HyperWorks

Chapter 1: HyperMesh Introduction

Getting Started

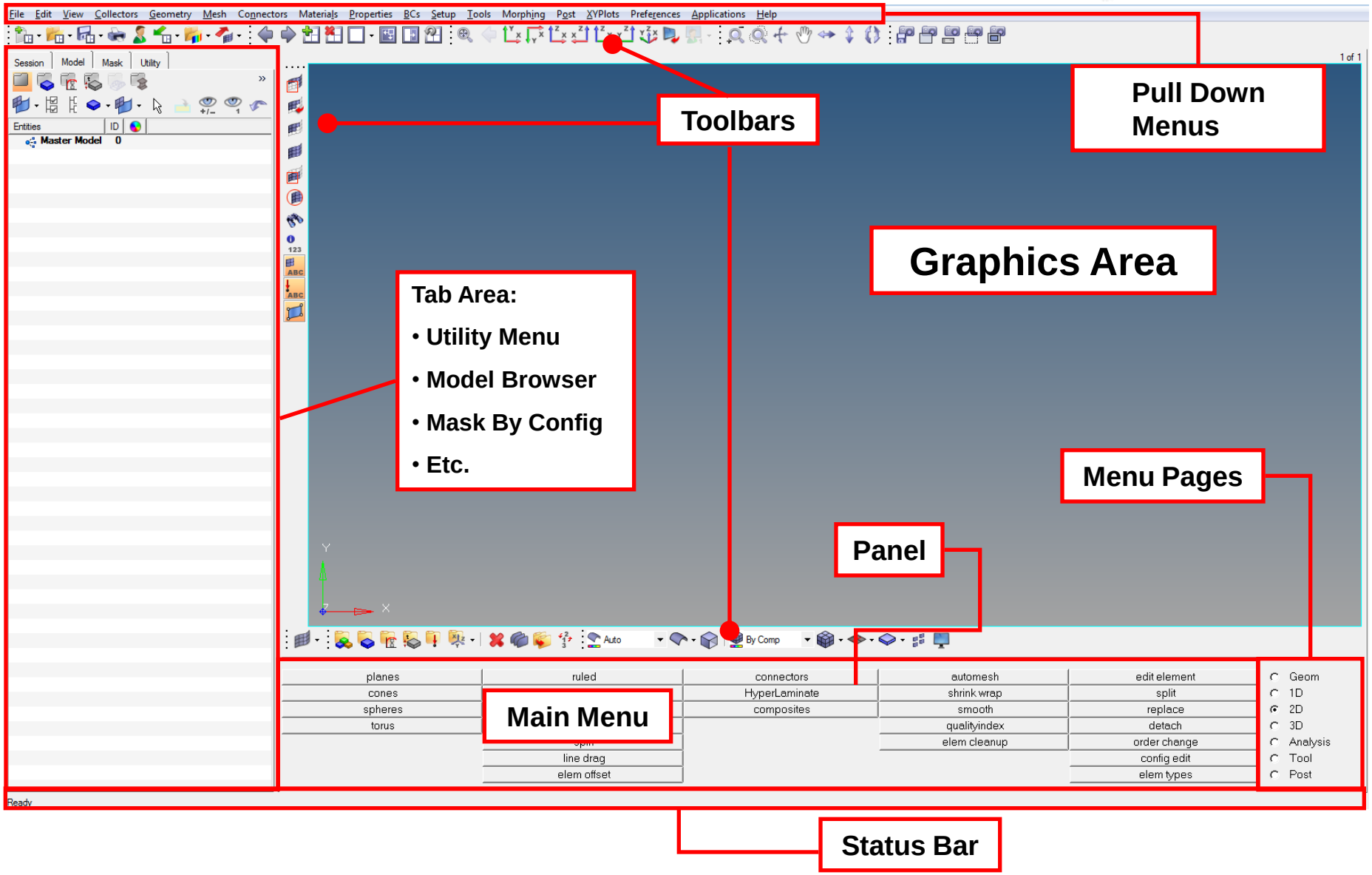
Opening and Saving Files

Working with Panels

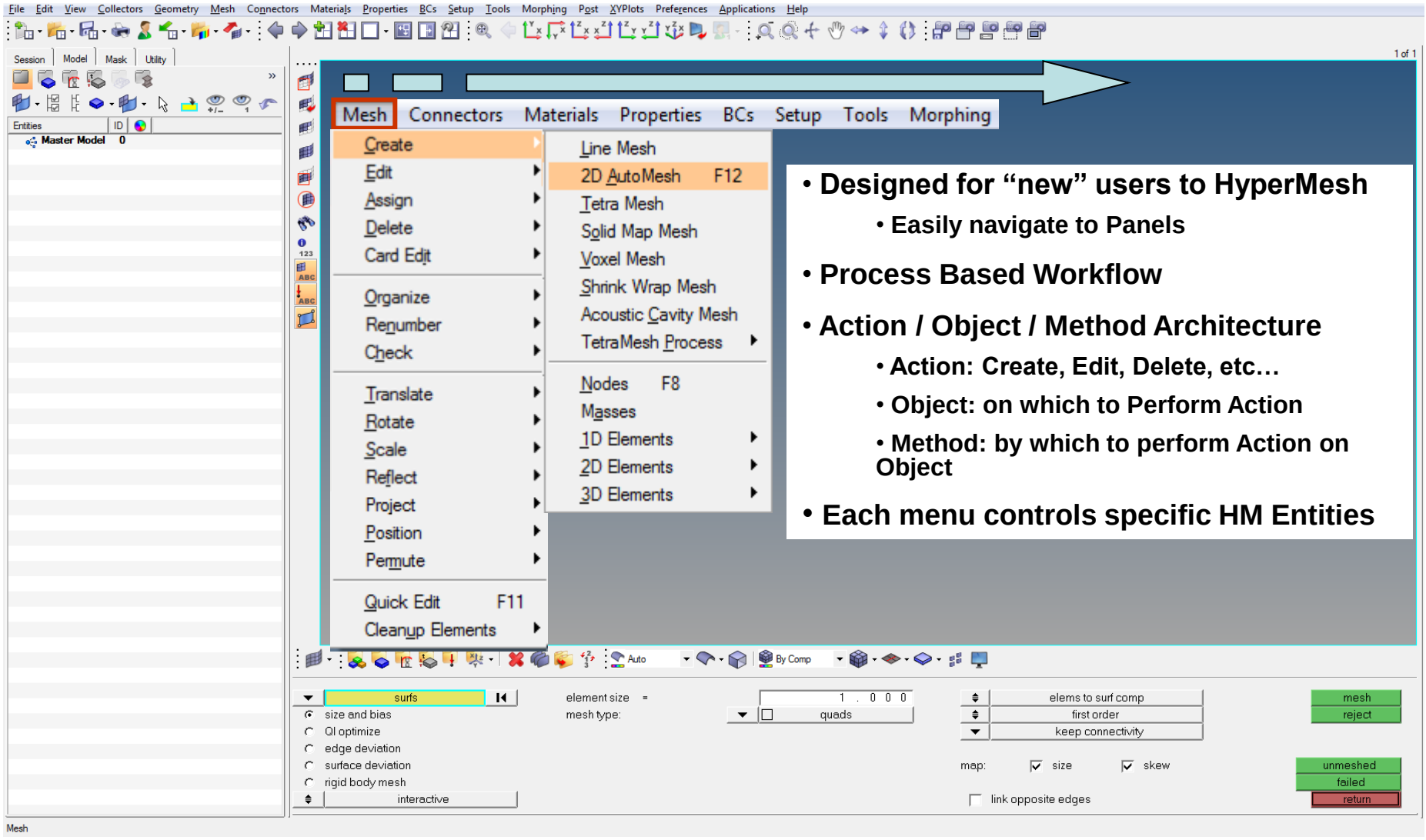
Organizing a Model

Controlling the Display

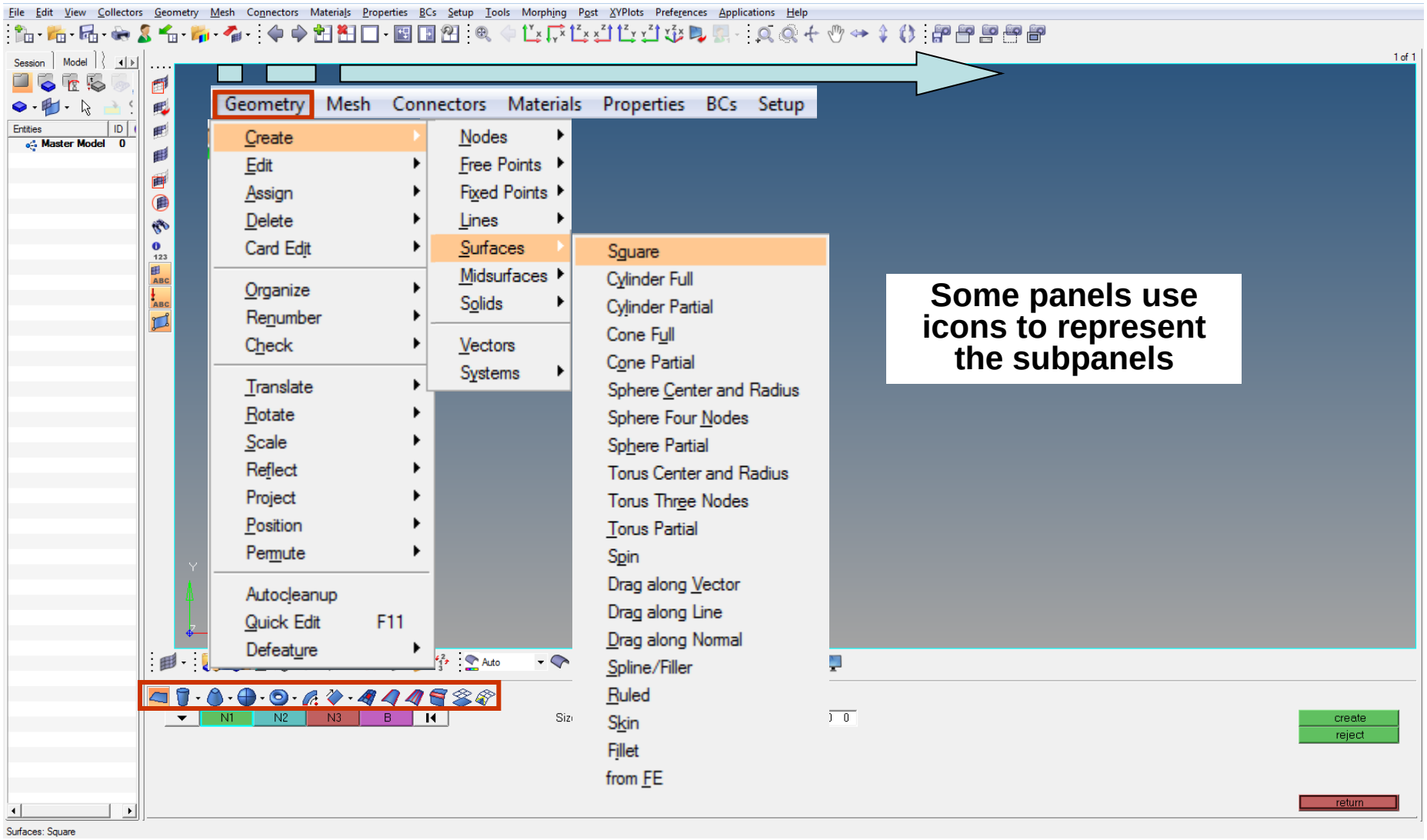
HyperMesh Introduction: The User Interface



