

Ansys Fluent Getting Started (New Fluent Experience)

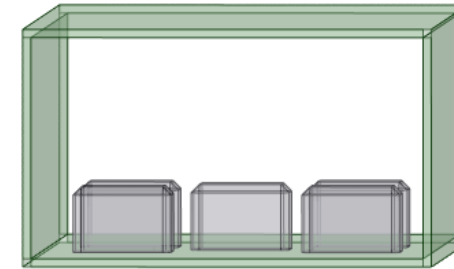
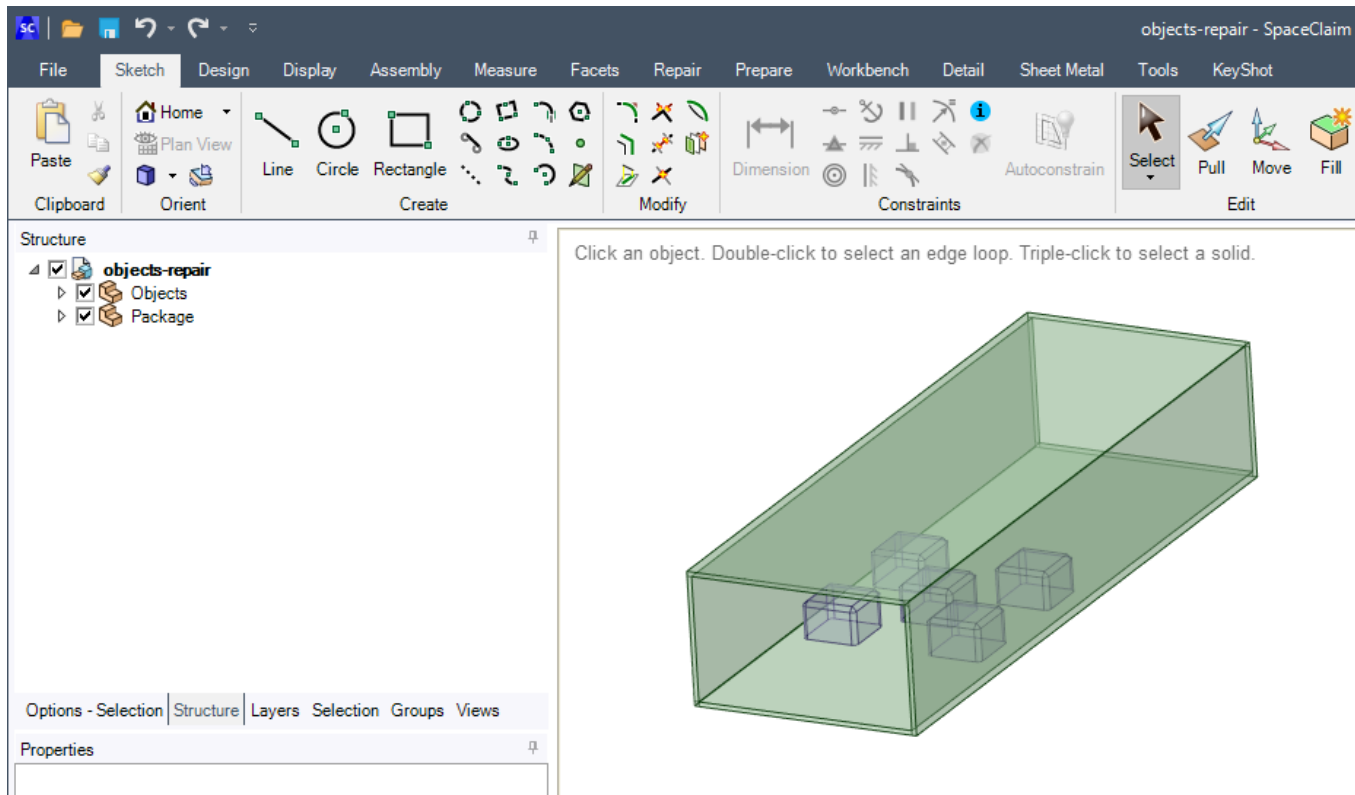
Workshop: Repairing Geometry in SpaceClaim

Release 2021 R1



Launch SpaceClaim and Import File

- Start SpaceClaim, go to File > Open and select "objects-repair.scdoc"



The model consists of an electronics package enclosure ("Package") and a number of electronic components ("Objects").

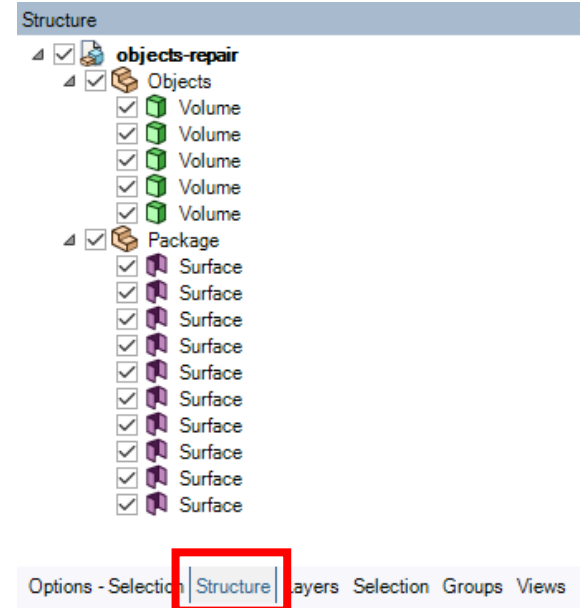
Because the model is symmetrical, it is desired to use a symmetry plane to reduce the size of the computational domain, which will result in fewer cells in the mesh and therefore reduced computation time.

Using the Watertight Geometry Workflow in Fluent, there is no way to use capping surfaces to extract the fluid volume when the symmetry plane intersects with an inlet or an outlet, so the fluid volume will be extracted here.

