



FDC125679

Demystifying the BIM 360 and Forge APIs

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Learning Objectives

- Understand the relationship between Forge and BIM 360
- Understand the basic structure of the Forge Data Management API
- Learn how to use the Forge Data Management API to access and modify BIM 360 Docs data
- Understand current capabilities and limitations of the API to access BIM 360 Docs

Description

Are you interested in learning BIM 360 and Forge, but not sure where to start? Are you feeling confused about how Forge APIs work together to give you access to your BIM data? If so, this class is for you. In this session, we'll look at the Forge API from the view of BIM 360 products and provide you with the foundational knowledge for you to implement powerful applications and workflows using these APIs.

Your Forge DevCon Expert

Mikako Harada works as an AEC technical lead and Americas manager for the Developer Technical Services (DevTech) team at Autodesk. She provides API (Application Programming Interface) technical support to the members of Autodesk Developer Network worldwide for AEC products. Prior to joining Autodesk, she worked as a researcher for the Swiss Federal Institute of Technology (ETH) in Zurich. While at ETH, she worked with projects involving the development of web-based collaborative environment with the Swiss building industry and web-based visualization projects for business data archive systems, aiming to enlarge our knowledge by providing a means of visualizing a large amount of information. She was also a researcher at Engineering Design Research Center in Carnegie Mellon University (CMU), Dr. Scott Fahlman's lab (who is known as the father of Common LISP and the person who first sent the smiley face on the Internet), and Artificial Intelligence Cognitive Systems group at General Motors Technical Center. Her interests is in the areas of interactive techniques, optimization and layout synthesis.



Prerequisite

This class assumes the basic knowledge of web services and REST API, and familiarity of BIM 360 products.

Agenda

- Session Goals
- BIM 360 products family overview
- API for BIM 360 Docs - big picture
- Closer look at the API
 - OAuth
 - BIM 360 account level API
 - Data Management API
 - Model Derivative API
 - Viewer
- Commonly asked questions
- Summary
- Q&A

Session Goals

By the end of this session, I hope you will get the basic picture of what Forge API is about with respect to BIM 360, and you can dive into writing code with it.

- Give an overview of BIM 360 product families
- Give an overview of API structure and design
- Points to commonly asked questions

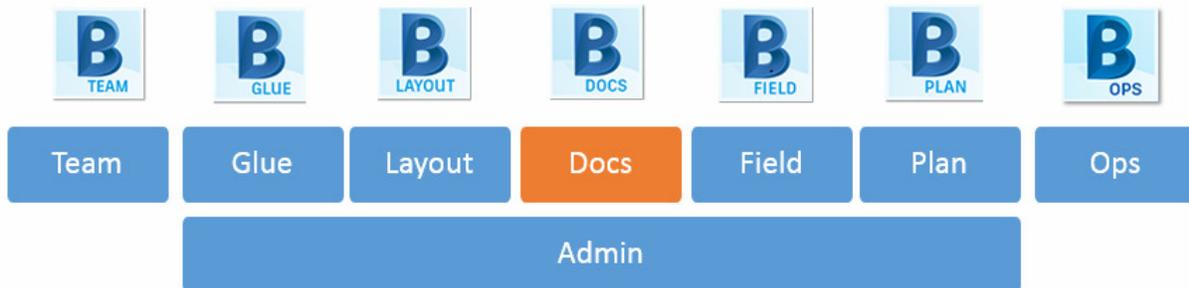
For those who has attended my session last year, “*Introduction to BIM 360 Docs API*”, this is an updated version. The big difference is – API is officially released this year!

BIM 360 Products Family Overview

Before we dive into API discussion, let’s first look at where we are with BIM 360 family products. Currently, we have the following products under BIM 360 branding, or if I may put it this way, under BIM 360 umbrella:

- BIM 360 Glue
- BIM 360 Field
- BIM 360 Layout
- BIM 360 Plan
- BIM 360 Docs
- BIM 360 Team
- BIM 360 Ops
- (BIM 360 Admin)

Note that Ops is formally known as Building Ops, and is now branded as BIM 360 and officially a part of BIM family cloud products. BIM 360 Team is used to be called A360 Team. Autodesk rebranded and we have two offerings: Fusion team and BIM 360 Team. Admin is not a product name as is. Rather, it a feature that controls an account and project level access across BIM 360 product except Ops and Team. The figure below depicts the structure of BIM 360 family products as of this writing:



BIM 360 Products API Today

In terms of API, following lists the status of API:

- BIM 360 Docs – Forge API
- BIM 360 Team – Forge API
- BIM 360 Admin – Forge API
- BIM 360 Glue/Layout – not Forge API except Admin functionality
- BIM 360 Field – not Forge API except Admin functionality
- BIM 360 Plan – no API
- BIM 360 Ops – no API

Note that Glue and Field have API, but they are not a part of Forge.

