



Innovative workstation platform technologies for outstanding performance, reliability, and flexibility.

The workstation platform of choice keeps getting better. Experience the expanded performance for specialized data-intensive interactive applications with 64-bit Intel® Xeon™ processor-based workstations.



The workstation platform of choice for high-performing single-user needs.

Mitigate risks, grow your business, and lower costs with a proven solution for specialized data-intensive interactive applications.



Proven technology gives you the freedom to focus on your business

For over 35 years, companies have been turning to Intel to solve their toughest business and IT challenges. We developed the first true general-purpose microprocessor in 1974, and today, the vast majority of workstations are built with Intel® architecture. With a proven track record and the latest technologies and innovations, dual processor (DP) workstations based on the Intel® Xeon™ processor offer outstanding performance and reliability for a broad range of applications from scientific computation and computer aided engineering (CAE) to digital content creation. Giving you the foundation you need to grow your business and move it forward.

DP workstation platforms based on the 64-bit Intel Xeon processor with 2MB L2 cache further enhance a proven platform, providing the versatility and cost-effectiveness you need for high-performing single-user needs. By combining performance with advanced power management technology and enhanced security features, these workstation platforms can also help lower your operating costs and total cost of ownership (TCO).

Do more than ever before with ongoing platform innovation

Simulation, 3D modeling, animation, graphics rendering, and other data- and compute-intensive applications need all the computing and I/O capability your workstations can provide. At the same time, you need power at an affordable price, and with the headroom to avoid expensive and frequent upgrades. That's just what you get with DP workstations based on the 64-bit Intel Xeon processor.

With advanced features such as DDR2 memory and PCI Express,* 64-bit Intel Xeon processor-based workstations deliver up to a 15%¹ performance boost (compared to prior generation). The second processor delivers up to a 93%² boost in performance in 64-bit Intel Xeon processor-based platforms.

64-bit Intel Xeon processors give you the flexibility to prepare for the future in the way that works best for you. Supporting larger data sets and both 32- and 64-bit applications, these workstations allow the smooth migration of your business solutions to 64-bit applications at your own pace.

For more information on performance, please visit www.intel.com/business/bss/products/workstation.

The power you need, the choices you want

The power of this new generation of DP workstations goes beyond the processor itself, to a platform that includes enhanced technologies like an expanded L2 cache that enables higher performance for compute-intensive graphics, visual Internet applications, scientific analysis, and engineering design.

Then there is PCI Express serial I/O technology, which offers two times the graphics bandwidth of AGP 8x. PCI Express also provides workstation platforms with scalable I/O bandwidth that is software-compatible with PCI and PCI-X. This flexible platform gives you a choice of multiple speeds spanning different performance levels and system price points. And you can take advantage of a variety of validated, proven platforms, which provides for increased reliability.

Other innovative technologies include the Intel NetBurst® microarchitecture for fast processing, and Intel® Hyper-Threading Technology⁴ (HT Technology). HT Technology helps to deliver the performance and headroom you need for multi-tasking, multi-threaded applications, and heavy workloads that demand performance in areas such as manufacturing, digital media, digital content creation, and financial analysis.

DP platforms based on 64-bit Intel Xeon processors incorporate a number of new and enhanced platform technologies that help improve business performance and lower TCO.

Maximum flexibility with 64-bit computing

When it comes to deploying 64-bit solutions, Intel® Enhanced Memory 64 Technology (Intel® EM64T)³ gives you a choice of three modes of operation. These platforms can switch between modes on a code-segment by code-segment basis for maximum flexibility.

