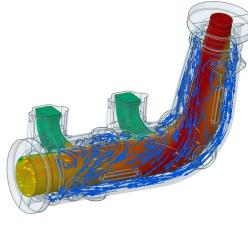# Release 2023 R1 Highlights
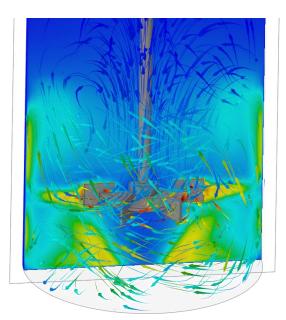# Ansys Discovery

Ansys

Fluids Overview

- Rotating fluid zone (Explore & Refine)

- Fluid-solid interfaces support thermal conductance (Explore)

- Option to compute thermal conductance from thickness and material (Explore & Refine)
  - For bonded contacts and fluid-solid interfaces

- New compressible flow options (Explore)
  - Combine compressible flow and porous media
  - Combine compressible flow and CHT

- Time-dependent CHT (Explore)

- Translating wall (Explore & Refine)

- Defined variations (Refine)

- Live-GX solver (Refine – Beta)

Mixing tank with rotating fluid zone

Exhaust header fluid-solid interface thermal conductance
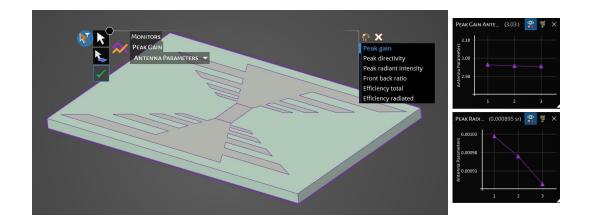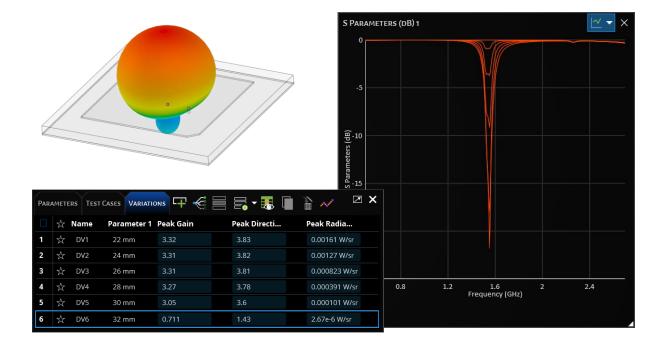

Wind tunnel simulation with translating wall

/\nsys

Electromagnetics Overview

- Antenna parameter monitors
  - Peak gain, peak directivity, peak radiant intensity, front back ratio, efficiency total, and/or efficiency radiated

- Parameters for port conditions
  - Impedance, magnitude and phase can be defined as input parameters

- Parametric studies for electromagnetics
  - Chart data includes all DVs

- Mesh display & statistics
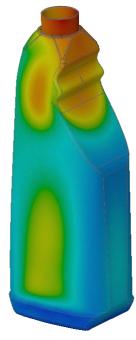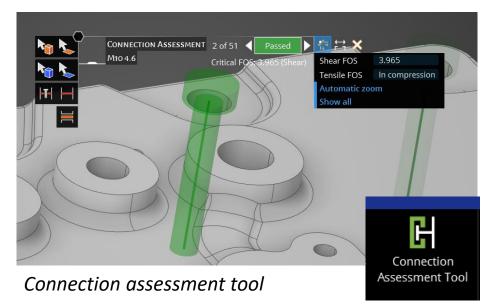
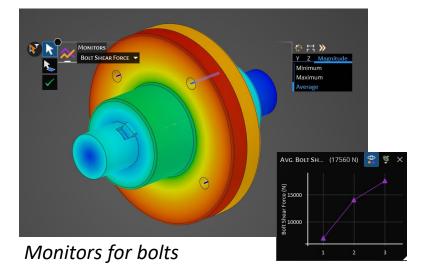- Export electromagnetic results to 3D images

Structures Overview

- Enhanced displacement accuracy for thin structures (Explore)
  - Reliable accuracy if voxel size < part thickness
- Connection assessment tool for bolts & bonded contacts (Explore & Refine)
- Monitors for idealized bolts (Refine)
  - Connection factor of safety, bolt axial stress, bolt shear force or bolt torsional moment
- Bonded contact factor of safety (Explore & Refine)
- Bearing load (Explore)
- Defined variations (Refine)
- Topology optimization workflow (Explore)
- Stress based topo opt (Explore – Beta)
- Nonlinear contact (Explore – Beta)

Connection assessment tool

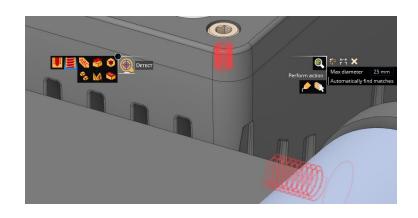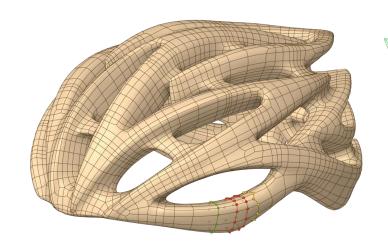*Improved displacement accuracy*

Monitors for bolts

Model Prep & UX Overview

- **Improved parameterization**
  - Allows easy parameterization of complex dimensions

- **Subdivision surface editing**

- **Customizable shortcuts and ribbon**

- **Large unit support**

- **New Measure UI**

- **Detect tool finds threads and holes**

- **Enhanced control of fluid body updates**

- **Improved share topology workflow**

- **Initial feature set of Detailing**

Automatically detect threads

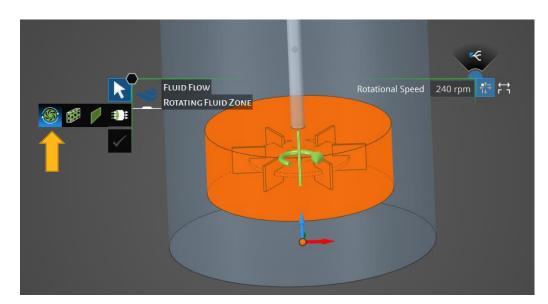*SubD editing allows organic edits to complex shapes*

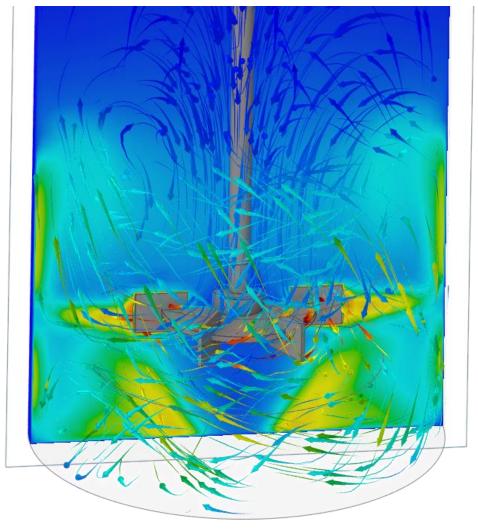# Fluids

Ansys

Rotating Fluid Zone (Explore & Refine)

- ## Rotating fluid zone
  - Specify rotational speed
    - Axis of rotation automatically defined by geometry
    - Rotating fluid zone walls added to physics tree and automatically rotate with fluid the zone
  - Model fans, mixers, electric motor cooling, etc.

