

■ Intergraph Accuses Intel of “Oppression”

In a bizarre turnaround, workstation maker Intergraph has gone from being one of Intel’s sweethearts to being tossed away like a cheap tart. Intergraph has filed a lawsuit against Intel alleging patent infringement and anticompetitive behavior. The suit was apparently expected: Intel responded within hours by filing a countersuit that attempts to overturn Intergraph’s patents. A second countersuit filed a week later accuses Intergraph of breach of contract.

The former Clipper vendor was the first major RISC workstation vendor to convert its products to Intel processors, and Intergraph’s systems were prominently featured at the Pentium Pro introduction (see MPR 11/13/95, p. 1). As recently as May, Intergraph was on stage during Intel’s launch of Pentium II.

According to the workstation maker, however, by then its relationship with Intel had already started to sour. The crux of the suits is a set of Clipper patents—U.S. 4,899,275, 4,933,835, and 5,091,846—relating to cache management, patents that Intergraph asserts are infringed by Intel’s Pentium and Pentium II processors.

The suit goes well beyond patent infringement, however, accusing Intel of “a systematic campaign of coercion and oppression...to pressure Intergraph into giving up” its patent rights. After Intergraph refused to license its patents to Intel without compensation, Intel directed its employees to “cease and desist providing any support to Intergraph,” according to the complaint.

Intergraph also claims that Intel unilaterally terminated its nondisclosure agreement (NDA), failed to inform the system maker of a chip-set bug, and prevented a third party from supplying Intergraph with Intel-compatible test equipment. Perhaps going over the edge, the suit even alleges that Intel has “introduced competitors into Intergraph’s customer accounts” and threatened to withdraw marketing funds from companies that buy Intergraph products. (The full complaint is available at www.intergraph.com/intel.stm.)

Intel claims that Intergraph’s patents are not valid and therefore its products don’t infringe. Intel acknowledges that it terminated Intergraph’s NDA but says it can legally do so at any time. The lack of an NDA prevented Intergraph from receiving bug reports as promptly as other Intel customers. Intel denies the other claims of improper activities. Intel’s countersuit accuses Intergraph of refusing to return confidential material upon termination of the NDA, as legally required by the agreement.

Sources indicate that Intergraph, which has had only one profitable quarter in the past five years, was wielding its patents in an attempt to gain royalties from other makers of x86 workstations. Instead of settling this matter in a court of law, these system makers asked Intel to be the judge and jury in this case. Intel told Intergraph to stop asserting its patents

and, when the company refused, sentenced it to the outer circle of Intel’s customer list.

Intergraph’s allegations of anticompetitive behavior will certainly feed an ongoing investigation by the U.S. Federal Trade Commission (FTC) into Intel’s business practices. The key issue the FTC must decide in this case is whether Intel must maintain NDA relationships with all of its largest customers, due to its dominant position in the market, or whether Intel has the same right as smaller companies to decide with whom it partners. Preventing Intel from arbitrarily terminating NDAs, a tactic it also used against Digital, would remove a powerful weapon Intel can use to keep its customers (i.e., most of the computer industry) in line.

Rulings in both the Intergraph suits and the FTC investigation could take months or years. In the meantime, Intel must move nimbly in both the courts and government offices to emerge unscathed from this latest spat. —L.G.

■ Intel Competitors Unify Behind AMD 3D

Cyrix and IDT are planning to adopt AMD’s 3D instruction-set extensions, according to sources at those companies, ensuring base-level compatibility among the vendors’ products and boosting prospects for software support. None of the three vendors was aware that the others were developing similar 3D extensions until October’s Microprocessor Forum, where AMD CEO Jerry Sanders publicly offered to license the AMD 3D extensions. This offer led to ongoing negotiations among the three companies. According to sources, Microsoft “encouraged” the CPU vendors to adopt a single standard in order to gain software support.

