

AS463668

Dynamo isn't Magic but these Tips and Tricks might seem Magical

Carl Storms

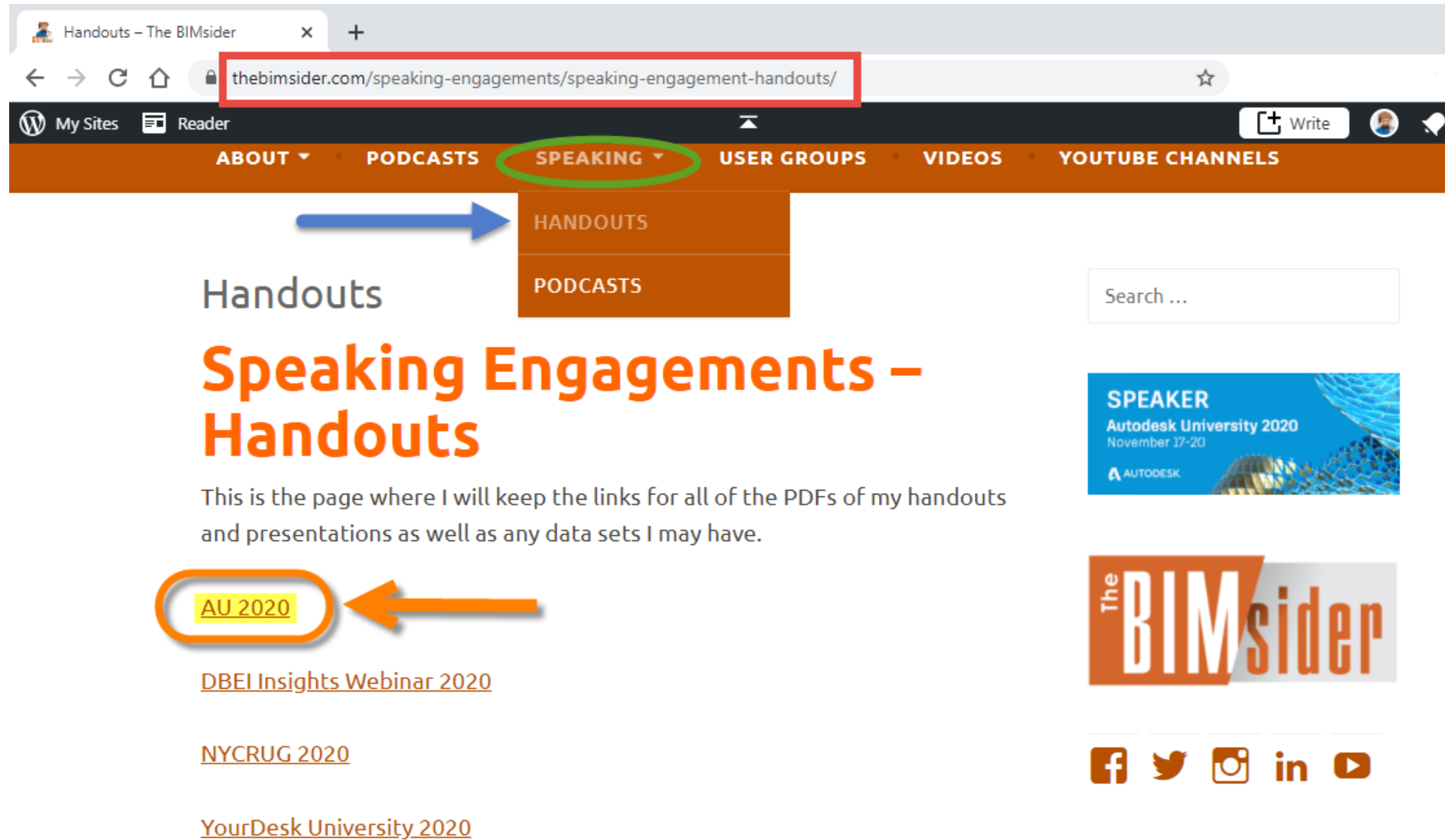
Technical Solutions Lead | @theBIMsider

BIM Track

Version 2.1

Session Handout & Presentation

Via Website



The screenshot shows a web browser with the URL thebimsider.com/speaking-engagements/speaking-engagement-handouts/ highlighted in the address bar. The website's navigation menu includes **ABOUT**, **PODCASTS**, **SPEAKING** (highlighted with a green circle), **USER GROUPS**, **VIDEOS**, and **YOUTUBE CHANNELS**. A blue arrow points from the **SPEAKING** menu item to the **HANDOUTS** sub-menu item. The main content area is titled **Handouts** and **Speaking Engagements – Handouts**. Below this, a text block states: "This is the page where I will keep the links for all of the PDFs of my handouts and presentations as well as any data sets I may have." A yellow box highlights the **AU 2020** link, with an orange arrow pointing to it. Below this are three more links: [DBEI Insights Webinar 2020](#), [NYCRUG 2020](#), and [YourDesk University 2020](#). The right sidebar features a search bar, a speaker announcement for Autodesk University 2020, and social media icons for Facebook, Twitter, Instagram, LinkedIn, and YouTube.

Via QR Code



Agenda

Introductions

What's New

Learning and Sharing

Have Fun

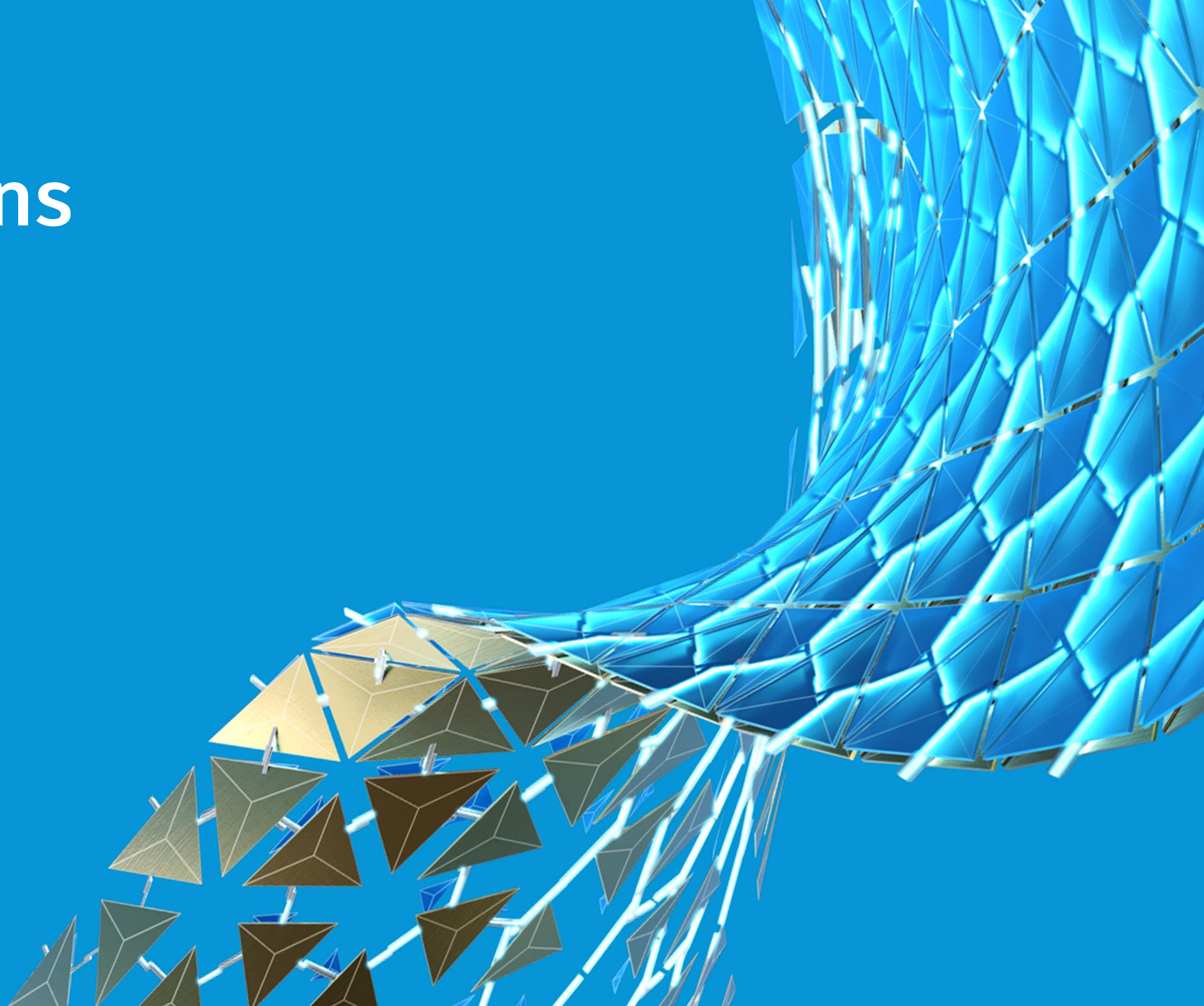
Quick and Dirty

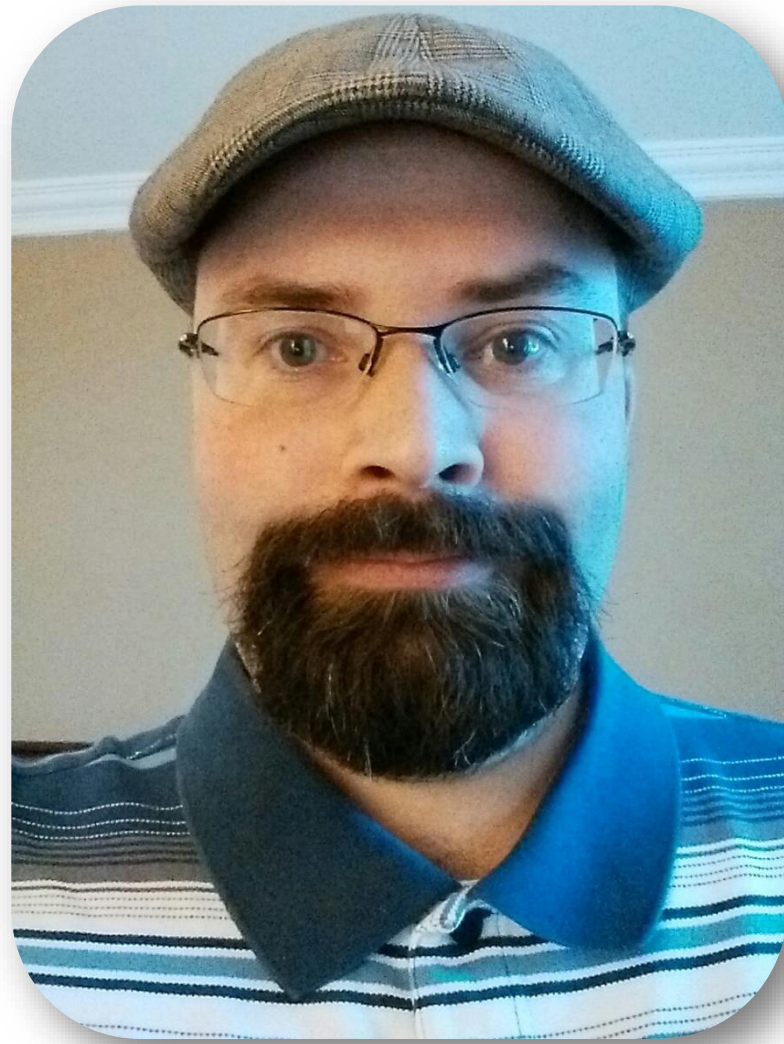
Mixed Bag

Packages and Extensions

Final Thoughts

Introductions





Carl Storms

Technical Solutions Lead
BIM Track

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Website: [BIM Track](#)

Twitter: [@theBIMsider](#)

Email: thebimsider@gmail.com

Blog: [The BIMsider](#)

LinkedIn: [Carl Storms](#)

Podcast: [BIMThoughts](#)

Podcast: [BILT Academy Podcast](#)

Podcast: [Simply Complex Podcast](#)

Podcast: [BluePrints](#)

About the Speaker

Worked in Residential & Commercial Architecture

Worked in Commercial Construction (BIM/VDC)

10 Years as a Collegiate & Industry Instructor

Started Working with CAD in 1993 (using since 1989)

Been Involved in AECO Since 1998

Been Utilizing BIM since 2008

Speaker at Multiple Global Conferences Since 2014

Dynamo AllStars

I've had some help from some **Dynamo AllStars** with some of the Tips & Tricks

When you see a badge like this, the tip or trick came from a Dynamo AllStar



[John Pierson](#)

Dynamo AllStars

A **HUGE** thanks to all the **Dynamo AllStars** that shared some of their Tips
& Tricks for this session!



Zach Kron



**Lisa-Marie
Mueller**



John Pierson



**Jason
Boehning**



**Dana
De Filippi**



**Marcello
Sgambelluri**



Sean Fruin



Sol Amour



Gavin Crump



Paul Aubin



**Colin
McCrone**



**Adam
Sheather**



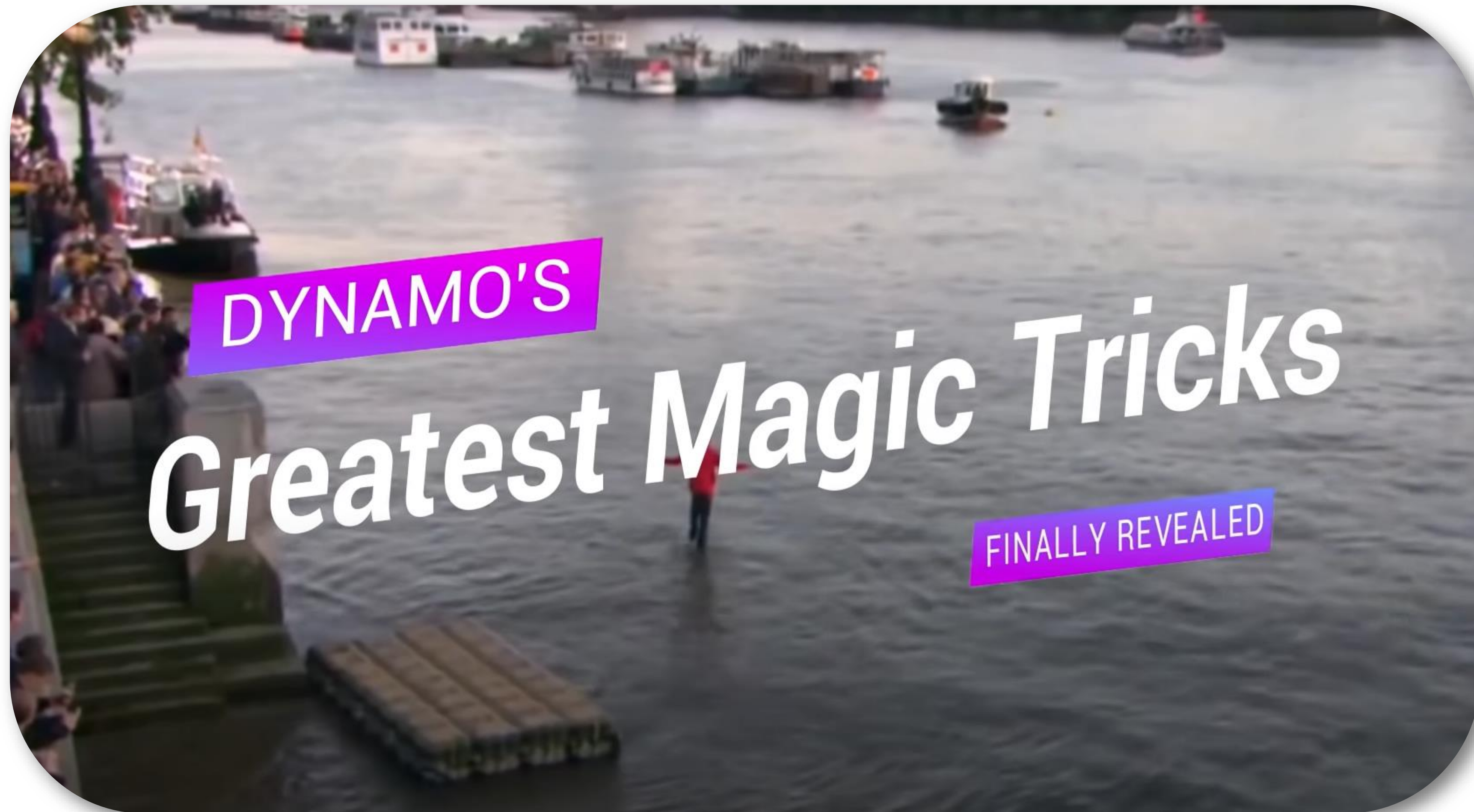
Jacob Small

Tailored Expectations

~~Dynamo is **NOT** magic~~

Dynamo **IS** a Magician

DynamoBIM is **NOT** magic



Tailored Expectations

DynamoBIM **IS** an Advanced Technology

ANY
SUFFICIENTLY
ADVANCED
TECHNOLOGY IS
INDISTINGUISHABLE
FROM MAGIC

ARTHUR C. CLARKE

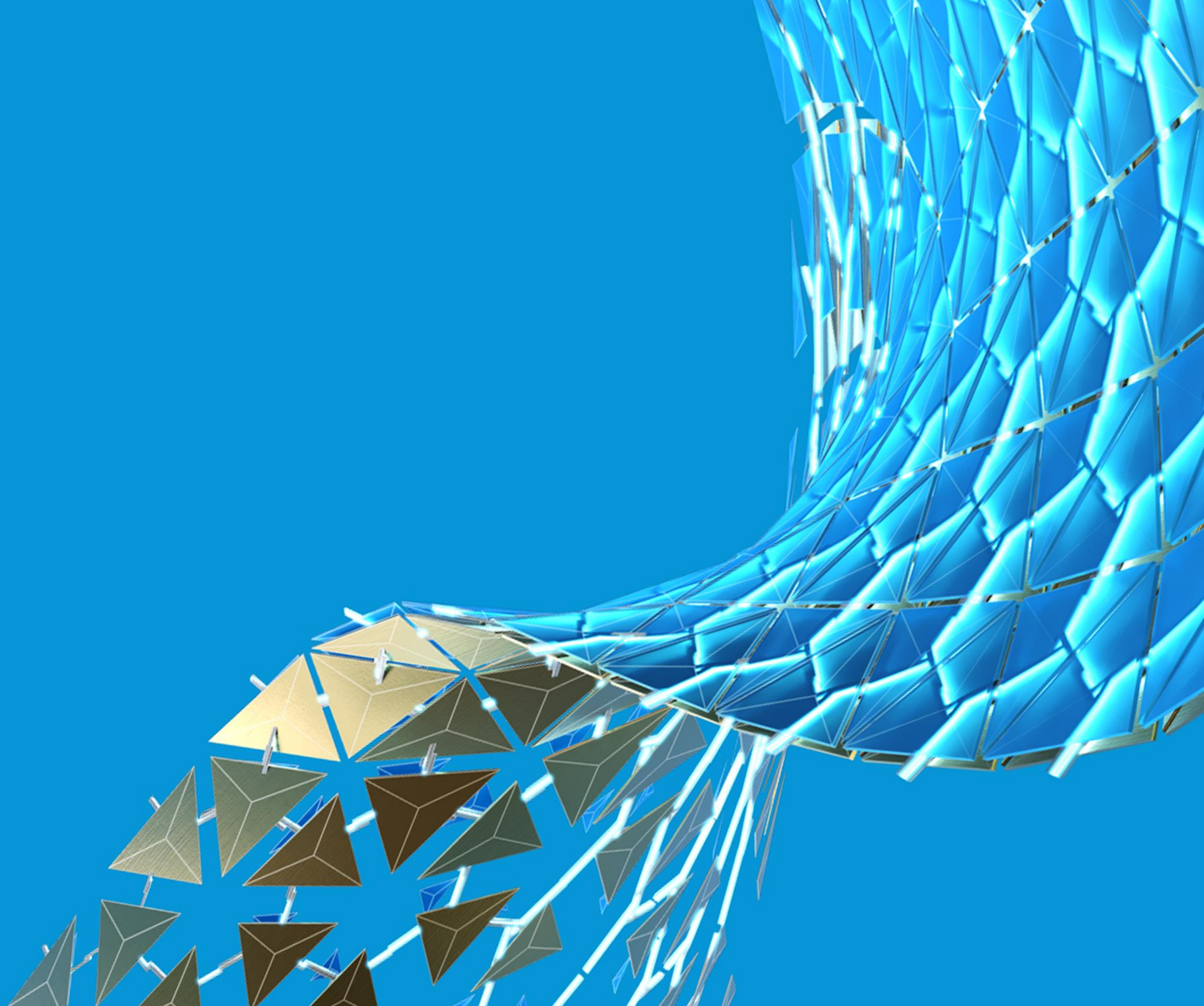
Tailored Expectations

Now before we truly get started let's agree to just call it...



Dynamo

What's New



Versions, Versions and more Versions



DYNAMO SANDBOX

Dynamo Sandbox is an open source environment for visual programming. Sandbox is a free download of our core technology that isn't integrated into any other product and has limited functionality.

- ✓ Test the most up-to-date Dynamo features
- ✓ Runs standalone from other Autodesk applications
- ✓ Can download packages but not upload of packages
- ✓ Work faster in a multi-threaded environment
- ✓ Unlike Dynamo Studio, Sandbox has no DWG import/export and requires other Autodesk products to access

DOWNLOAD

Version 2.8.0



AUTODESK REVIT

DynamoRevit is a graphical programming interface that lets you customize your building information workflow. DynamoRevit is an open source visual programming platform for designers. It is installed as part of Revit.

- ✓ Rapid design iteration and broad interoperability
- ✓ Lightweight scripting interface
- ✓ Current builds for Autodesk Revit 2017, 2018 and 2019

DOWNLOAD

Version 2.0.4

Version 1.3.4



DYNAMO REVIT

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- ✓ Rapid design iteration and broad interoperability
- ✓ Lightweight scripting interface
- ✓ Downloadable versions available for Revit 2017, 2018 and 2019
- ✓ Automatically installed as part of Revit since Revit 2020

2020.2.3

Version 2.3.0

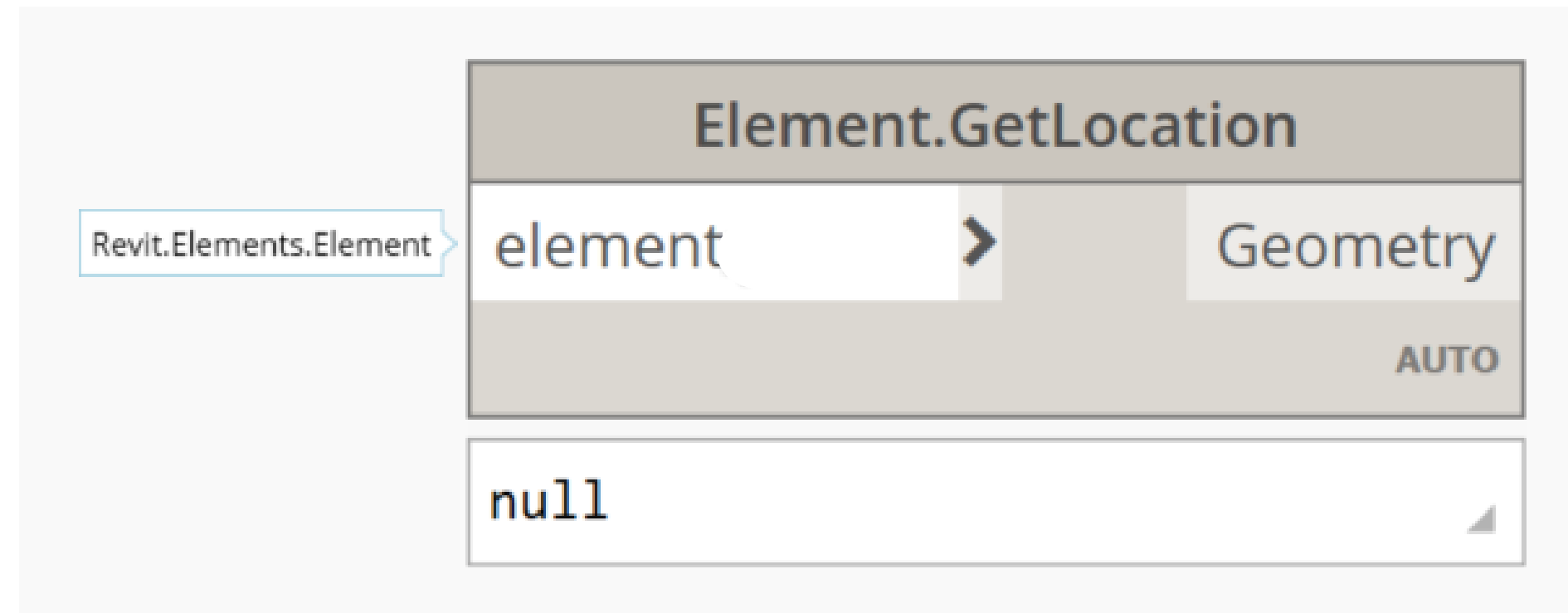
2021.1.1

Version 2.6.1

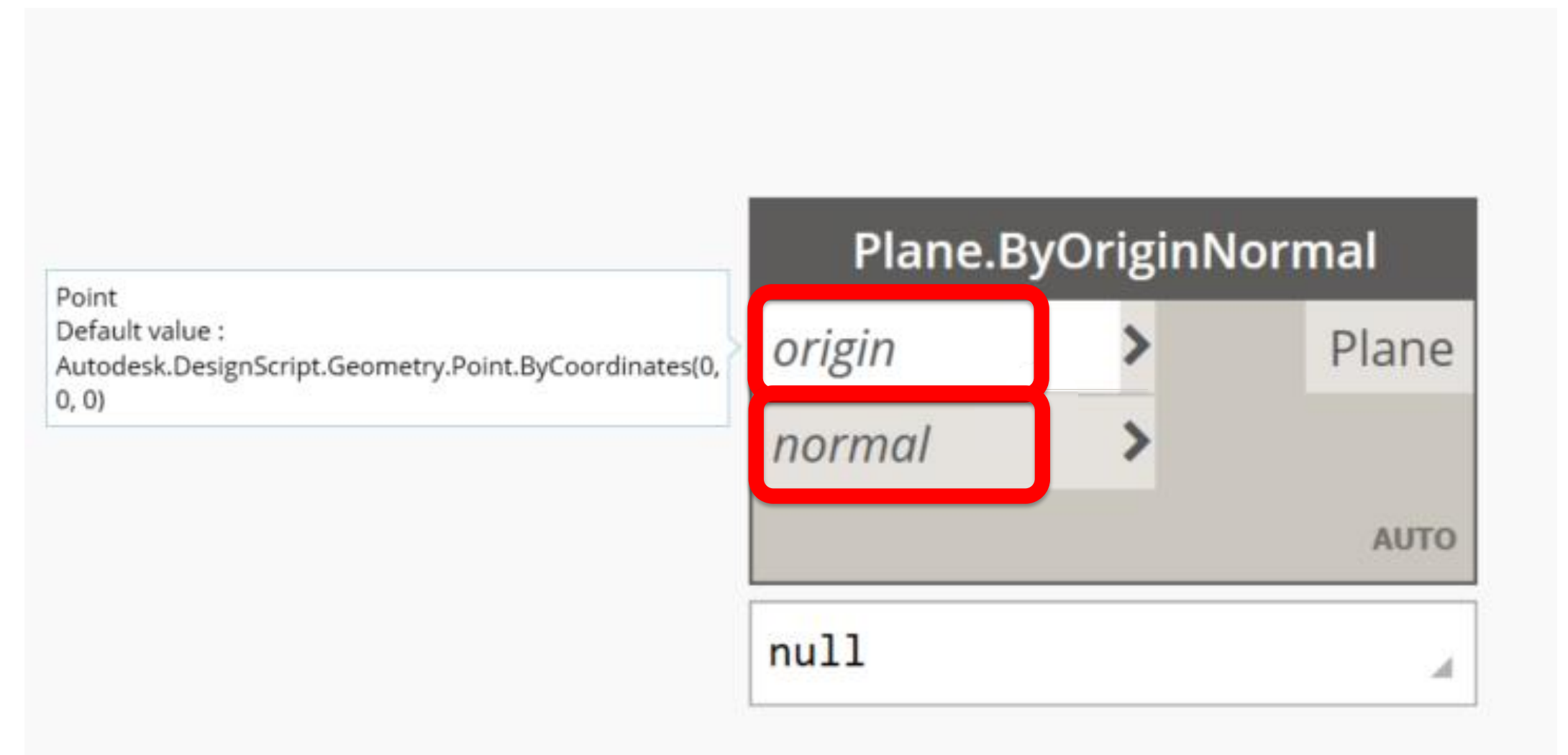
Get Dynamo Downloads [HERE](#)

Dynamo for Revit 2.6.1

Input ports that have a default value now show in *italic* font



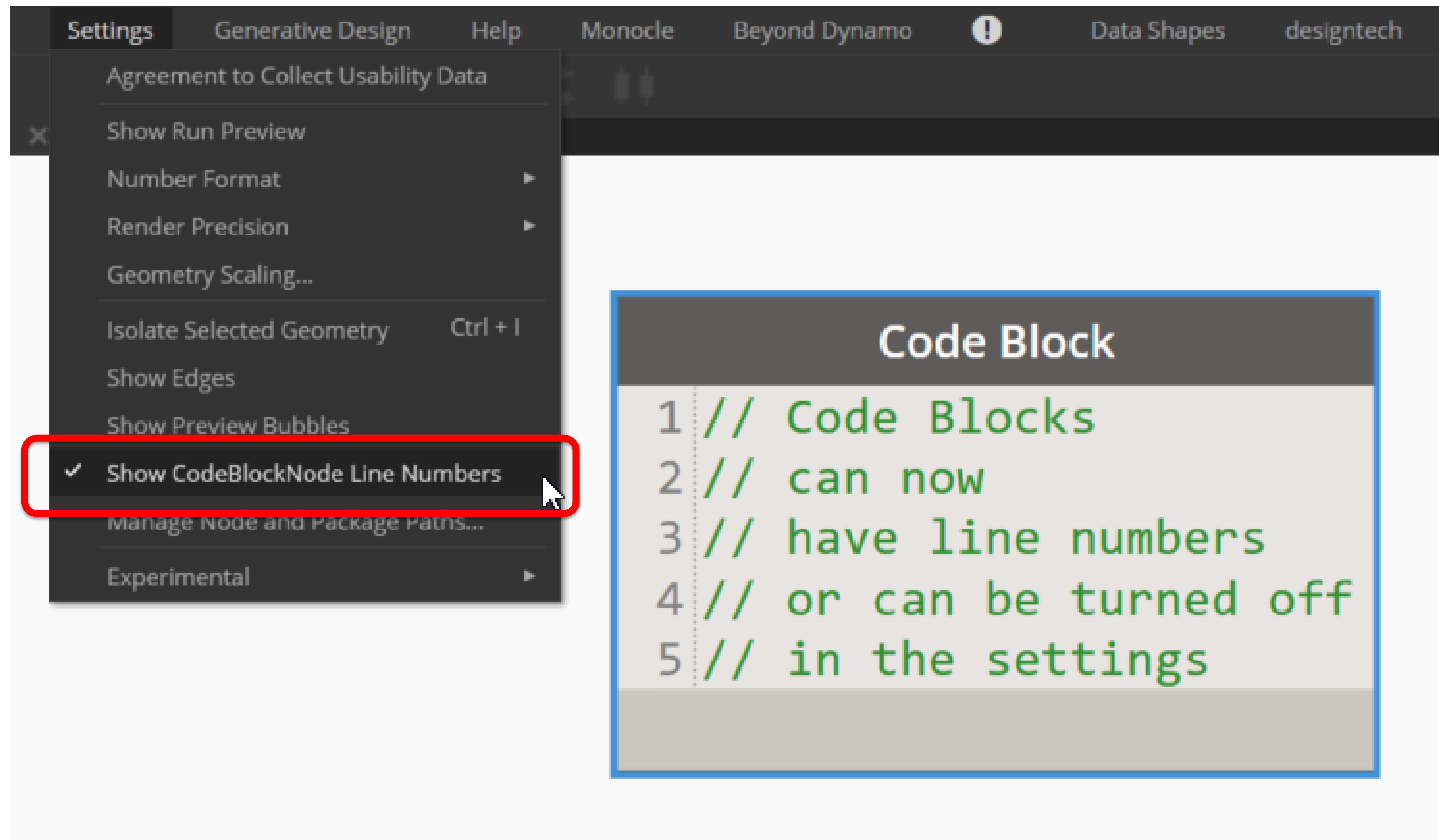
No Default Value



Default Value

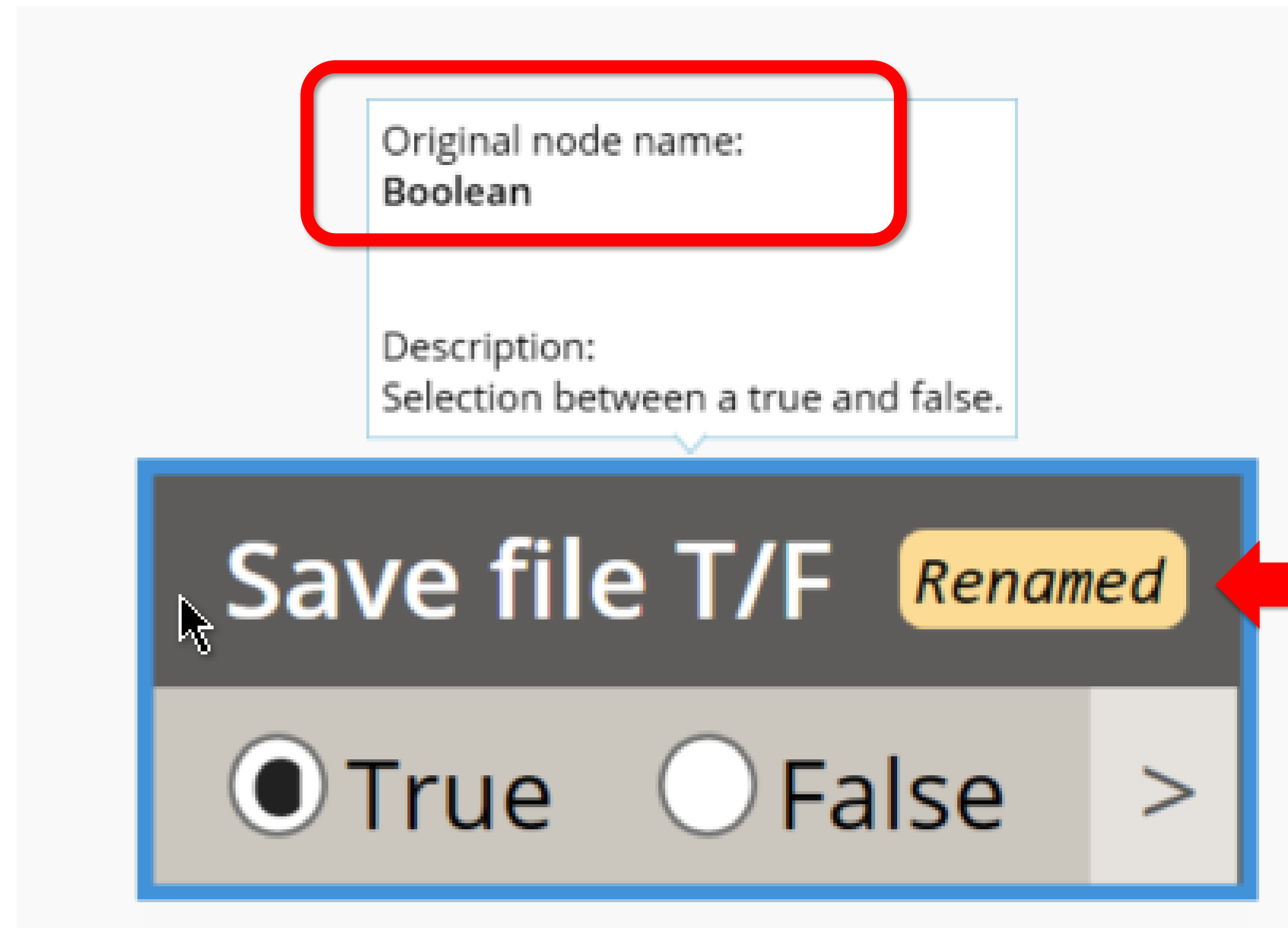
Dynamo for Revit 2.6.1

Code Blocks can now show **line numbers**, or be turned off in settings



Dynamo for Revit 2.6.1

New **Rename Tag** for all nodes that are manually renamed



Dynamo for Revit 2.6.1

A Documentation Browser extension to show more info on the 30 of the most common errors

The screenshot displays the Dynamo for Revit 2.6.1 interface. At the top, a dark header bar contains the text "Beyond Dynamo" followed by a series of extension names: "Data Shapes", "designtech", "DynaHub", "DynaMonito", "DynaStandard", and "QUASARII". Below this, a toolbar shows icons for workspace references and the documentation browser. The main workspace area features a yellow warning box with the text "Warning: Null value cannot be cast to Double". A red rectangle highlights a "Read more..." link within this warning box. Below the warning box, a "Code Block" node is connected to a "Point.ByCoordinates" node. The "Code Block" node contains the text "1 null; >". The "Point.ByCoordinates" node has three input fields labeled "x", "y", and "z", each with a right-pointing arrow. The output of the "Point.ByCoordinates" node is labeled "Point" and "AUTO". On the right side of the interface, a "Documentation Browser" extension is open, displaying information about the "Null value cannot be cast to type" warning. The extension includes a title, a description of the warning, a "How to fix" section, and a "More information" section.

