Business white paper

HP and CATIA

HP Workstations for running Dassault Systèmes CATIA®

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Introduction

The purpose of this document is to provide information that will aid in selection of HP Workstations for running Dassault Systèmes CATIA®. A performance study was completed by benchmarking CPU intensive operations in CATIA® V5R20 SP2 and running the Dassault Systèmes CATIA® V5R20 SP2 CATGTS graphics Performance Benchmark. Results and recommendations are provided for the HP Z Workstation running Windows 7 Professional 64-bit. Tips are also provided for running the solutions at ultimate performance.

What type of application is CATIA?

CATIA® is a software solution used to create and display 3 Dimensional electronic models that are accurately defined in dimensions and other physical properties, such that the electronic model viewed on the screen can be physically produced in the real world. CATIA® provides solutions to create, modify, and validate very complex innovative shapes and surfaces, and is used heavily in the Automotive and Aerospace industries in the design of their products. CATIA® is Dassault Systèmes' Pioneer Brand and Dassault's primary solution for large company Product Design and Innovation. CATIA® addresses the current trend of sustainable development, which is driving enterprises around the globe to create a constant stream of innovative and inspiring smart products. The role of the Engineers, Designers, Scientists and Architects, who must create these products, becomes more demanding. CATIA® serves these populations to dramatically increase the power they need for innovation. Based on the 3DEXPERIENCE platform, CATIA® goes far beyond traditional 3D CAD software tools to offer a unique Digital Product Experience. CATIA® is supported on Windows 7, Vista and XP. Dassault Systèmes tests and certifies CATIA® on HP Workstations configurations, and their customers normally view certification as a needed criteria prior to purchase. A Certified and Derived Configuration is defined on the **3ds.com/support/certified-hardware/certified-and-derived-configuration-definition/** web site. The certification results are displayed on the **3ds.com/support/certified-hardware/windows-certified-workstations/** web site along with the supported versions and notes. For quick reference HP also displays the CATIA® certification results at **hp.com/go/mcadcertification** along with other applications.

HP recommends Windows.

How does the new HP Workstation family (HP Z1, HP Z220, HP Z420, HP Z620 and HP Z820) provide ultimate CATIA® Performance?

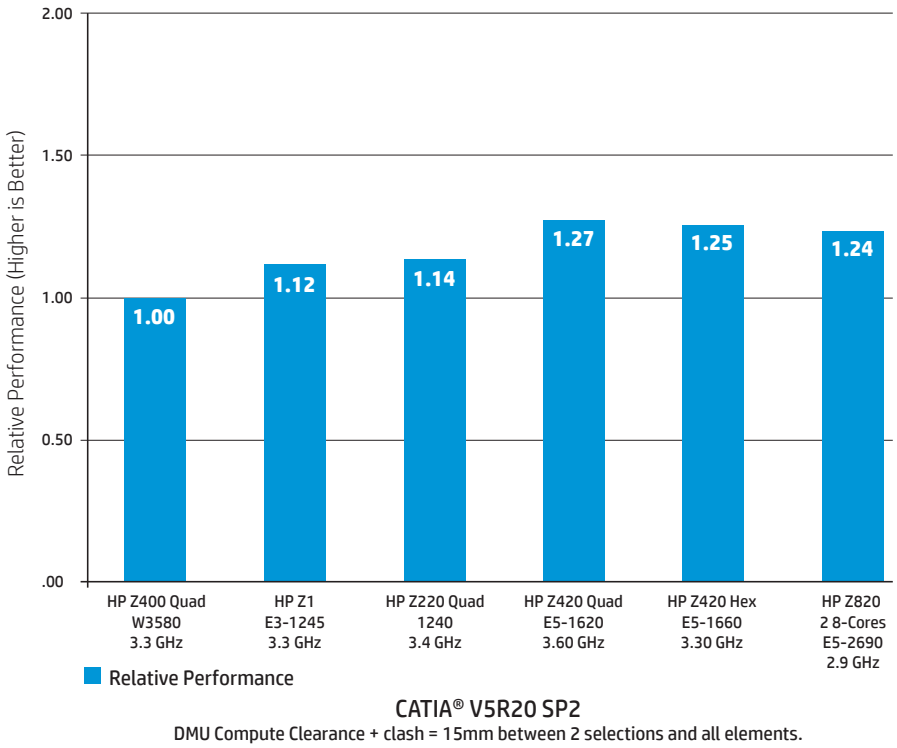
- **Compute** performance is improved over previous-generation Intel processor-based workstations. The new HP Z420, HP Z620 and HP Z820 Workstations utilize the Intel Xeon processor E5 Sandy Bridge family and the Intel C602 chipset. The HP Z1 workstation utilizes the Intel Xeon processor E3 family or the Intel Core i3 family and the Intel PCH C206 chipset. The HP Z220 workstations utilize the Intel Xeon processor E3v2 family or Intel Core i7 processor or Intel Pentium processor and Intel PCH C216 chipset.
- **Memory** bandwidth and latency is improved. The HP Z620 and HP Z820 have Dual QPI links in parallel with up to 8GT/s.
- **Memory** speed (1600Mhz) is improved.
- **Memory** design is improved with either 2 or 4 channels per processor
  - HP Z1 and HP Z220 supports unbuffered DIMMS and non-ECC unbuffered DIMMS
    - 4 DIMM sockets, 2 channels, 2 DIMMs per channel
  - HP Z420 supports unbuffered DIMMs (UDIMM)
    - 8 DIMM sockets, 4 channels, 2 DIMMs per channel
  - HP Z620 supports unbuffered DIMMS (UDIMM) and registered DIMMS (RDIMM)
    - 12 DIMM sockets, 4 channels
    - 2 DIMMs per channel - CPU0 – 8 sockets
    - 1 DIMM per channel - CPU1 – 4 sockets
  - HP Z820 supports unbuffered DIMMs (UDIMM), registered DIMMS (RDIMM) and load-reduced DIMMS 1333Mhz (LRDIMM)
    - Mixing UDIMM / RDIMM / LRDIMM is not permitted
    - 16 DIMM sockets, 4 channels
    - 2 DIMMS per channel – CPU0 – 8 sockets
    - 2 DIMMS per channel – CPU1 – 8 sockets
- **Storage I/O** performance is improved. PCI-Express 3.0, 6 Gb/s SATA and SAS ports, DMA bandwidth, 6 Gb/s hard drives (HDD) and 6 Gb/s solid state drives (SSD) can be configured with RAID 0 striped volumes for speed, USB 3.0

