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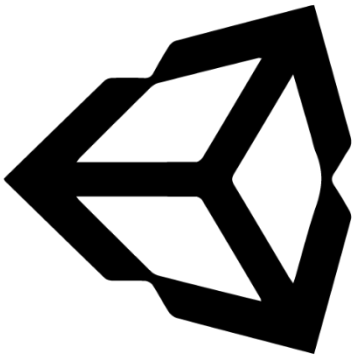
AS500107

Use Revit Cloud & 3Ds Max to Create a Tangible Immersive Experience in Unity

Presented by:
Felix Cambou
Microdesk

Learning Objectives

- Setting up an effective schedule and setting expectations to implement design strategies & flexible workflows.
- Incorporate non-technical stakeholders to encourage a more collaborative design process using BIM 360 & Autodesk Construction Cloud.
- Linking and managing Revit to 3Ds Max.
- Setting up a scene in unity.
- Connecting an oculus device to a low-graphics computer.
- Run the application in the developer mode.



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MICRODESK

BIM & Creative Technology Specialist

- 10 years of experience in BIM management & coordination
- 20 years of experience in 3D technology
- Founded and operated Monumental Design Studio prior to joining Microdesk
- Experience in using 3D solutions, visual scripting, & collaborative technology to help many in the AECO industry. Reducing time, making more informed decisions, and building intelligent systems based on logic-based nodes

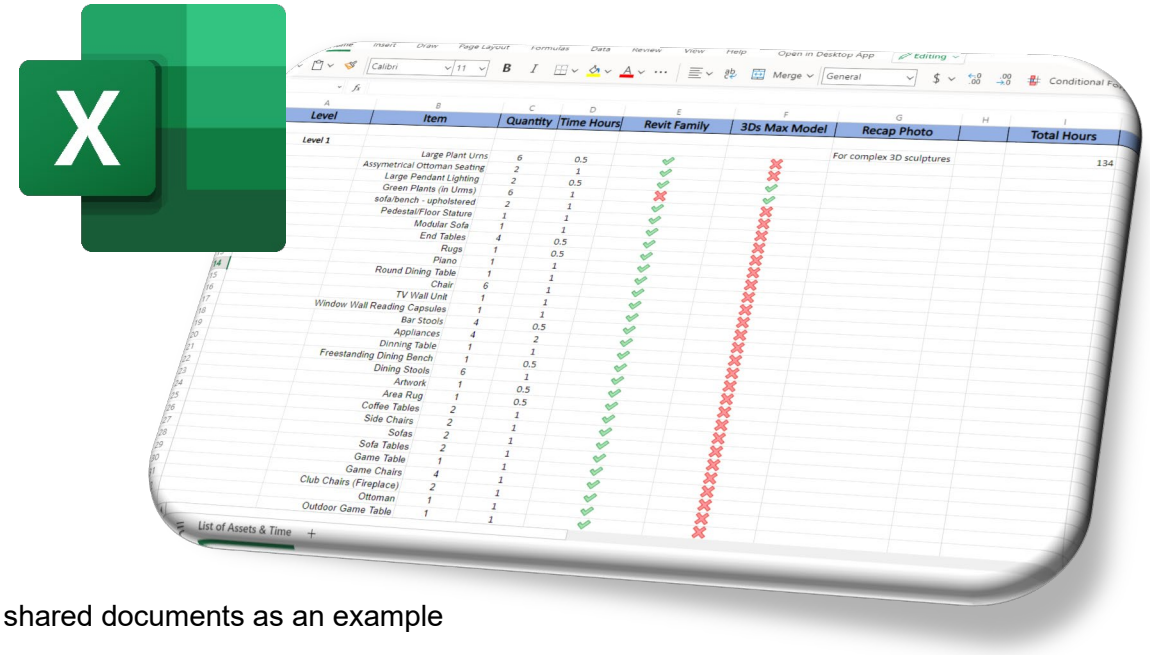
Felix Cambou

Scheduling For Success

As you are planning out the schedule for the big unveiling, you want to give yourself the ability to respond to unexpected challenges. You may start off with the goal of creating a full on, walk around game, with special effects, and interactive objects. However, due to unscheduled events, distracted designers, or maybe another project requires all-hands-on-deck, the project could fail. If you set up the project correctly, you can easily pivot to a different outcome that is just as impactful. Keep a pie in the sky goal to increase excitement and nurture innovation, but it's important to bake into your calculation a plan B when things go sideways.

Time estimates

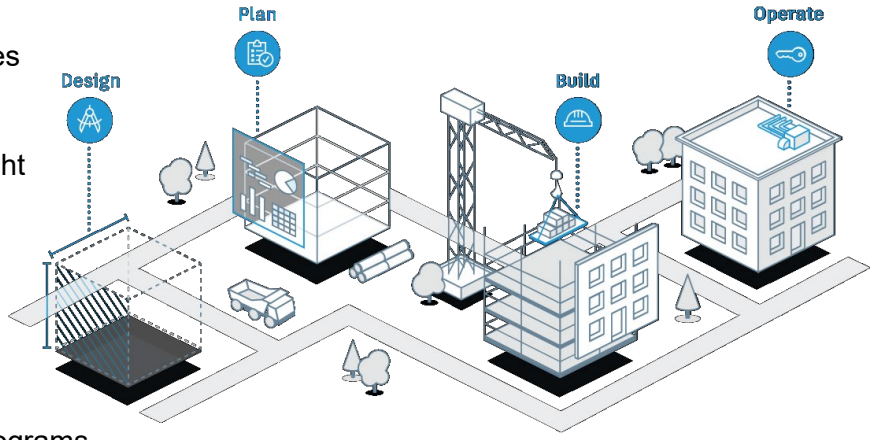
Create a spreadsheet detailing time estimates for each component, scenes, & workflows. Being as granular as possible and even describing several software options for the same task as well. This document will end up giving all stakeholders a better sense of what to expect and allow managers to reserve the necessary time for the staff. It's also better to define a solid time estimate that is slightly inflated vs an approximation window. For example, if you think modeling a table will take 1 to 3 hours, just mark down 3 so that everyone is on the same page instead of an ambiguous time frame.



Example Documentation

See Excel and Word from the shared documents as an example

Design Phase Workflow



Make this a part of your Design Phase workflow. Consolidate programs to ones that are useful for multiple outcomes. All the time spent massing in one program, then re-modeling in others, is a terrible waste of time. Everyone has grown accustomed to their own tools, but this industry's greatest challenge right now is convincing people to use tools that will benefit everyone on the team. Breaking habits and challenging your comfort level will only result in positive gains.

When it comes to Architecture & Construction, making Revit your primary modeling tool gives your proposed time frame more sway. Revit also tends to create more accurate proportions which become noticeable in the virtual environment. Usability of your space is sometimes lost in flexible modeling programs.

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XR Workflow Options

Specialist Recommendation for most AEC looking for custom game play = Revit, 3Ds Max, Photoshop, & Unity

End-User Capabilities
Understanding your audience should inform what technology to use

Majority End User Capabilities
Large masses available to everyone

-Cellphones
-Laptops

Stick with low poly executables that are usable on a cellphone.
Then position teleportaion triggers that activate either stand-in-place 360 panoramic renderings or 360 track video renderings with higher end graphics and animations.

High End User Capabilities
Requires expensive equipment

-Gaming systems
-Viewing Rooms
-Taptic feedback

A small group of users can run this.
You can also provide the equipment for large viewing stations or one on one viewing systems

3D Modeling & Preping
Creating content from existing and new

Rhinoceros 3D
Fast conceptual modeling

Revit
AEC Documentation

3Ds Max
Character rigging/development

Rendering Panoramas & 360 Videos
Complex scenes with full assets & animation

360 stand in place

Lumion
Still requires a web-based executable

360 Animation HD
On a track No walkaround

YouTube
Connect to the masses via VR Phone experience

3Ds Max
Camera & animations

Photoshop
Video Rendering

Immersive Game-play
Explore the project / final viewing programs

3D Walkaround
No animations, web-based executable

Complete XR Package
Combine all three experiences into one XR executable

Unity
Import all assets and develop
Character controls, colliders, & triggers

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BIM Quality Control

Working Backwards

I always start off by working backwards from the end goal. What type of devices are you going to have? Depending on the answer, that might completely change the project. If you're trying to reach a huge audience, a lot of people won't have access to high end equipment. That means you'll need to keep the game size & processing power extremely low. You might also consider hosting the game online so that they don't need to do any downloading and they can view it on any device.

Some companies will setup a space capable of a plug and play virtual game. This however requires a huge system with expensive graphic capabilities and installing built in sensors with a wire to the headset. Or maybe you are anticipating an Oculus only audience. Which is a good choice for those with terrible graphic cards because you can run everything wirelessly into the single headset. By working backwards, with the purpose of transferring models to the end game, it will change the way you create those components

Contingency Plan & Choosing the Software

With Revit & 3Ds Max you will have the ability to pivot your efforts. From 3Ds max you have the option to export those assets to a huge list of programs and file types. You can also create your high-end renderings directly in the program with the Arnold renderer. The Unity game experience is sort of the carrot down the road. If you run out of time to do that, having the direct link from Revit to 3Ds Max, will give you that flexible contingency plan. You should test the process in 3Ds Max first to see how the file is consumed.

The Obsidian project is a great example of how a Unity game-play effort was scrapped halfway through and rescued by 360-rendering. The digital infrastructure allowed the designers to rapidly shift gears and deliver this remarkable project on time.

https://obsidianbybadg.house/

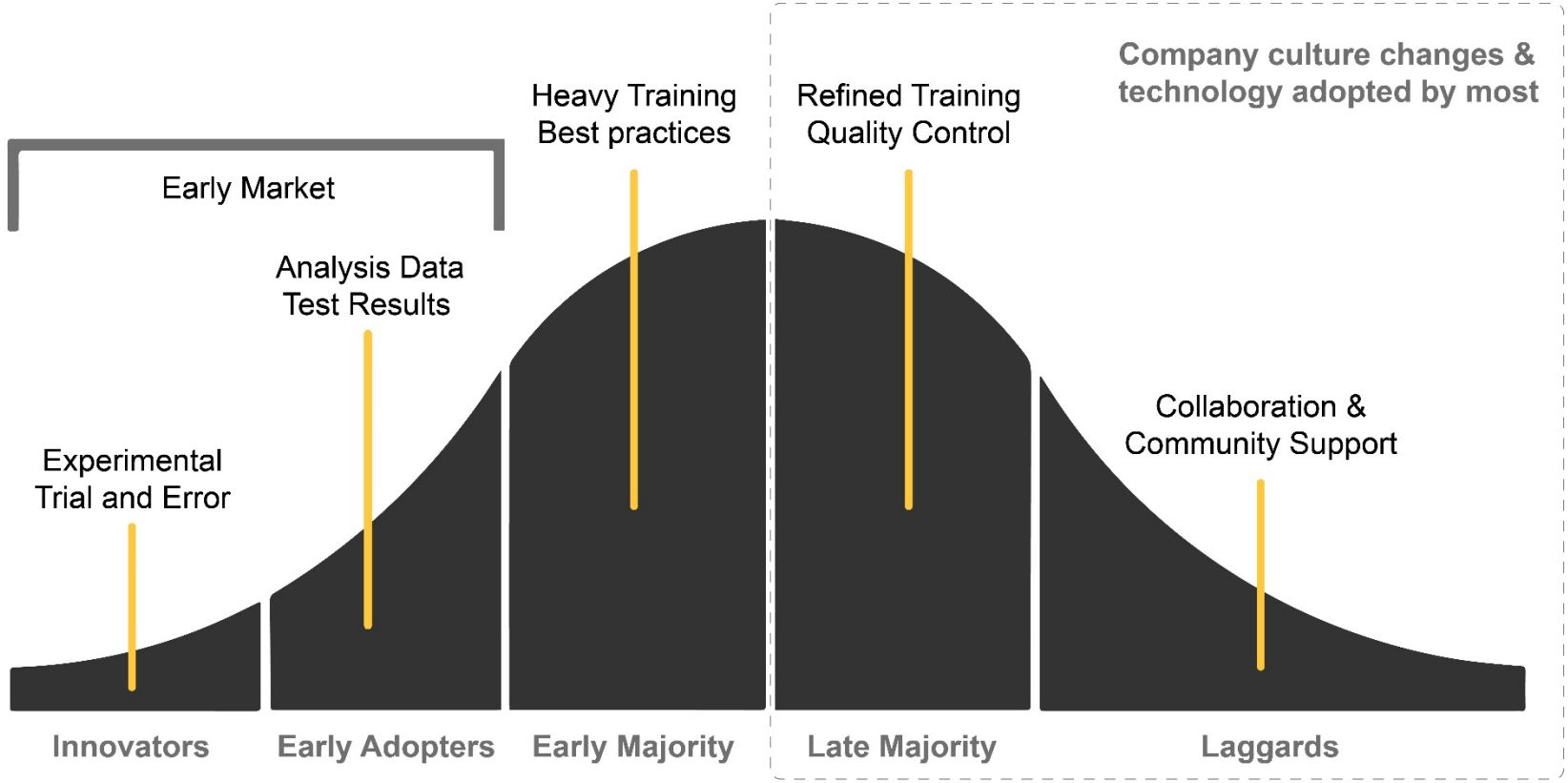
Leaning on skills

- Identify the tasks people love to do and encourage them to tackle it.
- Don't underestimate someone struggling with a program.
- You can help by scheduling more trainings or changing the assignments around.
- Keep experimental tasks for people that are hungry to learn

Know Where Your Team is on the Technology Bell Curve

As XR technology and workflows start to become common place, you will need to revisit the way you schedule for projects. Early adoption phases need a lot of buffers with your time estimates, allowing for program bugs, user errors, and a bigger learning curve. As your company and industry moves forward on the curve, you start to receive more data and community support. The group naturally starts to grow, and the focus is on training and quality of work.

This progression happens over a period of several projects. The initial projects might start with a lot of internal hours focused on research & development. Then later projects, as you grow in strength, will be billable hours with incredible results. The early market period is the inevitable growing pain that will build the foundation for later success.



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BIM 360 & Autodesk Construction Cloud

Installation

During your first meeting you should get everyone up and running with the ACC web interface. Giving everyone the links and demonstrating how important it's use will be helps make the point that they should be using it for all file sharing. Going over the installation and update management of the Desktop Connector & Desktop App will also prevent confusion and file error down the road.

