux bemoaned the present dearth and high cost of skilled Linux administrators, even as they praised the open source operating system’s ease of use.

Approximately 33 percent of the 1,000 survey respondents and two dozen corporate customers have Linux deployed somewhere in their organizations. Linux is typically used as a Web server or specialized departmental application server.

“We use Windows 2000 Servers for data applications and our Linux Server [is used] as an Internet Gateway. Linux is solid and 100 percent reliable but it is sooooo expensive to get help for,” according to an IT manager at a southwestern retailer.

Another MIS manager at a transportation firm echoed that sentiment. He noted that it is presently “harder to find competent Linux people who do not want to charge too much.” The manager added, “So much for free software. I don’t save anything if the technical service and support are too costly and poor.”

## Specific OS Platform Costs

During each conversation, corporate IT managers and c-level executives spoke frankly regarding the costs associated with each operating system. Not surprisingly, the Windows shops complained about the licensing costs (particularly the client access licenses—CALs) and of the time spent installing security patches and updates. UNIX users grouched about the high cost of the hardware, while Linux companies bemoaned the high cost of IT salaries.

Some of these costs—such as the Linux salaries—will resolve themselves with the natural product life cycle maturation in about 2 years. Others, such as Windows licensing, will remain static. Prospective Linux enterprise customers said they are grappling with the challenge of determining the true TCO of Linux, which includes the cost of new hardware purchases, software drivers, management, security, training and re-training existing staff and ongoing maintenance costs.

The mid-sized and enterprise corporations considering Linux were confused and cautious about the impact that purchasing Linux indemnification and product warranty may have on their TCO model. On the plus side, many of the Linux distributors and vendors—most notably HP and more recently, Novell, Inc. (which purchased SuSE and Ximian) and Jboss Group—said they will indemnify customers against the SCO lawsuit.

However, all of the vendors' indemnification programs have very specific conditions. HP for example, requires that customers not modify their Linux code as a condition of insurance. Novell's indemnification program for SuSE Linux Enterprise Server 8 customers mandates that users buy upgrade protection and the associated technical support contract. Additionally, Novell's indemnification is partial; it has a liability cap of \$1.5 million on copyright infringement protection per customer.

Microsoft Windows and Office represent the biggest bargain in terms of indemnification and product warranty. In early 2003—in advance of the SCO Group lawsuit—Microsoft enhanced its product warranty provisions from the standard 90 days to a full year for Volume License customers. Similarly, in response to customer feedback Microsoft removed the cap on liability protection. In the event a Microsoft Volume Licensing customer in good standing becomes the target of a copyright or patent infringement third party lawsuit such as SCO's Microsoft will take one of four specific actions, up to and including replacing the offending code, to remedy the situation for its customers.

In the majority of cases, such indemnification may never be necessary. However, in the event a situation does arise, the strong indemnification and product warranty provisions that come bundled with Microsoft's Volume Licensing agreement are worth not only the cost of the license itself, but it can considerably lower the TCO. This is especially true for mid-sized and large enterprises. Indemnification will not be as big a TCO issue for small firms.

One IT manager at a large U.S. healthcare company offered two very pragmatic reasons for its staunch support of proprietary software over open source solutions. "Our Windows desktops operate in a mission-critical, patient-confidentiality, data sensitive environment. It is because of the very nature of Linux's open source architecture that we will never migrate away from a closed source (Microsoft) solution. The liability is just too great." A second and equally compelling reason the healthcare firm "will always use Windows is because it is the only OS supported by our primary clinical application provider, Meditech," the IT manager said.

When one factors in the incremental risk and potential liability to a large enterprise without indemnification or a product warranty, the TCO and ROI of a large-scale Linux implementation could rise by 10 to 35 percent on average. In a worst-case scenario—that is, if a third party such as SCO successfully sues an uninsured corporation and wins royalties and damages—the cost to a corporation could be staggering.

In mid-April, Open Source Risk Management, a New York City-based startup began offering independent third-party insurance to protect customers against copyright infringement lawsuits such as The SCO Group's lawsuit against IBM and RedHat. The price for this third-party indemnification is 3 percent of however much insurance a corporate customer purchases. Therefore, \$100,000 worth of coverage would cost \$3,000, while \$1 million worth of coverage would cost a company \$30,000.

OSRM is only selling liability protection covering copyright infringement suits. However, company chairman Daniel Egger said OSRM plans to offer patent protection liability insurance for an additional premium at a later date.

