

# Advanced Computational BIM Workshop



Join the conversation #AU2017



# Agenda

08:30 – 08:45	Welcome
08:45 – 09:15	Getting Crazy with Dynamo Player
09:15 – 10:00	I Shipped My Nodes! (Custom Package Creation)
<b>10:00 – 10:15</b>	<b>Coffee Break</b>
10:15 – 10:45	Advanced List Manipulation – Upgrading a Face
10:45 – 11:45	Show Me the Data (Data Visualization)
<b>11:45 – 01:00</b>	<b>Lunch</b>
01:00 – 01:15	Autodesk Build Space Highlight with Special Guest <b>Rick Rundell</b>
01:15 – 02:00	Animation Strategies In Dynamo
02:00 – 02:45	Iterative, Generative, Optioneering with Dynamo Studio and Fractal
<b>03:00 – 03:15</b>	<b>Coffee</b>
<b>03:30 – 06:30</b>	<b>Forum</b>

# What makes an advanced Dynamo Users?

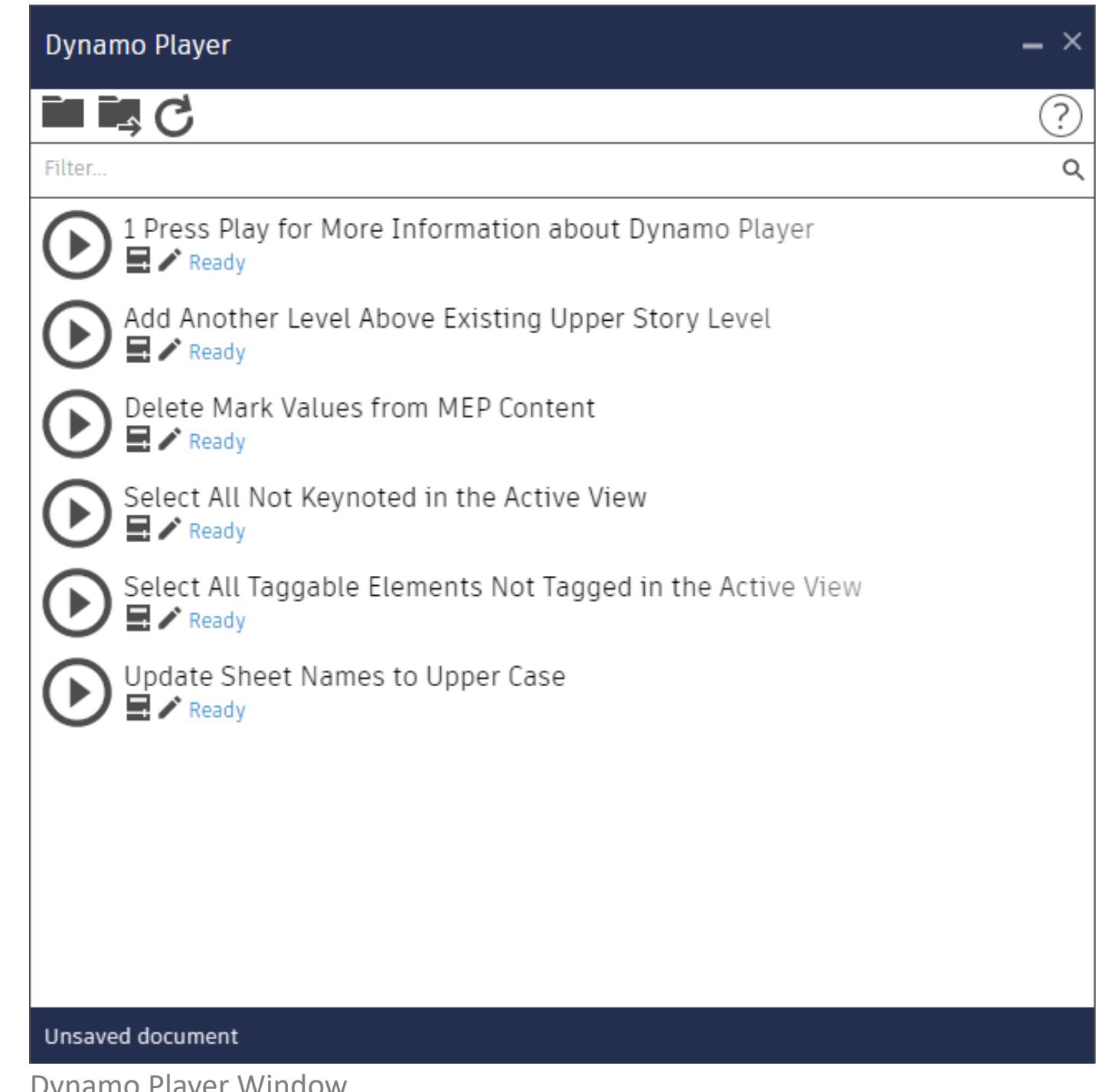
# Getting Crazy with Dynamo Player



Image Credit: Gina Rafaella Furnari from the Noun Project

# Dynamo Player Allows Us..

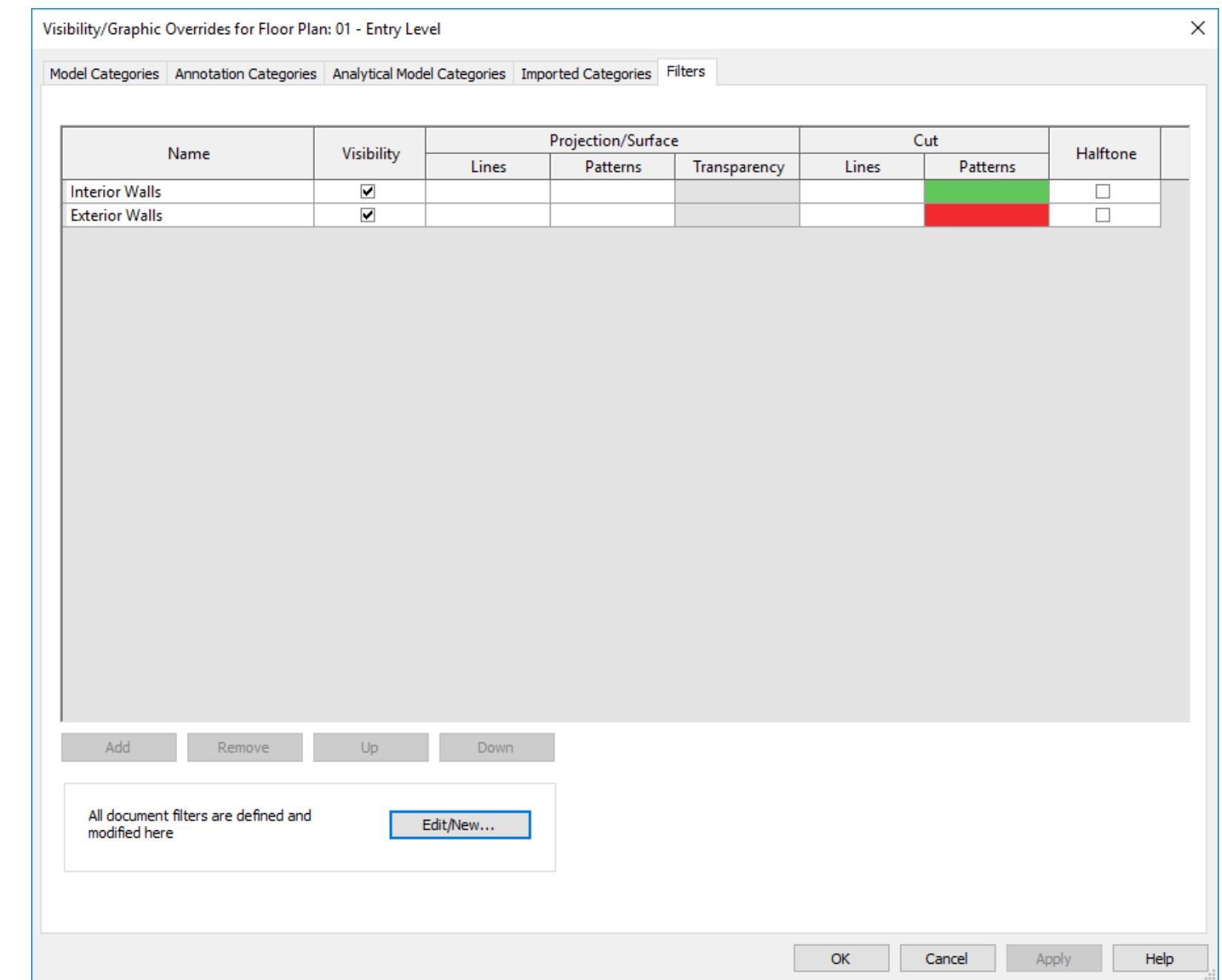
- Deploy graphs in a manageable way.
- Introduce beginners to computational workflows.
- Pretty much make our own deployable Revit addins. (*Shh... don't tell the addin creators*)
- Have awesome inputs in Revit 2018.1+
- Use custom packages to create slick user interfaces.



01 | OOTB Input  
Awesomeness

# Copy Filters from One View Template to Another

- Let's do something not possible through the UI.
- Filters are great, but take a while to set up.
- Then make it work for unopened files.



