The Architect, The Client and The Game Engine

An intro to optimizing workflows

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CALLISONRTKL™

AUTODESK®
UNIVERSITY

“You can't go back and **change** the beginning, but you can start where you are and **change** the ending.”

-C.S.Lewis

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Mission

To **enrich lives** and **design solutions**
to the complex issues of our clients,
our world and our time

LEADING THE
MARKET

SHAPING THE
WORLD AROUND US

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RESIDENTIAL

HOSPITALITY

RETAIL

URBAN PLANNING

Total Land Area
5,424,701sq.m

Population
161,714 Million

Residential Units
50,565

Gross Floor Area
10,632,571

Total Land Area
10,851,000 sq.m

Population
153,460

Towers
210. 25-30 storeys

Gross Floor Area
6,500,000 sq.m

Photo credit goes here

Total Leasing Area
400,000 sq.m

Population
44,979

Residential Units
14,408

Built Up Area
1,559,894 sq.m

Overview

LEARNING OUTCOME 01

IDENTIFY KEY ELEMENTS IMPORTANT TO DEVELOPING YOUR MODELS FOR ADOPTION INTO UNREAL

LEARNING OUTCOME 02

PREPARE BIM MODELS AND ARCHITECTURAL DESIGNS FOR SIMPLE INTEGRATION

LEARNING OUTCOME 03

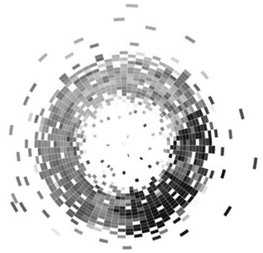
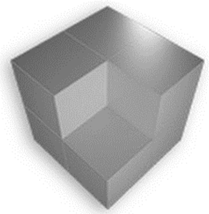
REFINE YOUR WORKFLOW TO ALLOW FOR FAST INTEGRATION BETWEEN ARCHITECTURAL PROGRAMS AND IMMERSIVE ENVIRONMENTS

LEARNING OUTCOME 04

CREATE BASIC TOOLS AND SCRIPTS TO OPTIMIZE DESIGN'S IN UNREAL ENGINE FOR A CLIENT FACING EXPERIENCE.

Real Time Ready
at any time

What can we do to refine our workflow to achieve the best results in the shortest amount of time

CONCEPT DESIGN

SCHEMATIC DESIGN

DETAILED DESIGN

CONSTRUCTION DOCUMENTS

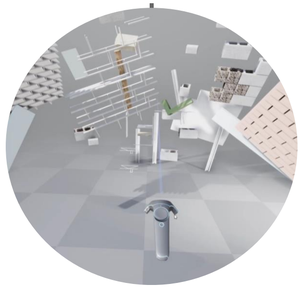
ARCH VIZ
EXPERIENCE

CONCEPT DESIGN

SCHEMATIC DESIGN

DETAILED DESIGN

CONSTRUCTION DOCUMENTS



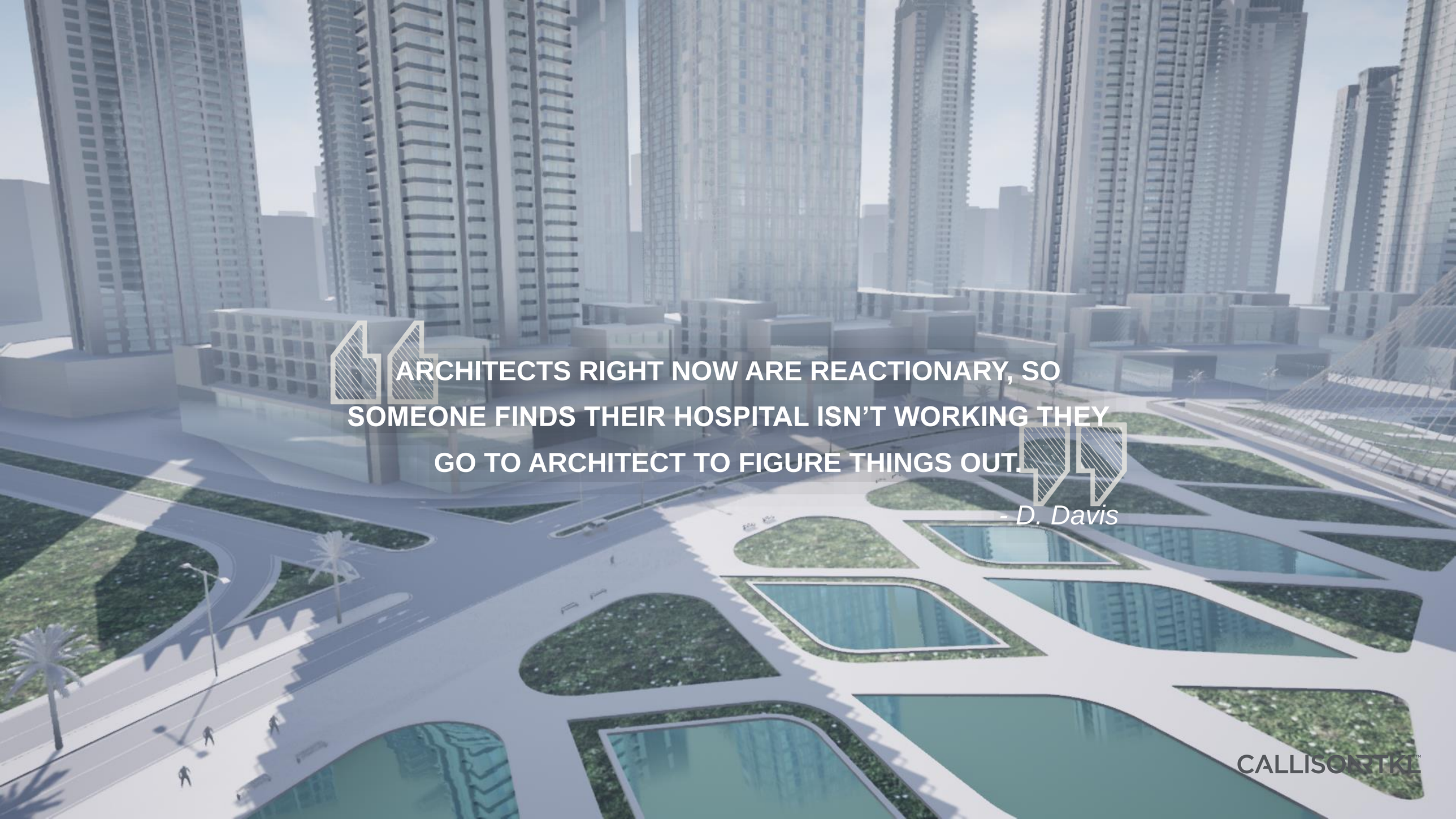
DESIGN
EXPERIENCE

eXtended Reality (XR) enables us to experience the future, everything we do begins with the production of visions of not yet manifested projects designed to enable not yet available experiences

-Nandi Nobell

The Architect, The Client and The Game Engine

- The Role of an Architect
- Managing and Optimizing your BIM Model
- Splitting your efforts, optimize your content
- Exporting and managing change


ARCHITECTS RIGHT NOW ARE REACTIONARY, SO SOMEONE FINDS THEIR HOSPITAL ISN'T WORKING THEY GO TO ARCHITECT TO FIGURE THINGS OUT.
- D. Davis
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Process

Innovation

+

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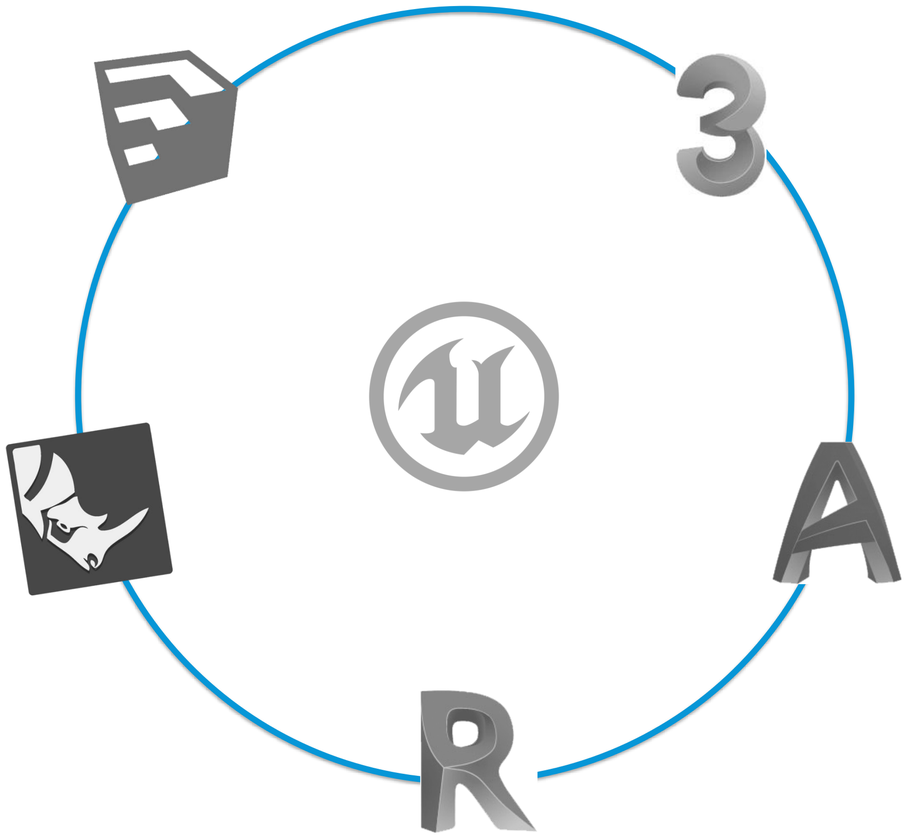
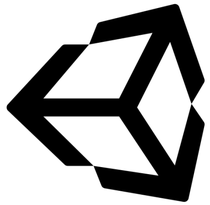
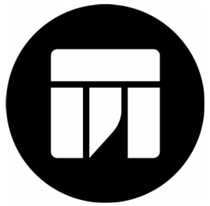




- Gaming engines
- Completely customizable
- Craft your journey like a game
- Requires learning a new platform.



- Custom plugins to your architectural programs
- Limiting customization
- Journey is limited by the extents of the program
- Quick and Easy to learn.

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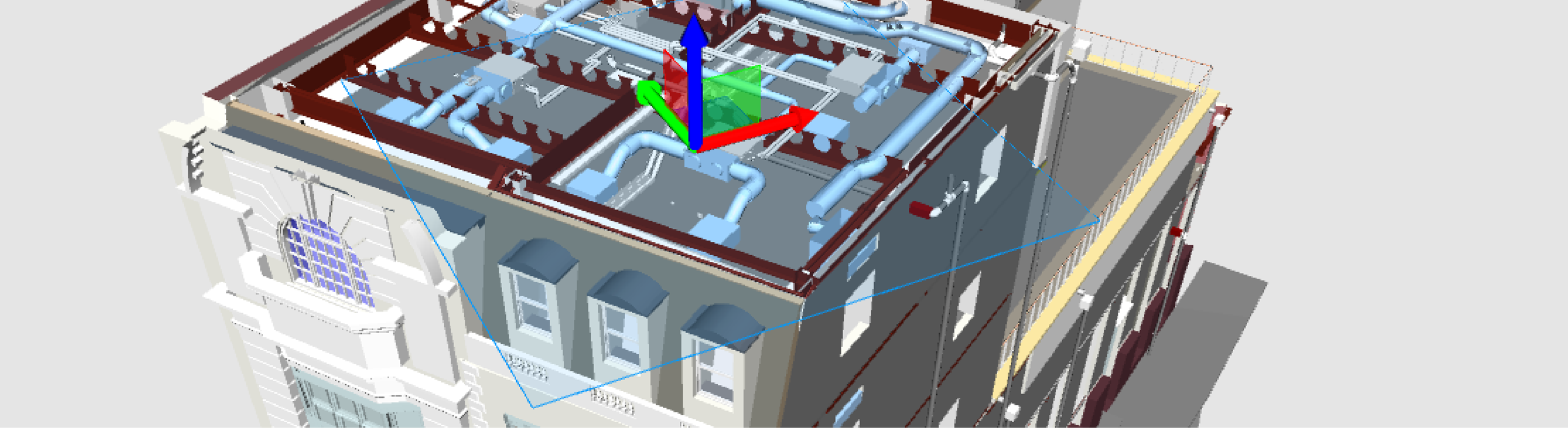


Managing and Optimizing your BIM Model

Before we begin looking at using gaming engines we first need to change and optimize the way that we work with our current architectural models. This is to streamline the process that help optimize and achieve our goal of being real time ready at any time. Starting at a very high level all the way down to small details within Revit that make this possible.

EXECUTION PLANS

Restructuring the way we execute the BIM execution plan to allow for a ‘Real Time Ready’ approach. This involves looking at the structure of files, work sets and filters.

MATERIALS & FAMILIES

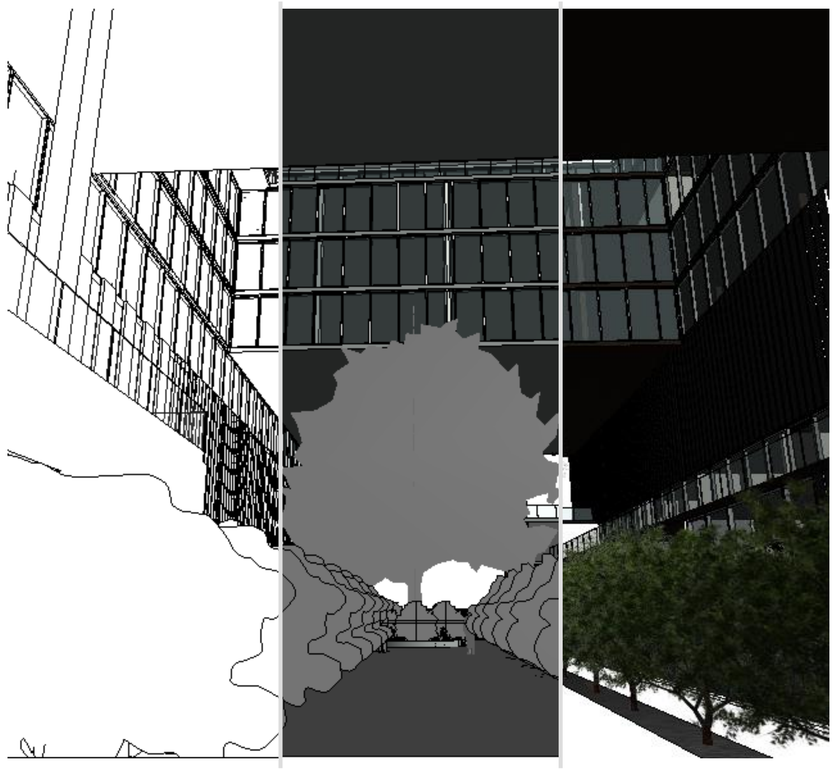
Custom family generation that not only provides drawings with accurate information but has specialized materials, bump maps, specular prepared for the real time renderer.

MODEL MANAGEMENT

Avoiding simple modeling mistakes will allow for a cleaner, optimized real time experience.

Execution Plans

- File structure – How we split the Revit files
- Work-set’s – Created to allow for flexibility in the Export process
- Phases and Filters for custom scene exports



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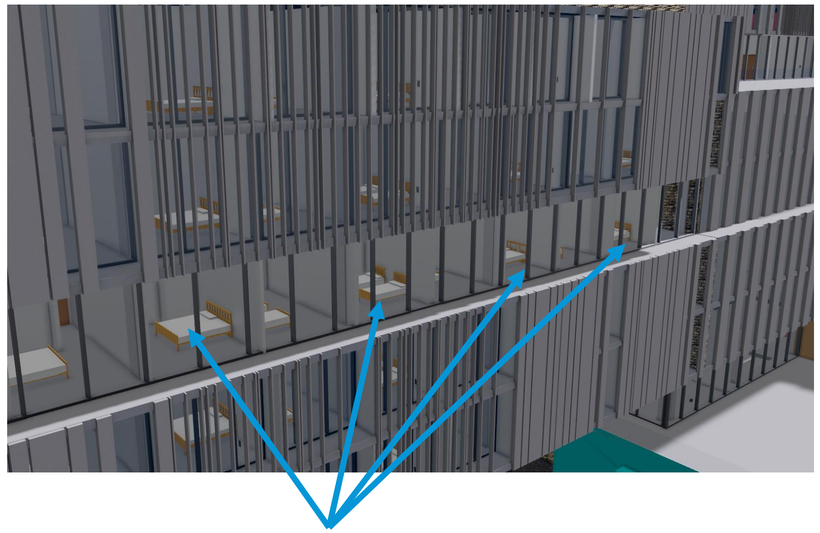
- Revit Models are instinctively Large
- Entourage can be your friend or foe
- RTR takes a lot of graphical power.
- Keep what you can see/want to see



Groups and large family types can make RTR experiences very slow

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CRTKL_Exterior

CRTKL_Interior

CRTKL_Structure

CRTKL_Skylights

CRTKL_MEP

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CRTKL_Interior

Interior Zone A

Interior Zone B

Interior Zone C

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00 General information
00 – Cover Sheet / Drawing Lists / Notes & Legends
10 Site Information
10 – Site Plans
20 – Existing Conditions & Demolition
20 – Floor Plans for all dicipline
21 – Reflected Ceiling Plans
22 – Floor & Wall Finish Plans
23 – Furniture Lay Out Plan
24 - Slab RC Plans
25 –
26 –
30 Elevations And Sections
31 – Elevation
32 – Sections
33 – Façade Modulation & Details
40 Setout Arrangement and General Construction
40 – Core, Shear, Retaining and Water Tank Wall Details all dicipline
41 – Stairs / Ramps & Connecting Elements
42 – Sanitary Set out Plans & Elevations
43 – Enlarged Plans
44 – Slab Profile Plans

50 Construction Details
50 – Typical Details
50 - Loading Diagrams
51 – Fit-out Details (Partitions & Ceilings)
52 – External works
53 – Door Schedule & Door Hardware
54 – Door Details
55 – Window Schedule
56 – Window Details
57 – Louvre Schedule
58 – Louvre Details
60 Schedules & Miscellaneous
60 - Schedules
62 – General Schematics (MEP)
63 – Perspectives & Axonometric
64 – Schedules Area
65 – Schedules Finishes
68 – Fire Strategy Plans
69 – Signage & Way Finding Plans
70 BIM Model
70 – Revit Model
71 – Navisworks Model

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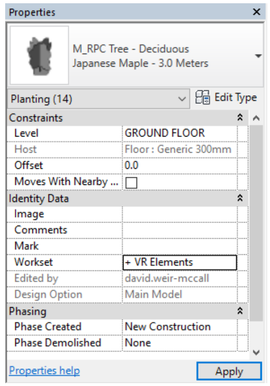
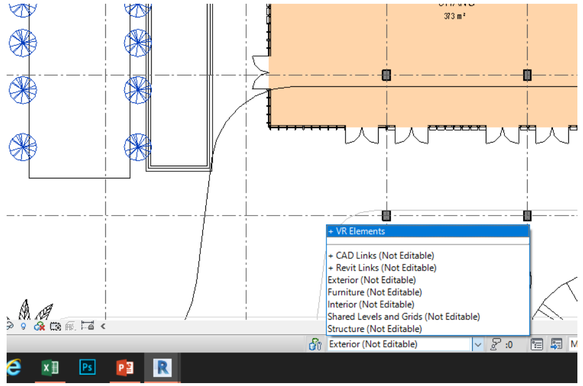
Workset Name	Architecture Workset Description
AR-Architecture	Architecture – Main Elements
AR-Doors	Architecture - Doors
AR-Rooms	Architecture - Rooms and space Separation Lines

Workset Name	Façade Workset Description
FC-wall	Façade – Exterior Wall
FC-Mullion	Façade - Mullion
FC-Details	Façade - Details

Workset Name	Structural Workset Description
ST-Beam	Structural – Beams
ST-Columns	Structural - Columns
ST-Foundation	Structural – Foundations
ST-Pile	Structural – Piles
ST-Ramp	Structural – Ramps
ST-Slab	Structural – Slabs
ST-Steel	Structural – Primary Steelwork
ST-Wall	Structural - Walls

Workset Name	Interior Workset Description
ID-Ceiling	Interior – Ceiling
ID-Casework	Interior - Casework
ID-Door	Interior - Door
ID-Floor	Interior - Floor
ID-Furniture	Interior -Movable Furniture & Non Movable
ID-Plumbing Fixtures	Interior -Sanitaryware
ID-Rooms	Interior -Rooms
ID-Wall	Interior -Walls





- Work-sets can help manage elements used only for RTR

- Hide elements within views and cameras to avoid them being rendered.

Do I need this? If I leave it in, it'll be rendered.

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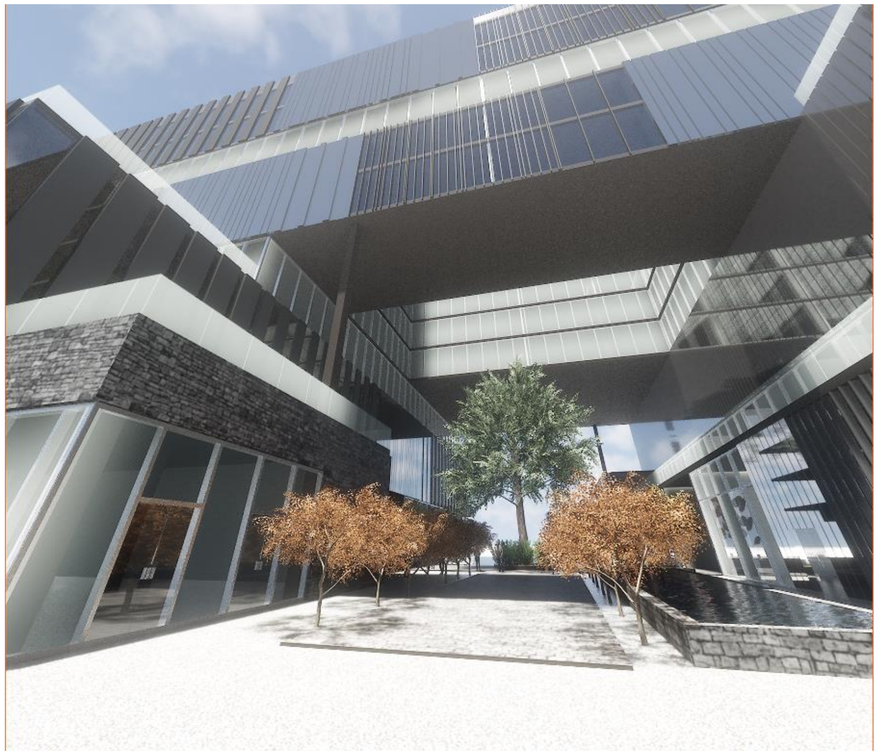
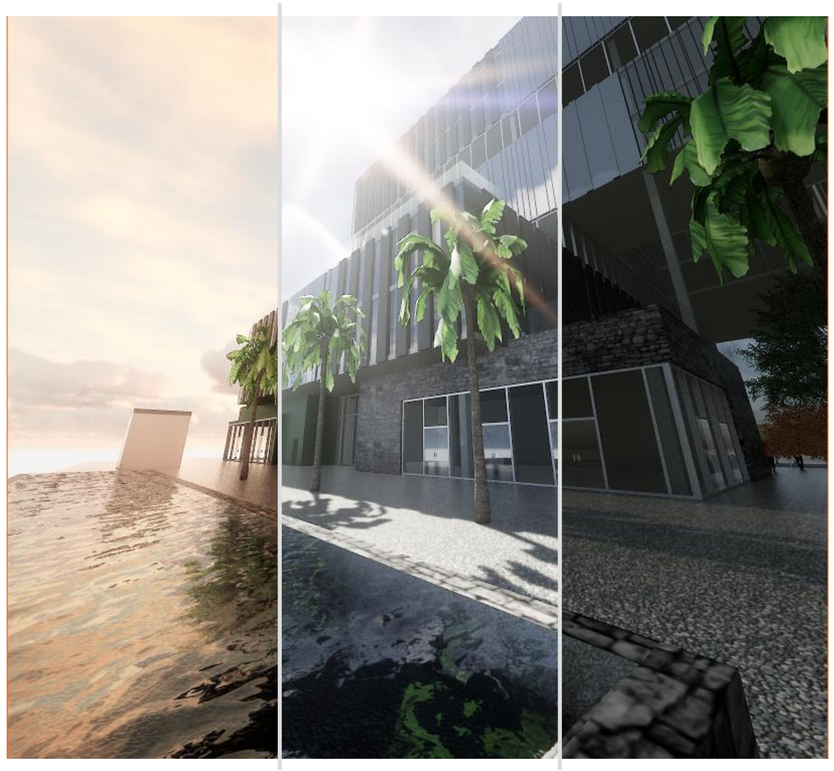
- Identify Elements Key to the RTR experience. Evaluate what experience youre looking to create. Design/story telling/Clashes

