Abstract
Keeping datacenters agile is key as IT organizations support dynamically changing business priorities and cope with economic pressures. By consolidating systems onto the latest server technology and taking advantage of virtualization techniques, enterprises can optimize datacenter efficiency, gain flexibility, and reduce operating costs—without sacrificing performance or impacting service levels.
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Introduction
Virtually every aspect of a business depends on the services provided by corporate datacenters to stay ahead of rapidly changing business conditions. While the tremendous resources and capabilities afforded by a large infrastructure prove invaluable, these same systems are often inflexible, hampering agility as companies look to react to evolving world markets. Indeed, today’s hyper-competitive environment is forcing businesses to find ways to adapt and innovate in order to grow and be profitable. Yet IT organizations are faced with service-level pressures that necessitate cost reductions and greater operational efficiency. The key to success is finding the right balance.

Innovative technologies and supporting services are bringing new economies of scale to enterprises. Opportunities exist to gain efficiencies by consolidating the datacenter infrastructure. With the latest technology and virtualization strategies, companies can streamline the datacenter and tackle business challenges head-on. Sun and its partners can help organizations select targets for consolidation that are well justified and provide a compelling return on investment. Whether companies are looking to lower costs, conserve energy, increase response times, raise service levels, react faster to new demands, or optimize the balance sheet, Sun can help deliver well-defined and measurable results.

Optimize Datacenter Efficiency with Consolidation
As businesses grow, IT organizations add systems to support skyrocketing datacenter loads, resulting in a sprawling, complex network of systems that consume valuable datacenter floor space, create excessive power and cooling demands, and are costly and difficult to manage. Today many of these platforms are reaching the edge of their capacity, making it difficult for datacenters to depend on systems and scale solutions to meet service-level agreements. The answer—consolidation. Bringing together applications, databases, and services onto fewer, highly reliable servers, server consolidation is not just a hot IT trend—it is a necessity. By moving to the latest technologies and implementing virtualization techniques, companies can consolidate onto fewer systems that get more work done and cost less to run.

Proof that Consolidation Works
Consolidation strategies are proving to be important allies for IT organizations looking to deliver more innovative services at less cost—and no one understands that better than Sun. Recently, datacenters in two of Sun’s California campuses were consolidated into new, next-generation datacenters supporting Sun’s core R&D business. By replacing older servers and storage systems with the latest Sun technology, Sun compressed 152 datacenter rooms occupying 202,000 square feet of space into 14 new, next-generation datacenters occupying 76,000 square feet. Over
Sun Microsystems, Inc.

2 Driving a More Efficient Business

Handle growth and reduce downtime
A major media company migrated to new machines and was able to:
• Handle growth concerns with higher application performance and reduced downtime
• Place the load that once required 400 servers onto 70 more powerful servers—without any code modifications
• Reduce server footprint by 50 percent
• Move to a smaller datacenter
• Achieve payback in 1.5 years

2,100 servers and 700 storage devices were identified as candidates for replacement. For example, Sun replaced 88 Sun Fire® V880 servers with 58 Sun Fire T1000 and T2000 servers with CoolThreads™ technology, and a variety of older systems were replaced with servers based on UltraSPARC® IV+ and multicore AMD Opteron™ processors performing at more than four times the processing speed.

By consolidating datacenter operations and refreshing the hardware infrastructure with high-performance, energy-efficient Sun systems, Sun was able to reclaim 88 percent of valuable datacenter floor space and reduce overall datacenter power consumption by 61 percent—all while improving server performance by 465 percent and storage capacity by 244 percent with less than half the original hardware. The result is over $500,000 in utility savings per year and reduction of over 3,000 tons a year in carbon dioxide emissions. In addition, the savings in datacenter floor space let Sun avoid over $9 million in construction costs, and project a 100 percent payback in three years. Results of this magnitude may seem extraordinary, but they can be replicated by Sun customers worldwide.