HP recommends Windows.

What performance was measured on HP Workstation running CATIA® V5R20 SP2?

CPU

The HP Z420 is 25 percent faster than the HP Z400 at similar frequencies.
CPU Intensive and some Multi-threaded

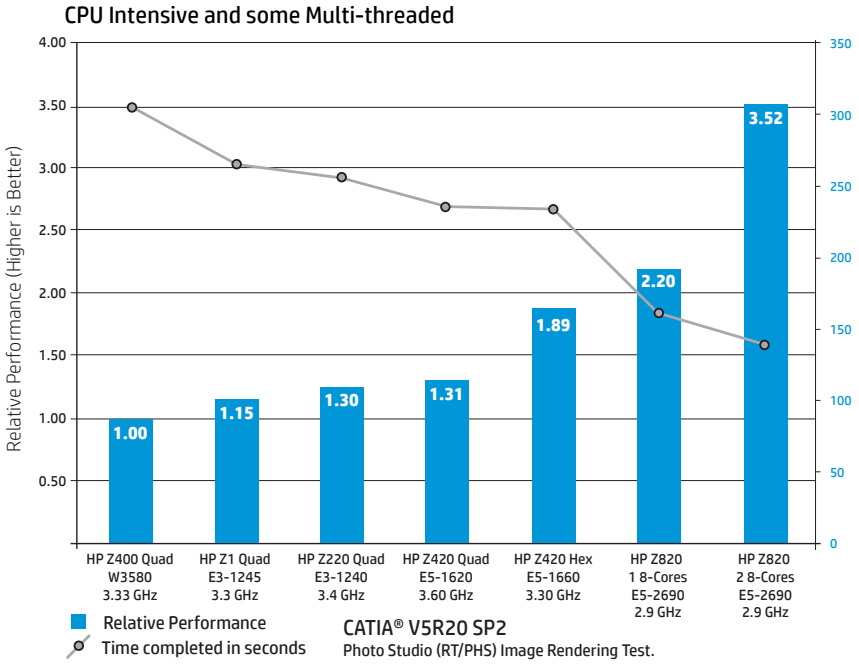


DMU Compute Clearance + clash = 15mm between 2 selections and all elements.

CATIA® operations are typically serial so selecting the fastest processor is best. DMU Clash Analysis and PHS Rendering do execute multiple threads on more cores. CATIA® can still benefit with increased clock frequency provided by Intel Turbo Boost (tb) Technology if all the processor cores are not being used. Turbo Boost allows processor cores to run faster than the base operating frequency. For example, if CATIA® is only running on one core, the base frequency of the HP Z820 with Windows 7 Professional 64-bit, Intel Xeon E5-2690 Eight-Core 2.9 GHz could increase the frequency up to 3.8 GHz.

