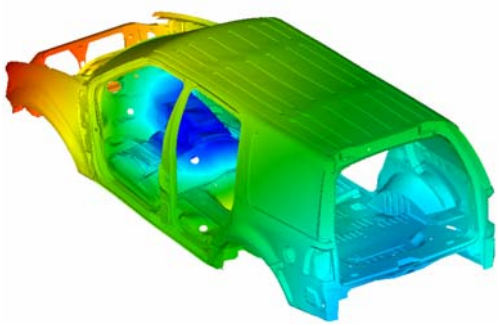
# NEiNastran

## Solvers

### Overview

NEiNastran uses the latest in solver technology providing fast results for the largest and most complex FEA models. Three linear solvers (PCGLSS, VSS, and VIS) and two eigensolvers (LANCZOS and SUBSPACE) are included. The PCGLSS (Preconditioned Conjugate Gradient Linear System Solver) is an advanced iterative solver licensed from CA&SI and used in many other leading FEA products. The VSS (Vector Sparse Solver) and (Vector Iterative Solver) are based on NASA developed technology and have been enhanced to provide better performance and accuracy.



*SUV Modal Analysis: 1,230,000 DOF. Total Solution time: 30.5 min. (20 modes) and 66.6 min. (100 modes). Run on a dual Intel Xeon + 3.2GHz CPU with 3GB of RAM.*

### Capabilities:

**PCGLSS Solver:**

- Extremely fast iterative solver capable of handling models over 7 million degrees of freedom on a Pentium PC
- Multi-mode solver using either an iterative (Preconditioned Conjugate Gradient) or direct solution technique
- The iterative solver mode requires less physical memory and disk storage than direct solver mode
- Automatically selects the most efficient mode of operation based on available resources
- Advanced preconditioner is optimized for all element types
- Available in all linear and nonlinear static solutions
- Supports multiple processors (parallel processing)
- Especially effective for large models comprised mainly of parabolic tetrahedron elements (CTETRA)
- User controllable performance and accuracy
- Accuracy measure output
- Supported in all NEiNastran solutions except direct transient and direct frequency response
- Windows, Linux, and Unix versions

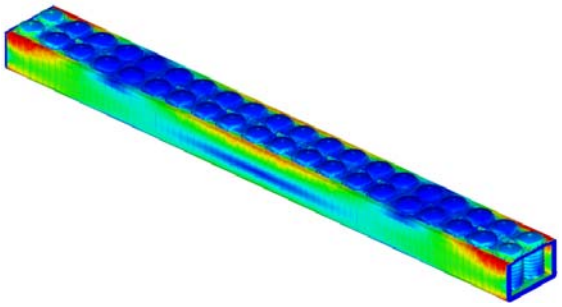
**PSS Solver (x64 Windows):**

- Extremely fast parallel direct solver capable of handling models over 15 million degrees of freedom
- Increased efficiency and performance using supernode techniques with update and pipelining parallelism
- Supernode pivoting ensures numerical stability and scalability during factorization
- Parallel scalability is nearly independent of the shared-memory multiprocessing architecture (performance increases of seven using eight processors have been observed)
- Handles non-positive definite matrixes
- Accuracy measure output
- Supported in all NEiNastran solutions

**VSS Solver:**

- Based on NASA Vector Sparse Solver technology
- Handles a wide range of model sizes
- Uses advanced reordering methods automatically selecting the most efficient one
- Handles non-positive definite and ill-conditioned matrixes
- Accuracy measure output

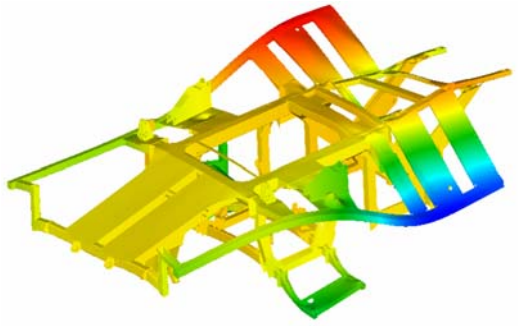
- Supported in all NEiNastran solutions
- Windows, Linux, and Unix versions



*Cargo Ship Linear Static Analysis: 10,963,000 DOF. Total Solution time: 3.58 hr. Run on an Intel Itanium 2 1.0 Ghz CPU with 6GB of RAM in 64-bit NEi Nastran for Linux.*

**VIS Solver:**

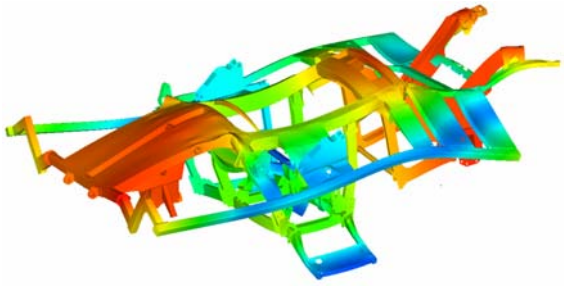
- Sparse iterative (Preconditioned Conjugate Gradient) solver
- Extremely robust
- Handles a wide range of model sizes
- Handles non-positive definite, ill-conditioned, and singular matrixes
- Accuracy measure output
- Supported in all NEiNastran solutions
- Windows, Linux, and Unix versions



*Modal Frequency Response Analysis of an Automotive Frame: 3,163,596 DOF. Total Solution time: 3.2 hr. (75 modes) and 7.5 hr. (150 modes). Run on a dual Intel Xeon + 3.2 GHz CPU with 3GB of RAM.*

**Lanczos Eigensolver:**

- Block Lanczos eigensolver capable of handling models over 4 million degrees of freedom on a Pentium PC
- Multi-mode eigensolver using either an iterative or direct solution technique
- Automatically selects the most efficient mode of operation based on available resources
- Advanced preconditioner is optimized for all element types
- Available in all modal response solutions including complex eigenvalue analysis
- Supports multiple processors (parallel processing)
- Iterative mode is especially effective for large models comprised mainly of parabolic tetrahedron elements (CTETRA)
- User controllable performance and accuracy
- Accuracy measure output (orthogonality loss and error measure)
- Windows, Linux, and Unix versions



*Modal Transient Response Analysis of an Automotive Frame: 3,163,596 DOF. Total Solution time: 5.7 hr. (75 modes) and 19.3 hr. (150 modes). Run on a dual Intel Xeon + 2.66 GHz CPU with 3GB of RAM.*

**Subspace Eigensolver:**

- Subspace eigensolver based on VSS
- Handles a wide range of model sizes
- Available in all modal response solutions including complex eigenvalue analysis
- User controllable performance and accuracy
- Accuracy measure output (orthogonality loss and error measure)
- Windows, Linux, and Unix versions

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**NEiNastran** ***for Windows***
**From Noran Engineering, Inc.**