Turbulent Pipe Flow (LES) - Mesh

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Mesh

In this section the geometry will be meshed using inflation feature to cluster more cells near the wall of the cylinder.

Launch Mesher

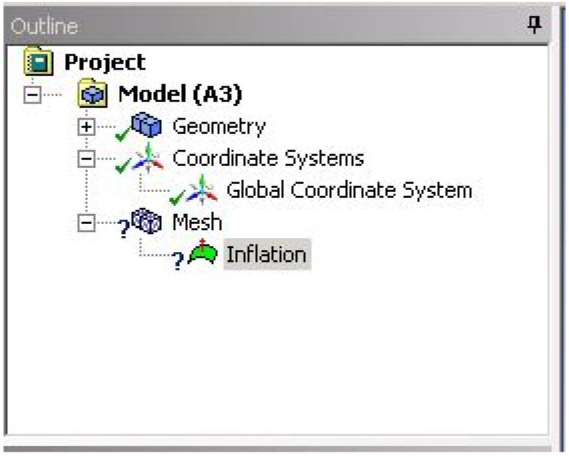
In order to begin the meshing process, go to the ***Workbench Project Page***, then ***(Double Click) Mesh***.

Inflation Feature (Mesh Control).

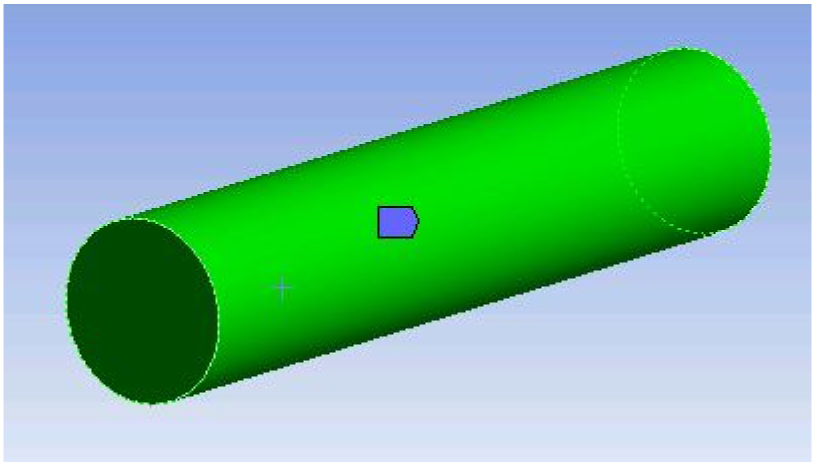
Right-click on the ***Mesh***, in the ***Outline*** view, choose ***Insert*** and then choose ***Inflation***.

Mesh> Insert> Inflation

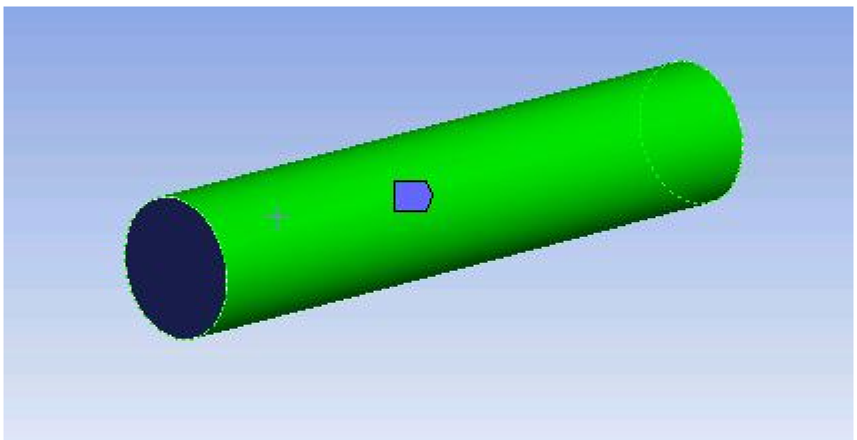
The ***Outline*** view should look something similar to the figure below.