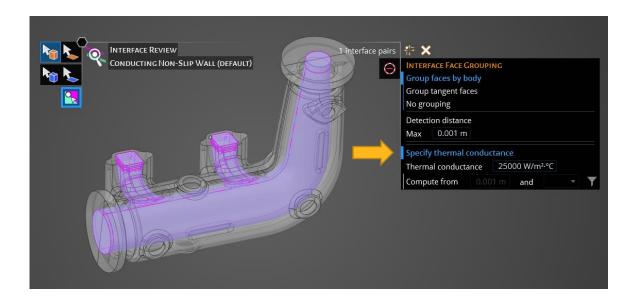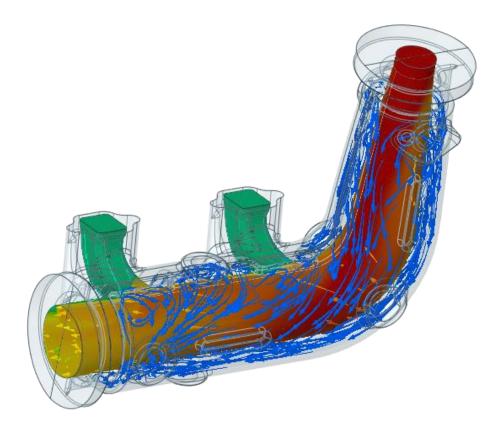*New fluid condition for rotating fluid zone*

Mixing tank velocity

Fluid-Solid Interface Thermal Conductance (Explore)

- Fluid-solid interfaces support thermal conductance for conjugate heat transfer

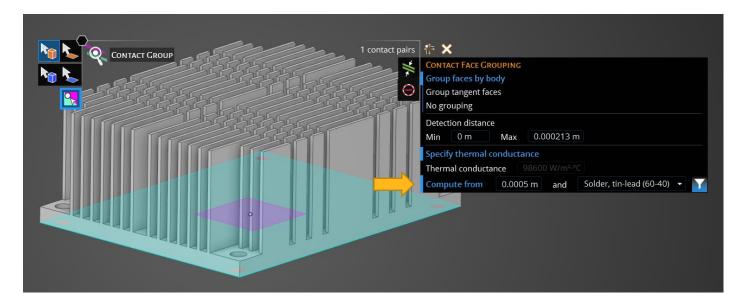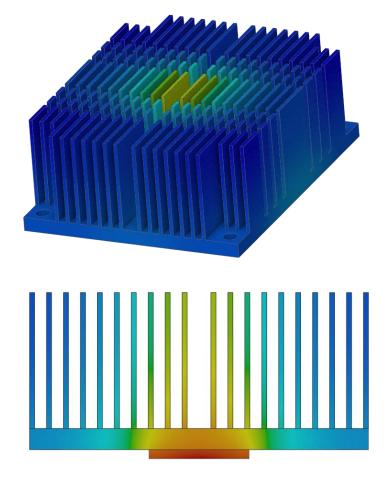 - Allows modeling of thermal conductance due to fouling inside of pipes or heat exchangers

Exhaust header temperature including fluid-solid interface thermal conductance

Thermal Conductance by Thickness & Material (Explore & Refine)

- New option to compute thermal conductance from thickness and material for bonded contacts and fluid-solid interfaces
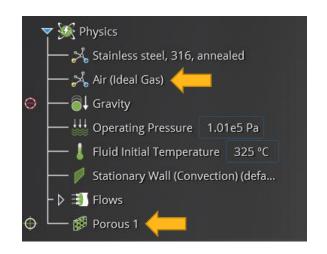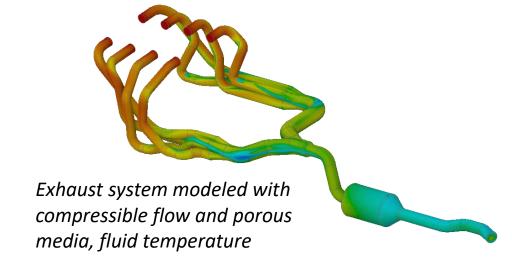 - Improves workflow for thermal simulation and conjugate heat transfer

Heat sink and die with thermal conductance computed from thickness and material
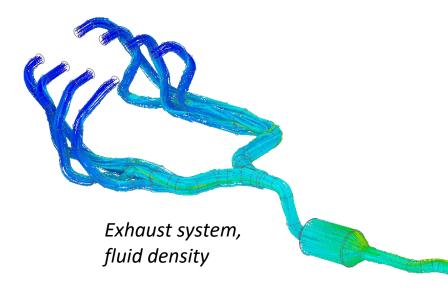
Ansys

Compressible Flow Enhancements (Explore)

- New compressible flow options
  - Combine compressible flow with porous media
  - Combine compressible flow with conjugate heat transfer
  - Model high-speed gas flows or flows with large temperature variations with porous media and/or conjugate heat transfer
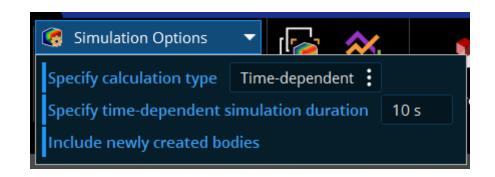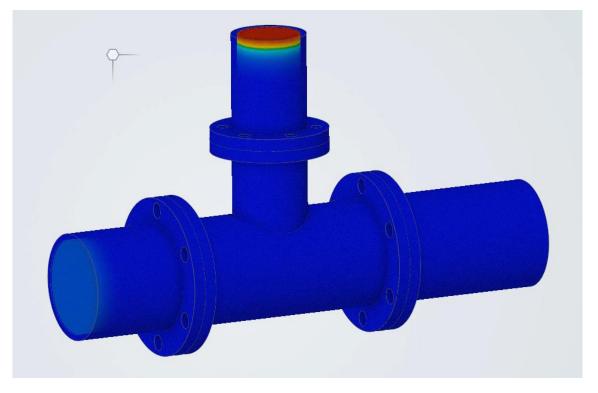

Exhaust system modeled with compressible flow and porous media, fluid temperature

Exhaust system, fluid density

Transient Conjugate Heat Transfer (Explore)

