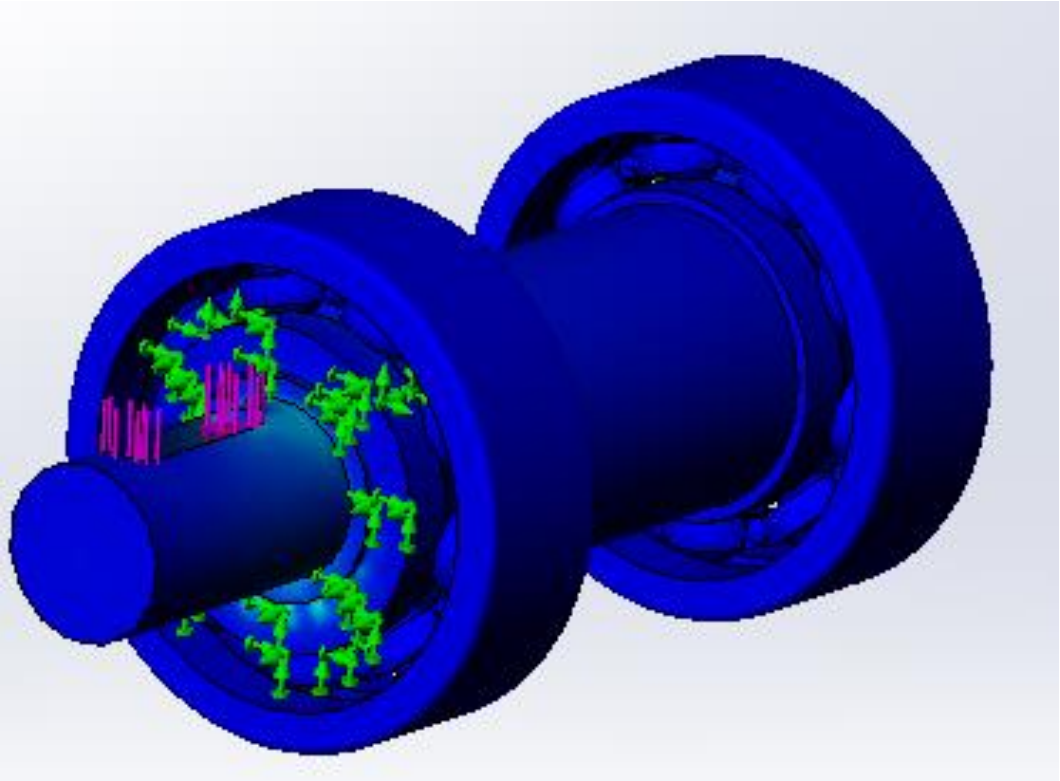
VM 250 Computational Lab Sessions
Lab #5

Finite Element Analysis with SolidWorks

Prepared by TA Group

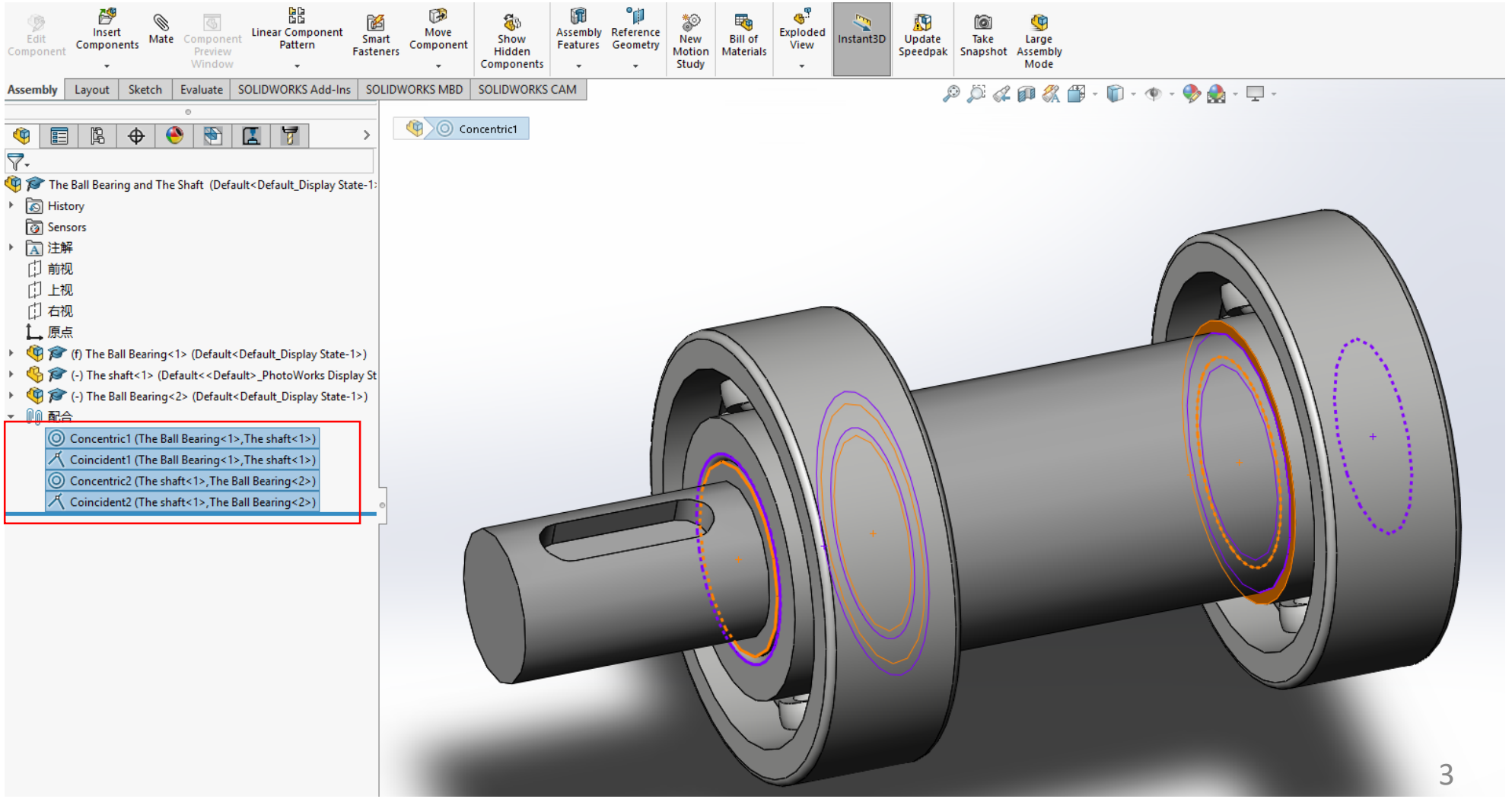
Outline

- Assign materials
- Fix the inner ring of the bearing
- Apply loads
- Local contact/ global contact
- Mesh
- Output of results