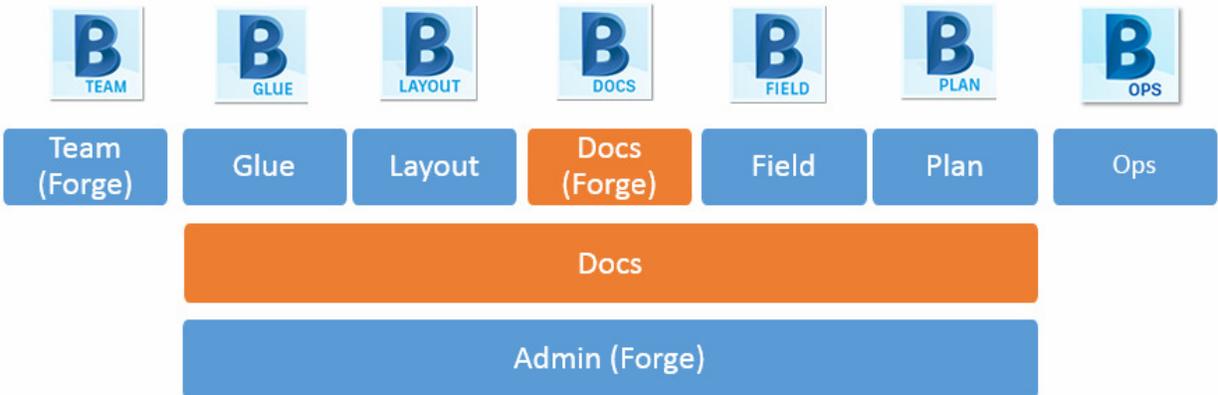
So, what is Forge?

Forge or [Autodesk Forge](#) is a collection of web services that allows you to build your own applications and services to work with design data. Forge is the technology that Autodesk is using internally to build its own products. Autodesk is sharing it to the 3rd party developers by providing the API. We'll come back to this with more detail shortly.

BIM 360 Docs as Data at the Center

Historically BIM 360 family products being acquired products, each product run very much separately. In a long term, we would like to have seamlessly integrated, unified BIM 360. You probably have seen changes, such as admin feature, which are common across BIM 360 family products now. You probably heard about Next Generation Filed and Glue, and I expect there are sessions about them during this year's AU as well.

Our view for future is to have more data centric architecture where the data and models stored in Docs are shared across BIM 360 family product services and beyond through Forge API. The image below depicts the architecture.



API for BIM 360 Docs – Big Picture

API's for BIM 360 Docs is a collection of Forge API's. There is no single set of API specifically for BIM 360 Docs. This is different from traditional desktop API if you are familiar with Revit API and AutoCAD API. As I mentioned earlier, Forge is a collection of web services that Autodesk is using internally to build their own product. BIM 360 Docs is a good example of such a product. The following is the list of Forge API that you can use with Docs:

- Authentication (OAuth)
- BIM 360 API (Account and project administration)
- Data Management API
- Model Derivative API
- Viewer
- (Issues API) *¹

*¹) The last item, **Issues API**, is to access Issue related data. I put it in brackets because we talked about it in the past, yet this is not officially released. I hear the product team is planning to cover this and a few other APIs at Forge Roadmap session (FDC125725 and FDC128455).

Authentication or **OAuth** is to control the user and application access to a specific account. When the user first accesses to <https://bim360docs.autodesk.com>, for example, a login window appears and requests for user id and password. OAuth API is used for this type of user access. This is a common component that across the Autodesk products uses.

Sign in



Email or Username

NEXT

NEW TO AUTODESK? [CREATE ACCOUNT](#)

BIM 360 API, or **Admin API**, gives full control over Account and Project Administration feature. This is specific to BIM 360 currently.

AUTODESK BIM 360 | Autodesk Forge Partner Development
? 

