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ANSYS中国技术大会  
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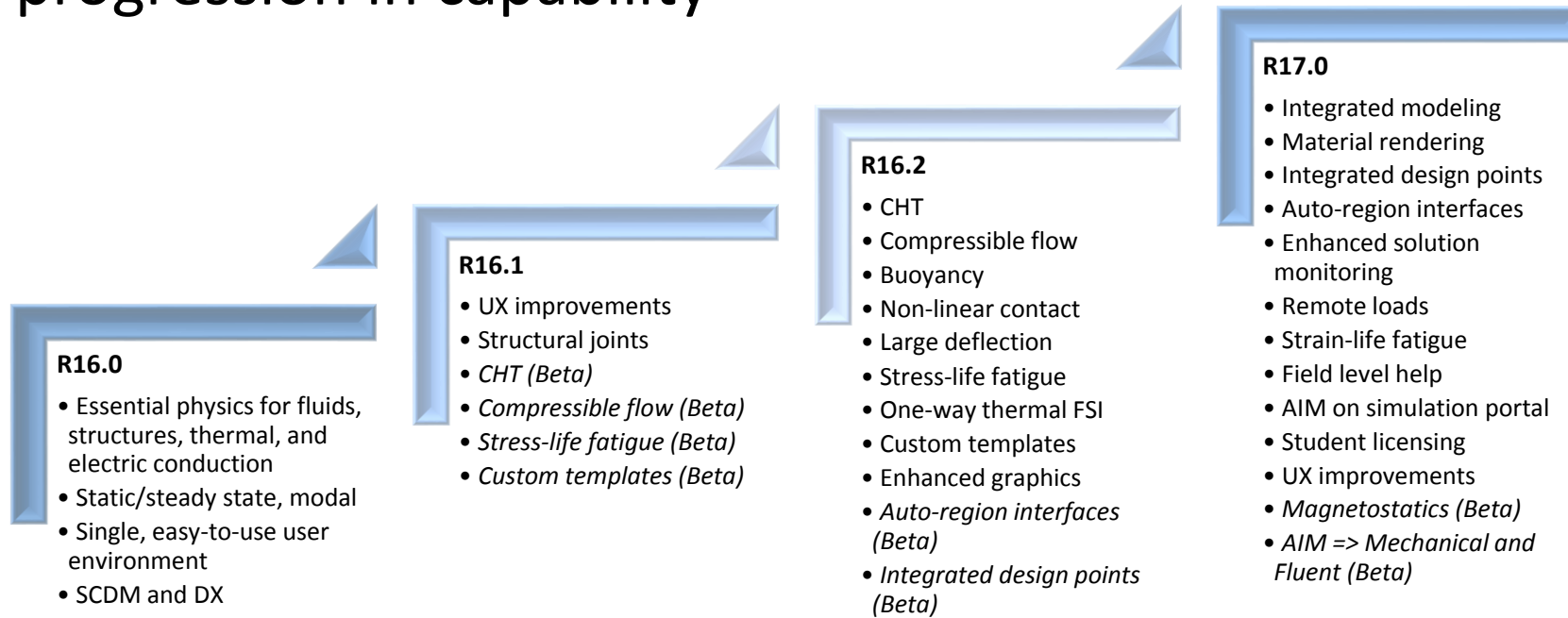
## ANSYS AIM技术专题培训

- 徐志敏 / 应用工程师
  - ANSYS China

# 目录

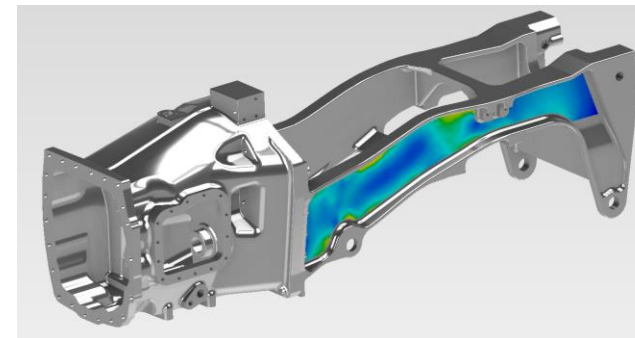
- AIM R17新功能介绍
- ANSYS AIM 案例分享
  - 实例演示

- Rapid progression in capability

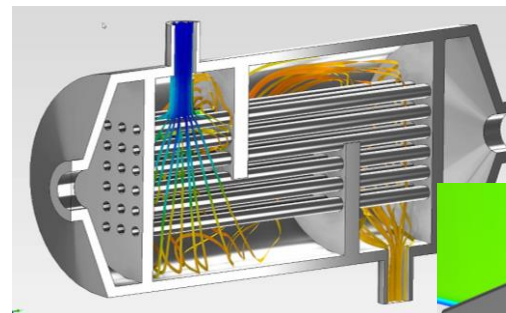


# AIM 17.0 New Features

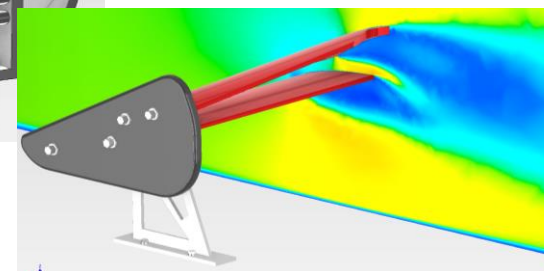
- Integrated geometry modeling
- Integrated design points
- Material based rendering
- Strain life fatigue
- Remote loads
- Auto-region interface generation
- Enhanced solution monitoring
- Field level help
- Enhanced one-way thermal FSI
- Project wizards
- AIM Student version



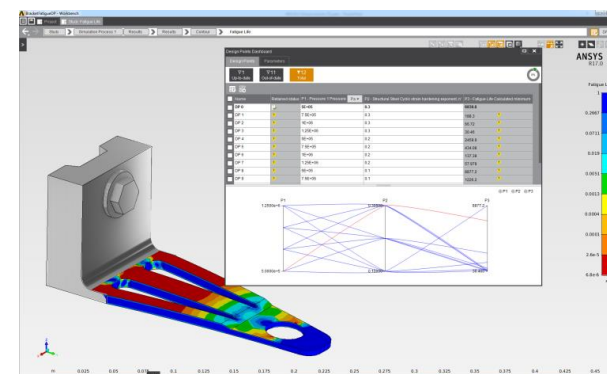
*Stress in Clutch Housing*



*Heat Exchanger Cooling*



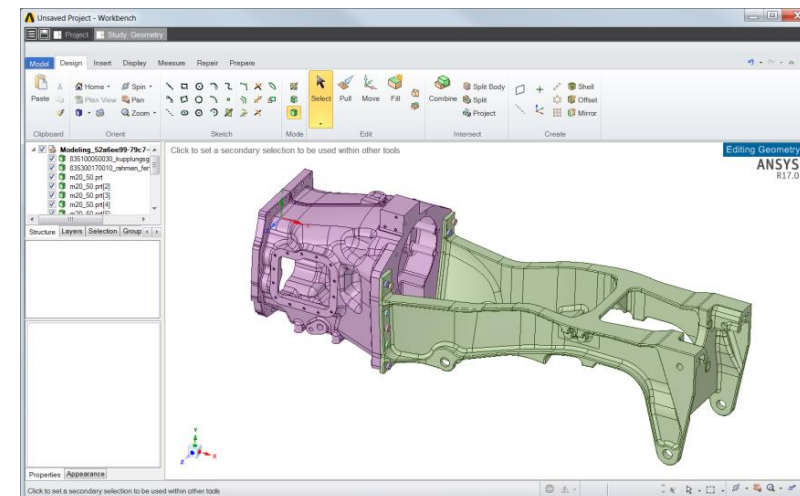
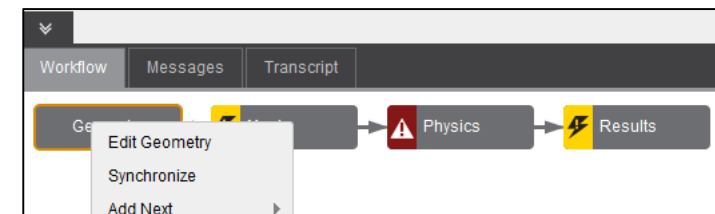
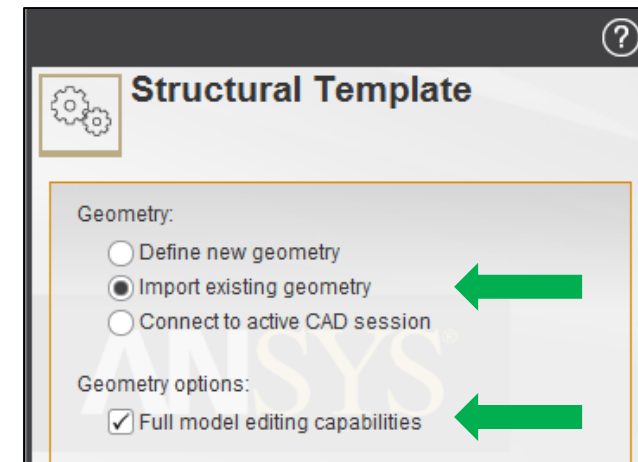
*Airfoil Performance*



