

SD462480

Fusing Document Management and GIS: An Autodesk Approach

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Learning Objectives

- Better understand the relationship between GIS and Data Management
- Learn some of the tools available to integrate Document management platforms with GIS data
- Learn how to provide document management capabilities to GIS users and how to integrate GIS frameworks inside of the CAD environment in the context of Document Management

Description

Engineering projects are complex, multi-disciplinary, sometimes isolated, and always time sensitive. Engineers, designers, GIS analysts and field teams often must exchange information that is critical to construction decisions and affect timelines and success of the project. In most cases the designers and engineers develop these complex designs utilizing a myriad of data sources and information. However, this information is not always communicated in a effective way to members of the team that do not have access to the same tools, or even the same information.

By integrating document management with GIS data, organizations can communicate design concepts, in-situ conditions, project requirements and much more from office to field teams and everything in between.

There are several technologies available to make this happen but with the partnership between Autodesk and ESRI this has become much easier and effective.

Speaker

Gerry has over 20 years of experience in Geographic information systems (GIS) and data management. He has worked within a number of different industries including mining, oil and gas, and all levels of government. Gerry has a breadth of experience ranging from 3D geospatial modelling frameworks to network analysis. He also has experience with several different software development platforms including C#, Python, PHP, VB.NET and VBA and has developed several services and applications to assist with software integration and enhancement.



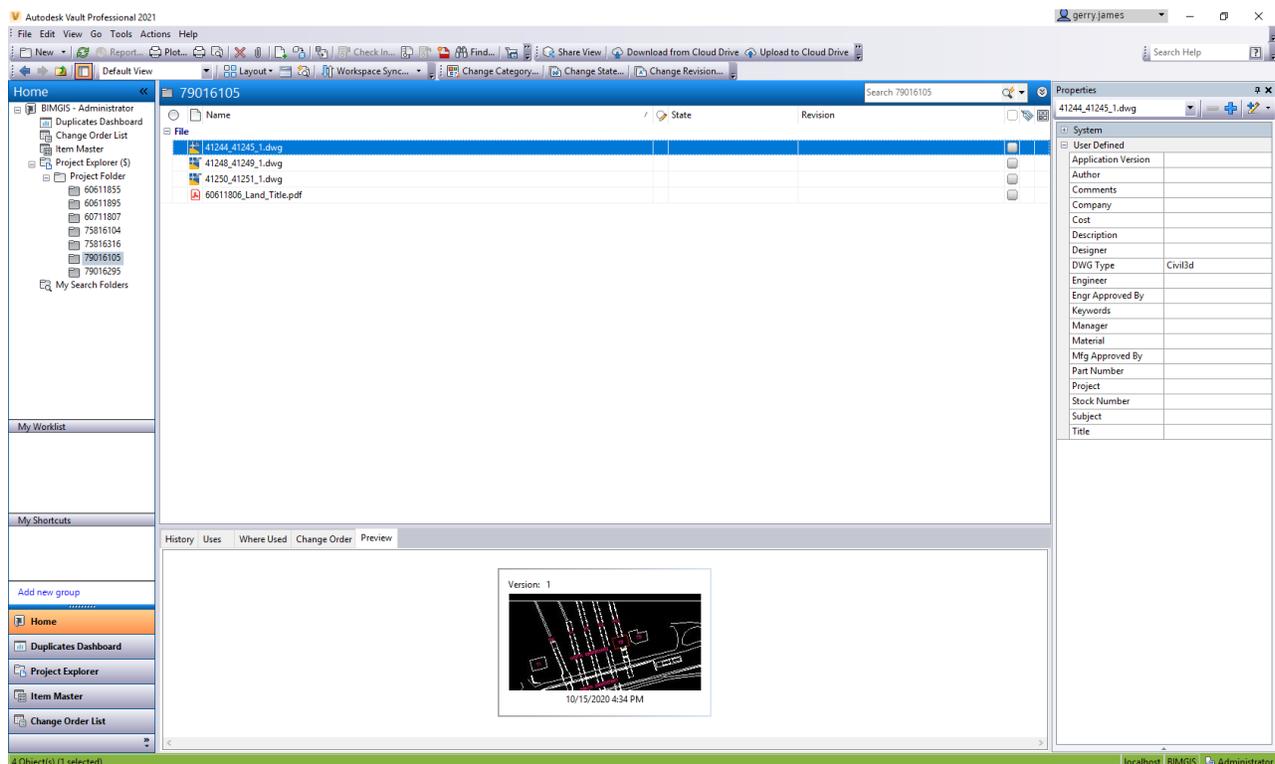
He has experience with a few different GIS platforms including AutoCAD Map 3D and database management systems such as SQL Server and Oracle. He has used his knowledge of geospatial and data management systems to help clients better understand their processes and develop solutions to meet their specific needs. Gerry prides himself on first understanding client business processes and requirements and then assisting them to develop solutions that fit their situation. Gerry has extensive experience assisting organizations leverage their spatial and non-spatial data assets through understanding their business processes and creating a solution that includes software and human capital to meet their specific requirements.

