SPARC hardware and the Oracle Solaris operating system: High-performance engine for mission-critical apps

COMPLETE POWER

BY DIANA REICHARDT

SPARC processor based hardware has been powering IT solutions for more than 20 years. Designed to scale up and known to consistently provide a high degree of reliability and availability under broad workloads, SPARC processors power big systems for companies with big problems to solve. Most customers that rely on the SPARC/Oracle Solaris platform for their mission critical applications have been doing so for years, because as the SPARC processor evolves, customers benefit from the performance gains of the advanced chip designs in a nondisruptive way. In fact, businesses around the world are running more than 11,000 applications on the SPARC platform and the Oracle Solaris operating system to deliver the highest quality and most efficient solutions internally and to their customers.

Eagle Investment Systems' clients demand stability and availability for their mission-critical applications, and enterprise-class servers based on SPARC64 deliver, says Steve Taylor, architecture and technology division director at Eagle.

Among those businesses is Eagle Investment Systems, a leading provider of financial technology solutions that has been using the SPARC/Oracle Solaris platform since 2001. Serving many of the world's most prominent financial institutions, Eagle has been providing a complete middle- to back-office software solution for data management, investment accounting, and performance measurement to the global investment management industry for the past 15 years. Eagle's applications are available on a direct subscription model or through Eagle's hosted offering, Eagle ACCESS, a secure private cloud infrastructure anchored by UltraSPARC- and SPARC64-based computers running Oracle Solaris 10. This advanced computing platform provides capacity on demand during critical data-processing workloads such as daily pricing and reporting.

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—Steve Taylor, Architecture and Technology Division Director, Eagle Investment Systems

"We need to service a wide range of clients where scalability and availability are paramount, while being sensitive to cost pressures," says Steve Taylor, architecture and technology division director at Eagle. "Eagle technology facilitates more-timely access to critical investment information. Our mutual fund clients price their funds daily, and they are exclusively using Oracle Solaris 10 right now because it's designed for mission-critical applications that require rock-solid stability and predictable performance."

DESIGNED TO SCALE

The Eagle application can be easily configured to take advantage of the specific hardware and is a key part of the design and deployment process to assess the workload, service-level agreements, and the shape of the data. The majority of Eagle's Oracle customers use systems based on SPARC64 and UltraSPARC processors running Oracle Solaris because of the compelling price/performance capabilities of those products. "Enterprise-class servers based on SPARC64 give them the scalability and the stability that they require for their daily operations," Taylor says.

For example, large mutual funds, portfolio managers, and some of the fund administration providers—including Eagle's parent company, BNY Mellon—benefit from Oracle's SPARC Enterprise M-Series systems with SPARC64 VI/VII+ processors in their daily accounting operations because of that scalability and stability. On the other hand, for a large wealth management shop that has hundreds of thousands of accounts, it's important for the processor to be able to execute multiple threads in parallel to drive high levels of concurrency—keeping throughput levels high. These customers are better suited to Oracle's SPARC T-Series systems, where concurrency is paramount. Being able to match hardware to application configuration and the shape of the data is key.

"Being able to utilize parallel threads in the CPU is critical to us, and this is where the SPARC/Oracle Solaris combination excels," adds Taylor. "It's a trusted platform with a high degree of engineering talent supporting it."

And the integrated engineering effort behind SPARC, Oracle

DAVE BRADLEY

Oracle Solaris Binary Application Guarantee Program

The Oracle Solaris Binary Application Guarantee Program, introduced by Sun in 2000 and continued by Oracle after its 2010 acquisition of Sun, supports the binary compatibility of applications developed on the Oracle Solaris operating system. The program is designed to provide assistance so that eligible Oracle Solaris applications running on Oracle Solaris 2.6, 7, 8, or 9 will run unchanged on Oracle Solaris 10, taking full advantage of new and advanced Oracle Solaris features.

If an eligible application experiences compatibility problems running on Oracle Solaris 10, the program commits Oracle to help in analyzing the problem and providing the appropriate remedy as set forth in the Oracle Solaris Binary Application Guarantee Program terms and conditions.

For a brief overview of the program, download the "Oracle Solaris: Binary Application Guarantee Program" document at bit.ly/g75aJT.

A Brief History of SPARC

Decades of continuous innovation from Sun, Fujitsu, and Oracle

SPARC—a name derived from scalable processor architecture—is a reduced instruction set computing (RISC) processor architecture developed by Sun in 1984. The following are key SPARC release milestones.

