Unreal Engine 4

GET STARTED WITH UE4

PAUL, 2020-06

UE4 VS Unity

- [Unity or Unreal Engine in 2020](#)
- [Unity VS Unreal Engine 4](#)
- [Unreal vs Unity: Clash of Titans](#)
- [Unity vs Unreal: Which Engine Makes You More Money](#)
- [Unreal Engine 4 vs Unity Showcase](#)
- [Why I chose Unreal Engine for my Indie Game](#)
- [Godot, Unity, Unreal Engine, CryEngine](#)

UNITY PROS

Support for all major platforms
Massive Community and Support Network (books, tuts, etc)
Largest developer community by far
Easiest to hire for, certification and training easily available
Much better support for 2D Game Development
Engine more genre agnostic and adapted to many game styles
Faster development cycle and much faster build times
Unity Ads for extremely easy and effective monetization
Transparent and quick development cycle (beta version + modules)
New modular design of engine should result in faster releases

UNITY CONS

Inferior visual quality "out of the box"
Performance Issues
No source code access (without serious spending)
No AAA titles shipped yet. So no 'halo' brand
Visual Scripting language only just started development
Modular packages approach leading to dependency hell
Lots of Unity "in development" as in-place upgrade is occuring
DOTS -- complicated, heck of a learning curve, leaving skills behind
C#, C# or C#?

UNREAL ENGINE PROS

Support for all major platforms
Source code available to everyone on GitHub
Graphics... All those graphics
More modern editor, less legacy cruft
Excellent performance out of the box
Battle tested engine. Unreal Engine "dog foods" UE with Fortnite
Free assets given away every month plus Megascans free
Epic Game Store. No UE4 royalty if published on EGS
12% royalty instead of standard 30%

UNREAL ENGINE CONS

2D support all but abandoned
Engine design very 1st and 3rd person shooter focused
Questionable support for HTML platform
Extremely slow build times
Asset importing can be extremely slow
Smaller asset marketplace, for both buyers and sellers
No C# language support
Much smaller developer community (books, hiring, tutorials, help, etc)

Introduce

- Unreal Engine is the world's most open and advanced real-time 3D creation tool

- Features

- Current Version: 4.25 (2020-05) 4.25.1 (2020-06)

- Next Version: 4.26 (2020.10)

- UE4 Roadmap

- License for Publishing: This license is free to use; a 5% royalty is due only when you monetize your game or other interactive off-the-shelf product and your gross revenues from that product exceed $1,000,000 USD. The 5% royalty is calculated on the amount over and above the first $1M in gross revenue

- Fortnite

UE5

► **Unreal Engine 5**

 ► Nanite: Virtualized Micropolygon Geometry frees artists to create as much geometric detail as the eye can see

   ► Import anything from ZBrush sculpts to photogrammetry scans to CAD data

   ► No more polygon count budgets, polygon memory budgets, or draw count budgets

   ► No need to bake details to normal maps or manually author LODs

 ► Lumen: Fully dynamic global illumination solution that immediately reacts to scene and light changes

   ► The system renders diffuse interreflection with infinite bounces and indirect specular reflections in huge, detailed environments, at scales ranging from kilometers to millimeters

