

Advanced Computational BIM Workshop

EvolveLAB Team
@Evolve_LAB

Join the conversation #AU2017



Who are we?

Presenters:

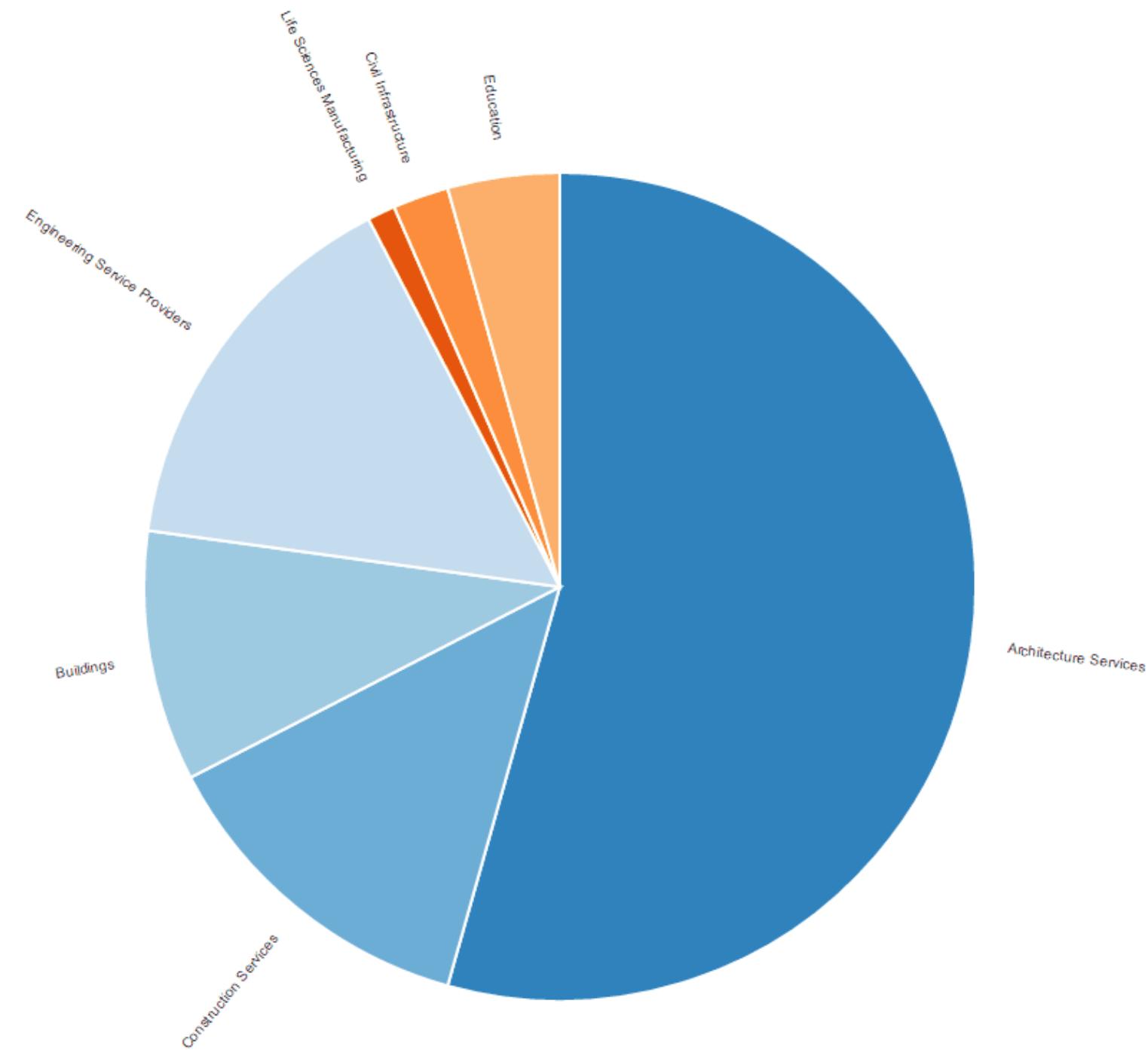
- Bill Allen *CEO/Managing Principal*
- Mark Mendez *Director of Product Development*
- John Pierson *Computational BIM Specialist*



Lab Assistants:

- Carlo Licea *Computational BIM Specialist*

Who Are You?



- Architecture Services
- Construction Services
- Buildings
- Engineering Service Providers
- Life Sciences Manufacturing
- Civil Infrastructure
- Education

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)
10:00 – 10:15	Coffee Break
10:15 – 10:45	Advanced List Manipulation – Upgrading a Face
10:45 – 11:45	Show Me the Data (Data Visualization)
11:45 – 01:00	Lunch
01:00 – 01:15	Autodesk Build Space Highlight with Special Guest Rick Rundell
01:15 – 02:00	Animation Strategies In Dynamo
02:00 – 02:45	Iterative, Generative, Optioneering with Dynamo Studio and Fractal
03:00 – 03:15	Coffee
03:30 – 06:30	Forum

What makes an advanced Dynamo Users?

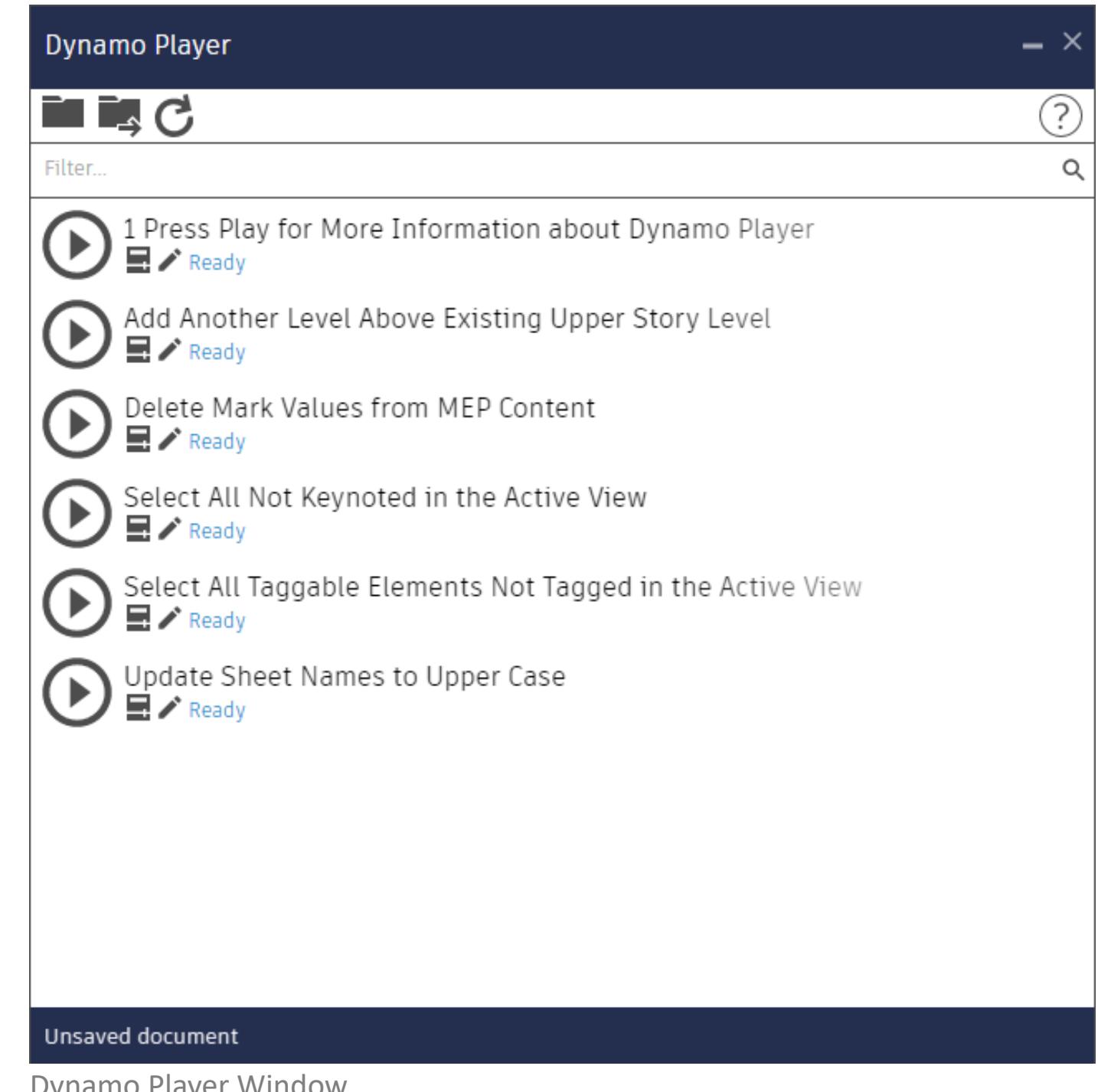
Getting Crazy with Dynamo Player



Image Credit: Gina Rafaella Furnari from the Noun Project

Dynamo Player Allows Us..

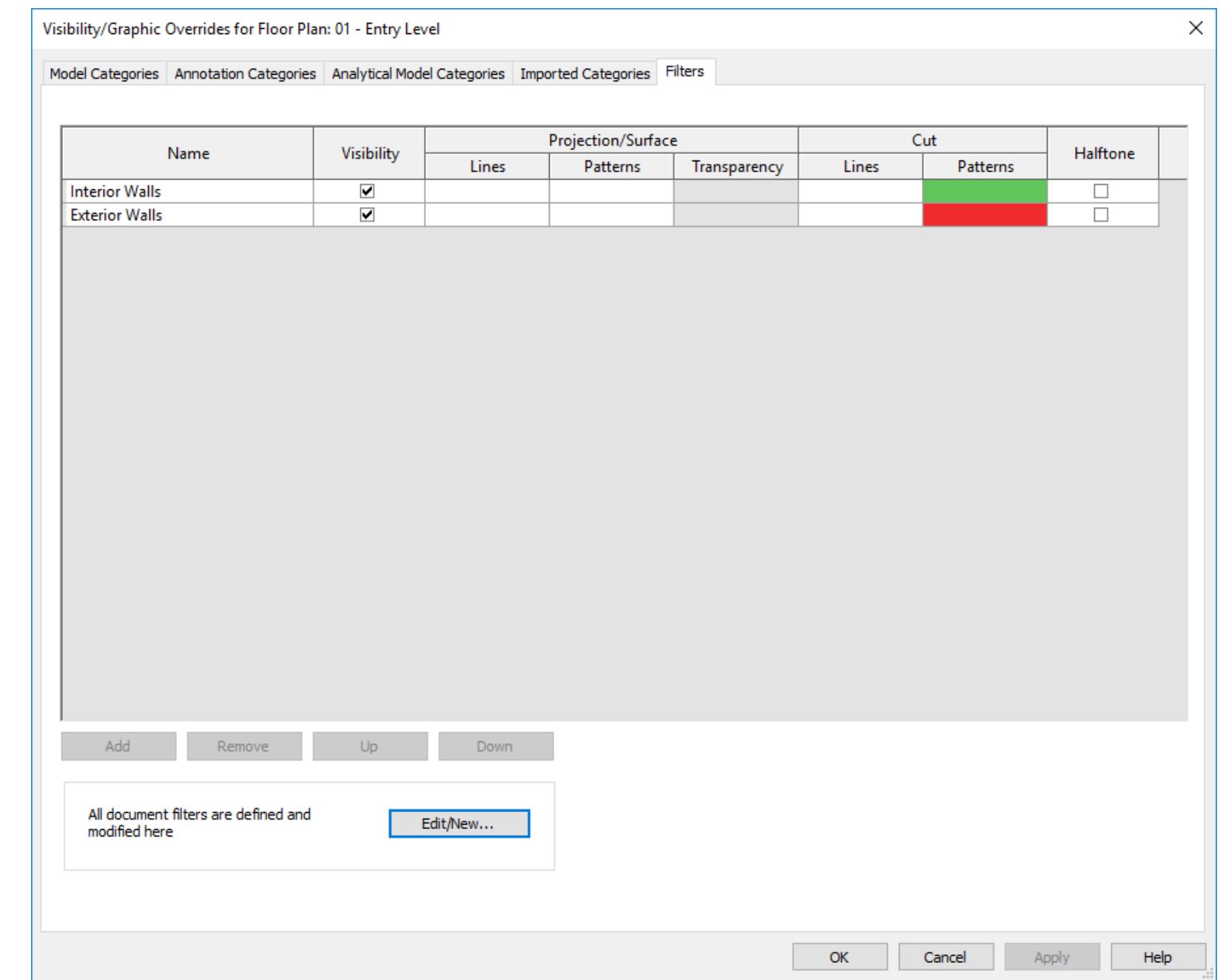
- Deploy graphs in a manageable way.
- Introduce beginners to computational workflows.
- Pretty much make our own deployable Revit addins. (*Shh... don't tell the addin creators*)
- Have awesome inputs in Revit 2018.1+
- Use custom packages to create slick user interfaces.