1986: Sun creates the first SPARC processor.
1987: Sun ships the first SPARC workstation using the SPARC processor.
1992: Sun ships SuperSPARC, the first multiscalar RISC chip with symmetric multiprocessing.
1995: The UltraSPARC I microprocessor, the first 64-bit microprocessor from Sun, is introduced.
1997: Sun releases the UltraSPARC II, which adds critical enhancements to boost data bandwidth and improve floating-point and multimedia performance.
2001: Sun releases the UltraSPARC III, with optimized instruction fetch, store bandwidth, and data prefetching.
2004: Sun ships the first dual-core SPARC processor, the UltraSPARC IV.
2005: The UltraSPARC IV+ processor ships, featuring enhanced processor cores and an on-chip L2 cache.
2005: The multicore and multithreaded UltraSPARC T1 is released, with an 8-core chip multithreading system capable of processing as many as 32 threads concurrently.
2007: Sun releases the UltraSPARC T2 processor. The first 64-thread processor, the UltraSPARC T2 boasts the industry's first massively threaded "system on a chip" with integrated networking, integrated PCI Express, and embedded wire-speed cryptography.
2008: Fujitsu releases the SPARC64 VII, a quad-core processor featuring two-way simultaneous multithreading.
2010: Fujitsu announces the SPARC64 VII+, providing performance improvements over the SPARC64 VII processor.
2010: Oracle introduces the SPARC T3. The world's first 16-core, multithreaded server processor, the SPARC T3 includes built-in cryptography, 10 Gb Ethernet, and integrated Gen 2 PCI Express.

Solaris, and Oracle's database, middleware, applications, and more is just getting started.

"Oracle now has the operating system, processor development, virtualization software, and applications all within one company, with each unit striving to move the performance ball forward," points out Rick Hetherington, vice president of hardware development at Oracle. "For example, the operating systems will be able to recognize critical threads in our applications and assign them to a dedicated processor core to achieve the very highest performance for specific workloads. This will enable customers to make much more efficient use of their IT resources."

While Oracle develops new hardware and software products, Eagle continues to look for the highest performance and efficiency from its SPARC-based solutions. "We've worked collaboratively with Sun and Oracle over the years to identify performance improvements and to take advantage of new features when they become available," says Taylor.

ROAD-TESTED FOR RELIABILITY

Ask Hal Moretto, director of database platforms at SunGard's Availability Services division, what keeps him up at night, and the first thing he will tell you is "high availability."

Downtime isn't an option when your company's IT infrastructure manages more than US$25 trillion in investment assets and processes more than 5 million trades each day. That's the processing load that financial intermediaries turn over to SunGard, one of the world's leading software and technology services companies.

In addition to software and processing solutions, SunGard provides disaster recovery services, managed IT services, information availability consulting services, and business continuity management software, serving 25,000 customers in 70 countries across virtually all industry and government sectors. As colocation and managed services gain in popularity, SunGard is also expanding into new technologies with cloud offerings and advanced recovery solutions.

"We do recovery services. We'll either manage a customer's facility or we'll manage a customer's equipment or applications within our managed services centers," Moretto explains. "If we have an issue, I want to know if we have a solid backup. Can we restore it? Are we doing our best from a security standpoint? And how are we doing performancewise?"

With a focus on supporting SunGard's internal business systems, Moretto's team is responsible for SunGard's internal Oracle E-Business Suite applications, the employee portal, and several internally developed and commercial applications, including Oracle's Hyperion. The team also manages the infrastructure that supports the company's iStore implementation, which is used by SunGard's channel partners.

And Moretto's team does a lot of product testing. "We want to be our own best customer," Moretto says. "Several of our own products are key pieces of the infrastructure that we rely on and support today." The most important of these is SunGard's advanced recovery solution, Recoverpoint, which is set up to replicate data from the company's production sites in Philadelphia, Pennsylvania, to a new recovery facility in Carlstadt, New Jersey. As Moretto describes it, implementing that solution didn't happen overnight.

