



## CADENCE AND SUN MICROSYSTEMS

Incisive Xtreme Server Helps Speed the Completion of  
Breakthrough Processor Technology

“Adopting the Incisive Xtreme Server gave us the power and efficiency of a system-level simulation approach. We could identify and fix hardware and software bugs progressively, even before the design was taped out. In addition, we were able to work within a very aggressive schedule and avoid a few silicon respins.”

Jai Kumar, Design Verification Technologist, Sun Microsystems

### CORPORATE PROFILE

- Sun Microsystems offers a full-range of systems, including Sun Fire servers, featuring UltraSPARC processors, that set new industry standards for performance, space, and energy efficiency (for more information, visit [www.sun.com](http://www.sun.com)).
- In tandem with the development of UltraSPARC T1, Sun implemented the next phase of its OpenSPARC initiative by releasing hardware design specifications, EDA tools and a Solaris port for the processor. The OpenSPARC T1 design is available to everyone at [www.opensparc.net](http://www.opensparc.net).

### DESIGN CHALLENGE

- Develop the highest throughput and most eco-responsible processor available
- Employ a verification platform that could eliminate costly respins and accelerate project completion

### CADENCE SOLUTION

- Seamlessly integrated simulation, acceleration, and in-circuit emulation into a single verification environment

### CADENCE PRODUCTS AND SERVICES

- Incisive® Xtreme® Server

## FORGING A COOL APPROACH FOR A HOT SERVER MARKET

In recent years, energy efficiency in the data center has escalated to the top of many companies' IT priority lists. By lowering power consumption, large IT organizations can significantly reduce their cost of ownership. As a result, there is now pressure on technology vendors to deliver a new set of “green” solutions capable of simultaneously delivering increased performance and energy efficiency.

Sun Microsystems has a rich history in processor innovation marked by its SPARC® and UltraSPARC® product lines, which have for many years been central to the design of the company's powerful servers. The company has responded to the call for a high-performance, energy-efficient solution with its CoolThreads™ technology, built into the UltraSPARC T1 processor that powers the Sun Fire

T2000 and T1000 server family. Drawing about as much power as a light bulb, UltraSPARC T1 delivers an unprecedented 32 simultaneous processing threads while providing the best performance per watt of any processor available.

## MEETING A DAUNTING VERIFICATION CHALLENGE

The design team at Sun knew a traditional software-based simulation approach to verification would stall their schedule, an unacceptable option. "The development of a highly complex processor like this could easily take five to seven years using traditional software verification techniques," said Jai Kumar, Sun's Design Verification Technologist. He explained that the chip introduced new levels of complexity because for the first time ever, the processor featured eight processing cores with four threads per core, resulting in 32 simultaneous threads of program execution. "Essentially, it's like 32 CPUs running simultaneously," said Kumar. "The complexity of verification goes up dramatically. We could not have done the project in a timely manner running software simulators alone."

To verify this next-generation advanced processor design while meeting an aggressive schedule, the verification team needed a new approach that would allow them to capitalize on the power of accelerators. Sun employed the Incisive Xtreme Server, capitalizing on the platform's unique ability to seamlessly integrate simulation, acceleration, and in-circuit emulation in a single verification environment.

The team used the Xtreme Server to run very long random tests and boot the Solaris Operating System prior to committing the design to silicon. "The Xtreme technology complements Sun's

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verification methodology, which includes in-house tools designed to leverage commercially available simulation, acceleration, emulation, and formal verification technologies," added Kumar.

## INCISIVE XTREME SERVER PUTS THE POWER OF HARDWARE ACCELERATION TO WORK

The Sun verification team cited ease of use and flexibility as key features of the Incisive Xtreme Server that helped them to save months on the project. "With all factors considered, including a new level of verification performance, I estimate that we cut the development cycle roughly in half," said Kumar. "We were able to run long simulations with a lot of random tests," he added. "The Xtreme platform allowed us to map the UltraSPARC T1 processor design to the underlying Reconfigurable Computing Processor and do things like boot our Solaris operating system even before design tape-out."

The Sun verification team realized the power of the Xtreme Server in a series of highly productive iterations. "We ran random and directed tests, found multiple bugs, and fixed them in the hardware," Kumar explained. "When the firmware or boot code was ready, we ran that and fixed our hardware/software integration issues. It helped make the firmware and boot code a lot cleaner before the silicon. Adopting the Incisive Xtreme Server gave us the

power and efficiency of a system-level simulation approach. We could identify and fix hardware and software bugs progressively even before the design was taped out. In addition, we were able to work within a very aggressive schedule and avoid a few silicon respins."

The Sun team found the VCD-on-Demand feature of the Xtreme Server to be a great time-saver. The feature facilitates fast debugging by saving snapshots of the simulation session during execution, enabling designers to obtain signal waveforms for the precise window required without having to resimulate for days to get there again. "Our simulations are very long," said Kumar. "They range from 2 to 15 days, so the VCD-on-Demand feature came in handy. You can go directly to any checkpoint and get your signal waveforms. It speeds up the debug from days to just hours." The Sun team also took advantage of the suspend/resume feature on the Xtreme Server, which enabled them to suspend long simulation jobs on hardware to make way for short high-priority simulation or debug jobs.

Kumar said he valued the fact that the Xtreme Server helps bridge the gap between simulation and emulation. "Having a closely coupled software simulator along with the ability to hot swap simulation from the Xtreme software environment to Xtreme hardware and vice-versa greatly reduced our time to bring-up for new designs on the Xtreme platform," he said.

## RAISING THE BAR FOR VERIFICATION

Kumar said that with the Xtreme Server, the bar for emulation has been set higher. He said his team needs to continue taking verification performance to the next level, running more applications, with higher efficiency to meet the verification challenge of the company's next-generation processors. "We believe it's vital to find design bugs before they show up in silicon. We're far more confident we can do that with the Xtreme Server playing a major part in the process," said Kumar.

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