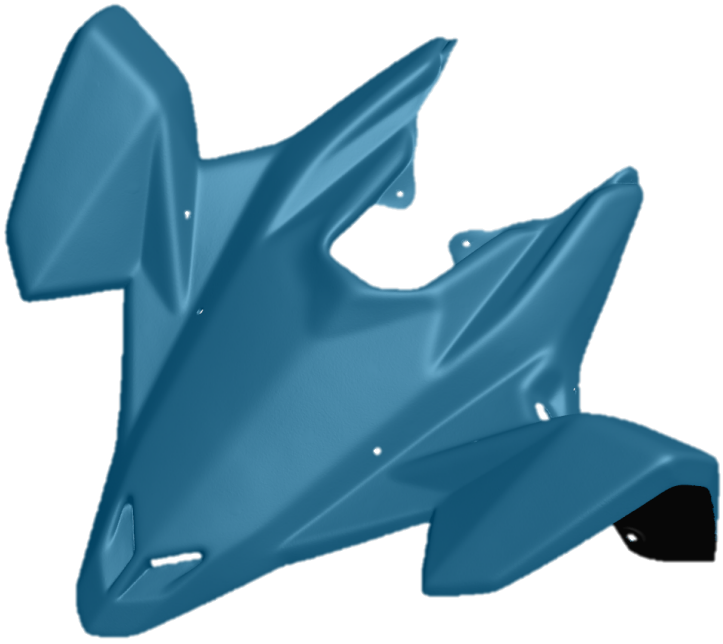
VXmodel Tutorial - Scan-to-CAD 4



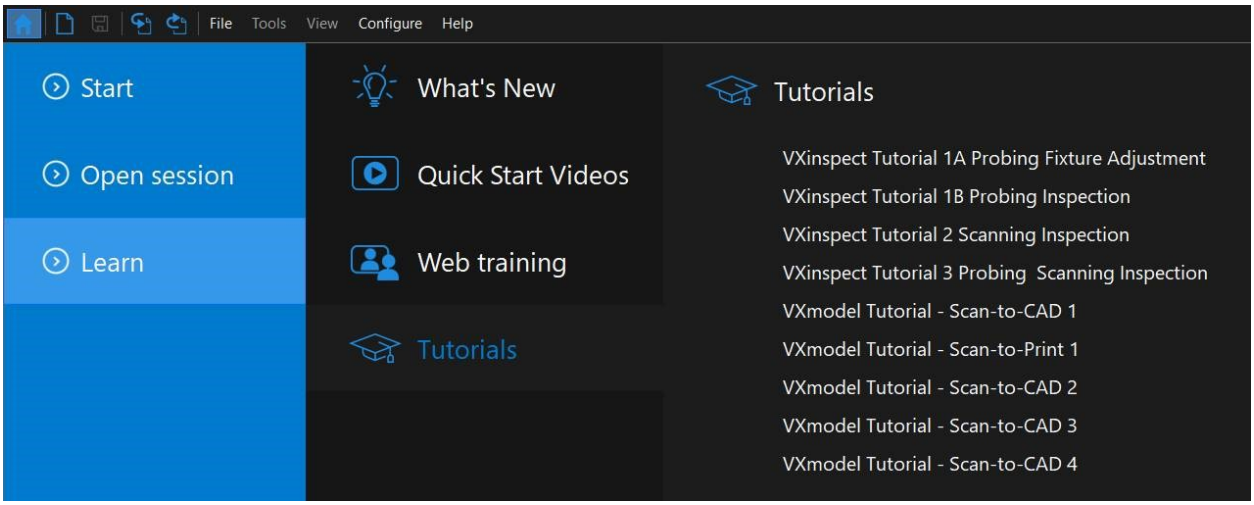
June 2018

Introduction

This tutorial is intended for users who need to become familiar with VXmodel. It will guide you through a Scan-to-CAD workflow by cleaning and aligning the mesh, then extracting required entities in order to transfer to CAD software.

Importing data File

Data files associated with this tutorial can be downloaded directly from the **Learn** panel of VXelements home page.



The **session file** will automatically open but the can be found here after download: ***\Documents\VXelements\Tutorials\VXmodel_4_CAD_DataSet**

*The sample data for this tutorial is provided by Creaform.. It is the property of Creaform and is used for informational purposes only.

After the acquisition, the **Scan** has to be transferred to the **VXmodel** node by clicking on the **Send nesh to VXmodel** button .

Note that for this tutorial, the scan data is already transferred to the **Meshes** node of VXmodel and the **Scan** and **Positioning targets** nodes were removed.

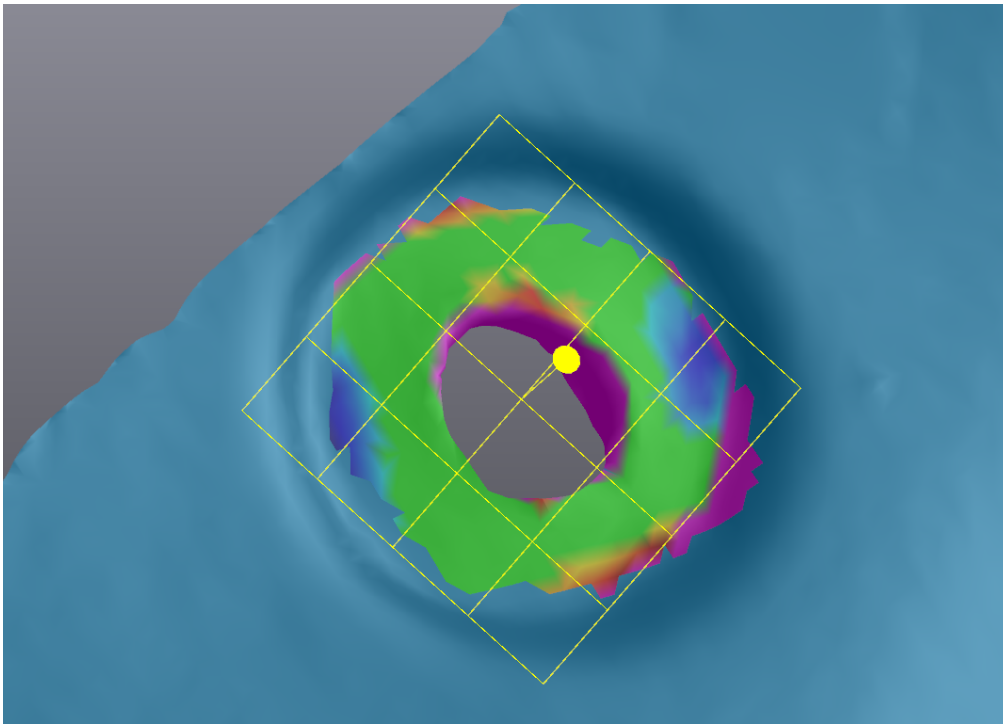
When working with a session that still has scanning information, hide the **Scan** and **Positioning targets** node from the navigation pane to avoid confusion.

» To do so, click on the eye icon to hide.

What will this tutorial cover?

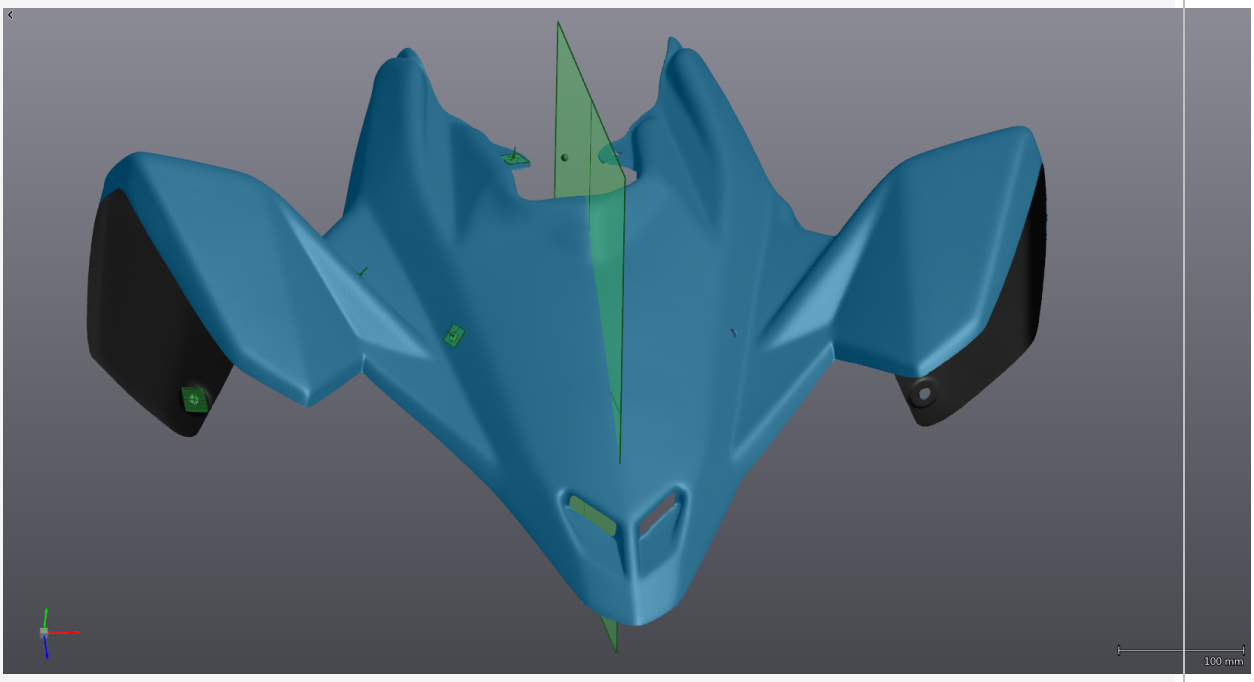
Step 1.

