

There Is an Easier Way to Do That: Lessons Learned in Three Years of Forge Dev

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About the speaker

Thiago Almeida

- Civil Engineer
- Software Engineer
- Several Autodesk Certifications
- CTO on Shedmate
- ADN Member



About the co-speaker

Raphael Rodrigues

- Full-stack Developer
- Desktop, Web and Mobile development
- Focus on Forge and Revit
- ADN Member

Intro



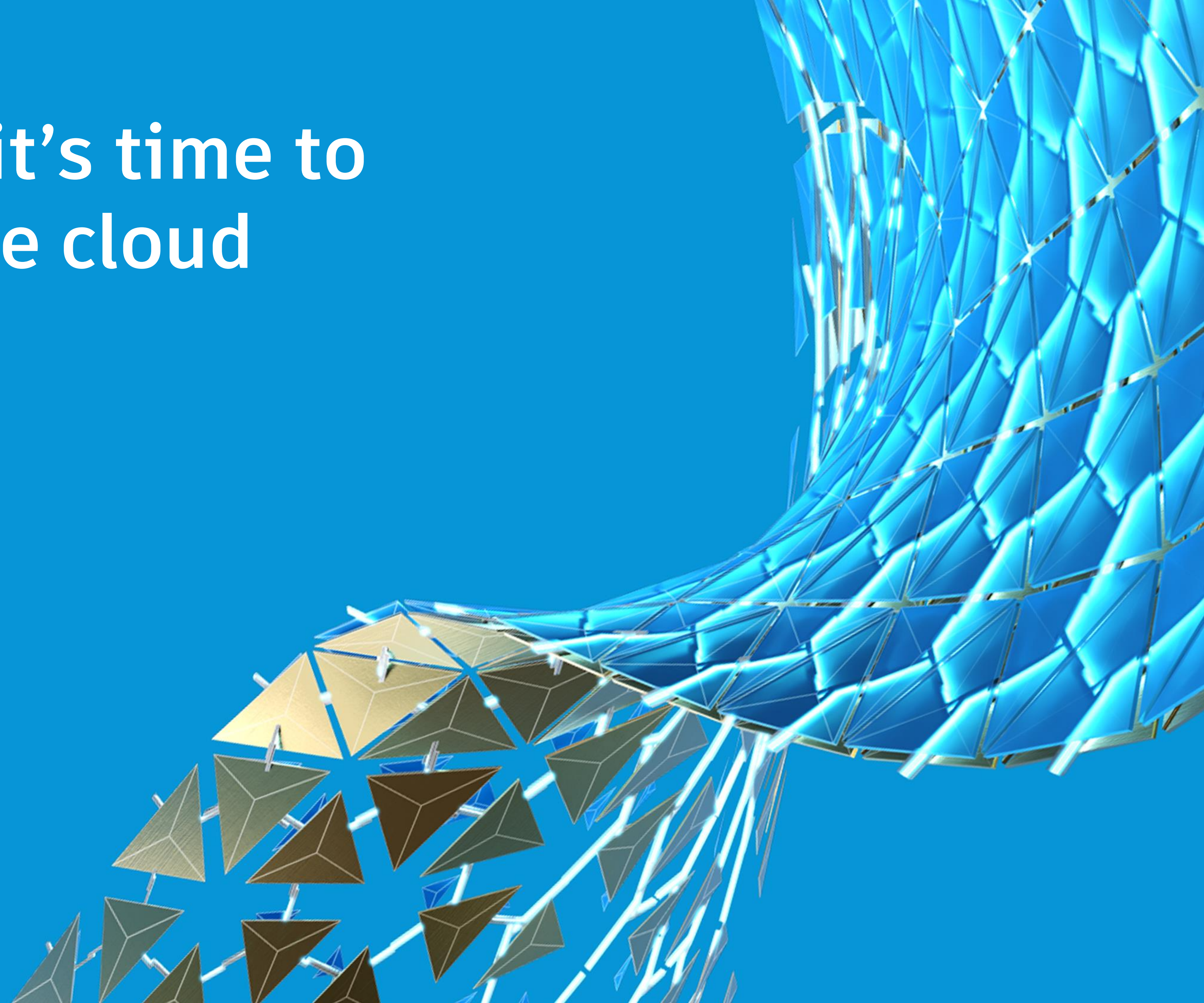
Check out our hands-on lab

**SD468797-L - The Cross-Platform Revit: Sharing
Code with Plug-Ins, Dynamo, and Forge**

Learn Objectives

- Learn how to create inclusive AECO solutions with collaboration in mind.
- Learn how to use your existing code base to power up the creation of cloud-based solutions.
- Learn how Forge can be used to deliver high-quality, feature-rich applications with less effort.
- Discover lessons learned from taking existing desktop applications to the cloud.

Know when it's time to
change to the cloud



Advantages of Cloud Applications

- Easy to use environment for the end users.
- Take advantage of mobile devices.
- Better data interaction and availability.
- Prebuilt infrastructure and maintenance.
- Controlled development environment.
- New business opportunities.
- Security.

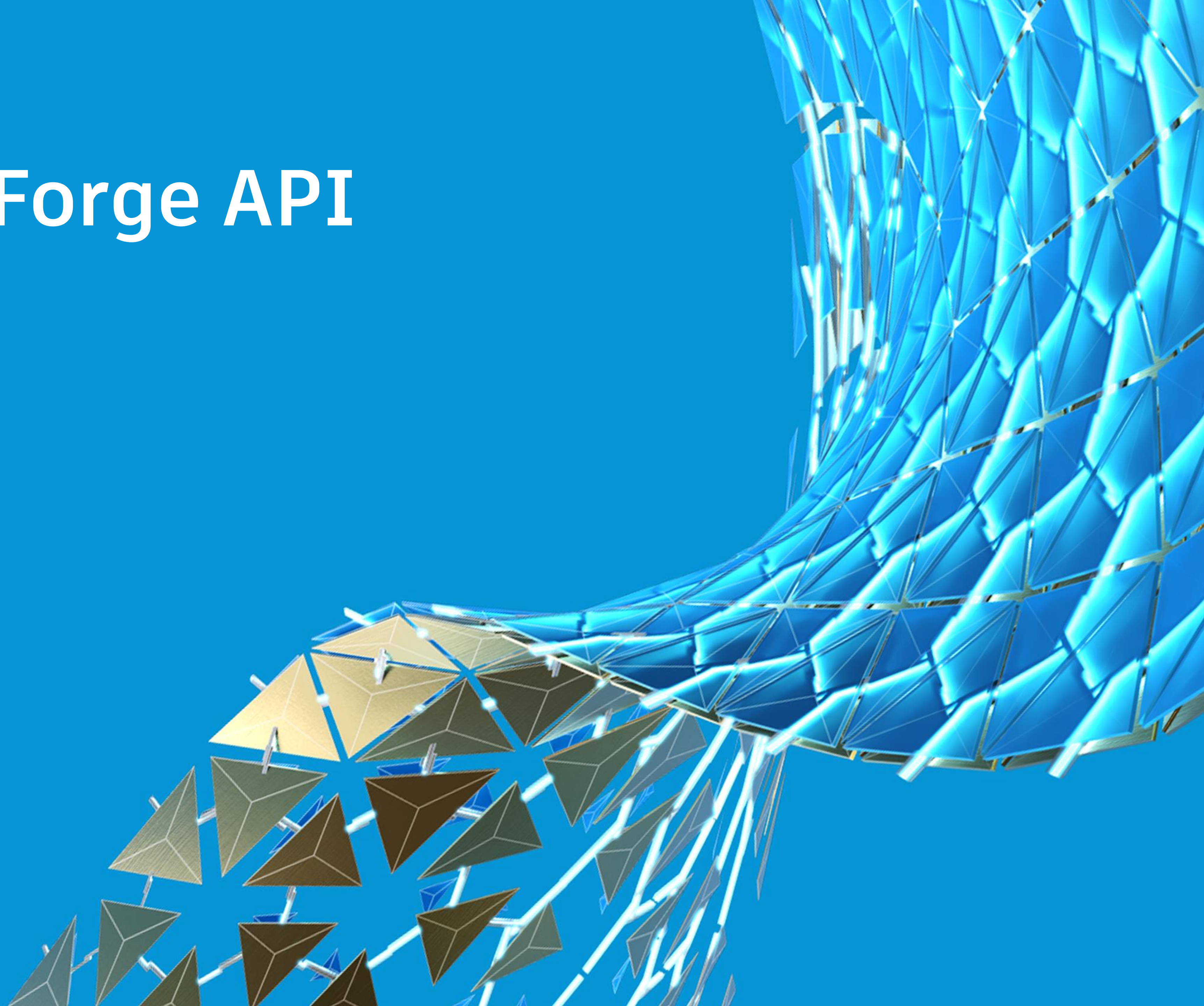
Disadvantages of Cloud Applications

- Security.
- Regulations.
- The change can be overwhelming.
- Investments to port existing applications.
- Latency and Internet Speeds.
- Needs a multi-disciplinary team.

Experience using Forge

- Great support.
- Small but growing community.
- Very well documented.
- Abundant training resources.
- You need to try things by yourself.

Tour of the Forge API



Authentication

The entrance door to Forge



Model Derivative API



Data Management API



Design Automation API



BIM 360 API

2 Legged Authentication

Communication happens between the Application and the Forge Servers.



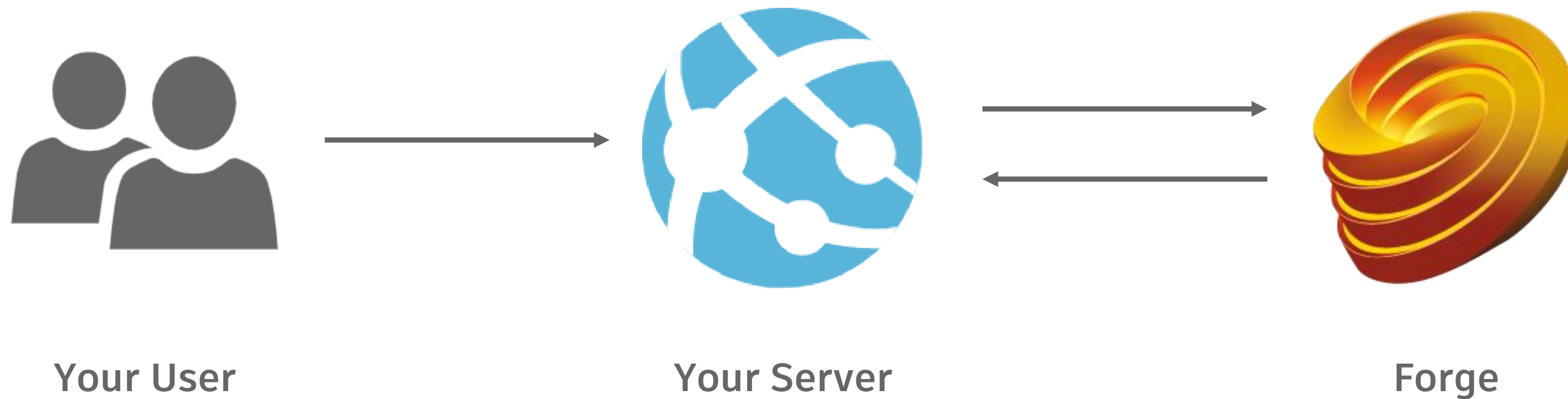
Your Server



Forge

3 Legged Authentication

User also participate on the communication.