Intel® turbo boost increased clock rate is limited by the processor's power, current and thermal limits, as well as the number of cores currently in use and the maximum frequency of the active cores.

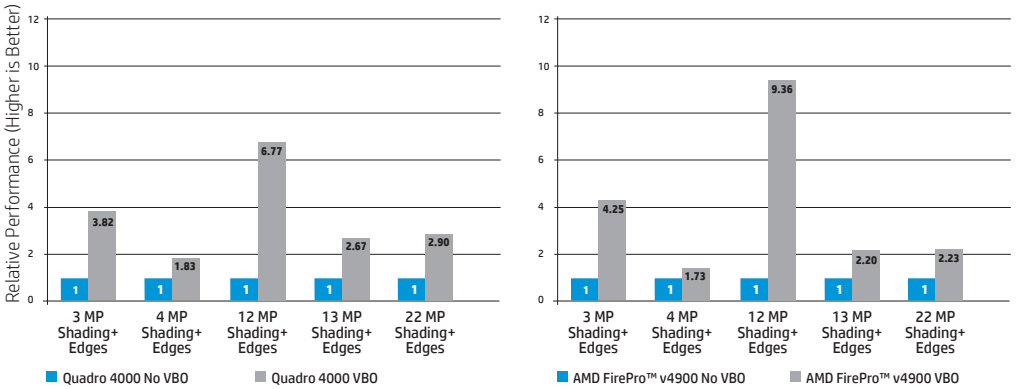
CATIA® Photo Studio rendering takes advantage of multiple cores on HP Workstations



Graphics

AMD and NVIDIA graphics delivers maximum performance when CATIA® V5R18 SP4 (or later) is configured to use Vertex Buffer Objects (VBO). VBO is a buffer where CATIA® stores vertex data which is located on the graphics processing unit (GPU) memory. Storing data on the GPU allows for direct access resulting in faster graphics performance. The amount of VBO buffer memory available is limited only by the physical amount of video memory on the graphics card. VBO graphics optimization is only available by exporting the following environment variable CAT_VBO_ALLOWED=1, except where it is activated by default in CATIA® V6 R2013 on Windows 7 Professional 64-bit (and planned to be activated by default in future CATIA® V5 and V6 releases).

NVIDIA and AMD graphics comparisons with and without VBO on

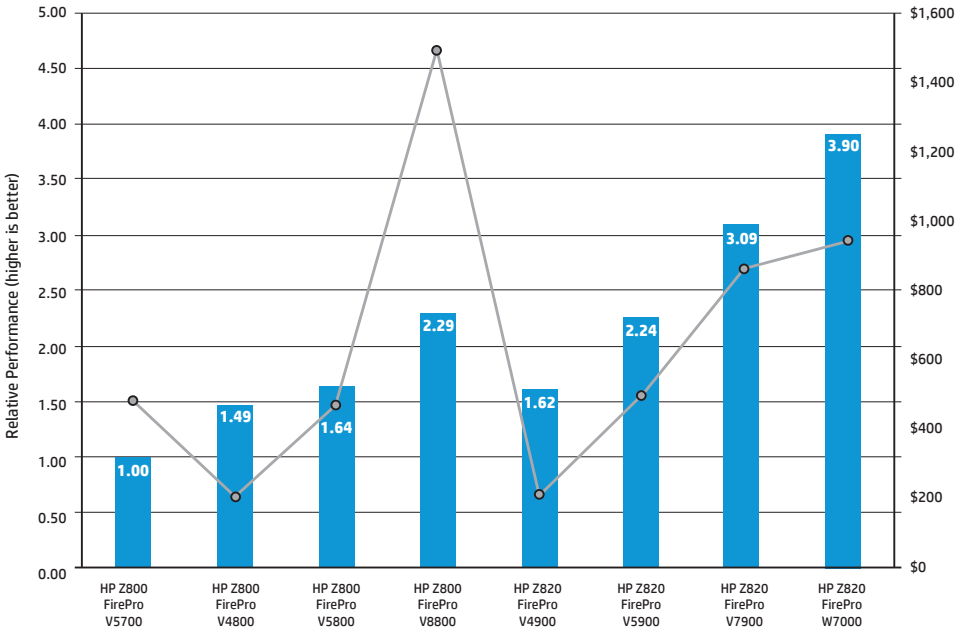


VBO should always be on / graphic leadership varies with model size

CATIA® V5R20 SP2—CATGTSPerformance Benchmark tests VBO graphics operations. MP = Millions of Polygons.
Good scaling is obtained with large models or assemblies containing large parts.

