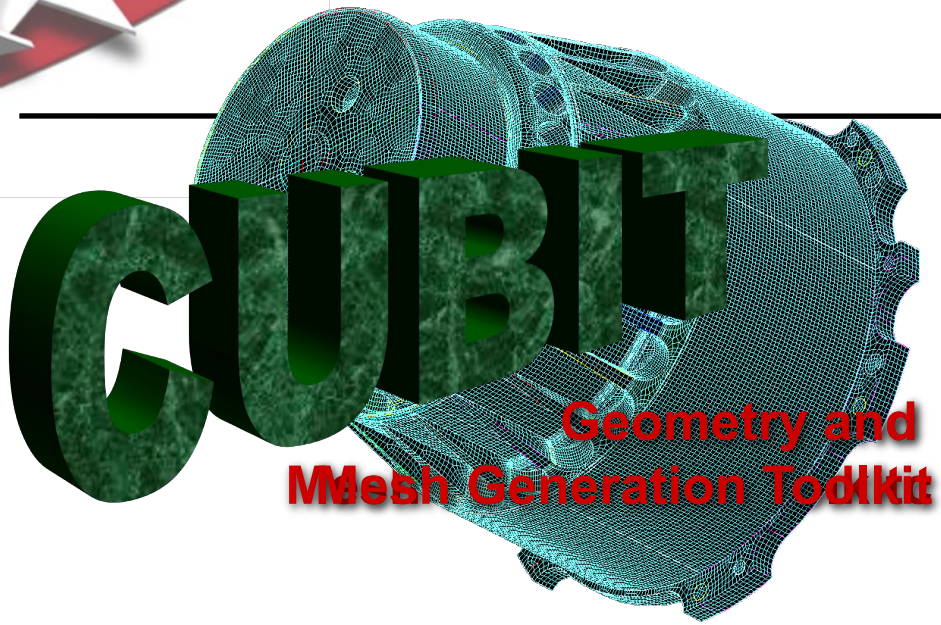

CUBIT Fast-Start Tutorial

7. CUBIT Power Tools

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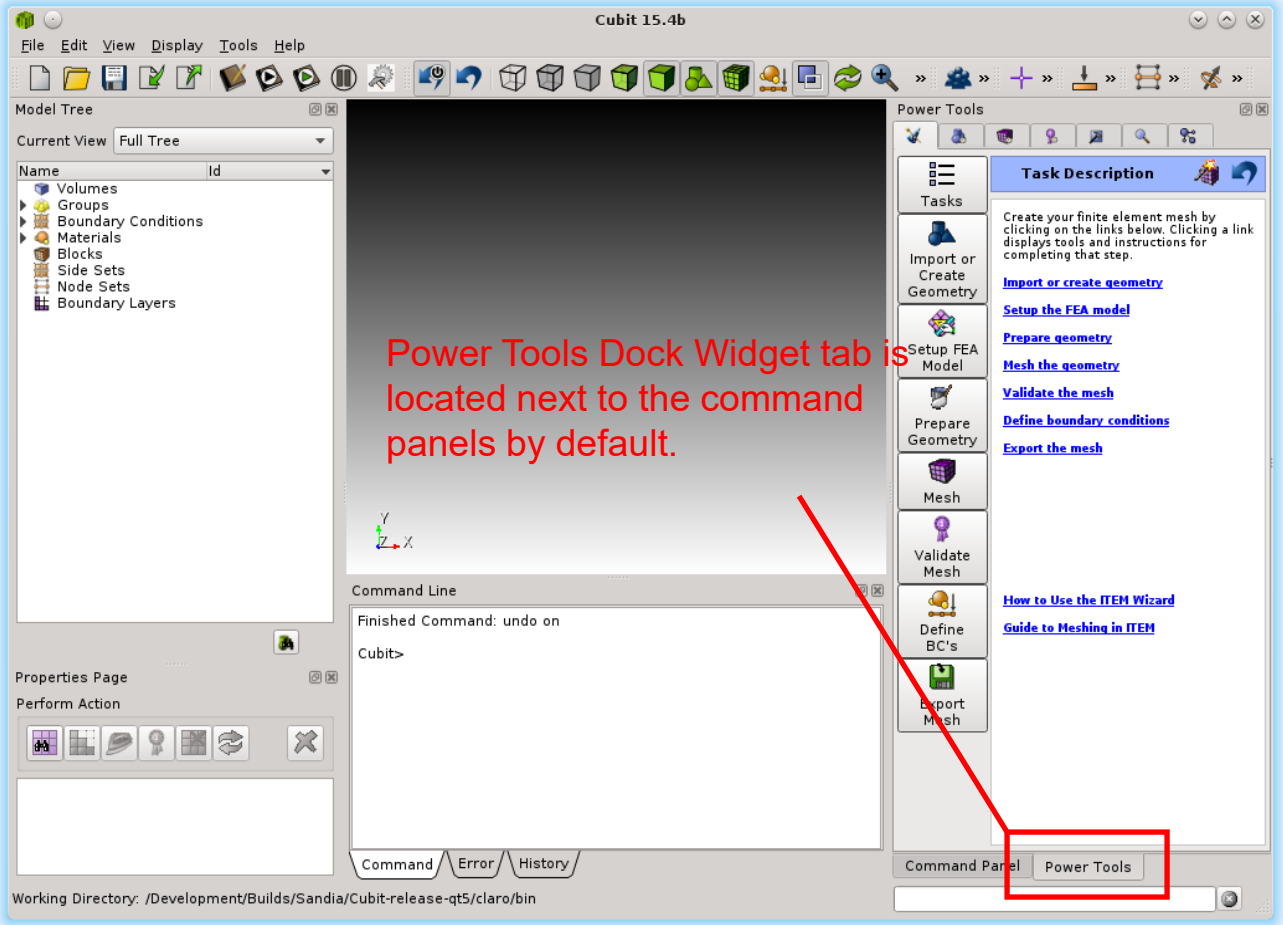
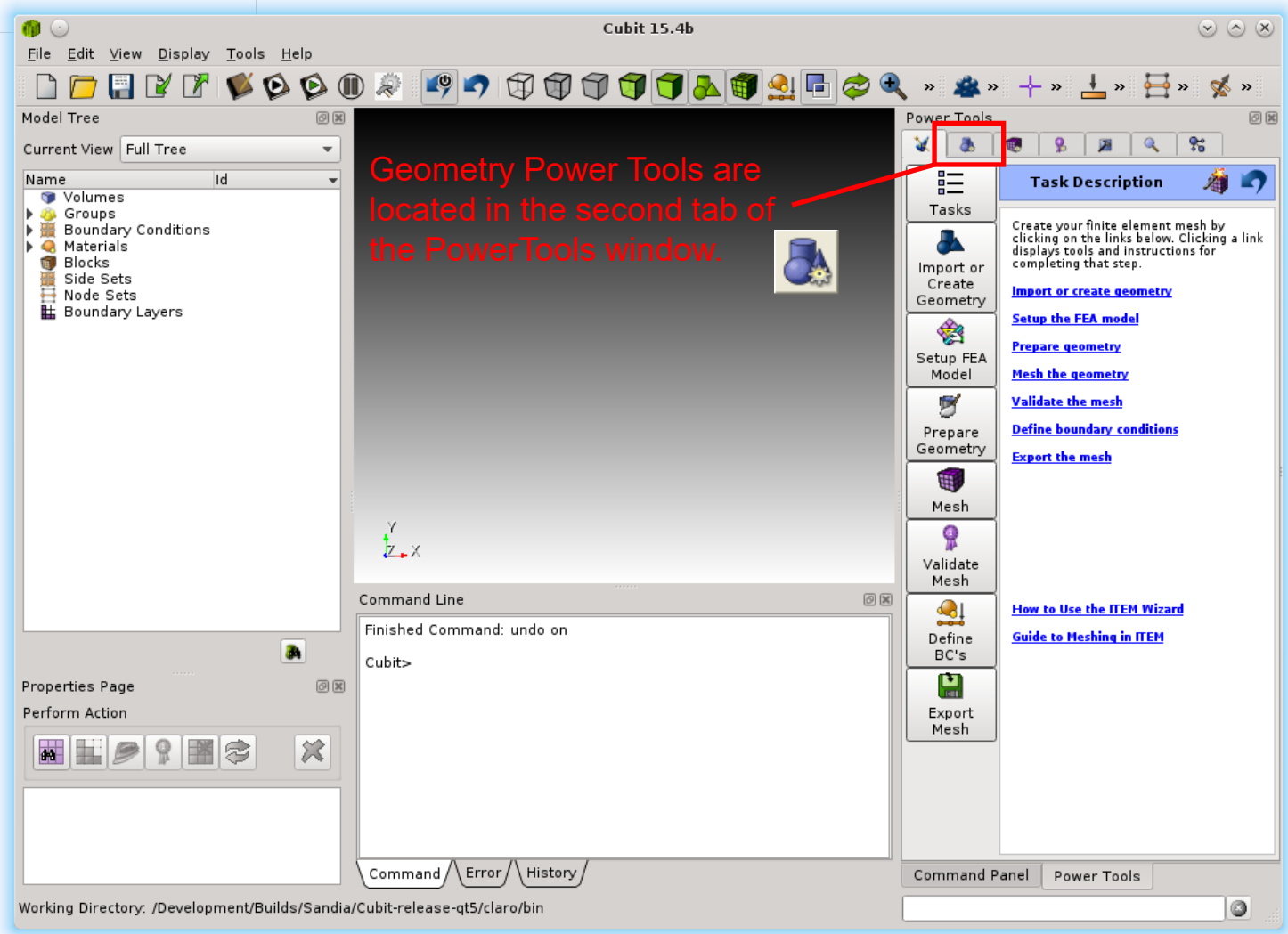
Power Tools


