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Two New Features by Forge Design Automation API: Open Network and WebSocket API

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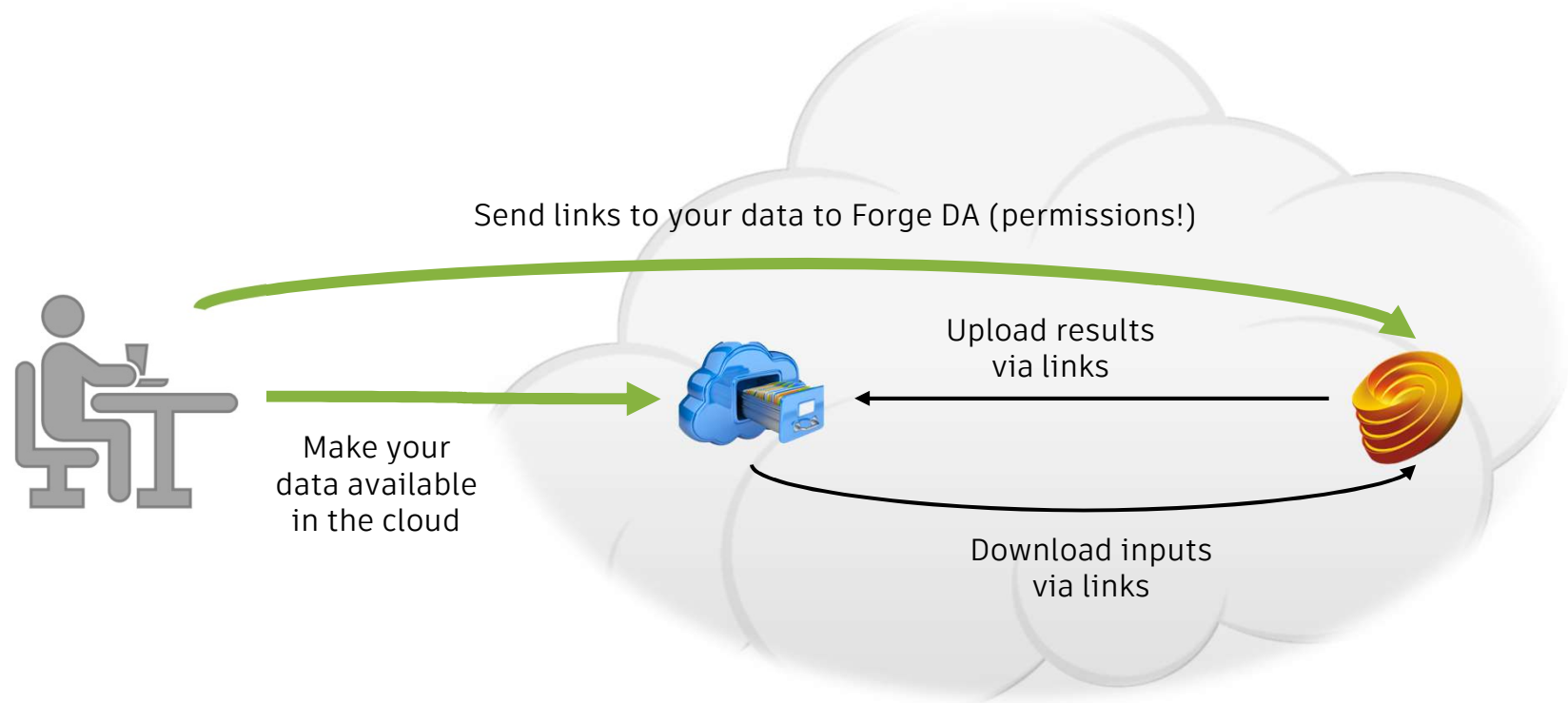
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Agenda

- Overview of Forge Design Automation
- Introduction of WebSocket API
- Introduction of Open Network
- Small features supported
 - PDF printing of Revit since R2022
 - Forge Token extender

Forge Design Automation Overview



WebSocket API

What Is WebSocket

- Internet protocol for asynchronous communication
 - Unlike request/response of HTTP
 - Both parties can send a message at any time
 - Think of chat apps
- Supported by all modern browsers and tech stacks
 - Browser apis
 - Console applications
 - .net, nodejs etc.