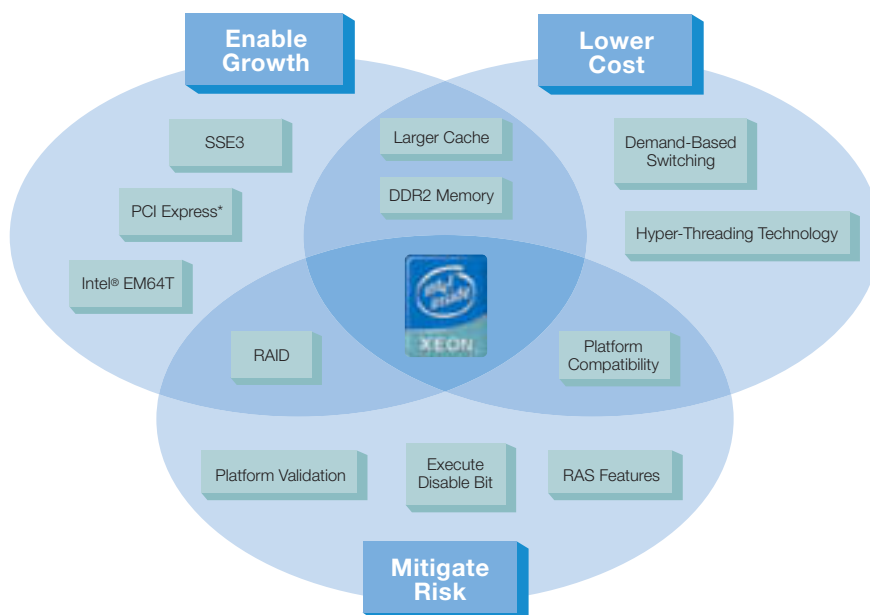
Legacy Mode (32-bit OS/32-bit applications):

This mode delivers leading performance for 32-bit and 16-bit applications and requires no changes to your existing code. For applications that do not need more than 4 GB of memory, a 64-bit software migration may not be the best solution. An alternative strategy is to scale your existing solution by upgrading your workstations. Even a simple platform upgrade can provide substantial performance improvements, especially if you're replacing a three- to five-year-old workstation. You may also benefit from a variety of new technologies that can help reduce your TCO through improved manageability and power savings.

Compatibility Mode (64-bit OS/32-bit applications):

This mode allows you to run existing 32-bit applications under a 64-bit operating system (OS), which can greatly simplify 64-bit migrations. A 64-bit OS, drivers, and BIOS are required, and you may have to certify your applications for this new environment. Existing 32-bit "protected mode" applications can continue to run without recompilation.

The Platform of Choice Just Got Better

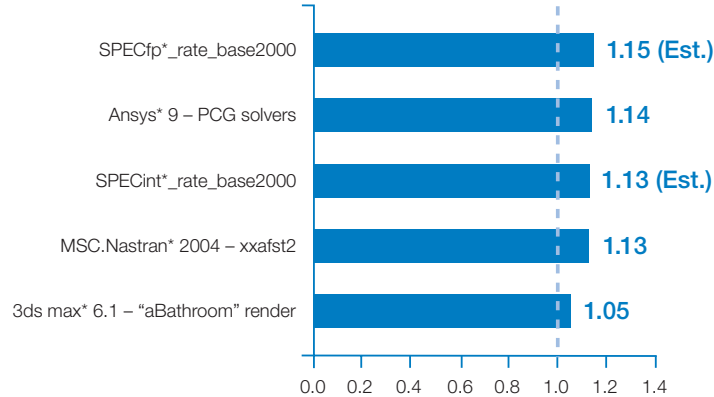


Products and technologies designed and validated together to deliver greater end-user benefits.

DP Workstation Performance

64-bit Intel® Xeon™ Processor Comparison

64-bit Intel® Xeon™ processor 3.60 GHz with 2MB L2 cache performance gains over 64-bit Intel® Xeon™ processor 3.60 GHz with 1MB L2 cache



DP Workstation Configuration: SPECfp*_rate_base2000 and SPECint*_rate_base2000, Ansys* 9, MSC.Nastran* 2004, and discreet* 3ds max* 6.1.
DATA SOURCE: Intel® Corporation internal measurements. Data current as of January 2005.

DP Workstation Configuration:

SPECfp*_rate_base2000 and SPECint*_rate_base2000 using Intel Compiler 8.1 binaries (August 2004). (Disclaimer: SPECint2000 and SPECfp2000 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.)

Ansys standard workloads using elapsed time geometric mean of three "PCG" solvers available at FTP site. "brakerotor_small_structural," "brakerotor_small_thermal," and "carrier_pcg_small."