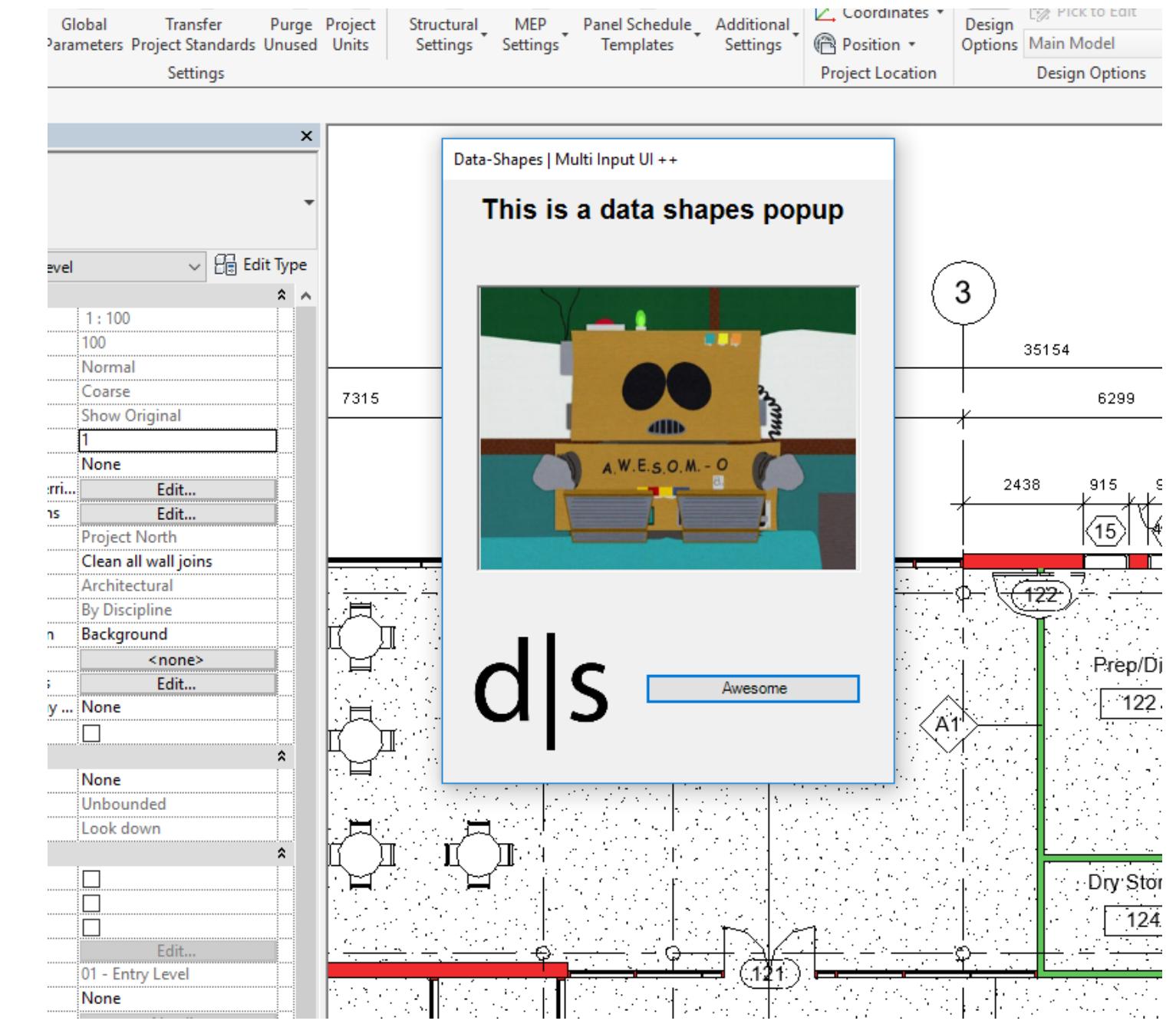
View Filters with Overrides

02 |

# Custom UI Popups

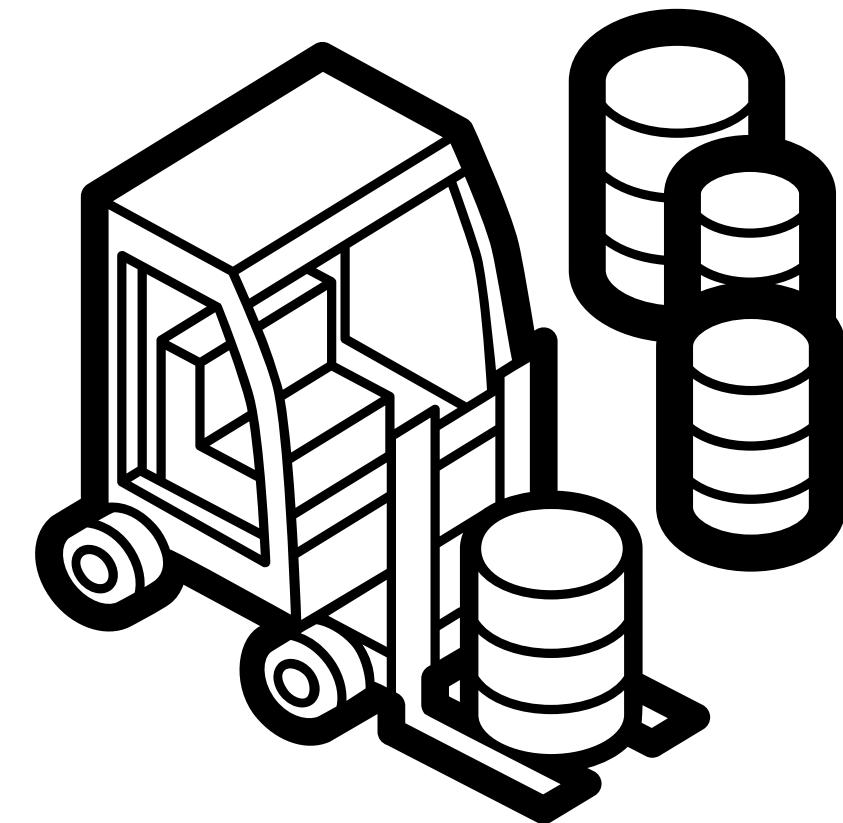
# OOTB Dynamo Player is Awesome but...

- Popups are even awesome-er.
- Build a UI with custom package Data-Shapes to provide this functionality to those without Dynamo player.
- Reusable workflows for your firm!



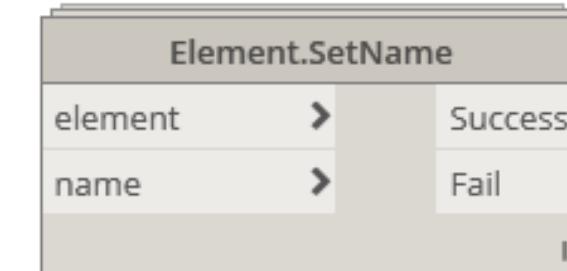
Data Shapes popup with Dynamo

# I Shipped My Nodes



# Deploying Dynamo Workflows (*So many ways, so little time.*)

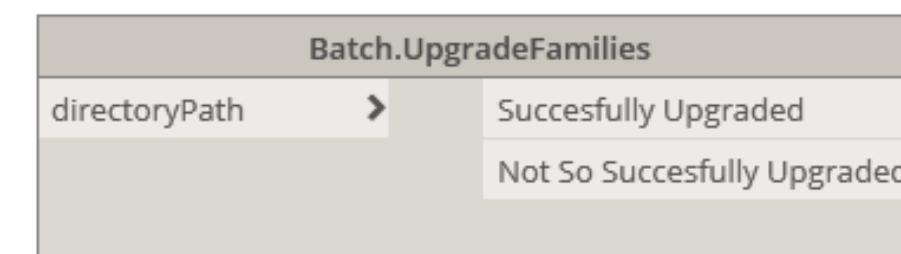
- Bundling OOTB nodes to form custom nodes.
- Python scripting with Python nodes.
- ZeroTouch import using .NET libraries (C#, VB.NET)
- Full Blown C# Development for Custom UI and More, (way out of the scope of this class).



Custom Node (Clockwork)



Python Script Node



ZeroTouch node made in C# (Rhythm)

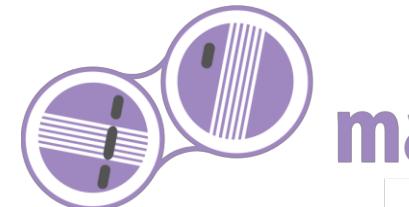
# Essential Dynamo Packages

## Revit Related

- Lunchbox
- Archi-lab.net
- Clockwork
- Springnodes
- Rhythm
- Steamnodes
- Data-Shapes
- Mandrill
- Bumblebee

## Additional Awesomeness

- Ladybug
- Energy Analysis for Dynamo
- Dynashape
- Firefly
- Mantis Shrimp
- Rhynamo



**mantishrimp**



**archi-lab**



**mandrill**



**DynaShape**  
MIT License © 2017 Long Nguyen  
Open-source Dynamo plugin for constraint-based  
form finding, optimization and physics simulation



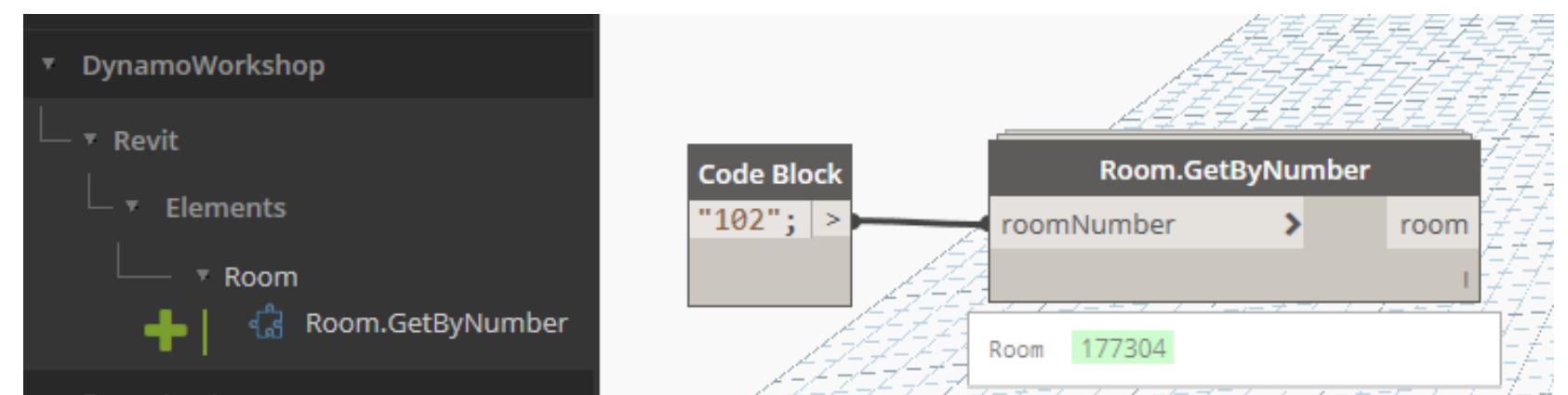
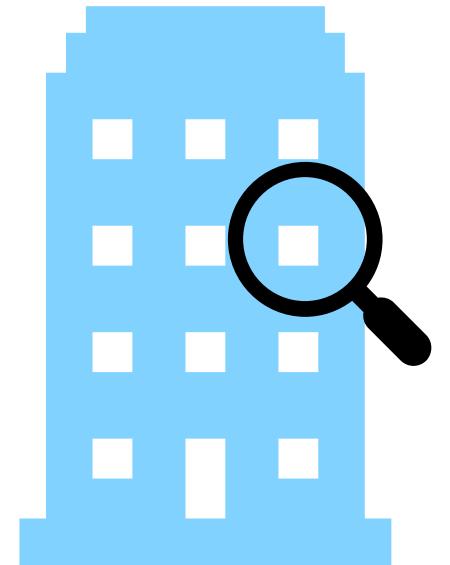
**d|s**

03 |

Build a custom  
node

# Building a Room Lookup Custom Node

- Retrieve rooms by number.
- Bundle as Custom Node
- Distribute for reuse.
- Using a tool called a dictionary.



