

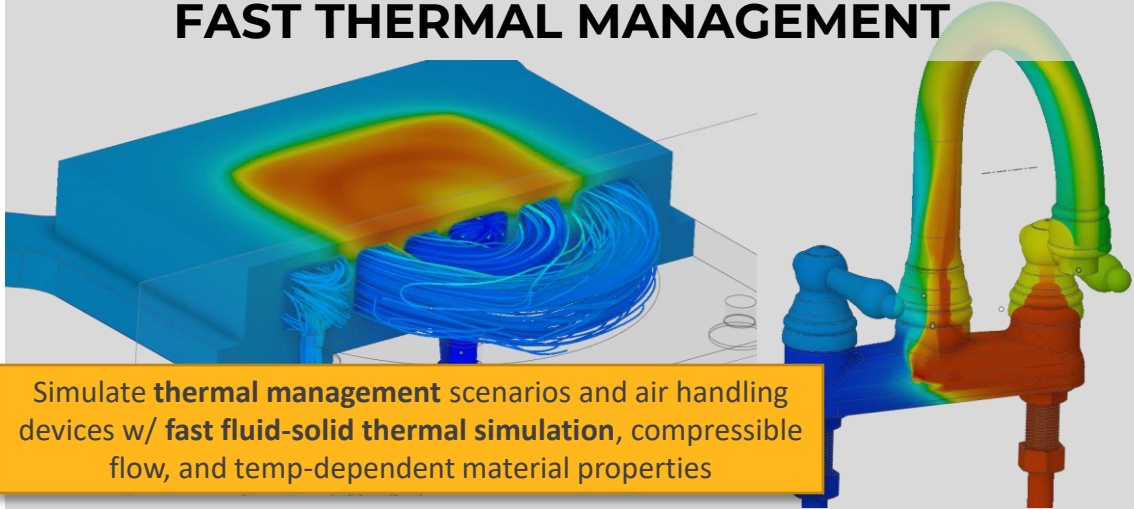
Release 2022 R1 Highlights

Ansys Discovery



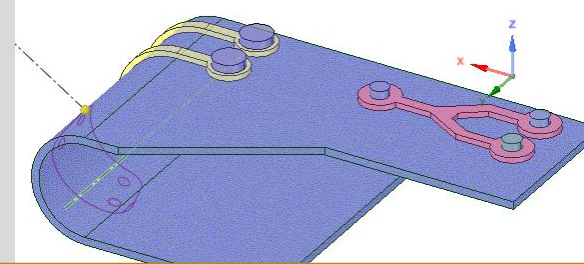
Discovery 2022 R1 Overview

FAST THERMAL MANAGEMENT

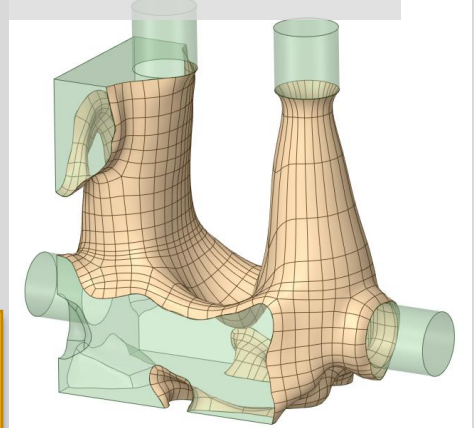


Simulate **thermal management** scenarios and air handling devices w/ **fast fluid-solid thermal simulation**, compressible flow, and temp-dependent material properties

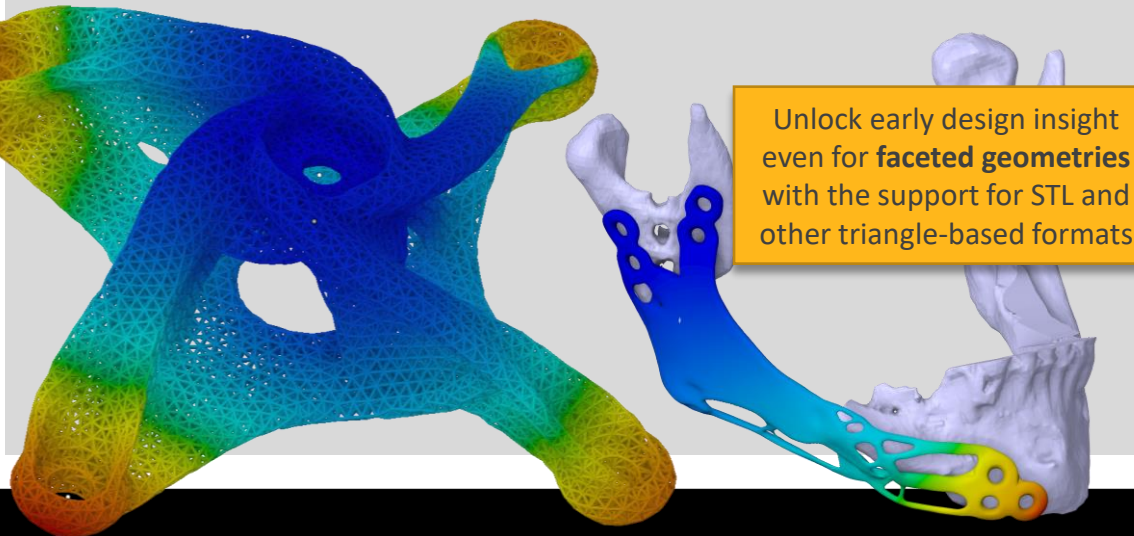
MODEL PREP FOR THE ANALYST



Extract **beams and midsurfaces**, wrap flex cabling, & model micro scale parts

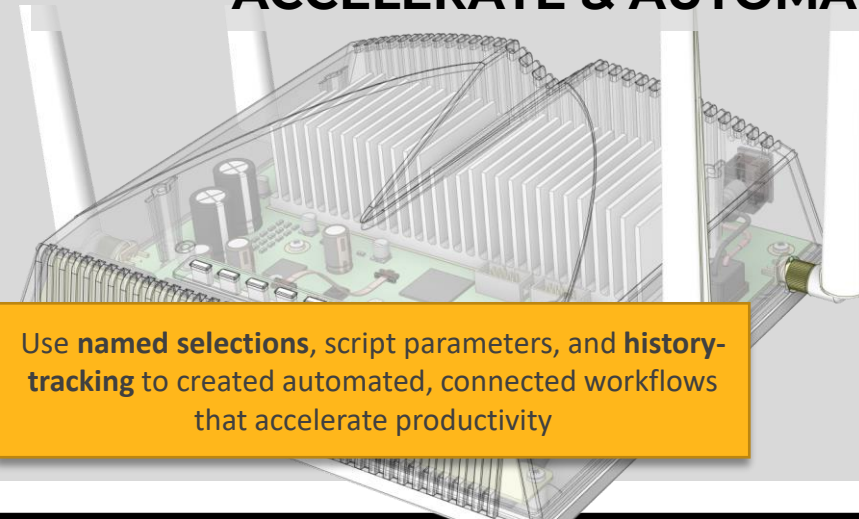


FACETED GEOMETRY



Unlock early design insight even for **faceted geometries** with the support for STL and other triangle-based formats

ACCELERATE & AUTOMATE



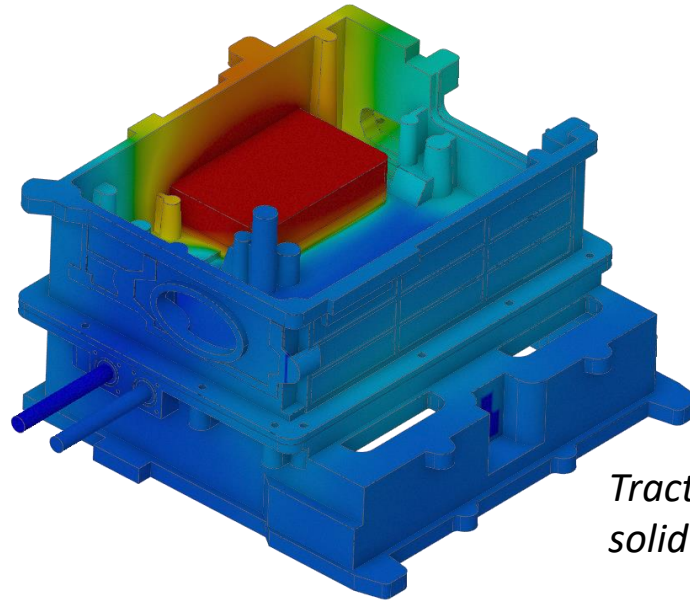
Use **named selections**, script parameters, and **history-tracking** to create automated, connected workflows that accelerate productivity



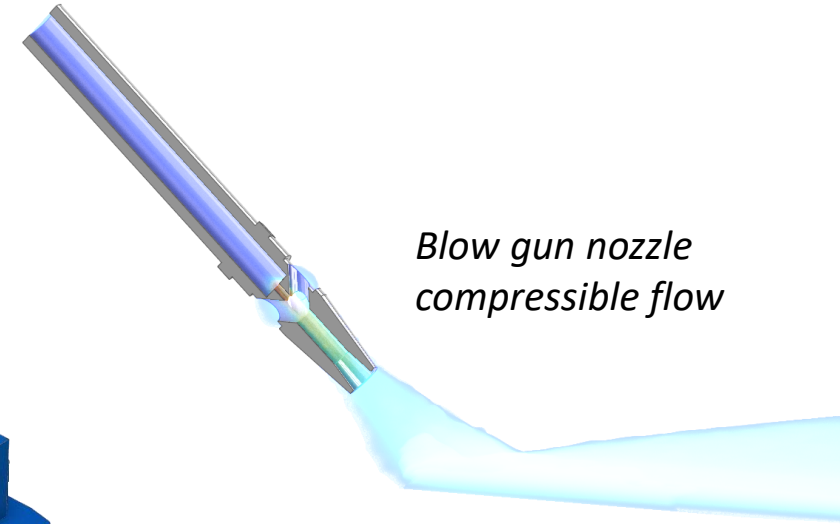
Physics Enhancements

Discovery 2022 R1 New Physics Features

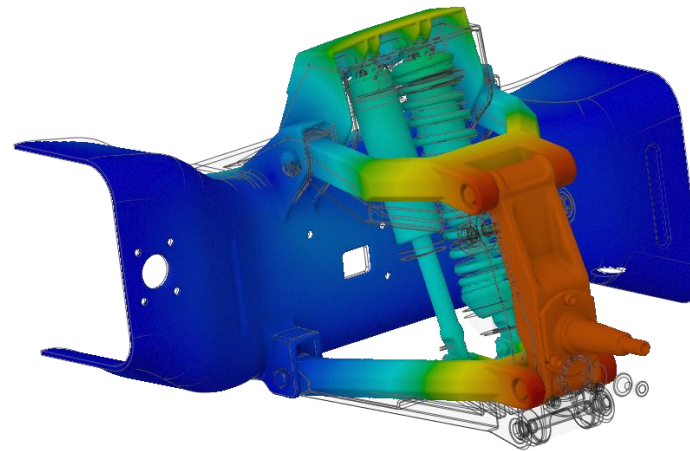
- Fluid-solid thermal simulation
- Compressible flow
- Hinge and spherical joints
- Spring connections
- Simulation units
- Temperature dependent materials
- Faceted body simulation
- Postprocessing enhancements



Traction inverter fluid-solid thermal simulation



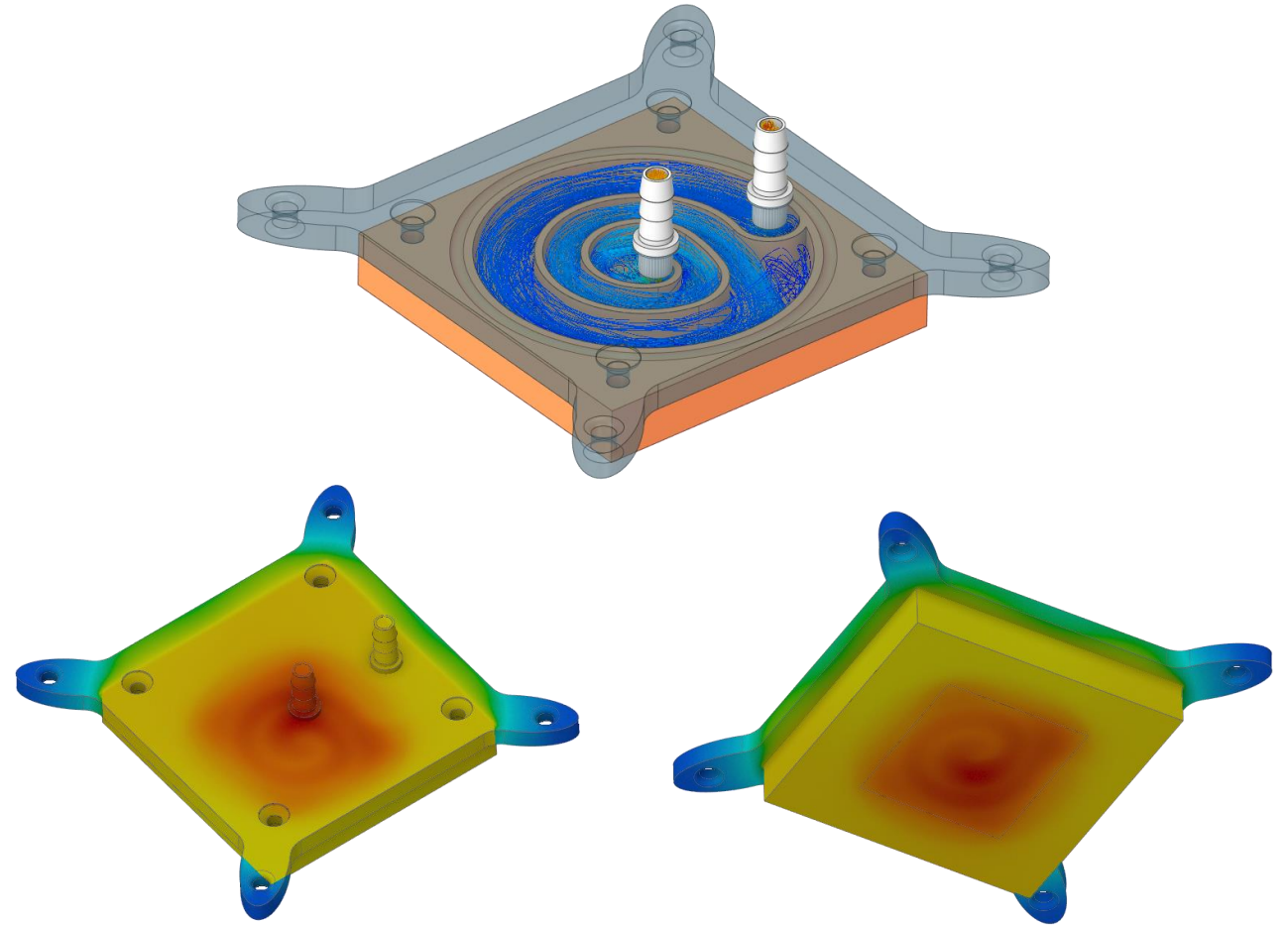
Blow gun nozzle compressible flow



Race truck suspension with hinge joints and idealized sliding contact

Fluid-Solid Thermal Simulation (Explore)

