AUTODESK. UNIVERSITY

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

Thiago Almeida

Civil and Software Engineer| @tabalmeida

Raphael Rodrigues

Software Developer | @rodriguesrl

About the speaker

Thiago Almeida

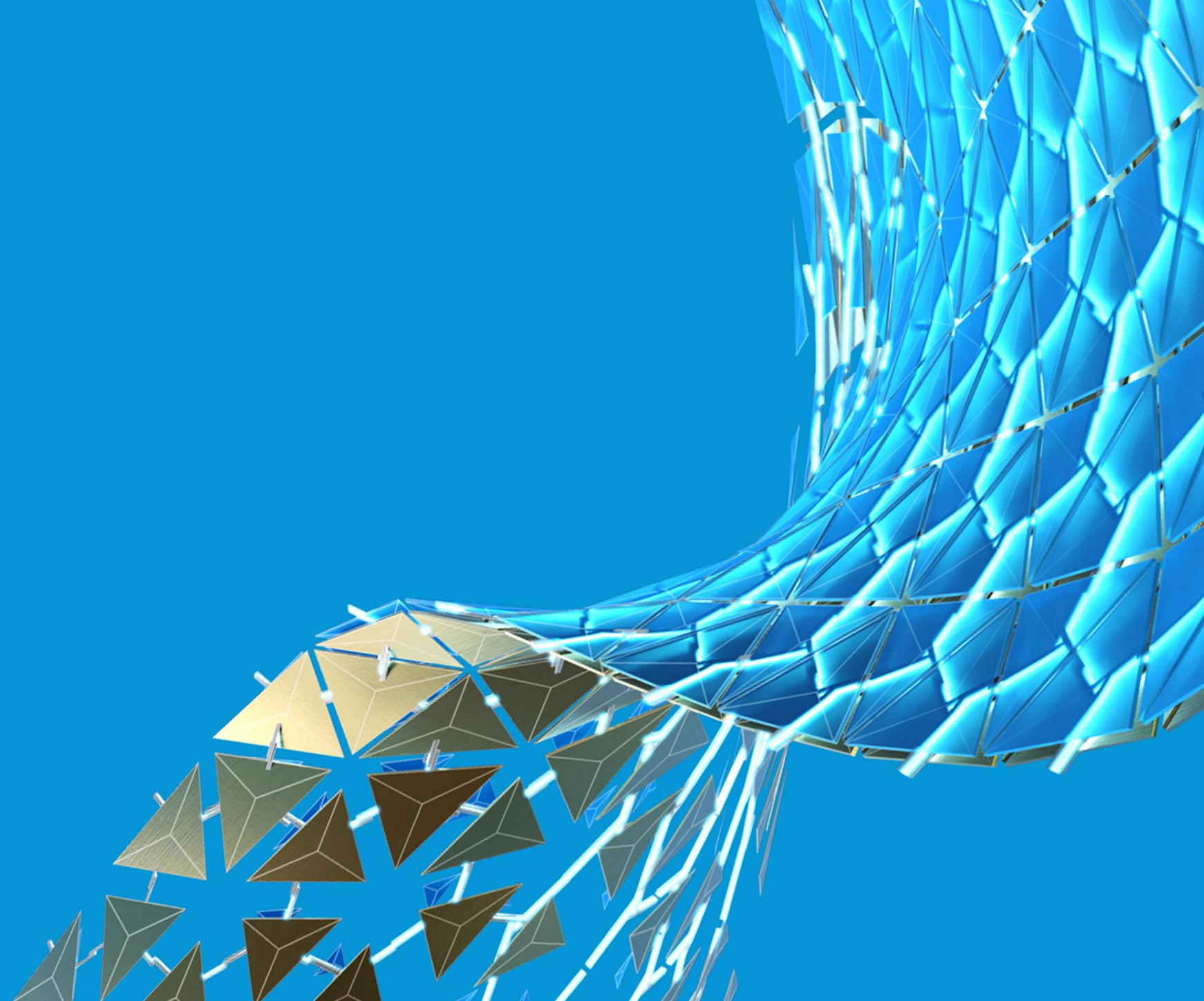
- Civil Engineer
- Software Engineer
- Several Autodesk Certifications
- CTO on Shedmate
- ADN Member

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.

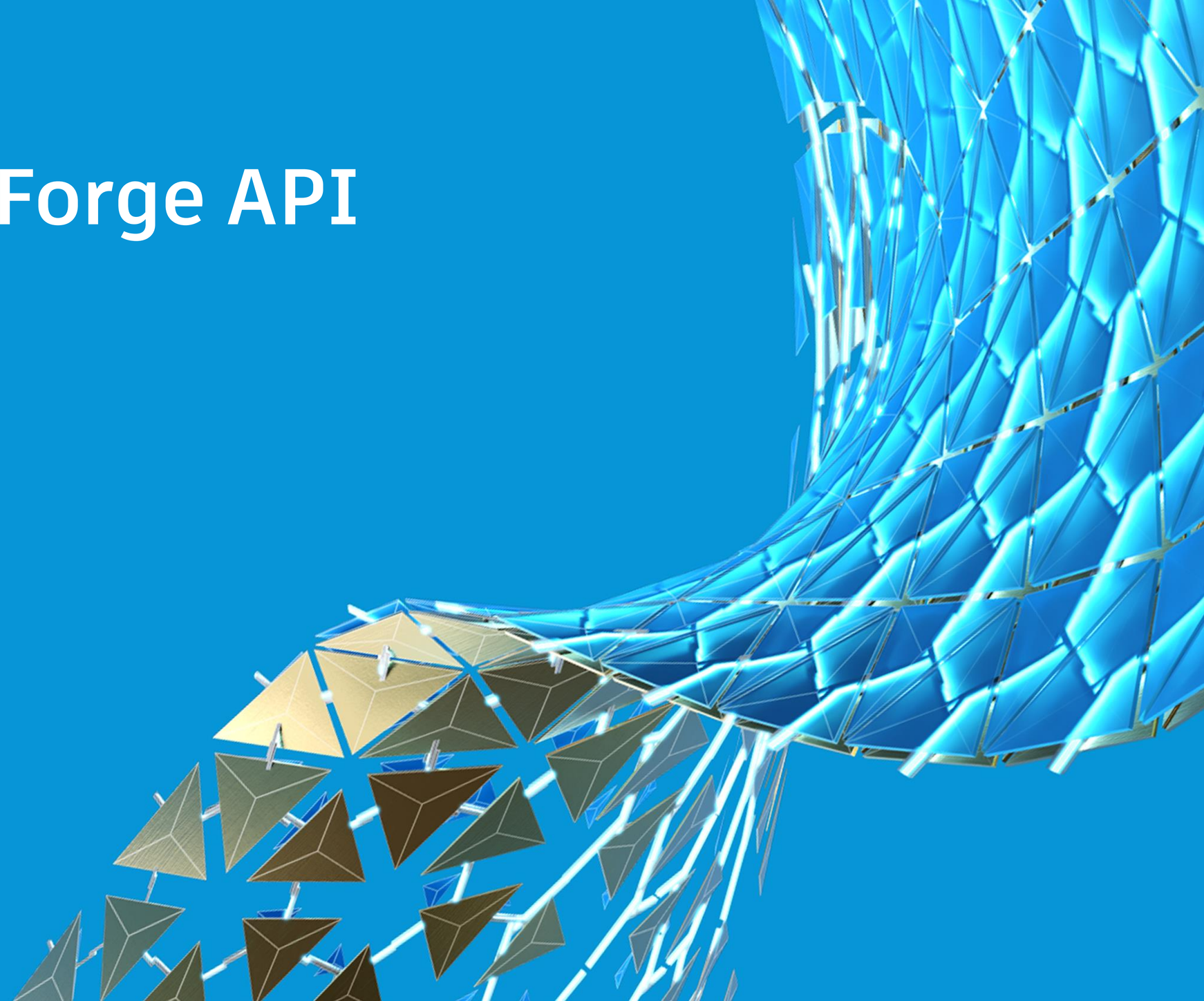
Disadvantages of Cloud Applications

- 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

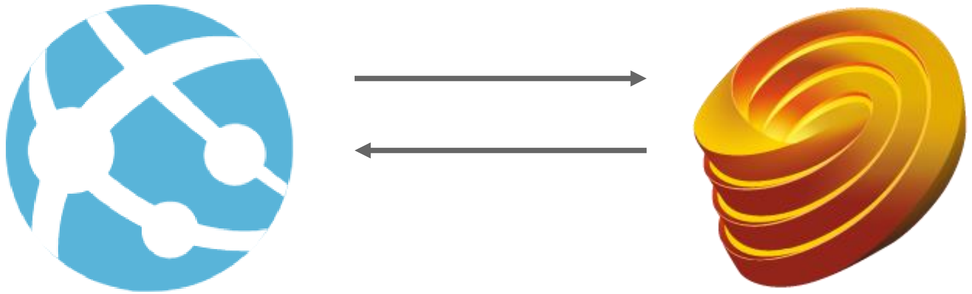
Data Management API

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.

