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From Design to Construction- The new era of Cloud connected data

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Learning Objectives

- BIM 360 Design workflow
- Integration of Design and Construction
- Understanding of Autodesk Forge
- Future of cloud technology

Description

"In the early days of CAD, it was 2-dimensional creation of design. Then came the era to create models in 3D. Now, the next phase of change is era of connected BIM. This era is about building applications and solutions that connect a community of people to a project or product, to the new means of production. In this era, you can optimize a design not only for how it functions but for how it is built and interconnects with other systems and that too on cloud. This class will showcase how users can utilize the power of cloud using Autodesk Revit and BIM 360. It will also showcase how the users can customize the information present in BIM 360 using Autodesk Forge and make their own customized apps."

Speaker(s)



Shashwat Bhardwaj
Linkedin

I am a Structural Engineer with experience in the power plant industry and residential projects. Diligent in establishing BIM protocols including development, training, and consultation. Worked as a key adoption person in his earlier Organization which was going through a transition phase from 2D to 3D.

Currently, as the key point of contact for AEC Technical support in Autodesk for APAC and EMEA region, I have helped many Autodesk Enterprise Priority customers, most of them related to diverse AEC products Autodesk Forge, BIM 360, Revit, Navisworks, etc.. Working for the EP accounts, I have also focused on finding the root cause of the problem, apart from troubleshooting which has helped in quicker resolution of repetitive cases, which is why I am currently BIM 360 Q/A Lead in APAC in Global Product Support Team. I am a charted civil engineer and is fascinated by buildings and structures.

I love driving and off roading on my bike. I love cooking and taking pictures with my DSLR wherever I go.

Shruti Gupta
Linkedin



I have been a part of the Architecture and construction industry for 5 years. After graduating as a civil engineer, I worked in a prestigious Indian company called Tata Consulting engineers, designing structural buildings for power plants. Realizing the potential of software integration, 3D revolution, and BIM in the construction industry, I became a part of the adoption team in my organization, gaining the technical skills required for the same.

I joined Autodesk as an Enterprise Priority Support specialist in May 2018, to provide support for Revit and Navisworks. Fascinated by BIM 360, I learned the product and started providing support for the same. Currently, I support Assemble, Robot Structural Analysis, and Structural Bridge Design, in addition to the above three.

In my free time, I love to travel and read. Lazy and relaxing holidays are my guilty pleasures. I firmly believe in giving back to society to make this world a better place.

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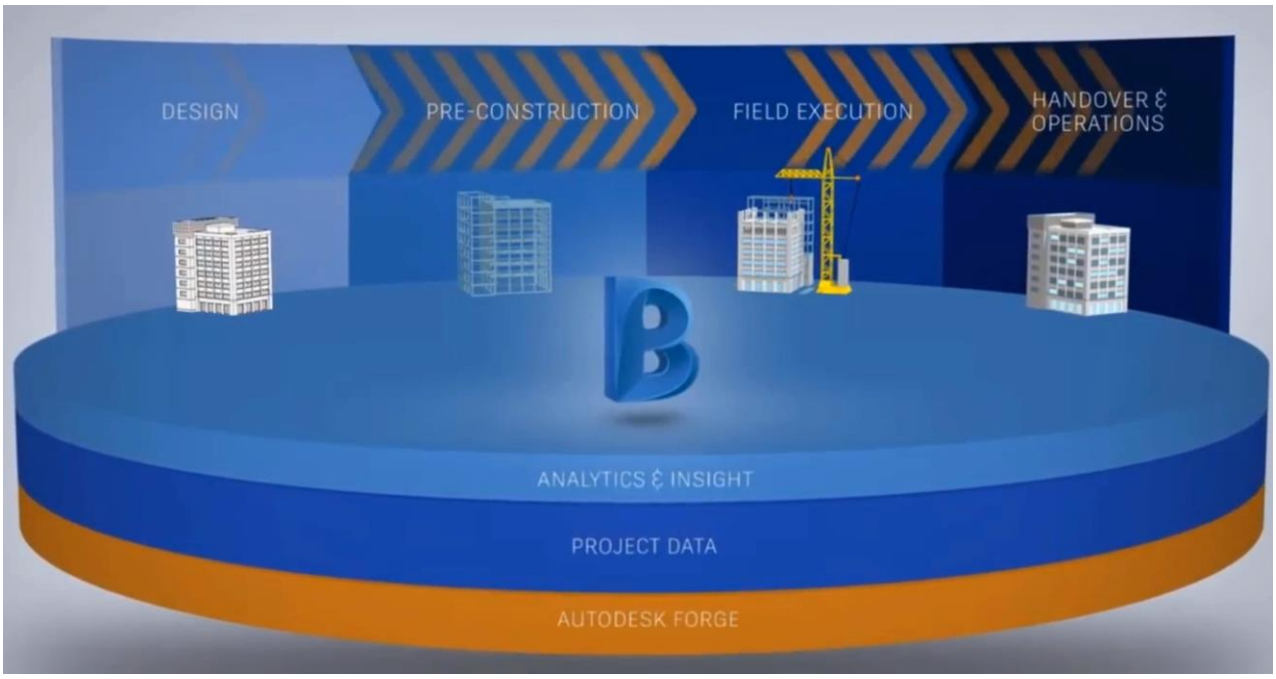
Introduction

What is the idea behind this class?

Human beings are natural builders. The need for shelter has motivated us to construct our houses and eventually other structures over the years since the 'Stone Age'. Building something has significantly changed over the years, but one thing has remained constant: **The idea of concept to creation.**

How humans shared their idea? In the early days, it was communicated verbally. As humanity developed, slowly the mode of communication evolved. It took approx. 10,000 years from writing to printing press and roughly around 500 more for an email to come. We have seen an era where 2D hand-sketched drawings communicated that concept. Then with the change in technology the computer-aided design came around early 19th century. We are in a time where the concept can be visualized beforehand using the 3D models. And the future beholds an era where the concept to creation cycle will be hosted on a cloud so that the most relevant concept or idea is not geographically constrained, and the construction becomes an even process.

This class is created to connect the dots between the 3D technology and the cloud technology with the help of Autodesk tools.



Why shall I attend the class?

Visualization of design is something that we are all aware of, but the incorporation of cloud-connected data and data analytics in this area and then eventually customization of the data is something that you might want to try hands-on.

This lab promises three takeaways:

- **The present understanding of the BIM scenario with the help of BIM 360 Design workflow**
- **Connecting data from site/ field to design, and analysis of this data to understand the project statistics.**
- **Usage of Forge to understand how in the cloud the BIM data is stored.**

Learning Objective 1 – "BIM 360 Design Workflow"

Building Information Modeling (BIM) is a process that begins with the creation of an intelligent 3D model and enables document management, coordination, and simulation during the entire lifecycle of a project (plan, design, build, operation and maintenance).

This section will cover the following learning objectives:

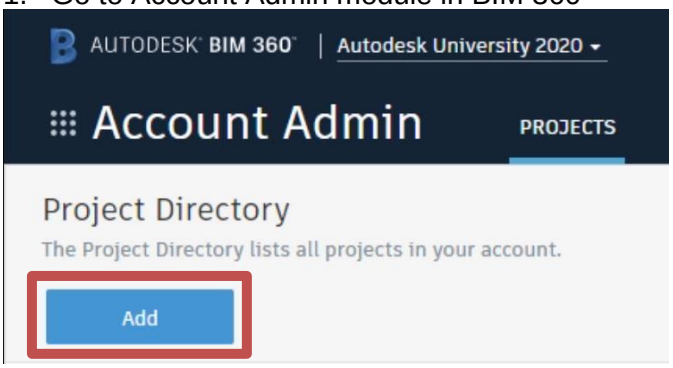
1) **Creating BIM 360 project and setting up teams**
2) **Collaborating Revit model with BIM 360**
3) **Using BIM 360 Design workflow to share/ consume data from other teams.**

Autodesk® BIM 360™ improves project delivery by supporting informed decision-making throughout the project lifecycle for the project, design, and construction teams.

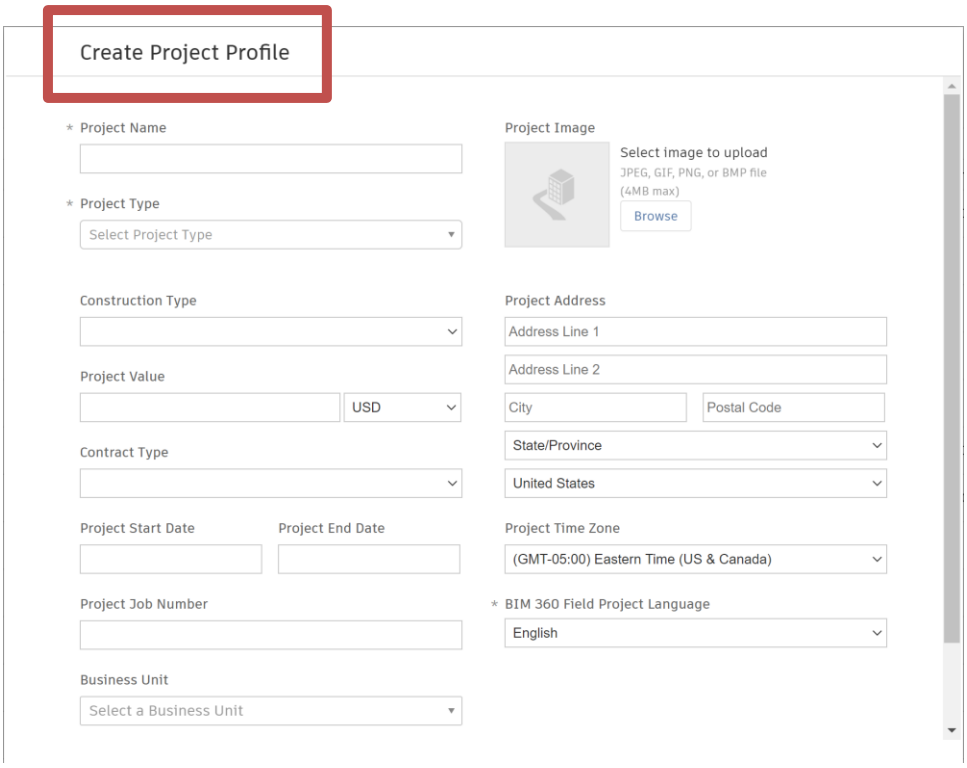
Note: This part is optional for users who have already set up the Project in BIM 360. They can directly go to Step 2.

Step 1) Creating Project in BIM 360

1. Go to Account Admin module in BIM 360



   a. If you do not have access to BIM 360 Design, then kindly refer this article to access free trial of BIM 360.
2. Go to Projects Tab
3. Click on Add and a new window will open to fill Project Profile

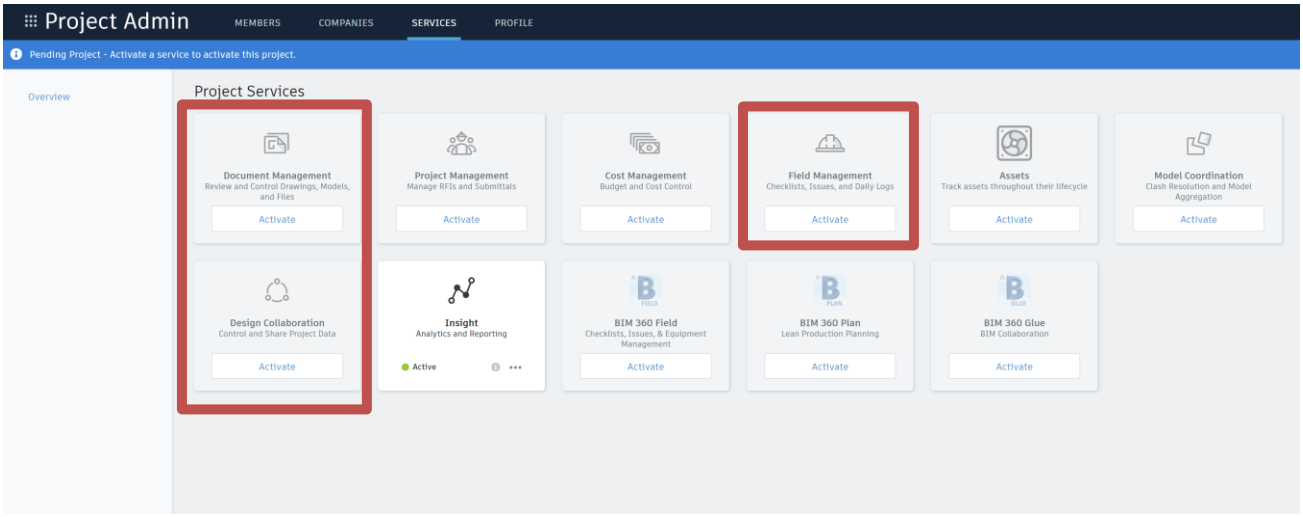


4. Fill all necessary details like Project Name, Project Type, Project Start Date, Project End Date, and BIM 360 Field Project language.
   Details for this project:
   Project Name: Autodesk University Project X
   Project Type: Data Centre
   Construction Type: New Construction

   The rest of the details can be filled by your choice.

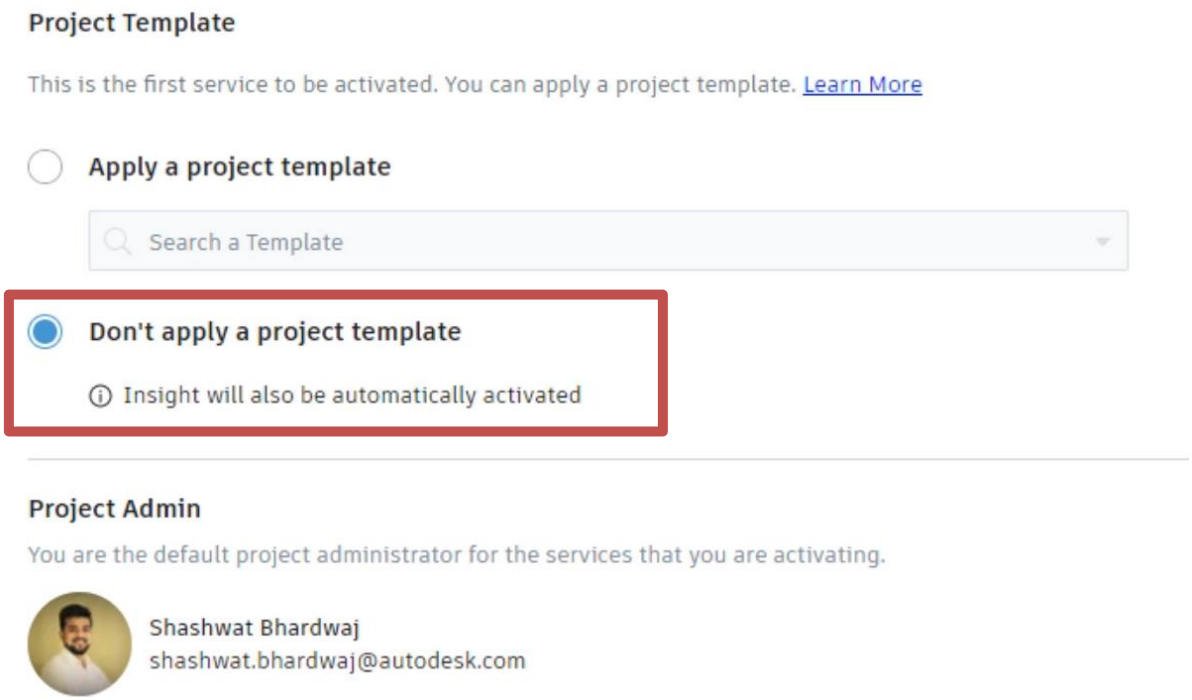
5. Click on Save and Continue
6. A new window will open with the new project and the Project Admin module opened.
7. Under Services tab, activate the services, Document Management, Design Collaboration and Field Management one by one.

Note: To know more about the activation of services, refer the document here.



8. Once you click on the Activate button for service BIM 360 Document Management, you will be directed to a page where you can select any project template.

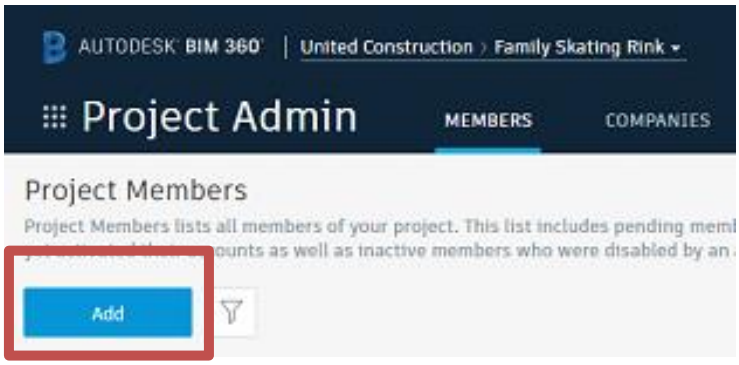
In this project, we will not use a project template and click on “Don’t apply a project template”



9. Assign Project admin for the Document Management service and all other services that you have activated.
10. Click on Finish.

Step 2) Inviting Project members

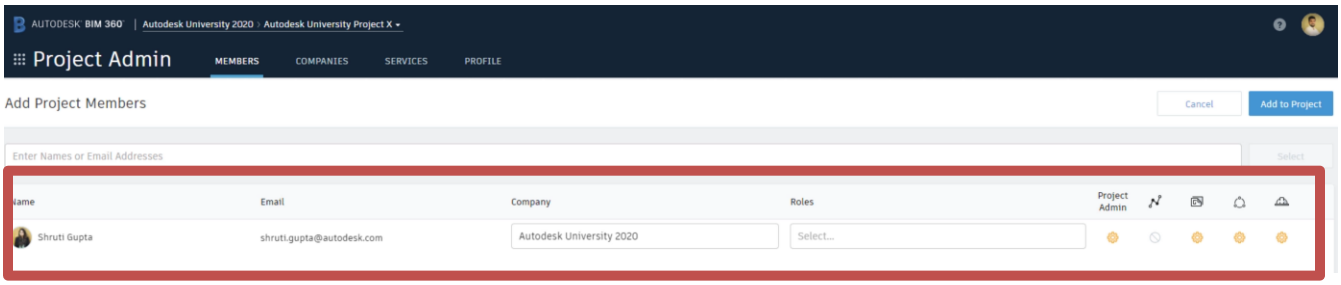
1. Click Add.



2. In the Add Project Members field, start typing a member's name if that person is already in the account.

3. Click on the member email from the available options on the drop-down menu.
   Note: To add a member who is not already in the account, enter that person's email address in the Add Project Members field.
   4. Click Select.
      Note: The list of added members will display the project member status of someone who was previously added.
   5. Repeat steps 2 - 4 to add multiple members to a project at the same time.
   6. Click Add to Project. This generates an email notification to members to activate their membership and access the project.

Note: In this case, we have added two members, Shashwat Bhardwaj (Project Admin) who is from the Architecture team, and Shruti Gupta (Member) who is from the Structural team.



To learn more about controlled access to users (Specific permissions) who are invited, please refer this document.