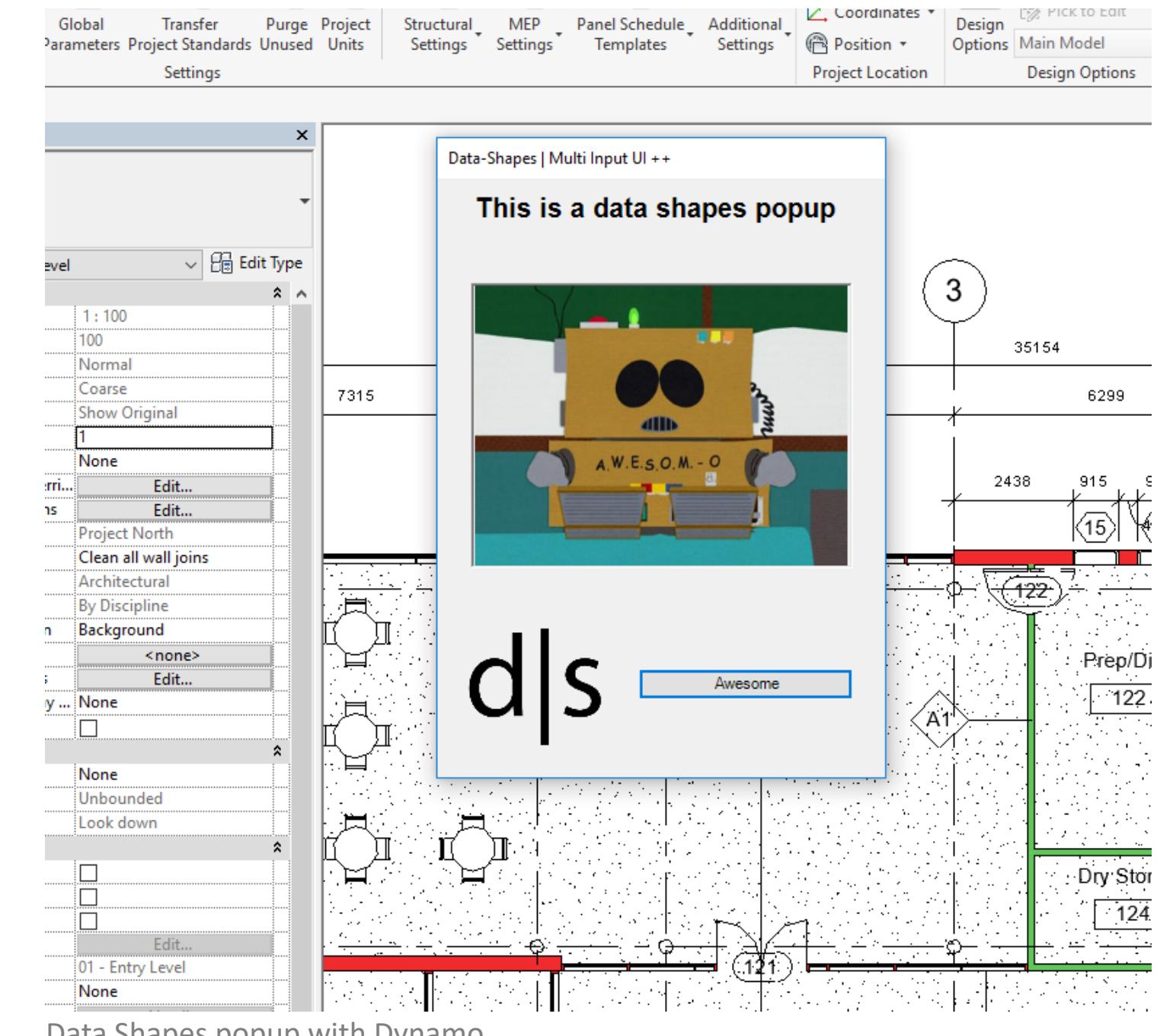
Custom node capable of searching for rooms by number.

04 |

renumber  
room with  
curve

# Bundling the Famous Renumber Rooms with Spline Workflow.

- Initially presented by William Wong of CASE.
- Hacked at by tons of people.
- Highly optimized by Colin Mccrone.  
Removed all the List.Map!
- We're going to bundle this as a custom node.



Data Shapes popup with Dynamo

05 |

small itty bitty  
python node

# Set Dimension Above Value with Python

- Import CLR - Common Language Runtime
- Add Revit API to it. - To work with Revit stuff
- Add RevitServices to it. - Transactions
- Get current document - Revit File
- UnwrapElement - Convert to internal Revit type
- Inputs – Element and new name
- TransactionManager.Instance.EnsureIntransaction(doc) – Start the changes
- Set the name
- TransactionManager.Instance.TransactionTaskDone – Make sure they are done
- OUT – Output something

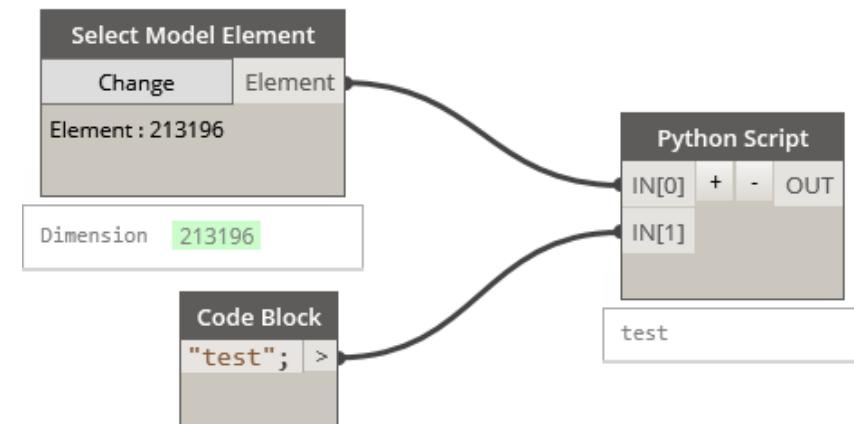
```
import clr
clr.AddReference('RevitAPI')
from Autodesk.Revit.DB import *

clr.AddReference("RevitServices")
import RevitServices
from RevitServices.Persistence import DocumentManager
from RevitServices.Transactions import TransactionManager

doc = DocumentManager.Instance.CurrentDBDocument
item = UnwrapElement(IN[0])
aboveValue = IN[1]

TransactionManager.Instance.EnsureInTransaction(doc)
item.Above = aboveValue
TransactionManager.Instance.TransactionTaskDone()
#Assign your output to the OUT variable.
OUT = aboveValue
```

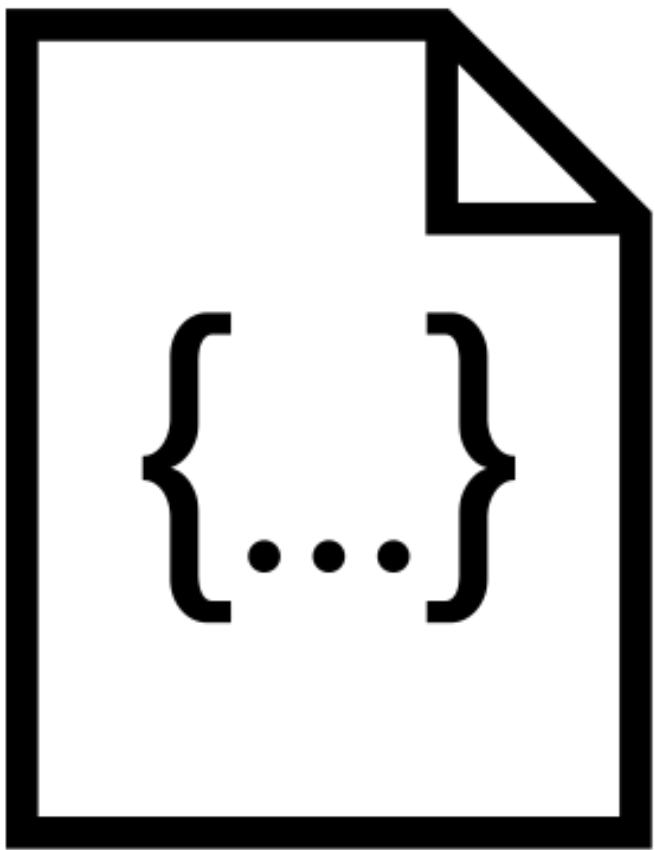
Dissect a python node. *Looping, access Revit API,*





