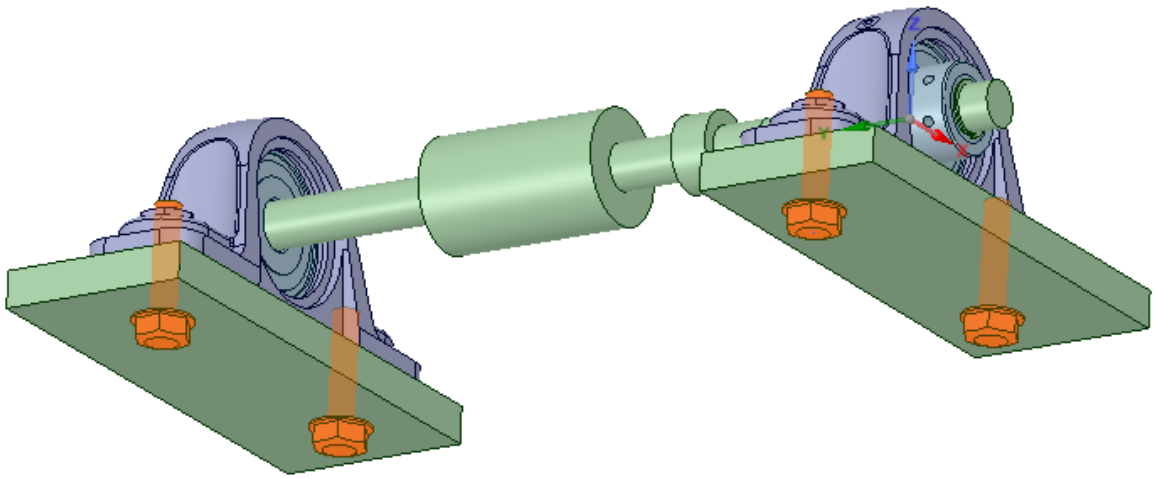
Ansys Mechanical Beyond the Basics

Module 02 Workshop:
Further Geometry Considerations

Release 2021 R2

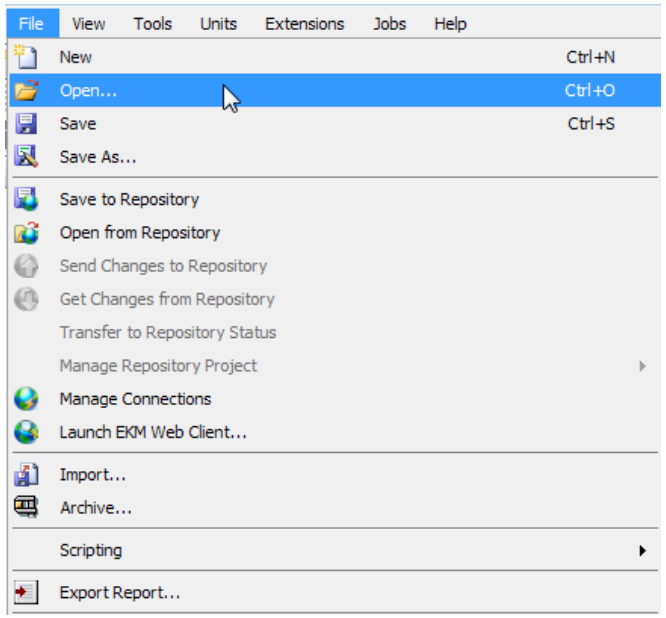
Workshop 02: Further Geometry Considerations

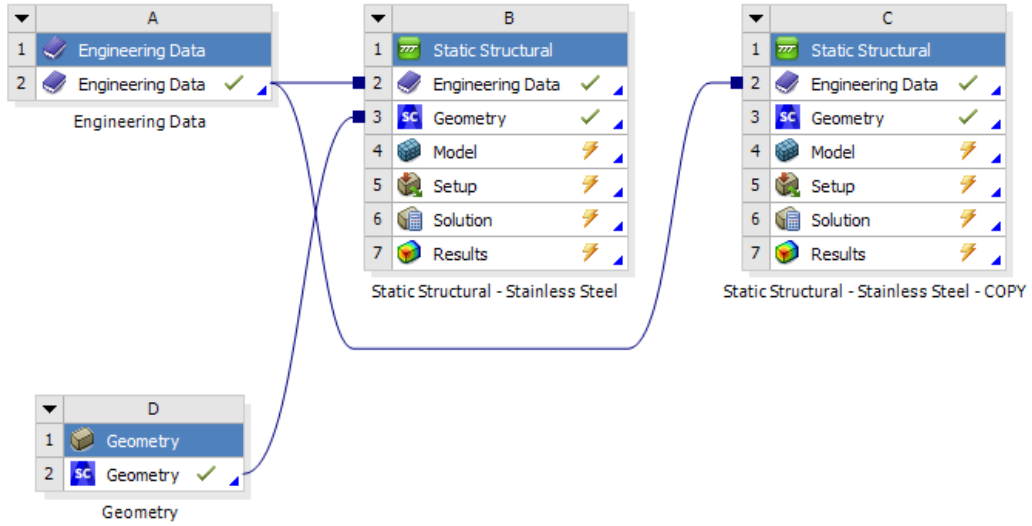
Use this guide to work on the Journal Bearing model.