Setting Up BIM 360

Intall & Update

Manage All Programs

- o Each Autodesk program should be managed with this
- o Work your updates from the bottom to the top, especially for Cloud services.
- o You can also download programs you don't have installed from this app

File sharing

- o This is a separate download
- o Let's you share ALL file types to the same Cloud Project folder
- o This is the best way to link CAD, PDFs, & JPEGs
- o You can also see non-cloud Revit projects inside of the project folder

Connect & Create

Link to Local Revit Template

- o Open Revit and selet Options
- o Select File Locations and click ✚
- o Under "This PC" navigate to Autodesk Docs

- o Open Shared Project Folder > Revit Standards Folder
- oSelect Customized Revit Template "XX_Project_Template_2022.rte"

Create New

- o Everytime you create a new project select this template
- o Select project not template
- o Do not upgrade original file

Save & Publish

Save & Name Temp file

- o Change your publish settings now
- o This is a temparary file
- o Save to desktop and name it Exactly to what it will be shared as

- o Select Collaborate & choose In BIM 360 Document Management
- o Close file
- o Open again from the main splash screen on the left, not from File
- o Sync / Relinquish
- o Do not upgrade

Link & Upload

Drag and Drop

- o Place all Linkable files into project folder (CAD, PDF, Images)
- o Do not import or link directly from personal computer location
- o Either the local Connector or BIM 360 Online will work
- o Always use the cloud path

- o You can right click on local files to sync, lock, & other actions
- o Click and drag to create a local copy of the file
- o Use BIM 360 to manage file names file location, and changing versions

Publish, Archive & Share

Sync and Publish

- o Publishing automatically saves a backup version you can find online
- o Compare or change versions

When archiving specific point in time

- o Open Cloud model and Sync then close all open projects
- o Select Home icon to show tabs
- o Select eTransmit and find hidden

C:\Users > UserName > AppData >

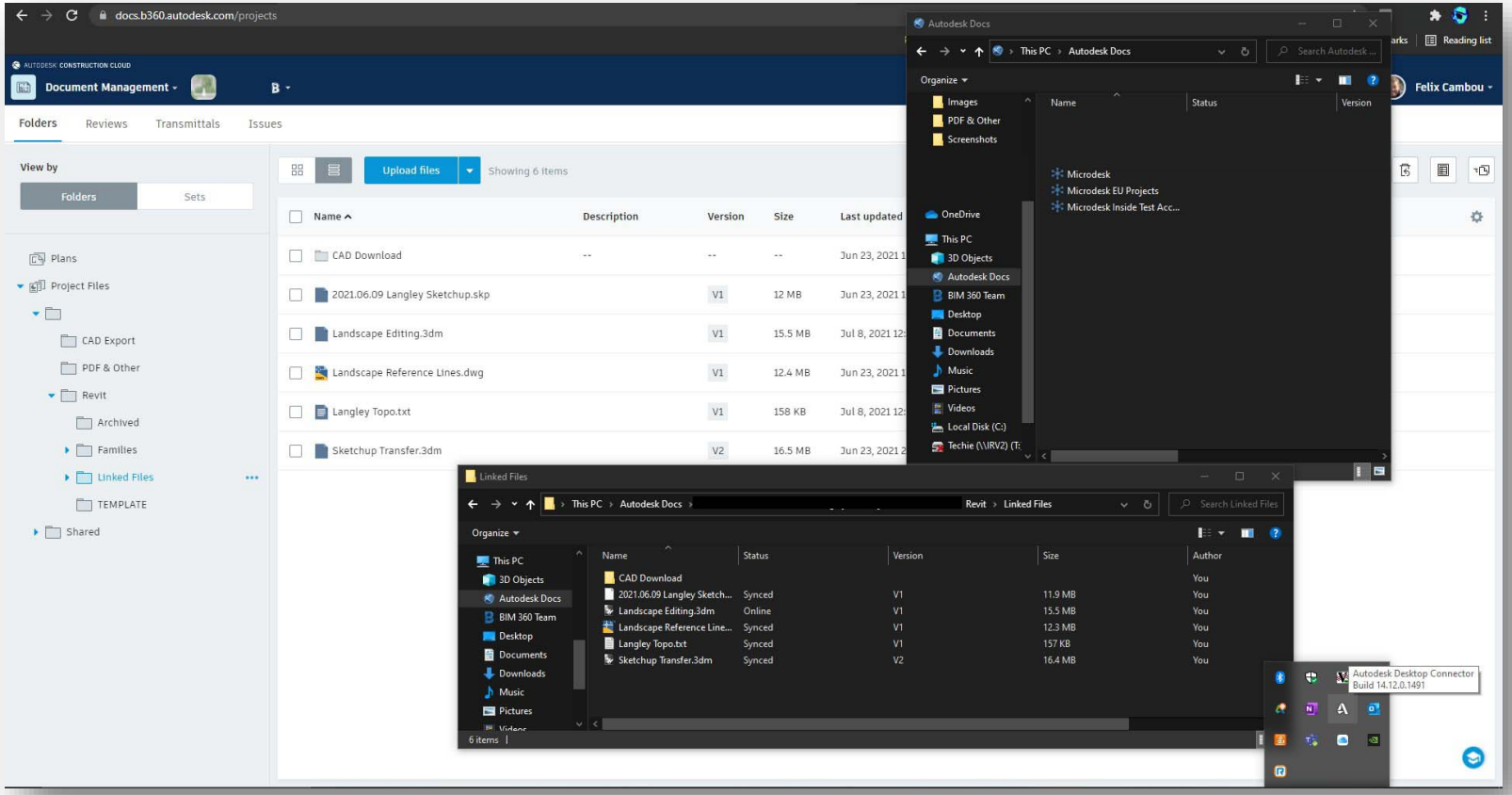
Local > Autodesk > Revit >

Autodesk Revit 2022 >

CollaborationCashe > Y733KS9VUEUM

- o Open the folders and find the Revit file based on the exact date & time you Synced
- o Select all the settings
- o Save to archive folder located in BIM 360 or Autodesk Docs

Install Desktop Connector: https://help.autodesk.com/view/CONNECT/ENU/?guid=GUID-847CE3FC-B26F-46B8-895E-5D825F4BD540



Markups and Views

Start off the project hitting the ground early, giving everyone access to BIM 360, and making sure everyone is comfortable with the tools. Show everyone how to navigate across the website. Explain the folder structure and file sharing process. Then show examples of how to open-up all file types, adjust visibility settings, create markups, & compare versions. When there are two locations for file sharing it causes confusion and you will inevitably have someone use an outdated or even completely wrong file.

It is also good to make sure every Revit user is aware of the publishing settings so that it is as comfortable for managers or reviewers to use on all devices: Computers, ipads, phones, etc. Since you will be linking the Revit file in 3Ds Max, you will need to publish more often. For linking purposes, it is better to use the main cloud file vs the hidden local cash even though it isn't the latest version. This is also a good time to consider how the 3Ds Max and Unity folder structure will be impacted. You can't be organized enough.

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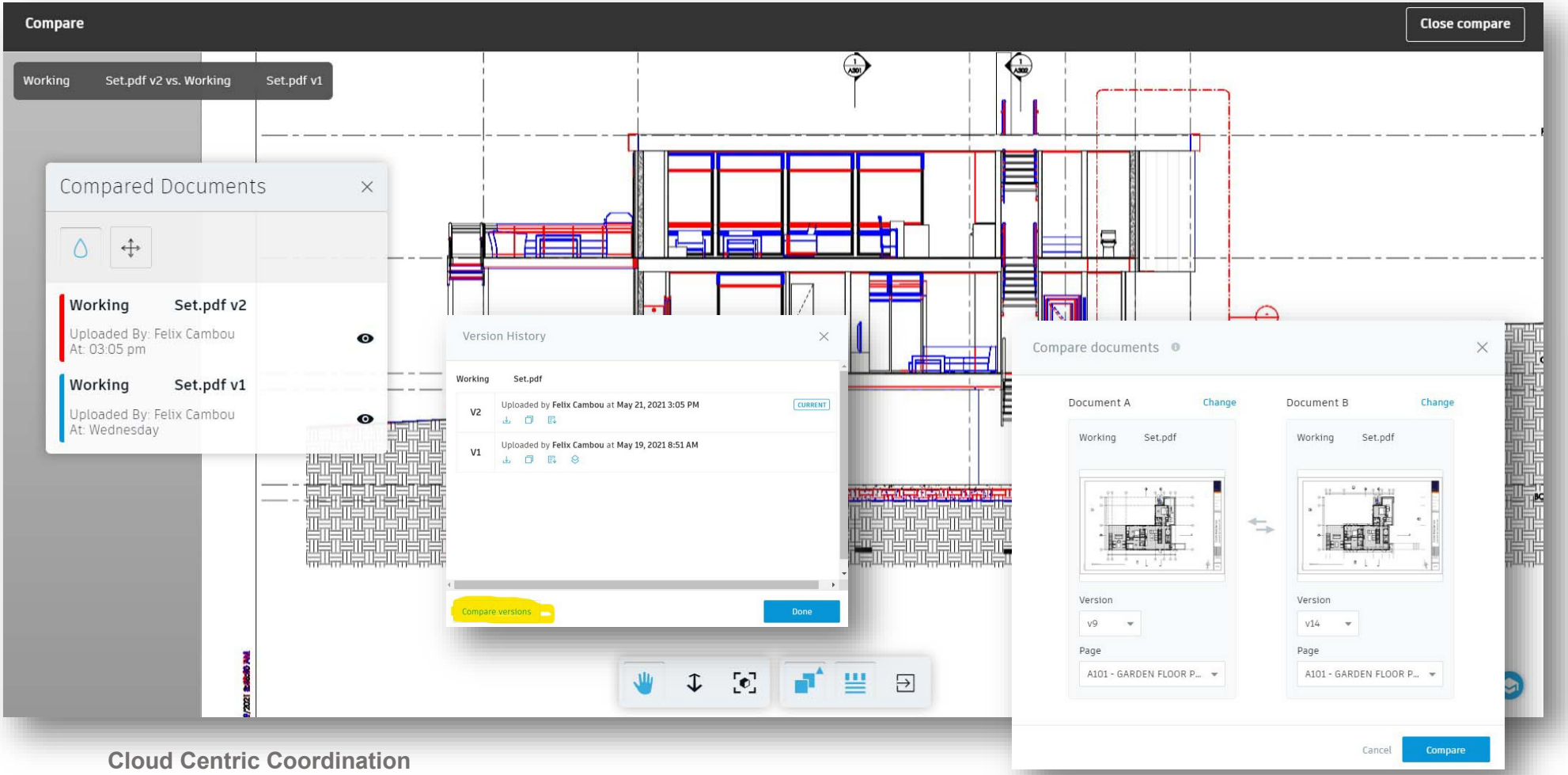

Cloud Centric Coordination

- Every meeting should center around the cloud
- Markups are done in real time
- We assign tasks to people and create lists on the call
- We set expectations early on with time estimates
- Make sure every stakeholder is a part of the process.
- Do everything you can to keep everyone communicating without the fear of saying something wrong.
- Be more open with all stakeholders in the working process instead of waiting until things are presentable.

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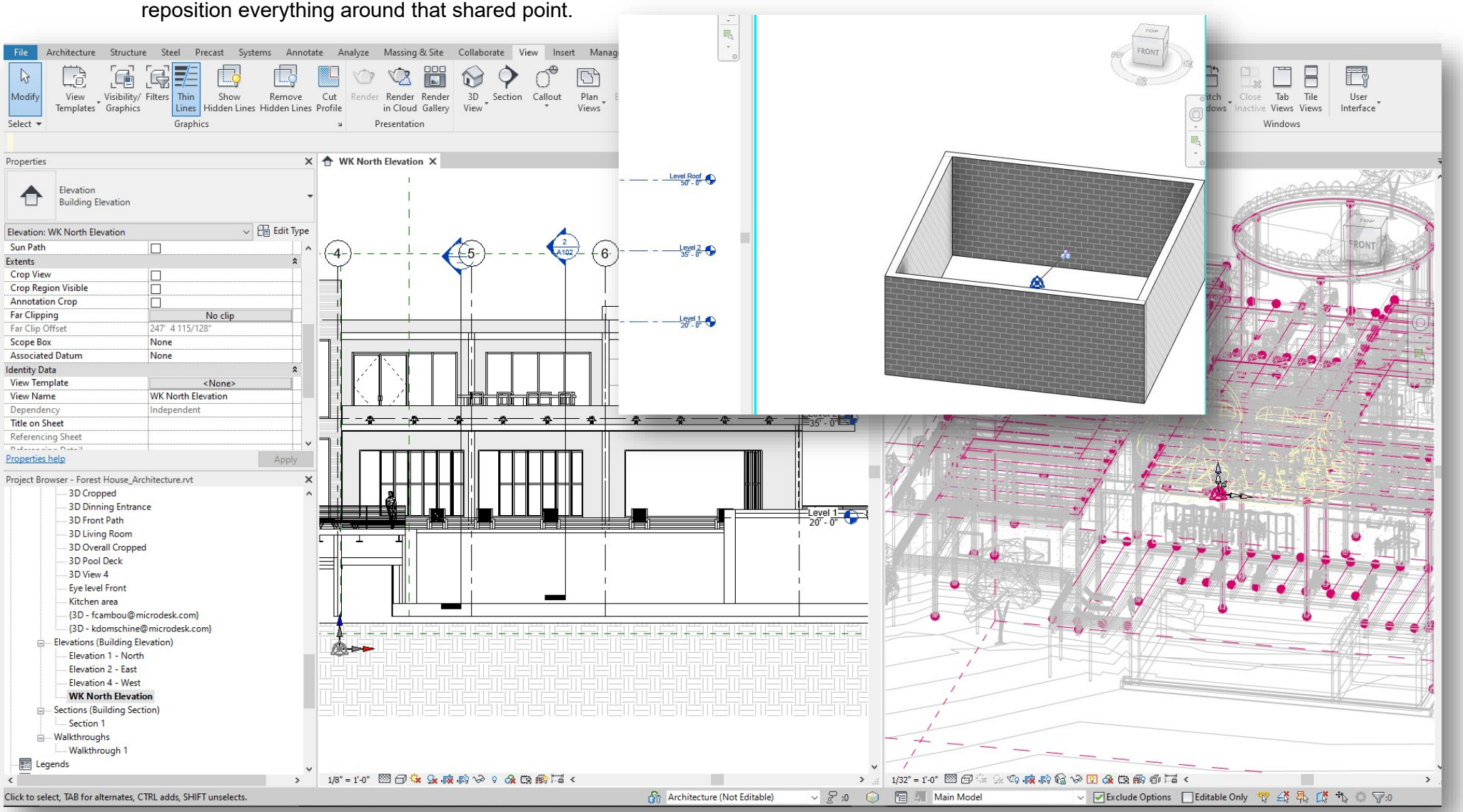
Linking and managing Revit to 3Ds Max.

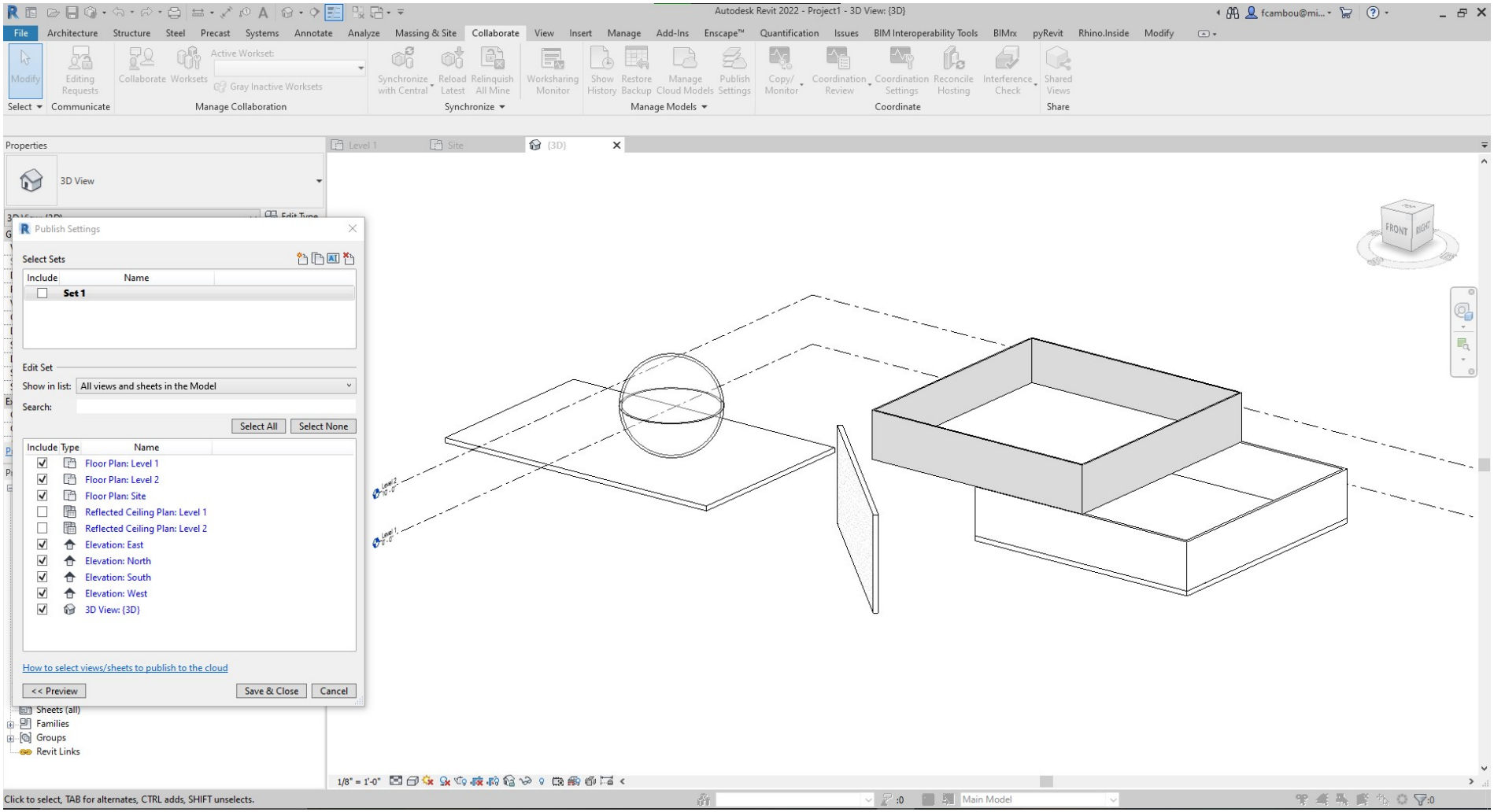
Shared Coordinates

When multiple programs and files are used, it is Paramount to set a clear 0,0,0 and orientation in all programs before anything is built. Start off by creating the levels and project basepoint in Revit. Then create a simple cube with walls and floors to be exported into as many 3D file types as possible, CAD, FBX, & a detached Revit project file. Then import that to all the other programs and reposition everything around that shared point.



