Enabling 3d model viewer in Power BI using APS Viewer API

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KBR

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Context

Power BI is the popular data engineering and visualisation tool for the enterprise users. It is also a great tool for managing / visualising the project / digital delivery information within the AEC industry. The presentation will demonstrate how to establish a Power BI custom visual that incorporates a 3D model viewer from Autodesk Platform Services (APS) Viewer API (formerly known as Forge Viewer).

The presentation will cover the following topics:
- Overview of the APS API
- Create your own Power BI custom visual with APS model viewer – a not-from-scratch approach
- Prepare the model properties using a Power BI custom data connector
- Connecting to the models stored on Autodesk Construction Cloud (ACC), especially for the newly establish ACC APAC region.
- Data modelling in Power BI to create your own storying telling experiences that interacts with model geometry
- Discussion of the opportunities to deploy the custom visual and the solution at the enterprise level

At the end of this presentation, the audience will have the basic understanding of how to enable the APS model viewer in a Power BI report from multiple available open-source repositories.

An open-source GitHub repository will be shared to help the audience to start and follow.

GitHub - visualphyzx/aps-powerbi-tools-apac: Integrating APS Viewer and ACC data connector in Power BI

About KBR

We deliver science, technology and engineering solutions to governments and companies around the world.

About Me

- One team member of KBR's national digital team with Digital Engineering specialists, Design and Digital System specialists, and developers.

- My passion lies in data engineering, data visualization, design automation, and system integration. I enjoy the challenges of developing and delivering the digital solutions targeting specific project information management and exchange requirement, and the integration of the systems such as BIM, GIS, and CDE.

Use the material

Presentation File

Core concepts and workflow

Handout

Step-by-step process for installation with references

GitHub Repo

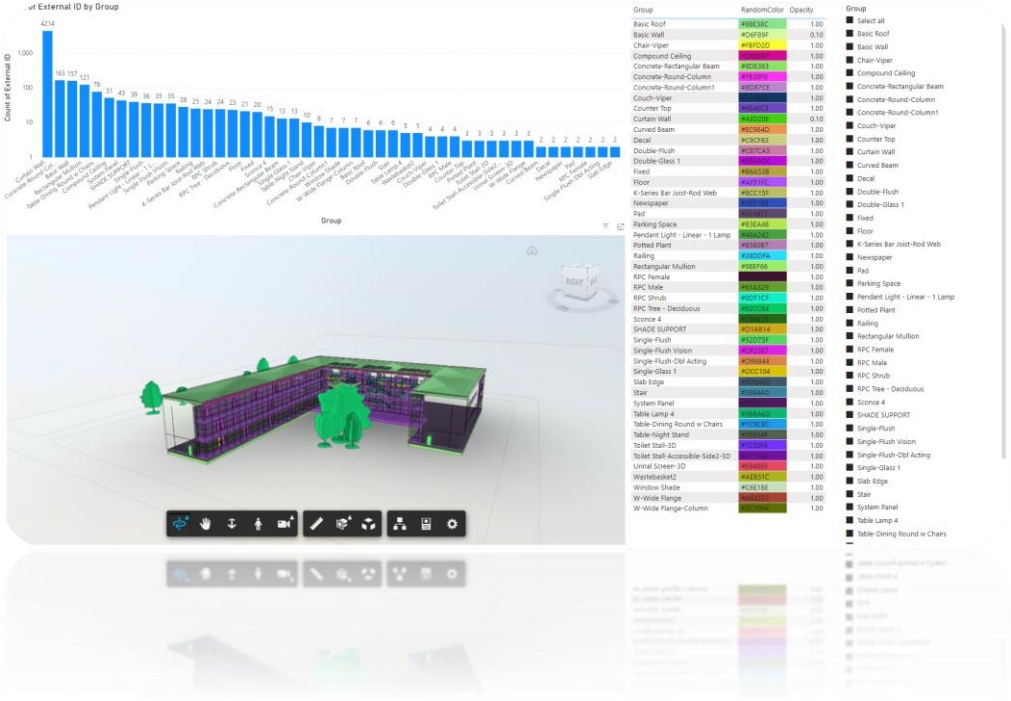
For experienced developers

Assumptions

- APS – Autodesk Platform Services
- ACC – Autodesk Construction Cloud
- ACC Australia (APAC Region) – Australia becomes the latest primary project data storage location
- Power BI - Power BI - Data Visualization | Microsoft Power Platform

First Impression

https://tinyurl.com/mrxy6k8c



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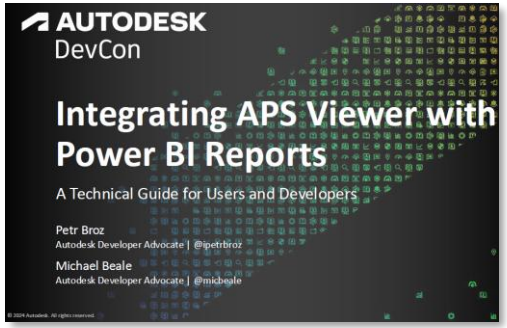
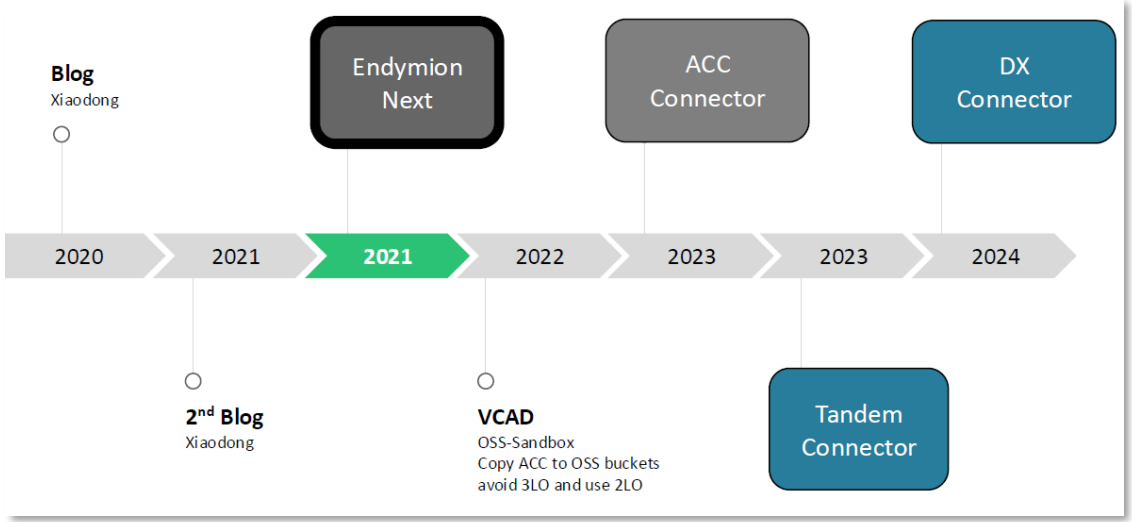
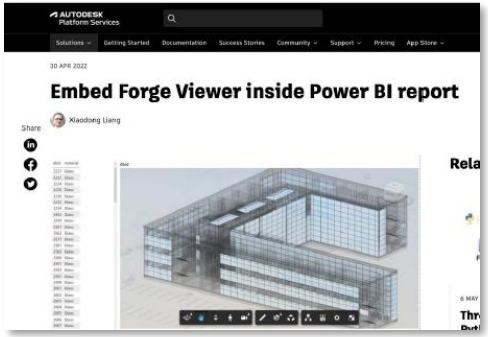