Demo

Data Management API

Allows the developers to manage and control data across all Autodesk's cloud products.

- Centralized and consistent way to move data back and forth.
- Access to the Object Storage Service.

Model Derivative API

Used to handle File Translations and Metadata Extractions.

- Translation.
- Thumbnails.
- Geometry Extraction.
- Metadata Extraction.

Source File



Translation

Derivatives

STL

OBJ

Thumbnails

SVF

...

Geometry Extraction

Metadata Extraction

Metadata

View organization

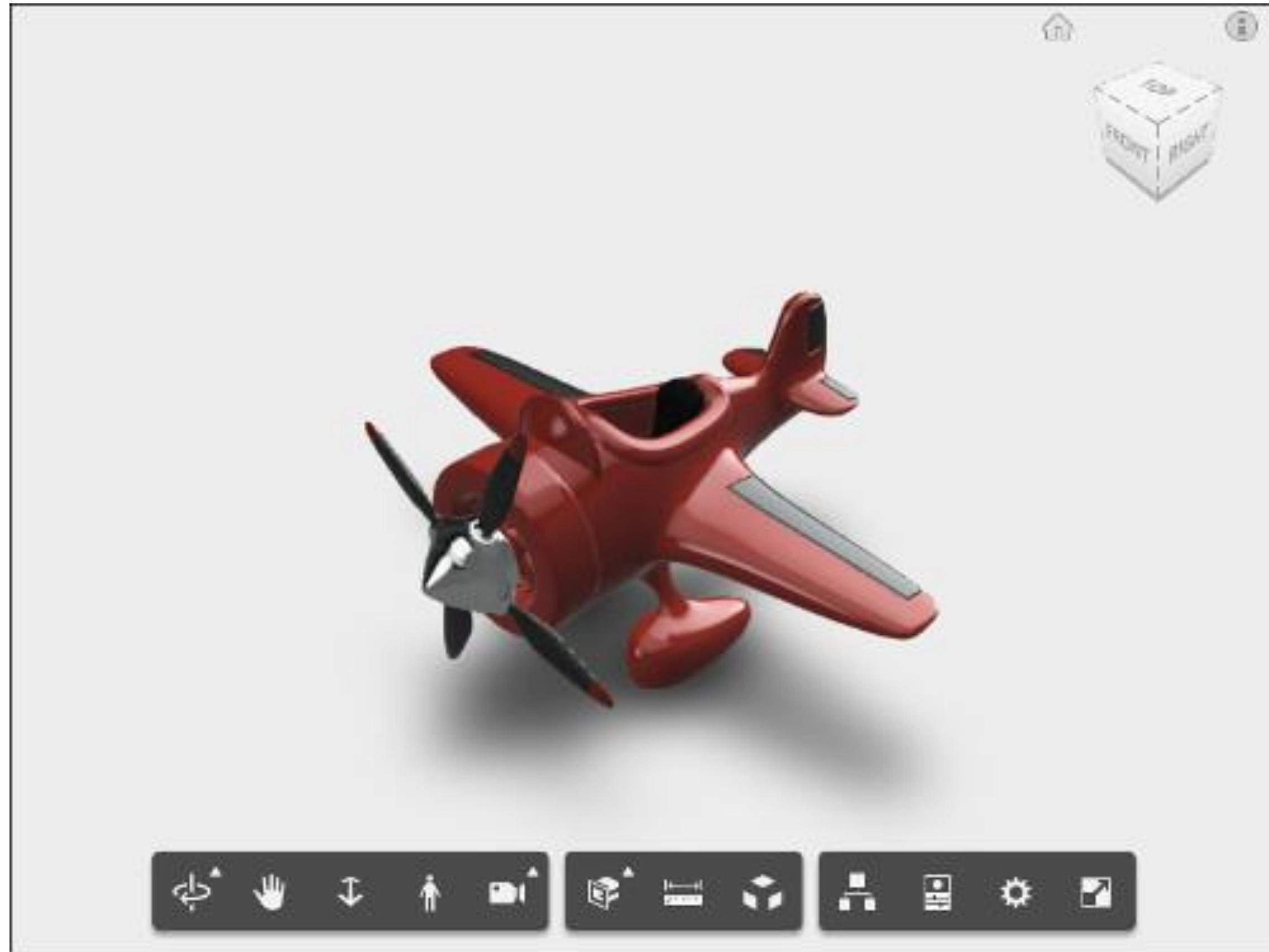
Object hierarchy

Object properties

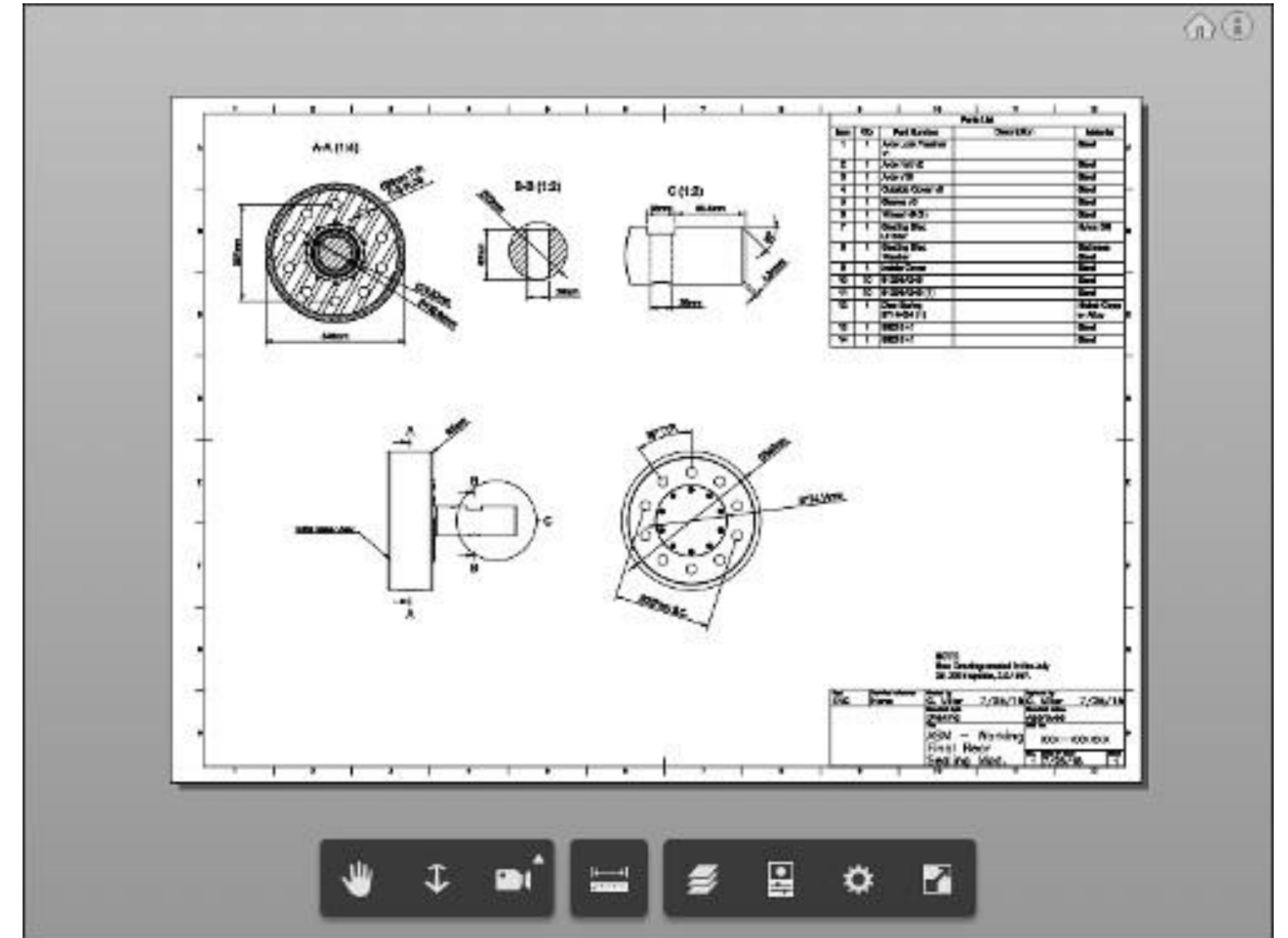
Forge Viewer API

Used to embed a 3D and 2D viewer on web applications.

- Web based, can be accessed from multiple devices.
- Contains a lot of ready-to-use extensions to improve the interaction.
- Allow the creation of custom interactions.
- Allow the access of properties database to get information about the model.
- Developed using Three JS.



Forge Viewer on a 3D Model



Forge Viewer on a 2D Model

BIM360

Part of Autodesk Cloud Solutions, is a cloud platform for the AEC Industry.



Document
Management



Cost
Management



Coordination



Analytics

Document Management

FOLDERS

REVIEWS

TRANSMITTALS

ISSUES

View by

Folders

Sets


 Plans

▼  Project Files

...

