What's New in NX 11?

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Prepared for:

ATA Webinar Audience

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Robotics & Controls

Theme Park Rides

Defense

Industrial & Mining Equipment

Consumer Products

Our Services

We provide our customers with **complete, integrated solutions**

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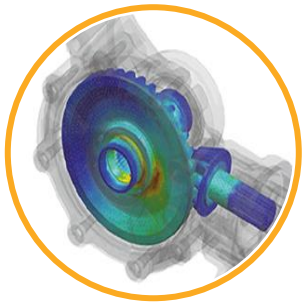
From initial concept development to detailed structural design



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Comprehensive structural, fluid, acoustic, and thermal analysis services

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- Femap
- NX Nastran
- NX CAD, CAM, & CAE
- Teamcenter
- Solid Edge
- Developer of the official NX Nastran training materials
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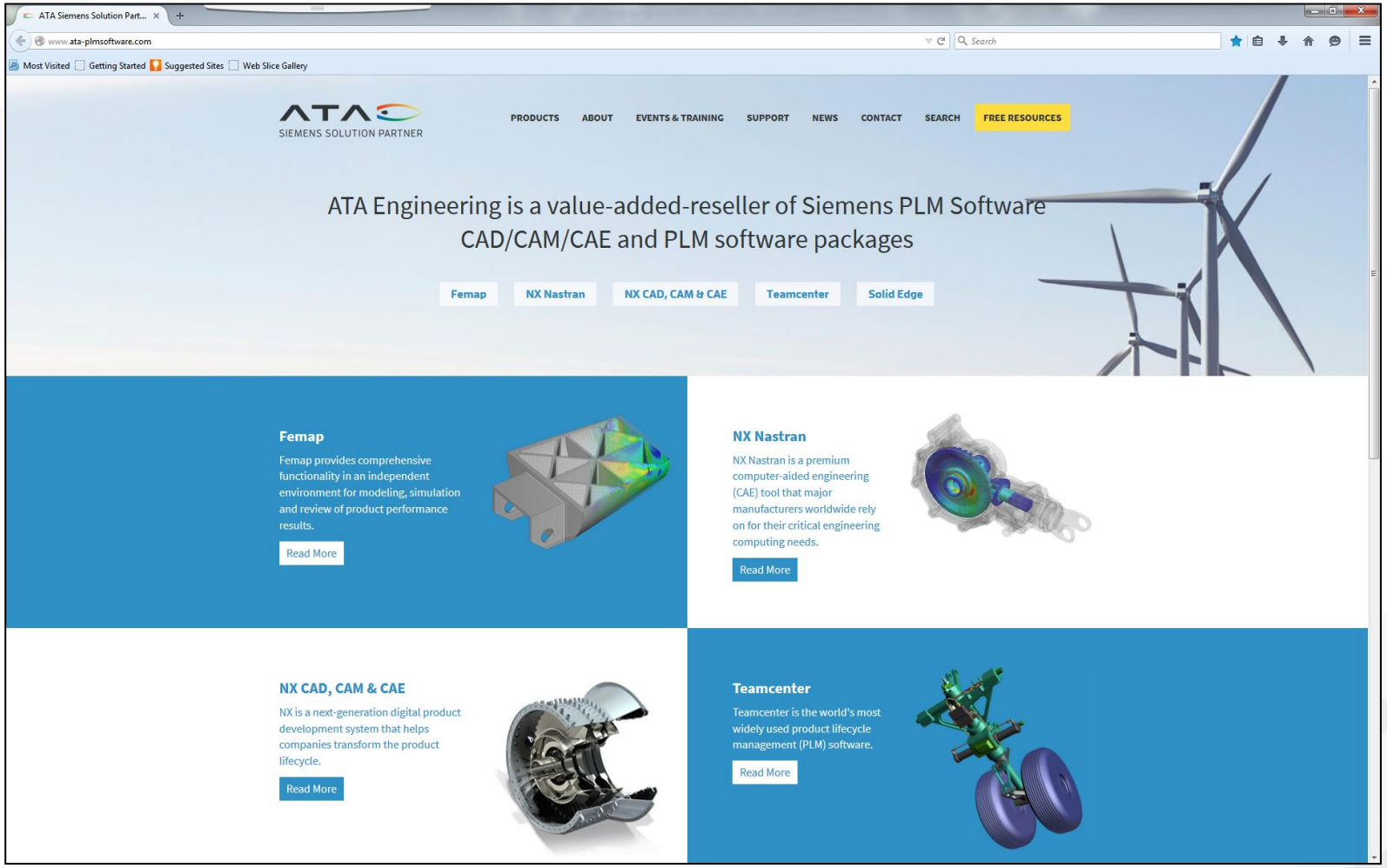

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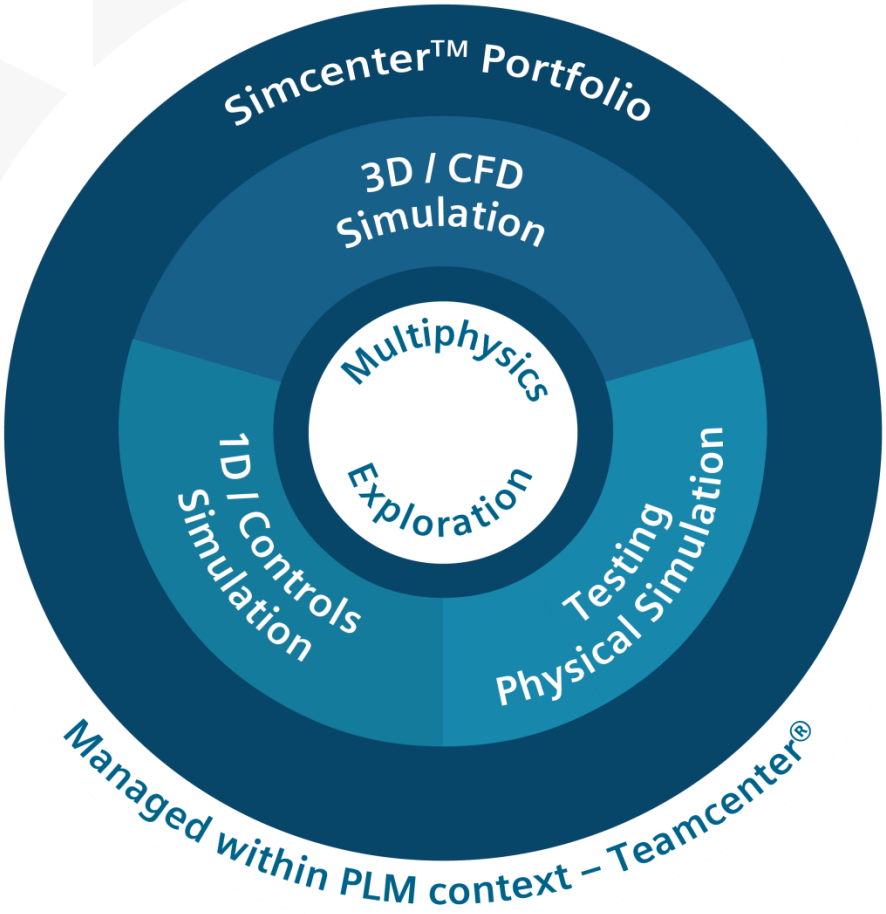
NX 11 Introduces New Nomenclature and Branding: The Simcenter Portfolio of Simulation Tools



- Simcenter is the Siemens software brand for addressing predictive engineering analytics.
- Consists of 1D, 3D, and testing solutions.
- The portfolio covers a number of disciplines as represented in the spokes of the inner circle
- The solutions are further enhanced with multi-discipline design exploration capabilities.
- Finally, the solutions are available with integrations to Teamcenter to enable data and process management and complete traceability within the PLM ecosystem.