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.



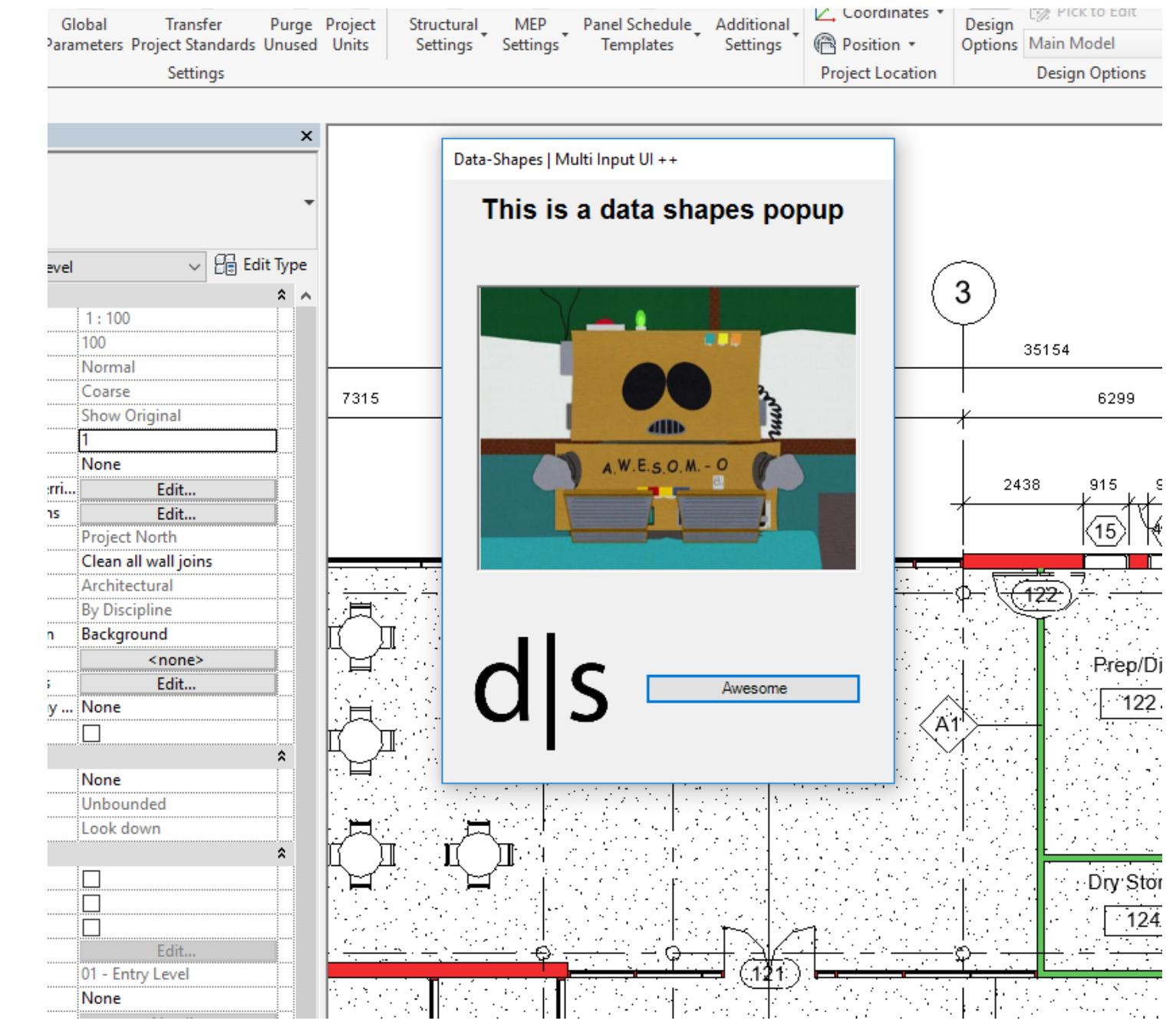
View Filters with Overrides

02 |

Custom UI Popups

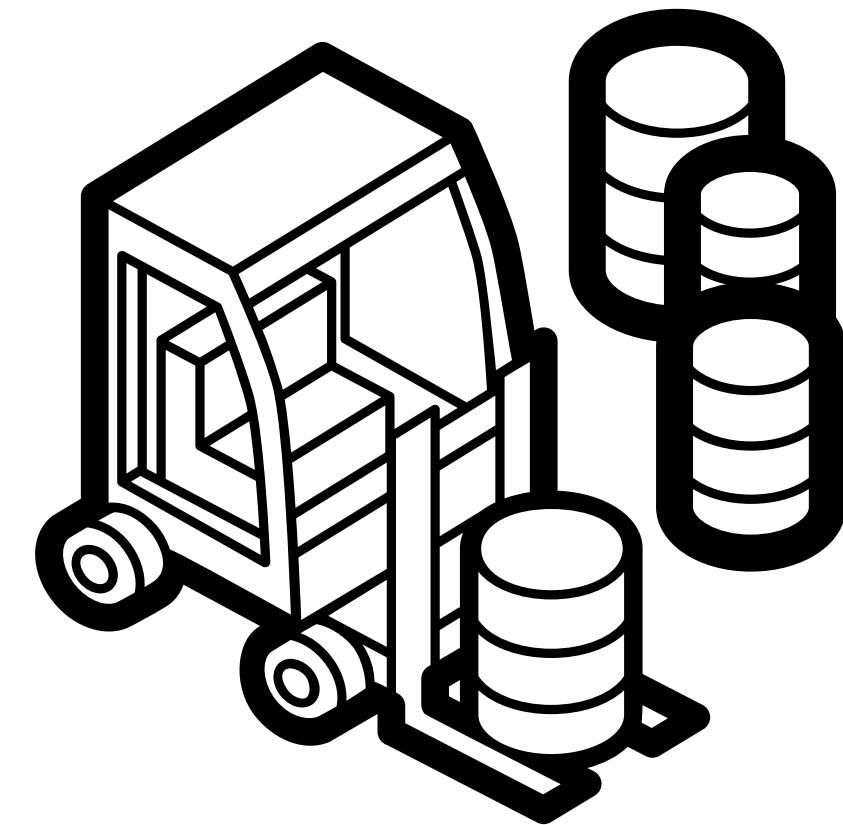
OOTB Dynamo Player is Awesome but...

- 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!



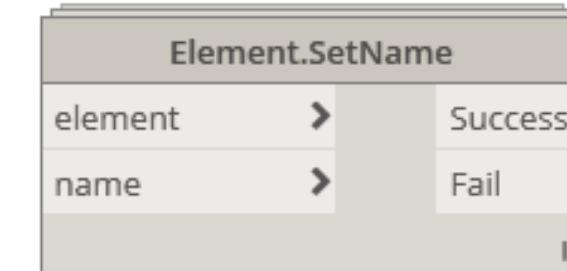
Data Shapes popup with Dynamo

I Shipped My Nodes



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

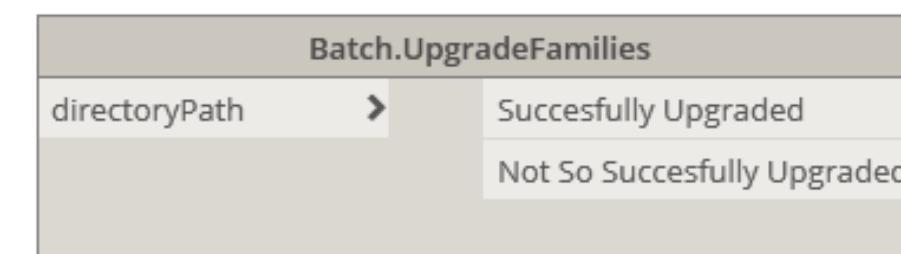
- Bundling OOTB nodes to form custom nodes.
- Python scripting with Python nodes.
- ZeroTouch import using .NET libraries (C#, VB.NET)
- Full Blown C# Development for Custom UI and More, (way out of the scope of this class).



