

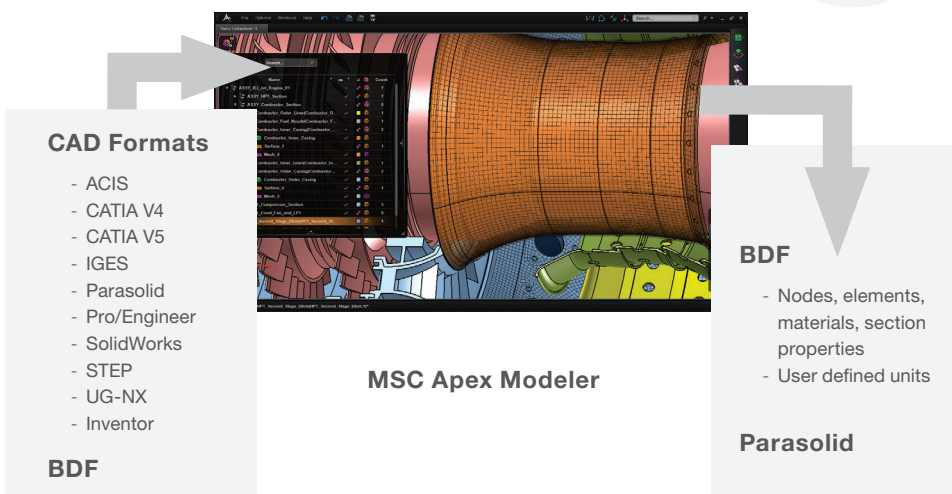
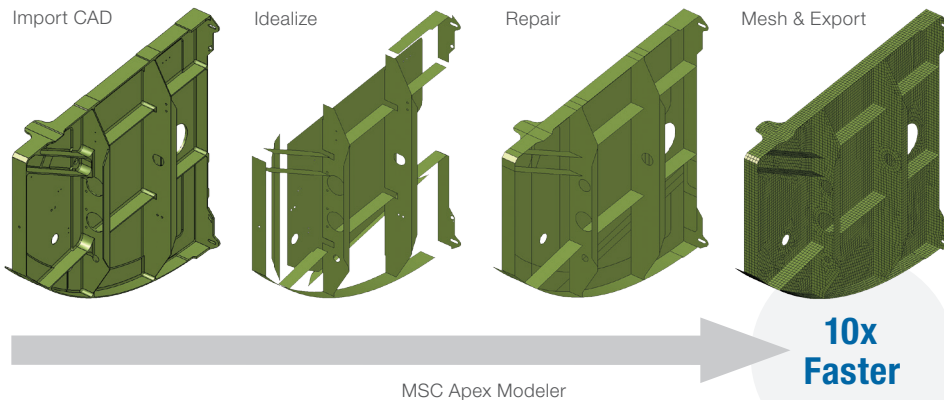
MSC Apex® | Modeler

Direct Modeling & Meshing Solution

Overview

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 was 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.



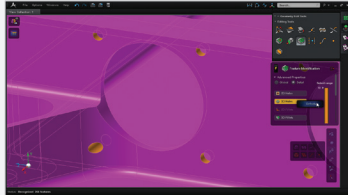
Capabilities

- Multi-Language Support**
 - Available in Chinese, English, and Japanese
- 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
- Assembly Management**
 - Interactively translate, rotate, and duplicate objects
 - Manage parts and assemblies based on model hierarchy
 - Execute model search queries
 - Control model appearance with color, transparency, and visibility
- Learning and Ease of Use**
 - Learn with in-program videos, workflow instructions, at-mouse instructions, and searchable documentation
 - Submit application enhancement ideas or issues with the Integrated Reporting Tool

Direct Modeling and Meshing Workflow

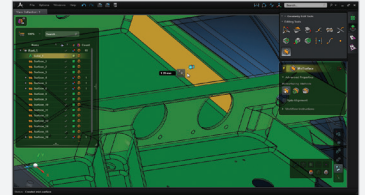
1 Remove numerous & unnecessary features

Specify feature type, i.e. fillets, chamfers, holes, cylinders, etc., define feature dimension ranges, and automatically remove targeted features from the model.



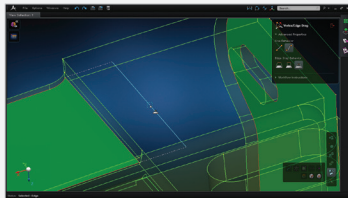
2 Interactively extract midsurfaces

Automatically or manually perform midsurface extraction. Options include: auto offset, constant thickness, distance offset, and tapered midsurface.



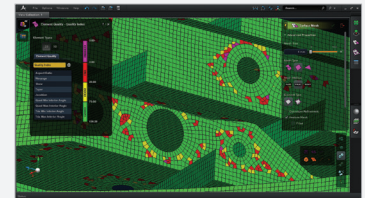
3 Repair surfaces with direct modeling

Select an edge or vertex and interactively drag it to a desired location. Guidelines give you a preview of the action being performed.



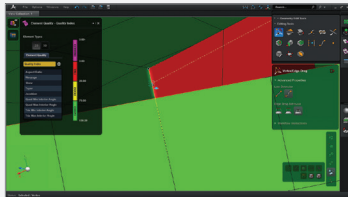
4 Mesh and review mesh quality

Mesh models based on mesh size, element type, mesh seed and feature



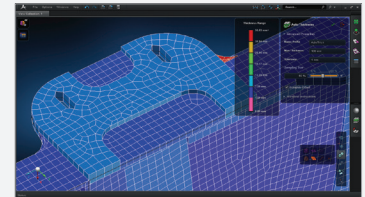
5 Continue repairing with direct modeling and meshing

Use direct modeling to further repair geometry that may already be meshed. Slivers or cracks may easily be resolved and the mesh can be quickly regenerated automatically.



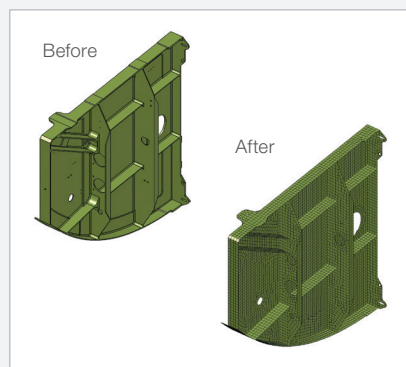
6 Automatically create thickness and offset assignments

Use Auto Thickness and Offset to create numerous property definitions for shell elements, and export to the .bdf file format



Productivity Gains

For this Aerospace Bulkhead and with conventional CAE tools, 50 hours were required to create meshed geometry. In MSC Apex Modeler, the process 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 |

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