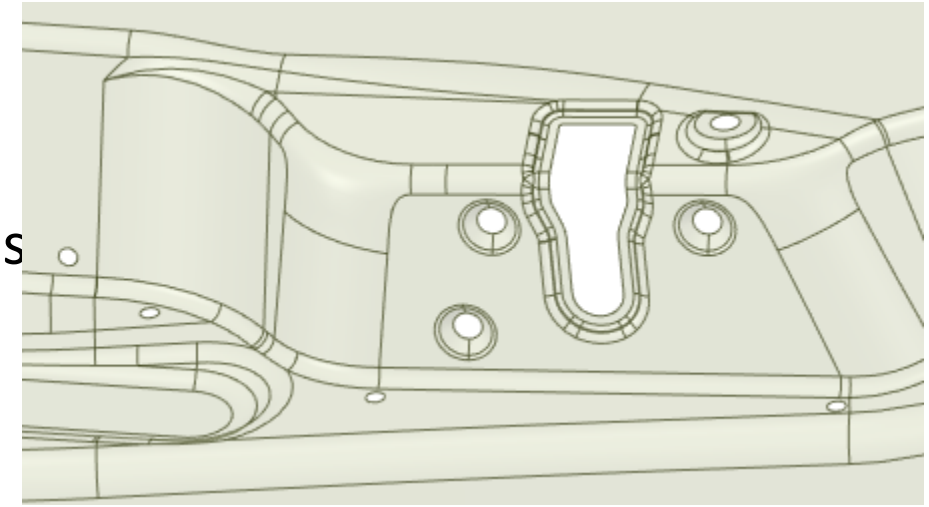
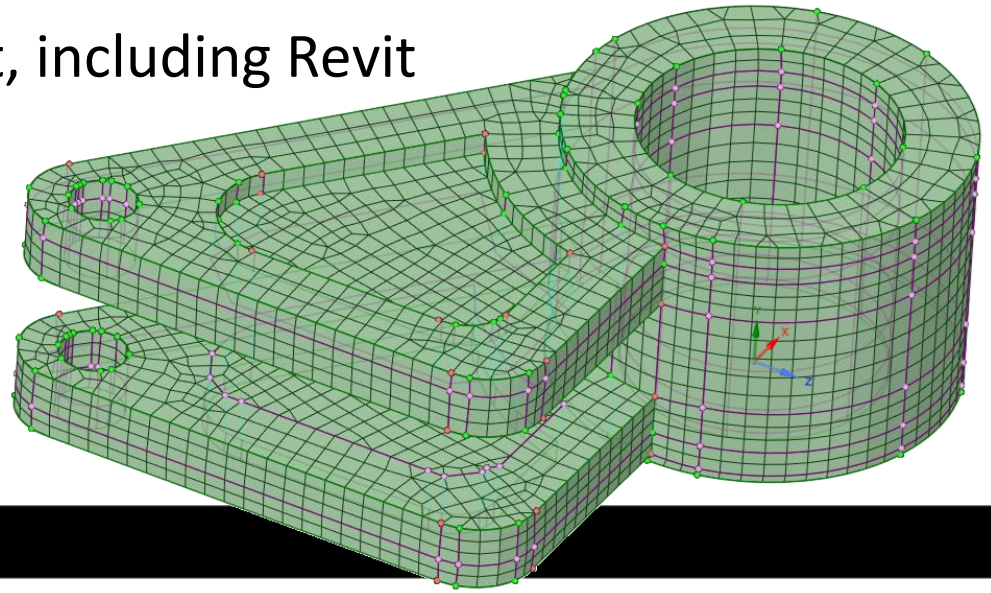
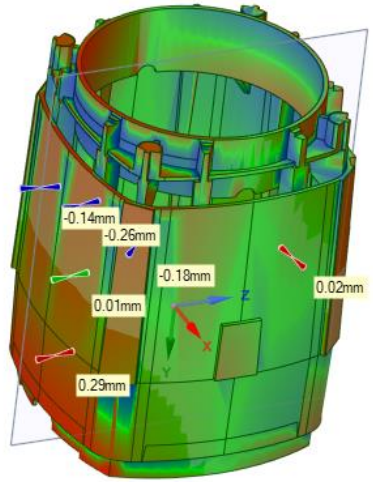
Ansys 2021 R1 Highlights
Ansys SpaceClaim

2021 R1 Highlights

- Improved midsurfacing of stamped parts
- New dimensional sketch relationships with expressions
- New probing in deviation tool
- New toolbox on Ansys App Store
- New block recording of SpaceClaim meshing
- New Cartsweep meshing
- New file format support, including Revit

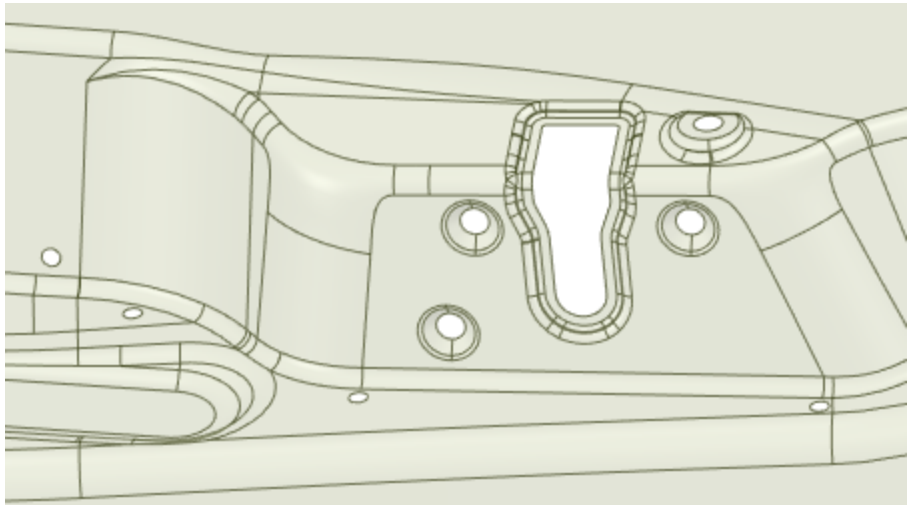




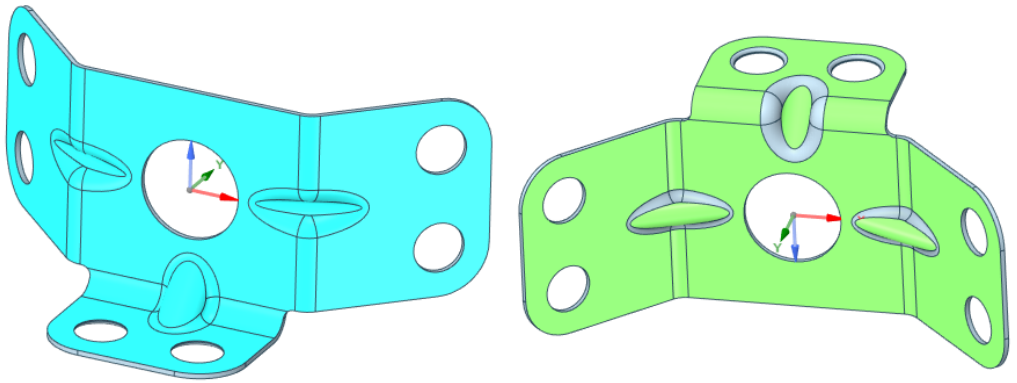


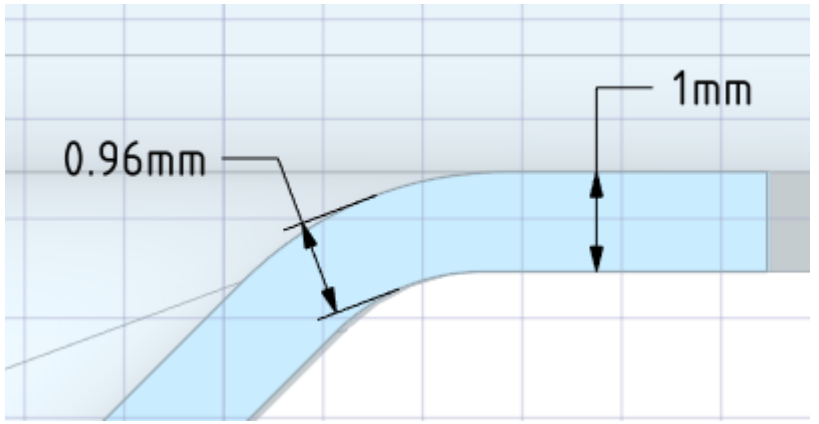
Midsurface Improvements

- Improved “Midsurface” tool
  - Automatically find missing midsurface regions
  - Extract midsurfaces faster and more accurately



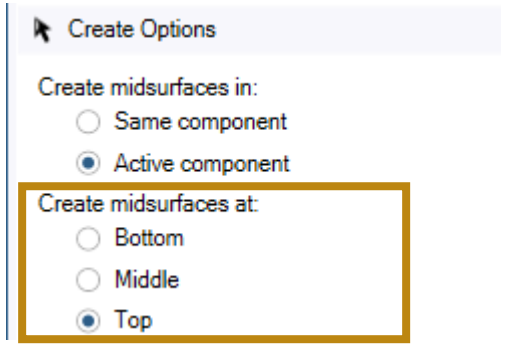
Improvements especially help with complex stamped parts

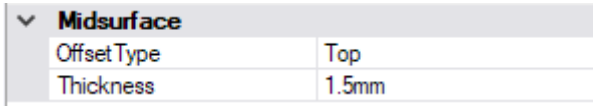


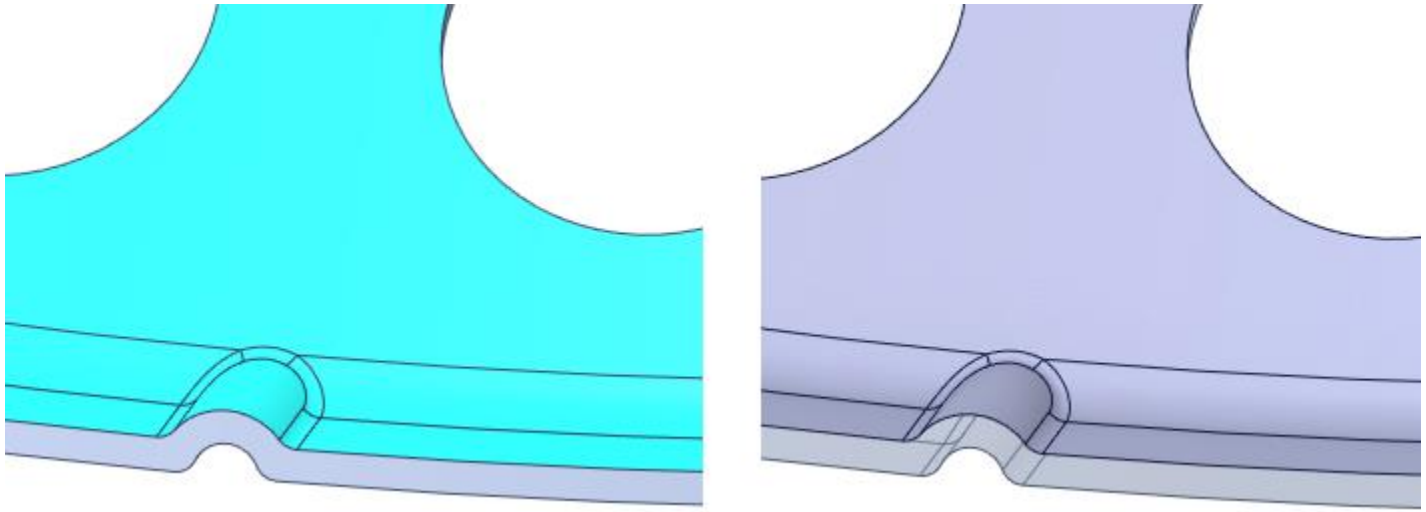


Midsurface Improvements

- New option to create midsurface at top or bottom location
  - Blue side is top
  - Green side is bottom
- Automatically assigns property to midsurface body during extraction

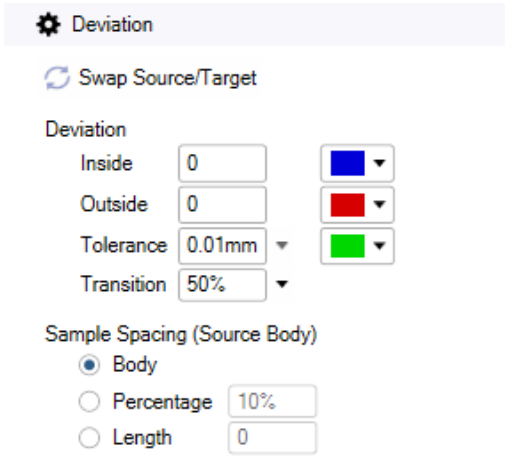


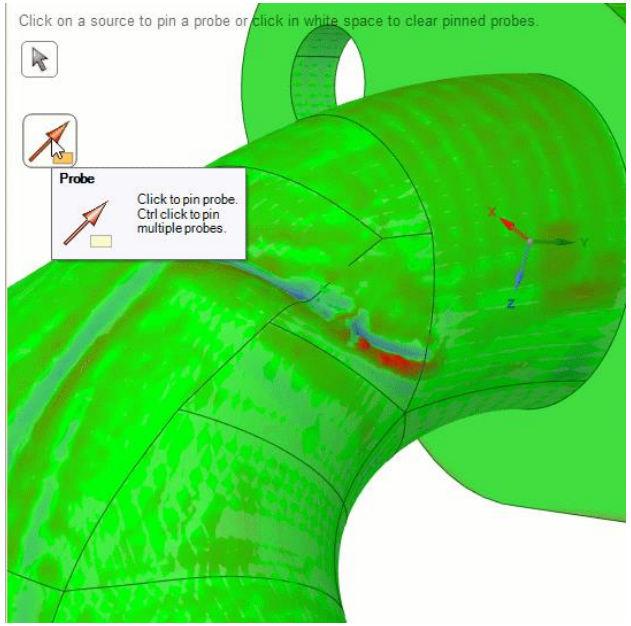


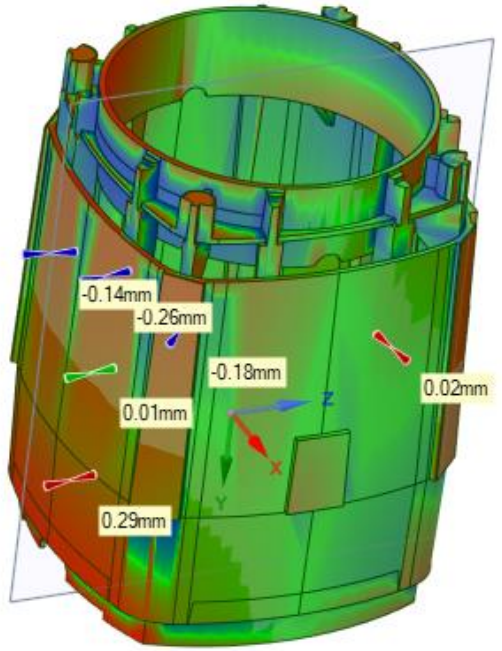


Deviation Tool

- New “Deviation” toolguide
  - New probing toolguide provides precise distance of deviation at any point
  - Condensed options panel simplifies user experience



