



Business Enterprise



Dual-Core Intel® Xeon® Processor-based Platforms vs. AMD Opteron*



Energy Efficient Performance

Get higher performance and capability along with lower energy consumption, reducing costs and improving density from every server in your infrastructure based on the new Dual-Core Intel® Xeon® processor.

The new Dual-Core Intel Xeon processor-based systems deliver leading performance and better performance per watt. Key platform feature improvements include:

- Lower power 64-bit dual-core processors based on Intel[®]
 Core[™] microarchitecture to improve performance per watt
- Flexibility to do more with every system by leveraging server virtualization, now hardware-assisted with Intel[®] Virtualization Technology
- New dual independent point-to-point bus and faster front side bus speed driving up to 3X bandwidth improvements versus prior Intel® Xeon® processor-based platforms
- Fully buffered DDR2 DIMM memory (FB-DIMM) for more throughput, higher capacity and improved reliability
- Platform supports future quad-core processors for continued performance gains and investment protection





Better Performance Better Performance per Watt at the System Level

Proven and Reliable Solution

Better for Virtualization

Leading Energy Efficiency

Why does system power matter?

IT managers are faced with the challenge of a growing need for higher compute density and constant pressure to lower overall spending. The cost of electricity is the second highest data center cost, only second to labor. Lowering the power (watts) of each system helps increase compute density within a rack or a fixed footprint and also helps reduce operational cost associated with powering both the servers directly and the associated cooling.



Performance per System Watt

Different Approaches to Energy Efficiency

Intel[®] Xeon[®] processor- AM

- based platformsNew Platform: A Balanced Approach
- Intel[®] Core[™] Microarchitecture
- 65 nm Process Technology
- Intel[®] Power Toolkit

AMD Opteron*-based platforms

- Performance Gains Tied to Increases in Frequency
- No New Efficient Microarchitecture
- One Generation Behind on Process Technology
- Same Interconnect



How is Intel driving new levels of power efficiency?

Intel has a comprehensive approach to improving power efficiency resulting in better optimized data centers and lower overall cost. First, Intel has already incorporated strained silicon into its 65nm processor technology to improve transistor per- formance and decrease power. Intel is shifting to the Intel® Core™ microarchitecture, further reducing the power consumed by the processor. Three power levels of Woodcrest are being offered: 80, 65, and 40 watts. Additionally, the Intel® power toolkit helps IT managers fit more servers within each rack. Finally, demand-based switching with Enhanced Intel SpeedStep® technology helps lower utility costs.

Intel* Xeon* processor (Paxville) 59.5 http://www.spec.org/cpu2000/results/res2005q4/cpu2000-20051006-04904.html Intel* Xeon* processor 5063 (Dempsey MV) 72.4 based on internal measurements

Intel* Xeon* processor 5160 (Woodcrest) 117 based on internal measurement using Pre-Production System with two Dual-Core Intel* Xeon* processors 5160 (30 GHz), 5000 Series chipset, 133 PHz FSB; 5X (GB DDR2 FBDIMMs; Windows 2003 Enterprise Edition. SPEC cryc2000 binaries built with Intel compler version 30 for 32-bit Windows

- Opteron 280 (2.4GHz) 71.8 http://www.spec.org/osg/cpu2000/results/res2005q4/cpu2000-20050919-04712.html
- Opteron 285 (2.6GHz) 76.4 http://www.spec.org/osg/cpu2000/results/res2006q1/cpu2000-20060306-05697.html

Performance Per Watt for this workloads was computed using system power internal estimates and measurements made by using the system level configuration details noted above

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel' products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, reference www.intel.com/performance?essures/shorthang. (IIIUS) 1100-DE368066 or 1916-556-3104.

Performance per System watt Details: Performance data was based on SPECint_rate*base results from published or internally measured data as of April 12, 2006:

Intel* Xeon* processor (Invindale) 39.9 http://www.spec.org/cpu2000/results/res2005q2/cpu2000-20050321-03942.html Referenced as published at 39.9

Breakthrough Performance

Intel® Xeon® processor-based platforms vs. AMD Opteron*

For more information on published performance results, please go to www.intel.com/performance/server/xeon.

(On the graphs below, the higher numbers equate better performance.)



