Mesh Creation

What is the mesh creation tool?

- The meshing panel allows you to perform simple meshing operations within PRIMER.

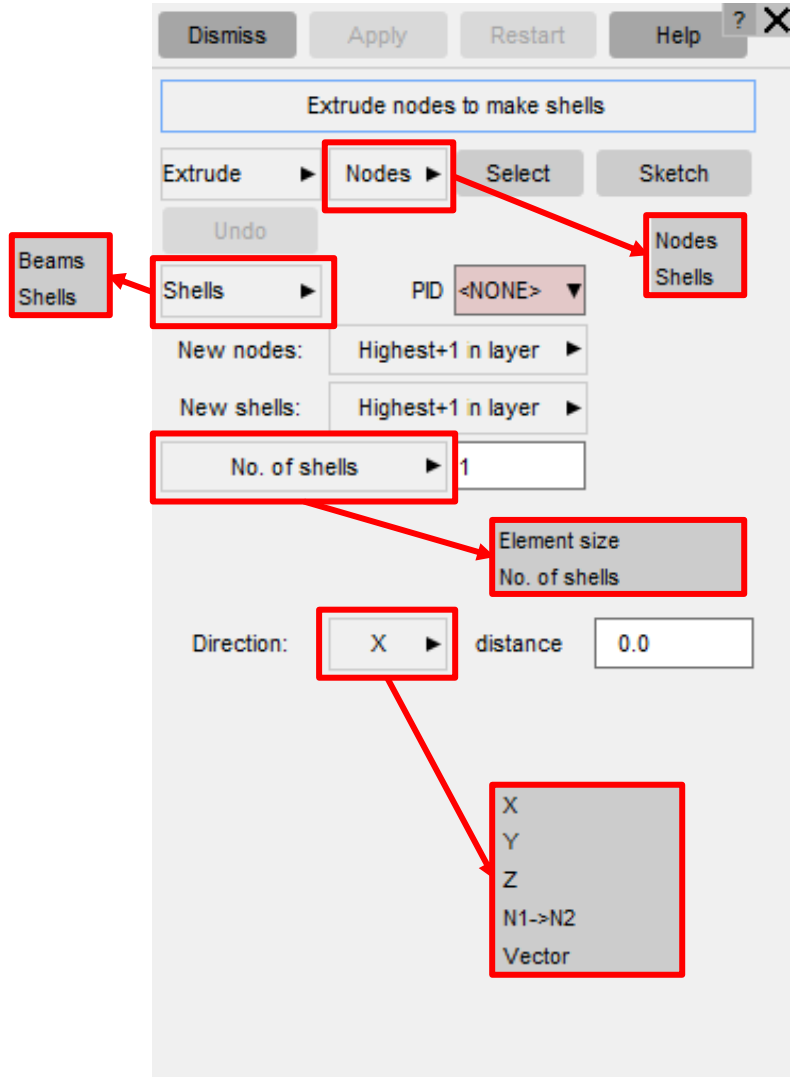
- There are a variety of different meshing capabilities within PRIMER that will be covered within this tutorial:
  - **Extrude** nodes to create beams or shells, or extrude shells to create solids or thick shells.
  - **Offset** shells to create shells or solids.
  - Create a **Ruled** mesh between two lines of nodes.
  - Mesh a quadrilateral or triangular **Area** by giving the corner nodes.
- There are also a variety of meshing capabilities that can be used to create meshed Shapes
  - Create a **Block/Box.**
  - Create a **Plate**
  - Create a **Line** of beams between 2 nodes.
  - Create a **Cylinder** made of shells.
  - Create a **Hemisphere** made of shells
  - Create a **Sphere** made of shells.

Extrude

- **Extrude** allows you to:
  - Extrude nodes to create beams.
  - Extrude nodes to create shells.
  - Extrude shells to create solids or thick shells.

- The pop up, as shown on the right, allows you to pick the mode for what you would like to extrude.

