What's New in Simcenter 3D 2019.2
Engineering Desktop

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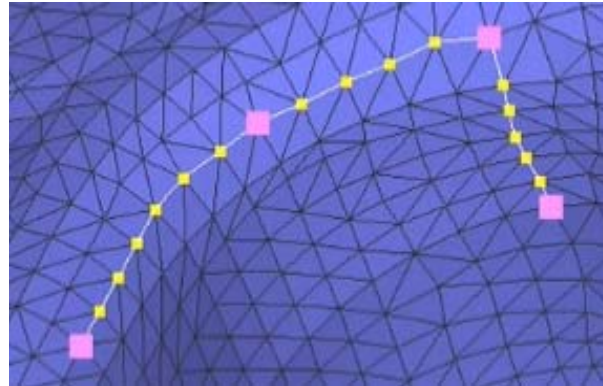
Selection and Graphics
Extend Selection Methods

Path selection enhancements
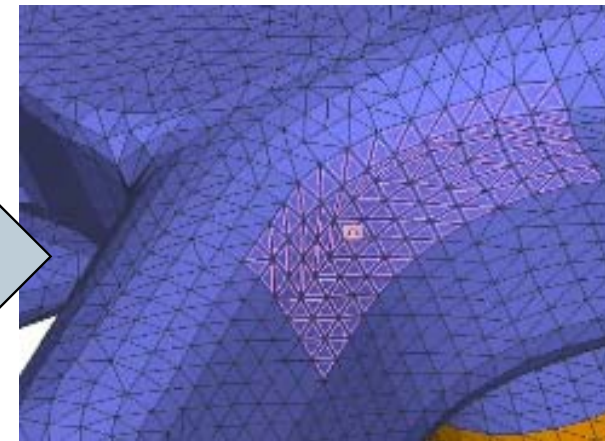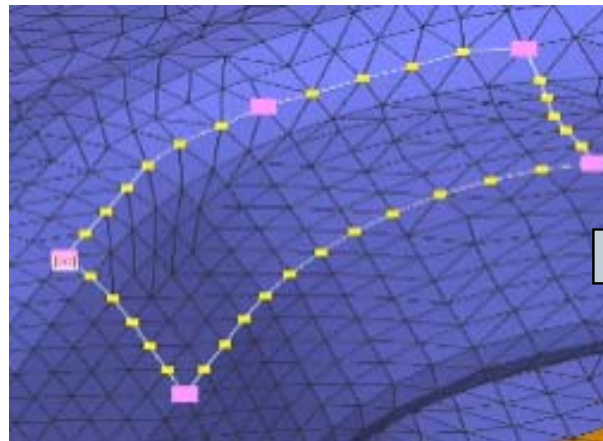
Challenge:

- Path selection methods for element edges are provided, but do not support selection of nodes along the path, nor finding entities enclosed by the path

Solution:

- Create new path selection related methods:
  - Select nodes along path
  - Select element faces enclosed in path
  - Select 2D elements enclosed in path
  - Select nodes enclosed by path

Nodes along a path

Element faces enclosed in path

Selection and Graphics
Stacked Adapter Support for Regular Selection
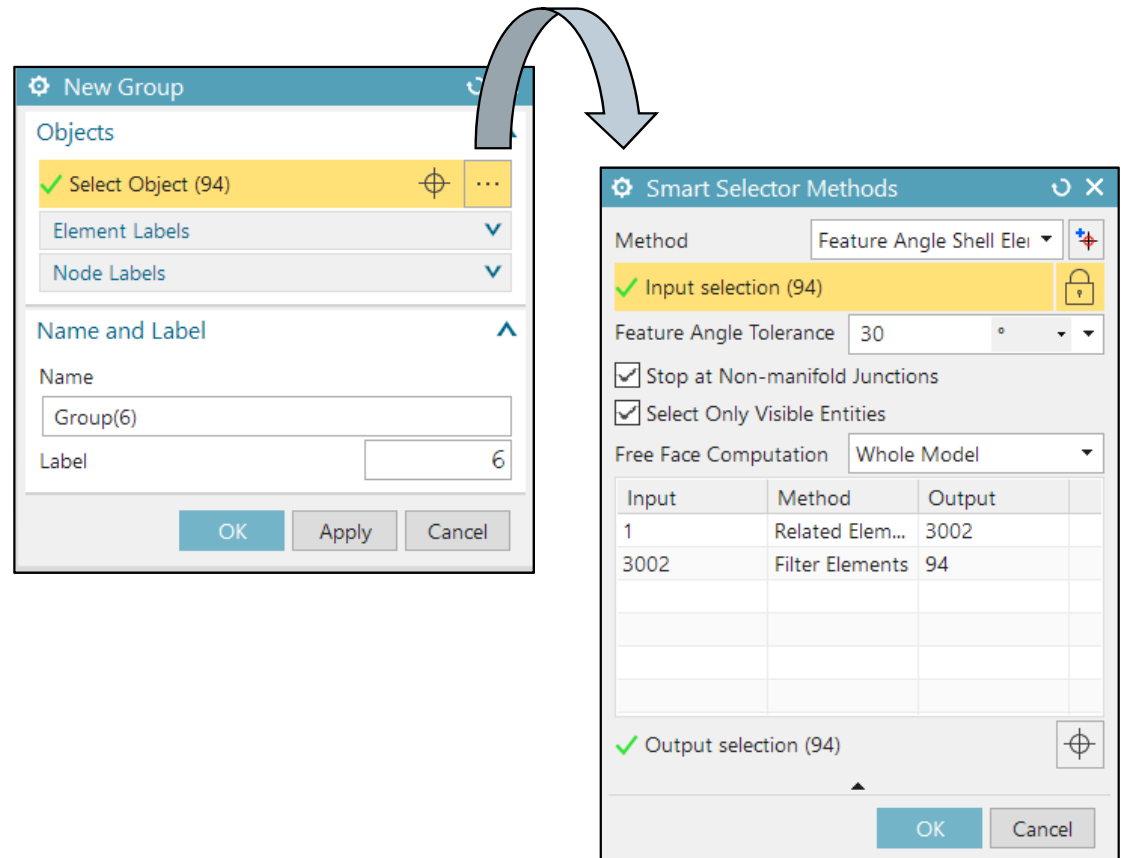
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General selection flexibility

