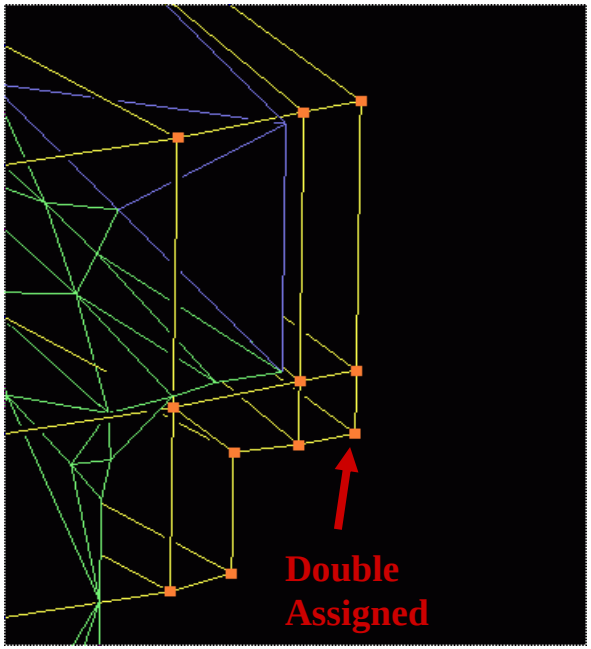
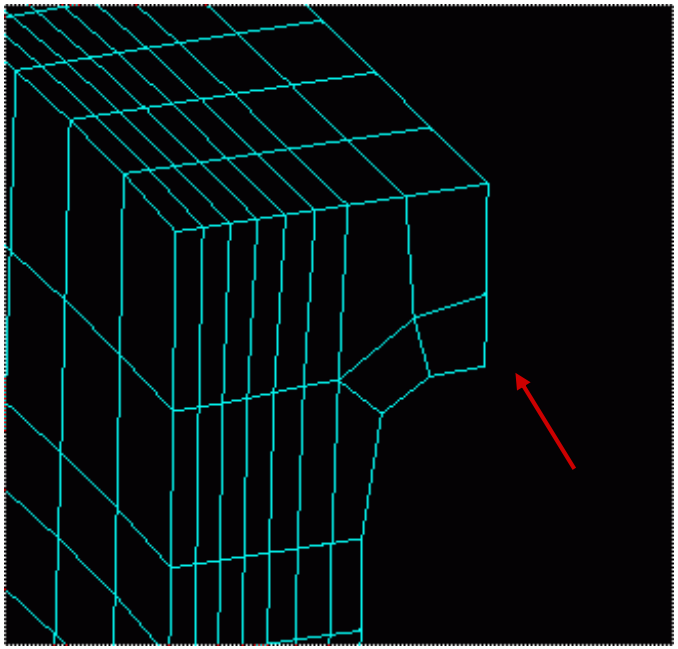
Advanced Terminologies

Capturing Sharp Edges

- To define a grid with a sharp edge, surfaces must be **segmented**
- To capture the edge a **double topology assignment** must be applied to the surfaces
- The corner that is double assigned will snap to the intersection of the surfaces
- If the double assigned corner is in **convex region**, then an **internal surface** should be created and assigned in order to capture the sharp edge.





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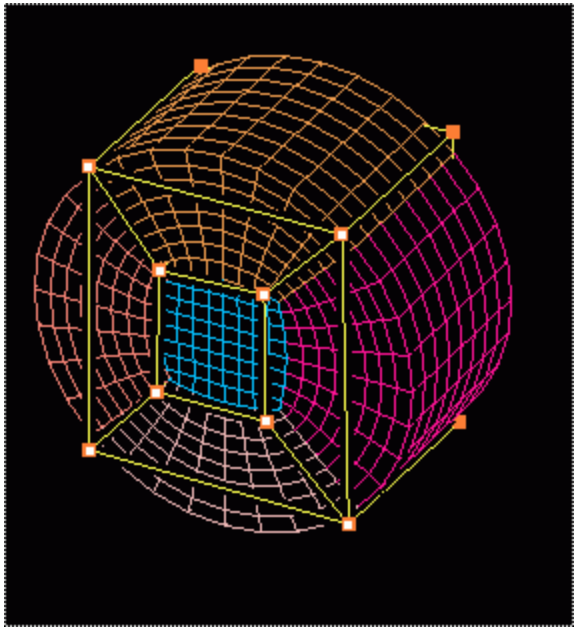
Face Exclusions

- At times a wrap must be made using face exclusions
- The objective is to create a grid with a well defined planar face

Example: Grid of a Tube



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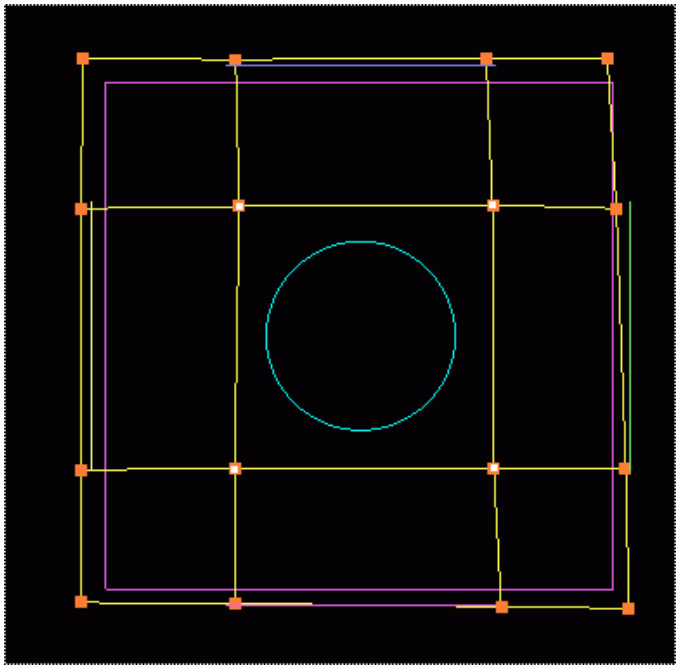
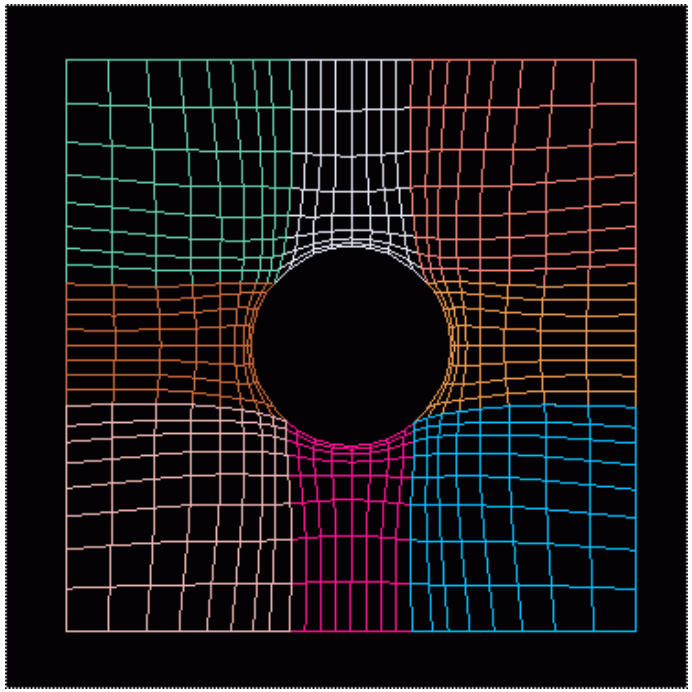
Wrap

