



Unreal Fest 2024 Seoul

Unfeatured Features of Unreal Engine 2024

Chris Murphy
Senior Technical Artist
Epic Games

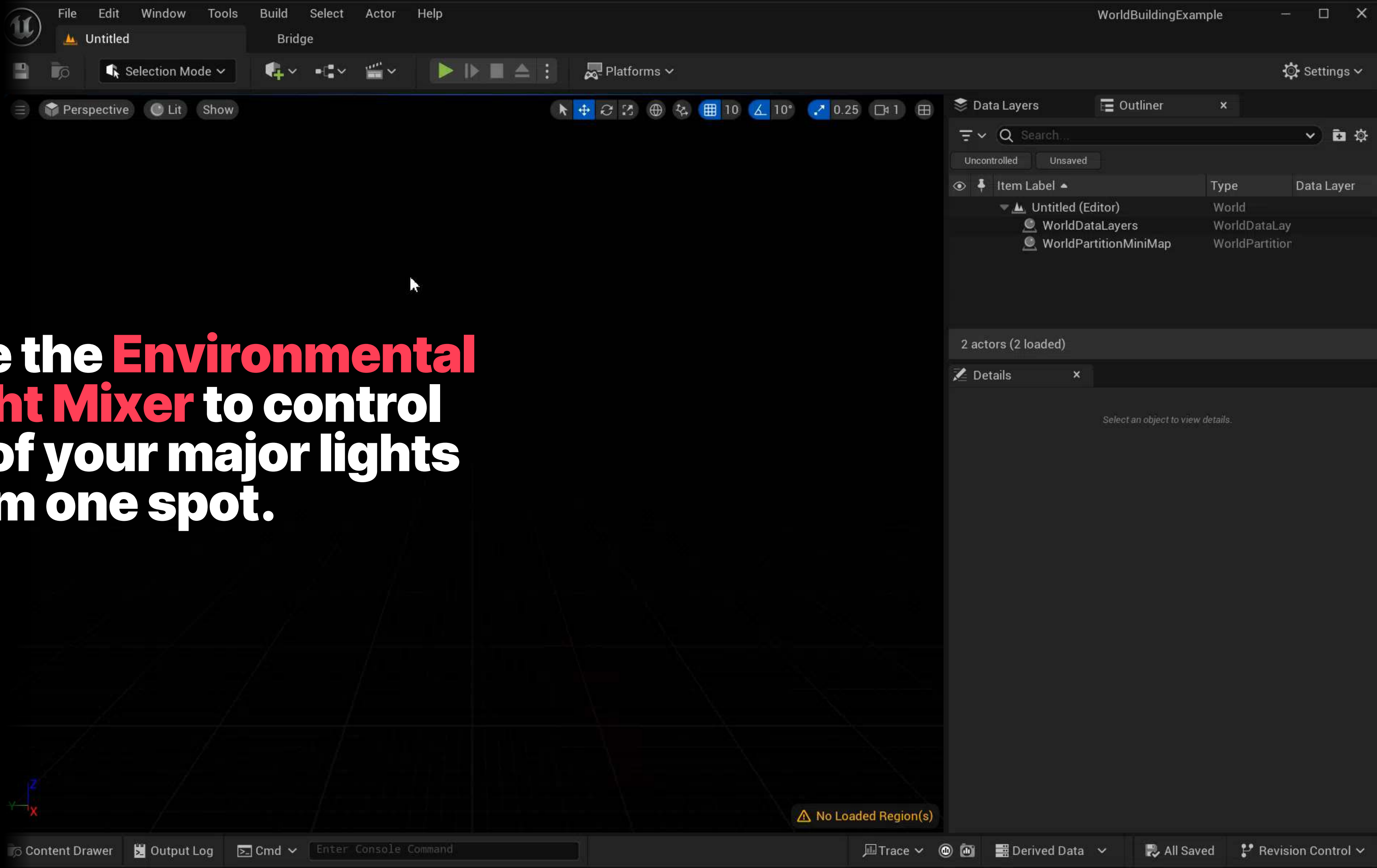
What is this talk?

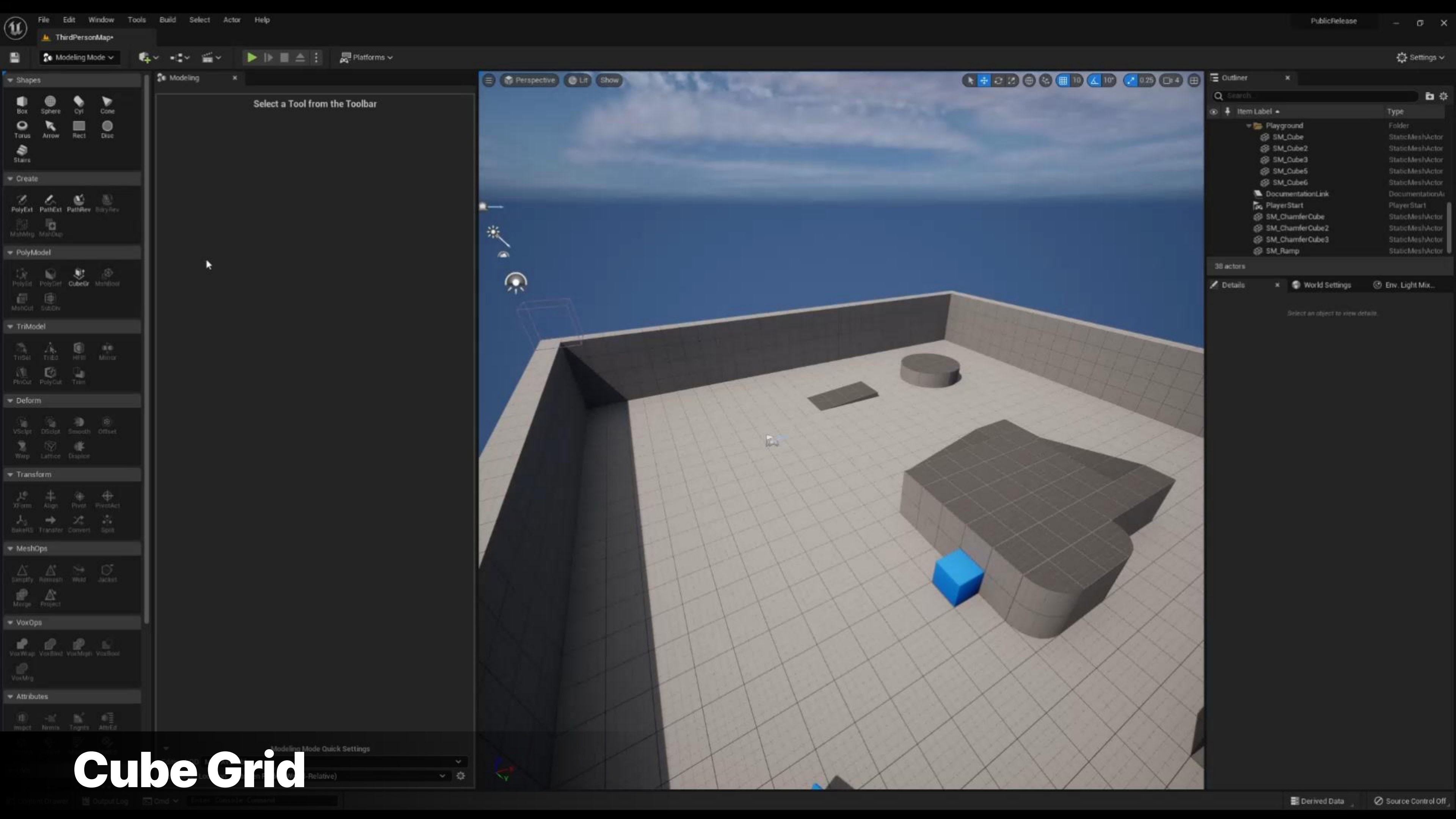
Highlight reel of features and tips that developers often don't know about.

Scene Construction

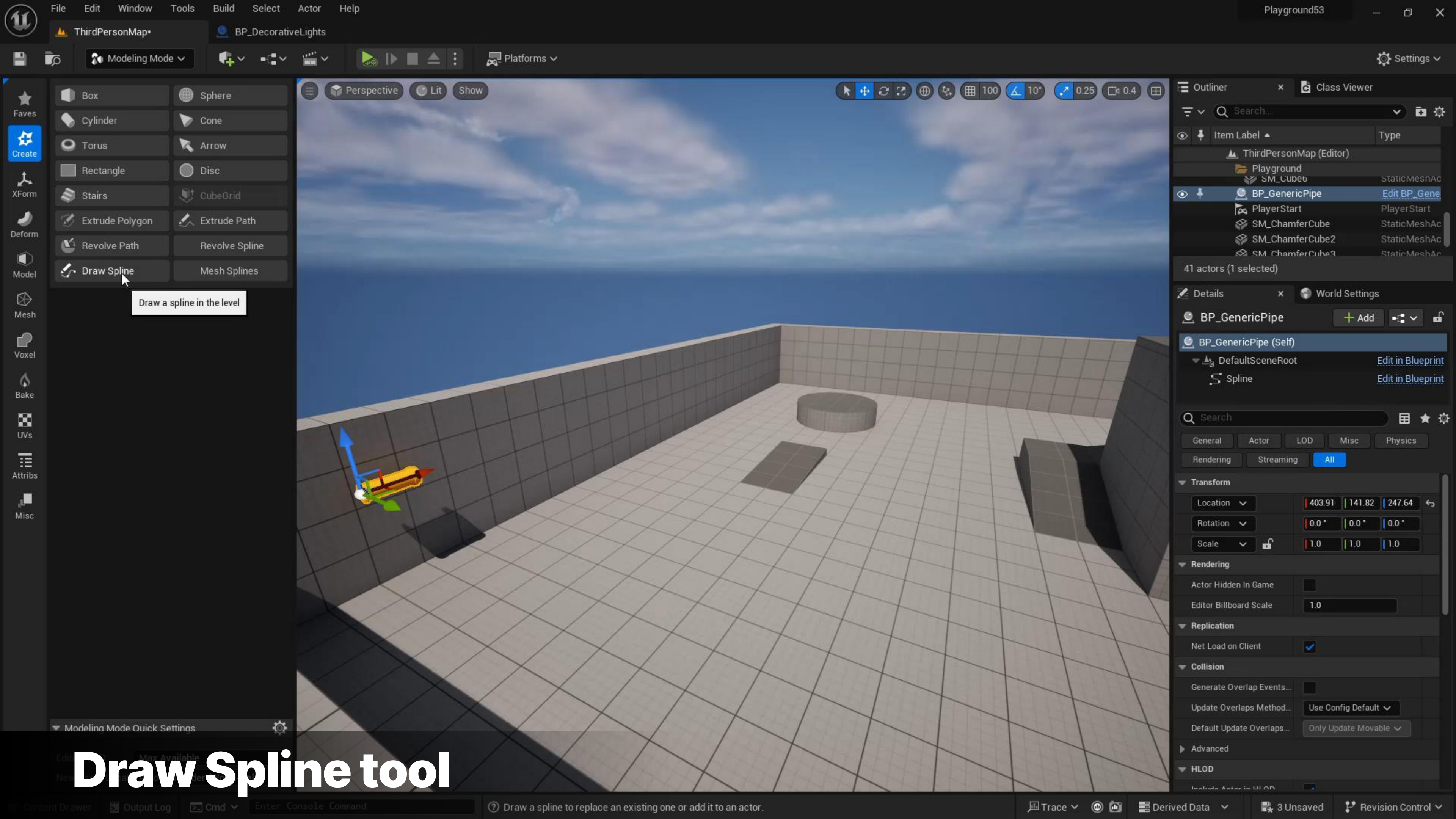


Use the **Environmental Light Mixer** to control all of your major lights from one spot.





Cube Grid



Draw Spline tool

Draw a spline to replace an existing one or add it to an actor.

Landmass Erosion



Navigation and tool icons: Move, Rotate, Scale, Zoom, Grid, 10, 10°, 0.25, 2.5, and a warning icon with '1'.

Outliner | Levels

Search...

Uncontrolled | Unsaved

Item Label	Type
Environment (Editor)	World
DirectionalLight	DirectionalLight
ExponentialHeightFog	ExponentialHeightFog
LandmassBrush_Erosion	Edit LandmassBrush
LandmassBrushManager	Edit LandmassBrush
Landmass_PreviewLandscape	Edit Landmass_Prev
LandmassBrush_TextureStamp	Edit LandmassBrush
Landscape	Landscape
PCG_DemoForest	PCGVolume
PCGWorldActor	PCGWorldActor
Rock_Assembly_01	LevelInstance
SM_FernB_00 (Unloaded)	StaticMeshActor
SM_FernB_1 (Unloaded)	StaticMeshActor
SM_FernB_2 (Unloaded)	StaticMeshActor

73 actors (1 selected)

Details | World Settings | Env. Light Mixer

LandmassBrush_Erosion

LandmassBrush_Erosion (Self)