Introduction to Autodesk Document Management

Autodesk has two main document management platforms that organizations can leverage for their project or programs. These are:

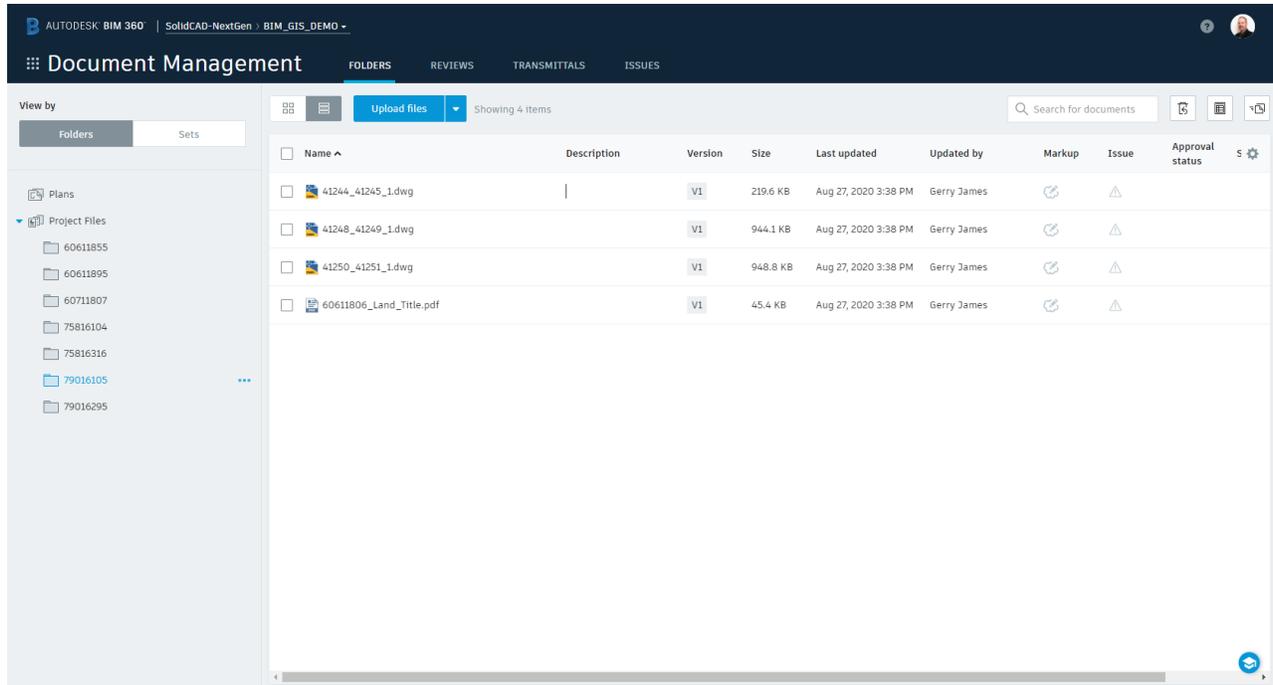
Vault

Vault is product data management (PDM) software that improves productivity. Everyone works from a central source of organized data—collaborating, reducing errors, and saving time. Installs quickly with easy administration. Integrates with Autodesk design tools. Connects internal and external teams.



BIM 360 Docs/Design

BIM 360 Docs is a cloud-based platform that allows organizations to manage their BIM and design data in a collaborative way. This tool provides connectivity to full project teams in such a way that users can view and manipulate models from anywhere in the world. The tool is intended to enhance project management tasks by providing mechanisms for managing, reviewing, and approving all construction project documentation, plans and models through a web interface.



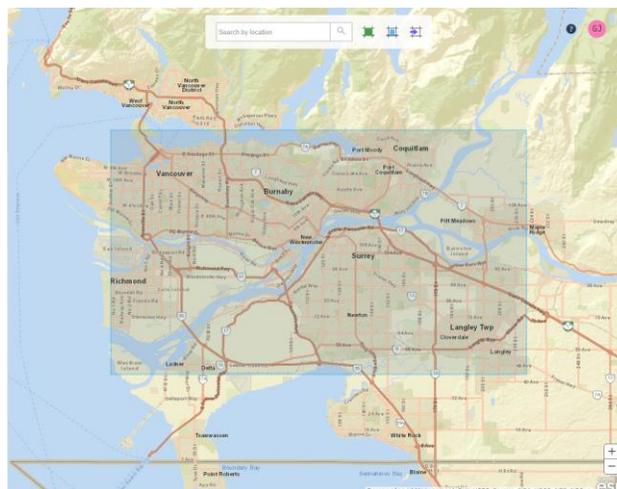
Accessing Document Management Links from GIS Features in Civil 3D

By utilizing the ability of Civil 3D to import GIS data for ArcGIS Online, users can attach Vault links to features for future reference. These links can be to a project folder in Vault where documentation for the project resides.

The following will guide you through bringing GIS data into Civil 3D and then attaching Vault links to features in the GIS data.