 00_Pre-Design

 01_Council

 02_Pre-Construction

 03_Construction



Upload files

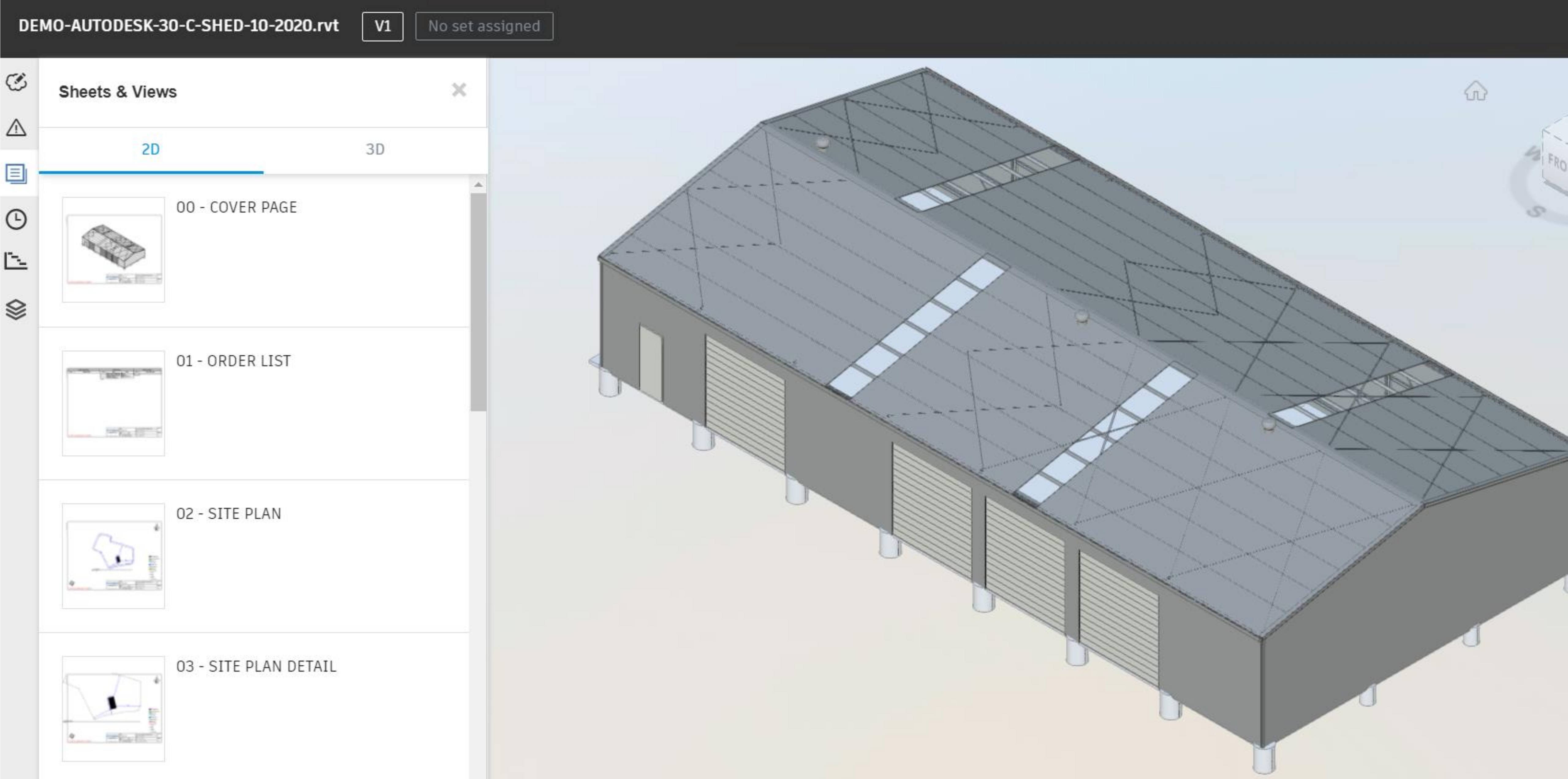


Showing 5 items

 Search

<input type="checkbox"/>	Name ^	Description	Version	Size	Last updated	Updated by
<input type="checkbox"/>	 00_Pre-Design	--	--	--	Oct 18, 2020 8:12 PM	Thiago Almeida
<input type="checkbox"/>	 01_Council	--	--	--	Oct 18, 2020 8:12 PM	Thiago Almeida
<input type="checkbox"/>	 02_Pre-Construction	--	--	--	Oct 18, 2020 8:12 PM	Thiago Almeida
<input type="checkbox"/>	 03_Construction	--	--	--	Oct 18, 2020 8:13 PM	Thiago Almeida
<input type="checkbox"/>	 DEMO-AUTODESK-30-C-SHED-10-2020.rvt		V1	12.3 MB	Oct 18, 2020 8:11 PM	Thiago Almeida

BIM360 - User Interface



BIM360 - User Interface

BIM360 API

- **Create Projects**
- **Invite Users**
- **Manage Folders w/ Data Management APIs**
- **Manage Files w/ Data Management APIs**
- **Automatic Conversion of files**

BIM360 API

- > Account Admin
- > Issues
- > RFIs (beta)
- > Document-related (Pushpin) Issues and RFIs (beta)
- > Checklists
- > Document Management
- > Model Coordination
- > Cost Management (beta)
- > Relationships

<https://forge.autodesk.com/en/docs/bim360/v1/overview/introduction/>

Shedmate Registration

Client

Site Address

Builder

Job

<

Back

Save

☐ This client is a Company

First Name

Autodesk

Last Name

Demo

Email

demo@autodesk.com

Phone

99 999 999

Phone 2 (Optional)

📍

Get from my location

Full Address

San Francisco, CA, USA

🔍

Search

Street Number

Shedmate Registration

Postal Code

Country

United States

State

California

Council


San Francisco County

Coordinates

37.7749295, -122.4194155

Map

Satellite



Confirm





Cancel

Shedmate Registration

Client	Site Address	Builder	Job
<div>Job Type</div> <div>C Shed</div>			
<div>Usage</div> <div>Domestic</div>			
<div>Job Number Addition</div>			
<div>Responsible</div> <div>Thiago Almeida - t.almeidaeng@gmail.com</div>			
<div>Confirm</div> <div>Cancel</div>			

BIM360 Integration

DEMO-AUTODESK-30-C-SHED-10-2020

	Project	Open
	User Groups	Acquire
	Folders	Open
	Revit Project	Sync

BIM360

<input type="checkbox"/> Name ^	Description	Version	Size	Last updated	Update
<input type="checkbox"/> 000-Revit IO	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 001-BIM Models (WIP)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 002-Plans (Review)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 002.1-BP (Submit to quoting)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 002.2-BP (Submit to Planning)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 003.1-CD (Submit to quoting)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 003.2-CD (Submit to Building)	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 004-3D-Coordination	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 004.1-Signed Off	--	--	--	Aug 4, 2020 12:09 PM	
<input type="checkbox"/> 005-Timber-fabrication	--	--	--	Aug 4, 2020 12:09 PM	

Plans

Project Files

000-TRASH

001-Client-information-require...

002-Models-Plans-Fabrication

000-Revit IO

001-BIM Models (WIP)

002-Plans (Review)

002.1-BP (Submit to quoting)

002.2-BP (Submit to Planning)

003.1-CD (Submit to quoting)

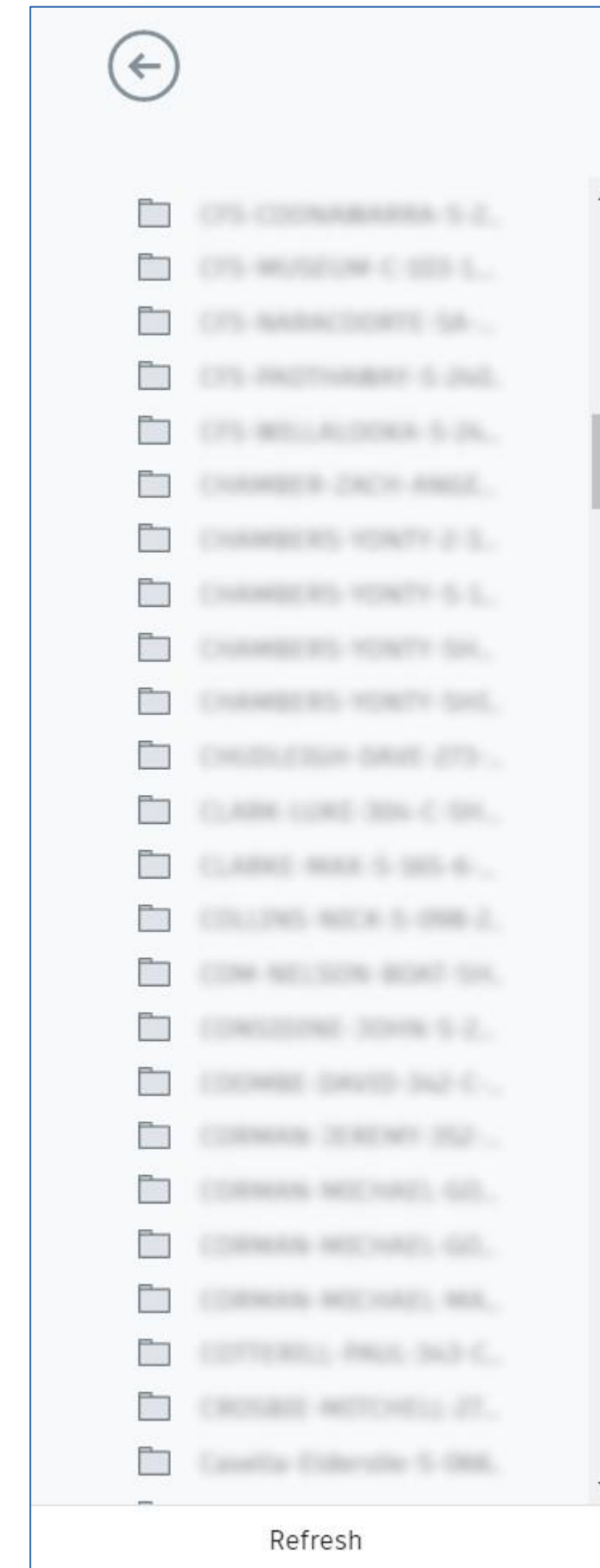
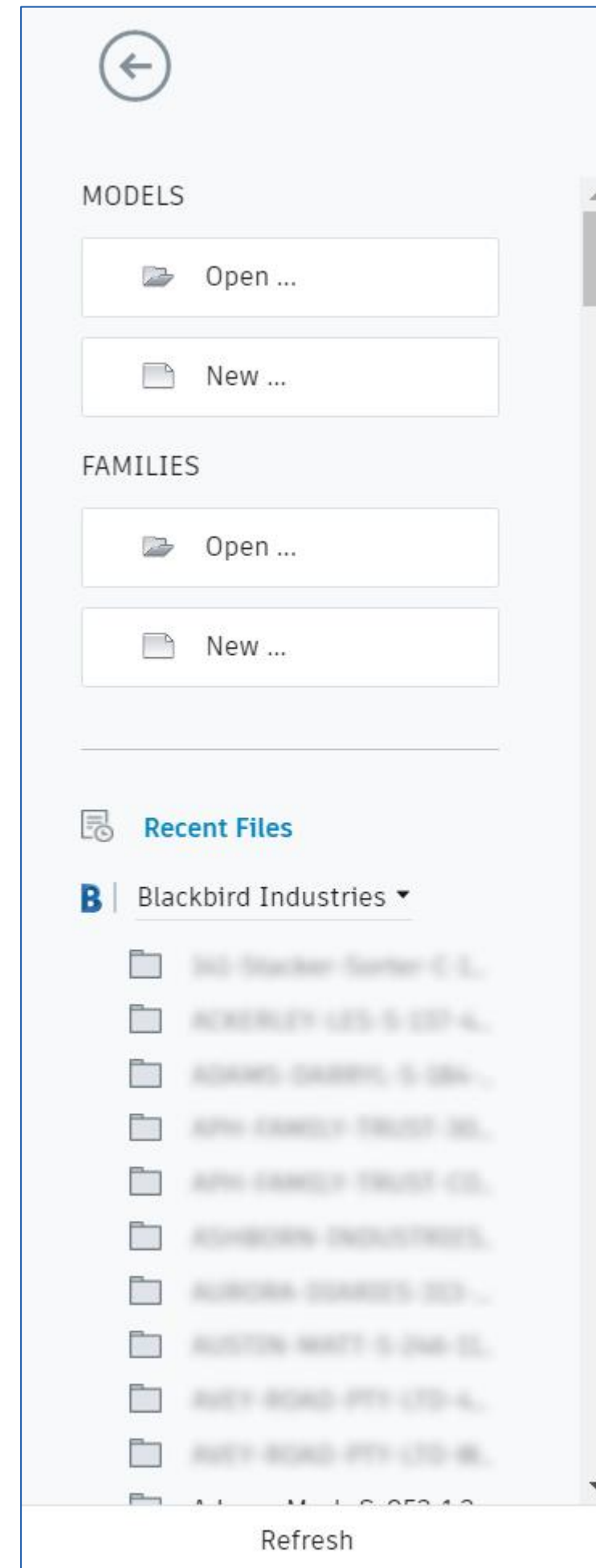
003.2-CD (Submit to Building)

004-3D-Coordination

004.1-Signed Off

005-Timber-fabrication

BIM360



**More than 300 projects
automated in 2 years, for just 1
company!**

Design Automation API

Allows the use of Autodesk's core products as cloud services.

