ANSYS Discovery 2022 R1 New

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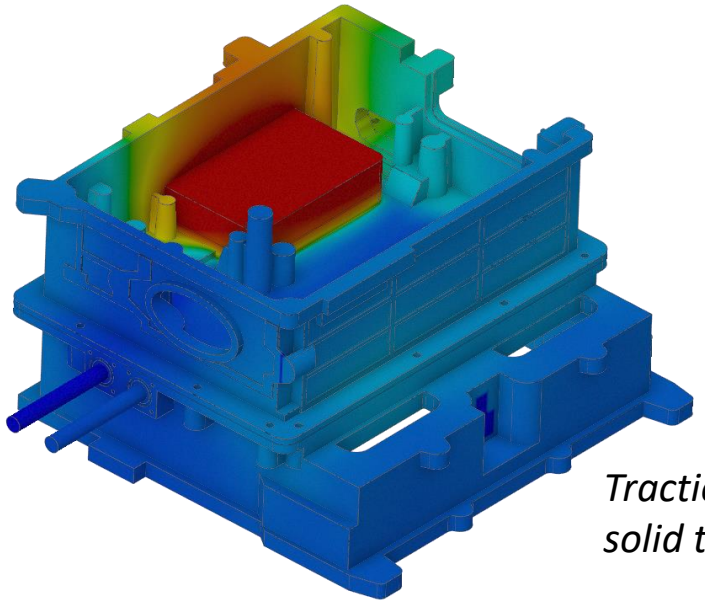
Agenda

- Discovery 2022 R1 New
- Example : CHT
- Capability
- Hardware Requirement
- Question & Answer

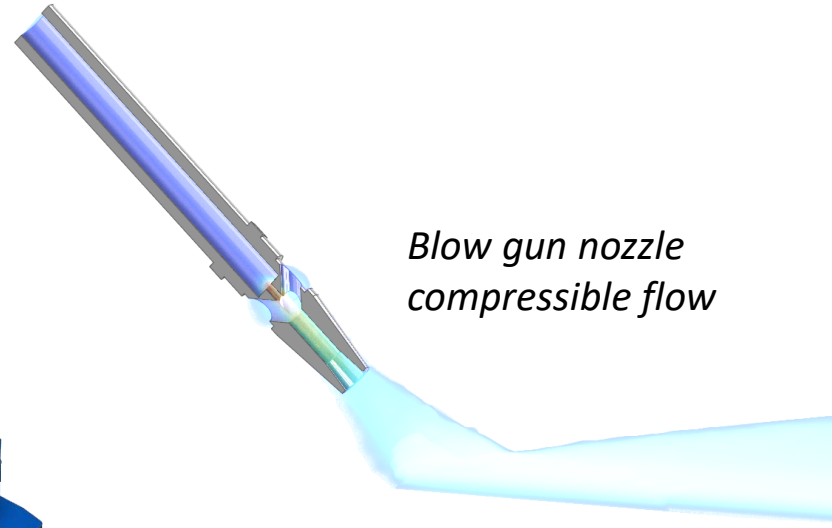
- **Discovery 2022 R1 New**

Discovery 2022 R1 New Physics Features

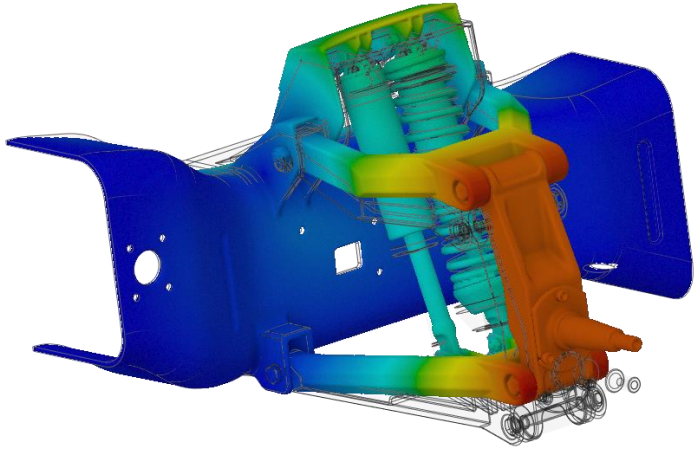
- Fluid-solid thermal simulation
- Compressible flow
- Hinge and spherical joints
- Spring connections
- Simulation units
- Temperature dependent materials
- Faceted body simulation
- Postprocessing enhancements



Traction inverter fluid-solid thermal simulation



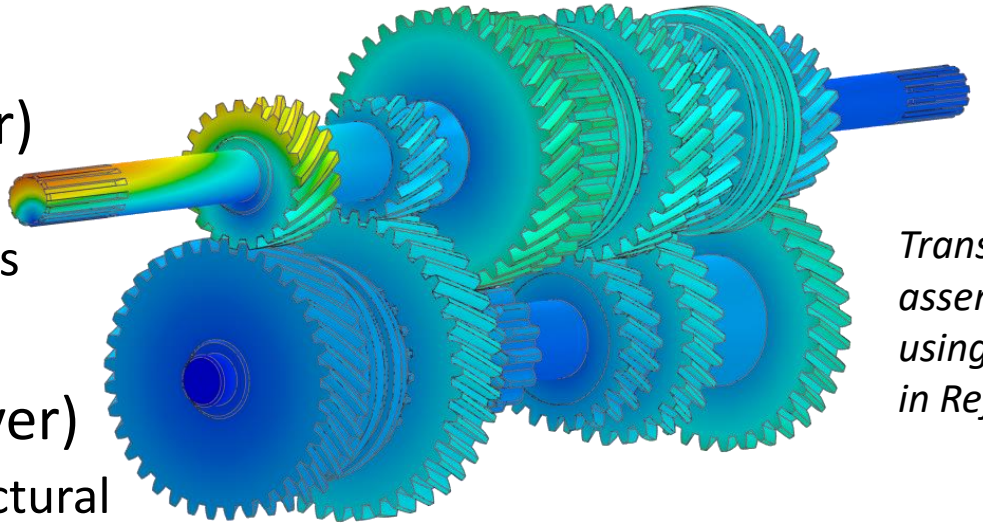
Blow gun nozzle compressible flow



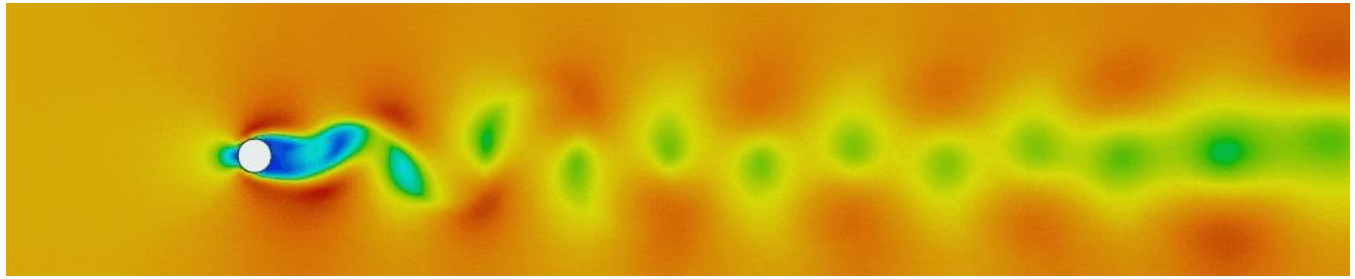
Race truck suspension with hinge joints and idealized sliding contact

Performance and Accuracy Enhancements

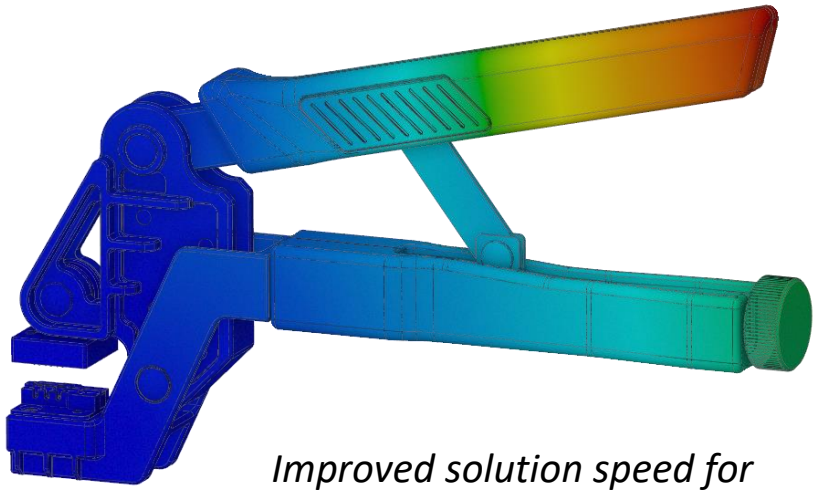
- Explore enhancements (Discovery solver)
  - Up to 100% faster solution speed for static structural and modal analysis of complex parts
  - Improved accuracy for transient flow
- Refine enhancements (Mech Fluent solver)
  - New default to use four HPC cores for all structural and solid thermal solutions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



Transmission assembly solved using four cores in Refine



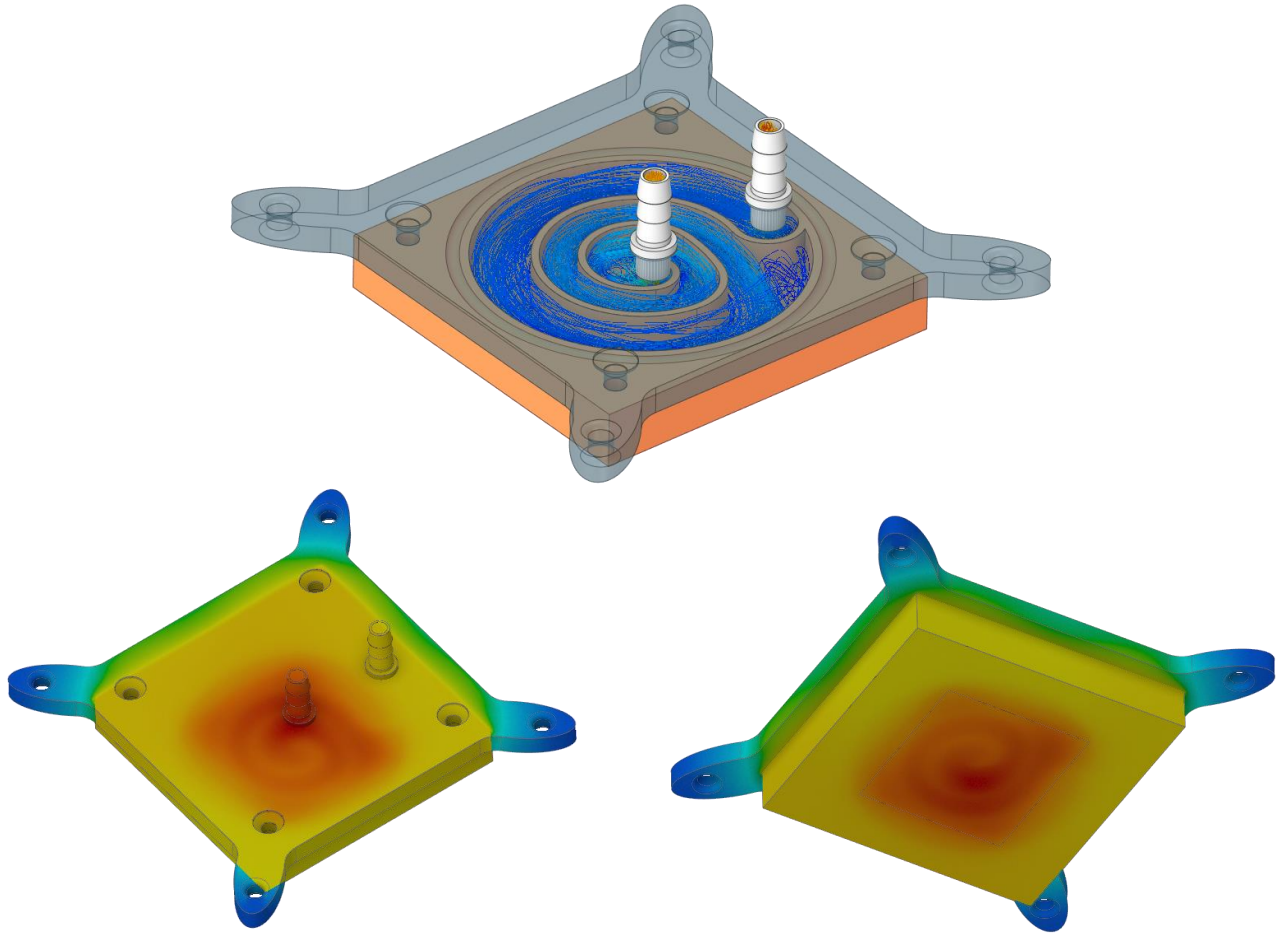
Improved accuracy for transient flow over a cylinder (vortex shedding)