1. Open Civil 3D
2. On the Insert tab select "Autodesk Connector for ArcGIS"

3. In the resulting window, select the  tool button and drag a box over the area of interest



- In the left hand side pane, select the area you wish to pull content from (e.g. My Content), and then select the data you wish to pull into Civil 3D



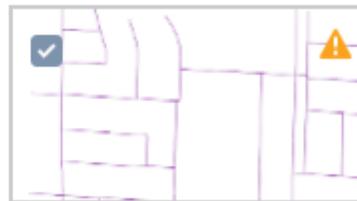
van_tech_school



Vancouver Property ...

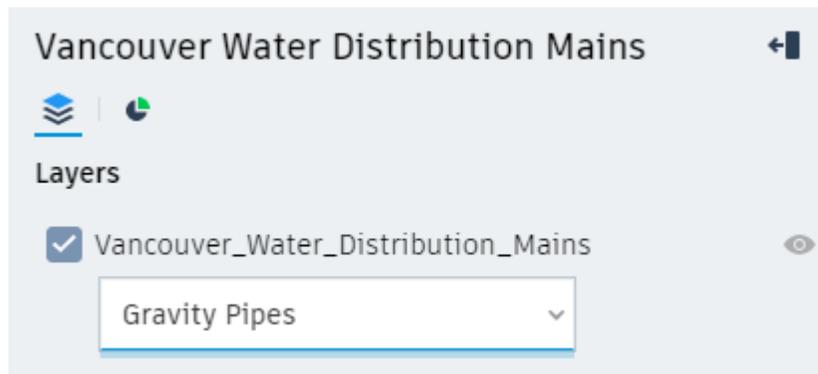


Vancouver Water Con...

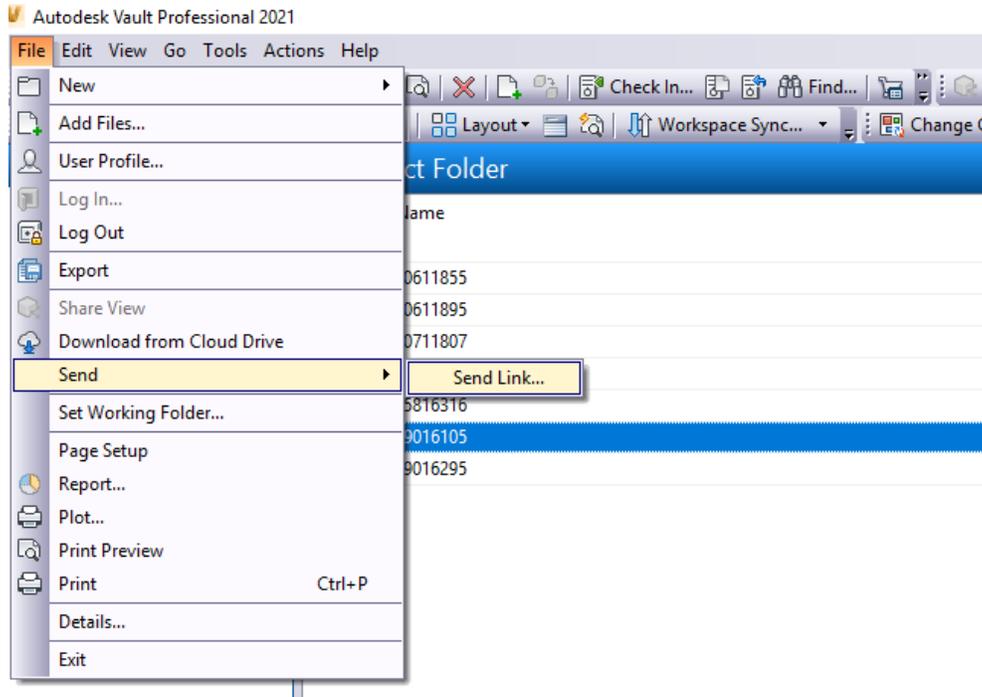


Vancouver Water Dis...

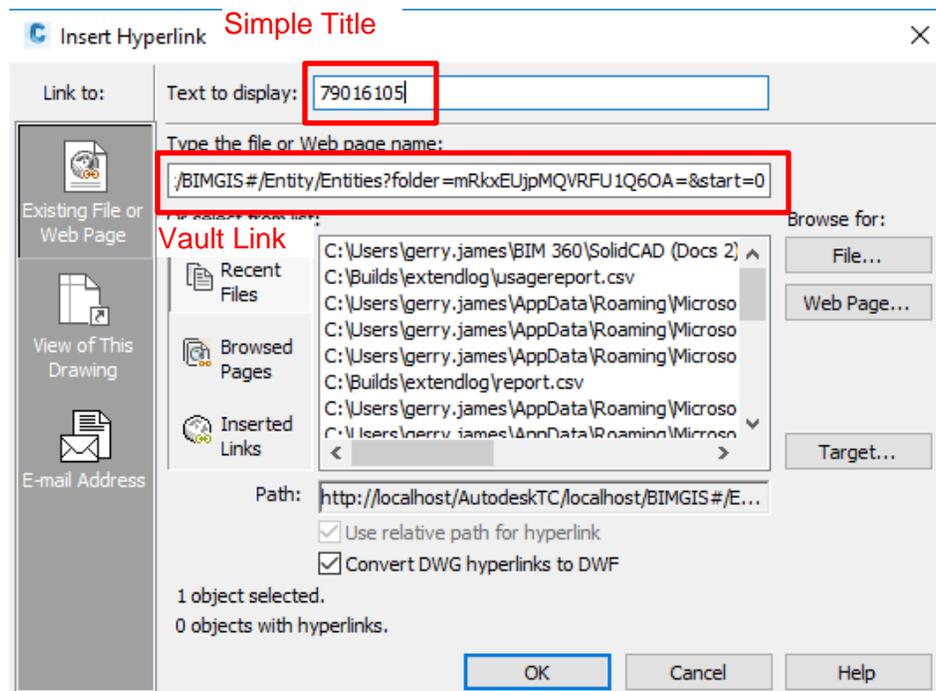
- In the subsequent pull-out, select each dataset as above and set the feature type (e.g. Feature Lines or Gravity Pipes)



