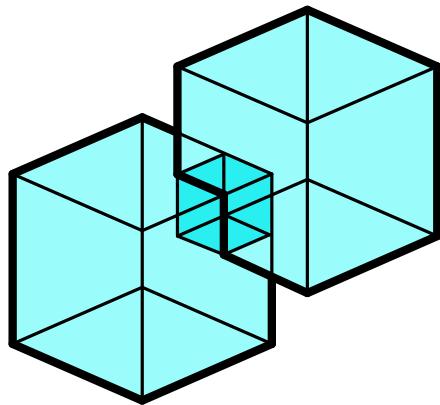




The Leverhulme Trust



Topologic

TUTORIAL 02 Creating a Multi-Storey Building

Version: 0.8.6

June 2020

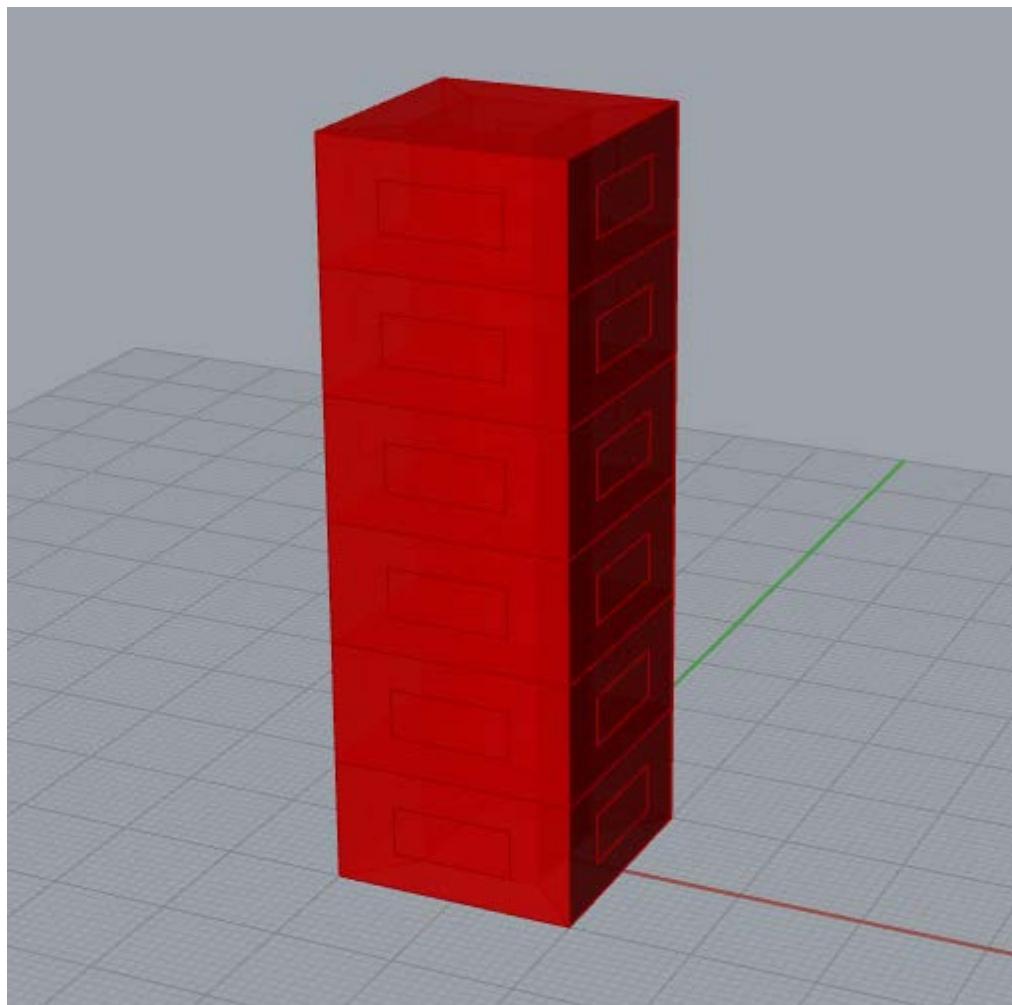
Katherine Sawey

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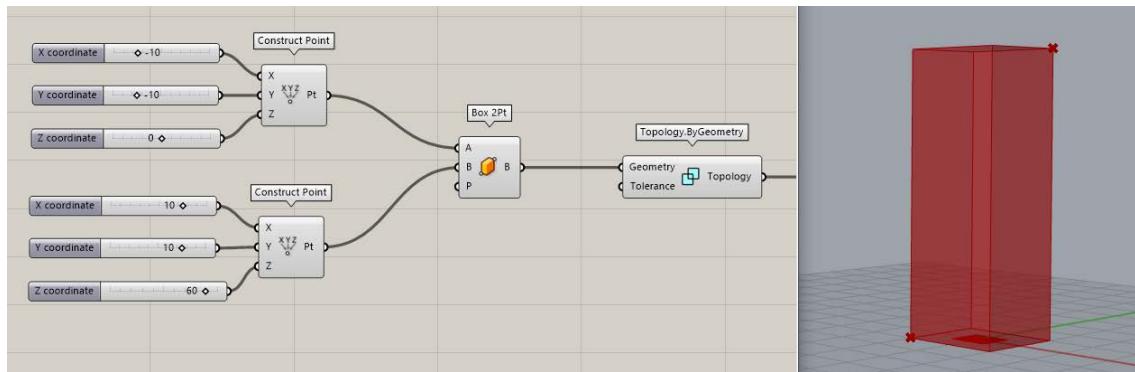
Introduction

In this tutorial, we will build a very simple multi-storey building as seen below. This building will also serve as the basis of future tutorials on energy analysis. Therefore, make sure you save the Grasshopper definition file when it is complete. The building will be made of an outer prism (**Cell**) that will be sliced horizontally into multiple floors by