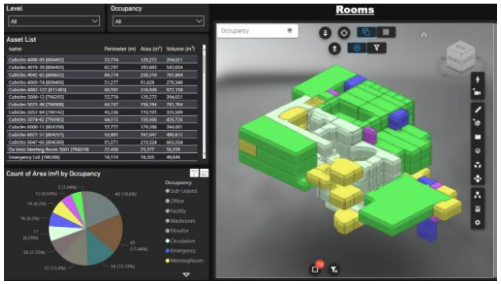
Autodesk DevCon 2024



https://github.com/autodesk-platform-services/aps-powerbi-tools/blob/develop/APS-PowerBi-DevCon2024.pdf

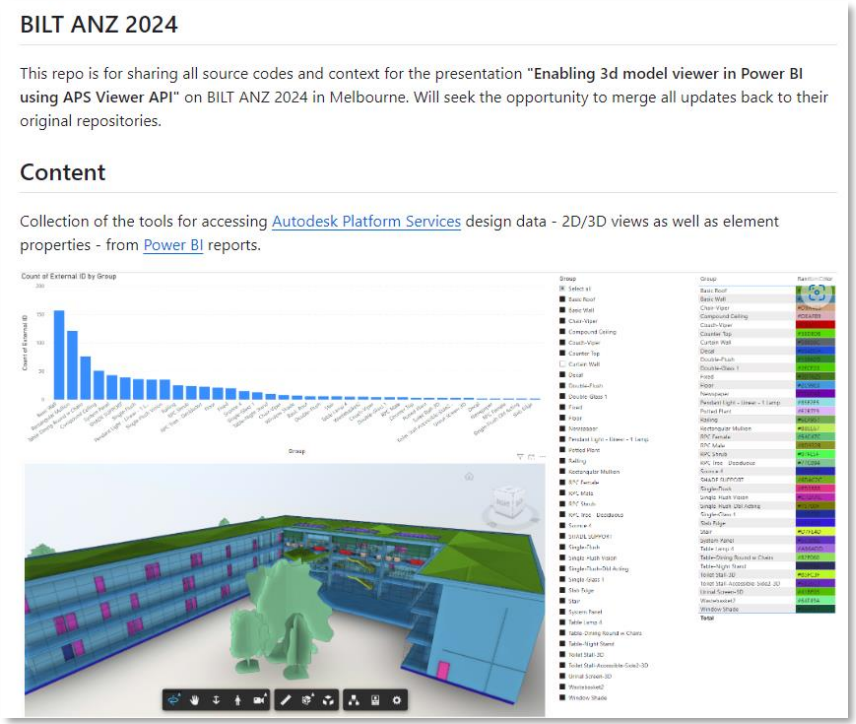


https://github.com/xiaodongliang/forgeviewer_embed_in_powerbi_report



VCAD FOR POWER BI (bimservices.it)

Today



[GitHub - visualphyzx/aps-powerbi-tools-apac: Integrating APS Viewer and ACC data connector in Power BI]

Acknowledgement
Source codes shared in this repo were originated from open-source projects shared by Autodesk Platform Services and Petr Broz:

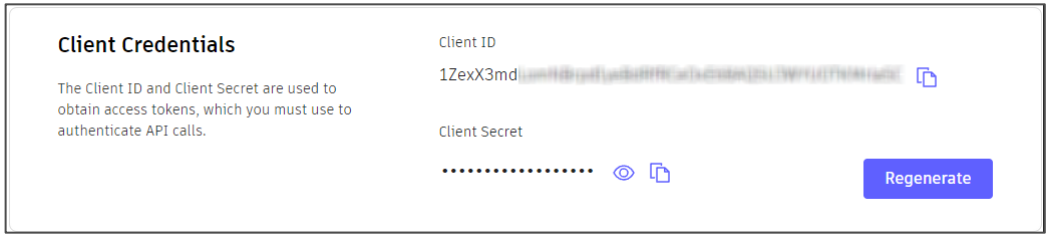
- [GitHub - autodesk-platform-services/aps-powerbi-tools: Collection of tools for accessing Autodesk Platform Services design data - 2D/3D views as well as element properties - from Power BI reports.]
- [GitHub - petrbroz/vscode-forge-tools: Visual Studio Code extension for accessing Autodesk Forge services and content.]

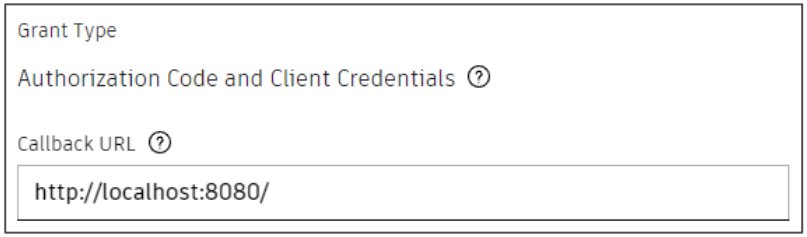
Tools and Components

	Description	Authentication
APS Viewer Visual **aps-viewer-visual-apac**	Power BI Custom Visual	Request **Endpoint** from APS Shares App. Receiving **Access Code** then use it for ACC connection.
APS Data Connector **aps-props-connector-apac**	Power BI Custom Data Connector	ACC User Authentication (3-legged) from a registered **APS App**
Shares App **aps-shares-app**	Web service for creating and serving model links with authorisation	**APS App** Authentication (3-legged for creating a Share. 2-legged for accepting request from Power BI)
VSCode APS Extension **vscode-forge-tools-apac**	Toolset for convenience	Can use either 2-legged or 3-legged using the credential from a registered **APS App**

★ All support ACC APAC (Australia) Region

APS App





Register APS App https://aps.autodesk.com/

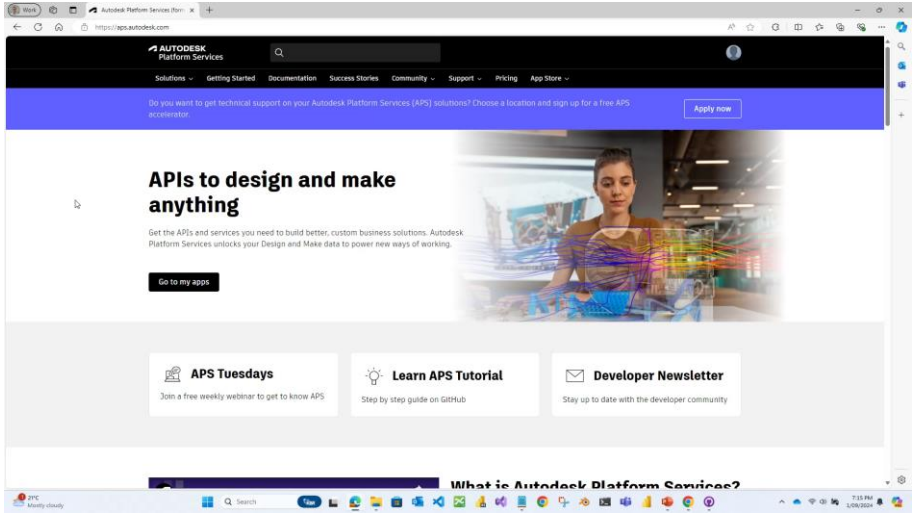
Credentials (**Client ID**, **Client Secret**)of the APS App are trusted by APS services

Provision APS App access to ACC (ACC Admin Portal)