*Fatigue Life Assessment*

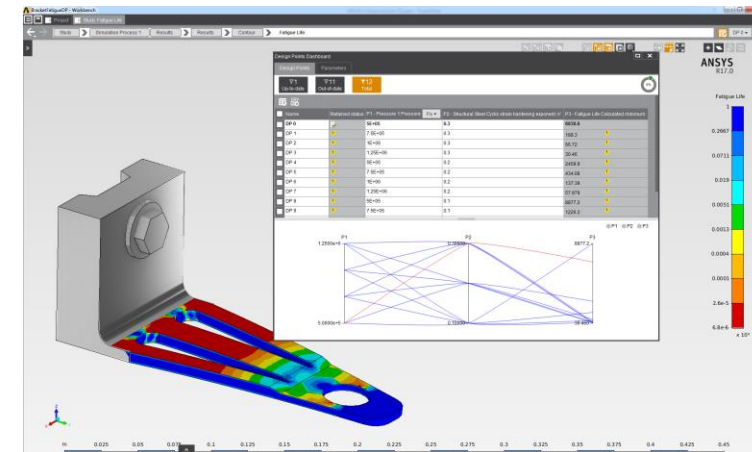
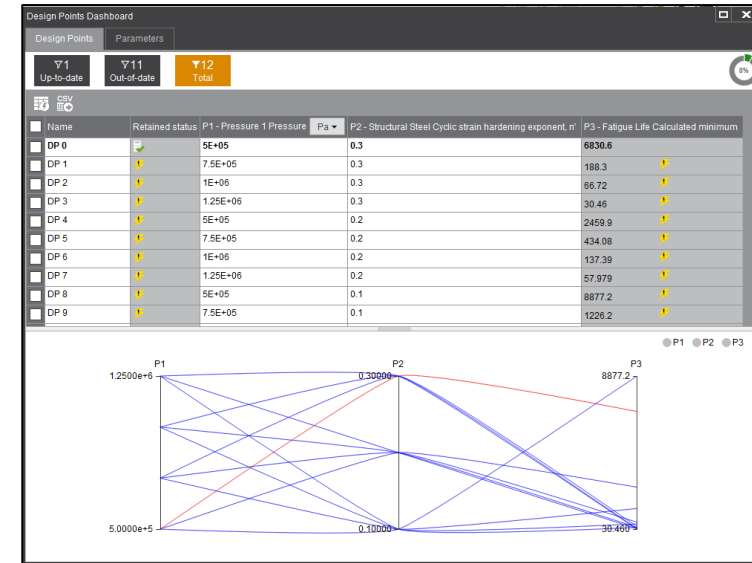
# Integrated Geometry Modeling

- Geometry modeling via SCDM is directly accessible from within AIM Study
  - Templates updated to reflect new import and geometry editing options
  - Familiar SCDM environment for geometry creation and editing
  - Directly add geometric parameters
  - Faster geometry updates



# Integrated Design Points

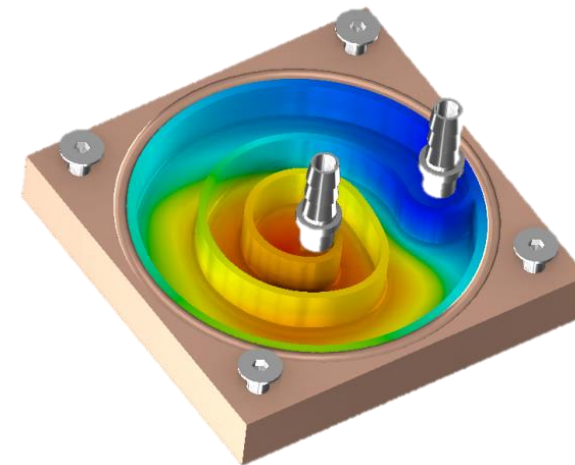
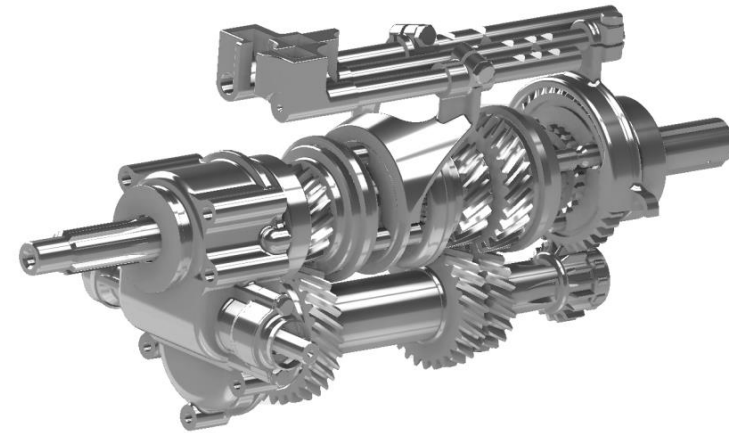
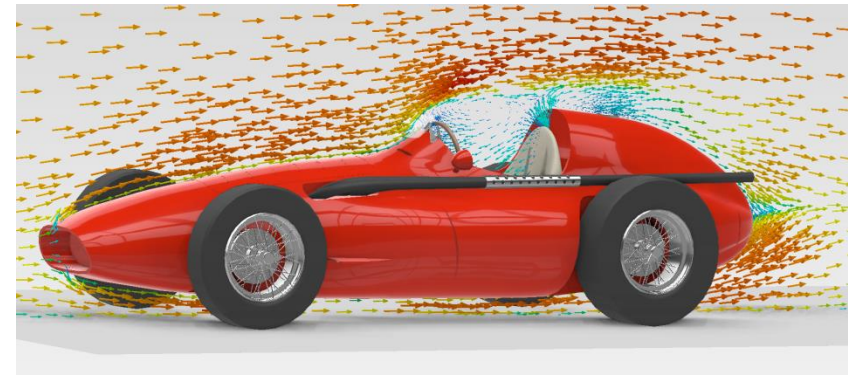
- Design point studies can be performed directly within AIM UI
  - New Design Point Dashboard
  - Manage, update and review design points on Dashboard
  - Retrieve full field data for selected design points



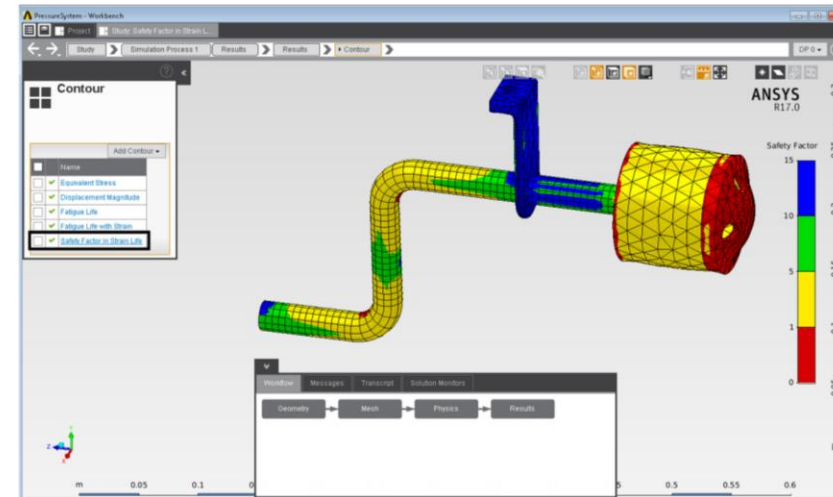
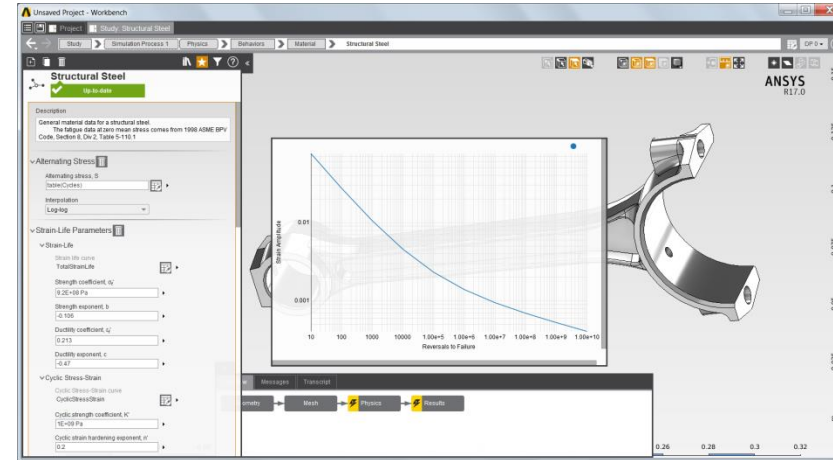


# Material Based Rendering

- Enhanced display renders bodies based on material appearance
  - Appearance settings included for many common materials
  - Beta option allows modification of appearance settings for materials
- Enhanced display can be used at any stage in the simulation process
  - All other graphics interactions, like selection, remain available



