IT Consolidation with Linux

Table of Contents

Overview

Companies today are struggling with how to grow their businesses, drive new revenue streams and compete while dealing with mergers, acquisitions, divestitures and economic downturn. They are seeking ways to optimize and revitalize their internal IT infrastructures, making them more simple with improved service levels and able to adapt quickly to changing business conditions. They must consciously balance the levels of risk and costs associated with any change and ensure the quickest possible return on investment. In addition, they must also deal with the IT challenge of "server sprawl" — the proliferation of individual, geographically distributed, single-purpose servers throughout the enterprise. In many distributed environments, applications are deployed on multiple systems, each of which requires an operating system, application software and support. In addition, each application typically requires a development and test server environment, further increasing cost and complexity. When each hardware unit is dedicated to a specific application, with its own gigabytes of storage, utilization levels are low. There may be servers that sit idle until application maintenance or testing is required, as well as terabytes of underused storage on hundreds of servers that other applications cannot access. As a result, what's needed is improved manageability, reduced costs, increased agility and proof that IT investments will have a favorable return.

If your company exhibits these symptoms, you may need a more adaptive enterprise and a flexible infrastructure. HP's vision of the adaptive infrastructure enables your enterprise to become more responsive to changing business conditions by creating a dynamic IT environment that fits with your evolving needs, reduces risk and complexity and delivers real-world return on your information technology investments. This allows you to drive business responsiveness and focus more on your business issues.

A consolidated environment that is easier to manage fits this bill nicely. IT consolidation has become a way to reach your goals, cut costs, increase agility, align your IT with your business goals and move toward an adaptive enterprise. IT consolidation is the reduction or centralization of disparate hardware and software to decrease operating costs and improve business continuity, security and manageability; it seeks to reduce the hidden costs of configuring, managing and supporting distributed environments. Companies dealing with a patchwork of hardware, software and operating systems—such as those that have recently undergone a merger or acquisition—are particularly good candidates for IT consolidation, as are organizations with geographically distributed systems and multiple data centers. However, any company with isolated or task-specific servers or multiple, distributed storage systems should consider consolidation's potential benefits.

Why consolidate with Linux?

Linux, with its flexibility, scalability and cost savings, can help overcome the obstacles and yield lasting infrastructure improvements. In building for the future, Linux is an architect's dream: It is reliable, adaptable, cost-effective and open. Standing alone or mixed with other operating systems, Linux architecture is a solid foundation for building an adaptive enterprise.

According to a recent survey[i], IDC expects worldwide server market revenue to remain relatively flat, with a slight decline of 0.3 percent in 2003 to about $49.2 billion. The five-year CAGR from 2002 through 2007 is expected to be 2.8 percent to $56.6 billion at the end of the forecast period. This represents a period of modest growth in factory revenue for the overall server market, although some market segments, such as the Linux, Windows® and blade server market segments, are expected to grow at faster rates. In particular, IDC forecasts that Linux will grow from its 2002 market share of 4.6 percent to 16.1 percent by the end of 2007 and its revenue increase from 2002's $2,295M to $9,128M by the end of 2007 -- a 31.8 percent CAGR.[ii]

Risks

Linux is just twelve years old, and with its relative newness comes some risks and the question "Is it enterprise ready?" — which translates into "Does it have the broad range of tools and capabilities to manage large environments available with UNIX® or Windows?" HP and other hardware and software vendors are working diligently to increase Linux features and tools to meet other operating systems current capabilities. The issue of support for Linux continues to be debated. Because Linux is maintained and enhanced by a community of loosely coupled developers, it may be difficult to receive guaranteed support. However, because the code is available to all, anyone can provide support, and self-support becomes a lower-cost and more viable option. There are other risks involving the management of intellectual property because you may need to establish new business processes. Some companies do provide support; HP provides Linux support at a level as high as its critical systems support.

Many companies are discovering that managing these risks responsibly is well worth the economic returns that Linux brings. Along with the risks, open source brings a wealth of new opportunities to increase productivity and refocus your energy to the core value you bring to your customers. Moreover, HP is reducing these risks by selling and supporting the major distributions.