- In GridPro a **wrap** is used to move the singularities into the interior.
- A wrap is an extrusion of the topology outward or inward, the distance being specified by the user

Example: Grid on cylinder



Cartesian Topology/H-Type



Grid

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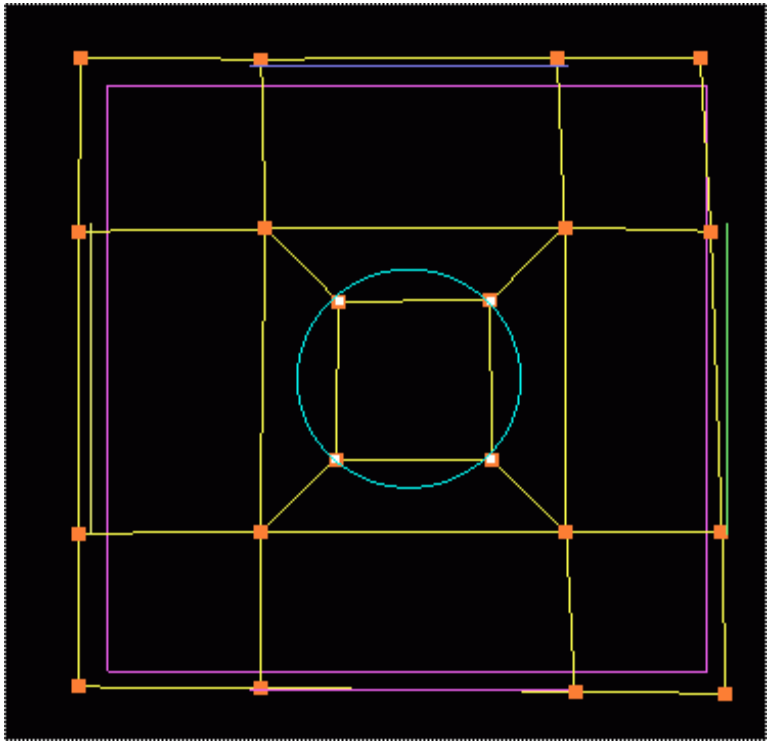
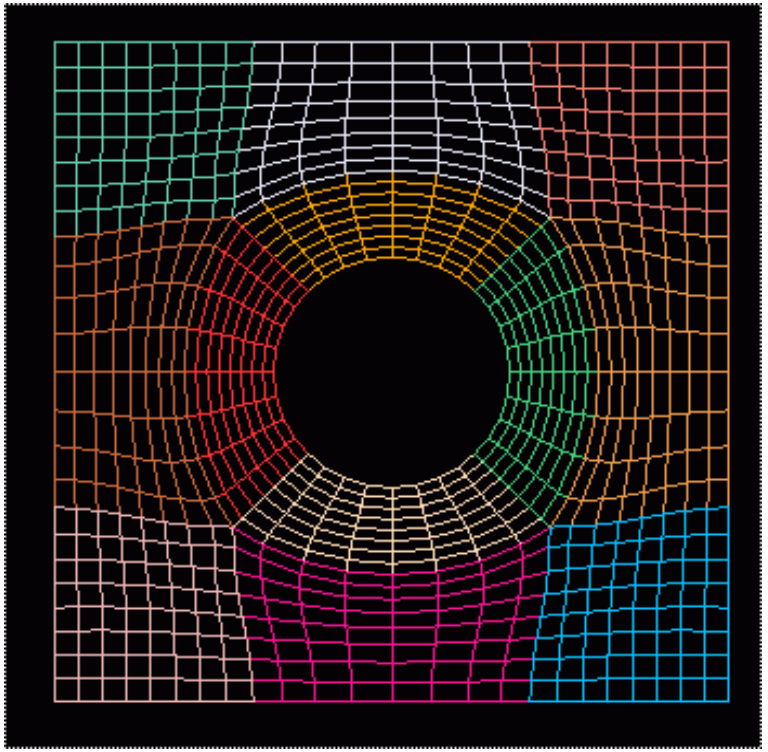


Cartesian Topology with Wrap

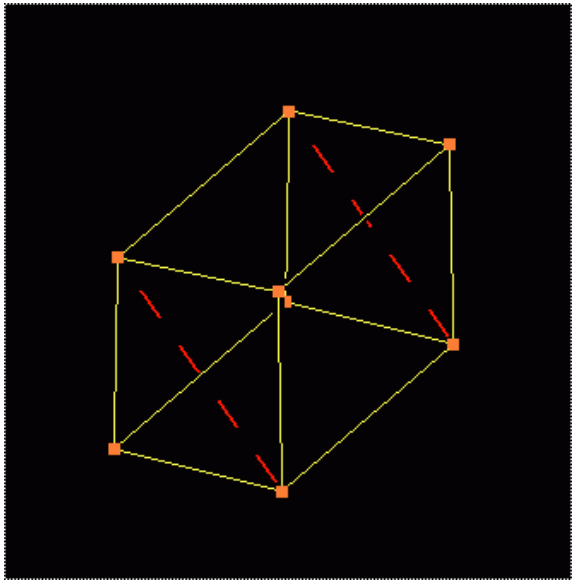


Grid

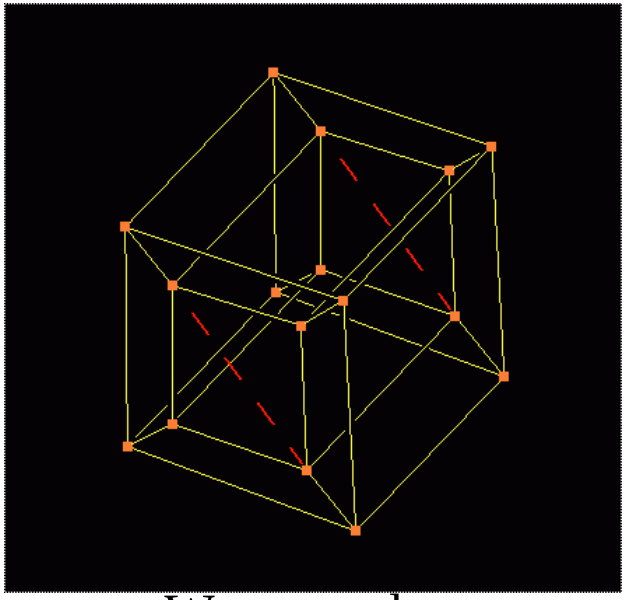
• Wrap ensures that a high quality grid will be created on the boundary and in the interior

