

## WHITE PAPER

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# Viewing the World Through New Windows: Comparing the Operational Costs of Windows Server 2003 with Those of Windows 2000 Server and Windows NT Server

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January 2005

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## IDC OPINION

Familiarity with an operating system platform generally translates to developing best practices for operation, maintenance, and deployment. Deep experience and well-orchestrated operational management have been two of the hallmarks of large system operation for decades, and the same benefits are moving to Windows as the current generation of Windows products continues to mature. In this white paper, IDC provides a look at the three-year total cost of ownership (TCO), comparing Microsoft's Windows Server 2003 product with its two predecessors — Windows 2000 Server and Windows NT Server — across six common workloads, including Web, file, print, networking, security, and email. Highlights of our analysis are as follows:

- ☒ The results of IDC's study show that when comparing Windows Server 2003 with its two predecessors, Windows 2000 Server and Windows NT Server, the operational costs favor the newer generations of Windows in most workloads by a significant margin. The primary drivers of this improvement are reduced costs associated with server administration and lower downtime costs.
- ☒ From a TCO perspective, Windows Server 2003 reduces operational costs versus Windows NT Server in all six workloads examined and significantly reduces these costs in five categories of workloads, including Web, file, print, security, and email. Compared with Windows 2000 Server, Windows Server 2003 offers significant improvements in four of the six workloads evaluated, with networking infrastructure and security workloads essentially equal in TCO between the two.
- ☒ Improved TCO for Windows Server 2003 is driven by a broad number of factors, with ever-present staffing costs a major contributor to the overall TCO story. The combination of deeper IT staff experience with the Windows environment and enhanced functionality sitting on more powerful hardware platforms has resulted in Windows Server 2003 sites requiring 60% less server administration staff than Windows NT Server and 27% less than Windows 2000 Server.
- ☒ The trend is clear: with each successive OS platform, Microsoft has added functionality and increased overall reliability, performance, and ease of operation. All these factors tend to drive down the costs of operation and create a more efficient and productive environment.

## **IN THIS WHITE PAPER**

This IDC white paper presents the results of a study conducted to determine the total cost of ownership for six common workloads, including Web, file, print, networking, security, and email on three Microsoft server operating environments (SOEs). Those SOEs include Windows NT Server, Windows 2000 Server, and Windows Server 2003. The results of this study are presented in terms of a three-year TCO for 100 supported users.

## **EXECUTIVE SUMMARY**

This IDC study compares the three-year TCO of Microsoft Windows Server 2003 against the three-year TCO for older Microsoft SOEs, including Windows 2000 Server and Windows NT Server.

The study was conducted through in-depth qualitative interviews across 156 large organization sites located in North America. In the vast majority (83%) of the cases, organizations use more than one of the Microsoft server operating environments being evaluated. This enabled IDC to collect directly comparable data from the two or three respective environments where other factors were relatively constant. This improves the quality of the cost data and analysis we were able to perform for this important study.

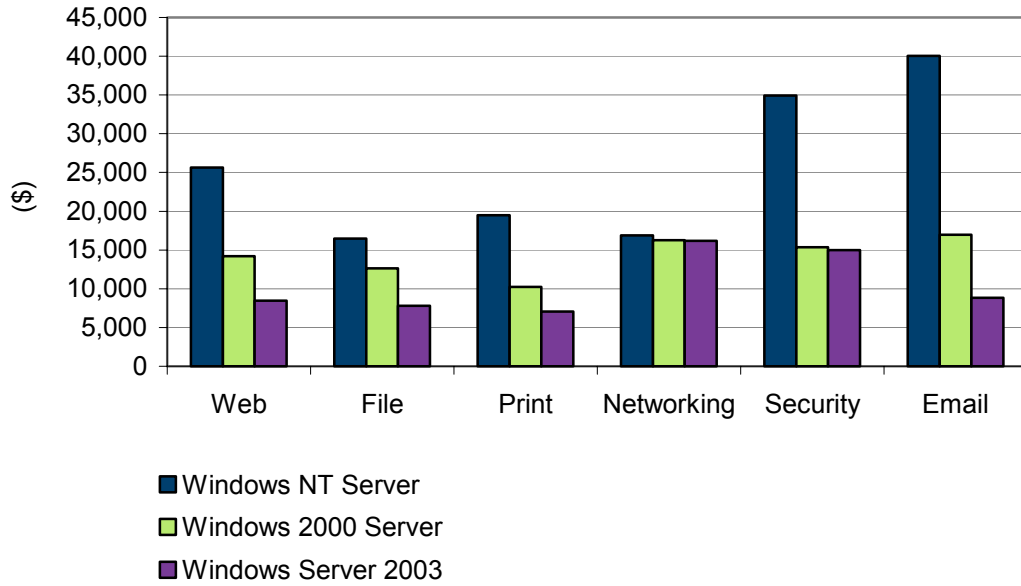
Consideration for this study was given to workloads, including:

1. Web (Internet, intranet, and extranet Web-serving)
2. File serving
3. Print serving
4. Networking workloads (DHCP, DNS, WINS, and directory services)
5. Security (firewall, VPN, intrusion detection)
6. Email

Figure 1 introduces the top-level results, comparing Windows Server 2003 against Windows 2000 Server and Windows NT Server. It is evident how dramatic an improvement the evolution to Windows Server 2003 has been for most of the workloads. Table 1 provides the data used to create Figure 1.

**FIGURE 1**

Three-Year Total Cost of Ownership per 100 Supported Users  
by Workload



Source: IDC, 2005

**TABLE 1**

Three-Year Total Cost of Ownership per 100 Supported Users by Workload (\$)

	Windows NT Server	Windows 2000 Server	Windows Server 2003
Web	25,630	14,202	8,446
File	16,491	12,649	7,803
Print	19,471	10,251	7,075
Networking	16,868	16,286	16,189
Security	34,940	15,378	14,987
Email	40,030	16,956	8,821

Source: IDC, 2005

Although each of these workloads will be discussed in the sections that follow, the following observations can be made:

- ☒ Windows Server 2003 generally offers a significantly better proposition than Windows NT Server when it comes to reducing TCO. The exception is in the networking workload, where costs were similar across all three products. We believe this workload's atypical profile is related to the fact that Windows NT Server already showed especially low costs for downtime and IT staff training, leaving staff costs as the main cost element. Yet, even the staff costs for Windows NT Server were low compared with other workloads supported on Windows NT Server.
- ☒ For the Web, file, print, security, and email workloads, the TCO comparison of Windows NT Server with Windows 2000 Server shows a reduction in TCO, ranging from 23% to 58%. Likewise, when contrasting Windows Server 2003 with Windows 2000 Server, particularly for the Web and email workloads, the decline in TCO is significant. Other workloads showed a decline, but not as dramatic as the drop from Windows NT Server to Windows 2000 Server.
- ☒ In terms of absolute dollar reduction, the largest savings resulted from a comparison of Windows NT Server with Windows Server 2003 for the email workload, where the Windows Server 2003 solution's three-year TCO suggests a savings of \$31,200 per 100 supported users, with the three-year TCO dropping from \$40,030 to \$8,821.