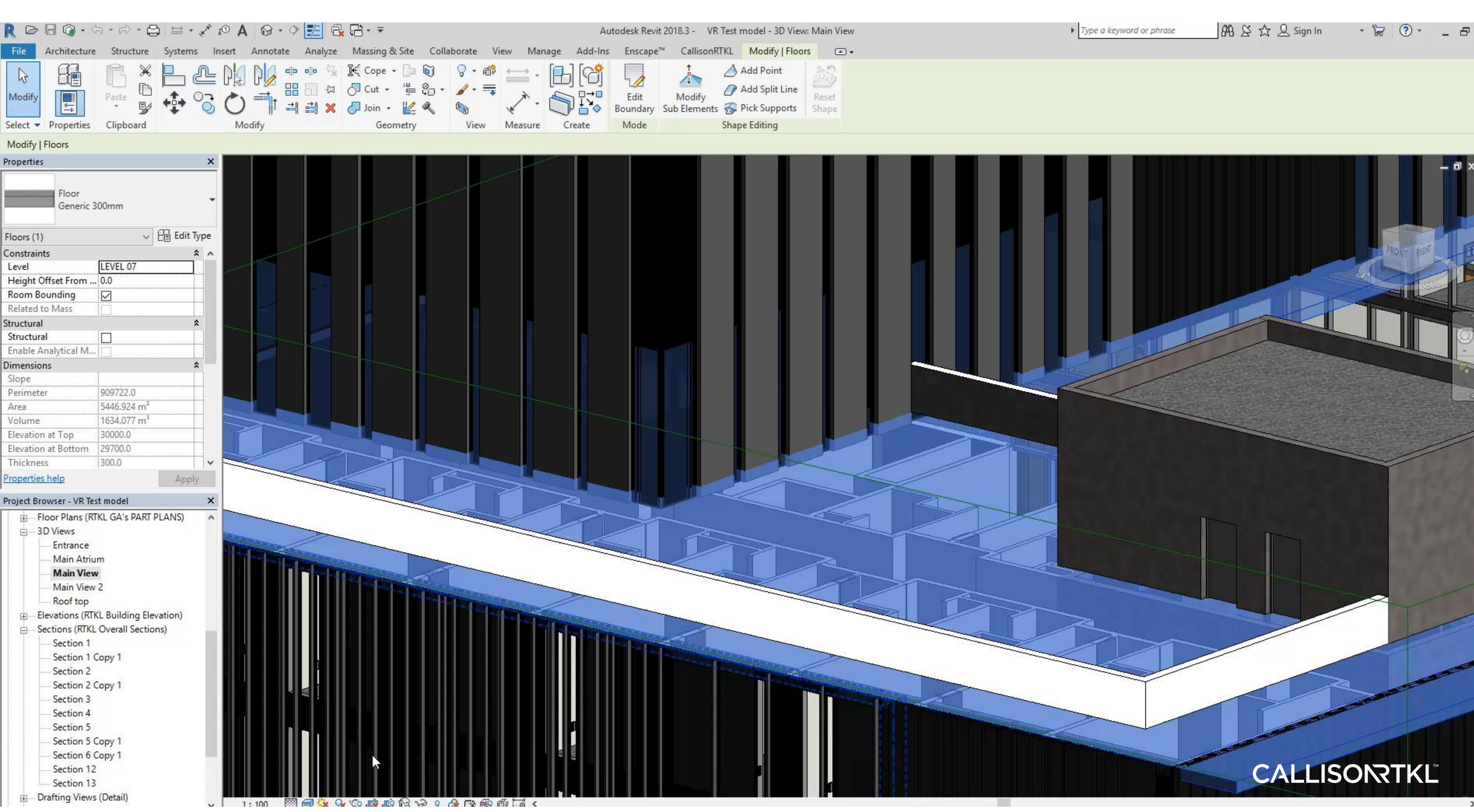
- Split Elements such as FoH and BoH elements
- Entourage and Furniture elements split into standalone worksets



Materials & Families

- Customize and create Revit families for RTR approach.
- Adjustments and alterations in Materials to create a more realistic rendered finish.
- Lights and setting up 3D views for export.




Autodesk Revit 2018.3 - VR Test model - 3D View: Main View
Type a keyword or phrase
Sign In
File
Architecture
Structure
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
Enscape™
CallisonRTKL
Modify | Floors
Modify
Select
Properties
Paste
Clipboard
Cope
Cut
Join
Modify
Geometry
View
Measure
Create
Edit Boundary
Mode
Modify Sub Elements
Add Point
Add Split Line
Pick Supports
Reset Shape
Shape Editing
Modify | Floors
Properties
Floor
Generic 300mm
Floors (1)
Edit Type
Constraints
Level
LEVEL 07
Height Offset From ...
0.0
Room Bounding
Related to Mass
Structural
Structural
Enable Analytical M...
Dimensions
Slope
Perimeter
909722.0
Area
5446.924 m²
Volume
1634.077 m³
Elevation at Top
30000.0
Elevation at Bottom
29700.0
Thickness
300.0
Properties help
Apply
Project Browser - VR Test model
Floor Plans (RTKL GA's PART PLANS)
3D Views
Entrance
Main Atrium
Main View
Main View 2
Roof top
Elevations (RTKL Building Elevation)
Sections (RTKL Overall Sections)
Section 1
Section 1 Copy 1
Section 2
Section 2 Copy 1
Section 3
Section 4
Section 5
Section 5 Copy 1
Section 6 Copy 1
Section 12
Section 13
Drafting Views (Detail)
1 : 100
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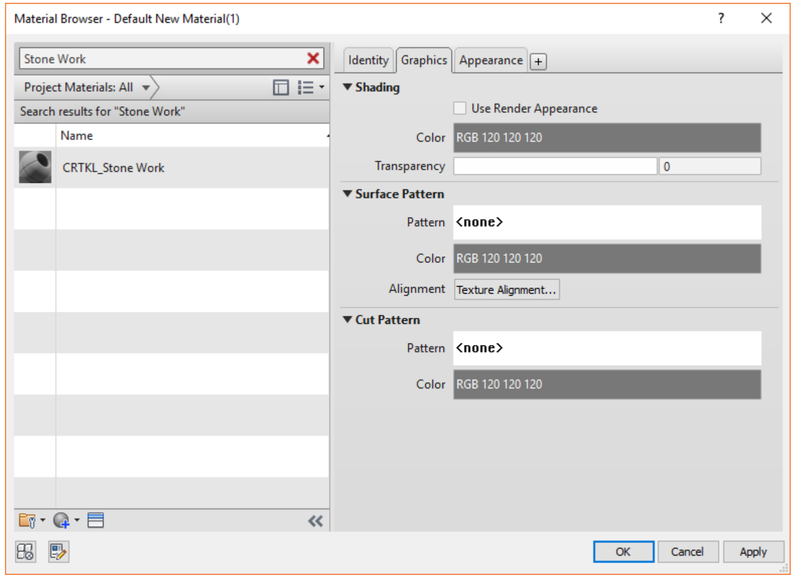

- Choose what materials you'll see
- Default materials sizes are standard
- Imported materials come in default size

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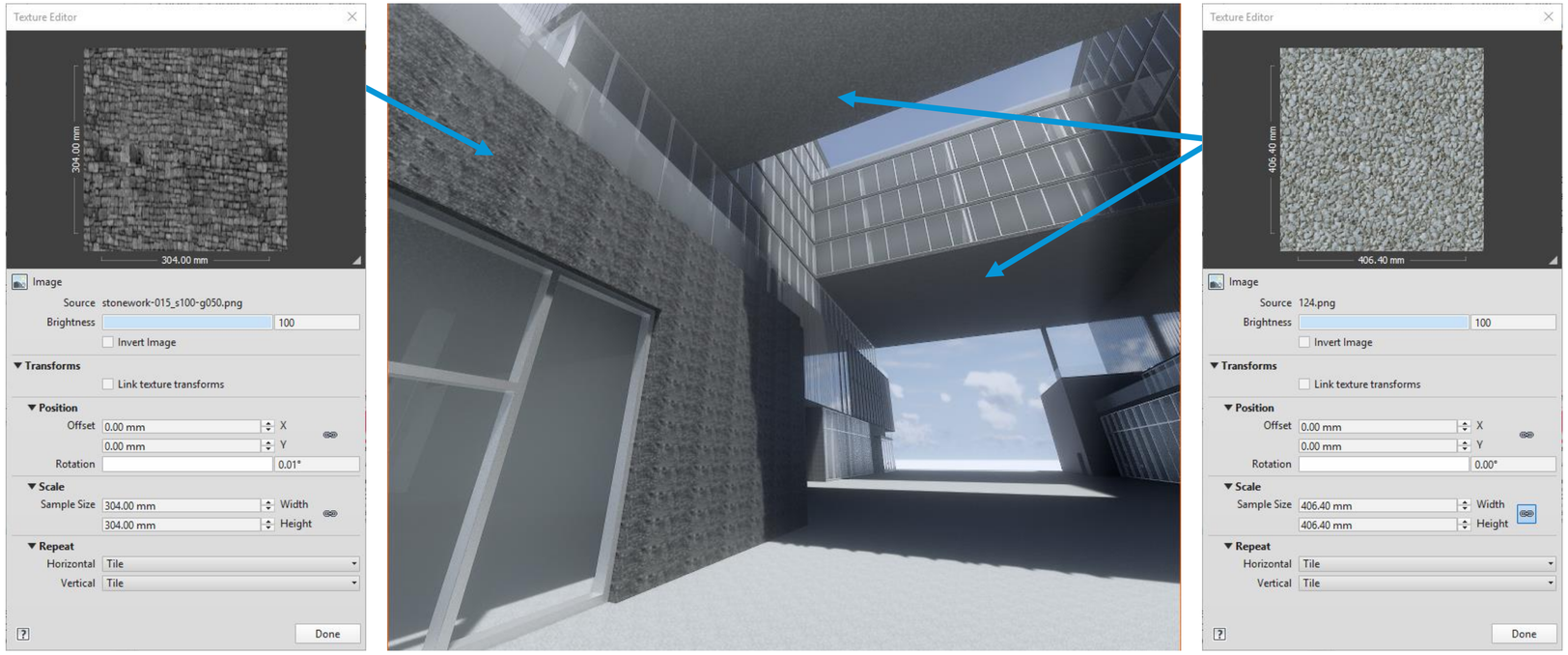

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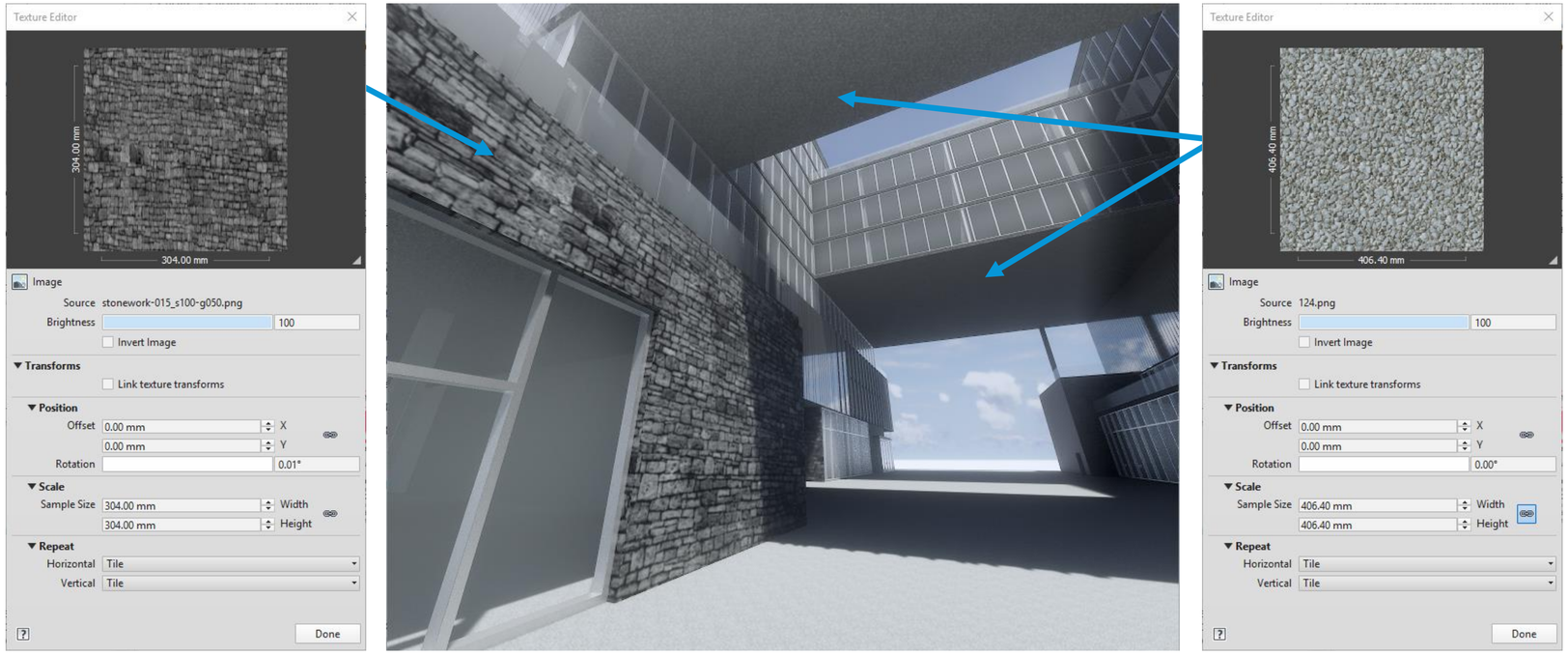

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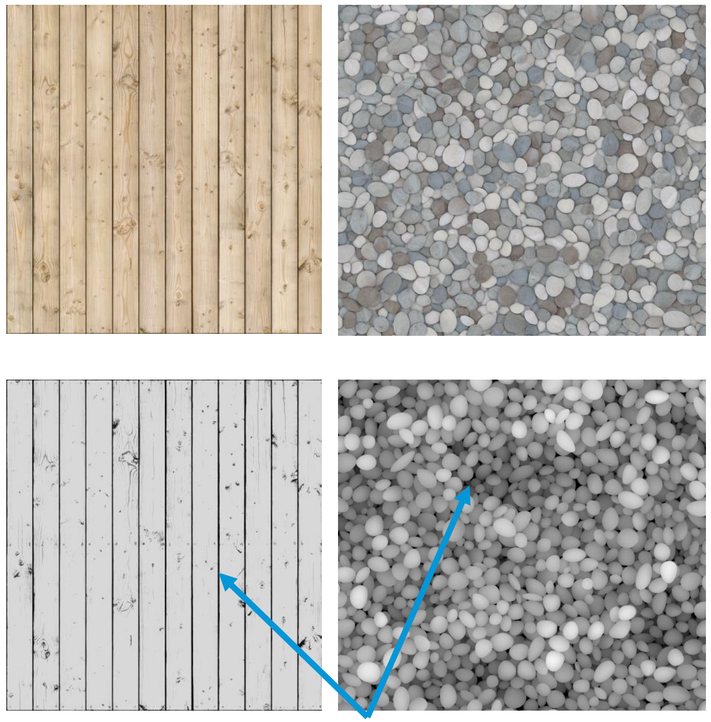


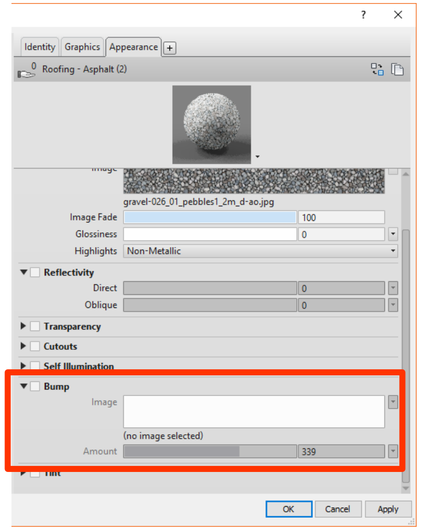
The darker the tone the greater the bump.

Diffuse Maps

- Defines the color and pattern of the object. Mapping the diffuse color is like painting an image on the surface of the object.

Bump Maps

- Bump mapping is a technique for simulating bumps and wrinkles on the surface of an object.



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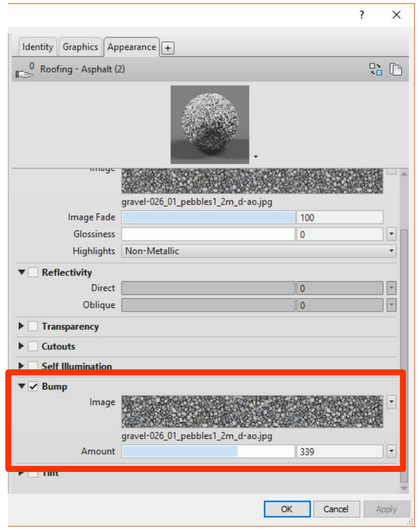

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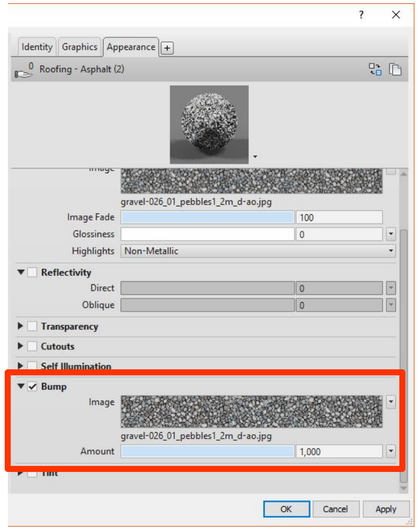

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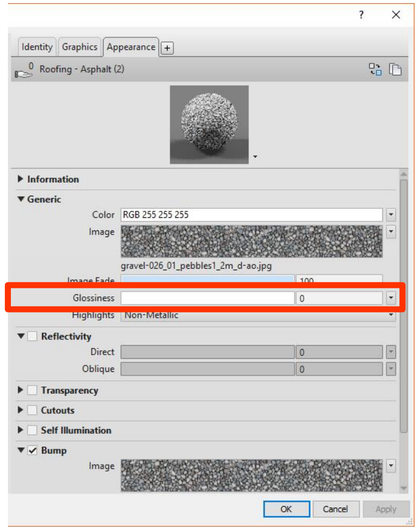

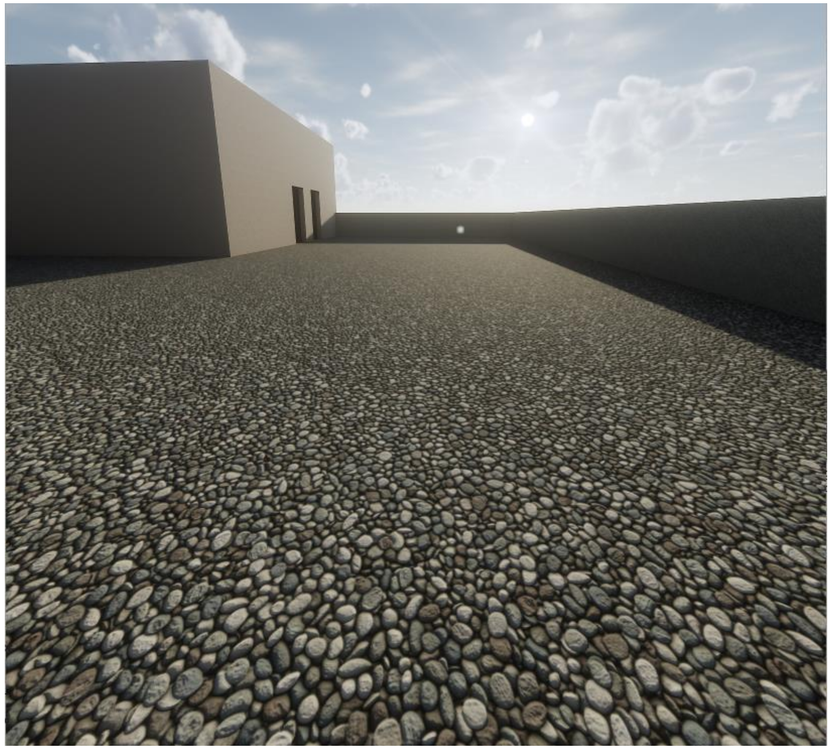

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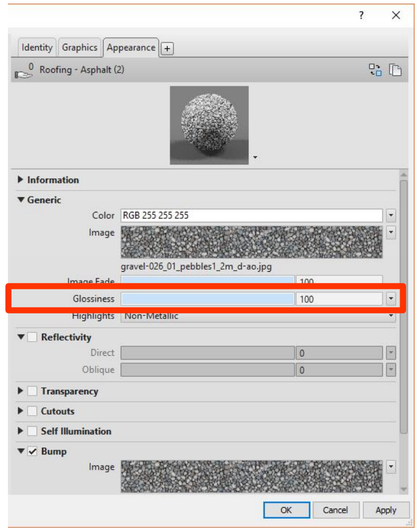
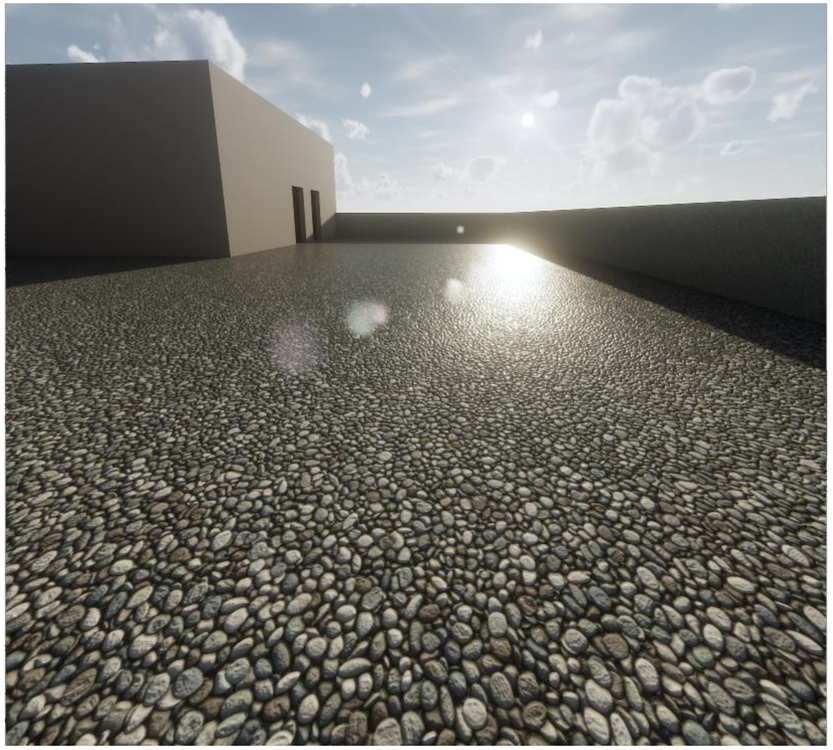
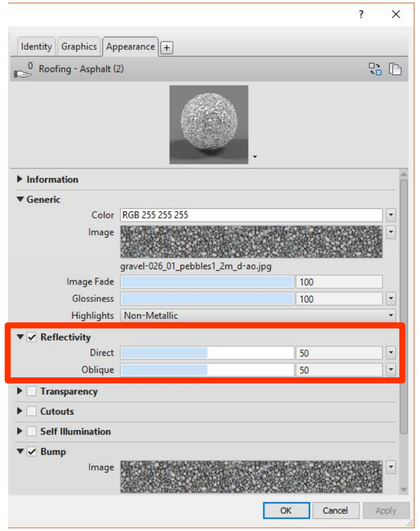
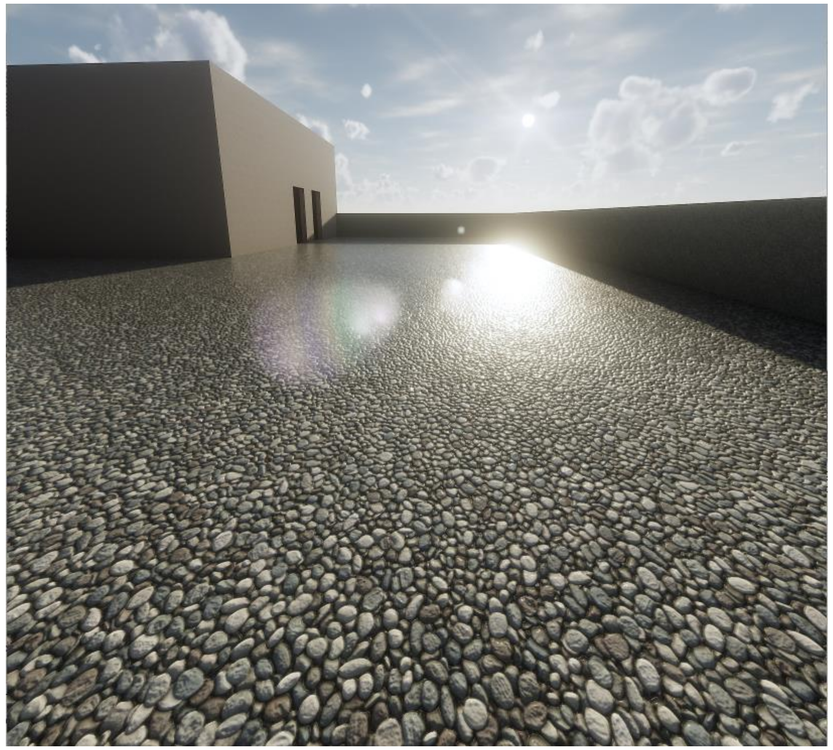