Websocket on FDA - The Problems

Use Case I

- Browser application wants to convert DWG to PDF
- User would like to see progress as each sheet is output
- User would like to notification when the entire PDF is complete

Current Behavior

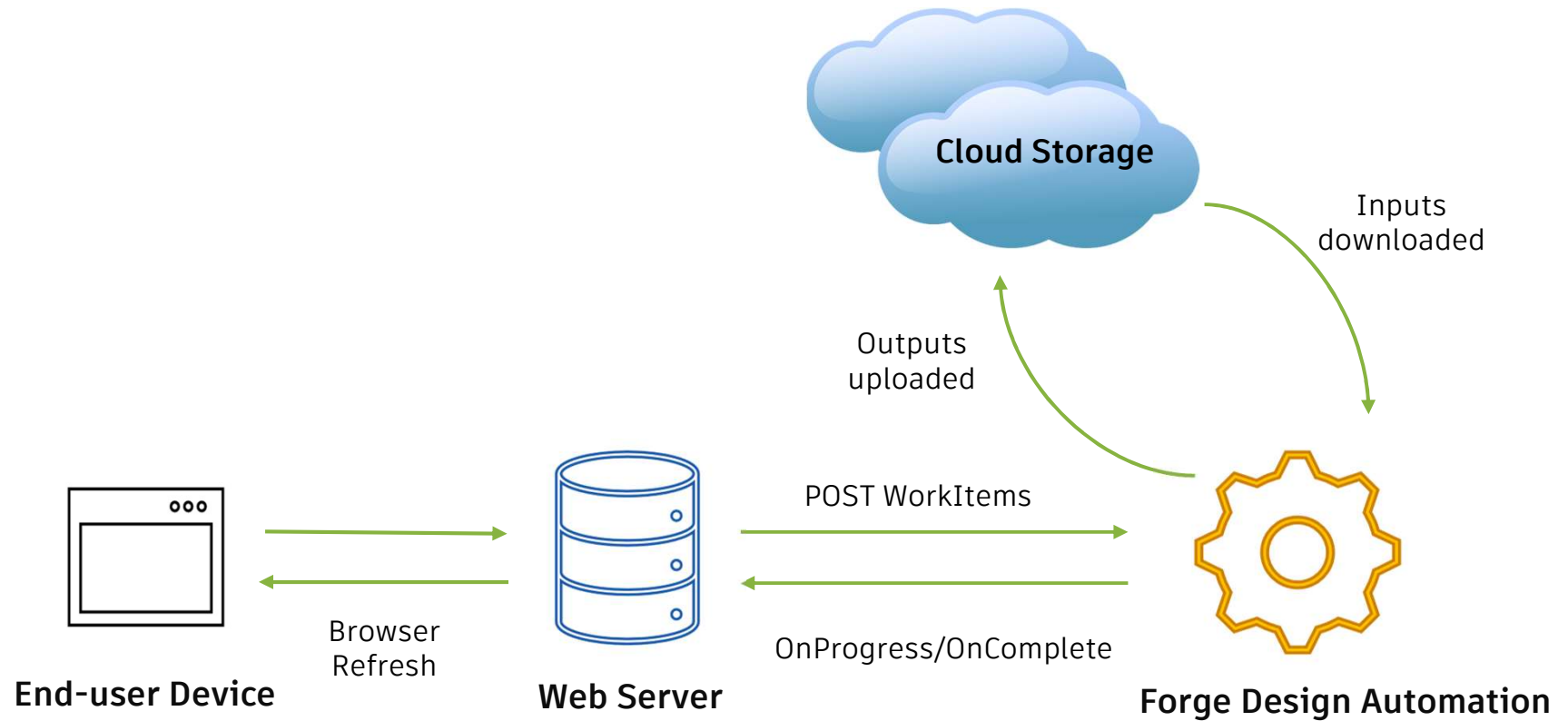
- Developer needs to setup its own server to receive onProgress and onComplete callbacks and push changes to browser.