- Select the “Add to my design project” button at the bottom.
- You may need to assign a coordinate system to the drawing at this point so just follow the instructions after selecting Assign coordinate system...
- You may also be prompted to setup certain Civil 3D features such as Gravity Pipes but this can be done later if needed, so you can just select OK as needed.
- Open the Vault Client and login to the appropriate Vault
- Select the folder directly above the project folder you are interested in then select File → Send → Send Link

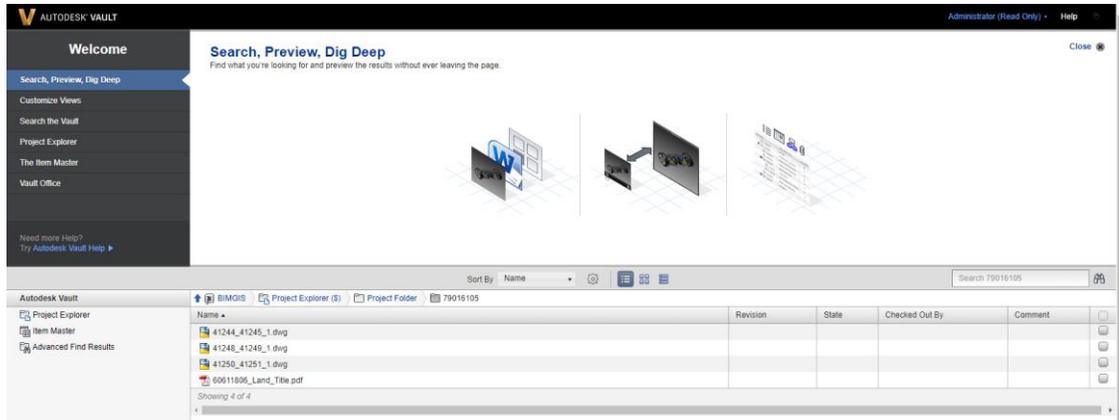


11. In the email client that pops up, select the link you wish to share (e.g. web or client) and then copy it.
12. In Civil 3D, select the feature you wish to attach the link to and open the Extended Data tab in the Properties window (hint: use the Properties command if the properties window is not open)
13. Click on the “Hyperlink” box and then paste the link from above in the appropriate box in the resulting dialog



14. Click OK

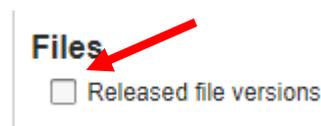
15. Users will now be able to select the feature with the hyperlink, select Hyperlink and Open to access the folder in Vault through the Vault Client or Thin Client.



Note: if drawings/models do not show, you may have to open the Settings for VAutl from the User Name dropdown



And uncheck the Files/Released file versions checked box to get all files to show in the Vault Thin Client



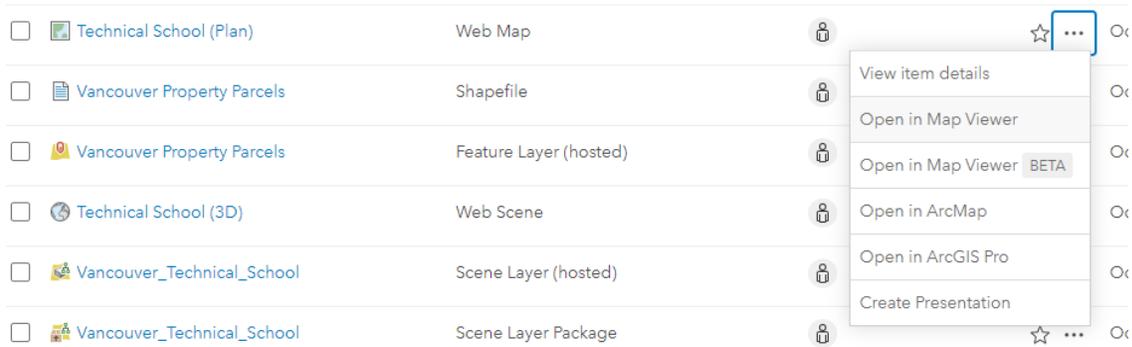
Accessing BIM 360 Docs from ArcGIS Online

BIM 360 Docs provides a collaborative environment for accessing documents and models through a cloud platform. To access documents through this platform via GIS tools, there are two ways to do this.