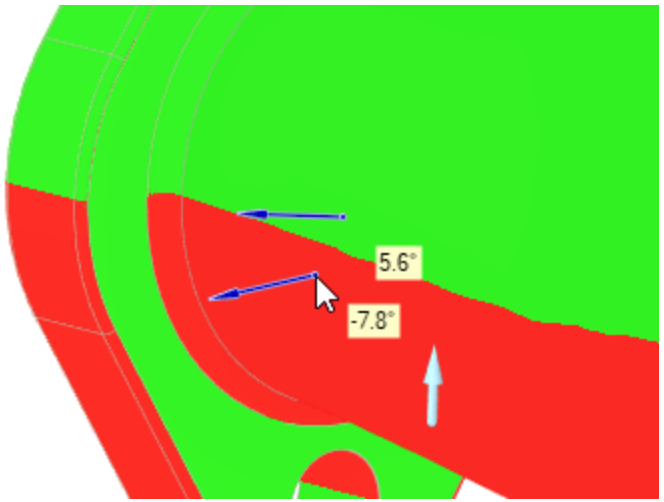


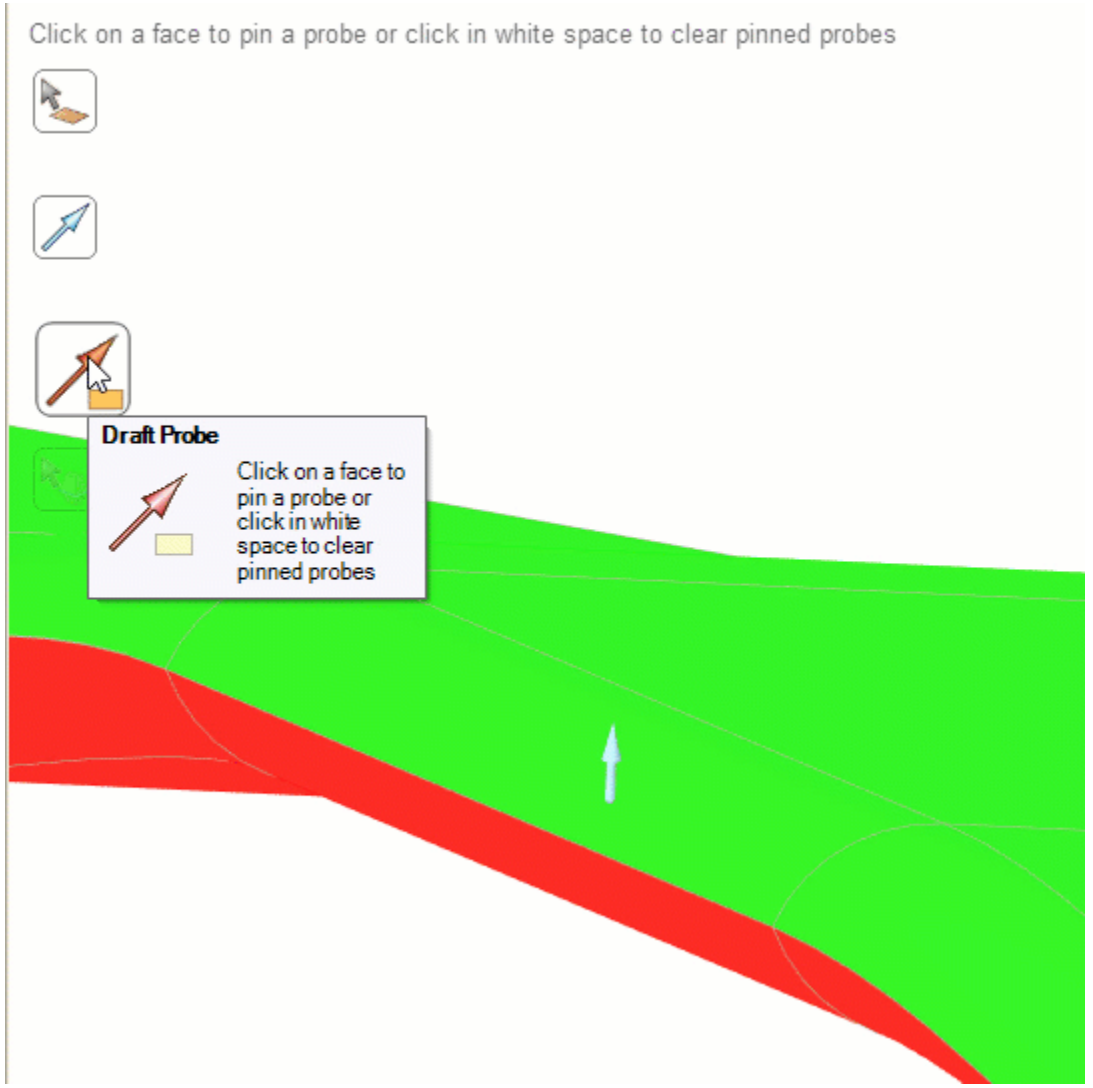


Ctrl select multiple points to see deviation at several locations

Draft Analysis

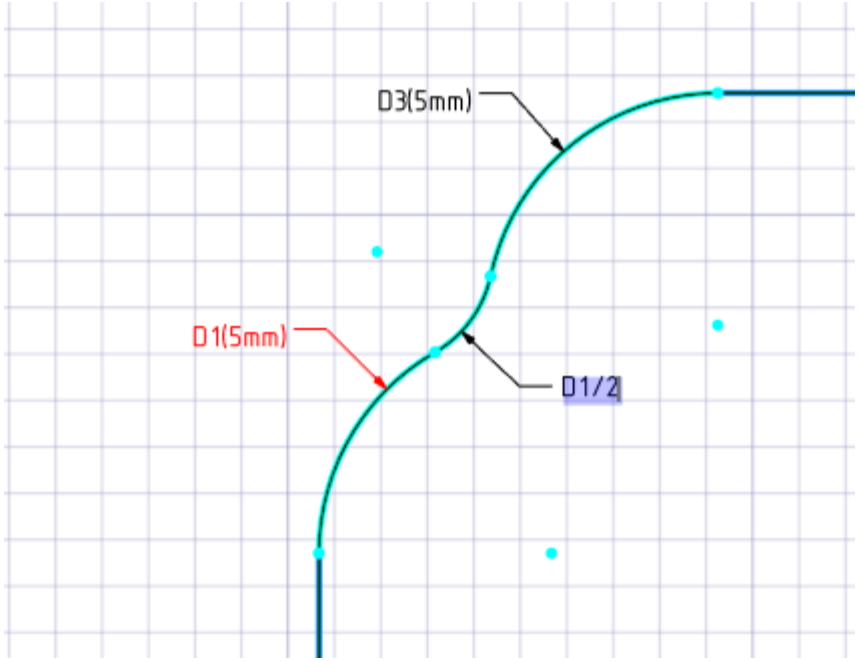
- New “Draft” toolguide
  - New probing toolguide provides precise angle of draft at any point
  - Select multiple draft locations by holding ctrl key



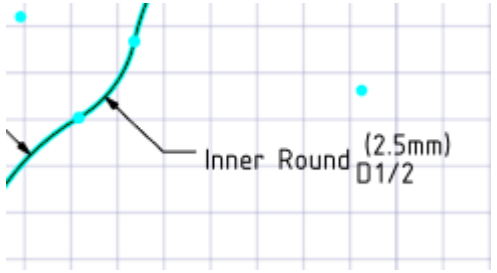


Sketching Enhancements

- Dimensional relationships can now be created using expressions
- The expression, label, or value can be changed in the property panel
- When a dimension is selected, expressions, labels, and values are seen in the design window



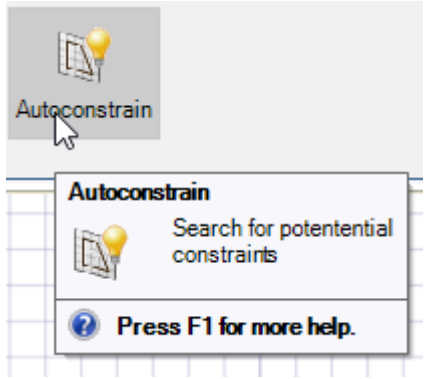
Dependent dimensions are highlighted in red

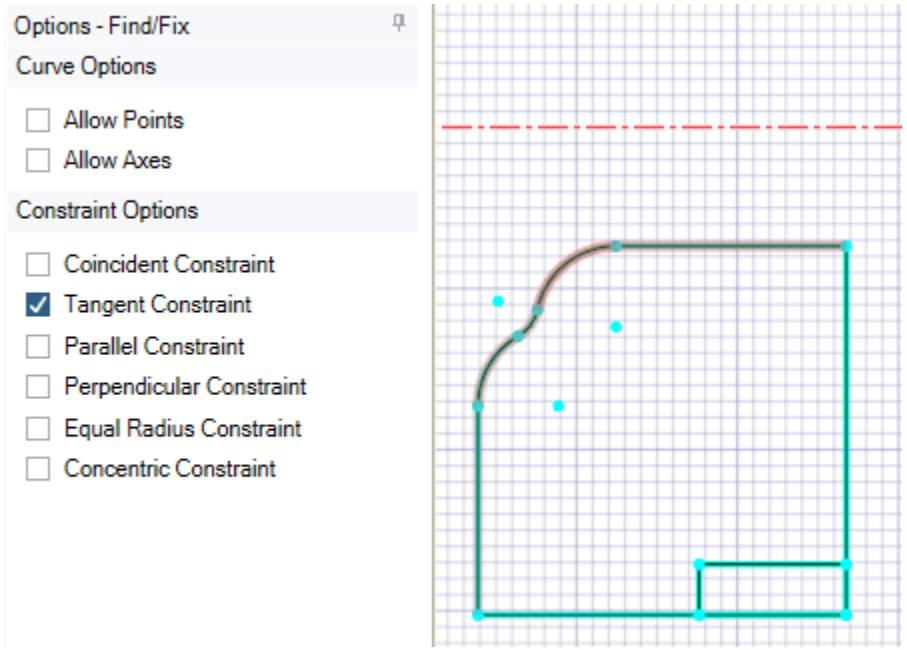


General	
Expression	D1/2
Label	Inner Round
Measurement	Radial
Value	2.5mm

Sketching Enhancements

- New “Autoconstrain” tool
  - Finds constraints that can be added to a sketch following a find-> fix paradigm
  - Useful when reverse engineering or adding constraints to an under-constrained sketch
- New Constraints icons better illustrate sketch relationships





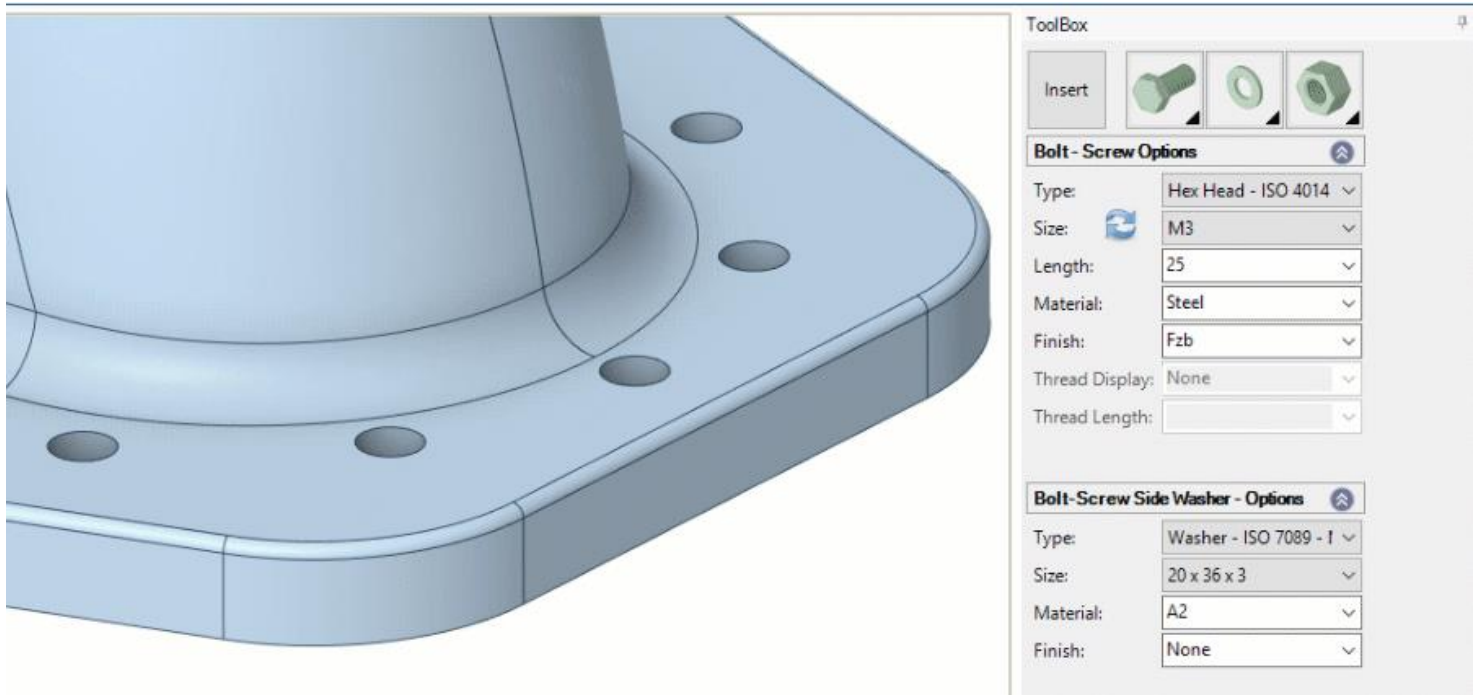
New constraint icons

SC Toolbox in App Store

Ansys / STORE

- New app that can be added to SpaceClaim with the following key features:
  - “Fasteners” tool
    - Add hardware, such as bolts, nuts, and washers into your assembly
    - Automatically add hardware to all holes on a given face

