



HP and NX

Introduction

The purpose of this document is to provide information that will aid in selection of HP Workstations for running Siemens PLMS NX™. A performance study was completed by benchmarking the HP NX Unigraphics Performance Harness (UPH) user function which measures CPU and graphics performance. UPH supports running any version of NX. 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 NX?

NX is a very complex 3D Computer-Aided Design software application, and is 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. NX provides solutions to create, modify, and validate very complex innovative shapes and surfaces, as well as manufacture these shapes. It is used heavily in the Automotive and Aerospace industries in the design of their products. NX has been supported on Windows® 7 Professional 64-bit, Vista and XP. Since January 2012, only Windows 7 64-bit is tested and supported. NX is certified on HP Workstations and professional 3D graphics combinations and tested along with Teamcenter Visualization and Techomatix. Siemens PLMS customers normally view certification as a needed criteria prior to purchase. The certification results are displayed on the plmapps.industrysoftware.automation.siemens.com/hwcert/HWCertList2 web site along with the certification document which includes tested versions and notes. For quick reference HP also displays the NX certification results at hp.com/go/mcadcertification along with other applications.

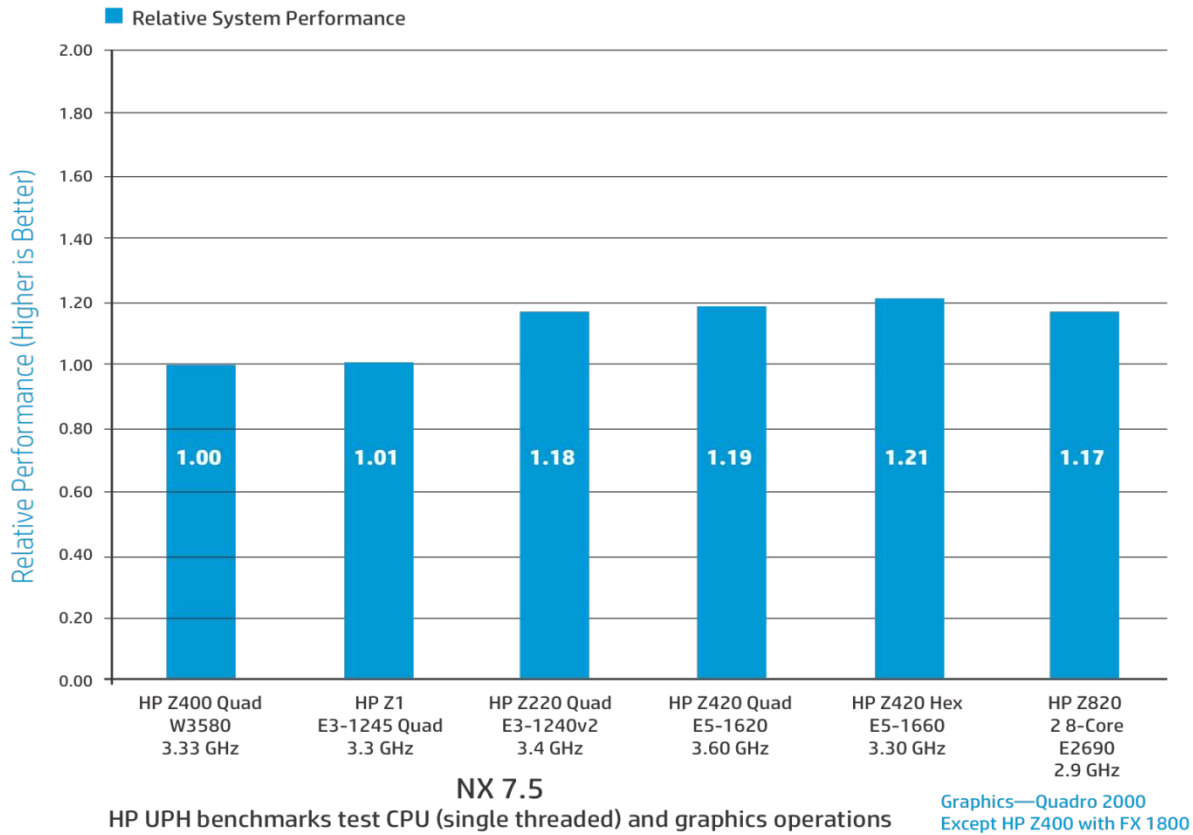
How does the new HP Workstation family (HP Z1, HP Z220, HP Z420, HP Z620 and HP Z820) provide ultimate NX performance?

- **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

What performance was measured on HP Workstation running NX 7.5?

