

# Multibody Dynamics-Nonlinear FEA Co-simulation Services

## SOLUTION BRIEF

### What is it?

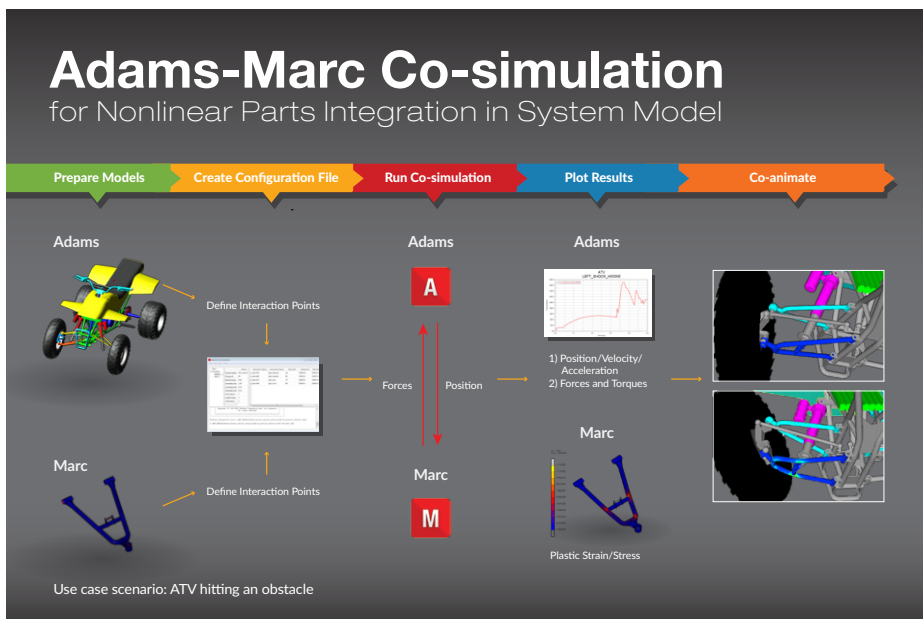
Efficiently designing and testing mechanical systems is a challenge for some engineers due to lack of smooth integration between system dynamics and finite element analysis (FEA) software domains.

The Adams-Marc co-simulation enables engineers to perform co-simulation between Marc nonlinear FE technology and the Adams Multibody Dynamics (MBD) software. By doing so, multibody dynamics engineers can increase model accuracy by including non-linear structural behavior; and Finite Element Analysis (FEA) engineers can study components with realistic boundary conditions. Coupling the technologies also produces time savings for nonlinear FEA software users since some of the rigid moving parts can be solved in Adams, which dramatically decreases the total solution time.

### Who is it for?

- Adams users who want to incorporate material nonlinearity, geometric nonlinearity or contact nonlinearity into their system model.
- Marc users who deal with mechanisms that include moving parts, and want to increase simulation productivity by using co-simulation.
- Anyone who is interested in performing coupled multidiscipline solution between Multibody Dynamics and Nonlinear FEA.

### What is the Workflow?



## Software & Services Offerings

### • How we Help

Engineering simulation software, implementation & support, modeling & analysis projects, methods development, and training

### • Who we Help

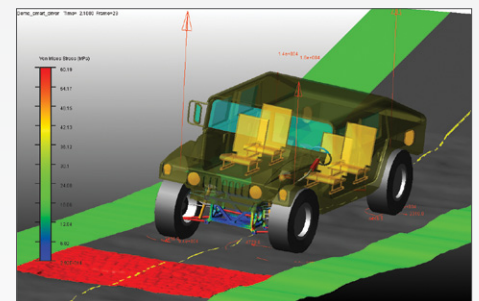
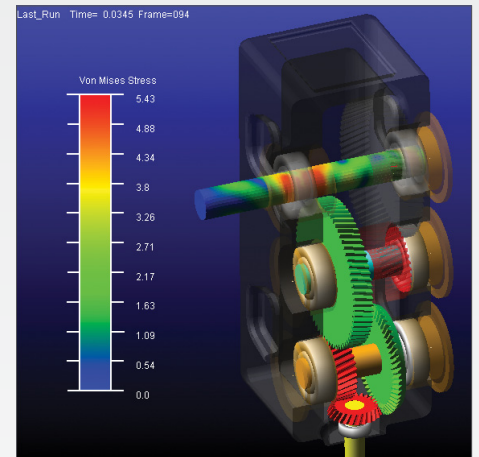
Product design and manufacturing engineers in transportation, machinery, consumer products and biomedical industries, parts suppliers, and researchers

### • How to Reach Us

[www.mscsoftware.com](http://www.mscsoftware.com)

