The Role of Linux in Reducing the Cost of Enterprise Computing

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IDC's recent study on Internet/intranet/extranet and collaborative workloads found significantly lower cost of ownership for Linux. To arrive at this important conclusion, we compared the total cost of ownership (TCO) of Linux on Intel architecture (IA) servers and RISC/Unix servers. Associated costs with Linux are not only dramatically lower for the hardware and software, as you might expect, but also comparable or lower for staffing — which you might not expect. With staffing typically the largest component of overall IT solution costs, this finding has important implications for IT planning. In summary, Linux provides a lower-cost platform for these workloads, especially in the first year of deployment. In the case of

IDC Opinion

Linux on the Intel platform has emerged as a viable alternative to RISC/Unix for enterprise computing. For enterprises with the right mix of requirements and skill, Linux offers tremendous potential to lower costs associated with supporting application workloads. Backing that statement are the results of a study conducted on the cost of computing, which showed Linux with a lower cost of ownership versus competitive RISC/Unix environments.

To realize the potential of Linux, enterprises must take the first step to pilot Linux and then build a vision for longer-term deployment that may include expanded application or infrastructure workloads supported by new systems or migrating some existing workloads over to new systems or redeployed systems running Linux.

The key to realizing the benefits of Linux in the enterprise begins with careful consideration of where to deploy Linux, understanding why to deploy in these roles, managing expectations, and monitoring results. Success requires good alignment between the requirements of the workload, the capabilities of the IT organization, and the attributes of Linux (cost, performance, reliability, manageability, applications availability, and vendor support). Considering these factors, two initial workloads to be evaluated Internet/intranet/extranet and collaborative computing — show promise for early and continued Linux adoption in many enterprises.

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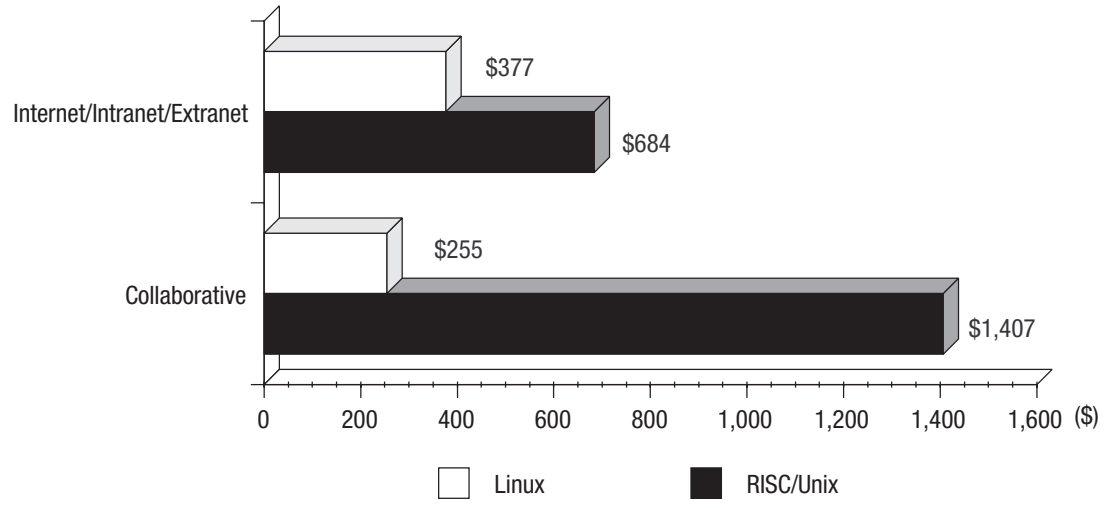
Internet/intranet/extranet workloads, Linux delivers a 1.8:1 cost advantage over RISC/Unix and a 5.5:1 cost advantage for collaborative workloads (see Figure 1).

Figure 1
Total Cost of Ownership Comparison Between Linux and RISC/Unix
(U.S. dollars per year, per user for 1,000 supported users)



Source: IDC, 2001

Enterprises with the right mix of workload requirements and in-house skills will realize a significant reduction in the cost of computing by deploying Linux.

Playing out this scenario, we believe that enterprises with the right mix of workload requirements and in-house skills will realize a significant reduction in the cost of computing by deploying Linux.

Beyond directly lowering cost for the workloads on Linux, visible deployment of Linux in an enterprise also provides the astute IT manager with a powerful tool for negotiating more favorable prices from other suppliers of hardware and server operating environments (SOEs). The broader leverage from Linux deployment is only one component of a collection of benefits Linux offers, which is a big part of the rationale behind lowering TCO.

Overview

Factors, such as TCO, can provide a compelling reason to choose between two competitive solutions offering similar operating environments and application solutions.

Many factors contribute to the selection of one operating system over another to fill a given business need. Some of these factors, such as availability of applications and IT staff expertise, experience, and comfort with a given operating environment, will help narrow the selection process quickly. Other factors, such as TCO, can provide a

compelling reason to choose between two competitive solutions offering similar operating environments and application solutions.

IDC recently conducted a study comparing the TCO for Linux on IA-32 systems with that of proprietary RISC/Unix systems from several leading vendors. Although different at the hardware level, these two SOEs present a significant number of similarities, including similar base operating environment capabilities, compatible user interfaces, command line interfaces, commonly used shells, similar scripting languages, similar utility and infrastructure support, and an increasingly compatible set of application programming interfaces.

This IDC study evaluates the TCO for each of two popular workloads in conjunction with the underlying operating system. It considers the cost of acquisition and ongoing support and maintenance for each workload independent of one another, as well as independent of other workloads that may be present on a given system.

Workloads Defined

The workloads studied include the Internet/intranet/extranet and collaborative categories. IDC research conducted earlier in 2001 identified these two workloads as early successes among Linux customers and likely short-term prospects for other potential users.