Workshop 02: Further Geometry Considerations

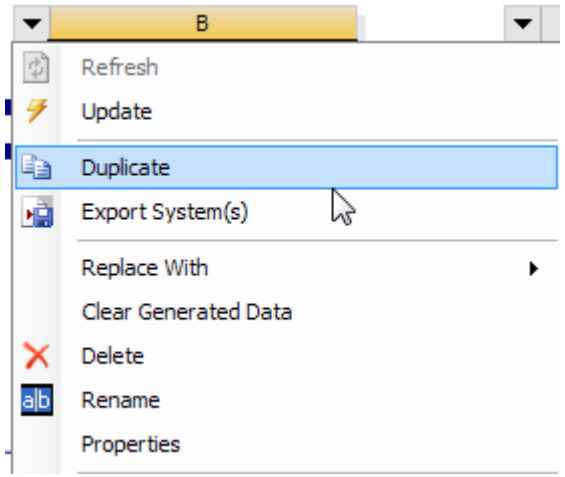
- **Open Archive** “Shaft_Bearings_WS02_Start.wbpz”
- The Project contains two Static Structural Analysis Systems, B and C. System B represents the full assembly at the conclusion of Module 08. System C represents the completed model following the geometry updates to be performed as part of this workshop. To preserve both systems, we’ll duplicate Analysis System B. We’ll work in that duplicated system to learn how to perform the updates that are already present in System C.