Project circle on plane



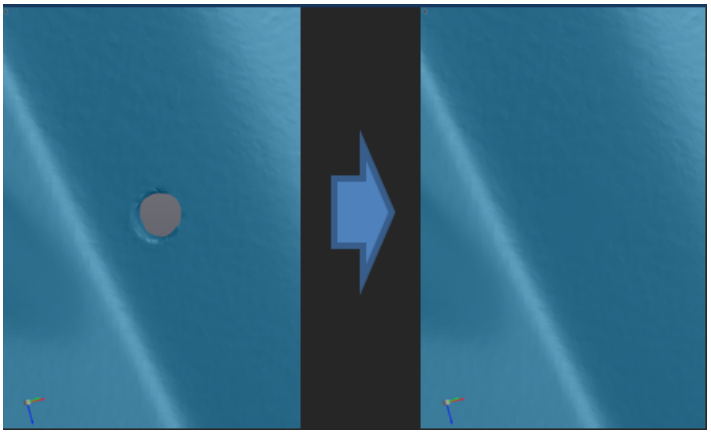
Step 2.

Extract symmetry plane



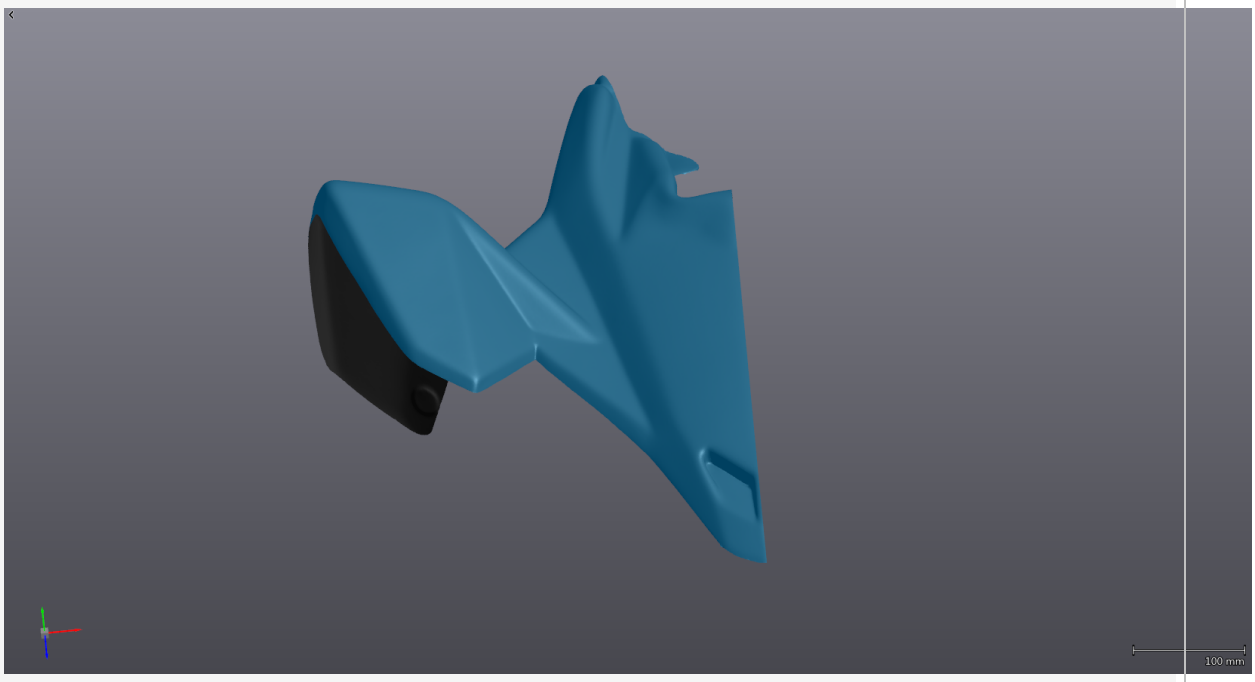
Step 3.

Defeature and fill holes



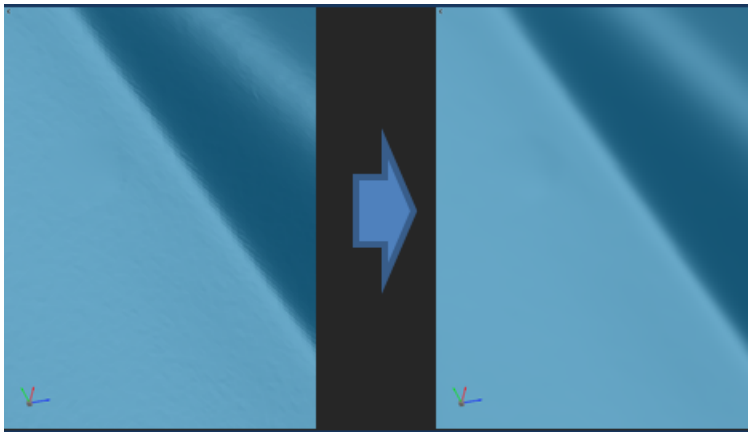
Step 4.

Reduce the size of the file



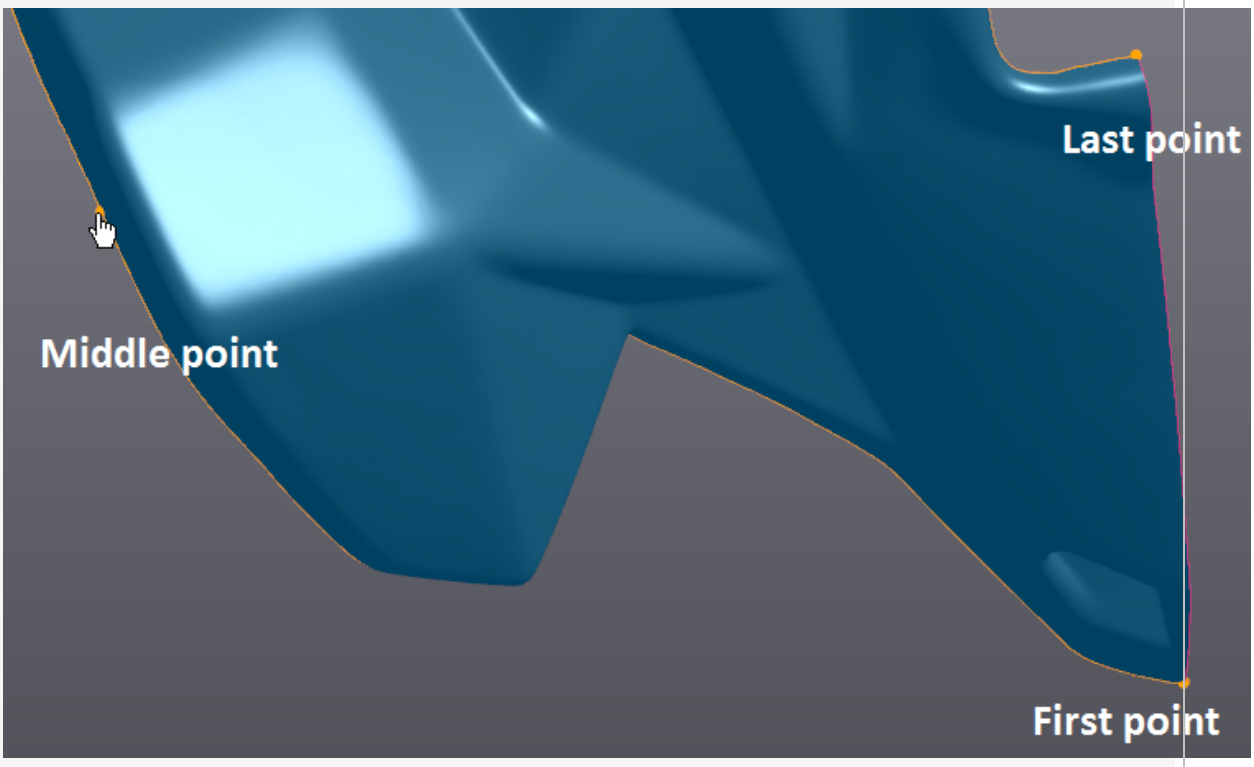
Step 5.

Smooth mesh



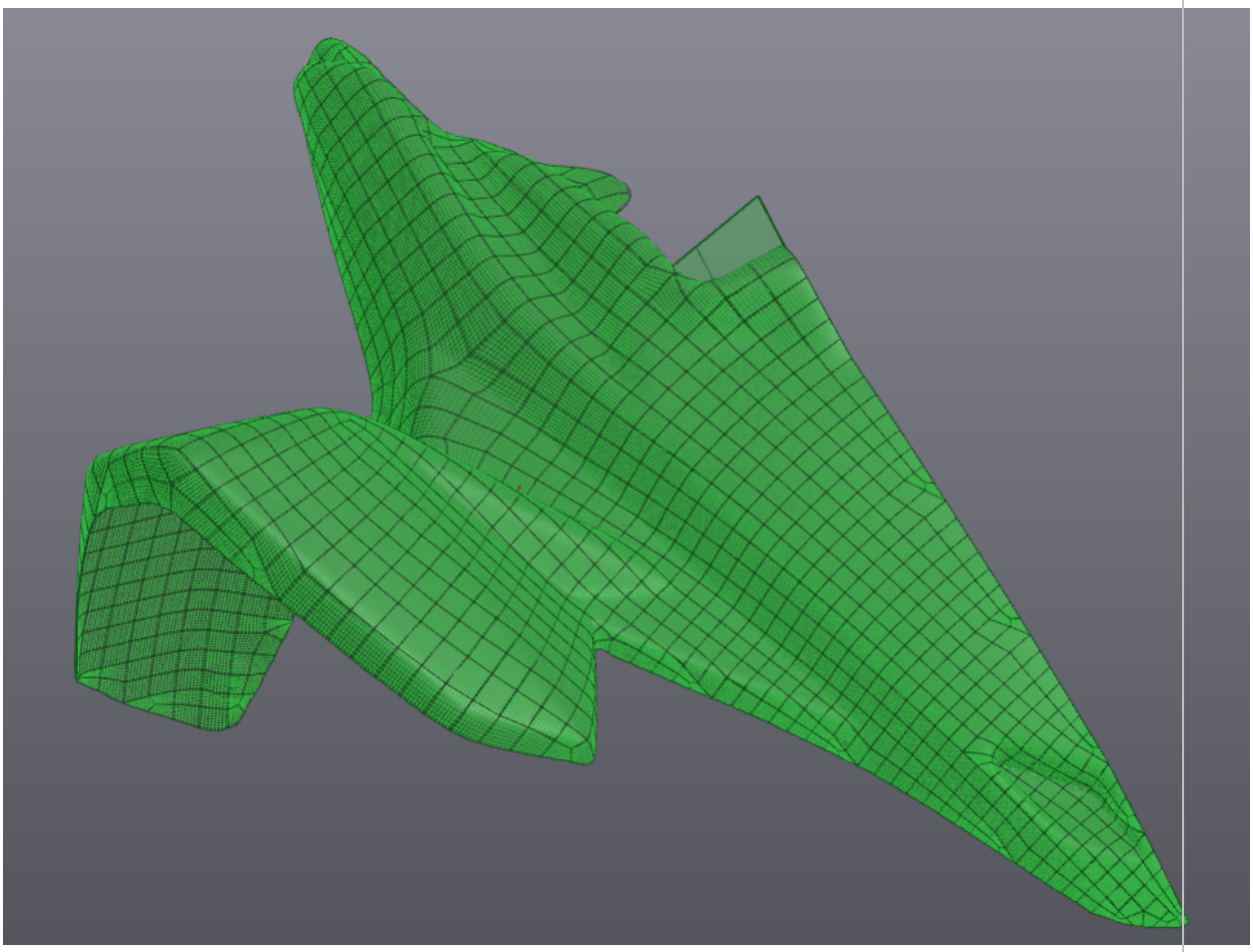
Step 6.