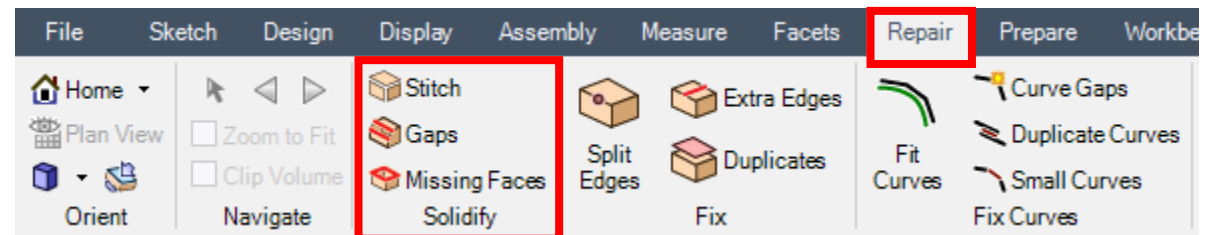
First, it will be discovered that the geometry of the enclosure ("Package") must be repaired. After repairing the geometry, the fluid volume will be extracted and a split operation will be performed to create a symmetry plane.

/ Repair Geometry (1)

- As you can see, some of the bodies are imported as surface bodies

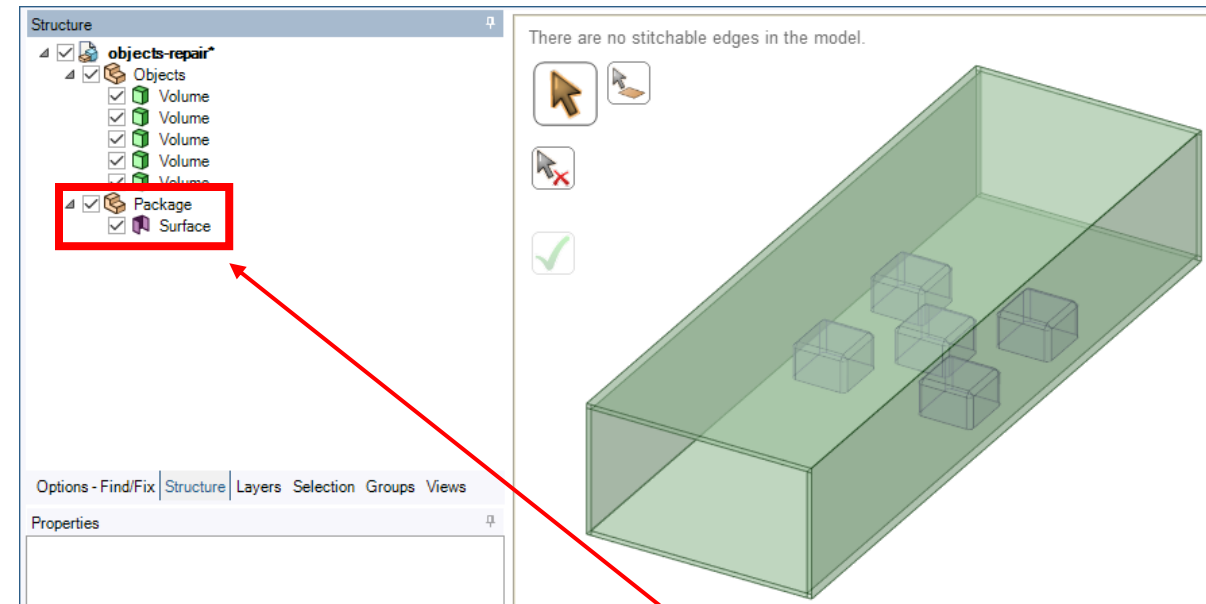
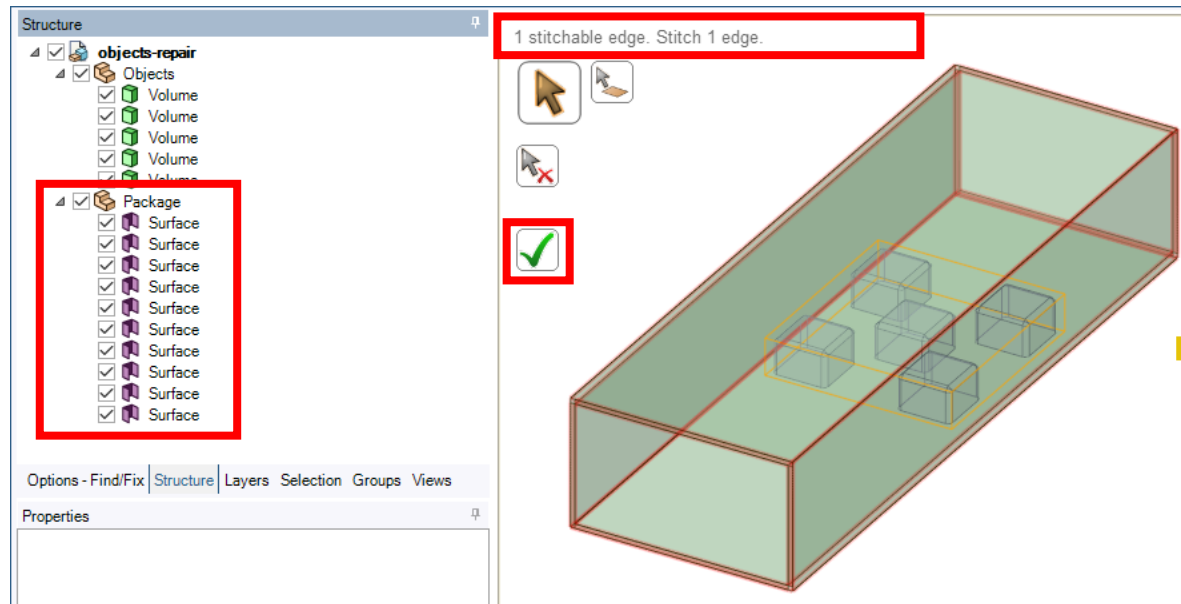
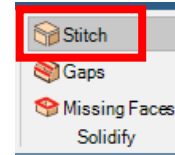


- To repair this, we will use the *Solidify* group in the *Repair* tab

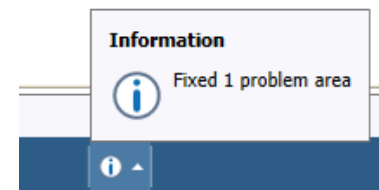


Repair Geometry (2)