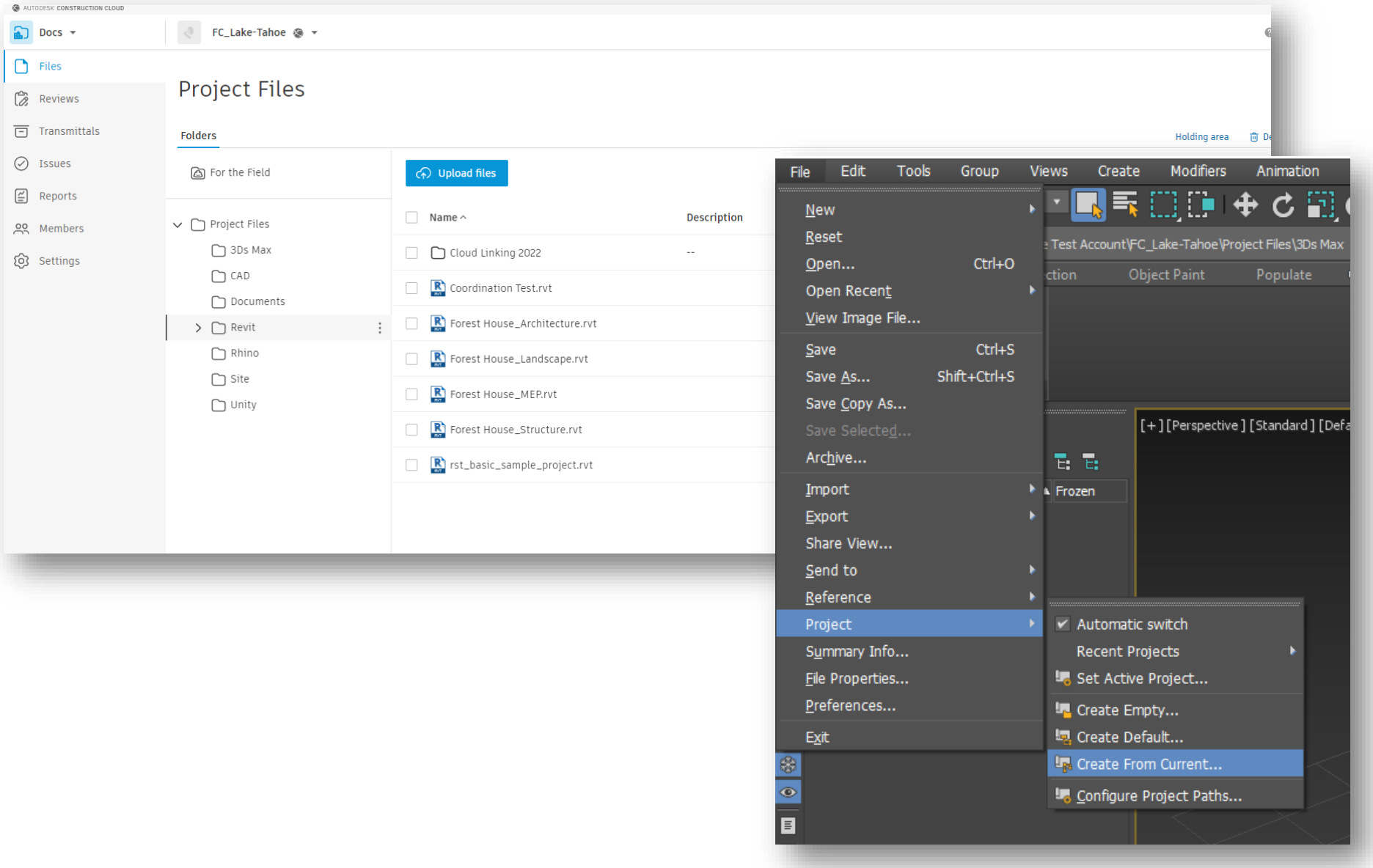
Dry Run Testing

Remember to set aside some time for an interoperability test run. Create a simple scene with a few shapes/materials in Revit and save it as a cloud file to the shared project.

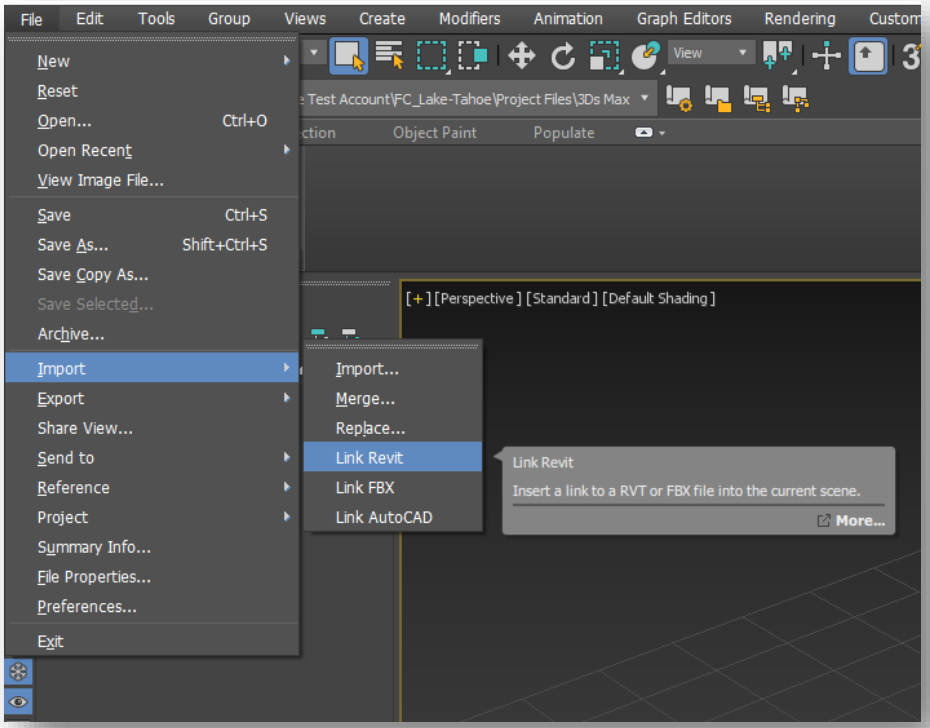


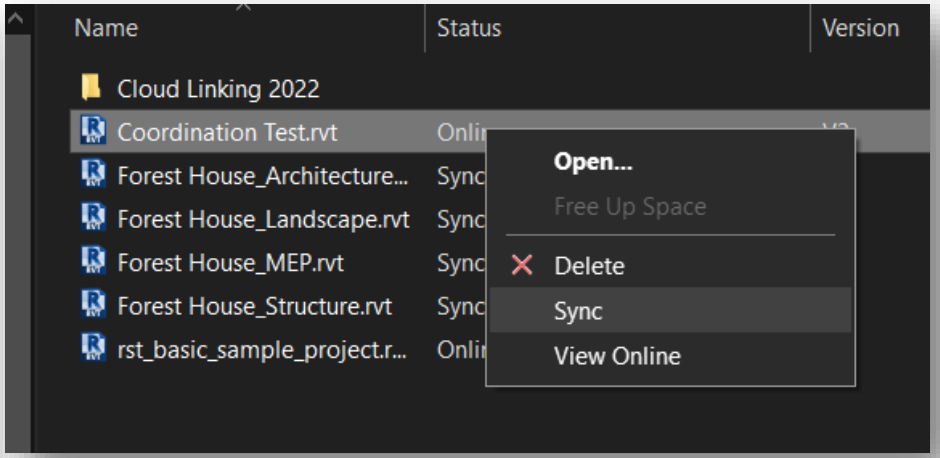
File Location & Linking

Your Autodesk Docs folder should have the Revit, 3Ds Max, & Unity folders separated. ACC works better when you make the folders using the web interface, then directing the other programs to sync to the specific path.

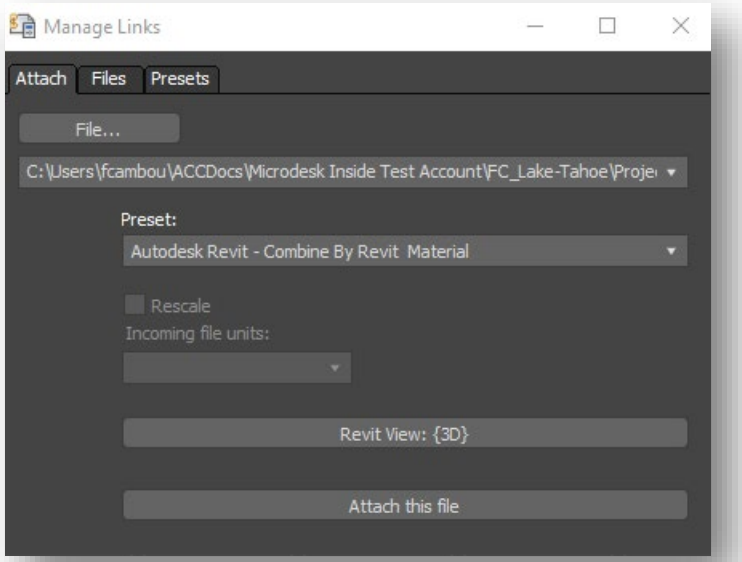


Before linking the Revit file, sync the .RVT located on the local drive by right clicking the project and selecting Sync. This file will only be the latest published version and not the latest synced project hidden in your collaboration cash folder. For coordination purposes, use this main file, that way anyone using it will have the same file paths on their computer.





From the preset drop down, select ‘Combine by Revit Material’. This can be customized under the preset tab. Copy the preset and rename to Revit to Unity. Maintaining the objects by Revit Material is important, everything else is up to you.



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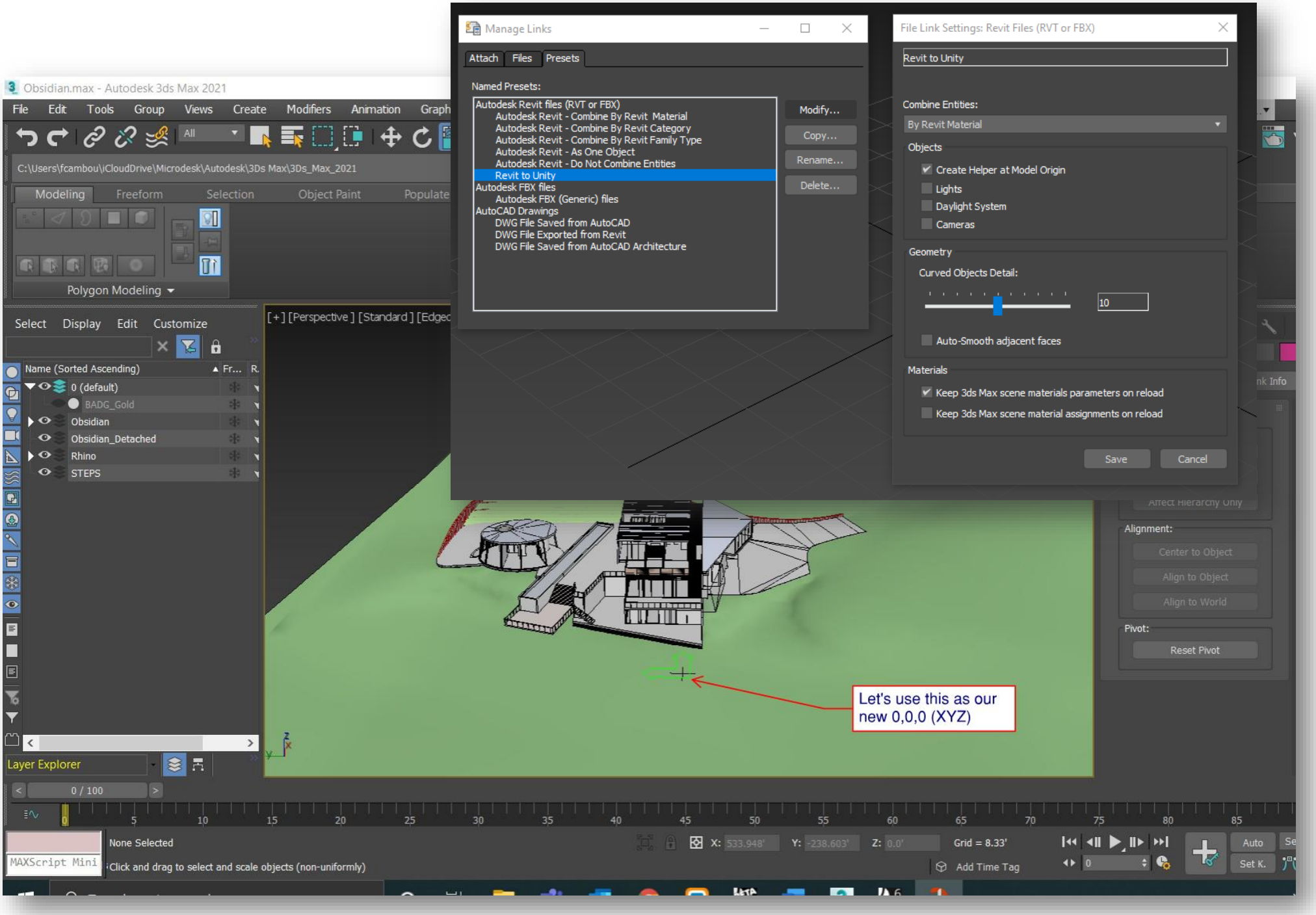
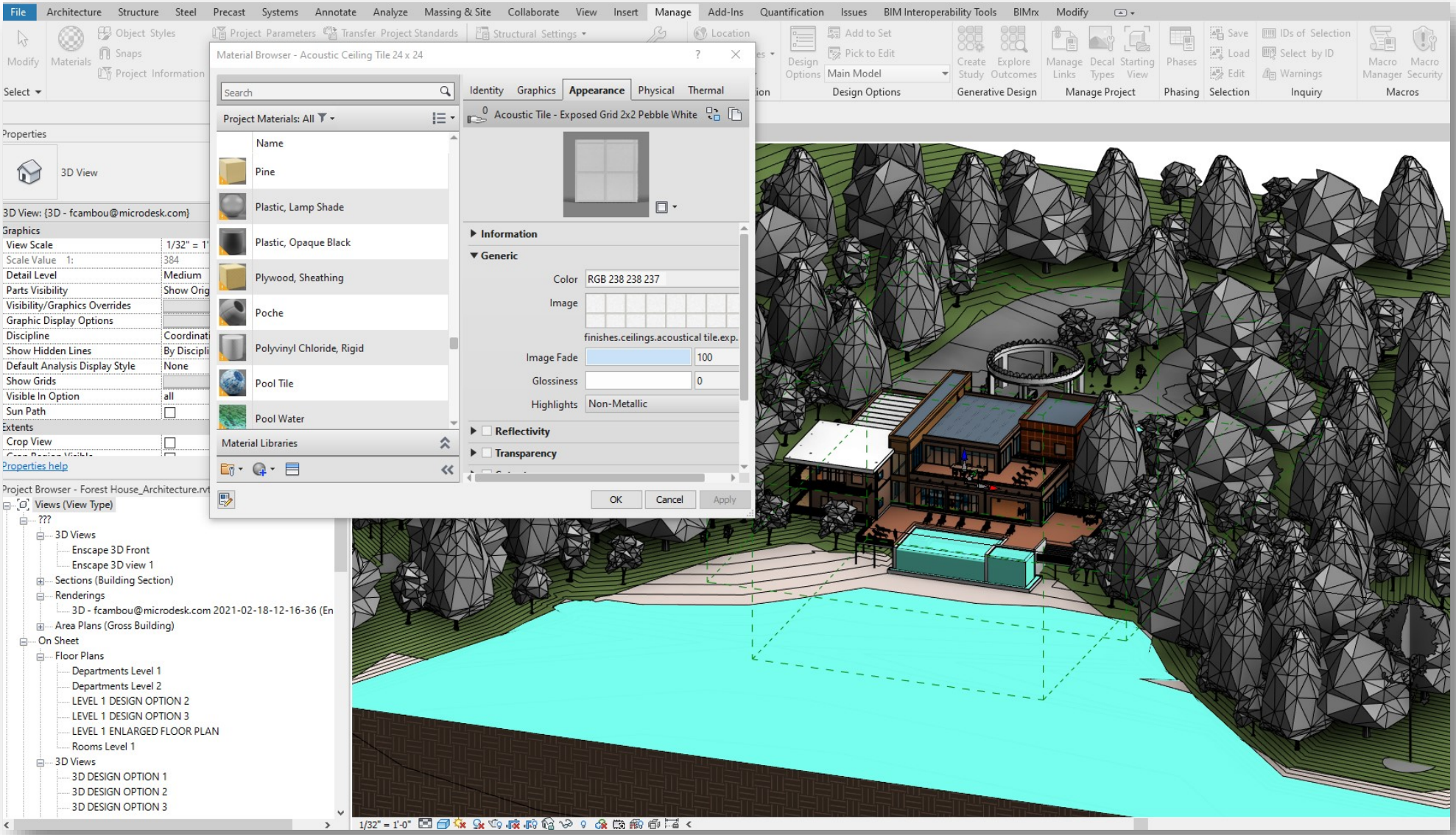
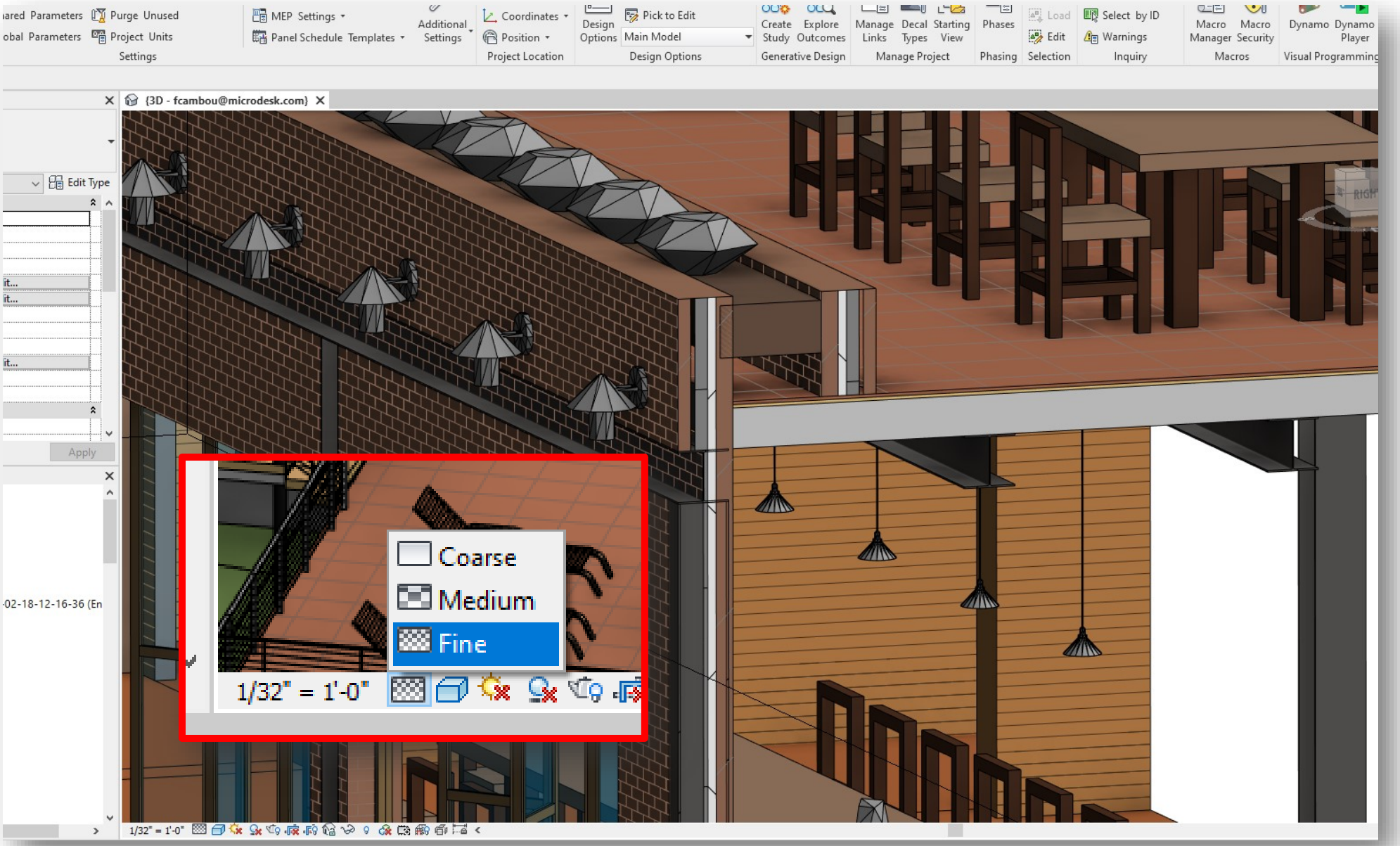