Benefits

There are many significant benefits to using Linux. One benefit via the software licensing terms is the ability to access and modify the source code, which can be important if you need to make changes to fit your needs. The fact that Linux can be freely copied, subject to reasonable license terms, without payment of royalties is one of the main business advantages of Linux. Affordability is a key factor; even though the initial negligible price of Linux software puts it in a class by itself, initial price isn't the only consideration. Ongoing operational expenses, licensing fees and support costs can make the initial costs seem insignificant. The open source code makes Linux simple to administer, users have no licensing fees to pay and support can be inexpensive via the experts or the Linux community or by fixing it on your own through the open source code. Many argue that Linux is backed by expert support and can be easily customized to meet specific operating needs. In the enterprise, Linux has a proven track record when it comes to solid availability in areas such as web serving and edge services, at a much lower cost than other environments. Servers running Linux have been known to run for months, even years, without needing to reboot.

> "Every OS environment has a set of accelerators and inhibitors to its deployment. When the inhibitors overwhelm the accelerators, environments eventually fade and die. In the case of Linux, the accelerators currently in importance and value outstrip the inhibitors. We have not perceived any major obstacles to Linux."
>
> —George Weiss
>
> Gartner Symposium/ITxpo, October 2003

Control is another notable benefit. Because Linux resembles UNIX, the transition to Linux can be an easy and welcome one. And while security on any system depends on the IT staff's attentiveness and oversight, Linux excels as a secure operating system, due to the many additional security related software packages bundled with it. For maximum security and performance, you can custom-tailor services and even the operating system kernel itself with minimal effort.

With limited resources, companies are often reluctant to allocate money for large-scale projects that don't show clear and immediate ROI. Linux consolidation can provide additional savings that can help justify your consolidation project, and the savings on software licensing fees can bolster the business case for IT consolidation.

IT consolidation and Linux are both means to the same end: doing more with less —which makes Linux a good choice for consolidation efforts.

Established in June 2001, The Shared Hierarchical Academic Research Computing Network (SHARCNET) is Canada's largest high-performance computing (HPC) research facility.   SHARCNET is a consortium of five Southwestern Ontario universities and two community colleges that provides HPC resources, at no cost, to the Canadian and international research community. In January 2003, SHARCNET implemented a 64-bit two-way Intel® Itanium® 2 processor cluster with Linux, to meet the demands for cluster computing of a growing research community, which is producing increasingly larger, more complex sets of data. Based on positive results, and premised on a successful proposal to the Canada Foundation for Innovation, SHARCNET plans to implement an Itanium-based XC solution across its computing sites.

"We wanted to maintain a 64-bit architecture because research applications, especially those with large, complex data sets, are better suited to this for floating-point operations," said Gary Molenkamp, system administrator, SHARCNET. "The implementation of the Itanium 2-based servers provided an excellent migration path from the Alpha-based technology upon which SHARCNET's

original compute infrastructure was established. The Alpha is now an end-of-life technology, and, since many high-end UNIX servers (such as HP Superdome systems) are migrating to the Itanium processor, the implementation of this cluster allows researchers to develop and test code on this platform now, instead of two years from now. For SHARCNET, the Itanium 2-based HP solution was one of forwarding thinking."

Linux Consolidation Methods

IT consolidation takes many different forms, depending on the existing infrastructure and business objectives. Because of its flexibility, you can apply Linux to any of several different types of consolidation:

- `Collocation`. Gathering widely distributed systems into fewer locations is often the quickest way to realize the financial benefits of consolidation. Management and operation costs decrease while security, usage and availability increase.
- `Hardware, application and data integration.` Server integration reduces the number of systems when more powerful servers of the same architecture host a single application or multiple instances of a single application. Centralizing storage and reducing the number of servers enables you to lower operating costs while improving performance and maximizing the availability of applications and data. Switching from numerous applications accessing multiple databases to Linux solutions running on fewer servers can help you standardize systems and applications. Combining different workloads on one server can reduce your total cost of operation (TCO) and combining data of different formats onto Linux can reduce hardware needs.
- `IT utility`. Self-configuring components and the dynamic allocation of resources can dramatically boost server and storage utilization for maximum cost-effectiveness.

Additionally, HP offers unique consolidation options that combine some of the above consolidation methods. HP can help you build an infrastructure for an adaptive enterprise by simplifying, streamlining and optimizing IT environments, making them more agile and able to adapt dynamically. The result is a more powerful, flexible platform that provides continuous and secure operations and lowers the cost of managing change.

