

## Optimize the Web Tier

### Consolidate to Get More Performance in Less Space and Lower Power Consumption



The continued increase in demand for IT services is creating major challenges for many businesses that are running short on computing capacity in their data centers. Research indicates that more than 80 percent of data centers are constrained by power, cooling, and space. As IT services grow, IT managers are also finding that managing and operating their expanding network of servers is much more costly than was anticipated. Hindered by high costs and capacity constraints, IT managers have recently turned their focus to consolidating the Web tier and deploying more energy efficient servers.

#### Benefits of Sun's Web Tier Consolidation Offering

- Dramatic reduction in power and cooling costs without compromising performance
- Greater throughput and performance in less space
- Safely consolidate multiple applications onto a single server with virtualization technologies
- Investment protection for applications running on Solaris OS, Linux, and Windows environments
- Reduced management costs through greater automation

#### Key Components of Sun's Offering

- Sun Fire™ servers with CoolThreads™ technology running the Solaris™ 10 Operating System
- Sun Fire x64 servers running Solaris 10 OS, Linux, or Windows operating systems
- Sun N1™ System Manager
- Sun N1™ Service Provisioning System
- Sun Fire x64 servers running VMware
- Sun Managed Services

#### Hidden Costs of Distributed Web Servers

Expansion in the Web tier is generally accomplished by adding more servers whenever extra capacity is needed. As the pool of servers grows larger, however, the complexity of the environment can grow exponentially. Management tasks such as maintaining operating system patches on hundreds of small servers can become a nearly a full time job. Minor repairs such as replacing a fan or failed disk also take more time because it is harder to find the faulty unit amongst racks of seemingly identical servers.

In addition to higher management costs, it is also a bigger burden to provide power and cooling for the growing number of servers. Recent increases in energy costs have only made this situation worse. Even more importantly, many large data centers simply cannot get more power or cooling capacity even if they can afford it. Government regulations may constrain power resources or the design of the power and cooling infrastructure in an existing building simply might not accommodate greater capacity.

To meet your needs for greater capacity, you can either build a new data center, or replace your older inefficient systems with newer more powerful systems that require less power and produce less heat.

IDC estimates that the proliferation of Web and application servers will continue to expand, yielding 50% more servers for a total of 14 million servers installed in the U.S. by

2009<sup>1</sup>. Electricity costs alone (not including cooling) for operating these servers is estimated at \$5B annually. As a result of this trend, IDC expects power consumption to become an important metric in server purchase decisions as IT managers strive to get more performance per watt of power and minimize the watts per square foot for data center servers<sup>2</sup>.

Anticipating this need for its customers, Sun has solutions that can help you get more out of your Web tier server infrastructure while reducing the cost of operating Web and application servers. Sun systems can help you optimize the Web tier by:

- Providing dramatic savings in power and cooling costs
- Delivering greater throughput and performance in a smaller footprint
- Reducing the number of servers by more than 50 percent by securely hosting multiple Web or application servers on each system
- Reducing management costs and risks through greater automation of administration tasks

#### Choice and Flexibility

Sun offers customers a choice to take advantage of the powerful features of the Solaris™ 10 OS on new Sun Fire™ servers with CoolThreads™ technology, or to utilize Sun Fire x64 servers powered by AMD Opteron™ processors which can run applications on Solaris, Linux, or Windows.

“The industry has an opportunity to reduce utility costs through better management of the systems installed. This can be achieved by supporting advanced server consolidation programs through virtualization techniques.”

