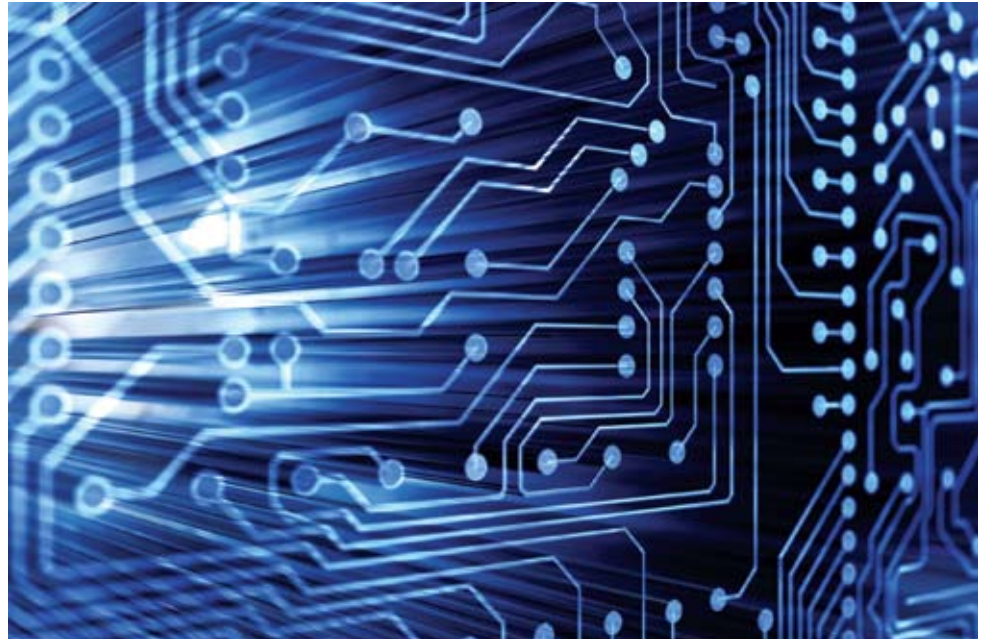


Sun Business Ready HPC for IC Design and Manufacturing

Solutions for higher productivity with EDA design tools



Highlights

- Scalable and efficient — optimized compute, storage, networking, and software components deliver maximal application performance
- Dramatically reduced complexity — fully integrated hardware and software eases deployment and use
- Breakthrough economics — Sun Open Network Systems architecture provides industry-leading price/performance
- Increased productivity — run more simulations and computational jobs, get more work done faster
- Fast deployment — factory integration and professional services available for faster, easier installation
- Reduced risk — preintegration and factory testing reduces installation issues

Target applications

- Functional verification
- RTL synthesis
- Physical verification and design for manufacturability (DFM)
- IC manufacturing — computational lithography, mask data preparation



Today's semiconductor companies, electronic design houses, and manufacturing foundries face new challenges with the growth in electronic design complexity, shrinking geometries, and the surge in storage and data requirements. They are constantly looking to find new ways to cope with this explosion in compute and storage requirements, while striving to remain competitive with faster time to market and higher margins. Sun's expertise and experience in high-performance computing (HPC) can help address these challenges. Sun's HPC solutions are built in conjunction with leading software vendors in the EDA industry to create specific solutions to address the needs of today's and tomorrow's EDA customers.

Increasingly complex designs along with changing industry trends, such as the shift to parallelism and multicore computing, are driving the need for improved performance, capacity, and resource management, without arbitrary architectural limitations. Electronics designers today are asking more from their tools and designs, leveraging the latest advancements in multicore chip architecture and technologies for added functionalities and superior performance. At the same time, effective resource management tools are needed that organize computational resources, optimize the usage of high-value EDA licenses, and simplify the management

of hundreds or thousands of individual heterogeneous systems.

Sun™ Business Ready HPC for EDA meets these challenges with scalable HPC infrastructure that is capable of supporting this massive growth in compute and storage needs. New levels of scalable performance are obtained with Sun Open Network Systems architecture by using optimized systems, innovative storage and file systems, high-speed networking, and a comprehensive software and management stack in an integrated and easy-to-use platform.