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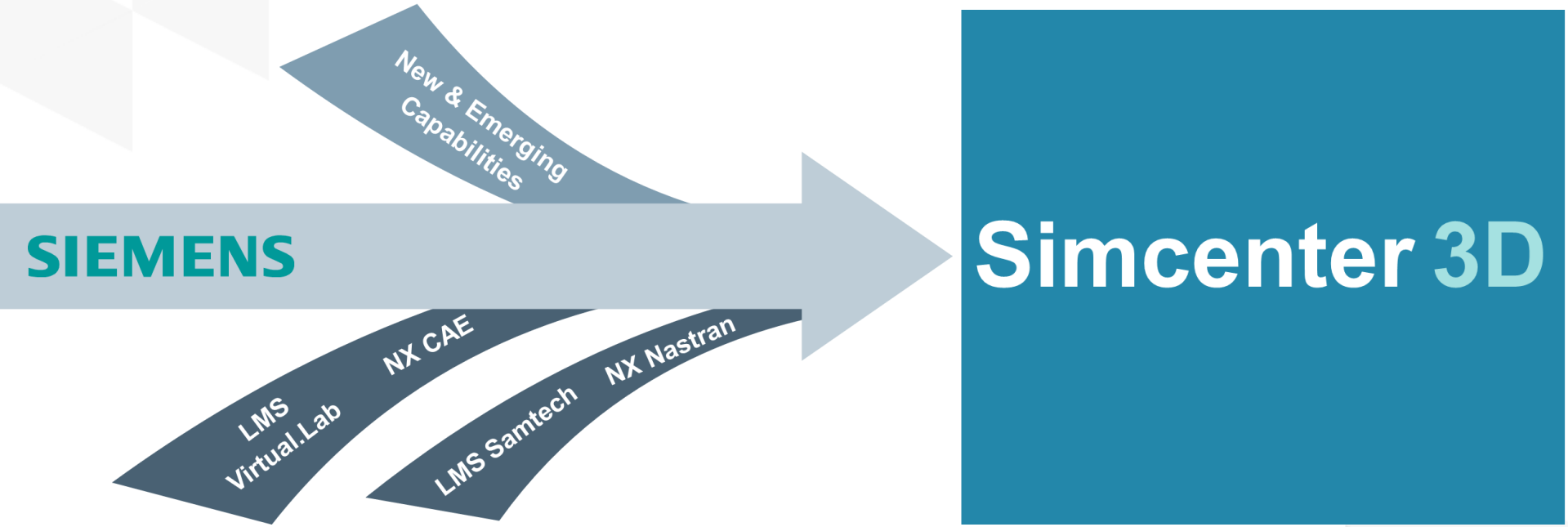
Simcenter 3D Unifies an Array of Simulation Tools



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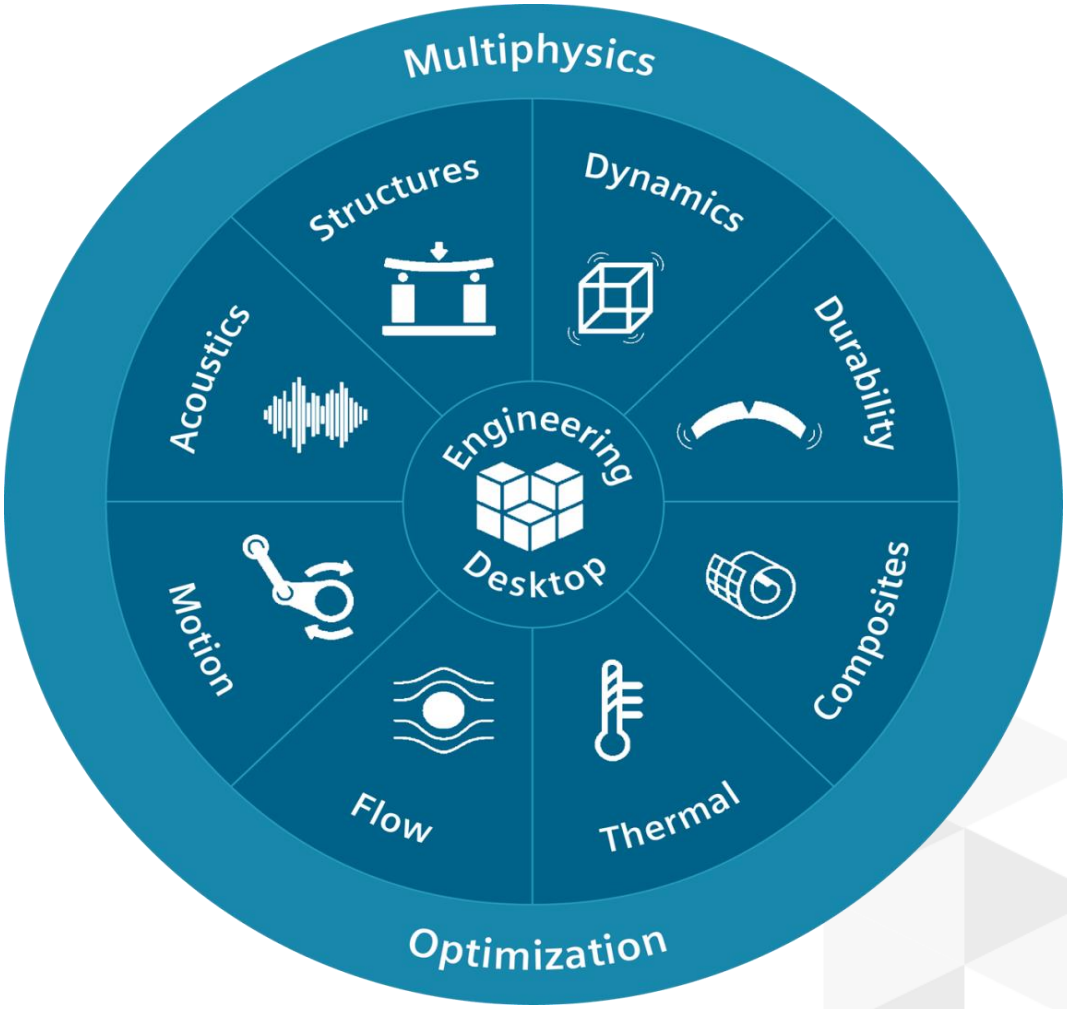
Introducing Simcenter 3D

Unified Environment

Multi-discipline integration

Openness and scalability

Leading in system simulation



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CAE Enhancements Fall Into Four Categories

Mesh robustness and new techniques

- Structured mesh regions in 2D free mesh
- Structured mesh on trimmed cylinders
- Geometry tolerance for midnode placement
- Manual abstraction process improvements
- Adaptive analysis extensions
- Meshing tools specific to acoustic modeling

Post processing robustness and new techniques

- Results probe extensions
- Fourier axisymmetric and cyclic symmetry display
- New report writer
- Save / restore multi-view layout and contents
- Octave bands scaling of abscissa
- Graphing paths on surfaces

Expanded solutions

- Sysnoise BEM acoustic / vibro-acoustic
- Fourier axisymmetric analyses
- Cyclic symmetry analyses
- Multiphysics chocking and cohesive elements
- Tensor based loads
- 4D pressures
- Progressive ply failure and cohesive damage

Continuous improvements

- Quick pick secondary highlight of parent entity
- Acoustic, multivariate, cohesive materials, fluid/thermal flow (these could be standalone topics)
- Circle area selection
- 2D and 3D element normal extensions

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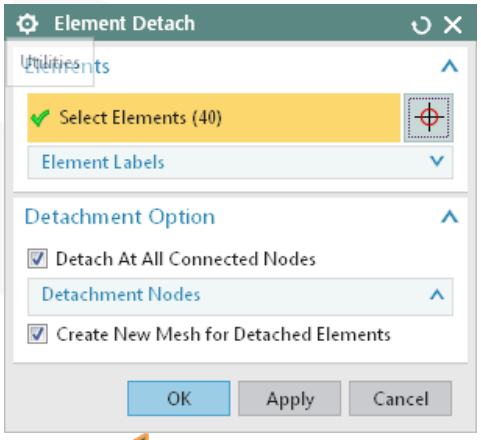
Meshing Enhancements

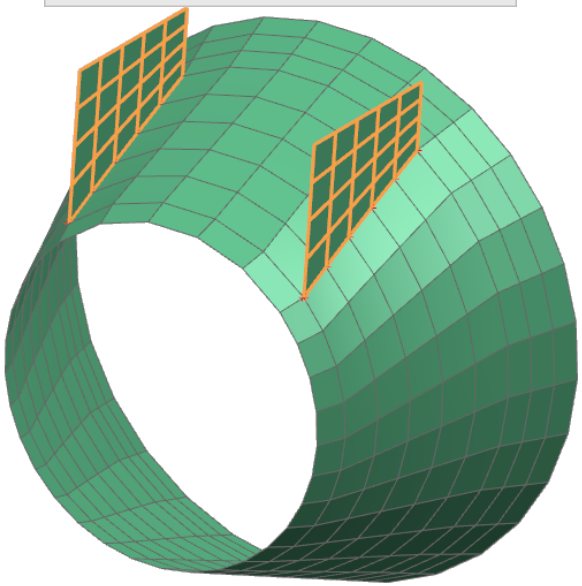
- 2D Meshing
  - Improve structured mesh generation via Multi-Block Decomposition enhancements
  - Target more element quality types to improve mesh quality
- 3D Meshing
  - Identify stacked cylinder conditions to assure cylinder seams (and meshes) line up
  - Structured mesh on trimmed cylinders
  - Target mid node distance off of geometry as a means for refining mesh and improving element distortion
- Polygon geometry operations
  - Merge face preview and smart selection
  - Geometry abstraction enhancements to improve feature capture in meshes
- Adaptive Meshing
  - Introduce primitive bounding volumes as a means for defining zones
  - Support suppression, refinement, and singularity zones
  - Automatic identification of singularities
  - Store intermediate step solver input files
  - Create and use an element size spatial field to adapt an existing mesh without solving the model
  - Create external log file for adaptivity tracking
  - Support adaptivity in AFEM

