Introduction to Ansys SpaceClaim

Module 01: Core Skills

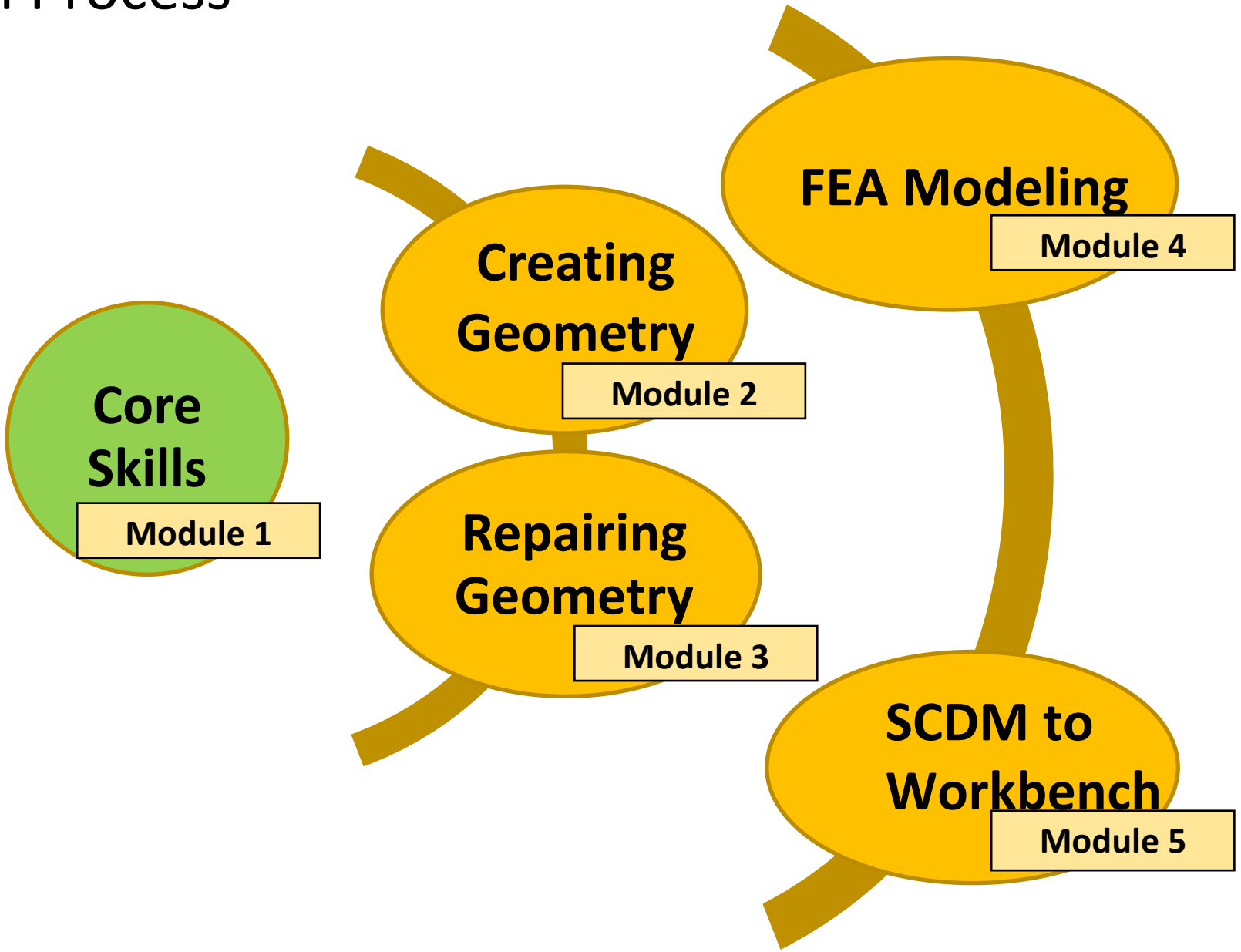
Release 2022 R1

Please note:
- These training materials were developed and tested in Ansys Release 2022 R1. Although they are expected to behave similarly in later releases, this has not been tested and is not guaranteed.
- The screen images included with these training materials may vary from the visual appearance of a local software session.

Learning Outcomes

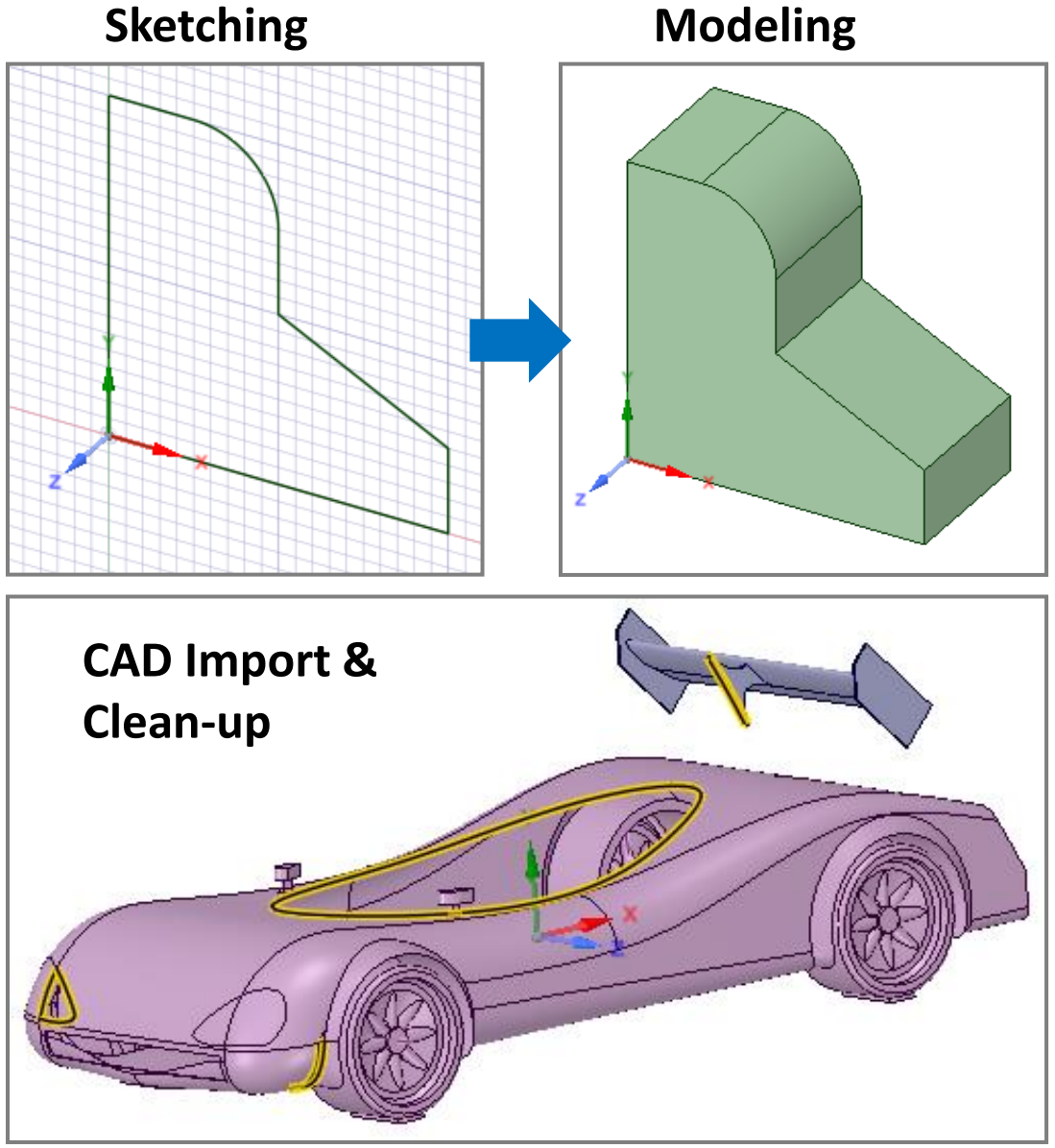
- In this module we will learn about:
  - What is Ansys SpaceClaim?
  - Launching Ansys SpaceClaim
  - Discovering the SpaceClaim Interface
  - SpaceClaim Options
  - Quick Workshop 01.1
  - Understanding the Block recording
  - File Operations
  - Working with Assemblies
  - Working with Layers
  - Display and managing views
  - Exploded Views in the Assembly tab
  - SpaceClaim Main Tools

Overall Process



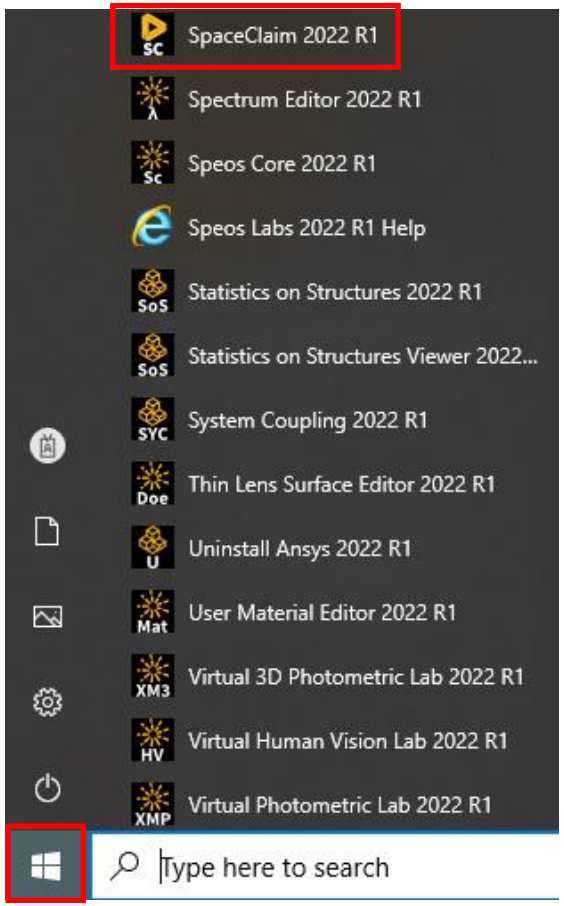
What is Ansys SpaceClaim?

- Industry leading direct modelling tool for rapid concept design and geometry manipulation
- Analysis-focused tools to repair, prepare, and optimize models
- Computer-Aided Design (CAD) – like approach to create new models OR Import CAD models without CAD connection
  - Dead model parameterization
    - No need of native CAD data for parameterization
      - Freedom to explore solutions without relying on CAD team
    - More flexibility to make unplanned and local changes
      - No features + No constraints = No regeneration failures
- Short learning curve for engineers without CAD background