Custom Node (Clockwork)



Python Script Node



ZeroTouch node made in C# (Rhythm)

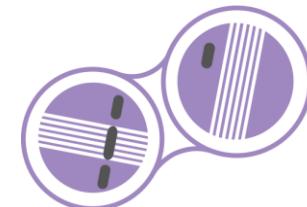
Essential Dynamo Packages

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
- beaker



mantisshrimp



clockwork
for dynamo



spring nodes



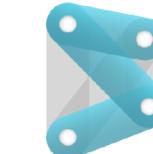
Rhythm
for Dynamo
sixtysecondrevit.com



mandrill



bumblebee



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



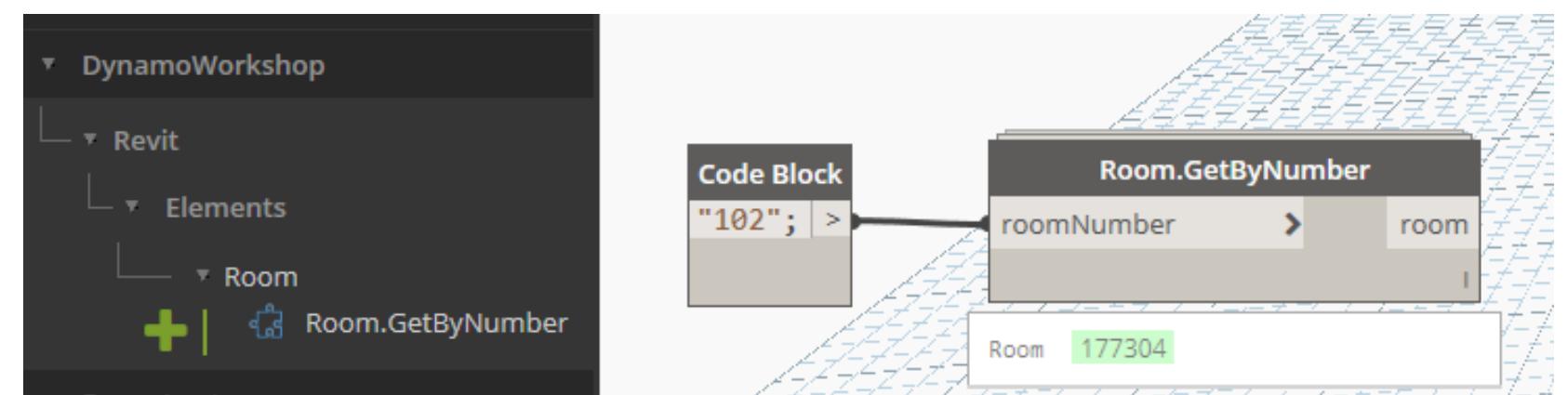
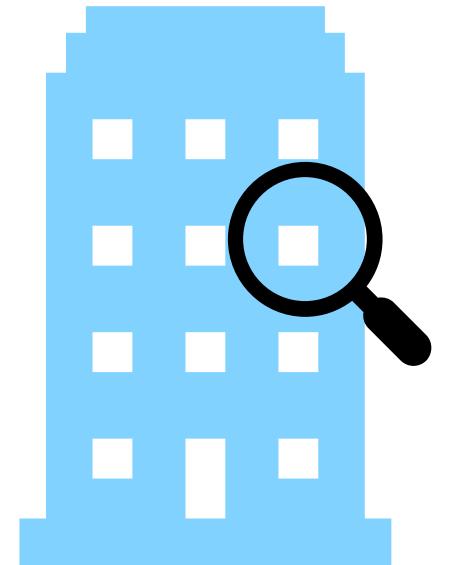
Firefly

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.



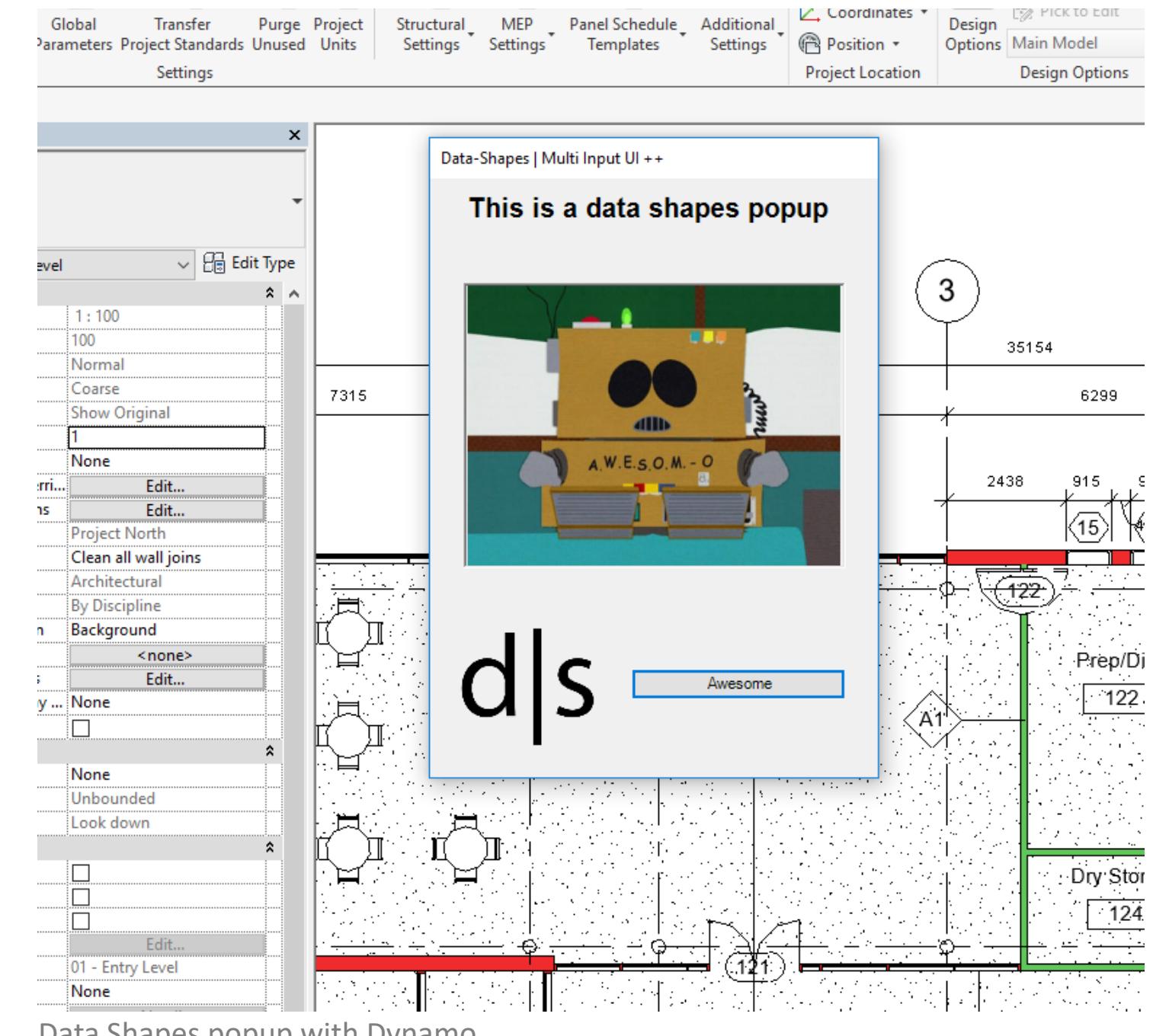
Custom node capable of searching for rooms by number.

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.



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

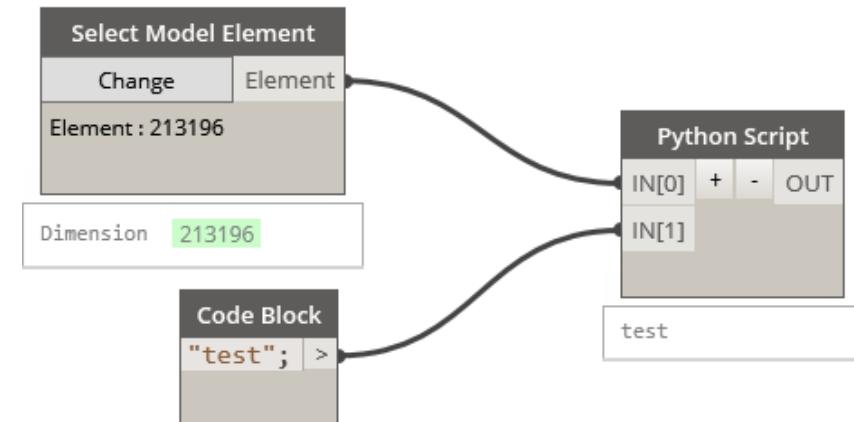
```
import clr
clr.AddReference('RevitAPI')
from Autodesk.Revit.DB import *

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
```

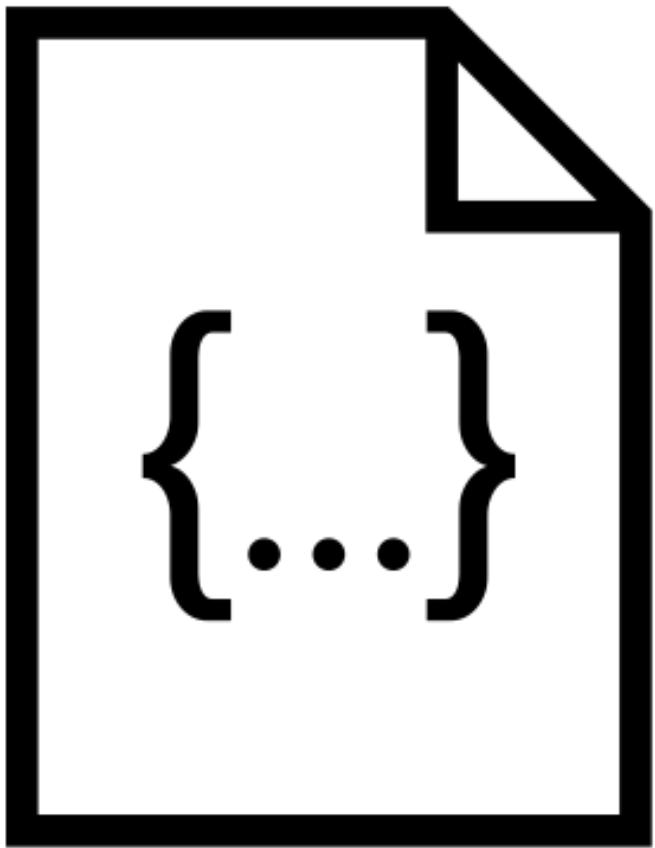
Dissect a python node. *Looping, access Revit API,*