   ► No need lightmap bakes

   ► No need author light map UVs

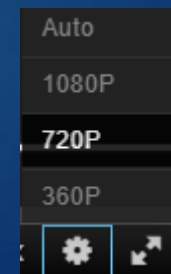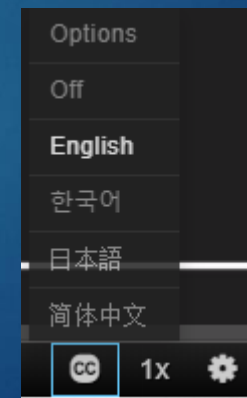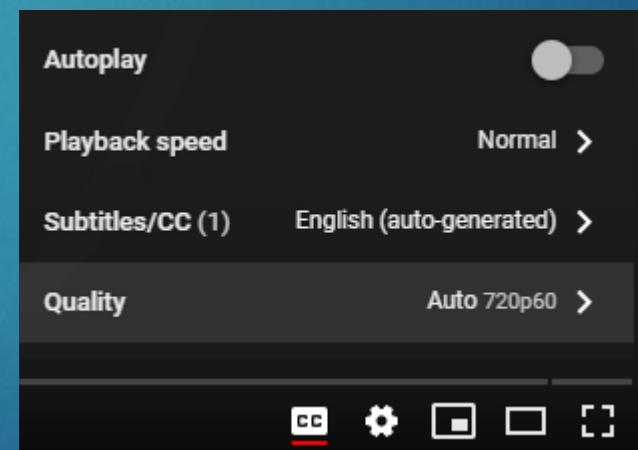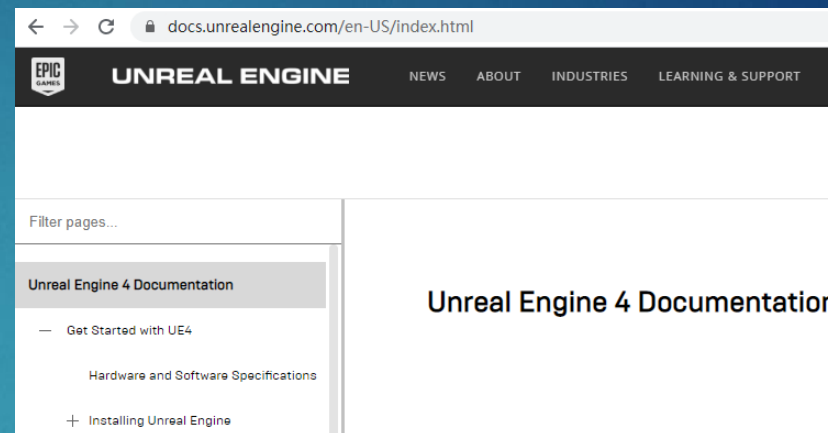 ► **Unreal Engine for Next-Gen Games**

► Timeline

 ► UE5.0 Preview (Early 2021)

 ► UE5.0 Release (Late 2021)
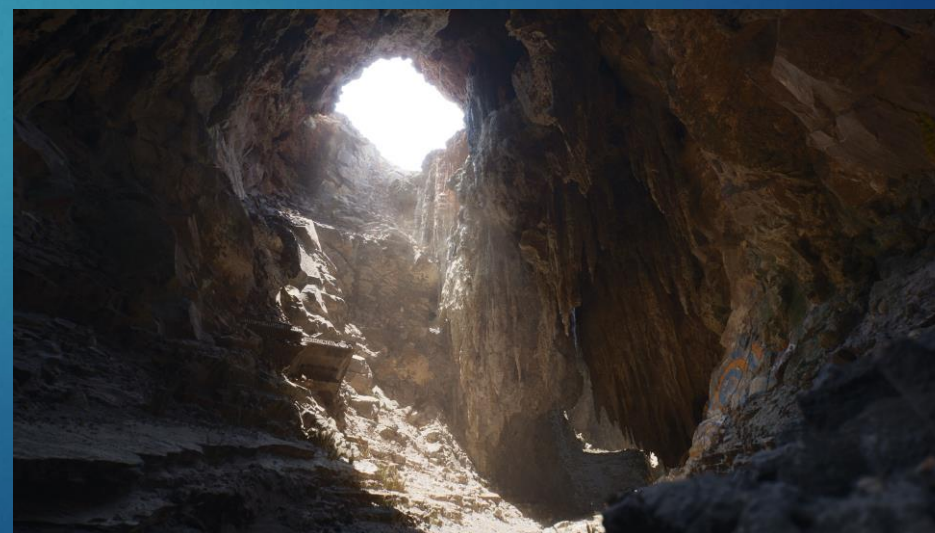
Before Starting

- Read English documents
- Turn on English subtitle
- Install UE in biggest driver
- PC Requirement:
  - 64 GB RAM
  - 256 GB SSD (OS Drive)
  - 2 TB SSD (Data Drive)
  - NVIDIA GeForce GTX 970
  - Six-Core Xeon E5-2643 @ 3.4GHz