- **Time-dependent conjugate heat transfer simulation**
  - Ability to define time-dependent simulation and simulation time duration for conjugate heat transfer
  - Simulate transient heating/cooling for thermal mixers, water jackets and heat exchangers
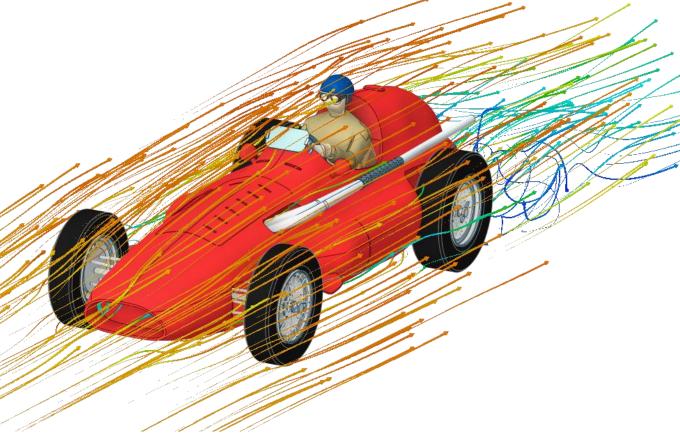

Mixer Tee conjugate heat transfer transient temperature results

Translating Wall (Explore & Refine)

- ## Translating wall
  - Allows specification of tangential wall velocity as part of wall definition
  - Useful for modeling fluid applications with moving walls

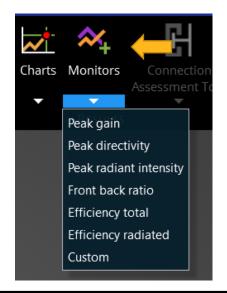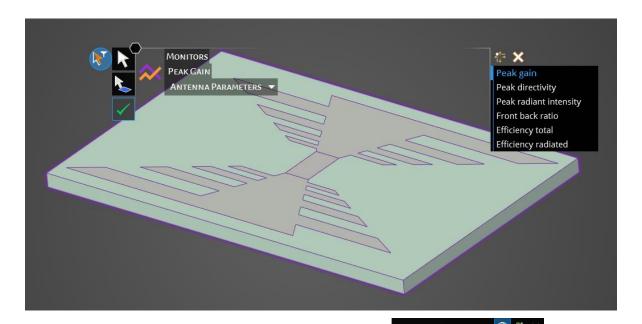*Sportscar and driver wind tunnel simulation with translating wall*
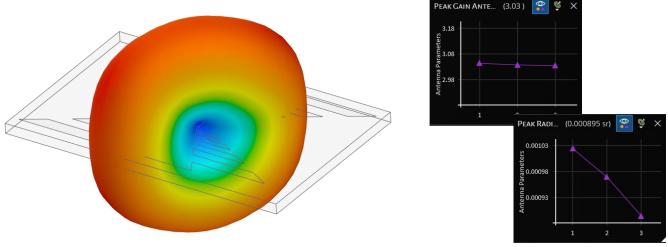
Electromagnetics

Ansys

Antenna Parameter Monitors (Refine)

- New monitors for electromagnetics
  - Define monitors from ribbon menu
    - Peak gain, peak directivity, peak radiant intensity, front back ratio, efficiency total, and/or efficiency radiated monitors
  - Peak gain, peak directivity, peak radiant intensity automatically defined
  - Track monitor values based on model updates or parametric studies
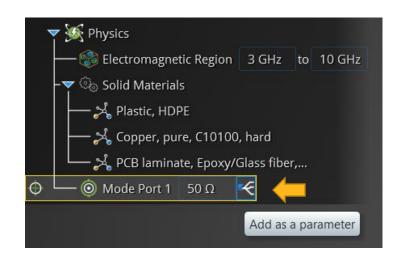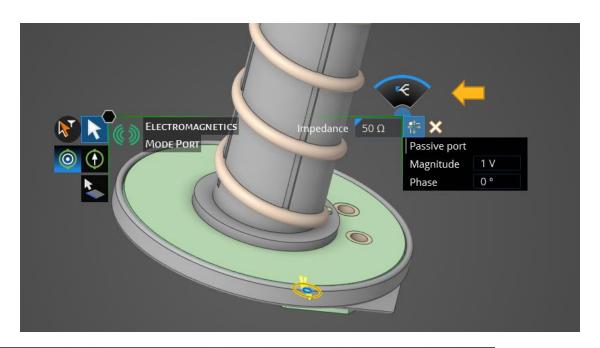 - Enhances workflow for antenna ideation

Parameters for Circuit & Mode Ports (Refine)

- Parameters for port conditions
  - Impedance, magnitude and phase can be defined as input parameters
    - Click on individual field to create parameter
  - Available from port condition or physics tree
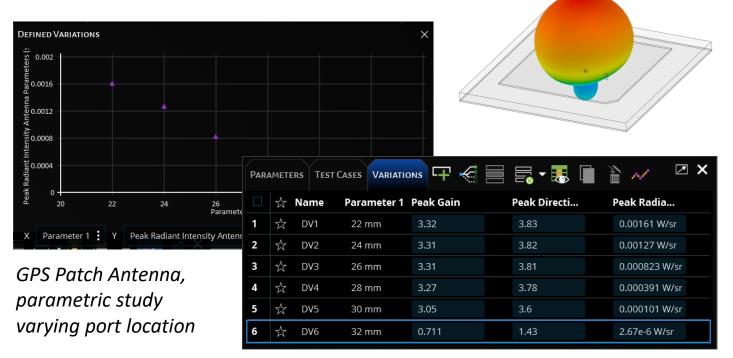 - Enables parametric studies for electromagnetic simulation

Defined Variations for Electromagnetics (Refine)

- ## Parametric studies for electromagnetics
  - Specify input parameters
    - Geometric and/or circuit/mode port parameters
  - Monitor antenna parameter results
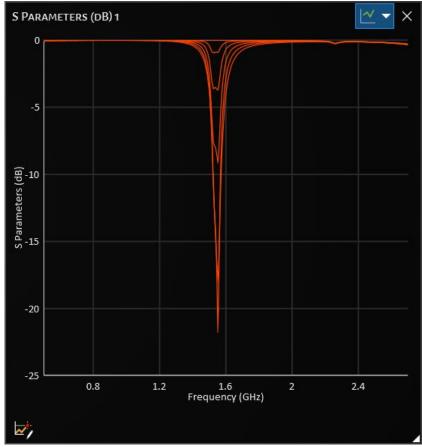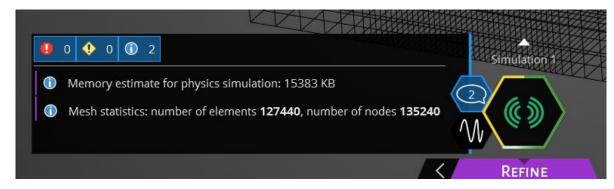 - Chart data include all defined variations

GPS Patch Antenna, parametric study varying port location

		Name	Parameter 1	Peak Gain	Peak Directi...	Peak Radia...
1	☆	DV1	22 mm	3.32	3.83	0.00161 W/sr
2	☆	DV2	24 mm	3.31	3.82	0.00127 W/sr
3	☆	DV3	26 mm	3.31	3.81	0.000823 W/sr
4	☆	DV4	28 mm	3.27	3.78	0.000391 W/sr
5	☆	DV5	30 mm	3.05	3.6	0.000101 W/sr
6	☆	DV6	32 mm	0.711	1.43	2.67e-6 W/sr