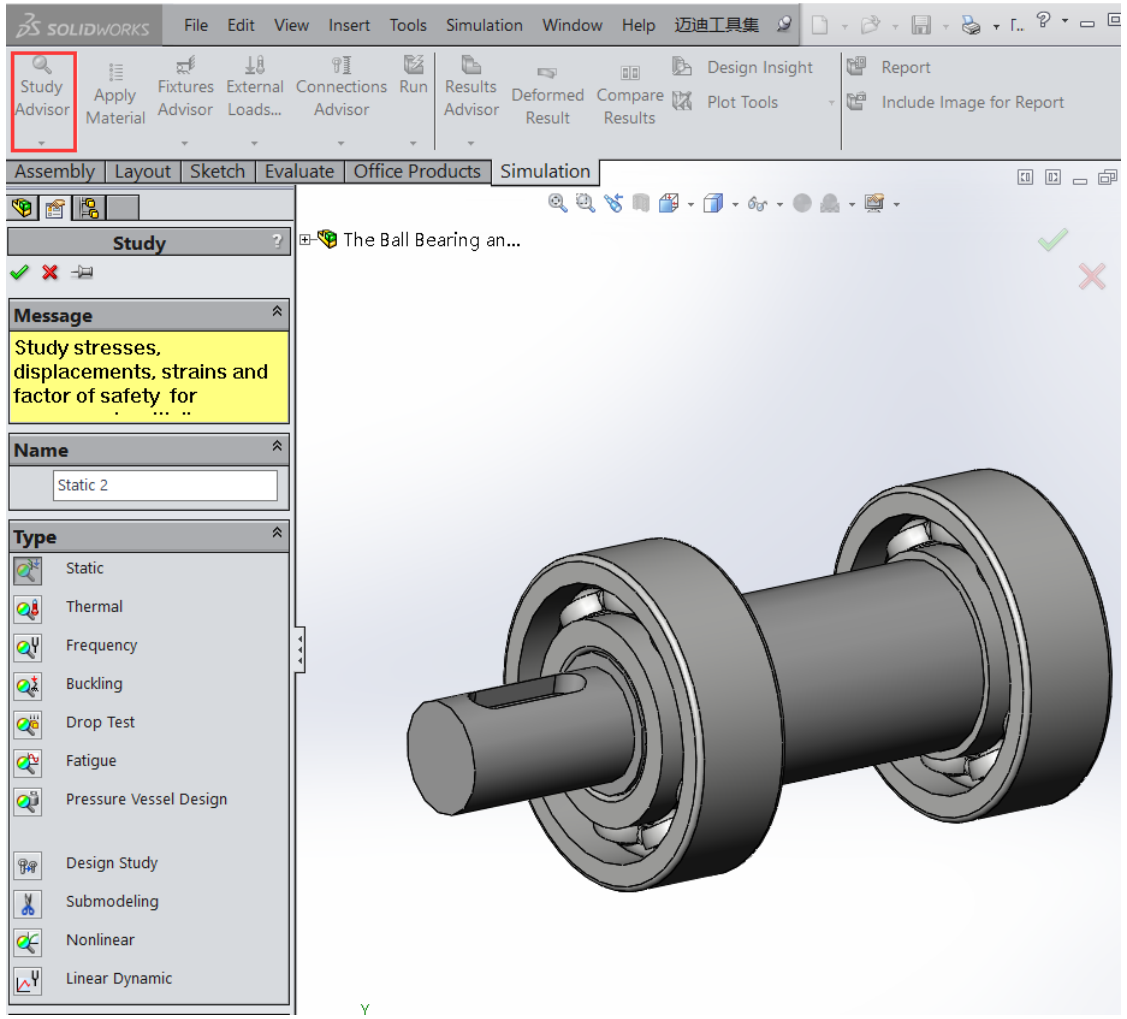
Create an Assembly

- Import all the previous parts including 1 shaft and 2 bearings, mating them.