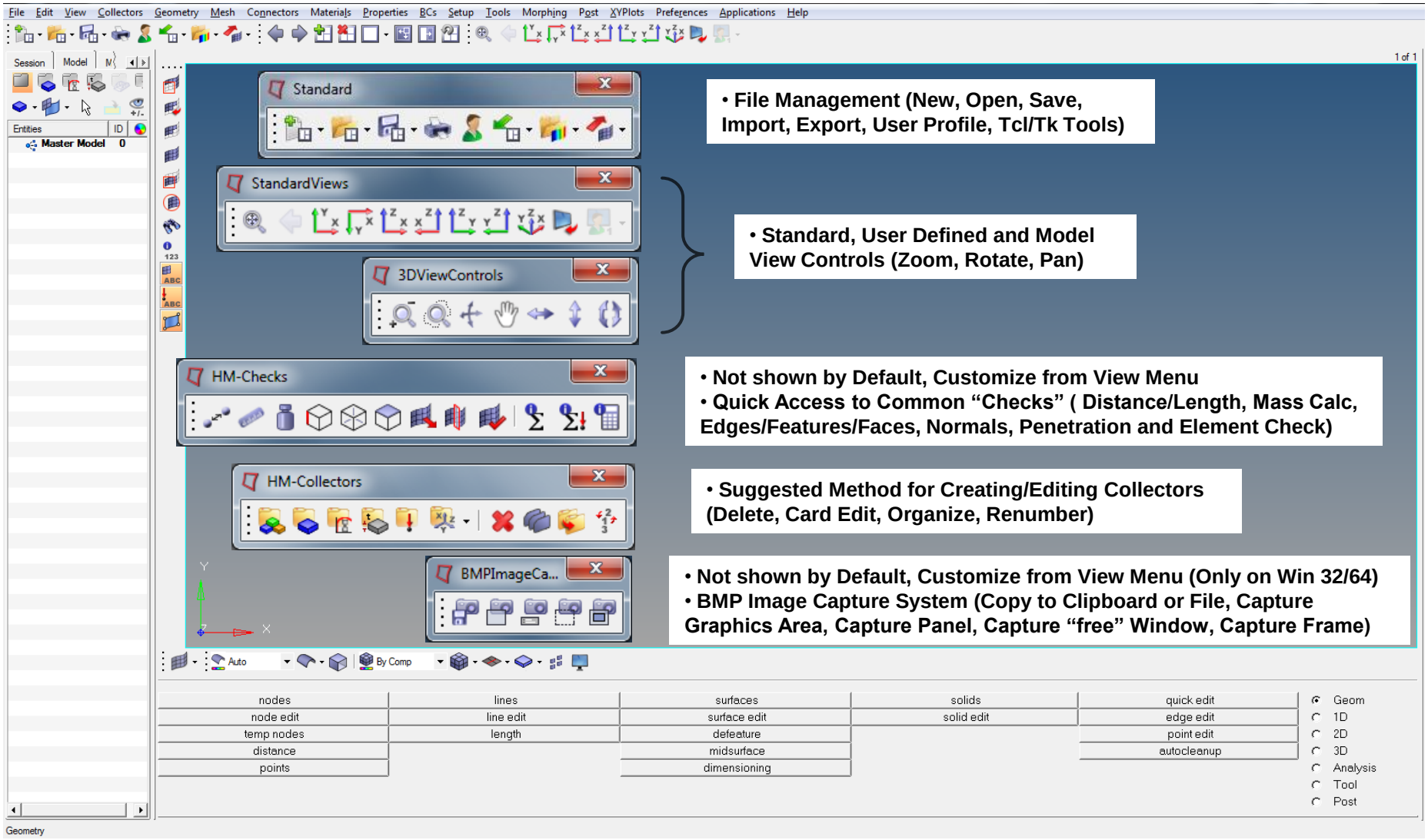
Modern GUI Environment: Menu Bar



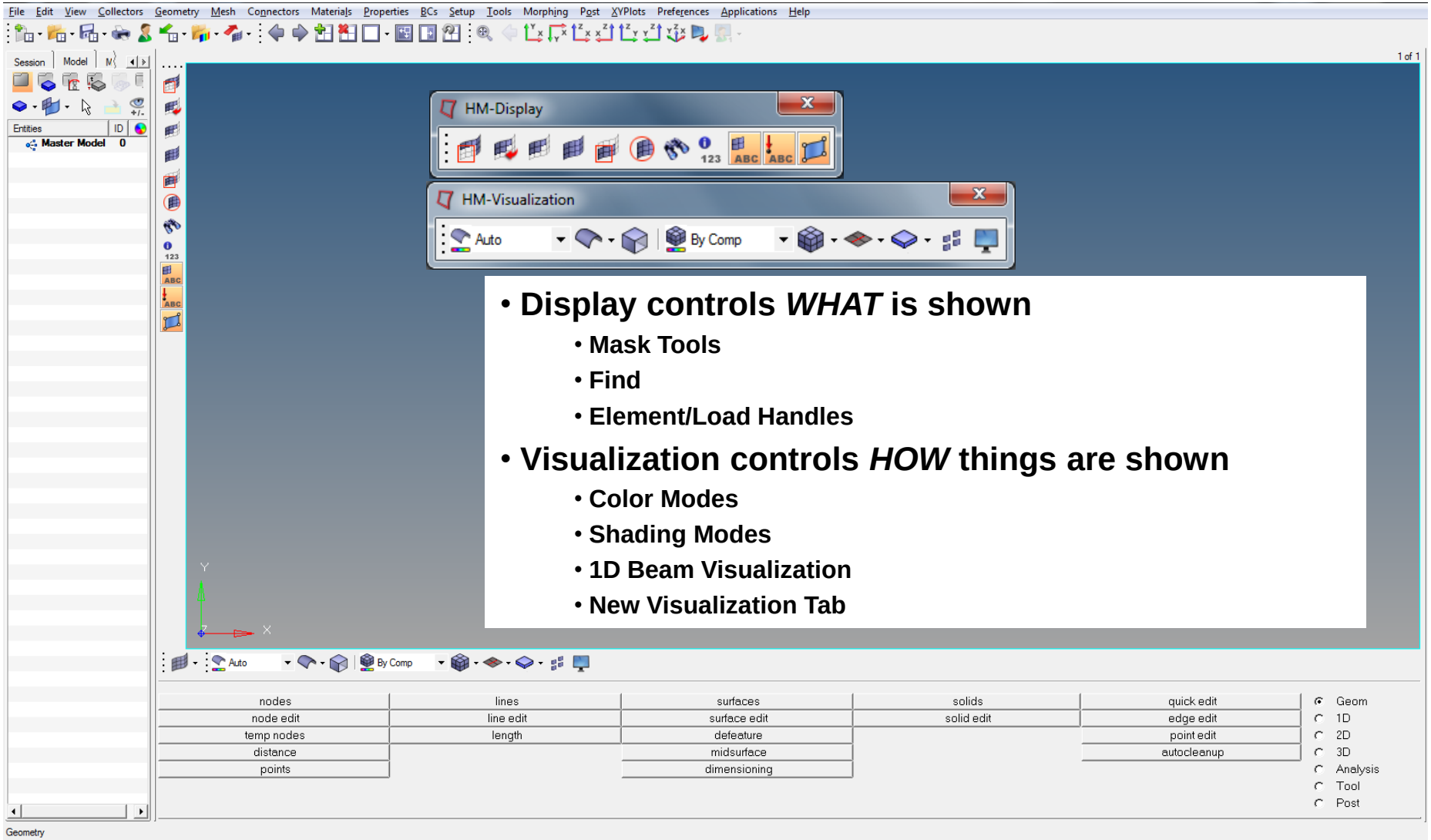
Modern GUI Environment: Menu Bar



Standard Toolbar



Display and Visualization Toolbars



HyperMesh Introduction: The User Interface

- Graphics area – displays the model
- Toolbar – Gives access to commonly used tools via icons
- Pull Down Menu – places functionality into groups, accessible via pull downs
- Menu Pages – divides the main menu into groups based on function
- Main Menu – contains “panels” grouped in columns
- Panels – menu items / functions for interacting with HyperMesh
- Sub-panels – divides panel into similar tasks related to panel’s main function
- Command Window – lets the user type in and execute tcl commands
  - Available through the *View* drop down menu (turned off by default)
- Tab Area – contains the following tabs:
  - Solver, Model, Utility, Include, Import, Export, Connector, Entity State, etc.
- Status Bar – shows status of operations being performed
  - Indicates the “current” Include file, Component Collector, and Load Collector

File Operations

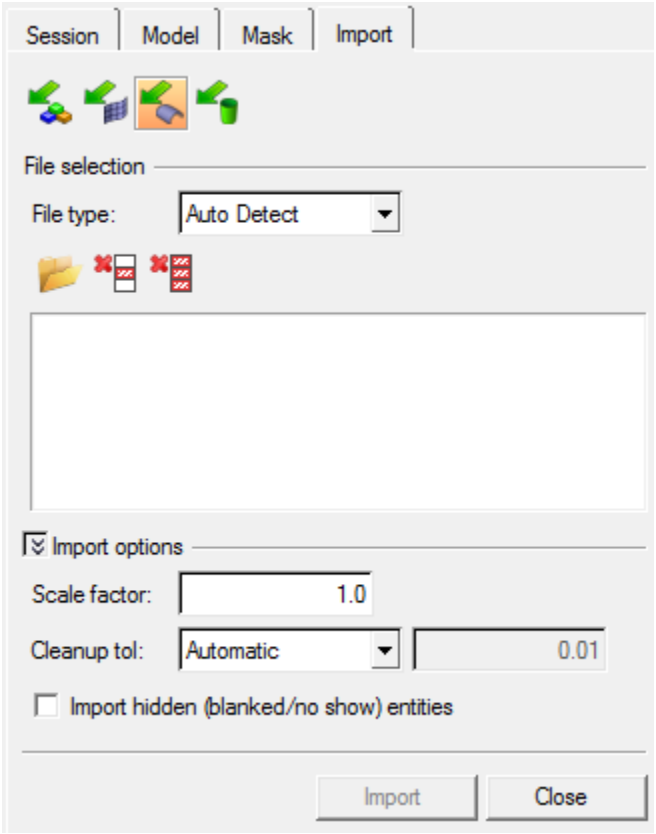
- General terminology:
  - *Open* : Loads a file into HyperMesh replacing the current session
  - *Save* : Saves the current session contents to the file name specified
  - *Import* : Loads a file into HyperMesh, merging with the current contents
  - *Export* : Saves data to the file name specified
    - Generally refers to file types other than a HyperMesh binary file

File Operations: The File Pull-down Menu

- *Open…* : Loads a HyperMesh file into current session
  - Replaces the model in current HyperMesh session
- *Save* : Saves the model in current HyperMesh session
  - File browser prompts for directory and file name if one doesn't exist
- *Save As…* : Opens file browser to specify directory and name to save current session
- *Import* : Merges / combines files with the model in the current HyperMesh session
  - Various types of files: HyperMesh, geometry (IGES, Step, etc.), finite element data (OptiStruct, Radioss, Nastran, Abaqus, Ansys, LS-Dyna, etc.)
  - Opens the Import browser
- *Export* : Writes data in current HyperMesh session to non-HyperMesh files types
  - IGES, OptiStruct, Radioss, etc.
  - Opens the Export browser allowing specification of directory and name
- *Recent Files* : A listing of HyperMesh files that have been worked on previously
  - Loads the file and replaces the model in the current session
- *Recent Imports* : A listing of files previously loaded into HyperMesh via Import