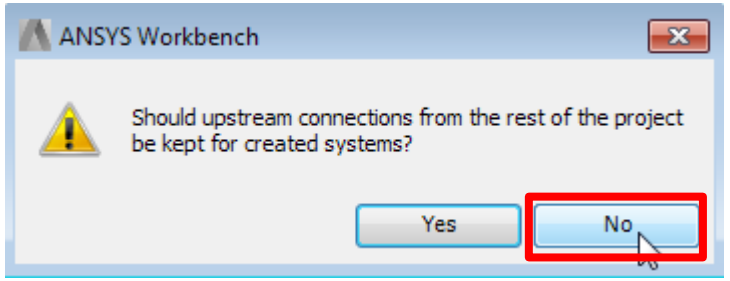


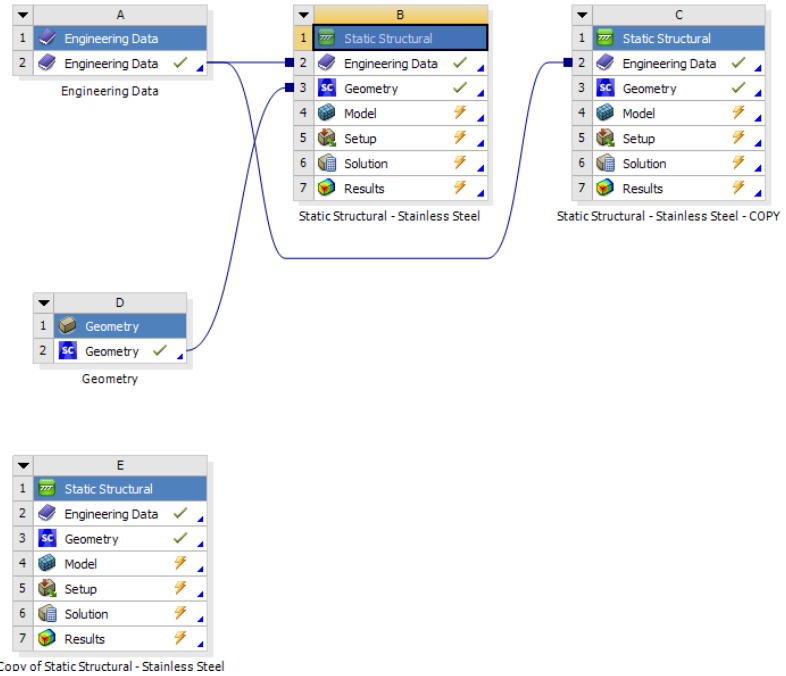


Workshop 02: Further Geometry Considerations

- **Duplicate Analysis System B and click “No” in the subsequent dialog:**

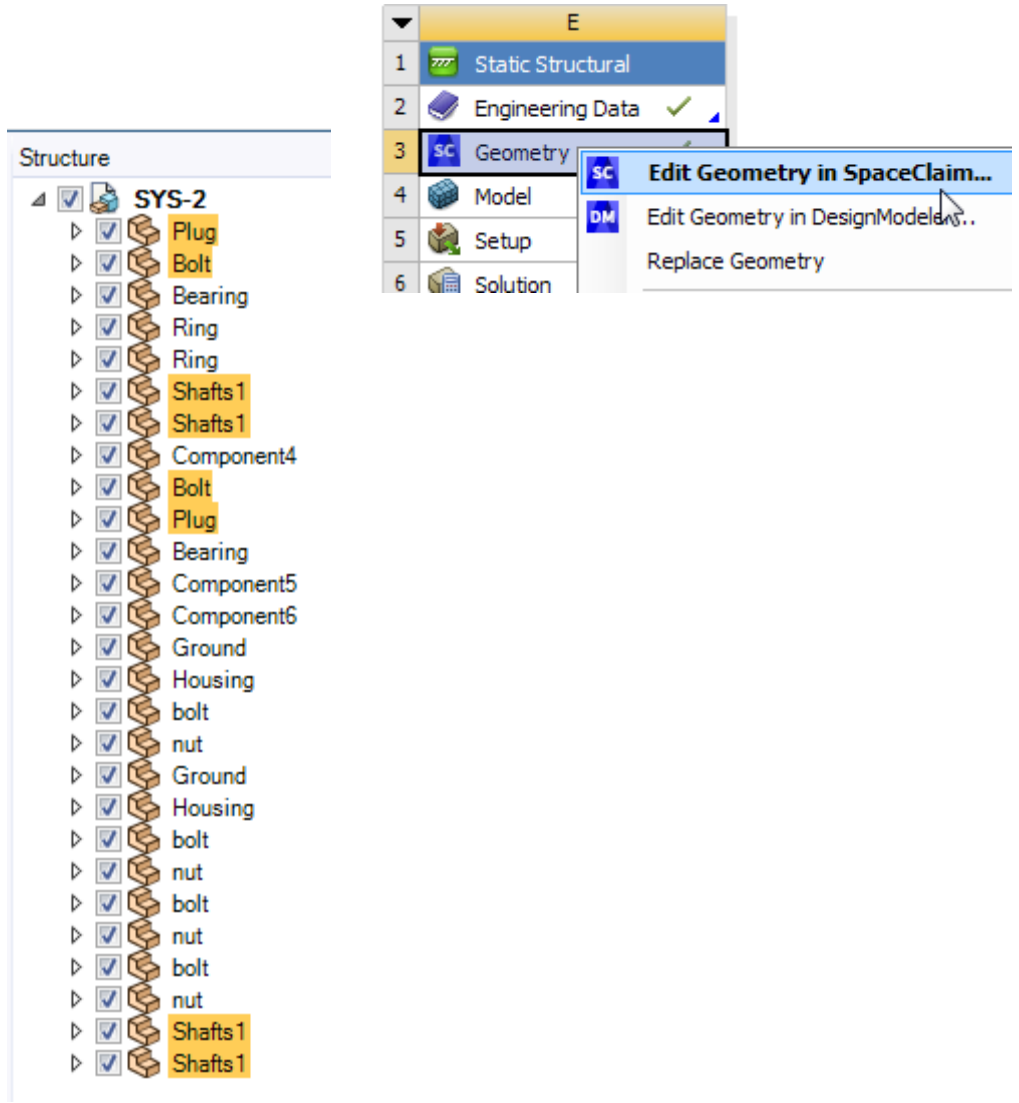






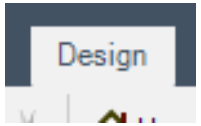
Workshop 02: Further Geometry Considerations