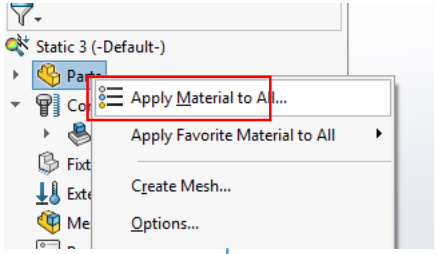


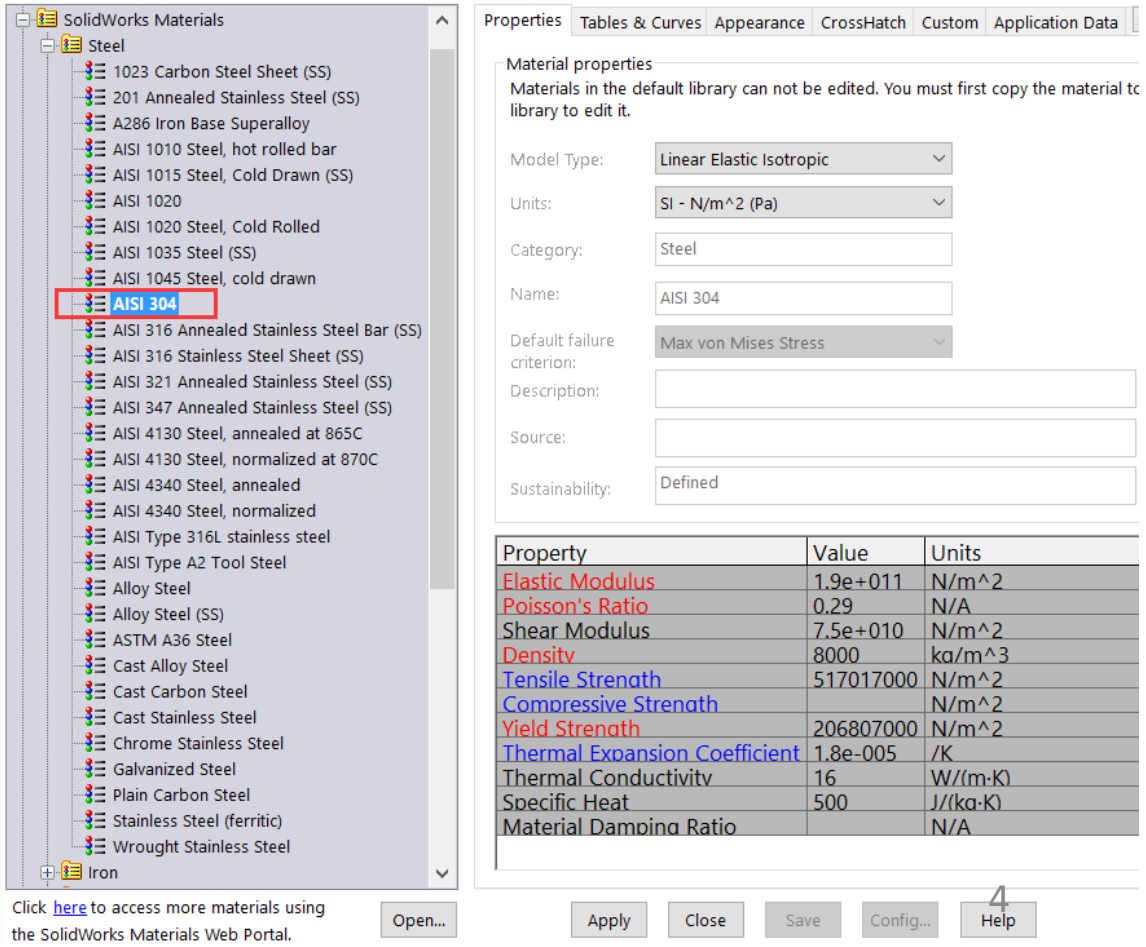
Assign materials to all parts

- Build a new static study in the simulation module



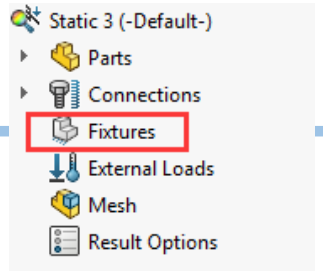
- Assign material to all

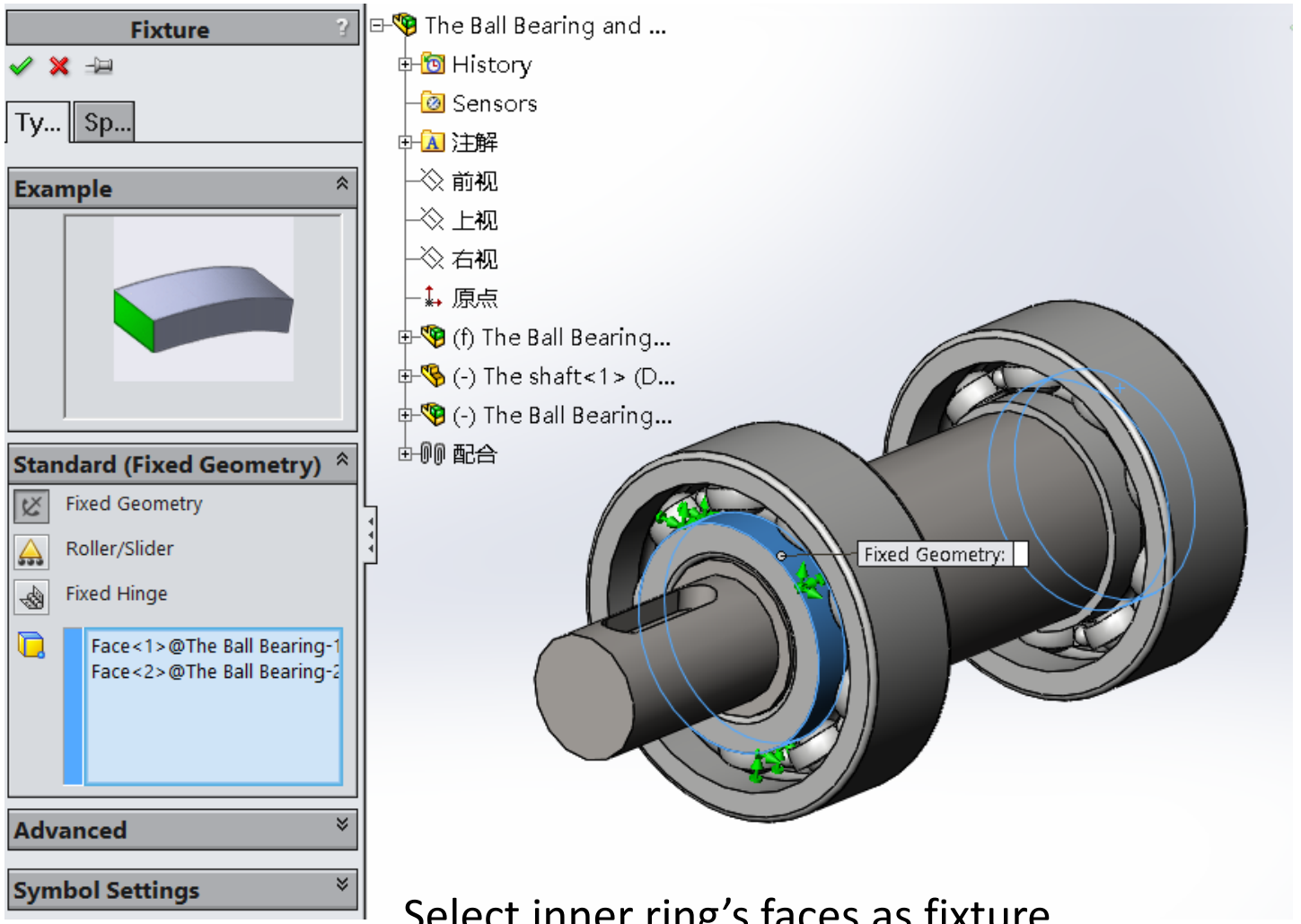




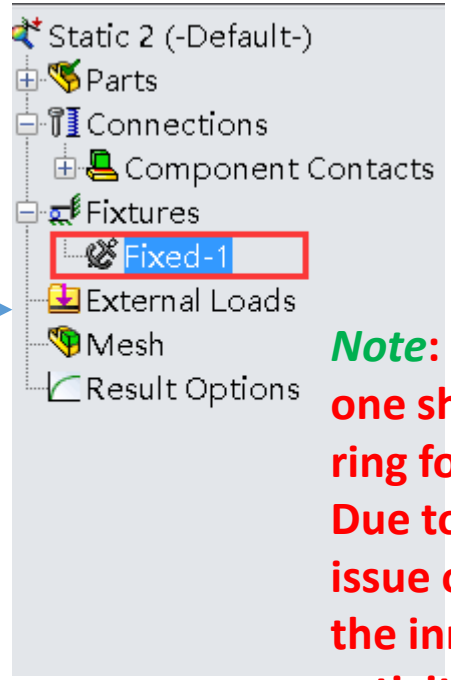
Fixture

- Fix the inner ring of the bearing





Select inner ring's faces as fixture

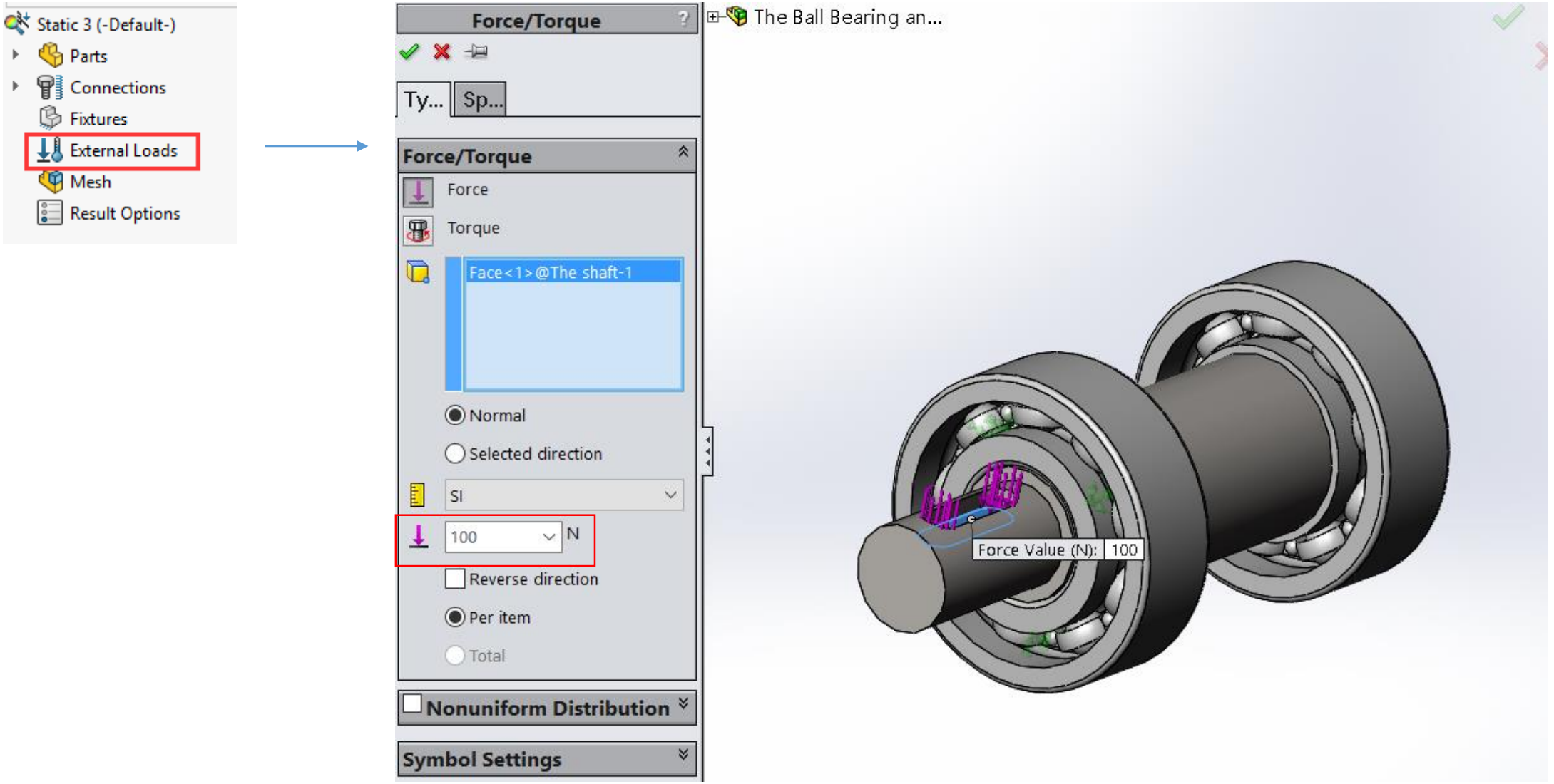


***Note*: For real applications, one should fix the outer ring for the analysis. Due to a computational issue on SolidWorks, we fix the inner ring in this activity.**

- Hide the green arrow by right clicking the fixed geometry.

