

Breakthrough Web-Tier Solutions with Record-Breaking Performance

Maximize efficiency, scalability, and security with Sun CoolThreads™ servers



Explosive Internet growth and the massive content delivery of new Web 2.0 services are driving new requirements for today's Web-tier infrastructures. The large numbers of low-cost computers typically deployed in the Web tier are getting increasingly costly to manage, and many organizations are simply running out of power and space in their datacenters. Sun systems with CoolThreads™ technology deliver breakthrough performance with dramatic space and power efficiency, enabling you to consolidate your Web tier and dramatically improve energy efficiency—all while increasing overall throughput and enhancing security.

Challenges for large-scale Web-tier infrastructures

Many organizations now realize that most of their Web tier total cost of ownership (TCO) is related to management and operations costs. As the pool of servers grows larger, the complexity of the Web tier can grow exponentially. Management tasks such as maintaining operating system patches on hundreds of small servers can become nearly a full-time job. And because it's difficult to find a faulty unit amongst racks of seemingly identical servers, minor repairs such as replacing a fan or failed disk can also take more time.

The rapid and unpredictable growth of online services requires fast capacity expansion in the Web tier. Yet many organizations are constrained by space, power, and cooling in their datacenter infrastructures. Recent increases in energy costs have made this situation worse. What's more, many large datacenters 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 might not accommodate greater capacity. Thus, the ability of the Web tier to scale to meet new demands within fixed space, power, and cooling limits is of paramount importance.

Stringent regulatory requirements such as the Sarbanes-Oxley Act and Basel II are also demanding more of the Web tier by increasing requirements for security and privacy. Today's Web tier solutions must help protect customers and businesses by enabling greater security while delivering high throughput and performance.

A better infrastructure for Web 2.0

In the face of these challenges, Sun's Web-tier offerings help you gain high compute density in a smaller footprint, with lower power and cooling overhead to streamline your Web infrastructure. Through consolidation and optimization, you can:

- Achieve greater throughput in less space
- Use up to 60 percent fewer systems
- Consume one-fourth the power consumption of competitive systems
- Improve security for the Web infrastructure
- Secure consolidation of multiple Web servers on each system
- Reduce acquisition and management costs with fewer systems and automated tools

Highlights

- Achieve dramatic reductions in power and cooling costs with a virtualized, energy-efficient Web tier
- Enable more than 1,250 isolated virtual servers in a single rack through integrated, open-source, no-cost virtualization technology
- Record-breaking performance for increased Web tier throughput
- Reduced management costs in a consolidated Web tier with fewer servers and operating system instances to manage
- Integrated on-chip cryptographic acceleration and 10 Gigabit Ethernet for no cost, secure computing at wire speed
- Sun Services offerings to help assess, optimize, and virtualize your Web tier for greater energy efficiency
- Sun Cool Tools for Web tier optimization can help you take advantage of the power of Sun CoolThreads servers

UltraSPARC® T2 Processor

The UltraSPARC T2 processor is the industry's first "system on a chip," packing the most cores and threads of any general-purpose processor available, and integrating all the key functions of a server on a single chip: computing, networking, security, and input/output (I/O), plus tight integration with the Solaris operating system.

The superior compute power and multithreaded 10 Gigabit Ethernet networking of the UltraSPARC T2 processor make it especially valuable for consolidation and virtualization of the Web tier. The UltraSPARC T2 processor consumes less power per core and thread than any processor in its class.

The integrated on-chip cryptographic acceleration also enables you to secure all of your Web services without sacrificing performance or deploying additional Web servers.

Sun provides a complete portfolio of hardware and software solutions, time-saving developer tools, and professional services for the Web tier. Our hardware offerings include state-of-the-art rack servers and density-efficient blade servers:

- Sun SPARC® Enterprise T5120 and T5220 servers, based on the new UltraSPARC® T2 processor with up to 64 active execution threads and integrated dual 10 Gigabit Ethernet technology, provide a highly scalable platform for Web-tier consolidation and offer outstanding network performance
- Sun Fire™ T1000 and T2000 servers (also called Sun SPARC Enterprise T1000 and T2000 servers) based on the UltraSPARC T1 processor, are the world's first eco responsible servers and a good fit for horizontally scaled Web-tier infrastructures
- The Sun Blade™ modular systems including the new Sun Blade T6320 server module based on the UltraSPARC T2 processor are specifically designed for today's requirements of balancing increased performance and greater flexibility with a low-cost solution that can help relieve datacenter capacity constraints
- All systems come with integrated no cost and open virtualization technologies, enabling you to quickly consolidate multiple Web services onto rack and blade servers that are highly space and energy efficient

Sun servers and blades powered by the UltraSPARC T2 "system on a chip" processor are designed for virtualization and eco efficiency. With up to eight cores and 64 threads per system, they provide the flexibility and power of 64 virtual systems in a single server. These systems can help you realize dramatic space savings, huge reductions in electricity costs, and simplified server administration—all while delivering much faster processing for each consolidated server.

