



## Double the Fun

Dual-core processors are expected to dominate the PC and server markets this year. Are you prepared?

*By Tam Harbert*

There's a sea of change going on in processor technology. With the arrival of dual-core microprocessors, upgrading a computer is more complicated than just buying a machine with a faster processor or more memory. If you're looking to move into an IT position that entails evaluating or purchasing hardware, you should understand the new dual-core technology and how to take advantage of it.

Over the last few years, microprocessors have run smack into some rather difficult laws of physics. As chip speeds increased, surpassing the three-gigahertz level, they began sucking too much power and generating too much heat. Last year, for example, Intel cancelled a planned 4-GHz processor when it realized that the chip was going to dissipate more than 100 watts. Not only do such hot chips make systems harder to design – manufacturers must include more heat sinks and cooling fans – but they also increase the energy costs both to run the systems and to cool the rooms where they reside, particularly in large installations like data centers or server farms.

To solve the problem, chip makers are putting two CPU cores on one piece of silicon. Each core runs at a slower speed, but because they are processing information in parallel they can run applications faster, at least theoretically. Because of the slower speeds, the processor isn't as power-hungry and runs cooler. Depending on who's doing the measuring, what type of system is running and what the application is, a dual-core processor can improve application performance only minimally or by nearly 100 percent.

The two perennial chip rivals – Intel and Advanced Micro Devices –

began shipping dual-core chips last year and now are racing to come out with more and better dual-core processors. In fact, Intel predicts that by the end of this year, more than 85 percent of its server shipments and more than 70 percent of its desktop and mobile PC shipments will have more than one core. And they won't stop at just two cores. Both companies plan to ship a four-core processor in 2007. And Intel says it's working on an eight-core device for 2008.

### **How dual-core works**

Improved performance from dual-core chips depends on a number of factors. Dual-core uses a technique called multithreading, and so requires both a multithreaded operating system and multithreaded applications to get the greatest performance improvements. Most modern operating systems, including Windows XP, Windows 2000 and the upcoming Vista, incorporate multithreading, says Howard Locker, chief architect for desktop and mobile development at Lenovo. But most PC applications were written to run on a single processor, and so they can't take advantage of the multithreading.

"Dual core won't make every application run faster, especially on the desktop," says Gary Chen, an analyst with the Yankee Group. In fact, a PC with one 2-GHz processor will still run a given application faster than a PC with a two 1-GHz processor cores, he adds.

What dual-core will do is speed up overall throughput of PCs because it can run two applications concurrently, says Locker. That's particularly useful when you need to run background tests and virus scans. Today, running such programs usually drains system performance dramatically, slowing any other applications in use to a crawl. But with dual-core, you can run a virus scan in the background, for example, while also using Word or browsing the Web, he notes.

"The biggest gain with dual-core PCs is productivity," agrees Charlie Killian, technology strategist at D.W. Morgan Co. Inc. in Pleasanton, Calif. The 85-employee company consults for large high-tech companies, helping them to monitor and better manage their supply chains. Because its clients are so technologically sophisticated, a big part of Killian's job is to keep abreast of the latest technology.

"With dual-core, you can switch from application to application without waiting for the PC to catch up with you," Killian says. That kind of performance makes dual-core PCs a good investment for power users. Killian's considering buying dual-core PCs for his graphics designers, so

they can run graphics applications while burning DVDs, and his software developers, so they can run other applications while compiling software.

## **Server boost**

But it's in servers where dual-core technology nets the biggest benefits. Systems makers have been selling servers with multiple processors for years, but putting the processor cores onto one chip lowers the cost. Plus, because server software is already designed to run on several processors at once, users see immediate performance gains. Among the applications likely to see the biggest boost from dual-core servers are enterprise resource planning (ERP), databases, Java-based programming and design automation. D.W. Morgan, which was already using servers with multiple processors, is planning to buy a blade server that uses one of Intel's dual-core processors, says Killian. "There's lots of number-crunching going on in our servers," he notes. "This is a cheaper way to get more processing power."

Pricing is still high for dual-core systems, ranging from 20% to 60% higher than single-core systems. But as it becomes the predominant technology the costs should come down.

One final caveat is the price of software licensing. Traditionally, server software vendors sold a separate license for each CPU in the server. That was fine when each CPU was its own chip. But now that two CPUs come on one chip, vendors have struggled with how their pricing structures.

Oracle caused a stir last year when it said it would charge per core, which made licenses for dual-core servers twice as expensive. The company later backed off, saying it would charge an additional 70 percent for the second core, a figure it said roughly matched the estimated increase in application performance.

But Microsoft, to the relief of chip vendors and users, has said it will charge by the chip, not the core, and most vendors have followed suit. Even Oracle finally announced late last year that it would charge only 50 percent of its license fee for each core of Intel and AMD dual-core processors – essentially charging only one license for each dual-core chip.

But the issue may not be entirely settled. "What happens when chips go from two cores to four cores, and then to eight?" asks Yankee

Group's Chen. Software vendors may be less willing to grant an eight-core processor the same license as a dual-core processor, he notes. Even while dropping prices, Oracle was careful to continue to charge per CPU core rather than per chip, which keeps the door open to charge more per core as the number of cores on each chip rises.

But Locker thinks per-core pricing is on the way out. With the coming of many cores on one chip, "software vendors need to rethink their business model," he says.

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