VIRTUALLY FAIL-SAFE

When he joined SunGard six years ago, Moretto explains, the company was already running its Oracle applications on Sun SPARC systems. But over the course of 15

SNAPSHOTS

Eagle Investment Systems
eagleinvsys.com
Location: Newton, Massachusetts
Industry: Financial services
Employees: 450
Oracle products and services: Oracle Database, Oracle Real Application Clusters, Oracle Enterprise Manager, Oracle Data Guard, Oracle VM, Oracle Solaris 10, SPARC64 processor, SPARC T-Series Servers

SunGard
sungard.com
Location: Wayne, Pennsylvania
Industry: High technology
Employees: 20,000
Revenue: More than US$5 billion
Oracle products: Oracle Database 10*g*; Oracle Real Application Clusters; Oracle Application Server 10*g*; Oracle WebLogic Server; Oracle Enterprise Manager; SPARC Enterprise M5000 servers; Sun SPARC Enterprise T5440, Sun SPARC Enterprise T5220, and Sun SPARC Enterprise T2000 servers; Oracle Solaris 10; Oracle VM Server for SPARC; Oracle Solaris Containers; Oracle E-Business Suite and Oracle Hyperion applications

Downtime is not an option for SunGard. The company depends on a combination of Oracle Real Application Clusters, SPARC Enterprise servers, and Oracle Solaris 10, says Hal Moretto, director of database platforms.

years, SunGard had accumulated a variety of classes of servers. "The configurations of these systems were so drastically different, it made our performance and QA testing a challenge," he explains.

So Moretto began a multiyear plan to enhance SunGard's infrastructure, addressing the storage, operating system, physical servers, database, and applications in use. He wanted a leading-edge platform that he could rely on to scale both internally and externally as additional servers were added to support SunGard's current and future needs.

With Oracle Solaris, SunGard was able to harden its servers at the operating system level, lock down processes, and lock down access controls and journaling with syslogging. When the company upgraded from Oracle Solaris 8 to Oracle Solaris 10, Moretto recalls, Oracle's application binary compatibility guarantee worked as advertised and the company had no issues with the operating system (see the sidebar "Oracle Solaris Binary Application Guarantee Program").

Next, Moretto started evaluating the servers. "We were looking at either the SMP [symmetric multiprocessing] model, with a single monolithic production type server, or an Oracle Real Application Clusters (Oracle RAC) infrastructure," says Moretto. "The Oracle RAC enhancements between Oracle9*i* Database and Oracle Database 10*g* were immense, and after we upgraded to Oracle 10*g*, it was an ideal fit. At that point, we decided our best option would be to configure from that single large server type model to an Oracle RAC cluster."

The solution Moretto and his team implemented uses Oracle Database 10*g* with Oracle Application Server 10*g* and Oracle WebLogic Server. This integrated platform supports SunGard's Oracle E-Business Suite environment along with some of the company's critical in-house developed systems. It runs on a four-node Oracle RAC configuration based on four of Oracle's SPARC Enterprise M5000 servers running Oracle Solaris 10, and it utilizes Oracle's Sun SPARC Enterprise T5440, Sun SPARC Enterprise T5220, and Sun SPARC Enterprise T2000 servers, all running Oracle Solaris 10, for its applications and Web services.

SunGard is also taking full advantage of the virtualization capabilities in Oracle VM Server for SPARC and Oracle Solaris Containers. The company's Oracle E-Business Suite environment uses two physical Sun SPARC Enterprise T5220s with a load balancer in front, giving SunGard the ability to have sessions going to individual logical domains or to individual virtual servers on those two physical SPARC systems.

"When we went live, I could not have been happier with how well the equipment performed," Moretto says. "We've been up and running in an Oracle RAC environment for about a year and a half now, with no complaints."

SunGard's New Jersey datacenter, which is dedicated to colocation and managed

CATHERINE GIBBONS

SPARC in the Cloud

According to Jean S. Bozman, research vice president at International Data Corporation (IDC), the industry is moving "to the next level of cloud and virtualization technologies," where UNIX platforms such as Oracle Solaris–based SPARC systems will rise in prominence.

"You're going to see UNIX more often in these scenarios because people are asking their cloud services to do more," Bozman says. "Early cloud deployments were mainly designed to support remote workers, along with collaboration, e-mail, groupware, and application development. But as cloud services become enterprise cloud services, we see more demand for line-of-business applications, financial applications, and online databases, and customers will need more-powerful and more-scalable server platforms."

UNIX servers have been fully virtualized for many years, and virtualization is a key way to enable a platform to provide cloud services, Bozman points out. "As end-user demand grows, these platforms can service a cascading wave of requests on an as-needed basis, by provisioning more capacity. And they can do that with high levels of security and availability—both of which are top requirements for next-gen cloud deployments, IDC studies show. That's why we expect to see more UNIX servers in private cloud settings."

What's Ahead for SPARC

When Sun launched the first SPARC T-series processor in 2004 and 2005, the goal was to keep a predictable pace of new products releasing about every 18 months, says Rick Hetherington, vice president of hardware development at Oracle. "I think if you look at the roadmap, we're pretty close to that," says Hetherington. "The SPARC T3 [released in 2010] is a follow-on to the SPARC T2 processor: we doubled the core count, and that doubles the thread count on a per-socket basis. We're building rack systems as well as bladed systems based on SPARC T3 technology. Going forward, the SPARC T4 processor is on track for delivery in 2011."