Account Admin
PROJECTS
MEMBERS
COMPANIES
ANALYTICS
SETTINGS
APPS

Project Directory

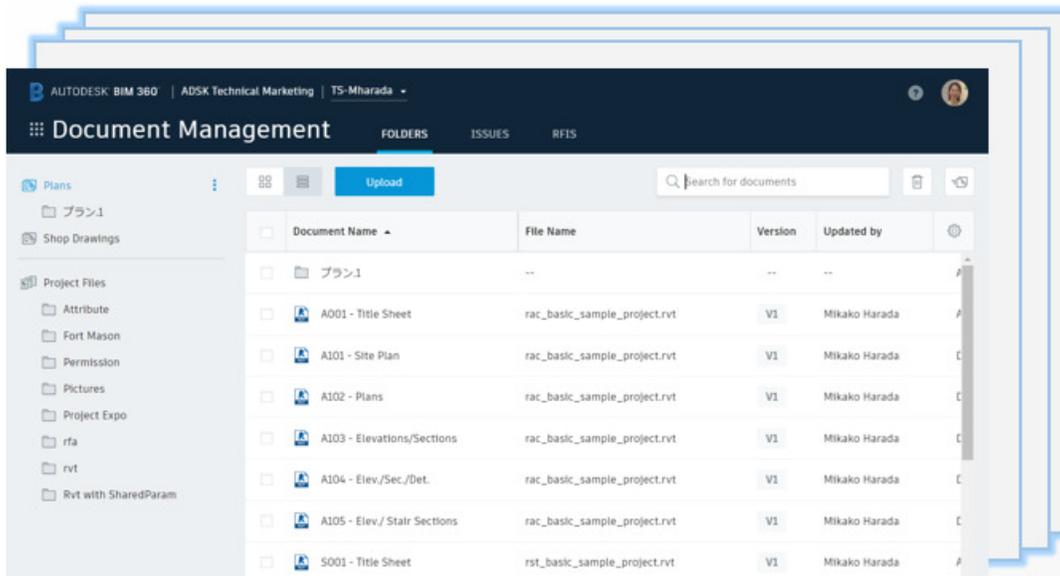
Add



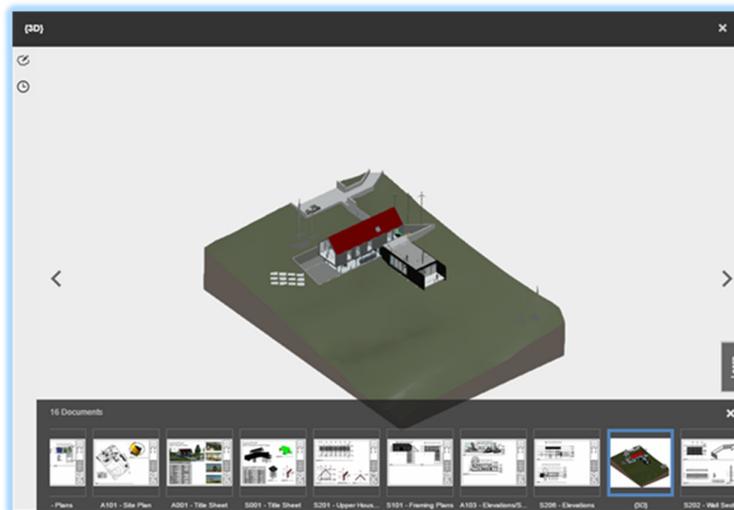
29 Current Projects | [View Archived](#)

Name	Members	Companies	Project Status	Last Sign In	
 Forge Demo AG	1	1	Active	Oct 31, 2017	<div style="font-weight: bold; font-size: x-small;">STATUS</div> <div style="margin-top: 5px;">Active 27</div> <div style="margin-top: 5px;">Inactive 2</div>
 Forge Demo AN	4	1	Active	Nov 3, 2017	
 Forge Demo DevTech	13	1	Active	Nov 3, 2017	
 Forge Demo EK	1	1	Active	Nov 5, 2017	

Data Management API, DM for short, gives an access to projects, folders and items stored in Docs.



Once you get to an item that represent a design data, you can use **Model Derivative API** to access to the model data. Model data could be geometry as well as meta data, such as properties attached to a certain element in Revit. You can also use **Viewer** to view it.



Closer Look at the API

Now that we understand what Forge means for Docs, let's take a closer look at each of building blocks, a.k.a., Forge API.



OAuth

OAuth, or OAuth 2.0 in more precisely, is an open standard for authorization commonly used for internet users to login to a third-party website and to integrate third party web services applications. There are two types of authentication mechanism on Forge:

- [2-legged](#)
- [3-legged](#)

2-legged OAuth2 is used for integrating at application level. For example, if the owner of the business wishes to integrate their ERP (Enterprise Resource Planning) system with the Admin or Docs at an enterprise level, 2-legged is used. We call it business-to-business integration. It uses on Client ID and Secret that you obtain from developer.autodesk.com. Client ID and Secret is used like ID and password between two services.