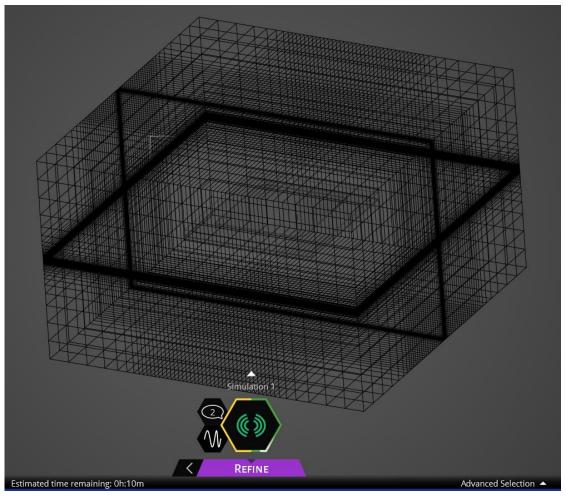*Chart data includes all defined variations*

Mesh Display/Statistics during Solution (Refine)

- ## Mesh display/statistics

  - Available once grid generation is complete

  - Mesh button in Results Arc controls display

  - Easier to verify local refinement and model size, improves solution debugging

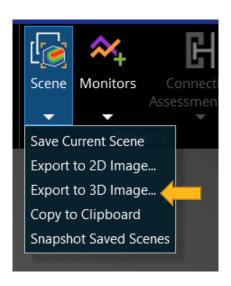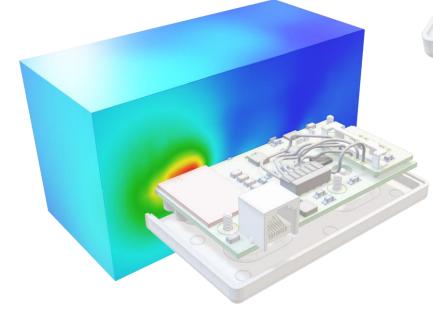*Mesh size and memory estimate available once mesh is complete*

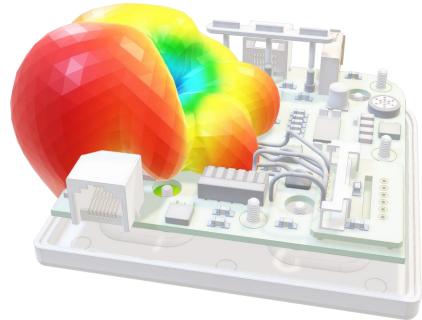*Mesh display and statistics available once mesh is complete*

3D Images for Electromagnetic Results (Refine)

- Scenes now support export to 3D images for electromagnetic results
  - 3D images can be embedded in Microsoft Word, PowerPoint or viewed in a browser
  - Improves post-processing for electromagnetic simulation

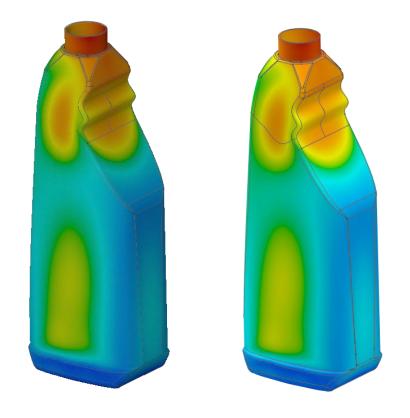*WiFi router near-field electric field and far-field gain 3D images*

Structures

Improved Displacement Accuracy for Thin Structures (Explore)

- Enhanced displacement accuracy for thin structures
  - Best accuracy when the voxel size is less than or equal to the part thickness
    - Derived results (stress & strain) are also improved
  - Improves structural results and reduces GPU memory requirements for thin structures

Stage	Peak Displacement	Percent Error
Explore 2022 R2	0.40 mm	11%
Explore 2023 R1	0.43 mm	4%
Refine 2023 R1	0.45 mm	0%

Detergent bottle with stacking load, Explore (left) and Refine (right) displacement results, voxel size = 0.52 mm, wall thickness = 1 mm
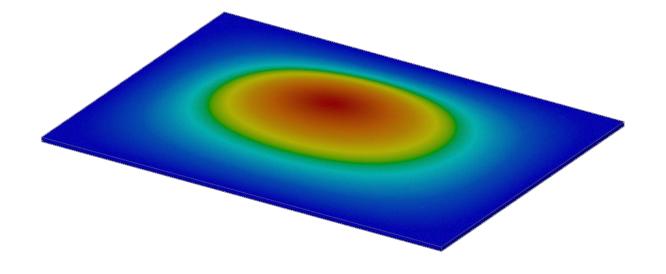
Modal Analysis of a Rectangular Plate

- Rectangular plate 6 in x 4 in x 0.063 in

- Natural Frequency = 1016 Hz
  - R. Blevins, Formula for Natural Frequency and Mode Shape, Van Nostrand Reinhold Company Inc., 1979, Table 11-6

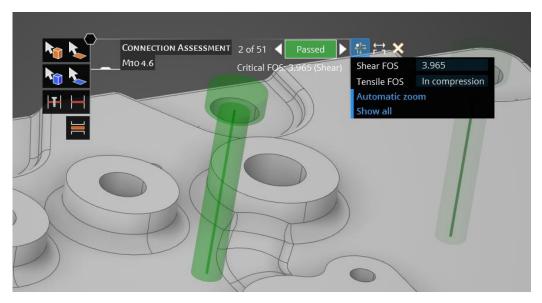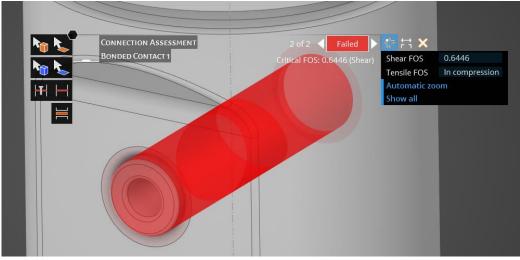| Stage	Natural Frequency	Percent Error
Explore 2022 R2	1130 Hz	9.7%
Explore 2023 R1	1020 Hz	0.4%

Default Fidelity 4GB graphics card

Connection Assessment (Explore & Refine)

- Assess pass/fail/borderline status of bolts (Refine) or bonded contacts (Explore & Refine)
  - Allows visualization of connection status based on factor of safety
    - Bolt factor of safety computed based on modified AISC allowable stress design
  - Options to show all or automatically zoom to connection location
  - Filtering by body, face or failed connections
  - Export to CSV (from ribbon) to export all bolt and contact results data