Identity
Graphics
Appearance
Roofing - Asphalt (2)
Information
Generic
Color
RGB 255 255 255
Image
gravel-026_01_pebbles1_2m_d-ao.jpg
Image Fade
100
Glossiness
100
Highlights
Non-Metallic
Reflectivity
Direct
0
Oblique
0
Transparency
Cutouts
Self Illumination
Bump
Image
OK
Cancel
Apply







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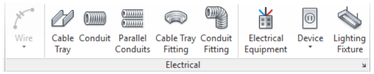

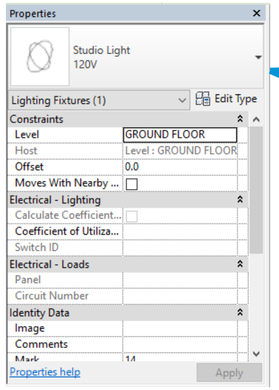

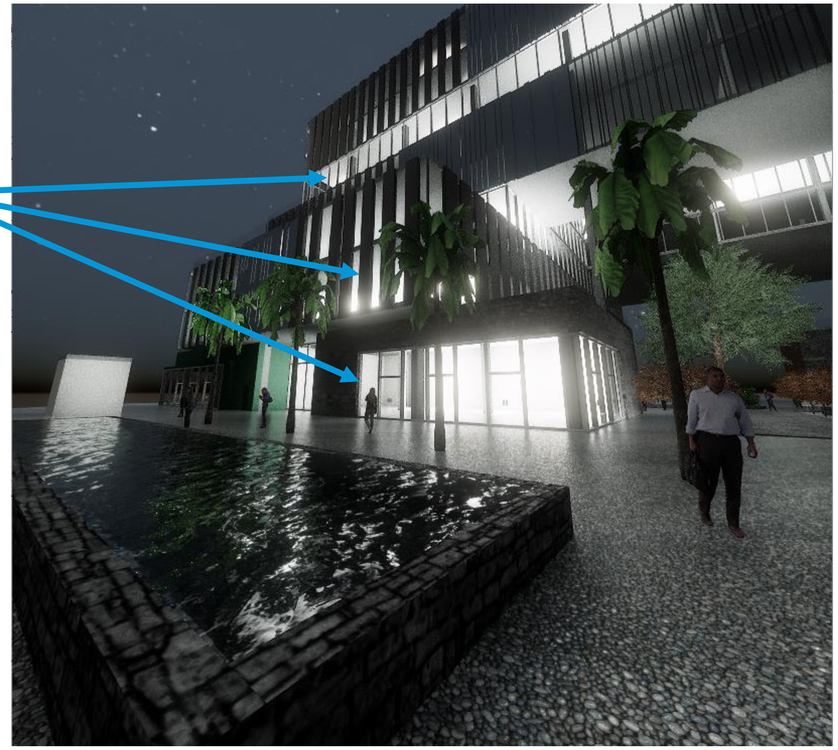

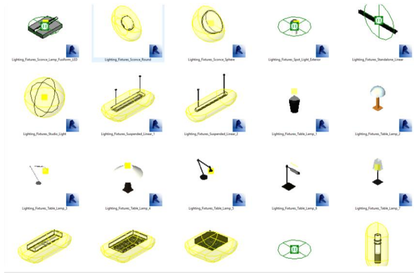

- Studio Light acts as great fast solution to light a space.

- Autodesk Library has fantastic light library to get you started.

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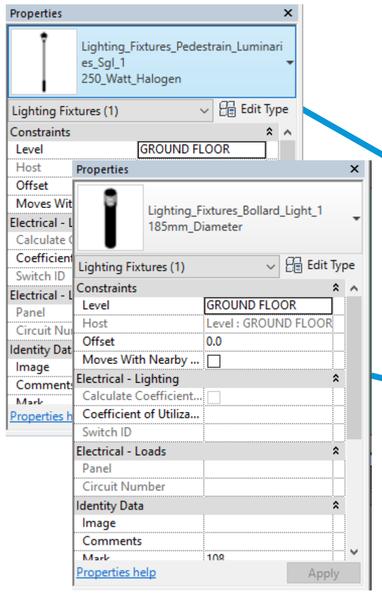
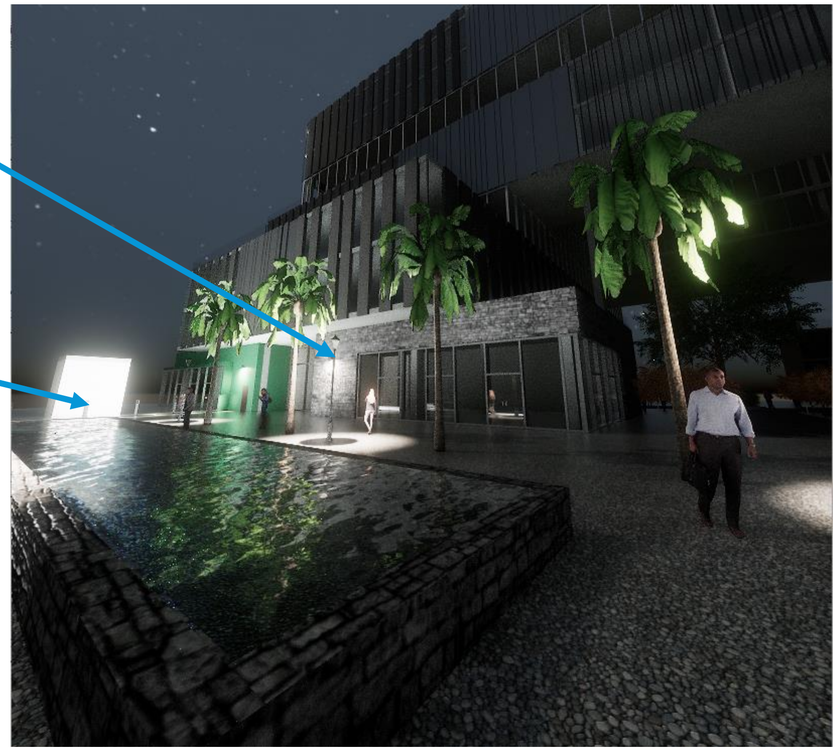
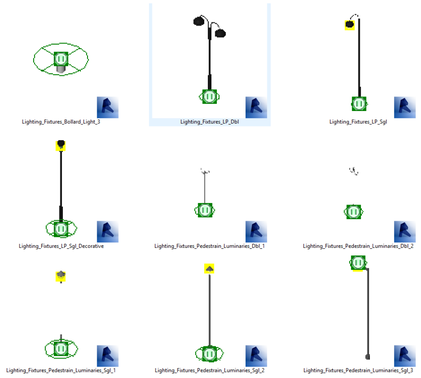


- Use Sparingly, don't crowd your scene.





- Lighting Entourage.

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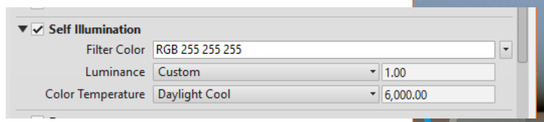
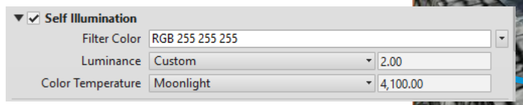
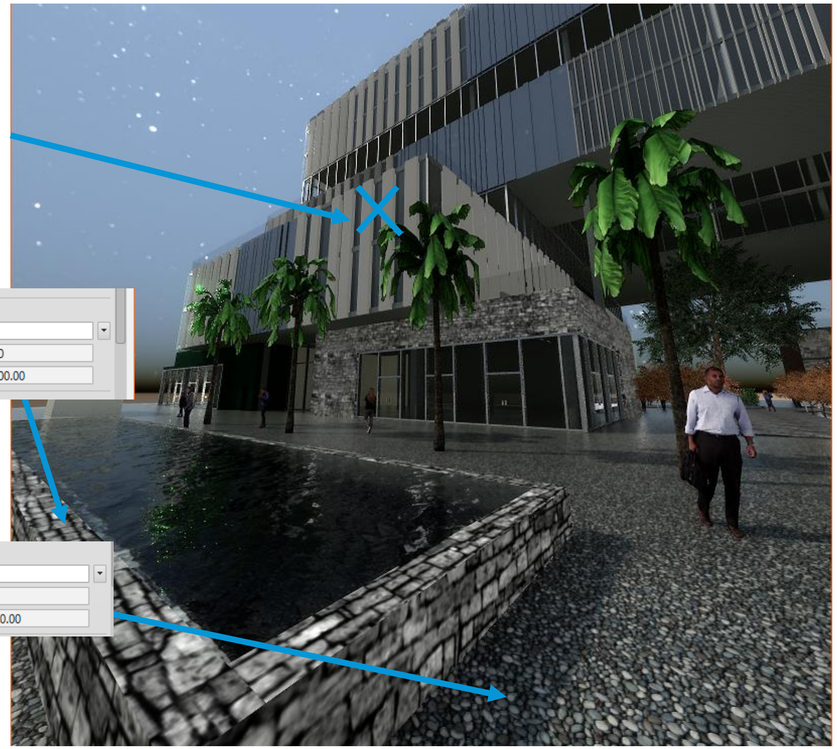
- Only add luminance to materials you want to stand out. Apply to many and scene losses its focus.







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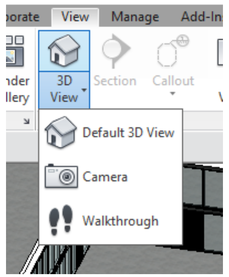
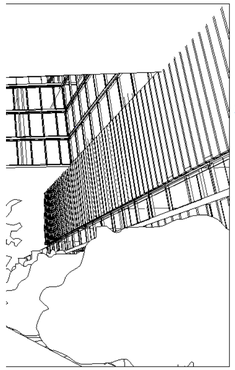
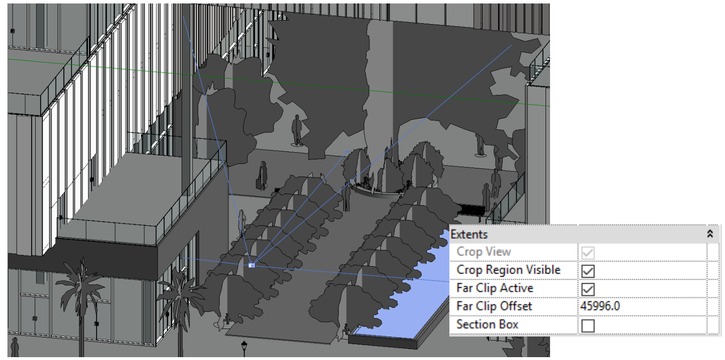


- Place your Camera
- Use Hidden Line to ease the Process of placing Cameras.



Best way to Navigate in Revit



- Far Clip Active will reduce Render time while you set up.
- Use elevation and plan views to place camera.

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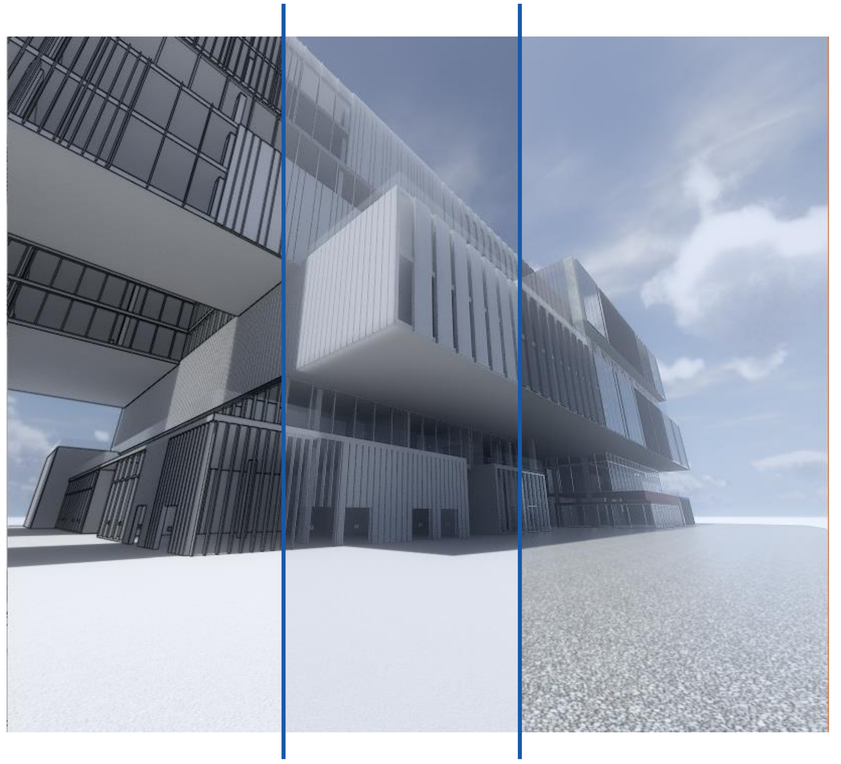
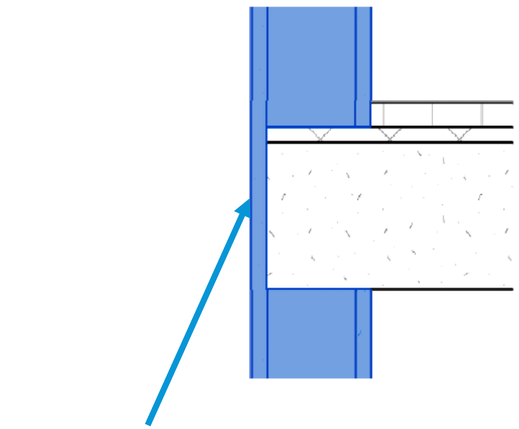
Model Management

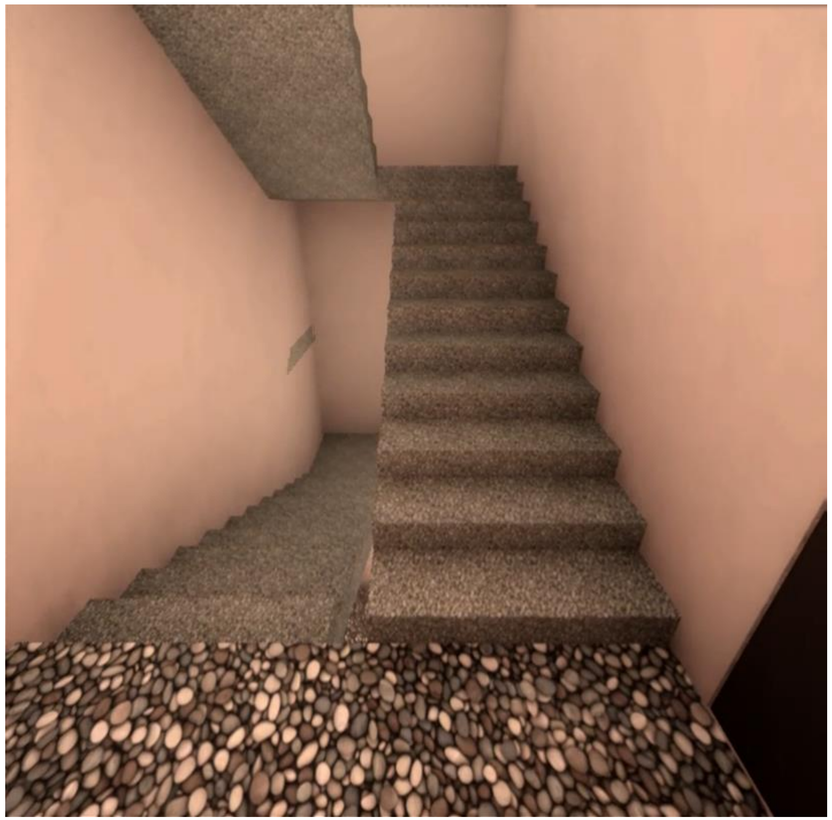
- Be cautious on overlapping materials
- Correct detailing
- Use correct model components for accurate UV Mapping

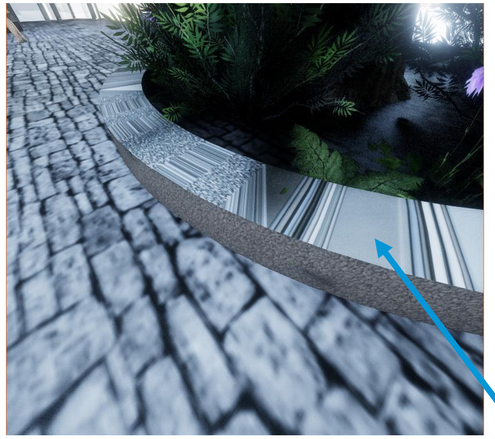


- Avoid Overlapping Surfaces



Finishes Should Cover exposed Structure

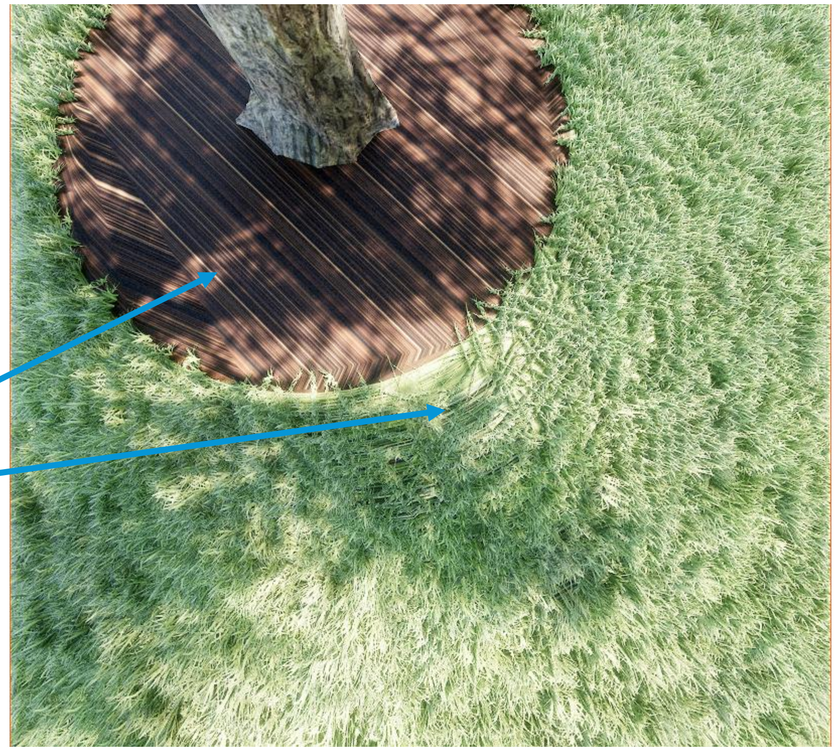


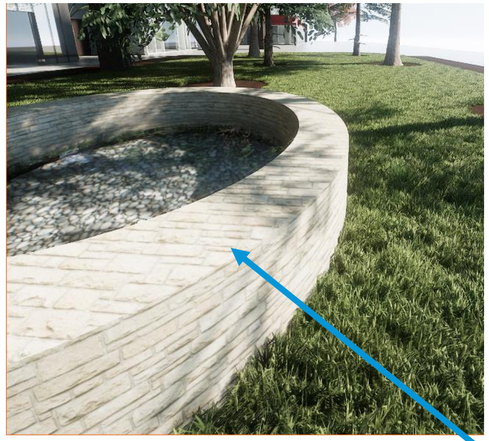


Complex Geometry Can Cause Materials

to appear stretched. Commonly

happens with Floors

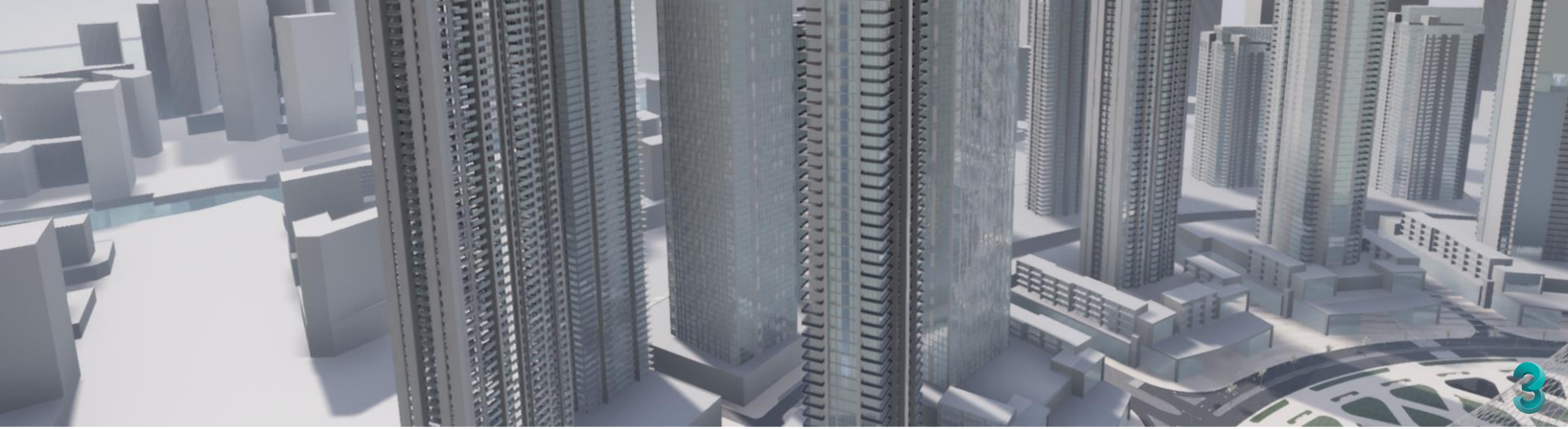




Simplifying Shapes or use other

modeling components helps minimize

the issue.



Splitting your efforts, optimize your content

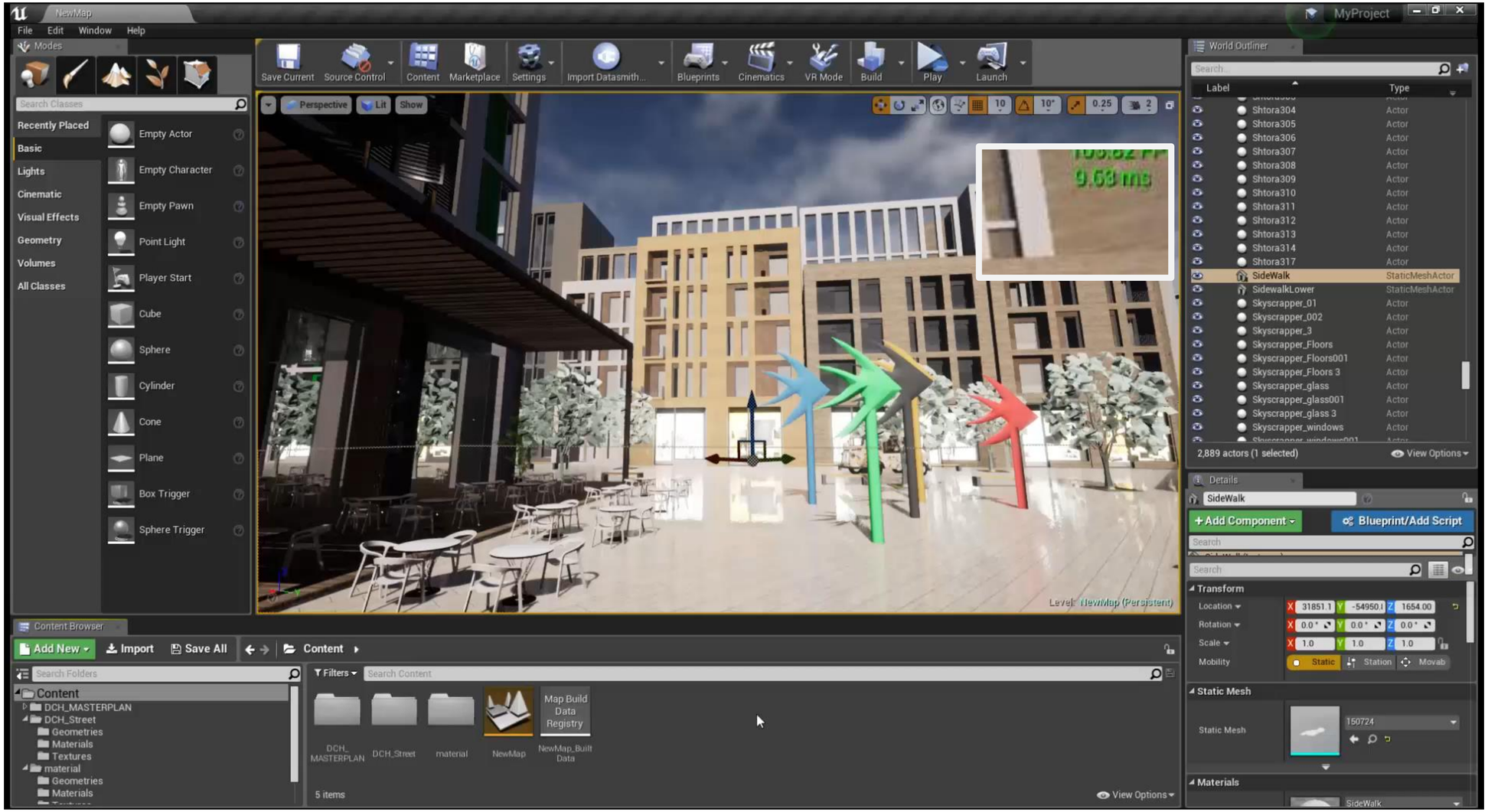
Unreal & Twin motion have an array of real time rendered assets to use at your disposal. Use these libraries to help split your model and remove effort in optimizing content in Revit and utilize assets in the gaming engines. Save time by eliminating elements in one to optimize the other.

