

Bulletin

Sun's "Midframe" Launches Ramp-Up in UltraSPARC III-Based Servers

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IDC Opinion

How will Sun Microsystems' launch of new midrange servers affect the dynamics of the overall midrange server market? What does the ramp-up of UltraSPARC III-based Sun Fire servers mean to Sun's business?

Sun has migrated advanced software functionality that brings enhanced system manageability and "controllability" into its midrange server line. The move acknowledges that, for many IT sites and service providers (xSPs) with no mainframes in the data center, a midrange server is the "high-end" server of choice. At the same time, Sun's ramp-up of the new UltraSPARC III-based servers brings new performance, speed, and improved I/O to Sun's midrange servers, encouraging Sun's installed base to "move up" to the new models. Sun rivals IBM, Hewlett-Packard, and Compaq are sure to answer this announcement later in 2001 as the "battle of the midrange" heats up. That's why there is no "turning back" — Sun must deliver on the promise of its new UltraSPARC III technology or face some erosion of its number 2 market position, gained during CY00, in the worldwide server market.

Announcement Highlights

On March 21, Sun Microsystems announced new models in its midrange server line. (IDC defines entry servers as those priced up to \$100,000; midrange servers as those priced from \$100,000 to \$1 million; and high-end servers as those priced at \$1 million or more.)

Sun has called these new Sun Fire computers “midframes” to underscore the arrival of advanced software that provides improved manageability, controllability, reliability, and availability on these midrange systems. Improved reliability is a key component of 24 x 7 operations for Internet infrastructure.

As it has in other recent announcements, Sun has targeted the requirements of service providers (xSPs) that are turning into very important customers because they are actively building out their “Internet infrastructure” on behalf of their customers’ Web-serving and ecommerce computing environments.

At the same time, Sun is aiming its new midrange servers at traditional IT organizations that want to acquire more horsepower for traditional applications and Web-enabled applications. These IT organizations may feel that Sun’s high-end Enterprise 10000 systems, priced at \$1 million or more, are out of their financial reach.

Hardware Specifications

The new systems are based on Sun’s second-generation 64-bit UltraSPARC III RISC microprocessor, which runs at 750MHz to 900MHz. IDC notes that the systems were originally code-named the “Serengeti” servers, based on the new “Cheetah” microprocessor. Initial shipments will have the 750MHz version of the UltraSPARC III microprocessor; servers based on the 900MHz version are due to ship later in 2001. At the March 21 launch, Sun stated that it had already manufactured 500 of the new Sun Fire servers; it expects to ship thousands more in Q101.

Sun will continue to sell the existing Enterprise midrange models — the Enterprise models 3500, 4500, 5500, and 6500. On April 18, Sun announced it would reduce prices of the UltraSPARC II-based models by up to 16%. Their continued sale will allow for a more gradual ramp-up to UltraSPARC III than would otherwise be the case, because not all of the new orders for Sun’s midrange servers will require the use of the new UltraSPARC III chips.

IDC also notes that customers must buy a new Sun server in order

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to get the UltraSPARC III processors; they cannot add UltraSPARC III processors to an existing UltraSPARC II-based server system. UltraSPARC III processors also require the use of Sun's Solaris 8 operating system, rather than older Solaris versions, such as Solaris 2.6 or Solaris 7.

The continued sales of these older midrange models will result in lower prices for the older technology, as the transition from UltraSPARC II to UltraSPARC III takes place over the next few quarters. This will provide a wider range of price/performance choices to Sun's installed base, as well as to new customers worldwide.

Details on the new Sun Fire servers, by model number, follow:

- **Sun Fire 3800.** This system houses 2 to 8 processors, with up to 64GB of memory; up to 12 cPCI cards (a new kind of PCI slot used by telecommunications companies and xSPs); and 1 or 2 Dynamic System Domains. It is aimed at front-end Web-hosting, email-serving, business applications, and high-performance compute farms. The system's Fireplane interconnect runs at 9.6GBps sustained and offers an aggregate system bandwidth of 24.0GBps. When configured with 2 750MHz UltraSPARC III processors and 2GB of memory, the 3800 is list priced at \$73,195. A 4-processor Sun Fire 3800 system, when configured with 4GB of memory, is priced at about \$175,000.
- **Sun Fire 4800.** This system is available as a rack-mountable server or as a standalone server. It houses 2 to 12 processors, with up to 96GB of memory; up to 16 PCI cards; and 1 to 2 Dynamic System Domains. It supports dynamic reconfiguration and the Hot CPU hot-pluggable upgrade capability. The system's Fireplane interconnect runs at 9.6GB sustained and offers aggregate system bandwidth of 33.6GBps. When configured with 2 750MHz UltraSPARC III processors and 2GB of memory, it is list priced at \$129,995. An 8-processor system, when configured with 2 CPU/memory boards (containing 4 UltraSPARC III processors on each board) and 8GB of memory, is priced at about \$365,000.
- **Sun Fire 4810.** This rack-mounted system houses 2 to 12 processors, with up to 96GB of memory; up to 16 PCI cards; and 1 to 2 Dynamic System Domains. It supports dynamic reconfiguration and the Hot CPU hot-pluggable upgrade capability. By design, all of the components can be replaced from the front of the rack. It is intended for use in IT or SP sites when space is at a premium. All 4810 servers can be placed back to back, or within inches of a wall, because all of the components may be maintained without access to the back of the server unit. The system's Fireplane interconnect runs at 9.6GB sustained and offers aggregate system bandwidth of 33.6GBps. When configured with 2 750MHz UltraSPARC III processors and 2GB of memory, it is list priced at \$129,995. An 8-processor system, when configured with 2 CPU/memory boards (containing 2

UltraSPARC III processors on each board) and 8GB of memory, is priced at about \$365,000.

- **Sun Fire 6800.** This system houses 2 to 24 processors, with up to 192GB of memory; up to 32 PCI cards; and 1 to 4 Dynamic System Domains. The system's Fireplane interconnect offers 9.6GBps sustained I/O and aggregate system bandwidth of 67.2GBps. When configured with 2 750MHz UltraSPARC III processors and 2GB of memory, it is list priced at \$250,995. A 12-processor system, when configured with 3 CPU/memory boards (containing 4 UltraSPARC III processors on each board) and 12GB of memory, is priced at about \$590,000.

The Sun Fire servers run the Solaris 8 release of the Sun Solaris operating system, which is a version of Unix. Older applications are binary compatible with the new hardware, but customers have to take administrative actions to move to Solaris 8 from an older release, such as Solaris 2.6 or Solaris 7.

The new Sun Fire 3800, 4800, 4810, and 6800 ship immediately; the dynamic reconfiguration system-management software is due to ship in late 2001.

Snapshot Analysis

Sun's splashy New York City launch of its "midframe servers" represents the second big "wave" of Sun's UltraSPARC server history. The first big wave began with the April 1996 launch of servers based on the UltraSPARC II chip: the UltraEnterprise line of 3000, 4000, 5000, and 6000 servers.

The March 21 launch also represents the ramp-up of Sun servers based on brand-new UltraSPARC III technology. Sun had introduced two UltraSPARC III-based products in September — the SunBlade workstation and the Sun Fire 280R server — but the 280R had shipped in limited quantities during 4Q00, Sun said.

Sun's server history stretches back to the late 1980s, with the 670 and the 690 based on SPARC chips, and to the early 1990s, with the popular SPARCserver 1000 and the scalable SPARCcenter 2000 outfitted with up to 20 SuperSPARC processors. The well-known StarFire was originally called the UltraEnterprise 1000 when it first shipped in January 1997; an enhanced version is now sold as the Enterprise 10000 (E10000). Starfire development originally began with the Business Systems Division of Cray Research, which had shipped a Solaris/SuperSPARC-based CS6400 64-processor SMP system in 1996. This system's design was enhanced, marketed, and sold by Sun (after it acquired the Cray division in 1996) as the Starfire UE10000.

The new Sun Fire servers show the synthesis of Sun's knowledge about day-to-day systems operations in both the IT and xSP customer spaces. The Sun Fire servers are more powerful than Sun's earlier midrange servers; they are also more manageable and much easier to maintain by means of on-the-fly, hot-swap hardware changeouts and improved systems monitoring software.

Sun claimed that the high level of redundancy supported by the Sun Fire systems, along with a highly efficient Sun FirePlane interconnect, lend support to its contention that the new servers provide mainframe-like resilience and high levels of availability for business and ecommerce applications.