Importing Geometry

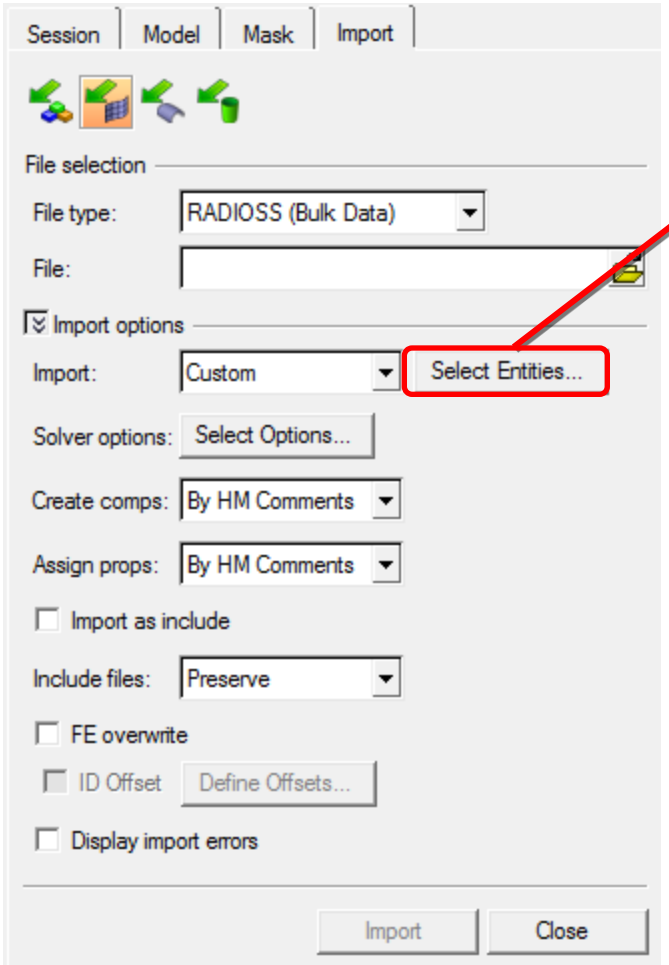
- **Import geometry data via:**
  - ***File > Import > Geometry*** **drop-down menu**
  - ***Toolbar >***  ***> Geometry***
- **Common types of geometry files supported:**
  - **Unigraphics (NX2, NX3, NX4, NX5, NX6)**
    - **UG Part Browser**
    - **Import of *.prt files**
    - **Requires an installation of Unigraphics to be available**
  - **CATIA (V4 & V5)**
    - **import of *.model files**
    - **CATIA V5 license required to import V5 files**
  - **Pro/ENGINEER (Wildfire 2.0 & 3.0)**
    - **import of *.prt and *.asm files**
  - **IGES**
    - **Import of *.igs / *.iges files**
  - **STEP**
    - **import of *.stp files**

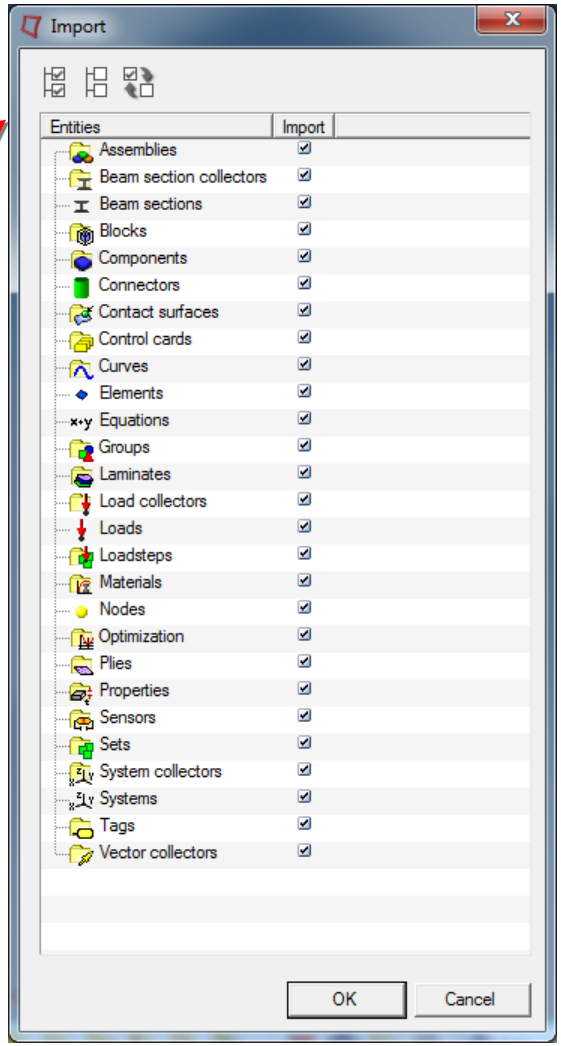


Custom Import

Import tab

- Complete control over FE import
- Import multiple geometry files

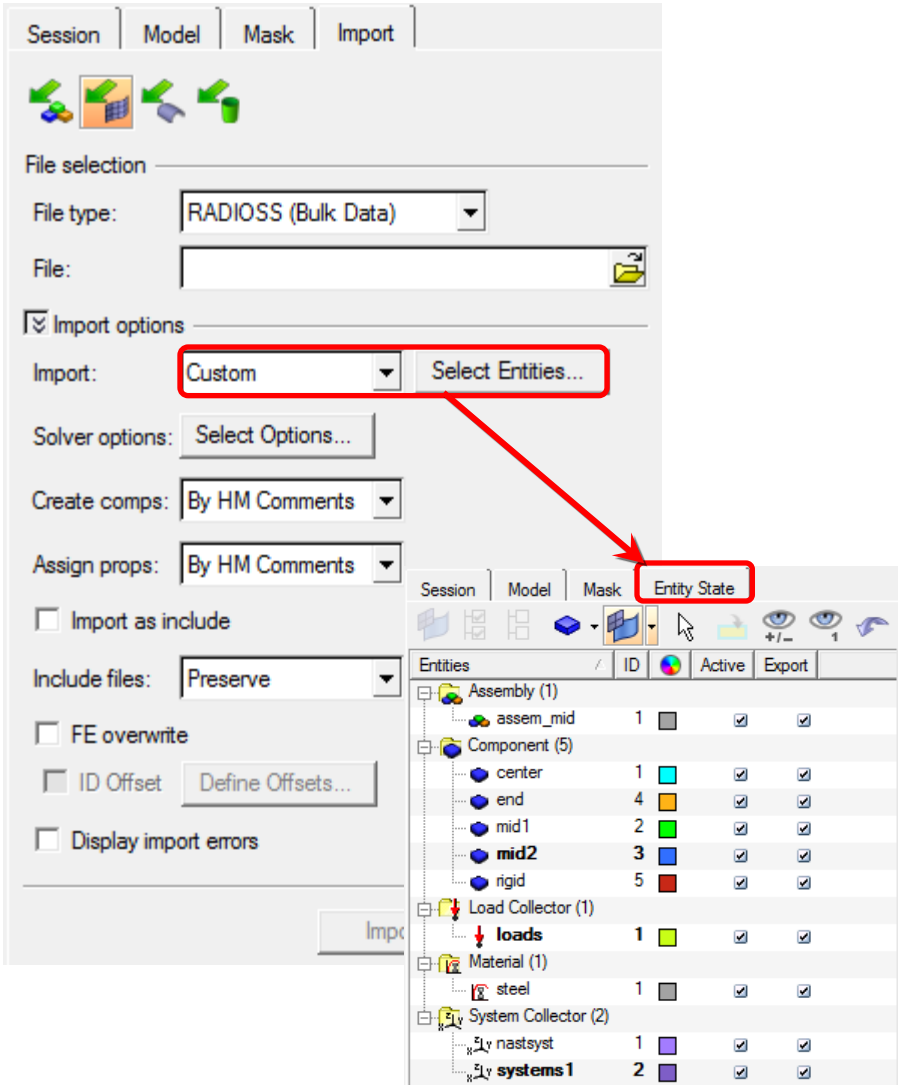




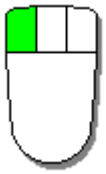
Entity State Browser

Entity State Browser

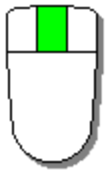
- Available for all entities
- Removes inactive entities from any list in the browser and panels
- Removes inactive entities from display and they cannot be turned on until made active
  - Exception: Find brings inactive entities back onto the screen too and switches these entities to active
- Removes inactive entities temporarily from the "database“
- Selection by “all” selects only active entities



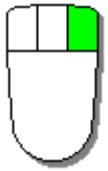
Display Control → Viewing: Mouse Buttons



- Left mouse button
  - +CTRL & drag for rotate
  - +CTRL & click on entity to change center of rotation
  - +CTRL & click in graphics area, off entities to reset center to middle of screen



- Middle mouse button
  - +CTRL & drag for zoom
  - +CTRL & click for fit

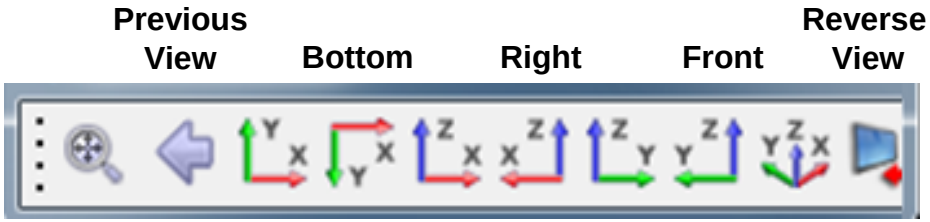


- Right mouse button
  - +CTRL & drag for pan

Toolbars

HyperWorks

Standard Views Toolbar



Display Control → 3D View Controls

Zoom In (+)
Zoom Out (-)

- Zoom in or out by dragging the mouse vertically

Circle Zoom (Z)
Dynamic Zoom (S)

- Draw a circle (freeform) around the area to be magnified
- Zoom into the center of the screen

Dynamic Rotate
Dynamic Spin

- Dynamically rotate the model about defined center
- Dynamically spin the model about a defined center

Pan
Center

- Drag the model around in the graphics area
- Select a node/point to center of the model at that point

Display Control → 3D View Controls

Rotate Left

Rotate Right

- Rotate the model view Left or Right about an imaginary vertical axis in the middle of the graphics area

Rotate Up

Rotate Down

- Rotate the model view Up or Down about an imaginary horizontal axis in the middle of the graphics area

Rotate Clockwise

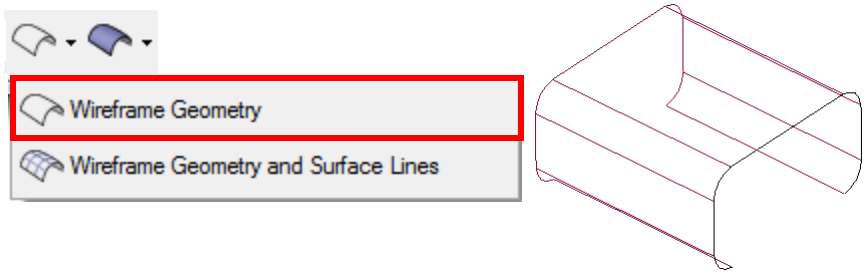
Rotate Counter Clockwise

- Rotate the model view Clockwise or Counter Clockwise about an imaginary axis coming out of the graphics area

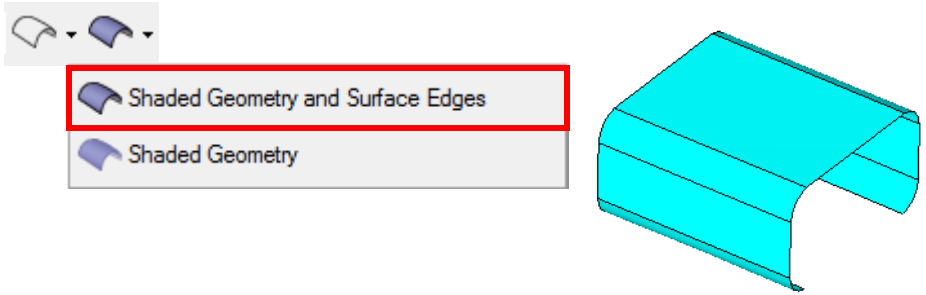
Display Control → Visualization: Surfaces

- Various surface shading options are available on the Toolbar:

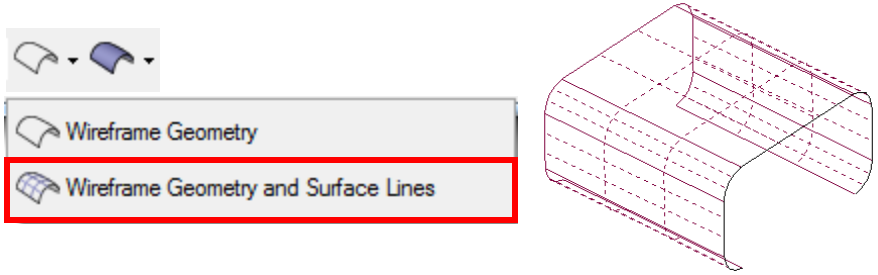
Wireframe



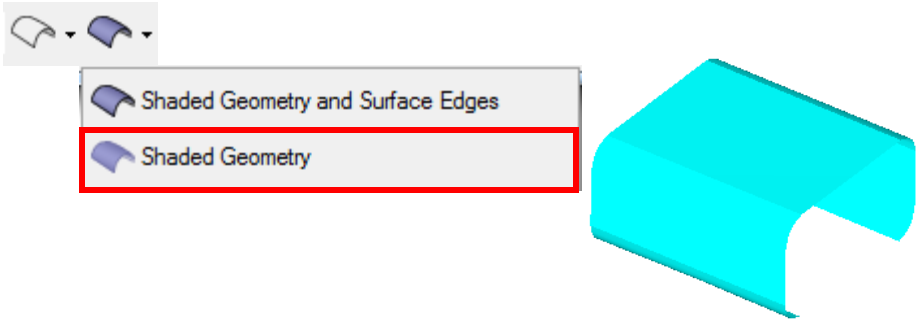
Shaded with Surface edges



Wireframe with Surf lines

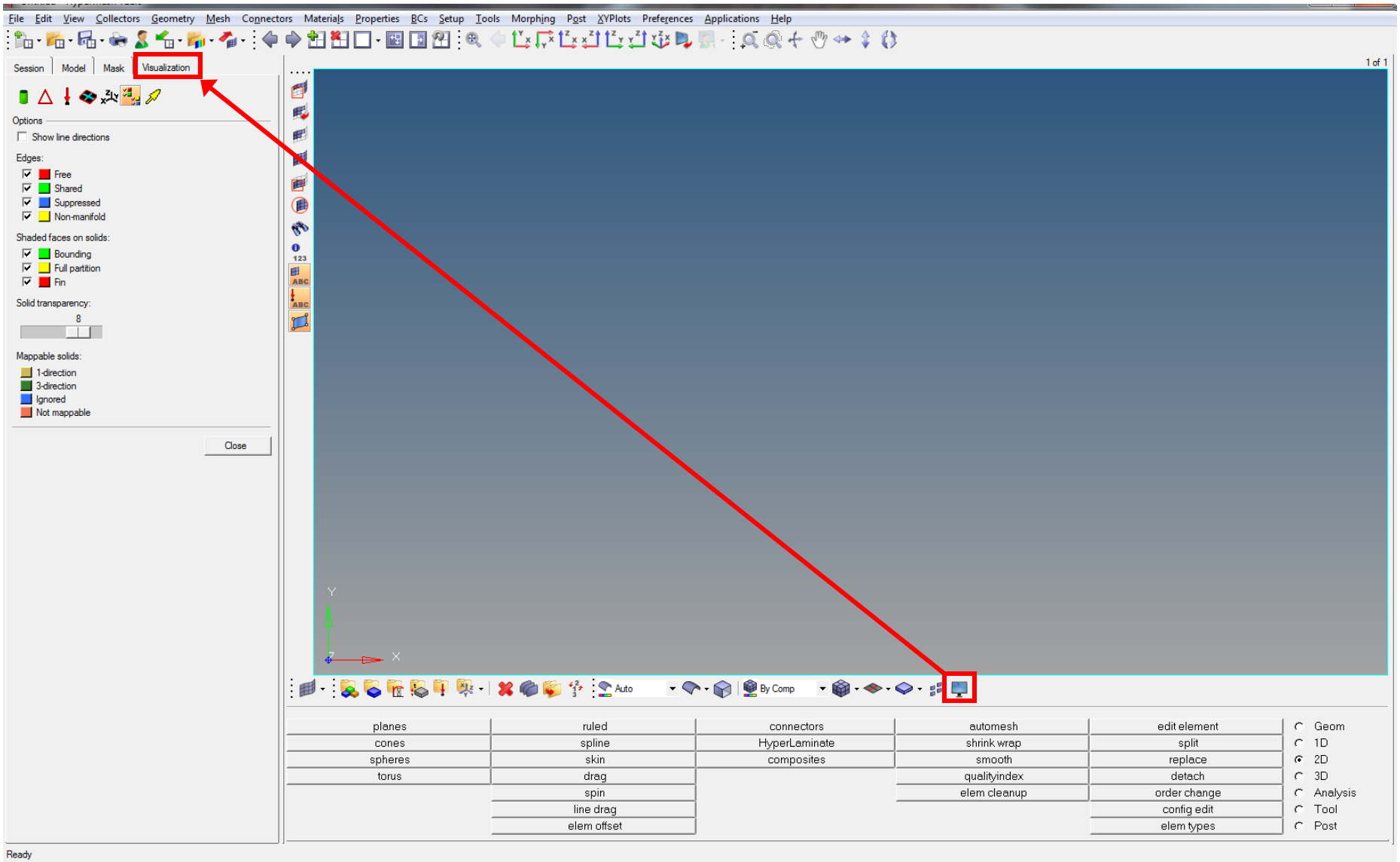


Shaded

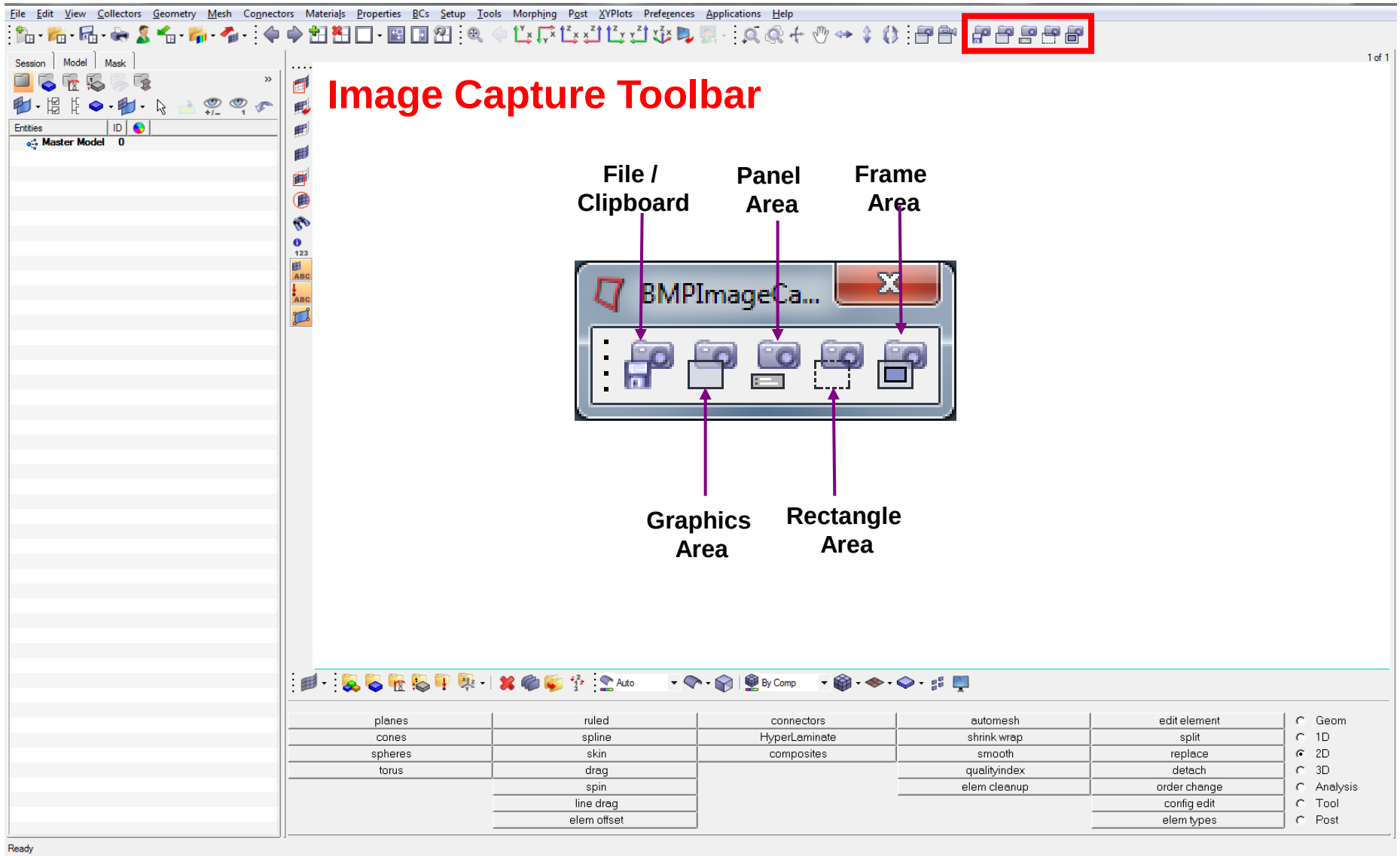


HyperWorks

Display and Visualization Toolbars

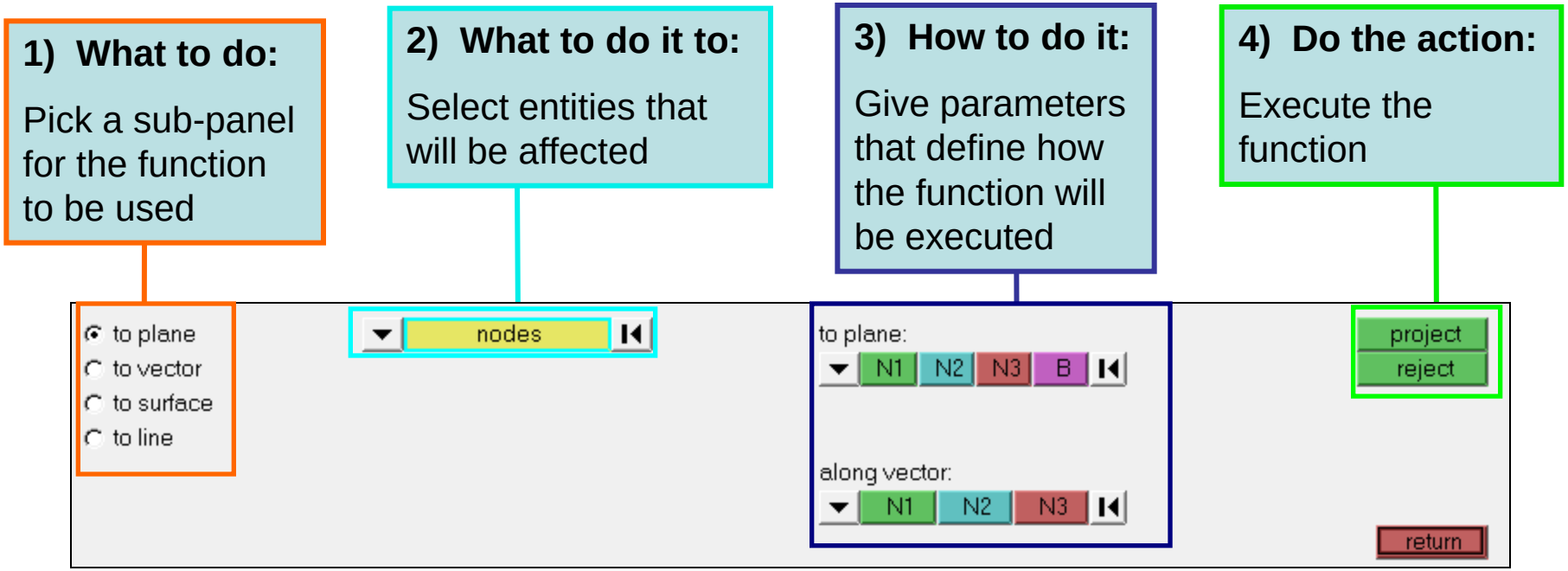


Toolbars



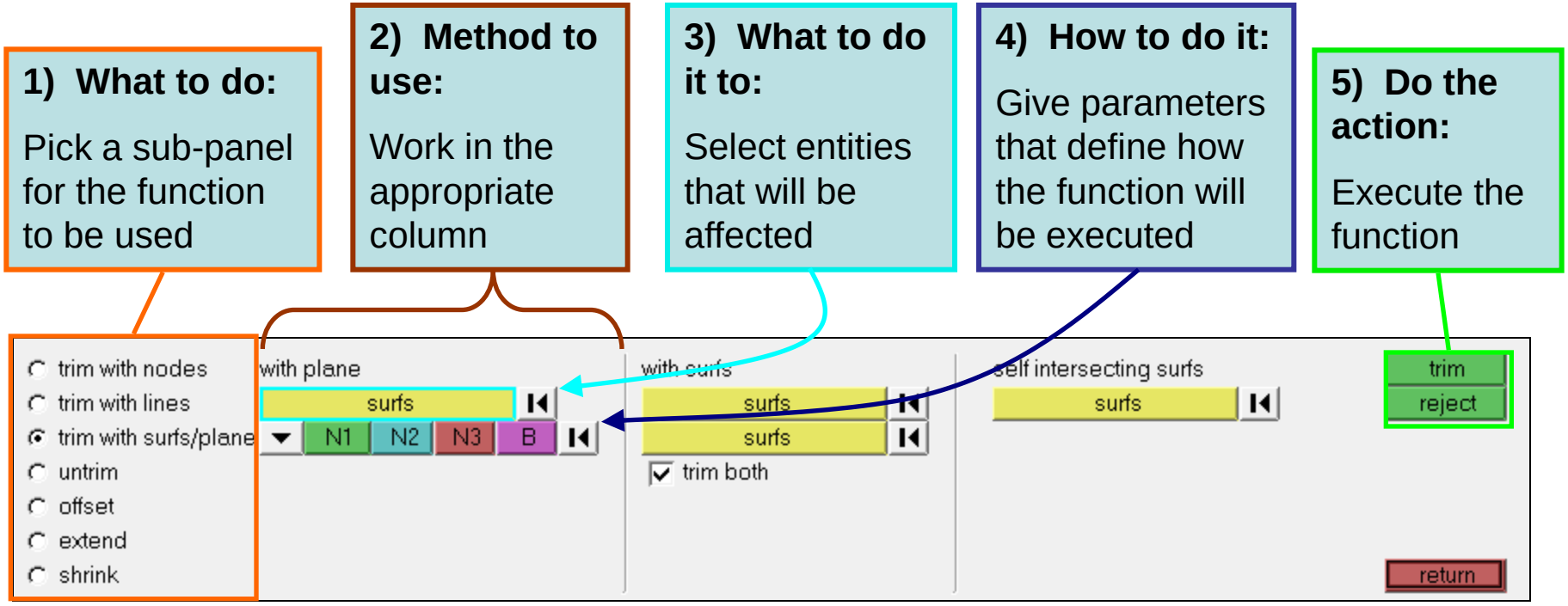
Panels: General Layout

- Panels often have sub-panels
  - Accessed by radio buttons on the left side of the panel
- Panels generally work from left to right
  - Example: ***Project / to plane*** sub-panel



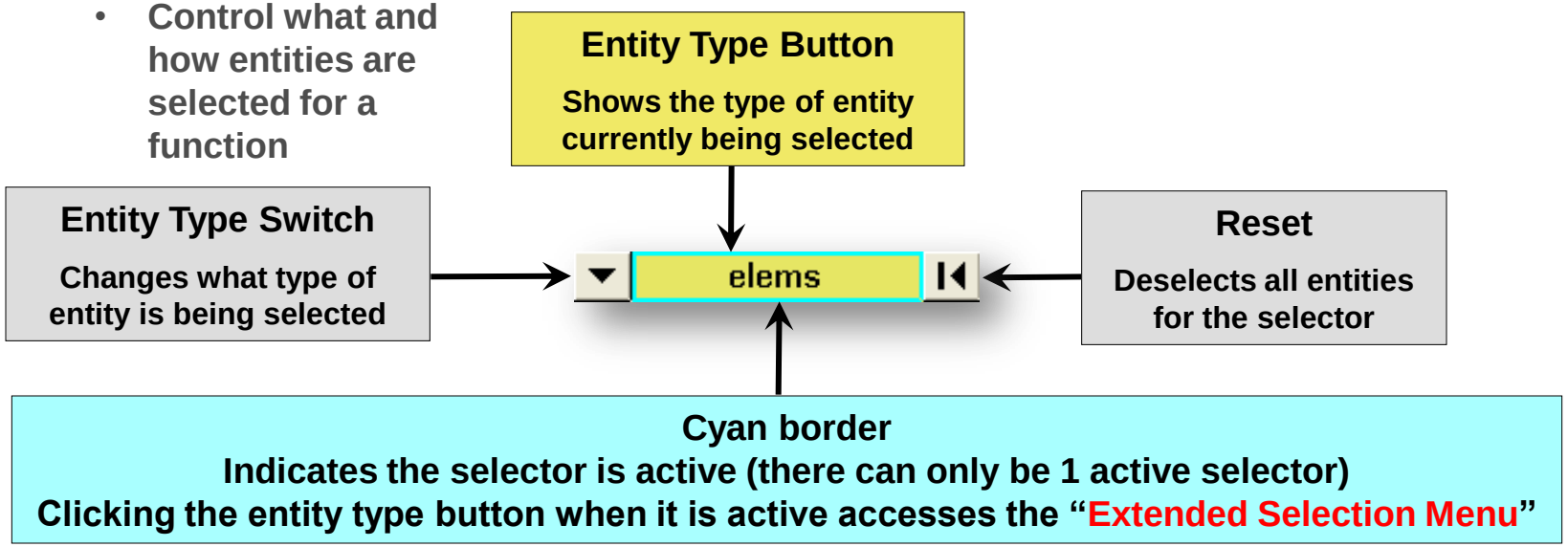
Panels: General Layout

- Some sub-panels are organized in columns
  - Each column is a different method
  - Work from top to bottom in the relevant column
  - Example: ***surface edit : trim with surfs/plane*** sub-panel

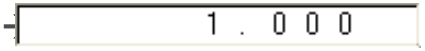


Panels: Selection

- **Entity selectors**
  - Control what and how entities are selected for a function



- Switches → 
  - Allows a choice of several options vis a pop-up menu
- Toggles → 
  - Allows a choice between 2 options
  - No pop-up; button label simply changes
- Reset → 
  - Allows to reset the entities selection

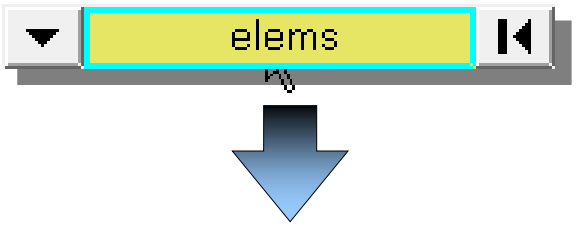
