# MOST SIGNIFICANT BITS

## Apple Broadens Mac OS Licensing

Finally moving toward open availability of Mac OS, Apple has granted Motorola a license for its Macintosh operating system. The arrangement is unique in giving Motorola the ability to sublicense Mac OS with its PowerPC motherboards. For the first time, a company can enter the Macintosh clone business without negotiating a licensing agreement with Apple.

This announcement, coupled with the completion of the PowerPC Platform Specification, previously known as CHRP, could enable a wide variety of vendors to enter the Mac clone market. To date, Apple's insistence on controlling the types of systems and geographical areas that its licensees could sell into has scared away all but a handful of small companies. Under the new agreement, vendors can simply purchase motherboards from Motorola with a Mac OS license and sell them however they please.

One drawback is that Motorola cannot sublicense the OS outside of a PowerPC motherboard. Although some vendors may be willing to purchase boards for a low-volume entry into the Macintosh market, this provision prevents a high-volume manufacturer from building its own boards and undercutting both Motorola's and Apple's costs. Another issue: Apple continues to insist that all Mac clone vendors submit their systems to Apple for certification, which could be a more subtle way to control the clone market.

This agreement is a positive step toward increasing the overall market share of Mac OS to a viable level. To continue the momentum, Motorola must aggressively market its motherboards, and Apple must consider a further expansion of its licensing program, both to allow other vendors to build their own motherboards and to address the concern of potential clone vendors that don't want to have their products certified by their biggest competitor.

## Digital First to Exceed 10 SPECint95

Putting some distance between Alpha and Pentium Pro, Digital today formally announced 366- and 400-MHz versions of its 21164 processor, already the fastest in the world. The new clock speeds are enabled by a move to 0.35-micron CMOS. The chip is the first to post a double-digit SPECint95 score: the 400-MHz version is rated at 11.2 SPECint95 and 15.2 SPECfp95 (base). Its closest competitor, the 200-MHz R10000, delivers 8.1 SPECint95 and 10.5 SPECfp95 (base).

The new device, initially called the 21164A *(see* **0914MSB.PDF***)*, is not only faster than its predecessor but smaller and cooler as well. At 209 $mm^2$, the chip's estimated manufacturing cost is down to $190. Power dissipation for the 2.0-V part is 20 W at 400 MHz. Both of these figures are a bit high for a mainstream PC but are comparable to Pentium Pro's ratings and actually quite good for a processor at this performance level.

Both speed grades are sampling now, with volume production slated for 2Q96. Coming down a bit from its usual $3,000 price point, Digital is listing the 400-MHz part at $1,913 and the 366-MHz version at $1,602, both in quantities of 1,000. This price/performance is on par with that of other high-end microprocessors and better than some.

These clock speeds are only a starting point for the 0.35-micron part. As Digital gains experience with its new process, it expects to deliver parts as fast as 500 MHz by the end of 1996. The company is also developing its next-generation device, the 21264, which it hopes to ship by the end of 1997. These plans give Alpha a good chance at staying in its traditional performance leadership role for at least the next couple of years.

By staying in the lead, Alpha systems continue to be attractive in the most performance-sensitive markets, such as scientific and technical computing. To broaden its markets, however, Digital must offer this strong performance at a lower price and expand its software base through products such as FX!32 *(see* **100302.PDF***)*. Without these changes, Alpha will dominate its niches but not surge in volume.

## Mobile Pentium Heats Up to 133 MHz

Striving to keep notebook performance close to that of desktop PCs, Intel has rolled out a 133-MHz member of its Mobile Pentium family. Like the rest of the family, the chip operates with a 2.9-V supply rather than the 3.3-V supply favored by desktop Pentiums. The lower voltage reduces power dissipation, simplifying cooling and extending battery life in a portable system.

The new part, known as the Pentium-133 VRT, is rated at 3.3 W (typical), about 10% more than any other Mobile Pentium. Although Intel considers this variance to be within the "thermal envelope" of most Pentium notebooks, it could cause cooling problems for systems that can barely handle today's Mobile Pentiums, which are already hotter than other notebook processors *(see* **1003CW.PDF***)*. The 133-MHz device carries a 1,000-piece list price of $371, a 16% premium over the comparable non-VRT part.