As a result, IC designers and manufacturers can execute EDA workflows with any mix of high-throughput, high-performance, large-memory, and I/O-intensive applications. This enables organizations to easily adapt to the growing demands of the design complexity, ensuring that investments made today will support future workload- and application-driven challenges.

Better electronics . . . to build better electronics

The Sun vision for IC designers and manufacturers is to provide them with open, integrated, end-to-end HPC and data management solutions that can help them speed up their EDA design cycles for faster simulations and quicker time to market.

Functional verification

Increases in the size and complexity of today's RTL designs have intensified the challenges of verification. This, coupled with the industry shift toward multicore architectures and parallelism, is further pushing the limits for raw compute cycles. These applications, which are now being rewritten to be multithreaded, typically are very compute intensive and are serviced by grid or cluster computing.

The Sun Compute Cluster uses its record-breaking x64 (x86, 64-bit) product line of blade and rackmount servers, based on AMD Opteron™ or Intel® Xeon® processor technology, with the option of using the Gigabit Ethernet (GbE) InfiniBand (IB) interconnect. It makes the perfect building block for the needs of functional verification. It can also accommodate Sun CoolThreads™ technology-based servers in the same chassis, all running seamlessly out of the same box based on customers' requirements of compute and operating system (OS) platforms. The Sun Compute Cluster integrated with Sun™ Grid Engine software,

Sun's distributed resource manager, can help achieve higher utilization, better workload throughput, and better end-user productivity with higher scalability — by optimal allocation and exploitation of existing resources and high-value EDA licenses — at a fraction of the cost of other DRMs.

RTL synthesis

The complexity of RTL designs has propagated down to intensify the needs of RTL synthesis tools as well. Today's synthesis tools need to support multicore architectures and fast runtimes, using advanced parallel and threaded capabilities to maximize efficiency. These are typically high-throughput, parallel applications that are both memory and data intensive.

Sun's compute solutions offer unmatched flexibility, outstanding capability, and better energy efficiency. And with up to 256 GB of RAM and up to 270 Gb/sec throughput, they provide twice the memory and I/O capacity of competing blade servers with industry-standard I/O — to ensure the highest end-to-end performance, eliminate network bottlenecks, and handle the most demanding throughput-hungry applications.

Physical verification and DFM

Shrinking geometries, increasingly sophisticated chip design, and the continuous struggle toward smaller, faster, and less expensive chips have necessitated stringent and more computationally intensive rule checks. These equation-based design rules, which are very complex and mathematical in nature, can be solved using HPC computing. These applications typically tend to be very compute and memory intensive. Sun HPC Compute Clusters are a perfect fit for such EDA workloads.



Figure 1. SunBusiness Ready Compute Cluster for EDA workloads.

Electronic design teams need dependable EDA solutions that effectively support product development efforts without interruption or delay. Project teams cannot afford downtime at critical points in the design cycle, such as the physical verification process. Sun Fire x64 server features, including redundant and hot-swappable components and built-in system management tools, help avoid service interruptions. In addition, Sun's focus on maximizing the power and cooling efficiencies of every Sun system helps reduce the cost of the overall engineering infrastructure.

IC manufacturing — computational lithography, mask data preparation

Shrinking process technologies and increasing design complexity have not only put a strain on the need for raw compute cycles and memory requirements but also pushed the limit for the storage systems on the far back end of the EDA design flow for processes like OPC and mask data preparation. Today's NAS storage networks for EDA are not able to support the massive file sizes and demanding throughput required as chips move from design to manufacturing, thereby reducing the aggregate performance across the cluster.

