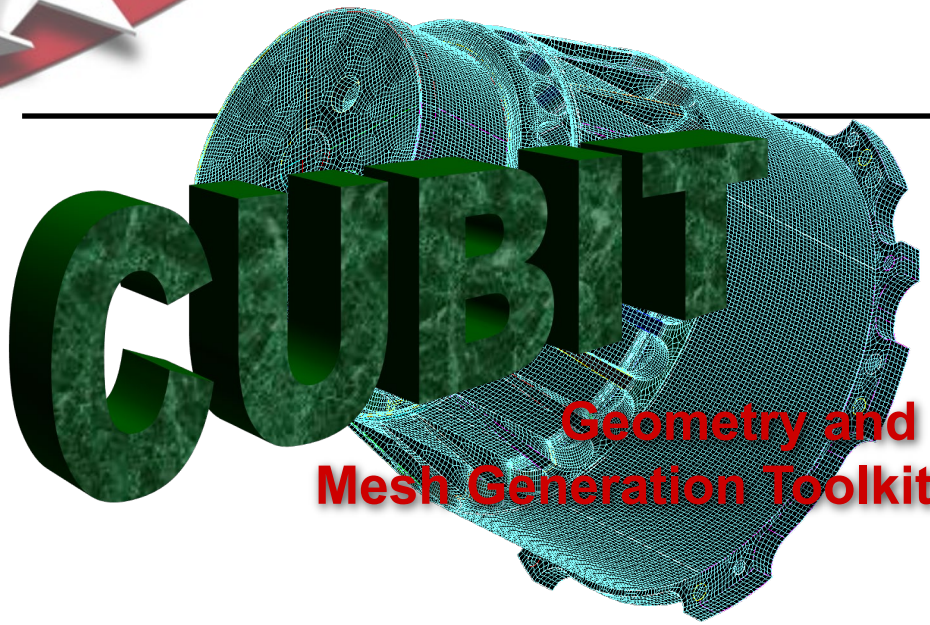


Simulation Modeling Sciences

CUBIT Fast-Start Tutorial

22. Using the Model Builder in SAW

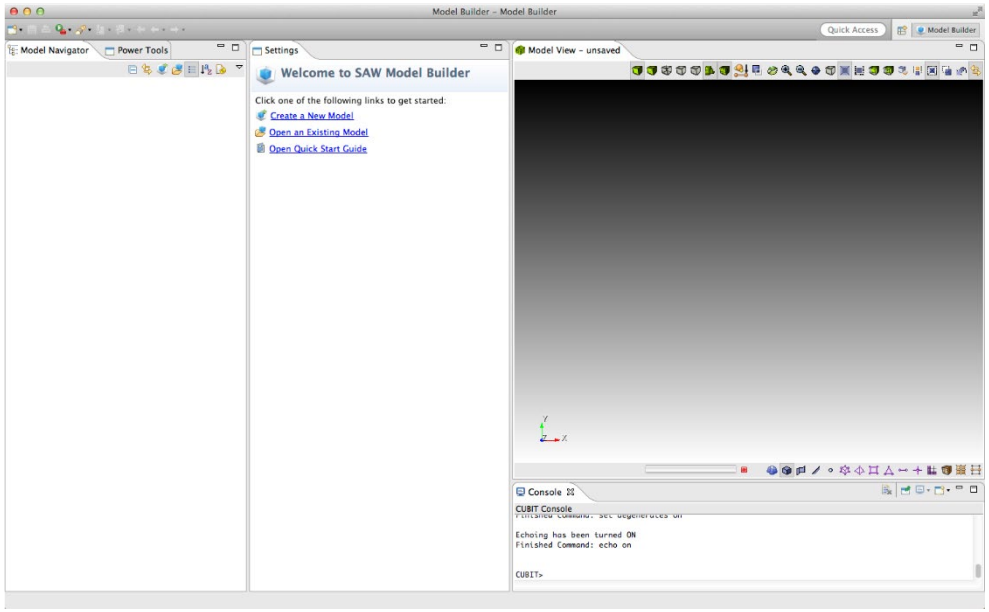
Sandia Analysis Workbench

Sandia National Laboratories is a multi-mission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

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Sandia Analysis Workbench (SAW)

Simulation Modeling Sciences



- Developed at Sandia – customized for Sierra codes
- Includes many analysts tools:
  - Meshing/Geometry (Cubit)
  - Graphical tools for input deck creation and editing for Sierra apps.
  - Environment for managing all files related to analysis
  - Job Submission/Monitoring
- Eclipse application – Windows, Mac, Linux
- Model Builder Edition: includes “all” of Cubit Functionality

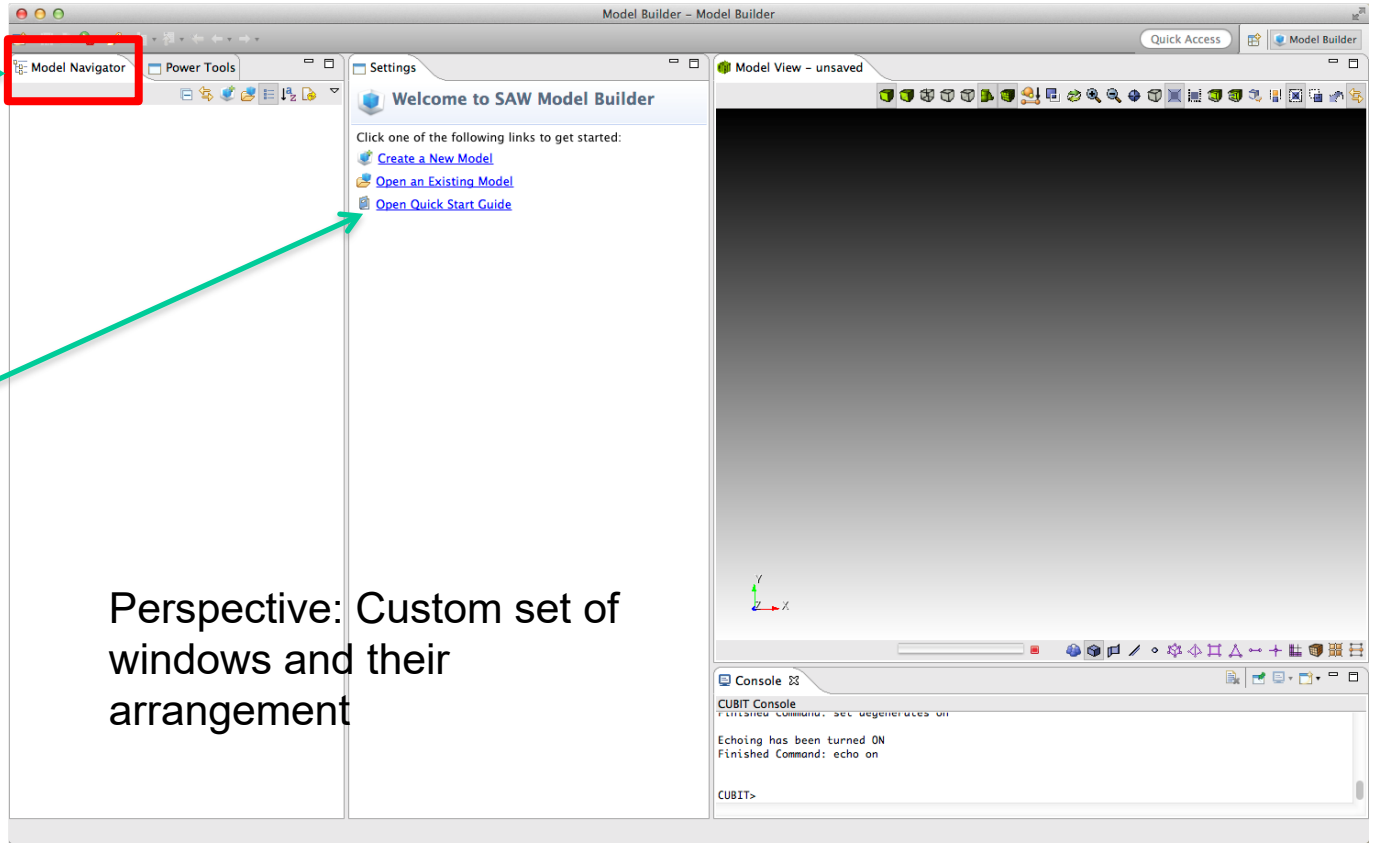
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SAW

Simulation Modeling Sciences

Start with the default Model Navigator

Recommend Starting with the Quick Start Guide to get an overview of the complete product

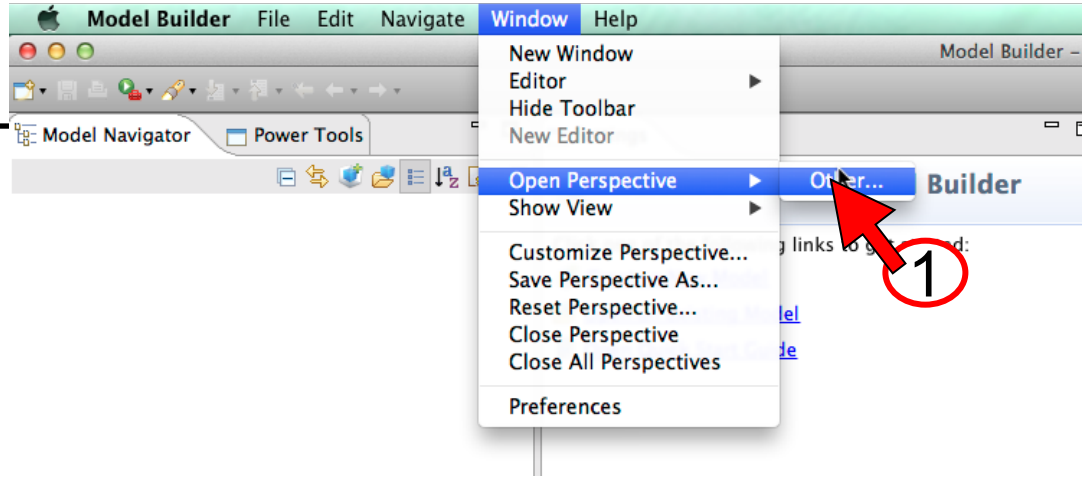


Perspective: Custom set of windows and their arrangement

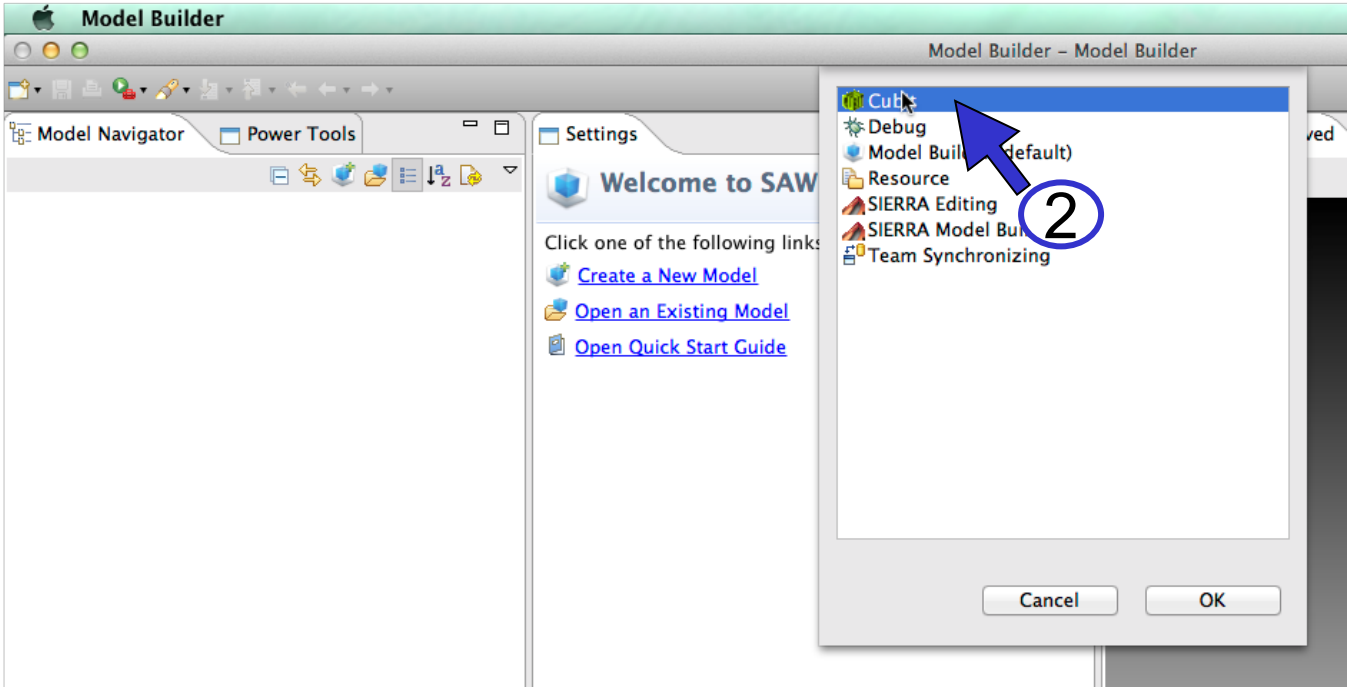
Default window arrangement when first starting up SAW – Model Builder Edition

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Showing the Cubit Perspective in SAW