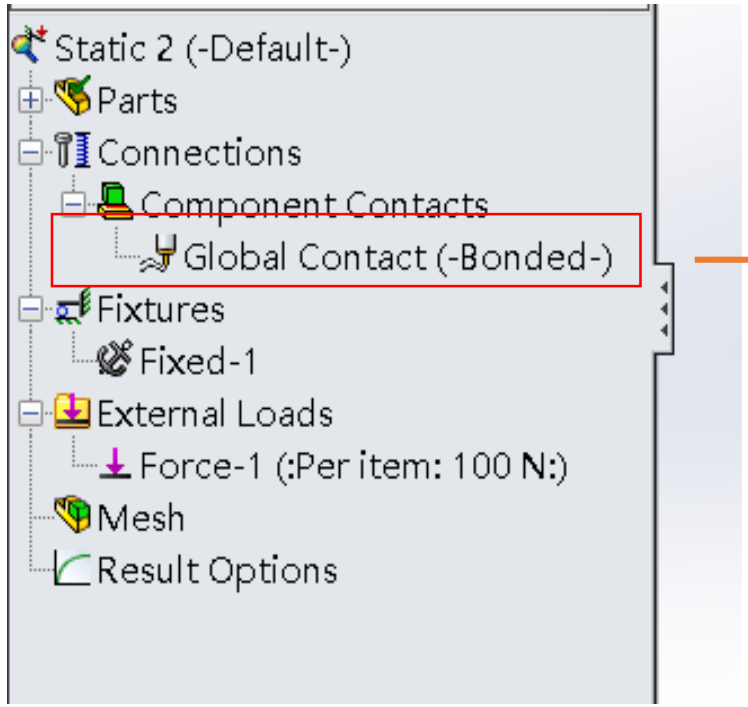
Apply loads

- Apply loads on the face of the key.



Local contact/ Global contact

- Assign a contact option on the surface sets.

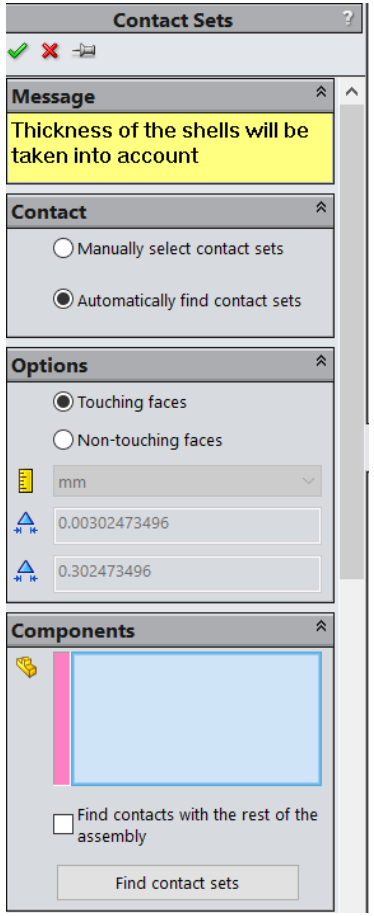


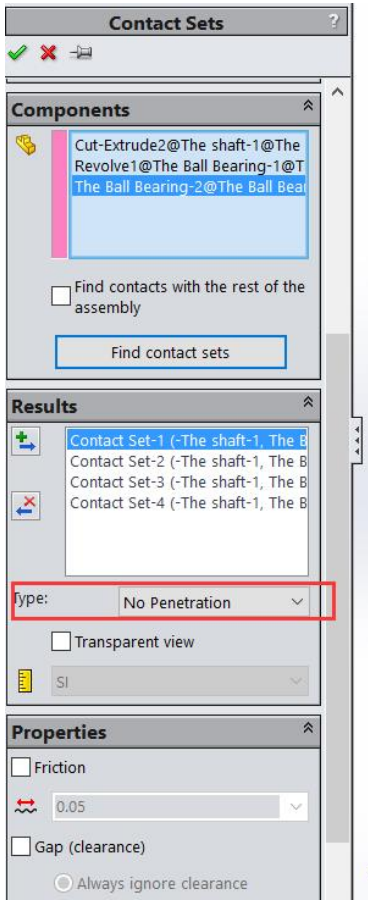
SolidWorks creates a global contact condition. The default option is a bond (tie), which means parts that are touching any other parts will be treated as bonded unless you choose any local contact sets.

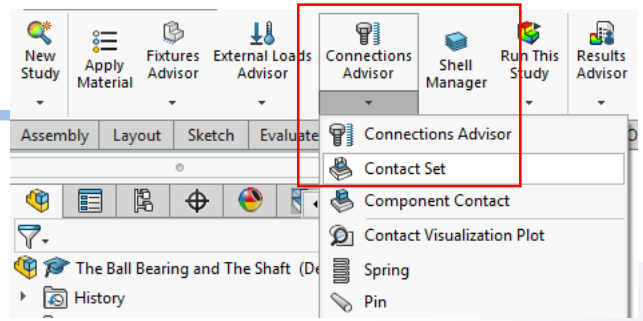
Note: Local contact sets:
Allow the contacting surface to be separable if the loads become extremely high.