### Vernon Turner

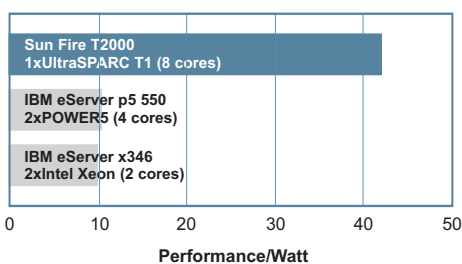
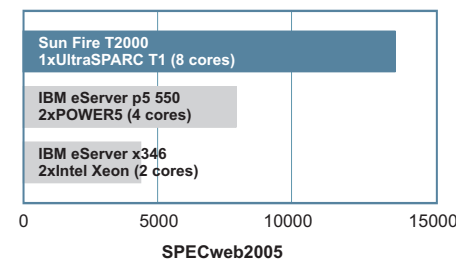
Source: IDC, 'Server Power Consumption Reemerges as a Critical Cost Factor in Datacenters', Doc #33937, August, 2005

Both server offerings can be deployed with Sun N1™ System Manager and Sun N1™ Service Provisioning System to bring greater automation and thus greater efficiency to the management environment.

### Reducing Power, Cooling, and Space Costs with Sun Fire™ T1000 and T2000 Servers

Applications that run on the Solaris OS, can gain the most benefit by being migrated to the new Sun Fire CoolThreads servers. Combining these servers with the Solaris 10 OS provides a computing environment that is optimized to run today's threaded applications such as Web servers and J2EE applications. Sun Fire CoolThreads servers also offer an eco-responsible solution that adds energy efficiency to outstanding performance.

Breaking new ground in performance per watt of power consumption, Sun Fire CoolThreads servers offer 3 times the performance while consuming 25 percent less power than competitive Xeon-based systems. The figure below shows SPECweb2005 benchmark results, a test that measures the performance of Web servers which are often multithreaded applications. The bottom portion of the figure also shows how the systems compare when power consumption is taken into consideration. The Sun



Fire T2000 server delivers more than 4 times the throughput per watt of power when compared to IBM p5 550 and x346 systems<sup>3</sup>.

The CoolThreads processor used in Sun Fire CoolThreads servers consumes as little as 72 watts, less than the power needed to turn on a typical light bulb, and 4 times less than the power required for some competitive systems. This substantial savings in power means that your data center will have the power capacity for at least twice as many servers.

### Delivering Enterprise Reliability

To meet the higher availability of consolidated environments, Sun Fire CoolThreads servers offer advanced reliability features including:

- Error detection and correction for improved data integrity
- Chip Multithreaded (CMT) processor design that greatly reduces the number of parts
- Highly reliable Solaris OS
- Redundant hot-pluggable components on Sun Fire T2000 server

### Extending Performance and Reliability with the Solaris™ 10 OS

The Solaris 10 OS is available for both Sun Fire CoolThreads servers and Sun Fire x64 servers. Solaris 10 offers substantial performance gains over competitive operating systems through innovative new features such as enhanced networking, memory placement optimization, and the Dtrace tool for performance analysis.

Solaris has a strong reputation as the industry-leading OS for reliability and the Solaris 10 OS takes it even a step further with predictive self-healing technologies that help protect applications from system failures. Advanced reliability features in Sun Fire servers combine with the Solaris 10 OS to yield an unbeatable solution for delivering enterprise reliability in consolidated environments.

### Securing Workloads with Solaris Containers

Virtualization technologies such as Solaris Containers can make it easier to securely consolidate multiple Web servers on a single system to get higher system utilization without compromising the security of application workloads.

Solaris Containers offer a low-overhead partitioning approach that combines fine-grained resource controls with the ability to securely isolate application workloads in separate partitions of the Solaris OS.

## System resources allocated to a Solaris Container are protected so that applications can run without concern about resource contention or security violations in other containers.

Each Solaris Container includes a unique root file system, a shared read-only set of system executables and libraries, and whatever resources the root administrator assigns to the container at creation time. An administrator can boot or shut down individual containers just as if they were separate operating system instances.

System resources allocated to a Solaris Container are protected so that applications can run without concern about resource contention or security violations in other containers. Solaris Containers restrict the propagation of software faults to a single container using security isolation enforced by the Solaris kernel.