a **Cluster of Faces** using the **Topology.Slice** method. This will result in a **CellComplex**. An inner core (**Cell**) will be imposed on the **CellComplex** using **Topology.Impose**. A cluster of four diagonal **Faces** will be used to slice the perimeter zones into four quadrants. Finally, a set of **Faces** will be added to the **CellComplex** as **Apertures** to define the location of windows using **Topology.AddApertures**.



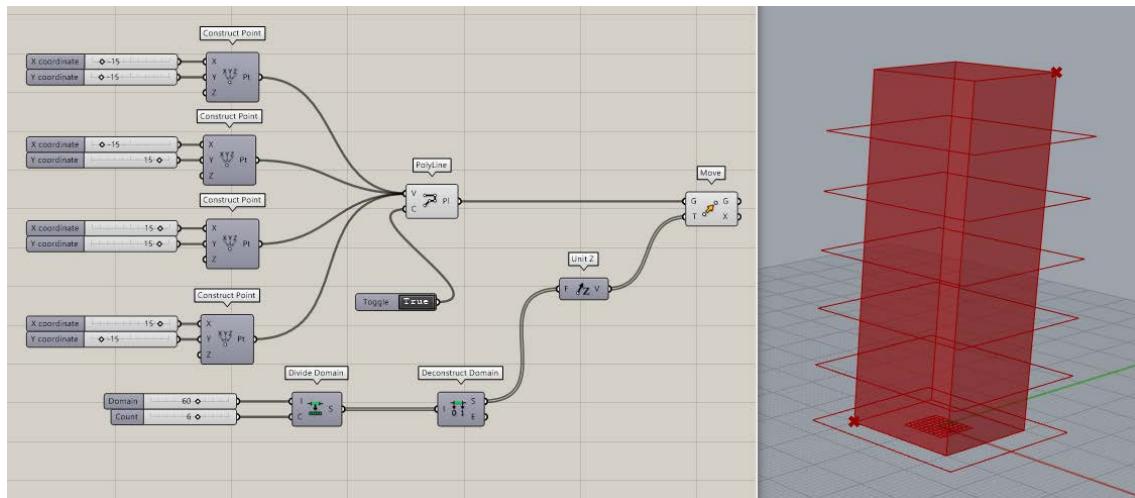
Step 1: Create the outer prism

Create a 20x20x60 Grasshopper Cuboid with its base centred at [0,0,0] and convert to a Topologic **Cell** using **Topology.ByGeometry**, as seen in the figure below.