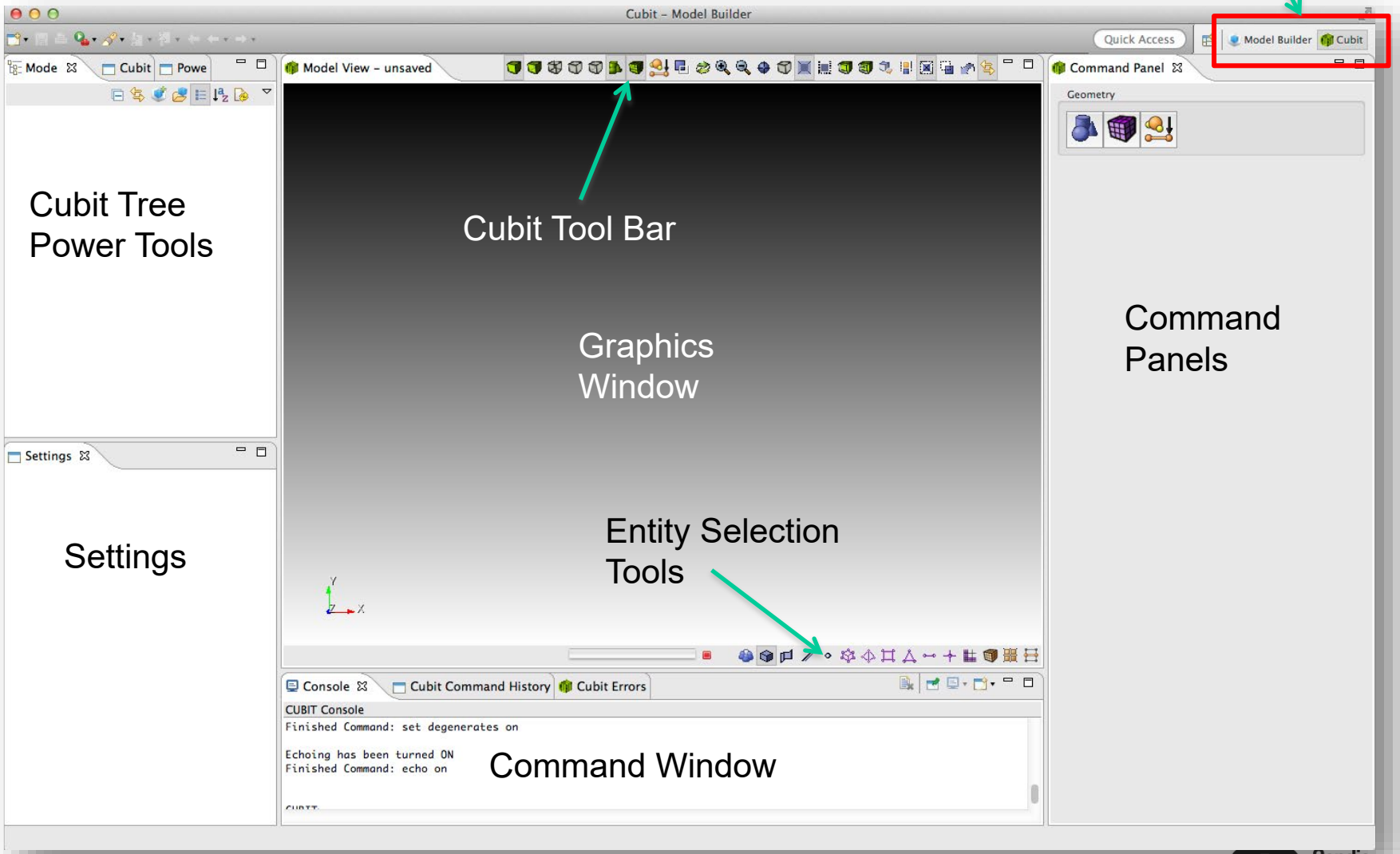
SAW will maintain perspective and window arrangement the next time you start the application



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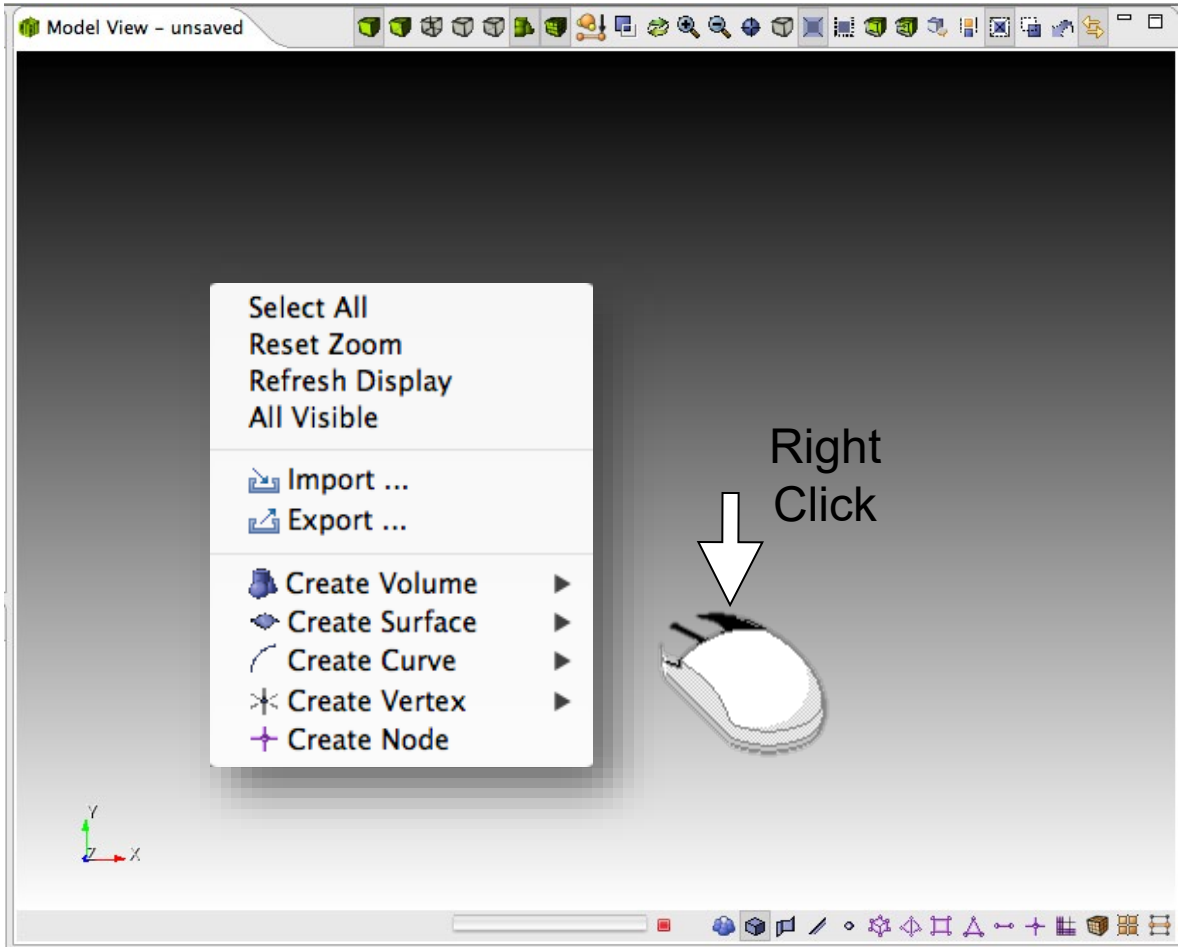
SAW

Simulation Modeling Sciences



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Graphics Window



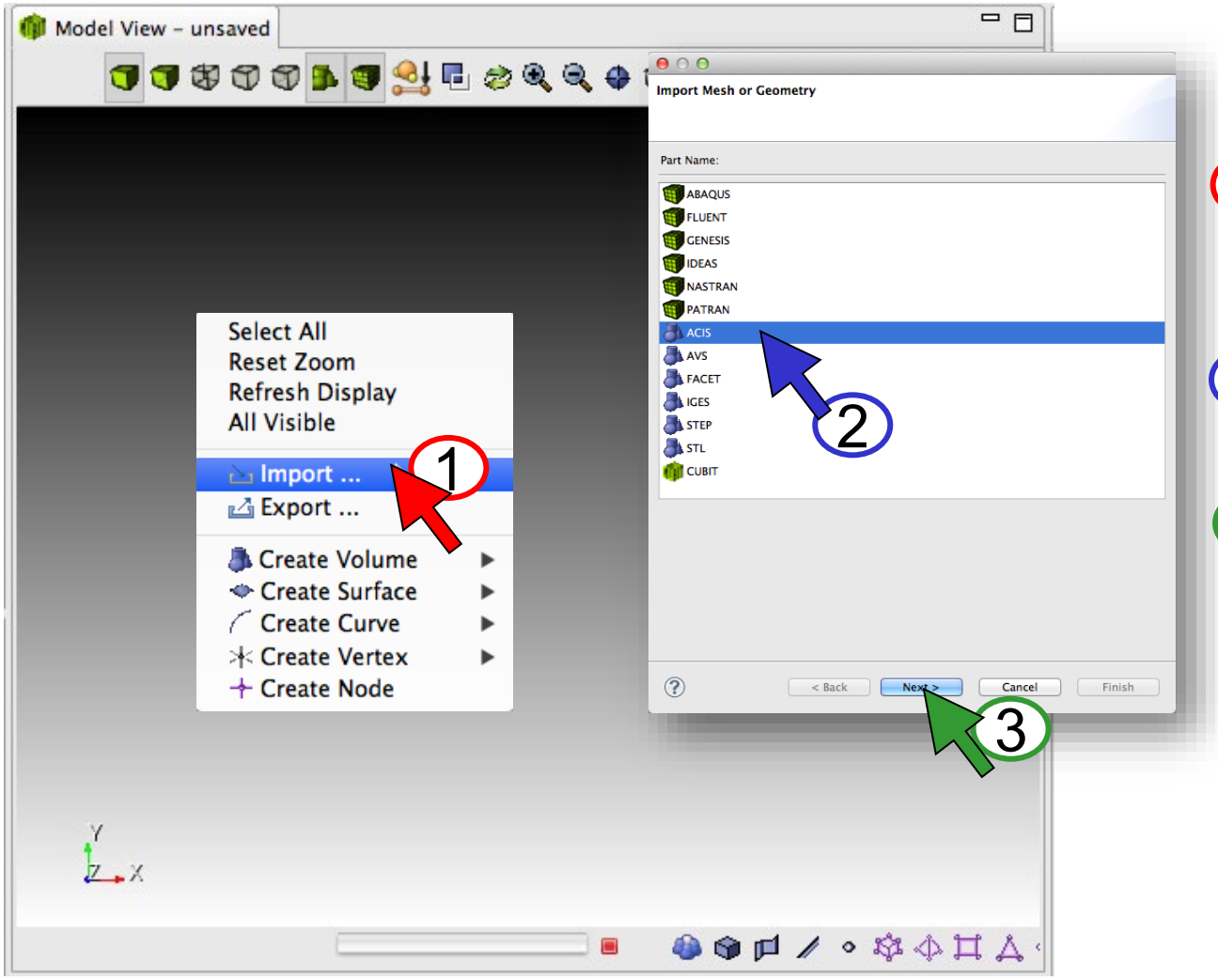
Context (Right Click) Menu: Includes most common cubit commands

- Import/Export
- Model Creation

When entity selected:

- Geometry operations
- Attributes
- Meshing
- Boundary Conditions
- Material Assignment

Graphics Window

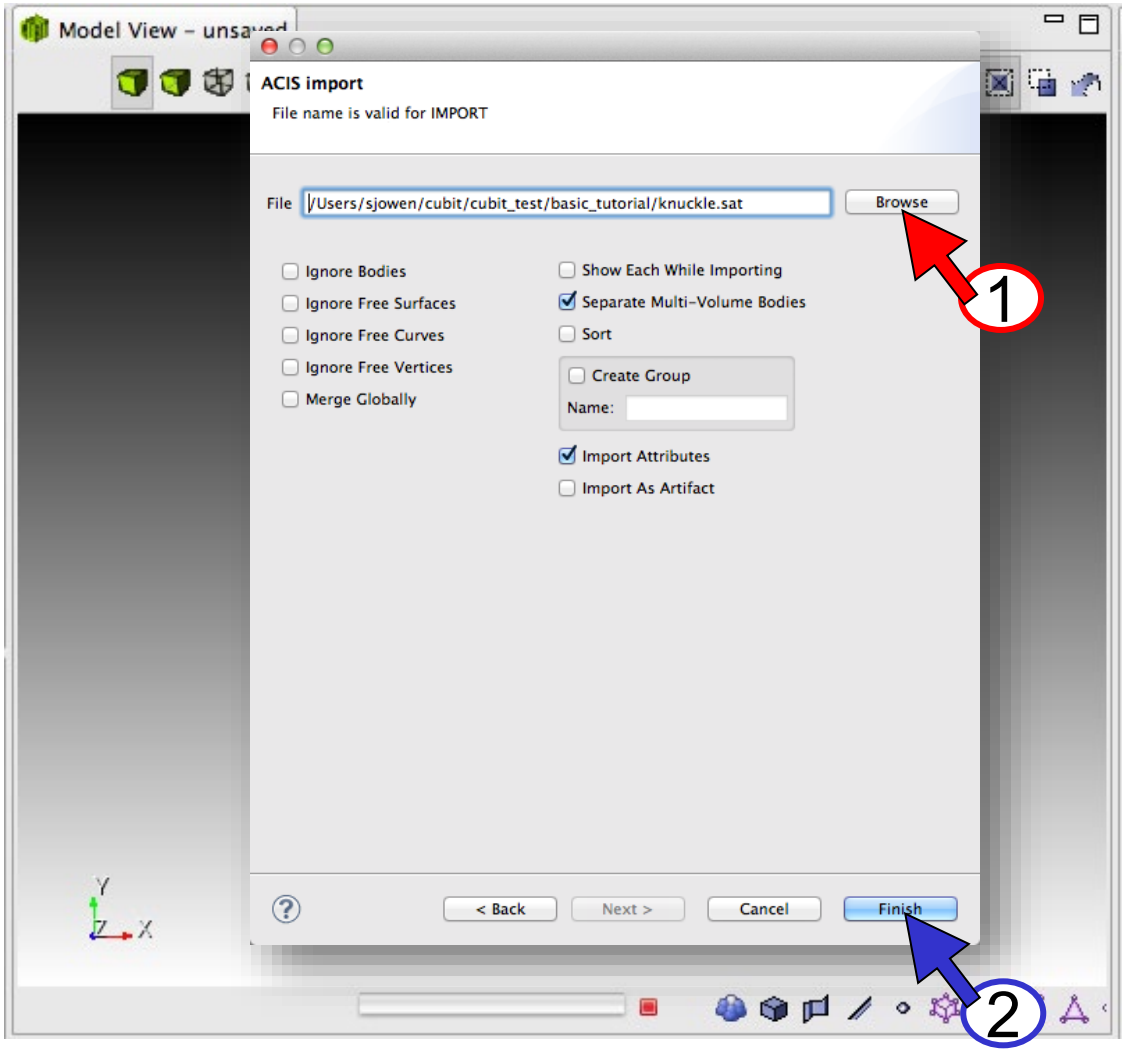


Import an ACIS file

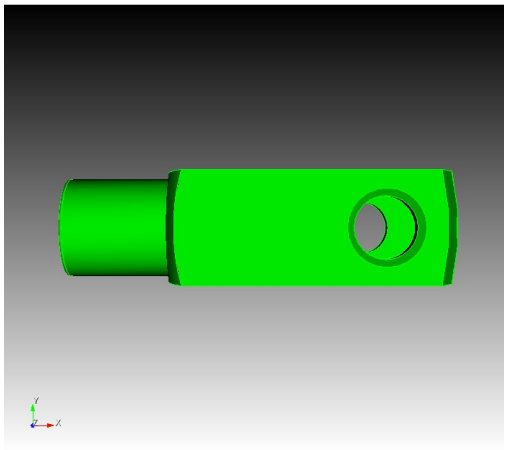
1. Select the Import Option from the Right Click Menu
2. Select ACIS from list of file types
3. Click Next

