

 **RELEASE NOTES**

# Altair<sup>®</sup> Inspire<sup>™</sup> 2023

# New Features and Enhancements 2023

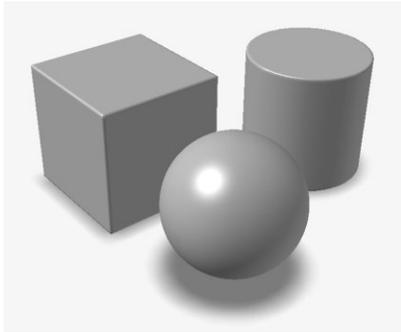
## Implicit Modeling

A new tab, with the following tools, has been added, allowing you to model with implicit geometry. Instead of explicitly defining the surface or boundary of an object, implicit modeling represents geometry through implicit functions, defining relationships between points in space using conditions or constraints. This lets you model complex, irregular, and organic shapes that are extremely lightweight. You can efficiently manipulate and modify this versatile geometry, perform Booleans and offsets without failure, and model at scale with a high resolution.



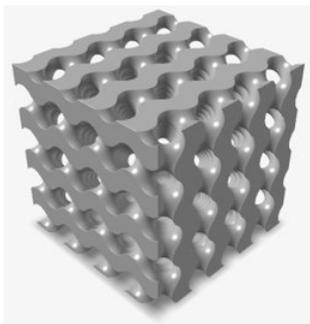
### Primitives Tool

Create simple geometric shapes that can be used for repetitive tasks or combined into more complex shapes. Implicit primitives include cuboid, cylinder, and sphere. Each primitive type has controllable position, orientation, and dimension.



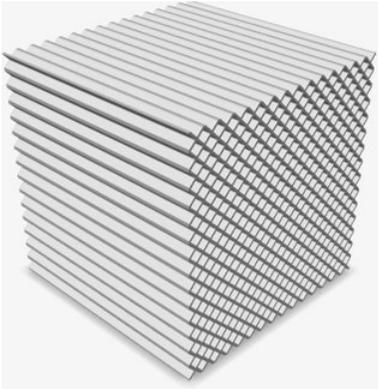
### Surface Lattice Tool

Fill an implicit body with a surface lattice, which is a cellular structure constructed from one or sometimes two surfaces. Rather than tiling or patterning a base unit cell, the natural repetition of the surfaces creates a lattice-like structure automatically. Popular examples are Triply Periodic Minimal Surfaces (TPMS), such as the gyroid.



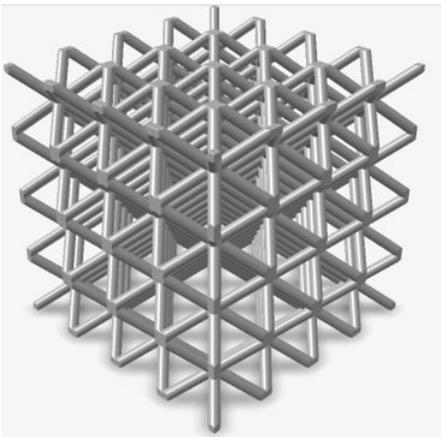
### Planar Lattice Tool

Fill an implicit body with a planar lattice, which is a 2.5D cellular structure with a clearly defined 2D cross-section that is drawn or extruded along the third dimension. A popular example is a honeycomb structure.



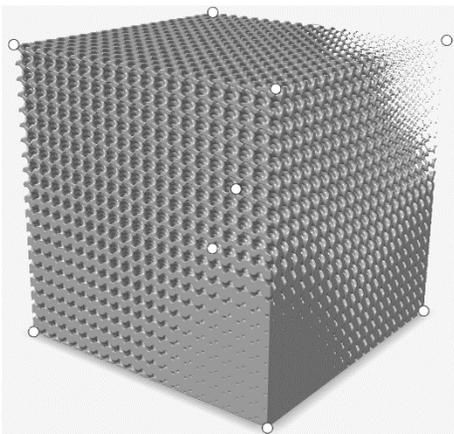
### Strut Lattice Tool

Fill an implicit body with a strut lattice, which is constructed from nodes that are connected by beams. Typically, there is a base unit cell that is tiled or patterned in one, two, or three dimensions to form the overall lattice structure. A popular example is the Body Centred Cubic lattice.



### Point Cloud Tool

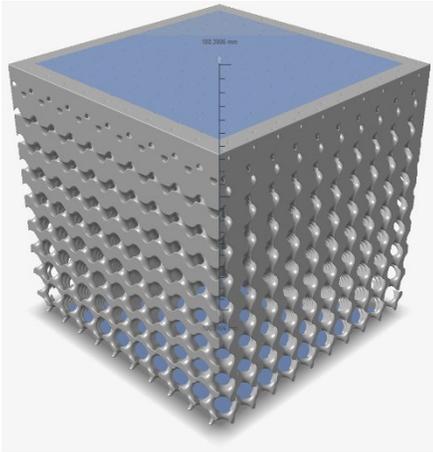
Import point clouds or create them from scratch to drive fields or create implicit geometry.



### Field Tool

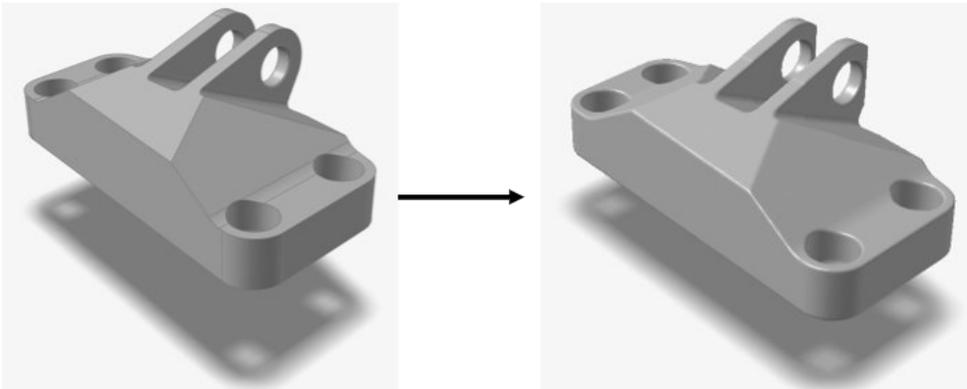
Create a field to customize an implicit parameter. You can construct a field from a source that is not yet described in a field format and remap field values to different ranges.

A field is a 3D grid, and each grid point contains a signed scalar value. An illustrative example would be to create a field based on the signed distance to a plane or line, and then rescale these distances into density values. This field can then be used to control the relative density of another geometry, such as a lattice, at each location in space.



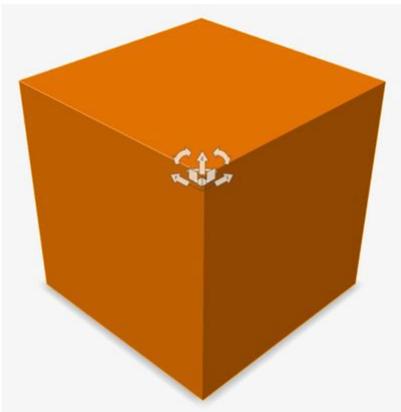
### Convert Tool

Convert parts to implicit geometry. You can select CAD, PolyNURBS, meshes, or optimized parts. The output is typically a Signed Distance Field (SDF) for the converted geometry.



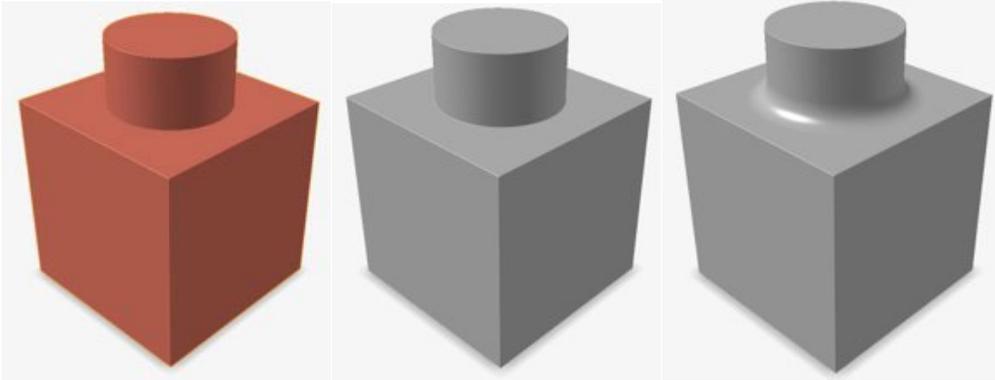
### Move Bodies Tool

Translate and rotate implicit bodies.