- Root Component (RootComponent) Edit in C++
- Landscape ISMC Edit in Blueprint

Search

Is Simulation Done

Particle Render Mat

Component Res

Render Targets

MIDs

Erosion Settings

Erosion Keyframes 8 Array elements

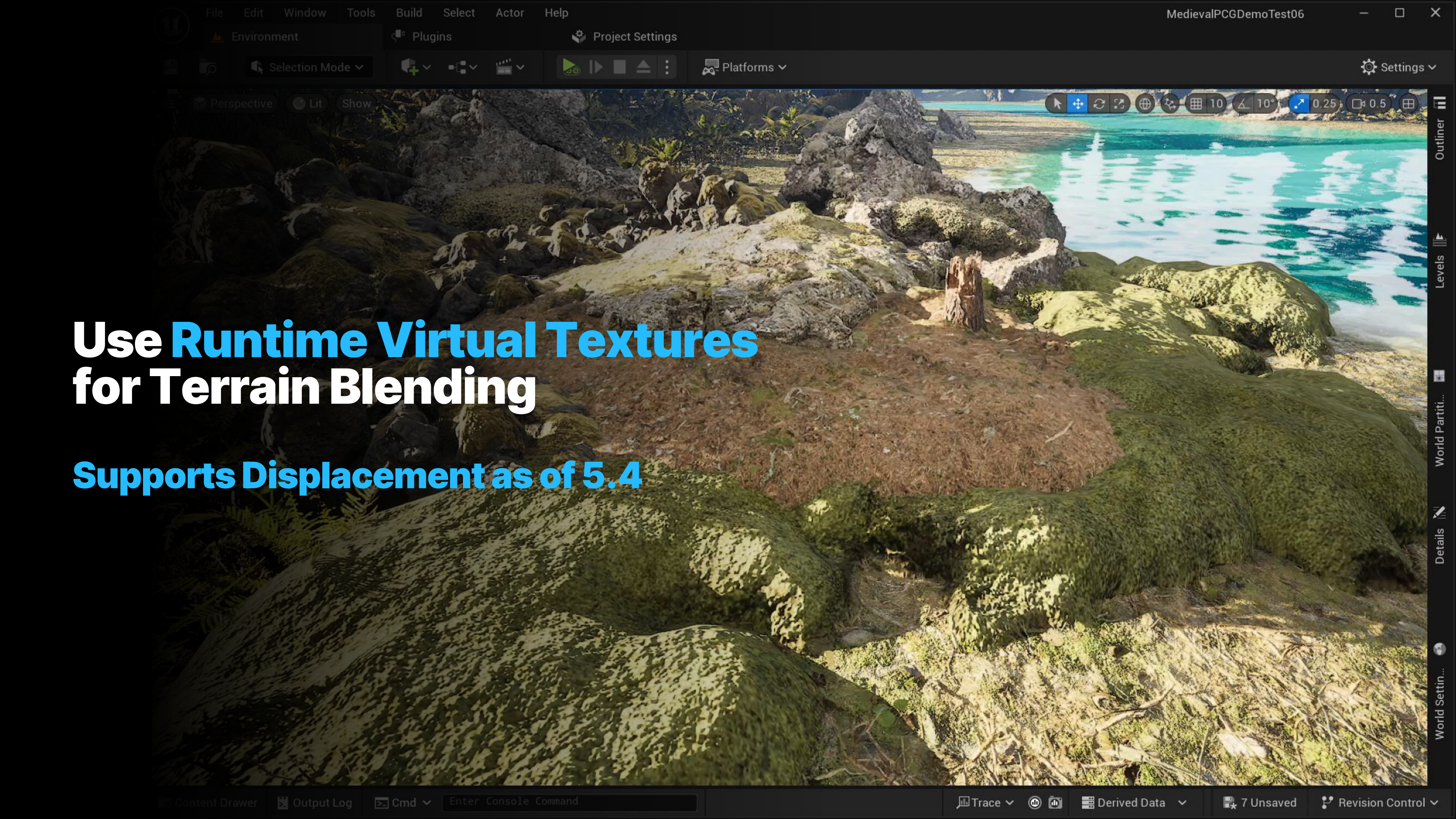
Mask

Iterations Per Tick

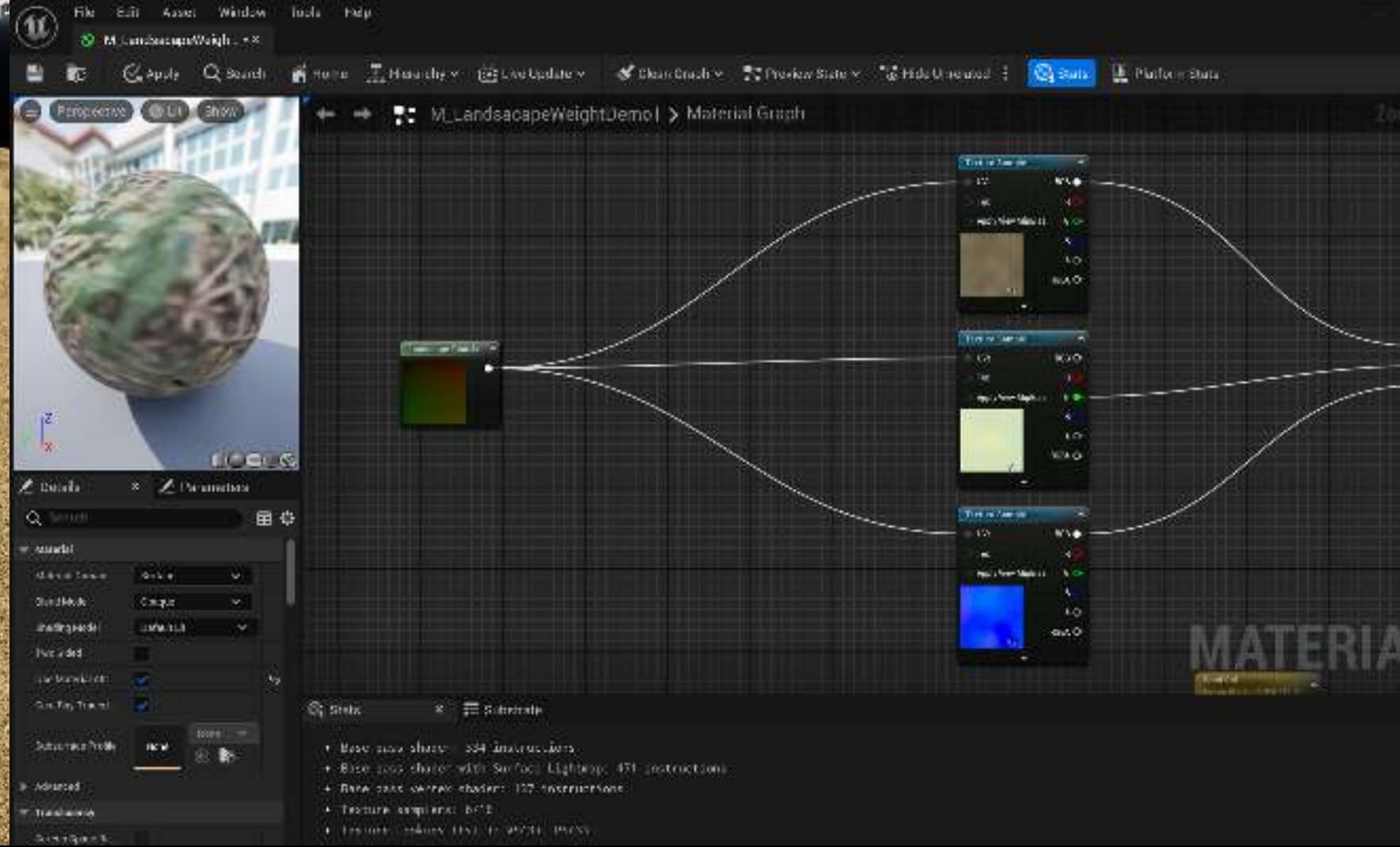
Export

Use **Runtime Virtual Textures** for **Terrain Blending**

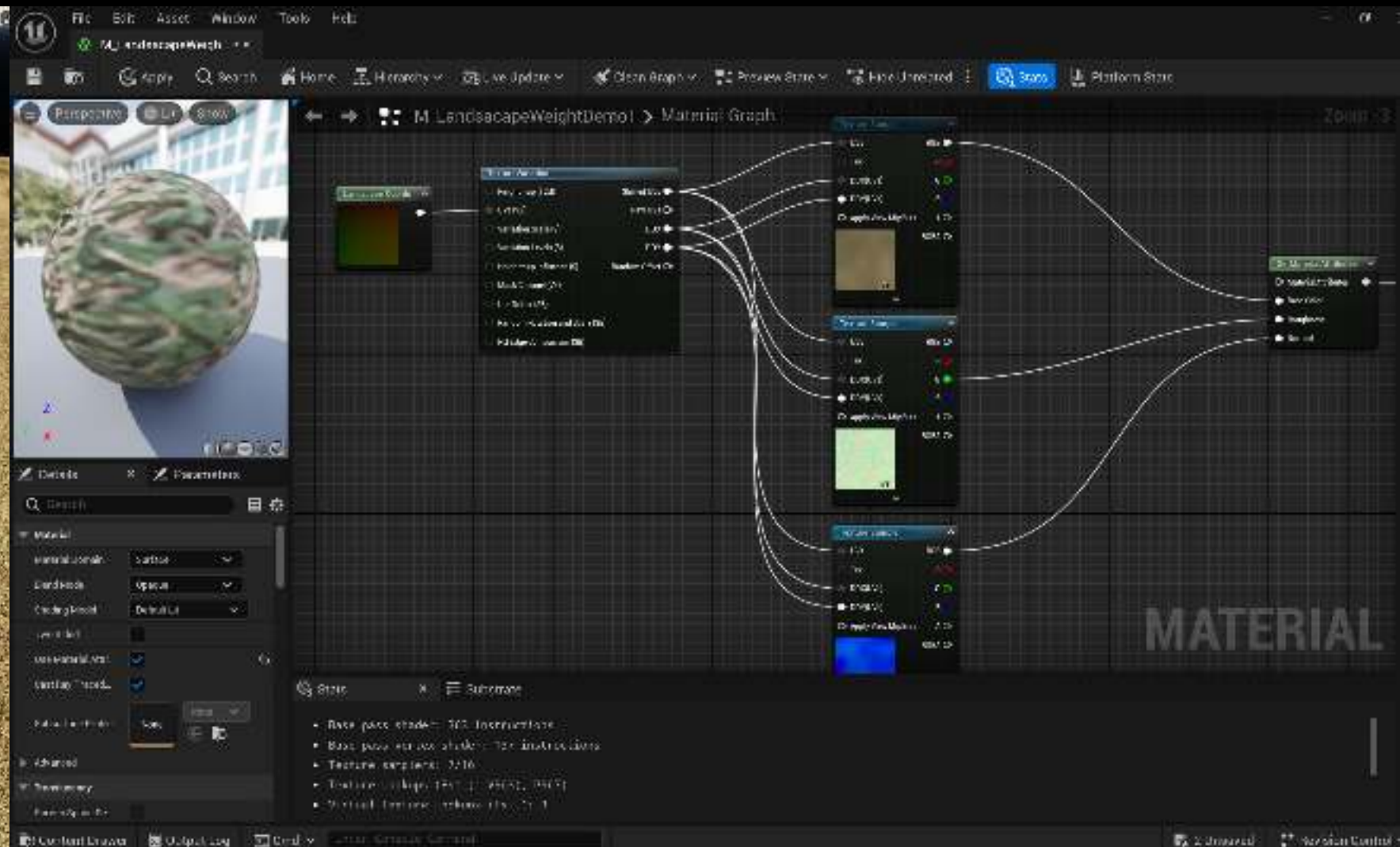
Supports Displacement as of 5.4



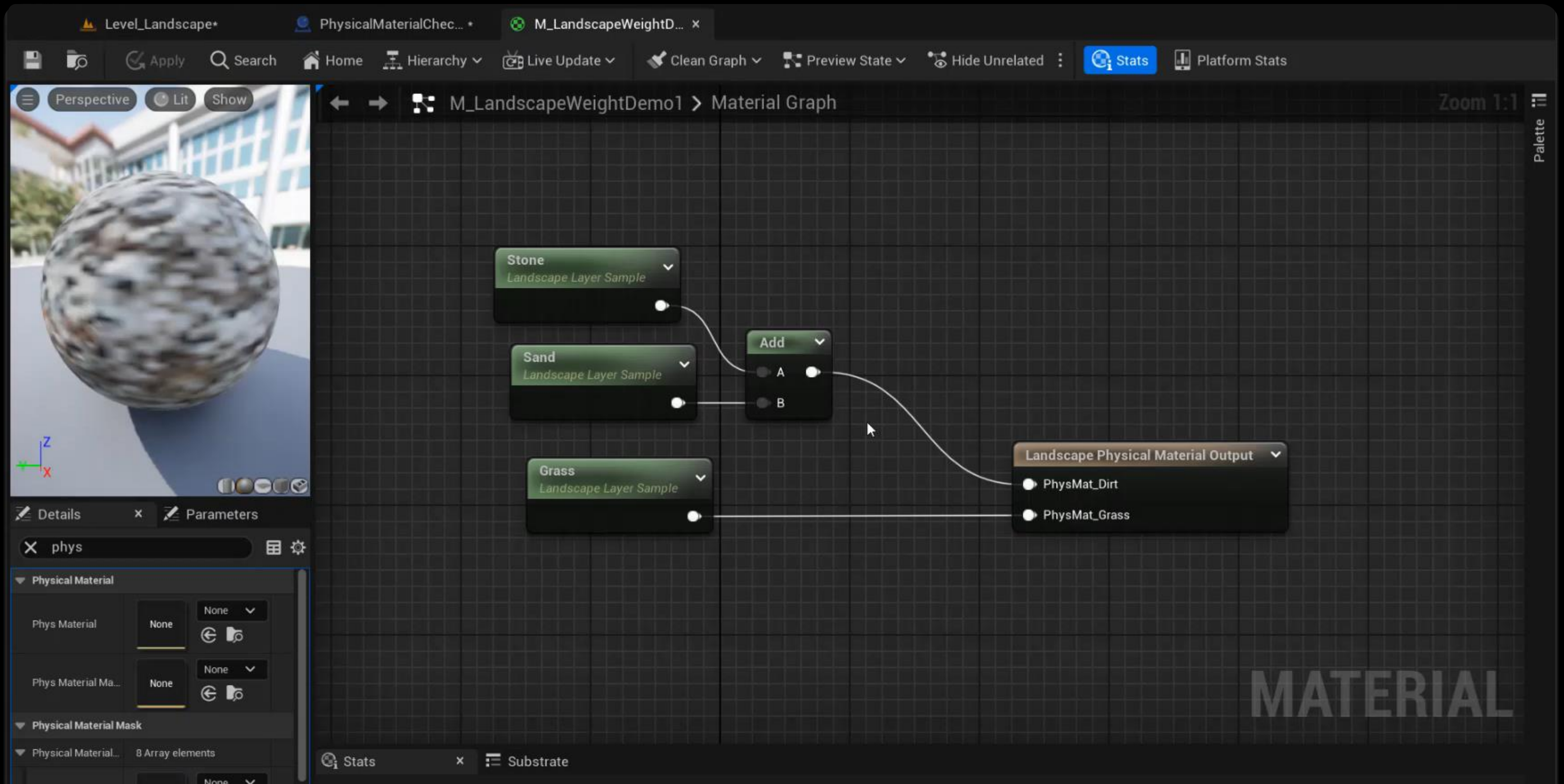
Normal Setup



Texture Variation Node



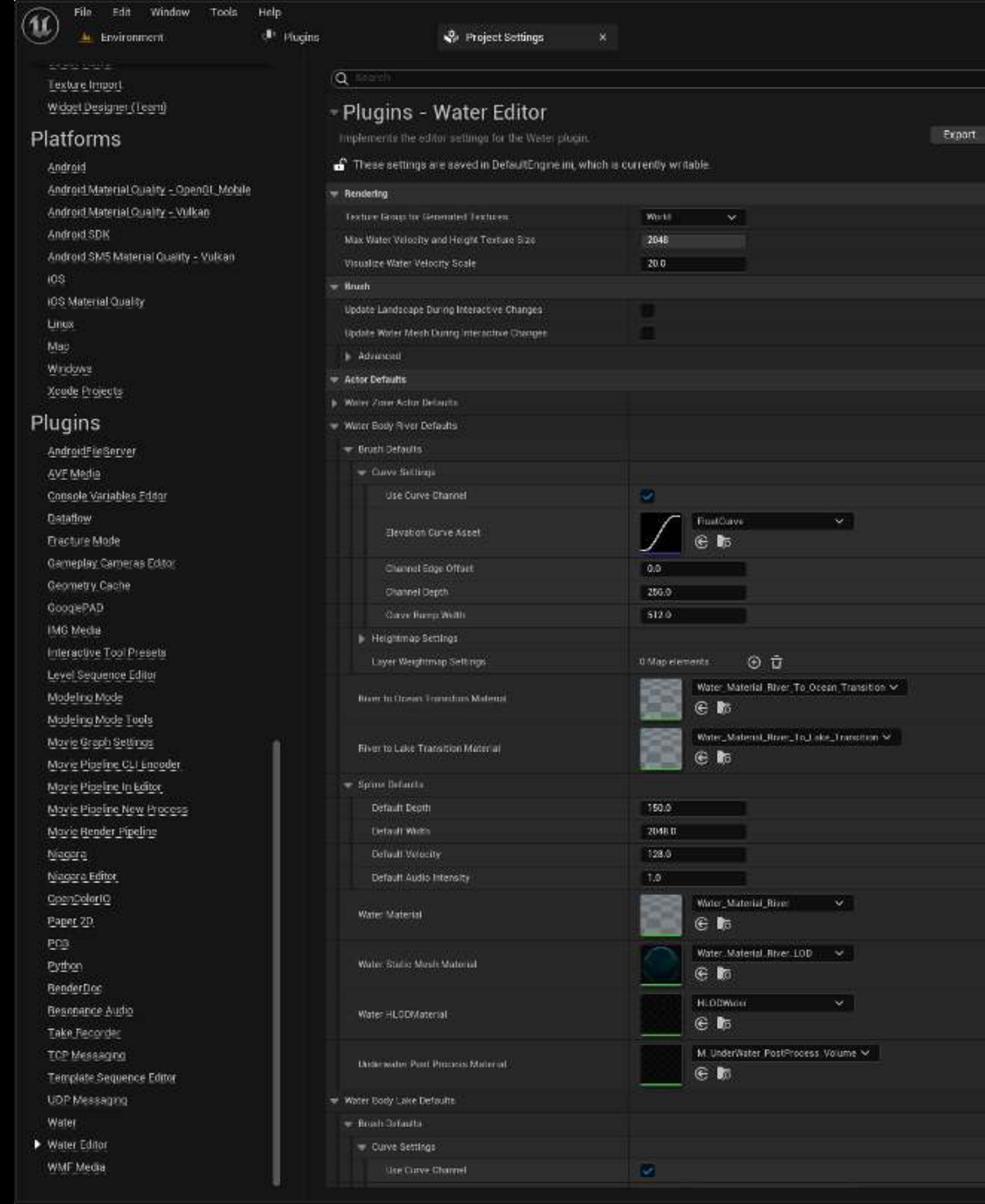
Landscape Physical Material Node



Water System Overrides

Water default settings are stored in Project Settings -> Water Editor.

Override defaults for Lakes, Rivers, Oceans and how they blend.



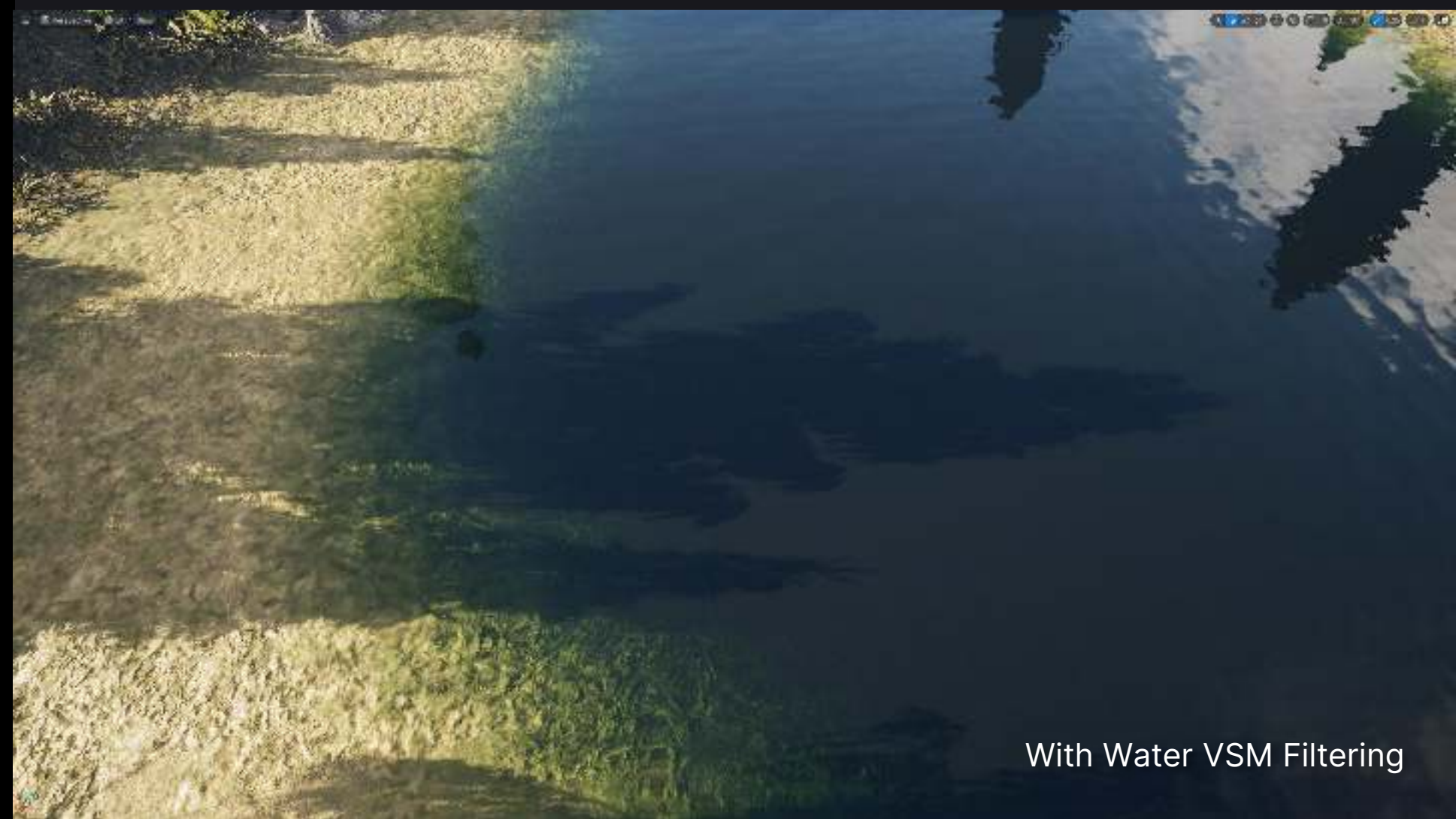
Console Water Variables

Add **VSM Filtering to the virtual shadow maps on your water surface.**

In your DefaultEngine.ini add:

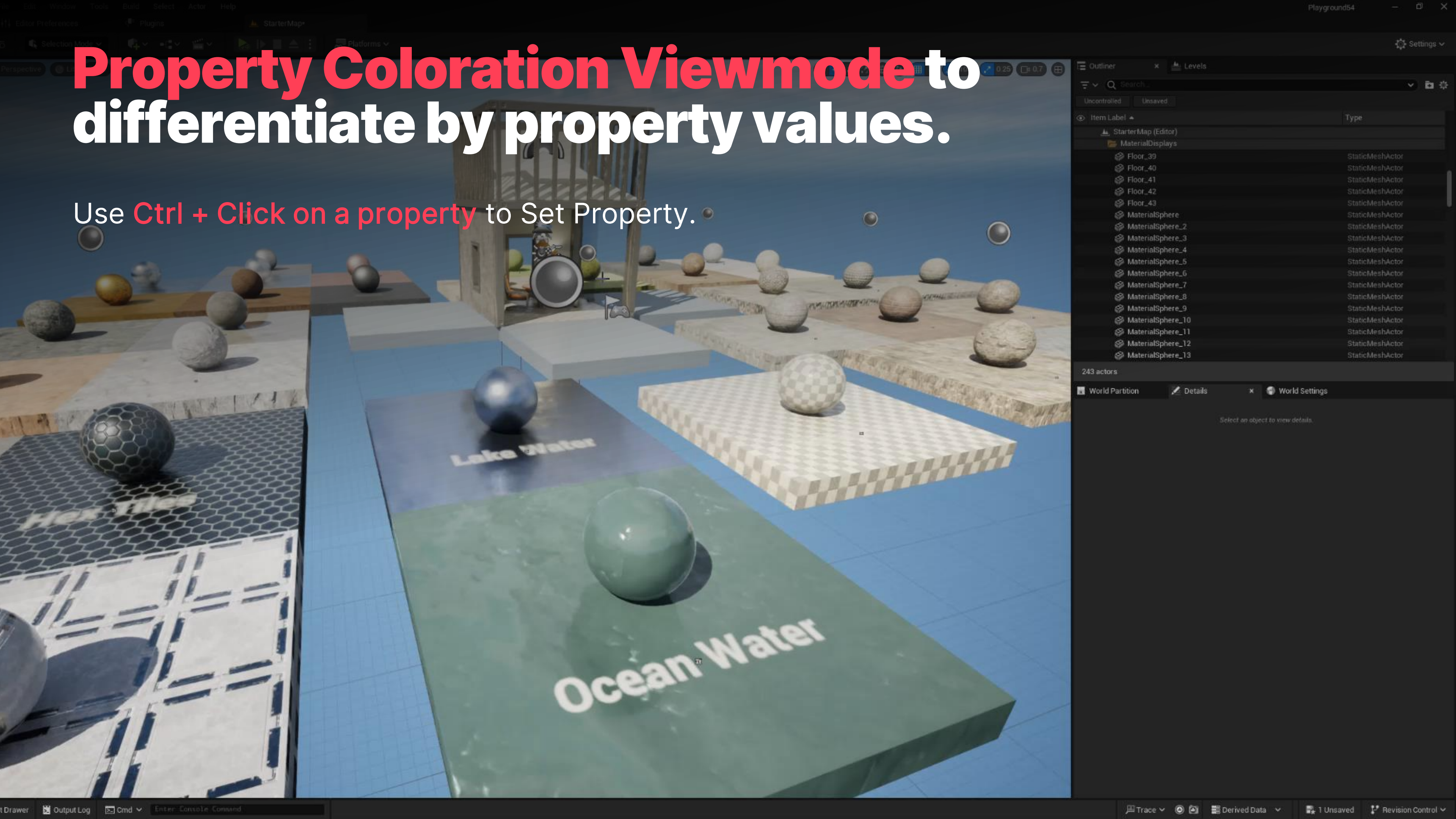
**r.Water.SingleLayer.Shaders
SupportVSMFiltering=1**

**r.Water.SingleLayer.VSMFilt
ering=1**

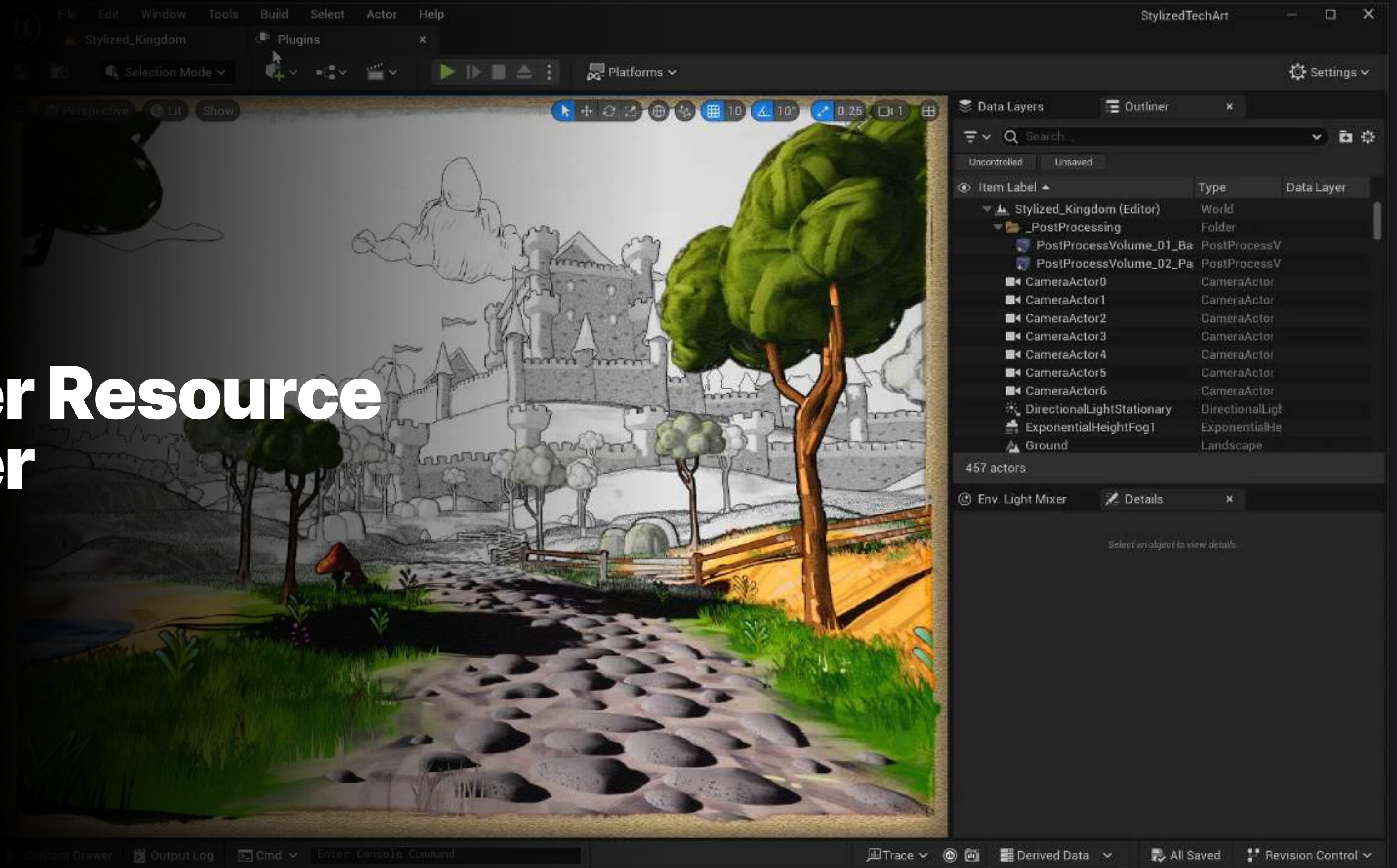


Property Coloration Viewmode to differentiate by property values.

Use **Ctrl + Click on a property** to Set Property.



Render Resource Viewer



Maintain detail across light levels

Local Exposure

- Automatically applies local adjustments to exposure.
- Preserves Highlight and Shadow Detail.
- Great for handling high-contrast areas like doorways or windows.
- Artist driven through post process volumes.



Local Exposure Enabled



Local Exposure Disabled

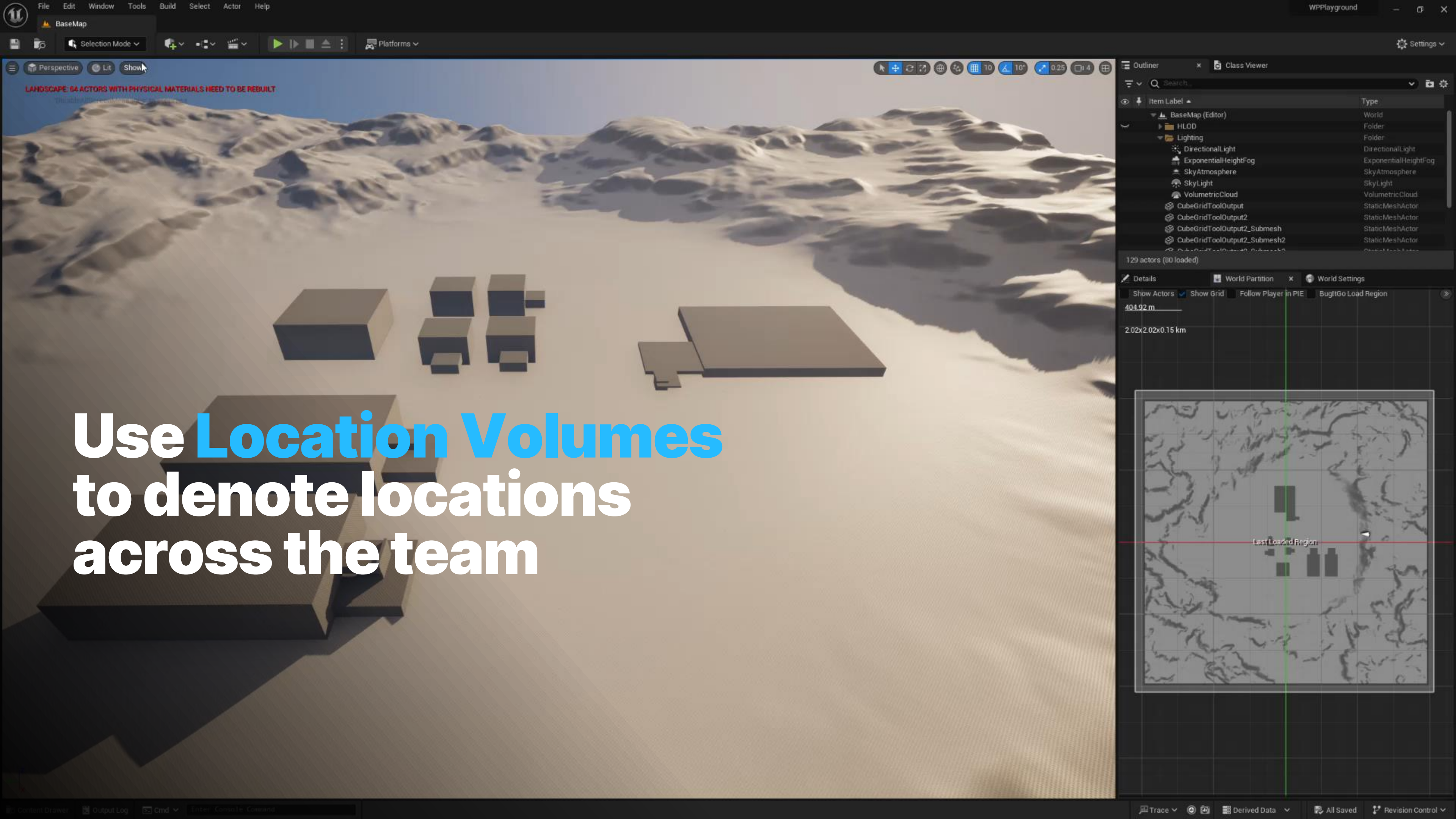
Maintain detail across light levels

Local Exposure



Local Exposure		
<input checked="" type="checkbox"/> Contrast Scale	0.8	↶
<input checked="" type="checkbox"/> Detail Strength	1.0	
<input checked="" type="checkbox"/> Blurred Luminance Blend	0.6	
<input checked="" type="checkbox"/> Blurred Luminance Kernel Size Percent	50.0	
<input checked="" type="checkbox"/> Middle Grey Bias	0.0	

Local Exposure Mask Visualized from the Show Menu



Use **Location Volumes** to denote locations across the team

Outliner

Class Viewer

Item Label	Type
BaseMap (Editor)	World
HL0D	Folder
Lighting	Folder
DirectionalLight	DirectionalLight
ExponentialHeightFog	ExponentialHeightFog
SkyAtmosphere	SkyAtmosphere
SkyLight	SkyLight
VolumetricCloud	VolumetricCloud
CubeGridToolOutput	StaticMeshActor
CubeGridToolOutput2	StaticMeshActor
CubeGridToolOutput2_Submesh	StaticMeshActor
CubeGridToolOutput2_Submesh2	StaticMeshActor
CubeGridToolOutput2_Submesh3	StaticMeshActor

129 actors (80 loaded)

Details

World Partition

World Settings

Show Actors Show Grid Follow Player in PIE BugItGo Load Region

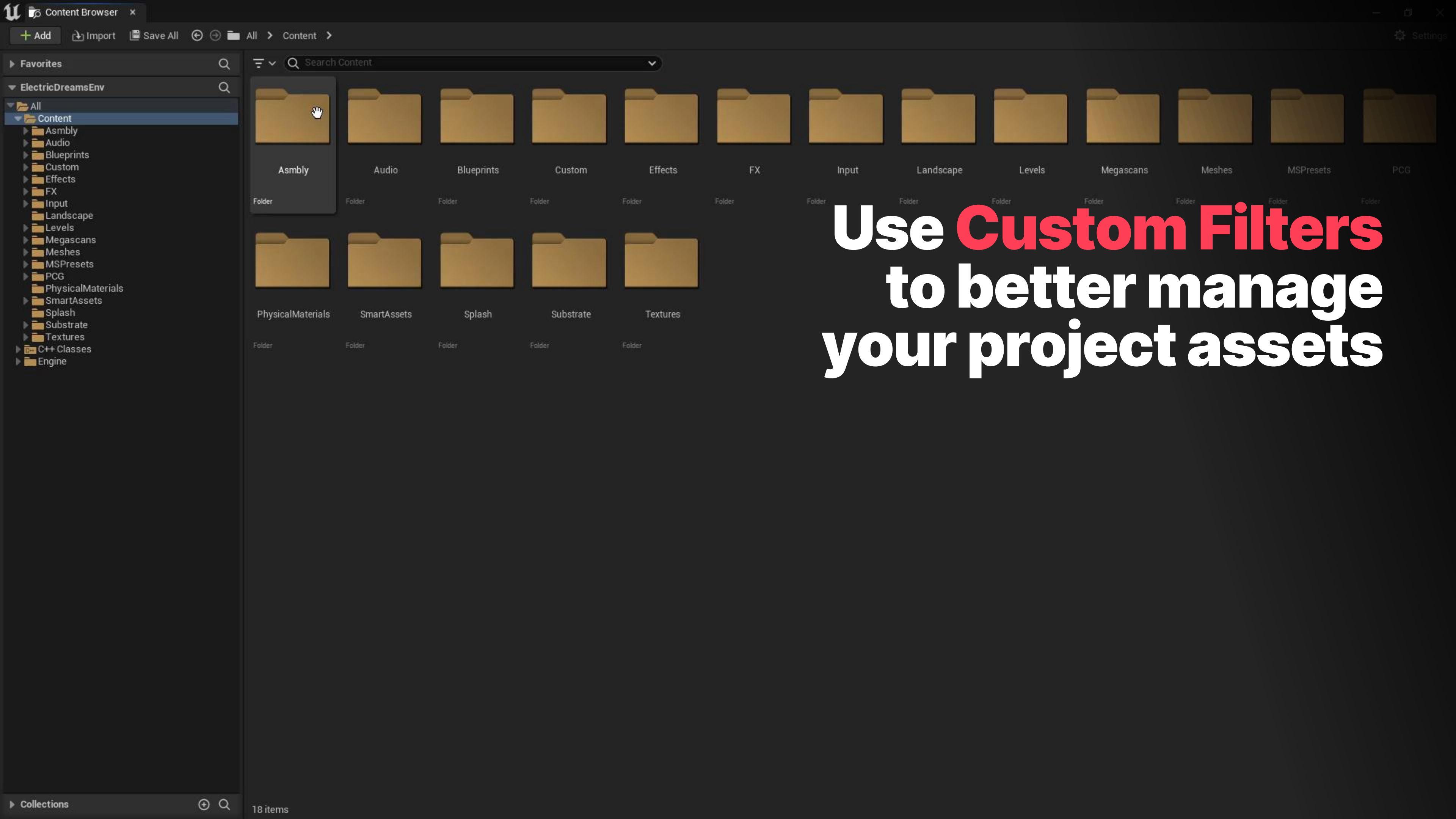
404.92 m

2.02x2.02x0.15 km

Last Loaded Region

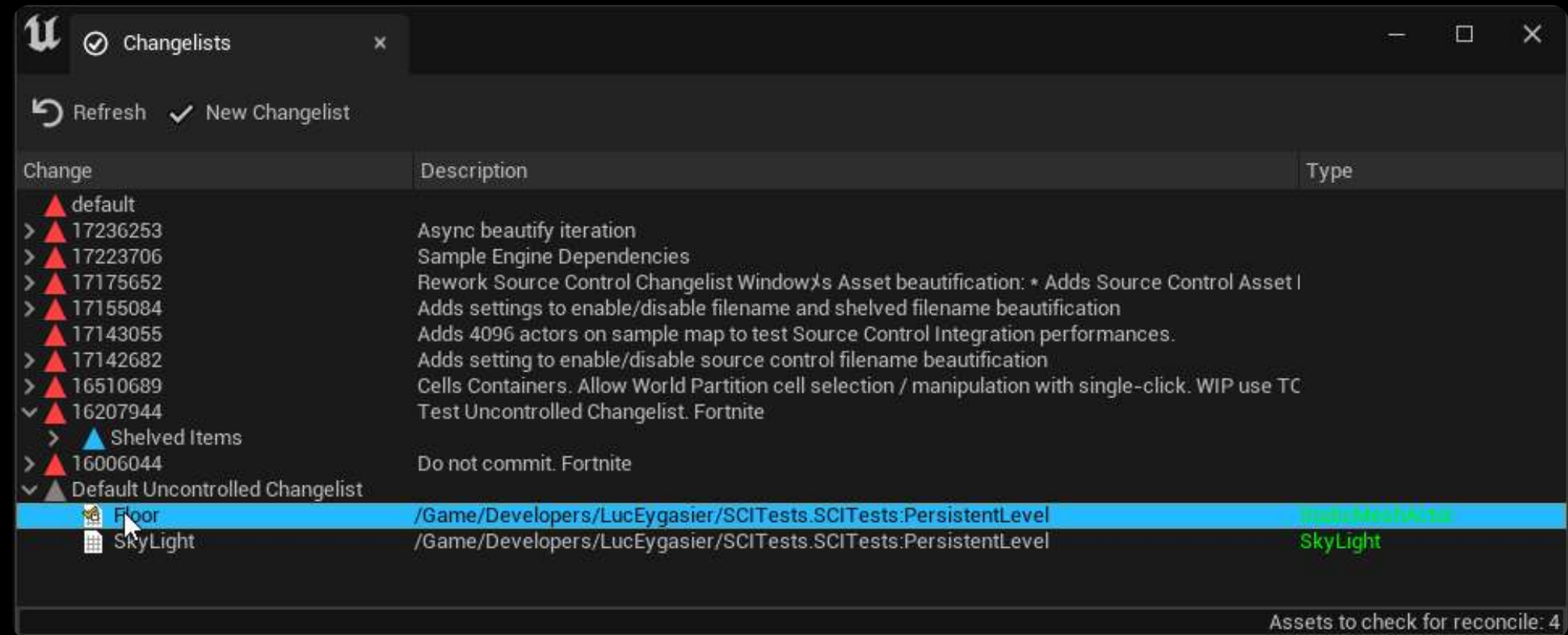
Use Pinning prevent actors from streaming out