Warning: Null value cannot be cast to Double

[Read more...](#)

Code Block

```
1 null; >
```

Point.ByCoordinates

x y z

Point

AUTO

Workspace References x Documentation Browser x

Null value cannot be cast to type

This warning means that the node you are trying to use is expecting an input of a certain data type and that type cannot be null. Null simply means "No Object", therefore the node throws a warning saying you are trying to input no object into the node, which is not allowed.

How to fix

The error might be caused by other nodes in your graph. Check upstream nodes to see whether they execute correctly – it is common that upstream nodes do not execute correctly and pass null values downstream to a node which then displays this error message. Start from the node that is causing this warning and work backwards, checking the output of each node until you find the node that is causing this issue.

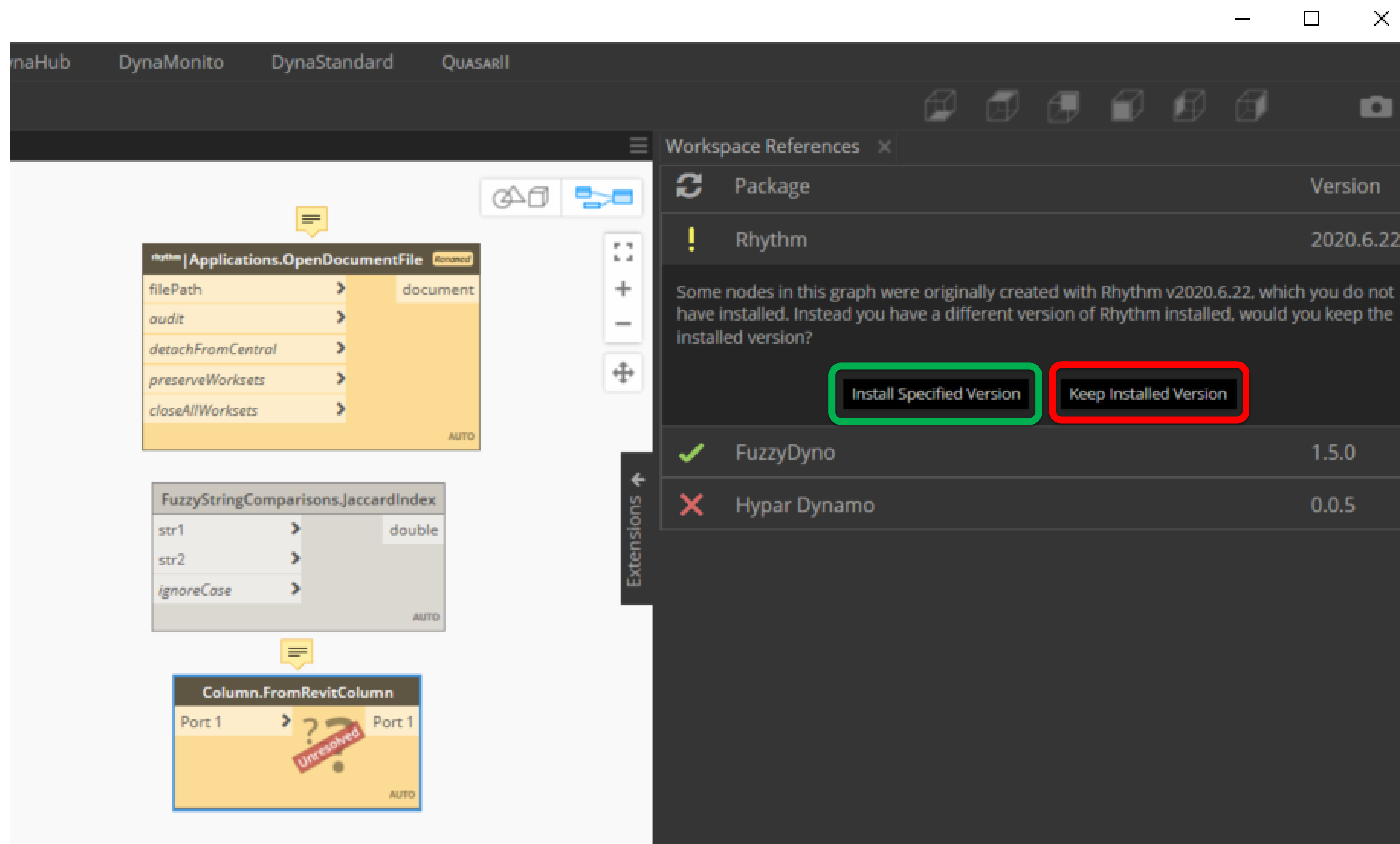
If the error message indicates which parameter is null, check nodes on that parameter's upstream path to see whether they execute correctly and pass non-null values downstream.

More information

To find out more, please check "[null value cannot be cast to type](#)".

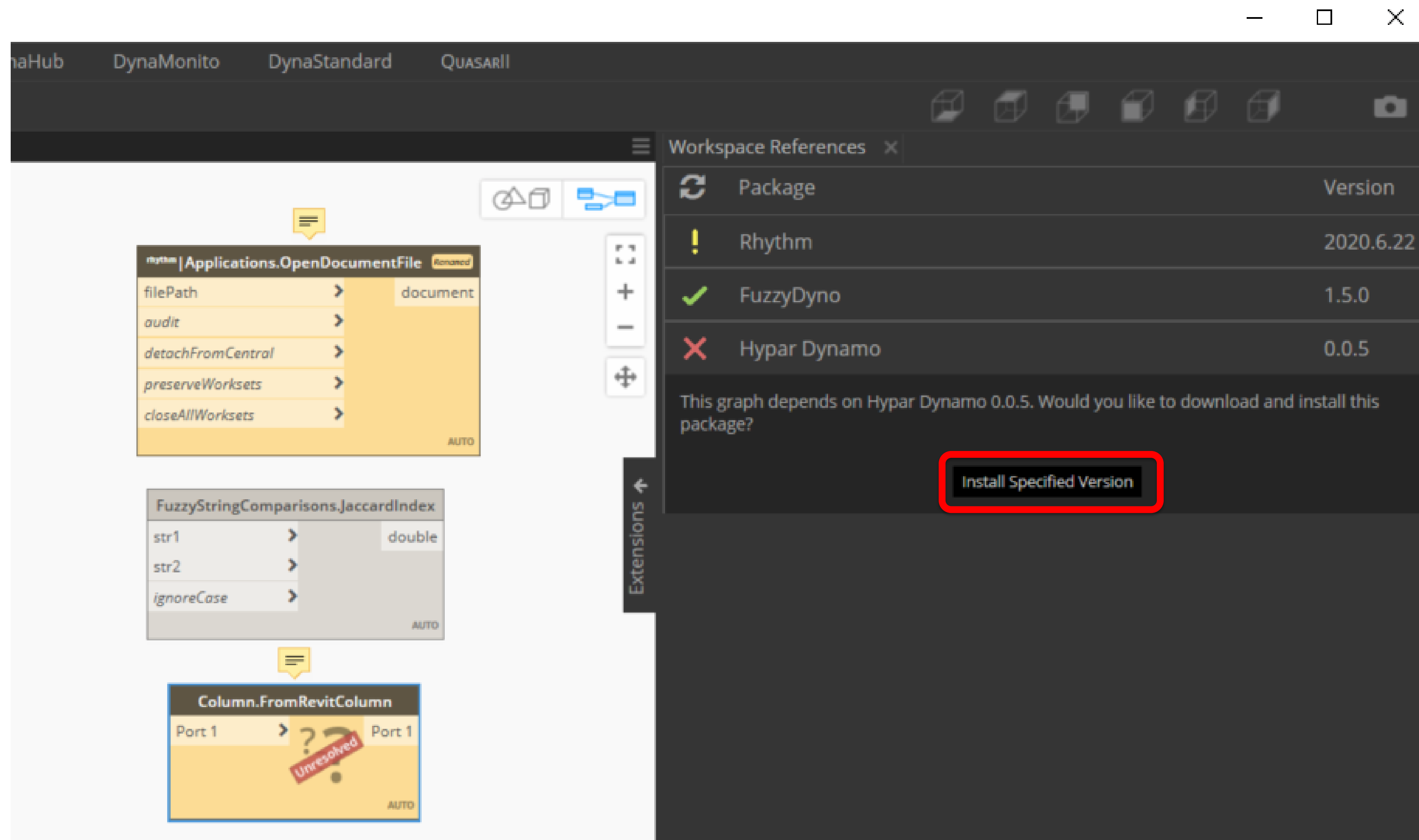
Dynamo for Revit 2.6.1

A **Workspace Reference** extension to help you keep your graphs up to date (new in 2.5)



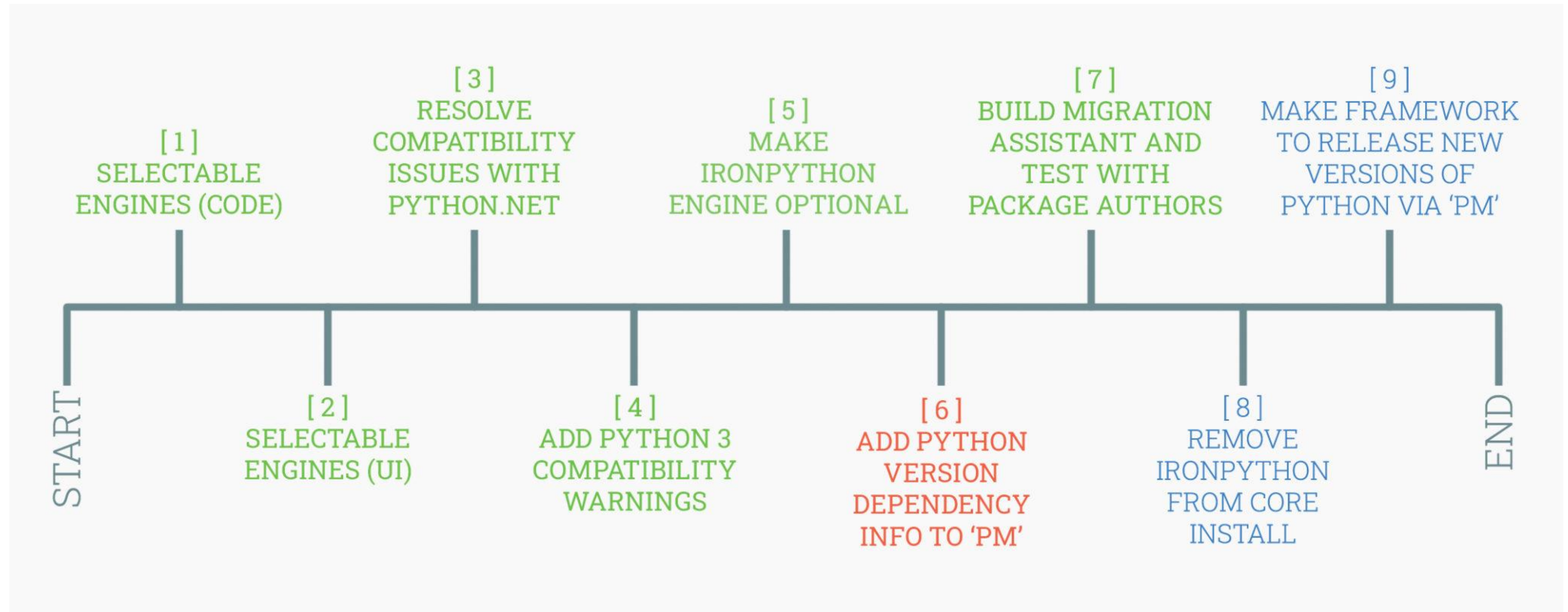
Dynamo for Revit 2.6.1

A **Workspace Reference** extension to help you keep your graphs up to date (new in 2.5)



DynamoCoreRuntime (Sandbox) 2.8.0

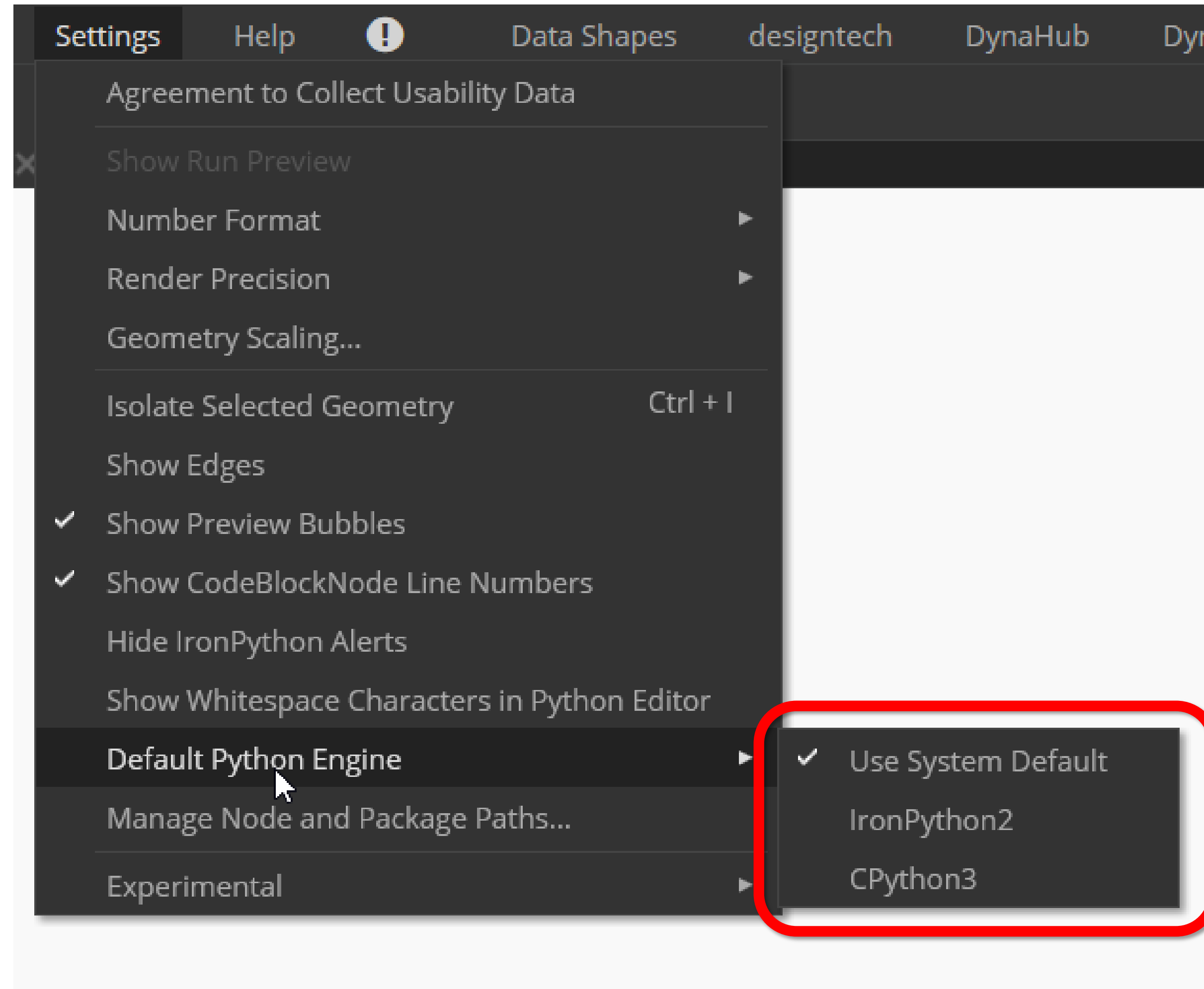
All about the move to **CPython 3**



- Green** are included in the Dynamo 2.8 release.
- Orange** are currently being worked on – all at various stages of completion.
- Blue** have not yet been started.

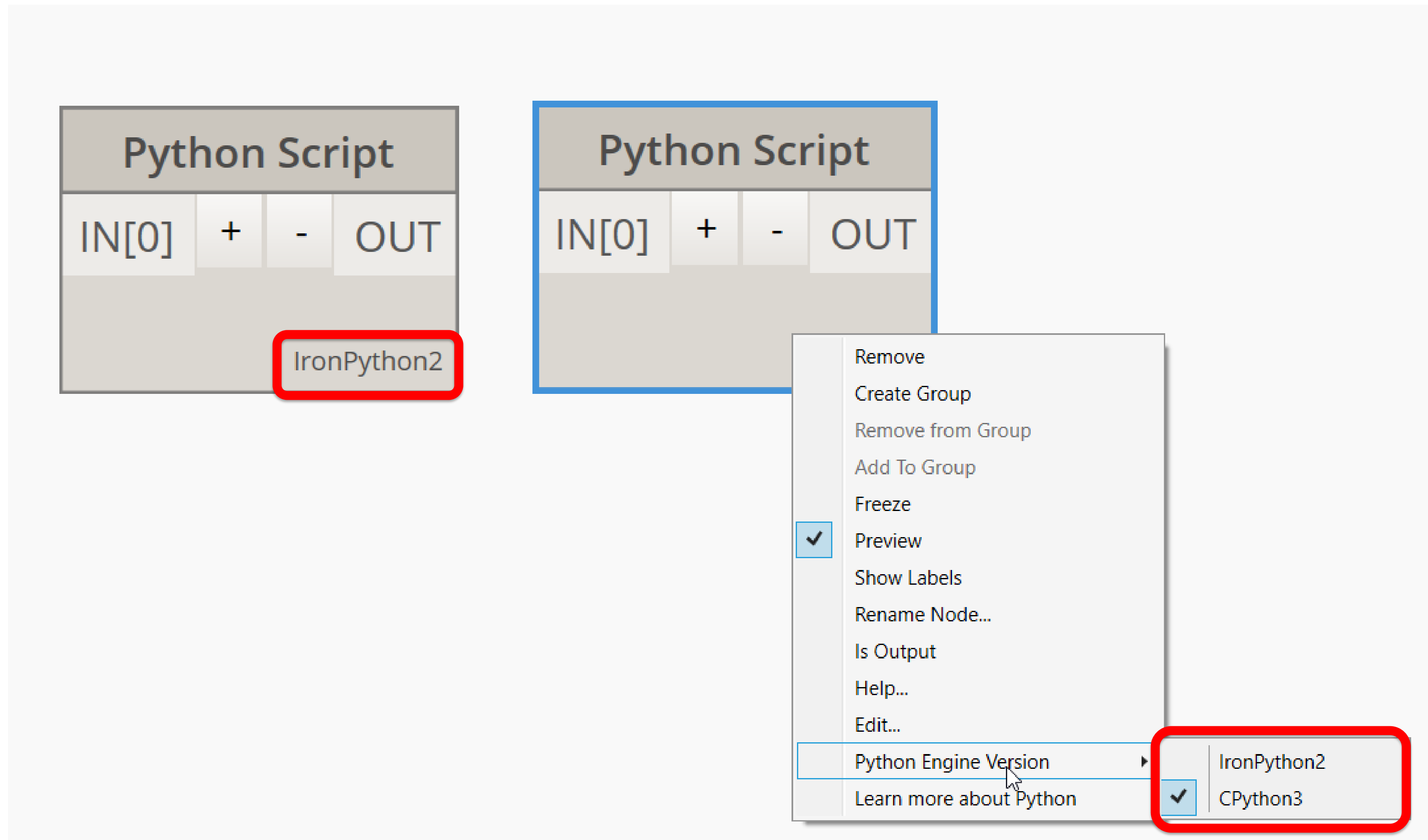
DynamoCoreRuntime (Sandbox) 2.8.0

Set the **Default Python Engine**



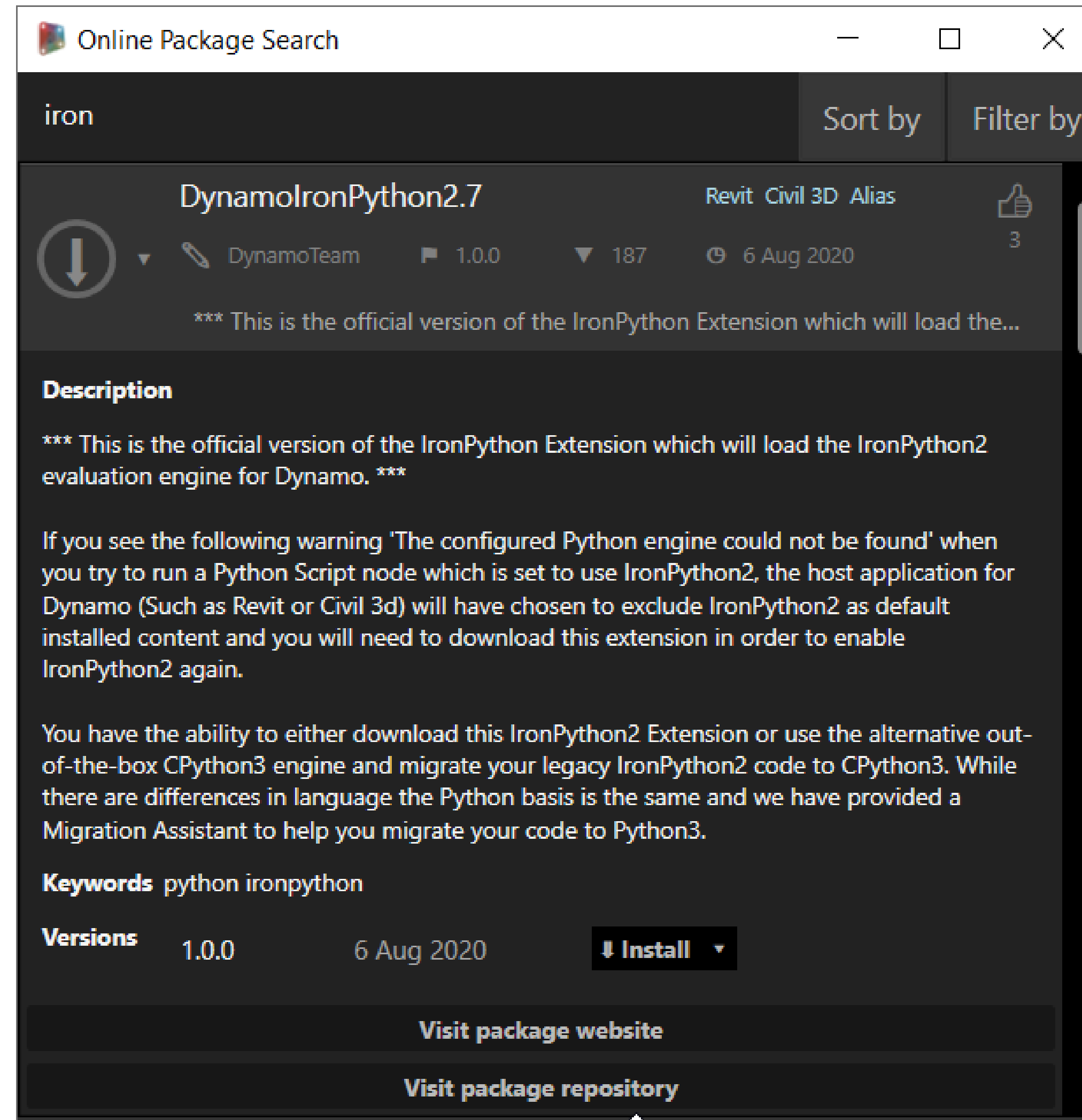
DynamoCoreRuntime (Sandbox) 2.8.0

Default Python engine selector using **Right Click** on Python Script node (new in 2.7)



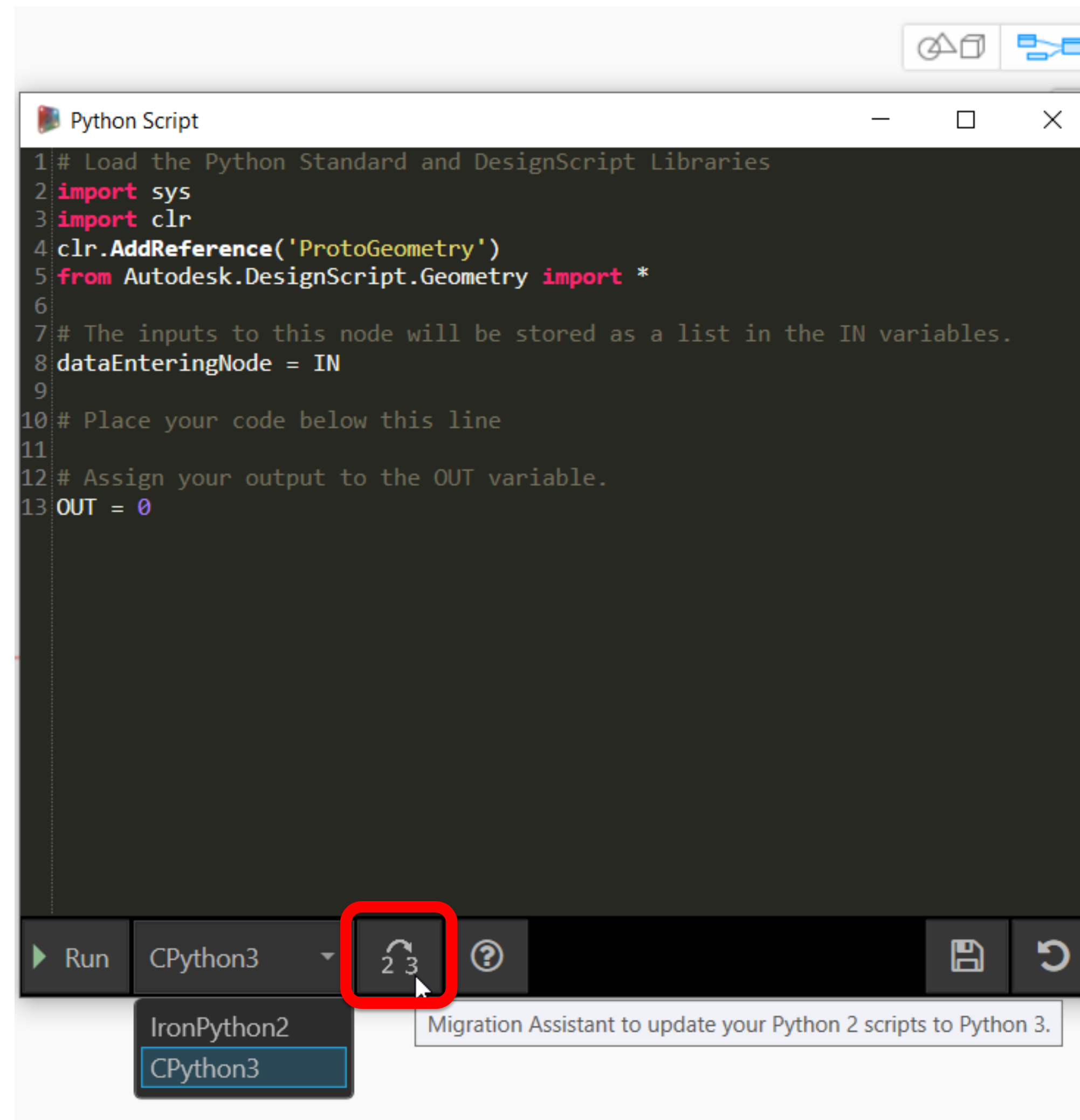
DynamoCoreRuntime (Sandbox) 2.8.0

New **Iron Python 2.7** Package on the package manager



DynamoCoreRuntime (Sandbox) 2.8.0

Improved button layout on Python Script Editor & new button **Migration Assistant**



More Integrations



Civil 3D
Version 2.5.2



FORMIT
Version 2.5.2

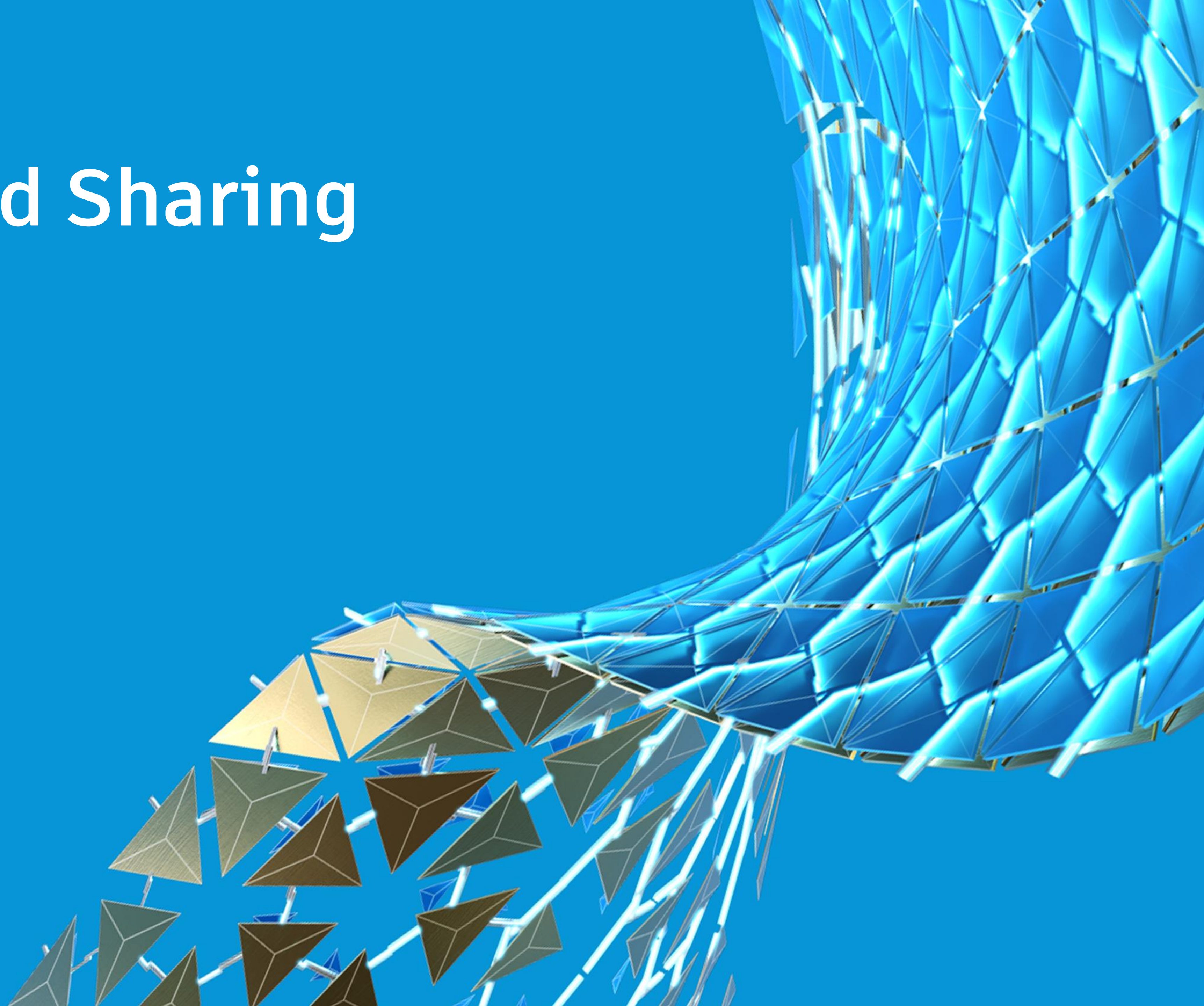


ADVANCE
STEEL
Version 2.5.2



ALIAS
DESIGN
Version 2.7.0

Learning and Sharing



Try It

The first tip is the **Easiest** but will seem like the **Hardest**!

- Check out the getting started videos from DynamoBIM.org/learn

Try It



[Learn](#) [Explore](#) [Blog](#) [Forum](#) [Developer](#) [Resources](#)



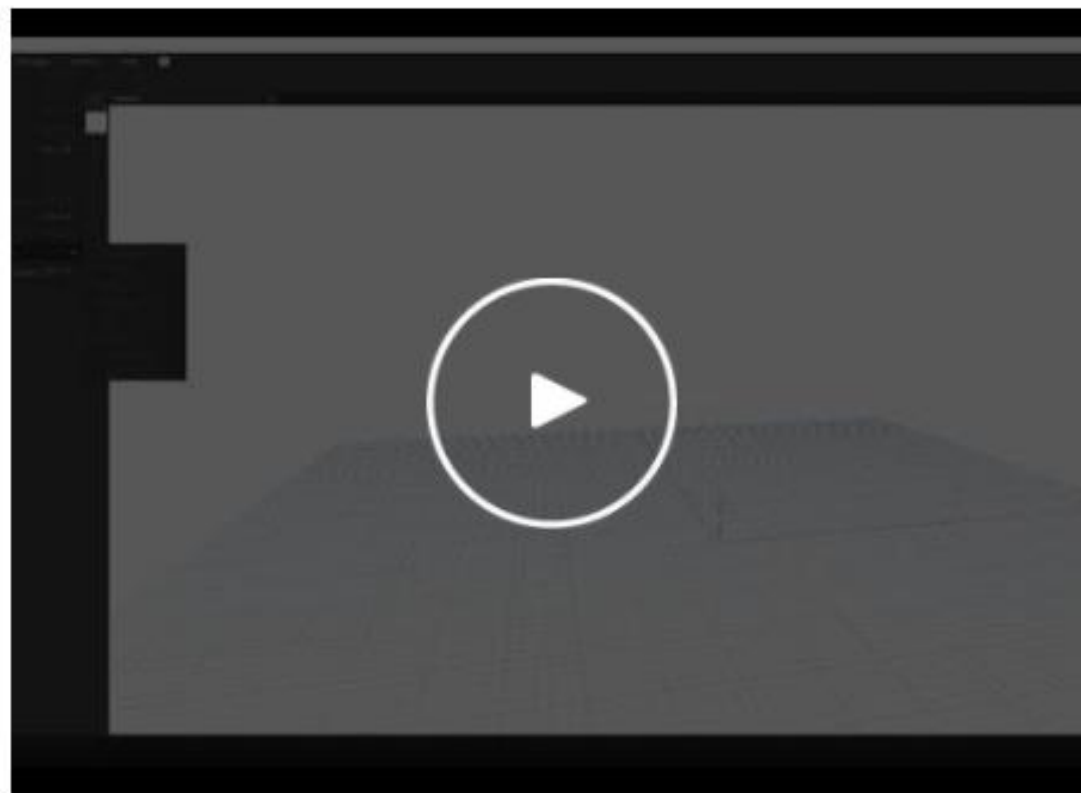
[GET DYNAMO](#)

[Introduction](#) [Primer](#) [Dictionary](#) [Developer](#) [Tutorials](#) [Resources](#) [Workshop](#)

Video Tutorial

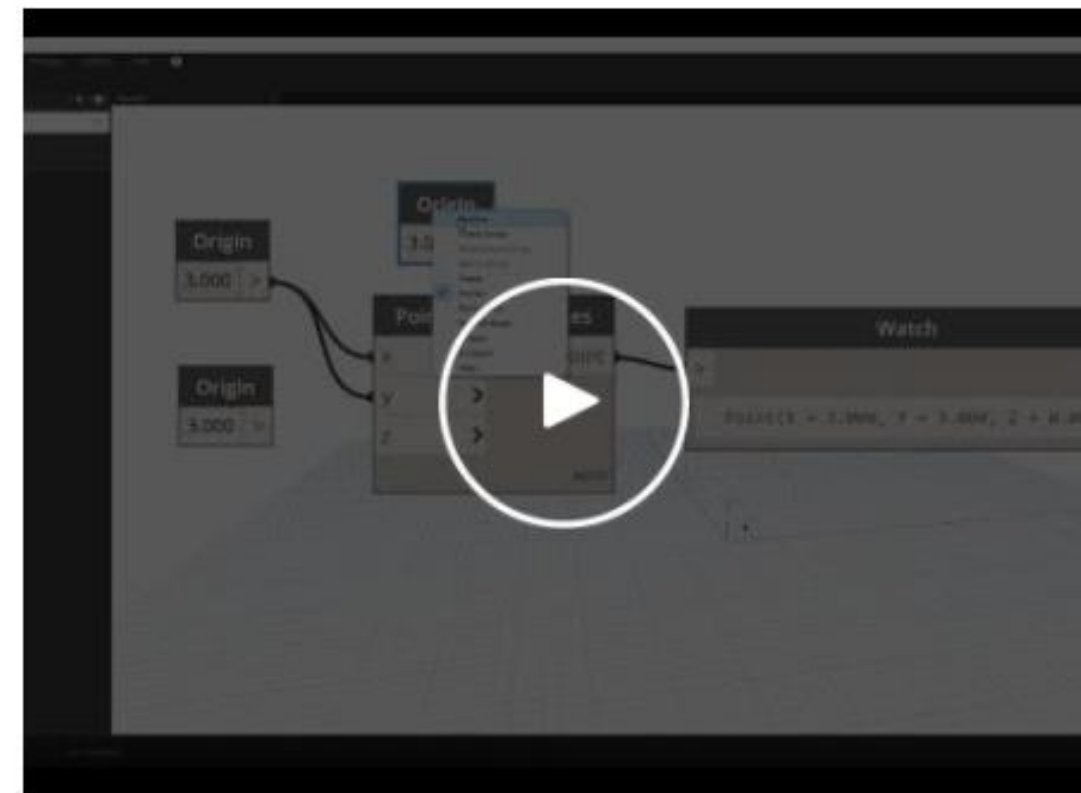
Introductory Tutorials for Dynamo 2.X

[DATASET](#)



GETTING SITUATED WITH DYNAMO

Launch Dynamo for the first time. Take a tour of



THE ANATOMY OF A DEFINITION

A closer look at the program elements used to



DATA MANAGEMENT

Basic concepts for working with lists.