Cubit 15.4b
File Edit View Display Tools Help
Model Tree
Current View Full Tree
Name Id
Volumes
Groups
Boundary Conditions
Materials
Blocks
Side Sets
Node Sets
Boundary Layers
Properties Page
Perform Action
Power Tools Dock Widget tab is located next to the command panels by default.
Command Line
Finished Command: undo on
Cubit>
Command Error History
Working Directory: /Development/Builds/Sandia/Cubit-release-qt5/claro/bin
Power Tools
Tasks
Import or Create Geometry
Setup FEA Model
Prepare Geometry
Mesh
Validate Mesh
Define BC's
Export Mesh
Task Description
Create your finite element mesh by clicking on the links below. Clicking a link displays tools and instructions for completing that step.
Import or create geometry
Setup the FEA model
Prepare geometry
Mesh the geometry
Validate the mesh
Define boundary conditions
Export the mesh
How to Use the ITEM Wizard
Guide to Meshing in ITEM
Command Panel
Power Tools

Geometry Power Tools

Simulation Modeling Sciences



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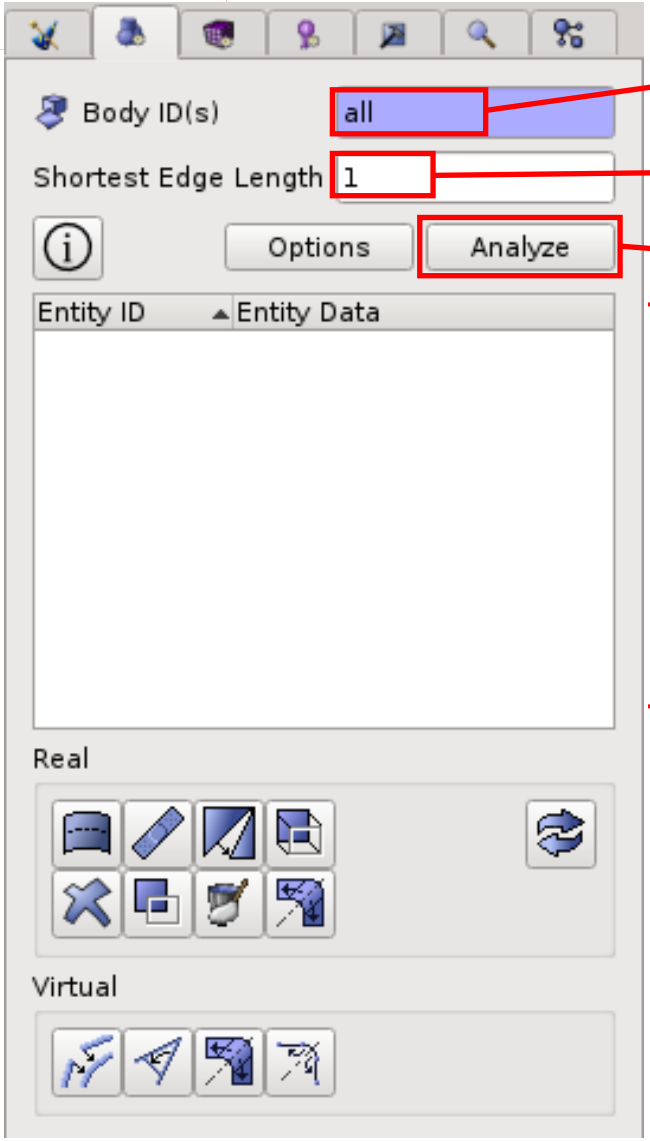
The Geometry Power Tools Panel



Entities to analyze

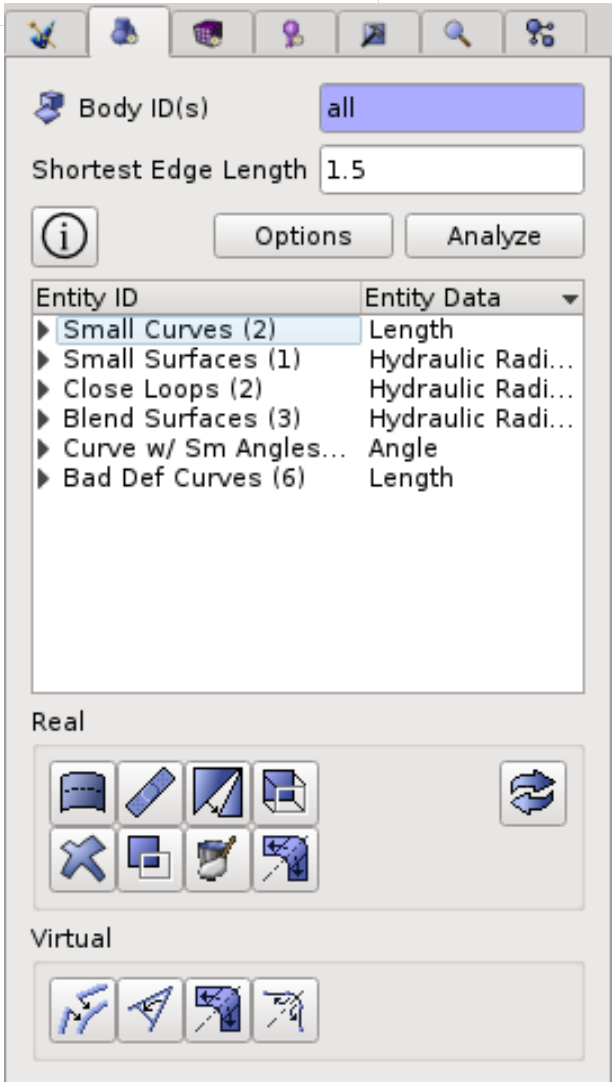
Characteristic mesh size

Run geometry analysis

Geometry analysis output

Geometry Operations

Example: Using the Geometry Power tools

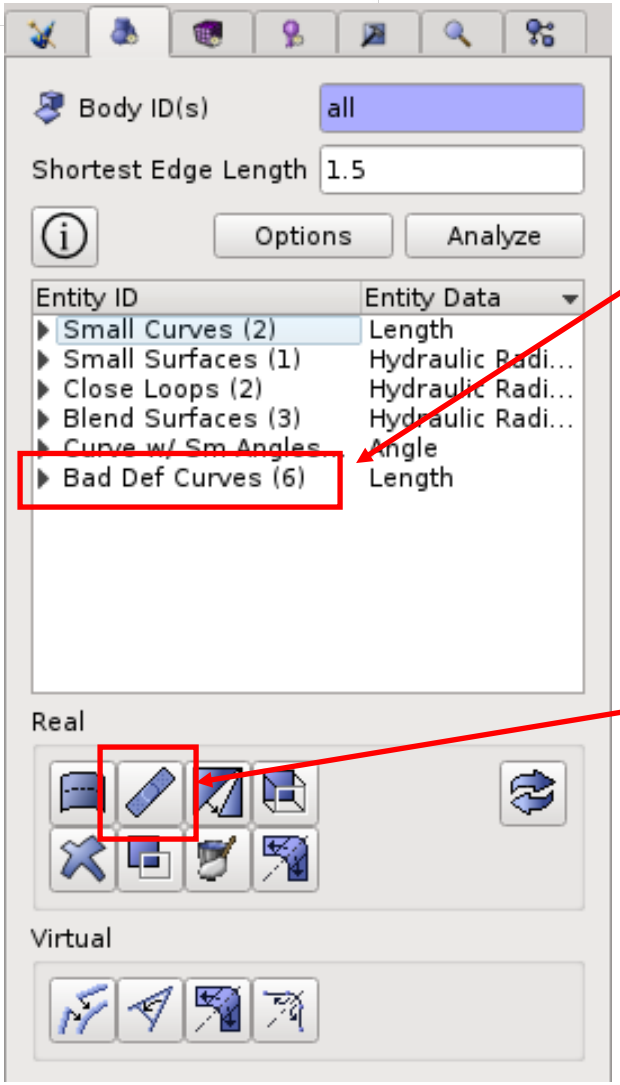


1. Import `knuckle.sat`
2. Select “all” or “1” for volumes to analyze

- Enter 1.5 as the shortest edge length
- Hit “Analyze”