Coffee Time

# Advanced List Manipulation



## Node Input/Output Controls

- List at Level
  - @L1, @L2, @L3,...
- Lacing
  - Short
  - Longest
  - Cross



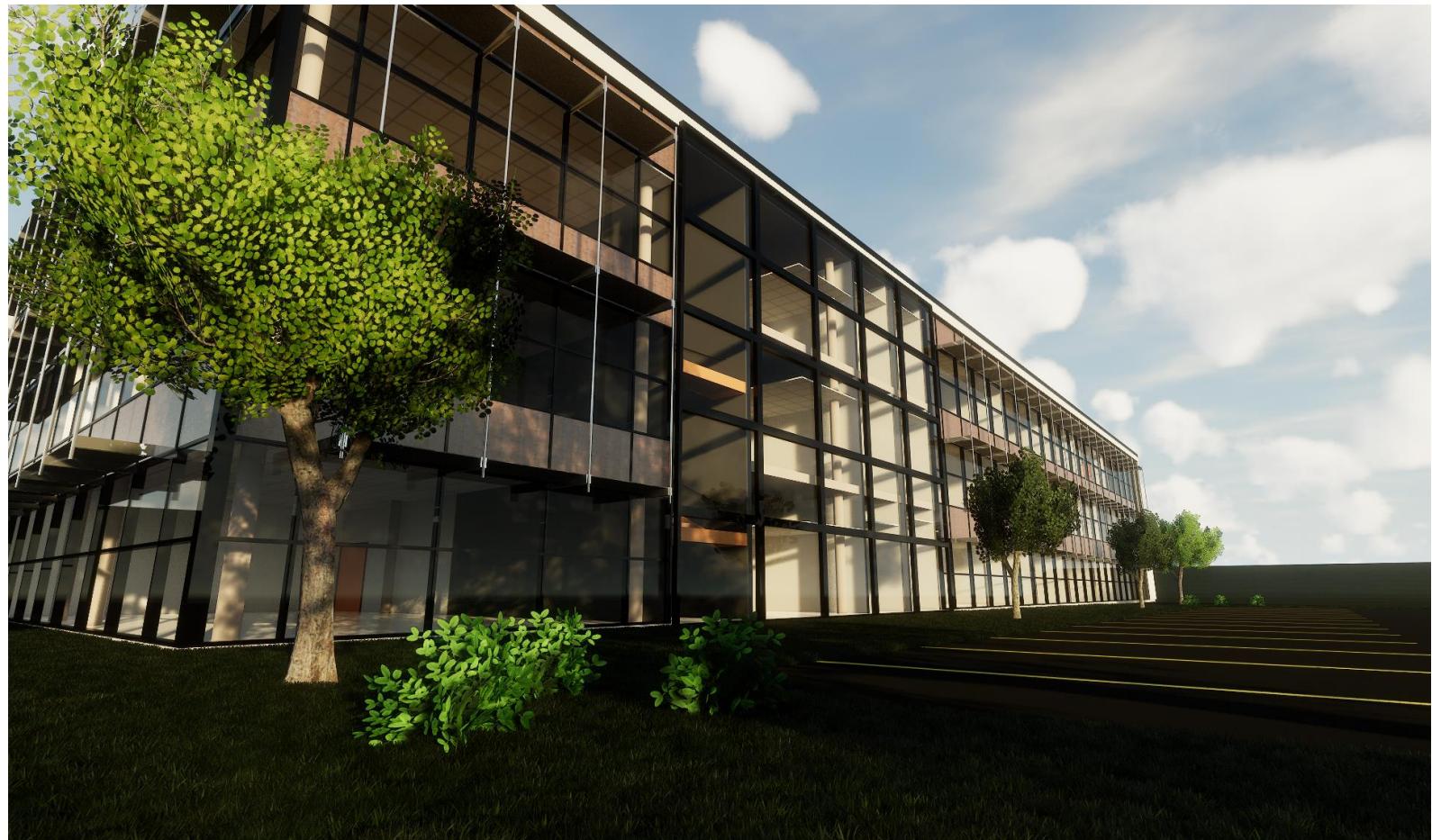
06 |

Upgrading a  
Face

Start with Exterior Wall Canvas

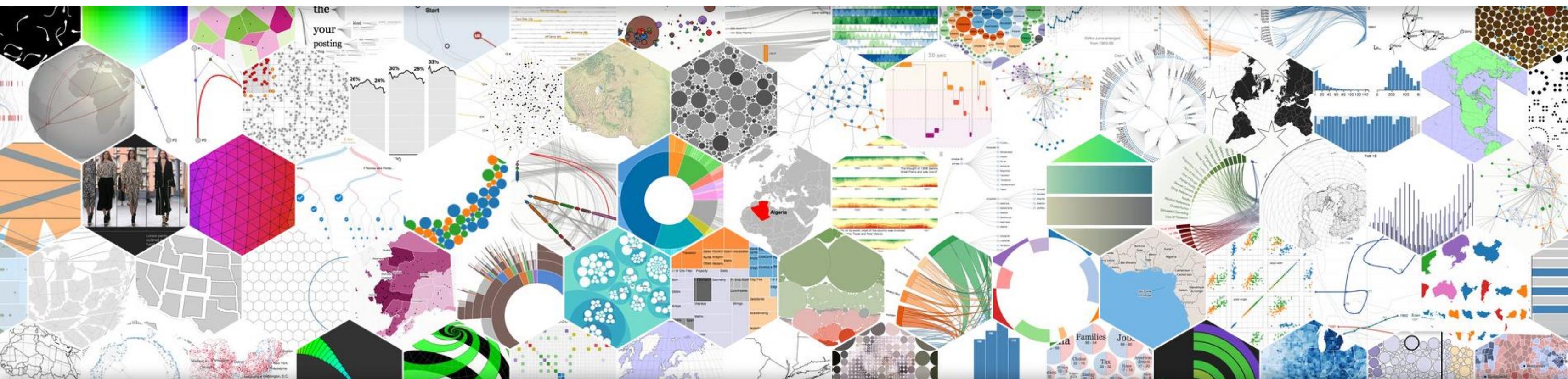


End with Panelized Facade



# 07 | Dynamo Visualization

# DATA VISUALIZATION

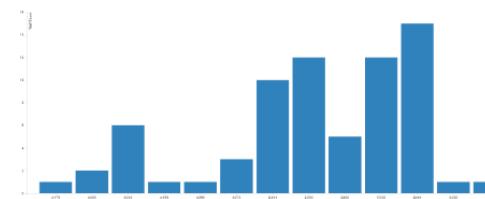




# mandrill

- Mandrill Primer
- Supports
  - Bar
  - Area
  - Line
  - Stacked bar
  - Grouped bar
  - Donut
  - Scatter Plot
  - Parallel Coordinates
  - Horizontal bar