More Meshing Enhancements

- Lumped mass at CG of polygon body or bodies
- Creation of multiple projected mesh points in a single step
- Detach / unzip elements from their surrounding elements
- Attach 2D elements via node/node and remesh
- Fill holes in a mesh (Mesh from Boundary) without having geometry in the hole
- Convex mesh, rib removal, and "thicken" mesh for acoustics analysis workflows
- Acoustic meshing specification of element size using frequency as input
- Mesh wrap for acoustics – update surface wrap generation when the input is a mesh and the desired output is an acoustic mesh
- Enhance surface coat to automatically detect and filter out solid element free faces at hex-tet interfaces
- 0D mesh option to use a geometry weighted distribution of mass

Detach Elements





- Breaks off a portion of a mesh while retaining all elements
- Creates coincident nodes at detachment locations and redefine connectivity of detached elements with the new nodes
  - Works with 2D and 3D elements
  - Automatic detection of detachment nodes

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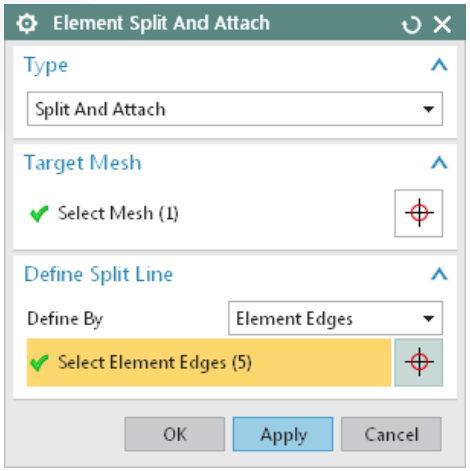
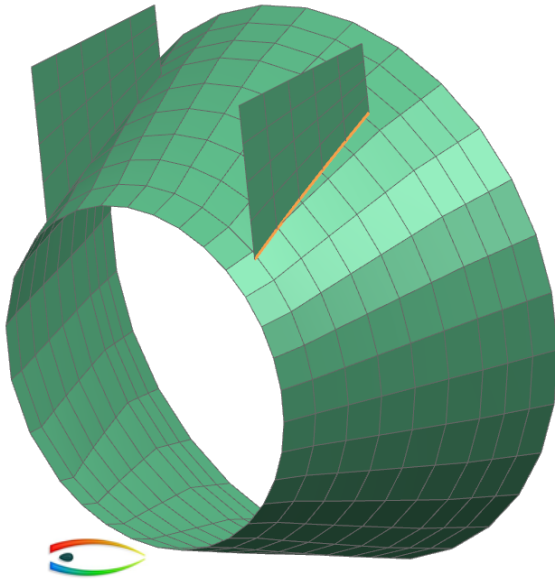
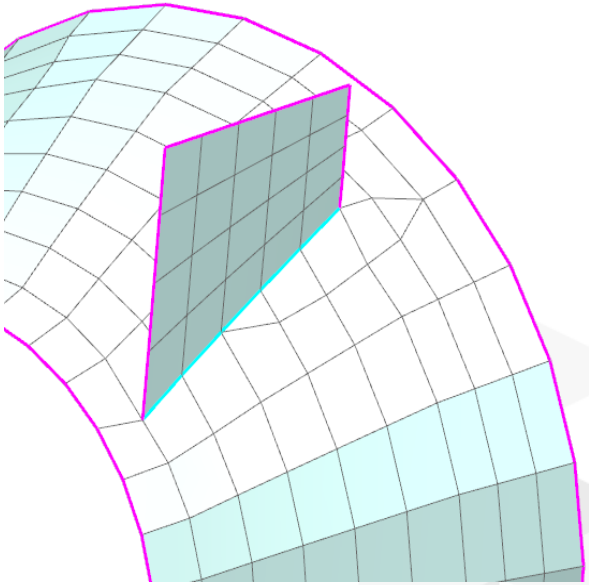
Attach Elements





- Stitch/split a mesh relative to another mesh
- Uses face from mesh techniques to remesh region where attachment is defined
  - Split only or split and attach
  - Works with 2D elements
  - Select target mesh that will be locally remeshed in attachment zone
  - Select element edges to be attached



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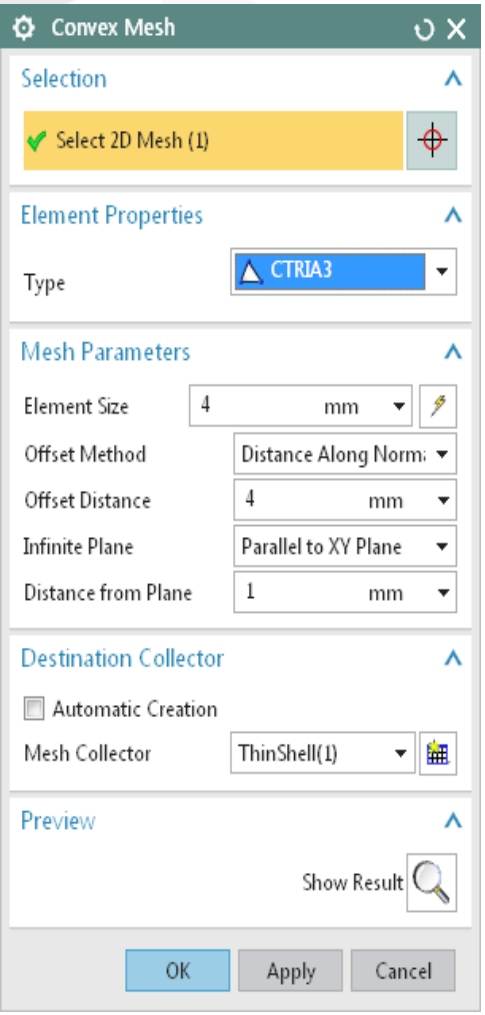
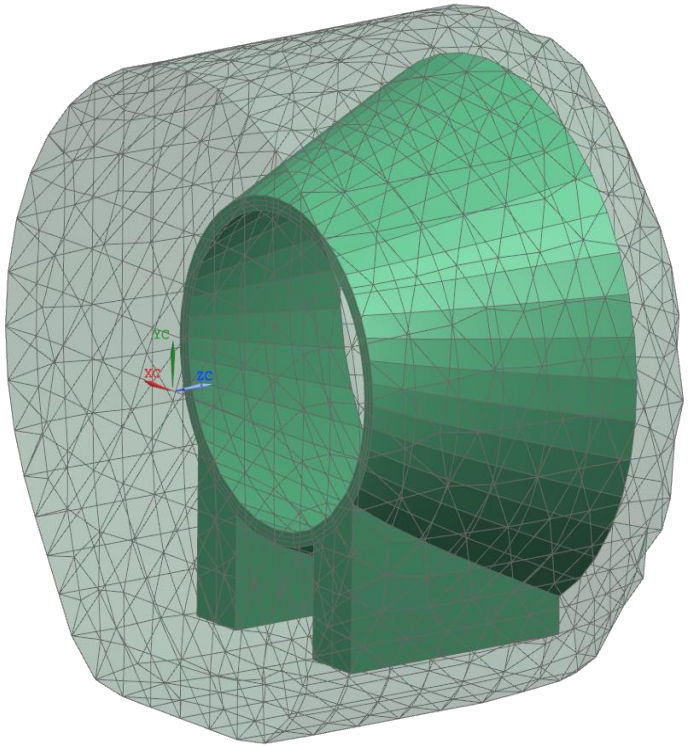
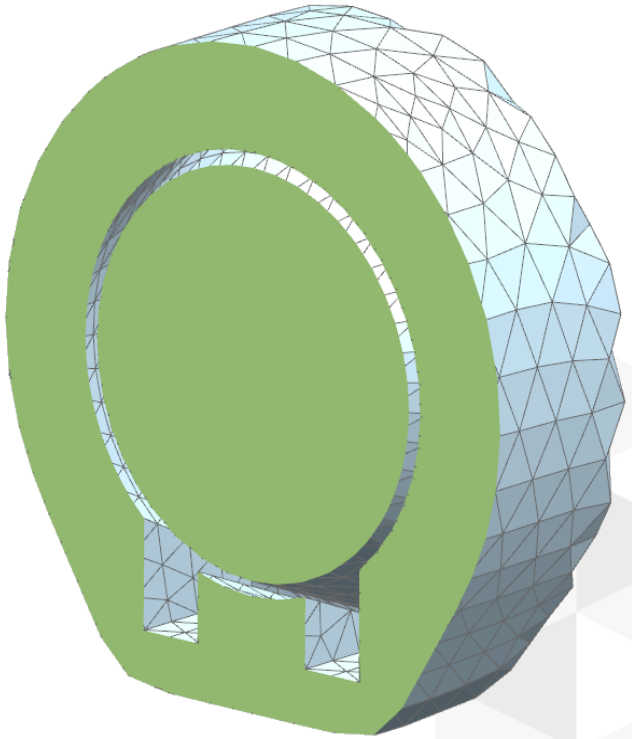
Convex Mesh for Acoustics Analyses