Sun Fire marketing will be aimed primarily at two categories of purchasers: traditional IT organizations that are moving to a “bricks-and-clicks” business model that provides Internet-enabled services to end users and xSPs that are adding Internet infrastructure to support data services on behalf of their business and end-user customers.

Speeding Up Both CPUs and I/O

This new “wave” of UltraSPARC servers — based on UltraSPARC III chips — brings a significant speedup to the Sun midrange platform. The first of the new Sun “midframe” servers will have UltraSPARC III chips running at 750MHz. Faster versions of the UltraSPARC III, running at 900MHz, are due to ship later in 2001.

That is good news for longtime Sun users who had been using UltraSPARC II chips running at 400MHz to 450MHz, which was noticeably slower than competing RISC chips running at 600MHz (IBM’s RS64 IV) to more than 700MHz (Compaq’s EV67).

Competing chips, including IBM’s POWER 4 and Compaq’s next-generation Alpha EV68 chips, will be moving to even faster speeds later this year and into 2002. Hewlett Packard’s PA-RISC 8600 runs at 552MHz today; the follow-on PA-RISC 8700 is slated to run about 50% faster than that when it ships later this year.

In the past, Sun had compensated for its slightly slower microprocessors by packing more of them into midrange servers than did its competitors. For example, Sun offered 30 CPUs in its Enterprise midrange systems to HP’s 16 CPUs in HP9000 V-Class servers and Compaq’s 14 CPUs in AlphaServers. Now, the effects of this speedup in UltraSPARC architecture can be seen: the most powerful server in Sun’s midrange line, the Sun Fire 6800, uses just 24 UltraSPARC III chips, and its throughput is more than that of the 6500.

System I/O has also been enhanced, which is especially important in I/O-centric xSP computing environments. The Enterprise servers’ Gigaplane had supported 2.6GBps, sustained, on the E6500, whereas the new FirePlane now supports 9.6GBps, sustained, on the Sun Fire 6800. The I/O rate for the E6500 was 3GBps, compared with the 6800’s 9.6GBps.

According to Sun, aggregate system bandwidths for the Sun Fire servers range from 24GBps to 67.2GBps (see product descriptions in the Hardware Specifications section of this bulletin). At the March 21 launch, however, Sun did not provide — for purposes of comparison — the aggregate system bandwidth range for the Enterprise series servers.

The Enterprise series was configured around a centerplane called the Gigaplane, running at 2.5GBps, sustained. Users had to decide on configurations that were weighted toward CPUs, or I/O slots, because there was a fixed number of total connections to the Gigaplane. The new systems do not force this tradeoff because standard configurations offer balanced solutions for different workloads. Moreover, users will be able to transfer workloads between system domains, allowing them to “resize” computing tasks, and to add or subtract the number of CPUs devoted to these workloads, as needed.

Moving Advanced Manageability to Lower Price Points

Sun has brought the domain-based approach to server workloads that first appeared on the UltraEnterprise 10000 to the new range of Sun Fire servers. At the same time, it has leveraged the advanced system-management capabilities that allowed administrators to move workloads between domains, as needed — and to contain operations faults, should they arise, within domains. Furthermore, dynamic reconfiguration software for the midrange servers, which is due to ship later this year, will allow workloads to be shifted automatically between domains.

In 1997, the UE1000's partitioning capabilities and dynamic reconfiguration software were a dramatic migration of mainframe functionality to high-end Unix servers. Now, in 2001, the move of dynamic reconfiguration to midrange machines illustrates the continuing march within the industry to bring high-end functionality to lower price points. (Even so, the high-end E10000 has up to 16 partitions, in contrast to the midrange Sun Fire 6800, which has up to 4 partitions.) It also shows how the technology is maturing and how user expectations about high availability have increased over time.

System Domains for Online Maintenance

All of the new midrange models support two or more System Domains, which Sun terms “Dynamic System Domains.” The Sun Fire 3800 has one or two domains, in contrast to the Sun Fire 6800, which has up to four of these System Domains. Customers have the option of moving computing workloads between domains, as needed. This allows growing applications to gain access to more CPUs and memory.