Step 3) Creating folders in BIM 360 Document Management

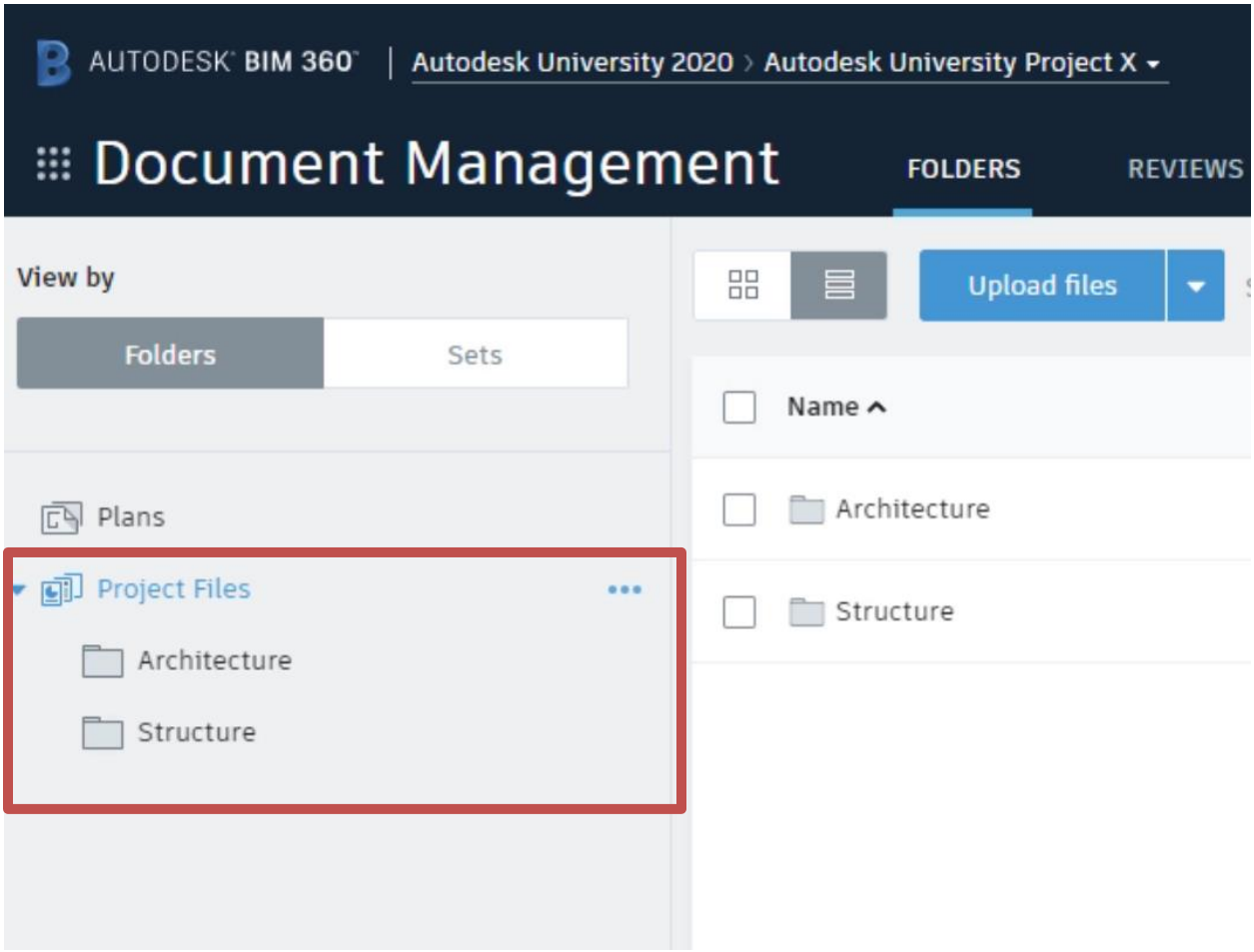
Every project starts with pre-configured top-level folders to support a specific process or data type. These folders are called Plans and Projects Files. You can add subfolders to these folders.

To learn more about them, refer: Plans and Project Folder

Note: We will be creating folders under "Project Files" as 'Plans' folder does not support Design Collaboration service.

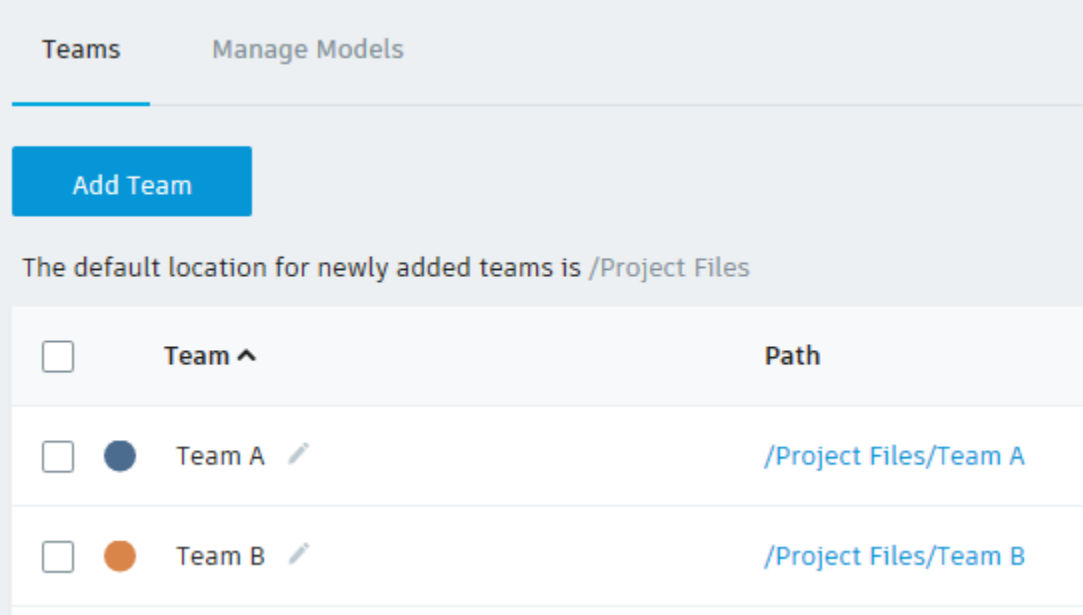
To Add Folders:

1. In the folder tree, right-click a folder and click Add Subfolder. A new folder appears below the parent folder.
2. Enter a name As "Architecture" and press Enter.
3. Follow step 1 and create another subfolder with the name "Structure".

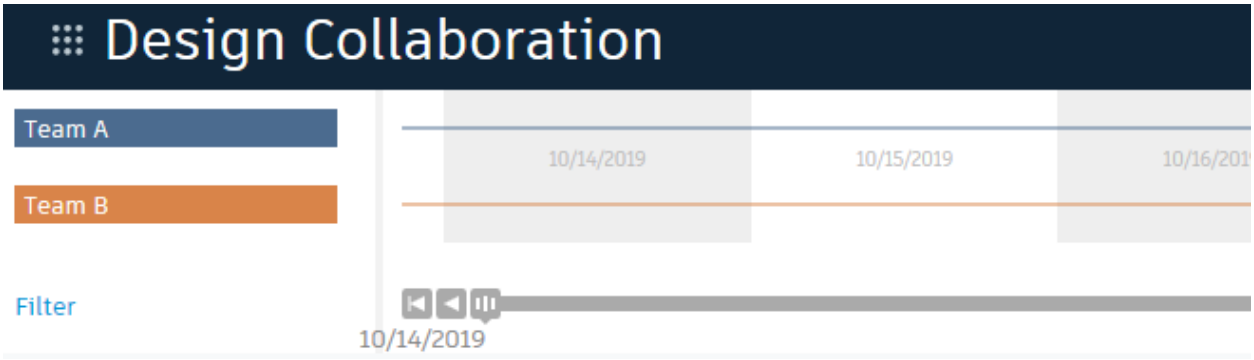


Step 4) Creating Teams in BIM 360 Design Collaboration

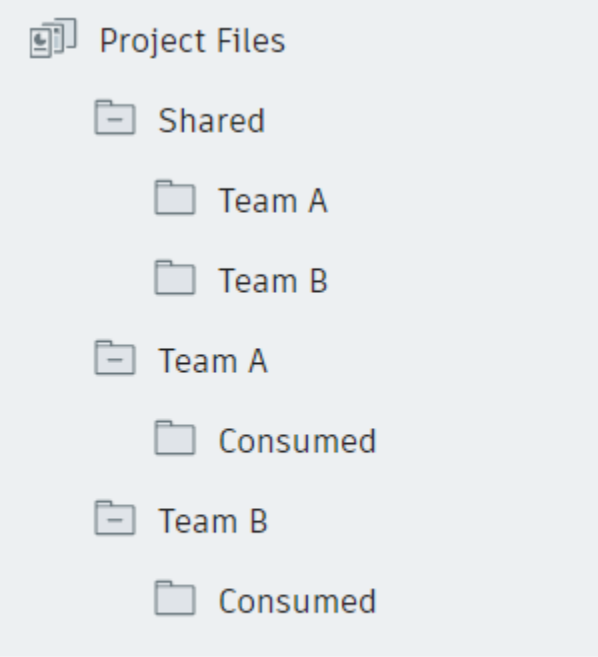
- Teams are created to represent a company or a specific function within a company. For example, there might be different teams for architects, structural engineers, mechanical engineers, and so on.
- Members can share data using the Shared and Consumed folder. These folders are essential for data exchange and shall not be deleted.
- Before adding teams and managing team members, it's important to understand what happens between Design Collaboration and Document Management when a team is added. To do this, consider the following example in which two teams were added; Team A and Team B.



- We see the two teams on the project timeline in Design Collaboration:



- We also see new Shared and Consumed folders for the two teams in Document Management:



- All these folders are created when you add teams using Project Admin for Design Collaboration.
- The Shared folder and its sub-folders for each team represent the shared space for all teams. The Consumed folder and its parent team folder represent the Team Space for each team.

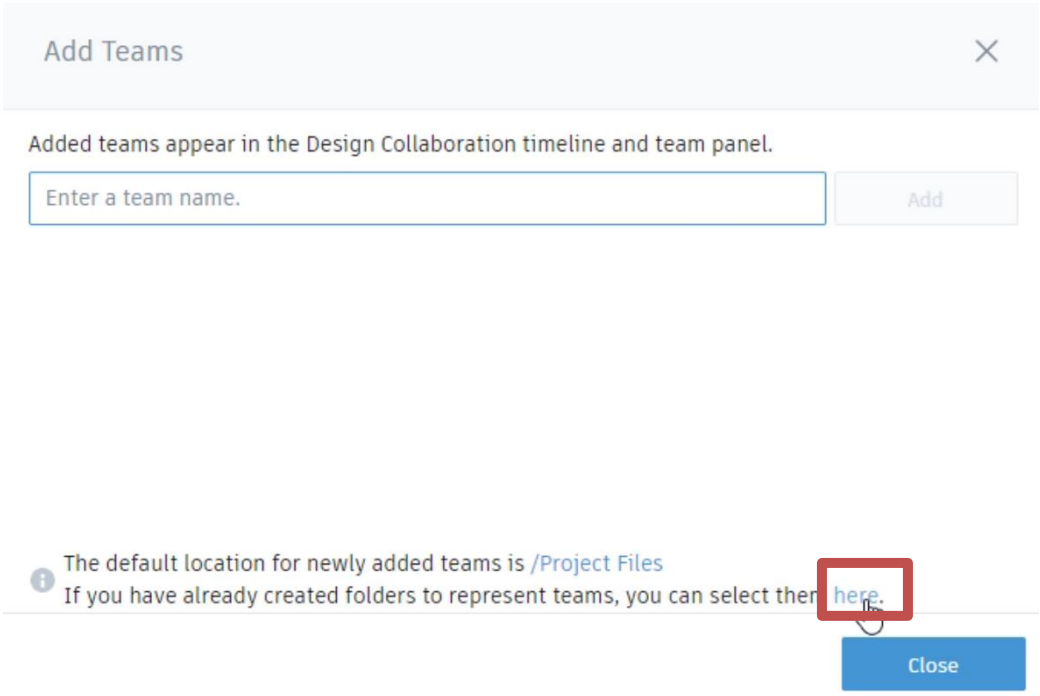
To create Teams:

1. Go to Project > Project Admin Module > Services
2. In the Services tab, go to Design Collaboration under the menus given on the left side.
3. Click on “Add Team” to create teams.

Note: There will be an option if we want to select the default location for the Shared folder or a different folder. At this point, we will be selecting “Use default Location’/Project files/ Shared’

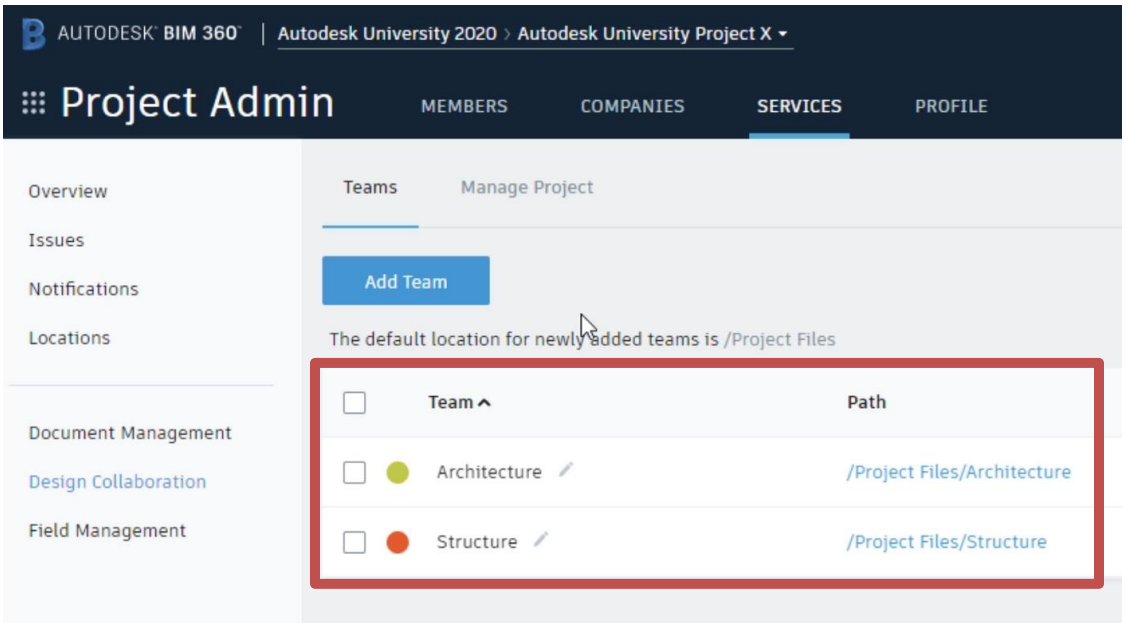
4. A window will appear to enter the name of the team. Below is a small notification stating: “If you have already created folders to represent teams, you can select them here”

5. Click on here.



6. Select the folder “Architecture” under Project files and click on Add Teams
7. The team will be created. Click on Close to complete the process.
8. Follow the same stems from 3-6 to create another team named “Structure”

This is how the teams will look like:



Step 5) Get Project Models into Collaboration for Revit

Note:

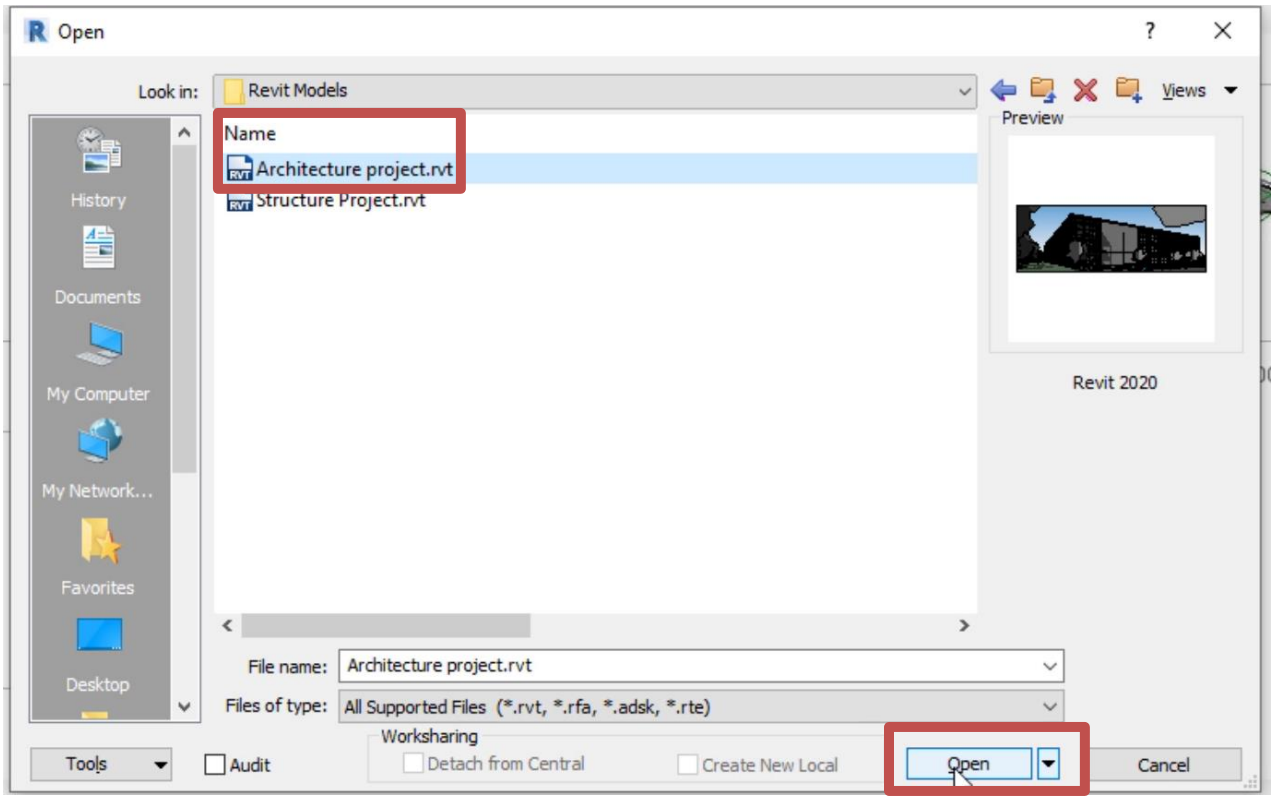
- *As of April 9, 2018, Autodesk® Collaboration for Revit® service is now Autodesk® BIM 360™ Design, a new cloud worksharing, data management, and collaboration solution built on BIM 360.*

- *The service currently named Revit Cloud Worksharing, as part of the product BIM 360 Design, was formerly called Collaboration for Revit (C4R). A BIM 360 Design Subscription is required to access this service*

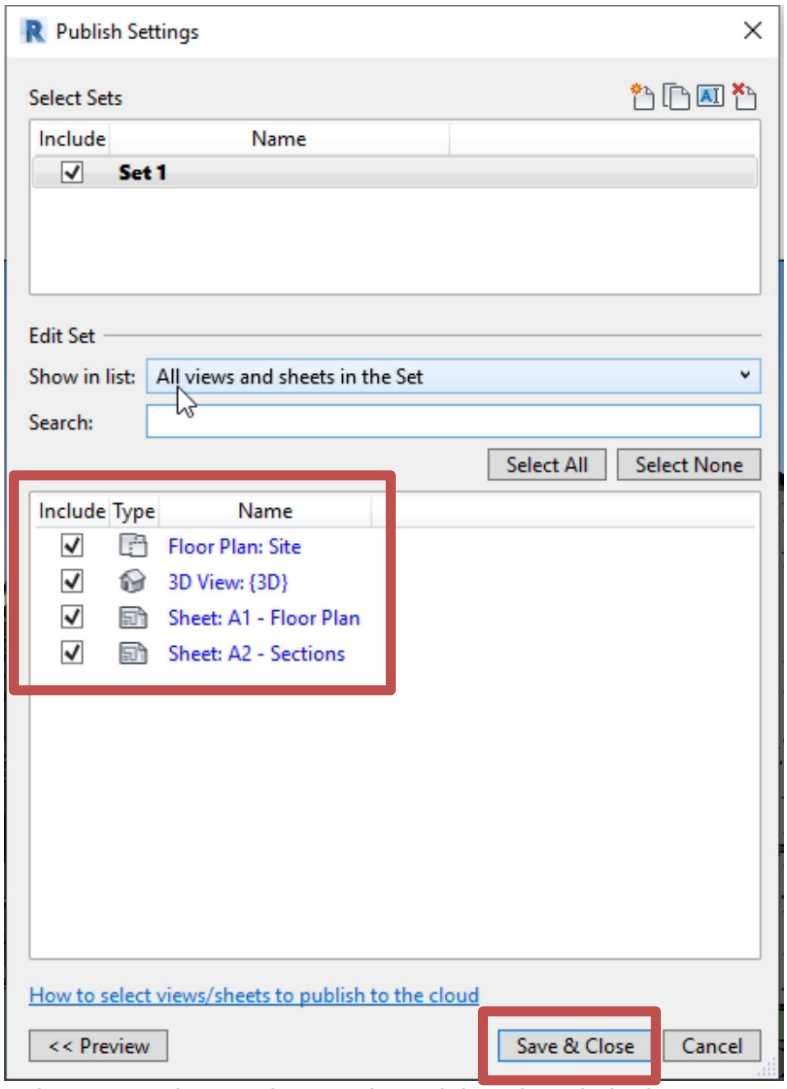
In order to check if the BIM 360 Design entitlement is provided to you or not, refer below:
[How to check if you have a BIM 360 Design entitlement]

To Initiate the Revit cloud worksharing for model Architecture.rvt

1. Open the model, “Architecture project” from the dataset that has been provided, in Revit 2020.



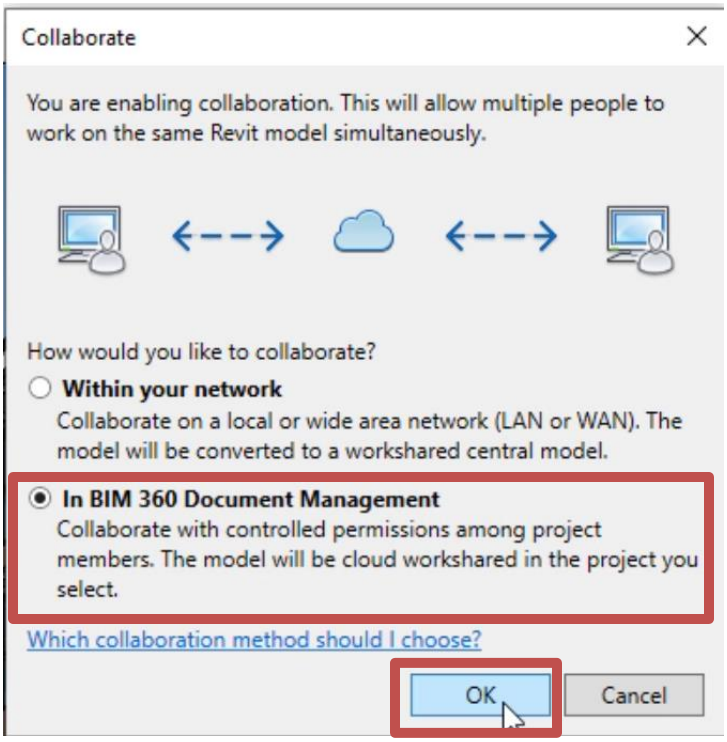
2. To create a new set, in the Publish Settings dialog, click (New Set). Enter a name for the set and click OK.