Your User

Your Server

Forge

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

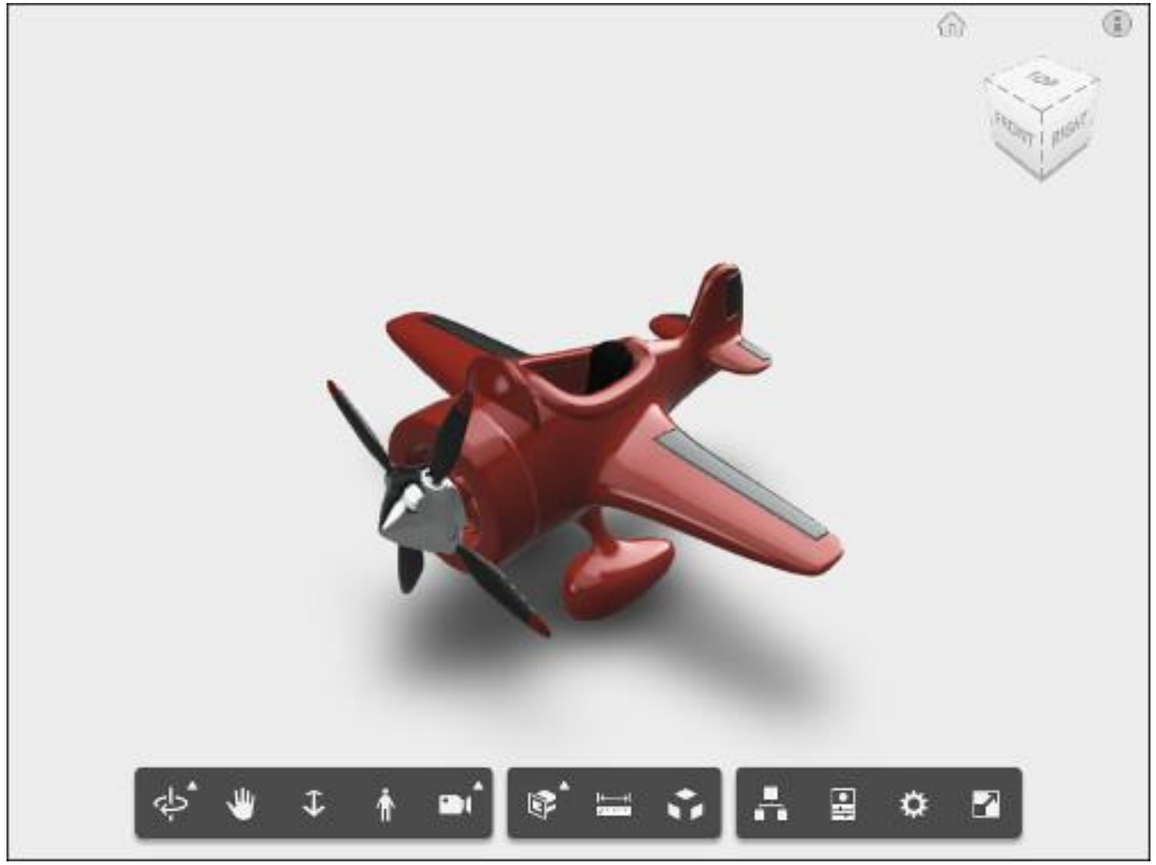
Object properties

https://forge.autodesk.com/en/docs/model-derivative/v2/developers_guide/basics

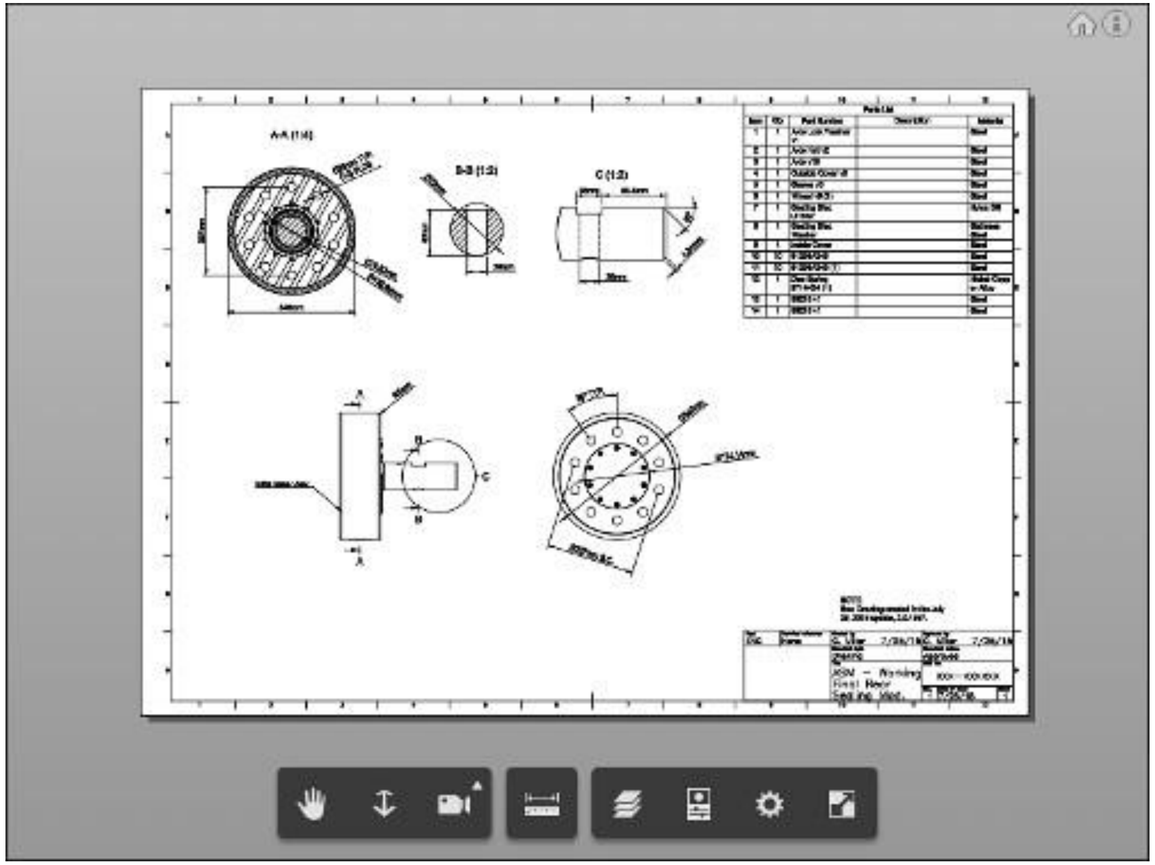
Forge Viewer API

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

https://forge.autodesk.com/en/docs/viewer/v7/developers_guide/overview/

BIM360

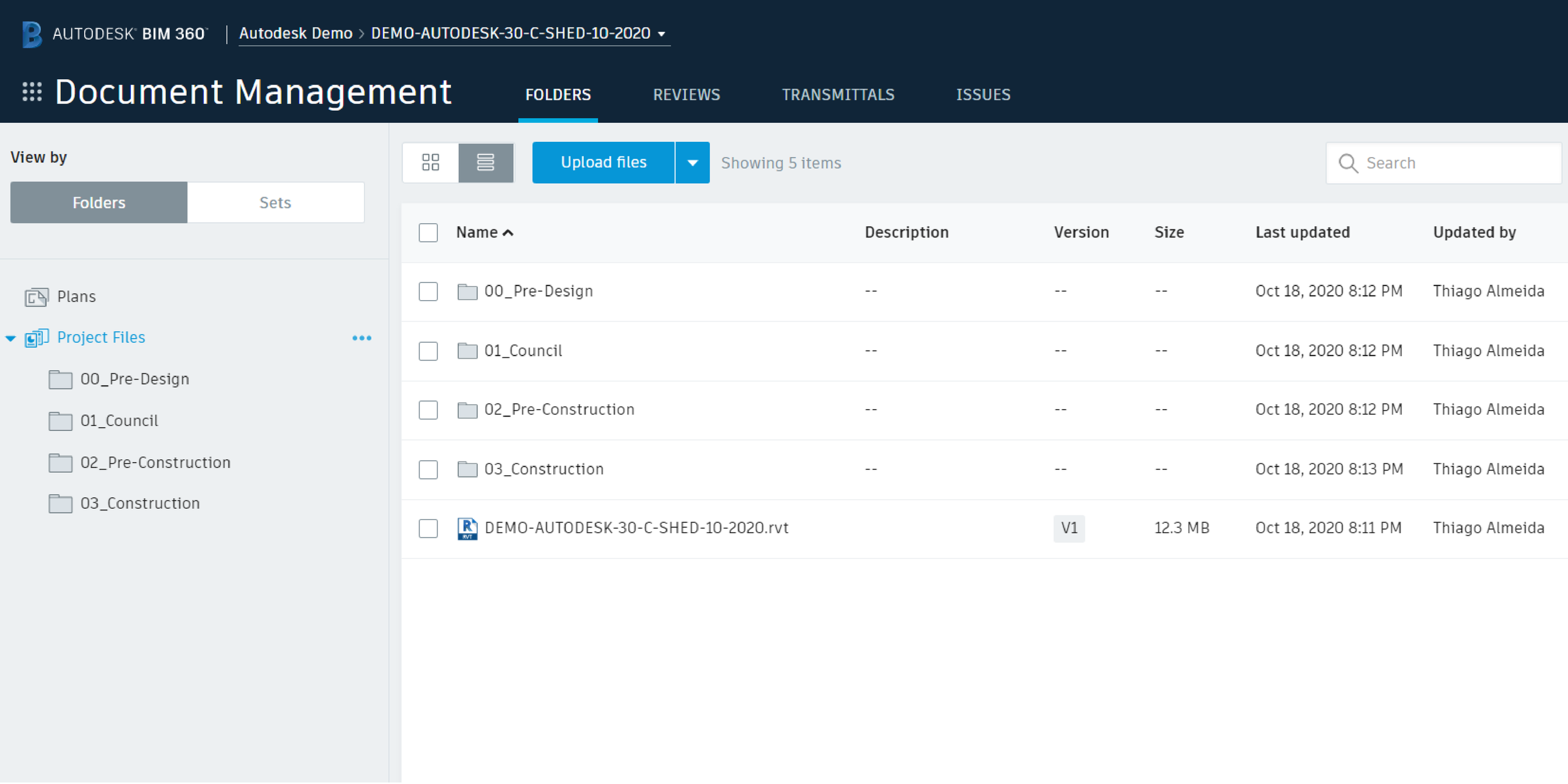
Part of Autodesk Cloud Solutions, is a cloud platform for the AEC Industry.