Challenge:

- Stacked adapter concept for general selection proven in previous "Hackathon" project
- Stacked adapter concept introduced for Selection Recipes, but not supported for general selection

Solution:

- Leverage stacked adapter selection concept in general smart selection
- Similar to I-DEAS selection, find elements with a given material, property or of a particular type

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Selection and Graphics
# Highlighting Element Faces & Element Edges in Groups

Graphics display enhancement

Challenge:

- Create a group with element faces or element edges but afterward cannot easily see the contents of the group
- Must go into the Manage Groups dialog in order to highlight contents of a group of element faces

Solution:

- Support for Element Faces and Element Edges in global selection context
- Add highlight support for element faces and element edges when selecting group from Simulation navigator
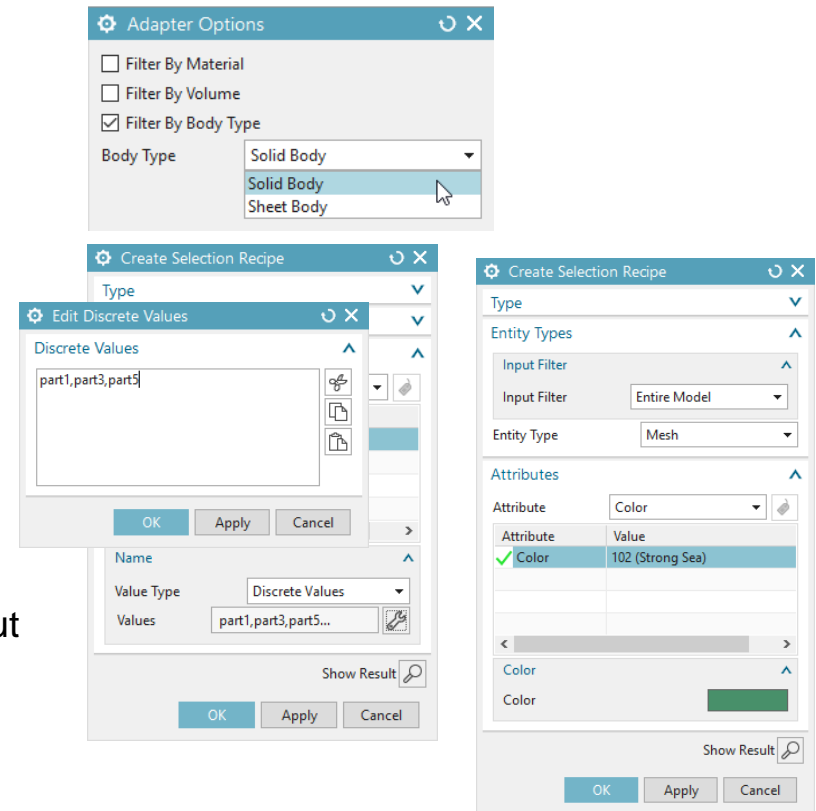
Selection and Graphics
Selection Recipe Extensions

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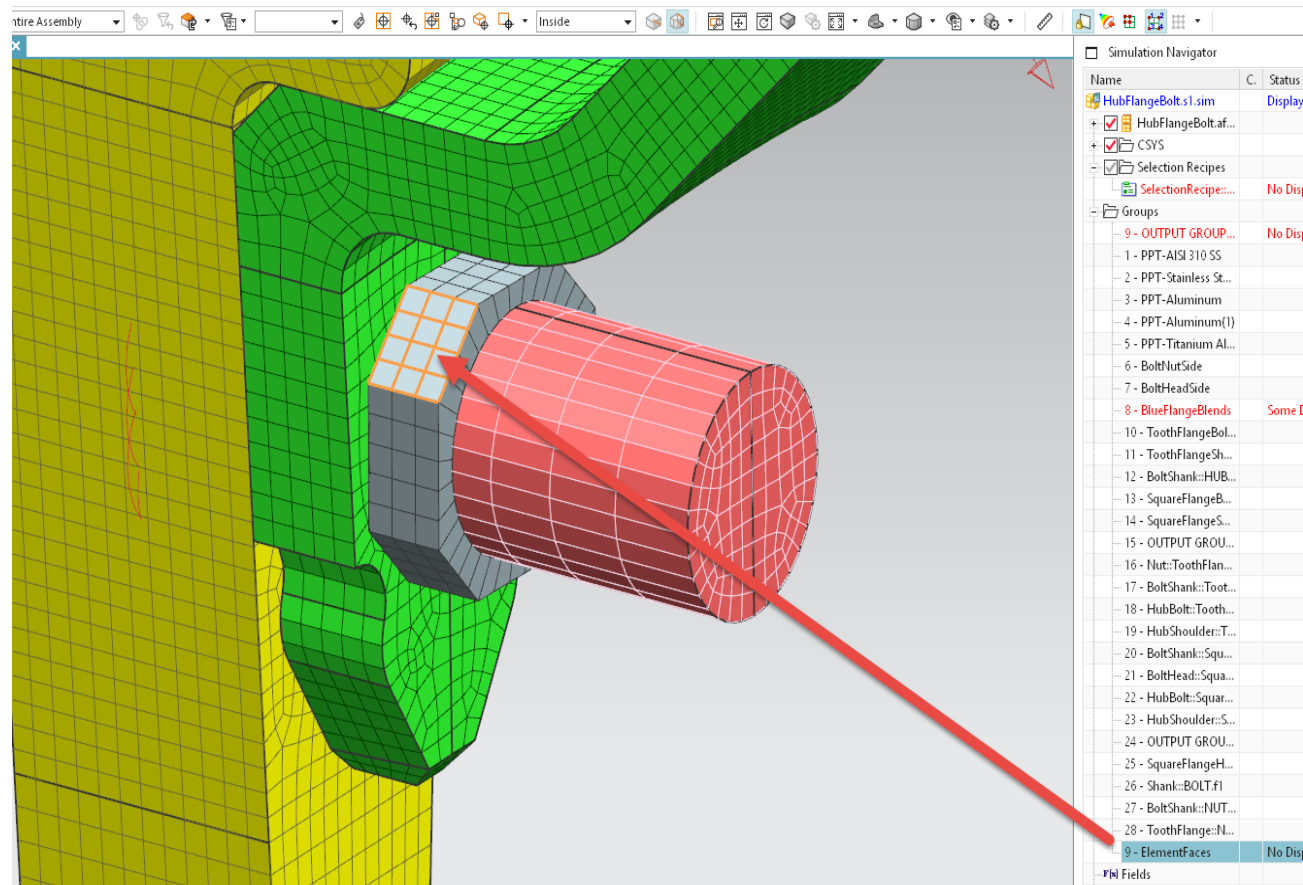
More Strategies and Adaptors to expand automation possibilities