## Hidden TCO Costs

Several other “hidden” costs that can drive up the TCO of a “free” Linux deployment:

- **Interoperability**
- **Integration**
- **Cost of deploying custom applications**

Even an organization that plans to have a homogeneous Linux environment must still consider the need and the cost for Windows and UNIX interoperability with business partners, customers and suppliers. There is also the issue of interoperability with the various Linux distribution versions and custom Linux deployments and the availability of applications. Corporations with a need for specific vertical applications (i.e., banking and finance, healthcare, pharmaceutical, automotive, and legal) may have to defer Linux upgrades or write custom applications in the absence of available off-the-shelf software packages.

Of course, businesses that write custom applications will bear the burden of the higher costs. Beyond the obvious additional expense of a custom application environment, corporations will discover that Linux is not the “free” operating system environment they previously imagined.

In fact, the initial deployment costs—including technical service and support, retraining and recertifying IT staff, building custom applications, integration and interoperability issues—may make Linux more 10 to 20 percent more expensive than UNIX or Windows in the short and intermediate term. The initial ramp up costs will level off within 24 months. However, as Linux gains significant traction as an enterprise server operating system, look for security to become a bigger issue and expense. As Linux's popularity soars, so too will the number of security hacks. Within 2 to 3 years, businesses will spend just as much securing their Linux servers as they now do with Windows.

## Customer Case Studies

The aphorism “to each his own” has never rung truer than it does in the 2004 operating system arena. Choosing an enterprise OS is taking on near religious overtones. Nowhere are the zealots more in evidence than in the Linux environment. This makes perfect sense. Software developers feel a keen sense of pride and accomplishment in open source and Linux since so many thousands contributed to the GNU Linux Public License.

### Exhibit 2

#### Linux TCO Benefits and Risks

Source: *The Yankee Group, 2004*

TCO Benefits	TCO Risks
<ul style="list-style-type: none"> <li>• Free licenses</li> <li>• Ability to use low-cost hardware</li> <li>• Ability to run Linux on multiple hardware platforms</li> <li>• Ability to modify and redistribute source code</li> <li>• Currently fewer security concerns than Windows</li> </ul>	<ul style="list-style-type: none"> <li>• Does yet support as many applications as Windows, UNIX</li> <li>• Paucity of skilled administrators</li> <li>• Limited or lacking in product warranty and indemnification</li> <li>• Integration and interoperability issues with legacy platforms</li> </ul>

Linux shines in developer-driven environments and as an alternative to more expensive UNIX software and hardware offerings. Anecdotally, customers report that Linux deployments are an order of magnitude less expensive on custom-built or off-the-shelf servers and desktops.

**That was the case with Company A, an organization with approximately 50 users.** The company’s vertical market is visual effects production. In that regard, the company is more like a scientific or engineering environment than a straightforward administrative office setup that mainly relies on file, print and e-mail applications. Company A, based in California produces special effects for movies. *X-Men 2*, *Titanic*, *Red Planet*, *Me, Myself and Irene*, *Woman on Top*, *Romeo and Juliet*, and *Blue Crush* are some of the company’s recent projects.

Linux was tailor-made for Company A. Its end users and managers are technically proficient. Most have UNIX backgrounds. The company uses Red Hat versions 8 and 9. The company engineers build their own PCs and custom applications. Technical support and maintenance are also done in-house. Indemnification and product warranties are not needed.

Company A’s chief technologist and one of four co-founders has a UNIX background. He told the Yankee Group he switched from SGI UNIX workstations to Linux and never looked back.

“Linux has all the power, flexibility and openness of UNIX. You can engineer things at the lowest possible level and we can do it on a high performance less expensive PCs,” he said. For what his company wants to do—visual special effects—the proprietary nature of the Windows environment is too constraining. “Under Windows we found it too hard to get into the guts and work at the level that we wanted to modify the kernel. Our workforce is a group of highly paid technically oriented people who have a real need to manipulate the data,” he said.

Company A reported that support for its Red Hat Linux versions 8 and 9, “Is virtually free.” And with good reason: Company A’s technically sophisticated staff is self-sufficient. “RedHat support is unnecessary for us because we can do it ourselves and thus avoid management and support fees,” the chief technologist noted.

The ability to use inexpensive hardware was also in Linux’s favor.