Improved solution speed for structural simulation in Explore

Fluid-Solid Thermal Simulation (Explore)

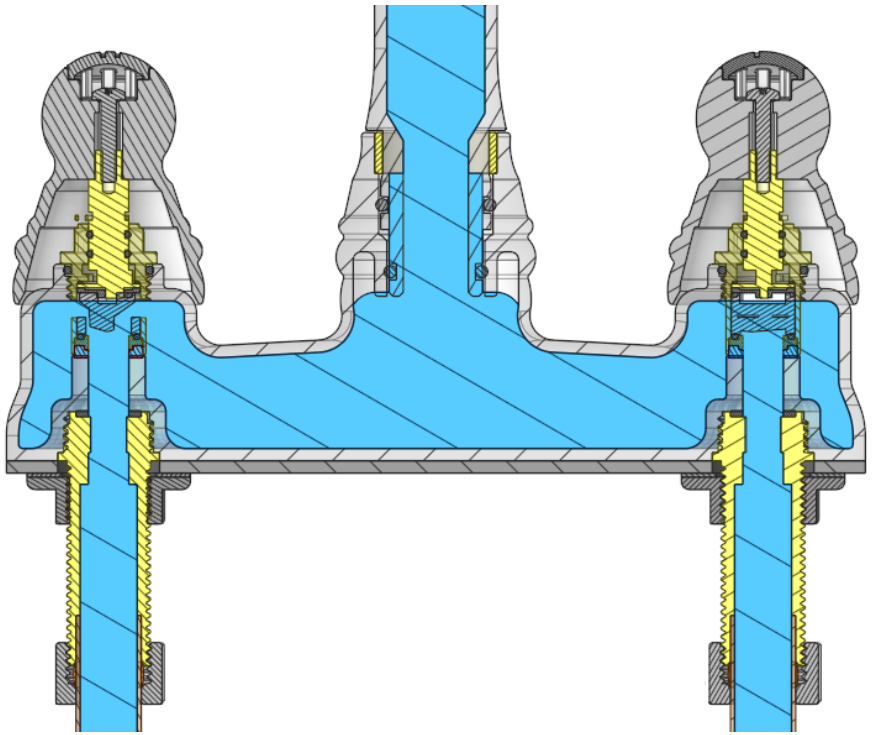
- Automated workflow for fluid-solid-thermal simulation (CHT)
  - Fluid and solid thermal regions automatically defined by materials and fluid/solid conditions
  - Automatic definition of fluid-solid interfaces and bonded thermal solid connections
  - *Imprinting is not required*
- Evaluate thermal and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

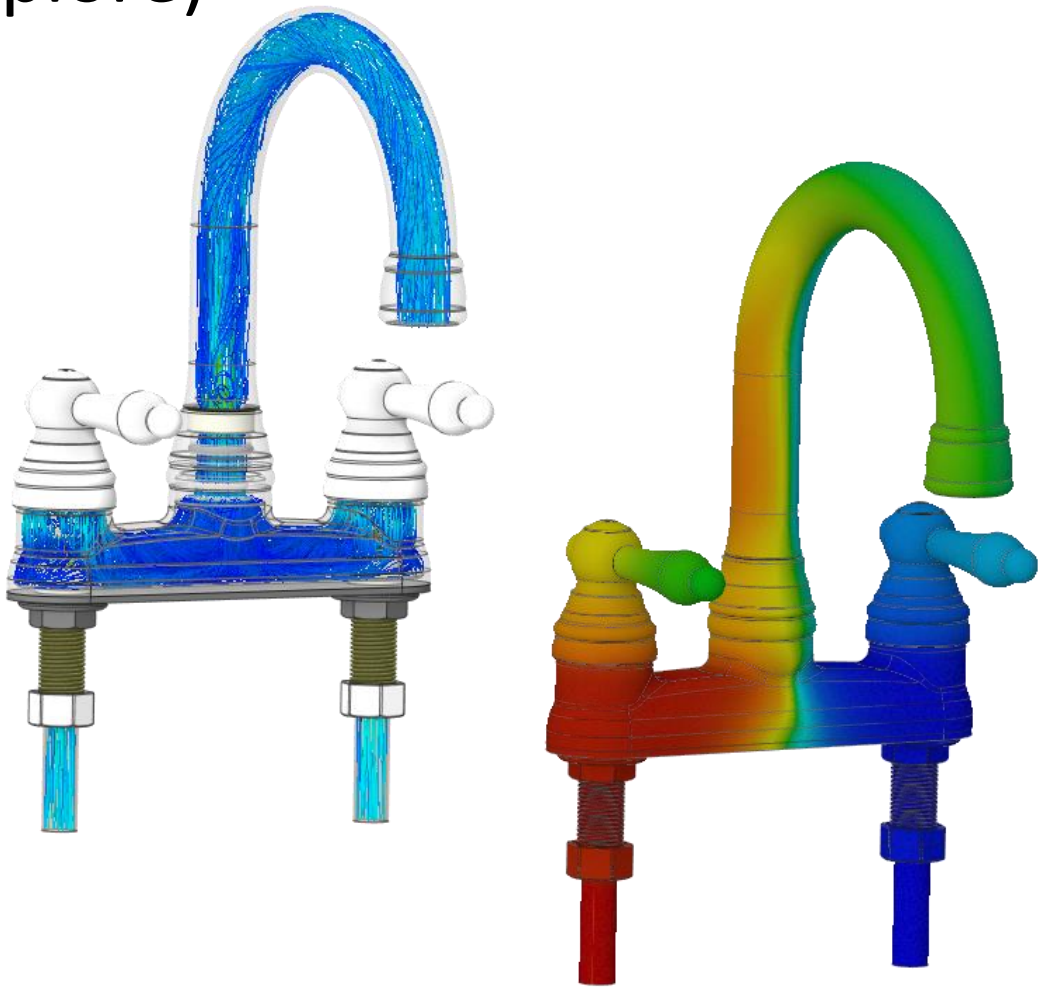


CPU Cooler – Velocity streamlines and temperature contours

Fluid-Solid Thermal Simulation (Explore)

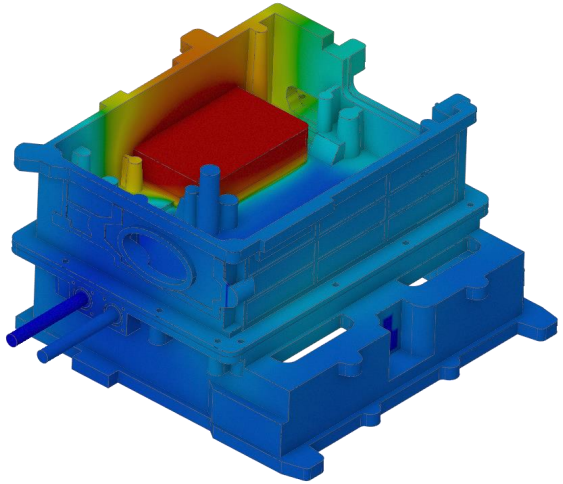
- Easily solve conjugate heat transfer with complex, dirty geometry
  - *Not necessary to remove small gaps & overlaps or imprint geometry*



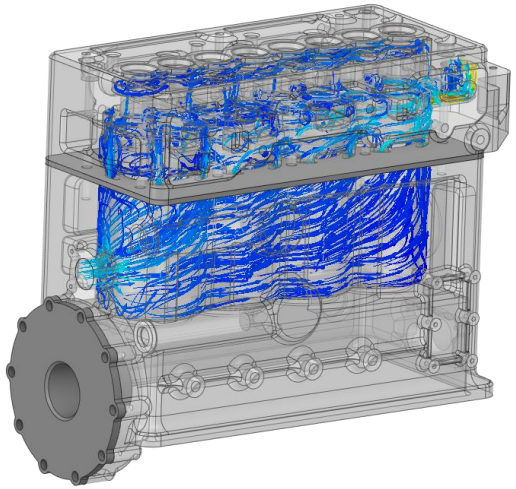


Faucet conjugate heat transfer solved without any geometry prep, velocity streamlets and temperature contours shown

