

Next-Generation Application-Tier Solutions

Sun CoolThreads™ servers



With the explosive growth of the Internet, increasing complexity of user requirements, and wide choice of hardware, operating systems, and middleware, IT executives are facing new challenges in their application infrastructures. Rapid expansion of the application tier has resulted in significant cost and complexity, and many organizations are simply running out of datacenter space, power, and cooling.

Sun systems with CoolThreads™ technology deliver breakthrough performance with dramatic space and power efficiency, enabling you to deploy enterprise applications in a virtualized application-tier infrastructure that offers greater throughput and eases datacenter capacity limitations.

Complexity and capacity constraints in the application tier

The core business logic of today's enterprise applications runs in the application tier, where redundant application servers are used to provide application scalability and resiliency. Traditionally, IT organizations have deployed one physical hardware server for each application-server-software component, resulting in a complex network of servers as the application tier grows with business needs.

As the pool of servers grows larger, management tasks such as maintaining operating system patches on hundreds of servers can become a full-time job. Minor repairs such as replacing a fan or failed disk also take more time because it's harder to find the faulty unit among racks of identical servers. It's clear that management and operations costs have become the biggest single factor in total cost of ownership (TCO).

Another challenge facing today's application-tier deployments is the need to curb power and cooling consumption. According to the Uptime Institute, datacenter power consumption doubled from 2000 to 2005. Analysts predict that IT infrastructure power usage will soon

cost more than the hardware itself. And AFCOM, an association of datacenter experts, believes that many organizations are in danger of running out of power in their datacenter within the next five years. 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.

What's more, the application tier's throughput capacity is growing faster than many datacenters can accommodate. Enterprise application services generally extend beyond the bounds of the organization to provide service to customers, partners, and suppliers. These user populations can sometimes experience rapid and unpredictable growth, requiring that application-tier capacity be faster than the datacenter infrastructure can handle. Today's application-tier infrastructures must scale to meet these new demands within fixed power, cooling, and real-estate limits.

So IT managers are looking to consolidate their application tier onto fewer, more powerful, and highly optimized servers that can deliver greater throughput using less power, cooling, and datacenter space.

A better infrastructure for next-generation applications

Sun's application-tier solutions help you gain high compute density in a smaller footprint, requiring less power and cooling to streamline your application infrastructure.

Highlights

- Dramatic reductions in power and cooling costs with a virtualized, energy-efficient application tier
- Record-breaking performance and scalability for application server software
- Reduced management costs in a consolidated application tier with fewer servers and OS instances to manage
- Cool Tools for Sun CoolThreads servers enable faster time to market by simplifying application selection, development, tuning, debugging, and deployment
- Best-in-class Java EE 5-compatible application server based on the open source Project GlassFish
- Sun Services offerings to assess, optimize, and virtualize your Web tier for greater energy efficiency
- Improved stability, security, and scalability with the free, open source Solaris OS
- Integrated open source virtualization technology available at no cost, supporting more than 2500 isolated virtual servers in a single rack

Through server consolidation and optimization, you can benefit from:

- Greater security for the application infrastructure
- Secure consolidation of multiple application servers on each system
- Reduced acquisition and management costs with fewer systems and automated tools
- Greater throughput in less space
- Deploying up to 60 percent fewer systems
- As little as one-quarter the power consumption of competitive systems

Sun's offering for the application tier includes a complete portfolio of hardware and software solutions, timesaving developer tools, and professional services designed to enhance energy efficiency. All major J2EE application

UltraSPARC T2 Processor

The UltraSPARC T2 processor packing “system on a chip,” is the industry's first the most cores and threads of any general-purpose processor available, and integrates 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 UltraSPARC T2 processor's superior compute power and multithreaded 10 Gigabit Ethernet networking make it especially valuable for consolidation and virtualization of the application tier. And it consumes less power per core and thread than any processor in its class.

servers, including BEA WebLogic, IBM WebSphere, JBoss, Oracle Application Server and Java System Application Server, are not only supported on Sun systems, but also deliver industry-leading performance and performance per watt. Sun's server offerings include both state-of-the-art rack servers and density-efficient blade servers:

- Sun SPARC® Enterprise T5120 and T5220 servers are based on the new UltraSPARC® T2 processor with up to 64 active execution threads.
- Sun Fire™ T1000 and T2000 servers (also called Sun SPARC Enterprise T1000 and T2000 servers) are based on the UltraSPARC T1 processor and are tailored for horizontally scaled, application-tier infrastructures.
- Sun Blade™ modular systems are specifically designed for large server deployments, delivering extreme energy and space efficiency in the Sun Blade 6000 chassis with no compromise to performance. Other benefits of the Sun Blade architecture include faster installation and provisioning with improved serviceability, cabling, and systems management.
- All systems come with integrated, no-cost, open virtualization technologies, enabling you to quickly consolidate multiple application 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 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.

