

## Most Significant Bits

### Pentium Debuts at \$965—Systems Available

In an anticlimactic announcement on May 20, Intel officially released its Pentium processor. After revealing technical details of the new CPU in March (*see 070401.PDF*), the latest announcement highlighted the final tidbits: price and availability. The 66-MHz Pentium lists for \$965 while the 60-MHz version goes for \$878, both in quantities of 1000. Intel claims that volume shipments of both speed grades will begin immediately and reiterated its plans to ship “hundreds of thousands” of Pentiums in 1993. Rumors persist that 66-MHz parts will be nearly impossible to obtain and that as few as 75,000 units may ship this year, most in the fourth quarter.

A number of leading PC vendors announced Pentium systems, including Compaq, HP, DEC, ALR, and Dell. Most are servers, although Compaq announced a desktop system. Most of the announcements emphasized 60-MHz systems, with 66-MHz products following “when chips are available.” Surprisingly, only one of these systems includes a local-bus interface (ALR’s VL-Bus system); PCI systems using Intel’s 82430 chip set will appear later this year. Some of the vendors allow for a two-processor configuration. Entry-level pricing is surprisingly aggressive: \$3000–\$5000 for 60-MHz desktop systems, \$5000–\$7000 for servers.

NCR announced a family of UNIX systems using Pentium, including a two-processor desktop workstation starting at about \$10,000 (for a single-CPU version) and an eight-way server with transaction-processing capabilities. The NCR workstation offers performance comparable to a 50-MHz SPARCstation 10 at a lower price, pressuring Sun’s industry-leading workstation line.

### Cypress Exits SPARC Chip Business

With its latest processor spurned by Sun, Cypress has decided to bail out of the SPARC chip business, selling its Ross Technology division to Fujitsu for \$23 million. Cypress was one of Sun’s major processor suppliers for the SPARCstation 1 and 2 product lines, but recent systems have shifted to CPUs built by Texas Instruments (TI). Although Cypress’ initial success came from manufacturing Sun designs, it attempted to win future sales by designing its own hyperSPARC processor (*see 060701.PDF*). The new design failed to offer enough of an advantage over Sun’s SuperSPARC to convince that company to adopt an outside design. The limited volume of other SPARC system vendors is inadequate to sustain Cypress’ interest.

Fujitsu has had a long association with SPARC, first as the original foundry for the SPARC processor, and then through its own computer system line and its ownership of SPARC-licensees ICL, Amdahl, and HaL.

Sales and support of Ross’ products will transition to Fujitsu by early 1994; Cypress will continue to build the parts as long as necessary. Ross hopes to move hyperSPARC from its current 0.65-micron process to Fujitsu’s 0.5-micron (drawn) process by the end of the year, eventually allowing a speed increase to 100 MHz. Ross continues to work the bugs out of hyperSPARC, which it still hopes to sell to Sun, and has begun development of a next-generation processor.

For Fujitsu, the Ross acquisition is presumably motivated by its value to Fujitsu’s various computer businesses; ICL is one of the few companies to announce systems based on hyperSPARC. The purchase also gives the company a team experienced in high-performance RISC processor design.

Fujitsu also expanded its SPARC portfolio by winning the opportunity to manufacture microSPARC-2, a microSPARC upgrade with larger caches and other enhancements (*see 070404.PDF*). Sun selected Fujitsu over TI, which currently builds microSPARC. (Both microSPARC versions were designed by Sun.) TI has already been selected to build SuperSPARC-2 and thus will avoid Cypress’ plight for at least a few years.

### Apple Demos PowerPC Macintosh—at 80 MHz

At its Worldwide Developers’ Conference in San Jose, Apple recently gave its first public demonstration of a PowerPC Macintosh. The company declined to give any product specifics but reiterated its plan to introduce systems in early 1994. The prototype systems demonstrated compatibility with hundreds of unmodified 68000 Macintosh applications, and a few native-mode applications were also shown. Performance appeared to be comparable to a Quadra when emulating 68000 code, but Apple did not provide any quantitative benchmarks. One prototype ran at 80 MHz, suggesting that the 601 will run faster than its announced 66-MHz frequency.