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Graphics Window

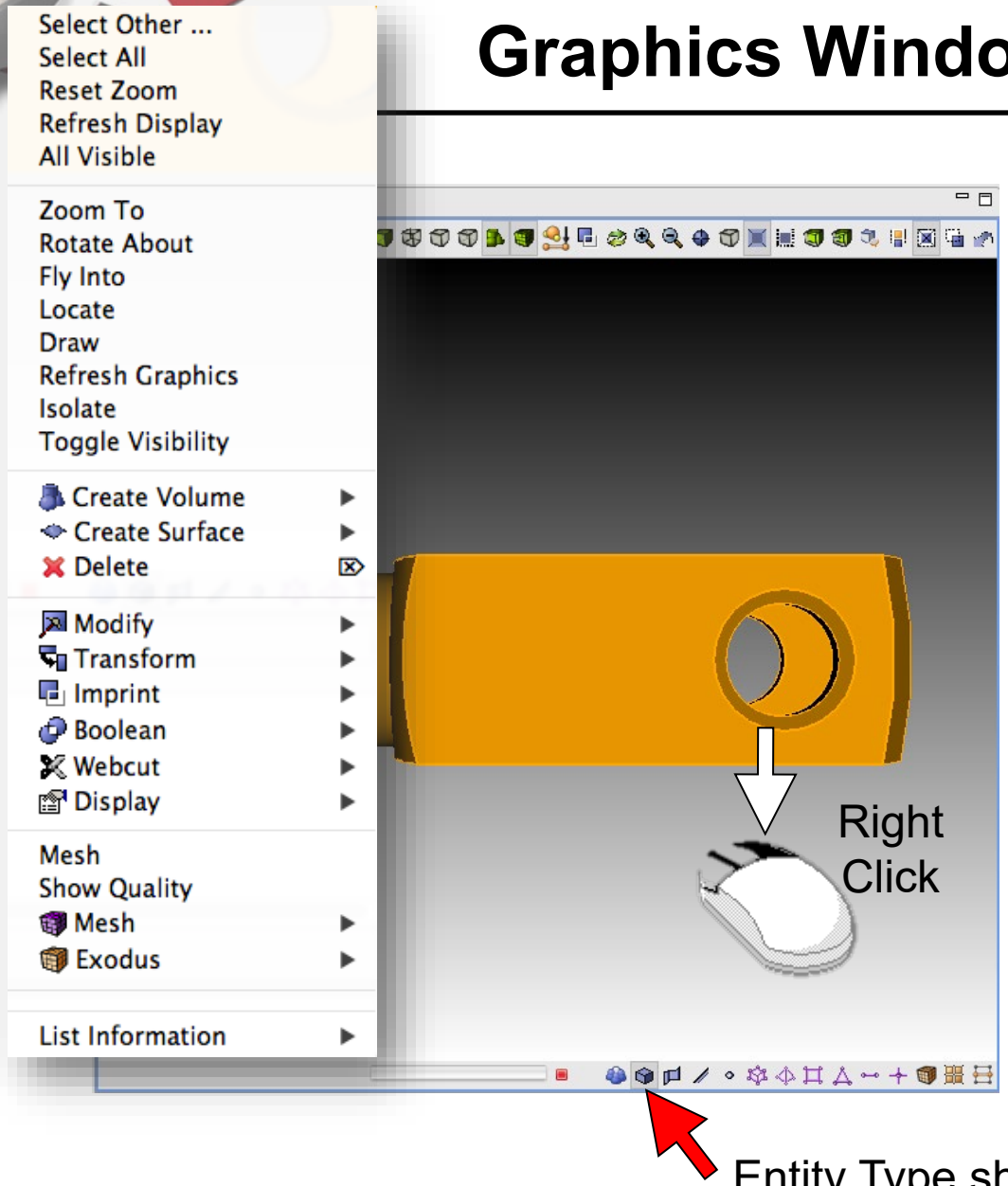


1. Browse to select the “knuckle.sat” file
2. Click Finish



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Graphics Window



When entity is selected in graphics window

Context (Right Click) Menu:
Many operations can be performed on the selected entity

Most right-click menu selections will bring up a dialog in the *Command Panels*

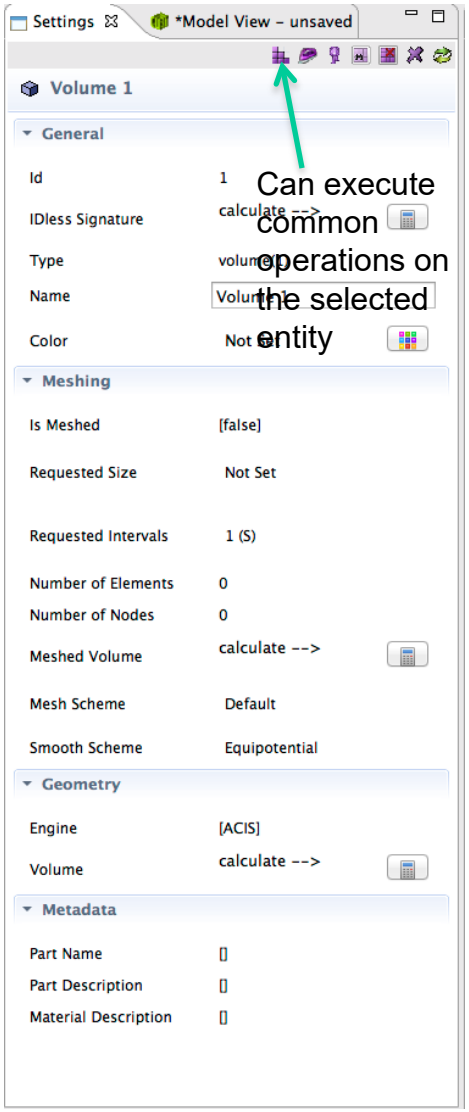
Sandia National Laboratories

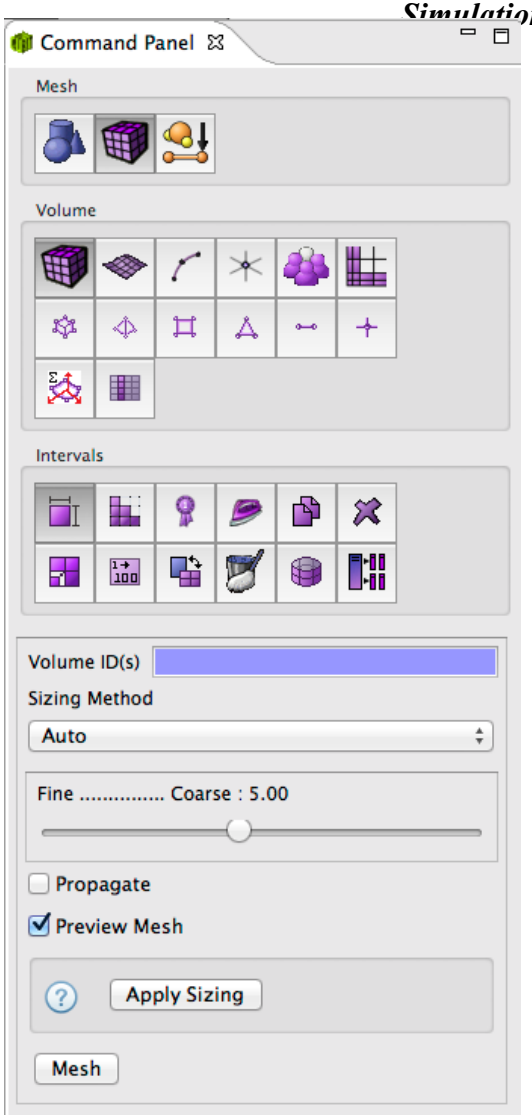
Settings & Command Panels

Settings

Displays properties of the currently selected entity (or entities)

Similar to Property Panel in QT Cubit





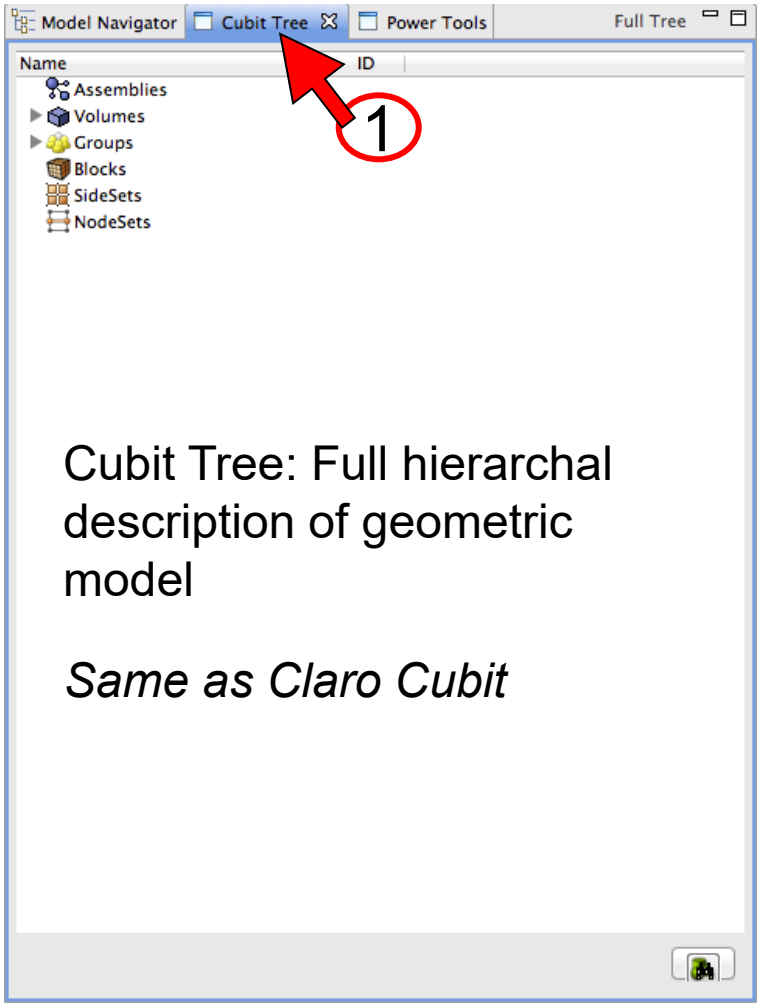
Command Panels

The most commonly used Cubit commands grouped by entity type

Similar to Claro Cubit Command Panel

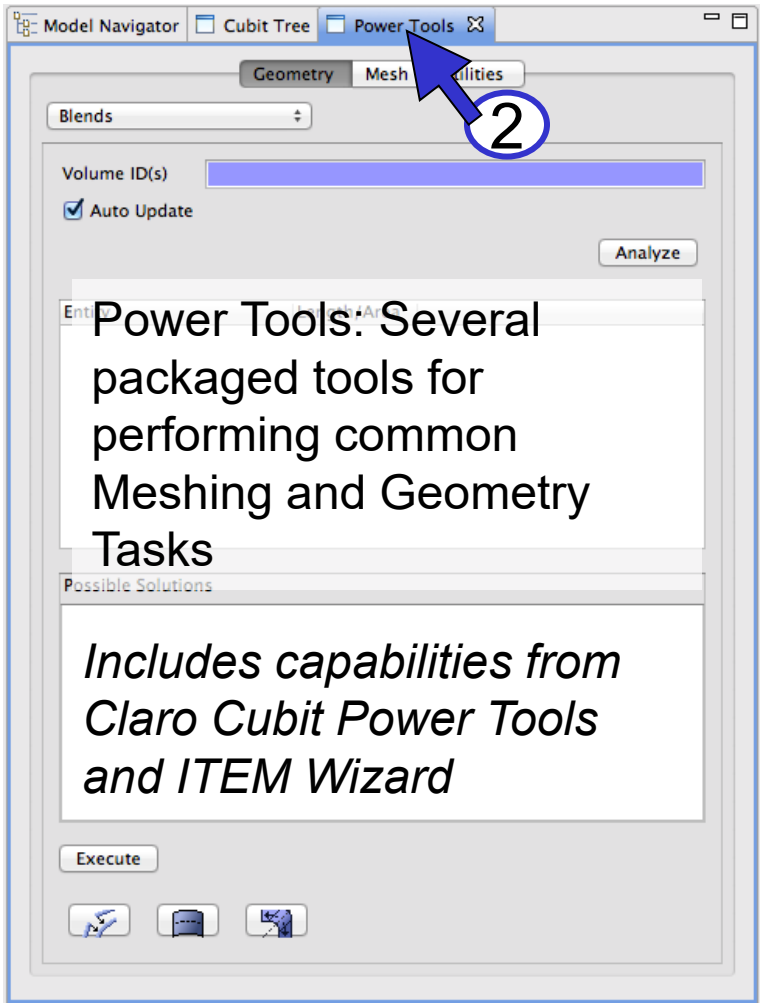
Cubit Tree & Power Tools

Simulation Modeling Sciences



Cubit Tree: Full hierarchal description of geometric model

Same as Claro Cubit

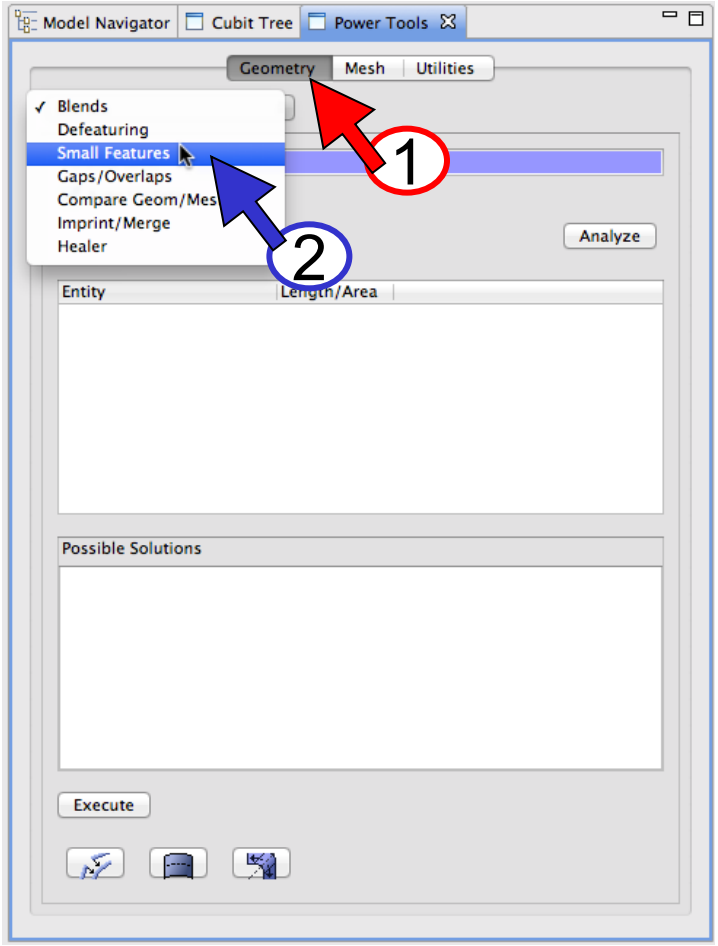


Power Tools: Several packaged tools for performing common Meshing and Geometry Tasks

Includes capabilities from Claro Cubit Power Tools and ITEM Wizard

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Exercise: Meshing the Knuckle

