

# Sun Previews Roadmap Through 2001

## *UltraSparc-5 at 1.5 GHz Signals Sun's Intention to Compete With IA-64*

by Keith Diefendorff

In June, Sun Microsystems shipped its one millionth UltraSparc processor, making Sun the leading supplier of 64-bit processors to the enterprise-systems market. Now Sun has released its roadmap through 2001, including two major new microarchitectures—all binary-compatible with the first UltraSparc—aimed at competing head-on with Intel's Merced, due in mid-2000, and McKinley.

Sun's roadmap defines three series of processors: the scalable S-series for high-end multiprocessor servers and workstations; the integrated I-series for volume desktop systems; and the embedded E-series for low-power embedded systems. As Figure 1 shows, new microarchitectures, labeled with odd numbers (US-1, -3, -5), are developed and deployed first in S-series processors, with derivatives trickling down into the I- and E-series.

At the top end, Sun is currently shipping a 360-MHz UltraSparc-2s, which is built by Texas Instruments in its 0.25-micron technology. Later this year, Sun will ship US-2s at 400 MHz as well as a US-2i at 360 MHz. Late next year, this processor will be remapped to 0.18-micron 18C07 (see MPR 9/14/98 p. 1) and delivered as the USe-400.

### UltraSparc-3 Behind Schedule

Last year at the Microprocessor Forum, Sun disclosed its US-3 processor based on its new six-issue in-order Cheetah pipeline with an IPC 1.3 times that of the US-2 pipeline. At that time, the company said US-3 would ship in early 1999 at 600 MHz. While still on target for 35 SPECint95, 60 SPECfp95 (base), and 600 MHz, the part has not yet taped out, and it now appears that the processor will not ship until late 1999. The delay has caused Sun to miss an opportunity to trump the Alpha 21264, which recently missed its performance targets by a whopping 25% (see MPR 9/14/98, p. 4).

US-3 will initially be built in TI's 18C07 process. By mid-2000, Sun will recast the US-3 as US-4, rendering it in TI's 0.15-micron 15C05 process, which will take the Cheetah pipeline to 750 MHz. In the final instantiation of Cheetah, TI will remap US-4 to its copper-based 15C05Cu, at which point Sun expects to exceed 1 GHz.

At this clock rate, US-4 should hold its own against the odds-on favorite—Merced—in the server market. By the time Merced ships, Sun expects to have six months of experience with very large—up to 1,000-processor—systems based on the US-3/4 microarchitecture. Sun is also counting on the fact that Merced will face massive OS and applications software hurdles, whereas Sun will have five years of compatible software behind it. Clearly, Sun is not ready to throw in the towel.

### UltraSparc-5 to Hit 1.5 GHz

Sun isn't stopping at one gigahertz. The company now has a 100-person team working on the next generation UltraSparc-5, code-named Millennium. Sun did not disclose details of the US-5 design other than to confirm that it would be a completely new pipeline but still V9 binary-compatible. US-5 is slated to ship in early 2002 and run at 1.5 GHz in TI's 0.12-micron 12C35 process. But, like many other vendors, Sun has had trouble delivering on plans. US-5 will have to compete with McKinley, Intel's second-generation IA-64 processor, which, by most accounts, will be formidable.

In late 2000, Sun will offer its first multiprocessor-capable integrated processor, based on the Cheetah pipeline, at 700 MHz. This seems strangely late for a company with Sun's multiprocessor inclinations and experience. Also late is Sun's first foray into on-chip L2 caches, which will occur with the USe-400 in early 2000.

The only major server vendor not to adopt IA-64, Sun may be the lone obstacle to IA-64's complete domination. Whether Sun is up to the challenge remains to be seen, but there can be no doubt the company is determined to try. ■

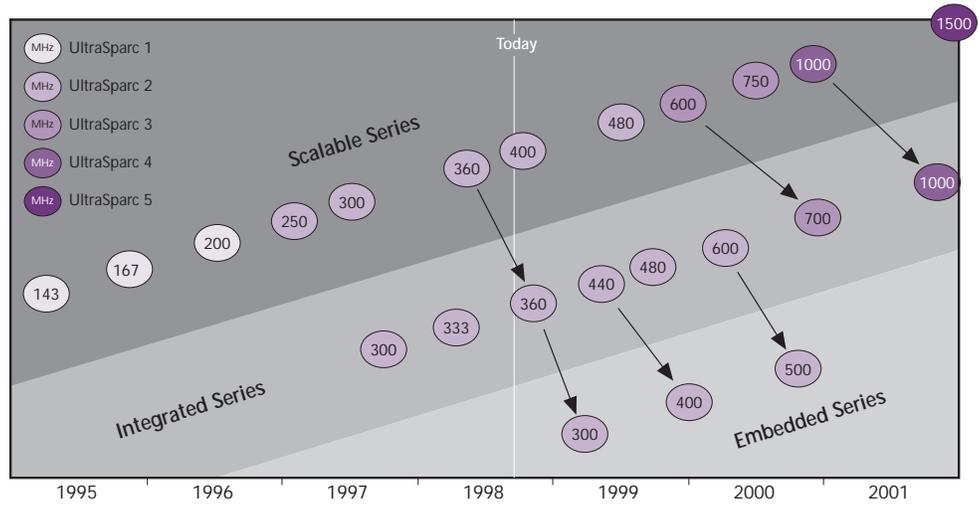


Figure 1. Sun's aggressive processor roadmap indicates it has no intention of turning over the enterprise server and high-end workstation markets to Intel's IA-64. (Source: Sun)