CPU

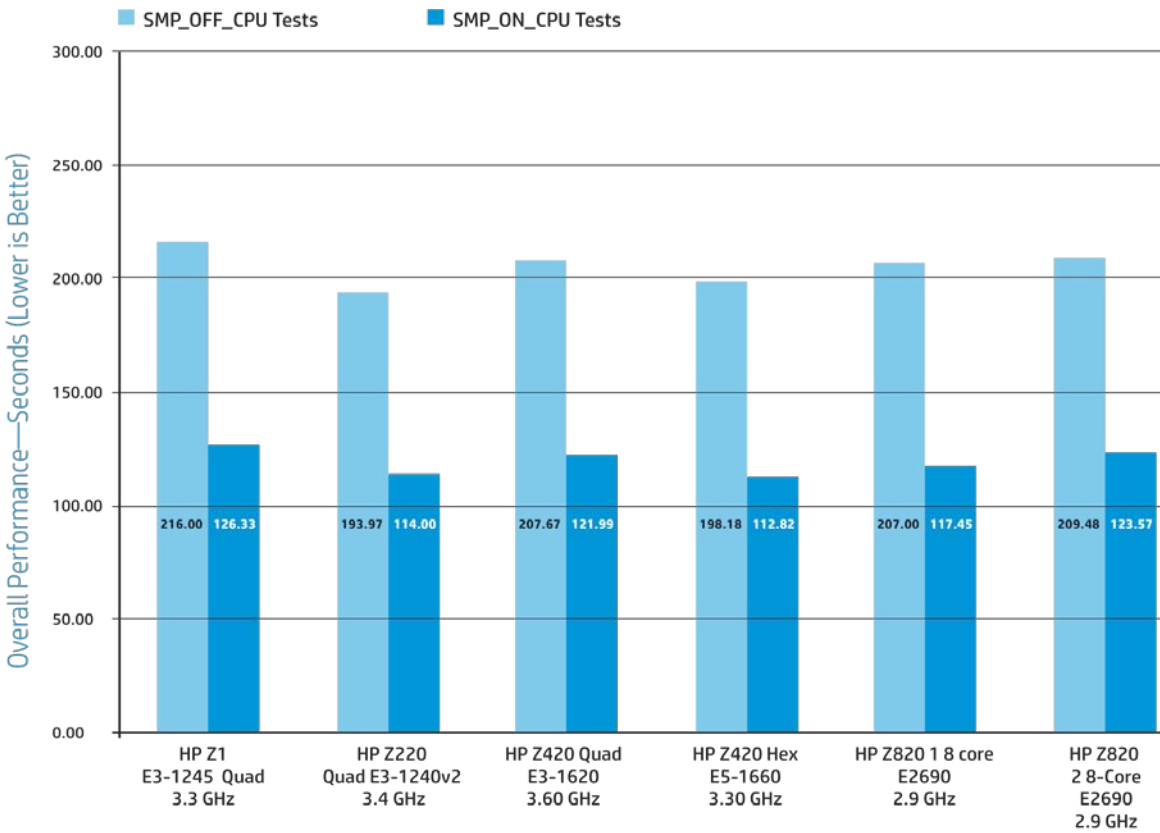
The HP Z420 is 21% faster than the HP Z400 at similar frequencies and updated graphics



NX operations are typically serial so selecting the fastest processor is best. There are several operations in NX that do execute multiple threads on more cores. Those operations are mass properties, silhouettes, facet shading, Boolean operations, hidden line rendering, loading new style facet JT format data and sketcher. Some operations will automatically run NX on multiple cores though most require the UGII_SMP_ENABLE parameter to be set to yes. Siemens PLMS continues to add threaded code in each new NX release as priorities permit. NX can 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 NX is only running on one core, the base frequency of the HP Z820 Intel® Xeon® E5-2690 Eight-Core 2.9 GHz could increase the frequency up to 3.8 GHz.

Intel® Turbo Boost Technology 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.

NX Mass Properties and Silhouette operations takes advantage of multiple cores on HP Workstations