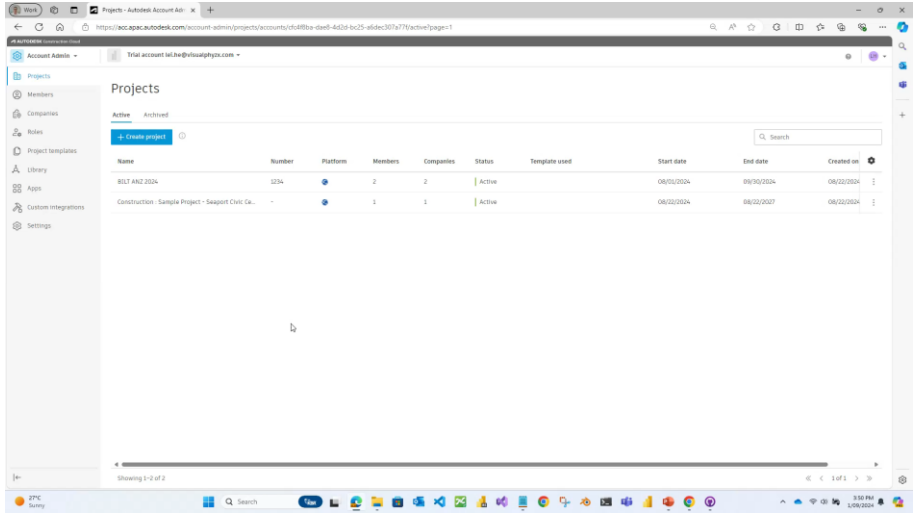
API Requests with APS App's credentials are trusted by your company's ACC

[Getting Started | Autodesk Platform Services Tutorials]

APS App Demo

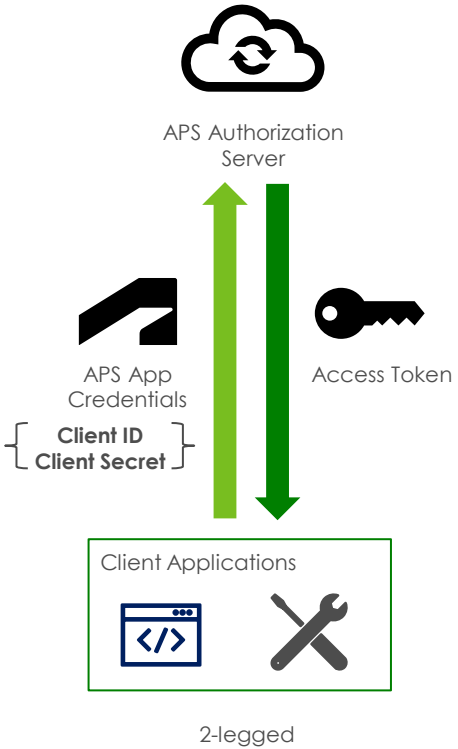


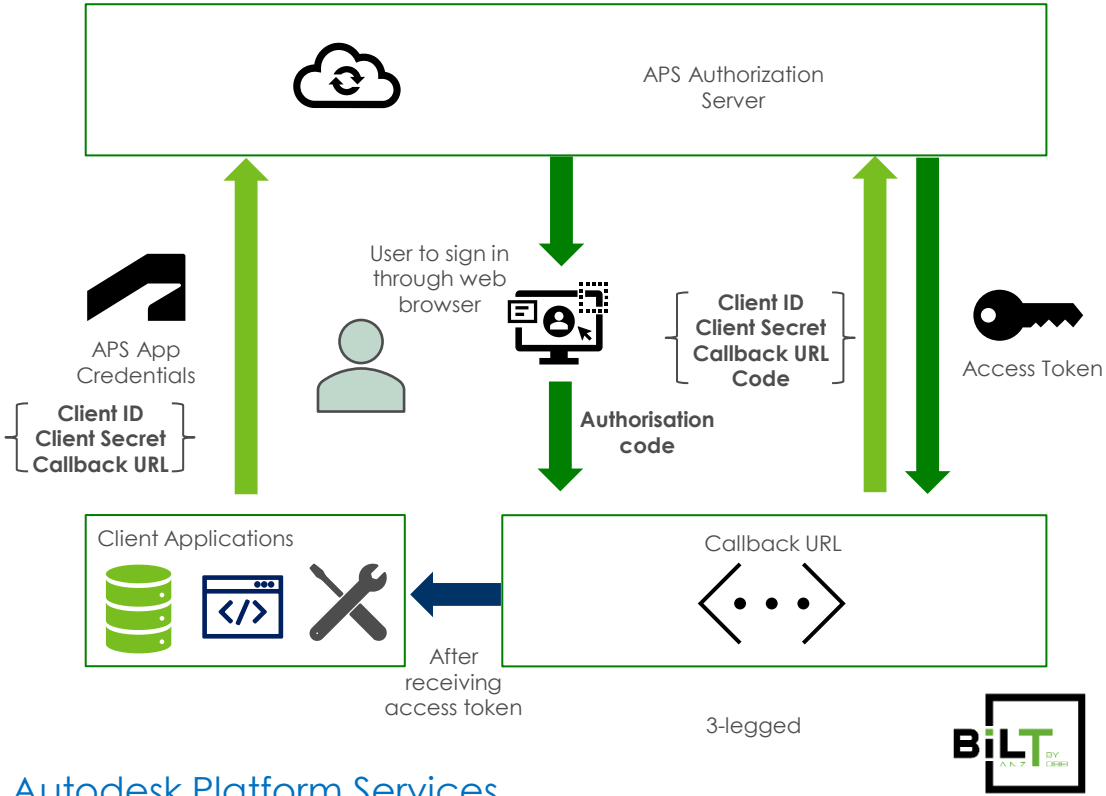
Register APS App



Register Integration to ACC

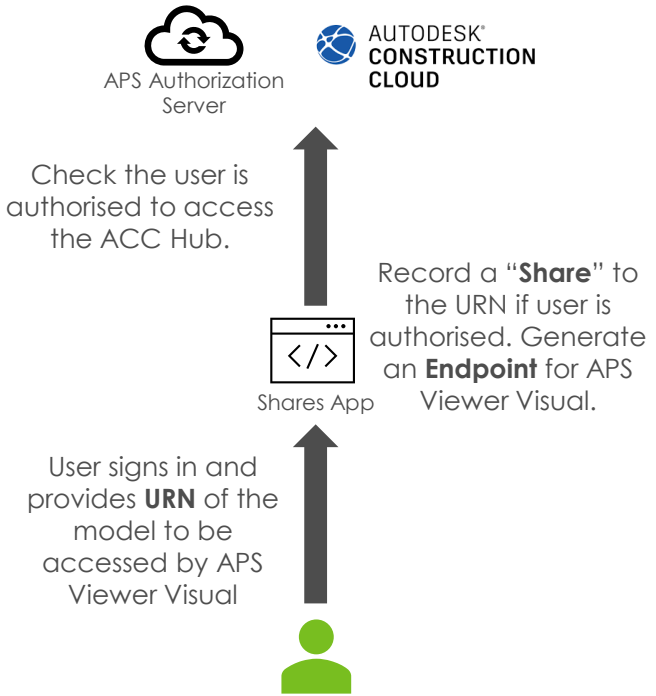
Authentication



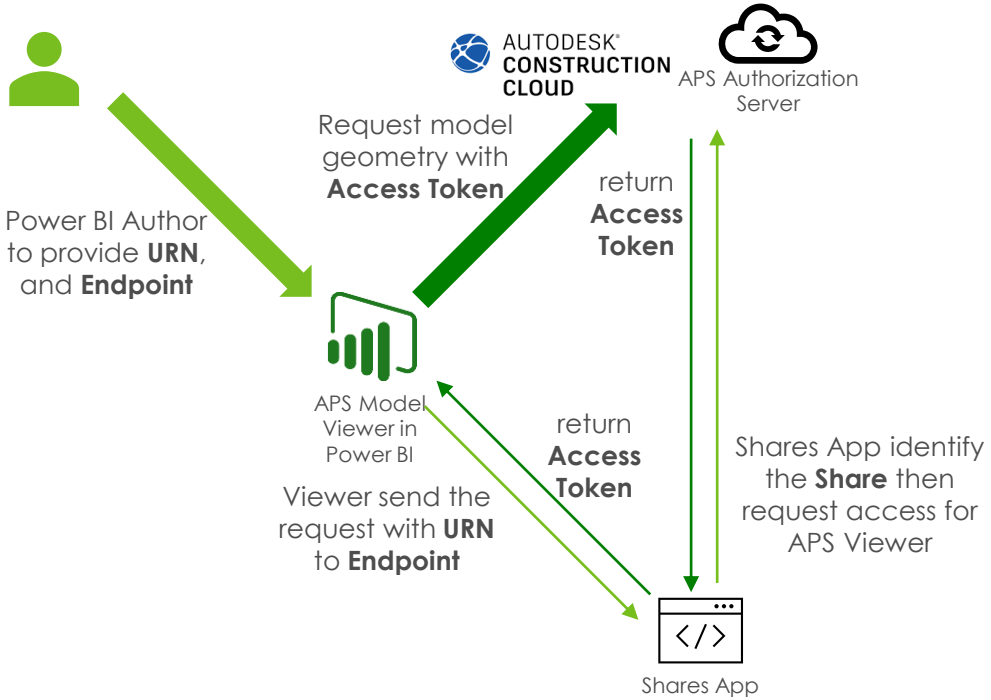


[Overview | Authentication (OAuth) | Autodesk Platform Services]

