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WHITE PAPER

Adding Business Value with Cross-Platform Solutions: Linux Running on IBM Servers

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EXECUTIVE SUMMARY

IBM has successfully executed a Linux and open source strategy that allows it to leverage the capabilities of its IBM Power Systems (formerly called IBM System i and IBM System p) and IBM System z mainframes with modern software solutions. This strategy has enabled IBM to efficiently build and deliver cross-platform operations through advanced virtualization and consolidation of Linux workloads running on those systems. Customers have a choice in the way they deploy Linux workloads across their enterprises; some have elected to invest in scalable IT infrastructure platforms, in some cases at a higher initial cost than that of Linux solutions that are deployed on volume servers, which are servers that are priced less than $25,000.

This IDC White Paper is based on research data collected at a dozen customer sites in the United States, Canada, and Europe, all with mixed server platforms, to find the technical and business outcomes from deploying cross-platform Linux solutions on IBM servers. This white paper presents the key findings of a return on investment (ROI) analysis that was conducted by IDC this year at these customer sites. It documents customers' decisions regarding hardware, software, and IT staffing, including the ROI that was seen in the year following the initial deployment. Details about the study's findings, based on data analysis and on in-depth interviews with respondents to capture both capital expenditures (capex) and operational expenditures (opex), are described in the ROI Analysis section of the paper. The examination of the components within this ROI analysis shows the business value provided by the systems that were acquired, deployed, and operated by the customers.

The scalable systems involved in these cross-platform Linux deployments can operate as communicating hubs in a high-bandwidth corporate network of multiple systems, including all types of servers and server blades running Linux. By adopting this cross-platform approach for Linux workloads, IBM is demonstrating the business benefits of workload consolidation, "green IT," and high availability — which is integral to these scalable servers — by leveraging virtualization software to deploy new "virtual servers" as business requirements change, over time.

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ROI Study Conclusions

The key findings of this ROI study show that respondent sites using IBM Power Systems and IBM System z realized the following benefits, based on the ROI analysis and in-depth interviews with respondents:

- Consolidation and virtualization reduced annual IT infrastructure costs by $17,700 per 100 users per year.
- More efficient server platforms increased the companywide average utilization rate — capacity of a server utilized — from 36% to 79%, compared with the previous deployment.
- Cross-platform management improved application availability from 99.2% to 99.9% per year, leveraging high-availability, reliability, and management features that are built into the scalable server systems.
- The use of fewer server footprints, made possible by the use of scalable servers, resulted in overall power/cooling savings of 50%.

In summary, the total annual value of the benefits came close to $30,000 per 100 users per year, based on the ROI analysis, and generated a three-year ROI of nearly 500%. The payback period for the investment, including hardware, software, consulting services, training, and IT staff to manage the server platforms was 6.3 months, following initial purchase and consolidation of Linux and open source workloads on the scalable IBM Power and IBM System z servers.

Methodology

IDC utilized our standard ROI methodology for this project. This methodology is based on gathering data from current users of the technology as the foundation for the model. Based on these interviews, IDC performs a three-step process to calculate the ROI and payback period:

- Measure the benefits from reduced IT costs (staff, hardware, software, maintenance, and IT support), increased user productivity, and improved revenues over the term of the deployment.
- Ascertain the investment made in deploying the solution and the associated training and support costs.
- Project the costs and savings over a three-year period and calculate the ROI and payback for the deployed solution.

IDC uses a standard discounted cash flow methodology to calculate the net present value (NPV) of the benefits (savings and increased revenue) over three years. IDC notes that the ROI value equals the NPV divided by the initial investment. Payback period is the time from initial deployment to the time when benefits equal the initial investment.

IDC uses the following assumptions in its calculations:

- To quantify investment and savings for IT and user labor, IDC multiplies time values by burdened salary (salary + 28% for benefits and overhead).
- IDC uses a 12% discount rate in the ROI analysis to fully account for the average cost of capital and risk and to ensure a conservative analysis.
- Because the full benefits of the solution are not available during the deployment period, IDC prorates the benefits on a monthly basis and subtracts the appropriate amount for the deployment time from the first-year savings.