- Automate design your tasks
- Engines for AutoCAD, 3dsMax, Inventor and Revit
- Reduce the need of a Desktop installed Software
- Make it easier for unspecialized users
- Increase your design operations at scale
- Massively reduce costs

Main Entities

- App Bundles
- Activities
- Work Items

App Bundle

- Package with all your Assembly files
- Can package any type of files
- You can pre-store files that you know you will reuse

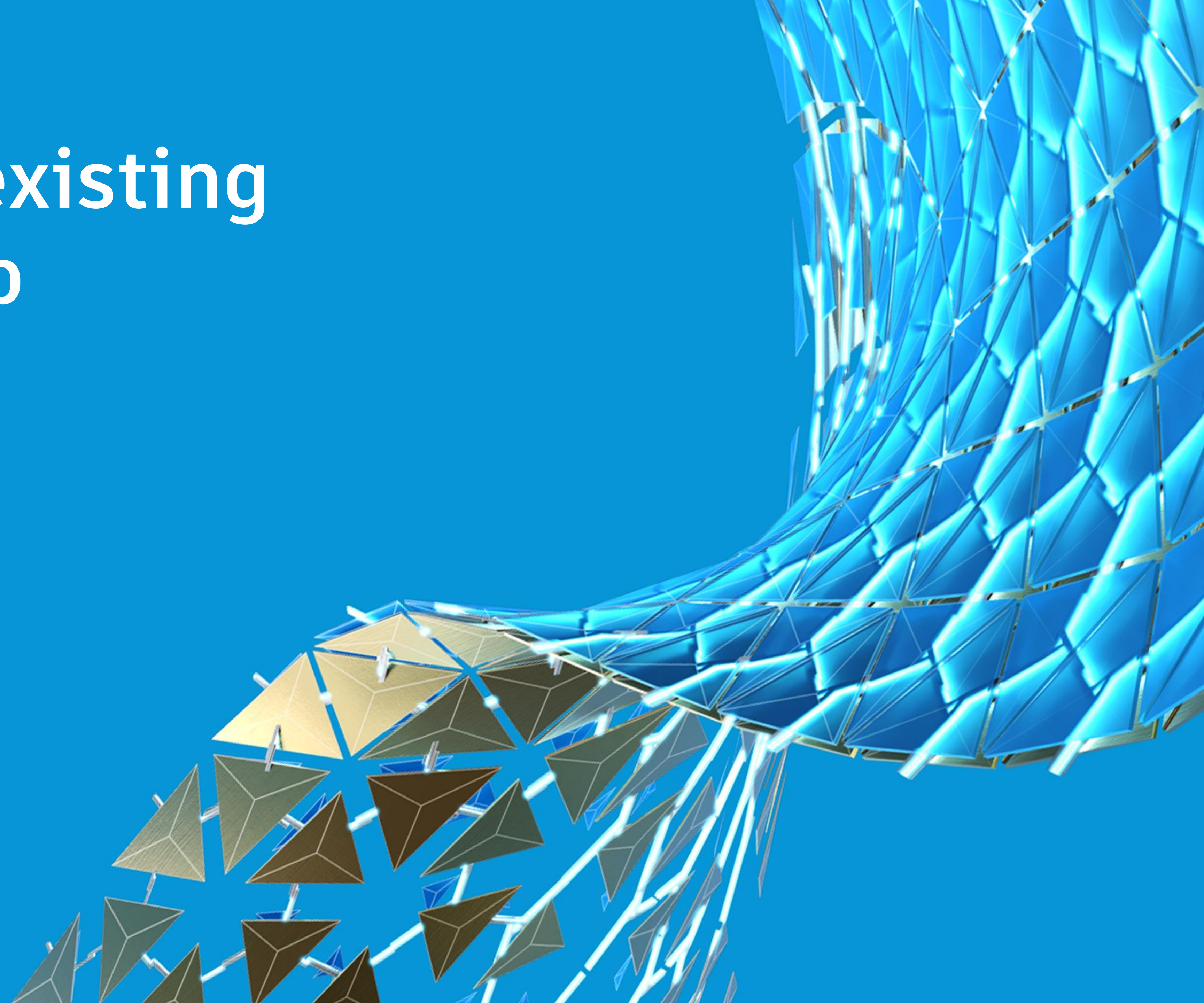
Activities

- Analog to an implementation of External Command
- Registers the inputs and the outputs
- Specifies what app bundle will be used to run

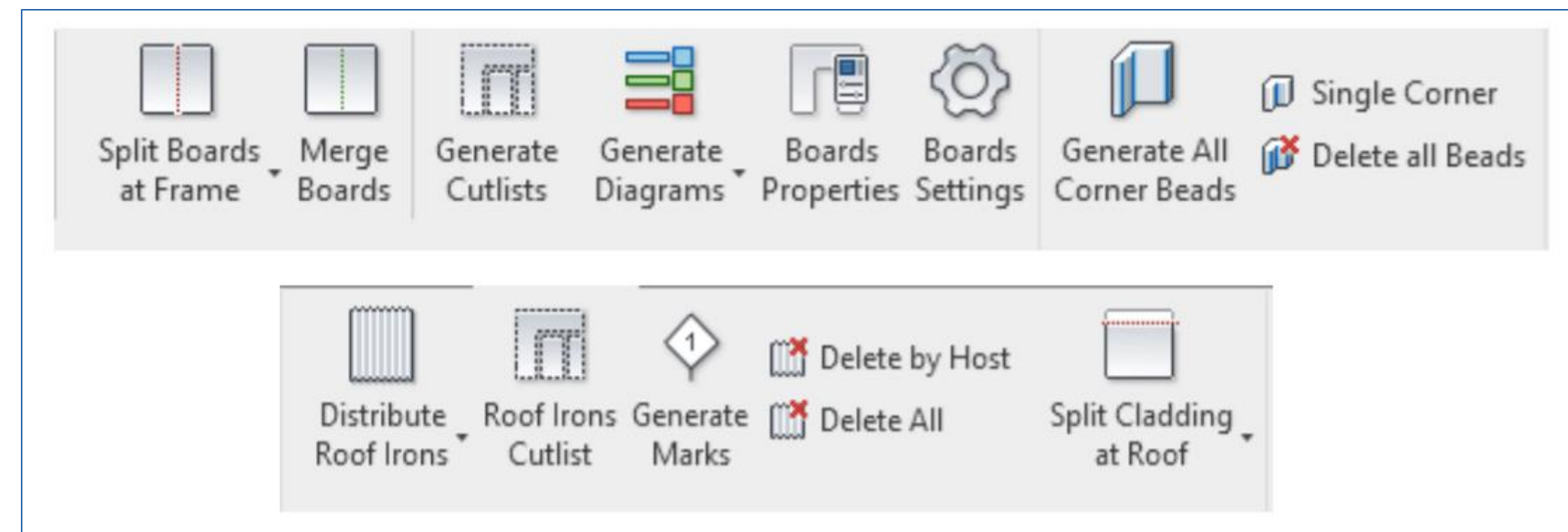
Work Item

- You call it with the data to be processed
- You need to specify the ActivityId / Alias to use
- Analog to a call to an External Command
- All files will be deleted after completed