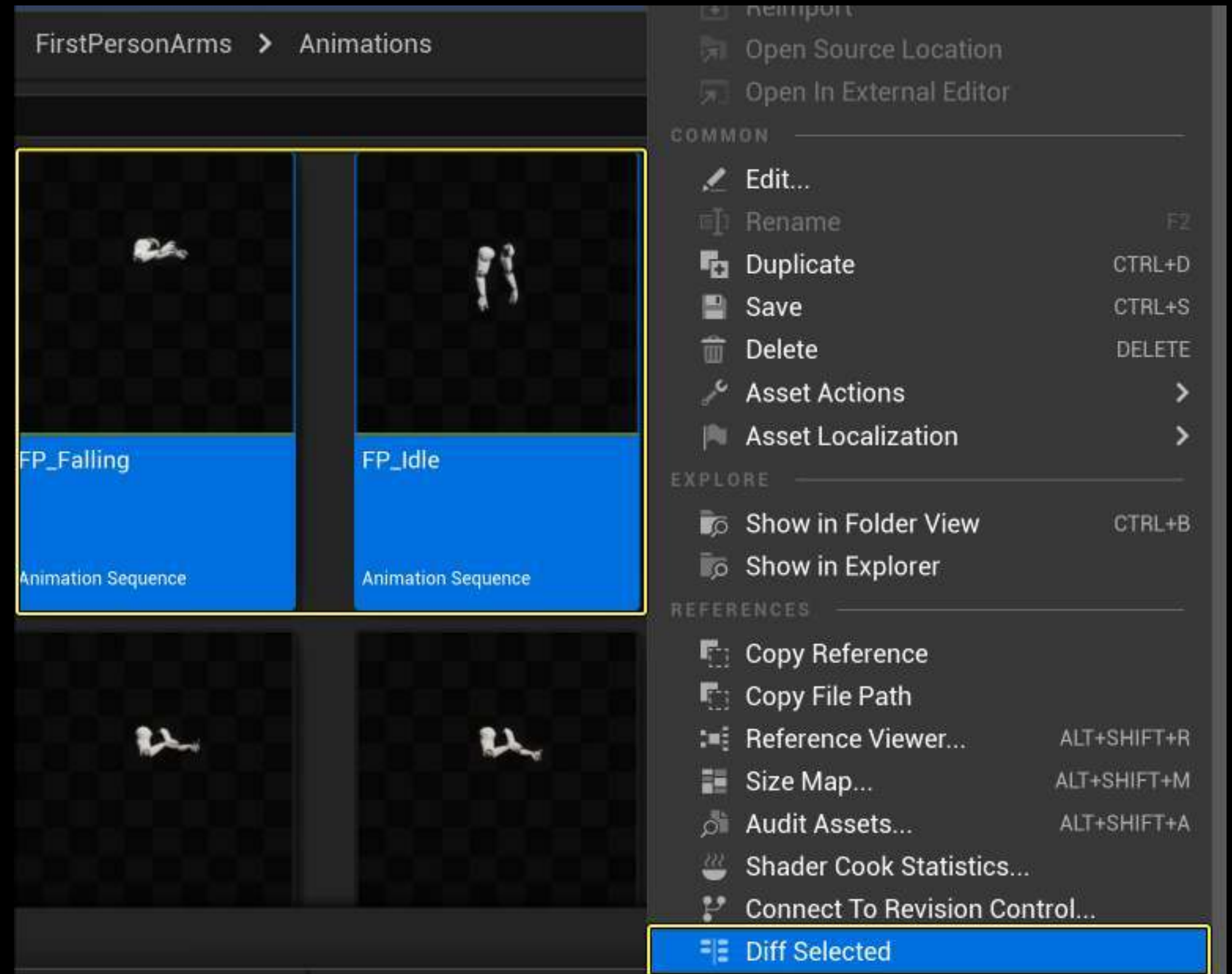


Use **Custom Filters**
to better manage
your project assets

Have your developers easily work with Uncontrolled Changelists and Shelving with In-Engine Source Control



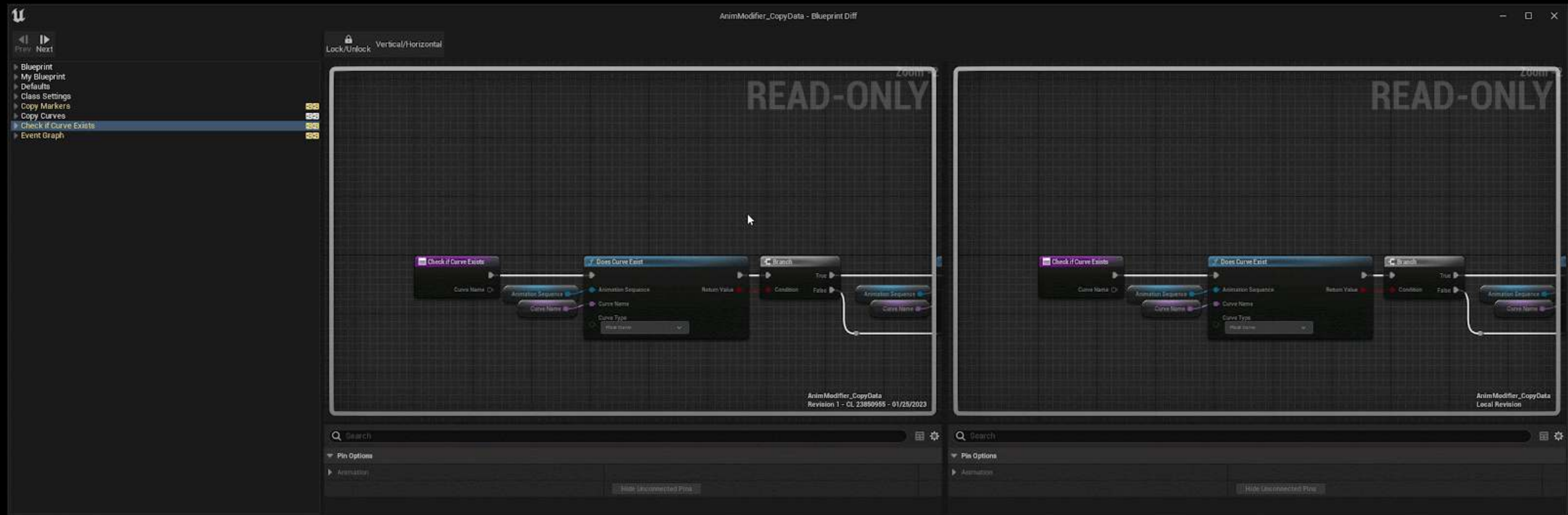
Diffing isn't just for Blueprints!



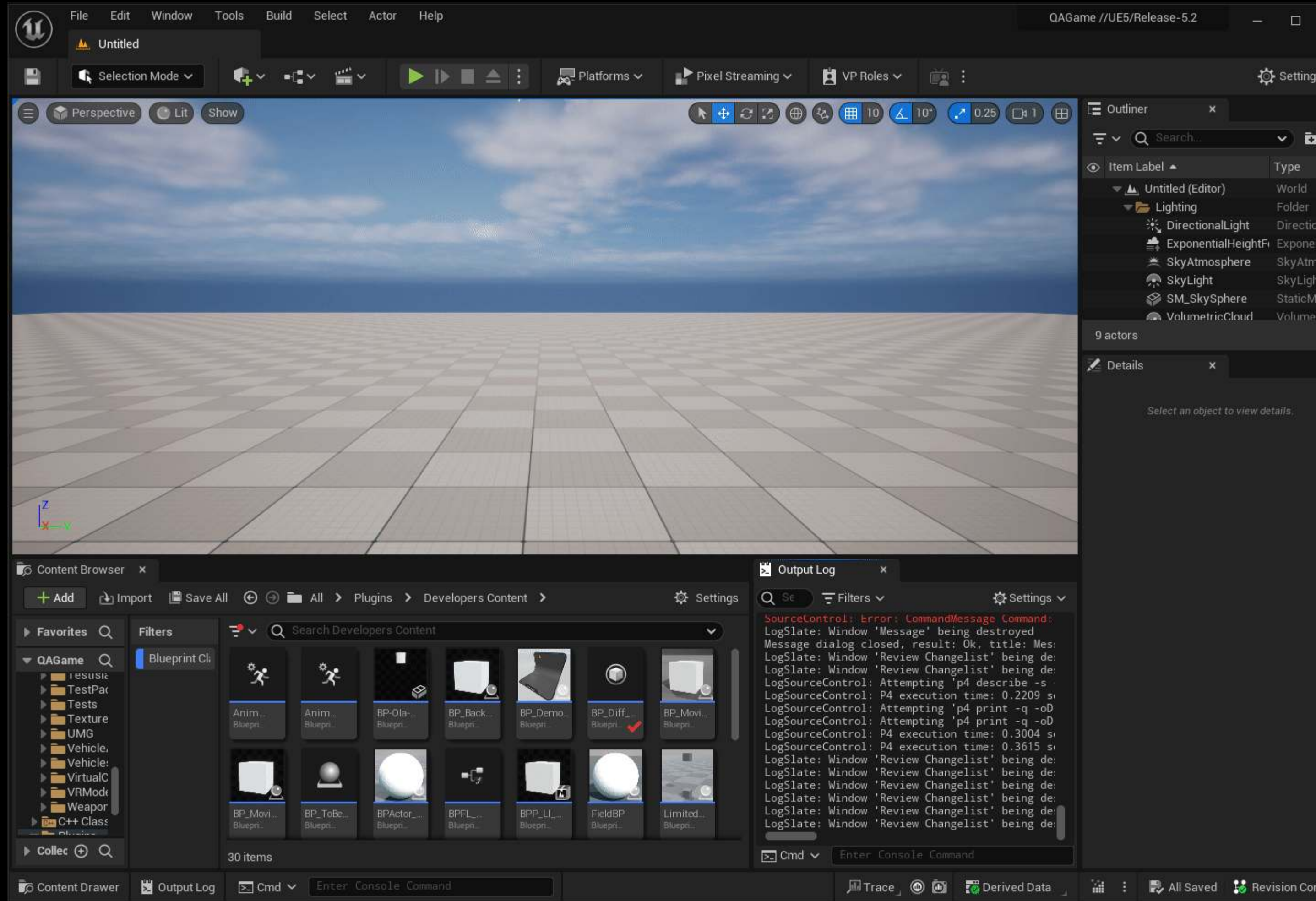
Use Step to jump between all changes made easily.

The screenshot displays the Unreal Engine 4.27.2 interface for editing a Blueprint named 'BP_Diff_Demo'. The main workspace shows a 'New Function 0' node with several 'Add pin' nodes and a 'Log Location' node. The left-hand sidebar contains a 'My Blueprint' panel with a search bar and a list of nodes: 'EventGraph', 'FUNCTIONS (1 OVERRIDABLE)' (NewFunction, NewFunction_0, GetActorSoundParams), 'INTERFACES', 'MACROS', 'VARIABLES' (NewVar_0 to NewVar_16), 'EVENT DISPATCHERS', and 'LOCAL VARIABLES (NEWFUNCTION_0)'. The bottom of the screen shows a 'Compiler Results' panel with a message: '[2330.16] Compile of BP_Diff_Demo successful! [in 80 ms] (/Developers/JordanHoffmann/BP_Diff_Demo.Bf...)'.

Lock and Unlock your Panning/Zooming



Review Tool



Keep your problems your problems.

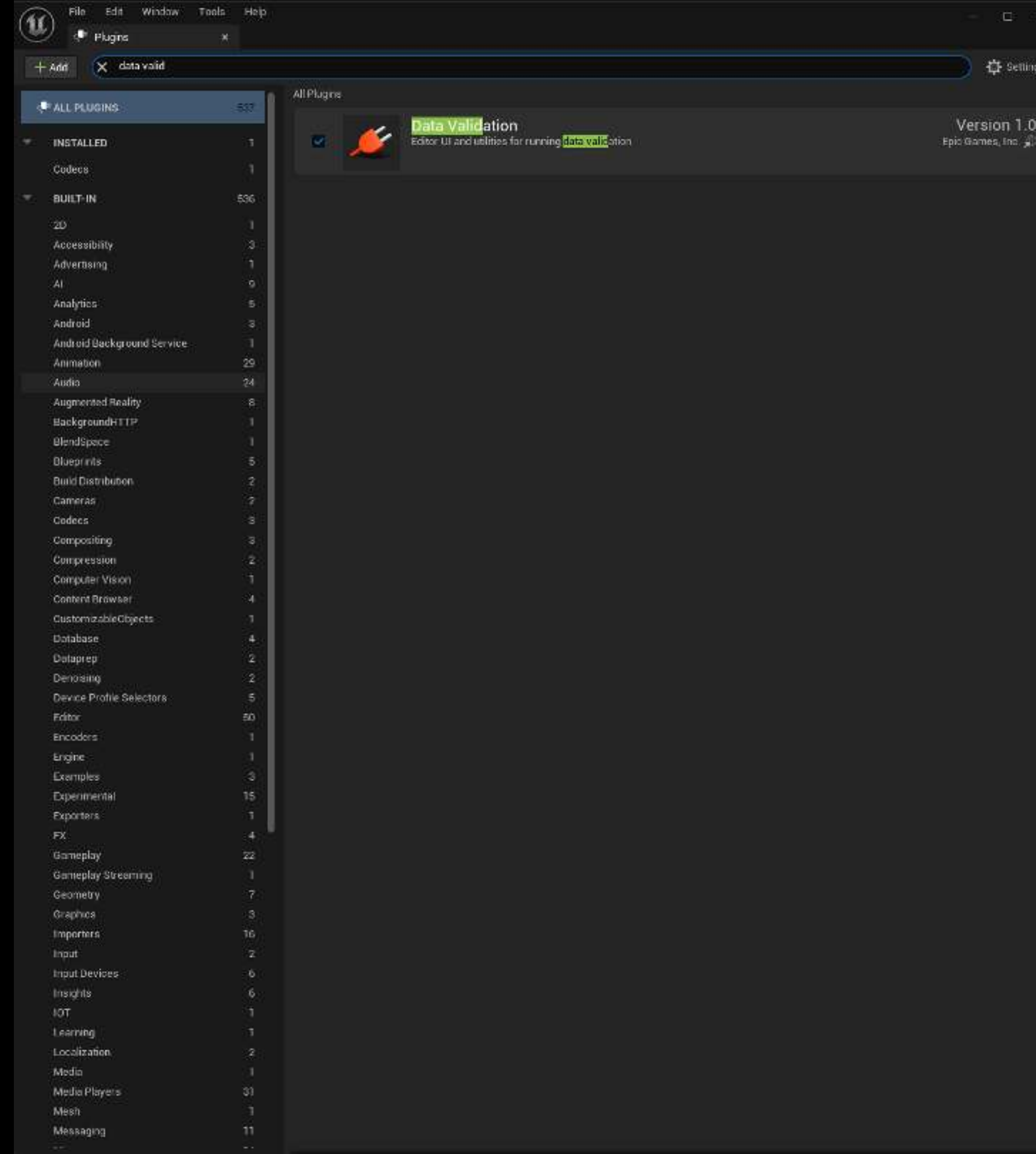
Custom Validation

What would you Validate?

- Checking that assets **meet name conventions**
- Enforcing **space and performance budgets**
- Catching **non-cyclic dependencies**

Developer Callouts:

- Validation Rules can be **set up through C++ or blueprint**, however the standard **commandlet will only run C++ rules if it's not extended.**
- Basic/Core validations are already done on submit such as references issues, missing files in CLs, etc.
- “Data Validation” docs delve into this well.
<https://docs.unrealengine.com/5.2/en-US/data-validation-in-unreal-engine/>



Things to know when

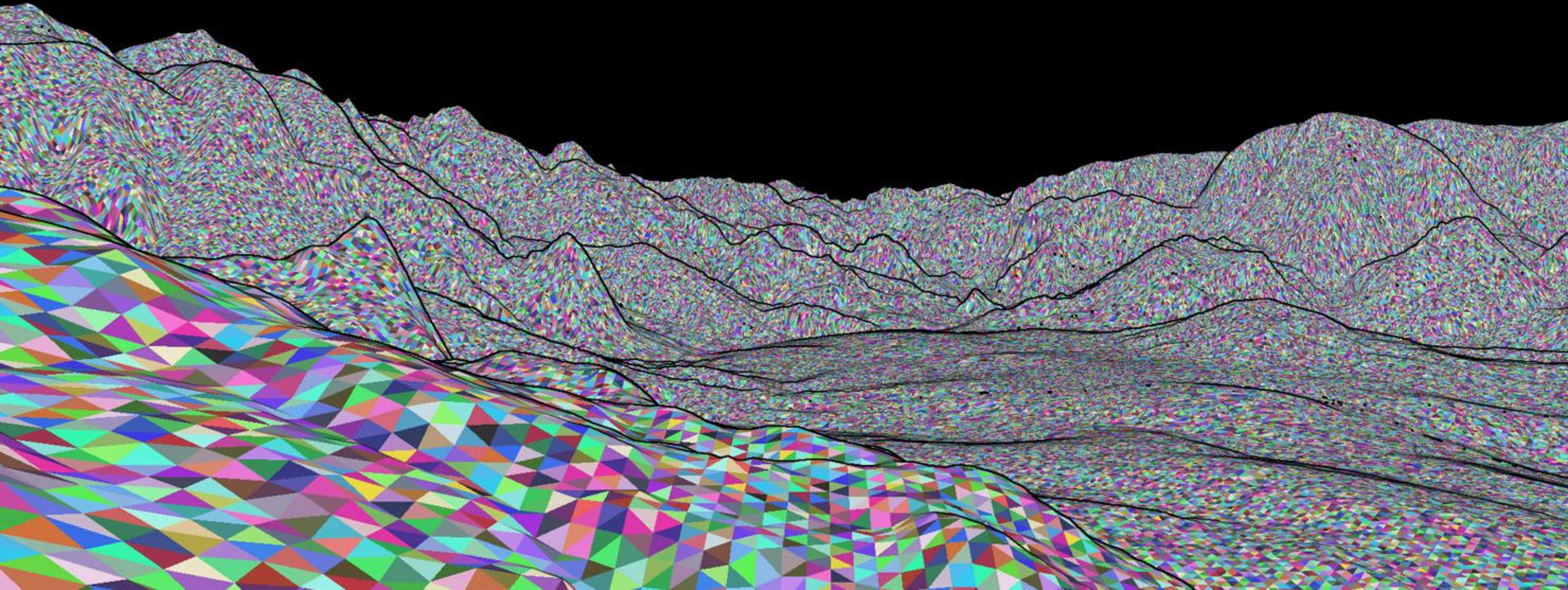
Working with Nanite



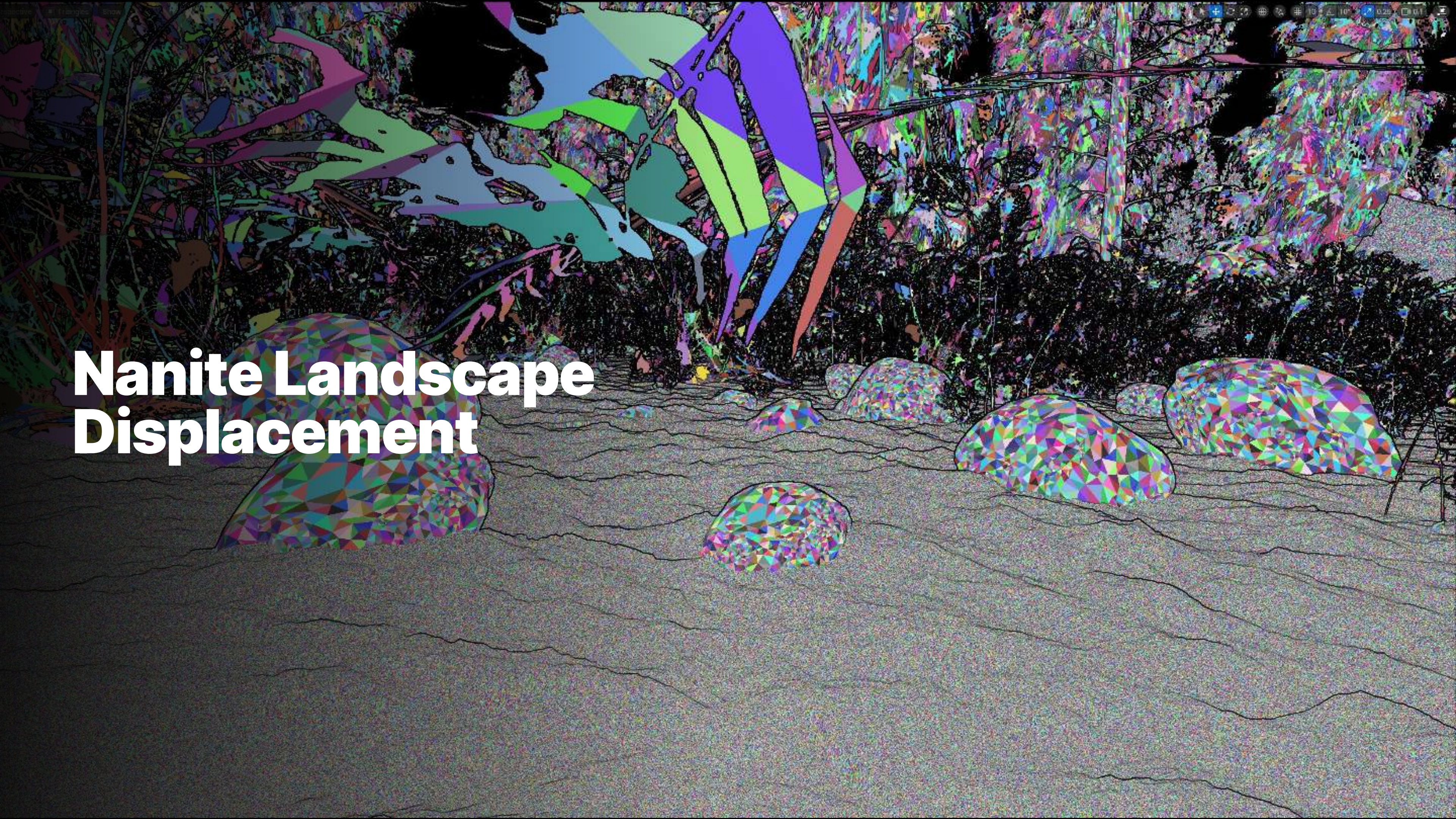
**Nanite Tessellation
allows for Static
and Dynamic
Displacement**



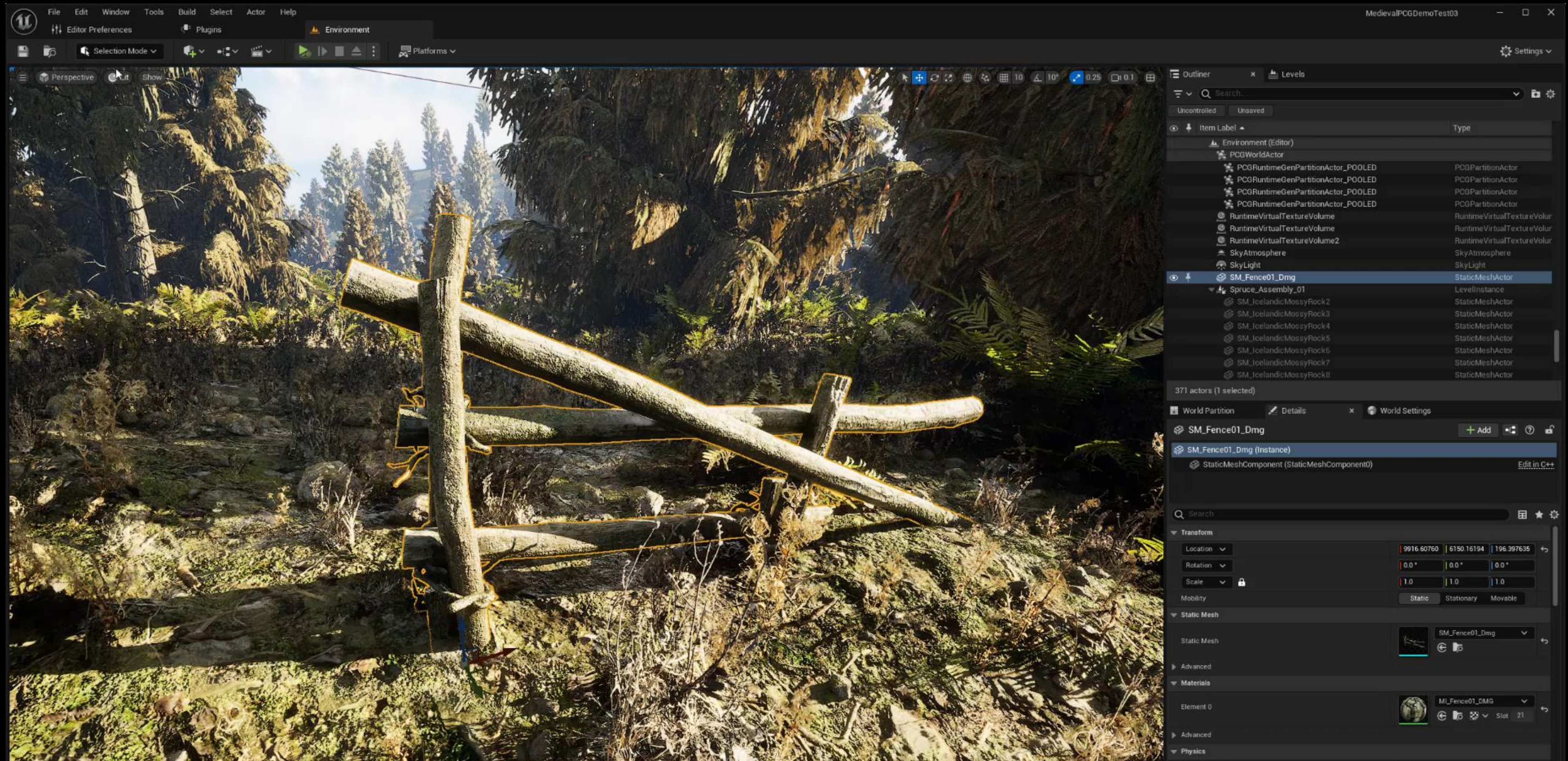
Nanite Landscapes



Nanite Landscape Displacement



Leverage **Nanite Vertex Colors** to store data and **reduce texture overhead**.