- Generates a 2D convex mesh to support acoustics analyses
- New meshing command using existing 2D mesh (tri or quad) as input







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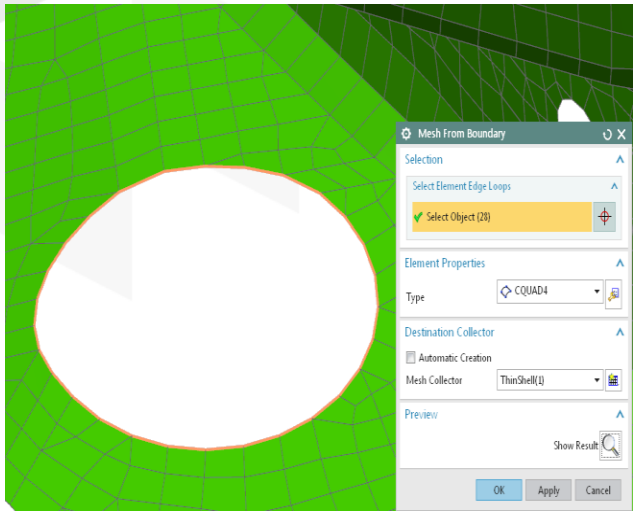
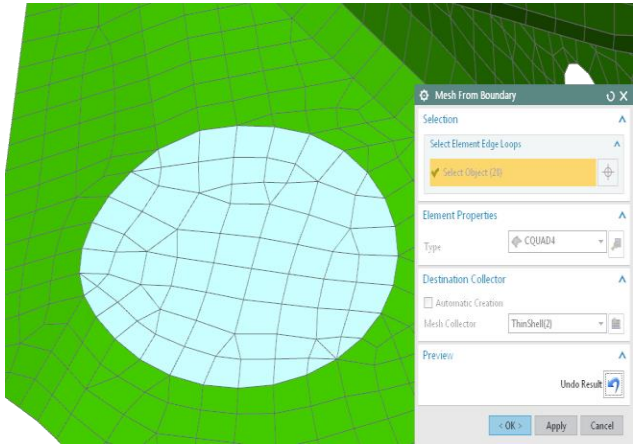
Fill Holes in a Mesh





- Fills holes in a mesh as needed for solid or shell analyses
- Introduces a new command and new selection methods
  - Mesh from Boundary
  - Smart selection hole element edges, element edges by group

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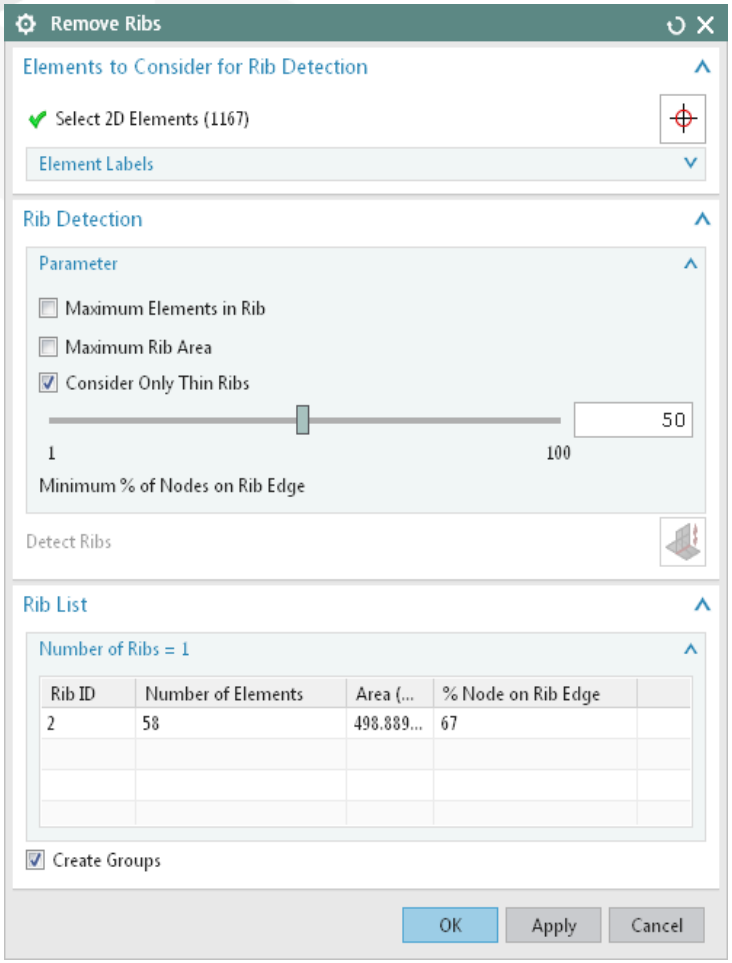
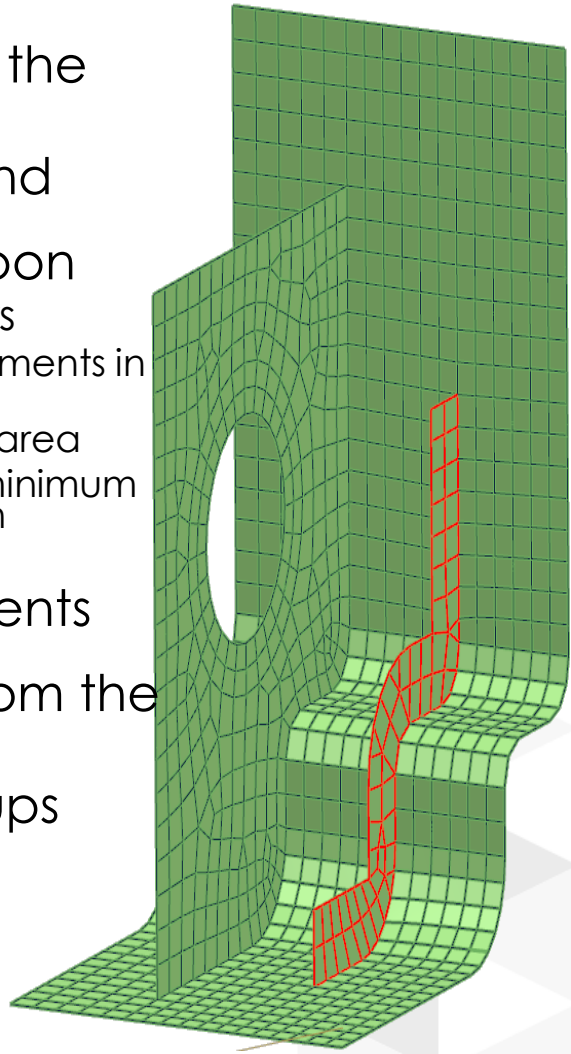
Remove Ribs



- Identifies and remove elements that define a rib feature in the FEM
- Remove Ribs command that detects rib elements based upon
  - Detection parameters
    - Maximum elements in rib
    - Maximum rib area
    - Thin rib as a minimum % of nodes on rib edge
- Option to retain elements identified as a rib by removing ribs from the list
- Option to create groups from the ribs