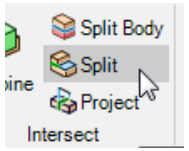
- Open SpaceClaim in the newly duplicated Static Structural analysis system: **RMB on Geometry cell E2 → Edit Geometry in SpaceClaim…**
- We are going to suppress unused components for analysis, here, in the geometry editor.
  - Select the following components from the SpaceClaim tree:
  - **RMB → Suppress for Physics**
  - **RMB → Hide all Suppressed**



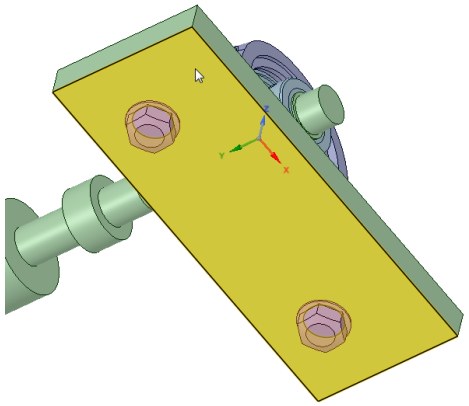
Workshop 02: Further Geometry Considerations

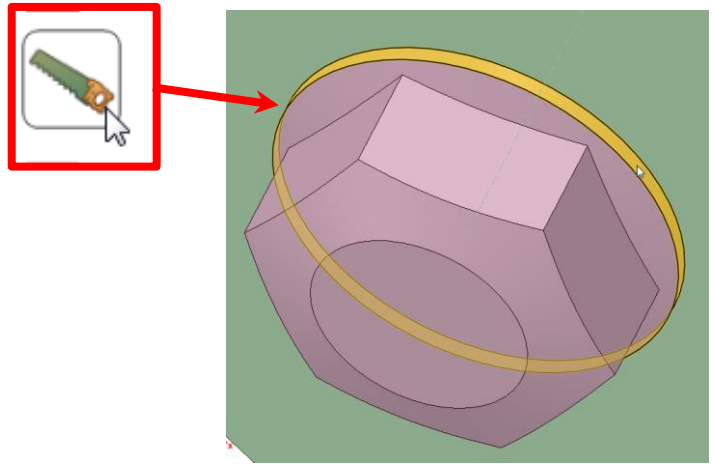
- We'll create imprints of bolt heads on the ground bodies. The imprinted faces will be used for contact definition: this will create local rigid regions as there are when bolts are solid bodies.
- Navigate in the **Design** tab and click the **Split** tool (*not* the **Split Body** tool)





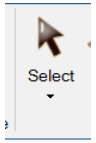
- Click on the lower face of a ground body as the **Target object**
- Click on the external circular face of the bolt head as the **Cutter tool**



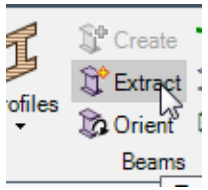


Workshop 02: Further Geometry Considerations

- **Repeat the previous 2 steps for the remaining 3 bolts of the model**
- Exit the Split tool by choosing the Select tool

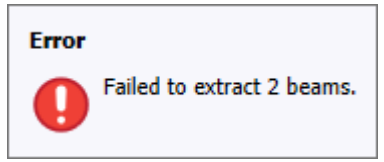


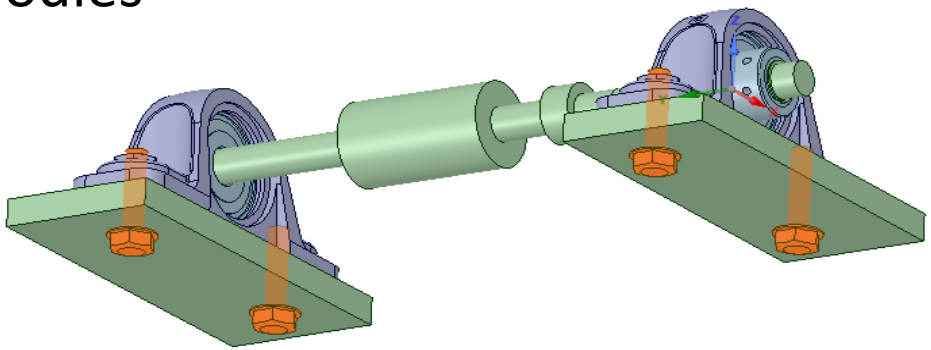
- Now, we'll extract beam bodies to replace bolts
- Go in the **Prepare** tab and Click the **Extract** tool
- Click on each of the 4 bolts to extract beam bodies

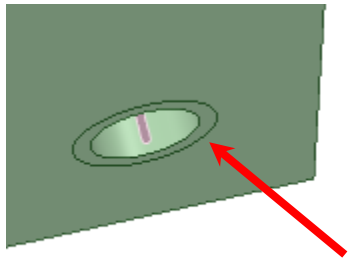


- Exit the Extract tool by choosing the Select tool
- While you're here, check that the imprints have been properly created on the ground bodies

NOTE: In this situation, there's no reason to be concerned if you see this message when extracting beam bodies—it occurs because the extraction algorithm had trouble extracting line bodies from the bolt head geometry. This is not a problem here, however, because the line body that *is* extracted, the one that corresponds to the cylindrical shank portion of the bolt, is exactly the one that you need.

