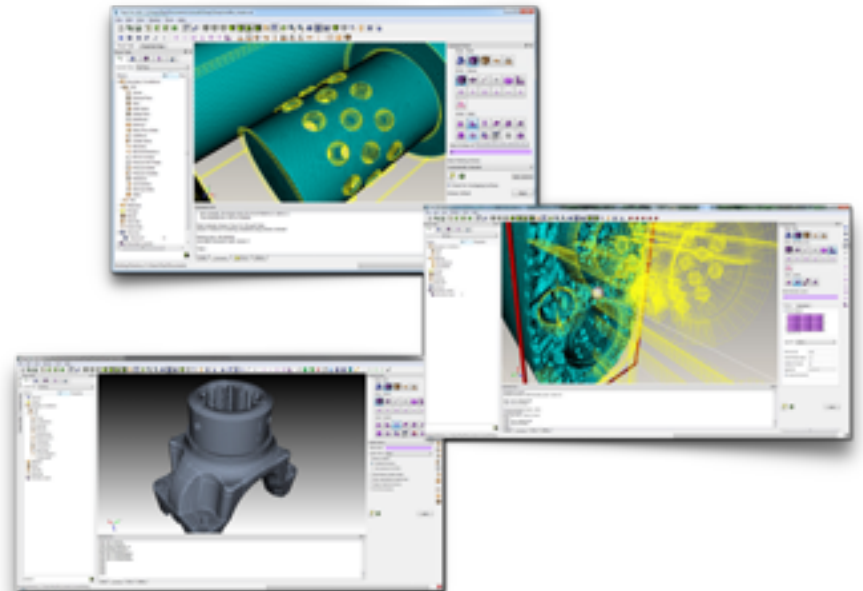
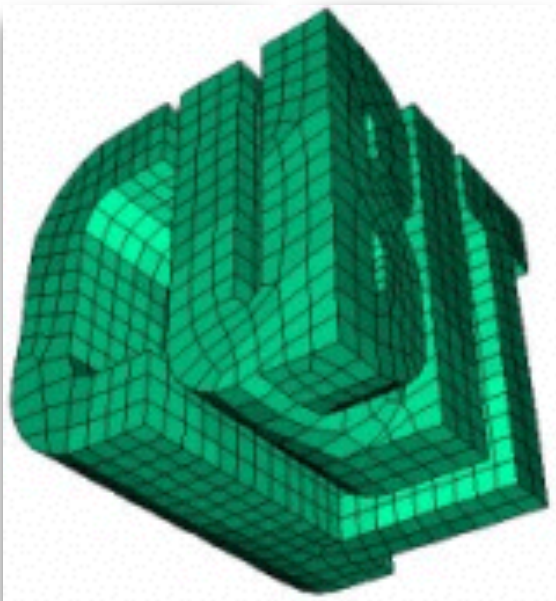
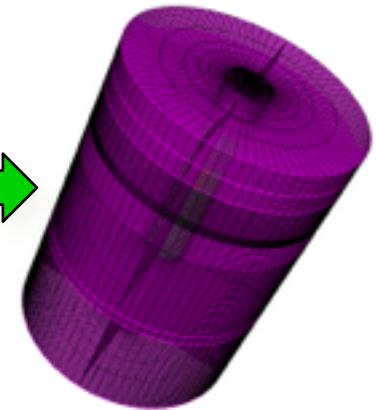
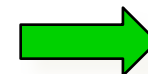
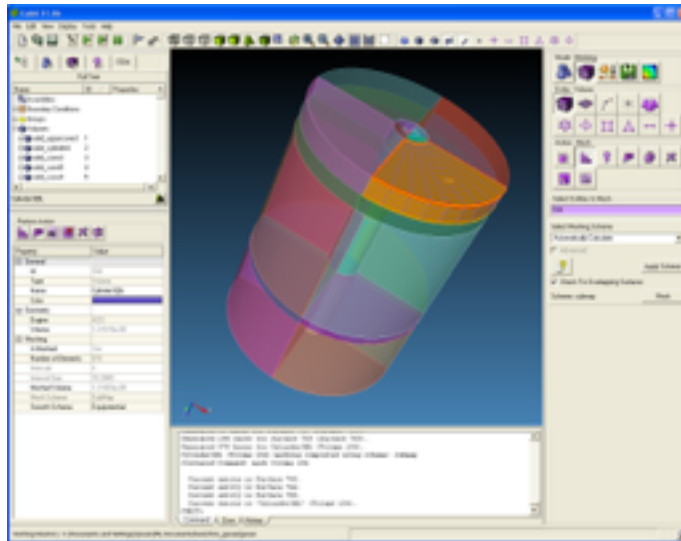


# CUBIT/TRELIS

Geometry and Mesh Generation Toolkit



# Mesh generation



## CAD Model

- ACIS
- STEP
- IGES
- Pro/E
- Facets
- STL
- Exodus II

## CUBIT/TRELIS

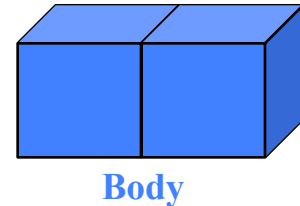
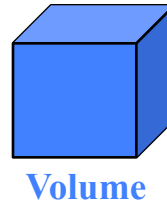
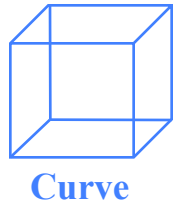
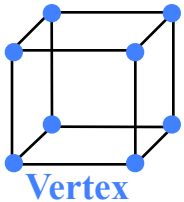
- Meshing Tools
- Geometry Creation
- Geometry Preparation
- Mesh Optimization
- Boundary Conditions
- Scripting
- Automation

## Mesh

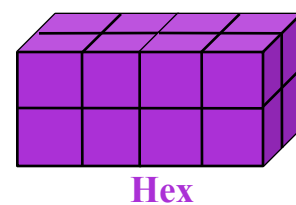
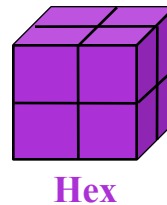
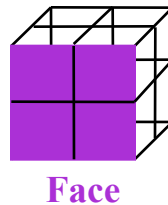
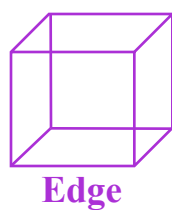
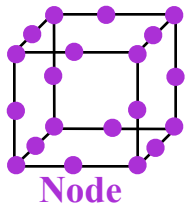
- Exodus II
- Abaqus
- IDEAS-Universal
- NASTRAN-BDF
- Patran
- LS-Dyna

# Entity types

## Geometry Entities in CUBIT



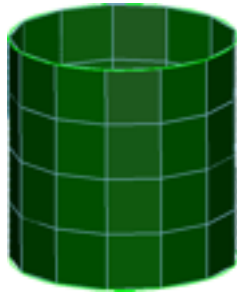
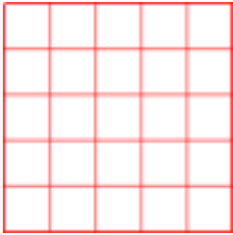
Mesh Entities, which approximate geometry entities of same dimension



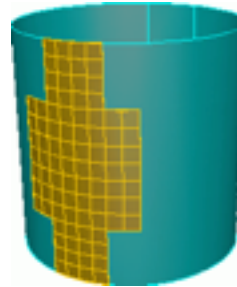
CUBIT Meshes **Vertices** First, Then **Curves**, Then **Surfaces**, Then **Volumes**  
(Advancing Front Paradigm)