Internet/Intranet/Extranet Workloads

Internet/intranet/extranet workloads include internal and external firewall operations, Web serving and Web caching operations, business-to-business Web operations, and business-to-consumer Web operations.

The first workload considered is Internet/intranet/extranet, which includes internal and external firewall operations, Web serving and Web caching operations, business-to-business Web operations, and business-to-consumer Web operations.

Collaborative Workloads

Collaborative workloads include applications that enable groups of users to work together by sharing information and processes.

The second workload considered is collaborative, which includes applications that enable groups of users to work together by sharing information and processes. Collaborative workloads include integrated collaborative environments, which provide a framework for electronic collaboration (typically within an organization) based on shared directory and messaging platforms.

The core integrated functionality areas are email, group calendaring and scheduling, shared folders/databases, threaded discussions, and custom application development. Administration and customization are generally performed by centralized IT staff. Collaborative workloads also include messaging applications, such as standalone email. Additionally, this category encompasses instant messaging, unified messaging applications, and other team-oriented collaborative applications.

Linux has a strong TCO story for Internet/intranet/extranet workloads.

Linux has a strong TCO story for Internet/intranet/extranet workloads, and the survey results offer a highly compelling comparison between collaborative workloads and RISC/Unix systems.

IDC's TCO Model

TCO Process at a Glance

1. *Determine number of staff supporting system*
2. *Determine percentage of time spent supporting system*
3. *Calculate weekly staffing hours*
4. *Convert to yearly staffing hours*
5. *Convert to cost dollars, including overhead allowance*
6. *Normalize to per-user cost for 1,000 supported users*
7. *Determine hardware and software licensing costs; normalize to 1,000 supported users*
8. *Combine support cost and hardware/software/installation costs to determine TCO value*

The purchase price of hardware and software alone provides little indication of total life-cycle cost for an IT solution. IDC believes that TCO includes not only hardware and software costs but also all of the staffing costs associated with acquiring, maintaining, and removing an IT asset from the organization. For many workloads, staffing represents the majority of the ongoing TCO.

IDC's TCO model organizes the costs to acquire, maintain, and replace an asset into three stages: procurement, use, and disposition. A number of activities occur during each of these stages:

- **Procurement** includes making the lease or purchase decision, generating requisitions, and receiving the equipment.
- **Use** includes activities such as setup, training, and technical support.
- **Disposition**, at a minimum, includes removing the equipment (e.g., server or PC) from the work area and transferring data and applications to the replacement equipment.

Costs of external communications, media, power, and floor space are assumed to be very similar between the two configurations and, therefore, are factored out of these TCO calculations.

Both hard and soft dollar costs are associated with each of the specific activities in the asset's life cycle. Combined, these costs represent the total life-cycle cost of an IT asset. Because the number of users supported varies by operating environment, IDC's calculation process averages the number of users to 1,000. All data was normalized to 1,000 users by allocating additional costs for multiple systems or removing costs associated with excess capacity for support services and hardware/software acquisition in accordance with the number of users supported on a system supporting a given workload. The figures are stated in U.S. dollars per year, per user for 1,000 supported users. (See the methodology shown in the Appendix for more information.)

This concept of full life-cycle support cost (from acquisition planning through final disposal) is particularly relevant when measuring Linux TCO. Linux server costs are highly competitive due to the low acquisition cost of Intel architecture server hardware, along with an operating system that can be acquired without the licensing fees commonly associated with proprietary operating environments (particularly if Linux is acquired without the support services that would normally accompany an enterprise-level purchase). Furthermore, Linux is usually bundled with many of the system services and applications required for the workloads under consideration, which increases the appeal of a Linux solution.

The study considered both staffing cost (support, administration, maintenance, and user support) and server cost (hardware, software, and installation) for the two environments. To measure IT staffing cost, IDC created a baseline model that organizes the cost to own, maintain, and replace an asset into 13 life-cycle activities. The costs were tabulated and adjusted for staff members' multiple responsibilities and for system workload sharing to determine TCO cost on a per-year, per-user basis. The process included a step to normalize the acquisition and support costs of various system-size configurations to a per-1,000-user basis. The staffing costs were then combined with the server purchase price, amortized over a one-year period. Ultimately, this data was used to generate a per-user, per-year TCO based on 1,000 supported users.

Under this front-loaded approach, all server hardware, software, and installation costs were allocated to the first year's cost. Although this raises average first-year TCO levels, both platforms evaluated in this study were compared using the same methodology. IDC believes the life expectancies of RISC/Unix and IA-32/Linux hardware and SOE software are similar in nature, justifying this comparison.

This study does not take into consideration support contracts that may be in place to cover software or hardware.

This study also does not take into consideration support contracts that may be in place to cover software or hardware. This cost area was not evaluated for several reasons. First, annual expenditures on software or hardware support contracts can vary greatly depending upon the level of assistance a given organization may need for a specific platform. Second, this expense is a tangible cost item that most companies can easily identify without elaborate calculations. Finally, this expense is generally an incremental cost that adds to the annual TCO figure, but it won't have significant impact on ongoing support costs or on hardware acquisition, software acquisition, and installation costs.