HP Utility Data Center

The HP Utility Data Center (UDC) is a highly integrated and consolidated environment that you can efficiently manage to furnish IT services on demand. Data center virtualization via HP's UDC offers a higher-level abstraction of resources in which groups of servers, storage and network elements can be provisioned or reallocated on the fly to meet the needs of a new IT service or handle dynamically changing workloads and reduce operational costs. The HP UDC is unique in offering a master software environment, known as Utility Controller Software, which can manage all of the virtualized environments — server, storage and networking — in a coherent and integrated manner. The HP UDC with Utility Controller Software creates and runs virtual IT environments as a highly automated service. Simplified delivery of that service optimizes asset utilization and reduces staffing loads.

Once wired, your infrastructure can be reconfigured flexibly and dynamically with minimum effort to respond quickly to windows of market opportunity. Total cost of ownership is reduced dramatically through process automation, standardization, simplification and improved resource utilization. And overall QoS improvements are realized through rapid, automated resource provisioning. The HP UDC's simple design allows you to wire your infrastructure just once. Any reallocation of resources

can now be done with drag-and-drop simplicity. As a result, this new programmable data center approach lets you manage more IT resources with less IT staff. The HP UDC with Utility Controller Software reduces costs and improves IT flexibility through:

- Virtualized network resources, permitting drag-and-drop "rewiring" of servers and related assets to create entire virtual IT environments.
- Virtualized storage resources, for secure, effective storage partitioning.
- Advanced data center management software, allowing resources to be automatically reassigned in response to changing business and IT requirements.

Running Linux on HP Integrity Superdome

As early as 2002, HP demonstrated its Intel Itanium 2-based HP Superdome server running multiple operating environments -- HP-UX, Windows and Linux – concurrently within a single system in three separate partitions. This highlights HP's ability to deliver multi-OS functionality on the industry-standard Intel Itanium architecture to meet the diverse customer workload requirements typical of today's enterprise computing environments. As businesses look to improve operational efficiencies and reduce costs, consolidating applications and workloads on their enterprise servers represents an effective means for increasing the return on their technology investments. By allowing multiple applications and operating systems to run in a partitioned environment, the highly available HP Superdome server provides the benefits of better manageability, scalability and flexibility. A 64-way HP Superdome system can run HP-UX 11i, Windows and Linux operating environments concurrently in three different hardware partitions. The configuration of the server includes:

- Four-way partition running HP-UX 11i with the Oracle® 9.2 database and HP-UX Systems Administration Manger.
- Twenty-way partition running an RC2 version of Microsoft® Windows .NET Server 2003 Data center Edition, 64-bit Microsoft SQL Server Enterprise Edition, and Windows System Resource Manager.
- Four-way partition running Linux with Linux desktop applications.

CalPERS: Building a model adaptive infrastructure

With assets of more than $150 billion, the California Public Employees Retirement System (CalPERS) is the nation's largest pension fund, providing retirement and health benefits to 1.4 million members and more than 2,500 employees. Its clients are active and retired employees and their families from state and local government, school districts, and public agencies.

As with many distributed enterprises, CalPERS had managed growth by adding servers for each new major application. When the data center reached the limits of capacity and floor space with eight HP-UX T600 and three K-class systems, HP recommended a new strategy—meeting capacity needs with a service approach rather than a box approach through IT consolidation with HP Superdome technology.

When the decision was made to host new front-end web applications on the Linux Red Hat operating system, CalPERS's new adaptive infrastructure made it easy to roll this cost-effective platform on HP ProLiant servers. With some fine-tuning for Linux, CalPERS could use most of the standards, processes and procedures already established for the HP-UX environment. With a streamlined, more manageable infrastructure and a highly professional IT service operation, CalPERS has kept staff and costs at a minimum while improving service levels, increasing uptime and supporting roughly three times the number of applications that it did five years ago.

VMware

HP and VMware have teamed up to provide VMware's ESX Server software on HP servers and blades, helping companies not only to implement server consolidation, but also to streamline development and testing, to improve availability and disaster recovery and to facilitate the coexistence of multiple operating systems — including Linux, Windows and NetWare — on one physical server. With the introduction of Virtual Center™ and VMotion™, joint customers can now also centrally manage their virtual compute resources and dynamically move workloads across ESX Servers without service interruptions. Virtualization is defined as an approach to IT that pools and shares resources so utilization is optimized and supply automatically meets demand.