SITUATION OVERVIEW

The datacenter is populated by a wide variety of servers and operating systems, based on different types of processors and acquired at different times in an enterprise's history. Whether old or new, these servers offer up an important challenge to business managers: How can this range of hardware platforms be tied together more easily? Although there are several paths to accomplish this goal, one way to answer this challenge is to centralize a number of workloads onto fewer server footprints and then to link the servers together via a high-speed network, making it easier to move data and work from one system to another.

In the next wave of computing, this ability to pull together workloads — and to hide the complexity of the underlying IT infrastructure through a Web-like front end — will become more important than ever. Why? Because a myriad of electronic devices, including PCs, PDAs, and cell phones, will demand universal access to the "back room" of the datacenter, where mission-critical applications and corporate data reside. This access to the datacenter is enabled by high-speed communications networks and by advanced identification and authentication software — both of which were not widely available a decade ago. Further, the move to integrate cloud computing into the mix of resources leveraged will accentuate the importance of being able to scale up workloads as demand from end users and end customers peaks, based on business conditions, Internet activity, and time-of-day considerations.

IBM has focused on a Linux and open source strategy that allows it to leverage its Power Systems and IBM System z mainframes for more efficient cross-platform operations through their advanced virtualization capabilities and consolidation of Linux workloads running on those systems. Rather than representing islands of automation, these systems can operate as communicating hubs in a high-bandwidth corporate network, spanning the enterprise (including a central site and remote sites) and supporting end-to-end Web-enabled applications. By adopting this approach, IBM is demonstrating the business benefits of workload consolidation, high availability for these scalable servers and "green IT" by leveraging virtualization software to deploy new "virtual servers," as business requirements change, over time.

How We Got Here

During the economic downturn of 2001–2003, IT managers began to look to volume servers (servers priced less than $25,000) to support many of the new workloads being deployed, where possible. But the deployment of a large number of volume servers caused the installed base of server units to rise sharply while increasing management, maintenance, power/cooling, and IT staff costs. A more recent cycle of virtualization and consolidation is reducing operational costs through more efficient utilization and management of deployed servers and through more efficient use of datacenter floor space.

System administrators soon found themselves managing hundreds, if not thousands, of physical servers sold in the volume server space — and individual servers were often underutilized, operating at 10–20% of their capacity. Further, the need to forge a kind of unified management of all of these systems also caused a new kind of complexity in the datacenter — and enhancements in management of the hardware, the operating systems, and the workloads running on them also became necessary.

The trend toward virtualization of x86 servers in recent years, as part of a consolidation cycle that better leveraged server utilization, brought real, bottom-line benefits to customers. To the extent that midrange and high-end systems could host the same workloads, by consolidating workloads that had been running on a larger number of small servers, these scalable servers leveraged built-in virtualization and management capabilities that were designed to support highly available workloads with a high degree of controllability and virtualization-based isolation of important applications — all of which is important to enterprise workloads.

As it turns out, one way to support the same workloads across multiple server architectures was to adopt Linux and open source software as the foundation layers, because these software products were available to run on all server platforms — x86, EPIC (Itanium-based), RISC, and mainframes — and across price categories — volume, midrange enterprise, and high-end enterprise.

This approach to Linux and associated software stacks leveraged Linux skill sets across the full range of all servers in the companies studied; it also brought a wide variety of Linux applications and open source software to all platforms present at the customer sites. This allowed the IT staff to leverage capabilities in the RISC server and mainframe systems, with respect to advanced system management and reliability, availability, and serviceability (RAS) features of those scalable server platforms, which often resulted in improved high availability for applications running on those servers.

Business Considerations for Consolidation Using Linux Server Solutions

Linux servers play an important role in the worldwide server market, generating more than $5 billion annually — and $1.8 billion, or 13.4% of all worldwide server revenue, in 2Q08. While the majority of the unit volume of Linux server shipments tracked by IDC is based on x86 architecture, this paper focuses on the experiences of IBM server customers who decided to run Linux workloads on server platforms not based on x86 architectures.

The study covered by this paper focused on customers who had a mixed server environment, including IBM Power servers and System z servers, in addition to a large number of small servers, most of them x86 servers (which IDC defines as servers based on microprocessors made by Intel and AMD) running a mix of Windows and Linux.