APS Viewer Visual Data Flow



Prepare a "Share" Record



APS Viewer Visual access ACC model

APS Viewer API

Initialisation

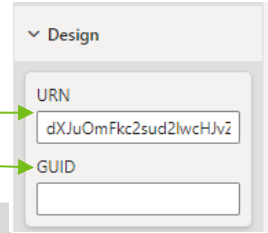
```
await initializeViewerRuntime({ env: 'AutodeskProduction2', api: 'streamingV2', getAccessToken: this.
getAccessToken });
this.container.innerText = '';
this.viewer = new Autodesk.Viewing.GuiViewer3D(this.container);
this.viewer.start();
// this.viewer.addEventListener(Autodesk.Viewing.OBJECT_TREE_CREATED_EVENT, this.onPropertiesLoaded);
// this.viewer.addEventListener(Autodesk.Viewing.SELECTION_CHANGED_EVENT, this.onSelectionChanged);
if (this.urn) {
    this.updateModel();
}
```

```
export function initializeViewerRuntime(options: Autodesk.Viewing.InitializerOptions): Promise<void> {
    if (!runtime.ready) {
        runtime.options = { ...options };
        runtime.ready = (async function () {
            window.DISABLE_INDEXED_DB = true;
            await loadScript('https://developer.api.autodesk.com/modelderivative/v2/viewers/7.*/viewer3D.js');
            await loadStylesheet('https://developer.api.autodesk.com/modelderivative/v2/viewers/7.*/style.css');
            return new Promise((resolve) => Autodesk.Viewing.Initializer(runtime.options, resolve));
        })() as Promise<void>;
    } else {
        if (['accessToken', 'getAccessToken', 'env', 'api', 'language'].some(prop => options[prop] !== runtime.options[prop])) {
            return Promise.reject('Cannot initialize another viewer runtime with different settings.');
        }
    }
    return runtime.ready;
}
```

// indexed DB is not supported by Power BI

// Loading APS Viewer JavaScript API

```
export function loadModel(viewer: Autodesk.Viewing.Viewer3D, urn: string, guid?: string): Promise<Autodesk.Viewing.Model> {
    return new Promise(function (resolve, reject) {
        Autodesk.Viewing.Document.load(
            'urn:' + urn,
            (doc) => {
                const view = guid ? doc.getRoot().findByGuid(guid) : doc.getRoot().getDefaultGeometry();
                viewer.loadDocumentNode(doc, view).then(m => resolve(m));
            },
            (code, message, args) => reject({ code, message, args })
        );
    });
}
```



// GUID is the identifier of a view in the model (Revit may have multiple views).
// If omitted, will load the default view.

[Viewing | Viewer | Autodesk Platform Services]

APS Viewer API

Update

```
/**
 * Notifies the viewer visual of an update (data, viewmode, size change).
 * @param options Additional visual update options.
 */
public async update(options: VisualUpdateOptions): Promise<void> {
    this.logVisualUpdateOptions(options);
    this.formattingSettings = this.formattingSettingsService.populateFormattingSettingsModel
    (VisualSettingsModel, options.dataViews[0]);

    const { accessTokenEndpoint } = this.formattingSettings.viewerCard;
    if (accessTokenEndpoint.value !== this.accessTokenEndpoint) {
        this.accessTokenEndpoint = accessTokenEndpoint.value;
        if (!this.viewer) {
            this.initializeViewer();
        }
    }

    const { urn, guid } = this.formattingSettings.designCard;
    if (urn.value !== this.urn || guid.value !== this.guid) {
        this.urn = urn.value;
        this.guid = guid.value;
        this.updateModel();
    }

    if (options.type == 4) //resizing or moving
    {
        console.debug("Resizing or Moving!");
        return;
    }

    let hasTable: boolean = false;
    this.currentDataView = options.dataViews[0];

    if (options.dataViews || this.currentDataView) {
        if (options.dataViews[0].table) {
            hasTable = true;
        }
```

// Update happens when any settings or data of the Visual changes

// Read the settings of this Visual

// Checking if the **Endpoint** changes

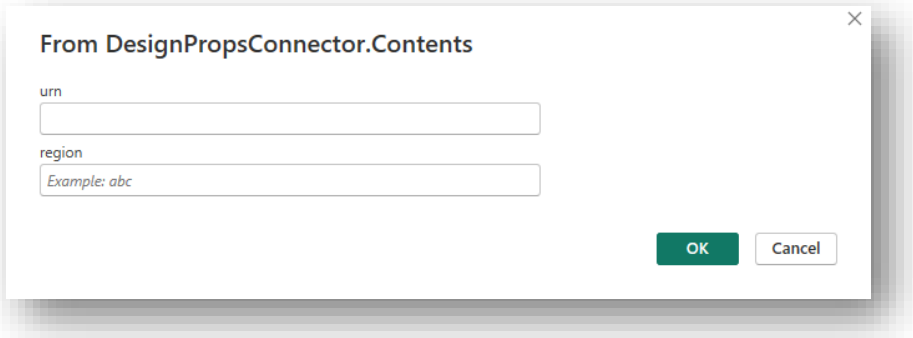
// Checking if the **URN or View GUID** changes

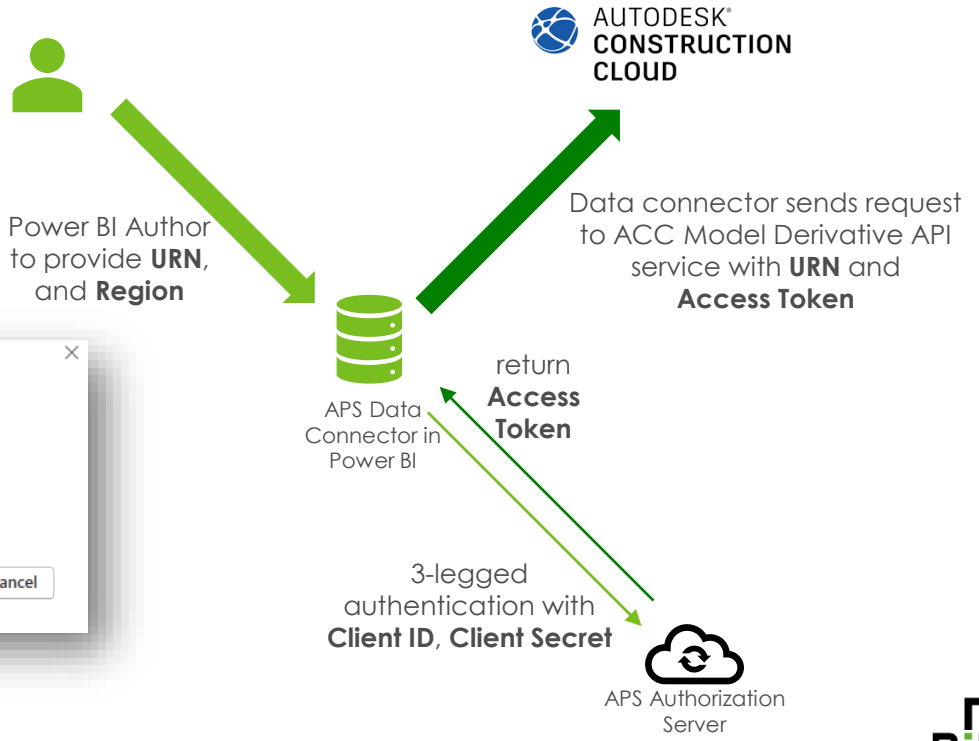
// Checking the filtered data fed into the Visual (Table format), then visualising the correspondent geometry according to it.