Because AMD’s K6 3D (see MPR 10/27/97, p. 19) is in the final stages of preproduction testing, that chip cannot be easily changed. In contrast, neither the Centaur C6+ (see MPR 11/17/97, p. 17) nor the Cyrix MXi (see MPR 12/8/97, p. 16) has achieved first silicon. Furthermore, AMD already has an optimized version of Microsoft’s DirectX code running, and Microsoft will include this code in DirectX 6.0, allowing 3D software vendors that use DirectX geometry to take advantage of the new extensions without modifying their application. By adopting the AMD instructions, the MXi and C6+ will also be supported by DirectX 6.0 and by applications that directly incorporate the 3D extensions.

AMD has not released full details of its 3D extensions, which incorporate parallel single-precision FP operations, but they are less extensive than Cyrix’s or Centaur’s extensions. Those companies may still implement new functions as a superset of AMD 3D, but since the DirectX software will probably use only the subset, any proprietary additions are unlikely to be of much value. Although Cyrix and IDT would have liked to have more influence over the design of the extensions, the unification will lead to a broader base of software for all three vendors. —L.G.

■ ATI Claims Performance Lead in Mobile 3D

By combining the fast Rage Pro 3D core with RGB and LCD controllers, a video encoder, and power-management logic, ATI's new Rage LT Pro lays claim to the fastest 2D and 3D performance available for notebook computers.

The new chip can drive LCD, CRT, and TV displays simultaneously, a feature the company calls Tri-View. This is the first time this capability has been offered in a single-chip implementation. The Rage LT Pro also includes integrated 65-MHz LVDS (low-voltage differential signaling) transmitters for LCDs with resolutions up to $1,280 \times 1,024$. The LCD controller can expand low-resolution display modes such as 640×480 up to $1,024 \times 768$ with both horizontal and vertical filtering, making better use of the large LCDs found on today's notebooks.

The Rage LT Pro also includes the MPEG-2 motion-compensation logic found on the Rage Pro, which should enable full-speed software DVD playback on next year's Mobile Deschutes-based notebooks. The chip's video encoder supports Macrovision copy protection, a required feature for DVD playback systems.

The new chip is currently available in sample quantities; ATI (www.atitech.com) expects to ship production units in 1Q98, priced at \$35 each in quantity. —P.N.G.

■ Intel Works Around Pentium Bug

Responding quickly to reports of a new bug in its Pentium processors (see MPR 11/17/97, p. 4), Intel has developed a workaround for the problem. The bug, which is triggered by an invalid `CMPXCH8B` instruction with a `LOCK` prefix, causes a Pentium/MMX or Pentium processor to freeze. When the invalid instruction is encountered, the processor attempts to execute the invalid-opcode-exception handler, but because the bus is locked, the processor halts. For other invalid instructions, the processor overrides the bus lock and fetches the exception handler appropriately.

The workaround is a patch that can be applied to operating systems. It involves aligning the Interrupt Descriptor Table so it spans a page boundary, with the first seven entries (0–6) on one page and the remaining entries on a second page. The first page should be marked as nonwritable in the page table. In this environment, an invalid opcode exception will cause the processor to attempt to access entry 6 in the table; because the lock bit is set, however, the processor will request write access to that entry and thus encounter a page fault due to the nonwritable status. This fault is correctly handled in the presence of a bus lock, allowing processing to continue. The page-fault handler must then be modified to correctly handle the invalid opcode exception.

With this workaround, exceptions that occur without the lock bit set will be handled normally. The workaround requires, however, that the operating system use the write-protect feature. Most server operating systems, including Windows NT and most versions of Unix, use this feature, but Windows 95 does not. A second workaround is available for

other operating systems; it uses a not-present page fault instead of a nonwritable page fault, which adds some overhead for normal page faults. For more information, access the Web at support.intel.com/support/processors/pentium/ppiie.

Operating-system vendors have taken various stands on the severity of this problem. Although the bug does not affect normal software, it could be used to crash a machine remotely. Patches for Linux and BSD Unix are already available on the Web. Novell claims the security features built into its Netware will prevent any attack of this type. Microsoft, Sun, and other vendors say only that they are investigating the potential impact of the problem and will take action appropriate to the needs of their customers, a stance that is hardly reassuring. —L.G.