Coffee Time

Advanced List Manipulation



Node Input/Output Controls

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



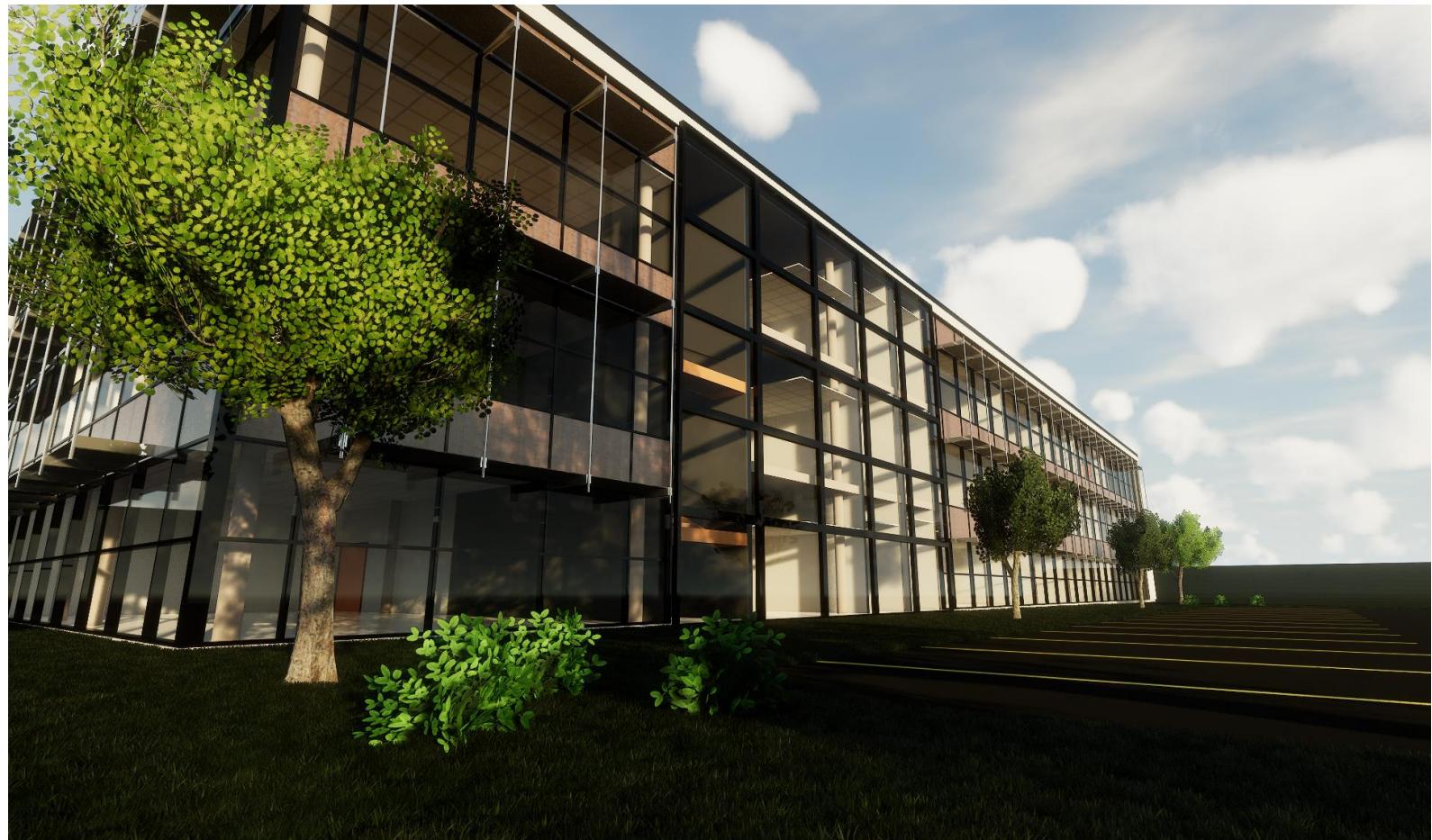
06 |

Upgrading a
Face

Start with Exterior Wall Canvas

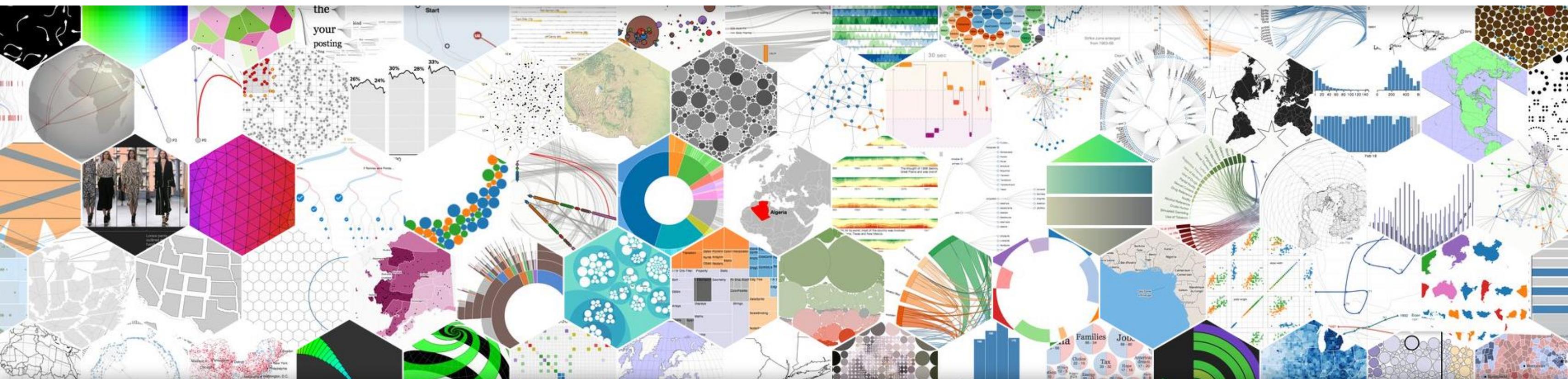


End with Panelized Facade



07 | Dynamo Visualization

DATA VISUALIZATION

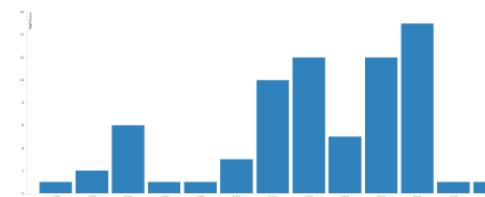




mandrill

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

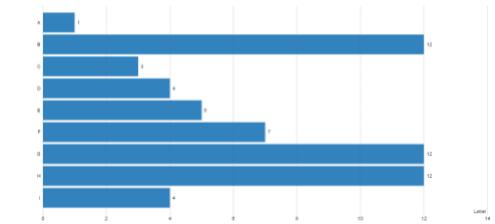
Bar Chart



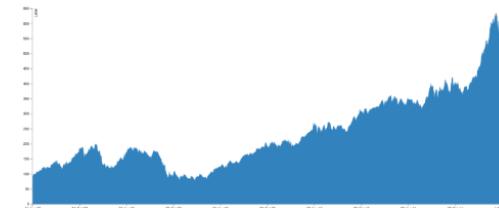
Donut Chart



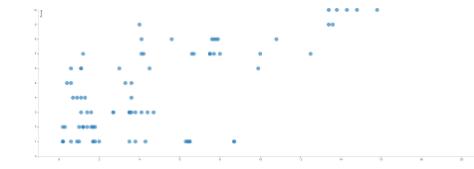
Horizontal Bar Chart



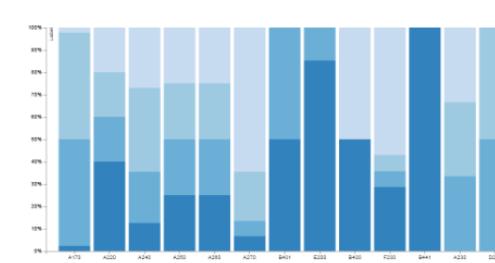
Area Chart



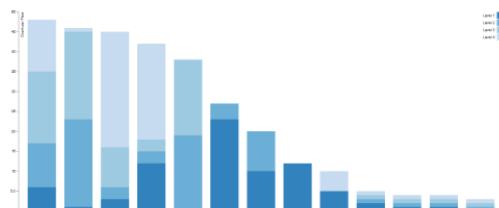
Scatter Plot