Porting an existing Desktop App

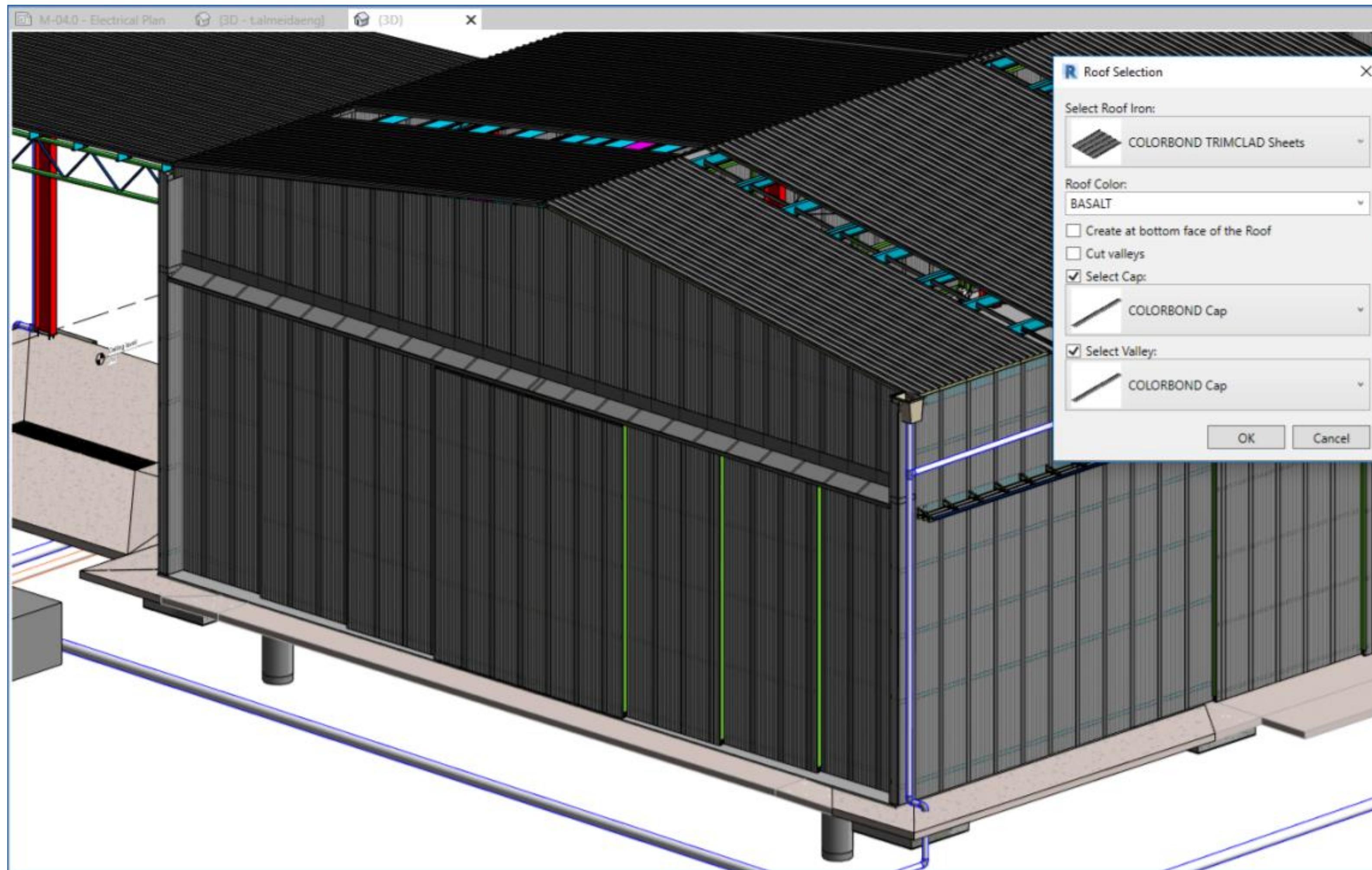


Design Automation API



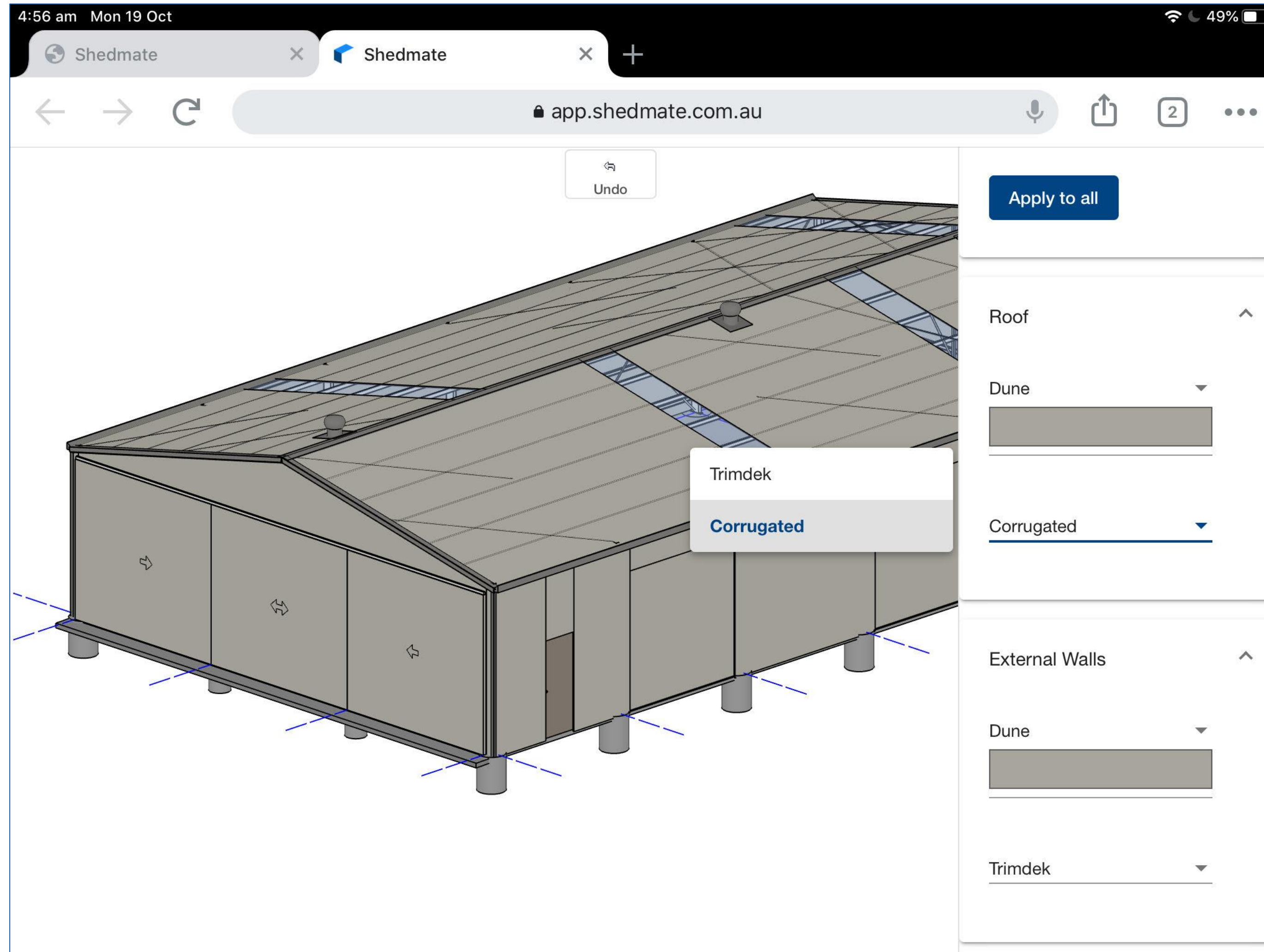
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



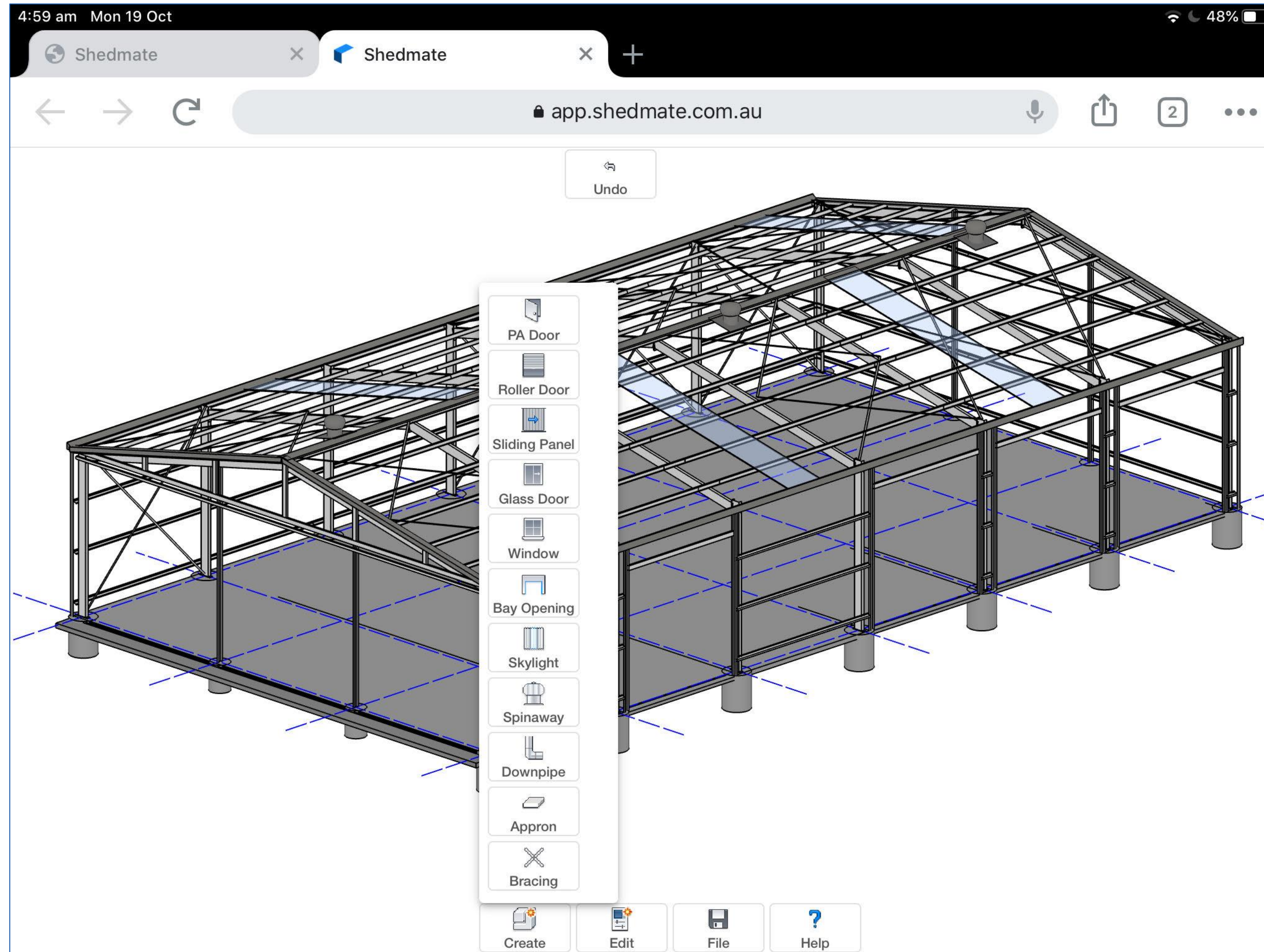
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



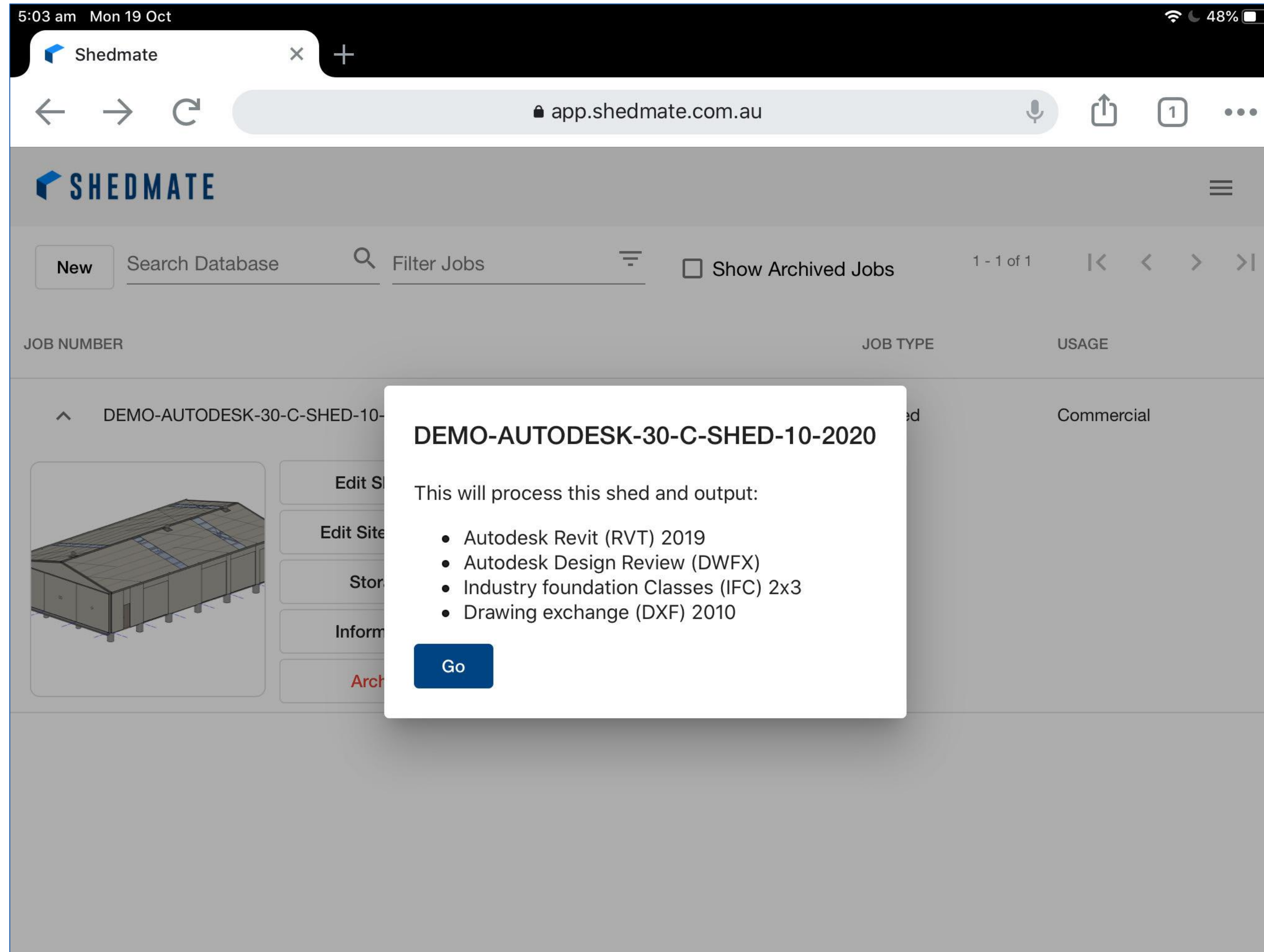
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