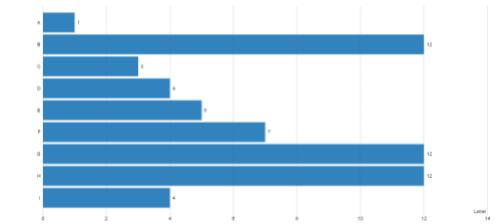
Bar Chart



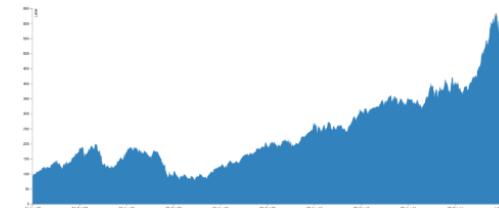
Donut Chart



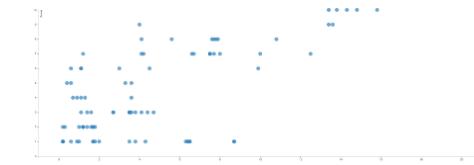
Horizontal Bar Chart



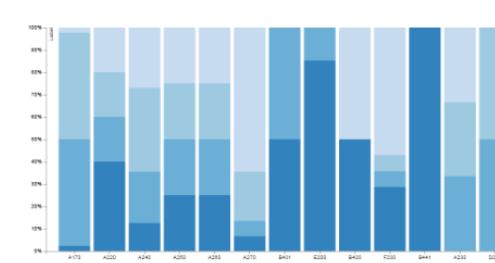
Area Chart



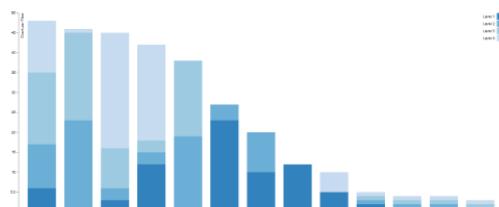
Scatter Plot



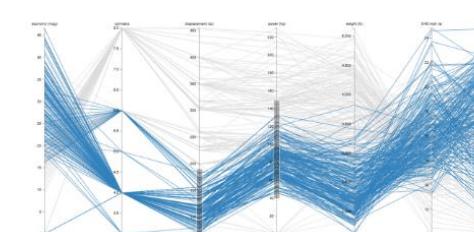
Normalized Stacked Bar Chart



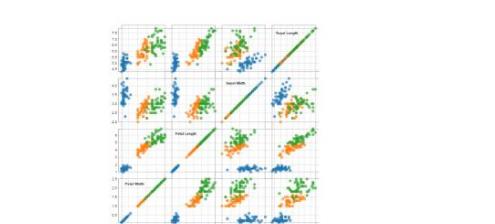
Stacked Bar Chart



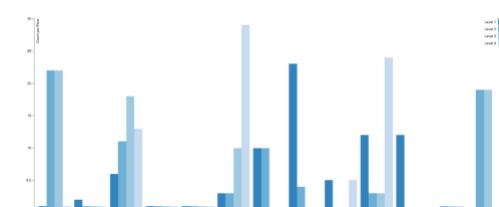
Parallel Coordinates



Scatter Plot Matrix

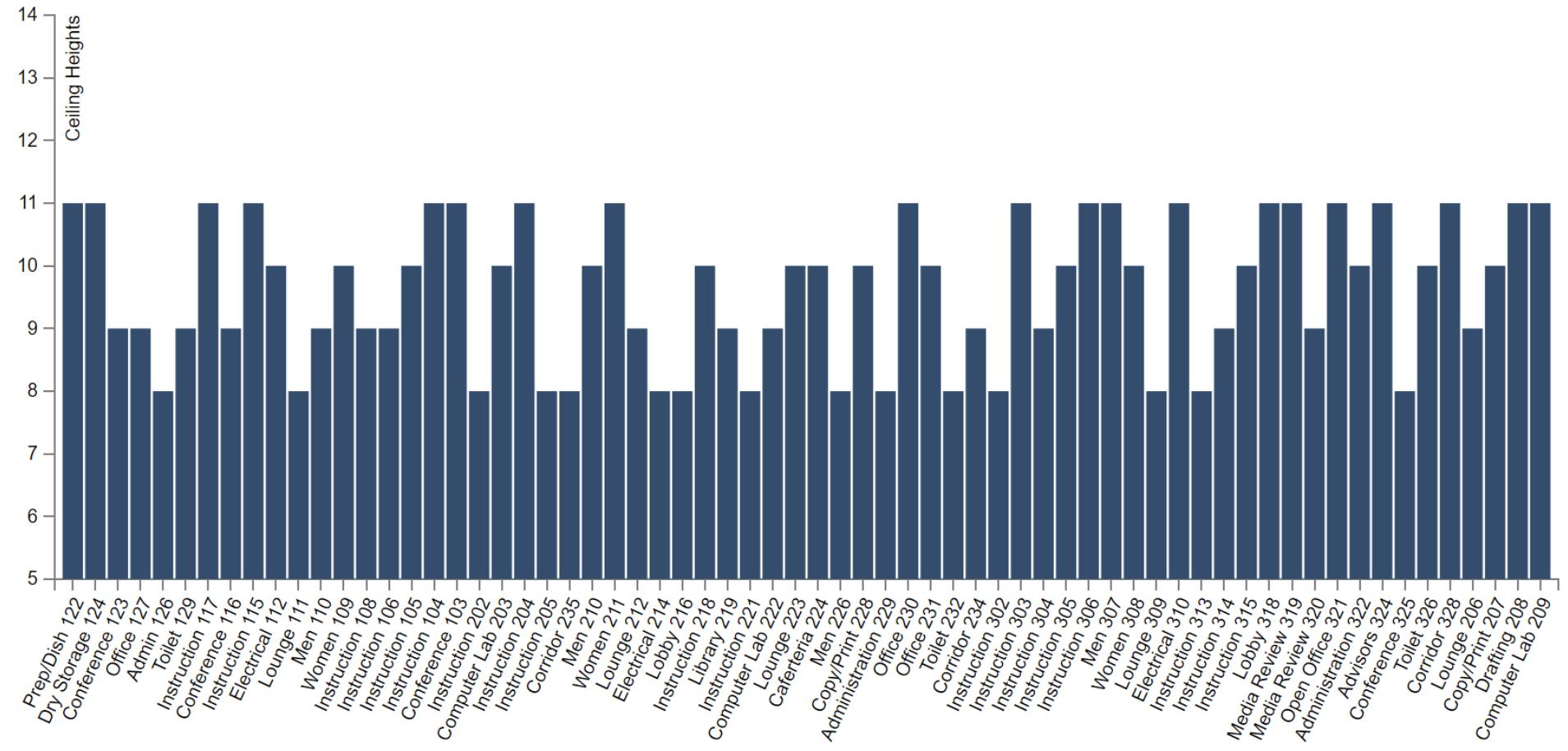


Grouped Bar Chart

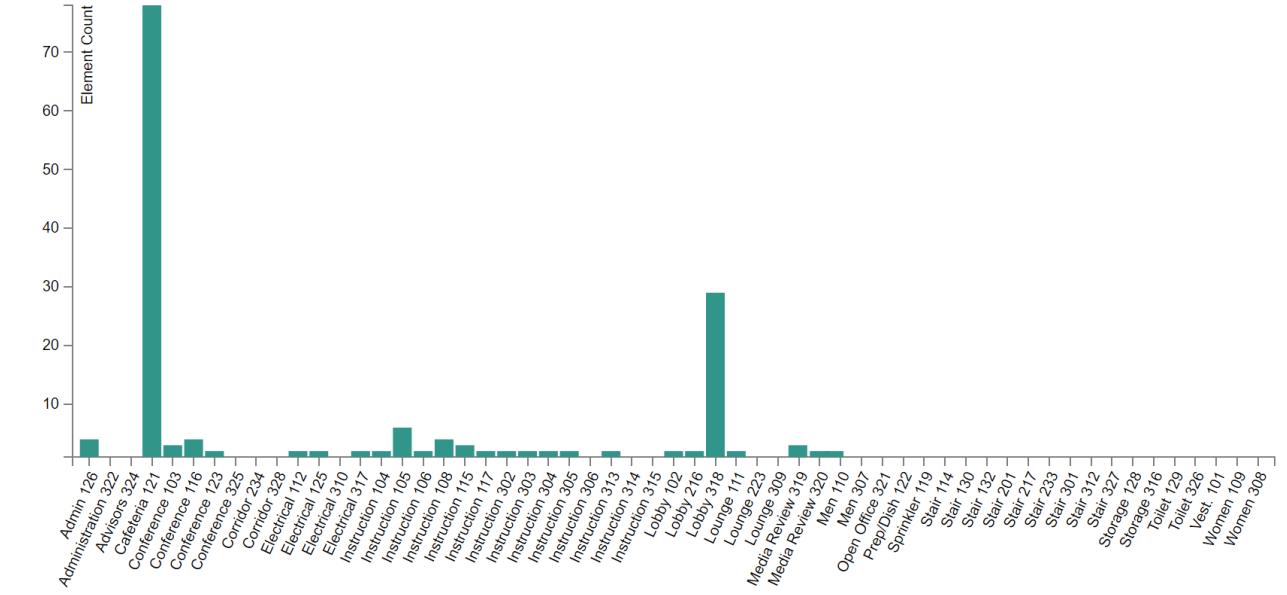


# Visualization Room Information

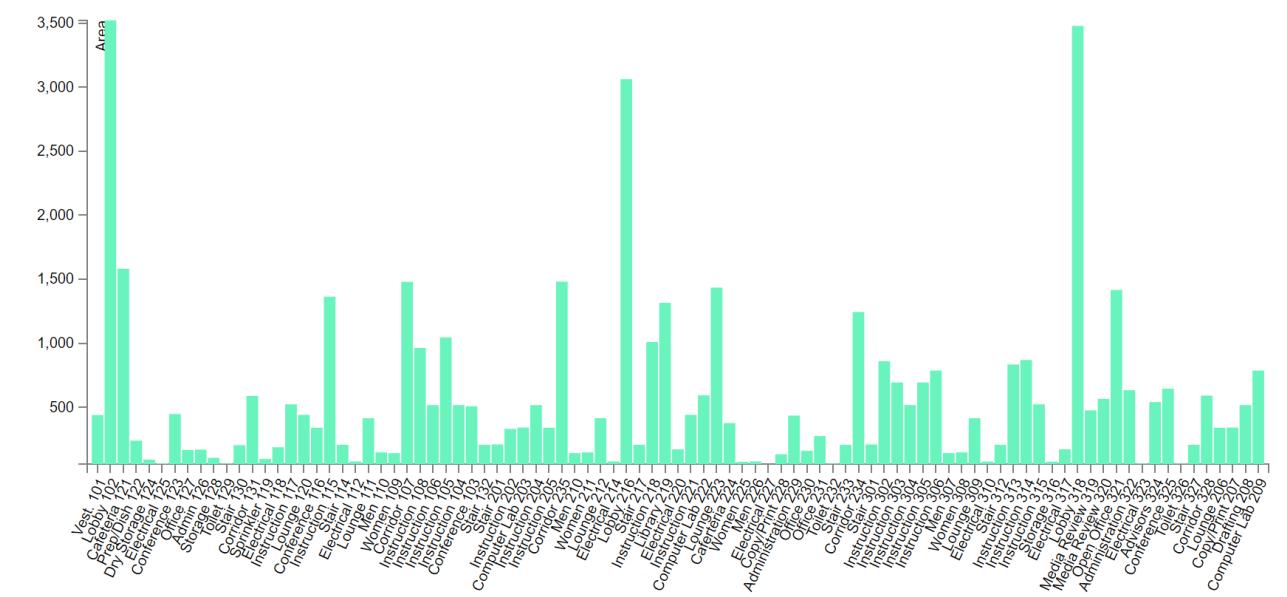
## Ceiling Heights by Room



## Element Count by Room



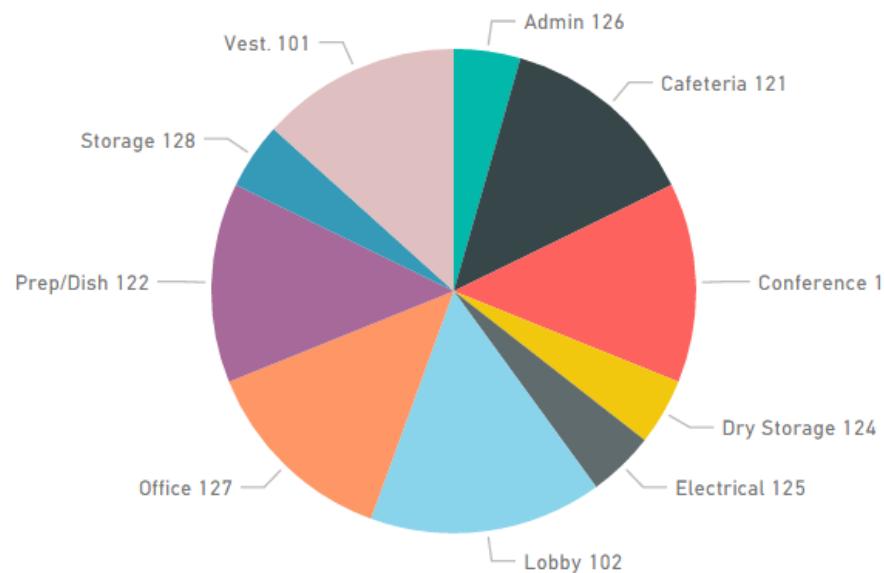
## Room Areas



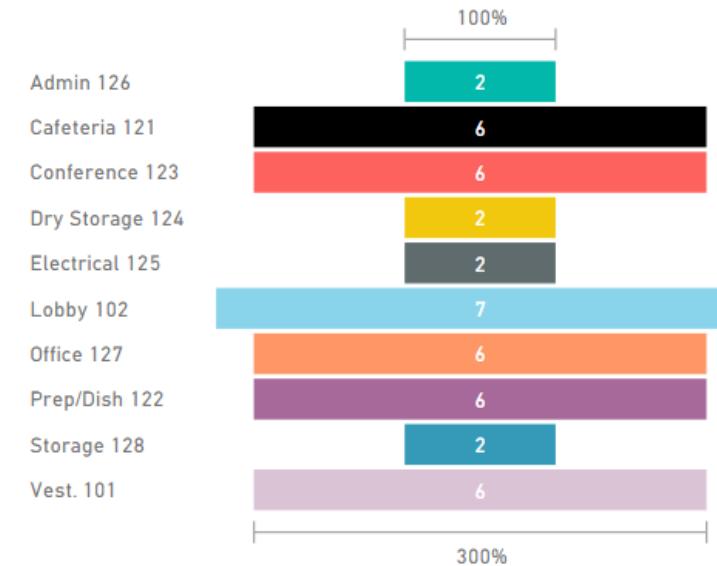
# 08 | Power BI Visualization

# Dynamo to Power BI Interaction

Count of Materials by Rooms



Count of Materials by Rooms



Air Barrier - Air Infiltration Barrier

Concrete - Cast-in-Place Concrete

Insulation / Thermal Barriers - External ...

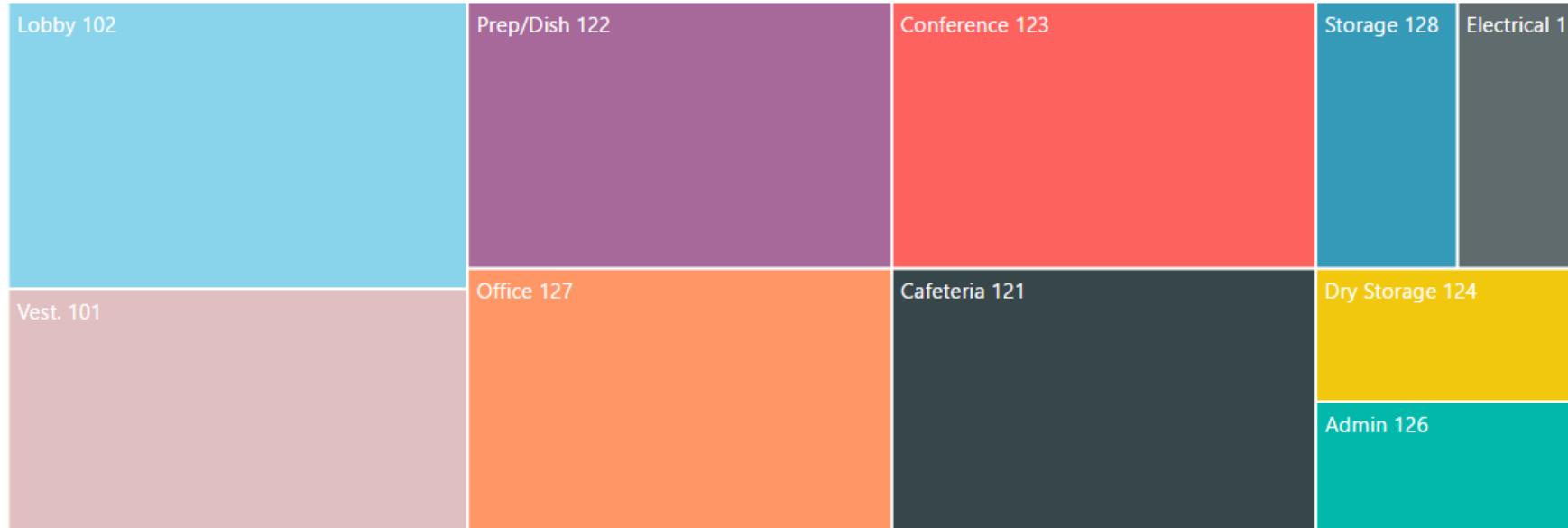
Masonry - Concrete Block

Metal - Stud Layer

Plasterboard

Vapour / Moisture Barriers - Vapour Re...