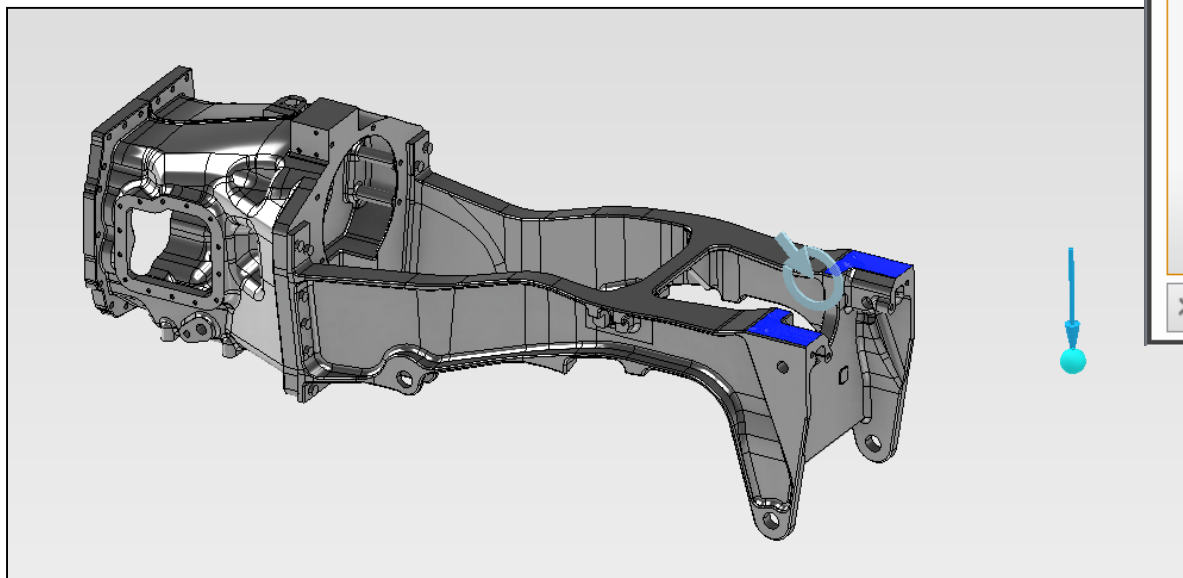
- Strain Life Fatigue
  - Guided template for fatigue analysis (stress life or strain life)
  - Fully reversed, zero, prescribed ratio and scale factor loading
  - Results include fatigue life, damage, safety factor, biaxiality indication and equivalent alternating stress





# Remote Loads

- Apply force loads remotely
  - Apply remotely on topology or point
  - Body, face or edge selection uses centroid of selected topology



**Force 1**  
Up-to-date

Location  
2 faces

☒ Apply remotely from originating point

Originating point location  
Point 1

Reference frame  
Global Reference Frame

Define by ?  
Directional components

Coordinate type  
Cartesian

X  
0 N

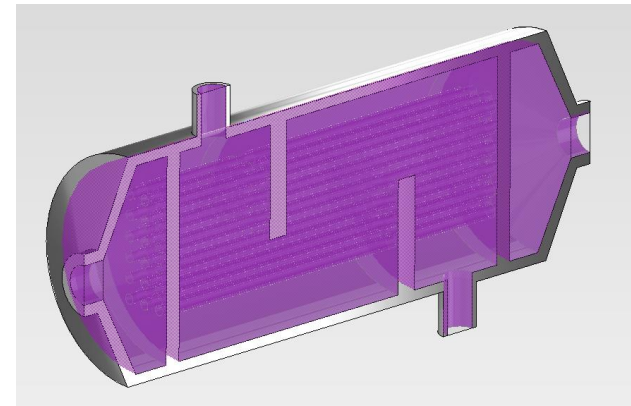
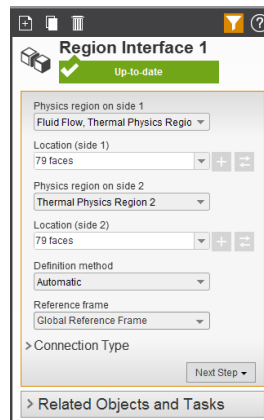
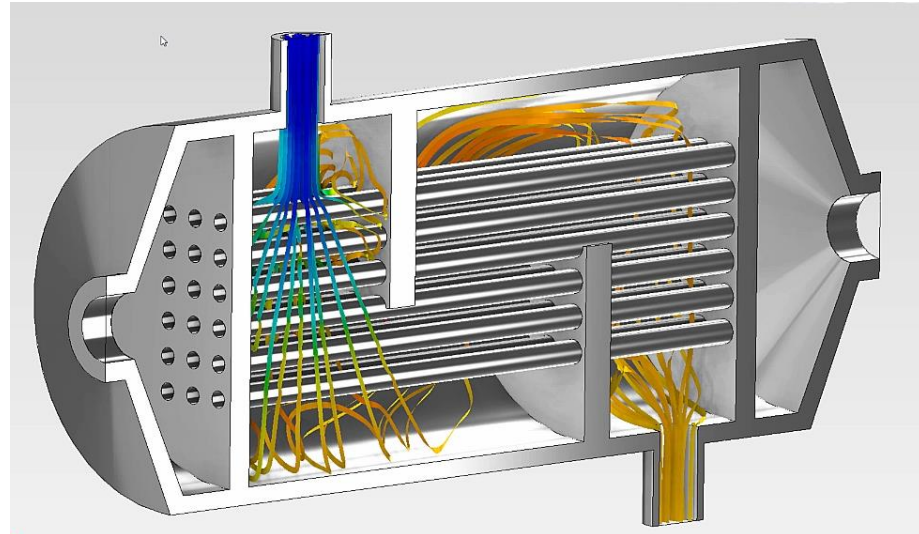
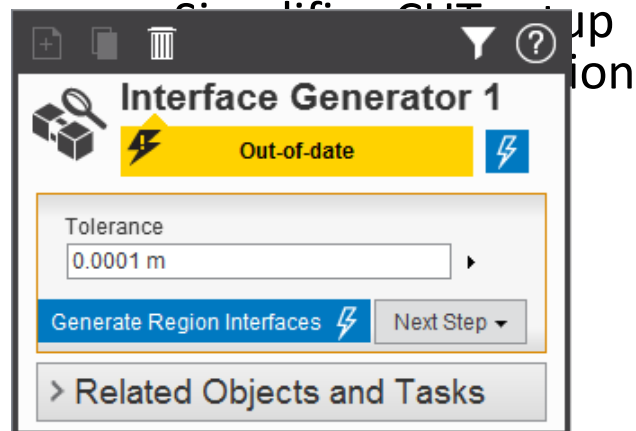
Y  
-10000 N

Z  
0 N

Next Step

> Related Objects and Tasks

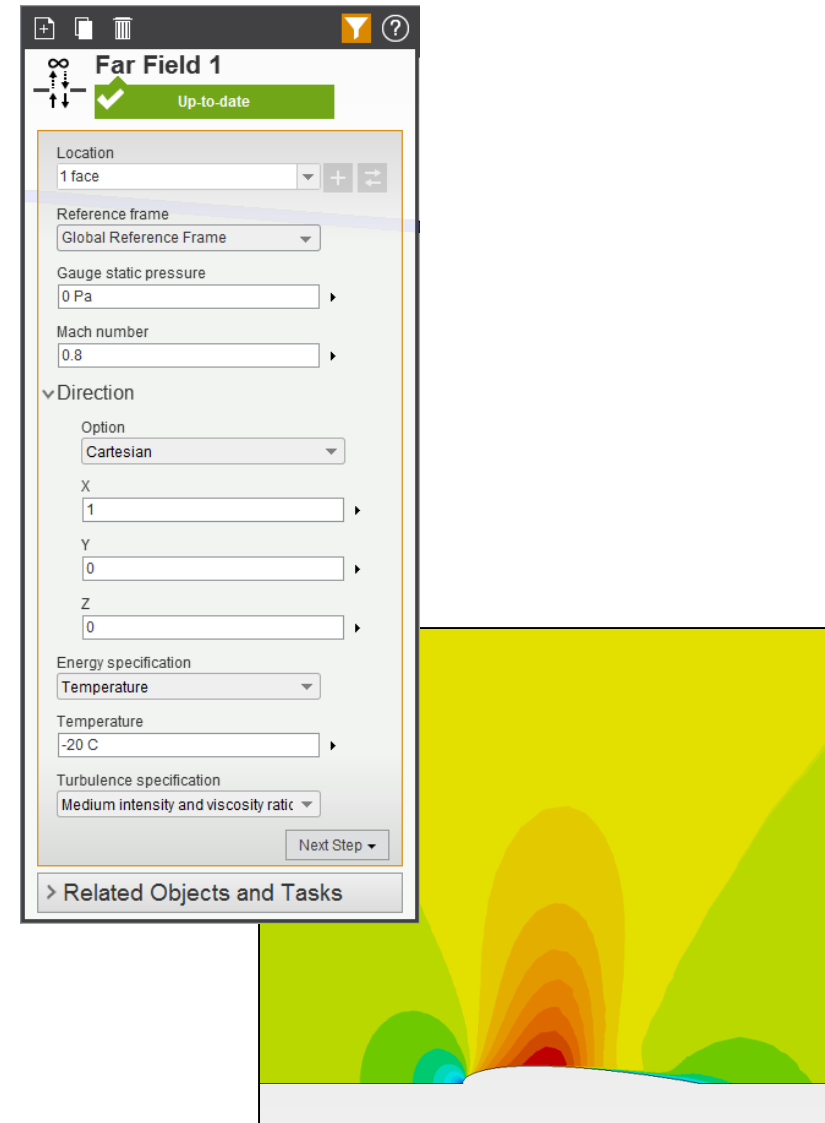
- Automatic region interface generation for CHT
  - Based on surface proximity
  - Included as part of CHT template or add Generator



***Heat exchanger model shown with automatically generated region interface based on surface proximity.***

# Far Field Boundary Condition

- Models free-stream compressible flow at infinity
  - Specify location, free-stream Mach number, static pressure, flow direction and temperature
  - Actual boundary values are computed using far field specification and local flow conditions
  - Applicable for compressible flows using the ideal gas law



*Compressible flow over an airfoil solved using far field boundary condition.*

# Improved Fluid Initial Conditions

- Initial conditions better aligned with boundary condition options
- Can be specified as 'Automatic' or 'User defined'