NESTED LIST MANAGEMENT

Basic concepts for working with lists and nested

Try It

The first tip is the **Easiest** but will seem like the **Hardest**!

- Check out the getting started videos from [DynamoBIM.org/learn](https://dynamobim.org/learn)
- Reading “[The Dynamo Primer](#)” the unofficial online user’s manual

Try It

About

1. Introduction

1.1. What is Visual Programming?

1.2. What is Dynamo?

1.3. Dynamo in Action

2. Hello Dynamo!

2.1. Installing and Launching Dyna...

2.2. The User Interface

2.3. The Workspace

2.4. Getting Started

3. The Anatomy of a Visual Program

3.1. Nodes

3.2. Wires

3.3. Library

3.4. Managing Your Program

4. The Building Blocks of Programs

4.1. Data

4.2. Math

4.3. Logic

4.4. Strings

4.5. Color

5. Geometry for Computational Design

5.1. Geometry Overview

5.2. Vectors

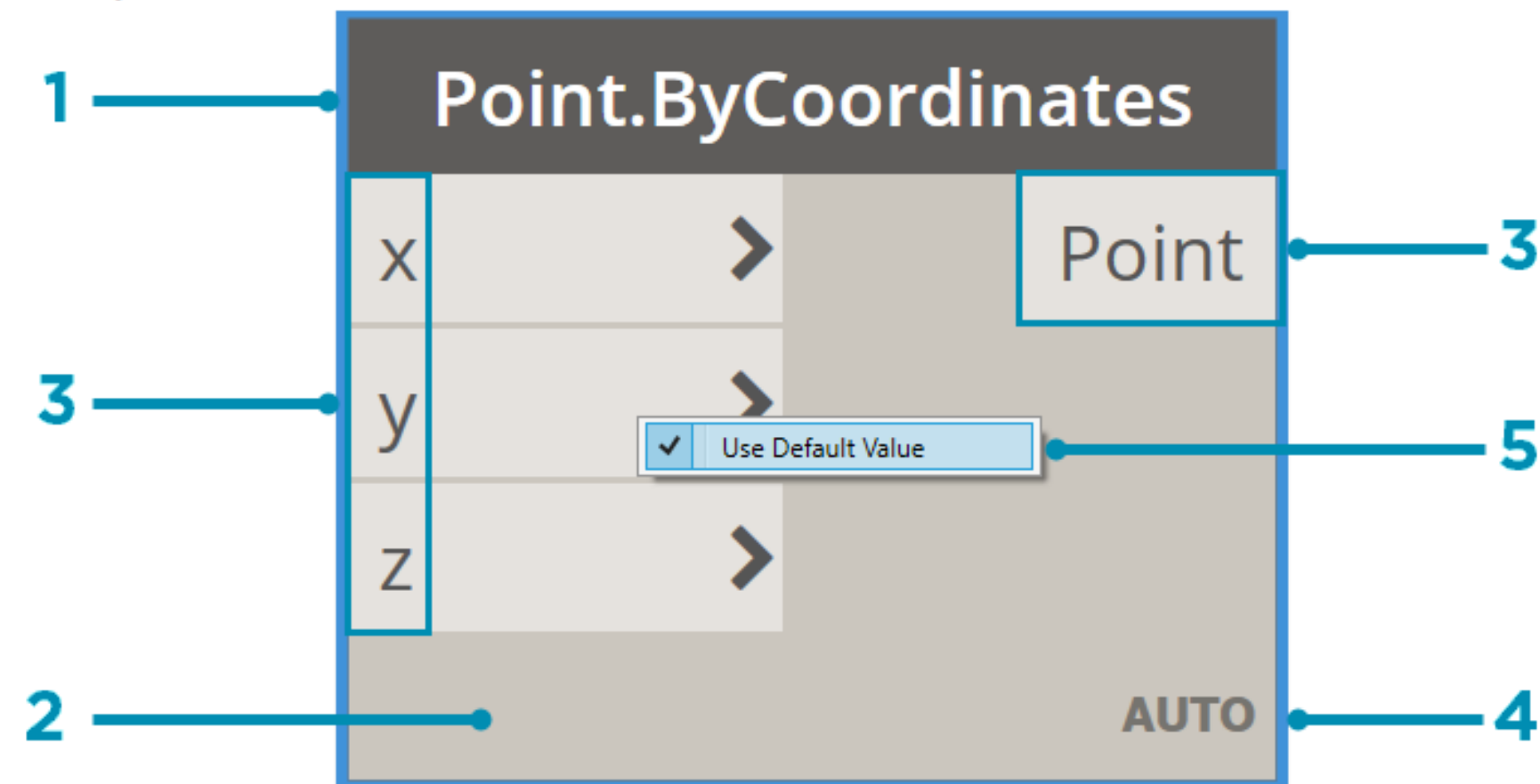
5.3. Points

Nodes

In Dynamo, **Nodes** are the objects you connect to form a Visual Program. Each **Node** performs an operation - sometimes that may be as simple as storing a number or it may be a more complex action such as creating or querying geometry.

Anatomy of a Node

Most Nodes in Dynamo are composed of five parts. While there are exceptions, such as Input Nodes, the anatomy of each Node can be described as follows:



1. Name - The Name of the Node with a Category.Name naming convention
2. Main - The main body of the Node - Right-clicking here presents options at the level of the whole Node
3. Ports (In and Out) - The receptors for Wires that supply the input data to the Node as well as the

Try It

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- Reading “[The Dynamo Primer](#)” the unofficial online user’s manual
- [Dynamo Dictionary](#) an open source, searchable database for Dynamo functionality. (Out of the Box Nodes)

Try It

Dynamo Dictionary

dictionary.dynamobim.com/2/#/

← → ↺ 🏠 🔍 ☆ 🌐 💬 📄 ⚙️ 🧑

LIBRARY

search...

Dictionary

Display

Geometry

ImportExport

Input


List

Math

Revit

Script

String

 Dynamo Dictionary 1.x 2.x

The Dynamo Dictionary

Welcome to the Dynamo Dictionary, a searchable database for Dynamo functionality. Here you can find explanations for nodes, sample files, and links to more information on associated workflows. This site is constantly evolving as the community continues to add more information. Like the [Dynamo Primer](#), this dictionary is open-source - check it out on our [Github page](#) and contribute!

Editing this Dictionary

We've added functionality to update the repository from this webpage. Click on edit icons on node pages and add your own in-depth description, update examples files and images, or add your own.

- After making your updates, remember to click the "Submit Pull Request" icon in the top right of the page. This will allow you to open a pull request on Github without having to login.
- The Pull Request will be opened on the Github repo. After we've reviewed it and

Try It

The first tip is the **Easiest** but will seem like the **Hardest**!









































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- Use and play with the out of the box stuff that comes with Revit/Dynamo
 - It can also be easier if you have a problem that **YOU** want to solve

Try It

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- Use and play with the out of the box stuff that comes with Revit/Dynamo
 - It can also be easier if you have a problem that **YOU** want to solve
- You can also find/give answers on the DynamoBIM.org Forum
 - <https://forum.dynamobim.com/>

Try It

<div><div>Dynamo</div><div>Learn Explore Blog Help Center Forum</div></div> <div><div> </div><div>DOWNLOAD</div><div>  </div></div>					
<div><div>all categories ▾</div><div>Latest</div><div>New (27)</div><div>Top</div><div>Categories</div><div>+ New Topic</div></div>					
Topic	Replies	Views	Activity		
<div><div></div><div>How to get help on the Dynamo forums</div><div> FAQ</div><div>One of the main goals of the Dynamo community is to help others. One way to do that is by answering your questions. But to get the right answer, you'll first have to ask your question in the right way. Although people ar... read more</div></div>	<div></div>	4	28.4k	Jan '19	
<div><div></div><div>Welcome to the Dynamo Forum</div><div> FAQ</div><div>Welcome to the new and improved Dynamo Forum! Please make yourself at home and feel free to ask/answer questions about Dynamo, the general purpose graphical algorithm editor for designers, architects, artists, and en... read more</div></div>	<div></div>	20	14.6k	Sep '18	
<div><div></div><div>Points are likely coincident</div><div> Civil3D civil3d</div></div>	<div></div>	23	584	1m	
<div><div></div><div>Python - Element Parameter Filter - Duct Length</div><div> Developers python</div></div>	<div></div>	4	62	2h	
<div><div></div><div>Beam bracing connections issues</div><div> Revit</div></div>	<div></div>	2	55	2h	
<div><div></div><div>Null workset?</div><div> Revit</div></div>	<div></div>	2	31	2h	



[Lisa-Marie Mueller](#)

Speaking of the Dynamo Forum

When you want to create a new script, start by searching for the topic in the forums. There may be a similar script on the forums that you can use as a template or there may be a package that will make your task easier.

The screenshot shows the top of a forum thread on the Dynamo website. The header includes the Dynamo logo, navigation links (Learn, Explore, Blog, Help Center, Forum), and social media icons. The thread title is "Parameter transfer from Excel to Revit" with tags for Revit, dynamo, revit, and excel. A welcome message from the community is visible. The first post is by user Gokhan, dated Jul 8, with 1 of 10 replies. The post content describes a problem with transferring data from Excel to Revit using the "Line No" parameter. Two screenshots of Dynamo scripts are included. The top script shows a complex workflow with multiple data tables and logic components. The bottom script is a close-up of a "List.Flatten" node connected to an "Element.SetParameterByName" node, with a warning message indicating a type mismatch: "Warning: Element.SetParameterByName expects argument type(s) (Element, string, var), but was called with (string[], string, string[])." The warning message is highlighted in yellow.

Use the Most Current Version

Using the most current version of Dynamo will improve your workflow and graphs



DYNAMO
SANDBOX

Dynamo Sandbox is an open source environment for visual programming. Sandbox is a free download of our core technology that isn't integrated into any other product and has limited functionality.

- ✓ Test the most up-to-date Dynamo features
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Version 2.0.4

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- ✓ Automatically installed as part of Revit since Revit 2020

2020.2.3

Version 2.3.0

2021.1.1

Version 2.6.1

Learning

Resources:



Resources

Past Labs and Presentations

2020 Presentation

- Here is a link to the presentation, handout & video from YourDesk University 2020.
 - [Dynamo Packages That will ROCK your world!](#)
 - [Dynamo Packages That will ROCK your world – YouTube Video](#)

2019 Lab

- Here is a link to the presentation, handout & video on from AU 2019.
 - [Revit Data Visualized with Dynamo](#)

2018 Presentation

- Here is a link to the presentation, handout & video on Dynamo Packages from AU 2018.
 - [Dynamo Packages: Have You Tried These Yet?](#)

2018 Lab

- Here is link to the lab handout, presentation & dataset from Data Day 2018.
 - [Dynamo: Everyone's Doing It – Vol. 3 – Attack of the Data!](#)
- Here is link to the lab handout, presentation & dataset from BILT ANZ 2018.
 - [Dynamo: Everyone's Doing It – Vol. 3 – Attack of the Data!](#)

2017 Presentation

- Here is a link to a presentation, dataset & video on Dynamo Packages for PDUG (this was also done at BILT NA 2017).
 - [Dynamo Packages – Have You Tried These Yet?](#)
 - [Dynamo Packages – Have You Tried These Yet? \(BILT NA 2017 version\)](#)

2017 Lab

- Here is link to the lab handout, presentation & dataset from BILT NA 2017.
 - [Dynamo: Everyone's Doing It – Again!](#)

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2016 Lab

- Here is link to the lab handout, presentation & dataset from RTC NA 2016.
 - [Dynamo: Everyone's Doing It!](#)
- Here is link to the lab handout, presentation & dataset from AU 2016.
 - [Dynamo: Everyone's Doing It!](#)




Blogs & Websites

- [AEC, you and me](#) – [Julien Benoit's](#) Blog, also the maker of the SteamNodes package
- [ArchSmarter](#) – [Michael Kilkelly's](#) blog about Revit, Dynamo, and Architecture
- [archi+lab](#) – [Konrad Sobon's](#) blog with lots of great Dynamo content, examples and packages
- [Autodesk Revit Structure](#) – A great blog for structural Dynamo users
- [Bad Monkeys](#) – A website for a great group of Dynamo cool cats
- [BattleBIM](#) – blog, lots of good Dynamo and Revit content, maker of the BattleBIM package
- [BIM 42](#) – [Simon Moreau's](#) blog, lots of good Dynamo and Revit content
- [BIM Extension](#) – blog with Dynamo content
- [Bimorph](#) – website with Dynamo content, maker of the Bimorph package



- [WC BIM](#) – blog with Dynamo content
- [What Revit Wants](#) – [Luke Johnson's](#) site tons of Revit &Dynamo info & maker of Bakery package
- [zhukoven](#) – blog, maker of the zhukoven package


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Courses & Training

- [ArchSmarter – Learning Dynamo](#) – This is a paid course by [Michael Kilkelly](#)
- [ArchSmarter – Managing Building Data With Dynamo](#)– This is a paid course by [Michael Kilkelly](#)
- [ArchSmarter – Dynamo for Busy People](#) – This is a paid course by [Michael Kilkelly](#)
- [ArchSmarter – Dynamo Dojo](#) – This is a paid course by [Michael Kilkelly](#)
- [BIMHIVE](#) – This is a site with free Dynamo tutorials
- [CADLearning Dynamo 2016](#) – This is a paid course by [Jason Boehning](#) & [Marcello Scambelluri](#)
- [CADLearning Dynamo 2017](#) – This is a paid course by [Jason Boehning](#)
- [CADLearning Dynamo 2018](#) – This is a paid course by [Jason Boehning](#)
- [Diving Deeper](#): A beginners look at Python in Dynamo by [Sol Amour](#)
- [DiRoots – Dynamo Revit I Basic Free course](#)
- [DiRoots – Dynamo Revit I Advanced Free course](#)
- [Learning Dynamo](#) – This is a site with free Dynamo tutorials created by [Jeremy Graham](#)
- [Lynda.com – Dynamo for Revit: Python Scripting](#) – This is a paid course by [Jeremy Graham](#)
- [Lynda.com – Dynamo 1 x Essential Training](#) – This is a paid course by [Ian Siegal](#)
- [Lynda.com – Dynamo for Revit Workflow](#) – This is a paid course by [Ian Siegal](#)
- [Lynda.com – Dynamo for Revit Project Setup](#) – This is a paid course by [Ian Siegal](#)
- [Lynda.com – Dynamo 2 x Essential Training](#) – This is a paid course by [Ian Siegal](#)
- [Lynda.com – Paneling with Dynamo for Revit](#) – This is a paid course by [Colin McCrone](#)
- [Lynda.com – Dynamo: Practical](#) – This is a paid course by [Paul F. Aubin](#)
- [Lynda.com – Revit and Dynamo for Interior Design](#) – This is a paid course by [Bill Carney](#)
- [Lynda.com – Advanced Revit and Dynamo for Interior Design](#) – This is a paid course by [Bill Carney](#)
- [Plurasight – An Introduction to Dynamo for Daily Use Within Revit](#) – A paid course by [John Pierson](#)
- [Plurasight – Exploring Dynamo Geometry](#) – This is a paid course by [Sol Amour](#)
- [ThinkParametric – Dynamo 101 Fundamentals](#) – This is a paid course by [Konrad Sobon](#)
- [ThinkParametric – Create Custom View Filters using Dynamo](#)– A paid course by [Konrad Sobon](#)
- [Udemy – Dynamo for Beginners](#) – This is a paid course by [Niko Gamsakhurdia](#)
- [Udemy – Dynamo: Advance, Part 1](#) – This is a paid course by [Niko Gamsakhurdia](#)
- [Udemy – Quantity take-off using Revit, Navisworks and Dynamo](#) – This is a paid course by [AulaGEO Academy](#)
- [Udemy – #CODE – Starting with Dynamo for BIM engineering projects](#) – This is a paid course by [AulaGEO Academy](#)
- [Udemy – DY01: Learn to use Dynamo BIM with Spreadsheets](#) – Paid course by [KIT To](#)
- [Udemy – DY02: Learn to use Dynamo BIM with Spreadsheets and Lists](#) – This is a paid course by [KIT To](#)
- [Udemy – Dynamo BIM from Zero to Hero](#) – This is a paid course by [Viktor Kuzev](#)
- [Udemy](#) – Paid Dynamo courses by [Enrique Galicia](#) – [Currently 21](#) to choose from

Page 17



Free Graphs

- [BIMOne – First Dynamo Script Pack by BIM One for Settings](#)
- [BIMOne – 2nd pack of Dynamo scripts for model maintenance](#)
- [BIMOne – Third pack of free Dynamo Scripts](#)
- [BIMOne – 4th pack of free Dynamo scripts to take control of Revit](#)
- [BIMOne – 5th pack of free Dynamo scripts to make your life easier in Revit MEP](#)

Podcasts & Videos

- [ArchSmarter Video](#) – [How to Create a Project Dashboard using Revit, Dynamo, and Excel](#)
- [ArchSmarter's YouTube Channel](#) – there are a few good getting started Dynamo videos here
- [Aussie BIM Guru](#) YouTube Channel – Lots of great Dynamo videos and tutorials
- [BIMHIVE](#) YouTube Channel – Dynamo Tutorials
- [Danny Bentley's YouTube Channel](#) – Revit API and Dynamo Videos
- [Dynamo](#) – Autodesk's Dynamo YouTube Channel
- [Dynamo Chicago YouTube Channel](#)
- [Dynamo-Hits](#) Vimeo Page – Boston Dynamo User Group
- [Dynamo Thoughts](#) – A Vodcast about teaching & learning Dynamo by [Bill Debevc](#) and [Ian Siegel](#)
- [EvolveLab](#) – YouTube Channel – Dynamo Tutorials and more
- [John Pierson's YouTube Channel](#) – Lots of great Dynamo videos from the maker of the Rhythm package and [sixtysecondrevit](#) blog
- [Konrad Sobon's YouTube Channel](#) – Creator of [archi+lab](#) and 4 helpful dynamo packages
- [Philadelphia Dynamo User Group](#) – YouTube Channel
- [RoMBIS](#) YouTube Channel
- [Ryan Cameron](#) YouTube Channel
- [SF Computational Design Institute](#) YouTube Channel
- [Sean Fruin](#) YouTube Channel
- [The BIM Coordinator](#) YouTube Channel
- [The Simply Complex Podcast](#) – A Dynamo podcast by [Marcello](#) with help from [Jason](#) and [John](#)

Learning

Take a **Dynamo Course**

Courses can be

- Self paced
- Lecture based
- Tutorial based
- Academic



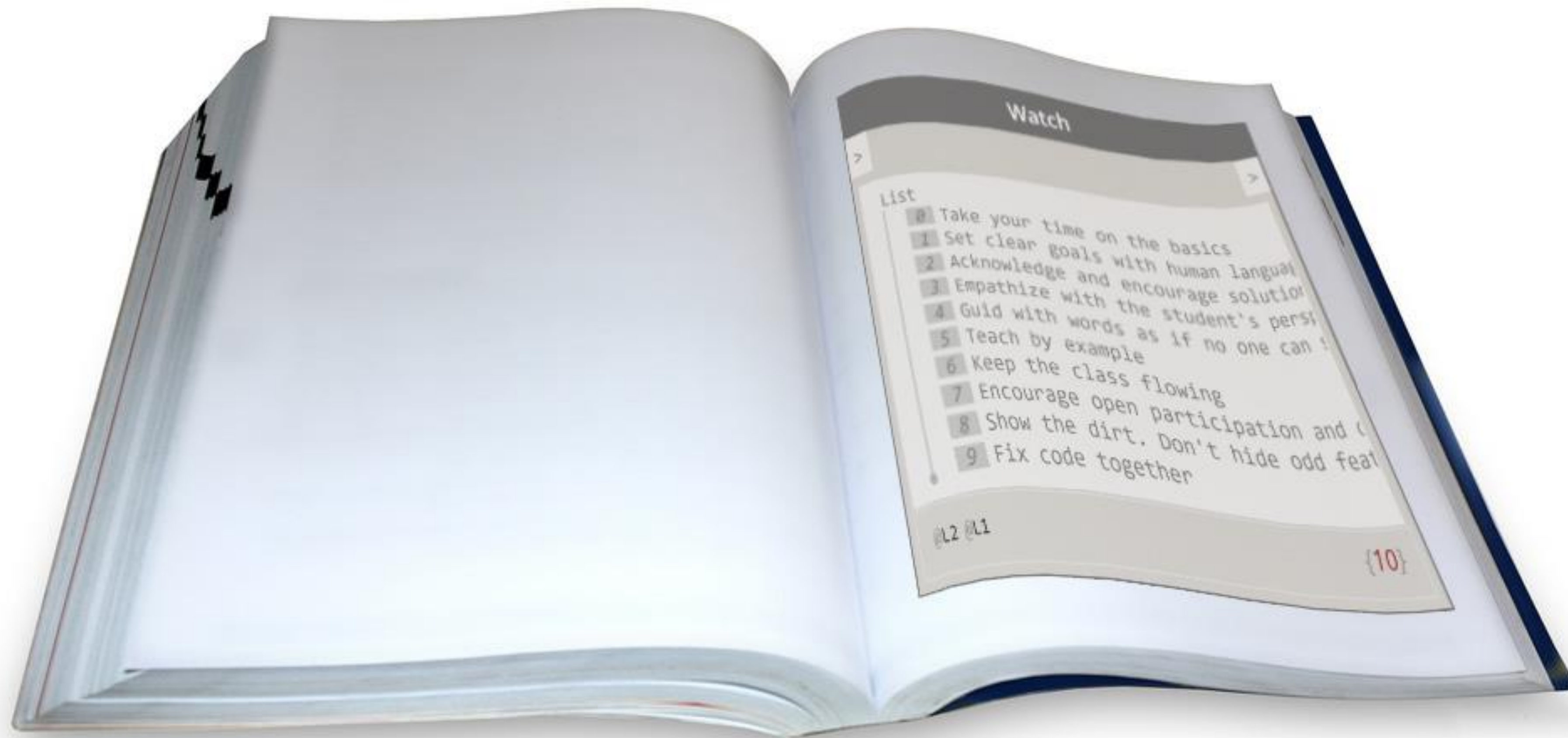


[Colin McCrone](#)

Teaching

If you are teaching Dynamo, **take your time on the basics.**

This is one of 10 great tips for teaching Dynamo from [Colin McCrone](#) blog post called: [*Ten Commandments for teaching Dynamo by a Former “Evangelist”*](#)

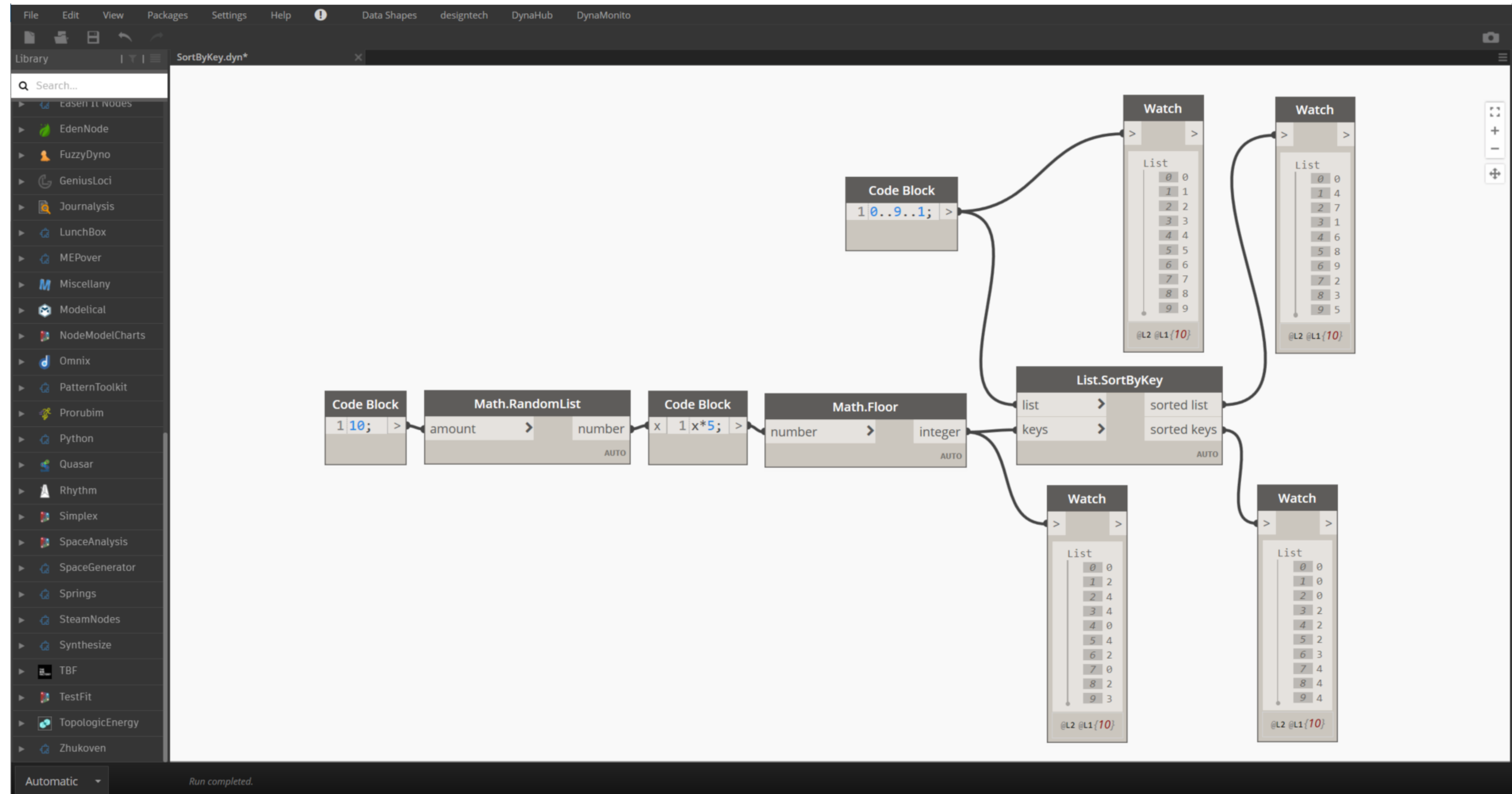




Zach Kron

Teaching

Learning content should be **small enough files** that you can read it all on one screen.



Use a Template

Organize your Dynamo graphs **using a template.**

Template

Dynamo File Name

INSTRUCTIONS: This is a starting template for Dynamo graphs.

GRAPH INFO

CREATED BY: Carl Storms
CREATED ON: 2019-05-20

GRAPH VERSION: 1.0
LAST EDITED: 2019-05-20

CREATED USING:
Revit 2018.3 & Dynamo 2.0.2

CUSTOM PACKAGES USED:
Rhythm - Version 19.4.25

TESTED ON REVIT: 2018, 2019 & 2020
TESTED ON DYNAMO: 2.0.2, 2.0.3 & 2.1.0
TESTED ON DYNAMO PLAYER: Yes

INPUT

Data input and preparation for other nodes

OUTPUT

Objects creation, data output

FUNCTION

For workflow and data manipulation

WIP

Nodes not to consider part of the final graph
(Work In Progress)

GET

Get parameter values and data from objects

SET

Set parameter values and data for objects

REVIEW

Nodes used to debug the graph logic and review graph process

Use a Template

Organize your Dynamo graphs using a template.

DP_250_RVT_Upgrade_SF

Dynamo File Name

NOTE: The Revit family will update to the version of Revit you have open when you run this graph

Folder and subfolders with files in them

Original node name:
Directory Path

Location of folder with files to be upgraded

Browse...

C:\Users\cstorms\Downloads\Test

Revit & Dynamo Info

Created on Revit 2018.3 & Dynamo 2.0.2

Custom Pacakges used: Rhythm - Version 2020.2.13

Tested on Revit 2018, 2019, 2020 & 2021
Tested on Dynamo 2.0.2, 2.0.3, 2.10, 2.30 & 2.50
Tested on Dynamo Player

Directory.FromPath

path directory

Include Subfolders

include Subfolders T/F
☒ True ☐ False >

Original node name:
Boolean

File format
"*.rvt" =
All Revit
families
in the
folders

Code Block

"*.rvt"; >

FileSystem.GetDirectoryContents

directory > files
searchString > directories
includeSubdirectories >
AUTO

Opening file options

Audit model T/F
☐ True ☒ False >

Original node name:
Boolean

Detach from central T/F
☐ True ☒ False >

Original node name:
Boolean

Custom Package: Rhythm - Version: 2020.6.22

Custom Node: Rhythm v.2020.6.22

Custom Node: Rhythm v.2020.6.22

rhythm | Applications.OpenDocumentFile

filePath > document
audit >
detachFromCentral >
preserveWorksets >
closeAllWorksets >
AUTO

rhythm | Applications.CloseDocument

document > result
save >
AUTO

Save File

Save file T/F
☒ True ☐ False >

Original node name:
Boolean



Marcello
Sgambelluri

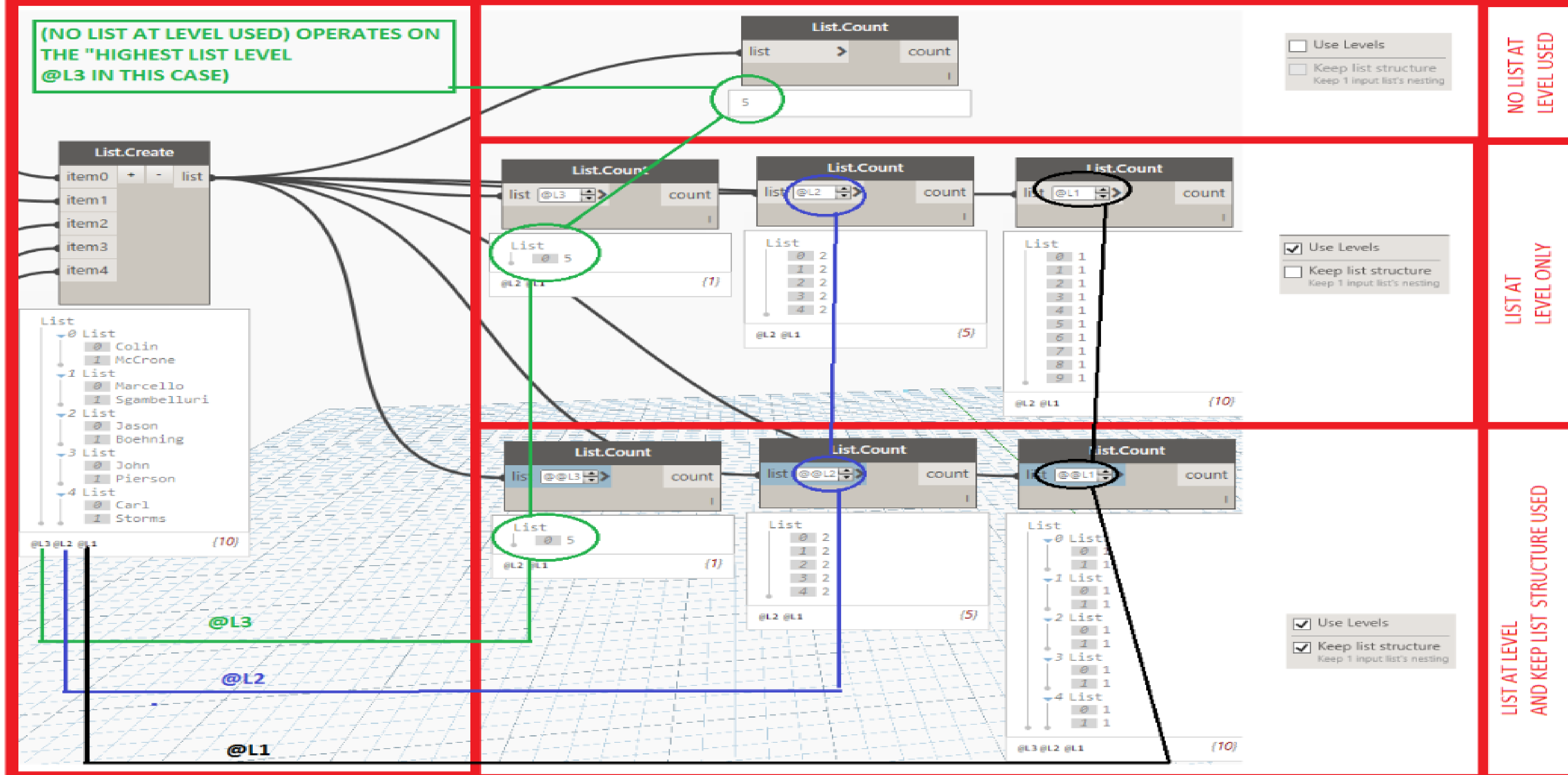
List @ Level

Learning **List at Level** will improve your Dynamo experience.



Colin
McCrone

UNDERSTANDING DYNAMO LIST AT LEVEL (SIMPLE LIST COUNT EXAMPLE)



List @ Level

Learning **List at Level** will improve your Dynamo experience.