While the mix of these servers varied from site to site, the point of the exercise is that Linux workloads can be deployed on a variety of server platforms, including cross-platform deployments supporting end-to-end applications that span the enterprise — and Web 2.0 workloads for the Internet. At these customer sites, some of the workloads — but not all of them — were moved to Power Systems servers or System z mainframes to manage Linux workloads that could be consolidated on scalable servers and where they would benefit from central-site management.

Customers' reasons for deploying Linux on Power Systems and IBM System z were varied, but several common themes emerged from the research into these IBM server deployments:

- New application types today are often built for the Linux platform first, particularly Web-centric workloads. Since Linux is a product of the Internet era, it makes sense that cutting-edge applications being developed today usually are compatible with Linux from day one. IBM's support for Linux aboard Power Systems and System z ensures that IBM customers can leverage these new applications aboard their existing hardware investments.

- Virtualization on RISC and mainframe platforms is more mature today than virtualization on x86 servers.

- The combination of virtualization and consolidation allowed these customers to deploy Linux workloads efficiently, on fewer server footprints than would otherwise be possible, especially on x86 servers.

- Unified management available on RISC and mainframe systems improved overall availability and manageability of the Linux computing environment at these sites. IBM has Linux implementations with end-to-end support for line-of-business (LOB) applications running on different types of servers, across multiple IT sites, across an enterprise.

Linux and open source technologies may be selected for technical reasons related to support for multiple workloads and applications; other choices for operating systems are also beneficial, but other operating systems may not be available on all server platforms in the datacenter. Therefore, the business benefits include the ability to run Linux workloads in a cross-platform deployment across server types.

IDC Workloads Data

IDC's Workloads data shows that more business processing workloads are moving to Linux platforms, over time, making the "mix" of workloads richer than it was in the early days of Linux server adoption, when Web-enabled workloads, network infrastructure workloads, and high-performance computing (HPC) workloads were more prominent, and enterprise application workloads were not as prevalent. Today, Linux servers are often deployed to support enterprise workloads, supporting important business processes — and important LOB applications, whether they are ISV packaged applications or custom applications, written specifically for their enterprise or industry. IDC Workloads research, updated each year, shows that 12% of all Linux server revenue is linked to business processing workloads (e.g., OLTP and LOB workloads such as ERP and CRM), and another 11% is linked to decision support workloads (e.g., database related, including data analysis and business intelligence), based on IDC's 2007 Workloads survey of more than 1,000 IT sites. Another 13% of Linux server revenue is linked to collaborative workloads (e.g., email and groupware). All of these workloads have high uptime requirements because any downtime would impact user productivity and therefore business productivity.

Overall, worldwide Linux server revenue growth tops 10% year over year, and Linux server revenue is at a $7 billion+ run rate worldwide, reflecting wide adoption and deeper investments in Linux server technology. Though this is less than the annual revenue for Windows servers or Unix servers, Linux servers accounted for 13% of worldwide factory server revenue in 2007 — and they accounted for 13.4% of worldwide factory revenue in 2Q08. The 2Q08 share represented 10% year-over-year growth, compared with 2Q07.

IT Considerations for Consolidation Using Linux Server Solutions

IT organizations that have deployed Linux across multiple server platforms have a degree of flexibility that is not available with most operating systems, which generally run on one or two server architectures.

This does not mean that Linux would be the preferred, or only, environment deployed for end-to-end solutions. Indeed, IDC demand-side studies have found that customer preference and onsite IT skill sets are the main determinants of whether a site will deploy Linux server solutions. However, where Linux is present, it can be an important element in workload consolidation projects, and in cross-platform management, via enterprise system management frameworks.

Consolidation and Opex

IDC demand-side research has shown an affinity between consolidation projects that attack inefficiencies in IT operations and savings in terms of IT staffing costs, power/cooling costs, and downtime costs. Sometimes, these consolidation plans are associated with blade-server deployments — but in other cases, consolidation on scalable servers results in improved uptime, improved management of workloads, and reduced IT staffing costs linked to maintenance procedures.

Consolidation of workloads can occur in many types of operating environments, including Unix, Microsoft Windows, and Linux. When Linux is chosen, it is possible to consolidate Linux workloads on mainframes, on RISC servers, or on x86 servers because Linux is supported on all of those types of hardware platforms. Today, with virtualization becoming widely adopted, it is possible to support multiple Linux workloads natively (directly on the hardware), on top of hypervisors, or running as Linux guests running under other types of operating systems. All of this brings IT flexibility and business agility into multiplatform sites running Linux server solutions.