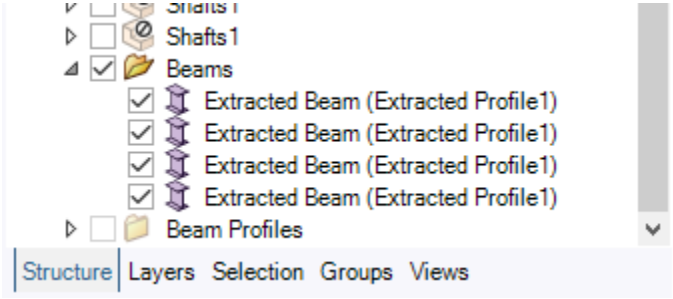




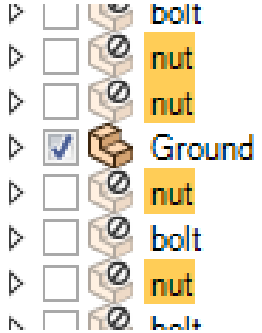


Workshop 02: Further Geometry Considerations

- Observe the 4 **Extracted Beam Bodies created** in the structure tree:

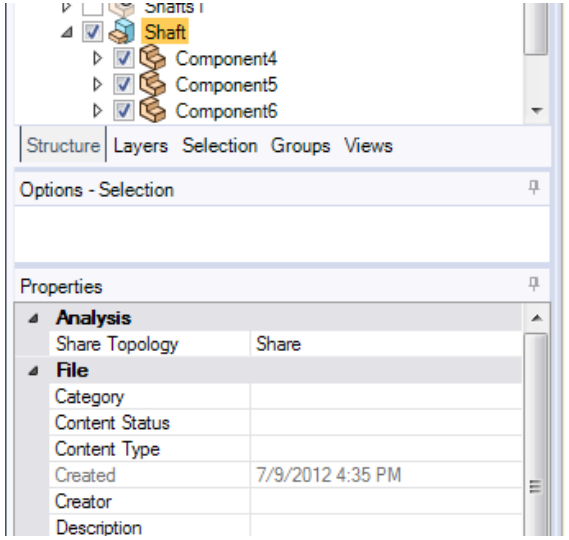


- **Select** the 4 **nut** bodies
- **Suppress** and **Hide** them

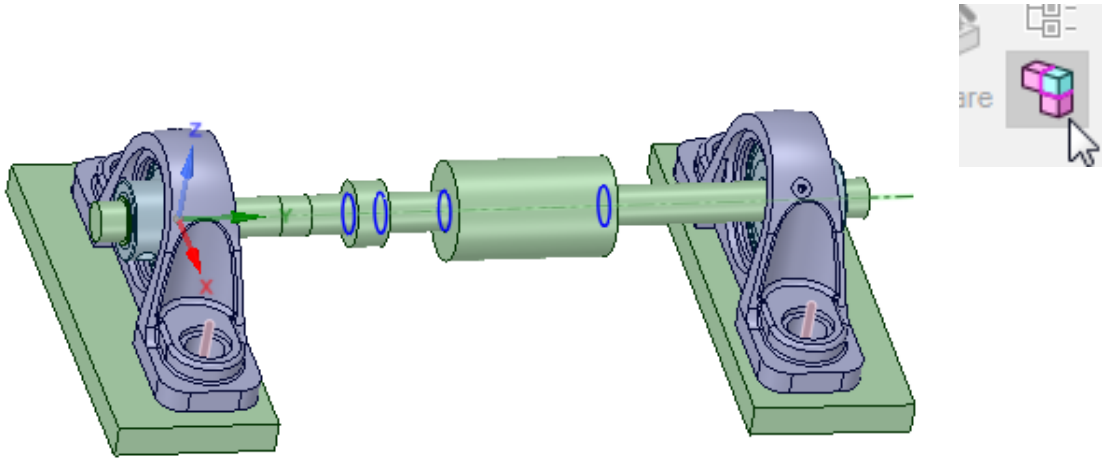


Workshop 02: Further Geometry Considerations

- **Select** the 2 Pulley bodies and the shaft body (**Component 4**, **Component 5** and **Component 6**)
- **RMB → Move to New Component**
- **Rename** the new created component as **Shaft**
- Set **Share Topology** for this component to S**hare**