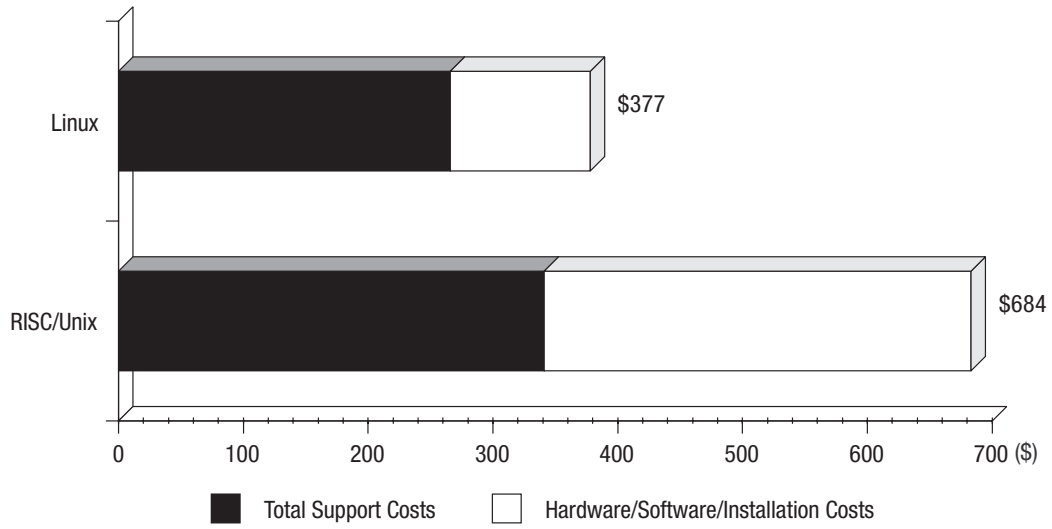
The study identified Linux as offering a distinct TCO advantage over RISC/Unix on both Internet/intranet/extranet and collaborative workloads. The ratio of Unix:Linux costs for Internet/intranet/extranet use was 1.8:1, with RISC/Unix TCO running 80% higher than that of Linux. In the collaborative workload study, Unix:Linux cost was 5.5:1, with RISC/Unix total annual per-user cost running at 5.5 times that of Linux.

Detailed Comparisons

Internet/Intranet/Extranet Workloads

Figure 2 presents the TCO comparisons between Linux and RISC/Unix workloads as determined by this study. First-year TCO comparisons show RISC/Unix cost at $684 per year, per user for 1,000 users. By comparison, Linux cost was found to be $377. These TCO values present RISC/Unix systems with a first-year TCO 80% higher than that of Linux.

Figure 2
Total Cost of Ownership for Linux and RISC/Unix Internet/Intranet/Extranet Workloads
(U.S. dollars per year, per user for 1,000 supported users)



Source: IDC, 2001

The study found that the mean number of servers running Internet/intranet/extranet workloads varied from 12.2 systems for RISC/Unix to 3.1 systems for Linux. In other words, the average RISC/Unix shop had far more systems running that supported this workload than did the average Linux shop. User-per-workload counts varied dramatically as well, with the mean number of users supported by a RISC/Unix Internet/intranet/extranet workload at 7,597, while the Linux users-per-workload mean for this same metric was only at 1,150.

It came as a surprise that the mean number of users supported on this workload aboard Linux systems was far lower than the mean number found on RISC/Unix servers supporting this workload. Why would this be the case? One possibility is that Linux is still a relatively new SOE used in larger organizations and, as such, has not expanded its reach to support the broad numbers of users that RISC/Unix does today.

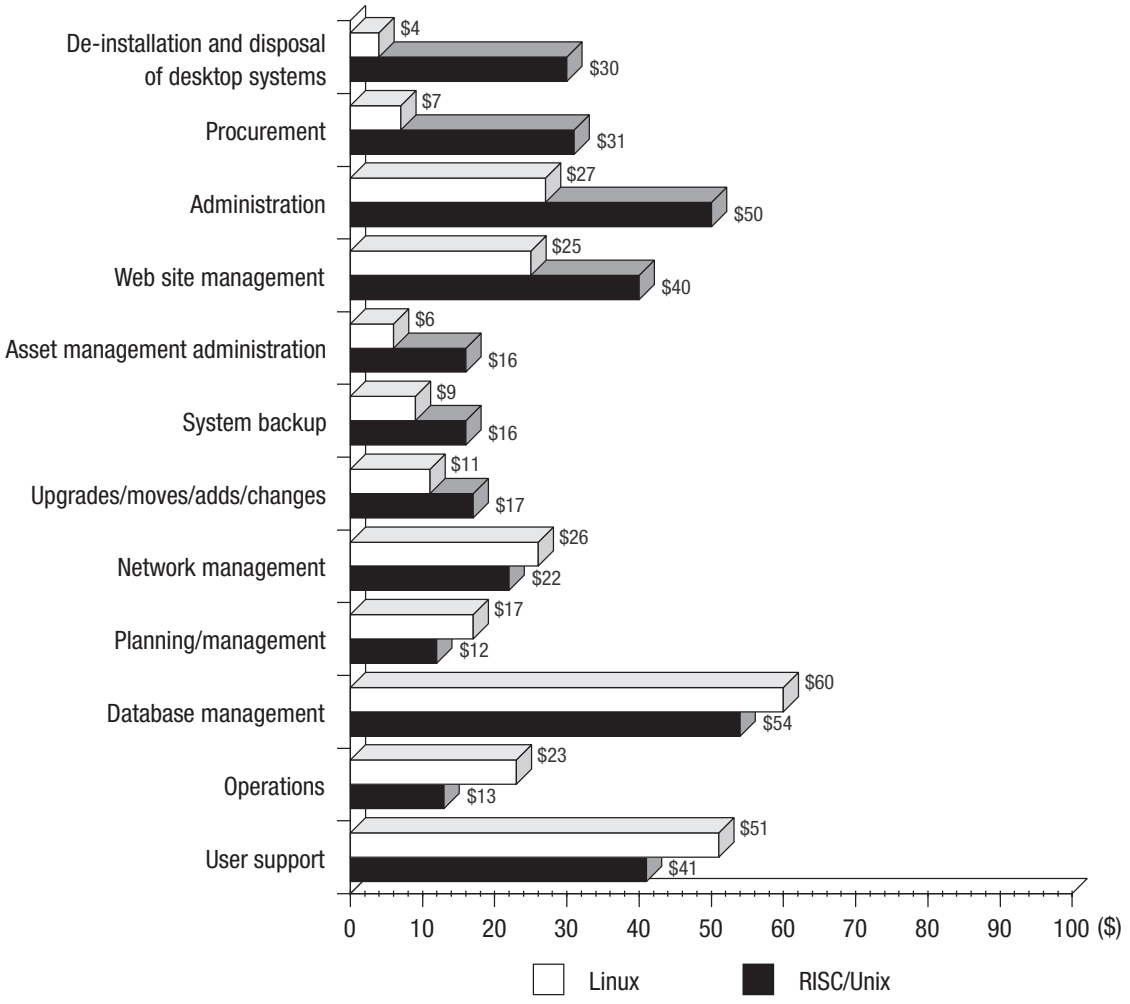
As the average number of Linux users supported (on this workload) increases, the findings of this study suggest Linux may also realize this economy of scale and extend its TCO advantage, as seen in other workload types.