Challenge:

- Respond to user feedback on opportunities to improve workflow automation

Solution:

- Adaptor to control selection of only 3D element faces
- Adaptor to filter by sheet or solid Polygon Bodies
- Adaptor to find all spider center nodes
- New Smart Selection (and Adaptor) strategy to allow Element as an input to Related Element Faces
- Allow a list of discrete values for Name Attribute method
- Add ability to select Meshes according to Attributes

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Selection and Graphics
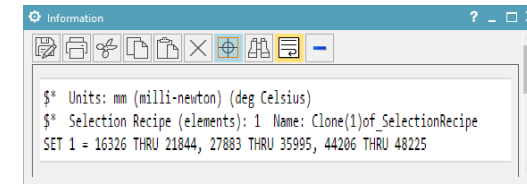# Selection Recipe Extensions

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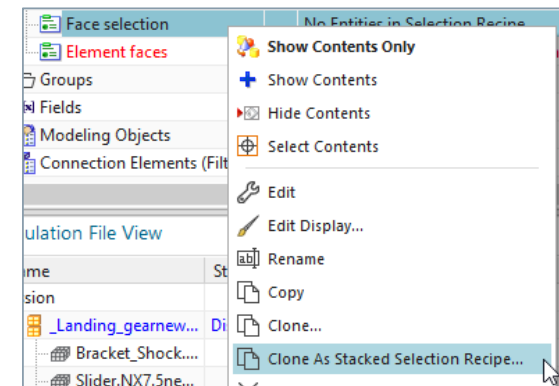## Improved Usability and Efficiency when working with Selection Recipes

Challenge:
- Respond to user feedback on usability issues with Selection Recipes

Solution:
- Enable Solver Syntax Preview
- Filter Navigator according to the owning component in an AFEM
- Align Navigator information with Groups
- Add ability to Clone Selection Recipes
  - Optionally delete original
  - "Clone as Stacked" option for single strategy Selection Recipes
- Add ability to edit the first strategy during Selection Recipe creation
- Lock Selection Recipe update for certain commands where performance issues were reported

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# 1D Connections – Proximity-based spider creation

Increased flexibility in manual meshing processes

Challenge:

- For some use cases, it was tedious to create beam spiders, particularly in orphan meshes

Solution:

- Add a new connection method (Proximity Spider) to 1D Node-to-Node Connection
- Select core and leg nodes
  - Creates multiple spiders simultaneously, using a tolerance to filter leg nodes
- Select core nodes only
  - Creates a single spider, finding the center of all selected leg nodes

