

Product Features

CAD Associativity

- ▶ CATIA
- ▶ Unigraphics
- ▶ I-DEAS
- ▶ Pro/ENGINEER
- ▶ SolidWorks
- ▶ Solid Edge

CAD Readers

- ▶ ACIS
- ▶ Parasolid
- ▶ IDI
- ▶ IGES
- ▶ STEP
- ▶ STL
- ▶ VRML
- ▶ DWG

Solver Support

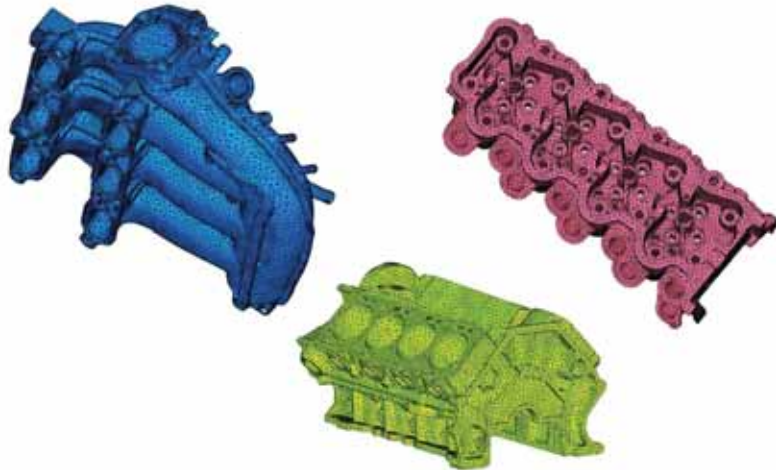
- ▶ Export to more than 100 solvers
- ▶ Import for:
 - Acusolve
 - ANSYS
 - CFD++
 - CFX
 - CGNS
 - Fieldview
 - Fluent
 - LS-Dyna
 - NASTRAN
 - Patran
 - StarCD
 - TecPlot

Geometry

- ▶ Solid modeling tools
- ▶ Surface-based modeling tools
- ▶ Geometry repair tools
- ▶ Faceted data editing tools
- ▶ Automatic mid-surfacing
 - Variable thickness
 - Constant thickness
- ▶ Feature detection/removal

Powerful pre- and post-processing tools for mesh generation

Meshing is an integral part of the CAE analysis process. The mesh influences the accuracy, convergence and speed of the solution. More importantly, the time it takes to create a mesh model is often a significant portion of the time it takes to get results from a CAE solution. Therefore, the better and more automated the meshing tools, the better the solution.



From automatic meshing to highly crafted mesh, ANSYS, Inc. provides the ultimate meshing solution. ANSYS provides powerful pre- and post-processing tools for mesh generation from any geometry source, to produce almost any element type, for nearly any physics, for virtually any application.

Solid Modeling

The ANSYS meshing solution provides robust automatic tetra meshing on even the most complicated geometries. With automatic contact detection and setup, a user requires little training to do sophisticated analysis.

For users that want control over every step in the meshing process to create highly crafted brick meshes, or mesh directly on scan data, ANSYS, Inc. provides state-of-the-art hex, tet and hybrid meshing tools.



Pure hex meshing that can selectively capture or ignore features.