- Click on *Stitch*; one stitchable edge is found
- Click the green tick to stitch it



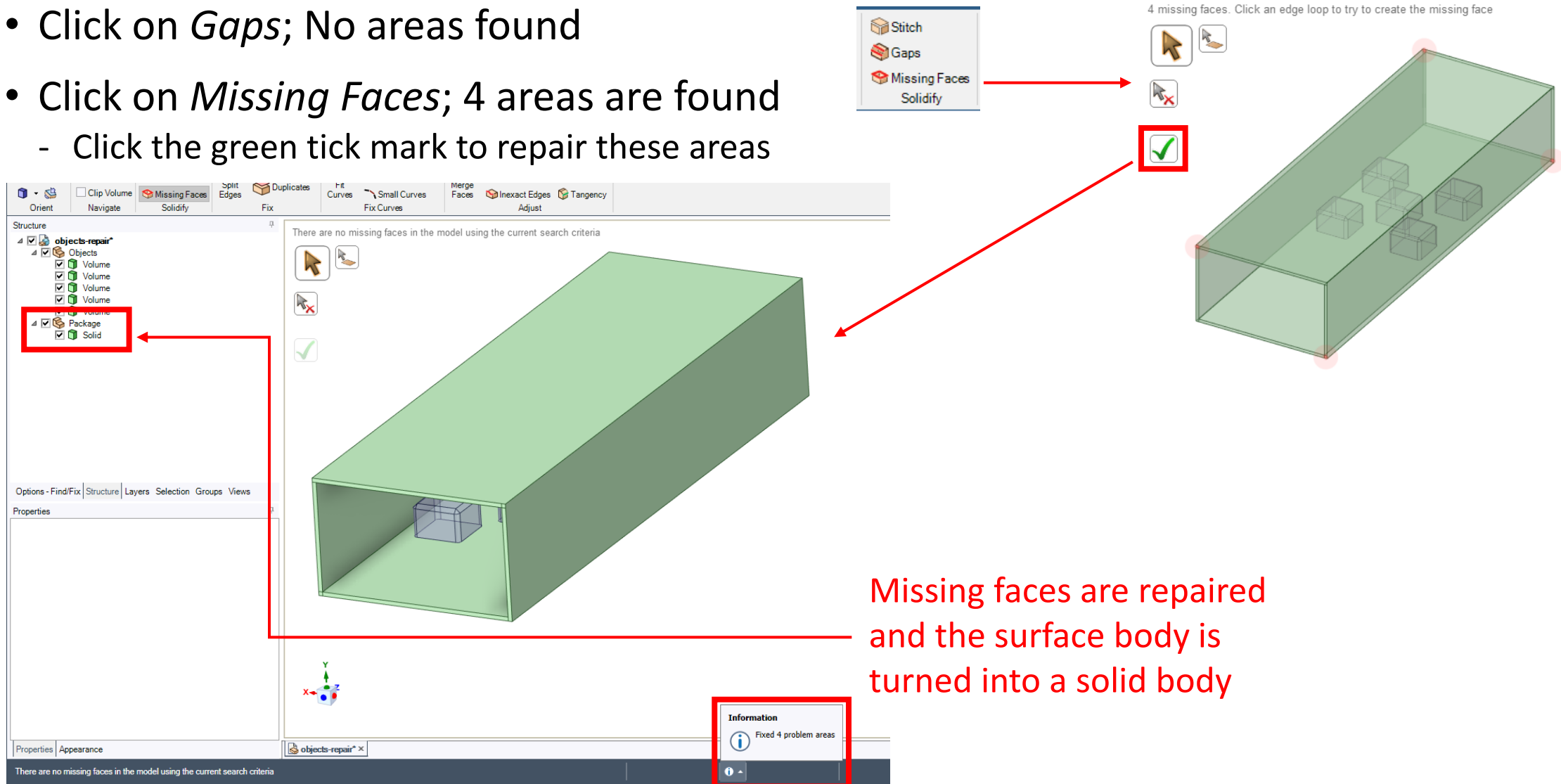
Report appears in the Status Bar if repair operation is successful



All the surface bodies are stitched into one surface body!

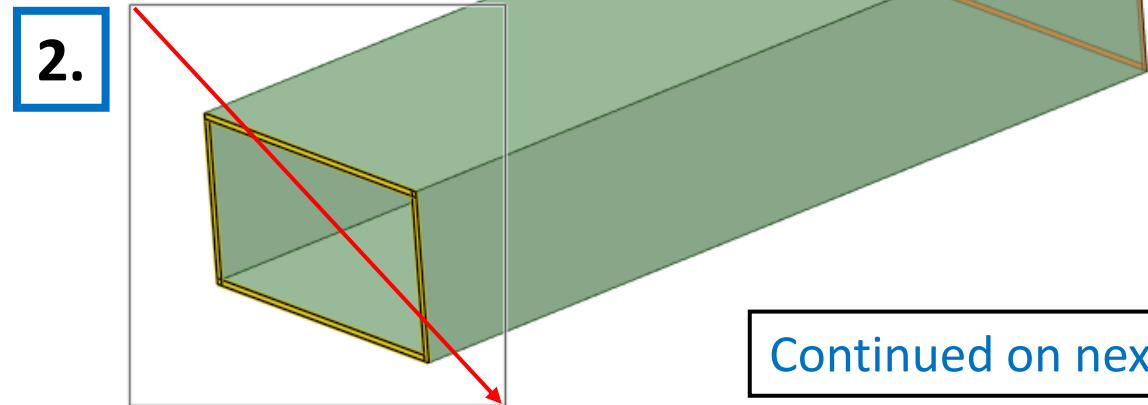
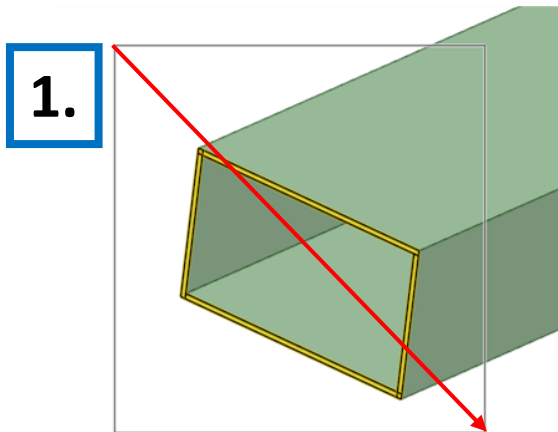
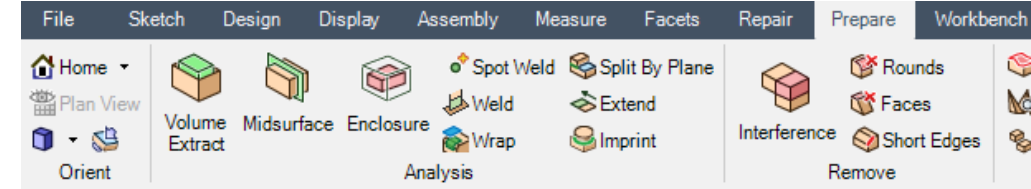
Repair Geometry (3)