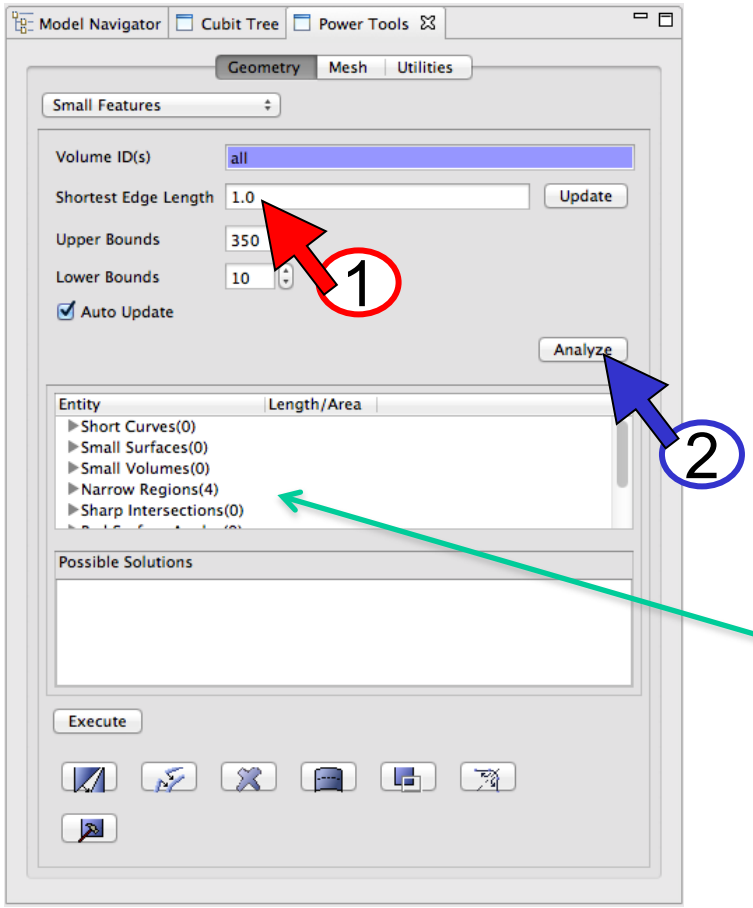


Use the power tools to prepare the knuckle model for meshing

The *Small Features* Power Tool will aid in identifying and removing small features

1. Select the Geometry Group of Power Tools
2. Use the drop-down to select the “Small Features” power tool

Exercise: Meshing the Knuckle

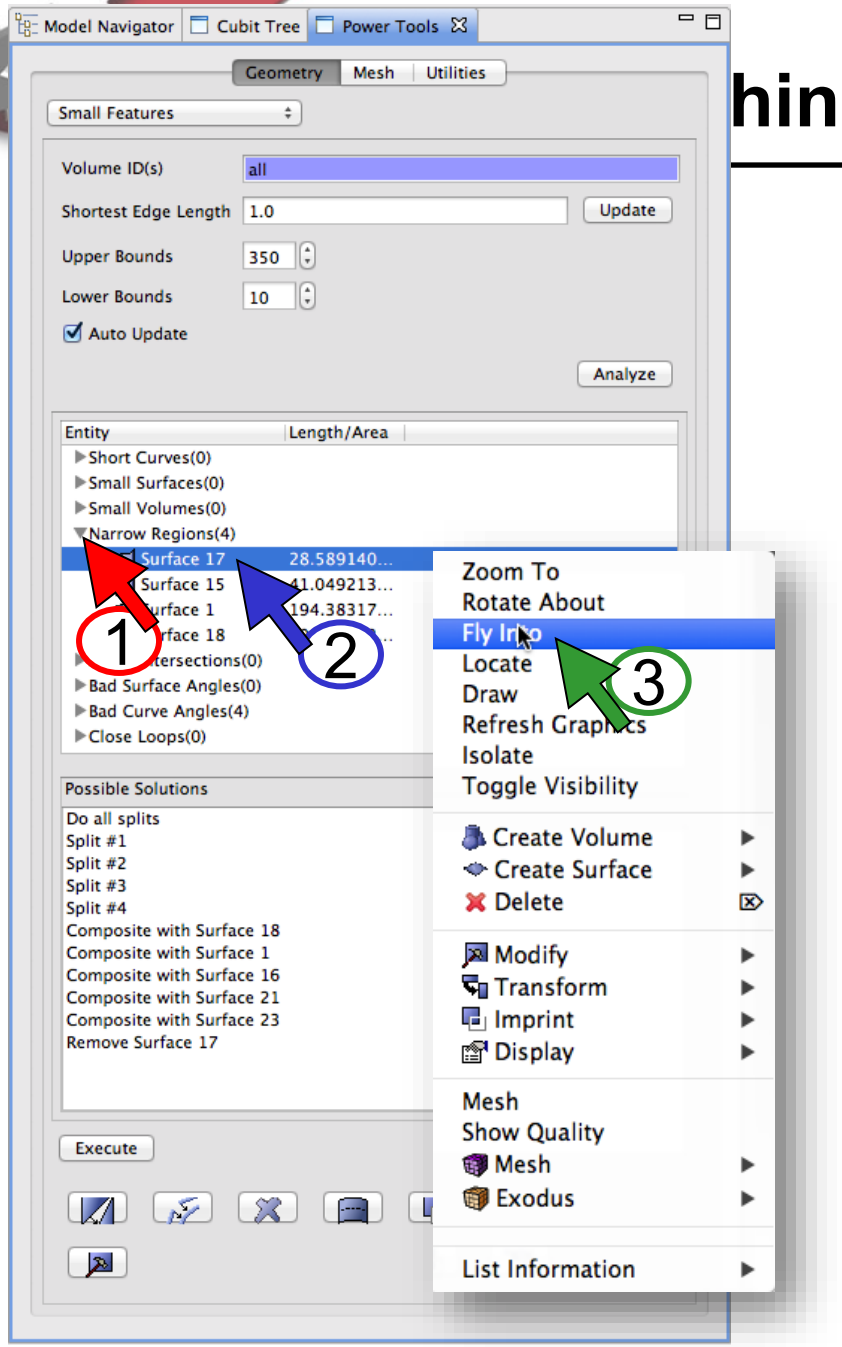


1. Enter a value for Shortest Edge Length of 1.0
2. Click Analyze

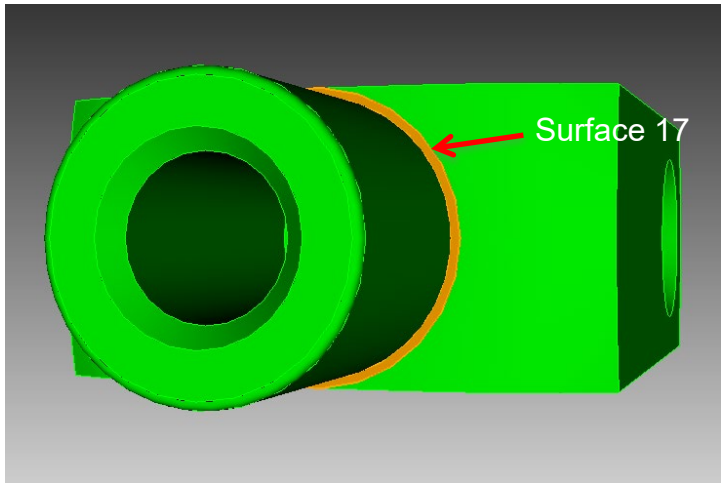
A list of features smaller than than “1.0” will be displayed

hing the Knuckle

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1. Expand the Narrow Regions Set
2. Select the first surface in the list (surface 17)
3. Right Click on Surface 17 to reveal the drop down menu. Select *Fly Into*



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Exe Knuckle

Simulation Modeling Sciences

Model Navigator | Cubit Tree | Power Tools

Geometry | Mesh | Utilities

Small Features

Volume ID(s): all

Shortest Edge Length: 1.0 Update

Upper Bounds: 350

Lower Bounds: 10

Auto Update

Analyze

Entity	Length/Area
Short Curves(0)	
Small Surfaces(0)	
Small Volumes(0)	
Narrow Regions(4)	
Surface 17	28.589140...
Surface 15	41.049213...
Surface 1	194.38317...
Surface 18	199.47892...
Sharp Intersections(0)	
Bad Surface Angles(0)	
Bad Curve Angles(4)	
Close Loops(0)	

Possible Solutions

Do all splits
Split #1
Split #2
Split #3
Split #4
Composite with Surface 18
Composite with Surface 1
Composite with Surface 16
Composite with Surface 21
Composite with Surface 23
Remove Surface 17

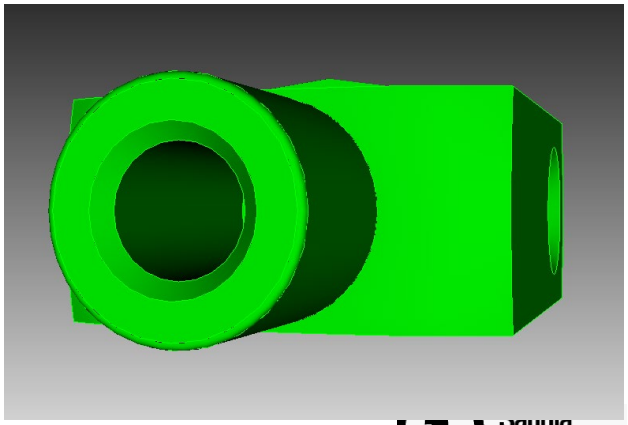
Execute

1 Click on any solution to see a preview of the command

2 Select the “Remove Surface 17” solution

3 Click Execute

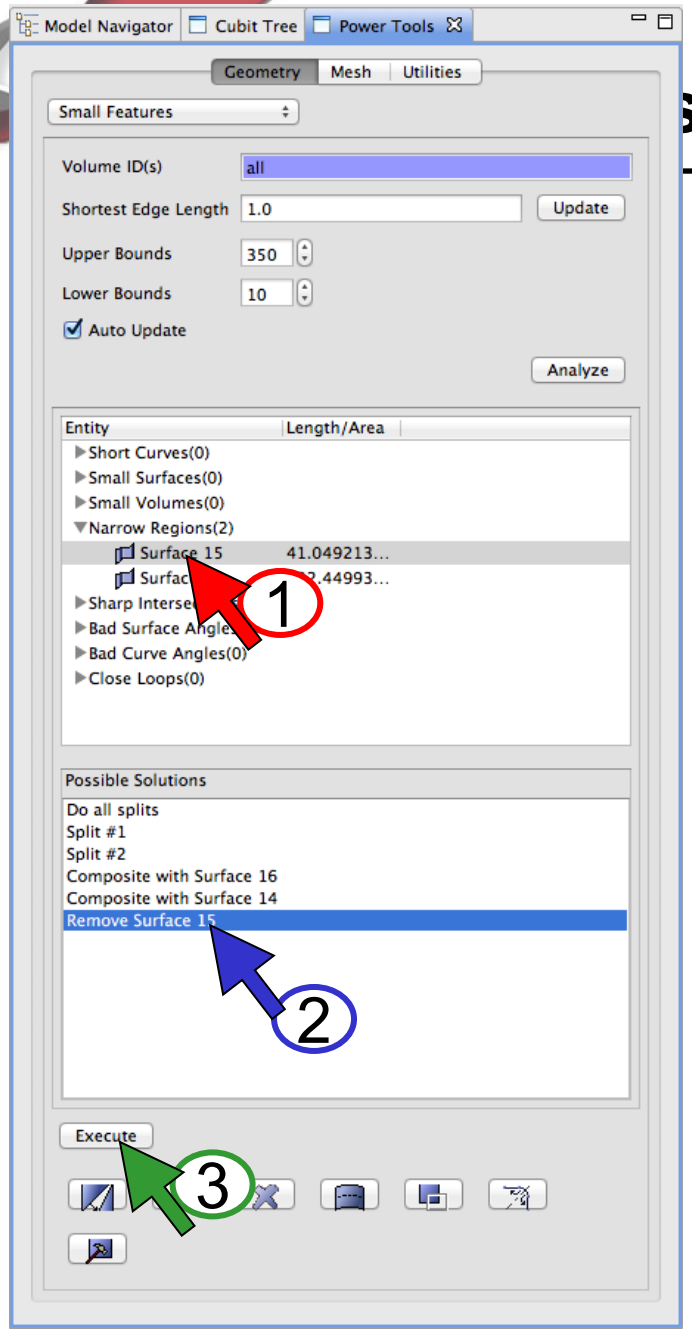
Solution window contains packaged commands that may provide a way to eliminate the small feature



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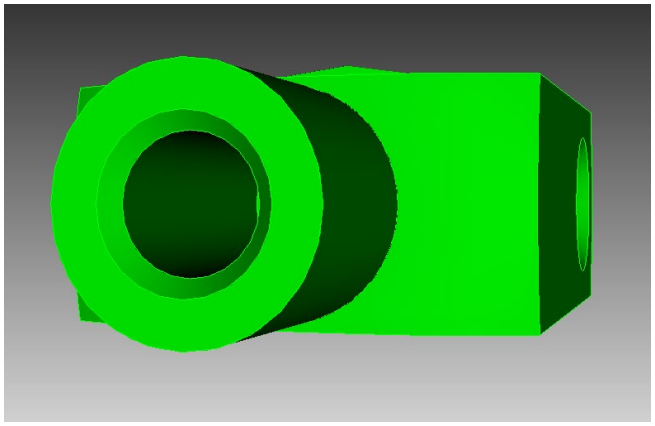
shing the Knuckle

Simulation Modeling Sciences



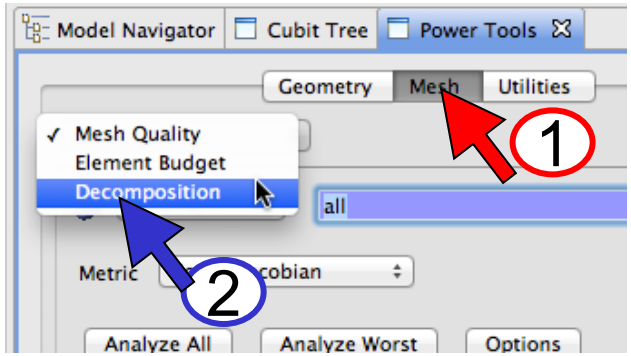
The list of features smaller than 1.0 should automatically update