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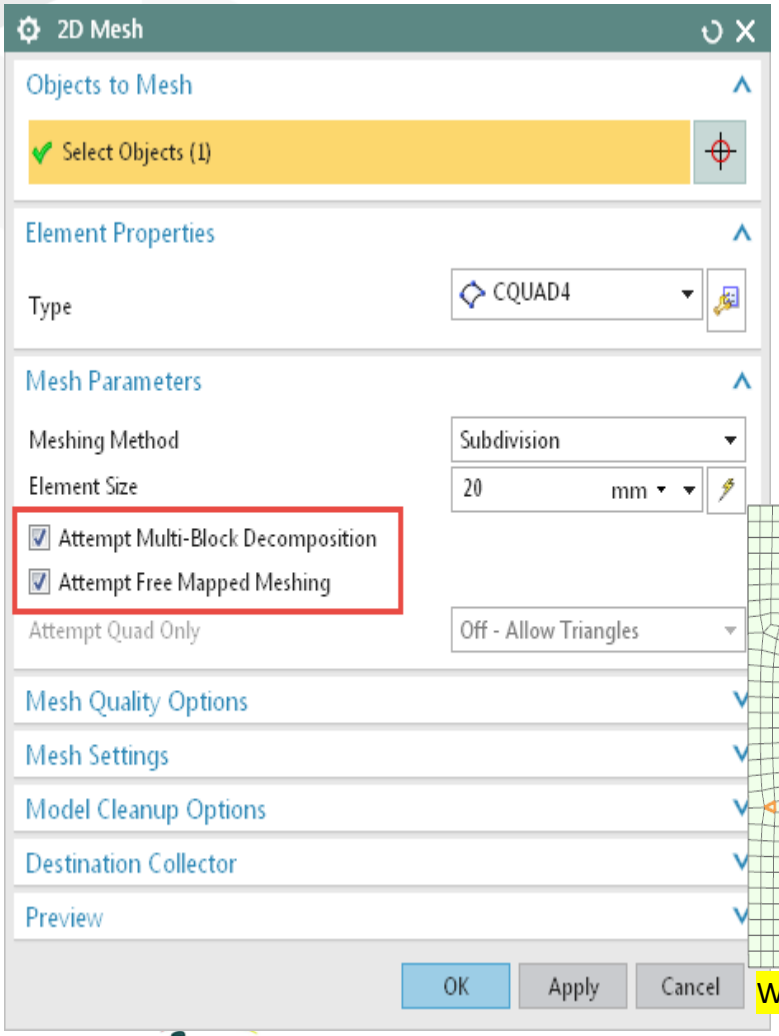
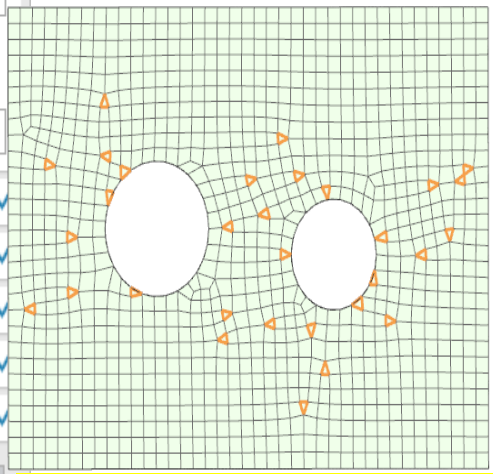
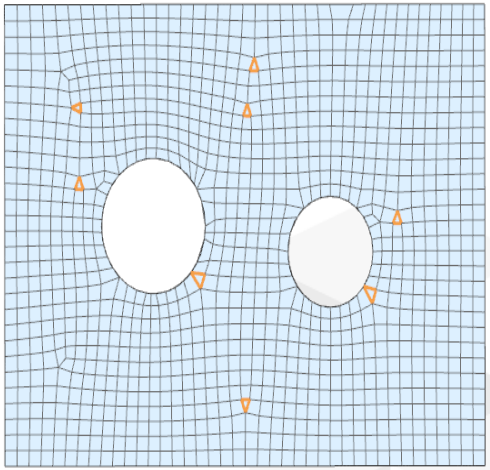
2D Mesh Multi-Block Decomposition

- Produces more structured 2D meshes
- Decomposes faces into more rectangular regions
- REQUIRES use of Free Mapped Meshing option to produce structured meshes; subdivision/paver also influence result





Without multi-block, with subdivision



With multi-block, free mapped, and paver

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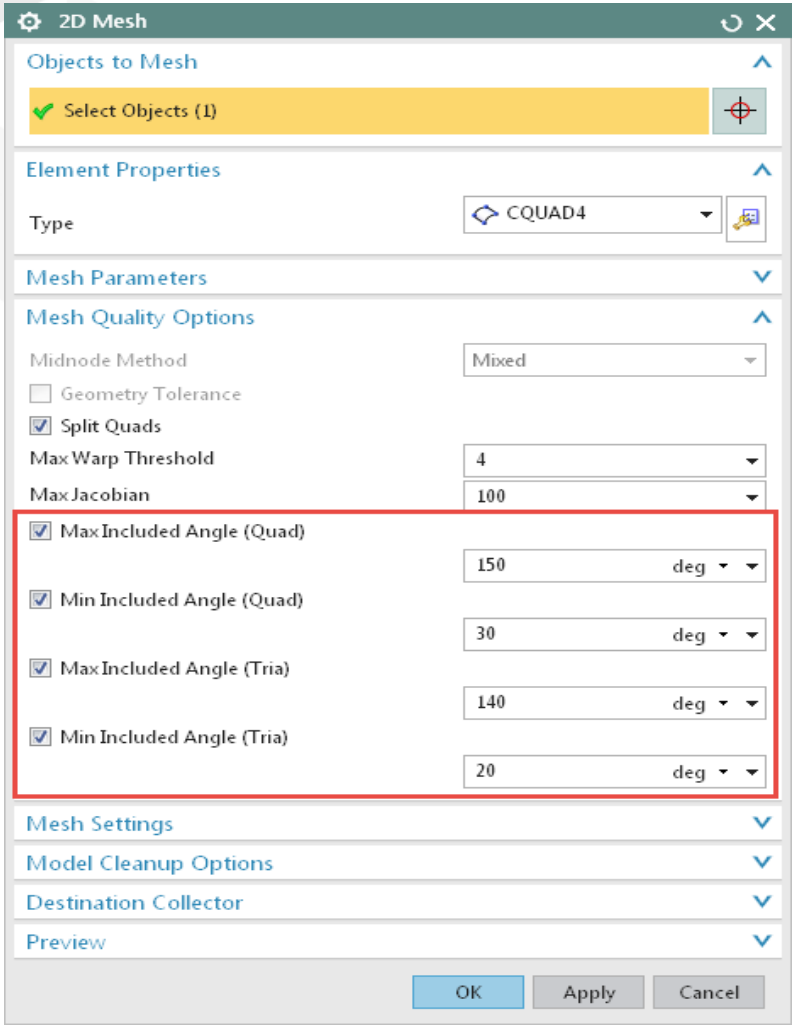
Element Quality Objectives in 2D Meshes



- Produces a higher quality mesh based upon user criterion
- Extends mesh quality options to more element checks
  - Quad and triangle included angles

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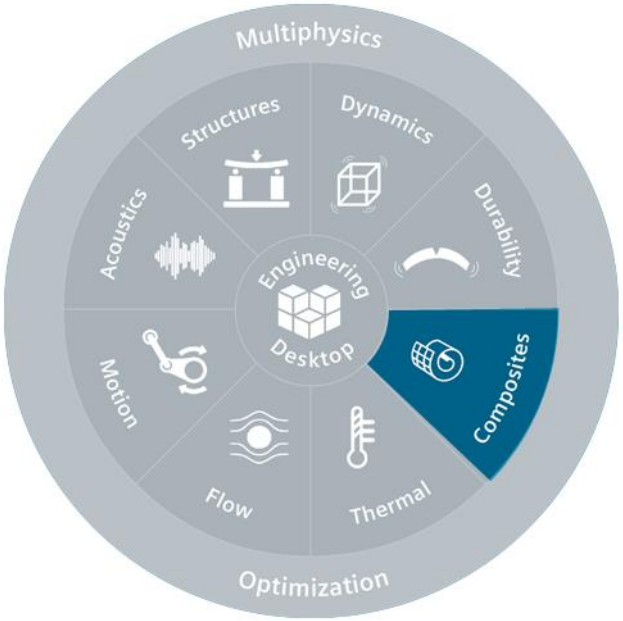
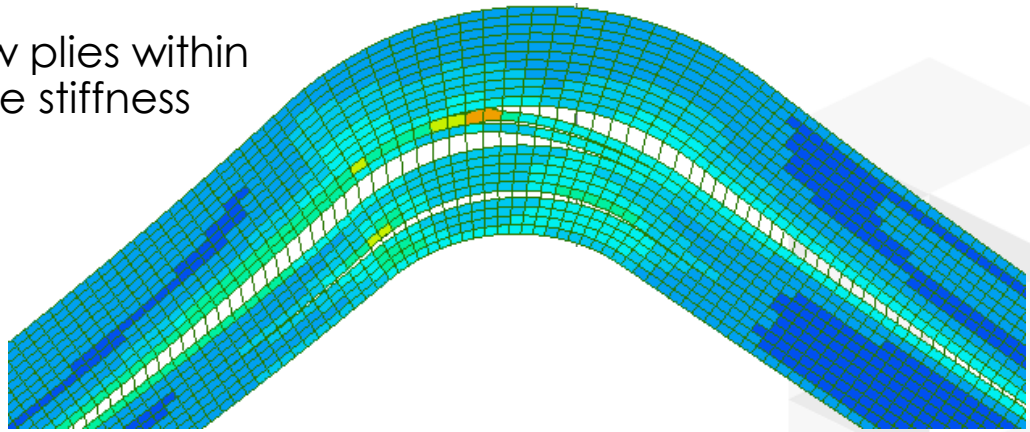
Composite Failure

- **Predict ultimate load capacity of systems made from laminate composite materials**
- New enhancements such as delamination and orthotropic damage material models and progressive ply failure.
  - Delamination damage material models
  - Orthotropic damage material models
  - Delamination simulation to allow solid elements to separate
  - Progressing ply failure to allow plies within elements to damage and lose stiffness





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NX Multiphysics – User-Defined Materials