### ***What Do These Results Mean?***

During the development of its Windows 2000 product line and following through into Windows Server 2003, Microsoft invested millions of dollars into improving product quality. These efforts were broad in nature and spanned the range from raising code development standards, to reducing vulnerabilities of the operating system, to tightening up application installation procedures to prevent the installation of substandard drivers and DLLs, which might have the potential to destabilize the operating system itself.

Beyond that, Microsoft has taken a page from the large systems/datacenter world and has been preaching the benefits of using best practices when managing Windows servers. Perhaps most important, the company has created a comprehensive customer feedback cycle where a panel of key customers must decide that a product is ready to be shipped before Microsoft will allow the product to go into production.

The effort is clearly having a positive effect. IDC's numerous demand-side studies continue to show both perceived and real improvements to the operational quality of Microsoft's software products. One of the hard proof points comes from a study such as that presented here, where the operational costs on a per-100 supported user basis have dropped dramatically, not only from Windows NT Server to Windows 2000 Server, but also from the seemingly less comprehensive update that Windows Server 2003 brings through its replacement of Windows 2000 Server.

The results of this study show a continued progression of lower total cost of ownership; however, it is also important to recognize that not all of the savings can be attributed purely to better, more easily managed software and greater levels of uptime. The continued increase of compute power in the same size of machine frames also plays a role, as well as the improved support and management tools available from third-party ISVs. In addition, the ever-deepening experience the industry has with the Windows product portfolio is likely to help lower TCO values.

As would be expected, the major cost element continues to be staffing, with that cost area the highest single contributor to TCO in five out of the six workloads studied.

The bottom-line result is that for the survey sample used in this study, Microsoft's Windows Server 2003 environment provides a superior, three-year TCO advantage over Windows NT Server and in most cases, a decidedly better TCO benefit when compared with Windows 2000 Server. Taken as a comprehensive solution rather than a series of individual workloads, Windows Server 2003 provides benefits that current users of older Windows server technology should be considering.

## **SCOPE OF STUDY AND METHODOLOGY**

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### **Scope of Study**

This study evaluated the three-year total cost of ownership for customers utilizing Windows NT Server, Windows 2000 Server, and Windows Server 2003 software in support of six common workloads.

The comparison presented here illustrates a representative TCO that a typical end-user organization would experience when supporting a system configuration hosting one or more of the six workloads considered here, either in a dedicated or combined form.

To make the comparisons more balanced, IDC did not evaluate appliance servers, which are dedicated systems that run a combination of vendor-installed operating system software and applications. Examples of appliance servers include security servers, firewall servers, caching servers, and proxy servers from companies such as Dell, Sun/Cobalt, HP, IBM, and others.

The study included participants from 15 different industries in medium-sized and large organizations (with 90–7,500 employees) located in North America, who contributed a total of 156 total interviews across the three platforms and six workloads studied.

The large organization segment, defined as more than 500 desktop/laptop computers, was used for the analysis and is presented here because it provided a comprehensive view of Windows Server 2003, frequently in an environment that also included either Windows 2000 Server or Windows NT Server and sometimes both older products. IDC notes that large organizations and medium-sized organizations (50–500 desktops) tend to be very different. If results from these two groups are blended together, the picture is not as accurate as looking at one or the other.

For instance, medium-sized organization sites tend to have higher levels of downtime and spend less on training. By comparison, IT functionality tends to be better stratified in the larger companies. Large organizations typically have more dedicated people supporting servers, while in medium-sized organizations, you may find IT staffers performing multiple jobs, resulting in different staff/server counts.

The study participants had a broad selection of Windows platforms installed, with 83% having more than one Windows SOE installed. Of the full study group, a remarkable 17% had standardized their Windows infrastructure on Windows Server 2003 and, accordingly, have to support only one SOE platform.

Another 63% of the total had two different versions of Windows SOEs installed, while the balance, 20%, had a mix of all three operating systems.

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## **Methodology**

### ***User Demographics and System Configurations***

To obtain the TCO data used in this analysis, IDC conducted 156 interviews by telephone with IT executives and managers at more than 50 North American companies. Interviewees were selected at random from a list of large and medium-sized organizations provided by *Network World*, an IDG publication. Each interviewee was asked about a specific workload (Web, file, print, networking, security, email) and about a specific server (Windows NT Server, Windows 2000 Server, or Windows Server 2003). In most cases, interviewees provided information on multiple workloads or multiple servers. Occasionally, multiple interviewees were conducted within a single company.

### ***Total Cost of Ownership and Return on Investment***

It is important to clarify that IDC evaluated the TCO, as opposed to ROI. TCO measures cost outlays over a specific time period, and it is a primary method of weighing alternative purchase decisions. This measure is used especially to compare systems running basic workloads. Not surprisingly, these basic workloads also represent a highly price-competitive environment for software and systems vendors. ROI, on the other hand, measures the specific benefit that one expects to achieve by investing in a new technology, product, approach, etc.

When evaluating the TCO for any given system, it is important to weigh all the factors contributing to cost, including initial acquisition costs for hardware and software; the ongoing cost of IT staffing; outsourcing costs associated with deployment, support or maintenance; and the cost of system downtime.

The TCO accounts for costs related to staffing, programming/development, configuration, installation, optimization/tuning, and ongoing maintenance. Both IT staff and user productivity are included as costs. IT staff productivity accounts for the time IT staff is engaged in activities that are not contributing to the business, specifically training and responding to outages. User productivity can also be measured by studying how often the systems go offline and by measuring the impact of that downtime on end-user work.

IDC's TCO studies frequently find that the most significant expense area is the category of ongoing IT support costs, and this labor-intensive cost component lessens the overall impact of initial software and hardware acquisition costs as time goes by. An environment that has integrated infrastructure software and performance tools, more mature administration and operations tools, and readily available expertise would generally have an advantage over an operating environment that does not have these attributes because greater integration can have a direct positive impact on IT support costs.

To quantify operational costs, IDC measured the total cost of creating, deploying, and maintaining the computing infrastructure to support 1,500 users (in large organizations) or 250 users (in medium-sized organizations) of specific workloads and then projected the costs over a period of five years. IDC then took snapshots of the total costs at the three- and five-year marks, normalized to 100 supported users. The data presented in this document highlights the costs found over a three-year period, mainly because we believe that a shorter comparison is most accurate for a relatively new operating environment such as Windows Server 2003, which has been on the market for less than two years as of the time this IDC white paper was written.

Our analysis found that the five-year TCO for 100 supported users generated average yearly costs over the supported time frame to be similar in size to the three-year TCO figures. That is, presenting a three-year TCO is not in any way optimizing the cost figures to show a benefit not recognized by the comparable five-year TCO, at least from the software and support cost perspective that is covered in this study.