Product Features

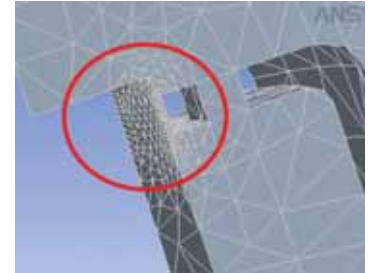
Meshing

- ▶ Global sizing
- ▶ Curve sizing
- ▶ Surface sizing
- ▶ Density regions
- ▶ Automatic contact detection
- ▶ Connectors
 - Arbitrary connectors
 - Bolt holes
 - Line seam welds
 - Quad seam welds
 - Tent seam welds
 - Spot welds
 - Welding from file
- ▶ Beam meshing
- ▶ Surface meshing
 - Automatic approach
 - Patch-based
 - Patch-independent
 - Orthogonal-based
- ▶ Tetra meshing
 - Automatic approach
 - Delaunay approach
 - Octree approach
- ▶ Prism (boundary layer) meshing
 - Extrusion before meshing
 - Extrusion into mesh
- ▶ Hex-dominant meshing
- ▶ Swept hex meshing
- ▶ Blocked hex meshing
 - Geometry-independent approach
 - Parametrically links to CAD
 - Structured or unstructured grid output
 - Mixed structured/swept/unstructured blocks

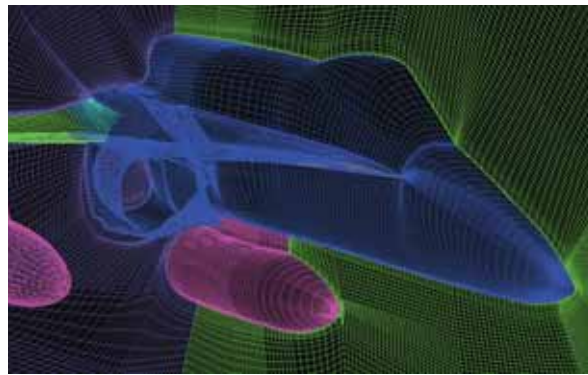
ANSYS® Emag™ Modeling

The ANSYS meshing solution for electromagnetic models provides the user automated, yet well-controlled meshing to accurately capture the field (dielectric) regions with tet, hex or hybrid mesh.

Electromagnetics models typically include narrow gaps between parts such as rotors and stators. It is important to have a refined mesh in these gaps, and the ANSYS Emag meshing solution provides full control over this “air gap” meshing.



Automatic meshing of an electromagnetic field.



Structured hex mesh of F-18 aircraft.

Image courtesy of SCSC (Swiss Center for Scientific Computing)

Fluid Modeling

The ANSYS meshing solution for fluid models gives the user a great deal of control. Regardless of the application —whether a sophisticated boundary layer meshing for Navier-Stokes meshes, or just a grid on a complicated fluid region — ANSYS has a robust meshing solution for the job.

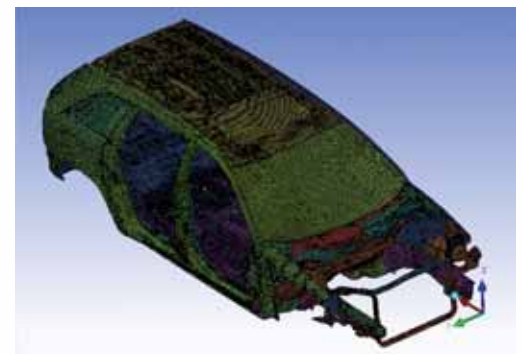
Beam Modeling

The ANSYS meshing solution provides easy methods to simplify geometry to beam models or to create beam models to easily help construct a simplified model for quick analysis.

Shell Modeling

The ANSYS meshing solution for shell modeling contains numerous approaches to provide the mesh that best meets the physics, whether it be:

- ▶ Coarse mesh on over-detailed geometry for NVH
- ▶ Tailored mesh to capture details in the model that are important and to neglect those that are less important for a durability model
- ▶ Highly orthogonal mesh where minimum edge length and element size are well controlled for large deformation models
- ▶ 2-D axisymmetric models



Feature-based surface meshing.