- Click on *Gaps*; No areas found
- Click on *Missing Faces*; 4 areas are found
 - Click the green tick mark to repair these areas



Fluid Volume Extraction (1)

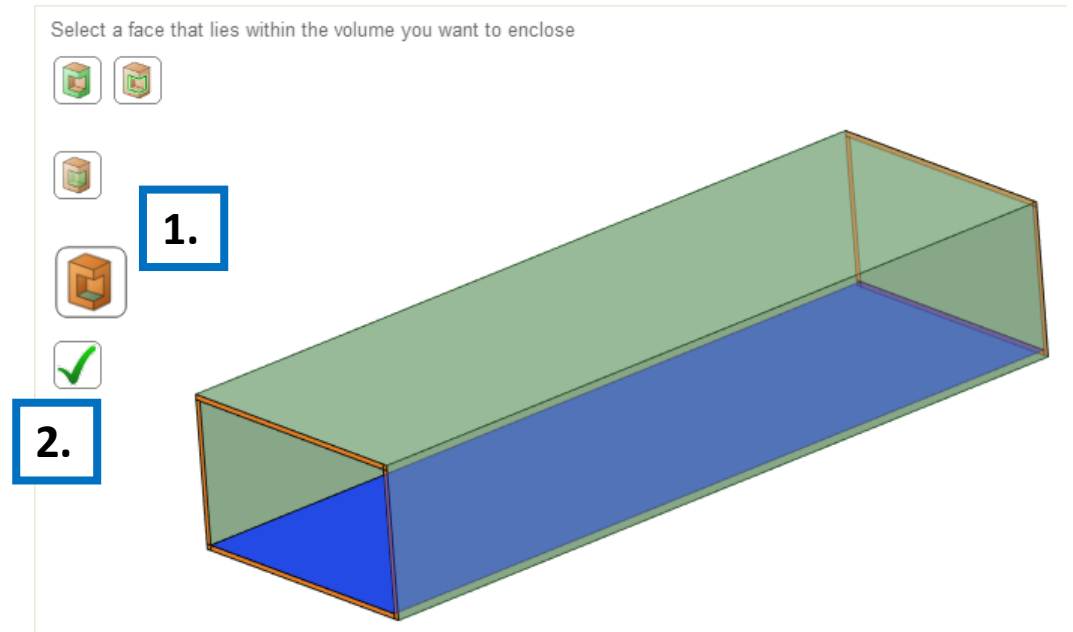
- Go to the Prepare tab
 - Do not select anything in the ribbon yet
- Use the Escape key on the keyboard to clear the Missing Faces tool guides from the window
- Hold down the left mouse button and drag from upper left to lower right to box select the small faces on the end of the solid
 - Dragging in this direction only selects those faces entirely inside the selection box
- Rotate the model (selected faces will remain selected) to a favorable position, press and hold the Ctrl key on the keyboard and box select the faces on the other end