### ***Cost Factors***

IDC captured the total costs to deliver Web, file, print, networking, security, and email applications to a large organization environment of 1,500 users, growing to 1,700 users (about 3% growth per year), or a medium-sized organization environment of 250 users, growing to 350 users (9% annual growth), over three years. TCO cost components were as follows:

#### **Software/Operating System**

- ☒ **Purchase.** Costs of the OS itself, whether purchased standalone or as part of a system acquisition (Purchased software costs were amortized in the first year of ownership in this study. Because of the low overall contribution of software costs — generally less than 13% of the total three-year TCO — this effect had little impact on the comparison between a three-year and five-year TCO calculation.)
- ☒ **Installation.** Costs to initially deploy the OS and for annual upgrades
- ☒ **Training.** External costs for initial training of IT staff, specifically on the OS
- ☒ **Maintenance.** External and internal costs to support software

#### **Applications Software**

- ☒ Total costs for applications specific to each workload (where application software is in addition to the operating system itself)

### **Software Management**

- ☒ Management software costs allocated across all workloads based on the IT staffing breakdowns

### **Staffing**

- ☒ Annual loaded salary, which includes cost for overhead and bonuses (Staffing costs are adjusted on a yearly basis to account for annual salary increases.)

### **Outsourced Services**

- ☒ IT services to support and maintain servers

### **Annual IT Staff Training**

- ☒ Fees for outside training as well as the productivity loss of staff for time spent in training

### **Downtime**

- ☒ **User productivity.** Hours of downtime x 40% productivity factor x annual loaded salary (The productivity factor allows us to recognize that users are not 100% nonproductive during network outages.)
- ☒ **IT staff productivity.** Time staff spends identifying and fixing the causes of outages times the loaded salary cost

Hardware costs were not included in this study because of the direct comparison of Windows environments with one another — they are likely to be using similar hardware selections.

### ***Normalization and Presentation***

Ultimately, the value of any TCO analysis lies in its utility to the IT buyer. To be useful in the buying decision, the analyst must take information from very different environments and standardize it so that IT buyers can compare their own environments with the standard.

To ensure that the three server environments are compared fairly, IDC normalized all costs on a per-server basis for average number of users and workloads. The normalization of workloads is based on comparing the workload for a given version of the operating system against the average of all three Windows versions being evaluated.

For example, in Web-serving workloads, Windows NT environments averaged 189 users per server, whereas Windows 2000 averaged 138. Likewise, on a per-server basis, Windows NT servers were running 24.6 Web sites per server versus 42.6 Web sites per Windows 2000 server. Normalizing the environments to the two factors resulted in a ratio of 1.75 Windows NT servers producing a workload capacity equal to one Windows 2000 server.

Each workload was treated with unique normalization factors relevant to that workload. For instance, although Web sites per server is applicable for Web servers, for file servers, IDC used users per server as one of the key normalization criteria. For print server, we used a combination of users and printers per server. In the email workload, we primarily used users as the normalization factor.

Ultimately, the results of the analyst must be expressed in a format that can be easily understood and scaled up or down by the reader to a magnitude reflective of that reader's actual environment. IDC's TCO studies usually present the TCO data in terms of total cost of ownership per 100 supported users. This metric is further qualified against the time frame of the measurement. Typically, the duration of the study is normalized to either a three-year or a five-year period. In this study, we chose a three-year analysis due to the short time that Windows Server 2003 has been available. It is our belief that a three-year TCO value is more reflective of a newer solution, while a more mature offering can be presented in either three- or five-year TCO metrics.

Workloads included in this study include the following:

- ☒ **Web.** Web servers include Internet, intranet, and extranet Web servers serving static and dynamic Web pages including HTML content and using Java Server Page (JSP), Active Server Page (ASP), PERL, and Hypertext preprocessor (PHP).
- ☒ **File.** File servers are intended to provide file transfer protocol (FTP) services or address file request over the network file system (NFS) and Windows file sharing (CIFS) — excludes network attached storage servers.
- ☒ **Print.** Print servers provide print services to Windows, Linux, Unix, NetWare, and other client and server systems.
- ☒ **Networking.** Networking servers provide DHCP, DNS, WINS, directory, and caching services. Also included in this category are servers providing remote access/application sharing services and traditional servers used as routers, hubs, and switches — excludes routers, hubs, and switches.
- ☒ **Security.** Security servers include firewall, virtual private network (VPN), and intrusion detection servers; antivirus management servers; and authentication, access, and authorization servers, including certificate servers and digital rights management servers.
- ☒ **Email.** Email servers include both standalone email and integrated collaborative environments servers and provide hosting of user mailboxes and routing of email messages, calendaring and scheduling entries, and other collaborative content.

## SITUATION OVERVIEW

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### **Evolution of Windows Server Operating Environment**

Microsoft's success as a solution provider for the operating systems requirements among companies of all sizes has led to an SOE installed base that dominates the industry. This success has also created an installed base that as of the end of 2004 includes Windows NT Server (accounting for about 17% of the total installed base of Windows SOEs, or about 2.4 million licenses), Windows 2000 Server (accounting for about 47% of the total installed base of Windows SOEs, or about 6.5 million installed licenses), and Windows Server 2003 (which makes up the balance of the Windows installed base — 36%, or 5 million licenses installed).

Windows Server 2003 represents the second generation of the Windows 2000 technology and has brought benefits to customers, including:

- ☒ Improvements to features introduced in Windows 2000 Server
- ☒ New features that help lower adoption blockers for Windows NT 4.0 users
- ☒ Features that are intended to address one of Microsoft's three targeted deployment scenarios (application server, information worker, and infrastructure server)
- ☒ Security improvements that are designed to provide better out-of-box security, including an integrated firewall (The Internet Information Server is not installed by default, and when it is installed, the default is configured to a locked-down default configuration.)
- ☒ Greater leverage of software installation restrictions (Group policy now supports the prohibition of unsigned software installations aboard Windows Server 2003.)
- ☒ Improvements that boost the overall scalability of the Windows Server product family
- ☒ Cross-forest trust and management (This allows secure access to other forests and provides mechanisms for trusts to be established between forests.)
- ☒ Directory improvements (These include features such as domain rename, which allows an organization to rename a domain after configuration, and a tool for determining resultant set of policies applied to a client system authenticating into a Windows domain.)

IDC research shows that there are many benefits associated with moving to Windows Server 2003 and comparatively few drawbacks. The main drawbacks include some remaining application compatibility issues (most frequently related to older Windows NT applications that do not install themselves appropriately into a Windows Server 2003 environment) and the need for regression testing on the part of user organizations.

Even the challenge of implementing Active Directory has been reduced substantially through both new Windows NT Server 4.0 migration tools and more flexible deployment rules associated with Active Directory. Third-party tools also help with implementing Active Directory. End users will find themselves moving to an environment that is not only inherently more stable and scalable, but also far more easily managed.

The results presented here provide yet another compelling reason to consider a move to Windows Server 2003, especially for customers currently using Windows NT Server or Windows 2000 Server.