Building with purpose

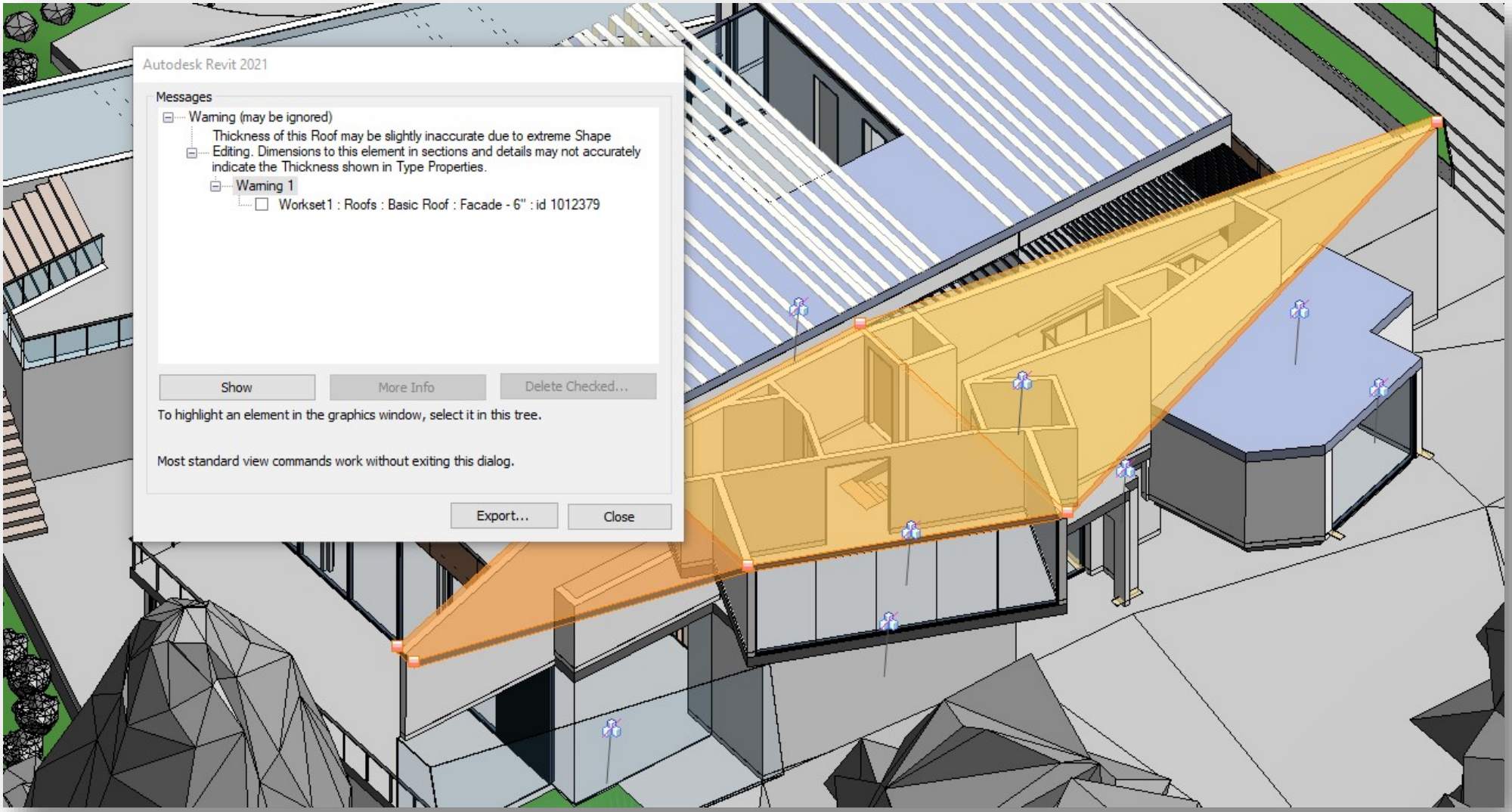
When importing elements by materials. That means that all materials in Revit should be grouped by a simple naming standard. Identical materials should not be splintering into different offshoots. The less material types you have, the easier it will be to manage later.



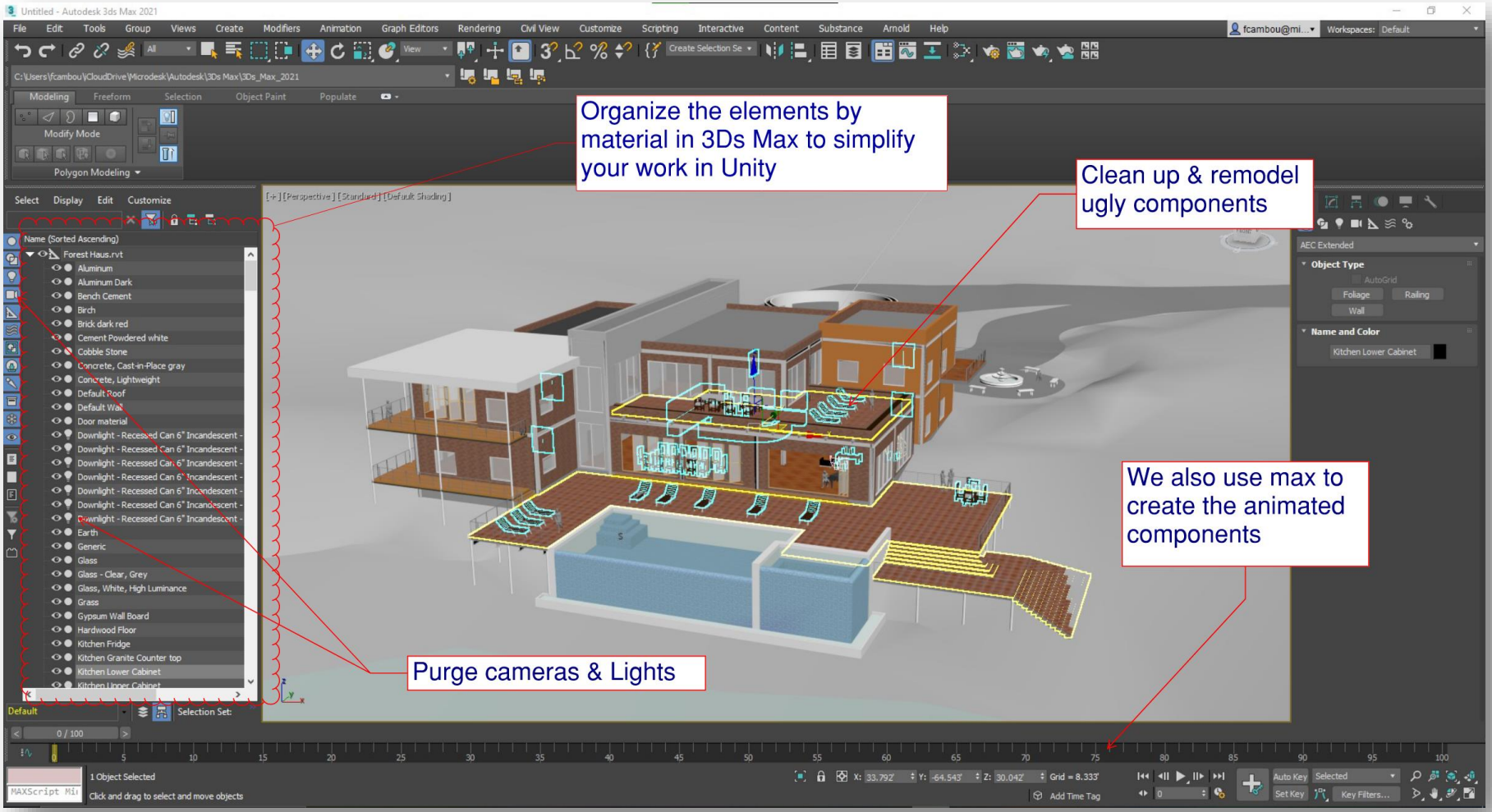
Limiting the Level Of Detail in your SD model will also make the file more manageable in 3Ds Max & Unity. The linking process in 3Ds Max will adopt the LOD of the view you choose. This helps limit the file size when dealing with wall construction, but it may also eliminate important details necessary for the VR experience. You may want to check for railing, window muntins, and other complex families designed to hide elements when the settings are on course.



Massing elements have a hard time being read in other programs, so instead create a skeleton object with reference edges. Any complex shapes are kept for 3Ds Max. Revit's adaptive modeling tool can create fantastic shapes, but 3Ds Max will always push it further. Max can quickly model complex elements that have clean model integrity, which can be properly consumed by receiving programs.



The biggest reason you will need to model some elements in 3Ds Max is for textures to show up correctly. The massing elements tend to break in the transfer. They do not face the correct way and UVW mapping becomes an issue.

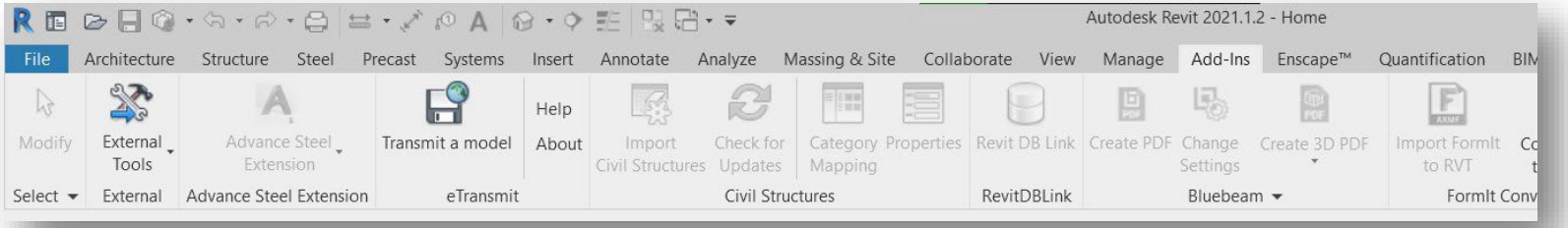


Another great aspect of Max is that you can add motion to your work. The more you develop this process the more interactive assets you will start to make; opening doors, custom buttons, CFD airflow diagrams, character rigs, and so on.

Clean, Purge, & Export A Revit File

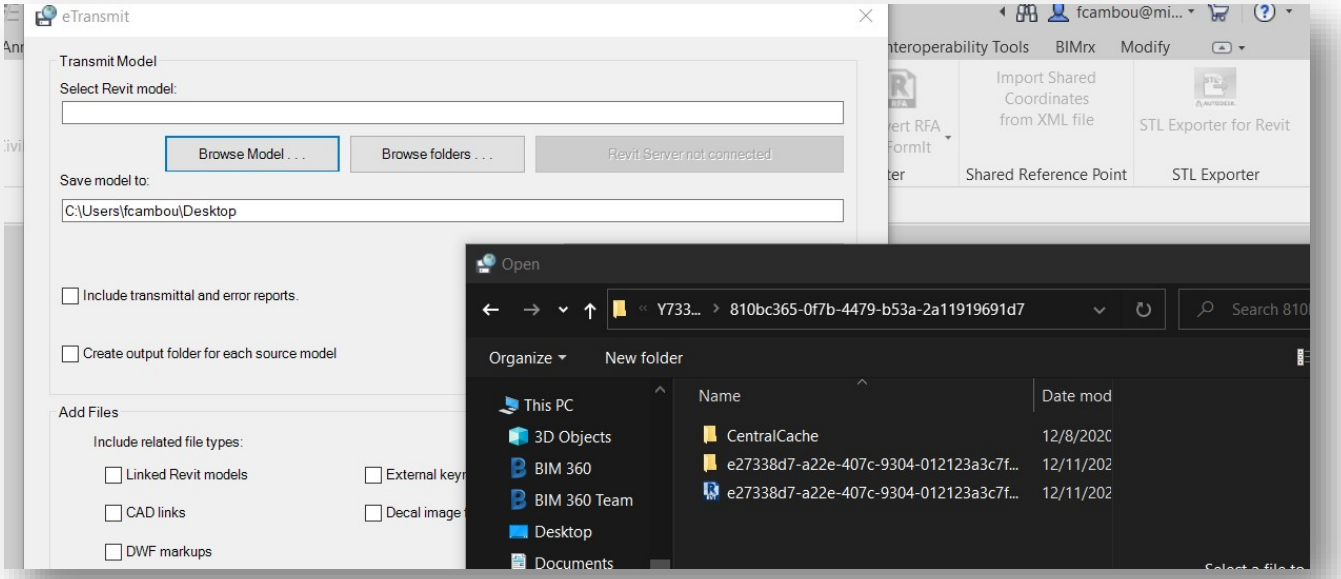
Linking directly isn't always the best solution for complicated files. Sometimes a working project deep into DD has been horribly abused and working with it will not be helpful. At this point it's best to just clear it out using the eTransmit add-in. Again, you can use the latest published or simply the latest collaboration cache if you have already synced the project to your computer.