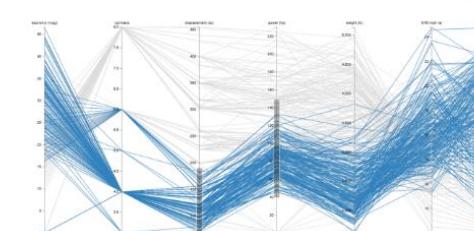
Normalized Stacked Bar Chart



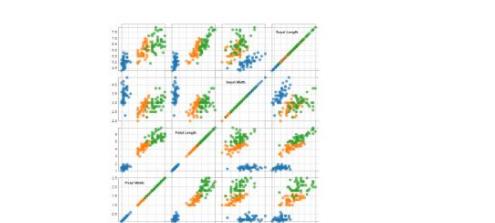
Stacked Bar Chart



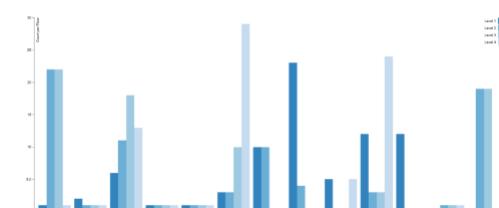
Parallel Coordinates



Scatter Plot Matrix

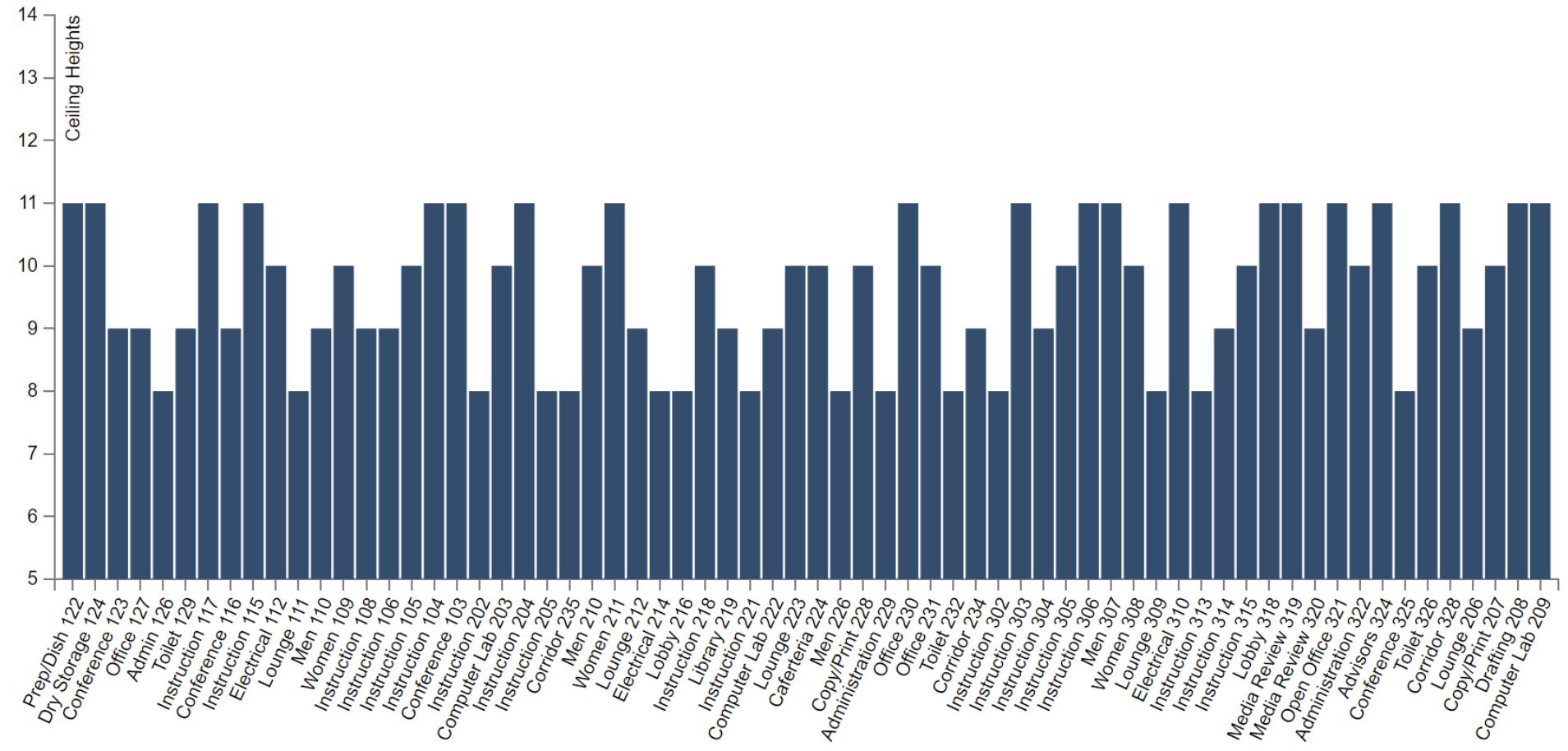


Grouped Bar Chart

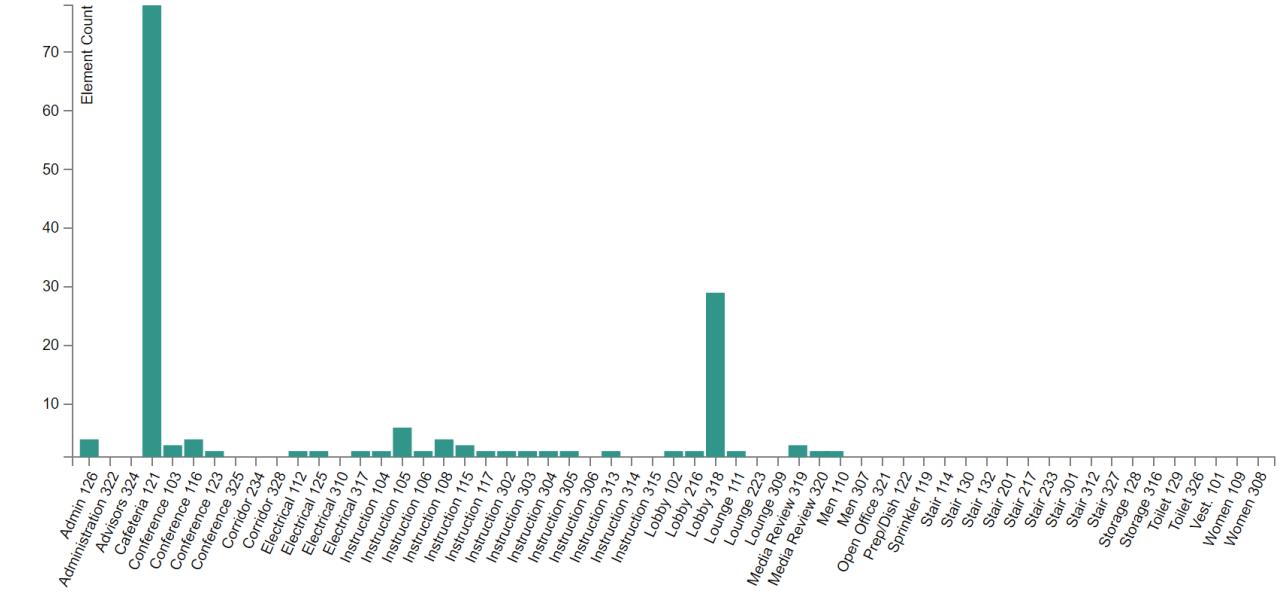


Visualization Room Information

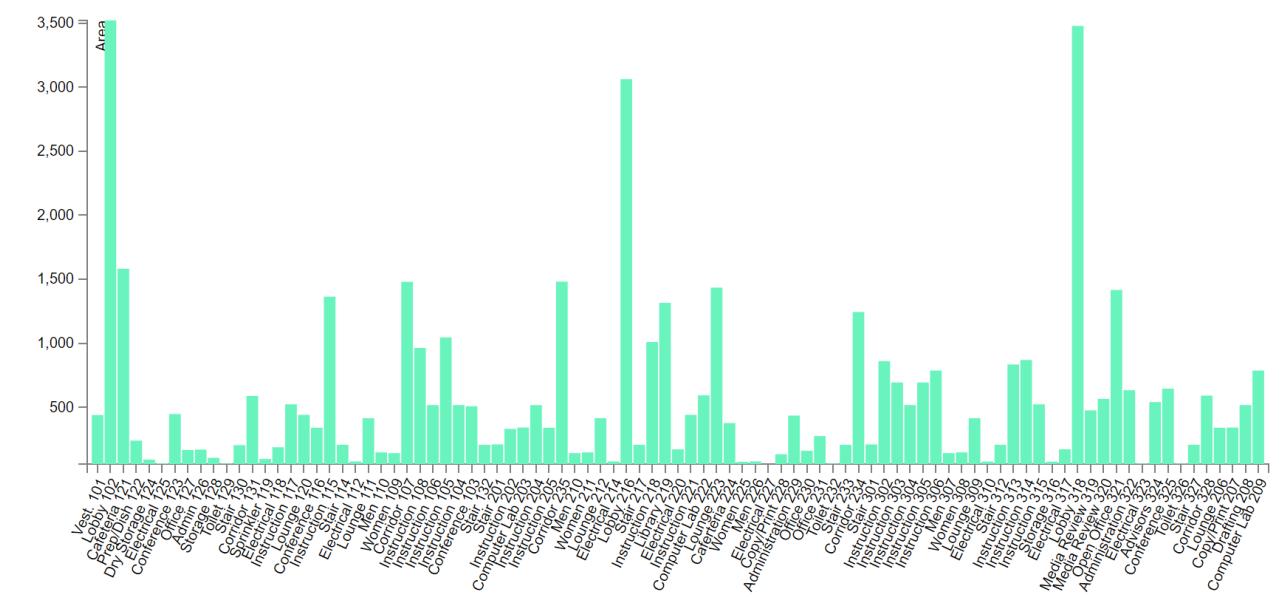
Ceiling Heights by Room



Element Count by Room



Room Areas

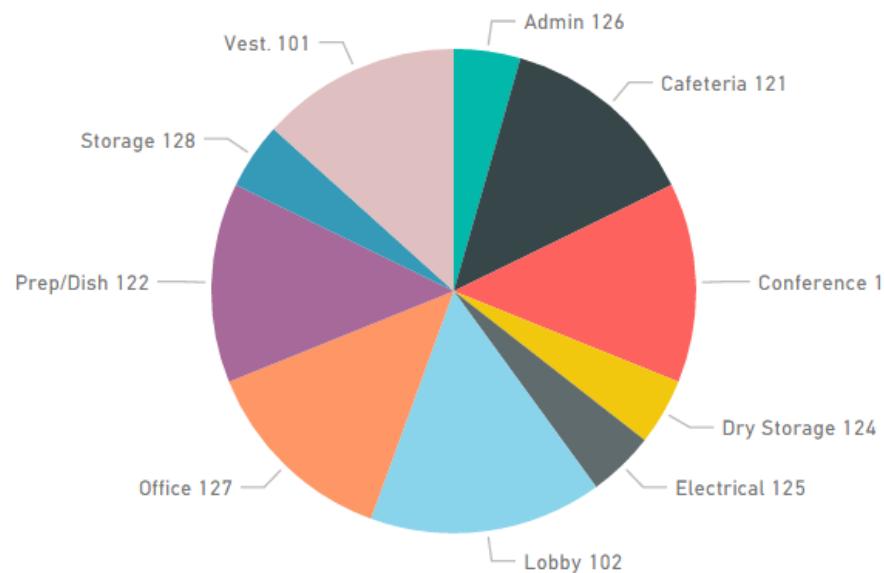


08 |

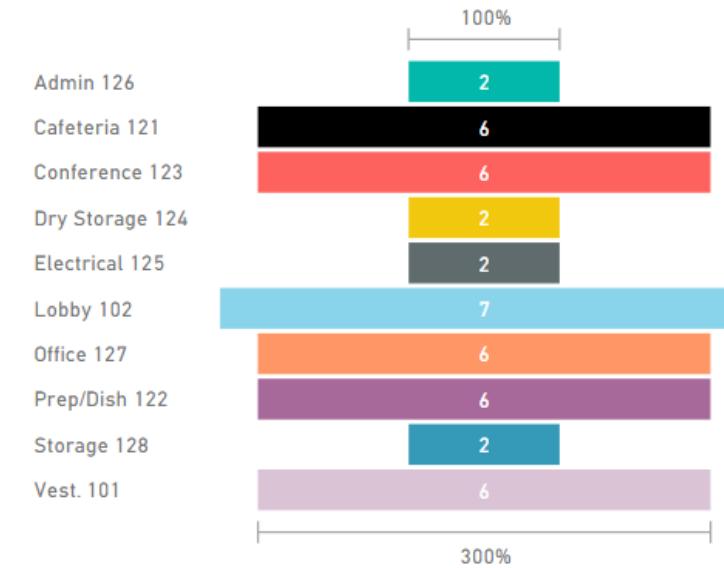
Power BI Visualization

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 ...

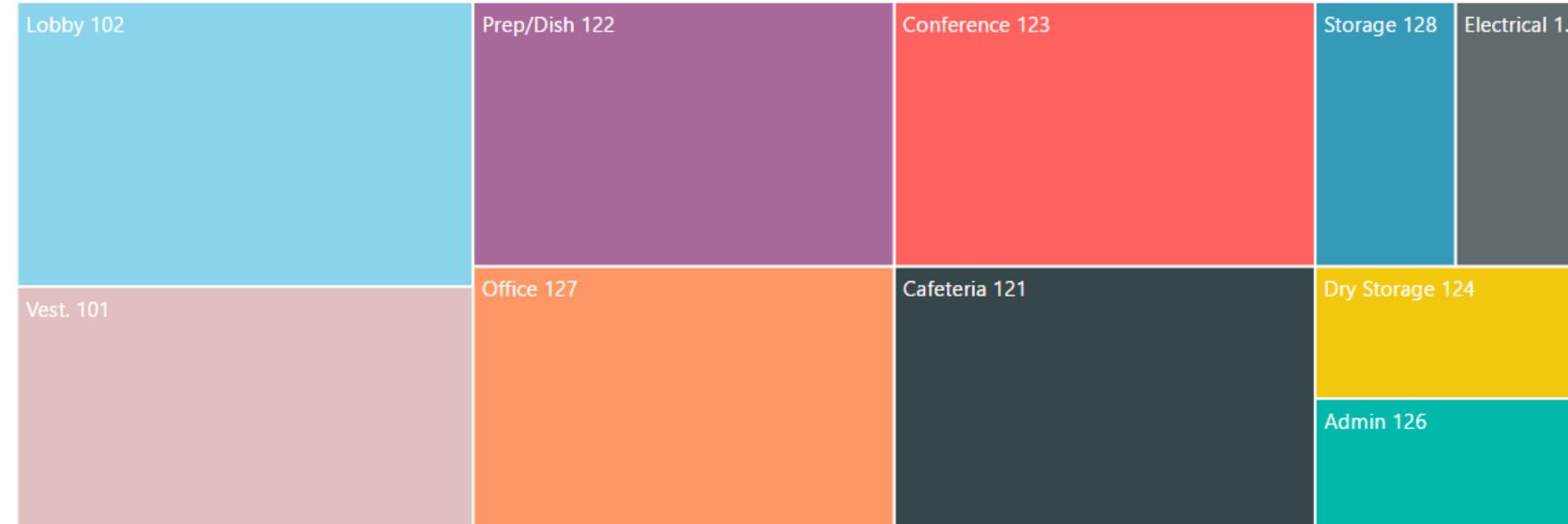
Masonry - Concrete Block

Metal - Stud Layer

Plasterboard

Vapour / Moisture Barriers - Vapour Re...