Setting a world record for performance

SPECjAppServer2004 is the only industry-standard benchmark used for Java Enterprise Edition application servers. It measures the volume of transactions a particular system configuration can deliver while maintaining acceptable response times for 90 percent of the transactions.

The Sun SPARC Enterprise T5220 set performance and efficiency world records for rack-optimized servers on the SPECjAppServer2004 2-node benchmark. The Sun SPARC Enterprise T5220 server running Solaris 10 and the Oracle Application Server 10g obtained a world record 2,000.92 Java Operations per Second (JOPS) in the SPECjAppServer2004 Standard Category. This system outperformed all other competitive rack-based servers in the two-node SPECjAppServer2004 benchmark, including systems based on the latest IBM Power6, Intel Xeon, and Intel Itanium 2 processors. In addition, the Sun SPARC Enterprise T5220 server delivered the highest overall performance per watt and the best per-socket performance in Java application serving. When the Space, Watts, and Performance (SWaP) metric is applied, Sun servers are the most efficient — seven times better than its closest competitor¹.

¹ All results from www.spec.org as of 10/10/07. SPECjAppServer2004 Sun SPARC Enterprise T5220 (8 cores, 1 chip) 2000.92 JOPS@Standard. SPECjAppServer2004 IBM p570 (4 cores, 2 chips) 1,197.51 JOPS@Standard. SPECjAppServer2004 Dell 2900 (4 cores, 2 chips) 652.93 JOPS@Standard. SPECjAppServer2004 HP rx2660 (4 cores, 2 chips) 874.17 JOPS@Standard. IBM p6 570 powerspecifications from 80 percent of maximum report power consumption published here, 06/07/07, posted at [ftp://ftp.software.ibm.com/common/ssi/rep_sp/n/PSB01628USEN/PSB01628USEN.PDF](http://ftp.software.ibm.com/common/ssi/rep_sp/n/PSB01628USEN/PSB01628USEN.PDF) Dell power rating 08/24/07 from Dell DataCenter Capacity Planner, System configured with 2 x Xeon 5160 processors, 8 x 2GB DIMMs, 1 x Disk, 1 x HBA & Redundant PSU HP rx2660 power calculated as 70 percent of max input power reported 07/17/07: http://h18004.www1.hp.com/products/quickspecs/12698_div/12698_div.HTML#Technical%20Specifications Sun SPARC Enterprise T5220 server power consumption taken from measurements made during the benchmark run.

Competitive Comparisons Table

	Sun SPARC Enterprise T5220	IBM Power 6 570	Dell 2900	HP rx2660
Space (RU)	2	4	5	2
Power Consumption (Watts)	468	1,040	350	559
Performance (SPECjApp JOPS)	2,000.92	1,197.51	652.95	874.17
Performance/Watt (Higher is Better)	4.3	1.2	1.9	1.6
SWaP (Higher is Better)	2.1	0.3	0.4	0.8

A cluster of six Sun SPARC Enterprise T5120 servers running the Solaris 10 OS and the Sun Java System Application Server 9.1 (Glassfish) delivered the highest results ever recorded for open source application servers on the SPECjAppServer2004 benchmark. The cluster of Sun SPARC Enterprise T5120 servers obtained a result of 8,439.36 SPECjAppServer2004 JOPS@Standard in just 6U of rack space while consuming 444 watts of power per node. Sun's cluster configuration provided 16 percent higher performance than a cluster of six HP rx6600 servers equipped with four dual-core Itanium 2 processors and running proprietary HP-UX. The cluster of HP rx6600 servers consumed two times more power and seven times more space than the Sun SPARC Enterprise T5120 servers. When considering both performance and data center efficiency, Sun's results are even superior to a cluster of

twelve HP Itanium 2 servers equipped with the latest Itanium 2 9100 processors and running proprietary HP-UX operating systems and application servers. The cluster of 12 HP BL860c blade servers consumed more than three times more space and nearly ten times as much power to deliver a result with only 20 percent higher performance than the Sun submission².