1. Create a clean 3D View in Revit. Remember that whatever is visible in that view will be seen in 3Ds Max. Even the Detail Level will be the same. If you set the view to course those complex shapes will not carry over.
2. Synchronize and close project, not Revit
3. Click the 'Home' button and select 'Transmit a model' under the 'Add-in' tab.

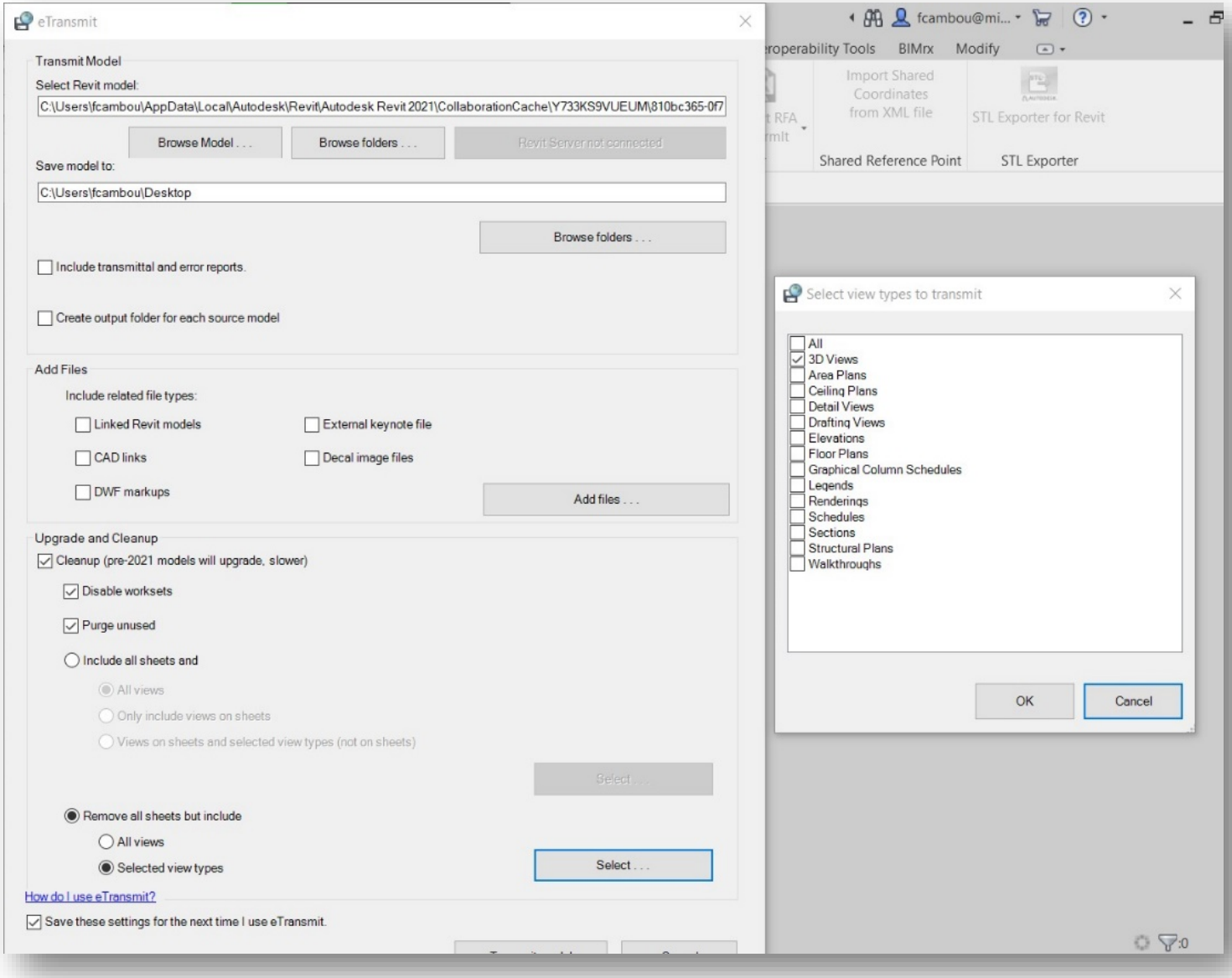


4. Browse for the hidden cloud backup: C:\Users\%USERNAME%\AppData\Local\Autodesk\Revit\<Autodesk Revit Version>\CollaborationCache

(Open the sub folders until you find a revit project with a super long name with the corresponding date modified)

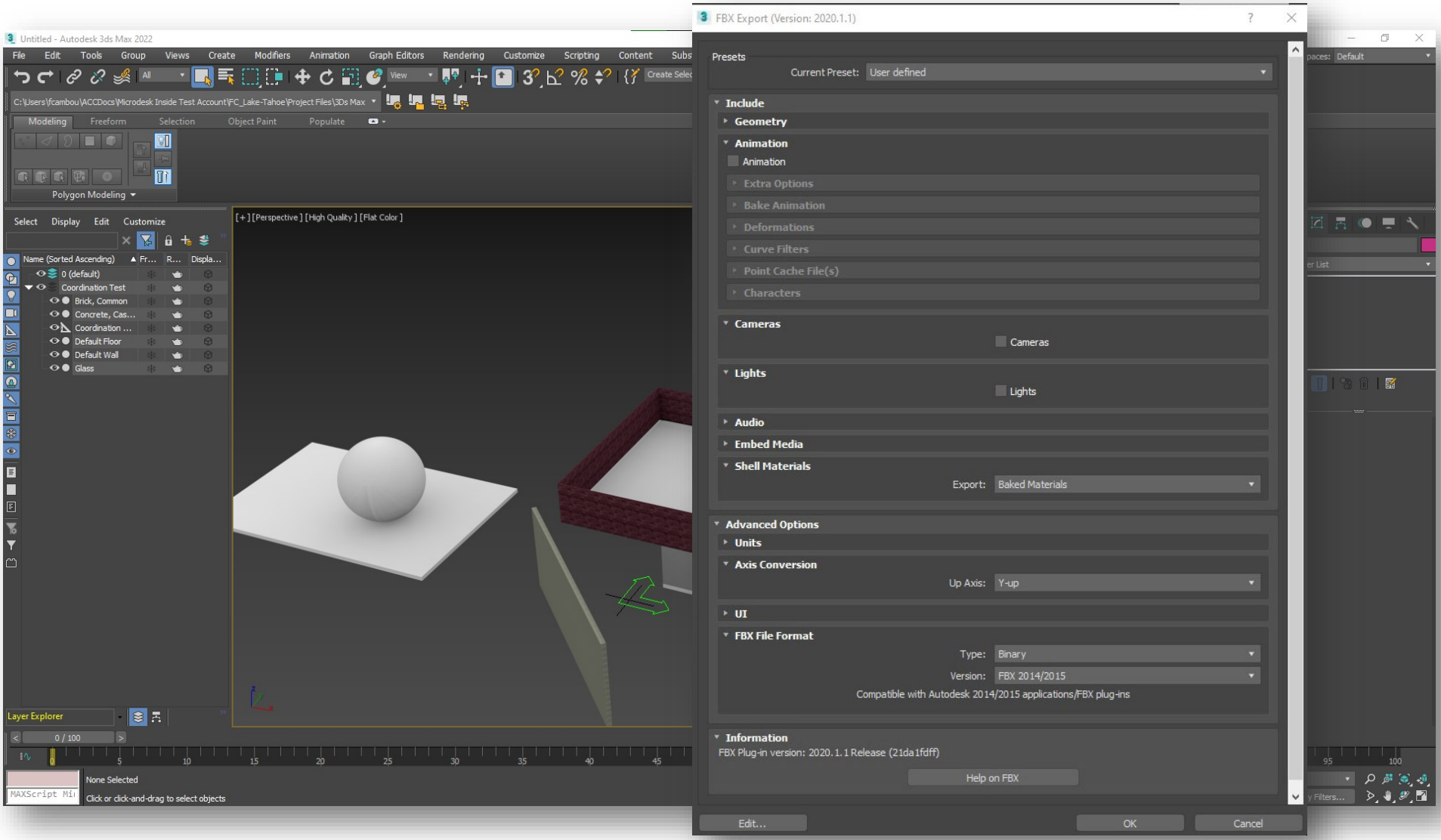


5. Uncheck all links, Disable Worksets, purge unused,
   delete all views except 3D views
6. Open File, delete all views but the one, and save new file to 3Ds Max imports folder with short name
7. Link Revit file
8. Bind to project
9. Delete cameras,
   Lights, and
   other elements



Exporting the FBX

Brining your project into 3Ds Max is primarily a way to control the integrity of the FBX file that will be consumed by Unity. You can export FBX files directly from Revit and there are plugins that let you transfer it directly to Unity. This, however, leaves you with hard to use objects, broken surfaces, and no ability to pivot to the Plan B approach. 3Ds Max is also the best way to develop animated components. If you are going to Unity from here, most of the work in 3Ds Max is to organize, purge, and touch up. Beyond that, the export process is straight forward: Uncheck elements you don't want to transfer, choose the Y-up Axis direction, and select the Binary type and FBX 2015 Version.



Arnold Rendering

If the schedule has pivoted to drop the Unity project and you need to develop either a stand in place viewer or track-based 360 rendering; then it will be time to switch over to the Arnold Rendering workflow. This could also be used to reduce the processing requirements for a lighter game. Regardless of the reason, it will be best to save this 3Ds Max file into a new scene dedicated to Arnold. The scene must have purely Arnold specific materials, lights, cameras, and render settings. See this YouTube series for help getting started with the Arnold Renderer.

Short little tutorial showing the simple setup:

https://youtu.be/1kpXcQddXZU

Comparing V-Ray and the Arnold Renderer

Overall, V-Ray is complicated for new users because it has more parameters and more ways to mess up. For an advanced scene, more buttons give the advanced artist complete control on a still frame. As an initial set up it will take you longer to get your scenes ready to go, but you may require that level of detail. If you are using multiple nodes, starting your project from scratch, constantly changing settings, you could be wasting a lot of time.

While V-ray focuses on COMPUTER rendering time, Arnold's ethos is to save the USER time. Your set up will have a minimal initial process since it does a lot of the work for you. Most of your time will be spent on managing the noise in the rendering. You can easily use AOV's to single out the Sample types and adjust the toggles in the general tab to quickly pinpoint the cause of the noise without increasing every adjustment. They both have active shaders for a real-time scene set up, they each have their own lights, materials, and so on that work with their own generators.

https://www.autodesk.com/products/arnold/overview

GPU vs CPU

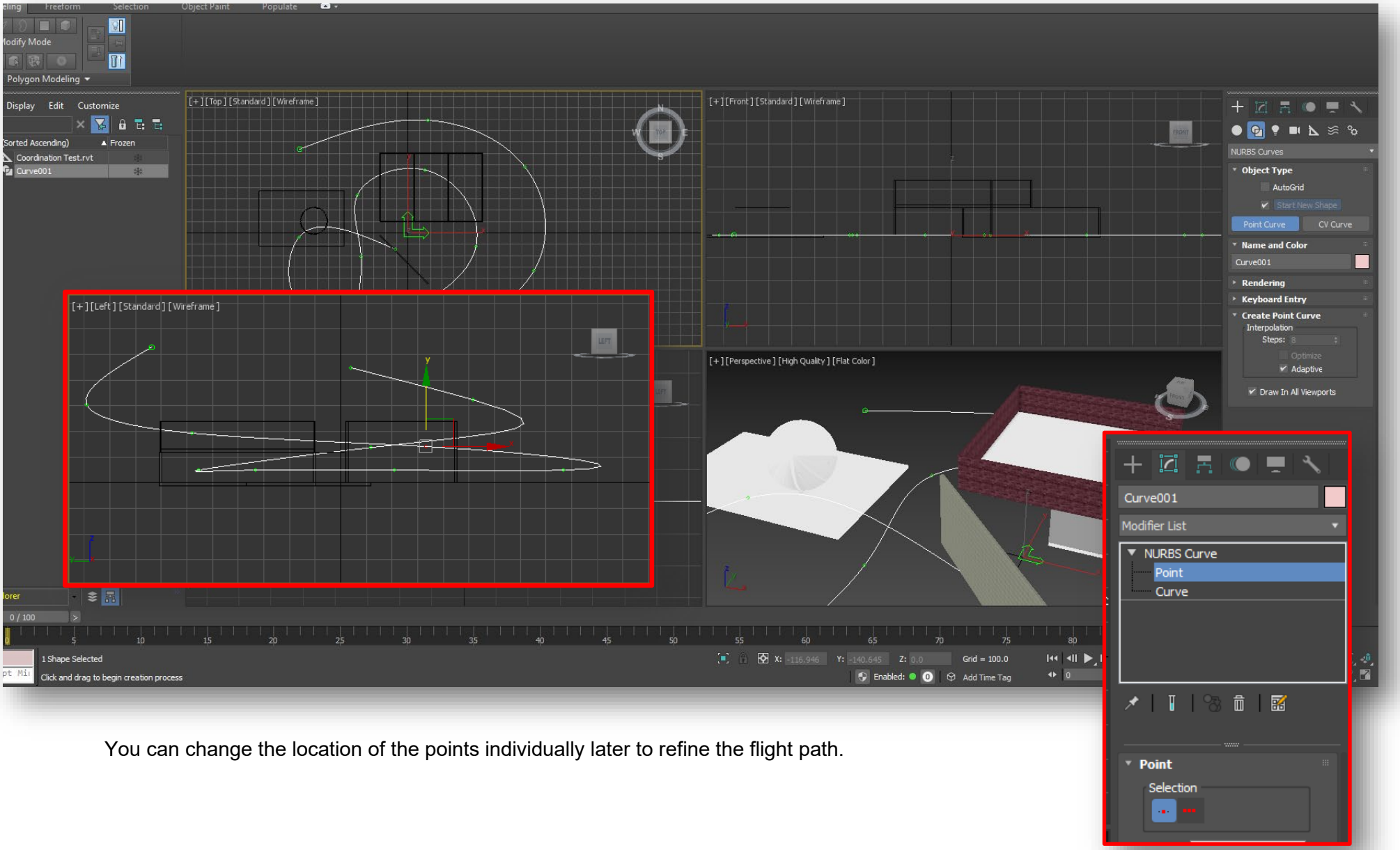
Both Arnold and V-Ray are capable of both. Deciding which renderer to use for this might be up to the way your company is set up. Many large AEC firms based out of the US tend to build better CPU capable computers, while some in the UK might have better GPU, etc. It will be beneficial to decide which one you want to go with early on and plan accordingly, well before the rendering time.

