

Multi-block Meshing of 2D Geometry

Spoken Tutorial Project

<https://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in/>

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Learning Objectives

We will learn to:



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- ▶ **Create a geometry with multiple blocks using `blockMeshDict`**



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- ▶ **Vary meshing parameters for each block**



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- ▶ **Vary meshing parameters for each block**
- ▶ **Label the** `boundary` `patches`
- ▶ **View the mesh in** `ParaView`



System Specifications



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► Ubuntu Linux OS version 18.04



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- ▶ **OpenFOAM version 7**



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- ▶ **ParaView version 5.6.0**
- ▶ **gedit Text Editor**



Prerequisites



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- ▶ You should be familiar with creation of a basic geometry using the `blockMesh` utility



Prerequisites

- ▶ You should be familiar with creation of a basic geometry using the `blockMesh` utility
- ▶ If not, please go through the prerequisite OpenFOAM tutorial on <https://spoken-tutorial.org>



Code Files

- ▶ **The files used in this tutorial are available in the `Code Files` link on this tutorial page**



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- ▶ **Please download and extract them**

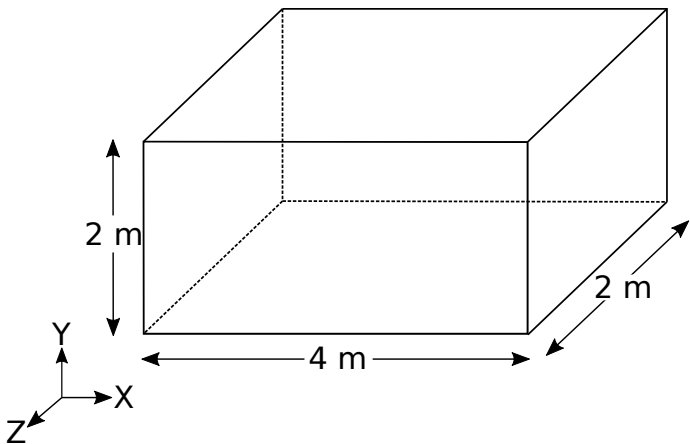


Code Files

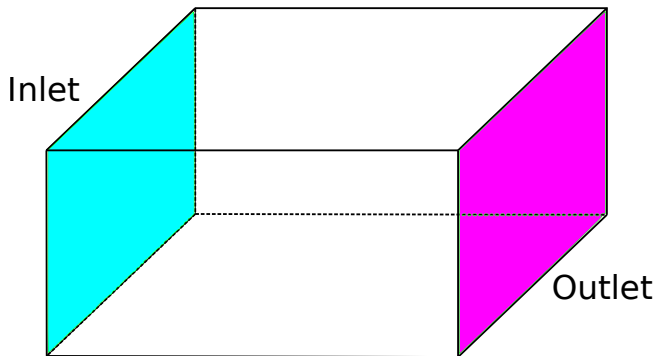
- ▶ **The files used in this tutorial are available in the `Code Files` link on this tutorial page**
- ▶ **Please download and extract them**
- ▶ **Make a copy and then use them while practising**