# Meshing schemes

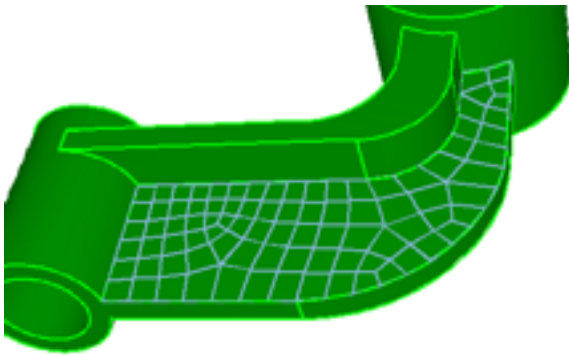
## Surface Meshing



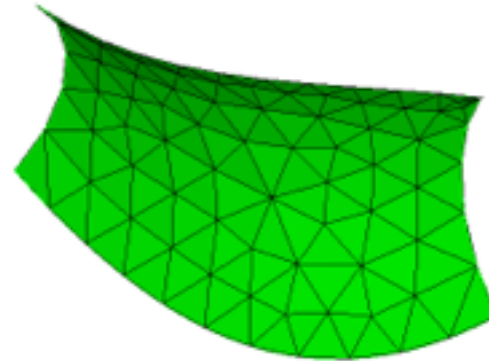
Mapped



Sub-map



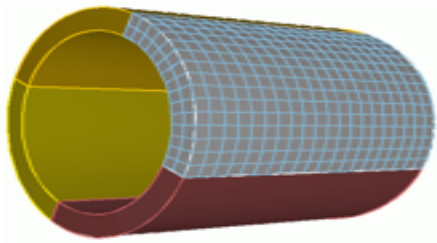
Pave



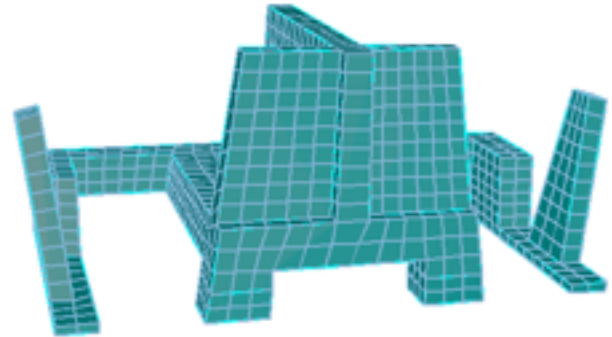
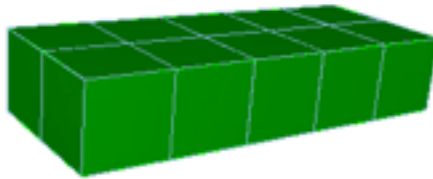
Trimesh

# Meshing schemes

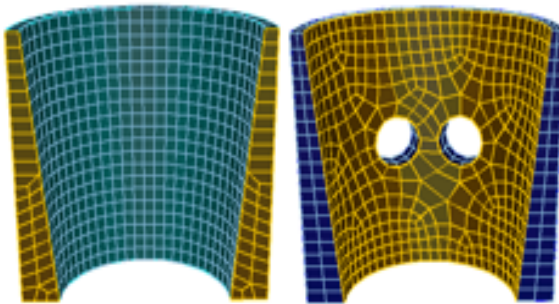
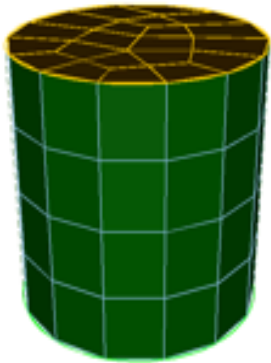
## Volume Meshing