By combining Sun CoolThreads servers with the free and open source Solaris™ 10 Operating

System (OS), and Sun's no-cost virtualization technologies, you can serve millions of new customers and communities while saving millions of dollars through a virtualized, environmentally responsible datacenter infrastructure.

World-record performance

The Sun SPARC Enterprise T5220 server running the Solaris 10 OS and the Sun Java™ System Web Server set a new world record in performance and performance per watt in the SPECweb2005 benchmark, the industry standard measure of Web server performance. As shown in the figure, the SPARC Enterprise T5220 server outperformed competitive servers that were running Red Hat Enterprise Linux and equipped with the latest Intel quad core and AMD dual core processors. The SPARC Enterprise T5220 server with one UltraSPARC T2 processor obtained a world record 37,001 SPECweb2005 users¹.

This world record benchmark clearly demonstrates that the Sun SPARC Enterprise T5220 can support thousands of concurrent Web server sessions while allowing larger and more complex Java applications in process to be run for better performance and scalability. The powerful combination of unique 8-core/64 threads UltraSPARC T2 processor, rock-solid Sun Java System Web Server and industry-leading Solaris 10 OS, provides the highest performing and most efficient Web serving environment available.

¹ Results from www.spec.org as of September 28th 2007. Sun SPARC Enterprise T5220 (8 cores, 1 chip) 37,001 SPECweb2005, submitted to SPEC for review HP DL580G5 (16 cores, 4 chips) 30,261 SPECweb2005. HP DL380G5 (8 cores, 2 chips) 20,387 SPECweb2005. HP DL585G2 (8 cores, 4 chips) 22,254 SPECweb2005. HP DL580G5 power consumption from HP Power Calculator system configured with 4 x 2.93GHz processors, redundant PSU, 16 x 4GB DIMMs, 8 x 36GB SAS drives, 1 x PCI card, 80% utilization on 9/10/07: <http://h30099.www3.hp.com/configurator/powercalcs.asp>. HP DL380G5 power consumption from HP Power Calculator for system configured with 2 x E5355 2.66GHz processors, redundant PSU, 8 x 4GB DIMMs, 2 x HBAs and 2 x 146GB SAS drives, 80 percent utilization on 6/4/07: <http://h30099.www3.hp.com/configurator/powercalcs.asp>. HP DL585G2 power consumption from HP Power Calculator for system configured with 4 x AMD 8222 3.0GHz processors, redundant PSU, 16 x 4GB DIMMs, 2 x HBAs and 2 x 146GB SAS drives, 80% utilization on 6/4/07: <http://h30099.www3.hp.com/configurator/powercalcs.asp>. Sun SPARC Enterprise T5220 power consumption taken from measurements made during the benchmark run.

“The Solaris 10 Operating System with [Sun] Logical Domains provides DigiTar with rock-solid fault isolation and stronger partitioning of server resources. These two qualities power the stability we need to ensure our customers receive business-critical communications 24 hours a day, 365 days a year and at a competitive price.”

Jason Williams
COO and CTO DigiTar

Competitive Comparisons Table

	Sun SPARC Enterprise T5220	HP DL580 G5	HP DL380 G5	HP DL585 G2
Space (RU)	2	4	2	4
Power Consumption (Watts)	606	1,062	572	832
Performance (Composite)	37,001	30,261	20,387	22,254
Performance/Watt (Higher is Better)	61.1	28.5	35.6	26.7
SWaP (Higher is Better)	30.5	7.1	17.8	6.7

Improve performance and flexibility with the Solaris 10 OS

The Solaris 10 OS is the current version of Sun’s tested, certified, and supported enterprise operating system, available free for download. Future versions of the Solaris OS will be based on technology from the OpenSolaris™ project, a community-based open source initiative.