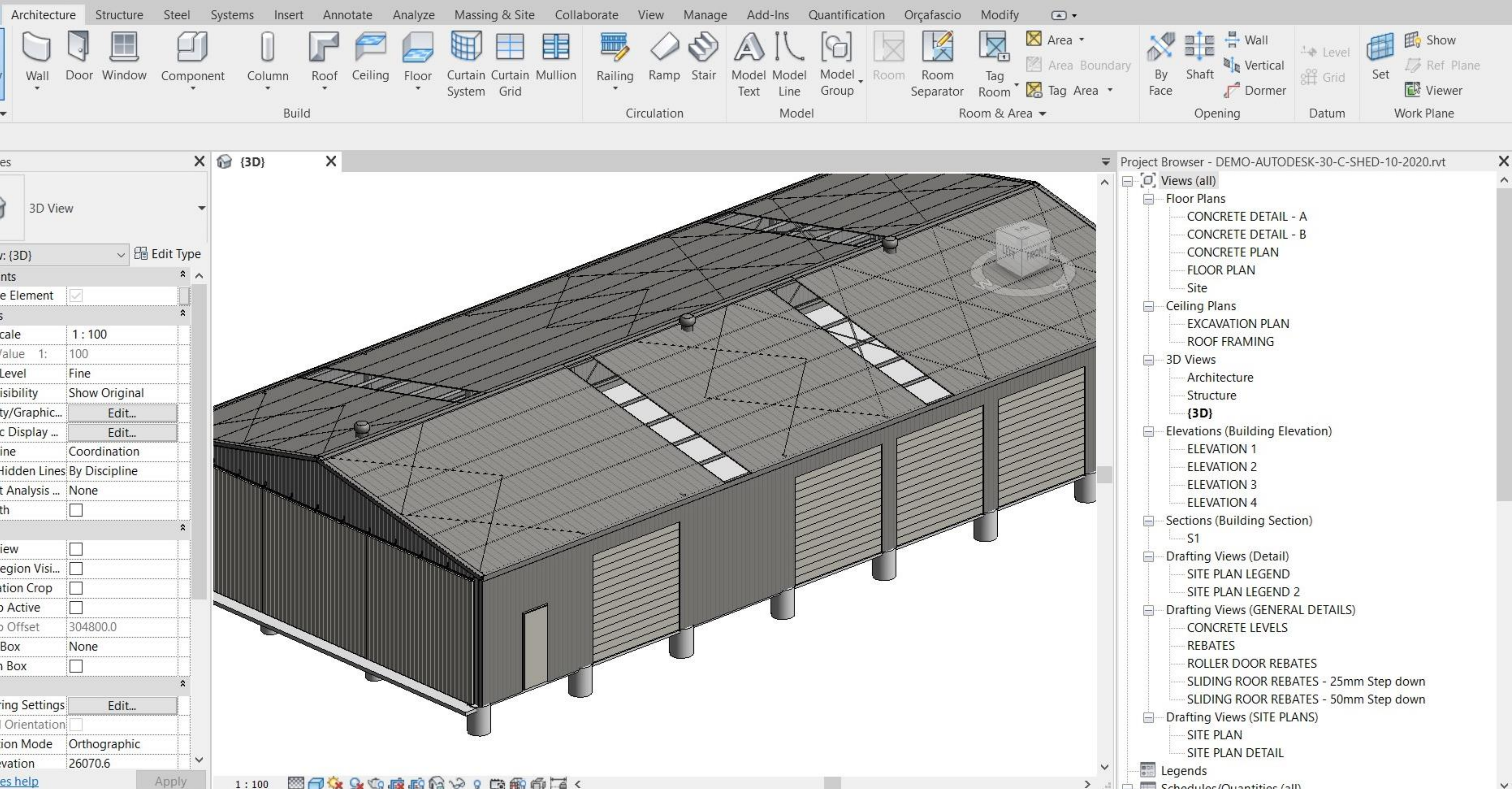
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API

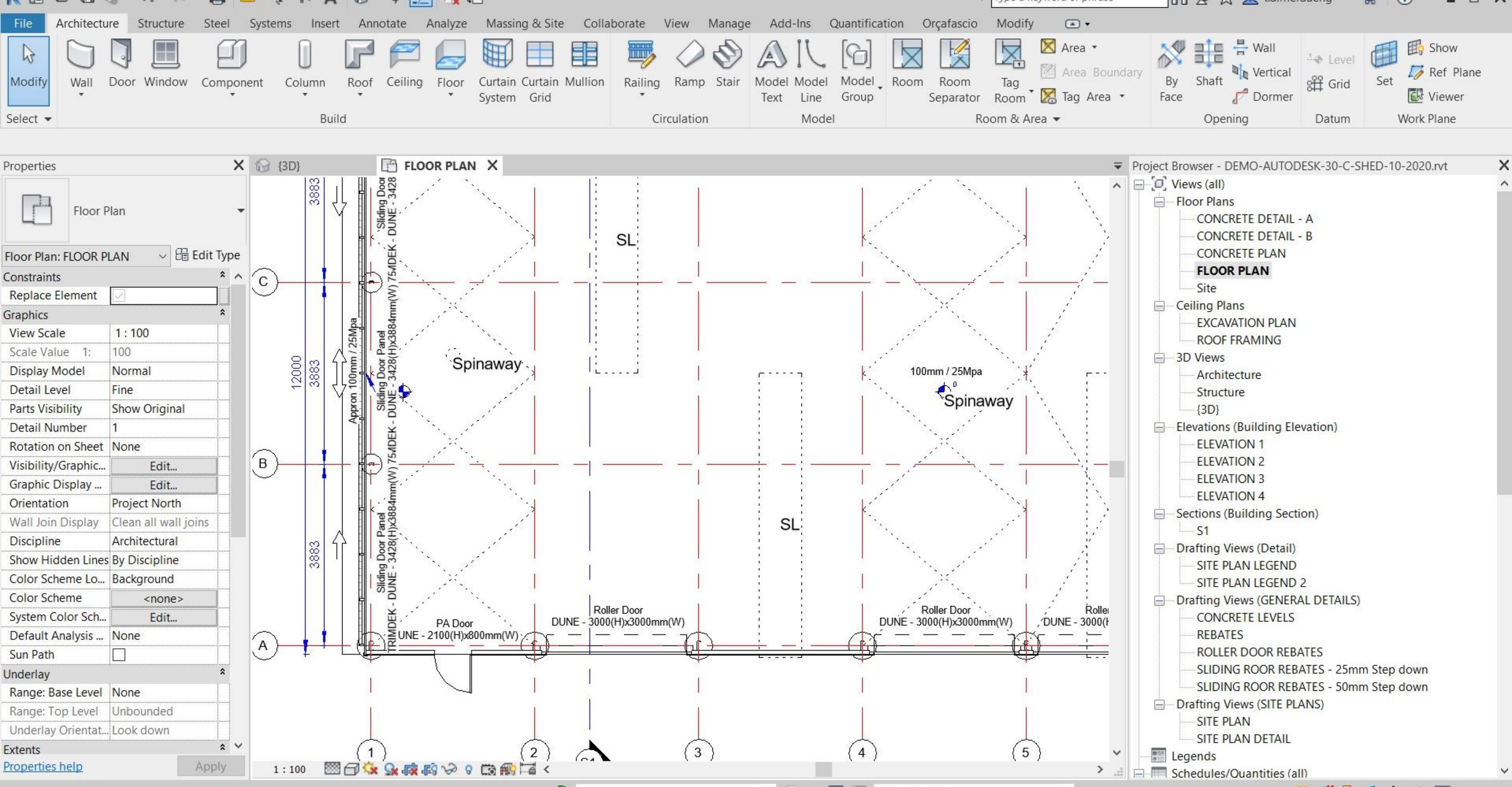


Sending Information to D.A.

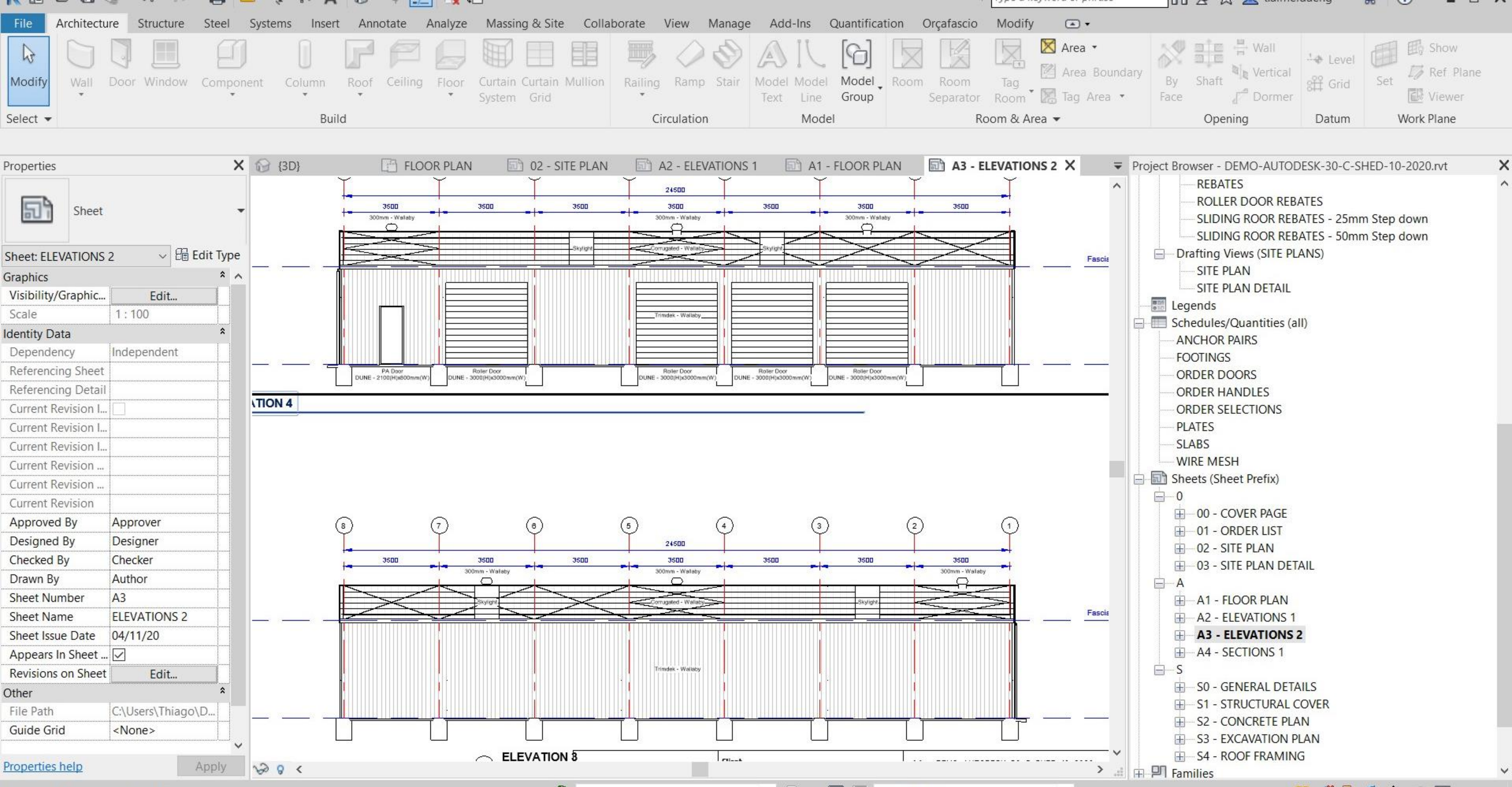
Demo



Resulting Revit file from D.A.



