

Most Significant Bits

Intel/AMD Arbitration Ruling Guttled

In yet another surprise legal development in the Intel/AMD saga, the California Court of Appeals has thrown out AMD's license to Intel's 386 technology, which was granted through arbitration (*see 060402.PDF*). The decision overturned a previous Superior Court ruling affirming the arbitration award. AMD will now request that the Court of Appeals reconsider its decision, and assuming that this does not succeed, AMD will appeal to the California Supreme Court.

The appeals court accepted Intel's argument that the arbitrator "exceeded his powers by fashioning a remedy which did not fall within the scope of the parties' agreement," and invalidated the key section of the award that gave AMD the right to continue selling the 386 without further legal attacks from Intel. This issue is specific to the 386 and does not affect AMD's legal situation regarding the 486. The appeals court also threw out a paragraph that extended the patent license until 1997, but AMD believes that this is not important because it has the needed patent rights through other agreements.

AMD's appeal will be based on several factors. First, the appeals court did not hear evidence on the scope of the agreement, so AMD argues that it should not have made a finding on this point. Second, the court did not provide for any alternative remedy. The arbitrator clearly did not believe that the \$15 million in damages was sufficient compensation for Intel's breach; that was the reason for the 386 license award. Finally, AMD has argued for the arbitrator's right to fashion a fitting remedy in whatever manner he deems appropriate.

This ruling will not immediately affect AMD's ability to continue producing 386 chips unless Intel seeks and is granted a preliminary injunction, which is unlikely. Intel now plans to proceed with the copyright infringement case against AMD's 386, which had been stayed pending a final resolution of the arbitration ruling. This stay might not be lifted until AMD's appeal is complete, which could take more than a year.

If AMD fails to get the arbitration ruling reinstated, the microcode copyright case becomes critical; if Intel were to prevail here as well, then AMD's 386 chips would be illegal, entitling Intel to a massive damage award, and AMD could be forced out of the 386 business. On the other hand, if AMD wins the copyright case, then the gutting of the arbitration ruling would have no effect.

While the \$1 billion damage figure that has been touted is probably an exaggeration, Intel's lost profits are clearly at least several hundred million dollars, since AMD's shipments are now over 15 million units and Intel's 386 sales have all but dried up. What is hard to evaluate is how much the market grew because of AMD's

entry, and how high prices would have stayed if it were not for the competitive situation.

The primary issue in the copyright case is whether the 1976 agreement between the two companies gives AMD the right to use Intel's microcode. This issue was addressed in the 287 case, where the jury ruled against Intel but the judge later threw out the jury verdict—and the precedent it had established—because of evidence withheld by Intel (*see 070601.PDF*). The 287 case, which addresses many of the same issues as the 386 copyright case, must now be retried.

In this legal morass, the only fact that has become clear is that the 386 market will be gone by the time the issue of AMD's 386 rights is finally settled. The dispute at this point is really over whether AMD will have to pay Intel all the profits it earned there.

PowerPC Gains Supporters

At Microprocessor Forum Europe, Motorola announced three more companies that plan to develop products relating to PowerPC microprocessors. MacroTek (Germany) introduced a system-logic chip set for the PowerPC 601. Tandberg (Norway) will use PowerPC chips in X-terminals and workstations. Chorus Systems (France) will port its eponymous UNIX microkernel to the PowerPC architecture, providing a real-time OS (albeit somewhat large) for embedded applications.

Ford finally announced its long-rumored decision (*see 0604MSB.PDF*) to switch from the 88000 to PowerPC for its next-generation engine controllers. This announcement, along with the 80% reduction in staffing at 88open, is another harbinger of the demise of Motorola's 88000 architecture. We await the final word from Data General, which is still not committed to developing any follow-ons to its 88000-based systems.

Motorola Reveals Low-Power 68040

Motorola provided more information on its forthcoming 68040V, a low-power derivative previously known as the LP040 (*see 0604MSB.PDF*). The chip will be a complete reimplement of the 68040 CPU core as a static design, using Motorola's leading-edge 0.5-micron CMOS process. It will include all of the features of a standard 68040—CPU, dual 4K caches, and dual MMUs—except for the floating-point unit. The 68040V will operate at 3.3V and support clock rates up to 33 MHz. Even at its top speed, the chip will require only 1.5 W, making it ideal for portable systems. To further reduce power consumption, the LPSTOP instruction places the processor in standby mode, which uses just 0.2 mW.