Document Management

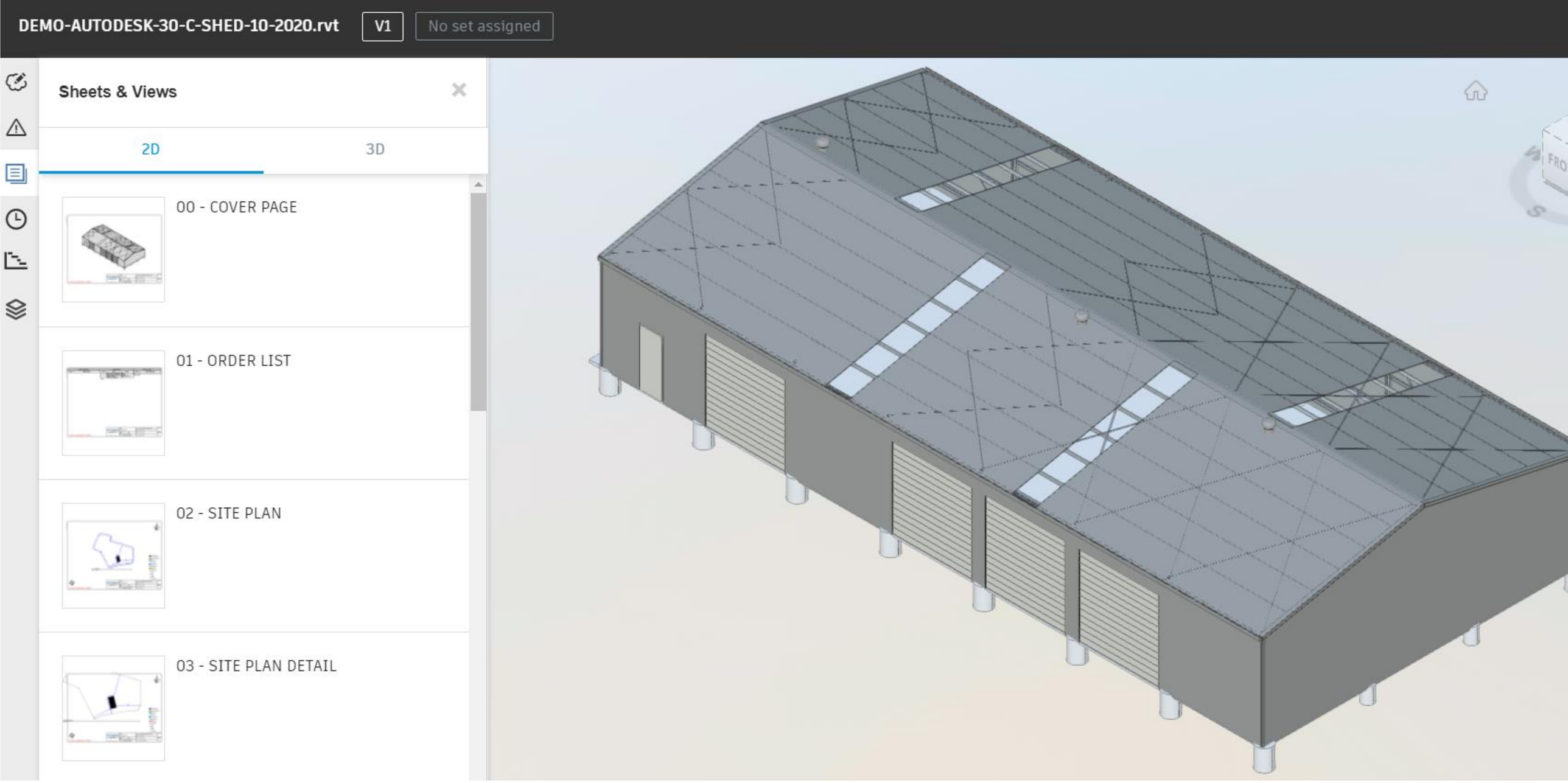
Cost Management

Coordination

Analytics



BIM360 - User Interface



BIM360 - User Interface

BIM360 API

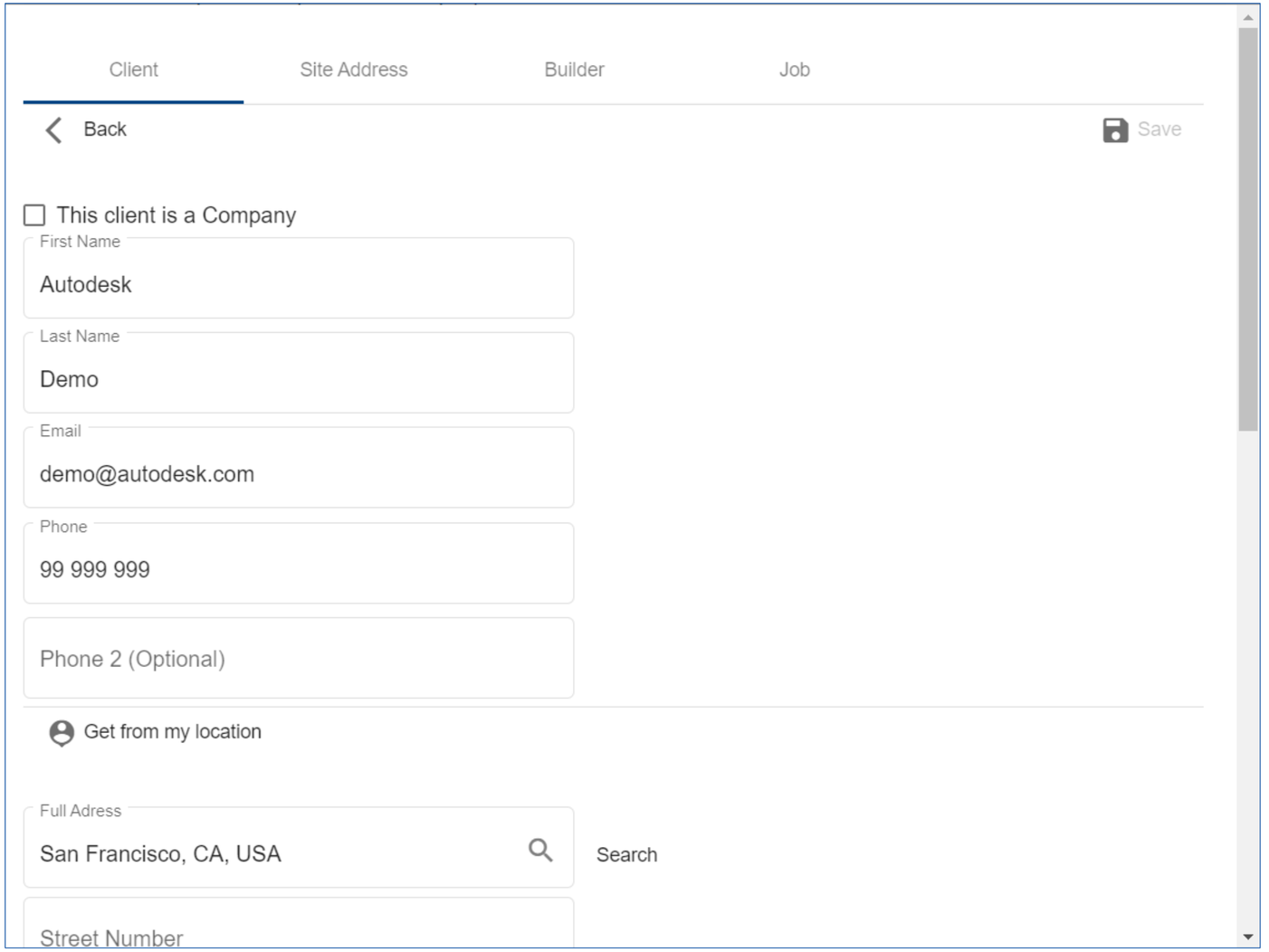
- **Create Projects**
- **Invite Users**
- **Manage Folders w/ Data Management APIs**
- **Manage Files w/ Data Management APIs**
- **Automatic Conversion of files**