Continued on next page

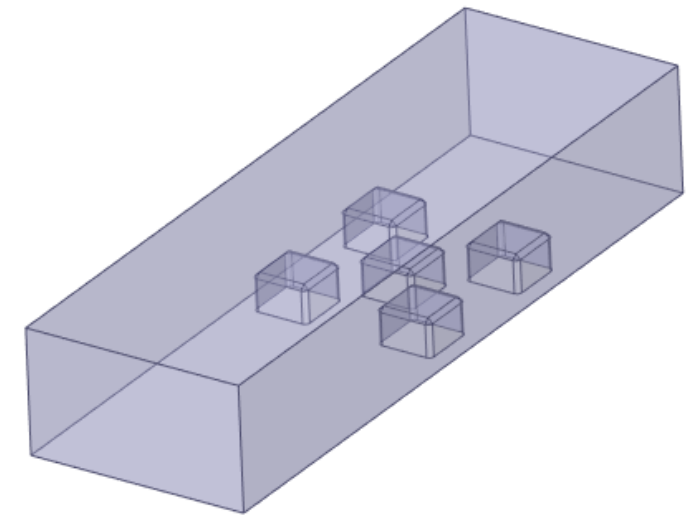
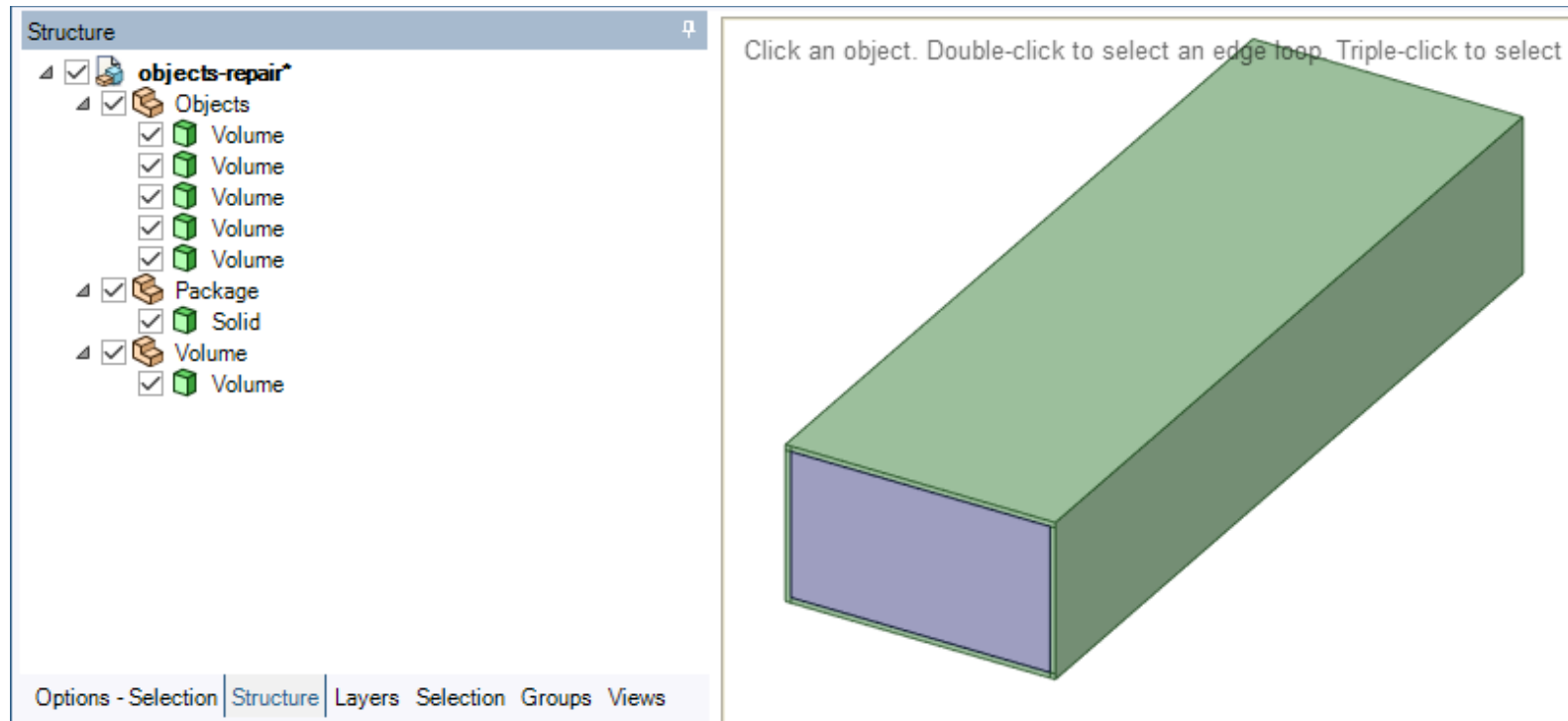
Fluid Volume Extraction (2)

- Select the *Volume Extract* function in the ribbon
 - Faces enclosing the region were selected on the previous slide
- Activate the Select Seed Face tool (1) and select one of the interior faces
- Use the green check (2) to extract the volume
- Use the Escape key on the keyboard to clear the volume extract tool options



Fluid Volume Extraction (3)

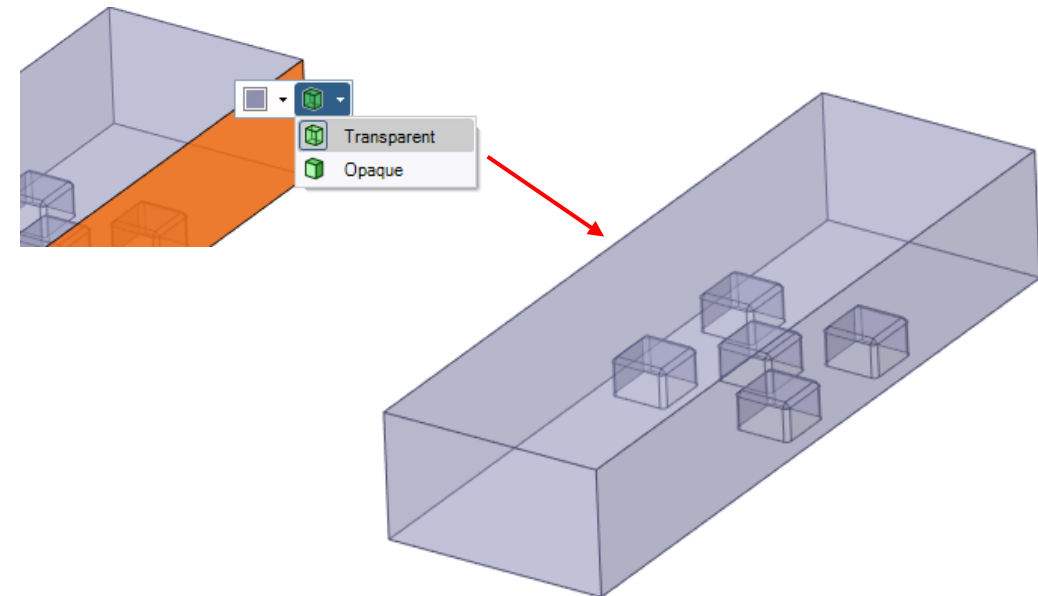
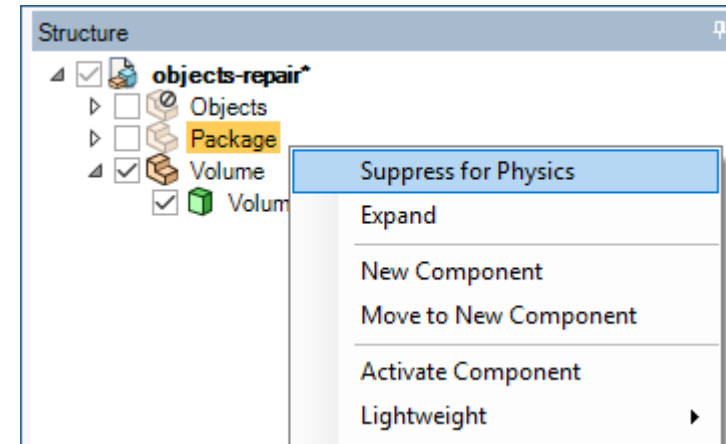
- A fluid volume is extracted
- Turn off visibility for Objects and Package to review the volume that was created



Volume extraction tool detected the objects and created volume accordingly.