Ideally suited to corporate IT and service provider data centers, VMware ESX Server works by partitioning physical servers into secure virtual servers. Different operating systems and applications are isolated within their own virtual servers and can safely coexist on a single HP server. Hardware resources are dynamically allocated to the virtual machine —as required by its workload or as specified by its administrator. The result is a level of infrastructure control more typical of a mainframe, at a fraction of the cost.

HP servers running VMware's virtual infrastructure technology create secure, fault-resistant partitions with guaranteed performance levels. Companies can reduce operational expenses and capital costs by running services and applications on virtual machines instead of on dedicated hardware. Integrated with HP's ProLiant Essentials software, VMware ESX Server simplifies server infrastructure by partitioning and isolating server resources so they can be remotely managed and automated. Because VMware runs natively on the hardware without a host operating system for ultimate performance, ESX Server should run on compatible HP hardware (as outlined in VMware's compatibility guide on www.VMware.com.)

Consolidation doesn't have to mean homogenization. For many companies, a combined Linux/Windows environment makes the most sense. With VMware software, HP ProLiant servers can run heterogeneous versions of Linux and Windows on a single server.

Partitioning also helps VMware ESX Server to bolster HP servers' already strong data protection capabilities by allowing critical data to be secured in isolated virtual machines. You can use these virtual machines to mirror physical servers or act as failover servers to increase availability. VMware ESX Server also helps streamline and economize development and testing processes. Using virtual rather than physical machines enables developers to execute realistic simulations and tests of sophisticated systems without acquiring new hardware.

The benefits of the HP/VMware solution should not come at the price of restricting future growth. With VMware VirtualCenter and VMotion, a system can be moved easily and quickly to a larger or dedicated computer when your needs grow beyond the capacity of a hardware platform, and migrations and maintenance can occur without interruption to users.

First Trust Corporation: Threefold performance improvement for rapid growth

As one of the nation's largest independent trust companies for self-directed retirement plans, First Trust Corporation handles transactions equaling millions of dollars per day on behalf of financial intermediaries. "At First Trust, we process transactions for financial intermediaries that have extremely high expectations for service levels," says Jeff Knight, vice president of technology and vendor relations for First Trust. "High availability and the ability to recover in seconds are absolute requirements for remaining competitive and ensuring client satisfaction."

First Trust's business is expanding rapidly, especially in the area of equities transaction processing. The company wanted to improve the performance and scalability of its trading support system to accommodate more transactions and more clients. In addition to these requirements, uptime was critical to ensure 24x7 customer support, security and failover capabilities. To remain competitive with other financial services organizations, one of First Trust's requirements was having a cost-effective solution to meet its immediate and long-term goals.

To create a state-of-the-art equity and mutual fund transaction processing system, First Trust deployed a cluster of four 2-way HP Integrity rx2600 servers running Oracle9*i* Real Application Clusters (RAC) and Red Hat Enterprise Linux AS. The new industry standards–based system has exceeded expectations, delivering 99.99 percent uptime and a threefold performance improvement over the company's previous IBM RISC-based trading system running on AIX.

Using Oracle9*i* RAC systems has also helped First Trust improve the uptime of the solution. "Oracle9*i* RAC clusters on Itanium 2–based HP Integrity servers running Linux helps us be competitive," says Bill Garner, lead database administrator for First Trust. "They allow us to deploy databases faster and to scale up quickly as our business demands it."

Another major advantage of moving to the HP, Red Hat, and Intel solution is that it provides an industry-standard architecture that can accommodate the multiple solutions First Trust needs to deploy. A standard Itanium 2–based platform allows the company to choose from a broad range of software, solutions and components. The ability to run multiple operating systems on a single platform by taking advantage of the unique Intel Itanium 2 microarchitecture is also benefiting First Trust. The company uses VMware virtualization software on Windows for development and quality assurance for its transaction processing system, but its production environment is Linux. As a result, First Trust is able to achieve a higher return on investment by moving to a single hardware platform for both testing and quality assurance. "With the HP and Intel solution, we can consolidate our development and deployment processes onto one standard platform, reducing costs and simplifying development and system administration," explains Garner.