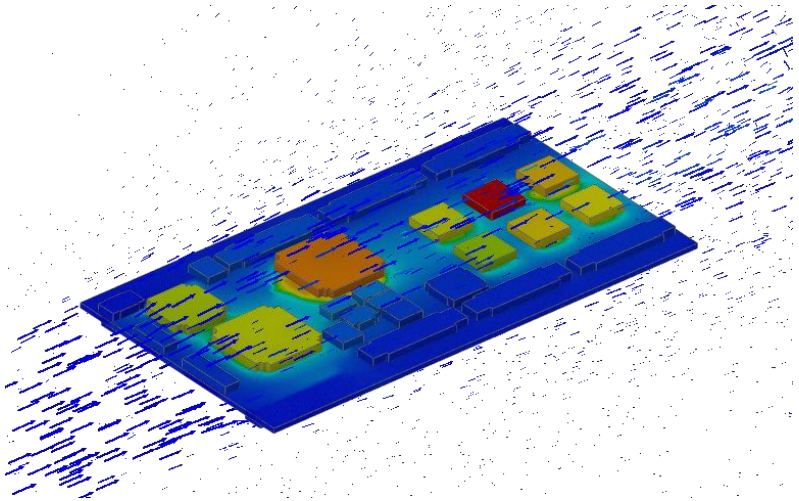
Fluid-Solid Thermal Applications



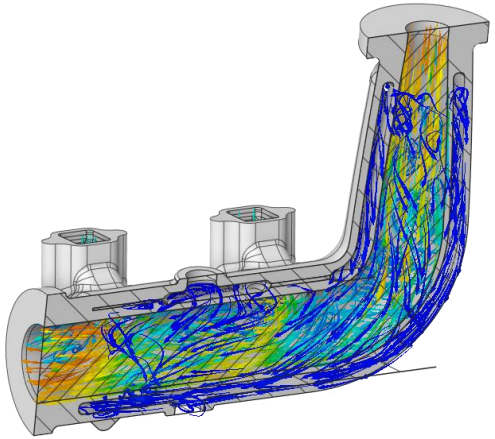
Traction Inverter



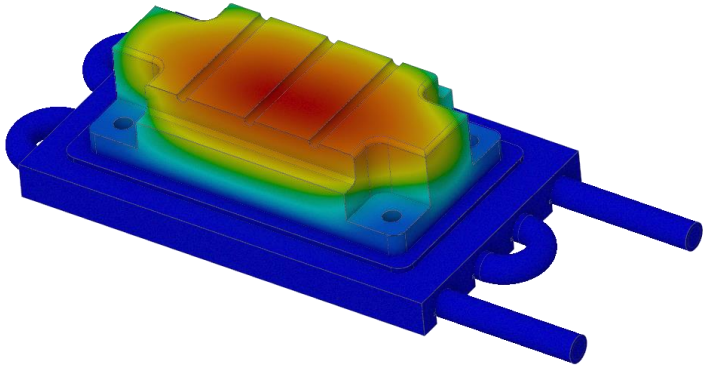
Water Jacket



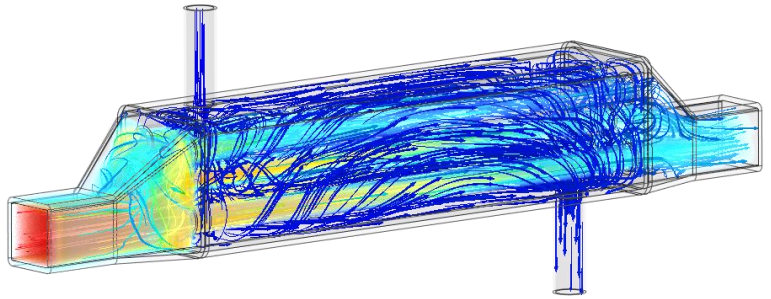
Printed Circuit Board



Exhaust Header



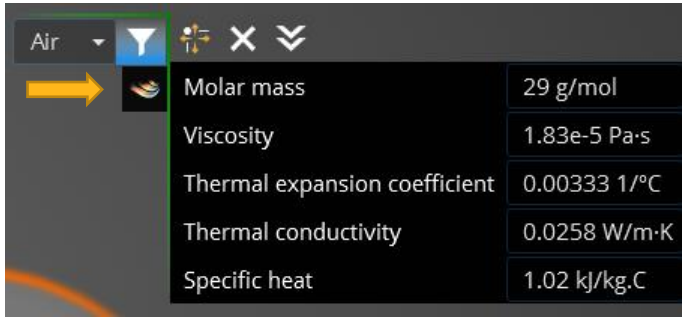
Cold Plate

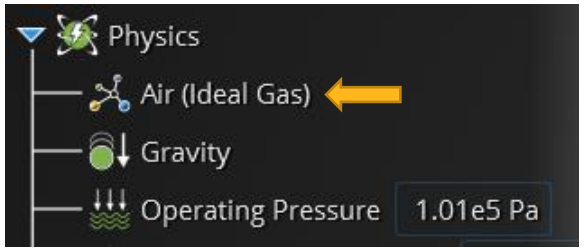


Shell and Tube Heat Exchanger

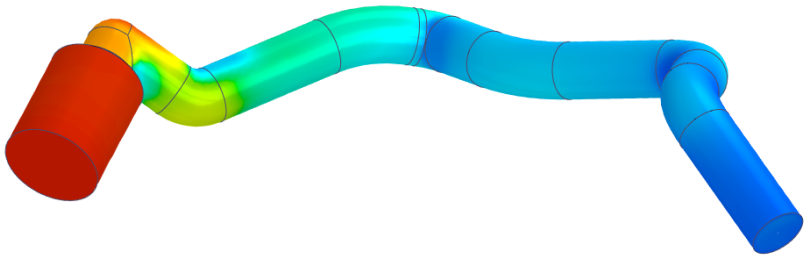
Compressible Flow (Explore & Refine)

- 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

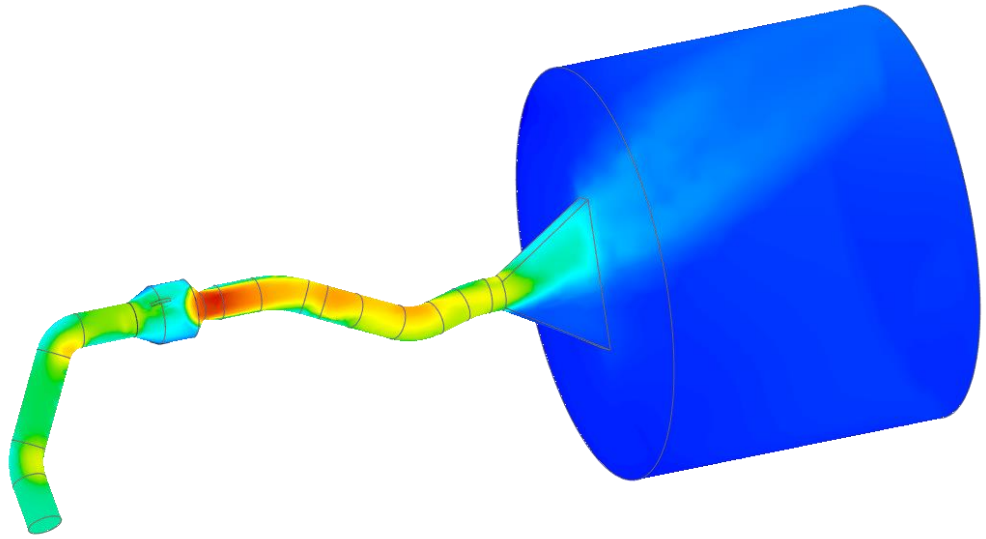




Specify ideal gas as part of material definition



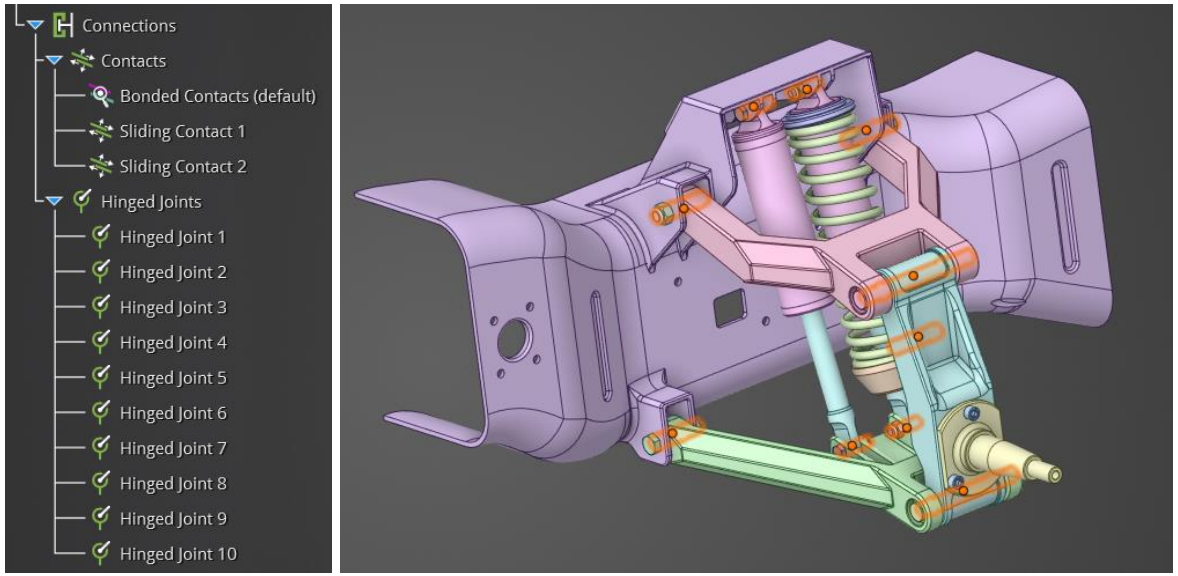
Gas density in high temperature pipe flow



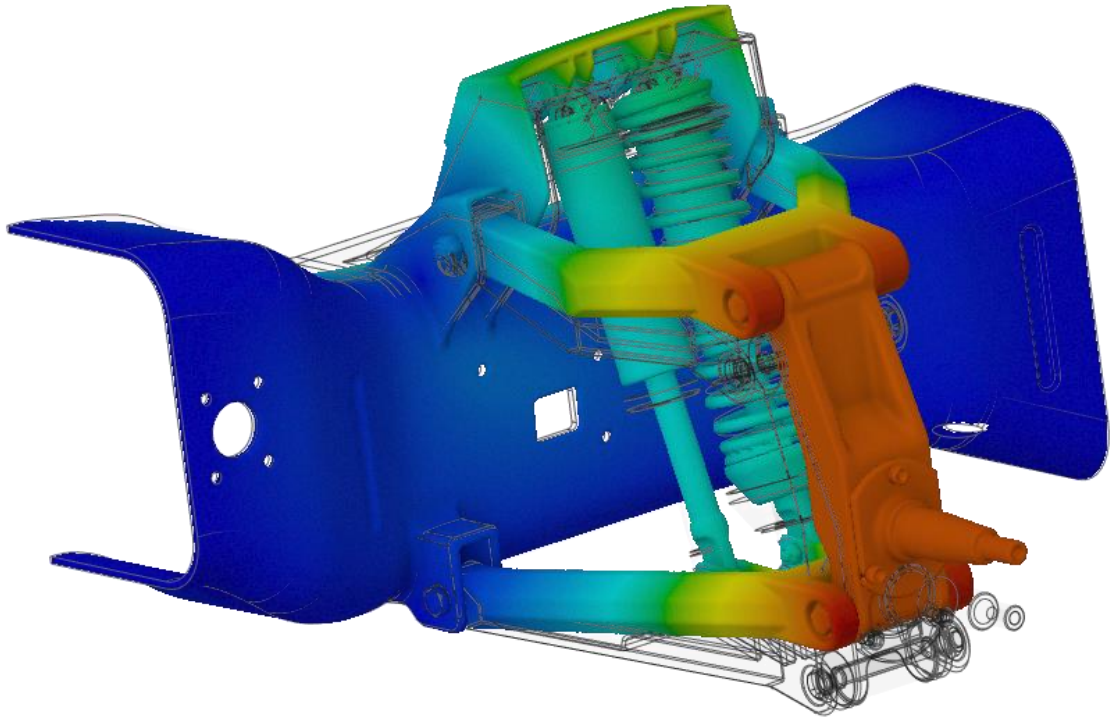
Mach number (0.4) for stability bleed system

Hinge and Spherical Joints (Explore)

