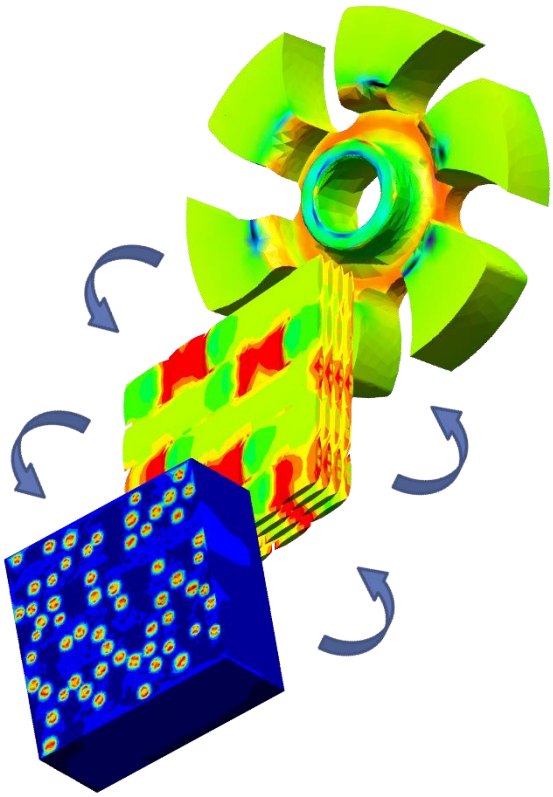
MultiMechanics

# MultiMech-2015 Product Overview

## GENERAL FEATURES

- Structural Analysis of Advanced Materials
- Automatic generation of Microstructures
- Finite Element solver
  - Linear and Nonlinear
  - Explicit and Implicit
  - TRUE multiscale™
- Progressive Damage Evolution
- Automatic Crack Initiation and Growth
- Mesh optimization
- 10x more accurate and 6x faster than conventional analysis techniques
- Plugins available for for Abaqus CAE and Ansys



MultiMechanics helps companies using advanced materials greatly reduce physical prototyping and testing, by letting them:

- Predict structural failure based on **microstructural design variables**, such as fiber orientation and volume fraction
- Virtually create and test new and existing materials with an unprecedented level of detail and accuracy, for multiple types of composites, including *woven, braided, particulate, continuous and chopped fibers reinforced plastics*
- Zoom into the material microstructure to find out *where, when and why damage initiates*

Multimech is an all-inclusive, Multiscale Finite Element software package for composite structural analysis.

Our unique TRUE Multiscale™ technology extends all the design flexibility and robustness of Finite Element Modeling down to the microstructural level, strongly coupling macro and micro mechanical response.

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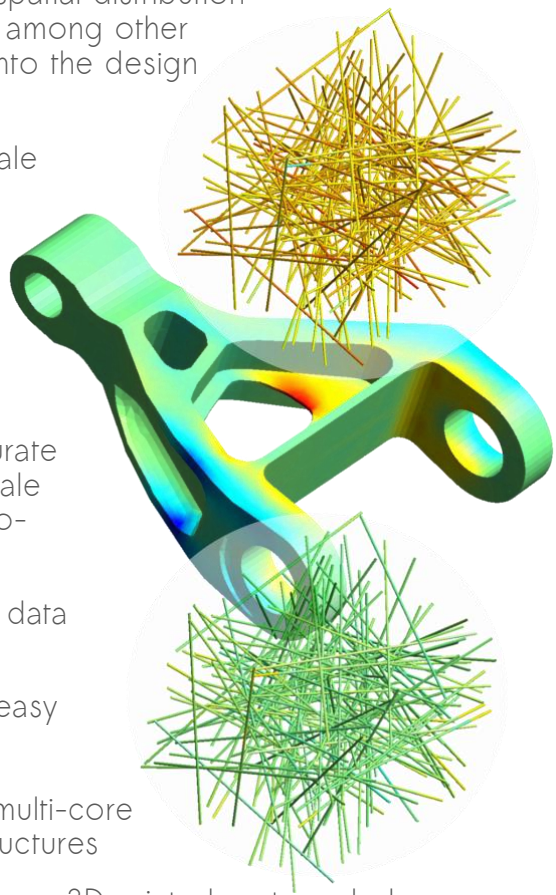
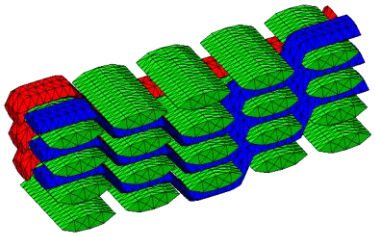
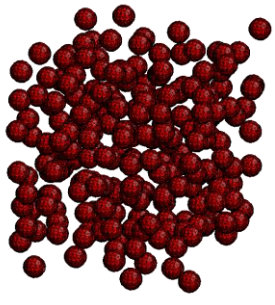
"MultiMech gives you an unprecedented level of precision when modeling your composites"

