



MSC Software SOLUTIONS

Simulating Reality, Delivering Certainty™





Our products and services are used by 900 of the top 1000 manufacturers in the world, including:

- Aerospace & Defense
- Automotive & Transportation
- Agricultural Equipment
- Heavy Machinery
- Medical Devices
- Oil and Gas
- Nuclear
- Renewable Energy
- Consumer Products
- Packaging
- Electronics

About MSC Software

Simulating Reality, Delivering Certainty

MSC Software is one of the ten original software companies and a global leader in helping product manufacturers to advance their engineering methods with simulation software and services. As a trusted partner, MSC Software helps companies improve quality, save time, and reduce costs associated with design and test of manufactured products. Academic institutions, researchers, and students employ MSC's technology to expand individual knowledge as well as expand the horizon of simulation.

MSC Software's engineering simulation technology is used by leading manufacturers for linear and nonlinear finite element analysis (FEA), advanced material modeling, acoustics, fluid-structure interaction (FSI), multi-physics, optimization, fatigue and durability, multi-body dynamics, controls, and manufacturing process simulation. The company's products accurately and reliably predict how products will behave in the real world to help engineers design more innovative products - quickly and cost effectively.

Company Profile

MSC Software Corporation was formed in 1963 and was awarded the original contract from NASA to commercialize the finite element analysis (FEA) software known as NASTRAN (NASA Structural Analysis). MSC pioneered many of the technologies that are now relied upon by industry to analyze and predict stress and strain, vibration & dynamics, acoustics, and thermal analysis in our flagship product, MSC Nastran.

Over our rich history, MSC has developed or acquired many other well-known CAE applications including Patran, Adams, Marc, Dytran, Fatigue, SimXpert, SimDesigner, SimManager, Easy5, Sinda, Actran, Digimat, and Simufact. We are committed to the continued development of new CAE technology that integrates disciplines and technologies from standalone CAE tools into unified multi-discipline solvers and user environments. These "next generation" products enable engineers to improve the reliability and accuracy of their virtual prototypes by including multi-physics and multi-discipline interactions.

MSC is also the CAE industry's leader in extending simulation to the engineering enterprise with Engineering Lifecycle Management solutions. Our customers recognize the need to scale the benefits of virtual prototyping and testing from pockets of experts to mainstream engineering and product development. MSC offers a Materials Data and Process Management platform as well as the only Simulation Data and Process Management solution in the world that has been successfully deployed in industries including automotive, aerospace, shipbuilding, electronics, and more. MSC Software employs 1,100 professionals in 20 countries.

Message from the CEO

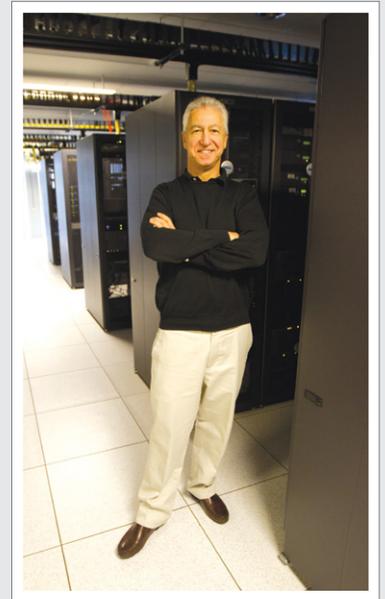
Dominic Gallelo

For half a century, MSC has been delivering certainty to our customers. By simulating the reality of complex manufactured systems through our software, we deliver certainty... so our users can delight their customers with great products, and certainty in business results by reducing time to bring the right products to market, reduce physical testing and warranty claims long after product design is over.

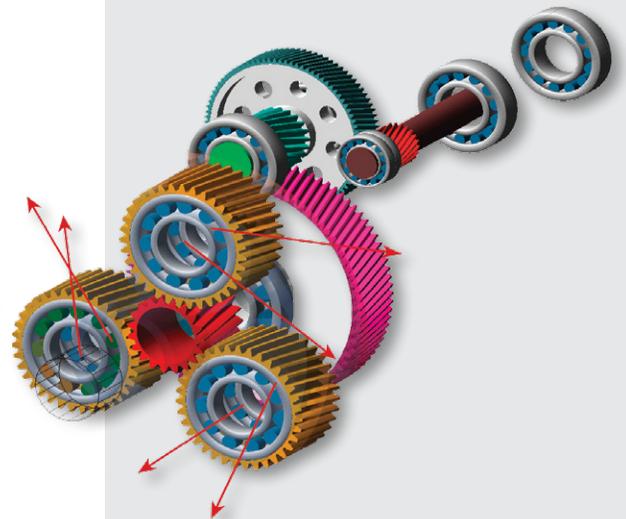
We do this by pushing the edge of physics and the latest computing technology to simulate real world behaviors. These principles that MSC was founded upon continue as our guiding light. We help to make cars safer and more efficient, airplanes more aerodynamic and more comfortable for passengers, ships stronger and able to travel longer distances, machinery run more efficiently and with less maintenance, and medical devices more effective to help us to live longer.

