



Computing Solutions for Siemens PLM Software NX Nastran

Increase CAE productivity and focus on innovation with HP servers

High-performance computing platforms

Get increased computing power, reduced cost, enhanced quality, and greater speed in the manufacturing process when you run Siemens PLM Software's NX Nastran on HP servers and clusters. HP Integrity-based solutions provide the highest performing computing platform for computer-aided analysis of stress, vibration, structural failure/durability, heat transfer, noise/acoustics, and flutter/aeroelasticity, while HP ProLiant-based solutions provide the best price/performance combination.

Proven solver technology

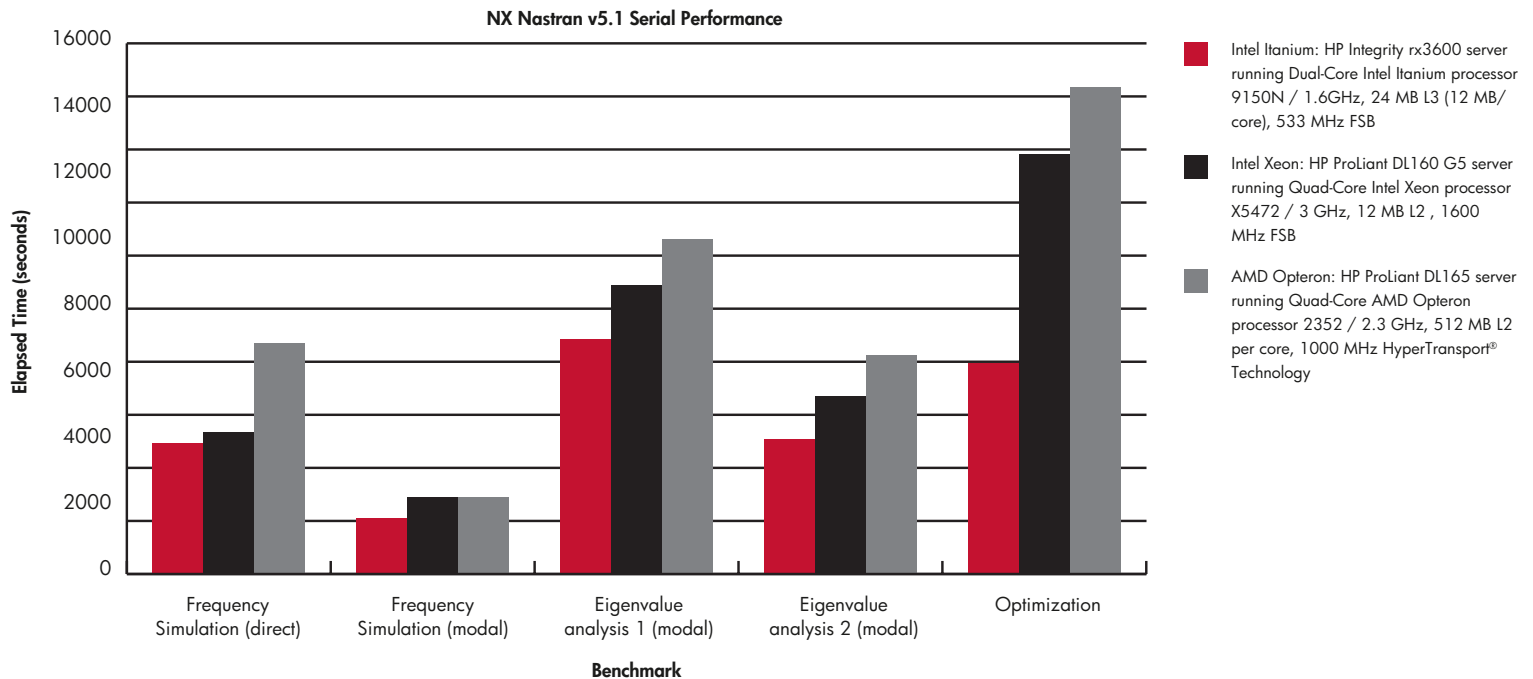
Siemens PLM Software's NX Nastran is a premium computer-aided engineering (CAE) solver. Major manufacturers worldwide rely on it to solve large and complex engineering problems, producing safe, reliable, and optimized designs within increasingly shorter design cycles. For over 30 years, Nastran has been the analysis solution of choice in major industries including aerospace, defense, automotive, shipbuilding, heavy machinery, medical, and consumer products.

