



Performance Brief

Quad-Core

Intel® Xeon® Processor



Innovating Faster with Quad-Core Intel® Xeon® Processor-Based Workstations and Dassault Systèmes Solutions

Innovative Intel® Quad-Core technology lets you move from serial to simultaneous workflows and achieve massive improvements in throughput.

Intel and HP have a commitment to strong, ongoing R&D collaboration with Dassault Systèmes (DS) to create innovative, high-performing, cost-effective infrastructure solutions for product lifecycle management (PLM). The results are helping our customers build their engineering competitive edge.

This paper reports on work HP and Intel jointly conducted to show the benefits of HP workstations powered by Intel® multi-core processors for engineering organizations using Dassault Systèmes' CATIA® V5 design authoring toolset and ENOVIA® V5 DMU design review and analysis applications.



Accelerating Time to Decision

In today's competitive climate, "business as usual" is a recipe for failure. To gain and maintain an engineering competitive edge, you have to do more and do it faster. You have to enhance innovation and slash time-to-decision and time-to-market. In short, you have to work differently.

The newest generation HP xw8400 Workstations powered by the Quad-Core Intel® Xeon® processor 5300 series¹ are built to match the demands of this challenging environment. With up to eight computational engines, 64 GB of memory, and 80 GFLOPS of performance in a single workstation, these systems let you scale your productivity in two important ways:

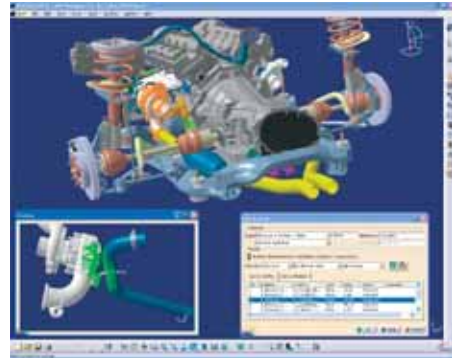
- By significantly speeding up individual applications
- By running multiple applications at once while still enjoying great performance

The net result is to enable a shift from serial to simultaneous workflows—and gains of up to **12x in total workflow throughput** are possible. That's working differently, and improving your engineering competitive edge.

Intel® Multi-Core Changes the Game

Working differently means exploiting multiple cores to run more of your workload in parallel. One way is by running multiple threads of a single application on multiple cores. A second and more powerful approach is to run multiple applications—different parts of your workload—in parallel.

CATIA is part of Dassault Systèmes' V5 PLM portfolio for integrated design. Dassault Systèmes' industry-leading integrated V5 PLM environment provides advanced collaborative tools, 3-D product development, simulation and analysis, digital manufacturing, and lifecycle management. This paper focuses on two key products of Dassault Systèmes' V5 R17 portfolio:²



Courtesy of DaimlerChrysler

Identifying clashes is an important activity throughout the design cycle. Resolving clashes on the manufacturing floor can cost hundreds of times what it costs to resolve them during the design phase.

- DMU Space Analysis 2 (SPA) provides the 3-D interactive capabilities to quickly check, analyze, and ensure the spatial integrity of the mock-up, then share the results with design and review teams across the value chain.
- Photo Studio* 2 (PHS) uses a powerful ray-tracing engine to generate high-quality photo-realistic images and movies of digital mockups. This engine drastically enhances the realism of the resulting images by computing real soft shadows as well as accurate reflections and refractions of light.



Courtesy of Dassault Systèmes

By simulating the appearance of products digitally, you can front-load more decisions in the virtual stage of development—before investing in expensive prototypes, production resources, and product launch activities.

1. Quad-Core is a new technology designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations.

2. This example does not necessarily represent an industrial case, but serves to illustrate the changes you can make to improve day-to-day productivity.