Our customers are faced with difficult questions every day; can I reduce the time it takes to develop? Will it work? Will it be innovative? Will it be safe? Will it be fuel efficient? Will it provide a new standard of passenger comfort? Will it last longer? Will it beat my competition? By knowing exactly how products will behave before they are built, manufacturers can deliver better products faster and with more reliability.

The first adopter of simulation technology was the aerospace industry. The challenge of safe flight from the very first test drove an industry to push the state of the art in simulation technology, long before any other industry. MSC became a trusted partner with the world's leading aerospace companies, delivering certainty every step of the way. In 2003, NASA put a value to society in excess of 10 billion dollars on the NASTRAN structural analysis simulation software delivered by MSC. Eventually, this kind of simulation technology became broadly adopted in nearly every industry from automotive to machinery, energy, infrastructure, consumer products and medical devices. Virtually every major OEM and manufacturer in the world is an MSC customer.

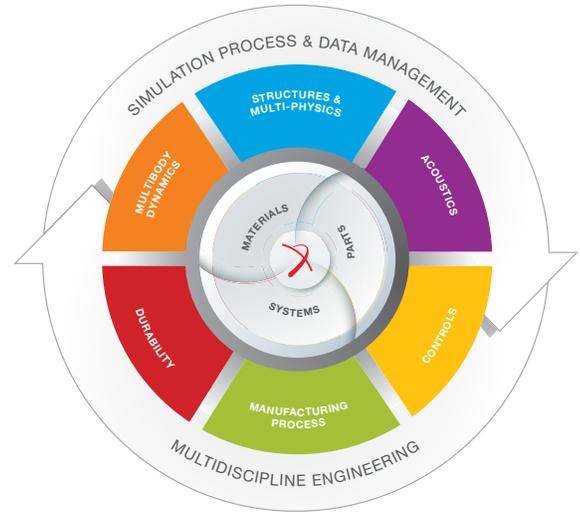


Dominic Gallelo
President & CEO
MSC Software



Solution Portfolio

MSC Software makes products that enable engineers to validate and optimize their designs using virtual prototypes. Customers in almost every part of manufacturing use our software to complement, and in some cases even replace the physical prototype “build and test” process that has traditionally been used in product design.



MSC Products

Simulating Reality, Delivering Certainty

MSC Apex

Modeler & Structures

Modeler
Structures

Integrated Solutions

Adams

Multibody Dynamics
Simulation Solution

Actran

Powerful Acoustic
Simulation Software

Digmat

The Nonlinear Multi-scale
Material & Structure
Modeling Platform

Easy5

Advanced Controls
& Systems Simulation

Marc

Advanced Nonlinear
Simulation Solution

Simufact

Manufacturing Process
Simulation

SimXpert

Fully-Integrated
Multidiscipline Simulation
Solution

Solver Solutions

MSC Nastran

Multidisciplinary
Structural Analysis

Dytran

Explicit Dynamics & Fluid
Structure Interaction

MSC Fatigue

FE-Based Durability
Solution

Sinda

Advanced Thermal
Simulation Solution

Mid-Sized Business Solutions

MSC Nastran Desktop

Multidiscipline Simulation
for the Desktop

SimDesigner

CAD-Embedded
Multidiscipline Simulation

Modeling Solutions

Patran

Complete FEA
Modeling Solution

SimXpert

Fully-Integrated
Multidiscipline Simulation
Solution

Engineering Lifecycle Management

SimManager

Simulation Process
& Data Management

MaterialCenter

Materials Lifecycle
Management





Unlock the World of Engineering Simulation

Overview

MSC One is an expanded products token system that lets you take advantage of the breadth and depth of MSC Software's simulation portfolio within a flexible token based licensing system*.

Offered on an annual subscription basis, MSC One provides efficient implementation of your investment in product development with access to a suite of multidisciplinary engineering software tools.

Key aspects of MSC One include:

- Substantially all current and future products will be available in the MSC One*.
- As a subscription product, MSC One capacity can be expanded or contracted based on current and future project needs.
- Access to more connected physics and disciplines allows better prediction of part and system behavior.
- Ability to leverage MSC's ecosystem of products including MSC Apex, MSC Nastran, Patran, Adams, Marc, SimManager, MaterialCenter and more.
- Access to MSC Apex and the new modules as they become available (such as Structures, Nonlinear, Multi-body Systems).

The MSC One Method

With the new subscription based token system, you receive a pool of tokens. Your tokens are checked out from the pool and are used to access and run a full range of CAE solutions available under the MSC One licensing system from MSC Software. Each individual software item requires a certain number of tokens to run. After each use, your tokens are returned to the pool for other use. There are dozens of software items available under MSC One.

Who is it for?