Learning Resource

▶ Course: Unreal Online Learning

   ▶ 10 ~ 20 Min/lesson

   ▶ With code

▶ Doc: Unreal Engine 4 Documentation

▶ Demo: Samples and Tutorials

▶ Video: Unreal Engine Youtube Channel

▶ AnswerHub

▶ Forum

▶ Unreal Engine Community Wiki

▶ Resources
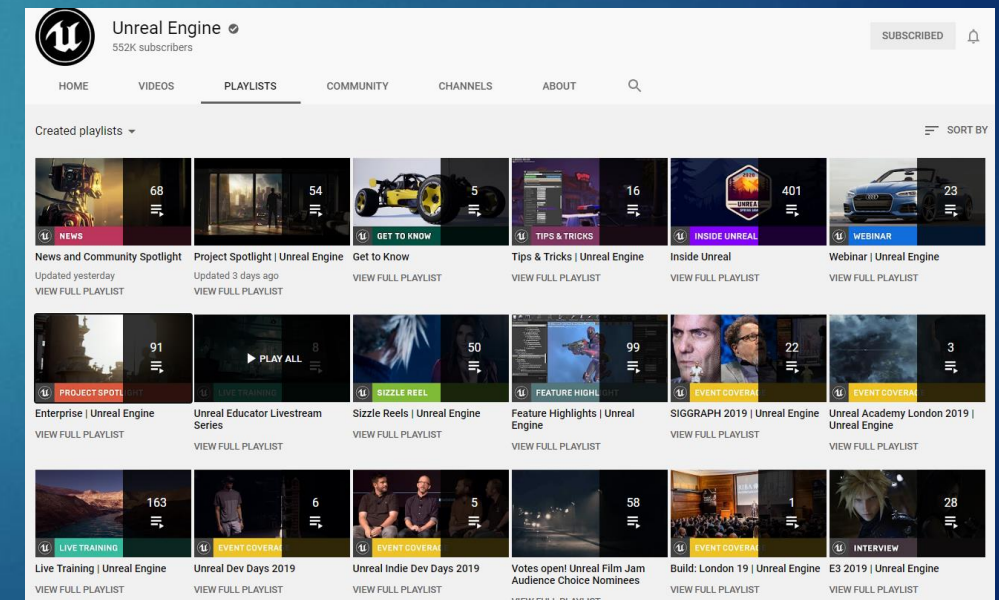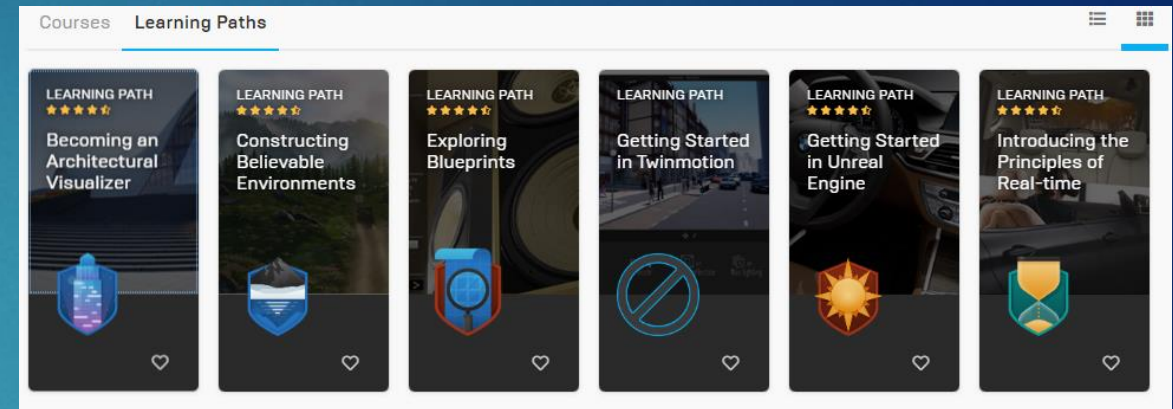
Learning Paths

- Getting Started in Unreal Engine

- Exploring Blueprints

- Becoming an Architectural Visualizer

- Constructing Believable Environments

- Introducing the Principles of Real-time

- Unreal Engine Kickstart for Developers (For Experts)