- Text input fields → 

  - Operate like text fields in most programs
  - Can use *Ctrl* + *C* and *Ctrl* + *V* to copy and paste between fields
  - Double clicking on a text field that requires numbers accesses the calculator
    - Uses "reverse notation"
    - Example: 1 + 1 = 2

      1 <Enter> 1 + instead of *1 + 1* =

Panels: Extended Selection Menu

- Click an active selector to access the extended menu selection



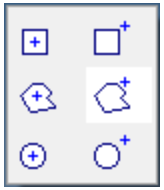
by window	on plane	by width	by geoms	by domains	by path
displayed	retrieve	by group	by adjacent	by handles	by include
all	save	duplicate	by attached	by block	
reverse	by id	by config	by face	by ply	
by collector	by assems	by sets	by outputblock	by laminate	

- The extended menu selection offers
  - Methods for selecting many entities at once
  - Tools for modifying an existing selection
  - Save an existing selection and retrieve it in any panel

- Multiple extended selection methods can be used on a selection
  - Allows you to easily select exactly what you want

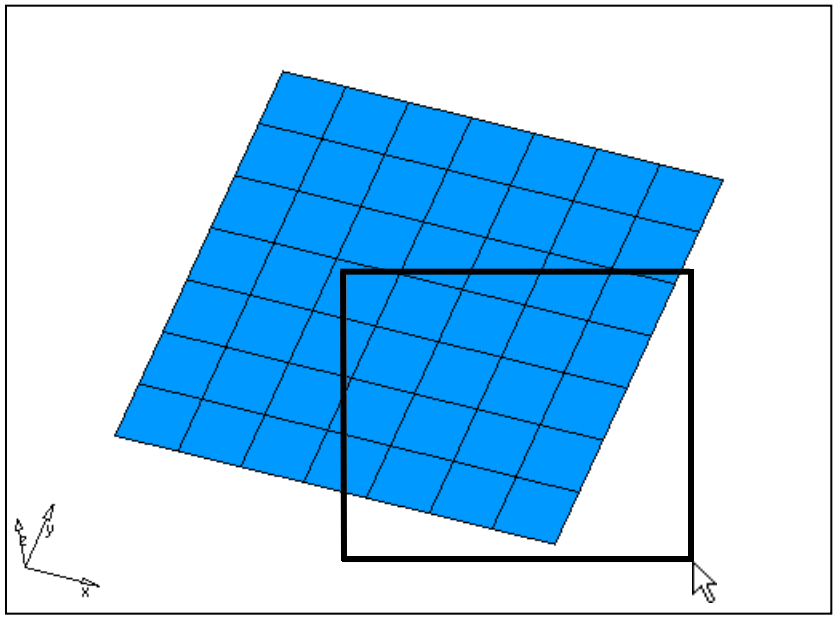
Panels: Overview

- Select entities with a window using Shift + mouse
  - Left mouse drag – select entities
  - Right mouse drag – unselect entities
  - Left click – change window shape