- Large-scale global enterprises
- Small-Medium sized companies with tight budgets and heavy engineering needs
- Consulting firms that cannot invest in outright per-seat purchases

**Exceptions do apply with certain products. Please talk with your MSC representative for more information.*

Benefits

- Innovation
 - Accelerate innovation in your product line by taking advantage of simulation solutions that your company did not have access to previously.
- Improve Productivity
 - Create a flexible environment, as your project and CAE needs mature or change.
- Reduce Risk
 - Reduce your financial risk with the ability to increase or decrease capacity as your engineering needs change.
- Reduce Cost
 - Obtain access to infrequently-used CAE applications that might otherwise be difficult to cost justify.
 - Consolidate your CAE software suppliers to most effectively stretch your limited budget.
- The benefits of MSC One will interest your entire organization:
 - Engineering project managers
 - CAE engineering departments
 - VP of Engineering
 - Purchasing and procurement

Capabilities

- Sketching
 - Sketch lines, squares, circles, ellipsoids, fillets, and chamfers
 - Project, split, and edit existing sketches
- Direct Modeling
 - Interactively edit solids and surfaces with Push/ Pull or Vertex/Edge drag
- Geometry Edit Tools
 - Identify features and defeature
 - Geometry cleanup and check
- Midsurface Creation and Repair Tools
 - Extract mid-surfaces by auto offset, constant thickness, distance offset, or tapered methods
 - Incrementally build mid-surfaces of uniform or non-uniform thickness for planar or curved solids
 - Connect surfaces via direct modeling (Vertex/ Edge Drag), auto Surface Extend or stitching
 - Split and fill surfaces
 - Add/Remove and Suppress/Un-suppress vertices or edges
- Meshing and Mesh Editing
 - Mesh curves, surfaces, and solids, available element types: beam, quad, tria, tet, hex
 - Regenerate meshes automatically as geometry is modified
 - Refine meshes with Feature Base Meshing or mesh Seeding
 - Visually inspect element quality
 - Construct Hard Points to facilitate part connection
 - Mesh surfaces via paver, 4 side map, or 4+ side map mesh methods
- Model Attribution
 - Material Creation and Assignment
 - Behavior Creation and Assignment
 - Automatic creation of thickness and offset properties for uniform and non-uniform cross sections
 - Glue Connections

MSC Apex® | Modeler

Direct Modeling & Meshing Solution

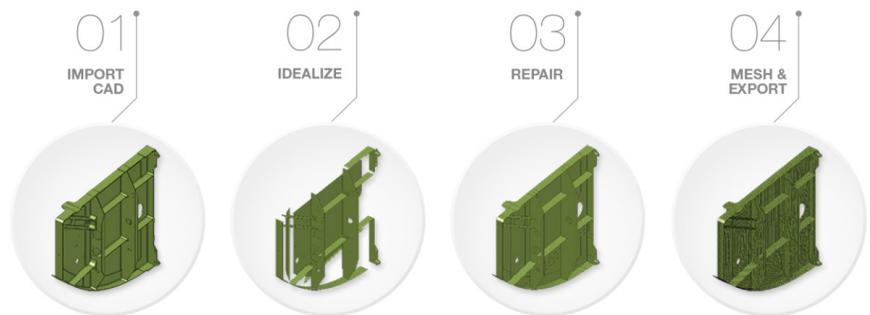
MSC Apex Modeler is a CAE specific direct modeling and meshing solution that streamlines CAD clean-up, simplification and meshing workflow. The solution features sophisticated and interactive tools that are easy to use and easy to learn.

- **Direct Modeling Direct:** modeling allows users to create and edit geometry interactively. Simply select the entities of interest, such as a face, edge or vertex, and push, pull, or drag to implement any modifications. Direct Modeling is complemented with built in meshing technology.
- **Direct Modeling and Meshing:** For models that have already been meshed and require further geometry modification, use any of the Direct Modeling or Geometry Clean-up/Repair tools and the mesh will be immediately regenerated.
- **Easy to Use, Easy to Learn:** MSC Apex is designed to have multi-purpose tools so as to make the application easy to use. It also features numerous learning aids such as tutorials, video based documentation, workflow and at-mouse instructions which promotes single day productivity.

Productivity Gains

Geometry creation and meshing of this aerospace bulkhead required 50 hours with conventional CAE tools. In MSC Apex Modeler, the process only took 5.5 hours and required little effort to extract mid-surfaces, connect separate surfaces, mesh, and assign thicknesses and offsets.

	Today's Workflow	MSC Apex Workflow
Expertise Required	High	Low
Analysis geometry creation	35h	3h
Mesh creation	3h	2h
Property Assignments	12h	.5h
Complete entire scenario	50h	5.5h



MSC Apex® | Structures

Computational Parts Based Structural Analysis

MSC Apex Structures is an end-to-end simulation solution that expands upon MSC Apex Modeler functionality with capabilities for linear structural analysis.