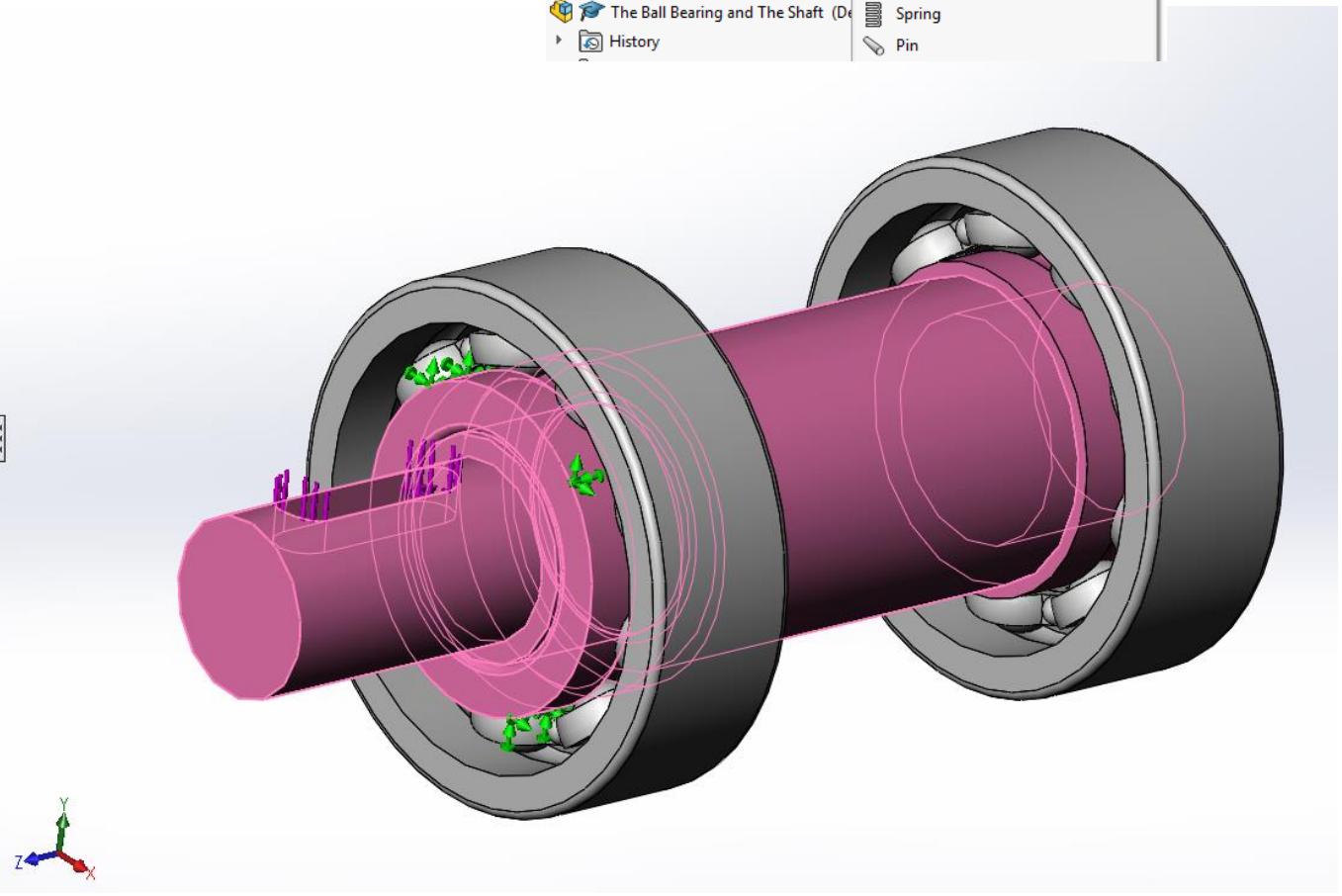
Local contact/ Global contact

- Manually/ Automatically choose the contact sets.