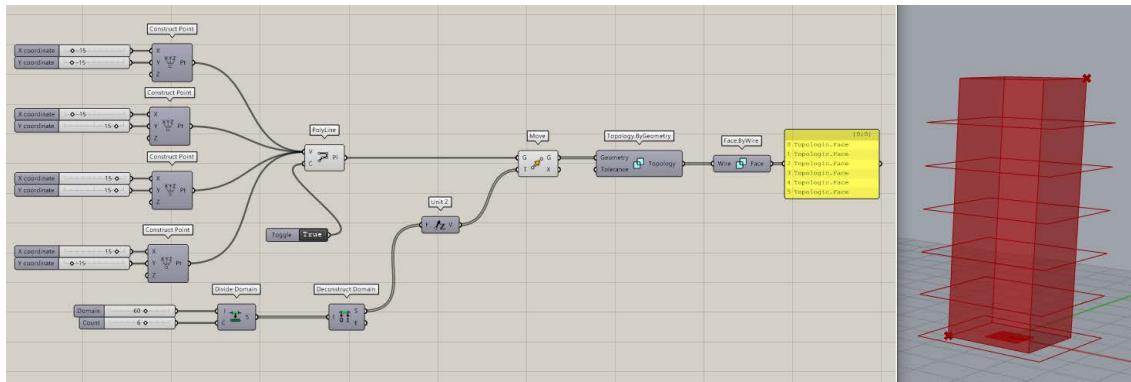


Step 2: Create a Cluster of Faces

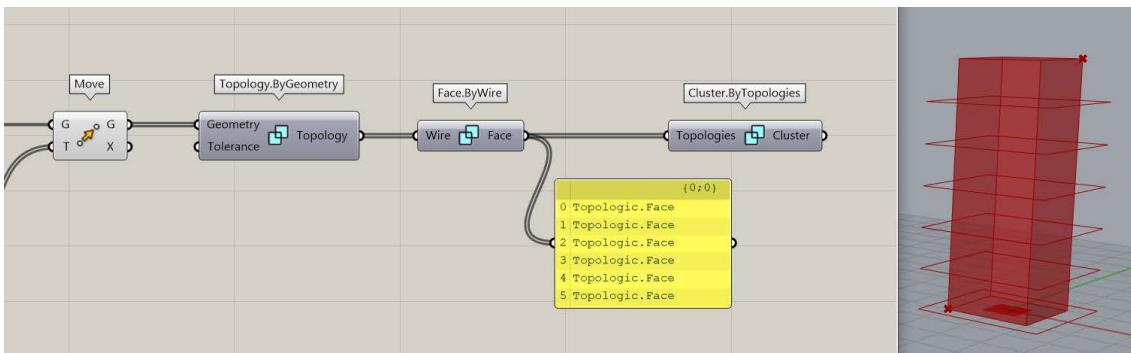
To create a **Cluster** of slicing Faces, start by creating a 30x30 rectangle centred at the origin and then translate 5 copies of it in the Z direction. You should use 0 for xTranslation and yTranslation and then a series using the syntax **10..50..10** for the zTranslation as seen below.



Convert the rectangles to **Wires** using **Topology.ByGeometry** and build **Faces** using **Face.ByWire** as seen below.