Motorola plans to begin sampling the 68040V in October and achieve full production in 2Q94. Pricing will be

announced later this year; the company expects it to be comparable to similar 5V 68EC040 parts, that is, about \$100–\$150 depending on clock rate. The new processor will be packaged in a 184-pin ceramic QFP.

A major customer for the low-power chip will be Apple, which can use it in a next generation of high-performance PowerBooks. The 68040V should appear slightly sooner than the PowerPC 603, also expected to be used in portable Apple systems. Although the 68040V seems suitable for handheld devices as well, Motorola is aiming its Dragon chip at that market (see *070803.PDF*).

The company also announced that it has achieved volume shipments of its top-of-the-line 40-MHz 68040, which uses a 0.65-micron process. The much-delayed 40-MHz speed grade is priced at \$393 in quantities of 1000, compared to \$290 for a 33-MHz part and \$245 for the 25-MHz version. Just over a year ago (see *0604MSB.PDF*), Motorola promised volume shipments for 3Q92 but has had numerous fabrication problems since then. The 68040V, on the other hand, continues—so far—to be on the same schedule as discussed last March.

P24T to Ship with “Active” Heat Sink

Because many systems advertised as “Pentium upgradeable” do not, in fact, provide adequate cooling for the Pentium-based P24T OverDrive processor, Intel is revising its plans for that device and implementing a verification program for systems offering an upgrade socket. Intel says that it informed system customers of the device’s cooling requirements, but that many vendors cut corners and didn’t provide adequate airflow. This is understandable, since providing the specified airflow, which is much greater than required for the 486, would increase system costs in a very low-margin business. Intel denies that the planned power dissipation for the chip has increased.

Intel now plans to sell Pentium OverDrive processors with an active cooling device—probably a heat sink with a built-in fan—to dissipate the expected heat. The new heat sink reduces the airflow requirement from 400 LFM (linear feet per minute) to 100 LFM but increases the vertical clearance above the upgrade socket from 0.55 to 1.2 inches.

Many vendors are already selling systems with a 238-pin Pentium OverDrive socket. Those systems that happen to have extra clearance above the socket will be able to use the “standard” P24T product with the active heat sink. For those systems that meet the original specification but don’t have the extra height, Intel will offer a special version of the Pentium OverDrive chip, probably with a passive heat sink. This special version may have to be purchased from the system vendor or from Intel rather than through retail channels. Intel is currently communicating the new specifications to its OEMs and expects all new systems to provide enough clearance for the active heat sink.

Intel also plans to introduce a new, 237-pin upgrade socket for systems meeting the revised specifications. This will limit the risk that parts with a passive heat sink will be plugged into systems that do not have adequate cooling. Intel is developing a testing program to verify and label those systems that meet the new specifications. Intel plans to announce full details of the upgrade and verification program in September. P24T itself is expected to begin shipping in mid-1994 and to offer at least a 50% performance improvement over a 66-MHz 486DX2.

Apple Supports PCI

In a surprise announcement, Apple said it plans to use PCI as the expansion bus in future PowerPC Macintosh systems. The company says that initial products will stick with the current NuBus but second-generation systems will move to PCI to take advantage of its higher performance. Since PCI is also being supported for x86 and Alpha PCs, there should be a wide variety of low-cost PCI add-in boards available in a few years.

This move should benefit end users by lowering board prices and allowing these cards to be interchanged among multiple platforms. Apple also benefits from lower prices and from not having to design its own bus. The company runs the risk, however, of losing its product differentiation from the x86 PC; one of the important Mac advantages is the auto-configuration of NuBus, which is far superior to the PC/AT bus in this regard.

Next Steps Onto PA-RISC

After a long series of negotiations, Next and Hewlett-Packard have agreed to port the NextStep operating system to HP’s PA-RISC architecture. The bulk of the work will be done by Next, and the new product is not expected to be ready until next year. HP has already agreed to bundle the x86 version of NextStep, which is now shipping, with its Vectra PCs. Once the PA-RISC version is completed, HP expects to offer that OS as an option to its workstation customers.