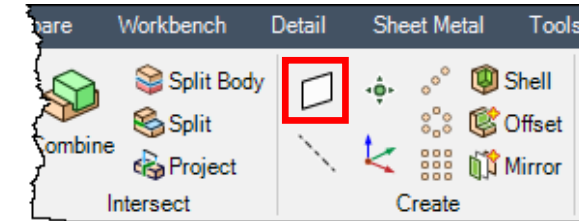
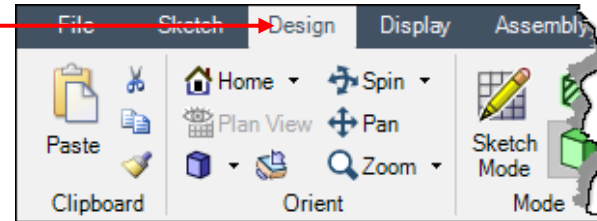
/ Suppress for Physics

- The solids (Objects and Package) are no longer required so disable the visibility (if not already disabled), right click on each in the structure tree and select Suppress for Physics
 - Suppress for Physics ensures the solid parts will not be transferred to Fluent
 - If you wanted to perform conjugate heat transfer simulations with the solids present, you would not do this step
 - Disabling visibility simply makes it easier to see the fluid volume while working with it
 - Making it transparent can also help in this respect

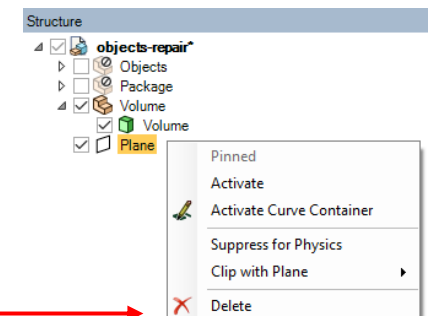
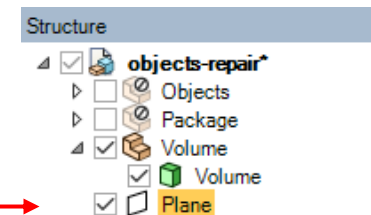
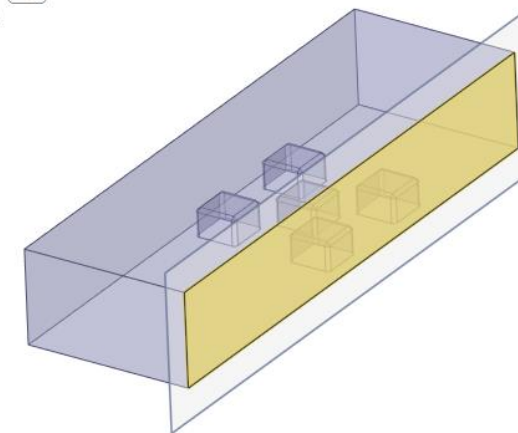


Plane (1)

- Click on the Design tab and select the Plane tool
- The purpose of creating a plane is to split the model in half in order to use a symmetry boundary condition for the CFD simulation
- Left clicking on a face in the model while the plane tool is active will create a plane on that surface
- The move tool could subsequently be used to move the plane to the middle of the fluid volume
- However there is also a way to create the plane exactly in the middle such that no move operation is required
- In case you created a plane as shown to the right
 - First use the Escape key on the keyboard to exit the plane tool
 - Otherwise it will keep creating more planes when you click in the structure tree
 - Right click and delete the plane in the structure tree

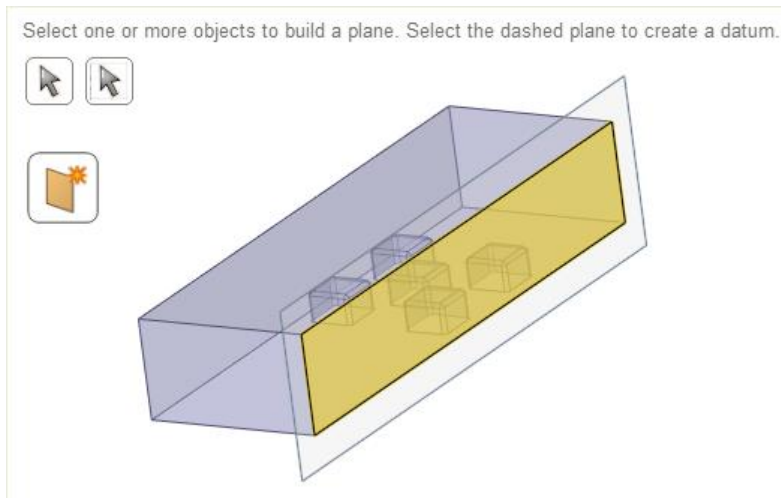
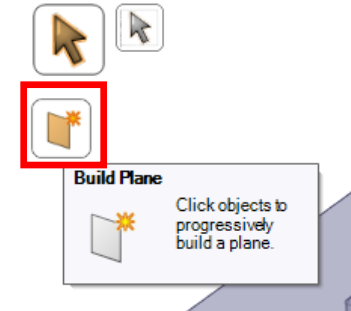