Edit Boundaries



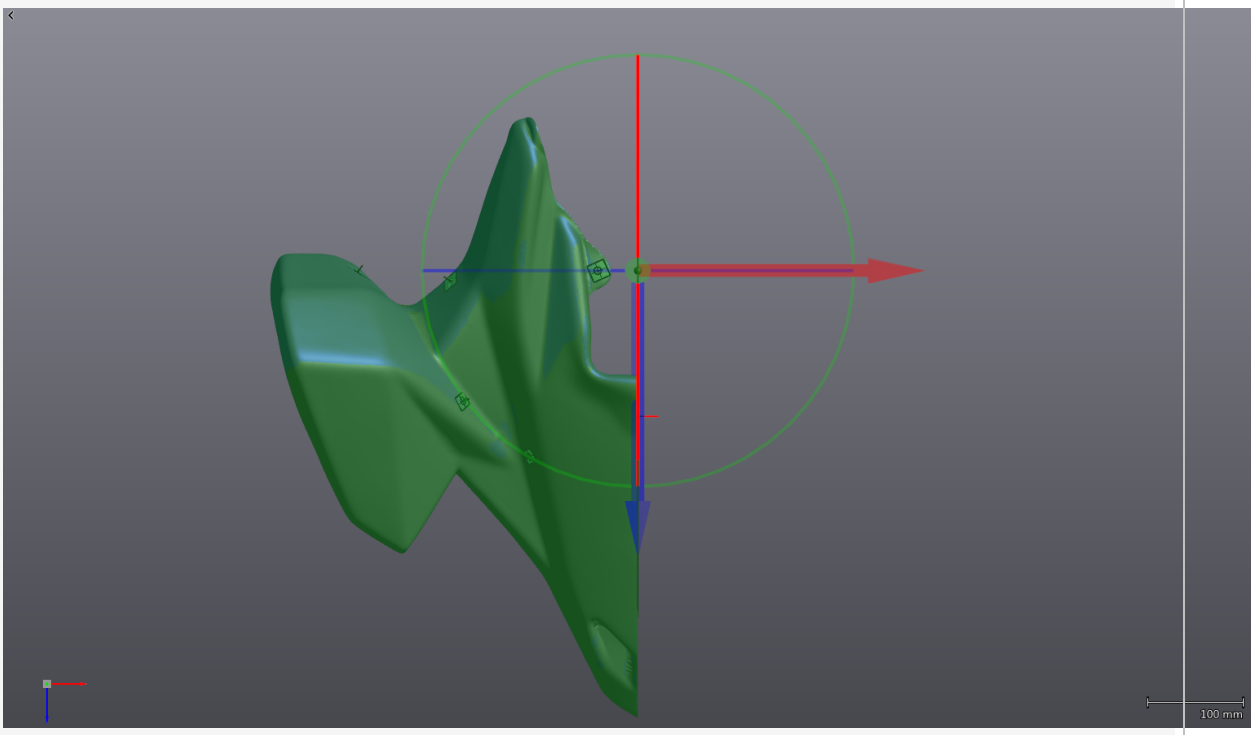
Step 7.

Create surface from mesh



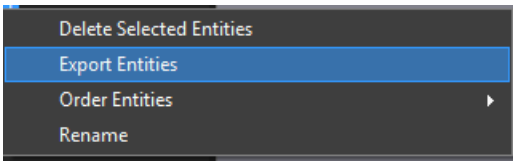
Step 8.

Align mesh to origin



Step 9.

Export for CAD software



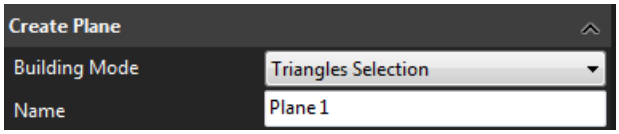
Project a circle on a plane

Add a plane

Create the plane on the surface where the holes circles will be created.

» Click on **Mesh 1** to see VXmodel functions.

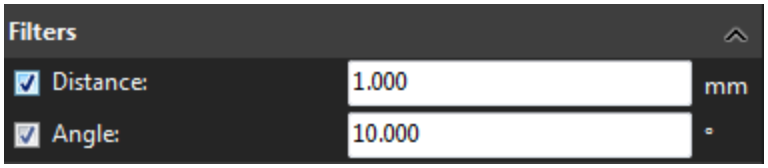
» Click on the **Add a plane**  icon .
» Set the **Building mode** to **Triangles selection**.



» Select the Brush button in the **Selection** tools.
» Hold the **CTRL** key and left click to select the planar surface close to the hole.

Note: The **Brush size** can be adjusted with the tolerance slider or the mouse scroll wheel.

» Check the **Distance** and **Angle** boxes for **Filters** and set the values to **1 mm** and **10°** respectively.

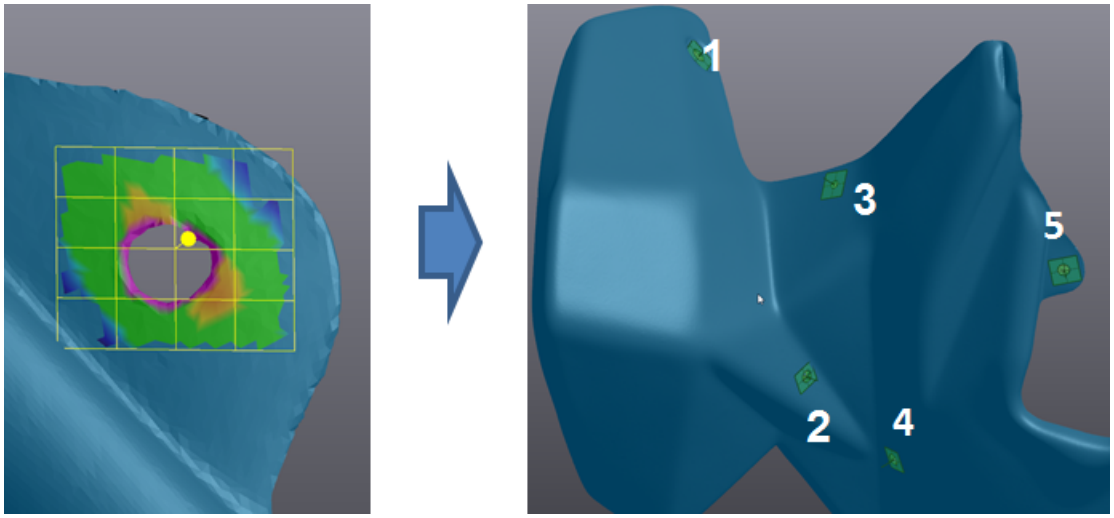


Note: Filtered data are shown in purple color on the selected data.

Note: The resulting plane is shown as well as a deviation colormap of the surface selected to the best fitted plane.

» Check **Keep constraints, filters and parameters settings** option in order to avoid readjusting the parameters for every new plane.

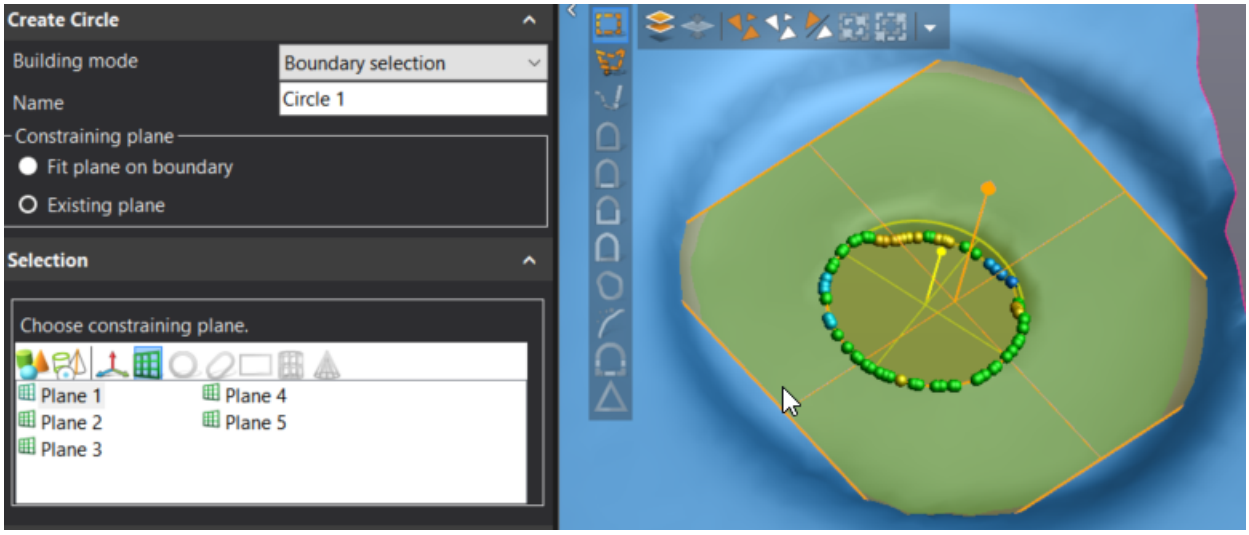
» Click on **Create** button to complete the task.
» Repeat the operation on every hole on the left side of the mesh.