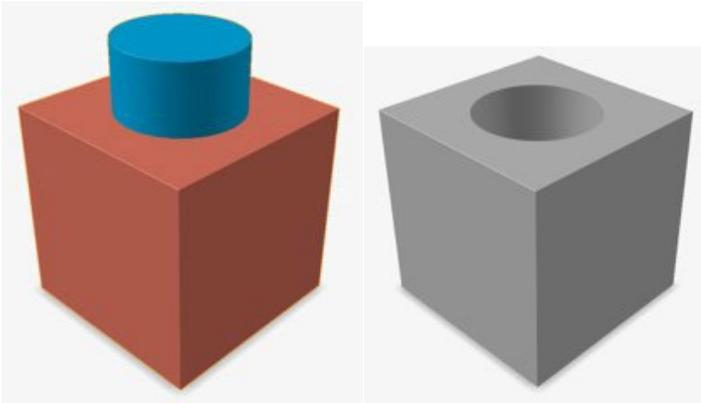
### Combine Tool

Combine two implicit bodies into one. A new body is created that envelopes any volume that falls within at least one of the bodies being combined. It is equivalent to a logical OR/disjunction.



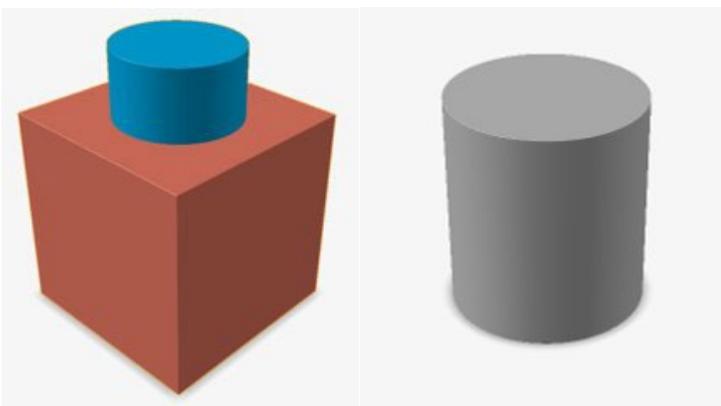
### Subtract Tool

Carve out one or more implicit bodies ("tools") from another implicit body ("target"). A new implicit body is created that envelopes any volume that falls within any target but not within any tools. It is equivalent to a logical NOT negation.



### Intersect Tool

Retain only the intersecting portions of two sets of implicit bodies. All the targets are combined to form "Body A," and then all the tools are combined to form "Body B." The result is a new implicit body that envelopes all volume that is inside Body A and inside Body B. It is equivalent to a logical AND/conjunction.



### Offset Tool

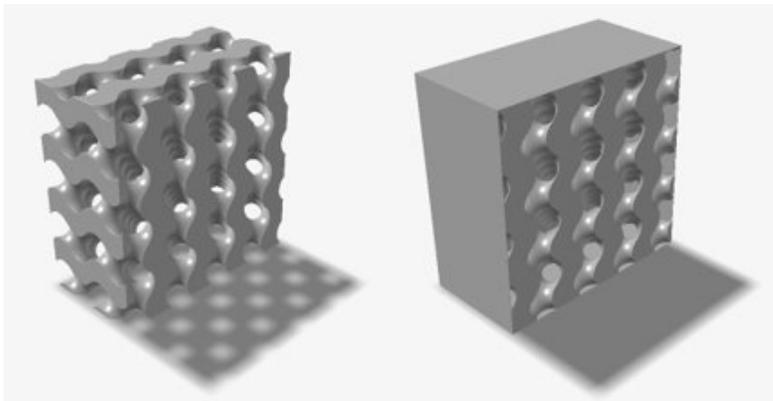
Inwardly (negative) or outwardly (positive) offset the surface of an implicit body. The offset surface is always normal to the original surface. The offset amount can be a constant value, a variable, or a field. Turning on the **Shell** option will hollow the model and populate the region between the original and offset surfaces with material.



### Invert Tool

Swap the “inside” and “outside” of an implicit body by reversing the sign of all scalar values in the underlying field.

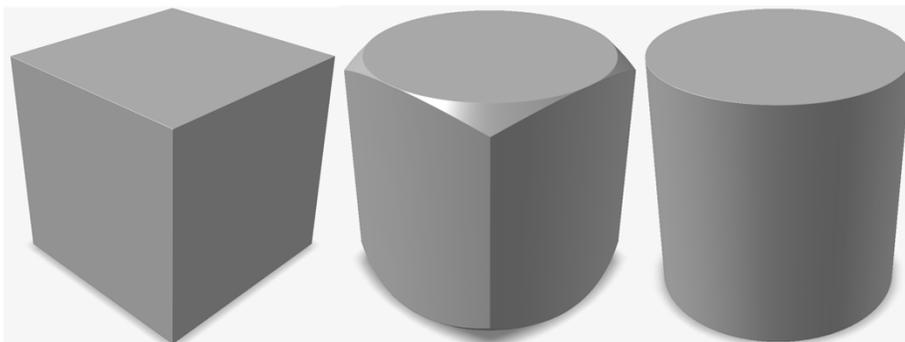
An illustrative example would be to invert the field of a sphere. The result in this case would be a cube that is the size of the bounding box surrounding the sphere with a spherical cut-out inside of it. The sphere that was once solid is now a void, and the external void surrounding the original sphere is now solid.



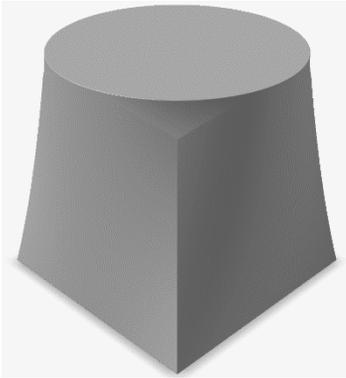
### Morph Tool

Morph one implicit body into another and vice versa. Physically separate bodies may not produce meaningful results.

An illustrative example would be to overlay a cube (Body A) and a sphere (Body B). The **Morph Value** should lie between 0 and 100, and this controls a linear interpolation between the underlying fields of Bodies A and B. A **Morph Amount** of 0 would result in a perfect copy of the cube (Body A), and a **Morph Value** of 100 would result in a perfect copy of the sphere (Body B). A **Morph Value** of 50 would produce a new implicit body that has some attributes of both the sphere and a cube—a rounded cube.



Field driven morph parameters can result in geometry similar to a loft along the field direction.



### Smooth Tool

Reduce the size of, or remove, unwanted small and sharp features in an implicit body.

Smoothing is analogous to “blurring” in digital image processing. It operates by moving a window through the underlying field, performing filtering operations on the field values that fall within the window. Example smoothing filters include **Mean**, **Median**, **Gaussian**, and **Laplacian**. Each of these have relative pros and cons, giving different smoothing effects. A second implicit body may be selected as the **Mask**, and smoothing will only take place within the volume of this mask.

### Fillet Tool

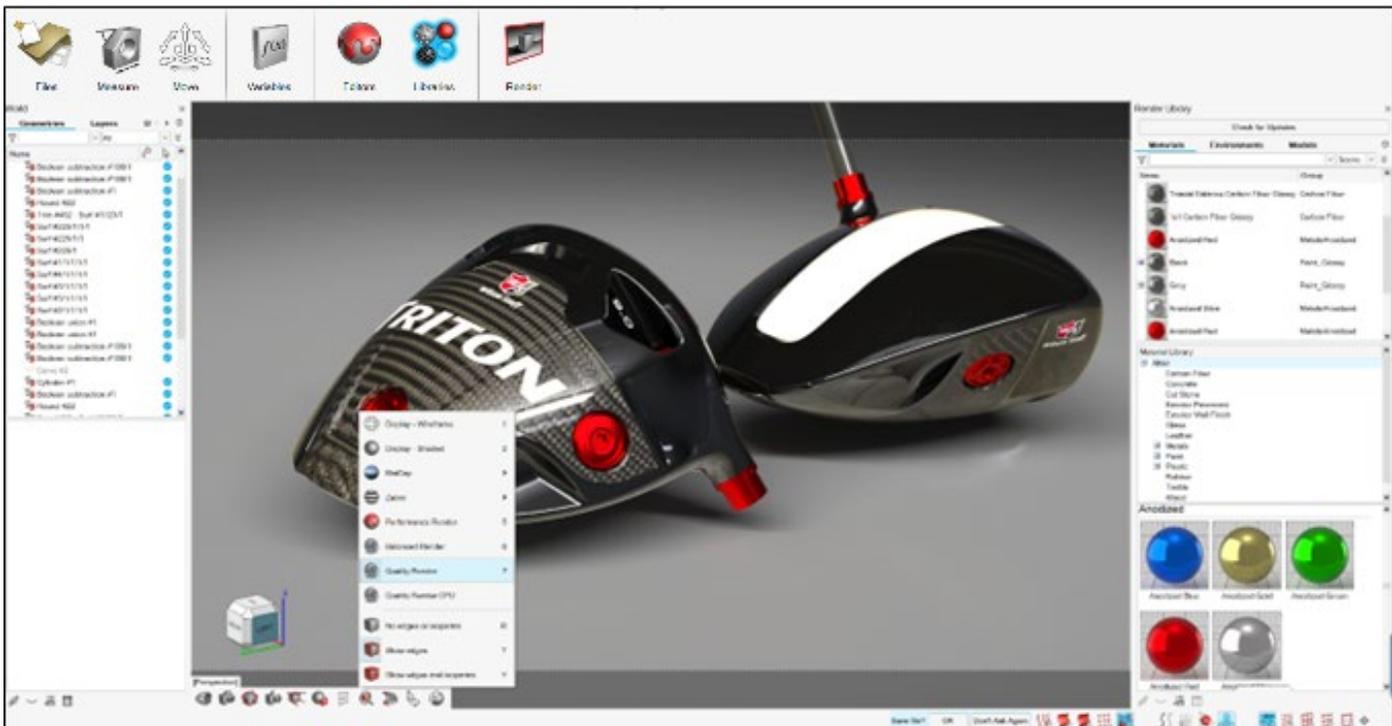
Round edges of implicit bodies to create fillets with a constant or variable radius.