Revit Elements

- Floors/Walls/Doors
- Facades
- Furniture
- Structural Elements
- Materials
- Basic Lighting Elements

Unreal

- People
- Vehicles
- Landscape
- Specialized Furniture
- Advanced Lighting



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Exporting and Managing Change

Successfully exporting and managing change between programs comes down to the method in which you chose, though there are many options available from .fbx and .obj exports to Datasmith and Live Links within Twin Motion. The idea is to find the simplest and easiest way that works with your chosen workflow whether it be Revit, 3DS Max or Sketch up. The following contains these processes and benefits to easily adopt your workflow for game engine integration.

Datasmith

- Manual Export process to stand alone file
- In depth breakdown of export process
- Controlled reimport process
- In-depth asset breakdown.

Twin Motion

- Revit/Sketchup/Rhino Live Link
- Fast & easy design changes viewed instantaneously.
- Material and object grouping option for fast RTR output.

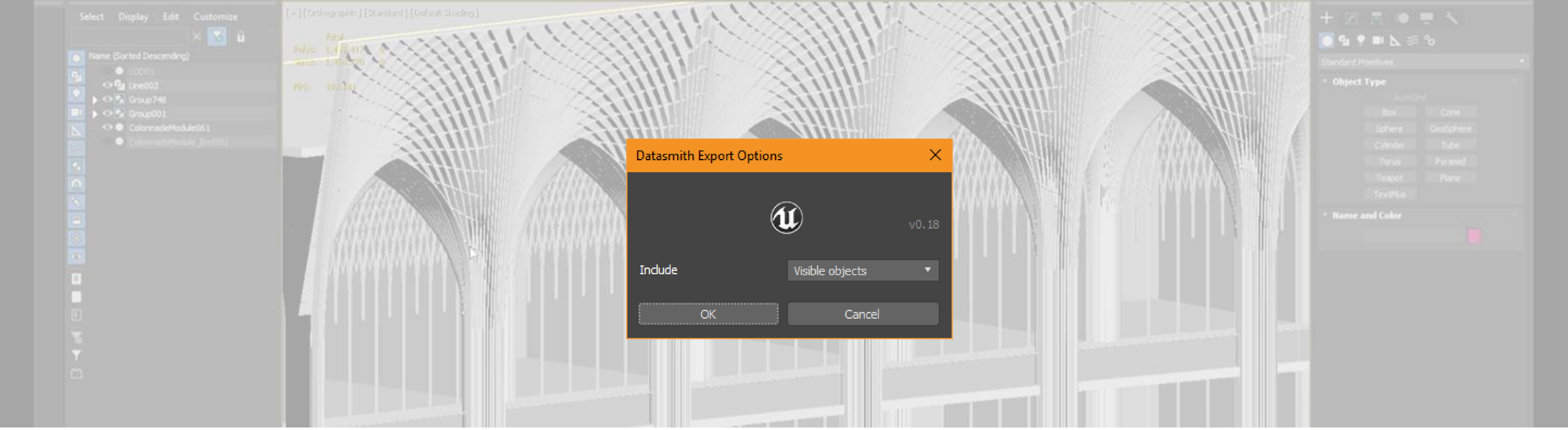
Autodesk Assets

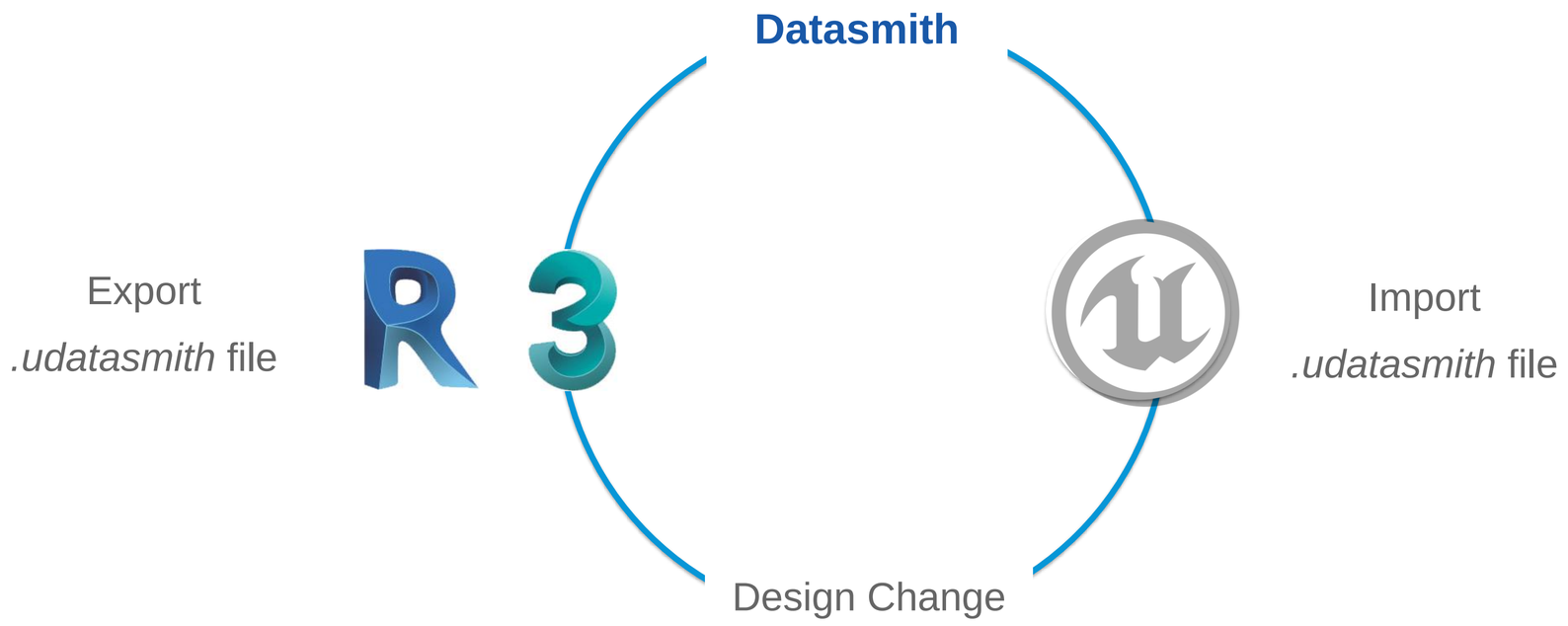
- Object Instances
- Pivot Locations
- Scene Hierarchy and Layers
- Material and Physical Based Rendering (PBR) Characteristics and Textures
- Light Positions, Colors, Sizes, and Intensities
- Camera Properties
- Meta Information and Custom Attributes
- Unit Conversion

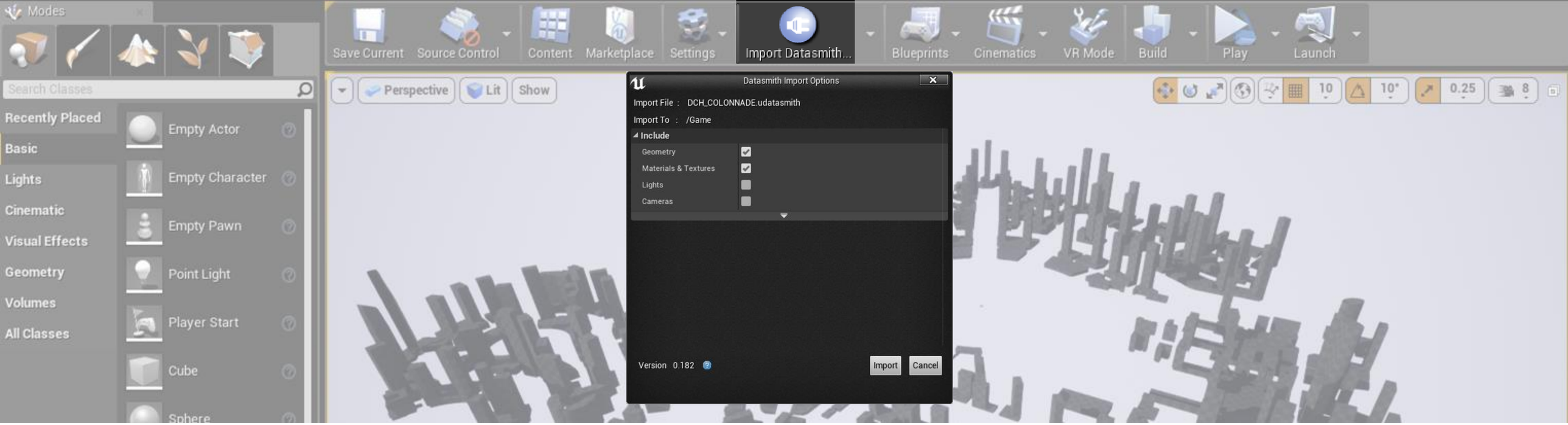
Unreal Assets

- Object Instances
- Pivot Locations
- Scene Hierarchy and Layers
- Material and Physical Based Rendering (PBR) Characteristics and Textures
- Light Positions, Colors, Sizes, and Intensities
- Camera Properties
- Meta Information and Custom Attributes
- Unit Conversion

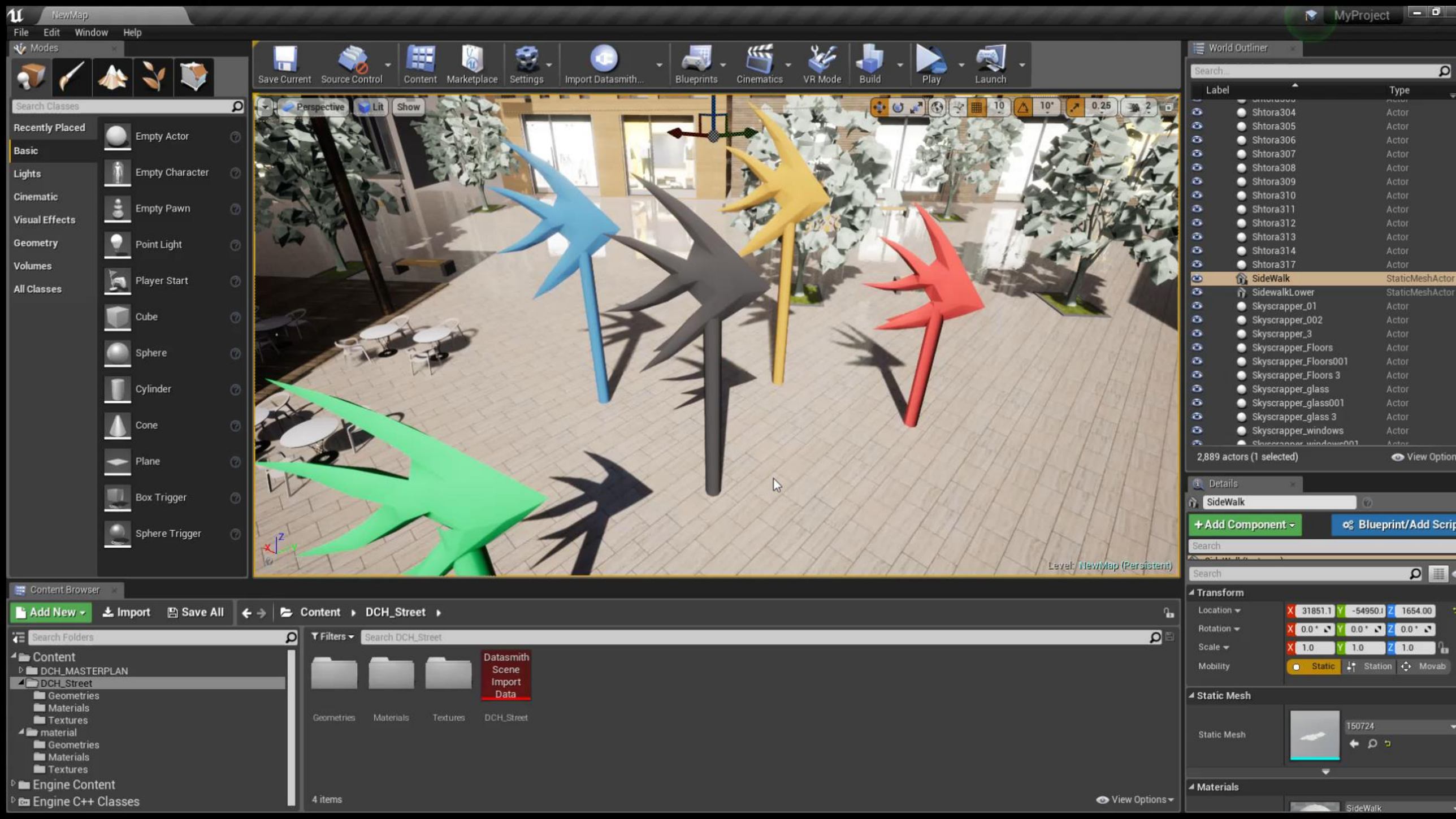
- Linked Revit Model Support.
- Scene Hierarchy Maintained based on Revit import.
- Non-destructively reimport access in your scene that have changed. Allowing for more seamless reintegration.

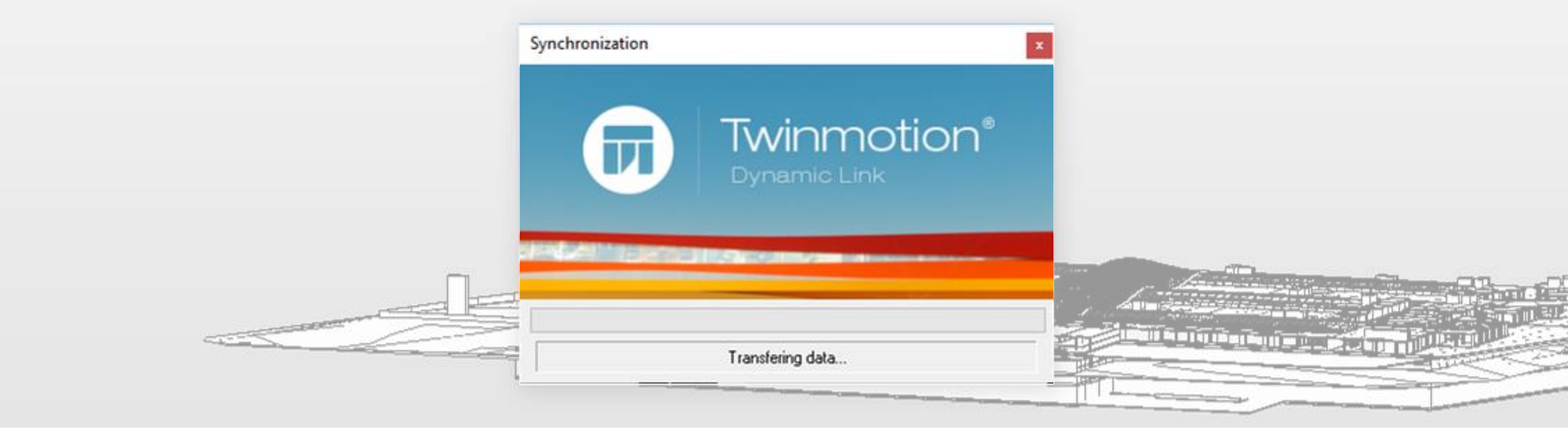

Datasmith Export Options
v0.18
Include
Visible objects
OK
Cancel


Datasmith
Export
.udatasmith file
Import
.udatasmith file
Design Change



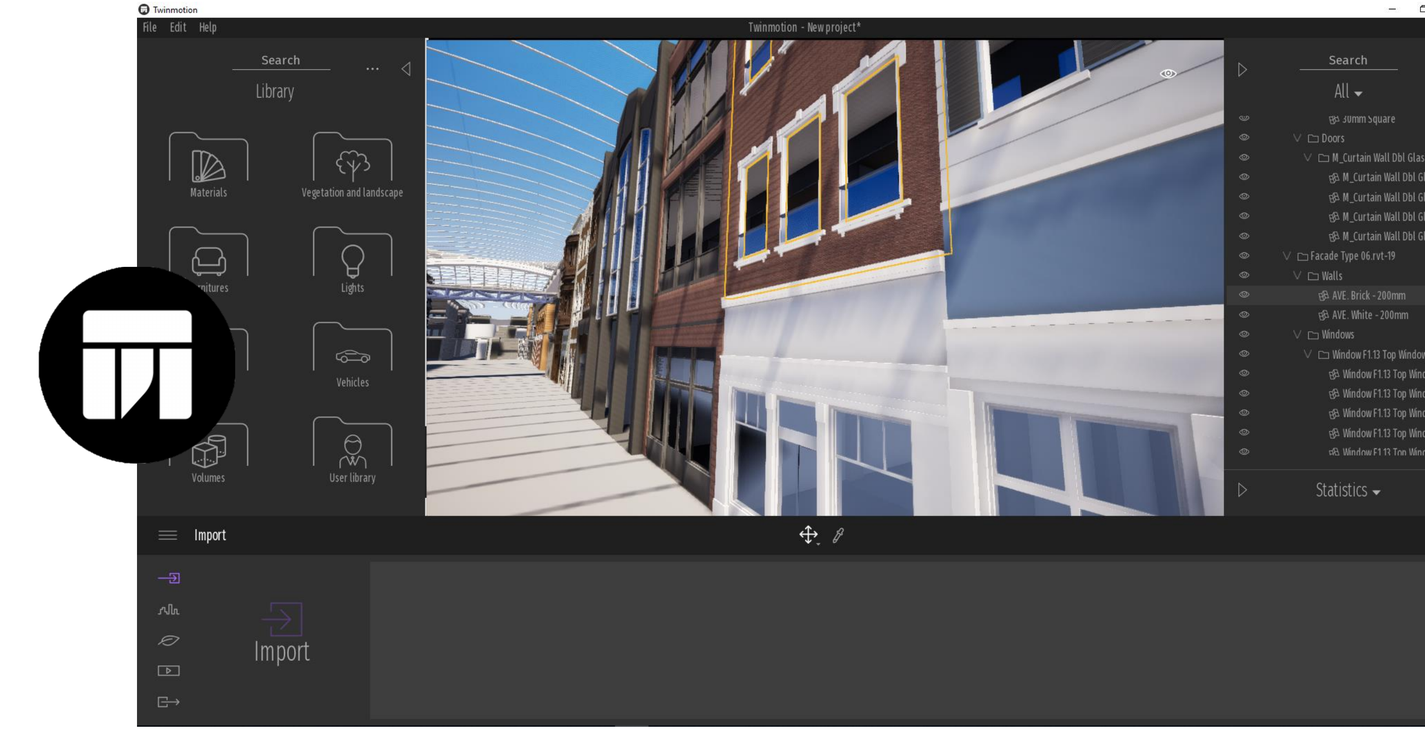
- Allows you to customize what you bring into the model
- With split files it allows us to pick and chose levels of detail we want with each model.


NewMap
MyProject
File
Edit
Window
Help
Modes
Save Current
Source Control
Content
Marketplace
Settings
Import Datasmith...
Blueprints
Cinematics
VR Mode
Build
Play
Launch
Search Classes
Recently Placed
Basic
Lights
Cinematic
Visual Effects
Geometry
Volumes
All Classes
Empty Actor
Empty Character
Empty Pawn
Point Light
Player Start
Cube
Sphere
Cylinder
Cone
Plane
Box Trigger
Sphere Trigger
Perspective
Lit
Show
Level: NewMap (Persistent)
World Outliner
Search...
Label
Type
Shtora304
Shtora305
Shtora306
Shtora307
Shtora308
Shtora309
Shtora310
Shtora311
Shtora312
Shtora313
Shtora314
Shtora317
SideWalk
SidewalkLower
Skyscrapper_01
Skyscrapper_002
Skyscrapper_3
Skyscrapper_Floors
Skyscrapper_Floors001
Skyscrapper_Floors 3
Skyscrapper_glass
Skyscrapper_glass001
Skyscrapper_glass 3
Skyscrapper_windows
Actor
StaticMeshActor
2,889 actors (1 selected)
View Option
Details
SideWalk
+ Add Component
Blueprint/Add Scrip
Search
Transform
Location
Rotation
Scale
Mobility
Static
Station
Movab
Static Mesh
Materials
Content Browser
Add New
Import
Save All
Content
DCH_Street
Search Folders
Filters
Search DCH_Street
Content
DCH_MASTERPLAN
DCH_Street
Geometries
Materials
Textures
material
Engine Content
Engine C++ Classes
Datasmith Scene Import Data
4 items
View Options


Synchronization
Twinmotion®
Dynamic Link
Transfering data...

Live Link

- Linked Revit Model Support.
- Scene Hierarchy Maintained based on Revit import.
- Non-destructively reimport access in your scene that have changed. Allowing for more seamless reintegration.



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The Architect, **The Client** and The Game Engine

- Narrative & Story
- Design Exploration
- Bridging the knowledge gap
- Journey Together.

Narrative & Story

Every project has a story, sharing that story and experience with the client is how we share the vision. The aim is to capture the essence of the project and get people looking at the things we want them to in a simple and engaging way. Imagine it’s the first time the client has seen the project, if you are not there to talk them through it. Gaming engines allow for us to tell a story.

“Begin at the beginning," the King said, very gravely,
"and go on till you come to the end: then stop.”