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



Shedmate Registration

Postal Code

Country

United States

State

California

Council

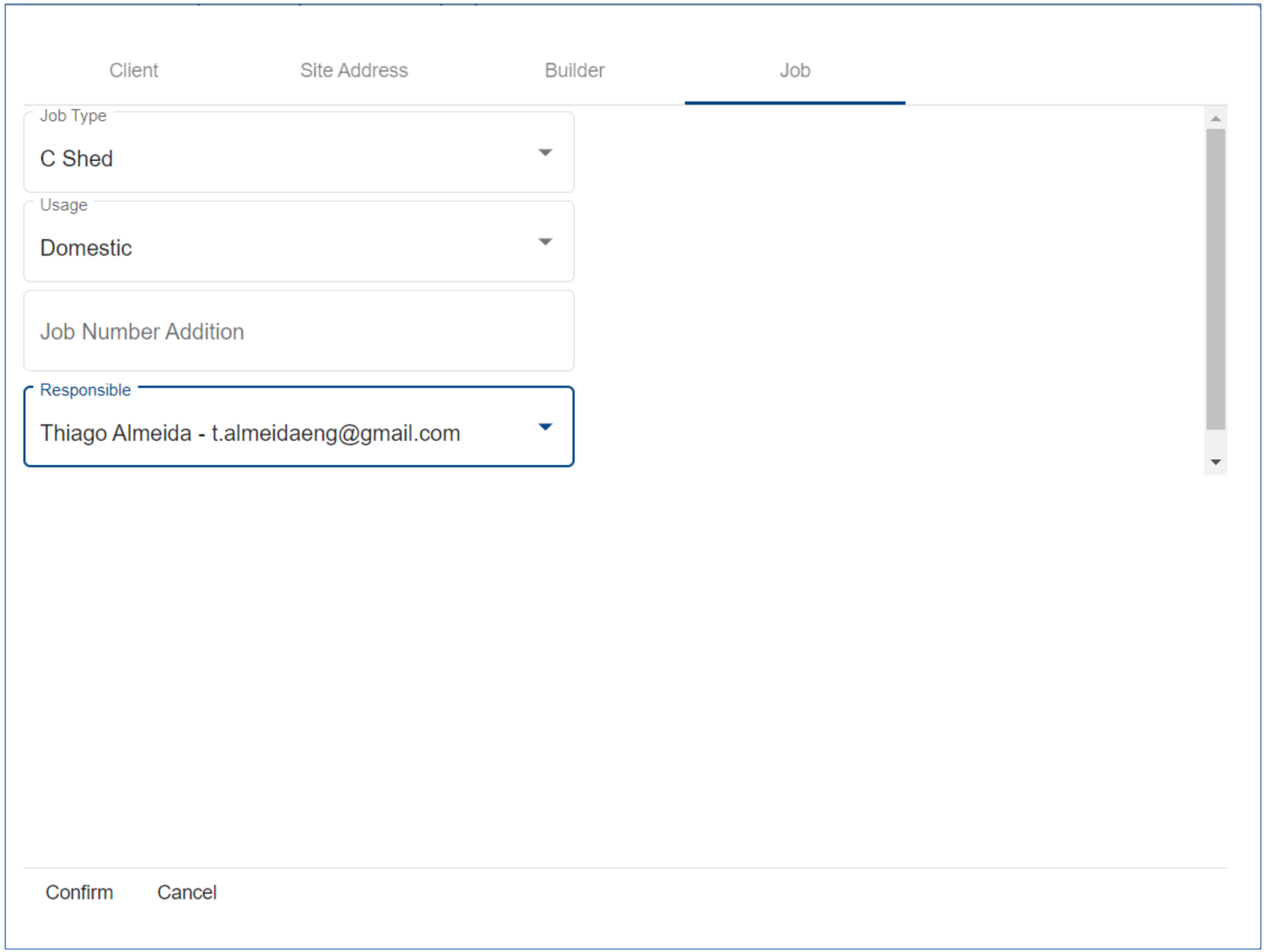
San Francisco County

Coordinates

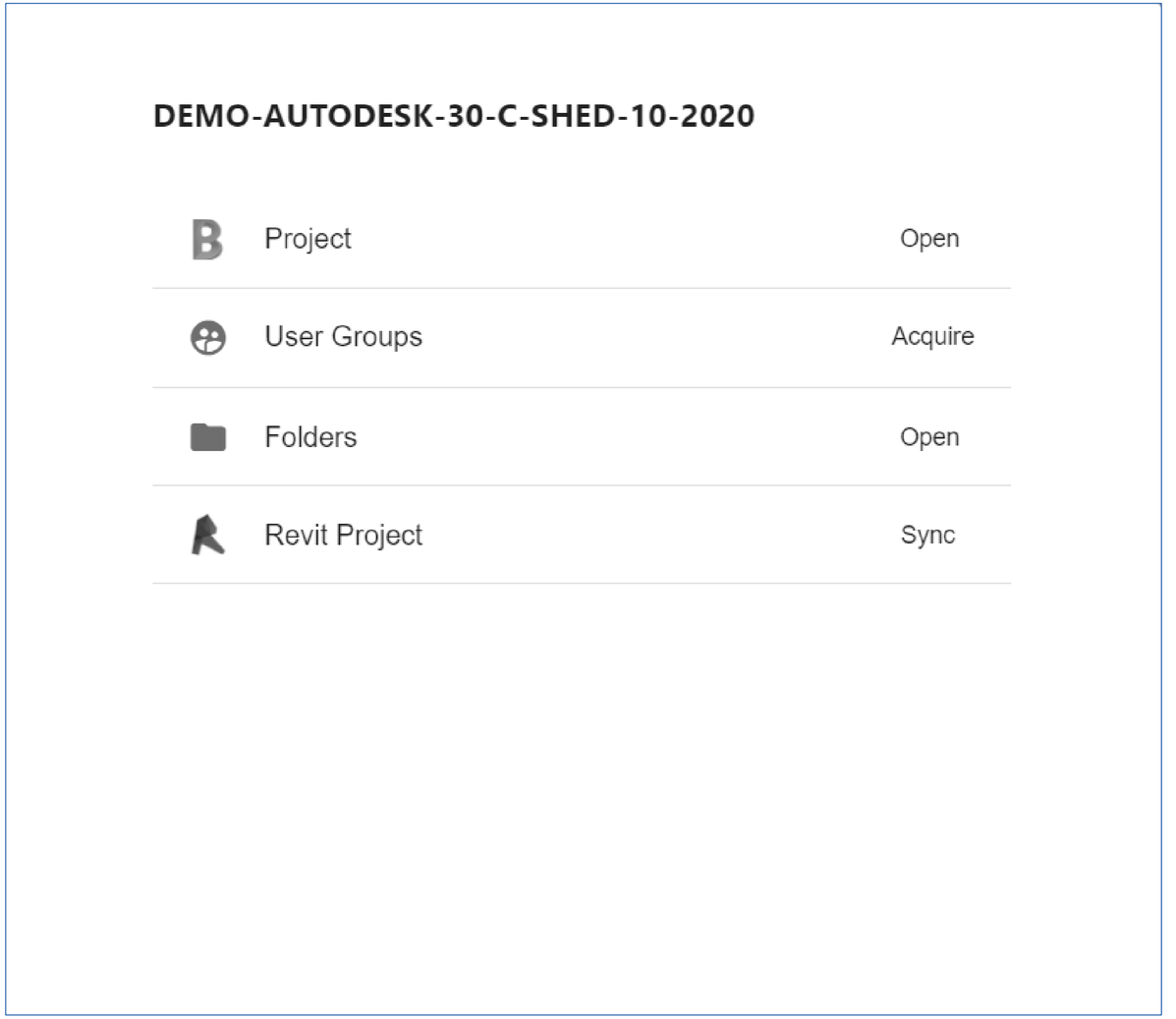
37.7749295, -122.4194155

Confirm Cancel

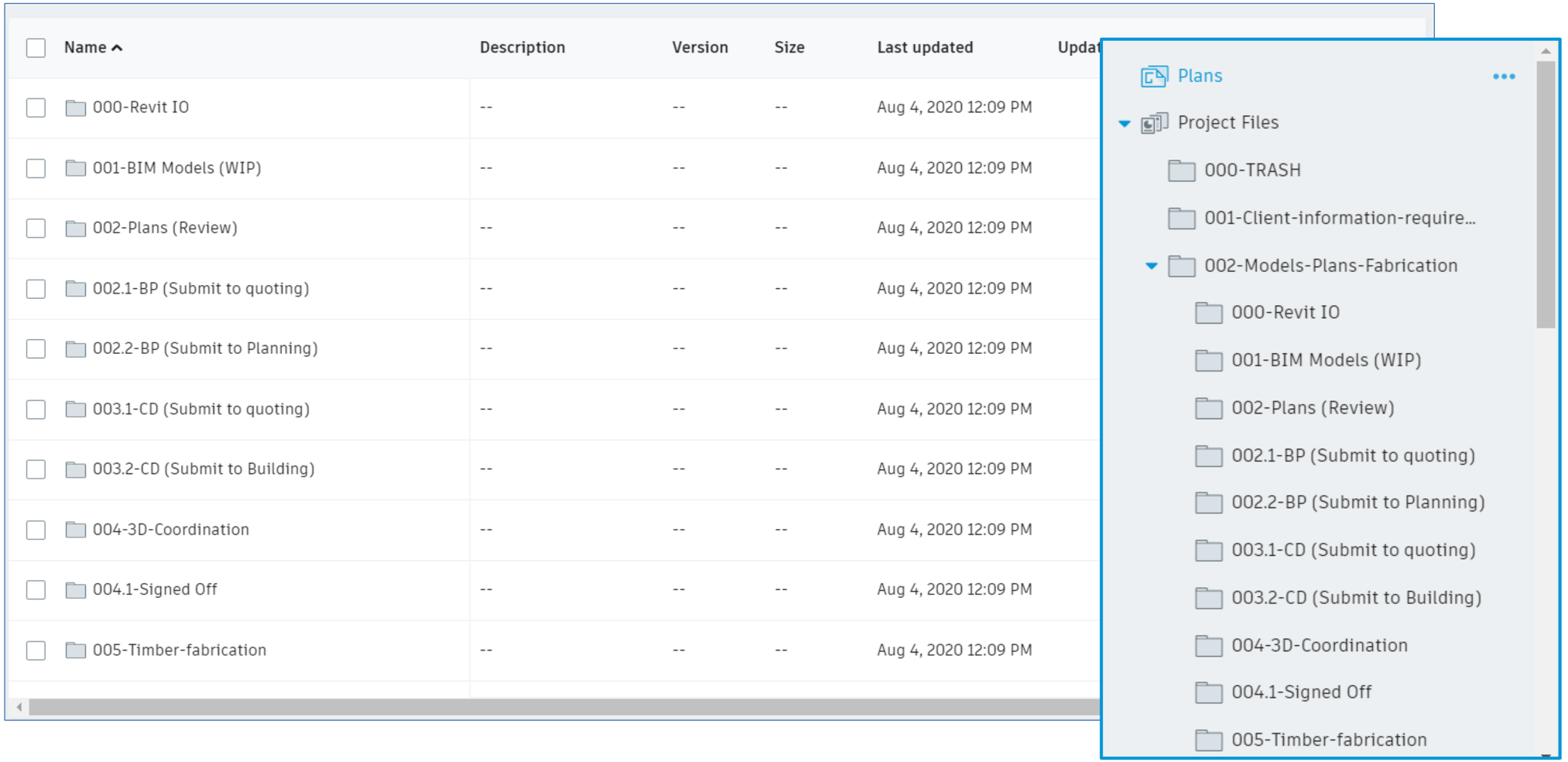
Shedmate Registration



BIM360 Integration

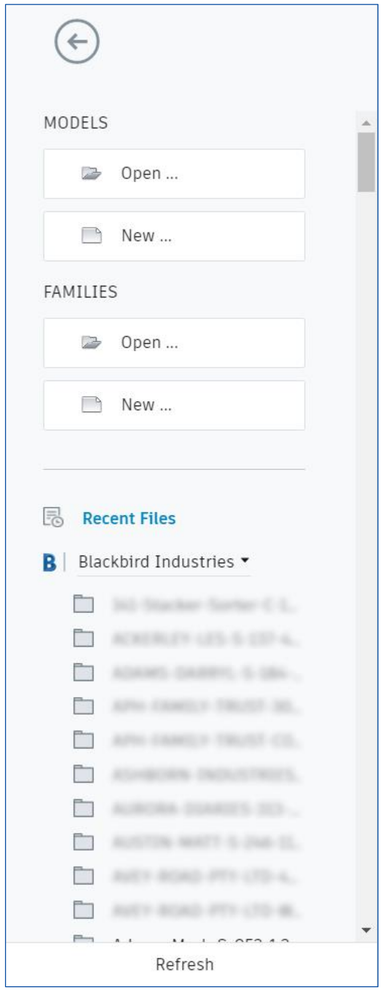


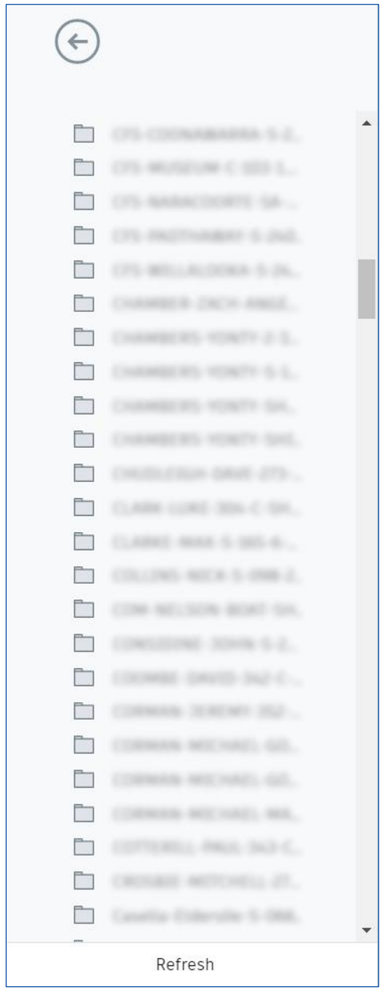
BIM360



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

BIM360


MODELS
Open ...
New ...
FAMILIES
Open ...
New ...
Recent Files
Blackbird Industries
Refresh


