Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc.com

EVENT FLASH

Sun Launches Niagara 2 UltraSPARC CMT Processor

Jean S. Bozman Matthew Eastwood
Vernon Turner

IN THIS EVENT FLASH

This IDC Flash describes Sun's launch of the Niagara 2 processor, which is the second-generation UltraSPARC T-Series chip multithreaded (CMT) processor family. It analyzes the importance of this announcement to Sun and examines how this new processor may affect competition in the worldwide server market, especially in servers supporting Web-intensive, transaction-intensive, and high-bandwidth workloads.

SITUATION OVERVIEW

On August 7, 2007, Sun Microsystems announced the Niagara 2 processor, an UltraSPARC T2 CMT design that will ship this fall, nearly two years after the December 2005 introduction of Niagara 1 processors. The announcement builds on Niagara technology; Sun has publicly stated that sales of Niagara-based UltraSPARC T-series servers generated about $200 million in revenue in 2Q07 (the fourth quarter of Sun's fiscal year, which ended on June 30, 2007). IDC has not yet published Q207 server market data.

The Niagara-based systems have already begun to attract new customers as engines for Web 2.0 workloads associated with start-ups, hosting and co-location companies, service providers, and a new wave of telecom hardware supporting IP-based multimedia workloads — even as they provide next-generation capabilities to Sun's large installed base of UltraSPARC volume servers, supporting some degree of product churn as older SPARC-based systems are replaced within the customer base. Importantly, Niagara CMT SPARC-based systems will provide a new type of highly performant platform for a mix of workloads that has expanded into high-performance computing (HPC) and more traditional business applications, due to design changes since Niagara 1.

Sun Microsystems is an early provider of eight-core (octo-core) processor systems at a time when most providers are shipping dual-core or quad-core processor designs for general-purpose computing. This early-mover position was enabled through the acquisition of Afara Inc. in 2002, along with Sun's earlier investments in multithreaded processor and operating system designs and Sun's later tape-out of Niagara 1 in 2005. Niagara 1 was initially aimed at what Sun once called "network facing" workloads handling high-bandwidth, Web-intensive workloads. Sun later open sourced the Niagara 1 design (OpenSPARC) in a bid to build an ecosystem of technology adopters, board-level providers, and ISVs that would support CMT on their products, including telco-specific products and embedded products. More recently, the company spun out a separate Sun Microelectronics business unit as a means of attracting OEM sales of Niagara 1 and Niagara 2 designs by other companies. One important clue about how Sun plans to expand the CMT ecosystem is that Sun is now referring to the Niagara designs as "commodity" processors, suggesting that high-volume production is a possibility if other companies — such as system vendors or network equipment providers — join in supporting the CMT designs for their own products.

The second-generation product, Niagara 2, is built on the same SPARC V9 design that is used in the SPARC64 processors in Sun's scalable server line. It is an eight-core, 64-thread processor that preserves binary compatibility across the Sun Enterprise server product line, announced this spring. That extends Sun's scalability story for end customers looking to re-host existing Solaris applications on a variety of Sun server platforms, scaling from the edge of the network to the datacenter. Sun engineering and R&D investments evolved the Niagara 1 design, so that Niagara 2 aims to support a wider array of workloads than Niagara 1 while delivering higher throughput in an equivalent power envelope, resulting in enhanced performance/watt ratios. Niagara 2 is tackling high-performance computing and higher levels of security support for end-to-end Web applications across network domains. The binary compatibility with Solaris running on SPARC V9 is especially important to the Sun Enterprise line of servers, ranging from Niagara-based volume servers to midrange M4000s and high-end M8000s and M9000s based on Fujitsu Ltd.'s SPARC64 implementation.

In the brief history of the UltraSPARC T1 CMT processors, the thread count has doubled from four to eight threads per core. This results in support for 64 threads per processor, which is intended to fit with the Solaris operating system's longtime support for multithreading — and with the parallel streams of Web-generated requests coming in from the "edge" of the Internet in enterprises, service providers, and Web 2.0 companies. Two future technologies — Neptune for virtualization of network traffic and parsing to compute engines and Crossbow for support of virtualized software stacks — are planned as complementary to Niagara 2 processors. All of these Sun technologies are aimed at addressing what Sun terms "red shift" opportunities (referring to Doppler red shifts associated with stars accelerating their motion away from other stars) that consume compute resources rapidly, due to high-bandwidth workloads, new data-based workloads, and Web 2.0 dynamic content and search.