3. Select 1 3D view and a 2D sheet (already existing)

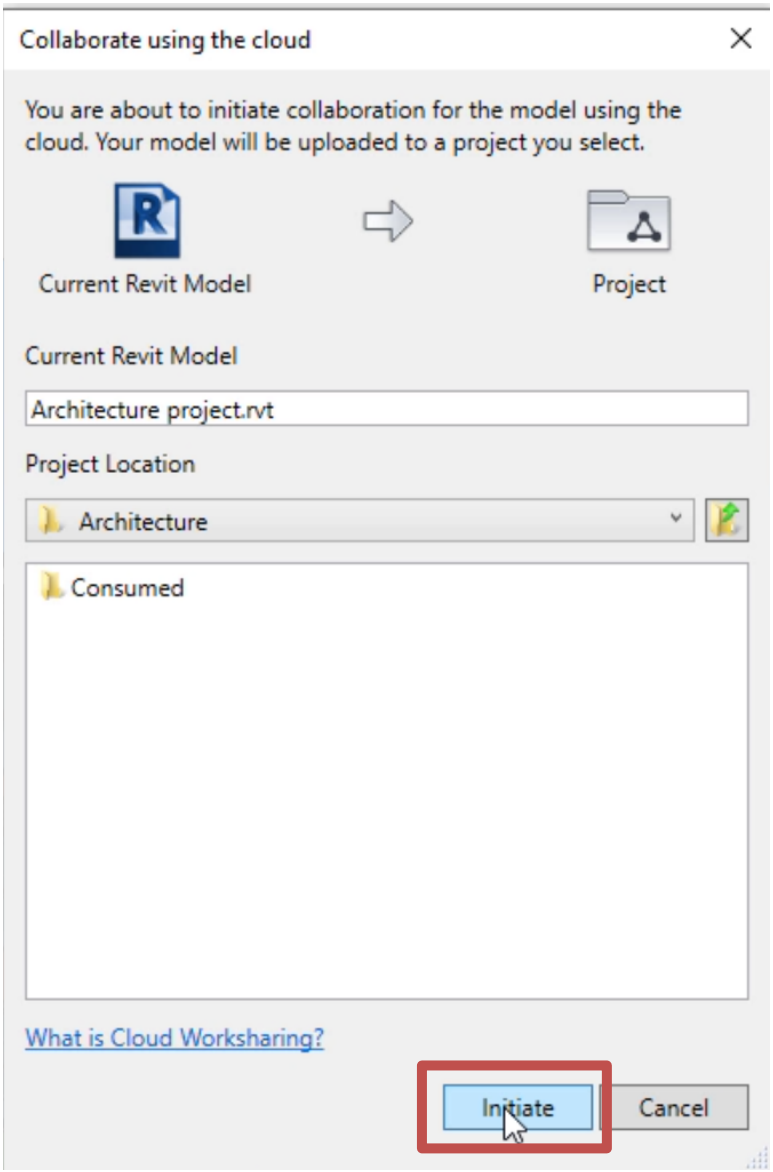
Note: To know more about Publish settings, refer this document from Revit help.

4. Click Collaborate tab ➤ Manage Collaboration panel ➤ Collaborate in Cloud. There will be an option to select Within your network or BIM 360 Document management.

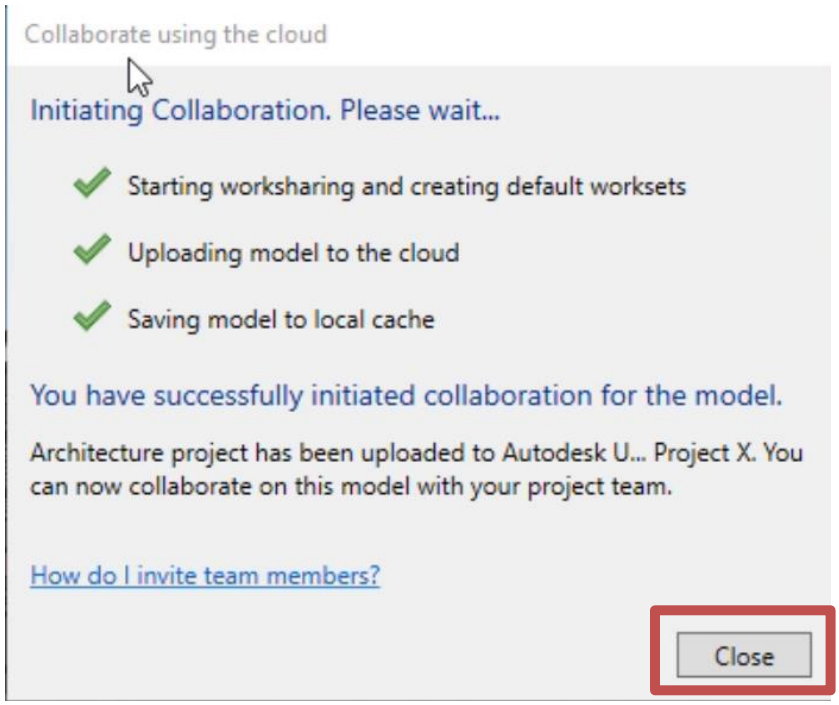


5. In the Collaboration in Cloud dialog, if desired, rename the model.

6. Select a cloud project (BIM 360 Project) that we have created and go to the Project files> Architecture and click OK.



7. In the Collaboration in Cloud dialog, click Initiate. Revit displays information about the status of the initiation process.



8. Click Close to continue.

Follow the same steps mentioned above for model Structure.rvt.

Now, these models will be visible in the BIM 360 Document Management web browser.

Note: For more details around Revit cloud worksharing refer this link.
For Best practices, you can also refer this document.

Step 6) Design collaboration workflow

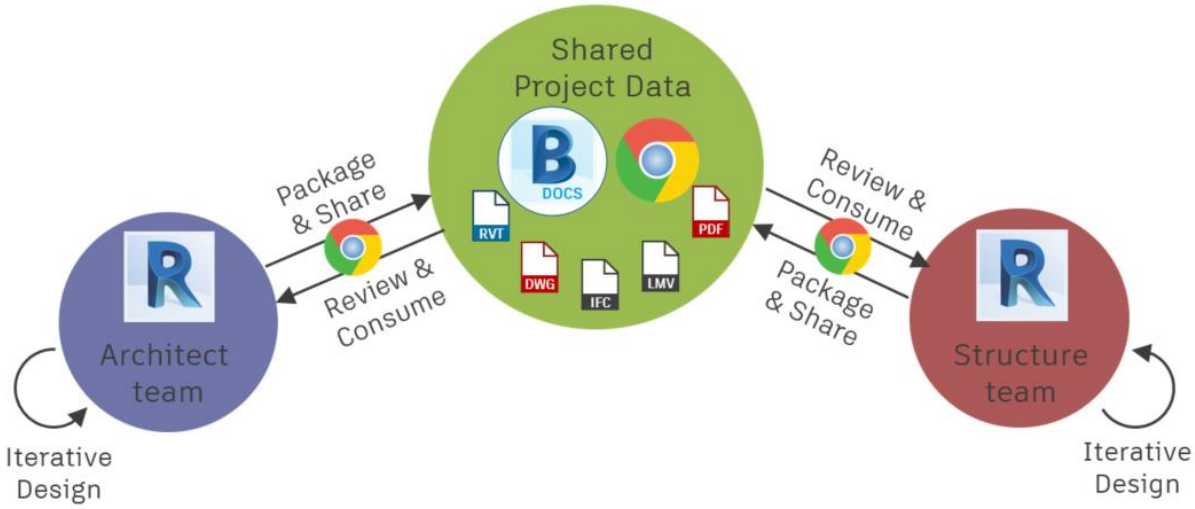
There are three methods available to share Revit models with other project teams using BIM 360 Design. These methods offer flexible ways for other teams to access your models.

1. Controlled Sharing - Consume Models from Packages
2. Controlled Sharing - Link from the Shared folder
3. Live Linking

In this lab we will use the first workflow- 'Controlled Sharing - Consume Models from Packages'.

To learn more about other two methods, click on the link here.

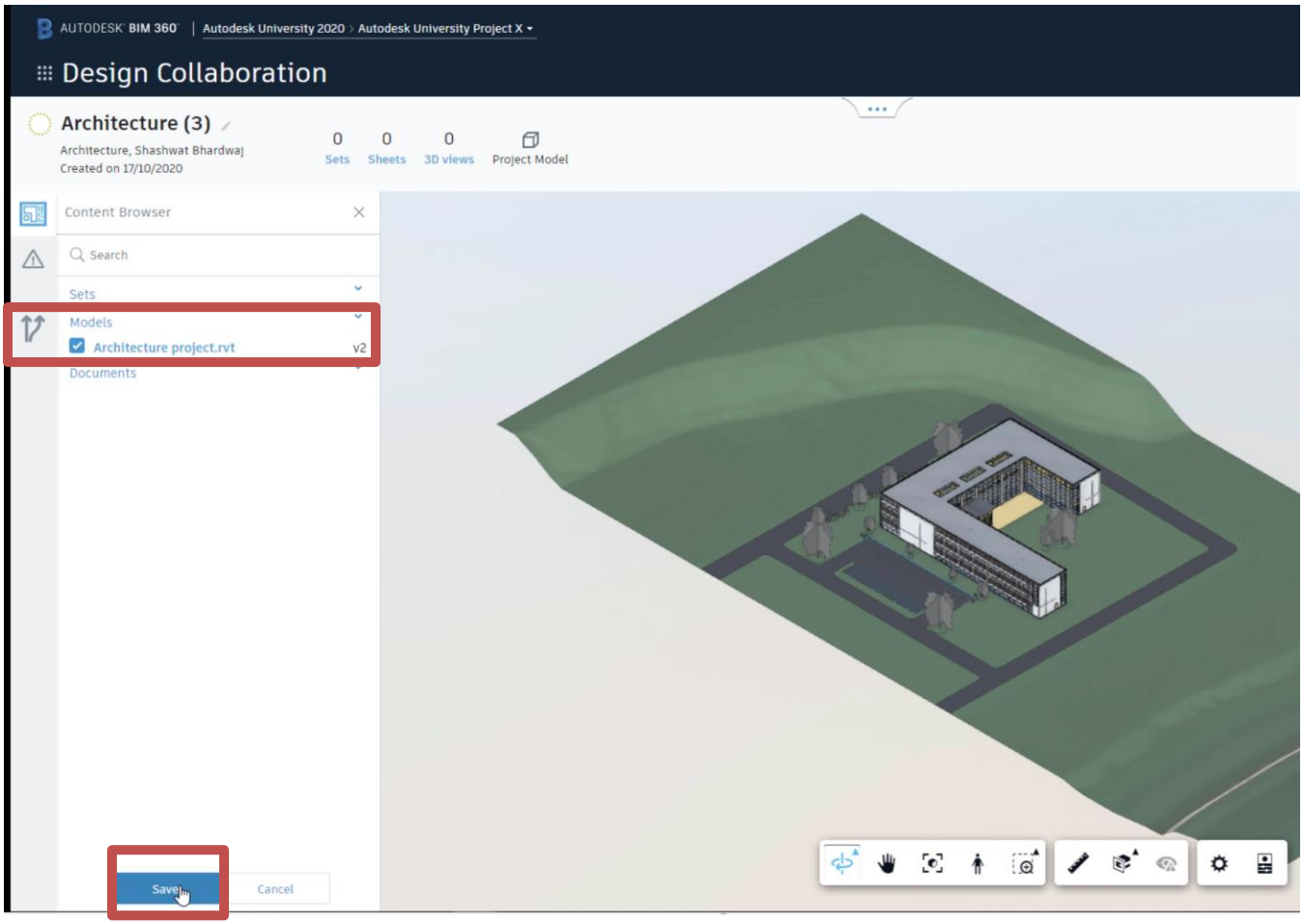
The basic workflow can be described using the below image:



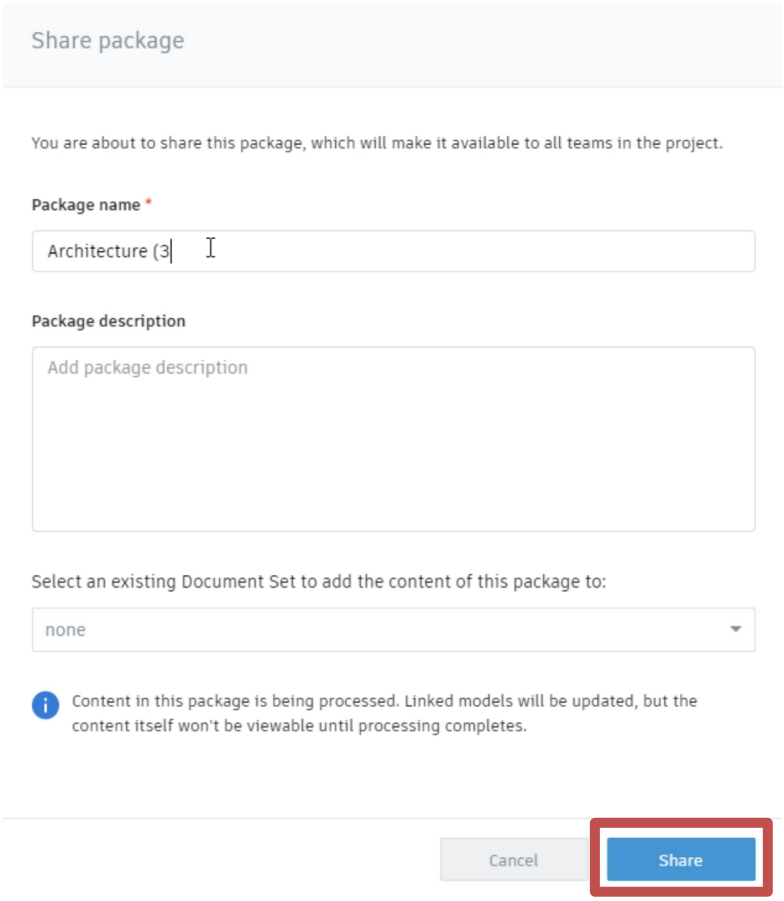
To understand more about the workflow, refer Choosing a collaboration workflow with BIM 360 Design

1. Go to Design collaboration module in BIM 360 project
2. Go to the Architecture team from the BIM 360 Design timeline.
   Note: To know more about timeline symbols, refer the document here.
3. Click on the + button to Create a new package.

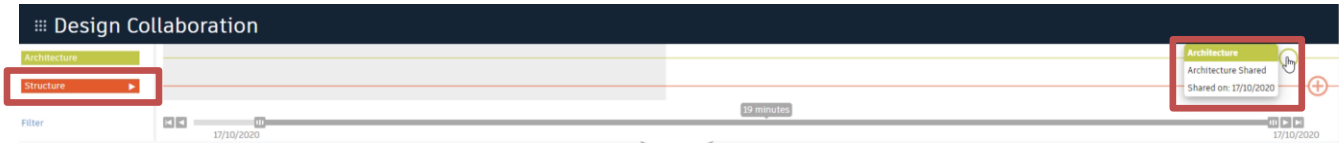
4. Include the ‘Architecture.rvt’ model from the models dropdown and click on Save.



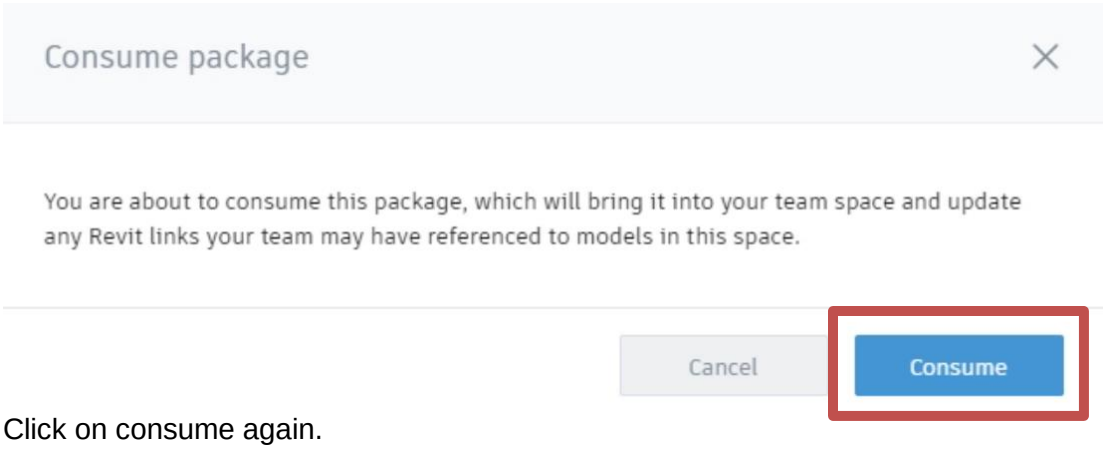
5. Click on “Share” to share the newly created package. A dialogue box will appear to name the package and add description if required.



6. As a member of Structure team, go to the team from the timeline. You will be able to see the package shared by the Architecture team from the timeline.



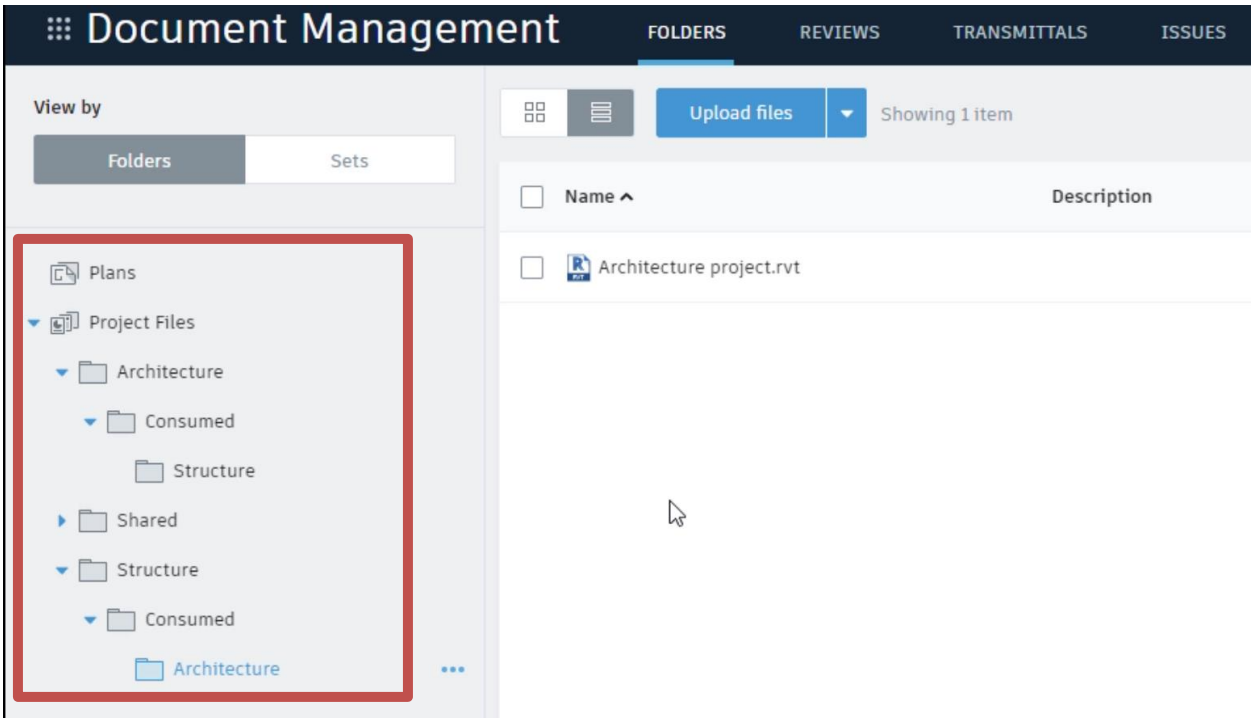
7. Click on the Package and click on Consume to consume the package from Architecture. Once you do that a dialogue box will appear to mention that we are about to consume model from another team space.



Click on consume again.

8. Go to the Structure team to create a new package and include the ‘Structure.rvt’ model and follow the same steps 3 to 7 for Structure team.