MSC.Nastran deck "xxafst" using solver 101. Median of three runs used for calculations.

3ds max rendering "aBathroom" scene using default settings. Median of three renders used for calculations. *HT enabled for these benchmarks.

SYSTEM CONFIGURATIONS: COMMON: 36GB SCSI Seagate* ST336753LW 15K hard drive, Microsoft Windows* XP Professional SP1 - NTFS.

Intel® Xeon™ processor with 800 MHz system bus-based workstation at 3.60 GHz (**2P unless noted) Intel WS400 internal E7525 chipset-based reference board, BIOS 38 HT disabled*, 4GB DDR2-400 - 8x 512MB Samsung* M393T6553BG0-CCC, Adaptec* AIC7902 Ultra320 SCSI adapter, Intel Chipset Software Utility INF version 6.01.1002, nVidia* Quadro* FX 1300 128MB PCIe video card using driver 61.60.

Intel® Xeon™ processor with 2MB L2 cache at 3.60 GHz Intel WS400 internal E7525 chipset-based reference board, BIOS 43 HT disabled*, 4GB DDR2-400 - 8 x 512MB Samsung* M393T6553BG0-CCC, Adaptec* AIC7902 Ultra320 SCSI adapter, Intel Chipset Software Utility INF version 6.01.1002, nVidia* Quadro* FX 1300 128MB PCIe video card using driver 65.73.

16-bit "protected mode" application operation will depend on operating system and driver support. On a traditional 32-bit platform, the OS and all applications typically share the 4 GB of available memory (in most cases, the OS reserves about half of this total memory for itself). By running existing 32-bit applications under a 64-bit OS, you can provide 4 GB of memory for each application. Since this strategy involves a migration to a new OS, you will need to install compatible drivers and test your applications in the new operating system.

Full 64-bit Mode: This mode delivers the memory benefits of 64-bit computing (up to 1 TB). A 64-bit OS, drivers, and BIOS are required, and existing 32-bit applications must be ported and optimized to take advantage of 64-bit addressing. This migration strategy provides 64-bit data manipulation and greatly extends memory capacity—up to 1 TB for platforms based on the 64-bit Intel Xeon

processor. To take advantage of 64-bit application support you must have a complete 64-bit system in place including your application, operating system, and drivers. Existing 32-bit applications are supported without conversion in this environment, however, they are not able to take advantage of 64-bit addressing and the associated memory capacity.

For additional information on Intel EM64T, please refer to <http://developer.intel.com/technology/64bitextensions>.

Increase performance and security while reducing costs

Dual-processor workstations based on 64-bit Intel Xeon processors incorporate a number of other new and enhanced platform technologies that help boost business performance and lower TCO.

Increase performance with an expanded L2 cache

Faster response times with double the L2 cache, 2MB, as compared to the previous generation of Intel Xeon processors. Because programs frequently use a subset of instructions or data repeatedly, the larger L2 cache provides higher performance in many workstation benchmarks.

Enhance performance for data-intensive applications with PCI Express*

With the increase in the compute performance of the Intel Xeon processor with 2MB L2 cache, the I/O (input/output) rate at which data can be supplied to the processor increases correspondingly. As processors become faster, the rate at which data needs to be supplied increases. In demanding computing situations, users running compute- and I/O-intensive applications may bump up against the maximum usable bandwidth afforded by PCI-X. Without sufficient memory bandwidth, the processor can sit idle, waiting for data to be transferred, which affects system performance. At the same time, the industry is transitioning from a parallel I/O (e.g., SCSI, ATA) towards a serial I/O (e.g., SATA, SAS) interconnect infrastructure.

A new serial I/O technology foundation is required to match the performance and capabilities of these next-generation serial interconnects. PCI Express is the answer to both of these issues.

PCI Express is architected to have lower memory and I/O latency compared to PCI. PCI Express is also capable of higher bandwidth compared to today's PCI or PCI-X solutions. Higher bandwidth means more data can be transferred in the same unit of time. A PCI Express x1 ("by 1") link has a bi-directional peak bandwidth of 500 MB/s, while x4 and x8 links are capable of 2 GB/s and 4 GB/s, respectively. The lower latency and the increased bandwidth help deliver the data speed required to fully utilize the processor's capabilities.