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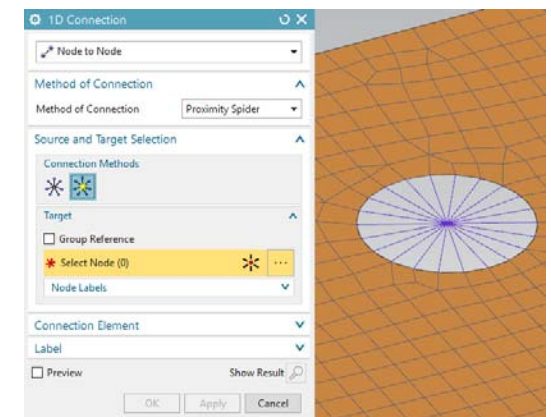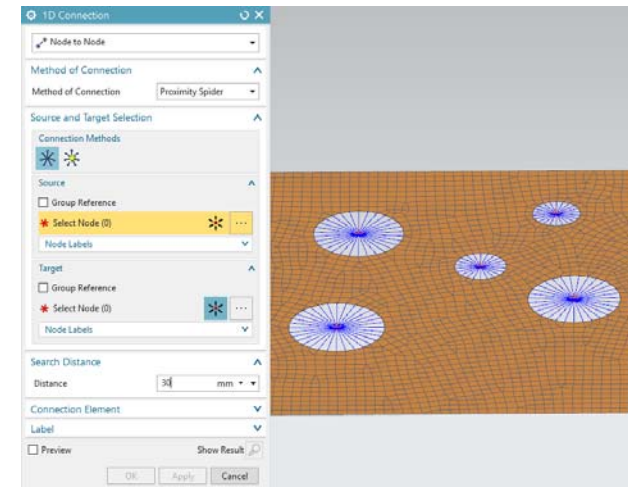
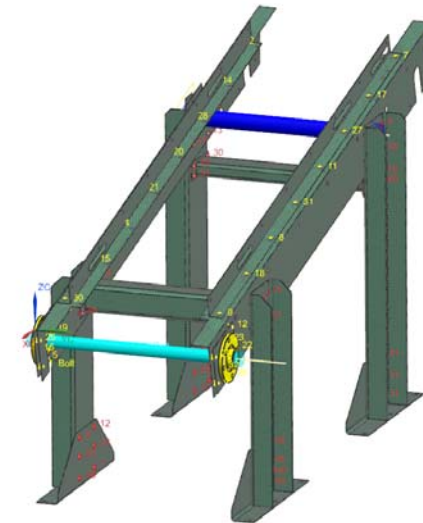# Universal Connections – Bolt Screw Diameter Detection

Improve workflow efficiency for bolted structures

Challenge:

- Large bolted structures may contain many different bolt sizes
- Manual definition of each connection can be tedious, especially if the bolt size is not available as a CAD attribute
- Setup of automation via templates requires unique selection recipes and connections for each bolt size

Solution:

- Introduce a new feature which detects the hole diameter and specifies the bolt properties appropriately
- Include an option to override the detected diameter to allow for clearance factors etc
- Also enhance the UC Bolt UI to list the detected bolt details

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Universal Connections – Solver Support Extensions

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Support more applications and solvers with Universal Connections

Challenge:
- Customer projects require support for different solvers
- Customer requirements for different bolt connection methodologies require new meshing configurations

Solution:
- Introduce ANSYS as a new solver target for Universal Bolt Connection
  - BEAM188+CERIG
- Add CBEAM+RBE2 as a new meshing option for Nastran
- Add options for the user to control the shank length of the bolt and the spider locations
- Add an option to split the bolt shank into multiple elements (typically to support bolt preload)

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Universal Connections – Rivet

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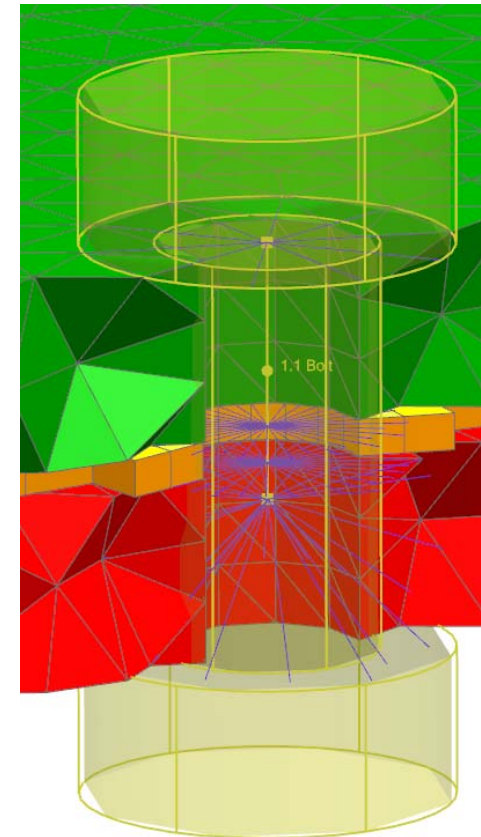
Enable rapid creation of large numbers of connections in aerospace assemblies

Challenge:
- Airframe analysis workflows require definition of 1000s of rivet connections
- Opportunity exists to replace legacy tools (e.g. Patran) with more efficient methods, leveraging geometry associativity
- An NX Open App from the Customization team is currently used by some customers to define rivet connections – this lacks the benefits associated with the Universal Connections framework

Solution:
- Introduce a new modelization method (CBAR+CBUSH+RBAR) for the UC Rivet which is widely used by airframe OEMs
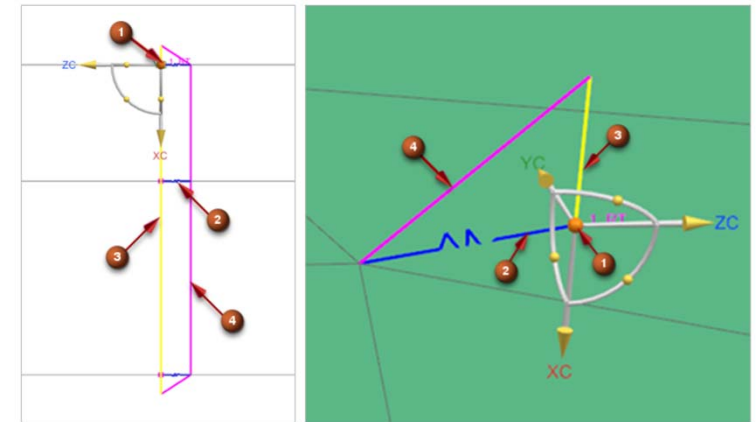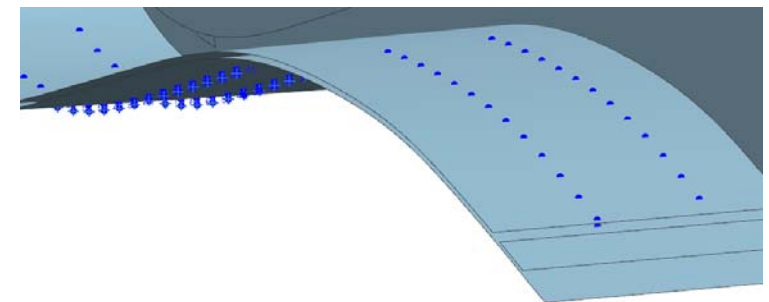- Replace use of NX Open App and allow customers to leverage UC benefits