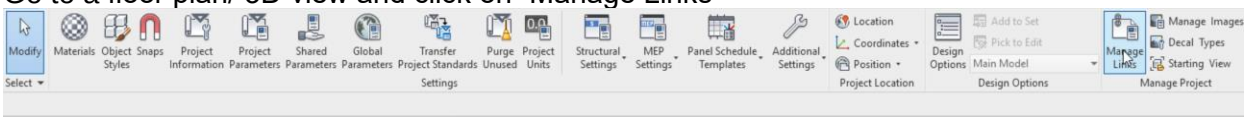
At this point, both the teams have other team’s model in their respective consumed folder. This is how the folder structure will look like:



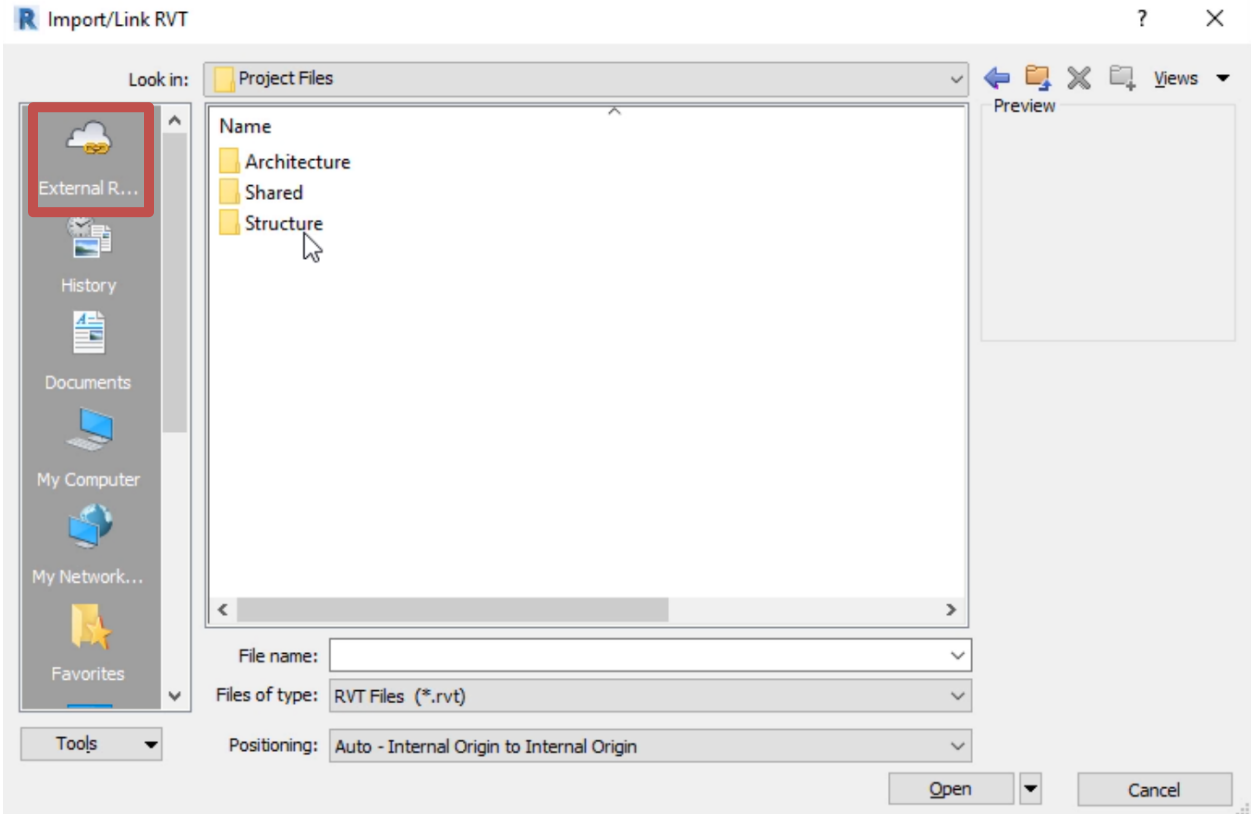
Linking the model from the Consumed folder:

For Architecture Team:

1. Open the now workshared model again in Revit 2020 from Revit home page (Ignore this step if already opened)
   Note: You can refer this document to understand more about Revit home page.
2. Go to a floor plan/ 3D view and click on “Manage Links”



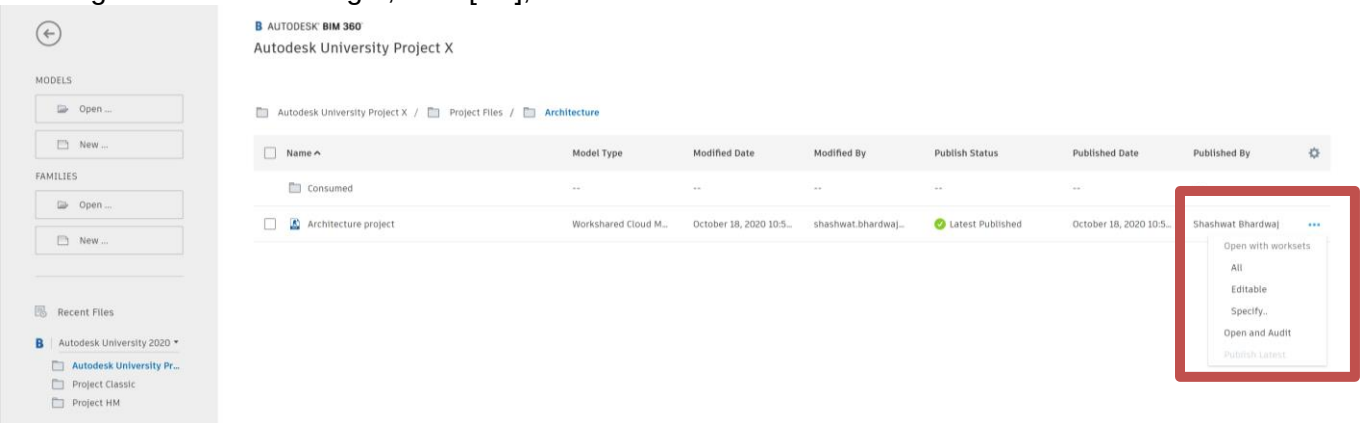
3. Click External Resource in the left panel of the file browser.



4. Navigate to the location of the cloud model, which is Architecture< Consumed< Structure< Structural Project.rvt
5. Select the model and click Add and OK
6. Once linked, synchronize the model and close the revit file.

To publish the latest version of a model from the Model Browser (recommended)

1. Click (Home) on the Quick Access toolbar or press CTRL+D to switch to Revit Home.
2. Click the BIM 360 link to navigate to a cloud project that contains Revit cloud workshared model.
3. Single model: On the right, click […], and click Publish Latest.



4. The Publish Status, Published Date, and Published By columns are updated.
7. To view the published models, click the BIM 360 project link.

This will make sure you are able to see the Structural model linked in your file. You can do the same for the structural team.

Learning Objective 2- ‘Integration of Design and Construction’

This section will allow us to dive into BIM 360 Field Management, a tool that can be helpful in construction sites for capturing field data.

With Field Management, your team can perform construction quality, safety, punchlist, and equipment commissioning workflows.
Note: The Field Management service is not available on BIM 360 Design trial.

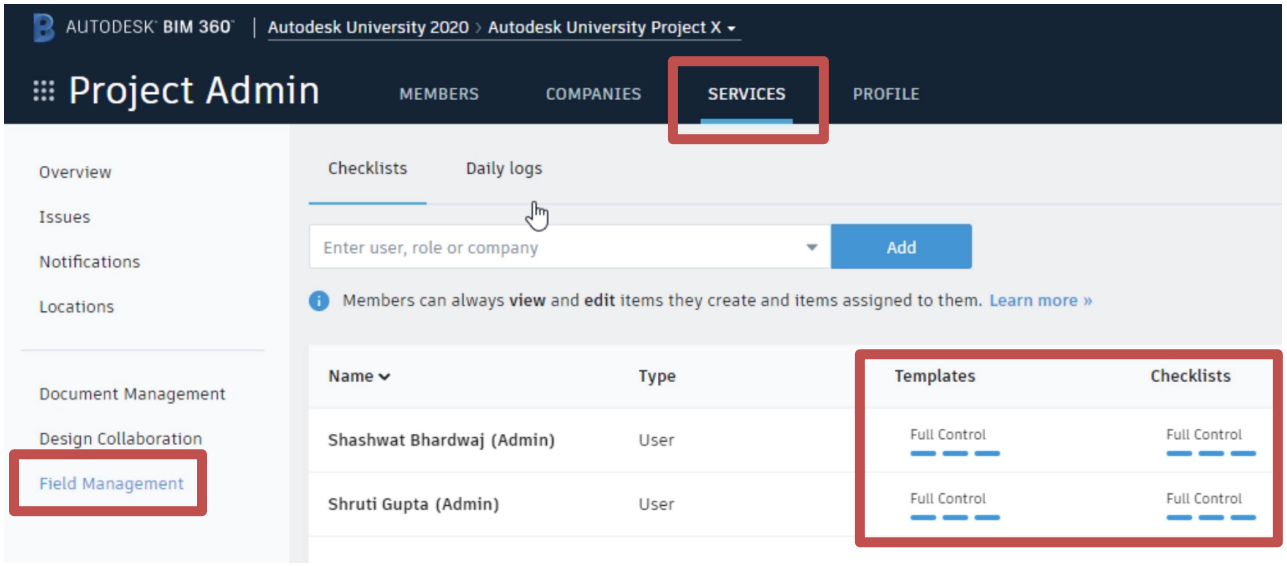
This section will cover the following leaning objectives:

- **Use of BIM 360 Field Management to create checklists and issues**
- **Overview of Construction IQ which uses this data to manage risk and improve performance.**
- **Use of Data Connector to import the BIM 360 data to Power BI for data analysis**

Step1) Providing permissions to specific members in Field Management

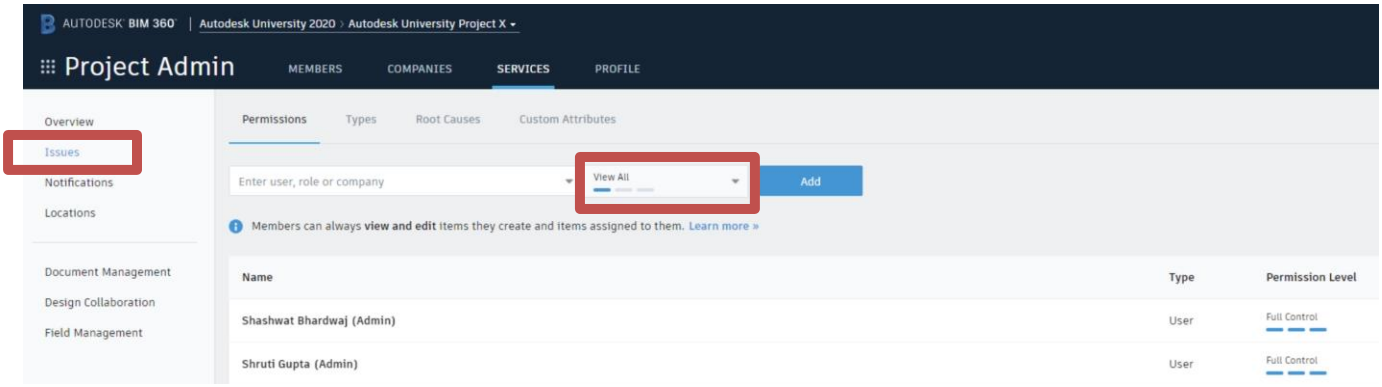
The permissions can be set individually for templates, checklists, and daily logs.

1. Go to the Project Admin module.
2. Click the Services tab.
3. Select Field Management in the panel on the left.
4. Select the Checklists or Daily Logs tab to modify permissions.



For Issue permissions:

1. Go to the Project Admin module.
2. Click the Services tab.
3. Select Issues in the panel on the left.
4. Use the search box to select the users, roles, or companies you want to modify permissions for.



Tip: You can select multiple users, roles, and companies, and then specify the same permission level for them all in bulk.

5. Use the drop-down menu to modify the permission level for the selected users, roles, and companies.
6. Click Add.

Note: Permissions can't be changed for other administrators. Project administrators have full control by default. If an individual has higher permissions than their role the higher permission set is used.

In this case, as we are two members as Project admins, we have full control in Field Management. To know more about permissions, click on the help document here.

1. Template Permission: Full Control- Members can create and import checklist templates. They can edit any template in the project.
2. Checklist Permission: Full Control- Members can work with and archive any checklist regardless of the creator.
3. Daily Logs Permission: Manager- Can view, edit, and publish daily logs in the project.
4. Issue Permission- Full Control- Members can view, create, and edit all issues in a project.

Step 2) Working with Checklists

Enable project members to add ready to use checklists. You can import templates from BIM 360 Field classic.

You must use one of these two templates to create a checklist:

- **Account-level template**: Allow a template to be shared with multiple projects. These templates can only be edited by account administrators of the company that manages them.
- **Project-level template**: Allow for multiple checklists to be made but can only be used in a single project. Project administrators can modify project templates.

In this case, we are using Project Level Template.

To Select Checklist Type:

Checklist types can help sort and filter checklists. The following types are available:

- **Quality**: Use quality checklists to provide quality assurance checklists.
- **Punch List**: Provide a list of items to complete.
- **Safety**: Standard safety checklists can keep the job site safe.
- **Commissioning**: Use to validating building performance for final delivery.

Using Checklist Signatures

You can require signatures for a checklist. Once all the checklist sections are done, signatures can be required to close the checklist. Reopening a checklist deletes signatures requiring the checklist to be resigned. Checklists are signed using Android or IOS mobile apps.

Using Checklist Sections

Sections can be reordered and have two main components:

- **Section Title**: To give a beginning descriptor of the location or type of checklist.

Note: Use a section title that reflects the work but is generic enough that multiple checklists can be made from the same template.

- **Section Description**: Section descriptions can be edited before creating a checklist to quickly make checklists that have the same items and sections.

Checklist Items

Checklist Items have a name, an optional description, and an answer type. You can make items optional.

The answer types can drive some of the functionality of the items and sections. The following types are available:

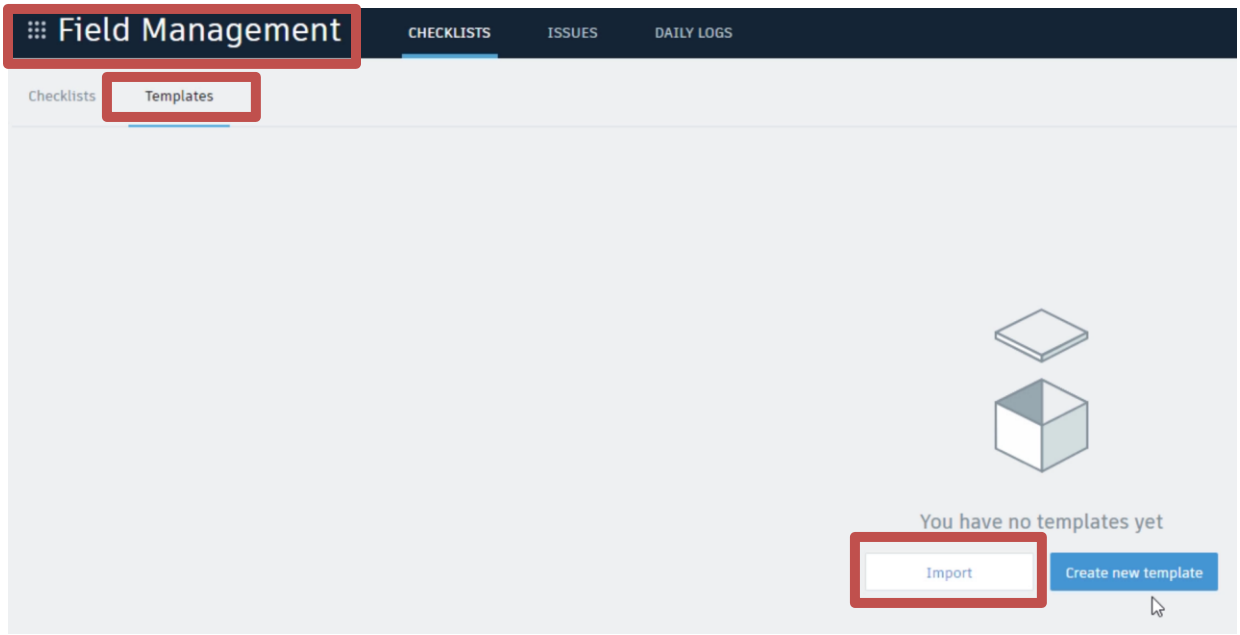
- **Yes / No / NA**: Creates a radio button answer field with these selections.
- **True / False / NA**: Creates a radio button answer field with these selections.
- **Pass / Fail / NA**: Creates a radio button answer field with these selections.
- **+ / - / NA**: Creates a radio button answer field with these selections.
- **Multiple Choice**: Add suitable answers and use the slider to select a non-conforming answer. Non-conforming answers keep track of work that needs to be corrected.
- **Checkboxes**: Add items boxes to check off for an item and use the slider to select non-conforming answers.
- **TEXT**: Create a text field for answers to be entered in the field.
- **Numeric**: Creates a field that requires a number for an answer.

Note: In this case, we will import the already created checklist template from Excel to BIM 360 Field Management.

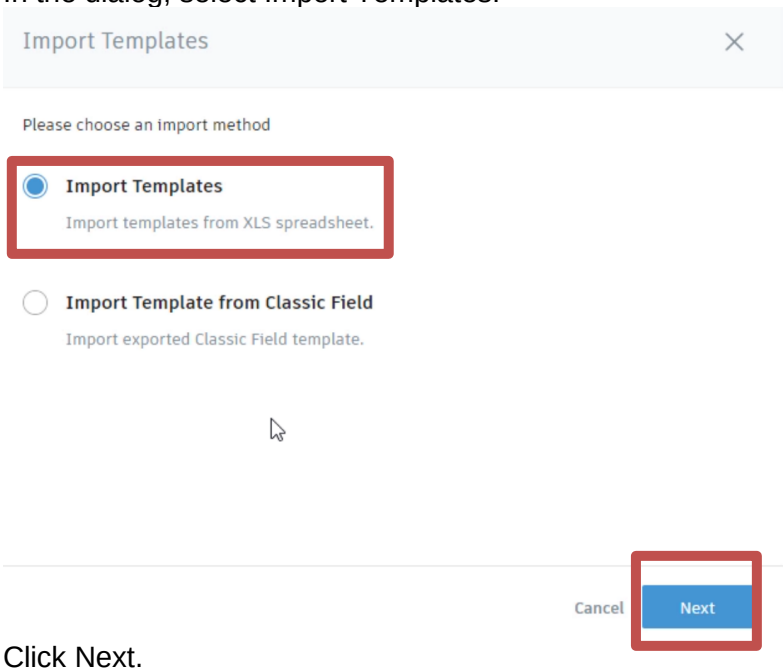
The checklist template name is “Checklist AU 2020 Sample” (Download this template from the class sample file)

To import a checklist template:

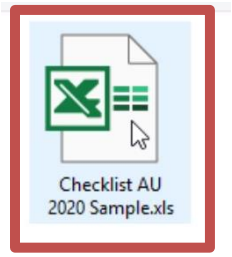
1. Click the Module Selector ➤ Field Management.
2. Click the Templates tab.
3. Click Import.



4. In the dialog, select Import Templates.



5. Click Next.
6. Click on Browse to import the excel sheet saved from the Data Set called as “Checklist AU 2020 Sample.xls”



7. Click on Import

Note: Once you see the template in your browser, you can also edit it to add some changes in the Template like check the sliders for:
Auto-create Issue settings.

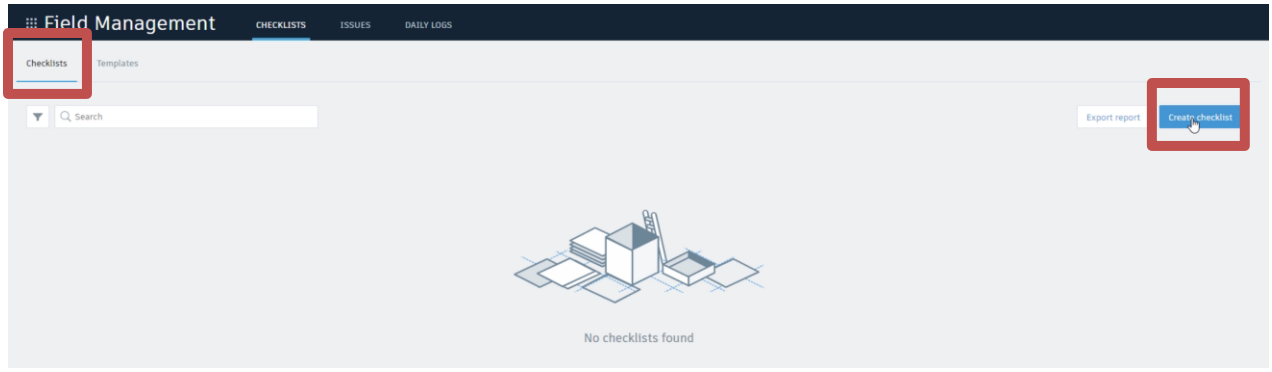
Note: You must select an Issue type to create settings for generating automatic issues. Section and checklist item settings can be modified.