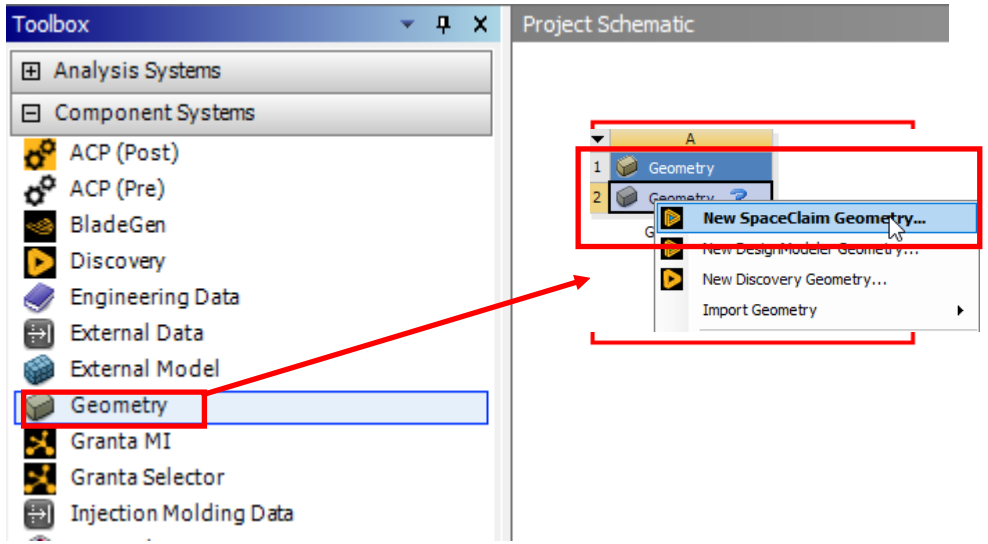


Launching Ansys SpaceClaim

Standalone Session



From Geometry cell of any System



Ansys SpaceClaim is supported only on the 'Windows' platform

SpaceClaim Interface

Quick Access Toolbar

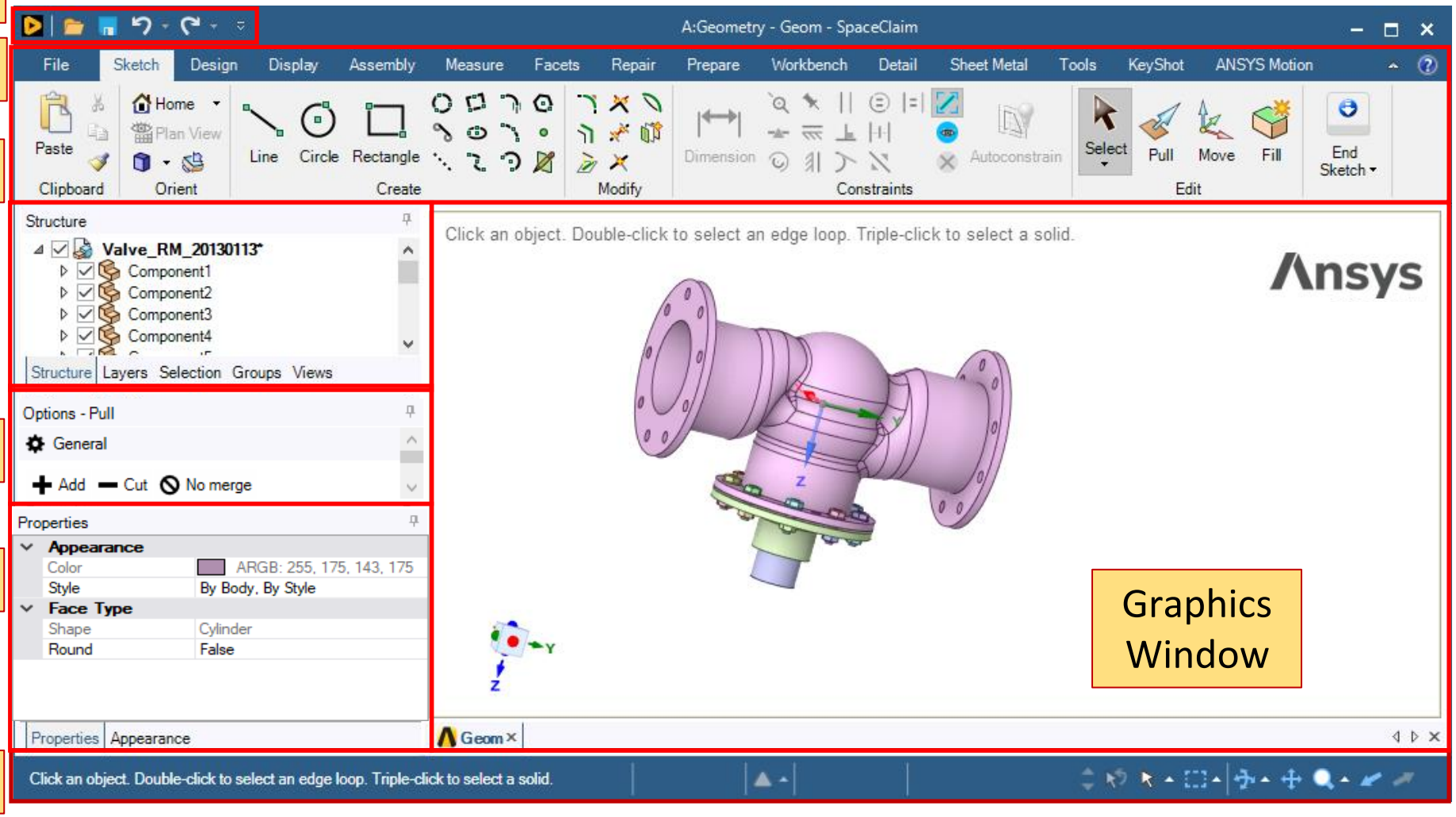
Ribbon Toolbar

Structure Panel

Options Panel

Properties Panel

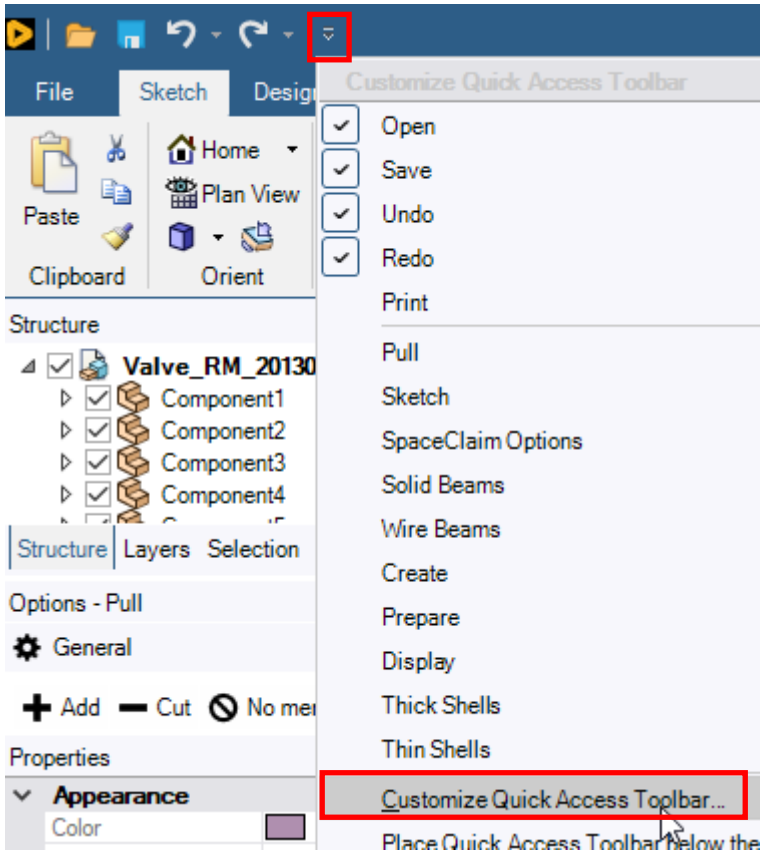
Status Bar



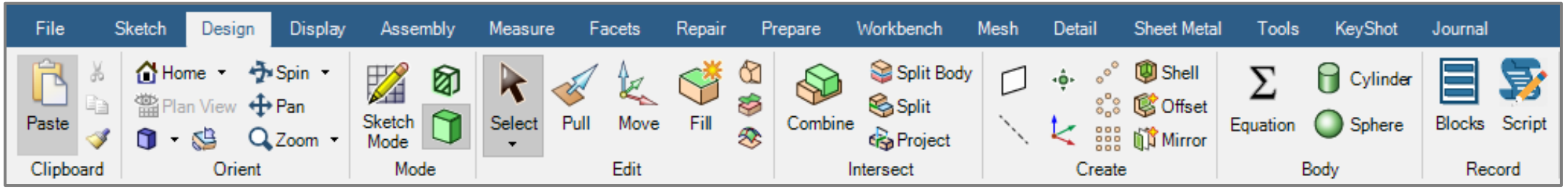
Graphics Window

Quick Access Toolbar (QAT)

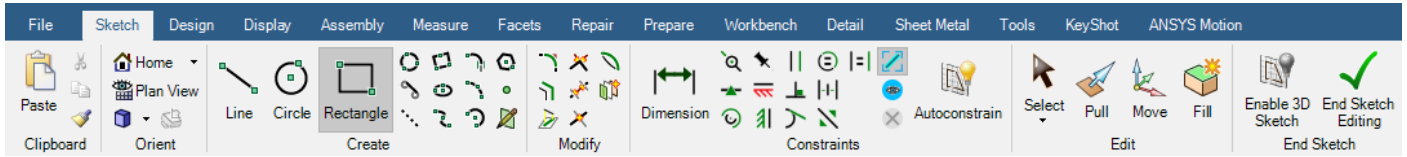
- Open, Save, Undo, Redo options available by default on the QAT
- Undo (CTRL-Z) can be used to undo your last action. Redo (CTRL-Y) can be used to repeat it.
- Most of the operations will be displayed in the QAT, you can undo to any operation displayed.
- Frequently used tools can be added to the QAT
  - Select the down arrow to the right of the Quick Access Toolbar (QAT)
  - Choose “Customize Quick Access Toolbar” from the drop-down list



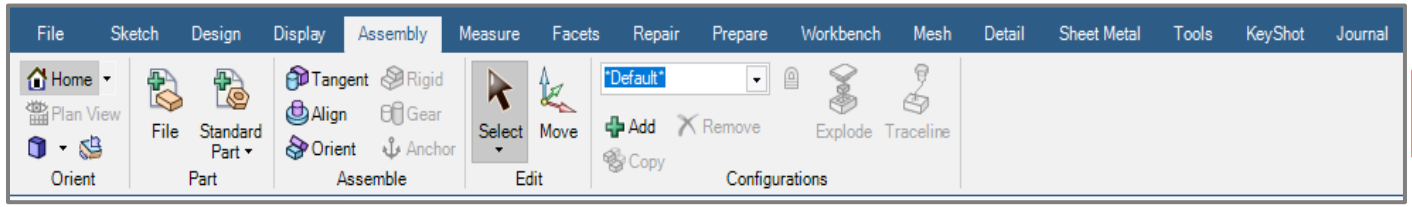
Ribbon Toolbar



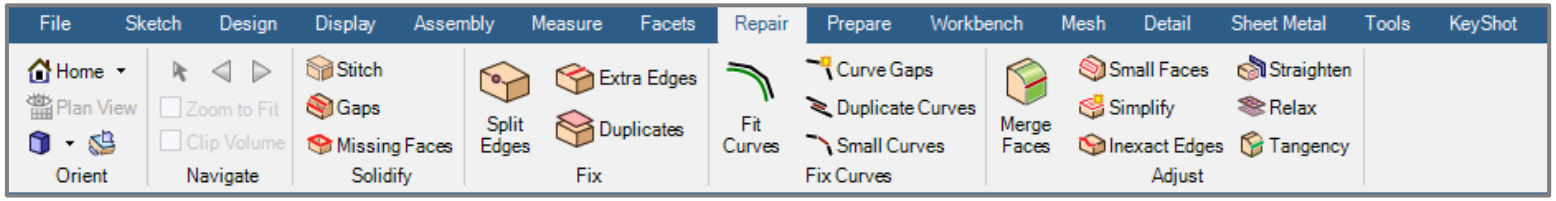
- Familiar ribbon UI design
- Tools categorized in a series of Tabs
  - Sketching
  - File handling
  - Designing
  - Displaying
  - Repairing
  - Etc.
- Each Tab displays relevant tools in organized sections



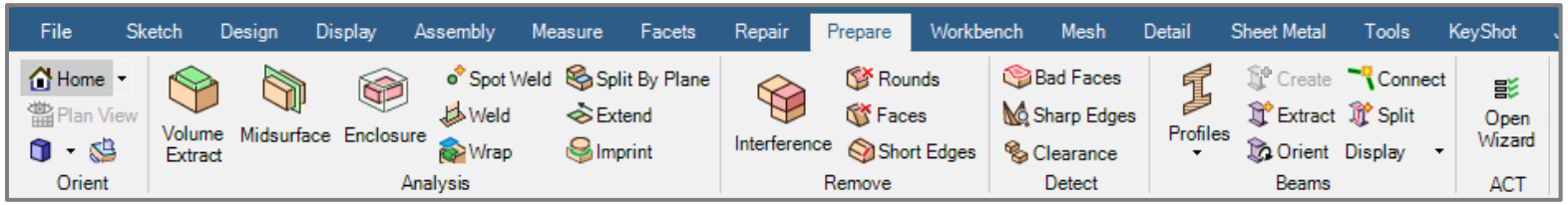
Sketch Tab



Assembly Tab



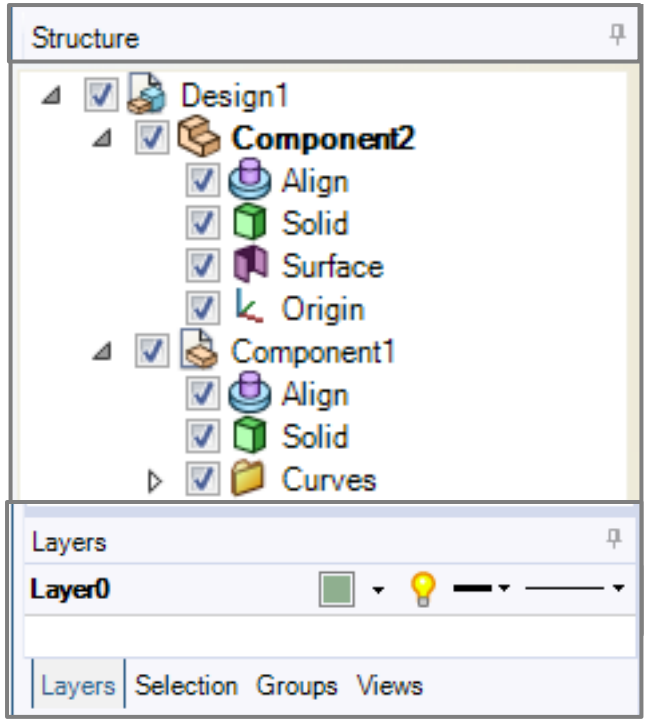
Repair Tab



Prepare Tab

Structure Panel

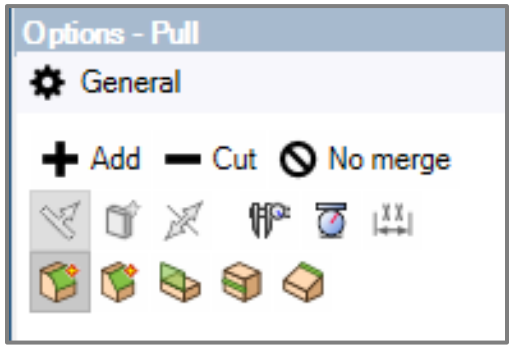
- Structure Tree shows the objects/entities
  - Bodies (solid, surface)
  - Curves (sketch curves, 3D curves)
  - Assembly constraints
  - Origin
  - Plane



Options Panel and Properties Panel

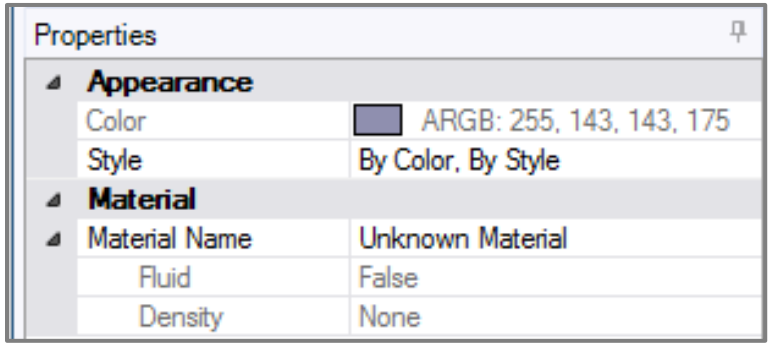
Options Panel

- Displays options for modifying functions of active SpaceClaim tool
  - E.g., Pull tool contains option for add material, subtract material, create fillet, chamfer, etc.



Properties Panel

- Displays properties of selected entity in Graphics window or Structure panel
- Modify property values
  - Color



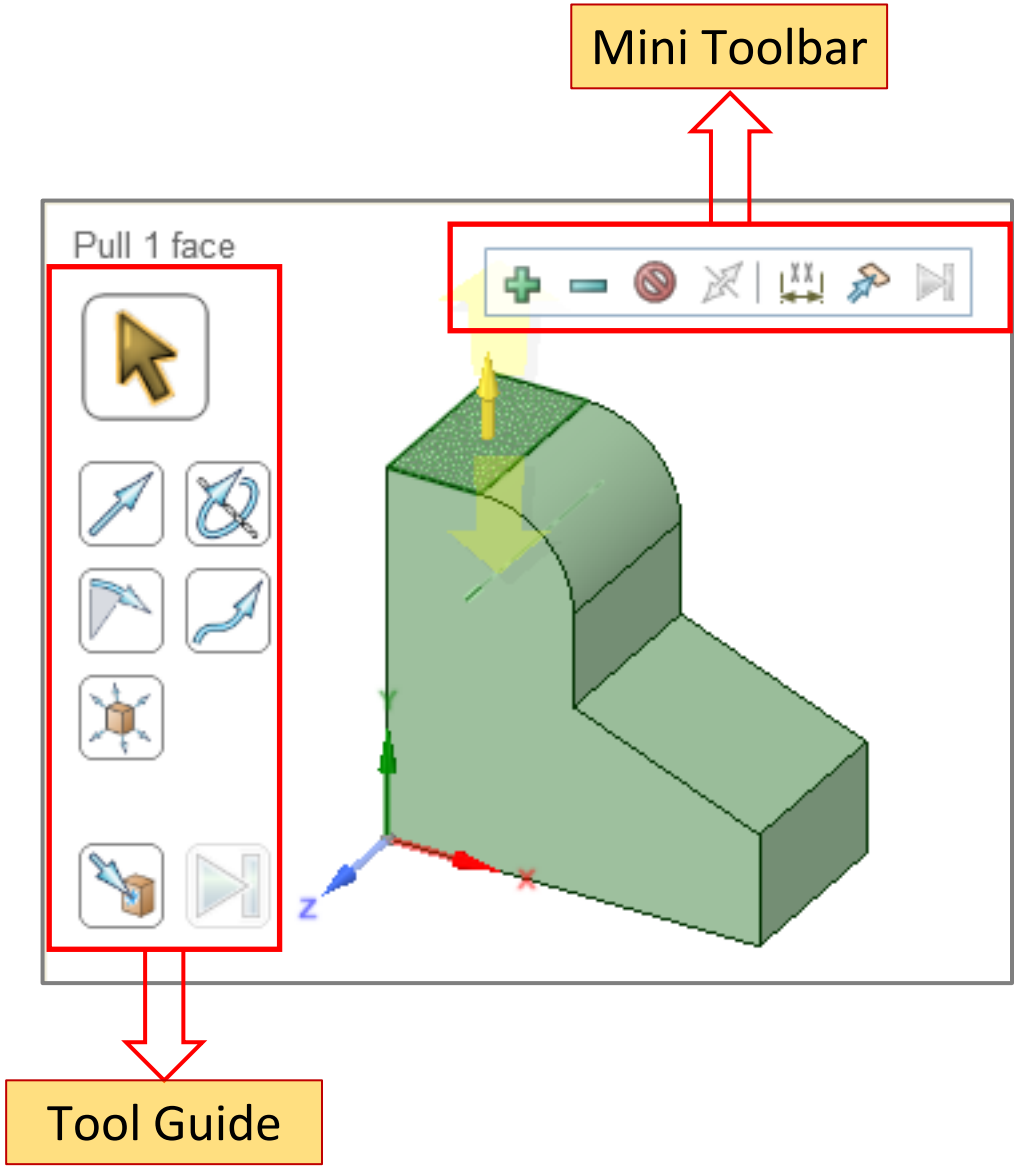
Tool Guide and Mini Toolbar

Mini Toolbar

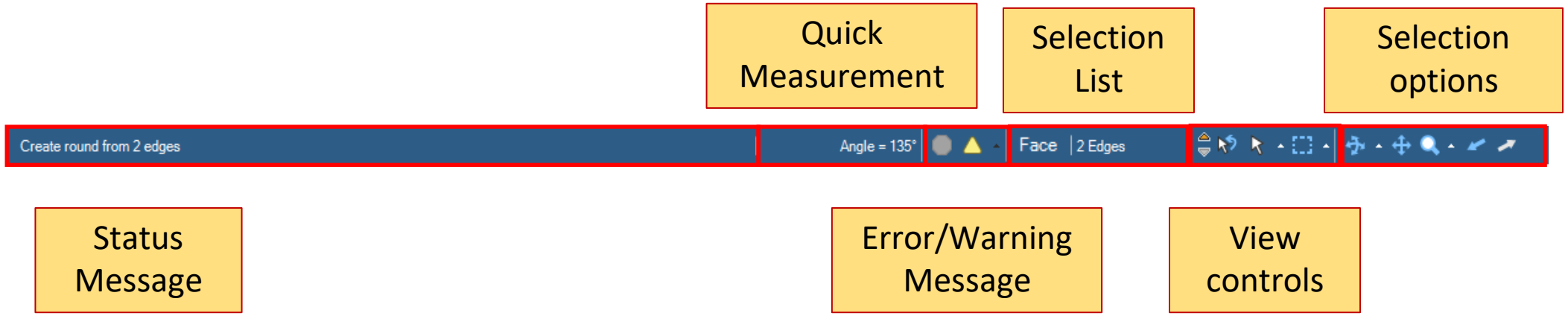
- Contains frequently used options of active tool

Tool Guide

- Contains different options to change behavior of active tool
  - E.g., Tool guide of “Pull” tool contains option for Revolve, Sweep, Scale, etc.



