The Shift from Speed to Power Dissipation

By Steve Leibson

As he usually does, PC architectural guru and perennial rabble-rouser Glenn Henry, president of Centaur Technology, challenged the PC world at this year's **Microprocessor Forum**. Henry flatly stated that 600MHz was all the clock rate needed to run today's mainstream business applications. He then challenged the other PC processor panelists to contradict him. On that panel, along with Henry, were Bill Siu, Michael Upton, and Bob Jackson from Intel; David Beardon from Motorola; Dean Klein from Micron; and Luigi Mantellassi from STMicroelectronics.

None of the other panelists seriously challenged Henry's assertion! That's somewhat stunning, considering that Siu and Upton had just described Intel's Pentium 4, which runs at 1.4GHz out of the gate (and 2.095GHz in a demo at this year's Intel Developers Forum). Beardon had just described Motorola's latest PowerPC G4 processor, which uses SOI to boost operating speed above 1GHz.

At a superficial level, it's easy to understand why Henry made this assertion: 600MHz is close to the maximum clock rate for Centaur's current processor crop. QED: That's all you need. But Henry's statement is not as simple as framing the market to meet self-serving goals. It's rather apparent that the PC market is no longer willing to accept the "performance at any price" development curve that the industry has ridden for the past two decades. There are two primary reasons for this change in outlook.

The first reason is, as Henry states, a lack of need. With most PC users in this world wedded to Microsoft Office, increases in processor speed are unlikely to garner the usability gains seen in previous years. Most justifications for more PC processor speed revolve around multimedia and the ability to generate and display smooth video and graphics on the PC screen. Gamers and video editors need such abilities, but most users don't need such multimedia processing power at present, because most of the world still revolves around plain, boring, old static media—namely printed documents, including forms, memos, and paper reports. Few of us are prepared to adopt nonlinear video editing as our primary means of creating and sharing documents with colleagues. Even fewer of us have the training or talent to create interesting and informative videos.

The second reason that the PC world is changing is that our attention, thanks in no small part to Transmeta, is now focused on processing power delivered relative to energy expended, instead of just raw processing power. This issue is extremely acute for battery-powered PCs, including notebooks, sub-notebooks, and handheld computers, and it extends to PC-derived information appliances as well. As the recent summer's rolling brownouts in northern California and other parts of the United States prove, power dissipation is not just important for battery-powered PCs;

it's important for all PCs. We don't have power to burn for CPU cycles we don't really need. This issue is even more acute in other parts of the world that do not have the natural resource base of the United States.

Transmeta and its low-power Crusoe manifesto have gotten Intel's attention, as demonstrated by Jackson's presentation at the Microprocessor Forum. Intel is totally revamping its Mobile Pentium program to create lower-power PC processors with a clock range of 500MHz to 1GHz, with core operating voltages down to 1.1V and a 0.7V deep-sleep mode that holds the processor state until there's work to be done.

Does that mean that Transmeta is finished now that its low-power message has gotten Intel's attention? Not if Transmeta CEO Dave Ditzel has anything to say about it. Ditzel spent the remainder of the Microprocessor Forum making sure that everyone at the Forum saw his new Hitachi notebook with a Transmeta Crusoe processor inside. He also made sure that everyone within earshot got his take on Jackson's mobile PC processor presentation. It's an understatement to say he was unimpressed.

Both Intel and Transmeta have untapped resources they can bring to bear on low-power development. For its part, Transmeta might partake more deeply of manufacturing partner IBM's process technology to further reduce power dissipation on its devices. Intel has yet to bring the low-power advances developed for the new XScale (StrongARM-2) processor to bear on PC processor design. Thus, both companies have clear development paths to traverse in the new race to drop PC processor power dissipation. Meanwhile, AMD has yet to ante up for this new game.

This new PC processor playing field is important, in no small part because sales of mobile PCs are growing faster than the overall PC market. This fact alone confirms that, for many people, sub-GHz processor speeds are good enough. Kudos to Transmeta for its prophecy. But, to paraphrase Satchel Paige, "Don't look back, Transmeta. Something may be gaining on you."

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