Add new circle

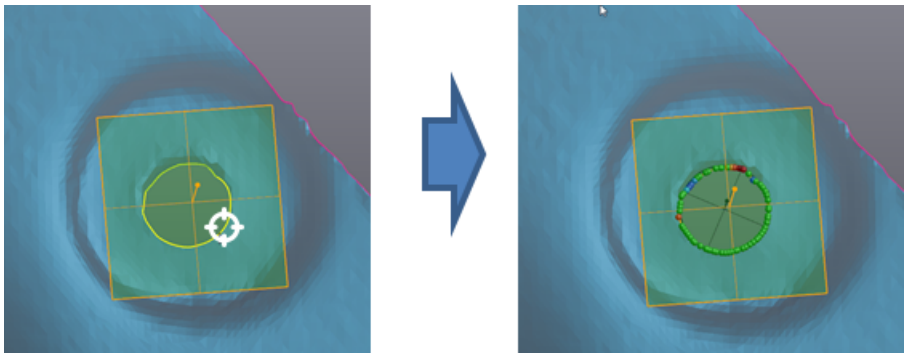
Repeat the previous step but this time for a circle.

- Click on the **Add a circle** button. Set the **Building mode** to **Boundary selection**.
- Select **Existing plane** as **Constraining plane**, then choose **Plane 1** or the plane that corresponds to the circle that will be created.



> **Note**: The plane can also be selected in the 3D viewer by holding **CTRL** and hover the mouse over it until the plane is highlighted in yellow.

- Click on the boundary corresponding to the circle to be created **Circle 1**.



- Check **Constraints** for the **Diameter** and set the value to **9.5 mm**.
- Click on **Create** to finalize.

> **Note**: Depending on the boundary, a prompted message can appear concerning data point filtering.

- Repeat these steps for **Circle 2** to **Circle 5** constraining their diameters following these values:

Diameters

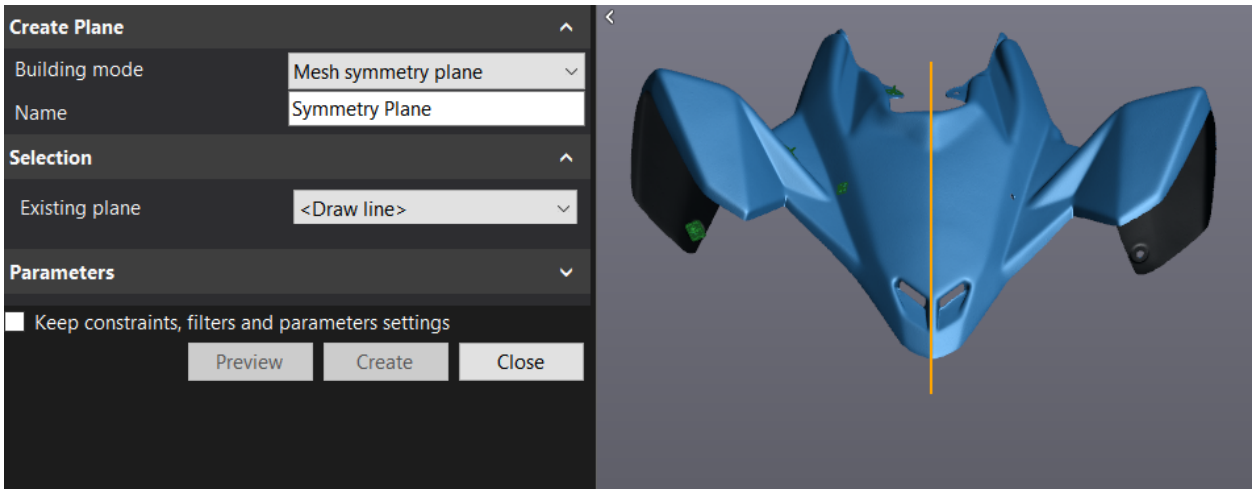
Circle 1	9.5 mm
Circle 2	8.0 mm
Circle 3	5.5 mm
Circle 4	8.0 mm
Circle 5	8.0 mm

Extract symmetry plane of mesh data

Later on in this tutorial, the mesh will be aligned using a plane going through its center. Because the geometry of this part is too complex and has a lot of freeform shape, it will be difficult to extract entities from the mesh. To resolve this issue, a **Symmetry plane** will be created.

Mesh symmetry plane

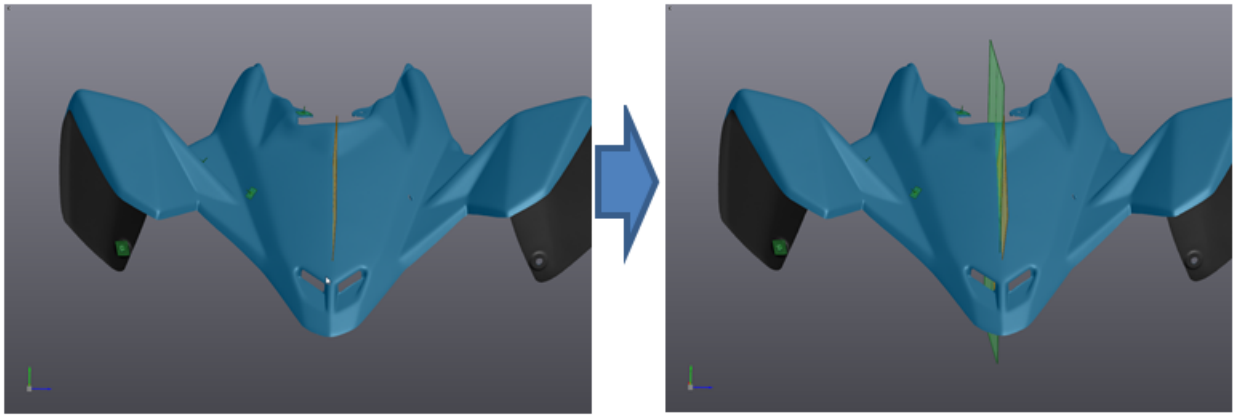
- Click on the **Add a plane**  icon.
- Set the **Building mode** to **Mesh symmetry plane**. In Selection, select **Draw line** in the **Existing plane** drop-down menu.
- Rename the plane **Symmetry plane**
- Hold **CTRL** and draw a line in the middle of the mesh.



Note: Drawing a line help the software locate the symmetry plane wanted by the user.

» Click on **Preview**.

Note: By clicking on the**Preview** button, VXmodel runs an analysis that locates and creates a precise symmetry plane.



» Click **Create** to confirm and **Close**.

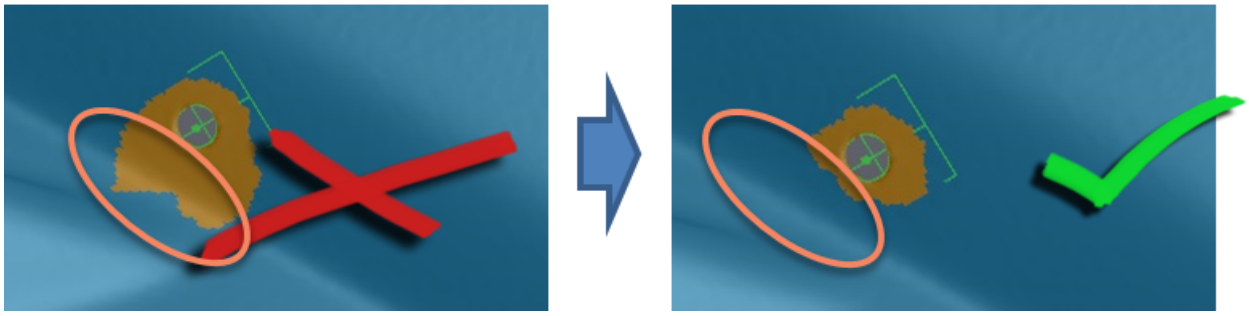
Defeature and fill holes

Defeature

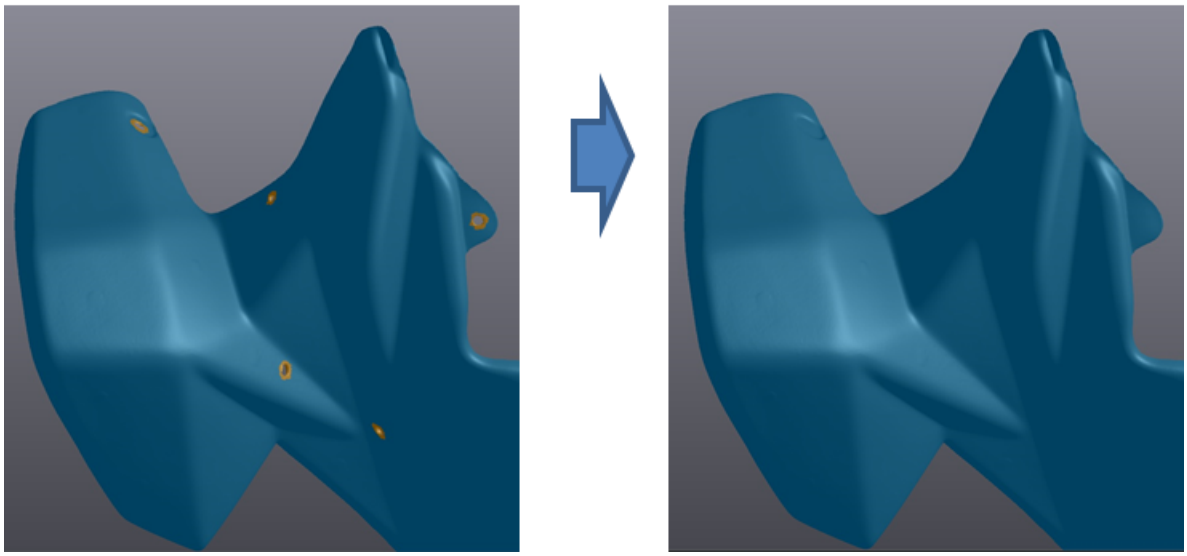
» Click on the **Free form** icon.