Refresh

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

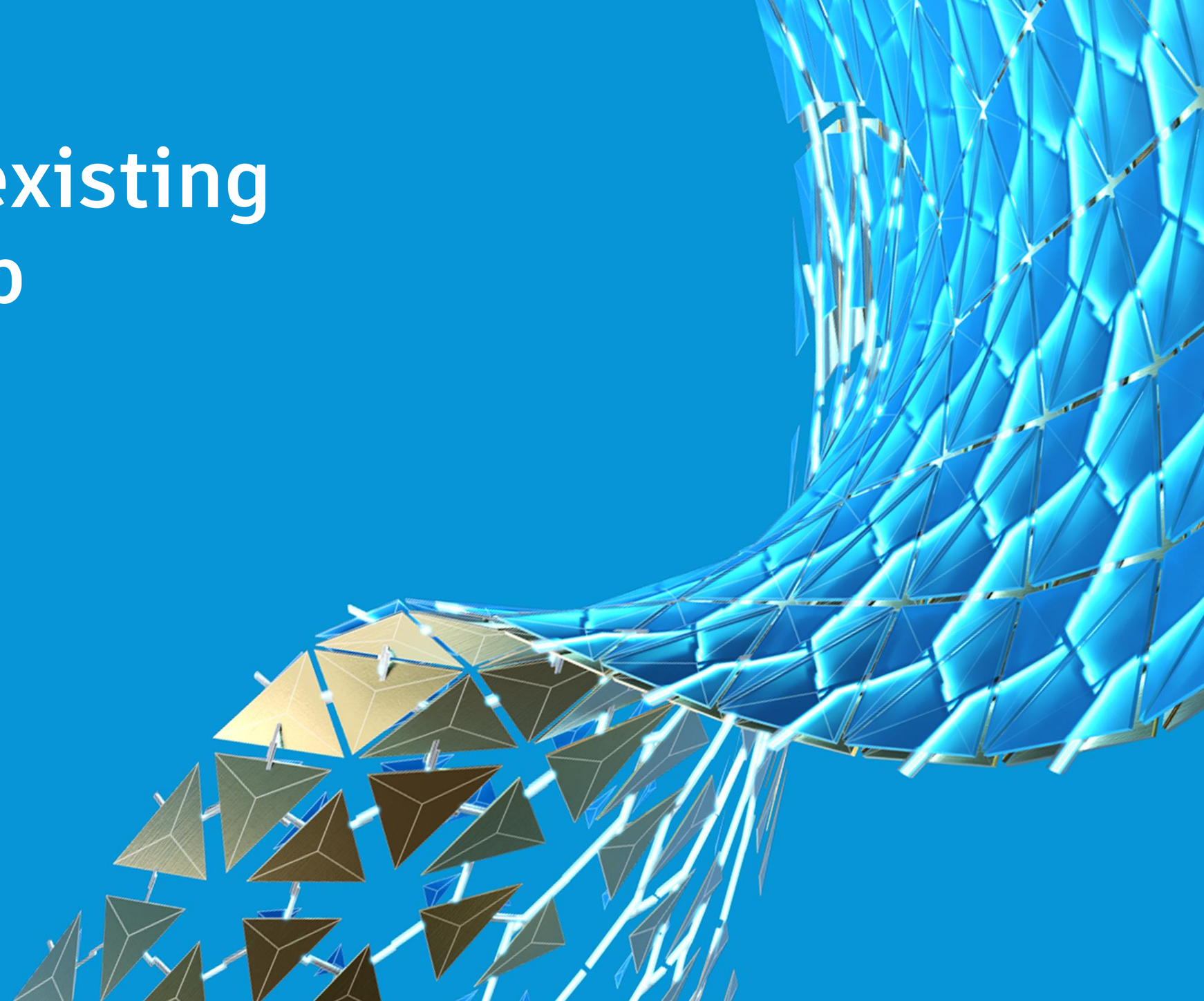
Activities

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

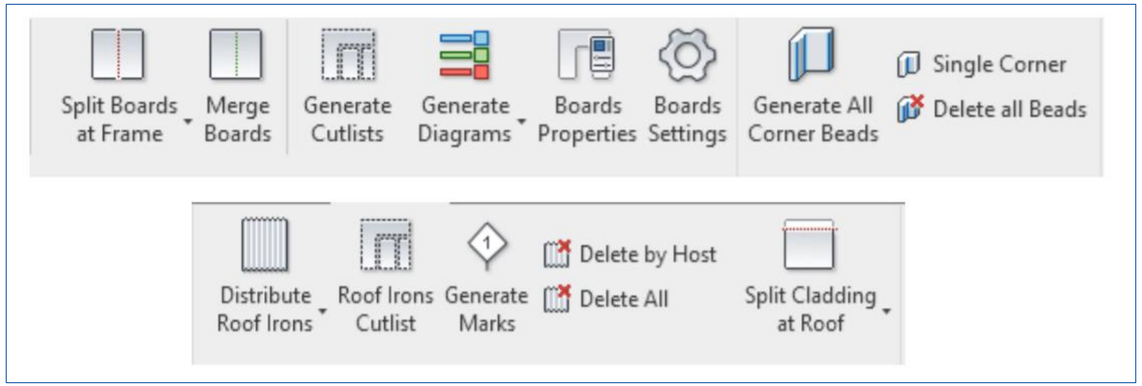
Work Item

- 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

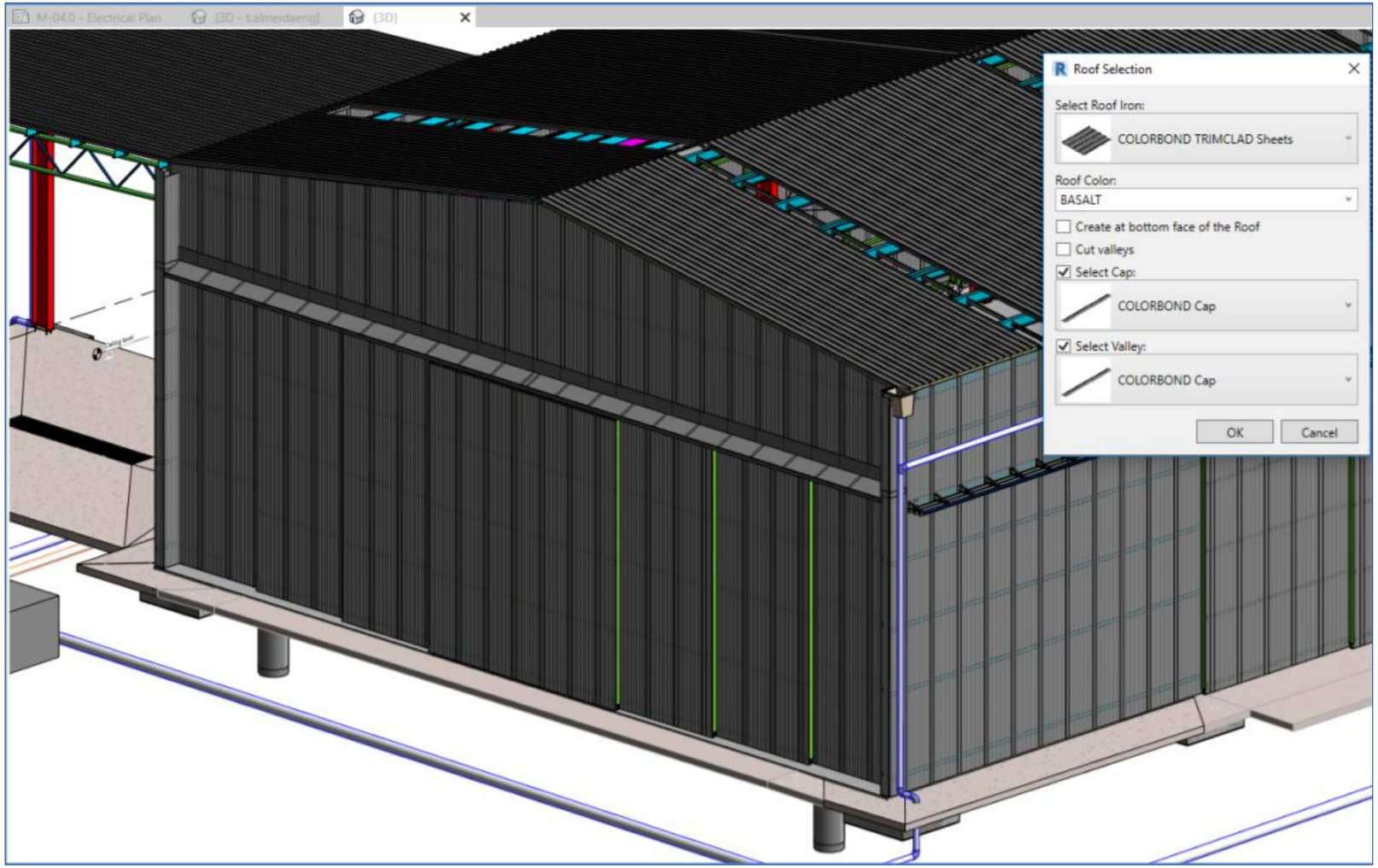


Design Automation API



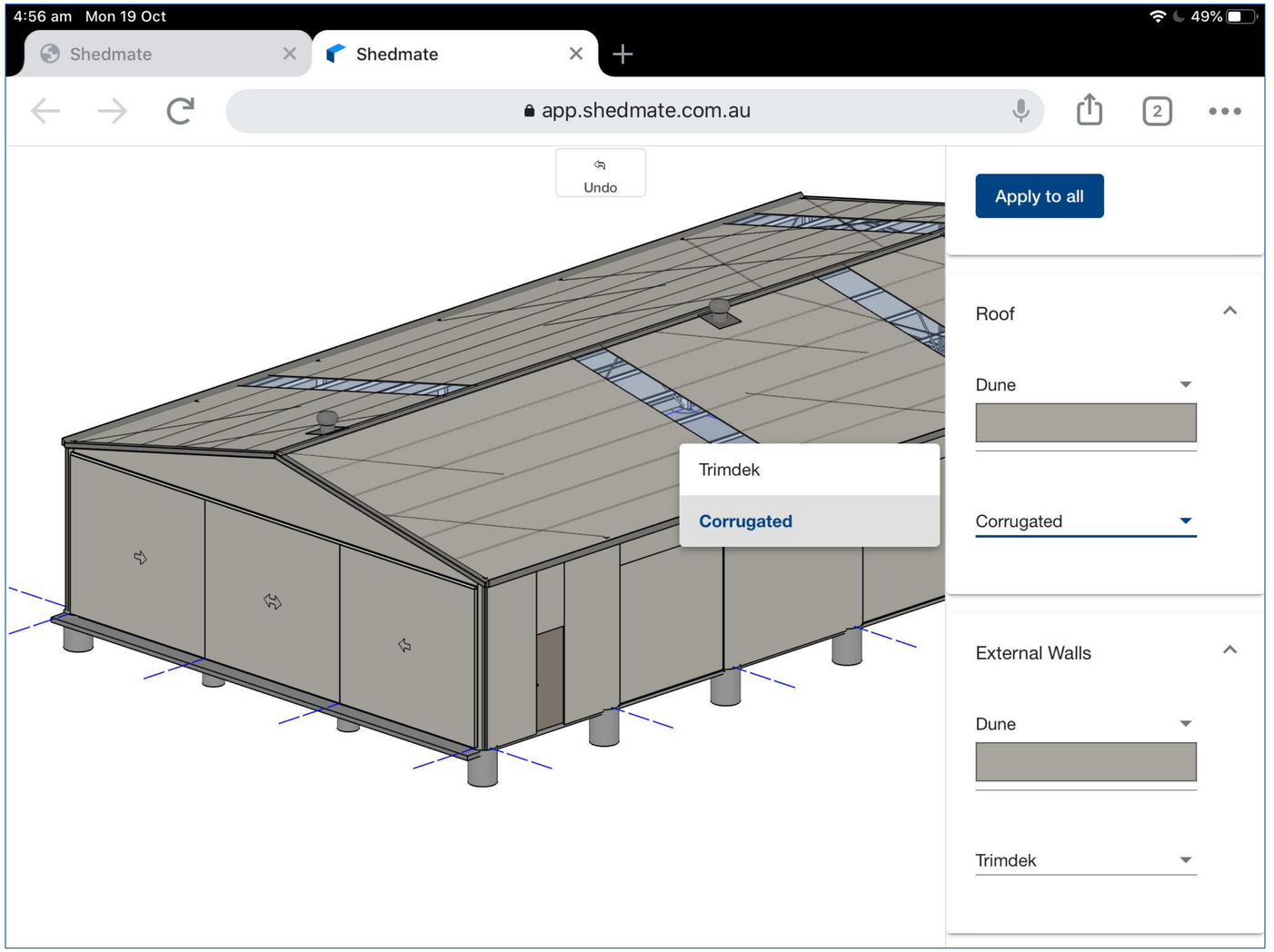
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



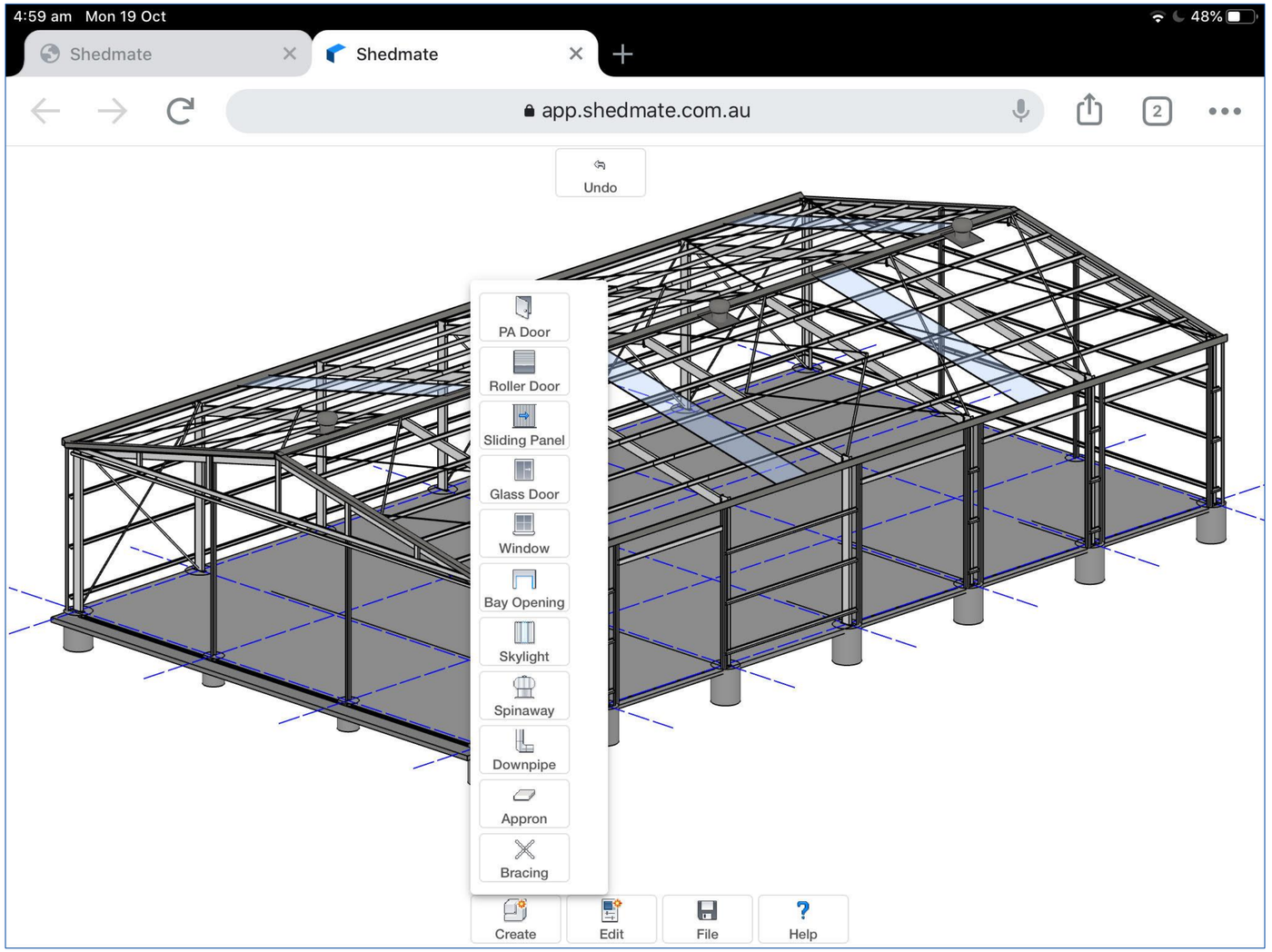
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