With the Intel® E7525 chipset, PCI Express adapters have a direct path to the chipset's memory controller instead of having to go through a parallel bridge component. With the direct attach to the memory controller, two stages are removed, which minimizes the latency between the I/O adapter and the memory controller, improving I/O performance.

In addition to the many benefits of PCI Express, it is also a common I/O interface for mobile, desktop, workstation, storage, and network technologies. This results in economies of scale, which in turn rapidly drives down the cost of PCI Express solutions.

As the industry transitions from a parallel to a serial I/O infrastructure, users can confidently invest in new DP workstation platforms supporting PCI Express technology. With their scalable architecture, these platforms provide a smooth upgrade path to 10 Gigabit-based technologies.

Platform Feature	User Benefit
2MB integrated L2 cache	<ul style="list-style-type: none">• More data can be stored closer to processor execution units for faster data access, resulting in higher system throughput and shorter system latency than previous generation
Intel® Extended Memory 64 Technology	<ul style="list-style-type: none">• Enables extended memory addressability for workstations
Demand-Based Switching with Enhanced Intel SpeedStep® technology	<ul style="list-style-type: none">• Enables platform and software power management features to lower average power consumption while maintaining application performance and improving acoustics
PCI Express* serial I/O	<ul style="list-style-type: none">• Next-generation I/O capable of up to 8 GB/s peak bandwidth• Offers two times AGP 8x graphics performance
DDR2-400 memory	<ul style="list-style-type: none">• Provides up to 20% increase in memory bandwidth over DDR 333• 40% lower power consumption vs. DDR 333• Increased DIMMs per system for enhanced memory scalability
Enhanced reliability and manageability	<ul style="list-style-type: none">• Many memory controller features, together with PCI Express RAS features combine to improve platform reliability vs. previous-generation platforms• The Intel® E7525 chipset includes an SMBus port for remote management operation and support for a variety of third-party BMC (base management controller) and BIOS solutions
Streaming SIMD Extensions 3 (SSE3) Instructions	<ul style="list-style-type: none">• Better multimedia and encryption/decryption processing than previous generation, along with support for more computationally intensive graphics
Hyper-Threading Technology ⁴	<ul style="list-style-type: none">• Improved processor utilization and system responsiveness in conjunction with the new Streaming SIMD Extensions 3 Instructions
800 MHz system bus	<ul style="list-style-type: none">• 1.5x system bus bandwidth increase over previous 533 MHz system bus platforms

Save on power costs with Demand-Based Switching (DBS) and Enhanced Intel SpeedStep® technology

Enhanced Intel SpeedStep® technology, a feature of the new Intel Xeon processor with 2MB L2 cache, enables platform and software power management features to lower average power consumption while maintaining application performance. It can help reduce average CPU power consumption by up to 25%, with minimal performance impact.⁴

The processor's operational states can vary based on usage. So when utilization is high and maximum performance is desired, the processor can be switched to a higher operational state automatically. When usage is lower, transitioning to a lower operational state lowers the average power consumption while maintaining application performance. There is even a state for maximum power conservation during system idle periods. Not only are power-consumption levels reduced during lower operational states, but system acoustics can also be lowered by slowing down or halting fan operation entirely.

Protect yourself against virus attacks with Execute Disable Bit Functionality

Malicious buffer overflow attacks pose a significant security threat to your data and to your business. In a typical attack, a malicious worm creates a flood of code that overwhelms the processor, allowing the worm to propagate itself to the network and other computers. Intel's Execute Disable Bit functionality can prevent certain classes of malicious "buffer overflow" attacks when combined with a supporting operating system.

Execute Disable Bit allows the processor to classify areas in memory by where the application code can execute and where it cannot. When a malicious worm attempts to insert code in the buffer, the processor disables code execution, preventing damage or worm propagation.

Replacing older workstations with Execute Disable Bit-enabled systems can halt worm attacks, reducing the need for virus-related repairs. In addition, Execute Disable Bit may eliminate the need for software patches aimed at buffer overflow attacks.