ANSYS meshing is used in a variety of applications. The following provides some examples of the benefits in the specific industry sectors:

Aerospace

- ▶ Stick models for simplified model analysis
- ▶ Variable shell mid-surfacing and thickness assignment
- ▶ Structured hex meshing
- ▶ Hybrid meshes of hex, tet, shells and transitional elements
- ▶ Robust boundary layer meshing
- ▶ Large mesh models (100+ million elements)

Appliances

- ▶ Invisible meshing for quick design alternatives
- ▶ Flexibility in meshing approaches and physics for varying geometry shape and complexity
- ▶ Flexible parametric modeling process
- ▶ Automatic contact setup

Automotive

- ▶ Extensive surface meshing routines for anything from batch meshing to highly controlled mesh editing
- ▶ Extremely powerful hex meshing to simplify or capture model details with pure hex mesh
- ▶ Hybrid meshes of hex, tet, shells and transitional elements
- ▶ Automated mid-surfacing and welding for large assemblies
- ▶ Robust boundary layer meshing
- ▶ Large mesh models (100+ million elements)

Chemical Processes

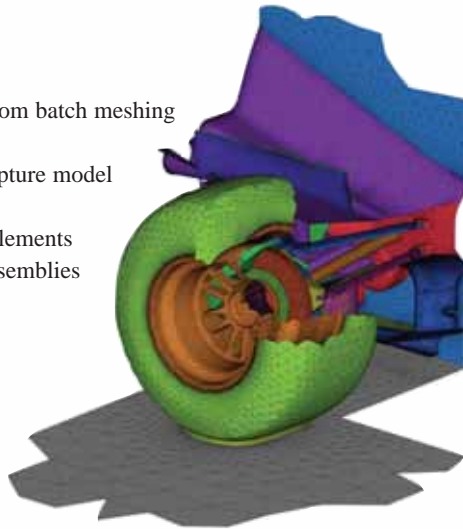
- ▶ Define number of elements through a thickness to ensure proper modeling through thin regions
- ▶ Anisotropic meshing to control stretch direction
- ▶ Ability to define symmetric meshing to ensure proper node alignment across periodic regions

Environmental

- ▶ Structured hex meshing for in-house solvers
- ▶ Mesh with/without geometry
- ▶ Use meshing to simplify over-detailed geometry models

Government/Defense

- ▶ Structured hex meshing for in-house solvers
- ▶ Mesh with/without geometry
- ▶ Stick models for simplified analysis
- ▶ Large mesh models (100+ million elements)



Product Features

Mesh Editing

- ▶ Connectivity checks
- ▶ Quality checks
- ▶ Mesh smoothing
- ▶ Mesh morphing
- ▶ Mesh repair tools
 - Topology checker
 - Remesh elements
 - Remesh bad elements
 - Remesh holes in mesh
 - Close holes from selecting
- ▶ Edges
 - Stitch edges
 - Locally smooth elements
- ▶ Merge volume meshes
- ▶ Merge nodes
 - Interactive
 - Tolerance
- ▶ Mesh splitting
 - Split nodes
 - Split edges
 - Swap edges
 - Split elements
- ▶ Node movement
 - Interactive
 - Project-to-surface
 - Project-to-curve
 - Project-to-point
 - Unproject
 - Tri-to-quad
 - Quad-to-tri
 - Tet-to-hex
 - Hex-to-tet
- ▶ Offset mesh
- ▶ Transformation
- ▶ Convert mesh types
- ▶ Adjust mesh density
 - Refinement
 - Coarsening
- ▶ Renumber mesh
- ▶ Variable mesh thickness
- ▶ Reorient mesh
- ▶ Delete elements/nodes

Product Features

Properties

- ▶ Material library
 - Isotropic
 - Temperature-dependent
 - Nonlinear
 - Anisotropic
 - Orthotropic
- ▶ Element properties
 - Mass
 - Rigid
 - Damper
 - Spring
 - Viscous damper
 - Bar
 - Beam
 - Rod
 - Gap
 - Shell
 - Shear
 - Composites
 - Solid
- ▶ Local coordinate systems

Constraints

- ▶ Imposed displacements
- ▶ Fixed constraints
- ▶ Rigid walls
- ▶ Initial velocity
- ▶ Automatic contact
- ▶ Manual contact