Figure. (1) Local CSYS, (2) CBUSH, (3) CBAR, (4) RBAR

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# Meshing – Surface Meshing Improvements

Quality and aesthetic improvements for thin bodies

Challenge:

- Automotive BIW workflows involve strict quality requirements and very complex components
- Meet mesh quality objectives while still honoring feature details
- Meet the user's eye test – "aesthetic" mesh quality continues to be very important

Solution:

- Continuous improvement of 2D meshing algorithms
- Minimize triangles
- Cartesian paver improvements
- 2D Mesh cleaner improvements
- Fixes for max element length failures

Before

After

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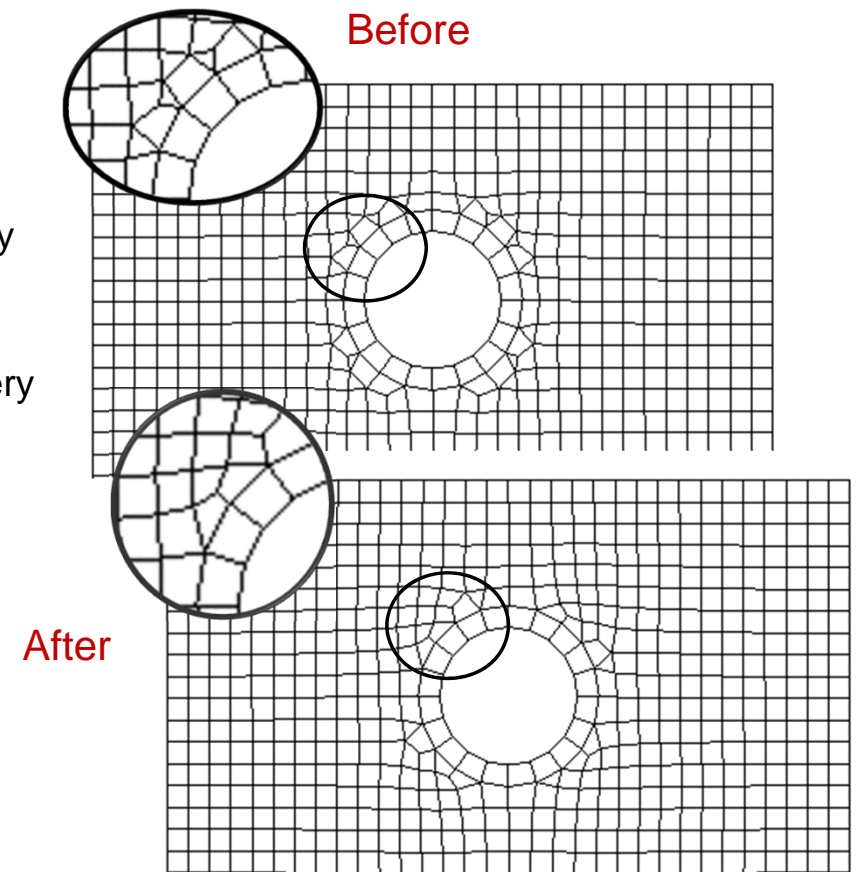
Meshing – Remesher Integration within Standard 2D/3D Meshing Tools