IBM'S LINUX SERVER PLATFORMS

Linux on Power Systems and System z

Linux is an operating system that runs on all major hardware platforms. This is an important aspect of cross-platform support for IT organizations, accomplished in a variety of ways, ranging from running Linux natively on server processors, to just-in-time translation technologies, to running Linux on top of Java Virtual Machines (JVMs) that run on many types of operating systems and processors.

IBM has embraced Linux as a cross-platform technology that spans all of its server platforms — the Power Systems based on POWER processors (a type of RISC processor), IBM System z mainframes, and IBM System x x86 servers. Many applications have been written for Linux on x86 server platforms — and IBM has developed ways to bring this wealth of application software — both custom applications and packaged applications — to its Power Systems, using a technology called PowerVM Lx86 — which is now integrated into all POWER6-based Power Systems. IDC notes that Linux can also be run natively, directly on the POWER processors — and that Red Hat and Novell SUSE both run natively on Power Systems.

Equally important, IBM System z mainframes have dedicated Integrated Facility for Linux (IFL) processors that can be used to accelerate performance of Linux as it runs on those servers. By using IFLs, Linux performance can be optimized to the IPL hardware feature, and the total number of Linux instances can be increased, compared with running Linux without the feature installed.

Finally, Linux running on IBM's Power Systems and System z products complements the deployments of Linux on x86 servers, which account for high volumes of Linux x86 servers deployed worldwide. In those cases, Linux is a common denominator across the enterprise network so that end-to-end applications written for Linux can "touch" end-to-end applications, with important components of those workloads running on different platforms (e.g., x86 servers, Power servers, and System z mainframes). Several years ago, IBM encouraged software vendors to port their Linux x86 applications to the Power platform through the IBM "Chiphopper" program, which provided economic benefits and system loaners. In recent years, the PowerVM Lx86 feature has allowed any Linux x86 application to run, without change, on Power Systems. In addition, IBM offers customers IBM Migration Factory services, which aid in evaluating a customer's current workloads and developing a plan to move those applications and databases to Power Systems. This can aid customers in moving workloads from Unix servers or Linux servers to the POWER/Linux platform.

IBM Software on Linux

A full complement of system software and middleware is supported on IBM servers running Linux. IBM has defined Linux as a tier 1 or "top tier" platform for its middleware products, emphasizing the strategic value of Linux for IBM business systems. This covers Linux, whether it is running on IBM System z, on IBM Power Systems, or on IBM System x and other x86 systems. This means that IBM supports all of its key middleware on two enterprise Linux distributions — Red Hat Enterprise Linux (RHEL) and Novell SUSE Linux Enterprise Server (SLES) — across all three hardware architectures: mainframe, POWER, and x86.

Examples of the IBM middleware products supported on Linux include IBM Tivoli for system management, workload provisioning, and orchestration; IBM WebSphere for application serving and transaction processing in end-to-end applications; IBM Lotus/Domino for collaborative software and support of Web portals; and IBM DB2, the relational database that runs on a wide variety of servers, including IBM Power Systems servers and IBM System z mainframes. This means that customers who have adopted Linux and open source software and have invested in Linux skill sets can see the applicability of these skill sets across all IBM server models, providing business value through investment protection in people, software, and hardware.

IBM Services and Support for Linux

IBM provides services and support on a global level. Rapidly developing economies, such as those in the BRIC countries (Brazil, Russia, India, and China), are adopting Linux systems and open source rapidly, leveraging open source development models and local IT skill sets in open source and Linux. In addition, IBM has a dedicated lab, located in India, that supports customer proof of concepts, prototypes, and development of open source software. IBM has a total of more than 7,000 Linux consultants worldwide utilizing a Web portal to provide consistent, dependable, high-quality Linux implementations; IBM also works with IBM Linux Alliance Business Partners to extend its service offerings in specific geographies and market segments.

Services focus on consolidation, virtualization, high availability, and high-performance computing (via support for expandable Linux compute clusters). Linux deployments supported by IBM services include both HPC workloads for scientific/technical purposes and enterprise workloads based on ISV software (e.g., ERP, CRM software) or software that is tailored to support specific vertical-market segments (e.g., retail, financial services, telecommunications, government, and manufacturing).