https://www.arnoldrenderer.com/news/whats-new-with-arnold-gpu/

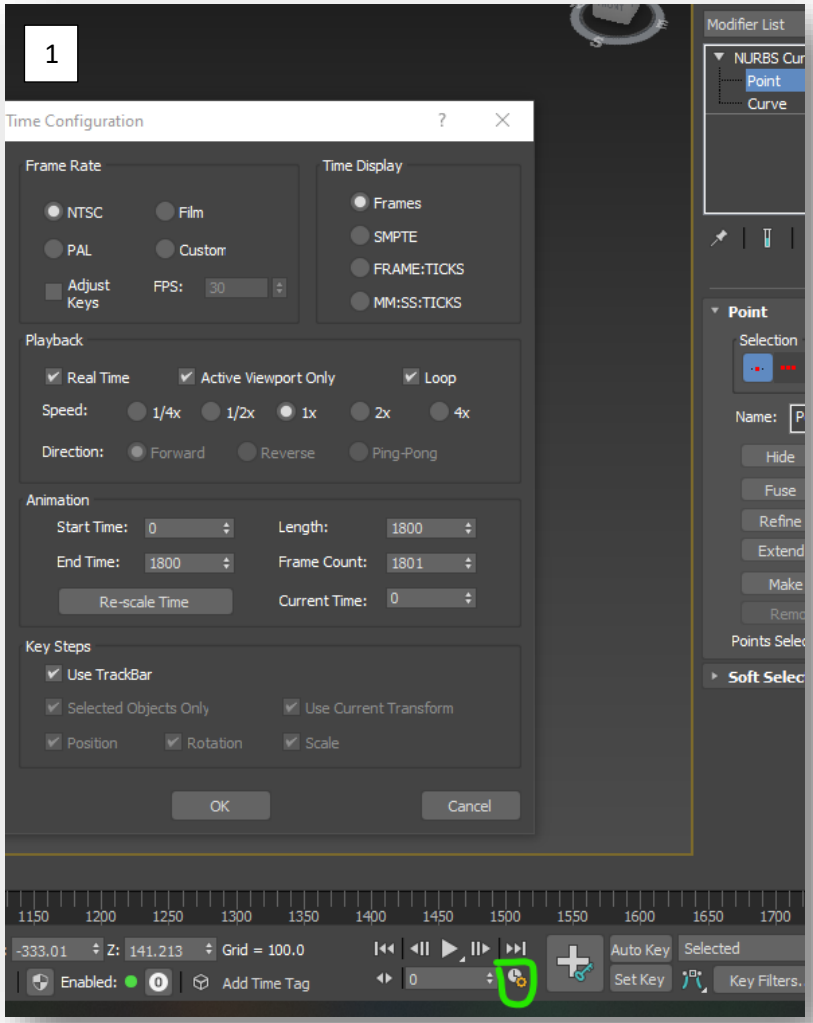
See the "Rendering Pipeline" document for rendering time estimates

Export Process - Image Sequence

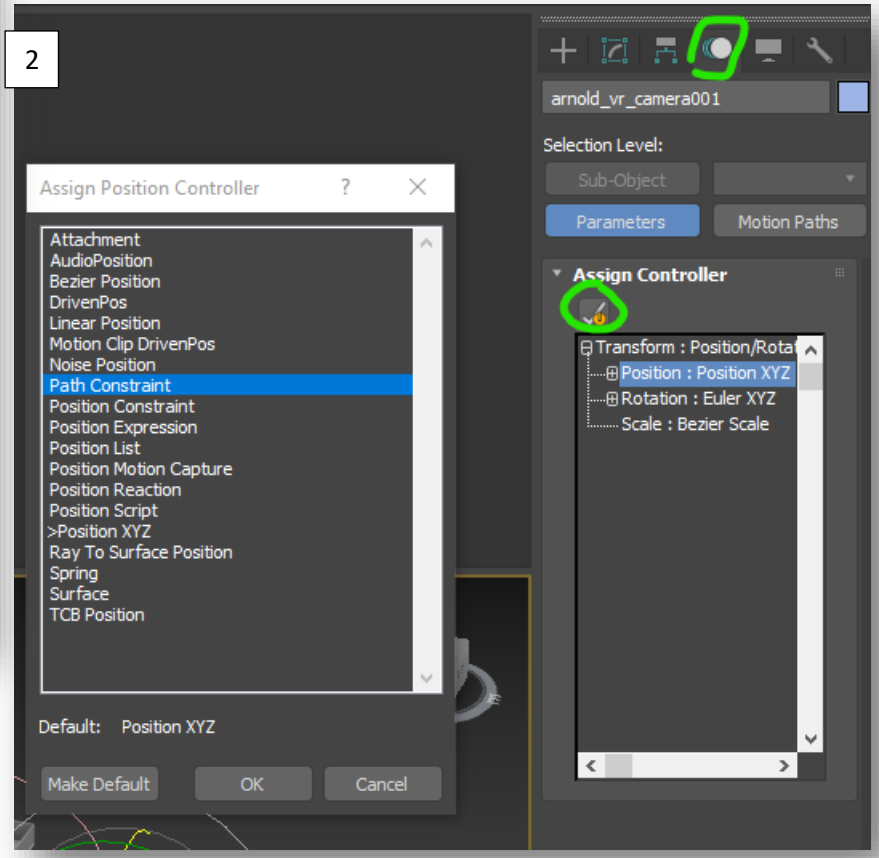
Create a NURBS Curve by selecting points in the general 3D path your camera will take.

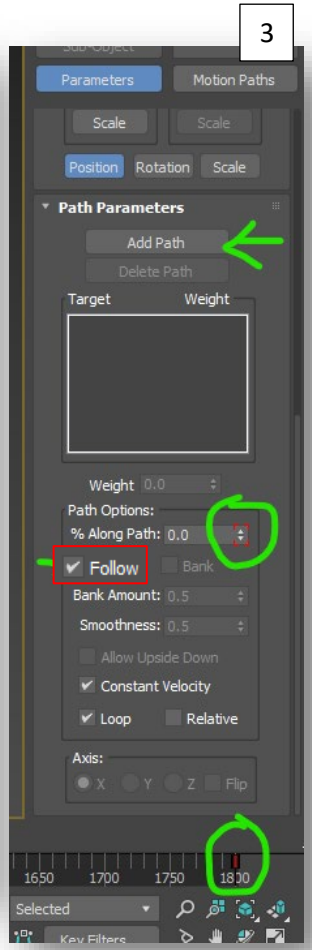


You can change the location of the points individually later to refine the flight path.



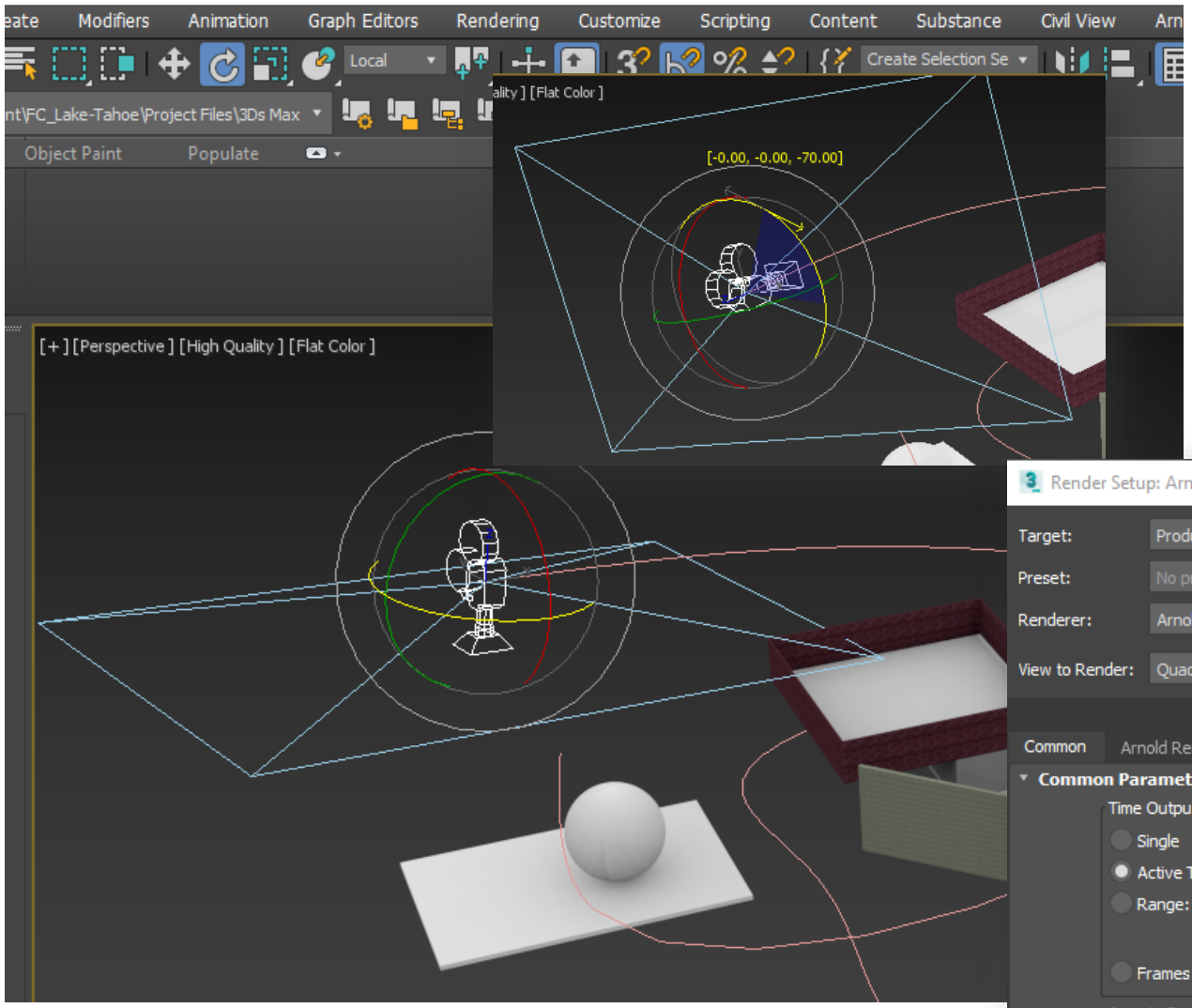
Next, change the keyframe time scale, remembering the final video output. If it's 30 frames per second for X min, then you will need the "Length" set to X times 60 times 60 times 30 FPS. Then select your camera and go to Motion > Parameters > click position > and select the button under Assign Controller. This is where you can choose Path constraint and make the NURBS curve the cameras position by Adding the Path. This will automatically create the keyframes from the beginning to end.



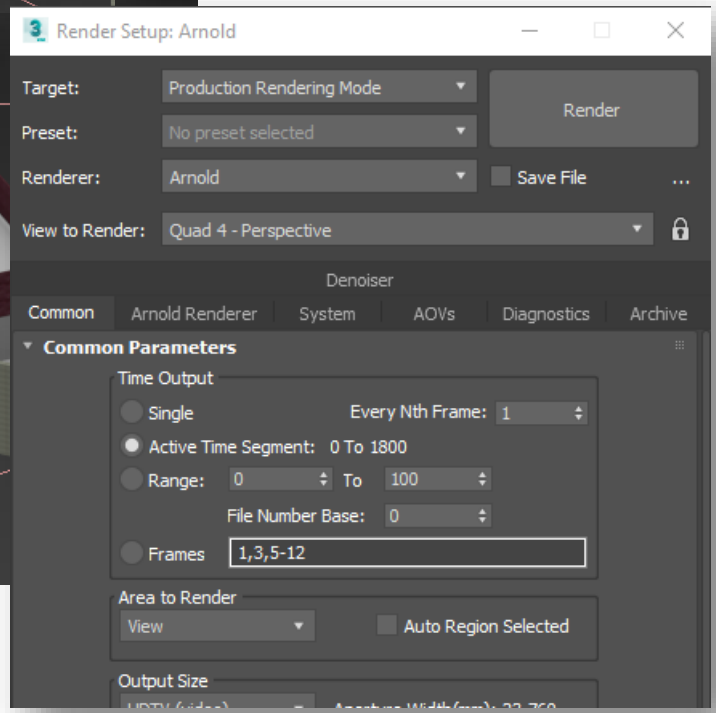


You can always rotate the camera independently or select Follow to look in the direction of the path.

If you forgot to rotate at the beginning, you can always modify the local rotation while keeping the connection to the path (90 x , 90 y).



Beyond this, the options are vast. Camera type, output size, & many other render settings should be backwards designed for the end user device. YouTube, Google Cardboard, phone, computer, headset, etc. Essentially whatever format you choose to export, you will ultimately export this as a group of images and compile them as an image sequence. Photoshop has an easy import & render process



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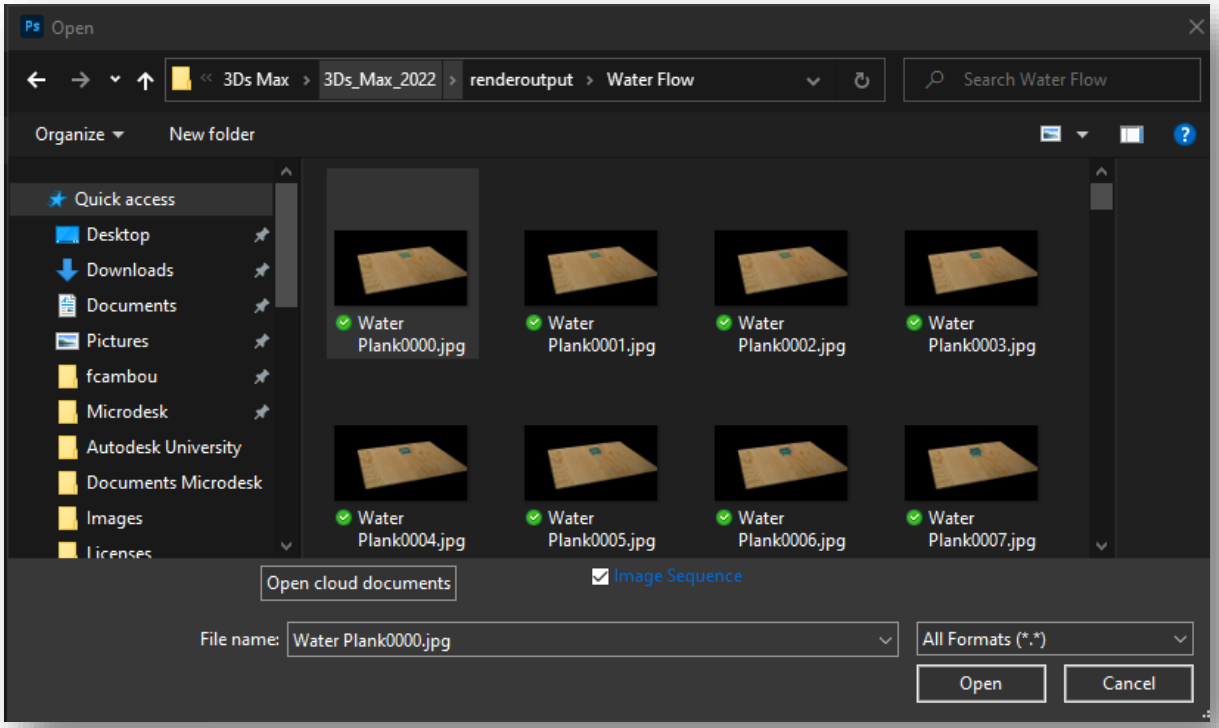
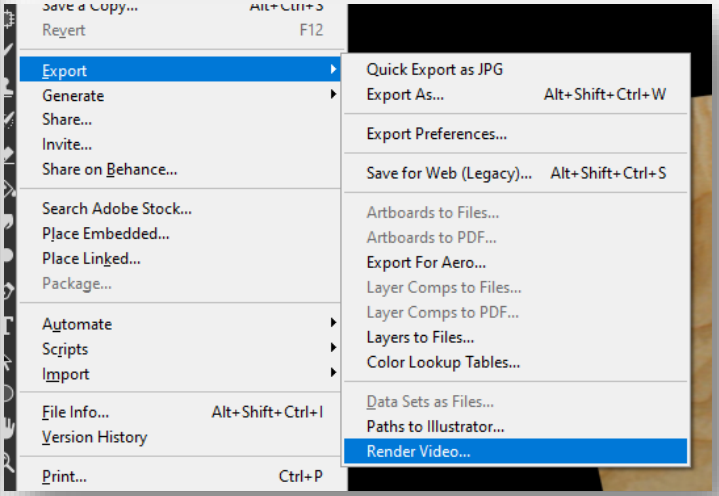


Simply open the images from Photoshop, select the first image in the sequence, and make sure to check “Image Sequence”. This will automatically create a video that can be exported as a rendering.