This dramatic difference apparently is one metric that helps close the gap in TCO between RISC/Unix and Linux systems, probably due to the economies of scale the RISC/Unix configurations can provide. As the average number of Linux users supported (on this workload) increases, the findings of this study suggest Linux may also realize this economy of scale and extend its TCO advantage, as seen in other workload types. The recent advances in scalability of Linux, including the release of the 2.4 kernel and the availability of IA-64 hardware, will play a supporting role in growing Linux's scale-out story. Considering the close proximity of the release of Linux SOE products using the Linux 2.4 kernel with the study interviews, it is unlikely that most study participants were currently using versions of Linux built on the Linux 2.4 kernel.

Support Cost Comparisons

It is interesting to compare areas with significant differences between these two platforms. Figure 3 and Table 1 present summary TCO comparisons on a line-by-line basis for Internet/intranet/extranet workloads.

Figure 3
Detailed Total Cost of Ownership for Linux and RISC/Unix Internet/Intranet/Extranet Workloads
(U.S. dollars per year, per user for 1,000 supported users)



Source: IDC, 2001

Starting from the top of Figure 3, we note that disposal of a Linux server is considerably less expensive than that of RISC/Unix platforms. This is likely because the "disposal" process associated with an IA-32 server is to recycle it into another in-house use, possibly with a different operating system. For example, when an IA-32 server running NetWare, Unix, or Windows is retired, it may find another use within the

Table 1
Detailed Total Cost of Ownership for Linux and RISC/Unix Internet/Intranet/Extranet Workloads
(U.S. dollars per year, per user for 1,000 supported users)

Cost Area	Linux	RISC/Unix
Deinstallation and disposal of desktop systems	4	30
Procurement	7	31
Administration	27	50
Web-site management	25	40
Asset management administration	6	16
System backup	9	16
Upgrades/moves/adds/changes	11	17
Network management	26	22
Planning/management	17	12
Database management	60	54
Operations	23	13
User support	51	41
Total support costs	**266**	**341**
Per-user server hardware/software/ installation costs	111	343
Total one-year cost of ownership	**377**	**684**

Source: IDC, 2001

organization as a file/print or communications server running Linux rather than being discarded. By comparison, retirement of a proprietary RISC platform is likely a more complex and more permanent operation.

Likewise, procurement staff costs also strongly favor Linux. Presumably, the lower costs associated with procurement of Linux are related to the standard nature of IA-32 hardware. It is unlikely that acquiring a platform to support the Linux operating system is much more difficult than acquiring an IA-32 platform for use with Windows or NetWare. As a result, procurement may be as simple as "adding one more" to the open purchase order.

Administration costs on the Linux system are roughly half those of the RISC/Unix system. This is likely because of higher incidence of multiple workloads aboard RISC/Unix and its generally more complex configuration (including ERP, database, and other complex workloads), whereas a Linux server's workloads will often be more simplistic in nature (print and file, Web serving, Internet and network infrastructure workloads). Although this study sought to measure administration costs

associated with a singular workload, a more complex system configuration and more complicated workloads have the potential to raise the administration challenges even for unrelated workloads.

One of the highest individual cost areas for the Internet/intranet/extranet workload came from database management support. IDC believes this comes because most environments that are supporting Web operations are likely either using a Web content management system that is based on a database or have some interaction with a database for authentication purposes, dynamic content generation, or archive retrieval.

Otherwise, Linux and RISC/Unix TCO are remarkably consistent from a staffing-support consideration. The big differentiation for Linux and RISC/Unix TCO in an Internet/intranet/extranet workload is the acquisition cost for hardware and software.