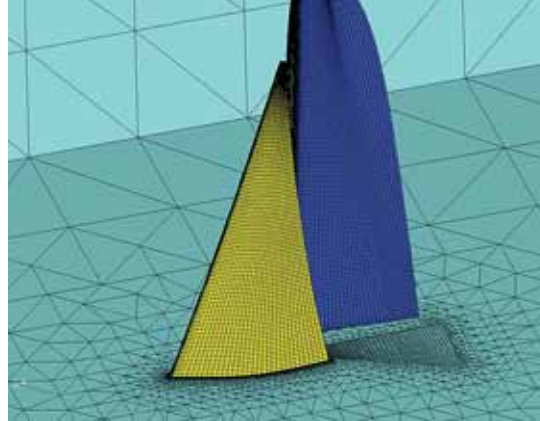
Loads

- ▶ Forces
- ▶ Moments
- ▶ Pressure
- ▶ Temperature
- ▶ Gravity

Post

- ▶ Modal/deformation animations
- ▶ Contour plots
- ▶ Hardcopies/AVIs/etc.
- ▶ XY plots
- ▶ Multiple views
- ▶ Point probes
- ▶ Animated streamlines
- ▶ Solution mapping

Image courtesy of University of Applied Science Kiel, Yacht Research Unit



Hybrid mesh of a sail/mast assembly.

Medical/Biomedical

- ▶ Ability to mesh directly to scan data
- ▶ Extremely powerful hex meshing to simplify or capture model details with pure hex mesh
- ▶ Stick models for simplified analysis
- ▶ Robust boundary layer meshing

Microelectronic

- ▶ Define number of elements through a thickness
- ▶ Anisotropic meshing
- ▶ Automated meshing of high aspect ratio structures

Power Generation

- ▶ Robust boundary layer meshing
- ▶ Structured hex meshing for in-house solvers
- ▶ Ability to define symmetric hex and/or tet meshing
- ▶ Large mesh models (100+ million elements)
- ▶ Flexible parametric modeling process

Related Products

ANSYS, Inc. provides a complete framework for meshing tools based on ANSYS® ICEM CFD™, CFX® and CADOE™ technologies. With the ANSYS® Workbench™ interface, users can access meshing tools in a unified environment tailored to the user's experience.

Please visit www.ansys.com/products for more information.

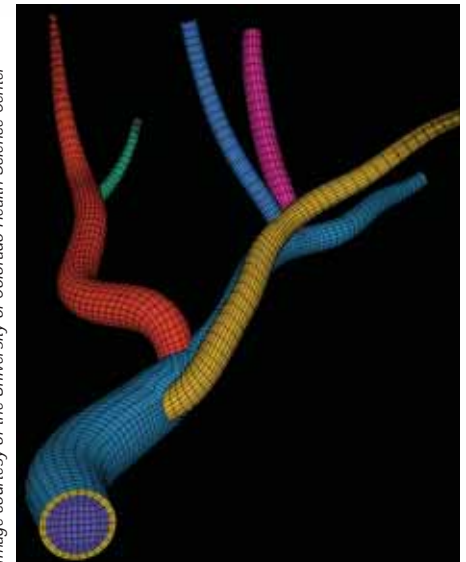
HVAC & Refrigeration

- ▶ Robust boundary layer meshing
- ▶ Structured hex meshing
- ▶ Ability to define symmetric hex and/or tet meshing
- ▶ Hybrid meshing consisting of tet/hex meshes with pyramid transitions

Marine

- ▶ Robust boundary layer meshing
- ▶ Structured hex meshing
- ▶ Ability to define symmetric hex and/or tet meshing
- ▶ Flexible parametric modeling process

Image courtesy of the University of Colorado Health Science Center



The ability to create meshes using geometry data from scan is critical for biomedical applications. Shown is a hex mesh of an artery bifurcation.