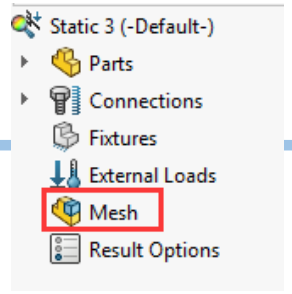




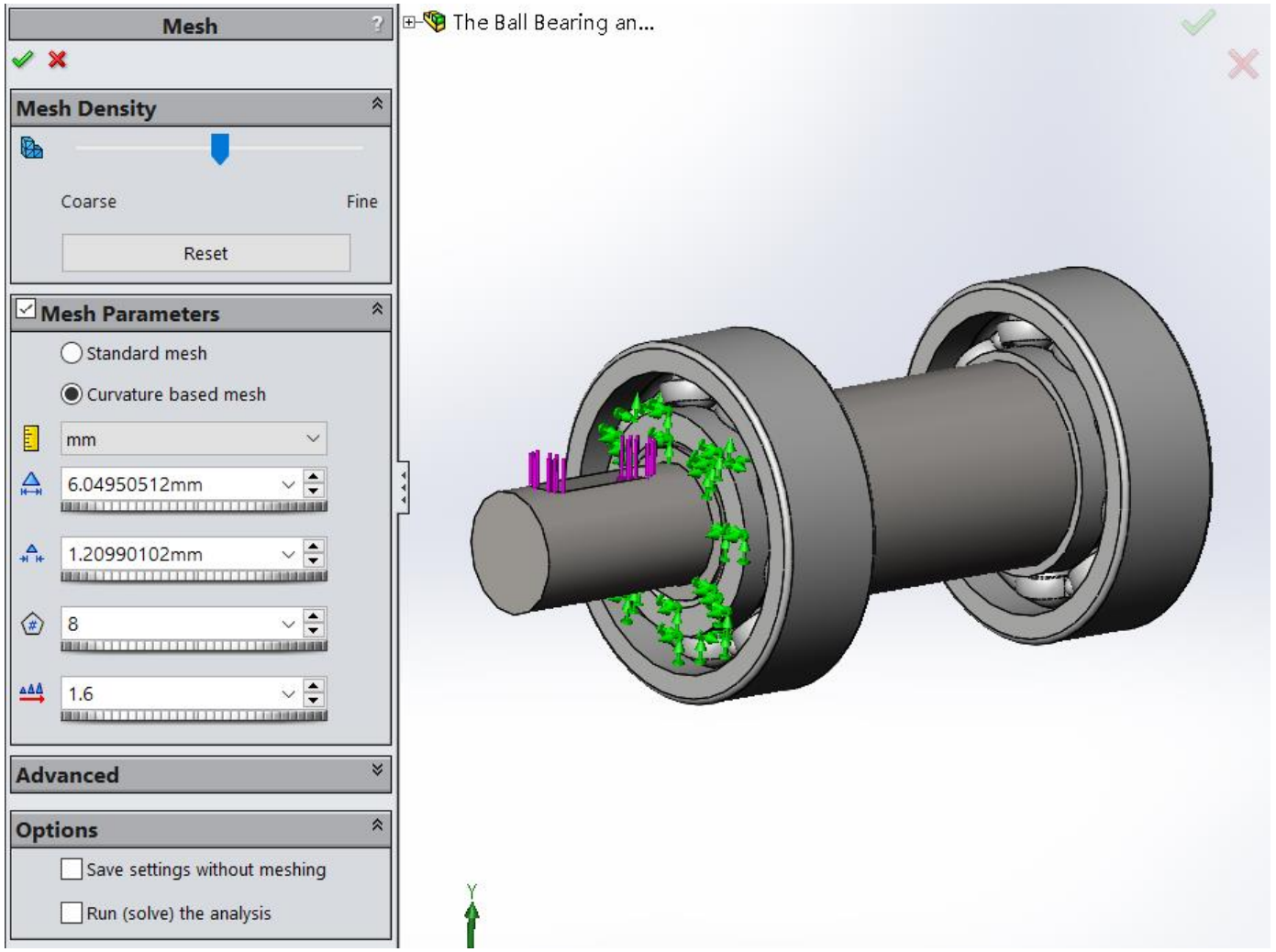
Automatically

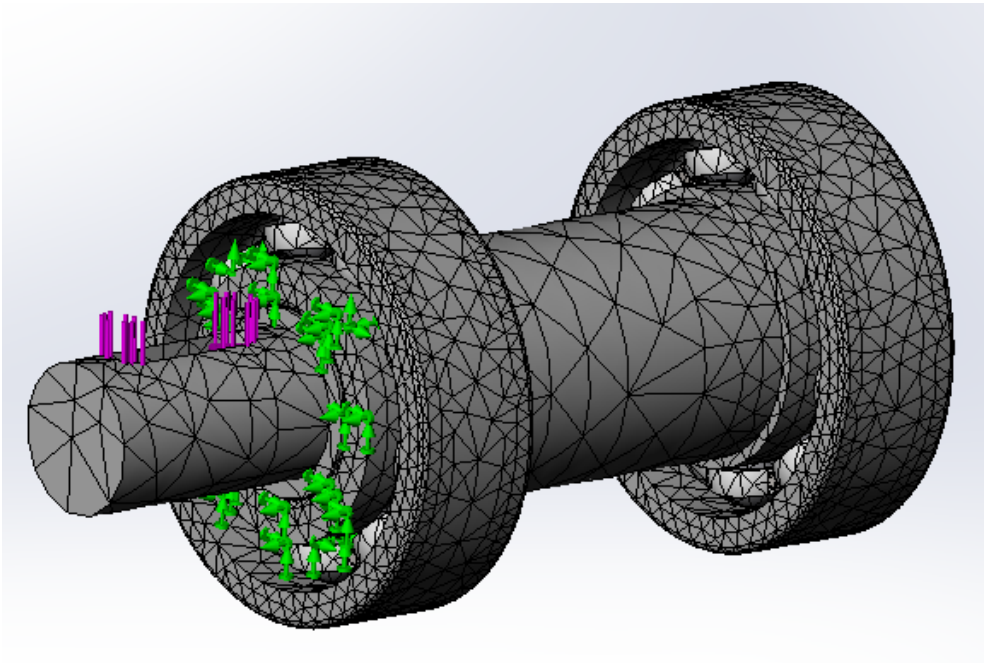
- No penetration means SolidWorks will monitor the contacting surfaces which may be separated from each other depending on the level of loads.

Mesh



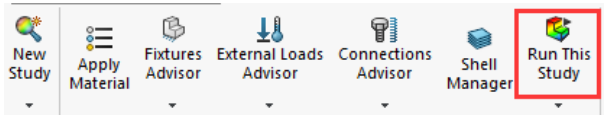
- Curvature based mesh



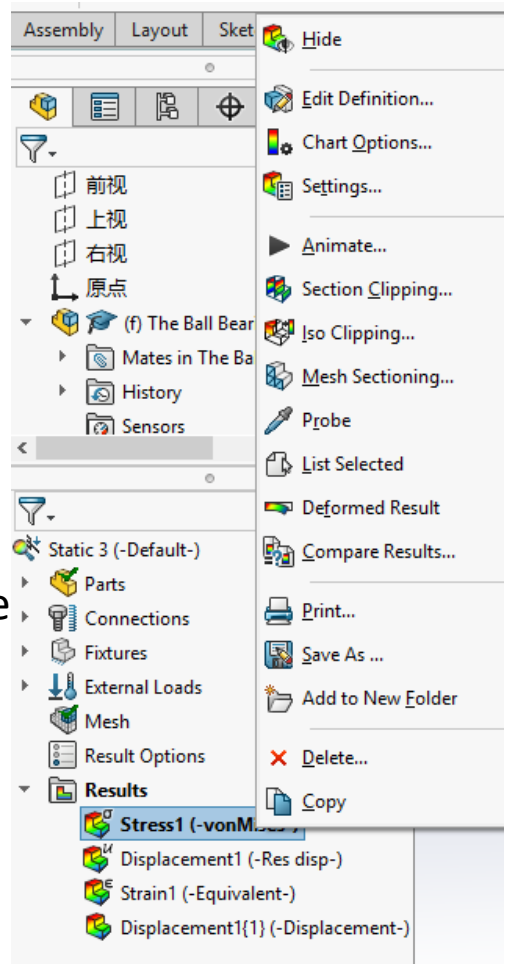


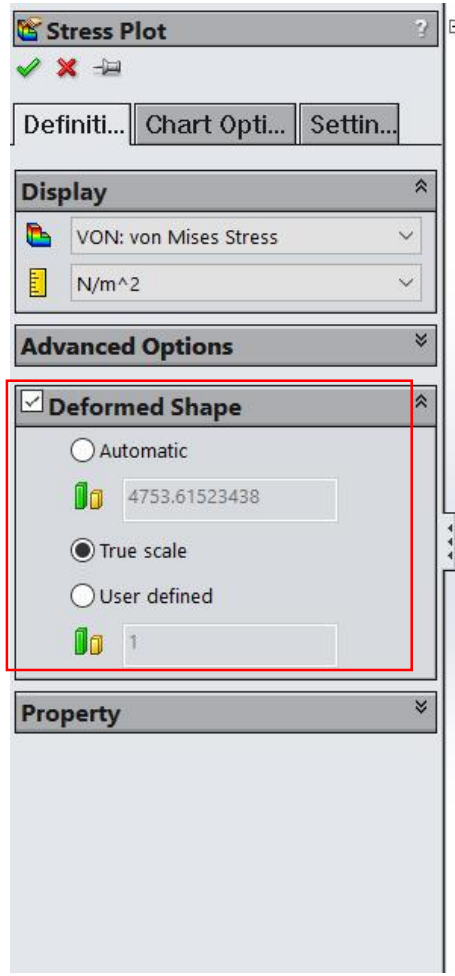
Run

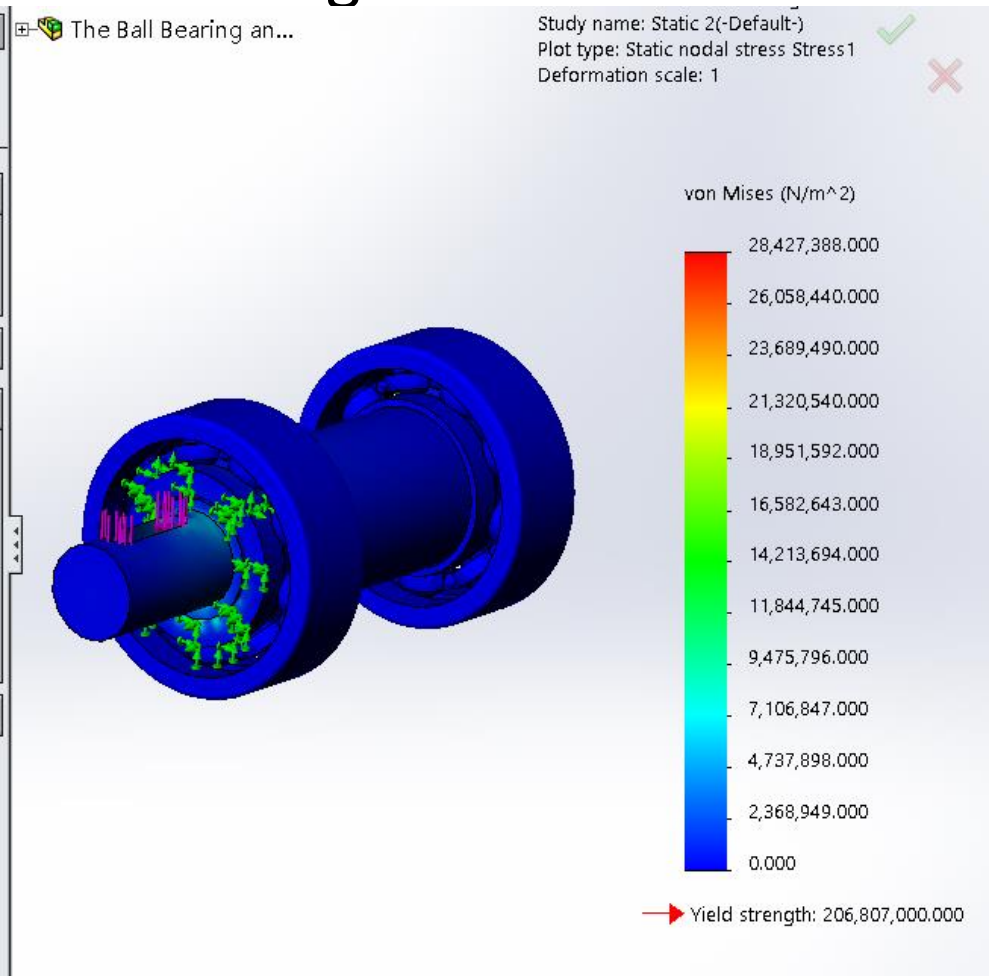
- Run this study
- Exaggerate the deformation or use true scale setting