Count of Materials by Rooms



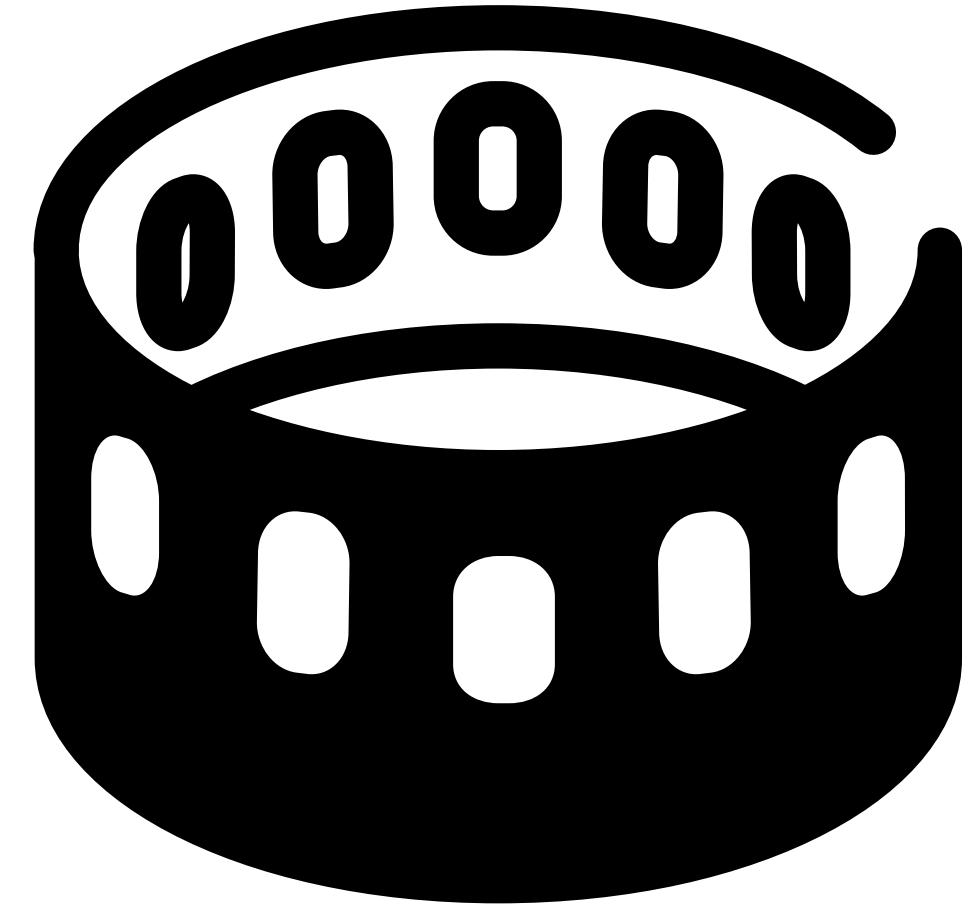
The background features a complex, abstract geometric pattern composed of numerous thin, light-grey lines forming a series of overlapping circles and organic shapes. A solid blue horizontal bar runs across the middle of the image. The text "Lunch Time" is centered within this blue bar.

Lunch Time



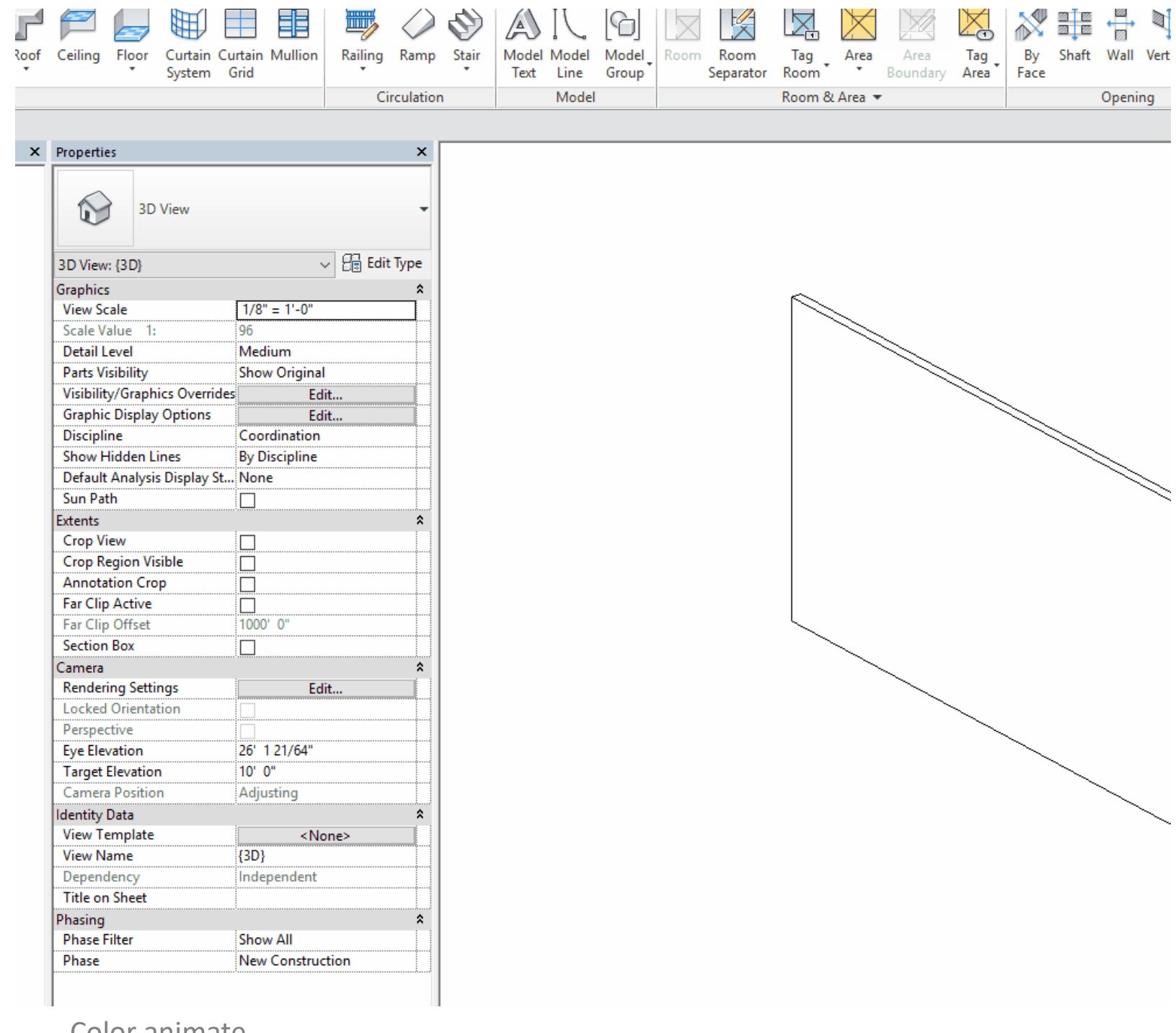
# Autodesk Build Space Highlight with Rick Rundell

# Animation Strategies



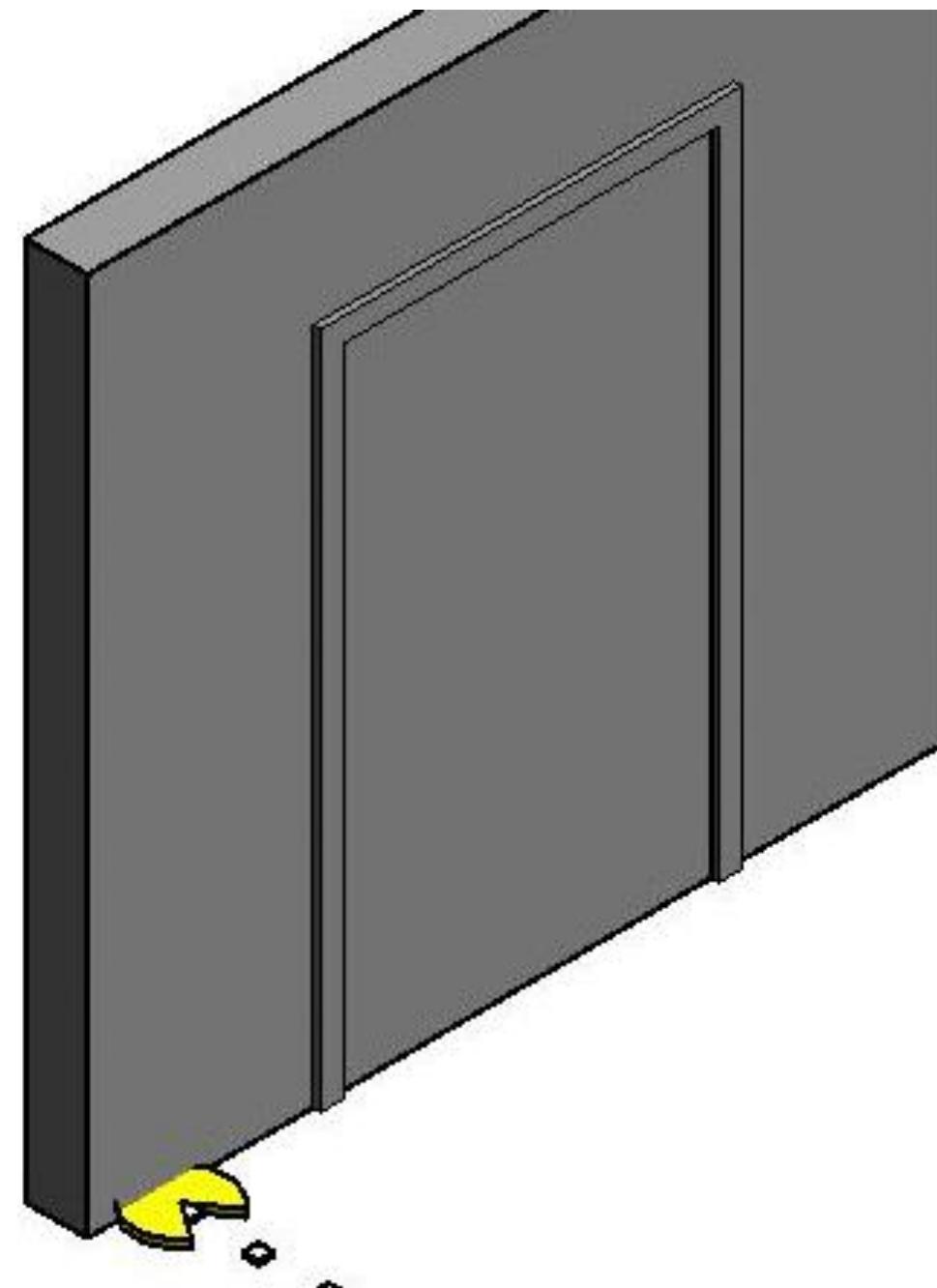
# Animation Strategies in Dynamo

- Using Dynanimator from the Badmonkeys
- Using Rhythm with inspiration from the Badmonkeys.
- Using Firefly for rapid iteration.
- Using sliders with file name replacements.



