Creating a building with **building**Engine

Gustavo Patow  
Geometry and Graphics Group (GGG)  
Universitat de Girona (UdG)

- **building**Engine comes as a .otl
- A Houdini library of digital assets
- First thing, you must install the library
- **Install Digital Asset Library**

  ![Install Digital Asset Library](image1)

- **Select `buildingEngine`**

  ![Select buildingEngine](image2)

<table>
<thead>
<tr>
<th>Digital Assets To Be Installed</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sop/Comp</td>
<td>(non-commercial)</td>
</tr>
<tr>
<td>Sop/CreateBase</td>
<td>(non-commercial)</td>
</tr>
<tr>
<td>Sop/Cutter</td>
<td>(non-commercial)</td>
</tr>
<tr>
<td>Sop/Exception</td>
<td>(non-commercial)</td>
</tr>
</tbody>
</table>
- Now, let’s do the outline of our building
- Swap to a “top viewport”

And create a Curve node
- And draw a (2D) polygon!
- (try not to make it too big or too small... about 10x20 units would be ok)

- Switch back to a “perspective viewport”
And rename our object to “building”

Extrude node

And now add an Extrude (Digital Asset) node
Extrude node

- Extrude is used to generate the mass model from the building lot

- But nothing can be seen!
Filters and Products

- All **building**Engine nodes work with a system of **filters** and **products**.
- A **filter** is used to select the geometry we are going to operate onto.
- A **product** is what this node produces.
- They are modeled as Houdini **groups**

So, the curve has no label and the Extrude node does not know on what to operate!

- So, let’s create a Group Geometry node, to add a label to the polygon
- Our label will be “lot”
- Now, we can configure our Extrude node
  - Filter: lot
  - product: mass
  - height: 10 (?)
- Now, create a new Comp node
- And wire the Extrude into it

- First, set the filter to mass
- Now, set the number of components...
in our case, 3:
  - front → facade
  - side → sides
  - Top → roof

- Our new model is identical to the previous one...
- Except that no bottom was selected!!!
- Now, let's subdivide the facade into floors
- For that, create a Subdiv node and wire our Comp node into it

Choose
- **filter**: facade
- **Axis**: Y (default)
- **Divisions**: 2
  - Uncheck Approximate
  - Value: 2 (absolute)
  - Product: bottomFloor
- Check Approximate
  - Value: 1 (approximate)
  - Product: floors
- As this node is “tuned” for facade, it’ll only work on the facade
- It will result in two divisions: one fixed-size for the first floor
- And other representing the other floors

Now, let’s divide the floors area into its several “floor” areas
- For that, create a Repeat op
Repeat node

- Is identical to a repeated subdiv node
- It performs as many subdivisions as possible given
  - The desired individual area
  - The total area to subdivide

Repeat node

- Set
  - filter = floors
  - Product = floor
  - Axis = Y (default)
  - Check Approximate
  - Value = 1.5 (approximate)
Repeat Node

Create another Repeat node
Wire the first one into this one
Set
- Filter = floor
- Product = window
- Axis = X
- Value = 1.5 approximate
Repeat node (II)

Subdiv (II)

- Create a Subdiv for the 1st floor
- Connect Subdiv1 to it
Subdiv (II)

Set:
- filter = bottomFloor
- Axis = X
- Divisions = 3
  - bottomWindows
    - Value = 1 approximate
  - door
    - Value = 2 absolute
  - bottomWindows
    - Value = 1 approximate
Non-linearity!

- With **building** Engine, we can be non-linear!
- For instance, wire the Subdiv2 into the Repeat2 already created
- Simply add bottomWindows to the Repeat2 filter!
Insert node

- Now, let’s insert some real geometry!
- For that, let’s create an Insert node
- And wire the Repeat2 to it.

Set
- filter = window
- Product = ?
- Asset File = choose!
- RotateY = 180 (depends on your asset)
- Uncheck “relative z”
- Scale Z = 0.3
Let’s create another Insert node for the door.
Insert node

- **Set**
  - filter = door
  - Product = ?
  - Asset File = choose!
  - Uncheck “relative z”
  - Scale Z = 0.3
Object_merge node

- This is a standard Houdini node
- Useful to visualize several nodes at once
- Like the Merge node, but without the wires!

Set number to 2
And choose the insert nodes!
Object_merge node

More non-linearity
More non-linearity

More non-linearity
Visualizing the entire model

Add the roof to the visualization

- At the Object_merge, increase the number to 3
- And add the Comp1 node
- But do not forget to add **only** the roof group!
HDA

- If wanted, we can create an HDA with the building nodes.
- For instance add
  - Building height (from Extrude)
  - First floor height (from Subdiv1)
  - Floor height (from Repeat1)
  - Door width (from Subdiv2)
  - Window width (from Repeat2)
The entire model as an HDA!