Count of Materials by Rooms



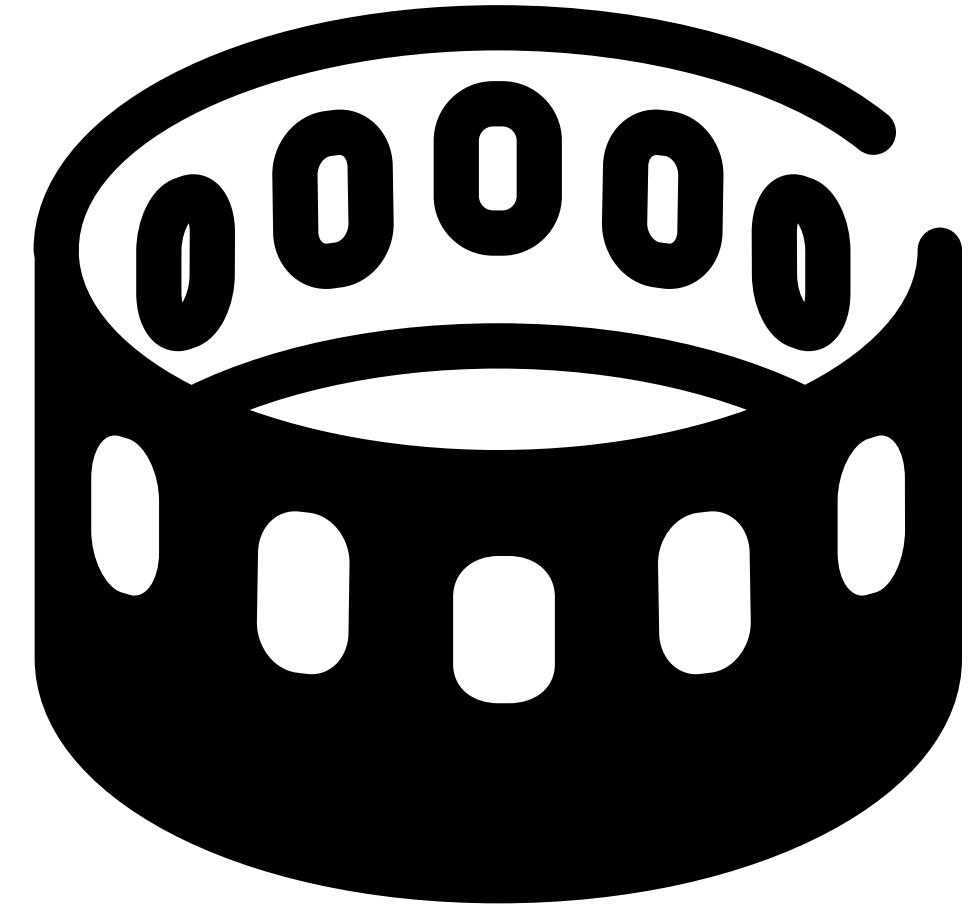
The background features a complex, abstract geometric pattern composed of numerous thin, light-grey lines forming a mesh of triangles and irregular polygons. Three large, semi-transparent white circles overlap in the center. A solid blue horizontal bar runs across the middle of the image. The text "Lunch Time" is centered on this blue bar.

Lunch Time



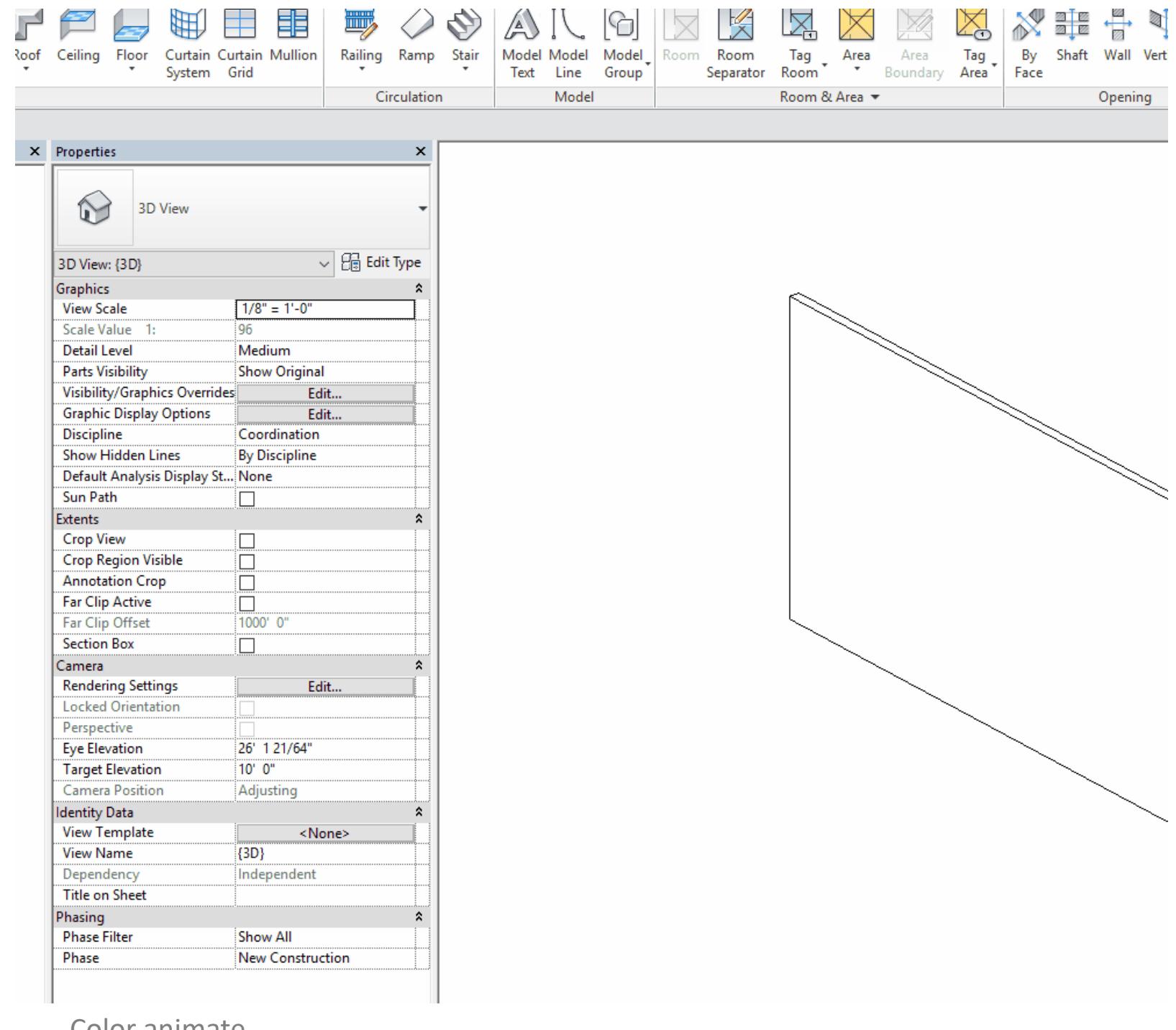
Autodesk Build Space Highlight with Rick Rundell