  - Unreal Kickstart: Exploring the Anatomy of Unreal

- Unreal Academy 2019

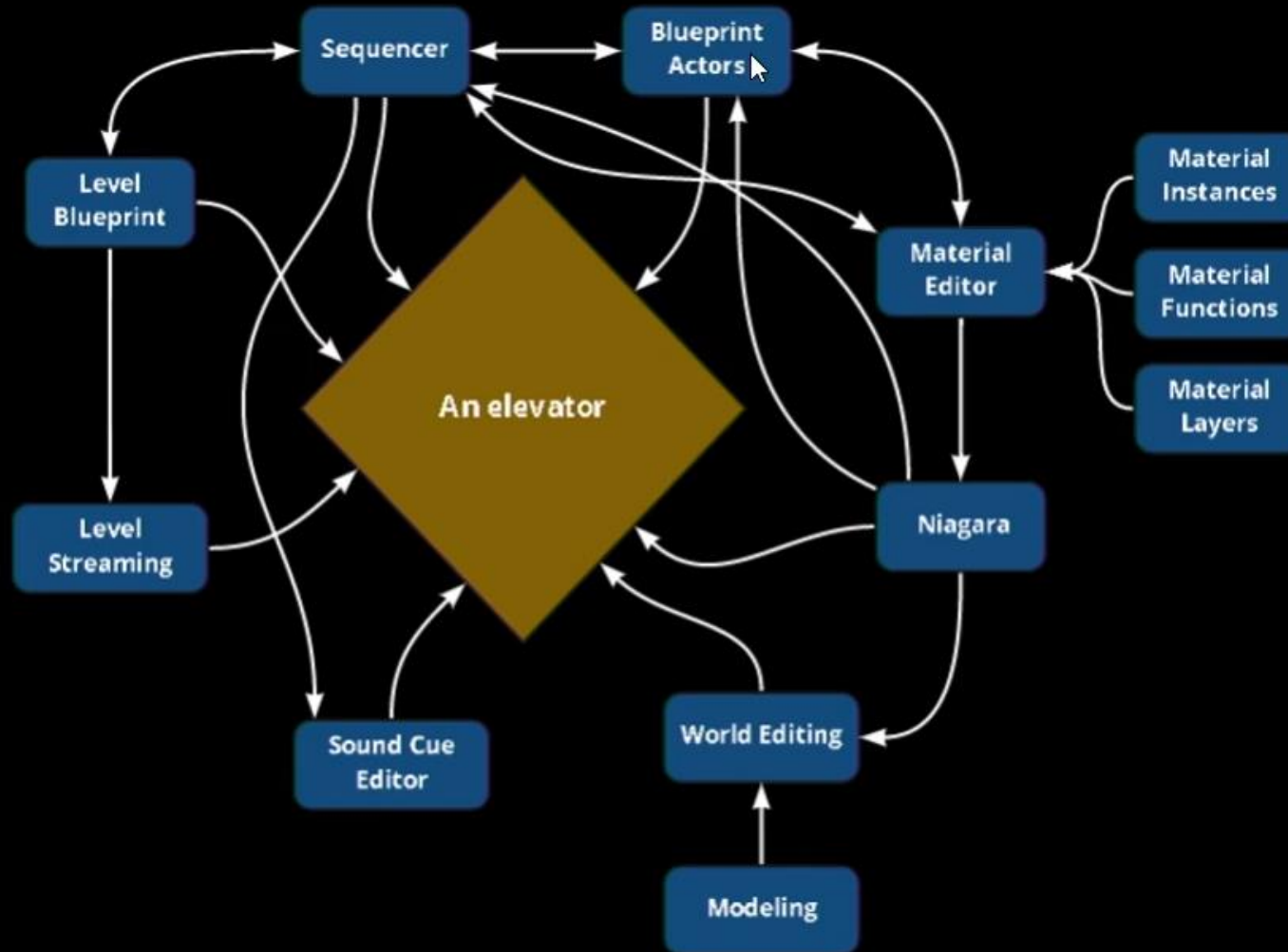|	
● Engine Structure	● Blueprint
● Rendering	● Programing
● World Building	● Character
● Materials	● Animation