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



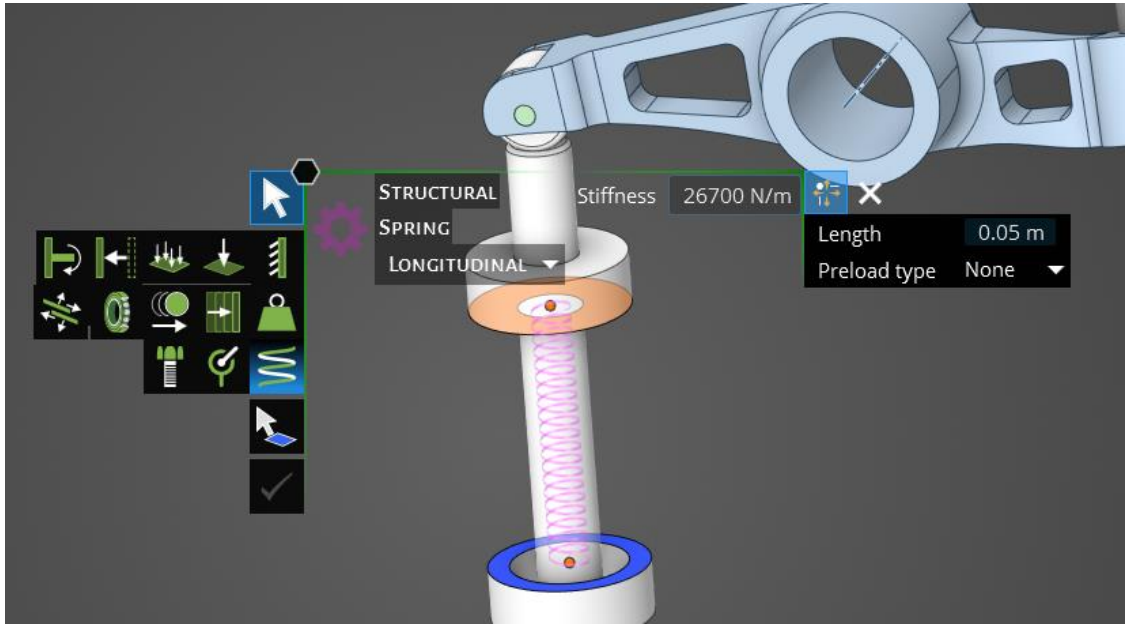
Race truck suspension with hinge joints and sliding (idealized) contact



Race truck suspension displacement

Spring Connections (Explore & Refine)

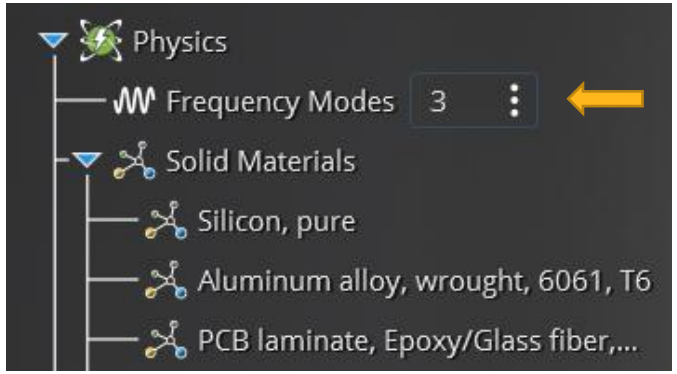
- New spring connection
  - Longitudinal or rotational 1-D spring
  - Body-to-body or body-to-ground connections
  - Specify spring stiffness and spring pre-load (Refine)
  - Reduces model size and improves solution speed

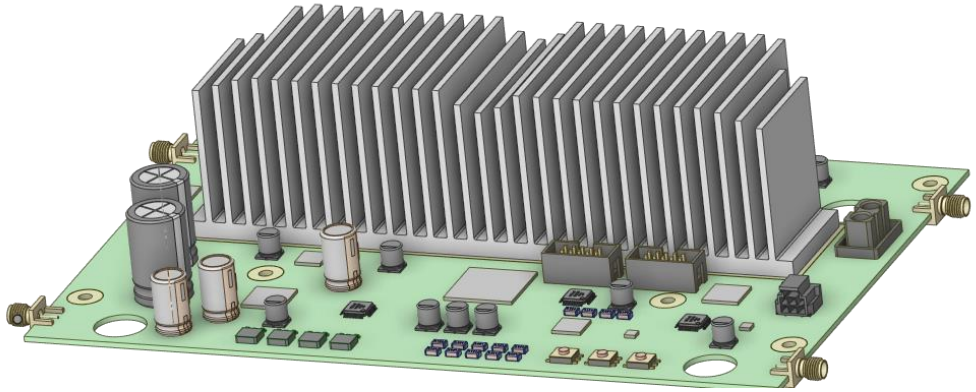


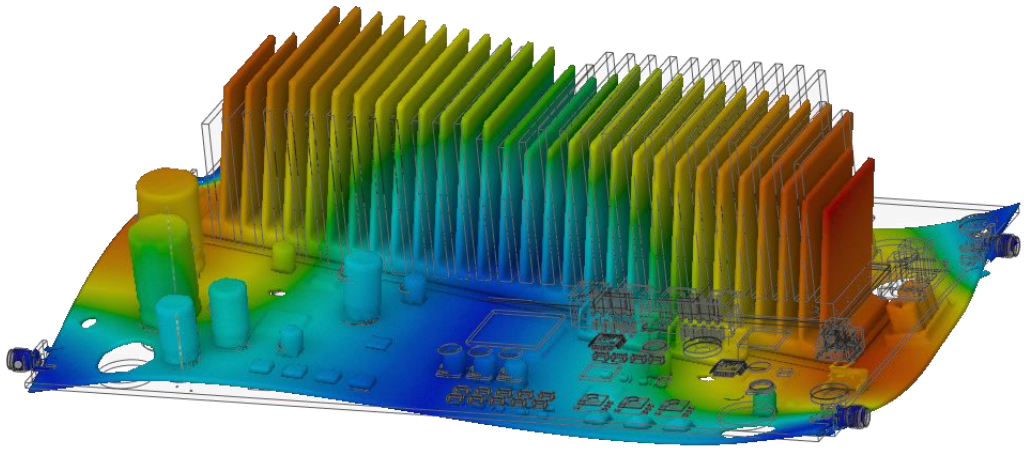
Displacement of rocker arm assembly including a spring connection

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



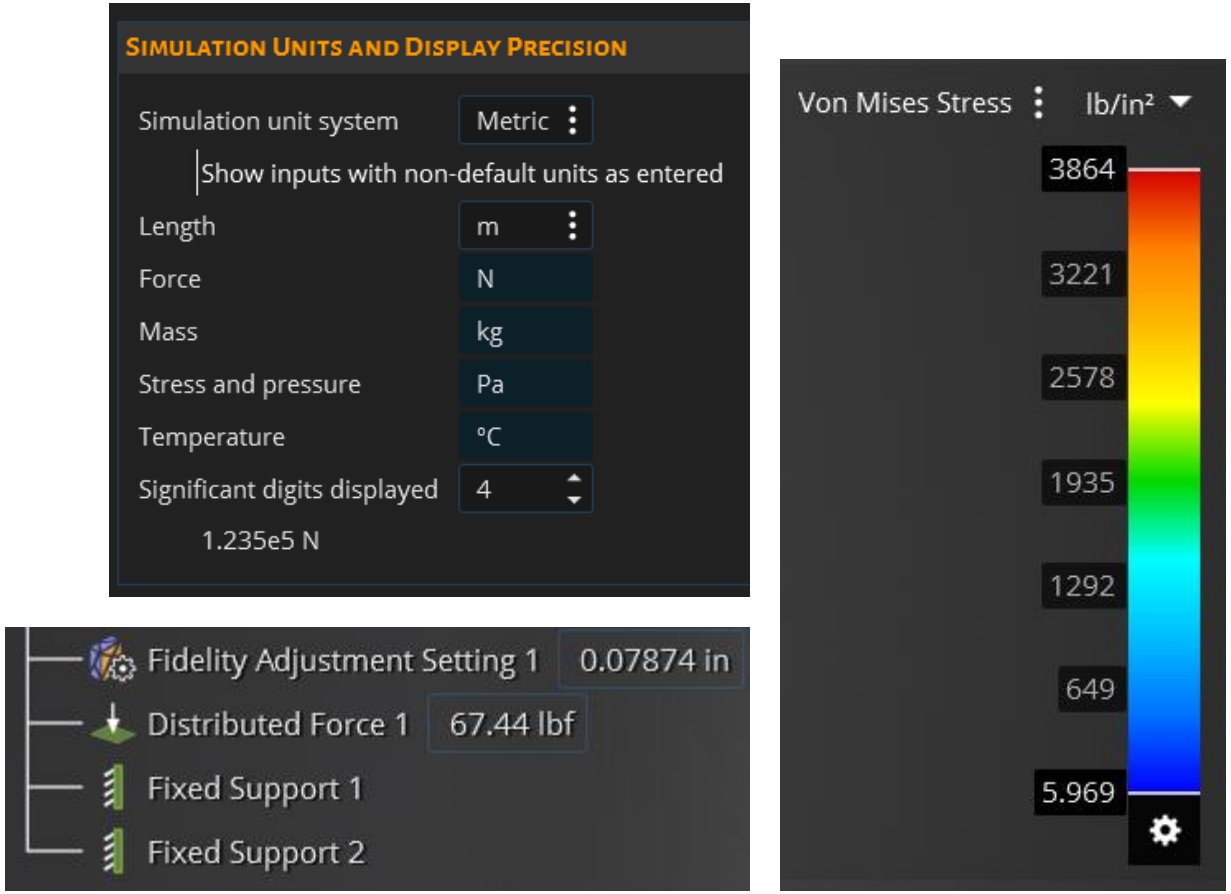




Third mode shape of wireless router PCB assembly

Simulation Units

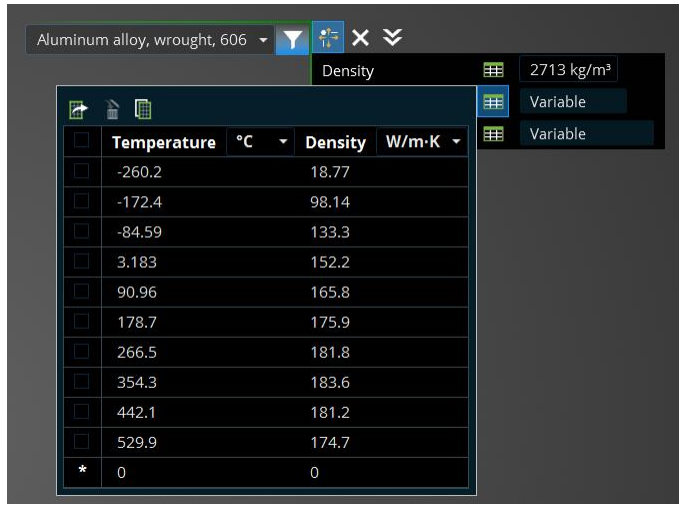
- Define simulation units as part of user settings
  - Select either metric or imperial units and the length unit to define one of four consistent unit systems
    - Metric with m or mm as length unit
    - Imperial with in or ft as length unit
  - Option to show inputs with non-default units as entered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