1. Click surface 15 under Narrow Regions
2. Select the “Remove Surface 15” solution
3. Click Execute

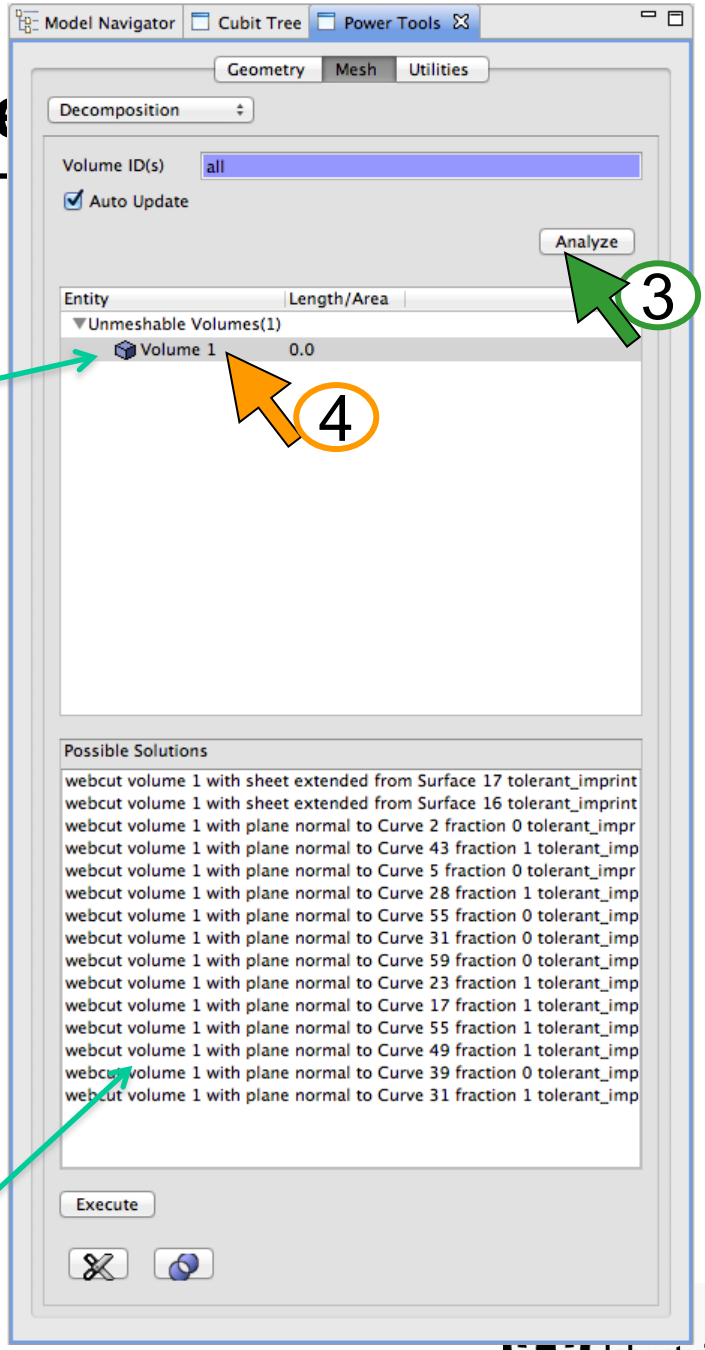


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Exercise: Meshing the



A list of volumes not currently meshable is displayed

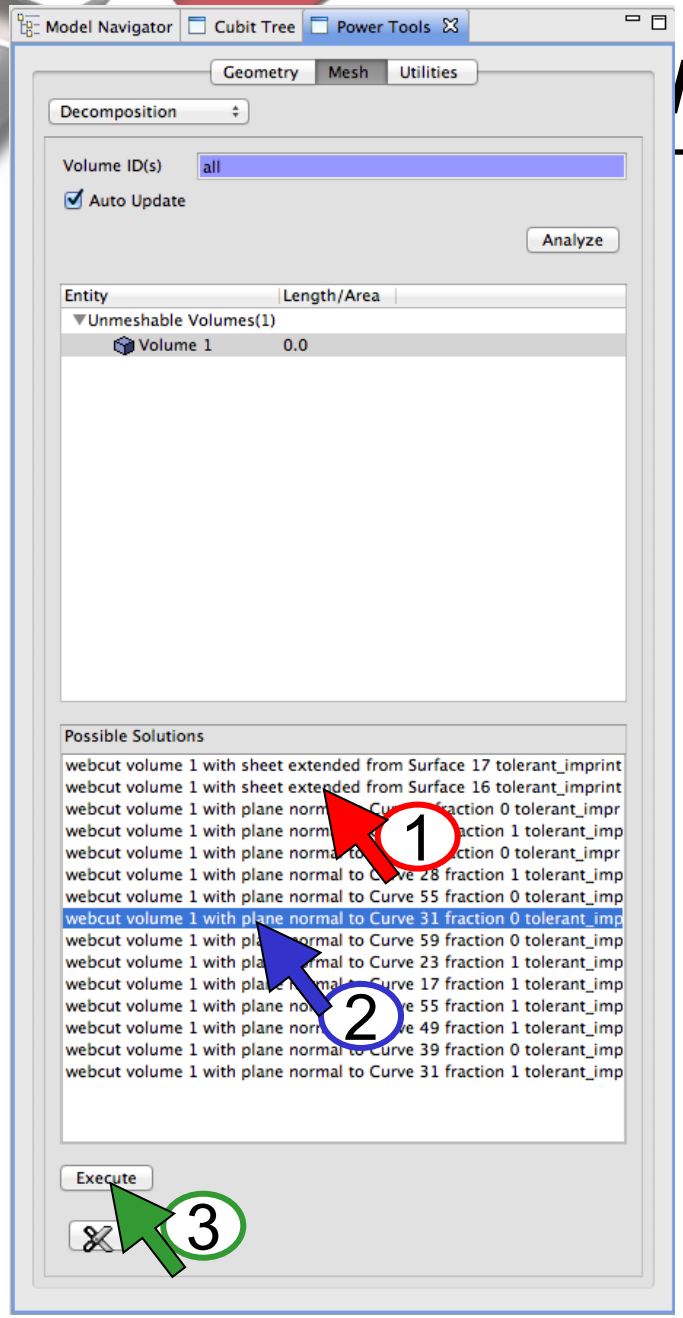


The *Decomposition* Power Tool will help identify meshability and provide webcut strategies for decomposition

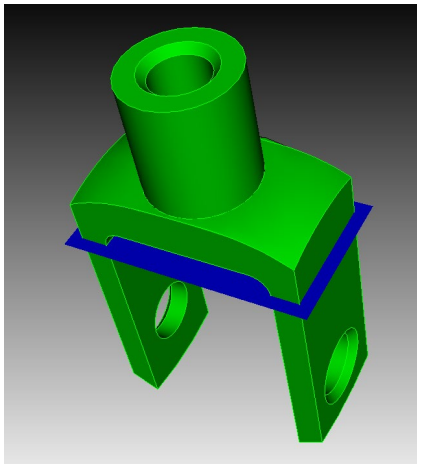
1. Select the *Mesh* Group of Power Tools
2. Select *Decomposition* from the dropdown
3. Select the *Analyze* button
4. Select Volume 1 in the list. Display a list of decomposition solutions for this volume

Meshing the Knuckle

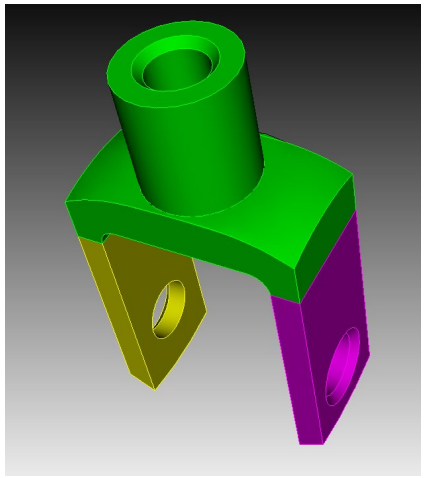
Simulation Modeling Sciences



1. Select any solution to preview potential webcuts. Use the keyboard down arrow to quickly cycle through solutions



2. Choose the solution "*webcut volume 1 with plane normal to Curve 31…*"



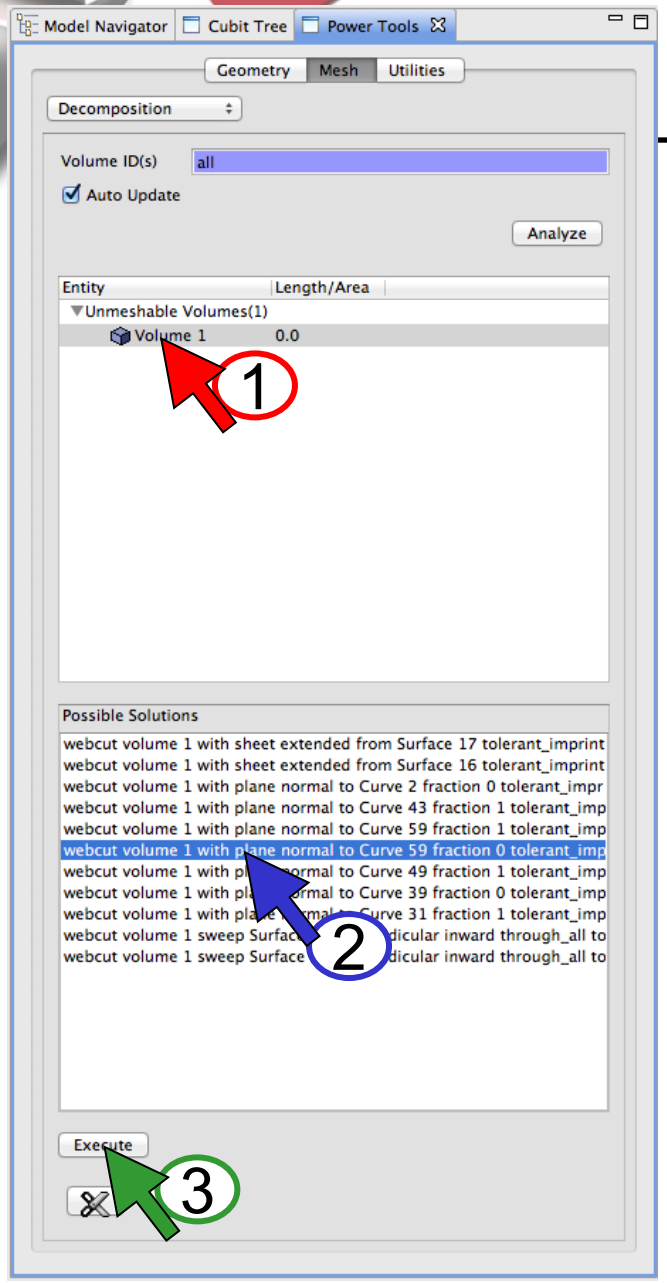
3. Select the *Execute* button

Note that this operation also imprints and merges following webcut

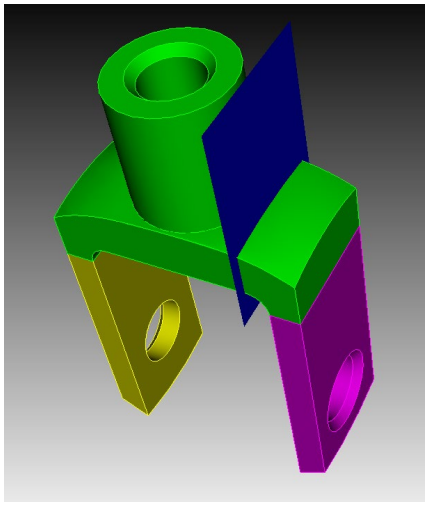
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Meshing the Knuckle

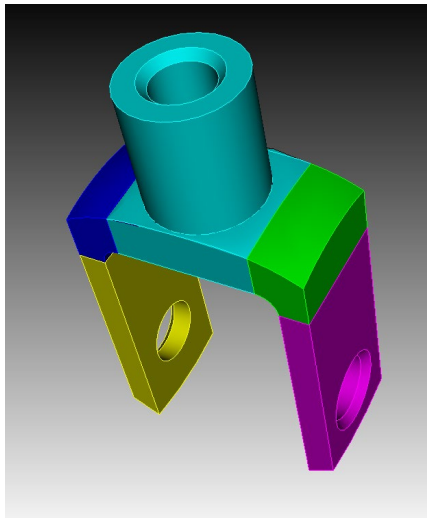
Simulation Modeling Sciences



1. Select Volume 1 again
2. Choose the solution that looks similar to the image at right
3. Select the Execute button

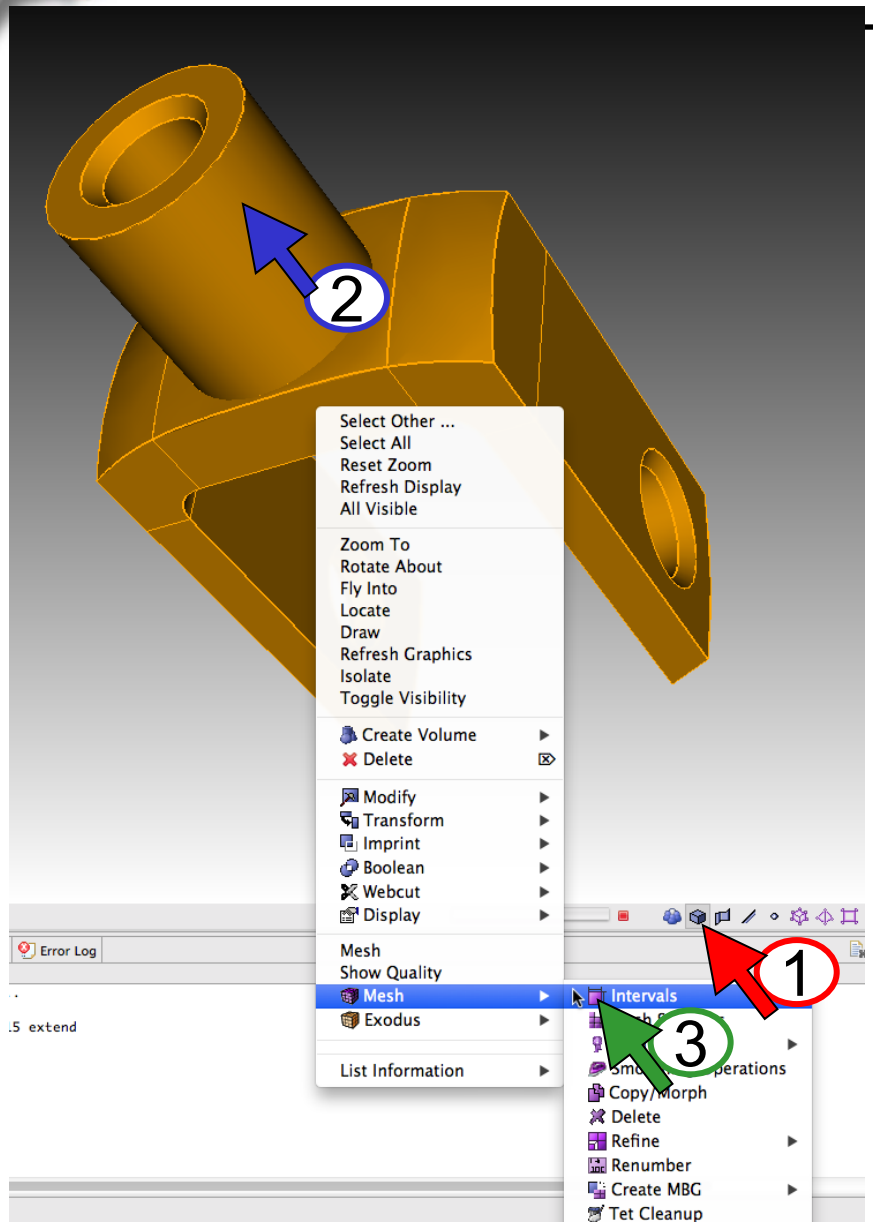


Repeat the procedure to arrive at the decomposition shown at the right



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Exercise: Meshing the Knuckle