World Build
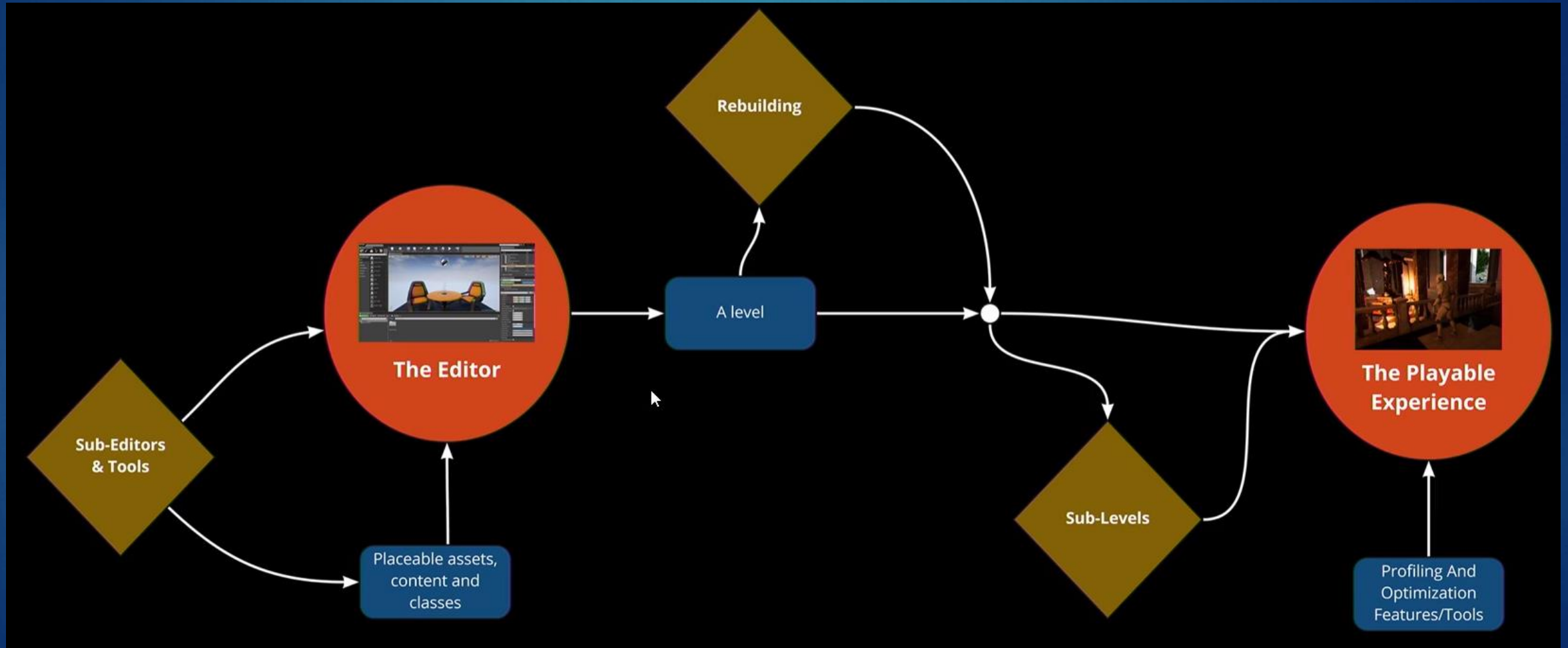
World Build

World Build

- WYSIWYG
- Placeable Actors excluding 3D Actors
  - Audio, Emitter, Reflection Captures, Lights, Volumes, Blueprints, Gameplay/Other
- Placeable 3D Mesh Actors
  - Static Meshes, Skeletal Meshes, Splines, BSP, Procedural mesh, Foliage, Landscapes, Geometry Collections
- Doc: Level Editor
- Course: Unreal Editor Fundamentals - Editor Introduction
- Video: UE4 Editor Basics