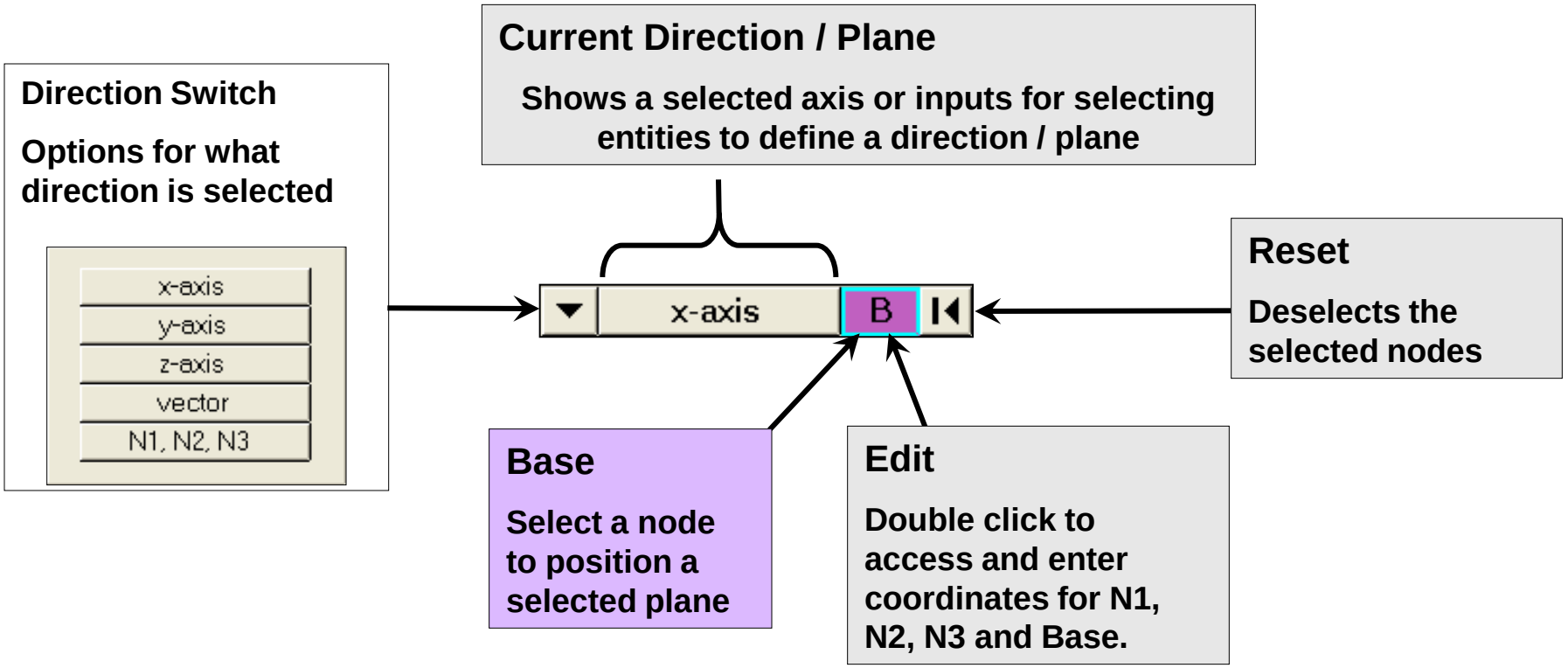
- Rectangle Inside
- Rectangle Outside
- Polygon Inside
- Polygon Outside
- Circle Inside
- Circle Outside

- Entities are selected when mouse button is released



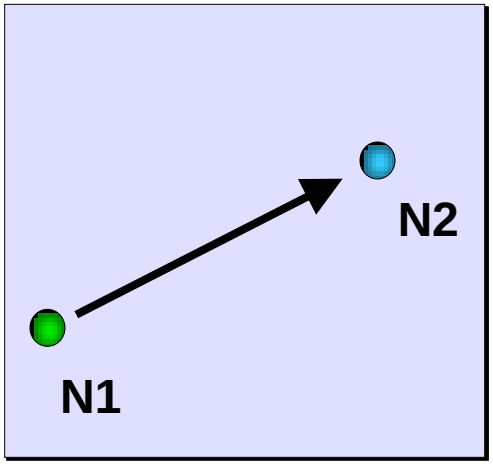
Panels: Direction Selection

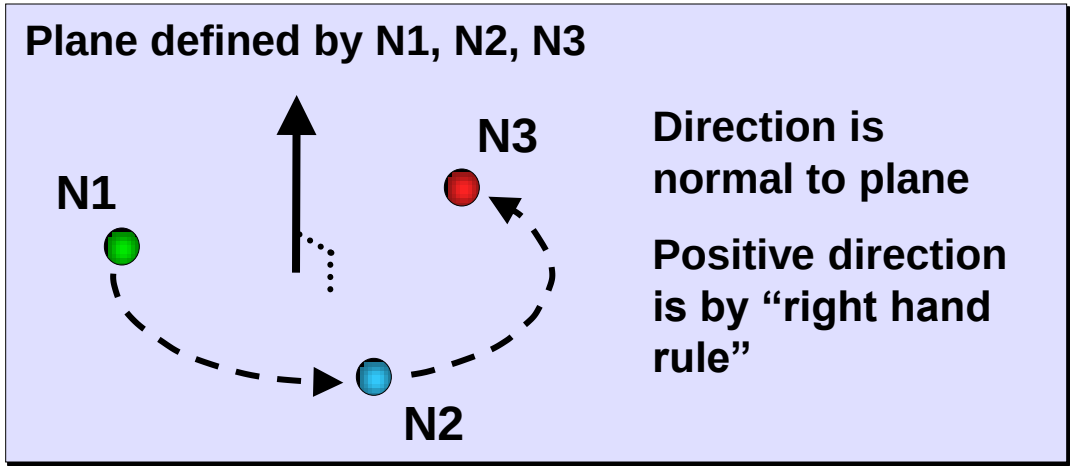
- Used for input of directions or planes for a given function
  - Planes can be selected from a vector (normal to the vector)
  - Directions can be selected from a plane (normal to the plane)



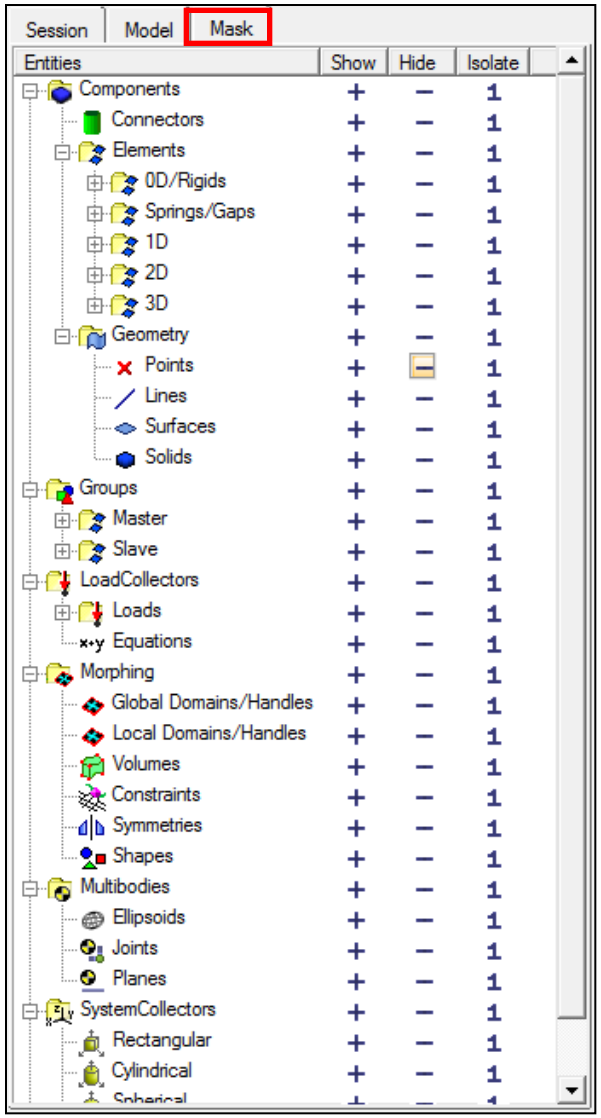
Panels → Direction Selection: N1, N2, N3

- N1, N2, N3 direction option allows nodes to be selected to define either a direction or a plane
  - Select 2 nodes to define a direction (only N1 and N2)
  - Select 3 nodes to define a plane (N1, N2, and N3)





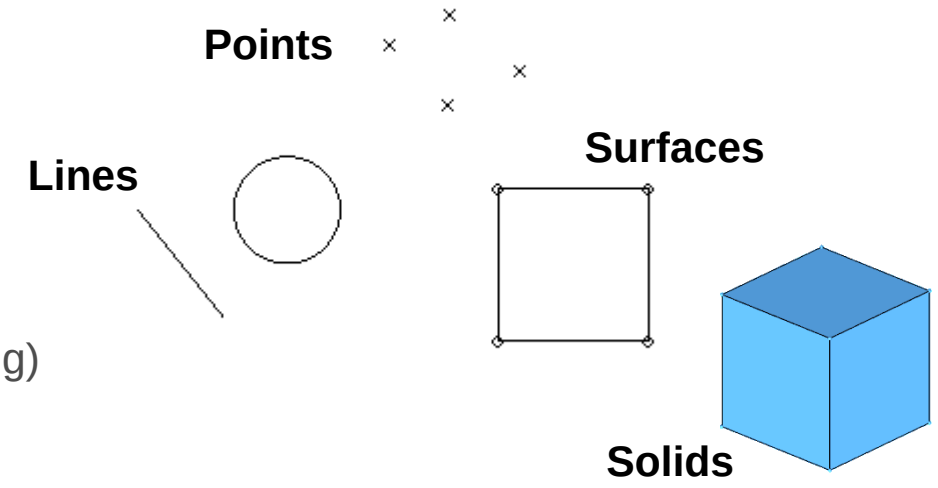
Display Control → Visibility: Mask Browser



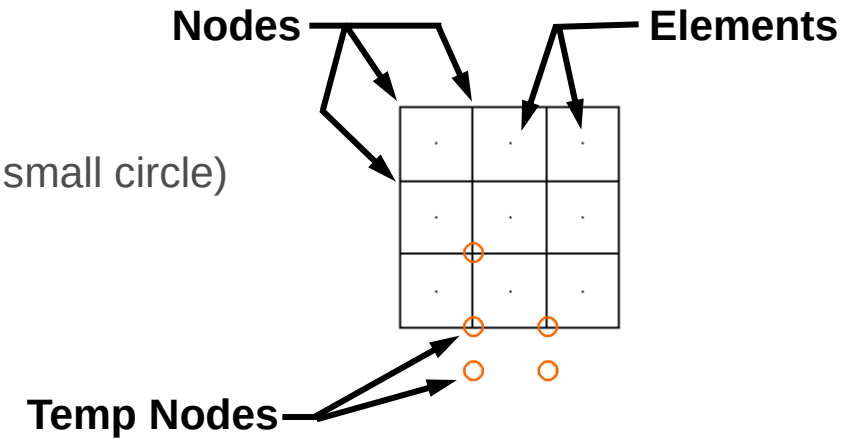
- **Mask Browser– Control of visibility by entity type**
  - **+ *:* Displays / unmasks all of the selected entity type**
    - **Added to whatever is already displayed**
  - ***-* :** **Switches off display or masks all of the selected entity type**
  - ***1* :** **Displays only the selected entity type and switches off display of all other entity types.**

Model Organization: HyperMesh Entity Types

- **Geometry**
  - **Points**
  - **Lines**
  - **Surfaces**
  - **Solids**
  - **Connectors** (used for welding)

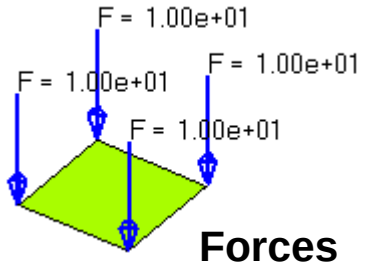


- **FE Model**
  - **Nodes**
  - **Temp Nodes** (marks a node with a small circle)
  - **Elements**

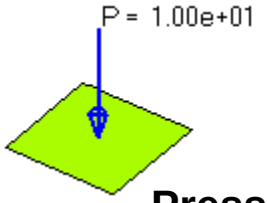


Model Organization: HyperMesh Entity Types

- **FE Loading**
  - **Loads** (constraints, forces, pressures, etc.)
  - **Equations** (mathematical link between nodes)



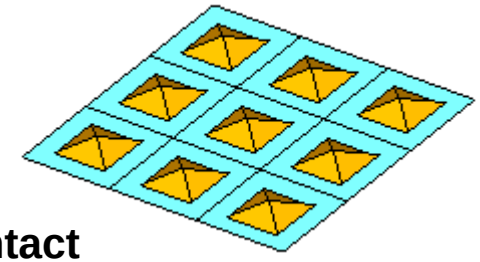
Forces



Pressures

Constraints

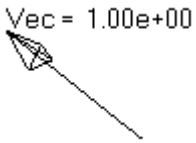
- **Contacts**
  - **Group** (defines contact between entities)
  - **Contact Surfs** (defines a list of entities that can be used as master or slave in a group)