List at Level Resources:

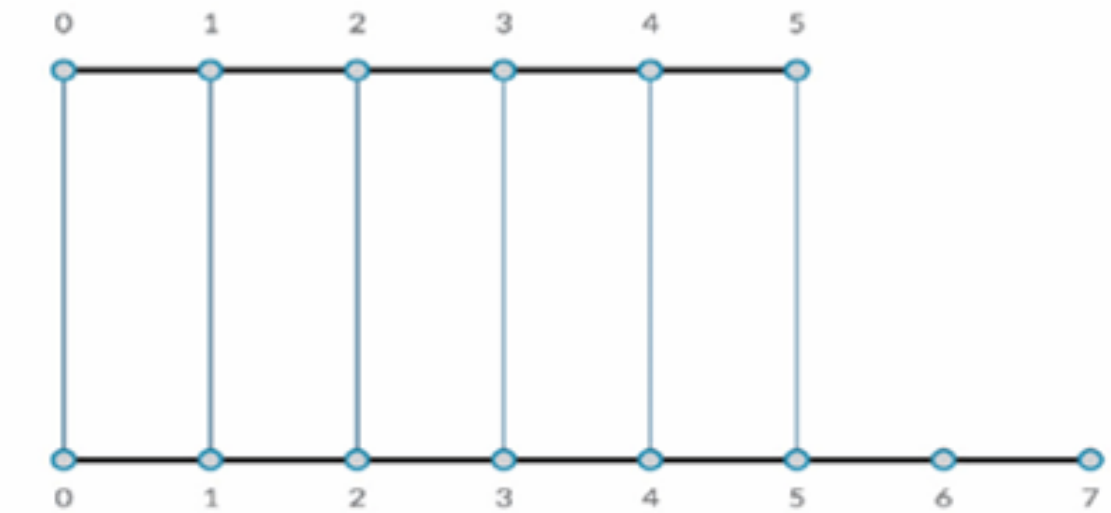
- [List@Level](#) blog post from the [Dynamo Blog](#)
- [List@Level](#) from the [Dynamo Primer](#) (starting on page 200 if looking at PDF V2.0)
- [List@Level](#) explained by [Colin McCrone](#) on the [Simply Complex Podcast](#).
- [List@Level](#) sample image from [Marcello Sgambelluri](#) and [The Simply Complex Blog](#)

Lacing

Learning how **Lacing works** in Dynamo is a helpful skill.

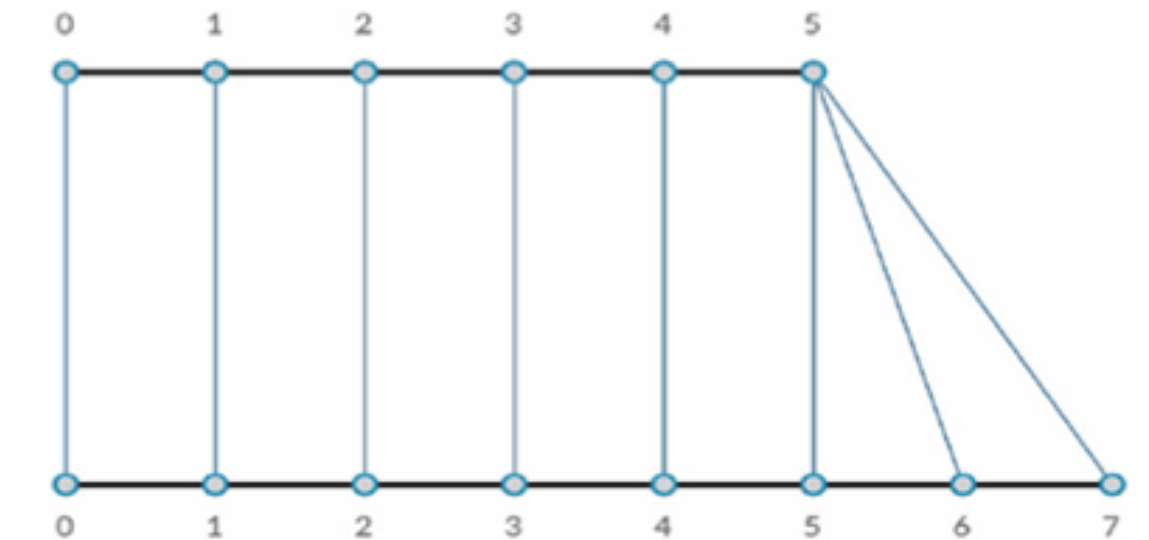
- **Shortest Lacing**

- Use items from both sides until one side is done



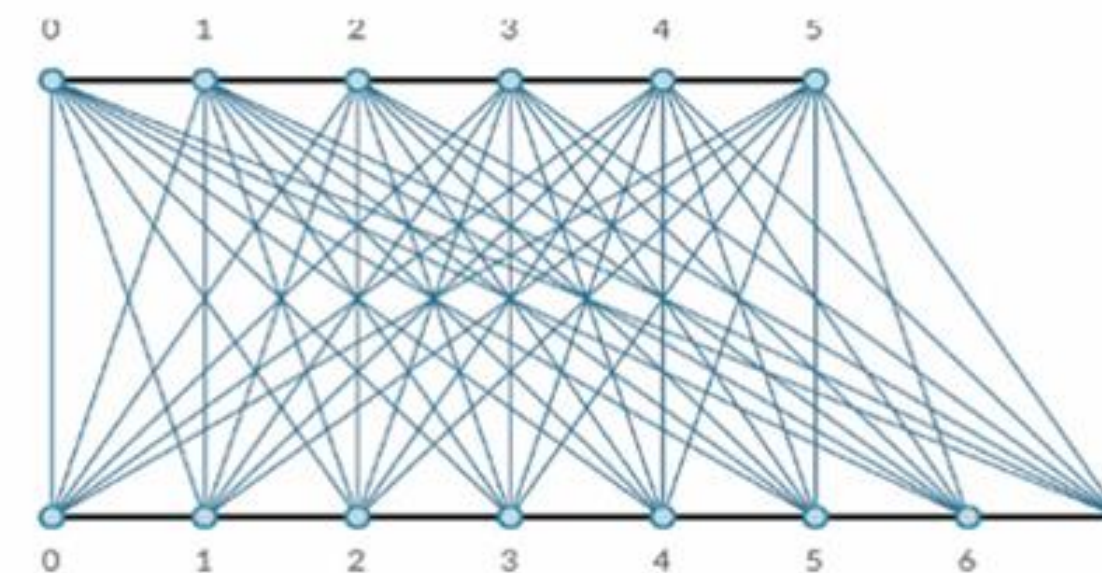
- **Longest Lacing**

- Reuse the last item in each list until all sides are done



- **Cross Product Lacing**

- Make all possible connections



- **Auto Lacing**

- Let Dynamo pick the best lacing for the task

Naming Convention

Like your BEP and the naming convention you have for your models you should have **a naming convention for your Dynamo graphs**. This makes it **easier for others (and yourself)** to use them and **understand what they do in the future**.

DP_134_RFA_Upgrade

Dynamo File Name

NOTE: The Revit family will update to the version of Revit you have open when you run this graph

Folder with files in it
(no subfolders)

Original node name:
Directory Path

Location of folder with files to be upgraded

Browse...

C:\Users\cstorms\Downloads\Test

Revit & Dynamo Info

Created on Revit 2018.3& Dynamo 1.3.4

Custom Pacakges used: Rhythm - Version 19.4.25

Tested on Revit 2018, 2019

Tested on Dynamo 1.3.4

Tested on Dynamo Player

DP_250_RFA_Upgrade_SF

Dynamo File Name

NOTE: The Revit family will update to the version of Revit you have open when you run this graph

Folder and subfolders
with files in them

Original node name:
Directory Path

Location of folder with files to be upgraded

Browse...

C:\Users\cstorms\Downloads\Test

Revit & Dynamo Info

Created on Revit 2018.3 & Dynamo 2.0.2

Custom Pacakges used: Rhythm - Version 2020.2.13

Tested on Revit 2018, 2019, 2020 & 2021

Tested on Dynamo 2.0.2, 2.0.3, 2.10, 2.30 & 2.50

Tested on Dynamo Player

Learn a Little DesignScript

Like List at Level, learning even a little DesignScript will expand what you can do with Dynamo.

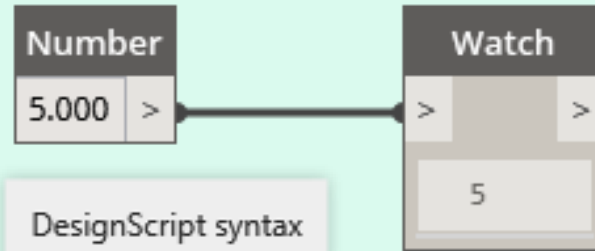
Comments

DesignScript syntax for code Comments

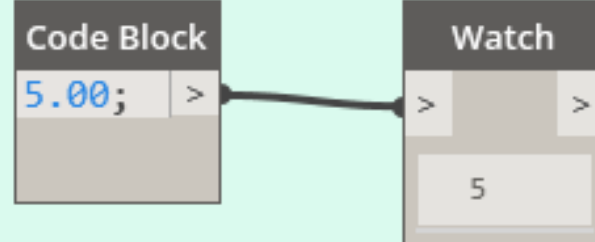
```
Code Block
// Single line Comment in DesignScript
/* Multiline
Comment in
DesignScript */;
```

Numbers

Nodal composition

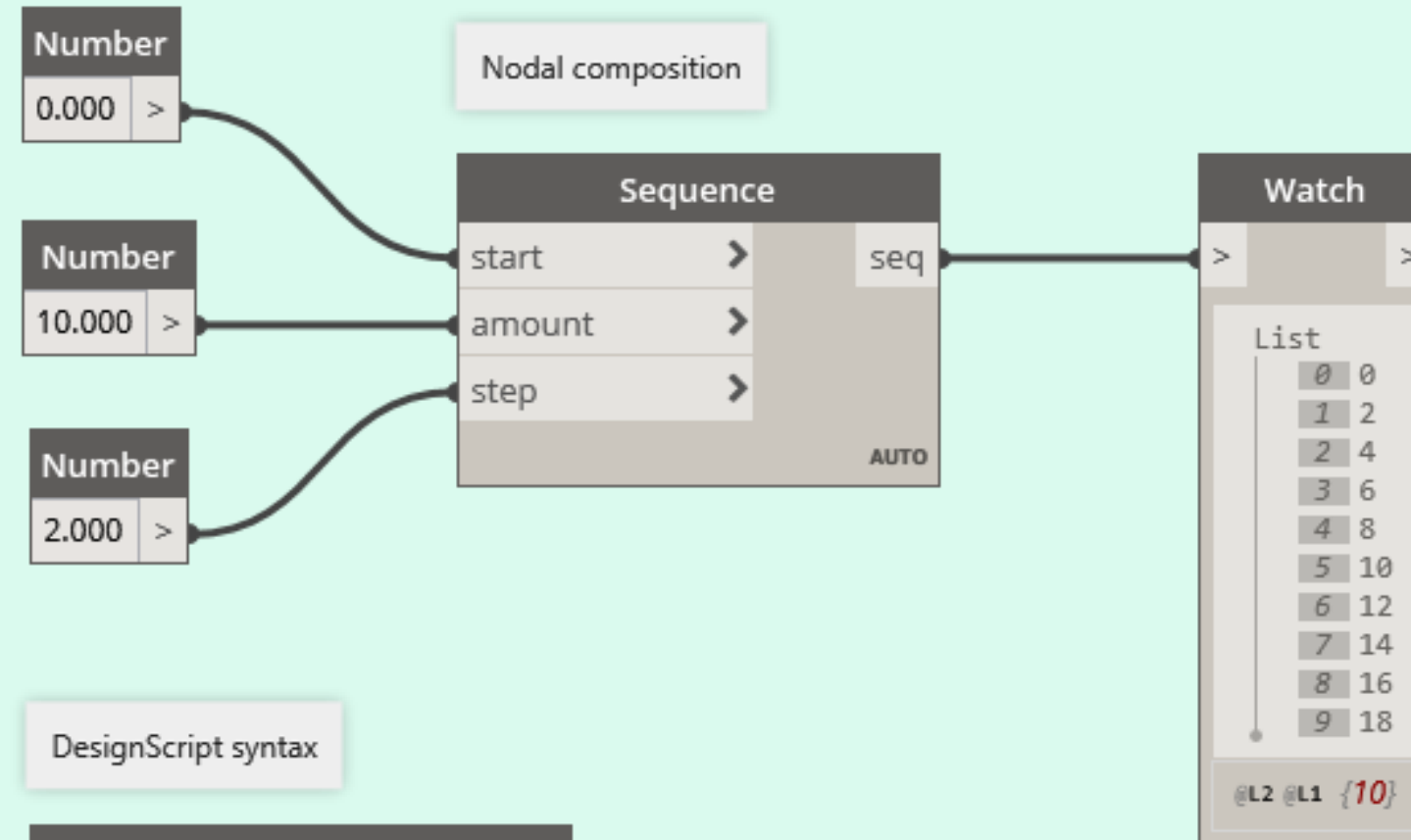


DesignScript syntax

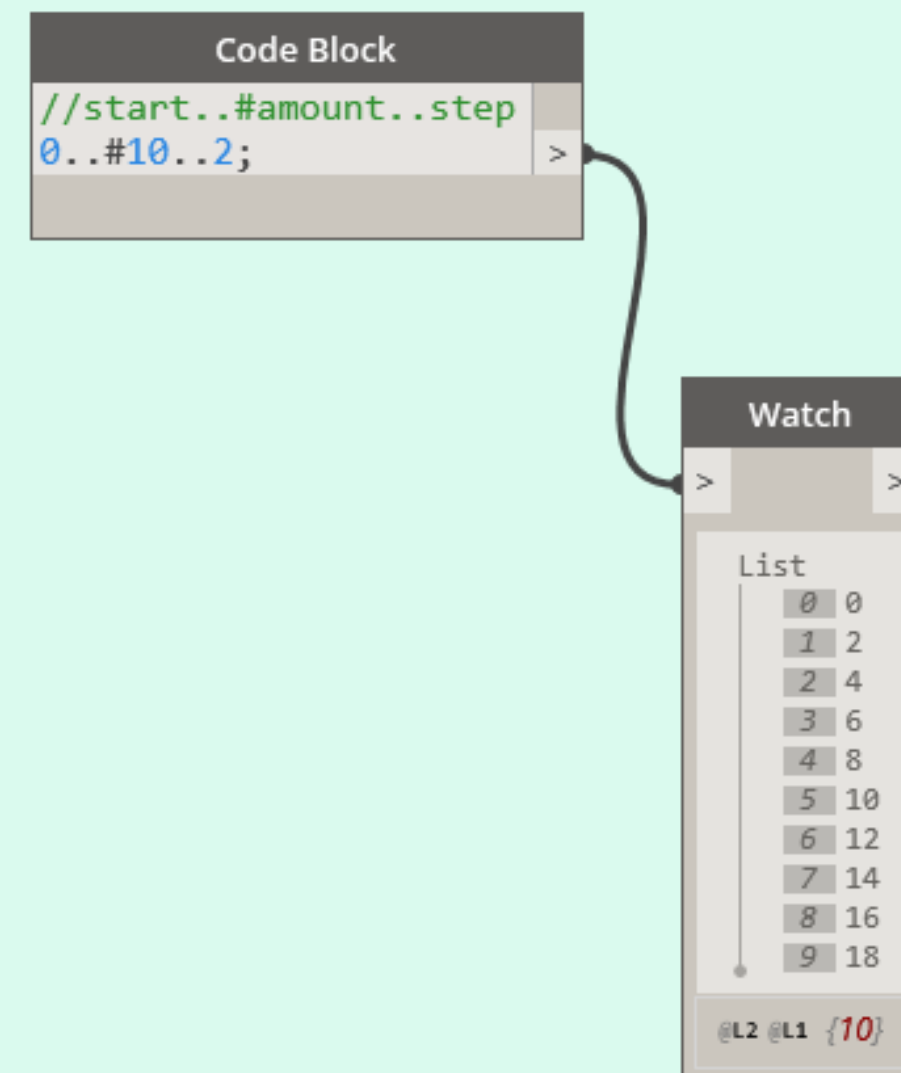


Number Sequence

Nodal composition

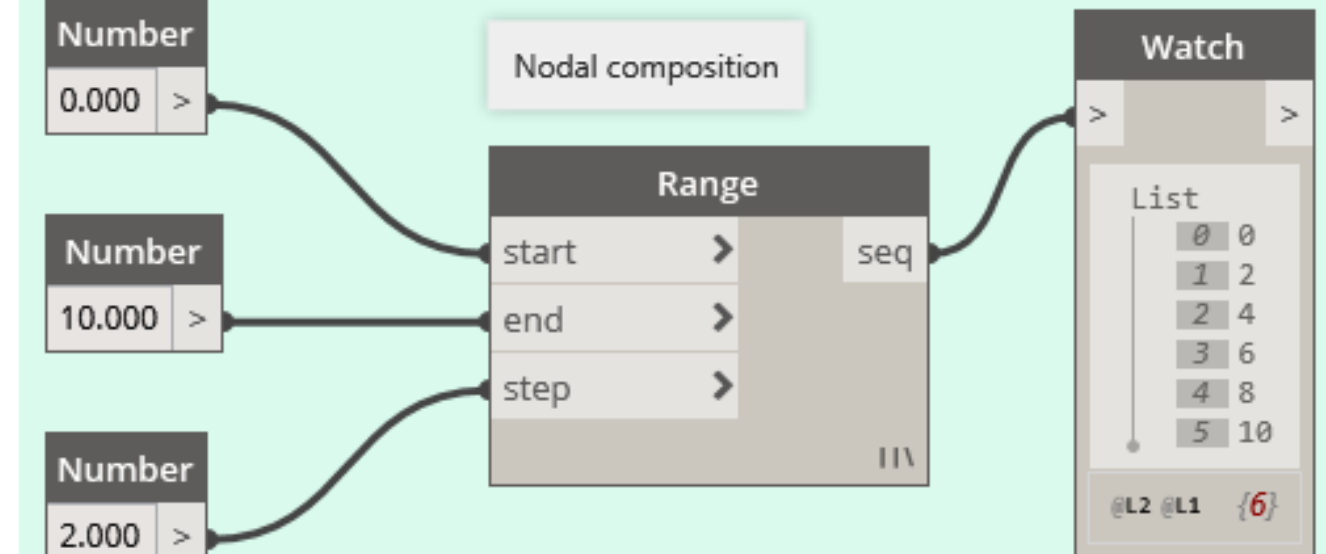


DesignScript syntax

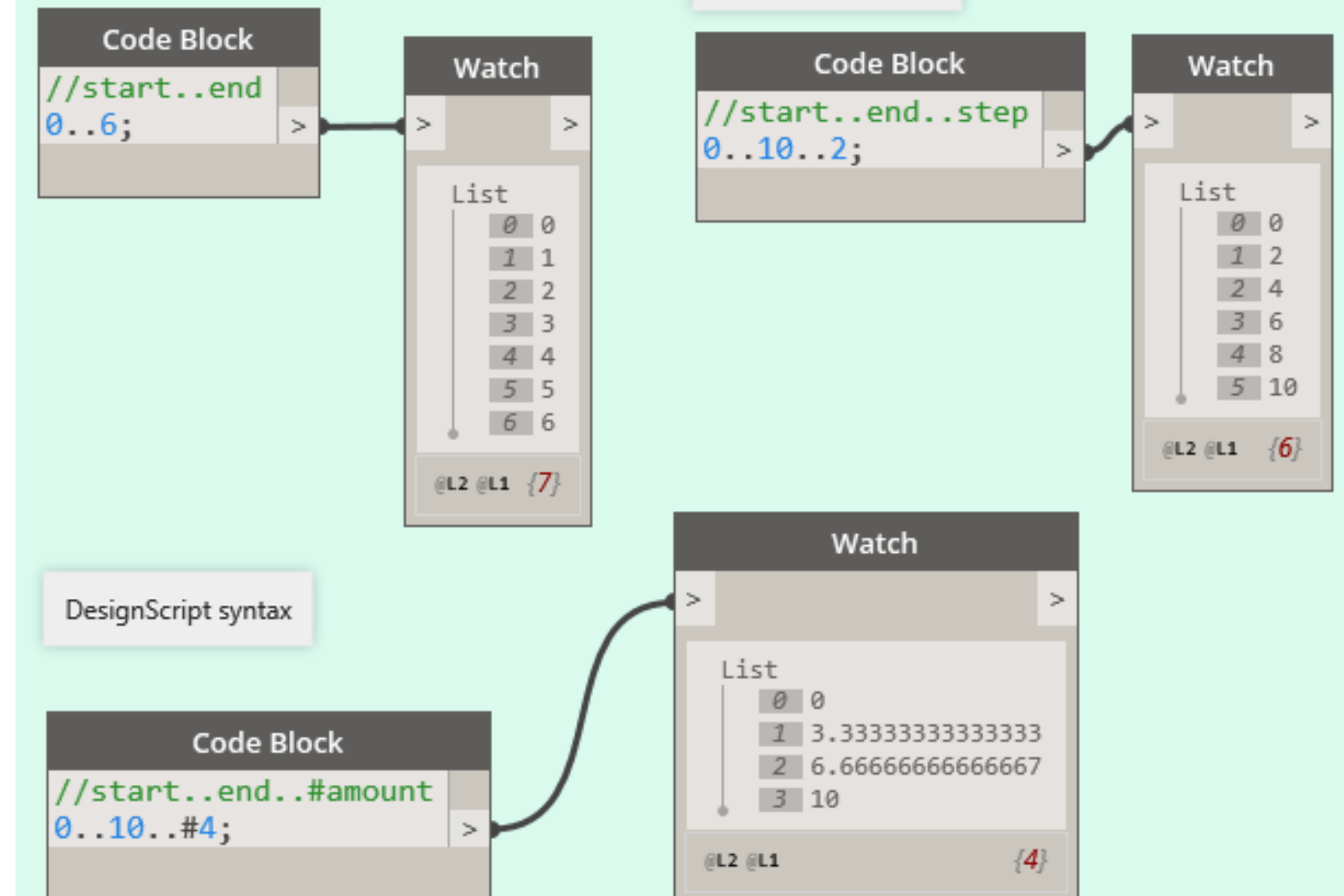


Number Range

Nodal composition

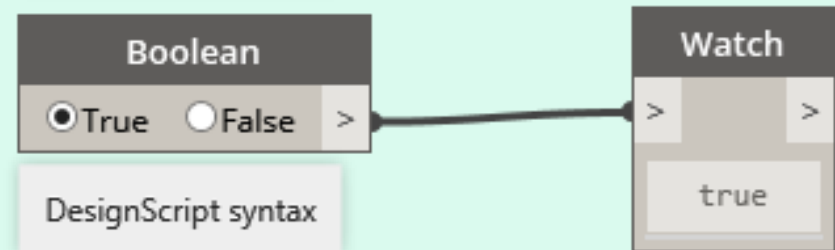


DesignScript syntax

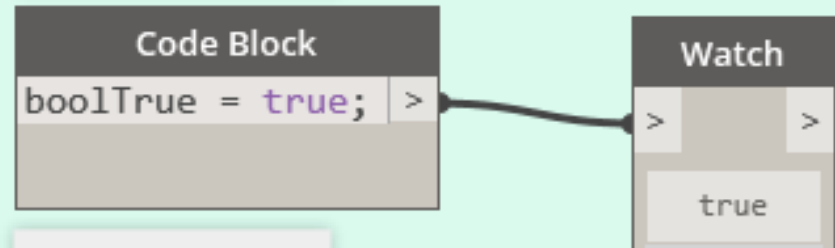


Booleans

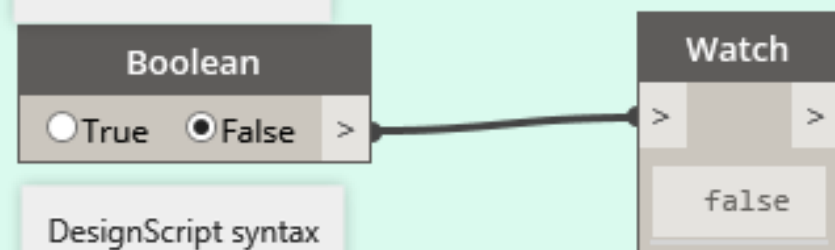
Nodal composition



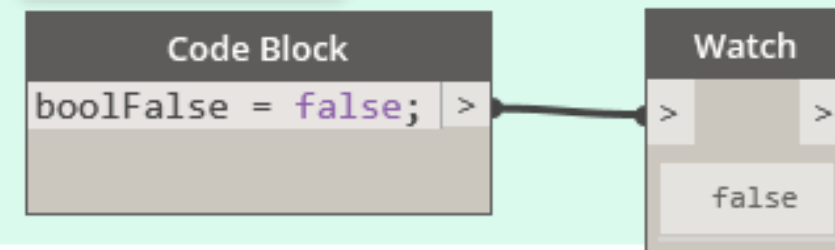
DesignScript syntax



Nodal composition

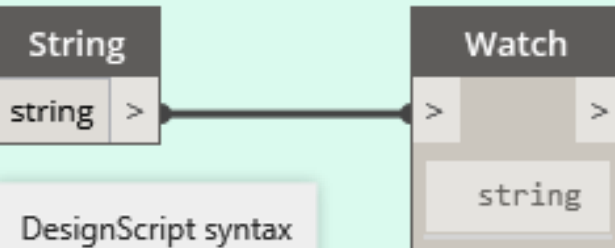


DesignScript syntax

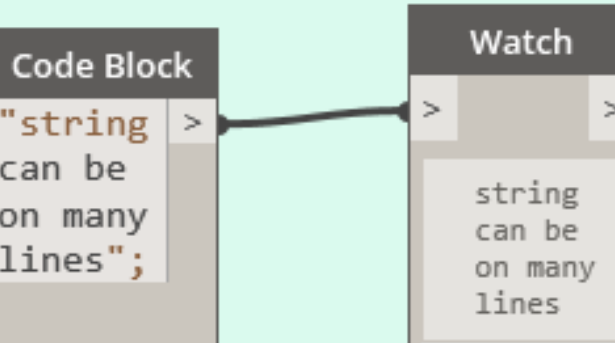
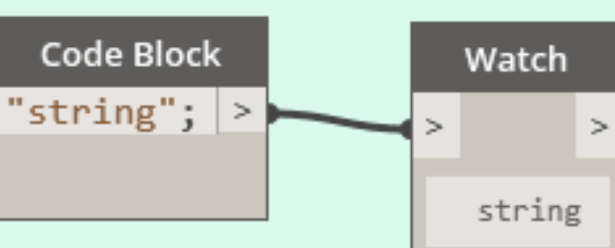


Strings

Nodal composition



DesignScript syntax



Learn a Little DesignScript

Like List at Level, learning even a little DesignScript will expand what you can do with Dynamo.

DesignScript Resources:

- DesignScript Language Summary:
 - http://designscript.io/DesignScript_user_manual_0.1.pdf
- DesignScript Language Guide:
 - <https://dynamobim.org/wp-content/links/DesignScriptGuide.pdf>
- DesignScript presentation by Sol Amour:
 - <https://github.com/Amoursol/dynamoDesignScript>

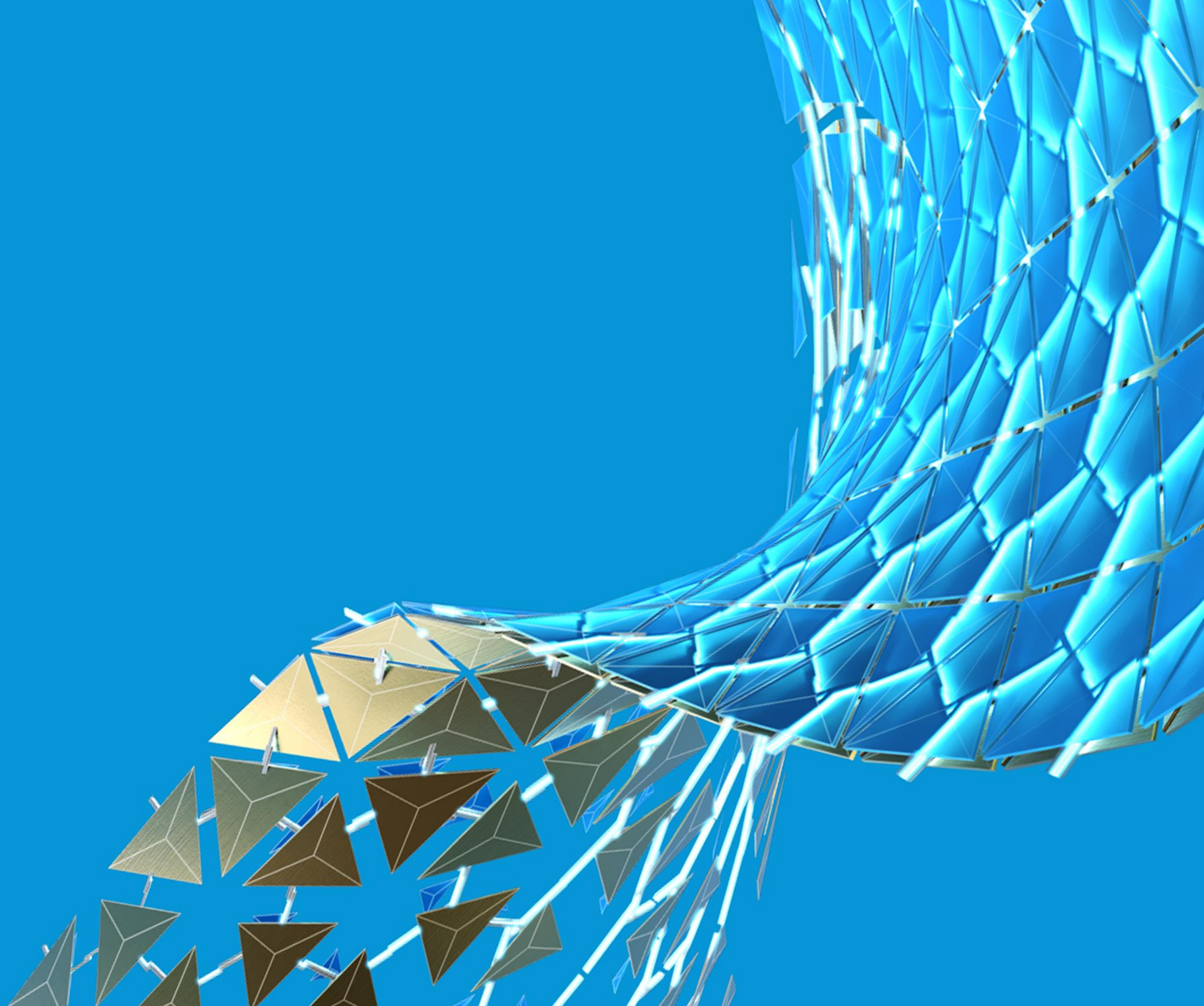


Wise Words from the Aussie BIM Guru

Gavin Crump

- Apply your learning progress to real world problems you need to solve wherever possible
- Try not to focus on preview geometry, at least at first. **Focus on data such as numbers, strings and Revit elements**
- Avoid copying blocks of your code, **learn about lists, levels and lacing early**
- Take the time to read warnings, and research what they mean. **A large amount of time in Dynamo is typically related to troubleshooting**
- **Walk before you run.** Target basic workflows to begin with, then move your way towards the complex ones

Have Fun

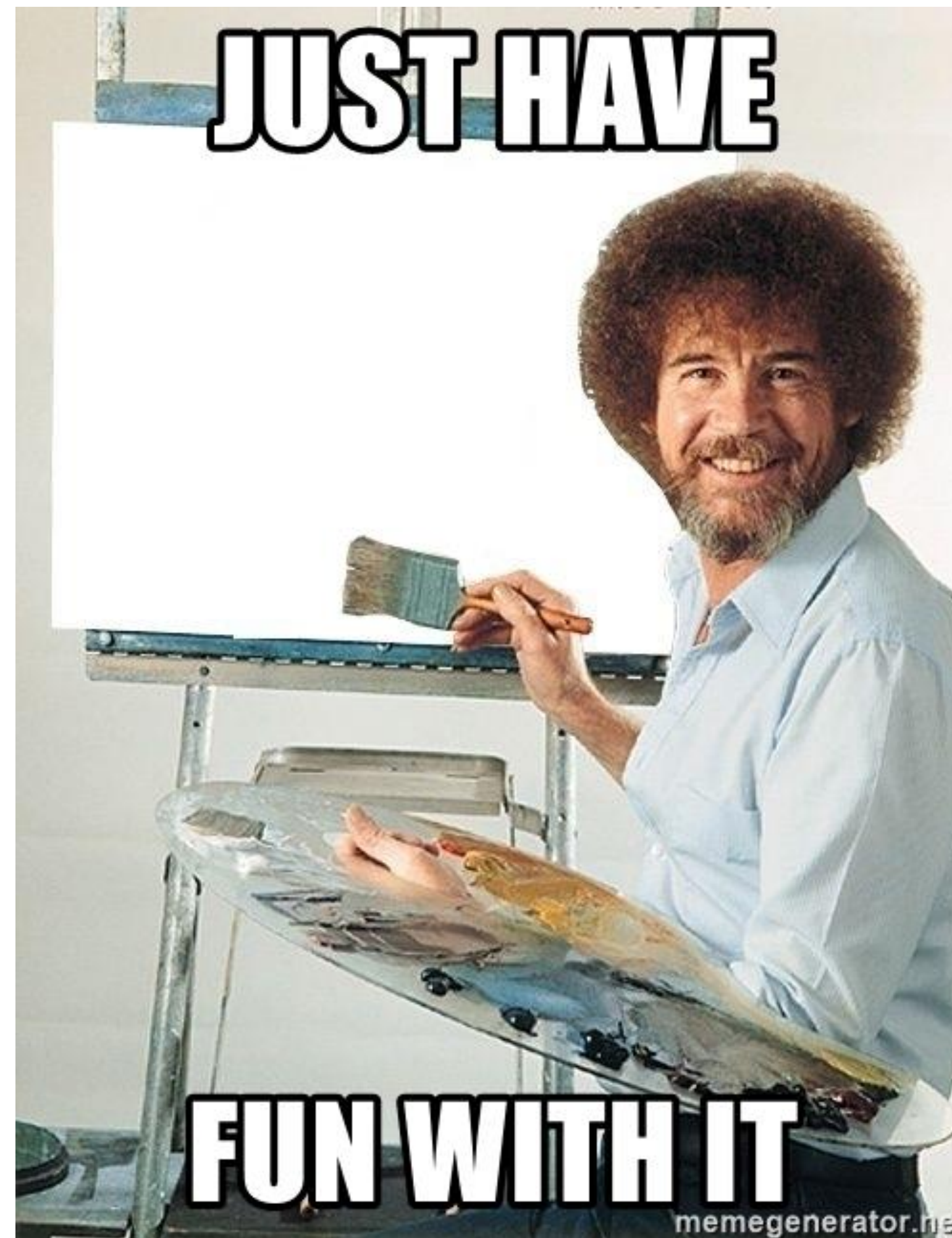




[John Pierson](#)

No Work is Ever Wasted

John has a **great blog post** about how **having fun** and doing things that might “seem like a waste of time” can in fact be the exact opposite!



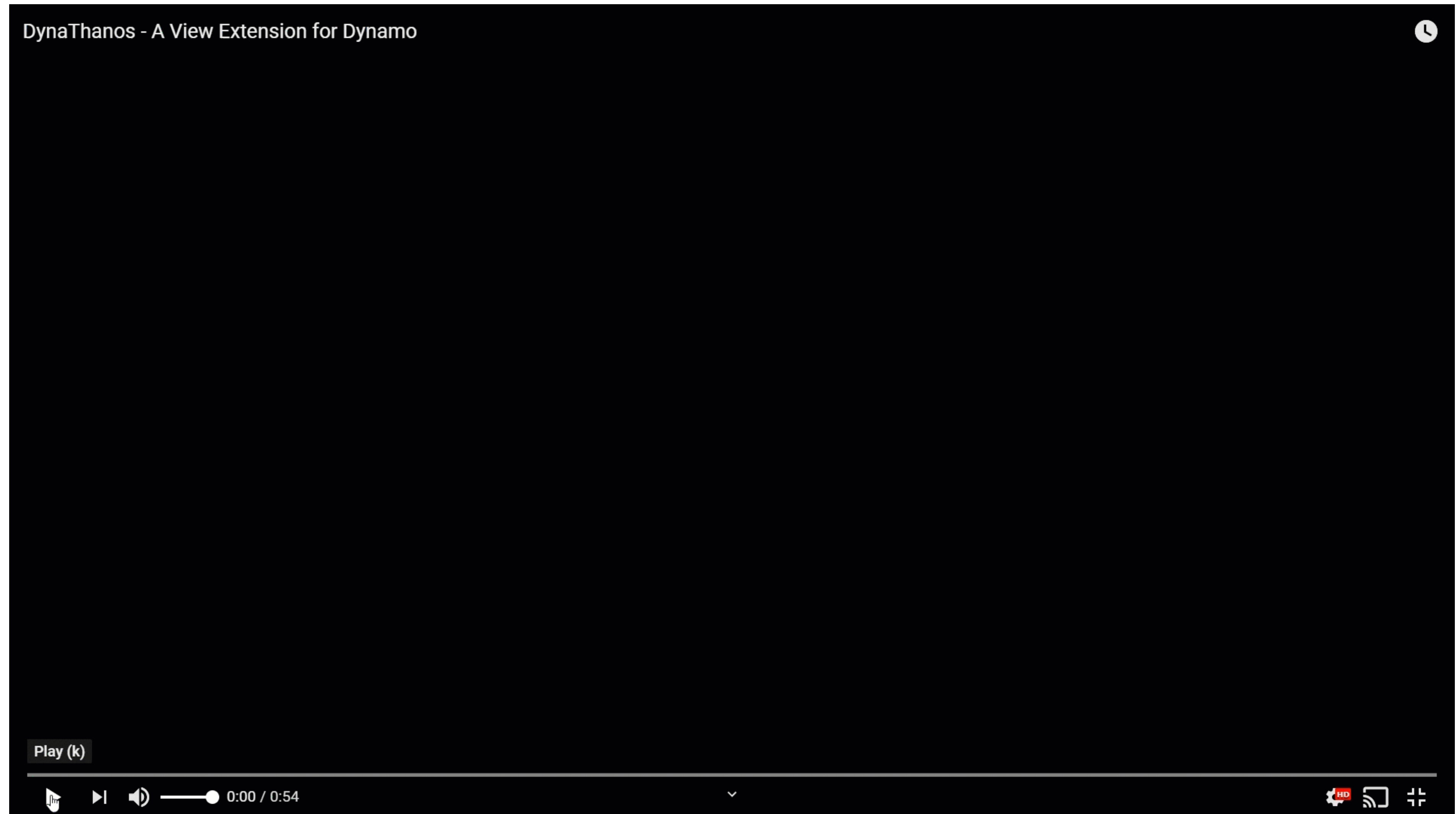
[Blog Post](#)



[John Pierson](#)

DynaThanos

John always **has fun** with his **Dynamo** graph, while learning a great deal along the way. A great example of this would be his “April Fools” YouTube video from 2019: [DynaThanos](#).