SC Toolbox for SpaceClaim V1

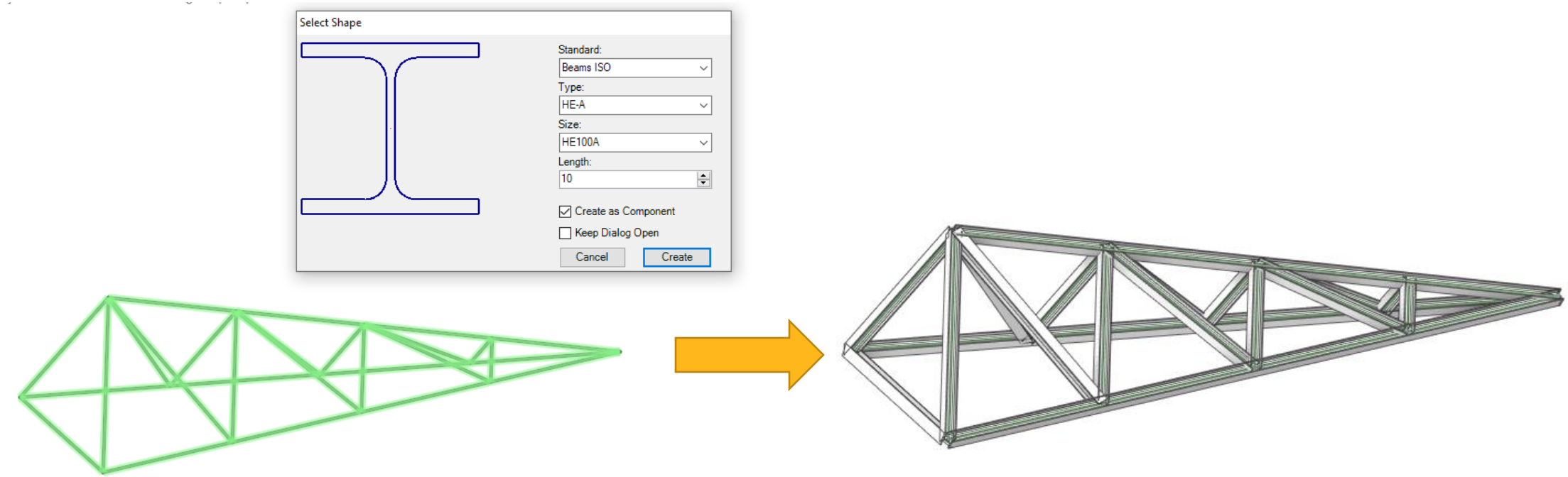


SC Toolbox in App Store

Ansys / STORE

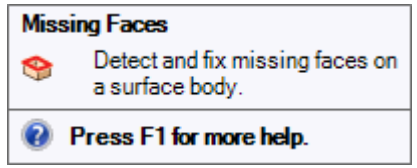
- “Shapes” tool
  - Insert solid beam profiles into your assembly or automatically align them to existing curves

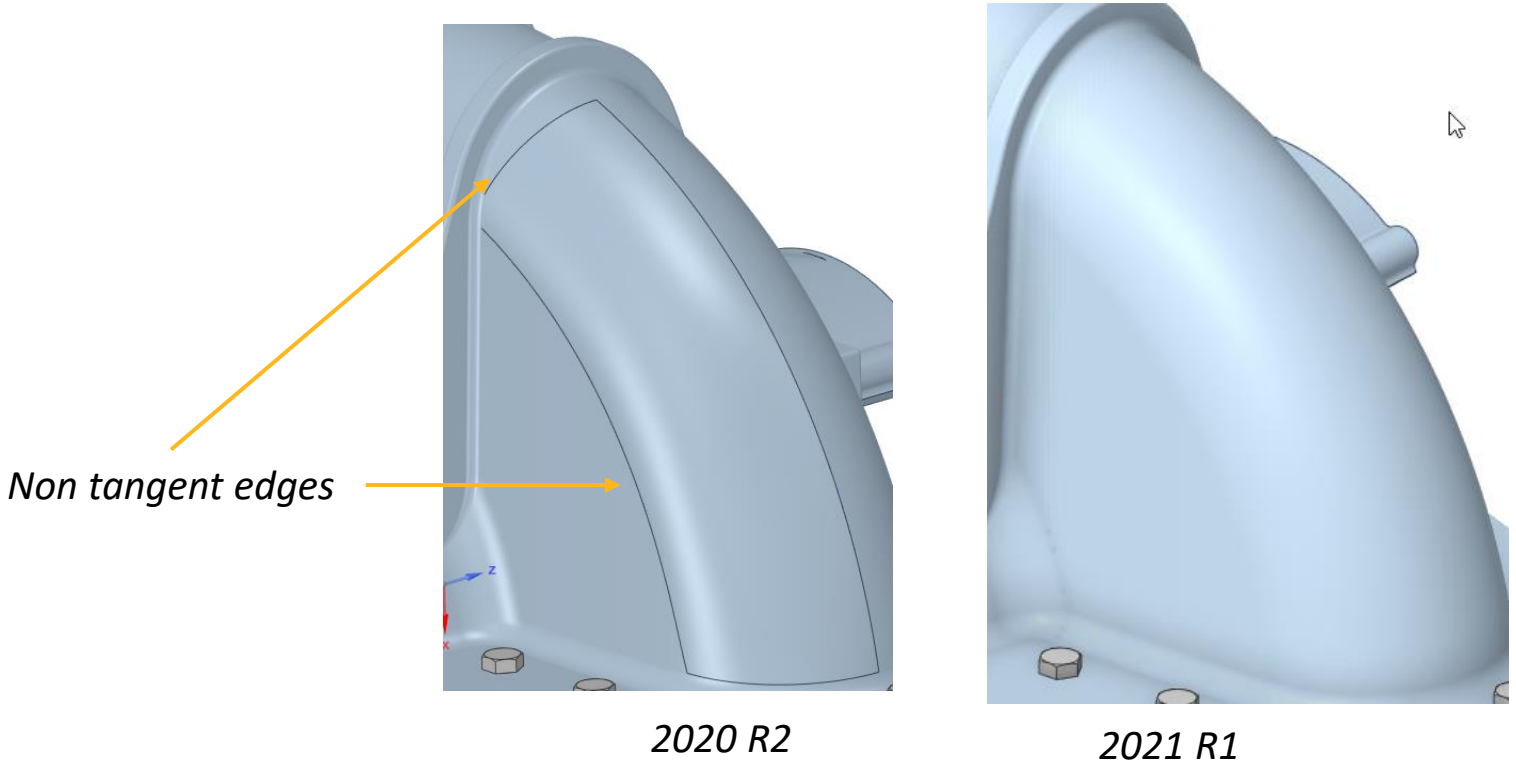
SC Toolbox for SpaceClaim V1



Missing faces

- Improved “Missing faces” tool
  - Creates tangencies in many more cases than before
  - Tangency is only attempted when the neighboring edges are tangent



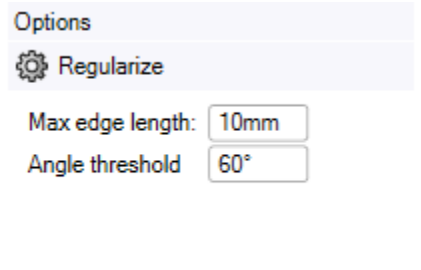


2020 R2

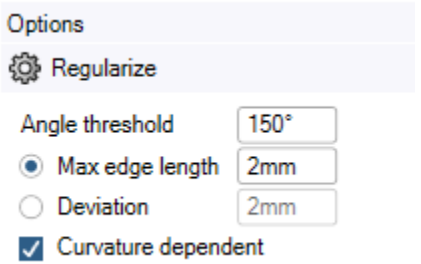
2021 R1

Curvature-Based Smoothing

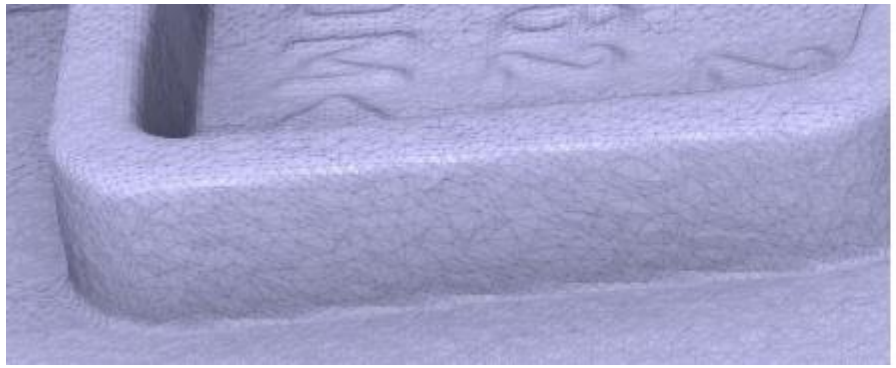
- New options in the “Regularize” tool:
  - New option for curvature-based smoothing
    - Allows variable-sized faceting based on curvature using the “Max edge length” to guide the average size of the triangles
  - New option to control facet size based on Deviation from the original faceted body

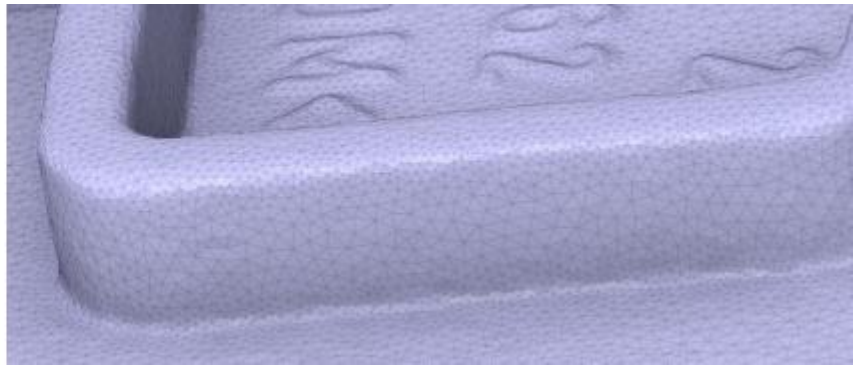


2020 R2



2021 R1

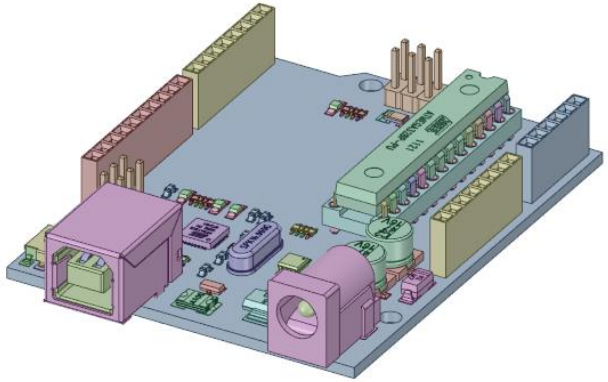




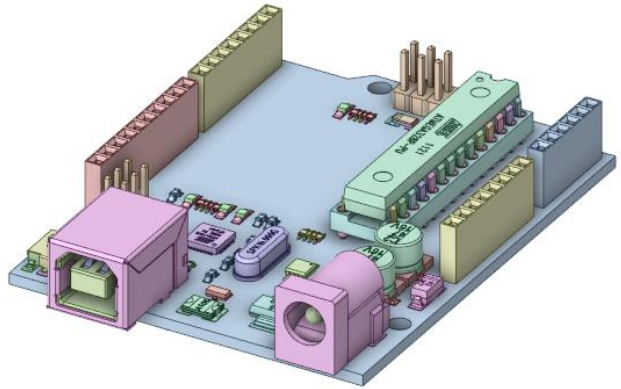
Remesh with triangles of equal edge length of variable sizing based on curvature

Graphics Improvements

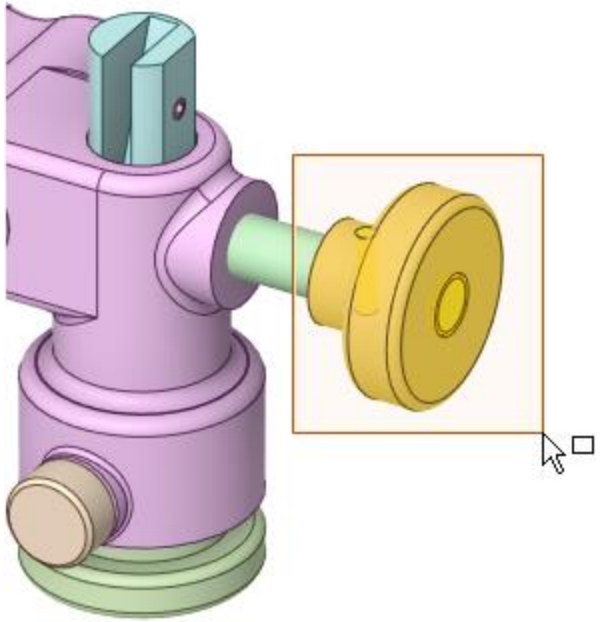
- Renderer now defaults to enhanced shading, making geometry appear brighter and capturing inner shadowing
- Box select now has orange shading to better see pre-highlighting