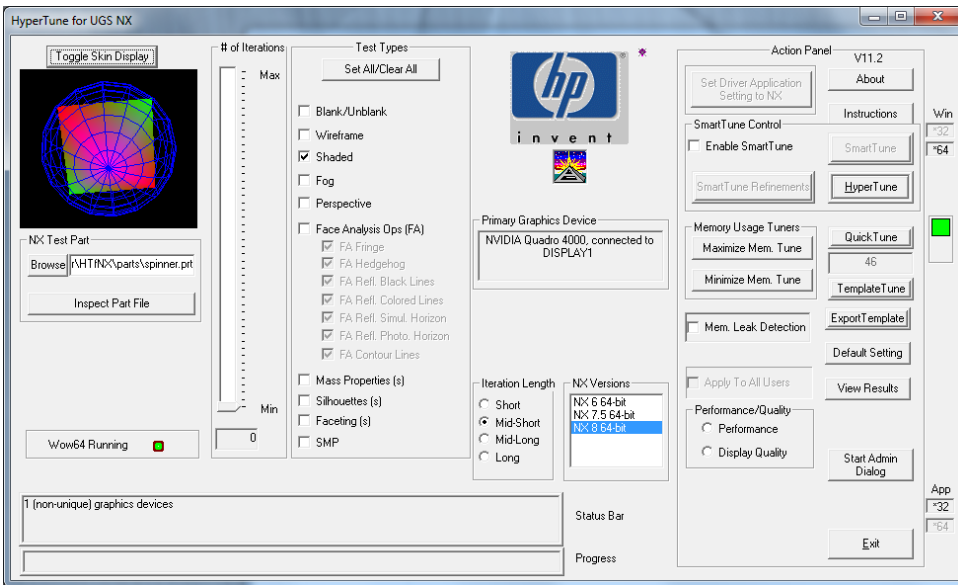
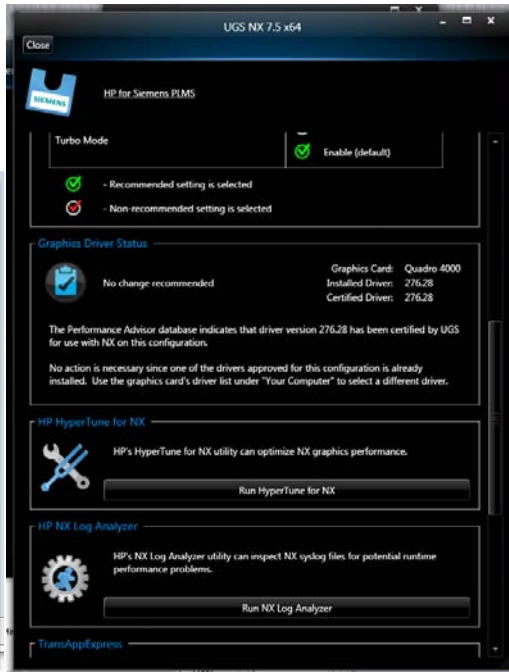


NX 7.5
HP UPH benchmarks test CPU (SMP) mass properties and silhouette operations

Graphics

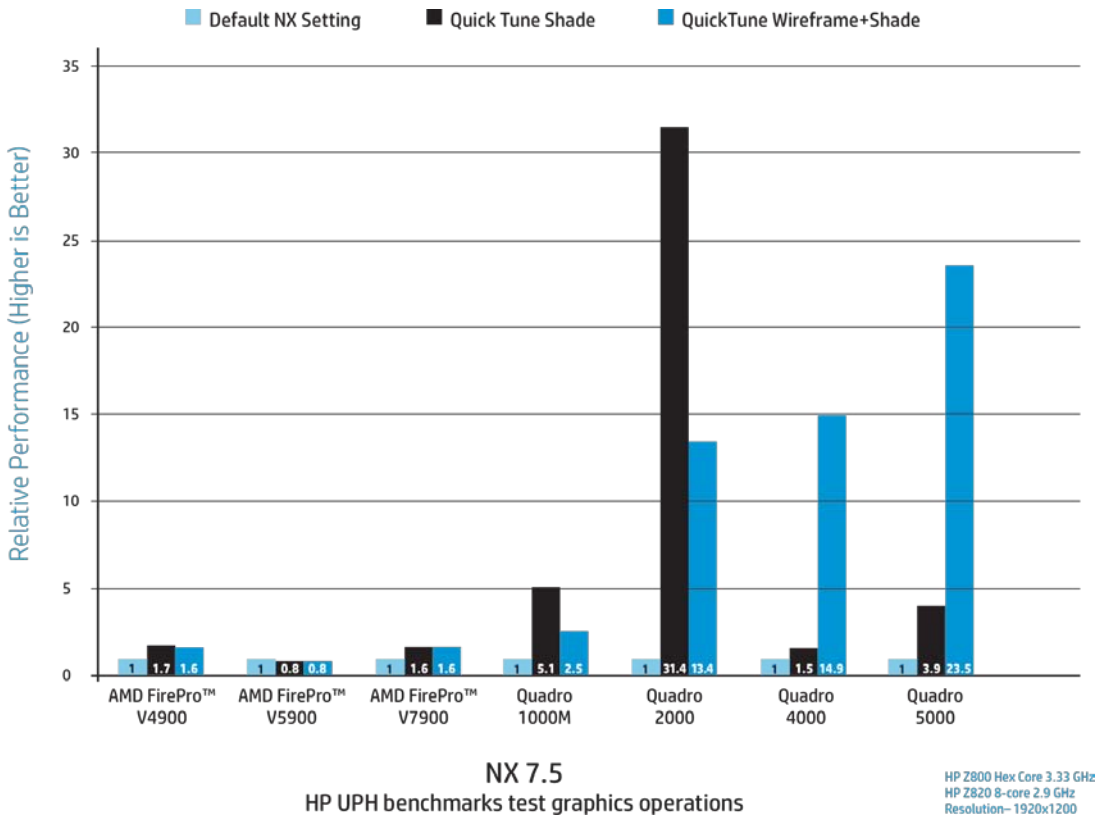
AMD and NVIDIA graphics delivers maximum performance when HyperTune for NX (HTfNX) is used to optimize the performance of graphics operations. Supporting NX since version 17, HTfNX is an HP exclusive toolset which optimizes the performance of NX graphics intensive operations as well as offers admin reporting and checking tools for the NX environment. The tuning feature can be used in QuickTune mode, which uses predetermined tuning selected for your configuration, or it allows the option of evaluating the performance of NX with any parts and a selection of graphics operations. It runs on all NX supported versions of Microsoft Windows® 7 Professional 64-bit in conjunction with all HP and mobile workstations. HTfNX Improvements varies by graphics device and graphics operation measured.