Dual-Core Intel[®] Xeon[®] Processor 5000 Series

Opteron 200 Series*





Leadership for Performance Workstations

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel[®] products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing, for more information on performance tests and on the performance of Intel products, reference www.intel.com/performance/resources/benchmark_limitations.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

Comparing the Architectures

Key Architecture Advantages

Dual Independent Point-to-Point Bus

• Up to 3X system bandwidth increase vs. previous generation, resulting in higher performance

Intel[®] Smart Cache

• 4M shared cache fully accessible by each core lowering memory latency and increasing performance

Fully Buffered DIMMs

- Increases memory capacity and throughput
- Simultaneously read and write helps reduce latency at peak load
- Allows for maximum capacity at full bandwidth

Intel[®] Logic Chipsets PCI Express*

Dual-Core Intel® Xeon® Processor

Advantages

2X cache and fully accessible by both cores (fewer cache misses)

- Wider bus solely for data (higher data bandwidth)
- Full speed memory at full capacity

AMD Opteron* 200 Series Processor



Limitations

- Smaller cache and only one-half accessible to each core
- Sacrifice capacity for bandwidth
- Requires both processors for max memory BW and capacity
- Shared link for Data and Address (lower data bandwidth)

	Dual-Core Intel® Xeon® processor (5100 series)	Opteron* (Socket 940))
System Bus Format	Bi-direction, Discrete (separate address and data bus)	Uni-directional, Encoded Packet (shared address and data bus)	
System Bus Width	64 bits	16 bits (each direction)	
System Bus Peak Bandwidth	21 GB/s	8 GB/s	
Cache Size/Accessible per Core	4M Shared (Intel® Smart Cache)/Full 4M Accessible per Core	2x1M Discrete/Only 1M Accessible per Core	
Memory	Fully Buffered DDR2-667	DDR-400	DDR-266
Peak Memory BW	21 GB/s	12.8 GB/s	8.5 GB/s
Maximum Memory	64 GB	32 GB	64 GB

Intel" Xeon" 5080 - Dual-Core Intel" Xeon" Processor 5080, Intel" Xeon" 5160 - Dual-Core Intel" Xeon" Processor 5160

1. SPECint_rate_base2000* Data Source: Published/Submitted results as of May 22, 2006.

Intel* Xeon* 5080 based platform details: Fujitsu Siemens Computers* PRIMERGY RX300 S3* server platform with two Intel* Xeon* 5080, 3.73 GHz with 2x2H L2 Cache, 1066 MHz system bus, 8 GB (8x1 GB) FB:0IMM memory, Microsoft Windows Server* 2003.SPEC binaries built with Intel* C/C+++ Complex 9.0. Referenced as published at 81.2. For more information see www.spec.org/quc2000/results/ res2006q1/cpu2000-2006036-05674.html.

Intel* Xeon* 5160 based platform details: Dell Power:6dg: 2950* server platform with two Intel* Xeon* 5160, 300 CH2 with 4M L2 Cache, 1333 MHz system bus, 8 GB (Bx1 GB) FB-DIMM memory, Microsoft Windows Server* 2003. SPEC binaries built with Intel* Crt++ fomplier 31. Result submitted to www.spec.org for review at 1238 as of May 22, 2006.

AMD Opteron* 285 based platform details: HP Proliant DL145 G2* server platform with two Opteron* 285, 2.60 GHz with 1 MB L2 Cache, 16 GB (8x2 GB) PG3200 memory, Microsoft Windows Server* 2003 0S, SPEC binaries built with Intel* C/C++ Compiler 8.0. Referenced as published at 76.4. For more information see www.spec.org/pu2000/results/res2006q1/cpu2000-2006306-05597 htm.

Specing here and a source: Published/Submitted results as of May 22, 2006.

Intel[®] Xeon[®] 5080 based platform details: HP ProLiant DL380 G5* server platform with two Intel[®] Xeon[®] 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8 GB (8x1 GB) F6-DIMM memory, Microsoft Windows Server[®] 2003. SPEC binaries built with Intel[®] UC++ Compiler 9.0. Referenced as published at 1764. For more information see www.spec.org/pu2000/results/res2006q2/ cpu2000-2006032C 05773 html. Intel⁺ Xeon⁺ 516D based platform details - fuljicu Siemens PRIMERXY Server (PX200 S3⁺ server platform with two Intel⁺ Xeon⁺ 5160, 300 CHz with AHL 2 Cache, 1333 MHz system bus, 8 CB (KH CL 60) FeD/IMM memory. Microsoft Mindows Server⁺ 2030 SPEC binaries built with Intel⁺ C/C++ Compiler 9.1. Result submitted to www.spec.org for review at 3012 as of May 22, 2006.