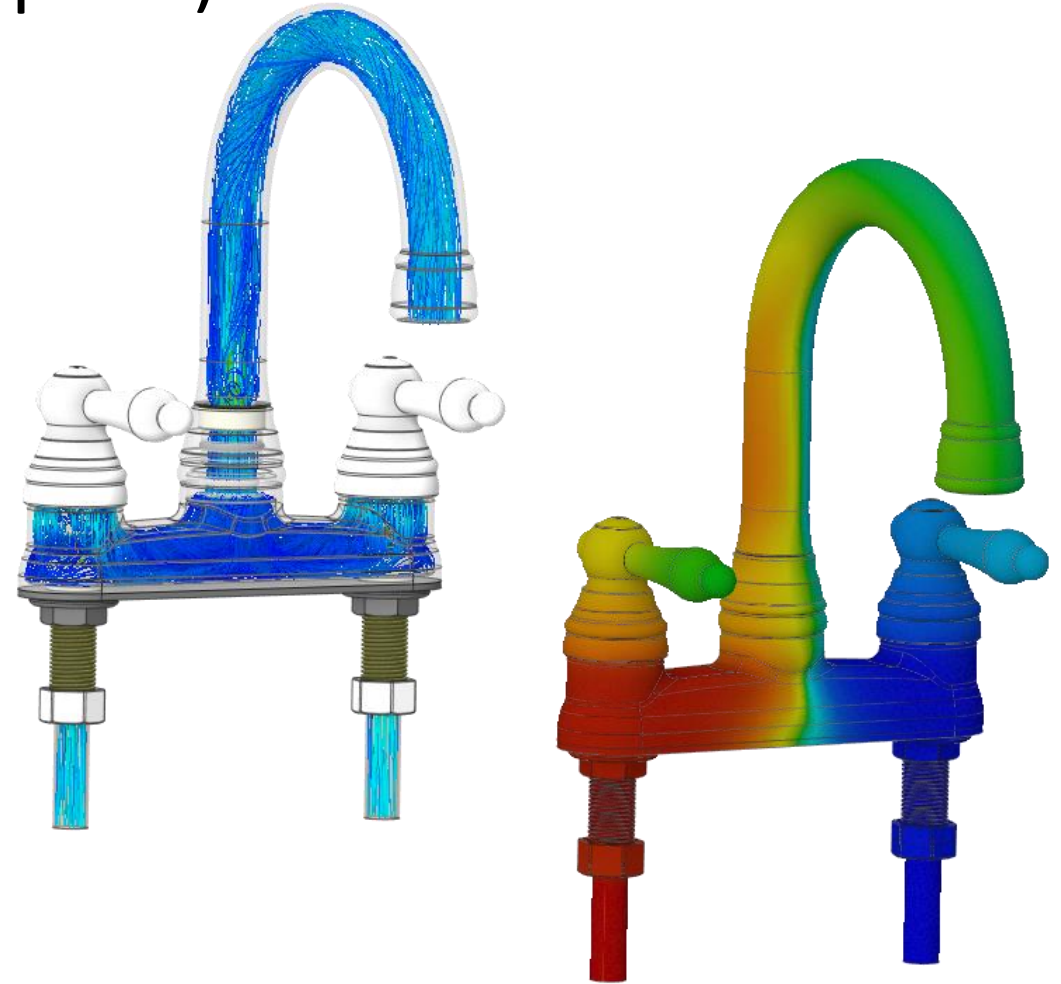
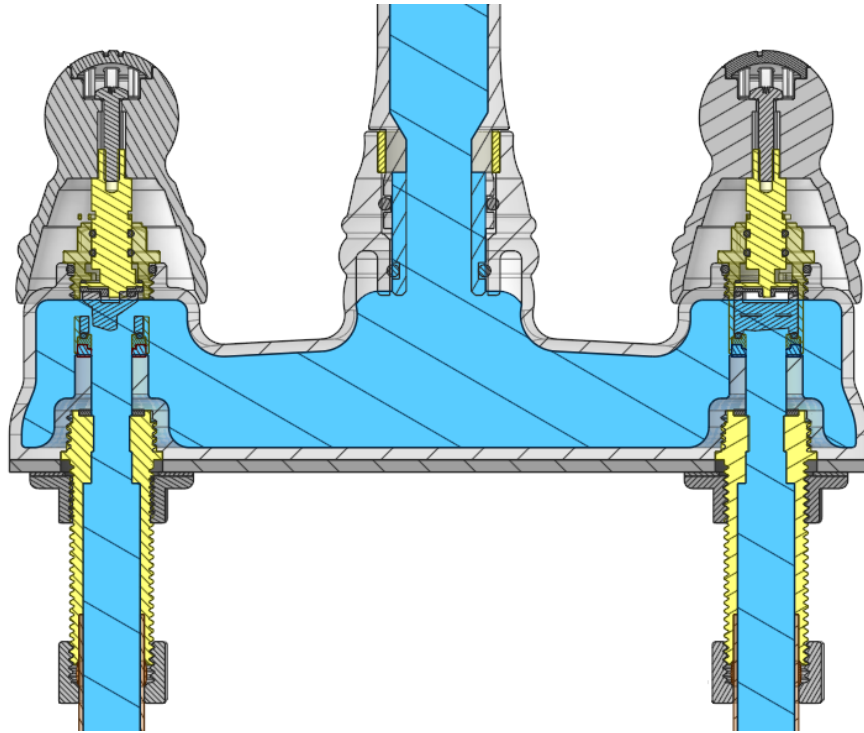
- Automated workflow for fluid-solid-thermal simulation (CHT)
 - Fluid and solid thermal regions automatically defined by materials and fluid/solid conditions
 - Automatic definition of fluid-solid interfaces and bonded thermal solid connections
 - *Imprinting is not required*
- Evaluate thermal and fluid performance of manifolds, water jackets and heat exchangers



CPU Cooler – Velocity streamlines and temperature contours

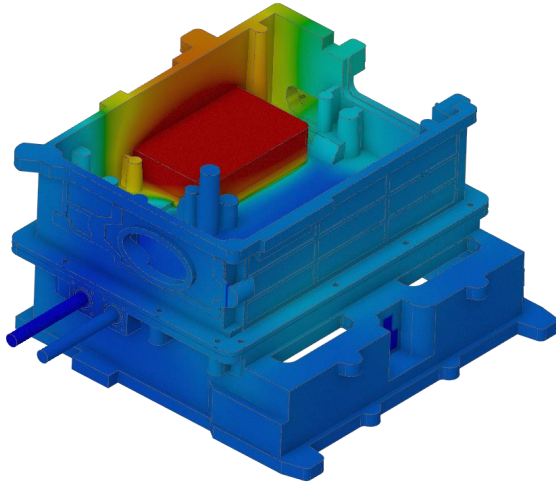
Fluid-Solid Thermal Simulation (Explore)

- Easily solve conjugate heat transfer with complex, dirty geometry
 - *Not necessary to remove small gaps & overlaps or imprint geometry*

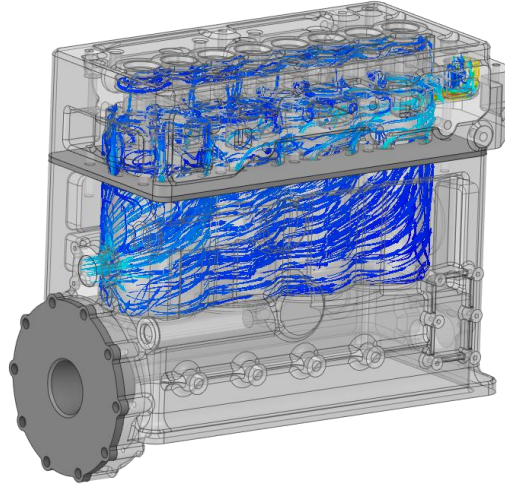


Faucet conjugate heat transfer solved without any geometry prep, velocity streamlets and temperature contours shown

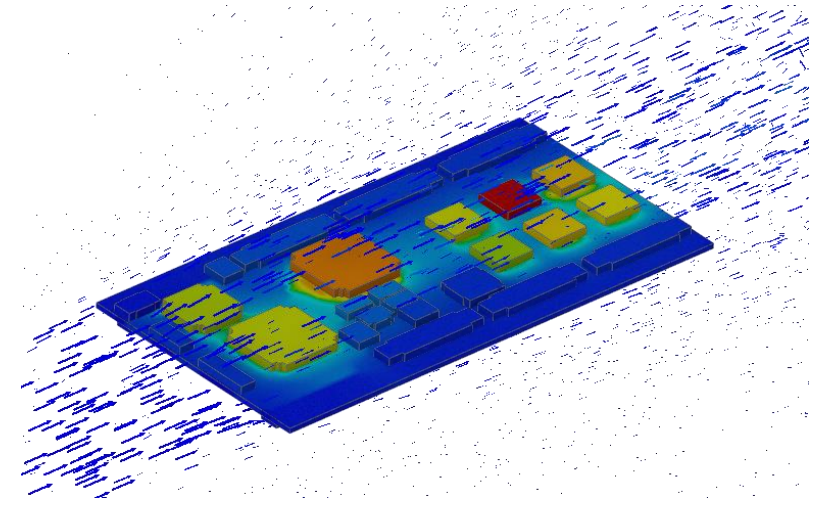
Fluid-Solid Thermal Applications



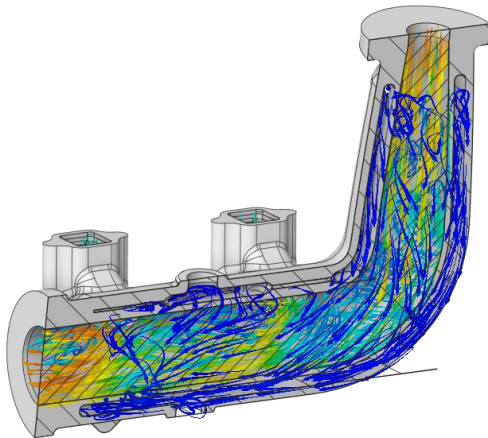
Traction Inverter



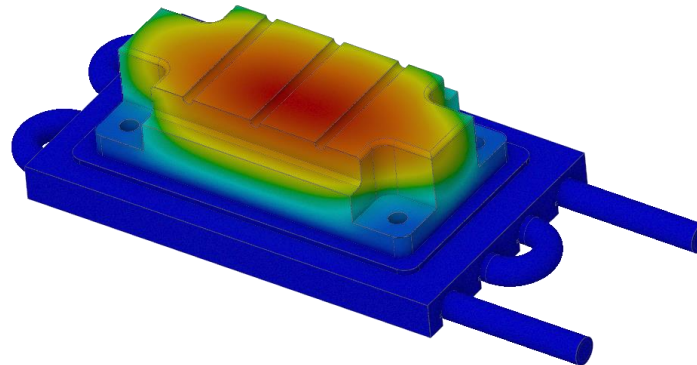
Water Jacket



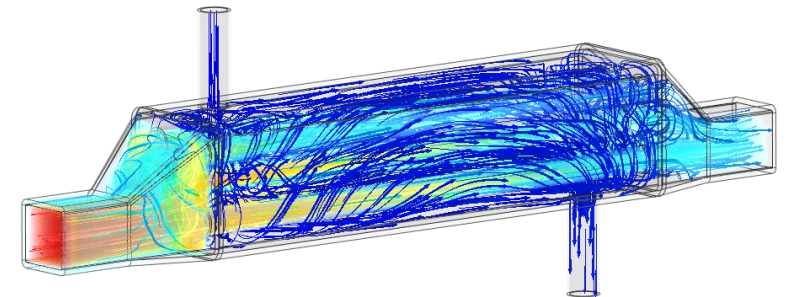
Printed Circuit Board



Exhaust Header



Cold Plate

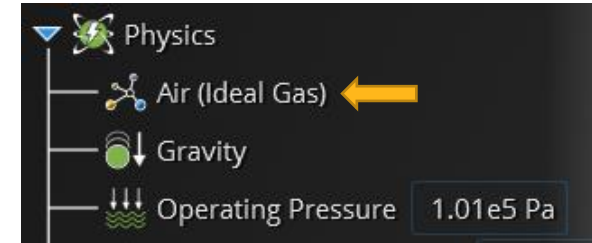


Shell and Tube Heat Exchanger

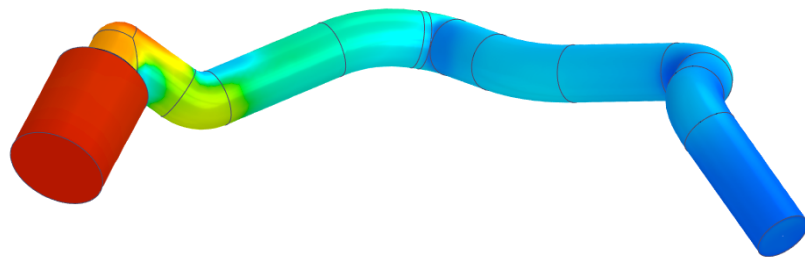
/ Compressible Flow (Explore & Refine)

- Simulate subsonic gas flows using the ideal gas law
 - Model high-speed gas flows or flows with large temperature variations
 - Allow variable density based on the ideal gas law as part of the material assignment
 - Mach number < 1.0 recommended for both Explore and Refine
 - Post-process gas density and Mach number

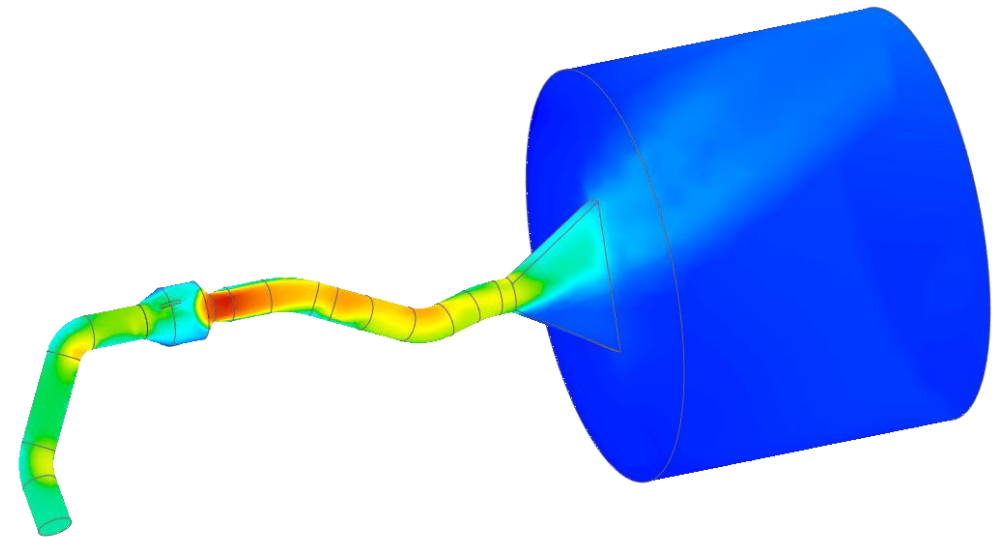
Air			
Molar mass		29 g/mol	
Viscosity		1.83e-5 Pa·s	
Thermal expansion coefficient		0.00333 1/°C	
Thermal conductivity		0.0258 W/m·K	
Specific heat		1.02 kJ/kg·C	



Specify ideal gas as part of material definition



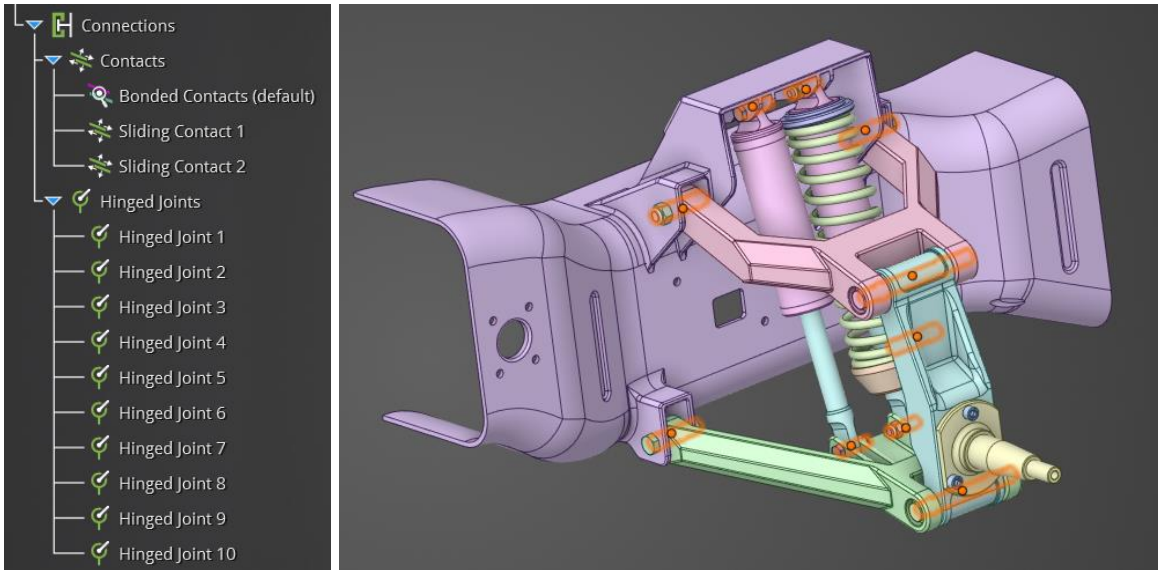
Gas density in high temperature pipe flow



