

REDUCING COSTS BY IMPROVING SERVER PERFORMANCE

An IT Director's Guide
March 2009

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.

Table of Contents

Introduction	1
Optimize datacenter efficiency with consolidation	1
Proof that consolidation works	1
Refresh the datacenter with the latest server technology	2
Sun servers with CoolThreads technology	3
Sun SPARC Enterprise M-Series servers	4
Virtualize for even greater savings	4
Putting it all together.....	6
Upgrade safely and easily.....	7
Try, buy, upgrade, and save.....	8
For more information	8

Introduction

Virtually every aspect of a business depends on the services provided by corporate datacenters to stay ahead of changing business conditions. While the tremendous resources and capabilities afforded by a large infrastructure prove invaluable, these 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 survive 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 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, improve 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 datacenter loads. If not carefully planned, such additions can result 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 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 important allies for IT organizations looking to deliver more innovative services at less cost—and no one understands that better than Sun. Recently, Sun consolidated facilities supporting Sun's storage engineering and corporate and customer support groups into a next-generation datacenter. By replacing older servers and storage systems with the latest Sun technology, Sun compressed datacenter rooms from nine buildings occupying 496,000 ft² of space into a new, next-generation datacenter occupying 126,000 ft² at its Colorado campus. Using a unique pod architecture with innovative techniques for connectivity, power, and cooling, the datacenter virtually eliminated the need for raised floor space.

Deliver services faster and at less cost

DigiTar, a messaging services innovator, was able to deliver highly scalable advanced messaging services and process messages faster and at less cost.

- 8 HP servers replaced with 2 Sun servers
- 4.5x the performance of existing systems
- 2x processing capacity of MySQL™ database servers
- 10x improvement in price/performance
- 75% reduction in operating costs for MySQL database applications
- 83% reduction in power usage and heat dissipation
- 5% decrease in total power consumption

See sun.com/customers/servers/digital.xml for more information on DigiTar's success.

Sun's Datacenter Consolidation Results

By upgrading to new technology, Sun was able to consolidate datacenters and create a greener environment for exceptional savings:

- Compressed 496,000 ft² of datacenter space into 126,000 ft² of space
- Virtually eliminated raised floor space, avoiding \$4M in building costs
- Decreased power consumption by more than one million kilowatt hours per month
- Increased chiller efficiency by 32%
- Reduced costs with free cooling for more than one-third of the year
- Removed lead and chemical waste
- Implemented a water treatment system that saves 675,000 gallons of water per year

Sun was able to utilize server consolidation to great effect. In one area, the team consolidated 63 servers and 30 direct attached storage devices onto two Sun Fire™ X4600 servers utilizing Solaris™ Zones technology and VMware ESX Server software. In addition, the virtual tape library group replaced 19 legacy enterprise-class servers with two Sun SPARC Enterprise™ M5000 servers using Dynamic Domains and Solaris Containers to partition the hardware and replicate the application environments that were running on the old systems. In the end, Sun achieved an impressive 88% square footage compression and avoided building 5,000 ft² of datacenter space, saving the company \$2.3M

By consolidating datacenter operations and refreshing the hardware infrastructure with high-performance, energy-efficient Sun systems, Sun was able to avoid \$4M in building costs for raised floors, decrease power consumption by more than one million kilowatt hours per month, increase chiller efficiency by 32%, remove lead and chemical waste, and reduce costs with free cooling for more than one-third of the year. 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 256 processor cores and four terabytes 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.

Handle growth and reduce downtime

PlanetOut Inc., a major media company, migrated to new machines and was able to:

- Consolidate 400 older Sun servers to 70 Sun Fire T1000 servers
- Reduce server footprint by 50%
- Move to a smaller datacenter
- Realize higher customer satisfaction due to virtually no service interruptions
- Achieve payback in 1.5 years

For more information on PlanetOut, see sun.com/customers/servers/planetout.xml



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

Sun servers with CoolThreads™ technology

Sun servers with CoolThreads technology deliver the next wave in innovative system design with world-record performance and great price/performance, as well as groundbreaking energy and space efficiency and the industry's best performance per Watt. Blending the performance and scalability of midrange servers with the economies of energy-efficient CMT designs, these servers support up to 64 simultaneous execution threads on a single processor, large memory, cryptographic acceleration, and integrated on-chip I/O technology to deliver dramatic improvements over traditional system architectures. Scalable systems are available, from space- and power-efficient blade and rackmount designs, to expandable systems with I/O and internal disk options, to NEBS-certified servers that handle the demands of carrier-grade environments. Hot-pluggable cooling fans, drives, and power supplies help eliminate disruption and deliver best-in-class reliability for mean time between service interruptions (MTBSI), service intervals, and fault robustness.