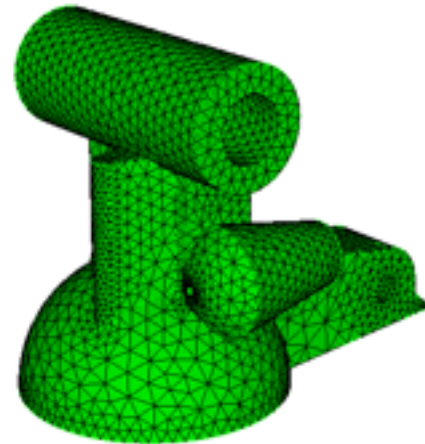
Mapped



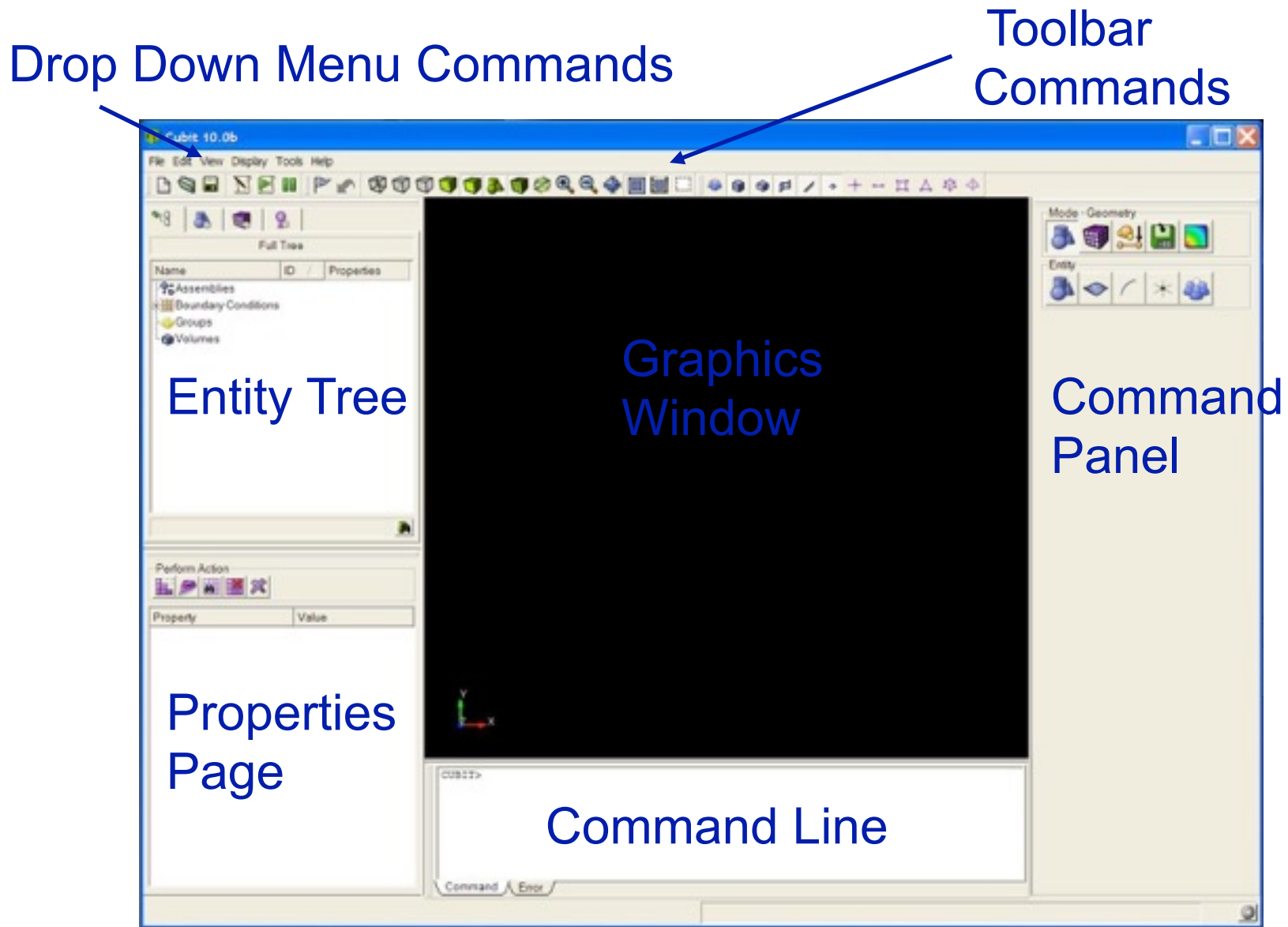
Sub-map



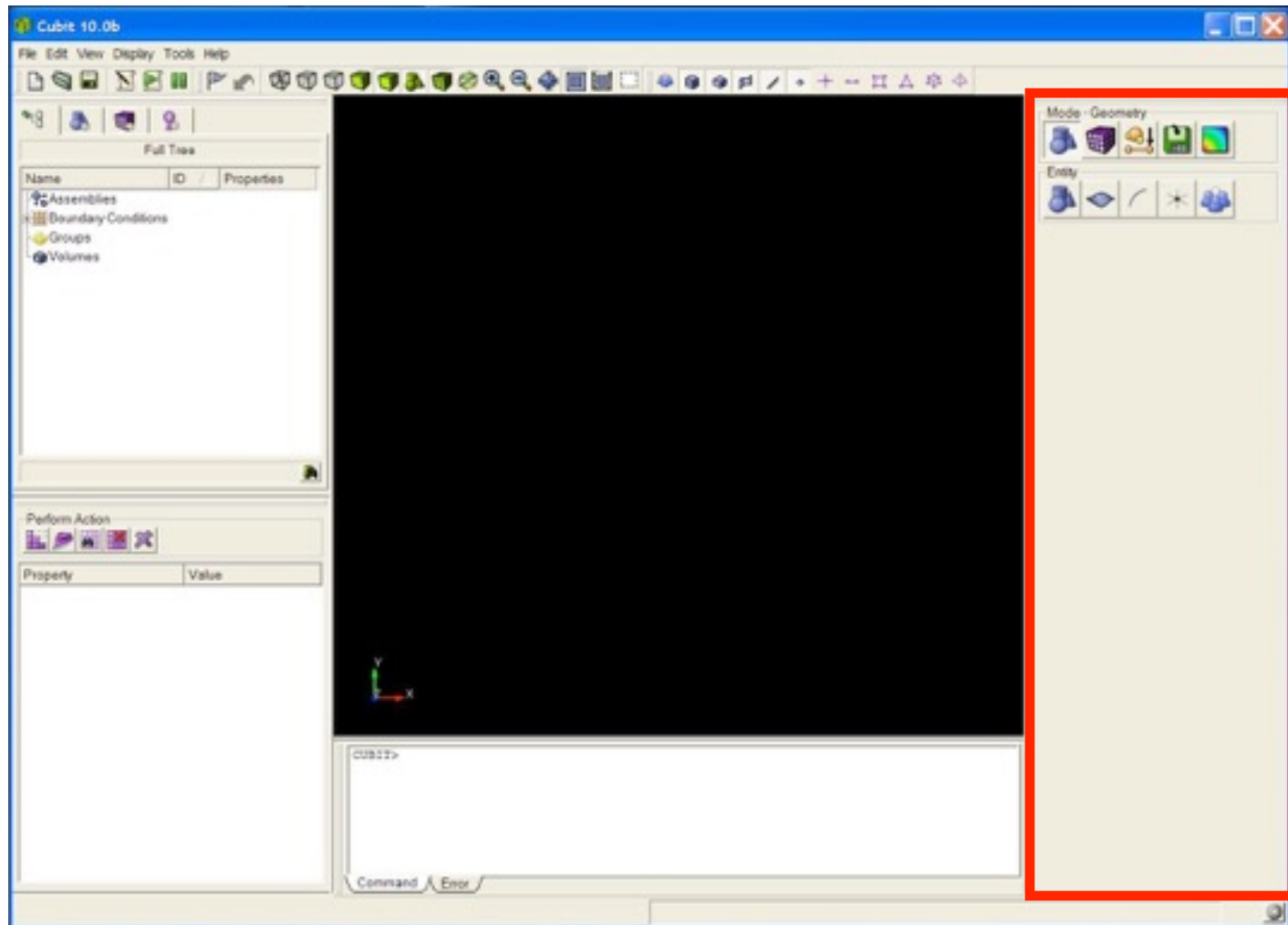
Sweep



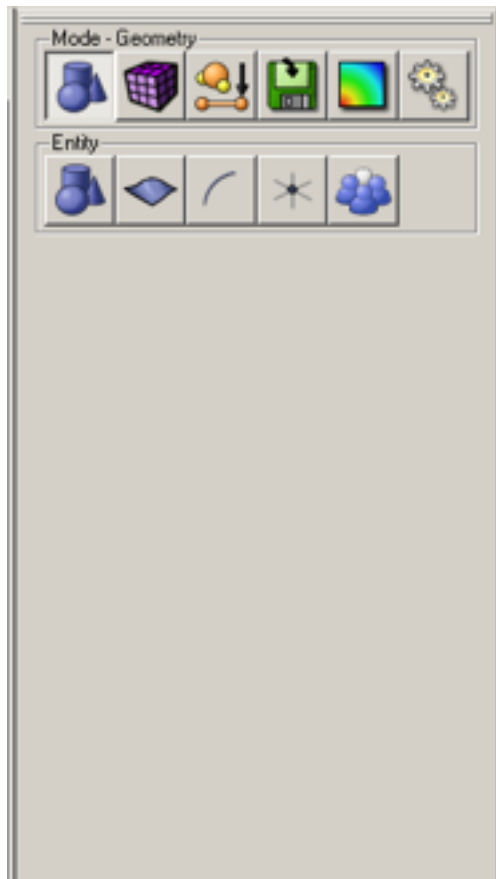
Tetmesh



# The Command Panel



# Operation Mode Buttons



Press an Icon to enter a new mode



- Geometry: Create, modify, cleanup...



- Mesh: Intervals, schemes, smoothing...



- Properties: Nodesets, sidesets, blocks



- Analysis Setup: Export mesh

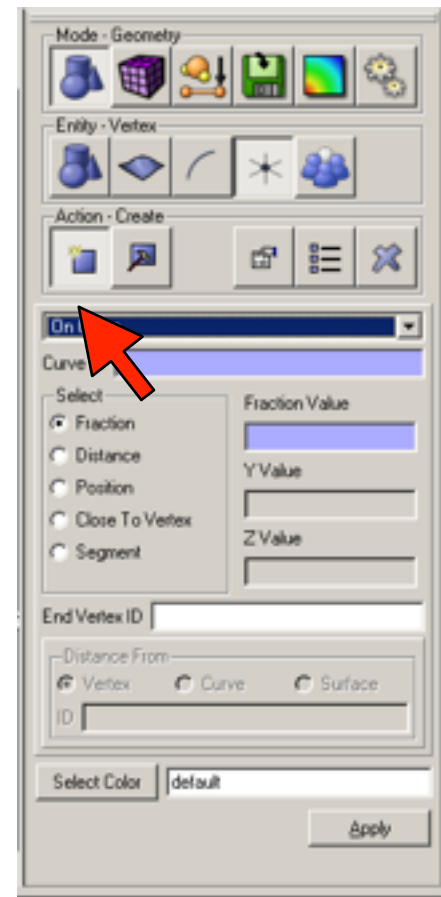
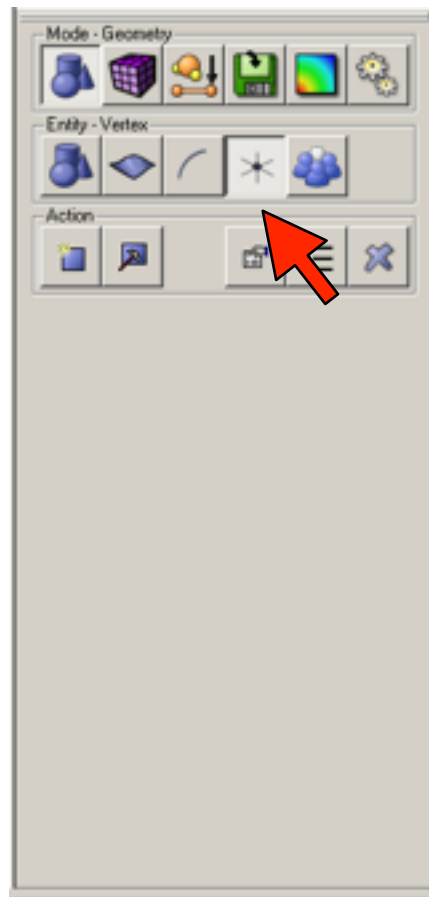