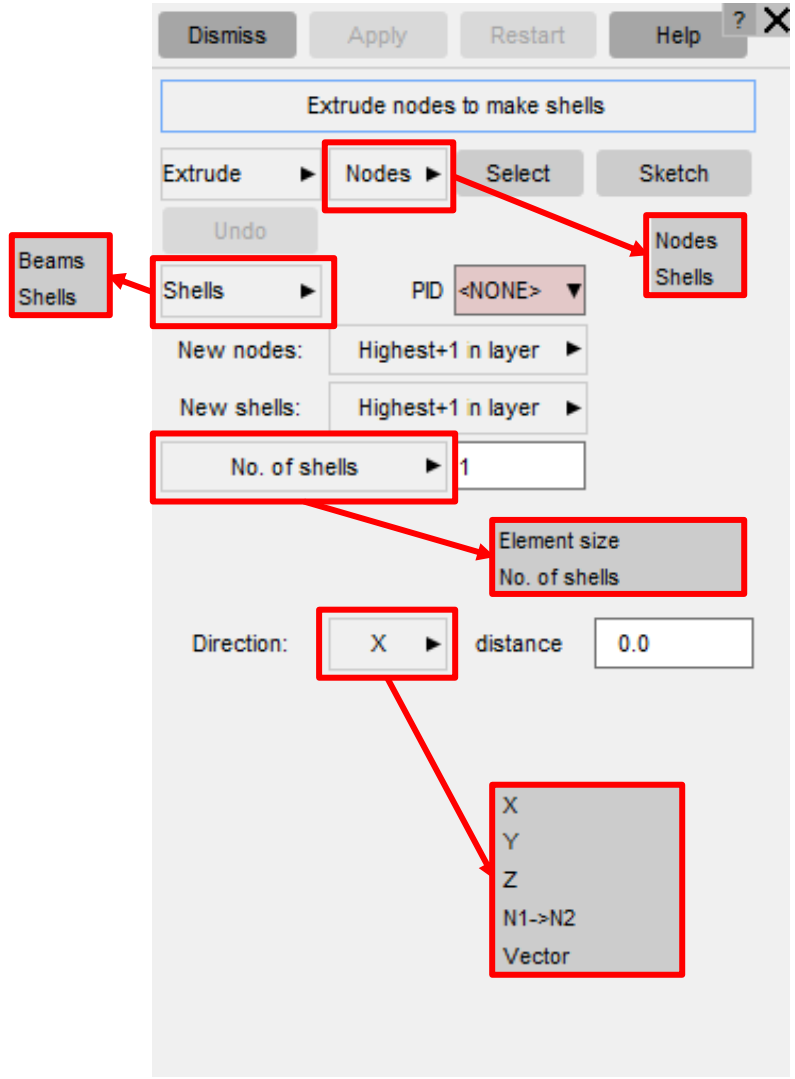
- The number of beams, shells, solids or thick shells to create in the extrude direction can either be given or you can give the element size, in which case PRIMER will determine the number required.



Extrude

- The extrude direction can be given by:
  - The global X,Y or Z axes. (Give the distance).
  - A vector given by 2 nodes. Either give a distance or use the length N2-N1.
  - A vector given by X, Y or Z components. Either give the distance or use the length of the vector.
  - In case of extruding shells to Solid/Thick shells, we can also extrude in shell normal direction.

- When extruding nodes to create shells, if the last node chosen is the same as the first node then the shells created will connect as expected.

