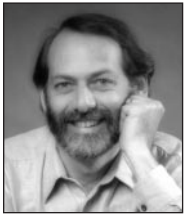


Will Graphics Follow Chip Sets?

Intel's Domination Isn't Assured—But It Is Certainly Possible



Intel's recent move to purchase Chips and Technologies puts to rest any speculation that Intel is developing a 3D chip just to push the high end of the market. Intel clearly has big plans for its future role in the graphics chip business, and today's vendors have good reason to be worried.

The parallels with the changes Intel wrought on the chip-set industry are numerous. Before Intel entered the chip-set market, there were three dozen chip-set makers—about the same number as there are graphics chip companies now. Today, there are only half a dozen chip-set makers, and some of these are far less significant than they once were.

Major changes in market share frequently occur when there are technology discontinuities. Intel had been a chip-set supplier for years, but it had never been very successful. The transition from the 486 and VL-Bus to Pentium and PCI created a discontinuity that enabled Intel to step in and take a leadership role. The fact that Intel defined PCI and had intimate knowledge of its new processor certainly helped.

Intel's past efforts in graphics haven't been successful. But the graphics business also is in the midst of major discontinuities. It is just about to make the transition from PCI to AGP—another bus defined by Intel. The shift from 2D to 3D is another discontinuity, although this shift is one that Intel did not define and is already well under way. And the shift from Pentium to Pentium II is just getting started.

Intel probably did not set out to dominate the chip-set business. But Intel did believe it had to provide technology leadership in chip sets to ensure a rapidly growing market for its latest processors. Being the leader in chip sets gives Intel more control over the platform. The devastation of the chip-set industry was not Intel's goal, but merely a side effect.

Intel entered the chip-set business in pursuit of a strategic platform goal—but once the business unit was in place, it took on a life of its own. Intel has more resources to apply to chip-set development than any other company. Furthermore, unlike system-logic vendors, Intel can justify investing in platform technologies—even at a loss—if it helps boost high-performance processor sales.

The situation with graphics is similar. Few mainstream applications today are driving demand for faster processors as much as 3D graphics, and Intel executives presumably believe Intel can boost total system performance more rapidly if the company creates graphics chips as well.

Intel also has different ideas about how the graphics tasks should be partitioned: Intel wants to keep geometry

processing on the host CPU, while many high-end 3D chip vendors plan to move geometry processing to the graphics chip. Intel's preferred partitioning will make host CPU performance more important, helping keep demand for leading-edge processors strong. Intel's need to influence 3D graphics chips is arguably even stronger than was its need to influence system-logic chip sets.

One key difference between chip sets and graphics is that chip sets can be built with previous-generation process technology, whereas high-performance 3D graphics chips require the same technology as leading-edge processors. Chip sets give Intel something to build in fabs that are past their prime for building microprocessors, taking advantage of these fully amortized assets. Graphics chips aren't likely to play this role.

Graphics chip vendors shouldn't take much comfort from this difference, however. If Intel wants to invest in fab capacity for graphics chips, it clearly has an unparalleled ability to do so. And just as fabless microprocessor vendors have found it hard to compete with Intel because they can't get cost-effective access to comparable process technology, graphics chip vendors could find themselves a generation behind Intel in IC technology.

The stock market measures Intel's success on revenue and profit growth. Intel can't expect to gain much, if any, market share in PC microprocessors, and profit margins are likely to go down, not up. If PC market growth slows, the only way for Intel to maintain its growth rate in this market is to broaden the number of chips it supplies. Chip sets and graphics chips give Intel three major blocks in each PC.

Any graphics chip maker not yet seriously anxiety-ridden should consider the parallels between Intel and Microsoft. Operating systems are the heart of Microsoft's business. Microsoft has demolished one competitor after another in the most popular business application categories—in large part because it can out-invest its competitors, is persistent, and gains synergy by supplying all the major software components for a typical PC. And there just may be some benefit from being part of the same company that controls what future operating systems will look like.

For Intel, the operating system is the microprocessor, and the applications programs are the surrounding chips. The analogy is not perfect, since the microprocessor represents a much larger share of the revenue than the OS—but it is strong enough to be disturbing for Intel's competitors. □

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