Intel Sees Slowdown in Sales

According to Intel, its processor shipments in the first quarter of this year are slumping, falling well behind its unit shipments in the previous quarter. The company also reports that its average selling price declined from 4Q97 to 1Q98, although this decline was expected. Intel had hoped these lower prices would spur demand for its products in the traditionally weak first quarter, but apparently they did not.

Analysts are mixed about whether this report indicates trouble for the PC market as a whole. Computer Intelligence sees no evidence of a slowdown in PC sales and reports that buying plans remain strong (see *www.infobeads.com/insider/pages/topics/commercial_pc*). Dell also reported that its sales continue to grow.

Compaq warned of slowing sales, but in this case the problem is excess inventory. The PC maker apparently overbuilt in the fourth quarter and is now paying the price. Since Compaq is Intel's largest customer, its decline in purchases may account for a significant portion of Intel's problem.

Other PC makers have been focused on reducing inventory by shrinking their lead times. The emerging build-to-order model at many PC vendors has significantly shortened the time between when a processor is shipped from Intel and when that processor is purchased by an end user. As lead times shrink, Intel's shipments will grow at a slower rate than PC sales.

One might suspect that Intel is losing share to its competitors, but AMD and Cyrix are not seeing a significant increase in sales, due mainly to product and production shortfalls. We believe that Intel is not losing a significant amount of market share at this time.

The shortfall will cause Intel's 1Q98 revenues to come in around $5.9 billion rather than the $6.5 billion the company had previously expected. The revised figure matches our forecast from last summer (see MPR 7/14/97, p. 1). Although this situation is not beneficial for Intel, the evidence does not yet indicate a slowdown in PC sales, which would have broad implications for the PC and semiconductor industries. The situation is complex, however, and bears careful monitoring. —*L.G.*

Geyserville Notebooks to Shift Gears

Sources indicate that Intel is planning a dual-voltage version of the Mobile Katmai processor that will be able to shift to a higher voltage, and thus a faster clock speed, when extra power is available. A notebook design code-named Geyserville will switch to the higher speed whenever the notebook is connected to an external power source.

To reduce power consumption, all of Intel's current mobile processors operate at a lower voltage than the corresponding desktop versions. Because CMOS circuits run more slowly when operated below their normal voltage level, these mobile parts achieve lower clock speeds than the desktop products. This gap has caused notebook performance to trail desktop performance since the introduction of the first Pentium processor.

The same chip, however, could run at high speeds in a desktop environment but lower speeds in a notebook system. To take advantage of this fact, Geyserville notebooks will be able to increase the voltage to the CPU on demand, enabling it to run faster. Sources indicate that the Mobile Katmai will run at 350 MHz at the lower voltage but will speed up to 450 MHz at the higher voltage.

At top speed, power dissipation might rise to 15 W, nearly twice the power of the mobile version. Removing this extra heat will probably require a second fan, which could be mounted in the notebook or outside, perhaps in a docking station. (Putting the extra fan inside the system would allow the notebook to switch to the higher speed anytime it had access to external power, even outside of the docking station.) If the higher voltage is used only when the system is running from an external power supply, the extra power for the CPU and the second fan would not impact battery life.

Portable PCs are often plugged into a docking station or into an AC outlet, for example, at a meeting or in a hotel room. Airplanes are the most common opportunity to use the battery as the sole source of power, but many airlines are putting power outlets into business-class seats. Thus, a Geyserville notebook could spend most of its time running at the higher clock speed.

The only change Intel needs to make for such a design is to test its chips at two voltages; today, chips are tested and sold for either the mobile voltage or the desktop voltage. Intel may charge a small premium for the dual-voltage parts, or it could simply include this feature in all mobile parts, which already carry a hefty premium. In either case, this innovative design could help close the gap between notebook and desktop performance as early as 2H99. —*L.G.*

Nvidia's TNT Demolishes Speed Records

Close on the heels of its record-setting Riva 128ZX (see MPR 3/9/98, p. 16), Nvidia has announced an even faster 3D chip. The new Riva TNT offers a peak fill rate of 250 Mpixels/s, 2.5 times that of the 128ZX. The chip has two on-chip rasterizers running at 125 MHz. The rasterizers can apply two textures at once to a single pixel, or they can each process separate pixels to achieve the peak fill rate.

TNT supports 32-bit RGBα (color plus alpha) and 24-bit Z values, which should provide better visual quality than the 16-bit color and Z values used by the original Riva core. To support the faster rendering rate, TNT doubles the local memory size and bandwidth of the 128ZX, with up to 16M of 128-bit 200-MHz SGRAM providing 3.2 Gbytes/s of memory bandwidth. The new chip also includes an 8-bit

stencil buffer, anisotropic texture filtering, and a full-featured 2× AGP interface.