[Develop custom visuals in Power BI - Power BI | Microsoft Learn]

- Develop your own custom visual
  - Set up your environment for developing a Power BI visual
  - Power BI visuals project structure
  - Power BI visuals system integration
  - Define capabilities
  - Data view mappings
  - Sort data
  - Microsoft Entra ID application setup
  - Objects and properties
  - Performance tips
  - Create mobile friendly visuals
  - Debug visuals
  - Troubleshoot environment setup

APS Data Connector Data Flow



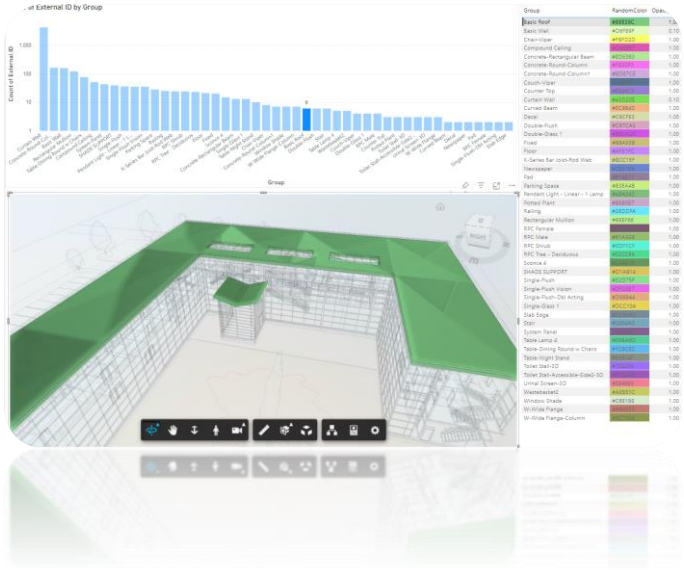


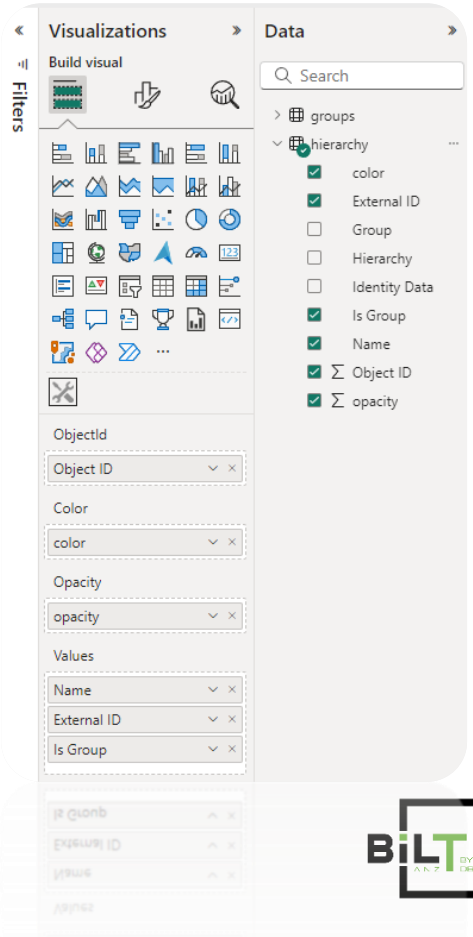
[Overview | Model Derivative API | Autodesk Platform Services]