- Lewis Carroll, Alice in Wonderland

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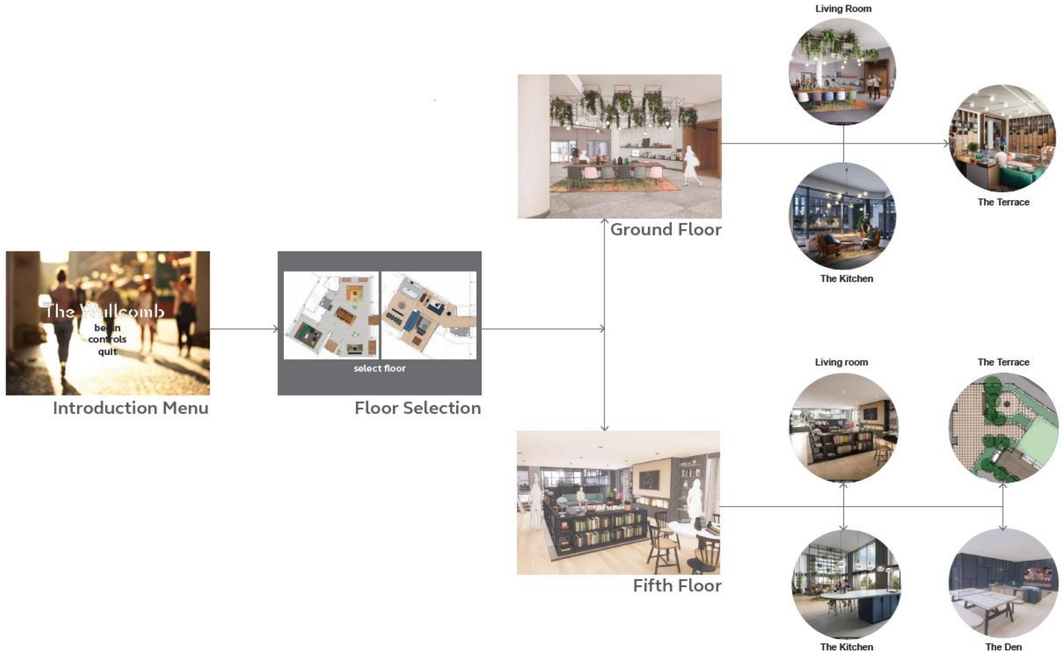
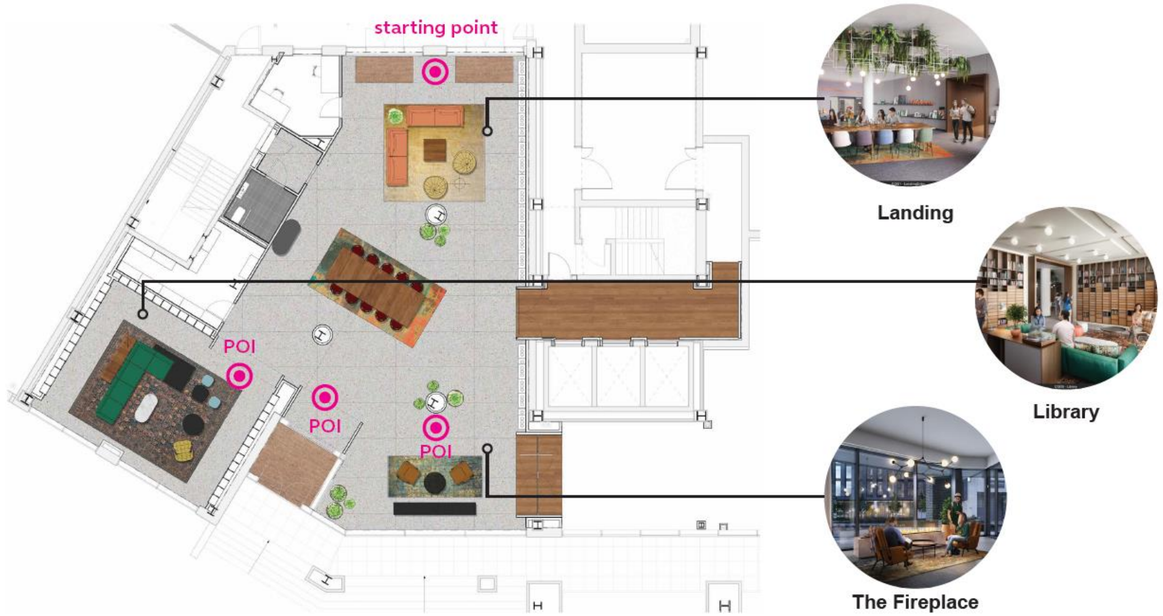
Way of Life.

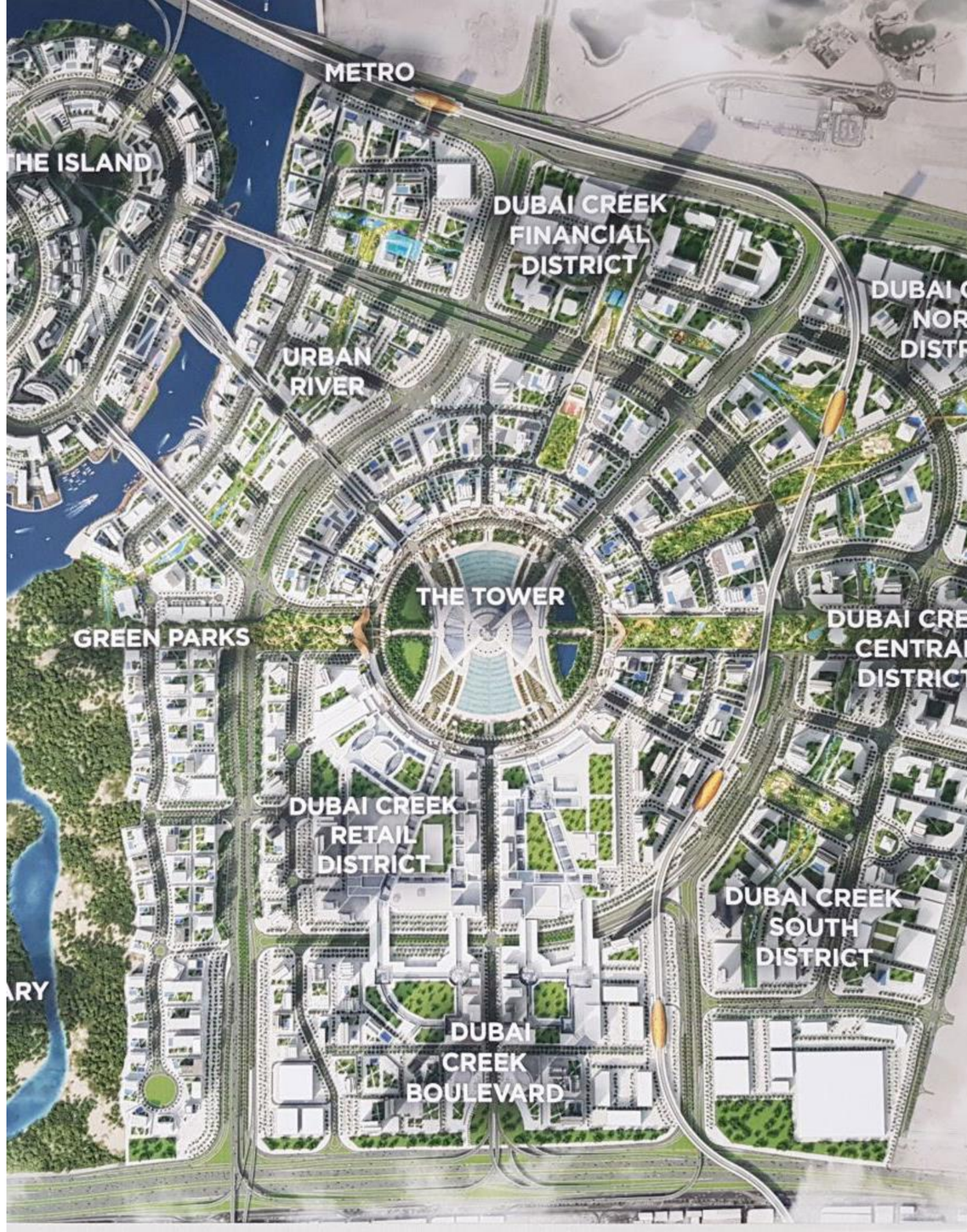
Intuitive


The Wallcomb
begin
controls
quit
Introduction Menu
select floor
Floor Selection
Ground Floor
Living Room
The Terrace
The Kitchen
Fifth Floor
Living room
The Terrace
The Kitchen
The Den

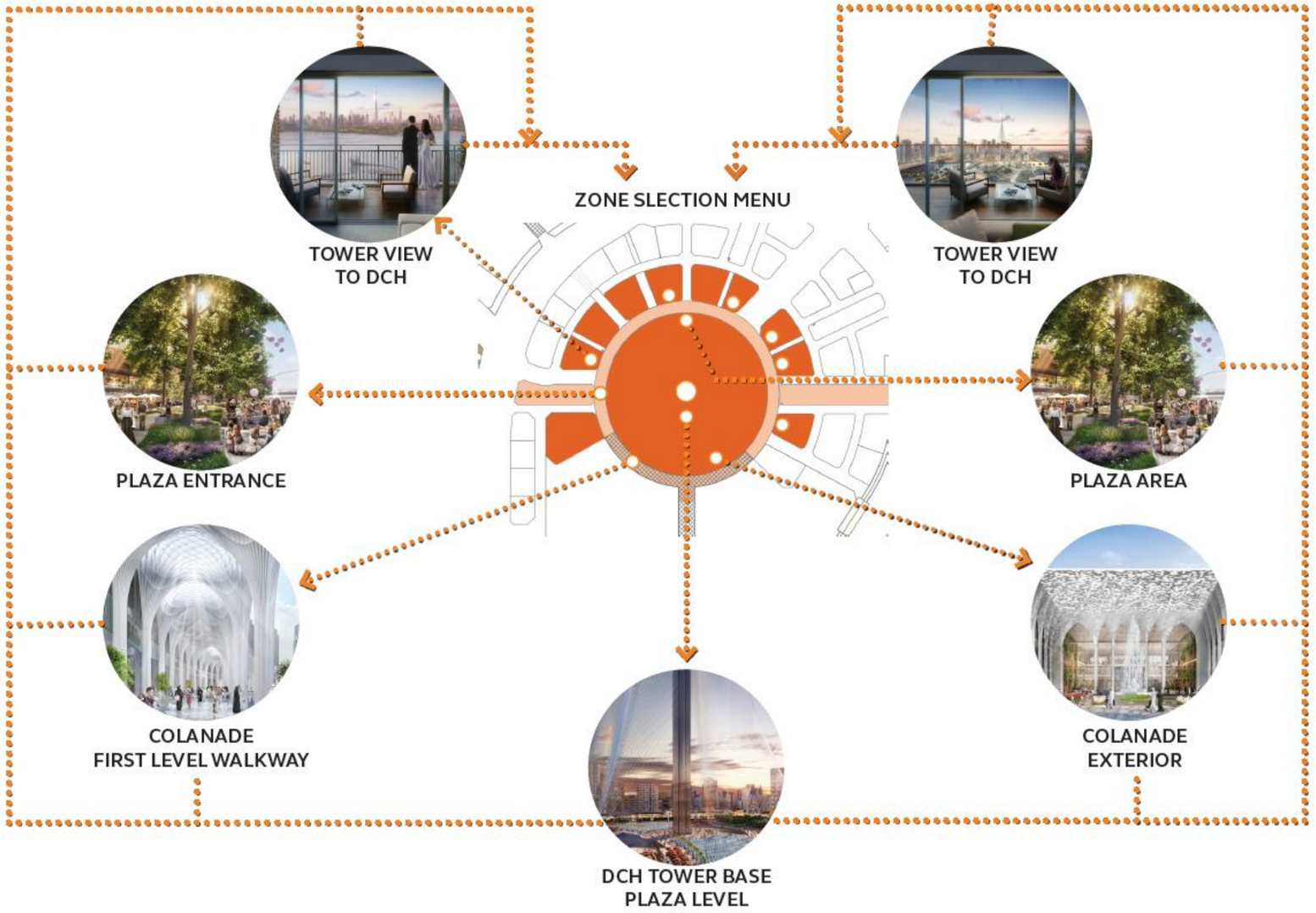

starting point
POI
POI
POI
Landing
Library
The Fireplace

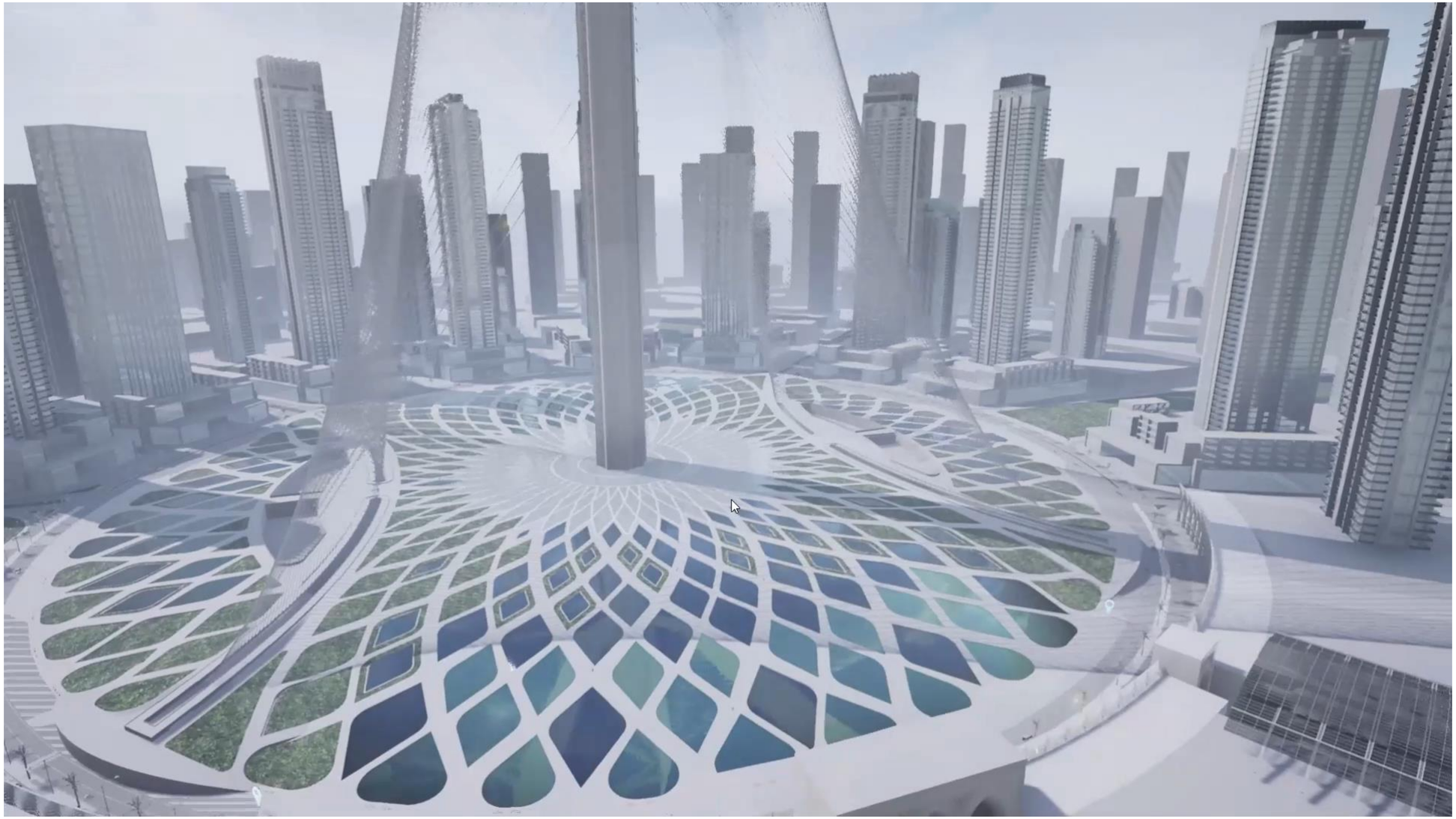
Large Scale Navigation

Spans in Urban Planning can make the user experience messy and hard to navigate. Spanning across hundreds of meters sometimes even kilometers.



Zone Selection





Pick up items
by pulling the trigger

Design Options

Animating design options into your narrative is another benefit that Unreal offers and a direct way to make the client feel engaged in connected to their design. In Urban Planning this can involve larger scale elements such as tower positions, setbacks, orientation, solar analysis and GFA Studies.

Positioning

Design Options can be simple from easy positioning techniques, to help explain scale and size.

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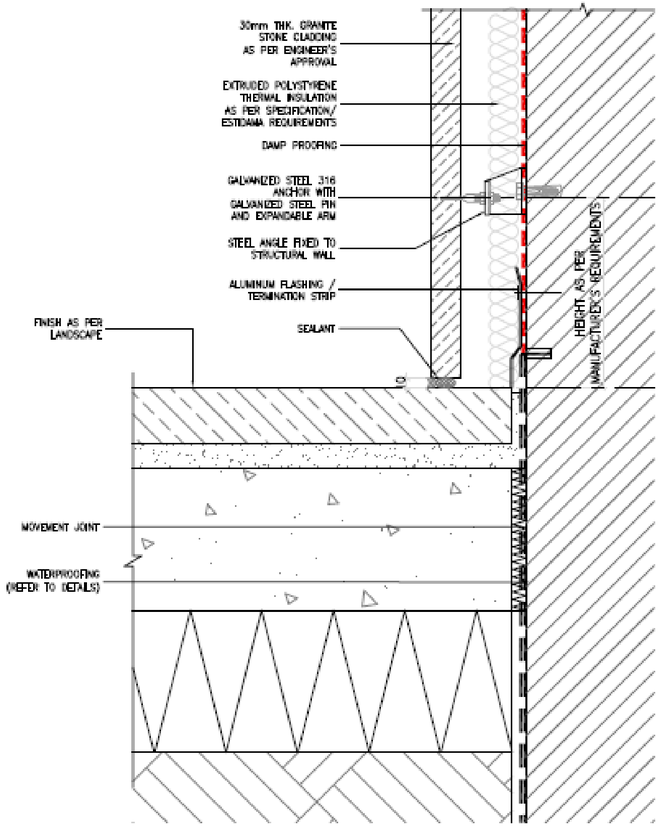
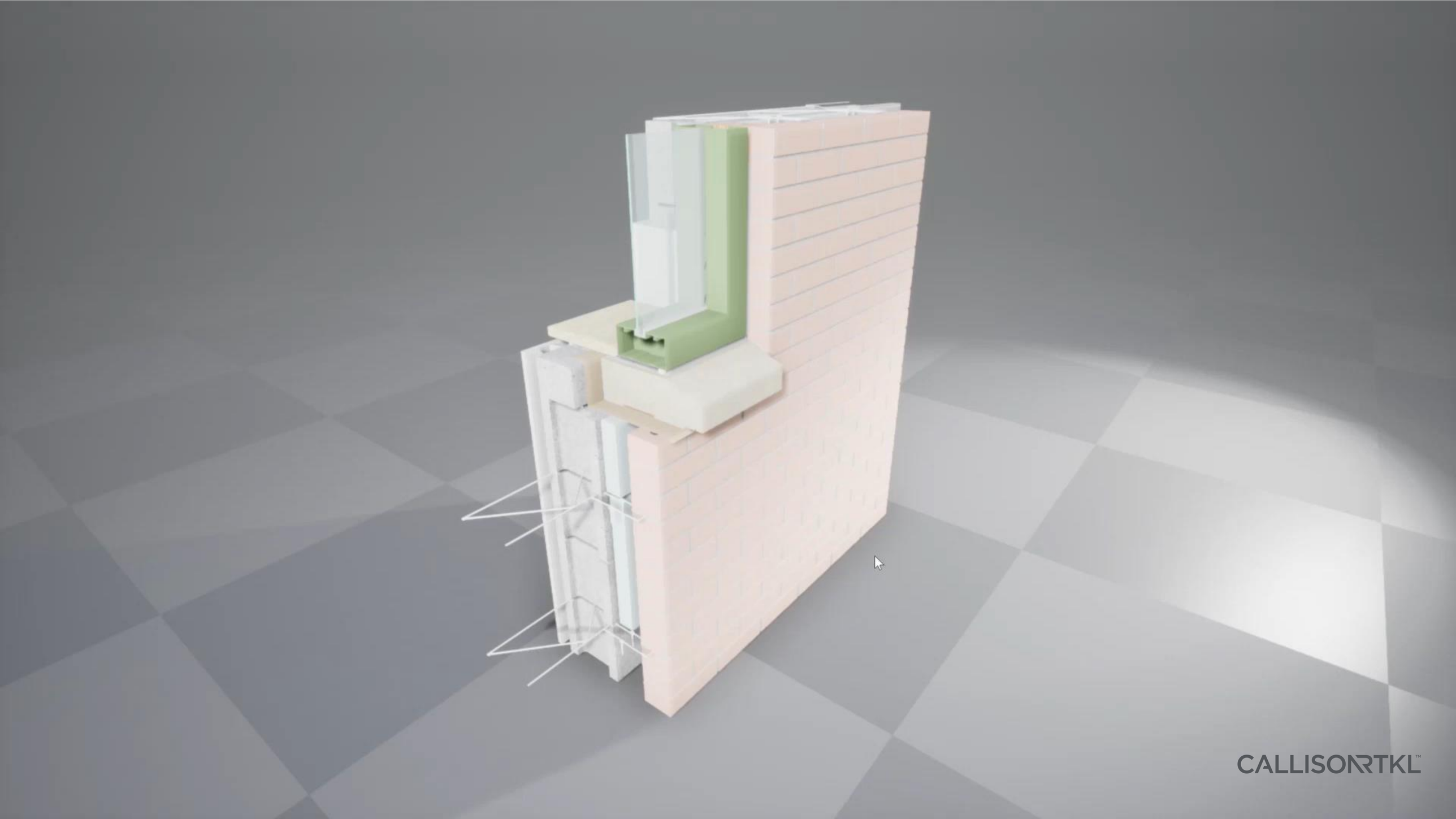
Design Exploration

Easy switching between different design options in context for clarity and understanding in design decisions.

Bridging the Knowledge Gap

Understanding projects and design comes easy to architects but guiding the client through this process helps them understand the impact of their decisions. This can range from large scale elements down to the small details on facades. The aim is collaboration between architect and client for a smoother more integrated approach to design.


30mm THK. GRANITE STONE CLADDING AS PER ENGINEER'S APPROVAL
EXTRUDED POLYSTYRENE THERMAL INSULATION AS PER SPECIFICATION/ ESTIDAMA REQUIREMENTS
DAMP PROOFING
GALVANIZED STEEL 316 ANCHOR WITH GALVANIZED STEEL PIN AND EXPANDABLE ARM
STEEL ANGLE FIXED TO STRUCTURAL WALL
ALUMINUM FLASHING / TERMINATION STRIP
SEALANT
FINISH AS PER LANDSCAPE
HEIGHT AS PER MANUFACTURER'S REQUIREMENTS
MOVEMENT JOINT
WATERPROOFING (REFER TO DETAILS)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Element Break-down

Interactive workshops with building elements allow for understanding of design elements and how they impact the construction.

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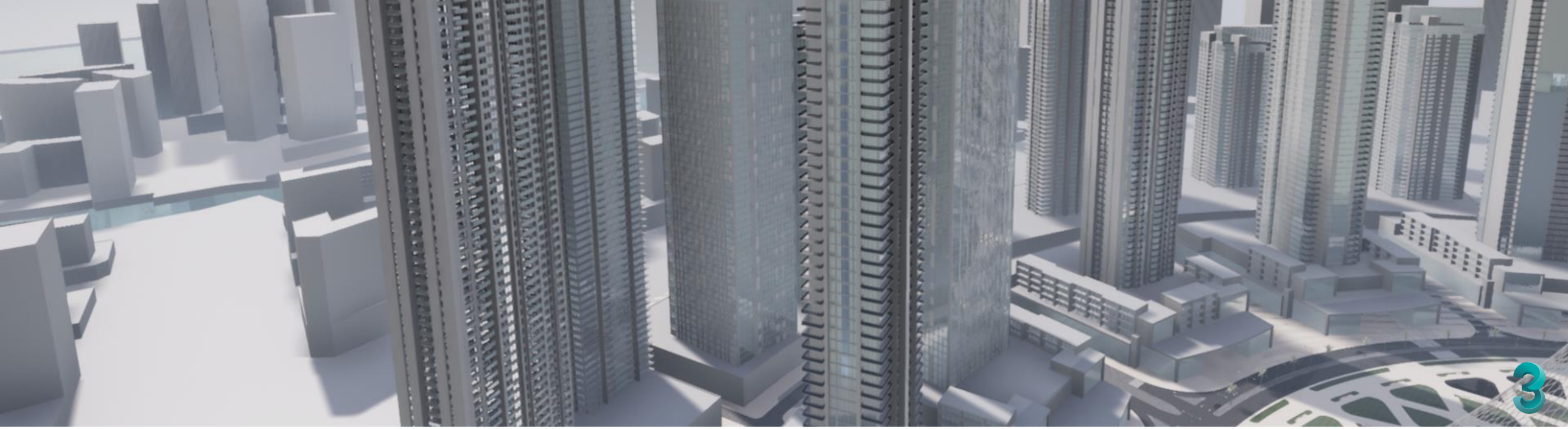
Learn Together

The way we understand architectural details are not just for the client but as much for the new generation of architects, these methods help young designers build and construct their ideas



Journey Together

Renders and walkthroughs are primary marketing tools in the industry. But these are snapshots of designs at particular points of time. These again come at the end of an experience and excludes the client from the journey to get there. Using XR tools and hardware such as VR and AR we can journey through the design together.

