

NEi Nastran

64-bit Solver

Overview

NEi Nastran 64-bit is a true 64-bit application capable of accessing memory above the 4GB limit of the Windows 32-bit platform. In a 32-bit operating system such as Windows 2000, XP or Vista there is a limitation of $2^{32} = 4\text{GB}$ of memory that can be addressed. Windows reserves 2GB for the operating system leaving only 2GB for external programs (such as NEi Nastran). With the analyst's ever increasing demand for more detail and finer mesh sizes, some have reached the limit of the 32-bit platform. With the release of Windows XP and Vista x64, engineers now have a direct upgrade path to a 64-bit platform without having to switch to a Unix/Linux based operating system.

Features:

PSS Solver:

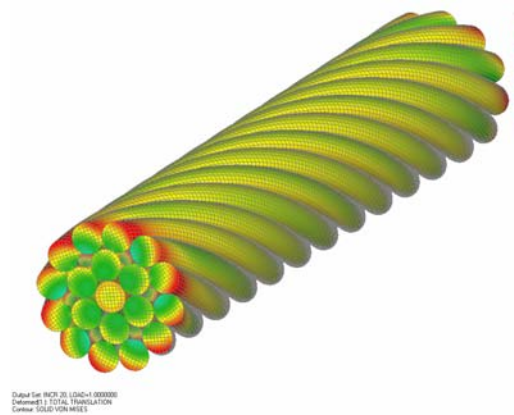
- NEi Nastran V9.2 64-bit is a true 64-bit application capable of accessing memory above 4GB
- With its ability to access larger amounts of memory, the improvements are twofold:
 - Huge models (such as a 15 million DOF linear static analysis) can be analyzed; that would normally be impossible on a 32-bit platform
 - Large models that would normally use virtual memory in NEi Nastran 32-bit, can now directly access large amounts of physical memory (if the system is configured with sufficient RAM)
- Faster solution times since physical memory is tens to hundreds of times faster than virtual memory
- New direct and extremely fast parallel solver called the Parallel Sparse Solver (PSS)

- Parallel scalability is nearly independent of the shared-memory multiprocessing architecture
- Handles non-positive definite matrixes
- Accuracy measure output
- Supported in all NEi Nastran solutions

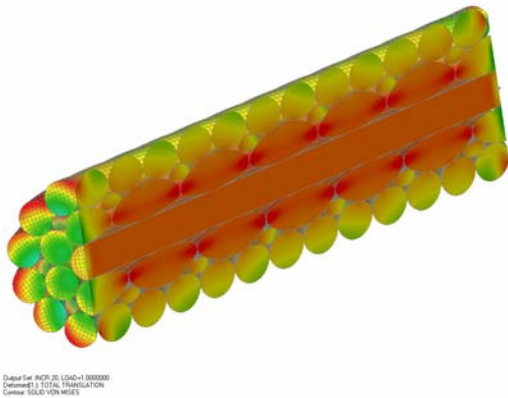
Case Studies:

Twisted Cable – Nonlinear Contact Analysis:

- A twisted cable consisting of 25 individual strands was modeled to determine the load and stress distribution within the cable. Because of the twisted geometry of the cable, there are no planes of symmetry to take advantage of (other than lengthwise symmetry). The cables contact themselves at more than 50 points within any given cross-section. Ordinarily, setting up the contact segments for a model such as this would be extremely difficult and time consuming. However, taking advantage of NEi Nastran's automatic contact capability, no manual contact setup was needed.

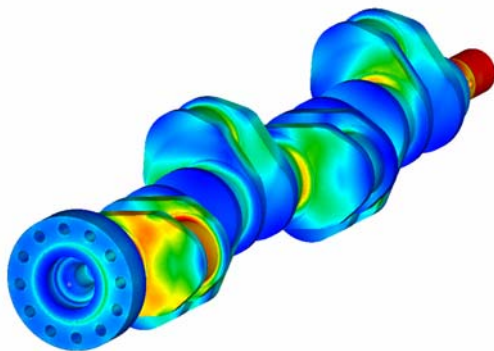


- The model was setup as a nonlinear static analysis with an enforced displacement to stretch the cable by 0.4%. The model consisted of 280,000 HEX elements for a total of 1 million degrees of freedom (DOF). The analysis was first run in NEi Nastran 32-bit and the total solution time was 22.4 hours. Then, using the same computer, the analysis was performed using NEi Nastran 64-bit with the PSS solver. The total solution time dropped dramatically to 10.1 hours.
- NEi Nastran 32-bit Solution Time: 22.4 hours
- NEi Nastran 64-bit Solution Time: 10.1 hours



Linear Static Analysis of an Automotive Crankshaft:

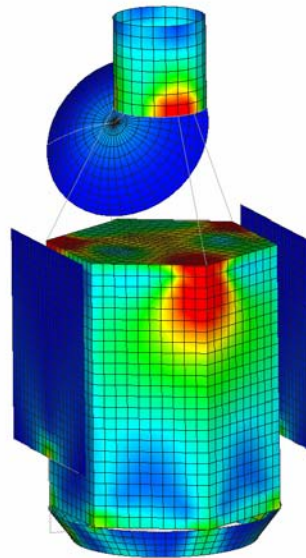
- A crankshaft consisting of 12.3 million degrees of freedom (2.6 million TET10 elements and 4.1 million nodes) was analyzed in NEi Nastran 64-bit. A model of this size would be impossible to run using NEi Nastran 32-bit.



- The total solution time was 66 minutes on an Intel Xeon 3GHz CPU with 16GB of RAM

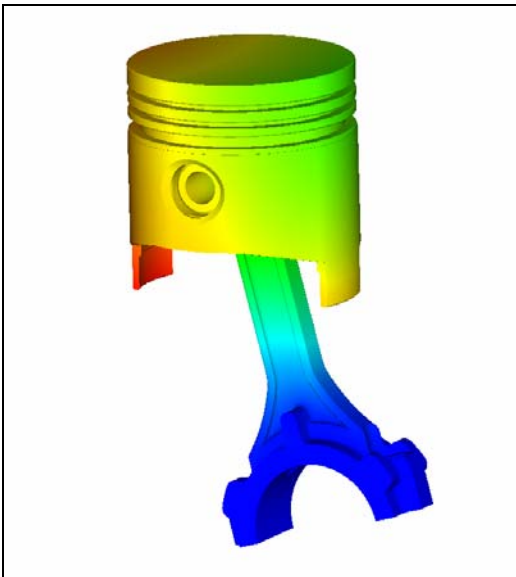
Direct Frequency Response of a Satellite:

- The following case study was performed to show that NEi Nastran 64-bit will also speed up medium and small sized direct frequency response models by taking advantage of the PSS solver. The PSS solver is able to take advantage of multiple CPUs or cores whereas the VSS solver can only take advantage of a single CPU/core. The satellite structure has 4,284 elements and consists mostly of plate and beam elements. The model consists of 26,382 DOF and was setup to solve for 100 frequency steps.
- NEi Nastran 32-bit Solution Time: 12.1 minutes (VSS solver)
- NEi Nastran 64-bit Solution Time: 6.2 minutes (PSS solver)
- By increasing the mesh density of the model (for a total of 358,000 DOF) and running the same 100 frequency steps, the power of NEi Nastran 64-bit is revealed.
- NEi Nastran 32-bit Solution Time: 17.6 hours (VSS solver)
- NEi Nastran 64-bit Solution Time: 2.1 hours (PSS solver). Performance improvement of over 800%



Normal Modes Analysis of a Piston Assembly:

- A normal modes analysis of a piston assembly consisting of 2.6 million degrees of freedom was analyzed. The first 75 modes were extracted, and the Lanczos eigensolver was used in both NEi Nastran 32-bit and NEi Nastran 64-bit. NEi Nastran 64-bit was able to perform a direct Lanczos solution, whereas the 32-bit solver had to revert to the iterative Lanczos solver (which requires less memory). The solution time was over twice as fast using NEi Nastran 64-bit.
- NEi Nastran 32-bit Solution Time: 13 hours
- NEi Nastran 64-bit Solution Time: 5.8 hours



- Hard Drive(s): Primary standalone HD (for operating system). 2-4 HDs in RAID0 for temporary file storage. Hard Drives can either be SATA or SAS.
- All the case studies mentioned above were run with the following system:
 - Operating System: Windows XP x64 (64-bit)
 - CPU: Intel Xeon 5160 3.0 GHz (dual-core)
 - Memory: 16 GB
 - Hard Disk: 3 SATA 250 GB (7,200 RPM) in RAID0

Computer Recommendations:

Twisted Cable – Nonlinear Contact Analysis:

- To get the most out of NEi Nastran 64-bit, NEi Software, Inc. recommends the following system specifications:
 - Operating System: Windows XP x64 (64-bit)
 - CPU: Intel Xeon processor (dual-core or quad-core) or AMD Opteron (dual-core)
 - RAM: 4GB – 16GB depending upon budget
 - Video card: 64-bit Compatible Video card with 256MB of memory (Example: Nvidia Quadro)

NEi Software, Inc. is aggressively focused on commitment to the customer. Detailed documentation, customized on-site training, and comprehensive technical support ensures that you will see immediate return on your investment.

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