Can a uni-processor deliver compelling entry-level workstation performance?

Yes. Based on Intel® NetBurst™ microarchitecture, the Intel® Pentium® 4 3 GHz is ideal for multitasking entry-level workstation environments.

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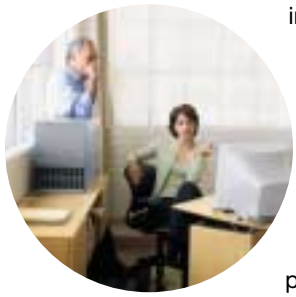
The Intel® Pentium® 4 Processor

Intel's Most Advanced, Most Powerful Processor for Entry-Level Workstations

The Intel® Pentium® 4 processor, based on the Intel® NetBurst™ microarchitecture, is the ideal solution for uni-processor entry-level workstation platforms. The Pentium 4 processor provides compelling performance; great for driving complex content creation by accelerating graphical, mechanical design applications and enhancing productivity by decreasing the time needed to create content.

Product Performance

The Pentium 4 processor delivers the next generation of performance where workstation users can experience and appreciate the performance most.



Intel® NetBurst™ Microarchitecture

The Intel NetBurst microarchitecture delivers a number of innovative features including higher frequencies, 800 MHz, 533 MHz, or 400 MHz system bus, Execution Trace Cache, and Rapid Execution Engine, as well as a number of enhanced features such as Advanced Transfer Cache, Advanced Dynamic Execution, enhanced floating-point and multimedia unit, and Streaming SIMD Extensions 2 (SSE2). Many of these new innovations and advances were made possible with improvements in processor technology, process technology, and circuit design that could not previously be implemented in high-volume, manufacturable solutions. The features and resulting benefits of this new microarchitecture are defined below.

Hyper-Pipelined Technology

The hyper-pipelined technology of the Intel NetBurst microarchitecture doubles the pipeline depth compared to the P6 microarchitecture used on today's Intel® Pentium® III processors. One of the key pipelines, the branch prediction/recovery pipeline, is implemented in 20 stages in the Intel NetBurst microarchitecture, compared to 10 stages in the P6 microarchitecture. This technology significantly increases the performance, frequency, and scalability of the processor, while providing the frequency headroom for much greater scalability in the future.

Hyper-Threading Technology

Hyper-Threading Technology from Intel changes the landscape of processor design by going beyond GHz to improve processor performance. It allows software programs to "see" two processors and work more efficiently. This new technology enables the processor to execute two series, or threads, of instructions at the same time, thereby improving performance and system responsiveness. The Pentium 4 processor with Hyper-Threading Technology is specially designed to deliver immediate increases on performance and system responsiveness with existing applications in multitasking environments (i.e. where two or more things are running at the same time) and with many stand-alone applications today. Furthermore, the Pentium 4 processor with Hyper-Threading Technology provides performance headroom for the future.

Advanced System Bus up to 800 MHz

The Pentium 4 processor's 800 MHz system bus supports Intel's highest performance desktop processor by delivering 6.4 GB of data-per-second into and out of the processor. This is accomplished through a physical signaling scheme of quad pumping the data transfers over a 200 MHz clocked system bus and a buffering scheme allowing for sustained 800 MHz data transfers.

The Pentium 4 processor's 533 MHz system bus supports Intel's performance desktop processor by delivering 4.2 GB of data-per-second into and out of the processor. This is accomplished through a physical signaling scheme of quad pumping the data transfers over a 133 MHz clocked system bus and a buffering scheme allowing for sustained 533 MHz data transfers.

The Pentium 4 processor's 400 MHz system bus supports Intel's performance desktop processor by delivering 3.2 GB of data-per-second into and out of the processor. This is accomplished through a physical signaling scheme of quad pumping the data transfers over a 100 MHz clocked system bus and a buffering scheme allowing for sustained 400 MHz data transfers. This compares to 1.06 GB/s delivered on the Pentium III processor's 133 MHz system bus.