Select a reference to create a plane on it

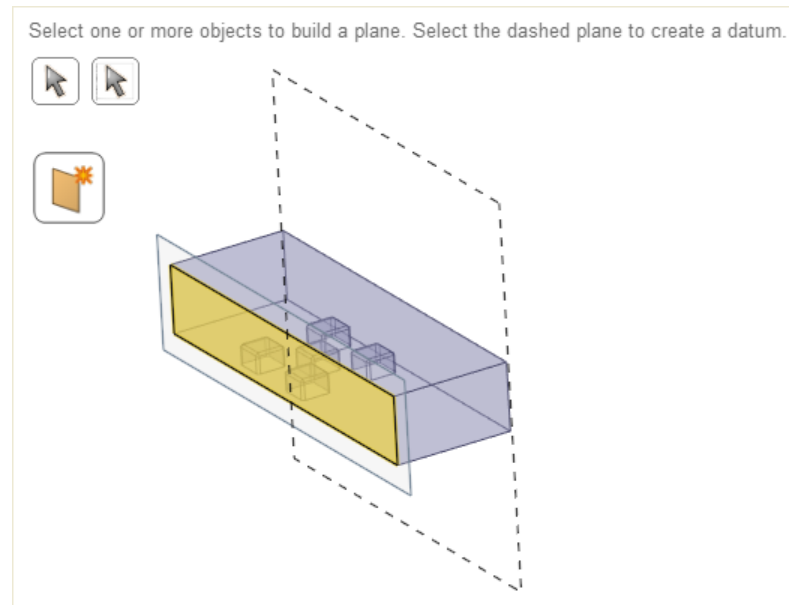


Plane (2)

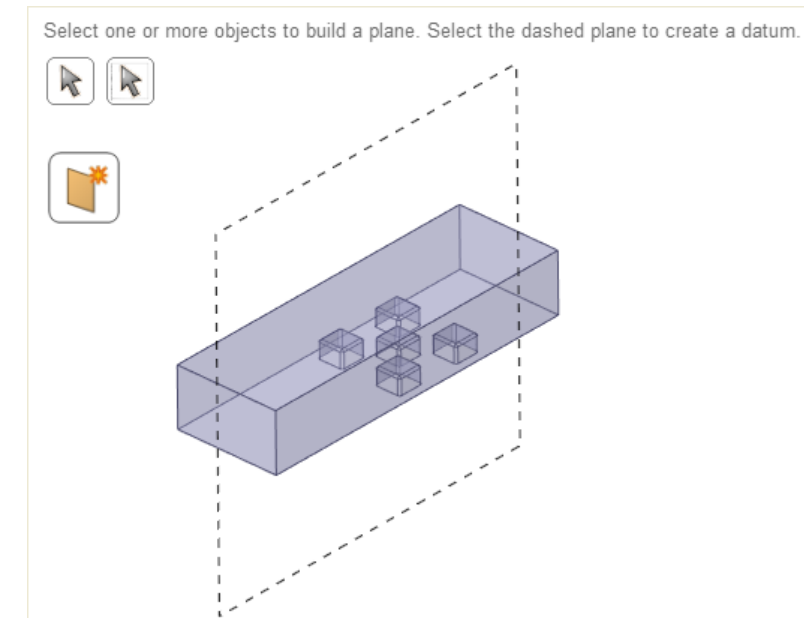
- Select the plane tool again in the ribbon
- Select the Build Plane tool guide in the window



With the Build Plane tool guide active, select one side of the volume.



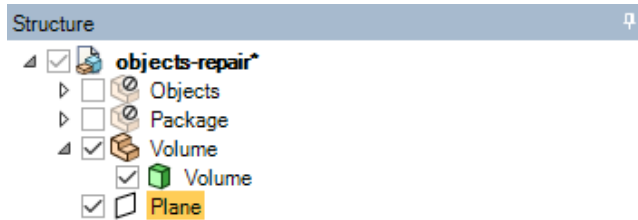
Rotate the model and select the face on the opposite side.



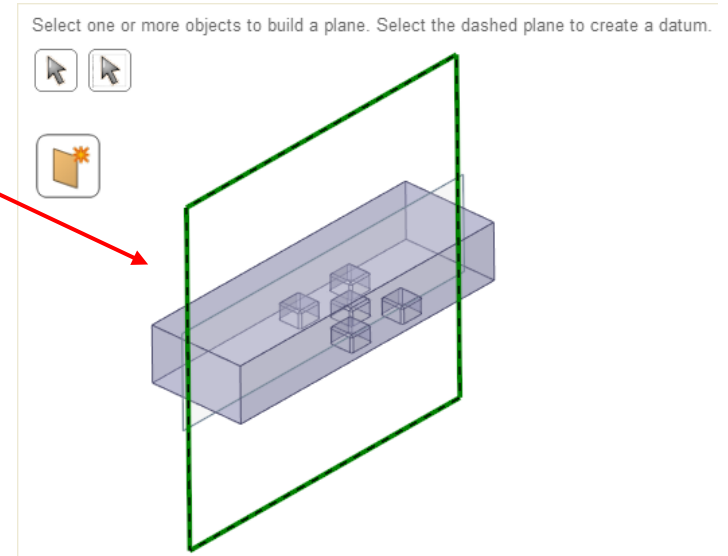
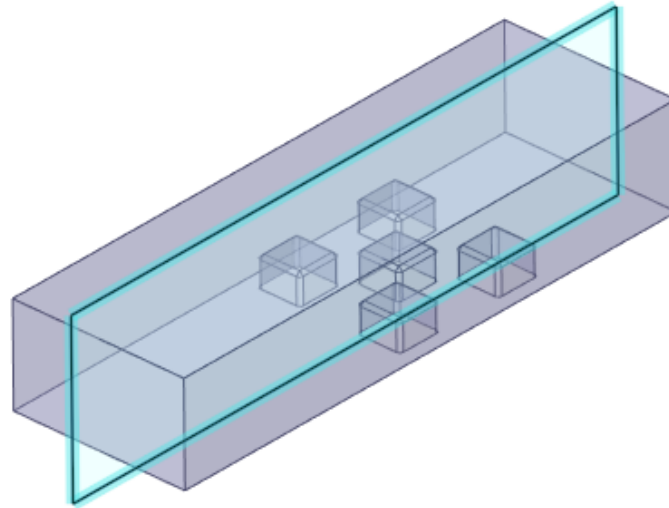
This will produce a dashed datum plane midway between the two selected surfaces (next page).