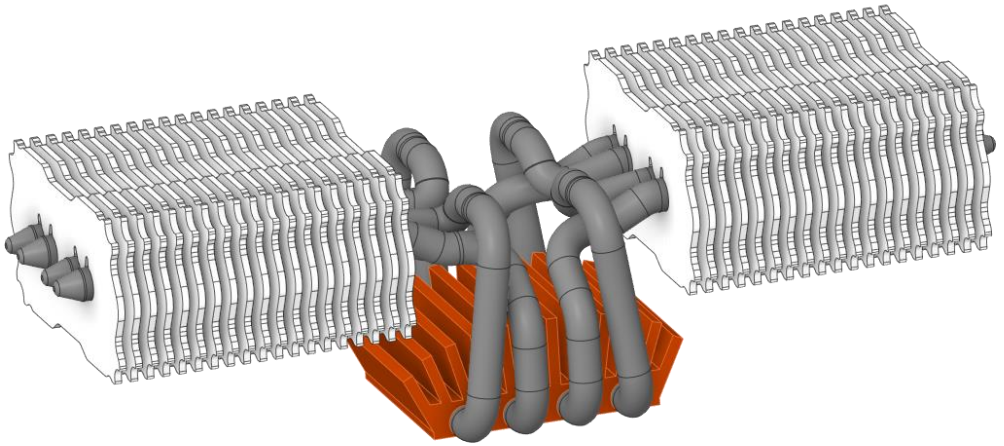
Controls simulation unit display for physics inputs and outputs

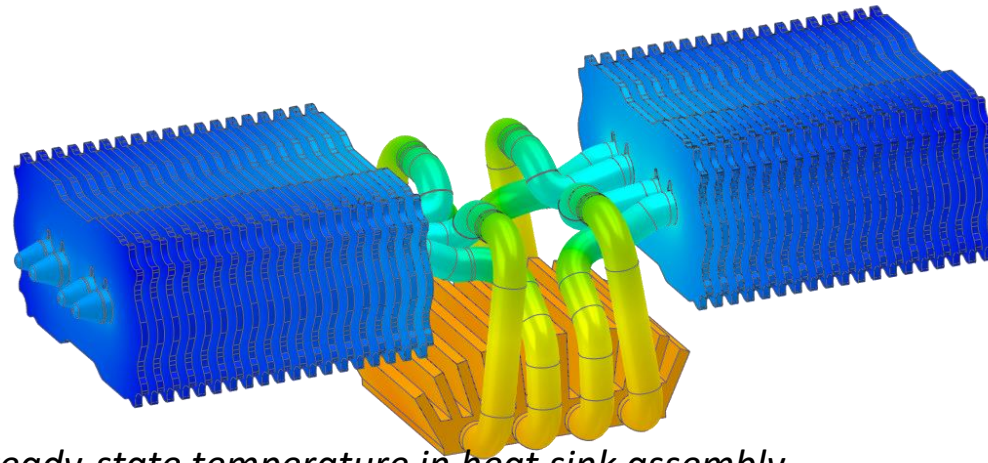
Temperature Dependent Material Properties (Explore & Refine)

- 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



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

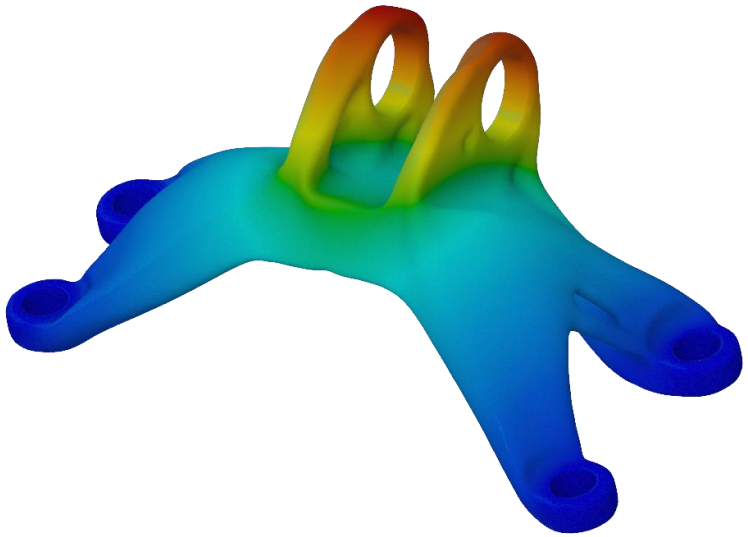




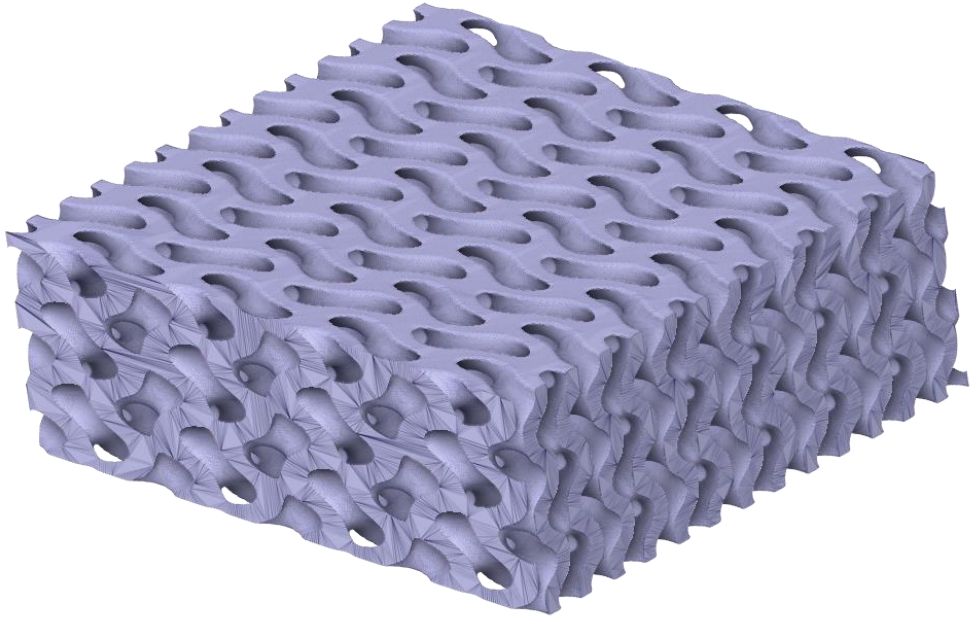
Steady-state temperature in heat sink assembly with temperature dependent thermal conductivity

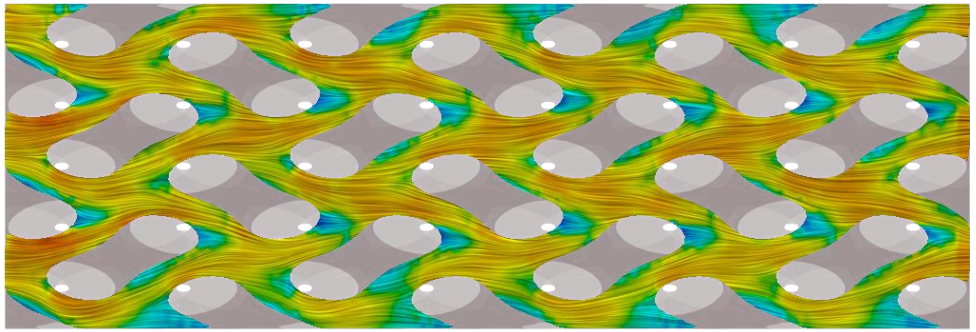
Faceted Body Simulation (Explore)

- 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

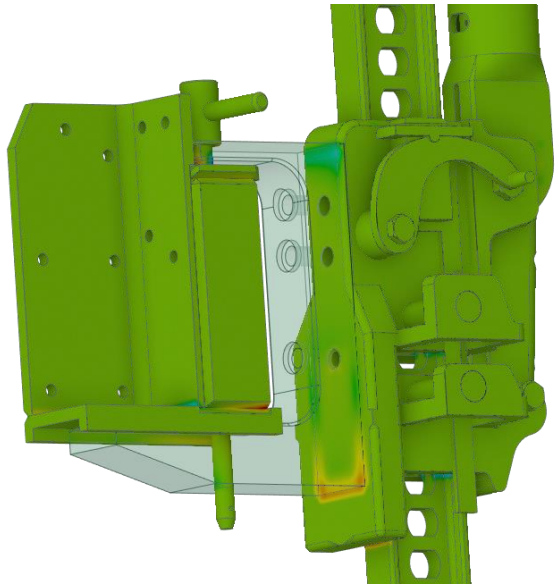


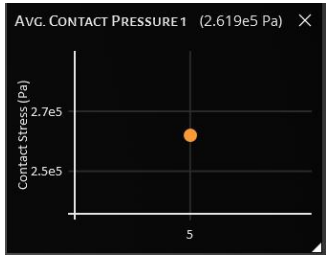


Gyroid heat exchanger velocity results

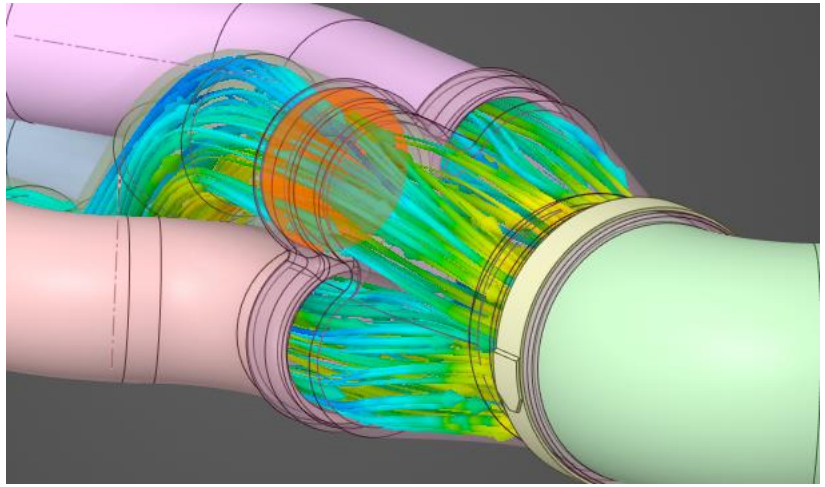
Post-processing Enhancements Explore

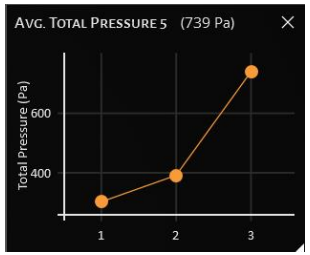
- Contact pressure
  - Contour results and monitors
  - Verify bonded and idealized sliding behavior
- Probes
  - Legend shows contour value at cursor location
- Monitors on 2D regions, lines or points
  - More flexibility for monitor locations



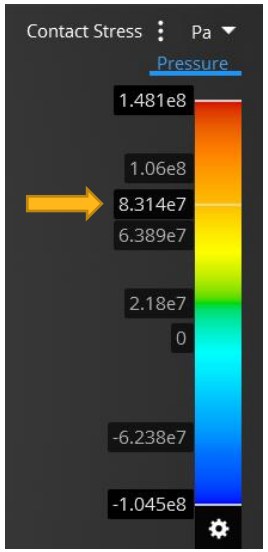


Contour of contact pressure in high-lift jack assembly and average contact pressure monitor





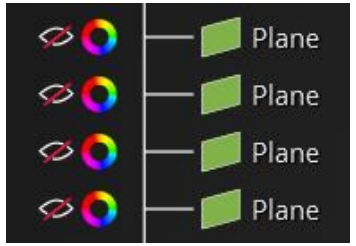
Total pressure monitor on 2D region enables monitoring of individual flow paths