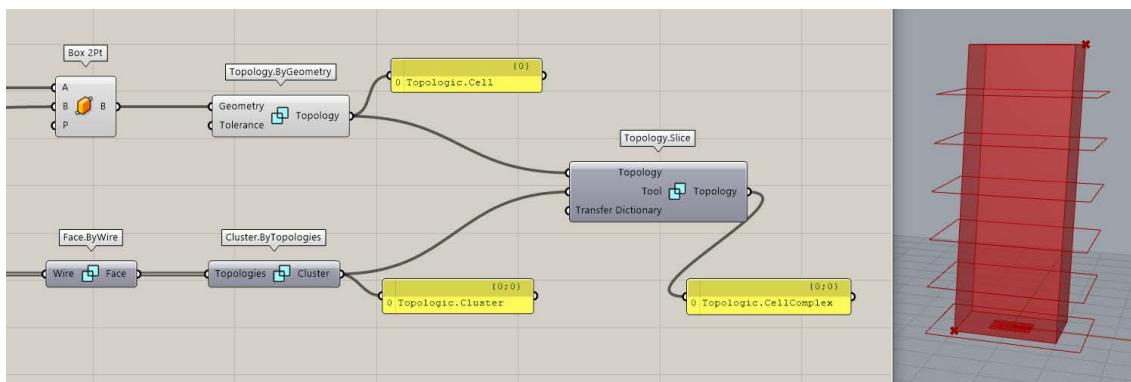


The last step is to build a **Cluster** from the **Faces** using **Cluster.ByTopologies** as seen below.

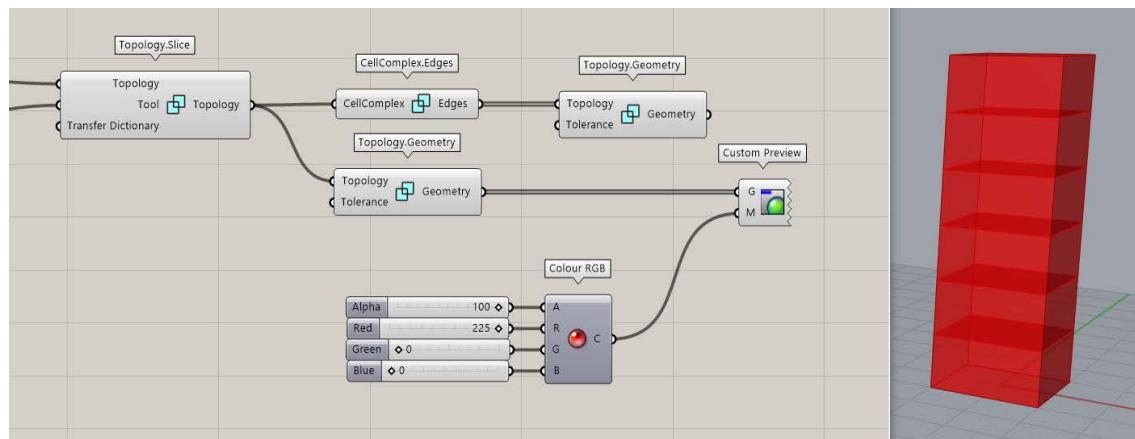


Step 3: Slice the outer prism with the Cluster of Faces

To create a **CellComplex**, add a **Topology.Slice** node and feed it the **Cell** (to the topology input port) and the **Cluster of Faces** (to the tool input port).