Seamless facet geometry meshing workflow

Challenge:
- Mesh facet geometry
- Make meshing methods transparent to the user
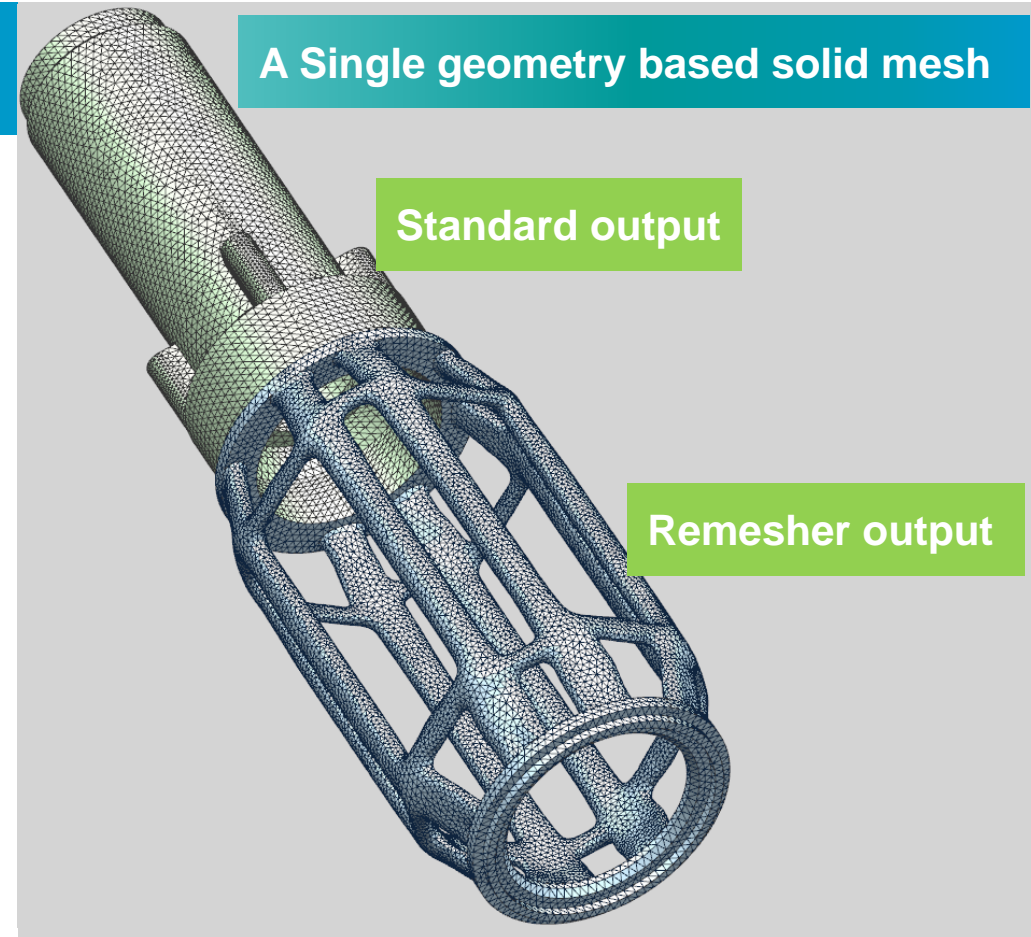
Solution:
- Remesher introduced in 2019.1 (CD-Adapco technology)
  - Remesh command accepts 2D meshes as input

2019.2
- Introduce remeshing techniques in 2D and 3D meshing commands
  - Unflattenable faces get meshed with the remesher
  - Flattenable faces get meshed using the standard techniques

A Single geometry based solid mesh

Standard output

Remesher output

# Meshing – Batch Meshing Enhancements

Better usability and efficiency in Batch Meshing

Challenge:

- Prior to Simcenter 3D 2019.1, the Batch Mesher was cumbersome to use and maintain
- Simcenter 2019.1 leveraged FEM Templates to make the process more user-friendly and any new interactive meshing feature is automatically available in the Batch Mesher
- However, it was still somewhat inefficient for processes with large numbers of component meshes with differing settings required

Solution:

- Introduce a new UI which allows efficient adding of parts and templates and modification of settings
- Allow user to select additional geometry items to be included – e.g. points for mesh constraints, etc.
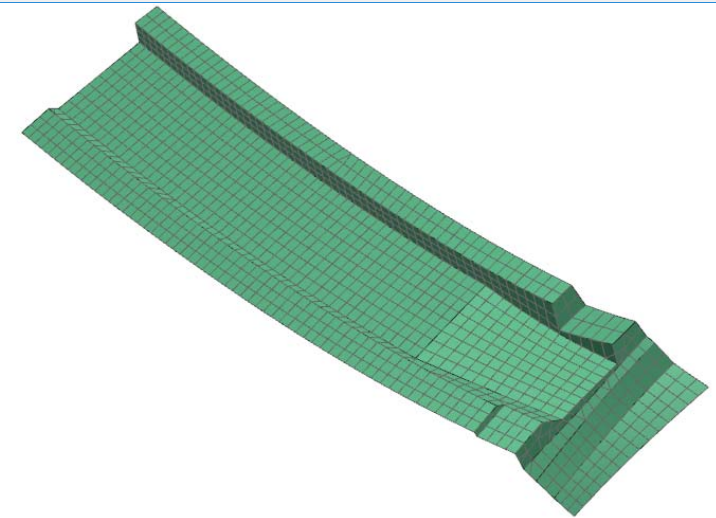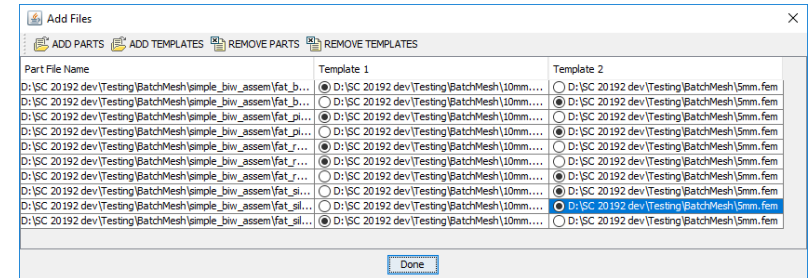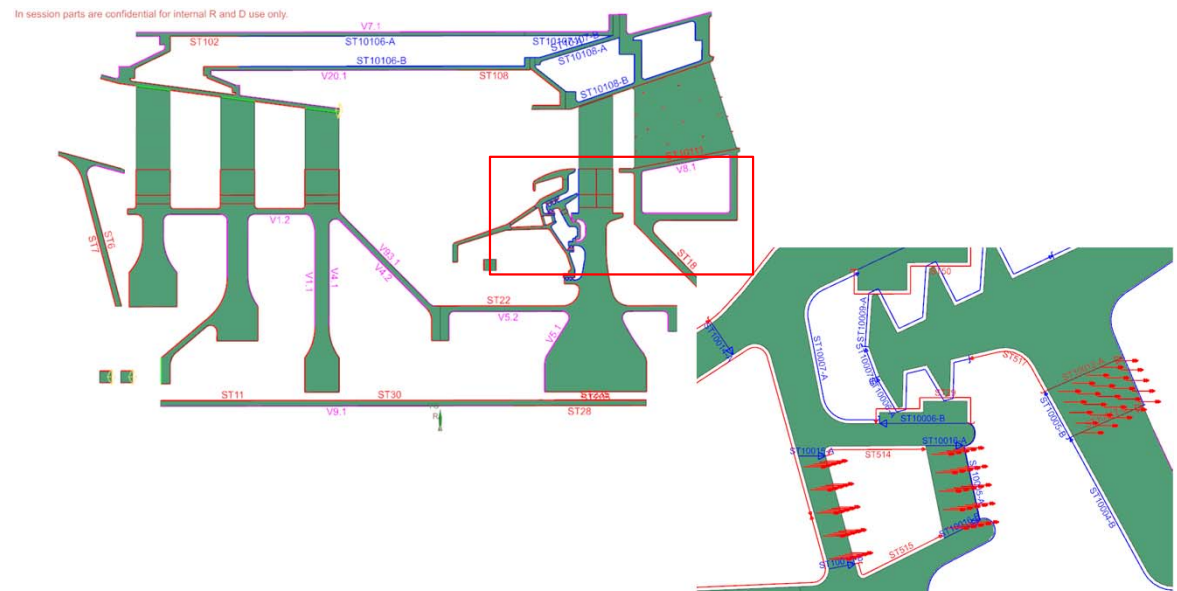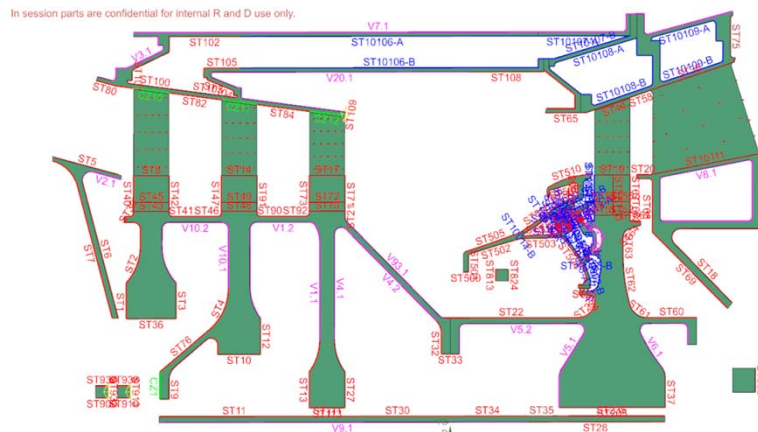
LBC Display - Level Of Detail