Figure 1.
HP CAE cluster for structural analysis



- Choice of node
 - HP Integrity server, based on Intel® Itanium® processors
 - HP ProLiant server, based on Intel Xeon® or AMD Opteron™ processors
- Choice of cluster interconnect
 - Gigabit Ethernet
 - InfiniBand
- Choice of storage
 - Direct attached storage in RAID 0 to compute nodes
 - HP Scalable File Share (SFS) storage

Figure 2.
NX Nastran serial performance with a complex dataset running frequency simulation, eigenvalue analysis, and optimization benchmarks



Power for your projects

Cluster solutions for NX Nastran are simple and fast with HP Cluster Platforms. These systems combine the flexibility of a custom solution with the simplicity, reliability, and value of a preconfigured, factory-built product. They are the foundation of the Unified Cluster Portfolio—a comprehensive, modular package of tested and pre-configured hardware, software, and services for scalable computation. HP Cluster Platforms include:

- Broad choice of processors, cluster interconnects, and middleware
- Factory integration and testing, with final on-site installation
- Choice of packaging styles: dense or expandable modular design with up to 1024 nodes
- Uniform, worldwide specifications backed by an HP warranty and support
- Comprehensive software selection, tested and verified by HP and/or its partners
- Rapid deployment services, including optional software installation, on-site training, and implementation support

For the highest NX Nastran performance on clusters, HP recommends the HP Cluster Platform 6000 (rack mount) and 6000BL (BladeSystem), based on the Dual-Core Intel Itanium® processor. Cluster nodes consist of HP Integrity rx2660, rx3600, rx6600, and BL860c servers.

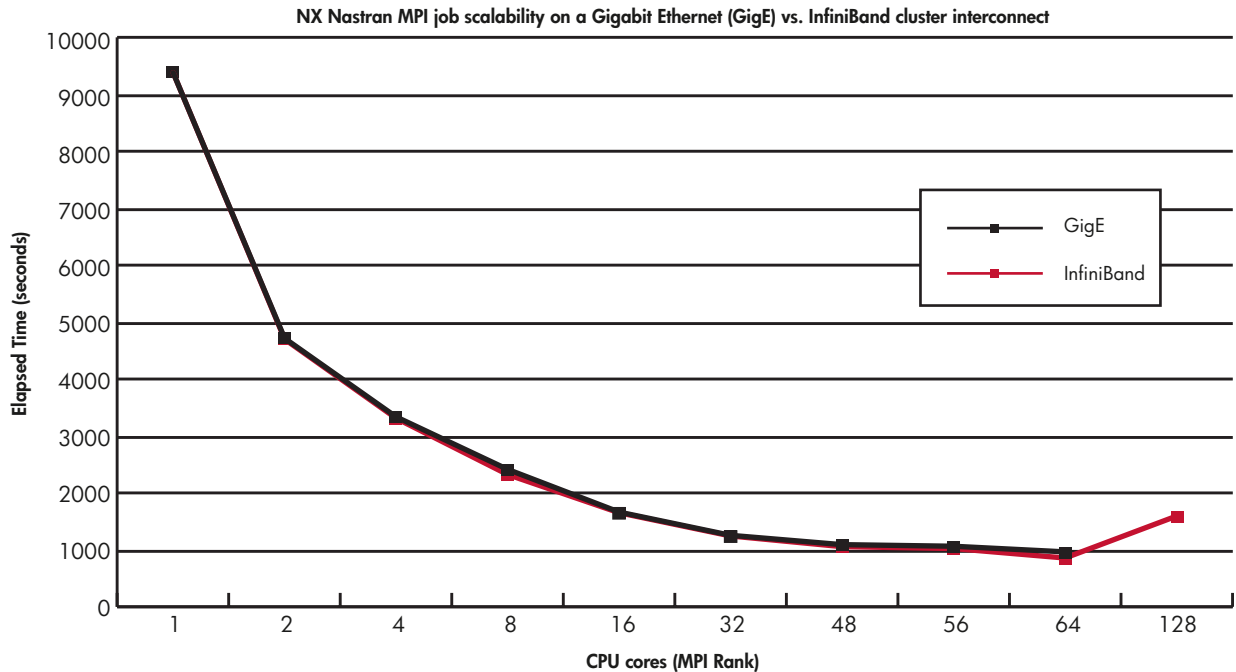
For the best NX Nastran price/performance on clusters, HP recommends the HP Cluster Platform 3000/3000BL and 4000/4000BL, which are based on the Quad-Core Intel Xeon processor and the AMD Opteron processor, respectively. For more information, visit www.hp.com/go/hpc.

NX Nastran performance benchmarks

HP benchmarks NX Nastran to determine optimal performance and optimal price/performance, enabling you to make informed decisions about your computing platform. Serial benchmarks set the performance bar for a platform. If serial processing time is faster on a system, then parallel performance is also faster.

Figure 2 shows that HP Integrity servers based on Intel Itanium processors provide the absolute fastest performance with a complex dataset running a variety of NX Nastran benchmarks. HP ProLiant servers based on Intel Xeon Processors¹, offer lower absolute performance but excellent price/performance.