Resulting Revit file from D.A.



Resulting Revit file from D.A.

**So how did we managed to do
that?**

Software Architecture

The MVVM Pattern



The diagram illustrates the MVVM (Model-View-ViewModel) pattern with three distinct components arranged horizontally. On the left is a light blue square labeled 'View' with 'WPF' underneath. In the center is a dark blue square labeled 'View Model'. On the right is an orange square labeled 'Model'. The 'View' component is associated with WPF (Windows Presentation Foundation).

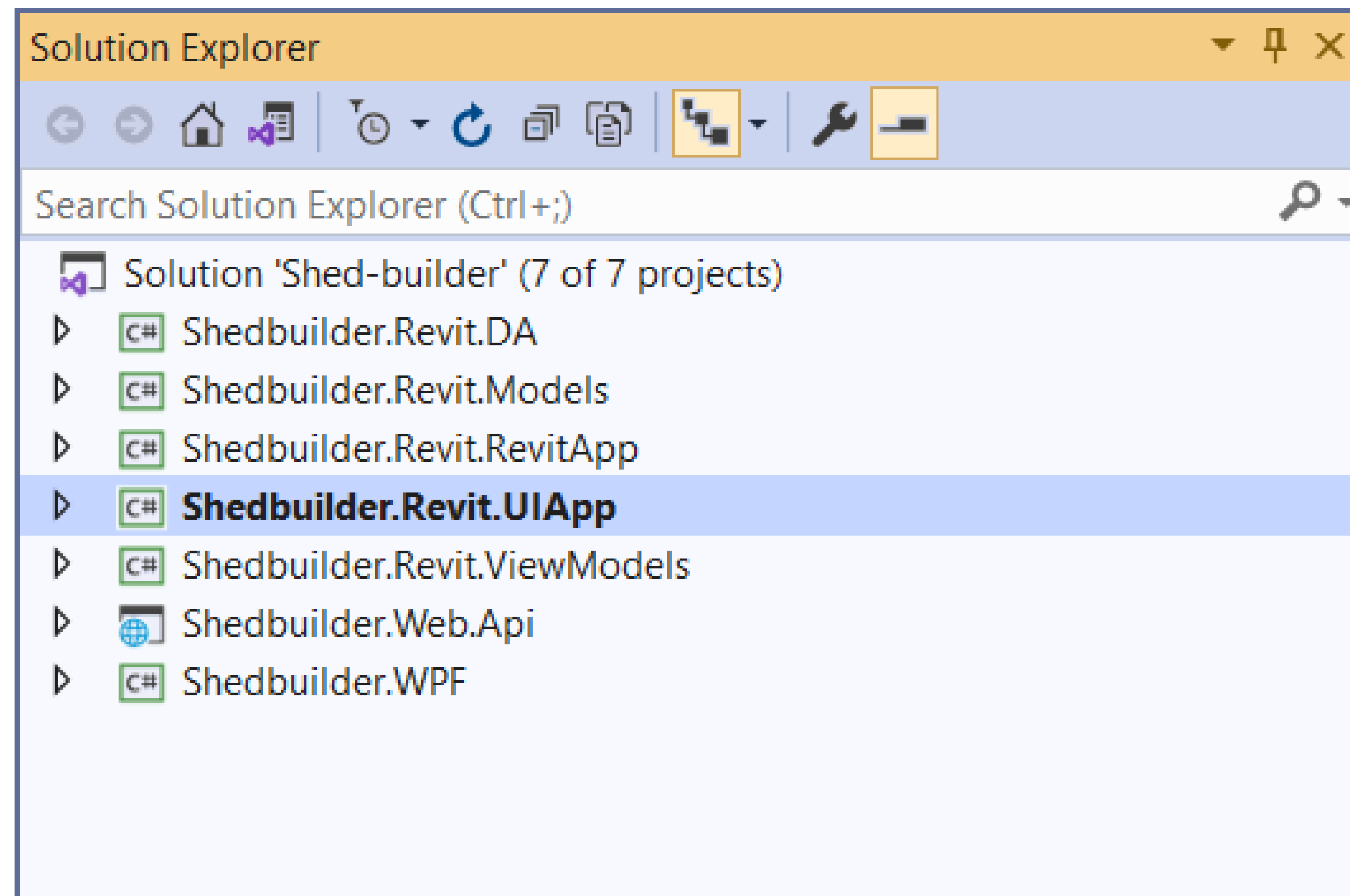
View
WPF

**View
Model**

Model

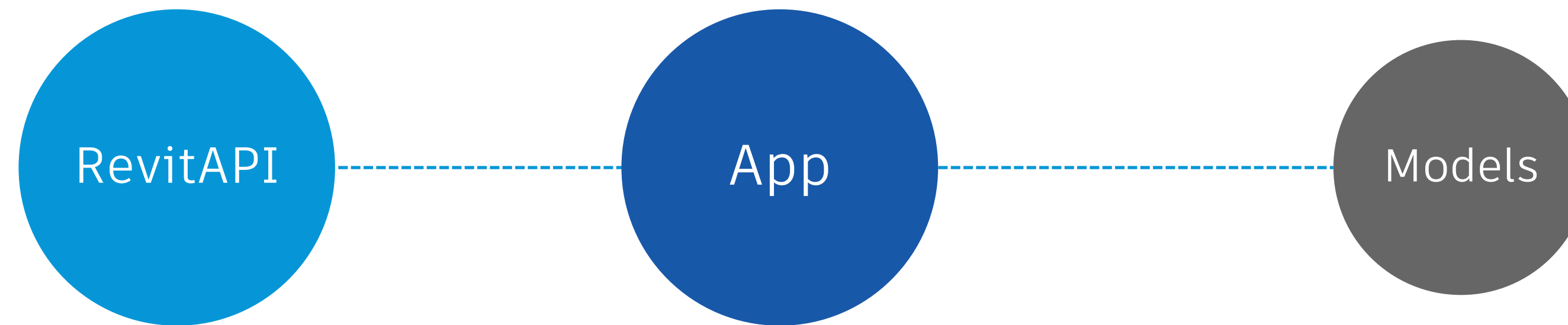
Software Architecture

This is how our Solution looks on Visual Studio...