Initial Conditions 1

Up-to-date

Reference frame  
Global Reference Frame

Flow specification  
Automatic

Turbulence  
Automatic

Energy  
Automatic

Next Step

> Related Objects and Tasks

Initial Conditions 1

Up-to-date

Reference frame  
Global Reference Frame

Flow specification  
Static pressure and velocity

Gauge static pressure  
20 Pa

Velocity

Option  
Cartesian components

X  
1.5 m s<sup>-1</sup>

Y  
0 m s<sup>-1</sup>

Z  
0.5 m s<sup>-1</sup>

Turbulence  
Automatic

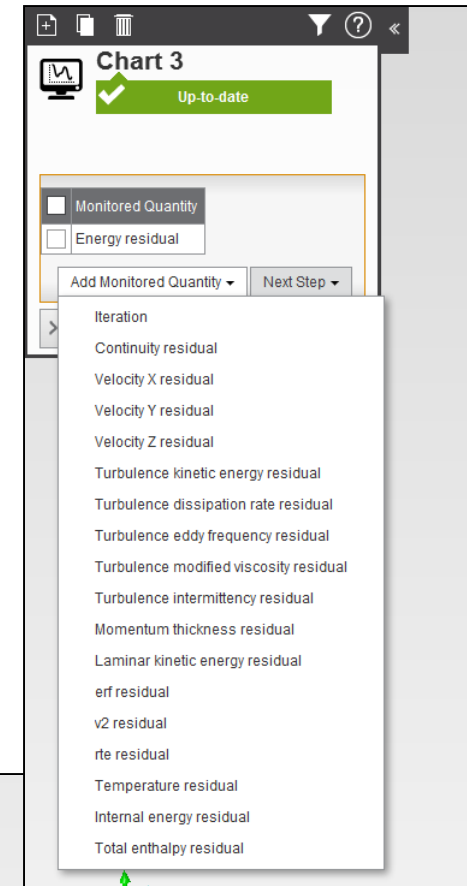
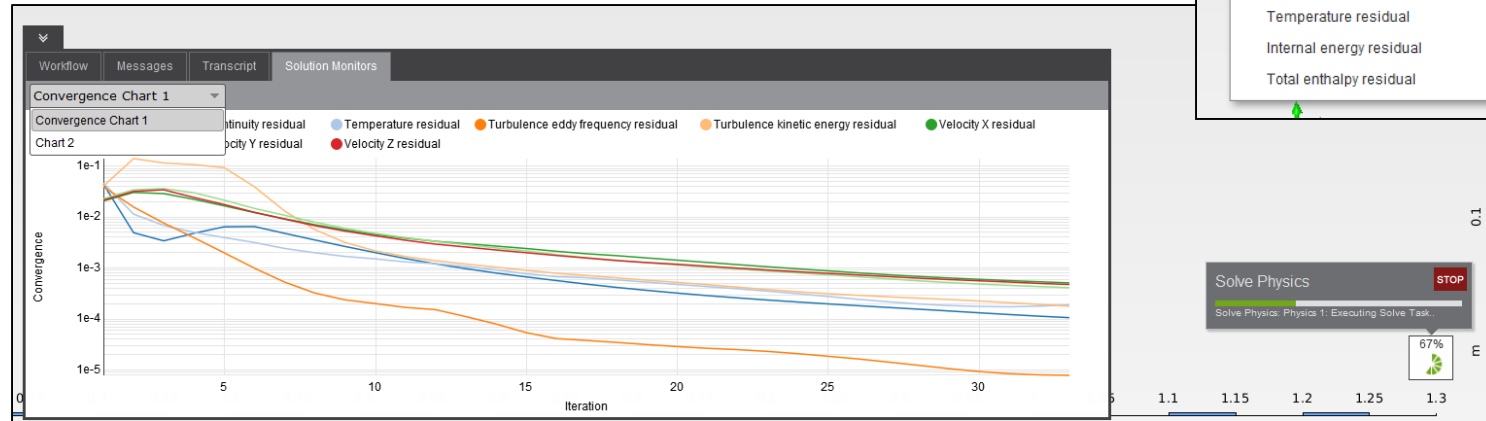
Energy  
Automatic

Next Step

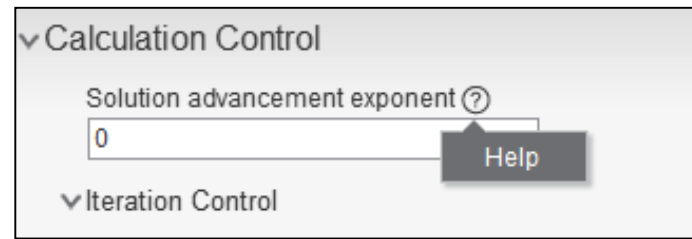
> Related Objects and Tasks

# Enhanced Solution Monitoring

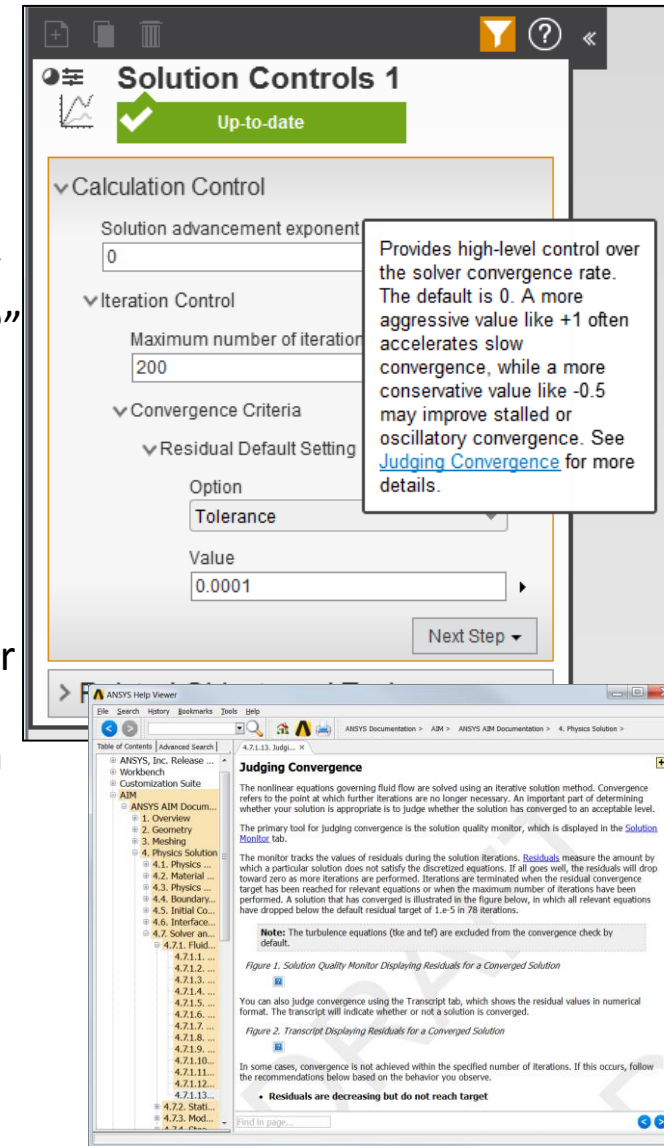
- Add multiple convergence and residual monitors
- Review multiple charts during solution update
- Convergence monitors available for all non-linear physics
- Interrupt, interrogate results and continue from interrupted state for all physics



- Easily accessible help for any property
  - Hover over property name to expose “?” symbol

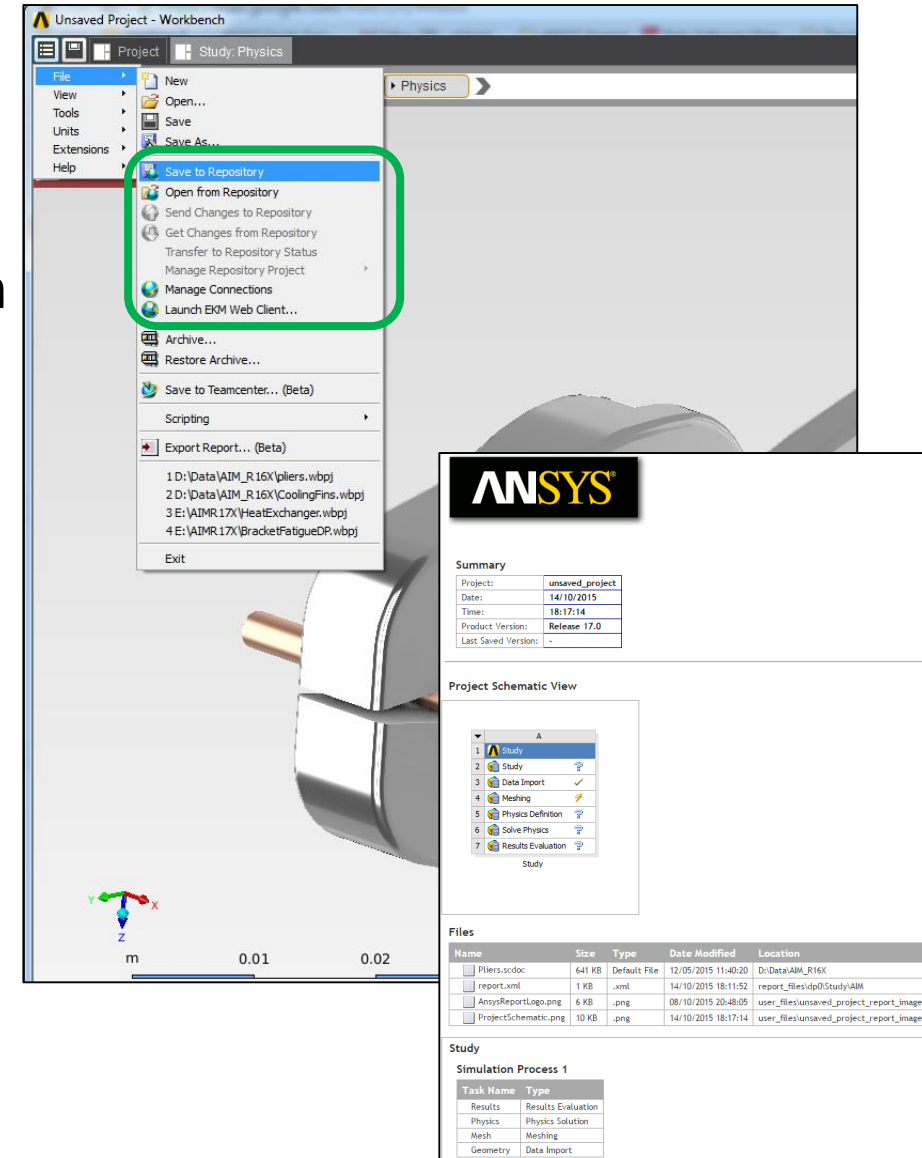


level help for  
documentation  
for more detailed information





- Connect to the Simulation Portal (EKM) from AIM
  - Archive and restore AIM projects
  - AIM summary reports available