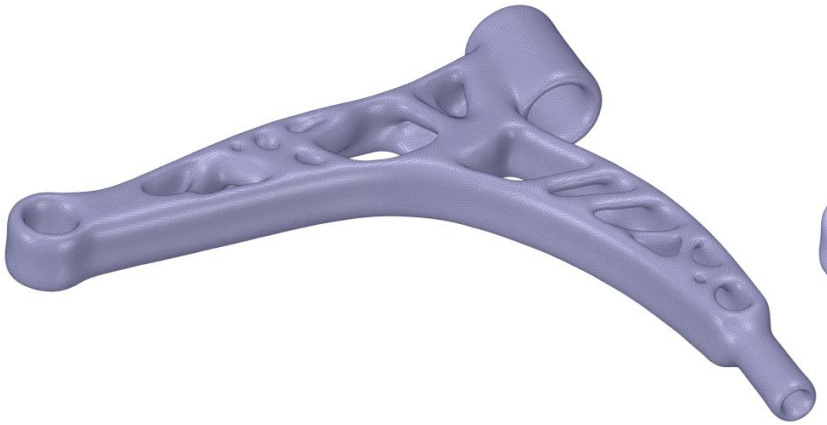


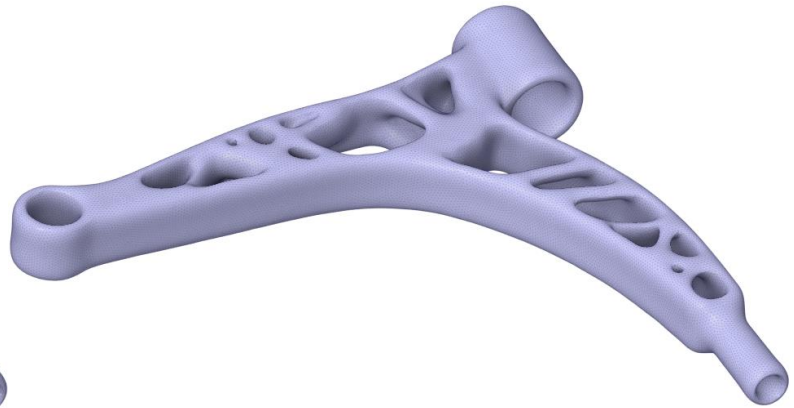
2020 R2



2021 R1

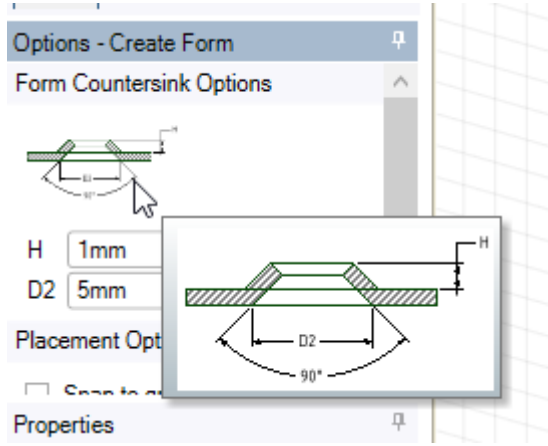


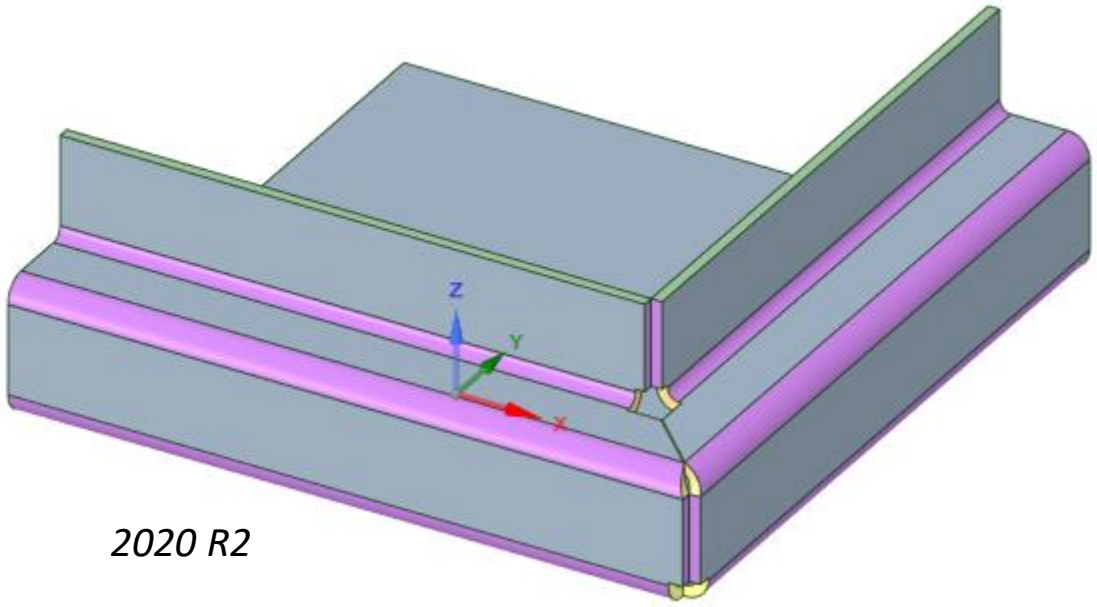




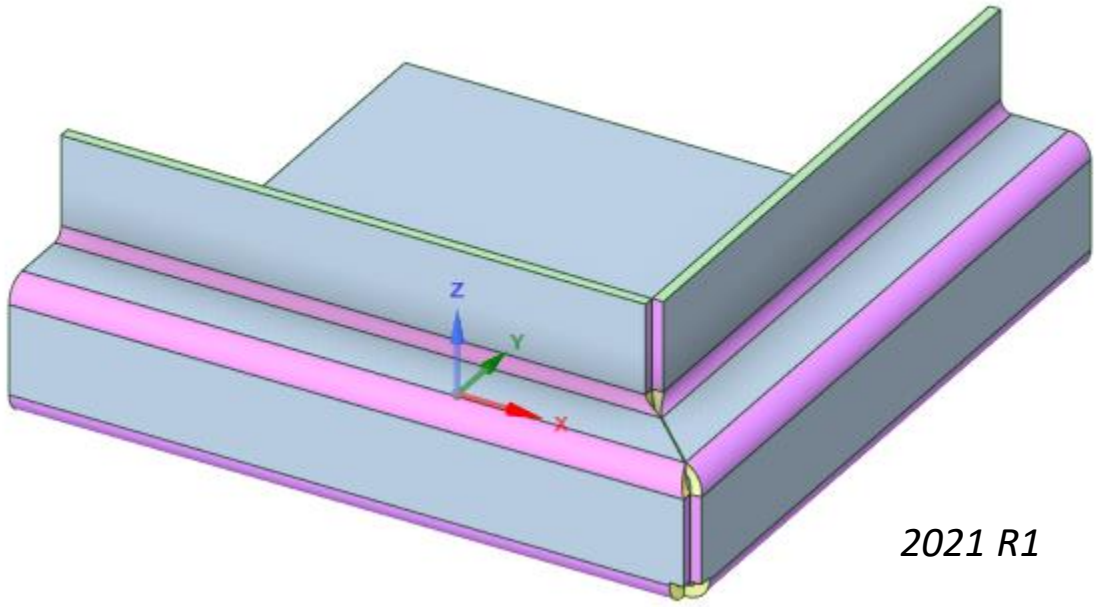
Sheet Metal

- Inner miter corners are now automatically closed creating smoother, tighter corners when unfolded
- Form images corrected to more accurately show dimensions of forms





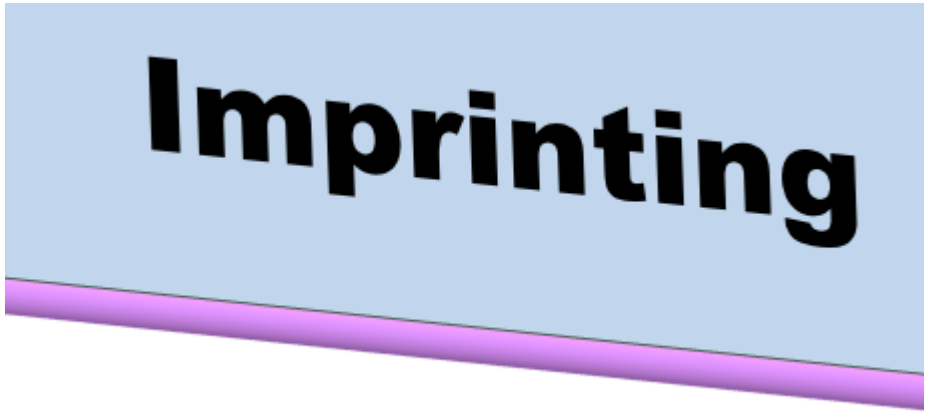
2020 R2

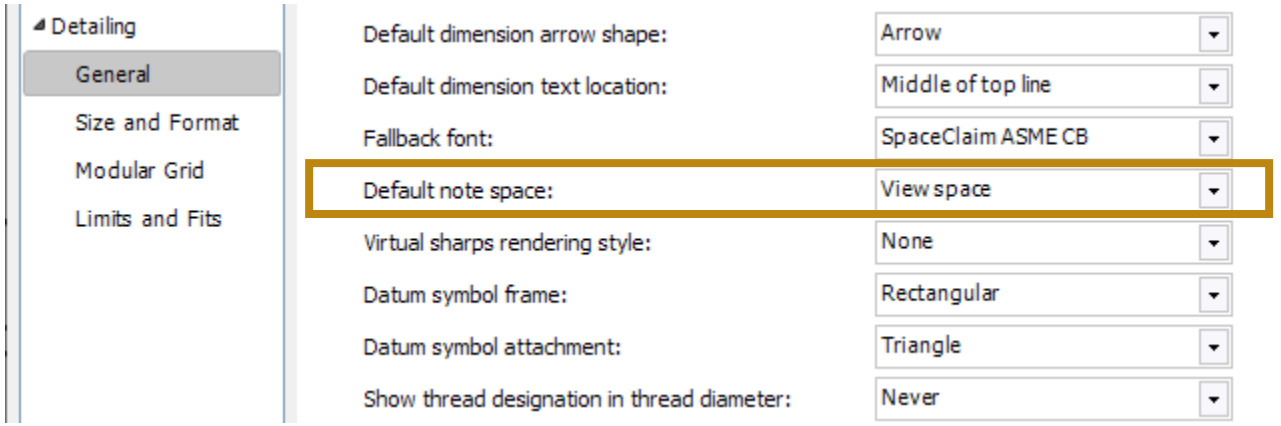


2021 R1

Note Sizing in 3D

- You can now select the default space for adding notes
- The options available are View space (default) and Model space





Cosmetic	
Space	View space
Mirrored	False
Stacked	False

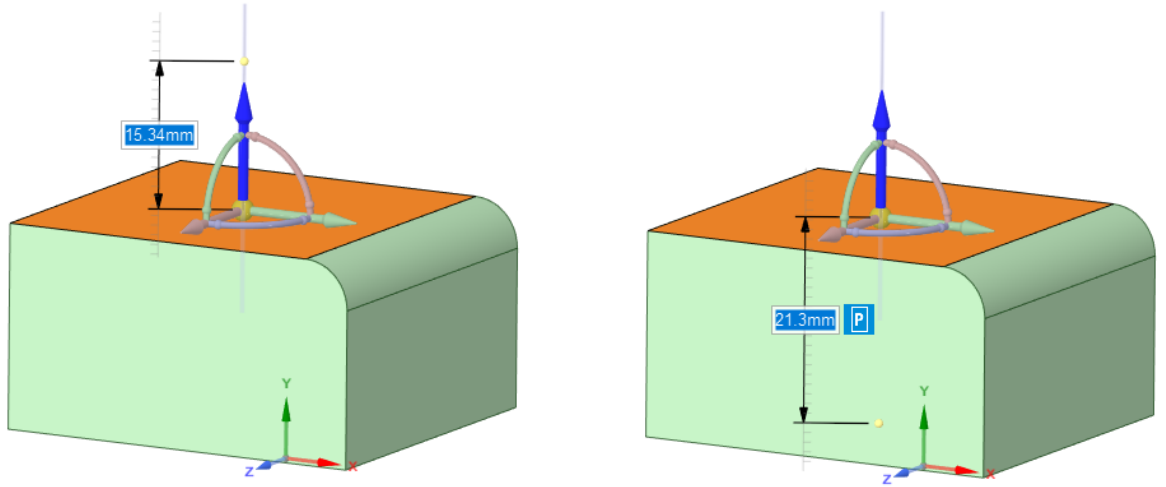
Notes in the Model space are their true size and are not scaled based on the Detail scale setting

New Import Export

- New file types:
  - Discovery files (*.dsco)
    - If Discovery files contain physics objects and simulation data, they will be removed
  - Revit fles (*.rvt, *.rfa)
- New Versions:
  - Reader:
    - AutoCAD 2021
    - CATIA V6 R2020x
    - Creo Parametric 7.0
    - Inventor 2021
    - JT 10.5
    - NX 1899
    - SketchUp 2020
    - Teigha/RealDWG 2021
  - Writer:
    - SketchUp 2020
    - Teigha/RealDWG 2021