» Click on the **Select through** icon .

» Hold **CTRL** and click to shape selection around the five holes without including any corners in the selection.

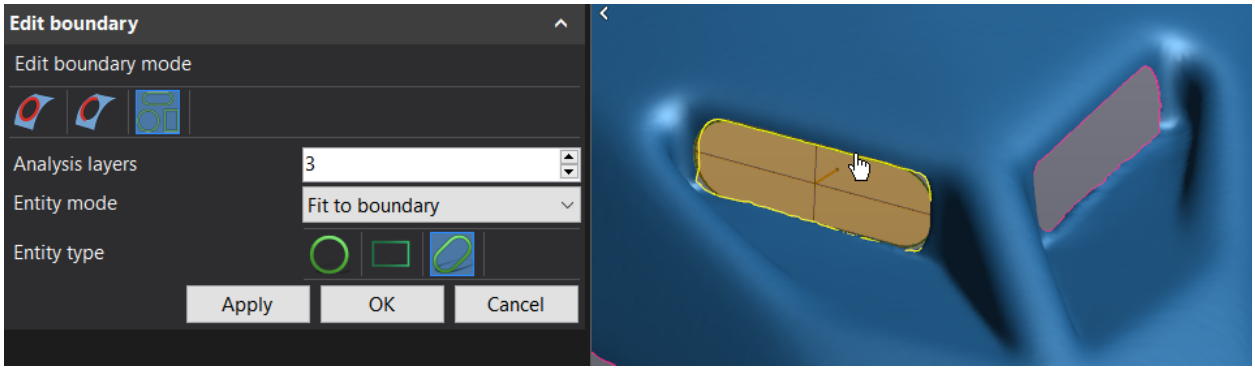


» Click on the **Defeature**  icon .



Edit boundary

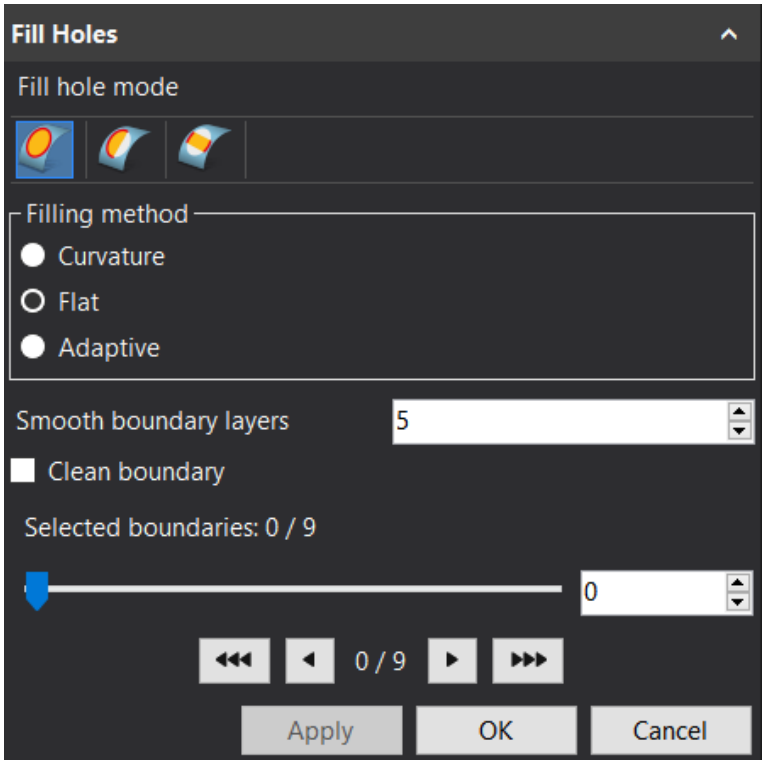
» Click the **Edit Boundary**  icon.
» Slect the **Slot** icon under **Fit to entity mode**.
» Set **Analysis layers** to **3**.
» Select the left opening.
» Click **Apply**.

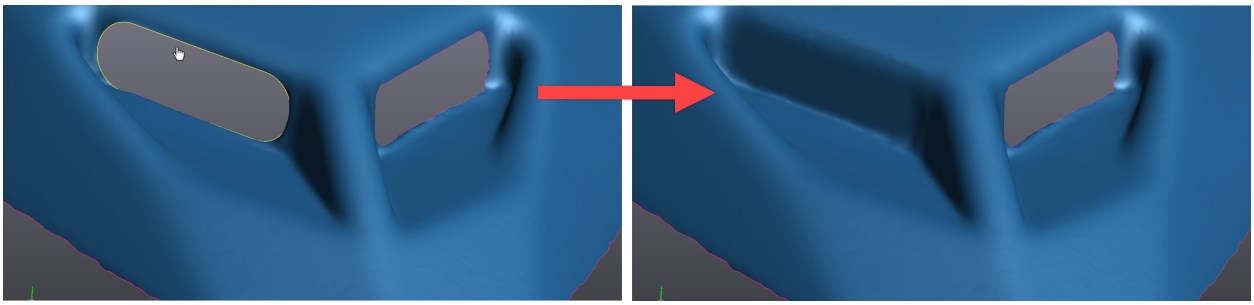


» Click **OK** to confirm and **Close**.

Fill holes

- Click the **Fill holes**  icon.
- Click on the **Whole** icon under **Fill hole mode**.
- Set **Filling method** to **Flat**.
- Set **Parameters** at **5** for **Smooth boundary layers**.
- Leave **Clean boundary** unchecked and click on boundary to locate.

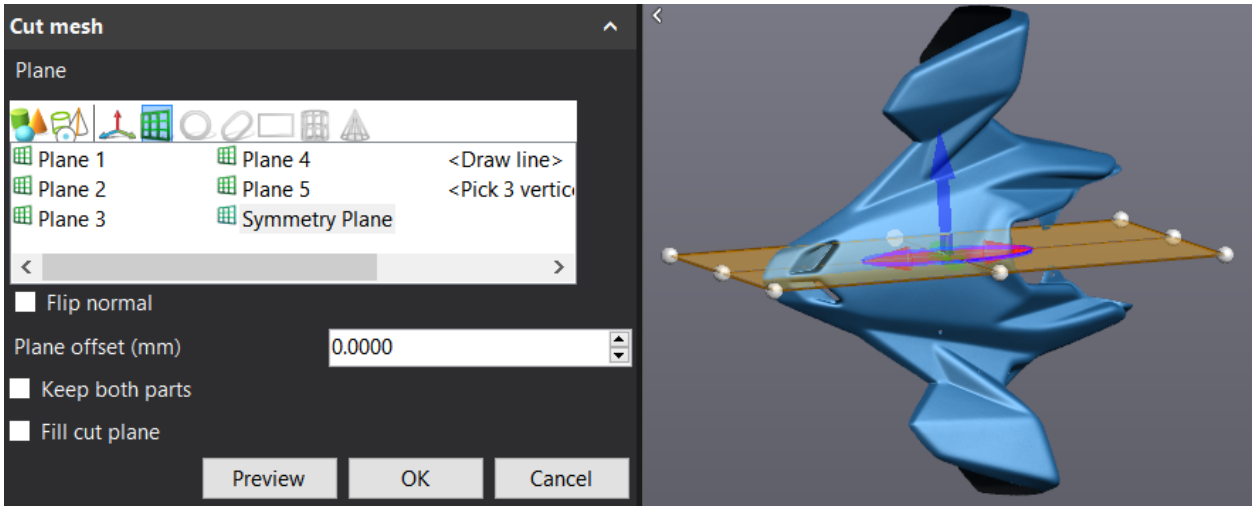




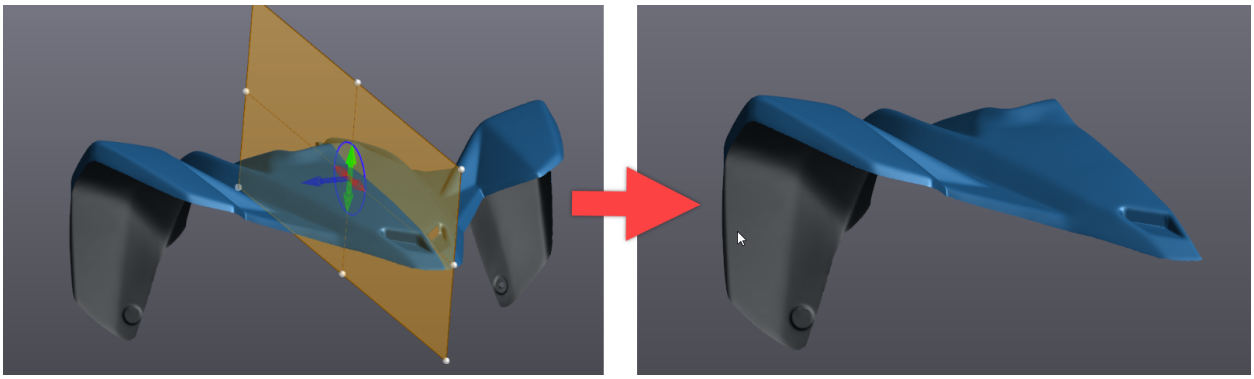
- Click **OK** to confirm and **Close**.