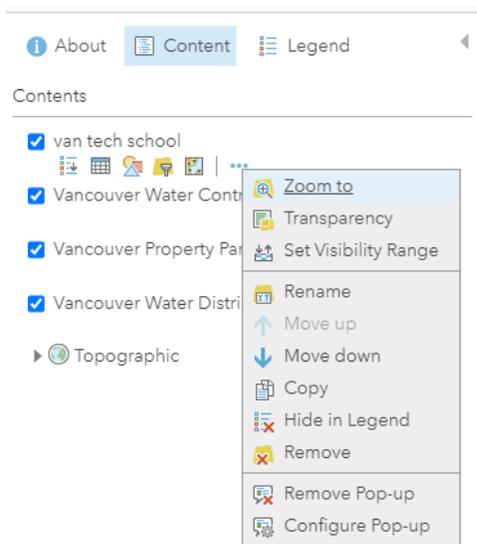
Utilizing BIM 360 and Forge

This method is quite involved and requires that a BIM 360 viewer be built using .NET or PHP technologies. The basic method for attaching the viewer to the GIS viewer is as follows:

1. Open ArcGIS Online (<https://arcgis.com>) and login
2. Open the Web Map of your choosing in the Map Viewer by selecting the ellipses beside the Web Map and select Open in Map Viewer



3. In the resulting map viewer select the layer you want to add a link to and select the Content tab if not already selected
4. Select the Ellipses beside the layer of choice and select Configure Pop Up



5. Under the Attribute Expressions section, Click 'Add'.
6. You will now need to add the expression

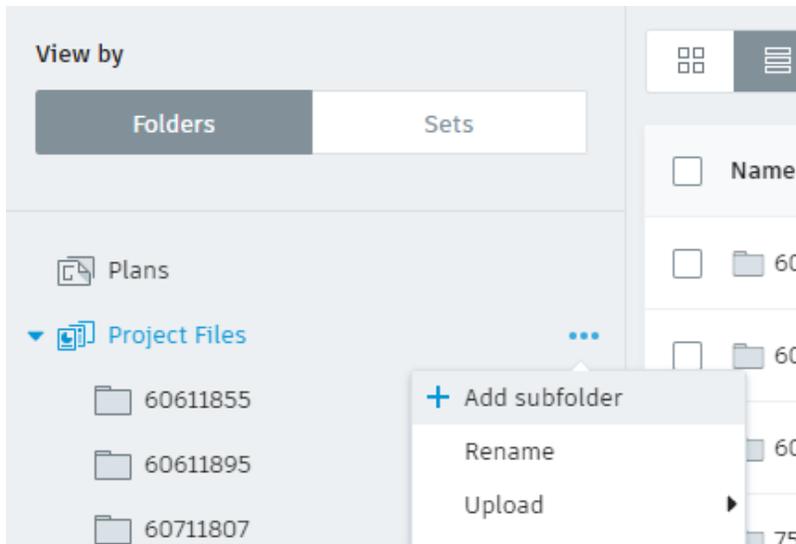
```
concatenate("http://localhost/bimviewer/?project=", $feature["tax_coord"])
```

Where tax_coord is the field name that contains the name of the folder to direct to. Note this requires a custom BIM 360 viewer be built. Autodesk has an exceptional tutorial on how to create a custom BIM 360 viewer. <https://learnforge.autodesk.io>

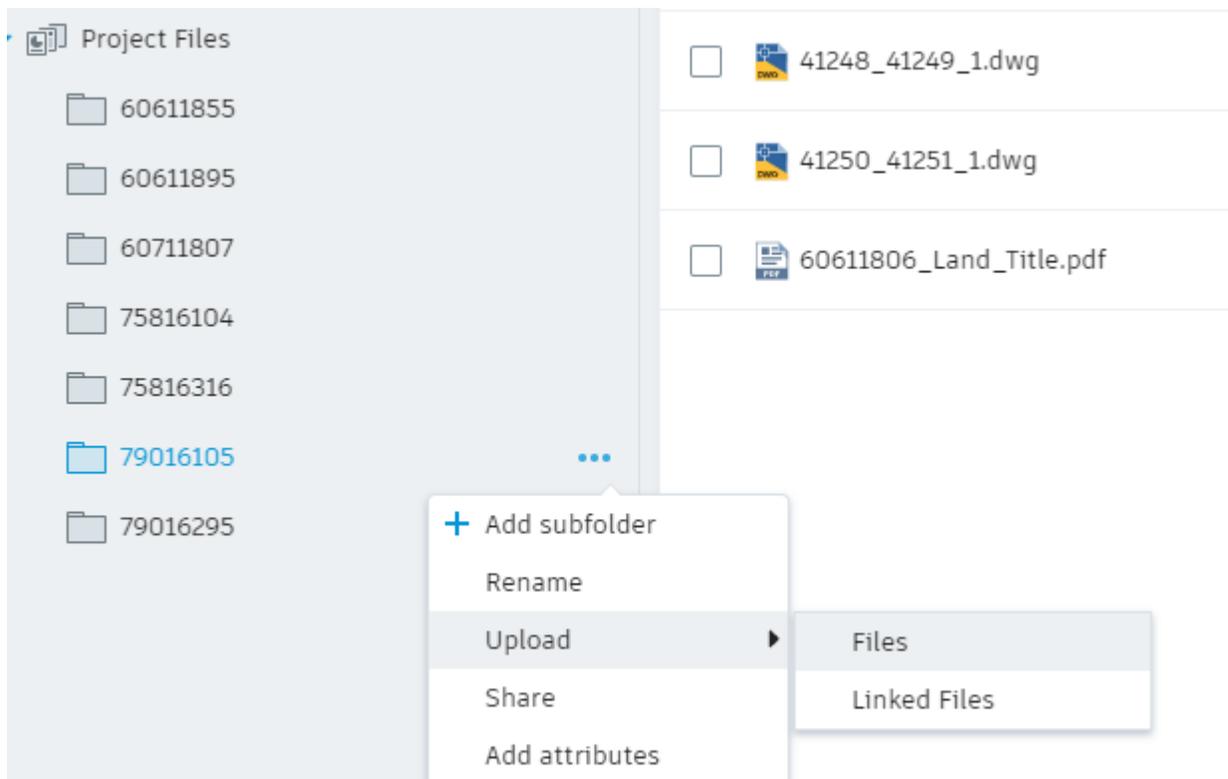
Leveraging Forge to Build a BIM 360 Viewer