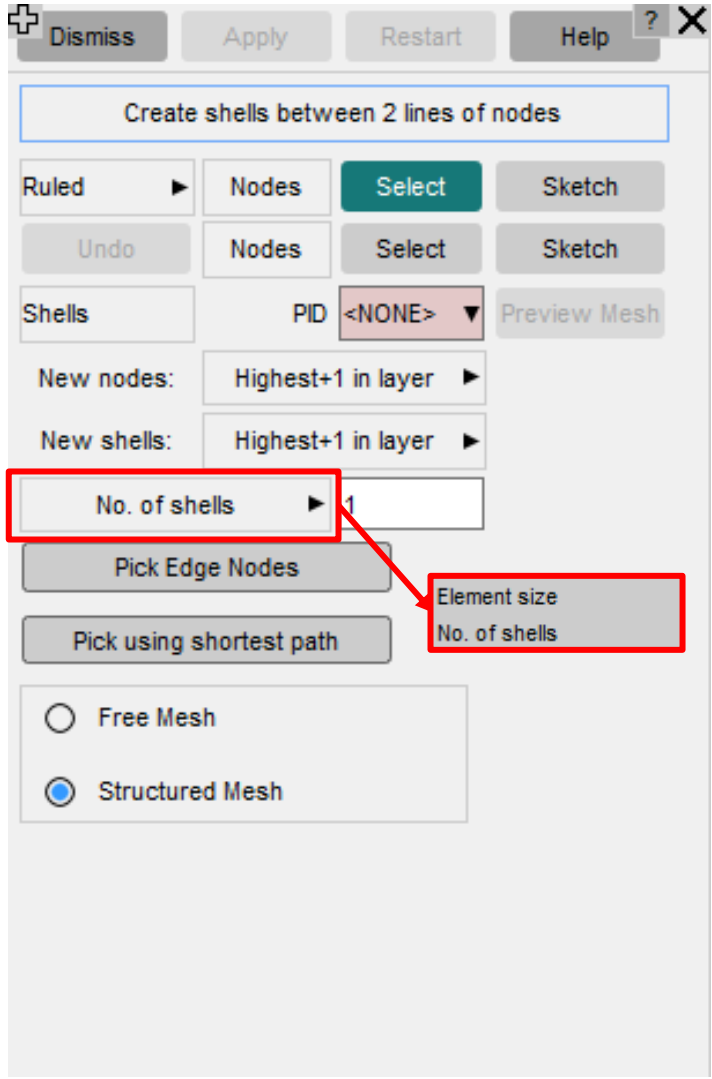


Offset

- **Offset** allows you to:
  - Move shells or create shells offset a specific distance from existing shells.
  - Create solids by offsetting existing shells.
- For both options ensure that the normal of the shells you want to offset are consistent, otherwise shells moved/created may not be as expected.
- For shells give the distance that the new shells should be offset from existing shells.
- For solids give how many solids should be created while offsetting and the distance to offset.
- For shells, to move the original shells rather than create new ones toggle the “Offset and Copy” button to “Offset – no copy”.