Raising its profile as a merchant-market supplier of the chip, IBM announced its pricing for the PowerPC 601: \$275 at 50 MHz and \$380 at 66 MHz, in quantities of 25,000 to 50,000. These are very close to Motorola’s quoted prices of \$280 and \$374 in quantities of 20,000.

### MIPS’ T5 Moves Ahead, But TFP Slips Out

MIPS Technologies announced that its semiconductor partners have agreed to full funding of its next-generation “T5,” a speculative execution superscalar CPU. The company expects the processor to exceed 200 SPECint92 and 300 SPECfp92 with first shipments around the end of 1994; tape-out is scheduled for early ’94. Preliminary design work has been underway for over a year (*see 060502.PDF*), but the new agreement ensures funding to

complete product development. MIPS estimates that the total design cost will be about \$100 million (roughly the same as the R4000) and could hit \$150 million by including some IC process development.

The predecessor to T5, a superscalar processor known as TFP (*see 070202.PDF*), is behind schedule. Earlier this year, MIPS discussed plans to tape out the complex two-chip CPU in March, and Silicon Graphics announced TFP-based products for shipment by year-end. Recently, the company admitted that only one of the two chips has taped out by May, jeopardizing the year-end shipment goal. TFP—like SuperSPARC, Pentium, and other complicated CPUs—appears to be taking longer than originally planned. No word yet on whether the design will meet its aggressive performance goals.

### Windows NT Slated for July Release...

Microsoft launched its Windows NT operating system in grand fashion at Windows World, a sideshow of Spring Comdex. Like the Pentium announcement, the NT gala was long on glitz and short on news, since the technical aspects of the new OS have been available for months (*see 061001.PDF*). Price and availability were again the highlights, as the company announced it would begin shipments in July at a list price of \$495, or \$295 as a Windows upgrade.

The initial release will support x86, MIPS, and Alpha processors, making it the first Microsoft operating system to run on RISC platforms. RISC system vendors hope the new OS will provide them with entry into the high-volume desktop market, but analysts expect NT to take less than 10% of that market over the next few years. Compared to workstation volumes, however, even a portion of that 10% is appealing to many RISC vendors (*see also 0707VP.PDF*).

### ...as Several Vendors Announce RISC PCs

Acer and DEC were the only two large PC vendors to announce RISC-based Windows NT systems at Comdex, but a host of small companies are also exploring this market. The new products combine RISC CPUs with standard PC packages, SIMMs, and expansion buses.

The AcerFormula product line includes a 50-MHz R4000PC system for \$3600 and a 66-MHz R4400PC system for \$4600. Both systems include 16M of memory, a 240M hard drive, and a CD-ROM but no monitor. The new products use Acer's PICA chip set (*see 070501.PDF*); based on SPECint92 ratings, the R4000-based product should match the speed of a Pentium PC, while the R4400 box should be about 30% faster.

The DECpc AXP/150 uses a 150-MHz Alpha CPU with 512K of cache. Again based on SPECint92, this system should be about 30% faster than a Pentium-based PC. DEC's new PC, which comes in desktop and tower configurations, is priced starting at \$7000—far above

volume PC prices. The company hopes to drop that price to under \$5000 using its Low-Cost Alpha (LCA) chip, due out late this year (*see 061506.PDF*).

Meeting its earlier promises (*see 0617MSB.PDF*), tiny DeskStation Technology (Lenexa, KA) revealed its Evolution systems. The rPC/40 costs \$4000 for a configured system (including 14" color monitor) with a 50-MHz R4000PC processor and 512K of cache. The rPC/44 uses a 50-MHz R4400PC and costs \$5000. Both are in volume production.

Startup Carrera Computers (Laguna Hills, CA) announced its Cobra R4400 motherboard, hot on the heels of its R4000-based product (*see 0703MSB.PDF*). The new board uses a 50-MHz R4400PC processor in MIPS' ARC-set design. It includes a graphics accelerator, Ethernet port, and four EISA slots. At \$5500, it sells for a \$500 premium over the R4000 version. The company says that several small system integrators are building systems using its motherboards.