[Source](#)
[GitHub](#)



Zach Kron

Code Block Fun

How well do you know your alphabet?





[Zach Kron](#)

Code Block Fun

How well do you know your alphabet?

Code Block

1 "A" ..#2000..-1; >
// start..#amount..step

>

Watch

>

List

0	A
1	
2	↓
3	-
4	τ
5	†
6	‡
7	π
8	τ
9	μ
10	‡
11	‡
12	‡
13	⊥
14	‡
15	‡

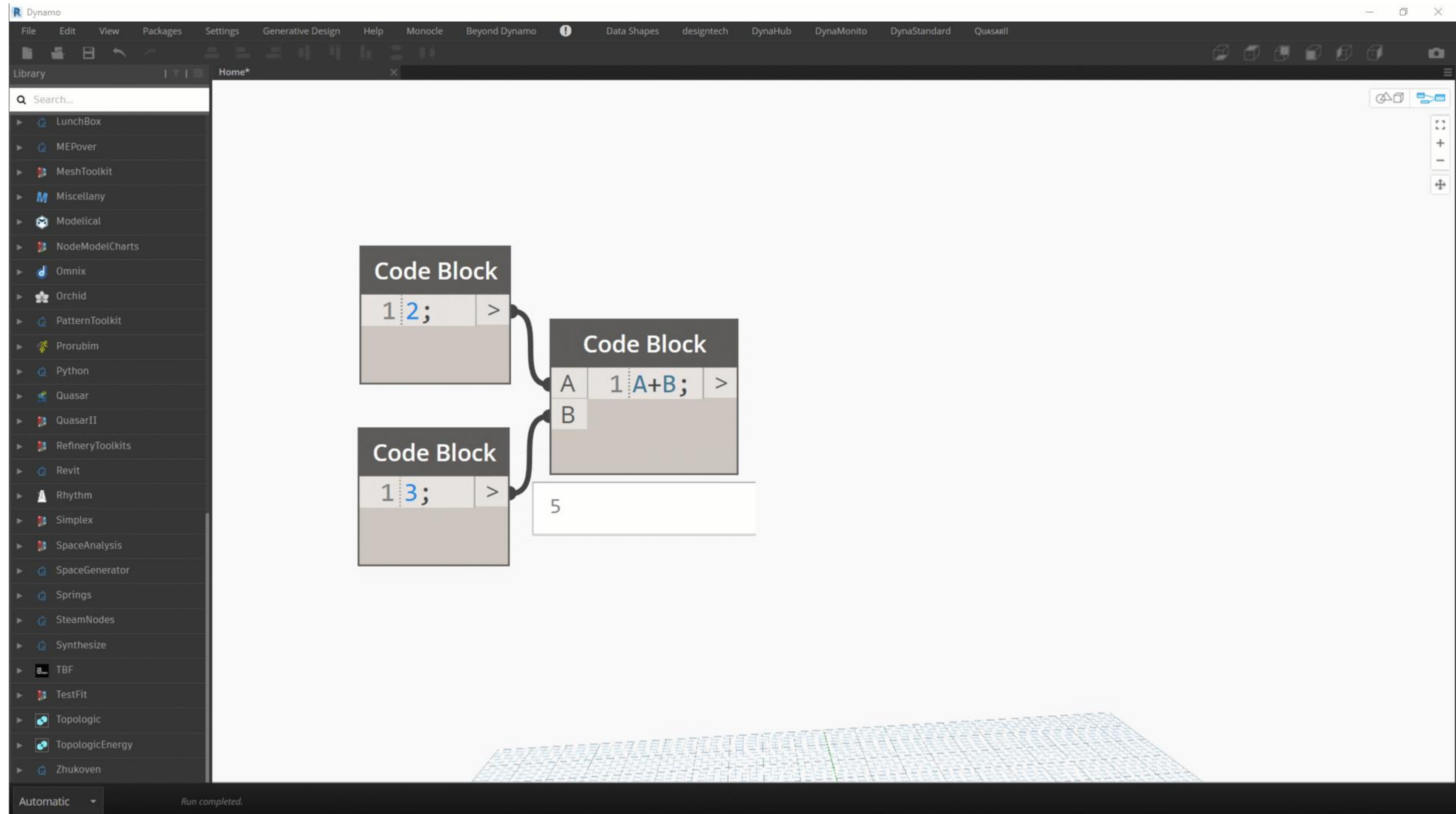
@L2 @L1 {1422}



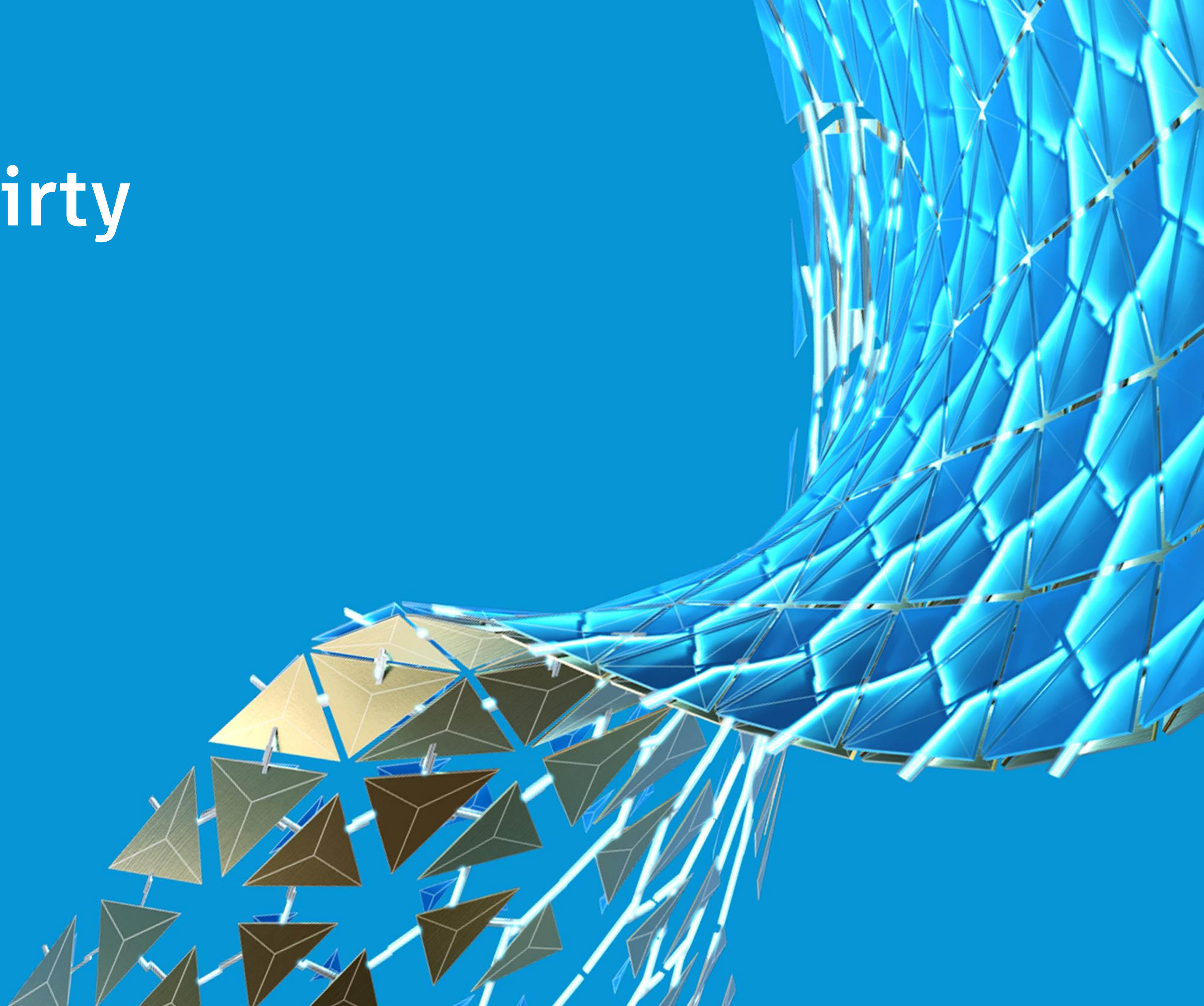
[Sean Fruin](#)

Emojis 🤖 🚚 🏗️

Who said you can't add some **emojis** to your Dynamo graphs 😊

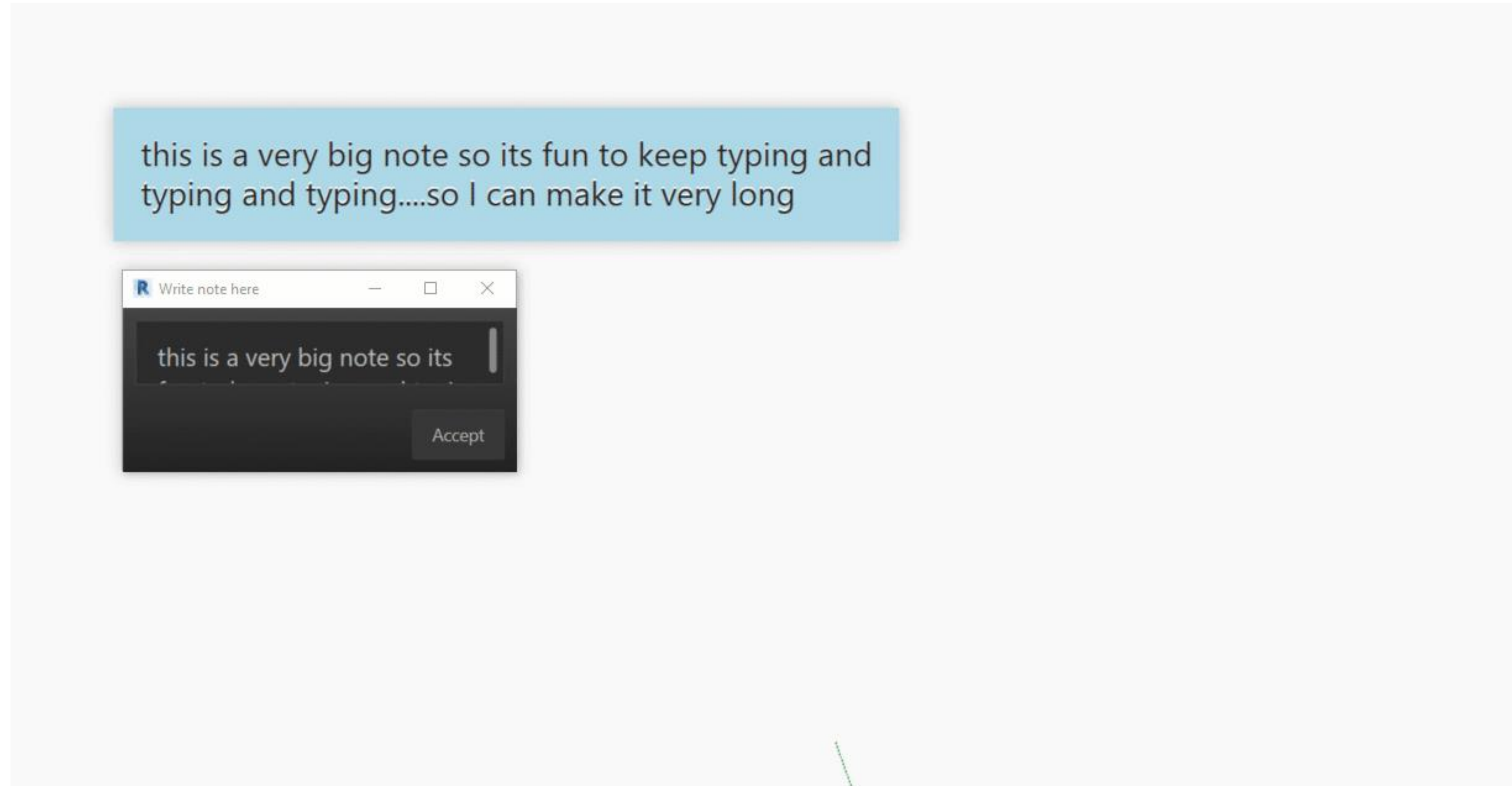


Quick and Dirty



Resize Notes

You can resize the notes dialog box while creating a note (2.3 and on)



Comment Your Code

It is always best practice to **comment your code**, and **this goes for Dynamo too!**

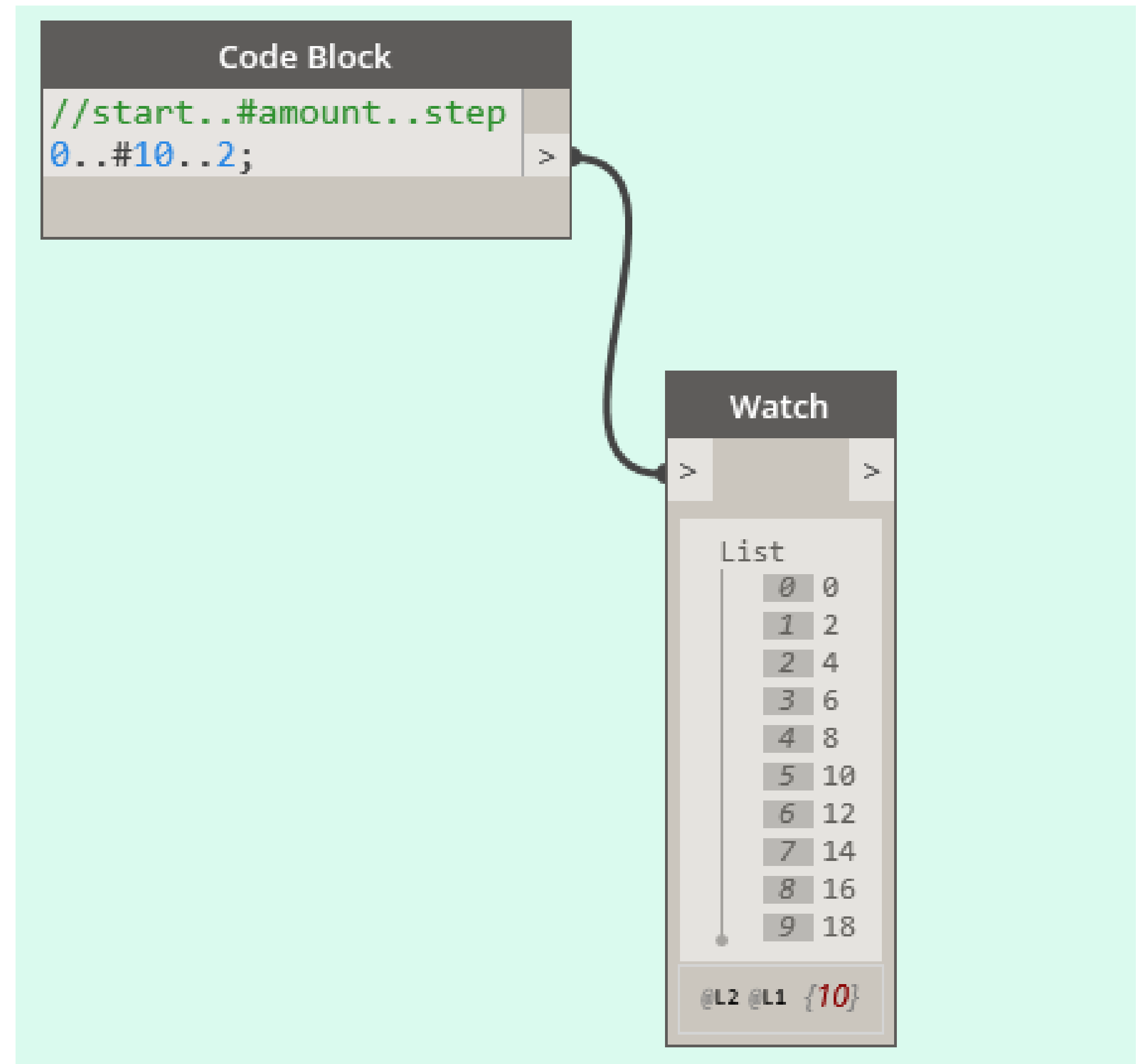
A couple slashes (//) and **a few words** can be a **game changer in a few months** when you open the graph again.

Comments

DesignScript syntax
for code Comments

```
// Single line Comment in DesignScript

/* Multiline
Comment in
DesignScript */;
```

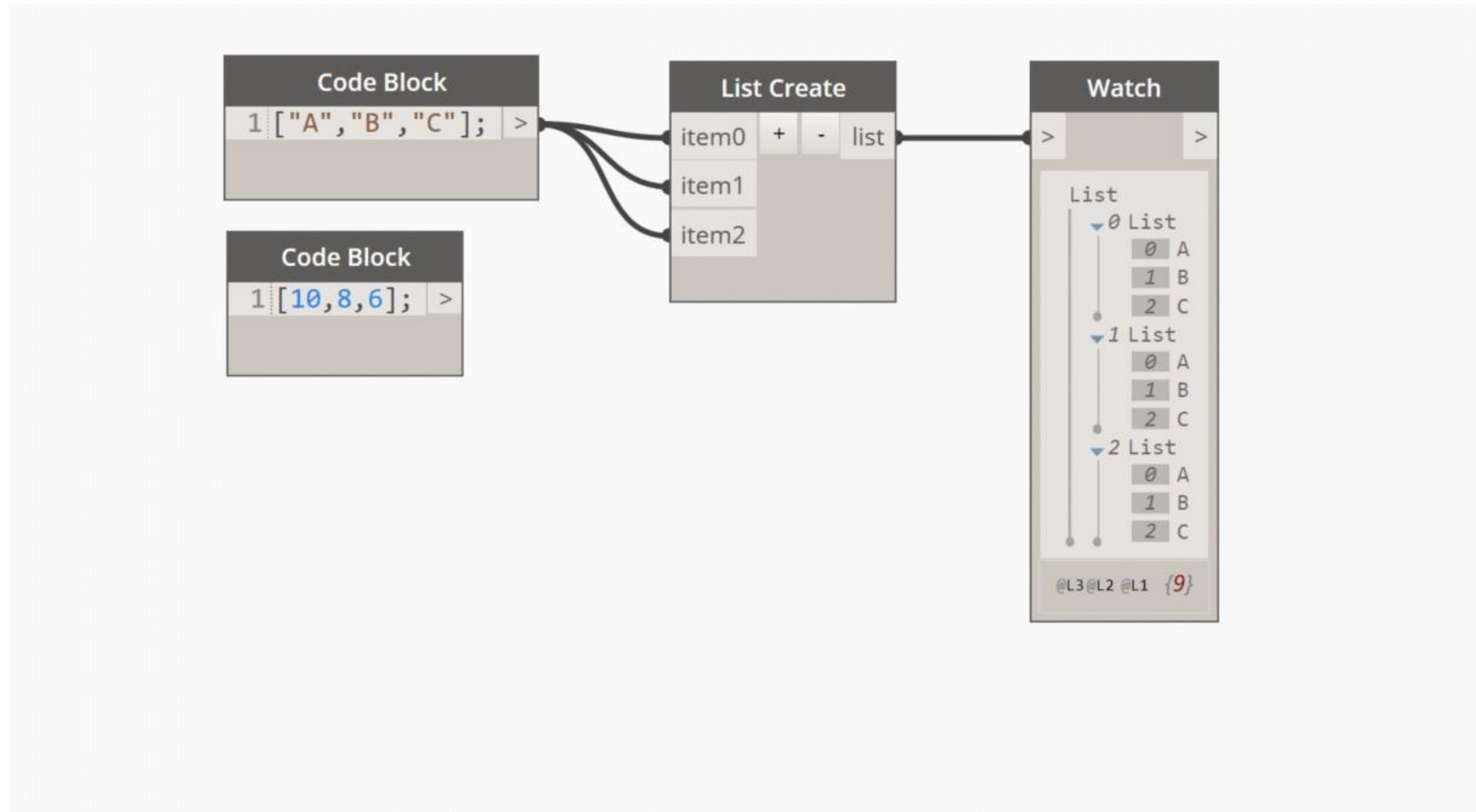




Shift + Left Click

Use **Shift + Left Click** to remove **all wires** from a node port at once.

[Paul Aubin](#)





[Zach Kron](#)

Play in the Sandbox

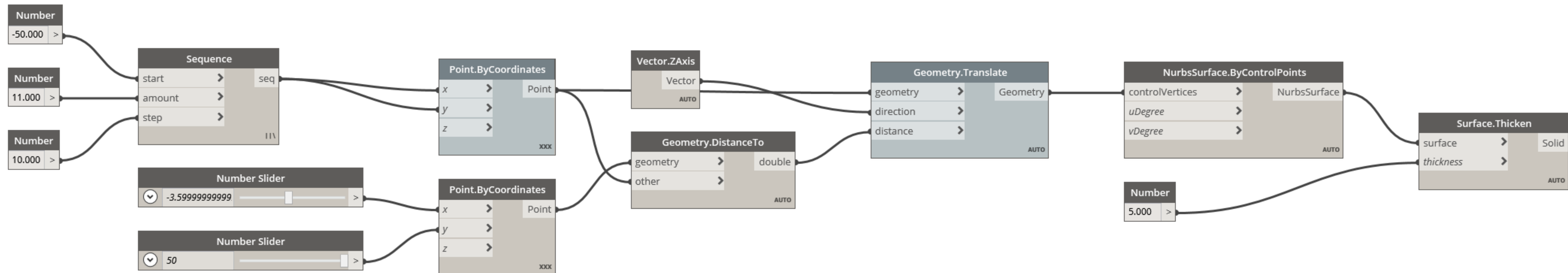
Use the **Dynamo Sandbox** (DynamoCoreRuntime) to work out **little ideas** without having to go through Revit, Civil3D, Advance Steel, FormIt, or Alias.



Node to Code

Turn **Dynamo** nodes into **DesignScript** code using the **Node to Code** feature

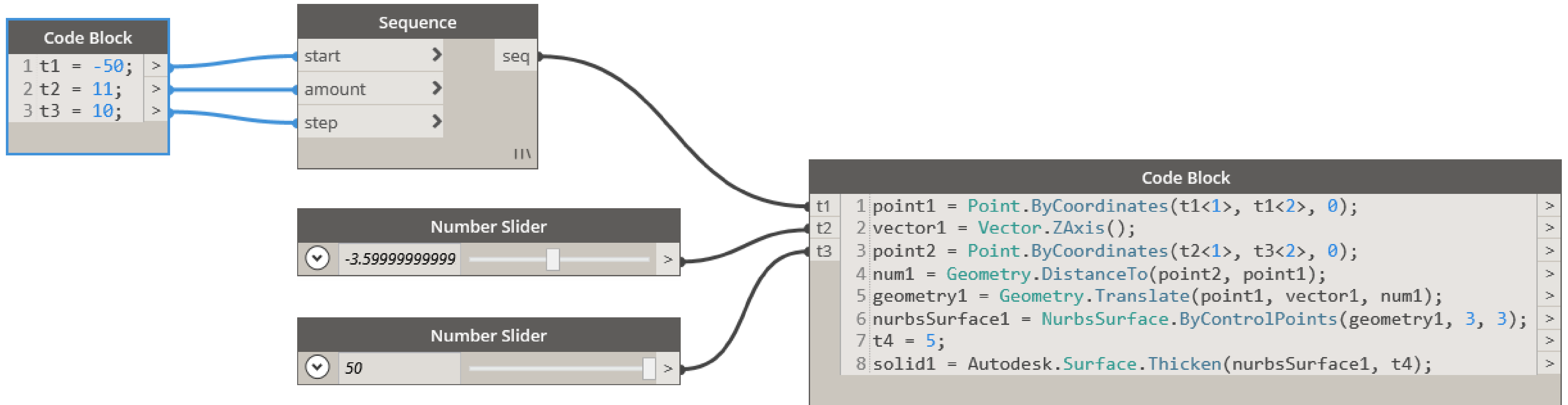
This becomes...



Node to Code

Turn Dynamo nodes into DesignScript code using the **Node to Code** feature

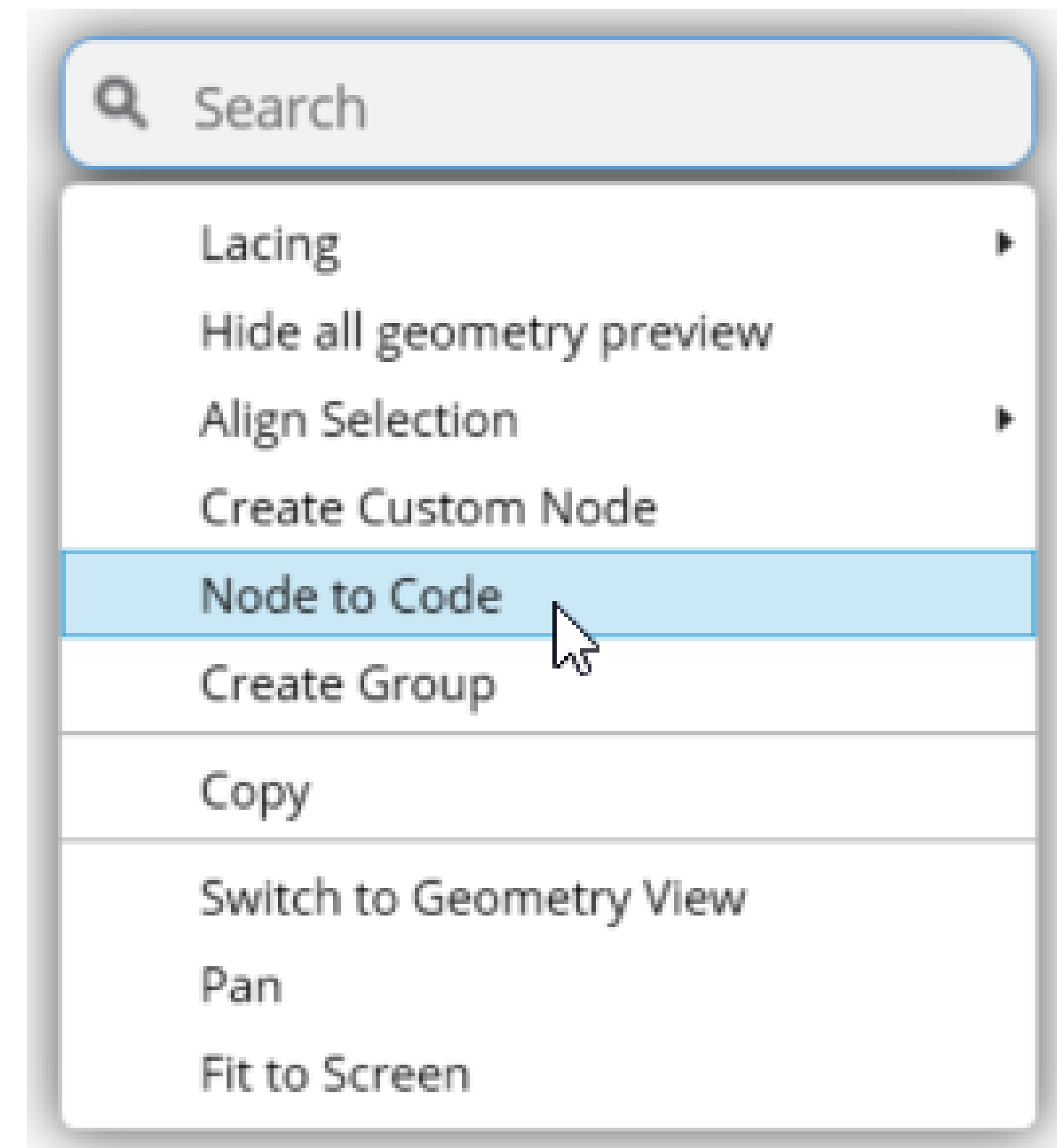
...This



Node to Code

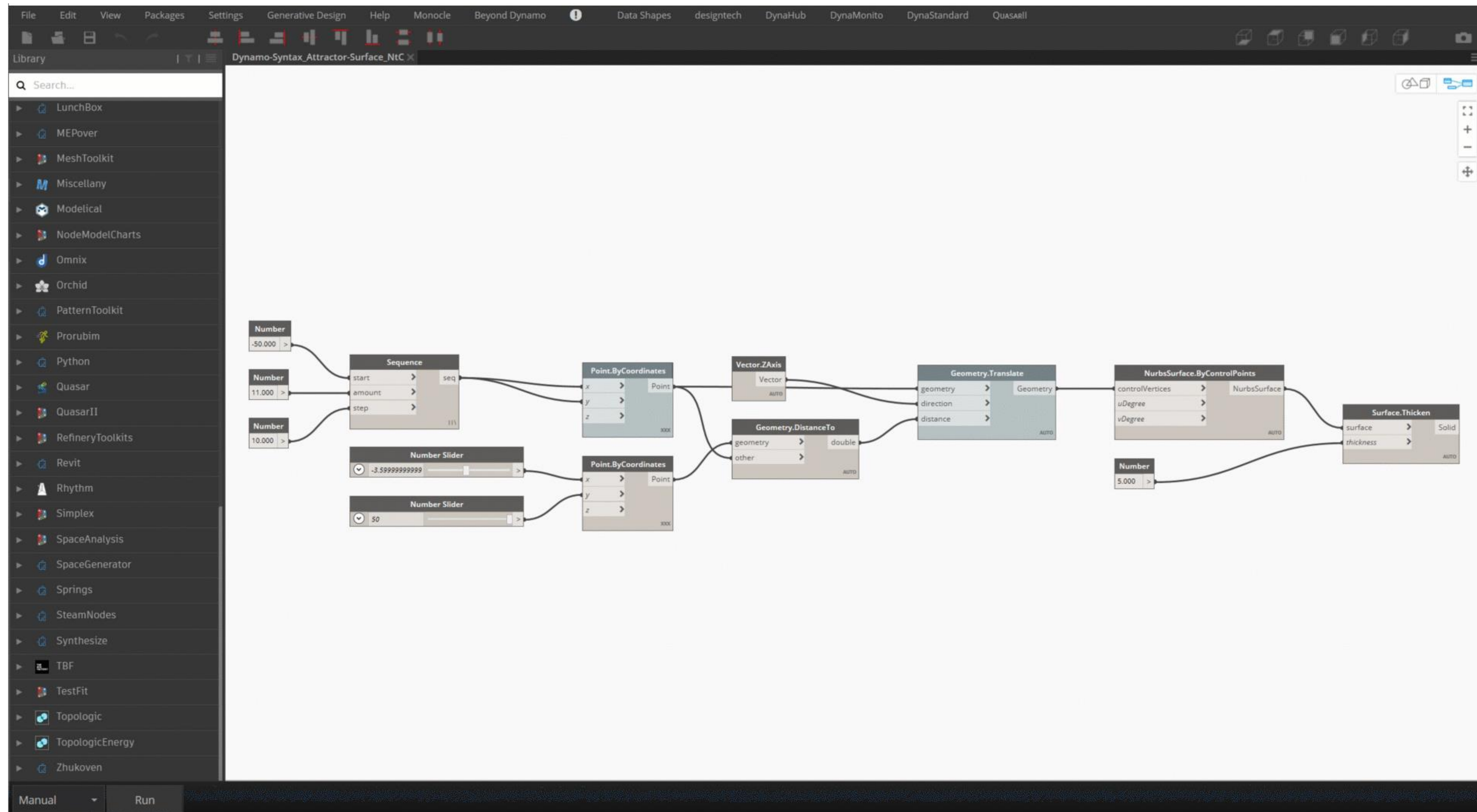
Turn Dynamo nodes into DesignScript code using the **Node to Code** feature

using **This** with a right click



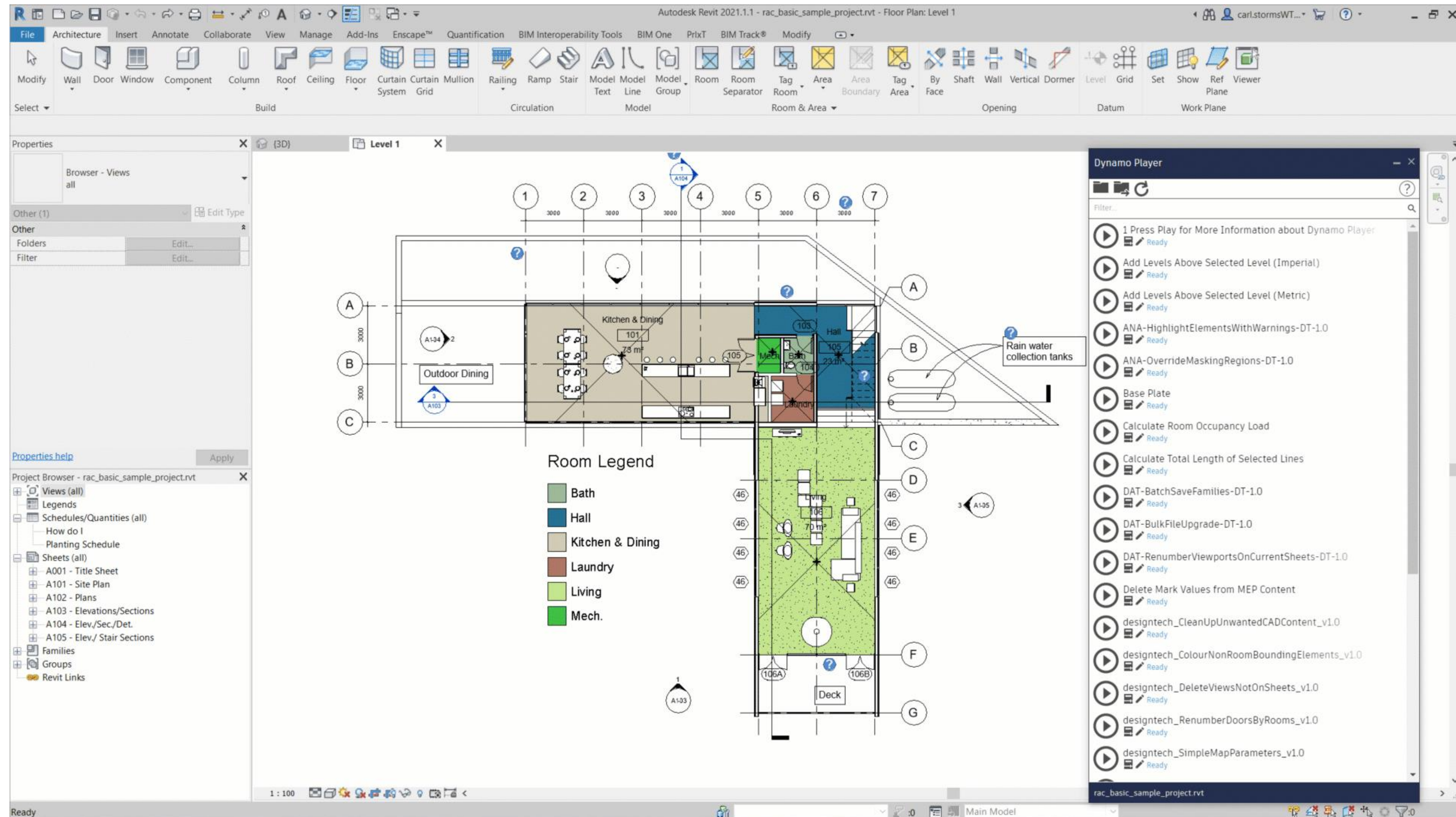
Node to Code

Turn Dynamo nodes into DesignScript code using the **Node to Code** feature



Make use of Dynamo Player

Grow the base of Dynamo users in your office by making graphs that work on Dynamo Player