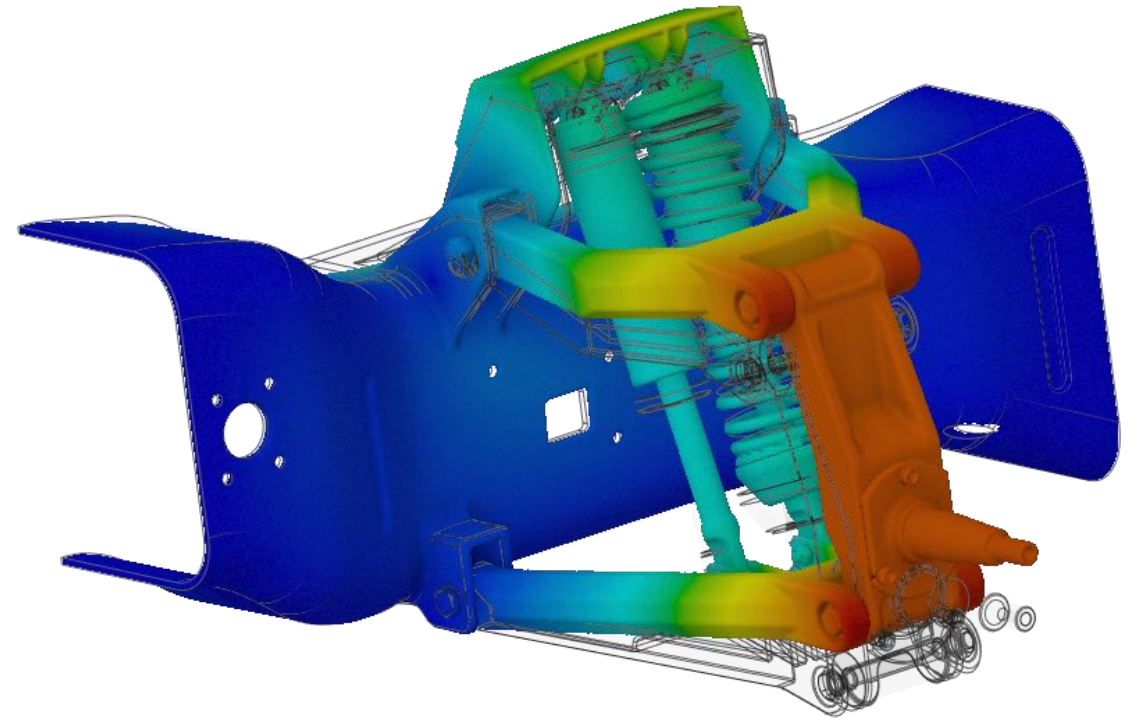
Mach number (0.4) for stability bleed system

/ Hinge and Spherical Joints (Explore)

- New hinge and spherical joints
 - Enables more realistic assembly conditions



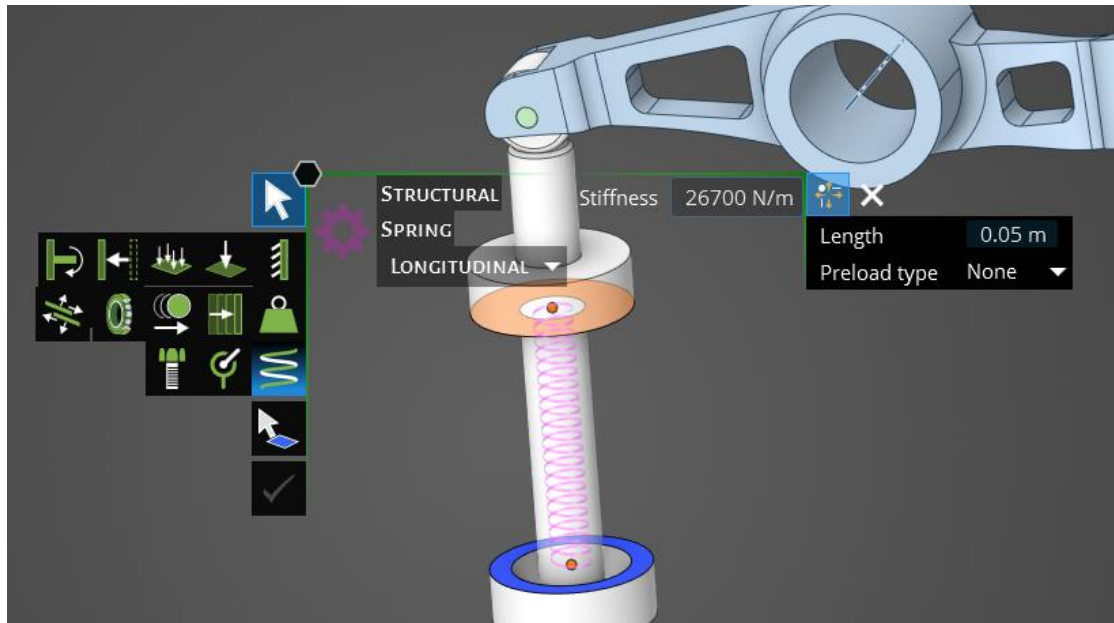
Race truck suspension with hinge joints and sliding (idealized) contact



Race truck suspension displacement

Spring Connections (Explore & Refine)

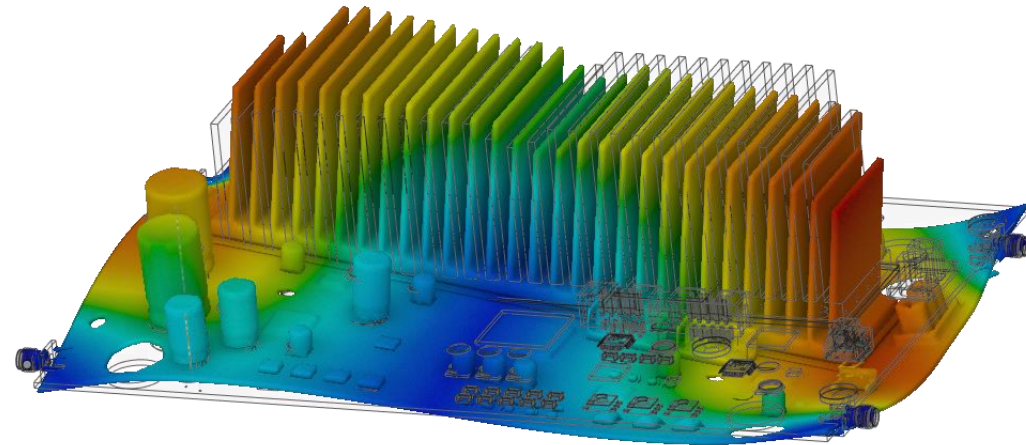
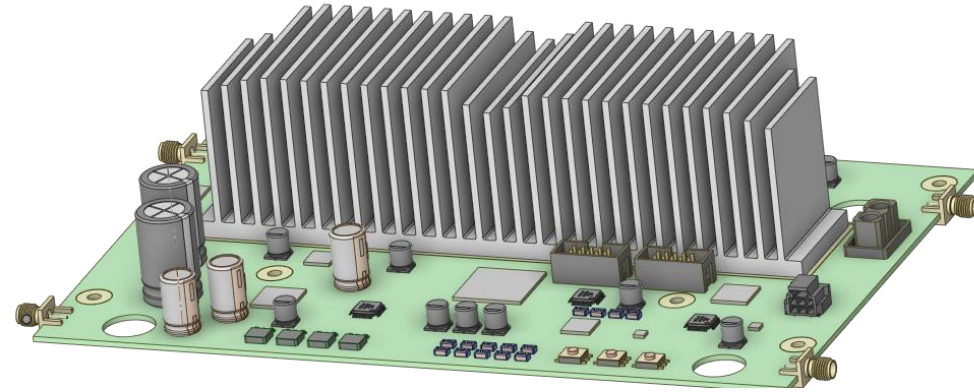
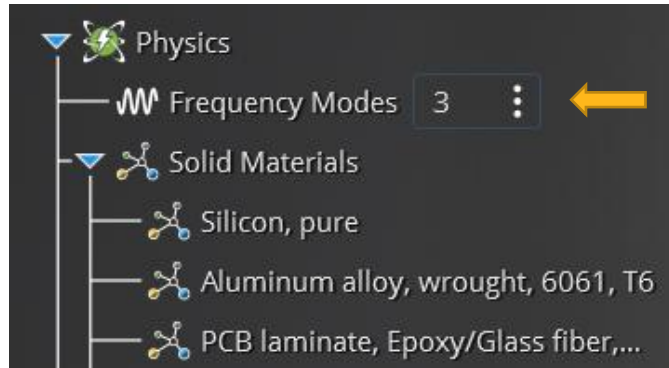
- New spring connection
 - Longitudinal or rotational 1-D spring
 - Body-to-body or body-to-ground connections
 - Specify spring stiffness and spring pre-load (Refine)
 - Reduces model size and improves solution speed



Displacement of rocker arm assembly including a spring connection

/ Number of Modes (Explore)

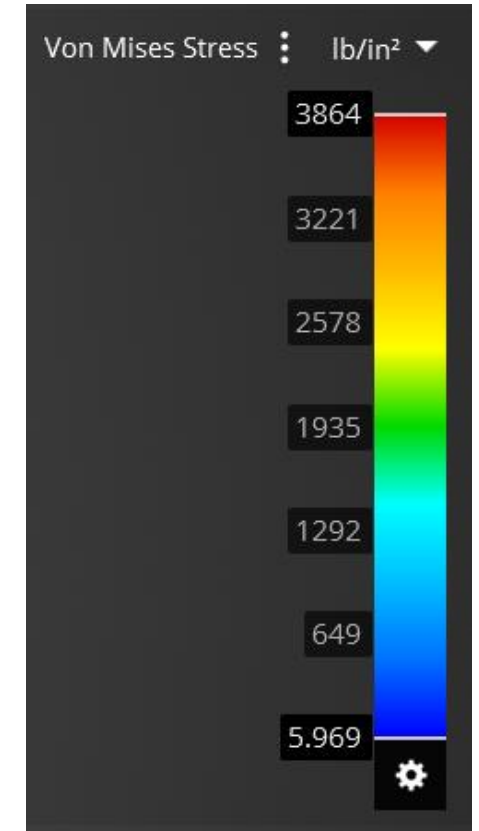
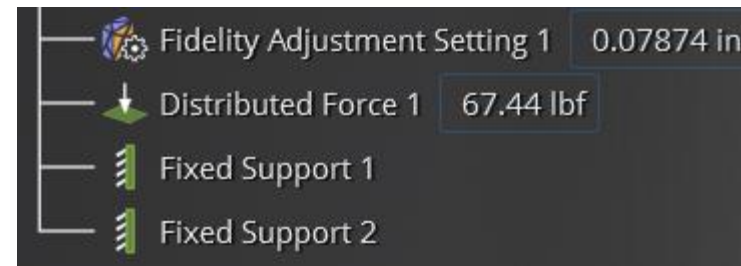
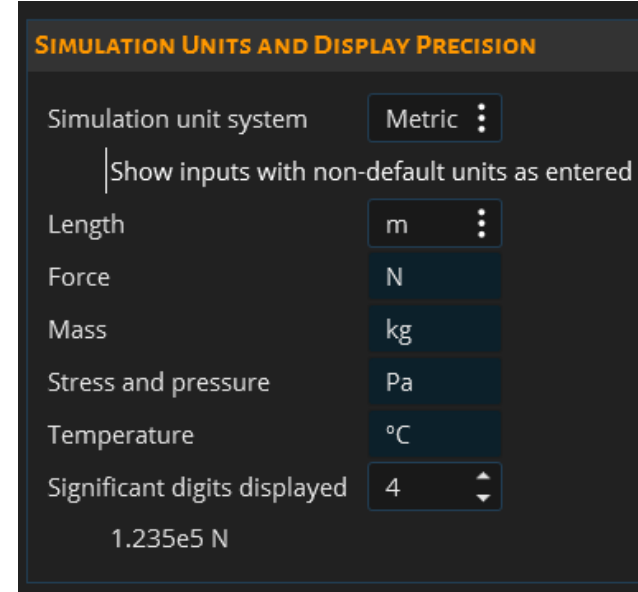
- Specify number of modes for Explore
 - Specify computation of between 1 and 12 natural frequencies and mode shapes
 - New default of 3 frequency modes
 - Provides faster solutions and more flexibility for modal analysis



Third mode shape of wireless router PCB assembly

/ Simulation Units

- Define simulation units as part of user settings
 - Select either metric or imperial units and the length unit to define one of four consistent unit systems
 - Metric with m or mm as length unit
 - Imperial with in or ft as length unit
 - Option to show inputs with non-default units as entered
 - Flexibility to select modeling units independently of simulation units
 - Draw in mm, simulation in inches, etc.



Controls simulation unit display for physics inputs and outputs

Temperature Dependent Material Properties (Explore & Refine)

- Temperature dependent material properties for thermal and thermal-stress
 - Specify Young's Modulus, Density, Thermal Conductivity and/or Specific Heat as a function of temperature
 - Granta MDS and MI materials include temperature dependent data
 - Improves accuracy for solid thermal and thermal-stress simulation