The SWaP metric¹ shows that Sun servers can surpass systems from other vendors that utilize even the latest Power6 or Intel® Xeon® processors, using up to 30% 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 T5440 server with four processors provides up to 4.4x better performance, over 3.5x better performance/Watt, and saves up to half the space of IBM p570 and HP rx6600 servers² 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% less³.



Figure 2. Sun servers with CoolThreads technology use less energy and occupy less datacenter space than systems from other vendors, without sacrificing performance.

1. 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.
2. SPEC, SPECjbb reg tm of Standard Performance Evaluation Corporation. Results from www.spec.org as of 10/10/08. Sun SPARC Enterprise T5440 (4 chips, 32 cores) 692,736 SPECjbb2005 bops, 21,648 SPECjbb2005 bops/JVM. Results submitted to SPEC. IBM Power 570 (4 chips, 8 cores) 402,642 SPECjbb2005 bops, 100,731 SPECjbb2005 ops/JVM. HP rx6600 (4 x1.6 GHz Intel Itanium2 chips, 8 cores) 158,174 SPECjbb2005 bops, 39,544 SPECjbb2005 bops/JVM. IBM Power 570 (8x4.2GHz Power6 chips, 16 cores, 128 GB RAM) 798,752 SPECjbb2005 bops, SPECjbb2005 bops/JVM = 99,844 IBM Power 570 (2 building blocks) power specifications calculated as 80% of maximum input power reported 10/5/08. HP rx6600 power calculated as 80% of max input power dissipation reported 10/5/08. Sun SPARC Enterprise T5440 power consumption taken from measurements made during the benchmark run. Estimated HVAC costs calculated as 100% premium over Power Usage per Year (based on global average of \$0.13/kWhr gathered from the World Energy Organization).
3. The latest benchmark information is available at <http://sun.com/servers/coolthreads/t5240/benchmarks.jsp>.

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, Core Services Corporation was able to:

- Reduce the runtime of manufacturing batch jobs by up to 67%
- Increase CPU idle time by 60% at load average
- Reduce the number of CPUs needed by more than 35%
- Reduce footprint by two-thirds with compact, multicore servers
- Save \$200,000 to \$300,000 in licensing costs

See sun.com/customers/servers/coreservices.xml for more information.

Sun SPARC Enterprise™ M-Series servers

Sun SPARC Enterprise M-Series servers are highly reliable, easy to manage, vertically, horizontally, and diagonally scalable systems with all of the benefits of 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 4 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 M3000, 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. For example, the Sun SPARC Enterprise M9000 server running the Solaris 10 OS, SAP ERP 6.0, and Oracle Database Server 10g achieved 39,100 SAP SD users on an industry standard measure of ERP performance the SAP 2-tier Sales and Distribution benchmark⁴ (Figure 3). In addition, the Sun SPARC Enterprise M9000 server has achieved a new single-system performance world record on the TPC-H data warehousing benchmark at the 1 TB scale factor, demonstrating the effectiveness of the Solaris 10 OS running Oracle 11g database on the SPARC processor-based platform. Using the same number of cores, the Sun SPARC Enterprise M9000 server outperformed the best competing single system result, posted by the HP Integrity Superdome, by 69% with 18% advantage on price/performance.

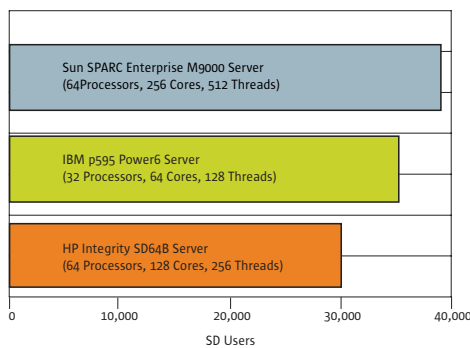


Figure 3. Sun SPARC Enterprise M9000 servers deliver exceptional ERP performance on the SAP 2-tier Sales and Distribution benchmark

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. In addition, Dynamic Reconfiguration features allow companies to consolidate onto Sun SPARC Enterprise M-Series servers and retain complete control over system resources—for unprecedented online reconfiguration for processors, memory, and I/O.

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 4).