Subsequent Years

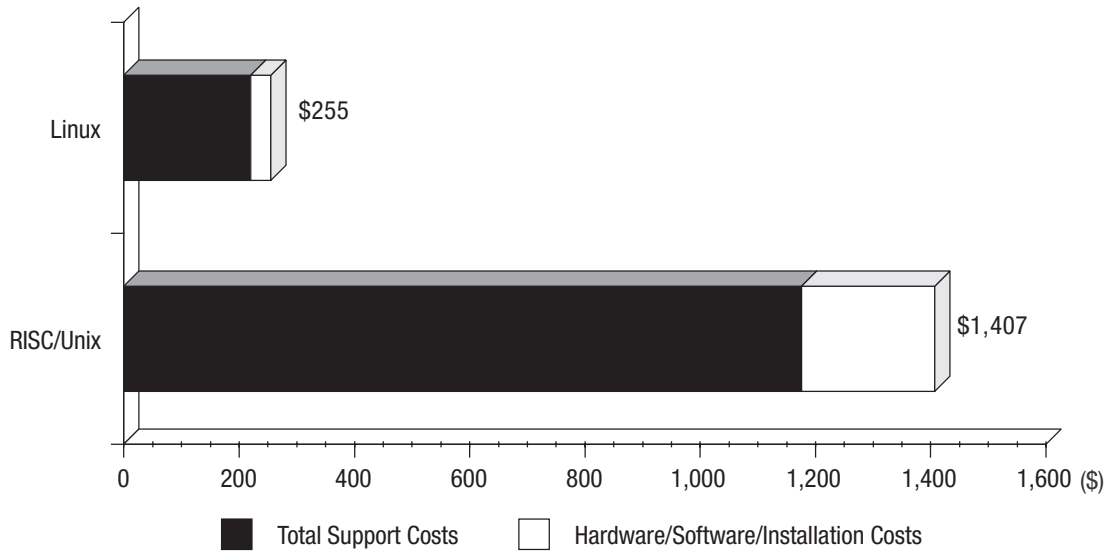
During the first year, total support costs, platform, software acquisition, and installation costs ran 80% higher for RISC/Unix than for Linux. Given the one-year hardware-software amortization considered under this study, in subsequent years, Linux versus Unix TCO falls back to a more competitive level of $266 versus $341 per year, per user, with the Unix environment TCO running 28% higher than that of Linux. Subsequent-year costs are shown in Figure 2 (discounting "hardware/software/installation costs"). IDC notes that few companies amortize the cost of hardware and software investments over a one-year period and that there will likely be some hardware or software support contracts with key vendors that will influence the actual results any end-user company will experience.

Collaborative Workloads

Figure 4 compares TCO values for collaborative workloads on Linux and RISC/Unix. At the roll-up level, costs for one-year TCO for Linux, based on a 1,000-user load, is $255 per year, per user. By comparison, RISC/Unix one-year TCO is $1,407 for a similar support level. These values show the first-year TCO level for RISC/Unix systems costing 5.5 times that of Linux.

The study found that the mean number of servers running collaborative workloads varied from 11 systems for RISC/Unix to 4.1 systems for Linux. In other words, the average RISC/Unix shop had far more systems running that supported this workload than did the average Linux shop. However, the user-per-workload ratio was nearly equal, with the mean number of users supported on RISC/Unix collaborative workloads at 4,802, while the Linux users-per-workload mean for this same workload was 4,558.

Figure 4
Total Cost of Ownership for Linux and RISC/Unix Collaborative Workloads
(U.S. dollars per year, per user for 1,000 supported users)



Source: IDC, 2001

Considering the relative difference in the mean number of systems, with study participants citing on average nearly three times the number of RISC/Unix systems versus Linux, but a virtually identical mean number of users supported on this workload, we found that Linux clearly has a significant advantage over RISC/Unix in this workload. Supporting an equal number of users with fewer systems contributes to the TCO advantages of Linux (see Figure 5 and Table 2).

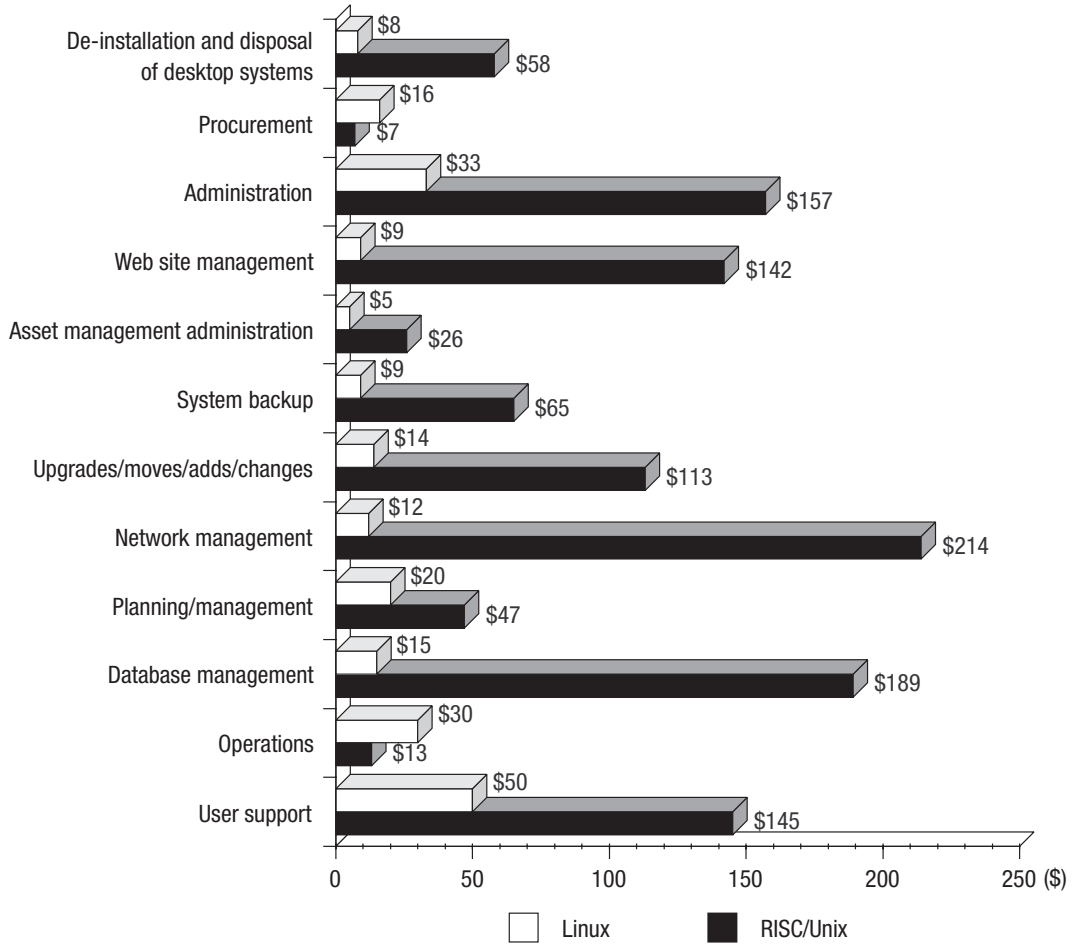
Staffing costs for Linux were anywhere from 50% down to 6% of the staffing cost of RISC/Unix systems supporting a comparable workload.