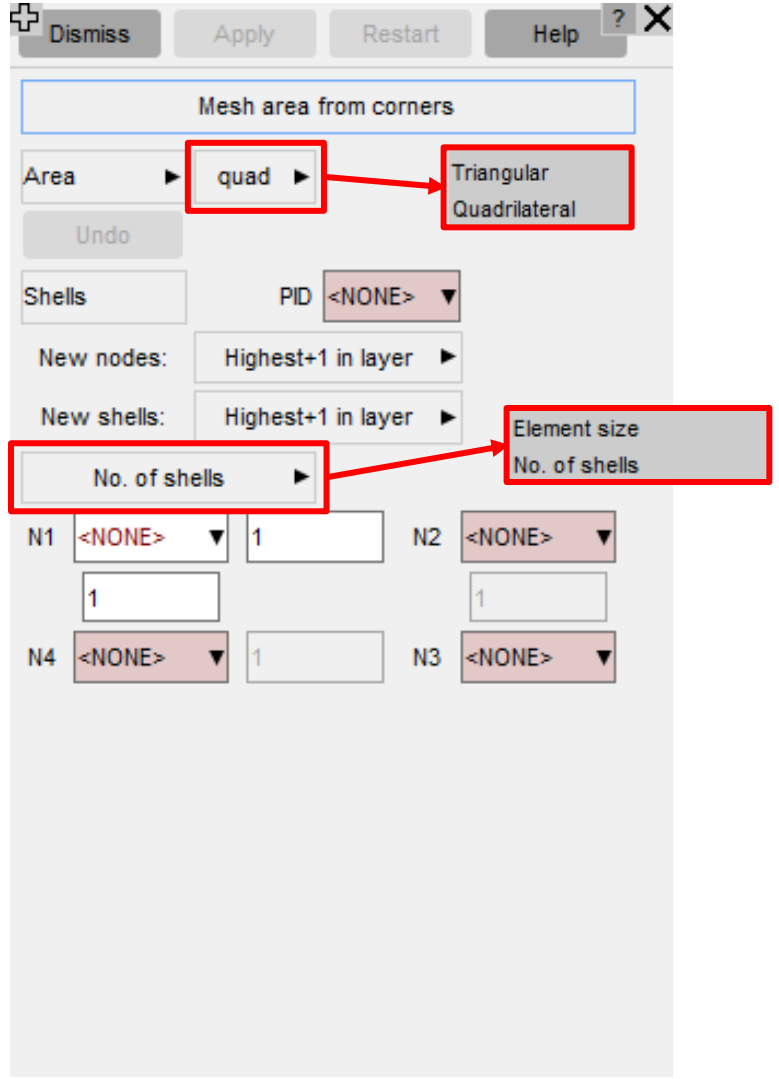
Ruled

- **Ruled** allows you to create a mesh of shells between 2 lines of nodes.
- Click the two Select buttons to define the two sets of nodes.
- Two meshing methods are available
  a) Free meshing
  b) Structured Meshing.
- You can pick nodes by selecting “Normal screen pick” or “Pick Edge Nodes” or “Pick using shortest path” methods.
- Give either the number of rows of shells to create or the size of shell element size, in which case PRIMER will determine the number of rows of shells required.



Area

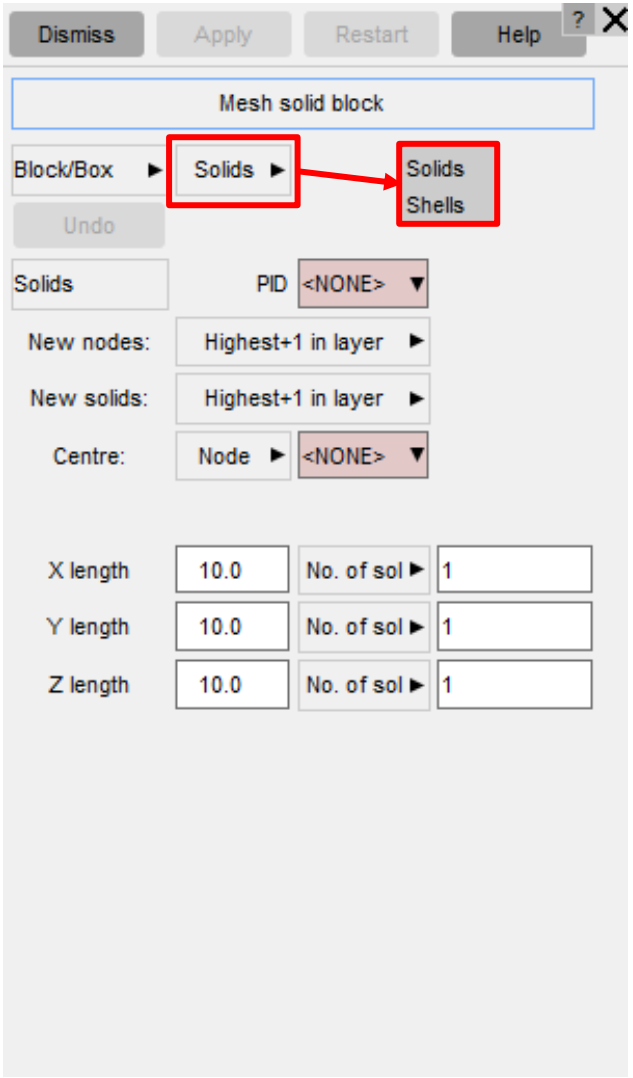
- **Area** allows you to mesh a quadrilateral or triangular area. (Use the popup menu to choose which type to mesh).
- Pick the 3/4 corner nodes for the mesh.
- Currently, for a quadrilateral mesh the number of shells between N1 and N2 must be the same as between N3 and N4, and the number of shells between N1 and N4 must be the same as between N2 and N3.
- For a triangular mesh the same number must be used for all sides.
- Give either the number of shells to create or the size of shells to create, in which case PRIMER will determine the number required.



Block/Box

- **Block/Box** allows you to create a simple block of solid elements.