In the financial services world, many companies are moving toward real-time computing to deliver information to customer service representatives and customers over the Web. Knight also sees mobile communications and the ability for employees and customers to access information from anywhere, at any time, using wireless devices becoming more important. "In the near future, First Trust will need to become even more responsive to employees and clients, and in new, innovative and more convenient ways," says Knight. "HP Integrity servers will be a factor in our future strategies."

Wine and Bochs

In addition to VMware, other applications have been designed to enable Microsoft Windows- based applications to run on the Linux operating system.

The Wine project does its job by forming a layer between the Microsoft Windows application and the Linux operating system, behaving more as an interpreter than a full emulator. Think of Wine as a Windows compatibility layer that does not require Microsoft Windows. More than 1,000+ applications run under Wine. With Wine, you can take advantage of all the UNIX strong points such as stability, flexibility and remote administration while still using the Windows applications you depend upon. Wine is open source software, so you can extend it to suit your needs.

Bochs is a PC emulation package written in C++ that can run many Microsoft Windows applications. Currently, Bochs can run most operating systems inside the emulation, including Linux, Windows 95, DOS and Windows NT 4. Bochs can be compiled and used in a variety of modes. The typical use of Bochs is to provide complete x86 PC emulation, including the x86 processor, hardware devices and memory. This allows you to run operating systems and software within the emulator on your workstation — similar to having a machine inside of a machine.

Ensim

Ensim® and HP offer joint hosting management solutions for service providers. Ensim's award-winning solutions for Linux and Windows offer fully automated hosting management. Ensim WEBppliance has four interfaces to delegate administration to specific user roles and a common interface for Linux and Windows-based testing. It is designed for a range of HP ProLiant servers. Joint solutions components include Ensim Virtual Private Server, Ensim server manager and HP ProLiant Servers.

Workload Management

The type or makeup of the workload that you envision migrating to Linux not only will have a large impact on the hardware resources needed, but it will also affect the possible economics of reduced personnel resources. Therefore, identify workloads accurately as early as possible. The classic environments typically slated for migration to Linux are:

- `File and print`, monitoring basic network functions such as file sharing and remote printing.
- `Email`, including SMTP mail and authentication.
- `Web/Internet`, ranging from simply serving static web pages to ostensibly delivering a customized Web site to every user.
- `Firewall/Other I/O bound applications`, including firewalls, LDAP directories and other applications that access data across multiple systems.
- `Business intelligence`, including applications such as data warehousing that typically are I/O bound.
- `Other CPU bound applications`, including calculation-intensive applications such as CAD/CAM and statistical packages.
- `Mixed workload`, servers that are running more than one application.

TCO studies

IT consolidation should be an ongoing approach to making your business more cost-efficient and improving the alignment between business and IT. Application and data reconfiguration, security, access rights, storage management, performance and maintenance are only a few of the issues that must be handled correctly. Another obstacle is that obtaining funding for a consolidation project is difficult without a clearly demonstrable and timely ROI.

Although Linux servers, especially small ones, can be less expensive than many traditional UNIX/RISC servers, it's important to take into account the total cost of ownership (TCO). To determine whether long-term ownership of Linux servers is truly less expensive than entry-level UNIX or Windows servers, you'll need to examine all aspects of ownership, including custom programming, deployment of new applications and ongoing maintenance of those custom applications. Other factors can also affect the TCO calculation, such as the kind of hardware (and how much of it) you're using, whether you're transitioning from Windows or UNIX or starting from the ground up and if your IT staff has any experience with a UNIX-like OS. Analyst firm IDC forecasts that as the entire Linux server market matures, TCO costs will come down due to wider availability of package applications for Linux servers and greater numbers of programmers and systems administrators with skill sets relating to the Linux server platform.

A recent Gartner Group study[iv] shows that enterprises that tend to install Linux on client desktops will save $80 in hardware acquisition costs and an average of $74 per user per year on office automation software. Table 1 presents a TCO comparison using the typical numbers of ten servers, 3,000 GB of storage, 5,000 users, and an average transaction value per hour of 258,250.