The screenshot shows the ANSYS Workbench interface. The 'File' menu is open, and the 'Save to Repository' option is highlighted with a green box. The right panel displays a summary report for the project 'unsaved\_project'.

**Summary**

Project:	unsaved_project
Date:	14/10/2015
Time:	18:17:14
Product Version:	Release 17.0
Last Saved Version:	-

**Project Schematic View**

The schematic view shows a sequence of steps: 1. Study, 2. Study, 3. Data Import, 4. Meshing, 5. Physics Definition, 6. Solve Physics, 7. Results Evaluation.

**Files**

Name	Size	Type	Date Modified	Location
Pliers.scdoc	641 KB	Default File	12/05/2015 11:40:20	D:\Data\AIM_R16X
report.xml	1 KB	.xml	14/10/2015 18:11:52	report_files\dp0Study\AIM
AnsysReportLogo.png	6 KB	.png	08/10/2015 20:48:05	user_files\unsaved_project_report_images
ProjectSchematic.png	10 KB	.png	14/10/2015 18:17:14	user_files\unsaved_project_report_images

**Study**

**Simulation Process 1**

Task Name	Type
Results	Results Evaluation
Physics	Physics Solution
Mesh	Meshing
Geometry	Data Import

# Enhanced Mapping for FSI

- Radial basis function mapping for volumetric temperature data
  - Provides greater accuracy with a higher computational cost versus default nearest node algorithm
  - Diagnostic information to assess quality of temperature mapping

PhysicsCoupling 1		
Interface Mapping Diagnostics		
Source		
Nodes Used In Mapping [%] :		12
Temperature Average [K] :	3.109651E+02	
Target		
Nodes Mapped Using		
Nearest Node [%] :	23	
Radial Basis Function [%] :	77	
Temperature Average [K] :	3.085696E+02	

+

🗑️

🔍

?

Physics Coupling 1

Up-to-date

Physics region on source

Steel - Thermal

Location (source)

AllCouplingSourceBodies()

Physics region on target

Structural Physics Region 4

Location (target)

1 volume

+

↔

Variable Transfer To Target

Temperature

Mapping Control

Profile preserving algorithm

Option

Radial basis function

RBF Formulation

Option

Gaussian

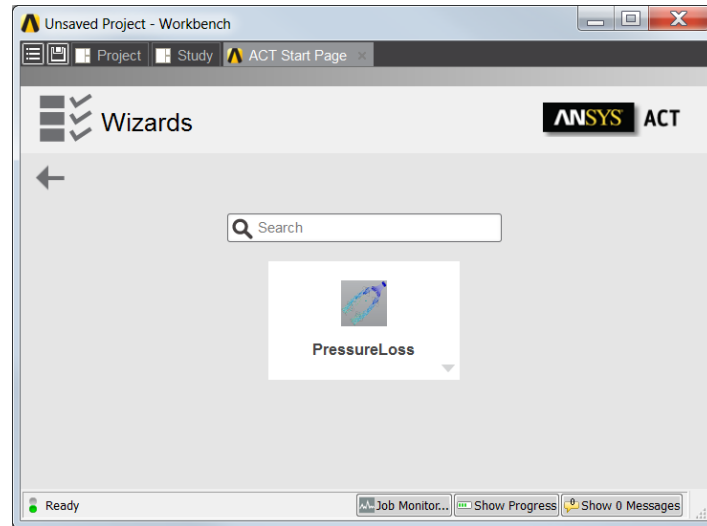
Shape parameter

5

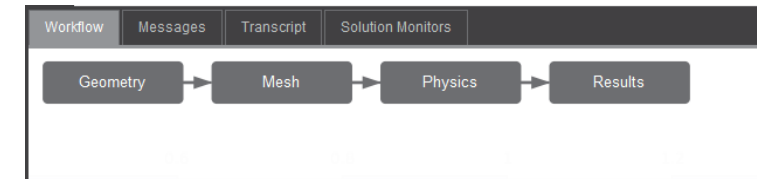
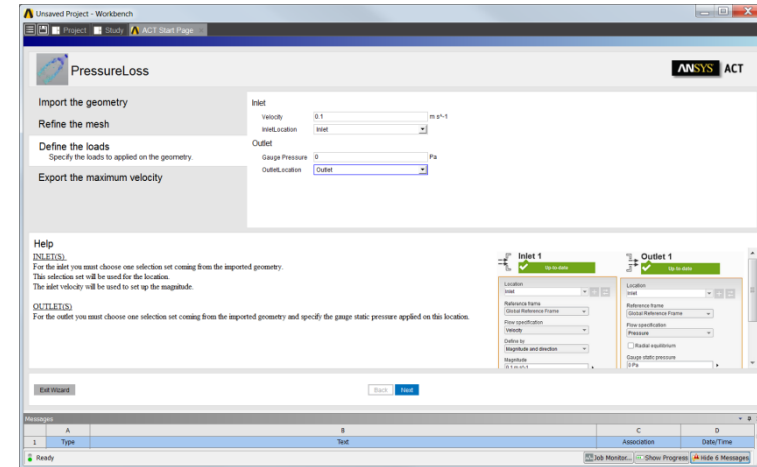
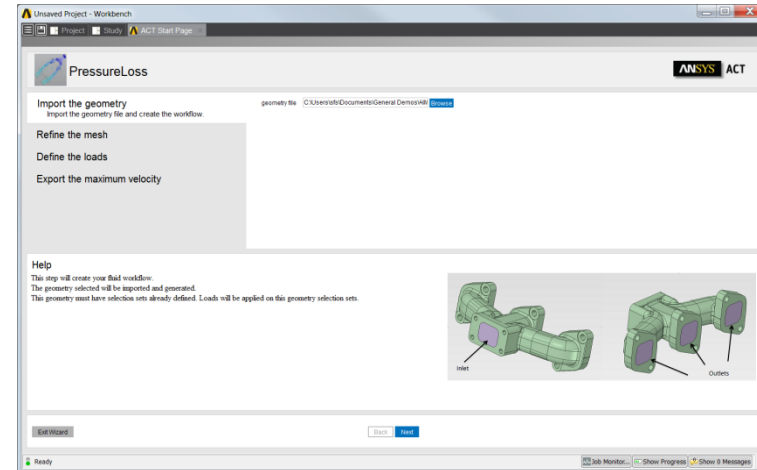
Next Step

Related Objects and Tasks

- AIM Project Wizards
  - Completely automates an AIM simulation
  - Walks a non-expert user through a simulation step-by-step

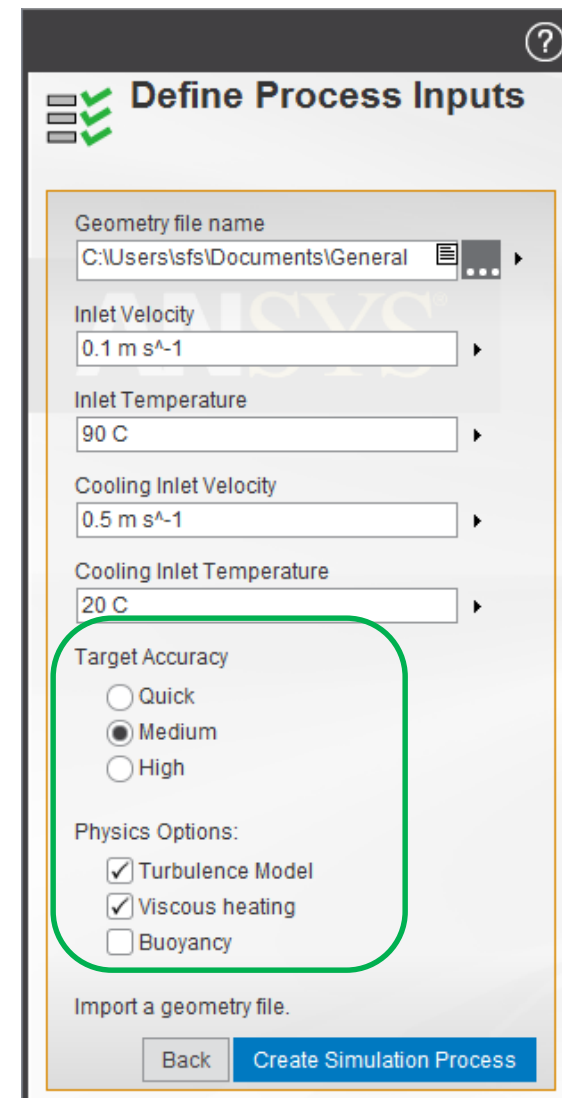
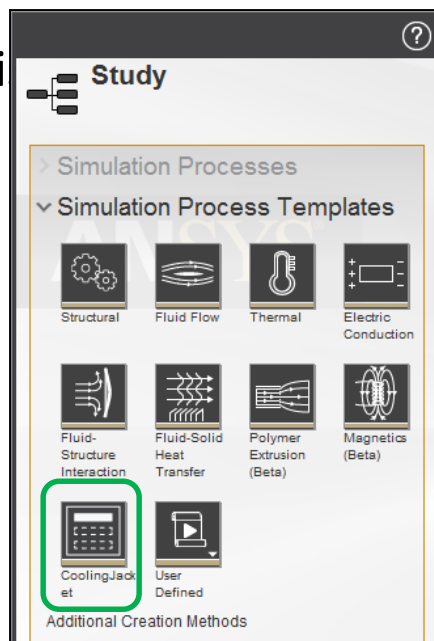