Working Differently Moving from Serial to Simultaneous Workflows

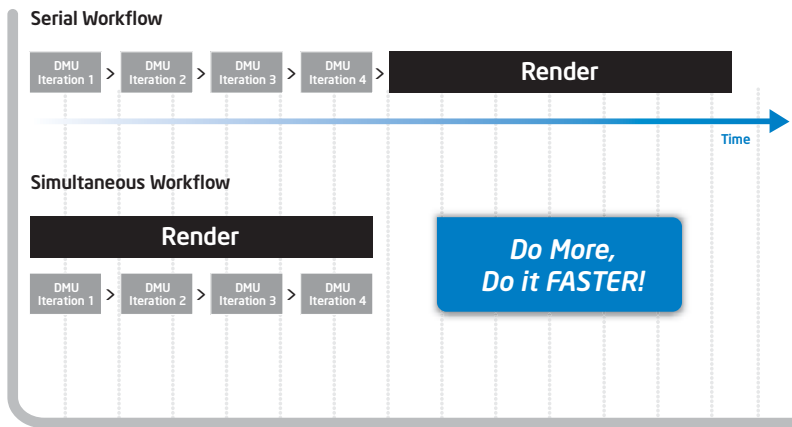


Figure 1. By running tasks in parallel, the simultaneous workflows enabled by the Quad-Core Intel® Xeon® processor 5300 series can increase productivity and help you accomplish more work in less time.

Working differently can help you enhance innovation, make better design decisions, and reduce time-to-market.

Figure 1 uses the example of DMU Space Analysis 2 and Photo Studio 2 to illustrate the benefits of parallel or simultaneous workflows compared to traditional, serial workflows. Because of sequential nature of design and the lack of workstation capability, most workstation workflows today are serial. In a serial workflow, each instance of DMU clash detection or rendering images runs alone on the machine, as shown in the upper half of Figure 1. If you're developing multiple mockups, you run multiple analyses, one task at a time in sequence, and you're typically finished only at the end of the design process. At this point, designs may need to be reworked and perhaps even sent back through analysis again, causing considerable delays.

Contrast that with the simultaneous or parallel workflow shown in the lower half of Figure 1. With the innovation of multiple, high-performance cores at your disposal, you have much more flexibility to scale the number of tasks you run at any one time. Instead of having to interrupt your serial flow of CATIA V5 design, you can now run the DMU Clash jobs in overlapping, parallel fashion, as well as running rendering tasks in parallel. DMU Clash tasks can run as multiple iterations, each with different parameters, in the background. And you can do this while maintaining excellent performance on both applications.

Simultaneous workflows empower you to work differently—and more productively. For example, while still working on the design, you might launch DMU to analyze the design, and select different parameters to test and run those in parallel—you have the performance on your workstation to run multiple iterations at the same time. When the analysis is complete, the answers can be factored into the design. In this way, analysis moves into the design process, driving key engineering decisions, rather than being performed after the design is complete and causing design rework. This *analysis-driven design* is just one way to work differently and gain a business advantage.

By delivering the performance to run tasks such as DMU Clash and rendering in parallel without compromising performance, HP workstations based on the Quad-Core Intel Xeon processor enable you to improve your overall efficiency and productivity as you accomplish more work in less time and sharpen your engineering competitive edge.

Accelerating Individual Applications

HP has designed its HP xw8400 Workstations around the multi-core Intel® Xeon® processor architecture employing the next-generation Intel® Core™ microarchitecture. As a result of HP's attention to detail and solution excellence, customers can use these workstations to meet their most demanding computational and visualization needs and optimize business processes along the value chain.

Intel and HP have a strong strategic commitment with Dassault Systèmes. One example is performance testing of CATIA V5-certified HP workstations with the Quad-Core Intel Xeon processor 5300 series based on Intel Core microarchitecture. These efforts help demonstrate the value of new technology and enable engineering organizations to see where they can best benefit their product development processes. The benchmarking for this study was done at the HP - DS PLM Competence Center. Table 1 (page 5) summarizes configuration details for the benchmarked systems.

The HP-DS PLM Competence Center

Located in the Dassault Systèmes headquarter offices in Suresnes, France, the HP-DS Product Lifecycle Management Competence Center is the centerpiece of the HP and Dassault Systèmes Technology Partner Alliance. The mission of the Competence Center is to evaluate, test, certify, benchmark, optimize, and support the HP platform for use with the DS V5 PLM portfolio in collaboration with Dassault Systèmes. Particular focus is put on usage scenarios of CATIA V5 on HP workstations. Together with partners such as Intel, the Competence Center collaborates on many different R&D projects covering the complete PLM spectrum—from workstations, to servers, storage, and system management.