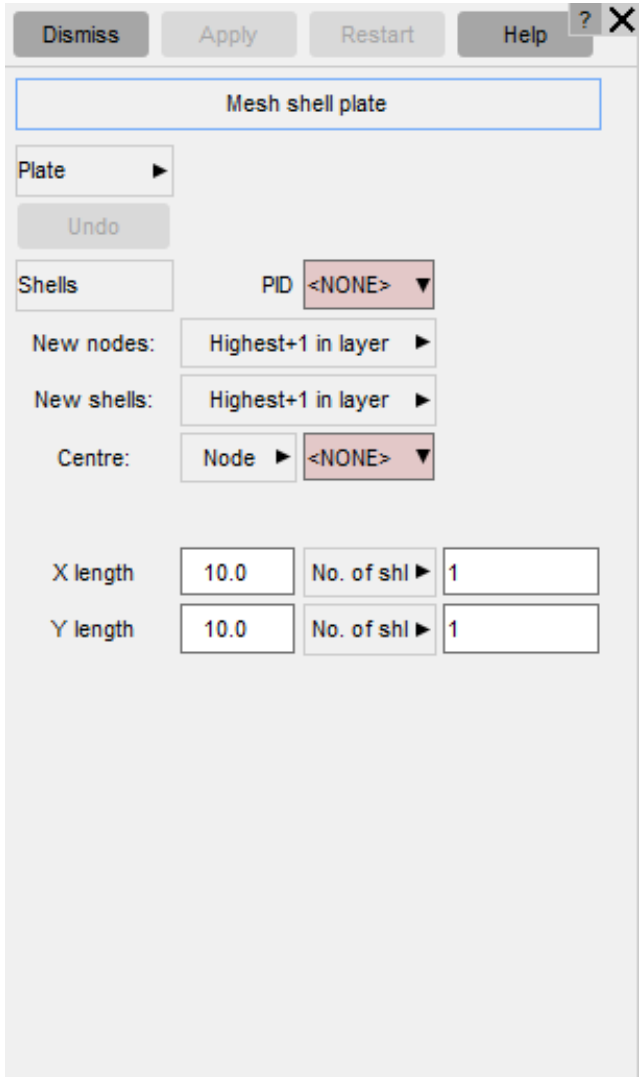
- Give a node or coordinate for the centre of the block, then for the X, Y and Z directions give the length of the block and either the number of solids or the element size.



Plate

- **Plate** allows you to create a simple plate of shell elements in the xy plane.

- Give a node or coordinate for the centre of the plane, then for the X and Y directions give the length of the plate and either the number of shells or the shell size.

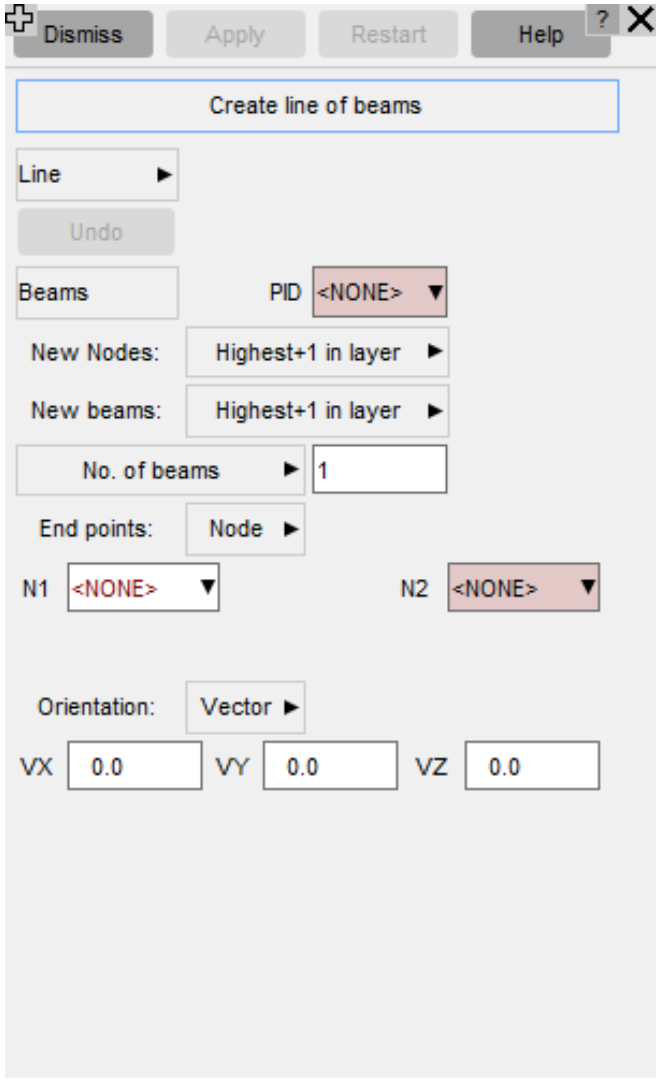


Line

- **Line** allows you to create a line of beams between N1 and N2.