Product Highlights

- Delivers outstanding performance for workstation platforms.
- Features Intel NetBurst microarchitecture.
- Support for Hyper-Threading Technology on the Pentium 4 processor 3 GHz with an advanced 800 MHz system bus and Pentium 4 processor 3.06 GHz with 533 MHz system bus.
- Supported by several Intel chipsets, including the Intel® 850 and Intel® 845 chipset families, the Intel® E7205 Chipset** and the Intel® 875P Chipset for entry-level workstations.
- Fully compatible with existing Intel® architecture-based software.
- Includes 144 Internet Streaming SIMD Extensions 2 (SSE2) to speed up audio and video applications.
- Memory cacheability up to 4 GB of addressable memory space and system memory scalability up to 64 GB of physical memory.
- Support for uni-processor designs.
- Based upon Intel's 0.13 micron manufacturing process.

Level 1 Execution Trace Cache
In addition to the 8 KB data cache, the Pentium 4 processor includes an Execution Trace Cache that stores up to 12-K decoded micro-ops in the order of program execution. This increases performance by removing the decoder from the main execution loop and makes more efficient usage of the cache storage space by not storing branched instructions. The result is a means to deliver a high volume of instructions to the processor's execution units and a reduction in the overall time required to recover from branches that have been mis-predicted.

Rapid Execution Engine
Two Arithmetic Logic Units (ALUs) on the Pentium 4 processor are clocked at twice the core processor frequency. This allows basic integer instructions such as Add, Subtract, Logical AND, and Logical OR to execute in 1/2 a clock cycle. For example, this means that the Rapid Execution Engine on a 2.80 GHz Pentium 4 processor runs at 5.60 GHz.

512KB or 256KB, Level 2 Advanced Transfer Cache
512KB L2 Advanced Transfer Cache (ATC) is available with speeds 1.80A, 2A, 2.20, 2.26, 2.40, 2.50, 2.53, 2.60, 2.66 and 2.80 GHz. 256KB L2 ATC is available with speeds 1.70 GHz to 1.90 GHz. The Level 2 ATC delivers a much higher data throughput channel between the Level 2 cache and the processor core. The Advanced Transfer Cache consists of a 256-bit (32-byte) interface that transfers data on each core clock. As a result, the Pentium 4 processor at 2.80 GHz can deliver a data transfer rate of 89.6 GB/s. This compares to a transfer rate of 16 GB/s on the Pentium III processor at 1 GHz. Features of the ATC include:

- Non-Blocking, full speed, on-die Level 2 Cache
- 8-way set associativity
- 256-bit data bus to the Level 2 Cache
- Data clocked into and out of the Cache every clock cycle

Advanced Dynamic Execution
The Advanced Dynamic Execution engine is a very deep, out-of-order, speculative execution engine that keeps the unit's implementing instructions. The Pentium 4 processor can also view 126 instructions in flight and handle up to 48 loads and 24 stores in the pipeline. It also includes an enhanced branch prediction algorithm that has the net effect of reducing the number of branch mis-predictions by about 33% over the P6 generation processor's branch prediction capability. It does this by implementing a 4-KB branch target buffer that stores more detail on the history of past branches, as well as by implementing a more advanced branch prediction algorithm.

Features Used for Testing and Performance/Thermal Monitoring

- Built-in Self Test (BIST) provides single, stuck-at fault coverage of the microcode and large logic arrays, as well as testing of the instruction cache, data cache, Translation Look aside Buffers (TLBs), and ROMs.
- IEEE 1149.1 Standard Test Access Port and Boundary Scan mechanism enables testing of the Pentium 4 processor and system connections through a standard interface.
- Internal performance counters for performance monitoring and event counting.
- Includes a new Thermal Monitor feature that allows systems to be cost effectively designed to expected application power usages rather 3than theoretical maximums.

Enhanced Floating-point and Multimedia Unit
The Pentium 4 processor expands the floating-point registers to a full 128-bits and adds an additional register for data movement, which improves performance on both floating-point and multi-media applications.

Internet Streaming SIMD Extensions 2 (SSE2)
With the introduction of SSE2, the Intel NetBurst microarchitecture now extends the SIMD capabilities that Intel® MMX™ and SSE technologies delivered by adding 144 new instructions. These instructions include 128-bit SIMD integer arithmetic and 128-bit SIMD double-precision floating-point operations. These new instructions reduce the overall number of instructions required to execute a particular program task and, as a result, can contribute to an overall performance increase. They accelerate a broad range of applications, including video, speech, image, photo processing, encryption, financial, engineering and scientific applications.