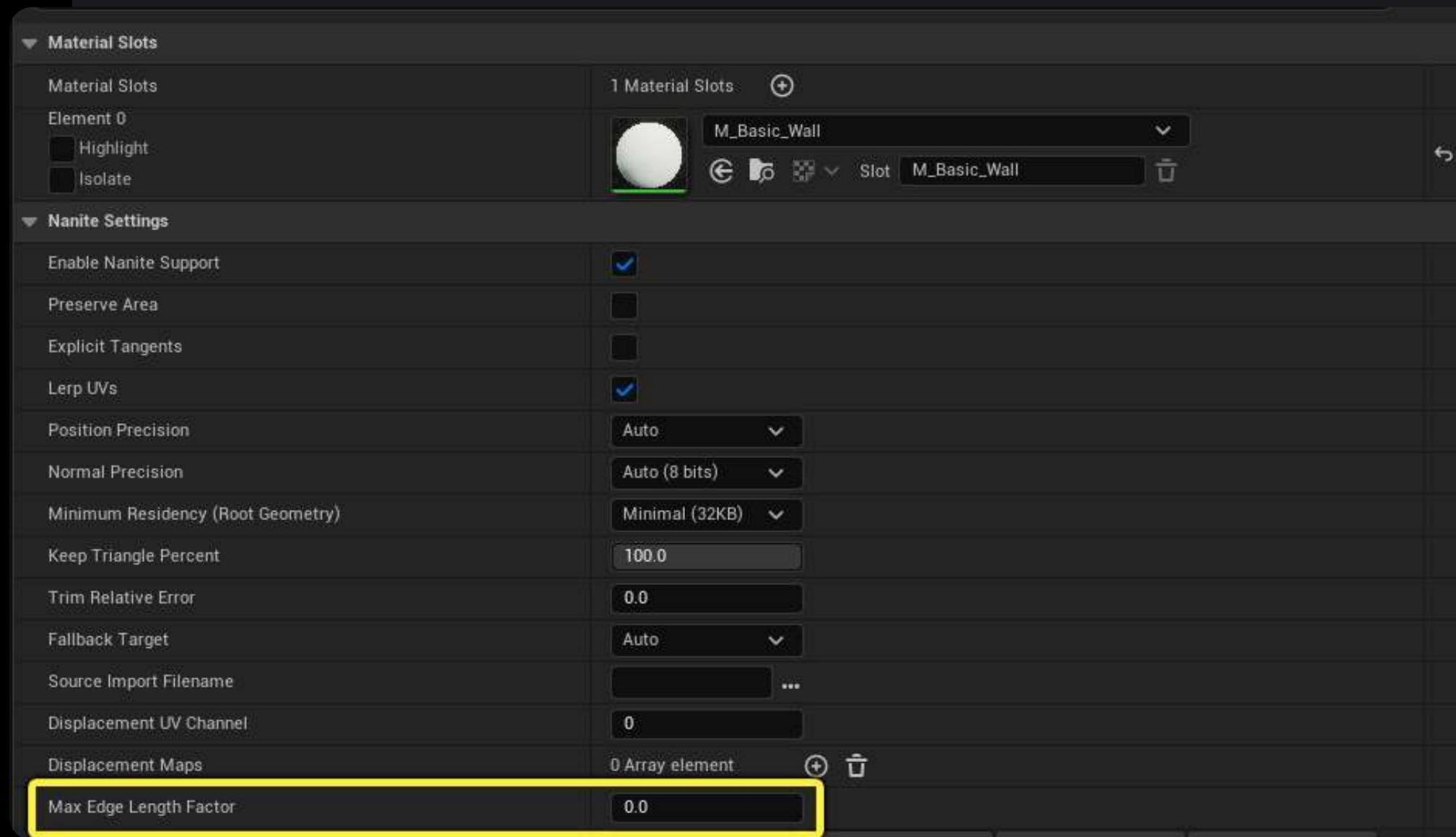


Leverage **Nanite Spline Meshes** for **bendy meshes**.

Want a single mesh to bend? Don't bother with a Spline Blueprint! Use the Spline Mesh Actor!

Nanite Spline acting strangely at a distance?

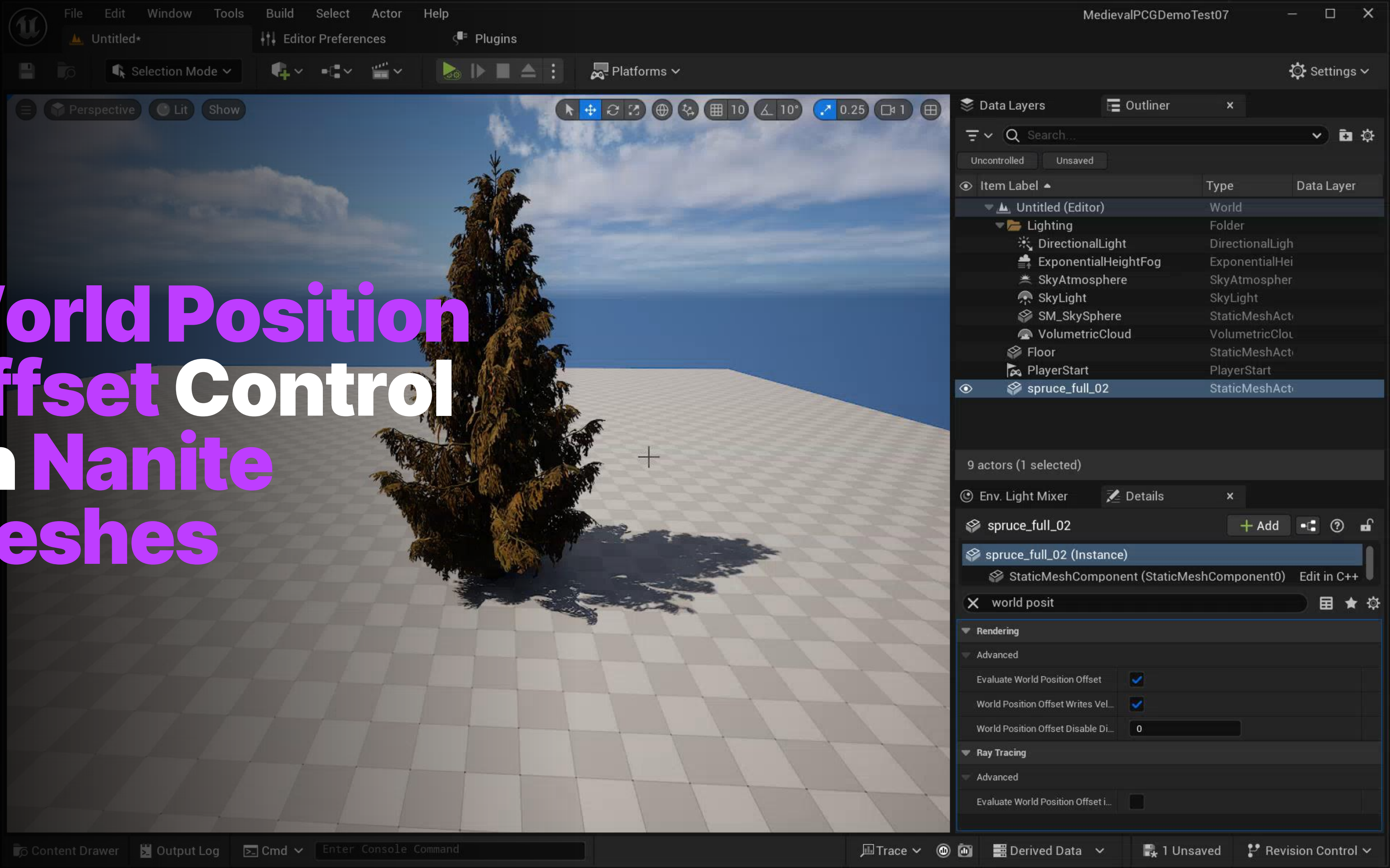
Try adjusting 'Max Edge Length Factor'



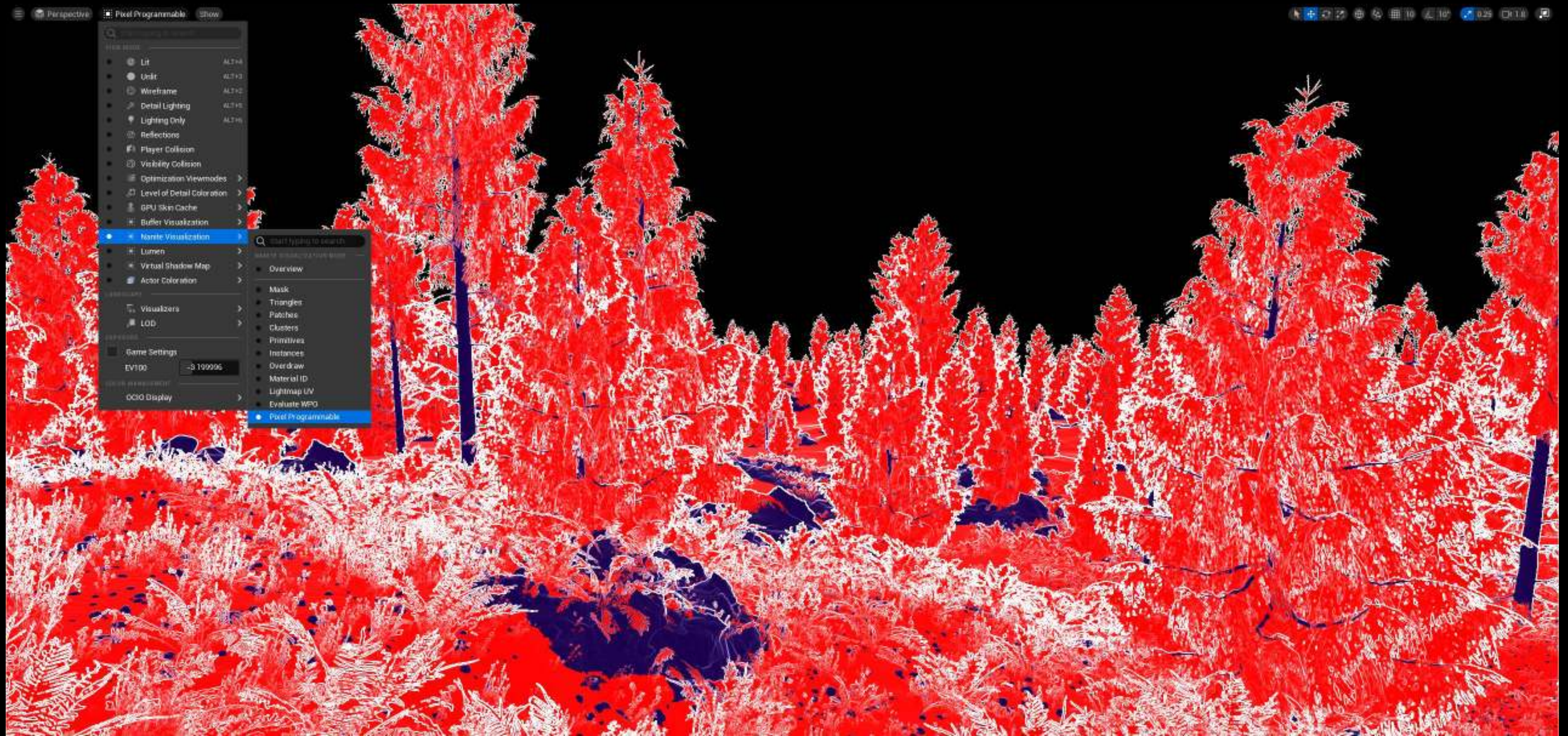


Use **Preserve Area**
on Nanite foliage
meshes to maintain
visual consistency

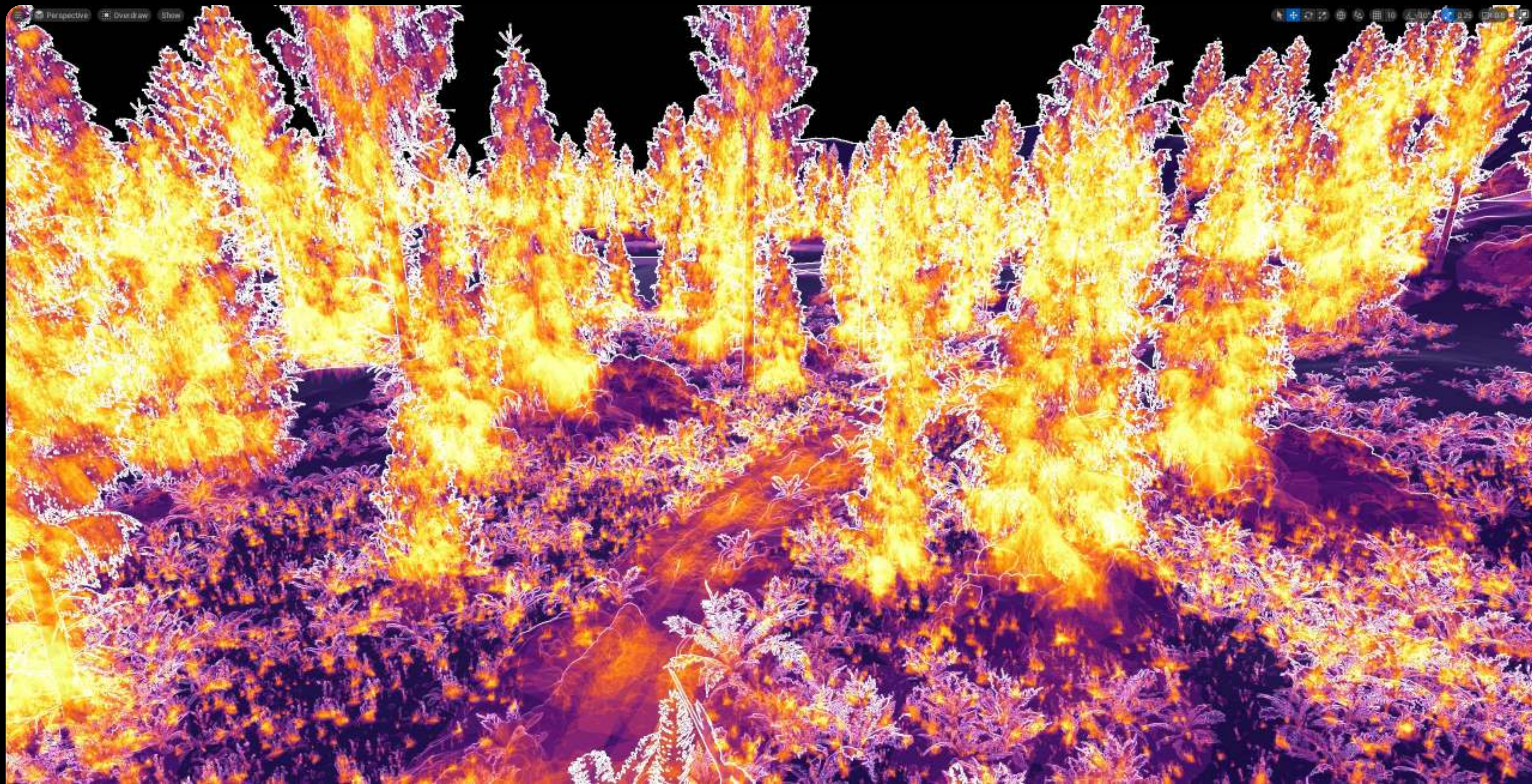
World Position Offset Control on Nanite Meshes



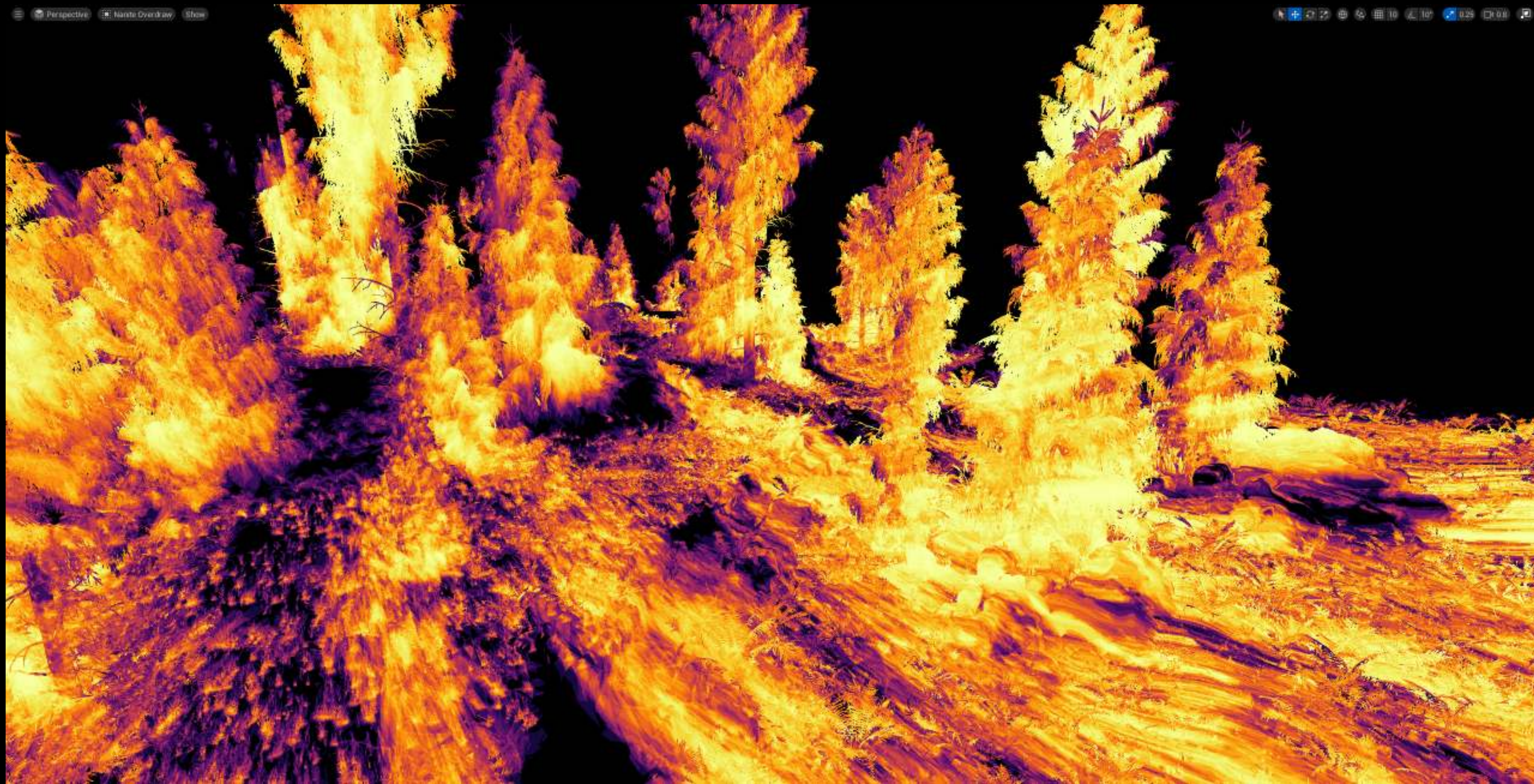
Use the **Pixel Programmable Visualizer** to identify troublesome Nanite setups.



Nanite Overdraw

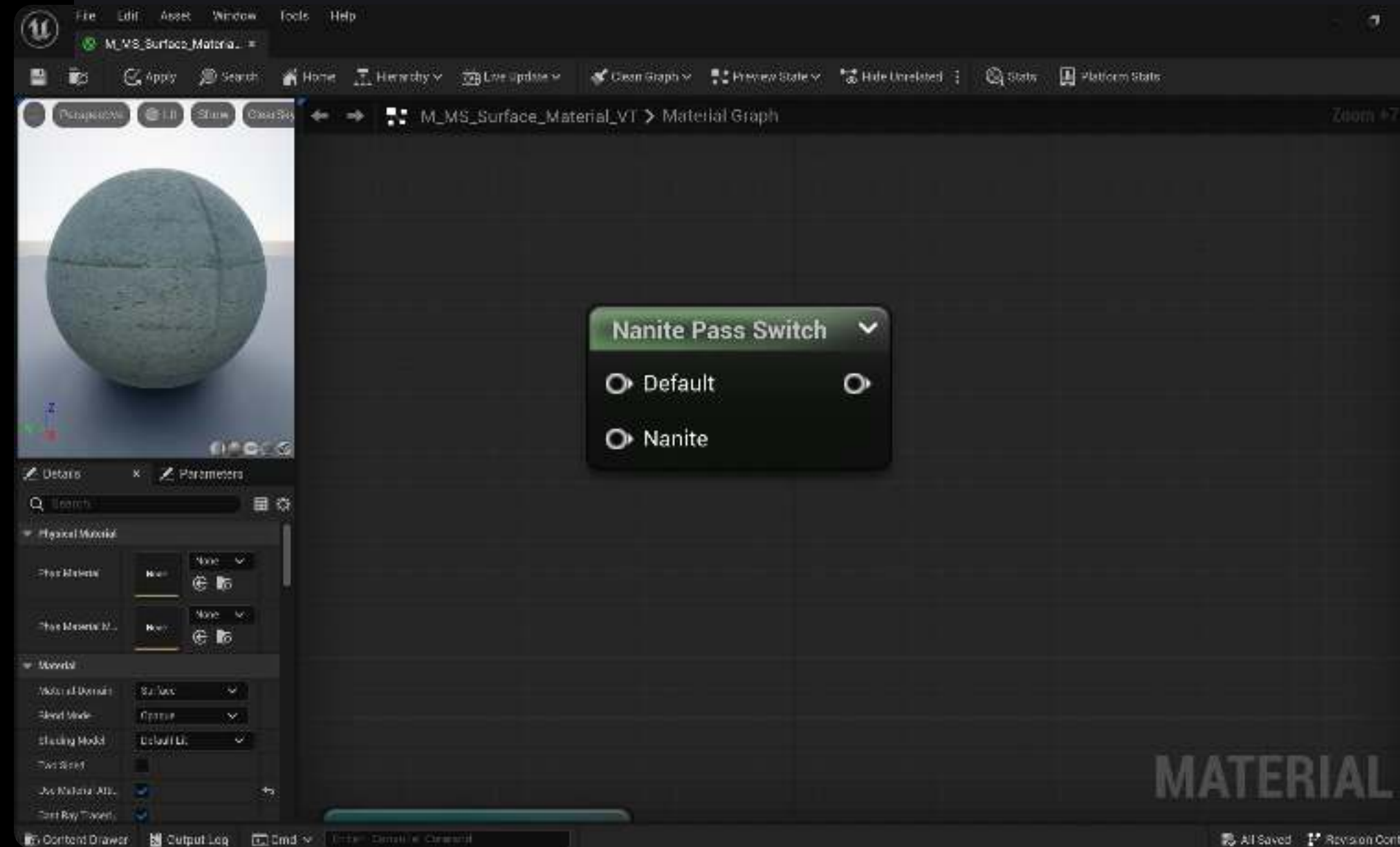


VSM Nanite Overdraw

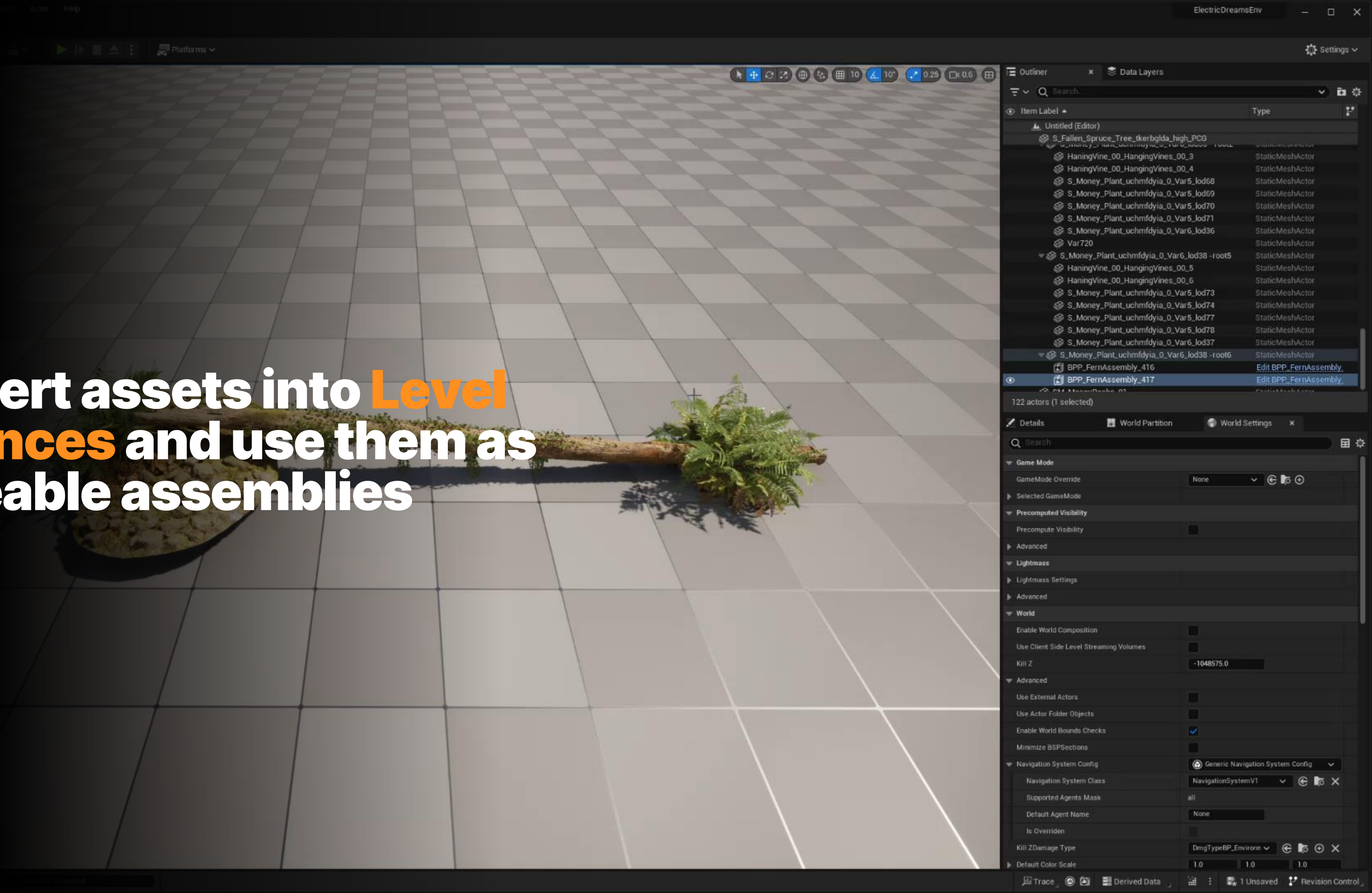


Nanite Overrides

- Nanite Switch expression in Materials
- Nanite Override Material in Static Mesh Components
- When you know you can't have Nanite on an object use the Disallow Nanite Flag on Static Mesh Components