While a full set of instructions for building a BIM 360 Viewer is not practical for this class, I will show how to set up BIM 360 Docs and Forge to allow a viewer to be created.

1. Open BIM 360 Docs and Sign In
2. Make sure you are in the appropriate project
3. Select the Project Files node in the left panel and start adding folders



4. Select the appropriate sub folder and select the ellipses beside it
5. Select Upload → Files



6. Upload any files you wish to include in the project
7. Go to the My Apps page
8. Select CREATE APP

My Apps CREATE APP >

Personal

BIM_GIS_INTEGRATION
Created 27 Aug 2020

Integrate BIM 360 Docs with 3rd party GIS (ESRI)

GeoFiling20
Created 10 Mar 2020

First Draft of new Geofiling application

9. Select all of the API's you wish to include. Note, BIM 360 API and Data Management API are mandatory for document management functionality

Create App

APIs

Select the APIs you want to use in your app.

BIM 360 API ✓

Data Management API ✓

Design Automation API ✓

Model Derivative API ✓

Reality Capture API ✓

Token Flex Usage Data API ✓

Webhooks API ✓

10. Setup all of the parameters for the new API interface as follows:

App information (Created on 27 Aug 2020)

Basic information about your app.

Client ID	SaVNulIMKQrCEb4nk4CvC5zcjFQp1mPWg
Client Secret	<input type="password" value="....."/> REGENERATE
App Name	BIM_GIS_INTEGRATION
Description	Integrate BIM 360 Docs with 3rd party GIS (ESRI)
CallBack URL	http://bimgis.localhost/bimviewer1/api/forge/callback/oauth
Your Website URL	http://mapdata.ca/viewmodels/www/index.html

DELETE
EDIT

Note Client ID and Client Secret are autogenerated and simply need to be noted. These are critical for authentication when you create you Viewer app.

Once these steps are complete you can then move into creating your BIM 360 Viewer or other BIM 360 Docs based apps. You can get more information on setting up Forge at <https://forge.autodesk.com/developer/documentation>

Basics of Developing a .NET BIM 360 Viewer

While we will not provide detailed instructions on creating a BIM 360 Viewer, the following are some basic principals that must be followed. The following instructions are based on the Autodesk tutorial.

Creating a .NET Project In Visual Studio

While the instructions in the Autodesk tutorial are good, there are a few things that should be pointed out.

1. In Visual studio you can create a new project that will hold the content for the new ASP.NET Core Web Application. Note: the .NET Core framework seems to work a little better than .NET Framework for this type of application.
2. You will also need to deploy the Newtonsoft JSON and Autodesk Forge packages through NuGet. These two libraries will provide functionality for integrating with Forge and for interpreting the JSON content that is returned in your API.
3. While the tutorial tells you to create Project based Environment Variables, it seems to be better to place the environment variables in the appsettings.json file like the following:

```

1  {
2    "Logging": {
3      "LogLevel": {
4        "Default": "Information",
5        "Microsoft": "Warning",
6        "Microsoft.Hosting.Lifetime": "Information"
7      }
8    },
9    "AllowedHosts": "*",
10   "FORGE_CALLBACK_URL": "http://bimgis.localhost/bimviewer1/api/forge/callback/oauth",
11   "FORGE_CLIENT_SECRET": "0KAZ7r5Vkj9eqCB4",
12   "FORGE_CLIENT_ID": "SaVNu1MKQrCEb4nk4CvC5zcjFQp1mPWg",

```

4. This will ensure these variables are accessible after the application is published to a new server

Working with Controllers

The basic premise of creating the Web API for this revolves around the concept of MVC controllers. To get these to work, you need to make sure the routing paths used are immutable and will be accessible outside of the debugging environment. There are a couple of things to ensure this is the case:

1. Make sure the [Route] tag includes the application folder path and doesn't just start with [Route("api/forge...]

```

[HttpGet]
[Route("bimviewer1/api/forge/oauth/token")]
public async Task<AccessToken> GetPublicTokenAsync()

```

This will make sure calls to the API are routed correctly. You will need to make this change everywhere in the code where the tag [Route("api/forge...]