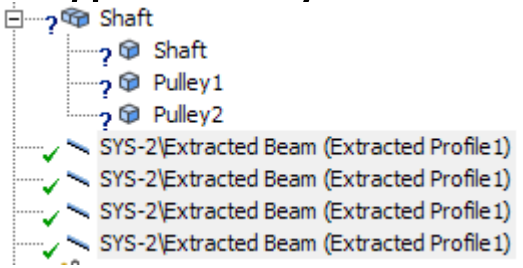
- Navigate in the **Workbench** tab and click **Show Connected Bodies**



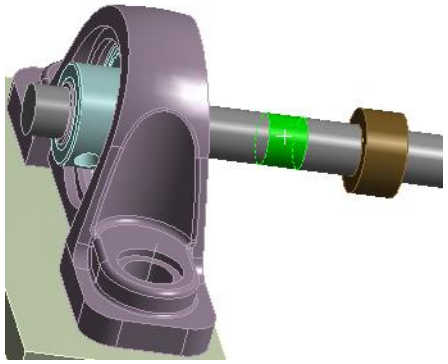
Workshop 02: Further Geometry Considerations

- **Close** SpaceClaim
- **Refresh** the Workbench project 

- Open **Mechanical** from Analysis System E, Cell E4.
- The geometry has changed a bit. Mechanical is unable to interpret some geometry scoping—that's why you see question marks in the tree

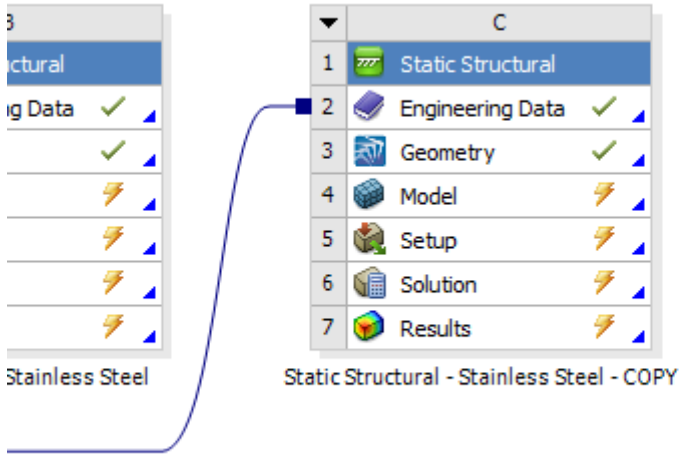


- Set **Material Assignment** for the 4 beam bodies to **Steel**
- Set **Material Assignment** for **Shaft** to **Steel**
- Set **Material Assignment** for **Pulley1** and **Pulley2** to **Aluminum Alloy**
- Scope the **Point Mass** to this surface:



Workshop 02: Further Geometry Considerations

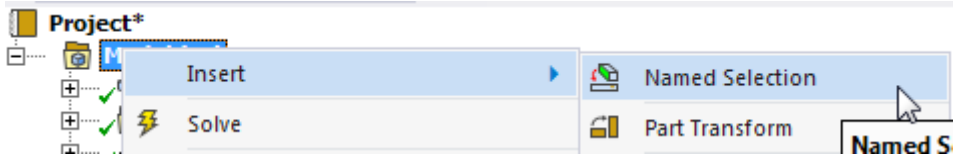
- We won't rescope the other objects in the tree. If you need it, analysis system **C** in the **Project Schematic** contains the model with everything well-defined except for the contact regions—they'll be entirely redefined in an upcoming module.