Wrapping for Grids with Sharp Edges

- Must use face exclusion
- Hold down <F> key and click on the two topology points defining the face
- A dashed red line will be created showing that the face will be excluded from the wrap



Exclude faces from wrap



Wrap topology

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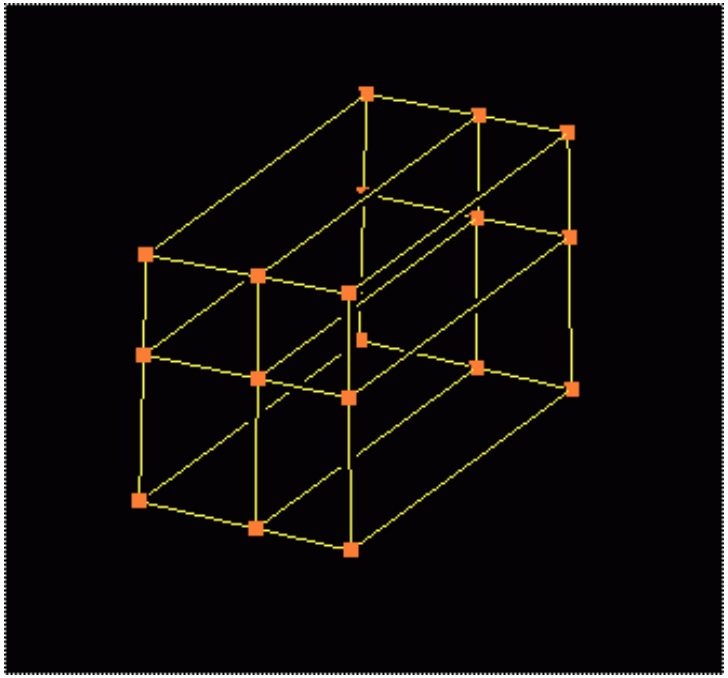
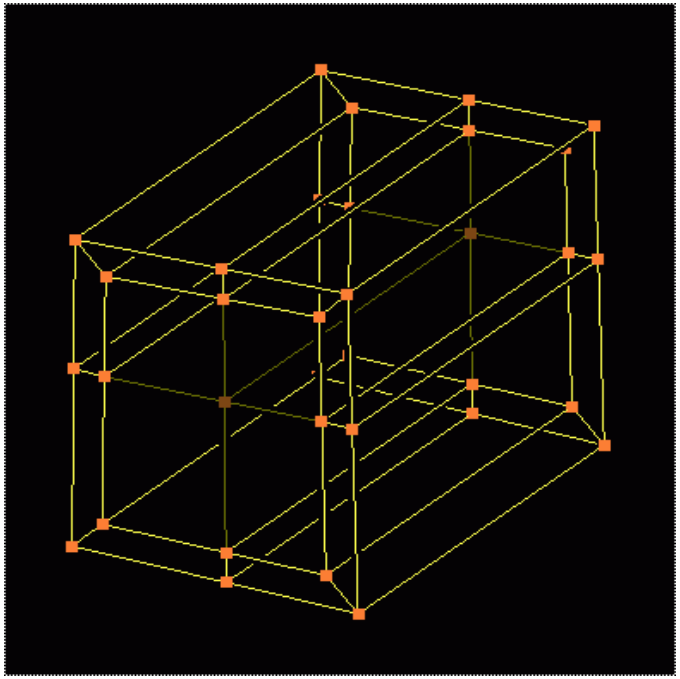
Splitting Topology

- The same wrap defining a grid with a well defined planer face can also be achieved by splitting the topology
- Split the topology by holding down the <I> key and clicking on the topology edge



Split Topology



Add outer topology to group and wrap

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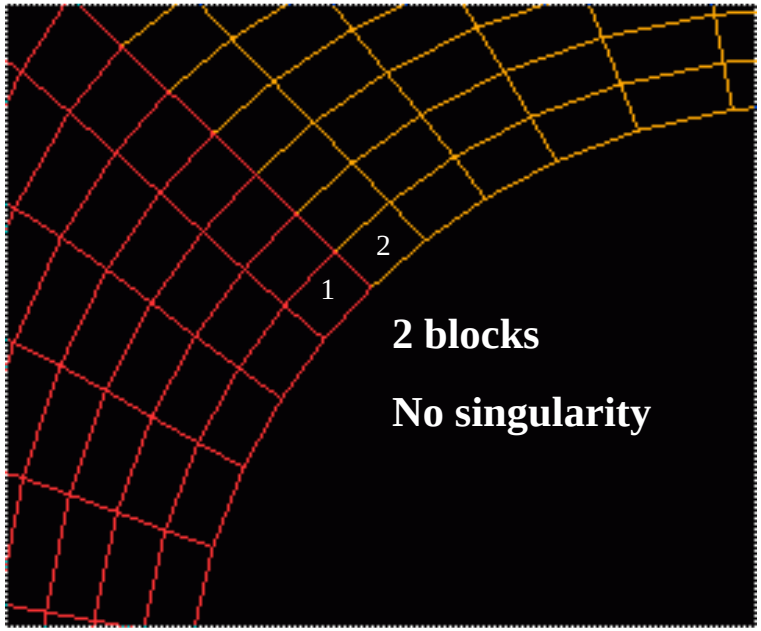
Singularities

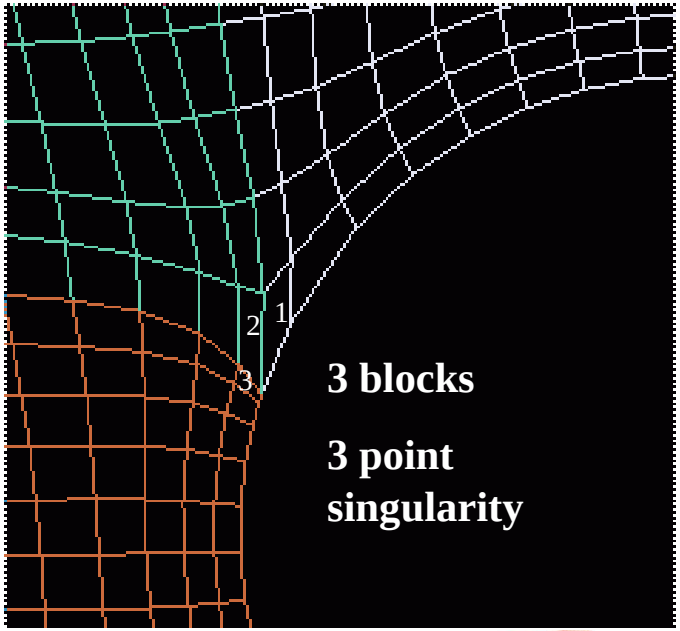
- A **singularity** in any region of the grid is where the vertex of the block structure is:

  1. Not equal to 2 on the boundary

  2. Not equal to 4 in the interior of the grid

Example of 2D Boundary Singularity





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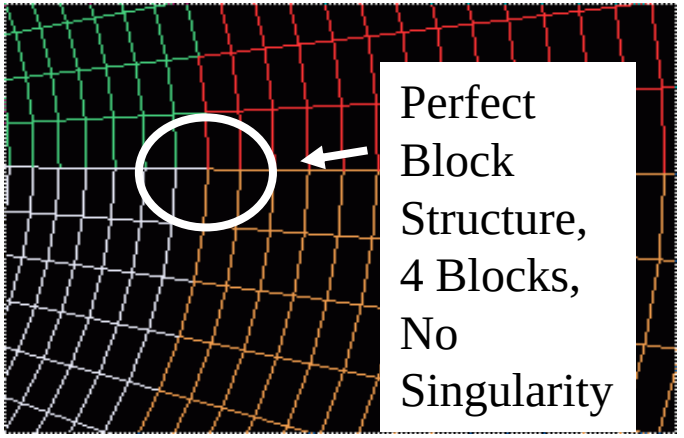
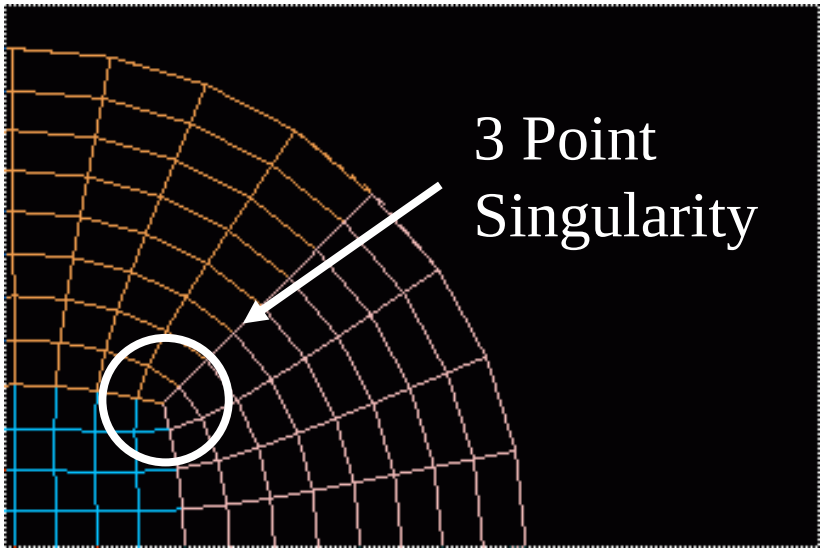
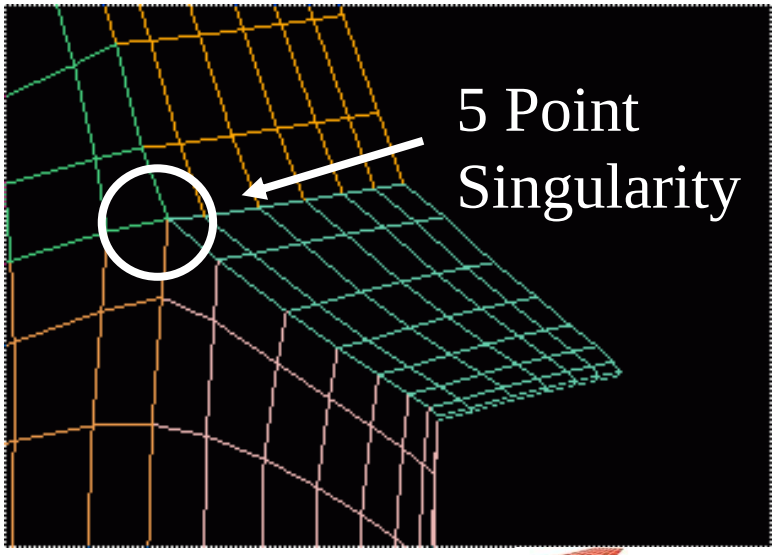
Example of 2D Interior Singularities







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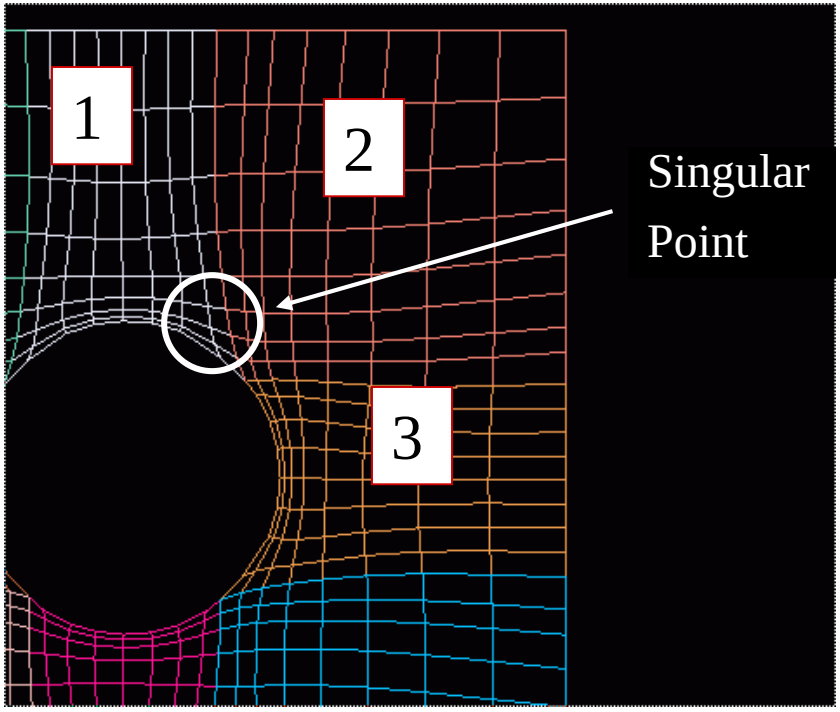
Singularities in 3D

- All singularities can exist within the **interior** of the grid.
    - **Singular Points**, can exist on a surface
    - **Singular Edges**, the point where the 3D block structure meets, **cannot** exist on a surface
- **Example: Singular Edges, 2D Case**