Connection Assessment

New connection assessment tool to evaluate bolts and bonded contacts
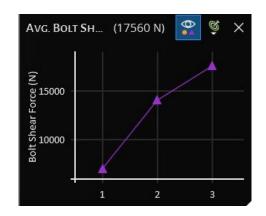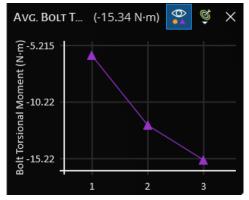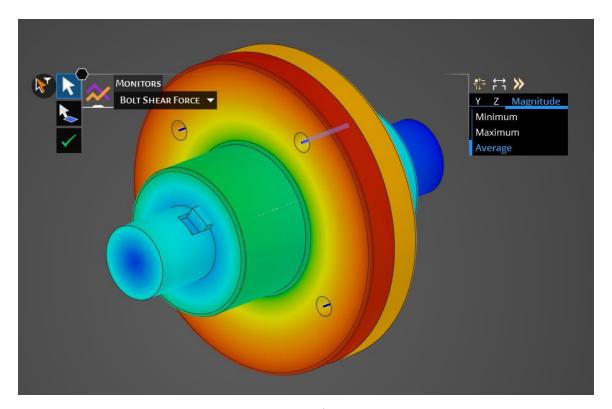
Monitors for Bolts (Refine)

- Bolt monitors
  - Define connection factor of safety, bolt axial stress, bolt shear force or bolt torsional moment for idealized bolts
  - Track monitor values based on model updates or design variations
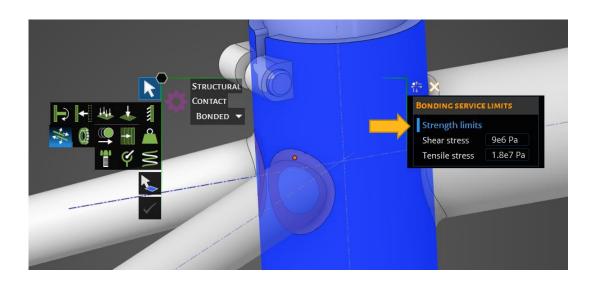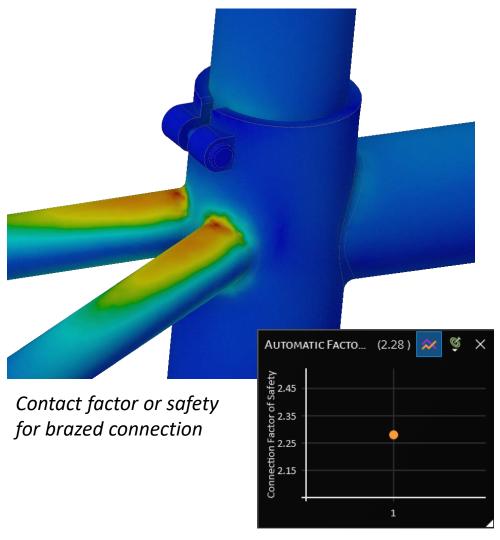 - Improves bolt post-processing

Flange coupling, bolt shear force magnitude monitor

Bonded Contact Factor of Safety (Explore & Refine)

- Bonded contact factor of safety
  - Specify bonding service stress limits to compute factor of safety
  - Factor of safety computed based on automatic, tensile or shear stress
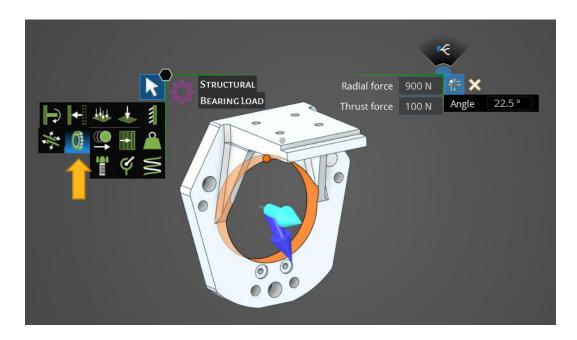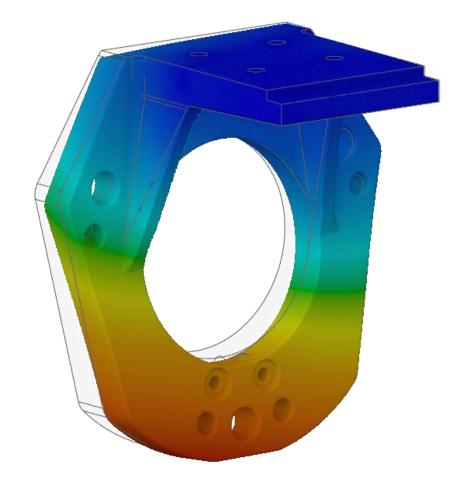 - Evaluate strength of brazed, solder, glue or other connections

Contact factor or safety for brazed connection

Bearing Load (Explore)

- ## Bearing load
  - Apply bearing radial and thrust forces to cylindrical surfaces
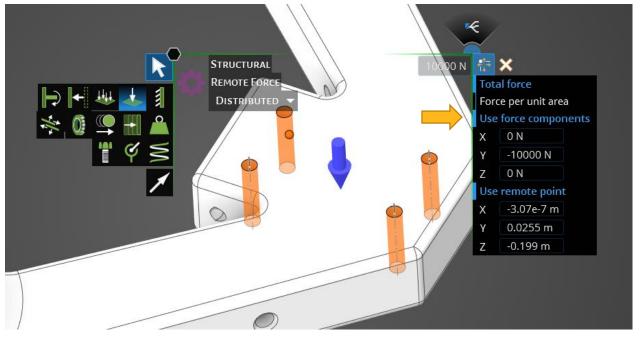 - Enables more realistic modeling of parts and assemblies with bearing loads

Deformation of bearing bracket with applied radial and thrust forces

Force Enhancements (Explore & Refine)

- Force enhancements
  - New "Use force components" option
    - Easier to discover force components
    - Force components can also be parameterized
  - "Use remote point" applies force to the centroid of all selected areas
    - Improves default location for remote point
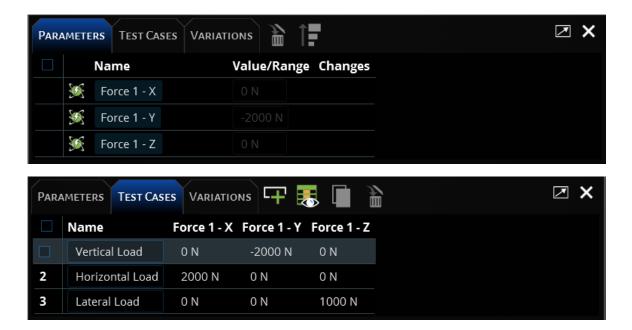 - Improves usability for applying forces with components and remote locations

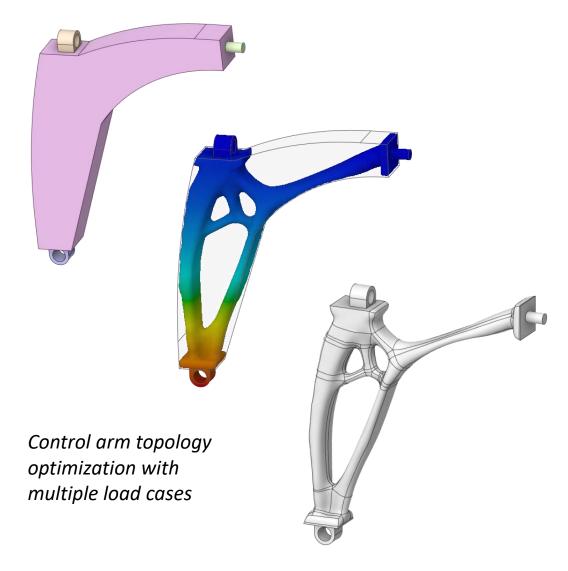*New options for "Use force components" and default location when using remote point location*