This level of performance isn't cheap: there are more than 7 million transistors on the 0.35-micron die, setting a new complexity record for single-chip 3D engines. Nvidia has not released the die size for TNT, but we expect it to be quite large. For comparison, Intel's Klamath processor, with 7.5 million transistors in a similar process, measures 203 mm^2. To reduce the die size, Nvidia is prepared to move the TNT chip to more advanced processes as they become available at foundries SGS-Thomson and TSMC.

While TNT includes mainstream 2D and digital-video features similar to those found on the 128ZX, the new chip will also compete with dedicated 3D-only accelerators like 3Dfx's Voodoo2. The TNT chip is priced at $45 in quantity, about 50% higher than the 128ZX and other mainstream 3D chips, allowing Nvidia to offer a range of products to its OEM customers. Nvidia *(www.nvidia.com)* expects to sample the Riva TNT in the second quarter and begin production in the third quarter.

Nvidia has not yet released benchmark results for the new chip nor provided samples for our testing. But given the chip's advanced rendering architecture, it will certainly deliver outstanding performance on 3D WinBench and other key metrics. TNT is likely to score far better than all previously announced 3D chips, including the 128ZX, Voodoo2, and Intel's 740, setting a new standard for 3D performance—at least for a few months. —*P.N.G.*

IBM to Build x86 Chips for IDT

IDT apparently has big plans for its little C6 processor. The company has signed IBM Microelectronics to provide additional manufacturing capacity for the x86 chip, which IDT is currently building in its own fabs. Under the three-year agreement, IBM will build a future version of the C6 (see MPR 11/17/97, p. 17) in its 0.25-micron process known as CMOS-6S2 (see MPR 8/4/97, p. 14). The IBM-built parts will not begin shipping until fall.

Although IDT touts the 0.25-micron process as IBM's "leading-edge technology," Big Blue has been building PowerPC chips in CMOS-6S2 since 2Q97, so the process will be more than a year old by the time IDT gets access to it. By that time, IBM is likely to be producing parts using its 0.20-micron copper process—but only for its own use.

IBM is now signed up to build x86 processors for all of Intel's major competitors: Cyrix, AMD (see MPR 3/9/98, p. 4), and IDT. Access to advanced process technology is a key factor for these vendors. Although IBM saves its best process technology for its own parts, once these technologies reach high volume, IBM makes them available to others. This results in a 6–12 month lag behind IBM's state of the art, which is still better than the 12–24 month lag found at typical foundries such as TSMC and Chartered.

In IDT's case, IBM's patent cross-license with Intel is also a key benefit. While AMD and Cyrix (through National) have their own licenses, IDT does not. The C6 vendor is currently building parts in its own unlicensed fab and believes it does not need a license. For customers that may be concerned about this strategy, however, the IBM deal provides a method for IDT to provide licensed processors. IBM could also provide a backup plan in the event that IDT's current production is blocked by an Intel legal attack. So far, Intel has not questioned IDT's practices in a court of law.

IDT probably hopes it won't use much of IBM capacity. Its own fabs can produce millions of C6 parts per year; to date, the company has sold only a few hundred thousand processors. By the time IBM is building 0.25-micron C6 processors, IDT expects to have its own 0.25-micron process up and running. Buying chips from IBM will be more expensive than building them in-house, so we believe IDT will buy large numbers of IBM-built chips only if it needs to mollify the fears of a major customer. —*L.G.*

Intel Trims Price of 333-MHz Pentium II

In an unusual midquarter price cut, Intel reduced the price of its top-of-the-line Pentium II processor to $583, effective March 15. The 333-MHz part was just announced in January at a price of $722. The company still plans to roll out its normal round of price cuts in April, including another cut in the price of the 333-MHz part.

Sources indicate the midquarter price cut paves the way for Intel's 350- and 400-MHz Pentium IIs, expected to be announced in April. With two powerful new chips coming out at the same time, the 333-MHz price must drop sharply to make room; Intel will make this big change in two stages. The company may continue to use this tactic in the future to keep a close match between supply and demand. —*L.G.*

Motorola Boosts PowerPC 750 to 300 MHz

Improved speed yields have allowed Motorola to deploy a 300-MHz version of its PowerPC 750. The new version is identical to the current members of the family (see MPR 8/4/97, p. 8) except for the higher clock speed. The 300-MHz part is rated at 13.2 SPECint95 (base) and 8.5 SPECfp95 (base). These scores are nearly identical to those of a 333-MHz Pentium II, casting doubt on Apple's infamous ads comparing Pentium II with a snail.

The new part carries a list price of $495, compared with $321 for the 266-MHz version. The PowerPC chip costs only slightly less than the 333-MHz Pentium II, which lists for $583. Motorola does not plan to offer the 740 (a version of the 750 without the L2-cache interface) at the higher clock speed. IBM also sells the 740 and 750 but has not yet announced any 300-MHz parts.

Motorola has not yet moved the 750 to its best process, the 0.25-micron PPC4. In that process, the 750 would likely reach 400 MHz. Motorola is also preparing its PPC5 copper process (see MPR 8/4/97, p. 14), which should boost speeds even further. Watch for faster versions of the 750 to appear in 2H98. —*L.G.*