Reduce File Size

- Click the **Cut mesh** icon.
- Select **Symmetry plane** under the **Plane** section.
- Leave **Plane offset** at **0 mm**.
- Click on **Preview**.

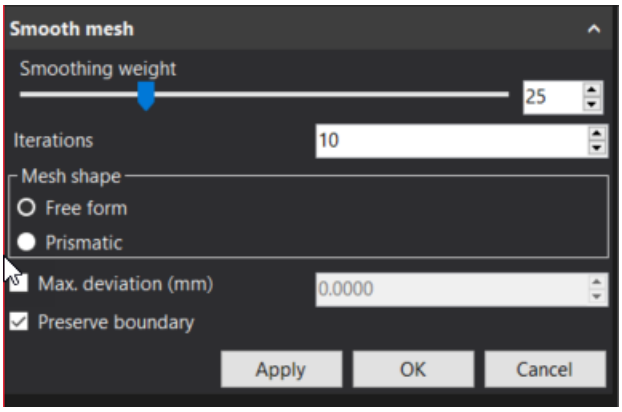


Note: Check the **Symmetry plane** positive direction to know which side is kept after the operation. If it is not pointing the side that needs to be kept, click on the  flip its direction.



Smooth Mesh

- Click the **Smooth mesh** icon.
- Set the **Smoothing weight** value at **25**.
- Keep **Iterations** to **10**.
- Select **Free form** for **Mesh shape**.
- Check only **Preserve boundary** in the **Options**.



- Click **Apply** to see a preview.

Note: The default values of the **Smoothing weight** are 25 and 10 for Iterations.

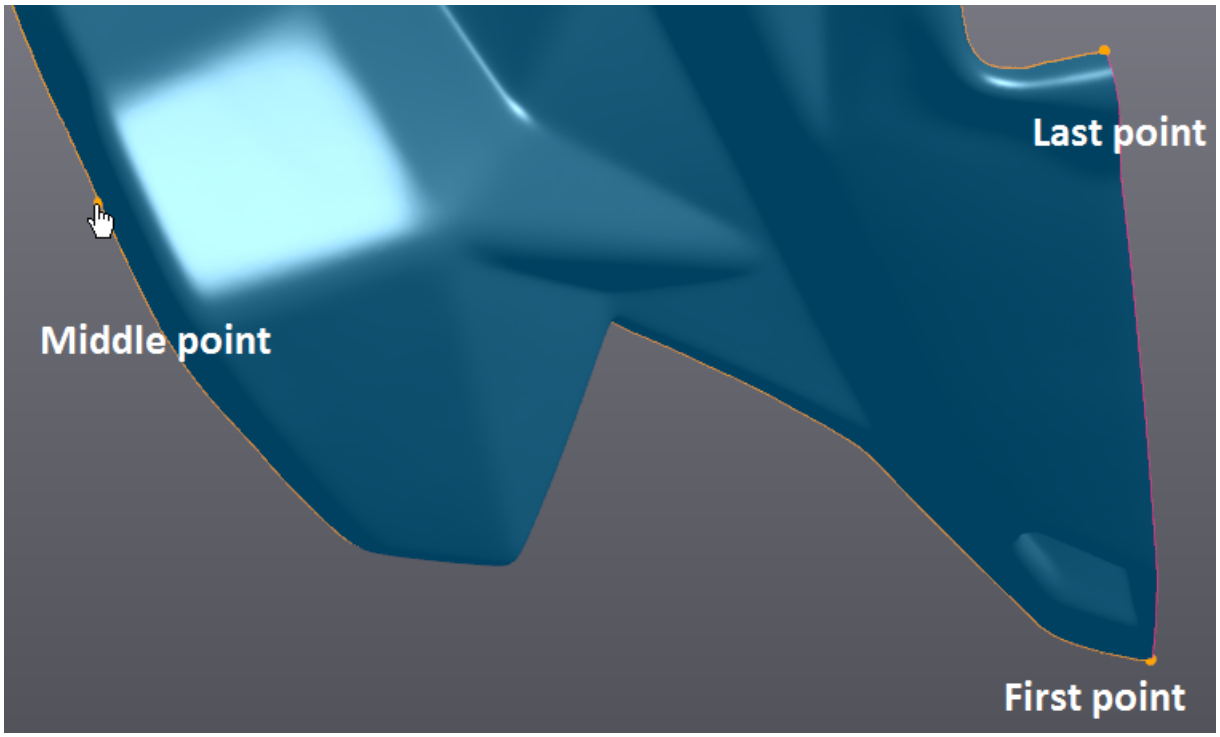
Note: The Iterations represent the number of applications done in one operation. For example, entering a value of 12 means that it will smooth the selected area 12 times once you click on apply.

Note: If there is no selection, Smooth Mesh will apply on entire mesh.

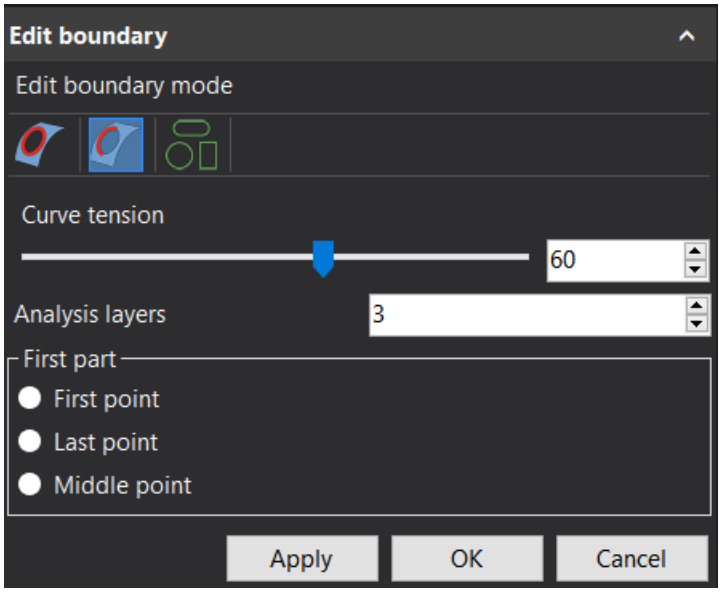
- Click **OK** to confirm.

Edit boundary

- Click the **Edit Boundary** icon.
- Click on **Partial**
- Click on the **First point**.
- Click on the **Last point**.
- Click on the **Middle point** to define the side of the boundary to edit.



» Change the curve tension to **60**.
» Click **Apply** then **OK**.



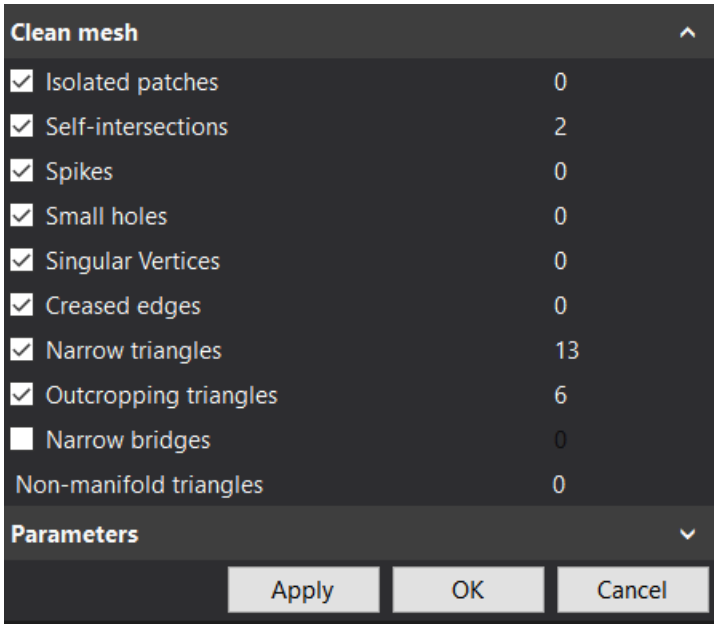
Note: Notice that the green curve is based on the original boundary and will be defined by the curve tension

Note: This step is important for improving the quality of the results of Step 7.

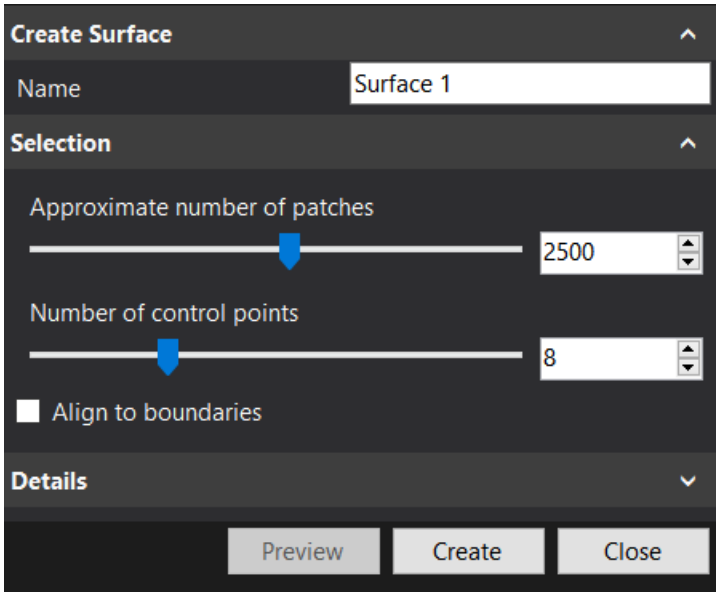
Create surface from mesh

This function allows creating a surface with organized patch layout on the entire mesh or on specific selected triangles. To avoid bad surface reconstruction, it is recommended to fix small irregularities of the mesh with the **Clean mesh** function.