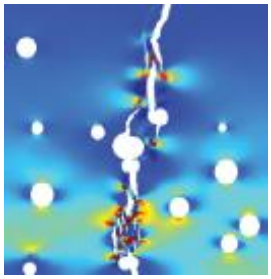
## Key Features

- Model the effect of individual microscale constituents, their interactions, volume fractions, spatial distribution and orientation, fracture toughness, among other factors, are explicitly incorporated into the design process
- Perform implicit and explicit, multiscale finite element analysis
- Multiscale nesting scheme allows modeling of unlimited number of scales, e.g., structural part + fiber reinforced material + resin reinforced with nanoparticles
- Advanced algorithm allows for accurate damage modeling, including multiscale transition of micro-cracks into macro-cracks
- Factor injection molding orientation data into your analysis
- One-click virtual test for quick and easy predictions of material behavior
- Fully parallelized on both standard multi-core Desktops/Laptops and HPC infrastructures
- Simulate additive manufacturing such as 3D printed parts and phase construction of cement concrete
- Automatic Generation of Complex, 3D Finite Element Microstructures
- Available as standalone software or as a Plugin for most major CAE Platforms









### GEOMETRY

Import

- Abaqus (.inp) ASCII format
- Gmsh (.msh) ASCII format
- Injection Molding Data
  - Moldex3d (.O2D)
  - Moldflow (.XML)

### POST PROCESSING

- Altair binary format (.h3d)
- Tecplot format (.dat)
- Gmsh ASCII format (.msh)
- History output of nodal and elemental variables
- Output of selected multiscale
- elements (RVE's)

### MICROSTRUCTURES

- Textile Composites
- Continuous and Chopped Fiber Composites
- Particulates
- 3D printed materials
- Heterogeneous Natural Structures

### SUPPORTED PLATFORMS

- Windows ( x86_64)
- Linux (x86_64)

MultiMechanics

# "The fastest and most accurate multiscale virtual testing tool available"

## SERVICES AVAILABLE

- Technical Support
- Installation and Setup
- Software Customization
- Simulation Consulting
- Training

## INDUSTRIES WE SERVE

- Aerospace
- Automotive
- Defense
- Energy
- Consumer Electronics
- Construction
- Materials Design
- 3D Manufacturing

## Simulation Details

Analysis

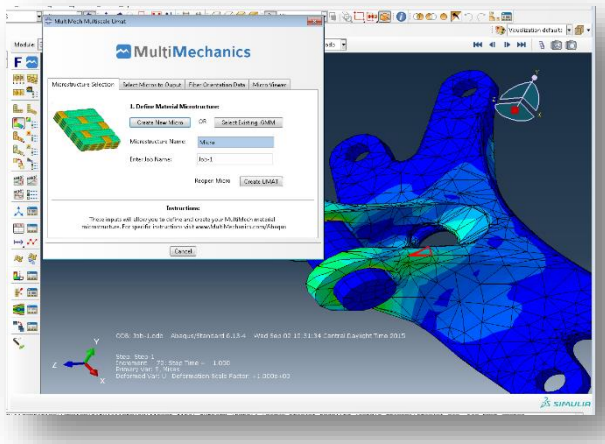
- Two-way coupled FE multiscale solver
- Quasi-static (implicit)
- Dynamic (explicit)
- Transient diffusion
- Thermo-Chemo-Mechanical coupling

Automatic Generation of Microstructures

- Textile Composites
- Continuous and Chopped Fiber Composites
- Particulates
- Voids

Progressive Damage

- Multiscale Failure Models
- Automatic Insertion of cracks (or cohesive zones)
- Automatic correction of interpenetrating interface elements
- Continuum damage models
- Element deletion
- Variety of failure envelopes




### USER INTERFACE

•**NEW**: Plugins available for your favorite CAE Platforms
•Easily generate FE microstructural models
•Wizard-like workflow - prevents mistakes and missing input
•Smarter and more intuitive - Auto-selects options as you build your project
•Optimized post-processing from a click of a button
•Highly Efficient - create projects and run analyses in 3 steps!

## Material Models

Elasticity

- Isotropic thermo-elastic
- Orthotropic thermo-elastic
- Isotropic continuum-damage thermo-elastic

Viscoelasticity

- Isotropic thermo-viscoelastic with aging
- Isotropic thermo-viscoelastic with aging for concrete
- Isotropic continuum damage thermo-viscoelastic with aging

Elasto-plasticity

- Isotropic Von Mises thermo-plastic

Cohesive zone models

- Linear decay
- Tvergaard
- Allen nonlinear viscoelastic
- Material interface (automatic crack/CZ insertion)

Contact models

- Elastic frictionless

Multiscale material models

- Microscale RVE
- Microscale cohesive zone RVE

Diffusion models

- Isotropic Fourier
- Isotropic Fourier for concrete

### WHY WE'RE DIFERENT

Our unique TRUE Multiscale™ technology is the industry break-through that allows efficient linking of macro and micro responses without loss of accuracy and material design flexibility.

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