1	2	3	4	5	6	7	8	9	10
MUMAT	MID	MODNAME1	MODNAME2	NUMSTAT	MATNAME	SETID			
	REAL	R1	R2	R3	R4	R5	R6	R7	
	INTEGER	I1	I2	I3	I4	I5	I6	I7	
	TABLES1	TIDS1	TIDS2	TIDS3	TIDS4				
	TABLEST	TIDST							
	TABLEM1	TIDM1	TIDM2	TIDM3	TIDM4	TIDM5	TIDM6	TIDM7	

Field	Contents
MID	Identification number of a MAT1, MAT2, MAT3, MAT8, MAT9, or MAT11 entry. (Integer>0)
MODNAME 1	Name of the material model. (Character).
MODNAME 2	Name of the material model. (Character).
NUMSTAT	Number of state variables (Integer , default=0)
MATNAME	Name of the material. (Character, default=blank) (limited to 8 ascii characters)
SETID	Identification number of a SET1 entry which defines which state variables are to be output. For ALL state variables SETID = -1. (Integer, default=0).
Ri	Material constants that are of real type. (Real)
Ii	Material constants that are of integer type. (Integer)
TIDSi	Identification number of a TABLES1 entry. (Integer > 0)
TIDSTi	Identification number of a TABLEST entry. (Integer > 0)
TIDMi	Identification numbers of TABLEM1 entries. (Integer > 0)

- Supports the use of user defined material models relative to structural analyses
- New MUMAT and MUMATC capabilies in NX Nastran
  - Supports elastic, plastic, and creep behavior
  - Elastic with ON/OFF options for plasticity and creep
- User compiled DLL or SO representing material model behavior is accessed by NX Nastran during solves

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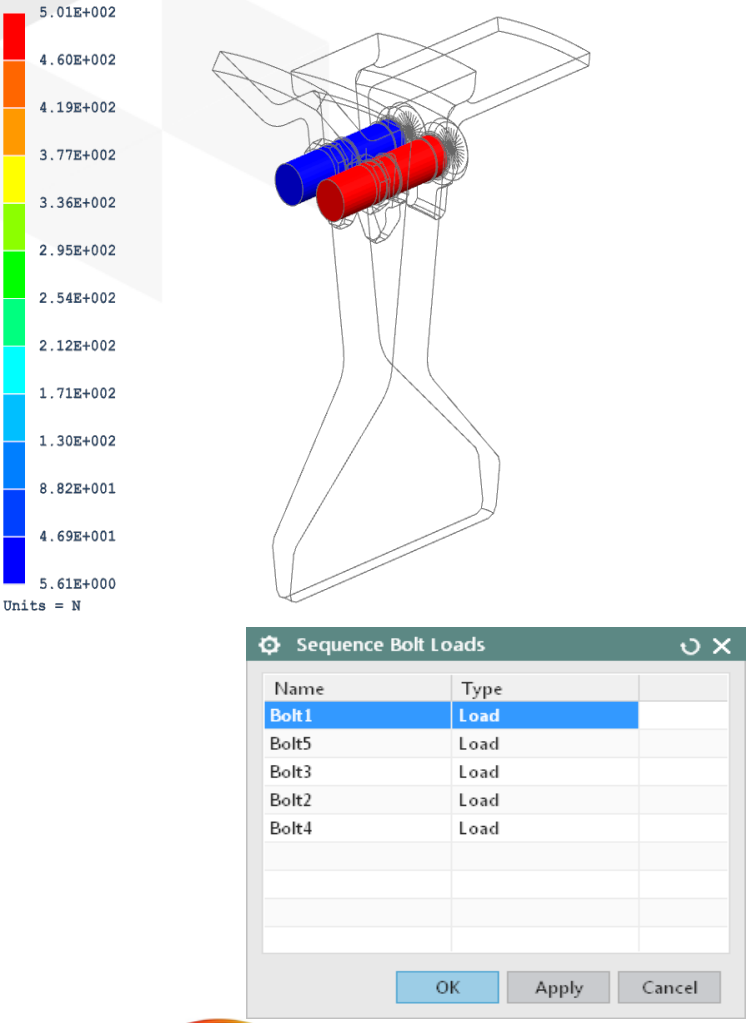
NX Multiphysics – Bolt Pre-Load Enhancments



- Extends existing bolt pre-load capabilities to address manufacture simulation, load path dependencies, and general post processing needs
  - Sequence of bolt loads within a step
  - Unloading or scaling of a bolt load
  - Pre-load steps at any point during a solve's duration
  - Bolt pre-load results
    - Axial initial strain, forces, and bending moments

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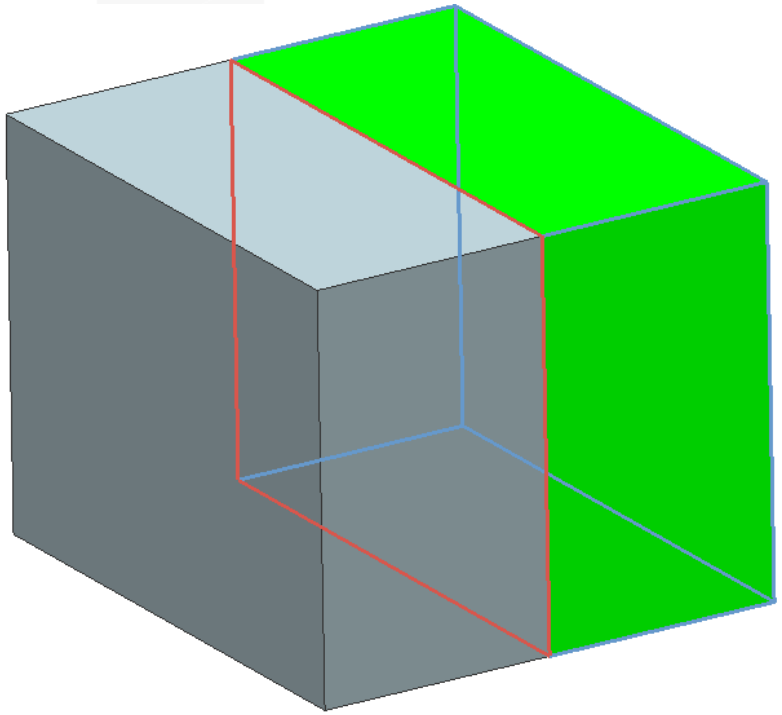
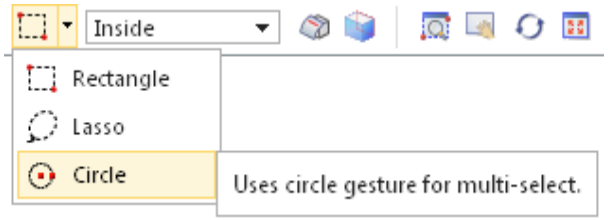
Selection and Graphics Enhancements



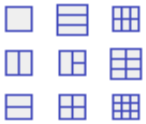
- Area selection option: CIRCLE



- Quick pick secondary highlighting
  - As mousing over quick pick items, the item is highlighted along with the secondary item it belongs to such as:
    - Face/body, edge/faces
    - Node/elements

- View layout formats

NX 11



NX 10

  - 3 new formats

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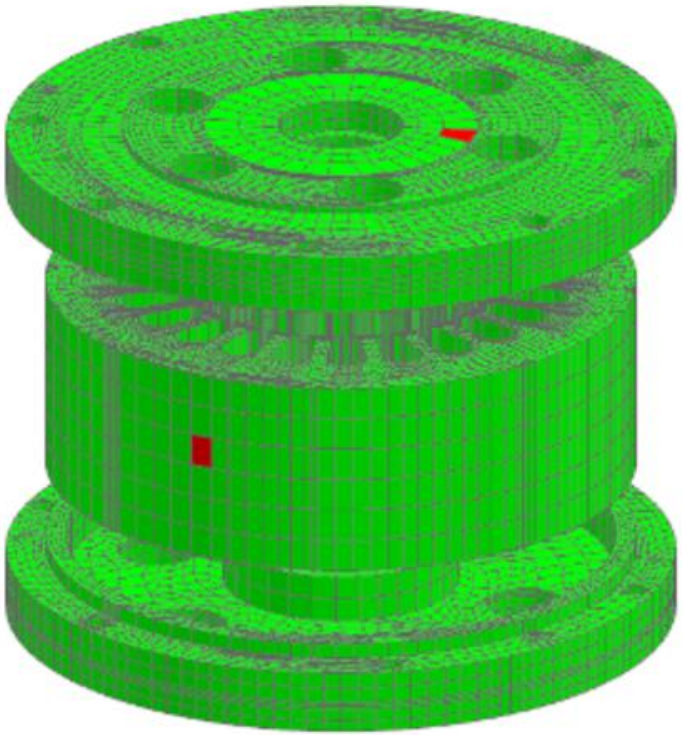
2D Element Normal Check – 2 Color Display