But there are other likely contributors to the TCO advantage realized by Linux systems with collaborative workloads. Across the spectrum of staffing costs, with the exception of procurement and operations, staffing costs for Linux were anywhere from 50% down to 6% of the staffing cost of RISC/Unix systems supporting a comparable workload.

It is informative to compare the dramatic TCO results illustrated by the collaborative workloads against the more competitive results found in the Internet/intranet/extranet workload study. IDC believes that the higher overall utilization of Linux systems supporting collaborative workloads in this study results in increased efficiency of supporting the Linux systems.

It also appears that as the number of users per workload approaches similar levels, Linux TCO expenses fall at a faster rate than the declines experienced by RISC/Unix configurations. This is partly due to the easy access to industry-standard IA hardware, the broad availability of Linux software, and the more simplified workloads typically supported by Linux.

Figure 5
Detailed Cost of Ownership for Linux and RISC/Unix Collaborative Workloads
(U.S. dollars per year, per user for 1,000 supported users)



Source: IDC, 2001

Database management costs were considerably higher for Unix than for Linux when supporting collaborative workloads. Comparing the collaborative workload results to the database management support costs on the Internet/intranet/extranet workload, we see a different scenario. In the Internet/intranet/extranet workload, the comparison was that of a lightly utilized system (Linux) that supported, on average, 1,150 users versus Unix with, on average, 7,597 supported users on that workload — yet database management support costs were close to equal. In the collaborative workload, Linux and Unix average numbers of supported users were effectively equal, at 4,558 and 4,802, respectively, while database management support costs differed by a factor of more than 12 in favor of Linux.

Table 2
Detailed Total Cost of Ownership for Linux and RISC/Unix Collaborative Workloads
(U.S. dollars per year, per user for 1,000 supported users)

Cost Area	Linux	RISC/Unix
Deinstallation and disposal of desktop systems	8	58
Procurement	16	7
Administration	33	157
Web-site management	9	142
Asset management administration	5	26
System backup	9	65
Upgrades/moves/adds/changes	14	113
Network management	12	214
Planning/management	20	47
Database management	15	189
Operations	30	13
User support	50	145
Total support costs	**220**	**1,176**
Per-user server hardware/software/ installation costs	35	231
Total one-year cost of ownership	**255**	**1,407**

Source: IDC, 2001

IDC believes there are two factors at work here. The first factor is that the more comprehensive use of Linux improved TCO on database management support costs (and on other cost areas).

The second factor is that Unix systems may be more likely to have Lotus Notes or Domino installed than Linux (which often is deployed with Sendmail), which creates a secondary DBMS environment to manage.

Other support areas, such as network management, show considerably higher support costs for Unix compared with Linux. Network management costs include those for system restore and network reconfiguration. IDC believes this difference relates to the relatively more complex workloads being supported by the Unix environments. Also, larger Unix systems are more likely to be part of a more complex infrastructure (such as a cluster, or they are providing critical services to other servers) that makes the network management aspects of the system more complex and, therefore, more costly.

Subsequent Years

During the first year, platform and software acquisition and installation costs on a per-1,000-user basis was $35/user for Linux versus $231/user for RISC/Unix. By comparison, total RISC/Unix support costs (excluding hardware, software acquisition, and installation costs) were 5.3 times those of Linux, or $220 per year, per user compared with $1,176 for RISC/Unix. Subsequent-year costs are shown in Figure 4 (discounting "hardware/software costs"). Because hardware/software/installation costs are a relatively small component of the first-year TCO, subsequent-year costs will be equal or slightly more favorable for Linux.

Conclusion

Linux on the Intel platform offers a lower-cost alternative to RISC/Unix for the workloads analyzed by this document. These study results do not suggest that Linux will offer lower TCO than RISC/Unix on every workload or at every level of system configuration. However, when used with key workloads, such as Internet/intranet/extranet or collaborative applications, Linux has the potential to offer significant cost savings for enterprise computing.

Not coincidentally, these workloads were found to be among the most popular workloads for Linux by other IDC studies. Other popular Linux workloads found by IDC included security and firewall, file and print services support, and software development on technical workstations.

The fact that these workloads offering TCO benefits aboard Linux are supported by open source application packages suggests that other workloads that are broadly supported by open source applications may also be attractive for enterprise users. As these other workloads increase in popularity for Linux, TCO benefits may emerge for those workloads as well.

Linux vendors are moving quickly to further improve Linux's position as a growing SOE. Initiatives are under way to further extend the reliability and scalability of Linux. Equally important, numerous technologies are being developed to further simplify the process of managing Linux server software through services such as Red Hat Network. IDC believes these services will ultimately have a positive impact on the TCO associated with Linux across most common workloads.

Enterprises with the right mix of workload requirements and in-house skills can realize a significant cost reduction by using Linux for workloads.

This study has shown that enterprises with the right mix of workload requirements and in-house skills can realize a significant cost reduction by using Linux for workloads today. This deployment can be accomplished in-house or with the help of professional services provided by consultants knowledgeable in Linux use and deployment.

Today, two workloads have been identified that offer TCO savings. In the future, it is likely that other workloads, such as firewall and security, will offer comparable benefits to companies that proactively manage their environments.