Status Bar



Status Message: Displays message and progress information about current tool
Quick Measurement: Displays simple measurement of selected entities (distance, angle)
Error/Warning Message: Displays error and warning messages
Selection List: Displays list of currently selected objects to the right and being hovered over at the left
Selection Options: Hosts various options for selection
View Controls: Controls for spin, pan, zoom, and switch to previous or next views

Selection

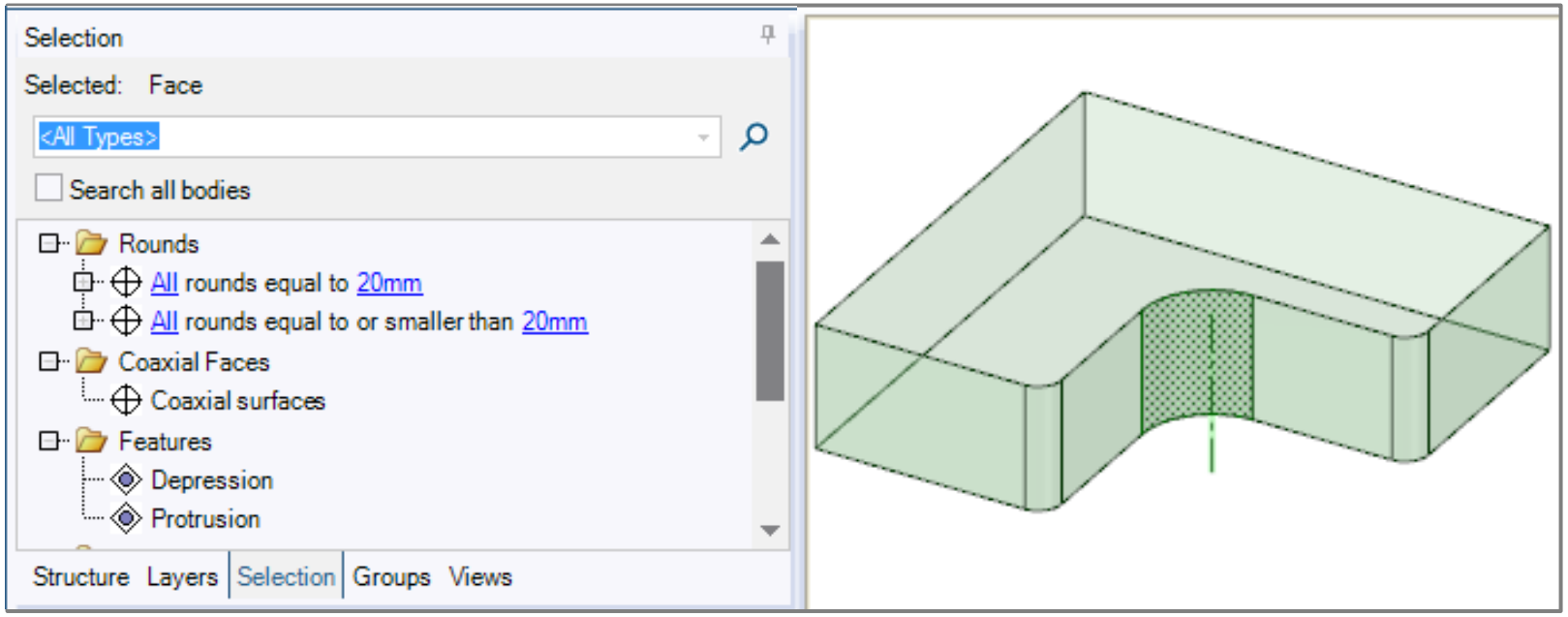
- You can select vertices (including centers of circles and ellipses, midpoints of lines, and points on splines), edges, planes, axes, faces, surfaces, rounds, solids, and components.
- Most commonly used selection methods are:
  - Click to select an object.
  - Double-click to select an edge loop. (Double-click again to cycle through alternate loops.)
  - Triple-click to select a solid.
  - Drag to create a selection Box (can also use Lasso, Polygon, and Paint). If you draw the box from left to right, all objects fully enclosed within the box will be selected. If you draw the box from right to left, all objects touching the box will be selected.
  - Press CTRL+A to select all similar objects, such as faces, edges, or points on the same solid or surface part.
  - Hold CTRL and select to add or remove items from the selection. Ctrl with box-selection toggles the selection; Shift with box-selection adds to the selection.

Selection List

Selection options

Power Selection

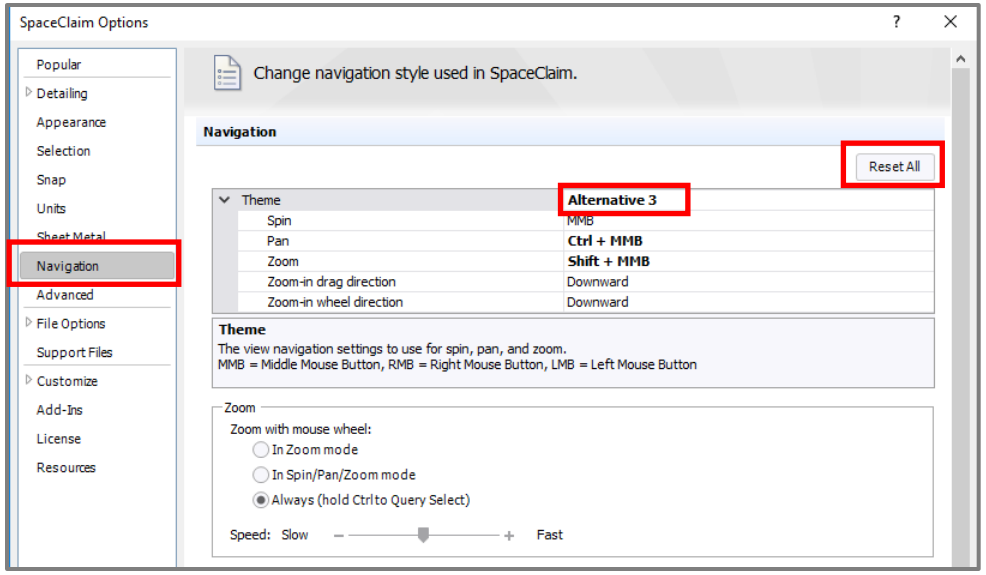
- Selection Panel: Use the Selection panel to select objects in the same part that are similar or related to the object currently selected. The results list is based on the geometry you select for the search.
- The relations available are displayed in the Selection window as per the item selected and items

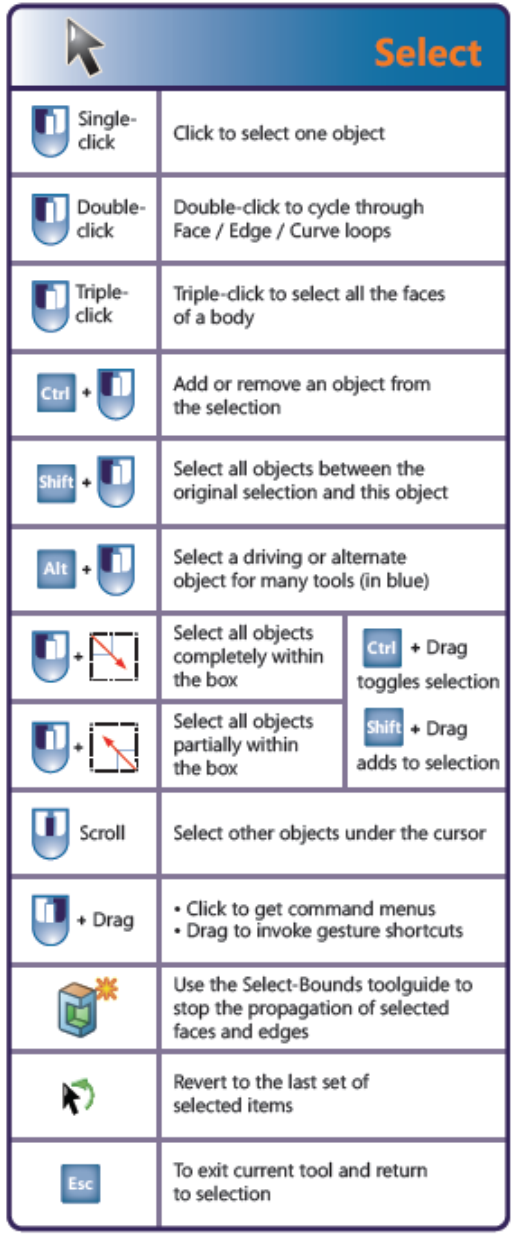


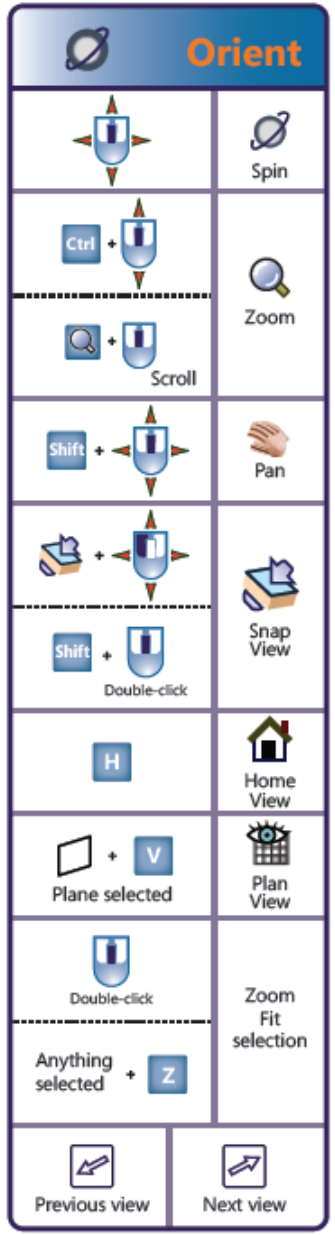
Mouse and View Controls

- Easy-to-use Mouse and View controls to speed up operations and manipulate graphics
- Controls listed in “Quick Reference Card”
- “Quick Reference Card” can be accessed during SCDM launch

  Notice: The controls shown here are true after doing a ‘Reset All’ in File/SpaceClaim Options/Navigation. They can be changed to match those of your CAD Software by changing the Theme or can be customized.