4. See <http://www.sun.com/servers/highend/m9000/benchmarks.jsp#9>

- 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—with extremely low overhead. 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. Up to 8,000 containers can be created on a domain—32x that of partitioning solutions from IBM.
- Sun™ Logical Domains and Solaris Containers provide built-in, no-cost virtualization capabilities for Sun servers with CoolThreads technology, helping companies to consolidate, virtualize, and save like never before. Run up to 128 virtual machines on a server without paying for proprietary virtualization technologies, and dramatically increase server utilization, efficiency, and ROI.
- 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. Unlike domain capabilities from other vendors, Dynamic Domains can be dynamically resized—one socket at a time.

Double performance with virtualization and massive consolidation

By deploying critical business applications on Sun SPARC Enterprise M5000, M9000, and T5220 servers running Solaris 10 OS, and using virtualization technology, Clifford Chance, one of the largest law firms in the world, was able to:

- Double the performance of a key business application
- Consolidate server hardware by 90%
- Plan to consolidate 10 global datacenters down to 4
- Project an increase in server utilization rates from 15-25% to 85%
- Project full ROI in within two years

See sun.com/customers/servers/clifford.xml for more information.

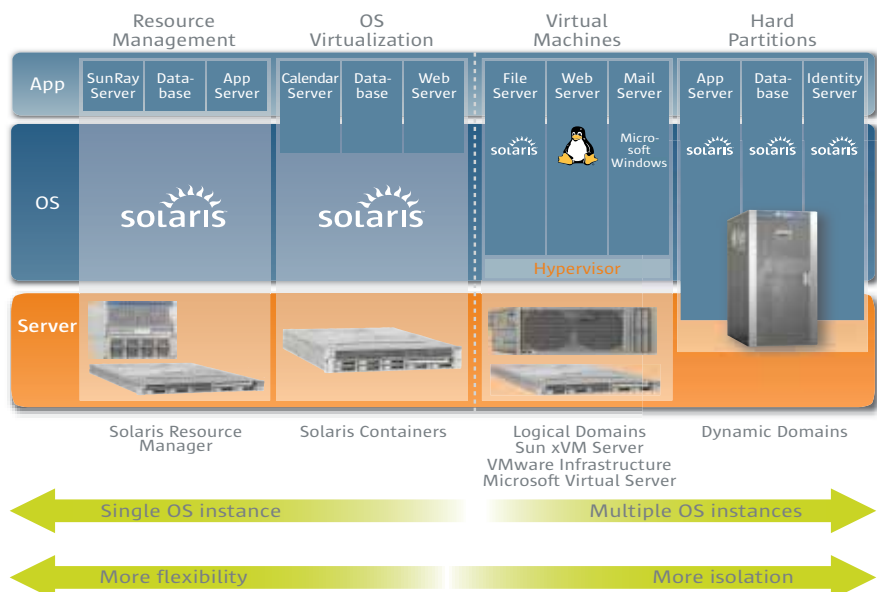


Figure 4. Sun's virtualization technologies range from simple resource management to full electrical isolation between multiple operating system instances.

Migrate from HP to Sun and save

- Consolidate 18 HP Integrity Superdome servers onto one Sun SPARC Enterprise M9000 server
- Realize over \$15M in savings within five years on hardware alone
- Reduce power and cooling by 90%
- Reduce floor space requirements by 95%
- Achieve an ROI of over 200%, with payback within 26 months

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 productivity⁵. 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 618 ft² of datacenter floor space, can consolidate and virtualize onto Sun SPARC Enterprise M8000 and Sun SPARC Enterprise T5440 servers for substantial savings.

By moving applications and services onto two Sun SPARC Enterprise M8000 servers with 14 system boards and four Sun SPARC Enterprise T5440 servers requiring only 68 ft² of datacenter floor space, the company can realize over \$3.5M in savings within five years on hardware alone, and reclaim nearly 90% of floor space used by the servers. Combined with an 80% reduction in power, cooling, and carbon dioxide emissions, the organization can save over \$1.3M in environmental costs.

With an initial investment of \$391K for the systems and professional services implementation consulting, the company can save nearly \$2.3M in maintenance costs and over \$147K in system administrator productivity, and increase reliability from three 9s to four 9s to save \$291K over five years by reducing unscheduled downtime. Delivering an internal rate of return of 151% and a return on investment of 903%, the refresh, consolidation, and virtualization strategy pays for itself in 14 months.

