Benchmark Summary

Dual-Core Woodcrest Processor

Embedded Computing

Benchmark Tests with 2.33 GHz Dual-Core Woodcrest Processor

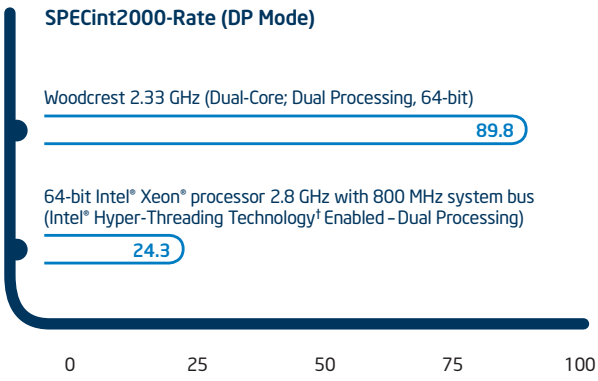
Improvements in Performance for Communications, Storage, Embedded and Medical Imaging Applications

Currently used by Intel customers in the server and workstation market segments, Woodcrest is also ideal for intense computing and I/O workload environments, and high-end systems such as single-height (1U) servers and blade servers, storage area networks (SAN) and network-attached storage (NAS) solutions, wireless and voice applications, and high-end medical imaging equipment.

The 2.33 GHz dual-core Woodcrest processor will soon be supported by Intel for an extended lifecycle of five to seven years, protecting system investment for communications, storage, embedded and medical imaging customers by enabling extended product availability.

The following benchmarks were completed by the Communications Infrastructure Group (CIG) of Intel in April 2006. These benchmarks compare the performance of two dual-core Woodcrest processors at 2.33 GHz in a dual-processing configuration (four cores per system) with two single-core Intel Xeon processors 2.8 GHz in a dual-processing configuration (two cores per system). Both processors would typically be used in applications of Intel's communications, storage and embedded customers.

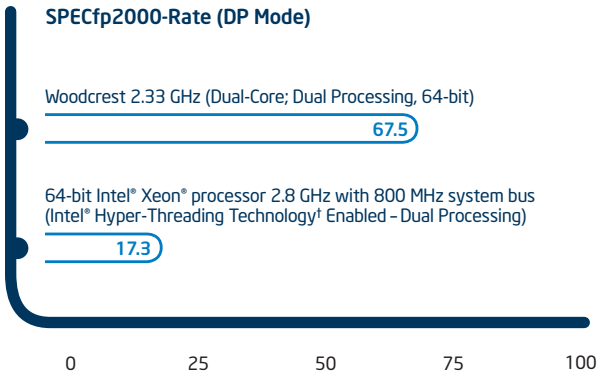
Dual-Core Woodcrest provides greater than 3x performance gain (SPECint2000-Rate) as compared to previous single-core Intel® Xeon® processor-based platforms for Communications, Storage and Embedded Applications



Comparing four cores to two cores, one would expect a doubling of performance (2x), but we see a greater than 3x performance improvement for the SPECint2000-Rate results (24.3 to 89.8) due to enhancements to the core, increased front-side bus speed and advanced platform technologies in the Woodcrest processor and the Blackford chipset.

Like other hardware-enhanced threaded capabilities advanced at Intel, multi-core capability reflects a shift to parallel processing – a concept originally conceived in the supercomputing world. For example, Hyper-Threading Technology† (HT Technology), introduced by Intel in 2002, enables processors to execute tasks in parallel by weaving together multiple "threads" in a single-core processor. But whereas HT Technology is limited to a single core, using existing execution resources more efficiently to better enable threading, multi-core technology provides two or more complete sets of execution resources to increase compute throughput.

Dual-Core Woodcrest provides almost 4x performance gain (SPECfp2000-Rate) as compared to previous single-core Intel® Xeon® processor-based platforms for Communications, Storage and Embedded Applications



Another industry-standard benchmark is SPECfp2000-Rate. In this instance, when comparing four cores to two cores, Woodcrest demonstrates almost a 4x performance improvement (17.3 to 67.5).

The SPECint2000-Rate standard benchmark (on Page 1) is of great interest to Intel's storage customers as they require enhanced performance to move large amounts of data quickly. Intel's communications, embedded and medical imaging customers also are very interested in the SPECint2000-Rate benchmark, however they also want to see the SPECfp2000-Rate benchmark (shown here), which indicates the performance they can expect for math-intensive applications such as wireless and voice applications, or high-end medical imaging equipment.

Woodcrest's dual-core with dual-processing capabilities provide significant performance headroom for wireless, voice and medical applications to run parallel tasks, such as database, image and voice/data processing. The Woodcrest performance headroom also reduces image production time and optimizes image quality for medical imaging applications.

Benchmarking results collected by Intel Corporation, April 2006.

Configurations:

- Two Dual-Core Woodcrest processors 2.33 GHz used on Intel® Bensley Reference Platform with Blackford chipset, 1333 MHz FSB, and 4x1 GB Dual Rank 667 MHz FB-DIMM DDR2. Software: Linux* RedHat 9.0, Kernel 2.6.9-22.EL, 32-bit & 64-bit OS, Intel® Compiler 9.0
- Two 64-bit Intel® Xeon® processors 2.8 GHz with 800 MHz system bus with Intel® E7520 chipset, 800 MHz FSB, and 1GB DDR2 400 MHz. (Intel® Xeon® Processor with 800 MHz System Bus, Intel® E7520 Chipset, and Intel® 6300ESB I/O Controller Hub Development Kit) Software: Linux RedHat 9.0, Kernel 2.6.9-22.EL, 32-bit OS, Intel Compiler 9.0

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SPEC* benchmark tests reflect the performance of the microprocessor, memory architecture and compiler of a computer system on compute-intensive, 32-bit applications. SPEC benchmark tests results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing. For more information about STREAM Benchmark, including a description of the systems used to obtain these test result, and other information about microprocessor and system performance and benchmarks, visit Intel's World Wide Web Site (www.intel.com), or call 1-800-628-8686.

†Hyper-Threading Technology requires a computer system with an Intel® Xeon® processor supporting Hyper-Threading Technology and an HT Technology-enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. See http://www.intel.com/info/hyperthreading/ for more information including details on which processors support HT Technology.

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