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## **Total Cost of Ownership by Workload**

The sections that follow introduce the specific analysis for each of the six workloads studied. Each section will present both a comparative cost analysis for each of the three Windows server operating systems and a view of cost items as a portion of total cost. In each workload discussion, a figure shows comparative cost values for the different operating systems evaluated. In addition, charts containing tabular data for each workload are included in the Appendix.

### ***Web Workload***

IDC's taxonomy defines Web server software as products that allow standalone systems or network nodes to access files stored on a local server or act as a relay station for information stored on other servers in the network. Web server software typically supports HTML- and/or XML-formatted documents and distributes them via HTTP. The Internet Information Services (IIS) 6.0 capability built into Windows Server 2003, the Windows Server 2003 Web Edition, and the Apache Web server are such products.

In many usages of the term "Web server," an application server software platform combines Web-related functions with other functions or works with underlying Web server software. In the context of this study, we are not considering this broader sense of this term. The Windows Server 2003 application server functionality, combining IIS, COM+, Microsoft Message Queuing, and other functionalities is an example of the broader use of the term and is what IDC calls an application server software platform.

In the narrow definition, Web server software primarily supports portal and HTTP serving and covers Internet, intranet, and extranet activity delivering both static and dynamic Web pages (that is, HTML pages, generally described as static Web pages, as well as Java Server Pages [JSPs], Active Server Pages, PERL, and PHP pages, generally described as dynamic).

### **Total Cost of Ownership Study Findings**

The Web server software workload is an area that clearly exhibits how the continuing improvements over time in Web-serving capabilities built into the Microsoft operating software (see Figure 2 and Table 2) have reduced TCO. This study projects that

Windows Server 2003 with IIS built in can provide considerably improved TCO versus Windows NT systems and even a potential 41% lower three-year TCO compared with a similar solution based on Windows 2000 Server.

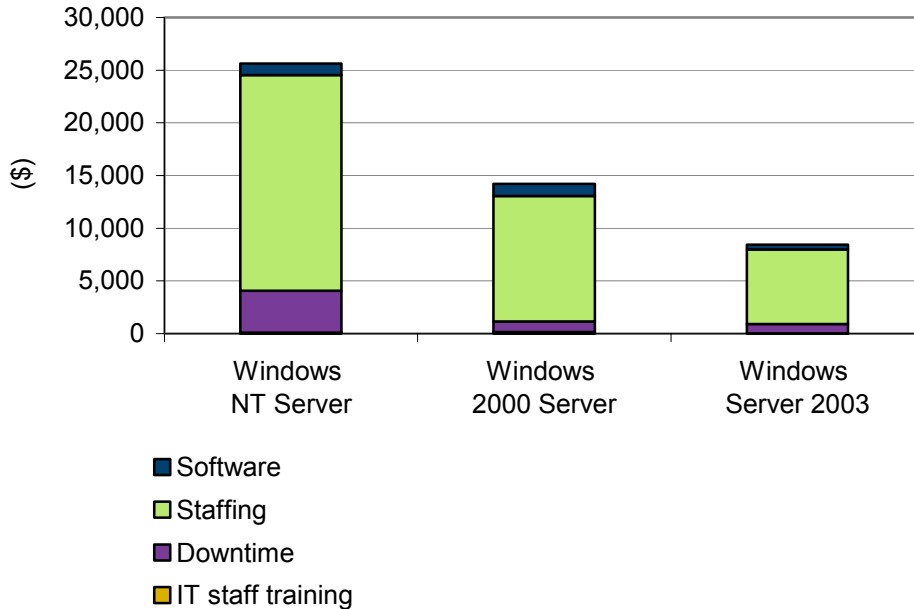
As with the other types of workloads covered in this IDC white paper, an assumption of 1,500 users was built into the analysis. This is a little misleading in terms of any kind of projection of absolute dollars spent, or to be spent, because Web server software does not primarily support "users" in the traditional sense of an "employee based at a desktop." However, every indication from non-TCO-related data collected as part of this research project indicates that the modeled finding of better TCO is directionally correct.

For example, to add a more relevant metric to the analysis, IDC based the number of servers required to support the environment based on the average number of Web sites per server. Using this metric, we see in our study that the Windows NT environments averaged 24.6 Web sites per two-processor server, compared with 42.6 Web sites per server for Windows 2000 and 57.0 Web sites per server for Windows 2003.

But there is a diminishing return in FTE staff required, even as it takes fewer and fewer physical servers to handle the Web serving workload; specifically, it takes 3.289 IT staff personnel to support the Windows 2000 environment Web server workload versus 3.269 to support the Windows Server 2003 workload, despite the fact that the actual number of servers required is cut. IDC would expect that users should be able to support more workload with fewer people as IT staffs gain more experience with the new features of IIS 6.0, but we cannot predict that based on the survey conducted to support this analysis.

**FIGURE 2**

Web Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

Other findings related to Web workload environments include:

- ☒ Microsoft Windows Server 2003 environments showed the three-year TCO for 100 supported users to be \$8,446, compared with \$25,640 recorded for Windows NT Server environments, over a three-year period, or a 67% decline in costs to support Windows Server 2003 versus Windows NT Server.
- ☒ Downtime costs associated with Windows Web workloads have dropped dramatically, falling from \$3,948 to \$871, for a decline of 78% from the costs measured for Windows NT Server versus those found on Windows Server 2003. This drop likely is influenced not only by improvements to the operating system and to IIS, but also to the higher likelihood that a modern Web server design will include multiple systems fronted by a load-balancing engine, creating more resiliency to the overall environment.
- ☒ In terms of the staffing costs related to the overall TCO, there is little change on a percentage basis. As indicated in Table 2, the staffing cost in a Windows NT Server environment accounted for 80% of the overall three-year TCO, while with Windows Server 2003, staffing costs are up slightly on a percentage basis, at 84% of the overall three-year TCO.

### **What's New About IIS in Windows Server 2003**

A lot of the improvement in Web server workload TCO from Windows 2000 to Windows Server 2003 can be tied to the enhancements to Internet Information Services 6.0, released as part of Windows Server 2003. The key to latest revision is what Microsoft calls a Request Processing Architecture, which serves to divide the Web-serving function of IIS from the administrative function. This provides (versus IIS 5):

- ☒ **Improved reliability and fewer server restarts.** It helps prevents Web sites and applications from affecting each other or the server as a whole.
- ☒ **Higher application availability.** It supports the autorestart of failed applications and the periodic restart of leaky/malfunctioning applications or applications with faulty code.
- ☒ **Scalability.** It supports scaling to ISP scenarios, where there may be hundreds to thousands of sites on a server and also supports Web gardens, where a set of equivalent worker processes on a server each receive a share of the requests that are normally served by a single worker process.

### **Web Workload Summary**

The Web workload presents an interesting challenge in that the staffing costs cannot be reduced to zero. Despite the challenges associated with comparing different types of Web-based workloads, if Web serving is a big part of an enterprise's Windows 2000 workload, it makes sense to move to Windows Server 2003 as soon as possible. For a Windows NT Server user with a large Web-serving requirement, every day the migration is delayed is extremely costly by all metrics.