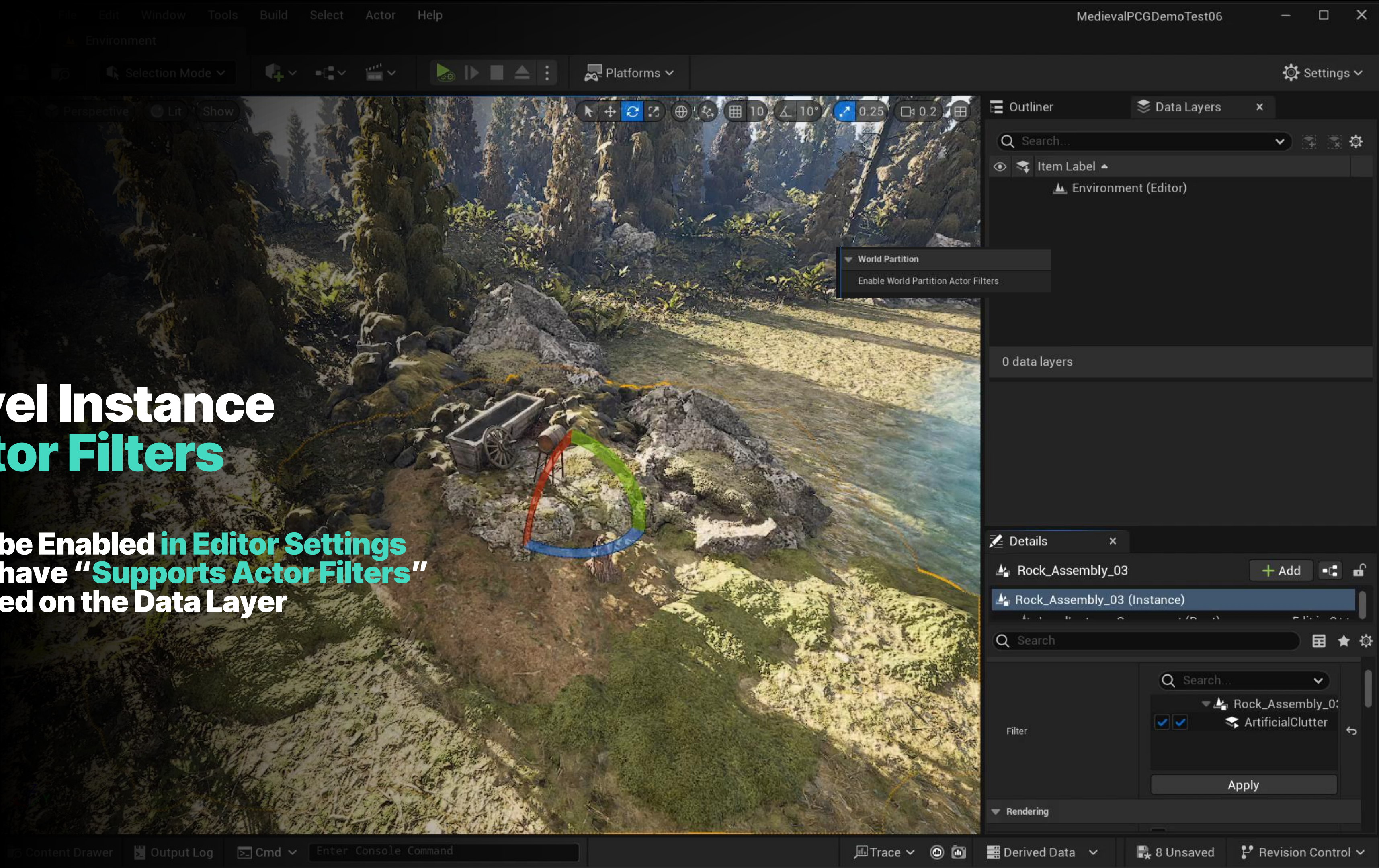


Convert assets into **Level Instances** and use them as placeable assemblies

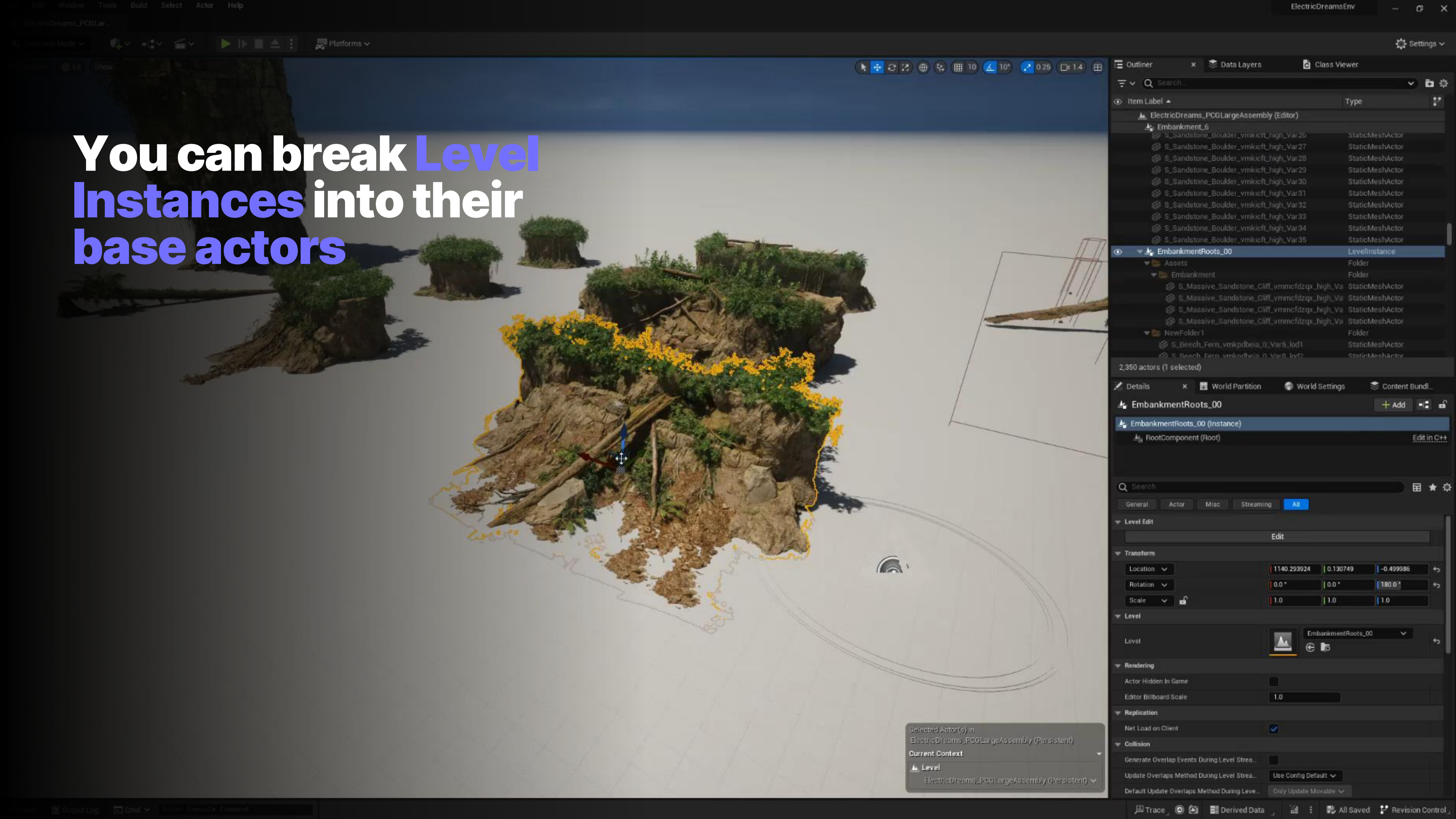


Level Instance Actor Filters

Must be Enabled in Editor Settings
Must have "Supports Actor Filters"
enabled on the Data Layer



You can break Level Instances into their base actors



Selected Actor(s) in
ElectricDreams_PCGLargeAssembly (Persistent)
Current Context
Level
ElectricDreams_PCGLargeAssembly (Persistent)

Outliner | Data Layers | Class Viewer

Search...

Item Label	Type
ElectricDreams_PCGLargeAssembly (Editor)	
Embankment_6	
S_Sandstone_Boulder_vmkiact_high_Var 26	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 27	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 28	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 29	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 30	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 31	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 32	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 33	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 34	StaticMeshActor
S_Sandstone_Boulder_vmkiact_high_Var 35	StaticMeshActor
EmbankmentRoots_00	LevelInstance
Assets	Folder
Embankment	Folder
S_Massive_Sandstone_Cliff_vmmcfdzqx_high_Va	StaticMeshActor
S_Massive_Sandstone_Cliff_vmmcfdzqx_high_Va	StaticMeshActor
S_Massive_Sandstone_Cliff_vmmcfdzqx_high_Va	StaticMeshActor
S_Massive_Sandstone_Cliff_vmmcfdzqx_high_Va	StaticMeshActor
NewFolder1	Folder
S_Beech_Fern_vmkiact_high_Var 5 lod1	StaticMeshActor
S_Beech_Fern_vmkiact_high_Var 8 lod2	StaticMeshActor

2,350 actors (1 selected)

Details | World Partition | World Settings | Content Bundl...

EmbankmentRoots_00 + Add

EmbankmentRoots_00 (Instance) Edit in C++

RootComponent (Root)

Search

General | Actor | Misc | Streaming | All

Level Edit

Edit

Transform

Location: 1140.293924 | 0.130749 | -0.499986

Rotation: 0.0° | 0.0° | 180.0°

Scale: 1.0 | 1.0 | 1.0

Level

Level: EmbankmentRoots_00

Rendering

Actor Hidden In Game: []

Editor Billboard Scale: 1.0

Replication

Net Load on Client: [x]

Collision

Generate Overlap Events During Level Strea... []

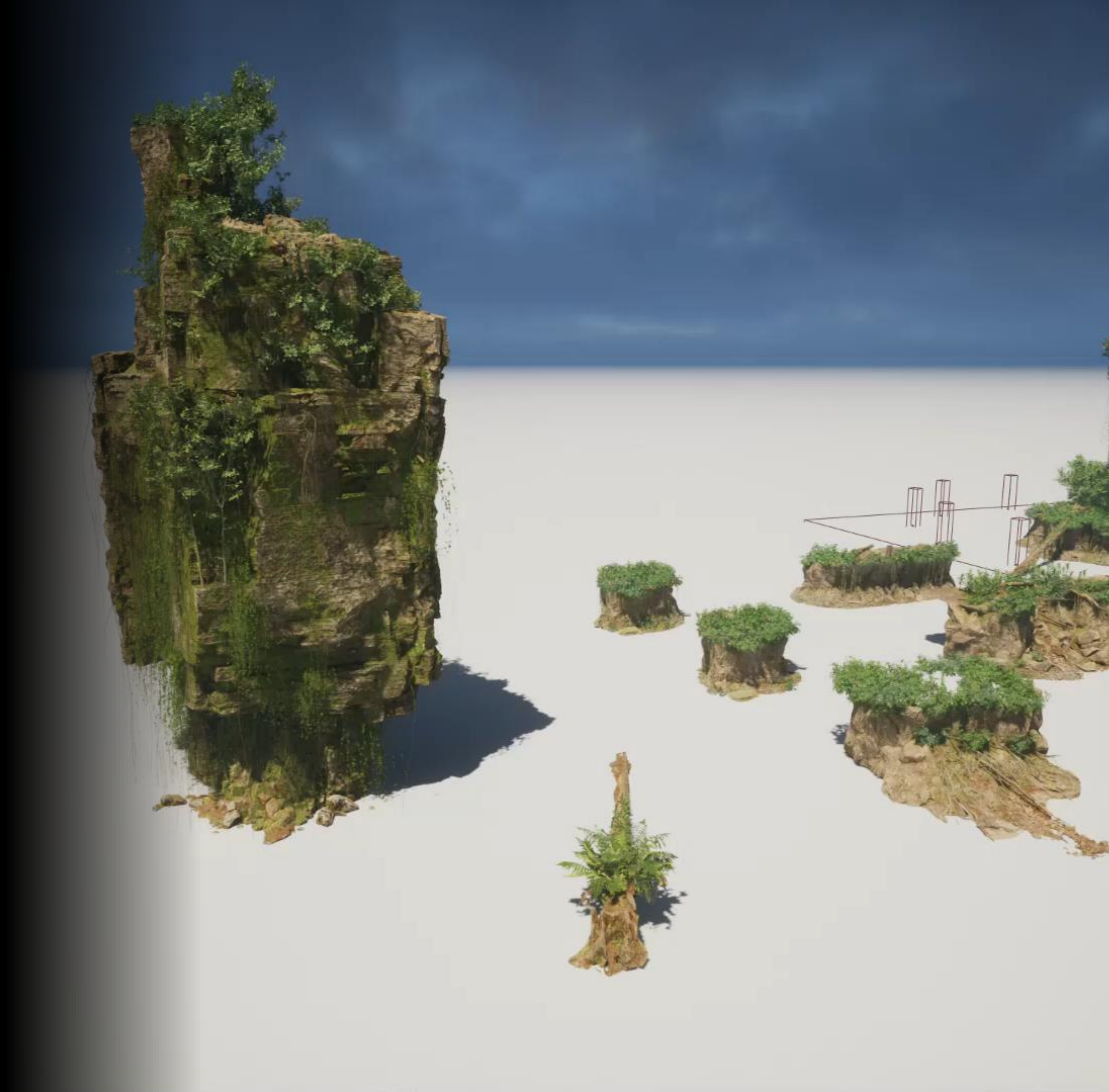
Update Overlaps Method During Level Strea... Use Config Default

Default Update Overlaps Method During Leve... Only Update Movable

Trace | Derived Data | All Saved | Revision Control

Level Instance Zoo

Create simple environments with **showcases** of your assets to more readily modify Instances without having to find them in the world.



Procedural Content Generation (PCG)

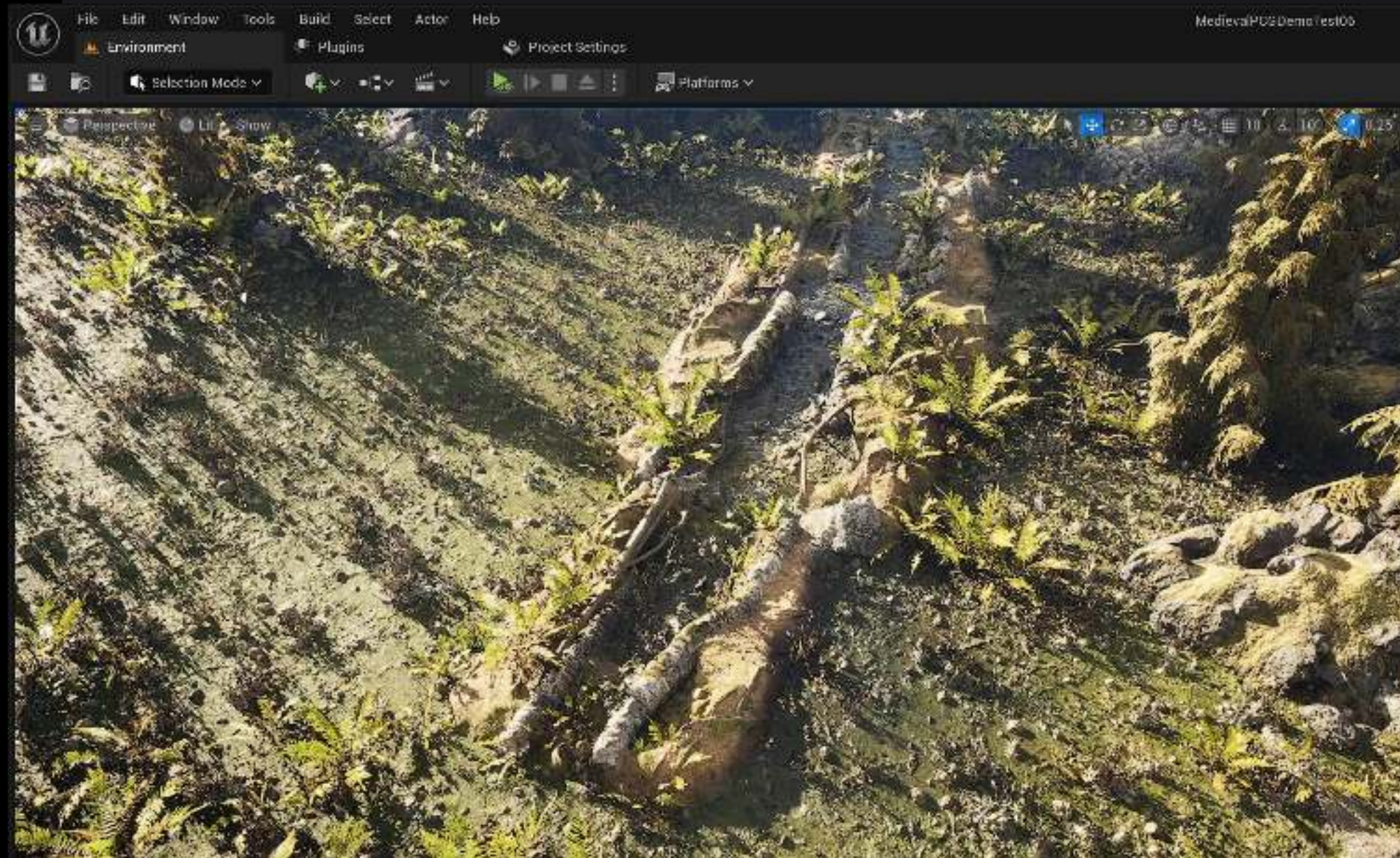
- A-sync node based procedural content generation.
- Large-scale demonstration available in the Electric Dreams sample project.
- Can be handled at a macro level or for fine details.
- Not just meshes. Can be used to scatter blueprints, particle systems and more.
- Custom Nodes can be implemented through Blueprint, C++ or nested PCG Subgraphs.



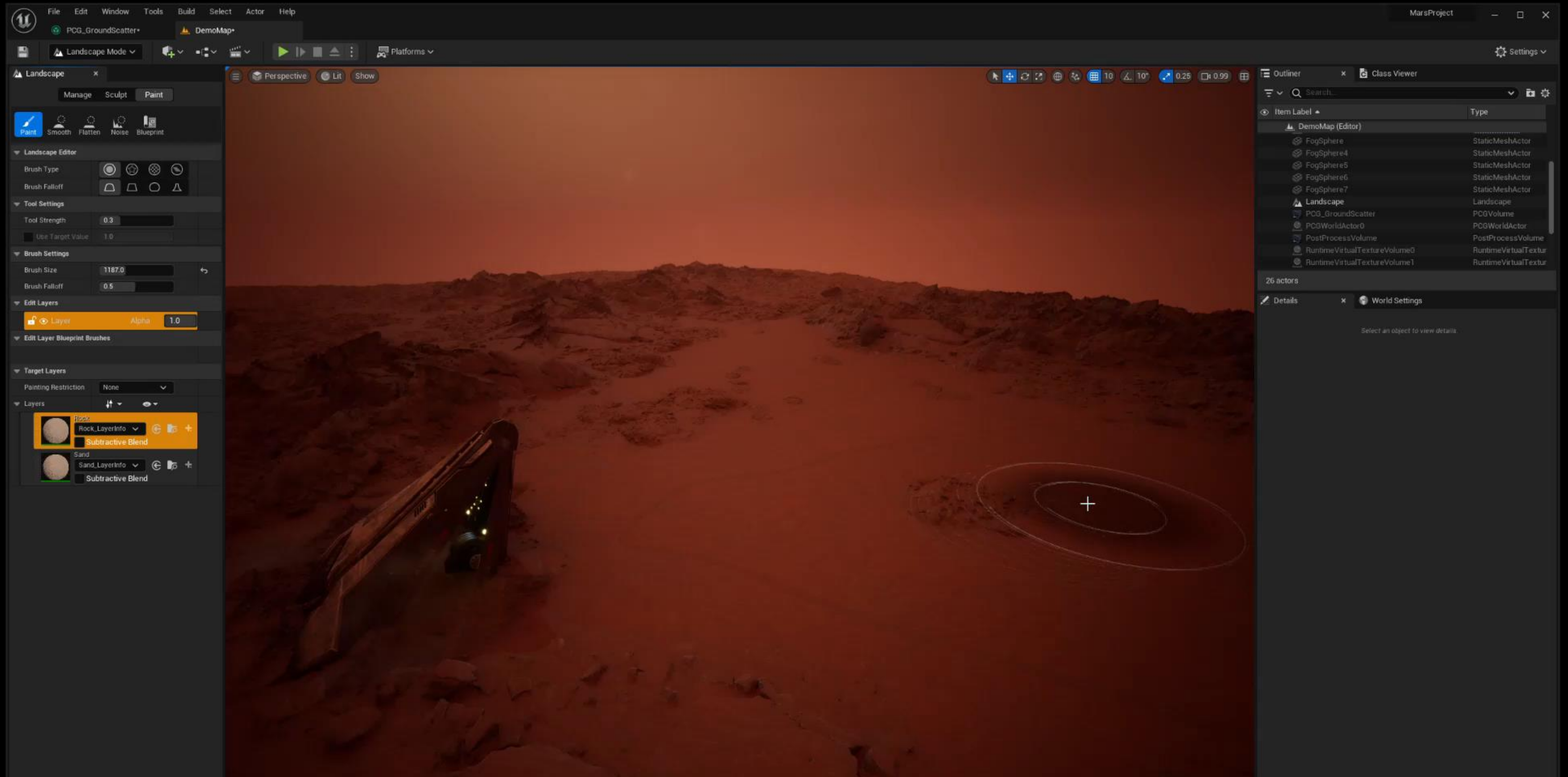
PCG Data Asset Support

Natively convert Level Instances to PCG Data Assets and update them from the right click menu

Create generic Data Assets and pass their information to PCG systems through Data Assets.



Sample Landscape Layer Data in PCG

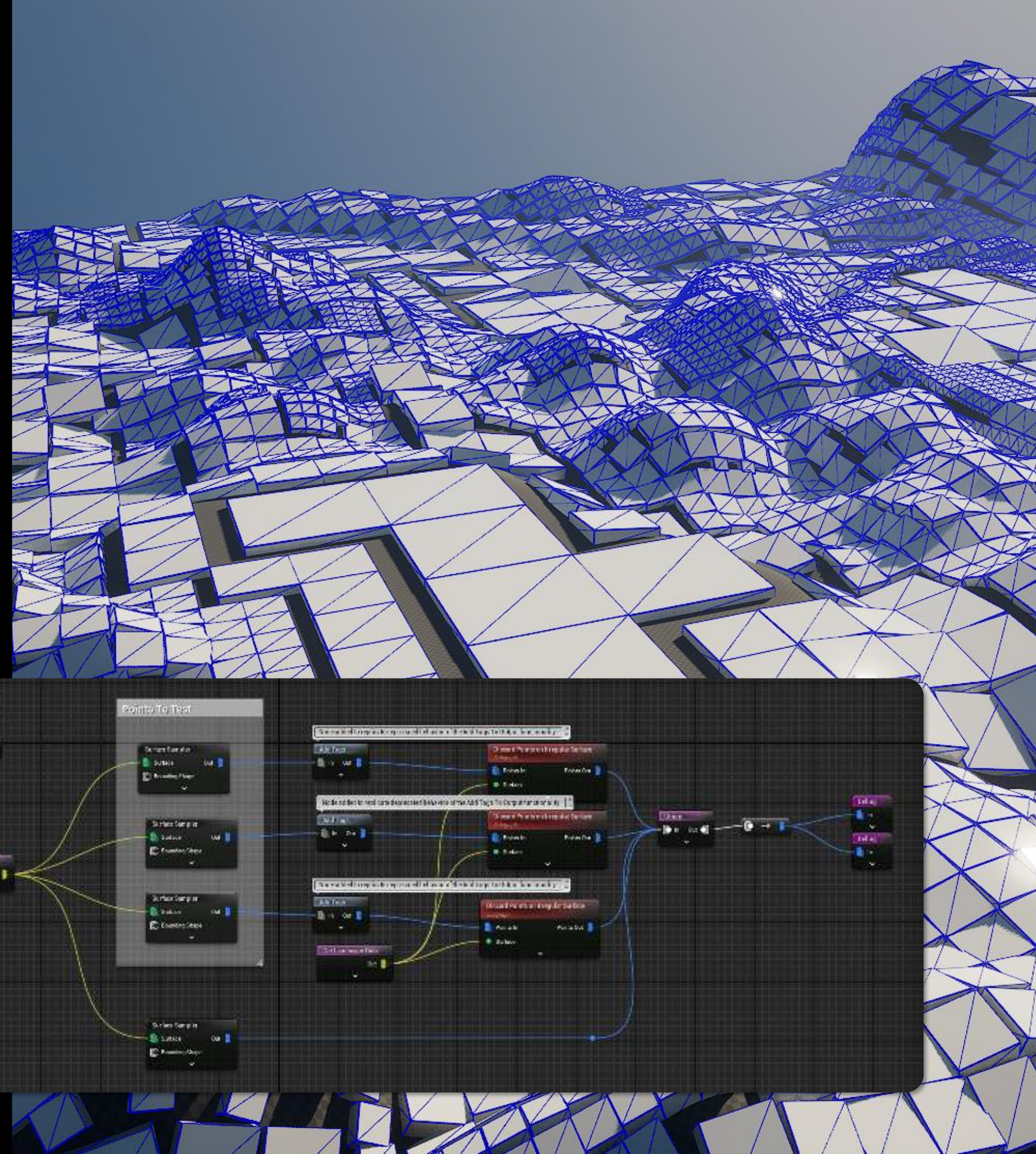
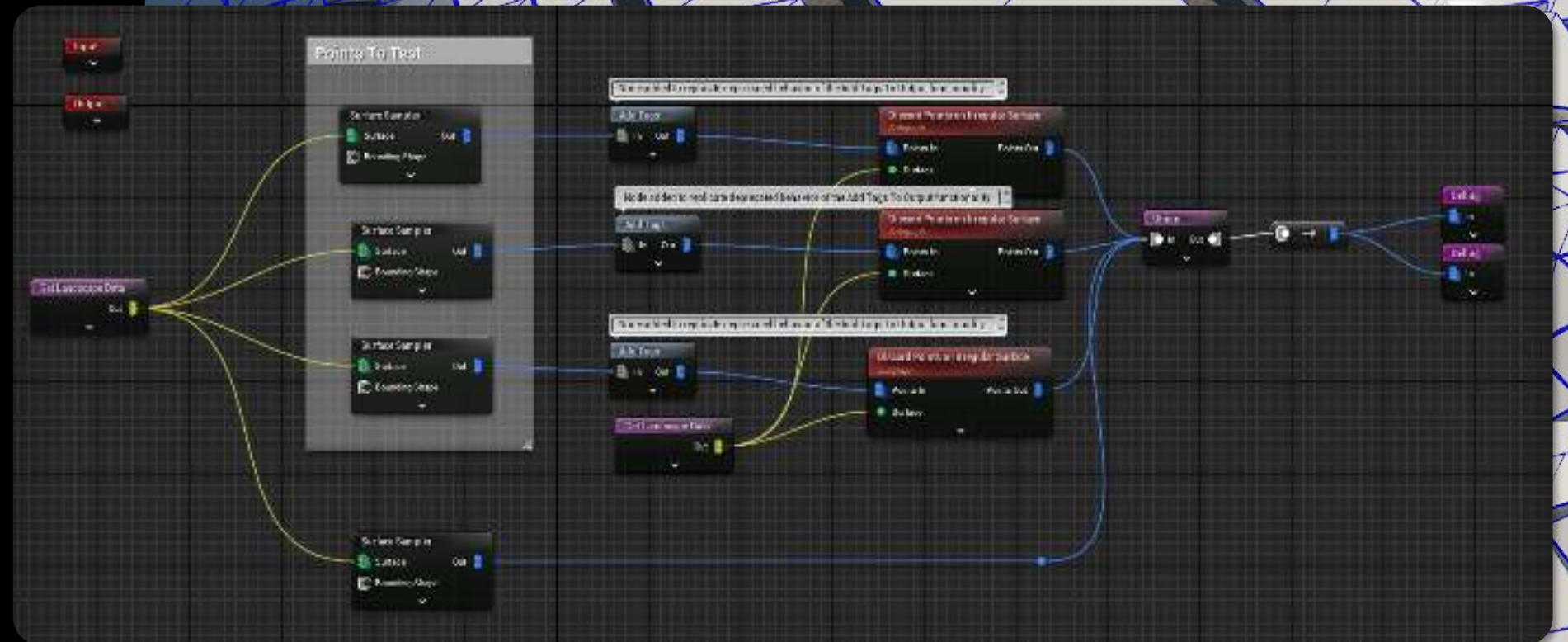


Discard Points on Irregular Surface

Subgraph designed to remove nodes that are sticking out over the edges of things.