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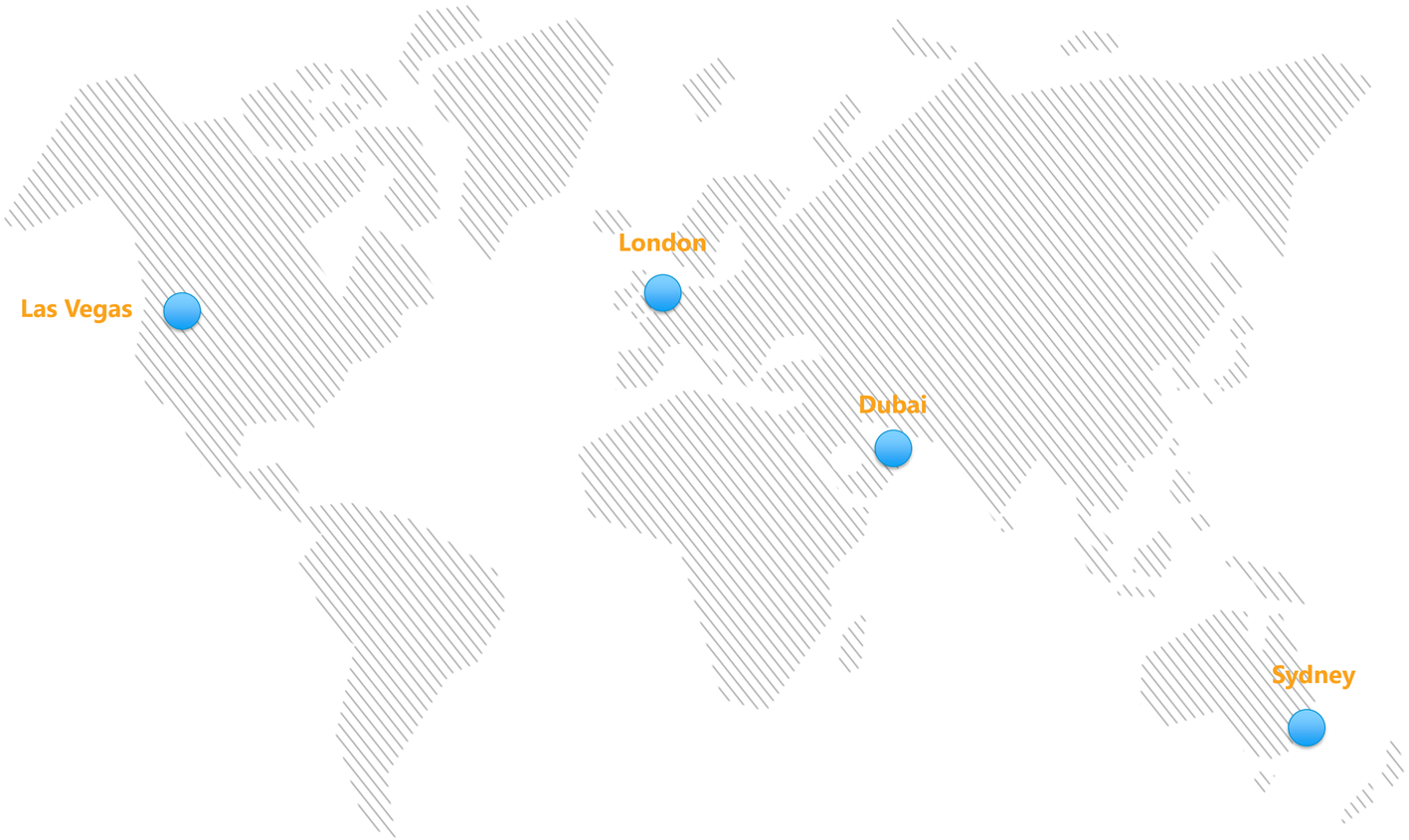
SUBLIME
CALLISONRTKL™



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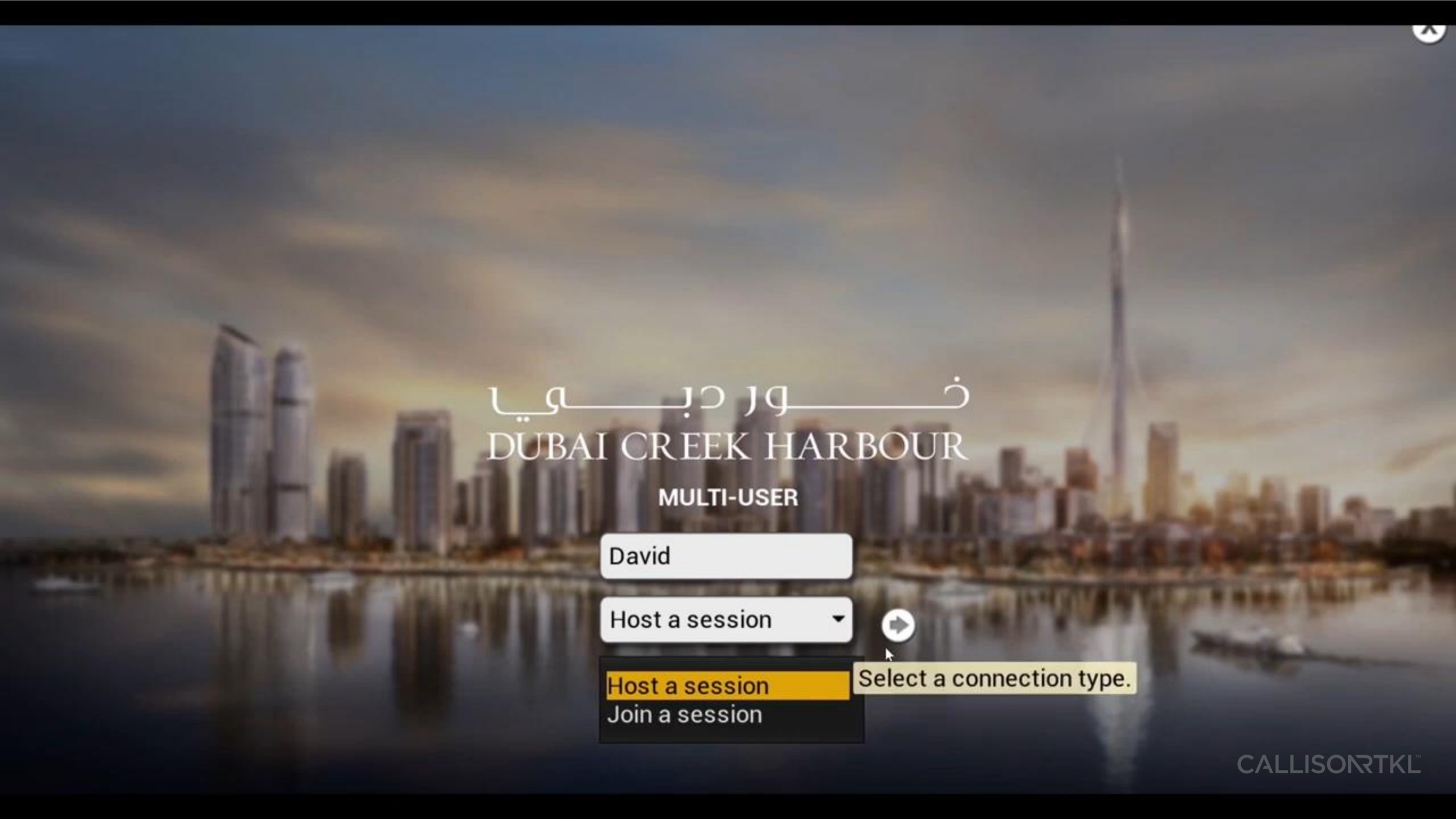
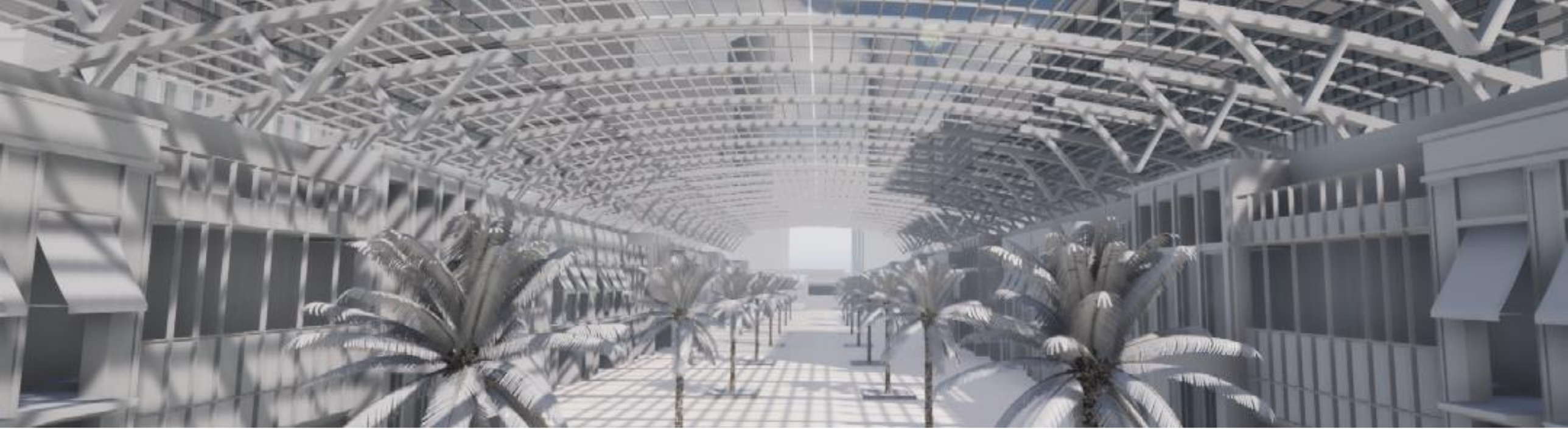

خور دبي
DUBAI CREEK HARBOUR
MULTI-USER
David
Host a session
Host a session
Join a session
Select a connection type.
CALLISONRTKL

CALLISONRTKL™

David
CALLISONRTKL

The Architect, the Client and **The Game Engine**

- Easy Transition
- Templates and Widgets
- People and Materials
- Navigation

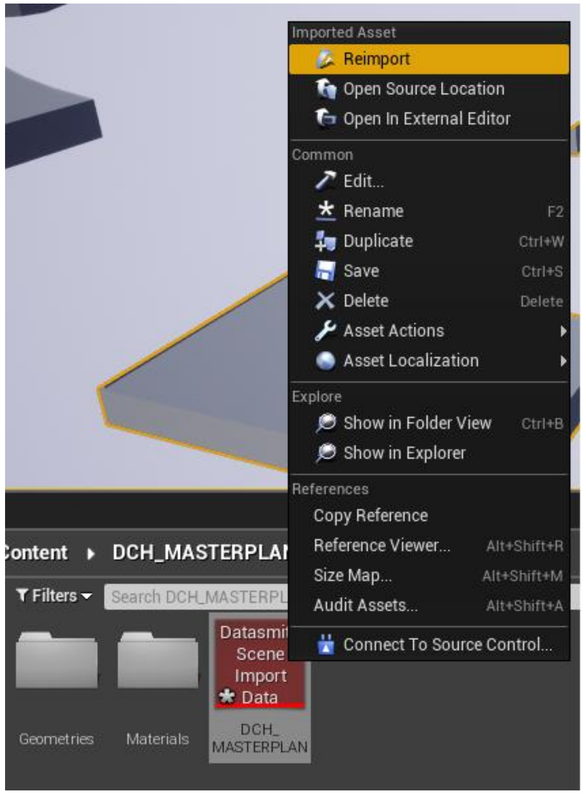


Easy Transition

Because of the nature of the job within architecture and urban planning, nothing stays still for very long, with multiple design options, changes to existing plans, alterations, it can be quite tough to stay on top of your unreal model. Datasmith does help manage these changes however it is important to be careful on how you do this, choosing incorrectly can mean having to reapply textures, materials, collision mapping all over again.

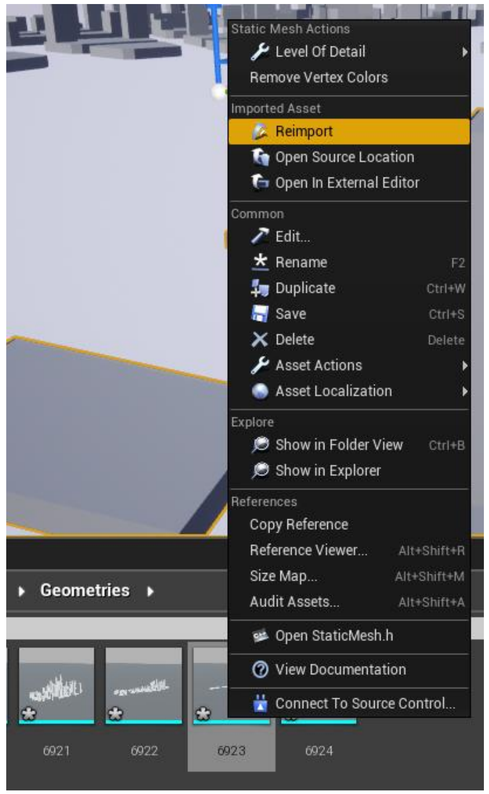
Re-imports

The two options you have when updating an existing data smith file are a full Import or a partial import. Depending on the scope of change this will dictate which action would be most appropriate.



Full Reimport

- You need to bring in new objects or materials from your source scene which did not exist previously in Unreal.
- The layout of the scene objects in 3D space has changed, or objects have new parenting relationships.



Reimport Asset

- When you want to import changes to a small number of known assets without disturbing the scene.
- You wish to apply different Datasmith import settings to particular assets

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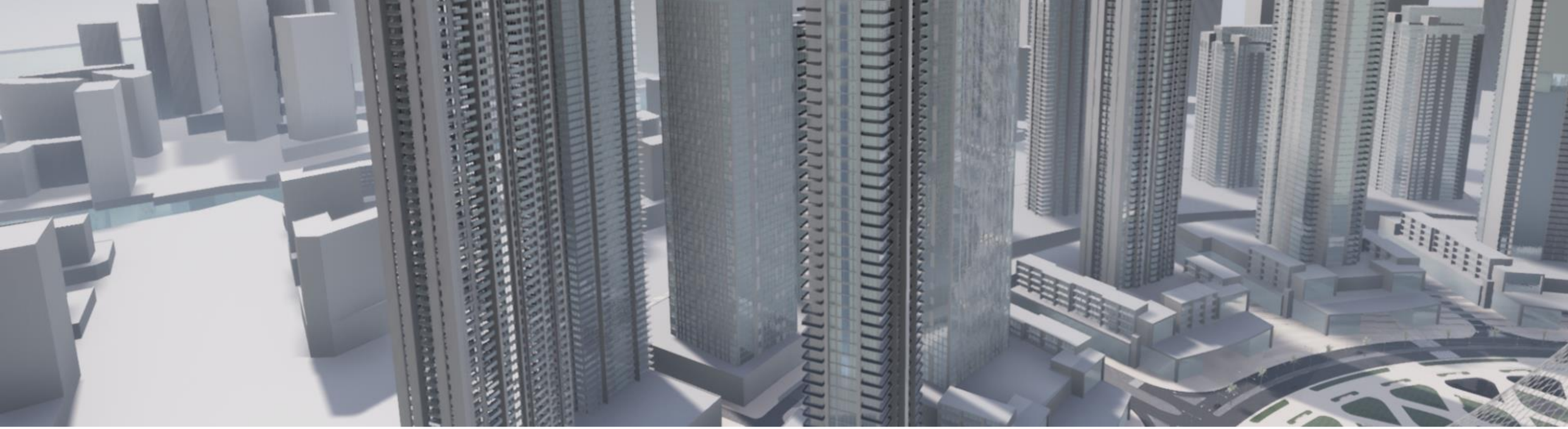

Templates and Widgets

As seen previously experiences have to built for easy of use and to maximize the time the client has within the model and design. Simple navigation methods can be set up as a template that allow for easy transition from the introduction of a project to making sure the client sees exactly what they need to see to allow for a beneficial interaction. Simple widget tools can allow for this.

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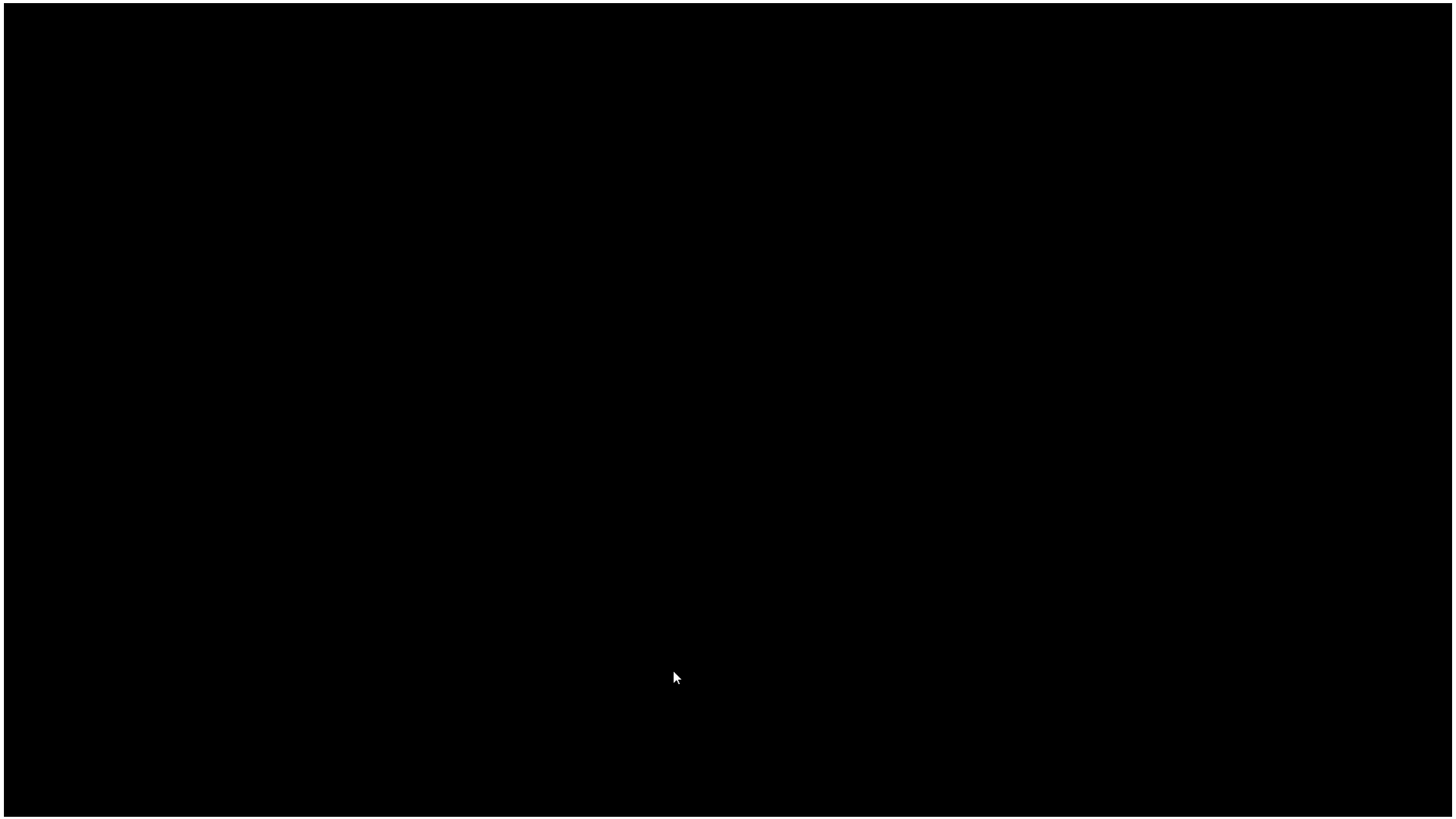

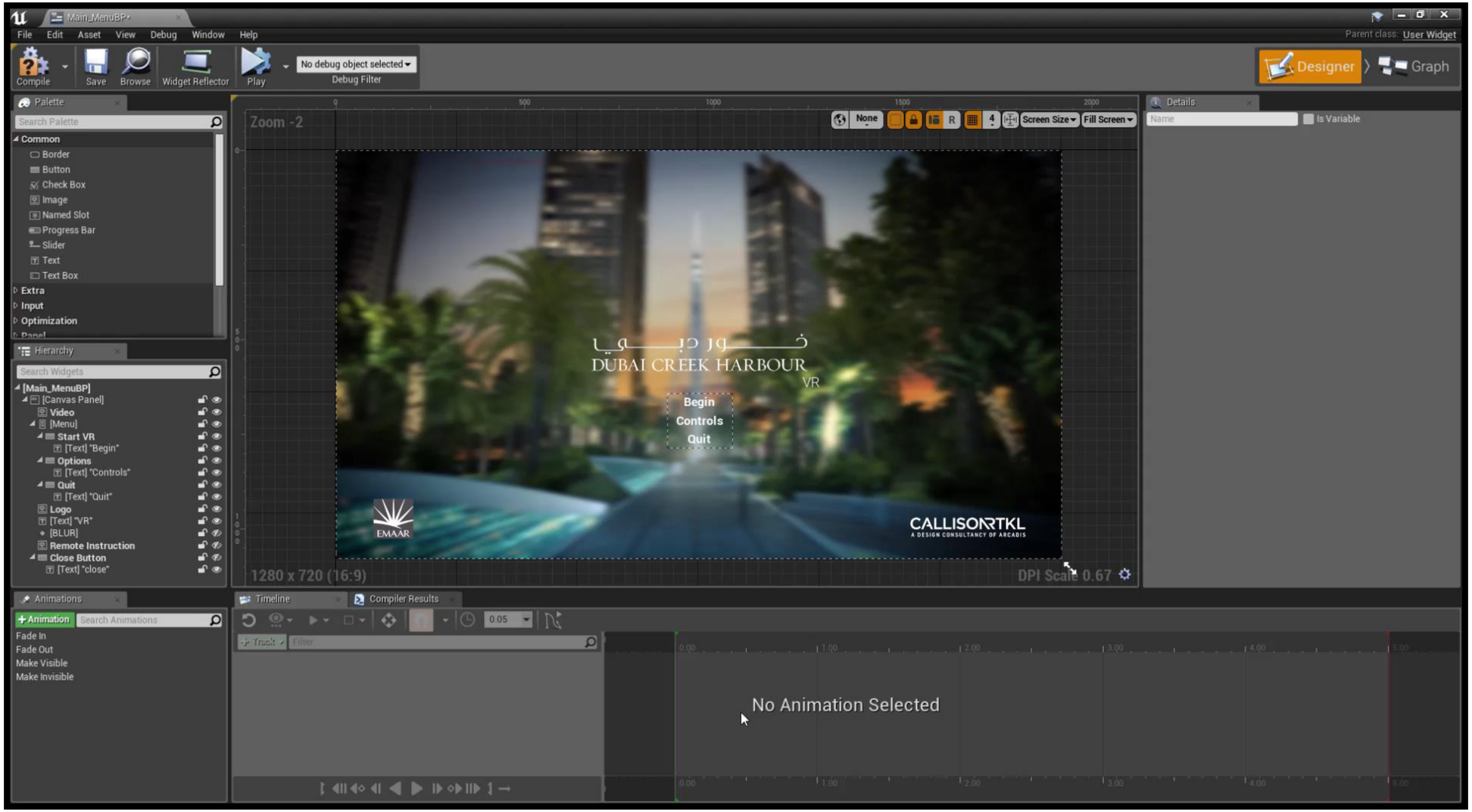

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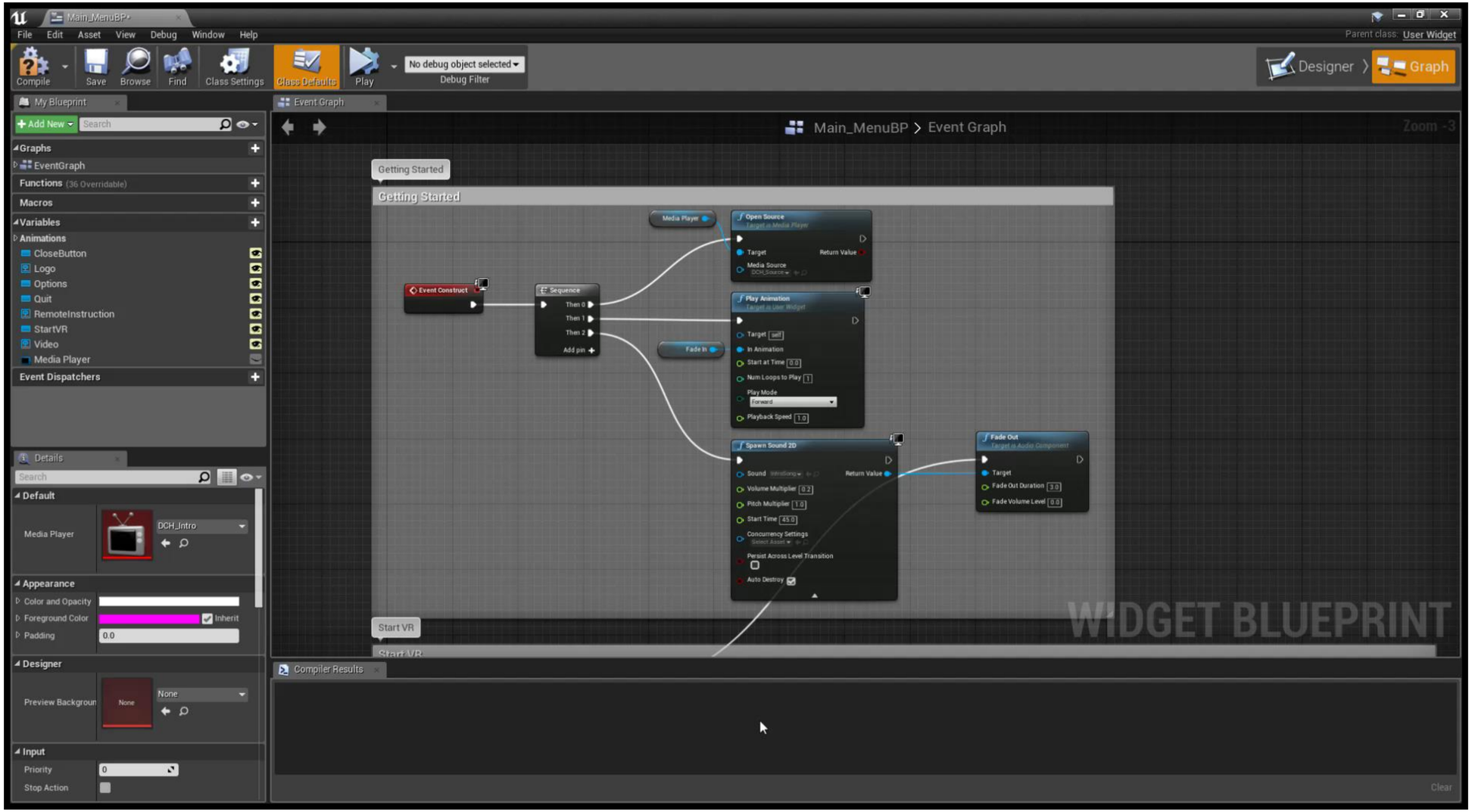