Workshop 02: Further Geometry Considerations

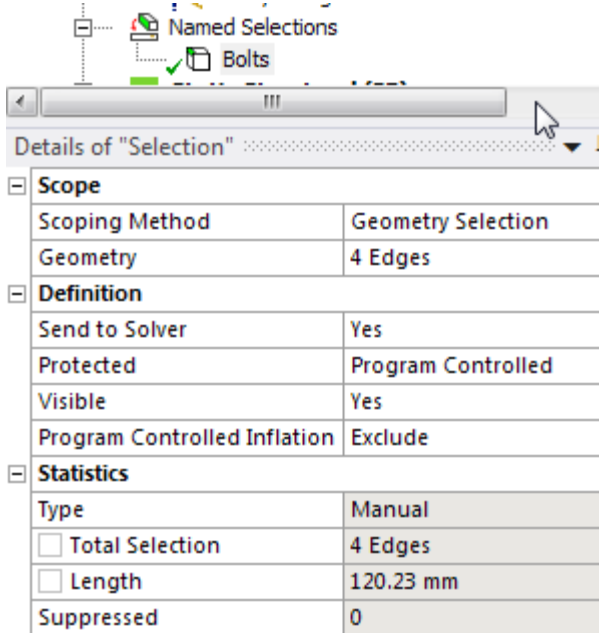
We'll create **Coordinate systems** now, using the **Object Generator**:

- Insert a **Named Selection**



- Scope the 4 beams (using the E**dges** selection filter)

- Rename the selection to **Bolts**



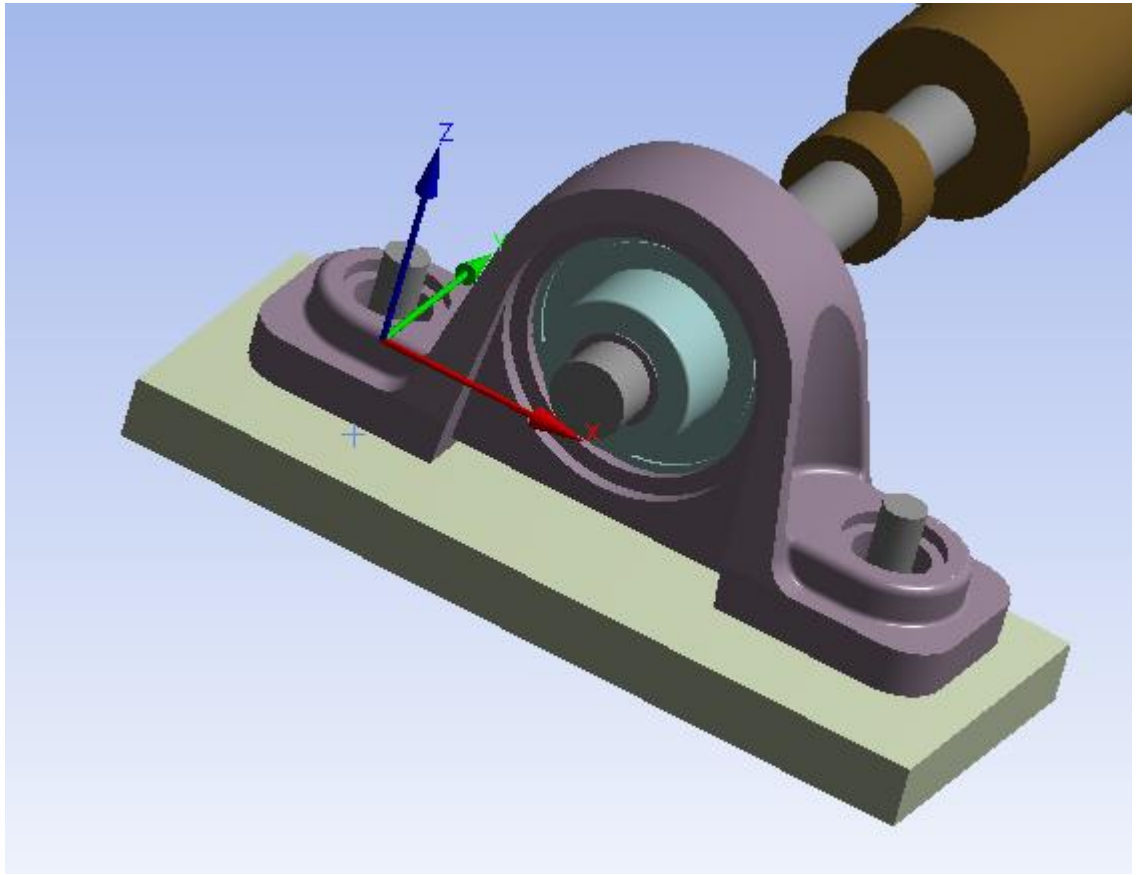
Workshop 02: Further Geometry Considerations

- Insert a new **Cartesian Coordinate System** scoped to one beam **(edge selection)**
- Rename it to **Bolt**