You should see results in your output window that look similar to those shown.

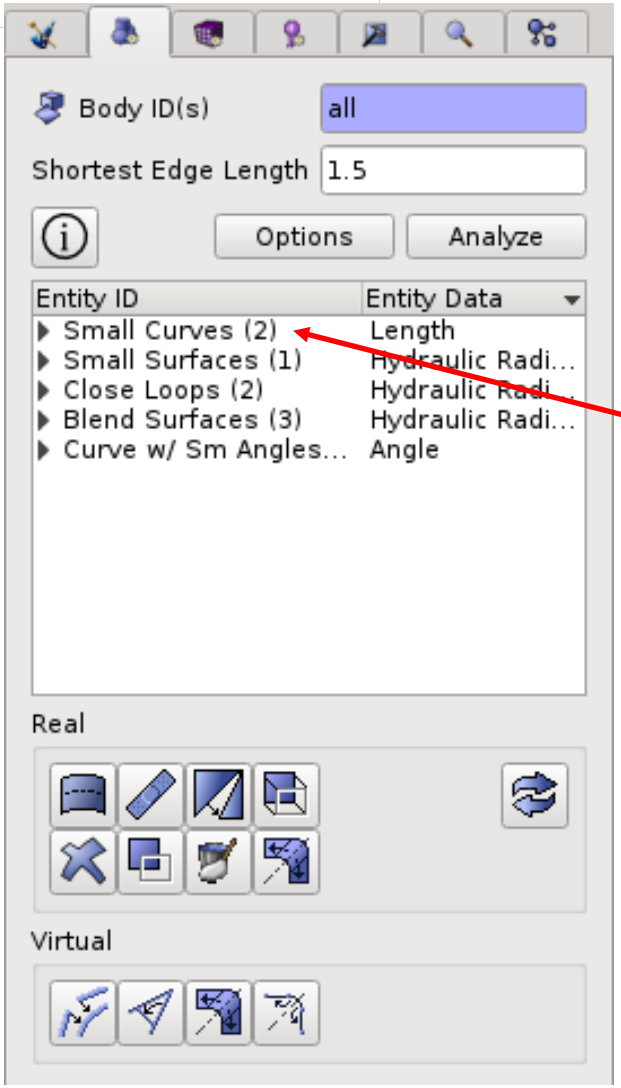
Example: Using the Geometry Power tools



"Bad Def Curves" indicates there is a problem with the geometry definition. These are the most serious problems and should be fixed first.

Fix the geometry problem by running the healer. Hitting this button will bring up the healer dialog in the main command panel.

Example: Using the Geometry Power tools

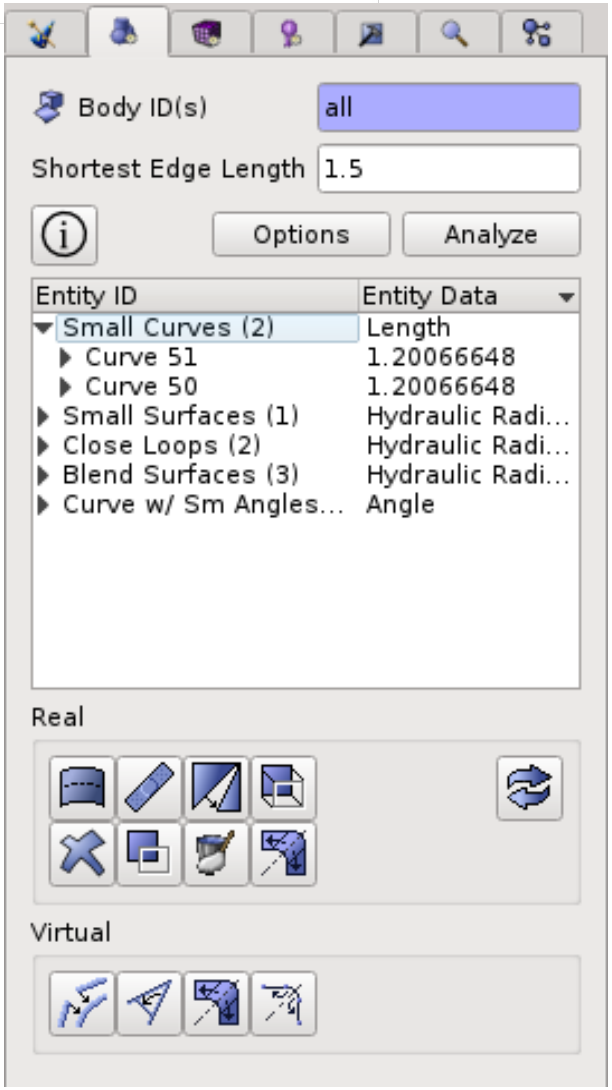


Hit the "Analyze" button again after running autoheal to remove outdated data from the output.

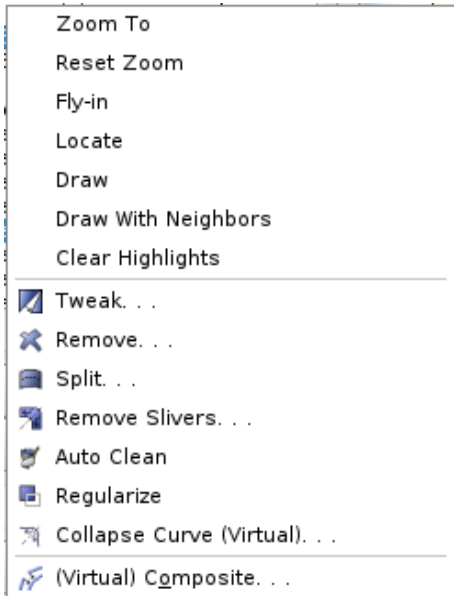
Expand the "Small Curves" field to see the curves that have been found.

Example: Using the Geometry Power Tools

Simulation Modeling Sciences



Examine the "Small Curves". Notice the length of the curves is less than the shortest edge length entered earlier. From the expanded list right click on a curve.



Use the context menu options to examine each curve. Nothing needs to be fixed with these curves.