Expected Behavior

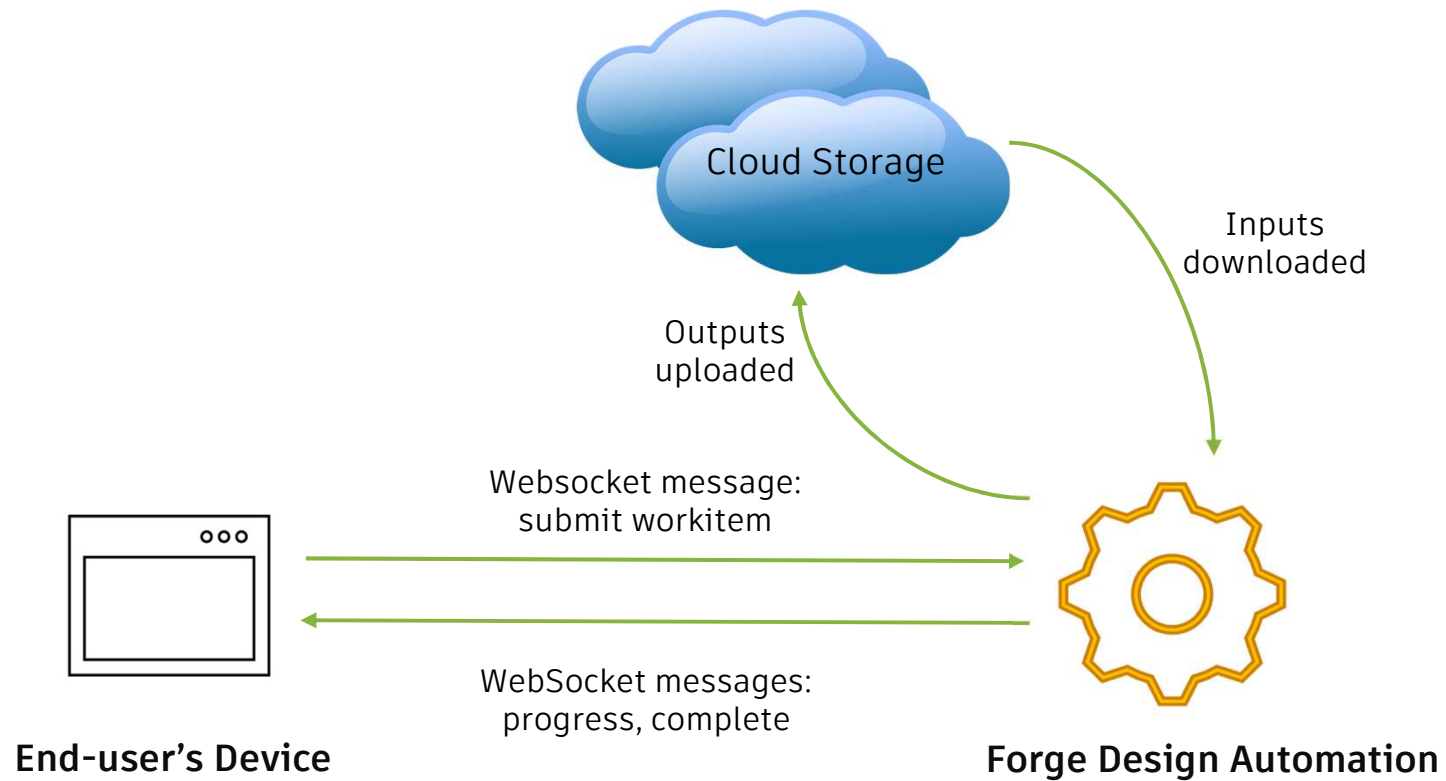
- Browser receive async notification from FDA.



