Most Significant Bits

Andy Grove Talks About P6

Perhaps to offset the bountiful publicity received by PowerPC, Intel chairman Andy Grove revealed the first official details of the next-generation P6 processor, which appears to have encountered some schedule delays from Intel's original plan. The company has consistently indicated that the P6 would appear two years after Pentium, which would mean volume production starting in 1H95. Grove now says that volume shipments will not occur until late that year. This schedule change supports rumors that Intel is having problems meeting its performance goal for the P6, which Grove set at 300 MIPS—three times the performance of a 60-MHz Pentium.

Grove said that the processor will incorporate six million transistors (twice as many as Pentium) using a 0.4-micron process. Intel has been investigating the use of multichip modules (MCMs) for the P6, but given these specifications, the CPU should easily fit on a single chip; in fact, the die should be considerably smaller than the 0.8-micron Pentium. Intel expects to give the P6 a big push as a server processor, and an MCM could include a large, fast second-level cache around the CPU. Given a reasonable die size, the P6 should also be suitable for desktop systems, although Intel may price the stand-alone CPU at $1,000 or more at first, until demand grows.

The new design also will be used to hold off the advances of PowerPC and other RISC processors. The 300-MIPS goal should translate to 150–180 SPECint92. Several RISC vendors plan to deliver 200–250 SPECint92 with processors shipping as much as a year earlier than the P6; MIPS Technologies' T5, for one, has already taped out. While the P6 will continue to advance x86 performance, it probably won't close the gap with RISC.

R.I.P. Clipper—Finally

Intergraph's Clipper architecture has reached the end of the line. The company has cancelled its Windows NT port to Clipper and eliminated most of its processor design team. A few engineers continue to work on improving the clock speed of the current C4 processor, but even this minor enhancement may never see the light of day. Intergraph plans to offer a field-upgrade module that allows current customers to swap their Clipper processors for 60-MHz Pentium CPUs. The company will, of course, continue to support its existing customers' Clipper systems for the foreseeable future.

For some time, Intergraph has been selling its software on x86 systems, as well as on its own Clipper-based workstations, and plans to continue to build this side of the business. Last summer, Intergraph announced that it would also offer its high-end customers an UltraSparc system in 1995 *(see 0710MSB.PDF)* by porting Windows NT to that platform. Sun has asked Intergraph to accelerate the NT-to-SPARC port, which finally led that company to pull the plug on its faltering architecture.

Clipper, originally developed by Fairchild, was one of the first commercial RISC architectures and, as late as 1987, was billed as the best-selling version of RISC. That same year, however, Fairchild was acquired by National Semiconductor, which had little interest in the processor. National sold Clipper to workstation vendor Intergraph, its major user. Since then, Intergraph has maintained Clipper as an in-house architecture after early marketing efforts failed to gain significant customers. As Intergraph fell from the ranks of the leading workstation vendors, its chances of supporting a sole-sourced processor design went from slim to none.

Intergraph's CPU design team has been absorbed by Sun's SPARC Technology Business (STB), which is responsible for all of Sun's processor development *(see 071501.PDF)*. Howard Sachs, who led the development of recent Clipper chips, is now VP of Engineering for STB. Much of the design team had already been working on the UltraSparc design as part of a cooperative venture with STB. The move heightens speculation that the next SuperSparc chip, due in 3Q94, will implement a bi-endian switch as STB attempts to accelerate SPARC's entry into the NT market.

Glenn Henry Starts PC Division at MIPS

MIPS Technologies (MTI) has a new strategy for gaining design wins among top-tier PC companies: hire one of them to help. The CPU company has signed Glenn Henry, formerly the chief technology officer at Dell Computer, to led a new team dedicated to putting MIPS processors into PCs. Before his five-year stint at Dell, helping the company grow from a $150 million company to a $3 billion giant, Henry spent 20 years at IBM and led the development of the IBM RT, the company's first commercial RISC system.