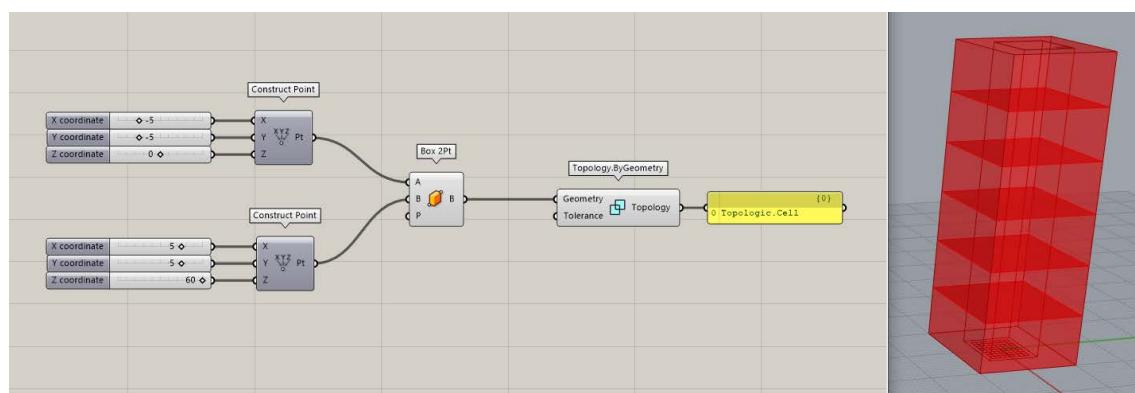


To visualise the result, first connect the resulting **CellComplex** from the slice operation to **Topology.Geometry**. Then disable the preview of all Grasshopper nodes that display geometry (right-click on the node and uncheck Preview). **Make sure nothing is visible in the Geometry View**. Next, create a **CellComplex.Edges** and connect it to **Topology.Geometry**. This will display the edges as a wireframe. Then create a Grasshopper Color.ByRGB node and feed it 100; 255; 0; 0; Finally, create a Grasshopper GeometryColor.ByGeometryColor and feed it the geometry and the colour as seen below. If you are an advanced user, you may wish to create a custom node as these final display nodes will be re-used often at the end of the process.



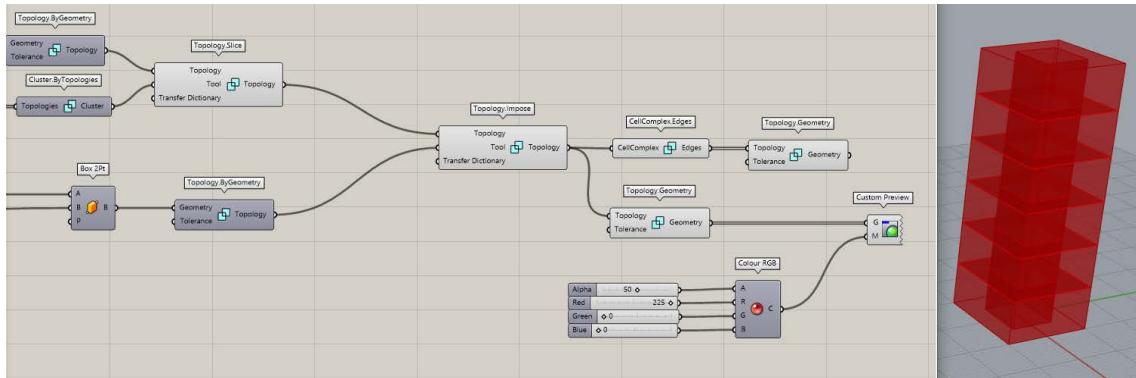
Step 4: Impose the inner atrium

In the previous step we created a **CellComplex** made of six (6) **Cells**. We will now impose an atrium that will create a seventh cell in the middle. This **Cell** will be un-interrupted by the horizontal **Faces**. To do so, we will first create a **Cell** and then use the **Topology.Impose** method. You may wish to copy and paste the nodes used to create the outer **Cell** and change the input parameters (to -5, -5, 0 and 5, 5, 60) as seen below.



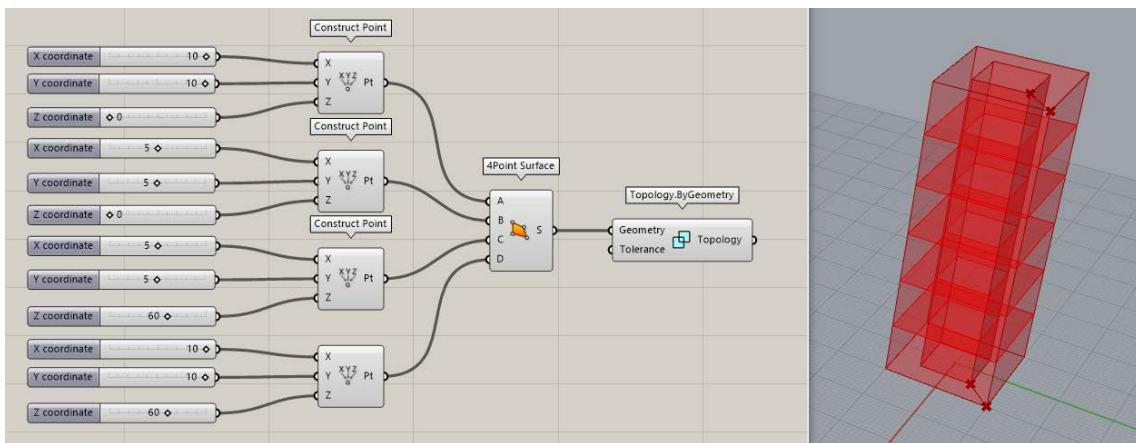
After you have visually checked that the inner atrium is in the correct location, go ahead and turn off the preview for the **Cuboid.ByCorners** node.