Aluminum alloy, wrought, 606

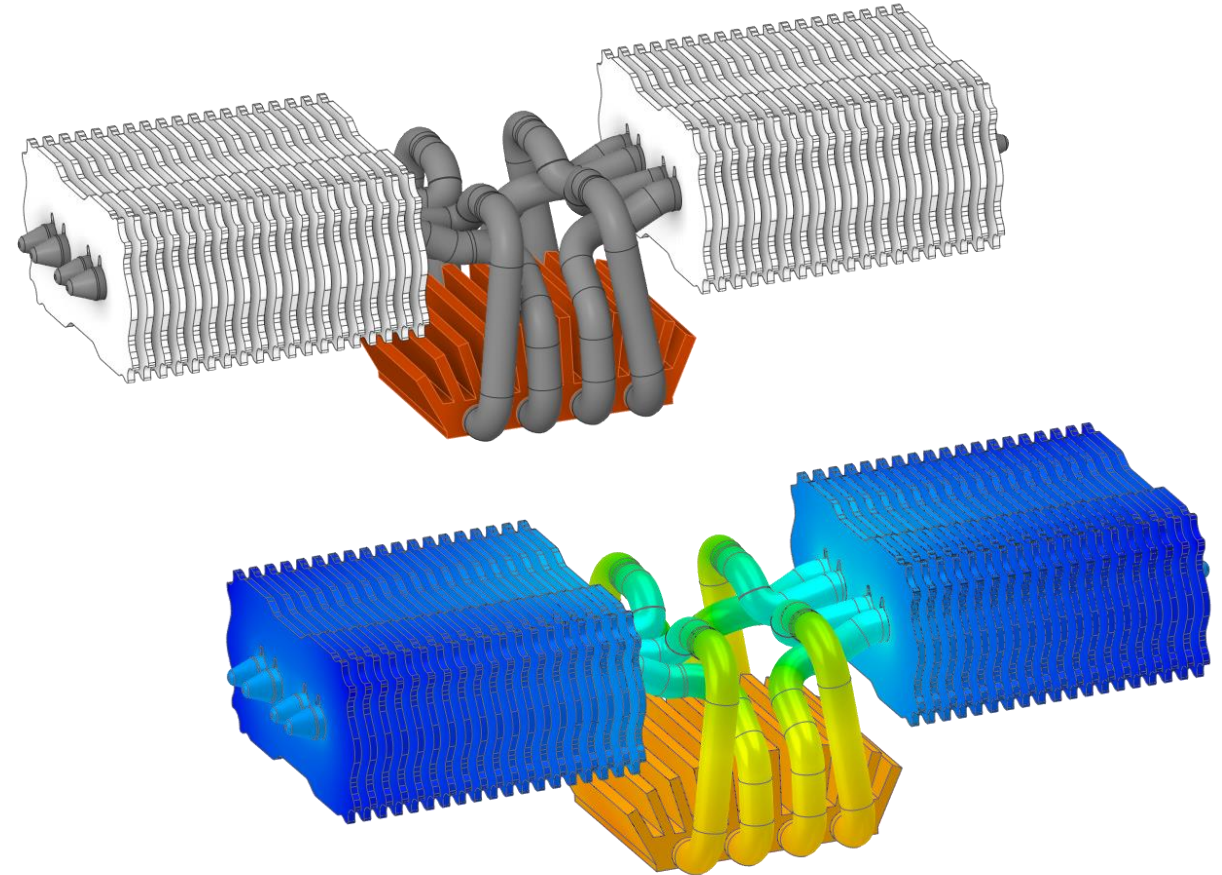
Density

2713 kg/m³

Variable

Variable

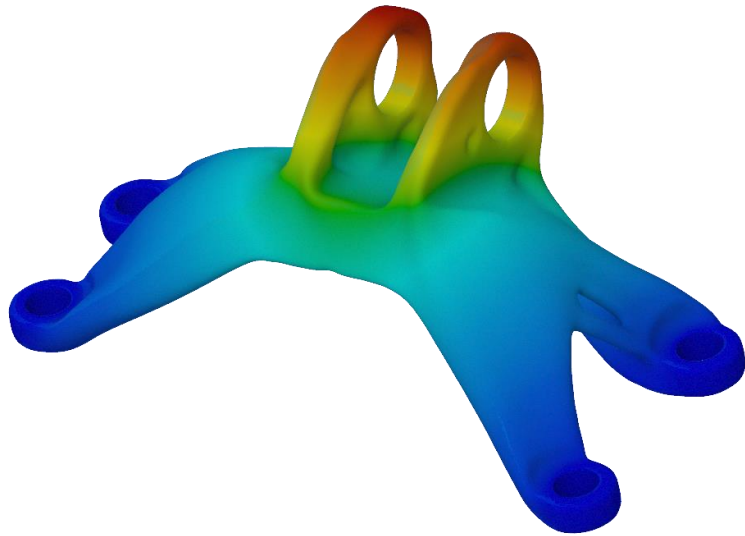
<input type="checkbox"/>	Temperature	°C	Density	W/m·K
<input type="checkbox"/>	-260.2		18.77	
<input type="checkbox"/>	-172.4		98.14	
<input type="checkbox"/>	-84.59		133.3	
<input type="checkbox"/>	3.183		152.2	
<input type="checkbox"/>	90.96		165.8	
<input type="checkbox"/>	178.7		175.9	
<input type="checkbox"/>	266.5		181.8	
<input type="checkbox"/>	354.3		183.6	
<input type="checkbox"/>	442.1		181.2	
<input type="checkbox"/>	529.9		174.7	
*	0		0	



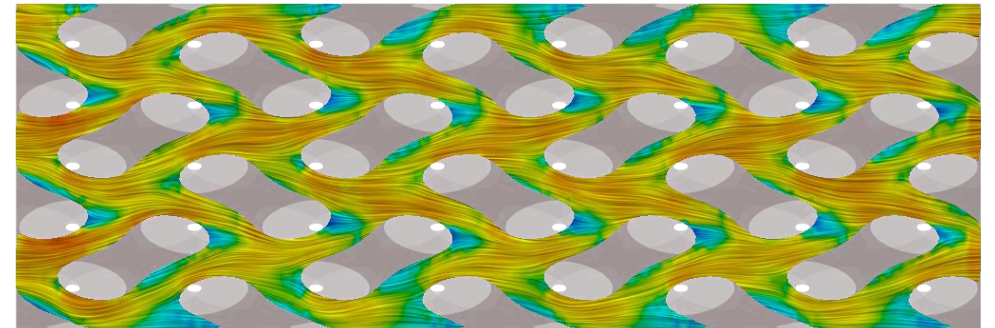
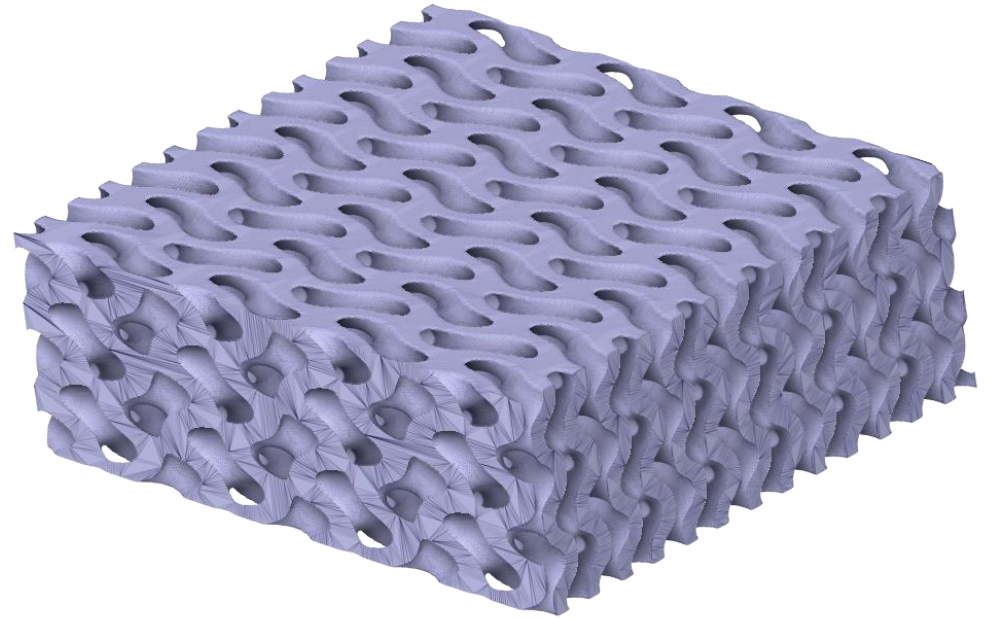
Steady-state temperature in heat sink assembly with temperature dependent thermal conductivity

/ Faceted Body Simulation (Explore)

- Perform simulation on faceted bodies
 - Any physics simulation on a single part
 - Facet regions required to apply physics conditions
 - Validate topology optimization results or simulate based on STL geometry



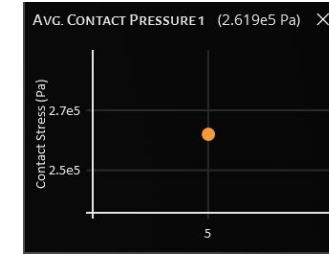
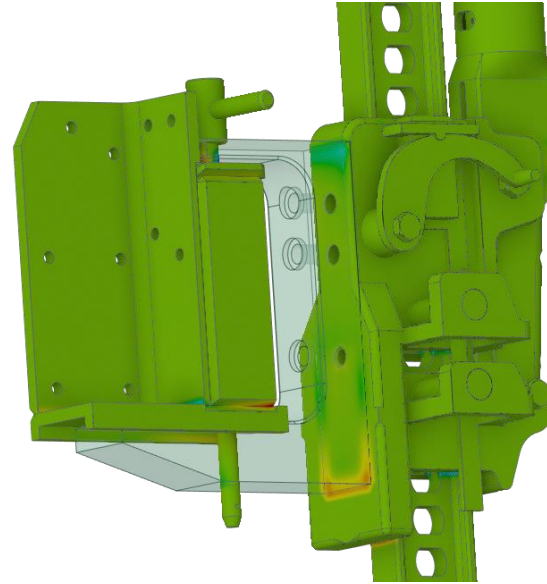
Optimized engine bracket displacement results



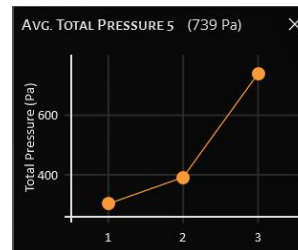
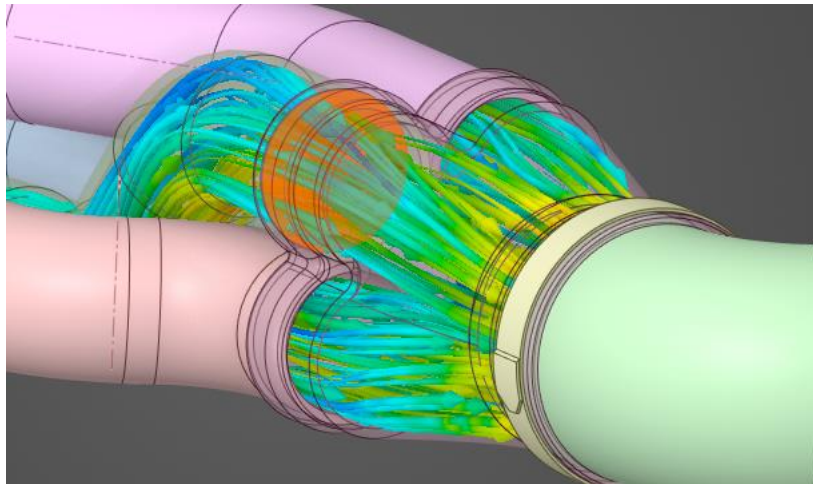
Gyroid heat exchanger velocity results

Post-processing Enhancements Explore

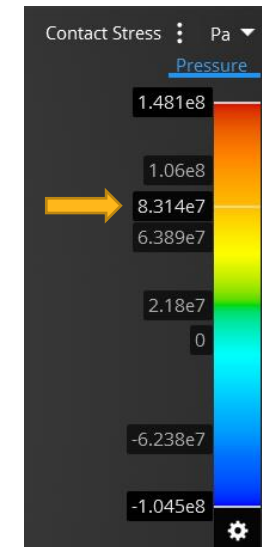
- Contact pressure
 - Contour results and monitors
 - Verify bonded and idealized sliding behavior
- Probes
 - Legend shows contour value at cursor location
- Monitors on 2D regions, lines or points
 - More flexibility for monitor locations



Contour of contact pressure in high-lift jack assembly and average contact pressure monitor



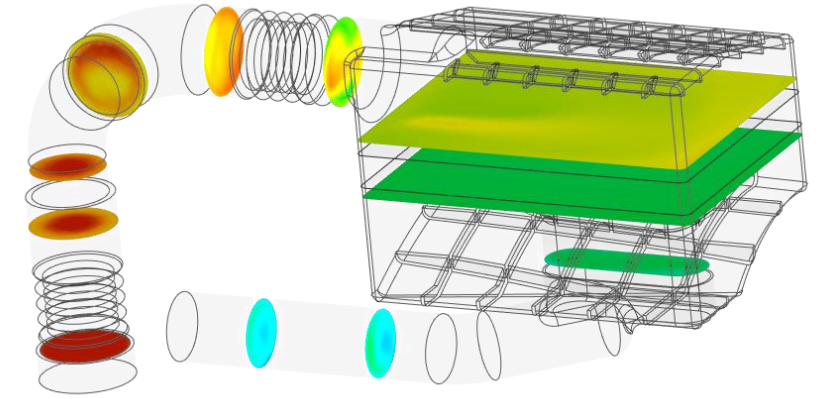
Total pressure monitor on 2D region enables monitoring of individual flow paths



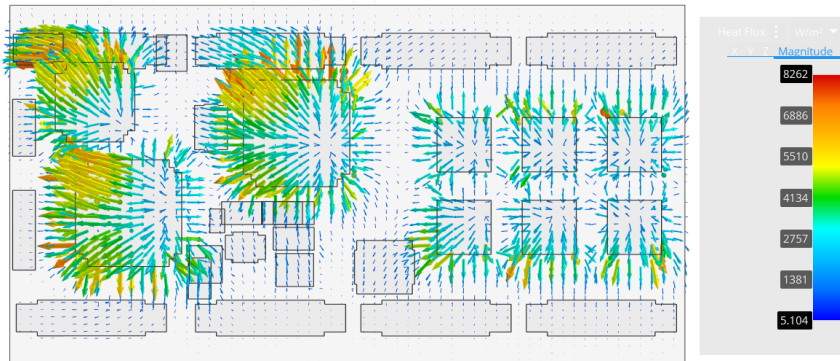
Tick mark in legend shows contour value at cursor location

Post-processing Enhancements Refine

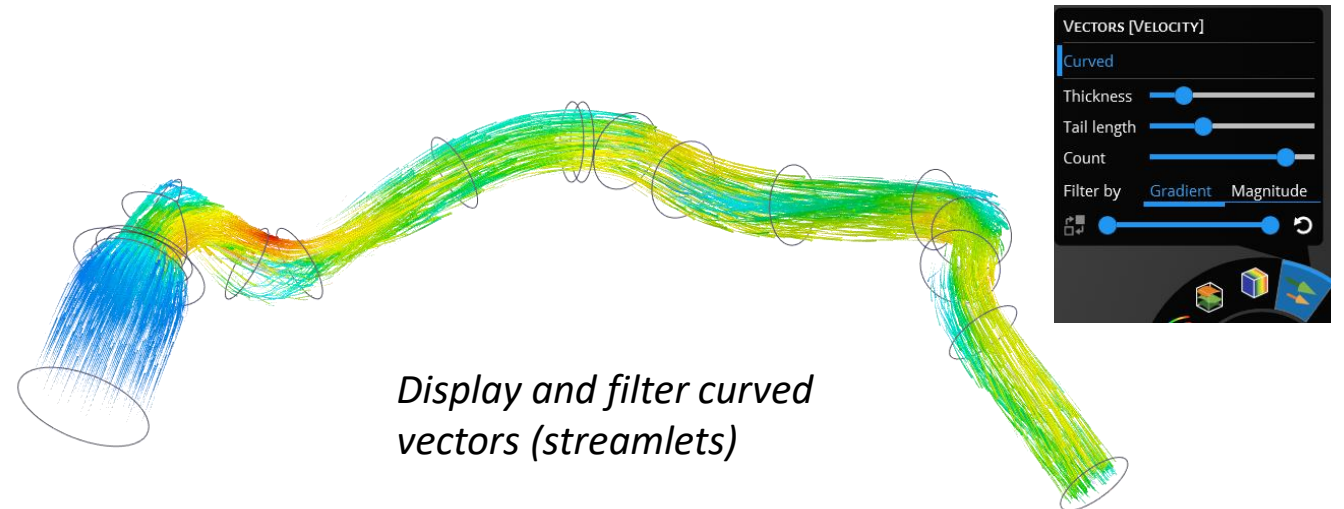
- Contours on planes and lines
 - Control visibility of contour results (outer) from model tree or context menu
- Monitors on lines and points
 - More flexibility for monitor locations
- Streamlets
 - Curved vectors for flow field visualization
- Heat flux vector results
 - Heat flux vector results in solid regions for conjugate heat transfer



Show or hide results on planes from model tree



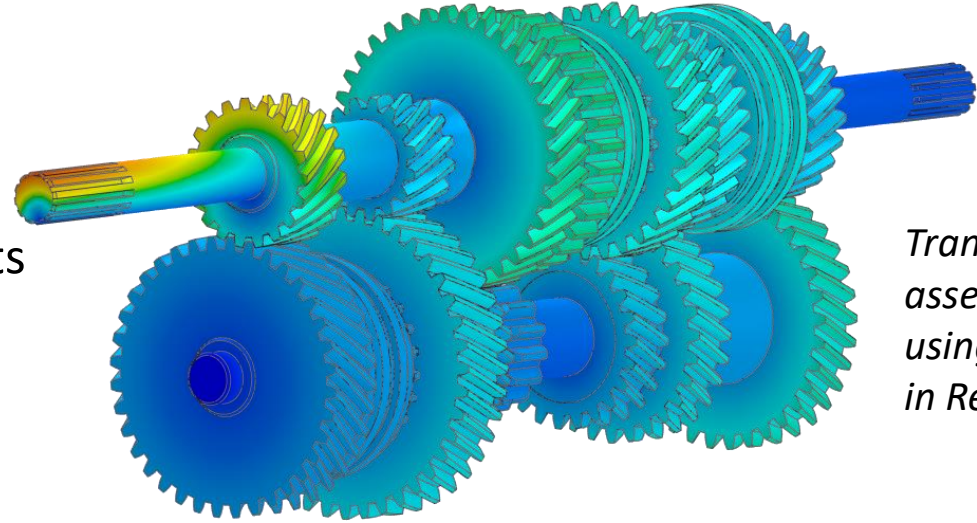
Heat flux vector results in PCB assembly