Solaris Containers can be used on Sun Fire servers regardless of the underlying processor

architecture. And best of all, Solaris Containers technology is included with the Solaris 10 OS at no extra cost.

### Protecting Investments with Sun Fire x64 Servers

Sun Fire x64 systems offer a high performance balanced architecture that is designed for lower energy consumption and high reliability. They leverage the innovative aspects of AMD Opteron processor technology to power applications that run on Solaris, Linux, and Windows operating systems.

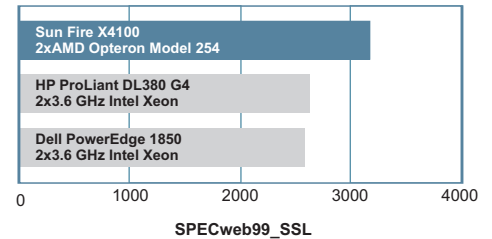
The combination of high performance, I/O throughput, simple remote administration, and enterprise availability features such as hot-swappable power supplies and fans makes these servers an excellent fit for Web server environments, among many others.

The availability of dual-core AMD Opteron processors on Sun Fire x64 servers enable these systems to save a significant amount of power when compared to HP, IBM, and Dell servers that utilize single-core Xeon processors. Innovative point-to-point HyperTransport™ technology also eliminates the I/O bottlenecks present in the front-side bus (FSB) Intel Xeon architecture, increasing overall system performance since I/O does not compete for bus bandwidth.

### High Performance Means Fewer Servers

The Sun Fire X4100 server has proven to be faster than any 2-socket Xeon-based server in areas such as Java™ application processing and secure Web serving. It achieved a world record benchmark for the SPECweb99\_SSL benchmark which measures the performance of servers conducting secure Web transactions. In the SPECweb99\_SSL benchmark for 2-core servers, the Sun Fire X4100 beat the 3.6 GHz Intel Xeon

results from HP by 21 percent, and the Dell results by 23 percent<sup>4</sup>.



### Consolidating Disparate OS Environments on Sun Fire x64 Servers

One of the many compelling reasons to select Sun Fire x64 servers for Web Tier consolidation projects is their ability to consolidate heterogeneous, multi-OS application environments on a single server.

Using VMware ESX Server to virtualize system resources, applications running with a mix of Solaris, Linux, and Windows operating systems can be provisioned on the same server. These disparate applications can run unchanged in their own native environments while sharing server resources. This gives IT organizations greater flexibility and higher server utilization when consolidating disparate systems onto fewer highly scalable, reliable servers from the Sun Fire x64 product line.

### Driving Greater Efficiency Through Remote Management and Automation

The efficiencies of a consolidated infrastructure can be further enhanced by management tools that automate provisioning tasks and provide greater economies of scale through remote management. Sun has designed its solutions to reduce administration costs with an integrated offering that makes management a central component of the overall solution. All Sun Fire CoolThreads servers and Sun Fire x64 servers include a sophisticated service processor that monitors the server hardware and software for faults, and interacts with remote management software including Sun N1 System Manager to enable zero touch

remote management. These tools enable any service operation that does not require physical insertion or removal of parts to be performed from another city or continent.

### Sun N1™ System Manager

Sun's experience with customers shows that an average 20 percent of a system administrator's time is spent on initial deployment of new servers. Using Sun N1 System Manager you can significantly reduce initial deployment time through automated system discovery which automatically captures the hardware environment information, allowing administrators to install and deploy new systems within minutes.

Sun N1 System Manager can also help you monitor, patch, and manage Sun Fire servers with greater efficiency. Grouping features in Sun N1 System Manager enable administrators to simultaneously perform operations such as OS and firmware patch updates on entire groups of like servers as easily as if operating on a single server. These efficient methods for managing a pool of server resources can help you reduce IT support costs and improve service levels.