Framework extensions:

- CAE LOD framework extended to support LBC

Goal:

- Improve graphics performance and reduce display clutter:
- Level Of Detail for both dynamic and static displays
- Culling of entities for both dynamic and static displays

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Post Processing Improvements
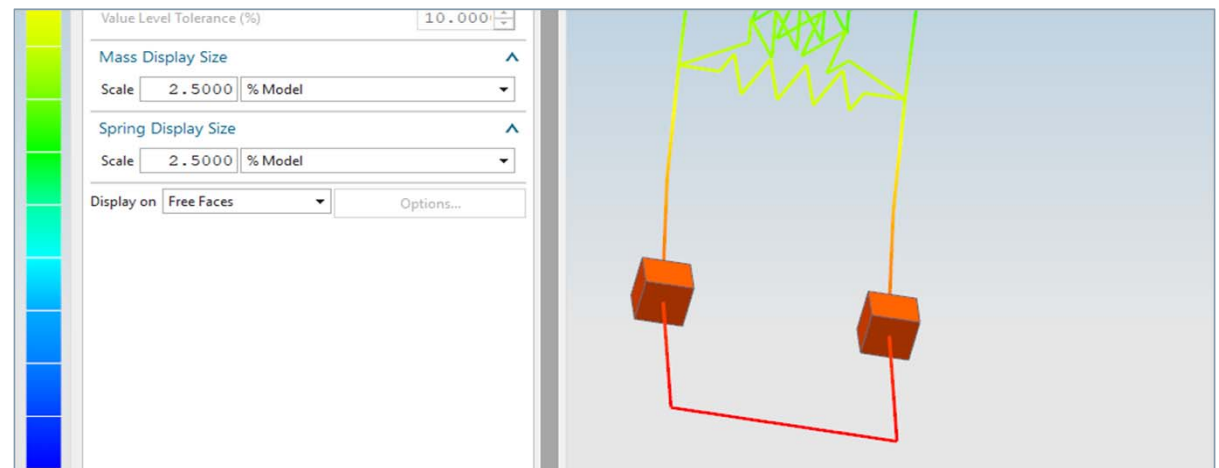# 0D & 1D Element Display

Mass & Spring Size Support

Challenge:

- 0D & 1D element display in post processing, no control over size

Solution:

- Provide user control size of element springs and lumped masses in post processing.
- For springs – need control for both coincident node and non-coincident node springs (i.e. the tooth size of the spring should be affected).
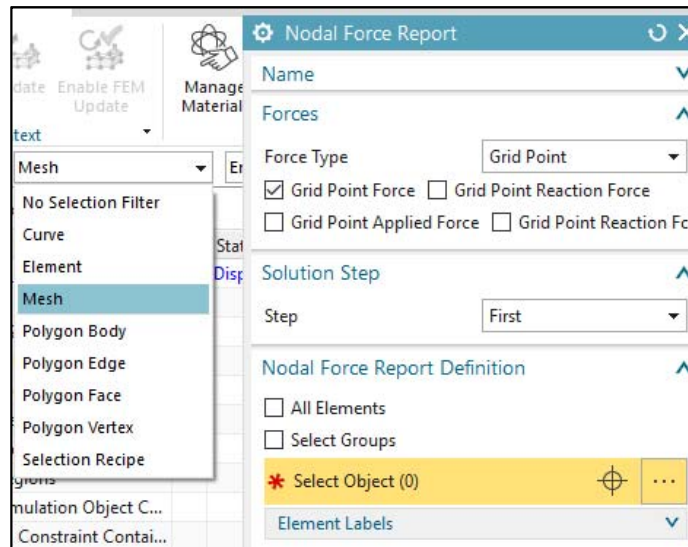
Post Processing
Nodal Force Enhancement