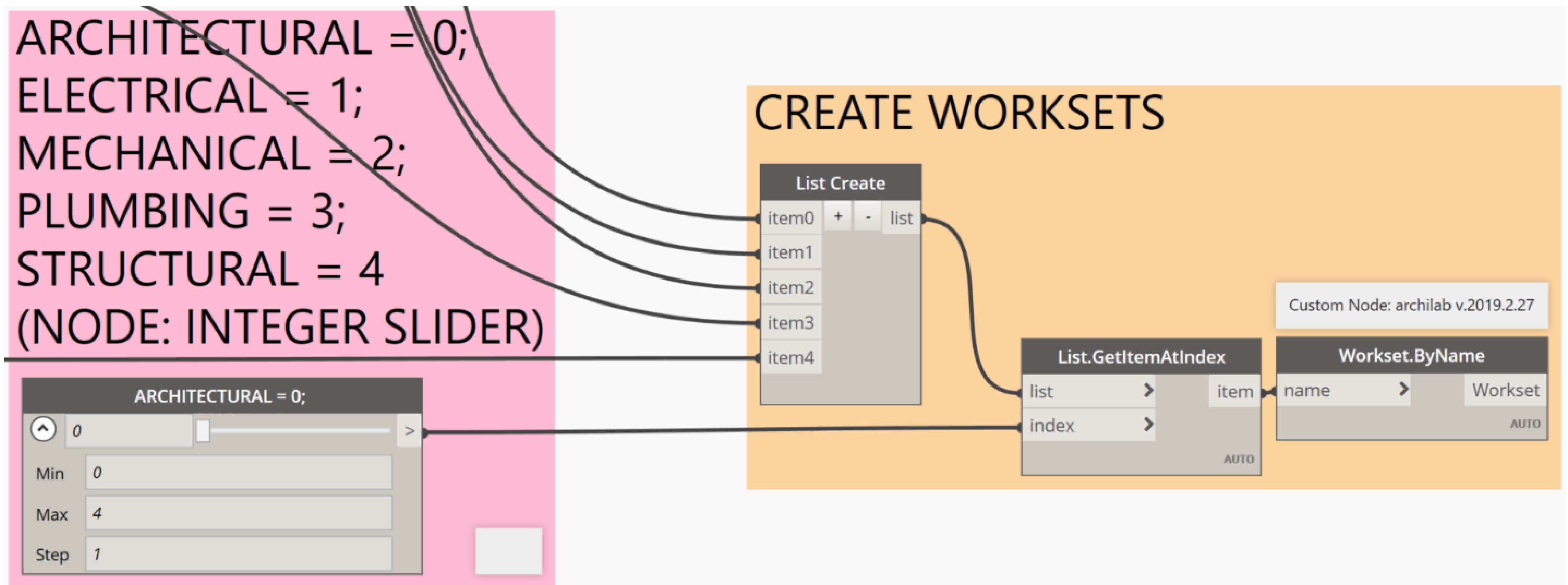




[Dana De Filippi](#)

Dynamo Player Trick

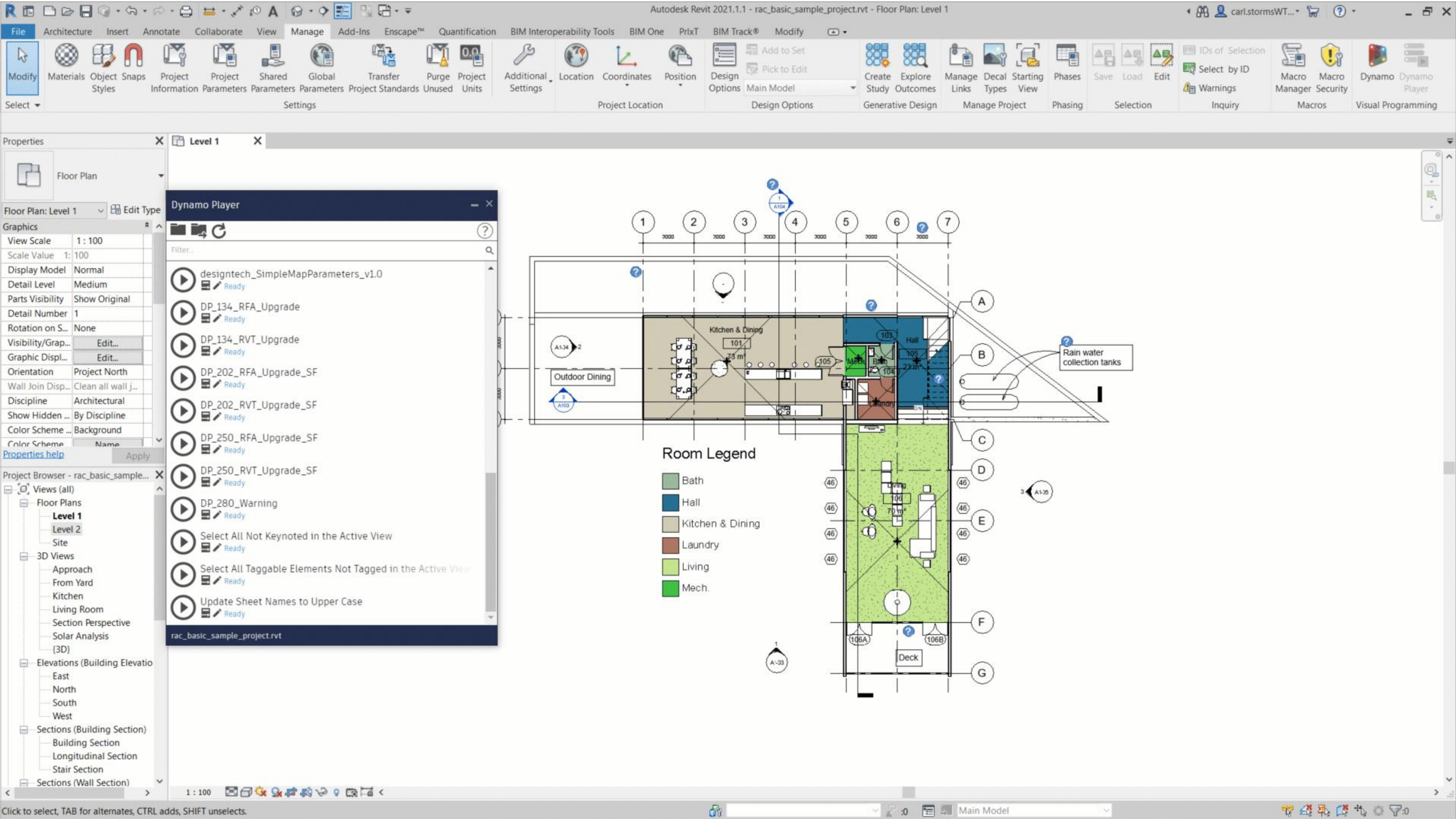
Utilizing **Dynamo player** an input for users to specify between **more than 2** options by **creating a list and getting the item of the list with a number slider** as the input!





Dana
De Filippi

Dynamo Player Trick

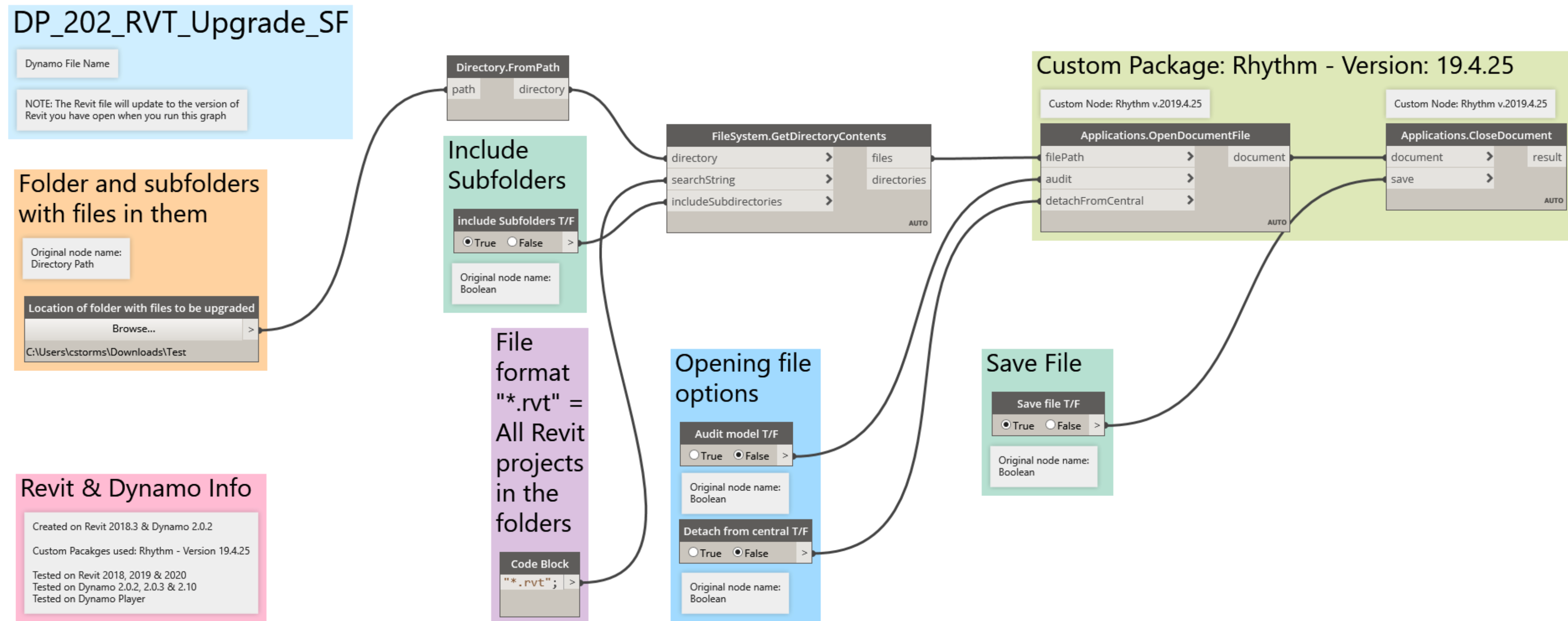


Store Pics with Your DYNs

Store a **screen shot of the finished graph** in the same folder, with the same name as the graph for easy reference when not in Dynamo

Name

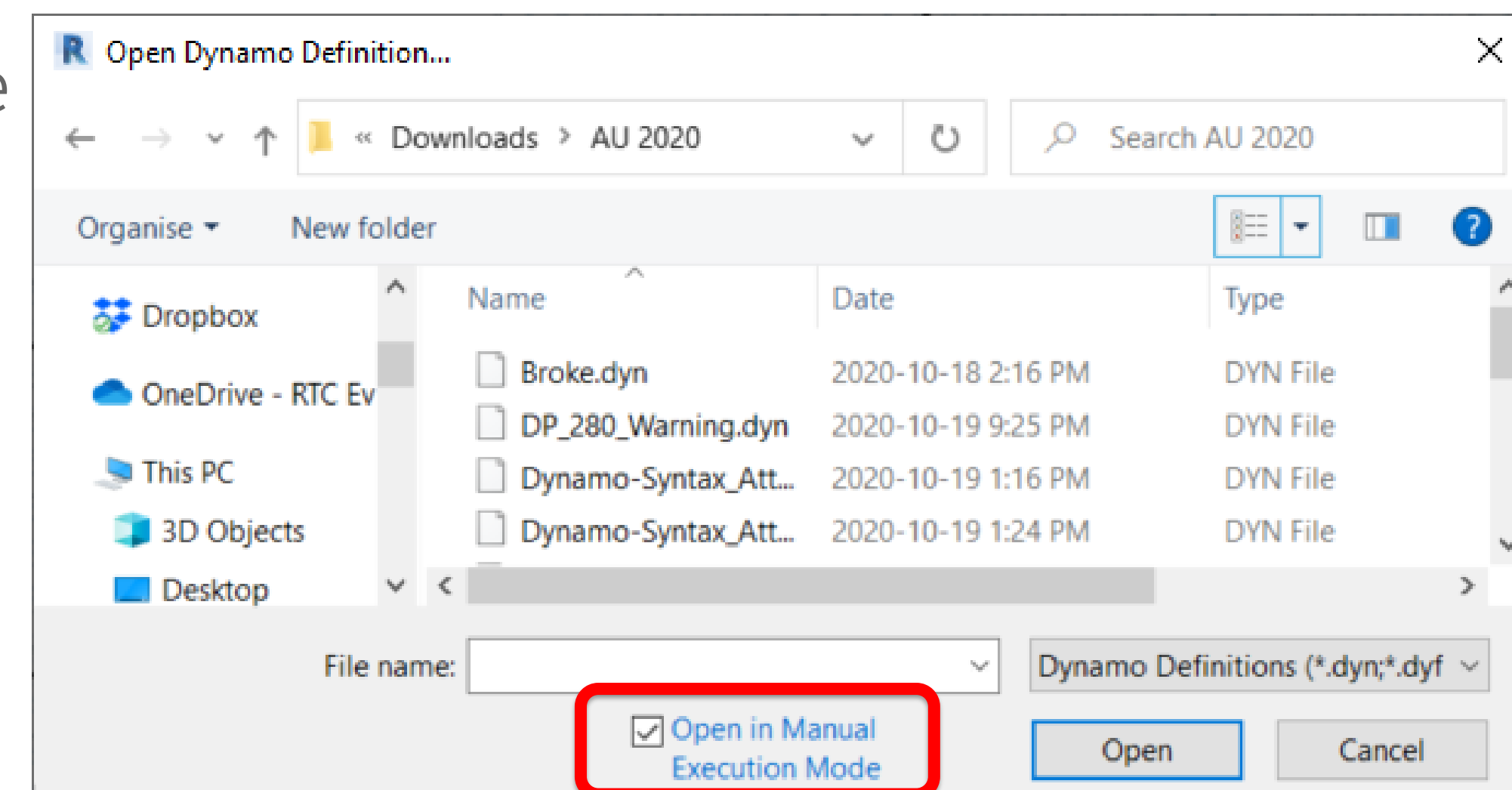
- DP_134_RFA_Upgrade.dyn
- DP_134_RVT_Upgrade.dyn
- DP_202_RFA_Upgrade_SF.dyn
- DP_202_RVT_Upgrade_SF.dyn
- DP_250_RFA_Upgrade_SF.dyn
- DP_250_RVT_Upgrade_SF.dyn
- DP_134_RFA_Upgrade.png
- DP_134_RVT_Upgrade.png
- DP_202_RFA_Upgrade_SF.png
- DP_202_RVT_Upgrade_SF.png
- DP_250_RFA_Upgrade_SF.png
- DP_250_RVT_Upgrade_SF.png



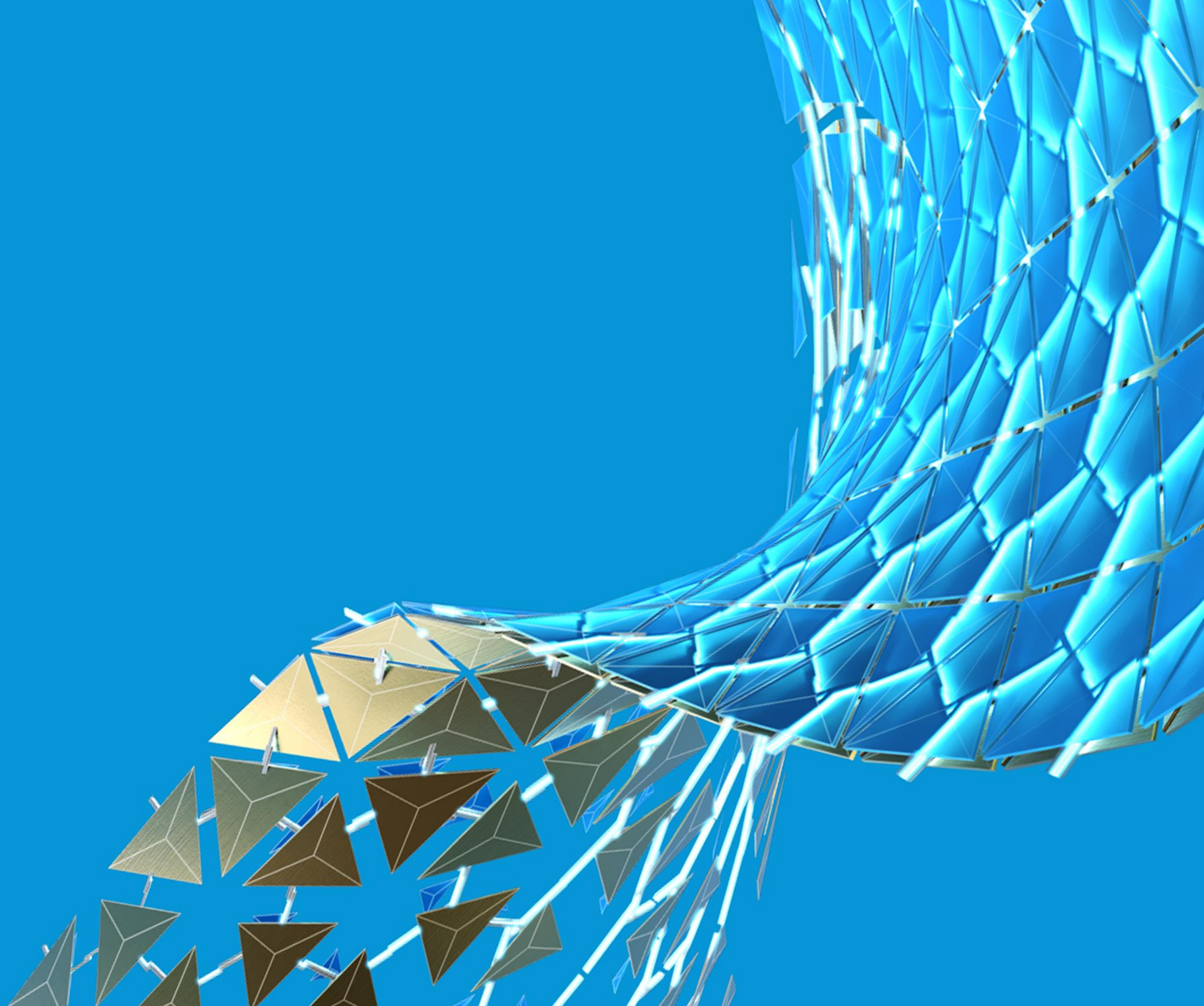
Keyboard Shortcuts

Knowing a **few** Dynamo **Keyboard shortcuts** can **speed up** the **creation of graphs**.

- **F5** = Run the Graph
- **Right Click** = Orbit in background preview mode
- **ESC + Right Click** = Hold down esc + right click to orbit the background preview **while** in graph view
- **CTRL + G** = Create a new group
- **CTRL + L** = Cleanup nodelayout
- **CTRL + W** = Make a new note
- **CTRL + SHIFT + P** = Package usage boring mode (Monocle)
- **Open in Manual Execution Mode** = Check box to check before opening a Dynamo dyn

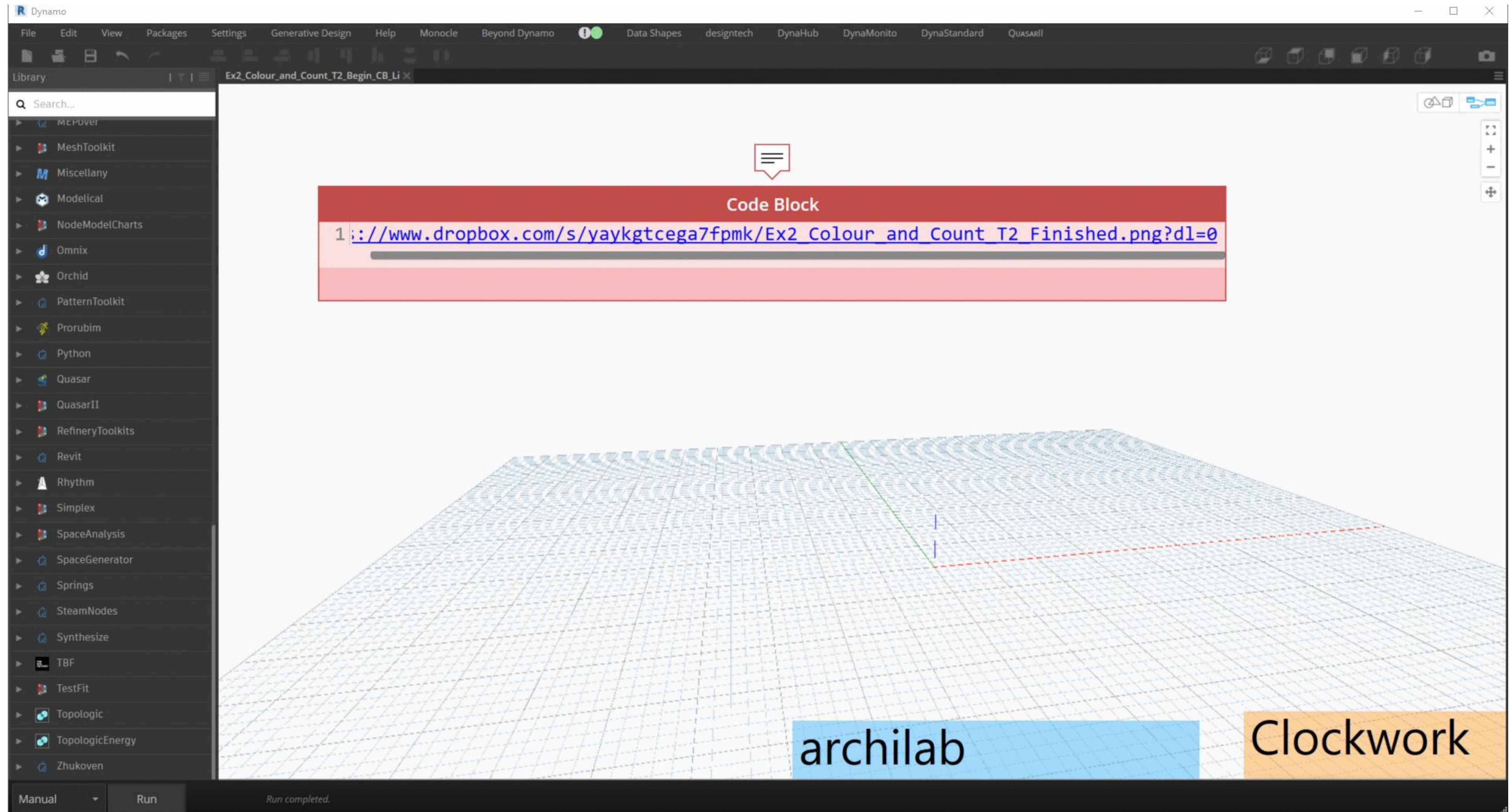


Mixed Bag



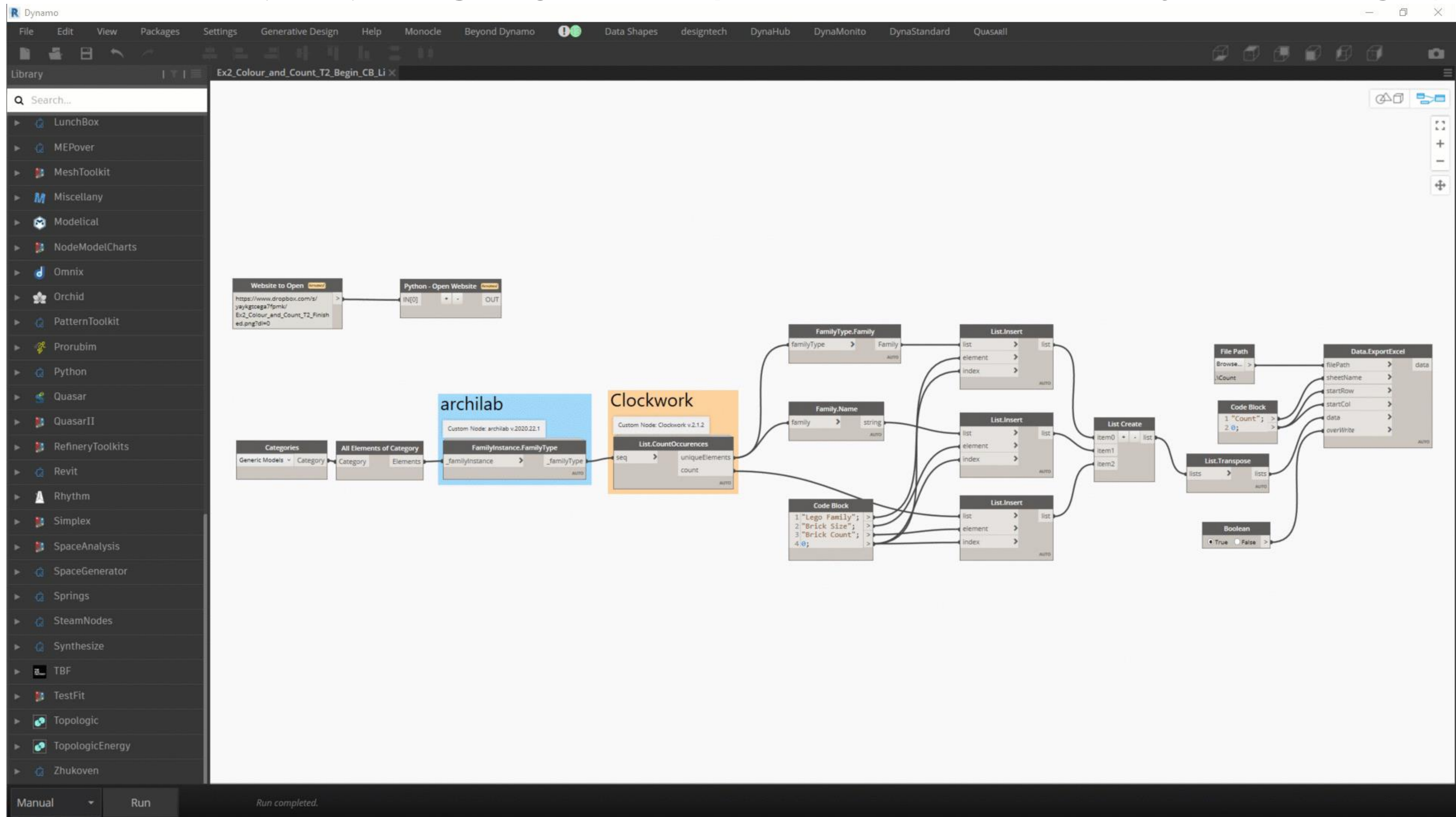
Links in Code Blocks

You can **store links** (url's) **inside Code Blocks**, then access them using CTRL + Click



Links with Python

You can **store links** (url's) using a **Python script** too, then access when you run the graph





[Dana De Filippi](#)

There are differing numbers of categories in differing version of Revit

This can cause issues when using the **Categories** node in graphs from version to version

Autodesk Revit 2018.3 - Project1 - Sheet: - - PROJECT BULLET

Help ! 6

LS_Tag Fire-Smoke Walls.dyn*

SELECT WALLS

Categories	All Elements of Category
Windows - Frame/Mullion	Category Elements

Get Categories

Names	Categories	Clean Name	Ids

List.Count

list	count
	292

Autodesk Revit 2019 - Project1 - Sheet: - - PROJECT BULLETIN BOA

Help Rapid re ! 5

LS_Tag Fire-Smoke Walls.dyn*

SELECT WALLS

Categories	All Elements of Category
Walls	Category Elements

Get Categories

Names	Categories	Clean Name	Ids

List.Count

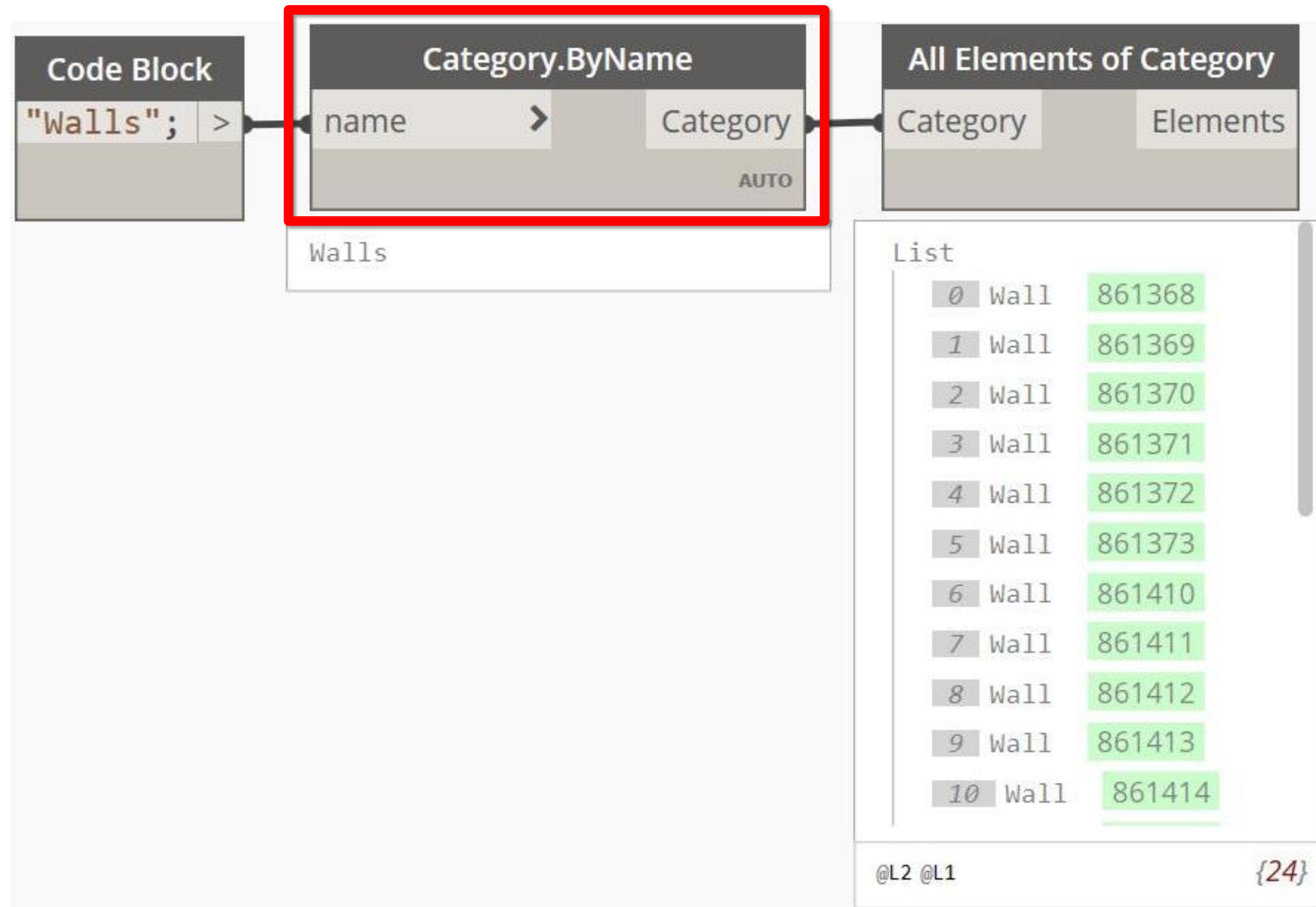
list	count
	302



[Dana De Filippi](#)

Category.ByName

If a category is **hardwired** in the graph, using a "[category.by.name](#)" node rather than the **Categories** drop down node this will not be an issue.





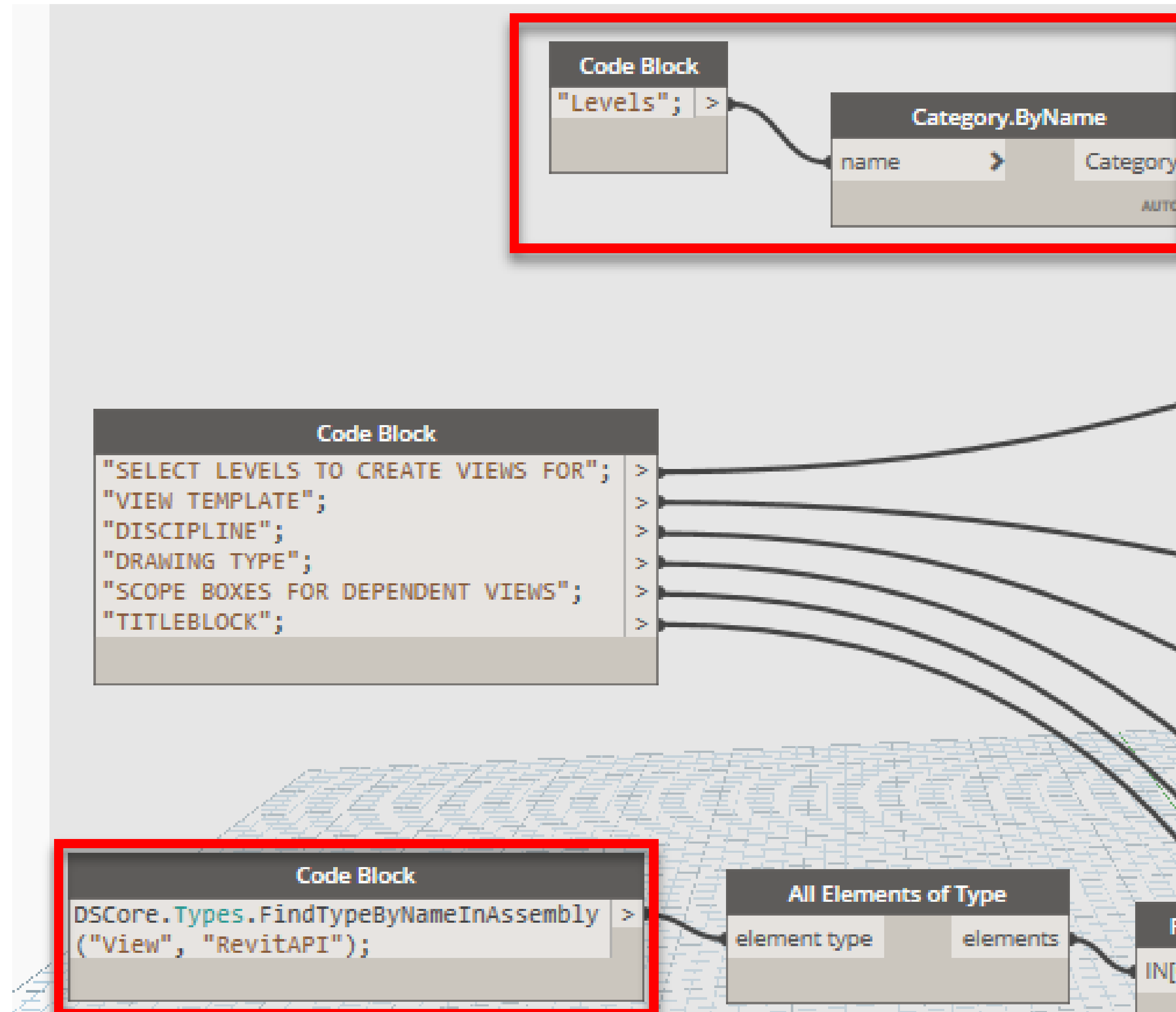
[Jason Boehning](#)

Category.ByName & Code Block

Jason said he learned this from John. He doesn't ever send a client a script with a drop-down. I use the **Category.ByName** node for categories and a **Code Block** for element types and family types.