with

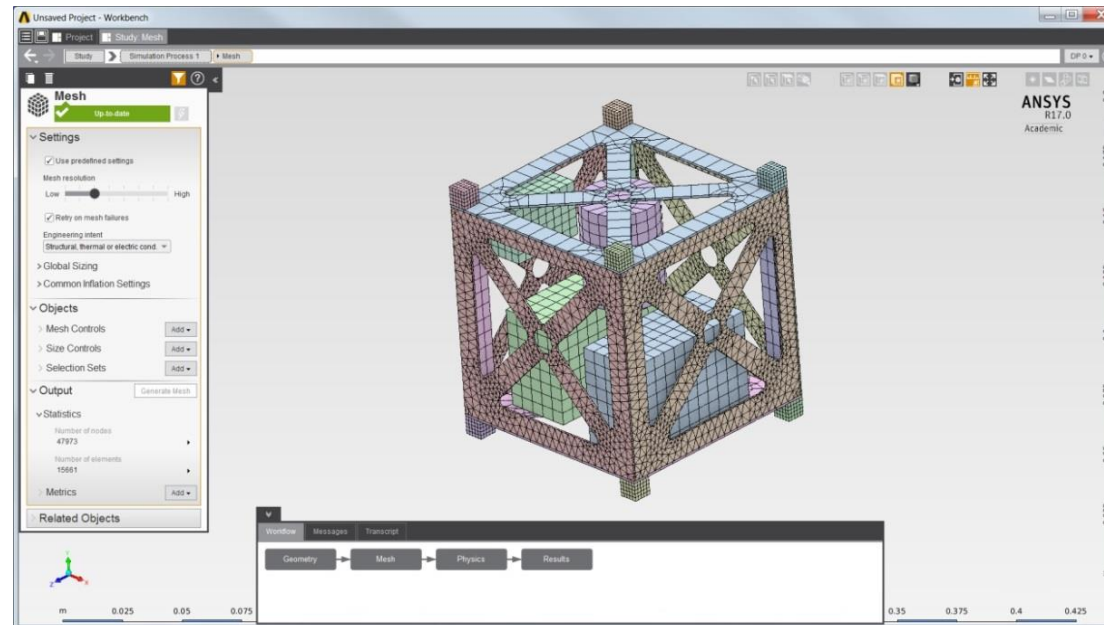


# Custom Simulation Process Templates

- Enhancements to custom simulation process templates
  - Field-level help
  - Radio lists
  - Multi-select li

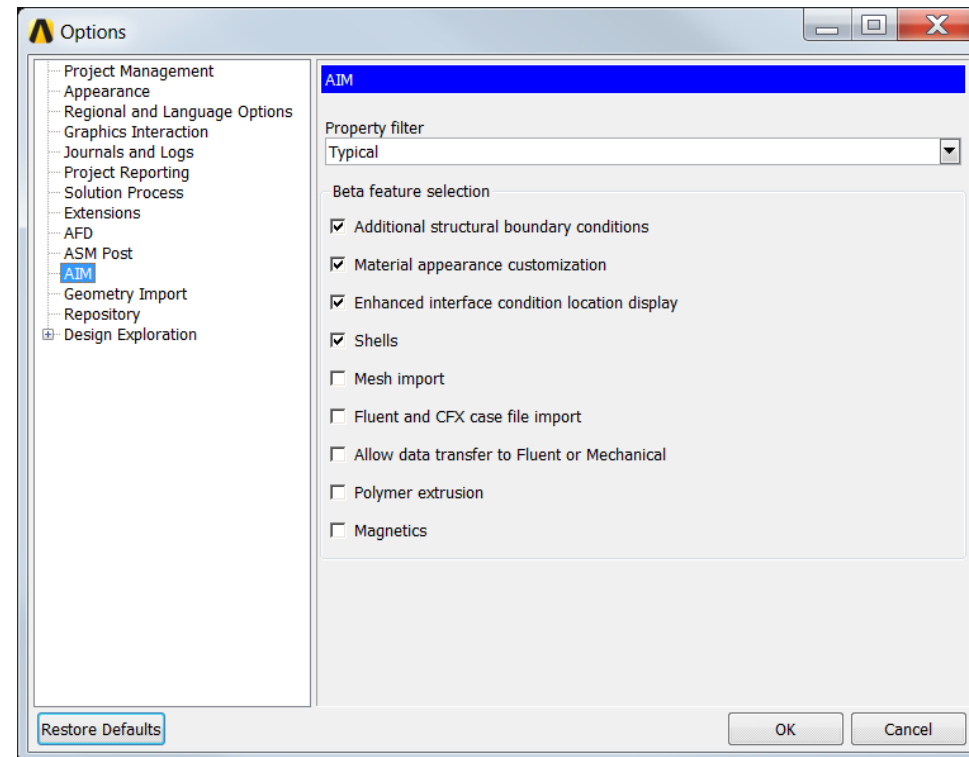


- Geometry, meshing and solution limited license
  - New license key (aa\_s\_aim)
  - Geometry modeling limited to 300 faces and 50 bodies
  - Structural, thermal and electric conduction meshing and solution limited to 100,000 nodes
  - Fluid meshing and solution limited to 1,000,000 nodes



# AIM 17.0 Beta Features

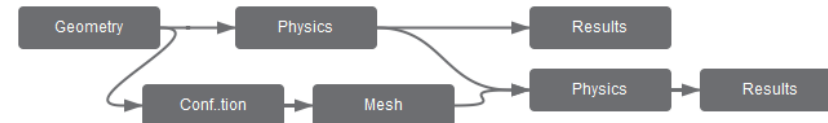
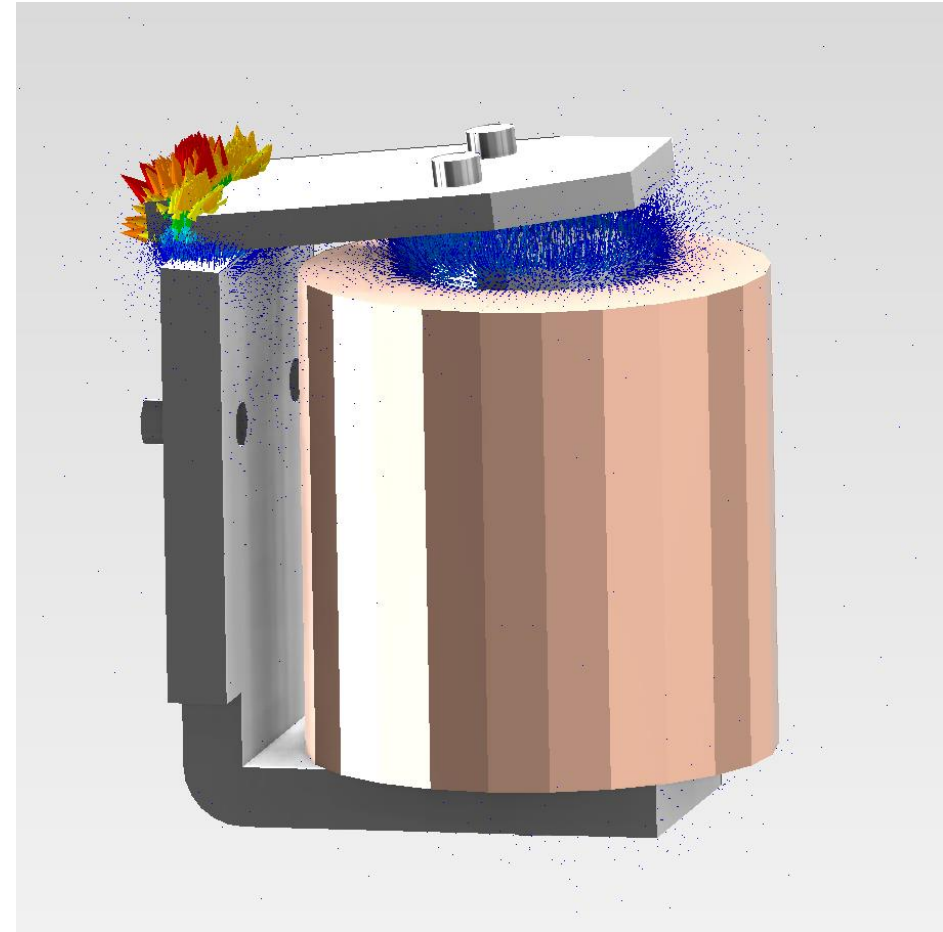
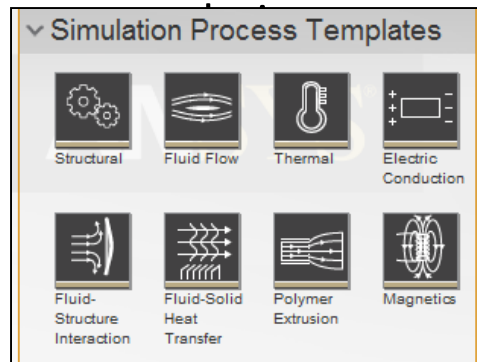
- Beta features can be activated by selecting Tools > Options > Appearance
- Beta features can be uniquely turned on or off
- For more information consult the AIM beta documentation available on the Customer Portal