For the spectrum of processor performance, please visit the Intel® Processor Performance Web Site at:
www.intel.com/eBusiness/products/workstation/entry/index.htm

Intel® 875P Chipset for Entry-Level Workstation Platforms

The Intel® 875P chipset represents the next step in entry workstation chipset technology for the Intel® Pentium® 4 Processor. The 875P chipset design provides a compelling transition to next-generation workstation-class technologies by delivering support for Hyper-Threading Technology along with maximized system bus, memory, and graphics bandwidth.

Advanced Technology and Next-Generation Graphics
The 875P chipset for entry-level workstations is the first Intel chipset to support Intel® Performance Acceleration Technology (PAT). Featuring an 800 MHz system bus and Hyper-Threading Technology, this technology uses Intel's advanced manufacturing processes and testing equipment to deliver a chipset that unleashes the full power of the Intel® Pentium® 4 processor. In addition, the 875P chipset supports dual-channel DDR400 memory configurations to realize the exceptional performance from the memory interface. It is optimized for the Intel Pentium 4 processor supporting Hyper-Threading Technology, adding intelligence to help manage and prioritize multiple threads received by the microprocessor.

The 875P chipset also integrates Intel's Communication Streaming Architecture (CSA) featuring a dedicated networking bus interface, Hi-Speed USB 2.0, Serial ATA and enhanced AC'97 audio implementation for improved sound quality. The 875P chipset helps to ensure that tomorrow's most demanding applications will run best on Pentium 4 processor-based entry-level workstation platforms.

Intel continues to offer next-generation AGP 8X graphics technology to increase graphics bandwidth, performance, and headroom for visually intensive workstation applications.

The Intel 82875P Memory Controller Hub (MCH) supports 800 MHz, and 533 MHz system bus designs; DDR400 or DDR333 SDRAM; and the latest graphics devices through the 1.5V AGP 8X interface. Performance Acceleration Technology delivers additional system level performance by optimizing memory access between the processor and system memory on platforms configured with 800 MHz and DDR400.

The 82801EB I/O Controller Hub (ICH5) integrates two independent Serial ATA controllers providing 150MB/s transfers each for the most demanding storage data transfers. The Intel 82801ER I/O Controller Hub (ICH5R) elevates serial ATA storage performance to the next level with Intel RAID technology. Additional Hi-Speed USB 2.0 ports provide ubiquitous end-user connections, while offering backwards compatibility with existing USB 1.1 peripherals. The ICH5 also supports an integrated LAN management controller supporting the industry standard Alert Standard Format (ASF) protocol.

Features that Maximize Performance and Balance the Platform

- Intel Pentium 4 processor with 512KB L2 cache and an 800 MHz system bus provide up to 6.4 GB/s of bandwidth between the processor and the chipset.
- Intel® Performance Acceleration Technology (PAT) delivers additional system level performance by optimizing memory access between the processor and system memory for 800 MHz and DDR400 based platforms.
- Dual Channel DDR400 memory bus with ECC provides optimal and balanced performance through matched processor and memory bus bandwidth while ECC ensures data reliability and integrity.
- The direct attach AGP 8X port provides 2.1 GB/s of graphics bandwidth directly out of the MCH.
- Intel RAID technology enables extreme storage performance for Serial ATA hard disks.
- The Intel 82801 EB I/O Controller Hub (ICH5) provides advanced features, including Hi-Speed USB 2.0.

For more information, visit the Intel Web site at:
http://www.intel.com/eBusiness/products/workstation/entry/index.htm

[1]*Hyper-Threading Technology requires a computer system with an Intel® Pentium® 4 processor at 3.06 GHz or higher, a chipset and BIOS that utilize this technology, and an operating system that includes optimizations for this technology. Performance will vary depending on the specific hardware and software you use. See www.intel.com/info/hyperthreading for information.*

**The Intel® E7205 Chipset supports 400 MHz and 533 MHz system bus speeds only

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