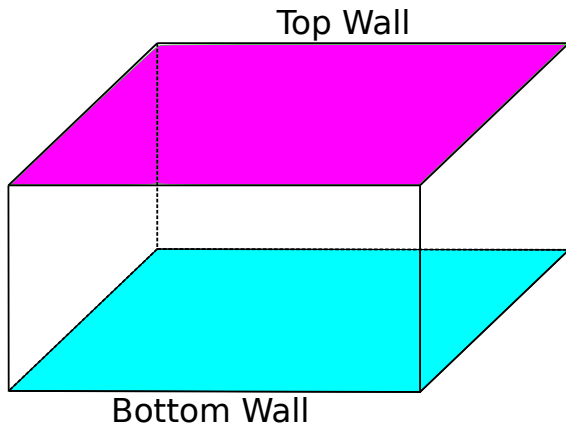
Geometry



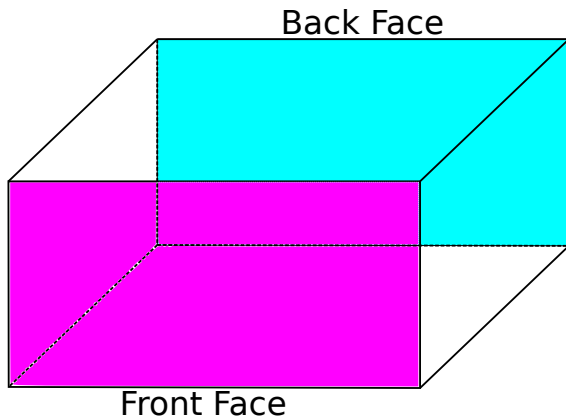
Faces



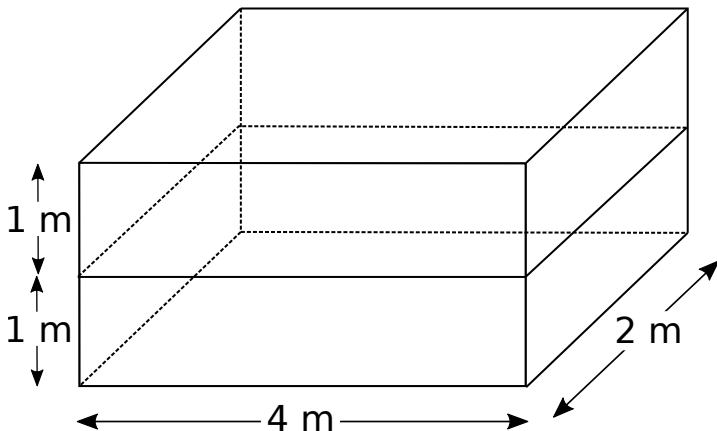
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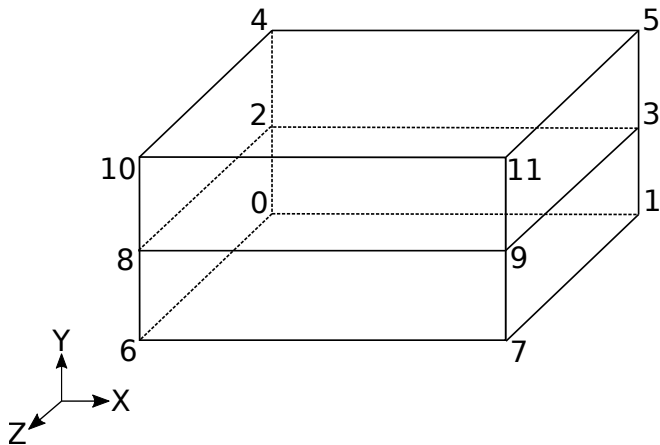
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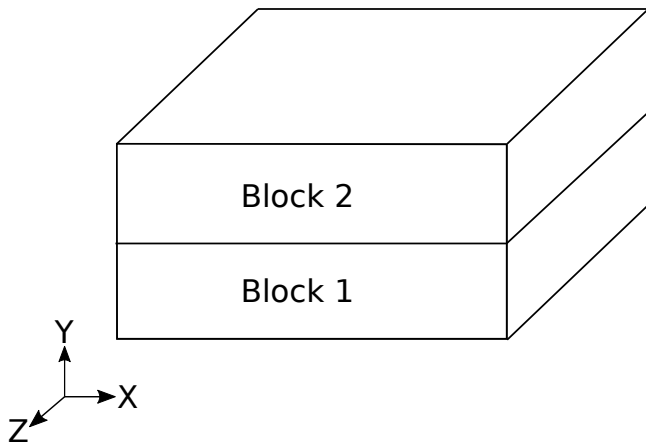
Blocks



Vertices



Blocks



Block 1



Block 1

- ▶ **We first enter the vertices of the back face and then that of the front face**



Block 1

- ▶ **We first enter the vertices of the back face and then that of the front face**
- ▶ **When viewed along the negative z-direction, the vertices should be ordered counterclockwise**



Block 1

- ▶ **Following this convention, the vertices of the back face are ordered 0, 1, 3 and 2**

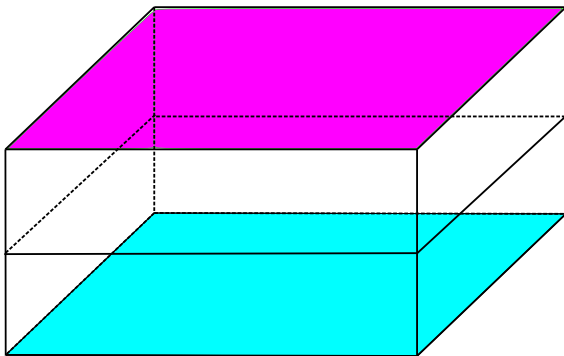


Block 1

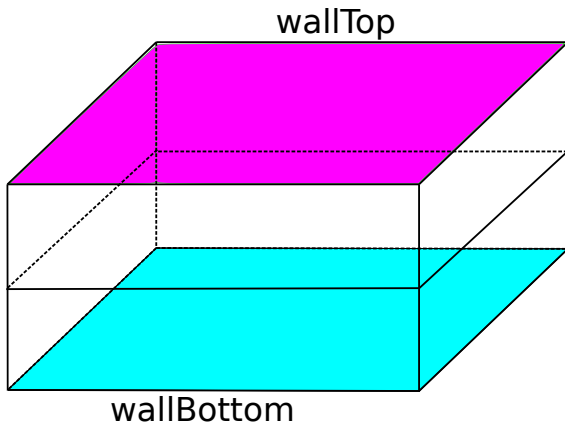
- ▶ **Following this convention, the vertices of the back face are ordered 0, 1, 3 and 2**
- ▶ **The corresponding order of the front face is 6, 7, 9 and 8**