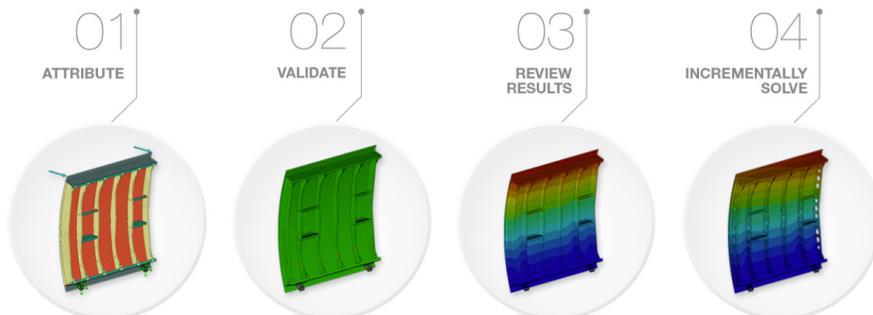
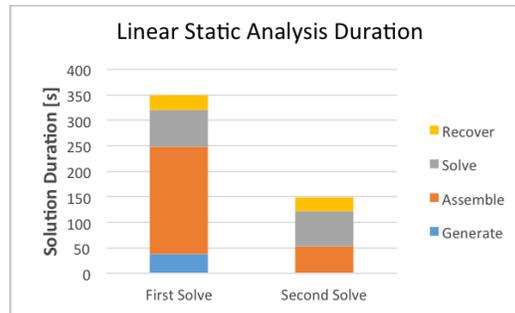
MSC Apex Structures packages a user interface for scenario definition and results post-processing, as well as integrated solver methods. This solution is unique in that it combines computational parts and assemblies technology with a generative framework, which enables interactive and incremental analysis.

The integration of the user interface with solver methods gives the user a unique ability to interactively and incrementally validate that FEM models are solver ready. At the user's demand, a series of solver checks can be run against individual parts and assemblies and the model diagnostics are reported in the Analysis Readiness panel. This Incremental Validation is a radical departure from the very time consuming traditional approach where pre/post processor and solver are separate.

In addition, with Computational Parts and Assemblies, MSC Apex Structures is a true parts-based solution, where each part behavioral representation (Stiffness, mass, and damping) can be pre-computed and stored independently. This approach is especially efficient when combined with the MSC Apex generative framework, as the solver execution will only re-compute behavioral representations for parts that have changed since the last solver execution. We call this Incremental Solving. This new solver architecture is especially efficient in the context of trade studies.

Productivity Gains

Computational Parts technology was used to perform an incremental analysis of this landing gear door assembly. After modifying one part of the assembly, an incremental or subsequent analysis completed 2.5x faster than its first solve.



Capabilities

- Generative Framework
 - Geometry, Mesh, Material, Property and Behaviors, Glue, Load and Boundary Conditions, Scenarios and Results
- Linear Structural Analysis
 - Linear Statics and Normal Modes
- Loads & Constraints
 - Concentrated Force and Pressure
 - Fixed Constraint
- Incremental Validation
 - Regenerative Analysis Readiness for mesh, materials, properties, LBCs, interactions, and simulation settings
 - Context specific (Part, Sub-assembly, Assembly)
- Incremental Solve
 - Computational Parts and Assemblies
- Study Manager
 - Manage multiple scenarios (model representations, output requests, analysis type)
- Post-Processing
 - Results display for static and normal modes
 - Results animation, including modes navigator
 - Spectrum controller
 - Results display in Cartesian, cylindrical or spherical coordinate systems

Capabilities

- Import of CAD geometry formats including STEP, IGES, DXF, DWG or Parasolid
- Extensive library of joints and constraints to define part connectivity
- Definition of internal and external forces on the assembly to define your product's operating environment
- Model refinement with part flexibility, automatic control systems, joint friction and slip, hydraulic and pneumatic actuators, and parametric design relationships
- Ability to generate flexible parts without the need to import MNF file from FEA software
- Ability to iterate to optimal design through definition of objectives, constraints, and variables
- Automatic generation of linear models and complex loads for export to structural analyses
- Comprehensive and easy to use contact capabilities supporting 2D and 3D contact between any combination of modal flexible bodies and rigid body geometry
- Comprehensive linear and nonlinear results for complex, large-motion designs
- Incorporate geometric and material nonlinearity through Adams-Marc co-simulation
- Create geometric nonlinear beam parts using FE part

High Performance Computing (HPC)

- Parallel processing support for Adams/Tire results
- Shared Memory Parallel solver
- State of the art Linear analysis capabilities
- High fidelity Adams-to-Nastran translation utilities to replace manual translation
- HHT integrators for a faster numerical integration of the equations of motion for a dynamic analysis



INTEGRATED SOLUTIONS

Adams™

Multibody Dynamics Simulation Solution

Adams is the world's most widely used multibody dynamics simulation software. It lets you build and test functional virtual prototypes, realistically simulating on your computer, both visually and mathematically, the full-motion behavior of your complex mechanical system designs.