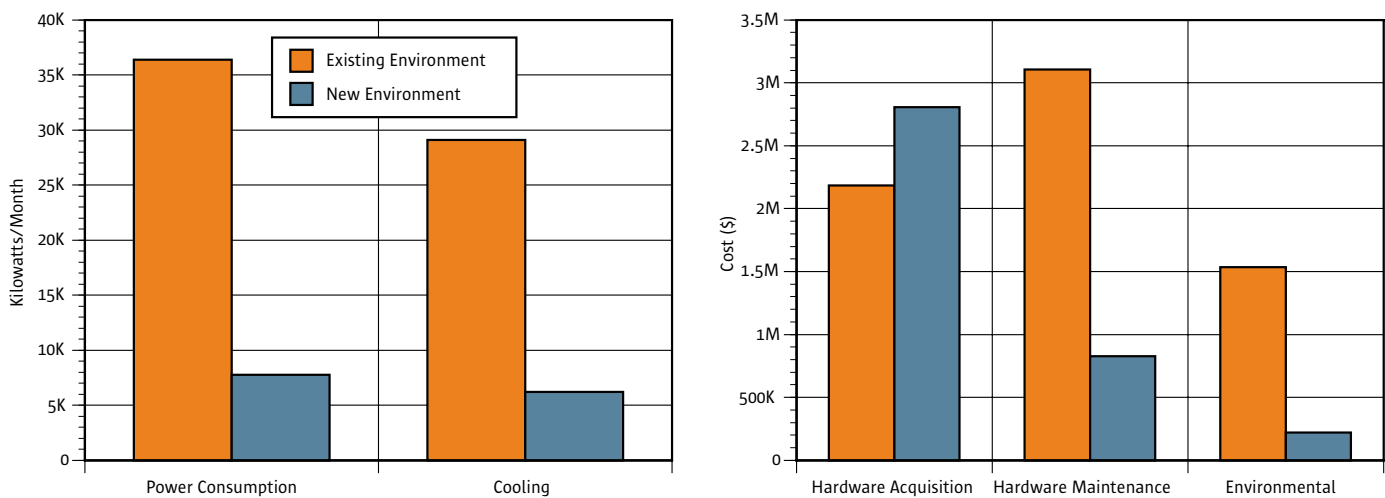


Figure 5. With an initial investment of 391K, companies can reduce overall datacenter costs by more than \$4.8M and achieve a full return on investment in 14 months

5. 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.

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 6).

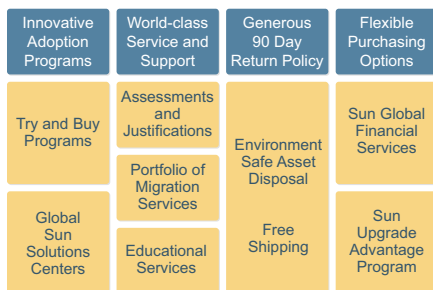


Figure 6. Sun offers a variety of programs, tools, and services that help enterprises refresh technology at lower cost and with less risk.

- 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 year⁶, achieve up to 99.99% availability, and improve utilization by as much as 80%.
- 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.

6. 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.

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% 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% 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.

Description	URL
Solaris Operating System	sun.com/solaris
Sun Servers with CoolThreads Technology	sun.com/servers/coolthreads
Sun SPARC Enterprise Servers	sun.com/servers/sparcenterprise
Sun Blade Systems	sun.com/servers/blades
Space, Watts and Performance Metric (SWaP)	sun.com/swap
Sun Services	sun.com/service
Sun Eco Innovation	sun.com/ecoinnovation
Sun Eco Services Suite	sun.com/services/eco
Virtualization	sun.com/datacenter/consolidation
Sun Try and Buy Program	sun.com/tryandbuy
Sun Upgrade Advantage Program	sun.com/tradeins
Sun SPARC Enterprise Technology Refresh Plan	sun.com/servers/sparcenterprise/leasing
Customer Success Stories	sun.com/customers

This page intentionally left blank.



Sun Microsystems, Inc. 4150 Network Circle, Santa Clara, CA 95054 USA Phone 1-650-960-1300 or 1-800-555-9SUN (9786) Web sun.com

© 2009 Sun Microsystems, Inc. All rights reserved. Sun, Sun Microsystems, the Sun logo, CoolThreads, Java, MySQL, Solaris, Sun Enterprise, and Sun Fire are trademarks or registered trademarks of Sun Microsystems, Inc. or its subsidiaries in the United States and other countries. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. in the US and other countries. Products bearing SPARC trademarks are based upon an architecture developed by Sun Microsystems, Inc. Intel Xeon is a trademark or registered trademark of Intel Corporation or its subsidiaries in the United States and other countries. SPECjbb is a registered trademark of Standard Performance Evaluation Corporation. Information subject to change without notice. Printed in USA SunWIN #540802 Lit. #SYWP14459-0 03/09