# Animate Door Parameters

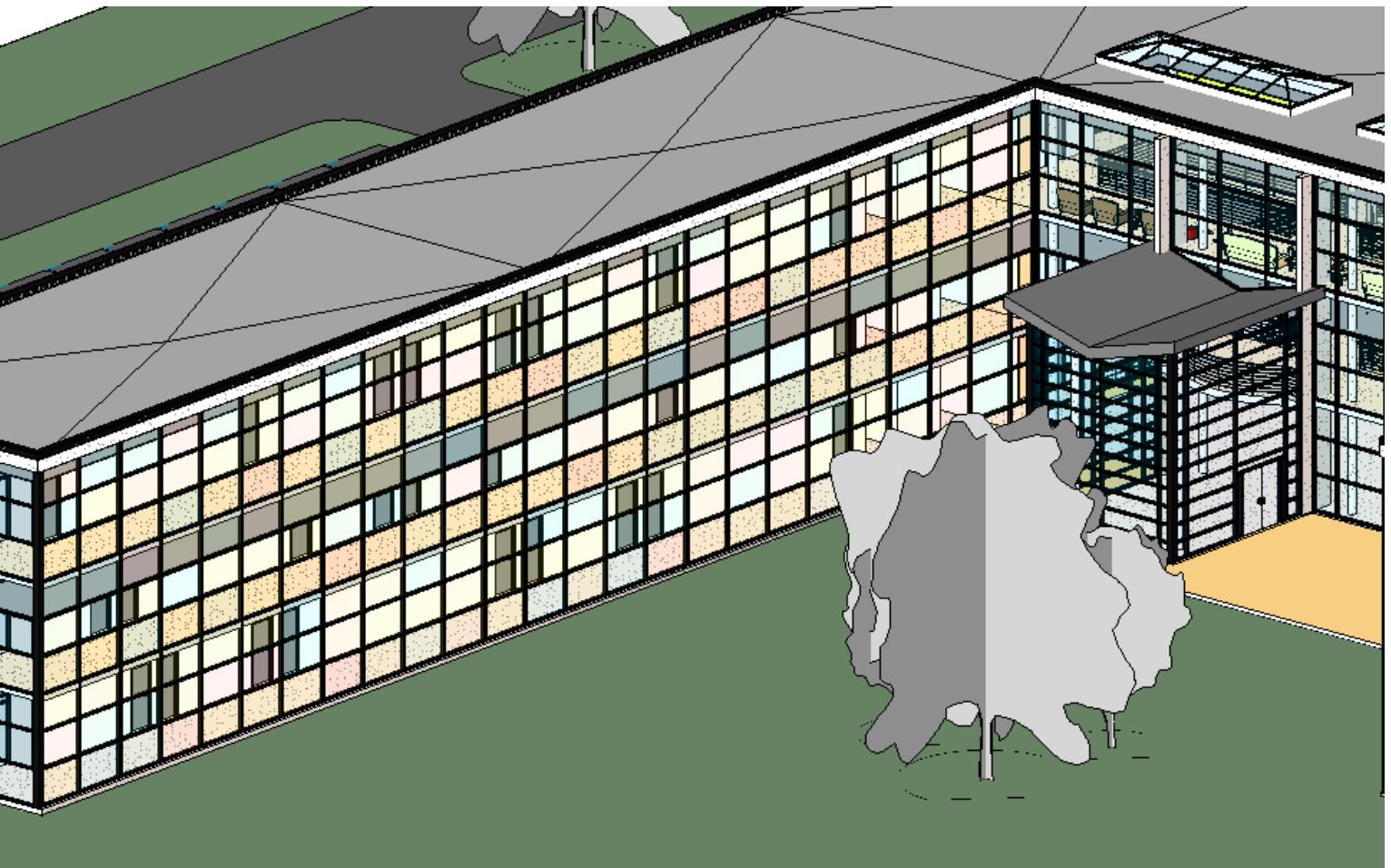
- Using a node that applies the changes and undoes them.
- Works with numeric parameters.
- Combine with a GIF maker website.



Animate Numeric Params

# Animate Color with Image Export

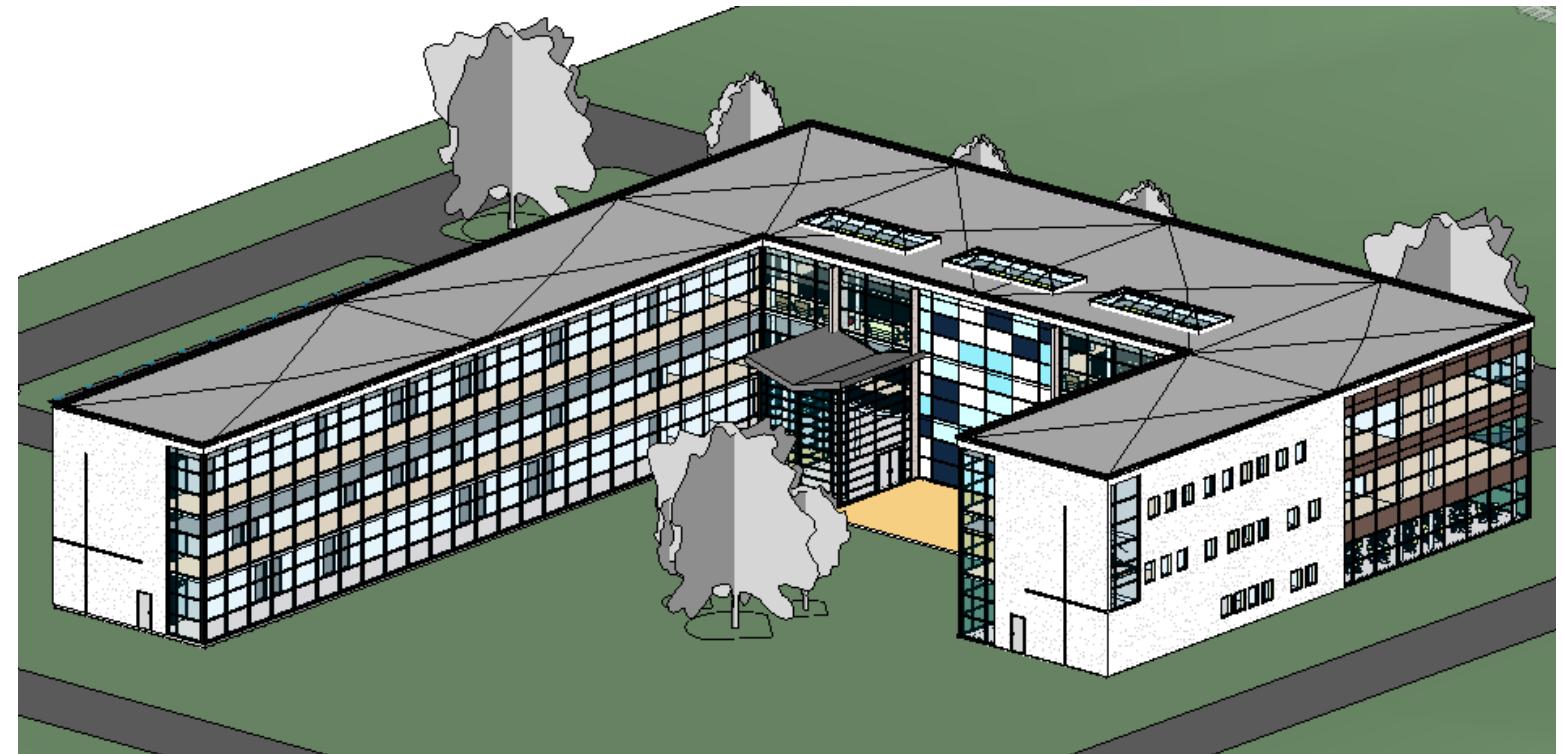
- Iterate over curtain panels and override color in view.
- Export image for each option.
- Have images for review or GIF



Animate Color

# Animate Panel Material

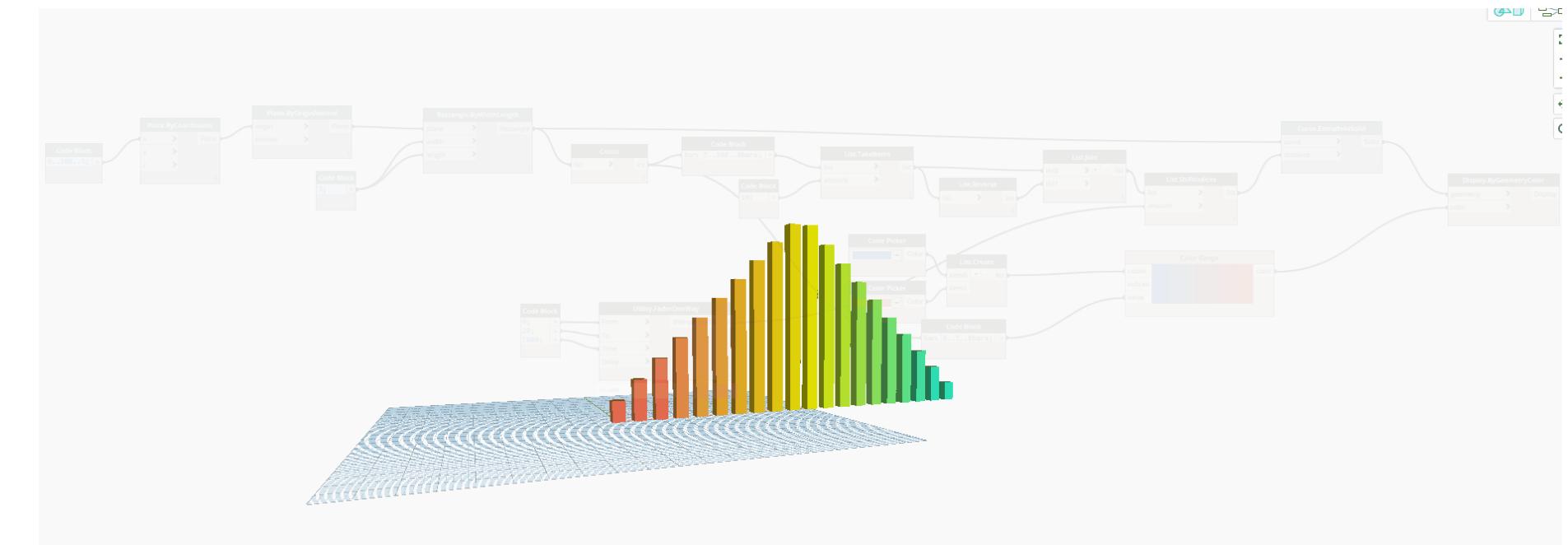
- Iterate over curtain panels and change actual panel type.
- Export image for each option.
- Have images for review or GIF.