- Provides a display free of clutter to readily identify top/bottom nature of 2D elements
- 2 color display option to the 2D element normals check
- User can specify positive/negative face colors
- Arrow display still supported

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Post-Processing Enhancements

- Results Probe Enhancements
  - Simultaneous graph of multiple probes in a single grid or stacked format
  - Partial model display
  - Export to UNV
  - Copy within a SIM and across SIMs
  - Enhanced path support (along surface) for graphs
  - Perform math operations on results from different solutions (interpolate in time and space)
- Enhanced banded display, include band edges
- Save / restore multi-view layout and view contents
- Define reference node or plane for color display as well as deformation display
- New Report Writer system
  - Reports saved in MS Word documents
  - Example templates provided, customize or create your own
  - Example report components provided based upon NX Open
  - Create a report automatically or interactively

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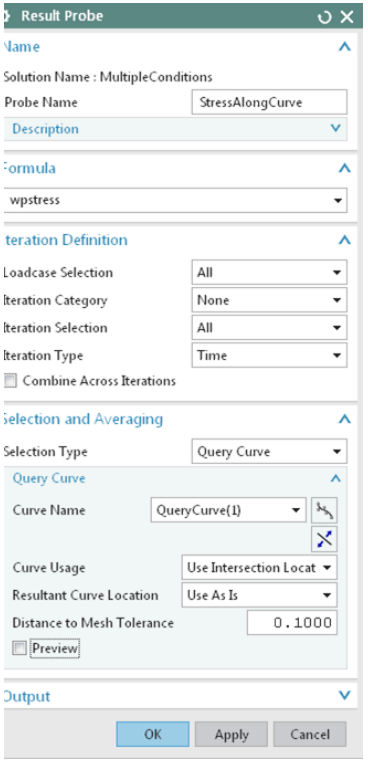
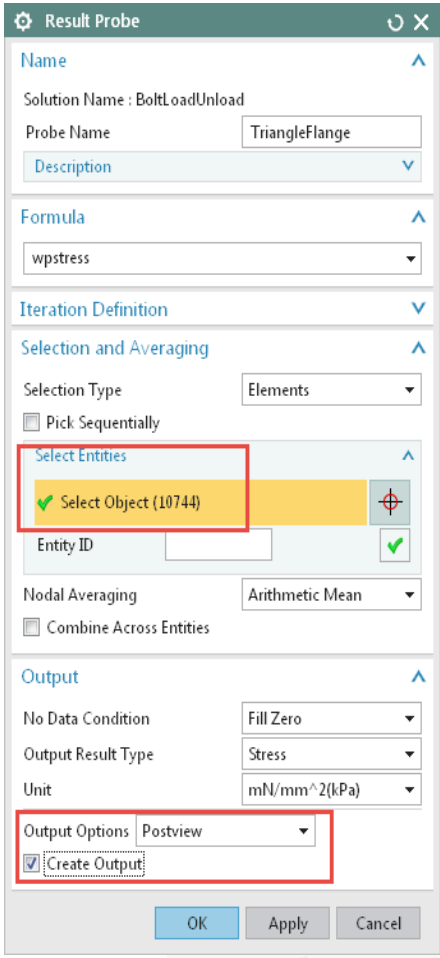
Results Probe Enhancements

- Contour plot a subset of the entire model
  - NX 10 could contour plot only when selection was set to entire model
- Create results probe output immediately
- XY graph multiple results probes at once
- Create stack graph support for results probes
- Copy results probes
  - To other solutions within a SIM and across SIMs
  - When cloning solutions
- Query results along path
  - Select existing curves or create "curves" using points, mesh points, nodes, polygon edges





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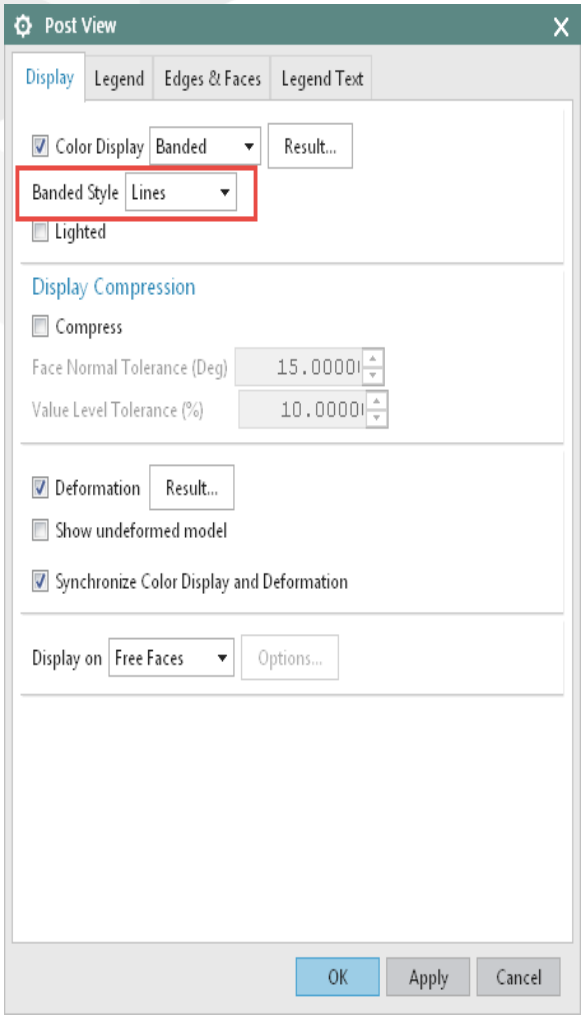
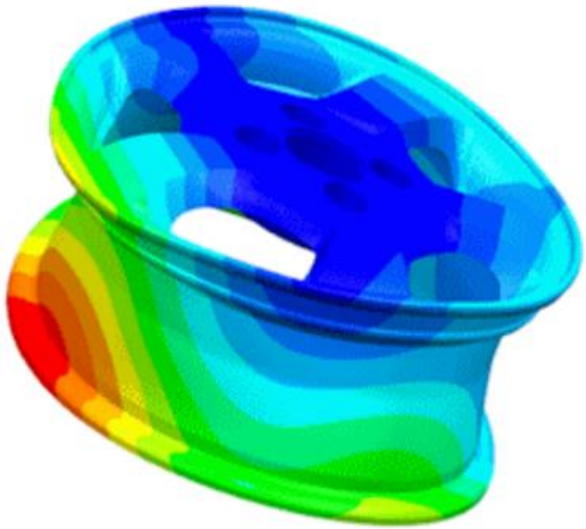
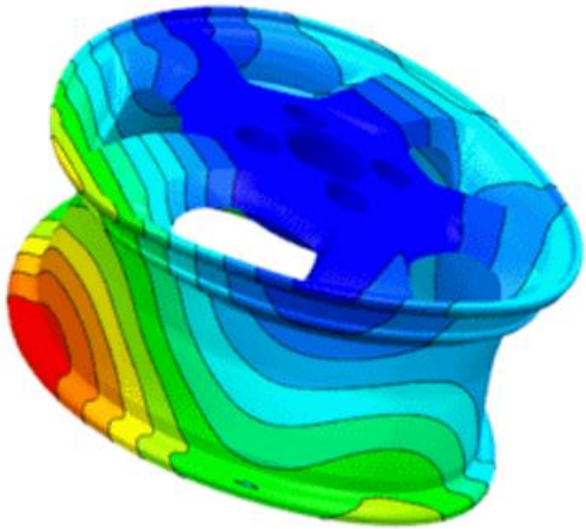
Banded Display – Include Banded Edges



- In a banded contour plot, add emphasis to the boundaries of each band



Default banded contour plot



Banded contour plot with contour lines

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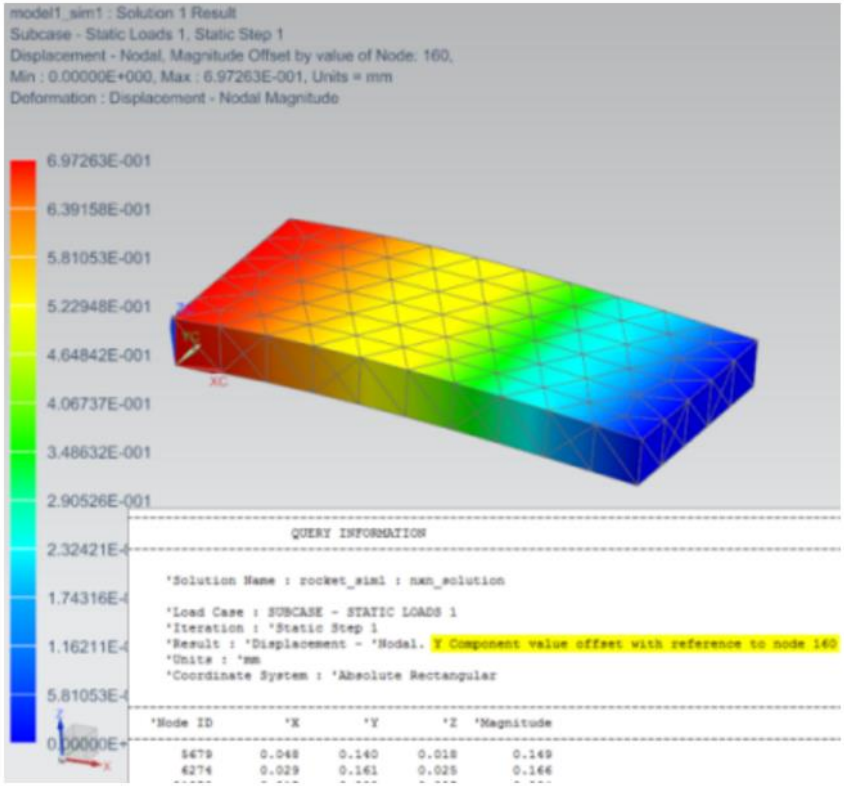
Relative Results Displays