Bolt

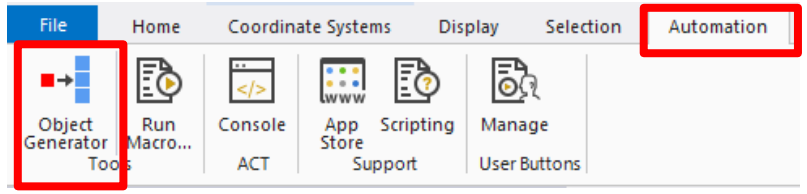
Details of "Coordinate System 3"

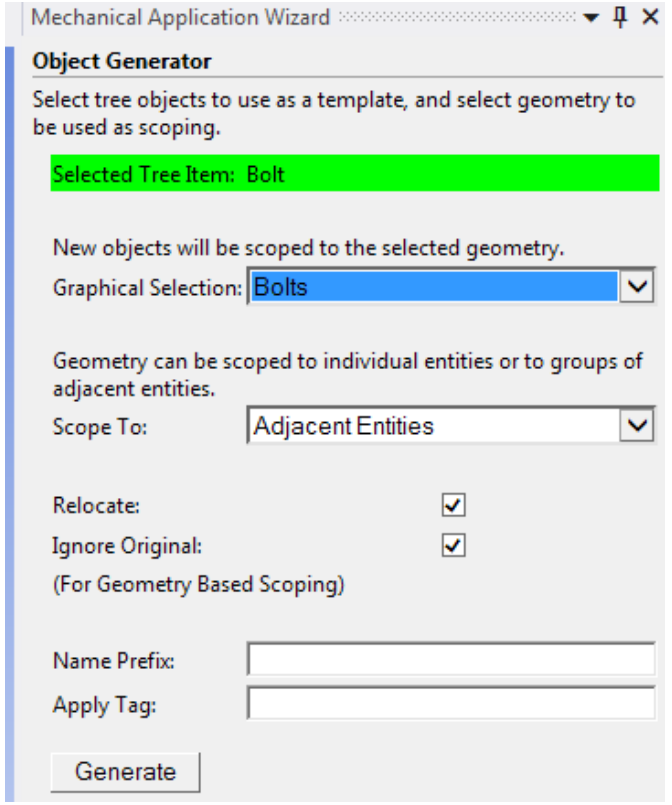
Definition	
Type	Cartesian
Coordinate System	Program Controlled
APDL Name	
Suppressed	No
Origin	
Define By	Geometry Selection
Geometry	Click to Change
Origin X	-41.993 mm
Origin Y	-1.09e-006 mm
Origin Z	-22.885 mm
Principal Axis	



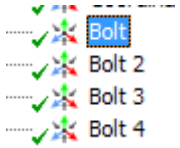
Workshop 02: Further Geometry Considerations

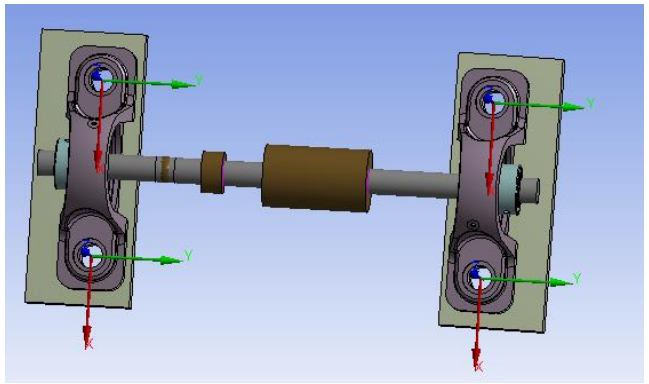
- Open the **Object Generator** tool in the Automation tab
- Select the coordinate system **Bolt** as a template
- Set **Graphical Selection** to **Bolts**





- Define the other options as shown and click **Generate**
- Check that 3 new coordinate systems have been created correctly

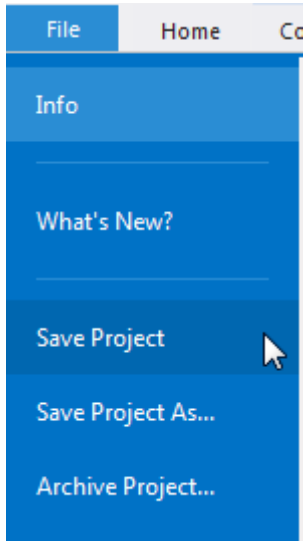




- Close the **Object Generator** panel

Workshop 02: Further Geometry Considerations

Save Project for use later if desired.

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