The parameters for the ***Inflation*** are given in the ***Details Pane***. With ***Geometry*** highlighted, select the cylinder using body selection tool, , and click ***Apply***.



With ***Boundary*** highlighted, select the lateral surface using face selection tool, , and click ***Apply***.



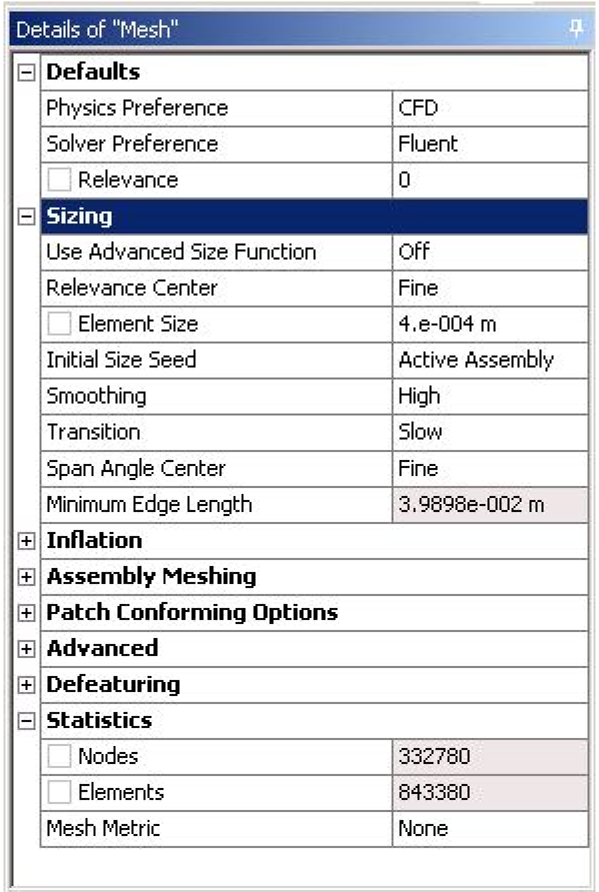
Finally, change ***Maximum Layers*** to 15 since we need more cells near the wall. The ***Details*** view should look something similar to the figure below.

Details of "Inflation" - Inflation

Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Suppressed	No
Boundary Scoping Method	Geometry Selection
Boundary	1 Face
Inflation Option	Smooth Transition
Transition Ratio	Default (0.272)
Maximum Layers	15
Growth Rate	1.2
Inflation Algorithm	Pre

Click on the ***Mesh*** in the ***Outline View*** to get the mesh details in the ***Details View***. Under ***Sizing***,change ***Use Advanced Size Function*** to ***Off***, ***Relevance Center*** to ***Fine***, ***element Size*** to ***4e-04m***, ***Smoothing*** to ***High***,

Right-click ***Mesh*** and choose to ***Generate Mesh,*** Generate Mesh, to generate the mesh. The ***Details View*** should look something similar to:



Details of "Mesh"