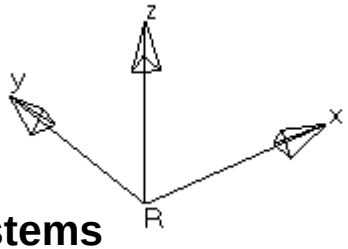
Contact Surface

Model Organization: HyperMesh Entity Types

- **Coordinate Entities**
  - **Systems** (coordinate axes)
  - **Vectors**



Vectors

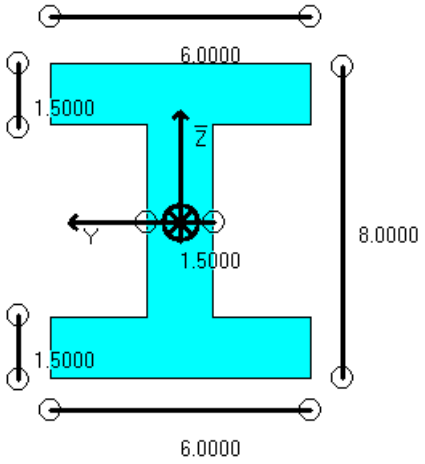


Systems

- **Reference Entities**
  - **Sets** (a simple list of a particular type of entity)
  - **Blocks** (a list of entities contained within a box shape)

- **1D Element Cross Sections**
  - **Beam Sections** (cross sectional properties for a property collector)

Beam Section



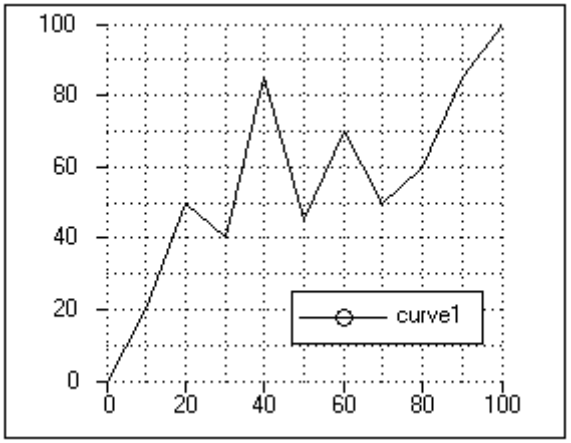
Collector id = 1
Section id = 1

Area = 25.5
Centroid
local Yc = 0
Zc = 0

Moments of Inertia
local IY = 209.125
IZ = 55.4063
IYZ = 0
centroidal Iy = 209.125
Iz = 55.4063
Iyz = 0
principal Iv = 209.125
Iw = 55.4063

Model Organization: HyperMesh Entity Types

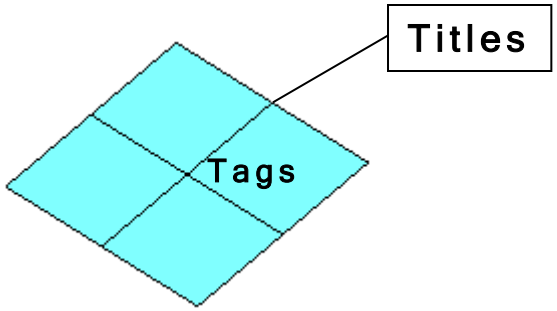
- **Plotting**
  - **Curves** (X-Y data)
  - **Plots** (a display of curves with axes)



Plot with a Curve

- **Output Requests**
  - **Loadsteps** (combinations of load collectors)
  - **Output Blocks** (request output from an analysis for certain entities)

- **Labels**
  - **Titles** (label for a displayed item)
  - **Tags** (assigns a name to an entity)



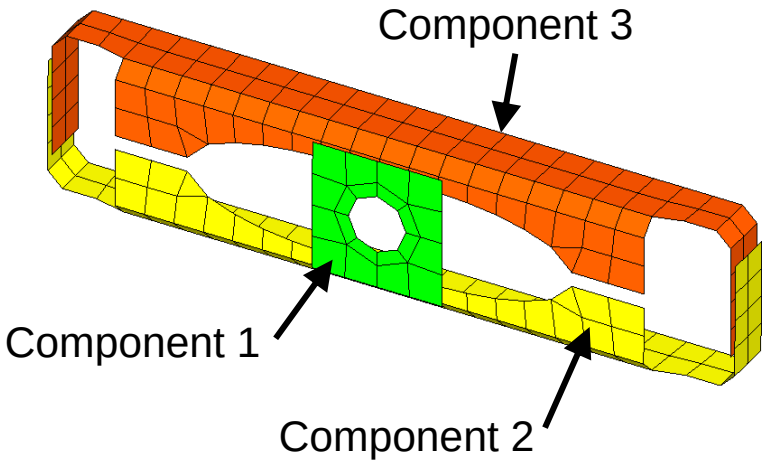
Model Organization: Collectors

- The HyperMesh model is organized using “collectors”
- There are many types of collectors
- Most entities in HyperMesh must be placed in a collector
- Each collector type holds a specific type of entity

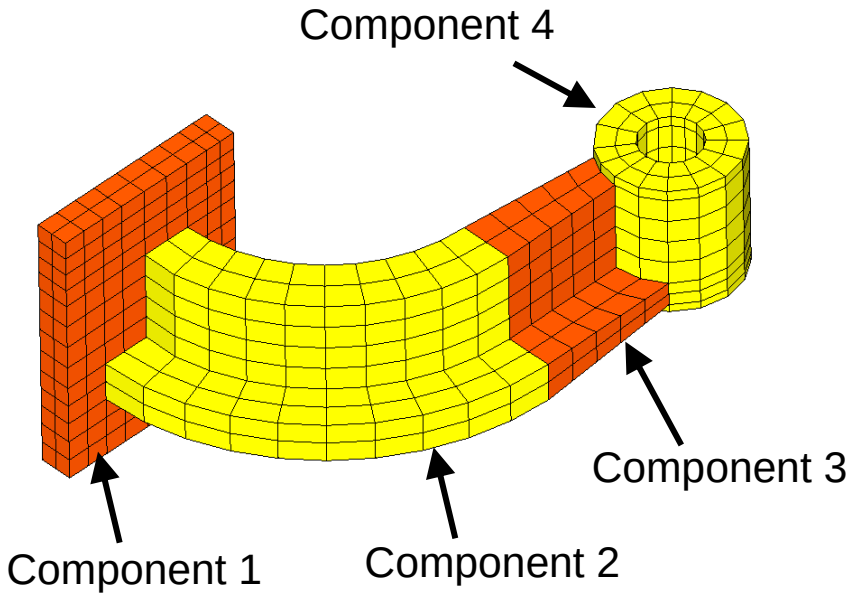
Collector Types	Can contain entity types:
Component	Elements, Points, Lines, Surfaces, Connectors
Multibody	Ellipsoids, Mbjoints, Mbplanes, Sensors
Assembly	Components, Multibodies, Assemblies
Load Collector	Loads, Equations
Material	none (materials and properties don’t contain other entities but are still treated as collectors)
Property	
System Collector	Systems
Vector Collector	Vectors
Beam Section Collector	Beam Sections

Model Organization: Collectors

- An entity can usually only belong to 1 collector of a given type
  - Ex: an element can only be in 1 component collector
- Can create many collectors of the same type
- All entities in a collector are the same color
- Organization can be however the user desires

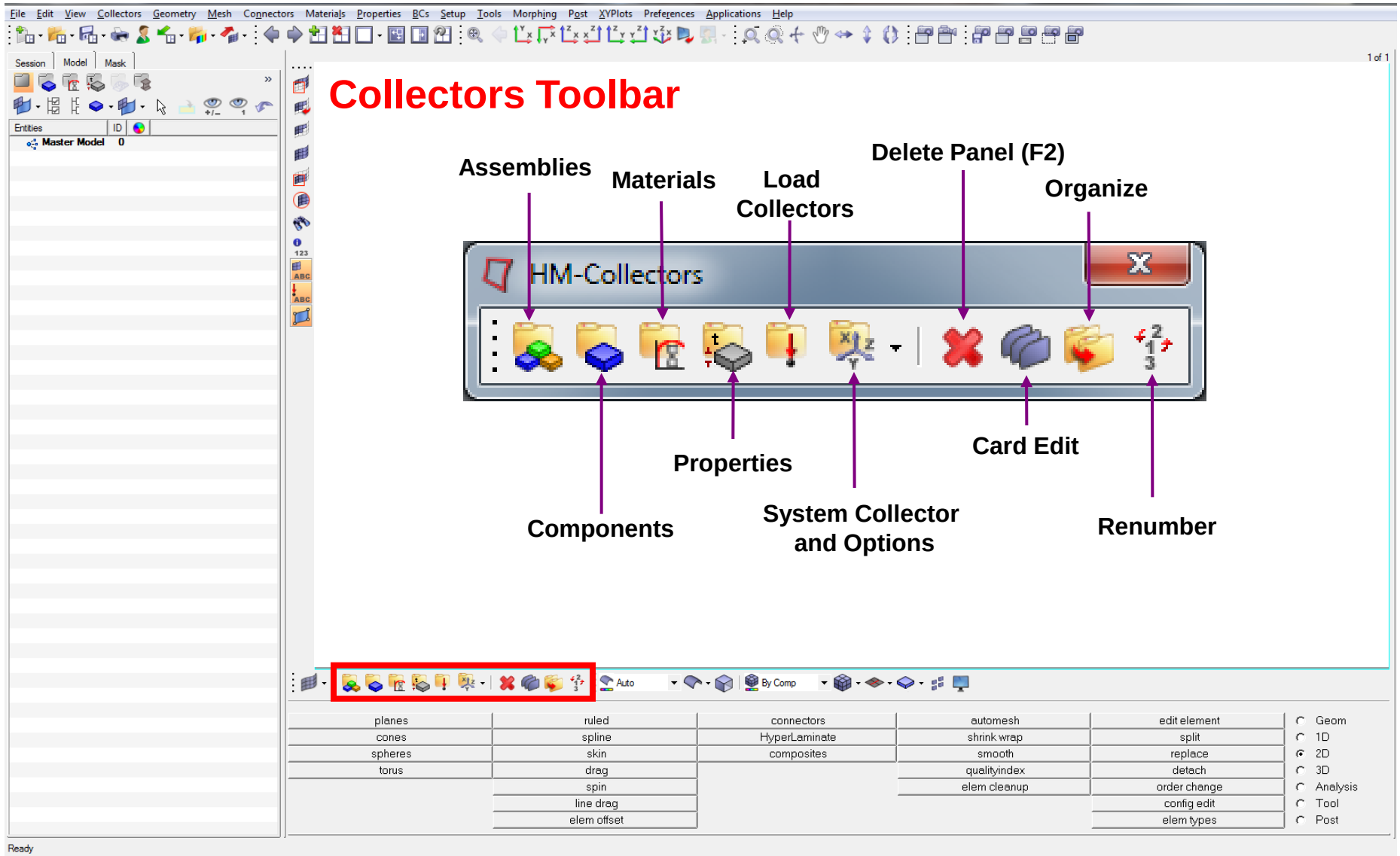


1 component per part



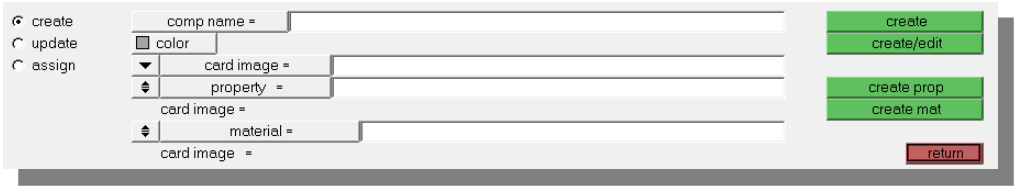
Multiple components per part

Toolbars

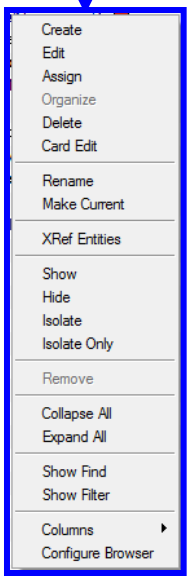


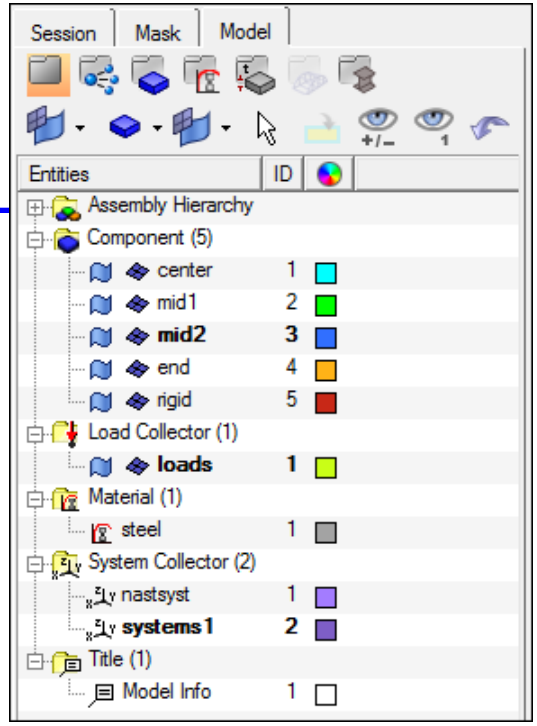
Model Organization: Collectors

- Model browser
  - View collectors and assemblies in a hierarchical tree format
  - Create, delete, and rename collectors
  - Edit collector attributes
  - Organize collectors into assemblies
    - Drag and drop
- Also available using toolbar “Collectors”