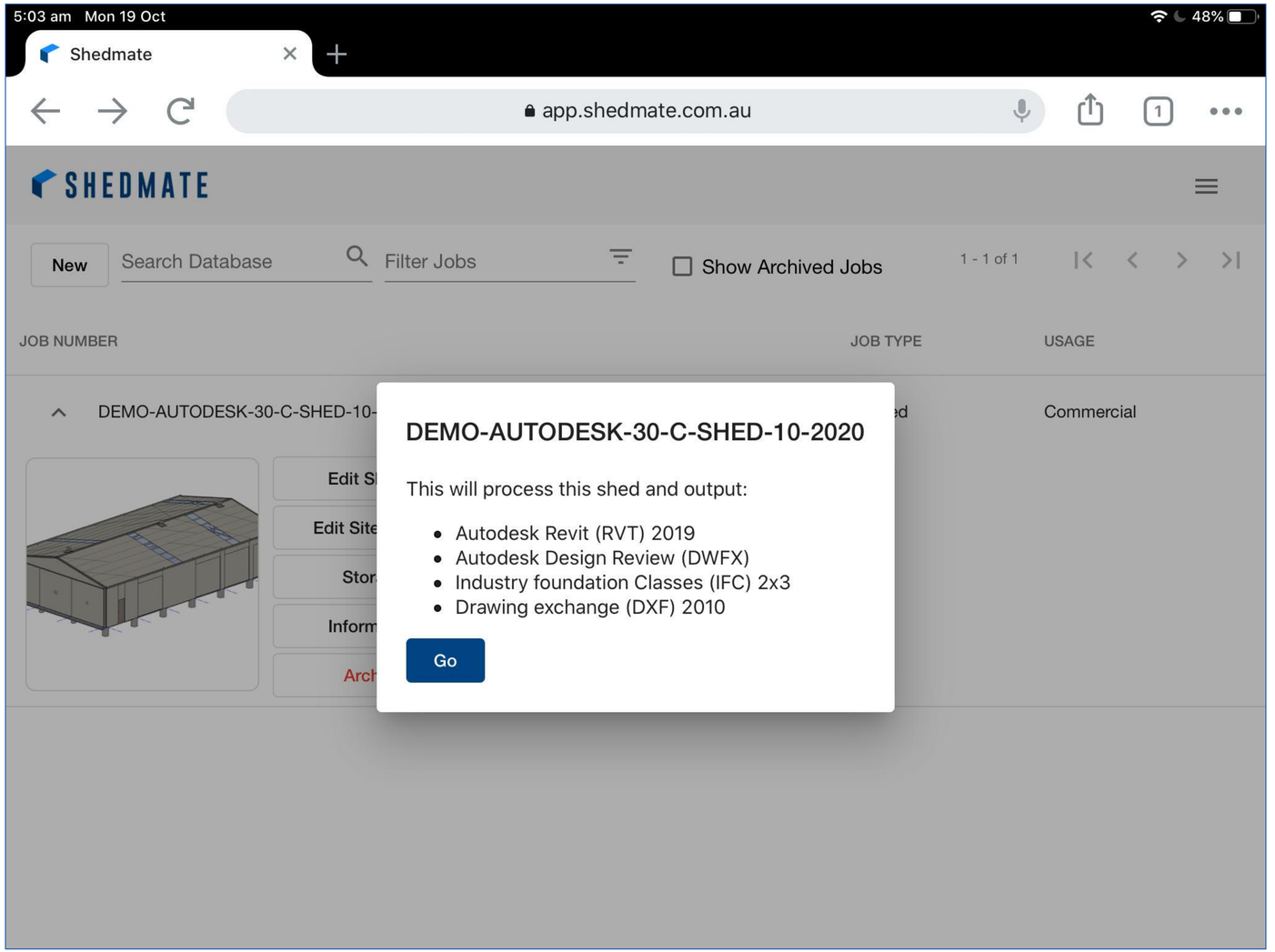
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API



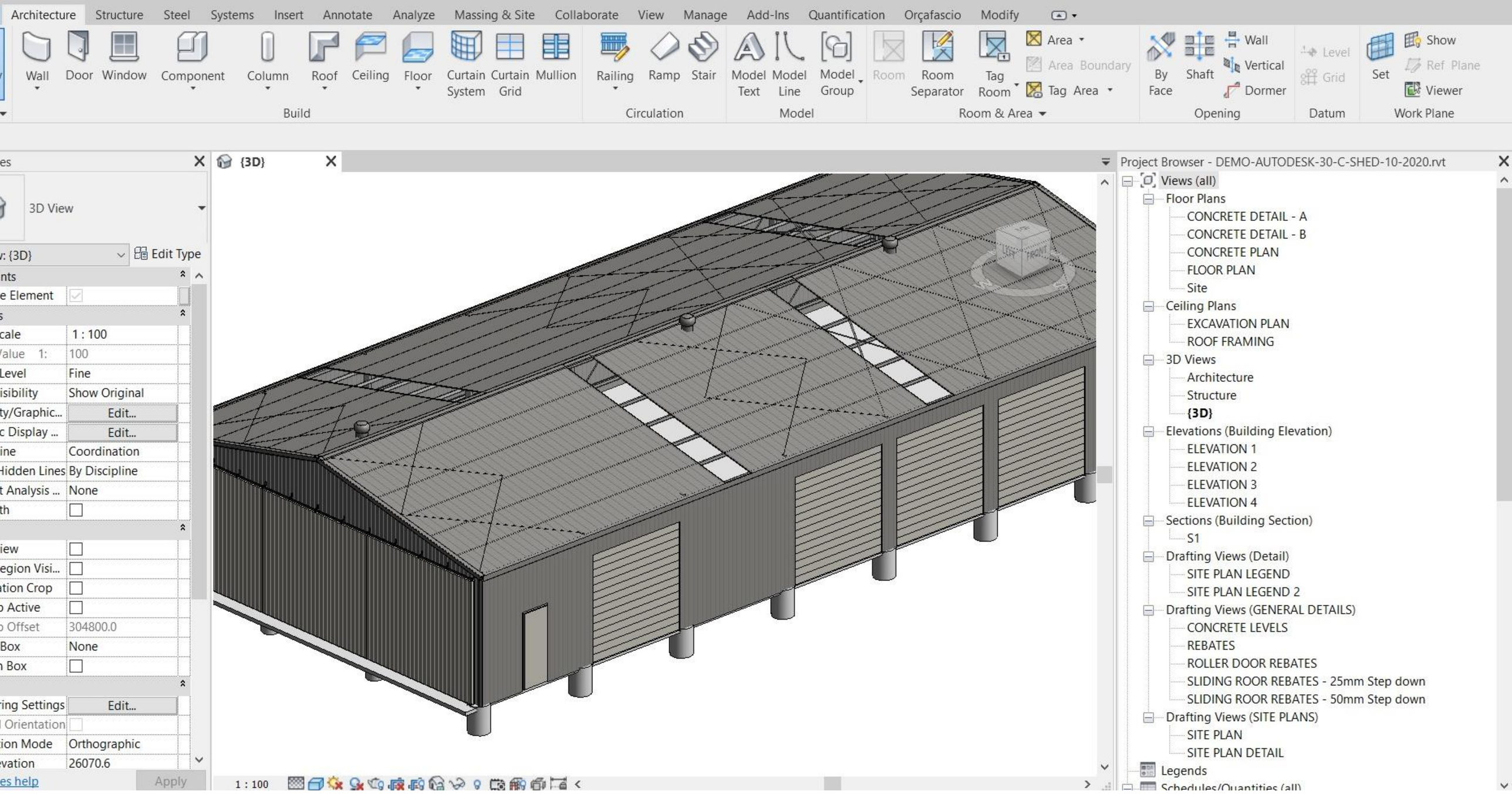
Example of a desktop (Revit Addin) that was ported to D.A.

Design Automation API

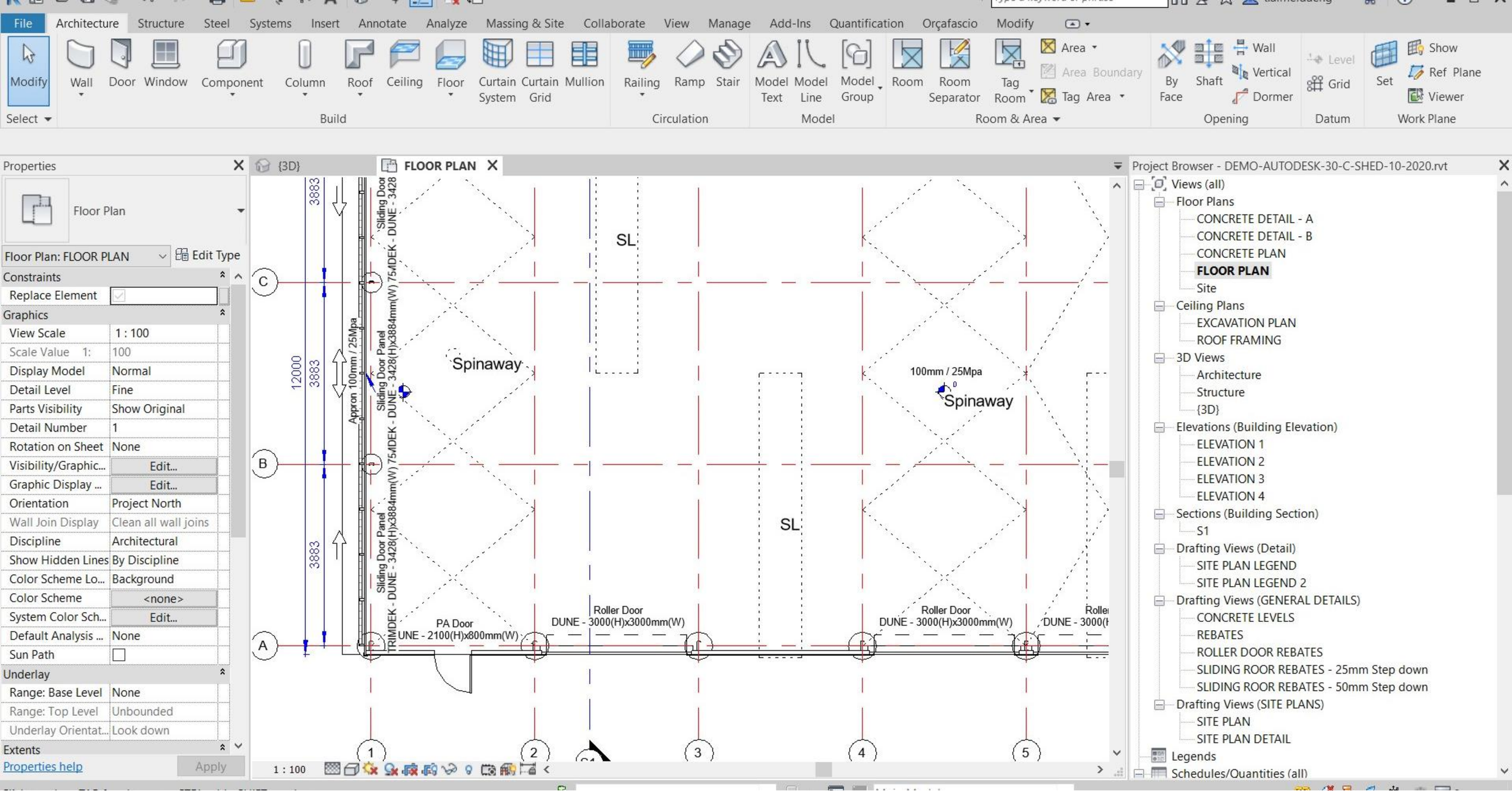


Sending Information to D.A.