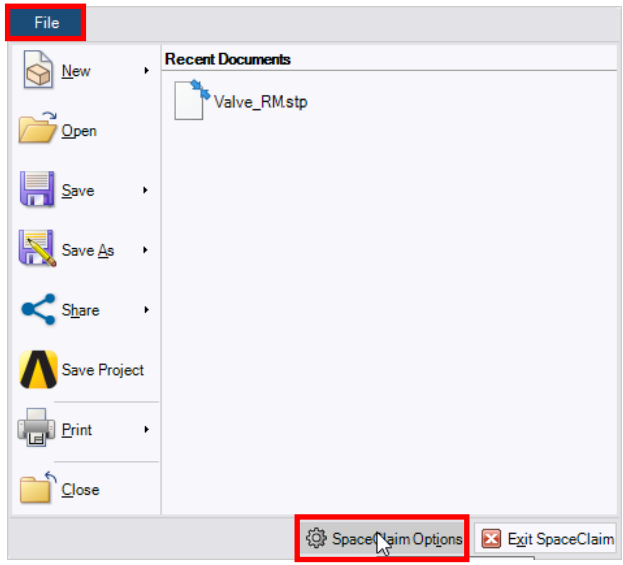


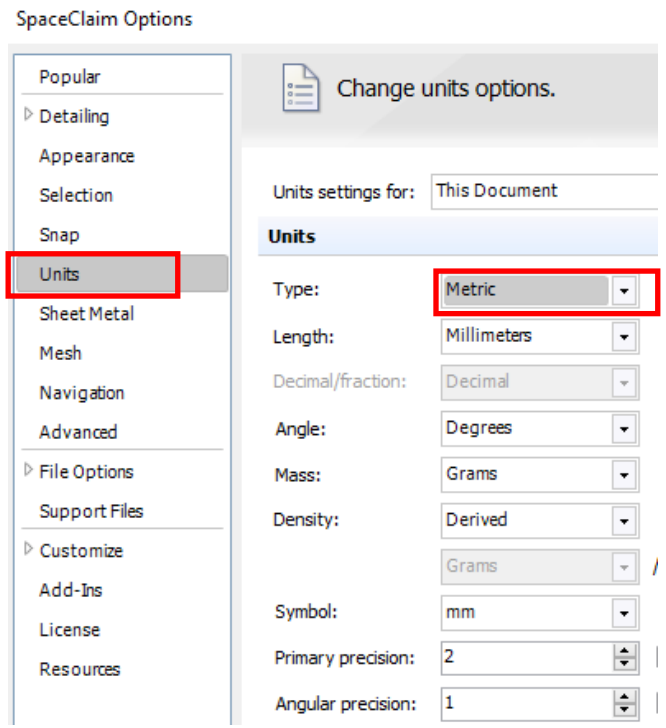


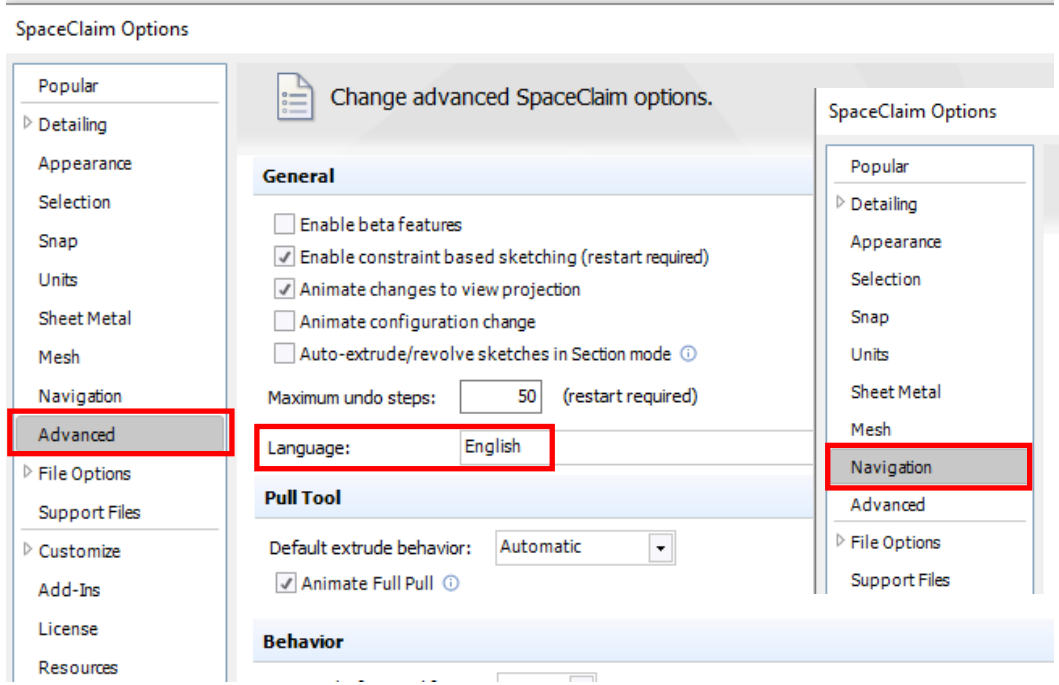


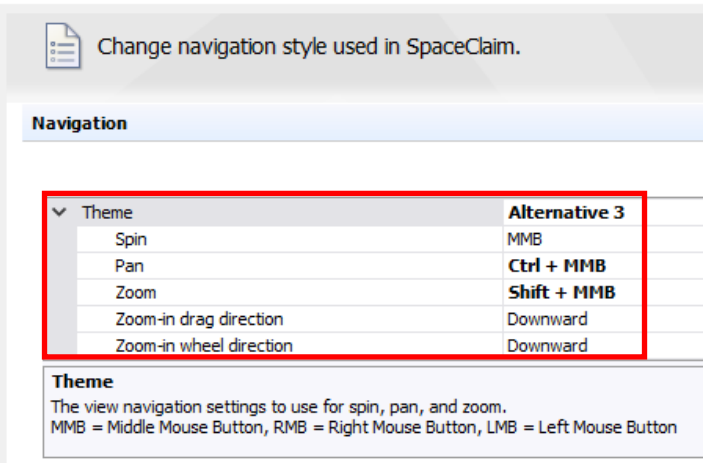
SpaceClaim Options

- SpaceClaim options is where you can control everything like the tool guide position, switch the unit system from imperial to metric, the language, the file options and many other options

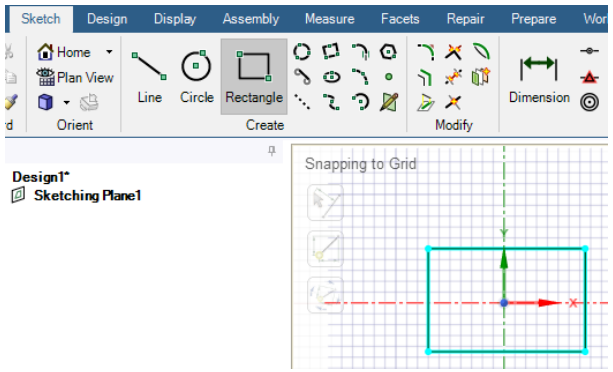




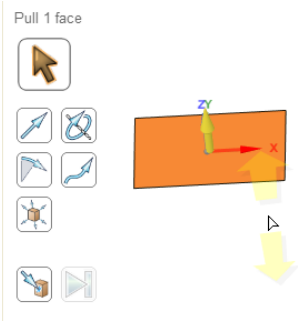




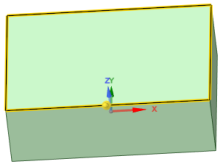
Quick Workshop 01.1

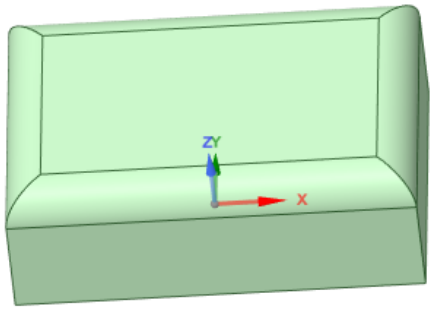


- Open SpaceClaim
- Start sketching a rectangle
- Switch to the Design tab or click on the ‘P’ button of your keyboard and pull the rectangle to create a box



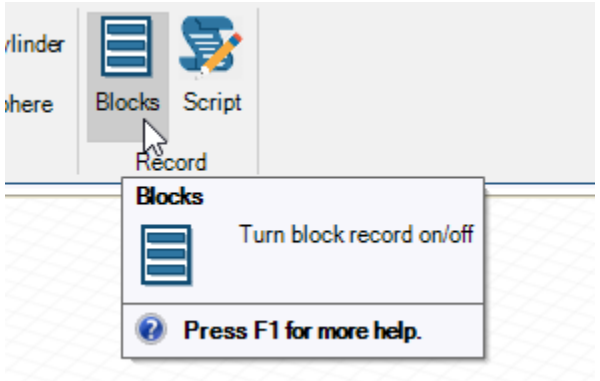
- With the pull function select the edge on the top face and double click to select all the edges loop
- Move your mouse to the right and notice that you have created rounds

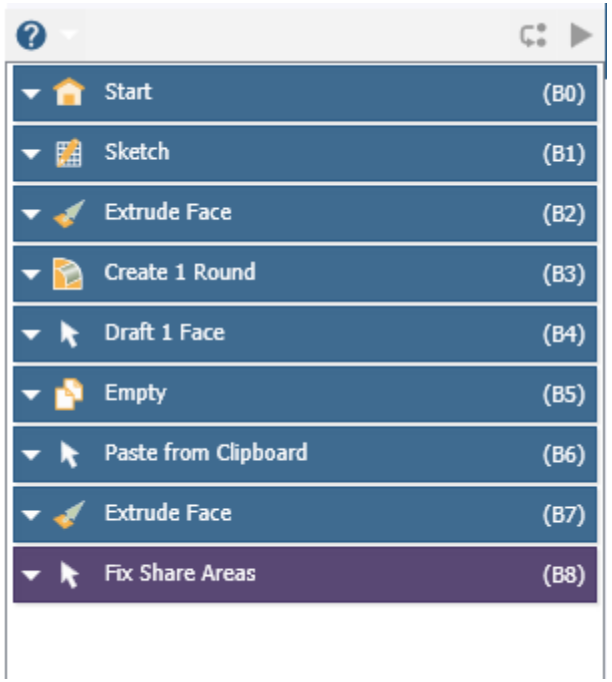




Block recording (1)

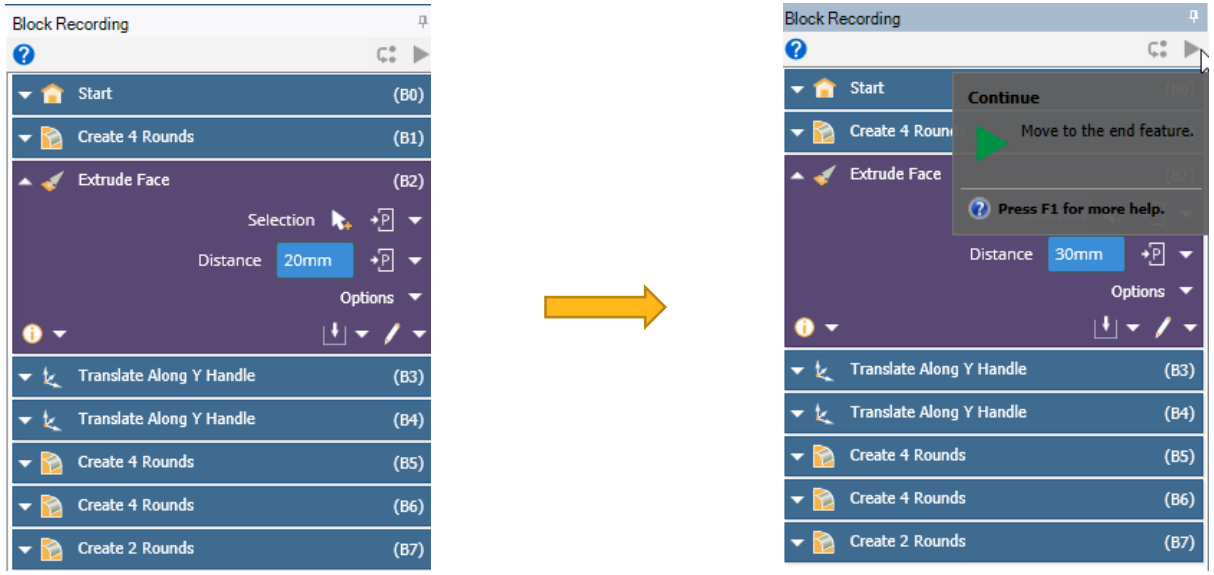
- The Block Recording feature enables you to use SpaceClaim to record and play back operations
- Connects bidirectionally from CAD <-SpaceClaim->Workbench
- Supports parametric and unplanned changes from CAD
- Combines direct editing with automation





Block recording (2)

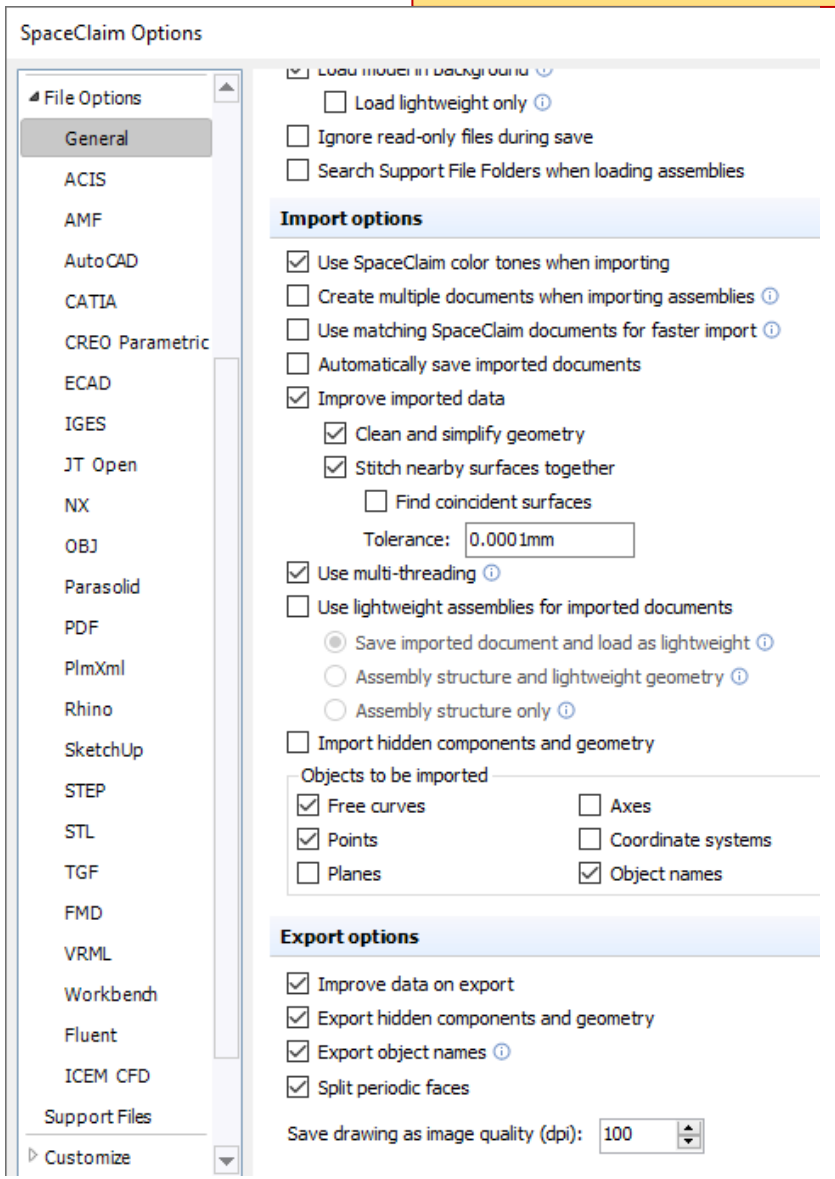
- With Block recording, we can change the value of a certain operation parameter and rerun all the operations
- For instance, we can change this extrude value to 30 mm and rerun all the recording



File Handling

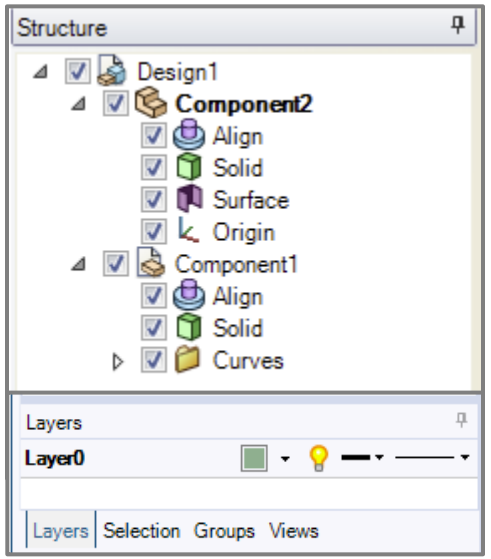
- Supports import from major CAD packages (CATIA, Pro/E, NX, Solid Works, etc.)
- Separate license not required except for CATIA V5 and V6, JT, and PDF3D
- Neutral file formats like STEP and Parasolid are also supported
- Additional options for controlling import/export of file formats available in SpaceClaim Options panel

SpaceClaim Options



Working with Assemblies (1)

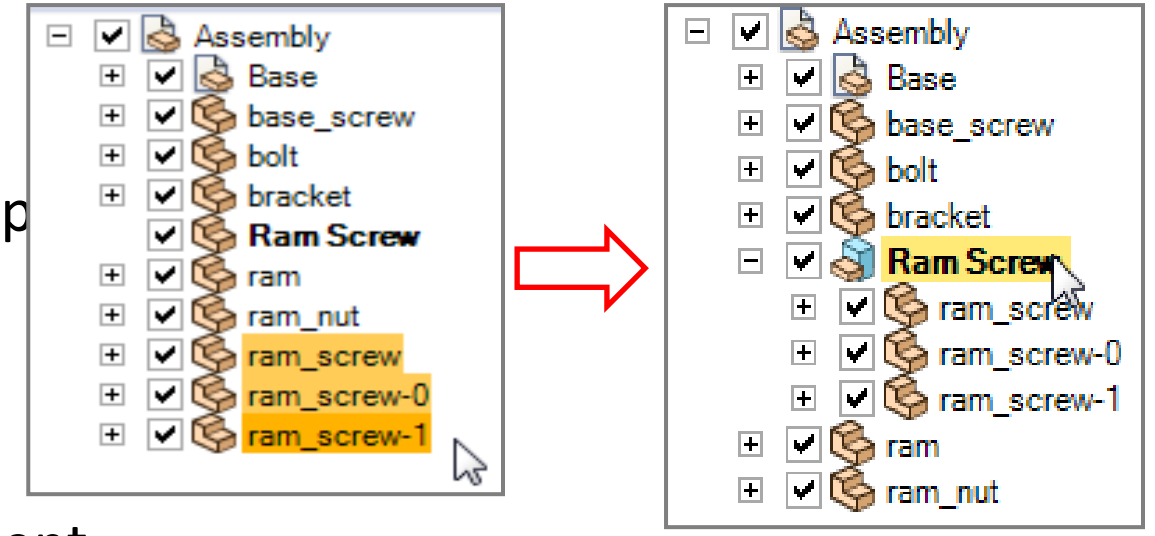
- Components are shown on the structure tree and are created automatically
- Components can be created manually by:
  - Right-click any component and select New Component
  - Right-click an object and select Move to New Component, it will create a component within the Active Component
  - Ctrl+click multiple objects, then right-click and select Move Each to New Components to create a new component for each object
- Activating a component (right-click Activate Component) allows to work with the objects within that component
- Components can be copied, cut, pasted, mirrored, and deleted