OnProgress/OnComplete Callbacks (HTTP)



OnProgress/OnComplete Callbacks (WebSocket)



FDA Websocket Protocol

- Connect to **wss://websockets.forgedesignautomation.io**
- Only workitem submission
 - You must use HTTP to create activities, appbundles
 - Workitems are still subject to the usual timeout

Messages Accepted

- Must use Authorization header in the first message

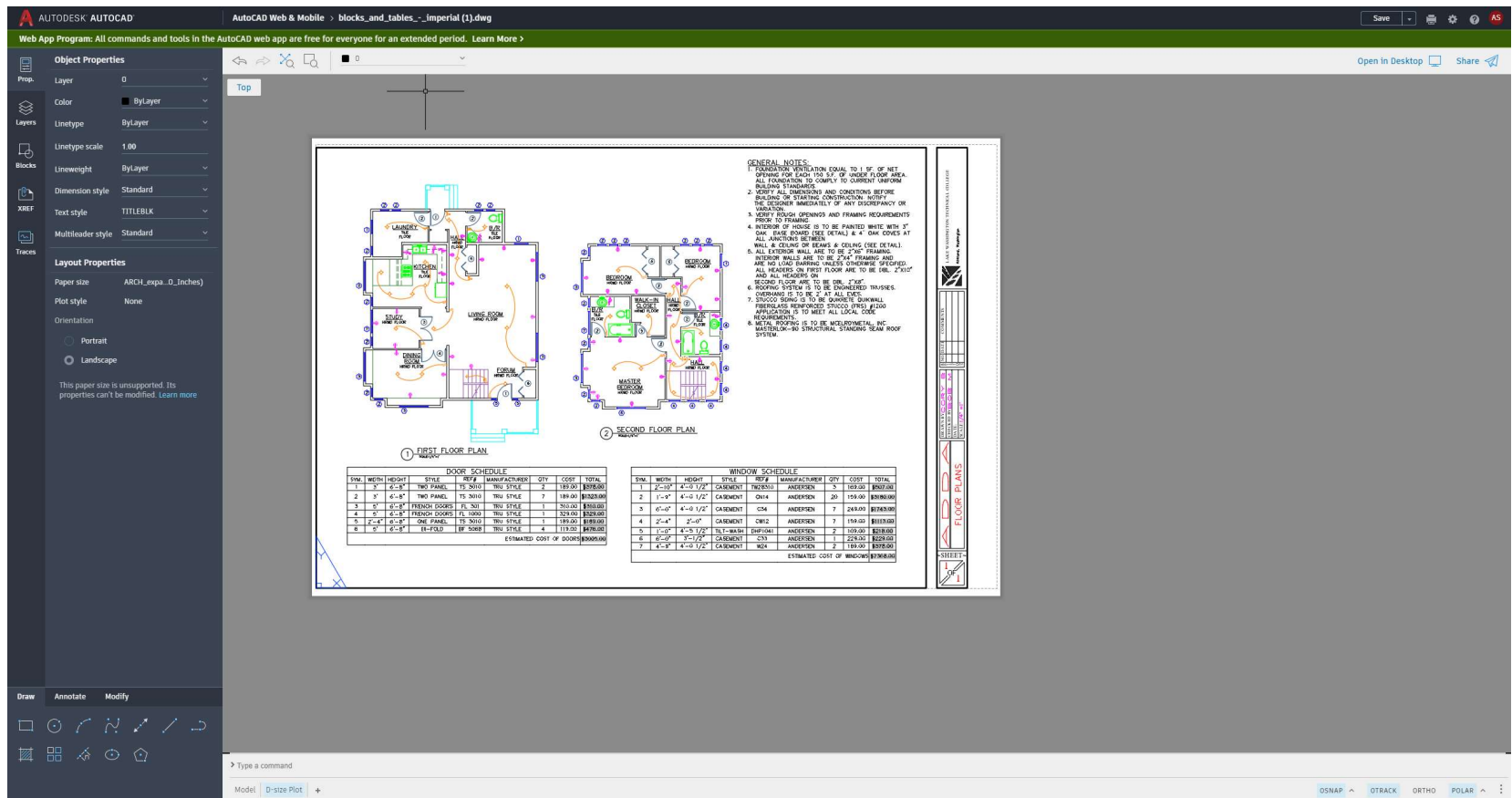
Action	Data	Example	Usage
Post-workitem	Same <u>workitem</u> payload used in the REST API. onProgress or onComplete arguments are not allowed.	<pre>{ "headers": {"Authorization": "Bearer secret..."}, "action": "post-workitem", "data": { "activityId": "Autodesk.Nop+Latest" } }</pre>	Sent to create a new workitem.

```
{
  "action" : "post-workitem",
  "data" : <workitem>,
  "headers" : <key_value_pairs>
}
```