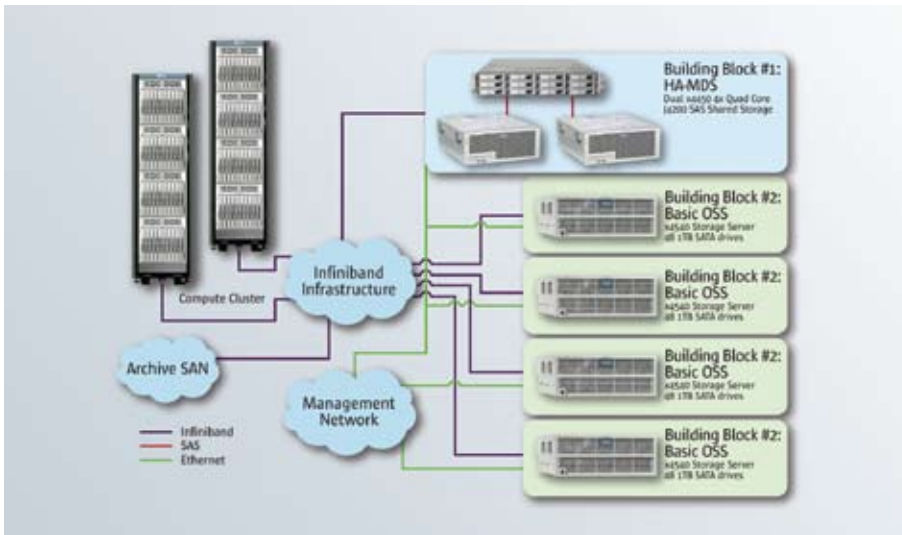


Figure 2. Sun Lustre™ Storage system for OPC and Mask data preparation.

Such I/O bottlenecks can be reduced using Sun's high-performance Lustre storage system. Built on the Lustre parallel file system, the Sun Lustre Storage system is a great fit for such incredibly complex and intense mathematical environments where multiple parallel nodes simultaneously access large files and perform calculations on the data at any given time. A performance improvement of at least 2.5x over current NAS networks in read and write speeds has been recorded for such a configuration.

Efficient and scalable application performance

With a host of world-record benchmarks, Sun™ Fire rackmount servers and Sun Blade™ systems, in combination with Sun Open Storage products, are especially suited to delivering application performance and scalability needed for today's and tomorrow's EDA applications. Sun's innovative servers combine the compute power and memory/data bandwidth required for DRC, OPC, extraction, and RTL synthesis, as well as the raw compute power needed for VHDL/Verilog simulation and RTL formal verification.

Sun's latest storage products deliver high-performance storage at up to 75% lower cost than traditional storage solutions. For environments with immense data storage requirements, the Sun Fire X4540 storage server is the first server designed for open-storage environments — with the highest throughput rate of 3 Gb/sec and 48 TB, in 4U of rack space — for twice the capacity in half the space at half the cost of the competition.

Making HPC for IC design and manufacturing easy

Sun Business Ready HPC solutions are designed to be easy to deploy, use, and manage. They are available as factory-built and -tested systems, so customers can expect reliability and out-of-the-box performance. By leveraging the Sun Compute Cluster and Sun Open Storage systems, you can quickly deploy infrastructure for IC design and manufacturing that delivers breakthrough economics, with the power to run and speed up more design simulations and bring new semiconductor devices to the market faster.

Sun Professional Services™ is available to provide the flexibility to customize solutions to specific application requirements. Sun provides a range of services to help enable successful deployments, including:

- Professional services — including project management and field installation support services for ongoing maintenance
- Sun™ HPC Quick Start Services — to make it easy for you to adopt, implement, and optimize HPC solutions, helping decrease deployment time by up to 80%

Sun Open Storage solutions

With growing complexity and next-generation process technologies moving toward 22 nm, it is expected that file sizes will continue to grow significantly, indicating how crucial HPC storage will be for IC design and manufacturing. Sun Open Storage Solutions for HPC use standard components and Sun-developed open-source software to deliver high-capacity, high-performance, high-reliability, simplified management, and exceptional value to EDA customers.