Fillets can be separately applied to convex and concave edges. Unlike traditional CAD, the fillet effect will be applied to any qualifying edges in the model rather than those that you manually select. The radii can be constant values, variables, or field driven.

# Rendering

## New Rendering Technology

- All rendering technology has been updated, and there are two new rendering modes available. The new rendering modes and their distinctive qualities are listed below:
  - **Performance**
    - An interactive, physically-based renderer
    - High-speed rendering
    - Works on all GPUs
  - **Quality**
    - An interactive, ray-tracing based renderer
    - Highest quality rendering fully featured with a built in denoiser
    - Works only with GPUs with hardware ray-tracing cores available

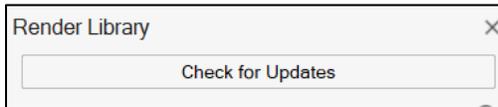


### Performance and Workflow Improvements

- The user interface for rendering has been simplified to streamline workflow
- New procedural-based materials for intuitive material creation and editing
- Application performance improved to handle larger, more complex models
- Added support for wider range of simulation data

### Check for Updates Button to Import Assets

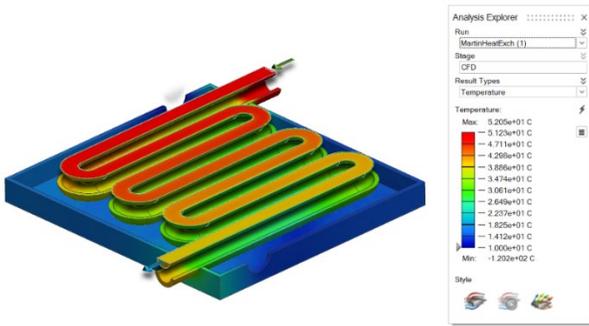
- Materials and Environments assets are now stored online. The new Check for Updates button in the Render library imports the latest assets to the application.



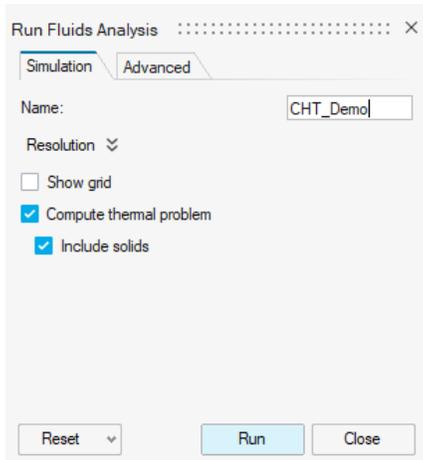
# Fluids

## Conjugate Heat Transfer

Fluids now offers steady-state Conjugate Heat Transfer simulation (CHT) capability. A steady-state CHT simulation computes the final equilibrium temperature field inside solids and fluids, and allows heat to pass between fluids and solids. Computing the heat transfer between fluids and solids provides more accurate results for temperature distribution, heat fluxes, and the overall thermal behavior within the simulation. By predicting peak and average solid component temperatures, CHT simulations can also assist with the identification of thermal hotspots and ensuring that the material thermal limits are not violated.

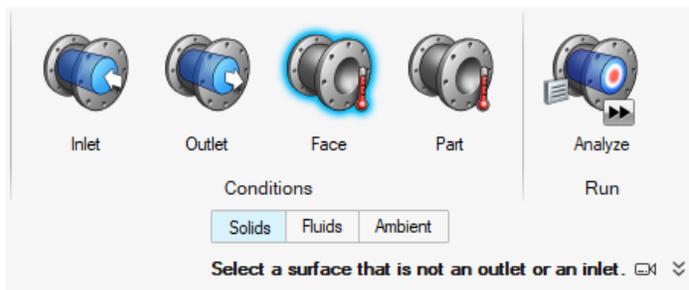


Steady-state CHT simulations can be performed by selecting the Compute thermal problem and Include solids options under the Run Fluids Analysis dialog.



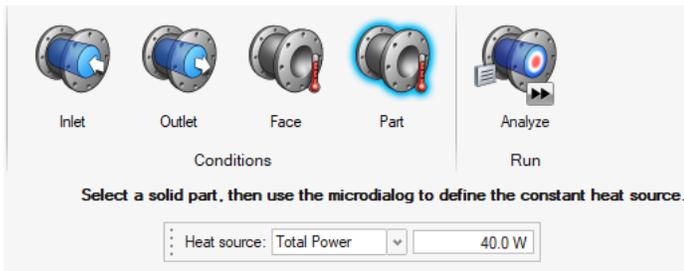
## Face Condition

The new Face boundary condition option allows you to specify thermal boundary conditions on the face of a solid or a fluid part. In addition to a thermal condition, you can also specify a slip-velocity condition on the face. By default, all unspecified surfaces are treated as adiabatic (thermally insulated) no-slip walls.



### Part Condition

The new Part condition option allows you to specify heat sources in solid parts.



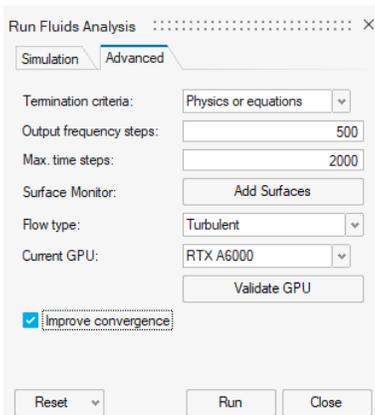
### Moveable Solid Domains

You can now designate parts in a Fluids analysis as moveable solids using the new Moveable Solid Domain tool. Moveable solids are excluded from the fluid volume identification process. This feature simplifies the process of fluid volume extraction and reduces the chances of failure.



### Convergence Acceleration with Algebraic Multigrid (AMG) Linear Solver

Fluids now offers an AMG linear solver. Enabling AMG can accelerate convergence in certain scenarios with long fluid paths, or when using a very small voxel size. Activate this feature by selecting the Improve convergence checkbox under the Advanced tab of the Run Fluids Analysis dialog.



### Faster Simulations

Fluids simulations are now up to 2X faster compared to version 2022.3 with more efficient algorithms.



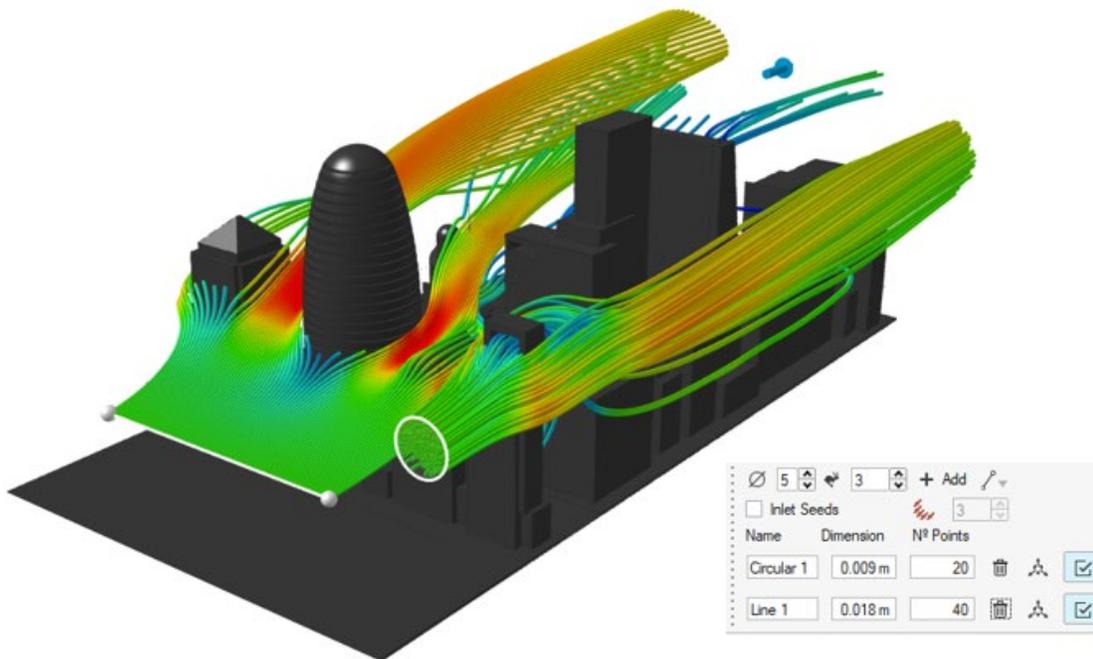
### Fluids Available for Linux

Inspire Fluids is now available for the following Linux operating systems:

- SUSE Linux Enterprise Server 15 SP3
- Red Hat Enterprise Linux 8.4/Oracle Linux 8.4 or newer

### Local Streamlines and Circular Shapes

You can now add local streamlines to a Fluids model after you run an analysis. You can choose to create streamlines in linear or circular forms and use the microdialog to organize and move the new streamline region. You can also turn off the default inlet streamlines.