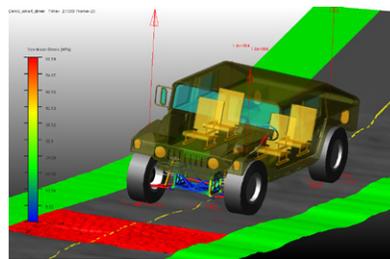
Adams provides a robust solution engine to solve your mechanical system model. The software checks your model and automatically formulates and solves the equations of motion for kinematic, static, quasi-static, or dynamic simulations.

With Adams, you don't have to wait until the computations are complete to begin seeing the results of your simulation. You can view animations and plots – and continue to refine your design – even as your simulation is running, saving valuable time.

For design optimization, you can define your variables, constraints, and design objectives, then have Adams iterate automatically to the design, providing optimal system performance.

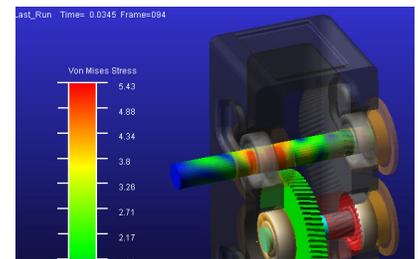
Adams/Car

- Explore the performance of your design and refine your design before building and testing a physical prototype
- Analyze design changes much faster and at a lower cost than physical prototype testing would require
- Vary the kinds of analyses faster and more easily
- Work in a more secure environment without the fear of losing data from instrument failure or losing testing time because of poor weather conditions



Adams/Machinery

- High-fidelity simulation of common mechanical parts, such as gears, bearings, belts, chains, Electric Motor and Cam
- Enhanced productivity with incredibly quick model-solve-evaluate process times
- An automated, wizard-driven model creation process for ease-of-use
- Straightforward evaluation of results in Adams/Postprocessor



Capabilities

- Advanced nonlinear materials
- Industry proven contact to accurately simulate product performance and manufacturing
- Coupled solutions of nonlinear structural, thermal, electromagnetics.
- Advanced heat transfer analysis capabilities
- Special purpose material models including Shape Memory Alloy and Solder models
- Comprehensive connector and fastener models to simulate commonly found connections
- State-of-the-art iterative solvers and parallel processing on shared and distributed memory machines
- Automated remeshing and adaptive meshing to increase solution robustness and accuracy
- Advanced damage and fatigue analysis of metals and composite structures
- Predict crack initiation and propagation under realistic load conditions

Benefits

- Shorten the design optimization process, while improving design and product performance through integrated simulation
- Reliable analysis capabilities to reduce product design, development, manufacturing & warranty costs
- Robust solver technology that greatly enhances the value of nonlinear solutions encountered in many industries

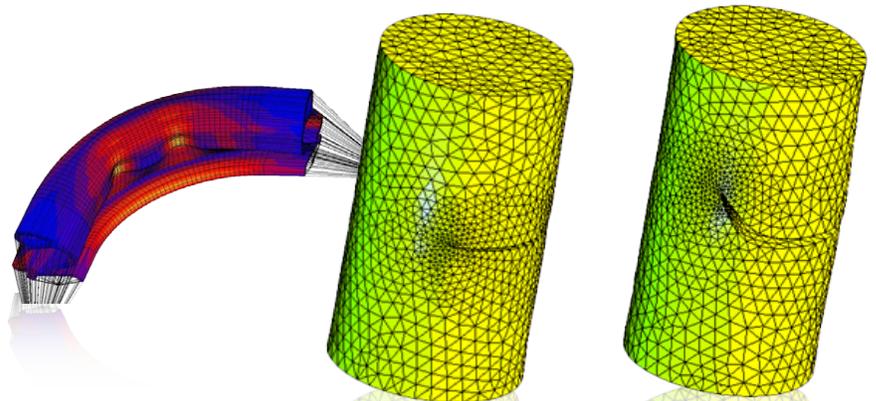
INTEGRATED SOLUTIONS

Marc®

Advanced Nonlinear Simulation Solution

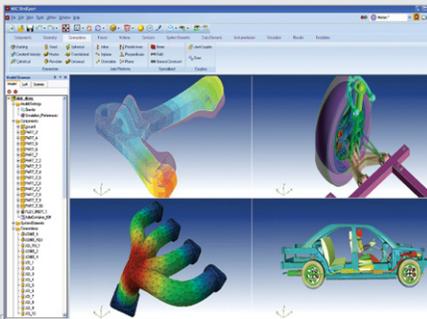
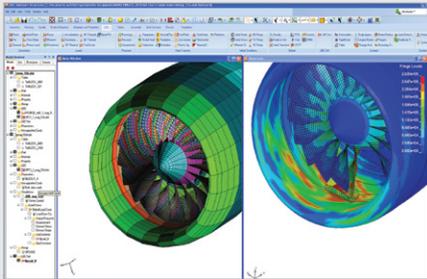
Marc is a powerful, general-purpose, nonlinear finite element analysis solution to accurately simulate the response of your products under static, dynamic and multi-physics loading scenarios. Marc's versatility in modeling nonlinear material behaviors and transient environmental conditions makes it ideal to solution for your complex design problems.