Working with Assemblies (2)

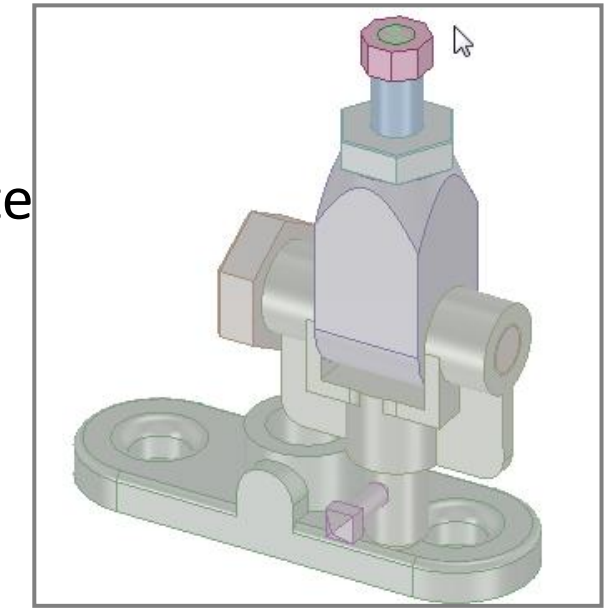
Components

- Reorder bodies/components using drag and drop

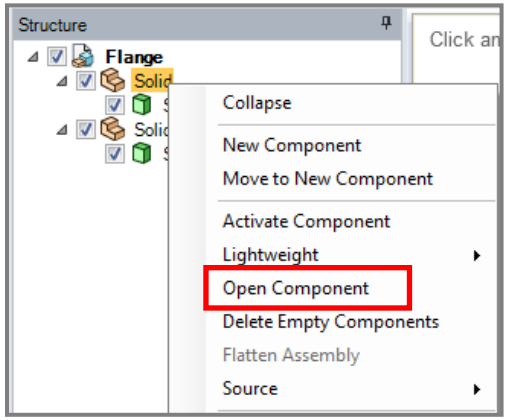


Active Component

- Allows to work with objects within that component
- Other components get greyed out
- To activate, right click on the component and select “Activate

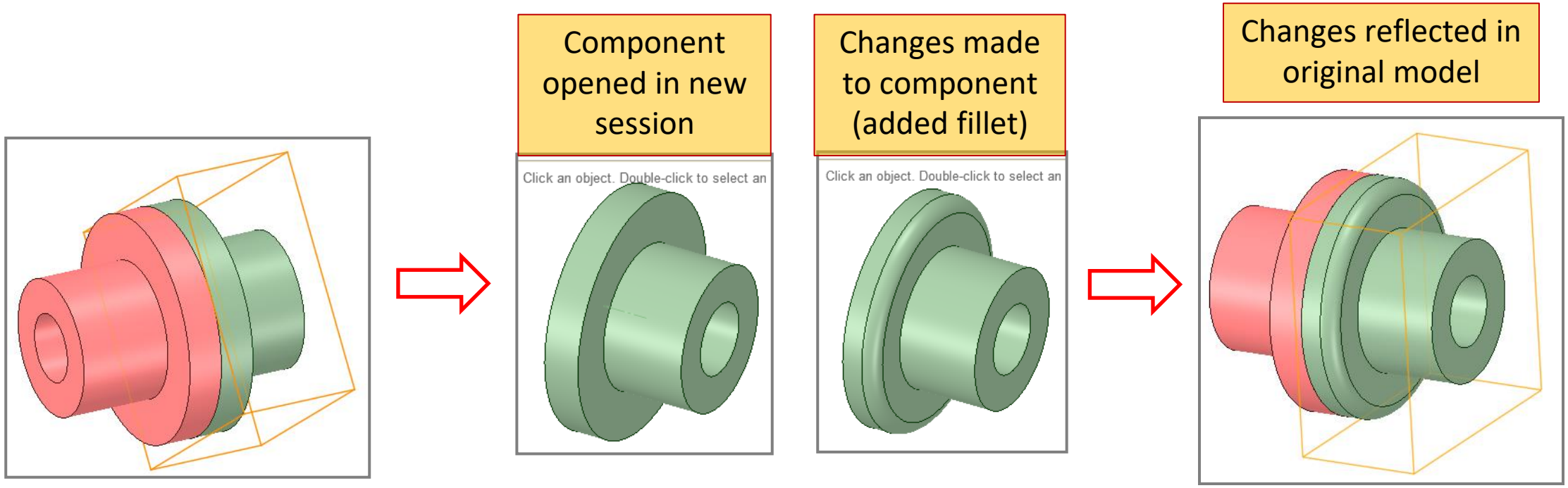


Working with Assemblies (3)



Open Component

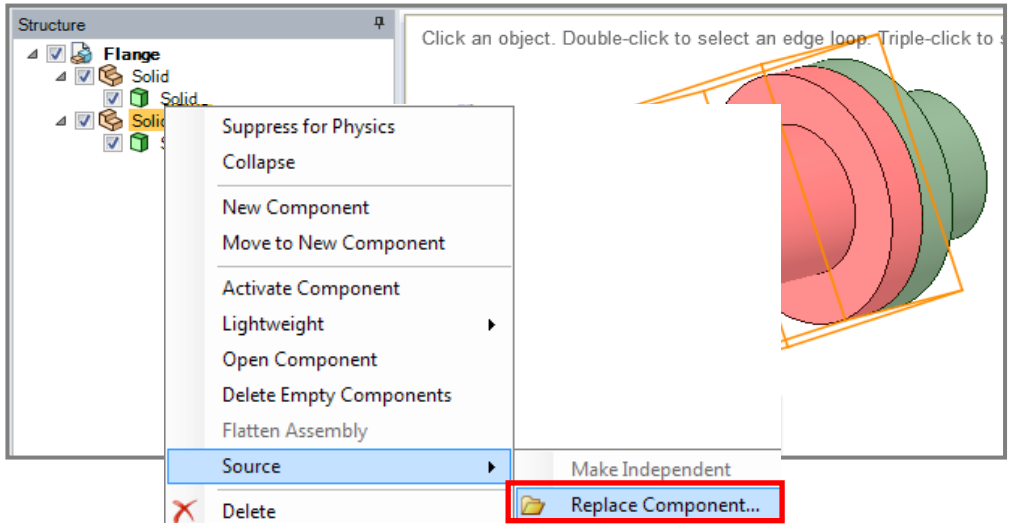
- Ability to work on a specific component by opening it in a new session
  - Right click and select “Open Component”
- Changes made to the component objects get reflected in the original model

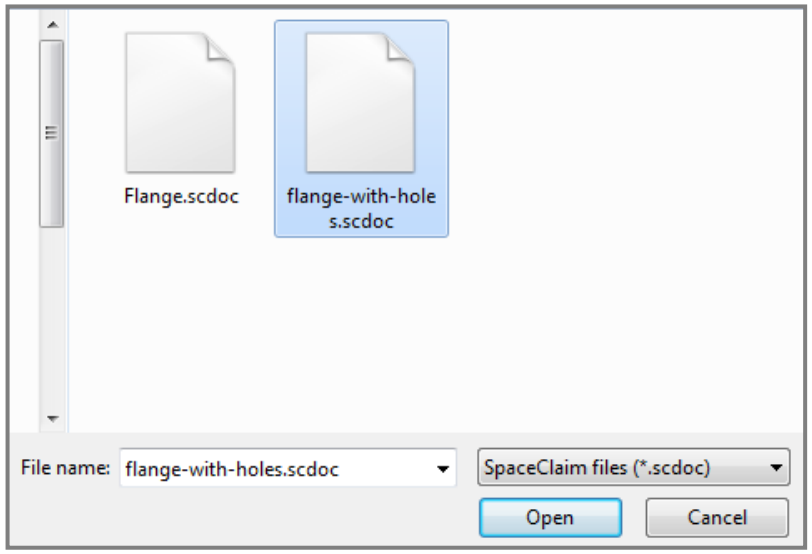


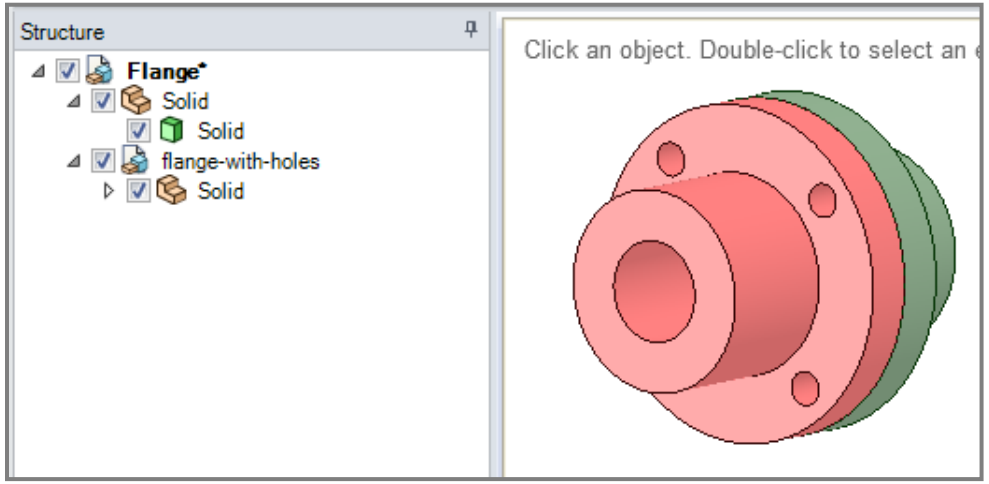
Working with Assemblies (4)

Replace Component

- Replace an existing component with another saved component
  - Reuse existing models



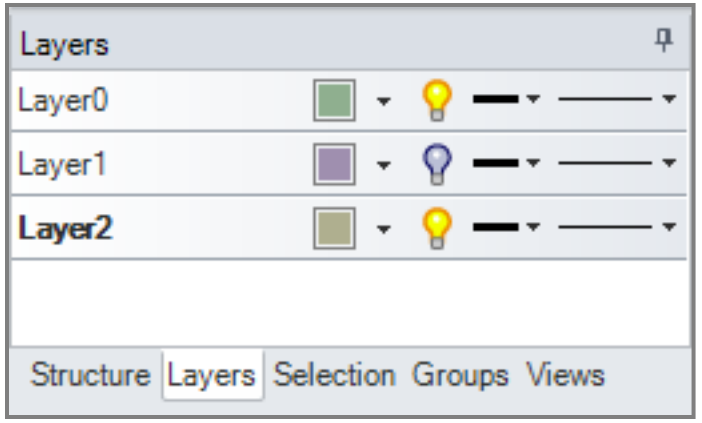




Working with Layers

Layers

- Useful for grouping objects based on visual characteristics
  - Visibility
    - Click bulb icon to change visibility
  -  Objects are hidden
  -  Objects are visible
  - Color
  - Linestyle, not for 3D objects

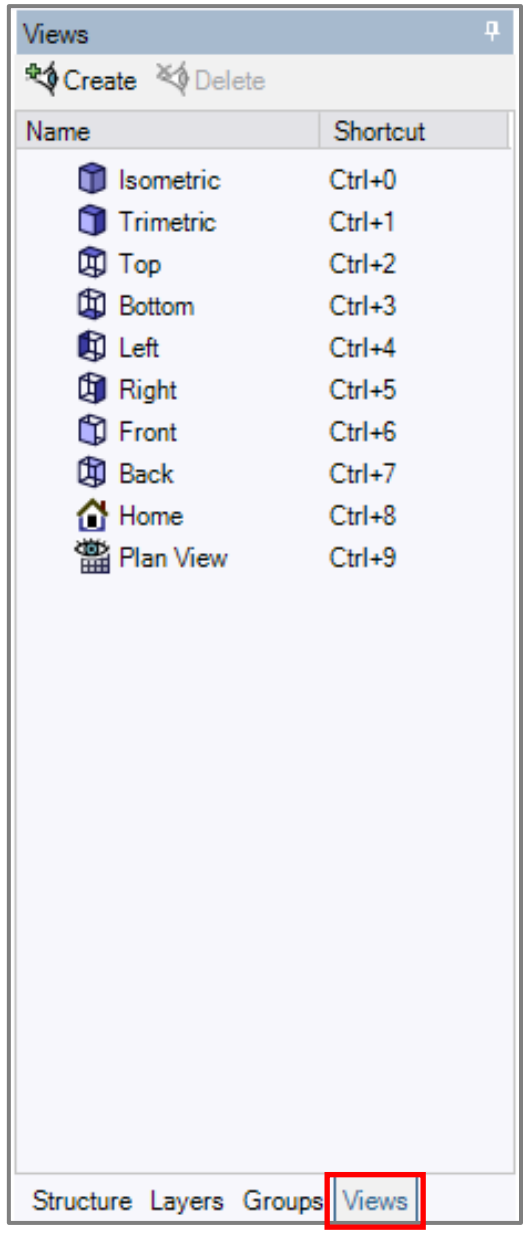


- Right click in Layers panel and select “New” to create a new layer
  - Set appropriate layer color
  - All new objects created in this layer will have the same layer color
- To add selected objects to a layer, right click on the desired layer and select “Assign To Layer”

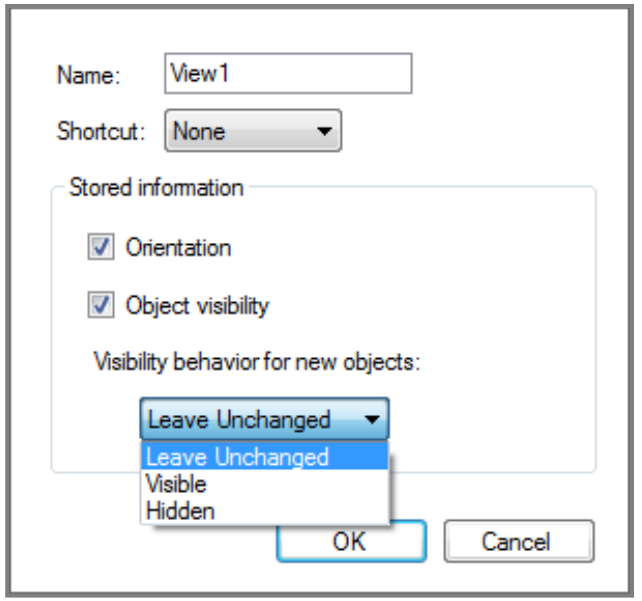
Managing Views

Views

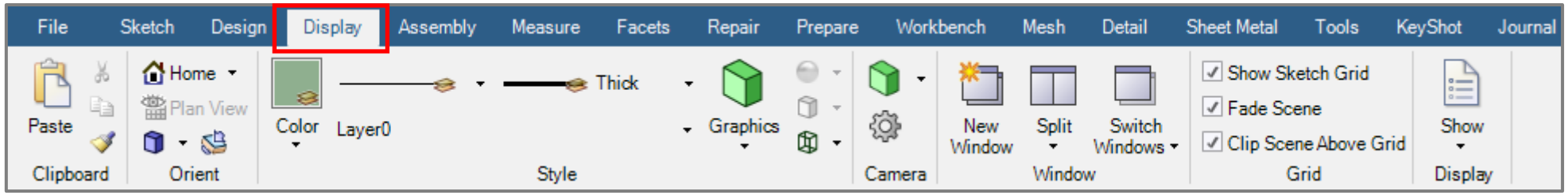
- Change shortcuts for standard views
- Create custom views to save object orientation and visibility
- Control visibility behavior for custom views
  - Leave Unchanged: New objects retain their visibility
  - Visible: New objects become visible
  - Hidden: New Objects get hidden