Project Big Green Linux

IBM announced its Project Big Green Linux initiative in the fall of 2007. Focused on approaches to deploying IT infrastructure in more efficient ways, the Big Green initiative is funded by IBM at $1 billion per year to develop products and services that are energy efficient and reduce operational costs linked to power/cooling and the need to build IT infrastructure with environmental considerations to reduce energy use.

Virtualization technology that turns IT infrastructure into "pools" of computing and storage resources is a key element of making the datacenter more energy efficient. For example, consolidation of client/desktop applications onto servers or consolidation of workloads from many small servers onto fewer server "footprints" — often on more scalable servers, such as IBM System z mainframes or IBM Power Systems — contributes to these energy savings. IBM's initiative targets reductions of 40% to 80% in terms of energy usage and floor-space utilization within the datacenter.

KEY FINDINGS OF THE ROI STUDY

IDC's in-depth study of a dozen sites using IBM Power Systems and IBM System z mainframes in the United States, Canada, and Europe showed that customers had deployed Linux in a cross-platform strategy for the datacenter that, in their opinion, had produced tangible savings in the form of operational efficiencies. Based on respondent data, IDC provides tabulated data and figures generated from that data in the ROI Analysis section of this paper.

Table 1 shows a summary of the key findings in the ROI analysis in the aggregate, as expressed in terms of benefits per 100 users within the enterprise organization. IDC notes that all ROI analysis results in this summary table are shown in terms of their benefit per 100 users. Therefore, since the average investment per 100 users was $12,333, the investment for a 500-user organization was five times that much.

TABLE 1

Three-Year ROI Analysis per 100 Users

Category	Value
Average benefit (discounted)	$72,079
Average investment (discounted)	$12,333
Net present value	$59,746
Discount rate	12%
ROI	484%
Payback period	6.3 months

Source: IDC. 2008

Table 1 shows that the companies in the study saw an ROI of nearly 5 to 1 in a 6.3-month payback period for Linux deployments on IBM Power Systems and IBM System z platforms. The bottom line is that the business benefits of the solution, as seen in operational cost savings, paid for the initial investment in just over a half year after deployment.

Overall, both technical and business benefits were seen when Linux workloads were deployed with virtualization and consolidation on these IBM scalable servers: supporting more workloads on fewer server footprints. This combination of virtualization and consolidation enabled the companies to reduce their IT infrastructure spending on hardware, software, and networking and to reduce IT staffing costs, as detailed below.

Virtualization on the larger platforms reduced datacenter footprints by as much as 85%, not only reducing space costs but also reducing power and cooling costs significantly, producing a "green IT" aspect to the workload consolidation project. "What is the competitive advantage?" asked one respondent who had consolidated Linux workloads on IBM Power Systems servers. "Just the cost savings … The goal is to maximize what we can return to the business. And I'd say that we've done pretty well there."

Regarding the deployment of Linux on the IFL feature of the IBM System z mainframe, one respondent described the ability to move Linux applications to the mainframe through a recompile of the source code. "The System z helps us consolidate our workloads and scale up," this respondent said. "That's the engine that we've been talking about. We can run [Linux code] without change on IFL systems. The only thing that needs to happen is a recompile … that's valuable to us."

Further, management of workloads was eased by more integrated management environment that conferred granular controllability to Linux applications that could be isolated within hardware-defined and software-defined partitions. This management software moved workloads, as needed, to alternate resources as business requirements changed over time. This was another factor in improving the high availability of applications.

In addition to reducing costs, the managed environment on the scalable servers hosting consolidated Linux workloads resulted in reliable and consistent utilization, based on the data collected from these sites. IT resources were allocated to handle peak times for processing without outages, which was important given that the respondents were running 78% of their mission-critical and business-critical applications in the Linux environment running on the IBM Power Systems and IBM System z servers. The data also shows that the unplanned downtime (e.g., downtime that is caused by power outages, network outages, the failure of a hardware component, natural disasters, or man-made causes), as reported by respondents, was reduced by 88% and availability increased to 99.9%, compared with operations prior to the deployment on IBM Power Systems and IBM System z servers.