Old vs. New HP Z800/HP Z820 with AMD FirePro™ Graphics

CATIA® graphics operations scale significantly with HP Z820 Workstation and newer AMD graphics.
New model show significantly better price/performance scaling

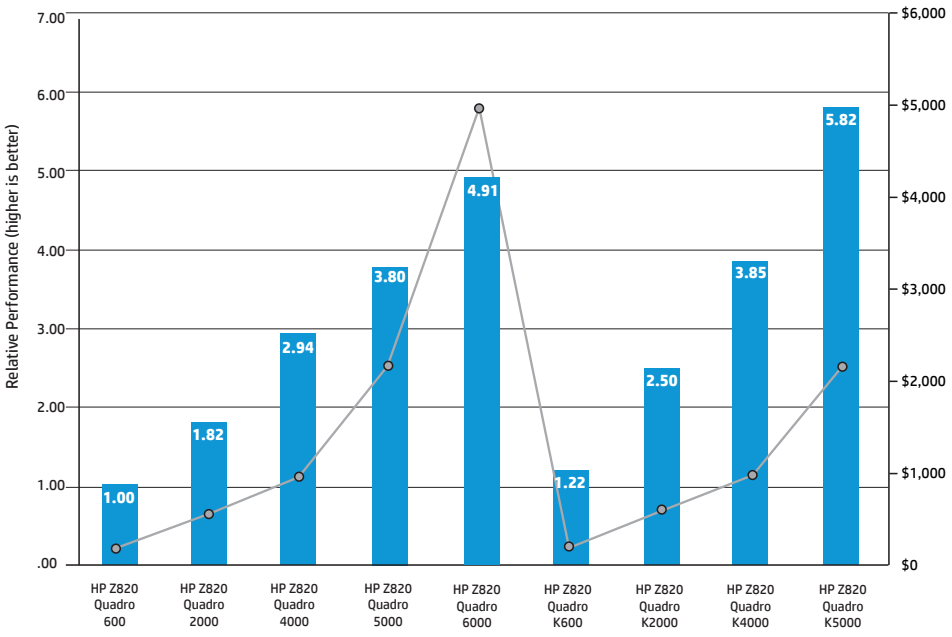


HP Z800 Hex Core 3.33 GHz
HP Z820 Eight Core 2.9 GHz
Resolution - 1920x1200

CATIA® V5R20 SP2 —CATGTSPerformance Benchmark tests VBO graphics operations. MP = Millions of Polygons
Good scaling is obtained with large models or assemblies containing large parts.

Old vs. New HP Z820 with NVIDIA Quadro Graphics

CATIA® graphics operations scale significantly with HP Z820 Workstation and newer NVIDIA graphics.
New model show significantly better price/performance scaling