■ 21164PC Appears in \$2,000 Systems

At Comdex, 14 companies unveiled systems based on the Alpha 21164PC processor (see MPR 3/31/97, p. 9), all priced below \$2,600 and some below \$2,000. These prices are for fully configured systems, typically with 1M of L2 cache, 64M of SDRAM, 2G–6.4G hard drive, CD-ROM, floppy, PC-class 3D graphics card, and the usual I/O ports, but no monitor. Most of the systems use Digital's PC164SX motherboard. A few of the lowest-price systems use 400- or 466-MHz 21164PC chips, but most use the 533-MHz version.

The biggest of the system vendors is Vobis, the largest PC maker in Germany. Other Alpha PC makers include Carrera, Enorex, Microway, and Polywell. Curiously absent from the list is Digital itself. For information on the available systems, see www.alphapowered.com.

The 21164PC processors are currently being produced by both Digital and Mitsubishi. Digital's 1,000-piece list prices range from \$225 for the 400-MHz version to \$401 for the 533-MHz version. By comparison, Intel's Pentium II carries a list price of \$401 to \$738 in clock speeds of 233 to 300 MHz. According to SPEC95 (base), Pentium II offers integer performance similar to that of the 21164PC but much lower floating-point performance.

These systems demonstrate that Alpha-based systems can reach PC price points and are an alternative worth considering for performance-focused PC buyers—as long as they use applications that are available in an Alpha version. Once VLSI Technology ships its 21164PC chip set (the current systems use a Digital chip set), prices should drop further and performance may go up slightly. Clock speeds will also get a big boost with a switch to 0.25-micron technology next year. Unfortunately, none of the vendors had good comparative benchmark results to show just how well the systems perform, but reviews should begin appearing in the PC press soon. —M.S.

■ National/Cyrix Merger Complete

Following a shareholders' meeting on November 17, the merger between National and Cyrix (see MPR 8/25/97, p. 1) is now complete. Cyrix is operating as a wholly owned sub-

subsidiary that retains its product marketing and branding. The new subsidiary has not announced any changes in its product plans for x86 processors (see [MPR 10/27/97, p. 22](#)).

Cyrix has been combined with National's Personal Systems Group to form one organization focused on processors and infrastructure for PCs. That organization will be managed by former Cyrix VP Engineering Kevin McDonough along with long-time National employee and Senior VP Richard Sanquini as "two in a box." Jay Swent, Cyrix's CFO, had led the company since the departure of founding president Jerry Rogers last year, but he has now resigned. Steve Tobak, formerly Cyrix's VP of corporate marketing, has become VP of corporate marketing and communications for all of National, including Cyrix. —*M.S.*

■ Cyrix Targets Office, Living Room

Seeking to expand the market for its low-cost integrated processor line, Cyrix showed two reference designs for MediaGX-based systems at Comdex. Both designs are currently based on the forthcoming GXm version of that chip, which will offer faster clock speeds and MMX compatibility (see [MPR 11/17/97, p. 4](#)). The first system is a "managed PC," also known as a NetPC until that term fell into disfavor. This system is designed to support Windows NT 5.0 and can boot from the LAN. Cyrix expects systems based on this

design to sell for about \$500 (without monitor).

The second reference design is more groundbreaking—and will also take longer to reach meaningful volumes. The Media Center system combines a MediaGX-based PC with a full complement of multimedia peripherals, including a DVD drive, 3D accelerator, AC-3 and MPEG-2 decoders, and television output. Cyrix wrote its own MediaSmart software to enable users to easily switch from TV to Web and other computer functions. Cyrix believes that such a system could retail for less than \$1,300.

While the managed PC design could be produced in high volume with little change, the Media Center is more of a proof of concept; the future MXi processor (see [MPR 12/8/97, p. 16](#)) will eliminate the need for the 3D and MPEG logic and make this design more compelling. By developing this reference design, Cyrix hopes to raise its profile as a system innovator; such efforts will also be valuable for defining future highly integrated processor designs. —*M.S.*

■ Erratum: Power3 Manufacturing Cost

In our article on IBM's Power3 (see [MPR 11/17/97, p. 23](#)), we printed the wrong manufacturing cost estimate for the processor. The MDR Cost Model estimates the chip's manufacturing cost at \$330, which is higher than the cost of most competing processors. —*L.G.* 