APS Data Connector access ACC model properties

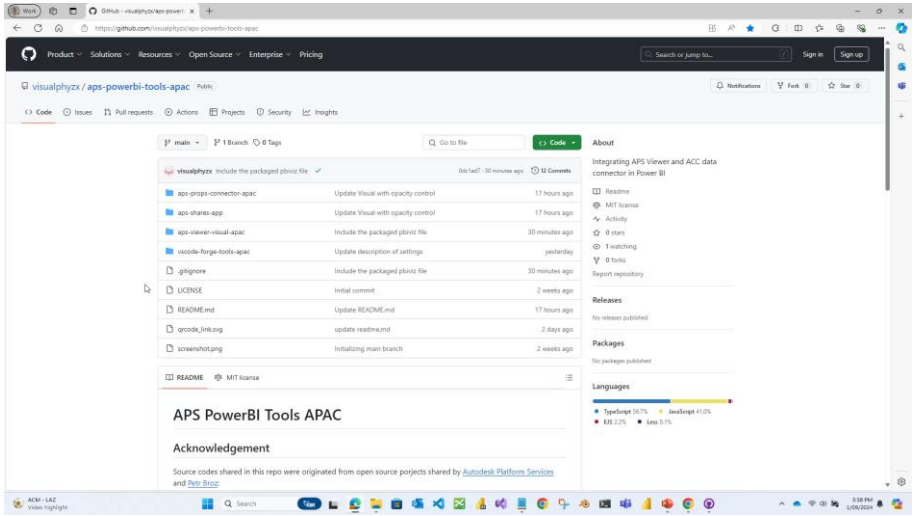
Demo

- Visual
- Connector
- Interaction

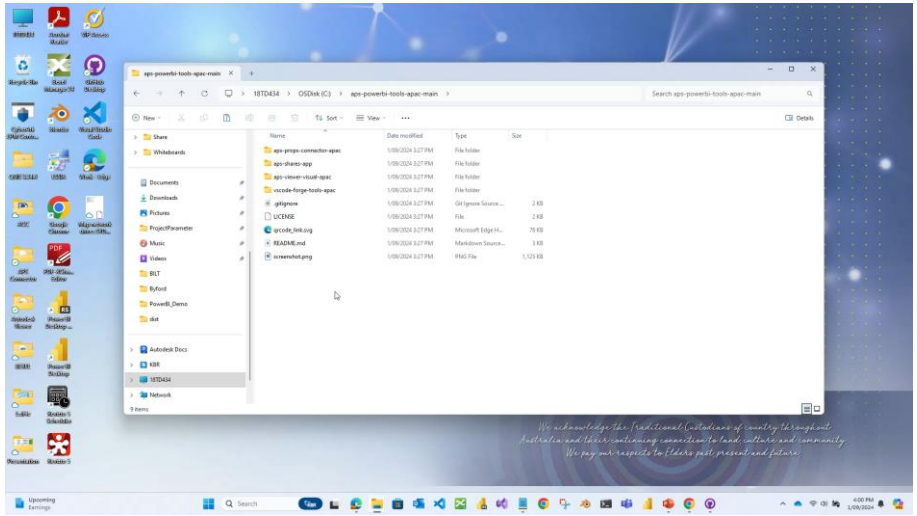




APS Viewer Visual Demo

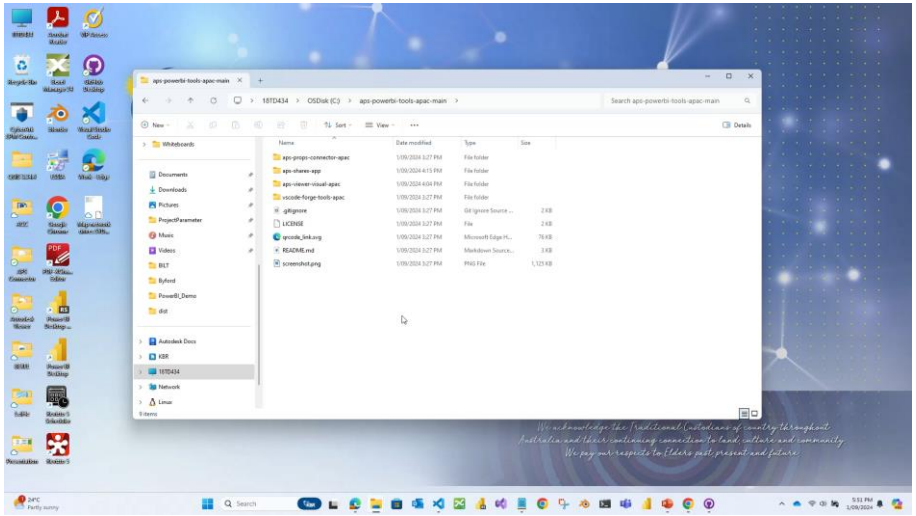


Download source codes

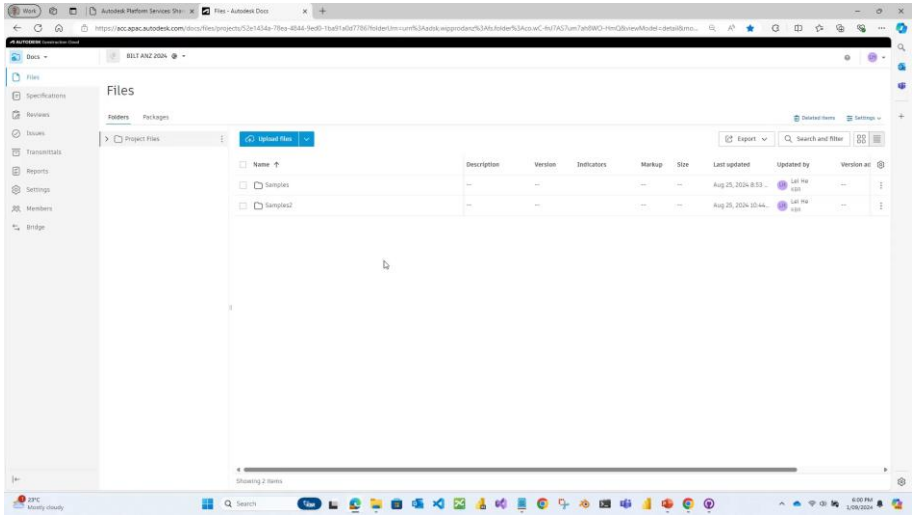


Install APS Viewer Visual and Package

APS Shares App Demo

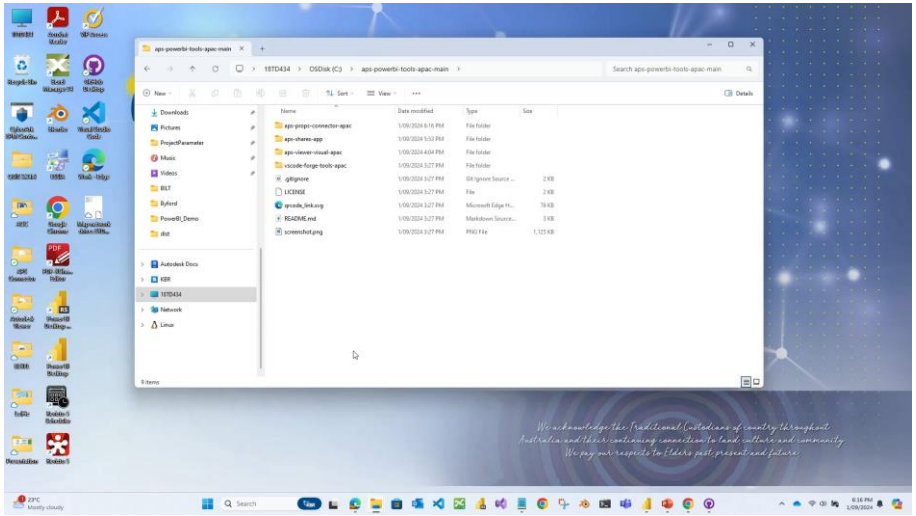


Install Shares App



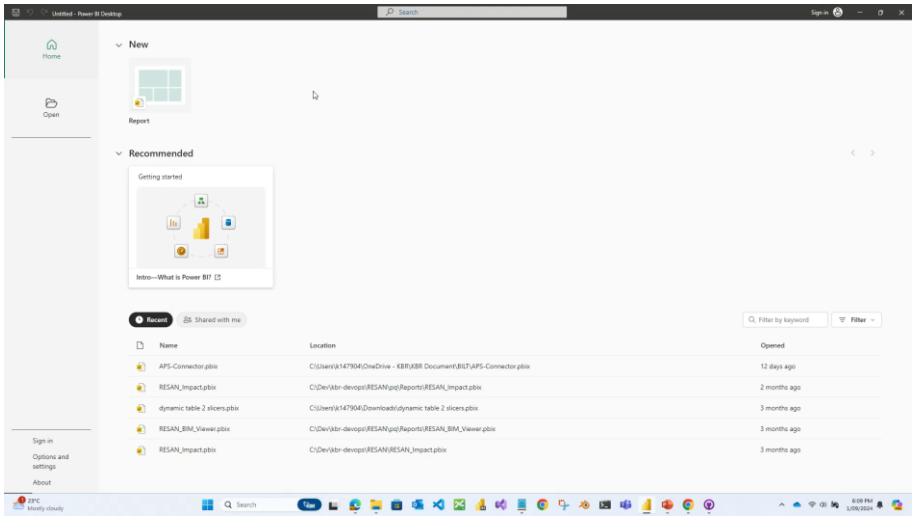
Prepare model URN and Endpoint

APS Data Connector Demo

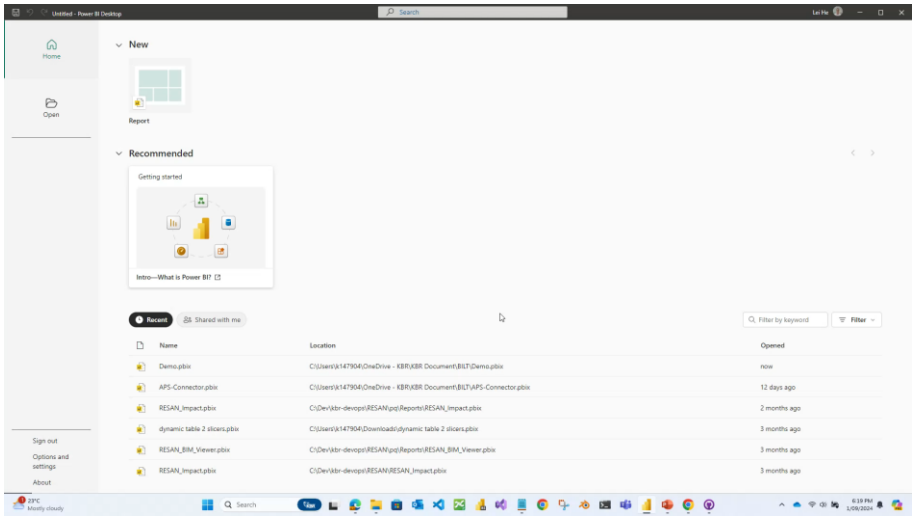


Install Power Query Data Connector

Connect APS Viewer Visual and Data Connector in Power BI

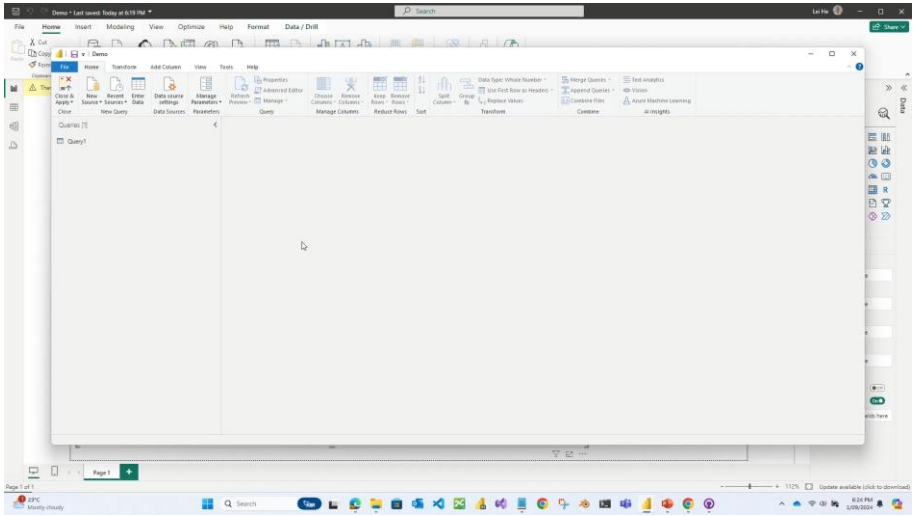


Display ACC Model

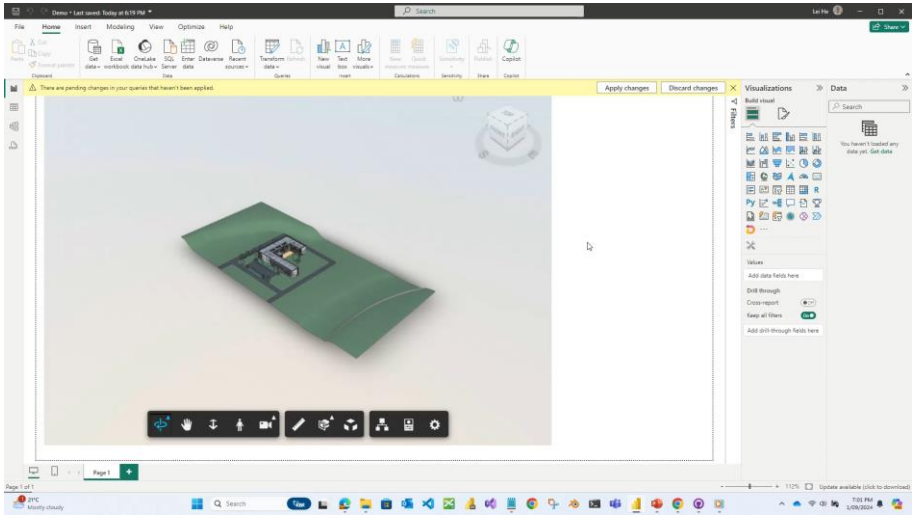