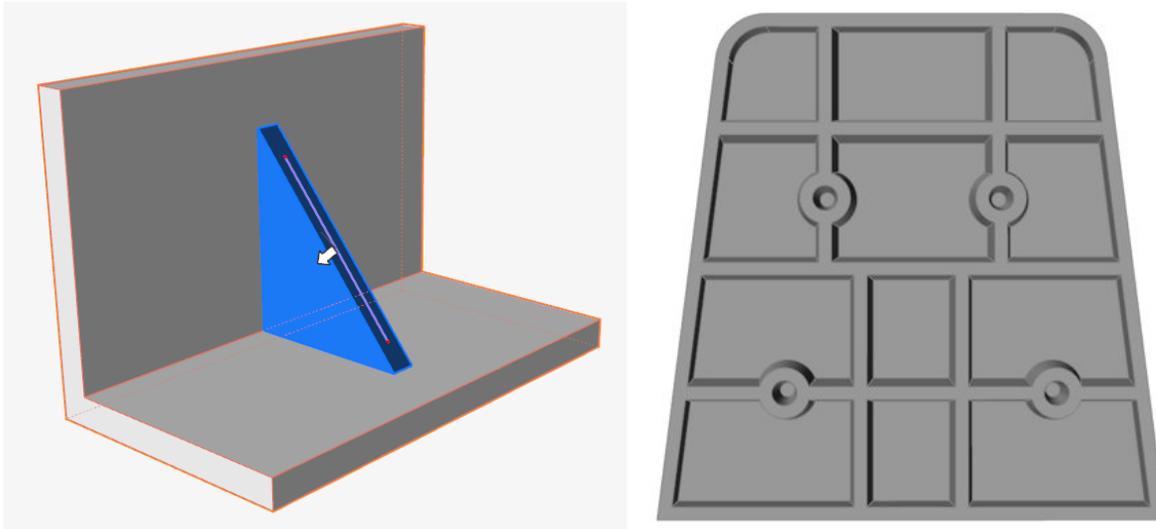
## Geometry

### Improved Trim/Split Tool

The Project/Split tool is now named Trim/Split. Use this improved tool to remove part of a surface or solid by projecting a profile curve onto it. Or use a set of tool surfaces to split a set of target surfaces.

### Rib Tool

The new Rib tool provides a convenient way for designers and engineers to add thin-walled features to their models that enhance the strength and structural integrity of the design. The tool allows you to specify the position, size, shape, and other properties of the rib. These features can also be parameterized for use in a design table.

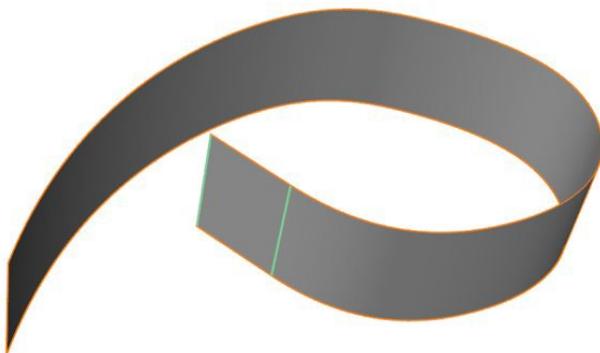


### Improved NURBS Curve Tool

You can now create a NURBS curve in 3D space by clicking in the modeling window, similar to Blend Curve.

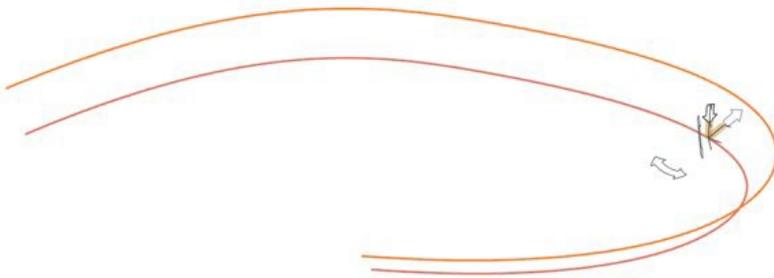
### Extend Surface Tool

Use the new Extend Surface tool to extend a surface along one or more edges. You can extend the surface to a curve or another surface.



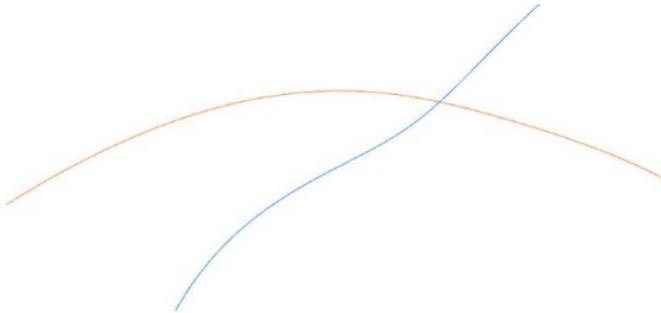
### Offset Curves Tool

Use the new Offset Curves tool to create a copy of one or more curves at a specified distance from the source curve. This tool can be used on both 2D and 3D curves.



### Intersect Curves Tool

Use the new Intersect Curves tool to split intersecting curves or wire bodies into several curves, with an option to combine them into one single curve.



### Improved Loft Tool

A new constraint option, Free Tangent Vector, has been added to the microdialog. When you select this option, the loft surface is made tangent to a selected vector. You can manipulate both the magnitude and direction of the selected vector; if more than one vector is selected, changes are applied to all.

The Loft tool now tries to match the number of vertices across profiles based on the profile with the highest number of vertices.

When the profile is a periodic curve, you can now select the seam and drag along the curve.

You can now select the profile itself, not just the vertices of the profile, to access the microdialog options.

### Improved Multi Sweep Tool

When the profile is a periodic curve, you can now select the seam and drag along the curve.

You can now select the profile itself, not just the vertices of the profile, to access the microdialog options.

### Improved Extend Curve Tool

A new option, **Create New Part**, has been added to the guide panel. Turn on this option to make the extension a new part. You can also select the edge of a surface or face and extend it as curve. The extension will be a new curve.

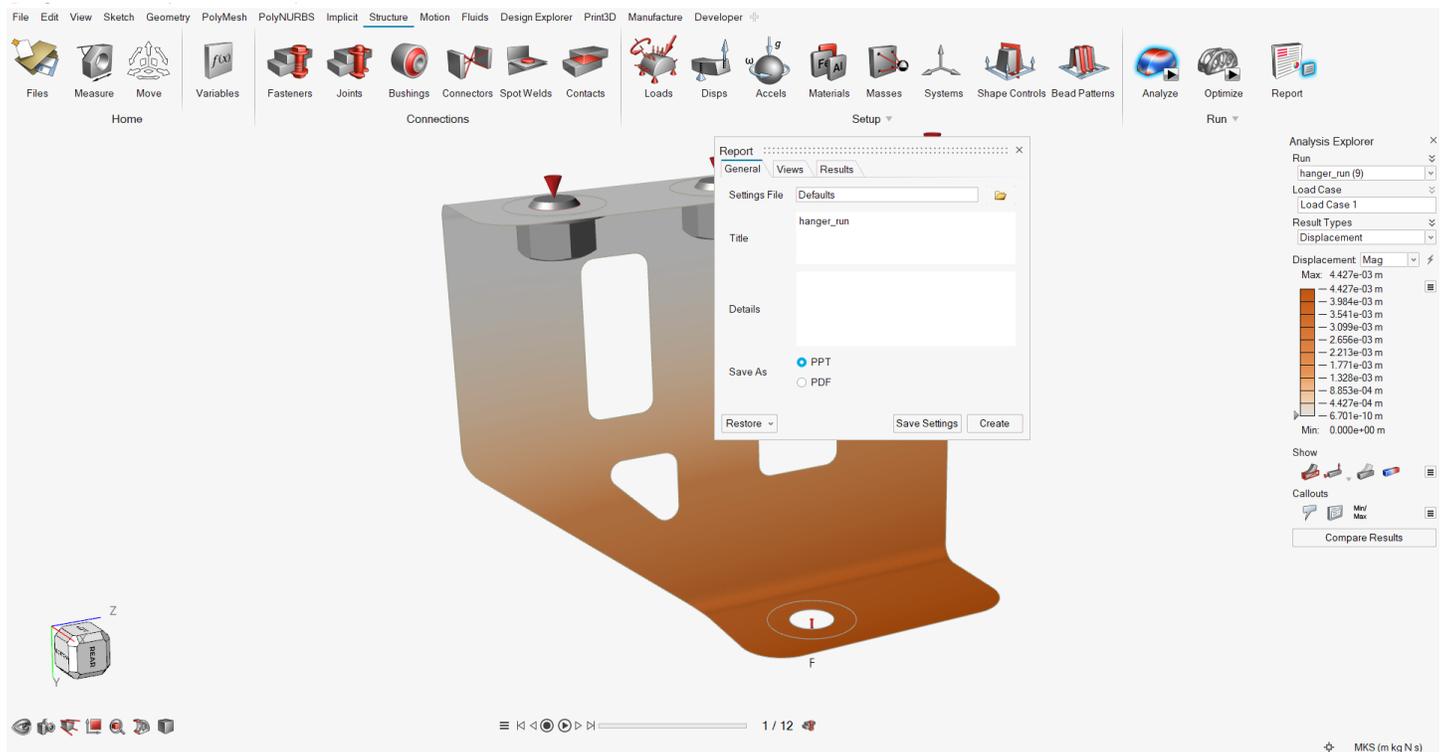
# Structure

## Report Tools

New Quick Report and Report tools have been added to the Structures tab. They are available after you have run a structural analysis.