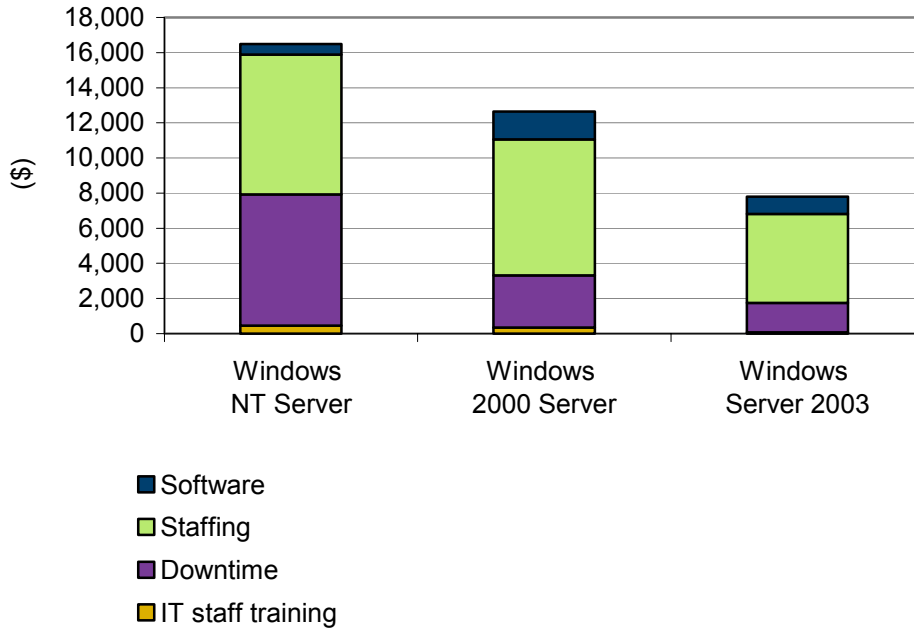
### ***File Workload***

The file workload (along with the print workload) is one of the most basic functions delivered by Windows and other widely used operating systems. In the context of this study, the file workload most commonly will be tasked with providing Common Internet File System (CIFS) services to Windows client machines as well as CIFS services to other Windows servers.

The file workload, of course, can include broader capabilities, including file services to Apple Macintosh client and server systems and Unix and Linux client and server systems and services to NetWare servers. Windows file servers may also be providing either network file services (NFS) or file transfer protocol (FTP) services to network- and Internet-attached clients and servers. Typically, the majority of the workload a Windows file server will be supporting would be focused on providing CIFS services to other Windows systems.

**FIGURE 3**

File Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

Looking at Figure 3 and Table 3, the overall three-year TCO for 100 supported users on Windows Server 2003 saves 53% of the cost for a similar configuration based on Windows NT Server, a decline from \$16,491 to \$7,803 over a three-year period. Although there were cost declines for each of the cost areas tracked, the single largest contributor to the decrease in cost is the dramatic reduction in downtime costs, which fell from \$7,469 to \$1,679 when comparing Windows NT Server with Windows Server 2003.

That decline dropped downtime costs as a portion of overall TCO for the file workload from 45% of the total cost to 22%, a dramatic reduction in operational costs.

We believe the reduction in downtime costs are related to the inherently greater reliability and stability of Windows Server 2003, bolstered by the benefits that Active Directory provides in terms of creating and allocating file shares to users by group policy.

### ***Print Workload***

The print workload includes managing print queues and connections to both direct-attached and network-attached printers. Print requests are handled by Windows servers for other client and server systems, including Windows clients and servers, Linux, Unix, NetWare, Apple Mac OS, and other systems.

Like the file workload with which print is frequently colocated, Windows Server 2003 brought about a significant cost reduction for print services provided to 100 supported users over a three-year period.

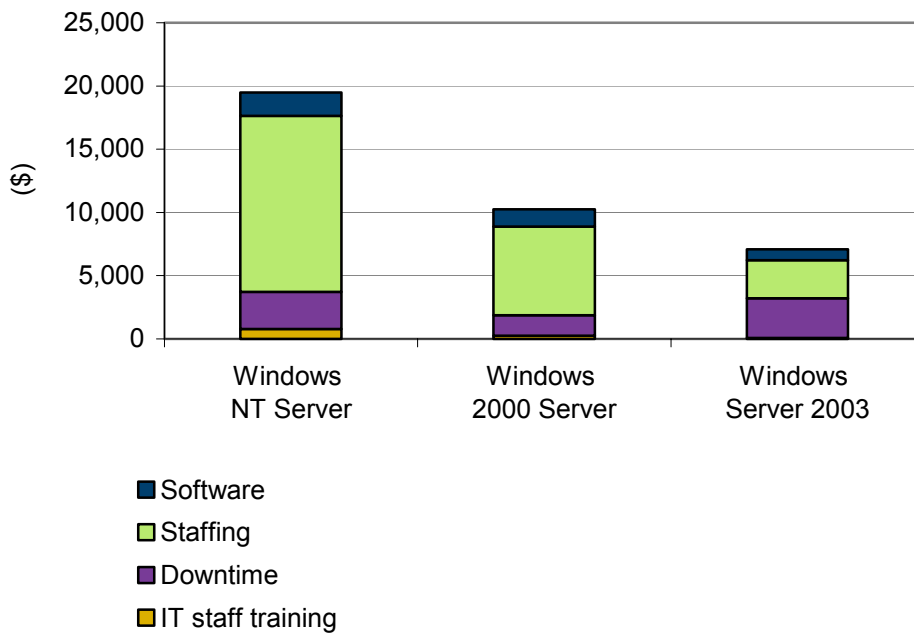
In this case, TCO reductions for the print workload fell from \$19,471 for Windows NT Server to less than half that value at \$7,075 on Windows Server 2003 (see Figure 4 and Table 4). Unlike the file workload, however, print services saw a reduction in staffing costs, but a growth in downtime dollar costs.

This trend, we believe, is related to two factors, including:

- ☒ The print workload on Windows 2000 Server was never as broadly implemented as on Windows Server 2003. As this research found, the number of clients per server is 175 on Windows NT Server, 205 on Windows 2000 Server, and 235 on Windows Server 2003. Because downtime costs are directly related to the number of attached users, this higher number of users per system means that downtime costs add up faster.
- ☒ Unlike other services, printers continue to include a distributed hardware architecture (e.g., printers are located throughout the network near users), and when a printer and/or the associated print server becomes nonfunctional, resolving the problem may still at times be labor intensive and require onsite attention by the IT staff.

**FIGURE 4**

Print Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

Ultimately, the dramatic decline in staffing costs associated with the print workload more than makes up for the small growth in downtime costs associated with this workload. Given the magnitude of the staffing cost declines — with Windows Server 2003 showing a staffing three-year TCO for 100 supported users at 22% of that recorded for Windows NT Server — the overall costs for the print workload show an attractive improvement aboard Windows Server 2003.