Intel also added a 100-MHz Pentium to its VRT lineup. The two new parts are the first Mobile Pentiums to use a 66-MHz system bus; most first-generation Pentium notebooks were unable to support this speed, sticking to 50- and 60-MHz buses. The 100-MHz part comes in two versions: a 0.6-micron part dissipating 3.0 W costs $218, while the 0.35-micron version, rated at just 2.25 W, is priced at $271. For comparison, a standard Pentium-100 sells for $198.

Coming on the heels of the Pentium-166 *(see* **1001MSB.PDF***)*, the Pentium-133 VRT keeps the notebook market one step behind the mainstream desktop. Because many buyers now use their notebooks as their primary system, Intel would like to keep this gap as small as possible.

Unfortunately, notebook users are unlikely to see a further performance upgrade until the P55C debuts late this year. While faster VRT Pentiums are certainly possible, their power dissipation would not fit within the existing envelope without another voltage drop, but the lower voltage would prevent the chips from achieving a higher clock speed. The notebook market is just beginning to digest Pentium, however, so it will probably take the rest of this year for the Mobile Pentium line, which now spans 75 to 133 MHz, to fully establish itself in the notebook market.

## Pentium Systems Get OverDrives

To help early Pentium buyers keep up with the latest advances, Intel has released the first of a series of Pentium OverDrive processors. Like the company's earlier 486 OverDrive parts, the Pentium OverDrive chips are retail products, but the new chips drop into existing Pentium sockets, boosting CPU performance by 60–70%. These chips are targeted at older Pentium systems at speeds up to 100 MHz.

Four parts were announced: a 125-MHz OverDrive processor for upgrading 75-MHz Pentium systems, a 150-MHz chip for Pentium-90 systems, and a 166-MHz part for Pentium-100 sockets. Intel also developed a single 120/133-MHz OverDrive chip that upgrades either 60- or 66-MHz systems. The low-end part conforms to the original P5 Pentium pinout and includes its own voltage converter. All four parts include an integral DC fan on top of the ceramic PGA package. The three 3.3-V parts run at 2.5× the rate of the external bus; the 5-V upgrade runs at 2× the bus frequency.

The new processors are compatible with nearly all Pentium systems and motherboards. Intel publishes a list of compatible systems; the company claims the major stumbling blocks for incompatible systems are lack of mechanical clearance for the fan, insufficient cooling, and a BIOS with timing-dependent code.

All Pentium OverDrive processors are packaged for retail sale and are intended as end-user upgrades. The upgrades for 60-, 66-, and 75-MHz systems are shipping now at a suggested retail price of $399, about 25% more than the 1,000-piece price for a standard Pentium-133. The upgrades for 90- and 100-MHz systems will be available in May for $499 and $679, respectively.

Intel expects to deliver a 180-MHz upgrade for Pentium-120 and -150 systems as well as a 200-MHz part for Pentium-133 and -166 systems, but not until late in 1997. Note the diminishing returns as the original CPU speed increases; Pentium-150 and -166 systems will see little improvement from these OverDrive processors.

The OverDrive product line, inaugurated with 486 upgrades, has not been wildly successful. Sales of DX4 OverDrive chips were disappointing, as 486 users swapped their motherboards for systems with 72-pin SIMMs and PCI rather than just a new CPU. As those Pentium systems begin to fall behind in performance, Intel stands a better chance of selling a second processor to those early adopters.

## Netpower Moves to Pentium Pro

Joining the growing list of RISC vendors that have adopted Pentium Pro, Netpower (Santa Clara, Calif.) has announced its Calisto family of workstations based on Intel's high-end processor, starting at $5,295 for a system with no monitor. The startup, founded by veterans of MIPS Computer and other RISC vendors, had been pushing MIPS-based systems running Windows NT *(see* **0704MSB.PDF***)*. Although it will continue to market MIPS boxes, Netpower says it has ceased development of new MIPS products. A key factor in the decision was Pentium Pro's ability to match the integer performance of the R10000.