Messages Sent

Action	Data	Example {"action" : <action>, "data" : <data>}	When
status	same as <u>response body</u> of GET workitems/:id	<pre>{ "action": "status", "data": { "status": "pending", "stats": { "timeQueued": "2021-02-19T03:09:01.4667236Z" }, "id": "598f34b49d264042a14373deb2d5eff0" } }</pre>	Sent when the workitem is accepted and when the workitem is completed.
progress	same as <u>payload</u> sent to onProgress argument	<pre>{ "action": "progress", "data": { "id": "b45e43a13a0348d482c280146d1be0ea", "progress": "heartbeat" } }</pre>	Sent 0 or more times during the lifetime of the workitem.
error	string	<pre>{ "action": "error", "data": "Invalid payload. Unexpected character encountered while parsing value: b. Path ", line 0, position 0." }</pre>	Sent when an error is encountered during workitem processing.

Websockets In AutoCAD Web



WebSocket API – Walk Through



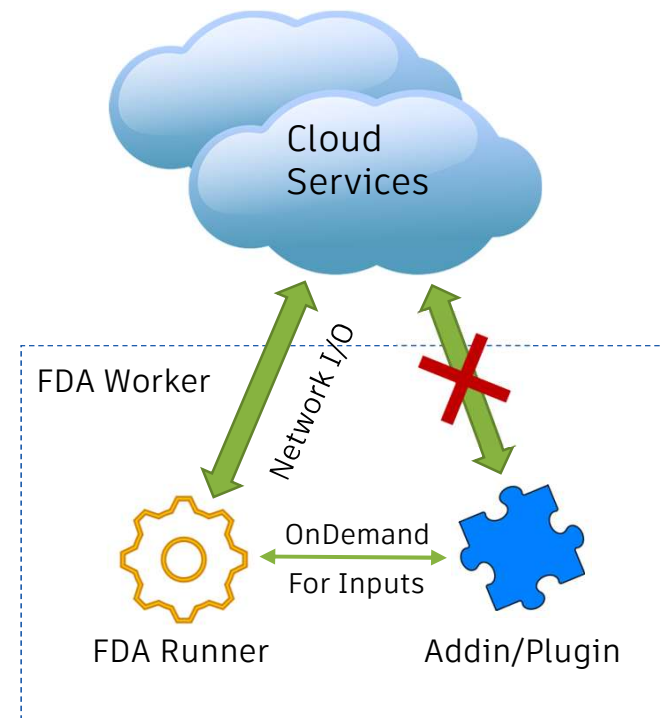
Open Network (*preview*)

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Open Network - The Problems

- FDA **disallows** network access during the job running
 - FDA does network I/O for inputs and outputs
- A current workaround to get inputs during job running: onDemand argument
 - It is tricky, not easy to use: <https://forge.autodesk.com/en/docs/design-automation/v3/tutorials/common/using-on-demand-inputs/>



Open Network - The Problems

User Case I

- A workitem plots A.dwg to PDF. A.dwg may have unknown xrefs, e.g. B.dwg, C.dwg, etc.

Current Behavior

- The xrefs cannot be downloaded during job processing. 2 WorkItems may be needed: the 1st one is to find xrefs; the 2nd one downloads xrefs as inputs and then plots PDF for A.dwg.

Expected Behavior

- When processing A.dwg, the addin finds xrefs and gets all xrefs downloaded, a full view of A.dwg can be plotted in one WorkItem.