ROI Analysis

IDC documented the IT sites' experience in deploying Linux workloads, on a cross-platform basis, on the IBM Power Systems and IBM System z server systems. This analysis took into consideration the hardware and software costs, IT consulting costs, power and cooling costs, space requirements, and bandwidth requirements associated with the deployment. IT staffing costs associated with system setup and configuration, as well as with application migration, were fully accounted for in this analysis.

IDC then conducted a discounted cash-flow analysis of the benefits and investment over a period of three years to quantify the ROI for the Linux cross-platform solution deployed. Summary data is expressed in terms of results per 100 users, which enables readers to associate the results with their own environments regardless of organization size. Other points such as downtime and infrastructure costs are presented in per-user terms so readers can benchmark their own company with averages of the study.

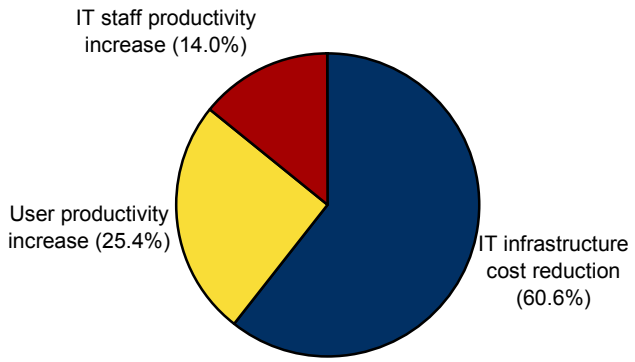
The next section examines the key attributes of Linux deployments that were identified in this ROI analysis, looking at them one by one and commenting on their business impact for enterprise customers. In this way, the changes in infrastructure deployments, via consolidation of workloads, can be seen as they affected both IT processes (e.g., maintenance, IT staff time) and business processes (e.g., user productivity and operational cost savings).

ROI Analysis in Detail

The major contributors to cost savings are summarized in Figure 1 under the heading Annual Benefits per 100 Users. IT infrastructure cost reductions were the leading contributor to overall cost savings, followed by improvements in user productivity (reduction in downtime) and IT staff productivity improvements. As discussed earlier in this paper, the average savings amounted to nearly $30,000 per 100 users, a significant savings in respondent companies that typically have tens of thousands of employees.

FIGURE 1

Annual Benefits per 100 Users



Total annual benefits per 100 users = $29,362

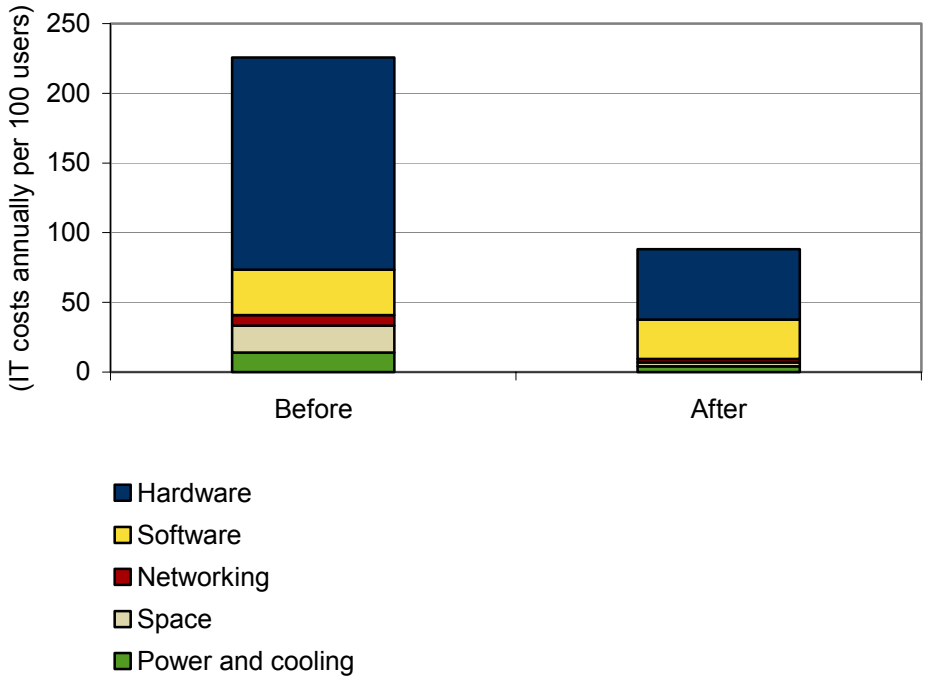
Source: IDC, 2008

Infrastructure Cost Reduction

As can be seen in Figure 2, significant cost savings were realized in terms of power/cooling and datacenter space utilization — and hardware, software, and networking costs were also reduced. The respondents' sites saw a dramatic change in total costs over a relatively short period of time, although the data is represented on a per-user basis.