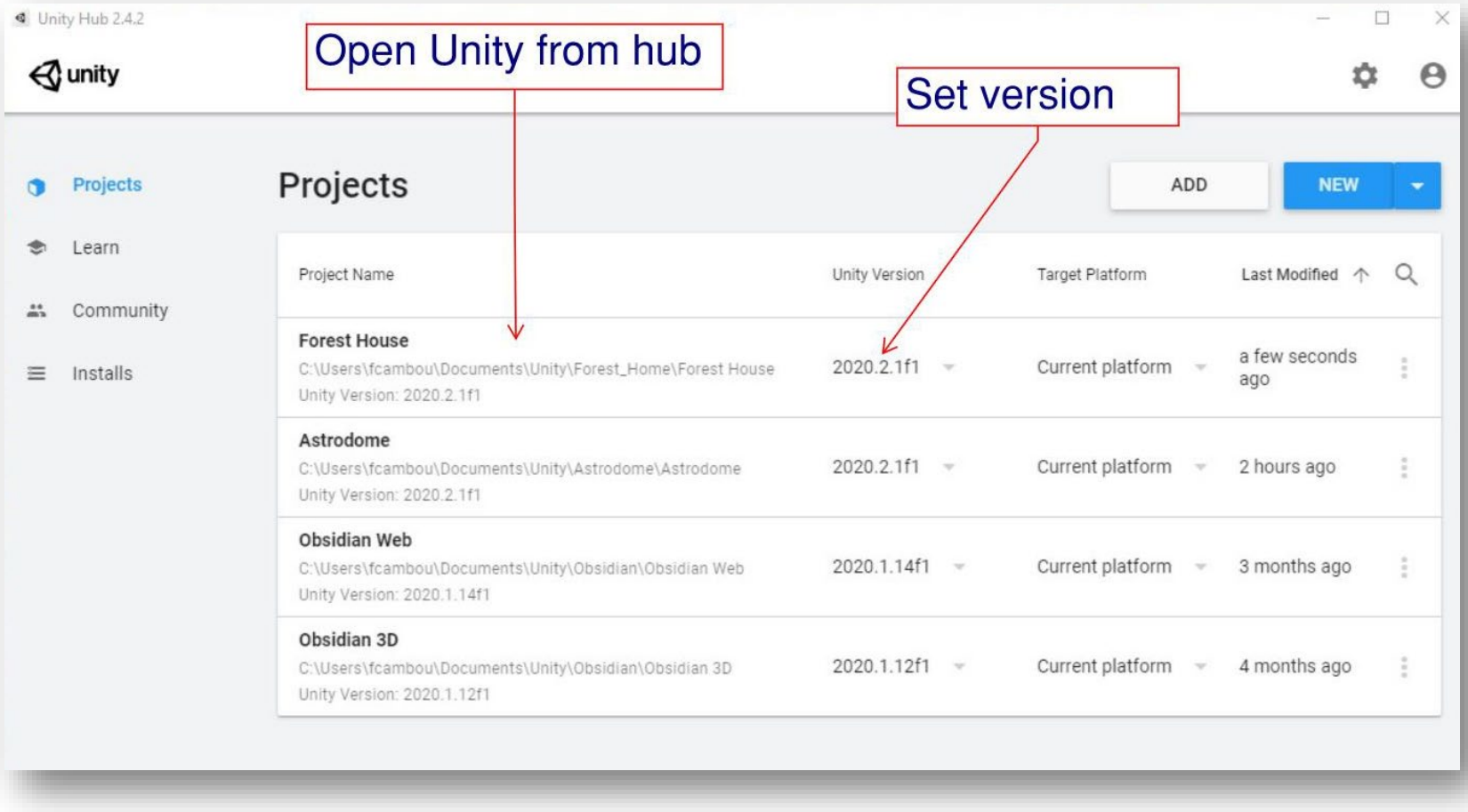
If the video as a 360-aspect ratio, YouTube, Facebook, and others will automatically convert it to a headset ready video or a click and drag desktop viewer.

Creating a scene in unity.

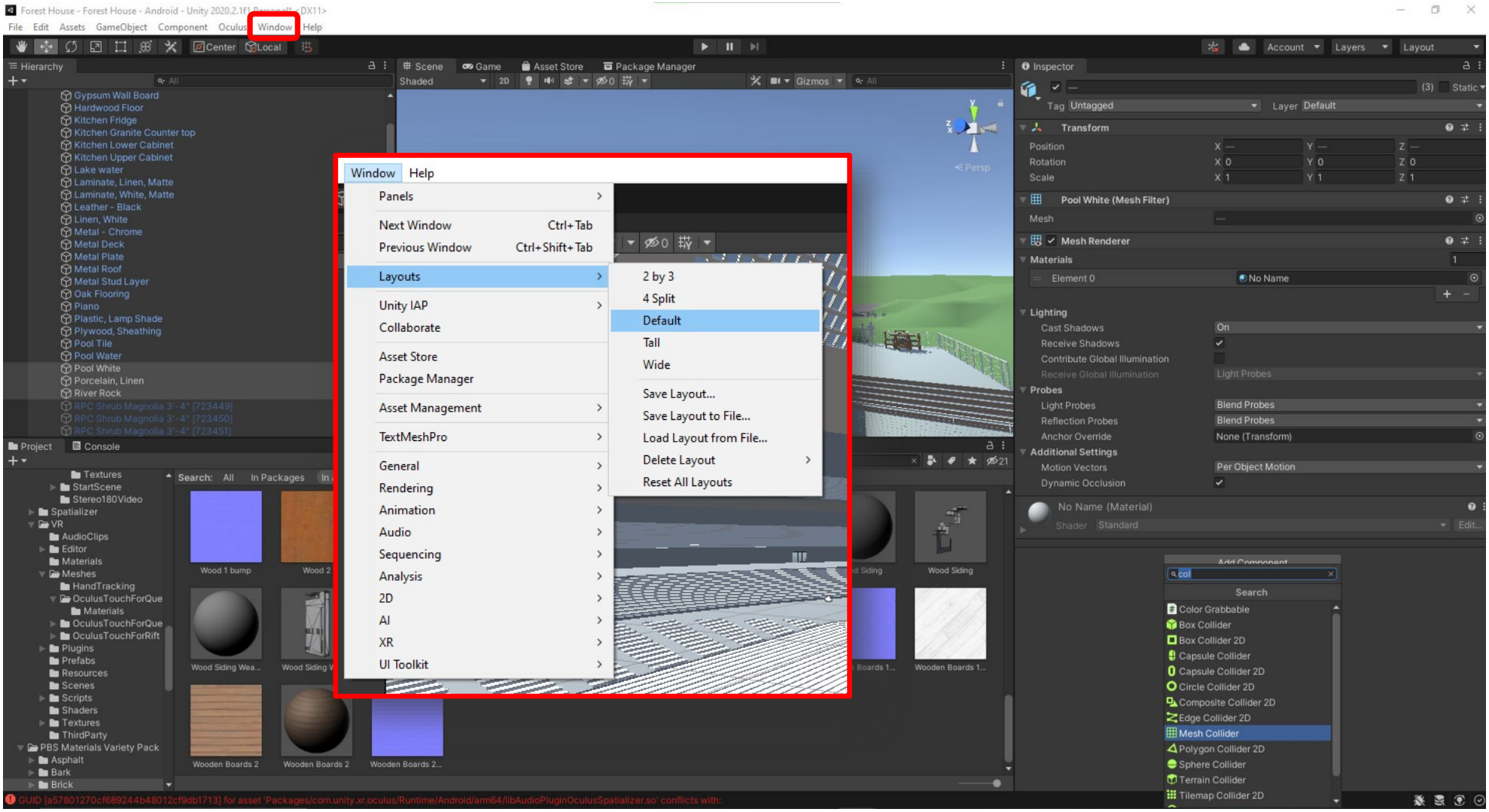
Initial Project Setup

It's a good idea to start developing the infrastructure of your Unity game at the same time or even before the work has started in Revit & Max. Time always slips away from you.

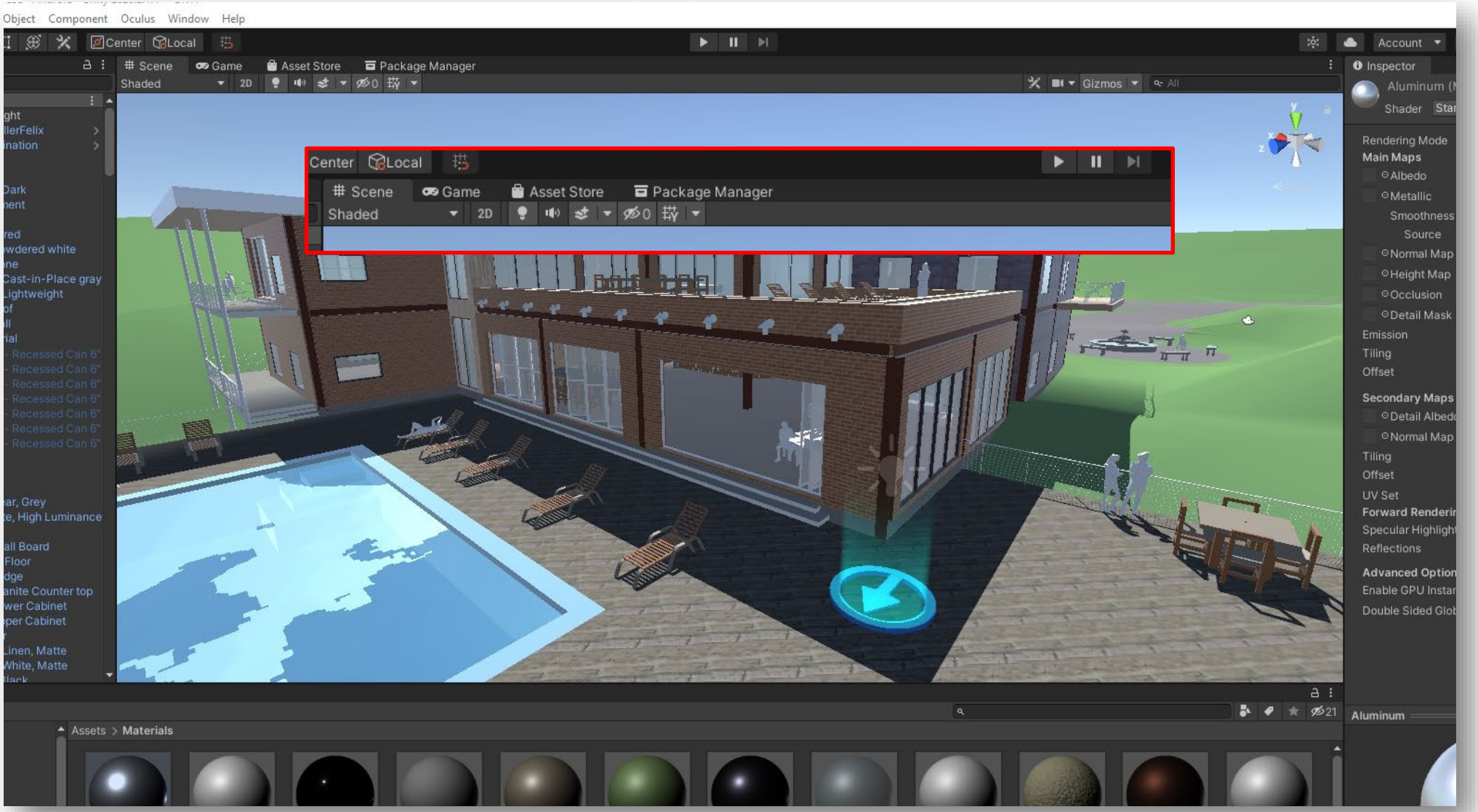
You will first create your project from the Hub. Remember to research the editor version, it's not always the case that you want the latest version. Sometimes specific workflows or packages have not yet upgraded or been fully tested yet.

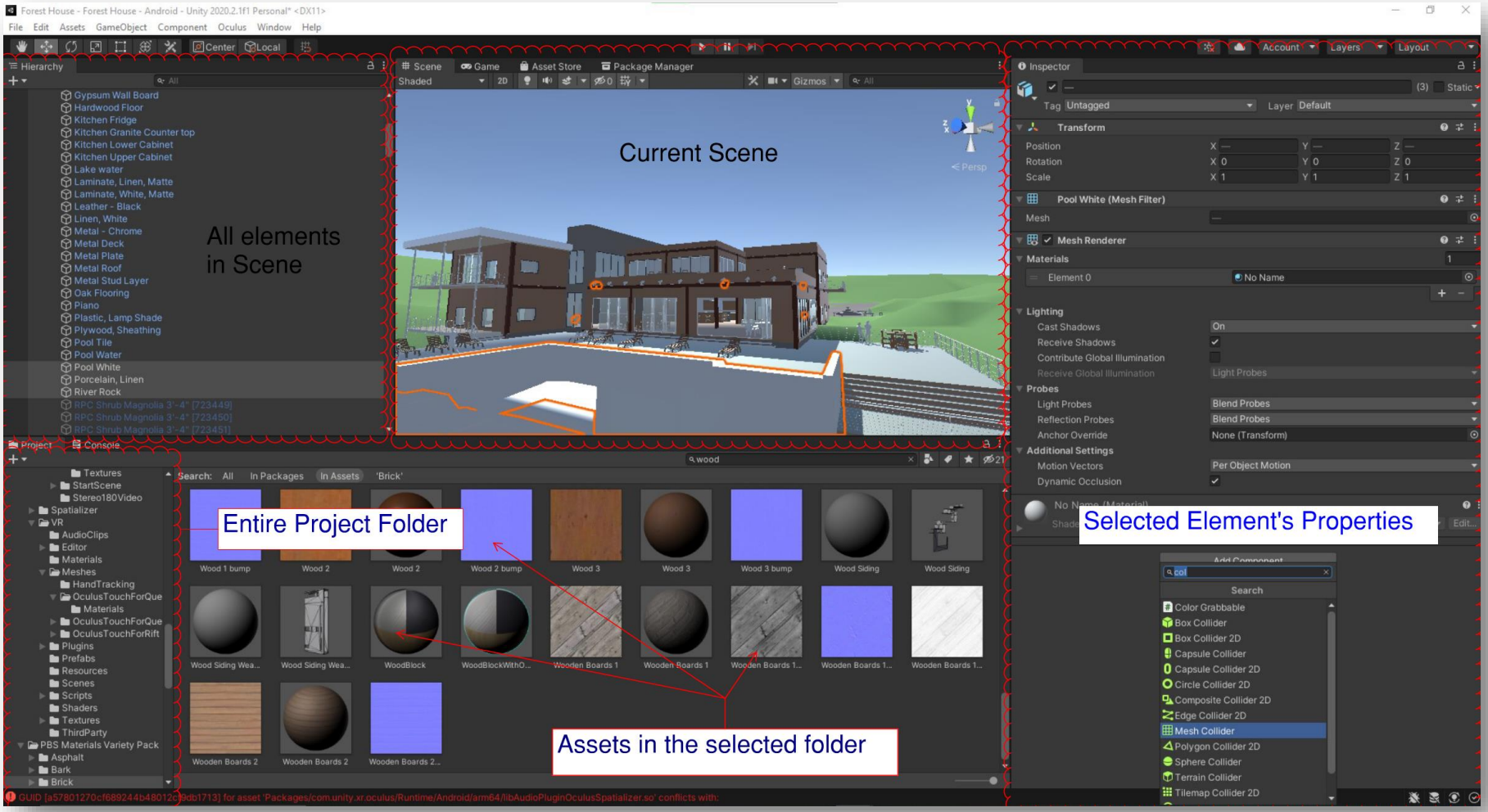


Once opened, you should see this default layout. It is completely customizable, and you can toggle through your saved layouts here.



The scene viewer and game mode are in the middle. This will automatically change, however it's good to be aware when you're in game mode, because all your scene development will be lost if the game is running.