Refresh the Datacenter with the Latest Server Technology
Technology refresh cycles are a necessity, and can help enterprises consolidate and operate at peak performance. Sun’s comprehensive line of powerful SPARC® and x64 systems scales from blades and rackmount servers to large-scale systems with up to 128 processor cores and more than half a terabyte of main memory that run the Solaris™ Operating System (OS), Linux, and Windows environments (Figure 1). Because all Sun servers run the Solaris OS, companies can rely on the Solaris OS Application Binary Compatibility Guarantee—a program designed to help ensure applications just run from one version of the Solaris OS to another, thereby protecting investments while lowering development, testing, and deployment costs.

Figure 1. Sun offers a comprehensive product family that scales from blades and rackmount systems to large-scale enterprise servers.

Sun’s Datacenter Consolidation Results
By upgrading to new technology, Sun was able to consolidate datacenters and save—without sacrificing performance:
• Improved server performance by 465 percent
• Increased storage capacity by 244 percent with less hardware
• Reclaimed 88 percent of datacenter floor space
• Saved over $500,000 per year in utility costs

Figure 1. Sun offers a comprehensive product family that scales from blades and rackmount systems to large-scale enterprise servers.
Sun published the Space, Watts, and Performance (SWaP) metric to calculate the performance of rack optimized servers in relation to power and space efficiency. SWaP equals performance divided by space times power.

The SWaP metric shows that Sun servers can surpass systems from other vendors that utilize even the latest Power6 or Intel® Xeon® processors, using up to 30 percent less energy and occupying one-half the datacenter space—all while meeting or exceeding performance levels. Indeed, Java™ technology-based applications can run faster in less space and with less power than on systems from IBM and HP. For example, a Sun SPARC Enterprise T5240 server provides over 2x the performance, over 3x the performance/Watt, and saves up to half the space of IBM p570 and HP rx6600 servers on the SPECjbb®2005 Java Server Benchmark (Figure 2). In addition, a Sun SPARC Enterprise T5240 server provides up to 5x the performance in half the space, and 2.5x better performance per Watt, than many x86 systems—and costs up to 30 percent less.

Figure 2. Sun servers with CoolThreads technology use less energy and occupy less datacenter space than systems from other vendors, without sacrificing performance.
Double Capacity While Reducing Footprint and Costs
By upgrading existing database servers to Sun SPARC Enterprise M4000 and M5000 servers, and using Sun Fire T2000 servers as application servers, an application service provider was able to:
• Reduce the runtime of manufacturing batch jobs by 67 percent
• Increase CPU idle time by 60 percent at load average
• Reduce the number of CPUs needed by more than 35 percent
• Reduce server footprint by 66 percent
• Save up to $300,000 in licensing costs

Sun SPARC® Enterprise M Series Servers
Sun SPARC Enterprise M Series servers are highly reliable, easy to manage, vertically scalable systems with all of the benefits of traditional mainframes and none of the associated cost, complexity, or vendor lock-in. In fact, these servers deliver a mainframe-class system architecture at open source prices. With symmetric multiprocessing scalability from one to 64 processors, memory subsystems as large as 2 TB, and high-throughput I/O architectures, Sun SPARC Enterprise M Series servers easily perform the heavy lifting required of consolidated workloads.

The entire product family—Sun SPARC Enterprise M4000, M5000, M8000, and M9000 servers—features a balanced and highly scalable design that utilizes the latest generation of SPARC64® processors connected to memory and I/O by a new high-speed, low-latency system interconnect, delivering exceptional throughput to software applications. Also architected to reduce planned and unplanned downtime, these servers include stellar reliability, availability, and serviceability capabilities to avoid outages and reduce recovery time. Design features, such as advanced CPU integration and data path integrity, memory chipkill and memory mirroring, end-to-end data protection, hot-swappable components, fault resilient power options, and hardware redundancy boost the reliability of these servers.

Virtualize for Even Greater Savings
Virtualization is emerging as an important tool as organizations look to consolidate redundant and aging infrastructure and create a more agile and cost-effective datacenter. Indeed, server virtualization technologies can help organizations quickly recover from disasters, reduce time to market for new services, and better utilize existing infrastructure to reduce space, power, and cooling requirements. Sun offers choice and flexibility when it comes to server virtualization technology—from support for one or more operating system instances, to little or complete isolation, to solutions that range in flexibility and performance characteristics (Figure 3).