FIGURE 2

IT Infrastructure Cost Reduction Annually per 100 Users ($)



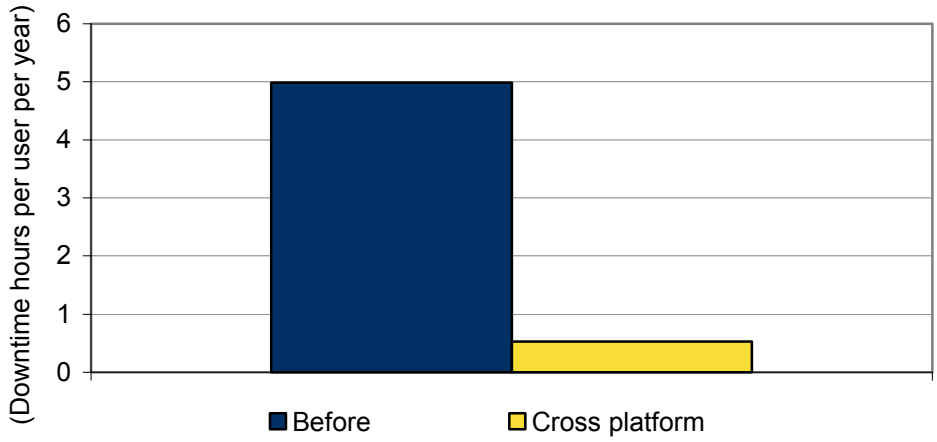
Source: IDC, 2008

Productivity Improvements

Productivity, in terms of both user productivity and IT productivity, increased as a result of the workload consolidation projects at the respondents' sites. Figure 3 shows that user productivity, as seen through the metric of downtime avoidance, improved by a factor of 10 — with average downtime per user at .53 hours per year, compared with nearly five hours per year per user before the consolidation work took place.

FIGURE 3

User Productivity



Source: IDC, 2008

Downtime — and the avoidance of downtime — is a major preoccupation of IT shops largely because any downtime in one system can have a ripple effect, touching many applications throughout an organization's business and reducing the ability of the business to respond to end users or end customers.

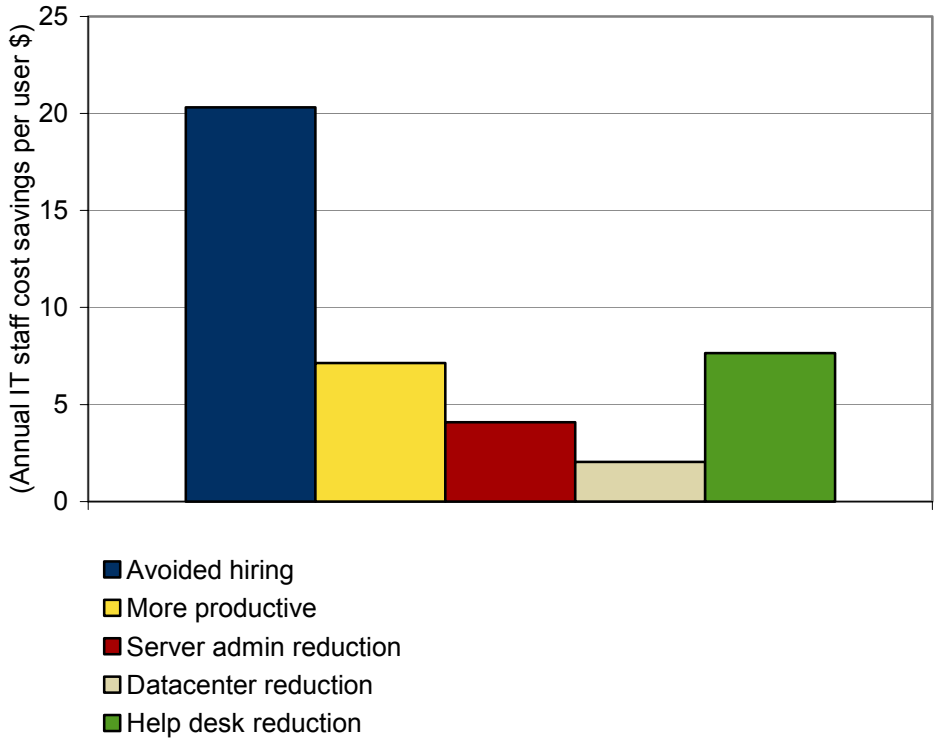
Highly available systems, based on hardware features that improve overall reliability and based on software that allows workloads to move to alternate computing resources, if needed, contribute to uptime improvements. Consolidation projects typically gather workloads that had been running on many servers and redeploy them on fewer servers that have more RAS features — another contributor to uptime (downtime avoidance).