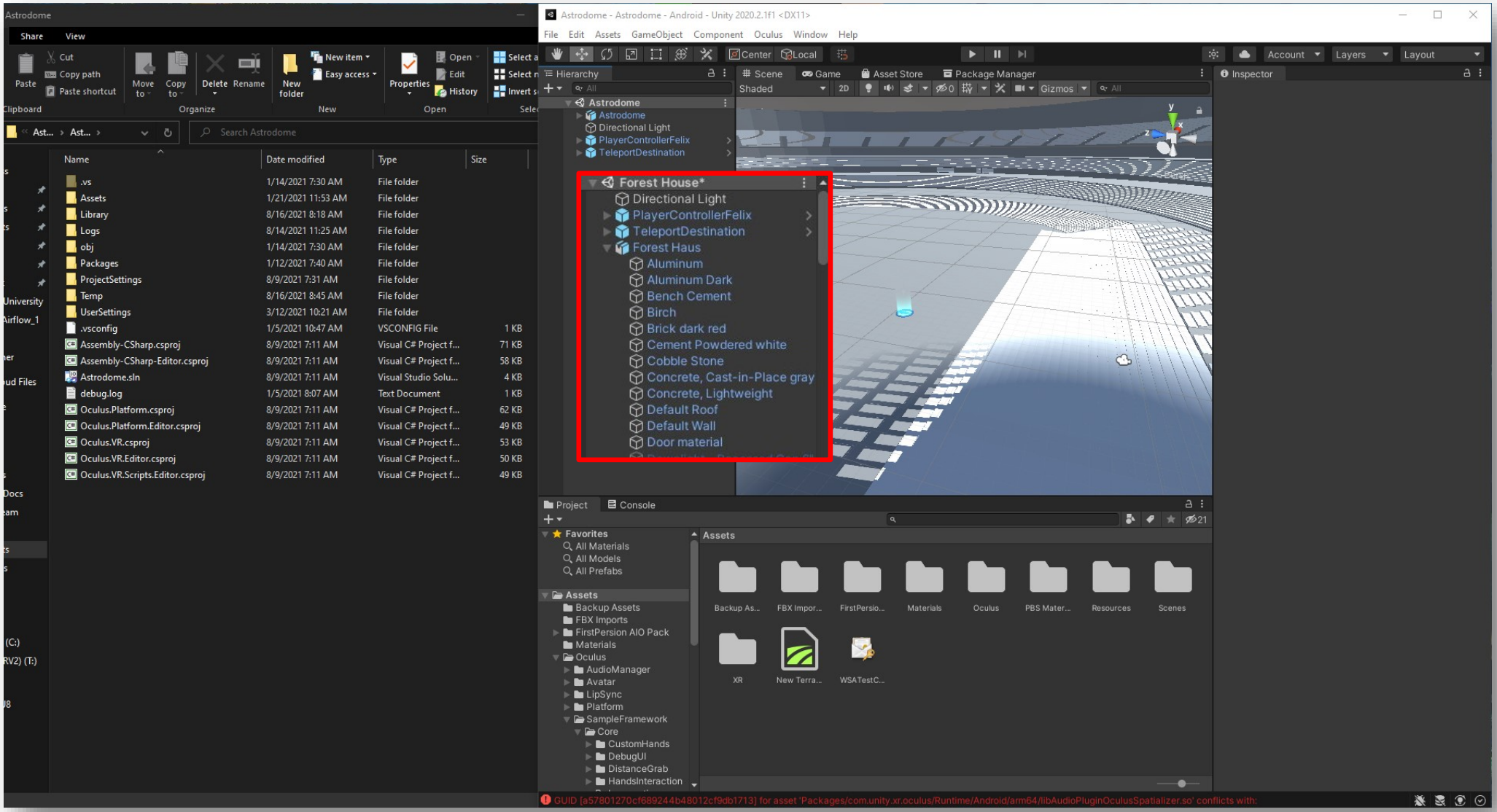
On the bottom we have the Project folder that gives you access to everything. This is where we will import and manage all our assets. In here you'll save your scenes and structure your projects, the more organized the better. This project folder can also be accessed directly on the computer. You can click and drag components directly to this or in the File Explorer

On the left we have the active Scene Hierarchy that has all the working assets in this specific game. You click and drag the components, from the various project folders, to copy all the things you've developed over time into the game.

The Inspector gives you the object properties with all its adjustable settings.

Folder Structure & Import

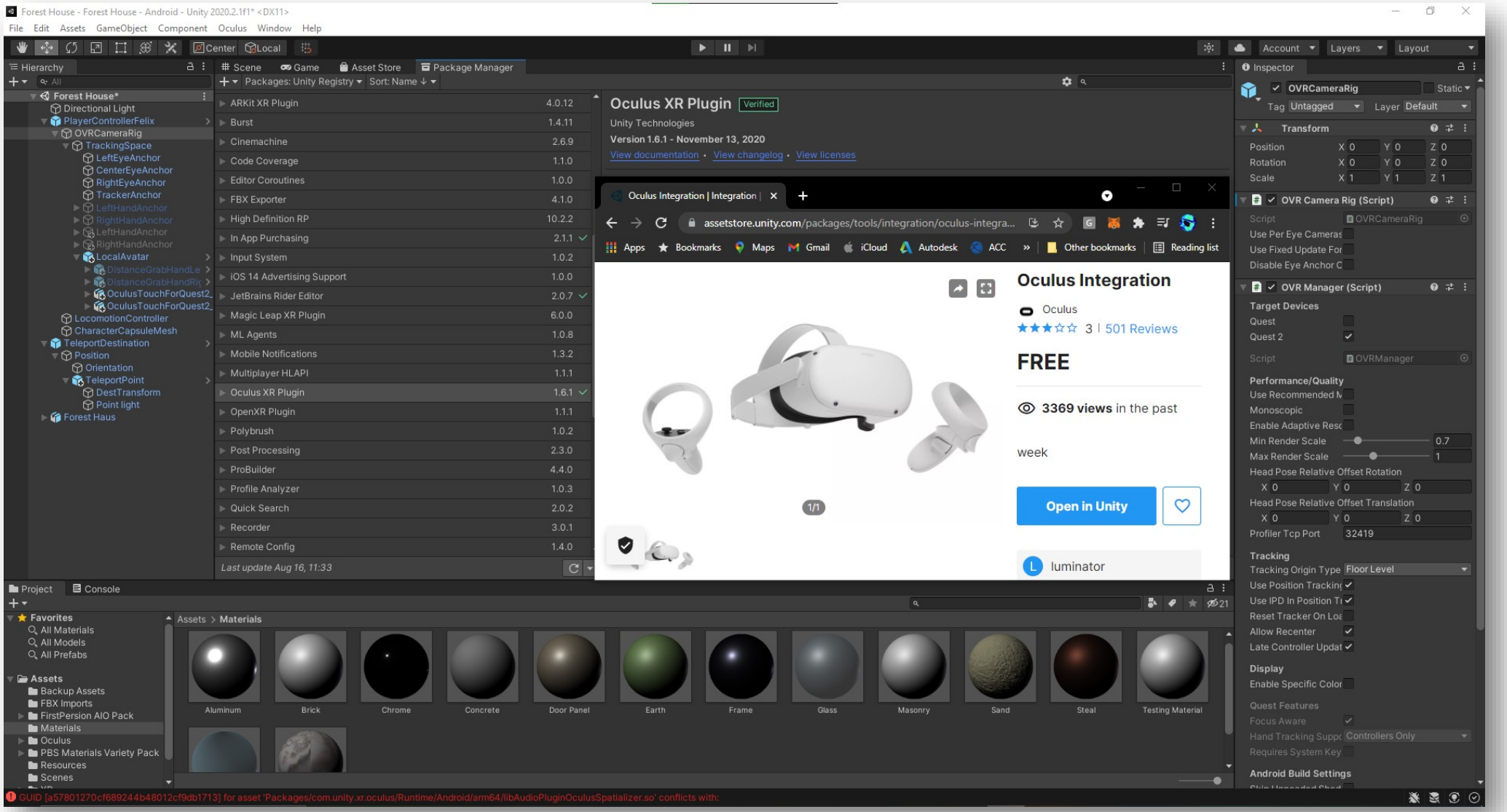
Over time you build these folders up and re-use a lot of the assets. It's important to keep these as simple to navigate as possible. Always think of the others that are going to join the project. You'll thank yourself later when you haven't been working on a project for a while. With all the initial 3Ds Max setup, your primary importing file type will be an FBX. From 3Ds max, each object should be organized into clear material groups, plus any individual components that you will need to select individually in the game.



It’s nice to have a folder for stagnant assets, animated objects, and texture maps. Your materials will need to be remade in Unity, you can transfer image files to this folder, but just plan on losing all the textures from the previous programs. The material set up in 3Ds Max and & Revit should be done to allow you to have the objects organized correctly in Unity.

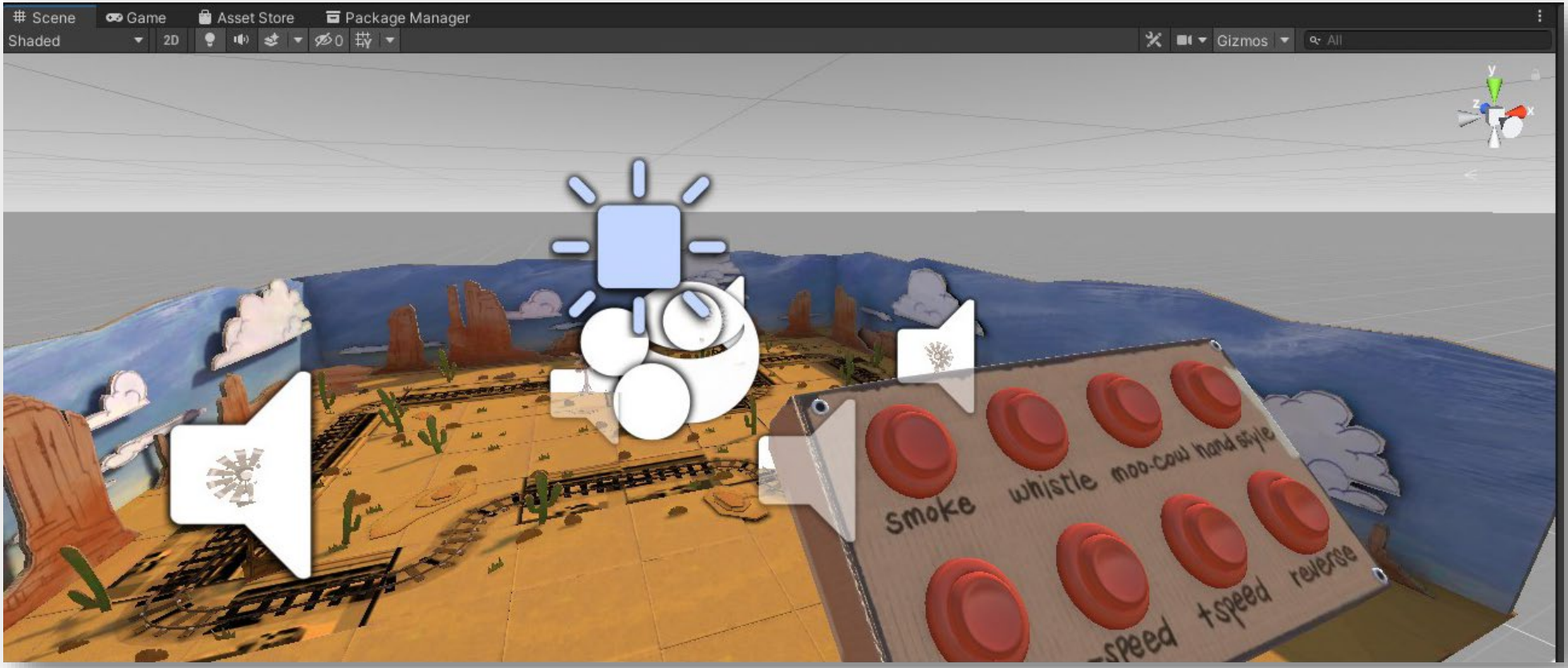
Asset Store & Packages

The Asset Store will be an import first step. There are thousands of downloads, both free and paid. From these installations you will be able to see how materials are set up and learn basic tips and tricks from the pre-built assets. Each Package offers a variety of systems that will transform your scenes.



For example: the Oculus XR Plugin provides cameras, controllers, materials, and example scenes that you can copy and paste into your existing projects to prepare it for the final VR export.

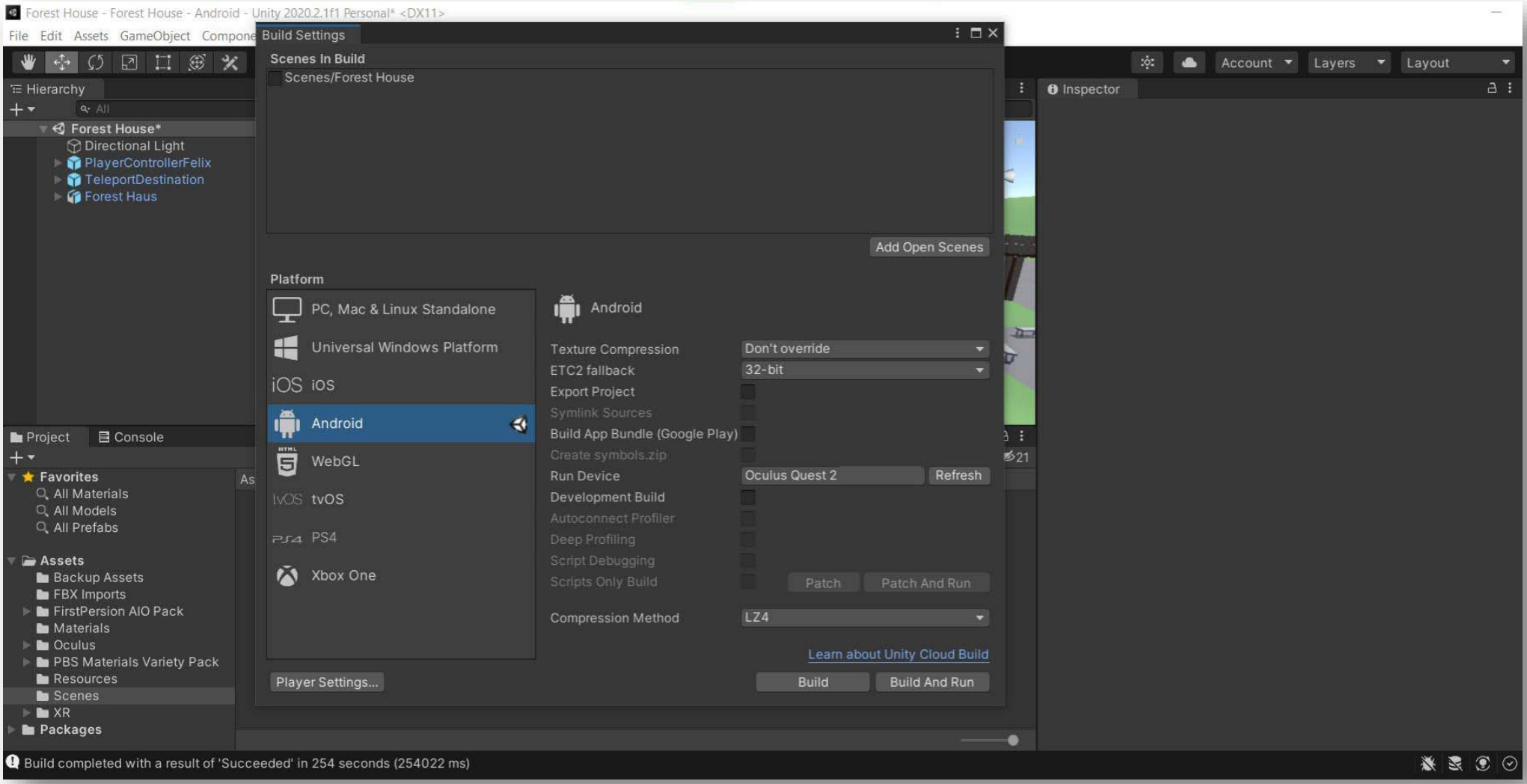
Your Package Manager will help you install the latest versions of each one. Once installed, you can start developing your own creative design, cannibalized from pre-existing assets. You don't need to know how to script to make something nice.



Connecting the devices & Game play

Quest 2

The Build Settings is the final stage where you choose the platform intended for viewing. You can create a Desktop, Consul, or Web-based executable. The Oculus Quest 2 is a good solution for portability and when your computer does not have an excellent graphics card.



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You can run the Oculus Desktop Support & Oculus Developer Hub that connects the hardware via the usb-c.

Once connected, you can test run the games directly off the computer. All functionalities will work in the game mode, so you can make sure it's ready before the final export.

This is where you will test to see if all the custom changes have been successful.

When the Oculus is connected, the Build settings for the Android device will appear and it can be adjusted to export the game.

The executable will work as a standalone game if you are using the developer mode on your Oculus account.

See the provided YouTube links from various channels that are very helpful to get your computer ready for this process.

Once you understand that workflow, you'll be able to export the APK's straight to the headset for onsite presentations, cable free.

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Software to download

Download Unity:

https://unity3d.com/get-unity/download

Developer Hub for installing stand-alone APK :

https://developer.oculus.com/downloads/package/oculus-developer-hub-win/

Connecting Desktop to Oculus (Steam):

https://store.steampowered.com/app/250820/SteamVR/

Install Oculus Packages to your game for Oculus controls:

https://assetstore.unity.com/packages/tools/integration/oculus-integration-82022

Youtube Videos

How to play Oculus from PC:

https://youtu.be/wGQDVZkoK7U

Make Oculus work with our lame computers:

https://youtu.be/h30abvkoIZY

Basics on setting up scene for Oculus:

https://youtu.be/8Xl5s-vTU6I

How to customize Teleport in VR

https://www.youtube.com/watch?v=r1kF0PhwQ8E&t=1s