3-legged OAuth2 is used for user context. 3-legged authentication method re-directs the user to Forge authorization server. Once the user is verified by signing in successfully and the user agrees to authorize the app to access their data, the app receives an access token which is valid for a short period of time. This way, the user does not need to expose password to the 3rd party apps. The name 3-legged comes from the fact that there are three parties involved to get authentication: the user, 3rd party app and Forge authentication server; while 2-legged between an app and authentication server.

BIM 360 Docs will provide both types of authentication methods, while Admin API is 2-legged only. BIM 360 Team provide 3-legged only. Registration of your app will be done by account admin in Admin UI or by invitation by the account admin. We will look at this in BIM 360 or Admin API section shortly.

Attention: 2-legged Authentication is very powerful and gives you a super admin right; i.e., you will have access to all the data in the given account. We strongly recommend to use 3-legged authentication where possible.

Documentation:

<https://developer.autodesk.com/en/docs/oauth/v2/overview/>

More about OAuth2:

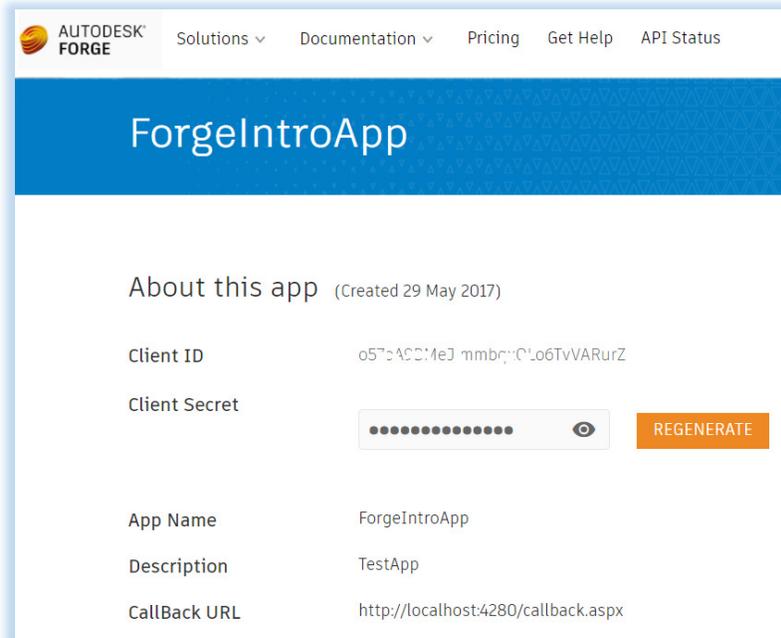
- <https://en.wikipedia.org/wiki/OAuth>
- <https://oauth.net/>

My Apps Portal

To use API, you need Client ID and Client Secret. You can obtain them from My Apps portal:

<https://developer.autodesk.com/myapps>

And you register your app:

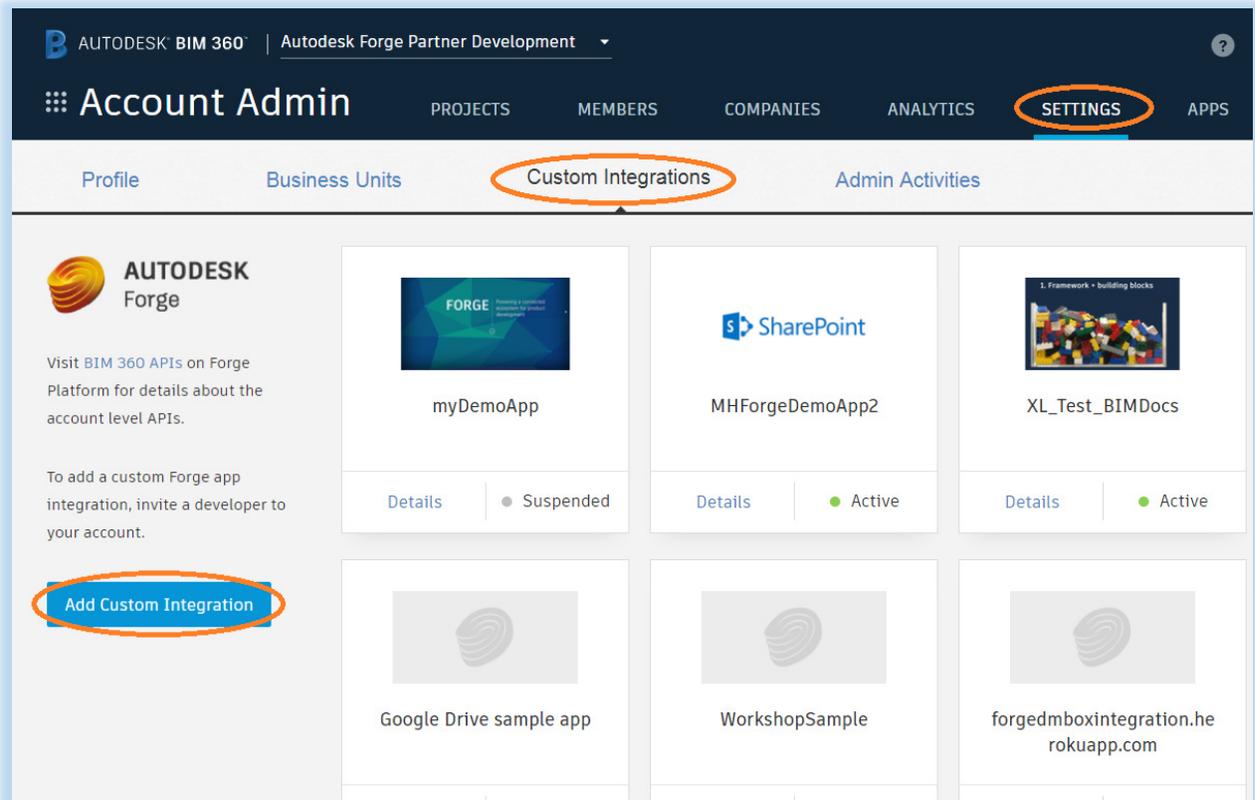


Keep your client ID and Secret at the safe place. **Do not share your secret.**

BIM 360 or Admin API

BIM 360 or Admin API is the API to control account and project level administration feature, and is a part of Forge that is specific to BIM 360. Admin API gives comprehensive set of API for Account level feature. (However, the project level feature is still to come.) To use Admin API, there is an important step that you need to go through; exchange of your developer Client ID and account ID in the account Settings. Here is how:

1. Log into your BIM 360 Admin: <https://admin.b360.autodesk.com/>
2. If you have more than one account, choose the account that you want to integrate your application.
3. Go to Settings tab.
4. You should see another layer of tab. With in it, "Custom Integrations" tab.
5. Click on "Add Custom Integration" button to register your app for the specific account. Then, follow the instruction.



This step allows your app to access the given account. Note that as of this writing, BIM 360 API or Admin API only allows 2-legged authentication which is meant for a business to business integration or enterprise application level integration. 3-legged authentication, which is for user context, is expected to come in future. For more detail about Custom Integrations, please refer to the product help: [To Add Apps & Integrations](#)

The API access for Docs are done in a similar manner. With Docs, however, both 2-legged and 3-legged authentications are supported.

Data Management API

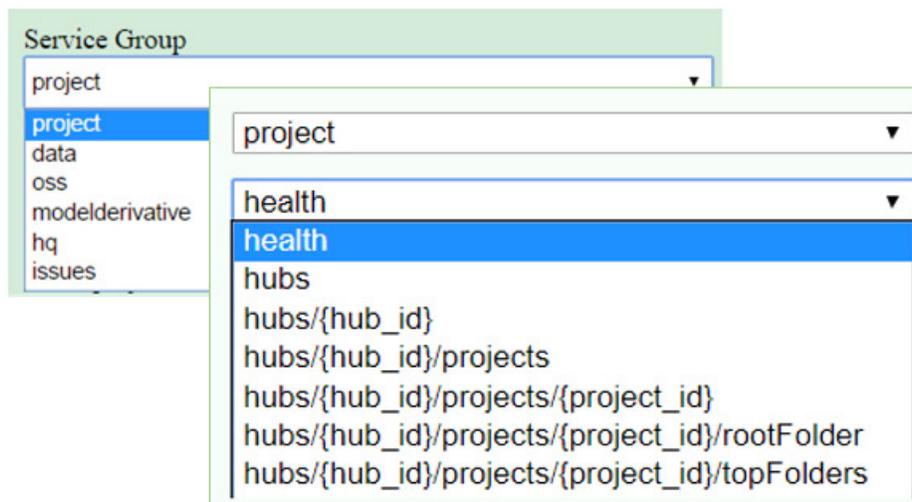
Forge Data Management API (or DM for short) is the core component for BIM 360 Docs. DM API is designed so that exactly the same API works across other Autodesk web services products, such as:

- A360
- Fusion 360
- Fusion Life Cycle (formally known as PLM 360)
- BIM 360 Docs
- Consumer products (e.g., Tinker CAD)

DM API is composed of the following services:

- Project service
- Data service
- Object storage service (OSS)
- Schema services

Project services provide access to hubs and projects. Data services provide access to folders and files in a folder. Object storage services (OSS) allows an application to download and upload files. Schema services tells you the structure of extended data types, which could be additional data specific to Docs, for example. The image below illustrates a list of endpoints for Project services.