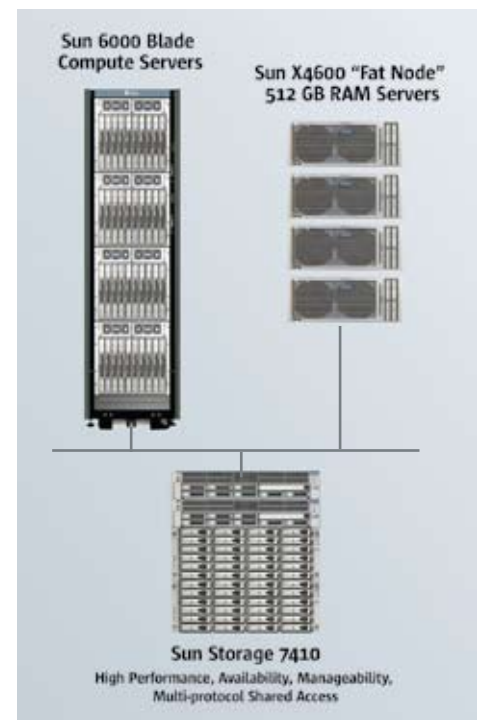


Figure 3. High Productivity EDA storage

Costly proprietary solutions lock you in and limit your ability to scale your infrastructure and adapt to changing business needs. Sun Open Storage solutions for EDA combine open-source software with industry-standard hardware, enabling you to reduce your reliance on high-priced systems and lessen your storage costs significantly. Solid-state drive (SSD) disks also dramatically increase performance while cutting power consumption by up to 80% compared to spinning disks. They're just what you need to reduce space and energy costs and improve scalability.

Sun's offerings include:

- **Flash technology-based storage** — The latest Sun storage solutions, including Sun™ Storage 7000 Unified Storage Systems, take full advantage of Flash technology and the ZFS™ file system to deliver high performance at one-fourth the cost of traditional storage solutions. Sun has also fully integrated Flash technology into its new Sun Blade, x64, and CoolThreads technology-based servers to help customers boost application performance without adding more servers or more high-speed disk drives to their HPC environment. Flash technology can be used with HPC applications to accelerate hot data files, alleviate the need to overbuy disks for performance, reduce the need for installing large memory pools in compute nodes, and accelerate processing, to churn out the most from high-value EDA licenses.
- **Network storage** — For home directories and shared scratch on small HPC clusters, Sun Storage 7000 Unified Storage Systems offer tremendous performance, scaling, reliability, and ease of management at a

fraction of the cost of traditional NAS filers. They utilize Hybrid Storage Pools and the ZFS file system to provide high-performance NFS storage with industry-leading throughput and price per gigabyte of capacity.

- **Parallel storage** — For scalable environments with thousands of cores that need fast I/O for high-throughput applications such as mask data preparation, OPC, and other applications at the back end, the Lustre storage system uses an easy-to-deploy, modular architecture to scale from 1 GB/sec to 100 GB/sec of performance and from tens of terabytes to petabytes of capacity. It provides superior throughput for applications, as well as access to a single global name space. Based on the Lustre file system and Sun Open Storage disk subsystems, it can deliver I/O performance in excess of 100 GB/sec.
- **Archive storage** — To address the escalating cost of storing large volumes of HPC data, Sun has a complete line of tape and archive products and software solutions for archival management. Sun StorageTek™ tape drives and libraries provide power-efficient and cost-effective media for this purpose. Built around Sun StorageTek™ Storage Archive Manager software, the Sun Storage and Archive Solution for HPC provides automated, policy-based archiving and on-demand, transparent file retrieval, so the cost of building and managing large data repositories can be reduced through low power consumption, low-cost media, and reduced effort for data management and operations.

Learn More

To learn more about Sun Business Ready HPC for EDA, go to:
sun.com/solutions/hpc/industries.jsp

Sun and EDA

The industry shift to parallelism, the adoption of multicore systems, and consequently the surge in multithreaded EDA applications will continue to draw the industry closer to adopting more and more HPC to solve its problems. As a result, chip designers and manufacturers will seek new ways to use HPC technologies to cut costs while remaining competitive.

Sun Business Ready HPC offerings deliver no-compromise versatility that supports EDA applications with any mix of high-throughput, high-performance, large-memory, and data-intensive applications. These systems leverage the innovative Sun Open Network Systems architecture, open-source software, and high levels of systems integration to deliver unsurpassed performance and value. Sun HPC and storage systems are easy to deploy, manage, and use, so IC designers and manufacturers can focus on their core business issues and leave the task of architecting their IT infrastructure to the Sun experts.