# Most Significant Bits

**Nintendo Selects MIPS Processor**

Nintendo announced that it will use MIPS processors in a forthcoming 64-bit video game system. The "Project Reality" system is planned to first debut in arcade games next year, then appear as a consumer product in late 1995. Nintendo will also license 3D graphics technology from MIPS owner Silicon Graphics.

Nintendo has not yet selected a specific processor chip (or vendor) for the program, but the arcade version will probably use the R4400 to maximize performance. The more cost-sensitive consumer version could use the R4200 *(see **070701.PDF**)* or a derivative version to meet the required cost point: about $20–$40 CPU cost in a system with a $250 list price.

The announcement of the new home system more than two years before its first shipment may be a counter to 3DO's announcement of its Interactive Multiplayer, which combines an ARM60 processor with custom graphics hardware *(see **0701MSB.PDF**)*. The 3DO system will provide much more realistic images than the current 16-bit Super Nintendo system. 3DO expects to deliver its system by the end of this year.

The deal could be a huge design win for MIPS, particularly MIPS Technologies (MTI); Nintendo claims an installed base of 100 million systems. Although the new system will start as the high end of the game maker's product line, it could still sell millions of units in the first year and eventually become Nintendo's main product. While the MIPS chip vendors fight over who will build the chips, MTI will collect a steady royalty stream.

**Intel Boosts i960, Previews New Chips**

By moving its high-end i960CF to a 0.8-micron CMOS process, Intel will offer a 33-MHz version of that part in 4Q93, boosting performance slightly from its current 30-MHz version. The new part, which is rated at 51 Dhrystone MIPS, will cost $142 in 1,000s. It will be the first 960 to move beyond 1.0-micron technology. The new process should allow even higher frequencies in the future.

Two new 960 designs, due next year, will also take advantage of advanced manufacturing technology. The first, code-named P100, will fill out the mid-range of the 960 line between the K-series and the C-series. The company expects it to hit 25 Dhrystone MIPS while consuming less than 1 W. Although not intended for portable applications, the P100 will reduce the power requirements of peripheral cards and subsystems. It will be built in 0.8-micron CMOS.

The P110 will extend the high-end of the product line. Intel believes it will deliver over 100 MIPS using a state-of-the-art 0.6-micron, four-layer-metal CMOS process. The P100 is expected to debut in 1H94, with the P110 following later in the year.

The 960 ships far more units than any other RISC processor; Intel expects to ship more than 4 million units this year. Much of this success comes from HP, which has adopted the 960 for its entire LaserJet 4 family. The Intel chips are also used in many other printers *(see **071001.PDF**)* and peripheral cards. The new chips should maintain the 960's competitiveness.

**PowerPC May Emulate x86 in Hardware**

Sources indicate that IBM is preparing "microcode" to allow future PowerPC chips to perform hardware emulation of x86 software. IBM would neither confirm nor deny reports that it is developing chips that could directly execute either PowerPC or x86 instructions. Such a plan would be similar to the "Trojan horse" strategy we have postulated for Intel *(see **0706ED.PDF**)*.

To perform hardware emulation, a processor would accept x86 instructions and translate them into one or more operations in the native RISC engine, in this case PowerPC. RISC registers could emulate the x86 register set, and x86 instructions and data could be stored in the caches. This strategy would require extra decode logic and a sequencer for multi-cycle instructions, but would use much less circuitry than a complete x86 CPU.

In this way, x86 code could be executed at nearly the speed of native RISC code, yielding performance far superior to that achievable by software emulation. Combined with Windows NT, hardware emulation would make it much easier to convince users with an x86 software base to switch to a PowerPC system.

Given IBM's unwillingness to comment, it is unlikely that such a product would be available in the next year. It is still possible, however, that IBM could beat Intel to market with a processor that provides a migration path from x86 to RISC. This device could be a crucial weapon in the battle to determine the dominant architecture at the end of the decade.

Initial reports claimed that the microcode project was aimed at developing "clean" x86 processors that IBM could sell on the open market. While these reports were not confirmed, Big Blue is clearly moving to increase its merchant market presence. The company announced a 16-bit microcontroller, the MC19610, that is compatible with Intel's 8096. IBM designed the chip in collaboration with Western Digital, which will use the new chip in a hard-disk controller. IBM's Technology Products Group even changed its name to "IBM Microelectronics" to sound more like a chip company.

A major factor behind IBM's aggressiveness in the merchant chip market could be its dwindling mainframe business, which has opened plenty of fab capacity. The

 

19610 aims at the high-volume embedded market, and boosting PowerPC sales would also help fill these fabs. Unrestricted x86 designs, if developed, could sell millions of units. All of these products could generate significant revenue (and profits) for the ailing company.