Alternatively, if you want to create a new template without using the excel, you can refer the document here

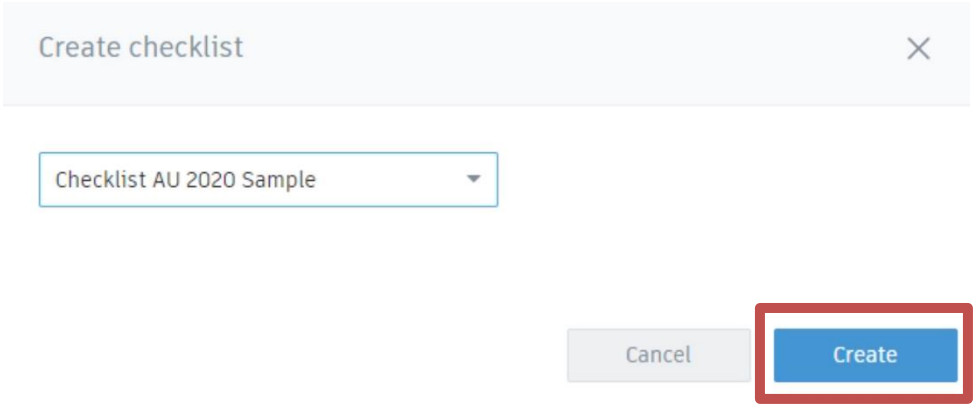
.

To create a Checklist in the Web browser:

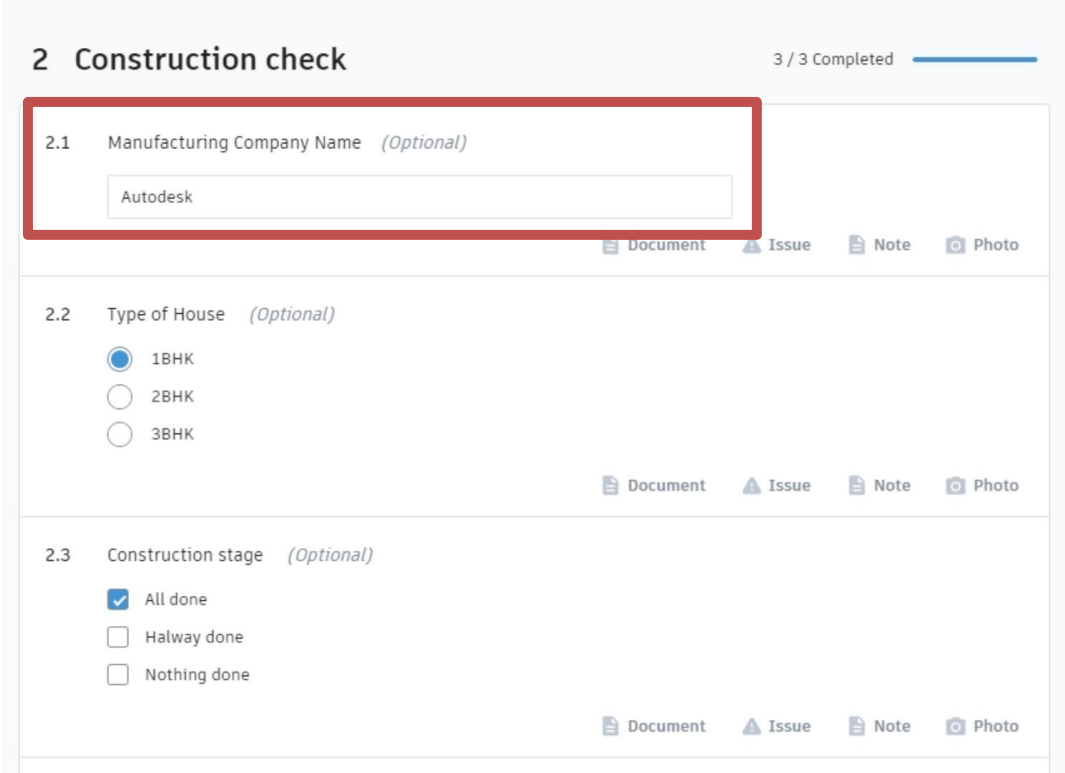
1. Go to Checklist tab
2. Click on Create Checklists



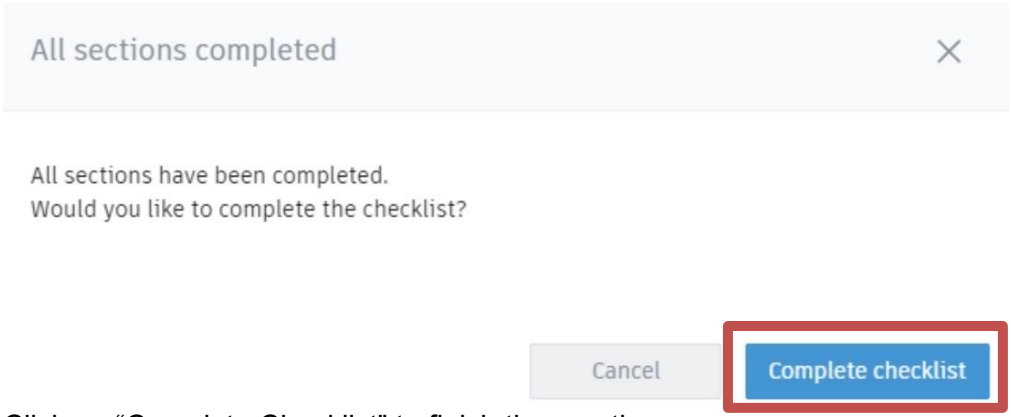
3. Select the template Checklist AU 2020 Sample and click on create.
4.



5. On the top, the title of the checklist is displayed. By default, it is same as the name of the checklist template. You can change the title if you wish.
6. Fill the checklist created using the template
7. In Construction Check, which is Item 2, you can write “Autodesk” under Manufacturing Company Name.



8. Once all details are filled, a window will appear saying All sections completed.



9. Click on “Complete Checklist” to finish the creation

Note: To create checklist from ipad, you can refer the video in this link.

Step 2) Creating Issue Template

Before creating a template, it is important to know about Issue Types and subtypes and how they can be customized for any project.

Issue Types and Sub-Types

When working with issues, understanding root causes helps prevent them from recurring. Root causes fall under categories, which helps you find and filter root causes.

Note: Only project administrators can create custom categories and root causes.

To know about the custom root cause, click on the help link here.

Issue templates can reduce the time required to create a frequent issue on the job site. Templates can be used to automate the process to create an issue. Templates must include the following:

- Title
- Issue Type
- Initial Status

Other attributes can be added depending on the Issue type. These are:

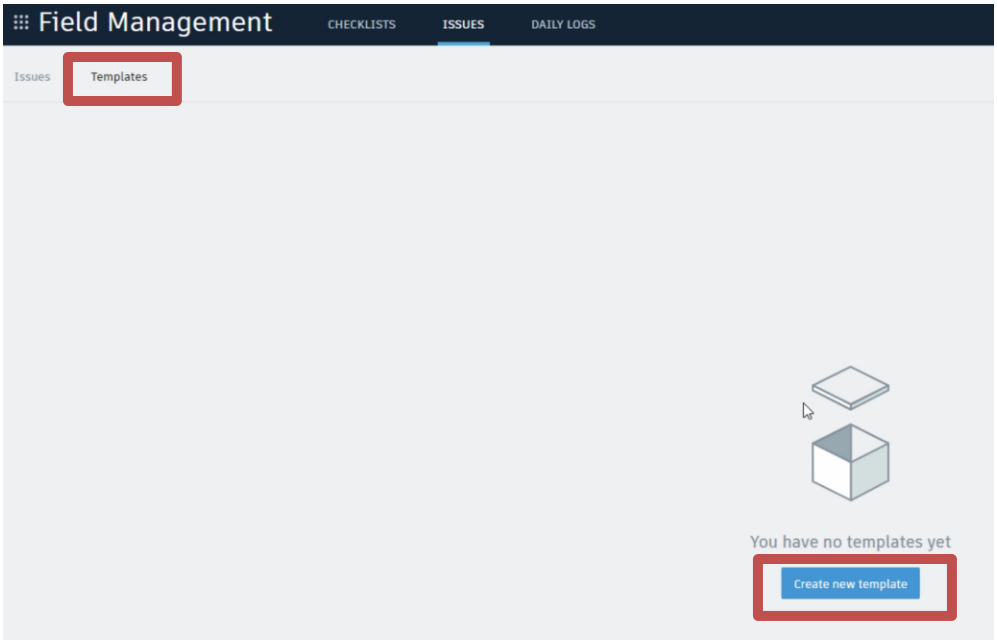
- Category
- Assigned to
- Due Date
- Location
- Location Details
- Owner
- Root Cause
- Description
- Custom Attributes

Note: To know more about Issue Types, you can refer the help document here

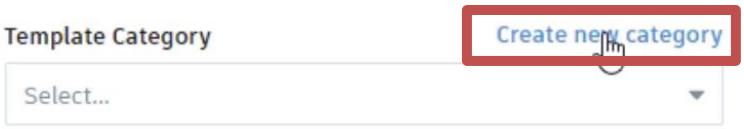
We will be creating Issues template, under the category called “Design”. You can understand more about the category part from here.

To create Issue Template:

1. Click the Module Selector ➤ **Field Management**.
2. Click the **Issues** tab.
3. Click the **Templates** secondary tab.
4. Click **Create a new template**.



5. Under Template Category, select “Create new category”
6.

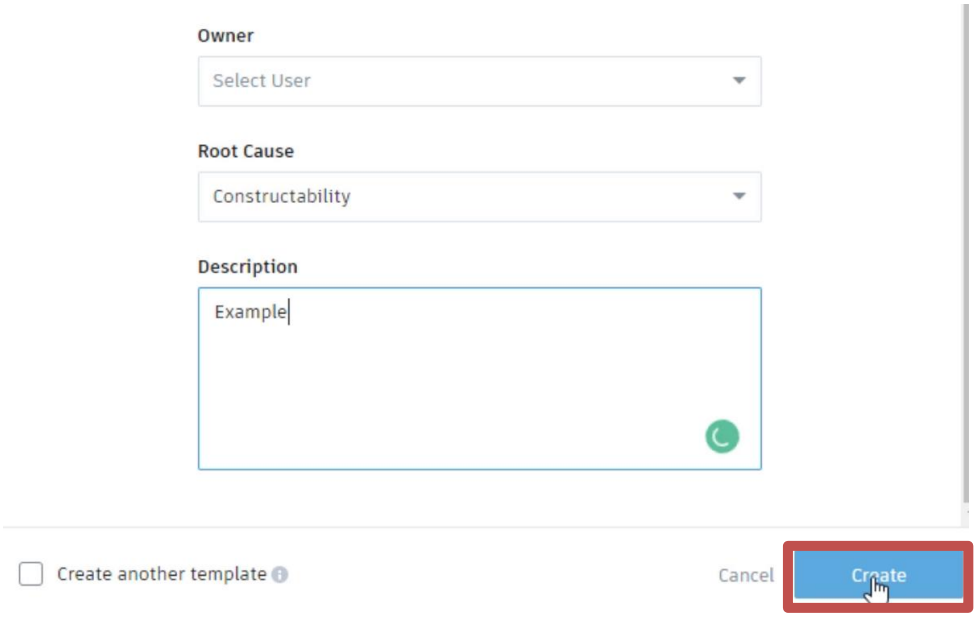


7. Create a new category called Coordination
8. Enter a title- Issues Sample AU 2020
9. Select the Issue Type as “Coordination”.
10. Keep the Initial Status as “Open”



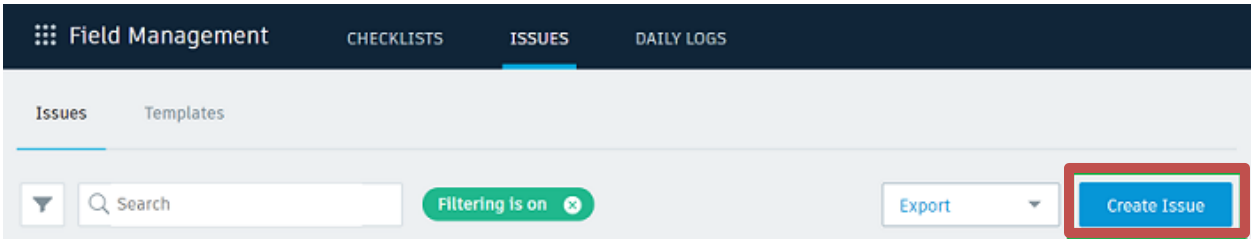
11. Select the Root Cause as “Constructability “under Coordination.
12. Click on Create to create the Template

Note: You can add the description by your choice.



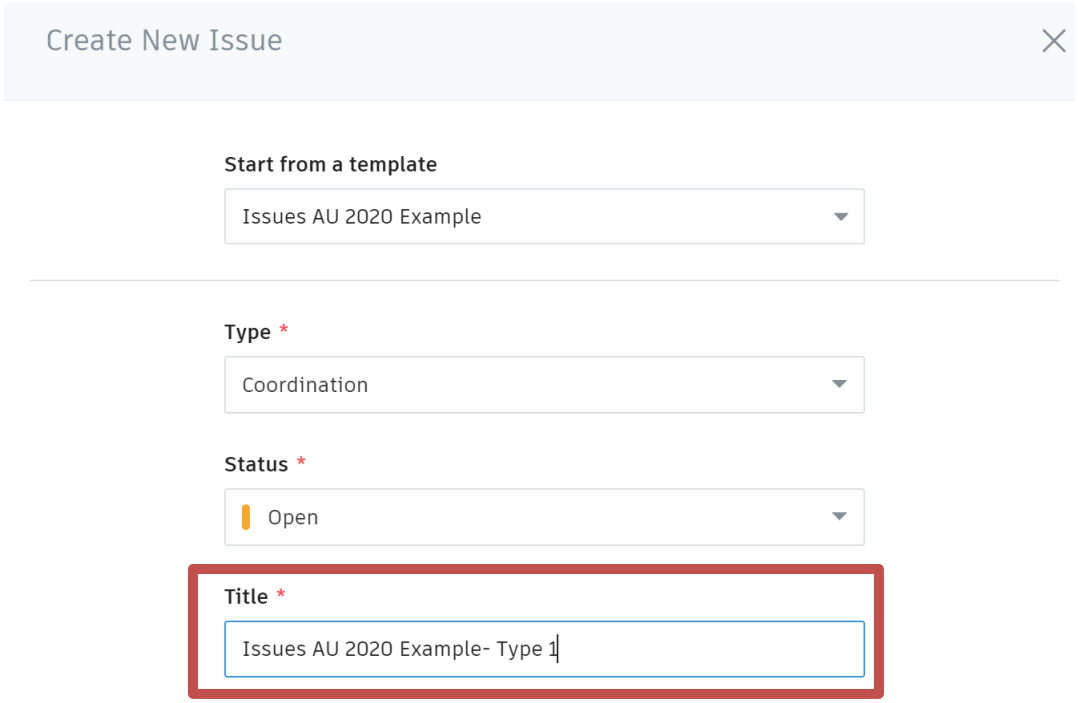
Creating Issue using the above template:

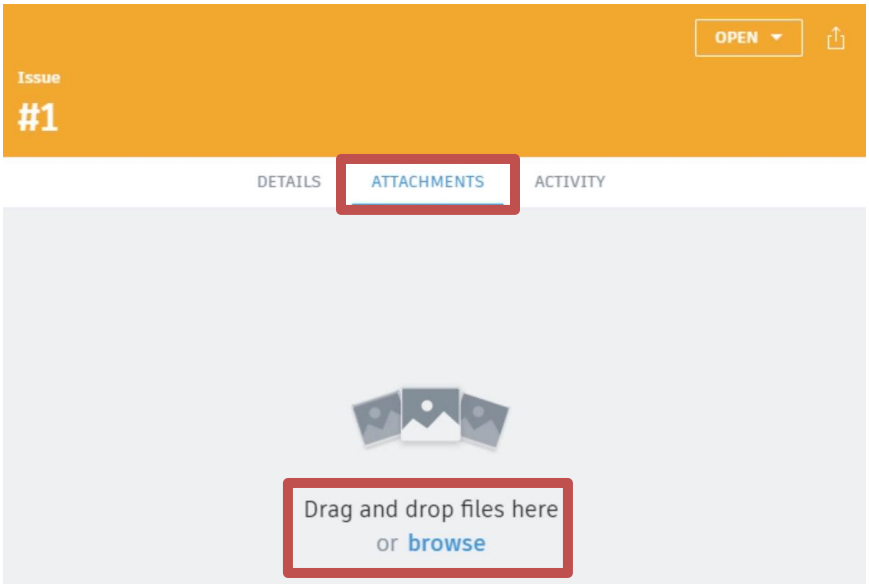
1. In the Issues tab, click Create Issue.



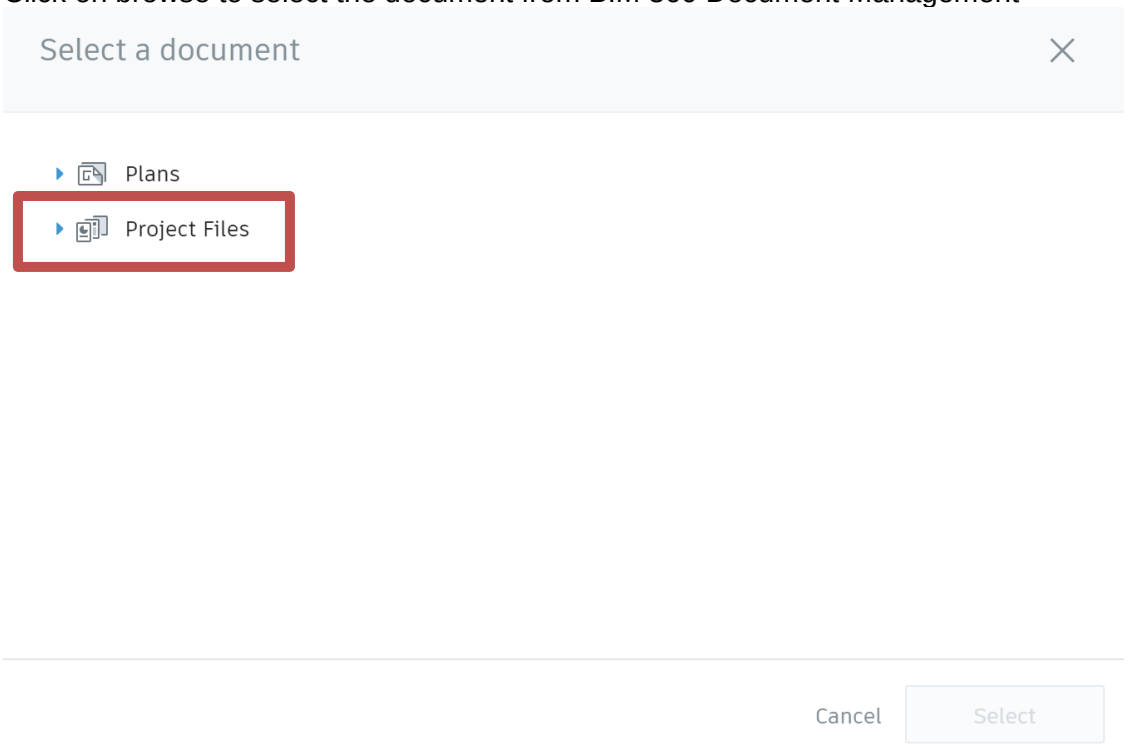
2. Enter issue details in the Create New Issue dialog as below with Issue Type as Coordination and template selected as “Issues AU 2020 Example”



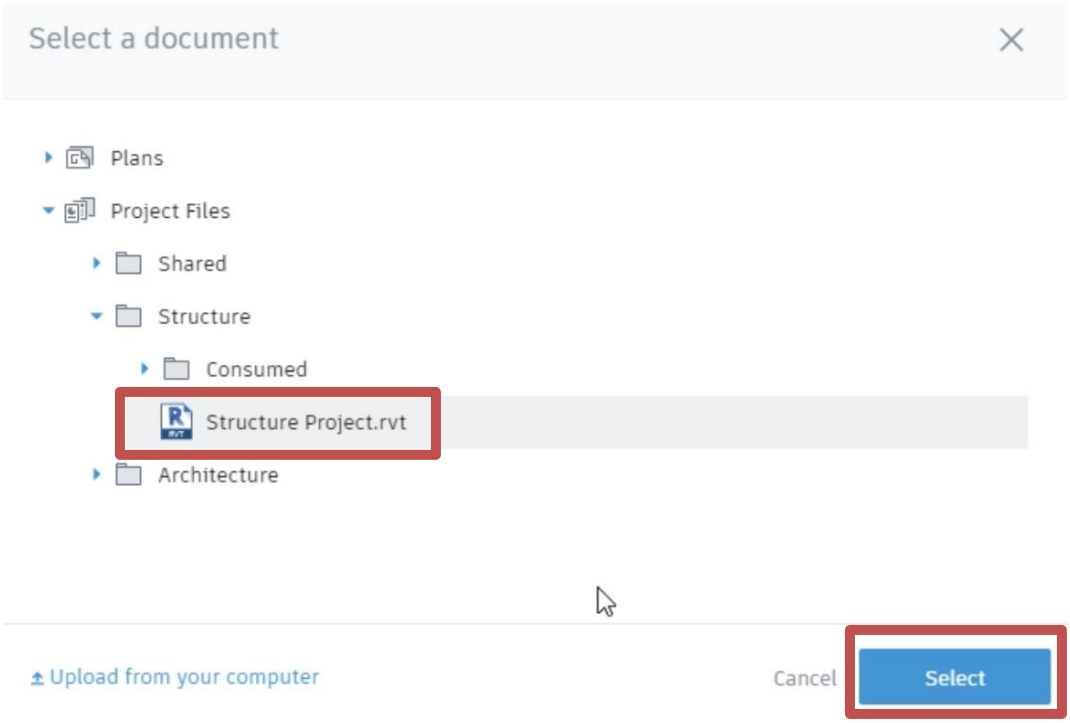


3. Set the status of the issue as Open in this case.
   Note: To know more about the issue workflow and status, you can refer to the document here.
4. Click on Create to create the issue.
5. We will select the issue and click on Attachments to attach a document.
6. 