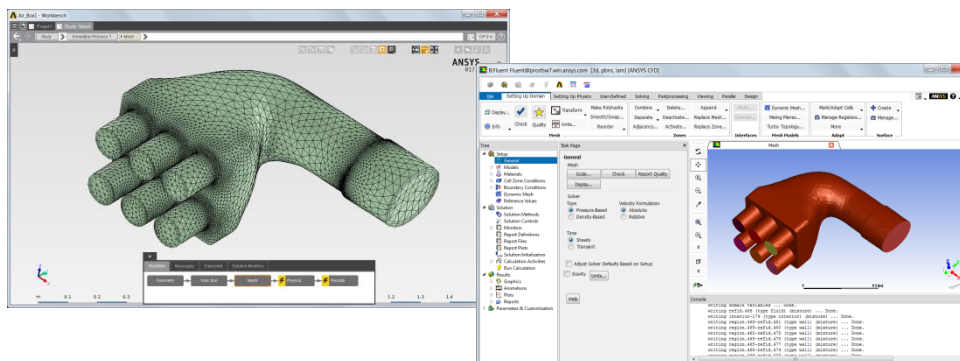
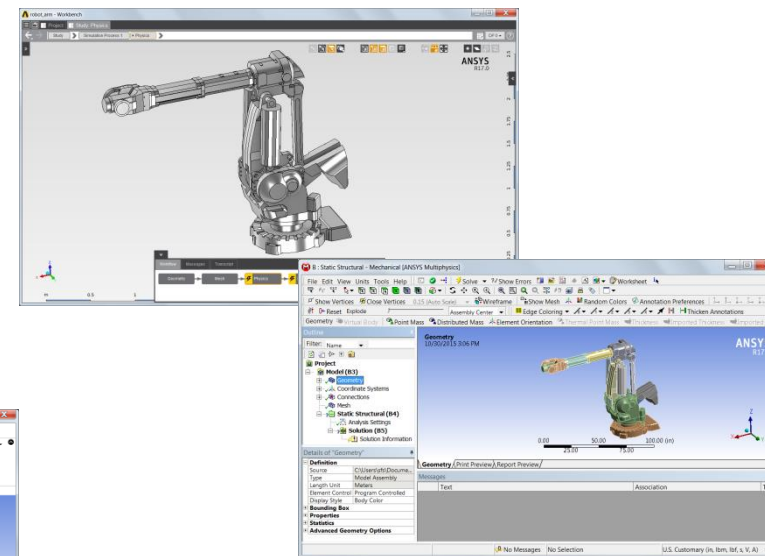
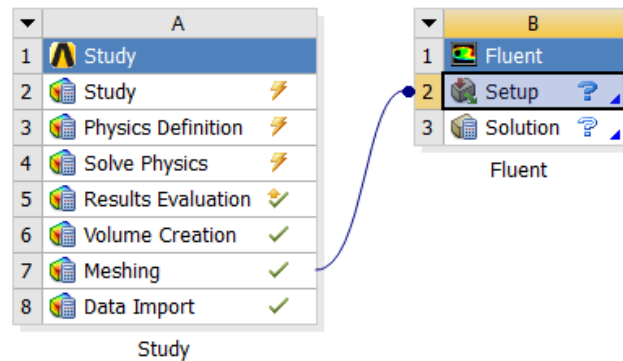
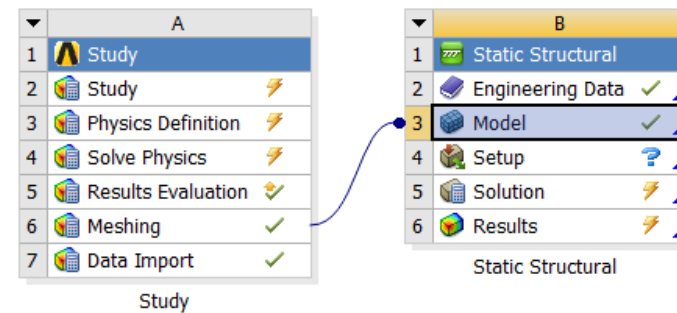
- Magnetostatics

- Compute magnetic flux density, magnetic field intensity, current density, Ohmic loss, magnetic force, torque and inductance
- Adaptive solution
- Insulating, terminal and winding boundary conditions
- Coupling with thermal




# Geometry and Mesh Transfer $\beta$

- Transfer geometry and mesh data from AIM to Fluent or Mechanical
  - Via Workbench schematic connect



# Material Appearance Customization $\beta$

- Customize material appearance properties
  - Included as part of material data
  - Customize RGB colors, roughness

▼ Appearance Properties (Beta) 

Color space (Beta)

Red color component (Beta)

Green color component (Beta)

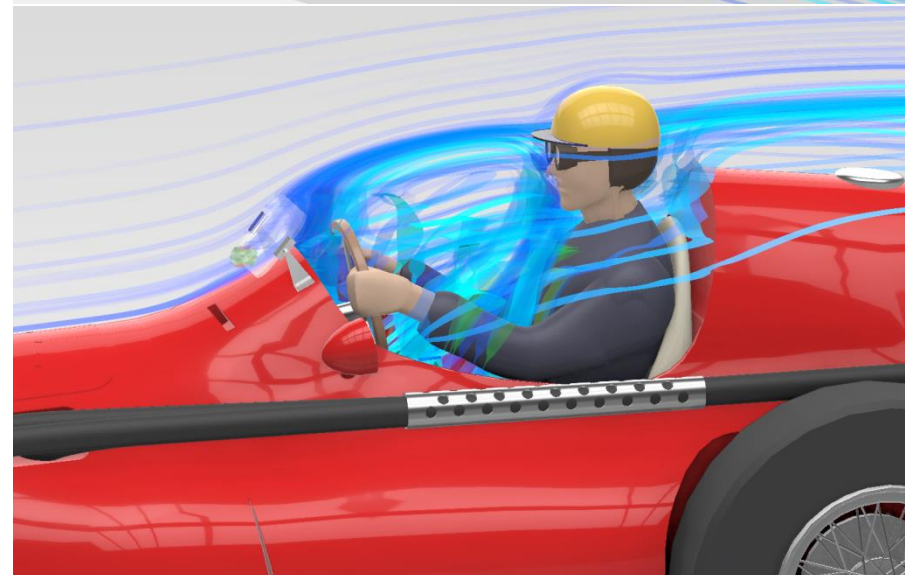
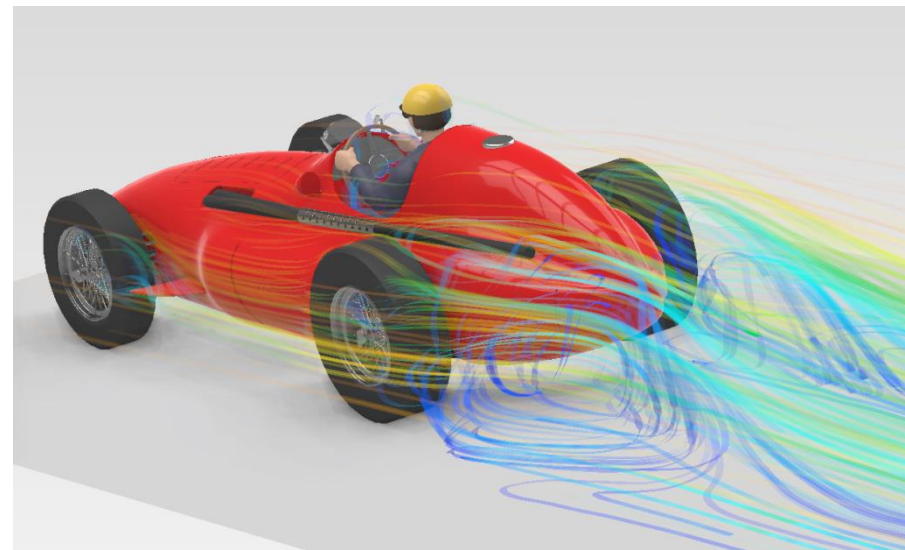
Blue color component (Beta)

Opacity (Beta)

Metallic (Beta)