- Post Processing: Customizable shortcut

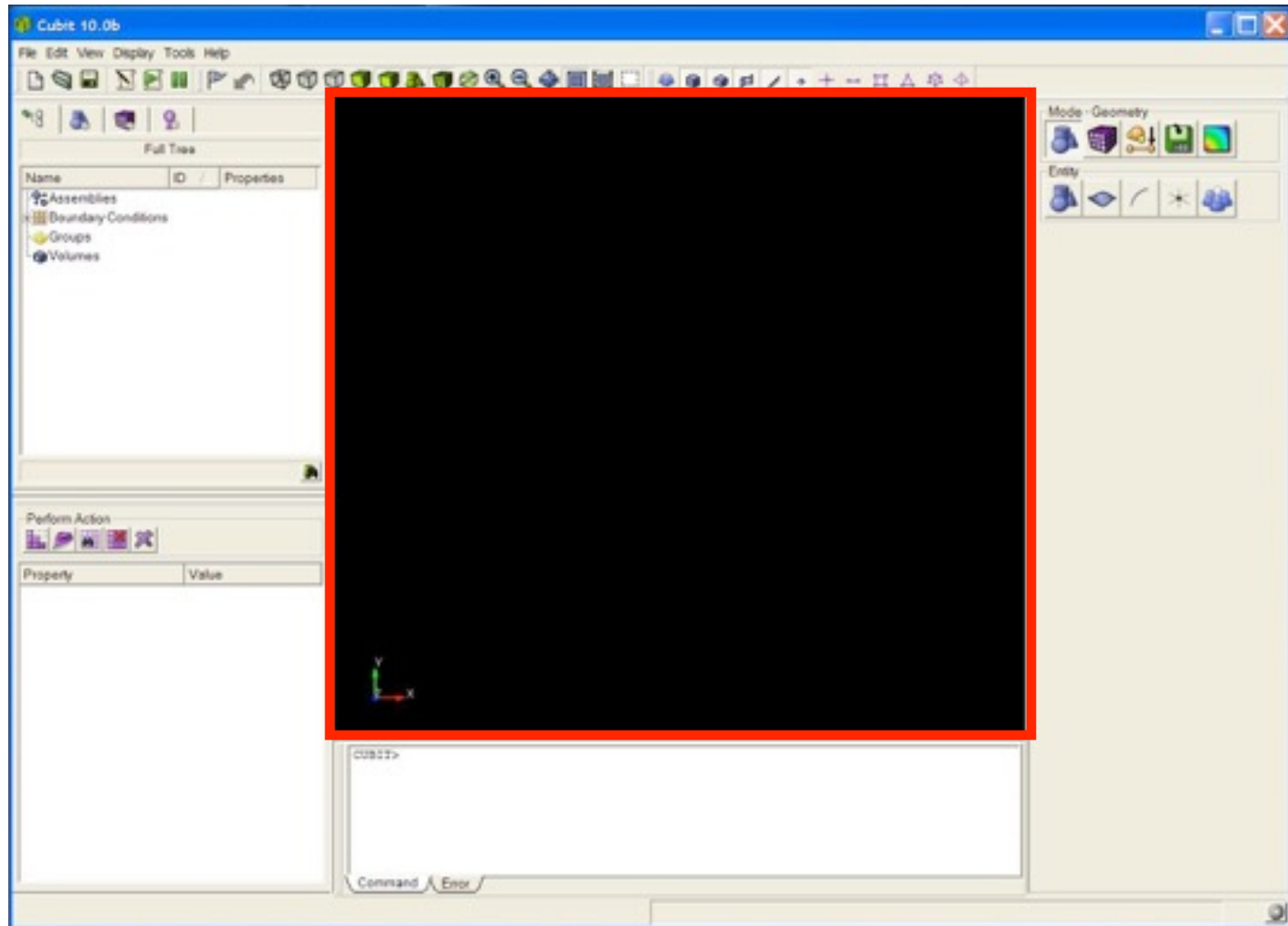


# Operation Mode Buttons

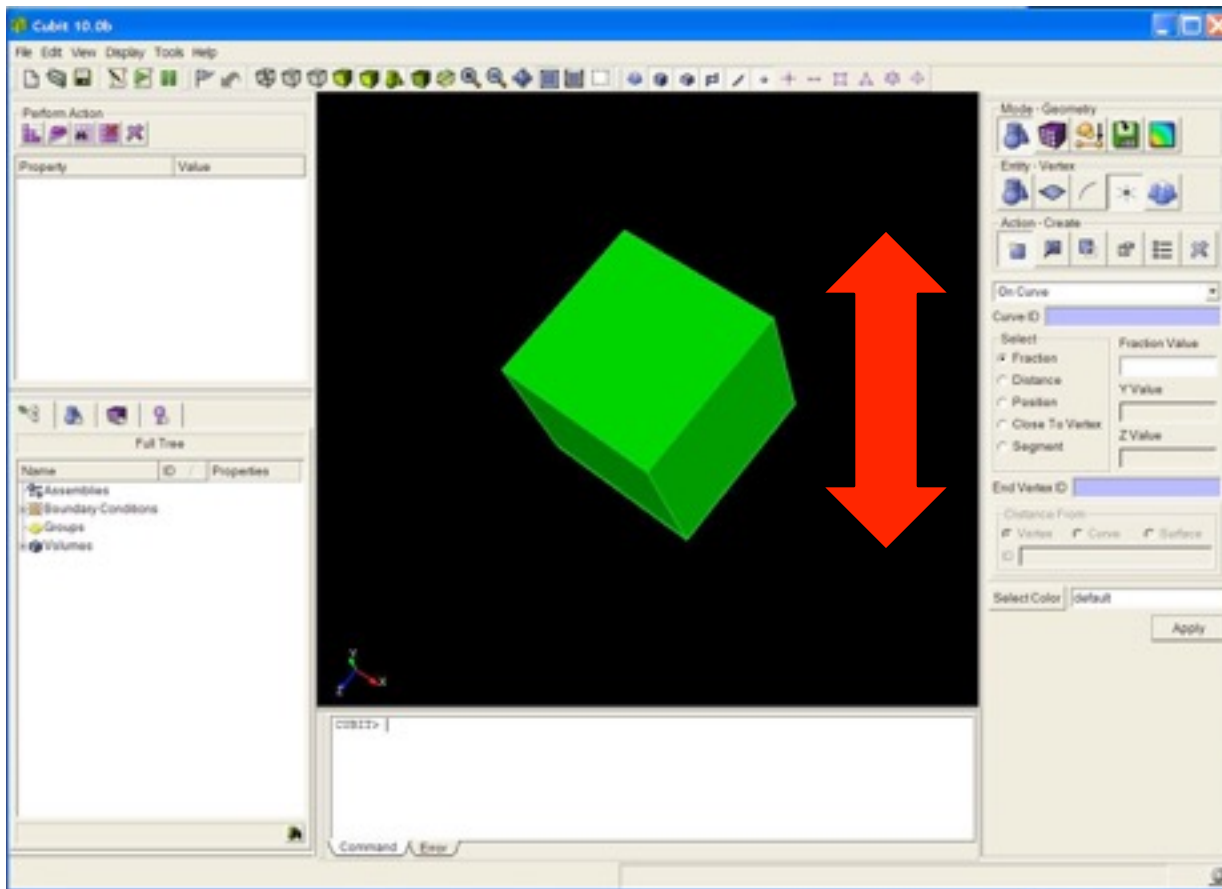
Each Button press takes you to a lower level



# The Graphics Window



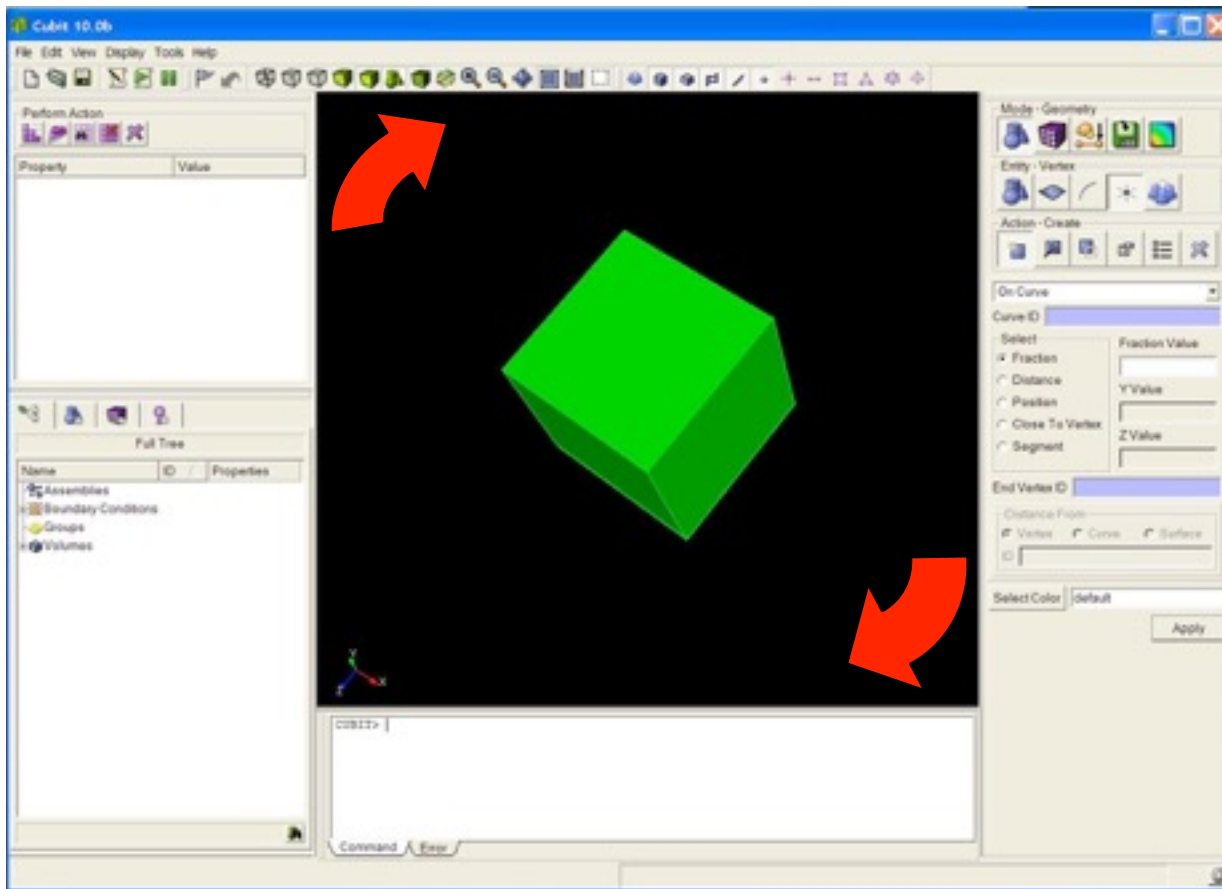
# Zooming



To zoom in and out, move the mouse into the graphics window, hold the right mouse button down, and move the mouse pointer vertically.