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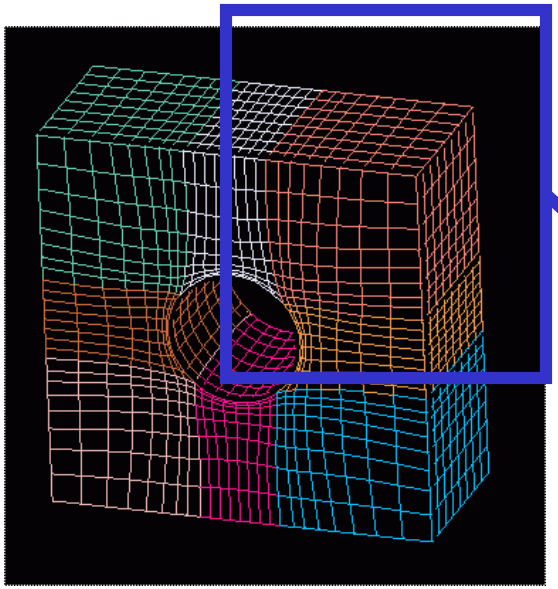
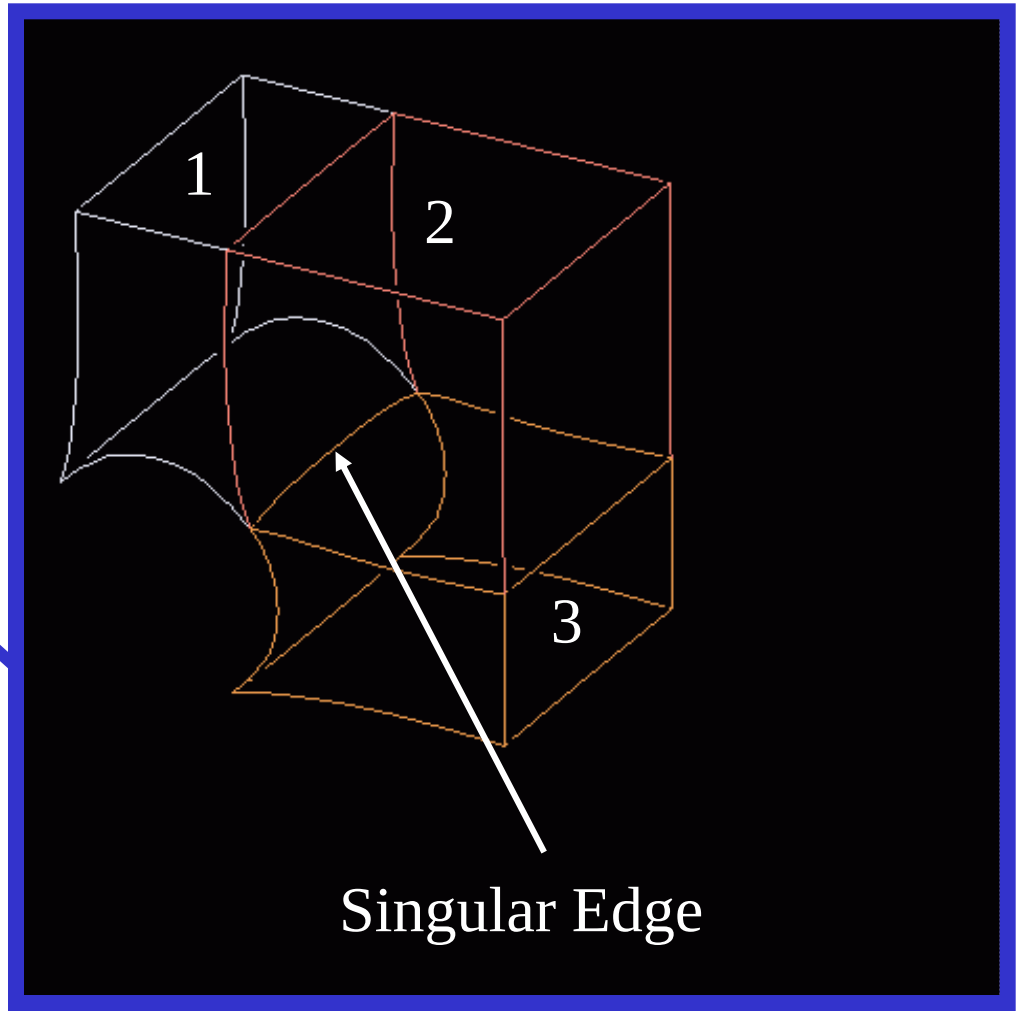
3D Case (Singular Edge Defined by 3 Blocks)





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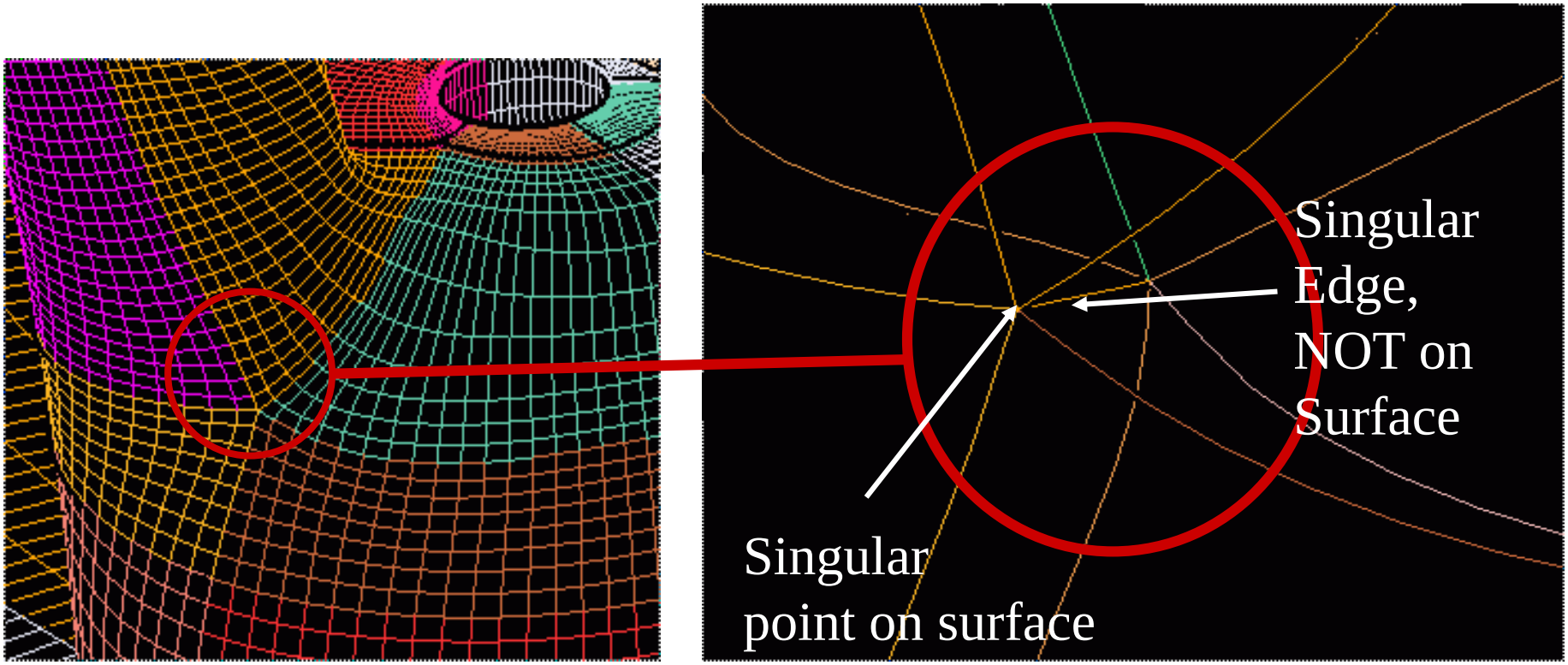
Singular Points Can Exist on the Surface

- Singularity defined by 5 blocks that meet at point and share a common edge
- Singular edge can exist in the interior but cannot lie on the surface

Example: Five Point Singularity on Surface



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Types of Singularity

- Based on the position of the singular point and singular edge, the singularities are classified into 3 different types.
- They are,
    - Mildly severe singularity
    - Mediumly severe singularity
    - Very severe singularity