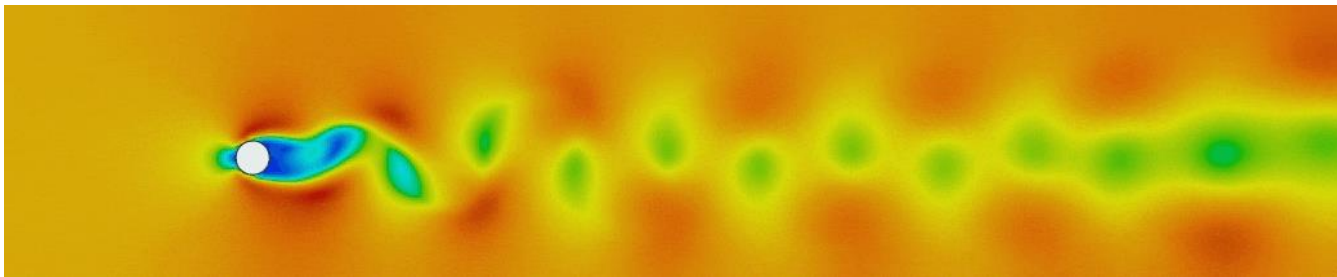
Display and filter curved vectors (streamlets)

Performance and Accuracy Enhancements

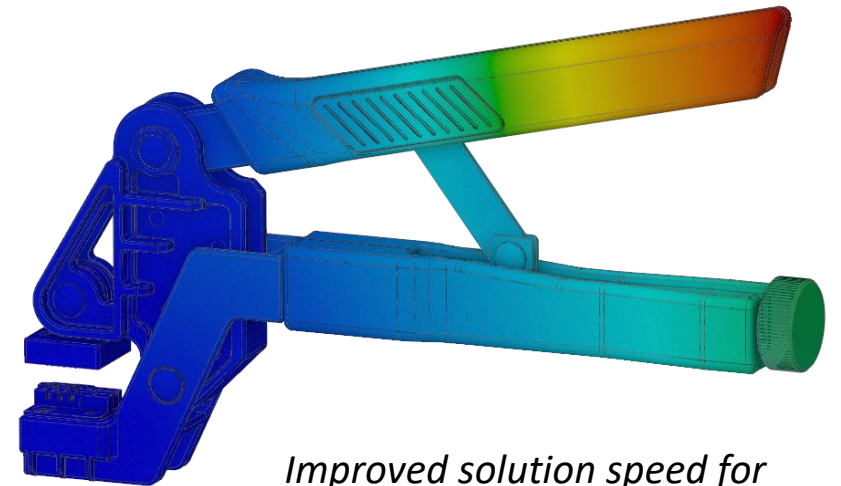
- Explore enhancements
 - Up to 100% faster solution speed for static structural and modal analysis of complex parts
 - Improved accuracy for transient flow
- Refine enhancements
 - New default to use four HPC cores for all structural and solid thermal solutions
 - (Additional cores can be used with Ansys HPC licenses)



Transmission assembly solved using four cores in Refine



Improved accuracy for transient flow over a cylinder (vortex shedding)



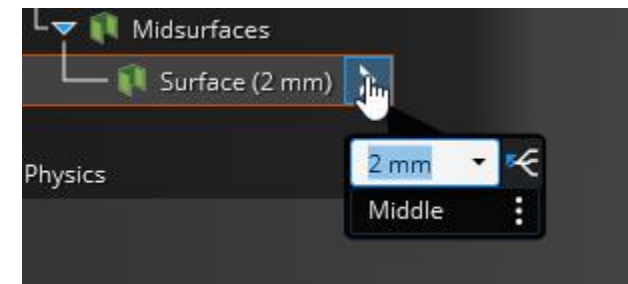
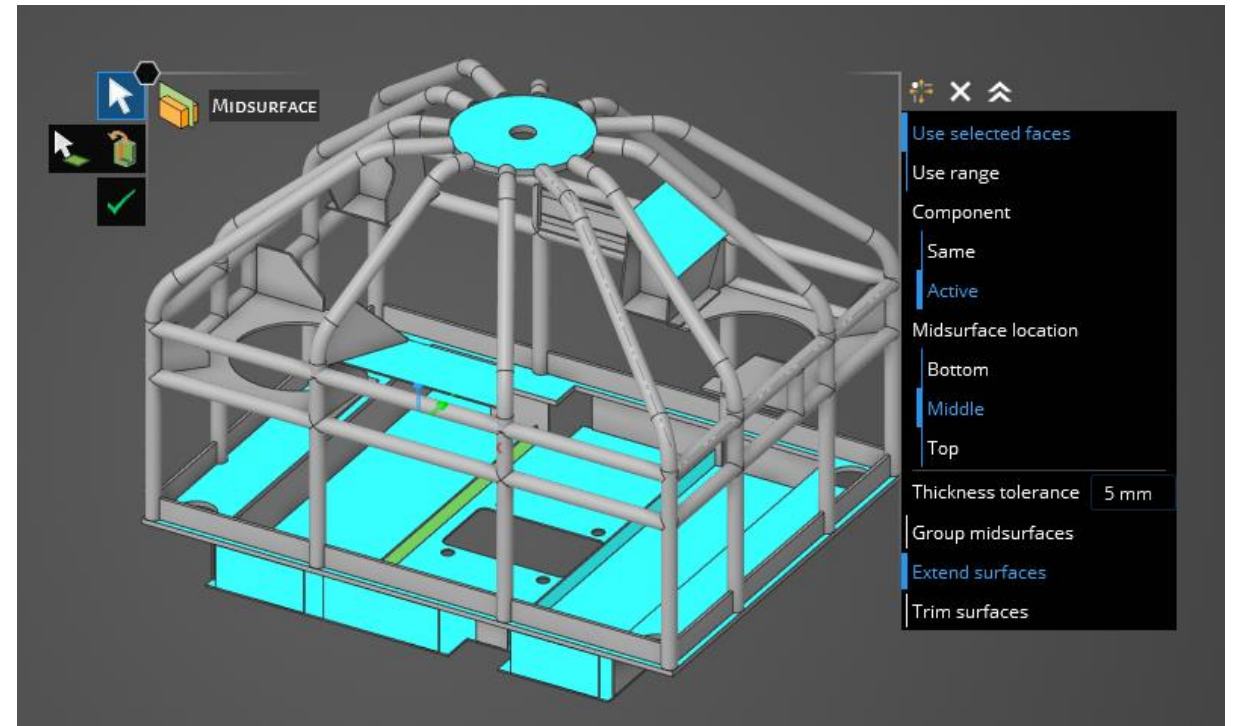
Improved solution speed for structural simulation in Explore

Modeling Enhancements



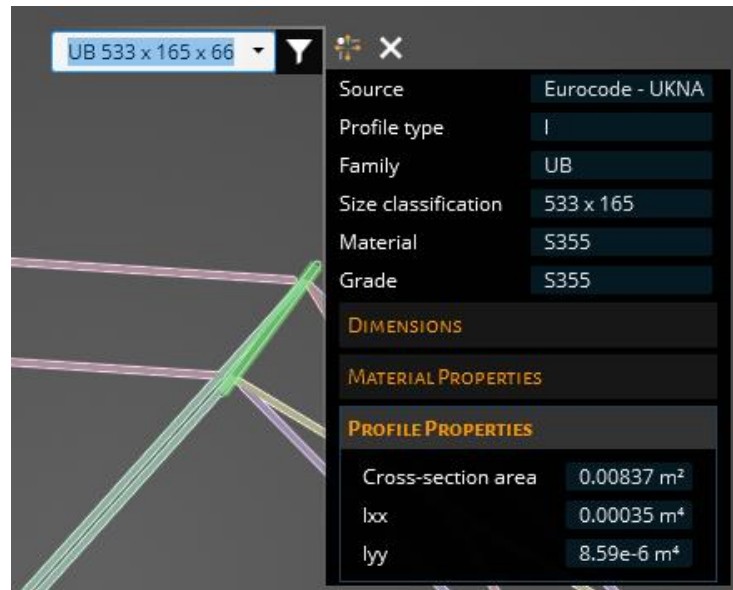
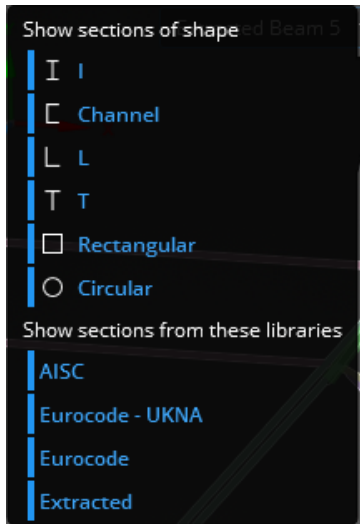
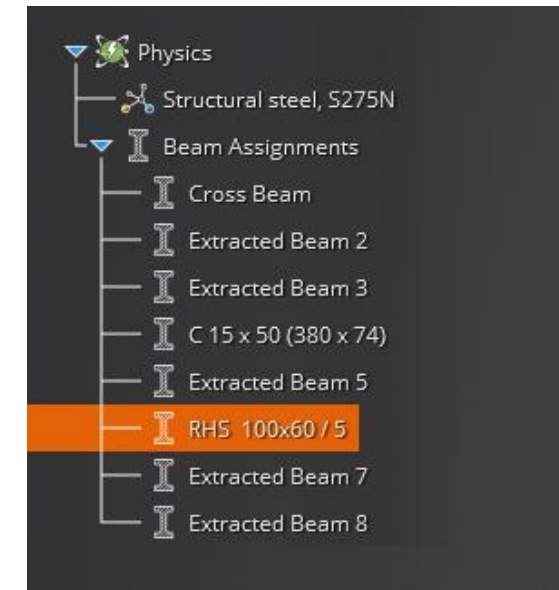
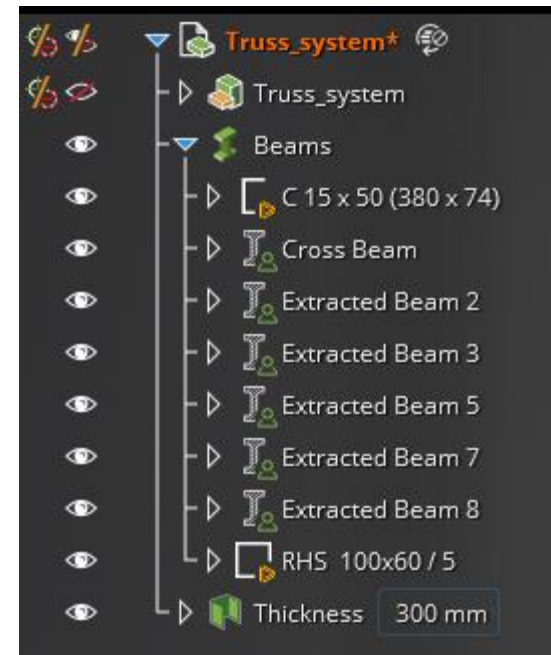
/ Midsurfacing

- Midsurfacing exposure in Discovery allows thin solid bodies to be abstracted to shell bodies for simulation
- Midsurfaces are organized in the tree for clearer identification of thicknesses as well of ease of modification
- Exposure of the Extend tool allows midsurface bodies to be extended to contact beams or other zero thickness bodies



/ Beams

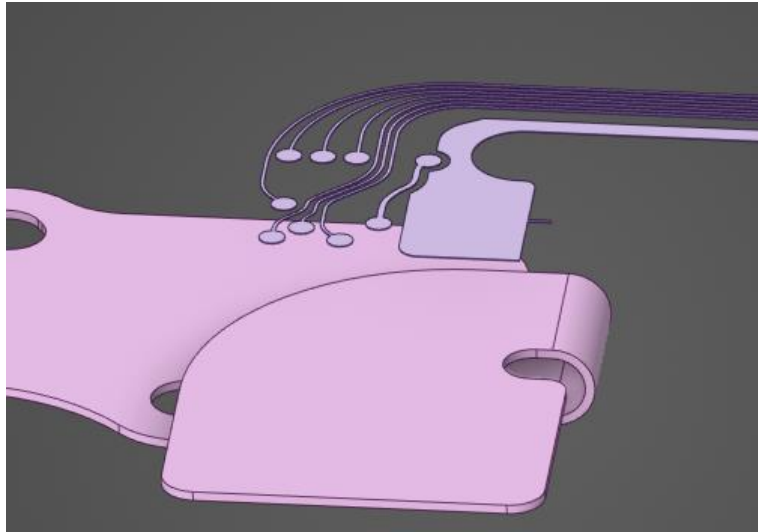
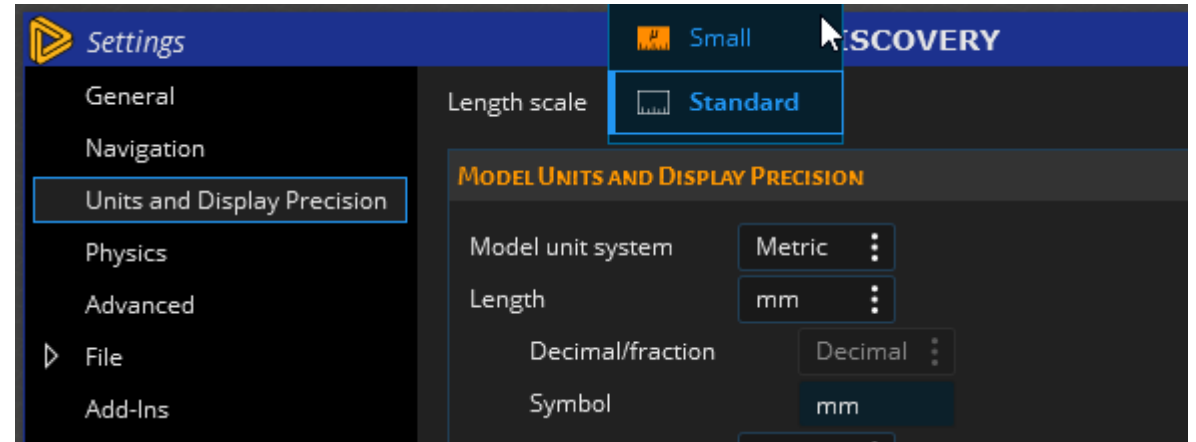
- Beam assignments structured like material assignment
- Ability to edit beam profile removed in Discovery
- Library of standard beams can be filtered



- Standard beams and extracted beams are displayed in HUD
- Filtering allows users to determine which beams to show in dropdown
- Extracted beams use default material while standard beams use embedded material