Parameterization improvements

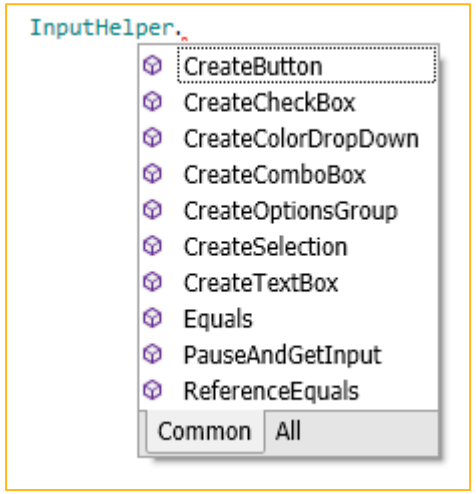
- Dynamically pulling or moving geometry no longer automatically allows parameters to be created
- Parameter shortcut requires reference geometry to be selected
- Unreferenced parameters can still be created by using the groups panel

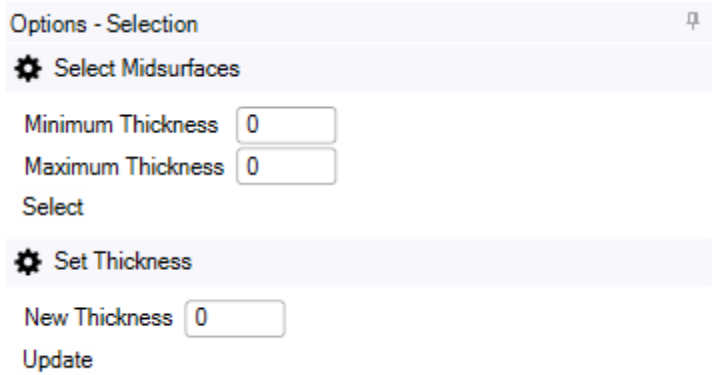


Requiring a Pull or Move dimensioned to be referenced to geometry allows dependable parameters to be created for design point studies

InputHelper with Scripting

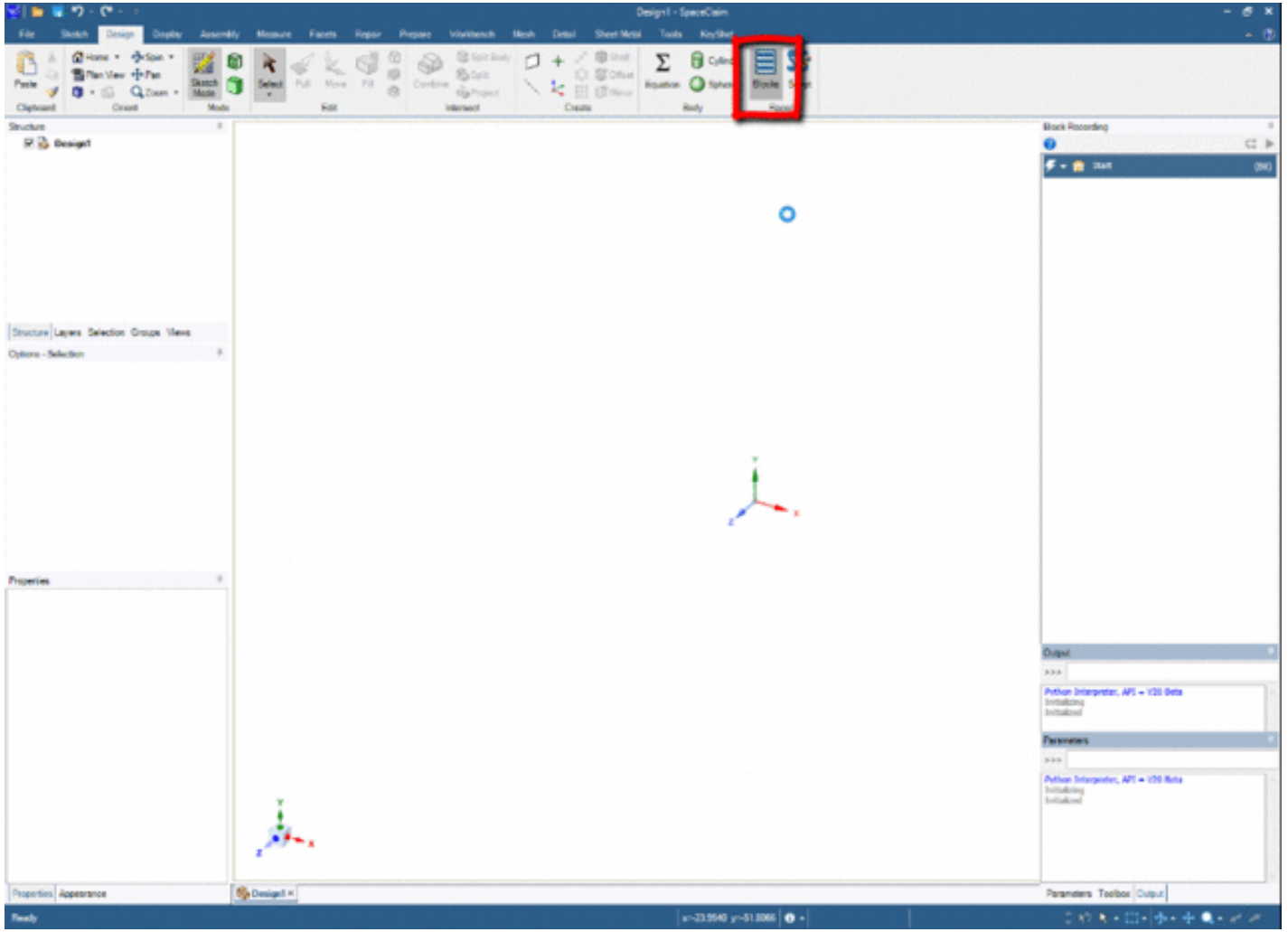
- InputHelper comes out of beta with v20 of scripting
- InputHelper allows users to create custom options and toolguides to look for inputs, such as:
  - Selections
  - Numeric inputs
  - Radio button option panel
  - Text inputs



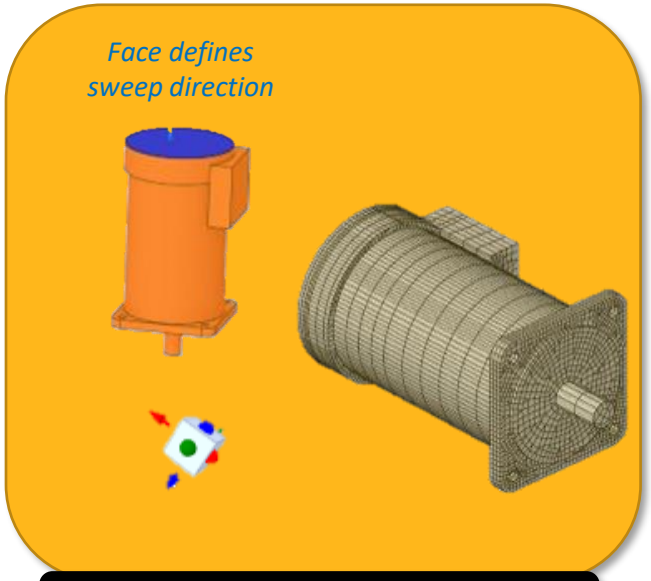


Block Recording

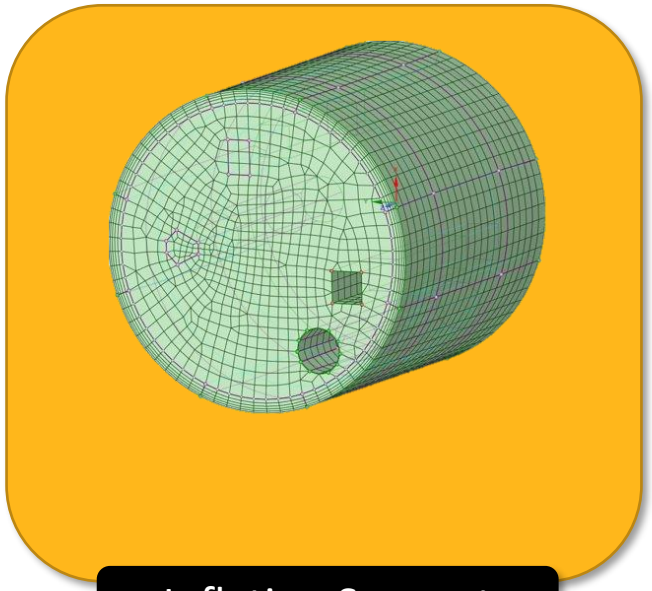
- Block Recording:
  - Records operations as blocks that capture the user's workflow
  - Options can be marked as parameters and parameters can be used as expressions
  - Can run through entire workflow or step through process
  - User can create custom blocks w/script
- Helpful for demonstrating steps in workflow
- Parametric/persistent process for design changes either at geometry or mesh level



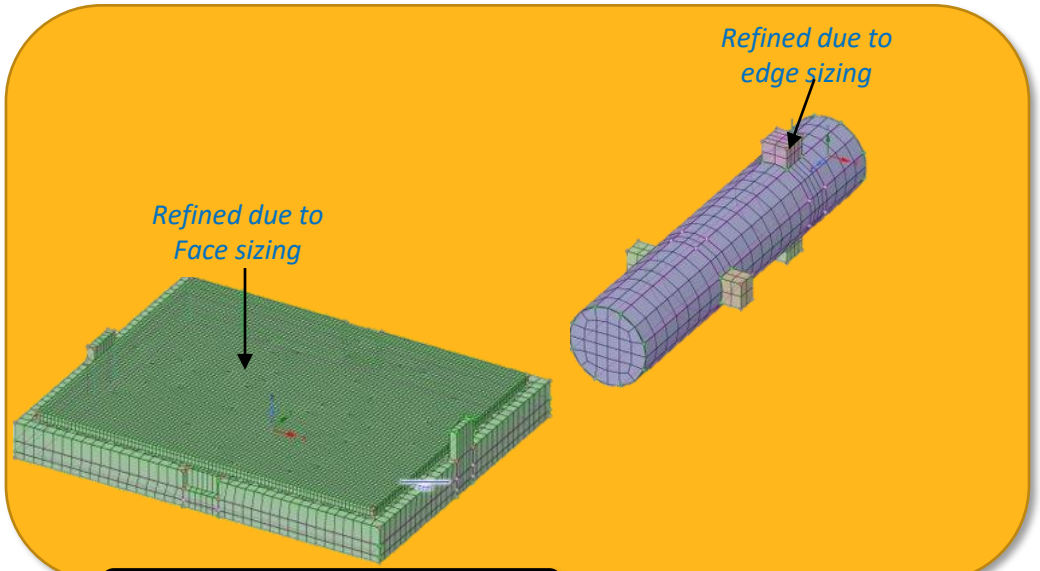
CartSweep



Arbitrary sweep direction



Inflation Support

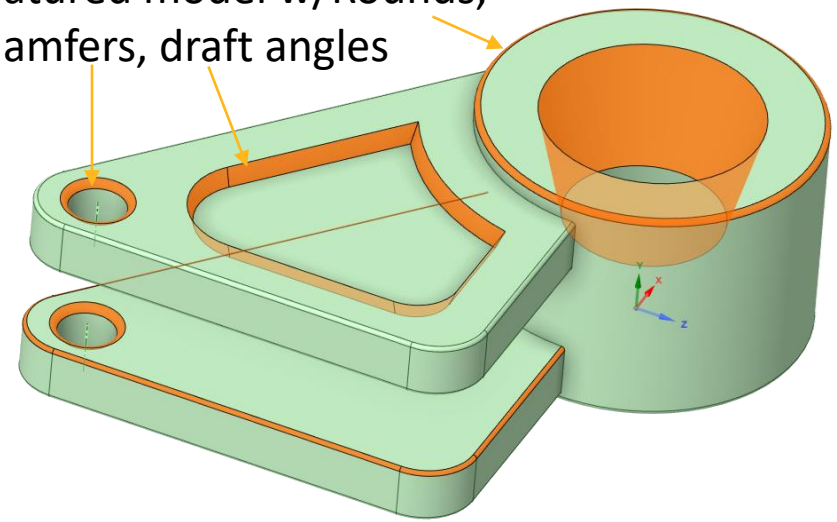


Local size controls

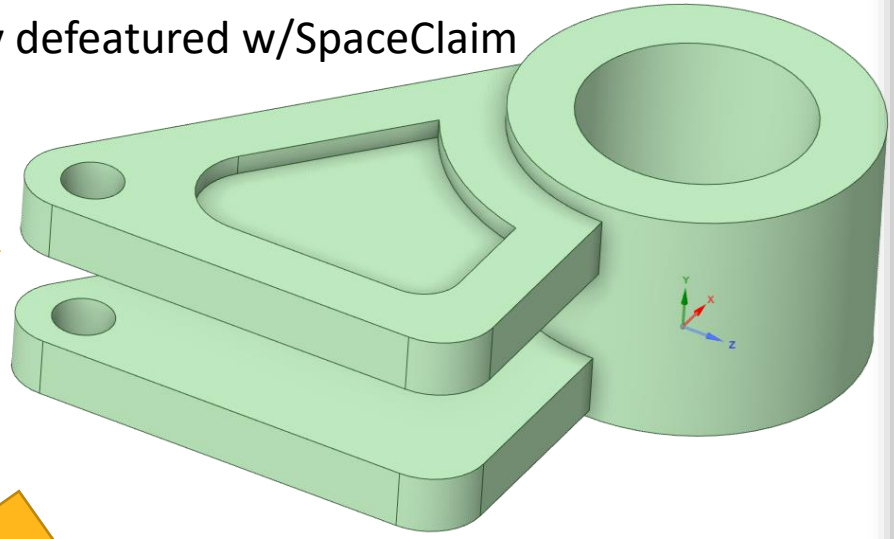
- Other Enhancements
  - Support for CartSweep for selected bodies in a Multi-Body Component
  - CartSweep on simplified geometry then re-use blocking on complex original geometry (see next slides)