Figure 3.
NX Nastran scalability on GigE vs. InfiniBand interconnect for 1–128 cores



Parallel benchmarks employ Distributed Memory Parallel (DMP) processing, which partitions and distributes tasks to different processors. Compared to a single core, Figure 3 shows a 9x speedup for 48 CPU cores in an HP CAE cluster¹. The results also indicate that DMP performance with an InfiniBand interconnect offers no significant advantage over a Gigabit Ethernet interconnect.

HP HPCD Multi-Core Optimization Program

In 2007, HP's High Performance Computing Division (HPCD) launched the Multi-Core Optimization Program to research and improve the performance of HPC applications on HP servers that use multi-core processors. NX Nastran jobs pose a high demand on server resources and are an important part of the HPCD program.

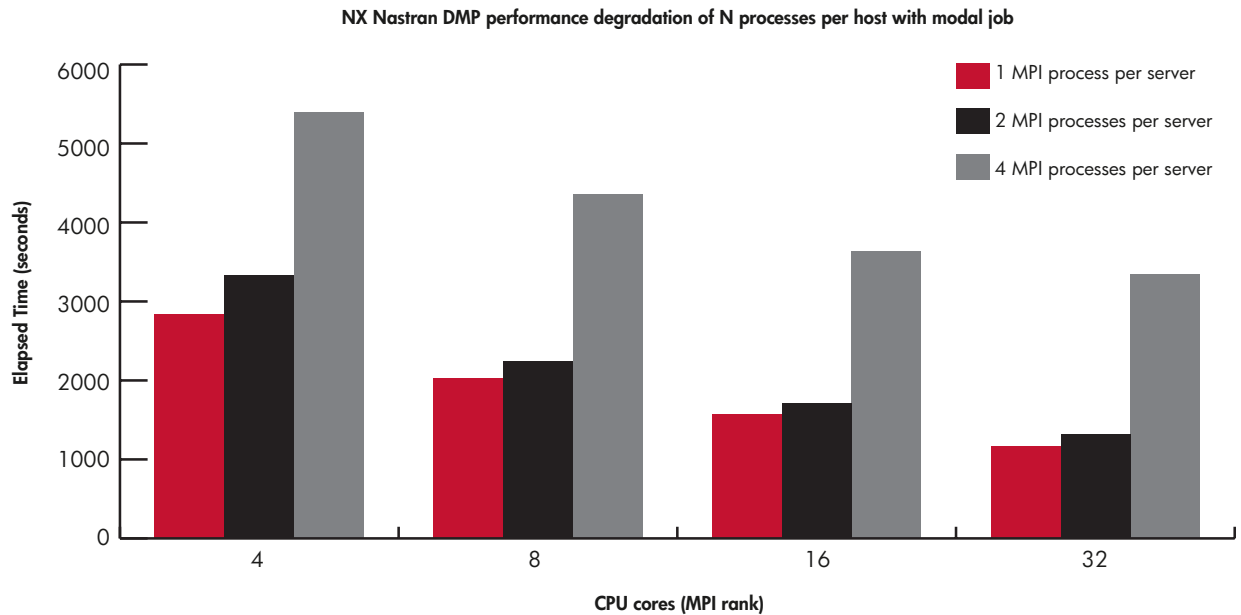
Application performance differs when using different numbers of cores per processor. The biggest performance scalability limiting of all multi-core processors is memory bandwidth per core.

To measure the performance of the NX Nastran DMP solution, HPCD ran benchmarks on quad-core processor-based servers, using one, two, and four CPU cores per server.¹ The results of this study are shown in Figure 5, which illustrates the following:

- One process per server provides the highest performance but requires more servers to run the job. (For example, 16 processes require 16 servers).
- Two processes per server results in a small performance reduction but requires only half as many servers to run the job. (For example, 16 processes require 8 servers).
- Four processes per server results in a significant reduction in job performance, but it requires one-fourth as many servers to run the job. (For example, 16 processes requires 4 servers).

For a given set of resources, it may make sense to allocate fewer processes per server to get better NX Nastran DMP performance¹.

Figure 4.
NX Nastran DMP performance using one, two, and four CPU cores per server



Boost your design simulation process

NX Nastran and HP servers and clusters for CAE provide a powerful, scalable, parallel processing solution that is easy to deploy and use. With the processing speed necessary to run complex simulations, this dynamic combination translates into innovative, safer, and more affordable products that are designed faster and at lower cost than before. And with extensive testing and characterization on HP servers, we can help you choose the best solution for your designs.

Technology for better business outcomes

(endnotes)

1 Pari Rajaram and Richard Bush, *Performance Characterization of the NX Nastran 5.1 Application on HP Multi-Core Processors*, www.hp.com/techservers/hpccn/hpccollaboration/ADCatalyst/downloads/NASTRAN_R14a.pdf

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