Mildly Severe Singularity

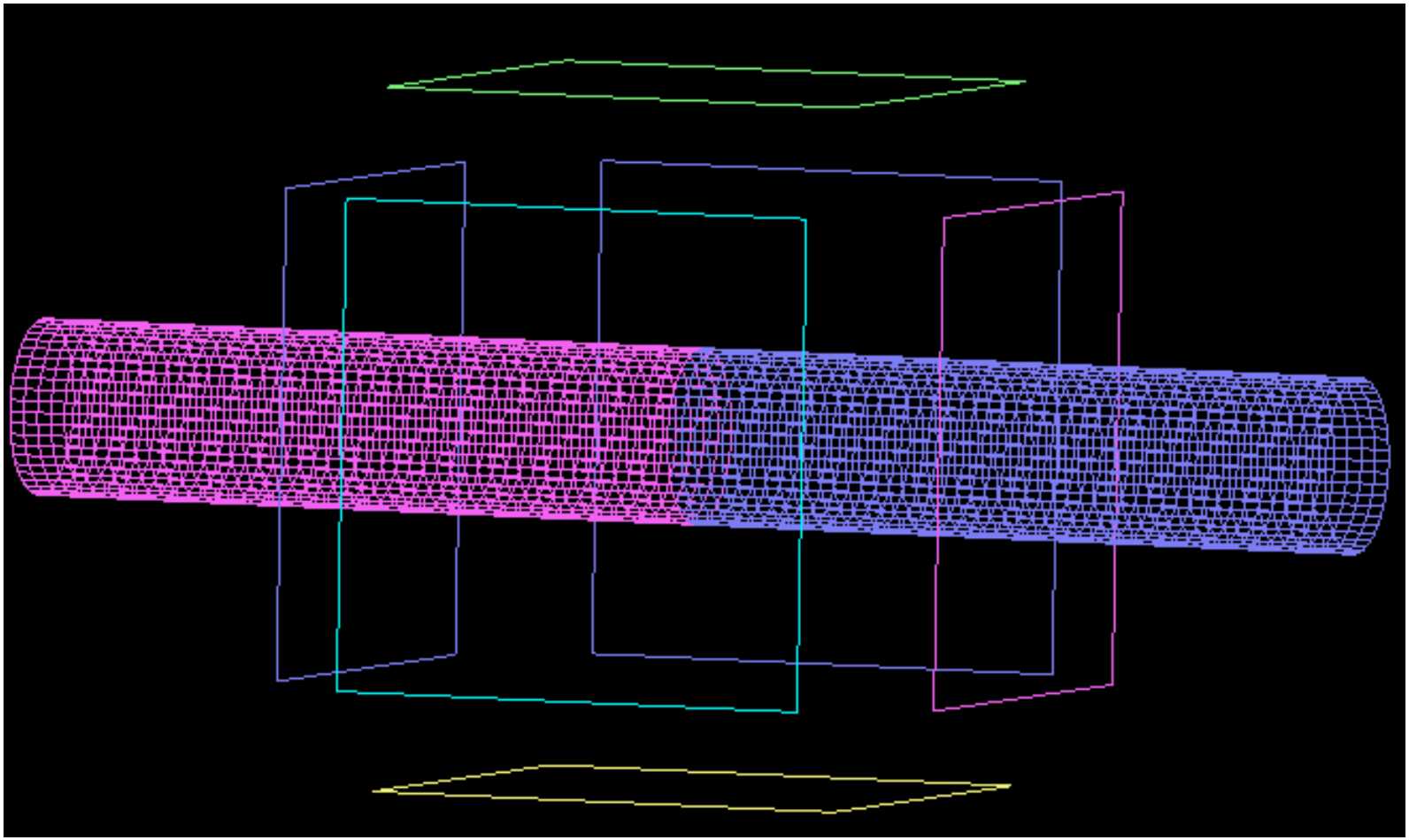

Fig: Example

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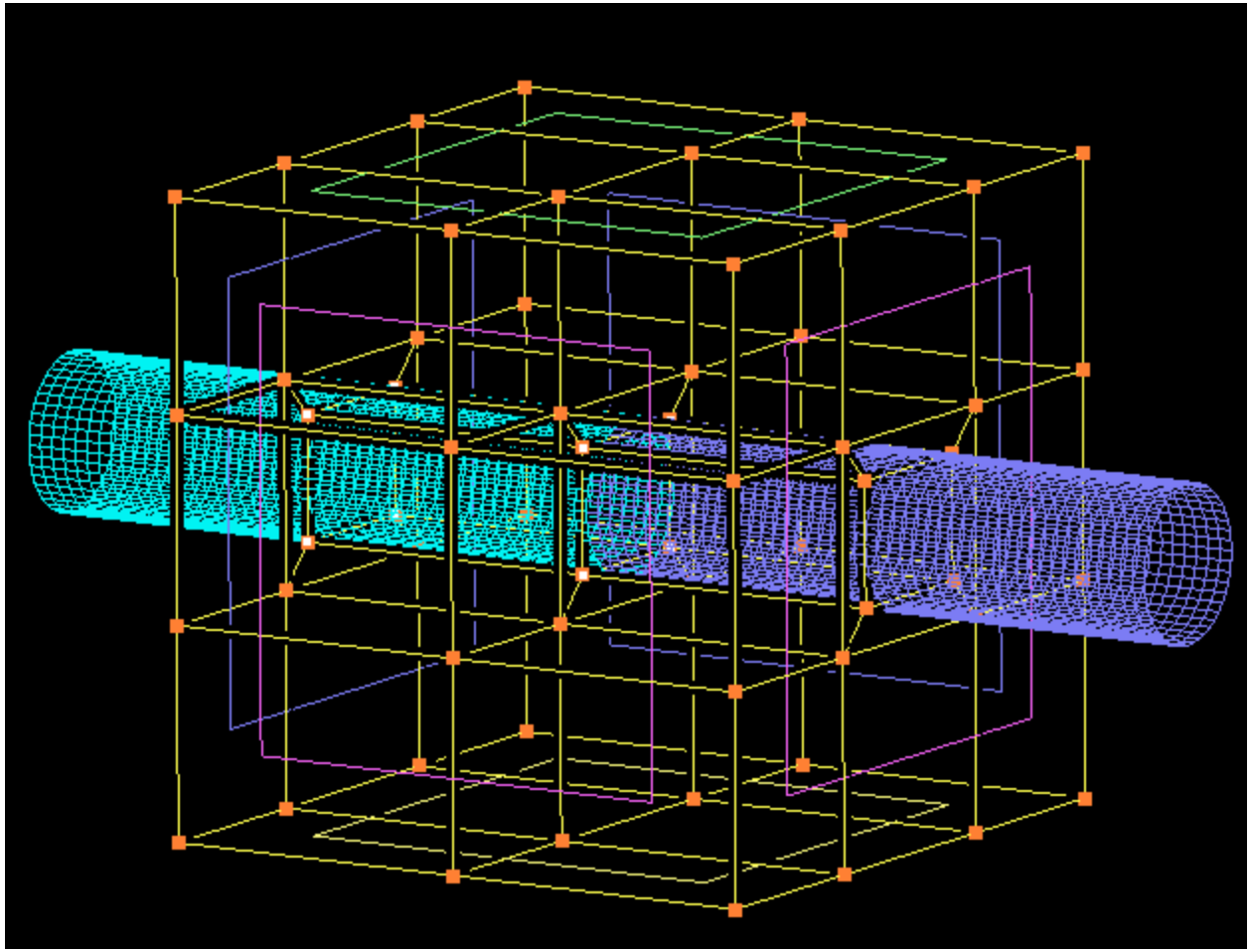

- If a corner/edge is fixed by assigning to more than one surface. And the edge emerging from that fixed point/edge is free to move, then it is called mildly severe singularity.