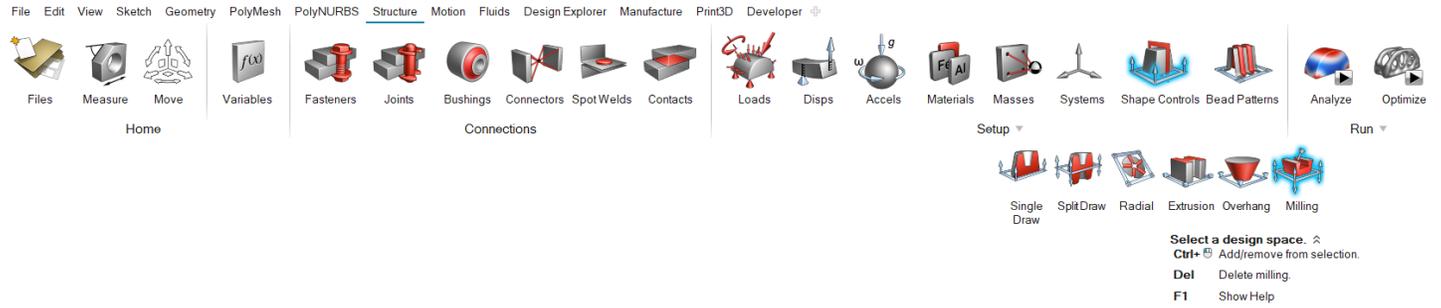
Use the Quick Report tool to generate a structural analysis report using the saved settings. You can export as a PPT or PDF. The report includes material data; model info; run settings; load case info and images; and results. The PPT template can include logos.

Use the Report tool to configure the settings and create a structural analysis report. You can save the settings so they can be used for quick reports. You can select saved view scenes, select multiple load cases, and select multiple result types to be used for different runs. You can also save scenes in a .stmod file using the View tool and use these for capturing hotspot views of the model for specific load cases.



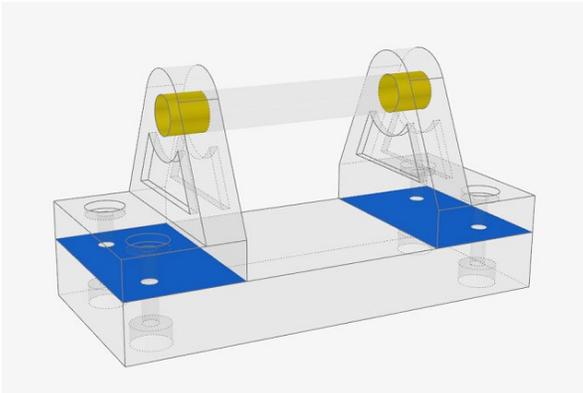
### 5-Axis Milling Optimization Constraint

The 5-axis milling constraint enables optimization results that emulate the capabilities of a 5-axis milling machine, utilizing two additional rotary axes (A and B) for a multidirectional cutting tool approach. This constraint adds another manufacturing process to the optimization results.

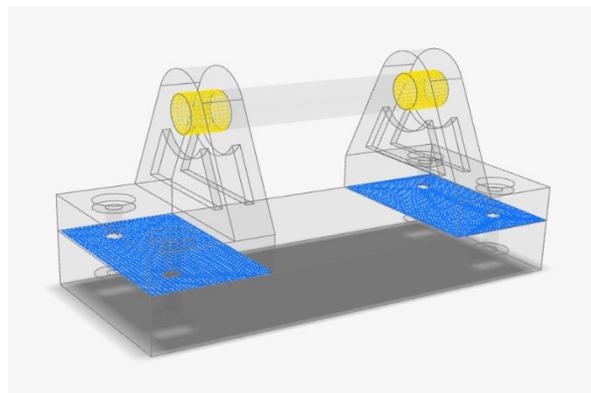


### SimSolid Contact Finding for Solid

The SimSolid contact algorithm has been incorporated for faster contact find and support of part pairs.



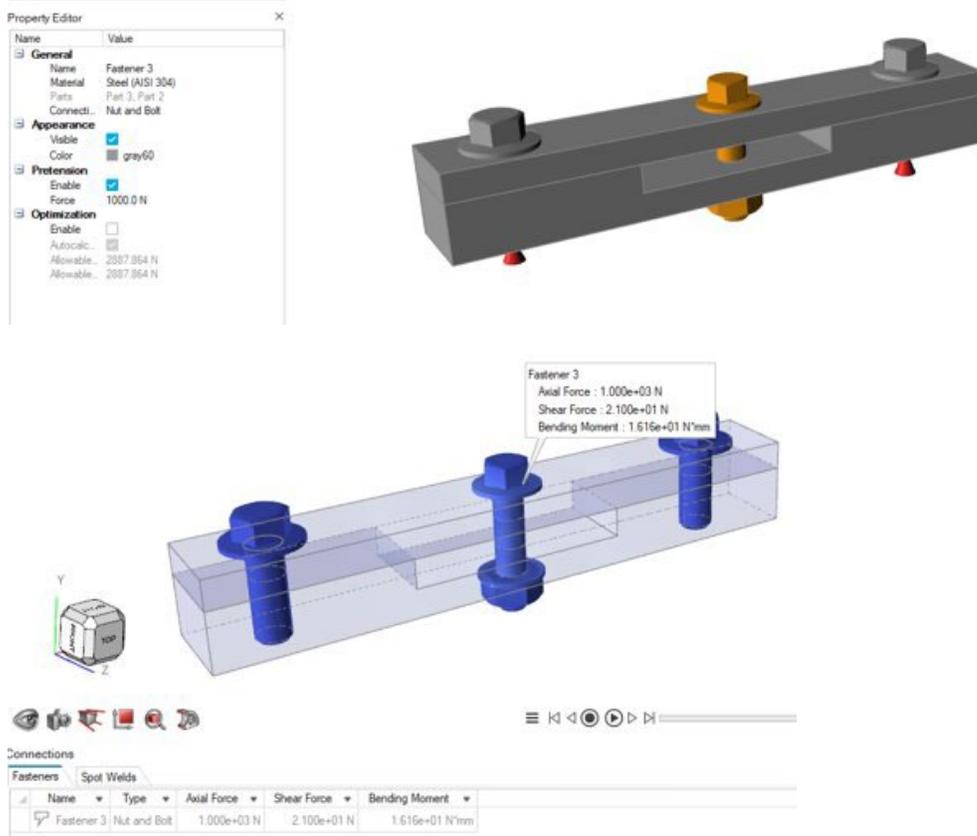
Old



New

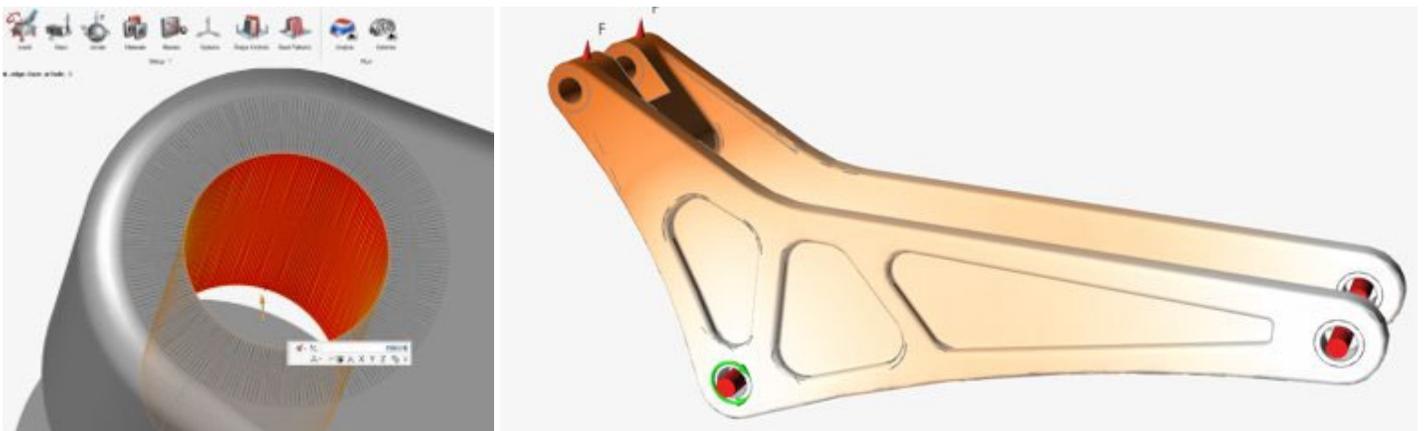
### Bolt Pretension Added to the SimSolid Analysis

Bolt pretension is now supported for SimSolid, allowing you to obtain more accurate results within the bolts.