APD Optenon* 285 based platform details: HP Proliant ID: 145 G2* server platform with two Opteron* 285, 2.60 GHz with 1 MB L2 Cache, 8 GB (c4x2 GB) PC3200 memory. Microsoft Windows Server* 2003 OS, SPEC binaries built with Intel* CC++ Complier 8.0. Referenced as published at 1714. For more information see

www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05696.htm. 3. SPECfp_rate_base2000* Data Source: Published/Submitted results as of May 22, 2006.

SPECIP_rate_base2000* Data Source: Published Submitted Hsuits as on May 22, 2000.
 Intel® Xeon® 5080 based platform details: Dell PowerEdge 2950* server platform with two Intel® Xeon® 5080, 3.73 GHz with

Intel⁺ Xeen⁺ S080 Dissed platform details: Uell Power-dge 250⁻⁵ server platform with two Intel⁺ Xeen⁺ S080, 3.7 / d. two Xe2NL 2 Cache, 1056 MHz system bask 0.8 (BK K0 B) Pol/MPM memory, Ref Hart⁻ Enterprise Linux A Advanced Server Update 3 EM64T, SPEC binaries built with Intel⁺ C/E++ Compiler 9.0. Referenced as published at 6.4. For more information see www.spec.org/cpu2000/results/res2005g2/ upu200-02060417-05870 html.

Intel "Acon" 5160 based platform details: Dell PowerEdge 2250" server platform with two Intel" Xeon" 5160, 3200 Update with 4M L2 Cache, 1333 MHz system bus, 8 GB (8X 16B) PB-DIMM memory, Red Hat" Enterprise Linux 4 Advanced Serve 2 BHS41. SPEC binaries built with Intel "C++ compiler 30. Result submitted to www.specorg for review at 8B as of May 22, 2006. APID Opteron* 285 based platform details: Sun Ultra 40* server platform with two Opteron* 285, 260 GHz with 1 HB L2 Cache, In 16 GI (Biz CG) P62200 memory, Sub El Lux* 90 SL56 EA bit (SP3) 02 WFEth banes built with PatrSca Ed KOPath* Compler Version 2.3. Referenced as published at 729. For more information see www.spec.org/cpu2000/results/res2006q1/cpu2000-20060306-05788.html.

4. SPECfp_base2000* Data Source: Published/Submitted results as of May 22, 2006.

Intel* Xeon* 5080 based platform details: Intel* Server Pre-Production System with one Intel* Xeon* 5080 3.73 GHz with 2x2 MB L2 Cache, 1066 MHz FSB; 8x1 GB FB0IMMs; Microsoft Mindows Server* 2003 Enterprise Edition. SPECcpu2000 binaries built with Intel C/E+Comple* 30 for 32-bit Microsoft Mindows; Asevit of 1880.

Intel[®] Xeon[®] 5160 based platform details: IBM System x3550[°] server with one Intel[®] Xeon[®] 5160, 3.00 GHz with 4 MB L2 Cache, 1333 MHz system bus, 8 GB (Bxi GB) FB-0IMM memory. Microsoft Windows Server[®] 2003. SPEC binaries built with Intel[®] C/C++ Complier. Result submitted to wwwspec.org for erview at 2602 as of May 222, 2006.

AMD Opteron* 285 based platform details: HP Proliant DL145 G2* server platform with one Opteron* 285, 2.60 GHz with 1 MB L2 Cache, 8 G0 (4x2 GB) PC3200 memory. Microsoft Windows Server 2003 OS, SPEC binaries built with Intel* CC++ Compiler 9.0. Referenced as published at 1731. For more informations server www.spec.org/ cpu2000/results/res2006q1/cpu2000-20060306-0570.blnml. Continued on next page.

Value of Fully Buffered DDR2

Why FB-DIMM?

Fully Buffered DIMM (FB-DIMM) is the next evolution in memory technology for servers and workstations that value both capacity and bandwidth. With older memory technologies, as the signaling rates are increased, the number of DIMMs supported per channel decreases. Therefore, there was a trade-off between overall memory capacity and bandwidth. FB-DIMM offers the no-compromise solution by providing maximum capacity at the highest bandwidth.

