Dramatic Productivity Improvements for Large Dynamic Analysis Problems

OVERVIEW
SimOffice™ is a stand-alone environment in which engineers can build, test, review, and improve their designs. SimOffice gives product development engineers the shared technologies they need to assess product performance and accelerate innovation.

The MSC.Nastran™ product family is modular, enabling you to analyze products ranging from simple components to complex structures and systems. This also enables you to start simply and to grow your analysis capabilities as your Virtual Product Development (VPD) needs expand. As part of your VPD process, you can use MSC.Nastran to assess many functional aspects of your products, such as the structural response (displacement, strain, stress, vibration, and temperature) due to its material properties and the loads and boundary conditions that are applied to it during operation.

MSC.Nastran™ ACMS
The MSC.Nastran™ ACMS (Automated Component Mode Synthesis) product module enables engineers to perform very large-scale dynamic analysis in a fraction of the time required by standard MSC.Nastran to solve dynamics and acoustic problems. MSC.Nastran ACMS automatically divides a single MSC.Nastran model into a number of smaller problems, or domains, via domain decomposition.

For large flexible structures, MSC.Nastran ACMS can significantly reduce time to solution. For example, a normal modes analysis of an automotive model (shown below), taking nearly 26 hours to complete using standard SOL 111, finished in less than four hours with MSC.Nastran ACMS.

Computing resource requirements are drastically reduced when using MSC.Nastran ACMS as compared to standard MSC.Nastran solution sequence execution. Overall throughput increase will improve productivity throughout your entire enterprise.

PRODUCT LINE
SimOffice™
Product Family
MSC.Nastran™

CAPABILITIES
- Two Partitioning Methods Available (Varies by Solution Type):
  - Geometric Domain (SOLs 103, 111, 112, 200).
  - Frequency Domain (SOLs 111, 200).
  - Matrix or DOF Domain – Now Default Method (SOLs 103, 111, 200).
  - Geometric Combined with Frequency Domain (SOLs 111, 200).
  - Matrix Combined with Frequency Domain (SOL 200).
- Accessible from a Variety of Analysis Types Including:
  - MSC.Nastran Dynamics (SOLs 103, 111,112).
  - MSC.Nastran Acoustics (SOL 108).
  - MSC.Nastran Design Optimization (SOL 200).
  - MSC.Nastran Adams Integration for Adams/Flex.
  - External Superelements.
- Available in Combination with the MSC.Nastran DMP (Distributed Memory Parallel) Product Module for Additional Solution Performance.

BENEFITS
- Partition Large, Complex Structural Models into Multiple Components Automatically for Increased Productivity.
- Fast, Proven Reduction Methods that Deliver Accurate and Reliable Results for Full-Scale, Detailed Simulation Problems.
- Multiple Decomposition Methods Available to Provide Alternative Solution Methods to Solve Problems that Exhibit Convergence Issues.
- Residual Vectors Employed for Improved Accuracy.
- Improved Solution Performance and Quality for Problems with a Large Number of DOFs, Complex Model Geometries, Connectivity, and Characteristics.
- Ability to Perform More Design Iterations in Less Time.
- Reduced Computational Resource Requirements per Simulation:
  - Less Disk Capacity.
  - Less Memory.
  - Less I/O Bandwidth.
  - Less CPU Time.
- Additional Productivity Gains for Both the Analyst and the Enterprise Available with MSC.Nastran DMP for More Efficient Use of Computing Resources.
ACMS for Fully Assembled Structural Dynamics
Dynamic analysis for completely assembled structures, such as fully trimmed automotive models is time consuming and resource intensive. With MSC.Nastran ACMS, both time and resource requirements are dramatically reduced thus boosting productivity.

Another benefit of improved performance allows for further refinement of the structural model and for more detailed analysis or investigation of more designs. For example, this means that an extended range of frequencies can be investigated to determine additional or hidden modes that may significantly impact the structure. Thus, MSC.Nastran ACMS provides improved quantity and quality of analysis available to the engineer.

Get Analysis Results Faster
MSC.Nastran ACMS automatically divides the analysis model into several smaller components via domain decomposition. These components are then used to perform a multilevel component mode synthesis (CMS).

For large flexible structures, cost savings can be found in three areas:
- The mode reduction process automatically removes degrees of freedom that do not participate in the frequency range of interest; therefore the size of the analysis is significantly reduced and the problem is more easily solved in less time.
- ACMS solves hundreds of small problems instead of one large problem, which are better suited to the low-cost cache-based RISC processors available today.
- The cost of large disk I/O associated with traditional modal dynamic analyses is considerably reduced.

Reduced System Requirements Allow For Better Machine Utilization, Greater Overall Throughput.
Traditional modal dynamic analysis in MSC.Nastran requires significant computing resources. Large amounts of memory, temporary disk capacity, and disk I/O bandwidth required by these jobs usually form system bottlenecks, forcing jobs to queue up and wait for available resources.

MSC.Nastran ACMS, which features automatic domain decomposition and modal reduction, performs the analysis in small pieces rather than all at once. As a result, memory, disk, and I/O bandwidth requirements are reduced, sometimes drastically.

Jobs that consume fewer resources are able to run simultaneously with other jobs, thereby boosting the throughput, and by extension the productivity, of the entire user community.

EXTEND YOUR INVESTMENT
MSC.Software recommends MSC.Patran™ or MSC.SOFY™ for an integrated modeling and analysis environment.

MSC.MasterKey™ delivers a flexible, token-based licensing system that provides access to the breadth and depth of MSC.Software’s world-class Virtual Product Development software portfolio, allowing you to use whatever simulation tools you want, whenever you need them – maximizing your productivity and reducing cost.

MAXIMIZE YOUR RETURN ON INVESTMENT
MSC.Software provides the most comprehensive training, support, and professional services with offices worldwide to provide local and centralized support. Investing in MSC.Software gives you access to extensive client support through comprehensive documentation, direct technical expertise, and customized onsite and offsite training classes taught by experienced engineers.