- Create a post display whose results are relative to a reference node or plane
- Reference assignment in the results selection dialog
  - When selecting a reference node, that node's result is set to zero and all other results are relative to that node's actual result

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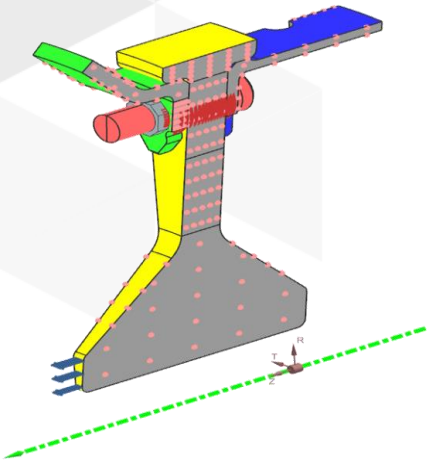
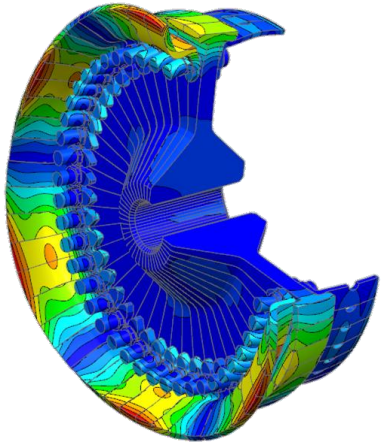
NX Multiphysics – Cyclic and Fourier Normal Modes



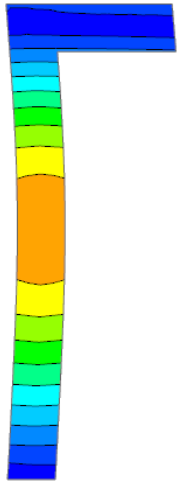
Sector model that is solved

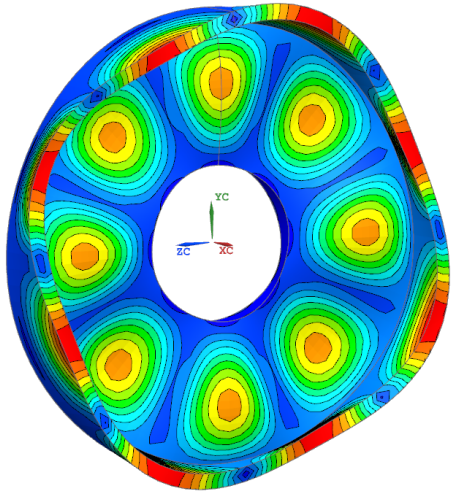
- For models solved with cyclic symmetry techniques, support results display at any location
  - Enhancements to NX Multiphysics environment and solver to achieve complete workflow coverage
  - Cyclic boundary coupling (mesh independent pairing)
  - Analysis axis display
  - Cyclic solution
  - Cyclic results display
    - Sector results or full model results



Results displayed over multiple sectors

2D plane model that is solved





Results displayed on 3D geometry

ATA ENGINEERING, INC.

NX CAD Has an Abundance of New Features…Although Not the Focus of This Webinar

- Surfacing
  - Powerful new and enhanced tools reinforce existing functionality and help create complex shapes in fewer steps with better accuracy
    - Create scaled copies of existing geometry with Scale Curve
    - Flatten, modify, and re-form curved surfaces
    - Enhanced sheet trimming
    - Create a body with constant and variable thickness

- Sketching
  - More control, easier changes, and better access to information.
    - Automatic dimension display option
    - Scale around sketch origin or first driving dimension
      - Scalable Sketch Group
    - More options for constraining to vertices
    - Sketch Relations Browser gives easy access to associated objects
    - Spline creation enhancements
    - Simplified sketch creation dialog box
    - Greater user control over display options for better performance

Sketcher

- **Significant improvements to core functionality**

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  - Automatic dimension display option
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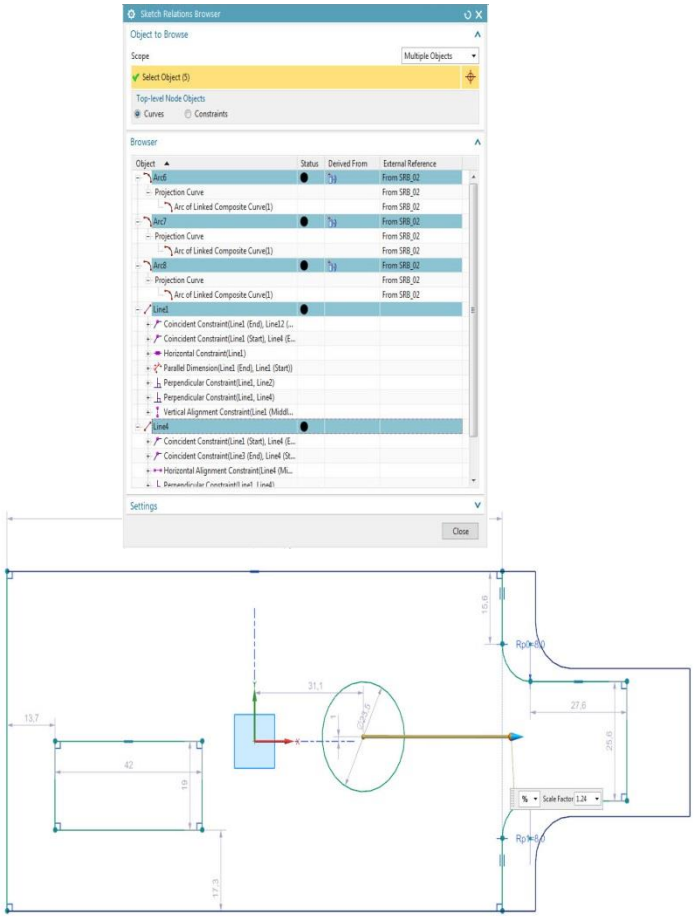

Surfacing

- **A vital tool in industrial design and other industries**

- Powerful new and enhanced tools reinforce existing functionality and help create complex shapes in fewer steps with better accuracy

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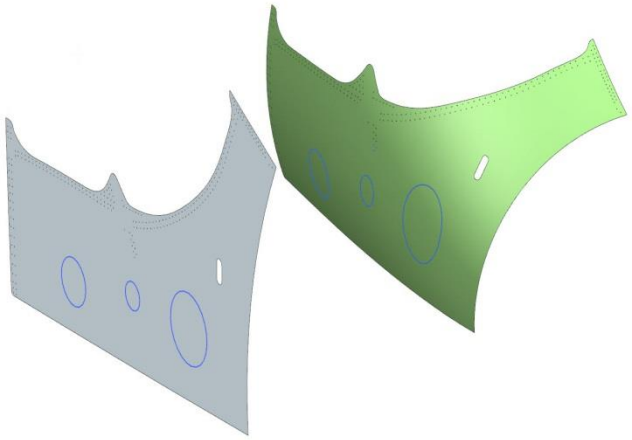

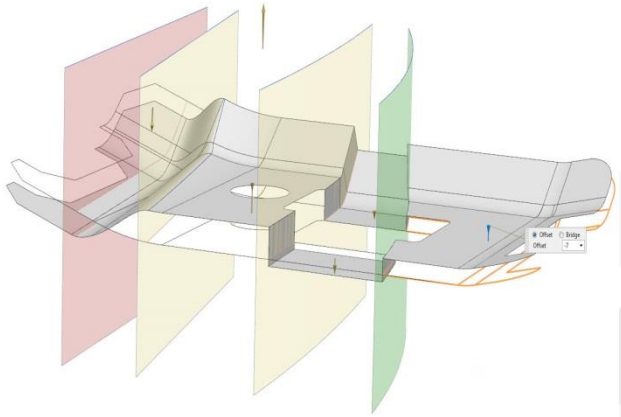

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