Create View Panel



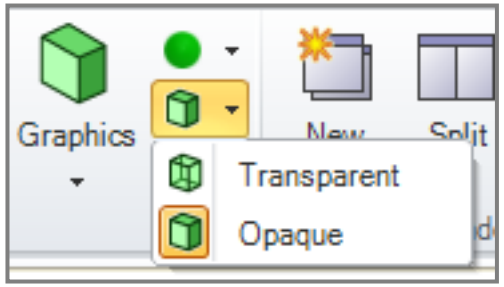
Display (1)

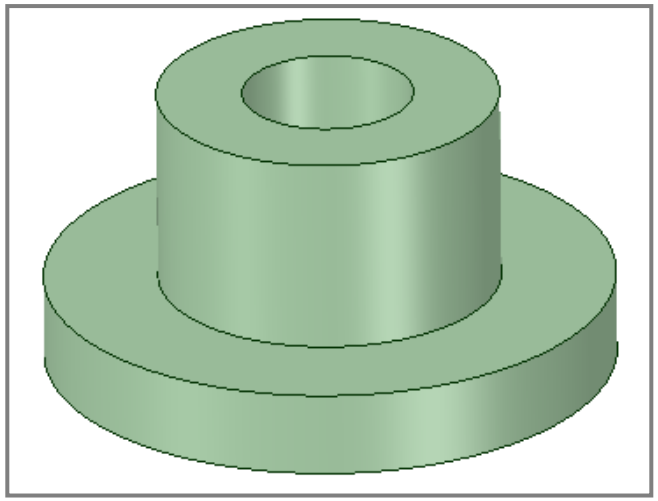


Display tab

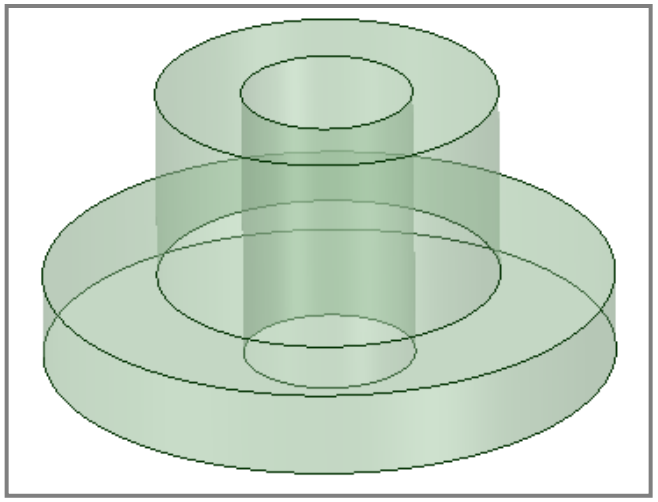
- Hosts several features for managing display of geometry
  - Cut, Copy, Paste objects
  - Standard and custom view
  - Change object color
  - Manage layers
  - Change graphics mode
    - Wireframe, shaded etc.
  - Rendering options
  - Change transparency
  - Arrange graphics windows
  - Etc.

Change Transparency



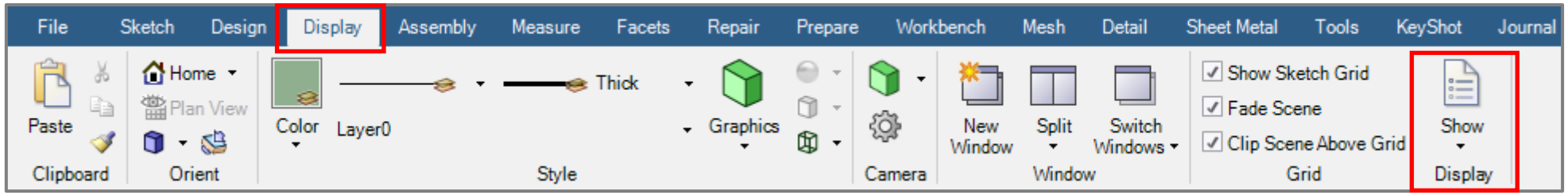


Opaque



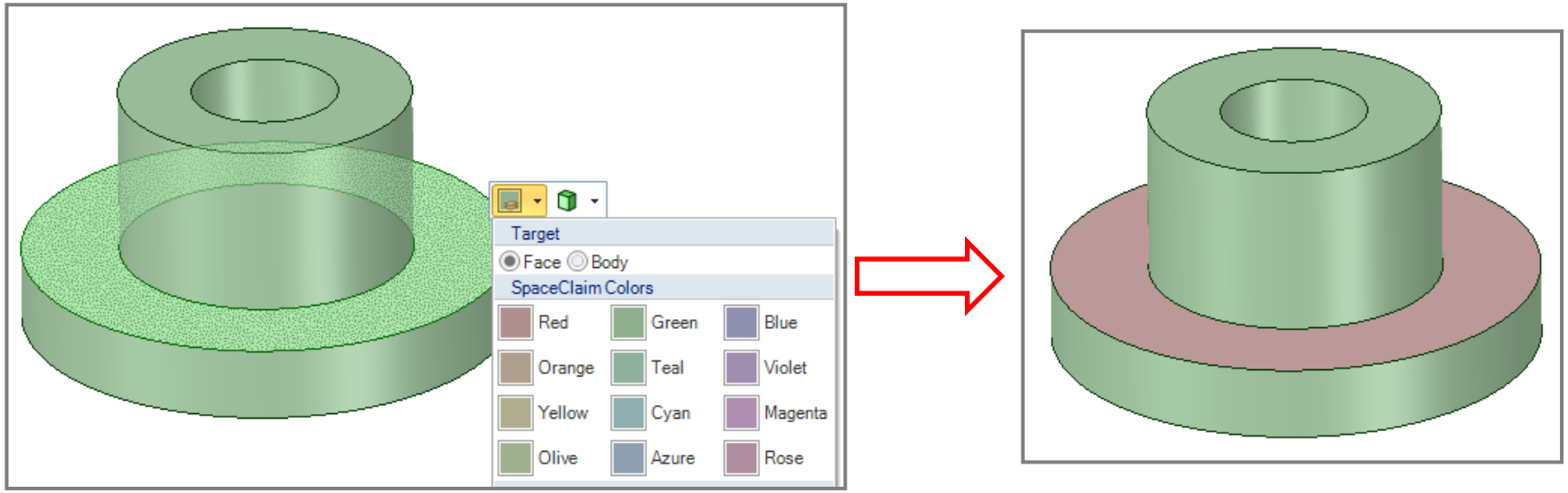
Transparent

Display (2)

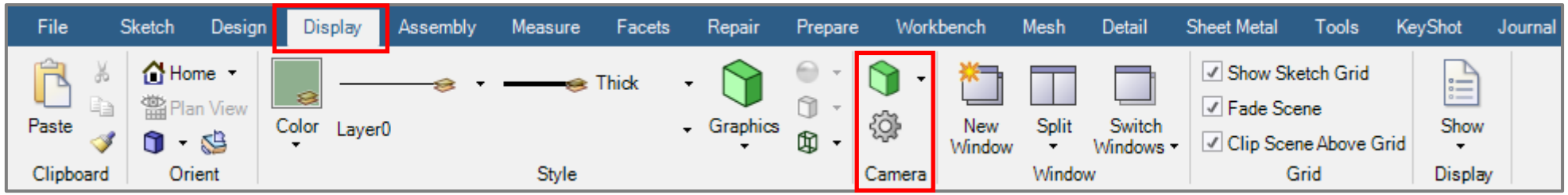


Display tab

- Change face color
  - Select face
  - Right click and open Color panel
  - Select “Face” target
  - Select desired color

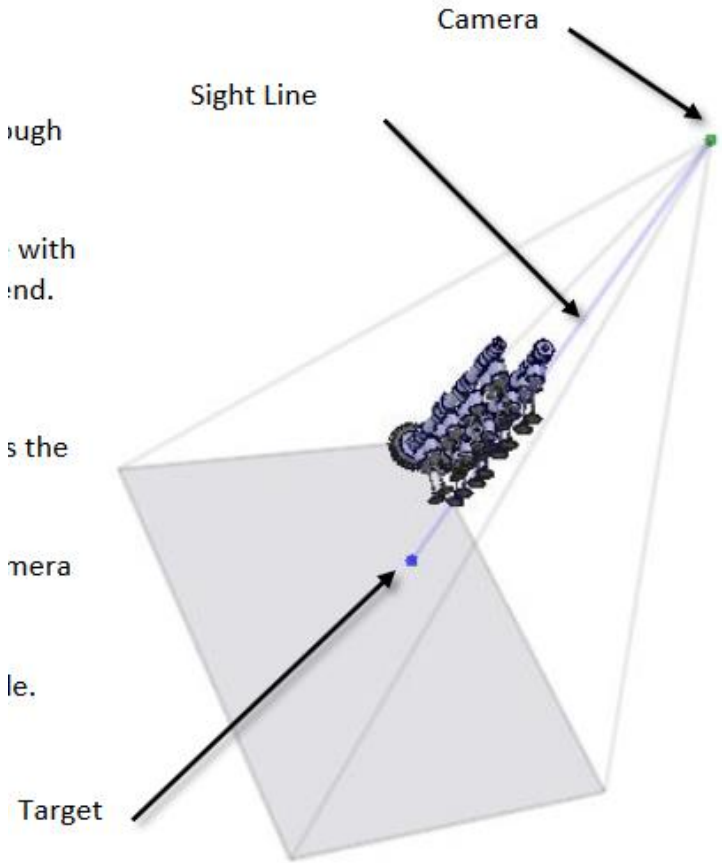


Display (3)



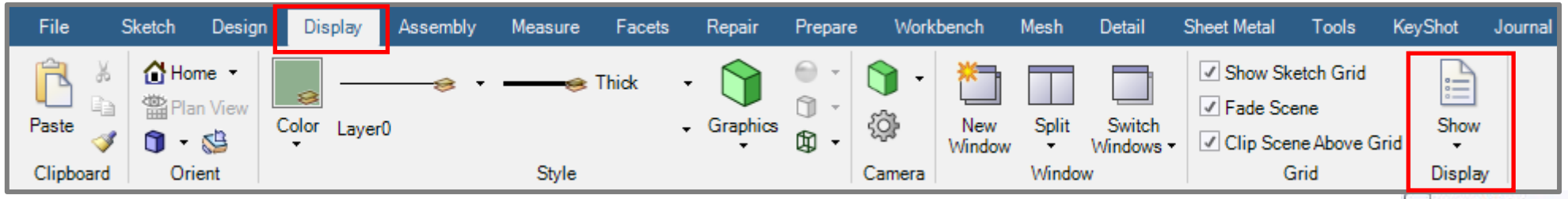
Flythrough

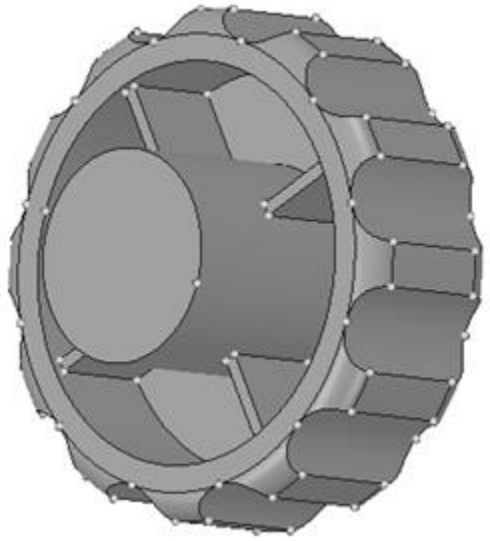
- Gives the impression that we are inside the model looking around
  - Click the Camera button in the display tab
  - Click the Identify Viewport button to show viewport numbers
  - Click the Show Camera
  - Choose a viewport
  - Click OK
  - Click the to activate Flythrough

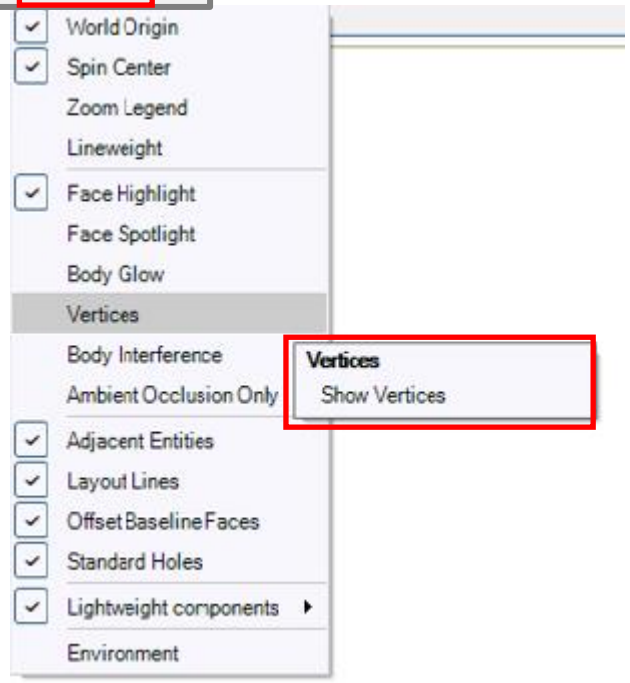


Display (4)