The chief technologist said that his firm builds its own state-of-the-art desktop machines with an Advanced Micro Devices (AMD) Athalon 2500 chip, outfitted with 2GB of memory, 160GB hard drive and 128GHz process speed for slightly more than \$1,000. This is an order of magnitude cheaper than a comparable Silicon Graphics UNIX machine, he said.

Company A saves a significant amount on its servers as well. The company spends about \$2,500 for each server, which is built to order by an outsourcer. The servers incorporate AMD Opteron chips in a dual 64-bit processor configuration, with a standard 4GB hard drive. “A UNIX server with a similar configuration would cost three to four times as much—about \$10K,” the chief technologist said.

His firm also achieves great economies of scale from Linux’s “excellent” reliability and scalability. “The Linux software doesn’t crash,” he said. “Our reliability issues have more to do with buying consumer grade hardware. We have 50 machines and we expect one or two to die per year.”

One area where Linux cannot help his firm cut costs is graphics cards. That’s owing to the fact that the high performance graphics market is controlled by two firms: Nvidia and ATI. Company A uses Nvidia SX 5900 graphic card. “Nvidia does NOT release open source graphics cards, so we’ll have to pay the price,” the chief technologist said.

In summary, Company A’s chief technologist extols Linux for giving his firm “all the flexibility, power and intimacy with the hardware of UNIX, but the ability to reduce our costs because it runs on very fast inexpensive commodity hardware.”

## UNIX Hangs Tough

With all the media hype surrounding the Linux versus Windows debate, UNIX is often overlooked. In fact, the majority of high-end enterprise UNIX installations have no plans to defect. As one manager told the Yankee Group, “I don’t mind paying a premium for premium performance and after-market services. There is simply no need to disrupt our environment with a switch to Linux at this time.”

**Exhibit 3****UNIX TCO Benefits and Risks**

Source: *The Yankee Group, 2004*

TCO Benefits	TCO Risks
<ul style="list-style-type: none"> <li>• Stable platform</li> <li>• High reliability, performance</li> <li>• Very good security</li> <li>• Plethora of skilled administrators</li> <li>• Thousands of available apps</li> <li>• High level of compatibility with other OS platforms</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive hardware</li> <li>• Cannot modify core kernel code to same degree a Linux</li> </ul>

**Windows Users Cite TCO Savings**

**Company B is a mid-sized law firm with 1,100 end users.** It is headquartered in New York City and has eight remote offices, including four international offices. The company has a heterogeneous environment that includes Windows, Linux and UNIX servers. However, Windows is the primary enterprise desktop and server OS. The law firm plans to remain with Windows.

According to the CIO (an 18-year veteran who also held a variety of IT jobs at the firm), Company A's strategy is to remain on Windows platforms, add one or two Linux servers and self-train its administrators on Linux.

Company A did an extensive TCO cost/performance analysis to determine that it made the best technical, business and financial sense to stick with Windows.

**Exhibit 4****Windows TCO Benefits and Risks**

Source: *The Yankee Group, 2004*

TCO Benefits	TCO Risks
<ul style="list-style-type: none"> <li>• High stability, performance and reliability</li> <li>• Tens of thousands of available applications</li> <li>• Broad hardware, driver and API support</li> <li>• Large pool of skilled IT administrators</li> <li>• Increasing amount of embedded functionality in the OS</li> </ul>	<ul style="list-style-type: none"> <li>• Number one hacker target heightens security risks</li> <li>• Licensing model = higher up front capital expenditure than Linux</li> <li>• Proprietary architecture (can be viewed positively or negatively)</li> </ul>

“The cost of maintenance and integration of Linux custom applications would far outweigh the initial savings the company might realize from the free Linux licenses,” the CIO said. Additionally, a wholesale conversion from Windows to Linux would quadruple the company’s capital expenditure outlay; increase deployment time by several orders of magnitude and raise the risk of running custom applications in an “unknown” Linux environment to an unacceptable level. The law firm also requires indemnification which would not be available from vendors if it modified the core Linux kernel and does not see the logic in purchasing indemnification from a third party, when Microsoft offers comprehensive indemnification and 1-year product warranties. Additionally, the company likes the new features and functionality of Office 2003, including OneNote, which it says provides a competitive edge for its attorneys and legal assistants.

The big appeal of Windows for this law firm is the breadth and depth of the available third-party application pool, which is unmatched in the Linux environment. Company B’s CIO noted that every application in the law firm—from the accounting applications, to patent trademark and litigation support—are not available in the Linux market.