Execute Disable Bit currently requires one of the following operating systems:

- Microsoft Windows* Server 2003 with Service Pack 1
- Microsoft Windows XP* with Service Pack 2
- SUSE Linux* 9.2
- Red Hat Enterprise Linux 3 Update 3

See the Microsoft Windows Service Pack Roadmap for more information on Service Pack releases, or download Windows XP Service Pack 2.

Multitask more effectively with Hyper-Threading Technology

Hyper-Threading Technology (HT Technology) is a groundbreaking technology that boosts computing performance to keep pace with today's applications and operating systems. HT Technology enables a single processor to function as two "virtual" processors by executing two threads in parallel, allowing you and your software to multitask more effectively than ever before.

Increase responsiveness with Streaming SIMD Extensions 3 (SSE3) instructions

Thirteen new SSE3 instructions are fully supported by the Intel Xeon processor with 2MB L2 cache. Two of these new instructions can improve thread synchronization over the previous-generation processor supporting SSE2 technology, helping to increase processor utilization, enhance Hyper-Threading performance and increase system responsiveness.

Increase bandwidth and lower power consumption with DDR2-400 memory

With the increase in processor bandwidth, it's important to have faster, dual-channel memory designs that can keep up. DDR2-400 memory provides better memory bandwidth and reduced latency compared to older DDR 333 memory designs, and the power generated is lower by up to 40%, which helps reduce the overall system power requirements.

Workstations that require large memory configurations (such as those employing Intel EM64T) also benefit as the total power generated is reduced in comparison with DDR technology.

Compatible with existing proven platforms

64-bit Intel Xeon processor-based DP workstations are compatible with a wide variety of existing platforms based on the prior-generation Intel Xeon processor with 800 MHz system bus. This makes these workstations ideal for high-performance needs such as computer aided engineering (CAE) and drafting, electronic design automation, digital media, financial analysis, oil/gas, and software engineering.

Summary

Dual-processor workstation platforms based on the 64-bit Intel Xeon processor with 2MB L2 cache and the Intel E7525 chipset deliver outstanding graphics computing power and flexibility, with the cost-effectiveness you need today and the headroom you need to migrate to 64-bit computing in the future.

In addition, these new platforms, backed by the Intel Xeon brand, offer optimized power consumption and improved platform reliability compared to previous-generation workstation platforms, making them the workstation of choice for engineering and high-performance computing needs.

¹ SPECfp^{*}_rate_base2000 – Intel[®] Corporation internal measurements; data as of January 2005. SPECfp_rate_base2000 using Intel Compiler 8.1 binaries (August 2004). (Disclaimer: SPECfp2000 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.)

² SPECint_rate_base2000 – Intel[®] Xeon[™] processor with 800 MHz system bus-based workstation at 3.60 GHz Intel WS400 internal E7525 chipset-based reference board, BIOS 38 HT disabled^{*}, 4GB DDR2-400 – 8 x 512MB Samsung[™] M393T6553BG0-CCC, Adaptec[™] AIC7902 Ultra320 SCSI adapter, Intel Chipset Software Utility INF version 6.01.1002, nVidia[™] Quadro[™] FX 1300 128MB PCIe video card using driver 61.60 Intel Compiler 8.1 binaries for SPECcpu2000.

³ Intel[®] EM64T requires a computer system with a processor, chipset, BIOS, OS, device drivers and applications enabled for Intel EM64T. Processor will not operate (including 32-bit operation) without an Intel EM64T-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel EM64T-enabled OS, BIOS, device drivers and applications may not be available. Check with your vendor for more information.

⁴ Based on preliminary Intel power testing with Intel[®] Xeon[™] processor 3.60 GHz with 800 MHz system bus. Intel Xeon processor with 2MB L2 cache expected to exhibit similar power consumption characteristics. Actual power savings will vary based on system configurations and workloads.

⁵ Hyper-Threading Technology requires a computer system with an Intel[®] Pentium[®] 4 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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Find out more about Dual Processor Workstation Platforms based on the 64-bit Intel® Xeon™ processor at www.intel.com/business/bss/products/workstation

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