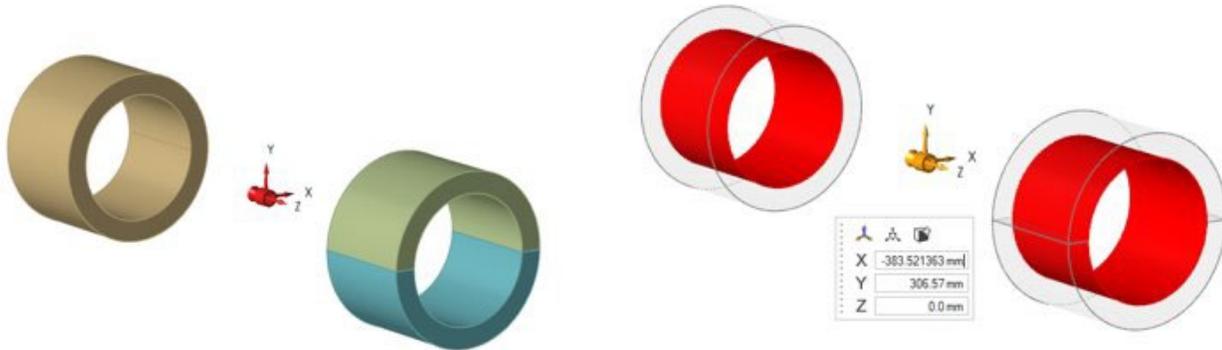
### Apply Boundary Conditions to Mesh Features

You can now apply boundary conditions to mesh parts from STL models and run analyses in SimSolid. Additionally, contacts are calculated for mesh or mixed CAD/mesh models.



### Apply Grounded Bushings to Multiple Part Features for OptiStruct

You can now apply grounded bushings to multiple part features for OptiStruct. This allows for more connections conditions for OptiStruct models.



## PolyMesh

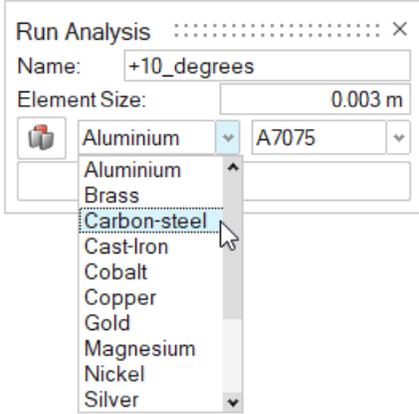
### Fill and Convert Tools Removed

The Fill and Convert tools have been removed as improved, richer filling and conversion functionalities are now available through Implicit Modeling.

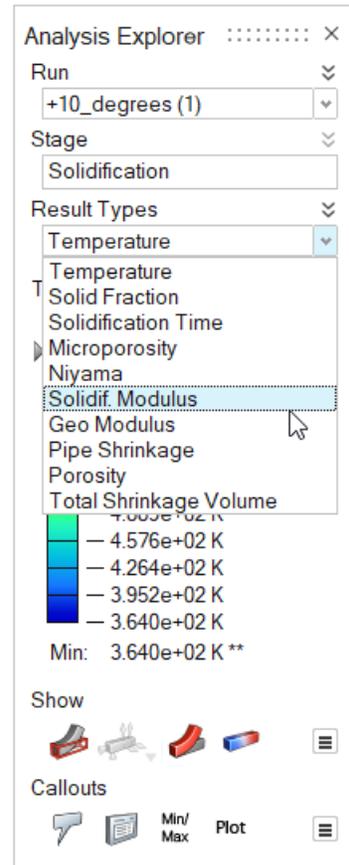
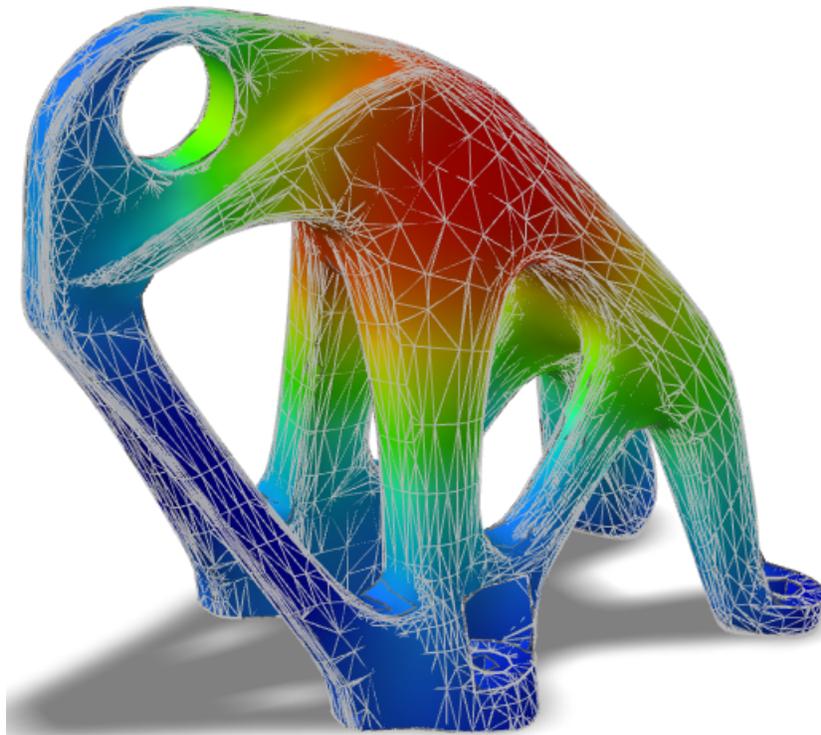
# Manufacture

## Porosity Analysis Enhancements

- Porosity analysis now supports .stl files.
- The Materials menu now includes the entire materials library, including alloys.



- Results include a wider array of result types.



# Print 3D

## Materials Window

The Materials Window now includes a tab for Powder properties, including Conductivity, Density, and Specific Heat.

Materials
✕

Materials Database

My Materials

Material Name Aluminum AlSi10Mg

General

Thermal

Mechanical

Powder

Density ▼

Conductivity

Density ▼

Specific Heat

1	293.15	1315.0
2	533.15	1291.8
3	773.15	1268.6
4	823.15	1228.9
5	885.65	1188.0
6	910.65	1185.7
7	923.15	1184.5

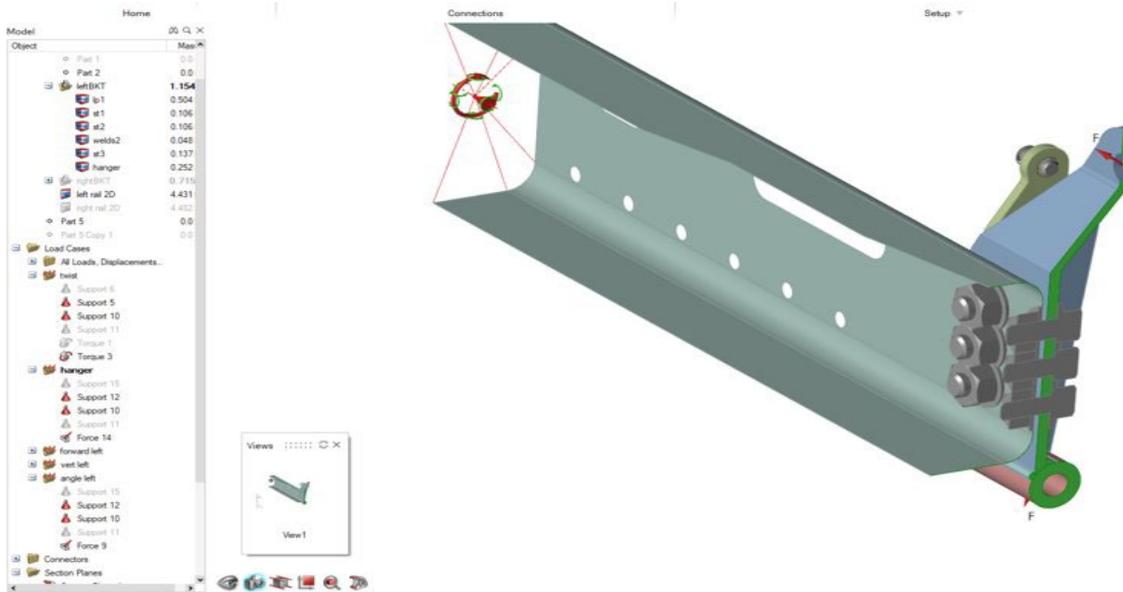
Temperature (K)	Density (kg/m³)
293.15	1315.0
533.15	1291.8
773.15	1268.6
823.15	1228.9
885.65	1188.0
910.65	1185.7
923.15	1184.5

