

Introduction to ANSYS Mechanical

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The goal of this workshop is to use several techniques in order to mesh an assembly. We will mesh half of the model because this model is symmetric.



ANSYS Project Schematic

- Begin a new Workbench session and, from the Project page, choose "Restore Archive . . . " and browse to the file "Meshing.wbpz" and Open (location provided by instructor).
- 2. When prompted, "Save" using the default name in the same location as the archive file.
- 3. Double click the "Model" cell to start Mechanical.







Generate a default mesh : RMB on mesh -> Generate mesh

Take time to have a look on this mesh.



By default, ANSYS Mechanical will use hexahedral elements for sweepable bodies as cylinder here and tetrahedral elements with patch conforming algorithm for other parts.

We will choose the best meshing method for each part and explain why. The first part has a lot of very small surfaces compared to the size of the part. We will use the tetrahedrons method with Patch independent Algorithm to get efficient node distribution on these small surfaces.







- 4. Choose the Body selection mode
- 5. Go on Mesh section by clicking on the mesh branch in the tree
- 6. Select the first part > RMB > insert > method
- 7. Change the method to "tetrahedrons"
- 8. Change the algorithm to "Patch Independent"
- 9. Put 5 mm for "Min Size limit" parameter









10.Select the body > RMB > Generate Mesh on selected bodies











This second part is sweepable since it is split prior to import. We can create a swept mesh by sweeping a surface mesh along the red arrows shown in the picture.





- 11. Select on body of second part > RMB > insert > method
- 12. Change the method to "sweep"
- 13. Change the Src/trg Selection to "Manual source an target". Select the source graphically then the target
- 14. Put 10 for the parameter "Sweep Num Divs"





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	Suppress Body		



- 15. Repeat the operations 11 -> 14 for the three other bodies in the part.
- 16. Select the 4 bodies > RMB > Mesh selected bodies





16.

Preview Surface Mesh On Selected Bodies
Clear Generated Data On Selected Bodies

Filter Tree Based On Visible Bodies

Insert Go To

Parts

Plide Body (F9)

Hide All Other Bodies

Show All Bodies



This third part has no problem. This part is simple to mesh so we will use tetrahedrons method with the patch conforming algorithm.



- 17. Select the third part > RMB > insert > method
- 18. Change the method to "tetrahedrons"
- 19. Change the algorithm to "Patch conforming"
- 20. Select the third part > RMB > insert > sizing
- 21. Put 8 mm for element size



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22.Select the body > RMB > Generate Mesh on selected bodies







This fourth and fifth parts are very simple. We will use the sweep method in the direction of the red arrows to generate the mesh.



- 23. Select the fourth part > RMB > insert > method
- 24. Change the method to "sweep"
- 25. Change the Src/trg Selection to "Manual source an target". Select the source graphically then the target
- 26. Put 25 for the parameter "Sweep Num Divs"



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	Definition		
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25.	Source	1 Face	
-0.	Target	1 Face	
	Free Face Mesh Type	Quad/Tri	
	Type	Number of Divisions	
26	Sweep Num Divs	25	
20.	Sweep Bias Type	No Bias	
	Element Option	Solid	





- 27. Repeat the operations 23 -> 26 for the fifth part.
- 28. Switch to face selection
- 29. Select the source face of each part > RMB > Insert > Sizing
- 30. Put 8 mm for element size.

Go To

Parts

P Hide Body (F9)

Show All Bodies

P Hide All Other Bodies

Show Bodies Visible In Tree

Filter Tree Based On Visible Bodies

Generate Mesh On Selected Bodies

Preview Surface Mesh On Selected Bodies

Clear Generated Data On Selected Bodies





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Contact Sizing

A Refinement

Face Meshing

Match Control

🗭 Node Merge

Node Move

Node Merge Group

A Inflation





The sixth part can be swept in different ways. This part can be sliced in DM or Spaceclaim before bringing into mechanical to mesh using Hex dominant method.





- 32. Switch to body selection
- 33. Select the sixth part > RMB > insert > method
- 34. Change the method to "hex Dominant"
- 35. Select the sixth part > RMB> insert > sizing
- 36. Put 8 mm for element size







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etails of "Body S	izing 2" - Sizing
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Scoping Method	Geometry Selection
Geometry	1 Body
Definition	N 83
Suppressed	No
Type	Element Size
Element Size	8, mm
Behavior	Soft





37. Select the sixth part > RMB > Mesh selected bodies







You can now look at the entire mesh.



You can check the mesh statistics for the number of nodes, elements and it's quality.

- 38. Select the mesh branch
- 39. Go on the details view > statistics > Check the number of nodes
- 40. Change mesh metric to element quality then you can have a look at the mesh quality





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You can now improve the mesh locally by using local Units Tools mesh tools. **3** k - € €

41. Switch to face selection



43. Generate the mesh on this part







We can improve the mesh by using inflation.

- 41. Go on mesh > RMB > Inflation
- 42. For geometry select the body



- 43. For boundary, select the two faces shown. Choose for inflation option: total thickness, number of layer: 5 Growth rate: 1 and maximum Thickness: 8mm
- 44. Generate the mesh

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	Details of "Inflation" - Inflat	tion	
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	Definition		
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	Boundary Scoping Method	Geometry	Selection
_	Boundary	2 Faces	
	Inflation Option	Total Thic	iness
5.	Number of Layers	5	
	Growth Rate	1	
	Maximum Thickness	8, mm	
	Inflation Algorithm	Post	





ANSYS Go further!

If you finish this workshop and find yourself with extra time, you could try the following steps:

1. Look at the mesh quality to identify the bad elements. Try other global or local mesh methods in order to improve it.



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