- **Nonlinear and Multiphysics Solution Schemes:** Solve problems spanning the entire product lifespan, including manufacturing process simulation, design performance analysis, service load performance and failure analysis with robust nonlinear algorithms and multiphysics capabilities that include coupled thermomechanical analysis, electromagnetics, piezoelectric analysis, electrical-thermal-mechanical, electrostatics and magnetostatics coupled with structural response and more.
- **Nonlinear Materials:** Choose from an extensive library of metallic and non-metallic material models, along with a library of nearly 200 elements for structural, thermal, multiphysics and fluid analyses.
- **Failure and Damage Analysis:** Investigate damage and failure using models suited for several material classes, including ductile, brittle, composites, elastomers, and concrete. Study crack propagation to avoid catastrophic structural failures.
- **Contact Analysis:** Easily set up a contact model, analyze and visualize the ever-changing component interaction. Account for friction and plasticity generated heating in a coupled analysis.
- **Automatic Remeshing:** Use local and global adaptive remeshing capabilities to overcome problems due to high stress gradients and/or large element distortions.
- **Parallel Processing:** Achieve higher productivity with the time tested parallel analysis capabilities. Take complete advantage of the multi-core processors and the GPUs available on their systems, to achieve higher performance.
- **Integrated Pre-/Post-Processing:** Create and analyze complex models with an integrated user interface designed expressly for nonlinear analysis. Customize the application with Python scripting language to automate repetitive tasks across the entire simulation process.



Capabilities

- Intuitive object based user interface with contextual actions
- View, manipulate, and organize your model with advanced browser functionality
- Import IGES, Parasolid, CATIA V4, CATIA V5, Pro/ENGINEER, ACIS, STEP and STL data for FE modeling
- Interactive CAD cleaning and healing with auto curve, shell, and solid meshing
- Define simulation properties using engineering terms for use across all workspaces
- Contact creation and setup through easy to use and intuitive contact tables
- Visualize and manipulate all CAE entities
- User configurable toolsets and menus to streamline the modeling process



INTEGRATED SOLUTIONS

SimXpert®

Fully Integrated Multidiscipline Simulation

SimXpert is a fully integrated simulation user environment for product simulation that brings together end-to-end multidiscipline simulation capabilities and best practice methodology capture and deployment technologies in a unified environment. This approach closes the collaboration gap that exists between analysts and designers, enabling them to share critical information across disciplines without duplicating work and allows them to deploy their best practices to the extended enterprise. This improved process enables manufacturers to accelerate the speed and accuracy of simulation, increase design productivity, and bring better products to market faster.

- **CAD Import and Superior Meshing Tools:** Import CAD files using any of the multiple formats supported, including IGES, Parasolid, CATIA V4, CATIA V5, Pro/ENGINEER, ACIS, STEP and STL. Create desired, high quality meshes with automatic and manual tools, along with modeling inputs for material data, boundary and loading conditions and contact interactions.
- **Multiple workspaces to tackle engineering problems:** Engineers can choose from various workspaces like Structures, Thermal, Explicit, Motion, and Systems and Controls to address problems experienced during the life of a product. Integrated with state-of-the art solvers in Finite Element Analysis, Multibody dynamics, and Controls, these workspaces provide all the tools required to complete all the stages of the simulation process – from pre-processing and modeling, solving, to post-processing, results manipulation and reporting.
- **Multidiscipline Analysis for Greater Accuracy:** Perform integrated multidisciplinary analyses on virtual prototypes ranging from components to complex systems. By passing the data across the multiple workspaces, improve the accuracy of the models with real-world loading and environmental conditions, including the complex interactions between engineering disciplines, without the inefficiencies of deploying multiple incompatible technologies or relying on costly physical prototypes.
- **Template Builder for Automation:** Automate the CAE process by reducing the number of steps in modeling and post-processing with the help of easy to use Template Builder. Take full advantage of the templates and expand the reach of the analysis tools while maintaining uniform, proven methods across the organization.

SOLVER SOLUTIONS

MSC Nastran™

Multidisciplinary Structural Analysis

MSC Nastran is a multidisciplinary structural analysis application used by engineers to perform static, dynamic, and thermal analysis across the linear and nonlinear domains, complemented with automated structural optimization and award winning embedded fatigue analysis technologies, all enabled by high performance computing.

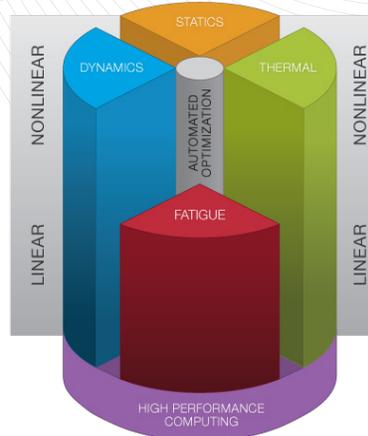
Engineers use MSC Nastran to ensure structural systems have the necessary strength, stiffness, and life to preclude failure (excess stresses, resonance, buckling, or detrimental deformations) that may compromise structural function and safety. MSC Nastran is also used to improve the economy and passenger comfort of structural designs.