HTfNX is HP patented technology and ships with HP Performance Advisor. HP Performance Advisor is included with every HP workstation or available for download from the hp.com/go/hpperformanceadvisor web site. HTfNX is available from the Your Software / Siemens PLMS NX icon.



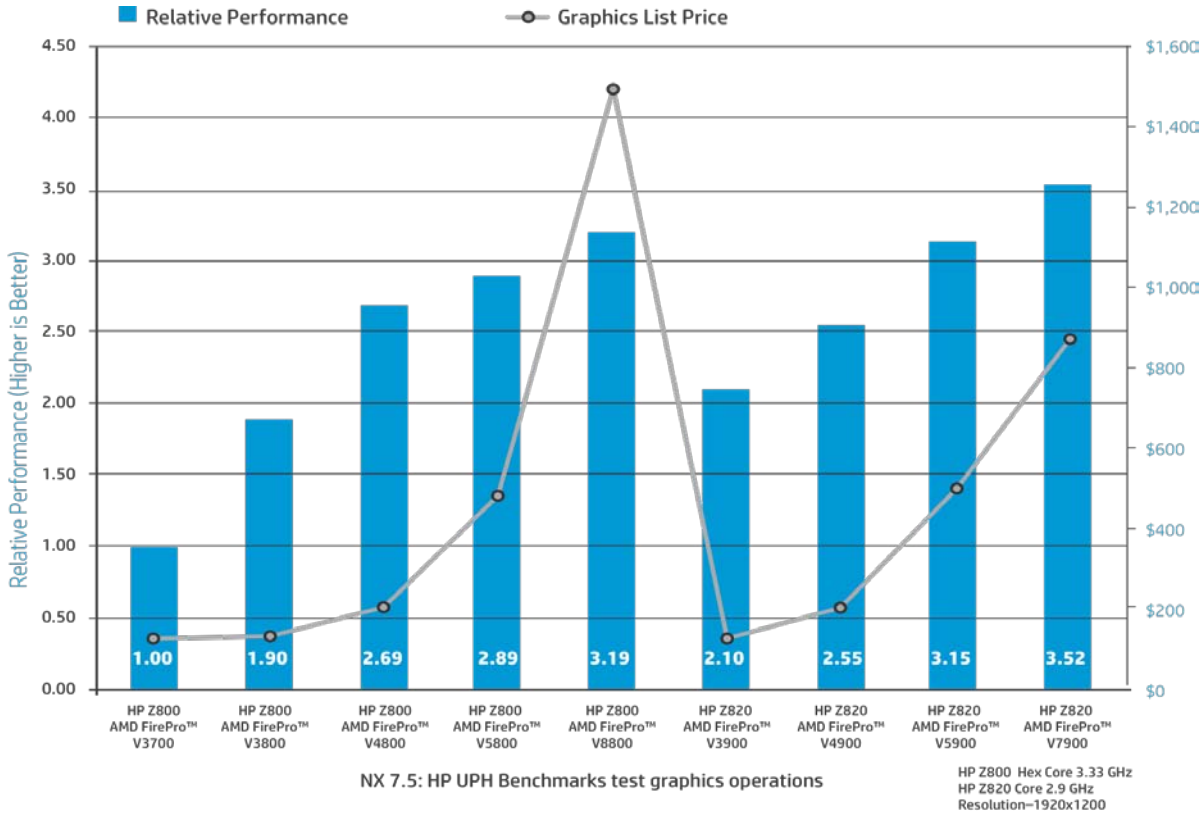
NX HyperTune improves NX graphics performance