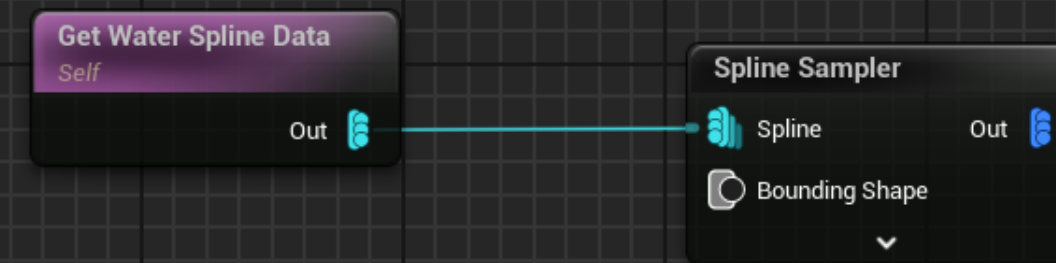
Uses the bounds of the first object so it's often a good idea to partition your data and only scale each set downwards from that point onwards.

Example Level: PCG/SampleContent/FlatnessDetection/FlatnessDetectionLevel.FlatnessDetectionLevel'



Spline Water Data

Allows you to sample Water Spline Metadata such as River Width, Velocity and Depth.



PCG Graph

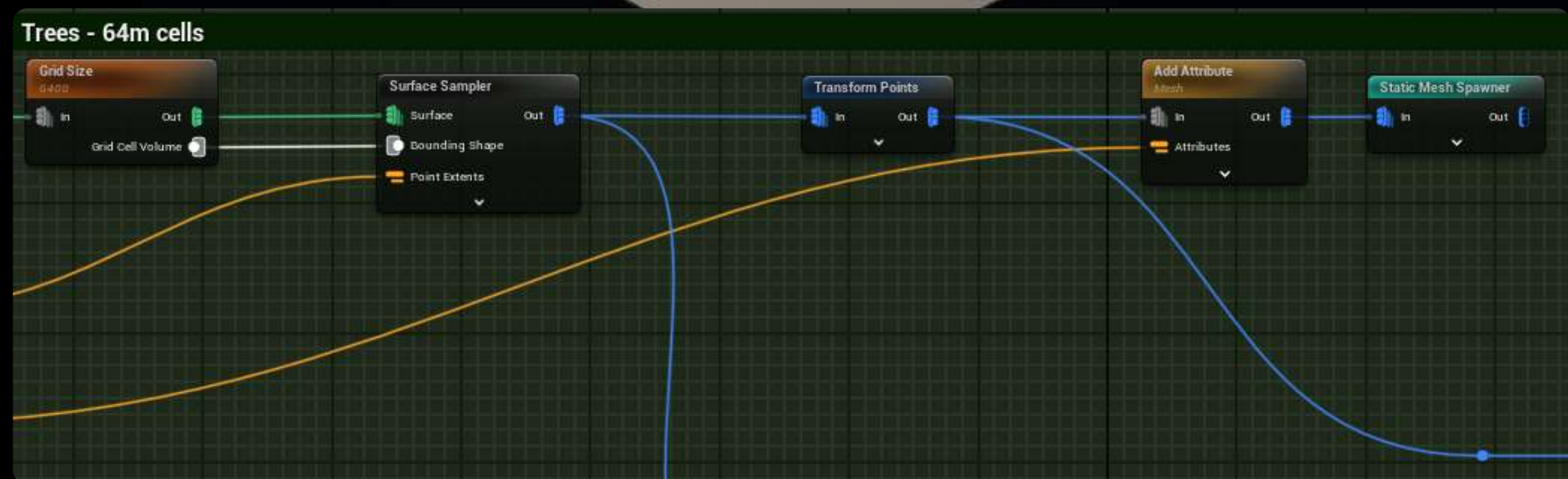
PCG Hierarchical Generation

Split up PCG logic to process in multiple subgrid sizes with different streaming distances.

In the future this will support Static and Runtime creation.

For Example:

Trees in 200 meter partitions
Ferns in 50 meter partitions
Grass in 25 meter partitions

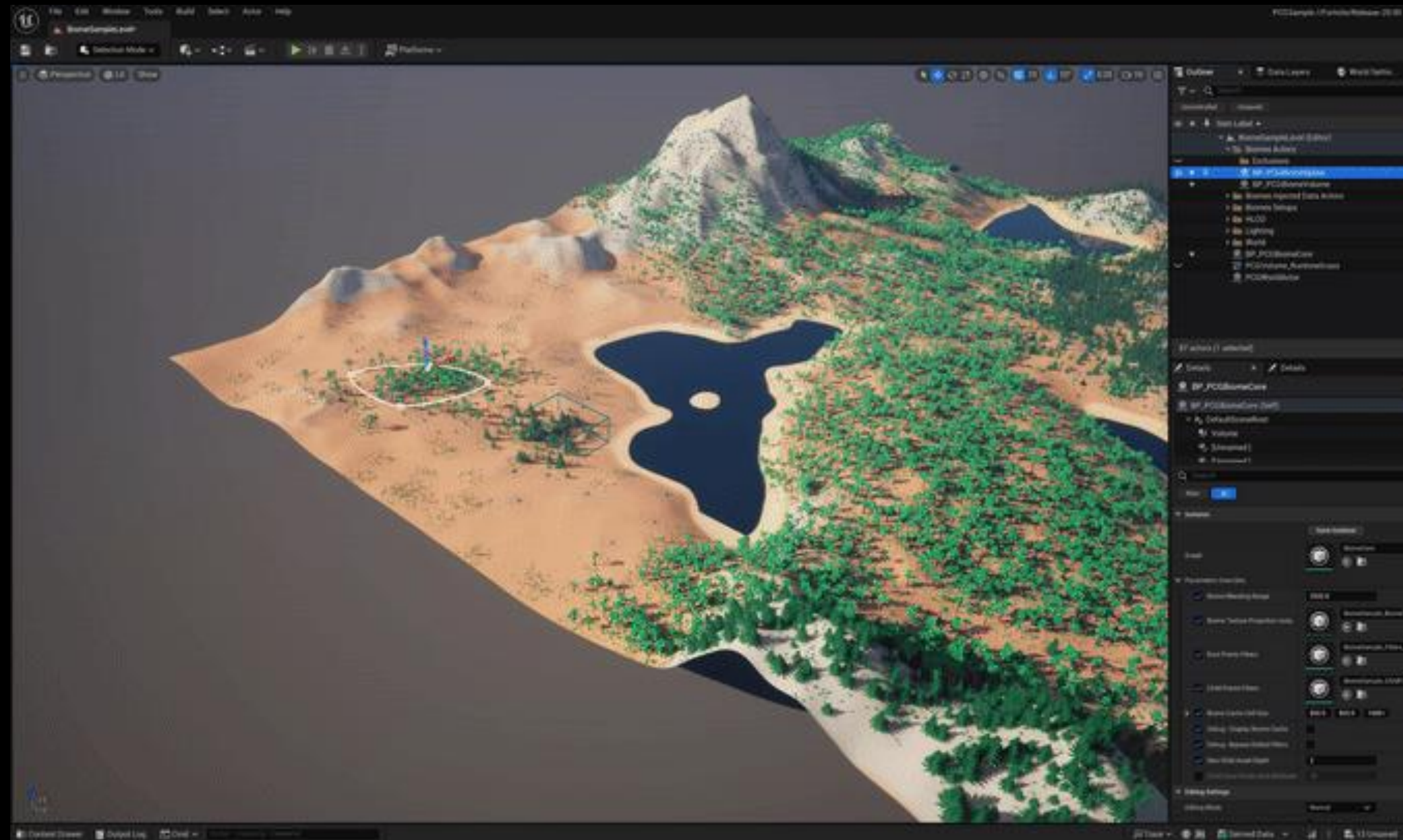


Command

Trace

Derived D

Implement varied PCG biomes with less overhead by leveraging the **Biome Plugin**



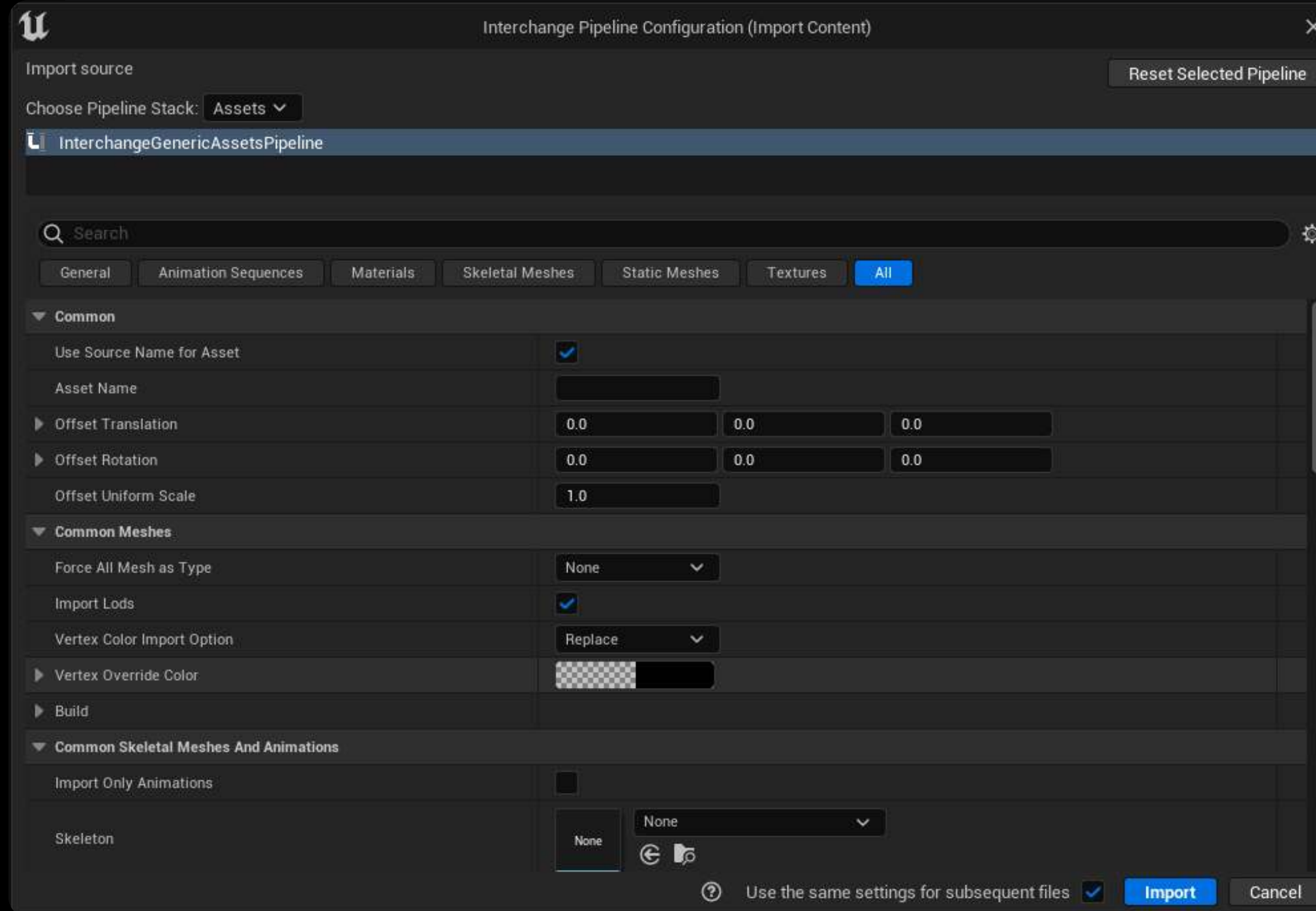
Custom Tools



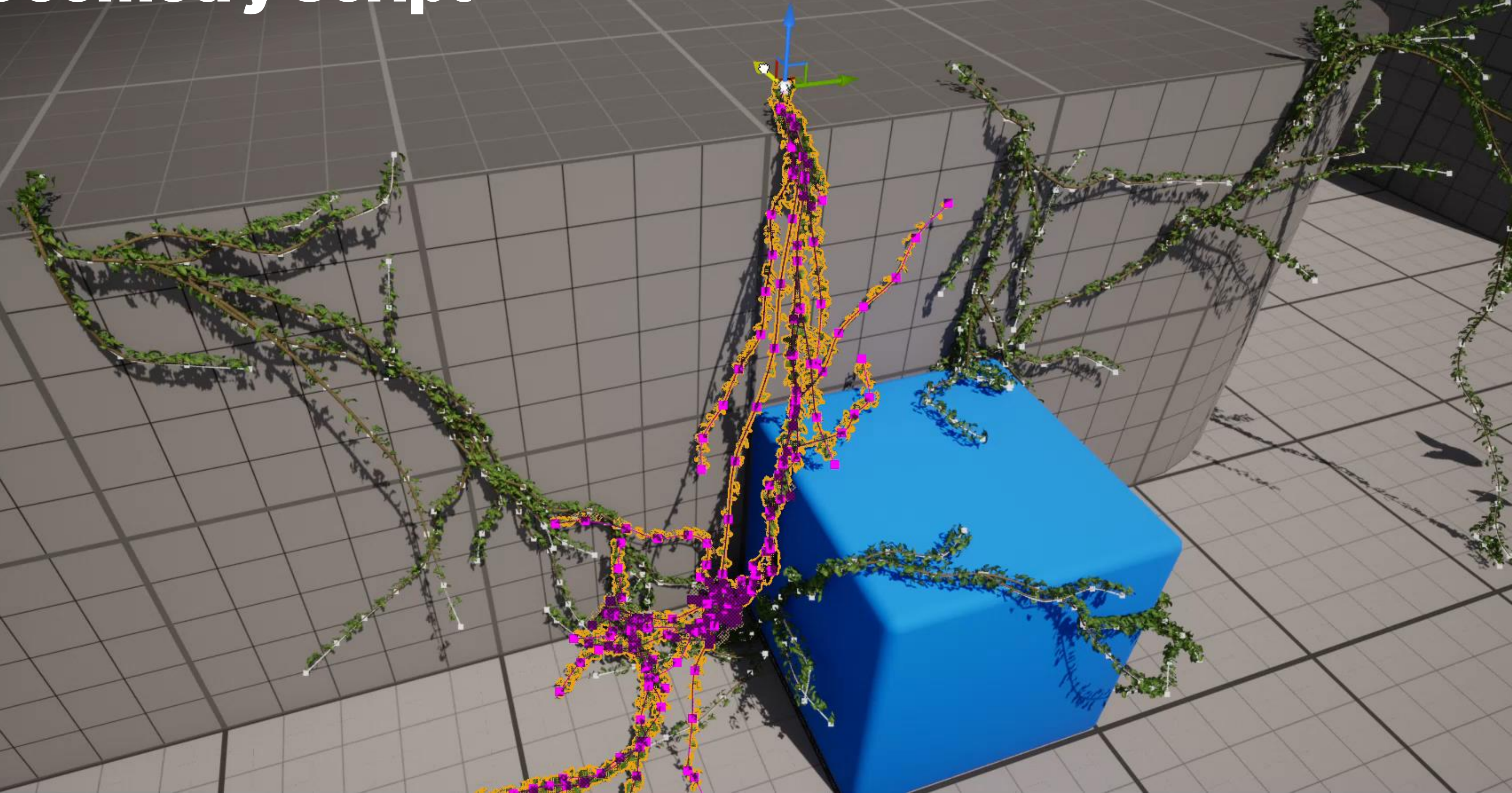
Interchange

**Import and export framework.
Provides a customizable asset
import pipeline and automation.**

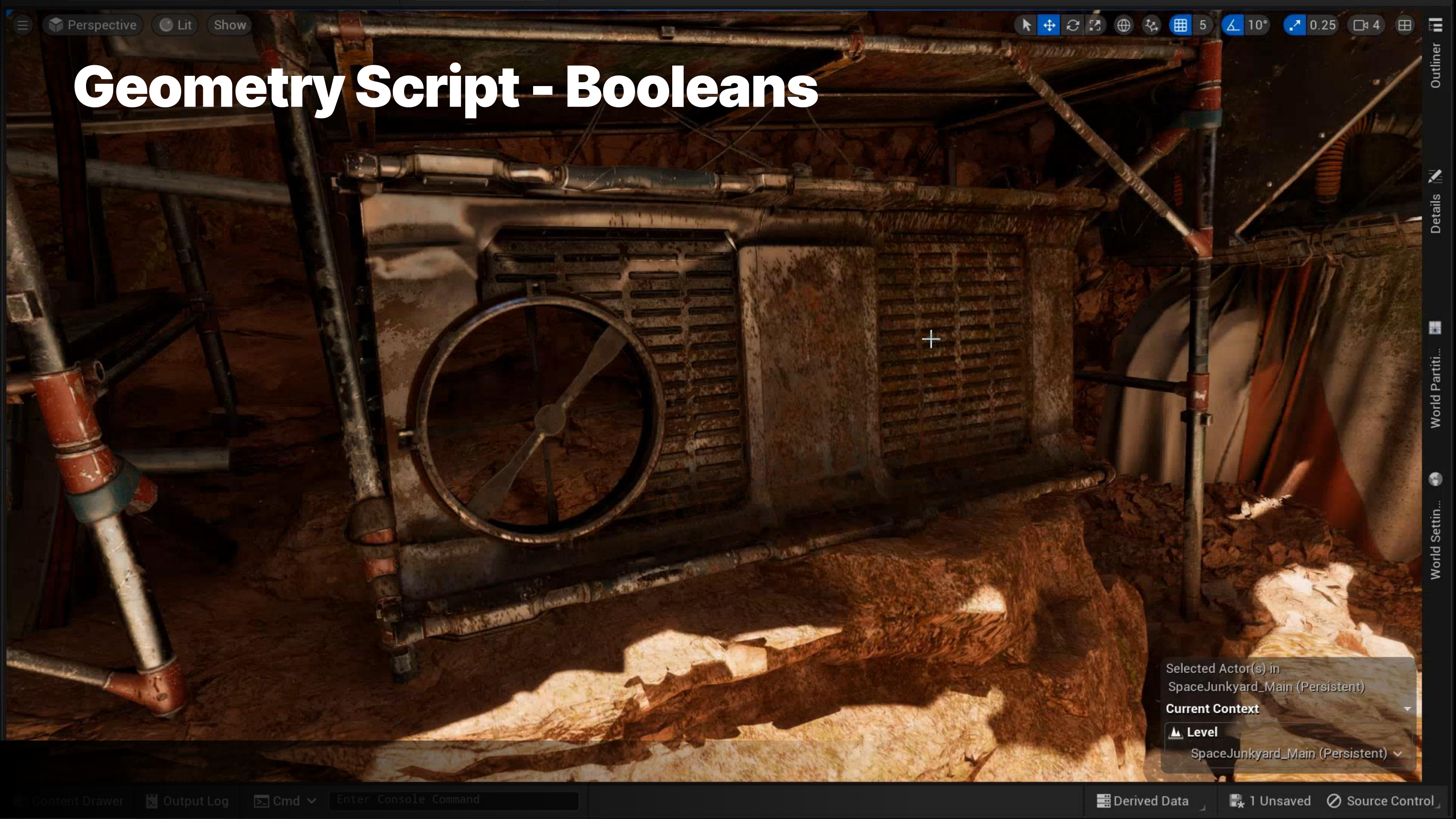
**Import file format agnostic,
asynchronous, customizable,
and can be used at runtime.**



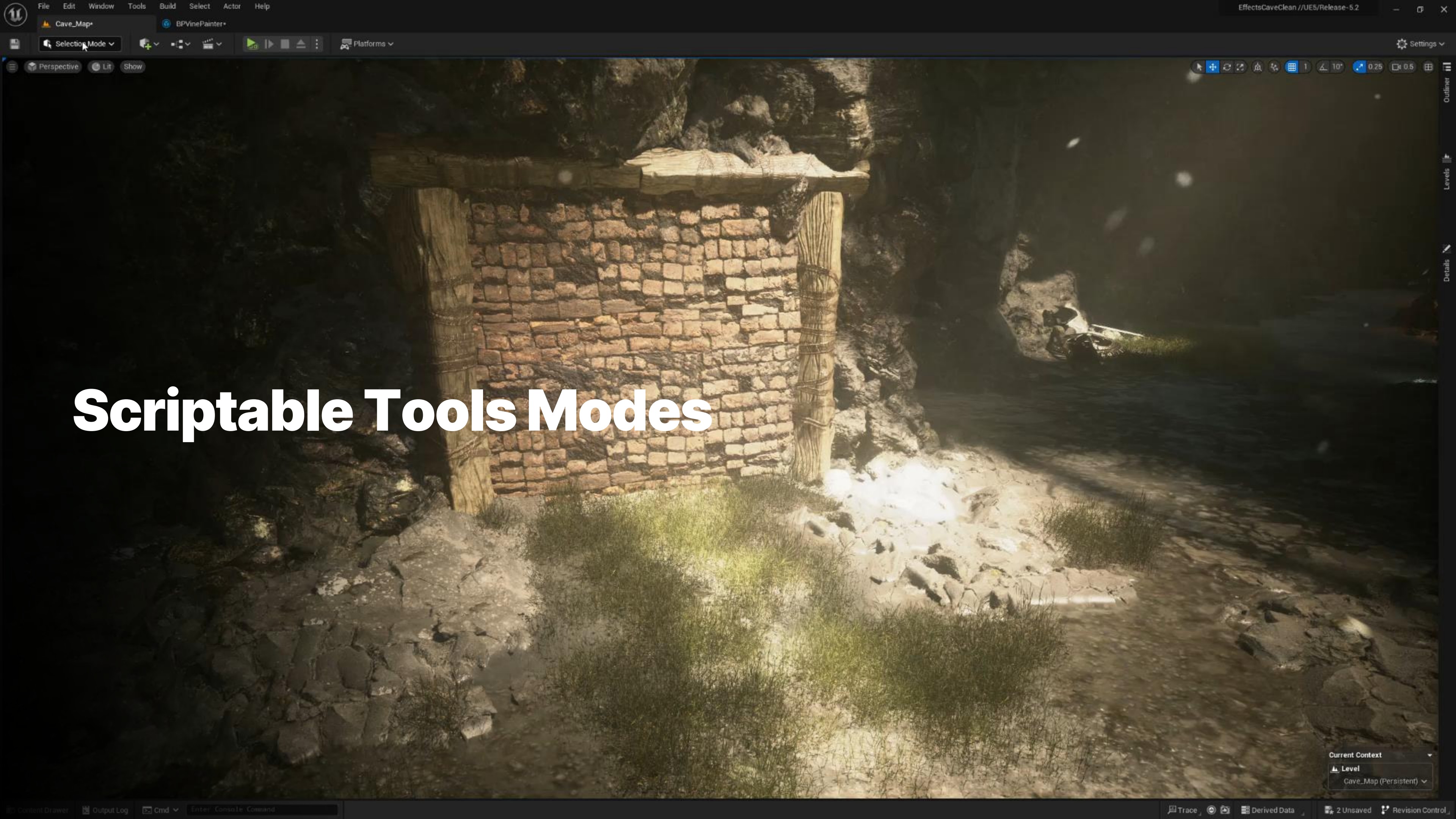
Geometry Script



Geometry Script - Booleans



Selected Actor(s) in
SpaceJunkyard_Main (Persistent)
Current Context
▲ Level
SpaceJunkyard_Main (Persistent)