“To put it bluntly, it would be a really dirty job to re-engineer and test the applications in Linux,” he said. “If I were to take the same custom applications I now run on Windows and migrate it to Linux, such as an Informix database, that’s a great unknown. I would have to worry about client PC and printer connectivity, maintain two different environments to do the same testing, including two different databases. It would be double the trouble. So why would I do it?”

Migrating a single Windows application (for which the law firm is familiar with all of the APIs, how to structure the database and perform the necessary reverse engineer testing) costs the company \$800,000 to \$1 million. Migrating that same custom application to run on top of Linux would cost three times as much to rewrite, re-engineer, test against all parameters and ensure the law firm has all the correct drivers.

In addition to the capital expenditure costs, a custom Linux deployment would also take much longer. “Typically, a normal Windows upgrade takes about a weekend to rollout in each of our eight remote offices,” said the CIO. “The same physical upgrade or conversion to free BSD Linux or Star Office could take a year or two to convert formats while at the same time maintaining the legacy Windows environment.”

Add to that the 20 percent to 30 percent salary premiums that skilled Linux developers command in the fiercely competitive New York City market and the TCO of switching to Linux becomes even more expensive for this law firm which has 95 servers in its headquarters and another 100 servers in its eight remote offices.

The CIO also cited another less tangible though equally compelling reason for Company B’s loyalty to Windows: the quick mobilization of Microsoft’s technical service and support staff, which showed up within 24 hours after the 9/11 attack on the World Trade Center.

Company B is located very near the World Trade Center and the CIO was just emerging from the subway when the second plane hit. All communications, including Company B’s offsite backup were knocked offline in the wake of the terrorist attack.

Confusion reigned. “No one knew anything—when or if we would be back online or if any of our data was lost,” the CIO recalled. “The very next day, the Microsoft technical support team showed up unannounced at our headquarters ready and willing to do everything they could to get us up and running again. What made this so amazing and so touching was that we never even called them.”

Microsoft rarely gets credit for selfless acts like this. However, Company B's experience is not unique. The Yankee Group has spoken with executives of at least six other firms in lower Manhattan, which recounted similar experiences of fast, efficient and unsolicited service in the wake of the 9/11 terrorist attack. Such positive activity on the part of any vendor will undoubtedly engender customer loyalty.

**Company C, a large healthcare organization in the Western U.S., has 18,000 end users and 25 hospitals and clinics.** The healthcare firm has an equal mix of 250 Windows servers and 250 NetWare servers. They are open to adding some Linux servers and have already performed due diligence on various TCO scenarios.

The company has not made any final decisions on what it will do with its NetWare servers. However, the Enterprise LAN architect manager said the healthcare organization is leaning toward switching the majority of those NetWare servers to Windows when its Novell Master License Agreement (MLA) expires in 2005.

The reason: uncertainty over Linux management and associated technical service, support and application costs. However, the healthcare firm is open to Linux via Novell's SuSE acquisition, although the healthcare firm says Novell has been short on specifics of migrating NetWare servers and applications to SuSE Linux. The firm feels that Microsoft's TCO has lowered considerably with the new Windows Server 2003 and Windows XP platforms. The constant security attacks against Microsoft are a concern but the company feels Microsoft is "stepping up to the plate" to address the issue and that Linux will also be at higher risk as its' popularity increases.

The healthcare organization also voiced concerns about a significant Linux deployment. "We're hesitant about Linux on several points," the high level IT manager said. "We're concerned about how easy/difficult Linux is to manage, third party support is not as extensible and available and could represent a steep incremental expense. And as we upgrade to new hardware, that will require us to recompile the drivers, which is a substantial undertaking."

Most of the company's clinical applications run AIX UNIX. The organization is testing a variety of Linux distributions including Red Hat, Novell's SuSE and Mandrake but it has no Linux in production at this point. The firm says it is open to Linux. In his role as the Enterprise LAN architect manager, this executive makes recommendations on both desktop and servers purchases.

Although the healthcare organization makes decisions based on TCO, technology deployments sometimes are made for purely emotional or human decisions. That was the case when the organization decided to buy a third-party nursing staff scheduling application. The question then became a choice between UNIX, Windows or Linux as the underlying OS. The Enterprise LAN Architecture's recommendation was to run the nursing scheduling application on UNIX because the third-party application had insufficient security. The purchasing committee wanted Linux for the free licenses. However, the healthcare organization ultimately went with Windows. Why? The end users—in this case, the nurses—vetoed the executives and insisted on Windows.