Topology Optimization Multiple Test Cases

- New topology optimization workflow
  - Define parameters for physics conditions and use test cases to define multiple load cases for topology optimization
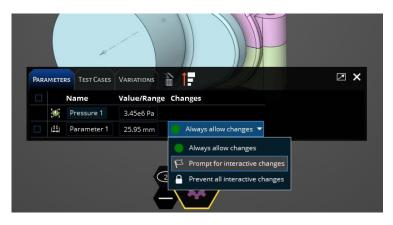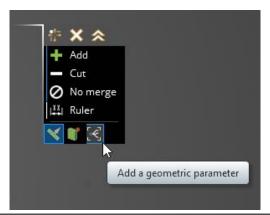 - Improves workflow for topo opt with multiple load cases

PARAMETERS	TEST CASES	VARIATIONS		
	Name		**Value/Range**	**Changes**
	Force 1 - X		0 N	
	Force 1 - Y		-2000 N	
	Force 1 - Z		0 N	

PARAMETERS	TEST CASES	VARIATIONS		
	Name	**Force 1 - X**	**Force 1 - Y**	**Force 1 - Z**
	Vertical Load	0 N	-2000 N	0 N
2	Horizontal Load	2000 N	0 N	0 N
3	Lateral Load	0 N	0 N	1000 N

Control arm topology optimization with multiple load cases

Modeling Improvements

Improved parameterization workflow

- New parameterization option allows modifications of measured values to be created as parameters
  - Improves robustness of replay and assists with complex relationships, unattainable with driving dimensions aloneGreat for editing topology optimization results

- Parameters may also be locked to disallow changes or prompt the user before modifications are made
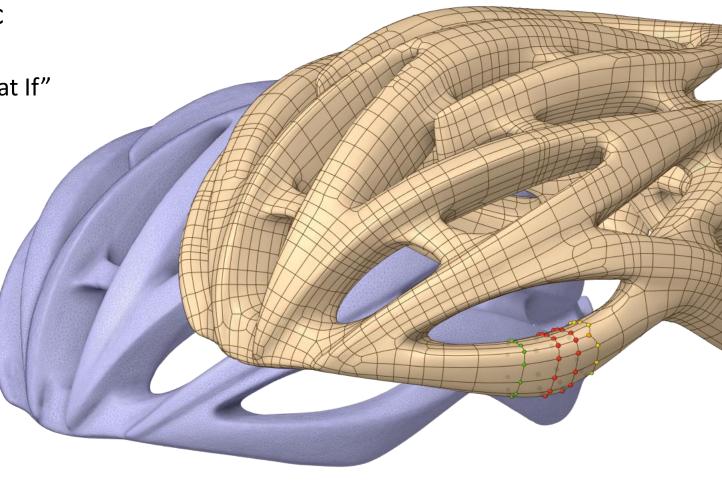
Subdivisional surface editing

- New Sub-D modeling allows organic modeling editing in Discovery

  - Very powerful for quickly exploring "What If" changes

  - Excellent fit for upfront simulation on complex bodies

  - Great for editing topology optimization results
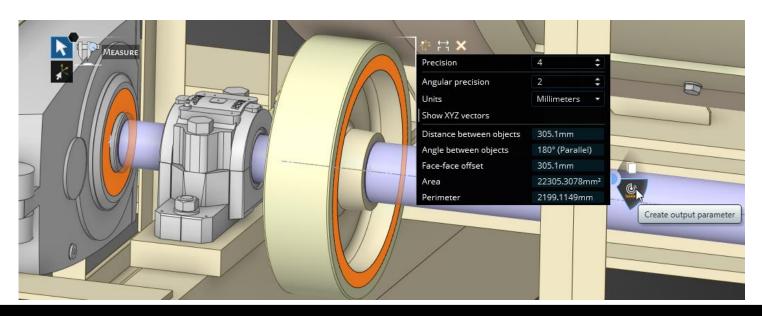
Convert smooth faceted models to Sub-D for modifications

Measure and Mass property Improvements

- Consolidated user interface
  - Vastly reduces conflict between widgets
  - Organized information around measured objects
- Semi halo on values
  - Output parameters can be created to lock critical measurements
  - Values can be copied for use in other applications
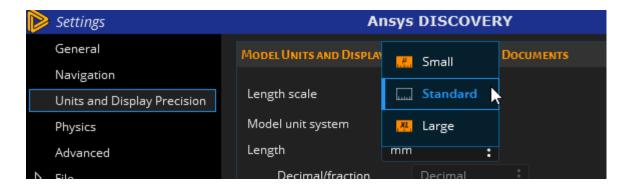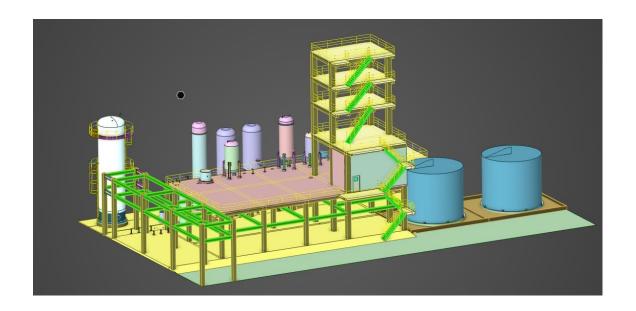
Large Unit Support

- Large unit support has been added in the Units settings

- Allows models larger than 500m from the world origin to be modified

  - Documents set to large units are marked with "XL" to indicate the scale of the file

Detect tool improvements

- ## Consolidated tools
  - Bad Faces, Sharp Edges, and Clearance tools have been consolidated under the new detect tool
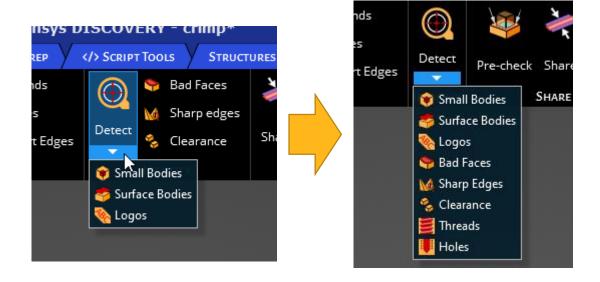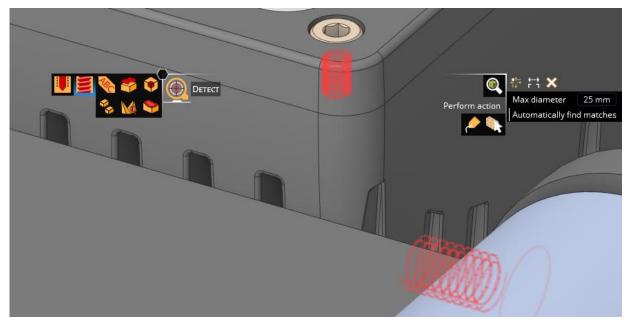
- ## Detection for threads
  - Thread edges can now be detected throughout an assembly up to a maximum diameter value