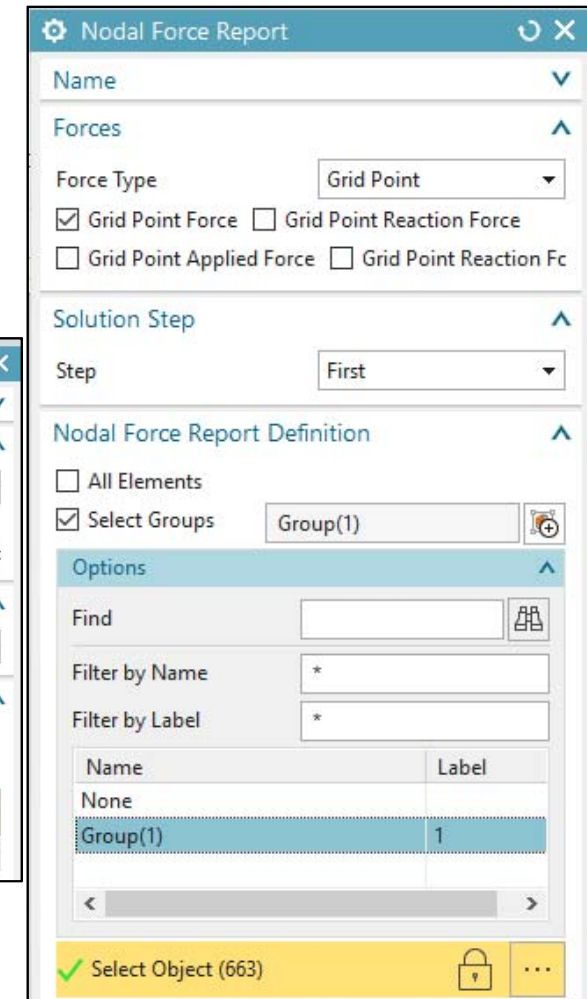## Geometry based selection / updateability

Challenge:
- Nodal Force Report accepts only nodes and elements as input
- Need geometry associativity for update

Solution:
- Support polygon geometry as inputs – body, faces, edges
- Support for Meshes as input
- Support for **Selection recipe** and Groups

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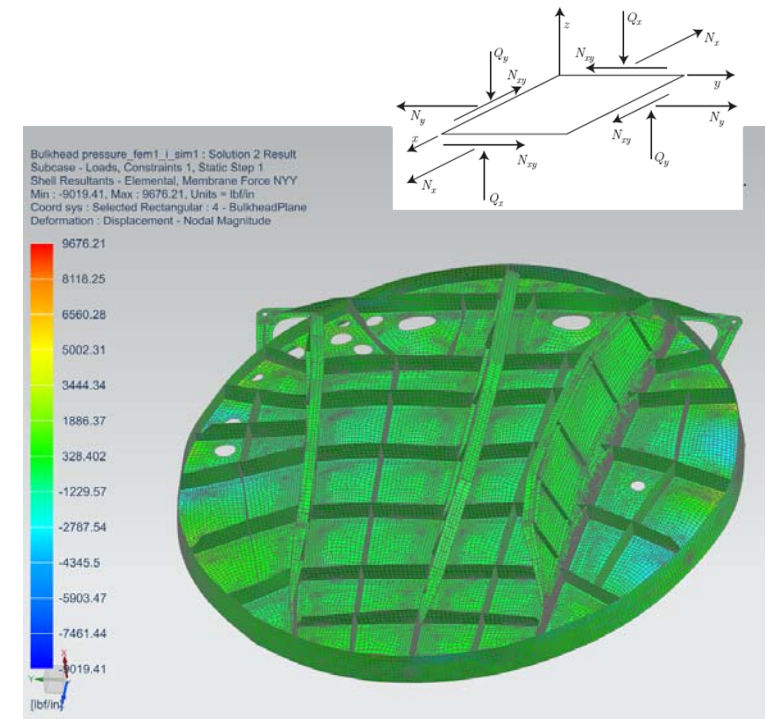
Post Processing
Shell resultant CSYS transformation

Flexible post-treatment enabling local sizing of shell structures

Challenge:

- Provide directional shell membrane forces (2D constraints assumption) post-treatment regardless of the model native/material orientation

Solution:

- Allow user-defined CSYS to be projected into Shell element's plane to define Shell resultant X and Y axes

- Also available at Margin of Safety level to perform easily local sizing of metallic structures (constant membrane forces – varying thickness)

- Enhance consistency with other results already "user-orientable"

Post Processing
Combined loadcases usability enhancement

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Efficient definition and reuse of linear combinations of load cases

Challenge:

- Enable definition and reuse of up to 100's of linear combinations among 10's of subcases, only needed at post-treatment level, without any increase on result file size

- Existing "legacy" feature in Simcenter 3D with a basic UI approach and no journaling

Solution:

- UI approach enabling load case combination, even with high number of subcases / combinations

- XL/CSV export/import ensuring flexible reuse and update

- Journaling ensuring scalable integration & automation

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Thank You!

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