7. Click on browse to select the document from BIM 360 Document Management



8. Select the Structural model from the Project files folder assuming that the issue is related to that model.



Note:

- You can also add a description.
- For Assigned To, you can assign by users, roles, or companies. Assignees receive an email notification with a link to the issue.

You can also create issues from Document Management and pin them to the 2D sheets/ 3D models using the Filed Management Issue template.

Create and manage issues related to 2D projects and 3D models, at a document or project level.

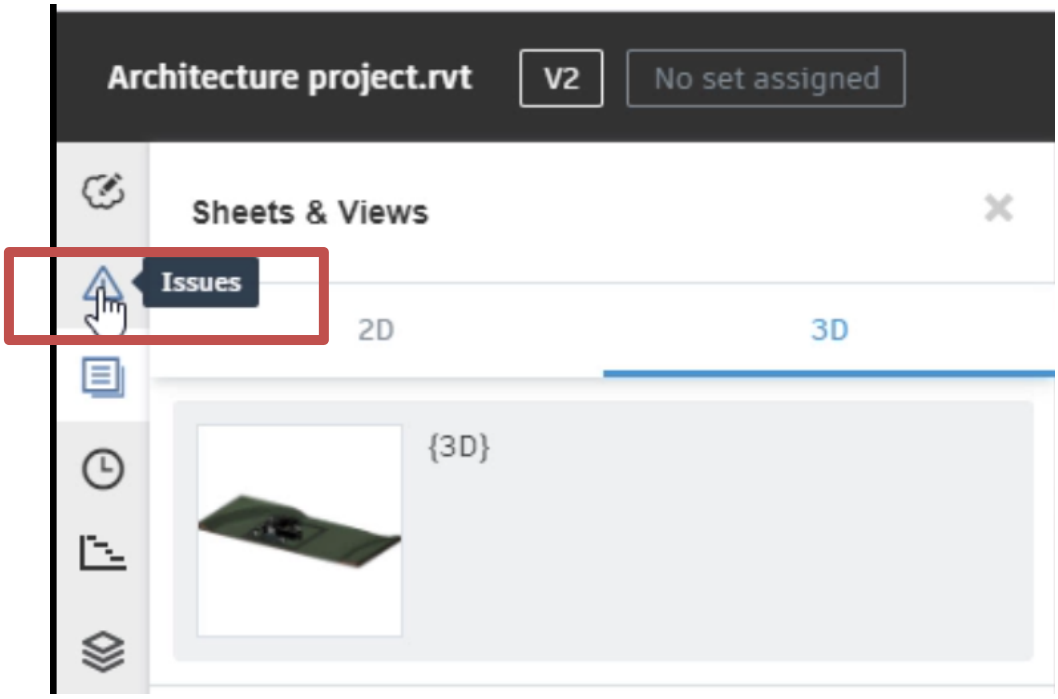
You can work with issues in BIM 360 alone or collaborate using Navisworks. See the Navisworks help for more information.

Note: In addition to document-based issues, you can also create issues that aren't associated with a specific location, but with a project. The process is similar to how we create independent issues in Field Management (Just tried above!). You can refer to this document for details.

You can also refer Issues in Document Management FAQs for additional queries.

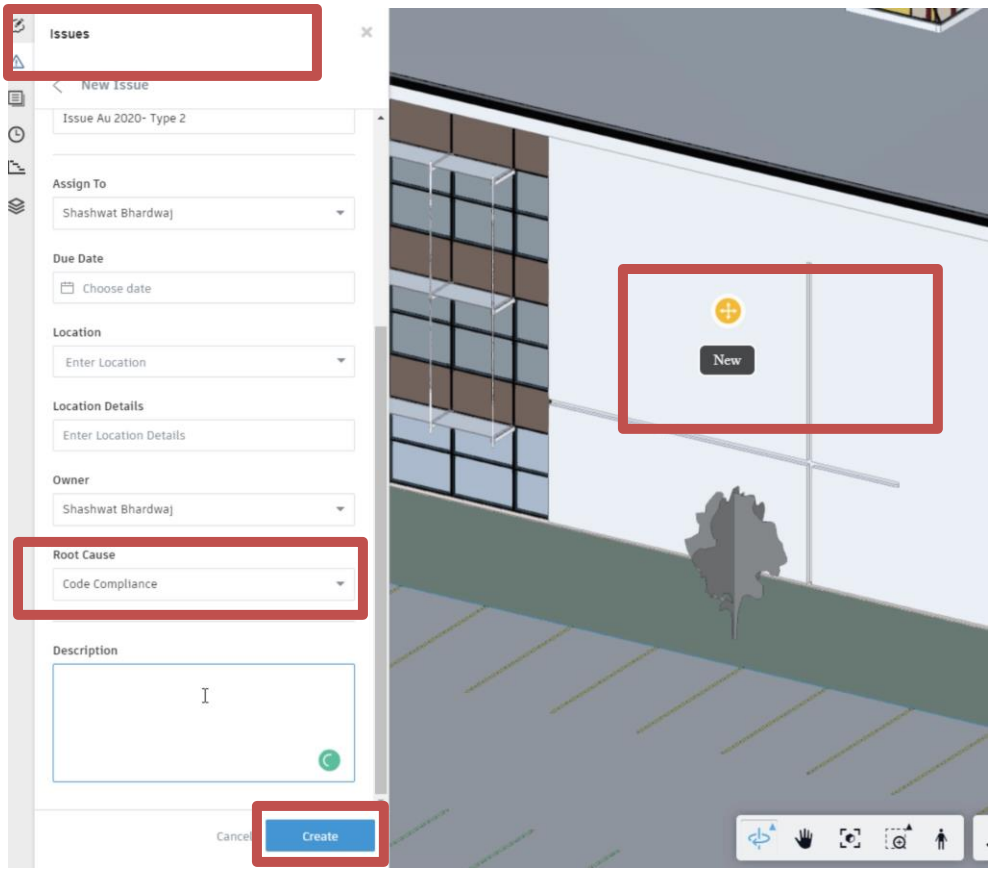
To create an issue in 2D/ 3D model-based issues in BIM 360 Document Management:

1. Open the 3D model “Architectural model” from the Projects files folder in BIM 360 Document Management.
2. At the bottom left of the Issues panel, click Create Issue.





3. Click a location to place the issue pushpin. A pushpin represents an issue. Drag the pushpin to where you want to place it.



Note: The location field will automatically populate if the pushpin *is placed in a defined location. To know more about locations, refer this document.*Moving the pushpin to an undefined location will clear the location field.

4. Specify the issue type as “Design” and Status as “Open”
   Tip: When creating an issue, you can set the issue status to Draft before saving it. When ready to assign, set to Open.
5. Provide the title as ‘Issue AU 2020- Type 2”
6. Add the root cause as “Code compliance” under Design
7. Add the description. In this case we will add something like “Want to remove the panel”
8. Click on Create

Additional Information:

- You can also edit project-level and document-level issues according to your needs.
- You can export a complete list of project issues in PDF, or CSV format for offline review.
  Note: PDF export is only available to project administrators.
- The issues, both from Document Management and Field Management can be viewed in the Issues list in both the services.

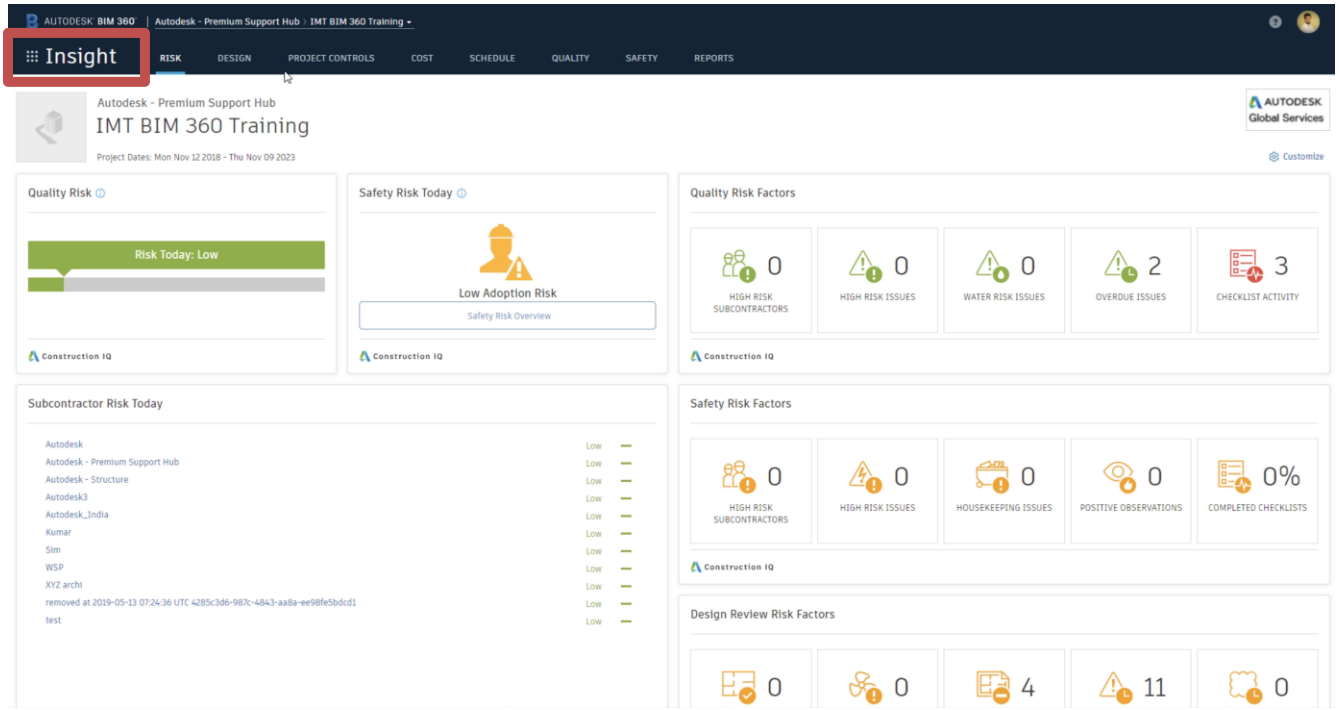
For more information on the above information, refer this document.

Note: To create issues from BIM 360 iPad, you can refer the link here.

Step 4) BIM 360 Insights

Insight is an ecosystem that delivers unified project-level data, analytics, and predictive insights. It can help get you up to speed with what's going on in a project, assess trends and patterns in project data, identify any gaps and problems, and use predictive risk data to improve project efficiency.

This is how the Insight page for the current project will look like with the data that we have created:



There are two broad categories of Construction IQ user, each with different associated permissions and workflows:

- **Executive** (Director of Quality, VP of Operations): Can see an executive overview of all projects in the account, which provides visibility of project and subcontractor risk and identifies cross-project patterns.
- **Project Lead** (Superintendent, Project Manager): Can see a project overview, including the risk level for all subcontractors and issues in the project.

Note: The Construction IQ data presented in Project Home and Insight depends on your project module access and the permissions associated with your assigned role.

We are looking into the Project Overview side of things.

There are different tabs in the Project Insight like Risk, Design, Project Controls, Cost, Schedule, Quality, Safety and Reports.

Risk:

Use the Risk tab to get an overview of metrics related to the current high-risk issues in your project.

Note: The data displayed on the Risk tab is collected from Classic BIM 360 Field, and the Next Generation Field Management and Account Admin modules, and analyzed by Construction IQ.

The Construction IQ machine learning algorithms are currently optimized for Commercial, Healthcare, Institutional, and Residential project types. Risk analysis of issues is only carried out in projects that use one of these project types. The project type is specified when the project administrator creates the project.

Design:

Use the Design tab to get an overview of metrics related to design review and model coordination processes.

The Design tab provides insights into trends and patterns around outstanding design and coordination issues and reviews, and which companies are responsible for resolving them

Note: You must have access to Document Management to see the Design tab. The cards displayed depend on your access to project services. For example, in order to see coordination analytics, you need access to the Model Coordination service in BIM 360.

See the Analyze Design Review Risk topic for more information on how the cards within the Design tab can be used to predict and prevent design issues as part of a design review.

Project Controls:

Use the Project Controls tab to get an overview of metrics related to the issues, RFIs, and submittals associated with your project.

Note: The Project Controls tab is visible to anyone with access to Document Management, and this allows you to see the Document Management-specific cards. Access to Project Management allows you to additionally view the Project Management-specific cards.

Cost:

Use the Cost tab to get an overview of cost and budget trends, such as the original vs projected budget for different aspects of your project.

Note: You must have access to Cost Management to see the Cost tab.

Schedule:

Note: The Schedule tab requires access to BIM 360 Plan.

Quality:

Use the Quality tab to get an overview of metrics related to the quality of your project.

The Quality tab aggregates your project quality data into one view, allowing you to monitor issue status, activity, and root cause.

Note: You must have access to Field Management to see the Quality tab. The cards displayed depend on your access to project services and permissions associated with your role. For more information, see Visual Workflow: Get Started with Insight.

Safety:

Use the Safety tab to get an overview of metrics related to the safety and risk of your project.

Report:

Use the Reports tab to get a quick overview of the reports exported in various BIM 360 modules, such as Document Management, Field Management, and Project Management. Gain insight into data related to issues, checklists, documents, submittals, and RFIs. Project administrators can also create reports using pre-defined custom templates. To learn more, see Reports in Insight.

Additional Information

- You can also customize the Insight Dashboard depending on what you want to see.
- Add, remove, or rearrange cards using the Customize Dashboard in Project Home and the tabs in Insight. For more information around it, refer: Customize Dashboards
- For more questions on Construction IQ refer: Construction IQ FAQs

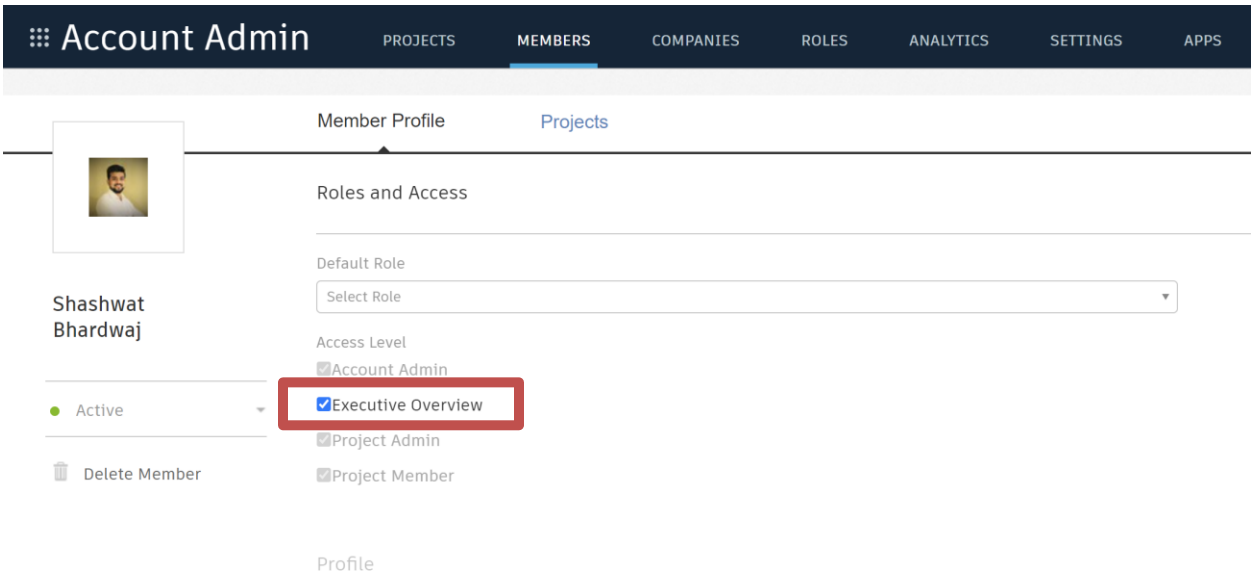
Step 3) Data Connector and Power BI

The data connector automatically extracts data from all BIM 360 projects in your account to a CSV file.

Note: In order to access Data Connector. One must have the Executive Overview access enabled in account admin service.

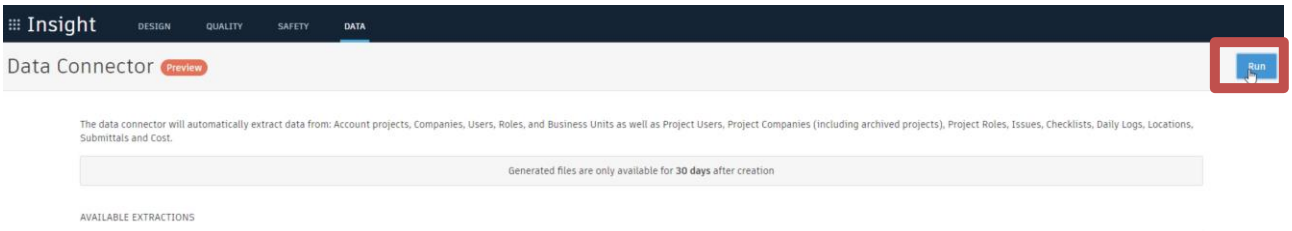
To give executive overview follow the steps:

1. Go to Account Admin Page.
2. On the members tab, select the member and click on edit.
3. Select the member and click Edit on the profile.
4. Select Executive Overview and click on Save.



To access data connector:

1. Go to the account administration service.
2. Select Insight module.
3. Open the Data tab within the Insight module.
4. Click Run.

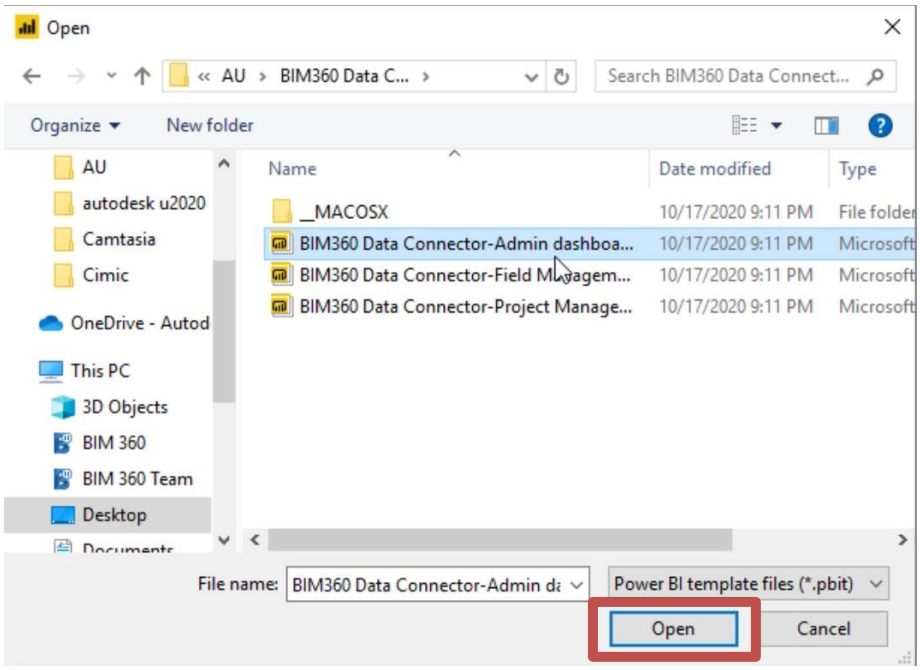


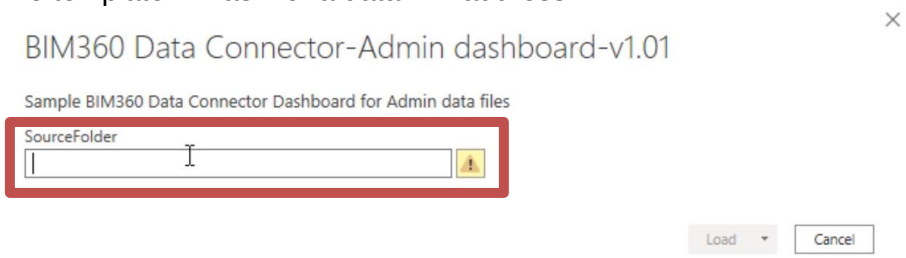
5. After the extraction is complete, click Download to download a .zip file of the extracted data.
6. The download files include project data information mentioned in this article.