Iterate through options

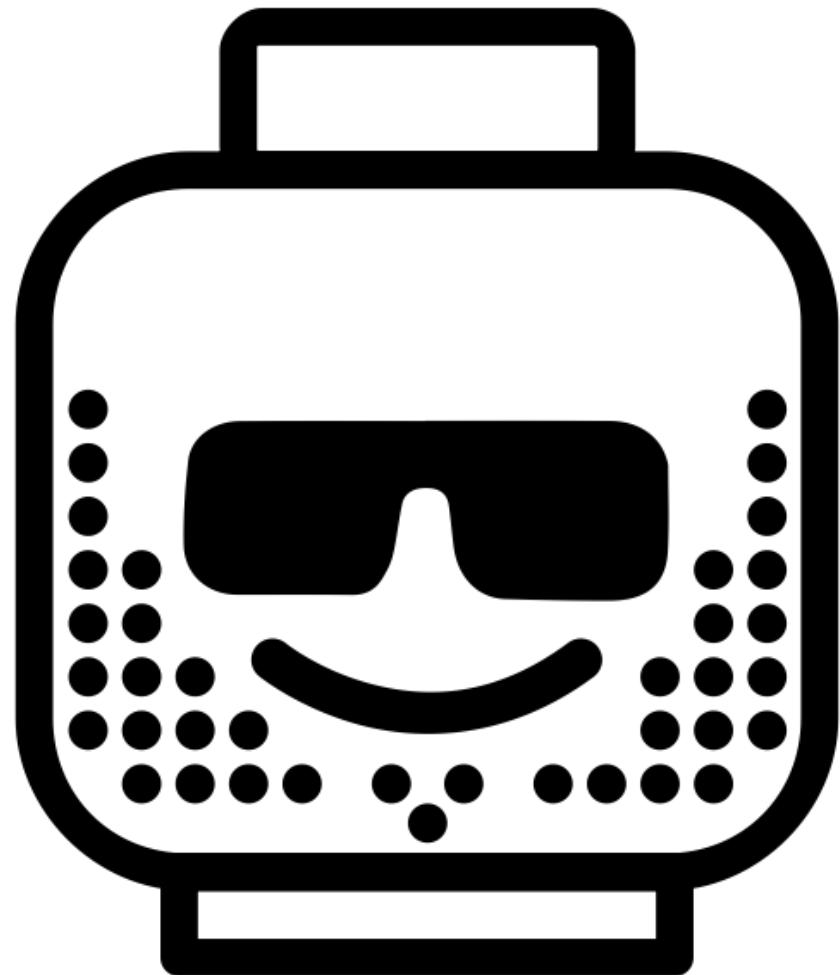
# Animate Pure Dynamo Geometry

- Using some logic.
- Using package, firefly for setting parameters sequentially
- Record with GIF software.

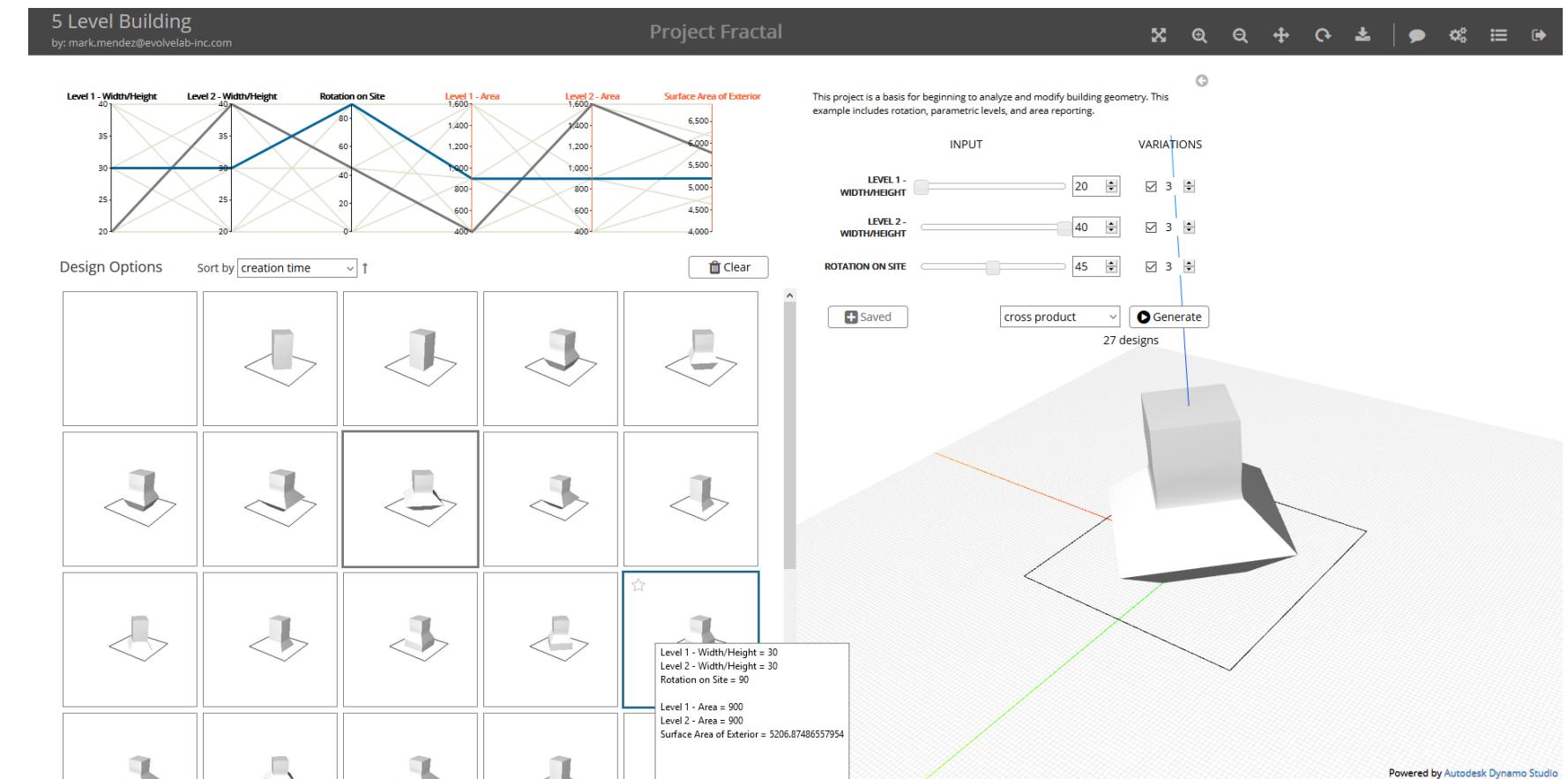
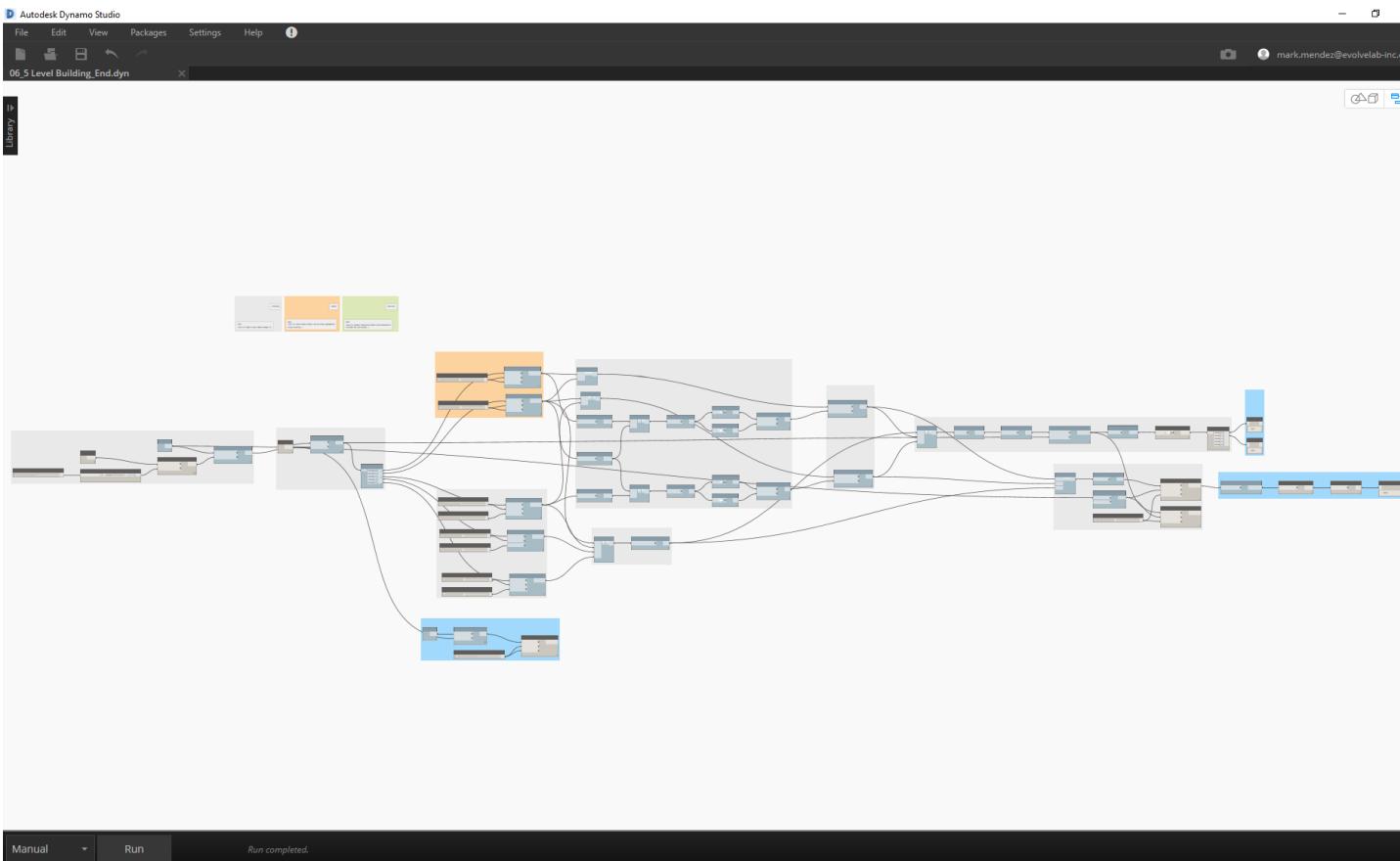


Dynamo geometry animation

# Optioneering



# Dynamo Studio to Project Fractal



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- Chance to win an AU2018 pass!
- Give your feedback after each session.
- Give instructors feedback in real-time.





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