• Resource management enhances the benefits and simplicity of running multiple applications on the same server and operating system instance. Controls govern the utilization of CPU, memory, and I/O resources, and let administrators set and enforce policies that guarantee the share of resources available to applications.

• Operating system level virtualization allows multiple applications to share the same operating system instance while providing separate security domains for each application. Solaris Containers combine resource management and virtualization in the Solaris OS for a no-cost solution that works on every server running the Solaris OS. On Sun servers with CoolThreads technology, Logical Domains partition hardware resources, including individual CPU threads, for greater isolation between operating system instances, each of which can be configured with Solaris Containers.
• Virtual machine monitors provide greater isolation by supporting multiple operating system types and instances on the same machine. Each application can run in its own operating system instance, and a hypervisor gives each application the illusion that it owns a complete, dedicated set of hardware.

• Hard partitions support multiple operating system instances without the overhead of a hypervisor. Available on Sun’s midrange and high-end servers, including Sun SPARC Enterprise M Series servers, Dynamic Domains provide the ultimate in isolation with a separate electrically isolated environment for each operating system.

Putting It All Together

By consolidating systems onto the latest server technology and employing virtualization techniques, enterprises can substantially reduce operating costs and increase reliability and productivity. For example, an IT organization with a variety of existing Sun systems, such as Sun Fire 220, 280, V440, and V880 servers with a total of 115 system boards located in over 725 square feet of datacenter floor space, can consolidate and virtualize onto Sun SPARC Enterprise M8000 and Sun Fire T2000 servers for substantial savings.

By moving applications and services onto two Sun SPARC Enterprise M8000 servers with a total of four system boards and 20 Sun Fire T2000 servers requiring only 86 square feet of datacenter floor space, the company can reduce hardware costs by $49K and reclaim 88 percent of floor space used by the servers. Combined with an 80 percent reduction in power, cooling, and carbon dioxide emissions, the organization can save over $1.8M in environmental costs.

Data in this example is provided for informational purposes only and is not a Sun Microsystems proposal or guarantee of results. Data is calculated with a Sun tool that illustrates the potential ROI, TCO, and other financial results customers may achieve by implementing various IT solutions. The results shown are based upon application of assumptions to the particular data input. Actual results may vary depending on factors including the accuracy of the assumptions and the data.
With an initial investment of $232K for the systems and professional services implementation consulting, the company can save over $2.3M in maintenance costs and over $139K in system administrator productivity, and increase reliability from three 9s to four 9s to save $274K over five years by reducing unscheduled downtime. Delivering an internal rate of return of 229 percent and a return on investment of 2,044 percent, the refresh, consolidation, and virtualization strategy pays for itself in 12 months.

Figure 4. With an initial investment of $232K, companies can reduce overall datacenter costs by more than $4.5M and achieve a full return on investment in 12 months

Upgrade Safely and Easily

Day-to-day operations leave little time for refresh, upgrade, consolidation, and virtualization projects. Sun’s portfolio of services and programs can help ease the move to new technology. (Figure 5).

- **SolarisSM 10 OS Upgrade Service**—While moving to the Solaris 10 OS can deliver many advantages, the upgrade process is sometimes delayed due to perceived risk, cost, or schedule constraints. Sun makes the process easier with the Solaris 10 OS Upgrade Service, a service designed to help IT organizations minimize disruption. Sun experts assess the complexity of upgrading existing infrastructure, identify potential constraints and risks, create a plan, and complete the upgrade.

- **Virtualization Services**—Sun provides Virtualization Workshop, Architecture, and Implementation services that provide assessments, justification, design alternatives, implementation, testing, and knowledge transfer. Sun consultants assess specific areas where companies want to reduce costs and optimize resources, and recommend an appropriate mix of virtualization technology and IT processes to help achieve these goals. By implementing Sun virtualization solutions, organizations can reduce IT costs by up to $2M per year5, achieve up to 99.99 percent availability, and improve utilization by as much as 80 percent.