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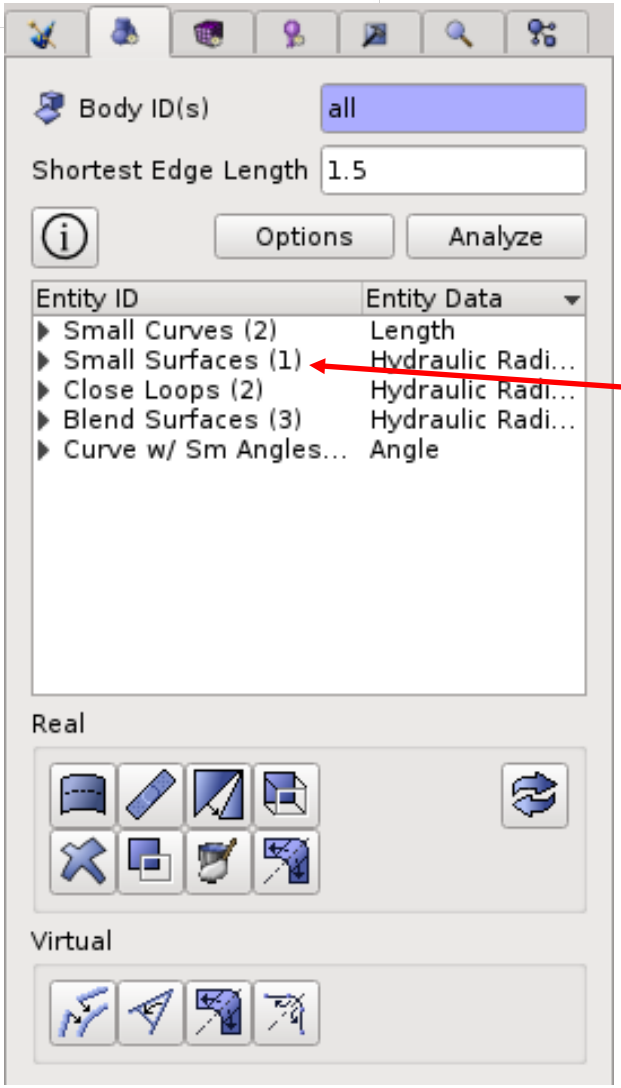
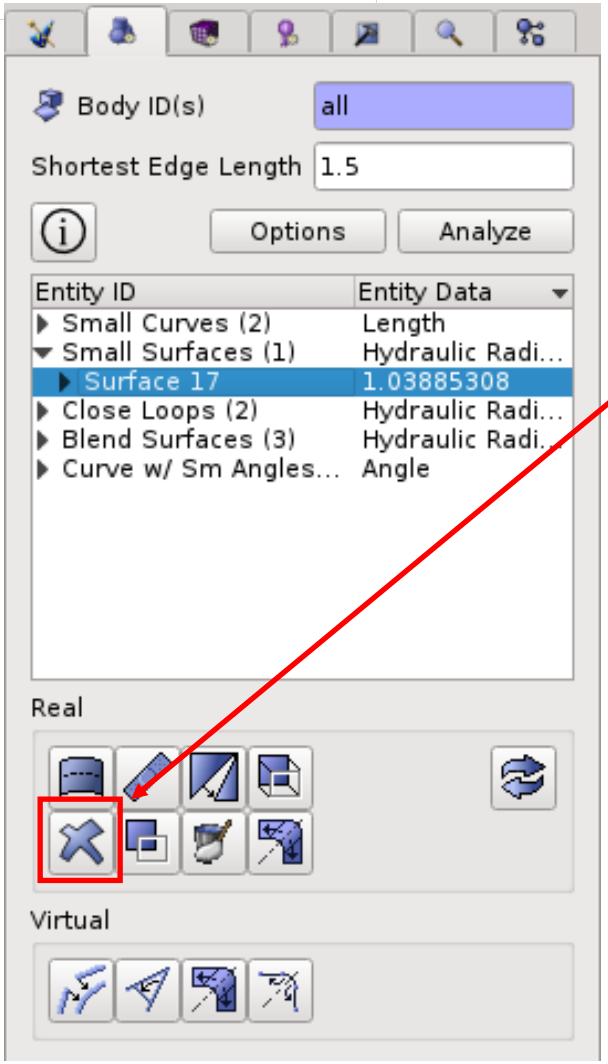
Example: Using the Geometry Power Tools



Expand the “Small Surfaces” field to see the surface that have been found.

Example: Using the Geometry Power Tools

Simulation Modeling Sciences



Examine the surface.

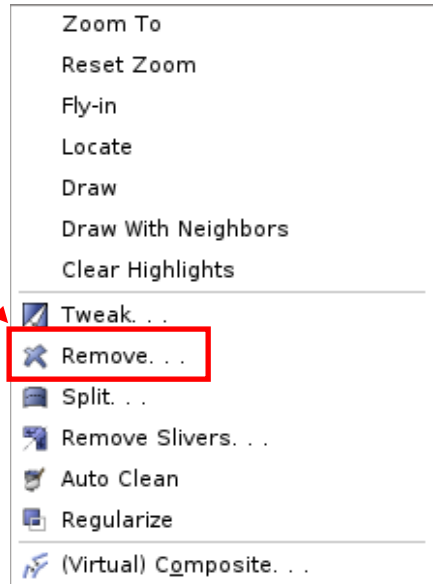
This is a surface we want to remove.

Use the "Remove Entity" button

- or -

the "Remove" option from the context menu.

These will bring up the remove surface dialog in the main command panel



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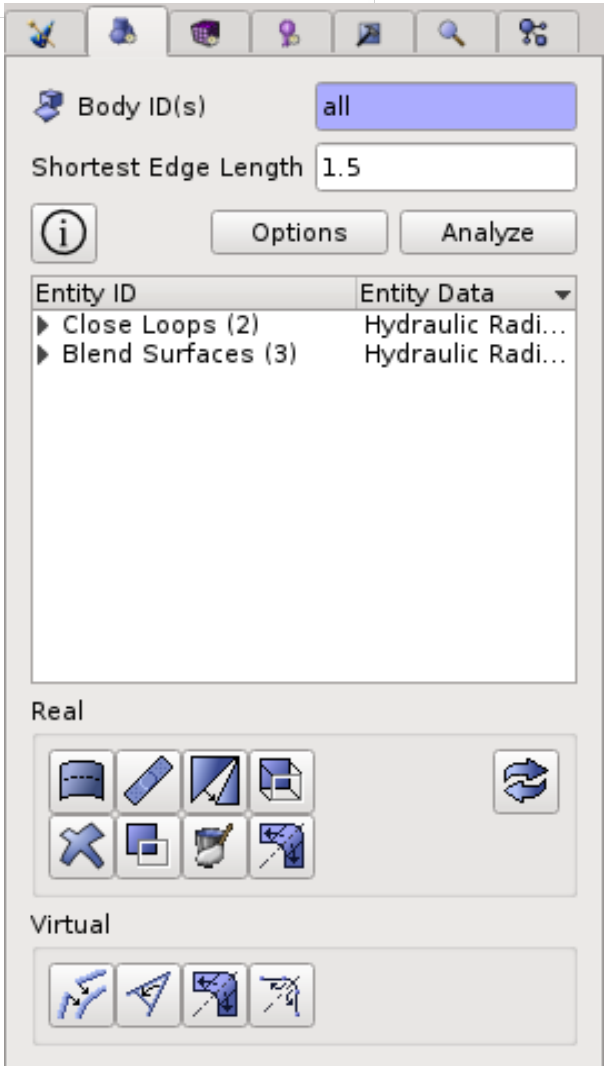
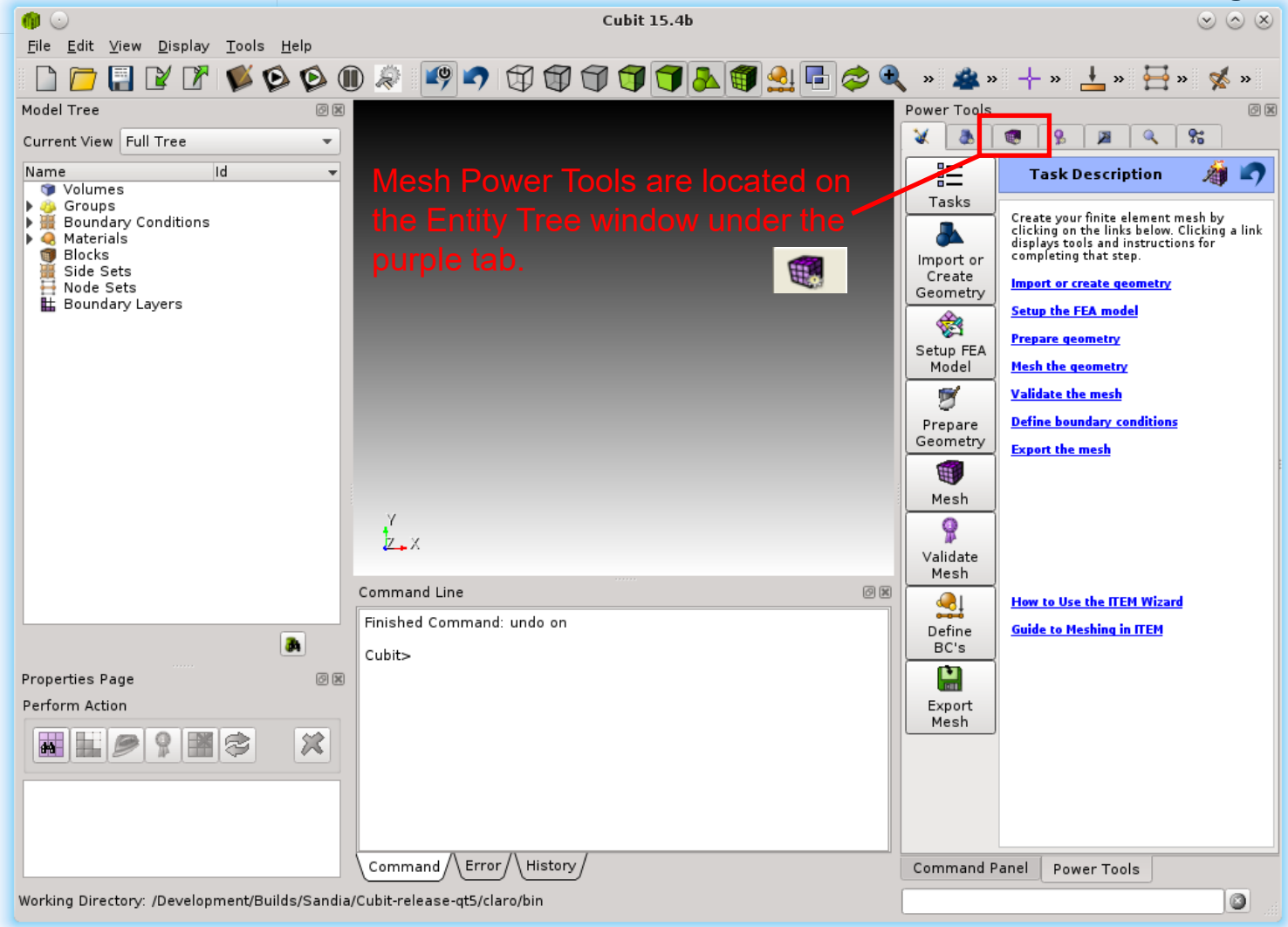
Example: Using the Geometry Power Tools