Improvements varies by graphics device and operation measured



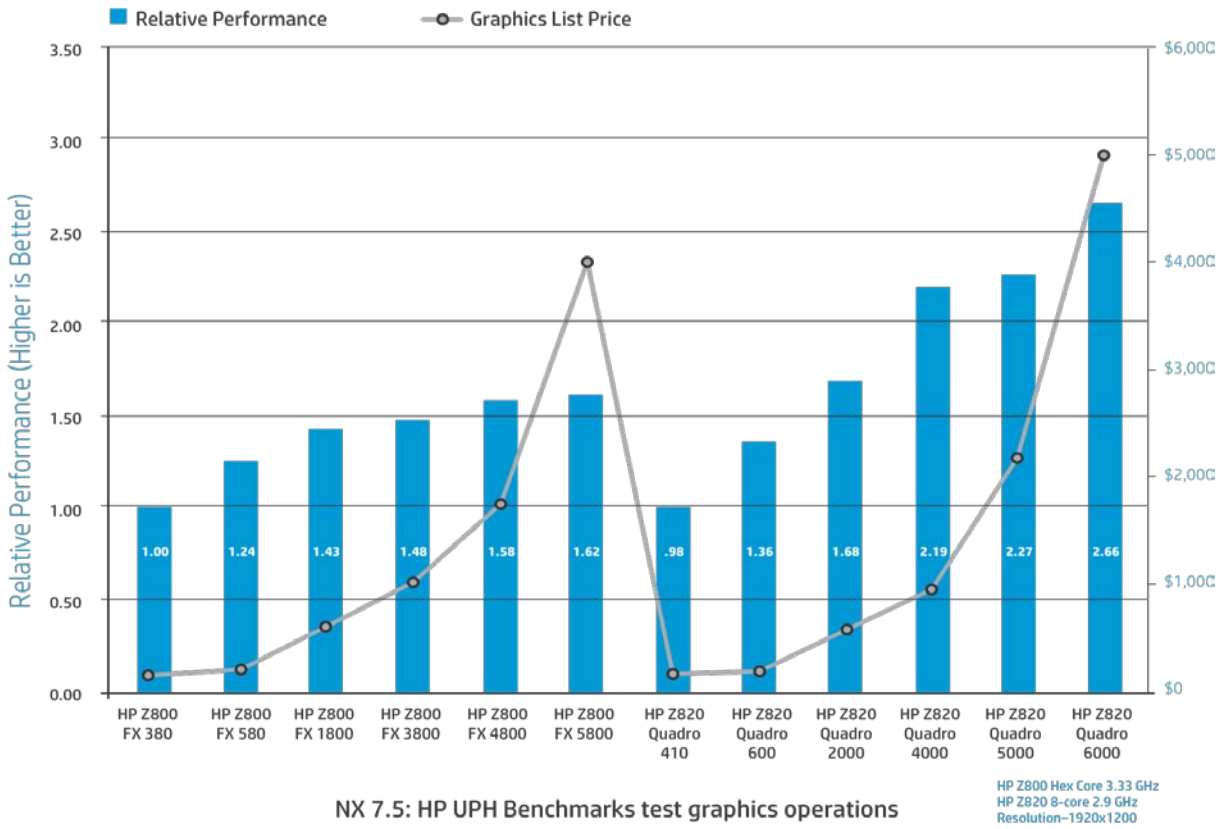
Old vs. New HP Z800/HP Z820 with AMD FirePro™ Graphics

NX graphics operations scale significantly with HP Z820 Workstation and newer AMD graphics. New models show significantly better price/performance scaling.