- N3 can be given and will be used as the third node for all the beams that are created.

- Either give the number of beams to create or the size of a beam, in which case PRIMER will determine how many to create.

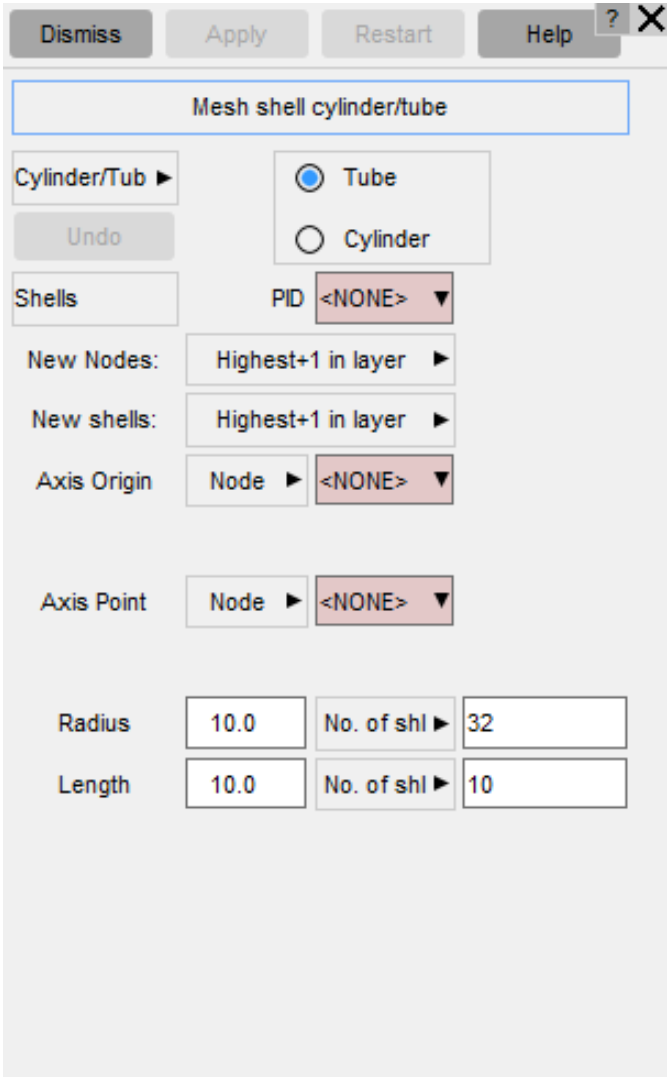


Cylinder

- **Cylinder** allows you to create a cylinder/tube mesh of shells.

- The axis of the cylinder/tube is defined by Axis origin and Axis point, which can be specified by a NODE id or by entering the coordinates.