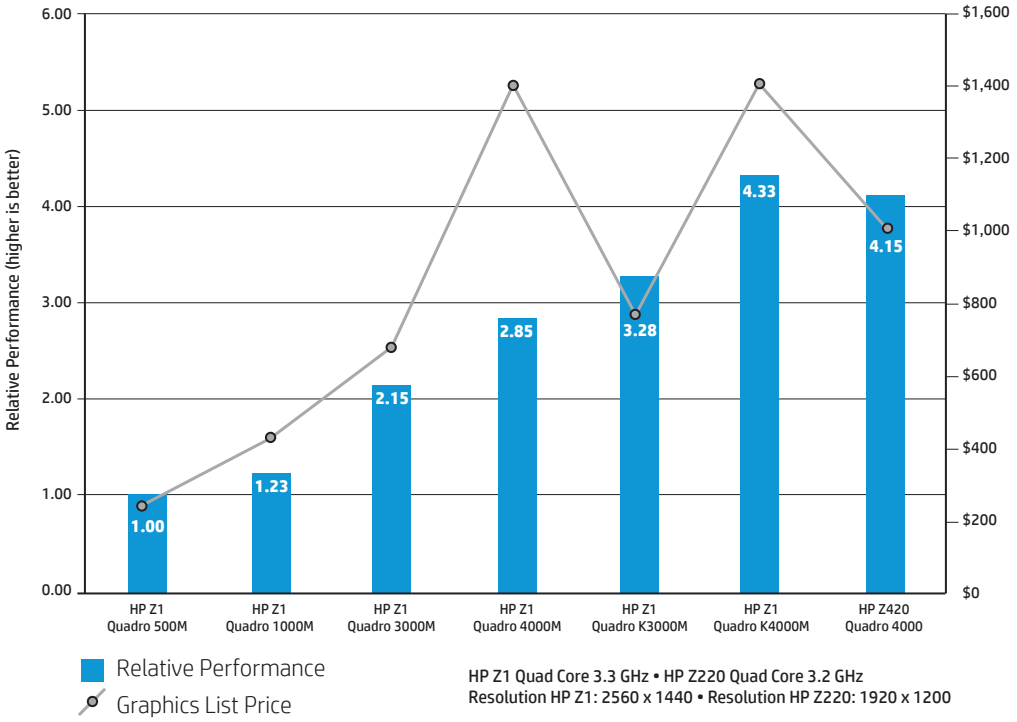


HP Z820 Eight Core 2.9 GHz
Resolution - 1920x1200

CATIA® V5R20 SP2 —CATGTSPerformance Benchmark tests VBO graphics operations. MP = Millions of Polygons
Good scaling is obtained with large models or assemblies containing large parts.

HP recommends Windows.

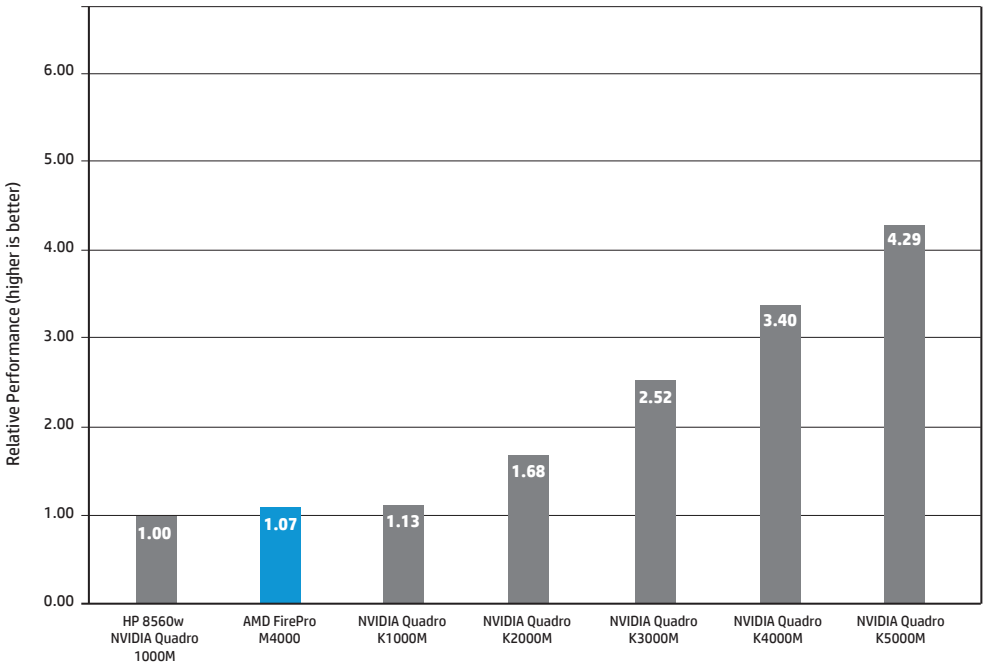
HP Z1 with Quadro K3000M provides the best HP Z1 Price/Performance



HP Z1 Quad Core 3.3 GHz • HP Z220 Quad Core 3.2 GHz
Resolution HP Z1: 2560 x 1440 • Resolution HP Z220: 1920 x 1200

CATIA® V5R20 SP2 Mobile Workstation Performance

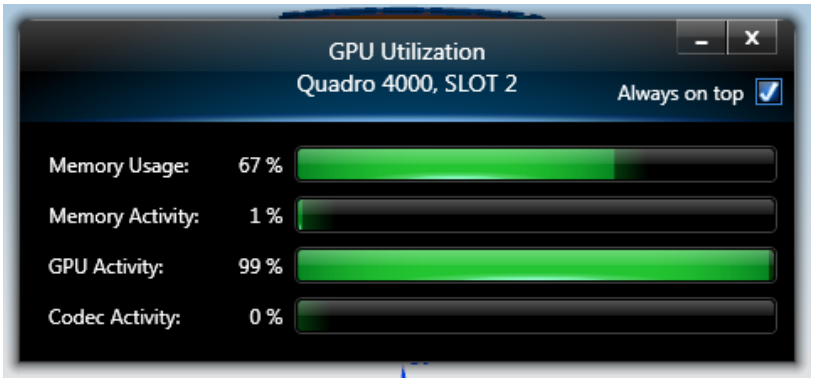
Relative performance – 12MP Shading+Edges CATGTS Performance Benchmark tests graphics operations. MP = Millions of Polygons (Nov. 2012)



i7 3820QM, 2.70GHz (turbo 3.7GHz)

Resolution – 8470w 1600x900
8570w 1920x1080
8770w 1920x1080

HP Performance Advisor can help users select the best graphics card using GPU Utilization. GPU Utilization allows users to monitor their GPU activity (and NVIDIA graphics memory) while running CATIA®. HP Performance Advisor is included with every HP workstation or available for download from the **hp.com/go/hpperformanceadvisor** web site.