Reduced IT Staffing Costs

IT productivity, expressed in terms of annual IT staff cost savings per user, shows that IT organizations were able to optimize IT staff resources — increase IT service levels and at the same time reduce staffing in the datacenters and at the help desk. They could avoid hiring new IT staffers, even as they increased the number of business applications provided. Figure 4 shows the top contributors to cost savings in the area of IT staffing.

FIGURE 4

IT Productivity



Source: IDC, 2008

Savings were seen in the key areas of system administration, datacenter operation, and IT help desk. Contributing to these savings were such factors as more efficient management of systems, fewer total server footprints under management following workload consolidation, and reduction in downtime, leading to fewer maintenance calls. In many cases, management of workloads running on fewer systems contributed to the reduction in IT staffing costs due to more centralized management.

CHALLENGES/OPPORTUNITIES

IBM has provided a number of paths to IT managers who want to run Linux: All of IBM's server products support this operating environment. This allows customers to run Linux applications across computing tiers on a variety of server form factors and system architectures. One challenge for IBM is that many potential customers are unaware of the Power Systems and System z offerings, often due to a broader familiarity with scale-out volume server deployments, many of them based on x86 server platforms.

IBM has worked to meet this challenge in several ways: First, it has found a way to bring Linux x86 server applications to the Power platforms, without change, through the just-in-time translation technology from Transitive Inc., a software company based in Manchester, United Kingdom. IDC notes that it is also possible to recompile Linux source code for use on the IBM System z mainframe's IFL feature.

In addition, IBM has encouraged ISVs to port their applications to the Power Systems platform and to System z, allowing a range of Web-enabled workloads to run on these IBM server systems. Another way to encourage cross-platform use of Linux would be to deploy prepackaged, preconfigured software appliances that could run on the full range of IBM server systems, without any changes at the application or hardware levels of the technology stack.

CONCLUSION

IDC has conducted a study of IBM customer sites deploying Linux workloads on scalable IBM Power Systems or IBM System z mainframes, collecting capital cost and operational cost data, to determine the ROI after acquiring these systems. Key to the study's results was the consolidation of Linux workloads that had been running on a large number of small servers at the same sites. Some of these workloads were rehosted on the Power and System z systems as part of a virtualization and consolidation process aimed at improving operational results.

As is often the case in consolidation work within datacenters, most of the sites reported operational efficiencies associated with running large amounts of workloads on fewer server footprints. Other efficiencies were associated with IT staff costs because IT skill sets could be leveraged across multiple server platforms, including x86 servers, RISC servers, and mainframe processor servers.

IDC believes that this ROI analysis clearly shows the major contributors to the cost savings seen by the respondents in their cross-platform Linux server deployments. Key to these cost savings were the workload consolidation projects that led to more efficient deployment of applications on the servers and the focus on reducing operational costs that ranged from IT staffing to power/cooling costs to downtime. Overall, this paper has described the key components of the ROI analysis, which examined the business value provided by the Linux servers at the customer sites.

The impact of the consolidation work done at customer sites, coupled with the ability to reduce costs within a relatively short time period of six months, addresses some of the top challenges in today's datacenters: how to improve utilization and management of the IT infrastructure and how to improve business continuity and business agility by making the datacenter more efficient.