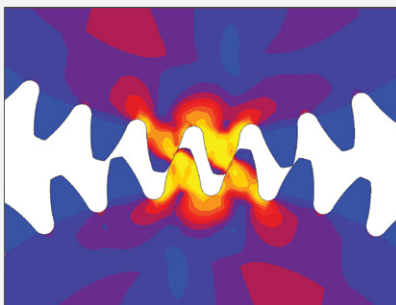
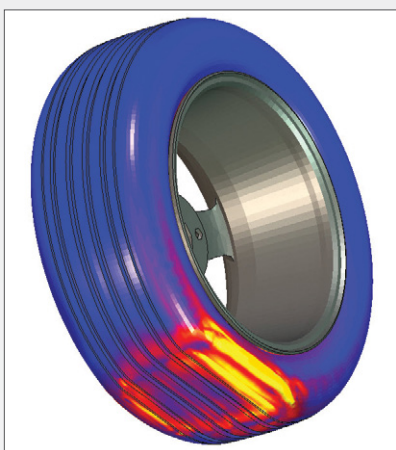
## Adams

As the world's most widely used Multibody Dynamics (MBD) software, Adams improves engineering efficiency and reduces product development costs by enabling early system-level design validation. Engineers can evaluate and manage the complex interactions between disciplines including motion, structures, actuation, and controls to better optimize product designs for performance, safety, and comfort. Along with extensive analysis capabilities, Adams is optimized for large-scale problems, taking advantage of high performance computing environments.



## Marc

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. With its innovative technologies and modeling methodologies, Marc enables you to simulate complex real world behavior of mechanical systems making it best suited to address your manufacturing and design problems in a single environment.



## About MSC Software

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.

[www.mscsoftware.com](http://www.mscsoftware.com)

**Corporate**  
 MSC Software Corporation  
 4675 MacArthur Court  
 Suite 900  
 Newport Beach, CA 92660  
 Telephone 714.540.8900  
[www.mscsoftware.com](http://www.mscsoftware.com)

**Europe, Middle East, Africa**  
 MSC Software GmbH  
 Am Moosfeld 13  
 81829 Munich, Germany  
 Telephone 49.89.431.98.70

**Japan**  
 MSC Software LTD.  
 Shinjuku First West 8F  
 23-7 Nishi Shinjuku  
 1-Chome, Shinjuku-Ku  
 Tokyo, Japan 160-0023  
 Telephone 81.3.6911.1200

**Asia-Pacific**  
 MSC Software (S) Pte. Ltd.  
 100 Beach Road  
 #16-05 Shaw Towers  
 Singapore 189702  
 Telephone 65.6272.0082

## How can we help you?

### Engineering Expertise You Can Trust

Getting started is easy.

Our extremely skilled engineers are experts at utilizing Computer Aided Engineering (CAE) for analyzing fatigue behavior. Our team is highly efficient in applying Adams and Marc for solving almost any type of co-simulation challenge.

### Flexible Services Offerings

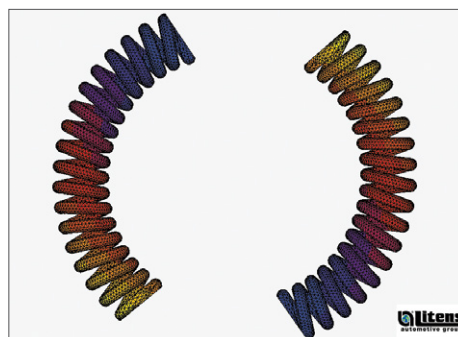
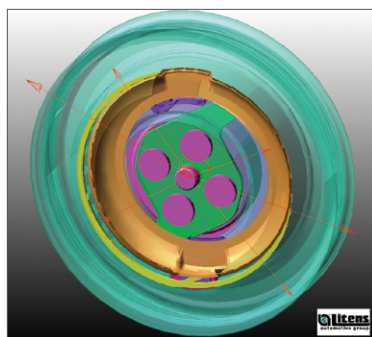
We provide consulting support based on your specific requirements. This could range from performing analysis for you on a project basis to providing full time staff members to help you create repeatable processes in-house.

### MSC's services team can help your company in a variety of ways:

- Quick Start Project
- Knowledge Transfer
- Mentoring
- Staff Augmentation
- On-site Support
- Methods Development
- Training
- Hotline Support

## Sample Project:

### Adams-Marc Co-simulation Makes System Analysis 15 Times Faster than Pure Nonlinear FEA Analysis



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We were looking for an approach that would allow us to simulate the performance of our torque modulators, including material and geometric nonlinearities, in a fraction of the time so that we could integrate advanced nonlinear analysis into the design process.

The Adams-Marc co-simulation capability more than satisfies our guideline of 'reasonable results in a reasonable time.' With up to a 90% reduction in computation time, optimization using advanced nonlinear FEA becomes practical. Such development provides a great benefit and is crucial for our product development and we are proud to work together with MSC in future projects.

**Dr. Steve Jia, Chief Engineer,  
 Litens Automotive Group**