Animation Strategies



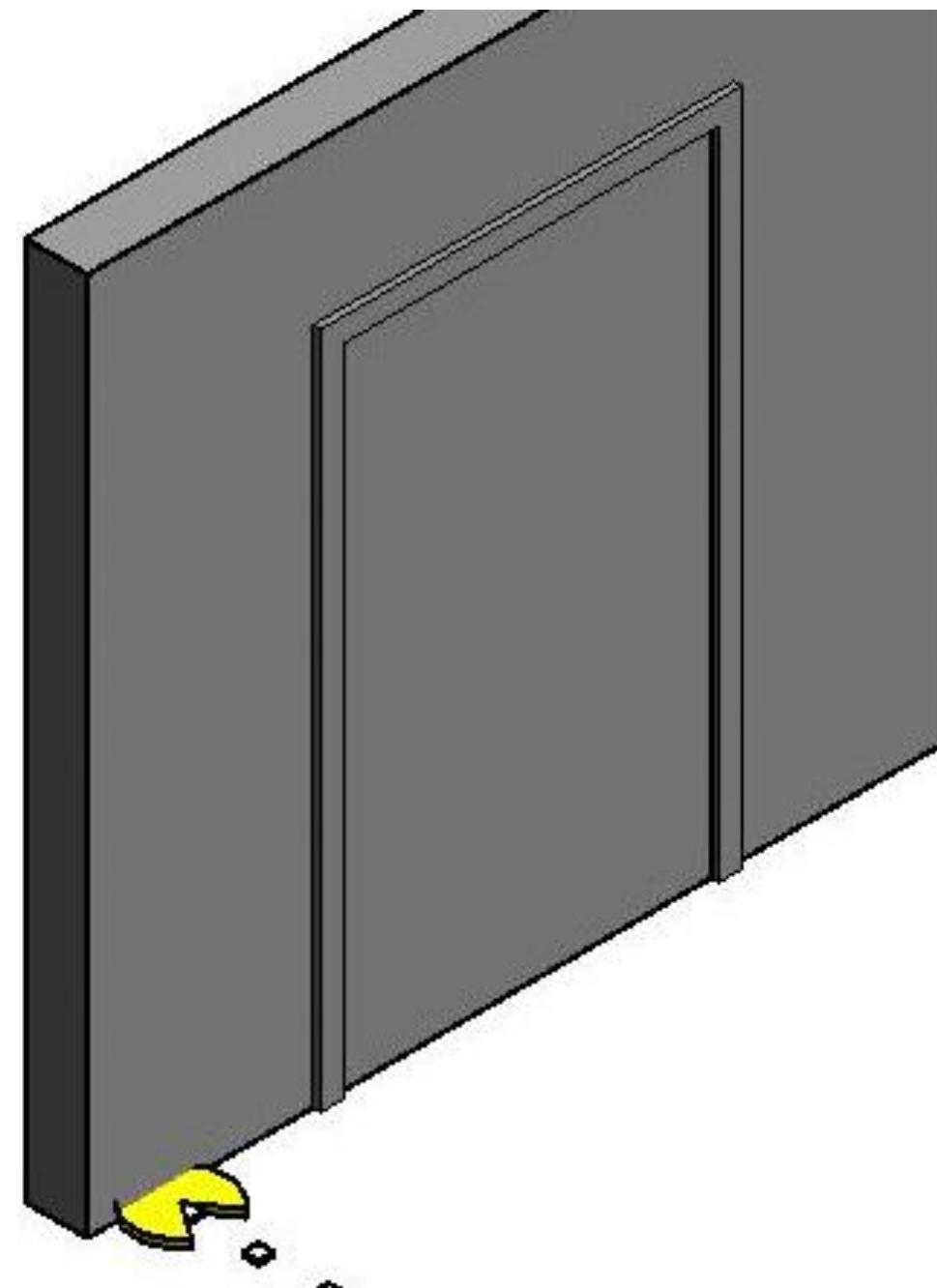
Animation Strategies in Dynamo

- 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

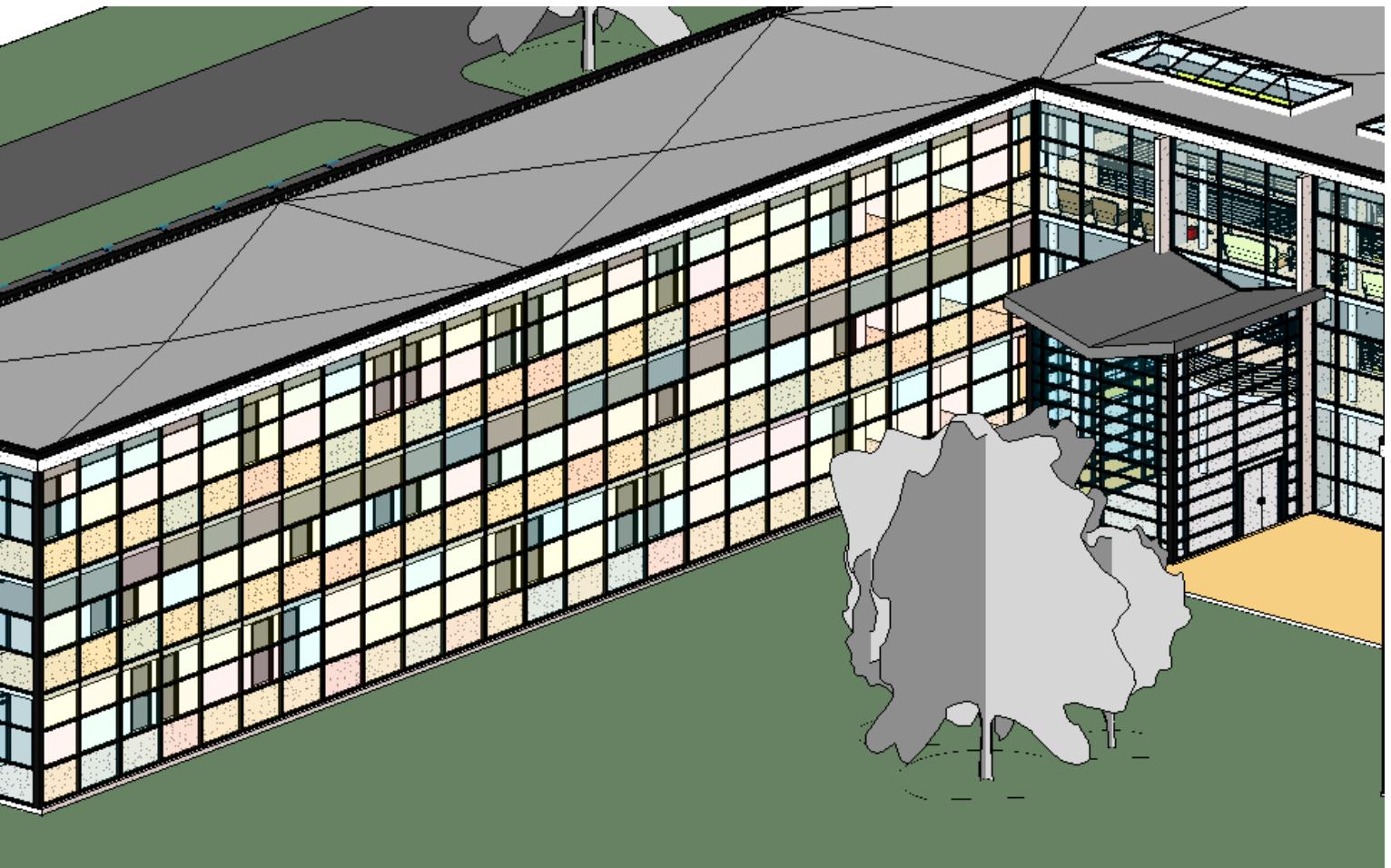
- Using a node that applies the changes and undoes them.
- Works with numeric parameters.
- Combine with a GIF maker website.



Animate Numeric Params

Animate Color with Image Export

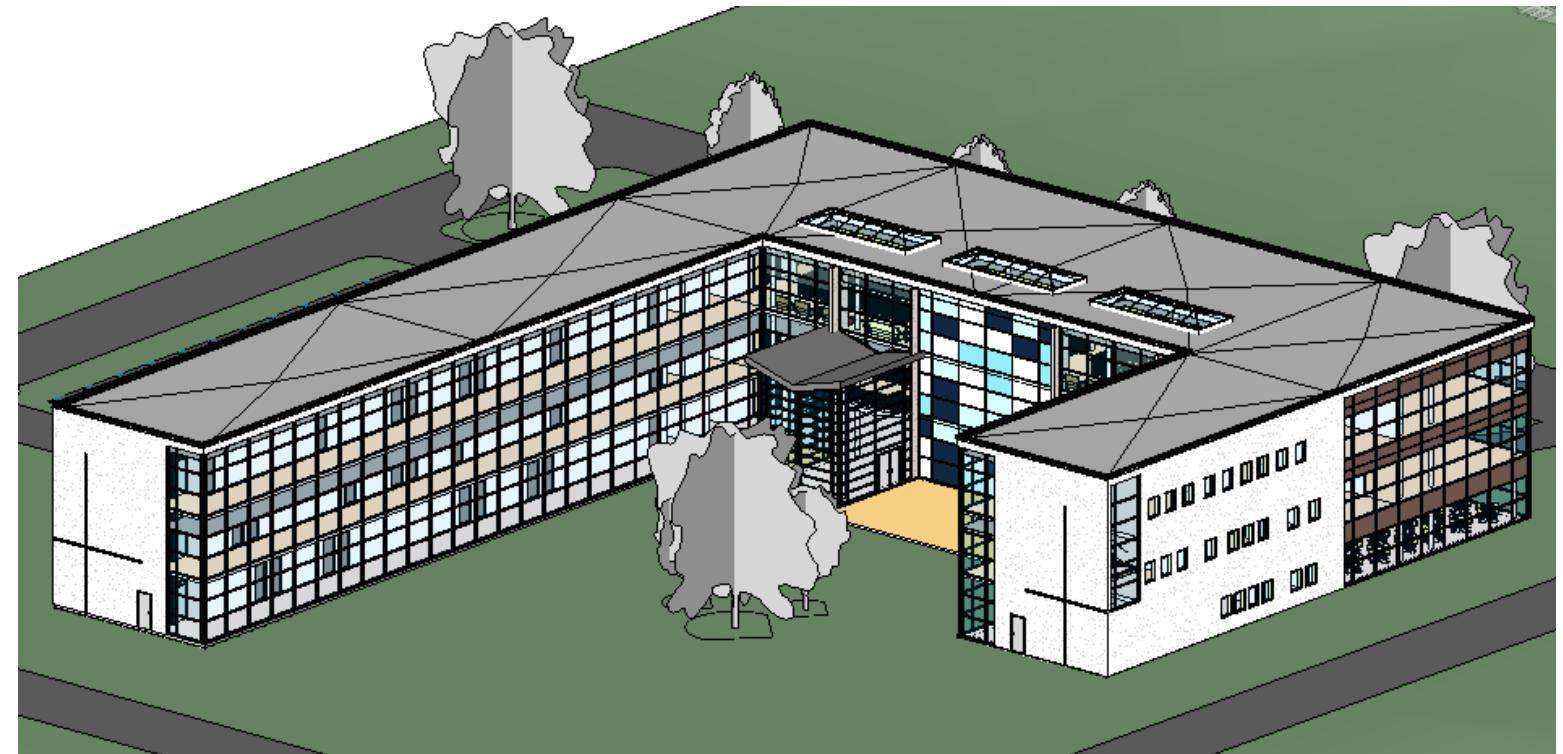
- Iterate over curtain panels and override color in view.
- Export image for each option.
- Have images for review or GIF



Animate Color

Animate Panel Material

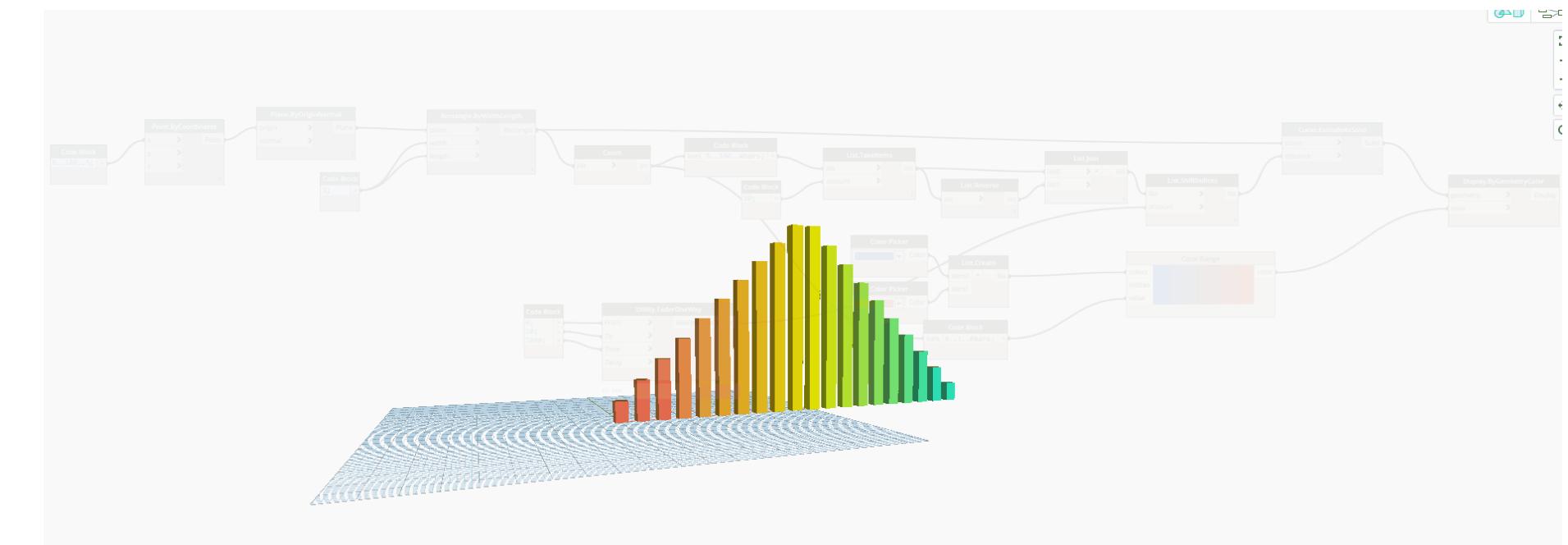
- Iterate over curtain panels and change actual panel type.
- Export image for each option.
- Have images for review or GIF.