Electronic prep improvements

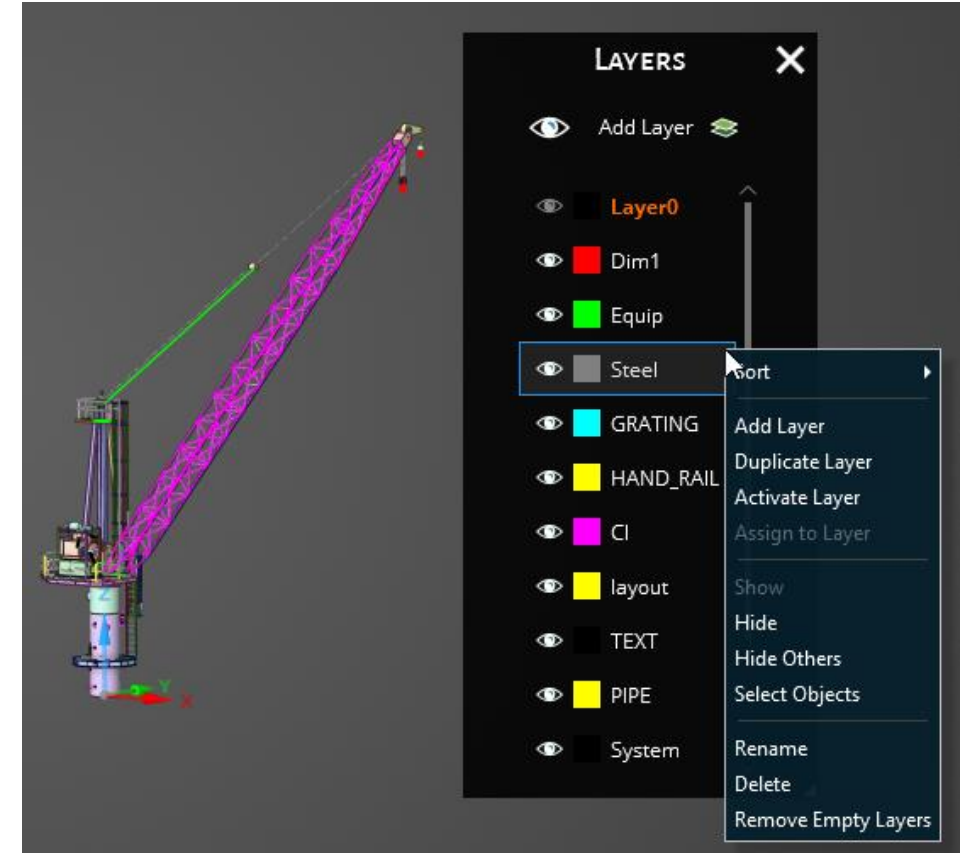
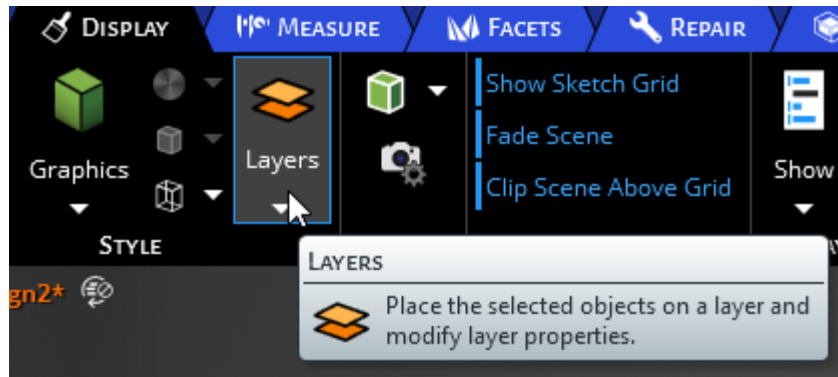
- Small unit support allows users to model in mil, um, or nm scale
- Small units are set to a document and cannot be mixed within the same design



- Wrap allows wrapping of flexible circuit boards or antennae onto secondary objects to simulate objects in real world environments

/ Layers

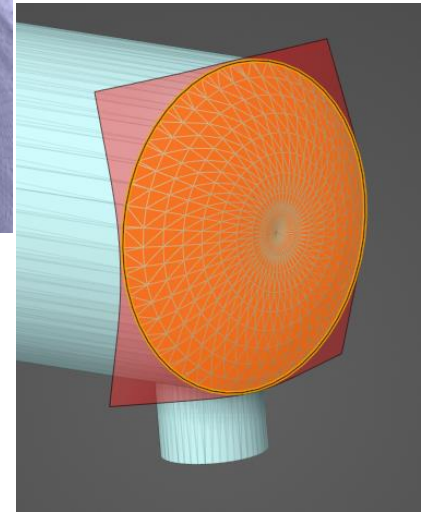
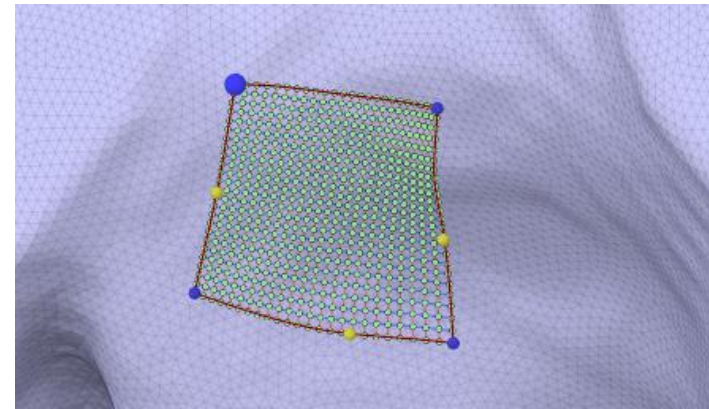
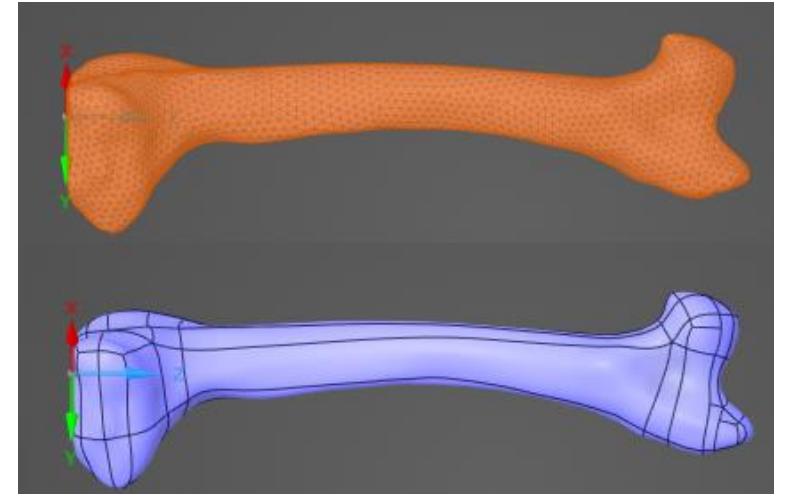
- New Layer panel exposure through the Display tab
- Active layer is displayed in orange and is always visible
- RMB contains common layer commands such as activating a layer or hiding objects



Layers help organize data within an assembly and can be imported from sdocs and other external formats

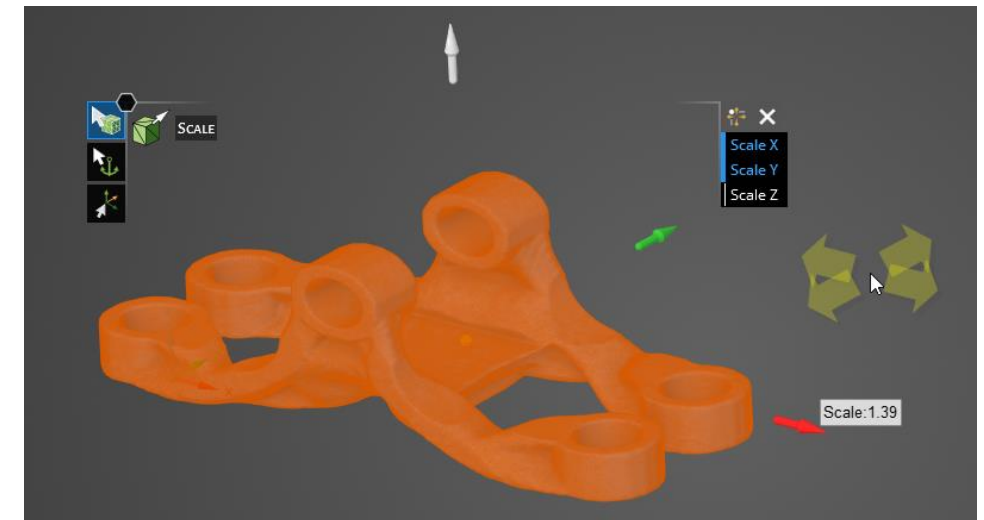
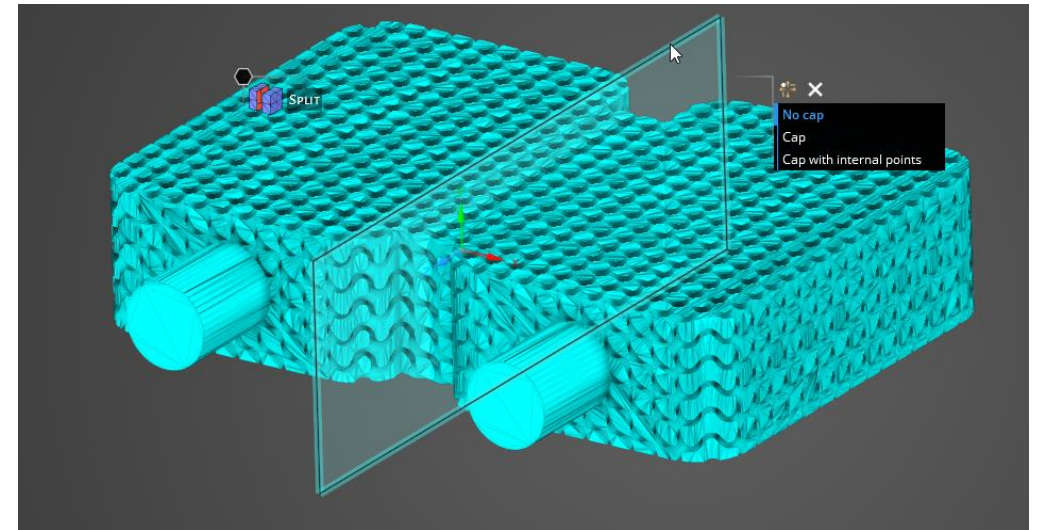
Reverse Engineering Exposure

- Autoskin
 - Wraps entire model with patches
 - Ideal for organic shapes such as topology optimization
- Skin Surface
 - Allows individual patches to be created and fit through facets
 - Can be used in conjunction with Autoskin to replace/refine missing patches
- Fit spline
 - Creates a single extended surface through selection of facets
 - Ideal for adding select organic faces into a mostly prismatic reconstruction



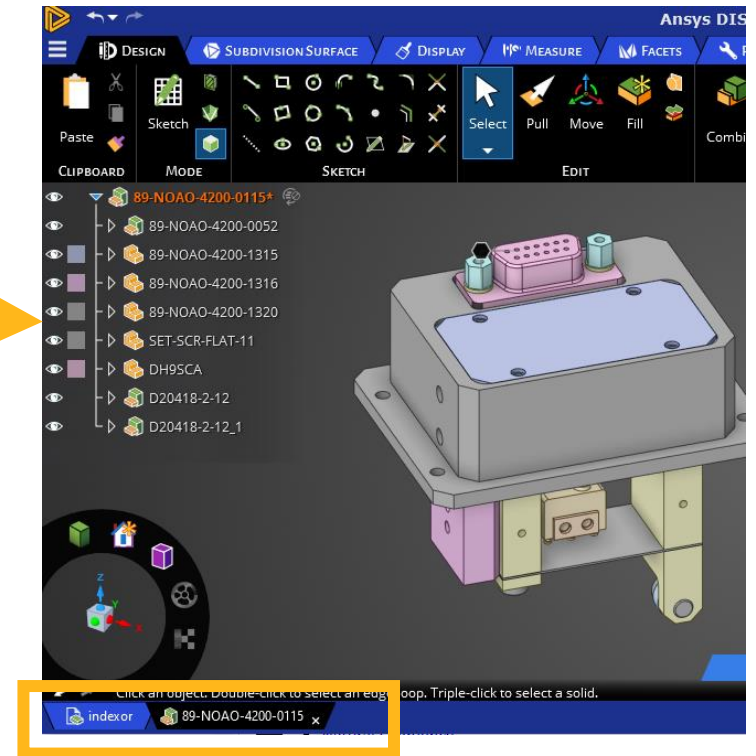
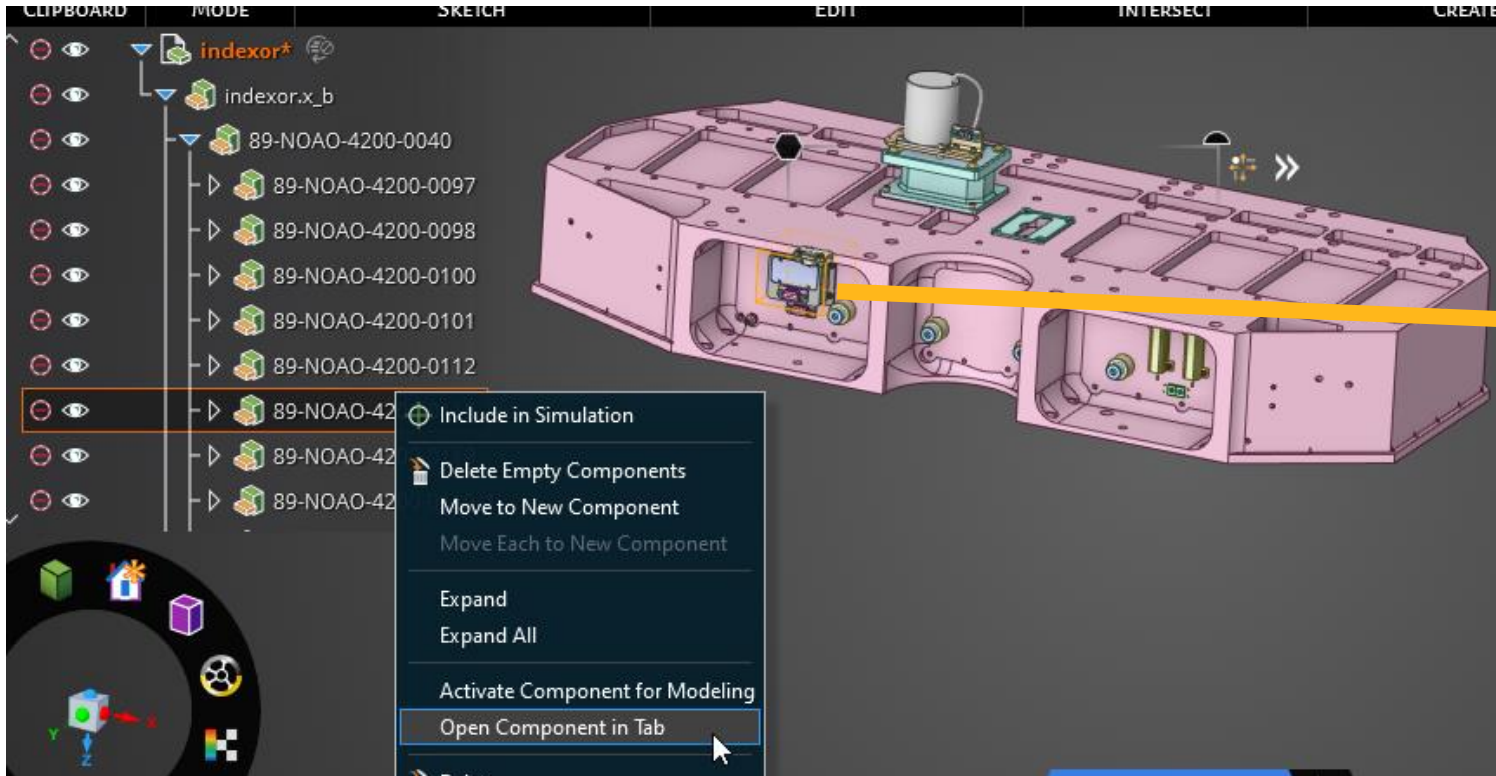
Newly Exposed Facets Tools

- Split
 - Faceted bodies can be split with a surface or plane and capped to create multiple bodies
- Scale
 - Allows bodies to be scaled uniformly or along one or two axes
- Shell
 - Remove interior volume of selected body and creating an offset inward or outward
 - Internal lattices not currently supported within this tool