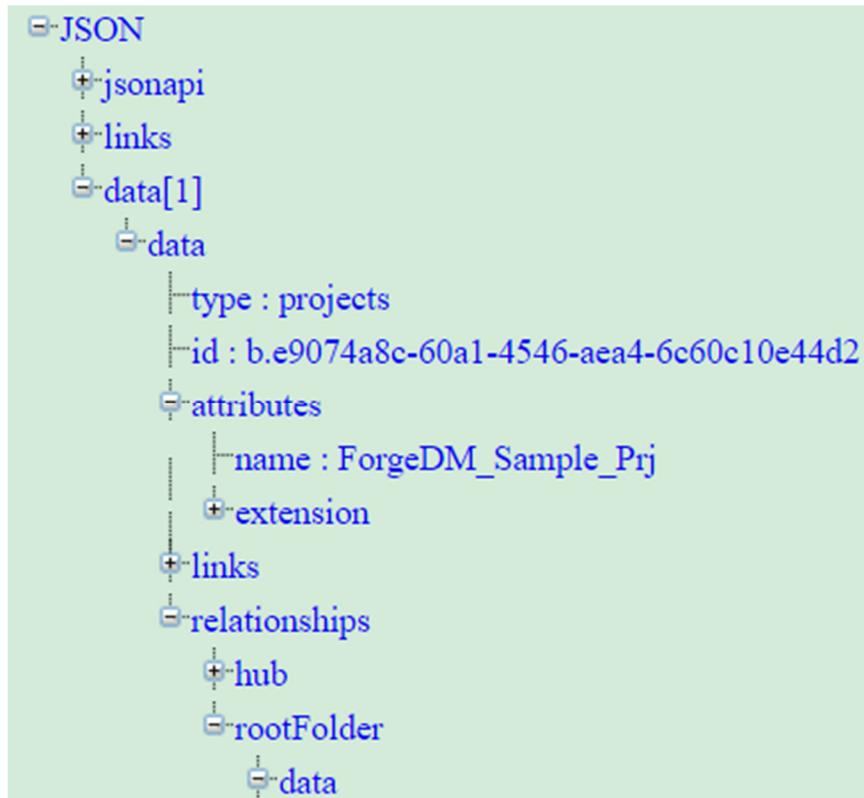


You can find more information about Data Management here:
<https://developer.autodesk.com/en/docs/data/v2/overview/>

The list of REST calls for DM API is found here:
<https://developer.autodesk.com/en/docs/data/v2/reference/http/>

JSON API: {json:api}

DM API (and also Model Derivative) uses so-called JSON API. JSON API is a strict form of JSON format. It is designed to be efficient transmitting data between clients and servers. At the top level, the response you will get typically looks like below. This is an example from calling hubs/{hub_id}/projects. You will see the same format when you use DM and MD. “extension” holds additional data that could be specific Docs.