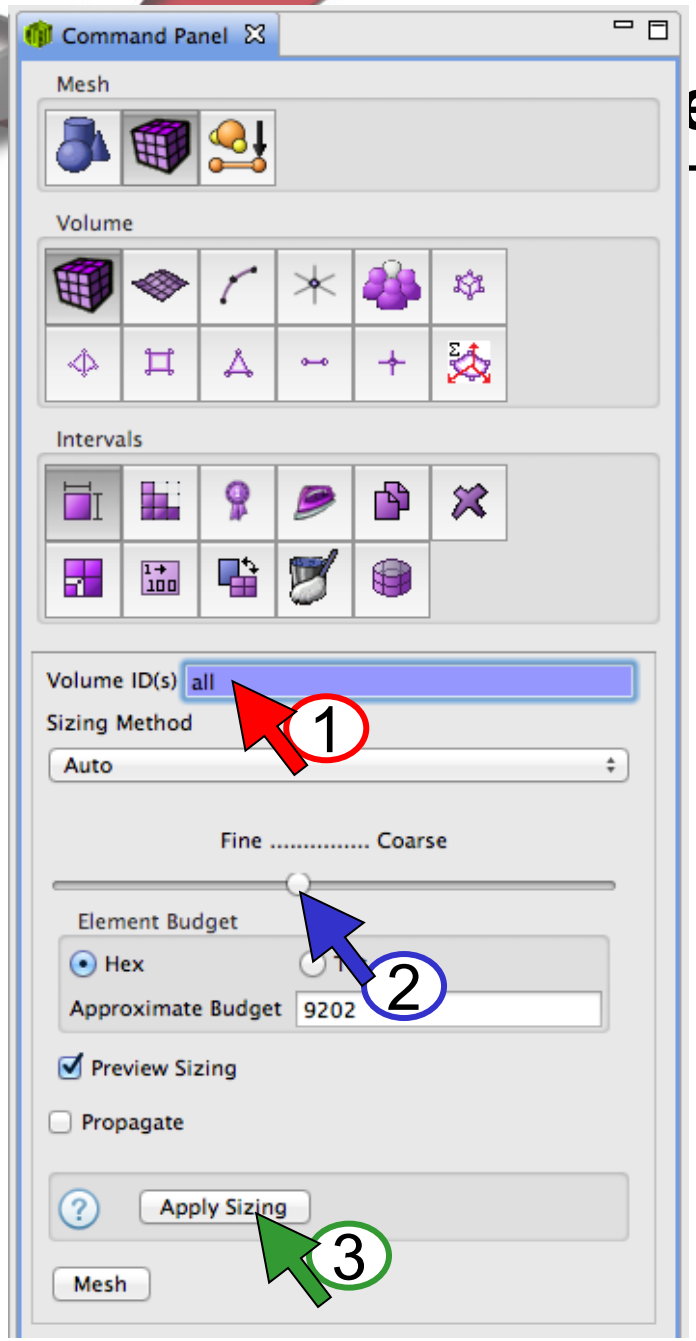
Assign a mesh size to the volumes

1. Make sure the Volume Selection icon is selected
2. Select all 5 volumes. Hold down the shift key to multi select.
3. Right click on any of the volumes to reveal the context menu. Locate and select the "*Intervals*" item under "*Mesh*"

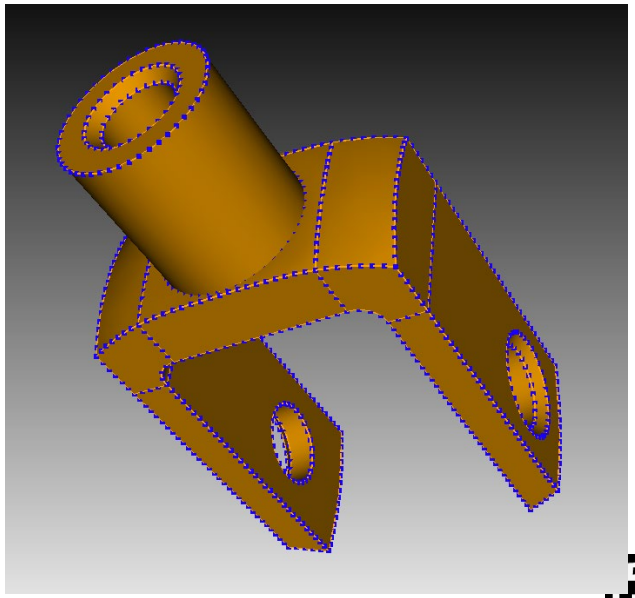
The Volume Intervals Command Panel should be displayed

eshing the Knuckle

Simulation Modeling Sciences



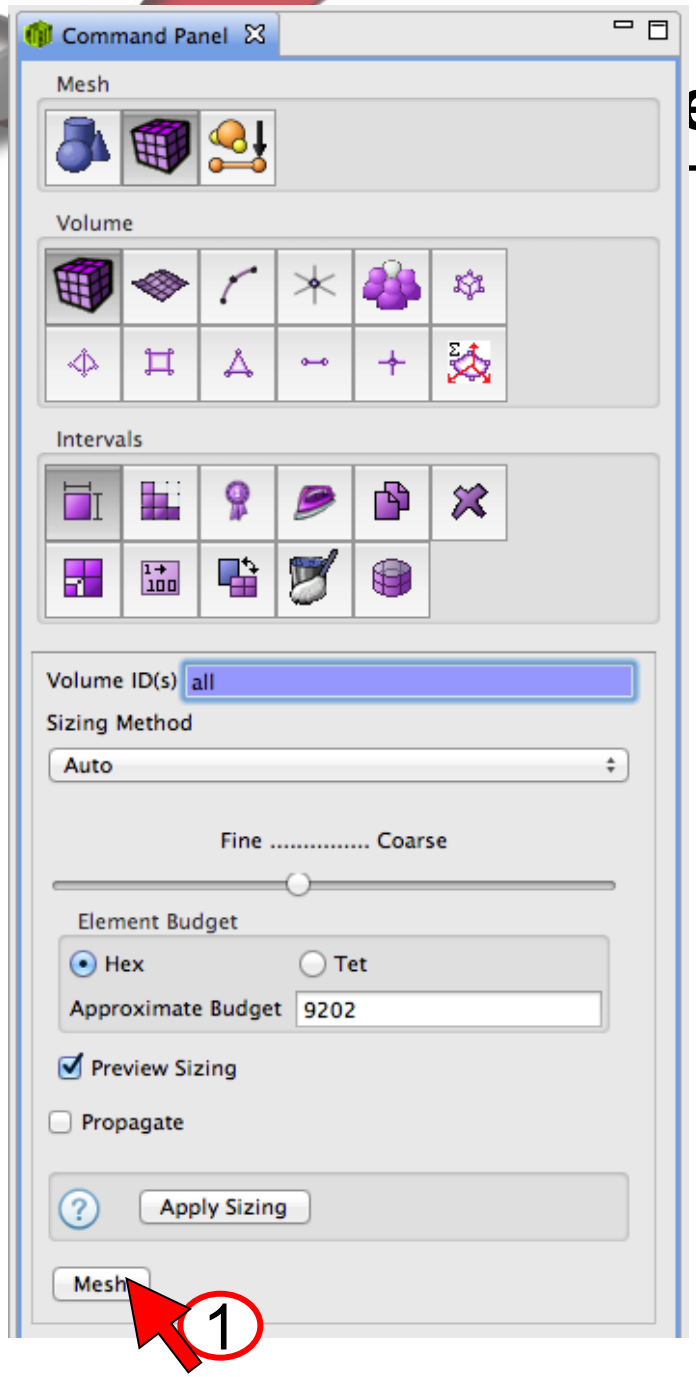
1. Make sure “All” is entered in the pick edit field
2. Adjust the slider to change the interval sizes. Observe the sizes change in the graphics window and find an approximate size you like.
3. Hit the *Apply Sizing* button



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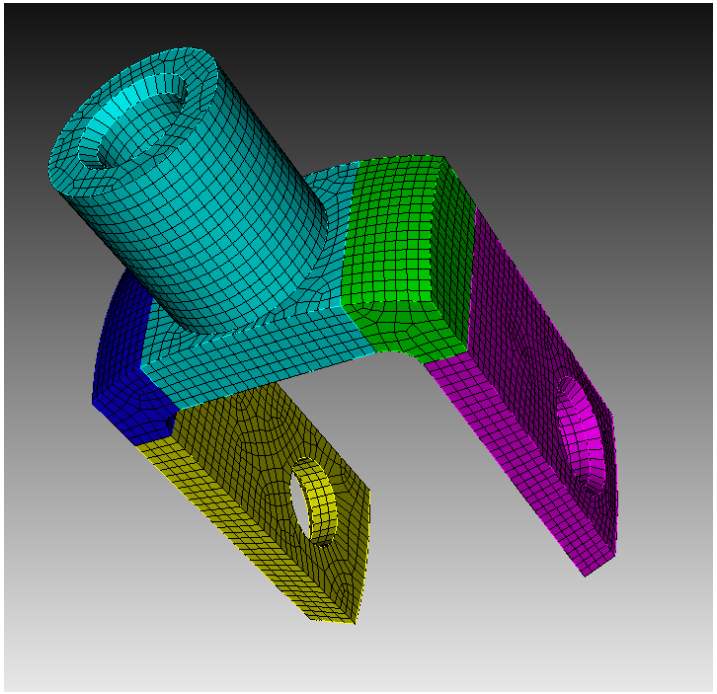
eshing the Knuckle

Simulation Modeling Sciences



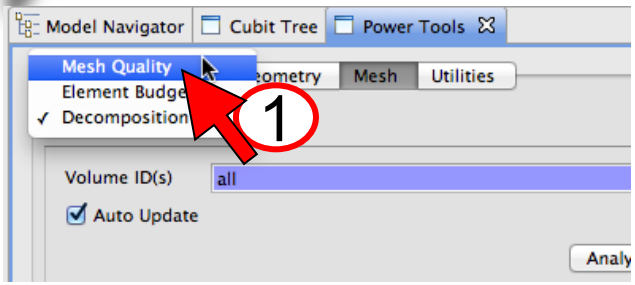
1 Hit the *Mesh* button

A hex mesh should be generated on each of the five volumes



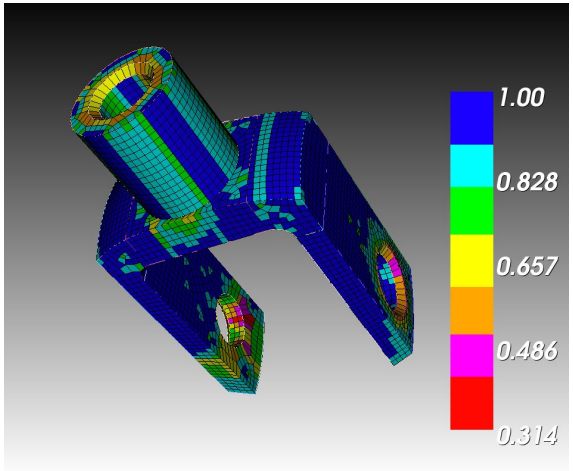
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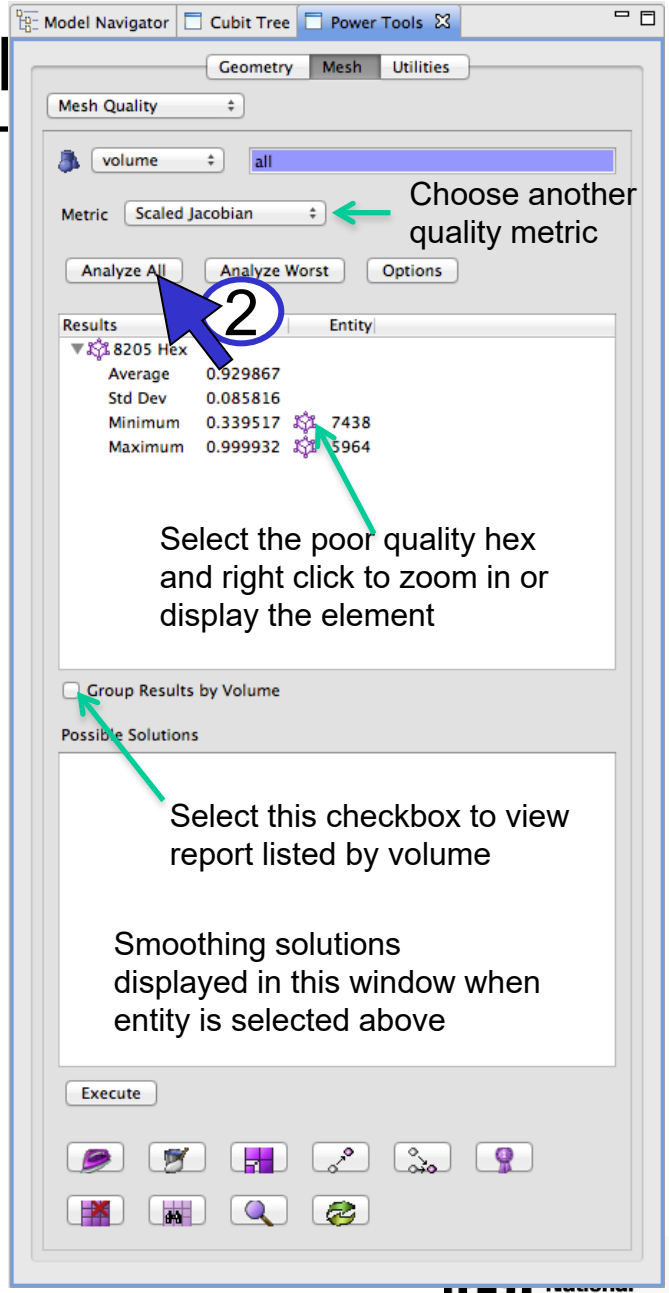
Exercise: Meshing the I



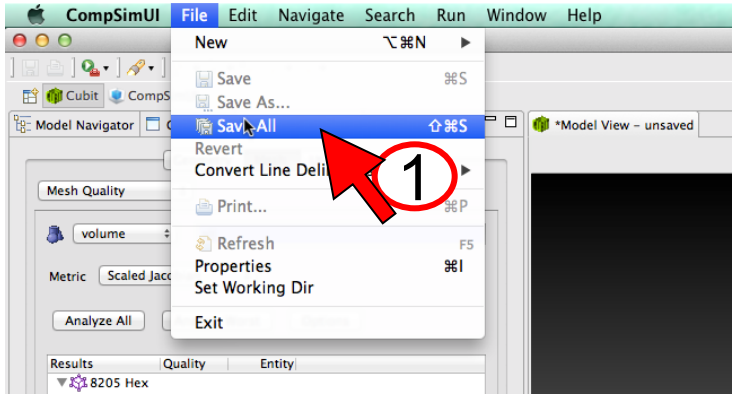
Examine the mesh quality using the Mesh Quality Power Tool

1. Choose *Mesh Quality* from the dropdown in the Power Tools window
2. Hit the *Analyze All* button to view the mesh quality and get a report of the quality
3. Experiment with other options in the Mesh Quality panel as shown at right