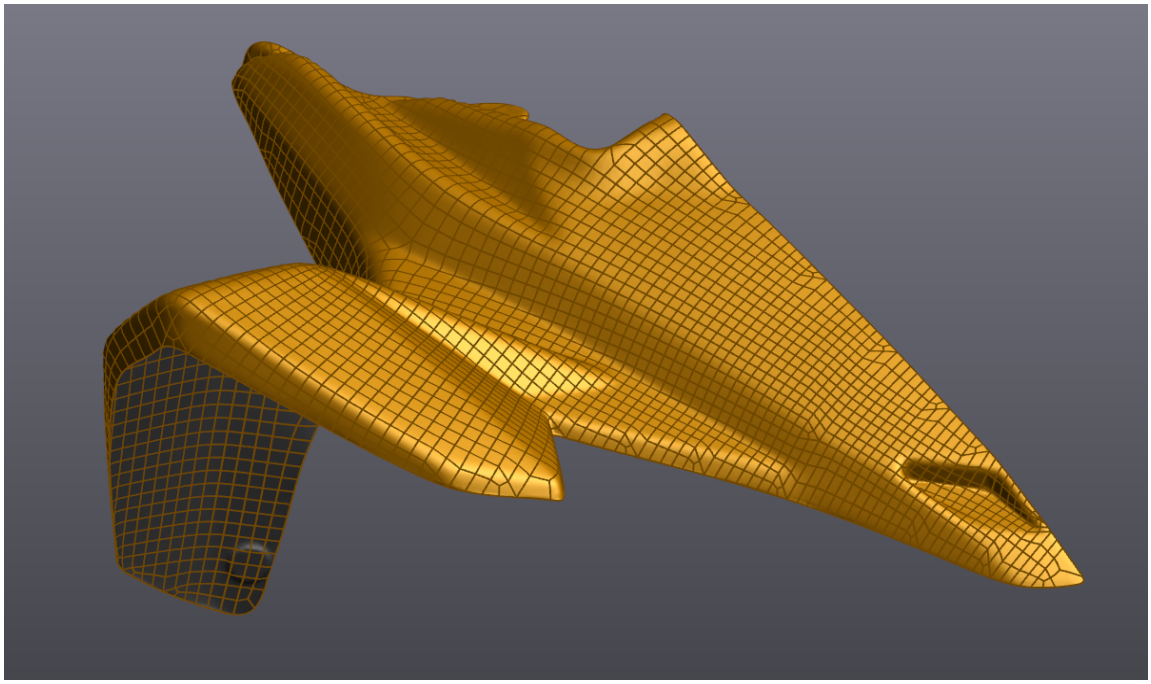
» Click on **Clean mesh** icon.
» Click on **Apply** then **OK**



» Click on the **Auto-surface** icon.
» Set **Approximate number of patches** to a value of **2500** and **Number of control points** to a value of **8**.
» Make sure that the option **Align to boundaries** is unchecked.



- Click **Preview** to visualize the result.
- Click **Create** to confirm.



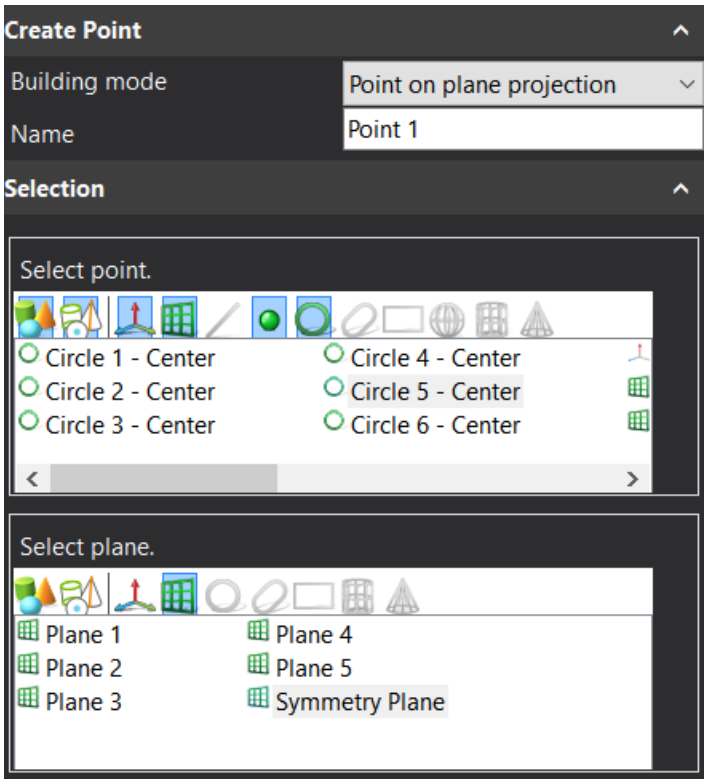
Align to origin

Alignment is done by pairing together entities previously created with the XYZ reference frame.

Project point on symmetry plane

- Click on **Create point**  icon.
- Set **Building mode** on **Point on plane projection**.

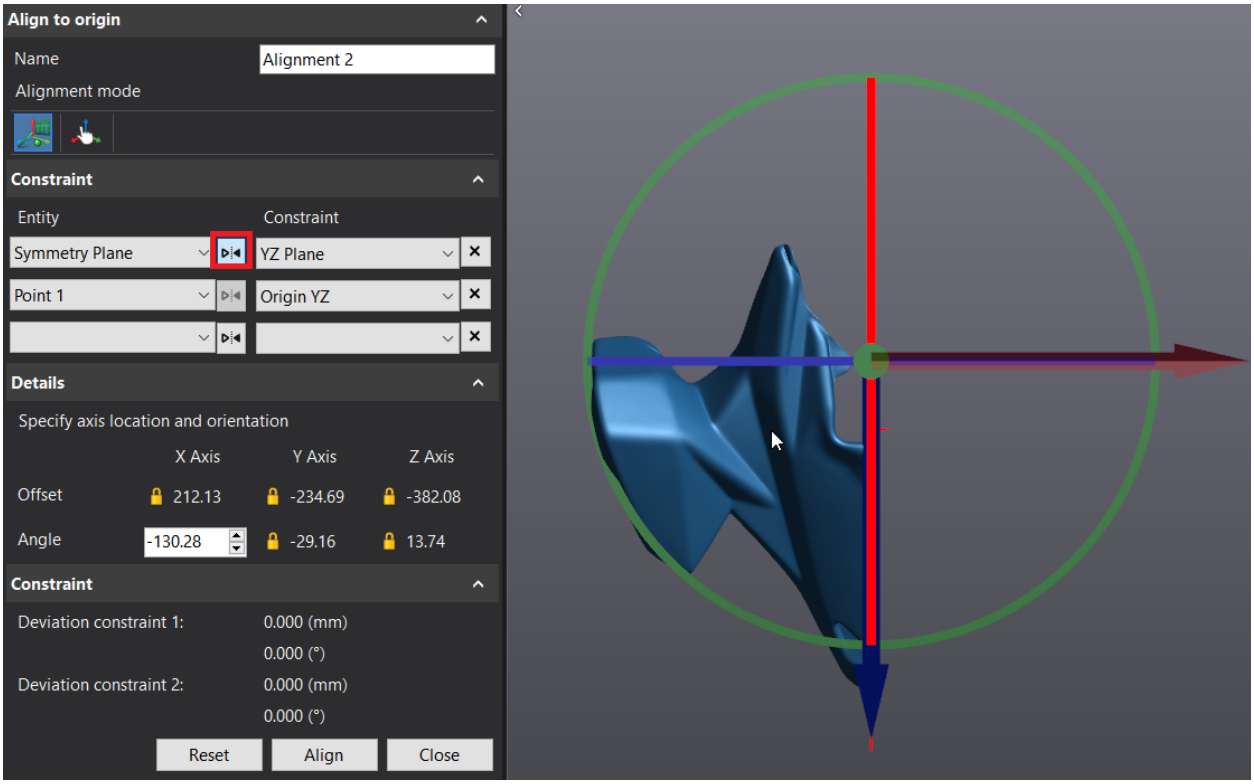
- Set in **Select point** the **Circle point** at the top right side (**Circle 5 – Center**).
- Set **Symmetry plane** for **Select plane**.



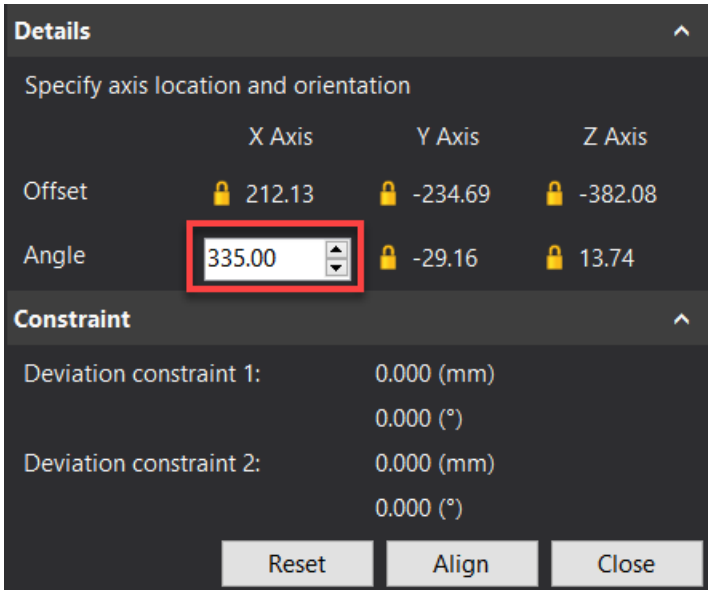
- Click on **Create** to finalize then **Close**.