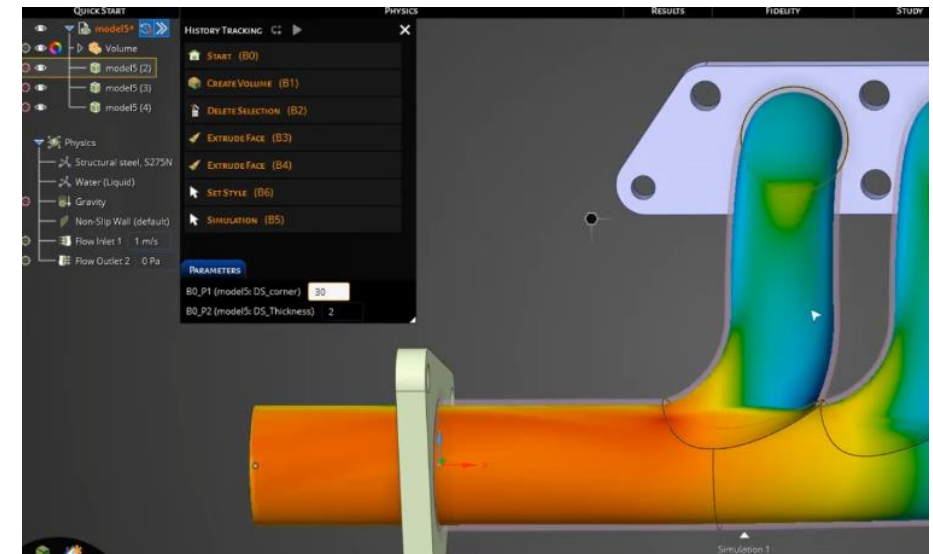
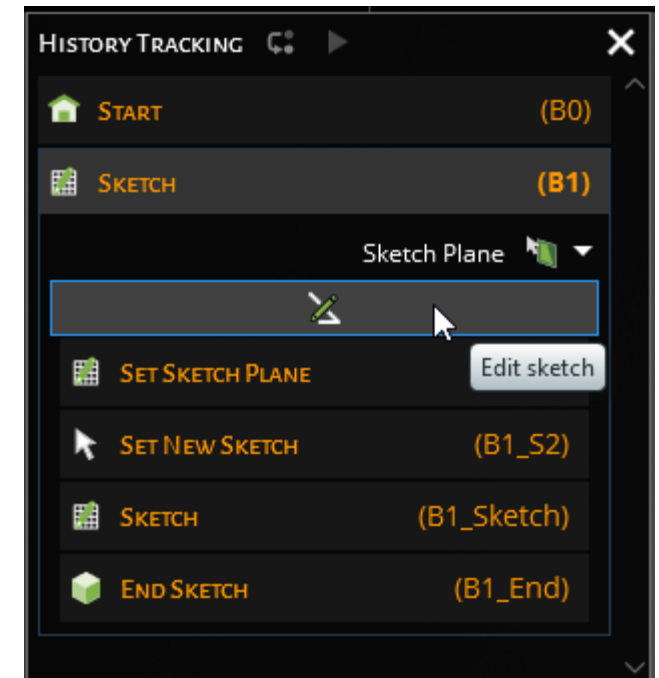
/ Multiple Tabs for model prep

- Allow subcomponents of models to be interrogated for model prep
- Useful when working in large assemblies when cleanup or editing is needed
- Does not allow simulations to be performed within additional tabs



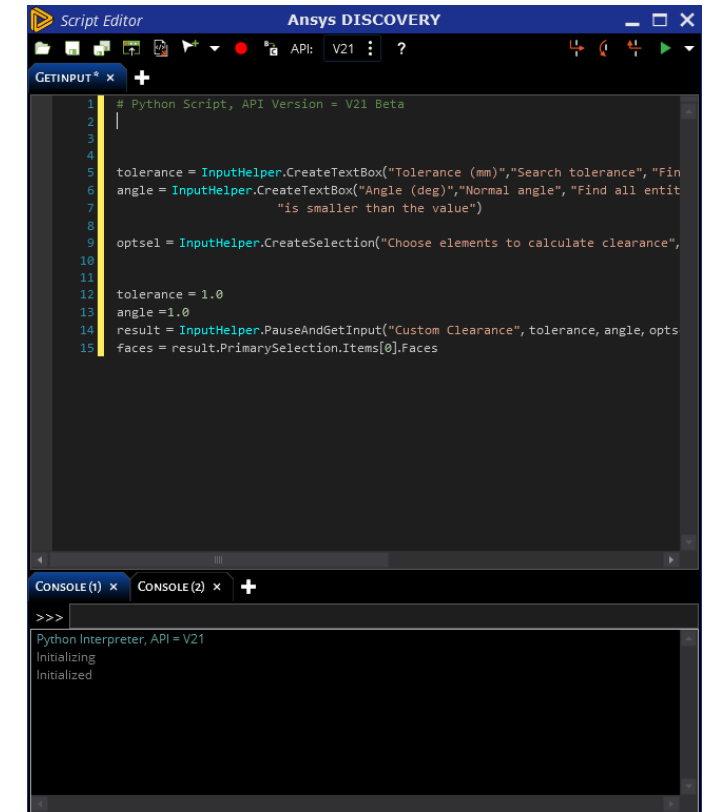
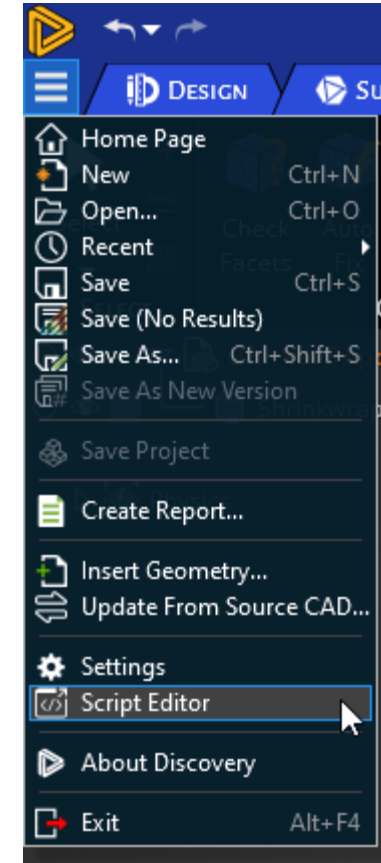
/ History Tracking

- History Tracking allows modeling and physics operations to be recorded and played back when connecting via CAD interfaces
- Parameters can be promoted and passed to Workbench for design optimizations
- Sketches can now be updated through History Tracking



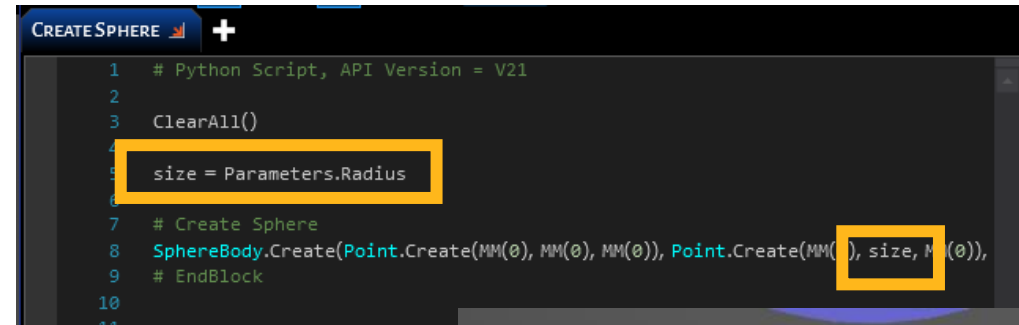
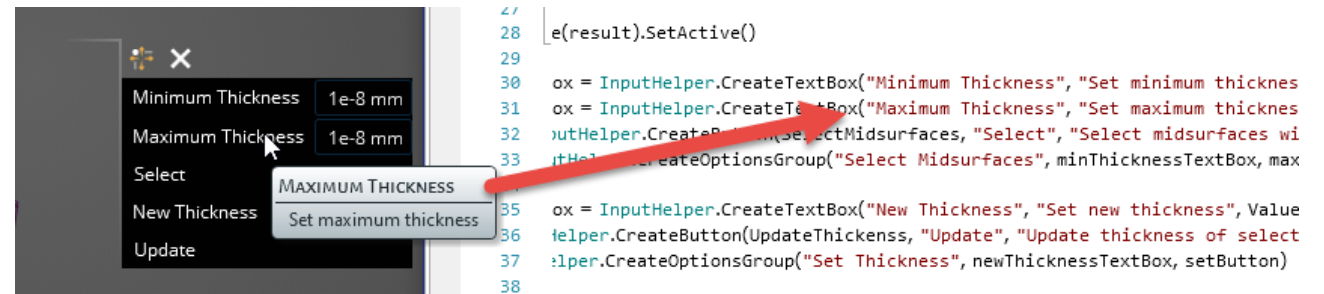
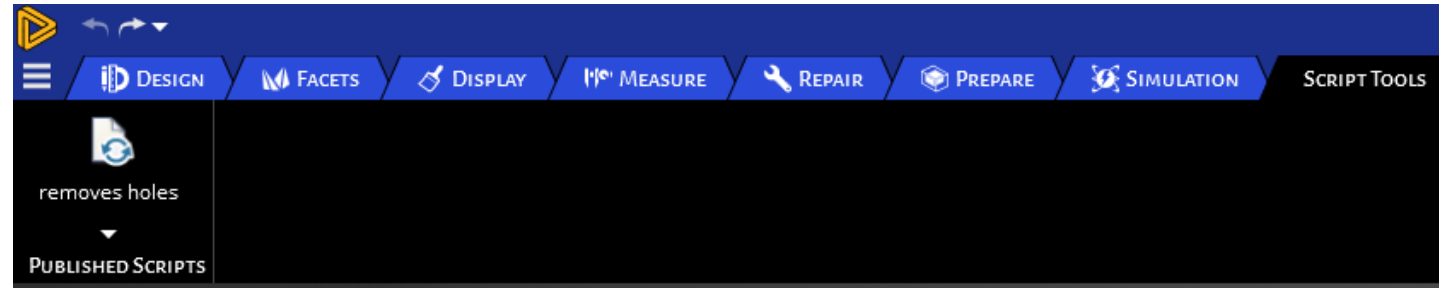
Scripting now available

- Scripting has been removed from beta with v20 and v21 of scripting available
- Scripting enables powerful automation and covers modeling and simulation within Discovery
- Online help available for new users to better understand scripting functions



Using Interactive Scripts

- Publishing Tools
 - Publish a script a tool so it can be easily be rerun within the application
- Leveraging Input helper
 - Allow InputHelper to pause a script for a user to give input into the subsequent action
- Embed script in .dsco file
 - Published script parameters available in variation table
 - Script parameters can be used to drive optimizations within Workbench

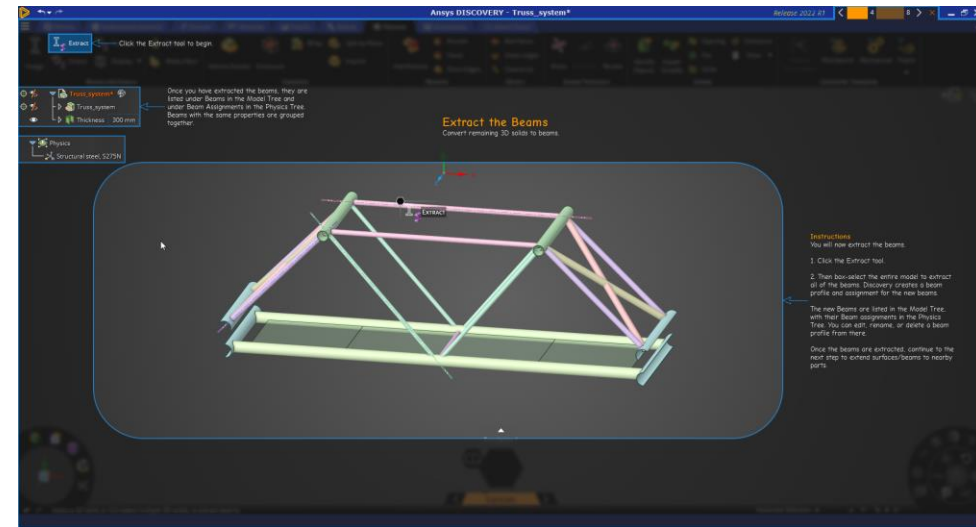
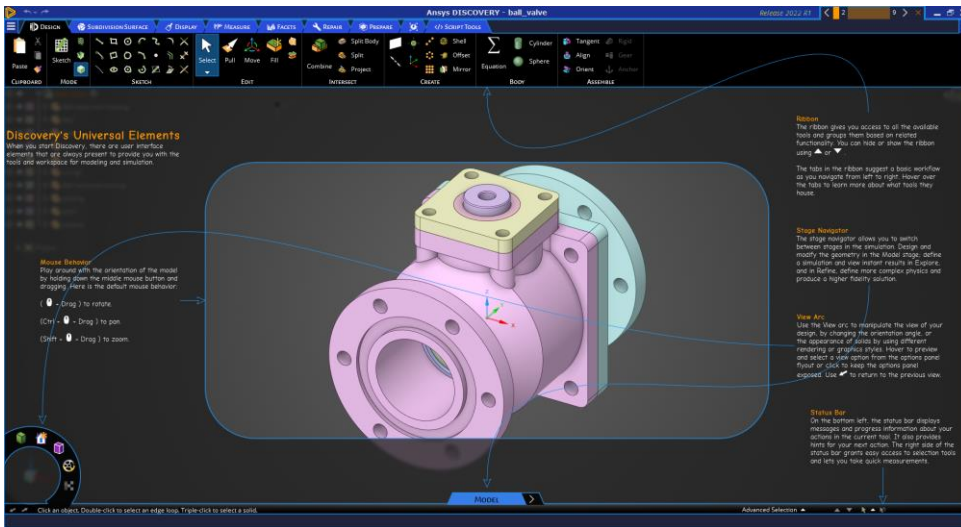
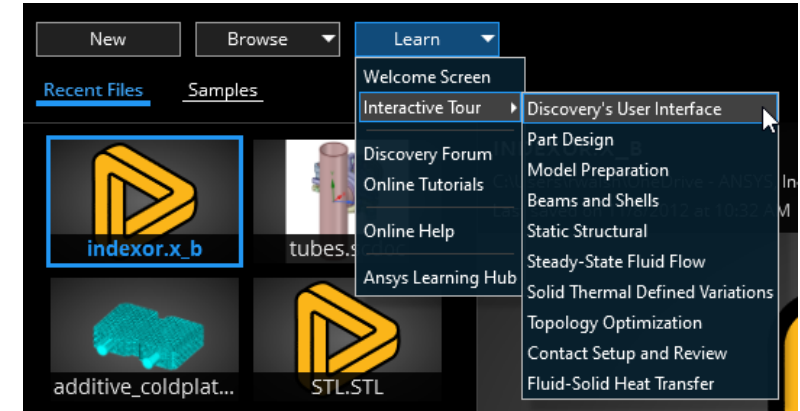


User Experience



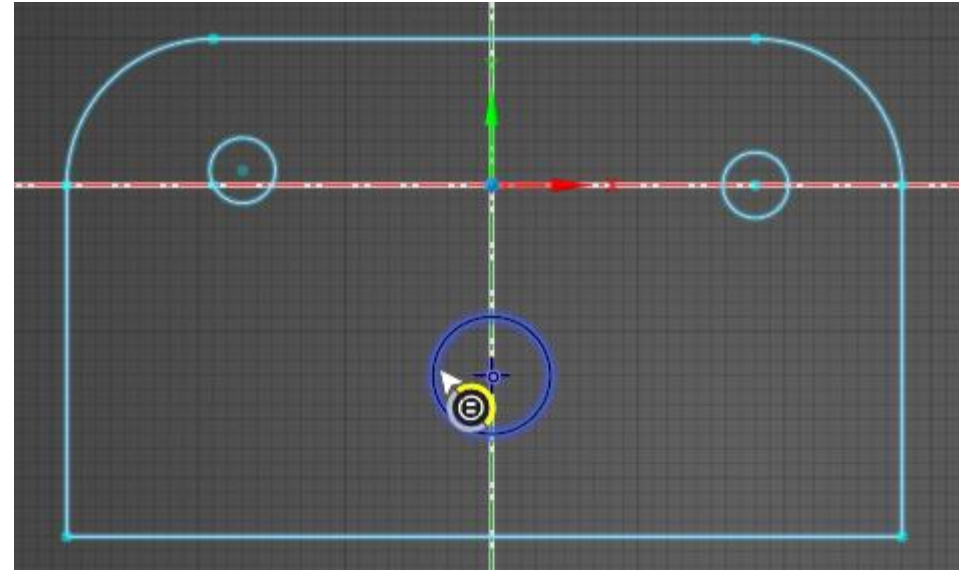
New Instructional Tours

- User Experience Walkthrough provides information on different aspects of the user interface and how they relate to modeling and simulation
- Beam and Shell editing guides users on tools such as midsurface, extend, and beams by simplifying a 3D model into beam and shell elements