Create a **Topology.Impose** node. Connect the **CellComplex** from the **Topology.Slice** node to the topology input parameter. Connect the atrium **Cell** from the **Topology.ByGeometry** node that you just created to the tool input parameter. Connect the resulting **CellComplex** to the existing **CellComplex.Edges** and **Topology.Geometry** nodes as you see below.

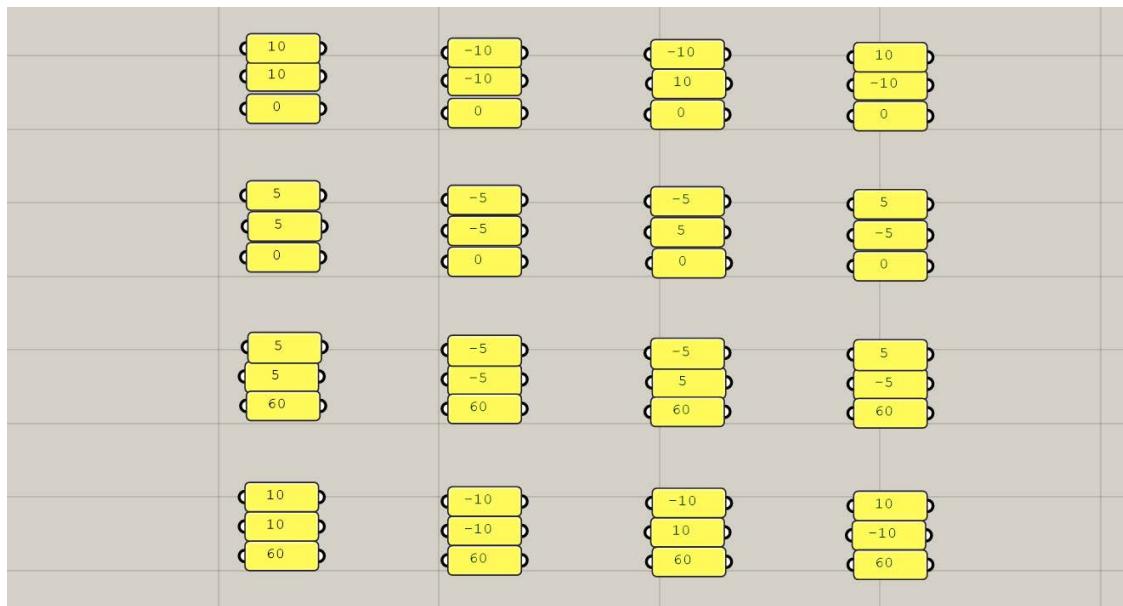


Step 5: Slice the CellComplex with diagonal faces

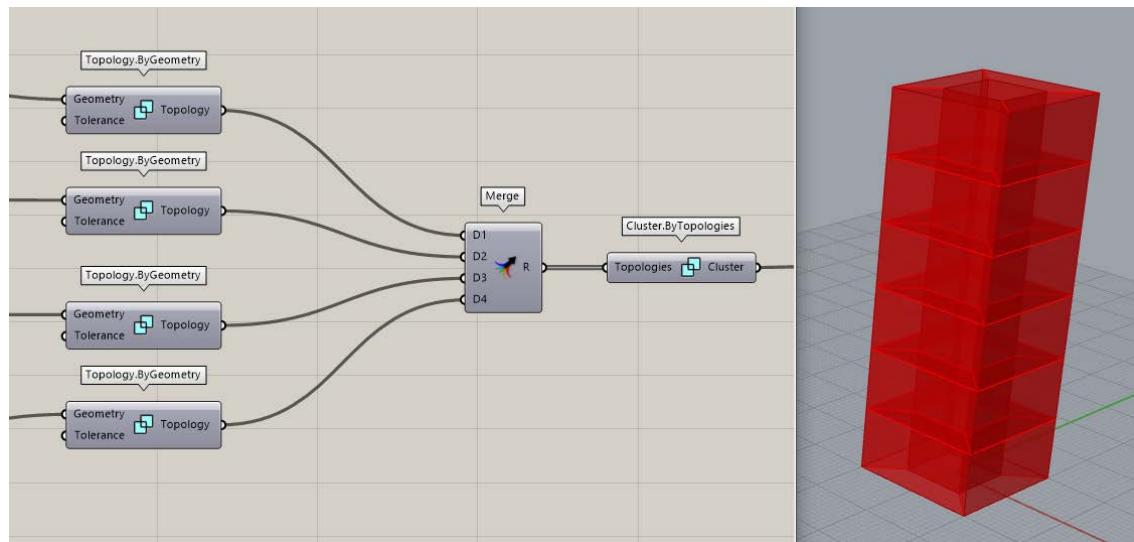
To create four perimeter zones for each side of the building on each floor, we will create four diagonal **Faces** that connect the corners of the outer prism to the corners of the inner atrium.



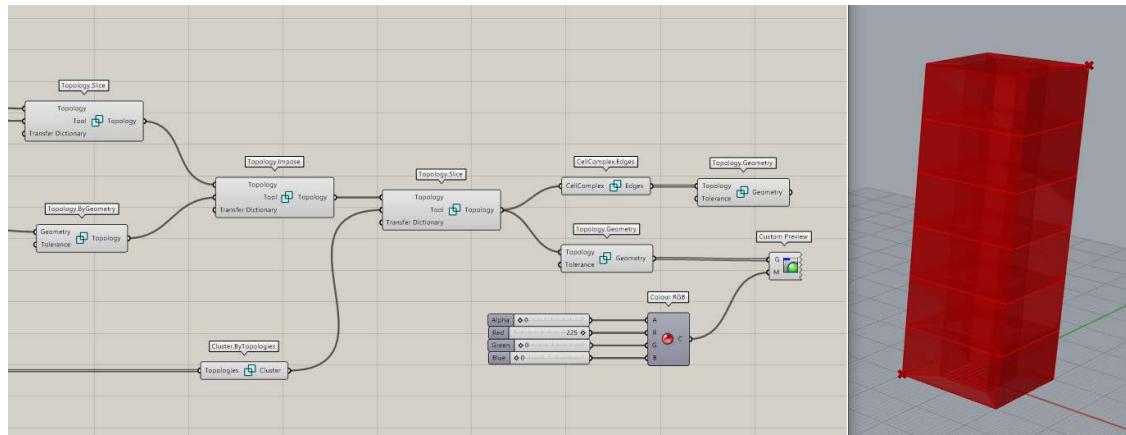
Copy and paste the above nodes three more times. The four sets of panels are listed below.



Next, turn off Preview for all prior Grasshopper nodes and create a list and then a **Cluster** from the four **Faces** using **Cluster.ByTopologies** as seen below.



The last step is to slice the **CellComplex** with the **Cluster of Faces** that you just created. Create a **Topology.Slice** node. Connect the **CellComplex** from the **Topology.Impose** node to the topology input parameter and the **Cluster** to the tool input parameter. Connect the resulting **CellComplex** to the existing **CellComplex.Edges** and **Topology.Geometry** nodes as you see below.



The resulting **CellComplex** now contains 25 **Cells**. Six floors with four **Cells** per floor, plus one additional **Cell** for the inner atrium. Save your work for use in future tutorials.

Congratulations. You are becoming an expert in the use of Topologic.



The Leverhulme Trust

This project is funded by a Leverhulme Trust Research Project Grant
(Grant No. RPG-2016-016)

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