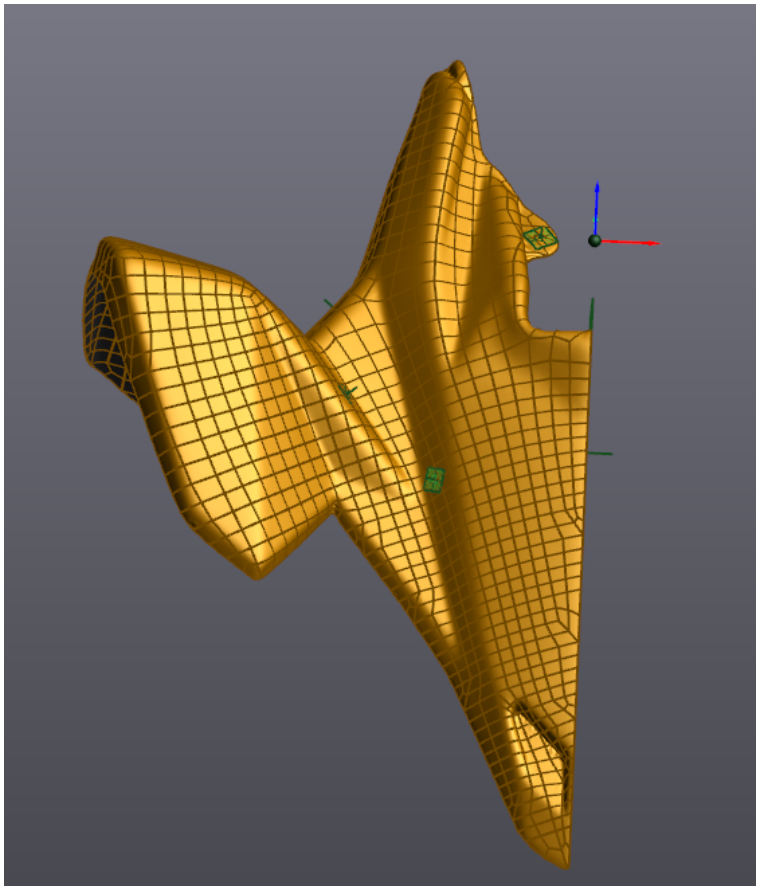
Mesh alignment

- Click on **Align to origin**  icon .
- From the Constraint Selection, under **Entity** column, click on the drop-down menu and select **Symmetry plane** and Pair it with the **YZ Plane** under the **Constraint** column.
- Second, under **Entity** column, click on the drop-down menu and select **Point 1** and pair it with the **Origin YZ** under the **Constraint** column.



» In **Details**, enter the value **335** in the **X Axis** for the **Angle**.
» Click **Align** to confirm.





Note: For paired entities, the degree of freedom (DOF) of the mesh decreases. The DOF constrained are locked next to the **Offset** and **Angle** boxes. The 3D view also indicates it with the colors of the reference frame for each DOF faded out.

Note: The flip button  allows flipping paired entities. Flip normal of Symmetry plane if needed.

Export entities

At this step, we will save the aligned mesh and the entities that will be used in the CAD software.

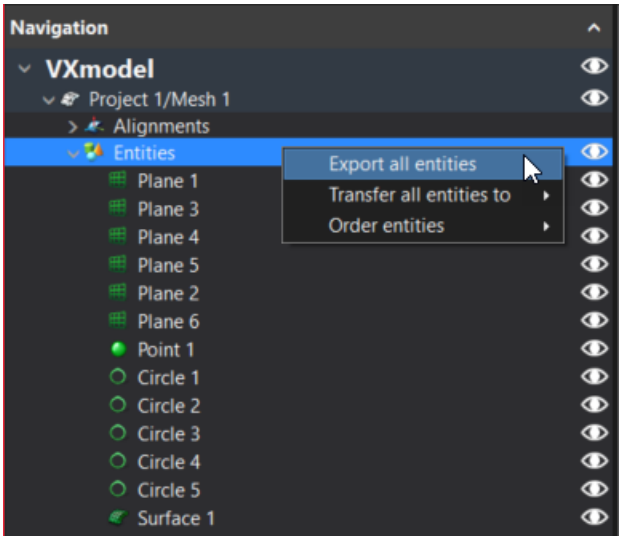
Save a mesh nodel

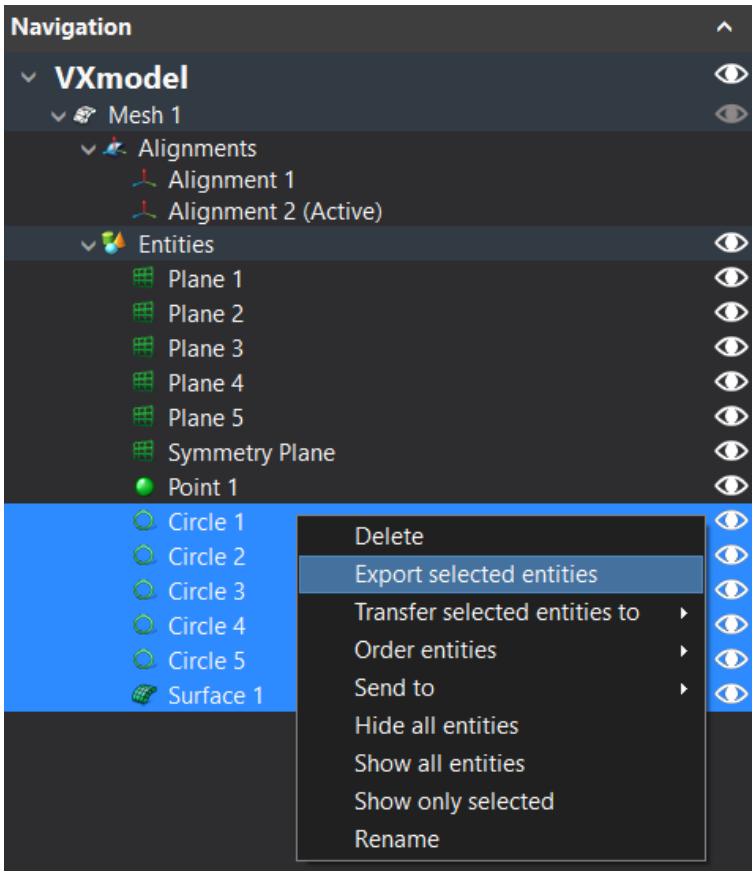
- Highlight **Mesh 1** by clicking on it in the **Navigation** tree.
- Click on the **Export>Mesh** button or Right click on the mesh en select **Export**

Export entities

Export the entities in STEP format to use in the CAD software

» Click on the **Export>All entities** button
» or right click on the **Entities** to export all the entities.



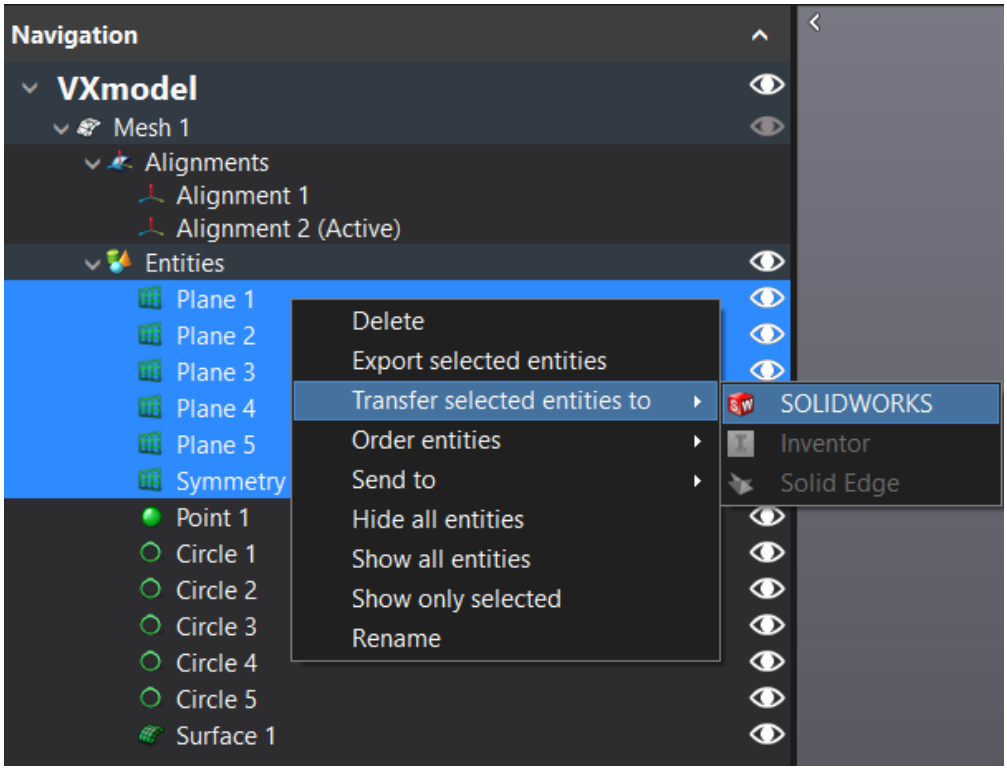


Note: To export one or more entities, select only the ones to be exported before clicking **Export selected entities**.

Export Entities – SOLIDWORKS/Inventor/Solid Edge Users

If you use SOLIDWORKS, Inventor, or Solid Edge VXmodel has a built-in CAD transferring function that executes the previous steps of exportation directly to SOLIDWORKS, Inventor, or Solid Edge.

- Right Click on the **Entities** node or on specific entities and Click on **Transfer All Entities to SOLIDWORKS, Inventor, or Solid Edge** button
- or **Transfer selected entities to SOLIDWORKS, Inventor, or Solid Edge** in order to directly export those entities to the selected CAD software.



Note: If SOLIDWORKS, Inventor, or Solid Edge is not open, the function will open it and create a new part and import the entities. If SOLIDWORKS, Inventor, or Solid Edge is open, it will import, in the active part, the entities.

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