MICROPROCESSOR REPORT

THE INSIDER'S GUIDE TO MICROPROCESSOR HARDWARE

TRANSMETA SHOWS NEW TM8000 ASTRO

By Tom R. Halfhill {1/6/03-02}

Transmeta is showing customers first samples of its next-generation mobile PC processor, promising to deliver production quantities by 3Q03. Although Transmeta is withholding most architectural details about the new TM8000 Astro until it's closer to release, the company says

the processor will offer higher performance and additional power-management features.

The biggest difference between the TM8000 and current TM5800 Crusoe processors is a much wider VLIW core. The TM8000 has 256-bit-wide instruction words that can issue up to eight 32-bit operations in parallel, compared with the TM5800's 128-bit-wide instruction words containing four 32-bit operations. Although the common wisdom is that typical PC applications yield little instruction-level parallelism beyond four-way execution, it's possible that the TM8000 can do better. Its "code-morphing software" dynamically translates x86 instructions into native VLIW instructions, often reducing complex x86 instructions into two or more simpler operations suitable for parallel execution. (See *MPR 2/14/00-01*, "Transmeta Breaks x86 Low-Power Barrier.")

In addition to wider instruction words, the TM8000 has many new instructions, instruction types, addressing modes, and registers; it's virtually a new architecture. Transmeta has the freedom to overhaul the processor's architecture so extensively because the VLIW core is invisible to x86 software, which runs atop the emulation layer. The native VLIW architecture is visible to only Transmeta's system programmers, who wrote a new version of the code-morphing software for the TM8000.

Transmeta won't publicly discuss whether the TM8000 will support the latest x86 media-processing extensions, such as Intel's SSE and SSE2. (The TM5800 doesn't.) However, Transmeta CTO David Ditzel says the TM8000 will have "significantly enhanced" floating-point performance, which is a notable feature of SSE2. Because the TM8000 will hit the market in 3Q03, about the same time *MPR* expects Intel to roll out SSE3, it will be unfortunate if Transmeta doesn't support at least the x86 extensions introduced to date. State-of-the-art media processing isn't critical for the TM8000, which is designed primarily for mobile computers and business applications, but that situation may change as more users follow the trend of replacing desktop PCs with laptops as their primary system.

Ditzel says Transmeta will announce the TM8000's clock speeds when the chip is closer to introduction. For now, he says only that the TM8000 will exceed 1GHz, a clock frequency already attained by the TM5800. Transmeta's foundry, TSMC, will manufacture the first TM8000 chips in a 0.13-micron process—the same process TSMC uses for the TM5800.

Although mobile PC users are generally less obsessed with clock frequencies than desktop users are, mobile processors that run at gigahertz speeds command higher prices and compete more effectively with Intel's fast mobile Pentium 4 and Pentium III. It will be interesting to see how Transmeta and Intel tune their marketing strategy after Intel's 1H03 introduction of Banias, a new mobile-PC processor. Banias will run at lower clock frequencies than the mobile Pentium 4 does, yet it will deliver strong performance. Intel, like Transmeta, may downplay clock speeds in favor of promoting low power consumption and longer battery life. (See *MPR 11/25/02-01*, "Intel Spills the Beans

About Banias.") There will almost certainly be a war of words and benchmarks as the two companies try to establish which mobile processor delivers the better balance of power consumption and performance.

Blade servers are a potential growth market for Transmeta's cool-running chips. In rack-mounted blades, high processing density and low heat dissipation are more important than maximum performance. Transmeta is already branching out in this direction. Earlier this month, RLX Technologies introduced its new ServerBlade 1000t, which uses a 1GHz TM5800 to replace an older 667MHz version of the chip. Los Alamos National Laboratory is using a 480-processor cluster of ServerBlade 1000t boards.

Transmeta is also trying to enter the embedded market, where low power is definitely a virtue. The relatively large memory requirements of Transmeta's code-morphing software and translation cache will rule out many embedded applications, but lucrative opportunities still exist for an x86-compatible processor that runs at 1GHz and sips only a few watts of power. Examples might be set-top boxes, personal video recorders, and other consumer appliances in which fanless operation is a plus. ◇