The strong industry reputation for reliability and scalability of the Solaris OS is based on many years of engineering investment from Sun. Solaris has been scaling to 64 threads since the introduction of the 64-way Sun Enterprise™ 10000 server more than a decade ago. And now the Solaris OS is optimized to take advantage of the UltraSPARC T2 processor’s chip multithreading (CMT) capabilities, enabling Web server instances running on the Solaris OS to deliver excellent throughput.

Performance gains over competitive operating systems are also made possible through innovative new features in Solaris such as enhanced multi-threaded networking and drivers and the DTrace tool for performance analysis.

All of the major Web server software solutions are available on Solaris and an optimized runtime version of the light-weight http server, lighttpd, is available as part of Sun’s Cool Stack for Solaris. This compiled version of lighttpd comes with a configuration file that is optimized for Solaris and supports php5 applications via fastcgi out of the box. The later section labeled, “Cool Tools for easy adoption,” provides more detail about Cool Stack.

Secure isolation with Sun™ Logical Domains technology

Standard to the UltraSPARC T1 and T2 processors with no additional licensing cost, Sun Logical Domains (LDoms) technology is built in as standard to the UltraSPARC T1 and T2 processors, allowing customers to deploy one of the industry’s most open virtualization solutions with no additional licensing costs. LDoms let you consolidate your Web tier by dividing Sun CoolThreads servers into multiple logical servers so that you can securely isolate Web server instances. This makes it easy to replace older, less efficient servers by simply moving the operating system, data, and applications to their own domain within a Sun CoolThreads server.

Each logical server’s operating system, data, and applications are partitioned to run independently of each other while sharing the processing and storage resources of the Sun CoolThreads server. It’s even possible to run multiple, different operating systems simultaneously, combining several UNIX® and Linux servers onto one Sun CoolThreads server.

Multiple logical domains are created by the addition of a software layer called hypervisor, interposed between the operating environment and the hardware platform. Hypervisor abstracts the hardware and can expose or hide various resources, allowing you to specify resource partitions for LDoms. Each logical domain is an independent, discrete system, separated from the others, with its own resource level specification.

Securing workloads with Solaris Containers

Solaris Containers technology offers 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. When using Solaris Containers to isolate workloads, each Web server instance is deployed in its own secure zone with its own resources while sharing a common instance of the Solaris OS. Thus, Solaris Containers can help reduce administration overhead by reducing the number of operating system instances to be managed.

Each 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 container are protected so that applications can run without concern about resource contention or security violations in other containers. Solaris Containers technology restricts the propagation of software faults to a single container using security isolation enforced by the Solaris kernel. And best of all, Solaris Containers technology is included with the Solaris 10 OS at no extra cost and has been open sourced through the OpenSolaris project.

Zero-cost security

Most customers would prefer to use secure Web-server technology for all of their Web-server transactions. However, adding encryption to Web services using Secure Sockets Layer (SSL) typically doubles the amount of hardware needed to achieve the same overall throughput. Consequently, many customers limit their use of SSL to only the most critical functions.

With Sun servers based on the UltraSPARC T2 processor, you can now use SSL-enabled Web services for all of your needs without affecting

the cost of your Web tier. The integrated cryptographic accelerators in the UltraSPARC T2 processor coupled with security software features available in the Solaris 10 OS practically eliminate the performance penalty of secured Web services. Now you can secure your Web tier without exhausting your budget and enable your customers to communicate safely with your organization. Learn more at sun.com/zerocost.

Cool Tools for easy adoption

No matter how compelling new hardware or OS platforms may be, organizations must be assured that the costs and risks of adoption are in line with the rewards. In particular, IT departments want to continue to leverage the considerable advantages of popular commercial and open source software. Developers want to use familiar compilers and basic development tools. And administrators cannot afford to spend extra time getting applications to run effectively in a new environment.

Sun Cool Tools for Web-tier optimization are designed specifically to enable you to seamlessly optimize your Web-tier environment and quickly deploy applications that take advantage of the high performance of multiple threads with CoolThreads technology. Cool Tools can help you with porting or performance optimization through the all stages of the development lifecycle.

A key element of the Cool Tools offering, Cool Stack, provides an optimized open source software stack for the Solaris OS. Cool Stack has been pre-configured to deliver the most popular applications (Apache, PHP, MySQL) working seamlessly out of the box. It includes the increasingly popular, light-weight http server, lighttpd, as an optimized Web server solution for CoolThreads servers. Most applications in Cool Stack have been recompiled to deliver a 30 to 200 percent performance improvement over standard binaries compiled with GCC. DTrace probes have also been added for enhanced observability. Learn more at sun.com/samp.