[John Pierson](#)

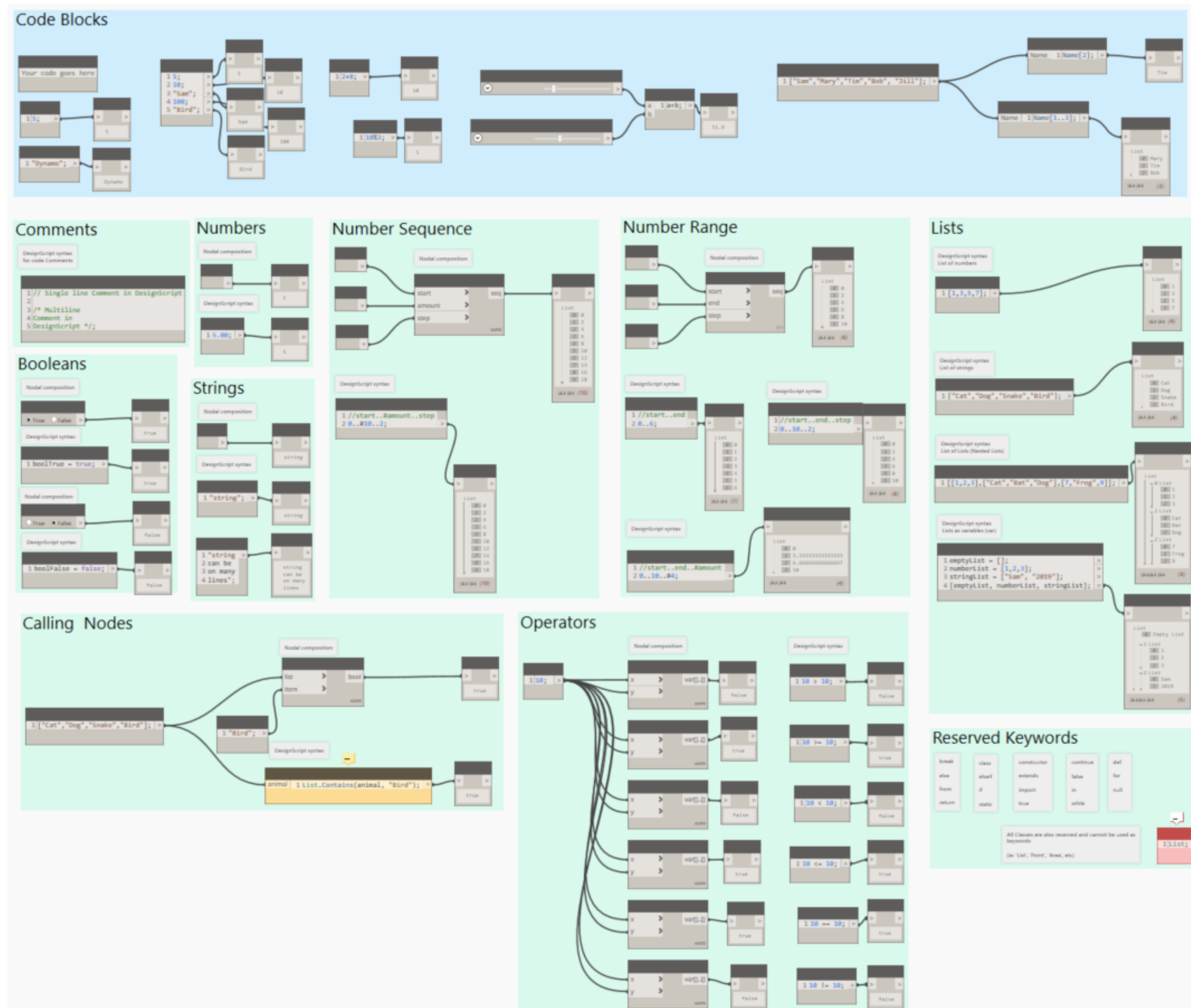




[Lisa-Marie Mueller](#)

Library Canvas

If you find yourself using **certain groupings of nodes together frequently**, keep a "**library canvas**" with those **groups saved for easy reference**.



Yes you can Copy from one graph close it then paste the nodes into a new graph



Sol Amour

Dynamo Resources

You can control **3 of the 6** things when it comes to lower resource usage in Dynamo, and subsequently improve the graph execution time. Those are **Node Execution, Tessellation and Rendering**.

1. UI Load up

2. Node execution

How long each
node takes to
run

3. Tessellation

Breaking
surfaces into
polygons

4. Rendering

Drawing in the
background
preview

5. Marshaling

6. Compilation



[Sol Amour](#)

Dynamo Resources

You can control **3 of the 6** things when it comes to lower resource usage in Dynamo, and subsequently improve the graph execution time. Those are **Node Execution, Tessellation and Rendering**.

Rendering:

- Will be faster if you change Precision settings
- Will be faster if you turn off Preview Bubbles
- Will be faster if you turn off Node Preview
- Will be faster if you Freeze off bits of your graph that don't need to be ran



[Sol Amour](#)

Dynamo Resources

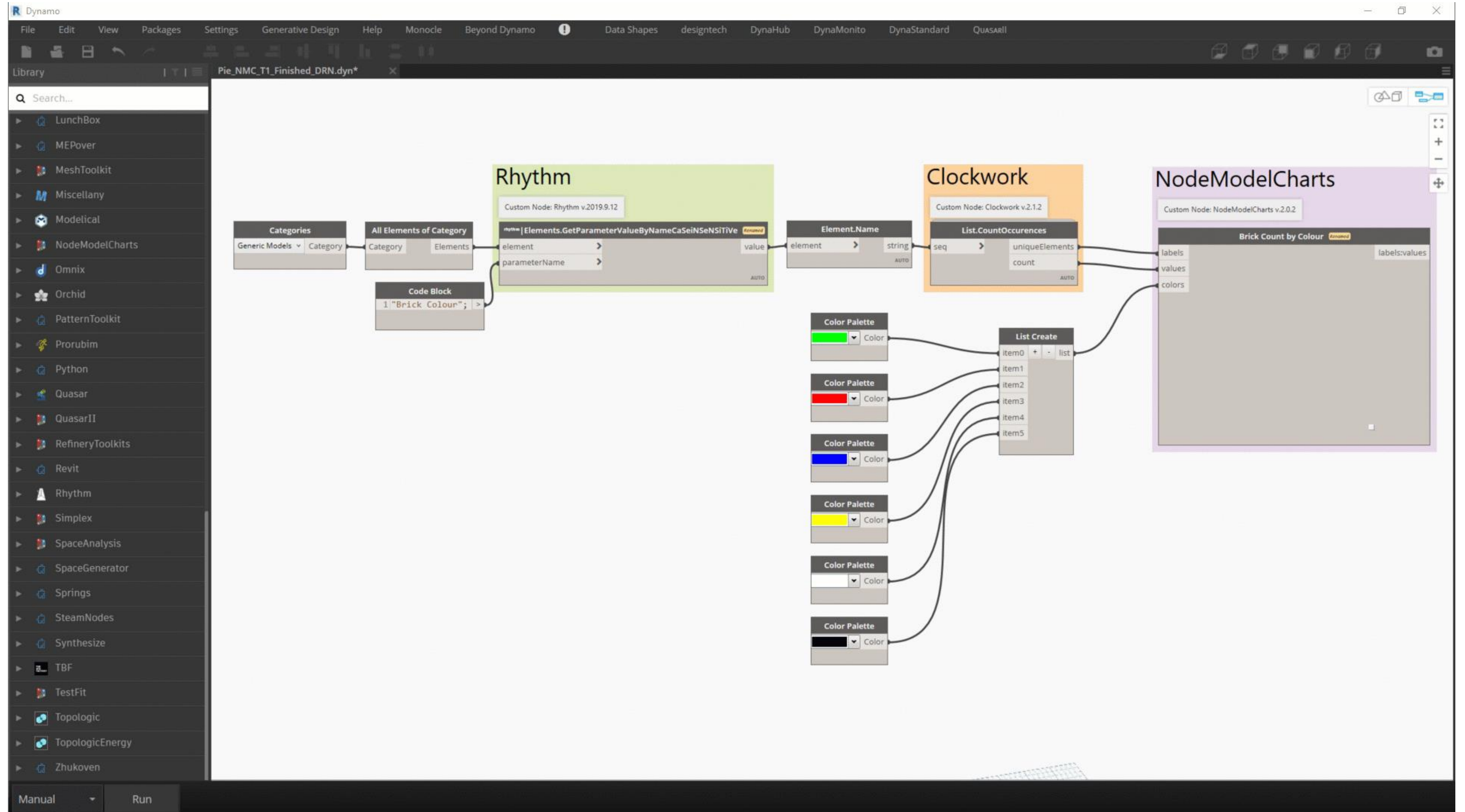
You can control **3 of the 6** things when it comes to lower resource usage in Dynamo, and subsequently improve the graph execution time. Those are **Node Execution, Tessellation and Rendering**.

Performance:

- Revit + Civil 3d = Single Threaded, Sandbox = Multi-threaded (i.e. you can still use the UI when you are executing something)
- Don't tessellate if you don't need to
- Avoid heavy cost geometry operations if you don't need them (Math is fastest!)



Use **Data.Remember** nodes to move Revit data out into **Sandbox** files for playing.

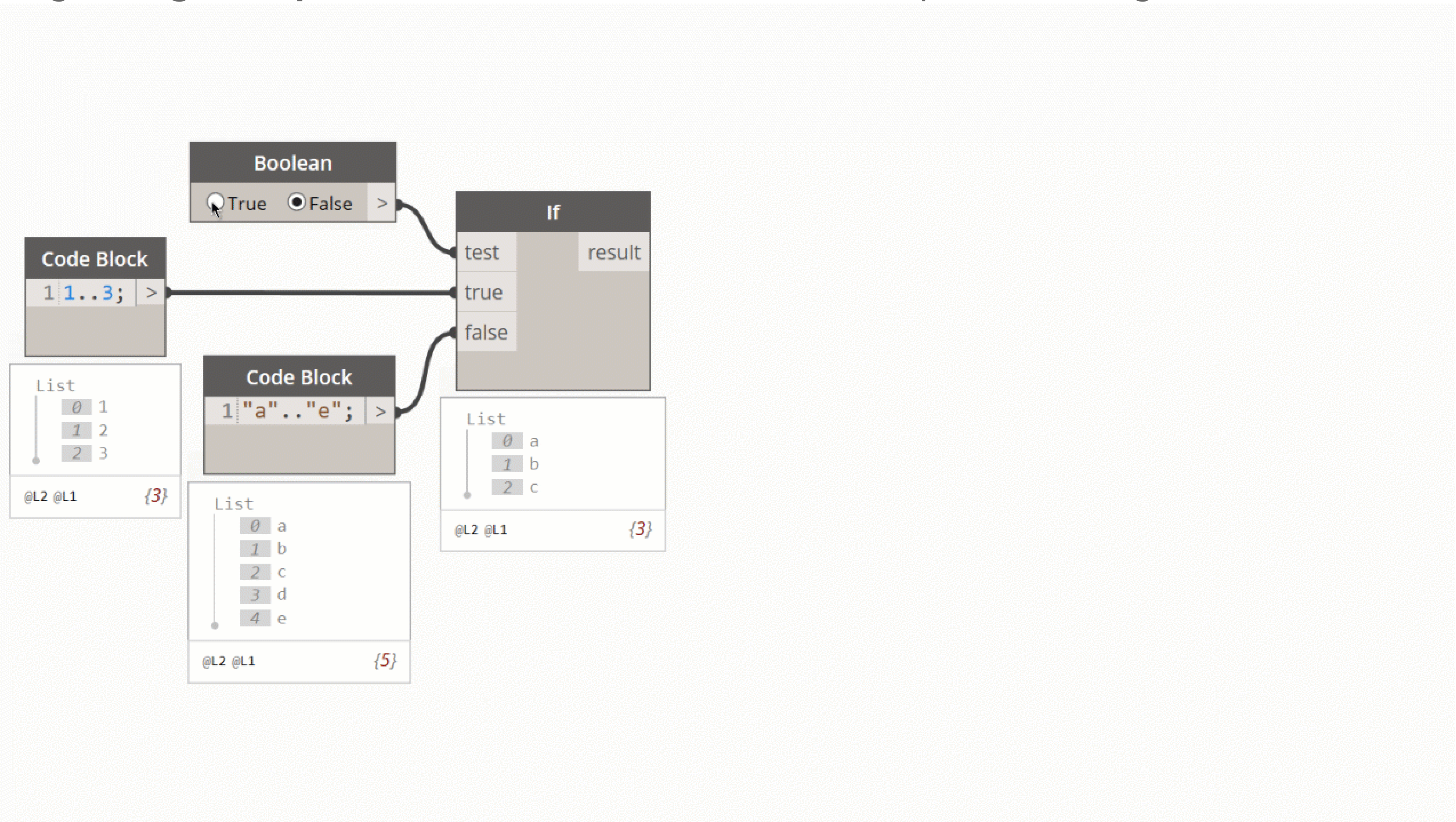




[Sean Fruin](#)

If Statement Hack

The **native If statement** node has **odd behavior** which lead to this trick. The trick is using **DesignScript** in a **Code Block** and some simple indexing.





[Marcello Sgambelluri](#)

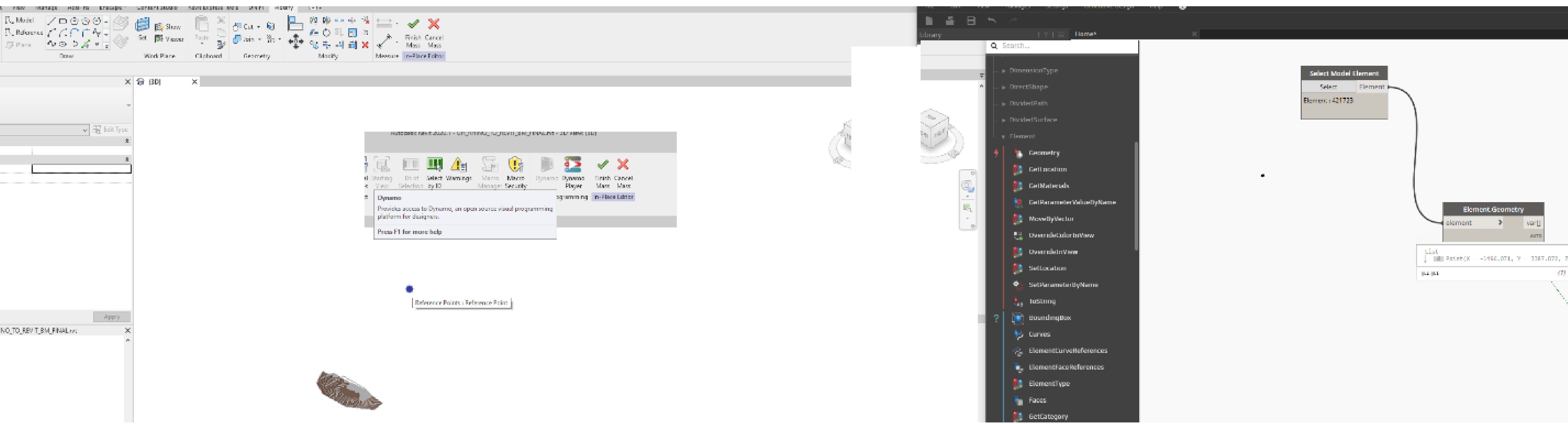
Dynamo Hack for In-Place Families

Using Dynamo for in-place families **IS possible** even though the Revit API does not allow it (or not easily).

You open an in-place family and launch Dynamo, then select or do whatever, then close the family editor. Then edit the in-place family and you will see that Dynamo will now interact with the in-place family.



[Adam Sheather](#)





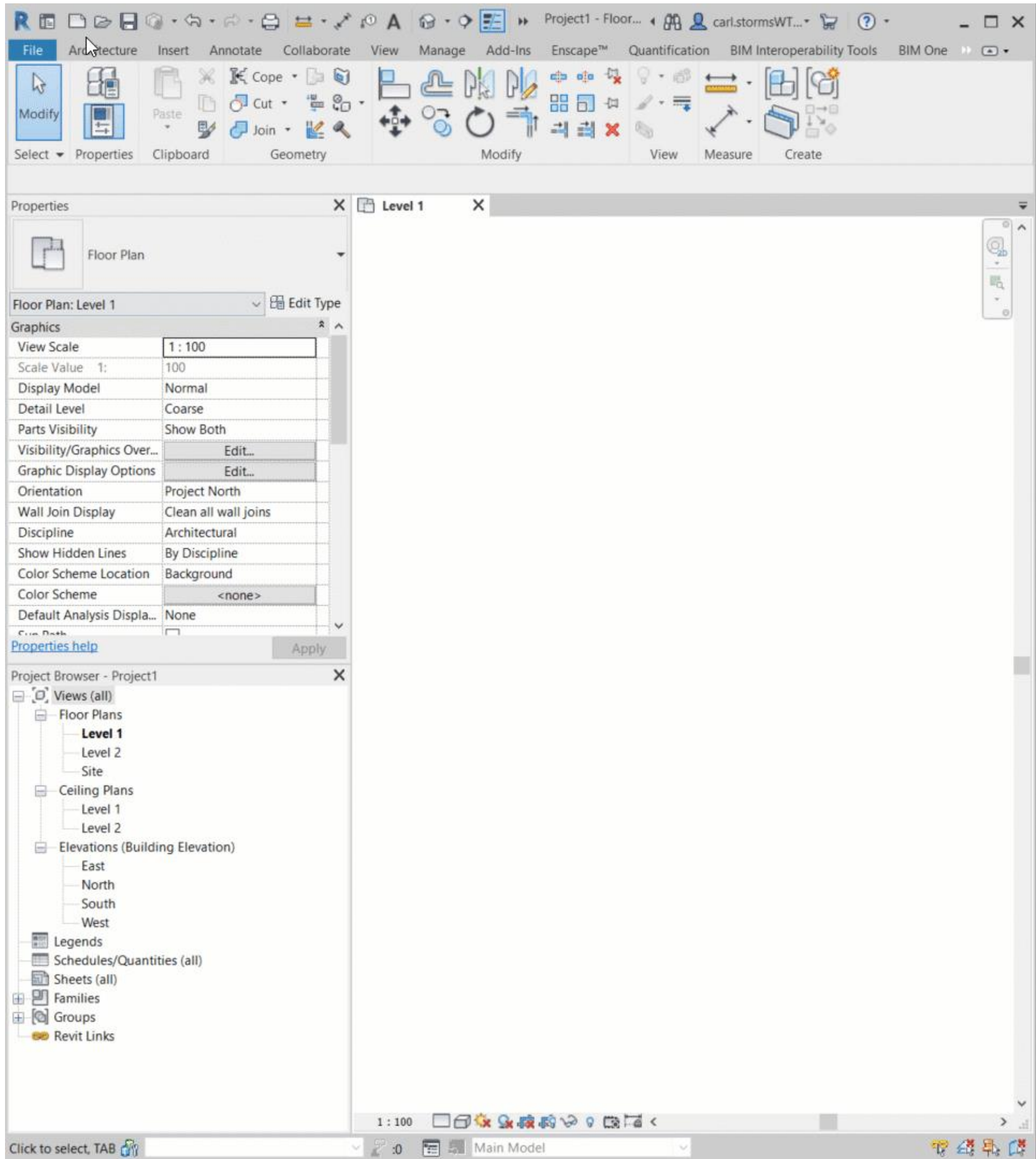
[Marcello Sgambelluri](#)

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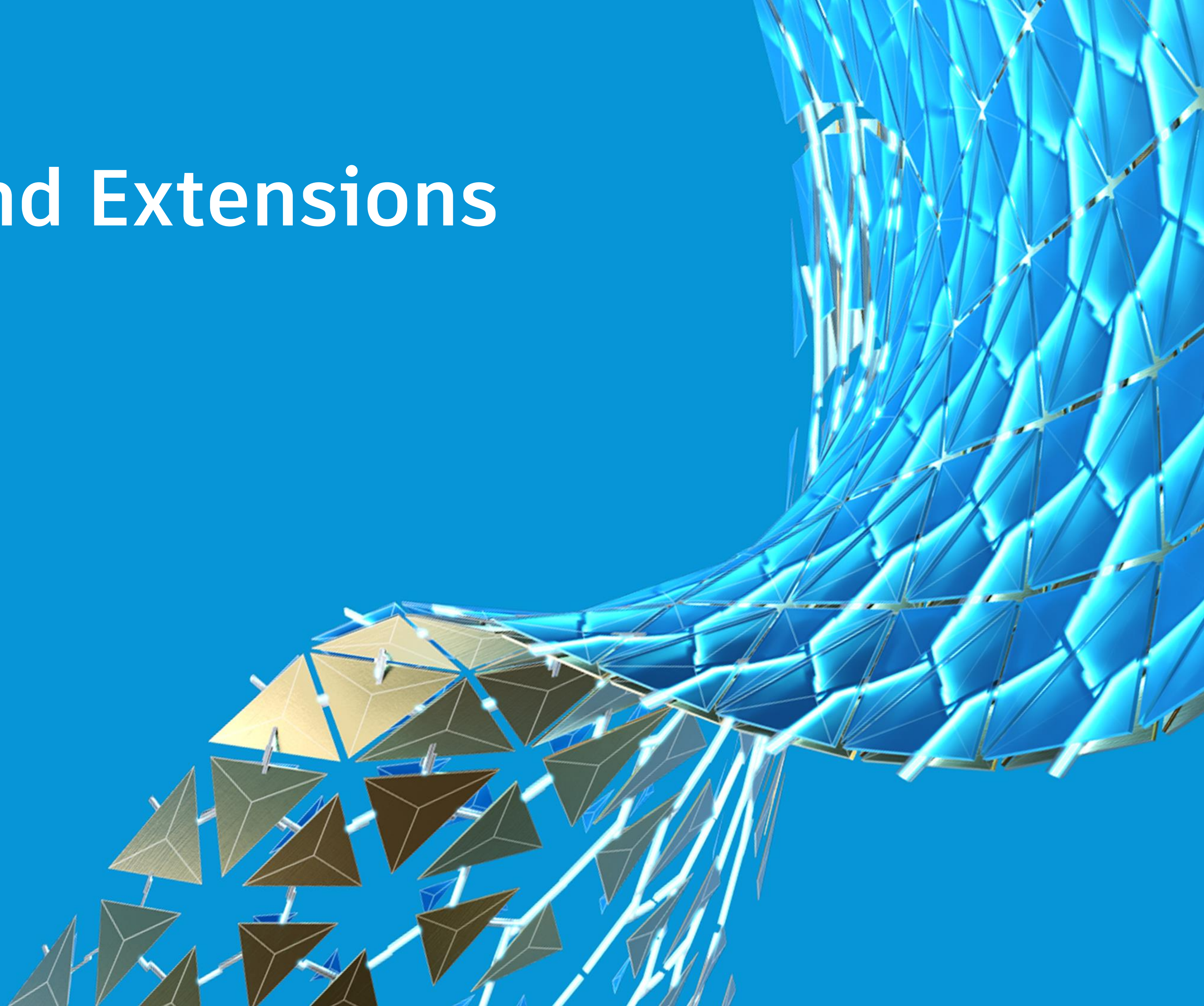


Whoops

Never assume that just because a graph works for you it will always work for someone else



Packages and Extensions




Essential Packages

Everyone has **their own list**, but you **can't go wrong** with the “**Most Installed**”.

Browse

Search



Dynamo Package Manager

Share and discover workflows for Dynamo visual programming

2686827

1483

896

INSTALLS

PACKAGES

AUTHORS

Packages

Newest

Most Recently Updated

Most Installed

Most Depended Upon

Custom1	2 weeks ago	Synthesize toolkit	4 hours ago	archi-lab.net	266728	Clockwork for Dynamo 1.x	119
QuasarII	2 weeks ago	AMR Sheet Set Manager	2 days ago	LunchBox for Dynamo	248060	archi-lab.net	119
LG_CustomNodes	3 weeks ago	Civil3DToolkit	3 days ago	spring nodes	166135	LunchBox for Dynamo	72
Dynamoid	3 weeks ago	dronovBIM	5 days ago	Clockwork for Dynamo 1.x	146560	Rhythm	58
Civil 3D	3 weeks ago	PFDYN	6 days ago	Rhythm	146115	spring nodes	55
NTD	3 weeks ago	DynaMEP	1 weeks ago	SteamNodes	101548	Clockwork for Dynamo 2.x	48
ladybug-fixer	3 weeks ago	Custom1	2 weeks ago	Clockwork for Dynamo 2.x	92151	SteamNodes	38
aaaaaaaaaaaaa	3 weeks ago	Structural Analysis for Dy...	2 weeks ago	bimorphNodes	77865	MEPOver	32

Essential Packages

Of course, I have **my own list** of “Essential” packages, here are **my 5 must haves!**

Package	Author	Current Version*
archi-lab.net	Konrad Sobon (https://archi-lab.net/)	2021.25.18
Clockwork for Dynamo 2.x	Andreas Dieckmann (https://www.badmonkeys.net/)	2.3.0
Data-shapes	Mostafa El Ayoubi (https://data-shapes.io/)	2021.2.91
Monocle	John Pierson (https://sixtysecondrevit.com/)	2020.10.1
Rhythm	John Pierson (https://sixtysecondrevit.com/)	2020.9.8

*As of Oct. 13th, 2020

Essential Packages

If I could only have one package or extension it would be Monocle hands down!

Monocle

The screenshot displays the Dynamo software interface with the Monocle package menu open. The menu lists the following features:

- ✓ simple search
- ✓ in-canvas alignment widget
- Alignifier3000
- sticky note
- custom colored grouping
- package usage doge
- ✓ custom node differentiator™
- clippy for dynamo

The background shows a Dynamo graph with nodes like 'Element.Name', 'List.CountOccurrences', and 'uniqueElements'. Several tool windows are overlaid:

- Monocle v.2020.7.7.0**: A window with the Monocle logo and a photo of a man and a woman. It includes the text "Monocle for Dynamo - 'Turn Dynamo up to 11'" and "Icons Credit: NounProject.com".
- Simple Search**: A window with a search bar containing "Room A" and a table of results.
- Custom Grouping**: A window with a table for custom grouping.
- Alignifier3000**: A window with a grid of alignment icons.
- Packages In Use**: A window listing installed packages.
- Send Package Usage to Clipboard**: A button to export package usage.
- Annotate Custom Nodes (add note)**: A button to add notes to custom nodes.
- Clear Custom Node Notes**: A button to clear notes from custom nodes.

Node Name	Node Full Name
RoomAtPoint	MEPover.Revit.RoomsAndSpac
GetRoomAtPoint	archilab.Revit.Select
AL.Room.AtPoint	Synthesize.Packages.Archi-lab_
Room.AtPointInPhase	Clockwork.Revit.Selection.Misc

title	color	group selection
Background		
Input		
Control		
To Revit		
Annotation		
Info		

Packages In Use:

- Clockwork
- Rhythm
- Archi-lab_Mandrill

Monocle's a Rad Dynamo Bolt-on!

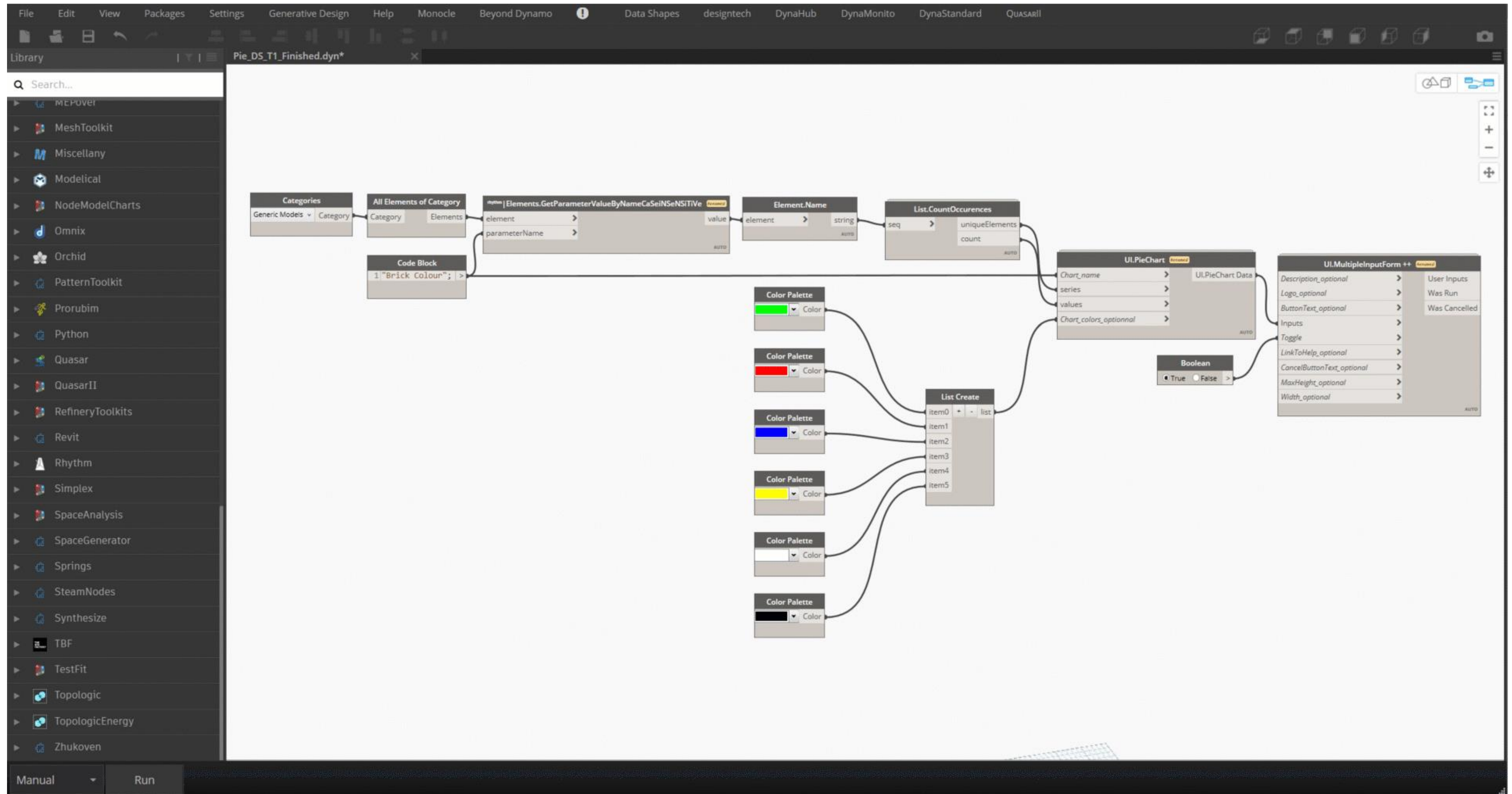
wow
much automation
many nodes
such efficiency
productivity increase
such custom



[Lisa-Marie Mueller](#)

Monocle to the Rescue

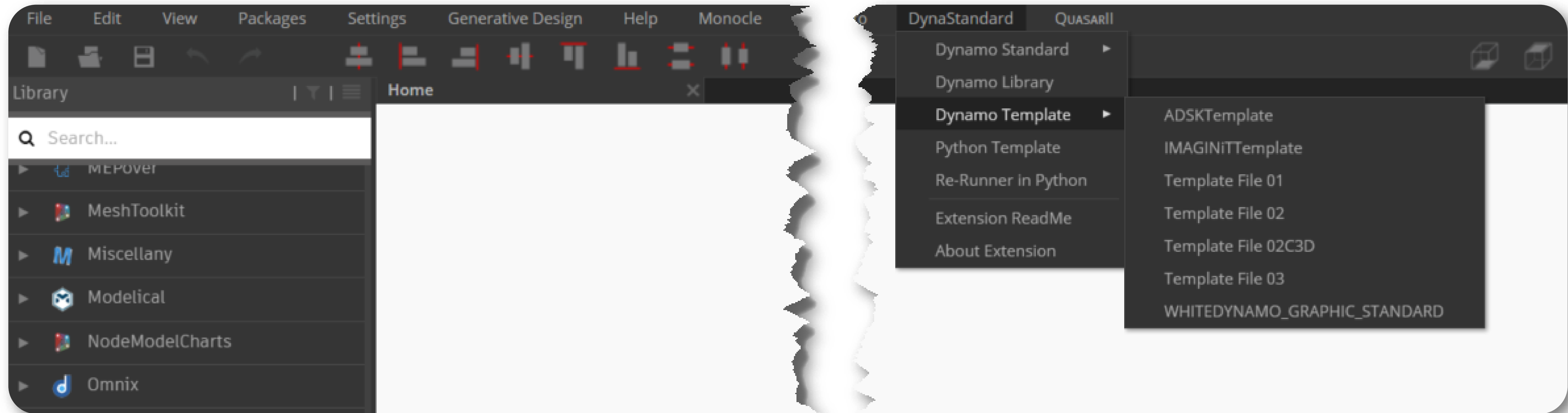
Determine a standard for annotating graphs with group colors and names. You can utilize the Monocle extension to quickly annotate and clean up your graphs.



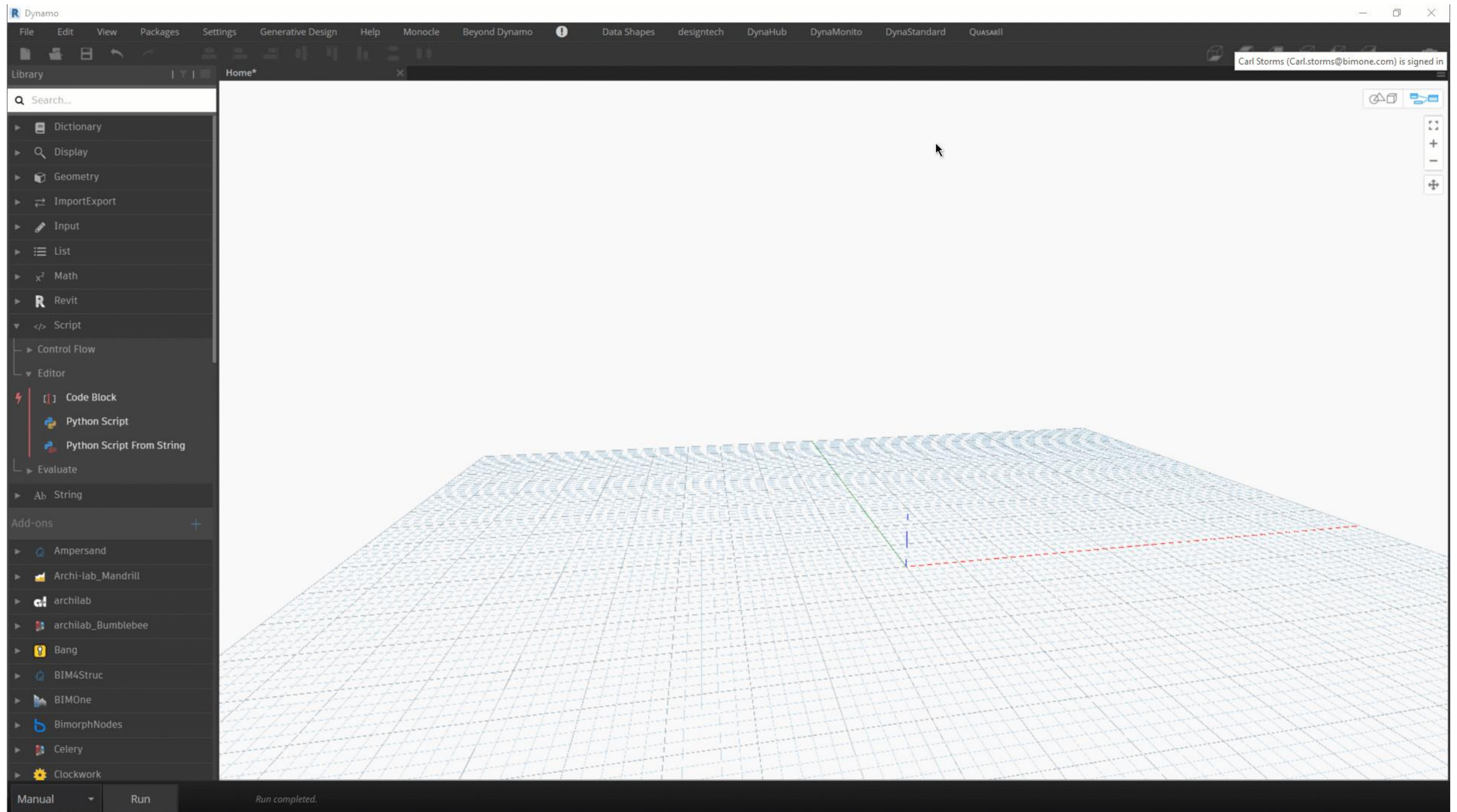
DynaStandard

Not all packages can be in the “Top 5” or must have “Essential Packages”, but I’m finding more and more that I’m also always using and **telling people about the DynaStandard extension!**

DynaStandard is a **content library** extension that can help a select a few or a company to **distribute scripts, access templates (dynamo or python)** and allow for **easy access to dynamo standards documentation**.



