

New Chips Pose a Challenge to Software Makers

By DON CLARK

SINCE THE 1960S, following a pattern dubbed Moore's Law, semiconductor manufacturers have steadily churned out computer chips that do more and cost less. In the latest twist, chip makers plan to offer two electronic brains on each piece of silicon.

These "multicore" chips, coming soon from Intel Corp. and Advanced Micro Devices Inc., offer a new way to boost personal-computer performance. The idea, long used on larger computers, is to break up problems to be handled in parallel by multiple calculating engines.

But fully exploiting the new dual-core chips will require modifications in PC programs—a daunting task for software companies that could once count on their creations running faster as chip manufacturers increased chip "clock speeds," measured in megahertz or gigahertz. Now, those easy gains are ending.

A Performance Paradox

"Processor clock speeds are not going up like everybody thought they would," Microsoft Corp.'s Bill Gates said recently during one of his minisabbaticals dubbed "think weeks." "That's a big, big, big change. That's a huge challenge for the industry."

Indeed, in some of the first independent tests, systems with Intel's dual-core chips ran some productivity and entertainment software slower than Intel's fastest single-core chip. The new systems were faster, however, at jobs such as encoding video and audio clips, espe-

cially when more than one such task is done simultaneously.

The performance paradox is particularly striking with computer games, a field where hobbyists are usually the first to upgrade to machines with new chips. "I haven't seen a game with any benefit," says Kyle Bennett, editor in chief of HardOCP.com, a Web site that tested the Intel chips.

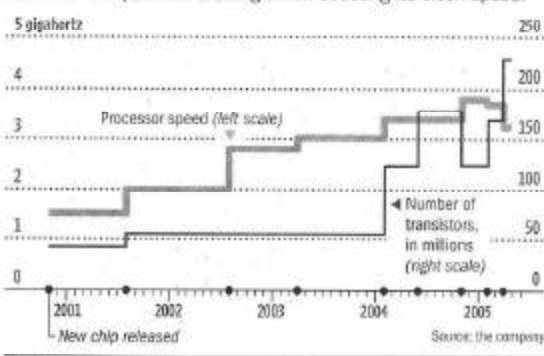
Yet there's no turning back from the multicore movement, a turning point in chip design and a milestone in the evolution of Moore's Law, which turns 40 years old next week.

Intel co-founder Gordon Moore in a 1965 article described how quickly companies reduce the size and cost of components that store data or make calculations. He predicted that the number of transistors on a typical chip would double every year, although he later amended the schedule to every 24 months.

That pace hasn't slowed, but the combination of microscopic circuitry and higher clock speeds has created power-consumption problems. Intel's high-end chips now draw up to 130 watts—com-

Shifting Gears

Intel has continued to squeeze more transistors onto its popular Pentium 4 chip, but is backing off on boosting its clock speed.



pared with 90 for Advanced Micro Devices—and both require clever cooling.

"It got absurd," Mr. Moore, Intel's chairman emeritus, says of trying to push higher clock speeds. "I'm surprised that people are willing to sit still for 100-watt processors."

'Like a Freight Train'

So Intel has shifted gears, using tinier transistors to add more processors while reducing clock speeds. Its first dual-core chips—which Dell Inc. and other companies expect to offer in PCs by the end of April—will operate at 3.2 gigahertz, compared with up to 3.8 gigahertz for Pentium 4 models. Intel is expected to offer

one dual-core chip at just a slight premium over single-core models, as well as a high-end version that is substantially more expensive.

Pat Gelsinger, a longtime Intel chief technology officer who now co-manages its server-chip business, predicts chips will eventually have dozens or even hundreds of cores, and has encouraged Mr. Gates to take advantage of the trend. "I said, 'This thing is coming like a freight train, buddy,'" Mr. Gelsinger recalls.

Advanced Micro Devices, which vows to ship dual-core chips before Intel, is first targeting servers. Those machines already use two or more microprocessor chips, as do some PCs, such as Apple Computer Inc.'s Power Mac line. But Advanced Micro Devices thinks multiprocessing will also kick into a higher gear on the desktop, as dual-core chips become a standard feature that programmers exploit.

"This is one of the biggest if-you-build-it-they-will-come opportunities that we've seen in a very long time," says Fred Weber, Advanced Micro Devices' chief technology officer.

Reaping the benefits requires "threads," sets of software instructions that can be executed in parallel. An operating system that accepts threads, such as Microsoft's Windows XP, can use dual-core chips to better handle multiple programs at the same time.

Application programs must also use threads to get speed benefits from more than one processor. Some programs for manipulating images and other content, such as Adobe Systems Inc.'s Photoshop

Please Turn to Page B4, Column 6

New 'Multicore' Chips Will Pose a Challenge To Software Makers

Continued From Page B3

and Premiere software, are already threaded. Most others aren't.

AnandTech, a Web publication that tests computer performance, found that Intel's new dual-core chip ran business software more slowly than its 3.73-gigahertz Intel chip with one core. But the dual-core chip transferred a video from a DVD to a hard disk—while running Web browsers and playing music—in less than half the time of the single-core chip.

So Intel plans to promote ways dual-core chips can help users now, while courting programmers to develop new applications. Naked Sky Entertainment Inc., a company based in Sherman Oaks, Calif., has demonstrated a shooting game called RoboHordes that uses the dual-core Intel chip to divide the number-crunching that determines how objects interact.

Ironically, the gaming community seems more excited about a different form of parallel processing—a technology from Nvidia Corp. that uses two graphics accelerators, making games look more realistic. But gamers are buzzing about Intel's decision to let users adjust settings to boost the clock speed of one new dual-core chip, a technique called "over-clocking" that the company had discouraged. "Then it's a very, very interesting chip," says Kelt Reeves, president of Falcon Northwest, a maker of gaming PCs in Medford, Ore.

*—Robert A. Guth contributed
to this article.*