Appendix: Methodology Overview

A total of 142 telephone interviews were conducted during June, July, and September 2001 with IT managers at companies with a minimum of 100 employees who were familiar with the details of staffing, systems configuration, and application software for the servers at their site.

On average, the 142 companies included in our survey reported annual revenue of $2.4 billion. Industries represented in our survey included manufacturing (15%), business services (13%), telecommunications (11%), government (10%), education (6%), healthcare (5%), transportation (5%), retail/wholesale (5%), finance other than banking and insurance (4%), insurance (4%), utilities (2%), nonprofit (2%), and other services (17%). The study results presented in this document represent platform demographics as shown in Table 3.

Table 3
Number of Survey Participants for Studied Workloads

Workload Type	Linux	RISC/Unix
Internet/intranet/extranet	50	30
Collaborative computing	30	32
Total	80	62

Source: IDC, 2001

Survey Instrument

The survey instrument, which averaged 23 minutes in length, was administrated with the use of a computer-aided telephone interviewing (CATI) system. A pretest of 30 interviews was conducted to test the survey instrument for flow, length, and question clarity. We spoke with individuals who were knowledgeable about their organization's use and management of PCs and servers and could provide a top-line view of their organization's current PC and server systems installed, including staffing requirements and system workload for both clients and servers.

Quotas were established based on the server operating environment and primary server workload. To allow comparisons between segments, we instructed respondents to answer the survey questions based on just one server operating system and workload, even if more than one was present.

Staff Cost Calculations

To capture staffing cost information, we asked respondents to quantify the human resources dedicated to the various operational tasks involved in server environments. These operational tasks investigated include those listed in Table 4.

Table 4
Operational Tasks Studied for Total Cost of Operation Calculations

Task
Administration
Asset management administration
Database management
Deinstallation and disposal of desktop systems
Installation
Network management
Operations
Planning/management
Procurement
System backup
Upgrades/moves/adds/changes
User support
Web-site management

Source: IDC, 2001

The staff tasks listed in Table 4 consist of the day-to-day activities (including related skills-maintenance training time) for the following specific activities:

- **Administration.** This category includes system-level operations, including activities such as adding or deleting users and setting and resetting user passwords. IDC notes that sites that invest more time and resources to tracking and maintaining system information (location, configuration) as well as user information (password, location, department) can have lower administration costs.
- **Asset management administration.** The asset management administration category includes tracking IT equipment (configuration, location, business unit, financing terms), and maintaining records of adds, moves, and changes.
- **Database management.** For the purposes of IDC's TCO studies, IDC defines database management as creating, adjusting, and allocating database resources related to the workload being studied. IDC believes that standardization of server and database vendors can reduce costs in this area. These factors contribute to less downtime and faster recovery from downtime.

- **Deinstallation and disposal.** At the end of a system's life cycle, there are residual costs associated with decommissioning a system, including the removal of the equipment from the workspace, removing cables and attached peripherals, and erasing sensitive data and applications. Disposal also involves removing equipment from the organization. Previous IDC research indicates that sites that have asset management practices in place, including asset tracking, standardized upgrade practices and scheduled replacement cycles, typically have lower deinstallation and disposal costs. Additionally, companies that lease PCs and servers also experience lower disposal costs.
- **Installation.** Installation includes setup and configuration of desktop systems and servers. Previous IDC research indicates that sites that standardize on fewer vendors and fewer supported configurations experience lower installation costs. Supporting fewer configurations and models helps to minimize integration issues and avoids incompatibilities of things like components and drivers. For the purpose of this TCO study, installation costs were included with first-year hardware and software acquisition costs.
- **Network management.** Network management includes tasks such as configuring network hardware, fault detection, and server recovery. Lower costs can result in network management due to an accurate account of devices on the network, including configuration and allocation, that allows for more efficient servicing and equipment replacement.
- **Operations.** The operations category covers such tasks as job scheduling, print management, and report formatting and distribution. It also covers routine interaction with applications for provisioning purposes.
- **Planning and management.** Operations under IT planning and management includes determining platform upgrade paths, time of upgrades, and installation and take-out schedules. IDC's past research indicates that sites that spend more time up-front on planning benefit from lower costs.
- **Procurement.** The procurement process involves activities such as researching and making a lease/purchase decision, ensuring requested equipment complies with company standards, obtaining authorizations, generating requisitions, and receiving the equipment. IDC believes that organizations that standardize on fewer technology (server and software) vendors spend less time on purchasing; therefore, they have lower costs. This results in less contract negotiation and management. Also, sites that lease equipment may benefit from the procurement services provided by leasing companies.
- **System backup.** System backup includes daily operations related to server storage backup and recovery operations, including managing storage devices that are used in the backup process.

- **Upgrades/moves/adds/changes.** This category includes the staffing costs only to upgrade/move/add/change PCs and does not include the cost of upgrades to hardware or software.
- **User support.** This category includes responding to help desk calls and desktop-oriented troubleshooting in general. IDC believes that maintaining a limited number of installed vendors and supported configurations reduces complexity and cost in computing environments. Additionally, past research indicates that sites that manage assets and maintain an inventory with specific hardware, software, and network configuration data for each user can achieve lower user support costs than sites that do not track this information effectively. This type of data provides the IS support staff with system information, saves time, and reduces visits to the user's desktop in resolving problems, thus lowering overall support costs. In some cases, the problem can be resolved over the phone, avoiding time-consuming visits to the user's desk.
- **Web-site management.** IDC defines Web-site management as Web server management; content management; posting, updating, and deleting of Web content (but not the creation of content); hyperlink maintenance; managing/monitoring ISP relationship(s); security; reporting Web statistics; and customer support.