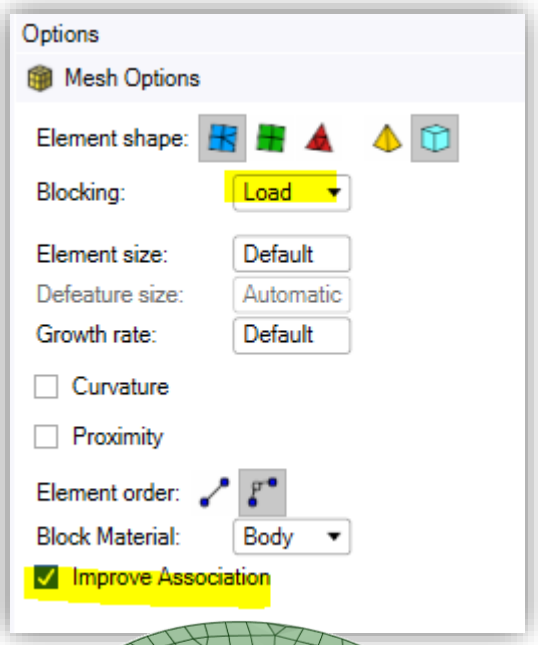
CartSweep: Featured ←→ Defeatured ←→ Featured model

Featured model w/Rounds, chamfers, draft angles

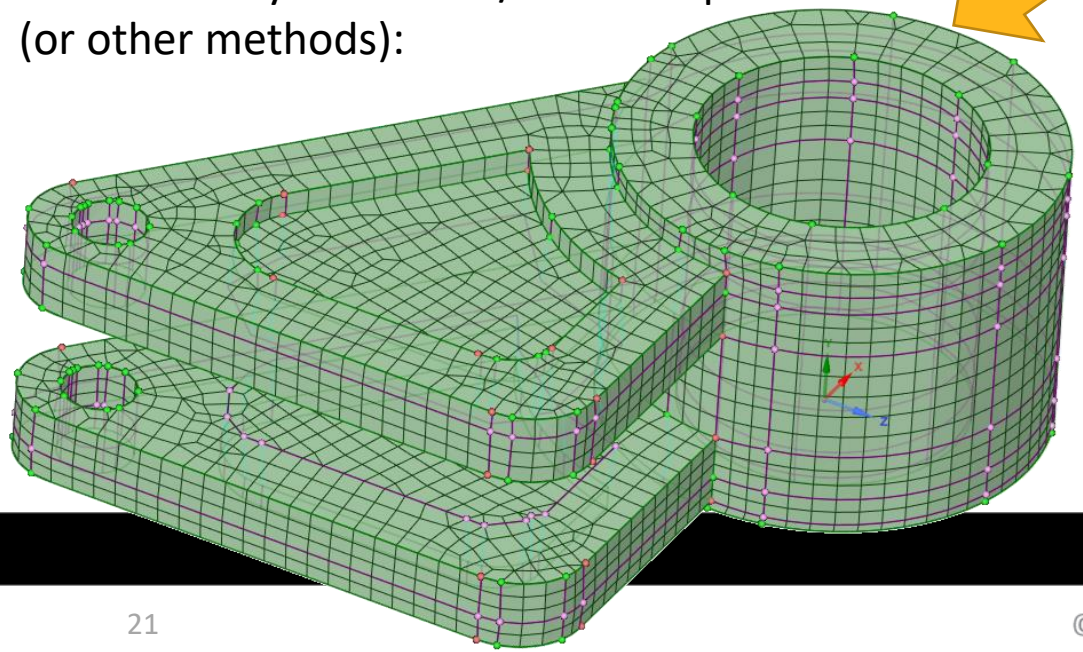


Easily defeatured w/SpaceClaim

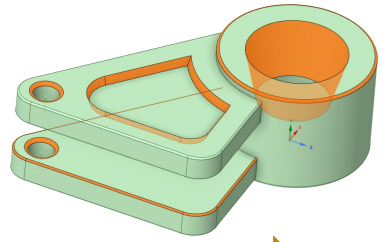


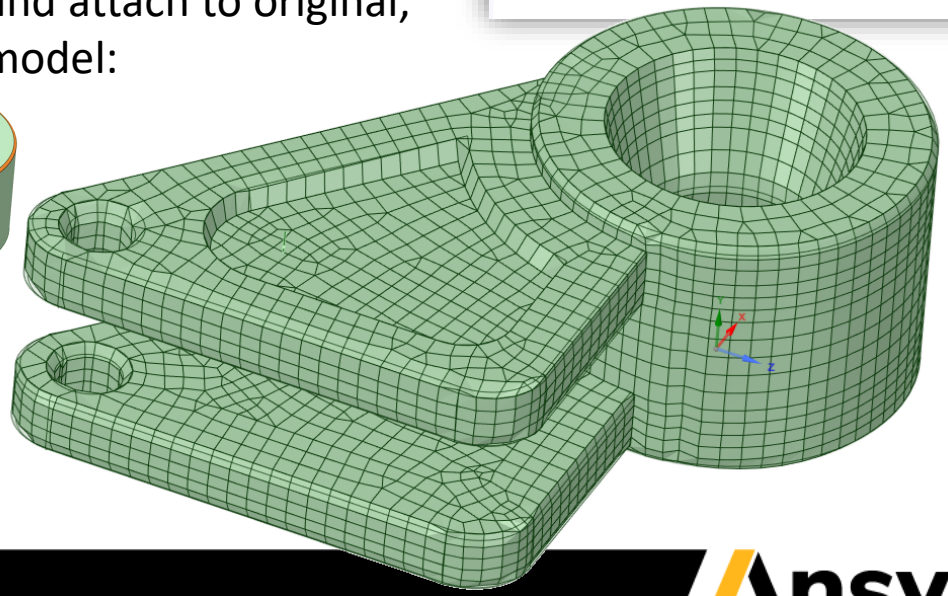


Automatically meshed w/CartSweep (or other methods):

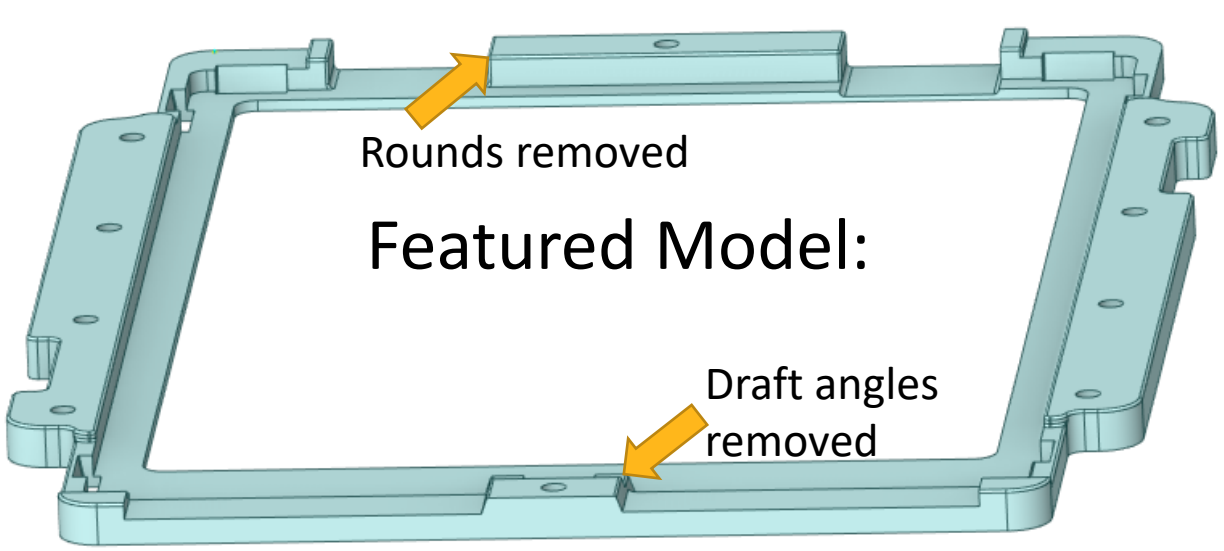


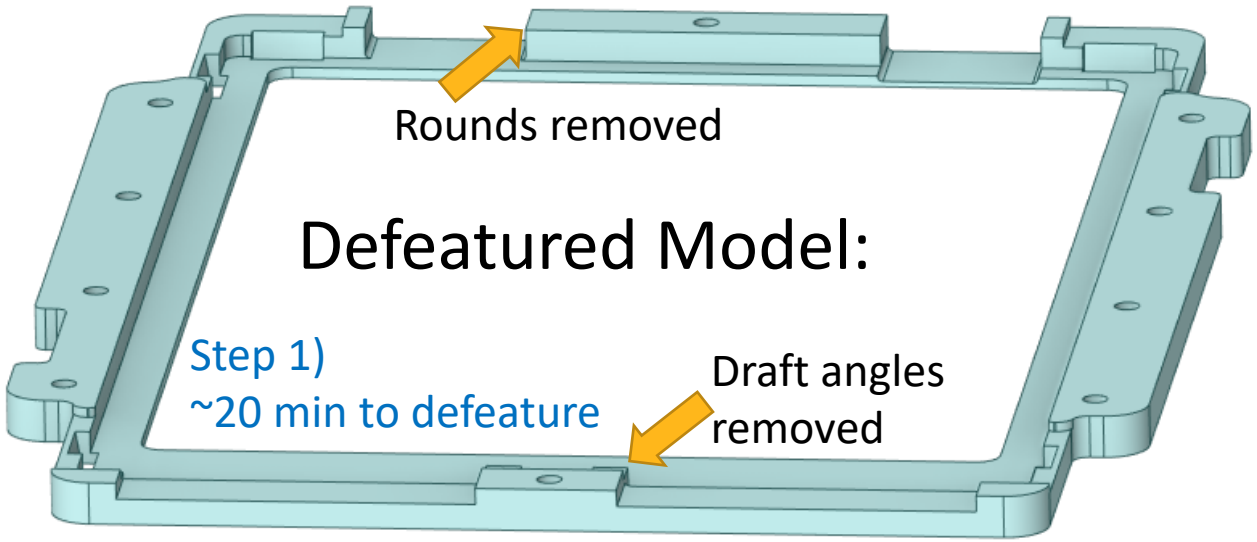
Save blocking and attach to original, fully featured model:

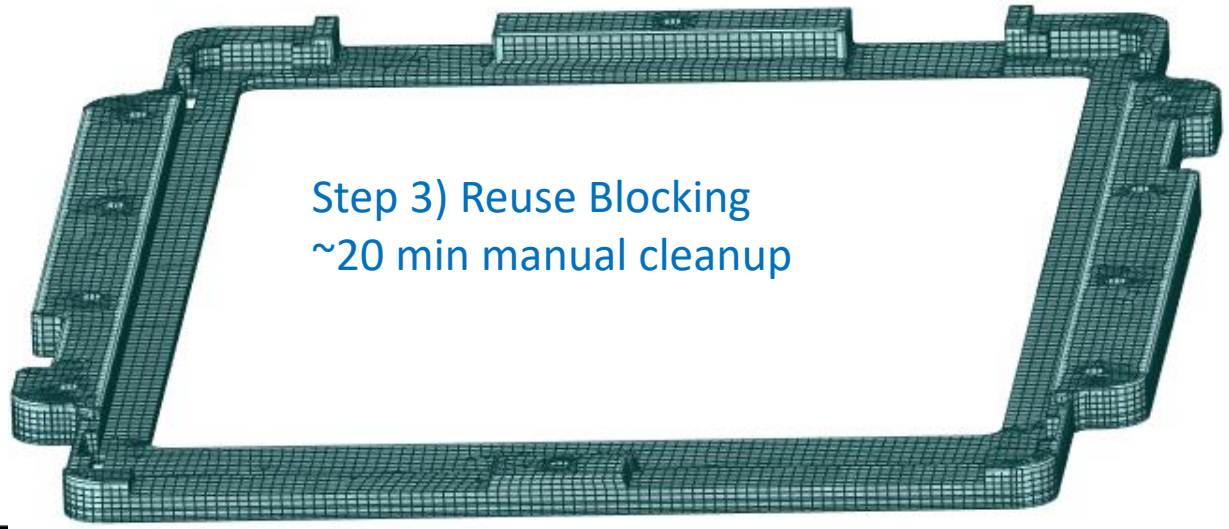


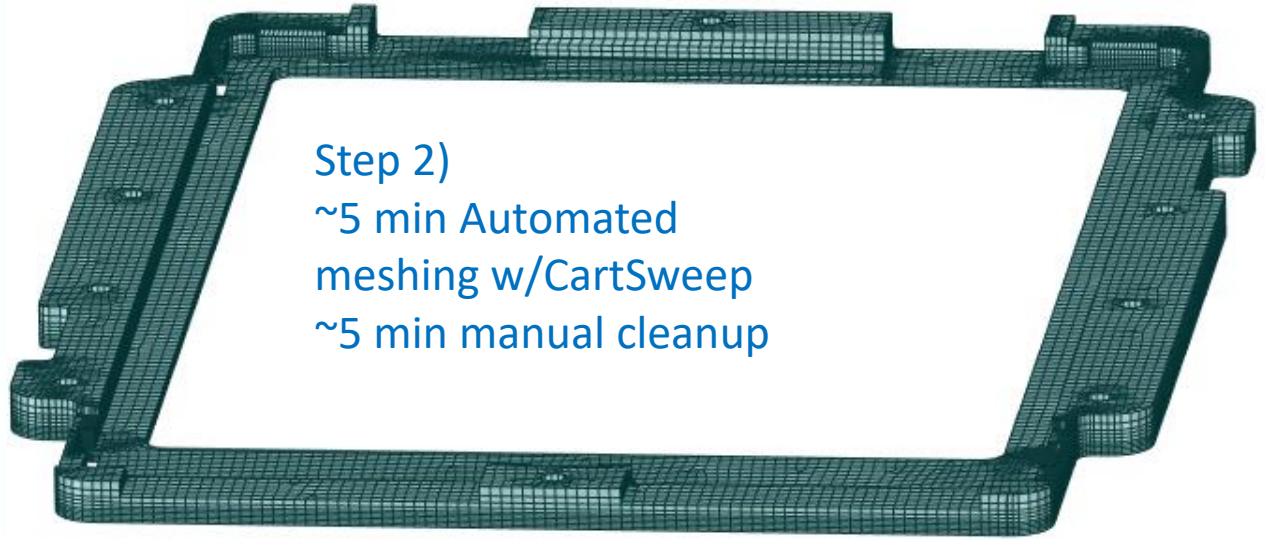


CartSweep: Featured ←→ Defeatured ←→ Featured model



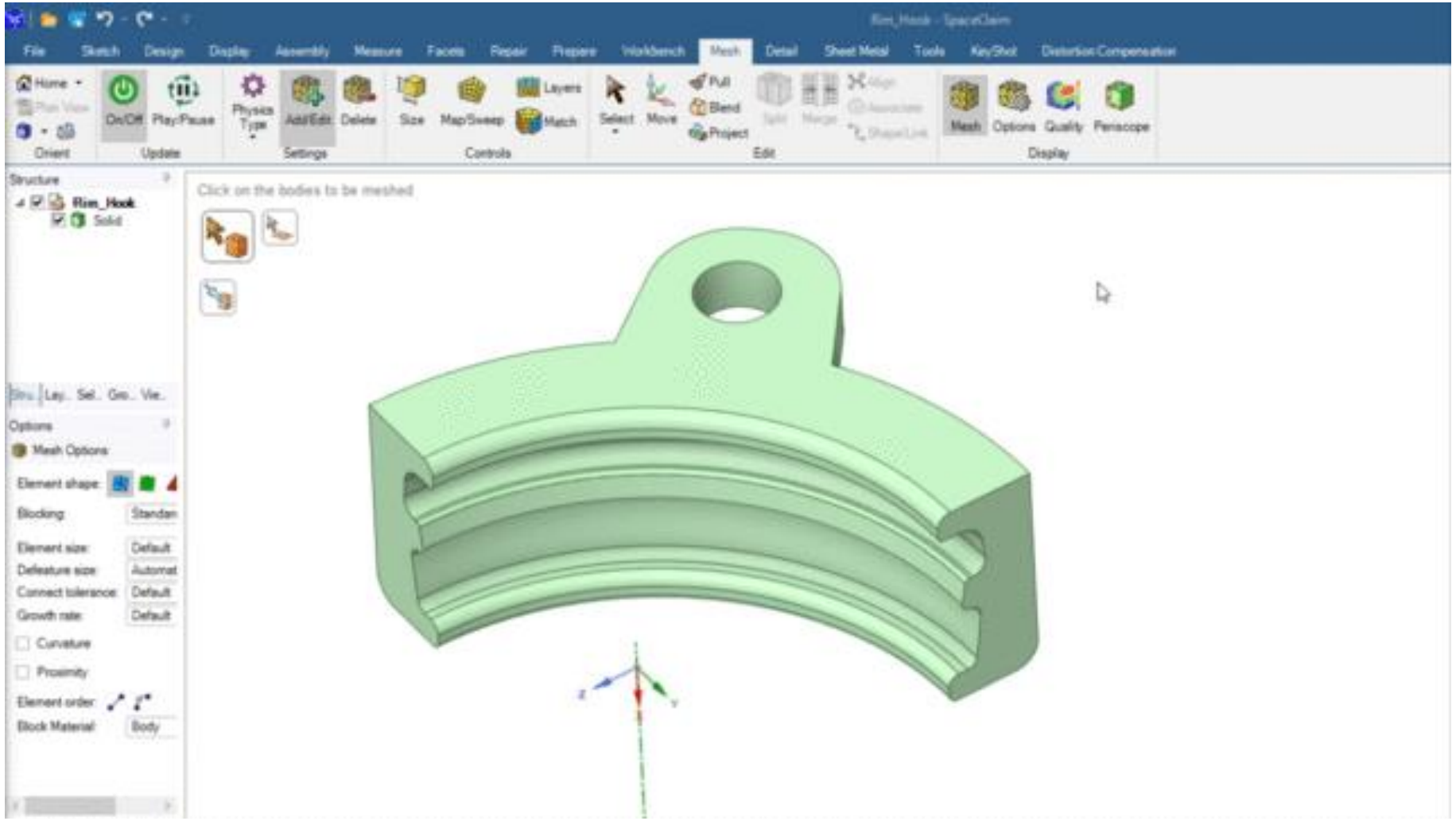






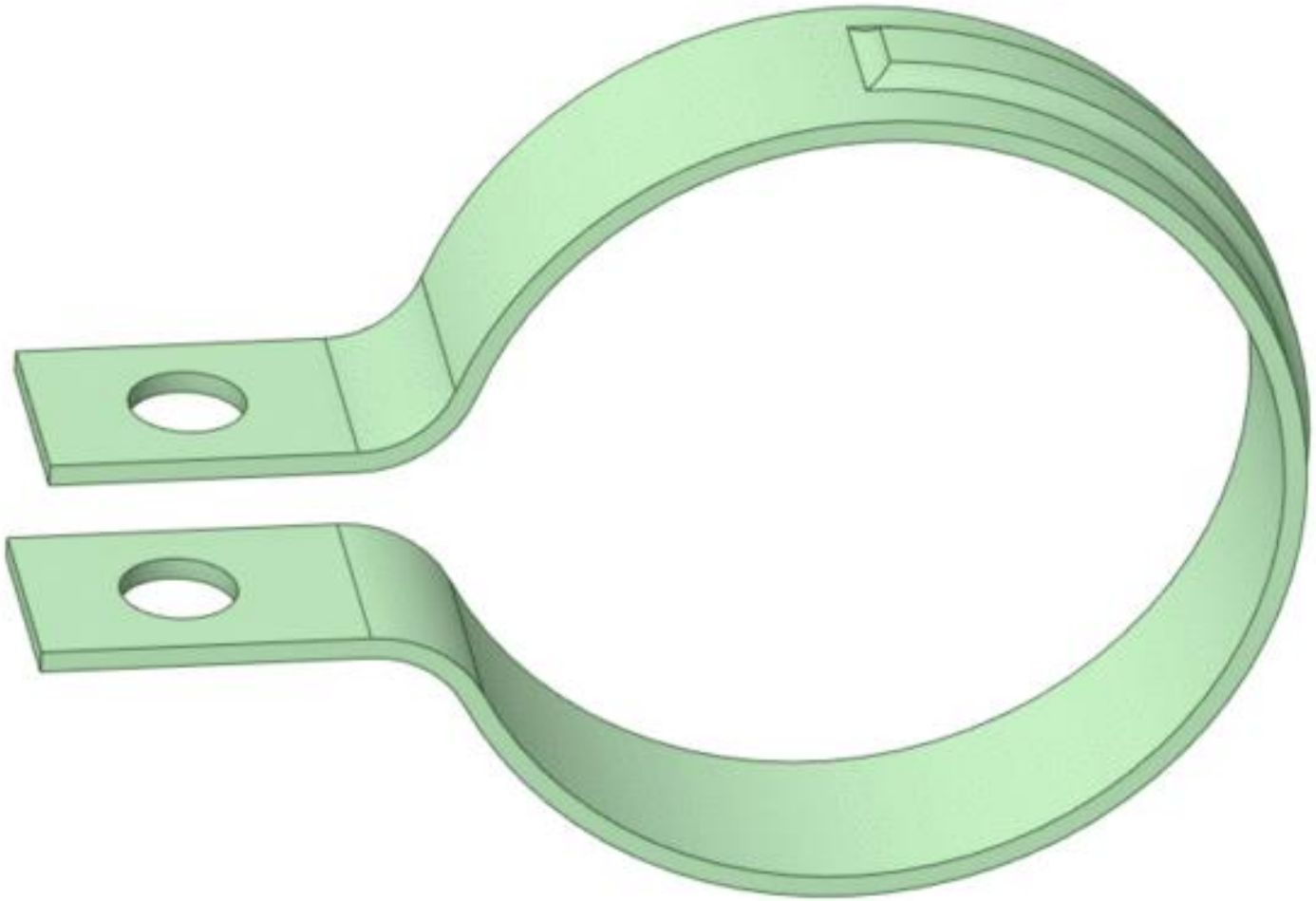
Improvements for Pull: Revolve

Improved process of building up mesh model through Pull operations



Improvements for Pull: Thin Solids

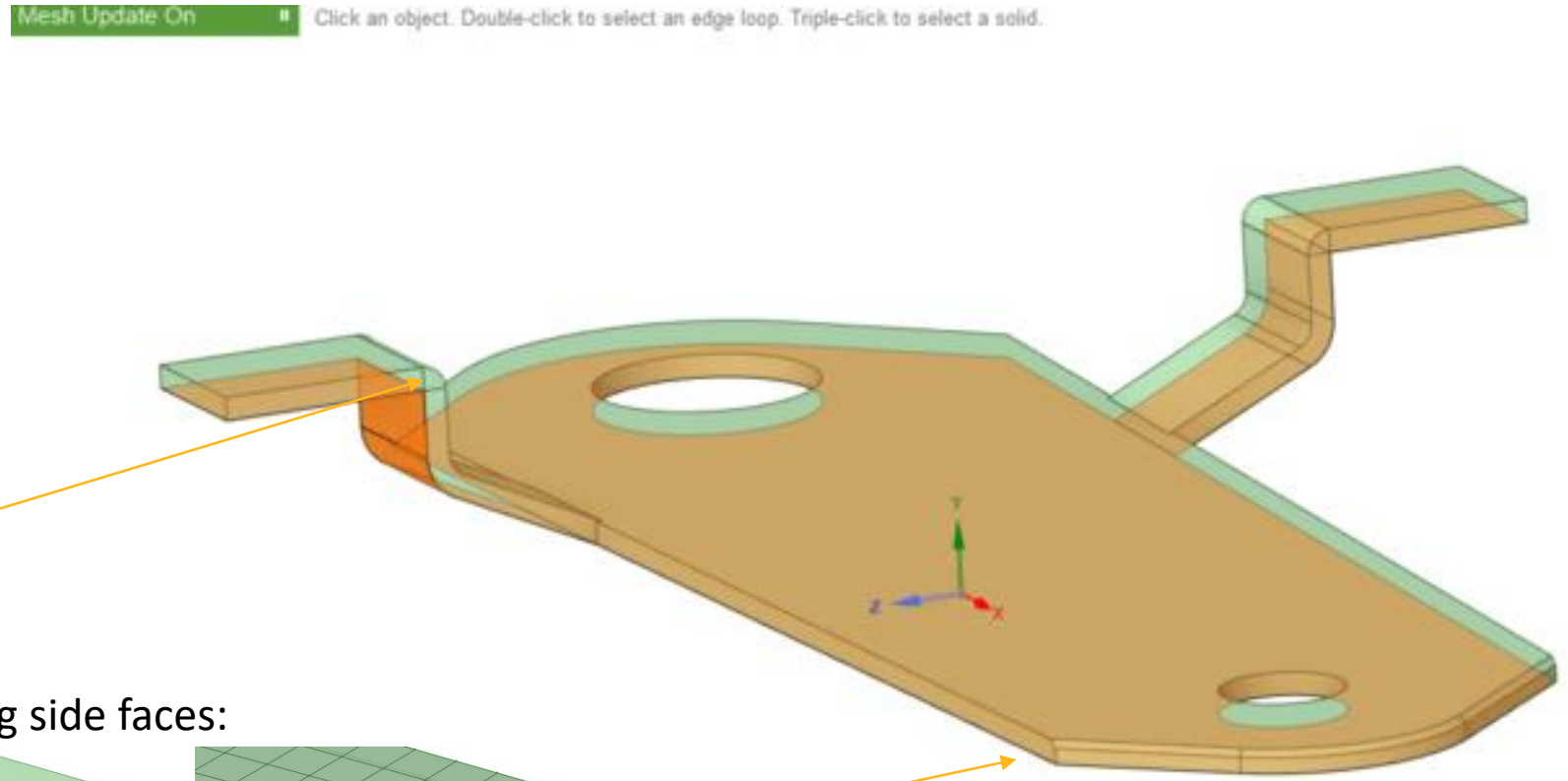
Improved process of building up mesh model through Pull operations



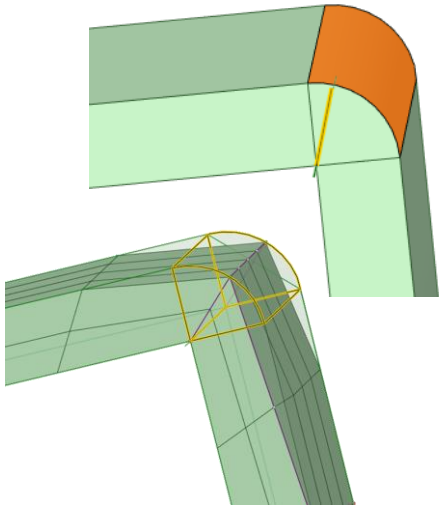
Improvements for Pull: Thin Solids

Pull shell block topology to solid block topology

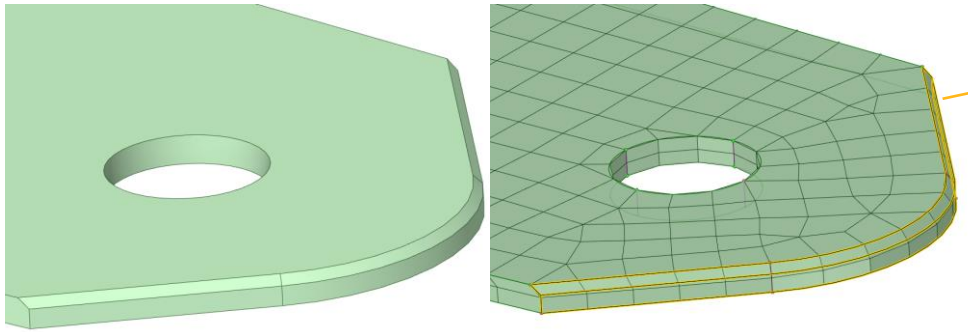
Automatically handles topology mismatches and features along side faces



Topology mismatch:

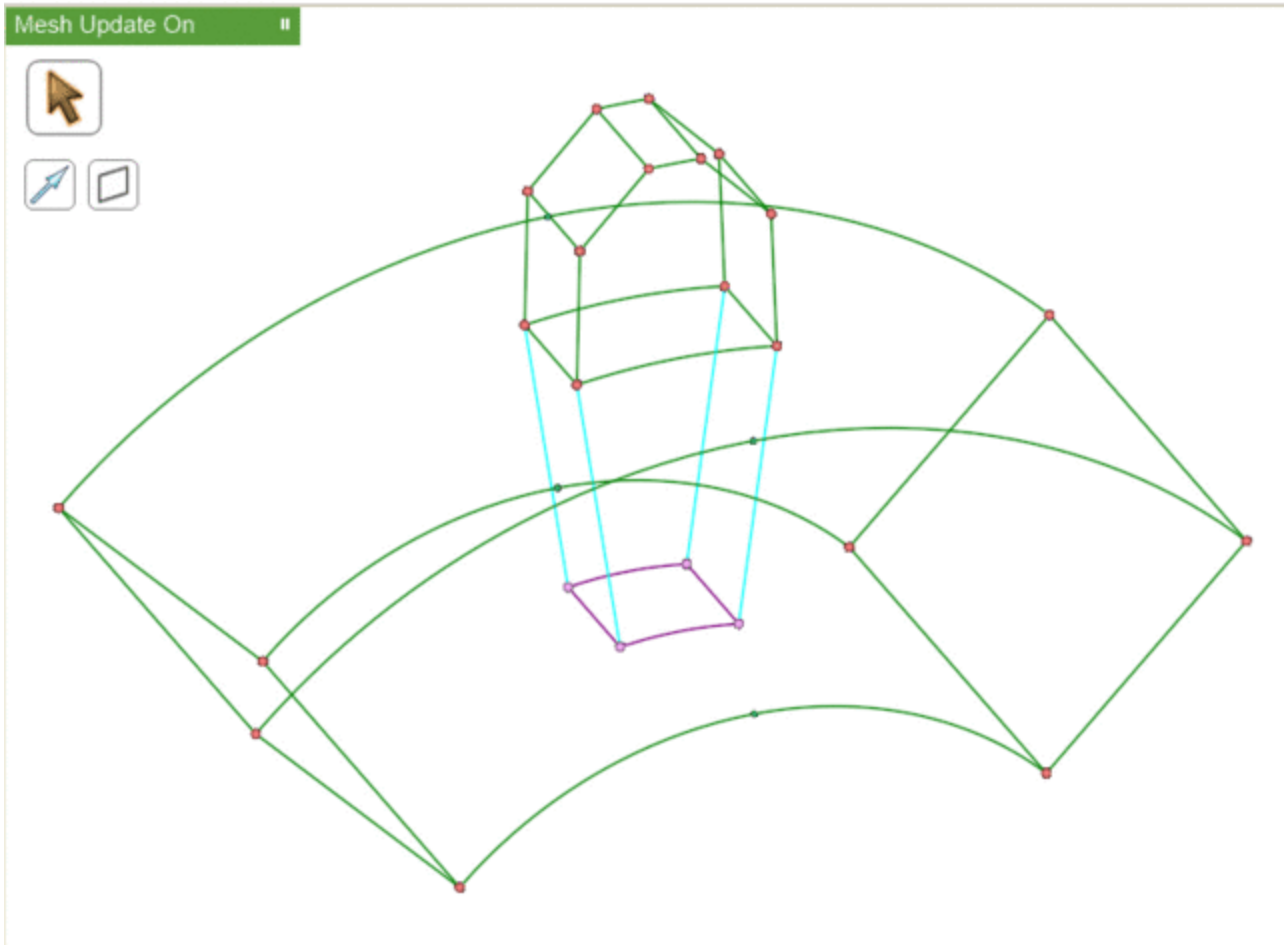


Features along side faces:

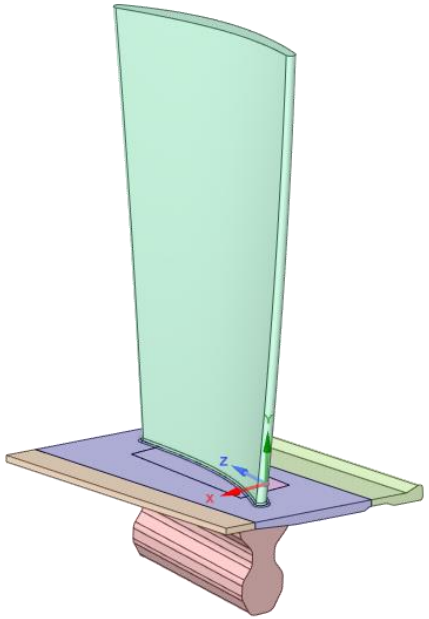


Align Tool

- Aligns selected block vertices to a line or plane
  - Line can come from a blocking or geometry edge, an axis or from 2 vertices
  - Plane can come from a blocking or geometry face, a plane or from 3 vertices



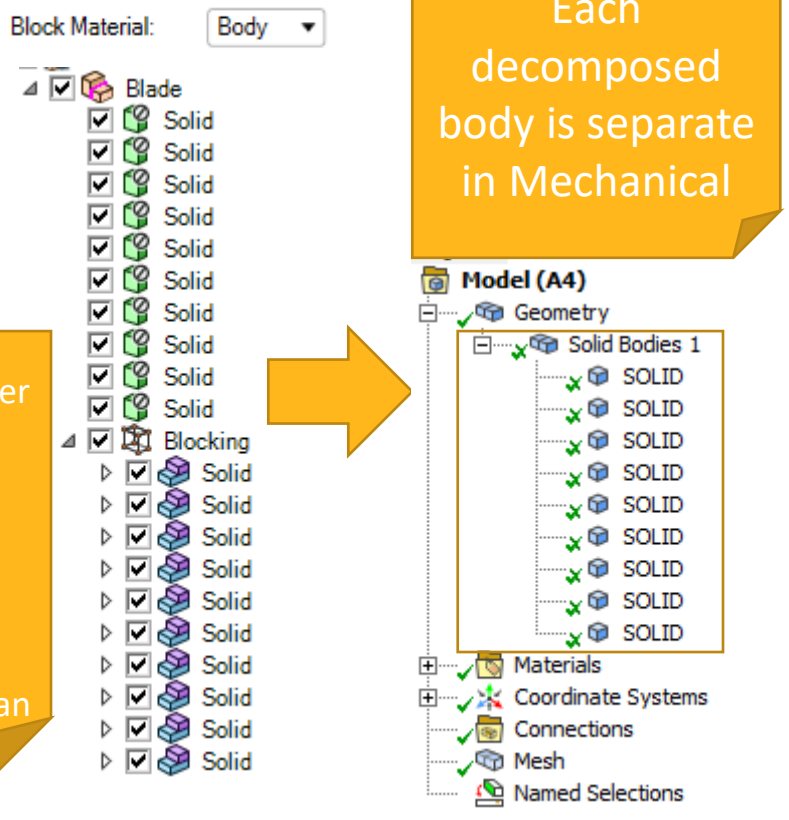
Body materials based on bodies/components:



Often geometry is sliced in order to get sweepable regions for meshing, but the material should be the same.

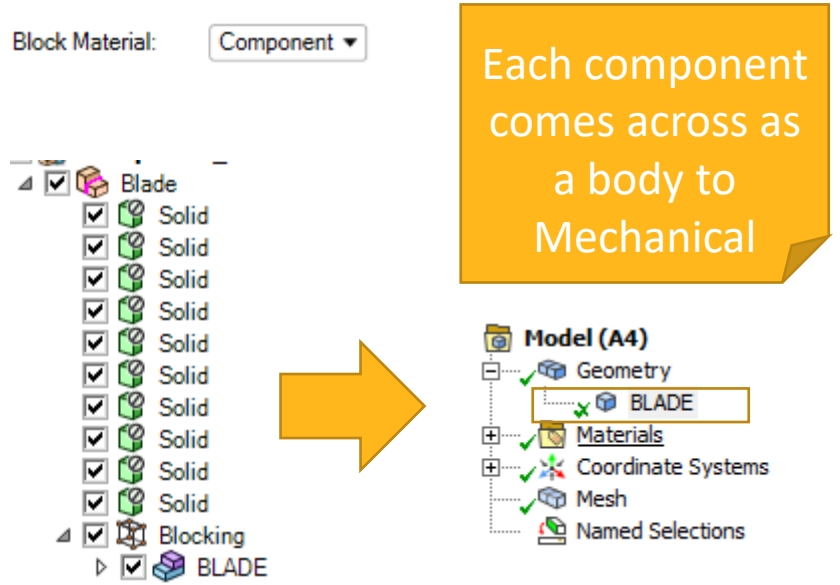
New in 2021 R1, a user can specify that materials follow component grouping rather than body grouping.

- Typical approach w/geometry decomposition



New Option

- New approach w/geometry decomposition via component



Dyna Improvements: Characteristic Length

- Characteristic Length quality metric added to help identify worst quality elements affecting time step

The CFL condition can be expressed as follows: $\Delta t \leq f * \left[\frac{h}{c}\right]_{min}$

where:

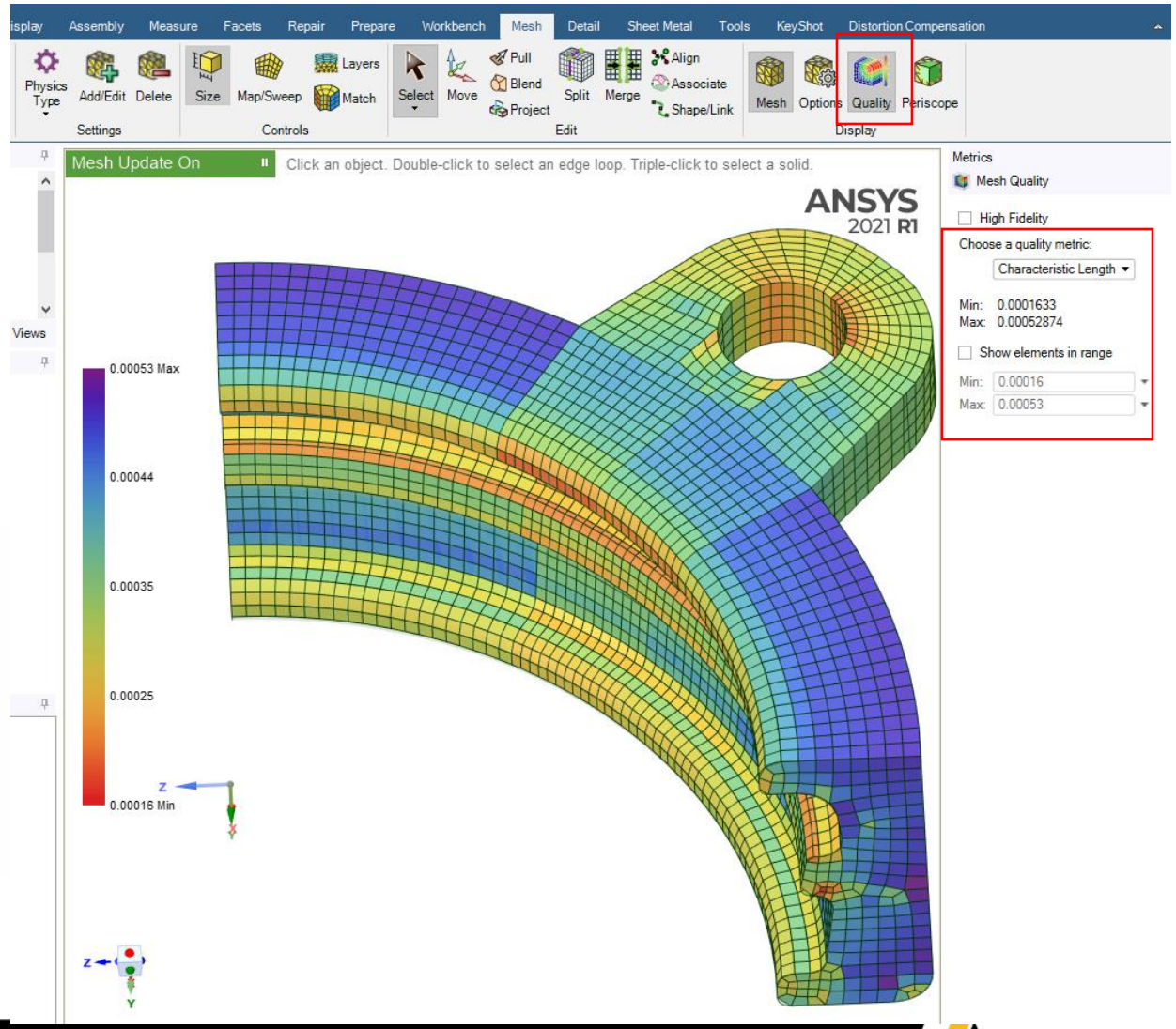
f = time step safety factor (commonly/default 0.9)

h = characteristic length

c = material sound speed

such that, if you know the characteristic length and material sound speed, you can determine the time step safety factor.

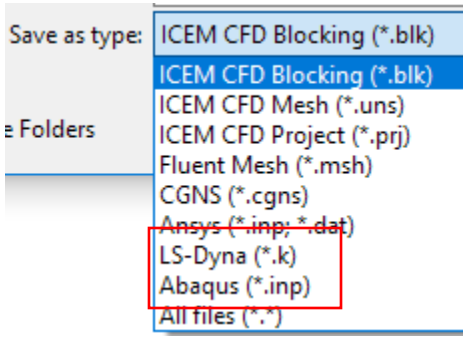
As h decreases, so does the time step. The definition of h varies based on element type:



Performance/Mesh Format Improvements

- Performance Improvements
  - Faster to switch visibility of blocking on/off
  - Faster clipping plane toggle
  - R&D for next release: Faster unstructured quad algorithm

- Mesh Formats
  - LS-Dyna *.k export
  - Abaqus export
  - Updated CGNS Format to Version 331 (conforms with Fluent)




Ansys