Select
Import
Export
Edit

## General

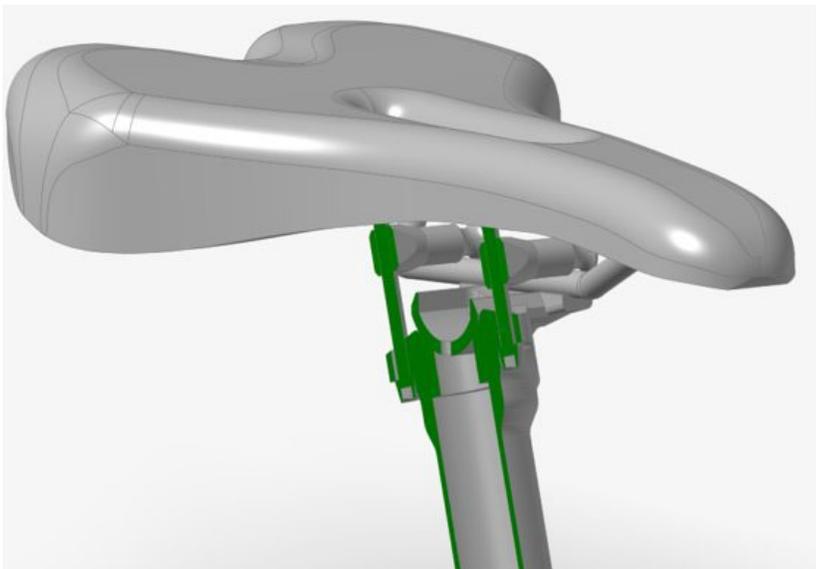
### Improved View Tool

The View tool has been improved to include the view state of all objects in the model, such as parts, loads, fasteners, and sections.



### Section Planes

You can now create a section cut on a selection of parts while allowing others to remain undisturbed. This works together with the View and Report tools to automate documentation workflows.



### Import of .3mf Files

You can now import .3mf files into Inspire.

### Improved Import Functionality for Variable Manager

Now when you import variables, by default they are merged with any existing variables. To clear existing variables on import, in the Variable Manager dialog box, from the hamburger menu, turn on **Clear Variables on Import**.

## Design Explorer

### Linux Support

Design Explorer is now supported on Linux.

- SUSE Linux Enterprise Server 15 SP3
- Red Hat Enterprise Linux 8.4/Oracle Linux 8.4 or newer

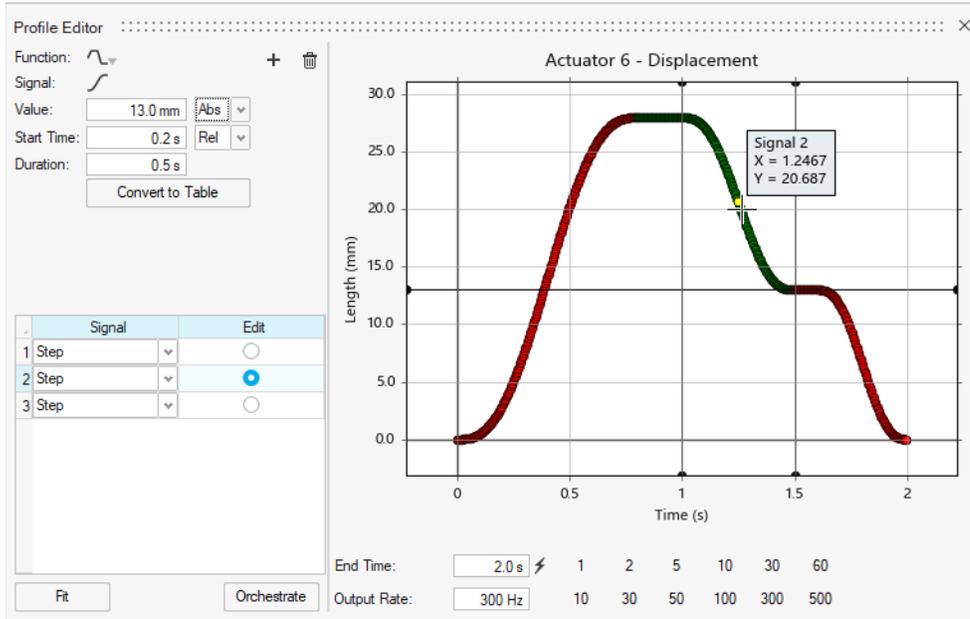
### Extract Non-Solver Responses

You can now execute a run when there are only model responses, no solver responses.

# Motion

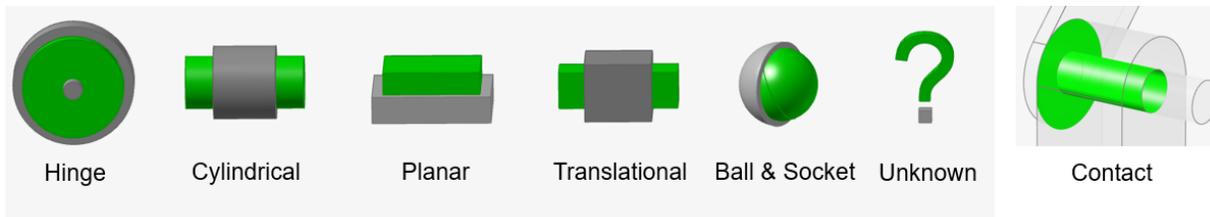
## Multi-Signal Profiles

With this new addition to the input types in the Profile Editor, you can create complex input profiles that are comprised of multiple signals in the same input. Previously, inputs were limited to single functions, such as Step, Step-Dwell-Step, and sinusoidal, and to create complex expressions, solver expressions had to be manually written. Now, you can quickly and easily create such expressions using an interactive interface inside the Profile Editor.

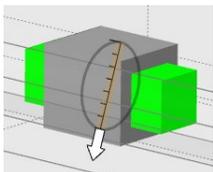


## New Joint Graphics

Joints are no longer represented only as highlighted surfaces, but now more closely represent the type of physical connection and its degrees of freedom. These new joint graphics are the same as the graphics used by Altair MotionView.



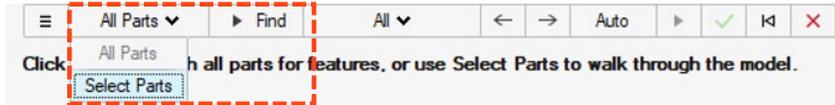
Selecting a joint graphic will display a sizing manipulator so you can adjust the visible size of the icon.



### New Joint Creation Option

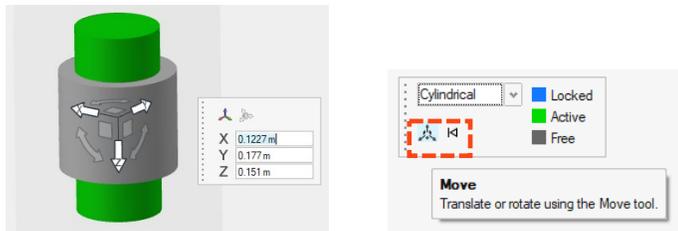
You can now create joints by selecting one or more parts individually, then gradually walking through the model. Previously, to reduce search times for joint features, you would need to hide all other parts and show only those related to the joint. Now, there are two options on the guide bar for creating joints: All Parts and Select Parts.

All Parts works the same as it did previously, but the Find function is no longer automatic. You need to click the Find button to search the model. With Select Parts, you can select two parts, for example, and only the joint feature candidates between those two parts will be shown. This allows for a more gradual approach to building models. It also prevents long joint feature search times.



### New Joint Edit Option

Joint location and orientation can now be changed using an integrated Move tool on the joint micro dialog. The option to reset is also available. The joint can be changed to any type regardless of the type of joint Inspire creates based on detected geometry.



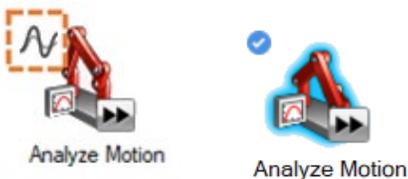
### List Table for Flex Bodies

A table is now available for flexible bodies. The table contains an organized layout of the parameters associated with flex bodies, such as the number of modes, Faster/More accurate, and more.