Boundary



Boundary



Cyclic Patch

- ▶ **The face type for a cyclic patch is defined using the keyword `cyclic`**

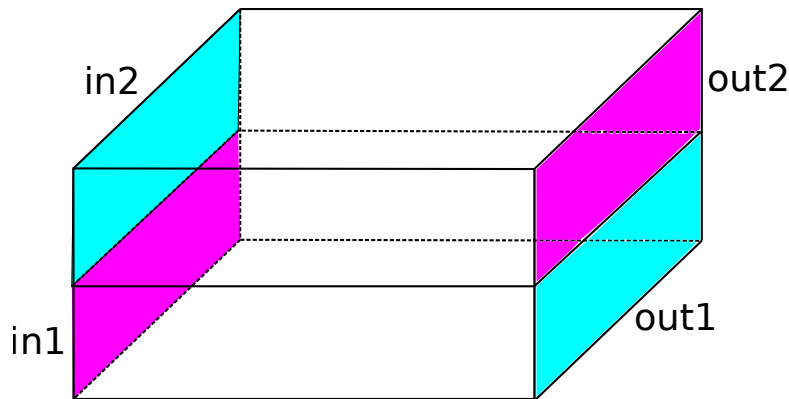


Cyclic Patch

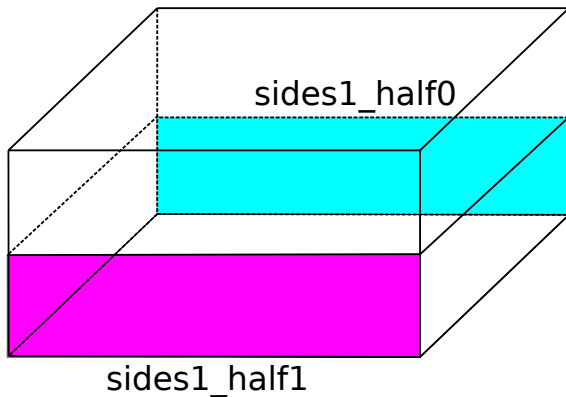
- ▶ **The face type for a cyclic patch is defined using the keyword `cyclic`**
- ▶ **The pair of faces are linked to each other through the keyword `neighbourPatch`**



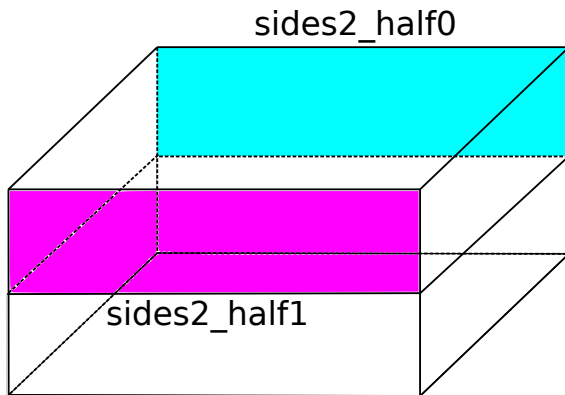
Boundary



Boundary



Boundary



Summary

We have learnt to:

- ▶ **Create a geometry with multiple blocks using `blockMeshDict`**
- ▶ **Vary meshing parameters for each block**
- ▶ **Label the boundary patches**
- ▶ **View the mesh in ParaView**



Assignment



Assignment

- ▶ **Create a geometry having dimensions 5 m, 4 m and 3 m along x, y and z axis**
- ▶ **Divide the geometry into 2 equal blocks along the x axis**



Assignment

- ▶ **Mesh the geometry such that it has 25, 20 and 1 cell along x, y and z axis for each block**
- ▶ **Set expansion ratio as 10, 1 and 1 along x, y and z axis for both the blocks**
- ▶ **View the mesh in ParaView**



About the Spoken Tutorial Project

- ▶ Watch the video available at https://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarises the Spoken Tutorial project
- ▶ If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- ▶ Conducts workshops using spoken tutorials
- ▶ Gives certificates to those who pass an online test
- ▶ For more details, please write to contact@spoken-tutorial.org



Spoken Tutorial Forum

- ▶ **Questions in THIS Spoken Tutorial?**
- ▶ **Visit** <https://forums.spoken-tutorial.org/>
- ▶ **Choose the minute and second where you have the question**
- ▶ **Explain your question briefly**
- ▶ **The Spoken Tutorial project will ensure an answer**

You will have to register to ask questions



FOSSEE Forum

- ▶ Questions not related to the Spoken Tutorial?
- ▶ Do you have general / technical questions on the Software?
- ▶ Please visit the FOSSEE Forum <https://forums.fossee.in/>
- ▶ Choose the Software and post your question



FOSSEE Case Study Project

- ▶ The FOSSEE team coordinates solving feasible CFD problems of reasonable complexity using OpenFOAM
- ▶ We give honorarium and certificates to those who do this
- ▶ For more details, please visit:
<https://cfd.fossee.in/>
<https://fossee.in/>



Acknowledgements

- ▶ **Spoken Tutorial Project is supported by the MHRD, Government of India**