However, the accompanying dynamic reconfiguration software, which activates the most advanced levels of system-management functionality, is scheduled to ship in the second half of 2001.

Significantly, customers can isolate workloads within the domains so that new hardware components can be added while the system is still online without having to take the entire system down for maintenance. This capability is one that can be leveraged by xSPs to maximize uptime for servers, even though occasional hardware maintenance, such as replacement of components, may be needed.

Sun has done other things to ensure high availability on the Sun Fire midrange servers. Aware that customers were unhappy about the episodes of unreliability associated with the “ecache” on some of its UltraSPARC II chips, Sun has boosted error-correcting code (ECC) on UltraSPARC III chips. Additionally, a new error-isolation feature called the Uptime Bus has been added to the systems. Sun has included larger data caches to increase total application throughput: It has outfitted each UltraSPARC III chip with an 8MB ECC Level-2 cache.

All of the new Sun Fire models “phone home” via Sun Remote Services (SRS) to report their uptime status to Sun’s support centers. This allows ongoing monitoring of Sun Fire servers, and system administrators can be notified of any failing components before they cause downtime.

“Pricing Granularity” in the Midrange

By adding four new models (including the cabinet-based 4800 and the rack-mounted 4810), Sun has increased its overall midrange lineup to eight server systems. This could turn into a competitive advantage against its major commercial-server competitors: IBM, HP, and Compaq.

Sun may be holding onto the older midrange models, in part, to ease the transition to the new UltraSparc III chips. The other reason is that UltraSPARC II-based systems cannot be field upgraded to UltraSPARC III-based systems. Instead, users must order a new Sun Fire server in order to take advantage of the faster UltraSPARC III chips and their associated electronics.

Sun is betting that a big slice of its installed base is still interested in buying the older, proven UltraSPARC II systems. The acceleration in Sun’s server sales during CY00 helped to prove this thesis because the UltraSPARC II-based 3000, 4000, 5000, and 6000 designs were first introduced four years earlier and were enhanced two years earlier with the 3500, 4500, 5500 and 6500 model introductions. The aging of the UltraSPARC II architecture did not appear to dampen demand for Sun’s midrange servers throughout CY00. However, Sun’s 1Q01 results (Sun’s fiscal 3Q), which were announced on April 19, showed a slowdown in the level of Sun’s server sales. Factors contributing to this include reduced IT spending in the United States during 1Q01, the presence of many Sun servers in the used and leased markets, and Sun’s own product transition.

Customers should note that the list prices provided by Sun at its March 21 launch are for minimum configurations with 2 750MHz UltraSPARC III processors and 2GB of memory. Building up the systems with more processors, memory, and storage will push price levels higher. Furthermore, IDC notes that the faster 900MHz processors will not be shipped until later this year.

One important software point is that the new UltraSPARC III-based Sun Fire servers require the use of Solaris 8, which means a move-up in operating-system release for longtime Sun customers who are running Solaris 7 or Solaris 2.6 on their servers. In its March 21

announcement, Sun emphasized the upward compatibility of Solaris applications and the fact that older applications are binary compatible with Solaris 8. Nonetheless, users will likely have to take some administrative actions to move to Solaris 8 from older operating-system releases.

At the same time, the eight models present a wide range of entry prices to the first-time buyer and the repeat buyer. This high level of “price granularity” is a fact of life in the entry space, where each price band supports many market segments defined by feature/functions, form-factors, and CPU capacity.

IDC notes that this kind of pricing granularity is somewhat new to the midrange market, in which one to four models typically define a vendor’s midrange line. However, capacity-on-demand programs have gained popularity within the midrange and high-end server markets in the past two years. Capacity on demand, which originated in the mainframe’s “glass house” and moved into the Unix server market in 1999, allows customers to install systems that have built in extra processors. When customers need to expand the server’s capacity, they can notify the system vendor and they can “activate” the extra processors right away without waiting to schedule a service call. These seamless upgrades have, in effect, improved pricing granularity within the midrange space during CY00.

The Transition to UltraSPARC III

Sun’s move to UltraSPARC III has been anticipated for years, and the initial shipments of UltraSPARC III-based Sun Fire 280R servers was limited in scope. Thus, the volume ramp-up to UltraSPARC III will really take place now, in the first half of CY01.