Open Network - The Problems

User Case II

- A workitem needs data to support on demand, for example, some data from database, during processing.

Current Behavior

- It is impossible! Unless the database is packaged as an input or in appbundles so the addin can access it locally.

Expected Behavior

- Users can use TCP/IP to call their database, or through http(s) by wrapping the database with REST, to get data in their addins.



Open Network - The Problems

User Case III

- A workitem generates a lot of files as outputs, but the number is unknown.

Current Behavior

- Users must tell FDA to compress the directory and upload the zip as an output, then uncompress the zip to get all files after.

Expected Behavior

- Users could upload files by any way they want, for example, uploading the directory to an AWS S3 bucket.



Open Network - Solution

There are more cases....

Solution: Allow the service to make network requests directly during job running

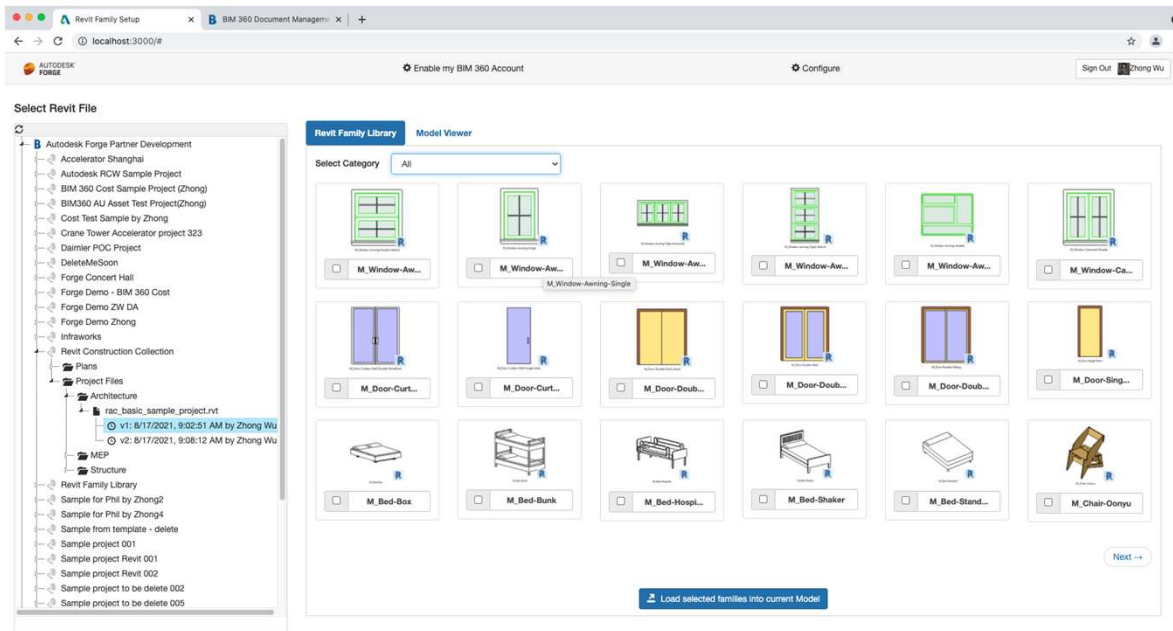


Open Network – How It Works

- Open Network allows customer's addin/plugin to access the network **through HTTP(S) calls**
 - Sample code snippet:

```
var request = (HttpWebRequest)WebRequest.Create("https://www.google.com/");  
  
request.MaximumAutomaticRedirections = 4;  
request.MaximumResponseHeadersLength = 4;  
  
var response = (HttpWebResponse)request.GetResponse();  
Console.WriteLine($"HttpWebResponse status code: {response.StatusCode}");
```

Open Network – Walk Through



Who

Zhong Wu
Developer Advocacy & Support

Solution

- Load selected Revit families from a library into a model by Forge Design Automation for Revit.
- Revit families are managed in a database.
- Multiple Revit families are downloaded directly from Design Automation Revit engine, using the new Open Network feature.