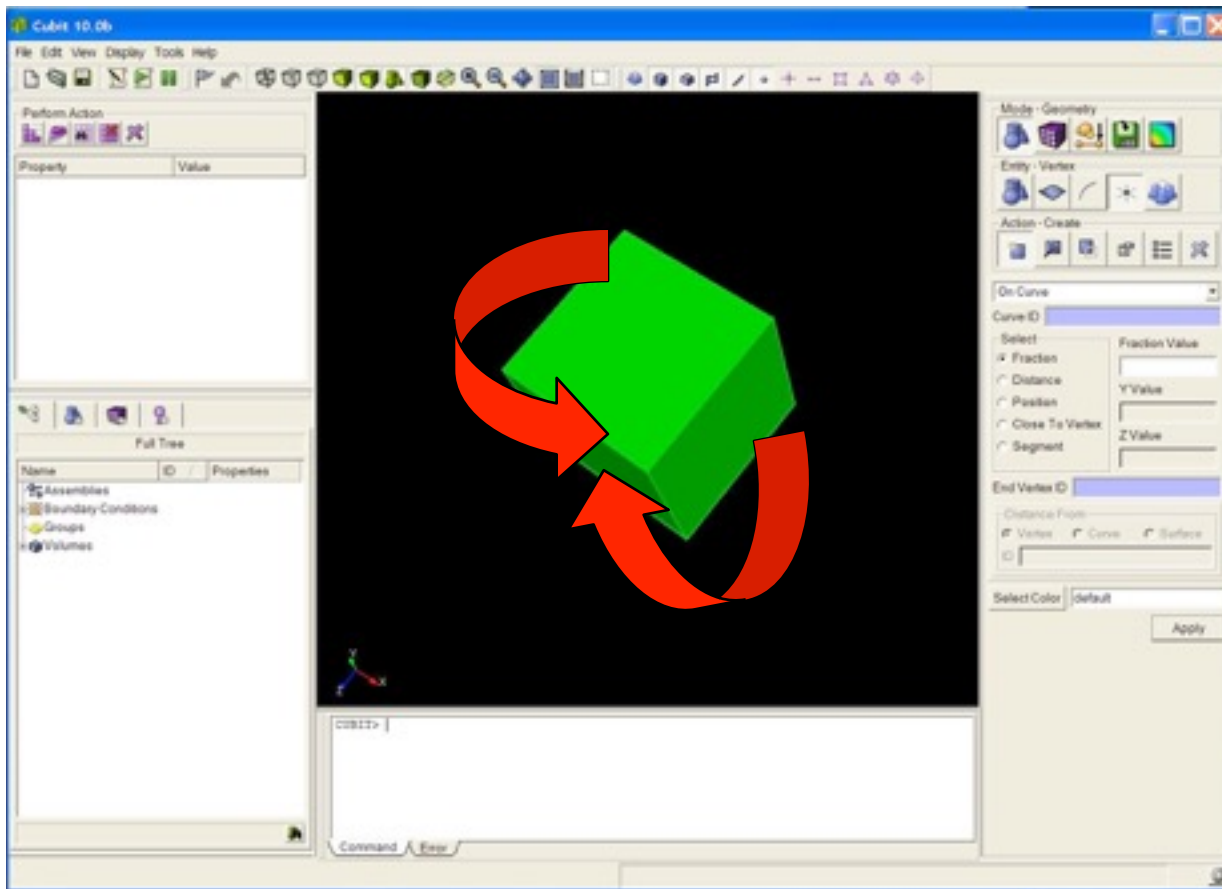
# Rotate



To rotate the model about an axis normal to the screen, move the mouse near the edge of the graphics window, hold the middle mouse button down, and move the mouse pointer along the edge of the window



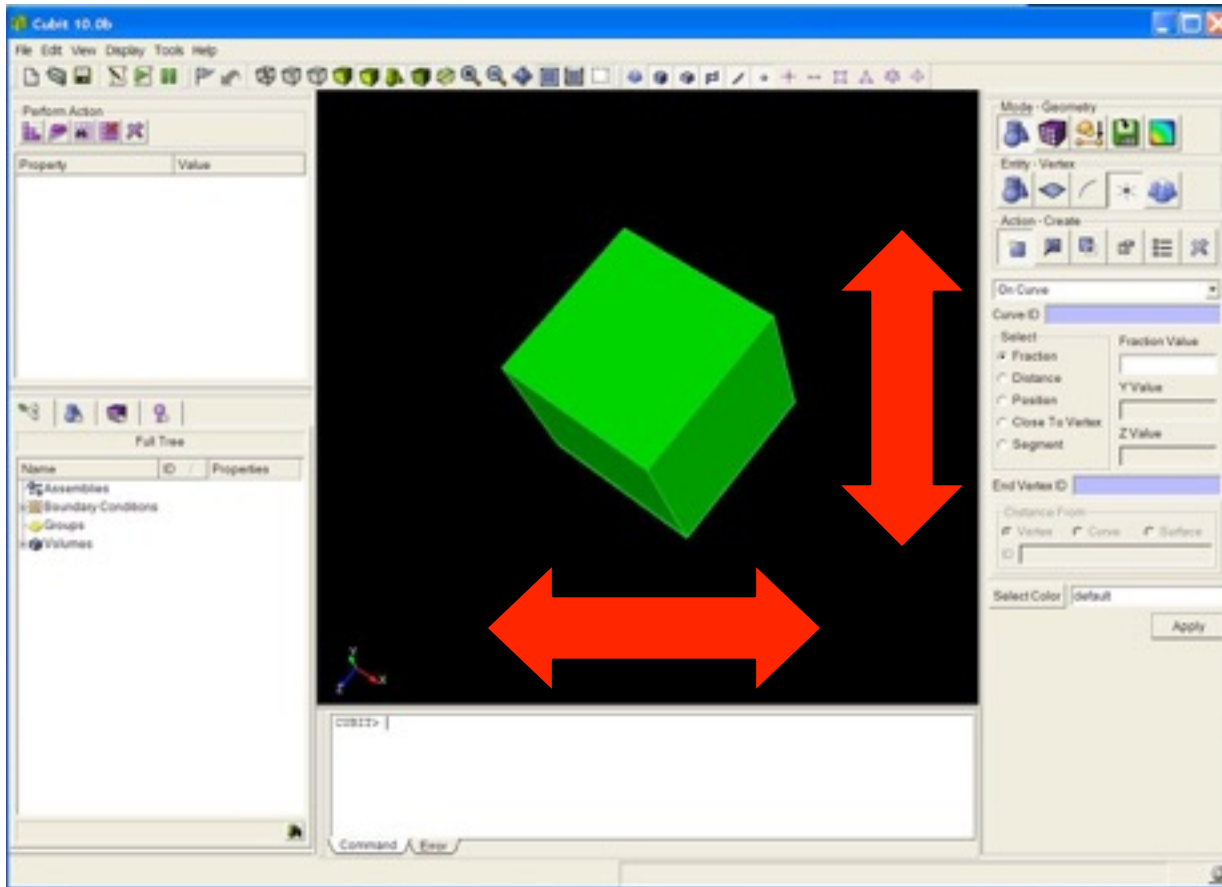
# Spin



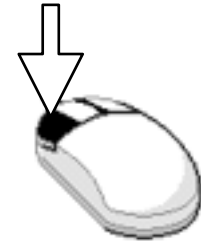
To rotate the model about the spin center, move the mouse near the center of the graphics window, hold the middle mouse button down, and move the mouse pointer.