While these new MIPS systems are the first fully-configured RISC systems to reach such a low price point, neither they nor the Alpha PC appear to offer a convincing price/performance advantage over Pentium-based products. While DEC is pinning its hopes on LCA, MIPS-based system vendors are eagerly awaiting the R4200 (*see cover*) to improve their competitive position.

### Star-Studded NeTpower to Build NT Systems

Startup NeTpower has assembled a cast of Silicon Valley veterans to leap into the NT-on-MIPS market. Led by Bob Miller, former president of MIPS, the group includes MIPS co-founder Skip Stritter, SPARCstation-10 manager Ed Frank, and key people from Silicon Graphics, Intel, and Hewlett-Packard. The firm initially will resell MIPS PCs manufactured by Acer, adding its own enhancements in graphics, networking, and ease of use. NeTpower eventually plans to design its own system-logic chip set, which it may license to a chip vendor for sale on the open market.

The company expects to announce its first products this fall. From the limited information available until then, there appears to be little to differentiate NeTpower's systems from other MIPS PCs. On the other hand, it is hard to believe that Miller could have attracted such a strong team and \$6 million in venture capital without a solid business plan.

### Intel Files ITC Complaint Against Twinhead

Intel has taken its first legal action against a PC maker based on its "Crawford" patent (#4,972,338), which describes the memory management unit in the 386 and 486 and how it interacts with page tables stored in memory. According to Intel, claims 2 and 6 of the patent apply to the system, not just the microprocessor chip; Intel says that its processor customers are inherently licensed, but

that systems using non-Intel processors must pay a license fee (*see 061502.PDF*).

Rather than filing suit in Superior Court, Intel has asked the International Trade Commission (ITC) to block importation of the Twinhead systems because they allegedly violate Intel's patent. The ITC has 30 days to review the situation and decide whether to start an investigation, which may then take 12 to 18 months.

Intel targeted Twinhead because it is one of the first companies to import computers that are pre-loaded with Microsoft Windows and use non-Intel chips (Twinhead uses both Cyrix and AMD processors). MS Windows is a key part of the equation, since a system running DOS does not use paging and thus does not violate the patent.

Intel originally proposed a royalty of \$15 per system for 386-based computers and \$25 for 486-based systems up to 33 MHz, but it has discarded this scheme in favor of a simple 1% of the system selling price. For typically-priced PCs, this will result in fees in the same \$15 to \$25 range. So far, Intel says it has one licensee—Dell Computer, which does not use any non-Intel microprocessors, and thus does not, at this point, have any liability.

Cyrix and AMD both claim that their patent license agreements (or, in Cyrix's case, its foundries' agreements) cover this application of the chip, since it cannot be used except in combination with memory. Intel counters that the chip can be used without paging. Cyrix was recently denied a request for a preliminary injunction

preventing Intel from suing its customers. A trial on this issue is scheduled for January, 1994.

### TI Licenses ARM for Embedded Control

Advanced RISC Machines announced it has licensed its ARM architecture and 32-bit RISC CPU core to Texas Instruments. Although ARM has gained much publicity from its selection as part of Apple's handheld Newton device (*see 061404.PDF*), TI will build derivative chips for application-specific products and is not licensed to sell CPUs for Newton systems. TI says its first target will be the automotive market, where ARM's low cost and relatively high performance make it a good solution for engine control and similar applications. TI will also include the ARM core in its library of standard cells.

This announcement brings to four the number of ARM licensees, including GEC Plessey, VLSI Technology, and a more recent entry, Sharp Electronics (*see 0704MSB.PDF*). Although this may seem like too many vendors, the companies are well-dispersed across different geographies and markets. Plessey has not yet done any major promotion of the architecture, and VLSI's efforts have never been very aggressive. TI's standing as one of the top microcontroller vendors will allow it to pitch ARM to the major auto makers, who don't generally deal with smaller vendors. TI is likely to devote more substantial resources to promoting ARM for embedded applications than the other vendors have. ♦