



## **Abaqus 6.9 New and Enhanced Features Addendum**

Mechanical engineers, designers, and researchers use Abaqus FEA software from SIMULIA to evaluate real-world behavior of all products, materials, and manufacturing processes.

Focused on solving engineering challenges in all industries, including aerospace, automotive, electronics, energy, and consumer packaged goods, Abaqus 6.9 provides many new and enhanced capabilities for model building, meshing, materials, and visualization of fracture and failure, implicit/explicit co-simulation, general contact, and linear dynamics.

### **Modeling & Visualization:**

- Comprehensive new features in Abaqus/CAE support the modeling of fracture and failure with XFEM, co-simulation, and general contact in Abaqus/Standard.
- Surface meshing enhancements make it faster and easier to mesh complex parts. This is extremely useful for applications in industries such as automotive, medical, consumer products, defense industries.
- New modeling tools for defining fasteners allow users to create attachment points that follow model edges or conform to a regular pattern. This enhancement enables the creation of complex fastener patterns rapidly on models such as an aircraft skin-stringer panel assembly.
- Step suppression enables users to change the analysis procedures without making duplicate models. This is useful for many applications, including those in the aerospace industry, which employs multiple model configurations for nonlinear simulation.
- Geometry import and repair tools have been enhanced to allow automatic or selective stitching of part bodies and edges with a user-specified tolerance value. For example, this enables a complete yacht hull model, created with multiple bodies in a CAD system, to be imported into Abaqus/CAE as a single part.
- A new feature enables the display of resultant section force and moment on a planar view cut. This allows the resultant section force data to be visualized and queried on any arbitrary plane such as a section on an aircraft landing gear cylinder component.
- An improved Abaqus/CAE translucent object display has controls that optimize accuracy and performance for your graphics hardware.

### **Analysis Capabilities:**

- The extended finite element method (XFEM) has been implemented in Abaqus and provides a powerful tool for simulating crack growth along arbitrary paths that do not correspond to element boundaries. In the aerospace industry XFEM can be used, in combination with other Abaqus capabilities, to predict the durability and damage

tolerance of composite aircraft structures. In the energy industry it can assist in evaluating the onset and growth of cracks in pressure vessels.

- A new co-simulation method allows users to combine the Abaqus implicit and explicit solvers into a single simulation—substantially reducing computation time. By using this co-simulation technique, automotive engineers can now combine a substructure representation of a vehicle body with a model of the tires and suspension to evaluate the durability of a vehicle running over a pothole.
- The new general contact implementation in Abaqus offers a simplified and highly automated method for defining contact interactions in a model. This capability provides substantial efficiency gains in modeling complex assemblies such as gear systems, hydraulic cylinders, or other products that have parts that come into contact.
- The subspace-based steady-state dynamic procedure now supports coupled structural-acoustics simulation using the high performance computing database.
- A new low-density foam model in Abaqus/Explicit captures strain-rate sensitive behavior of highly compressible elastomeric foams, which are used as energy absorbing materials in applications such as automotive passenger safety and consumer product packaging.
- Damage evolution models for ductile materials are now available in Abaqus/Standard.
- A new viscous shear model is available for simulating the behavior of non-Newtonian fluids such as blood, paste, molten polymers, or other fluids often used in consumer product or industrial applications.
- There are new boundary condition options available for modeling inflow and outflow of fluid using the Coupled Eulerian-Lagrangian technique in Abaqus/Explicit.
- New filtering options in Abaqus/Explicit allow users to track the maximum, minimum, and absolute maximum values over all time for both field and history output in an analysis.

#### **Performance:**

- Enhanced performance of the AMS eigensolver significantly improves the efficiency of large-scale linear dynamics workflows in applications such as automotive noise and vibration analyses.
- Geometry-related memory caches of Abaqus/CAE improve handling of complex features providing faster regeneration and enabling users to work with larger and more complex geometries.
- Dynamic operations in the Visualization module take advantage of display lists for improved view manipulation performance. Large models such as automotive powertrain assemblies can now be visualized with greater ease.
- Matrix input can now be used with distributed memory parallel execution.