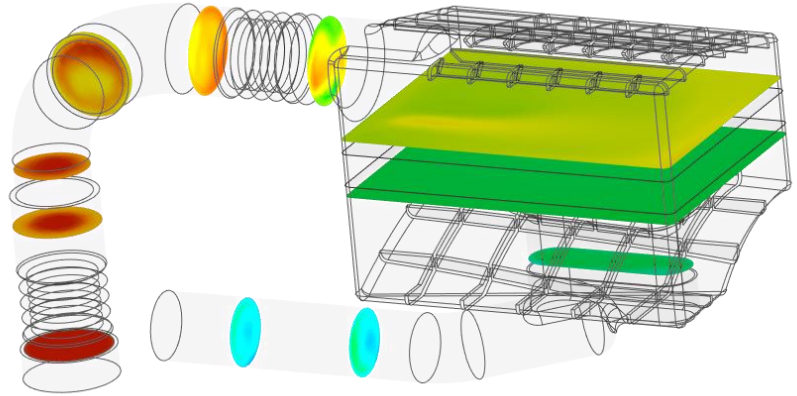


Tick mark in legend shows contour value at cursor location

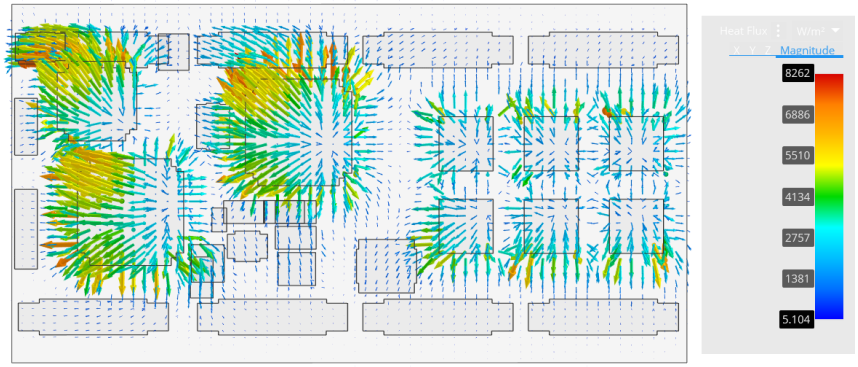
Post-processing Enhancements Refine

- 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

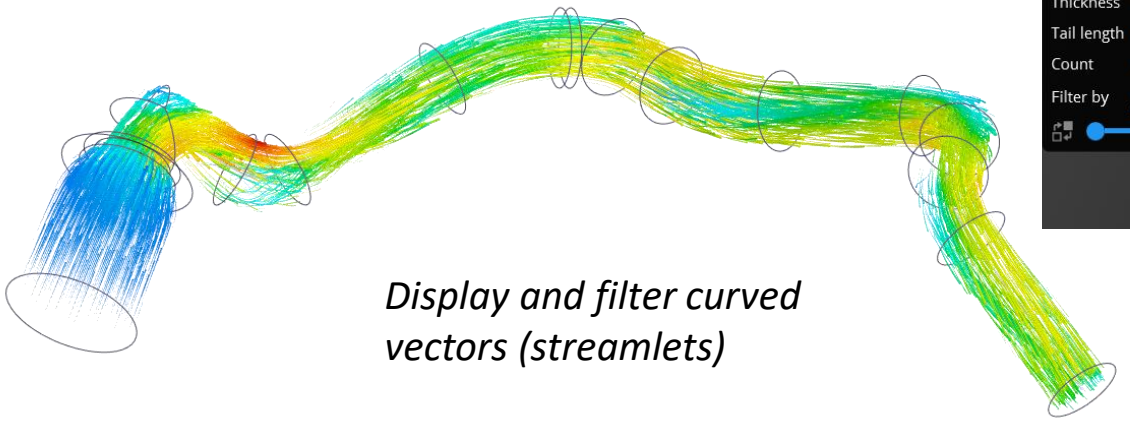


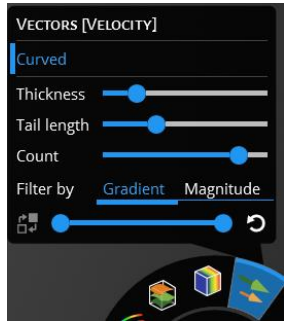


Show or hide results on planes from model tree



Heat flux vector results in PCB assembly



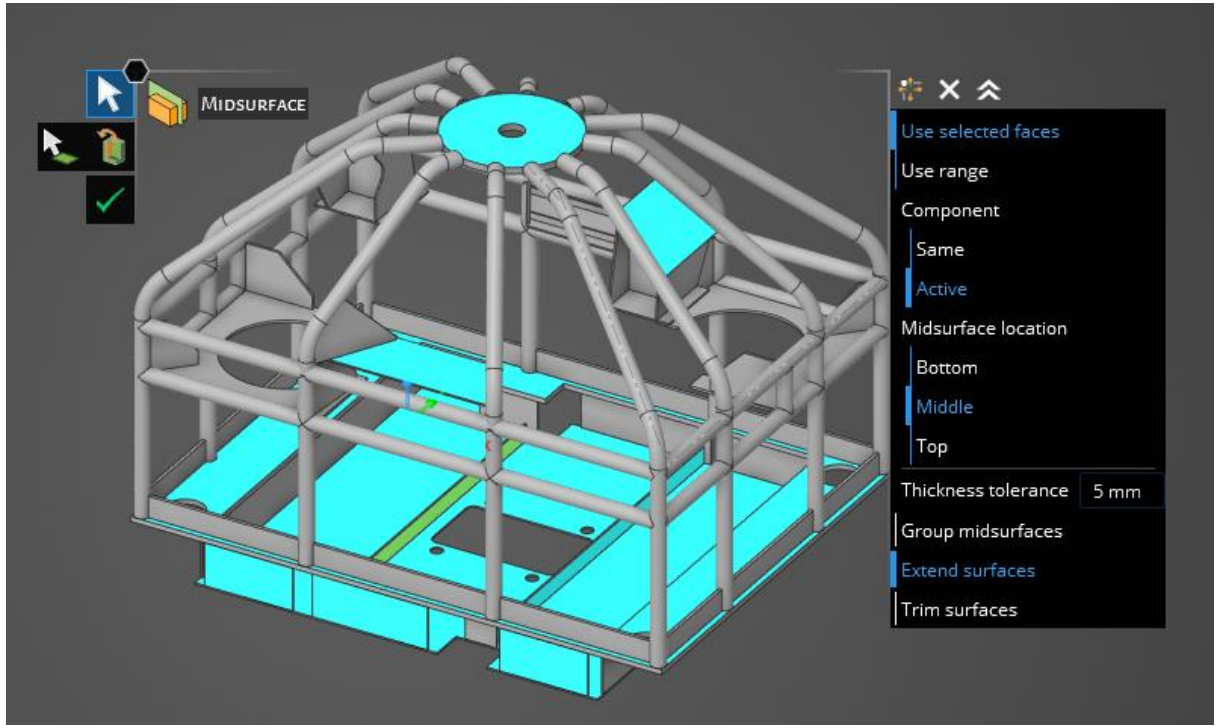


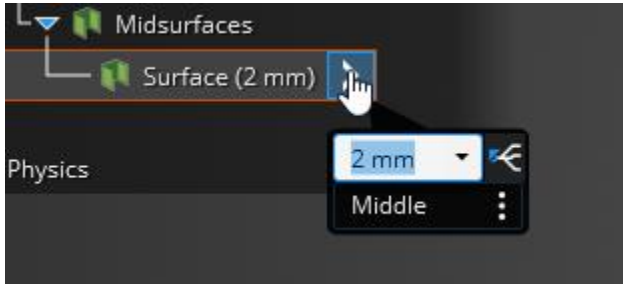
Display and filter curved vectors (streamlets)

Modeling Enhancements

Midsurfacing

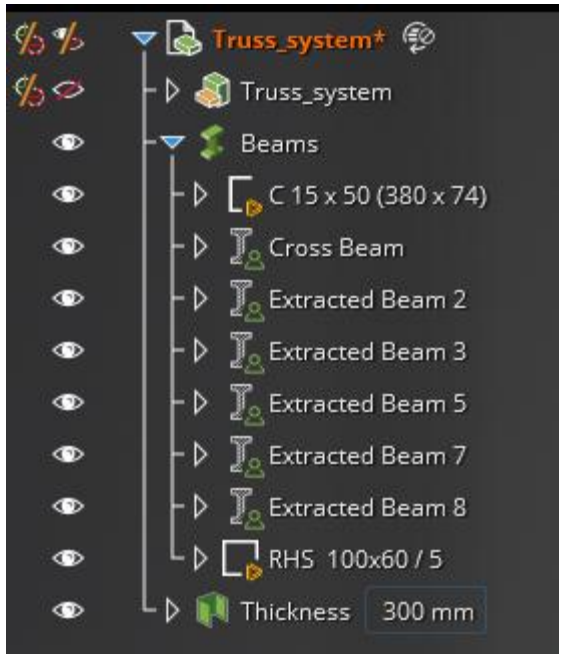
- Midsurfacing exposure in Discovery allows thin solid bodies to be abstracted to shell bodies for simulation
- Midsurfaces are organized in the tree for clearer identification of thicknesses as well of ease of modification
- Exposure of the Extend tool allows midsurface bodies to be extended to contact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