- ## Detection for holes
  - Simple hole detection has been added up to a maximum diameter value
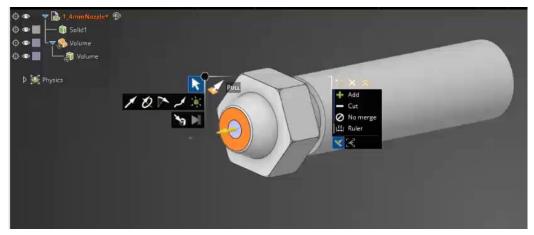 - Holes can be tagged with a named selection, added to a selection, or removed from the assembly
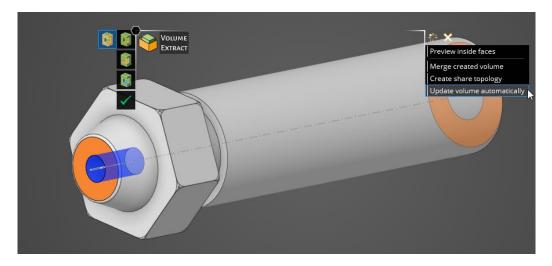
Fluid update

- Fluid body updates can now be updated automatically on geometric changes

- Automatic updates control updating the fluid body when transferring to Ansys Workbench

  - Allows users to dictate in which workflows in which fluids to be updated

  - Helpful if fluid bodies need further modifications

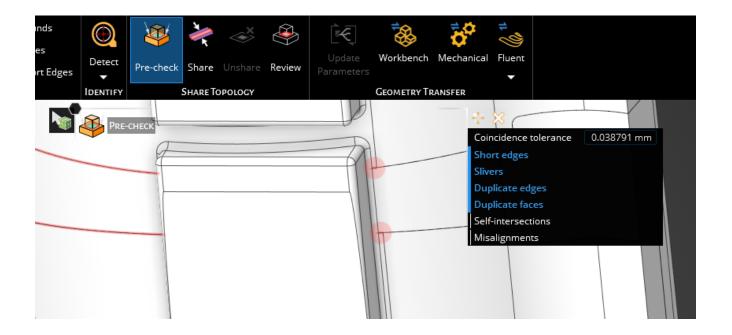 - New icon in the tree indicated that volumes will be updated when the model has been changed

Share Topology

- Pre-Check tool added for topology optimization

  - Finds potential issues that can lead to a share topology failure

  - Allows users to determine which issues to detect and add them to a selection for resolution
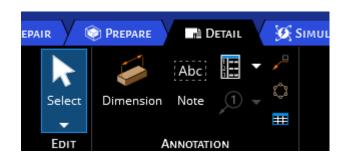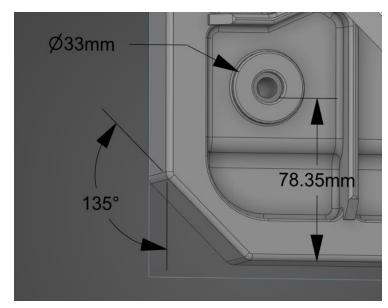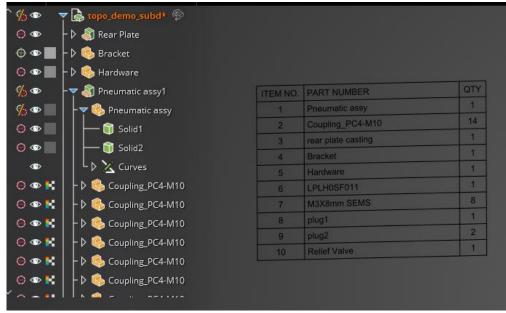
Detail Tab

- New detailing tools allow dimensions and annotations to be created on the model
  - Detailing tab can be turned on within Customization settings
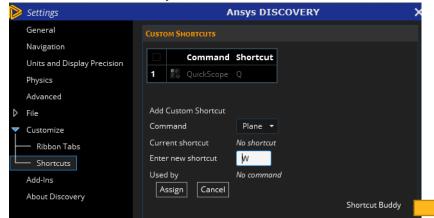- Allows additional details such as Bills of Materials or tables to be created
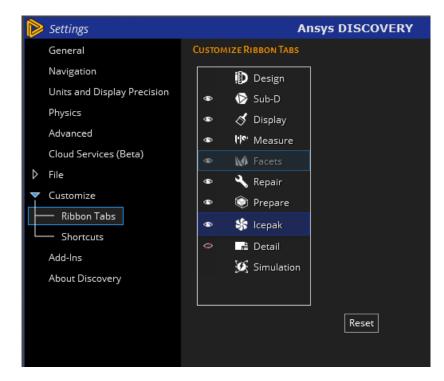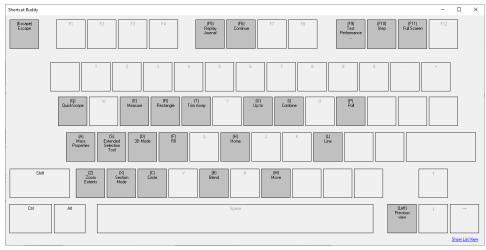
User Experience

Setting Customization

- Ribbon customization
  - Ribbon customization added, allowing users to turn ribbon tabs on or off
  - Sub-D, Icepak, and Detail tabs are off by default
- Shortcut customization
  - Most tools can be provided a custom shortcut or current shortcuts overridden
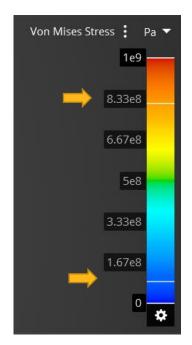 - Shortcut Buddy provides a quick look at all shortcuts in Discovery
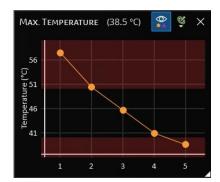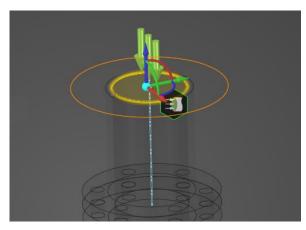
Postprocessing Enhancements

- Legend enhancements
  - Specify range beyond results limits

- Min/Max Range for Monitors
  - Specify allowable range for Monitors

- Reset button for Streamlines and Particles
  - Resets emitter to default location

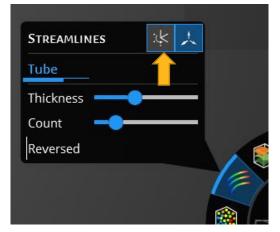- Drop Streamline or Particle Emitter on inlets/outlets by dragging