These results confirm the Sun SPARC Enterprise T5120 and T5220 servers as the highest performing and most efficient platforms on the planet for deployment of secure application services, enabling you to consolidate to reduce space and energy consumption, without sacrificing performance.

Improve performance and flexibility with the Solaris 10 OS

Solaris 10 is the industry's most innovative operating system, offering no-cost, open

source licensing coupled with the enterprise-level support demanded by mission-critical enterprise environments. Future versions of the Solaris OS will be based on technology from the OpenSolaris™ project, a community-based open source initiative.

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

Performance gains over competitive operating systems are also made possible through innovative new features in the Solaris OS, such as enhanced networking, memory placement optimization, and DTrace for performance analysis.

All major application-server-software solutions are available on the Solaris OS. In fact, Sun and the GlassFish community recently announced the availability of GlassFish v2, the next major version of the open source Java EE 5 application server, and its commercially supported counterpart, Java System Application Server 9.1. Building on the success of GlassFish v1, this release adds enterprise features such as clustering, advanced administration, and record-breaking performance. In addition, Java System Application Server 9.1 offers industry-leading, cost-efficient annual subscriptions for anyone who needs production-quality support.

² All results from www.spec.org as of 11/21/07. Six Sun SPARC Enterprise T5120 servers (48 cores, 6 chips) and one Sun Fire E6900 server (48 cores, 24 chips) for the database server delivered 8439.36 JOPS@Standard. Twelve HP BL860c servers (48 cores, 24 chips) and 2 HP Superdome (80 cores, 40 chips) delivered 10519.43 JOPS@Standard. Six HP rx6600 (48 cores, 24 chips) and HP Superdome (64 cores, 32 chips) delivered 7269.45 JOPS@Standard. HP blade power from: <http://h71019.www7.hp.com/ActiveAnswers/cache/347628-0-0-121.html>. HP blades configured with 1.6GHz Itanium 2 9040 processors with 18MB Cache, 24GB per blade via 6 x 4GB DIMMs, 1 x 73GB SAS drive and 80 percent utilization. HP rx6600 power from Typical Power Consumption, reported 11/30/07: http://h18000.www1.hp.com/products/quickspecs/12596_div/12596_div.HTML#Technical%20Specifications. Sun SPARC Enterprise T5120 power consumption taken from measurements made during the benchmark run.

Competitive Comparisons Table

	Sun SPARC Enterprise T5120	HP BL860c	HP rx6600
Space (RU)	1	8 blades per 10U chassis	7
Power per Server Chassis	444	4,272	998
Total Number of JEE Nodes	6	12	6
Total Space (RU)	6	20	42
Total Watts	2,664	8,544	5,988
Performance (SPECjAppServer 2004 JOPs)	8,439.36	10,519.43	7,269.45
Performance/Watt (Higher is Better)	3.2	1.2	1.2
SWaP (Higher is Better)	0.53	0.06	0.03

Secure isolation with Logical Domains technology

Sun's Logical Domains (LDoms) technology is built in as standard on Sun systems UltraSPARC T1 and T2 processor based on the, allowing you to deploy one of the industry's most open virtualization solutions with no additional licensing costs. LDoms let you consolidate your application tier by dividing Sun CoolThreads servers into multiple logical servers, so you can securely isolate application server instances. You can replace your older, less-efficient hardware servers and simply move the OS, data, and applications to a domain within a Sun CoolThreads server.

Each logical server's OS, data, and applications are partitioned to run independently of each other while sharing the processing and storage resources of the CoolThreads server. You can even run different operating systems simultaneously, combining several small 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 system and the hardware platform. The hypervisor abstracts the hardware and can expose or hide various resources, allowing you to specify LDom resource partitions. Each domain is an independent, discrete system, with its own resource-level specification.

Secure 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 application-server instance can be run in its own secure zone with its own resources, while sharing the same instance of the Solaris OS. In this way, Solaris Containers can help reduce administration overhead by reducing the number of OS 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.

Accelerate adoption with Sun Cool Tools

No matter how compelling new hardware or OS platforms may be, the costs and risks of adoption must be 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 can't afford to spend extra time getting applications to run effectively in a new environment.

Sun Cool Tools are designed specifically to enable you to seamlessly optimize your application-tier environment and quickly deploy applications that take advantage of the high performance of CoolThreads technology. Cool Tools can help you with porting or performance optimization through 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 preconfigured to deliver the most popular applications (Apache, PHP, MySQL) working seamlessly out of the box. Most applications in

Cool Stack have been recompiled to deliver a 30 percent to 200 percent performance improvement over standard binaries compiled with the GNU Compiler Collection (GCC).