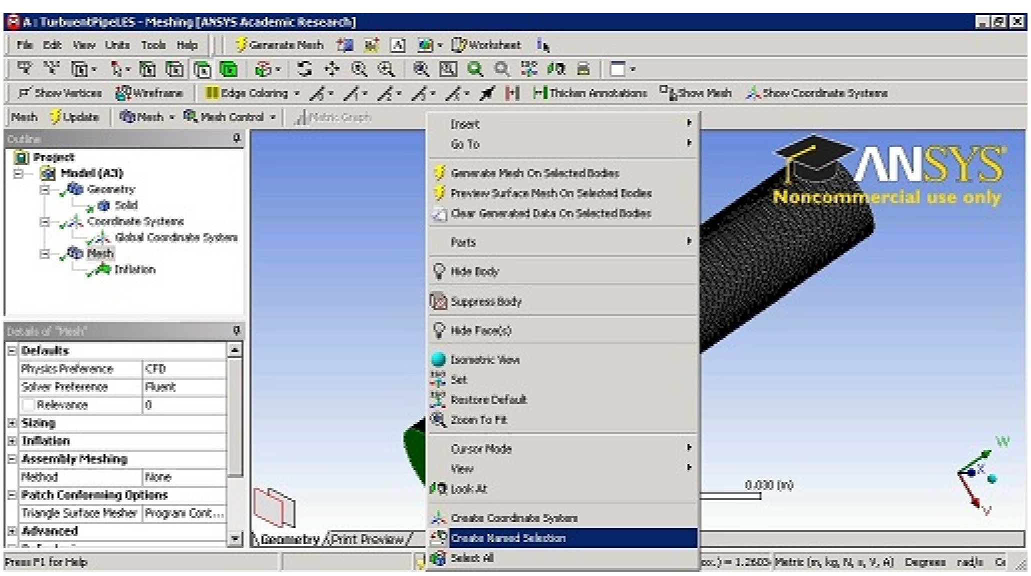
Defaults	
Physics Preference	CFD
Solver Preference	Fluent
Relevance	0
Sizing	
Use Advanced Size Function	Off
Relevance Center	Fine
Element Size	4.e-004 m
Initial Size Seed	Active Assembly
Smoothing	High
Transition	Slow
Span Angle Center	Fine
Minimum Edge Length	3.9898e-002 m
Inflation	
Assembly Meshing	
Patch Conforming Options	
Advanced	
Defeaturing	
Statistics	
Nodes	332780
Elements	843380
Mesh Metric	None

From the ***Mesh Statistics*** (in the figure above) we observe that we have about 0.85 million elements which would require multiple cores to run the simulation.

Create Named Selections

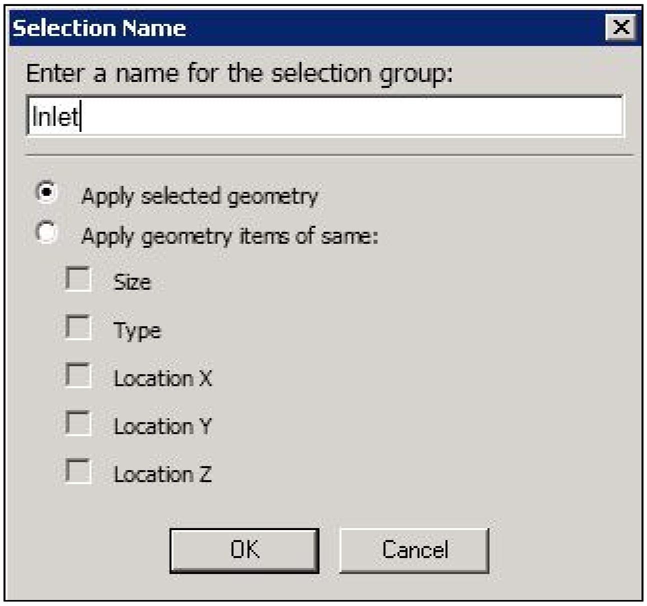
Here, the faces of the geometry will be given names so one can assign boundary conditions in Fluent in later steps. The left face of the pipe will be called "Inlet" and the right face will be called "Outlet". The lateral (or curved) surface of the pipe will be called "PipeWall".

To name the left face select the face selection tool, , ***(Left) Click*** the appropriate face and then ***(Right) Click*** to select ***Create Named Selection***.



Higher Resolution Image

Enter ***Inlet*** in the ***Selection Name Box*** as shown in the figure.



Repeat the same procedure for the other two faces.

Save, Exit & Update

First save the project. Next, close the Mesher window. Then, go to the ***Workbench Project Page*** and click the ***Update Project*** button,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Go to Step 4: Physics Setup

Go to all FLUENT Learning Modules