Extend legend range

Drop emitter on inlets or outlets by dragging emitter over conditions
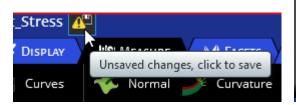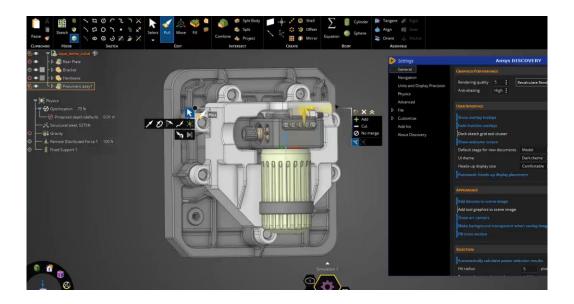

Specify maximum and minimum values

Reset streamline emitter to default location

Unit improvements

- **Heads up display (HUD)**
  - New option allows HUD to be docked in a user defined location

- **Units**
  - The unit settings for the current document was moved to the status bar, for better access and findability

- **Status Bar**
  - File status indicator icon next to the title of the file
  - This indicator button can be clicked to save unsaved changes

- **Significant performance improvement while interacting with the model tree**

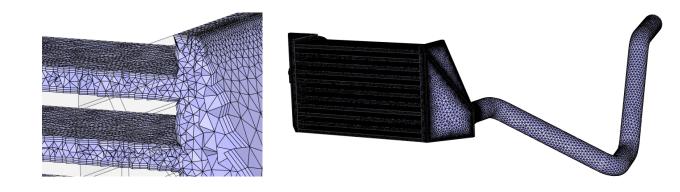- **Icepak tools have been moved to their own tab**
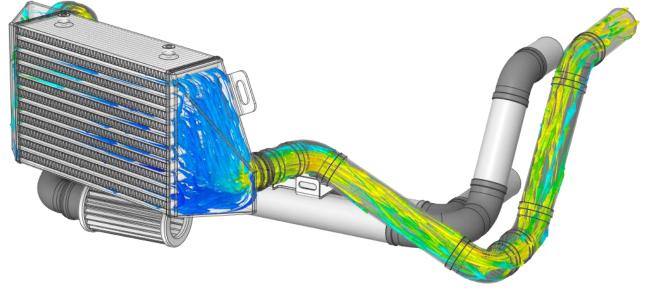
Beta Features

Live-GX Solver (Refine – Beta)

- Option to use Live-GX solver in Refine
  - Enables GPU solution on Refine mesh
  - Included with Discovery Simulation license
  - Provides fast *and* accurate solutions

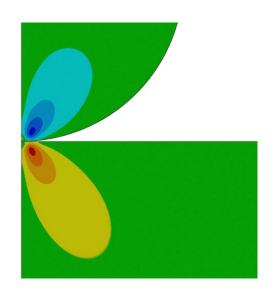*Refine local fidelity controls to resolve thin fluid channels*

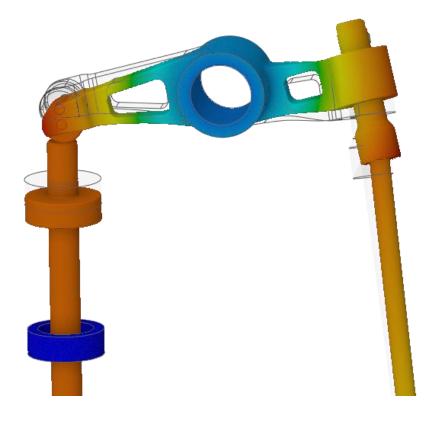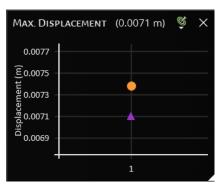*Provides accurate pressure drop results*

Nonlinear Contact (Explore - Beta)

- Frictionless contact (Beta)
  - New option for frictionless sliding contact
  - Robust and fast nonlinear small sliding frictionless contact solution
  - Contact pressure contours and monitors
  - Enables more realistic assembly modeling

Shear stress in Hertz contact model solved in Explore using frictionless contact
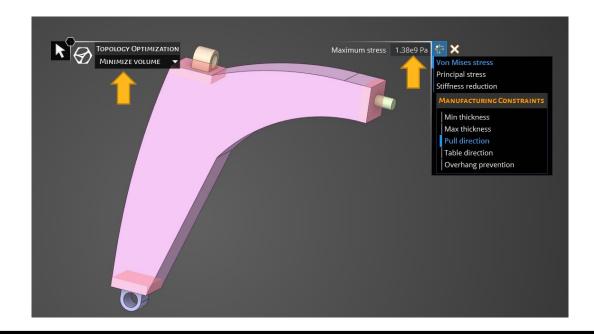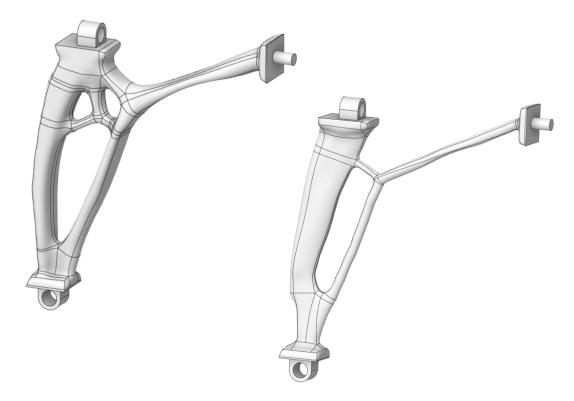
Rocker arm model solved with frictionless contact provides good correlation between Explore & Refine stages for max assembly displacement

Stress Based Topology Optimization (Explore – Beta)

- ## Stress based topology optimization
  - New option to minimize volume under von Mises or Principal stress constraint
  - Go directly to minimum acceptable mass without multiple optimizations at different volume constraints
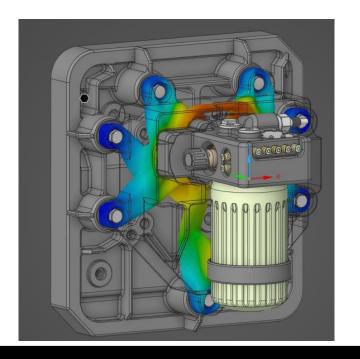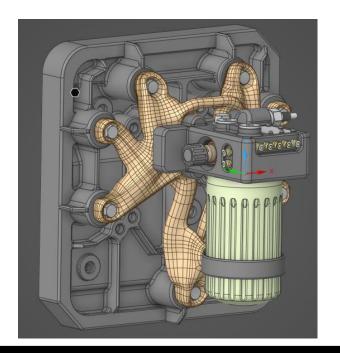

Control arm model with multiple load cases, maximize stiffness (left) and minimize volume with von Mises stress constraint (right)
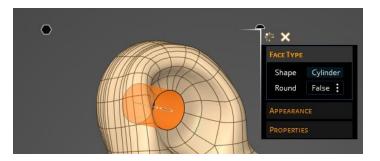
SubD (Modeling - Beta)

- Allows faceted bodies from topology optimization to be represented as a hybrid body

- Hybrid bodies contain both SubD faces and analytic faces such as planes or cylinders

/Ansys