Sun's three-step approach to greening the datacenter

Sun has gone beyond providing hardware and software solutions for application-tier efficiency through the Sun Eco Innovation Initiative, which defines a clear, actionable approach to greater energy efficiency in your application tier. The program showcases our wide range of powerful, scalable eco products; takes advantage of the ingenuity of our eco communities and eco partners; and fully leverages Sun's and others' eco expertise, turning it into documented best practices, step-by-step methodologies, state-of-the-art tools, and more.

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** – Measure the current efficiency and environmental impact of your application tier and optimize space, power, and cooling for better efficiency and utilization across your application-tier infrastructure.
- **Optimize** – Optimize your existing application servers or upgrade your infrastructure with Sun's Eco products for improved performance, space, power, and cooling efficiencies while delivering greater throughput.
- **Virtualize** – Get the most out of Sun's virtualization solutions to increase system utilization and ROI and overcome your power and space limitations.

“We found our performance scaled linearly with the 64 threads available, with the result that we were able to deliver much higher levels of performance than our existing x86 and SPARC-based rack and blade servers.”

Radoslaw Korzeniewski

IT Systems Expert, PTK Centertel

“Multiple performance growth with reduced power consumption is what any system administrator and IT professional can dream about.”

Vladimir Phillipov

Vice President, IT Director, VypelKom

Application server technology in action

Sun’s application-tier solutions are helping many companies around the globe improve the efficiency and scalability of their application-tier infrastructures.

Founded in December 1991, PTK Centertel, Ltd. is the first mobile phone operator in Poland. It operates two mobile phone networks—a digital network, operated under the IDEA brand with more than seven million customers, and the analog NMT 450i (Centertel) network. PTK Centertel offers its customers the latest, most-modern mobile services which make everyday communications easier. Services include interactive voice mail, data transmission and internet access, GPRS and EDGE, multimedia services, SMS and MMS, the mobile multimedia portal Idea World, mobile banking services, location based services, Intelligent Network services and roaming with over 330 operators all over the world.

PTK purchased a Sun SPARC Enterprise T5220 server, based on the UltraSPARC T2 processor, and tested a range of applications including the Web server as well as JBoss and BEA WebLogic Java application servers, mail servers, NFS and Oracle databases. The performance scaled linearly with the 64 threads available, with the result that PTK was able to deliver much higher levels of performance than their existing x86 and rack and blade servers based on SPARC technology. This was achieved with higher levels of power and space efficiency than anything they experienced before.

PTK also found installation to be quite simple, with rock solid system reliability. As a result of their tests, PTK deployed the Sun SPARC Enterprise T5120 and T5220 servers to keep pace with their ever-expanding customer base. Ease of installation and high reliability enabled PTK to also bring new services to market faster and with higher levels of availability—all serving to enhance their competitive position while at the same time reducing operational costs through higher power and space efficiency.

Vypelkom Group is using Sun servers and software to support a billing system running under BEA WebLogic. Their recent tests have proven the value of the higher performance and greater efficiency Sun Fire T2000 server of the in their application tier. In October 2005 VypelCom Group’s Beeline brand reached a top rating of the strongest and most valuable brands in Russia. The Beeline brand was estimated to be around US\$5 Billion, about half of the value of the company. The Beeline brand carries the promise of being simple, bright, friendly, effective, and an association of a positive experience. The quality of the IT implementation is an important part of this brand equity. The customer can have a positive experience from the company only if the company’s systems are fast and reliable.

Vypelcom’s IT Department turned to Sun for state-of-the-art technologies like the Sun Fire T2000 server to help maintain their positive image. They chose the Sun Fire T2000 server after conducting an internal test in which the Sun Fire T2000 server outperformed their eight-processor Sun Fire V880 server by 30 to 40 percent. Since the Sun Fire T2000 is one-tenth the size of the Sun Fire V880 server and uses 3-4 times less power, this was a big win for Vypelkom. It’s also worth noting that these performance gains were achieved by simply moving their Solaris 8 applications to Solaris 10 without any recompilation or other modifications.

“Multiple performance growth with reduced power consumption is what any system administrator and IT professional can dream about,” said Vladimir Phillipov, Vice-President, and IT Director at Vypelkom.

Get started now with a risk-free trial

Take the first step toward a more efficient application 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 to find out more information on all of Sun's Web infrastructure solutions, go to sun.com/newheights