Extracted data is packaged into a downloadable .zip file containing a series of .csv files. Each .csv file represents a different set of data for the categories listed above.

admin_account_services.csv	10/17/2020 9:14 PM	Microsoft Excel C...	1 KB
admin_accounts.csv	10/17/2020 9:14 PM	Microsoft Excel C...	1 KB
admin_business_units.csv	10/17/2020 9:14 PM	Microsoft Excel C...	4 KB
admin_companies.csv	10/17/2020 9:14 PM	Microsoft Excel C...	163 KB
admin_project_companies.csv	10/17/2020 9:14 PM	Microsoft Excel C...	261 KB
admin_project_services.csv	10/17/2020 9:14 PM	Microsoft Excel C...	300 KB
admin_project_user_roles.csv	10/17/2020 9:14 PM	Microsoft Excel C...	205 KB
admin_project_user_services.csv	10/17/2020 9:14 PM	Microsoft Excel C...	1,199 KB
admin_projects.csv	10/17/2020 9:14 PM	Microsoft Excel C...	242 KB
admin_roles.csv	10/17/2020 9:14 PM	Microsoft Excel C...	7 KB
admin_users.csv	10/17/2020 9:14 PM	Microsoft Excel C...	332 KB
checklists_checklist_assignees.csv	10/17/2020 9:14 PM	Microsoft Excel C...	31 KB
checklists_checklist_attachments.csv	10/17/2020 9:14 PM	Microsoft Excel C...	1 KB
checklists_checklist_item_doc_attachme...	10/17/2020 9:14 PM	Microsoft Excel C...	1 KB
checklists_checklist_items.csv	10/17/2020 9:14 PM	Microsoft Excel C...	296 KB
checklists_checklist_items_answers.csv	10/17/2020 9:14 PM	Microsoft Excel C...	51 KB
checklists_checklist_section_assignees.csv	10/17/2020 9:14 PM	Microsoft Excel C...	4 KB
checklists_checklist_sections.csv	10/17/2020 9:14 PM	Microsoft Excel C...	93 KB
checklists_checklist_signatures.csv	10/17/2020 9:14 PM	Microsoft Excel C...	20 KB
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checklists_template_item_instructions.csv	10/17/2020 9:14 PM	Microsoft Excel C...	11 KB
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checklists_template_sections.csv	10/17/2020 9:14 PM	Microsoft Excel C...	57 KB
checklists_template_signatures.csv	10/17/2020 9:14 PM	Microsoft Excel C...	12 KB
checklists_templates.csv	10/17/2020 9:14 PM	Microsoft Excel C...	42 KB
cost_budgets.csv	10/17/2020 9:14 PM	Microsoft Excel C...	50 KB
cost_change_order_cost_items.csv	10/17/2020 9:14 PM	Microsoft Excel C...	4 KB
cost_change_order_properties.csv	10/17/2020 9:14 PM	Microsoft Excel C...	8 KB
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cost_contracts.csv	10/17/2020 9:14 PM	Microsoft Excel C...	23 KB
cost_cost_items.csv	10/17/2020 9:14 PM	Microsoft Excel C...	4 KB
dailylogs_dailylogs.csv	10/17/2020 9:14 PM	Microsoft Excel C...	155 KB
dailylogs_labor_items.csv	10/17/2020 9:14 PM	Microsoft Excel C...	14 KB
dailylogs_labors.csv	10/17/2020 9:14 PM	Microsoft Excel C...	172 KB
dailylogs_notes.csv	10/17/2020 9:14 PM	Microsoft Excel C...	179 KB
dailylogs_weather_logs.csv	10/17/2020 9:14 PM	Microsoft Excel C...	197 KB
issues_attachments.csv	10/17/2020 9:14 PM	Microsoft Excel C...	371 KB

Adding BIM 360 extracted project data in Power BI.

1. Download the Power BI template from the reference material of this hands-on lab.
2. Open the template in Power BI.
3. 

4. The template will ask for a data-link address.


5. Copy-paste the file path. For example, in this case, I have downloaded the file in my desktop folder. I will use the path:



6. The data is now visible in Power BI.

Note: The data shown in the presentation is a data for our internal test account of Autodesk.

Learning Objective 3 – ‘Understanding of Autodesk Forge’

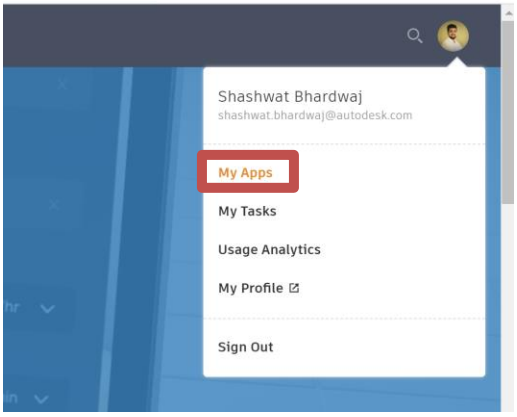
Forge is a cloud-based program from Autodesk. The platform offers APIs and services that help you access and use your design and engineering data via the cloud. Integrate with the Autodesk BIM 360 platform to extend its capabilities to reach segments of the construction ecosystem that don’t have direct access to BIM data.

This section will cover the following learning objectives:

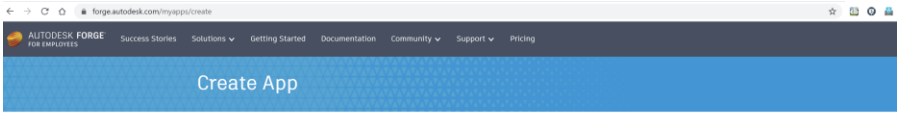
1. **Creating a Forge application and integrating it with BIM 360 Account.**
2. **Understanding of Forge APIs.**
3. **Live demonstration of BIM 360 data extraction using Authentication and Data Management Forge APIs.**

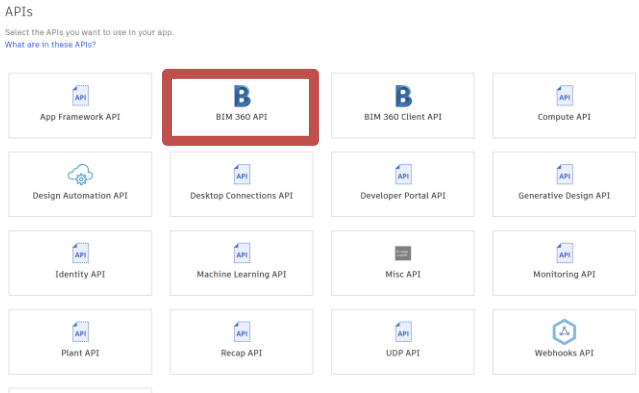
Step 1) Create an application in Forge

1. Sign in to https://forge.autodesk.com/
2. Go to the top right corner and select the option ‘My Apps’



3. Select the option ‘Create App’.
4. It will ask to select the desired APIs.





5. Select BIM 360 API.
6. Fill the App name and other information which are required.
7. Hit on ‘Create App’.
8. Make a note of your **Client ID** and **Client Secret**. They will be used to generate a token, which will be appended to every request your app makes. The token lets Forge authenticate each request and associate them with your account.

Client Id

A *Client Id* is sometimes called a *Consumer Key*. It’s a unique key – uniquely assigned to you that allows your application to identify itself in public. It is used during the authentication (OAuth) process, and many developers also use it as a prefix when they must generate a unique name for something (for example when naming buckets used for file storage in the Object Storage System).

Client Secret

The *Client Secret* is sometimes called a *Consumer Secret Key*. It is used in conjunction with the Client Id to authenticate your application. Unlike your *Client Id*, you must never share your *Client Secret* with anyone. (The only time you will use it is during the OAuth process). If you accidentally do reveal it to someone, you can regenerate the *Client Secret* for the *App* from the Forge App details screen (see image above). The advantage of regenerating your *Client Secret* instead of generating a completely new App is that this allows you to retain access to the data you have posted to the Forge platform.

Note: At any point in time, you can add or remove Forge services from your app. In today’s lab, we are extracting the information of BIM 360 project data with help of below Forge APIs:

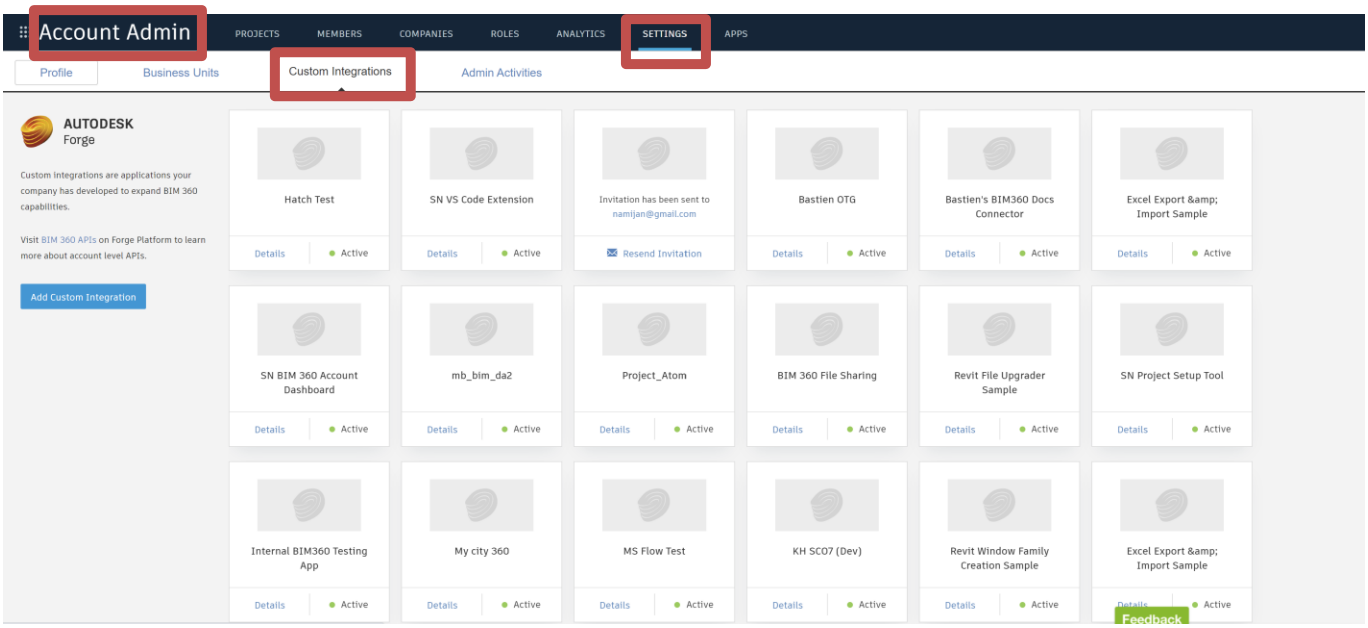
- *Authentication*
- *Data Management*

Step 2) Add Forge application to the BIM 360 account.

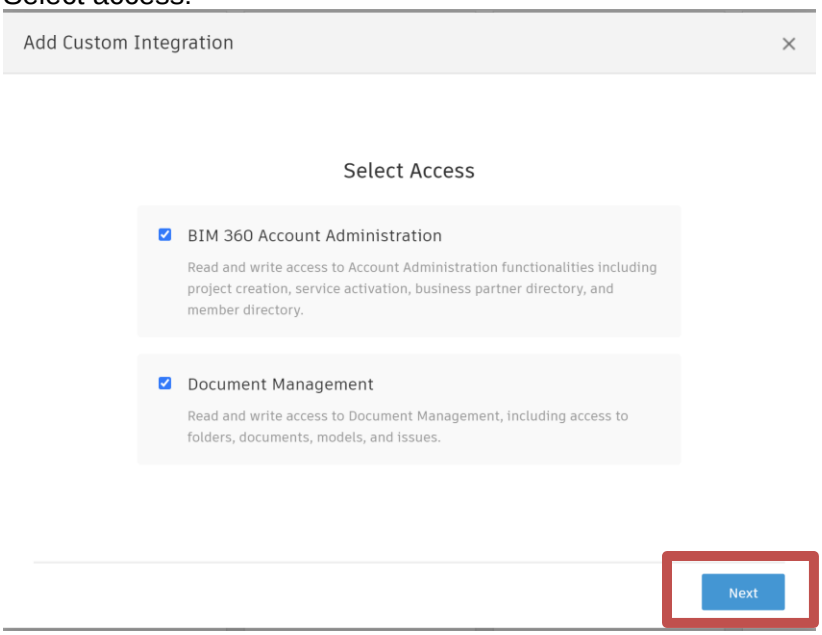
Once the app is created, then you need to integrate this application with the BIM 360 Account.

Follow the below steps:

1. Open BIM 360 in a web browser.
2. Go to the ‘Account Admin’ service.
3. Select the Sub-tab settings
4. Under ‘Settings’ select Custom integration

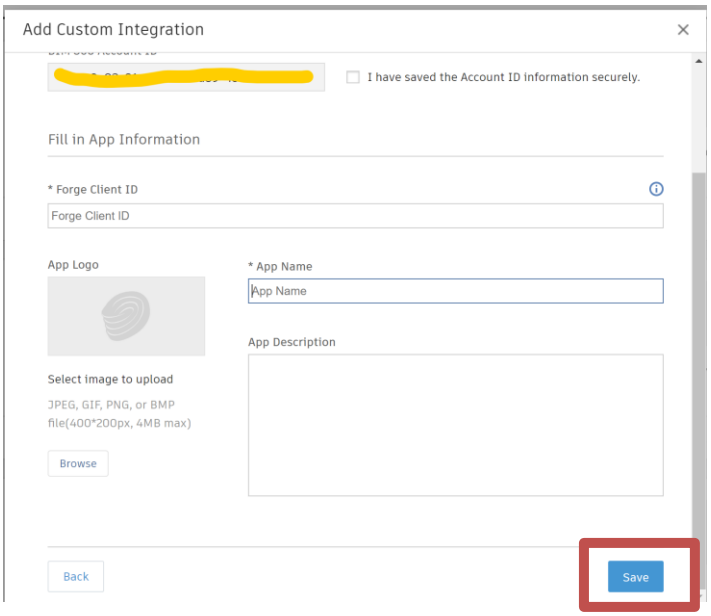


5. Select access:



6. Click Next.

7. Provide the required details:



8. Write down the client ID which you noted down during the app creation.
9. Click Save.

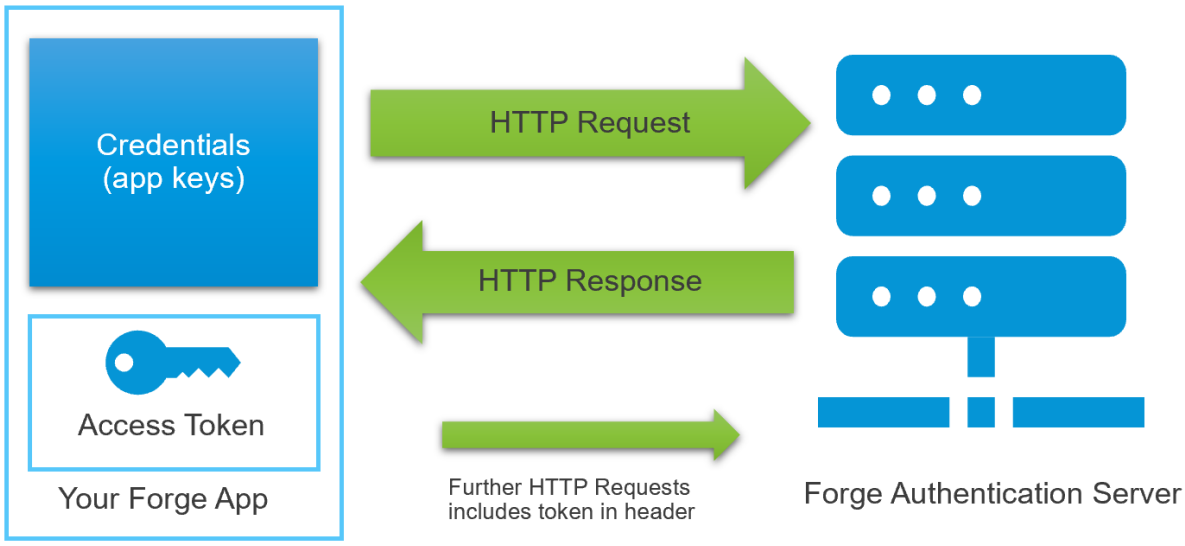
The forge application is now ready to extract BIM 360 data from your account.

Step 3) Postman and Forge

Postman is a popular tool that provides an easy-to-use interface to send HTTP requests. Postman can parse the responses that Forge sends and save response parameter values to variables.

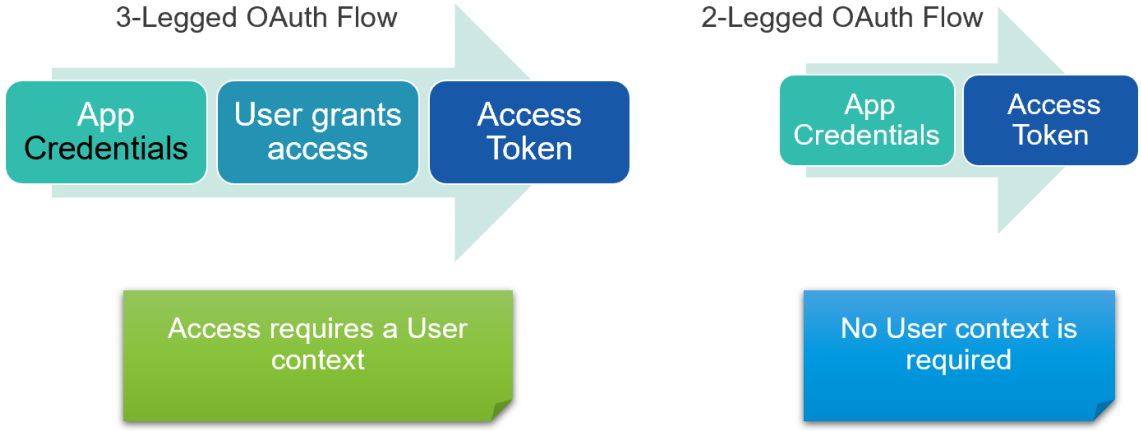
- You can learn how to install and use Postman from here.
- You can download the Postman installer from here.

Step 4) Authentication (OAuth) API



- The above is an example of understanding the basic concept of how Token-based authentication happens in the back end.

OAuth, specifically OAuth2, is the open standard used across the Forge Platform for token-based authentication and authorization.



Two-Legged Authentication

This is often considered the default type of authentication, and it is the simplest. When your app needs to call the API without having to access resources that require an end user's permission (for example, translating a design file from one format to another), the communication is directly between your app and the Forge Platform. The end-user, if there is one, does not need to be aware of the authentication or provide authorization for the app to access any resources.

Three-legged authentication

When an app needs to access resources belonging to an end-user, that user must explicitly provide authorization. The typical mechanism, in the case of a web app, is for the app to redirect the user to an Autodesk login page with information about which of the user's resources it wishes to access. The user then provides explicit consent, letting the Forge Platform know that the referring app is to be granted the requested access. The user is then redirected back to the app, which can then access the required resources.

Refer API basics for more information.