2. As mentioned above, it is advisable to setup the project to use the appsettings.json file that is created when making the Web API project to store the environment variables such as Client ID and Client secret. The tutorial will not show this as it uses the built-in Project Variable functionality to store those things. To create this you will need to do the following:

Replace

```

/// <summary>
/// Reads appsettings from web.config
/// </summary>
12 references
public static string GetAppSetting(string settingKey)
{
    return Environment.GetEnvironmentVariable(settingKey);
}

```

With

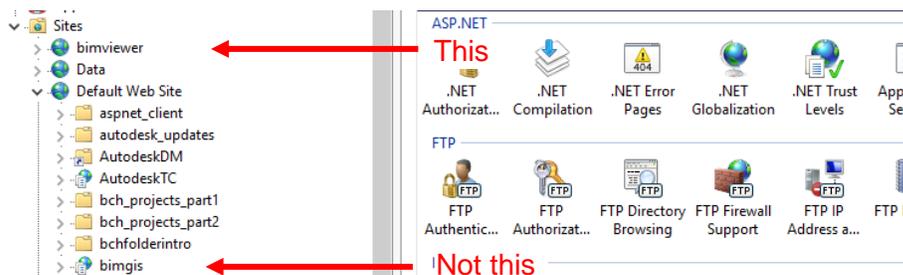
```

/// <summary>
/// Reads appsettings from web.config
/// </summary>
12 references
public static string GetAppSetting(string settingKey)
{
    string value = "";
    using (StreamReader file = new StreamReader("appsettings.json"))
    using (JsonTextReader reader = new JsonTextReader(file))
    {
        Newtonsoft.Json.Linq.JObject o2 = (Newtonsoft.Json.Linq.JObject)Newtonsoft.Json.Linq.JToken.ReadFrom(reader);
        value = o2.GetValue(settingKey).ToString();
    }
    return value;
}

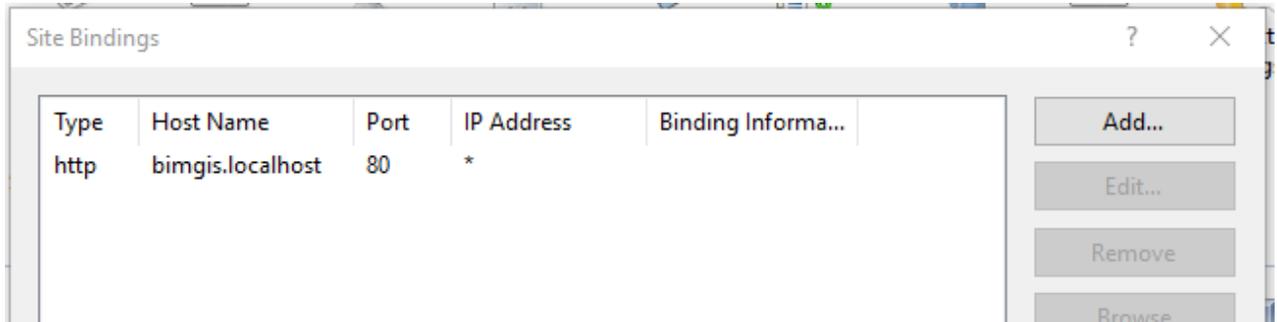
```

This will ensure the correct environment variables are acquired for the authentication tasks

- When the API is published, make sure to set up a new Web Site for the application and not just a new Application under an existing site. This will ensure the web server can validate the call and there will be no issues



- It is also helpful to ensure the bindings are setup so that there is a definitive url to access the site. If you create a new site, inside the server it should look something like the following when you check the IIS bindings for the new site:



Note: the leading the third level domain name bimgis. This is a pointer that differentiates this site from the default site. So when referring to this API you would use the syntax bimgis.localhost or bimgis.yourdomain.com etc.