Sun's three-step approach to greening the datacenter

Sun has gone beyond providing hardware and software solutions for Web tier efficiency and has created the Sun Eco Innovation Initiative, which defines a clear and actionable approach that can guide you through the steps that will lead you to greater energy efficiency in your Web tier. The program includes online information about Sun's approach that you can use to help save time and reduce risk. You can also take advantage of Sun Services offerings specifically designed to help you achieve greater energy efficiency.

The SunSM Eco Services Suite is based on a proven, straightforward process with three simple steps:

- **Assess** – Let Sun help measure the current efficiency and environmental impact of your Web tier and recommend ways to optimize space, power and cooling for better efficiency and utilization across your Web tier infrastructure.
- **Optimize** – Sun can help you optimize your existing Web servers and/or upgrade your infrastructure with Sun's Eco products to realize improved performance, space, power and cooling efficiencies while also delivering greater throughput.
- **Virtualize** – Sun Services experts can help you get the most out of Sun's virtualization solutions help increase system utilization and ROI and overcome your power and space limitations.

CoolThreads technology in action

Sun's Web tier solutions are helping many companies around the globe improve both the efficiency and scalability of their Web tier infrastructures.

With more than two million customer domains, Strato AG is Europe's second largest Internet service provider. Strato needed to expand its server capacities to cover the constantly growing demand for its services. They replaced the majority of their Web hosting servers with Sun Fire T2000 servers running the Solaris 10 OS. Each pair of servers replaced on average of 36 servers from the older infrastructure. This enabled Strato to reduce their power requirements by 90 percent and to save 20 percent on datacenter space. The server consolidation not only eliminated the need to relocate the datacenter to other premises, but also resulted in extra space for future expansion. The use of Solaris 10 on all Sun servers also creates substantial savings in administration costs.

At On-line Gaming Pioneer, Betfair, Sun servers, storage, software and services have helped double the company's Web tier throughput from 2 billion to 4 billion page impressions per week while also delivering a 60 percent reduction in power and cooling costs. Betfair was able to replace many racks of Dell servers running Linux with Sun Fire T1000 and T2000 servers running Solaris. The project delivered more computing power in the same physical space with significantly less power consumption.

Solaris Containers virtualization technology was used to safely run multiple applications concurrently. This allowed Betfair to increase server utilization and achieve lower power consumption because fewer servers were needed.

Betfair also consolidated their storage environment using the Sun StorageTek 9985 system, which features built-in virtualization capabilities. "Through virtualization, we've eliminated 40 terabytes of physical capacity, reducing storage power and cooling costs by 60 percent," said Rorie Devine, Betfair's Chief Technology Officer.

The testimonials for Sun Web tier solutions also include praise for the virtualization capabilities of Solaris Containers. After 10 years of successful growth, PlanetOut, a leading global media and entertainment company exclusively serving the lesbian, gay, bisexual and transgender (LGBT) community, was running into infrastructure limitations. Its overloaded servers began having service interruptions and PlanetOut was completely out of space in their hosted data center.

PlanetOut had obtained a Sun Fire T1000 server for testing through Sun's Try and Buy Program. They realized that the Sun Fire T1000 server could handle huge workloads and that they could use the Solaris Containers feature in the Solaris OS to create 10 zones in each server. With each zone able to do the work of one of their existing Sun Fire V100 servers, the consolidation project was very easy to justify.

When the project is finished, PlanetOut will have replaced a total of 400 Sun Fire V100 and other servers with just 70 Sun Fire T1000 servers. The project will pay for itself in 1.5 years according to PlanetOut's analysis. "We have made the product more reliable and more scalable than it was without making any code changes," said Tom Cignarella, Vice President of technical operations. "It's an extremely successful solution."

Get started now with a risk-free trial

Take the first step toward a more efficient Web tier now. You can try the world's first eco-responsible servers, the Sun Fire T1000 and T2000 servers or the new Sun SPARC Enterprise T5120 and T5220 servers, risk-free for 60 days and then buy at 25-45% off . Visit sun.com/tryandbuy/ to apply for your free trial system.

Learn More.

Learn more about Sun servers with CoolThreads technology at sun.com/coolthreads/ and find out about Sun Web tier solutions at sun.com/newheights.