Connect to ACC Model Data

ACC APS Viewer Interaction

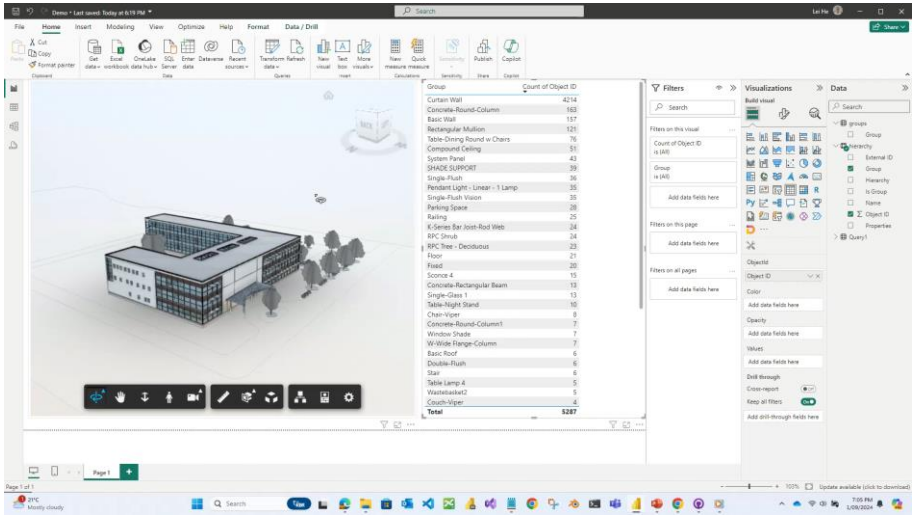


Data Transform



Interaction by Object ID

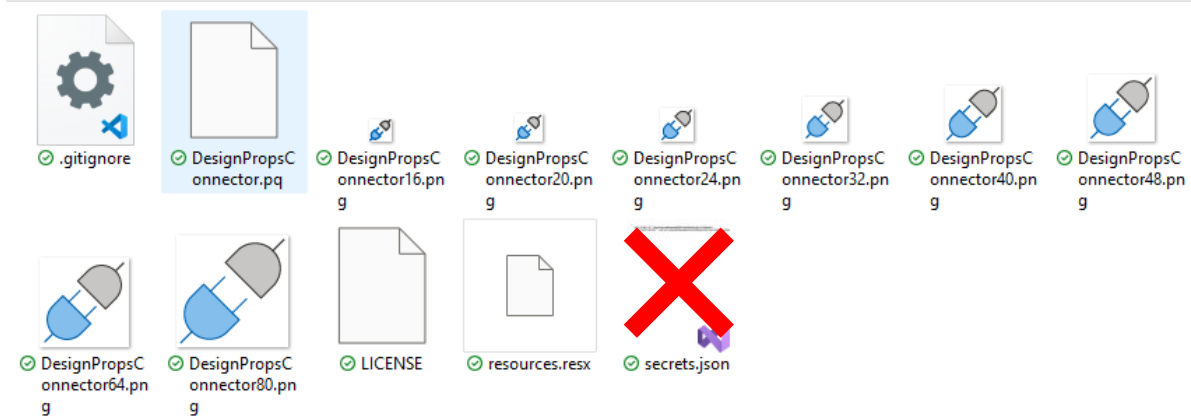
More Interaction



Consideration for enterprise deployment

Unzipping **.mez** file

aps-props-connector.mez



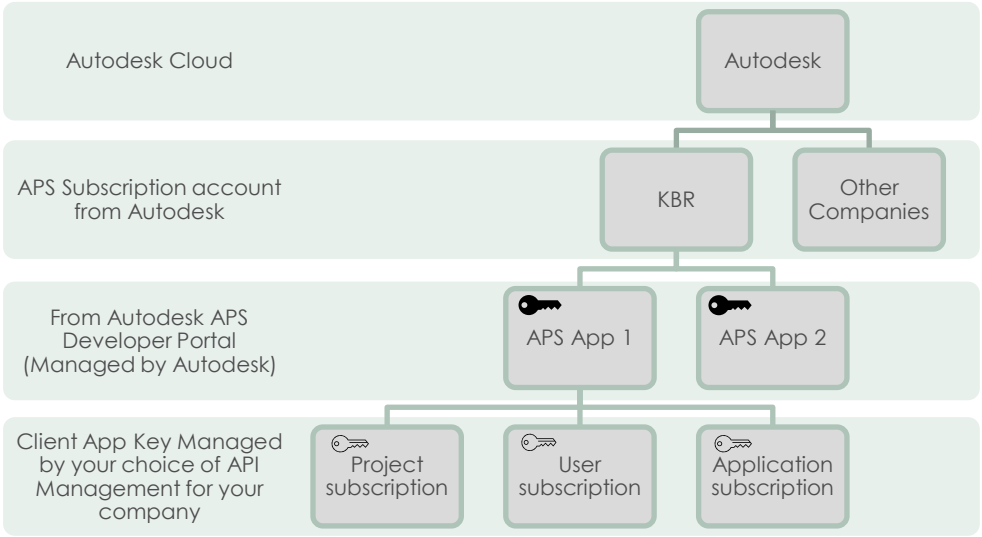

```
{
    "APS_CLIENT_ID":"1ZexX3mdLomXXXXXXXXXXXXX",
    "APS_CLIENT_SECRET":"xcW7mG1uXXXXXXXXXXXXXX"
}
```

- **Secrets shall be protected and shall not be included in the deployment file.**
- **Adding an authentication service which recognise users' identity then request Access Token for the users.**

Consideration for enterprise deployment

Credentials registered for APS App. Managed by Autodesk. Authorized by ACC Admin to access ACC projects.