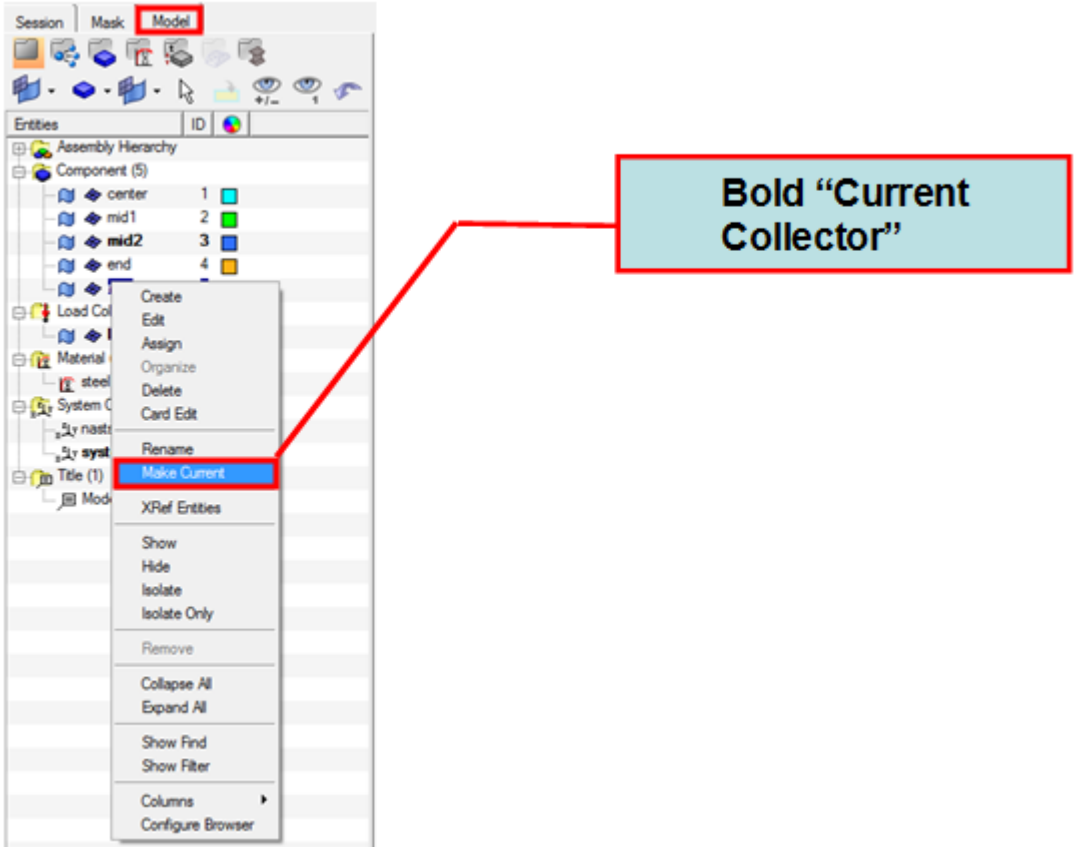
Right-Click on Collector for advanced options



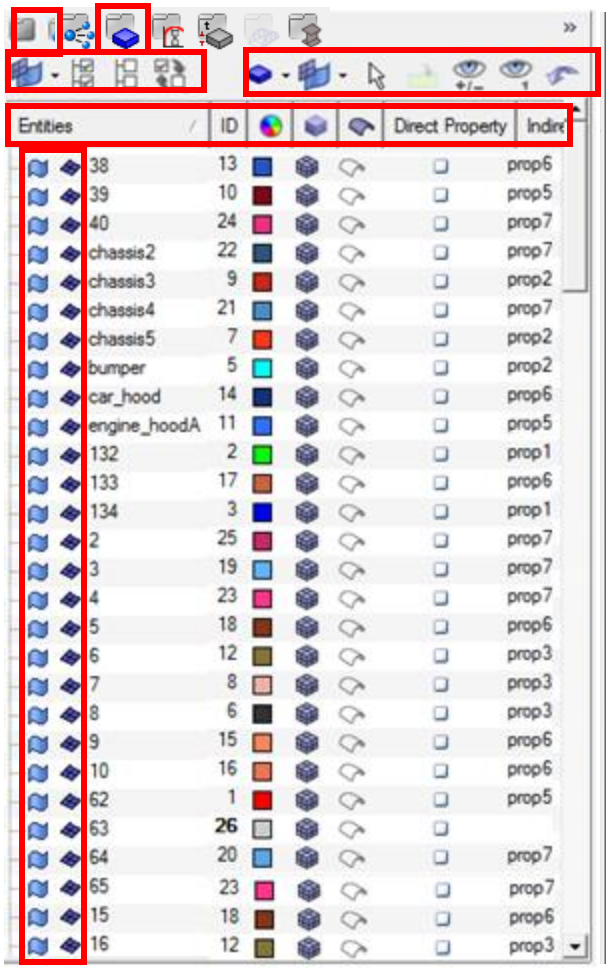


Model Organization: Collectors

- **New entities are created in the “current collector”**
  - **Creating a new collector automatically sets the current collector to that new collector**
  - ***Model Browser* used to change the current collector**
  - ***Organize* panel can be used to move entities into a different collector**



Browsers



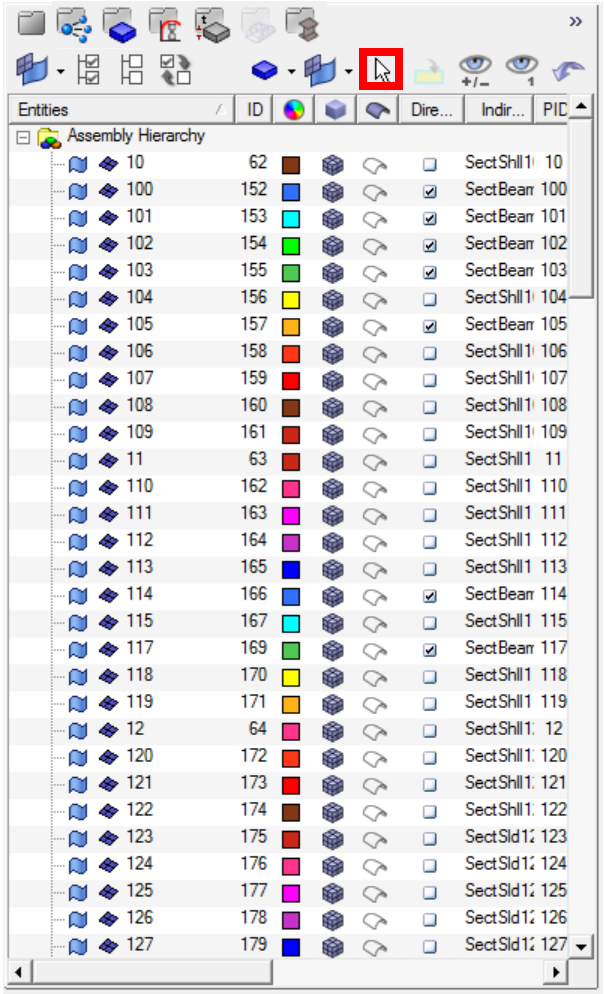
Model Browser

- Complete Listing of all HyperMesh Entities in Model
- Each “Collector” is expandable and lists all contained “Entities”

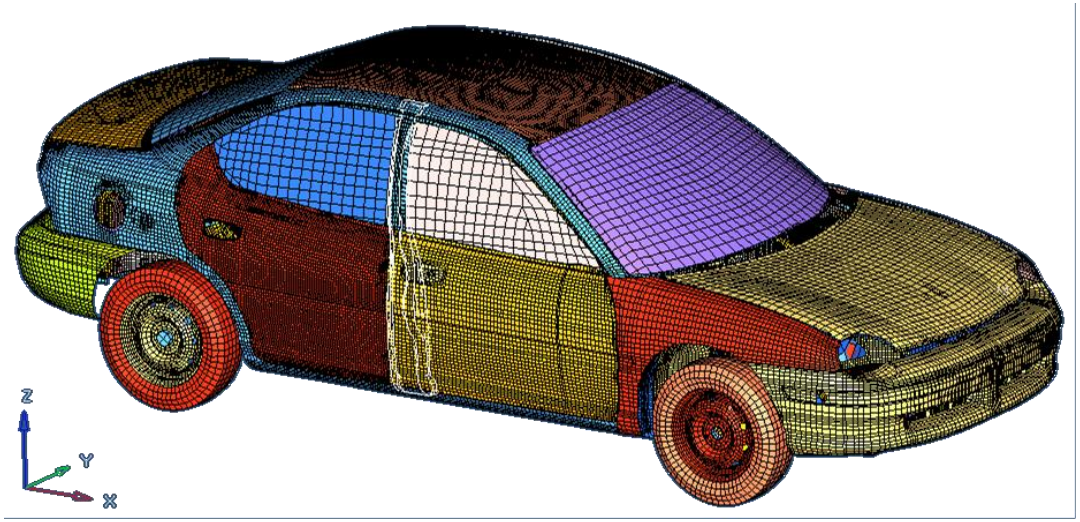
Component Browser

- Lists All Components in Model
- Colors Model “by Component”
- Quickly Sort by Name, ID, Color, or Property
- Display State Icons
  - Geom ON/OFF Single Picking
  - FE ON/OFF Single Picking
- Global Controls to Operate on all Components
  - All
  - None
  - Reverse
- Browser Modes
  - Graphics/Browser List Picking for:
  - Select
  - Show/Hide
  - Isolate

Browser Modes – Select



	Graphics Area	Browser Area
Add	Left mouse click	Left mouse click
Remove	Right mouse click	Ctrl + Left mouse click
Multiple	Shift + Left mouse click (drag and select)	Shift + Left mouse click
Advance	Left mouse click + Wheel	-



Model Organization: Tools

- Panels
  - ***Collectors*** – Create new collectors
  - ***Model Browser*** – Set the current collector for various entity types
  - ***Organize*** – Move entities into a different collector than the one they are currently contained in
  - ***Rename*** – Change the name of an existing collector
  - ***Reorder***
    - Collectors appear in a certain order when presented in a list to pick from
    - ***Reorder*** allows the order the collectors appear in to be changed
  - ***Delete*** – Delete entities or collectors