What is FB-DIMM?

Previous memory technologies used a shared parallel interface with all DIMMs on the same bus. FB-DIMM is based on a highspeed point-to-point interface that uses a buffer, referred to as the AMB (Advanced Memory Buffer), to decouple the memory interface from the DRAM components. Decoupling allows the memory bus to run at full speed no matter how many DIMMs are installed, and allows simultaneous reads and writes while still using industry standard commodity DDR2 DRAMs to keep down costs.

Reliability Built In

FB-DIMM technology offers better RAS (reliability, availability, serviceability) by complementing Intel's existing enhanced data ECC protection (error-correcting code) with enhanced CRC (Cyclic Redundancy Checking). Enhanced CRC checks the transfer of all address, commands, and data and automatically retries when an error is detected, allowing for uninterrupted operation in case of transient errors. Finally, there is an AMB pass-through mode whereby if part of the AMB fails, it switches into repeater mode. That DIMM is effectively turned off, but the memory requests are passed in both directions.

For more information on the new Dual-Core Intel Xeon processor, go to **www.intel.com/xeon.**

Higher Performance, Higher Capacity, More Protection, Increased Availability.

5. TPC-C* Data Source: Published/Submitted results as of May 22, 2006.

Intel[®] Xeon[®] 5080 based platform details: Lenovo SureServer[®] T350 with two Intel[®] Xeon[®] 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 32 GB FBDimm, Microsoft Windows Server[®] 2003 Enterprise x64 Edition, Microsoft SQL Server[®] 2005 Enterprise x64 Edition. Referenced as published at 125,954 tpmC; 56.63 China Yuan/tpmC; Availability Date as Isted in the submitted report is July 1, 2006. Results at www.tpc.org/corkesults/tpc.ceault_detailas/pdf=160650301.

Intel* Xeon* 5160 based platform details: HP Proliant ML370 G5* server with two Intel* Xeon* 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 64 GB FBDimm, Microsoft Windows Server* 2003 Enterprise x64 Edition, Microsoft SQL Server* 2005 Enterprise x64 Edition. Referenced as published at 169,360 tpmC; \$2.93/ tpmC; Availability Date as listed in the submitted report is Nov 22, 2006. Results at www.tpc.org.

AMD Opteron* 285 based platform details: HP Proliant DL385 G1* server

platform with two Opteron* 285, 260 GHz, 32 GB memory, Microsoft Windows Server 2003 Enterprise (x86) Edt. SP1, Database: Microsoft SQL Server 2005 Enterprise (x86) Edt. SP1 Referenced as published at 113,628 tpmC; \$2.99/tpmC; Availability Date as listed in the submitted report is May 5, 2006. Results at www.tpc.org/tpc/cresults/tpc_result_detailasp?id=106032001.

6. MMB3* Data Source: Published/Submitted results as of May 22, 2006

Intel* Xeon* 5160 platform details: Fujitsu Siemens PRIMER(7) XXX20 S3 Blade Server* with two Intel* Xeon* 5160, 3.00 Grik with 414. Carb. 1333 MHz system bak. 4 G PEDImm Microsoft Microlwos Server* 2003 Enterprise Edition. MAPI Messaging Benchmark 3. Result published at 13500 MHB3 users. For more information see. www.microsoft.com/sechange/eavlautation/performance/effault.msxx.

AMD Opteron* 285 platform details: Fujitsu Siemens PRIMERCY BX530 S3 Blade Server* with two Opteron* 285, 2.60 GHz, 4 GB, Microsoft Windows Server* 2003 Enterprise Edition. MAPI Messaging Benchmark 3. Published at 12008 users at www.microsoft.com/exchange/evaluation/performance/default.rspx.

7. SPECjbb2005* Data Source: Published/Submitted results as of May 22, 2006

Intel* Keon* 5080 platform details: Dell PowerEdge 2550* server platform with two Intel* Keon* 5080, 3.73 Ork: with 2.2XH L2 Cache, 1066 MHz system kus. 8 GB FBDinne memory, Microsoft Windows Server* 2003. BEA JRockit* 5.0 P26.0.0 Referenced as published at 54.288 bogs and 64.288 bogs/im. For more information server* 2003. BEA JRockit* 5.0 P26.0.0 www.ssoc.ord/bB2005/result/srcsystem20062/Ib20052-00060411-001 Ontmil.