/ Constraint Cursors

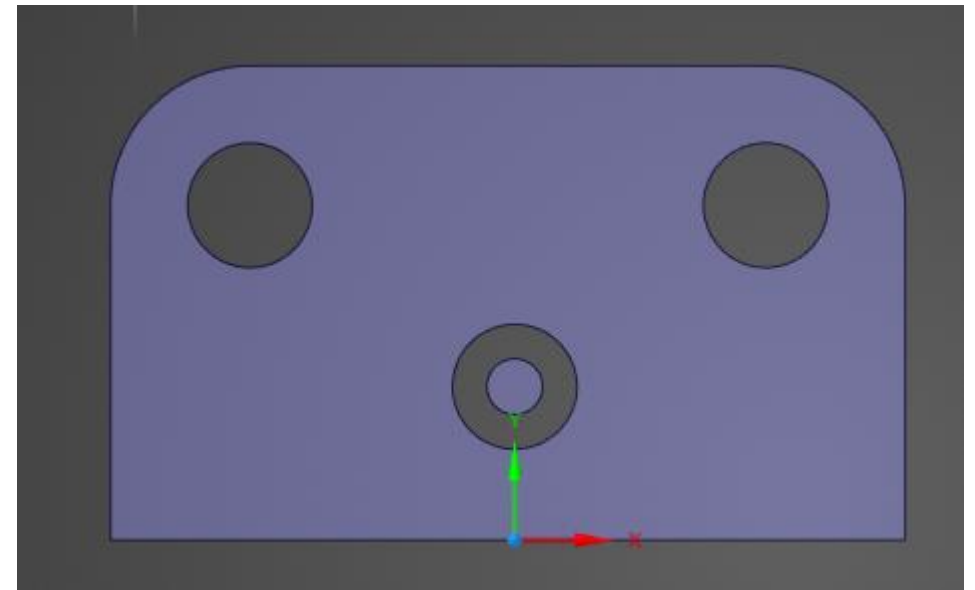
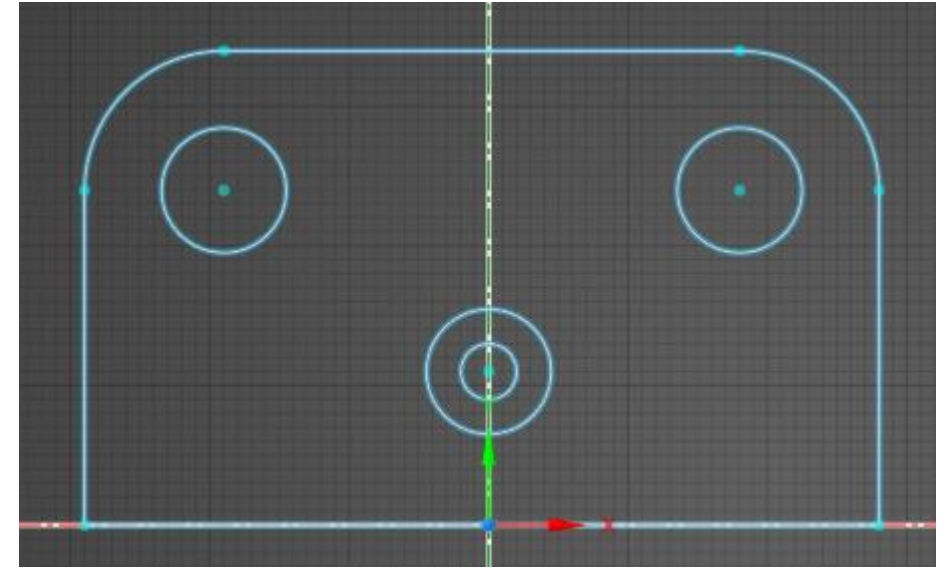
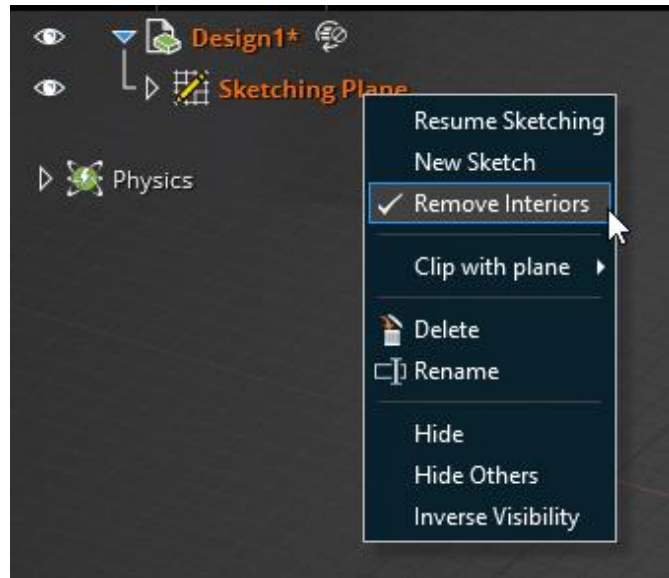
- Cursors assist creation of constraints by coloring correct selections
 - Green: Successfully completed step of constraint
 - Yellow: Allowable selection for next step of constraint
 - Red: Incorrect selection on hover



In this example, the first selected circle can not be made equal to the line but can be made equal to another circle

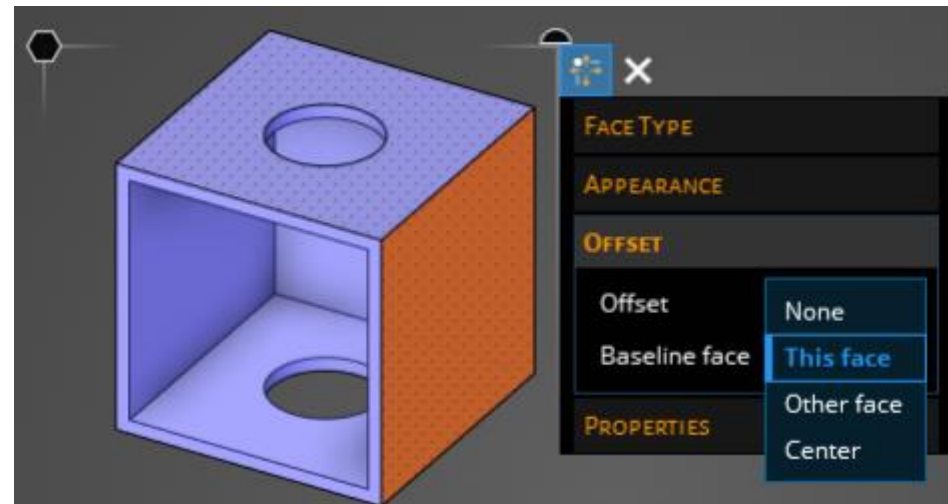
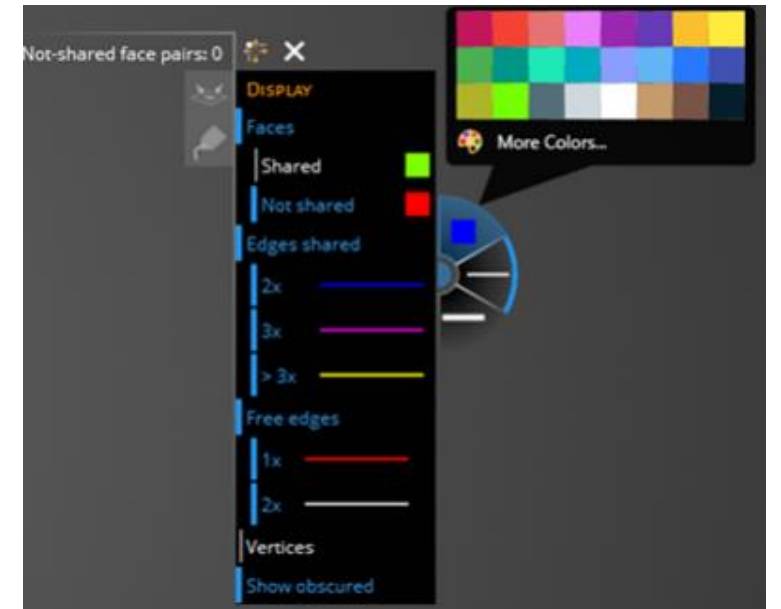
Removing holes while sketching

- Automatically removes holes from sketched region upon exiting a sketch reducing the need to later delete remaining surfaces
- Option available on Sketching plane prior to exiting the sketch



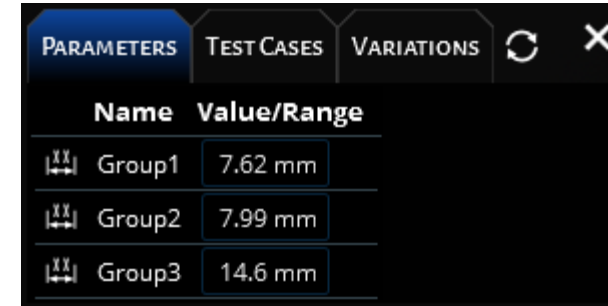
/ Heads up Display improvements

- Shared Topology
 - Halo added to change color
 - Support for Beam/shell bodies
 - Beam connection visibility
- Selection HUD
 - Support added for offset faces
 - Support added for beams type and shell thickness






/ Parameters

- Geometry and simulation parameters have moved from advanced selection to Parameter tab
- Parameters can be set in model stage through SID
- Ability to create/edit variations in refine stage



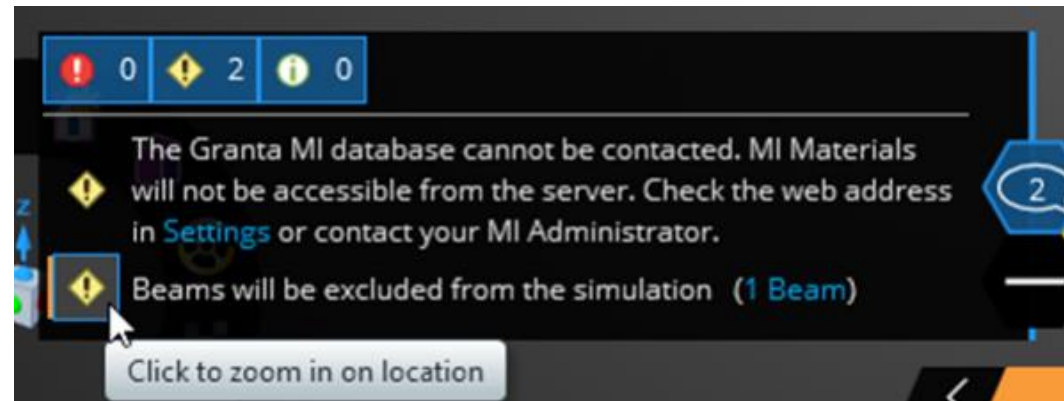
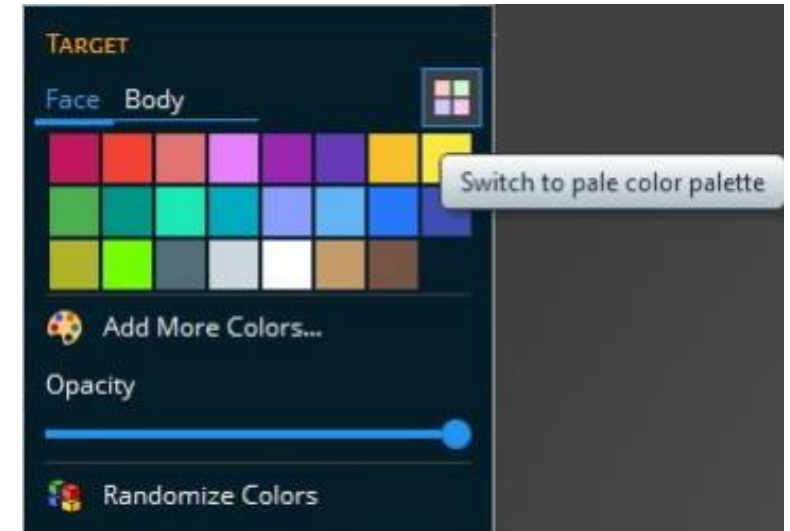
The screenshot shows the 'PARAMETERS' tab of a dialog box. It contains a table with three rows of parameters. Each row has a small icon to the left of the 'Name' column, followed by the 'Name', and then the 'Value/Range'.

PARAMETERS			TEST CASES	VARIATIONS	↺	✕
Name		Value/Range				
	Group1	7.62 mm				
	Group2	7.99 mm				
	Group3	14.6 mm				



Other usability improvements

- Muted color palette added
- Notifications containing geometry can be automatically centered on screen
- Import/Export
 - .aedti format added
 - Inventor V2022 reader
 - NX 1980 reader
 - Revit V2021 reader



 **Ansys**

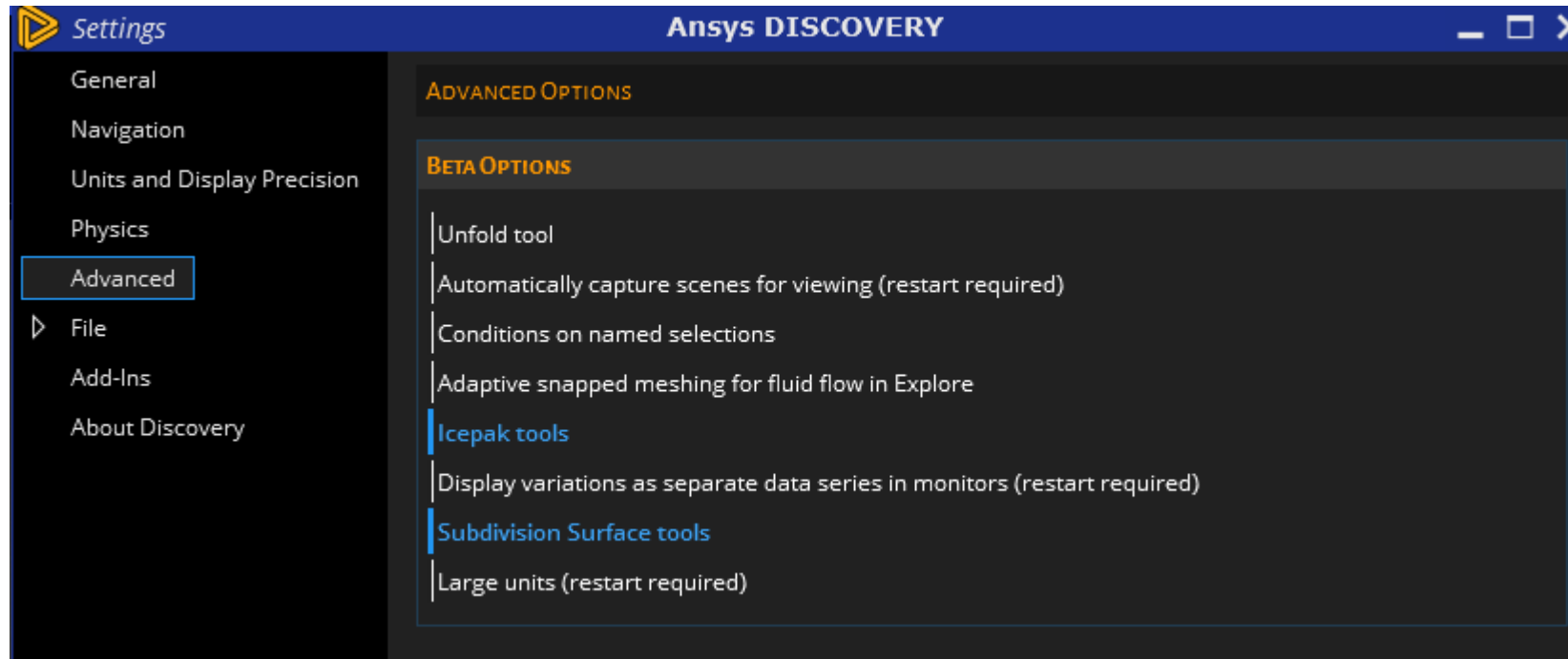


Beta Features



/ Beta Features

- New setting in Advanced panel allows exposure of beta options



/ Beta: Sub-Division Modeling

- Allows creation and editing of organic shapes
- Convert solids/faceted bodies to Sub-D bodies
- Explore physics available on Sub-D bodies
- Useful for:
 - Editing faceted bodies
 - Creating organic shapes
 - Editing complex CAD