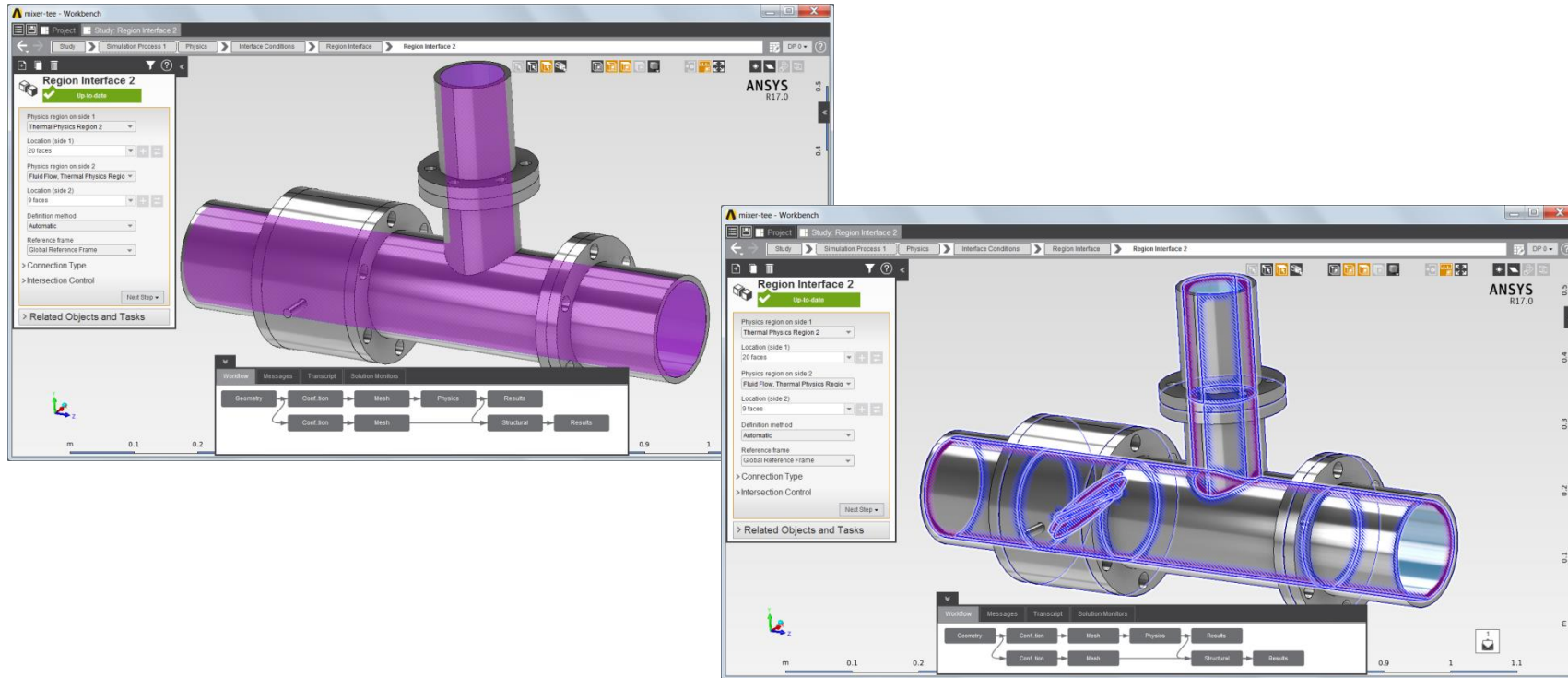
Roughness (Beta)

Transmittance (Beta)



# Enhanced Interface Condition Location Display $\beta$

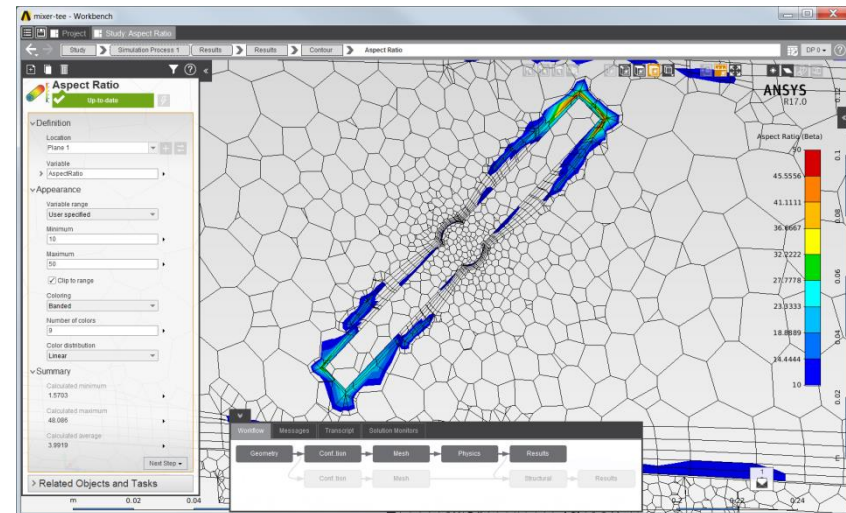
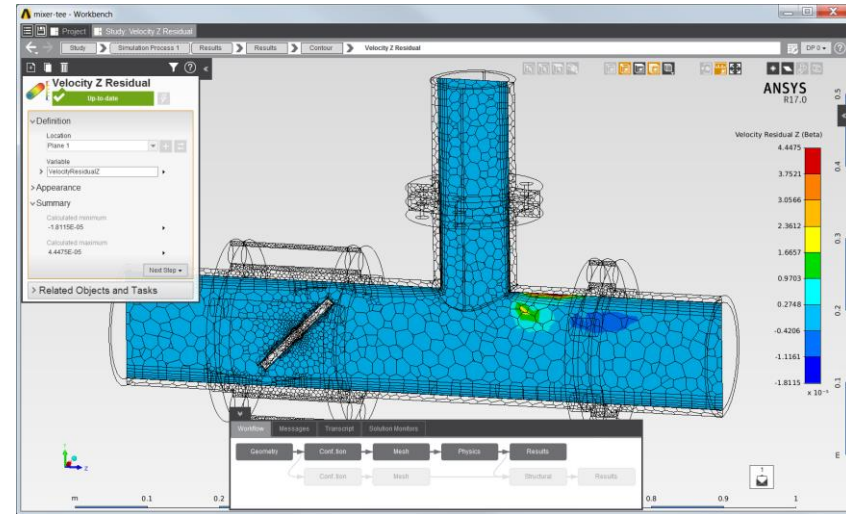
- Improved visualization of interfaces
  - Applicable to display of contact and





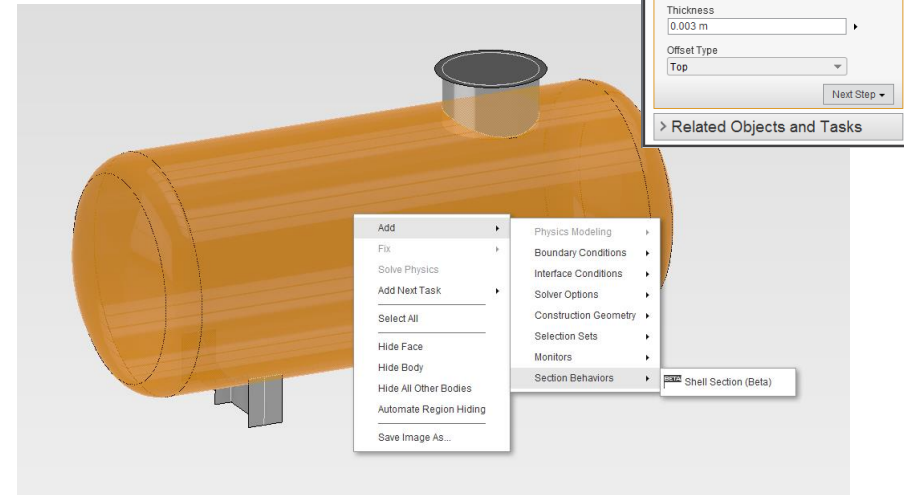
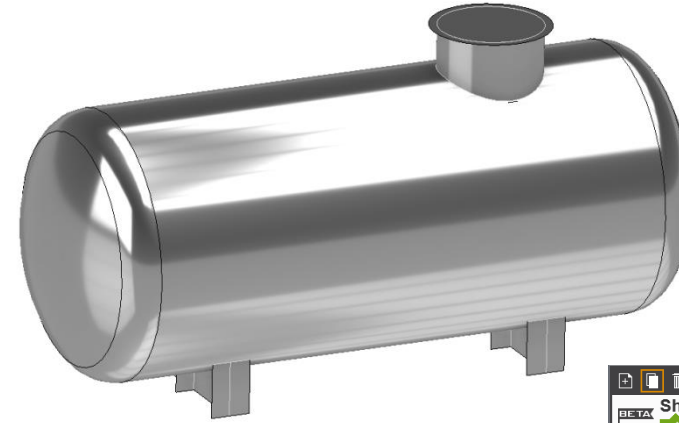
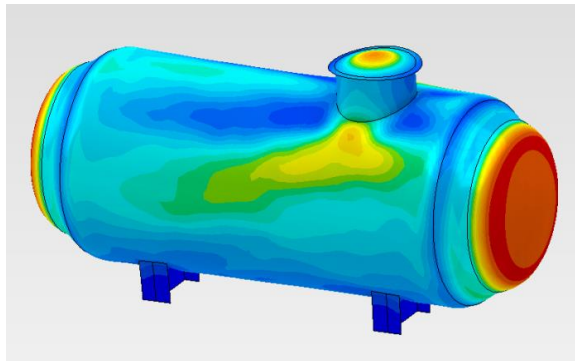
# Solution Residuals and Mesh Quality Plots $\beta$

- Available to post-process solution residuals and mesh quality metrics
- Evaluate mesh quality in regions where solution is struggling to converge or results are questionable



# Structural Shells $\beta$

- Shell modeling
  - Extract mid-surfaces using SCDM
  - Import surface bodies
  - Generate surface mesh
  - Specify shell sections on bodies via right-click context menu
  - Automatically define surface-to-surface contact
  - Manually define edge-to-surface and edge-to-edge contact
  - Post-processing limited to displacement data



**Shell model of a tank with an internal pressure load.**



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