Because he's been on the other side of the negotiating table, Henry knows what PC vendors want and need. In a recent interview with *Microprocessor Report*, Henry outlined his strategy. Given the low margins of the PC business, system vendors will rely on RISC chip vendors to develop motherboard designs for their processors. This requires delivering a complete design kit, including the processor and system-logic chips, that meets the needs of the PC vendors. By forming a team of PC veterans, Henry hopes to deliver designs that meet these vendors' requirements for the feature set and, most important, manufacturing cost.

In the longer term, it will be necessary to modify the RISC processors themselves to be more suited to the PC

market. MTI has already developed low-cost CPUs; the next step is to improve emulation of x86 applications. Although Henry would not reveal any specific plans in this regard, at IBM he had worked on a project to add an x86 execution engine to an IBM RISC processor. His team had assembled working prototypes before the program was cancelled, mainly due to IBM's uncertainty about how to market such a device. If Henry follows a similar path at MTI, processors with an x86 hardware assist could emerge as early as 1995.

Compaq to Buy AMD 486 Chips

AMD has announced a major design win at Compaq for its 486 processors, which could exceed $80 million. Compaq has been the ultimate target for Intel's competitors, as it is the largest x86-based PC company without an in-house supply of processor chips. Even as AMD's 386 processors became ubiquitous among PC manufacturers, Compaq refused to buy parts from AMD but now has changed its tune. Compaq will continue, however, to buy most of its processor chips from Intel.

AMD separately revealed that Digital will act as a foundry for the Am486, with production shipments expected by 4Q94. AMD is suffering from limited fab capacity for its 486 chips and has been searching for an outside foundry for some time *(see 070601.PDF)*. Digital expects to produce about 500,000 chips per quarter by 2Q95. This production should bridge the gap until AMD's Fab 25 comes on line later in 1995. AMD sorely needs the extra volume sooner, but it will take some time for the design to be brought up in Digital's fab.

The Compaq win validates AMD's position as the top competitor to Intel and alleviates concerns about the compatibility and legality of AMD's chips. It also indicates that Compaq has confidence in AMD's ability to deliver the large quantities of chips that the PC vendor requires, a confidence that is bolstered by the Digital disclosure. Having seen both AMD's and Intel's future plans, Compaq says that AMD will supply chips at price/performance points that Intel cannot match, a statement that hints at new chips from AMD that are more unique than its current offerings.

IBM, Intel Revise x86 Pact

Intel and IBM have modified the terms of their ongoing x86 licensing agreement to allow IBM to manufacture more 486 chips for its own needs; the company had previously been limited to about 50% of its total consumption, according to sources. (The companies have never revealed the exact terms of their contract.) In exchange, IBM has agreed to purchase all of its Pentium chips from Intel and will not build that processor in its own fabs.

Although the arrangement will benefit Intel as IBM begins shipping more Pentium systems, it increases speculation that Big Blue is developing a clean-room ver-

sion of Pentium that would not be restricted under the Intel agreement. If such a chip were to be ready within the next year, it would make little sense for IBM to devote an entire fab line to matching Intel's 0.6-micron BiCMOS process for less than a year of production.

IBM has not publicly mentioned a Pentium-class device and instead has said that the recent announcement indicates its confidence that PowerPC will satisfy its need for high-performance processors. IBM's PC business, however, will ship huge volumes of x86 systems for years to come and will require a source of Pentium-class processors. Given IBM's insistence on building its own 386 and 486 chips, it seems unlikely that the company would rely solely on Intel for the next generation of x86 processors.

IBM has also moved aggressively to set up a merchant chip business and has developed its own 486 processors. An internally designed Pentium-class device not only would satisfy the company's internal needs but would be a potent product for the merchant market; unlike the 486 chips developed under the Intel agreement, a clean-room Pentium processor could be sold as a standalone chip on the open market. ♦