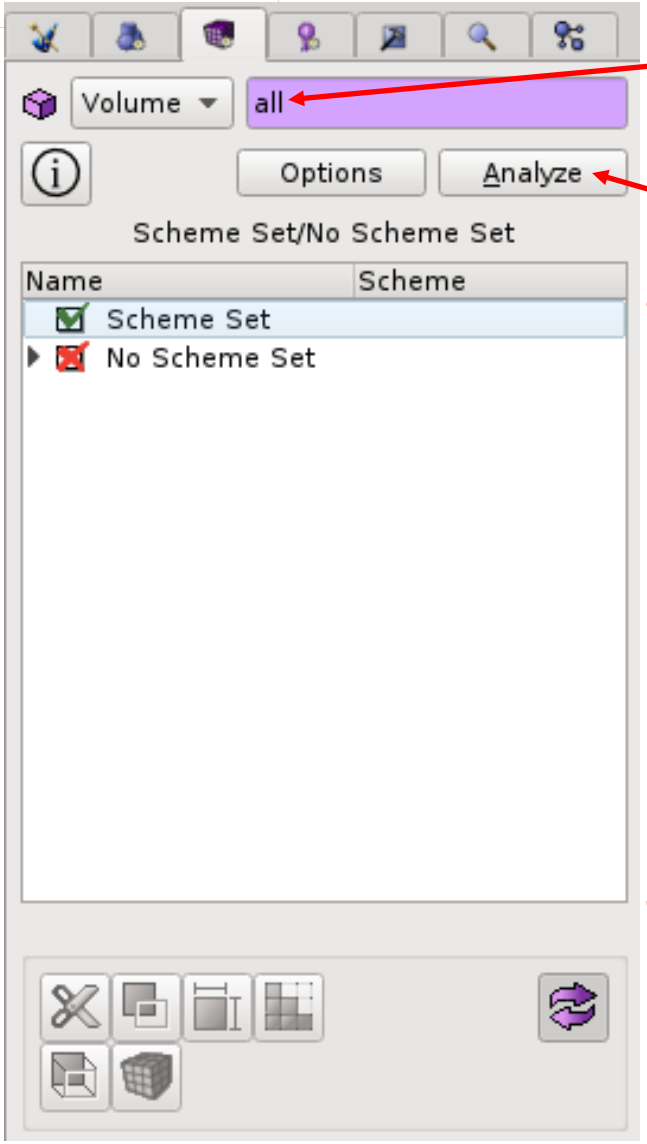
Hit the "Analyze" button again after removing the surface to remove outdated data from the output.

Check the rest of the output and remove anything else that should be remove.

Mesh Power Tool



The Mesh Power Tool Panel



Entities to analyze

Run scheme analysis

Scheme analysis output

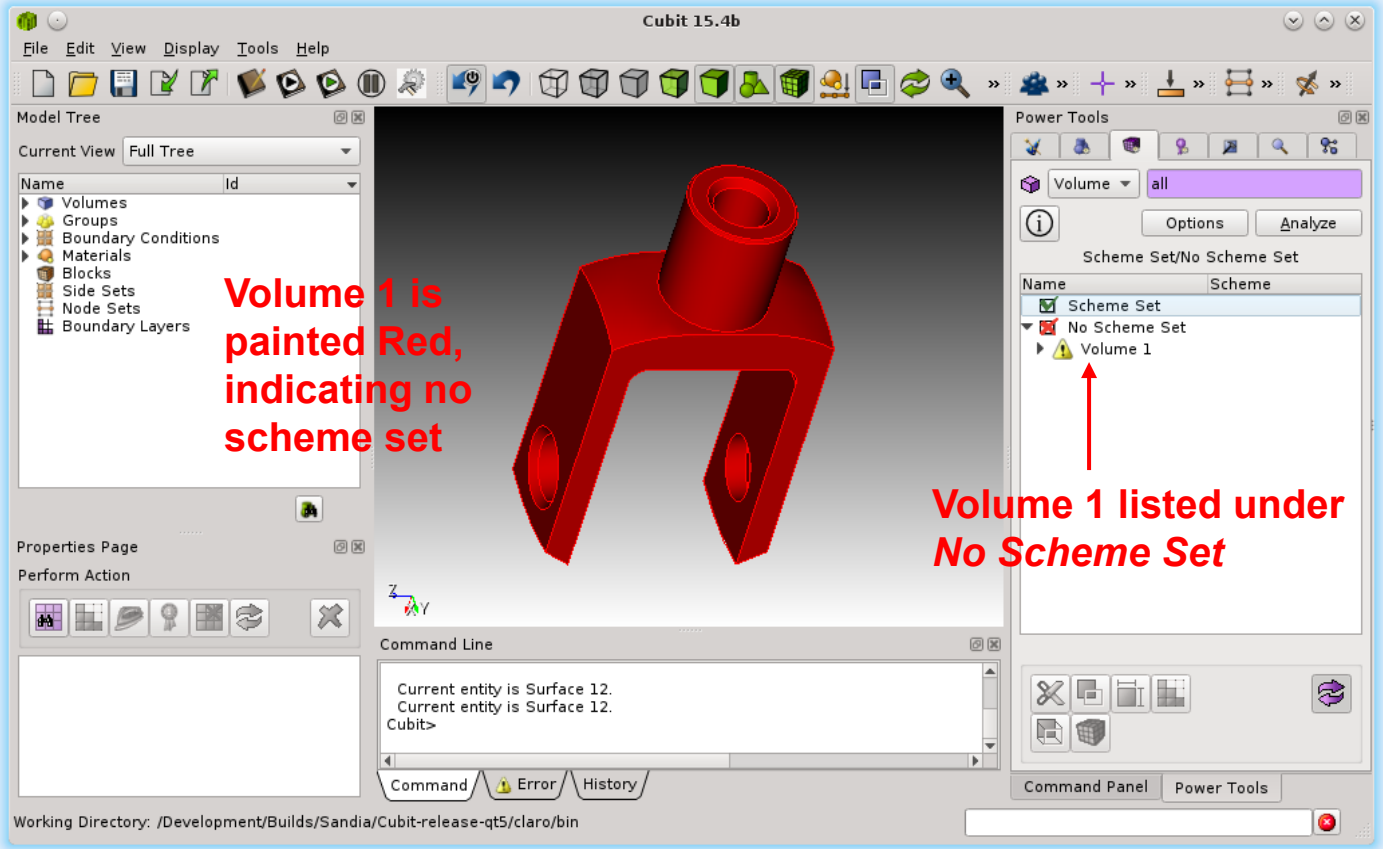
Tools for working on model

Example: Using the Mesh Power tools

Run the scheme analysis on `knuckle.sat` after cleaning up geometry but before doing any decomposition.