IBM is already one of the largest semiconductor manufacturers in the world, based almost solely on internal consumption; if it begins to throw its weight around in the merchant market, it could quickly become a major player. Its biggest challenge is to set up a marketing structure, and sales and support channels, to compete with the established players.

**Sun Picks TI as UltraSPARC Foundry**

Sun has revealed that Texas Instruments (TI) will build the next-generation UltraSPARC processor. The high-end SPARC chip, expected to begin shipments in early 1995, will be rated at over 200 SPECint92, according to Sun's long-term road map *(see **070404.PDF**)*. TI will use a 0.5-micron, four-layer-metal CMOS process for the first UltraSPARC chips and plans to move to more advanced processes for successive versions.

Sun had previously tapped Fujitsu to build its microSPARC-2 processor, despite TI's success with the original microSPARC chip. Sun believes that Fujitsu's manufacturing capabilities are best suited to a low-cost product such as microSPARC-2, but TI's high-end processes will best power the UltraSPARC line. TI's recent announcement that it has boosted SuperSPARC's clock rate to 60 MHz, an increase of 67% in less than one year, may have influenced Sun's decision.

Sun's SPARC Technology Business, or STB *(see **0705MSB.PDF**)*, announced that it will give vendors early access to the UltraSPARC design. For previous SPARC processors, system vendors (other than Sun) did not have access to new designs until after Sun began shipping systems, giving clone makers a built-in disadvantage in time-to-market. Under the new program, STB will make sure that system vendors have access to UltraSPARC design specifications, simulation models, and prototypes as early as possible and up to 18 months before volume shipments of the processor.

Early access comes at a price: $750,000 in this case. Vendors that can afford this outlay will be able to introduce systems at about the same time as Sun. Poorer vendors are left in the dark. Still, this represents a big step forward from Sun's previous policy of snubbing other system vendors, bringing SPARC closer to the openness of the x86 and MIPS architectures.

**AT&T Buys Go for Eo**

Consolidating its PDA strategy, AT&T purchased Go Corp., a pen-based software vendor, and promptly merged it with PDA-maker Eo. This move brings all of the major components of Eo's Personal Communicator *(see **061509.PDF**)* under AT&T's control, including AT&T's Hobbit microprocessor, Eo's hardware, and Go's PenPoint operating system. The telecommunications giant will own 51% of the merged Eo/Go, with partners Matsushita and Marubeni holding the rest. The move closes the circle for Eo, which began life when Go spun off its hardware business.

Although Go will continue to support PenPoint on x86, the new management will focus the pen-based OS on Hobbit. This announcement, along with an earlier second-source deal with NEC, strengthens Hobbit in the mobile market. The company says that Matsushita, NEC, Olivetti, Toshiba, and Eo will deliver a broad array of products based on the PenPoint/Hobbit platform.

**AMD Loses OmniBook Socket to TI**

Hewlett-Packard will use TI's 486SLC processor in a new version of its OmniBook 300 handheld computer, expected to be announced this month. The original OmniBook systems, introduced only a few months ago *(see **0709MSB.PDF**)*, use AMD's 386SXLV processor. The TI chip offers a much-needed boost in performance due to its 1K on-chip cache (the SXLV has no on-chip cache) while retaining the same 386SX pinout as the AMD chip, allowing it to be substituted easily into the HP design.

TI second-sources the 486SLC, which is a Cyrix design *(see **060501.PDF**)*. The 486SLC is the only merchant market 386SX-pinout processor with an on-chip cache. Another factor in TI's favor was the very aggressive price, said to be under $35, that it offered to HP.

**Intel, Cyrix Drop Court Cases**

In an effort to reduce the litigation weighing down the two companies, Intel and Cyrix agreed to settle most of their pending lawsuits. Specifically, Intel agreed to drop its charge that math coprocessors manufactured for Cyrix by Taiwan Semiconductor Manufacturing (TSMC) infringe on two Intel patents. Cyrix, in turn, will drop antitrust charges against Intel.

While the agreement simplifies the legal situation, the key issue, patent cross-licensing through foundries, remains. Cyrix claims that its chips are protected by cross-licensing agreements between its foundries and Intel, although Cyrix itself has no such cross-licensing arrangement. Intel disputes this claim, but lost its case in a Texas court *(see **061101.PDF**)*.

Intel's appeal of the Texas verdict is pending in Federal court. The recent agreement stipulates that Cyrix will pay Intel $2 million if the verdict is overturned; Intel will pay $500,000 if it is upheld. No other penalties would be required, although either company can pursue the issue to US Supreme Court if they desire. Thus, the Intel-Cyrix agreement has little impact on the greater legal situation until the patent cross-licensing issue is finally resolved. ♦

 