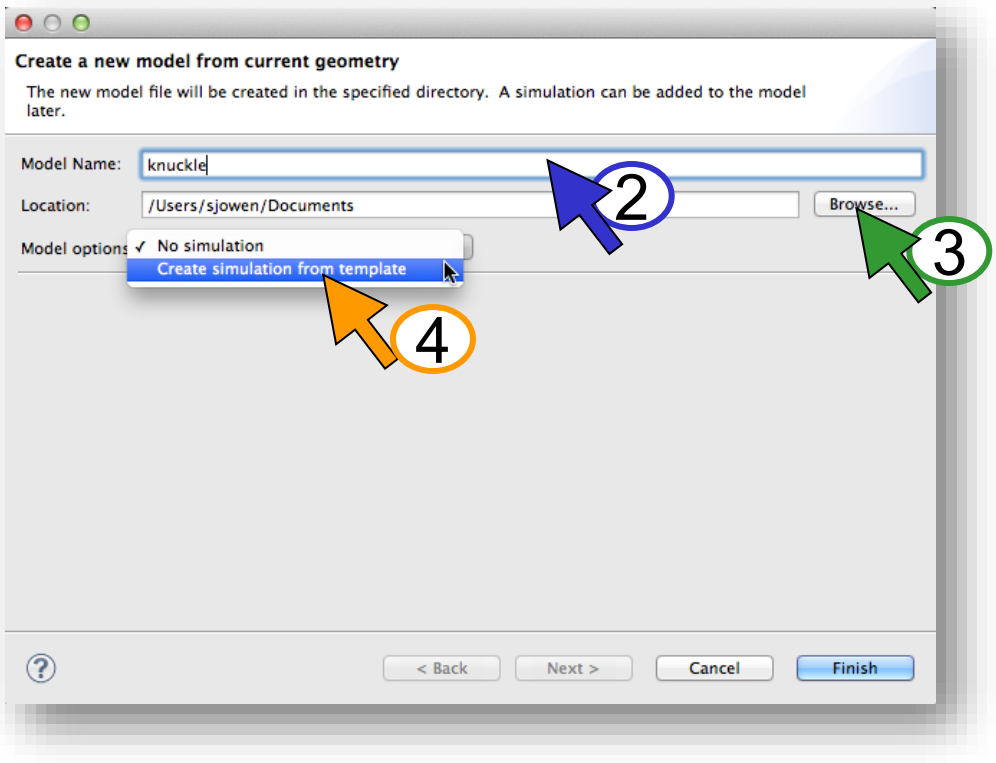


Exercise: Meshing the Knuckle



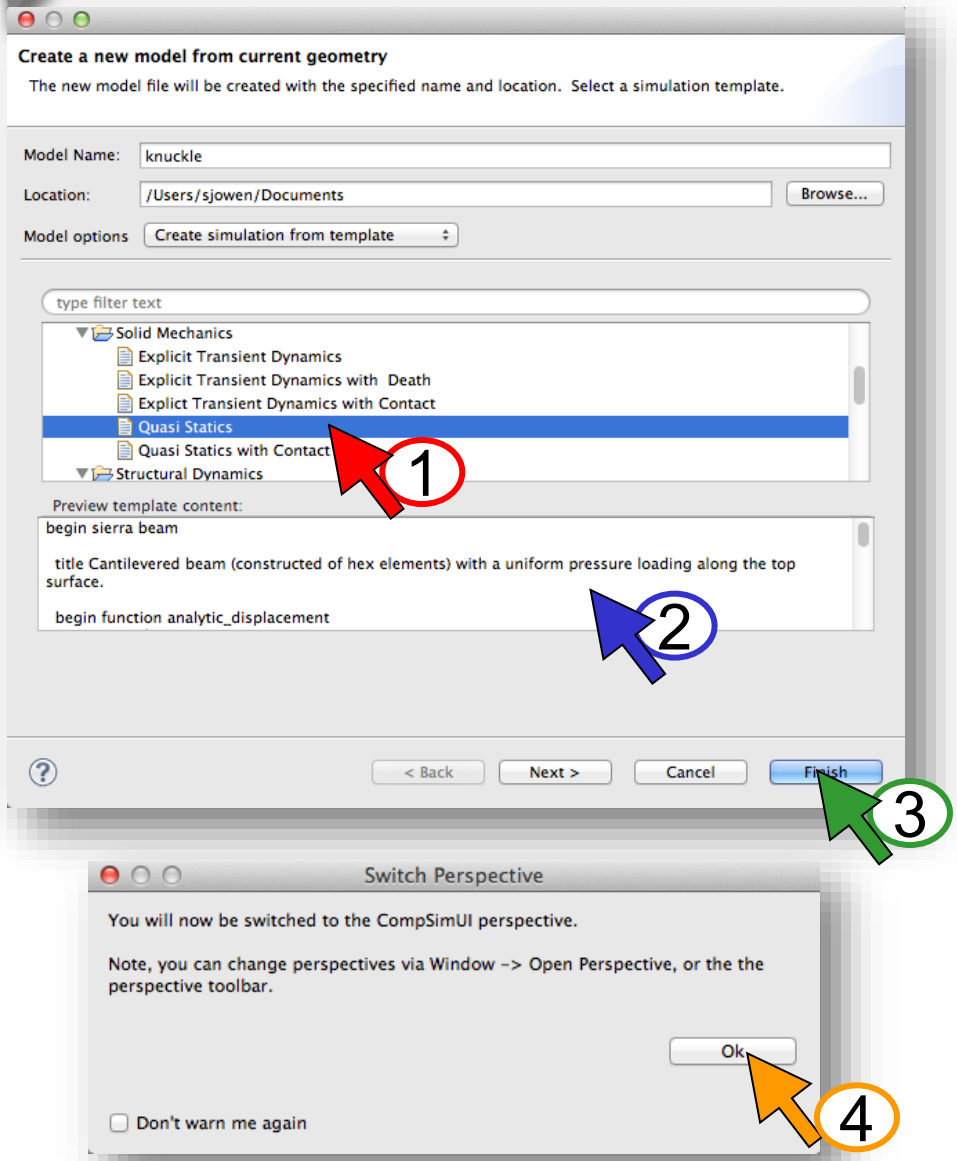
1. Select *Save All* from the *File* Menu
2. Enter a descriptive name for your model (ie. *knuckle*)
3. Browse and select a directory where you would like files for your model placed
4. Select *Create simulation from template* from the dropdown

Create a new analysis model from the current geometry and mesh



Note: Selecting *No Simulation* from the dropdown will save only a **.cub** and **.jou** file at the specified location

Exercise: Meshing the Knuckle



Choose the type of simulation you will be performing

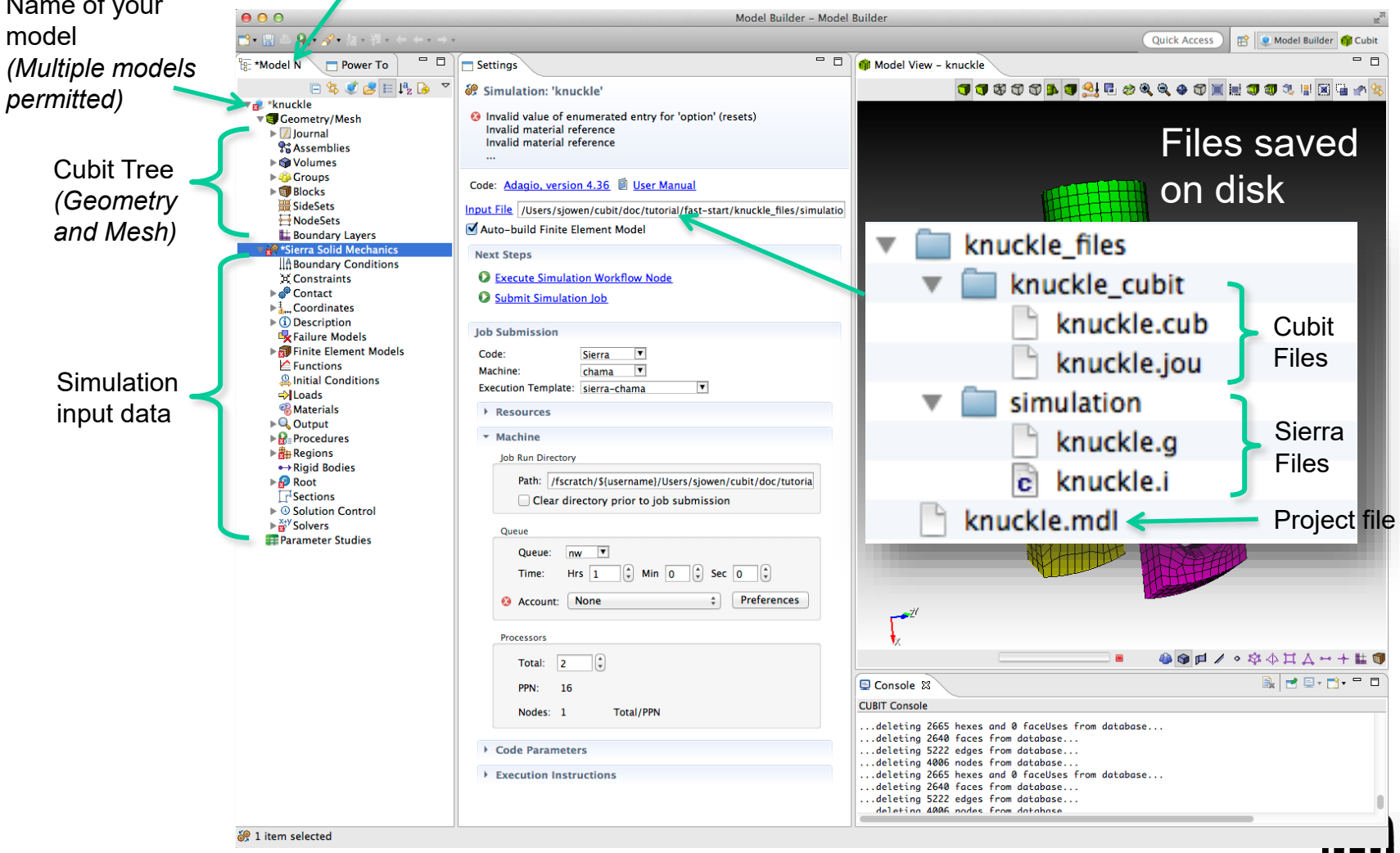
1. Scroll down to find an appropriate simulation template. For this example, choose *Quasi-Statics* under *Solid Mechanics*
2. A preview of the Sierra input deck for Quasi-Statics is displayed here. Scroll through this window to view
3. Click *Finish*
4. Click *OK* on the dialog that appears

The window arrangement should now be updated showing the original Model Builder perspective. This allows you to begin using tools to set up the simulation

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Model Builder Perspective

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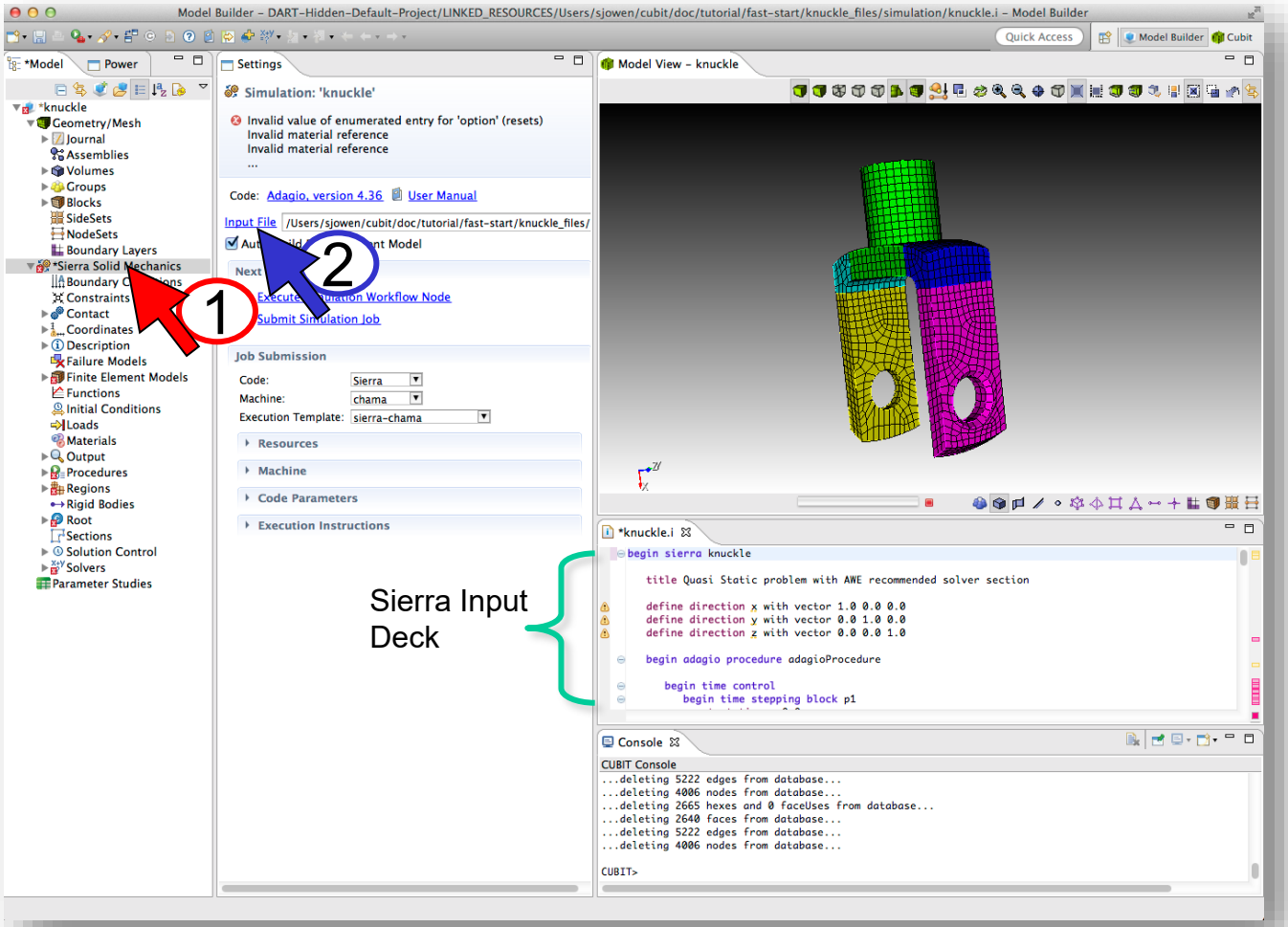
Sierra Input Deck Editor

Simulation Modeling Sciences

Sierra Input Deck Editor

1. Click on Sierra *Solid Mechanics* in the Model Navigator
2. Click the *Input File* Link in the Settings Window

Provides syntax coloring, interacts with graphics and GUI panels, syntax checking