Results are displayed in two ways

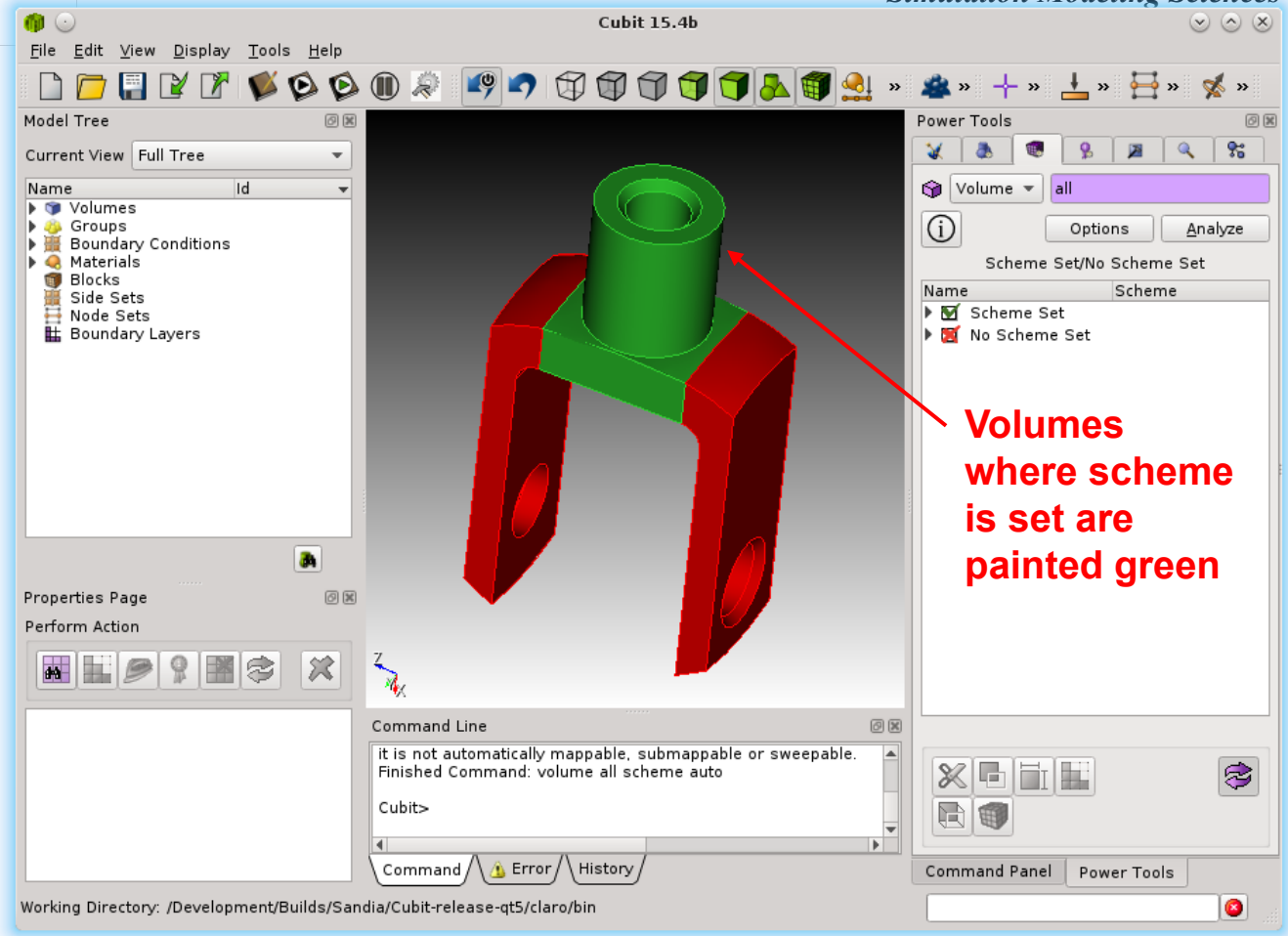
1. Listed in the power tool window
2. Displayed Graphically



Example: Using the Mesh Power tools

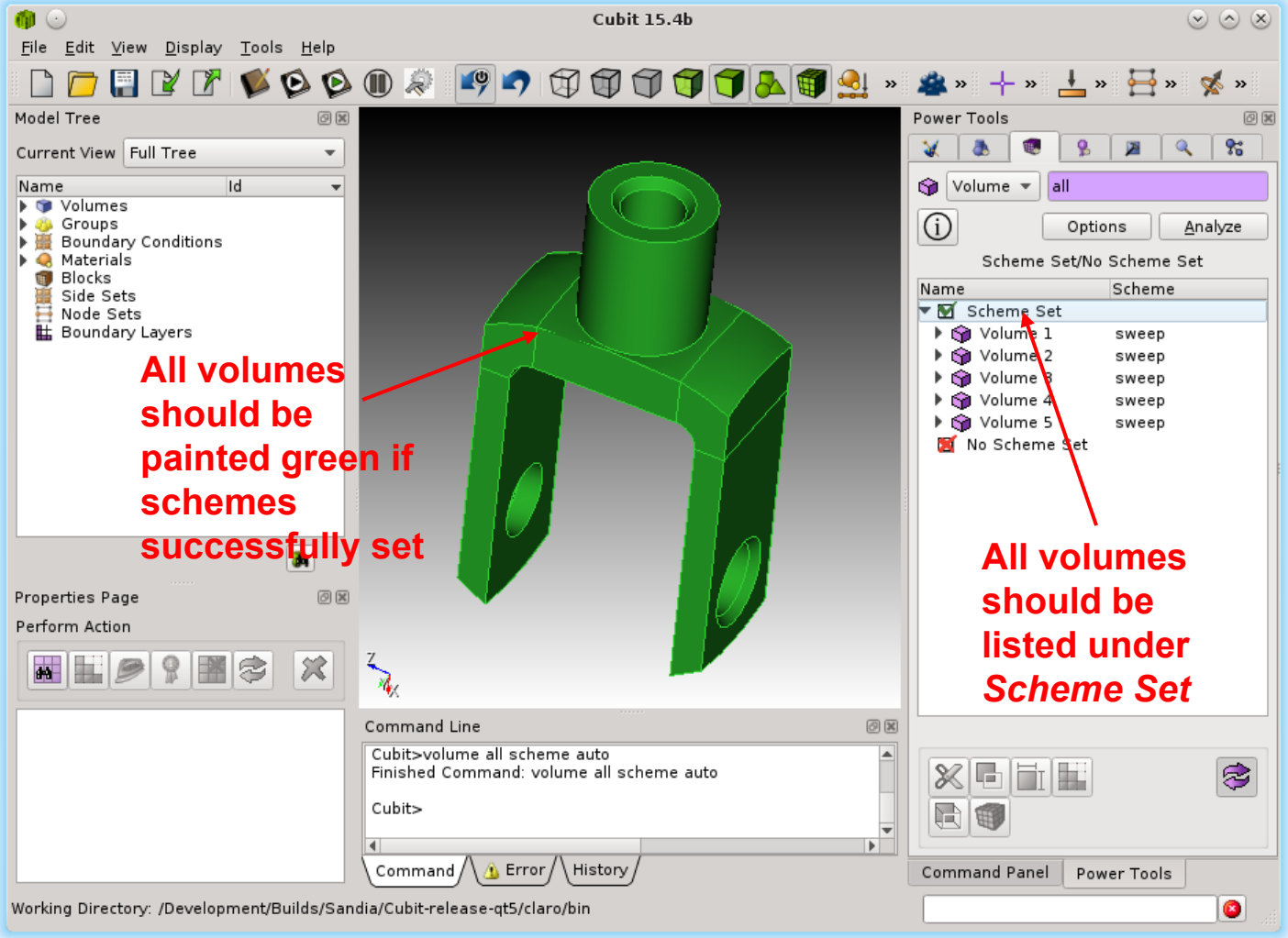
Begin the decomposition process you did in Exercise 13. After each webcut, run the analysis again to check meshability