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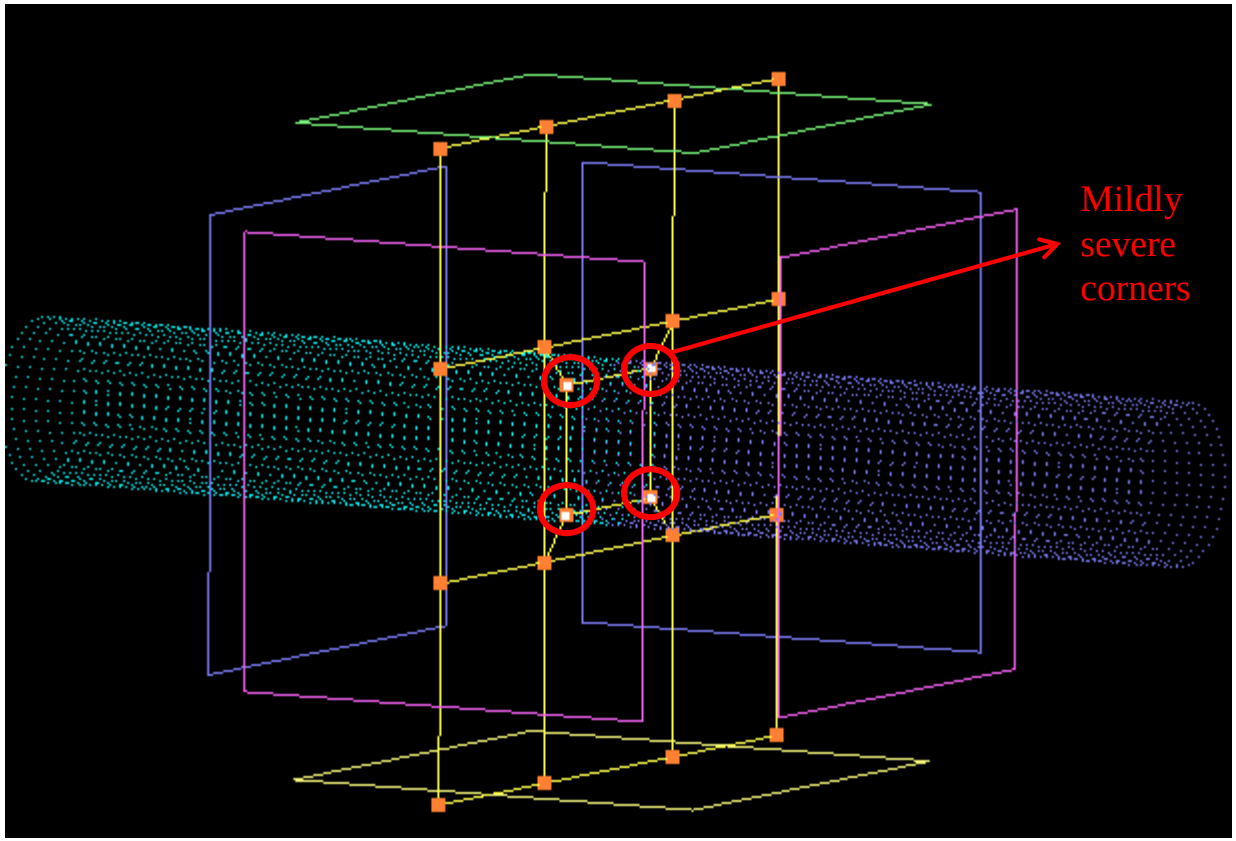

- These four corners are assigned to both the pipes.
- The edge emerging out of the double assigned corners are free to move, so it is called mildly severe singularity.
- This results in highly skewed grid.

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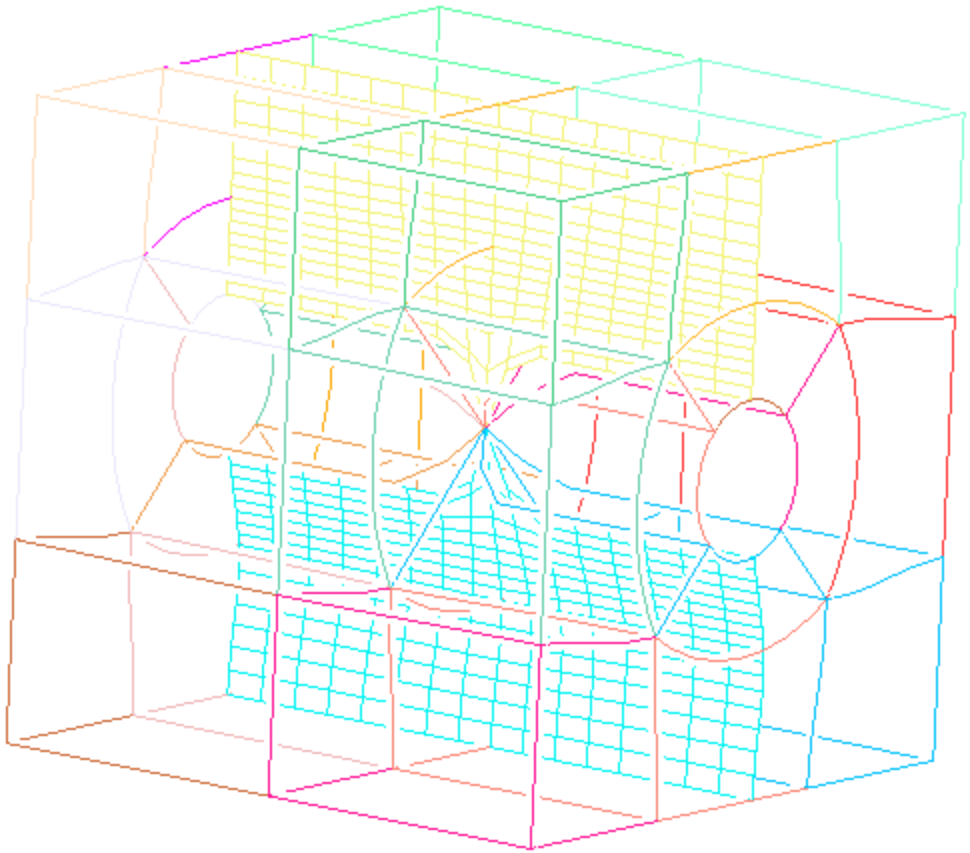