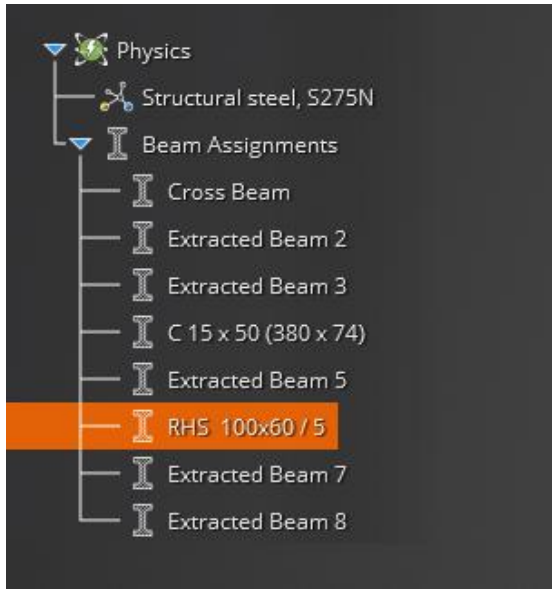


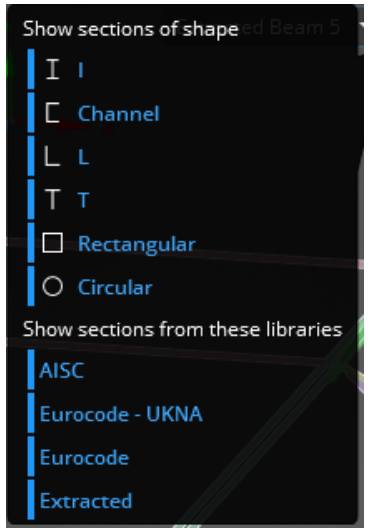


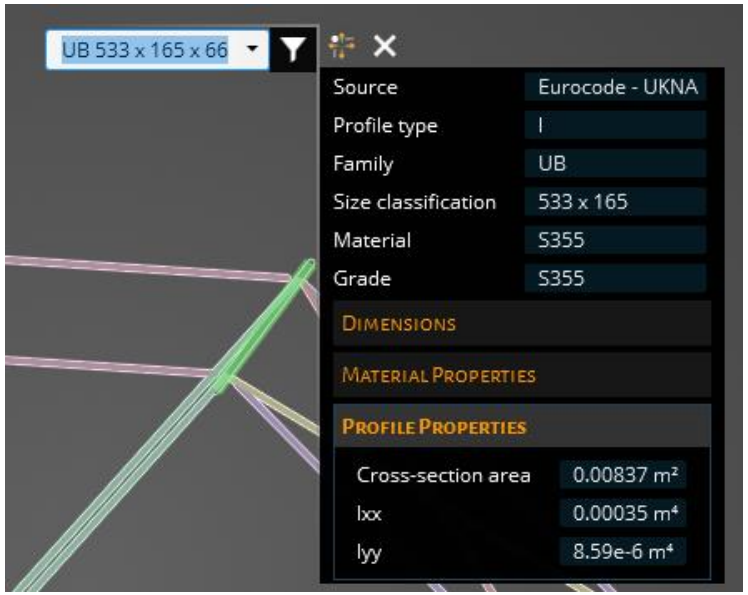
Beams

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





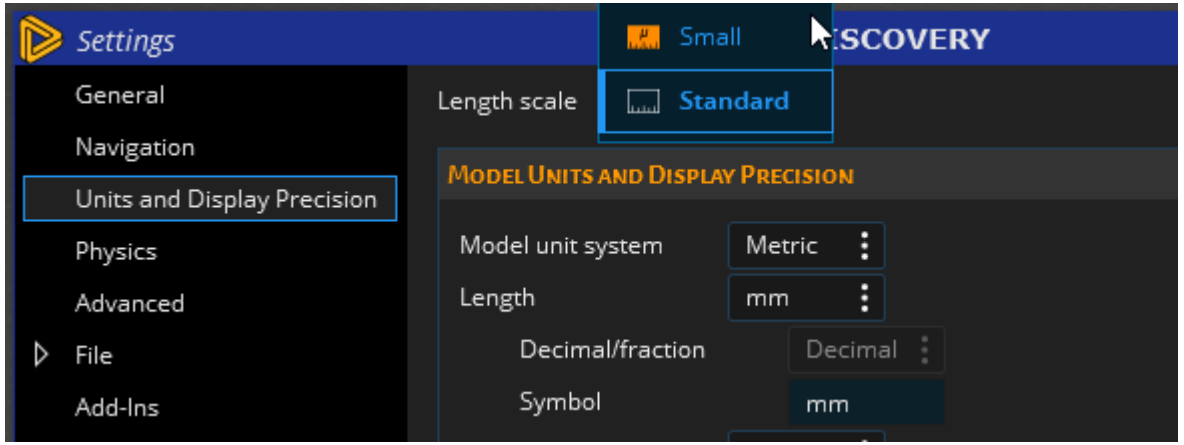




- Standard beams and extracted beams are displayed in HUD
- Filtering allows users to determine which beams to show in dropdown
- Extracted beams use default material while standard beams use embedded material

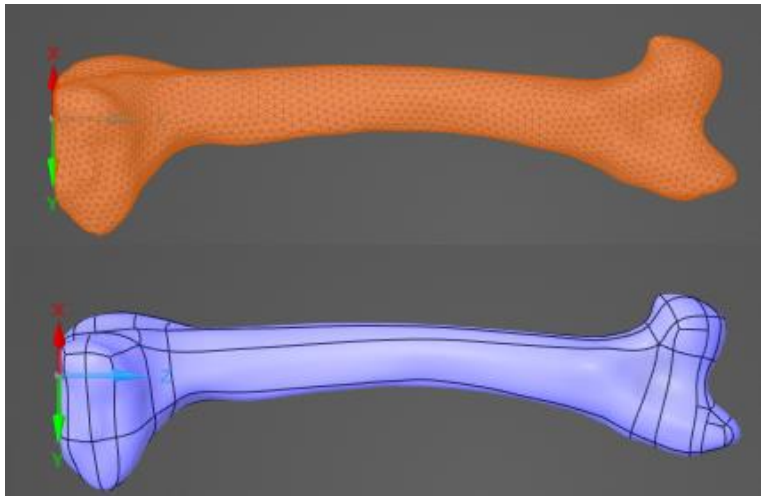
Electronic prep improvements

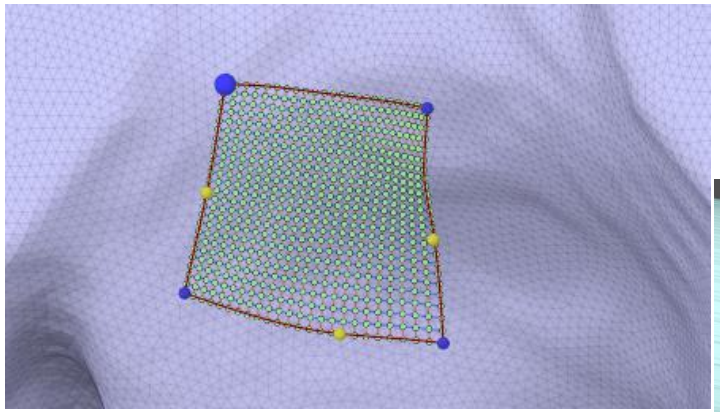
- Small unit support allows users to model in mil, um, or nm scale
- Small units are set to a document and cannot be mixed within the same design

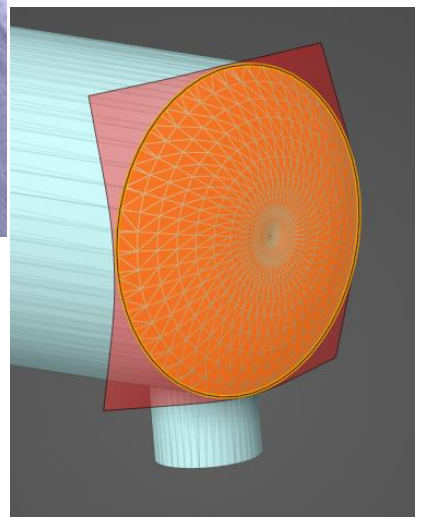


Reverse Engineering Exposure

- 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

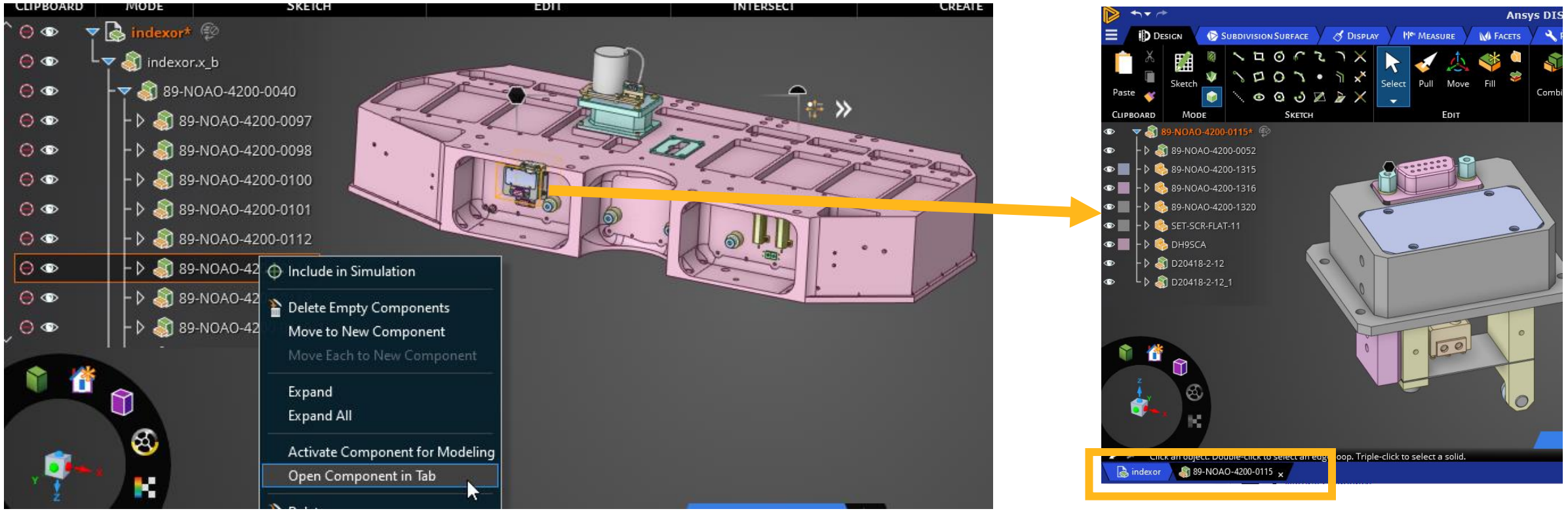






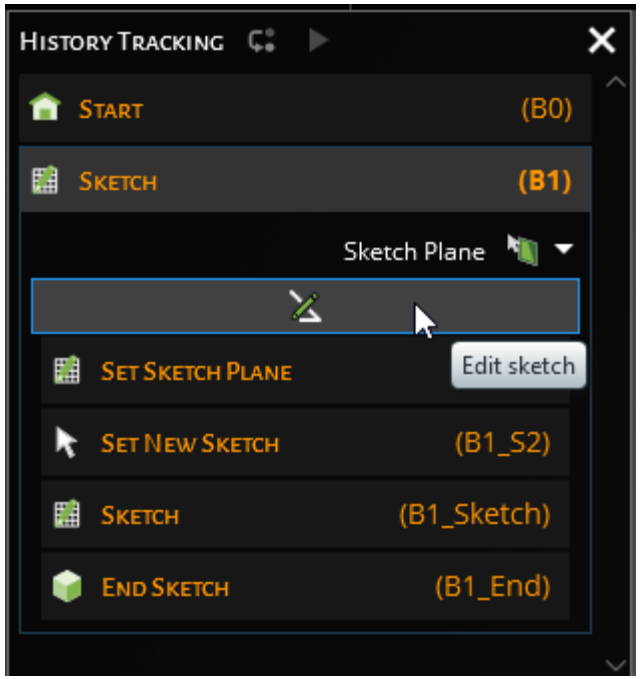
Multiple Tabs for model prep

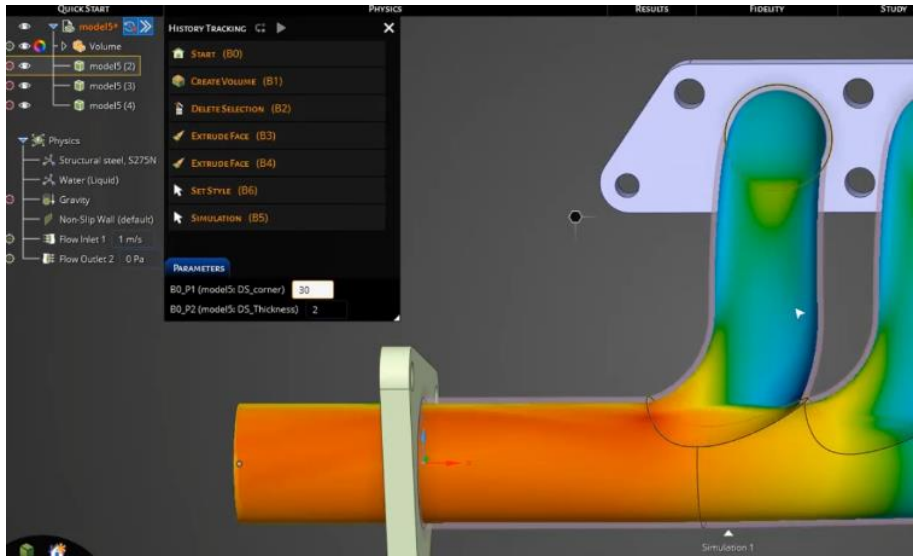
- Allow subcomponents of models to be interrogated for model prep
- Useful when working in large assemblies when cleanup or editing is needed
- Does not allow simulations to be performed within additional tabs