Iterate through options

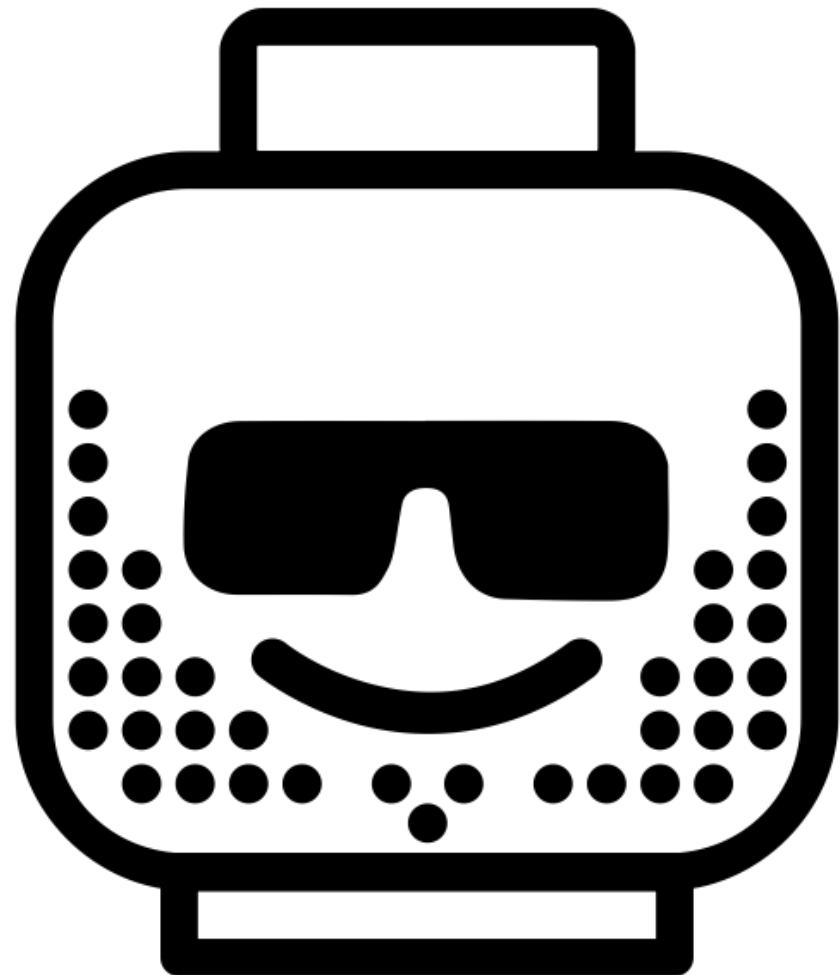
Animate Pure Dynamo Geometry

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

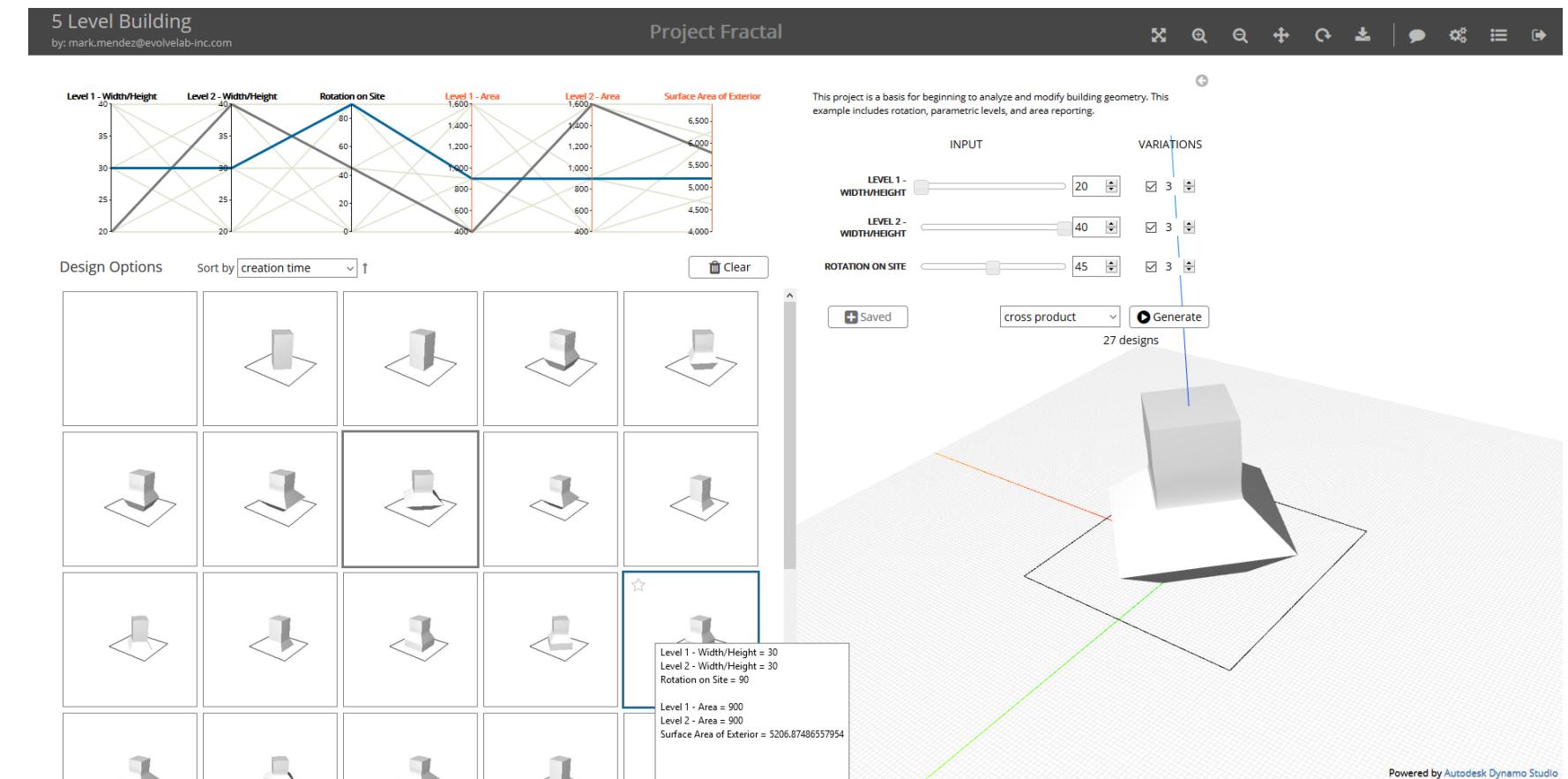
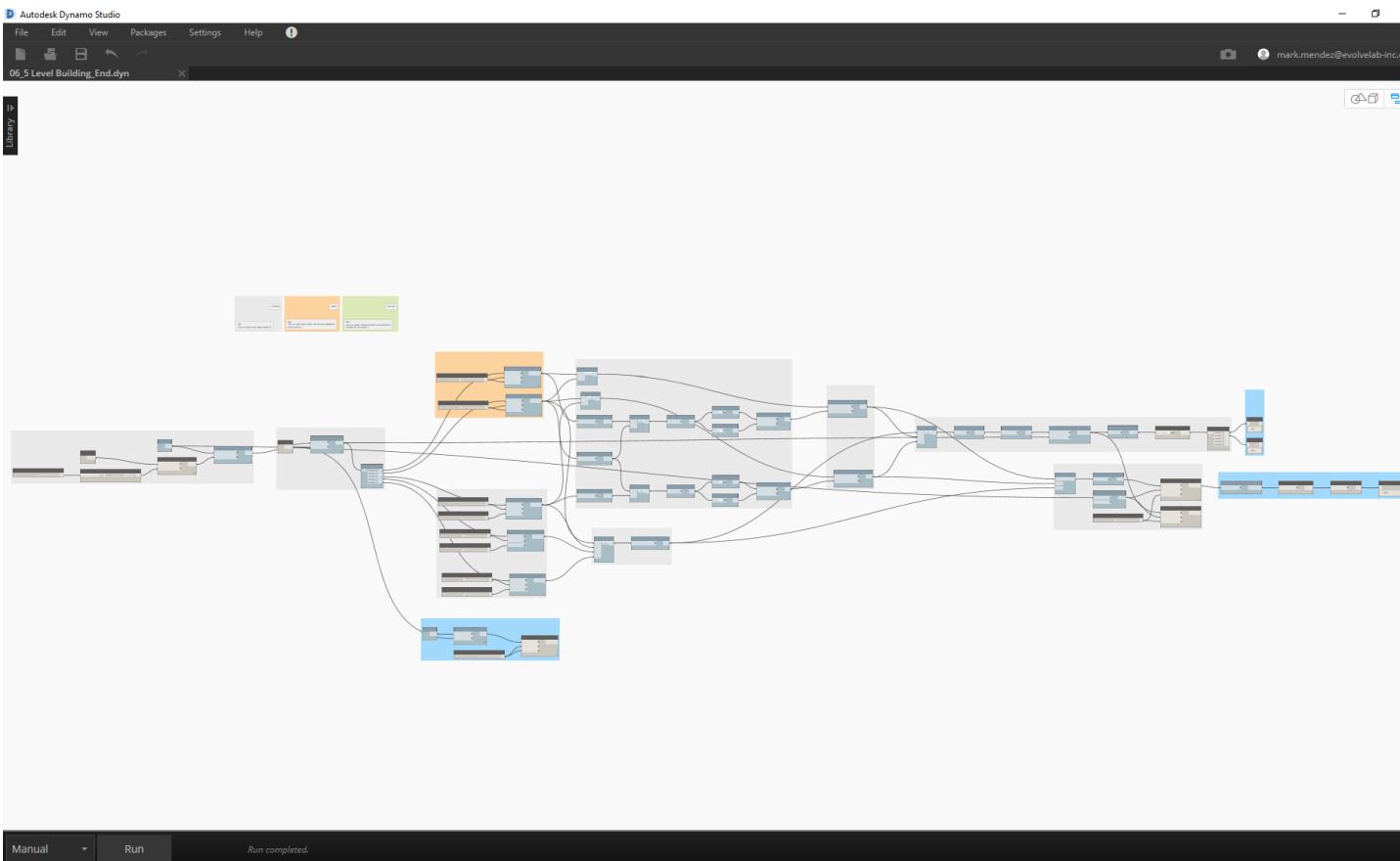


Dynamo geometry animation

Optioneering



Dynamo Studio to Project Fractal



Be heard! Provide AU session feedback.

- Via the Survey Stations, email or mobile device.
- Chance to win an AU2018 pass!
- Give your feedback after each session.
- Give instructors feedback in real-time.





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