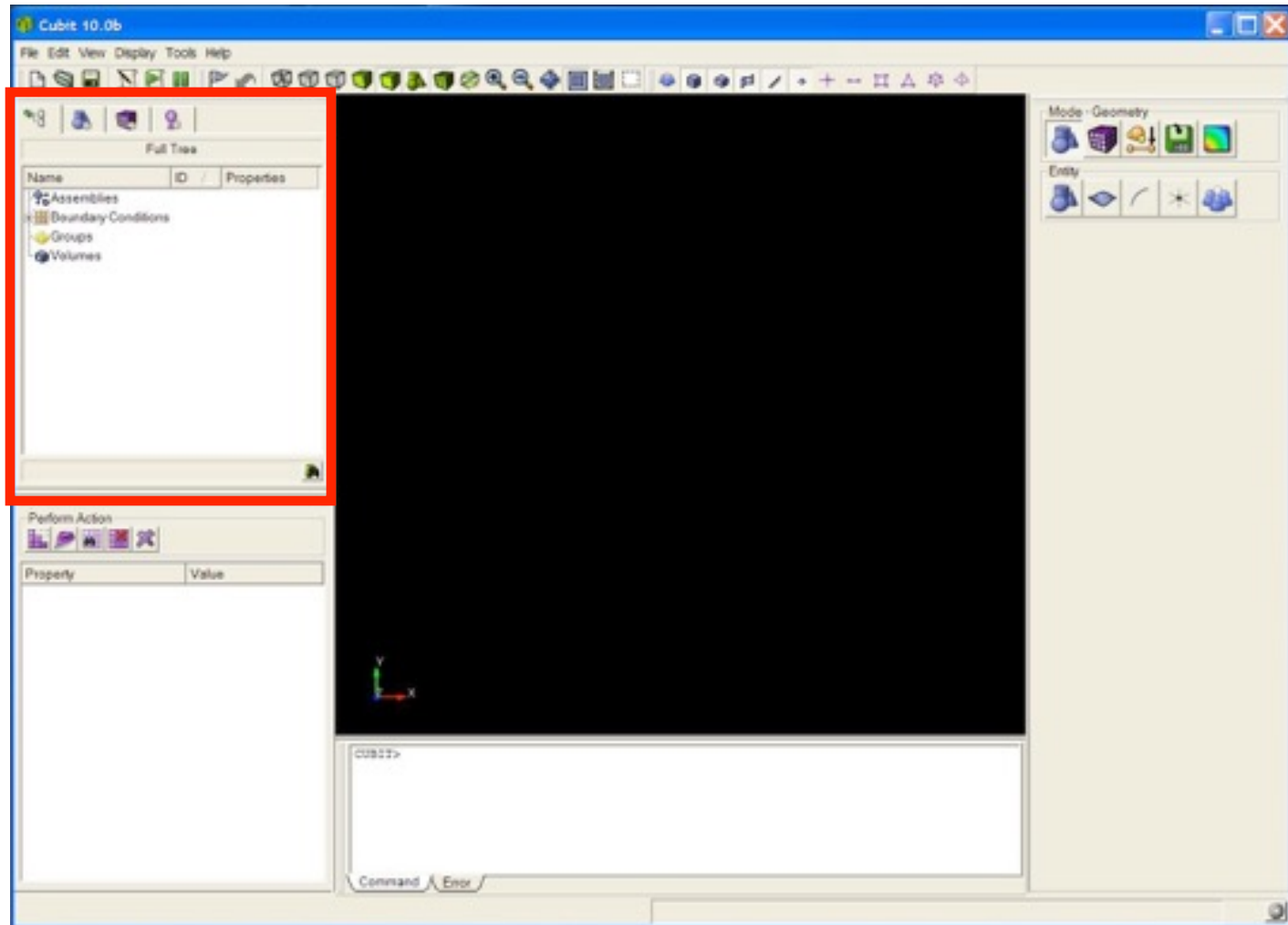
# Panning



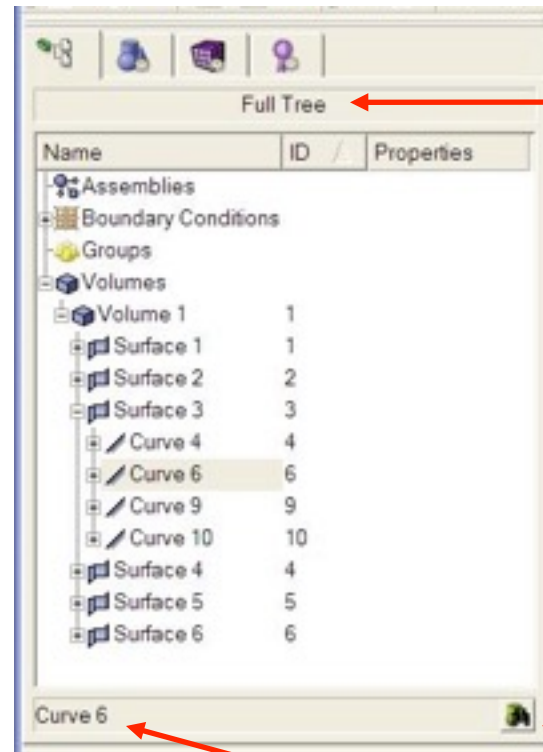
To pan, move the mouse into the graphics window, hold the left mouse button down, and move the mouse pointer horizontally or vertically.