APIs Used:



Design
Automation

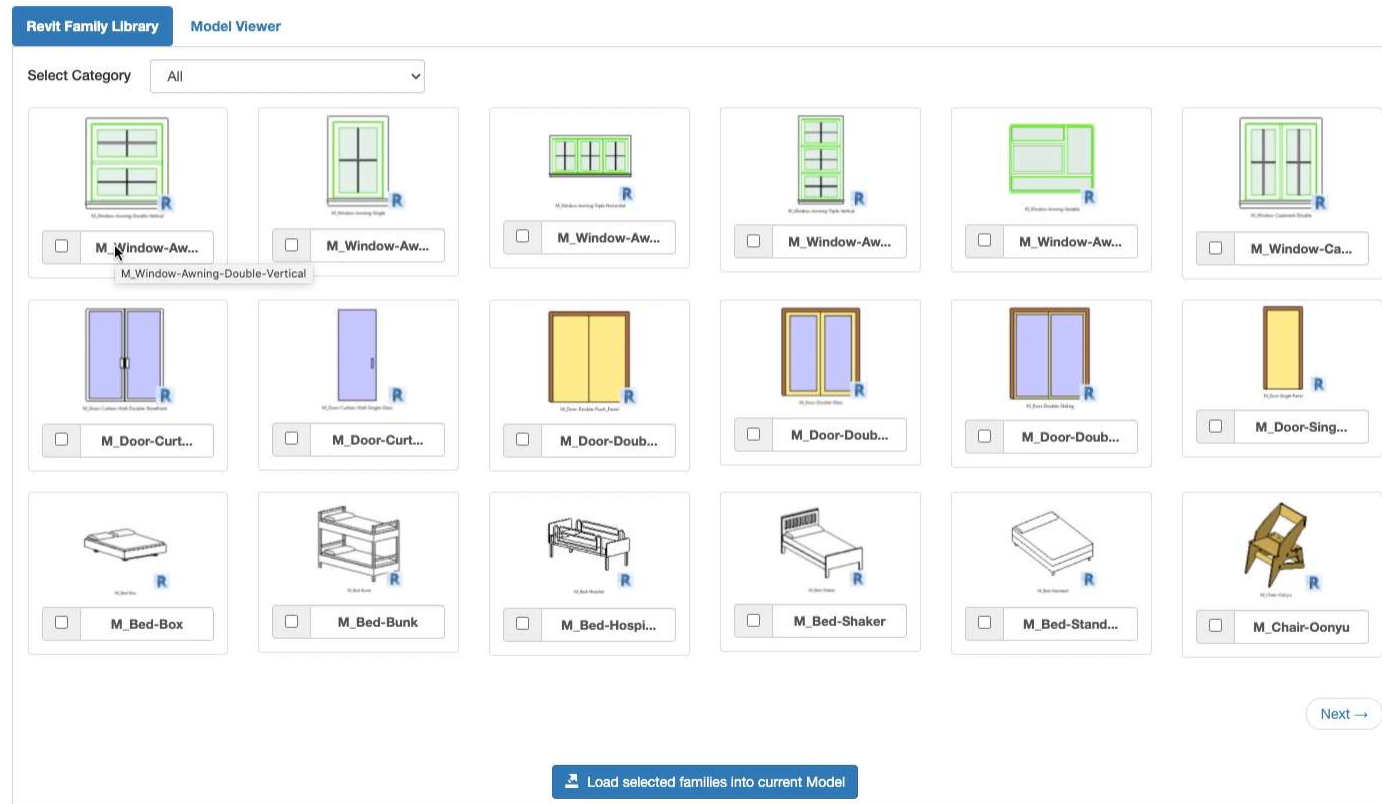
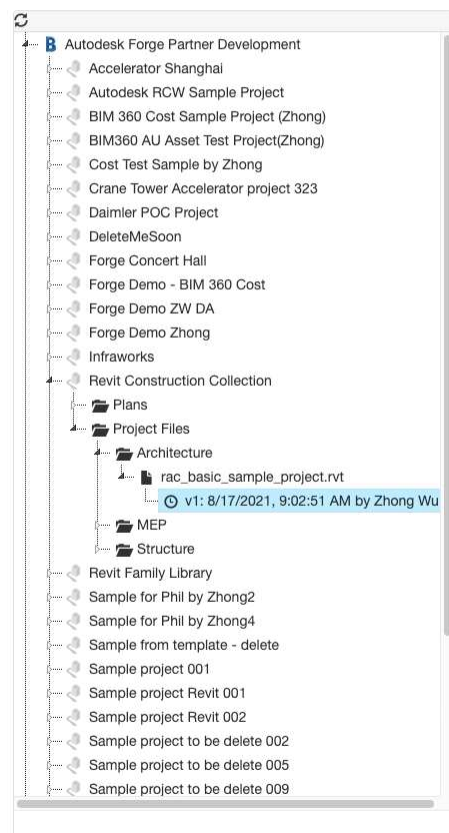