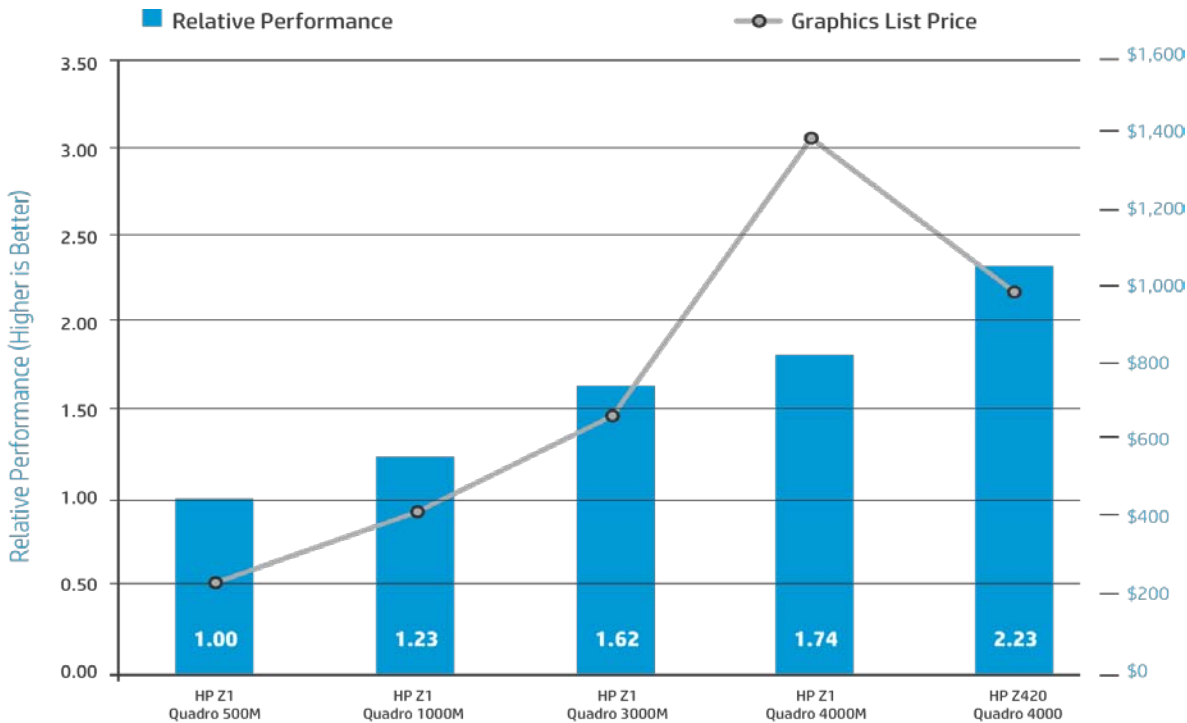


Old vs. New HP Z800/HP Z820 with NVIDIA FX/Quadro Graphics

NX graphics operations scale significantly with HP Z820 Workstation and newer NVIDIA graphics. New models show significantly better price/performance scaling.



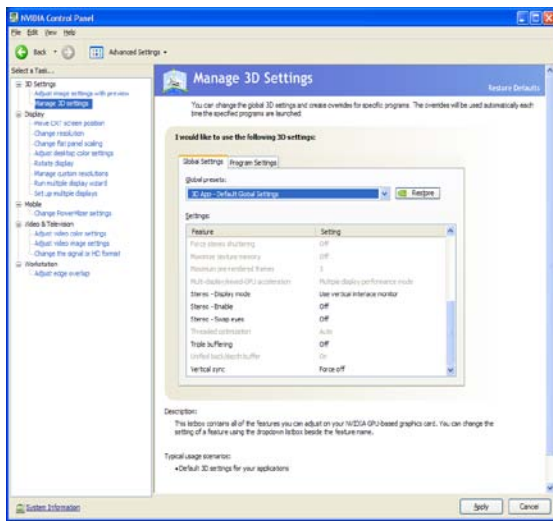
HP Z1 with Quadro 3000 provides the best HP Z1 Price/Performance



HP Z1 Quad Core 3.3 GHz;
Resolution—HP Z1: 2560 x 1440

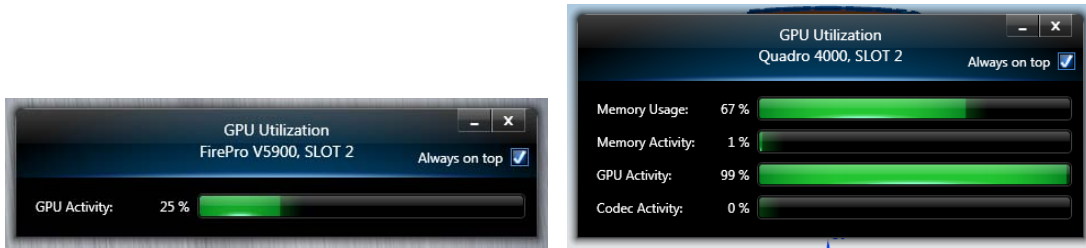
HP Z220 Quad Core 3.2 GHz;
Resolution—HP Z220: 1920 x 1200

For best NVIDIA graphics performance, set “vertical sync” to “forced off” in the NVIDIA control panel global settings. With vertical sync off, the image may appear to be slightly out of alignment or torn whenever the model is moved. The tradeoff for performance over quality could be significant for daily engineering work.



HP recommends Windows® 7.