Tallying Staff Support Hours

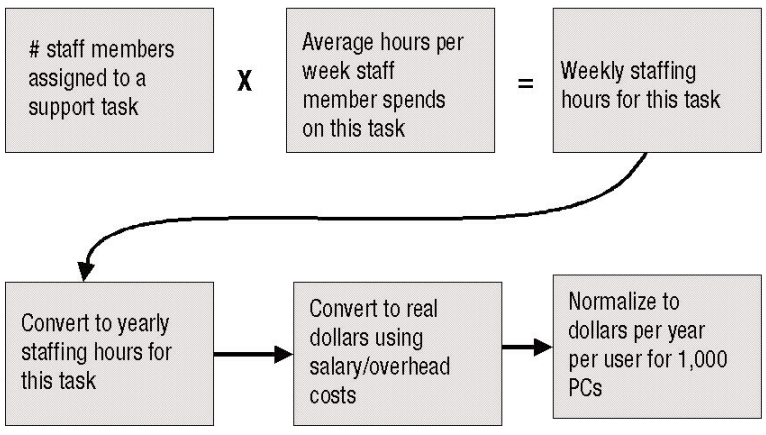
The study methodology followed the process identified in Figure 6, where study participants were first asked to quantify the number of staff members who participate in each of the support tasks listed in Table 4. Study participants were then asked to estimate the average number of hours per week that each staff member spends providing the type of support being measured.

Weekly staffing person-hours were then calculated by multiplying the number of staff members by the average number of support hours spent each week, which results in the weekly staffing hours required for covering this support area. These hourly totals were then projected out on a full-year basis.

Finally, the full-year hourly total was converted to dollar costs by multiplication with average salaries (including benefits) for their particular job description. Salaries and overheads are based on country-wide averages to eliminate any regional differences. The output from that calculation yielded average annual staffing costs.

Because the number of users supported varied by operating environment, IDC averaged the number of users to 1,000, and all data was normalized to 1,000 client PCs (users). This averaging was accomplished by allocating additional costs for multiple systems or removing costs associated with excess capacity for support services and hardware/software acquisition in accordance with the number of users supported on a system supporting a given workload. If a single system

Figure 6
Staffing Cost Calculation Process



Source: IDC, 2001

could support only 500 users, allowances for acquisition costs of two systems and double the number of related support hours were factored into this total. The figures are stated in U.S. dollars per year, per user for 1,000 supported users.

Hardware and Software Costs

Survey respondents were asked to provide the average purchase price of the typical Linux or RISC/Unix server, running either a collaborative computing or Internet/extranet workload, including the hardware and bundled software. (These costs include all software licensing fees and software support costs.) The system costs captured represent "as acquired" costs. They do not allow for upgrading or other hardware/software expansion costs because considering the result of such system reconfiguration would potentially affect both the number of users supported by a given system and staffing costs, thereby requiring a complete recalculation of the baseline TCO for that system. IDC then added installation costs to come up with total hardware acquisition, software acquisition, and installation costs.

These acquisition costs were considered in their entirety for the first-year TCO calculations. This allowed IDC to recognize those costs without attempting to conduct a detailed analysis of ongoing hardware or software upgrade and maintenance operations. IDC could then focus the subsequent-year component of this study specifically on staffing support costs.

Because the number of users supported varied by operating environment, IDC averaged the number of users to 1,000, and all data was normalized to 1,000-user environments. The figures are also stated in U.S. dollars per year, per user for 1,000 supported users.

Once full costs were calculated, IDC segmented the sample down based on an average workload rating on a per-system basis to allow for prorating of costs associated with supporting multiple workloads on a single system. Using workload data collected in IDC's *Server Workloads 2001* study, on average, 48% of Linux servers in use are single-workload systems, and 45% of RISC/Unix servers are used as single-workload systems. The remaining systems, 52% of Linux servers and 55% of Unix servers, are running multiple workloads. Additionally, the *Server Workloads 2001* study found that the average number of distinct workloads for Linux and RISC/Unix systems (that are known to be supporting multiple workloads) is 5 and 7, respectively.

This workload deployment was used to allocate costs as either 100% attributable to the studied workload or as a component workload of a more complex deployment. For single-workload systems, 100% of the hardware, software, and staffing costs were allocated to the TCO tally, while multiple workload systems were prorated to apply only the cost associated with a portion of the total workload that was consuming system resources. In the case of Linux servers, because the average multiple workload was five tasks, 20% (one-fifth) of the system costs were allocated to the TCO total. At the same time, RISC/Unix servers were typically running 7 distinct workloads, 14% (one-seventh) of the costs associated with multiple-workload systems were allocated to the TCO total.

Study Sample and Salary Conversions

Several lists were used as the sample for this study. The majority of the sample was pulled from a *NetworkWorld* subscriber list of IT managers. Red Hat Inc., sponsor of this study, provided two separate lists for Linux users; a list of under 200 "enterprise" customers and a list of 2,000 people who had visited **www.redhat.com** and downloaded a previously published IDC white paper on TCO. The *NetworkWorld* list also provided interview subjects for the Linux user segment. Geographic demographics for study participants were limited to North America.

Salary data used to calculate staffing costs came from a number of sources, including *Informationweek*'s 2001 National IT Salary Survey (approximately 20,000 IT professionals), *Computerworld's* 14th Annual Salary Survey, TechTarget.com 2001 Salary Survey (10,608 IT professionals — 3,306 HP Unix, 1,852 Solaris, 5,450 Windows), and *NetworkWorld*'s 2001 Salary Survey (1,700 IT professionals). Cost savings projected in this paper are IDC estimates based on survey data. Our survey did not attempt to summarize best practices. It did capture an average estimate of costs and savings for medium-sized and large organizations in the United States. The findings in this report are based on the results of the 142 phone interviews conducted with sites running Linux or RISC/Unix servers.

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