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

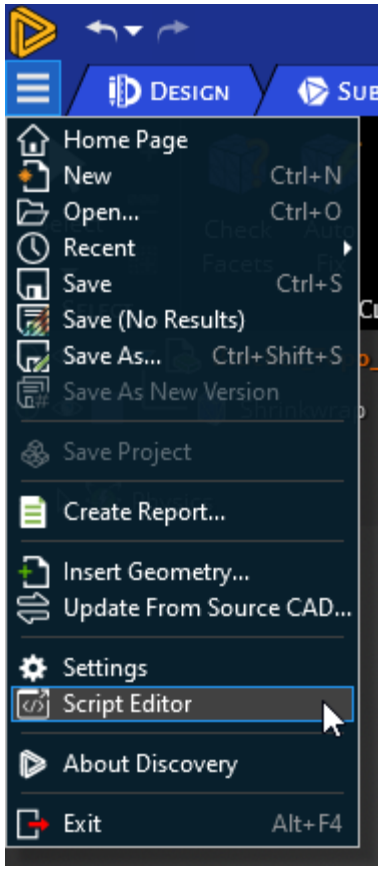


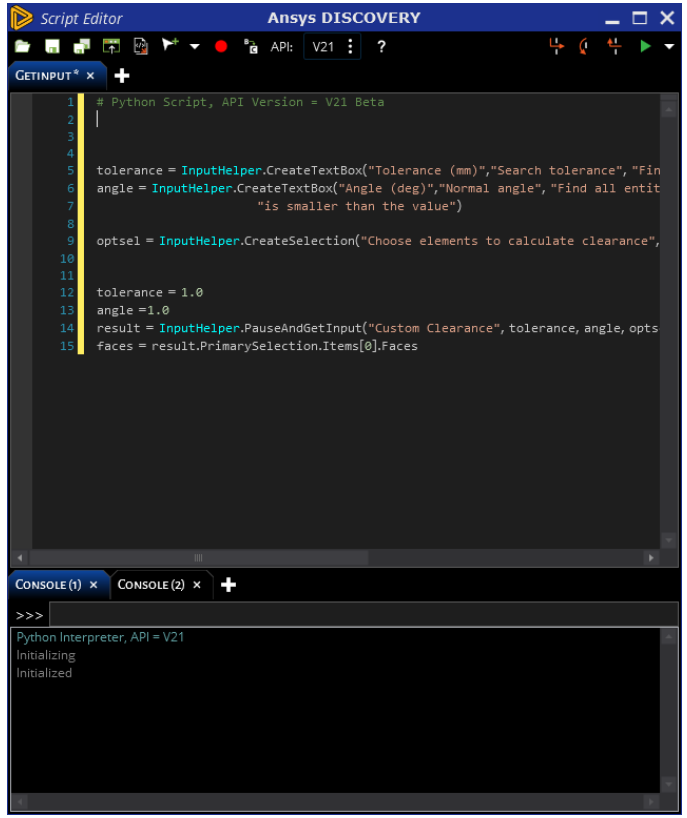


Scripting now available

- Scripting has been removed from beta with v20 and v21 of scripting available

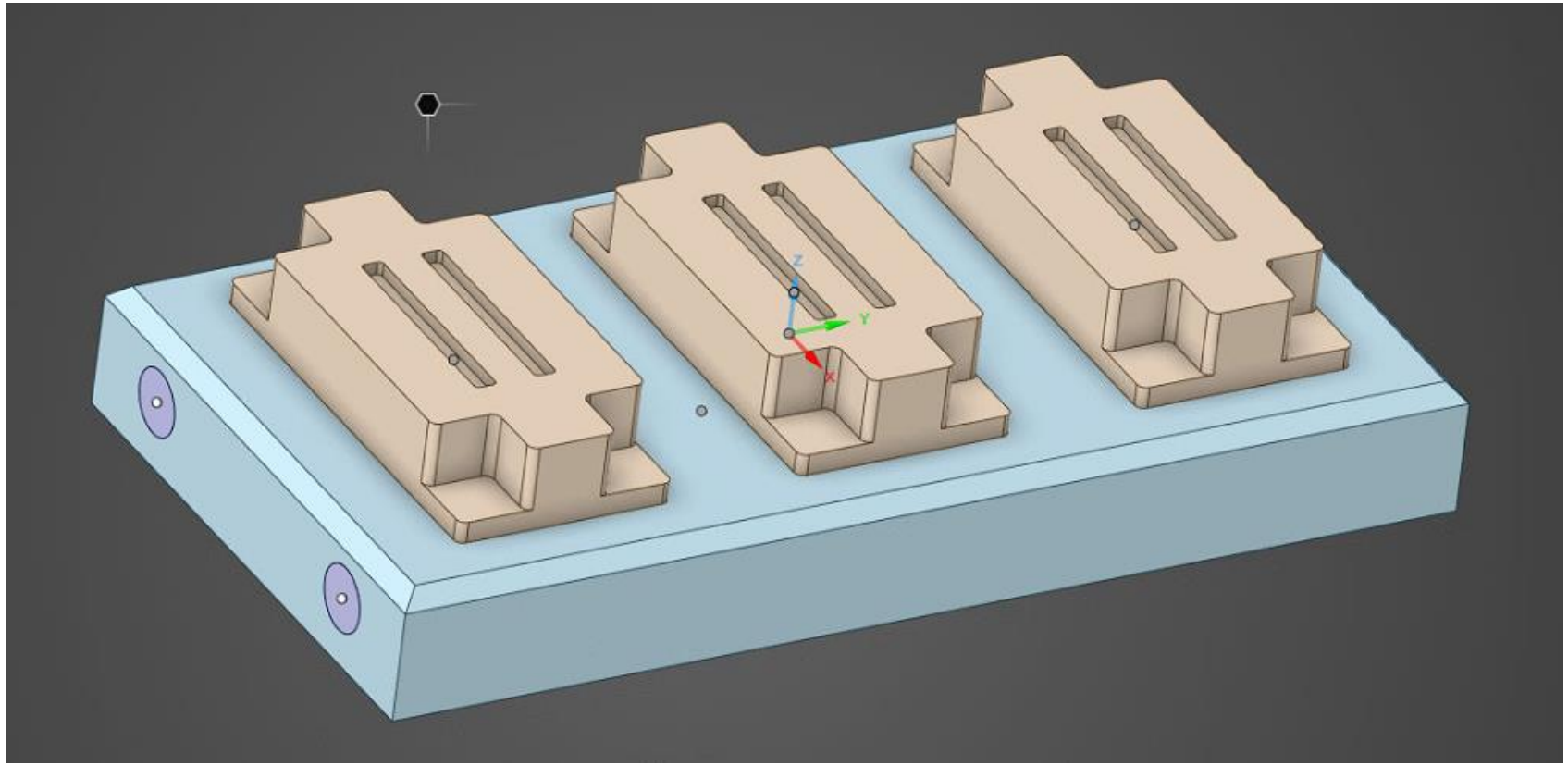
- Scripting enables powerful automation and covers modeling and simulation within Discovery
- Online help available for new users to better understand scripting functions





Example

Conjugate Heat Transfer



CHT simulation
Compressible Flow
Temperature Dependent

Capabilities

Capabilities

Not a comprehensive list, please contact discovery@ansys.com for additional info

Structural

- Static structural
- Modal & pre-stressed* modal
- Linear & non-linear* contact
- Large deflection*
- Linear materials
- Joints
- Pre-tension bolts*
- Topology optimization
- *Beams & shells (future)*
- *Bi-linear materials (future)*
- *Fatigue (future)*
- *Linear buckling (future)*
- *Bolts, welds, springs (future)*

Fluids

- Steady state
- Transient
- Incompressible
- Laminar & turbulent flows
- Single phase
- Single species
- Conductive & convective heat transfer
- Bousinesq model for natural convection
- Conjugate (fluid-solid) heat transfer
- Porous media *
- Ideal gas
- *Fan model (future)*
- *Multi-component mixing (future)*
- *Non-Newtonian fluids (future)*

Solid Thermal

- Steady state thermal
- Transient thermal
- Solid conduction
- Convection boundary condition

Productivity

- Import of all major CAD formats
- Geometry creation, editing & repair tools
- Volume extract, Midsurface, Beams tools
- Named selection and parametrization
- Automatic report generation
- Easy transfer to Ansys Mechanical & Fluent
- Connection to Workbench
- Connection to CAD

**Available only in Refine mode. Requires additional license.*

Hardware Requirement

Hardware Requirements

- **Minimum hardware requirements**
  - 64-bit Intel or AMD system, running Windows 10
  - 8 GB RAM (32GB or higher recommended)
  - A dedicated graphics card with latest drivers and at least 1GB video RAM, capable of supporting OpenGL 4.6 and DirectX 11, or higher. Use of integrated graphics (e.g. Intel HD/IRIS) is not recommended and is not supported.
  - 3 button mouse
- **Additional requirements for Live physics simulation (Explore stage)**
  - A dedicated NVIDIA GPU card (Quadro recommended, GeForce supported) based on the Kepler, Maxwell, Pascal, or Turing architecture. Maxwell 2000 or better strongly recommended.
  - Minimum 4GB of video RAM (8GB or higher recommended) on the GPU

- *Ansys Discovery can be installed and used in Model and Refine mode if minimum hardware requirements are met but appropriate NVIDIA GPU is not available*
  - *Refine mode requires additional license*

Thanks!!

Question & Answer

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Ansys 2022/R1 Engineering What's Ahead.

新技術線上研討會

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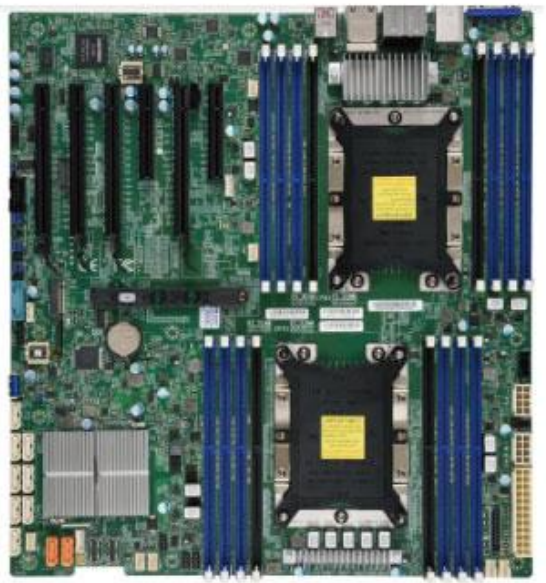
SUPERMICRO



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