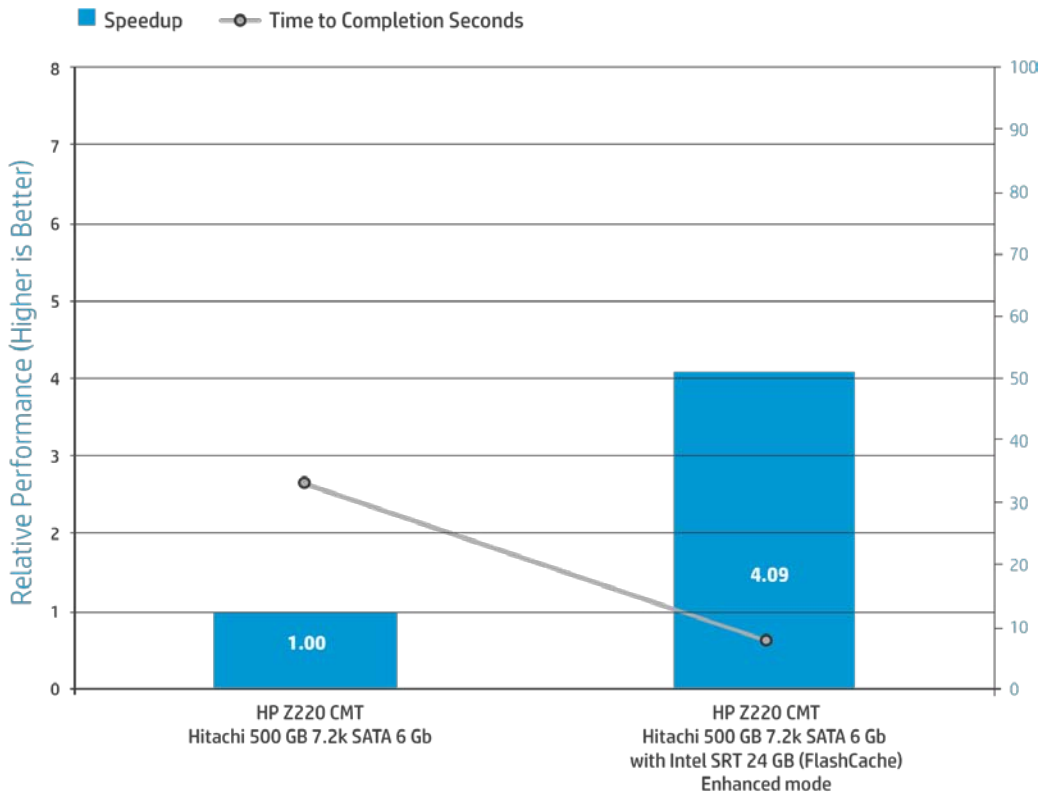
HP Performance Advisor can help users select the best graphics card using GPU Utilization. GPU Utilization allows users to monitor their GPU activity (and NVIDIA graphics memory) while running NX.



Storage

Disk Caching is available with Intel® Smart Response Technology (SRT) with HP Z220 and HP 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.

Starting NX after a reboot is over 4 times faster with Intel® Smart Response Technology (SRT)

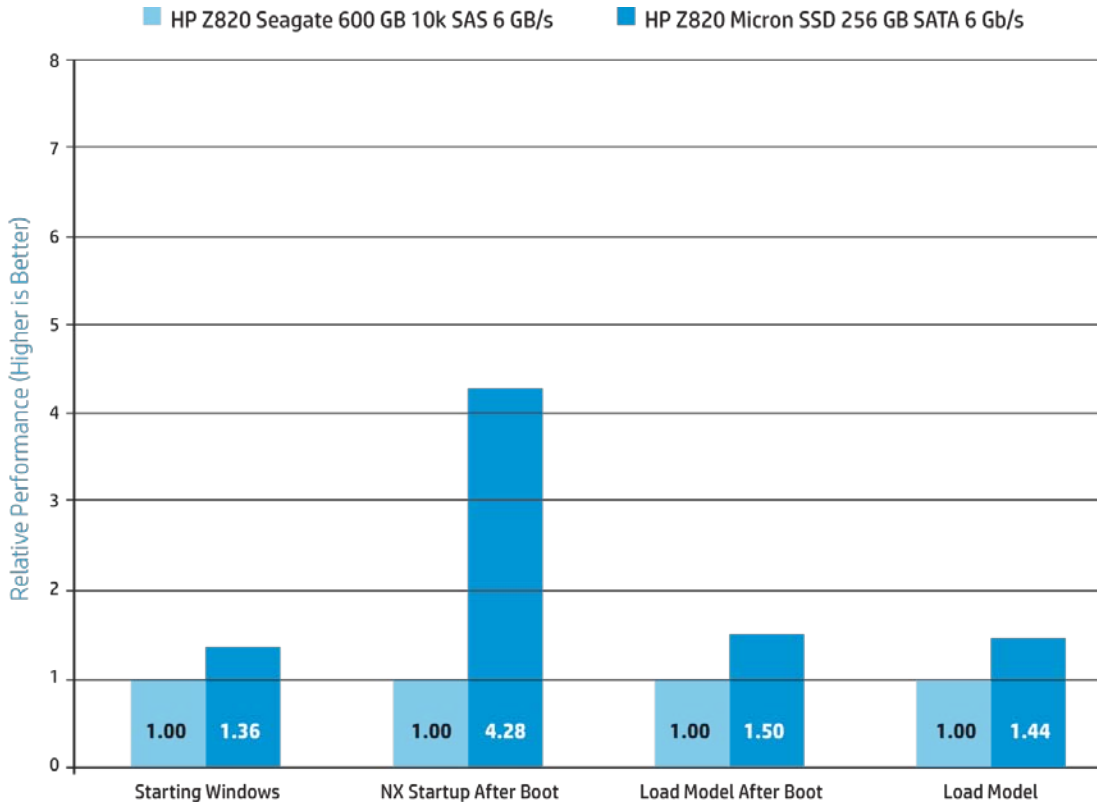


NX 7.5

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

HP recommends Windows® 7.