- Show Vertices: Shows all the vertices of the geometry



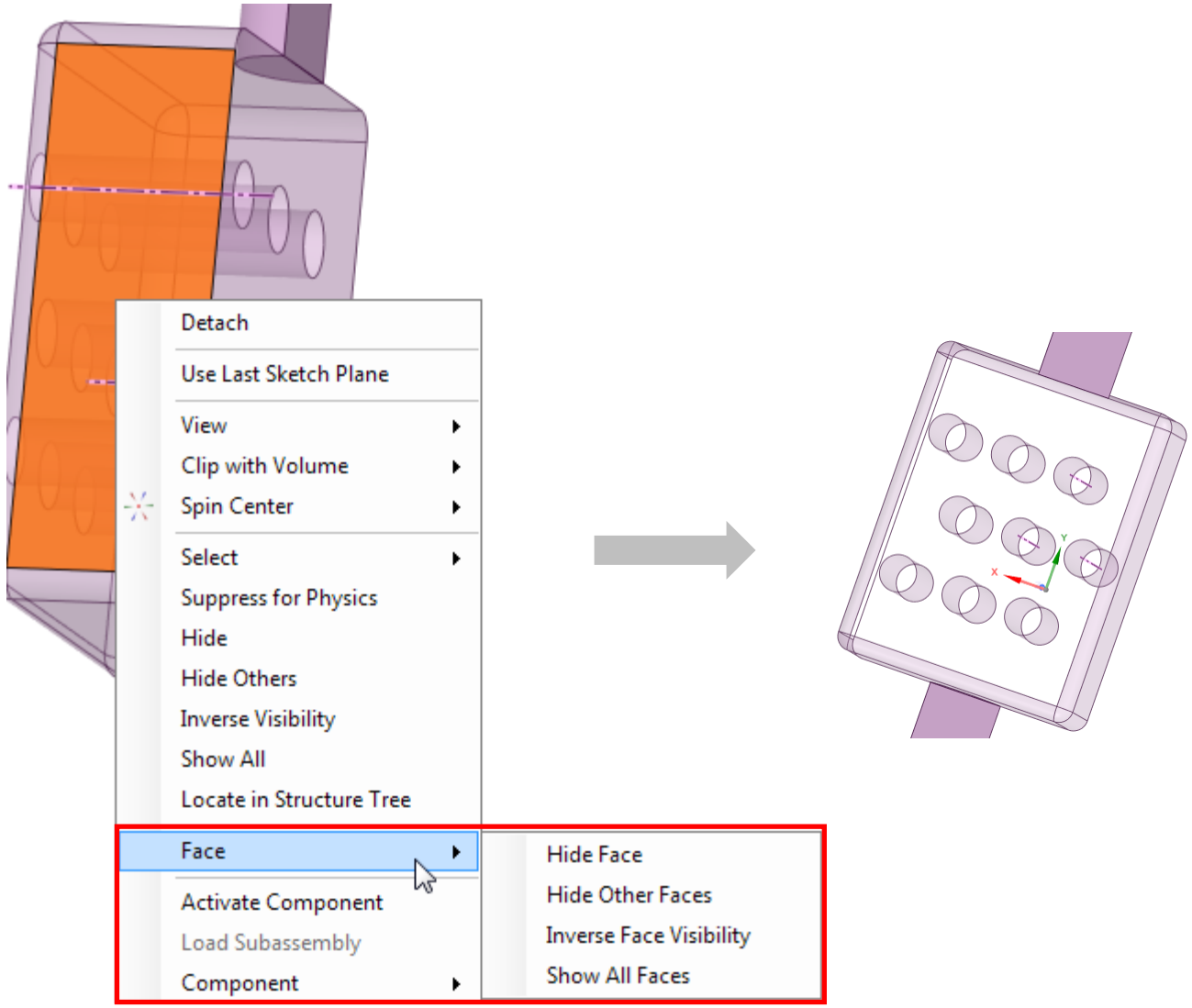




Display (5)

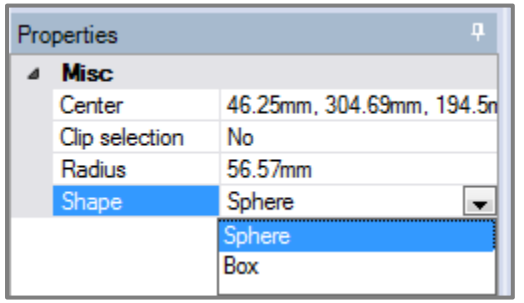
Face hide and face visibility

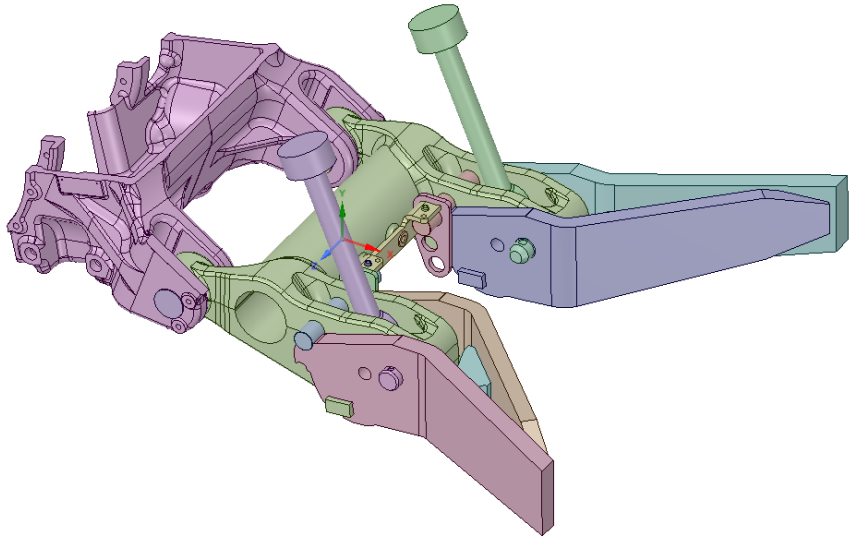
- By right clicking on a face, you can:
  - Hide it
  - Hide other faces
  - Reverse its visibility
  - Show all faces

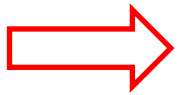


Display: Clip with volume

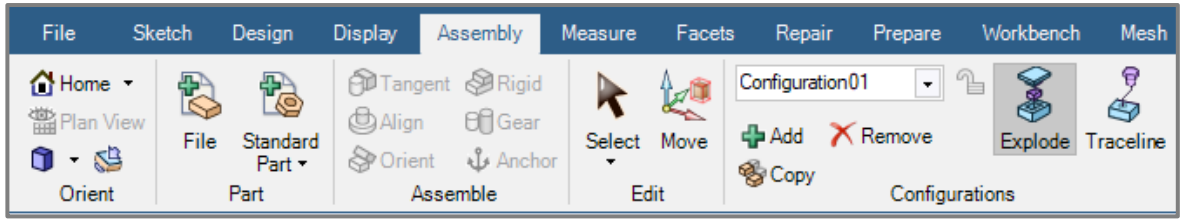
- Enables you to create a clip volume around an object so that you can selectively isolate a specific region of a design:
  - Right click on the area you want to view and click **Clip with Volume > Set using selection** then release the mouse
  - Right click and select **Clip with Volume > Select**. In the Properties panel, you can choose between a sphere and a cube and change the center and the radius.
  - Right click and select **Clip with Volume > Resize** to change the dimensions



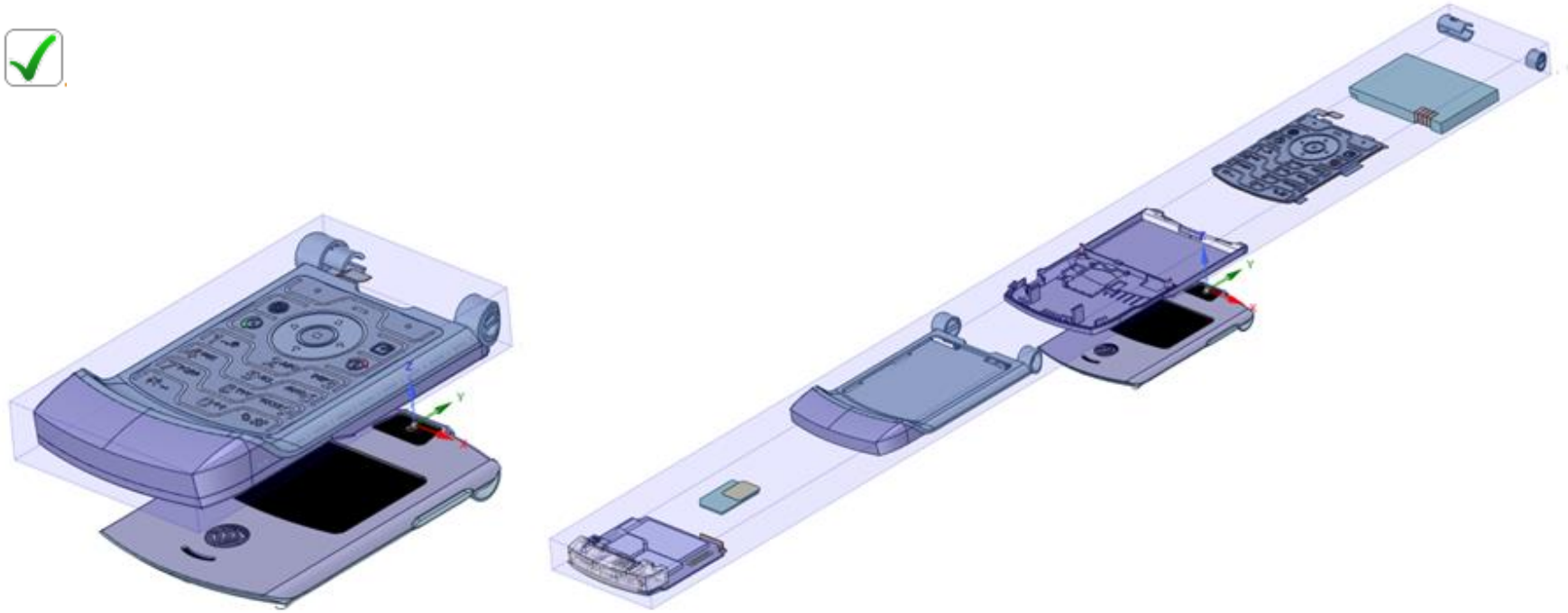




Explode View in the Assembly Tab



- Enables you to see views of individual components of your model and add tracelines between components using the Traceline tool
  - Click ✚ to add a new Configuration and rename it as desired
  - Click Explode in the Assembly tab; by default, the top-level component is selected
  - Select an edge, axis, or origin axis using the Select Explosion Direction to set the direction of the explode
  - Click Complete



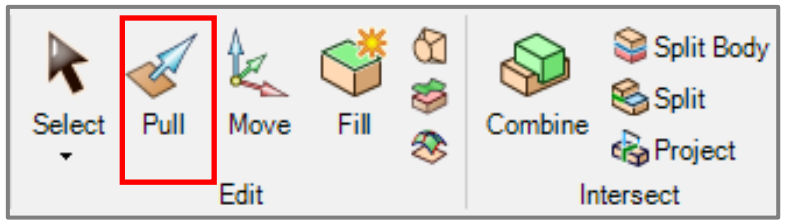
SpaceClaim Main Tools

There are 4 main Tools in SpaceClaim that must be known by all the users:

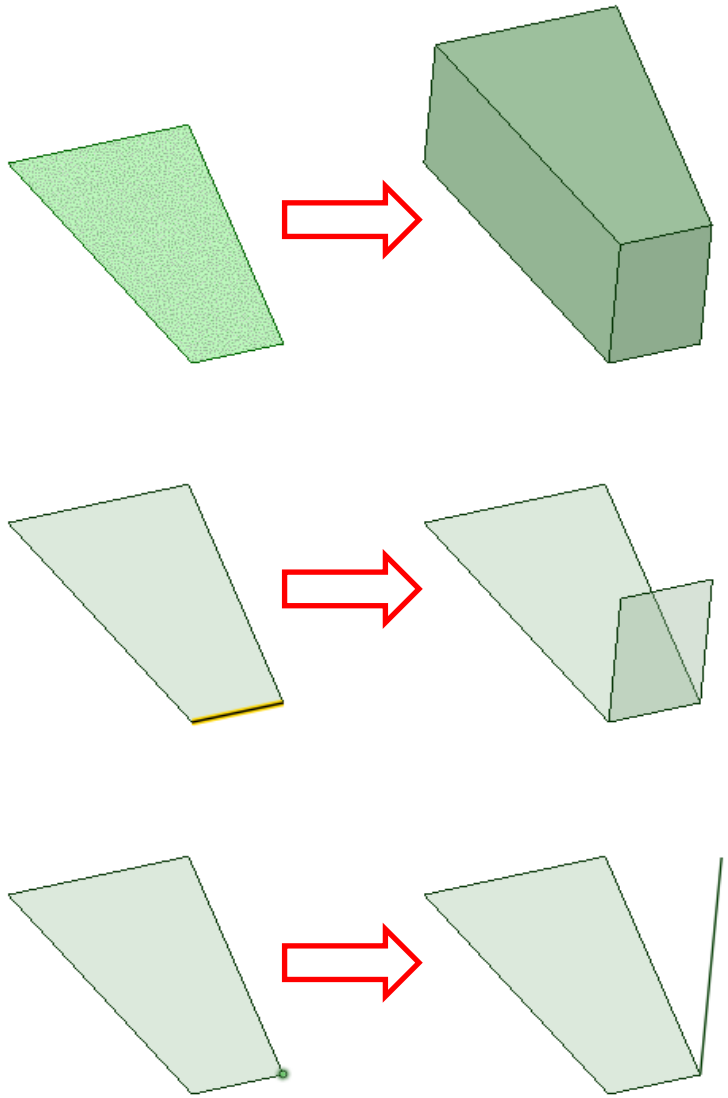
- Pull Tool
- Move Tool
- Fill Tool
- Combine Tool

Notice: In this Module we will just give a brief description of these tools
For more information, please consult the Module 2: Creating Geometry

Pull Tool



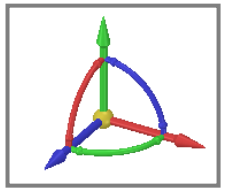
- Used to convert sketches to 3D
  - Pulling a line creates a surface
  - Pulling a surface creates a solid
- Distort or deform existing geometry
- Drag the selected object in a chosen direction when Pull tool is active
- Multi-functional tool
  - Extrude, Revolve, Sweep, Offset and Draft faces
  - Create Rounds (Fillets), Chamfers or Extrude edges
  - Pull a point to create Line
- Several tool guides available to alter its behaviour



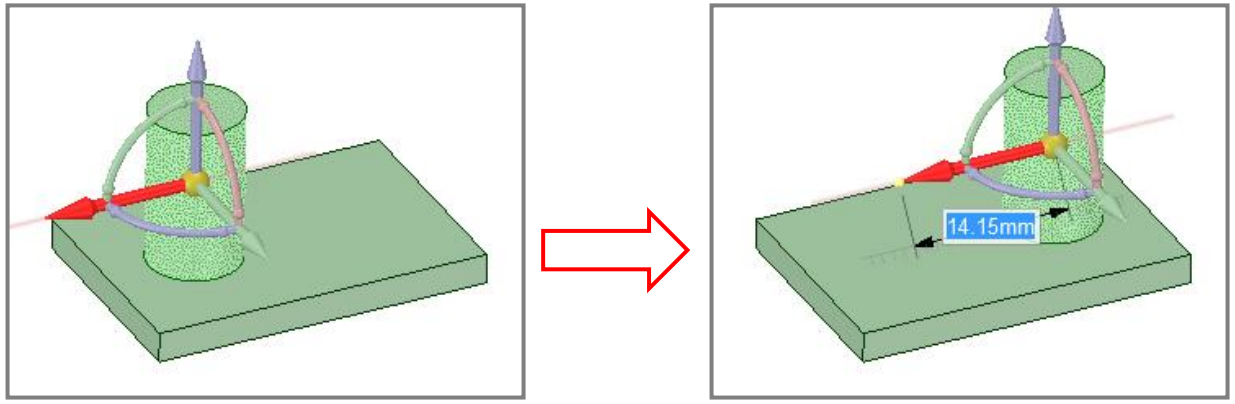
Move Tool

- Multi functional tool
  - Translate
  - Rotate
  - Pattern
- Move handle guides the direction movement
  - Translational movement along 3 “linear” axes
  - Rotational movement along 3 “curved” axis
- Drag the selected object along the Move handle axis (linear, curved) to facilitate Move
- Distort or deform existing geometry
- Several tool guides available to alter tool behaviour