DynaStandard



26 Packages You Should Check Out

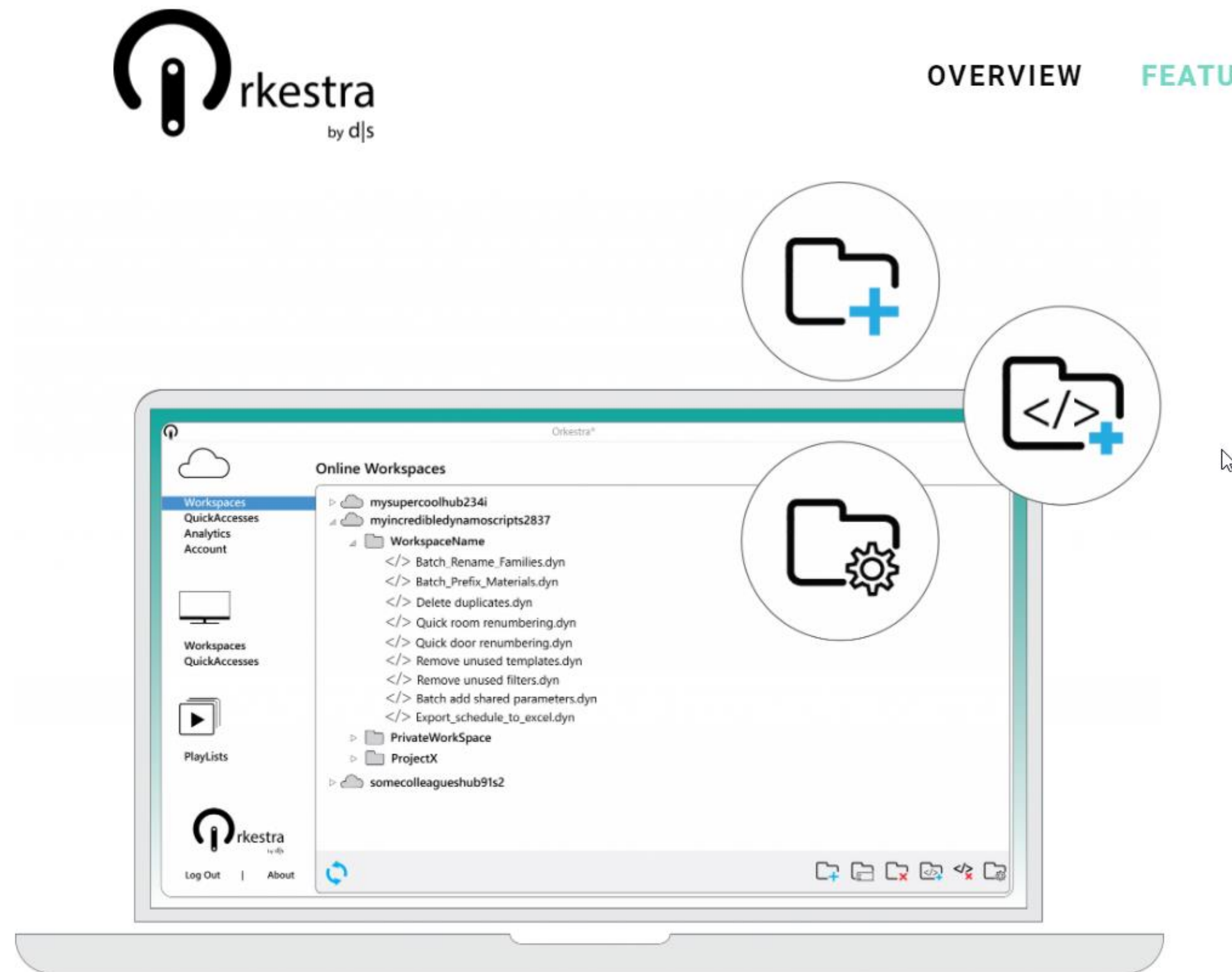
Number	Name	Version *
0	Ampersand	2019.12.31
1	archi-lab.net	2021.25.18
2	Archi-lab_Mandrill	2020.2.1
3	Bang!	2020.5.7
4	BIM4Struc.Productivity	2.2.2
5	bimorphNodes	3.0.3
6	BumbleBee	2021.25.3
7	Civil3DToolkit	1.1.13
8	Clockwork for Dynamo 2.x	2.3.0
9	Data-Shapes	2021.2.91
10	DynaMEP	1.2.5
11	DynaMonito	2.1.1
12	DynaStandard	1.1.0

Number	Name	Version *
13	Genius Loci	2020.9.28
14	MEPover	2020.6.2
15	Monocle	2020.10.1
16	NodeModelCharts	2.0.2
17	Orchid	7584
18	Pattern Toolkit	0.0.5
19	Rhythm	2020.9.8
20	Simplex	2020.2.19
21	spring nodes	203.2.0
22	SteamNodes	1.2.4
23	Topologic	1.4.0
24	TuneUp	1.0.7
25	Warnamo	0.1.3

*As of October 13th, 2020

Orkestra

From the folks that brought us [DataShapes](#) Orkestra is a platform to **create, deploy & scale** Dynamo scripts like never before.



Deployment made easy

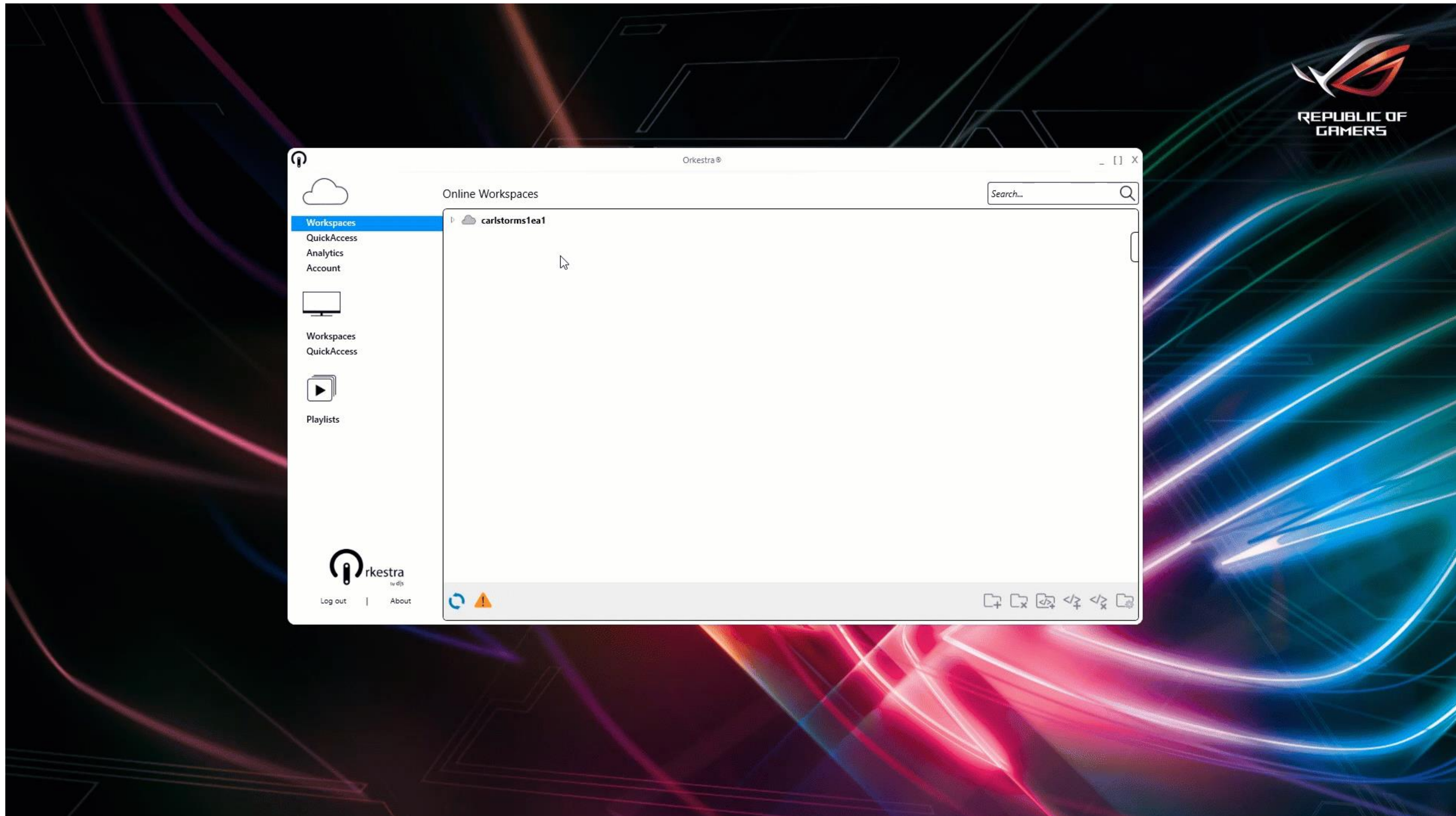
Easily deploy any Dynamo script through Orkestra's cloud based platform.

Ensure that everyone has the right packages and script version at each run!

[Source](#)

Orkestra

From the folks that brought us [DataShapes](#) Orkestra is a platform to **create, deploy & scale** Dynamo scripts like never before.



bimbeats

Use **bimbeats** to find out what custom packages are used, and their most used nodes

USERS

Who is Bimbeats for?

Bimbeats accesses the proprietary data in Architecture, Engineering and Construction Applications. It supports desktop and cloud CAD/BIM/CDE solutions, and allows organizations real-time insight & analytics to better understand their Technical Users, IT, Training needs, Project software usage and requirements.



Executive Managers

Look at your organisations total digital footprint, software usage, total hours spent on softwares, which IT investments are being used the most by staff.



Project Managers

Review work completed on projects in real time, measure progress and track efficiency improvements with investment.



IT Managers

Review AEC software tools strain on hardware, monitor crashes, performance across all hardware, security and usage issues relating to CAD/BIM software.



BIM Managers

Use metric to check training adoption, software efficiency, 3rd party software use and what tools are being used on specific projects. Be alerted to digital project health across all CAD/BIM tools and demonstrate efficiency and best practice gains.



Developers

Understand the impact and uptake/usage of all your dynamo/grasshopper scripts. Track performance, script sizes which projects they are being deployed on and who is creating scripts.



Users

Understand your software usage patterns and identify potential improvement areas. Find experts and resources in those areas. See what kind of tools others across the company are using, what kind of scripts they are running on projects.

bimbeats

Use bimbeats to find out what custom packages are used, and their most used nodes

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Use bimbeats to find out what custom packages are used, and their most used nodes

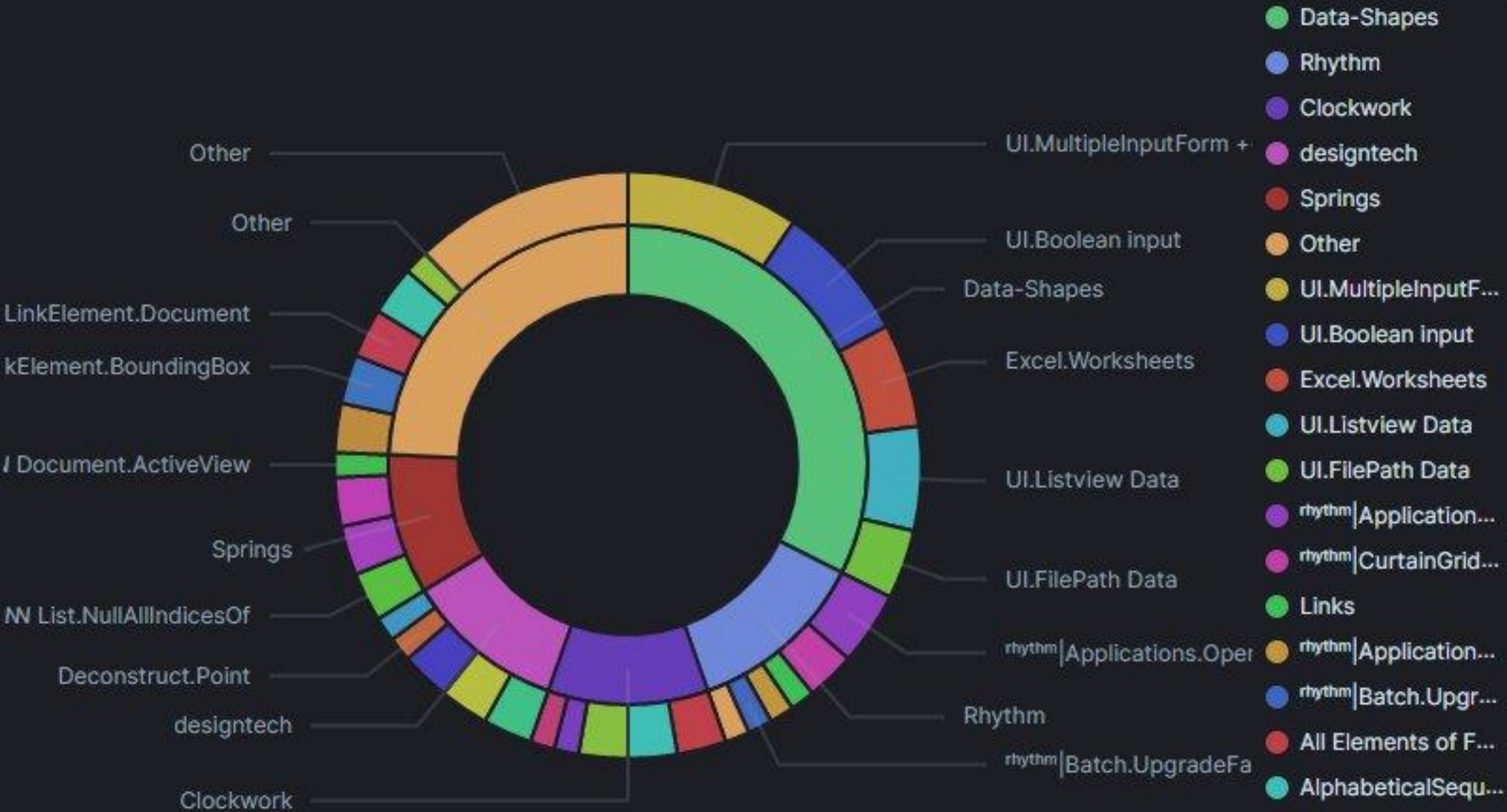


Understanding 3rd party Package usage throughout the company can lead to significant time/money savings. Each package that is being loaded when Revit/Dynamo is started, adds additional time to the "load time", as well as slows down things like "in Dynamo" searches and navigational menu. It is highly likely that more options - more nodes with similar names - do not lead to higher productivity, but rather to more confusion and lower productivity.

Custom Dynamo Package in Use ⓘ

Package ↑	Count
Data-Shapes	24
Clockwork	8
Springs	7
Ampersand	2
archilab	2
archilab_Bumblebee	2
LunchBox	1

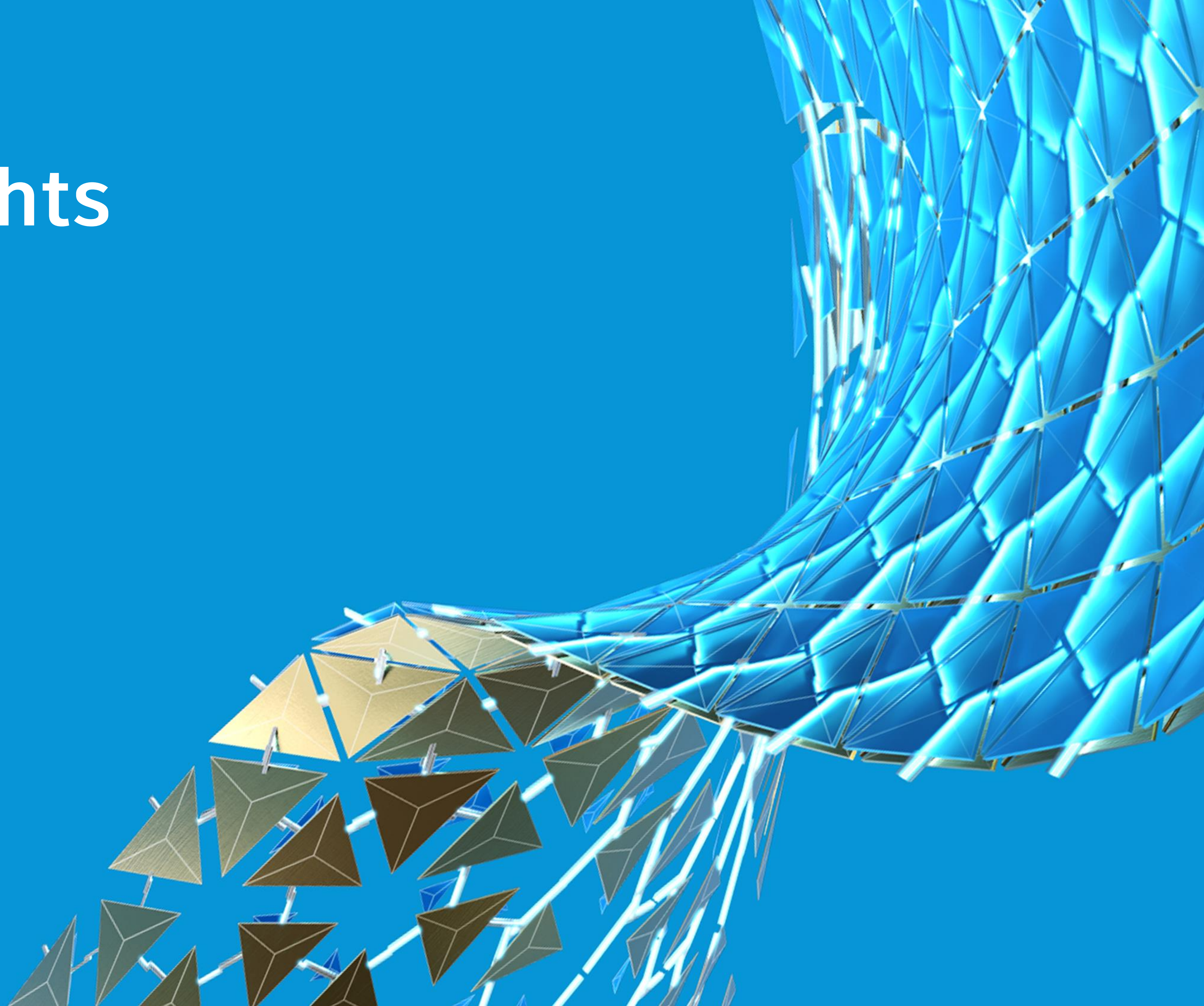
Custom Dynamo Packages in Use ⓘ



Custom Dynamo Nodes in Use ⓘ

Package ↑	Count
UI.MultipleInputForm ++	5
UI.Boolean input	4
Excel.Worksheets	3
UI.Listview Data	3
All Elements of Family Type+	2
AlphabeticalSequence.ByNumber	2
Clear List	2
ElementType.ByName	2
UI.FilePath Data	2
UI.RadioButton Data	2
UI.SelectModelElements Data	2
UI.TextNote Data	2
UI.Listview Data	2

Final Thoughts



The Steps

Steps to create a **Dynamo Graph** as a **solution** to **YOUR** problem

Step 1 = The Problem

Step 2 = Solve the problem

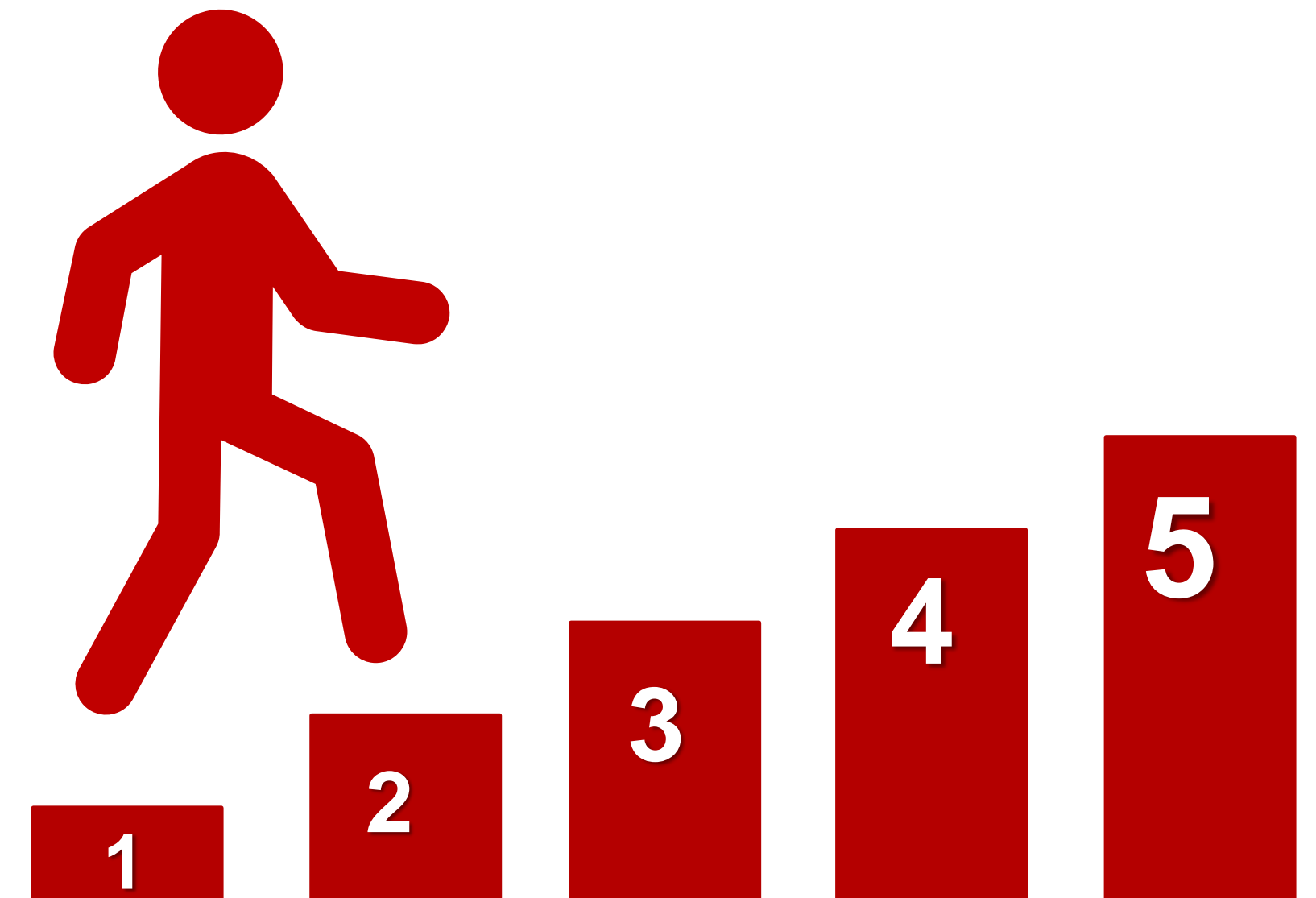
Step 2a = Research (google/forum) if you don't know how to solve the problem

Step 3 = Create the graph

Step 4 = Test the Graph

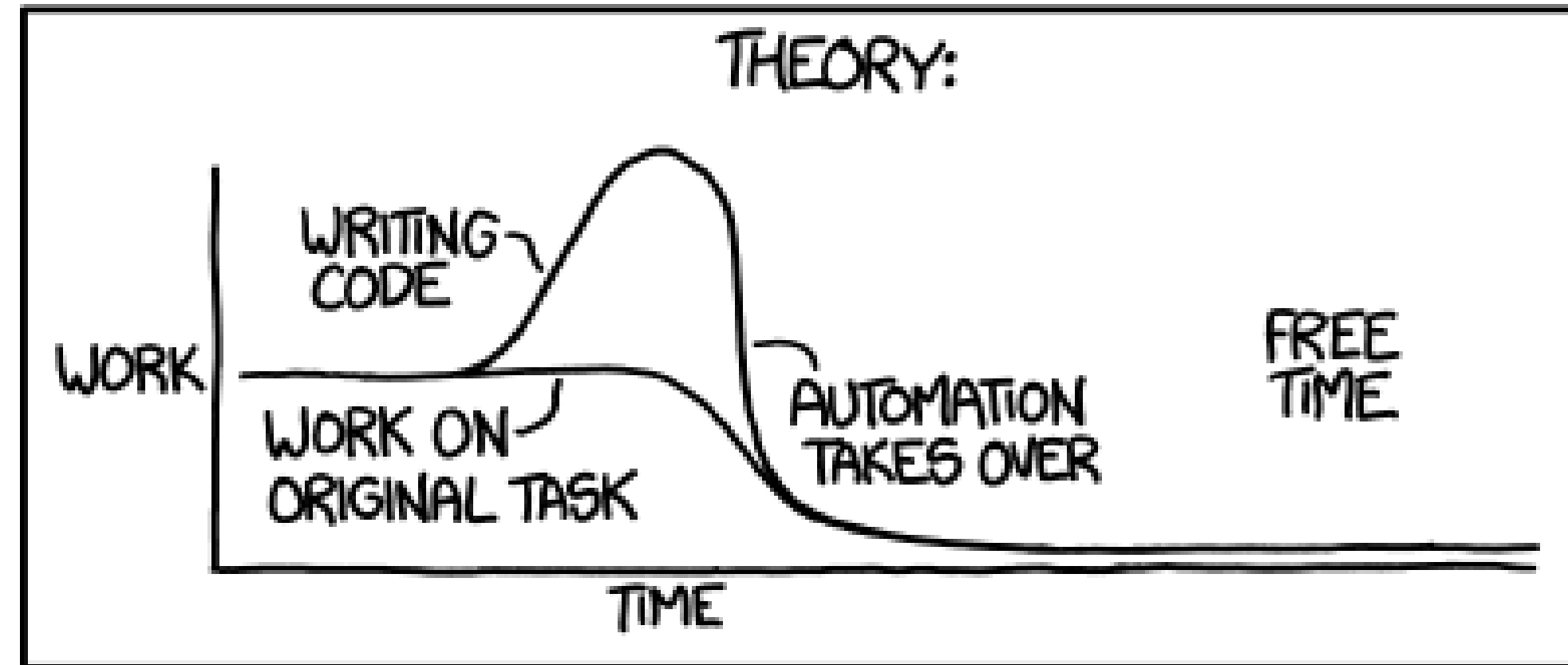
Step 5 = Working Solution Graph!

Step 5a = repeat steps 1 – 4 until a solution is reached



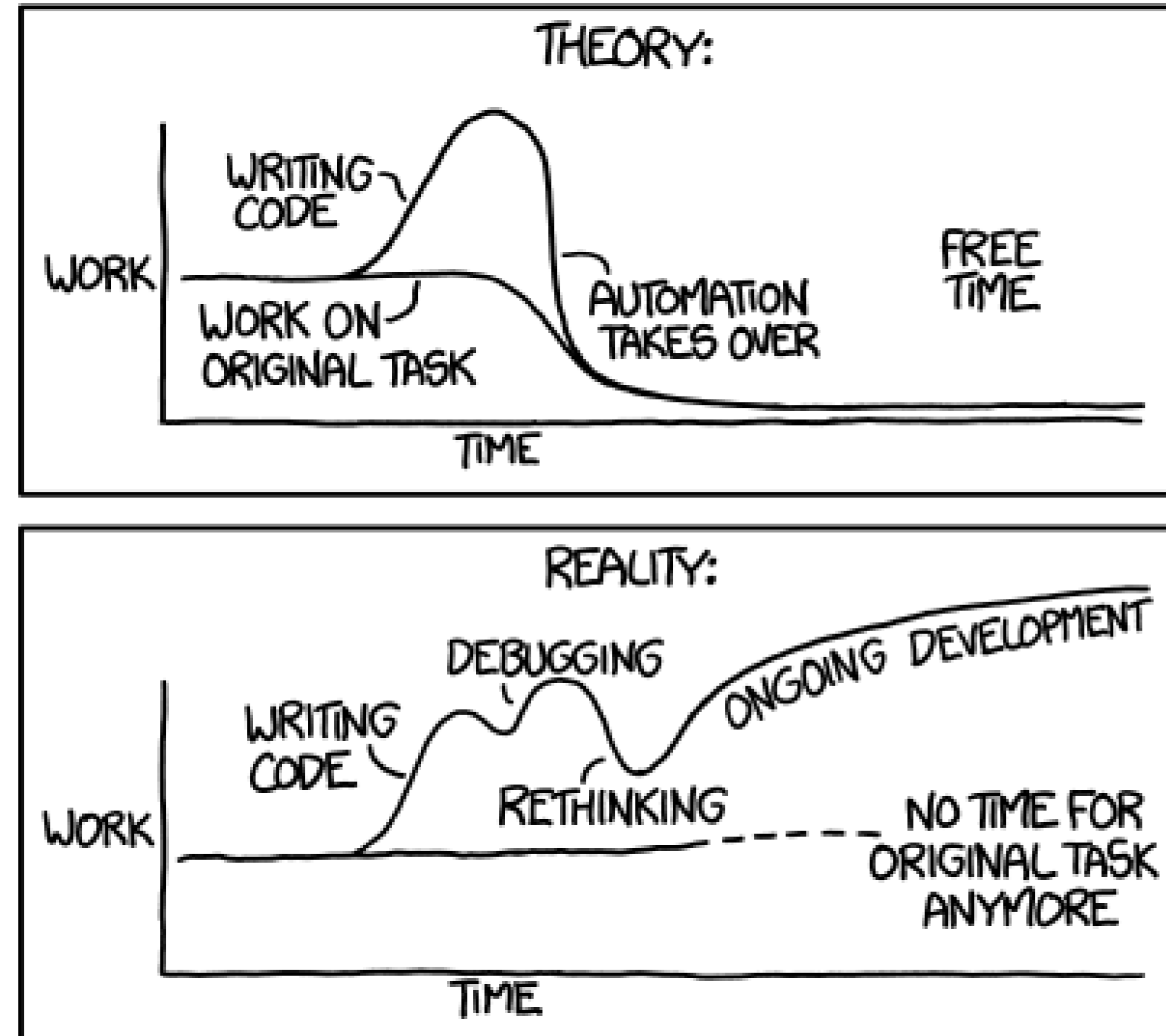
Beware of Reality

"I SPEND A LOT OF TIME ON THIS TASK.
I SHOULD WRITE A PROGRAM AUTOMATING IT!"



Beware of Reality

"I SPEND A LOT OF TIME ON THIS TASK.
I SHOULD WRITE A PROGRAM AUTOMATING IT!"



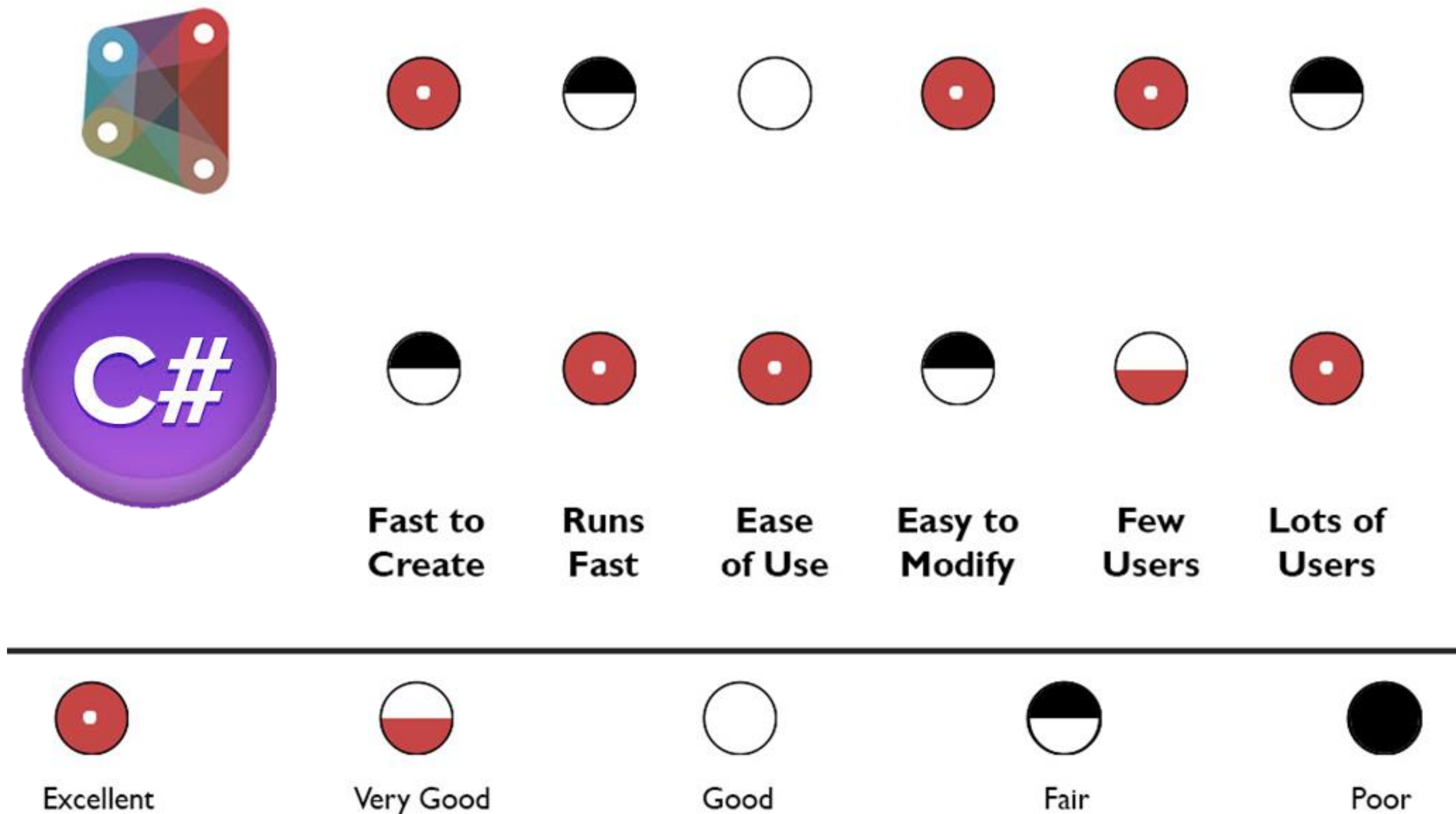
Is it Worth it?

HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?
(ACROSS FIVE YEARS)

		HOW OFTEN YOU DO THE TASK					
		50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
HOW MUCH TIME YOU SHAVE OFF	1 SECOND	<div><div>1</div></div> DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
	5 SECONDS	<div><div>5</div></div> DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
	30 SECONDS	<div><div></div><div></div><div></div><div></div><div></div></div> 4 WEEKS	<div><div>3</div></div> DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
	1 MINUTE	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 8 WEEKS	<div><div>6</div></div> DAYS	<div><div>1</div></div> DAY	4 HOURS	1 HOUR	5 MINUTES
	5 MINUTES	9 MONTHS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 4 WEEKS	<div><div>6</div></div> DAYS	21 HOURS	5 HOURS	25 MINUTES
	30 MINUTES		6 MONTHS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 5 WEEKS	<div><div>5</div></div> DAYS	<div><div>1</div></div> DAY	2 HOURS
	1 HOUR		10 MONTHS	2 MONTHS	<div><div>10</div></div> DAYS	<div><div>2</div></div> DAYS	5 HOURS
	6 HOURS				2 MONTHS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 2 WEEKS	<div><div>1</div></div> DAY
	<div><div>1</div></div> DAY					<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 8 WEEKS	<div><div>5</div></div> DAYS

Dynamo is Not Always the Answer

Dynamo is a great for **prototyping**, **quick fixes**, and **one-off solutions**. But if you find **you are using a graph a lot**, that might mean it's time to **transition** it into a **full-on add-in or program** using something like **C#**.





*Use this QR code
for all class content*



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Thanks for Watching



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carl.storms@bimtrack.co





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