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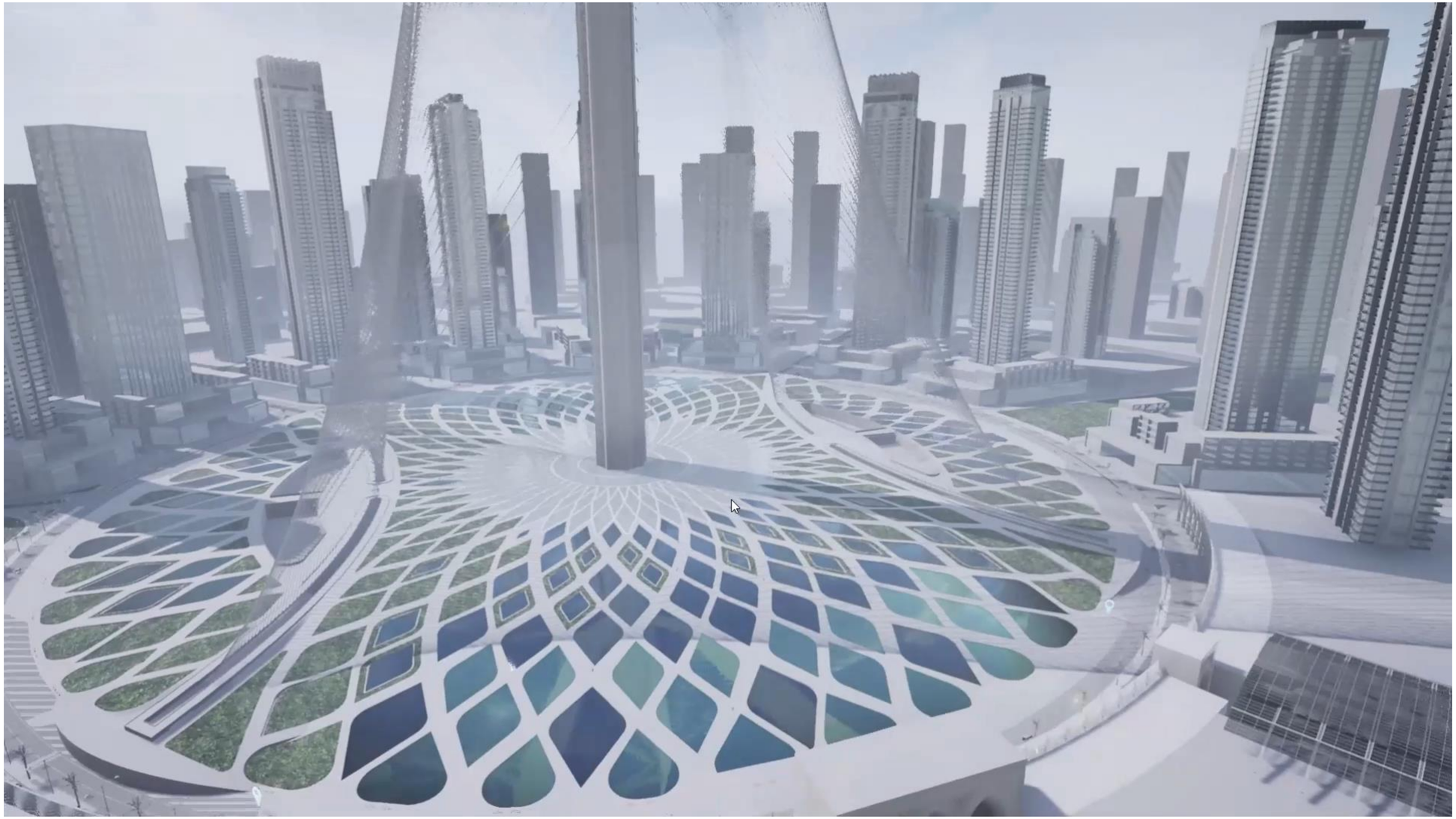

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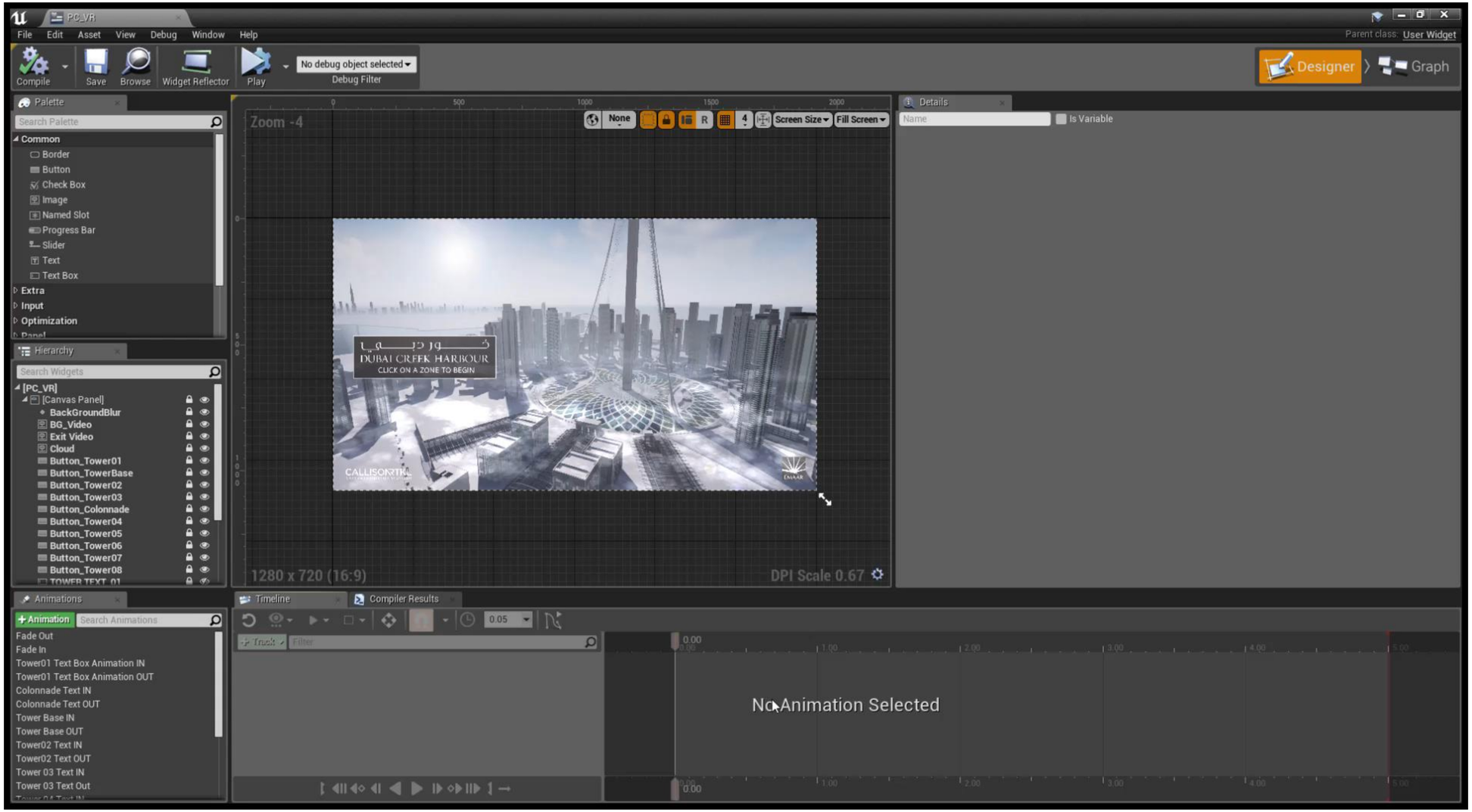

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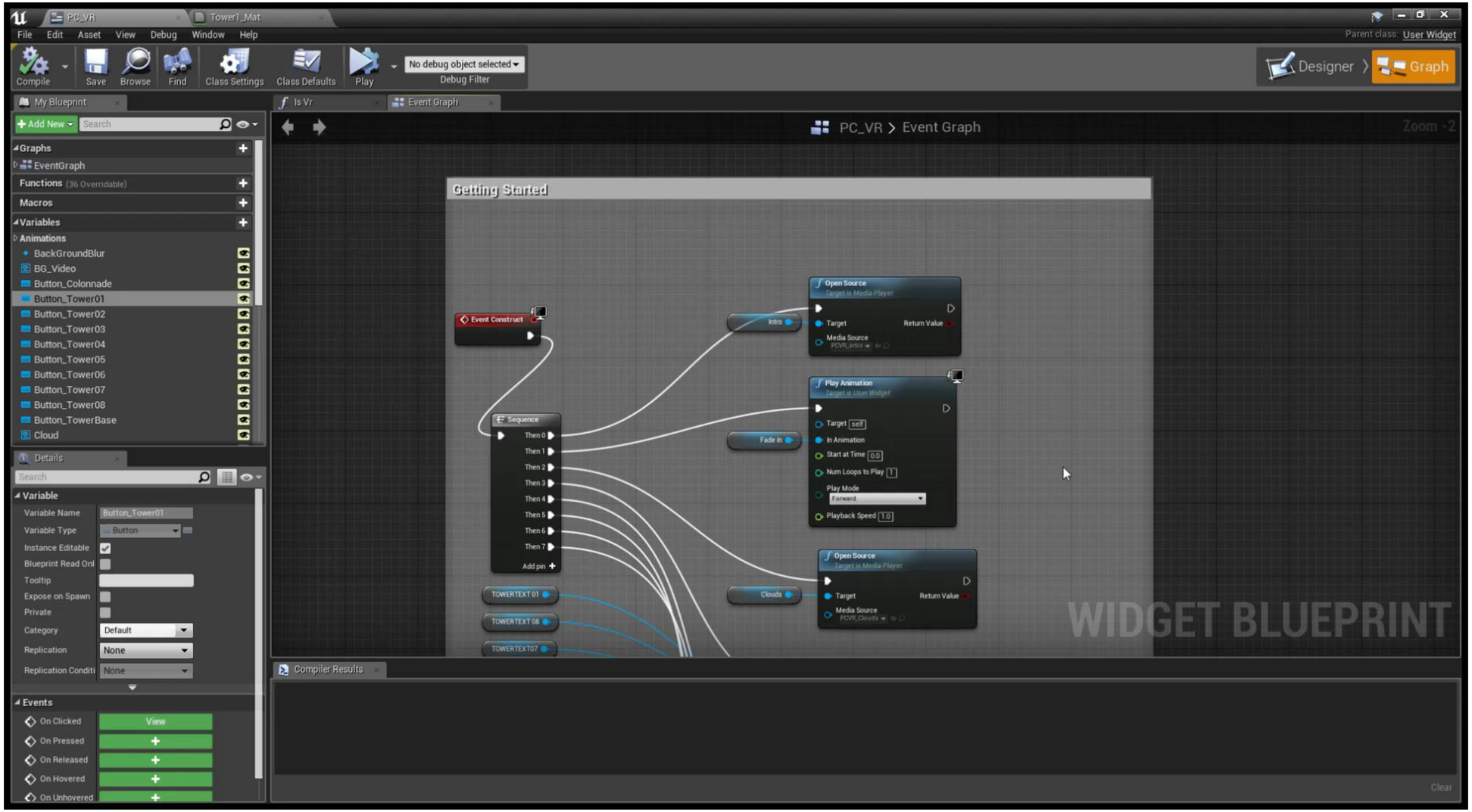

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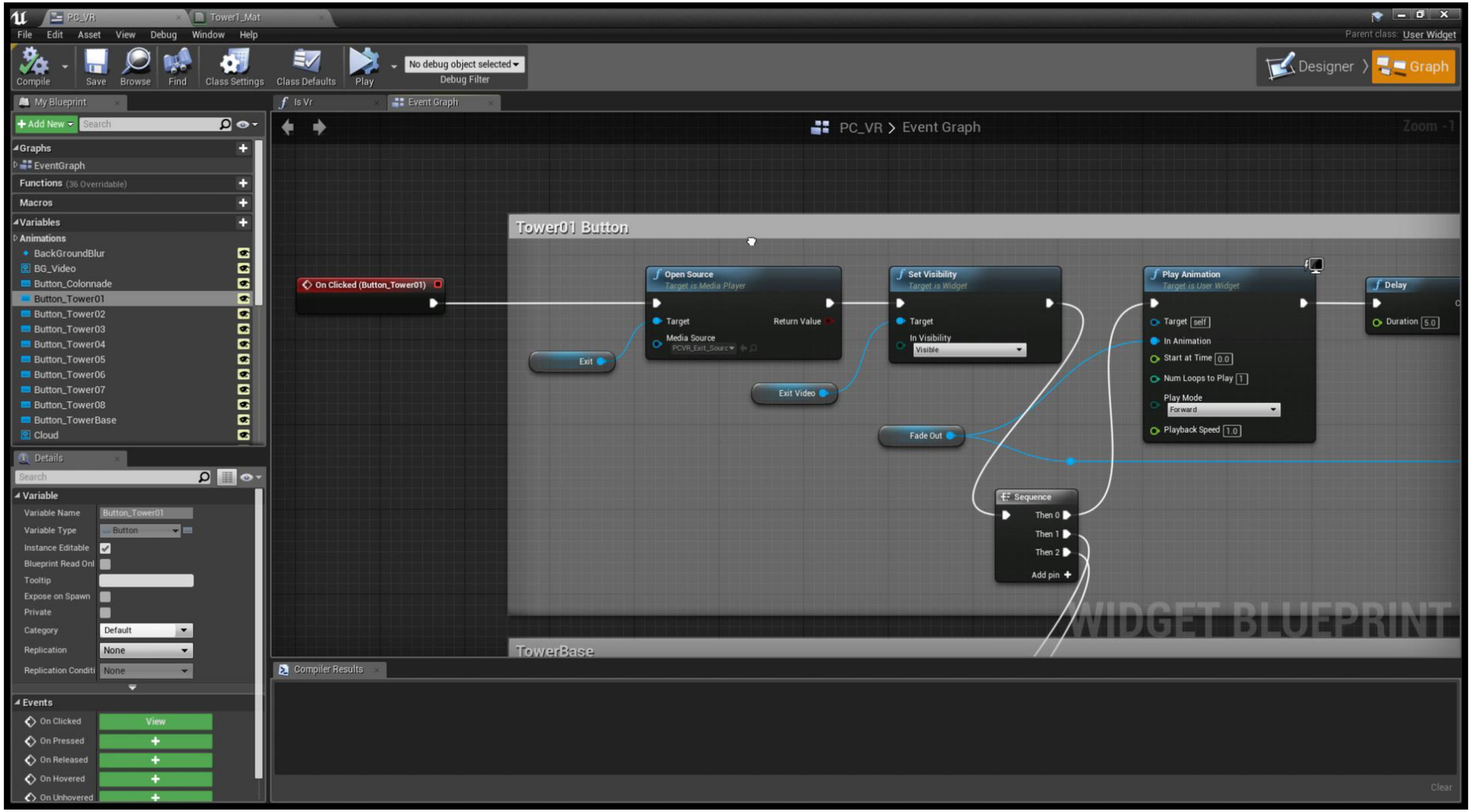

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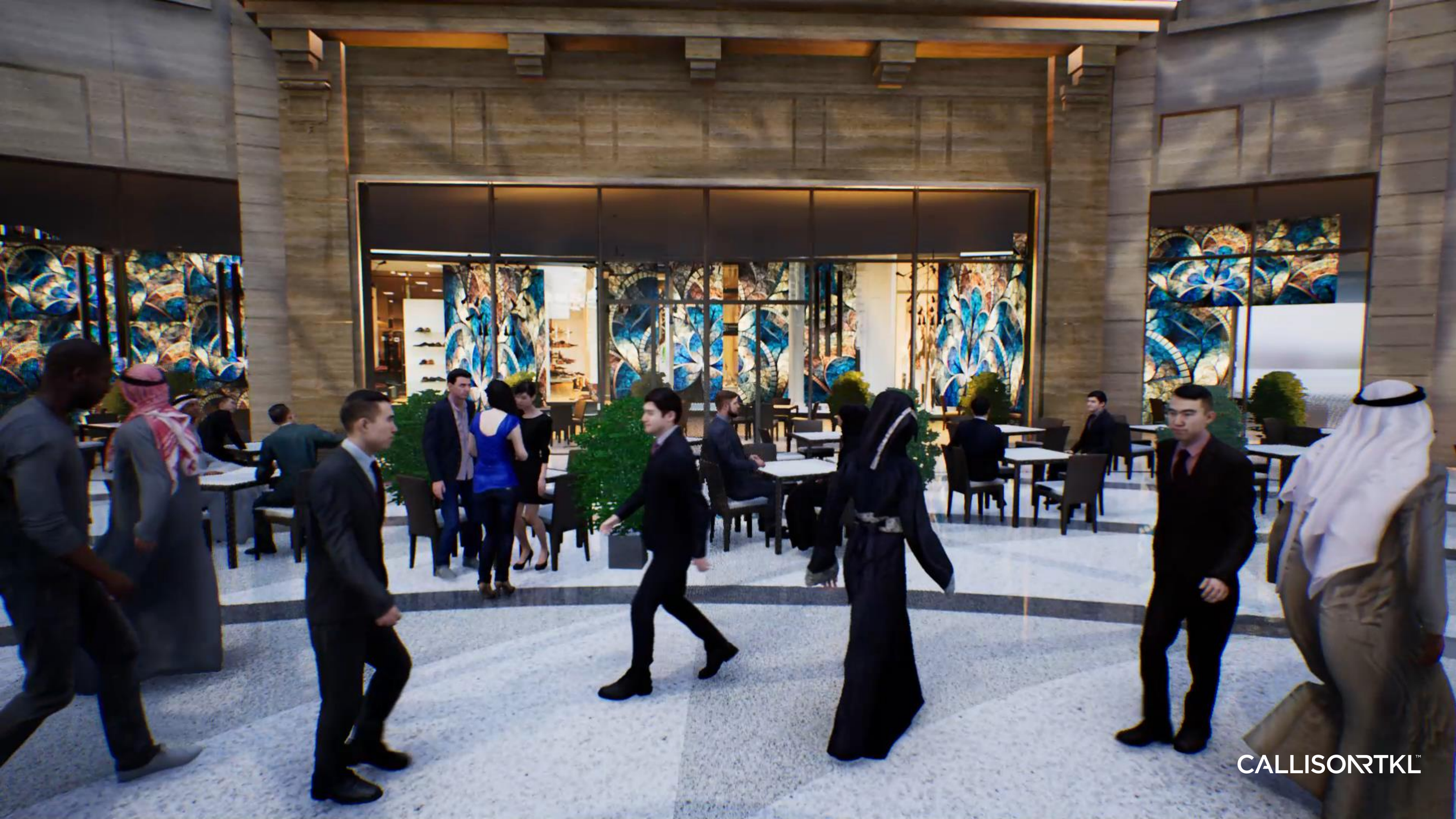
People and Materials

One of the favorable aspects of Unreal over other products on the marketplace such as Enscape, is the ability to animate the scene, and bring life to an otherwise abandoned empty experience. A.I. people also are a great mechanism to emphasis scale in RTR environments, a reference point that otherwise could seem skewed. Similar to what we've seen previously, we had to decide in the early planning stages between fully textured people or basic.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This is Eric…

- We can animate them using very simple steps in Unreal;
- Users reaction to fully textured is varied, from favorable to alarming;
- It keeps focus on the elements of the model you want to showcase;
- We can control the poly counts on our own models and even apply LOD’s to our characters.
- Downloaded content can be very heavy in addition to the movements being very static and on a loop.