Single-Core Speedup: From Intel NetBurst® Microarchitecture to Intel® Core™ Microarchitecture
(Lower is better)

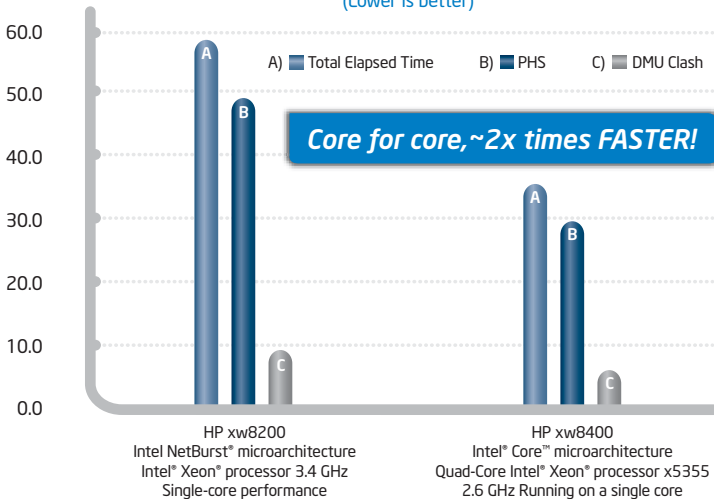


Figure 2. Intel® Core™ microarchitecture accelerates performance. Utilizing a single core of the Quad-Core Intel® Xeon® processor, the HP xw8400 Workstation cut the runtime from almost 60 minutes to 35—a ~40 percent reduction.

Tests were performed using both the previous-generation HP xw8200 Workstation and the present HP xw8400 Workstation. To meet a range of requirements, the xw8400 is available with the Dual-Core Intel® Xeon® processor or Quad-Core Intel Xeon processor, in both single and dual-processor configurations. The two-processor workstation based on the Quad-Core Intel Xeon processor provides eight processing cores for heavy computational lifting.

It is the combination of the Intel Core microarchitecture and Intel's multi-core platform architecture on HP workstations that delivers the performance to support simultaneous workflows. Intel Core microarchitecture accelerates application performance through a wide range of new capabilities, including:

- Intel® Wide Dynamic Execution, which executes up to four full instructions simultaneously
- Intel® Advanced Smart Cache, which is optimized for multi-core processing and reduces latency to frequently used data
- Intel® Smart Memory Access, which optimizes the use of the available data bandwidth from the memory subsystem and processes out-of-order instructions more efficiently

Combining these and other capabilities, Intel Core microarchitecture delivers a near **doubling in performance** core for core over previous-generation Intel technology—typical of what is on many engineering desktops today.

Figure 2 shows this difference by comparing a sequential run of DMU Clash and PHS on a single core of two HP workstations. On an HP xw8200 Workstation with a single-core Intel Xeon processor 3.4 GHz, it took nearly 60 minutes to run one instance of DMU Clash and one of rendering with PHS. That same workload needed just over 35 minutes when it ran on only one core of an HP xw8400 Workstation powered by the latest Quad-Core Intel Xeon processor—even though the newer processor ran at a lower clock speed of 2.6 GHz. This corresponds to **nearly a 2x speedup**.

Intel® Core™ microarchitecture is almost twice as fast as the single-core Intel® Xeon® processor running on many workstations today. Now imagine the power of eight cores at your fingertips.

Scalable, Simultaneous Workflows

Figure 3 highlights the increased efficiency delivered by running parallel tasks on a multi-core workstation. Using a single-core processor, a single iteration of rendering with PHS and DMU Clash takes almost an hour (as we saw in Figure 2). Running PHS and DMU Clash simultaneously over the eight cores of the Quad-Core Intel Xeon processor-based HP workstation, the time-to-completion (and potentially the time-to-decision) drops to just under five minutes. That’s approximately a **12x improvement in performance** for applications that you are probably running serially on your current workstation.

Imagine the Possibilities

HP’s high-end HP xw8400 Workstations powered by dual Quad-Core Intel Xeon processors play a key role in enabling new ways to work, such as analysis-driven design. With eight cores at your disposal, you can dramatically increase the performance of individual applications and evolve your workflow from serial to simultaneous—to iterate more, innovate faster, and accelerate time-to-decision.