Intel* Xeon* 5160 platform details: Fujitsu Siemens PRIMERGY RX200 53* server platform with two Intel* Xeon* 5160, 300 GHz with 4H L2 Cache, 1333 HHz system bus, 8 GB (8X 1GB) FB-DIMM, Microsoft Windows* 2003 Enterprise Edition. BEA Ricotit* 5.0 P26.40. Result submitted to www.specorg for review at 56404 bops and 56404 bops/um as of May 21, 2006. AMD Opteron* 280 based platform details: Fujitsu Siemens PRIMERGY RX220 Server platform with two Dual-Core AMD Opteron* processor Model 280, 240 OHz with 2x1 MB L2 Cache, 16 GB (8x2 GB) PC3200 memory. 64-Bit SUSE LINUX Enterprise Server 9 + SP3, Kernel 26.5-7.244 smp on x86, 64, BEA (Rockit* 50, RSC6.00. Referenced as published at 61155 bops and 30578 bops/jmn. For more information see http://www.spec.org/lbb2005/results/res2006q1/1 ibb2005-200621+00074.hml.

8. SAD-SD* 2-Tier Data Source: Published/Submitted results as of May 22, 2006

Intel* Xeon* 5080 platform details: HP ProLiant* ML370 G5 server platform with two Intel* Xeon* 5080, 3.73 GHz with 2x2H L2 Cache, 1066 MHz system bus, 32 G8 FBDimm. Microsoft Windows Server* 2003 Enterprise Edition. (64-bil) Microsoft SQL Server* 2005 (64-bil) SAP EC Release 5.0. Result published at www.sapc.orm Solutions/benchmark at 1047 SD Users.

Intel 'Keon' 5160 platform details: HP ProLiant' M-370 L55 server platform with two Intel' Xeon' 5160, 3.00 CH2 with 42 L2 Cache, 133 PM tz system busz, 32 GG FBOIm, Microsoft Windows Server' 2008 Enterprise Edition, 164-bit) Microsoft 5Q Server' 2005, 164-bit) SAP EEC Release 5.0. Result published at www.sap.com/ solutions/ benchmark at 1200 SD Users

AMD Opteron* 285 platform details: IBM eServer BladeCenter* Model LS20 Server with two Opteron* 280, 2.4 GHz, Bx2024 HB. Microsoft Windows Server* 2003 Enterprise Edition. Microsoft SQL Server* 2005. SAP ECC Release 5.0. Published at www.sapc.om/solutions/benchmark/pdf/recr13056pl at 395 SD Users.

9. Dual-Core AMD Opteron* based platform details for SPECapc* for 3ds max* 7: www.spec.org/gpc/apc.data/HP/ xw9300_Opteron280_frt1400/3dsmax7/result.html.HP* xw9300_Zx AMD* Opteron* 280 (Z.40 GHz, Zx 1 MB L2 cache), 2 GB DDR400 ECC, Samsung* 80 GB HD080HJ (7200 RPM, Serial ATA2), Windows* XP Professional SP2, NVIDIA* Quadro* FX1400 driver 77.82.

10. Dual-Core AMD Opteron* based platform details for SPECapc* for SolidWorks* 2005: www.spec.org/gpc/ apc.data/HP/ xw9300_28 OHz_FX1400/sw2005/result.html. HP* xw9300 AMD* Opteron* 254 (280 GHz, 1 MB L2 cache), 2 GB DDR400 ECC, Samsung* 80GB HD080HJ (7200 RPM, Serial ATA2), Windows* XP Professional SP2, NVIDIA* Quadro* FX1400 driver 77.82.

11. Dual-Core AMD Opteron* based platform details for SPECapc* for Pro/ENGINEER* Wildfire* 2.0 (ProE WF2): www.spec.org/ gpc/apc.dtat/HP/xw9300_3.0 GH2_FX540/proewildfire2/proe_wildfire2/proe_wildfire2_result.html. HP* xw9300 2x AMD* Opteron* 256 (Goo GHz, 1MB L2 cache), 4x512 MB DDR400 ECC, Samsung* 80 GB HD080HJ (7200 RPM, Serial ATA2), Windows* XP Professional SP2, 2x NVIDIA* Quadro* FX540 driver 84.26.