Sun must ensure that there is a steady supply of UltraSPARC III microprocessors, which are designed by Sun and fabricated by Texas Instruments (TI). In the event that demand for UltraSPARC III outstrips TI’s ability to produce enough chips in coming months, Sun must also consider lining up alternate sources of these microprocessors, IDC believes.

An important launch of follow-on products for the E10000 high-end servers, priced from \$1 million, is also due in the near future. Although they did not provide the date when that launch would take place, Sun executives have said that it will occur later this year. IDC expects that the launch could take place as early as Sun’s new fiscal year this summer, or that it could occur sometime later this fall — in keeping with the industry’s history of saving its biggest product launches for spring and fall.

Because Sun is retaining the older midrange models for sale, it has the option of taking pricing actions to keep those models more attractive for sale. In fact, that is what Sun did on April 18, announcing price cuts of up to 16% for UltraSPARC II-based servers. This will be especially meaningful in regions of the world like Asia or Latin America that are building up their IT infrastructure at a faster pace than in the United States or in Western Europe.

At the same time, IDC expects that Sun will encourage its installed base to “trade up” to the UltraSPARC III–based systems. As described in the IDC bulletin *Sun Brings UltraSPARC III RISC Chip to Server Market* (IDC #23409, October 2000), Sun will take a series of actions to move its installed base “forward” to an UltraSPARC III technology base and to Solaris 8.

Several migration scenarios were outlined by Sun executives at Sun’s February 2000 analyst meeting. IDC notes that Sun could have modified these move-up programs since that time. As outlined in February 2000, these programs included:

- **Trade-in programs.** Sun will authorize its resellers to accept trade-ins of UltraSPARC II–based equipment at up to 25% trade-in value. An online “point” system allows users to consolidate their trade-in units. To speed trade-in transactions, return kits will be distributed to users.
- **Competitive upgrades.** Users who buy UltraSPARC III–based servers in place of servers made by other vendors will get discounts as part of a “competitive upgrade.”
- **Try-and-buy programs.** These will allow users to install Sun servers at their site for a limited time, with the option to buy them after the trial period has elapsed.
- **Leasing programs with Technology Refresh.** UltraSPARC III upgrades will be made available as part of existing Sun leasing programs.
- **Upgrade specialists.** These upgrade experts will be located in all major geographies to assist existing customers in moving up to UltraSPARC III technology.
- **Innovative financing.** This option is similar to one used by HP and by IBM to encourage the use of new technology long term by means of decreasing the short-term cost of bringing the new technology in-house.

Features Aimed at Service Providers

As it has demonstrated with its Netra entry servers, its Enterprise Series 220R and 420R rack-optimized entry servers, and its new Sun Fire 280R rack-optimized entry server, Sun has been paying extraordinarily close attention to the requirements of xSPs that have been buying new servers for Internet infrastructure in recent years.

Support personnel can “swap out” all components of the rack-mounted systems without having to walk around to the back of the server rack. This is a feature of the new server line that Sun calls the “front-accessible” maintenance of the server bays.

Sun’s close focus on rack-optimized servers is now moving into the midrange server space. Before this announcement, the Enterprise 3500 and 4500 servers were rack mountable. Now, two new rack-mountable servers have been added: the 3800 and the 4810. The 6800, in contrast, is built like a rack-mounted server but is a

freestanding box with up to 24 processors. IDC notes that the 4800 is a cabinet-based version of the rack-optimized 4810.

High availability has been of increasing importance to Sun customers, both in the IT space and in the xSP space. Accordingly, Sun has enhanced its existing HA products and services. In December, Sun announced its Sun Cluster 3.0 software, which can be used to create clusters for high-availability failover of workloads or for greater manageability of multiple server systems.

Additionally, the new Sun Fire servers have built-in Sun Remote Services (SRS) support, which links systems monitoring software on the installed servers to a central monitoring console at Sun's corporate headquarters. This "phone-home" feature, which can spot failing components and alert local system administrators to take action, represents a high level of preventive maintenance. Alternatively, workloads can be moved to other domains while repair work proceeds.