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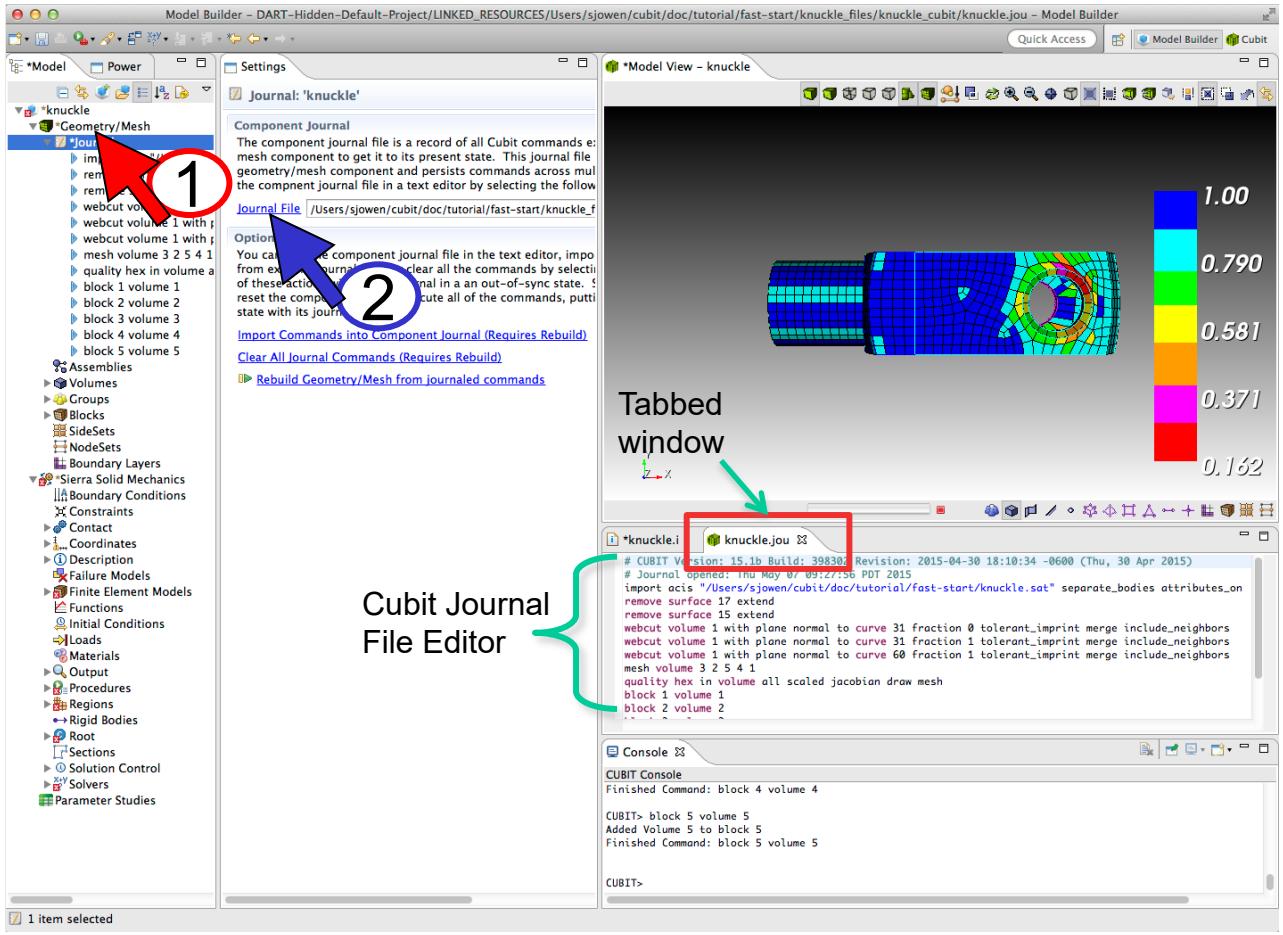
Cubit Journal File Editor

Simulation Modeling Sciences

Cubit Journal File Editor

1. Click on *Geometry/Mesh* in the Model Navigator
2. Click the *Journal File* Link in the Settings Window

Provides syntax coloring, edit or replay parts of journal file.
Contains all Cubit commands to date



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Cubit Journal File Editor

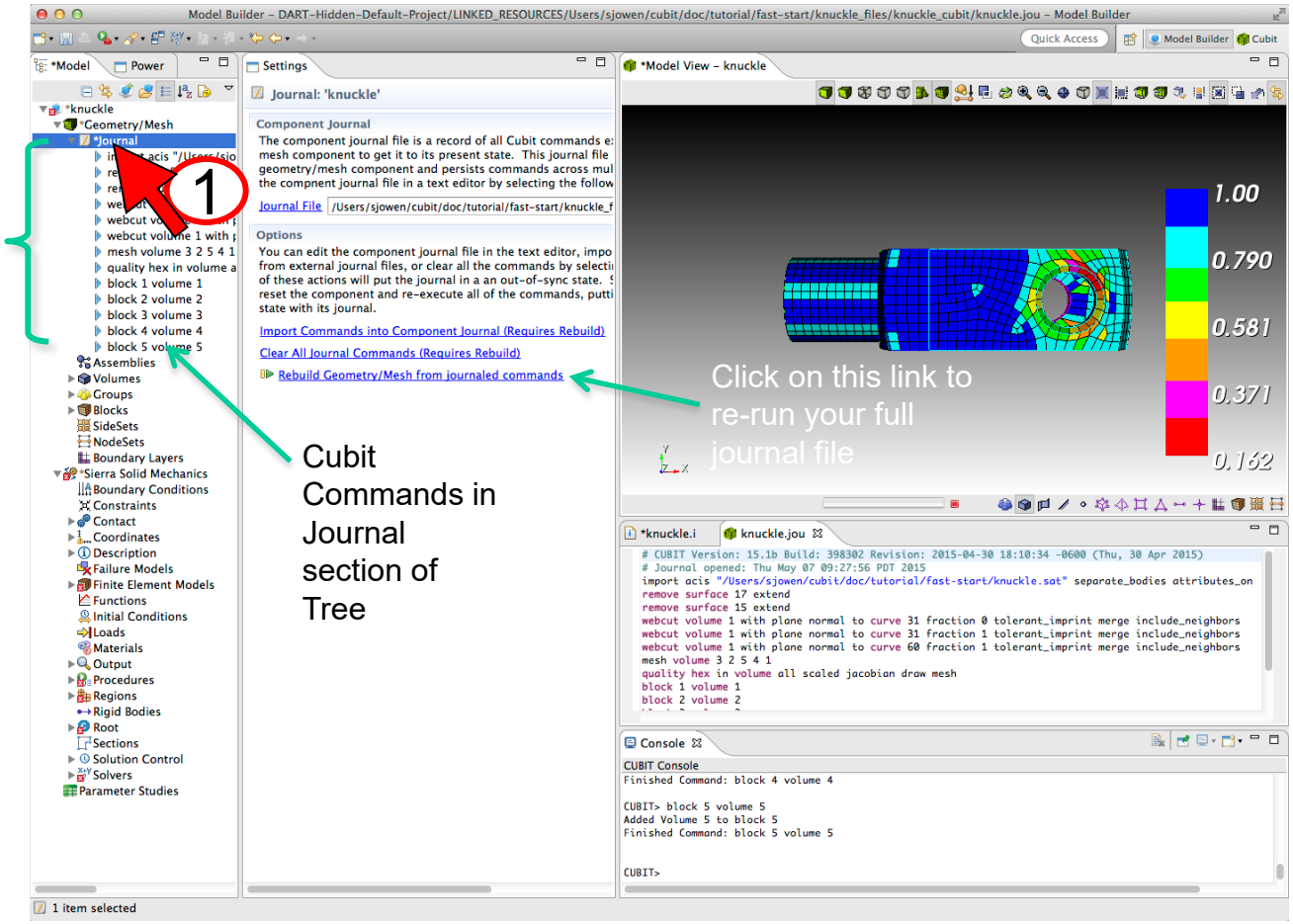
Simulation Modeling Sciences

Cubit Journal File Editor

1. Under *Geometry/Mesh* in the Model Navigator, expand the *Journal* item

Note that the Cubit Commands in the *Journal* section of Tree are identical to those in the Journal file editor.

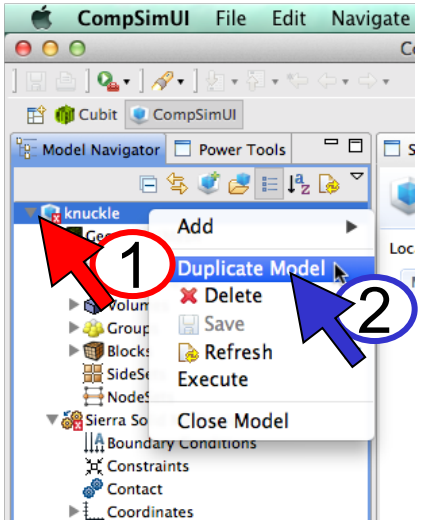
Changes in one will be updated in the other



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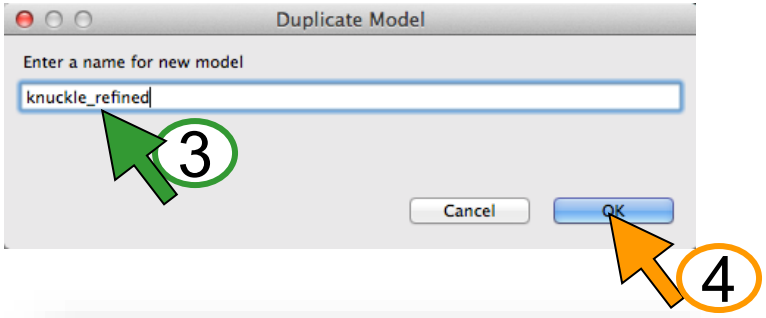
Defining Multiple Projects

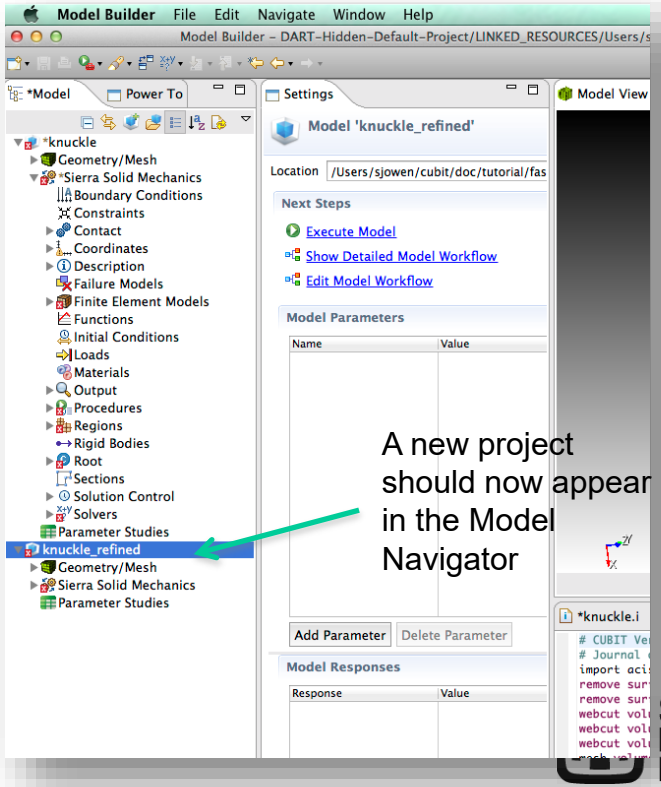
Simulation Modeling Sciences



SAW can manage multiple models in the same session

Duplicate the current model and define a different mesh





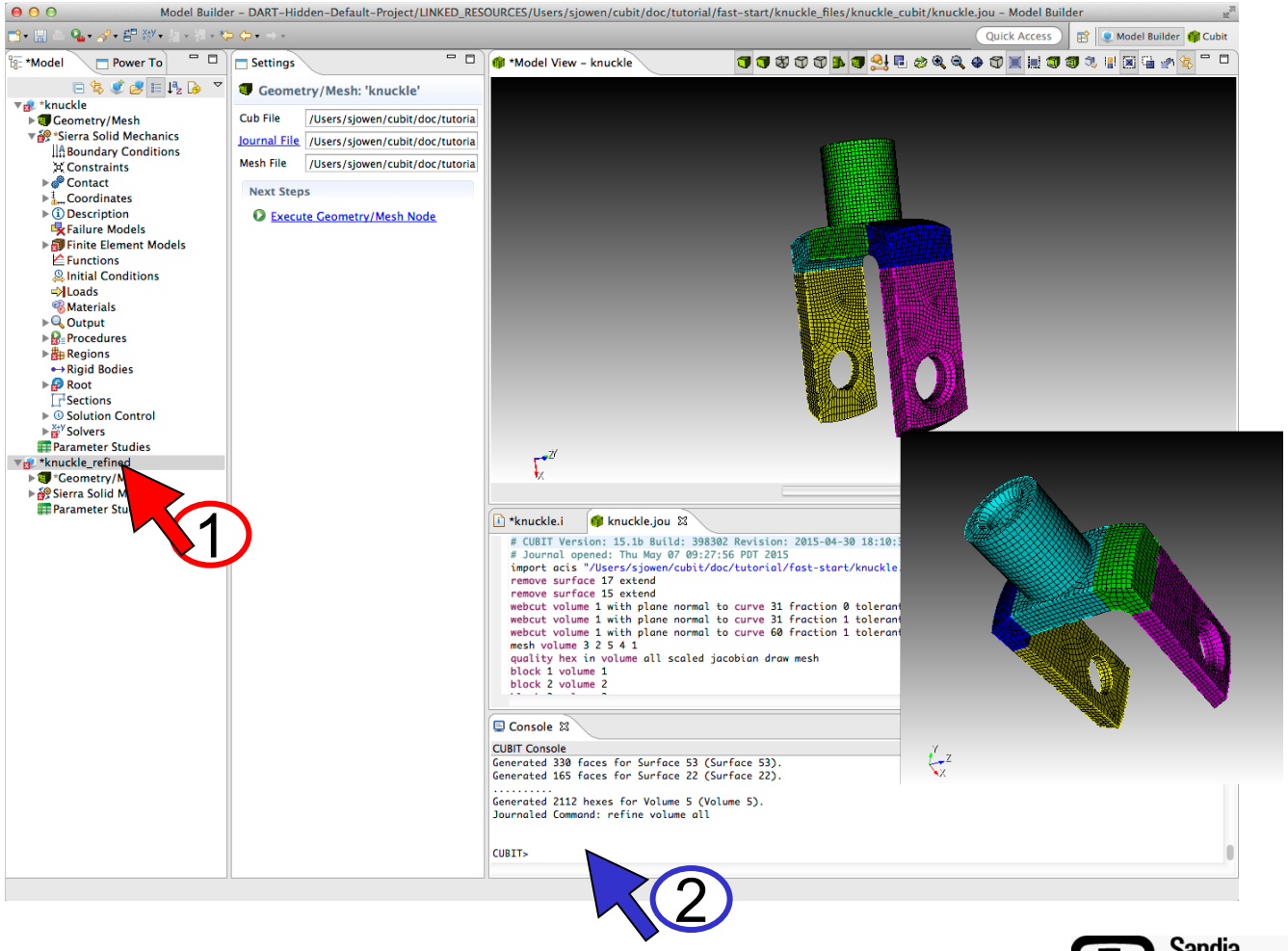
1. Right click on the knuckle project in the Model Navigator
2. Choose *Duplicate Model* from the menu
3. In the dialog enter the name for the new project. For example "*knuckle_refined*"
4. Click OK

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Defining Multiple Projects

Simulation Modeling Sciences

1. Make the new *knuckle_refined* model active by clicking on it in the Model Navigator
2. Enter the command “refine volume all” in the Console window



Two different projects now exist with distinct geometry and mesh. You can switch between them by clicking on the project name.

You may be asked to save the current model before switching to the another model
Note that only one model can be displayed at once.

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