### Sun N1™ Service Provisioning System

The Sun N1 Service Provisioning System simplifies application lifecycle management by enabling administrators to rapidly provision an entire software stack, from OS to applications. A master software stack is archived and then can be quickly replicated onto multiple servers

in parallel whether the target locations are individual systems or Solaris Containers within servers.

### Bringing Enterprise Consolidation Experience to the Web Tier

Since the mid 1990's Sun has been helping customers consolidate their data center infrastructures to reduce cost, simplify management, and increase agility. Now Sun is bringing its enterprise data center consolidation experience to a solution offering designed specifically for the Web tier, enabling you to extend the benefits of consolidation to your Web and application server resources.

To help you realize the full value of your IT investments, Sun Services, and its partners, also provide a continuum of expertise, technology, and global coverage to assess business needs, and implement and manage data center consolidation projects.

If you are looking to outsource a portion or all of your data center IT operations, Sun Managed Services offers for a cost-effective approach that enables you to retain strategic control of IT assets and staff while utilizing Sun experts to perform the tasks that are outside of your organization's core competencies.

The combination of strong products, deep expertise, and flexible service offerings makes Sun the best choice for your Web tier consolidation needs.

## Sun Fire Servers with CoolThreads Technology



Sun Fire T1000- server (1 rack unit)

- One 32 thread UltraSPARC® T1 processor
- Up to 16 GB memory

Sun Fire T2000- server (2 rack units)

- Up to two 32 thread UltraSPARC T1 processors
- Up to 32 GB of memory
- Redundant power, cooling, and disks

## Sun Fire x64 Servers Powered with AMD Opteron Processors



Sun Fire X4100, X4200, and V40z servers (1,2, and 4 rack units)

- Up to four single-core or dual-core AMD Opteron processors
- Up to 32 GB of memory
- Redundant hot-swappable power, cooling, and disks

### Learn More

For more information on Sun's Web Tier Consolidation offering, visit [sun.com/consolidation](http://sun.com/consolidation) or talk to your local Sun representative.

(1) Source: IDC, 'Server Power Consumption Reemerges as a Critical Cost Factor in Datacenters', Doc #33937, August 2005.

(2) Ibid.

(3) Sun Fire T2000 (8 cores, 1 chip) 14001 SPECweb2005. IBM p5 550 (4 cores, 2 chips) 7881 SPECweb2005. IBM eServer Xseries x346 (2 cores, 2 chips) 4348 SPECweb2005. Sun Fire T2000 results have been submitted to SPEC. Other results from [www.spec.org](http://www.spec.org) as of December 6, 2005. IBM x346 specifications from brochure, 09/05/05 posted at <http://www-03.ibm.com/servers/eserver/xseries/x346.html>. IBM x346 power rating estimated by calculating 70% of the power supply data reported in the product brochure. IBM p550 specifications, 10/06/05, from <http://www-03.ibm.com/servers/eserver/pseries/hardware/entry/550.html>. IBM 550 power ratings calculated by applying 70% of the power supply data published in "Facts and Features Report", 10/06/05, posted at <http://www-03.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html>. Sun Fire T2000 server power consumption taken from measurements made during the benchmark run.

(4) The comparison is based on SPECweb99\_SSL benchmark results as of 12/01/05. Sun Fire X4100 (2xAMD Opteron Model 254, 2 core, 2 chip, 1 core/chip, 16GB): SPECweb99\_SSL - 3158; HP ProLiant DL380 G4 (2x3.6 GHz Xeon, 2 chips, 1 core/chip): SPECweb99\_SSL - 2610. Dell PowerEdge 1850 (2x3.6 GHz Xeon, 2 chips, 1 core/chip): SPECweb99\_SSL - 2570. For the latest benchmark results, visit <http://www.spec.org>. The Sun Fire X4100 results were obtained using the Zeus Web Server. More information about Zeus Technology Limited can be found at: <http://www.zeus.com>.