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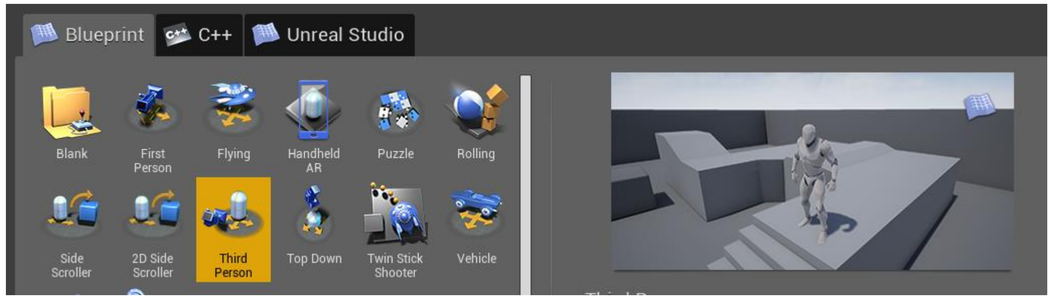
Simple Animation

If you are new to Unreal, or unfamiliar with Third Person Movement and animation, there is a great template to assist you to develop the knowledge required. That Provides:

- Unreal Robot Skin
- Unreal Skeletal Mesh pre-mapped to skin
- Preset animations such as walk, run and jump



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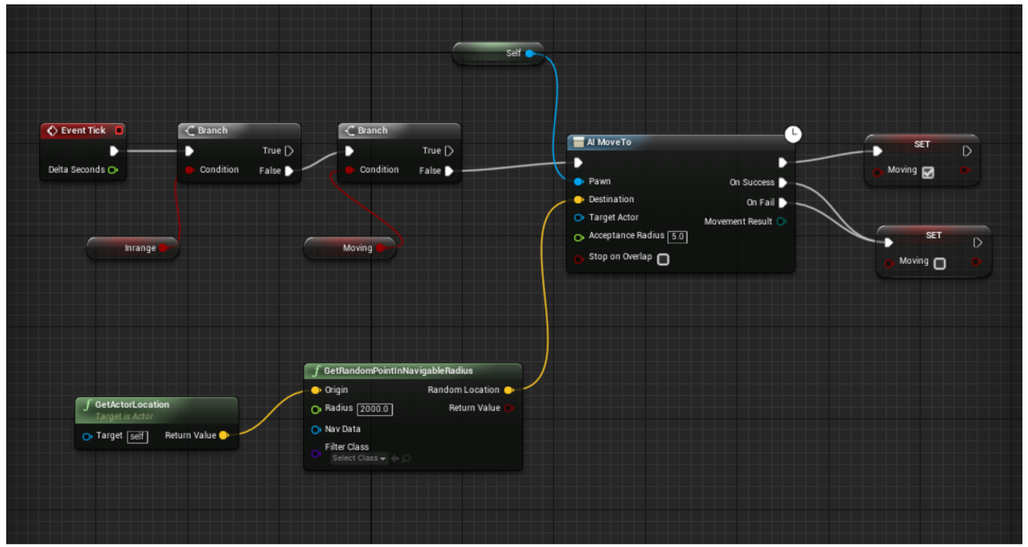
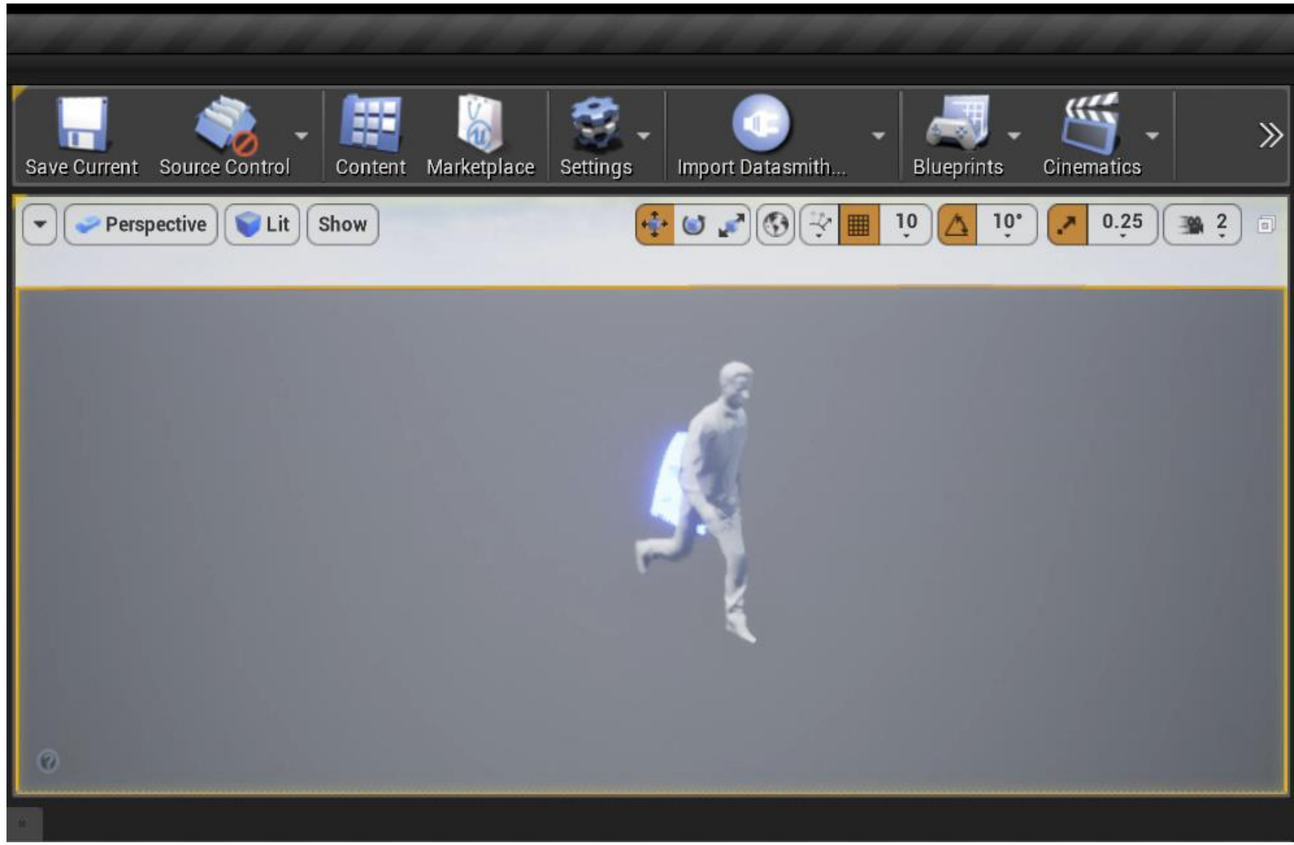
Simple Animation

We want the character not to walk on a loop, from point A to Point B, but instead wander randomly about our scene. This allows us to install them, and then leave them to their own devices, as we focus on other aspects.





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Navigation and Haptics

What if we don’t want to return to menu to select our next destination? What if it is a short 100m away, that we want to teleport to it? Or, another floor with a better view? We’ve experimented with numerous options to develop a way to signify to users, that they can teleport to a location. In the end, we settled on needing to make it large enough to see from a distance, as well as a recognizable logo. So, we looked to the classic directional pin for inspiration.

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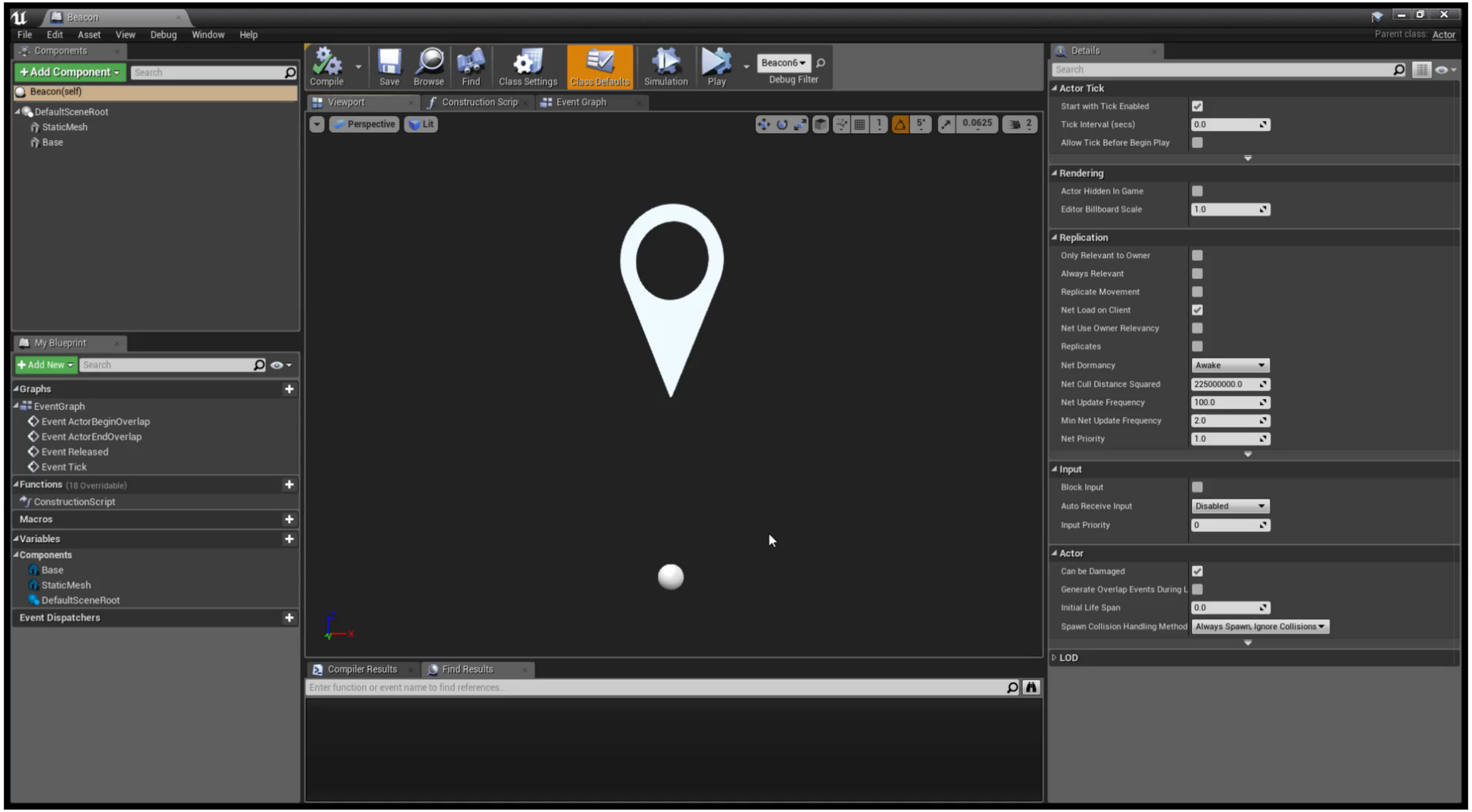

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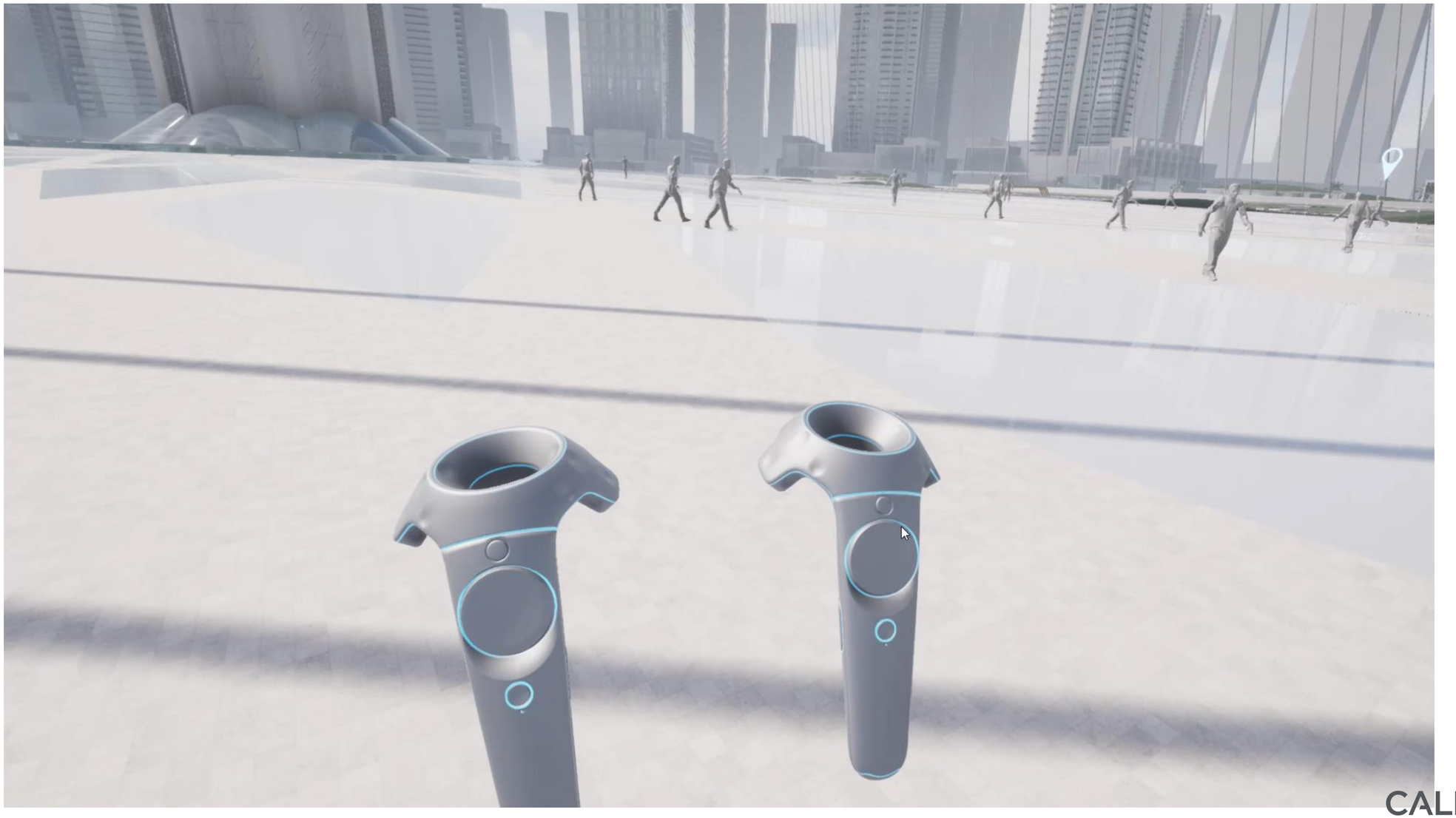
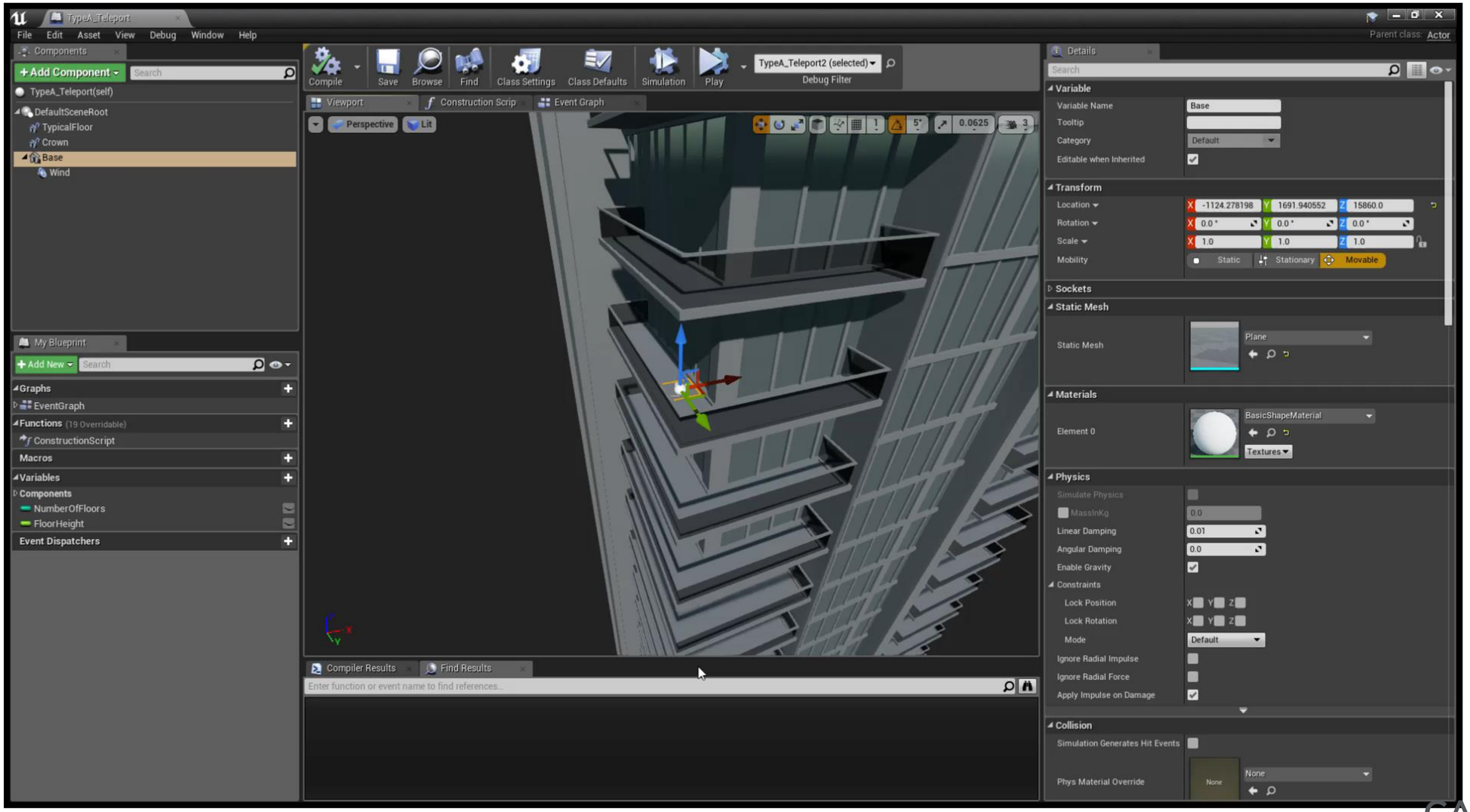
Points of Interest

A complication we discovered when endeavoring to show certain points of interest to the client, is the ability to achieve the exact desired view. For in RTR environments an VR it is all too easy to wander in a wrong direction, or to look at something from a poor vantage point. Another challenge is, although the location markers work for short range teleportation, they aren’t the ideal option to show the client a view of a tower in the distance. When returning to the zone selection or flying over, are not great options; we looked at using entire buildings as hotspots for teleportation.

Building Teleporting



Building Teleporting

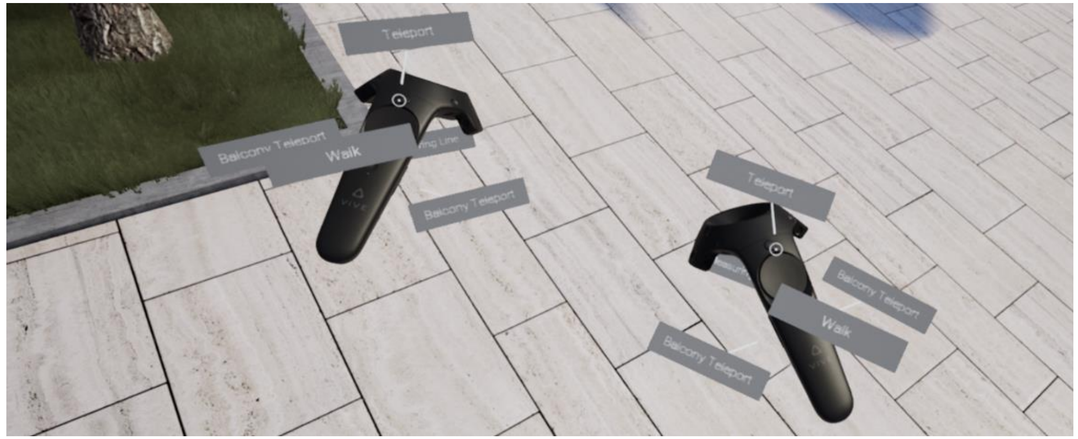


Controls

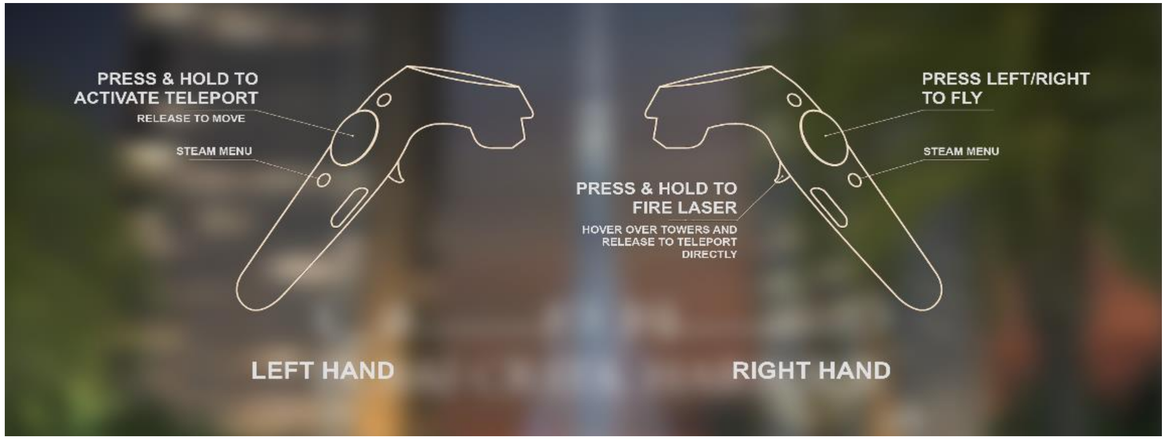
Overly complicated functions and application results in the experience being less fun and less intuitive. In one simulation that we tried, we used the series of buttons on the motion controller to guide the user to different views. However, those who have tried to explain to new users where the ‘grip buttons’ are on an HTC Vive are, will know the frustration of trying to tell a seamless story.

Keep it Simple

Complex



Simple



It’s rare in master planning VR, that you’re picking up and throwing furniture about, opening doors or pressing buttons. So, keeping it simple to navigate, will make the experience a lot more consistent which ultimately aids your goal of the VR experience being easy and educational.

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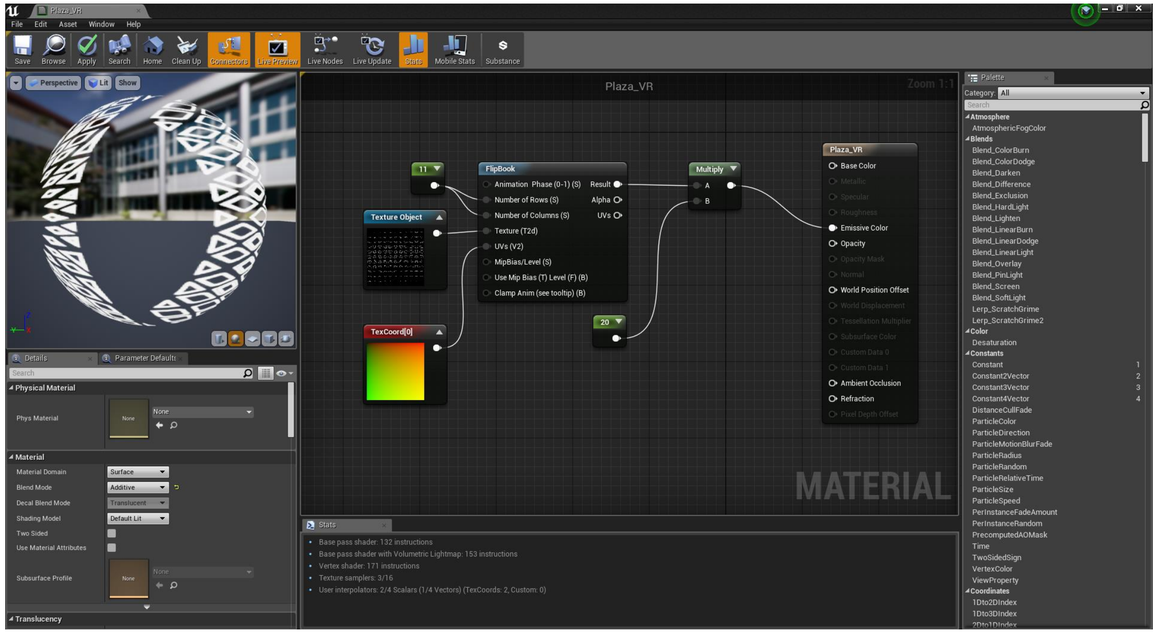
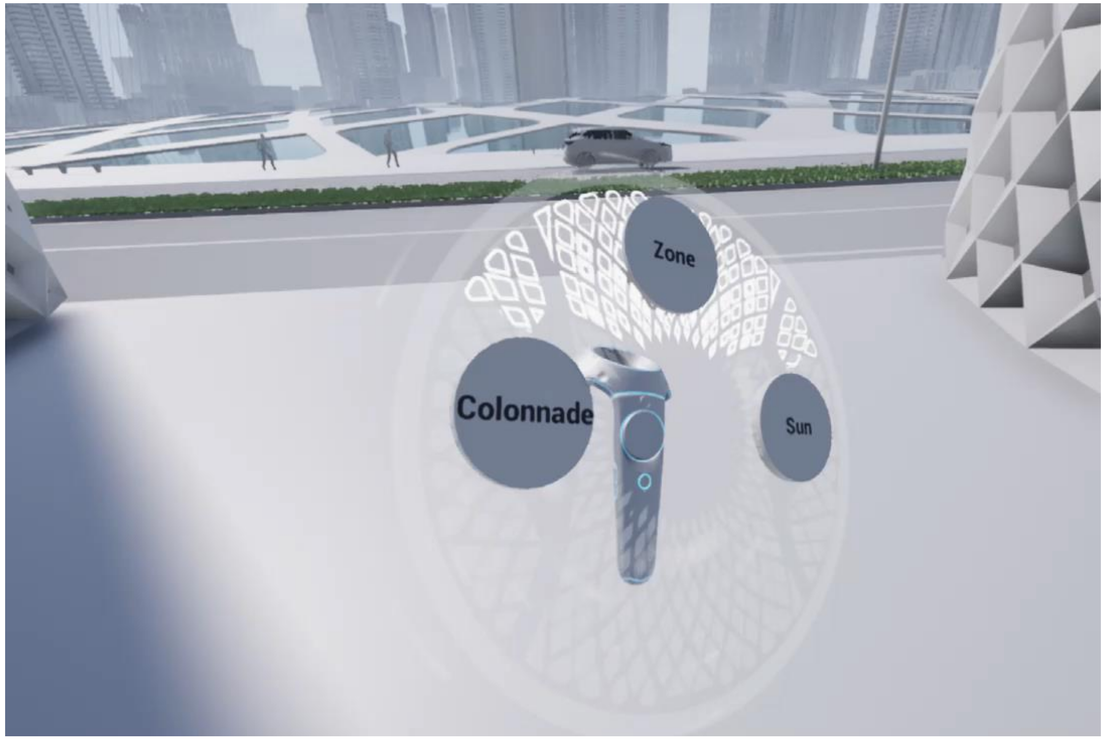
VR Watch example





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Summary

The Architect, The Client and The Game Engine

- Easy Transition
- Templates and Widgets
- People and Materials
- Navigation and Haptics.

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Real Time Ready
at any time

What can we do to refine our workflow to achieve the best results in the shortest amount of time

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"You can't go back and **change** the beginning, but you can start where you are and **change** the ending."

-C.S.Lewis

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