Startup and I/O are faster when the OS and NX are installed on a SSD drive. Starting NX after a reboot is over 4 times faster.



HP Workstation Recommendations for running NX

- NX operations are typically serial (executed on a single core/thread) but some tasks can leverage multiple cores. Mass properties, silhouettes, facet shading, Boolean operations, hidden line rendering, loading new style facet JT format data and sketcher can run multiple threads of execution and of course other programs can also run in parallel.
 - Good - Windows® 7 Professional 64-bit. HP Z1; Intel Xeon E3-1245 Quad Core 3.3 GHz (up to 3.7 max turbo) 8GB memory SSD Quadro 1000M
 - Better - Windows® 7 Professional 64-bit. HP Z220 CMT; Intel Xeon E3-1240v2 Quad Core 3.4 GHz (up to 3.8 max turbo) 8 GB memory SSD Quadro 2000 / AMD FirePro™ V5900
 - Best - Windows® 7 Professional 64-bit. HP Z420; Intel Xeon E5-1620 Quad Core 3.6 GHz (up to 3.8 max turbo) 16 GB memory SSD Quadro 4000 / AMD FirePro™ V7900
 - Mobile - Windows® 7 Professional 64-bit. HP 8570w; Intel Core i7 Quad Core 8 GB memory SSD Quadro K2000M / AMD FirePro™ M4000
- AMD or NVIDIA professional 3D graphics
- 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-bit Service Pack

HP recommends Windows® 7.

- 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
- Use dual monitors to view more content and increase productivity

Tips for running NX

• Operating System

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

• System BIOS

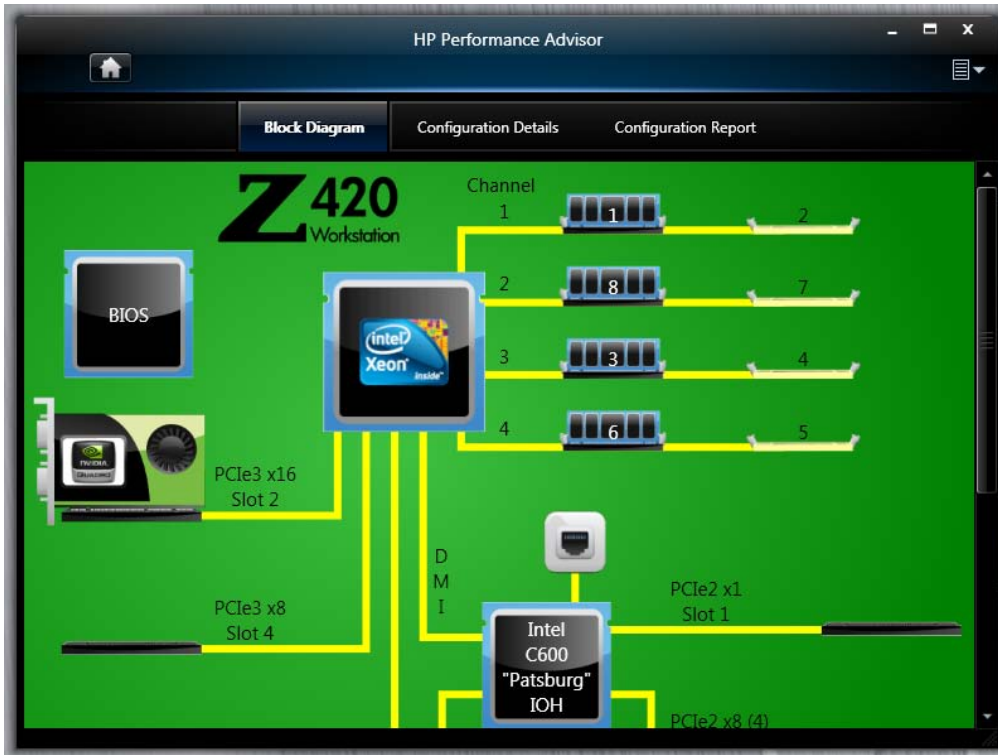
BIOS Setting	Default	Recommend
Power/OS Power Management/Runtime Power Management	Enable	Enable
Power/OS Power Management/Idle Power Savings	Extended	Normal
Power/OS Power Management/Turbo Mode	Enable	Enable
Advanced/Device Options/Hyper-Threading	Enable	Disable
Advanced/Bus Options/NUMA (HP Z620/HP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

• NVIDIA Graphics

NVIDIA Control Panel	Default	Recommend
Manage 3D settings/Vertical Sync	Use the 3d application setting	Force off

- Use HTfNX to tune NX graphics intensive operations
- Use a Siemens PLMS NX certified 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, tune NX graphics using HTfNX and help characterize NX 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® 7.



Additional resources

hp.com/go/whitepapers

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Intel® Turbo Boost technology requires a PC with a processor with Intel Turbo Boost capability. Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See www.intel.com/technology/turboboost for more information.

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