1. Right-click on the stress and edit definition.
2. Choose the scale value for exaggerating the results.





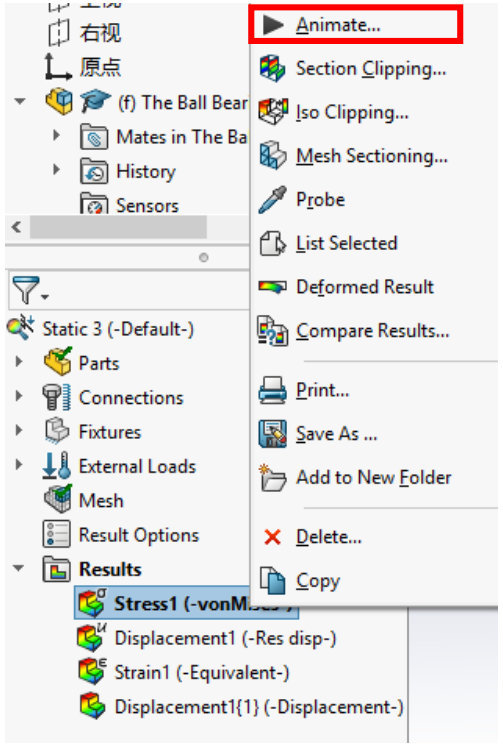


- The run time of the setting with no penetration contact will be longer than the one without it