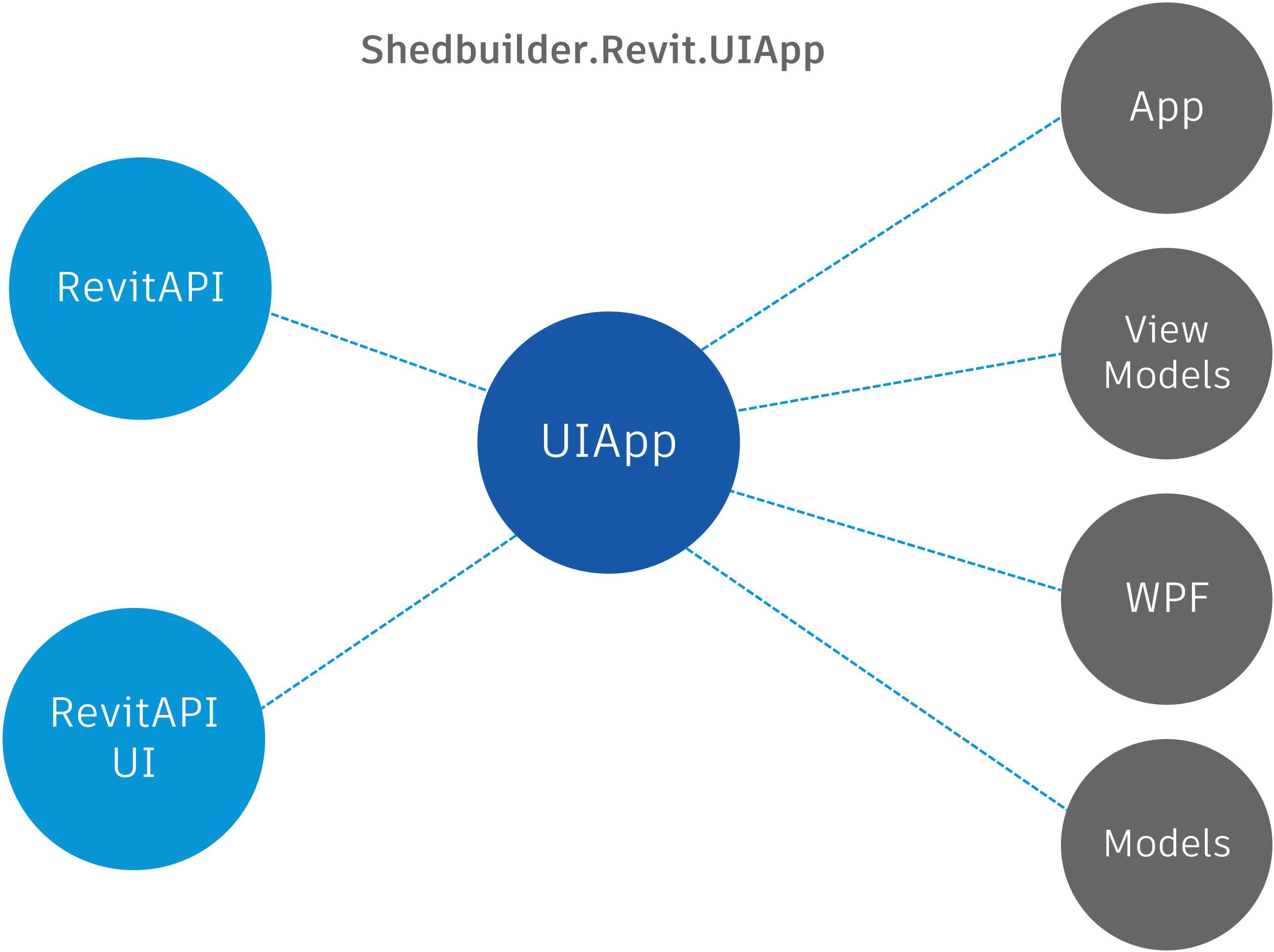


Software Architecture

Shedbuilder.Revit.App

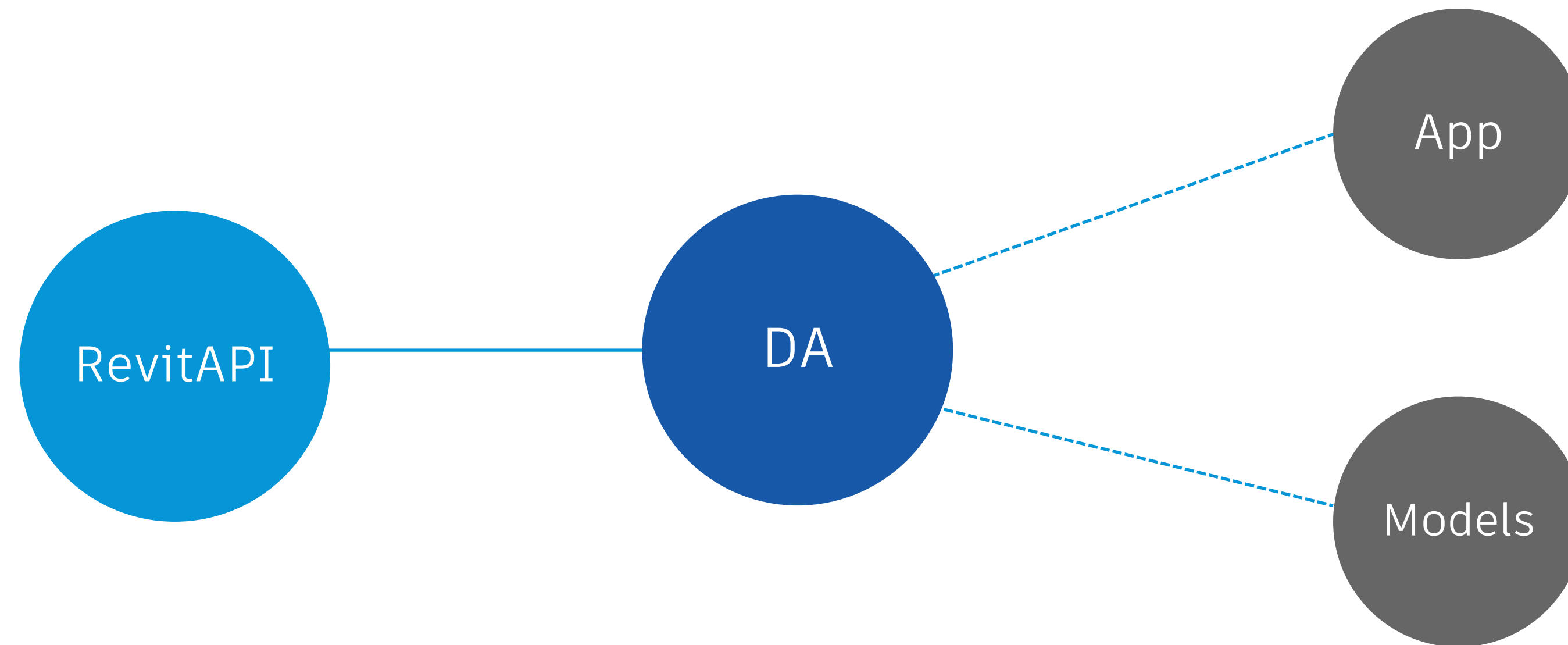


Software Architecture



Software Architecture

Shedbuilder.Revit.DA

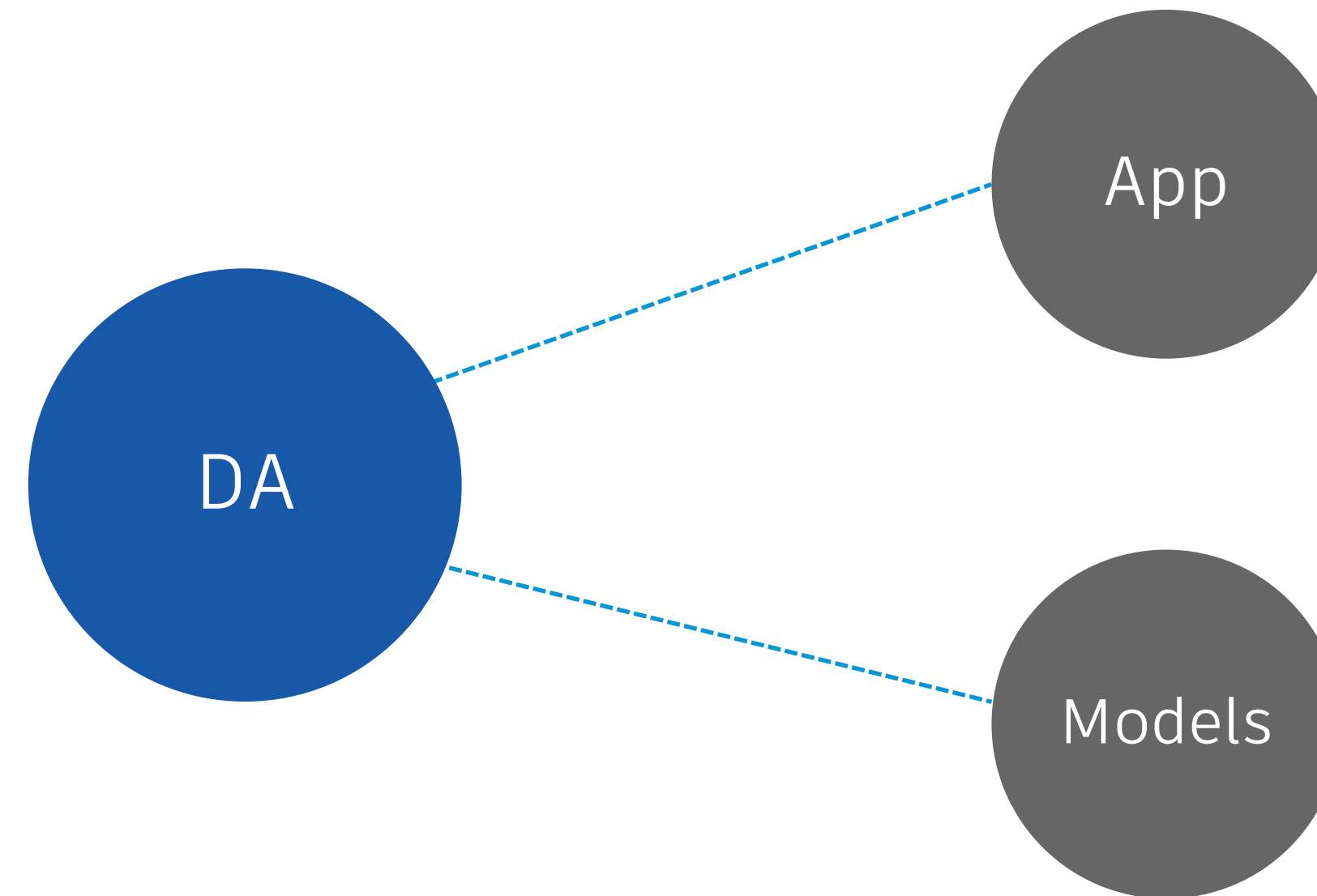


Shedbuilder.Revit.DA

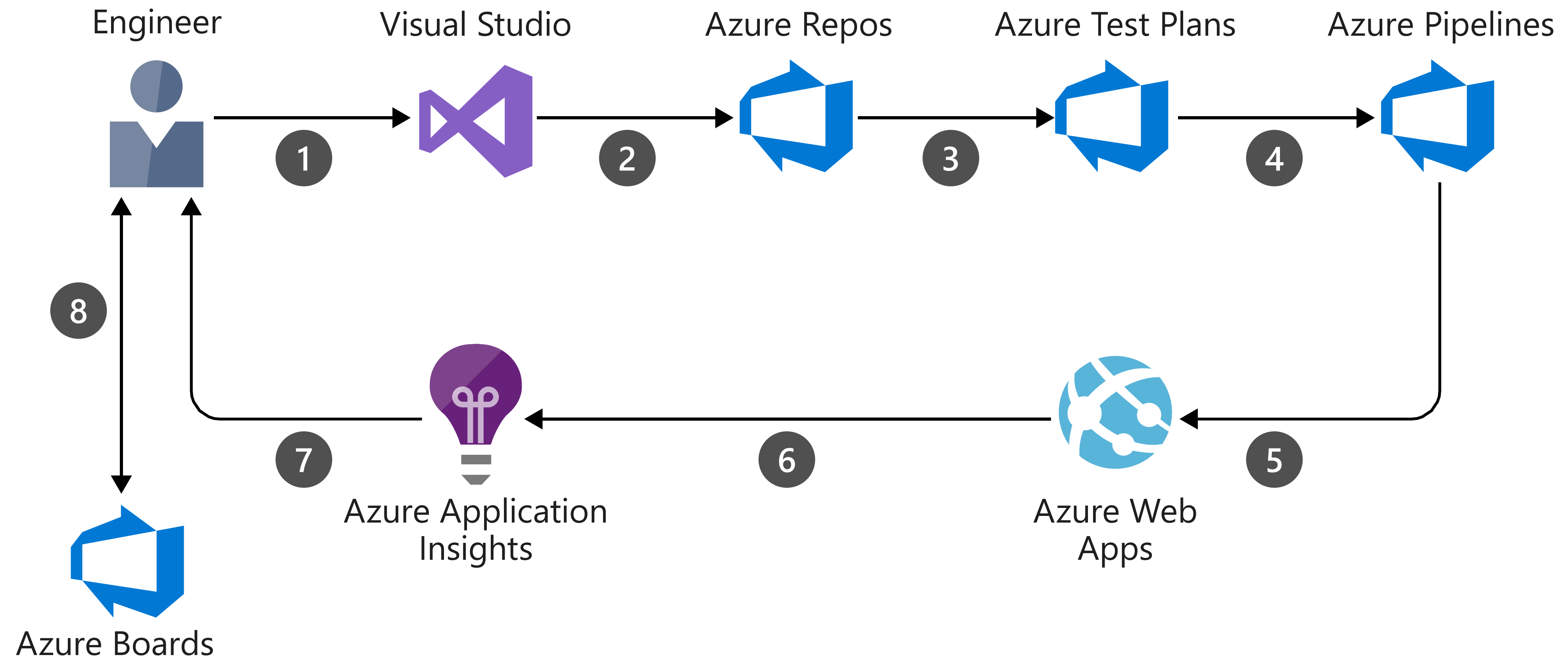
- Deserializes the a input json file into a data model
- Creates the site plan and its details
- Creates the shed
- Creates plans, elevations and section detailing
- Puts everything in sheets with correct scale
- Saves the file that will be used as output

Software Architecture

Shedbuilder.Revit.DA



CI / CD Microsoft Azure



<https://docs.microsoft.com/en-us/azure/architecture/example-scenario/apps/devops-dotnet-webapp>

Thanks for *Attending!*



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