### ***Networking Workload***

The networking workload studied here includes servers providing basic networking functionality, including services such as DHCP, DNS, WINS, directory, and caching. Also included in this category are servers providing remote access/application sharing services and traditional general purpose servers used as routers, hubs, and switches. This workload as defined did not include dedicated routers, hubs, and switches.

The networking workload is the one standout in this study, as it shows little in terms of cost reductions, and for some of the cost subcategories shown in Figure 5 and Table 5, such as software costs, there were increases.

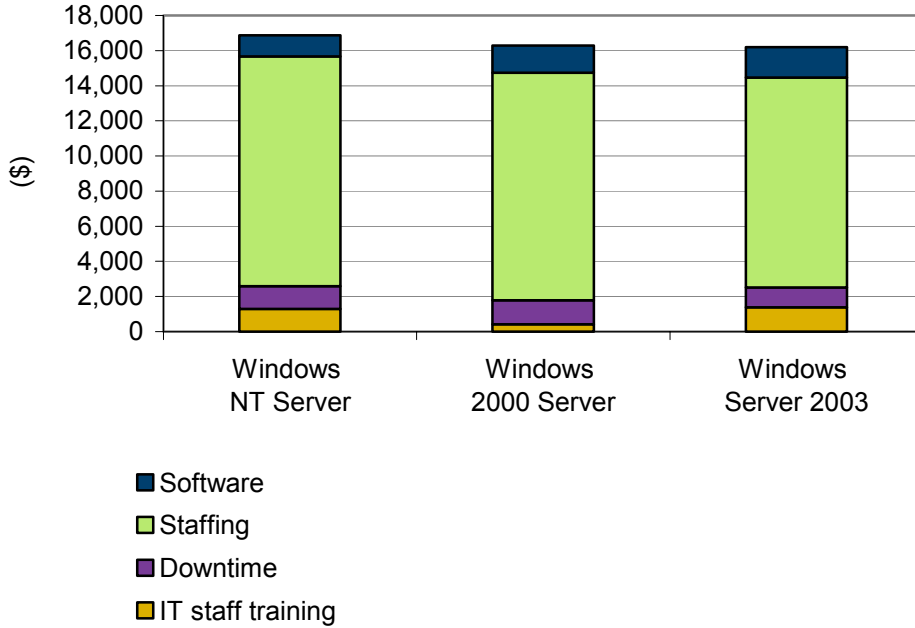
For this workload, the big cost item is the staffing element, which makes up a statistically dominant 74–79% of the total, depending on the operating system being compared. In the case of Windows Server 2003, software, downtime, and staff training each account for between 7% and 11% of the three-year TCO for 100 supported users.

To drive down the TCO related to this workload would require a reduction in the staffing costs. The relative size of the staffing costs for this workload across all three SOEs, ranging from 78% of the total for Windows NT Server to 74% of the total for Windows Server 2003, shows that this workload is staff intensive. This data suggests that the enhancements delivered through Windows 2000 Server and Windows Server 2003 have not dramatically lowered the costs associated with managing this workload.

Interestingly, the downtime costs remain a small minority of the TCO for the networking workload, with it accounting for a mere 7% of the three-year TCO for 100 supported users aboard Windows Server 2003. This suggests that the higher staffing costs are not related to difficulties of operating the networking services, but rather that the costs are simply a key element associated with keeping the network operational on a day-to-day basis.

**FIGURE 5**

Network Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

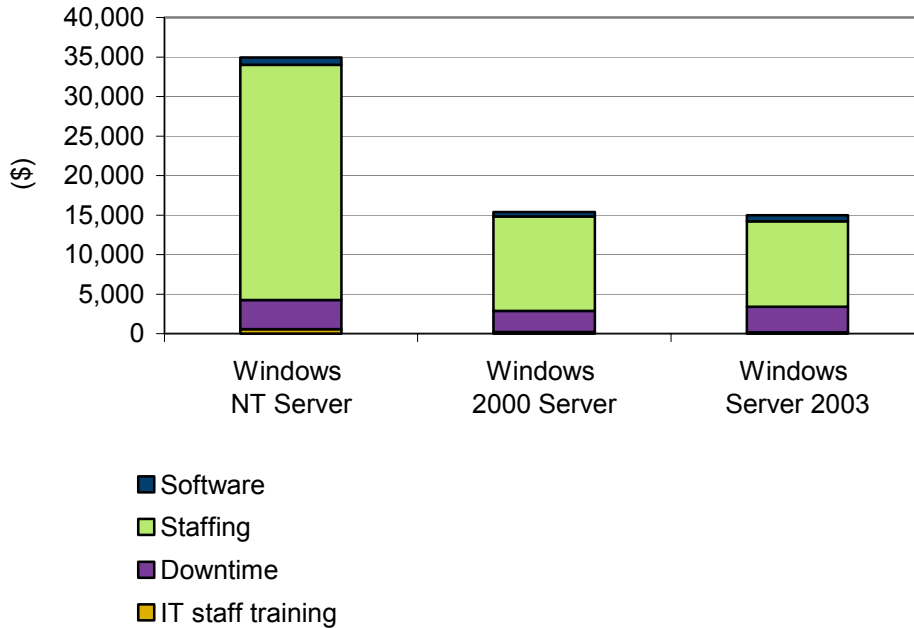
### ***Security Workload***

The security workload includes evaluation of servers running applications and services, including firewalls; virtual private network (VPN); intrusion detection servers; antivirus management servers; and authentication, access, and authorization servers, including certificate servers and digital rights management servers.

This workload, like the networking workload, has only the slightest advantage over Windows 2000 Server supporting the same workload area. Not surprisingly, on a comparative basis (looking at Figure 6 and Table 6), Windows NT Server had the highest TCO for 100 supported users over a three-year usage period. The three-year TCO for 100 supported users under Windows 2000 Server stands at \$15,378, compared with \$34,940 for Windows NT and \$14,987 for Windows Server 2003.

**FIGURE 6**

Security Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

In this TCO analysis, staffing was once again the largest single component contributing to the total cost of ownership. Windows NT Server staffing costs amounted to over 85% of the three-year TCO value, while Windows 2000 Server staffing costs were only 78% of the total. Windows Server 2003 landed below those values, registering 72% of total costs under the staffing category.

Downtime costs clearly favored the newer operating systems, although Windows 2000 Server offers lower costs in this category than even Windows Server 2003 could.