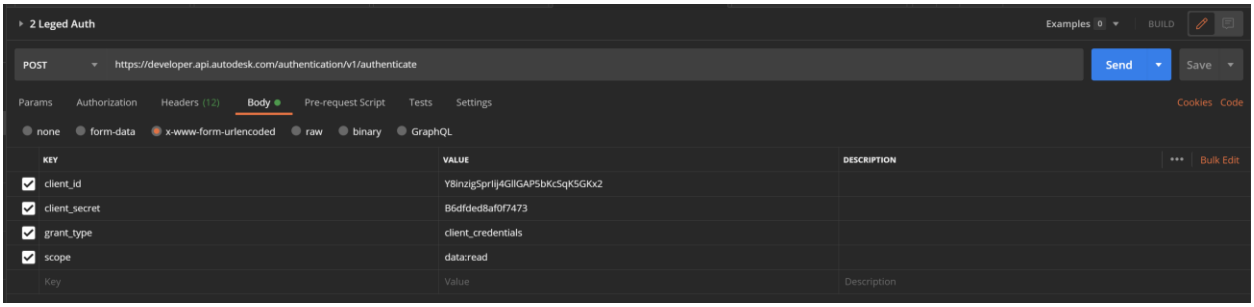
We will capture the access token using Two-Legged Authentication using the OAuth API service.

Follow below steps:

1. Open Postman
2. Create a new collection – OAuth (you can provide any other name)
3. Create a new POST Request under OAuth Collection

```
curl -v 'https://developer.api.autodesk.com/authentication/v1/authenticate'
  -X 'POST'
  -H 'Content-Type: application/x-www-form-urlencoded'
  -d '
    client_id=xxxxxxxxxxxxxxxxxxxxxx
    client_secret=xxxxxxxxxxxxxxxxxx
    grant_type=client_credentials&
    scope=data:read
```

4. This query in Postman will look like this



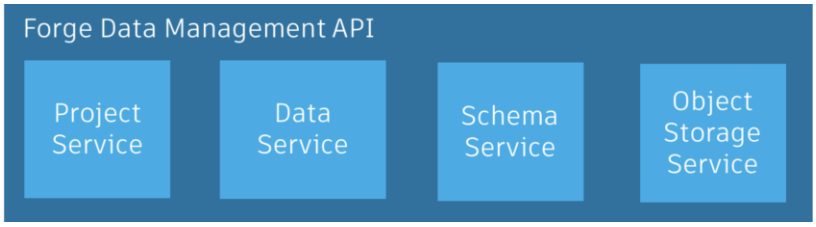
5. The response of this will give you access token.



- Note down this access token (one can copy the token). It is recommended to environmental variables in postman to capture the information. In this case, the access token has been assigned to an environment variable- bearer.

Step 5) Publish a Cloud Workshared Revit Model to NextGen BIM 360 Docs Using Data Management API

The Data Management API provides a unified and consistent way to access data across BIM 360 Team, Fusion Team (formerly known as A360 Team), BIM 360 Docs, A360 Personal, and the Object Storage Service.
The Data Management API is composed of the following services:



This lab demonstrates how to publish the latest synchronized Cloud Workshared Revit models to NextGen BIM 360 Docs. Each time you publish a latest model to NextGen BIM 360 Docs, you create a new version of the model.

To publish the latest model, you need to first:

- Initiate collaboration through Revit, and select BIM 360 Docs.
- This creates the first version in BIM 360 Docs.
- Modify the model locally, and synchronize the changes with the central model.

The below steps will demonstrate how to get the ID of the model that you want to update in BIM 360 Docs, publishing the model to BIM 360 Docs, and verifying that the model has finished publishing.

A) Find the Hub ID for the BIM 360 Account

The first few steps of the tutorial demonstrate how to iterate through several Forge Data Management endpoints to find the ID of the cloud workshared Revit model you want to update. Call GET hubs to find the hub ID for the BIM 360 account that contains the model you want to update.

1) Open Postman
2) Get the Access_ token (refer: *'Step 4) Authentication (OAuth) API'*)
3) Send the below 'GET' request from postman.

Request:

```
curl -v 'https://developer.api.autodesk.com/project/v1/hubs'  -H
'Authorization: Bearer AuIPTf4KYLTYGVnOHQ0cuolwCW2a'
```



Note:

- The 'ForgeURL' is the environment variable with loaded value- `developer.api.autodesk.com`
- Bearer is an environmental variable with the loaded value of the *access token.*

Response:
The response to the above query will look like:

```
"data": [
    {
      "type": "hubs",
      "id": "b.ddde928d-b610-4b18-b43d-2915ad438a84",
      "attributes": {
        "name": "DemoAccount",
        "extension": {
          "type": "hubs:autodesk.bim360:Account",
          "version": "1.0",
```

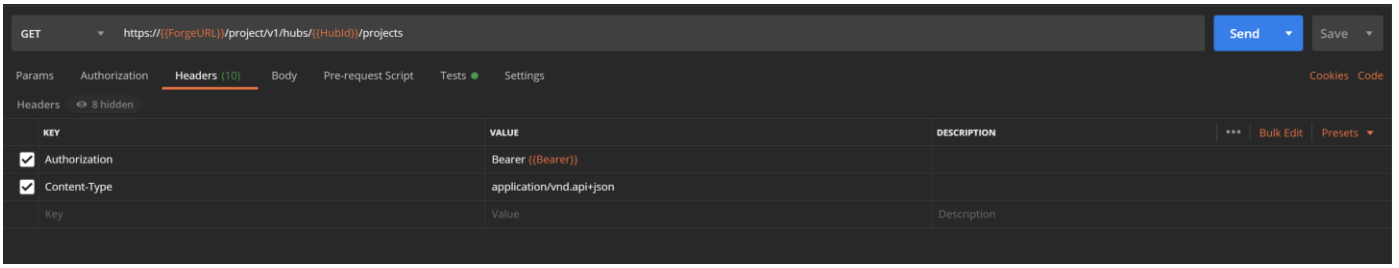
We will now note down this HUB ID of BIM 360 Account- b.ddde928d-b610-4b18-b43d-2915ad438a84

B) Find the Project ID

Put the HUB ID in the below request. One can also set up the environment variable for it.

Request:

```
curl -X GET -H "Authorization: Bearer nFRJxzCD8OOUr7hzBwbr06D76zAT"
"https://developer.api.autodesk.com/project/v1/hubs/b.ddde928d-b610-4b18-
b43d-2915ad438a84/projects?filter[attributes.name]=DemoProject"
```



Note:

- The ‘ForgeURL’ is the environment variable with loaded value- `developer.api.autodesk.com`
- Bearer is an environmental variable with the loaded value of the *access token.*
- ‘HubId’ is the environment variable in which the ID of the HUB has been saved.

Response:

The response to the above query will look like:


```
"data": [
    {
      "type": "projects",
      "id": "b.c8112490-4e08-435c-994b-64fe60fea507",
      "attributes": {
        "name": "DemoProject",
        "extension": {
          "type": "projects:autodesk.bim360:Project",
          "version": "1.0",
          "schema": {
            "href":
"https://developer.api.autodesk.com/schema/v1/versions/projects:autodesk.bim360
:Project-1.0"
          },
          "data": {}
```

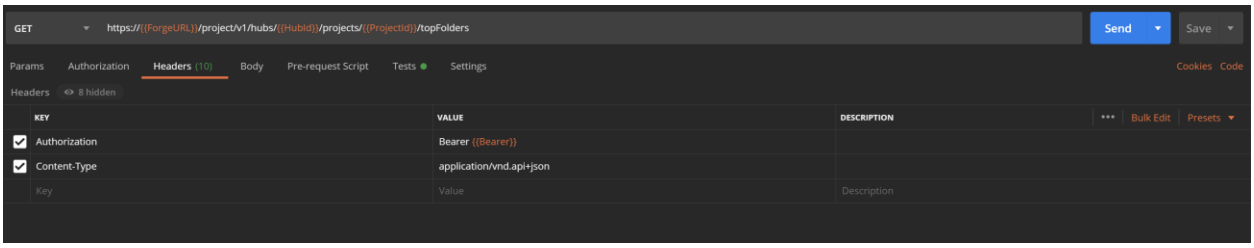

We will now note down this Project ID of BIM 360 Project- b.c8112490-4e08-435c-994b-64fe60fea507

C) Find the Folder ID:

Put the HUB ID, Project ID in the below request.

Request:

```
curl -X GET -H "Authorization: Bearer nFRJxzCD8OOUr7hzBwbr06D76zAT"
            "https://developer.api.autodesk.com/project/v1/hubs/b.ddde928d-
b610-4b18-b43d-2915ad438a84/projects/b.c8112490-4e08-435c-994b-
64fe60fea507/topFolders"
```



Note:

- The 'ForgeURL' is the environment variable with loaded value- `developer.api.autodesk.com`

- ‘Bearer’ is an environmental variable with the loaded value of the *access token.*
- ‘HubId’ is the environment variable in which the ID of the HUB has been saved.
- ‘Project ID’ is the environment variable in which the ID of the Project has been saved.

Response:

The response to the above query will look like:


```
"data": [
      {
          "type": "folders",
          "id": "urn:adsk.wipprod:fs.folder:co.BJU3PTc4Sd2CmXM492XUiA",
          "attributes": {
              "name": "Project Files",
              "displayName": "Project Files",
              "createTime": "2017-06-13T05:16:18.0000000Z",
              "createUserId": "38SCJGX4R4PV",
              "createUserName": "John Doe",
              "lastModifiedTime": "2018-02-22T17:51:11.0000000Z",
              "lastModifiedUserId": "38SCJGX4R4PV",
              "lastModifiedUserName": "John Doe",
              "lastModifiedTimeRollup": "2018-02-22T17:58:36.0000000Z",
              "objectCount": 4,
```


We will now note down this Folder ID -
`urn:adsk.wipprod:fs.folder:co.BJU3PTc4Sd2CmXM492XUiA`

D) Find the Item ID of the Cloud Workshared Model

Put the Project ID and Folder ID in the below request.

Request:

```
curl -X GET -H "Authorization: Bearer nFRJxzCD8OOUr7hzBwbr06D76zAT"
"https://developer.api.autodesk.com/data/v1/projects/b.c8112490-4e08-435c-994b-64fe60fea507/folders/urn:adsk.wipprod:fs.folder:co.BJU3PTc4Sd2CmXM492XUiA/contents?filter[attributes.extension.type]=items%3Aautodesk.bim360%3AC4RModel"
```



Note:

- The 'ForgeURL' is the environment variable with loaded value- `developer.api.autodesk.com`
- Bearer is an environmental variable with the loaded value of the *access token.*
- 'Project ID' is the environment variable in which the ID of the Project has been saved.
- 'Folder ID' is the environmental variable in which the ID of the folder has been saved.

Response:
The response to the above query will look like:


```
"data": [
    {
      "type": "items",
      "id": "urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q",
      "attributes": {
        "displayName": "DemoModel",
        "createTime": "2018-02-22T17:51:11.0000000Z",
        "createUserId": "38SCJGX4R4PV",
        "createUserName": "John Doe",
        "lastModifiedTime": "2018-02-22T17:58:36.0000000Z",
        "lastModifiedUserId": "38SCJGX4R4PV",
        "lastModifiedUserName": "John Doe",
        "hidden": false,
        "reserved": false,
        "extension": {
          "type": "items:autodesk.bim360:C4RModel"
```


We will now note down this Model ID of Revit cloud work shared model-
`urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q`

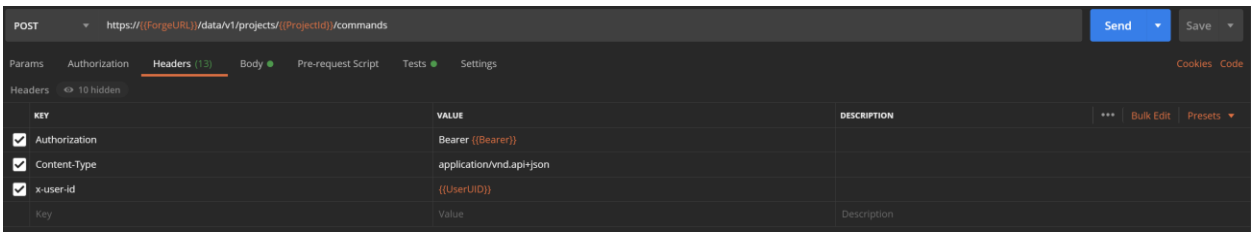
E) Publish the Latest Version of the Model to BIM 360 Docs

Put the Project ID, Folder ID in the below request.

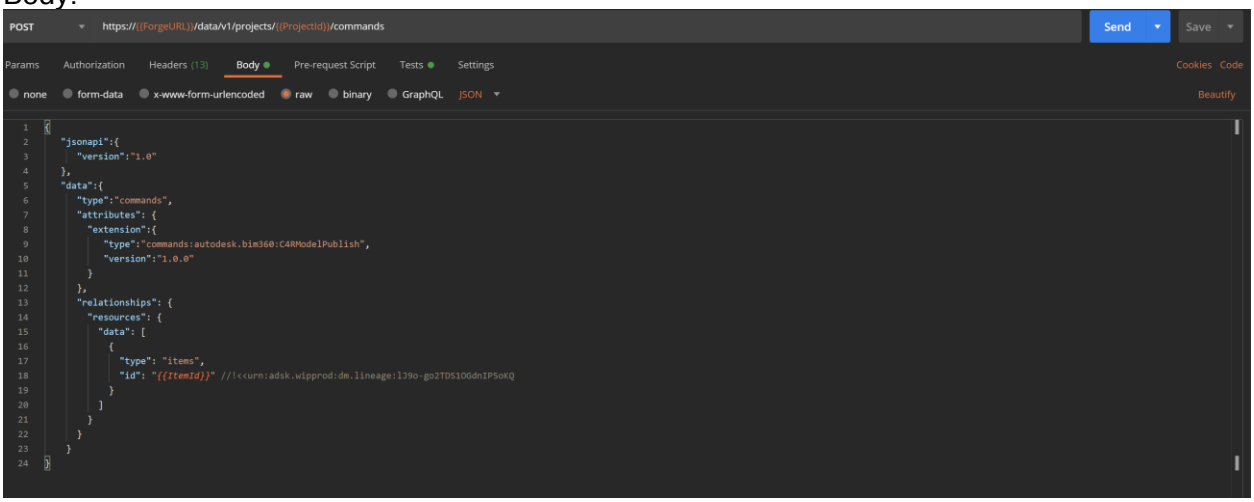
Request:

```
  curl -X POST -H "Authorization: Bearer nFRJxzCD8OOUr7hzBwbr06D76zAT"
"https://developer.api.autodesk.com/data/v1/projects/b.c8112490-4e08-435c-994b-
64fe60fea507/commands" -H 'content-type: application/vnd.api+json' -d '
{
  "jsonapi": {
  "version": "1.0"
  },
  "data": {
  "type": "commands",
  "attributes": {
    "extension": {
      "type": "commands:autodesk.bim360:C4RModelPublish",
      "version": "1.0.0"
      }
    },
  "relationships": {
    "resources": {
      "data": [ { "type": "items", "id": "urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q"
} ]
    }
  }
  }
}'
```

Headers:



Body:



Note:

- The ‘ForgeURL’ is the environment variable with loaded value- `developer.api.autodesk.com`
- Authorization must be Bearer <token>, where <token> is obtained via either a two-legged or three-legged OAuth flow. Note that it will not accept a two-legged token unless you **add the x-user-id header**.
  - **x-user-id:** In a two-legged authentication context, the app has access to all users specified by the administrator in the SaaS integrations UI. By providing this header, the API call will be limited to act on behalf of only the user-specified.
- Content-Type- Must be application/vnd.api+json.
- ‘Project ID’ is the environment variable in which the ID of the HUB has been saved.
- Folder ID is the environmental variable in which the ID of the folder has been saved.

Response:
The response to the above query will look like:

```
{
  "jsonapi": {
    "version": "1.0"
  },
  "data": {
    "type": "commands",
    "id": "971ee7a6-5737-483a-bc64-31a88aae09b3_3_636549189940000000",
    "attributes": {
      "status": "committed",
      "extension": {
        "type": "commands:autodesk.bim360:C4RModelPublish",
        "version": "1.0.0"
```

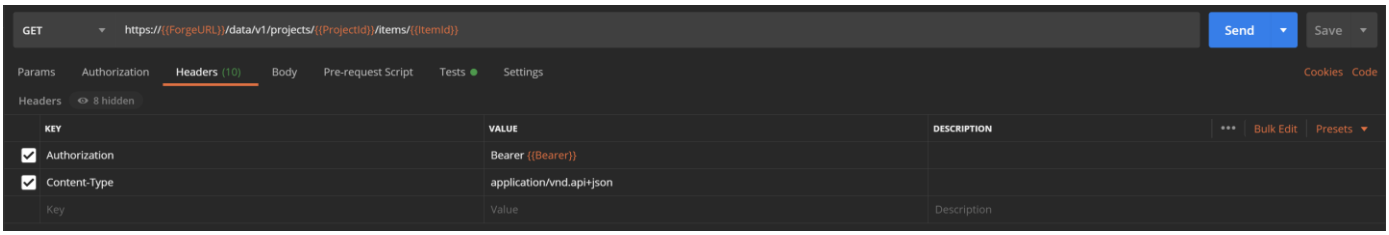
We will now note down this Model ID of Revit cloud work shared model- `urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q`

F) Verify the Model Has Finished Publishing

Use the project ID (`b.c8112490-4e08-435c-994b-64fe60fea507`) and item ID (`urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q`) to iteratively call GET projects/:project_id/items/:item_id, which returns the extraction status of the latest (tip) version of the model.
When `included[i].data.extractState` is set to `SUCCESS`, the model has finished publishing.

Request:

```
curl -X GET -H "Authorization: Bearer nFRJxzCD8OOUr7hzBwbr06D76zAT"
"https://developer.api.autodesk.com/data/v1/projects/b.c8112490-4e08-435c-994b-
64fe60fea507/items/urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q"
```



Note:

- The ‘ForgeURL’ is the environment variable with loaded value- `developer.api.autodesk.com`
- Bearer is an environmental variable with loaded value of the *access token.*
- ‘Project ID’ is the environment variable in which the ID of the Project has been saved.
- ‘Folder ID’ is the environmental variable in which the ID of the folder has been saved.

Response:

The response to the above query will look like:


```
"data": {
            "modelVersion": 4,
            "projectGuid": "cb5b9d79-a68a-4d35-adf6-dc824248f698",
            "originalItemUrn":
"urn:adsk.wipprod:dm.lineage:hPW2BlBbQG2L5HjCOh7Z8Q",
            "isCompositeDesign": false,
            "modelType": "multiuser",
            "latestEpisodeGuid": "bb57cf74-0e5c-459c-9271-5b421f9fc886",
            "mimeType": "application/vnd.autodesk.r360",
            "modelGuid": "971ee7a6-5737-483a-bc64-31a88aae09b3",
            "compositeParentFile": "",
            "processState": "PROCESSING_COMPLETE",
            "extractionState": "SUCCESS",
            "splittingState": "NOT_SPLIT",
            "reviewState": "NOT_IN_REVIEW",
            "revisionDisplayLabel": "4"
          }
```


After the model gets successfully published. The **`extractionState`** should return value as "**`Success`**".

`

Learning Objective 4 – 'Future of cloud technology'

As we have reached the last section of this class, it is important to summarize what we have learned till now.

From the era of the stone age to the era of the cloud age, the construction industry has evolved drastically. Let us take a step back to acknowledge technological innovations and their impact on design and construction. The future looks exciting, considering the fact that now we have cloud-connected data. We have reached a stage where we can create customized applications that can help us achieve our goals at a faster pace.

But we are still developing. Every day we hear customer stories that inspire us, that make us believe that there is much more that can be done using the technology in hand.

This is why, we want to keep this last objective as an open forum where we would like to hear from you, what you think about the future of design and construction. Feel free to provide feedback, drop a comment, or write to us personally to discuss any of the following:

1. How would you like to use the learnings from this class in your upcoming projects?
2. What are your thoughts about using this technology more efficiently?
3. Do you feel this change exciting?
4. What are the challenges that recent innovations have removed? (an experience which you want to share).

Please share your ideas with us in the comments box or the live Q/A session, so that, as an industry, we can all work on it together. You can also find us on Linked in for further discussion.

Conclusion:

Thank you all for attending the class. We are glad that you were able to take out time to listen to our recording and have a look at our handout as well.

At the end of the class, I would like to revisit the learning objectives, which were:

- BIM 360 Design workflow, where we covered:

1) Creating BIM 360 project and setting up teams
2) Collaborating Revit model with BIM 360
3) Using BIM 360 Design workflow to share/ consume data from other teams.

- Integration of Design and Construction, where we covered:

1) Use of BIM 360 Field Management to create checklists and issues
2) Overview of Construction IQ which uses this data to manage risk and improve performance.
3) Use of Data Connector to import the BIM 360 data to Power BI for data analysis

- Understanding of Autodesk Forge, where we covered:

1) Creating a Forge application and integrating it with BIM 360 Account.
2) Understanding of Forge APIs.
3) Live demonstration of BIM 360 data extraction using Authentication and Data Management Forge APIs.

- Future of cloud technology, which is an open-end to this hands-on lab, waiting for ideas and feedback.

I am hopeful that each one of you has learned something new from our class.

As mentioned before, please feel free to provide comments and feedback on the AU page and, in the live Q/ A session.

I would like to end the class with a quote:

"The future depends on what you do today." *- Mahatma Gandhi*