# The Tree View



# Using the Tree View



List Type

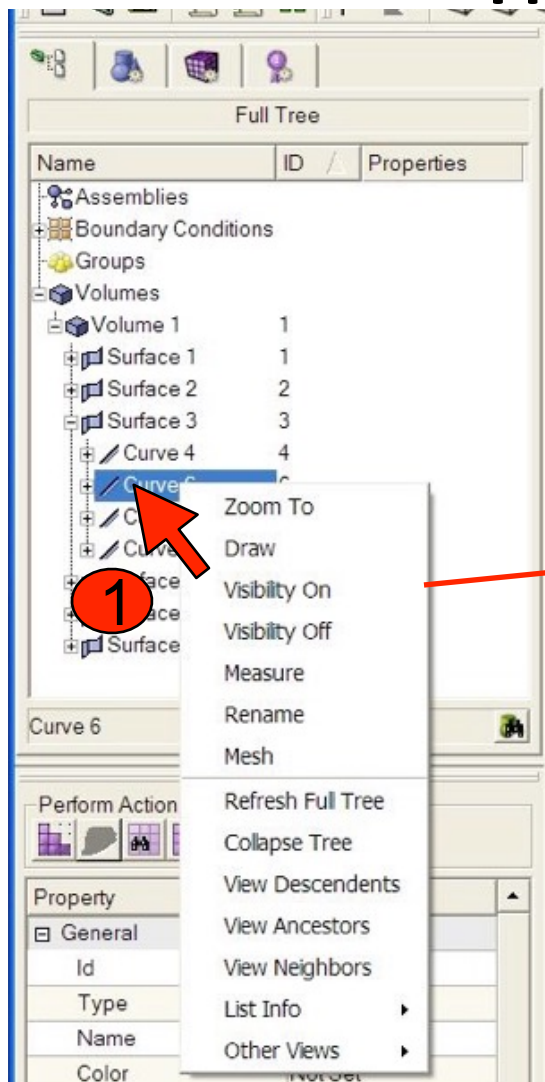
List View

Expand tree to show  
selected entity

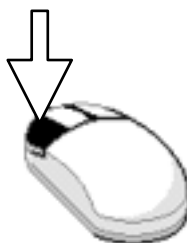
Current Selection



# Tree View Options



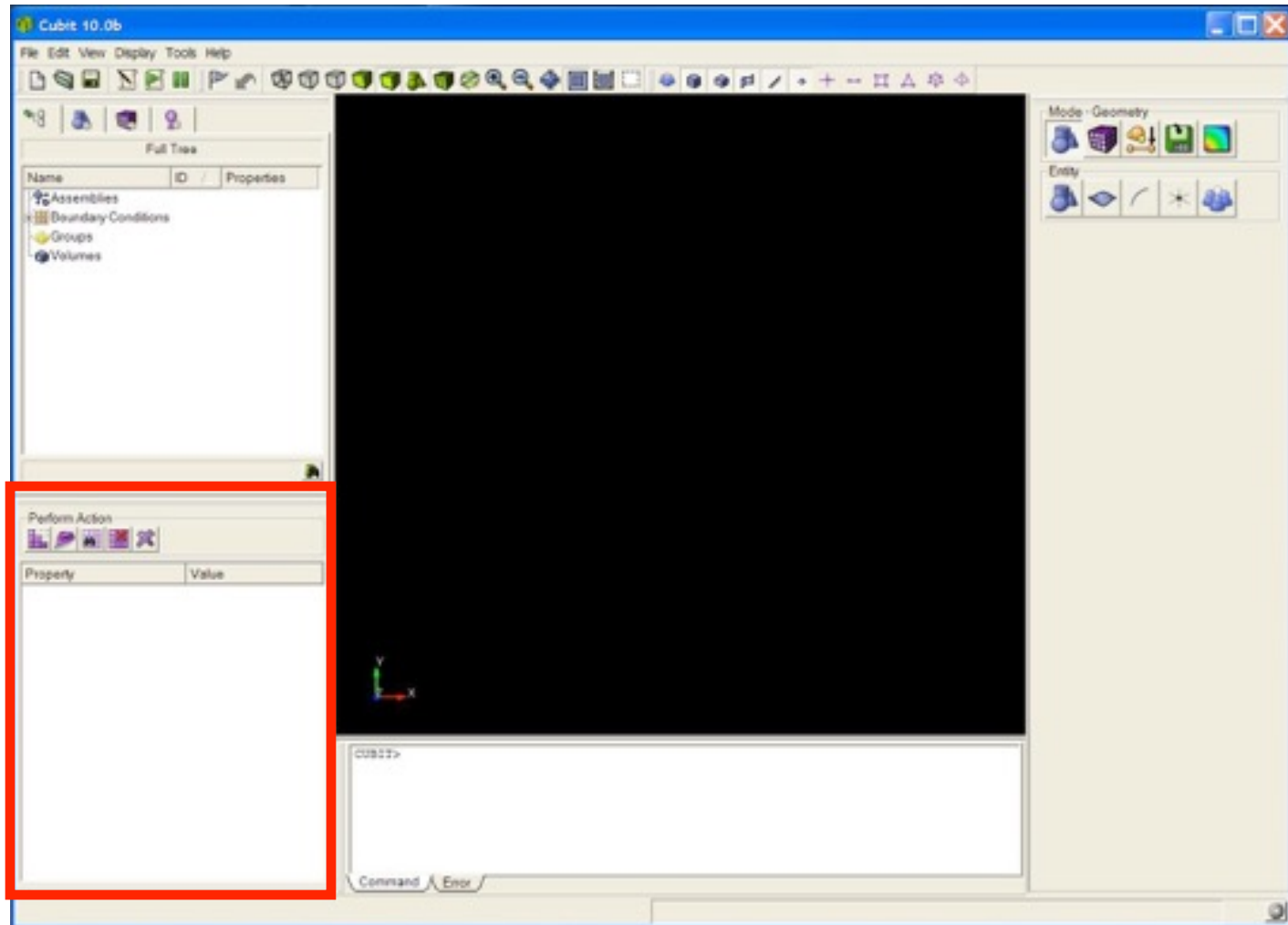
①  
Select an  
entity in  
the tree



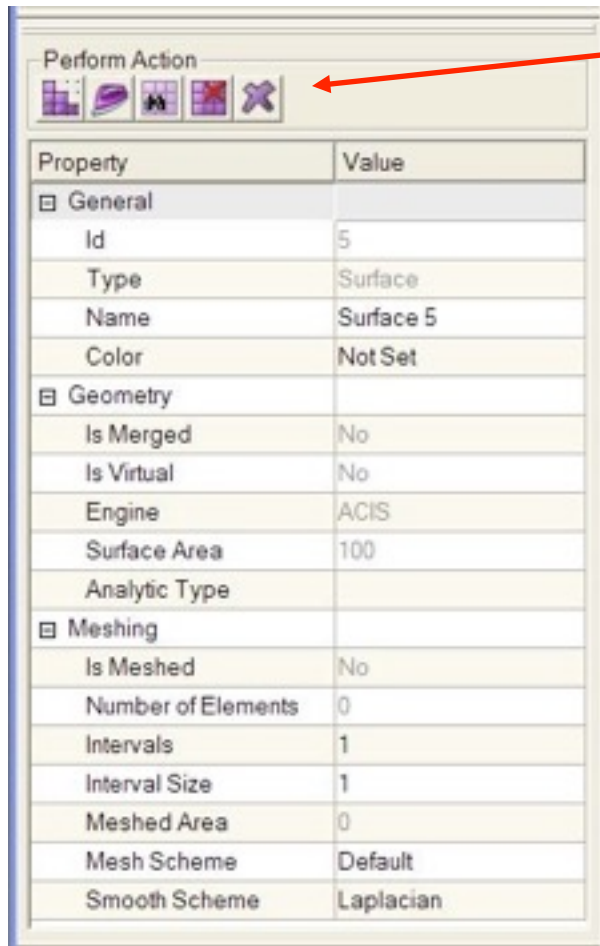
②  
Right  
Click



# The Properties Page



# Using the Properties Page

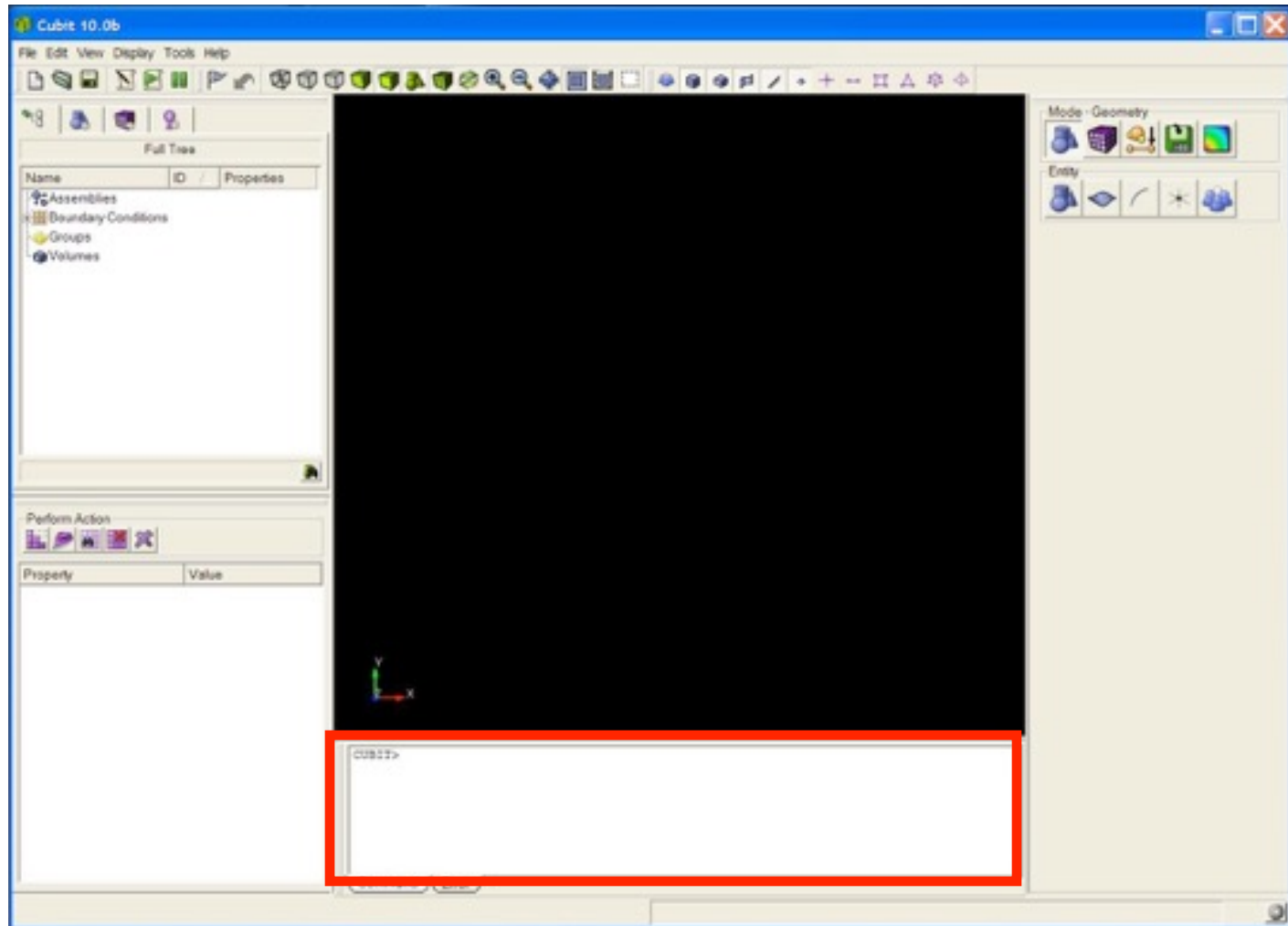


Action Buttons

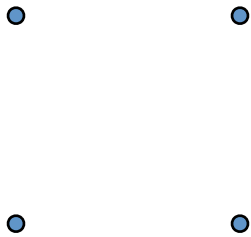
- Mesh
- Smooth
- Preview
- Delete Mesh
- Delete Entity

Entity properties. Grayed properties cannot be edited. Others can be changed from this page.