NVIDIA® Maximus™ workstation technology to accelerate design workflow

HP Z Workstations with NVIDIA® Maximus™ technology shorten design cycle times for design plus CAE simulation and for design plus photorealistic rendering. Maximus combine the NVIDIA Quadro® graphics and NVIDIA Tesla® GPUs into a single workstation. Details are available at the NVIDIA **nvidia.com/maximus** web site.

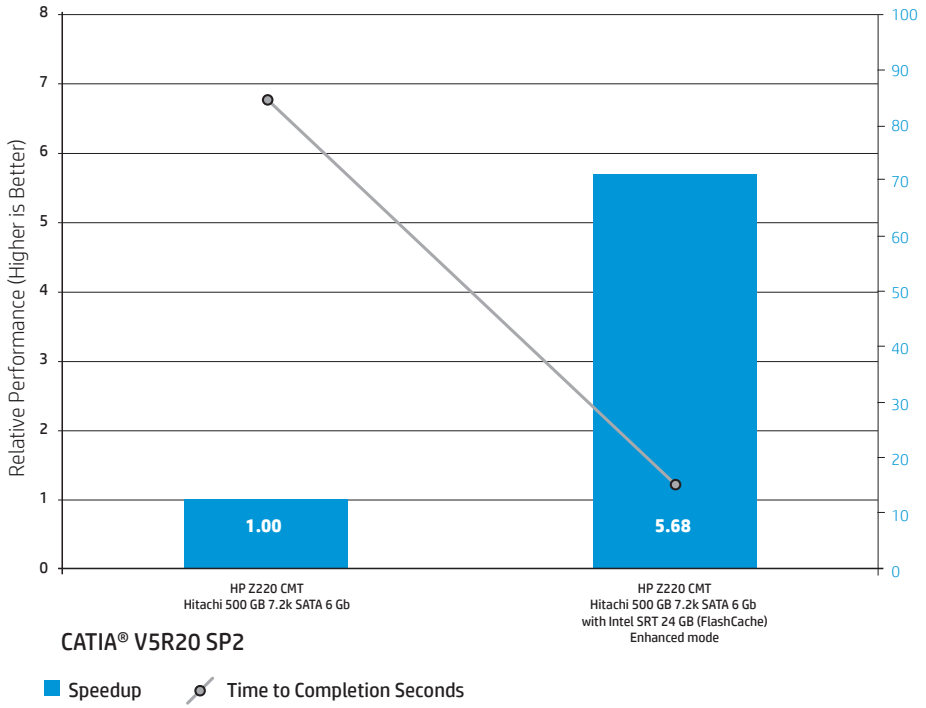
- CATIA® will run at full graphics performance on the NVIDIA Quadro® graphics allowing SIMULIA's Abaqus 6.11 (or later) to take full advantage of the GPUs of NVIDIA Tesla® card. The NVIDIA **nvidia.com/abaqus** web site shows benchmark details for the GPU acceleration with SIMULIA's Abaqus.
- For photorealistic rendering of CATIA® V6 R2011x (or later) designs the V6 Live Rendering module shortens ray tracing time with the Maximus configuration taking advantage of both the Quadro GPU and Tesla GPU providing the best performance for Live Rendering. Performance acceleration with Maximus technology is documented at the NVIDIA **nvidia.com/object/quadro-catia-live-rendering.html** web site.

Storage

Disk Caching is available with Intel® Smart Response Technology[1] (SRT) with HP Z220 and 8x70w mobile workstations. SRT allows a low capacity solid-state drive to function as cache for the conventional disk drive resulting in faster boot and improved application responsiveness.