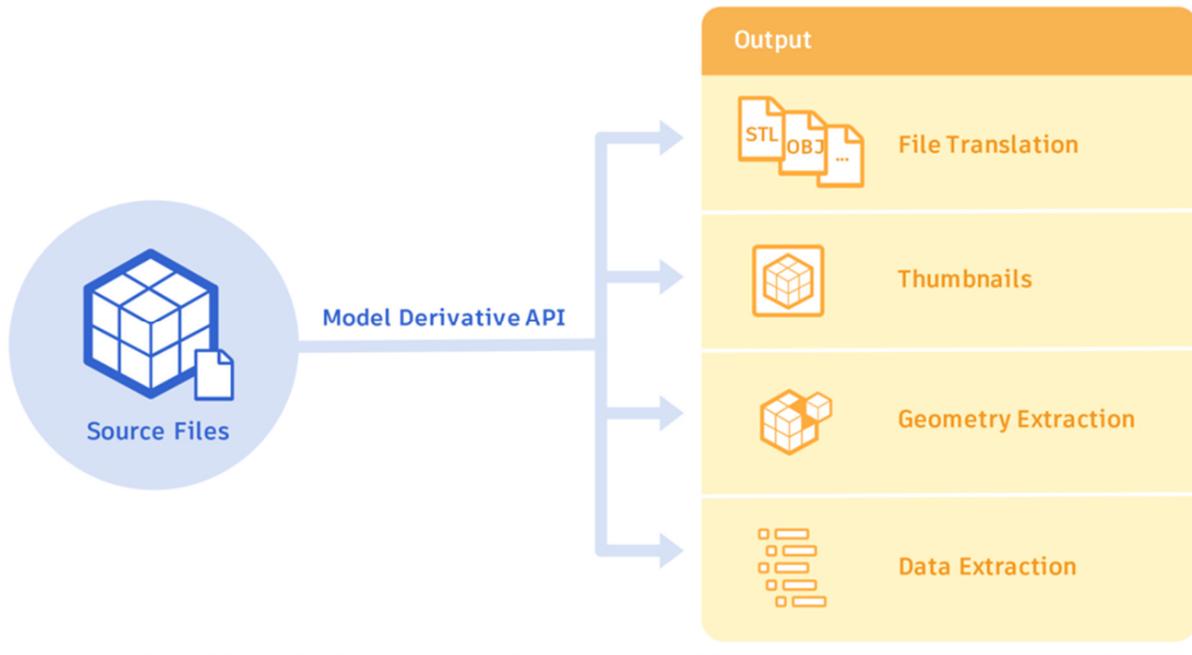


For more information about JSON API, please refer to: <http://jsonapi.org/format/>

Model Derivative API

Model Derivative API (or MD for short) is for all about model data. Once you have reached to a specific model data, such as Revit (.rvt) file, you can use MD API to get geometry and properties of a model as well as thumbnails. You can also use MD API to translate (or convert) a file. You can extract a portion of geometry from a given model. You can also search properties. Right now, File translation is still limited to small set of file types mainly to manufacturing products (e.g., stl, obj and svf). But we expect more supports are added gradually. You can find the list of supported translation formats here:

<https://developer.autodesk.com/en/docs/model-derivative/v2/overview/supported-translations/>



Viewer

Once you have a viewable data, (which is usually the case when you are accessing a model data in the Docs), you can use Viewer to view the model. For example, by drilling down the folder structure, you will find an item called "derivative". Using the derivate urn, you can view a model in a web browser.



Once you reach to a design data, the rest is up to you how you want to make use of the data you have access. Philippe Leefsma made an extensive collection of extension using viewer, such as annotations, docking panels, and materials, name a few. You can explore the collection here:

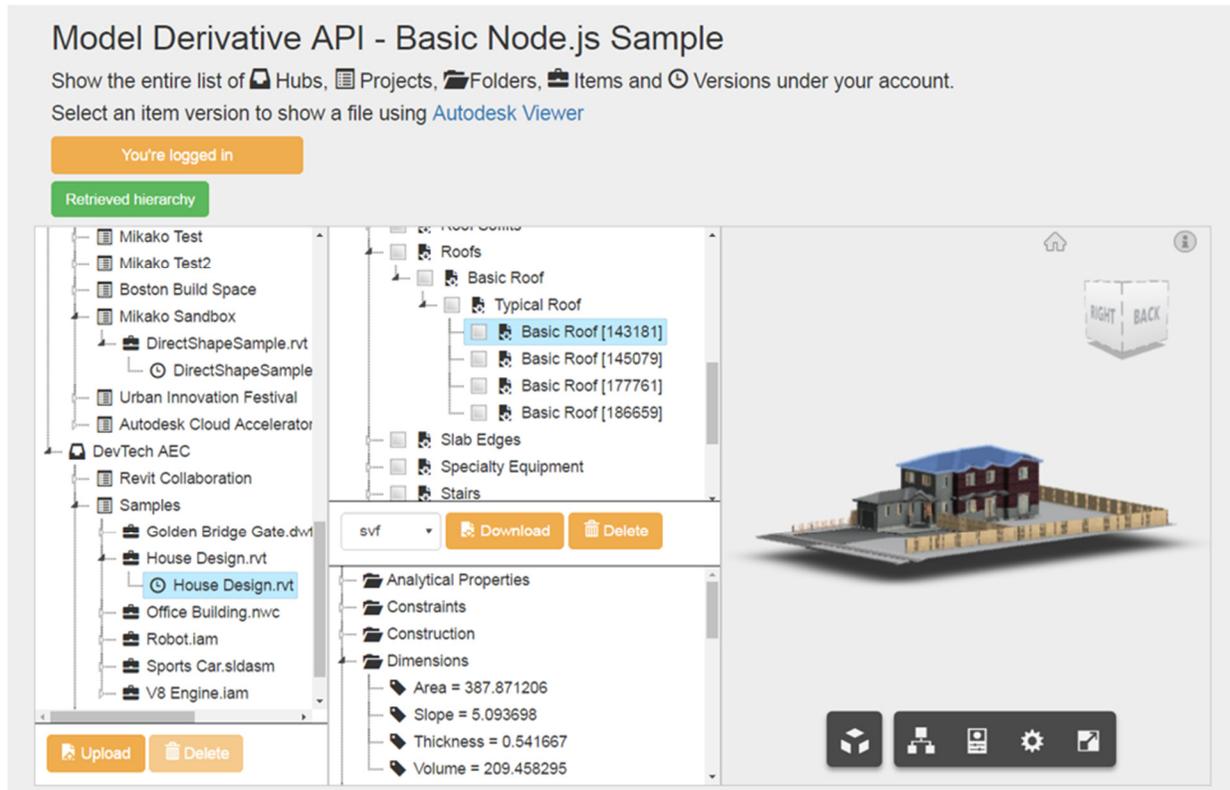
<https://github.com/Autodesk-Forge/library-javascript-viewer-extensions>