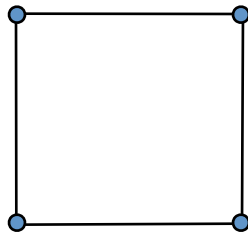
# The Command Window



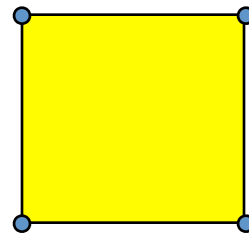
# Bottom-Up Geometry Creation



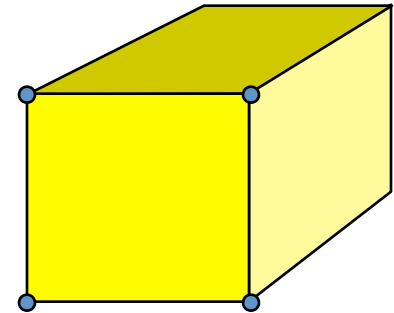
① Start by defining vertices



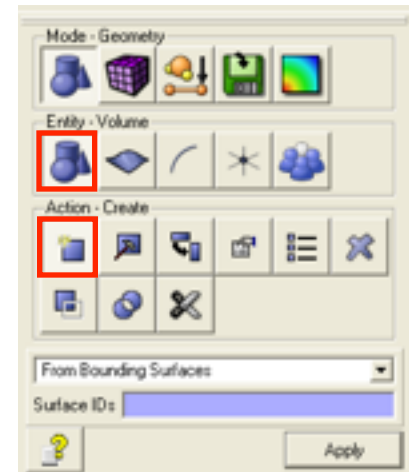
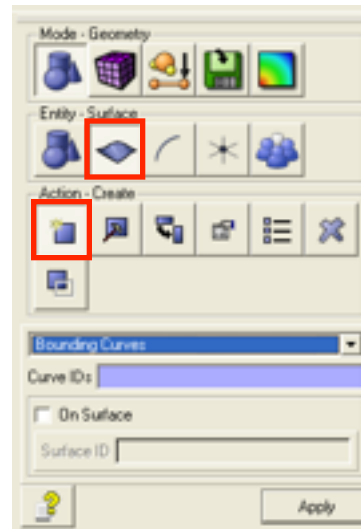
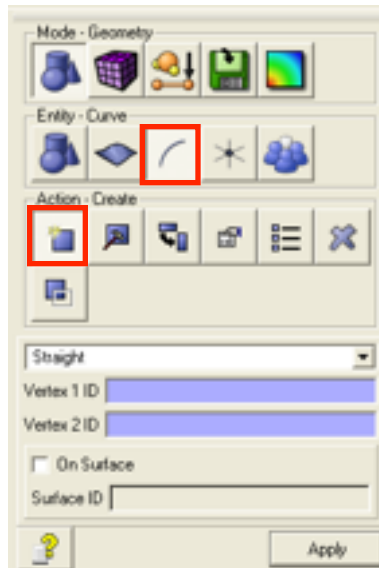
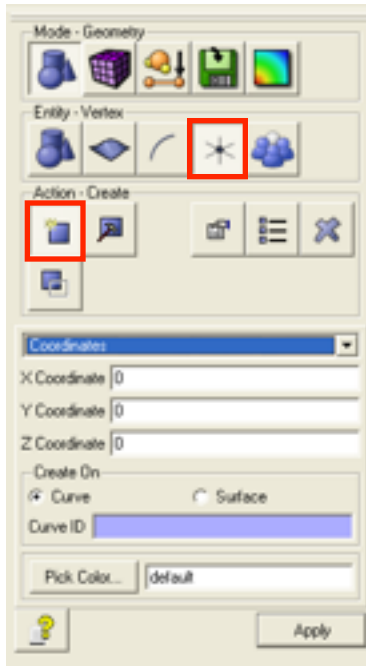
② Connect them with curves



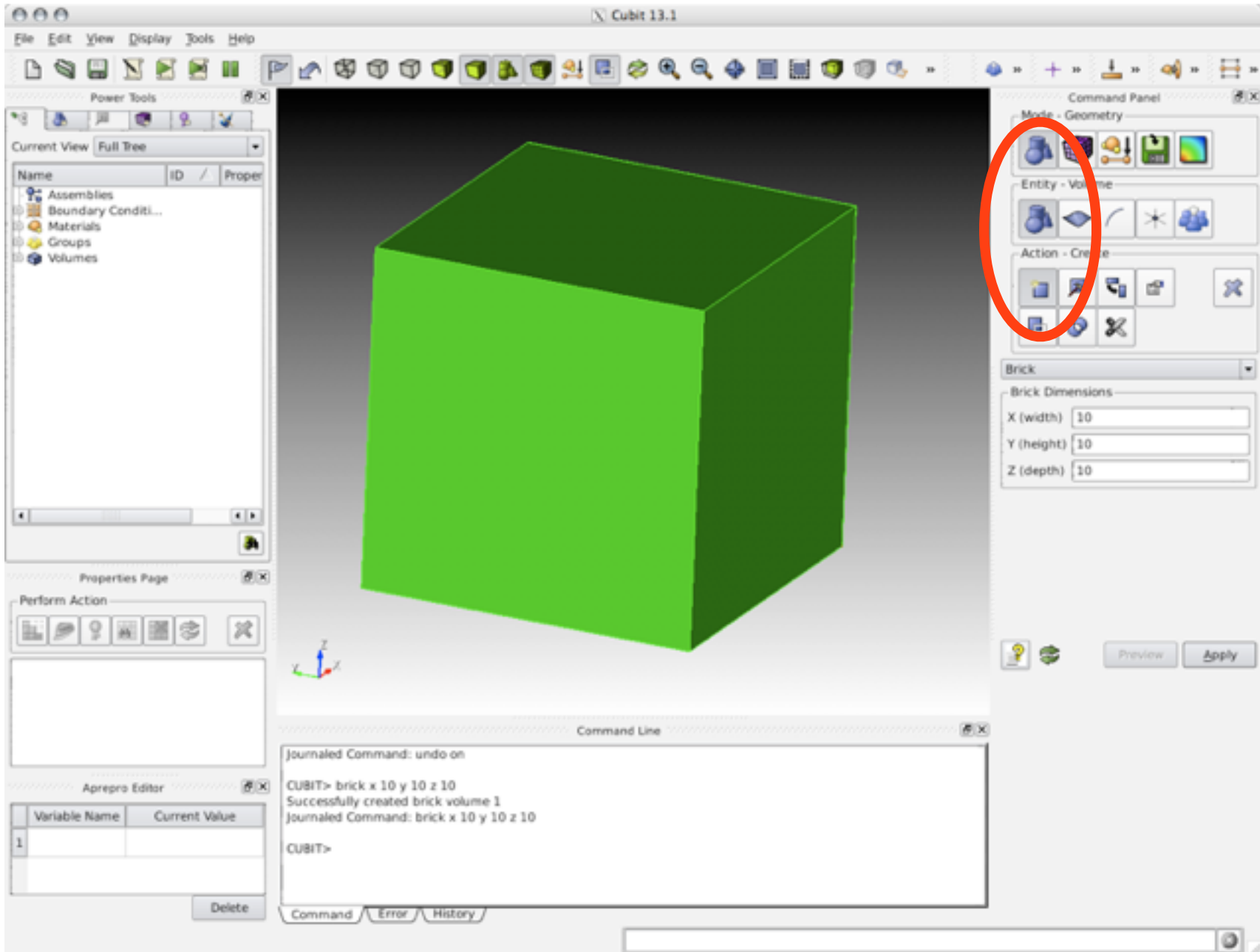
③ Create a surface from a loop of curves



④ Create a volume from a closed set of surfaces



# Simple example (3D)



Power Tools

Current View: Full Tree

Name	ID	Proper
Assemblies		
Boundary Condi...		
Materials		
Groups		
Volumes		
Volume 1	1	

Volume 1

Properties Page

Perform Action

Property	Value
General	
Id	1
Type	Volume
Name	Volume 1

Aprepro Editor

Variable Name	Current Value
1	

Command Line

```
CUBIT> brick x 10 y 10 z 10
Successfully created brick volume 1
Journaled Command: brick x 10 y 10 z 10

Current entity is Volume 1.
CUBIT> volume 1 scheme Map
Journaled Command: volume 1 scheme map

Current entity is Volume 1.
```

Command Error History

Working Directory: /u/dpeter/Data/programs/fortran/models/SPECFEM3D/daniel/examples/cubit\_tests

Command Panel

Model - Meshing

Entity - Volume

Action - Intervals

Select Volumes

1

Auto

Auto Factor

Fine Coarse

Approximate Size: 0.630825

Preview

Check For Overlapping Surfaces

Apply

Mesh

Power Tools

Current View: Full Tree

Name	ID	Proper
Assemblies		
Boundary Condi...		
Materials		
Groups		
Volumes		
Volume 1	1	

Volume 1

Properties Page

Perform Action

Aprepro Editor

Variable Name	Current Value
1	

Delete

Command Panel

Mesh - Meshing

Entity - Volume

Action - Mesh

Select Entities to Mesh

1

Select Meshing Scheme

Map

Apply Scheme

☒ Check For Overlapping Surfaces

Scheme: Default

Mesh

Command Line

Generated 100 faces for Surface 4 (Surface 4).  
Generated 100 faces for Surface 5 (Surface 5).  
Generated 100 faces for Surface 6 (Surface 6).  
Generated 1000 hexes for Volume 1 (Volume 1).  
Volume 1 (Volume 1) meshing completed using scheme: map

Meshing time: 0.040000  
Journaled Command: mesh volume 1

CUBIT>

Command Error History



# Downloads

## STL surfaces

- google: STL download
- <https://www.thingiverse.com>
- <https://grabcad.com/library>
- <https://nasa3d.arc.nasa.gov>