TCO Comparison: Sun Solaris vs. HP Linux ProLiant			
	Sun Solaris	**HP Linux ProLiant**	**Savings with HP Linux**
Hardware	$178,531	$70,130	$108,401
Software	$120,000	$66,000	$54,000
IT Operations	$620,116	$181,913	$438,203
IT Administration	$49,797	$29,175	$20,622
Facilities and Overhead	$50,000	$20,000	$30,000
Downtime	$46,485	$104,592	$-58,107
TCO Summary	$1,064,929	$471,810	$593,119
Savings with HP Linux			56%
TCO per System	$106,493	$47,181	$59,312
TCO per User	$213	$94	$119

Table 1. A value calculator from Alinean[v], the IT value experts, estimates the potential TCO savings and benefits of migrating from your current business computing platform to Linux on HP ProLiant servers.

To accomplish an accurate TCO analysis for a Linux migration, detailed cost data must be available for hardware, software, IT operations, IT administration, facilities and overhead and downtime (as Table 1 shows). It may also be relevant to include storage and networking costs as well as support and maintenance.

It is only after you examine all of the cost categories that you can fully appreciate the economic impact that Linux may have. For example, Table 2 gives the estimated budgeted TCO of a mainframe versus Linux on an Intel system is as follows:

Costs of Linux on an Intel System		
Cost Category	**Linux/Intel**	**New Mainframe**
Hardware	$497,822	$5,700,041
Storage	$124,807	$156,009
Software	$776,700	$1,163,600
Services	$188,496	$227,290
Network	$449,987	$839,987
Facilities	$209,752	$225,185
Personnel	$1,759,498	$1,199,658
Downtime	$1,234,800	$749,146
Support and Maintenance	$577,379	$777,113
Total Cost of Ownership	$5,819,242	$11,038,028

Table 2. This presents your budgeted cost of ownership over the life of your analysis length, showing raw cost data before adjusting for tax and present value effects. It summarizes the amount you will need to budget to your Linux migration over the time span you have chosen.[vi]

For example, to make a traditional purchase decision based on an acquisition price (hardware and software), Table 2 indicates that a Linux/Intel based solution would be the winner. Yet those costs rarely amount to as much as 40 percent of the TCO. As a result, acquisition costs can be deceiving at best and, at worst, can lead to dismal platform decisions.

However, note that many factors – which may not be easily foreseen or controlled – can affect TCO calculations and realizations. A recent Gartner symposium indicates that most of the financial benefits of Linux are clearly cost acquisition-driven and could be affected to some degree by your IT organization in ongoing operational efficiencies, which may be directly or tangentially a result of Linux. For example, poor provisioning, management and server utilization could counter the reduced license, maintenance and capital costs of the hardware.[vii]

Comparing Linux/Mainframe to Linux/Intel

While the mainframe does provide certain advantages and strengths, there are many reasons to migrate off of a mainframe. These include increasingly high cost of ownership as skills become scarcer and legacy applications and hardware need to be maintained and a lack of flexibility/new applications, which would inhibit growth and limit server utilization. Counterintuitive as it may seem, some companies are running Linux on their mainframes. If you are considering running Linux on your mainframe, be aware of these limitations:

- To run Linux on a mainframe, you'll need to run a Linux partition, and you will still need a mainframe OS to give you the LPAR partitioning functionality.
- Only three of the 265 available Linux versions today are specially designed for the mainframe. To date, these include special mainframe versions of SuSE, TurboLinux, and Red Hat (32-bit only).
- If you currently have fewer than 20 Linux/Intel (Lintel) servers, consolidating onto the mainframe will not provide a cost advantage.
- All but one vendor (IBM) has exited the mainframe market.
- Linux on a mainframe supports only a few hundred ISV applications, compared to the thousands that run on Lintel. This does not provide the same investment protection as Linux on Intel Itanium 2 Superdome.
- The mainframe does not work well with UNIX and other server lines.
- The initial entry costs and ongoing maintenance are expensive.
- There are hidden software, maintenance and hardware component costs.
- The technology — and certified mainframe technicians — are aging.
- Only about 250 Linux applications are supported on the mainframe vs. thousands on Intel.

Case Studies

HP's proven commitment to both Linux and IT consolidation is evident not only in its record of success working with partners, but also in its own IT infrastructure: HP reduced its own data centers from 153 to just 7, lowering costs by 40 percent. No vendor has more experience helping companies do more with less, and HP continues to consolidate and optimize its infrastructure as a matter of course.