Competitive Analysis

Sun's midrange servers have put a "stake" in the ground for reducing the price points of highly available and controllable data-center servers. But IDC fully expects that IBM, HP, and Compaq will answer this midrange announcement in future quarters with their own platforms, manageability and clustering software, and capacity-on-demand upgrade programs.

On March 20, IBM announced enhanced clustering capabilities and the availability of a global file service that were previously only available on the RS/6000 SP parallel processing system. Now, these advanced software features, which compete with Sun Cluster 3.0 software, are being made available to IBM's p-Series Unix servers running AIX.

According to an HP server-group executive who was quoted in news reports, HP can be expected to announce a 16-processor midrange later this year. The 16-processor system is intended to fill in the gap between HP's N-Class 8-processor system and the SuperDome server, which has 32 to 64 processors. (HP still sells the older V-Class midrange servers with up to 32 processors, but has de-emphasized V-Class servers in its server marketing campaigns.) HP already has advanced system-management software for SuperDome, and it can be expected to enhance its midrange server software features over time, because both the midrange N-Class servers and the SuperDome servers (spanning the midrange and high-end categories) run the same HP-UX 11.X Unix operating system.

Additionally, IDC notes that Compaq's AlphaServers running Tru64 Unix can be divided into four partitions of eight processors each. Compaq already offers advanced clustering features, including a global, clustered file system and TruCluster software to manage the AlphaServer clusters.

IDC notes that SGI offers advanced 64-bit system functionality on its modular Origin 3000 servers, although most of these units address

the scientific/technical segments of the market rather than the commercial market. Nonetheless, SGI's Origin servers will compete with Sun for back-end Web hosting and for data-mining applications. This battle in the midrange stems from several factors:

- Midrange servers are the de facto "high-end" servers for many xSPs that are running low-cost entry servers in the front-end Web-server tier and in the application-serving transaction tier of their Internet data centers.
- Advanced functionality, including clustering, clustered file systems (or global file systems), partitioning, and resource-reallocation are all flowing to midrange servers from high-end servers, which is where these technologies were born.
- Intense competition on hardware platforms means that average hardware prices are falling for all categories of servers — entry, midrange, and high-end.
- User expectations about uptime and reliability are rising, spurred by the need to provide reliable data services to Internet end users on a 24 x 7 global basis.

Because outsourcing of Internet infrastructure build-out can be expected to occur, even during the economic downturn of 2001, Sun, HP, and IBM clearly see xSPs as the bright spots in today's IT landscape. Furthermore, traditional IT organizations want to acquire more horsepower for traditional applications and Web-enabled applications, but many feel that systems priced at \$1 million, or more, are out of their financial reach.

Upgrades within these midrange server lines are commonplace — and are almost inevitable — as more users are added to the systems or as databases grow. All of these vendors have capacity-on-demand programs, which allow customers to buy systems at lower prices and then to activate "instant" upgrades to boost capacity without scheduling a service call from a vendor's field support organization.

Thus, Unix midrange servers represent "scalable" computing, in contrast to entry servers, which can "top out" at four to eight processors. Indeed, it is this "midrange" server market that has been so elusive for the Windows/Intel-based server ranges from Compaq, Dell, HP, IBM, and others.

However, the notion that Windows 2000 servers are not shipping at midrange server price-bands (\$100,000 to \$1 million) will need to be amended during 2001 and 2002. Now, with Microsoft Windows Data Center shipping in volume, and with the wider availability of Intel-based systems with up to 32 processors from Unisys (CMP ES/7000) and IBM (NUMA-Q), the stage is set for Windows 2000-based midrange servers. This means there will be even more reason for suppliers of Unix servers to differentiate their midrange servers with advanced functionality and greater manageability than the Windows-based servers in their product lines.

Conclusion

Sun has a great opportunity to expand its current lead in Unix servers and its number 2 position in the overall server market (see *2000 Worldwide Server Market Year in Review*, IDC #23863, January 2001). To do so, Sun must execute well in an increasingly negative economic climate. It is important for Sun to ensure a ready supply of the UltraSPARC III microprocessors to adequately meet the demand that has been sparked by the Sun Fire launch. Finally, Sun must manage the expanded midrange lineup (with eight models instead of four) to reduce consumer confusion about which models to buy. If it can meet all these challenges, and meet them well, then Sun is off to another big round of building upon its enterprise server franchise.

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