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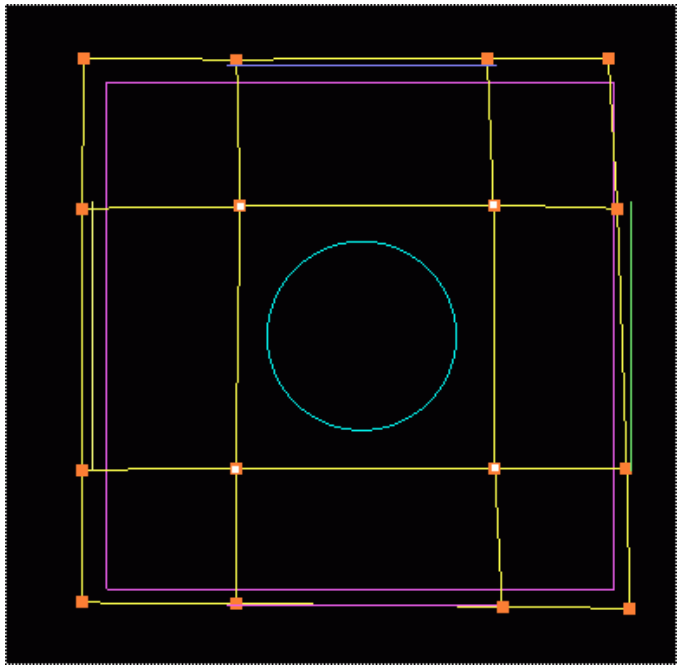
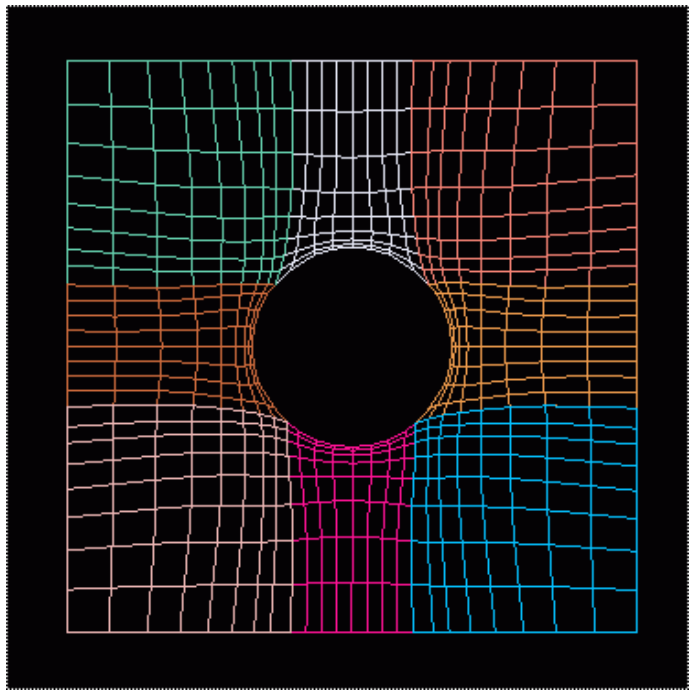
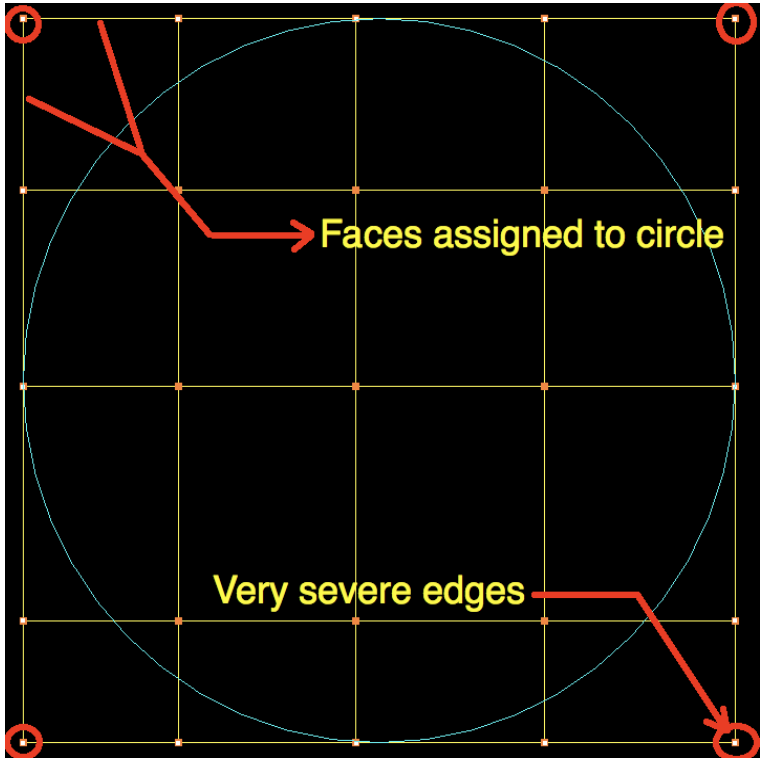
Mediumly Severe Singularity



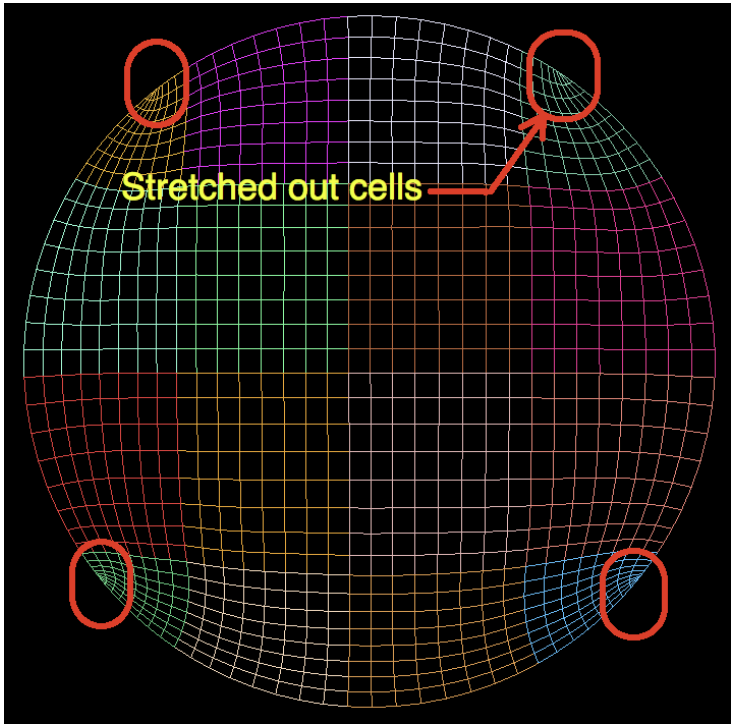
- If a non-fixed edge has more than two blocks on one side of the surface, then it is called mediumly severe edge.



Very Severe Singularity



- If two faces of a block is assigned to a surface, then it is called very severe edge.



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End of terminologies and concepts