The SPARC T4 processor is on an accelerated release cycle for a reason, says Hetherington. "We wanted to get more single-thread performance into the SPARC T-series sooner rather than later. So we developed a new core for the SPARC T4 that combines throughput performance through threading as well as really high-speed single-thread performance. It's a breakthrough technology."

Another thing Hetherington's excited about is "what we are calling 'critical thread API,' or the ability of the operating system to recognize critical threads in our Oracle applications and assign them all by themselves to a single core." He explains that this allows the critical threads to run at the highest performance levels without competing with other less critical threads. "And those threads that aren't as critical get assigned at a lower priority," adds Hetherington, "but they can still take advantage of the threading capabilities we have on that core."

Five-Year Plan

When Oracle announced its SPARC roadmap at Oracle OpenWorld 2010, John Fowler, executive vice president of systems at Oracle, revealed a five-year trajectory for Oracle's SPARC servers that included 4 times the number of cores between 2010 and 2015, 32 times the number of threads, 16 times the memory capacity, 40 times the number of transactions per minute, and 10 times the number of Java operations per second.

"Core to the server design element for Sun for many years has been SPARC, the first volume 64-bit processor. It's about building mission-critical, high-performance systems for the enterprise," said Fowler during his Oracle OpenWorld keynote. "We're committing publicly . . . to at least double application performance every other year," he added, noting that this commitment comes with binary investment protection for customers, who are often "picking . . . business applications and running them for many years, expecting performance improvements throughout."

Supercluster

In December 2010, Oracle expanded its SPARC portfolio by announcing Oracle SPARC Supercluster, which combines Oracle's SPARC Enterprise servers, Oracle Solaris, Oracle's Sun ZFS Storage Appliances, and InfiniBand QDR for a complete infrastructure solution, enabling consolidation of mission-critical workloads, leading database and application performance, and fast deployment.

"Oracle made a significant commitment when it acquired Sun to go and invest in these [SPARC and Oracle Solaris] technologies," Fowler said during the SPARC Supercluster launch. "You're going to see us continue to execute on building up these core components and delivering the best possible technologies."

services, opened in October 2010, with the advanced recovery solution implemented by Moretto's team replicating data from the company's production environments in Philadelphia to the recovery facility in Carlstadt.

"What I really love about this solution is that it gives me peace of mind," says Moretto. "I tell people that in the event of a disaster or a problem, my data is within 10 minutes of concurrency, sitting 150 miles away. All of our data is sitting at the other datacenter, and within minutes these systems could be fully activated and functioning."

BUILDING TOMORROW'S POWER TRAIN

Moretto is looking forward to even greater advancements in the Oracle product family—including Oracle Enterprise Manager Ops Center, Oracle Solaris 11, and Oracle Exadata—now that Oracle is engineering hardware and software to work together. "It's nice having one vendor from top to bottom," he says.

The combined engineering teams from Oracle's hardware and software groups are now able to work together in new ways to improve system performance, adds Jean S. Bozman, research vice president at International Data Corporation (IDC). Bozman says that she expects to see "more examples of beneficial collaboration, using SPARC building blocks in the overall line of Oracle products." She goes on to say that this close collaboration was not possible before, "but now Oracle hardware developers and software developers can spot architecture bottlenecks as well as software issues when they are examining the minute details of processor design, applications, networking fabrics, and operating system code."

Oracle's Hetherington believes these technical synergies represent a huge advantage that no other technology company enjoys. "If the hardware team sees anomalous behavior, they can instantly consult with the Oracle Solaris group or our database experts to understand what is happening," he says. "Oracle's entire hardware and software stack is fully integrated and functioning quite well. And we are just beginning to see the benefits." ◀

Diana Reichardt is a senior writer with Oracle Publishing, specializing in server and storage systems.

NEXT STEPS

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a Q&A with Oracle Vice President of Hardware Development Rick Hetherington
oracle.com/us/corporate/innovation/innovator-hetherington-191304.html

about Oracle's SPARC servers
oracle.com/us/products/servers-storage/servers/sparc-enterprise

LISTEN to the podcast on Oracle Solaris and the SPARC Supercluster
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the SPARC Supercluster launch Webcast
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Oracle Executive Vice President of Systems John Fowler's Oracle OpenWorld keynote, *Evolving to the Efficient Datacenter*
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