"The users didn't care about security or and they didn't care about free Linux licenses. All they wanted was Windows for the usability—that is what they know and that is what they like. And the users won the day," the enterprise manager said.

**Company D is a mid-sized healthcare organization with 120 Windows servers and 12,000 end users in New York.**

“Funny you should ask,” said this organization’s Windows NT/Windows 2000 server project manager when the Yankee Group contacted him to ask about his firm’s operating system strategy. With the theft and publishing of the Microsoft source and the proliferation of Microsoft security exposures/patches released in recent months, the manager said his firm’s network administrators wanted to consider alternatives to possibly replace some of our Windows NT 4 and Windows 2000 server. However, before this manager would commit to swapping Windows in favor of Linux, he did his due diligence on the portability of existing applications/databases to Linux. When he realized the degree of difficulty and cost associated with migrating the hospital’s overwhelming Windows-based applications, his interest in Linux waned.

As the manager reviewed the cost/performance of the existing Windows OS infrastructure, he was satisfied. “We have a positive relationship with Microsoft and outside of the security issue we find the reliability of NT 4 and Windows 2000 to be just fine,” he said. “It’s tough to afford financing for new equipment and operating system upgrades these days. So we’re not going to switch unless we have a good reason to migrate.”

### III. Conclusions

The conversations with end users cemented the Yankee Group’s belief that the issue is not black and white, and no operating system is right for everyone. Each company must look within. Make a realistic assessment of your existing software operating system infrastructure. Decide whether the current infrastructure meets your company’s current and planned business needs and goals. Balance your business requirements against your current and future budget and then chart your technology course.

The results may surprise you. Above all do not follow the crowd and do not make a decision based on media hype. The Yankee Group’s extensive TCO and ROI research showed that Linux has significant momentum and the support of impassioned developers and industry giants such as IBM, HP and Oracle. Additionally, the list of Linux distributors and third-party ISVs joining established vendors such as RedHat, Novell (SuSE), Debian and others, is growing monthly.

Linux server unit shipments and revenue will enjoy double-digit growth and enterprise adoption will increase steadily over the next 2 years.

Do not expect Windows or UNIX to fade away. Windows and UNIX both have proponents that are just as passionate, albeit not as vocal, as the Linux enthusiasts. UNIX and Windows are mature platforms that continue to evolve technically. For many large enterprises with significant financial investments and embedded physical, and services and support infrastructure, it is not fiscally feasible or technically advantageous to discard Windows. Only a small minority (4 percent) of UNIX users and about 10 percent of Windows users has any desire to switch platforms.

## Recommendations

Any organization that hopes to achieve optimal results with their OS upgrades and migrations would do well to emulate the case study subjects. Corporations should formulate a total cost of ownership model that considers:

- **Upfront capital expenditure costs**
- **Ongoing management and maintenance costs**
- **Third-party utilities and applications**
- **Cost of developing and supporting customized applications**
- **Need for indemnification or Linux insurance**
- **IT salaries**
- **Competitive technical and business advantages delivered by existing and potential new platforms**
- **Timeframe for realizing ROI**

Only after a corporation performs its due diligence with a thorough cost/performance analysis can it accurately determine which operating system platform or combination of Linux, Windows or UNIX, will yield the best TCO and ROI.

## IV. Further Reading

### **Yankee Group Application Infrastructure & Software Platforms Reports**

*Linux, UNIX and Windows TCO Comparison, Part 1*, April 2004

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

*Microsoft Readies Longhorn but Tells Users Not to Hurry Up and Wait*, February 2004

*Top Vendors Already Stake Their Claims in Web Services*, December 2002

*Microsoft Licensing: Pay Now or Pay More Later*, October 2002

*The Desktop OS: Are There Real Alternatives to Microsoft?*, July 2002

### **Yankee Group Application Infrastructure & Software Platforms Research Notes**

*Security Flaws Shadow Windows Operating Systems*, February 2004

*Microsoft Launches New Security Initiatives*, November 2003

*Microsoft Offers Six-Figure Bounty for Capture of Outlaw Virus Writers*, November 2003

*Is Windows XP Business Ready?*, September 2002

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