The bottom line on the Security Workload is that the TCO for Windows NT servers is considerably higher than those of both Windows 2000 and Windows 2003. The TCO comparison between Windows 2000 Server and Windows Server 2003 finds that the latter has a slight cost advantage, a mere \$391 over a three-year period per 100 supported users. Given this small differential, it is unlikely that a customer would choose Windows 2000 Server in lieu of Windows Server 2003, especially when considering the security benefits that Windows Server 2003 brings to the table, including:

- ☒ Network Access Quarantine Control, which delays normal remote access to a private network until the configuration of the remote access computer has been examined and validated by an administrator-provided script

- ☒ Internet Connection Firewall (ICF), which is a software firewall that provides protection to computers directly connected to the Internet or to computers located behind an Internet Connection Sharing (ICS) host computer that is running ICF
- ☒ Software Restriction Policies, which let system administrators use policy or execution enforcement to prevent executable programs from running on a computer
- ☒ Improved security settings such as program components not installed until specifically added; Internet Explorer's security setting set to high; and wizards that encourage secure, long passwords

Ironically, these security features may actually require additional administration and staff to administer them, which may have contributed to the higher downtime cost for Windows Server 2003 when compared with Windows 2000 Server. Windows Server 2003 has many services that are inherently disabled or that, in the case of stronger password management, require additional administration staff and time to correctly configure and maintain (i.e., enable services when required) the components. Thus, when a system goes down it takes a little longer to return it to full operation.

IDC does not believe that the slight TCO cost advantage of Windows Server 2003 has over Windows 2000 Server fully reflects the security improvements inherent in Windows Server 2003. Microsoft has paid considerable attention to (i.e., made many important enhancements to) security with Windows Server 2003. Users need to factor in the level of security when looking at both operating environments.

An additional consideration is when Windows Server 2003 is utilized with Microsoft's Internet Security and Acceleration 2004 firewall. The combination includes additional security features such as Network Access Quarantine Control, and built-in integration with Active Directory is available, creating another inherent benefit for a Windows Server 2003 solution.

Ultimately, a product decision for security workloads may be simplified in the future, given that Microsoft and appliance vendors are now offering the ISA server on a dedicated turn-key appliance. Such an appliance will be preconfigured, reducing some of the administrative costs.

### ***Email Workload***

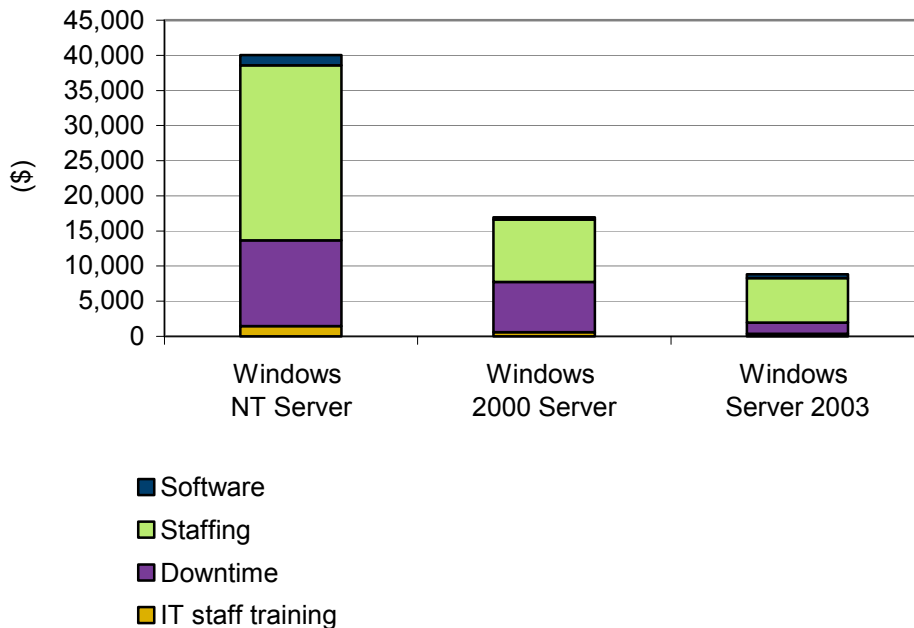
The Email workload offers the clearest-cut case for Windows Server 2003, delivering significant benefits in terms of lower three-year TCO for 100 supported users compared with older Windows environments (see Figure 7 and Table 7). Large firms running Microsoft Exchange Server on Windows Server 2003 will generally have significantly lower costs than customers with Windows NT Server or Windows 2000 environments.

For example, total costs over a three-year period for 100 supported users at large firms with Windows Server 2003 are \$8,821, which represents savings of 48% of cost for a Windows 2000 Server–based solution and a 78% reduction in TCO relative to

Windows NT. The comparison of this workload shows a greater potential savings than for any other workload evaluated here when comparing Windows Server 2003 and Windows NT Server costs.

**FIGURE 7**

Email Workload Three-Year Total Cost of Ownership per 100 Supported Users



Source: IDC, 2005

**What Is Behind This Huge Cost Differential?**

The single largest factor behind the huge cost differential is the significantly reduced IT staffing requirements to deploy, manage, and otherwise support email servers in Windows Server 2003 environments. Compared with the costs of IT staff in Windows NT Server environments, which cost \$40,030 over the cost of three years per 100 supported users, Windows 2000 Server environments cost \$8,881, while Windows Server 2003 environments require a mere one-quarter of the costs of Windows NT Server environments, at \$6,340 per 100 supported users.

The second-largest factor is the email server downtime that results from the improved reliability and availability of Windows Server 2003 and Exchange Server 2003. Email downtime aboard Windows NT Server translates into IT and email user productivity costs of \$12,195 through year 3 per 100 supported users. Although Windows 2000 does a much better job, with \$7,151 in downtime costs, Windows Server 2003 makes a quantum leap forward at reducing downtime costs to \$1,578 through year 3 per 100 supported users, or just 13% of Windows NT Server email downtime costs.

How has Windows Server 2003 and its email counterpart Exchange Server 2003 accomplished these tremendous cost reductions and other benefits for customers? Let's look at a number of key enhancements.

First, migration tools make setting up servers and migrating existing users and email from older servers easier and faster. Previously, tools for creating Active Directory domains and moving users to them required significant expertise that most customers lacked. New deployment tools and Active Directory Connector tools for Exchange Server 2003 enable IT to use existing email server topologies to ease migration off of Windows NT Server and Exchange Server 5.5.

Second, Windows Server 2003 customers are able to leverage support for up to eight node clusters that enable customers to keep email traffic flowing smoothly in the event of server or storage failure. Clustered servers can immediately pick up where a failed server left off. In addition, faster, more flexible backup and restore capabilities enable Windows Server 2003 customers to recover individual or groups of mailboxes more efficiently. Both of these Windows Server 2003 and Exchange Server 2003 enhancements can translate directly to less downtime for email users and fewer fire drills for IT staff.

Third, security enhancements in Windows Server 2003 and Exchange Server 2003 include antispam functionality such as IP relay restrictions and integrated intelligent message filters that can reduce the amount of spam and spam-carrying viruses that waste lots of IT and email user time.

Fourth, faster performance for Outlook 2003 users based on a new cached mode can make email users more productive and reduce the number of complaints requiring the attention of IT.