The two companies were rumored to have discussed Next building PA-RISC systems, but that issue became moot once Next decided to stop selling hardware. HP was also rumored to be considering an equity stake in the smaller company, but that is not a part of the current arrangement.

Alpha Design Kits Available

Digital announced that it will offer sample Alpha motherboard design kits, including schematics, Verilog models, application notes, and low-level software for either OSF or Windows NT. They are available for a nominal fee of \$50 and require no additional royalty or license fees. The first kit, due to ship in 3Q93, combines the 21064 CPU with standard PC peripherals and an ISA ex-

pansion bus. It uses discrete logic for the memory and bus interfaces. Future kits will include a 21064 design based on a PCI system-logic chip set as well as a 21066 (Low-Cost Alpha) design.

Evaluation boards will be available for \$5000. CAD models for the 21064 are available from Mentor, Cadence, and Viewlogic. Both Tektronix and HP logic analyzers support the 21064 processor.

Rambus Licensed for Graphics Products

Brooktree (San Diego, CA), the leading supplier of RAMDACs for graphics subsystems, has licensed the Rambus interface for use in future graphics and video products. Brooktree is the first such company to announce a licensing agreement. The Rambus interface has already been licensed by Toshiba, Fujitsu, and NEC for use in memory chips called RDRAMs (see [070304.PDF](#)).

The 8-bit Rambus can be used in small, inexpensive packages to provide data rates up to 500 Mbytes/s. A Rambus-equipped RAMDAC could quickly transfer data from an RDRAM video buffer to the display. The fast transfer rate should satisfy the most demanding graphics applications, which combine large monitors, 24-bit color depth, and high screen-refresh rates. Brooktree did not reveal any specific product plans or a timetable to introduce such products.

TI Discloses MPEG Audio Chip

Texas Instruments revealed the first fruit of its "if you can't beat 'em, join 'em" pact with C-Cube Microsystems. The agreement calls for TI to develop dedicated MPEG audio chips while C-Cube, the leader in MPEG video chips, continues to focus on its specialty. TI announced that the TMS320AV110 will be its first DSP specifically designed to decode MPEG audio. In addition to supporting C-Cube chips in audio/video applications, the 'AV110 can also be used for digital compact cassette (DCC) systems and digital radio broadcasts that use the MPEG format.

Functionally, the chip is similar to LSI's L64111 (see [070605.PDF](#)) audio decoder. Both accept either MPEG audio data or an MPEG system stream (multiplexed audio and video) as either serial or parallel data at rates up to 15 Mbps with mono or stereo PCM outputs. The LSI chip is currently available for under \$30. TI declined

to provide any pricing information on the 'AV110 until the official product announcement this summer. The new chip is currently sampling and TI expects production volumes in the third quarter.

Quickturn Eats PiE Design

Quickturn Systems, the leading manufacturer of hardware-based logic emulation systems, will acquire its chief competitor, PiE Design Systems, in a friendly merger. The merged entity will continue to support products from both companies until unified software and hardware platforms are delivered sometime next year. Both companies are privately held, but the total revenue of the combined entity is estimated to be about \$30 million, making it the third-largest EDA (electronic design automation) firm in Silicon Valley.

Both companies manufacture systems that allow chip designs to be simulated using a combination of software models and field-programmable gate arrays. This method can be up to a million times faster than traditional software-only simulation, allowing operating systems and applications to be run on a new microprocessor before it is even fabricated.

Hardware emulation has become increasingly popular with CPU designers for this reason. Intel used Quickturn systems to verify Pentium and is using them for the P6 project as well. HP, Sun, and Intergraph are also using Quickturn systems to verify their next-generation CPU designs. AMD and Motorola are major customers of PiE. As processor complexity continues to grow, hardware emulation may be a necessity to maintain a competitive design time.

"Father of RISC" Joins HaL

John Cocke, a former IBM fellow who led that company's famous "801" project, has joined HaL Computer as Chief Scientist after retiring last year from IBM after 37 years. Cocke is known for his wide-ranging contributions to computer technology, including computer architecture (the 801 and RS/6000 are among the systems for which he was a pivotal influence), optimizing compilers, and mass storage devices. His role in the 801 program, a pioneering RISC design, led him to be called "the father of RISC architecture." He joins ex-IBMer and HaL CEO Andy Heller to work on 64-bit SPARC systems. ♦