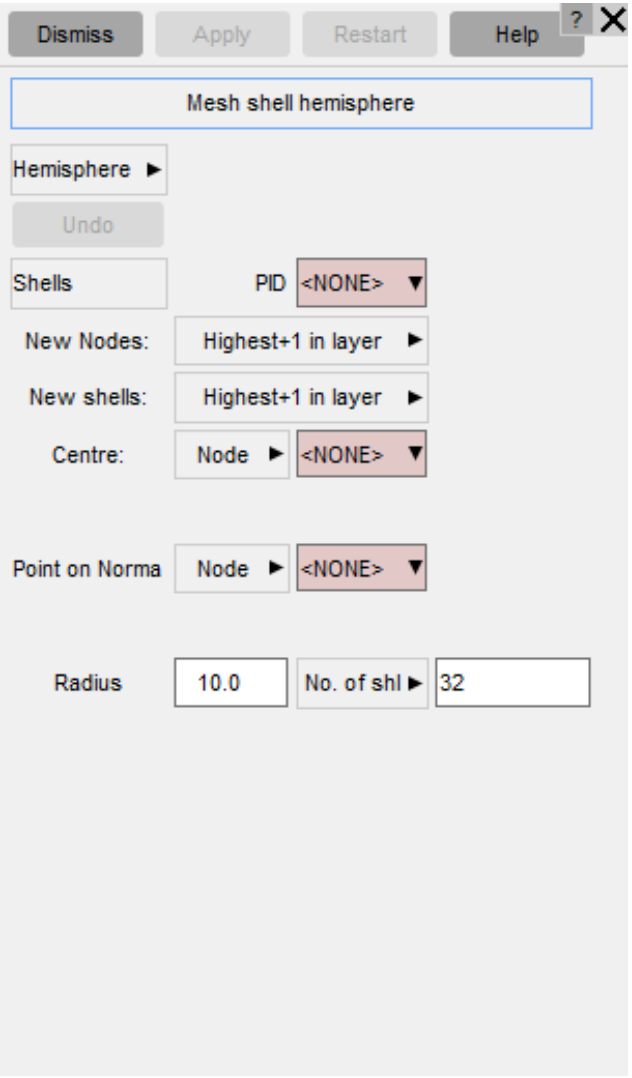
- After setting the Axis origin and Axis Points, give a radius, height and either the number of shells or the size of shells to create in radial and axial directions and press “Apply” to create.



Hemisphere

- **Hemisphere** allows you to create a hemispherical mesh of shells.

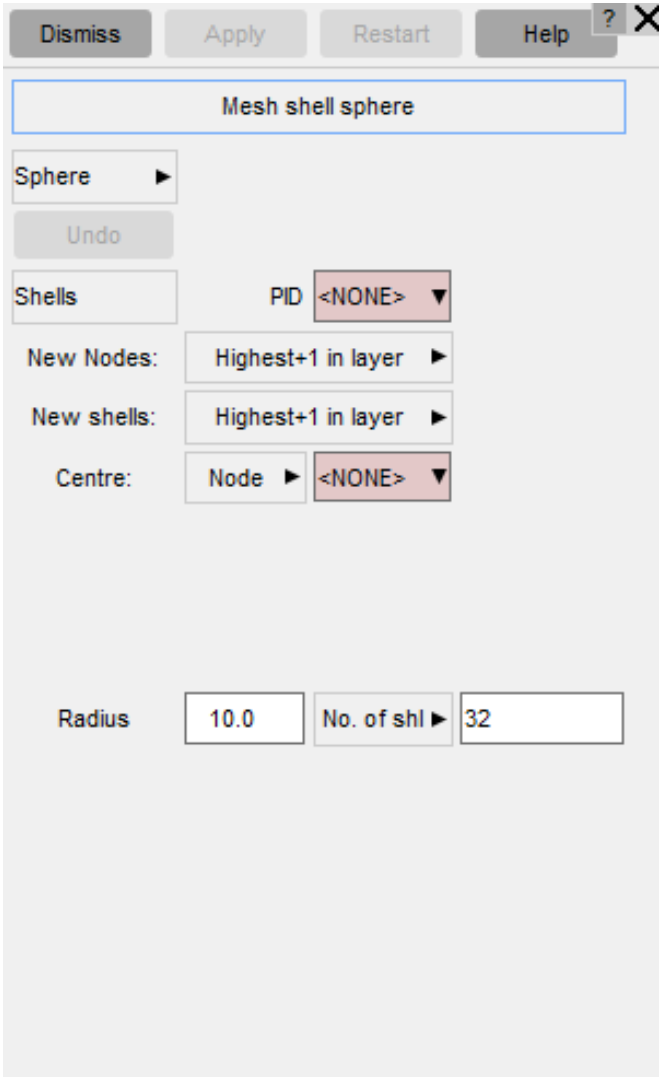
- After defining the Centre and a Point on normal, give the radius and either the number of shells around the circumference or the size of shells and press “Apply” to create.



Sphere

- **Sphere** allows you to create a spherical mesh of shells.

- After defining the Centre, give the radius and either the number of shells around the circumference or the size of the shells and press “Apply” to create.



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