Note when a volume moves to the *Scheme Set* category



Example: Using the Mesh Power tools

Simulation Modeling Sciences

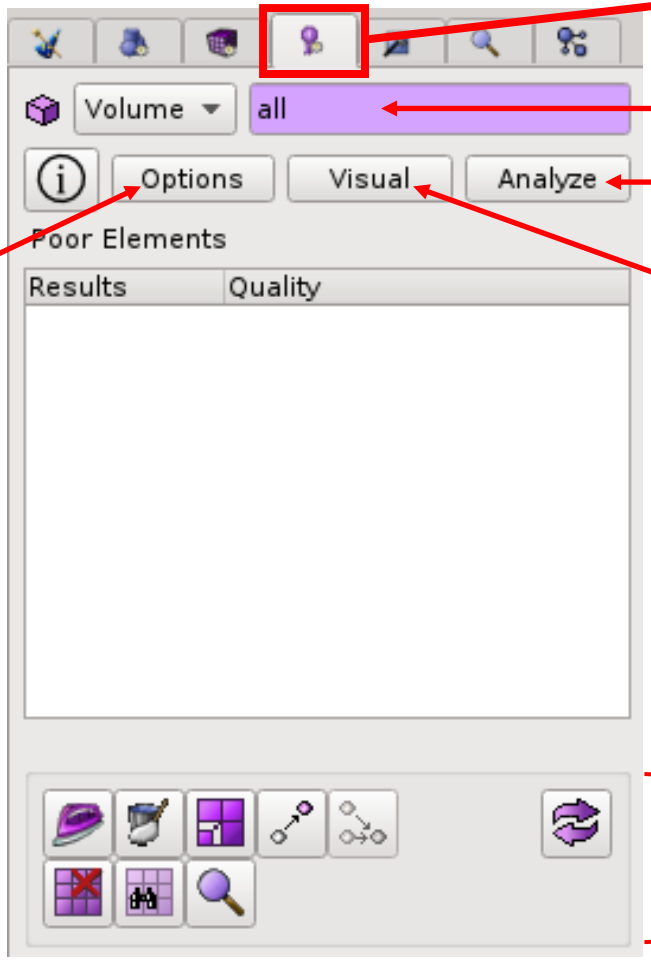


- Complete the decomposition
- Run imprint and merge
- Run the analysis again
- Mesh the parts

The Mesh Quality Power Tool

Simulation Modeling Sciences

Hit the quality Tab to display the Mesh Quality Power Tool



Entities to analyze

Run mesh quality analysis

Select Metrics to use during analysis

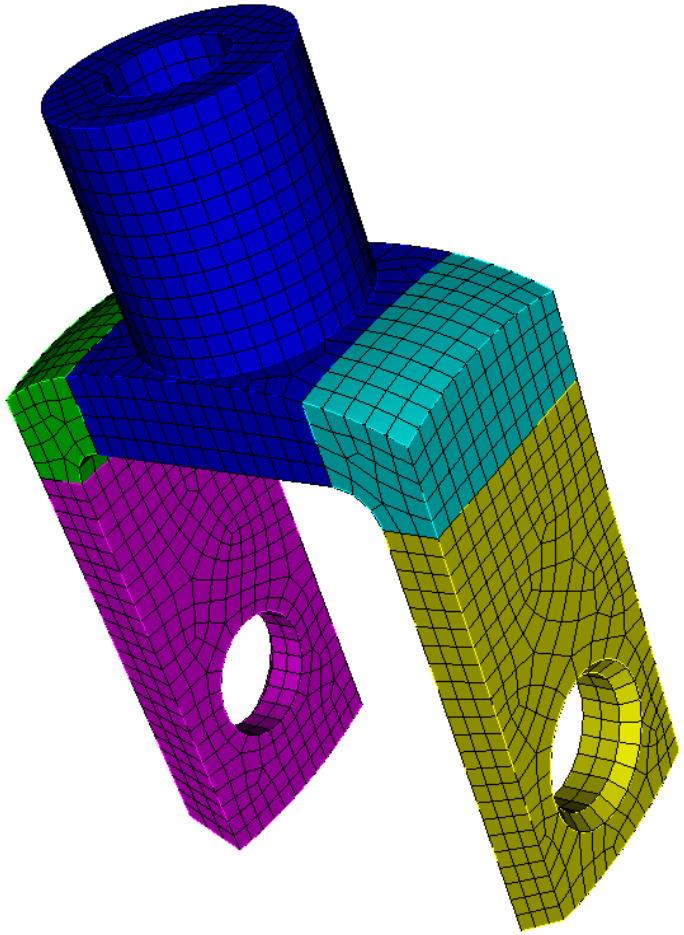
Display additional mesh quality visualization options

Mesh Quality analysis output

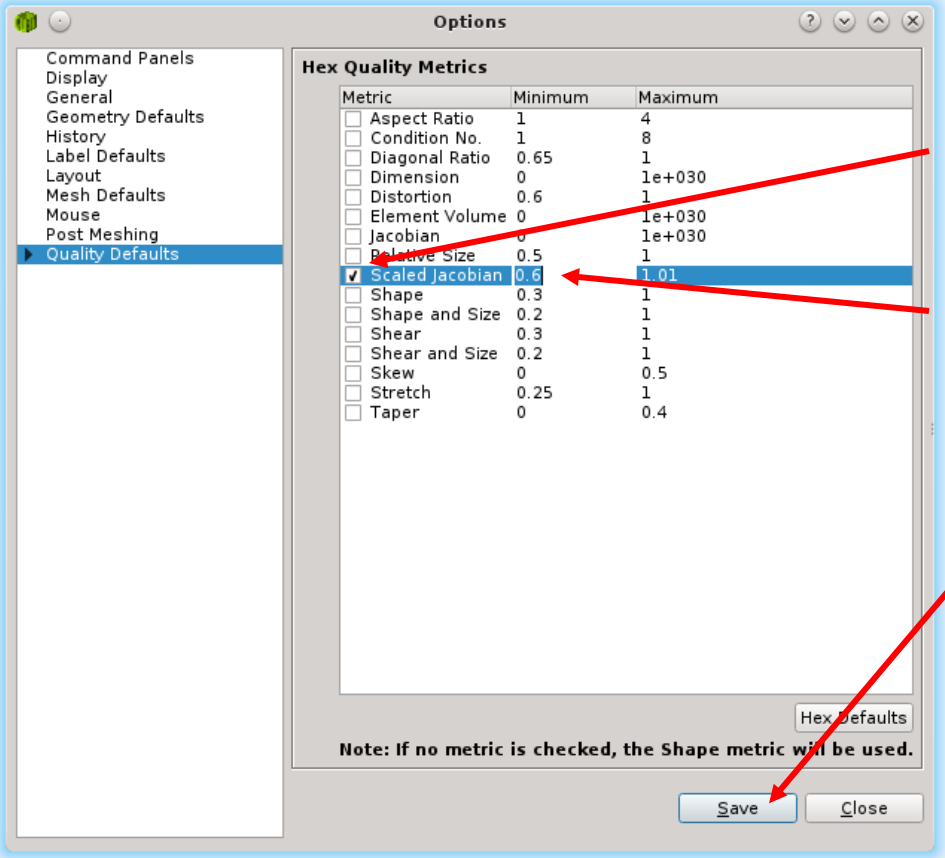
Tools for improving element quality

Example: Mesh Quality Power Tool

- Reset CUBIT
- Import the cub file: `knuckle.cub`
- Or use the meshed knuckle model from the previous exercise



Example: Mesh Quality Power Tool



- Select the Options Box

The Options Dialog should appear

- Check the Scaled Jacobian Metric
- Change the minimum value to 0.6 (Hit Return)
- Click Save