5. The $2M claim is based upon average savings over an 18 to 36 month period of Sun consolidation customers. Customers calculated savings based on energy, space, licensing, service contract costs, increased utilization, and reduce of management of systems. With each customer reference Sun does, Sun asks the customer how much money this solution has saved them, and how. Most Sun customer references have a cost savings associated with them, and that is how Sun calculated the average of $2M saved.
• Sun Enterprise Migration Suite—Sun provides evaluation, assessment, and implementation services that can help companies adopt a new IT infrastructure or upgrade to the Solaris 10 OS and remain focused on business. Sun consultants carefully analyze project goals and objectives and identify possible constraints, including partnerships, resources, road maps, dependencies, and operational requirements. They demonstrate the value of the migration as a necessary step for improving business and IT efficiency, taking into account the associated value of upgrading, such as improve IT efficiency and service delivery, and the ability to adapt to evolving corporate standards, strategies, and regulatory requirements, challenges, and effort.

• Sun Eco Services Suite—These services give organizations the tools needed to implement an energy management program for controlling IT operating costs through better utilization of internal resources. Assessment, monitoring, and support services help companies establish a baseline for existing conditions, identify areas for improvement, and optimize energy usage so that organizations can reduce power costs and transform the datacenter into an eco-friendly IT infrastructure.

• Global Sun Solution Centers—Over 70 Sun Solution Centers around the globe provide enterprises assistance and take the guesswork out of implementing projects. Companies gain easy access to environments for collaborating with engineers and technology experts from Sun and Sun partners, tuning applications, testing interoperability and scalability, and more.

Try, Buy, Upgrade, and Save
In today’s challenged economy, IT managers often do not have extra capital to spend on new systems for in-house evaluations, and look for money saving opportunities.

• Sun’s Try and Buy Program—A program that allows for no risk, 60 day trials of many server and storage platforms, giving enterprises the ability to test new technology with no obligation to purchase. Plus, this risk-free trial provides easy options for returning systems at Sun’s expense, if needed.

• Sun Upgrade Advantage Program—A program that offers up-front, scalable trade-in allowances for virtually any Sun or non-Sun system without special negotiations. Time-bound promotions on specific product offers or trade-ins are available, letting companies save up to 30 percent when moving to Sun technology. Sun even covers shipping from the customer dock and manages the environmentally safe disposal of legacy equipment.

• Sun Microsystems Global Financial Services (SMGFS)—A program that provides single-source worldwide finance and 100 percent financing on both Sun and third-party hardware, software, and services. Flexible lease plans, custom mix and match lease term lengths, purchase options, and payments structures are available to help maximize procurement budgets and reduce acquisition costs.
For More Information

To learn more about Sun products, and services that can help optimize datacenter operation, contact a Sun sales representative or visit the Web sites listed in Table 1.

Table 1. Web sites for more information.

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<thead>
<tr>
<th>Description</th>
<th>URL</th>
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<tbody>
<tr>
<td>Solaris Operating System</td>
<td>sun.com/solaris</td>
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<tr>
<td>Sun Servers with CoolThreads Technology</td>
<td>sun.com/servers/coolthreads</td>
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<tr>
<td>Sun SPARC Enterprise Servers</td>
<td>sun.com/servers/sparcenterprise</td>
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<tr>
<td>Sun Blade Systems</td>
<td>sun.com/servers/blades</td>
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<tr>
<td>Space, Watts and Performance Metric (SWaP)</td>
<td>sun.com/swap</td>
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<td>Sun Services</td>
<td>sun.com/service</td>
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<td>Sun Eco Innovation</td>
<td>sun.com/ecoinnovation</td>
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<td>Sun Eco Services Suite</td>
<td>sun.com/services/eco</td>
</tr>
<tr>
<td>Virtualization</td>
<td>sun.com/datacenter/consolidation</td>
</tr>
<tr>
<td>Sun Try and Buy Program</td>
<td>sun.com/tryandbuy</td>
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<tr>
<td>Sun Upgrade Advantage Program</td>
<td>sun.com/tradeins</td>
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