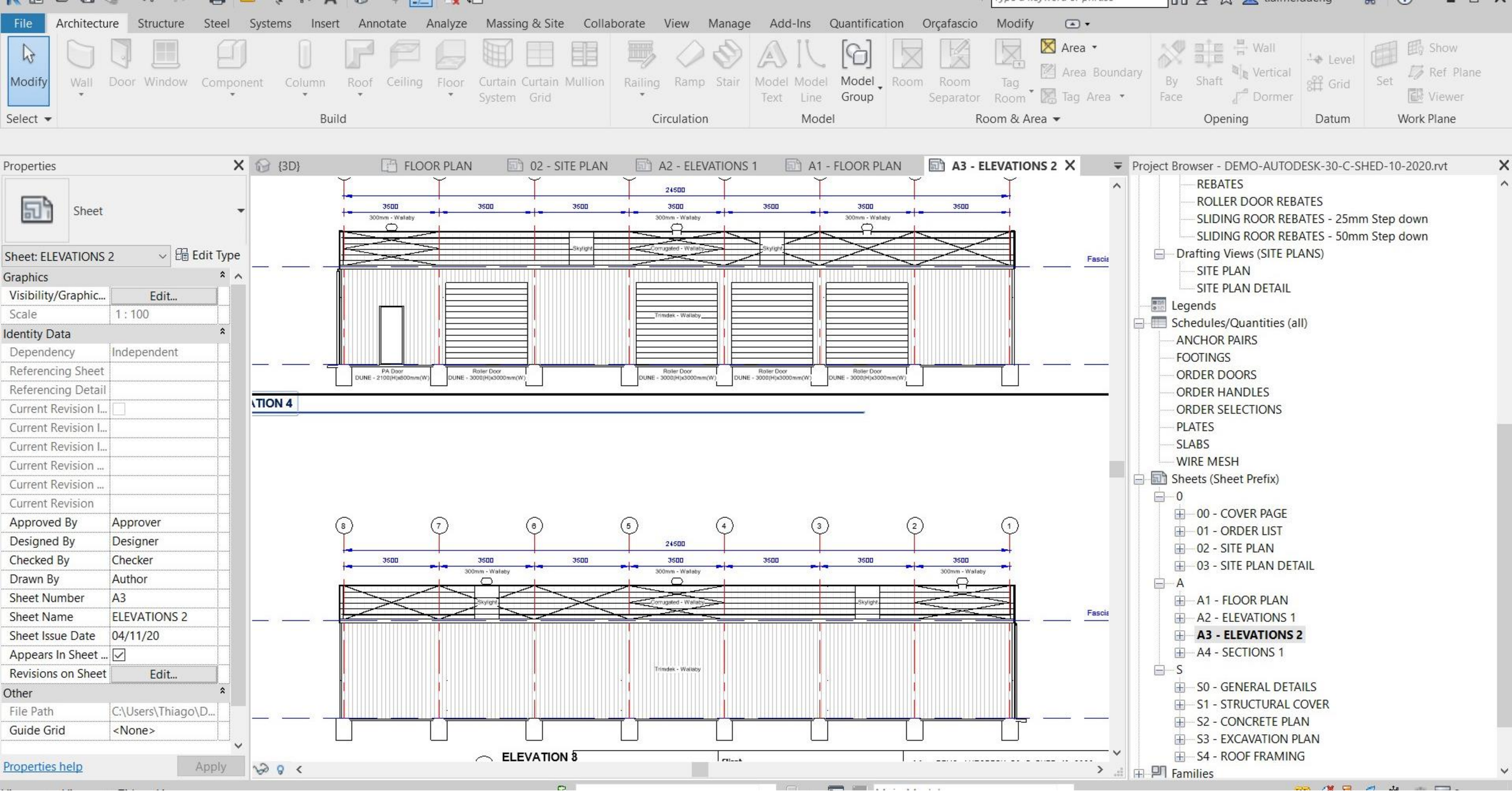
Demo



Resulting Revit file from D.A.



Resulting Revit file from D.A.

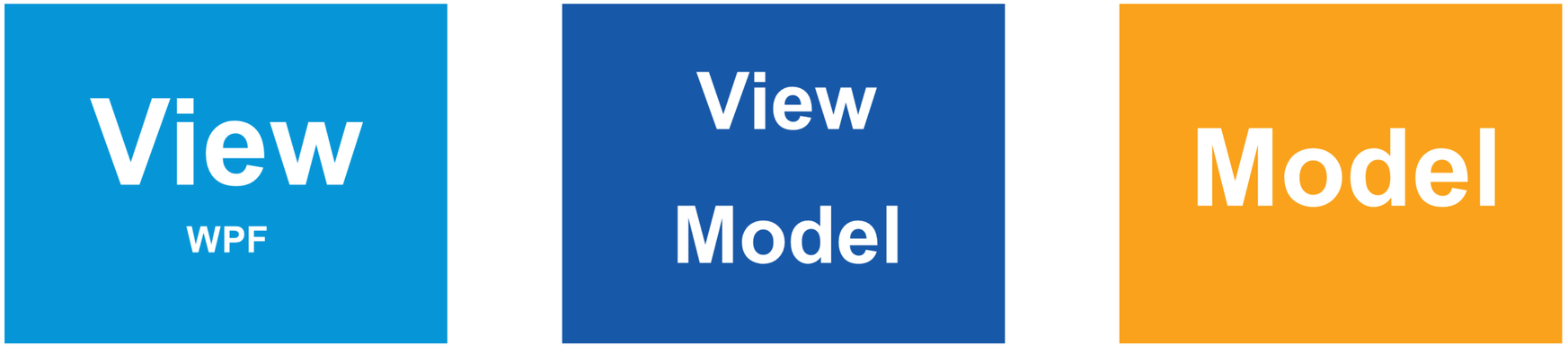


Resulting Revit file from D.A.

So how did we managed to do that?