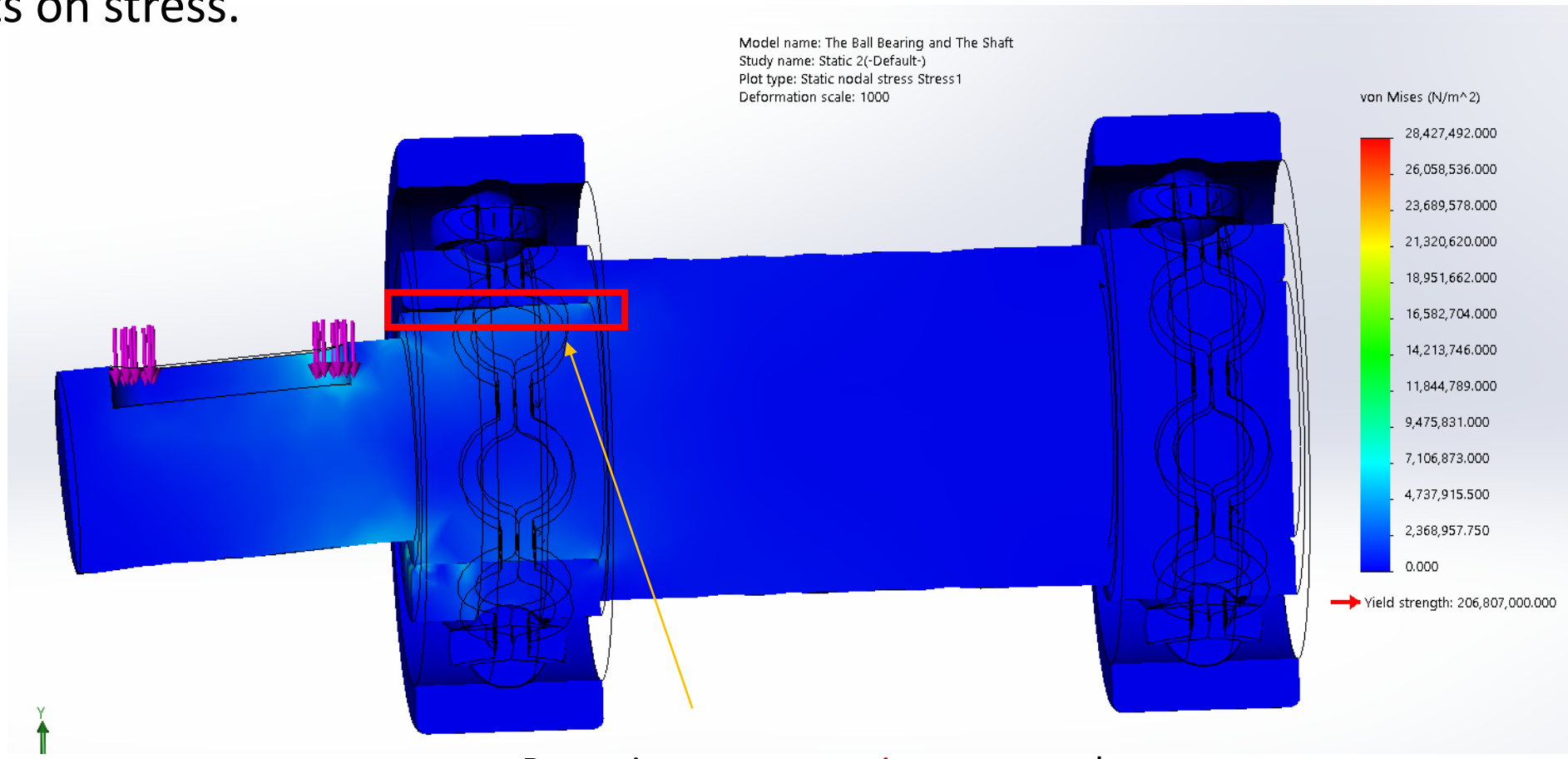
Results on stress

The procedures to generate results

- 1. Create a cross section view.
- 2. Show results on stress.
- 3. Animation



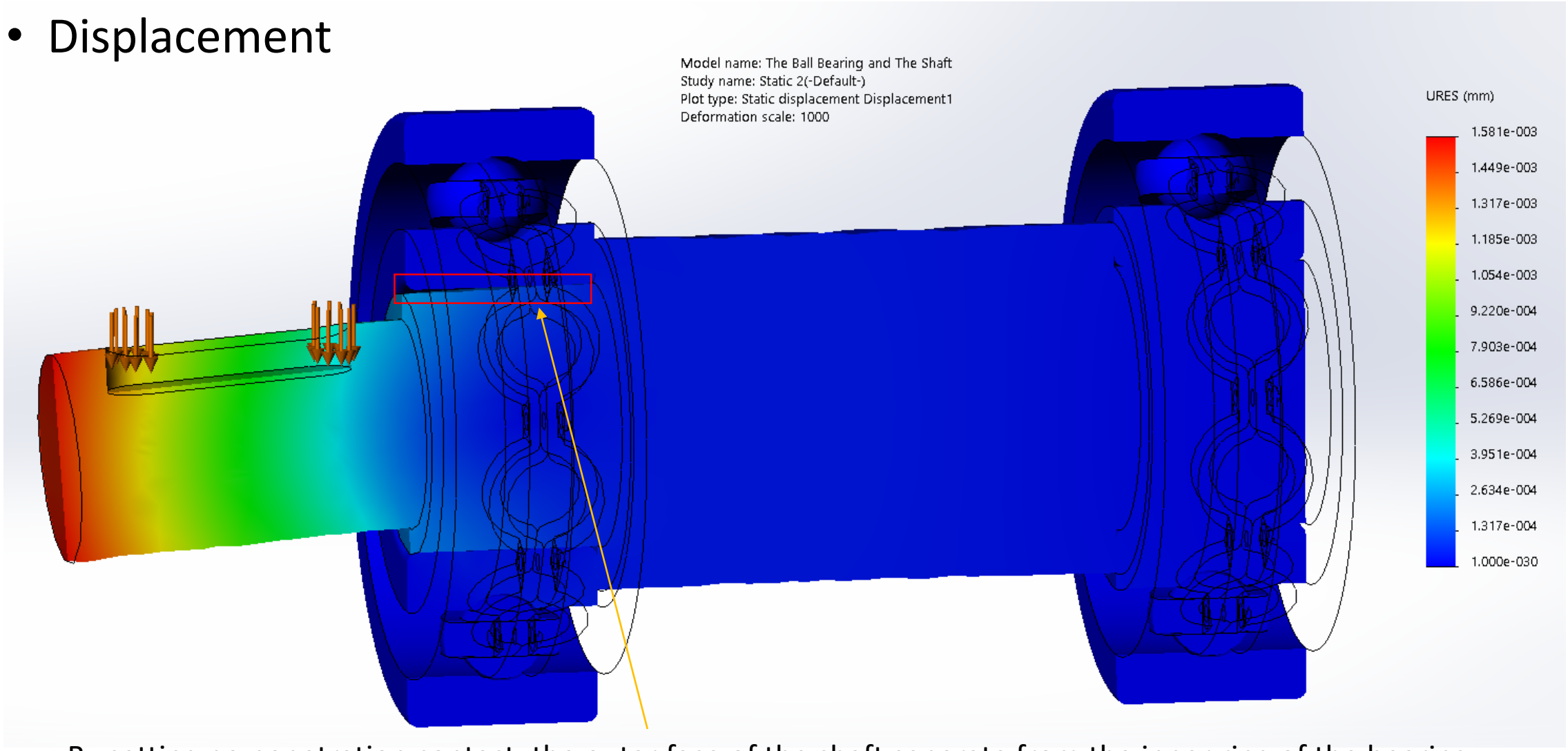
Visualize with an animation



By setting no penetration contact, the outer face of the shaft separates from the inner ring of the bearing (shown on the rectangle in red)

Results on displacement

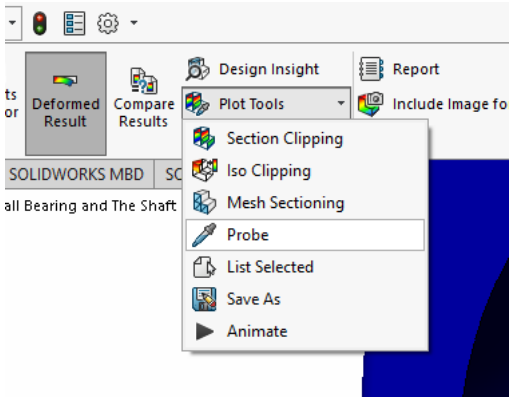
- Displacement



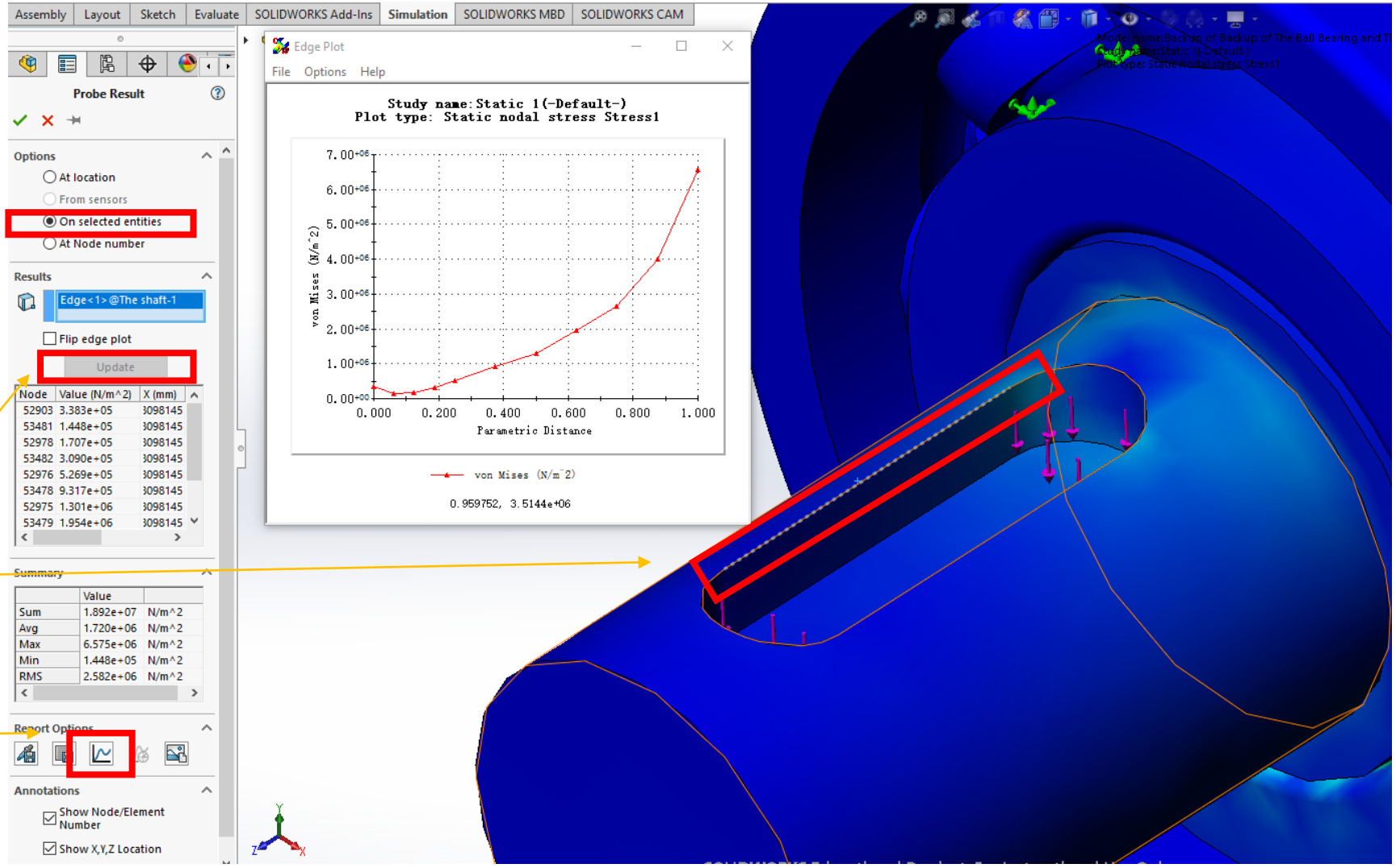
By setting no penetration contact, the outer face of the shaft separate from the inner ring of the bearing as shown on the rectangle in red.

Plot of stress on an edge

- Stress



1. Choose probe
2. On the selected entities options
3. Select the edge
4. Update
5. Plot



Lab assignment

3D Sketch

- Draw this part with SolidWorks.