In addition, the NT-on-MIPS market has not developed as expected. Silicon Graphics, the largest maker of MIPS systems and owner of MIPS Technologies, has taken a negative position toward NT, and no other MIPS vendor has the size to support NT on its own. Relatively few applications are available for the NT/MIPS combination, and the platform has clearly lost the momentum it had as the first RISC architecture to support NT.

In the past months, both Intergraph and Data General have adopted Pentium Pro as their primary platform, replacing moldy RISC architectures (Clipper and the 88000, respectively). Netpower is certainly not of the magnitude of these other vendors, but its decision indicates that the RISC/x86 pendulum continues to swing toward Intel.

## Processor Modules Aid Notebook Design

MicroModule Systems (Cupertino, Calif.) has introduced a revolutionary new way to design notebook PCs. The company, which manufactures multichip modules, has defined a standard MCM pinout for these systems. In this scheme, the MCM contains the processor, secondary cache (if present), and system-logic chip set. It has two main connections, one directly to DRAM and the other to PCI.

Thus, the notebook system itself can contain standard memory chips and peripheral devices, but the processor core can be dropped in at the last minute to configure the system for the desired price/performance point. This technique would simplify notebook makers' manufacturing and inventory process and provide easy access to next-generation CPUs (e.g., P6) when they are introduced.

Other advantages of this approach are a reduction in the board space required for the processor core, which is now smaller due to the MCM packaging; the possibility of higher operating frequencies between the CPU and the cache; and improved thermal management.

MicroModule has arranged to obtain the necessary bare die: Mobile Pentium, Mobile Triton, and cache SRAM. Modules with these chips are now sampling, with production slated for June. The company also plans to offer a version with PicoPower's Vesuvius chip set, but this product is about three months behind the initial device. All the products in this family will be pin-compatible to allow easy upgrades.

 

The technology outlined by MicroModule is compelling. The issues are the same as with other MCMs: price and availability. The company must be able to deliver these modules with only a small premium over the cost of the discrete components; the notebook market is slightly less price sensitive than the desktop market but is unwilling to pay significantly more for similar functions.

MicroModule must also demonstrate the ability to deliver these modules in volume. The first usage will probably come from small vendors or in low-volume product lines. The adoption of this technology would be hastened by the existence of a second source.

Intel is developing similar modules but has not yet committed to offering them as a product. Intel is unlikely to use MCM technology or match MicroModule's pinout. But if Intel chooses to offer processor modules, or if MicroModule can get its products into high-volume production, it could change the way notebook systems are designed.

## First USB Microcontroller Comes from Intel

Intel has announced its first microcontroller with an integrated USB (universal serial bus) interface. The 82930A is a derivative of the company's MCS 251 family, the 16-bit upgrade of the venerable 80C51 architecture. The chip is intended to control intelligent USB peripherals such as keyboards and telephony products.

From a programmer's perspective, the new part is similar to other members of the 16-bit 251 family, which is upward binary-compatible with a plethora of 8-bit 80C51 microcontrollers and development tools. The 82930A includes a full USB master/slave interface, four transmit and receive FIFOs, 1K of on-chip RAM, a UART, timers, a 16-bit address bus, and an 8-bit data bus. In 10,000-unit volumes, the part is priced at $6.

The 82930A represents the first of a promised range of USB-capable microcontrollers, chip sets, and interface logic from Intel. The company's 430VX and 430HX Pentium core-logic chip sets *(see* **1002MSB.PDF***)*, for example, are the first to include USB interfaces. For Pentium Pro systems, VIA's Apollo P6 chip set *(see* **1002MSB.PDF***)* also includes a USB interface, which Intel's Orion does not. We expect USB to become an integral part of most new PCs by the end of 1996, with USB-compatible keyboards, modems, and other peripherals to follow.

## P-Rating Clarification

In the Chart Watch of our February 12 issue *(see* **1002CW.PDF***)*, we listed "P ratings" for PowerPC microprocessors. These are our estimates of what Pentium speed class each chip falls in, based on the vendor's SPECint95 ratings. It has no relationship to the recently announced P-rating standard *(see* **100202.PDF***)* and does not reflect any testing by MDR Labs. M

 