Filing Information: August 2007, IDC #208272, Volume: 1, Tab: Vendors

Enterprise Servers: Technology Markets: Event Flash

Just how customers will utilize the Niagara processors remains to be seen, in terms of workload mix. But it is already clear that what began in late 2005 with an emphasis on network-facing Web infrastructure and IT infrastructure workloads has broadened, over time, to include support for databases, business applications, and high-performance compute workloads. Indeed, early adopters evaluated many types of workloads on Niagara 1 systems, which were originally intended to support Web infrastructure and IT infrastructure workloads. The first generation saw more adoption of business applications and right-sized databases than was originally expected, and users leveraged Solaris containers to consolidate workloads onto Niagara-based servers. Many early adopters reported cost-savings in terms of reduced power/cooling costs and less data-center "real estate" required for new deployments of Niagara-based servers running consolidated workloads.

It is also clear that some applications were extensively piloted and tested before going into production because Niagara 1 presented a new chip design that was unproven for enterprise applications. For example, it was clear from the start that Niagara processors were not intended to run large corporate databases in a monolithic mode, in the fashion of more scalable SMP servers. Even so, some early Niagara server adopters have been working with scale-out deployments of smaller instances of databases, including MySQL or Oracle, especially as persistent data stores for Web-enabled multi-tier applications. Alternatively, Niagara servers running application workloads were deployed in multi-tier infrastructure that also included larger Sun servers, such as midrange or high-end systems, to run the very largest databases.

Importantly, deployment of HPC workloads had awaited further technical change. In Niagara 2, Sun addressed the need to improve floating-point performance, which is essential for HPC workloads and was not a design goal for Niagara 1. Now, Niagara chips can be used in HPC grid computing deployments. Sun is also providing SPEC-fp benchmarks to demonstrate this new capability. Support for security, via on-chip cryptographic accelerators, has also been enhanced compared with Niagara 1, which should work to enhance identity management and authentication components of end-to-end Web-enabled applications, as well as secure file systems and document archiving. Other highlights of the announcement include on-chip integration of dual 10GbE port components, housed directly on the Niagara 2 processor; support for clock speeds of 1.2 and 1.4GHz; on-chip 4MB L2 cache; support for up to 512GB of memory and up to 64 fully buffered DIMMs; support for PCI Express (PCIe) directly on chip to reduce latency and speed I/O performance; and support for energy-efficient power/cooling features for rack-optimized servers and bladed servers.

FUTURE OUTLOOK

Sun Microsystems has gained valuable experience from its first-generation eight-core, 32-thread Niagara 1 (UltraSPARC T1) processors, with adoption in telecommunications, financial services, government, and Web 2.0 companies, including start-ups hosting dynamic Web content, such as video streaming and graphics. Now, with an eight-core, 64-thread processor in Niagara 2, Sun is driven by a vision that it is a leader in providing process engines for the next wave of Web-enabled workloads — and by its intent to carve out its role in the broader market space, as it expands its total available market (TAM) with technology attracting new customers.

With other processor providers (e.g., IBM, AMD, and Intel) aiming at the same goals of dense multicore processor technology and workload consolidation, Sun will need to keep advancing the technology and investing — even as it seeks to trim R&D costs and operational costs to grow its profit margins in calendar 2008. That will require close attention to the design process itself and to product execution from initial design through working with partners that will fabricate the semiconductor parts.

All of this will happen as semiconductor providers move to 45nm, and later 32nm, semiconductor processes. IBM, the largest RISC processor competitor to Sun, has introduced quad-core modules (QCMs) in POWER5+-based servers. IBM has the capacity and deep pockets to move to higher core counts as a challenge to Sun's dense multicore processors. IBM will likely favor head-to-head competition between POWER and Niagara, while IDC believes it is possible that Sun's joint marketing relationships with AMD and Intel on servers may lead to a more nuanced cooperation/competition story there. For Niagara, Sun partners with Texas Instruments to fabricate the Niagara 2 processors that Sun's engineering team designs, and this will be true for the future Rock CMT SPARC processors as well. The rapid evolution of processor technology raises the question of whether Sun will be interested in a future "coopetition" relationship with other semiconductor manufacturers — some of which are already partners for Sun systems products — to leverage R&D for future Niagara products.

Sun is clear about the demands of the next stage of CMT technology in terms of R&D, which it discussed in its July quarterly call with financial analysts. The need to keep Sun's corporate costs in line, even as the company develops and launch new products like Niagara 2, was clearly communicated to Wall Street, as Sun posted a $0.09-per-share profit for its fiscal 4Q07, which ended June 30 — Sun's most profitable quarter since 2001. Maintaining that balance between investing in new technology and reaping the profits that come from new and differentiated products will be top-of-mind priorities for Sun's executive team in coming months.

At the same time, as Niagara systems expand into new workloads, future success will be heavily influenced by the willingness of traditional Solaris ISVs to optimize their software to leverage the features of these new systems. Customers will need to speak in a loud and clear voice, as they highlight their interest in using CMT technology, to help the ISVs understand the business impact of this new technology (e.g. workload consolidation and energy savings) in the enterprise marketplace.