You can find the description of complete viewr javascript library here:

<https://developer.autodesk.com/en/docs/viewer/v2/reference/javascript/>

Examples

During the class at AU, I intend to show some examples. Below is an example (courtesy of Adam Nagy): <https://derivatives.autodesk.io/>



Model Derivative API - Basic Node.js Sample

Show the entire list of Hubs, Projects, Folders, Items and Versions under your account.
Select an item version to show a file using [Autodesk Viewer](#)

You're logged in

Retrieved hierarchy

- Mikako Test
- Mikako Test2
- Boston Build Space
- Mikako Sandbox
 - DirectShapeSample.rvt
 - DirectShapeSample
- Urban Innovation Festival
- Autodesk Cloud Accelerator
- DevTech AEC
 - Revit Collaboration
 - Samples
 - Golden Bridge Gate.dvt
 - House Design.rvt
 - House Design.rvt
 - Office Building.nwc
 - Robot.iam
 - Sports Car.sldasm
 - V8 Engine.iam

svf Download Delete

Basic Roof [143181]

- Basic Roof [145079]
- Basic Roof [177761]
- Basic Roof [186659]

Slab Edges

Specialty Equipment

Stairs

Analytical Properties

Constraints

Construction

Dimensions

- Area = 387.871206
- Slope = 5.093698
- Thickness = 0.541667
- Volume = 209.458295

RIGHT BACK

Upload Delete

Summary

In this class, we gave an overview of API for BIM 360 Docs. We explained that the API for BIM 360 Docs is not a single set of API. Rather, a collection of Forge API, which is used by Autodesk to build their own product. We explained about authentication methods, account level API, data management API, model derivative API and viewer. We gave a preview of described API.

I hope you got the clear picture of basic idea of API for Docs and that you are ready to start implementing a creative use of API.

Appendix

Related classes

Followings are AU 2017 classes that go further detail on each Forge API if you are interested in learning more.



FORGE DevCon 2017

- Forge Road Map

FDC128455 - Forge Road Map

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=128455

By a team of Forge product managers

Monday, Nov. 13, 11:00 AM – 12:00 PM

FDC125725 - BIM 360 and API for a Connected Construction Ecosystem

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=125725

By BIM 360 product managers

Monday, Nov. 13, 1:00 PM – 2:00 PM

- Forge Data Management API

FDC124079 - Integrating Forge Data Management API with Other Storage Providers

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=124079

By Augusto Goncalves

Monday, Nov. 13, 3:45 PM – 4:15 PM

- Forge Model Derivative

FDC126529 - Deep Dive with the Model Derivative API

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=126529

By Sharmila Phadnis

Monday, Nov. 13th, 1:00 PM – 2:00 PM

- Development Tips

FDC124141 - Best Practices with Forge REST APIs

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=124141

By Philippe Leefsma and Jaime Rosales

Monday, Nov. 13th, 2:15 PM – 3:15 PM

- Features in Beta

FDC122160 - Seamless integration with Forge Webhooks

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=122160

By Monmohan Singh and Adam Nagy

Monday, Nov. 13th, 1:00 PM – 2:00 PM

- Applications



FORGE DevCon 2017

FDC123224 - 10 Useful (and Cool) Forge Applications

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=123224

By Jim Quanci and Stephen Preston
Monday, Nov. 13th, 1:00 PM – 1:30 PM

- Meet the Experts

SD121052 - Forge Platform / API: Meet the Experts

https://autodeskuniversity.smarteventscloud.com/connect/sessionDetail.ww?SESSION_ID=121052

By product management team
Tuesday, Nov. 14, 1:00 PM – 2:00 PM