Viewer



Data
Management

Select Revit File



Open Network – Best Practices

- Do network I/O in parallel if possible
 - The time consumed for network I/O is charged as a part of job processing time
- Get the greatest benefit by utilizing open network feature and current network I/O supported by FDA
 - FDA still supports network I/O for inputs/outputs as before

Open Network – Welcome to Try

- Talk to us to try this new feature
 - Open Network is preview feature, not exposed to all users yet
 - We will add you in the allow-list to try
 - Trying open network is still charged as normal



New Small Features

New Small Features – PDF Printing for Revit

- PDF printing of Revit since 2022
 - How it works: Revit 2022 exposes new API to support printing pdf
 - Example, including sample code:
 - <https://forge.autodesk.com/blog/export-pdf-revit-design-automation-sample>
 - <https://github.com/Autodesk-Forge/forge-revit2pdf>
 - <https://forge.autodesk.com/blog/design-automation-revit-2022-now-support-exporting-pdf-directly>

```
using (Transaction tx = new Transaction(doc))
{
    tx.Start("Export PDF");
    IList<ElementId> views = new List<ElementId>();
    viewsAndSheetsToExport.Select(vid =>
        doc.GetElement(vid) as View)
        .Where(v => v.ViewType == ViewType.ThreeD)
        .ToList().ForEach(v => views.Add(v.Id));
    if (views.Count > 0)
    {
        PDFExportOptions options = new
        PDFExportOptions();
        options.FileName = "result";
        options.Combine = true;
        doc.Export(OutputDirectory, views, options);
    }
    tx.Rollback();
}
```

New Small Features - Forge Token Extender

- Forge Token extender
 - Use case: *"A workitem takes long time to process, while it will output result to BIM 360. Since bucket of BIM 360 has not signed URL, we would have to use authentication by token, but token will expire in 1 hour. How to handle such situation?"*
 - How it works: Extend token provided in WorkItem payload for inputs and outputs hosted on Forge services if it is expired
 - FDA takes care of the token extension when doing network I/O for inputs/outputs
 - Customer's addin/plugin is not able to use Forge Token extender yet

Useful Resources

- GitHub repos :
 - <https://github.com/Autodesk-Forge/forge-api-dotnet-design.automation>
 - <https://github.com/Autodesk-Forge/forge-designautomation-signer>
 - <https://github.com/Autodesk-Forge/forge-revit2pdf>
- Forge Lightning Talks: Troubleshooting and Debugging Forge Design Automation Jobs: https://www.youtube.com/watch?v=ujaQ_rcgImw
- FDA Forge Doc: https://forge.autodesk.com/en/docs/design-automation/v3/developers_guide/overview/
- Ask questions on stack overflow: <https://stackoverflow.com/questions/tagged/autodesk-designautomation>
- Contact: forge.help@autodesk.com

The background of the slide features four abstract, dark, metallic-looking geometric shapes in the corners, resembling stylized computer monitors or architectural elements. They are arranged symmetrically, with two in the top corners and two in the bottom corners, framing the central text.

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