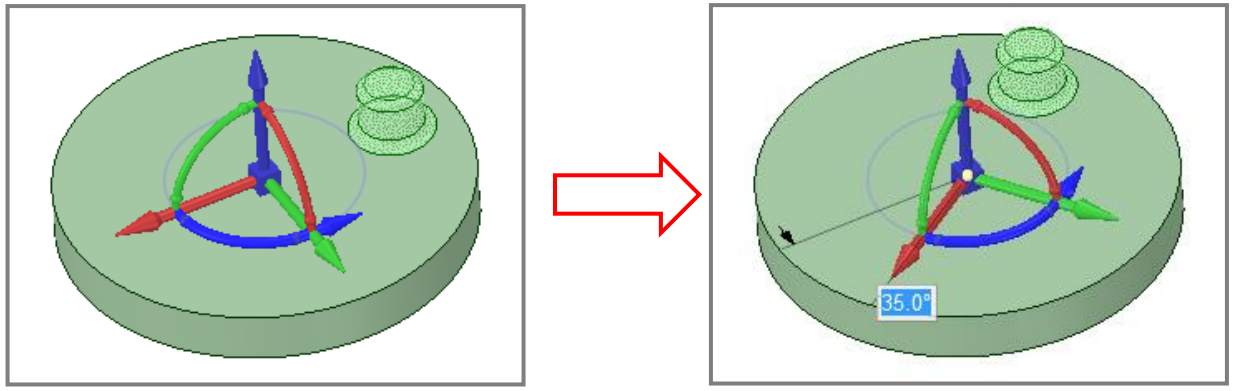
Move Handle



Translation movement



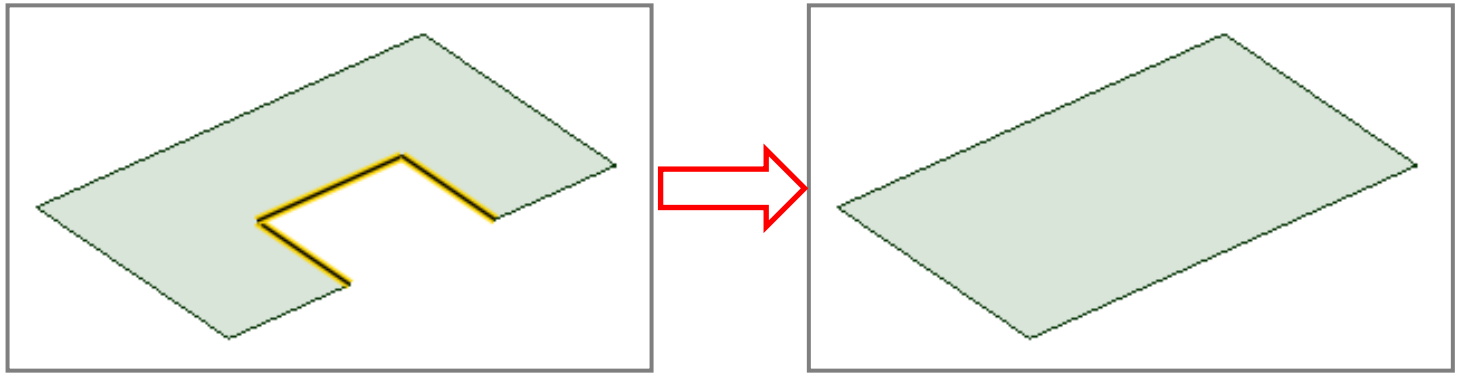
Rotational movement

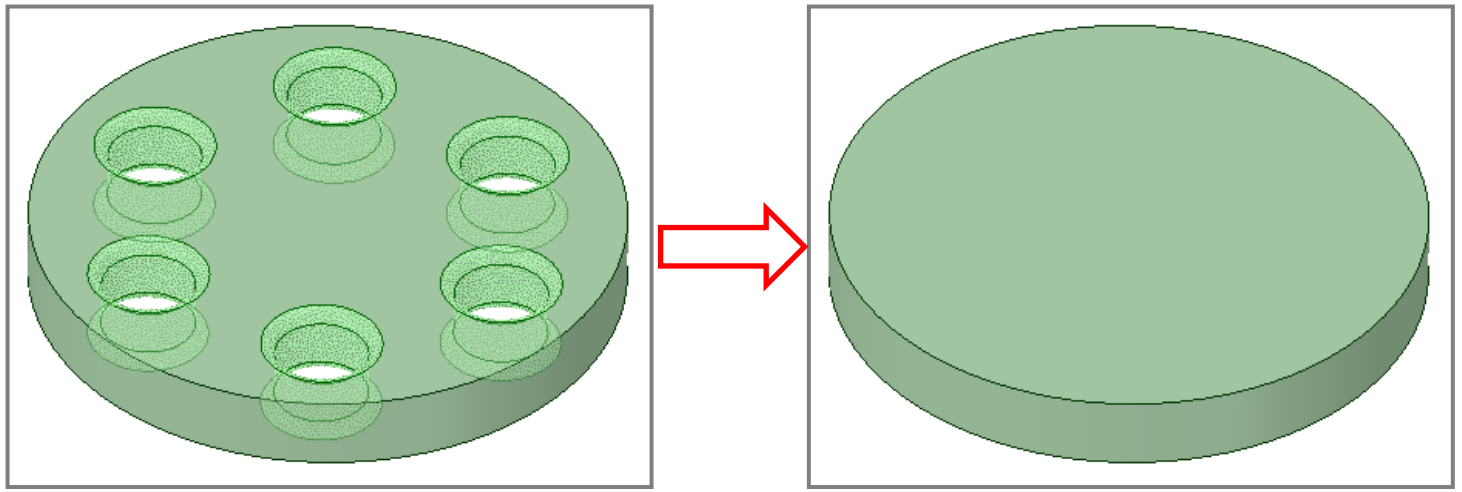


Fill Tool

- Fill selected region with surrounding surface or solid

- Acts as a “healing” tool to remove:
  - Fillets
  - Chamfers
  - Holes
  - Protrusions
  - Depressions

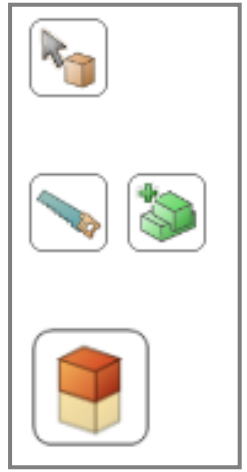




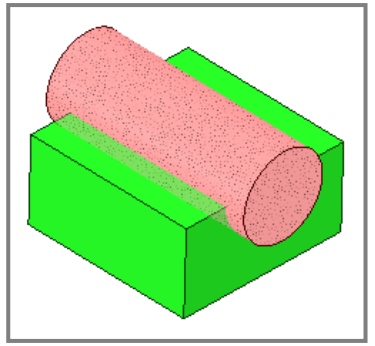
Notice: Sometimes a simple delete after selecting the entities can replace the Fill Tool

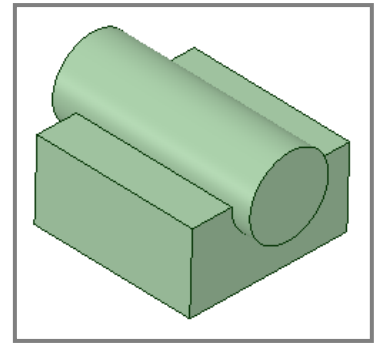
Combine Tool

- Perform Boolean operations
  - Add
  - Subtract
- By default, second selected object acts as a cutter to perform subtract operation
  - Cutter tool guide gets activated once a body is selected
- Select multiple objects using “Ctrl” key to add them
  - “Merge” tool guide gets activated automatically
- Option to delete or retain left over region after subtract operation
  - “Regions to Remove” tool guide automatically gets activated after subtract operation

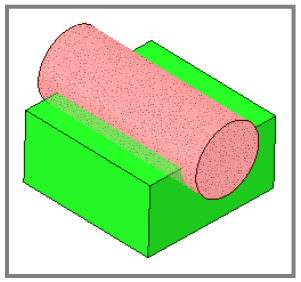


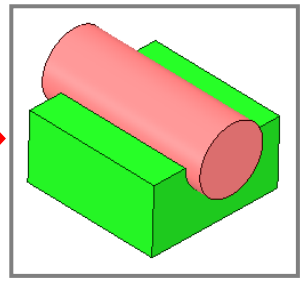
Merge multiple objects



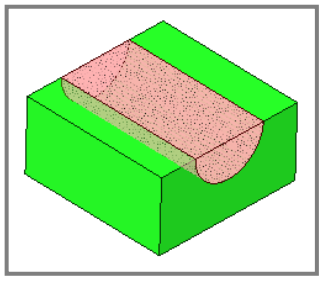


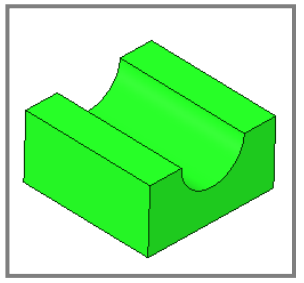
Select cylinder as cutter





Select region to remove

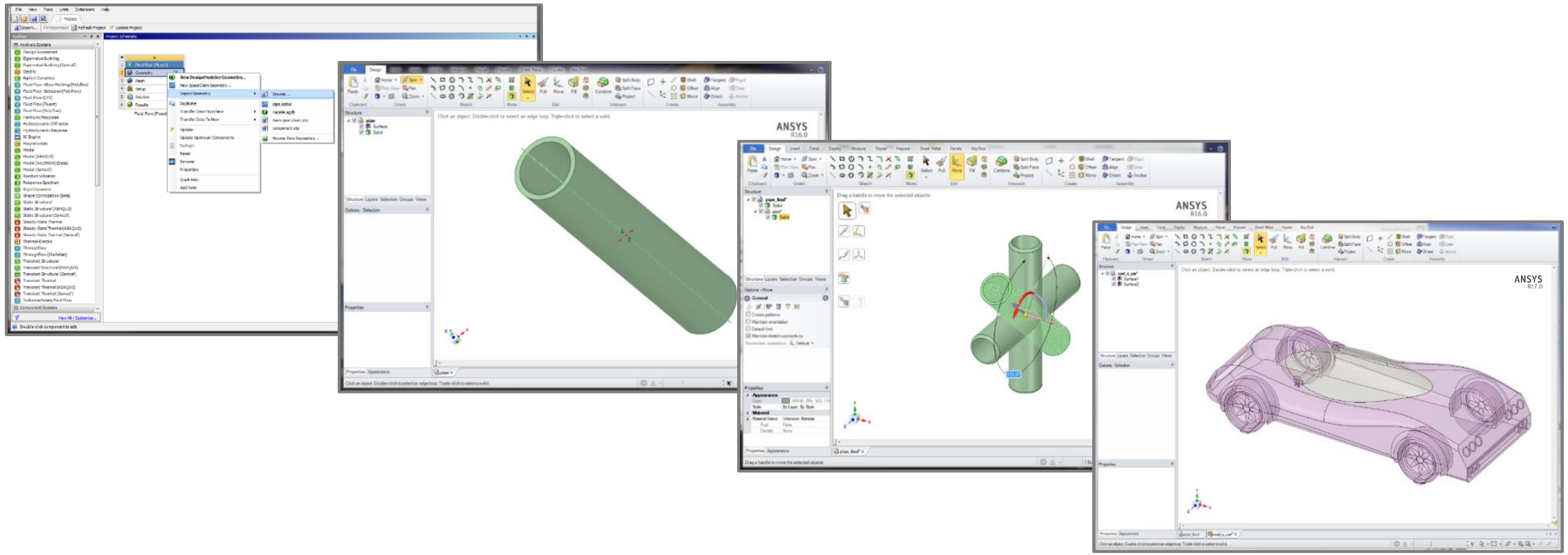




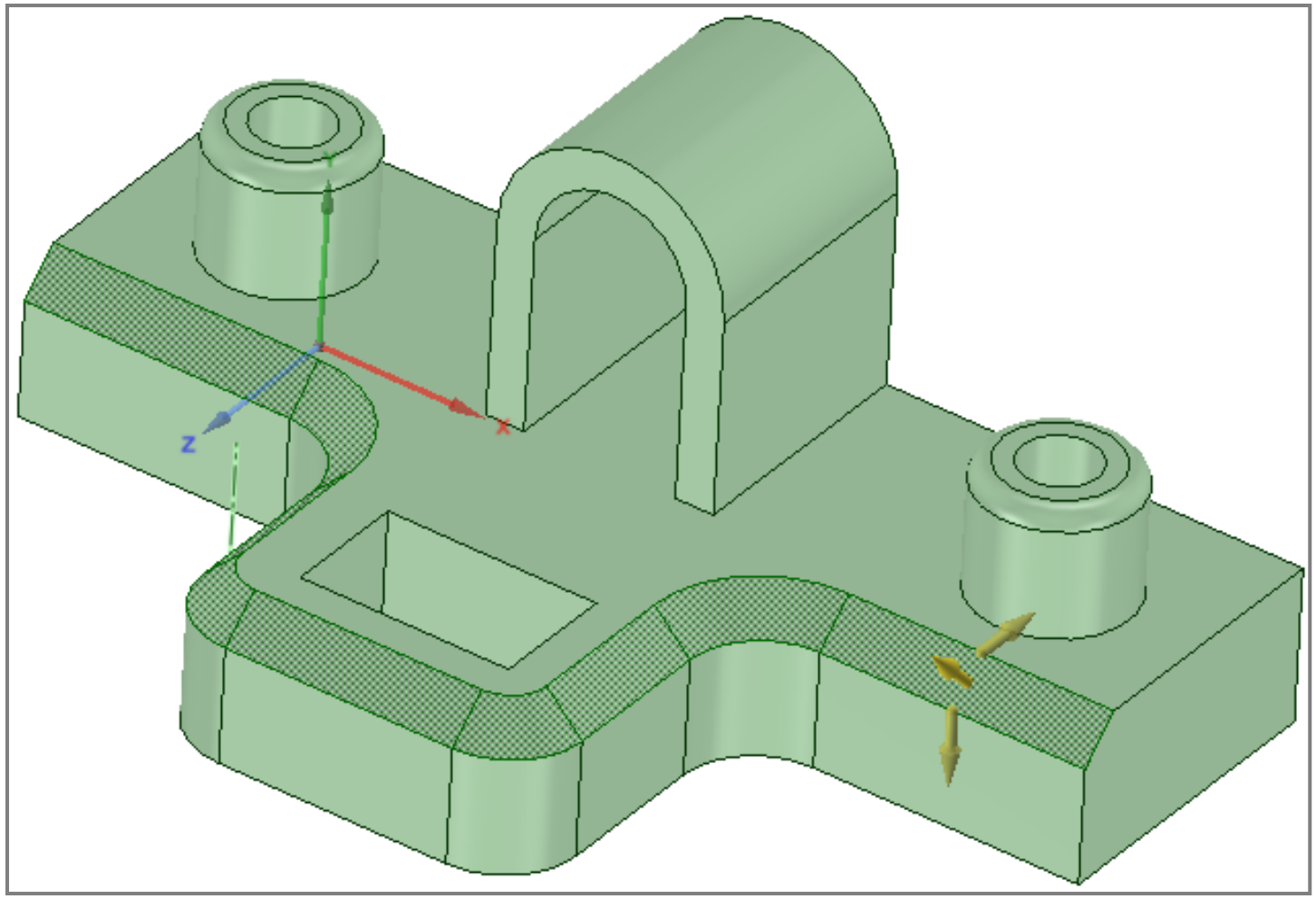
Summary

- SpaceClaim is a direct modeler that offers the capability of recording the sequence of operations via the ‘Blocks’ feature
- With the 4 main tools: pull, move, fill and combine we can edit any geometry created or imported in Ansys SpaceClaim
- We can import the parameters from external CAD files using the Blocks feature and create others in SpaceClaim

Workshop 1.1 Basics



Workshop 1.2 Sketching in SpaceClaim



End of presentation