## FUTURE OUTLOOK

There are three general factors that continue to drive TCO improvements. Of those three, one factor benefits all SOEs supported on a given hardware platform, while the other two are specific to the software layers above the hardware:

- ☒ **Hardware continues to scale up.** As the x86 architecture continues to grow in scale-up and scale-out capabilities, including 64-bit versions such as Opteron and EM64T processors, the TCO should continue to fall for all operating systems deployed on x86 hardware platforms. IDC research has found that large system configurations supporting large numbers of users on a minimal number of hardware platforms and operating system instances offer competitive TCO characteristics. Scaling a Windows server from 250 supported clients today to 400 supported clients in 18 months, with little or no software modifications, means potentially lower TCO. The same could well be true for Itanium-based platforms, although that continues to not be a mainstream platform choice for Windows deployments.
- ☒ **Software performance, manageability, and reliability/security attributes continue to improve.** Although Microsoft has made excellent progress with Windows Server 2003, there is always more room for further improvement on all

platforms. While most cost areas show declines in this TCO analysis, staffing costs continue to represent a majority cost element when compared to the overall total — which is consistent with other TCO studies IDC has conducted in the past. Staffing costs, of course, are falling as well, but continue to be a standout value as a percentage of the TCO and should remain a focal point for Microsoft and third-party ISVs.

- ☒ **Staff support skills continue to improve.** The more time spent with a given operating system, or family of similar operating systems (such as Windows 2000 Server and Windows Server 2003 could be described), the better and more efficient the staff becomes in supporting this software. As a result, it can be expected that end-user organizations will continue to drive down both staffing and downtime costs associated with all operating environments in use.

## CHALLENGES/OPPORTUNITIES

The story presented in this IDC white paper is compelling, but not all IT investment decisions are made exclusively on the basis of price and cost alone. The following factors are issues that need to be considered when evaluating a Microsoft solution, particularly organizations looking at Windows as an alternative SOE to another platform that may be in use currently:

- ☒ **Migration costs as a component of ROI.** An incrementally better TCO value is an attractive proposition for Windows users. However, for users currently running other SOEs such as NetWare or Unix, the costs associated with a move to Windows can be significant, especially when there are applications that need to be migrated to the new operating system, or when new in-house IT staff skills need to be acquired or developed. As a result, the best choice for overall operational costs, for non-Windows shops, may or may not include a move to Windows platforms.
- ☒ **Complexity of a Windows to Windows domain migration.** Despite the improvements Microsoft has made to the domain migration wizards and tools used to move a Windows NT Server 4.0 domain to Windows Server 2003, such a move can be a hurdle for some users. This white paper shows a clear benefit of moving to Windows Server 2003 from an operational perspective, but does not consider the direct cost associated with the activities involved in making such a move.
- ☒ **Commitment to a long-term Microsoft solution.** To maximize operational benefits, companies will likely want to have a long-term and deep product-level commitment to a Microsoft solution. For customers who are currently committed to Microsoft solutions, this is a nonissue. For companies not heavily vested in Microsoft product today, such an approach may require additional justification.

## CONCLUSION

Microsoft's efforts to improve the product quality and scalability and lower downtime concerns are producing tangible results. When coupled with the continued rapid advances in the underlying hardware performance and scalability, these improvements create a desirable scenario for Microsoft customers. The falling TCO values shown in this IDC white paper quantify the type of benefits that are possible aboard Windows today.

The results of this study show a continued progression of lower total cost of ownership; however, it is also important to recognize that not all of the savings can be attributed purely to better, more easily managed software and greater levels of uptime. The continued increase of compute power in the same size of machine frames plays a role, as well as the improved support and management tools available from third-party ISVs. In addition, the ever-deepening experience the industry has with the Windows product portfolio is likely to play a role, too.

In most, although not in every single case, the major cost element continues to be the staffing. The one surprising exception to this is the print workload, where downtime costs slightly exceed the staffing costs, the only workload where downtime costs lead the chart. However, in other workloads where downtime takes a back seat to staffing costs, downtime still captures the number 2 cost factor when tabulating a three-year TCO value.

The bottom-line results is that for the survey sample used in this study, Microsoft's Windows Server 2003 environment provides a superior, three-year TCO advantage over Windows NT Server and in most cases, over Windows 2000 Server as well. Taken as a comprehensive solution rather than a series of individual workloads, Windows Server 2003 provides benefits that current users of older Windows server technology should be considering.

## APPENDIX

Tables accompanying workload-specific results are shown in this Appendix.

**TABLE 2**

Web Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	1,092	4	1,143	8	467	6
Staffing	20,484	80	11,898	84	7,071	84
Downtime	3,948	15	1,023	7	871	10
IT staff training	106	0	138	1	37	0
<b>Total</b>	<b>25,630</b>	<b>100</b>	<b>14,202</b>	<b>100</b>	<b>8,446</b>	<b>100</b>

Source: IDC, 2005

**TABLE 3**

File Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	601	4	1,592	13	985	13
Staffing	7,968	48	7,743	61	5,072	65
Downtime	7,469	45	2,963	23	1,679	22
IT staff training	453	3	351	3	67	1
<b>Total</b>	<b>16,491</b>	<b>100</b>	<b>12,649</b>	<b>100</b>	<b>7,803</b>	<b>100</b>

Source: IDC, 2005

**TABLE 4**

## Print Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	1,828	9	1,361	13	844	12
Staffing	13,930	72	7,012	68	3,016	43
Downtime	2,921	15	1,637	16	3,141	44
IT staff training	792	4	242	2	75	1
<b>Total</b>	<b>19,471</b>	<b>100</b>	<b>10,251</b>	<b>100</b>	<b>7,075</b>	<b>100</b>

Source: IDC, 2005

**TABLE 5**

## Network Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	1,207	7	1,548	10	1,718	11
Staffing	13,073	78	12,947	79	11,962	74
Downtime	1,294	8	1,363	8	1,118	7
IT staff training	1,293	8	428	3	1,391	9
<b>Total</b>	<b>16,868</b>	<b>100</b>	<b>16,286</b>	<b>100</b>	<b>16,189</b>	<b>100</b>

Source: IDC, 2005

**TABLE 6**

## Security Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	940	3	559	4	785	5
Staffing	29,732	85	11,936	78	10,819	72
Downtime	3,715	11	2,667	17	3,239	22
IT staff training	553	2	215	1	144	1
<b>Total</b>	<b>34,940</b>	<b>100</b>	<b>15,378</b>	<b>100</b>	<b>14,987</b>	<b>100</b>

Source: IDC, 2005

**TABLE 7**

## Email Workload Three-Year Total Cost of Ownership per 100 Supported Users

	Windows NT Server (\$)	Share (%)	Windows 2000 Server (\$)	Share (%)	Windows Server 2003 (\$)	Share (%)
Software	1,443	4	329	2	518	6
Staffing	24,933	62	8,881	52	6,340	72
Downtime	12,195	30	7,151	42	1,578	18
IT staff training	1,459	4	595	4	385	4
<b>Total</b>	<b>40,030</b>	<b>100</b>	<b>16,956</b>	<b>100</b>	<b>8,821</b>	<b>100</b>

Source: IDC, 2005

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