Manufacturers leverage MSC Nastran's unique multidisciplinary approach to structural analysis at various points in the product development process. MSC Nastran may be used to: (1) Virtually prototype early in the design process, saving costs traditionally associated with physical prototyping; (2) Remedy structural issues that may occur during a product's service, reducing downtime and costs; (3) Optimize the performance of existing designs or develop unique product differentiators, leading to industry advantages over competitors.

MSC Nastran is based on sophisticated numerical methods, the most prominent being the Finite Element Method. Nonlinear FE problems may be solved either with built-in implicit or explicit numerical techniques. A number of optimization algorithms are available, including MSCADS and IPOPT. The fatigue capability in MSC Nastran has been developed jointly by nCode International Ltd. and MSC Software.

MSC Nastran Advantages

- **Multidisciplinary Structural Analysis:** To build up a comprehensive level of engineering analysis capability, multiple software solutions must be acquired, and users must be trained with each new tool. MSC Nastran features multiple analysis disciplines, enabling customers with one structural analysis solution for a wide variety of engineering problems.
- **Structural Assembly Modeling:** One structural member is rarely analyzed independently. Structural systems consist of numerous components, and must be analyzed as a whole. MSC Nastran features a number of methods to join multiple components for system level structural analysis.
- **Automated Structural Optimization:** Design optimization is a critical element in product development, but is often very iterative and requires a great deal of manual effort. MSC Nastran includes optimization algorithms that automatically seek optimal configurations in an allowed design space.

**Capabilities****Multidisciplinary Structural Analysis**

- Use one platform to perform linear or nonlinear analysis for the following disciplines: static, dynamic (NVH & Acoustics included), thermal, and buckling, and reduce the dependency on multiple structural analysis programs from various vendors
- Perform fatigue analysis with embedded fatigue technologies and reduce the time usually associated with fatigue life determination
- Assess the behavior of advanced composites and fiber reinforced plastics with built in Progressive Failure Analysis and User Defined Services for Mean-field Homogenization coupling with Digimat

Structural Assembly Modeling

- Expedite meshing with Permanent Glue, enabling you to connect incongruent meshes that would traditionally require time consuming mesh transitions
- Save time constructing assemblies that consists of welds or fasteners via specialized connector elements
- Speed up the re-analysis of large assemblies by constructing Superelements, and optionally, share Superelements with other manufacturers while concealing confidential design information
- Perform contact analysis and determine contact stresses and contact regions in multi-component designs

Automated Structural Optimization

- Optimize for stress, mass, fatigue, etc. while varying design variables such as material properties, geometric dimensions, loads, etc.
- Enhance the shape or profile of structural members with shape optimization
- Find optimal composite laminate ply thicknesses with topometry optimization
- Determine optimal bead or stamp patterns for sheet metal parts with topography optimization
- Remove excess and unnecessary volume with topology optimization
- Simultaneously optimize multiple models across disciplines with Multi Model Optimization

MODELING SOLUTIONS

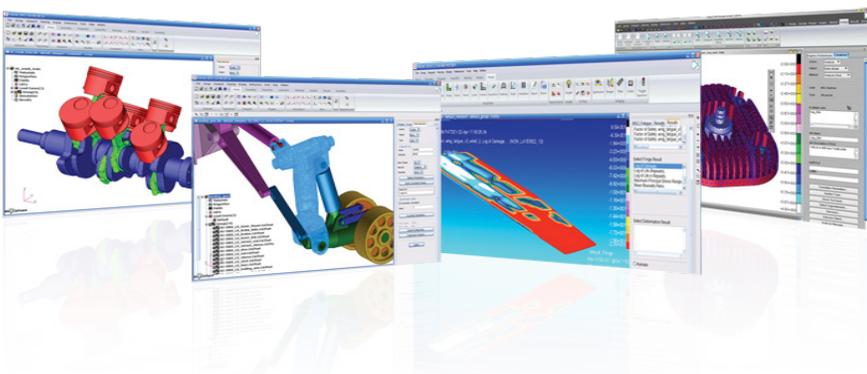
Patran®

Complete FEA Modeling Solution

Patran is a comprehensive pre- and post-processing environment for finite element analysis, helping engineers to conceptualize, develop and test product designs. Used by the world's leading manufacturing companies as their standard tool for the creation and analysis of simulation models, Patran links design, analysis, and results evaluation.

Patran provides a rich set of tools that streamline the creation of analysis ready models for linear, nonlinear, explicit dynamics, thermal, and other finite element solutions. From geometry cleanup tools that make it easy for engineers to deal with gaps and slivers in CAD, to solid modeling tools that enable creation of models from scratch, Patran makes it easy to create FE models. Meshes are easily created from 1-D, 2-D or 3-D CAD entities using fully automated meshing routines, manual methods, or combinations of both giving users the flexibility and the ease of use. Finally, with support for material properties, loads, boundary conditions data input, and analysis setup for most of the popular FE solvers, Patran reduces the need for multiple modeling environments in organization.