12. Linpack* results as of May 19, 2006: Dual-Core Intel* Xeon* Processor 5080 based platform details: Intel preproduction board with two Dual-Core Intel* Xeon* processor 5080, 737 GHz with 2x2M L2 Cache, 1066 MHz syste m bus, 806 (8x168) 533 MHz FB-DIMM memory, Red Har4* Enterprise Linux 4, Update 2, CM647, Intel Linpack 30.1. Dual-Core Intel[®] Xeon[®] Processor 5160 based platform details: Verari Systems performance measurement using Intel preproduction customer reference board with two Dual-Core Intel[®] Xeon[®] Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory; Red Hat^{*} Enterprise Linux 4, Update 2, EM64T, Intel Linpack 30.1.

Dual-Core AMD Opteron* Processor Model 275 based platform details: AMD "Quartet** internal development platform with two 2.2 Gnz L2 Cache 2 x 1024 KB, Memory: 8 GB total; SuSE Professional* 9.2. Libararies: Goto, Publicly available benchmark numbers cited www.amd.com/us-en/Processors/Productificromation/3.0.3.118, 3756.8800-95687.0.0.html.

13. Fluent*, LS-Dyna* results as of May 19, 2006: Dual-Core Intel* Xeon* Processor 5080 based platform details: Intel preproduction board with two Dual-Core Intel* Xeon* processor 5080, 3.73 GHz with 2x2M L2 Cache, 1066 MHz system bus, 8 G8 (8x1 G8) 533 MHz FB-DIMM memory, Red Hat* Enterprise Linux 4, Update 2, EM64T, Fluent 6.2.16 Version; LS-DYNA mp97056434 Version. Intel Internal measurement.

Dual-Core Intel[®] Xeon[®] Processor 5160 based platform details: Intel preproduction board with two Dual-Core Intel[®] Xeon[®] Processor 5160, 300 CHz with 4M L2 Cache, dual 1333 MHz system bus, 8 GB (Bx) GB) 667 MHz FB-0IMM memory, Red Hat^{*} Enterprise Linux 4, Update 2, GMB4T, Fuent 62.16 Version, L5D-WM hump970.54344 version, Reference as published.

Dual-Core AMD Opteron* Processor Model 275 based platform details for Fluent* result: IBM LS20* platform with two 22 Ghz L2 Cache 2 x 1024 KB. Publicly available benchmark numbers cited: www.fluent.com/software/fluentfl5bench/ flbench_62.7/illues.htmc I-50yna result at http://toprunch.org/benchmark_details.isf2requery=28i/a+63.

Dual-Core AMD Opteron* Processor Model 275 based platform details for LS-Dyna* result: Hewlett-Packard DL145* platform with two 22 GHz12 Gache 2 x 1024 KB, Biblichy available benchmark numbers cited.

piortonin win wo 22 viz 22 cable 2 x 1024 KB Polocy available beformation of the source topcrunchorg/benchmark_detailssfe/query=28id=463 Workstations details (SPECapc* for 3ds max* 7 Interactive & Rendering, SPECapc* for SolidWorks* 2005, SPECapc* for Pro/ ENGINEER* WildFire* 2.0).

Dual-Core Intel[®] Xeon[®] Processor 5080 based platform details: Dell[®] Precision[®] 690 Workstation platform with two Dual-Core Intel[®] Xeon[®] processors 5160 (3:00 GHz, 1333 MHz FS8, 4 MB L2 cache), Microsoft[®] Windows[®] XP Professional SP2t, Bx 1024 MB FB-DIMM 667 MHz (total 8 GB), Western[®] Digital[®] WDB00/JD SATA Hard Drive (7200RPM, 8 MB cache), NVIDIA[®] Quadro[®] FX4500 PCIe[®] graphics and with driver B1.76.



www.intel.com

Disclaimers:

Relative performance for each benchmark is calculated by taking the actual benchmark result for the first platform tested and assigning it a value of 1.0 as a baseline. Relative performance for the remaining platforms tested was calculated by dividing the actual benchmark result for the baseline platform into each of the specific benchmark results of each of the other platforms and assigning them a relative performance number that correlates with the performance improvements reported. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel[®] products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, reference http://www.intel.com/performance/resources/benchmark_limitations.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

64-bit Intel* Xeon* processors with 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.

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