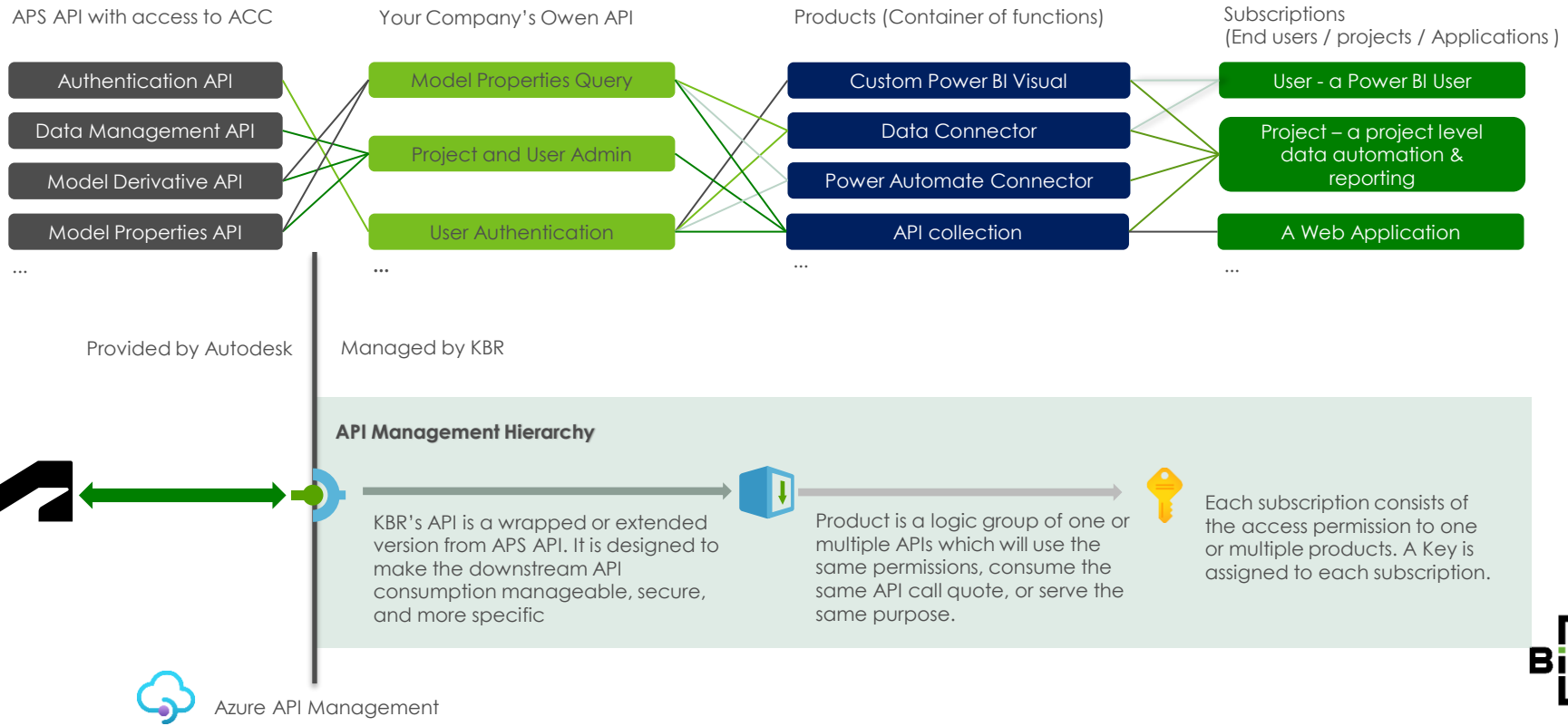
Client Application Key. Managed by your company. Application Key can be provided at either application level, project level, or user level.



Do not give **APS Credentials** to anyone outside Developer Team. It is trusted by ACC and hence having read / write permission to all ACC projects.

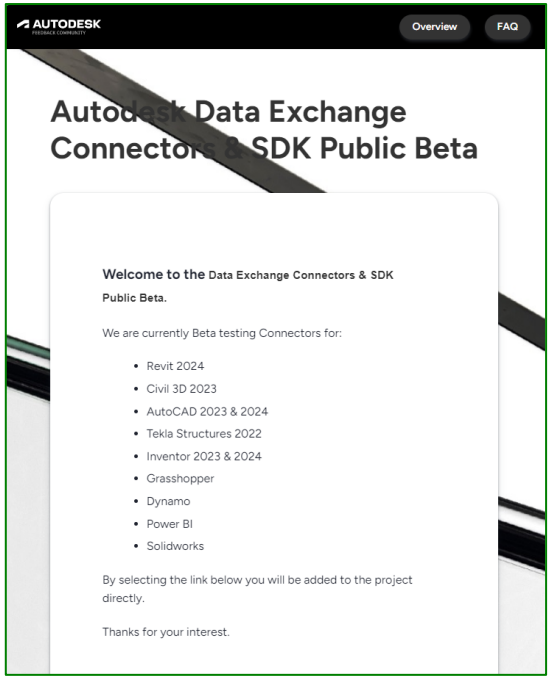
Client Application Key helps to manage the user requirement for accessing ACC. We can bundle mix difference scopes / permissions into one Key and assign it to a requirement, which can be from a project, a user, or an application.

Consideration for enterprise deployment

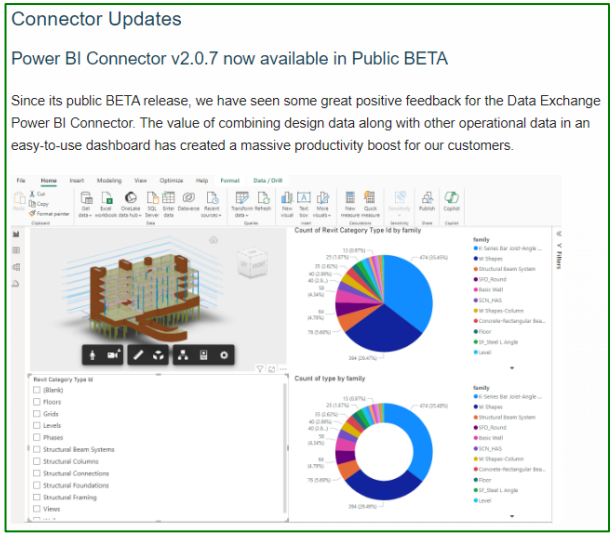


Other APS Power BI Integration

Autodesk Data Exchange Connectors & SDK Public Beta



[Autodesk Data Exchange Connectors & SDK Public Beta]



[Autodesk Data Exchange – Connector Updates and New Releases | Autodesk Platform Services]

- **REMINDER**:
- Speaker Feedback is appreciated
- *Fill in the Survey on the Event App*

Enabling 3d model viewer in Power BI using APS API

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5-7 September 2024