



# Multi-Core Processing

## Traveling at the Speed of Development

Until recently, increases in processor performance were achieved by augmenting the number of transistors while decreasing the size of the overall chip. However, developers had difficulty restricting energy consumption and heat generation while developing new chips, subsequently slowing increases in processor speeds. This led manufacturers to turn their efforts to producing processors with multiple cores. A multi-core processor combines two or more single-core processors on one chip, allowing tasks to be run unilaterally while increasing the overall performance without requiring excessive energy or generating too much heat.

Multi-core processing is the next wave. It's faster and more efficient—two qualities that the marketplace insists on. While all manufacturers agree on that point, getting to a place where the terms are agreed upon is proving to be a larger challenge. At stake are multi-million-dollar licensing contracts, Sarbanes-Oxley consequences and teams to ensure compliance is adhered to while companies grow and consolidate daily.

### HISTORY

The first dual-core general purpose processor appeared in 2001 as IBM's POWER4 processor for servers. Sun Microsystems' UltraSparc IV processor chip is also among those dual-cores already in use.

Advanced Micro Devices (AMD) was the next manufacturer to announce multi-core development plans. According to AMD, its multi-core architecture has been in place since the 1990s. However, it only showcased a fully functioning dual-core processor in August 2004 with plans to release a full version in mid-2005. Intel also announced in mid-2004 its plans to concentrate on a processor with multiple cores rather than its typical increase in clock speed.

Intel had already developed hyperthreading technology, which allows software to run separate threads on a single-core processor, but planned for its first dual-core chip, the Pentium D, to be released in the second quarter of 2005 without this technology. The company also planned to release a chip targeting gamers—the Pentium Extreme Edition 840—for the same quarter. IBM, having already successfully produced a dual-core processor, is working with Toshiba and Sony on a processor expected to be used in Sony's PlayStation3. This cell processor will have nine separate cores, one of which will be a 64-bit Power Processor to divvy up tasks between the remaining eight synergistic processing cores.

### HARDWARE

Hardware vendors have been experiencing pressure in response to competition between AMD and Intel. Some ven-

dors are compromising by producing systems based on each processor, such as Agama Systems. Hewlett-Packard, Alienware and Lenovo have released systems based on Intel's dual-core processors. Dell is also using Intel's newly released processors, while Hewlett-Packard is producing Athlon-based systems along with IBM and Sun Microsystems. IBM's preoccupation with the Cell processor and its new servers has led Apple to transition to Intel processors, although Apple will continue using Power processors in its systems until differences in Intel's processors and Apple's software are fully compatible. This will give Apple the flexibility of using the fast, low-energy dual-core processors Intel is developing.

### SOFTWARE

The mass production of dual-core processors is not only creating competition among chipmakers and vendors, but also software companies. Software can be licensed on a per-CPU, per-server or per-user basis, but there are disagreements over the definition of a CPU. Prior to the release of its dual-core processors, AMD attempted to convince software vendors that processors should be counted by the number of chips, not the number of cores. Microsoft and Novell concurred, saying a processor is a chip regardless of the number of cores it has. After months of discussion, Oracle agreed to alter licensing guidelines to count the core of a processor with multiple cores as three-quarters of a CPU instead of a full one. However, the respective licensing plan for these processors is rounded to the next whole number, which in some cases can add almost a full processor.

For example, a multi-core chip with 11 cores would require a nine-processor license (11 multiplied by a factor of .75 equals 8.25, which is then rounded up to the next whole number, which is 9). This pricing policy change contributes to leveling the playing field with Microsoft, which had previously announced that it would be treating two-core CPUs as a single CPU, as cited in the July 25 newsletter from Miro Consulting, Oracle Changes Multicore Pricing.

Other companies released plans for licensing the processors earlier. IBM, for example, announced more than a month ago, its decision to charge per chip for its upcoming servers without altering licensing regulations on previous models. BEA Systems also plans to charge on the number of cores a processor has, but the second core's licensing fee will be discounted. Analysts have been encouraging customers to ask software vendors for clarification on their positions when licensing a processor with multiple cores, as it is expected that they will be the majority, if not the only processors produced by 2007.

*Scott Rosenberg is CEO of Miro Consulting.*