Name	Flexible Body	Flexbody Element Order	Normal Modes	Frequency Type	Flexbody Stress Calculation	Flexbody Strain Calculation
Base						
Link Crank	<input checked="" type="checkbox"/>	More accurate	15	Normal Modes	All	None
Link Dual Slot	<input checked="" type="checkbox"/>	Faster	10	Normal Modes	All	None
Link Single Slot	<input checked="" type="checkbox"/>	Faster	10	Normal Modes	All	None
Mount Clevis	<input type="checkbox"/>					
Mount Crank	<input type="checkbox"/>					

### Run History Access

Run history data can now be plotted without loading a model using a new, temporary satellite icon that opens the Plot Manager. After a model is loaded and solved for the first time, the icon is replaced with a blue check mark. After the icon changes to a blue check mark, the Run History can only be accessed from the Plot Manager.



### Flex Body Meshing Improvements

Significant improvements have been made to prevent the failed creation of flex bodies.

# Python API

## General

- New APIs for store and recall views have been added.

## Geometry

- Added Rib capabilities: Now you can create thin-walled features of your models that enhance the strength and structural integrity of the design.
- Added Extend Surface capabilities: Now you can extend the surface up to a curve or another surface.
- Added Offset Curves capabilities: Now you can offset the curves at a specified distance from the source curve.
- Added Intersect Curves capabilities: Now you can split intersecting curves or wire bodies into several curves, with an option to combine them into a single curve.
- Added Extend Curve capabilities: Now you can extend a 3D curve or a wire body.
- Added Blend Curve capabilities: Now you can create a free-form curve that blends into one or more existing curves, surfaces, or edges.
- Added Face Curve capabilities: Now you can extract curves from a face in the U or V direction.
- Added Trim and Split capabilities: Now you can remove part of a surface or solid by projecting a profile curve onto it.

## Implicit Modeling

- Extensive APIs for generating and editing implicit components have been added. Now you can quickly model complicated, irregular, and organic forms.

## Structures

- Added an API for the 5-axis milling constraint.
- APIs for the Report tool have been added. You may now use it to build your own reports.

## Enhancements

- Added enforced displacements on a cylindrical hole [IN-31780]
- API support for the Extend Surface tool [IN-31698]
- A geometry import option was added to properly support point names [IN-30298]
- Added the ability to add/remove parts from Section Cuts [IN-9456]
- Added variable support to the Partition [IN-31142], Fillet Edges [IN-31140], NURBS Curve [IN-31139], Helix Curve [IN-31138], sketch patterns [IN-30905], Offset [IN-31144], and Geometry Simplify tools [IN-31141]
- Allowed the Extract tool to extract lines and points from reference lines and points [IN-30709]
- Applied Symmetry and Extrusion shape controls in the same optimization run [IN-30659]
- Grounded bushings can now connect multiple cylindrical faces through multiple parts [IN-30299]

## Resolved Issues

- Inspire no longer performs a 30-unit license checkout to turn on Print3D UI [IN-33014, IN-32940]
- Fixed File New crash after isolating the part in the simulate context when the model contains measures [IN-33386]
- Fixed a crash when opening a file containing a PolyNURBS part [IN-31381]
- Fixed a crash when opening a file containing corrupted data from a 2022.2 file [IN-33087]
- Fixed callout ignored with 2<sup>nd</sup> order elements [IN-32845]
- Fixed Japanese wording [IN-32392]
- Fixed contact not being found after geometry was read with surface errors [IN-32326]
- Fixed a crash when saving a file under a different name [IN-32121]
- Fixed model view center moving upon rotation [IN-31374]
- Fixed View Cube for Dark mode [IN-30643]
- Fixed STEP file import translations [IN-31130]
- Fixed forces not being applied perpendicular to faces [IN-31713]
- Fixed grounded bushings for modal analysis [IN-30848]
- Fixed fastener shear and axial response [IN-29631]

## Known Issues

- Pre-highlighting issues in post-processing results [IN-24980]
- Modifying edge fillet leads to selection of additional edges [IN-27932]
- Hidden edges appear in many tools [IN-32396]
- Snap to visible still allowing some “hidden” snaps to be selected [IN-33450]
- View Cube doesn't appear correctly using AMD graphics card [IN-32550]
- When assigning a material and enabling Performance Render within the Print 3D tab, there is no effect on the visualization [INP-2092]
- When Model units are set to MMKS, Eigen Analysis results are graphically incorrect. However, the numerical Mode results are correct. For now, users can run an Eigen analysis using MKS Model units (under Preferences). A second option is to use MMKS Model units, and then open the resulting .H3D in HyperView. [IM-4658]
- Min/Max flags and Callout flags inside flex body results review context are not being displayed when using MMKS Model units (under Preferences). [IM-4952]
- Power output results are being scaled incorrectly when using MKS Model units (under Preferences). For now, it is suggested to use MMKS Model units when seeking Power results for Motors and Actuators. [IM-4916]
- When loading Analyze Part results from previous versions, there may be an increase in the time it takes to load the results. A warning message will appear, giving the option to either proceed with loading or cancel, where it may be faster to run a new Motion + Analyze Part. [IM-4940]

# Learn More About Inspire

You can learn more about new and existing features in Inspire using the following resources:

## In-Application User Assistance

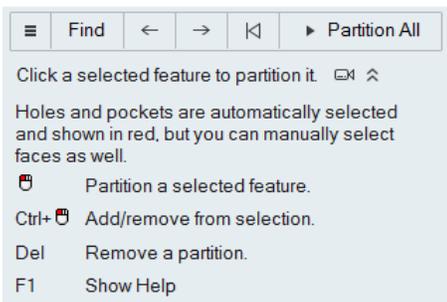
Inspire provides two types of user assistance. **Enhanced tooltips** appear when you hover over icons and other features. They describe what the tool does.



**Workflow help** appears when you select a tool that opens a guide bar or microdialog. The text prompts you what to do next.

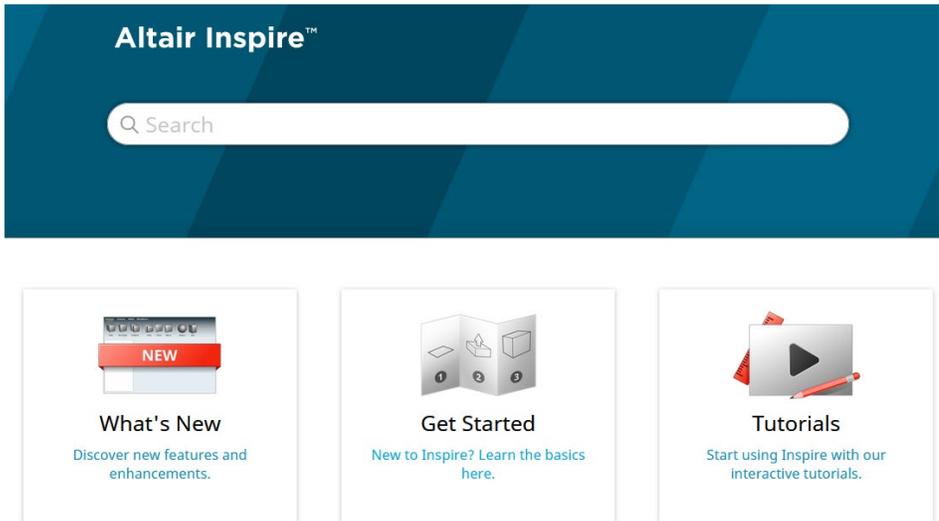


Click to view additional tips and shortcuts. Some tools also include a video .

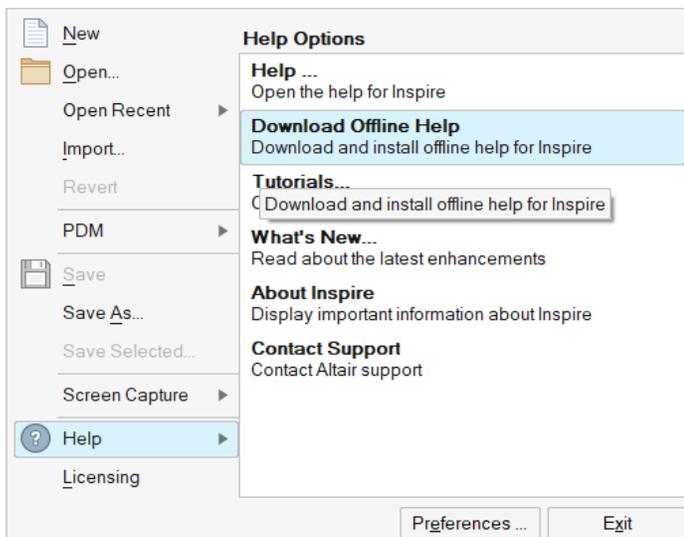


## Online and Offline Help

Press F1 or select File > Help > Help to view the online help.



You can download an offline version by selecting **File > Help > Download Offline Help**. An internet connection is required to download.



## Supported Languages

The language for the user interface and online help can be changed in the Preferences under Workspace > Language. User interface text is available in English, Chinese, French, German, Italian, Japanese, Korean, Portuguese, and Spanish.

The online and offline help is available in English at the time of release, and in Chinese, Japanese, and Korean generally 1 to 2 months after release. If a language is selected in the Preferences that is supported for the user interface text but not for the help, the English help is shown. Similarly, if an unsupported language is selected in the Download Offline Help dialog, the English offline help will be downloaded instead.