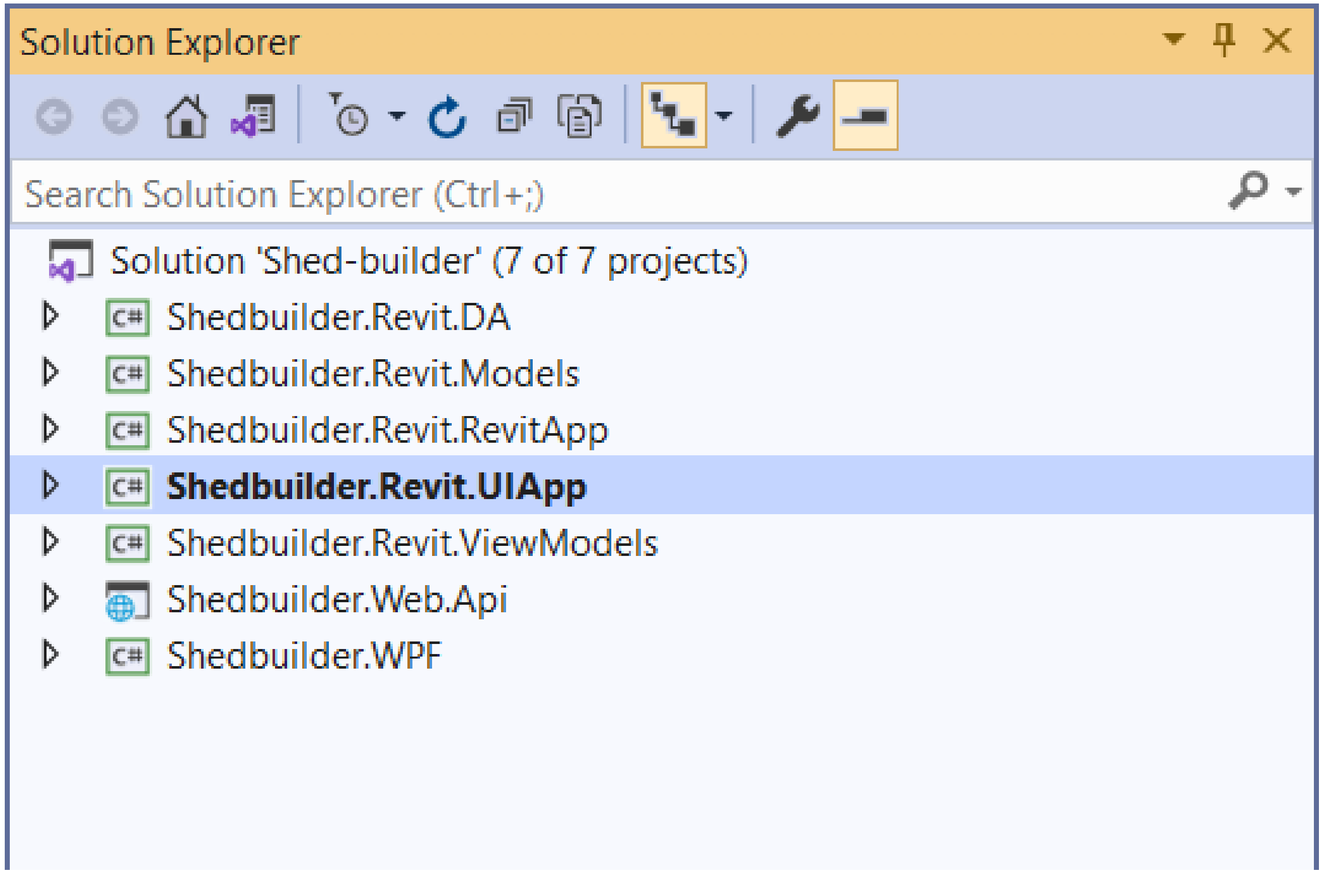
Software Architecture

The MVVM Pattern



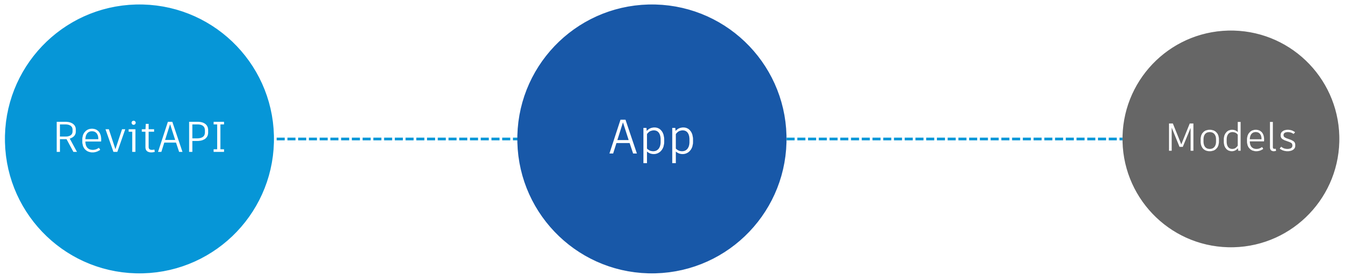
Software Architecture

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

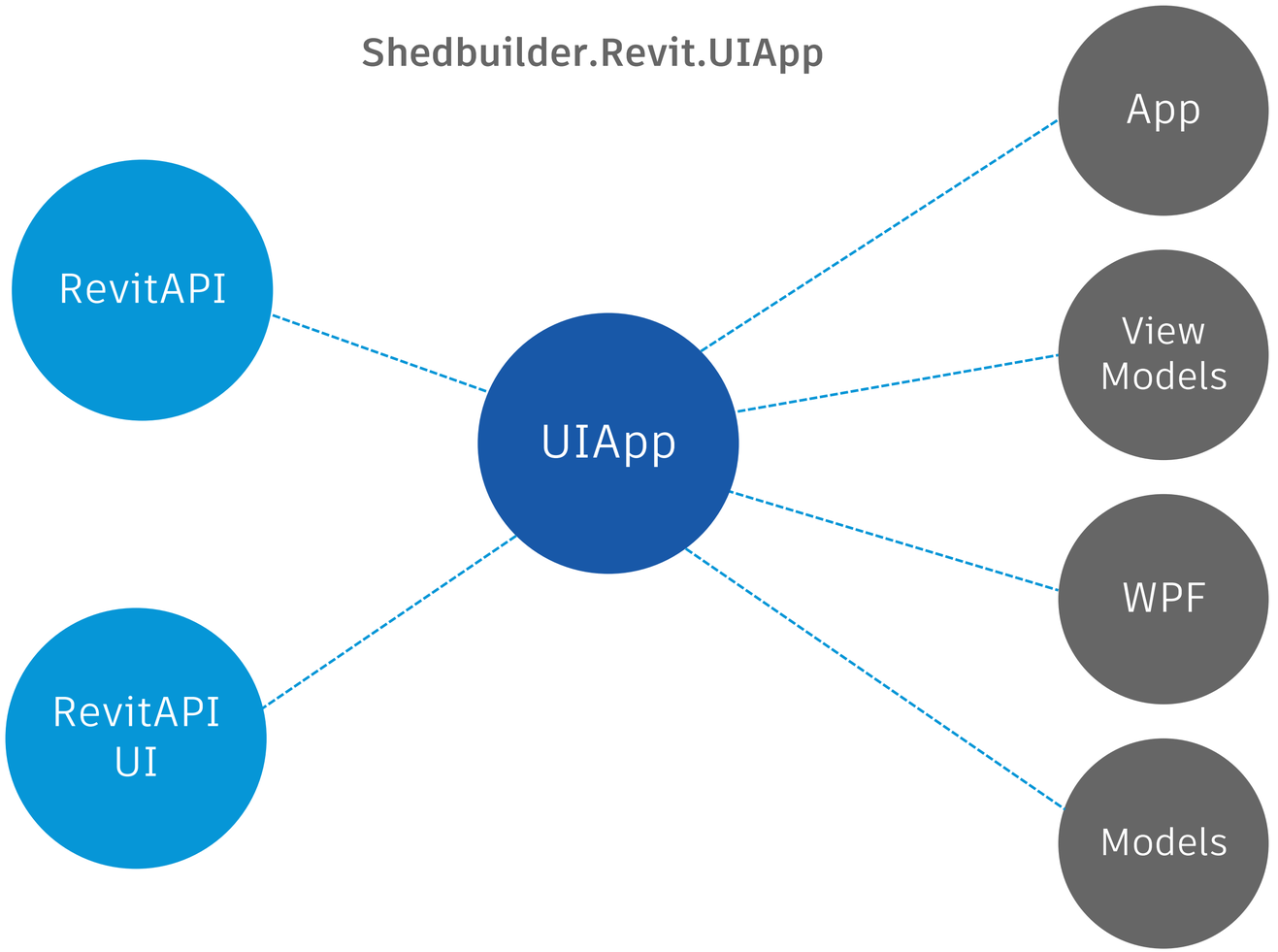


Software Architecture

Shedbuilder.Revit.App

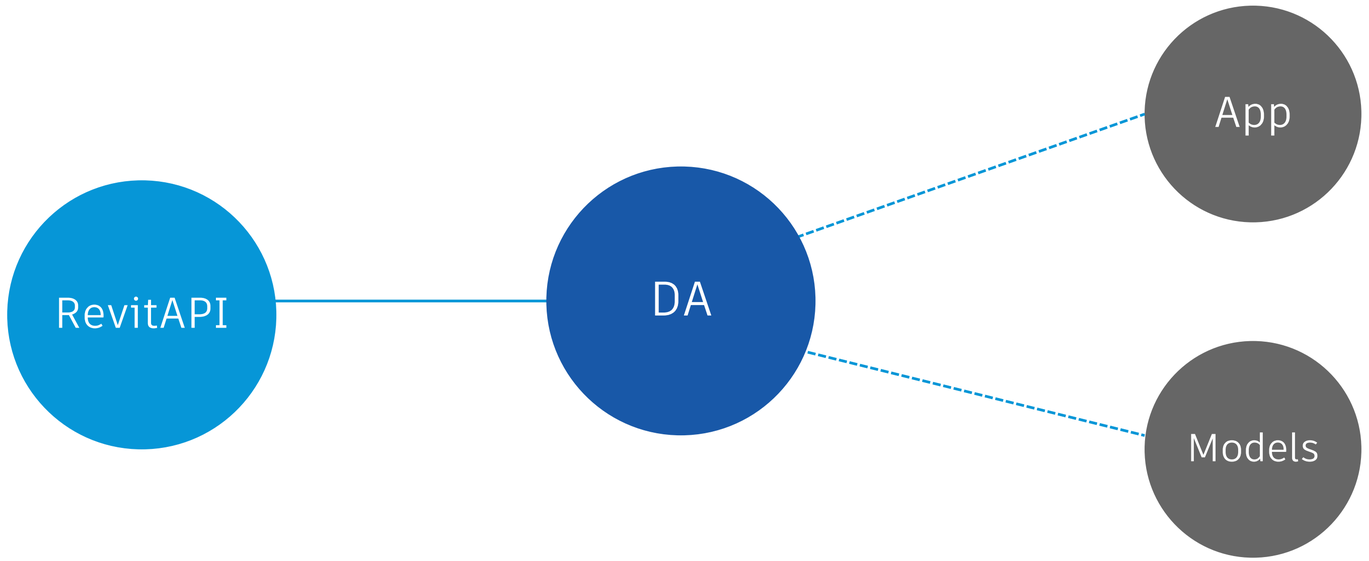


Software Architecture



Software Architecture

Shedbuilder.Revit.DA

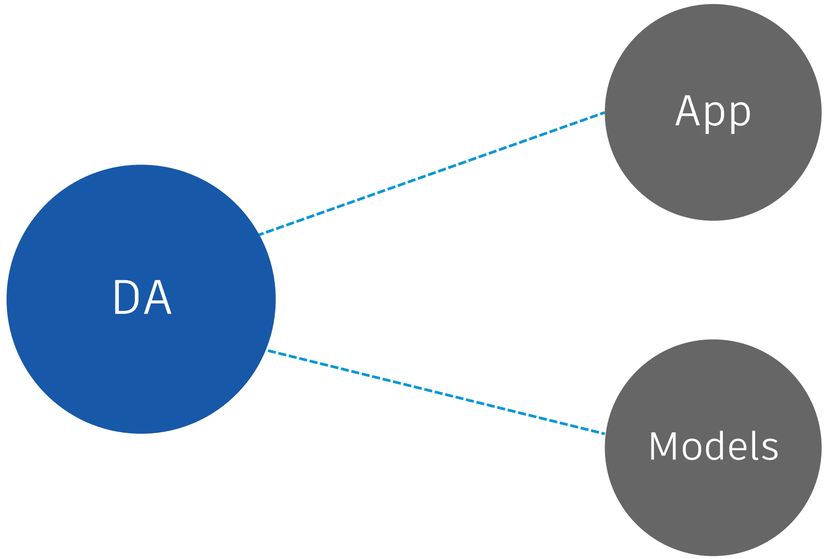


Shedbuilder.Revit.DA

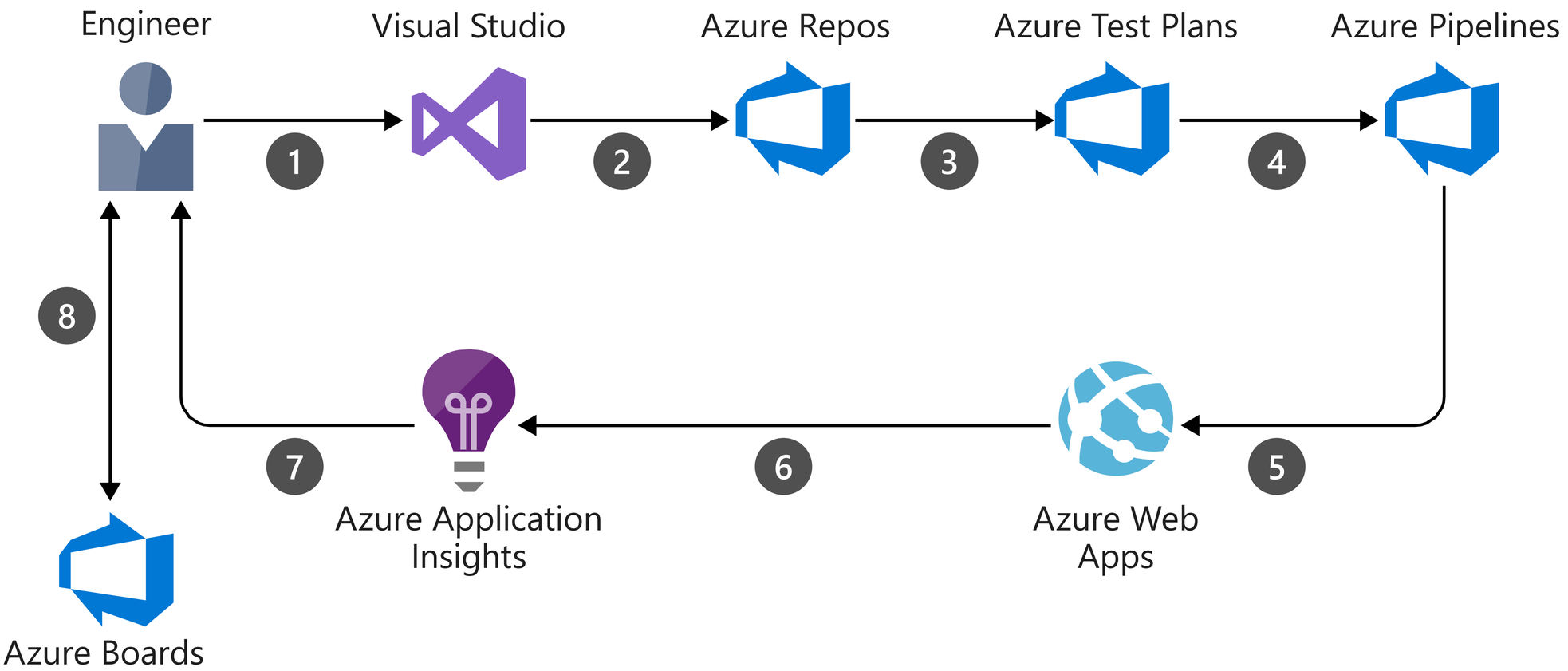
- Deserializes the a input json file into a data model
- Creates the site plan and its details
- Creates the shed
- Creates plans, elevations and section detailing
- Puts everything in sheets with correct scale
- Saves the file that will be used as output

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!