MD Nastran 2011
Welcome to MD Nastran 2011

MSC Software is pleased to introduce you to the exciting new technologies in MD Nastran 2011 and MSC Nastran 2011. This release delivers significant performance gains through efficient numerical methods and High Performance Computing (HPC) methods. In addition, new features are also introduced for the disciplines of optimization, aeroelasticity and rotordynamics.

High Performance Computing
• Improved Shared Memory Parallel (SMP) scalability providing better performance
• Enhancements to Automated Component Modal Synthesis (ACMS) provide faster solutions in frequency domain

Optimization
• Flexibility to include external optimizers with OpenMDO enables users to use methods of their choice

Aeroelasticity
• Enhancements in splining capability result in improved performance in simulation of large models

Rotordynamics
• Improved support of ROMAC’s (University of Virginia Rotating Machinery and Controls Laboratory) ground based rotodynamic solution to help you solve broader class of problems

Enhancements to the current Nastran releases are designed to improve user efficiency, provide superior performance and speed improvements, and also provide improved integration flexibility with partner solutions.

Thank you very much for your continued support of MD Nastran and MSC Nastran.
The MSC Software Product team
High Performance Computing

Automated Component Modal Synthesis (ACMS)

Enhancements are made to detect and exploit modeling practices which lead to a structural damping specification resulting in a low rank \([K4]\) matrix, leading to faster reduction to modal coordinates with no loss of accuracy. For large frequency ranges that produce a significant modal dimension, Nastran’s Fast Frequency Response Algorithm (FASTFR) now provides significant increase in the speed of modal frequency response analysis.

The interaction between enforced motion DOF specified via SPCD keyword and frequency dependent elements is improved to provide faster run times. With the enhancements made to ACMS, users can see performance improvements ranging from 25% to 500% based on the analysis scenario.

Enhanced Math Kernel Library

Nastran employs a highly tuned set of mathematical kernels that provide high performance for computationally intensive tasks, especially tuned for Nastran. The current release of Nastran takes greater advantage of these kernels, resulting in faster computations and improved performance. Additionally, the multi-threaded Shared Memory Parallel (SMP) scalability has also been improved.

With these enhancements, computational efficiency improvement of up to 100% has been achieved for the following tasks:

- Lanczos eigen solution
- Matrix factorization for symmetric real and complex systems
- Mixed mode (systems with real and complex matrices) matrix multiplications

Automated SMEM Allocation

Nastran employs a disk resident database consisting of blocks residing in database partitions to hold temporary information generated during an analysis. The Scratch Memory (SMEM) feature allocates blocks for the SCRATCH database partition in main memory instead of on the disk to reduce the amount of I/O, hence reducing the wall time associated with an analysis.

The amount of memory used for SMEM will now be computed automatically resulting in significant reduction in the amount of disk I/O for large models and improvement in run times. This automation, available for SOL 101 and SOL 400, also relieves users and system administrators from having to adjust the memory on different systems.
Inertia relief is a technique to simulate self-equilibrating quasi-dynamic loading in static analyses. It is now available in MD Nastran for SOL 400 with nonlinear material and contact analysis, under the restriction of small displacement/rotations.

External Optimization via OpenMDO™
Nastran products from MSC provide users with two proprietary general purpose optimizers: MSCADS and IPOPT. In MD Nastran 2011, a new Simulation Component Architecture (SCA) plug-in, referred as OpenMDO™, is introduced to allow users access to other commercially available optimization codes or user-developed software. With the ability to use external optimizers, users and researchers gain flexibility to take advantage of the optimizer of their choice.
Aeroelasticity

The CFD model for an aeroelastic analysis often consists of thousands and even more than a million aerodynamic grid points. This presents a challenge to the splining methods that were originally developed to handle smaller number grid points. In order to handle larger model with greater efficiency, new capabilities have been introduced in this release, which include:

- Implementation of an automated partitioning concept that breaks a single spline (SPLINE4) into a number of smaller splines.
- Ability to restrict relaxation to the displacement instance of the spline while not applying it to the force instance

These enhancements provide the much desired speed improvements for larger models and provide users with flexibility in the use of relaxation to displacements.

Rotordynamics

MD Nastran 2011 allows users to provide their own SCA-object to calculate properties of CBUSH2D elements. It is also possible to use the ROMAC (University of Virginia Rotating Machinery and Controls Laboratory) THPAD routine to calculate the properties of tilting pad journal bearing.
MD and MSC Nastran 2011 – Essential New Real World Behaviors & Breakthrough Performance

With your continued support, MSC Software remains committed to the persistent enhancement of our core linear, nonlinear and multi-disciplinary technologies in MD Nastran. The MD Nastran 2010 release demonstrates that commitment on multiple levels.

Customer Driven Features
We value customer feedback. MSC commits itself to meeting customer needs and requirements. Many of the new capabilities and enhancements in this release are a direct result of customer-driven efforts. This includes capability and solver enhancements in the areas of performance, contact, materials, usability, and multiphysics.

Leading Edge Innovation
We push the envelope. MSC continues to bring exciting new technologies to CAE world. As evident in this release of MD Nastran, advanced solver technologies and new material model capabilities expand the range of problems that can be solved by analysts with greater accuracy.

High Performance Computing
MSC is focused on bringing you the latest High Performance Computing (HPC) technologies to dramatically increase your productivity. The numerous performance improvements in the solvers and new parallel processing methods available in this release will help you reduce your product design cycle and improve your time to market.

Thank You
MSC Software appreciates the confidence and trust that you, our customers, have placed in our products all these years. This is also demonstrated by the customizations of our solutions and level of integration of our products into your CAE processes. You will continue to see more technologies and capabilities in our products and we, as always, are pleased to have you as a customer and partner.