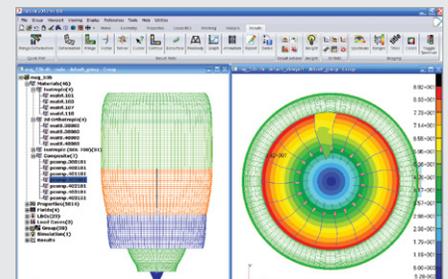
Patran's graphical interface is built to be fully customizable to your organization's unique engineering processes. With Patran Command Language (PCL), engineers can supplement the powerful modeling and analysis capabilities with their own, customized applications, commands, and menus. Patran users can easily iterate and evaluate different design decisions and reuse existing designs and results without the time consuming manual clean-up and re-creation of data.

**Capabilities**

- Use an intuitive graphical interface with direct access of CAD geometry with automatic/interactive feature recognition
- Access multiple MSC Software and third-party solvers
- Utilize robust automatic surface and solid mesh generation with advanced surface mesh-on-mesh capability
- Model connectors and bolts with pre-loads
- Easily define full 3D general contact scenarios for nonlinear analyses
- Optimize your designs by setting up MSC Nastran optimization tasks
- Define superlements to analyze large FE models
- Create coupled analysis cases for Marc
- Use numerous post-processing tools to review your results
- Implement results standardization through results templates
- Customize your user interface through Patran Command Language (PCL)

Benefits

- Increase productivity of your design and development process
- Reduce development costs through increased use of simulation technologies
- Improve productivity and accuracy with multidiscipline analysis and optimization



Training

MSC offers basic and specialized training in the use of our simulation tools to maximize your investments in our software. Whether you need an introduction to our simulation tools or expert instruction in specialized applications, we offer the courses you want, with the expertise you deserve.

Flexible Training Offerings

To further meet your specific requirements, we offer the following options for live instruction.

- **Public Classroom Training*** – Choose from our wide selection of courses conveniently offered at sites throughout the world.
- **Public Online Training** - The convenience of on-line learning with the interactivity and depth of a traditional classroom setting – no travel required. The entire instructor-led course is live and online on your own computer. Live Online Training is an efficient, cost effective and convenient way to gain skills in the use of our MSC simulation software.
- **Training at Your Facility** – If you have a number of employees who need training, we offer the cost effective option of bringing our class to your facility. This eliminates employee travel costs, minimizes time away from work, and can be arranged at your convenience.
- **Custom Courses** – If our standard seminar offerings do not meet your training requirements, MSC can develop a course or set of courses tailored to your specific needs. A custom course might include a combination of topics from several standard courses or specialized material not found in any of our standard seminars. MSC will work with your staff to design the course you need.

MSC can deliver custom and private courses live or via the web. We can also help ensure that you have the adequate hardware and software licenses available for private courses.

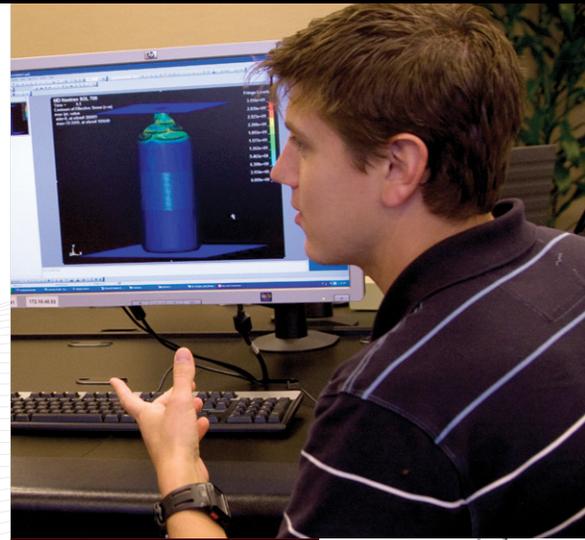
The table on the next page lists the standard courses offered. Please refer to the MSC Software training website for detailed course descriptions and dates offered at sites throughout the world.

***Go to www.mscsoftware.com/training to access our Global Training Schedule.**

MSC Learning Center

MSC Learning Center for eLearning – MSC offers several training courses in an interactive format with audio from subject matter experts. With the complete training content that includes lectures, workshops, demos, and workshop review questions in a format that you can complete in a self-paced and self-directed manner, you can keep up and improve the simulation skills helpful to your work.

***Go to www.mscsoftware.com/msc-learning-center to access our training courses.**



Our MSC application engineer comes out at least once a month to see how we are doing and help us with any issues. In fact this plane would have been impossible to model without the phone support, on-site visits and consulting services provided by the MSC support team”

Dana Taylor, AeroVironment





For more information contact UK Distributor :
Desktop Engineering Ltd
6/7 Bankside
Hanborough Business Park
Long Hanborough
Witney Oxon OX29 8LJ
T : 01993 883555
W : www.dte.co.uk