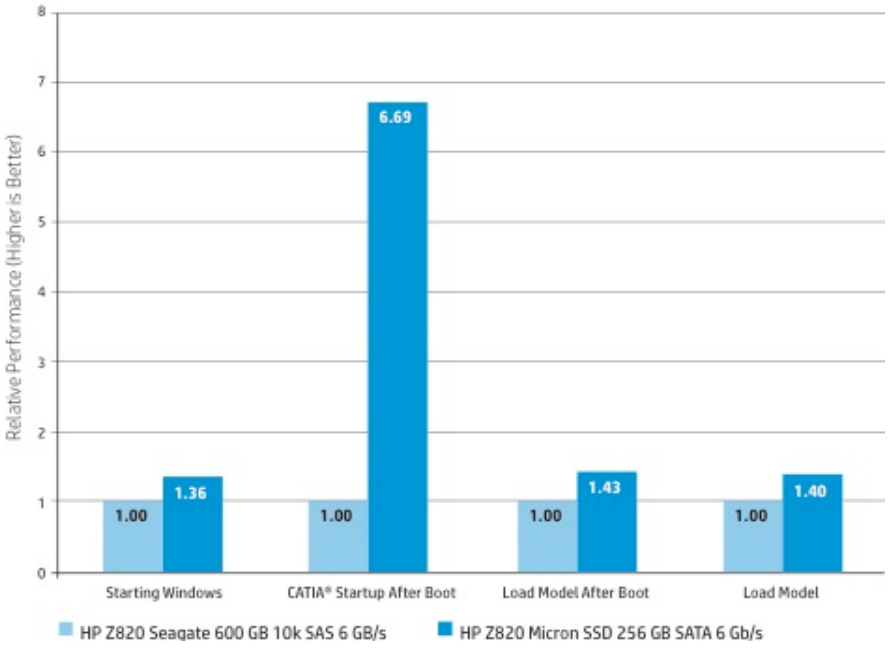
HP recommends Windows.

Startup CATIA® after a reboot is over 5 times faster with Intel® Smart Response Technology (SRT).



The HP Z820 startup and I/O are faster when the operating system and CATIA® are installed on a SSD drive.

Starting and I/O are faster when the OS and CATIA® are installed on a SSD drive Starting CATIA® after a reboot is over 6 times faster.



Not every workstation configuration benchmarked has been certified for CATIA®, but the driver used is part of at least one Dassault Systèmes Certified Configuration on Windows 7 64-bit.

HP recommends Windows.

HP Workstation Recommendations for running CATIA®

Good–HP Z1	Better–HP Z220 CMT
Windows 7 Professional 64-bit Intel Xeon E3-1245 Quad Core 3.3 GHz (up to 3.7 max turbo) 16 GB memory SSD Quadro K3000M	Windows 7 Professional 64-bit Intel Xeon E3-1240v2 Quad Core 3.4 GHz (up to 3.8 max turbo) 16 GB memory SSD Quadro K4000 AMD FirePro™ W7000
Best–HP Z420	**Mobile–HP 8770w**
Windows 7 Professional 64-bit Intel Xeon E5-1620 Quad Core 3.6 GHz (up to 3.8 max turbo) 16 GB memory SSD Quadro K5000 AMD FirePro™ W7000	Windows 7 Professional 64-bit Intel Core i7 Quad Core 8 GB memory SSD Quadro K3000M AMD FirePro™ M4000
Best PHS Rendering-HP Z820	
Intel Xeon E5-2690 Dual Eight-Core 2.9 (up to 3.8 max turbo) 16 GB memory SSD Quadro K5000 AMD FirePro™ W7000	

- AMD or NVIDIA professional 3D graphics. Minimum of 1 GB video memory. Recommend minimum 2 GB video memory for CATIA® V6 advanced rendering effects.
- Memory sizing/selection is critical. For best performance, use same total memory size on each channel. Use same total size on each CPU.
- Use ECC memory to protection against data bit corruption events. Non-ECC memory does not detect or correct single-bit or multi-bit errors. This can lead to system crashes or data corruption.
- Windows 7 Professional 64-bitService Pack 1
- Windows 7 Professional 64-bit uses physical memory for dynamic buffer cache when available. The buffer cache prevents slower Disk I/O transactions. Memory is much faster than disk I/O. Additional memory for the OS is necessary.
- HP Z420, HP Z620 and HP Z820 chipset design has 6 Gb/s and 3 Gb/s disk I/O ports. The 6 Gb/s I/O ports are recommended for 6 Gb/s devices.
- 3 Gb/s devices will negotiate 3 Gb/s protocol when plugged into 6 Gb/s ports
- 6 Gb/s SSD drive for operating system and application data or use intelligent disk caching with Intel® Smart Response Technology on HP Z220 or HP 8x70w Mobile Workstations.

HP recommends Windows.