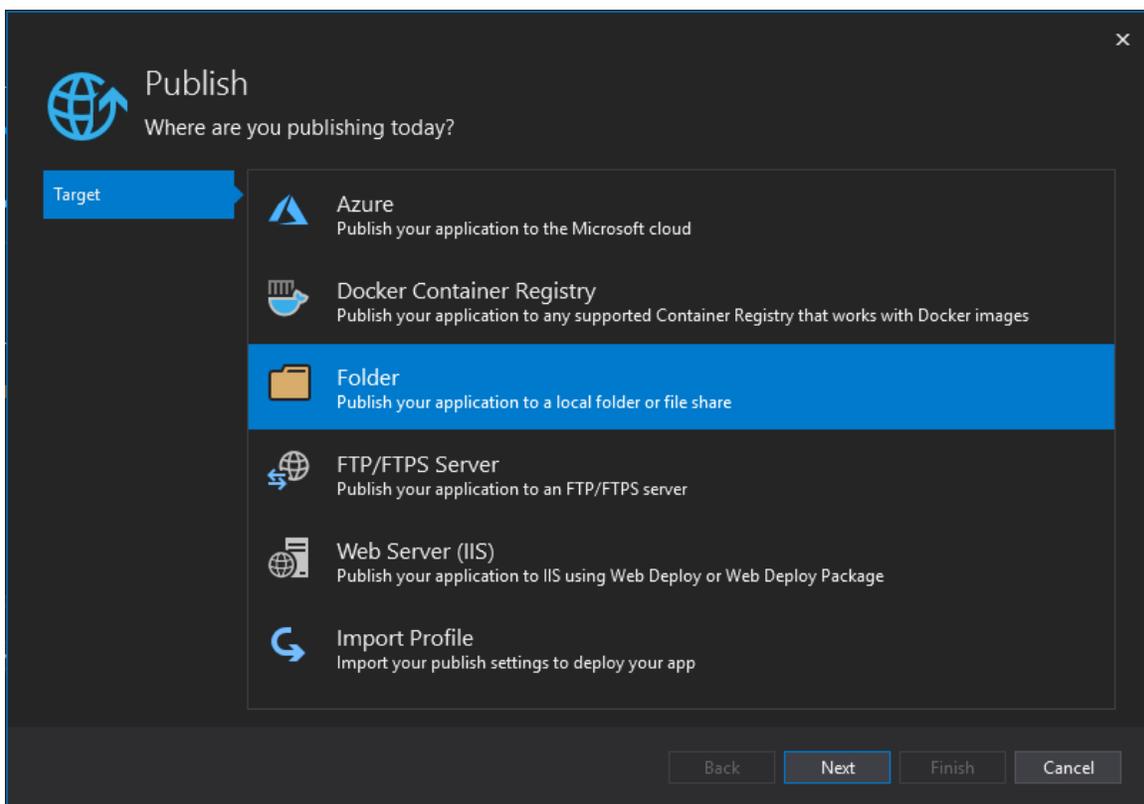
A Word About Deployment

In the tutorial that Autodesk has put together there are only 4 options for deployment:

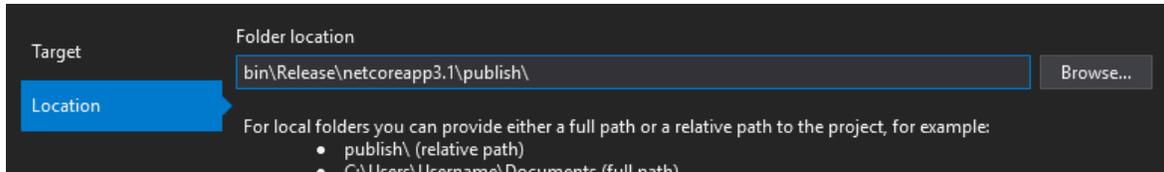
1. Amazon Web Services (AWS)
2. Microsoft Azure
3. Heroku
4. AppHarbor

If you want to deploy the application to an IIS instance you can follow these instructions:

1. Make sure you have set up IIS as in #3 and #4 above
2. In the Solution Explorer in Visual Studio, Right Click on the project and select Publish
3. In the next dialog select Folder and select Next



4. Browse to the correct Folder for your web server application



5. Select Finish
6. If the Publish Profile needs to be changed you can Select Edit and make the changes.
7. From this point on, whenever you select Publish you will be directed to this profile that can be reused.
8. If you have set everything up as described above, the site should not need any other changes for publishing.

Some Additional Resources

The following are some additional resources that discuss GIS and CAD integration as well as more complex topics around BIM and GIS integration.

Autodesk

Introducing the BIM 360 API

<https://forge.autodesk.com/en/docs/bim360/v1/overview/introduction/>

Setting up BIM 360 Docs

<https://knowledge.autodesk.com/search-result/caas/simplecontent/content/how-do-i-setup-bim-360-docs-for-fast-start.html>

BIM & GIS Integration

<https://www.autodesk.com/solutions/bim/bim-gis-integration>

ESRI

ArcGIS Tools for BIM

<https://www.arcgis.com/apps/Cascade/index.html?appid=df637a80bd17412caf4a4e075019748e>

Common Patterns for BIM and GIS Integration

<https://www.esri.com/arcgis-blog/products/arcgis-pro/transportation/common-patterns-for-bim-and-gis-integration/>

BIM-GIS Integration with IFC

<https://www.esri.com/arcgis-blog/products/product/3d-gis/bim-gis-integration-with-ifc/>

Survey 123

https://www.esri.com/en-us/arcgis/products/arcgis-survey123/resources?rmedium=www_esri_com_EtoF&rsource=/en-us/arcgis/products/survey123/resources

ArcGIS Javascript API 4.16

<https://support.esri.com/en/products/developers/web-apis/arcgis-api-for-javascript/4-16>