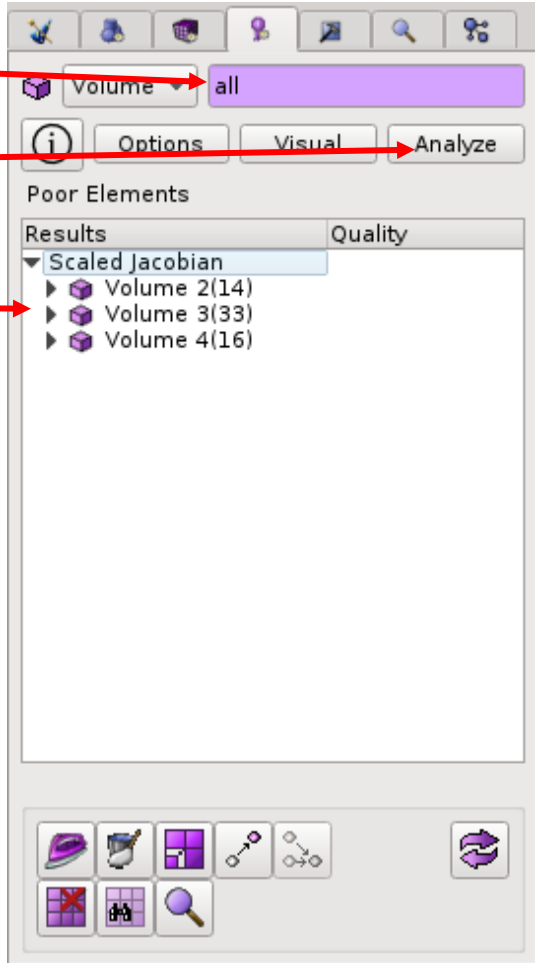
The Quality Power Tool will show results for all checked metrics

The Quality Power Tool displays results for all elements falling below the minimum

Example: Mesh Quality Power Tool

- Enter “all” in the edit field
- Hit the Analyze Button
- Drop down the list under Scaled Jacobian

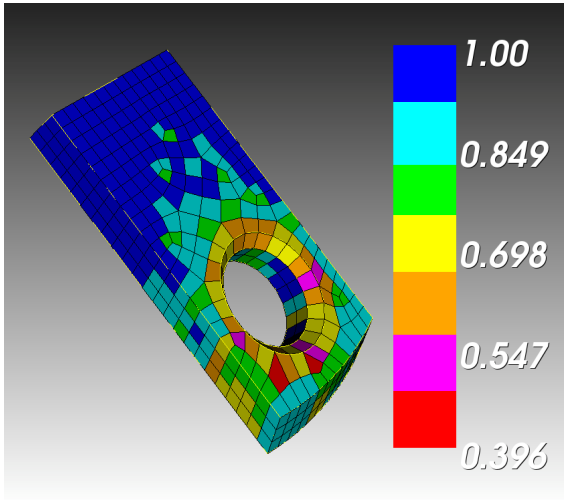
List shows all Volumes where at least one element has Scaled Jacobian < 0.6

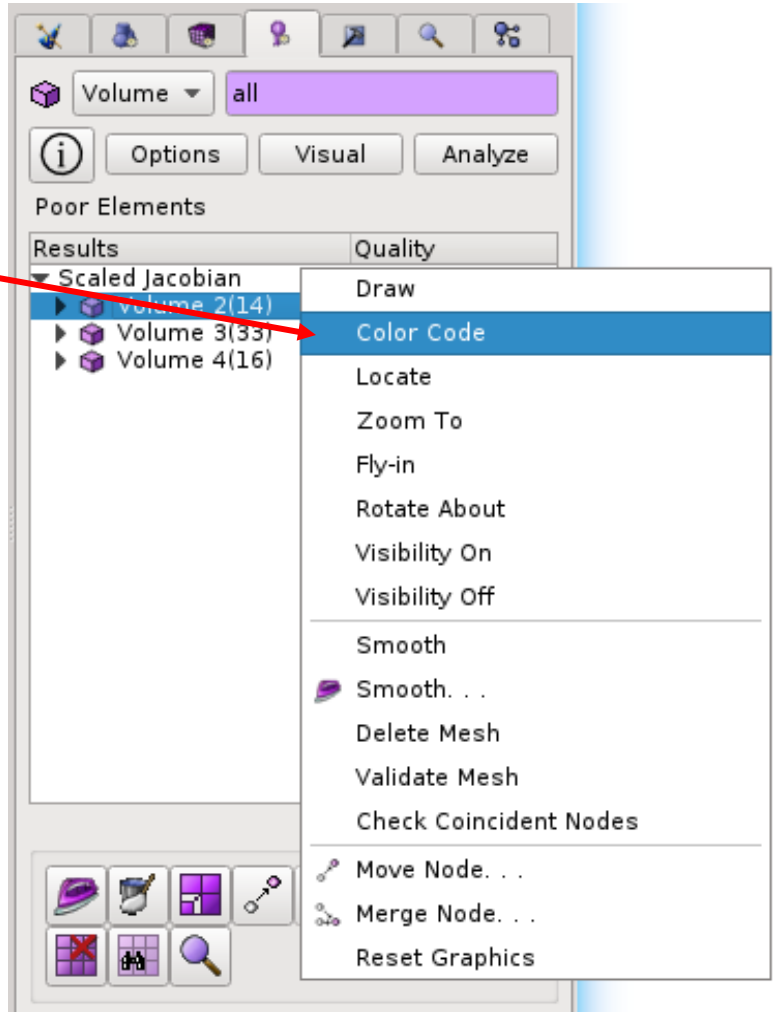


Example: Mesh Quality Power Tool

- Right Click on the first volume in the list and select Color Code

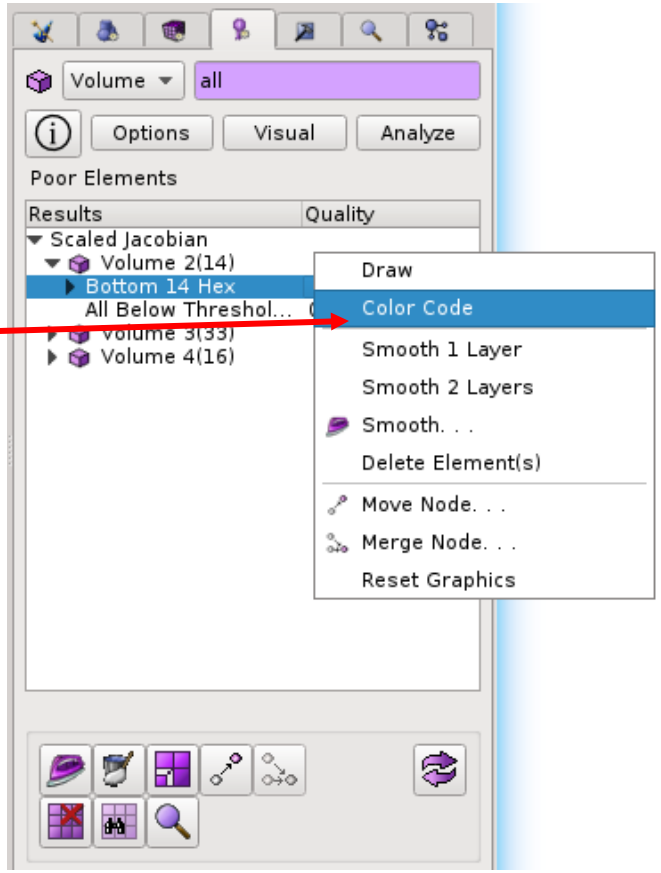
Color Code displays the elements in the selected volume, colored according to their Scaled Jacobian Value

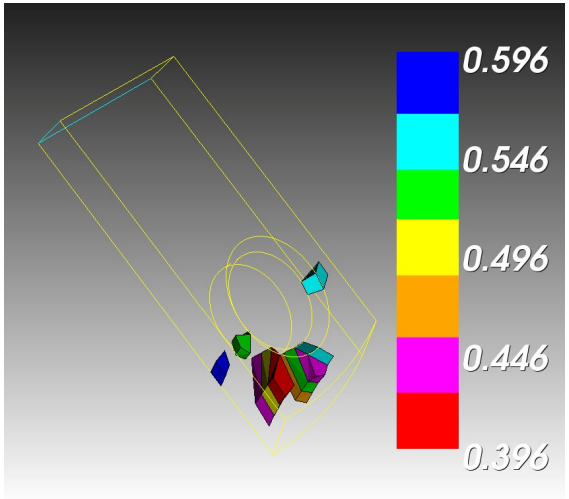




Example: Mesh Quality Power Tool

- Drop down the list under Volume 2
- Right click on the first line in the list and select Color Code





Color Code in this case displays only the elements in volume 2 falling below the 0.6 minimum Scaled Jacobian Metric

Example: Mesh Quality Power Tool

Try to improve the mesh quality by removing the chamfers on volumes 2 and 3.

First delete the mesh, remove the chamfers and then remesh. How does the element quality improve?

Check your result with the Mesh Quality Power Tool.