Tips for running CATIA®

Operating System

Operating System / Setting	Default	Recommend
Windows 7 Professional 64-bit		Service Pack 1
Control Panel/Power Options	Balanced	High Performance

System BIOS

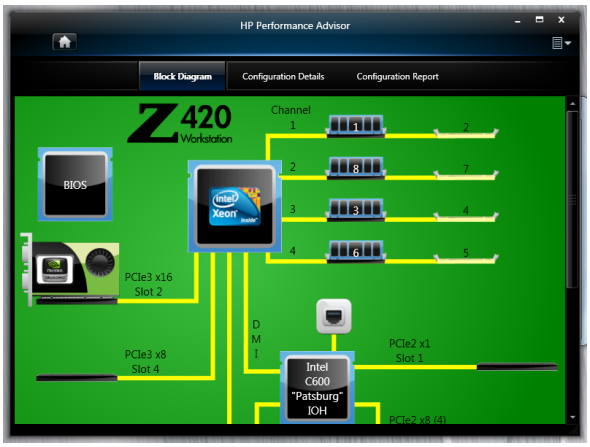
BIOS Setting	Default	Recommend
Power/OS Power Management/Runtime Power Management	Enable	Enable
Power/OS Power Management/Idle Power Savings	Extended	Normal
Power/OS Power Management/Turbo Mode	Enable	Enable
Advanced/Device Options/Hyper-Threading	Enable	Enable
Advanced/Bus Options/NUMA (HP Z620 and HP Z820 Dual processor)	Enable	Enable

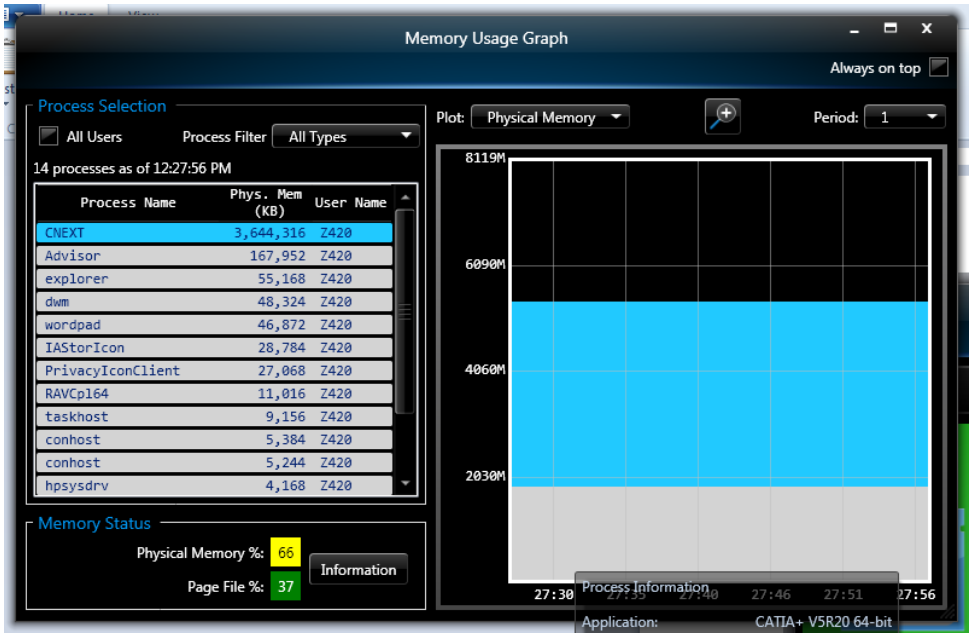
CATIA® VBO

Control Panel/Advanced system settings	Recommend New
Advanced/Environment Variables	Variable name: CAT_VBO_ALLOWED Variable value: 1

- Use a Dassault Systèmes CATIA® certified Workstation, including graphics driver
- Code and data should reside in memory. To avoid swapping, HP Performance Advisor Memory Usage Graph can help users determine if enough memory is installed in the workstation.
- HP Performance Advisor should be used to install graphics drivers, select BIOS settings, set CATIA® VBO environment variable and help characterize CATIA® graphics and memory usage. HP Performance Advisor is included with every HP workstation or available for download from the **hp.com/go/hpperformanceadvisor** web site.

HP recommends Windows.





Additional resources

hp.com/go/whitepapers

1 Requires a 2nd gen Intel ® Core TM processor, enabled chipset, Intel Rapid Storage technology software, and a properly configured hybrid drive (HDD + small SDD). Intel Smart Response Technology is sold as an optional feature and is only available on HP's 2012 Workstations, HP Elitebooks and HP UltraBook. Depending on system configuration, your results may vary.

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