Scriptable Tools Modes

Tab Section x User Toolbox Tab x Tab Details Command List x Command Details x

Sections

- Camera Operations
- CameraLens
- Hidden

Camera Operations

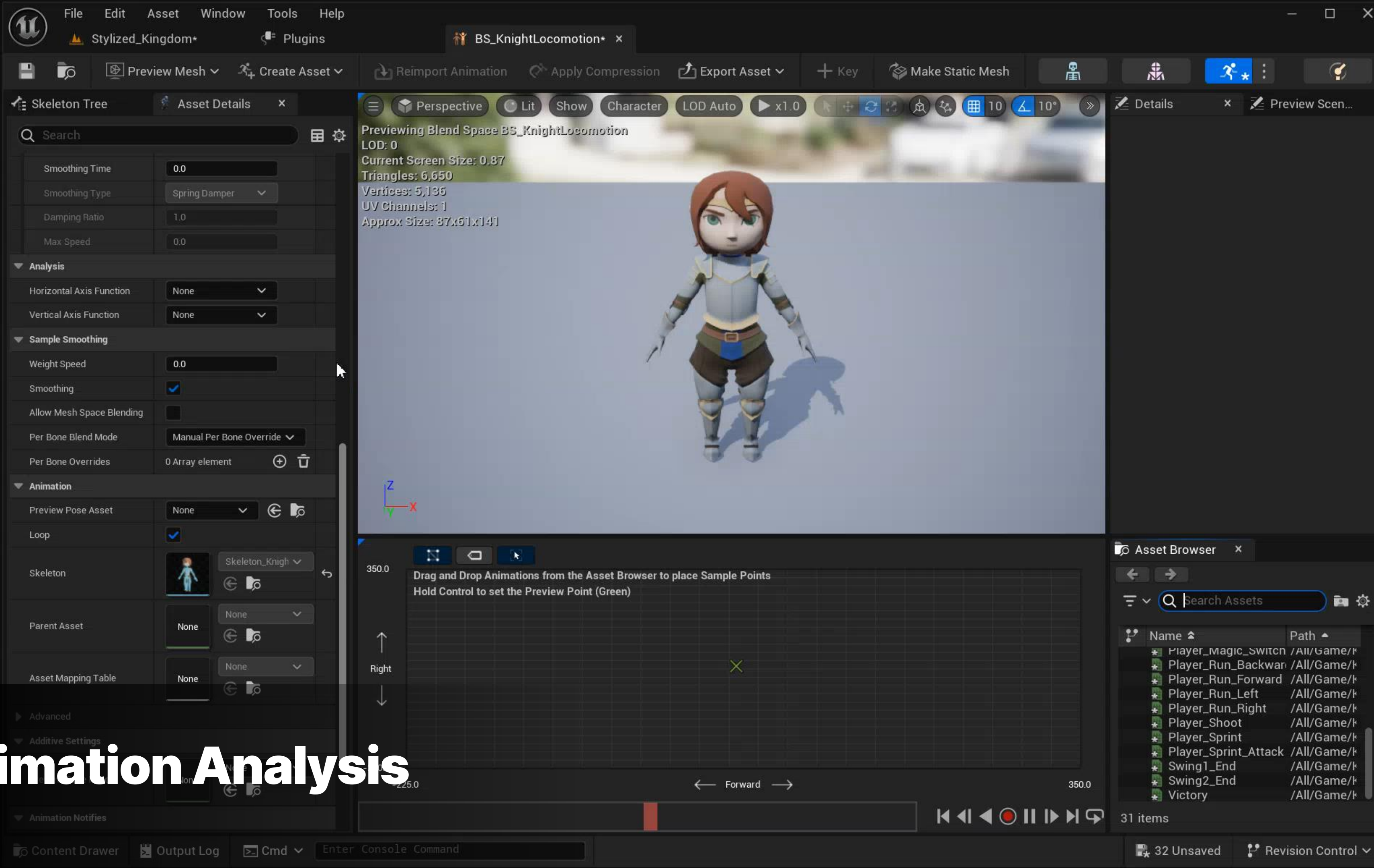
Search

- Level Dev
 - CTBLock Transform
- Camera
 - CTBSet Film Back
 - CTBSet Lens
 - UBT Auto Focus
 - UBT Spawn Camera
 - UBT Change Aperture
 - UBT Change Camera
- Level
 - Assign to Layer
 - Assign to Level
- Viewport
 - Change View Mode
 - Zoom All
- Scene
 - Clean Hierarchy
 - Isolate Selection
 - Show Layers Command
- Utility
 - Composite Command
 - Composite Inline Command
 - Console Variable
 - Engine Command
 - Execute Bindable Action
 - Execute Python Script
 - Tab Spawner
 - Toggle Command
 - Toggle Command Inline
- Mesh
 - Flip Normals
 - Merge
 - Set High Precision on Mesh
- Actor
 - Mirror Actor Command
 - Push Component Material into Mesh
 - Select Actor by Filter
 - Select Actor by Size
- Default
 - Refresh Tokens
 - UBT Lock Transform

Toolbox Plugin

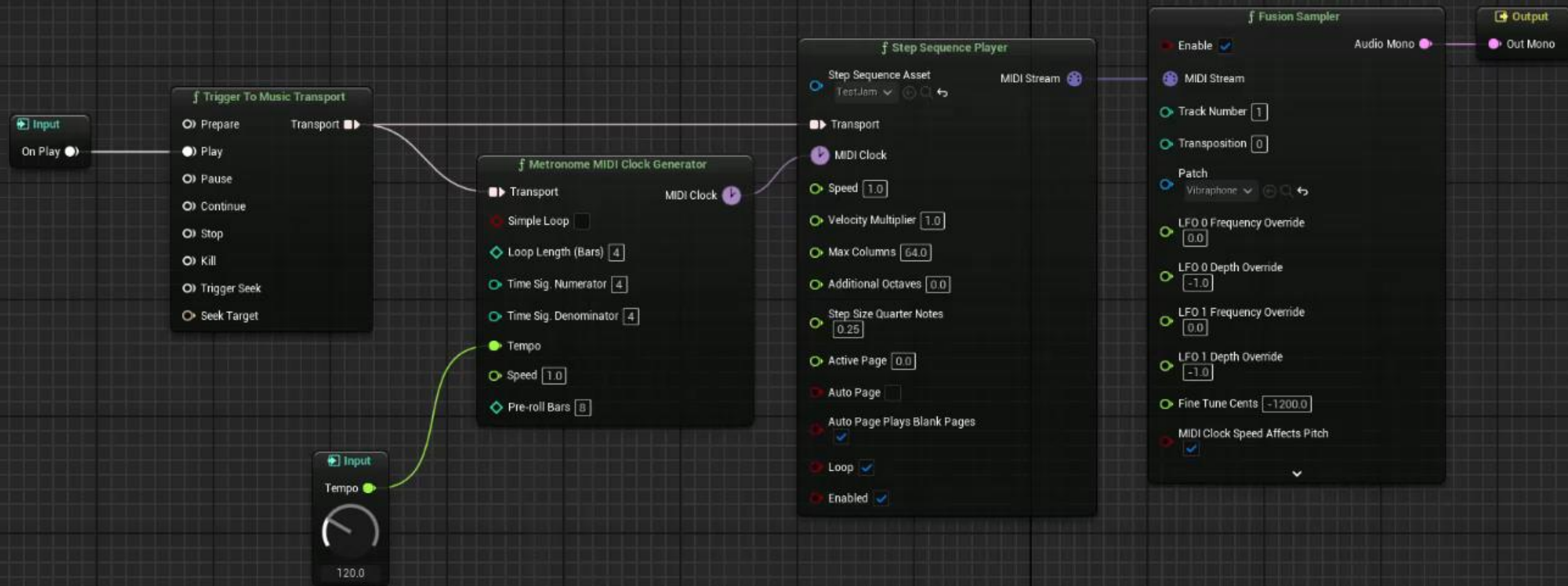
Bells and Whistles





Animation Analysis

Create Custom MIDI Sequences with the Harmonix Plugin



MetaSoundSource



Harmonix

Experimental

A package of Harmonix music related audio functionality.

Details

Search

Sound

Volume Base 1.0

Pitch Base 1.0

MS_Insects

Modulation Behavior

Randomize Volume

Volume Min 0.95

Volume Max 1.05

Randomize Pitch

Pitch Min 0.95

Pitch Max 1.05

Fade Volume

Min Fade in Time 0.0

Max Fade in Time 0.0

Min Fade Out Time 0.0

Max Fade Out Time 0.0

Only Fade in on Retrigger

Playback Behavior

Randomize Starting Seek Time

Limit Playback Duration

Min Playback Duration 0.0

Max Playback Duration 0.0

Spawn Behavior

Delay First Spawn

Min First Spawn Delay 0.0

Max First Spawn Delay 3.0

Continuously Respawn

Min Spawn Delay 0.25

Max Spawn Delay 3.0

Max Number Of Spawned Elements 3

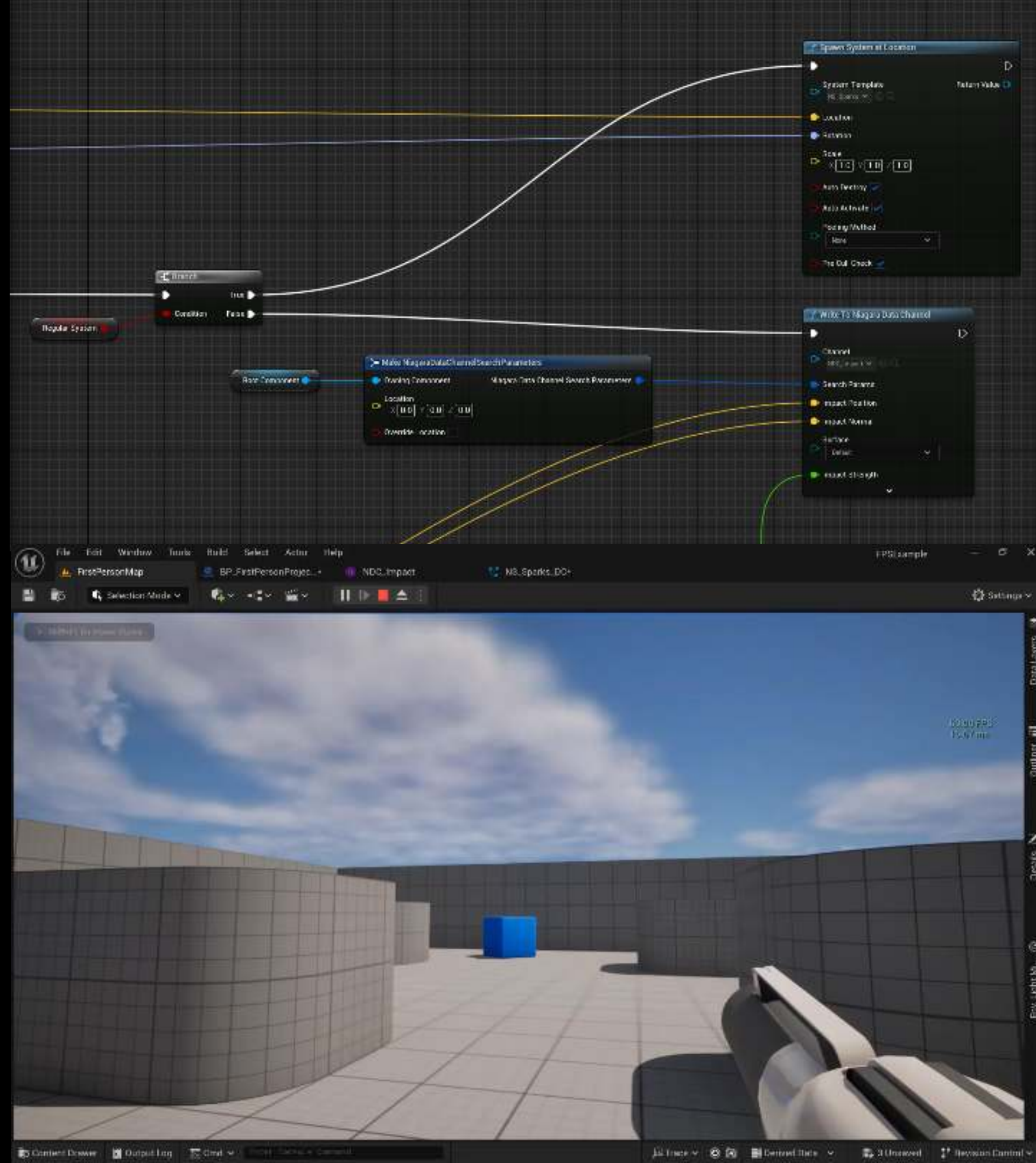
Procedural Audio through the Soundscape Plugin

Data Channels

Consolidate your effects into automatically managed & pooled setups.

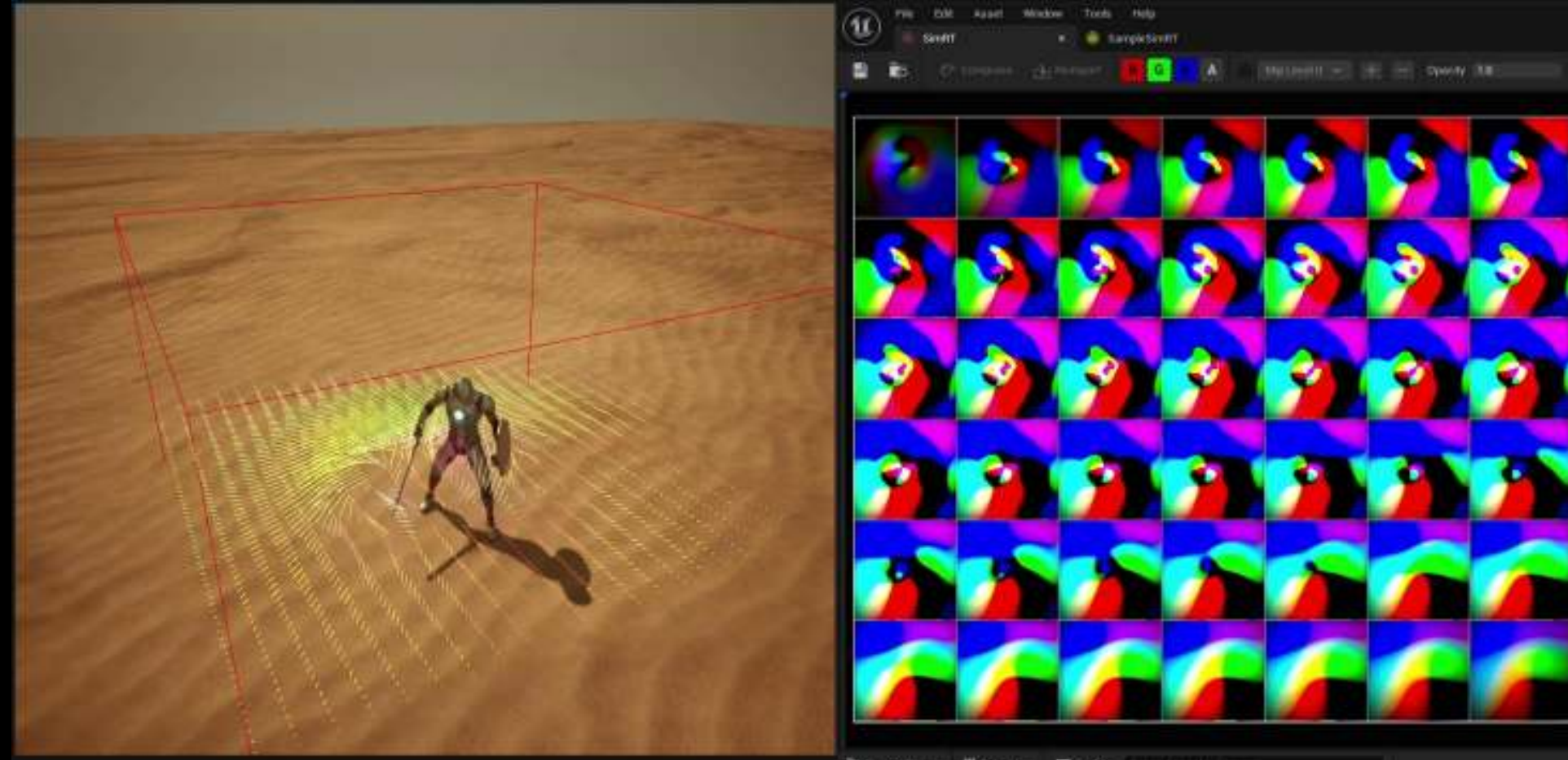
Instead of calling a Spawn event in Blueprint you write to Data Channels that Niagara Systems can detect.

Great optimization for Impact Effects and projectiles!



Niagara Simulation Stages

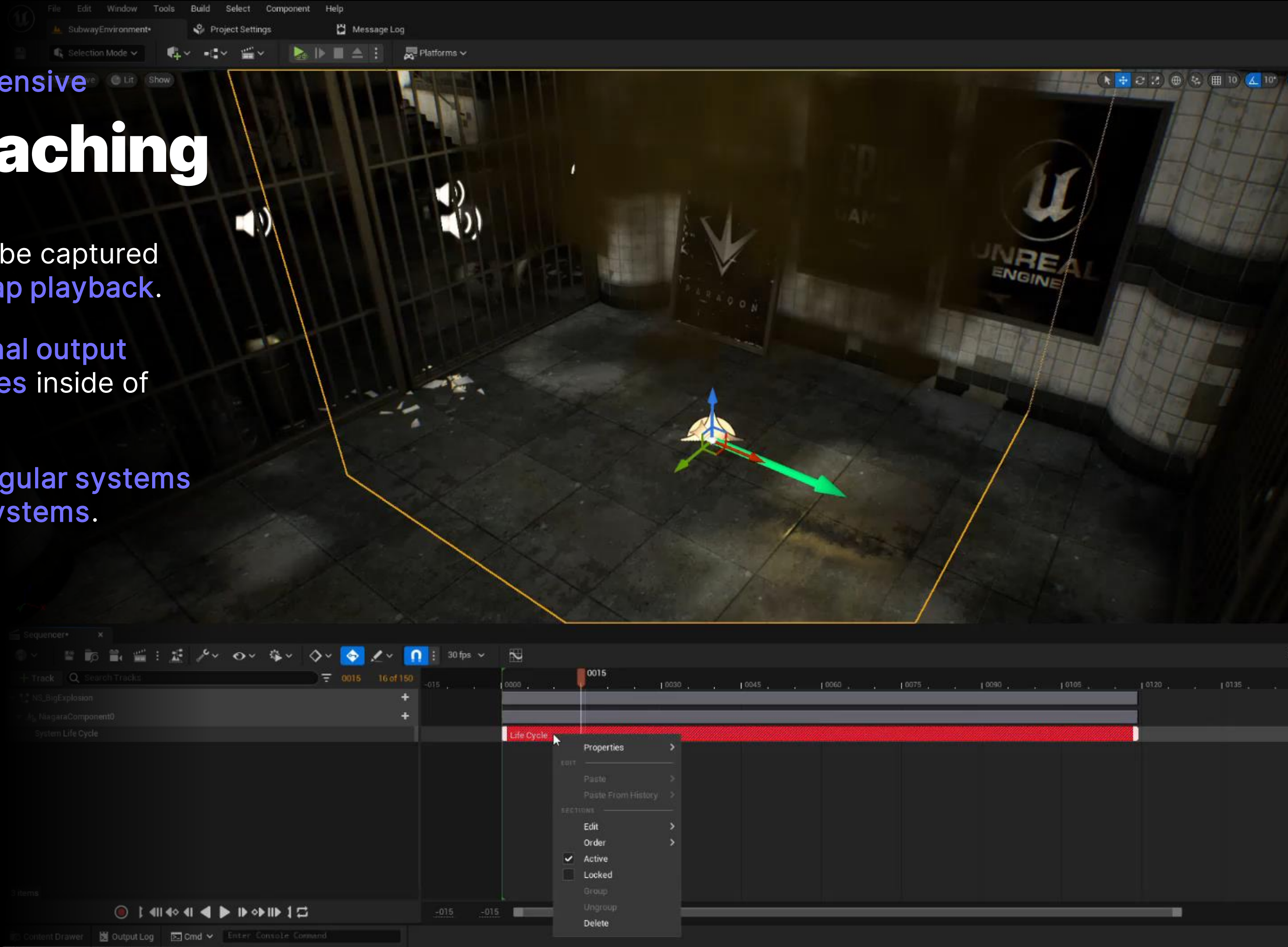
- Most people have heard about them but most also don't really know what they are.
- Run staged loops over grids, particles, render targets, etc.
- The difference between Niagara as a Particle System and Niagara as a VFX System.



Same visuals, less expensive

Niagara Caching

- Niagara effects can be captured and cached for **cheap playback**.
- Can capture both **final output values** or **all variables** inside of a system.
- Can capture both **regular systems** and **Niagara Fluid systems**.

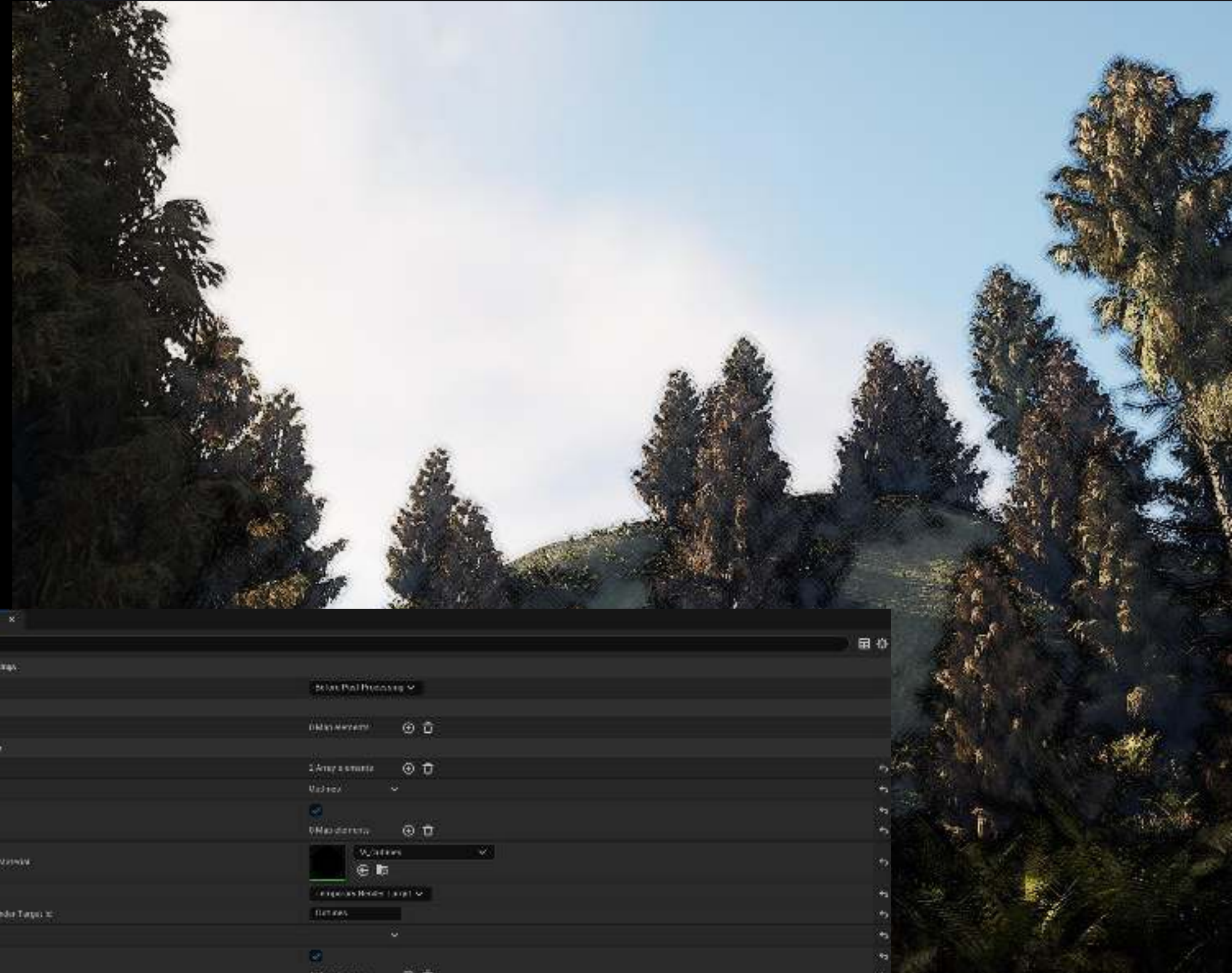


Leverage **Translucency**
Overlay Materials for
unique stylization



Post Process Material Chain plugin

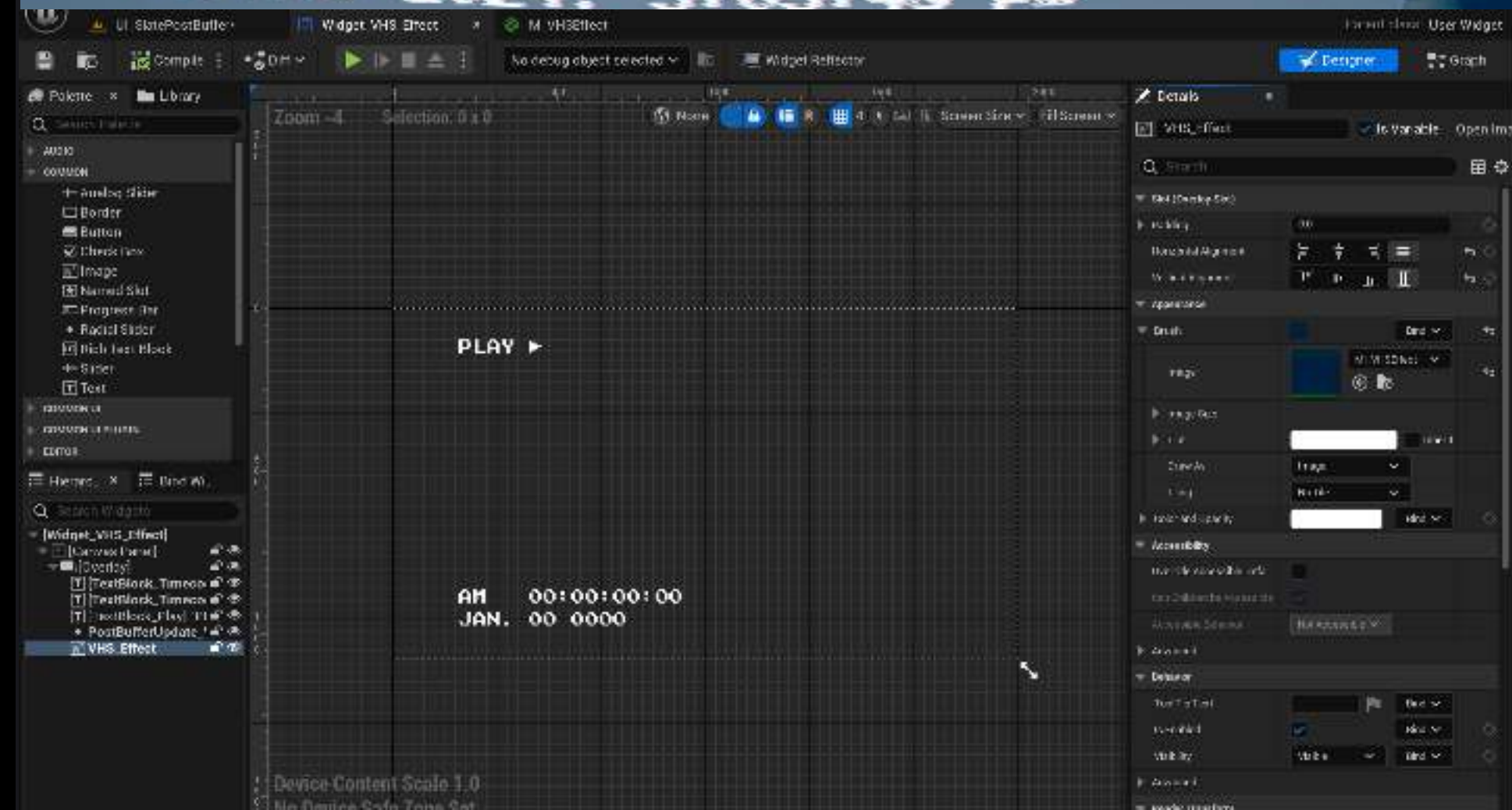
- Allows for post process materials to output to temporary Render Targets.
- Override incoming Post Process textures with previous pass Render Targets.
- Create unique effects by using passes to modify the sampling of future passes.
- Great for Blurred Outlines!