Plane (3)

- Click the dashed datum plane to create the plane
- Use the Escape key on the keyboard to clear the plane tool
- The plane will appear in the structure tree

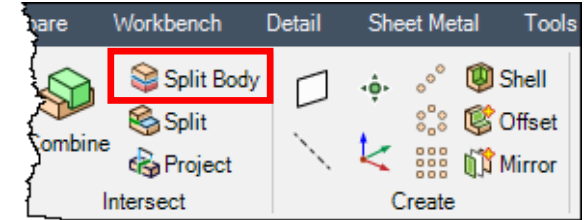
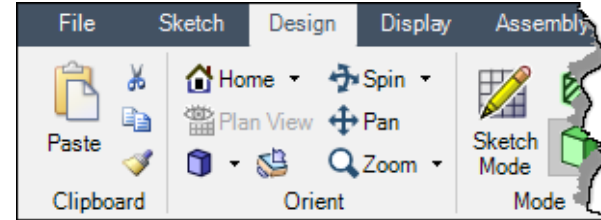


Click an object. Double-click to select an edge loop. Triple-click to select a solid.



Split

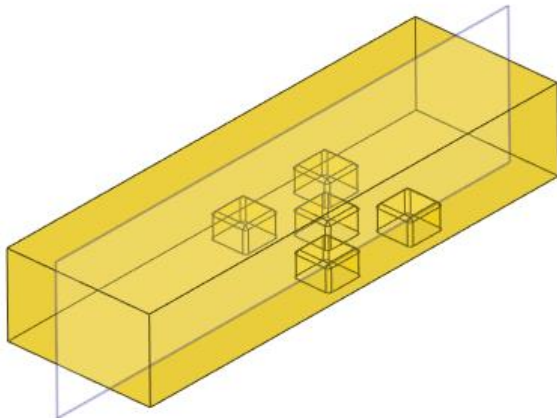
- Remain in the Design tab and Select Split Body
- First select the fluid volume when prompted to select a target object
- Select the plane to use as a cutter
- Click the region of lower x-coordinate to remove it
 - Only one side is needed for a model using symmetry



Click a target object. Box select or click the Select tool guide to choose multiple targets.



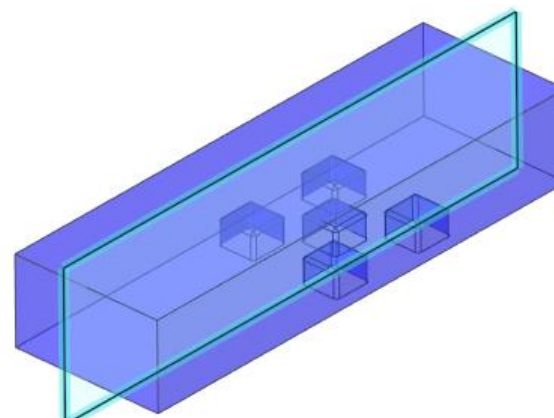
1.



Click a face, plane, or an edge loop to use as a cutter.



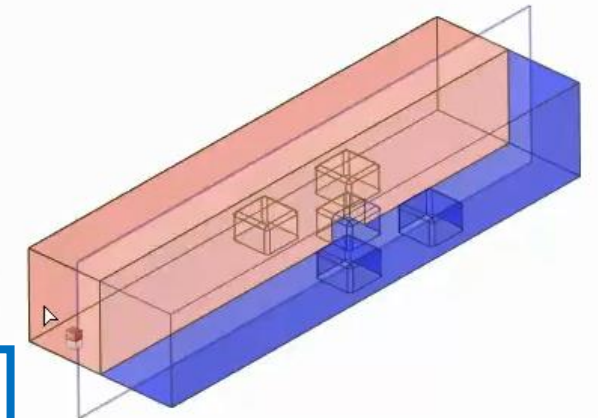
2.



Click regions to remove. Press Ctrl to select an additional cutter. Use Merge When

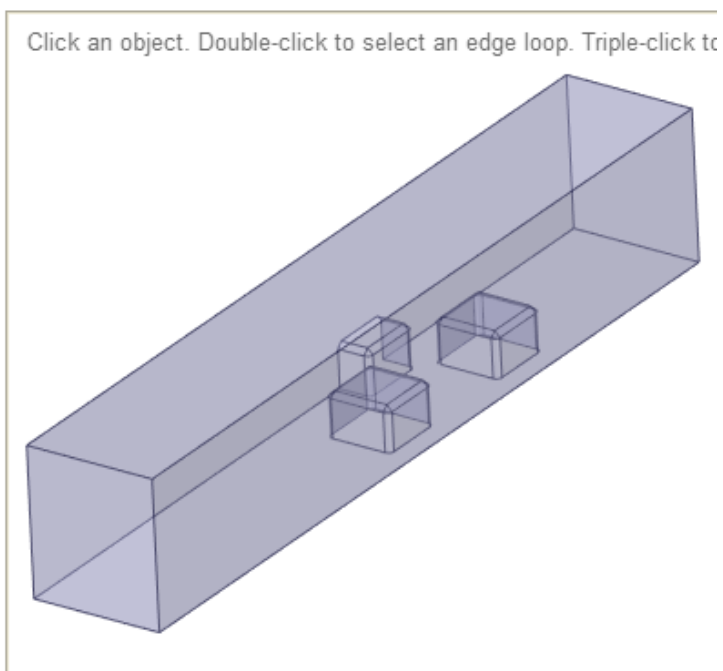


3.



/ Save Model with New Name and Exit

- The newly created volume appears in the structure tree
 - Untick the plane to hide it
- The model is ready for CFD analysis and, if desired, could be transferred to Fluent
- Go to File > Save As and save the model as WS1.2-objects-sym.scdoc
- Exit SpaceClaim



/ Summary

- This workshop covers skills presented in Lecture 1.1
 - Repair tools
 - One of the parts in the solid model initially was not a body but instead a collection of surfaces, with some missing faces and repair tools were used to stitch the surfaces and fill in the missing faces so a watertight body could be formed
 - Volume extract
 - Volume extract can be performed in Fluent, but here, because it was desired to create a symmetry model, the fluid volume needed to be extracted in SpaceClaim
 - The use of symmetry is a way to reduce computational time once the mesh has been created and the flow is being calculated
 - Split
 - A plane was created to split the model at the symmetry plane
 - The Build Plane tool guide allows for the initial plane creation to occur on the symmetry plane
 - The split creates two volumes, one of which was removed
 - It would also have been possible to keep both volumes and suppress one, as the solids were suppressed



End of presentation