# Intel Pushes Xeon to 550 MHz

## *Pentium III Core Provides Additional Performance Gain*

*by Linley Gwennap*

Just a few weeks after the official Pentium III launch, Intel rolled the new CPU into its Xeon line, adding 550-MHz clock speeds and the new Streaming SIMD Extensions (SSE) to its high-end processors. Signaling a new trend, Xeon workstations will get 550-MHz parts in April, a month or so before this speed reaches the mainstream PC market.

### SIMD Extensions Boost Some Workstation Apps

The new processors, code-named Tanner, are essentially identical to the Pentium II Xeon parts, except for the substitution of the Katmai CPU for the Deschutes CPU. Although Katmai uses the same IC process as Deschutes, its design includes faster critical paths, allowing it to operate at speeds of up to 550 MHz. This extra speed improves the performance of many workstation applications by up to 20%.

For example, the 550-MHz Tanner is 20% faster than a Xeon-450 on SPECint95 (base) and 12% faster on SPECfp95 (base), delivering an estimated 22.6 int/14.9 fp. The FP tests are more sensitive to memory bandwidth, which hasn't changed, and thus don't improve at the same rate.

Some key workstation applications will see much larger gains if they utilize Katmai's new SIMD instructions, which accelerate single-precision floating-point calculations. On the Viewperf CDRS-04 and ProCDRS-01 OpenGL benchmarks, for example, Intel measured gains of nearly 60% for a 550-MHz Pentium III Xeon over a Xeon-450. Many workstation applications, however, use double-precision FP and thus do not benefit much from SSE. ProEngineer, for example, gains only 14% in the same comparison. Applications such as AutoCAD and Photoshop are being optimized for SSE.

Xeon workstations use the 512K-cache version, which is the least expensive option. At this cache size, the 500- and 550-MHz Pentium III Xeons have 1,000-piece list prices of $931 and $1,059, respectively. Since the Xeon-450 lists for $824, all three parts will coexist in Intel's line, giving workstation makers several options. Because some key workstation applications can take advantage of SSE, Intel can charge a premium for that feature in this market.

| Cache Size | P II Xeon 450 MHz | Percent Premium | P III Xeon 500 MHz | Percent Premium | P III Xeon 550 MHz |
|---|---|---|---|---|---|
| **512K** | $824 | 13% | $931 | 14% | $1,059 |
| **1M** | $1,980 | 0% | $1,980 | n/a | n/a |
| **2M** | $3,692 | 0% | $3,692 | n/a | n/a |

**Table 1.** Intel is charging a premium for the Pentium III core in the workstation market (512K cache) but not the server market (1M and 2M caches). List prices are in 1,000-piece lots. (Source: Intel)

### Servers Gain From Faster Clock Speed

Xeon servers will also use the new parts, but they will benefit mainly from the higher clock speed. Server applications will see some additional gains from the "streaming" part of SSE, which includes data prefetching, streaming stores, and enhanced write combining (see MPR 3/8/99, p. 1). Most high-end databases are being modified to use the new instructions, but users will need to upgrade their software to take advantage of them. The net benefit of these features, however, is likely to be in the 5–10% range (in addition to the clock-rate gains).

Although the 500-MHz Pentium III Xeon is currently shipping with cache sizes of up to 2M, the server (1M and 2M) versions of the 550-MHz Xeon won't begin shipping until 3Q99. This delay, also seen with the earlier Xeon-450, is attributed to the extra testing required for four-processor configurations. As Table 1 shows, the 500-MHz server parts have the same list price as their 450-MHz predecessors. With no premium for the Katmai core, the 500-MHz parts should quickly replace the older products.

Server users will benefit further from Intel's forthcoming Profusion chip set (see MPR 9/16/96, p. 9), which supports up to eight Xeon processors. Vendors using Intel chip sets are currently limited to four-way systems. Several server vendors that have never delivered eight-processor systems will begin shipping Profusion-based systems by midyear; this increase in competition should reduce the price of these powerful servers.

### Cascades Set for Q4 Launch

The next step in the Xeon line will be a 0.18-micron processor code-named Cascades. This part will use the same Pentium III core but will move the L2 cache onto the CPU chip, reducing its latency (and lowering Intel's manufacturing cost). This part is likely to appear in 4Q99 at clock speeds of 667 MHz or more; as with the Xeon-550, the server versions of Cascades may lag by six months or so.

Cascades—like its desktop counterpart, Coppermine—will support a 133-MHz bus, improving memory bandwidth to keep pace with the faster CPU. Workstations and small servers will be able to use up to two Cascades processors with the Camino and Carmel chip sets (see MPR 4/20/98, p. 18). Systems with more than two processors, however, will be restricted to the 100-MHz bus, limiting the performance of large systems.

The new Pentium III Xeon processors provide a sizable speed boost to Intel's high-end line. As x86 systems scale to greater numbers of processors, the remaining niches for RISC workstations and servers continue to shrink. M