Slate Post Buffer

Render scene with UMG into a texture then continue to render the rest of the UI over the top.

Great example in the Content Examples sample project.

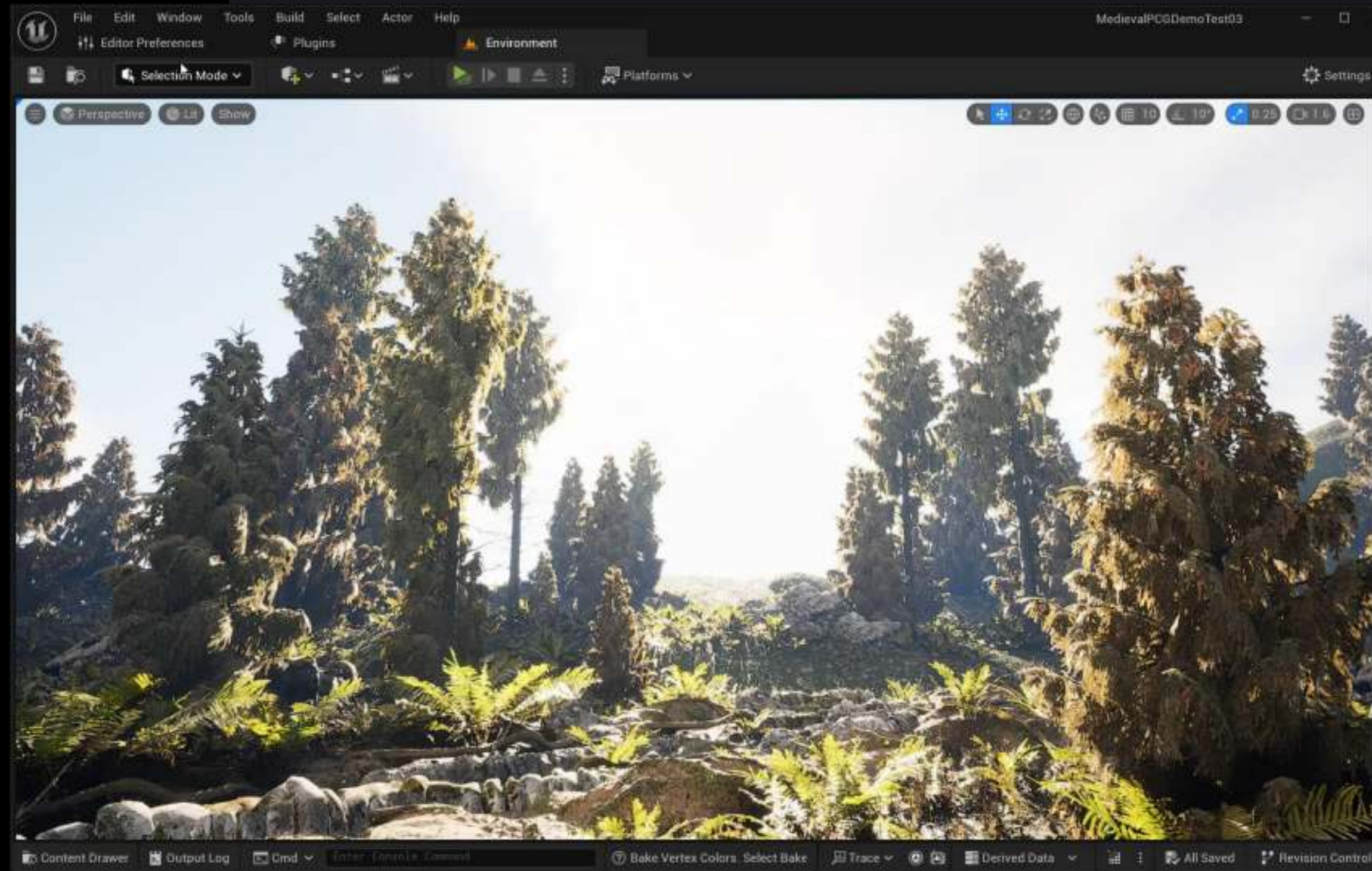


Console Variables Tool

Easily lookup, modify and reset console commands.

Save/Load presets.

Toggle between different variables to easily see the difference.



ABTest

Type ABTest before a console command and then the options to test and Unreal will toggle between them and give you the performance difference.

For Example:

“abtest showflag.fog 0 1”

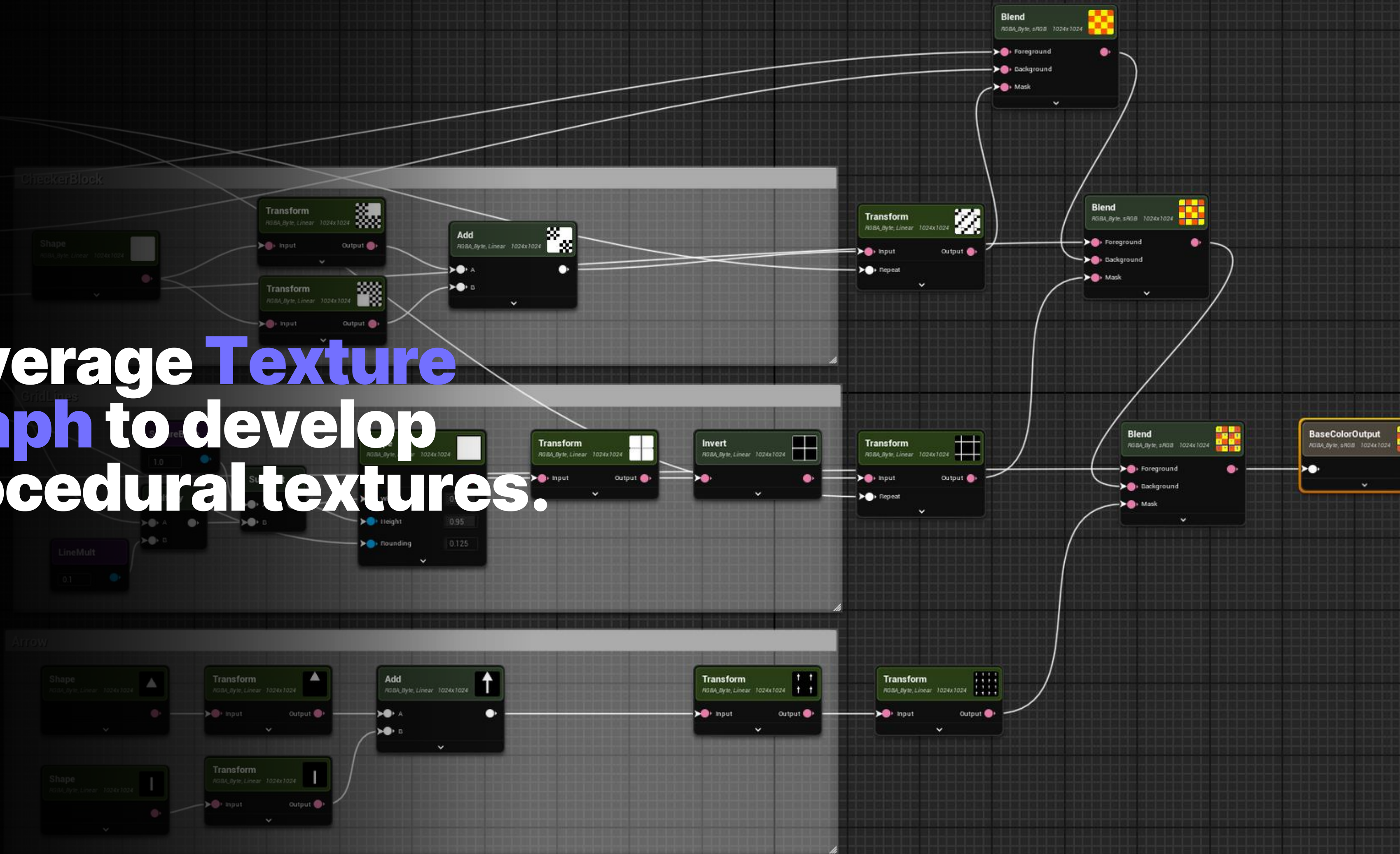
“Abtest Stop” to stop the test



Use ? in console commands for a description



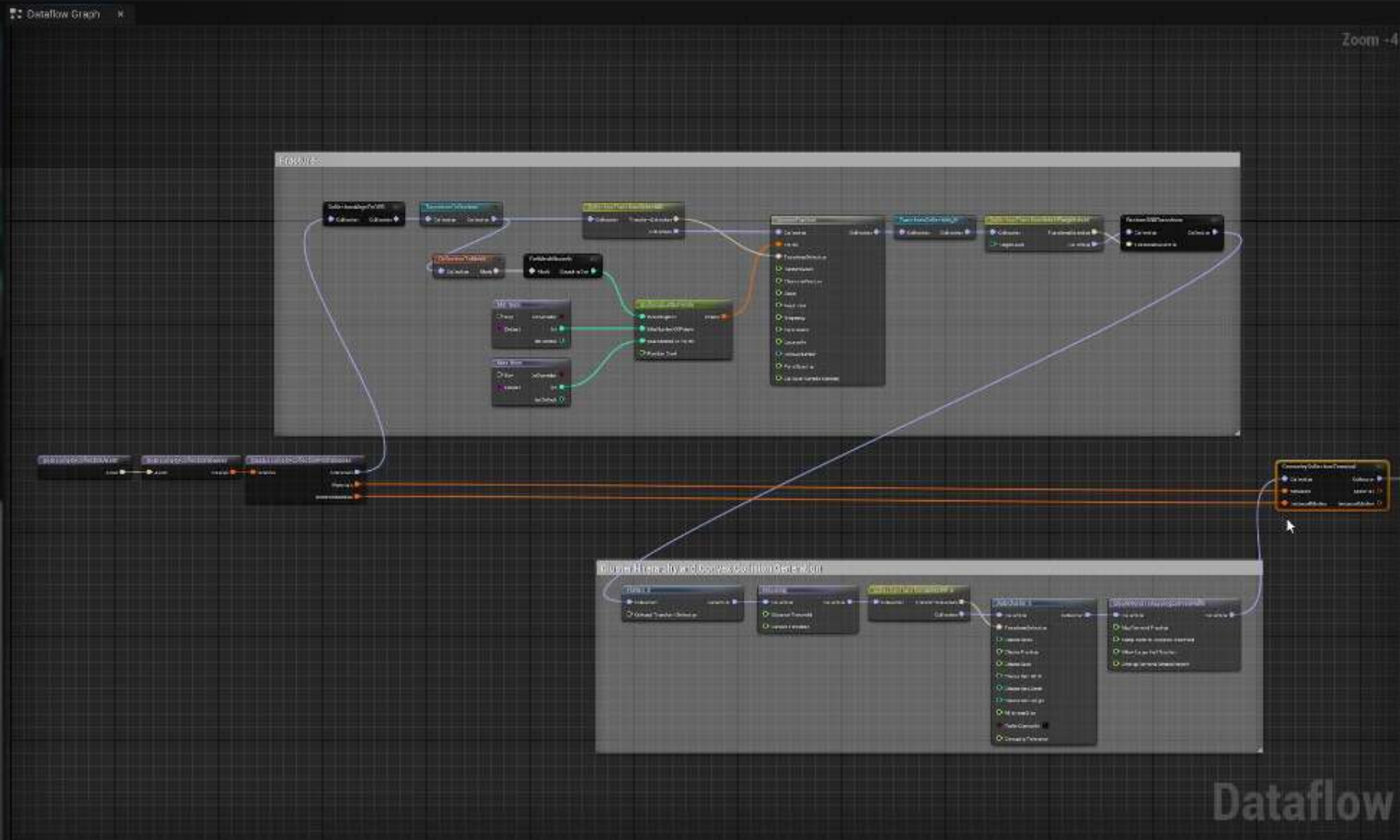
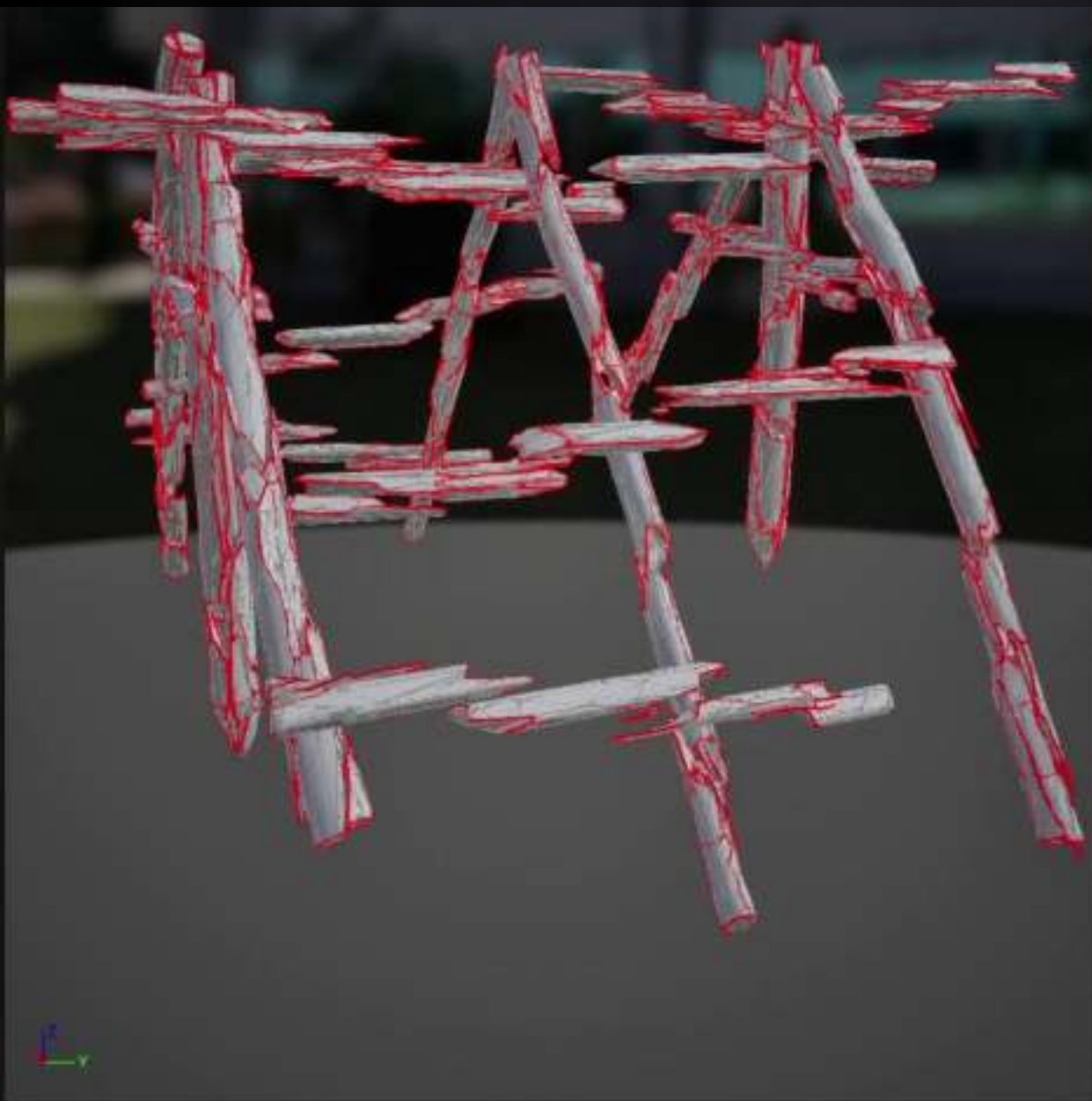
Leverage **Texture Graph** to develop procedural textures.



Chaos Visual Debugger



Data Flow



Node Details

Active

Collection Spread

Node: GeometryCollectionTerminal

Output: Collection

Group: Transform

Index	Transform	BoneName	BoneColor	Parent	Children	TransformToGeometryIndex	SimulationType	StatusFlags	InitialDynamicState	ExemplarIndex	Act
0	<Unknown Data T	Cluster Bone	(R=0.00 G=0.00 B=0.00 A=0.00)	-1	354 355 351 24 26 416 356 353 434	-1	2	0	0	-1	
1	<Unknown Data T	SM_85_1	(R=0.07 G=0.10 B=0.10 A=1.00)	350		0	1	0	0	-1	
2	<Unknown Data T	SM_8_1	(R=0.07 G=0.10 B=0.10 A=1.00)	350		1	1	0	0	-1	
3	<Unknown Data T	SM_1_1	(R=0.07 G=0.10 B=0.10 A=1.00)	354		2	1	0	0	-1	
4	<Unknown Data T	SM_1_2	(R=0.07 G=0.10 B=0.10 A=1.00)	354		3	1	0	0	-1	
5	<Unknown Data T	SM_49_1	(R=0.07 G=0.10 B=0.10 A=1.00)	352		4	1	0	0	-1	

Group has 419 elements

Physics Control Component

2.5

Ledge hanging

The two characters are driven with the same animation but the one on the left is simulated to achieve more natural looking hanging. The one on the right is following the animation on.

This demonstrates using the Physics Control Component to set up per-limb world and parent-space controls.

The character on the left will start rotating an obstacle which demonstrates how the hanging character can interact with the environment. You can also shoot the character with the left mouse button to get a simple physical hit.

Cheat Manager

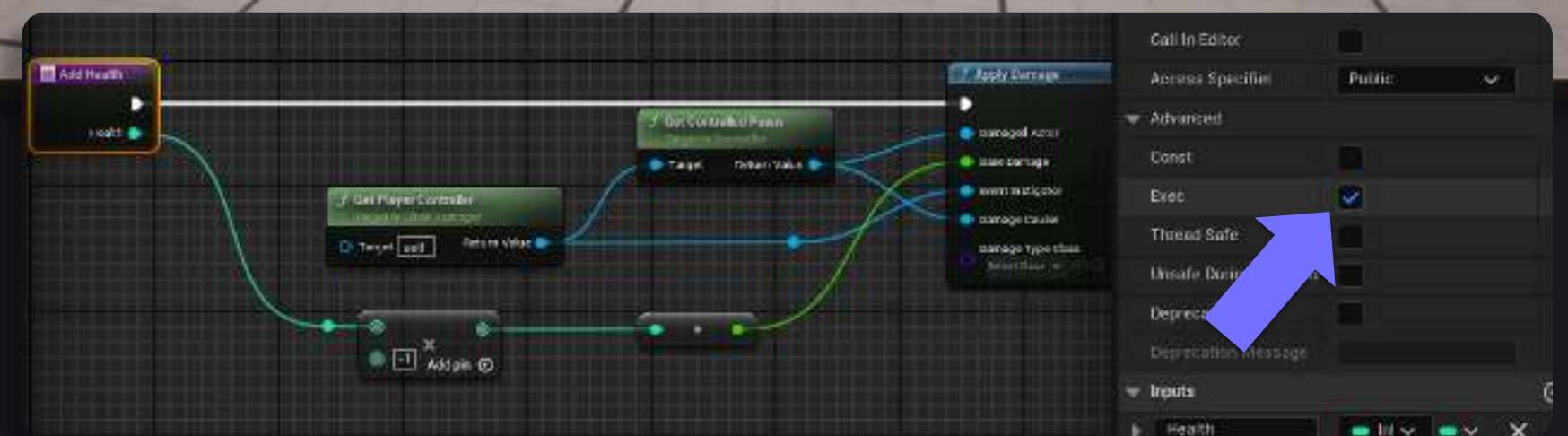
Add console commands for an easier time debugging your project.

Can be easily extended with Game Feature Plugins.

Automatically stripped out on shipping builds!

Steps Involved:

- Create a CheatManager class
- Create functions inside of it with “Exec” enabled.
- Set the CheatManager in your Player Controller.



Blueprint C++ Header Preview

The screenshot displays the Unreal Engine interface. On the left, the 'My Blueprint' panel shows a graph with several nodes connected. The main area shows a 'Blueprint C++' class for 'BP_HierarchicalInstanceConverter' with a parent class of 'Actor'. The right panel, titled 'C++ Header Preview', shows the generated C++ code for the class. The code includes a class declaration, a constructor, and several public member variables with UPROPERTY macros. The compiler results panel at the bottom shows a successful compilation message.

```
UCLASS(Blueprintable, BlueprintType)
class ABP_HierarchicalInstanceConverter : public AActor
{
    GENERATED_BODY()

public:
    /** Please add a variable description */
    UPROPERTY(BlueprintReadOnly, VisibleAnywhere, Category="Default")
    TObjectPtr<UHierarchicalInstancedStaticMeshComponent> HierarchicalInstancedStaticMesh;

    /** Please add a variable description */
    UPROPERTY(BlueprintReadOnly, VisibleAnywhere, Category="Default")
    TObjectPtr<USceneComponent> DefaultSceneRoot;

    /** Please add a variable description */
    UPROPERTY(BlueprintReadWrite, EditAnywhere, Category="Default", meta=(MultiLine="true"))
    TArray<FTransform> TransformArray;

    /** Please add a variable description */
    UPROPERTY(BlueprintReadWrite, EditAnywhere, Category="Default", meta=(MultiLine="true"))
    TObjectPtr<UStaticMesh> MeshToInstance;
};
```

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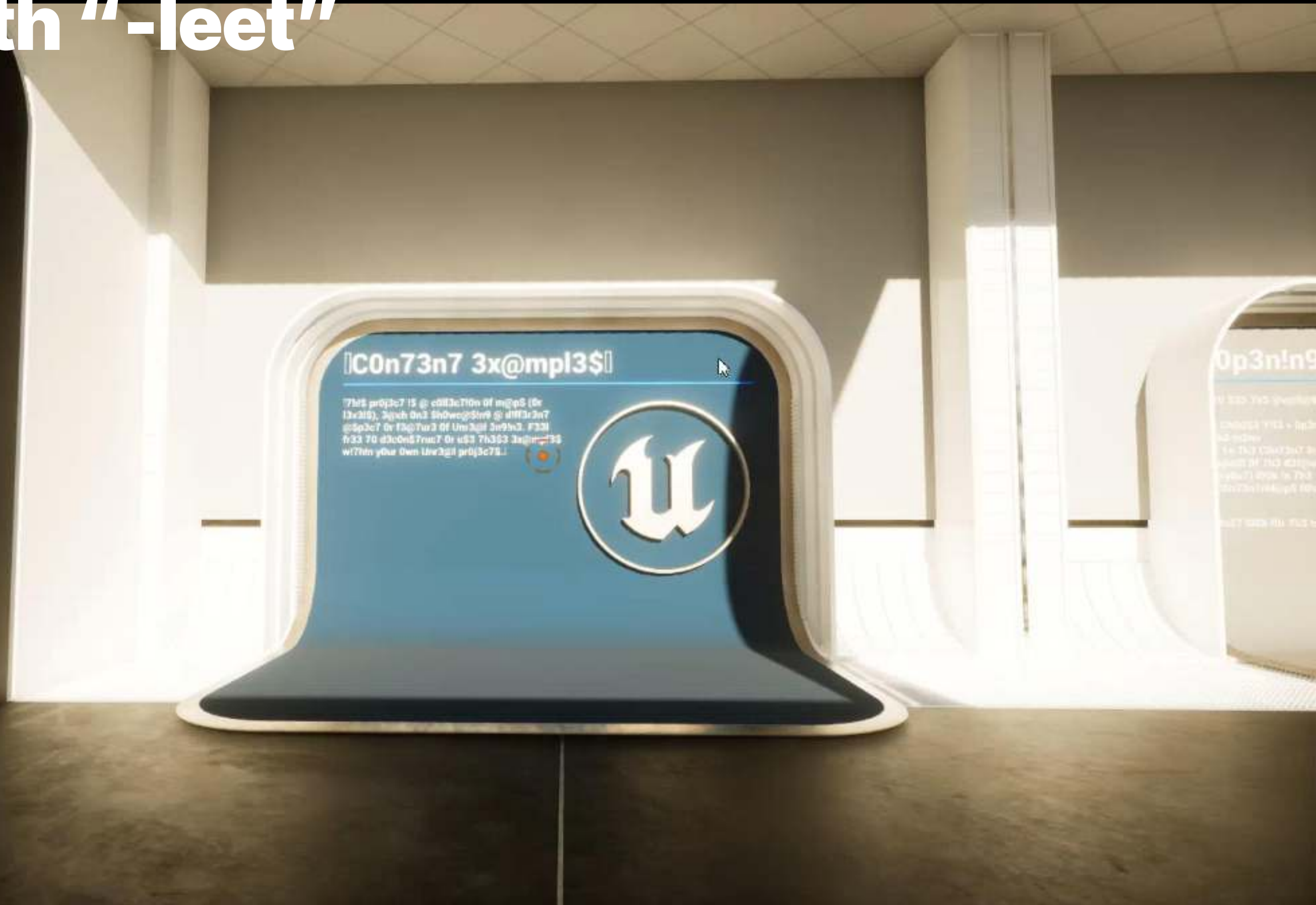
    /** Please add a variable description */
    UPROPERTY(BlueprintReadWrite, EditAnywhere, Category="Default", meta=(MultiLine="true"))
    TObjectPtr<UStaticMesh> MeshToInstance;
};
```

Gameplay Tags

Reference Tags from an easy manager that are shared and managed from *.ini files.
Set Queries as parameters.

The screenshot displays the Unreal Engine 4 interface with a Blueprint Event Graph for the class BP_GameplayTagDoor. The graph starts with an 'Event ActorBeginOverlap' node, which triggers a 'Cast To PlayerCharacter' node. This node has a 'Target' parameter set to 'Gameplay Tags' and an 'As Player Character' output. The output of the cast node connects to a 'Does Container Match Tag Query' node. This node has two inputs: 'Tag Container' (set to 'Return Value') and 'Tag Query' (set to 'Tag Query'). The output of the match node connects to a 'Branch' node. The 'Branch' node has two paths: 'True' and 'False'. The 'True' path leads to an 'Open Doors' node, which has a 'Target' parameter set to 'self'. The 'False' path leads to a 'Cast Failed' node. The interface also shows the 'Components' panel on the left with 'BP_GameplayTagDoor (Self)' and its sub-components: 'Base', 'Right door', 'Lock', 'Left door', and 'DoorOverlapCollision'. The 'My Blueprint' panel on the left shows 'EventGraph' and 'FUNCTIONS (20 OVERRIDABLE)'. The 'Details' panel on the right shows the parent class as 'Actor'. The 'Event Graph' panel shows the graph with a zoom level of -4.

Leet mode with "-leet"





Unreal Fest 2024 Seoul

Unfeatured Features of Unreal Engine 2024

Chris Murphy
Senior Technical Artist
Epic Games