While other companies might specialize in one or two areas of consolidation, HP's consolidation experts can handle your entire consolidation project or execute any part of it, including assessment, design, planning, testing, piloting and installment. That might be one reason HP was ranked number one in a 2002 IDC customer server and storage consolidation study.

Key partnerships with software leaders such as Oracle, SAP and Brocade help HP provide end-to-end consolidation solutions. Only HP supplies a complete storage solution for Linux environments, including consulting and support services, SAN infrastructure, disk arrays, management solutions with integration into enterprise management tools and value-added programs such as Instant Capacity on Demand. HP makes Linux consolidation easy with a comprehensive program of consulting services, including data migration, backup integration and SAN integration.

HP's comprehensive Porting and Migration Services maximize the benefits of IT consolidation, enabling a smooth transition from legacy environments to HP servers. HP can protect investments in legacy systems by migrating applications, data or both to the HP Linux platform. During an initial feasibility phase of a consolidation project, HP consultants help companies evaluate the best options for their needs.

Platform implementation and optimization services—rehosting, refronting and rebuilding—help ensure a smooth, low-risk, cost-optimized transition, while operational management assistance and remote monitoring address resourcing and project management concerns. Educational consulting, mentoring and skills management support IT and development staff throughout the transition.

All these services help lower TCO by reducing staffing and training requirements for hardware and software, accelerating the introduction of new features and services and enabling the implementation of data center best practices.

The BMW Group: Two to three times performance

BMW is an internationally renowned manufacturer of prestigious cars, recognized around the world. The BMW Group uses its motto "Driving ahead" both as an aspiration and a motivation. The company's will to be ahead is the result of a passion for mobility and a continued drive for improvement. From this aspiration flows the energy that makes the company successful.

The BMW Group in Europe needed to simulate large car models on NASTRAN and had a high demand for large I/O bandwidth and performance in a CAE supercomputer data center. Its solution was 12 x 4 way HP Itanium 2-based servers and Nastran
(MSC), Pamcrash (ESI) and Linux.
BMW reported results of two to three times more performance than the fastest RISC systems. It showed the best I/O bandwidth with HP servers of all tested server technologies. Itanium 2 can, on Linux and HP-UX, provide more freedom of choice and more flexibility with IA vs. RISC.

Lower Saxony Police: Access anywhere

Lower Saxony police needed to be able to deal with crime and emergencies around the clock in Germany's second largest state. Its applications are mission critical and data intensive; they include operative, administrative and statistical and management information tasks. In the past, individual police forces in the area had separate, incompatible IT systems at 600 police stations that were not connected, creating cost overheads, operational inefficiencies and delays in the fight against crime.

The solution was IT consolidation with Linux, with a balanced, distributed architecture with unified information system for criminal records, investigative data and administrative needs, with Intel Itanium 2-based HP ProLiant Servers (20 at the headquarters and 100 at stations). The solution includes BEA WebLogic Server 8.1 and WebLogic JRockit, a central database repository based on Oracle9*i*, Red Hat Linux and HP-UX operating systems, and Intel Pentium® 4 processor-based PCs for information access. "In the area of central servers, the Intel Itanium 2-based HP servers reduce the complexity in our customers' IT environments. With HP Itanium 2-based servers, we can run on a single hardware architecture, even though more than one OS is required," said Roland von Bethusy-Huc, senior manager, Mummert Consulting.
"We're using HP servers based on the Intel Itanium 2 processor in our central environment. That allows us to administer and operate different operating systems on similar hardware architecture at a low cost," said Axel Köhler, project manager, Lower Saxony Police.

The results are rapid access to criminal proceedings, investigations and administration info throughout the state, exceptional performance and rapid response times for the 11,600 distributed users, lower cost of ownership and capital expenses by running HP-UX and Linux on a common platform and outstanding reliability for mission-critical computing.

Conclusion

IT consolidation solves many of the problems prevalent in today's data center, and Linux offers an attractive package of flexibility, scalability and reliability. As you build for the future, make sure you have the right master plan. Then lay a strong foundation with the three Linux pillars: HP hardware platforms, HP enterprise software and HP services. In addition, be sure to partner with the right builder — one who can help you achieve maximum return on IT investment.

For More Information

HP IT Consolidation, HP, 2003

Endnotes

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