Dassault Systèmes has worked closely with Intel to optimize its solutions to take full benefit of the Quad-Core Intel Xeon processor used on the HP 64-bit workstations. Imagine how simultaneous workflows using 3-D product lifecycle management solutions from Dassault Systèmes on these powerful workstations can help you **scale your productivity**. By taking advantage of the innovation and collaboration of these three industry leaders, your engineering organization can:

- Accelerate the release of complex product designs
- Reduce risk and rework by enabling changes earlier in the development process
- Improve the productivity of highly-skilled workers
- Maximize the return on your HP workstation hardware investments
- Create and innovate more, to optimize your design solutions

Accelerating PHS/DMU Clash Throughput With Simultaneous Workflows and Multiple Cores

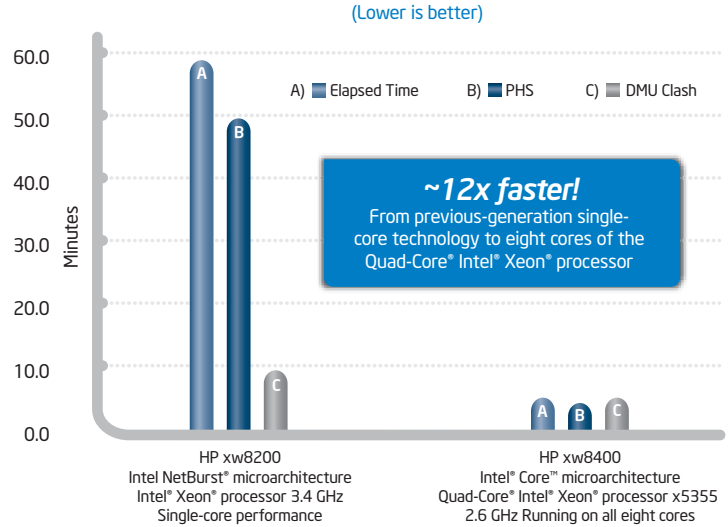
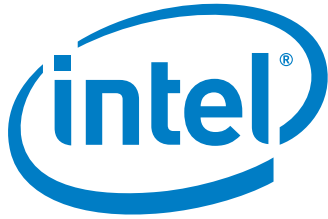


Figure 3. Running in parallel over the eight cores of dual Quad-Core Intel Xeon processors on the HP xw8400 workstation, the PHS/DMU Clash workload experiences a **~12x performance increase** over the serial, single-core performance of a workstation that’s typical of many in use today.

With up to eight cores, 64 GB of memory, and 80 GF of performance in a single workstation, engineers can shift from serial to simultaneous workflows, with the potential to gain up to 12x in total workflow throughput.

	HP xw8200* Workstation	HP xw8400* Workstation
Processor	Two single-core Intel® Xeon® processors	Two Quad-Core Intel® Xeon® processors x5355
Clock speed	3.4 GHz	2.6 GHz
Microarchitecture	Intel NetBurst® microarchitecture	Intel® Core™ microarchitecture
Application	CATIA Version 5 R 17 (64-bit) SP3	CATIA Version 5 R 17 (64-bit) SP3
Operating system	Microsoft Windows XP Pro x64 SP1 Edition*	Microsoft Windows XP Pro x64 SP1 Edition*
Memory	8 GB of DDR2/400	8 GB of DDR2-FB/667
Graphics card	nVidia* FX3450	nVidia* FX4600
Graphics driver	91.36	97.78

Table 1. Benchmarked System Configurations



www.intel.com

Learn More

About how innovative solutions from Dassault Systèmes, running on HP workstations powered by the Quad-Core Intel Xeon processor, can help you work differently and build your competitive edge. Contact your HP or Intel representative or visit us on the web:

www.intel.com

www.hp.com/go/3ds

www.3ds.com

About Dassault Systèmes

As a world leader in 3-D and Product Lifecycle Management (PLM) solutions, Dassault Systèmes brings value to more than 100,000 customers in 80 countries. A pioneer in the 3-D software market since 1981, Dassault Systèmes develops and markets PLM application software and services that support industrial processes and provide a 3-D vision of the entire lifecycle of products from conception to maintenance.

The Dassault Systèmes portfolio consists of CATIA for designing the virtual product, SolidWorks for 3-D mechanical design, DELMIA for virtual production, SIMULIA for virtual testing, ENOVIA for global collaborative lifecycle management, and 3DVIA for online 3-D lifelike experiences. Dassault Systèmes is listed on the Nasdaq (DASTY) and Euronext Paris (#1 3065, DSY.PA) stock exchanges. For more information, visit www.3ds.com

About HP

HP focuses on simplifying technology experiences for all of its customers—from individual consumers to the largest businesses. With a portfolio that spans printing, personal computing, software, services, and IT infrastructure, HP is among the world's largest IT companies, with revenue totaling \$97.1 billion for the four fiscal quarters ended April 30, 2007. More information about HP (NYSE: HPQ) is available at www.hp.com

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.

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Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See http://www.intel.com/products/processor_number for details.

64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Consult with your system vendor for more information.

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