Material
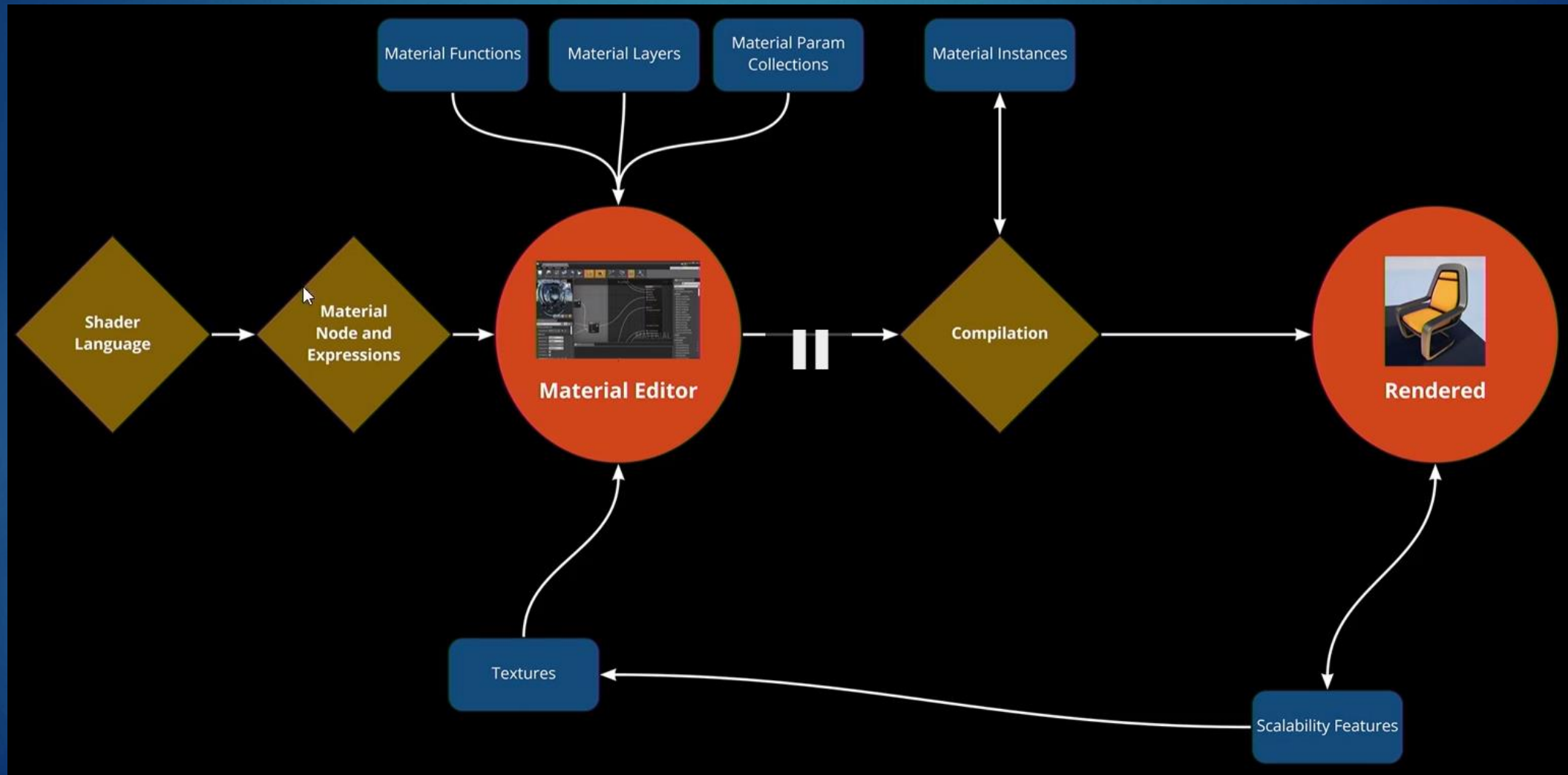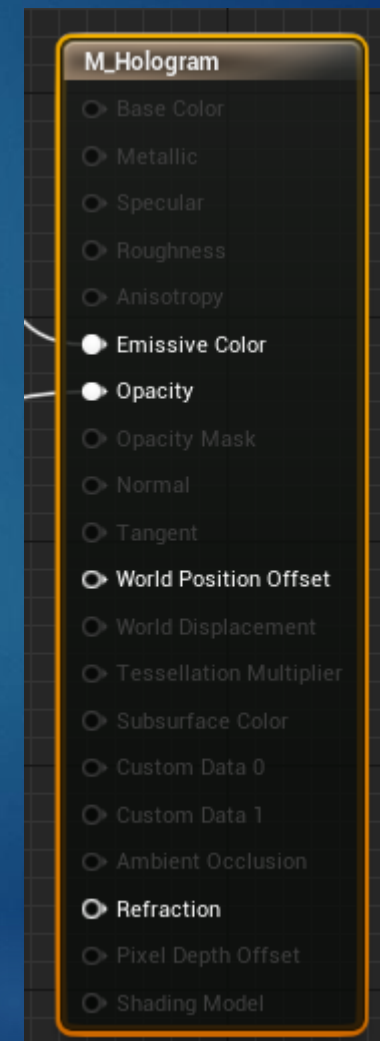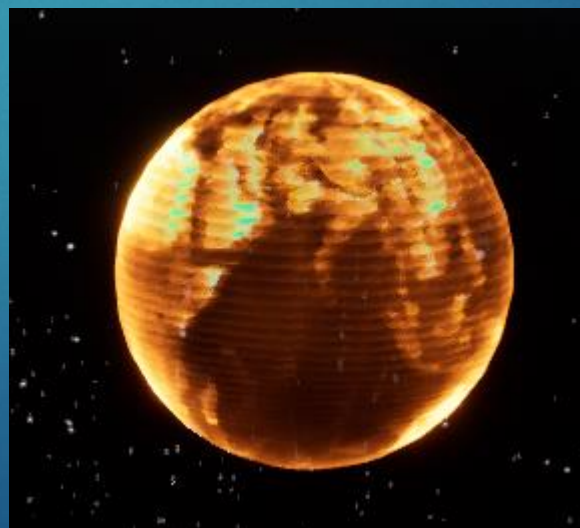
Material
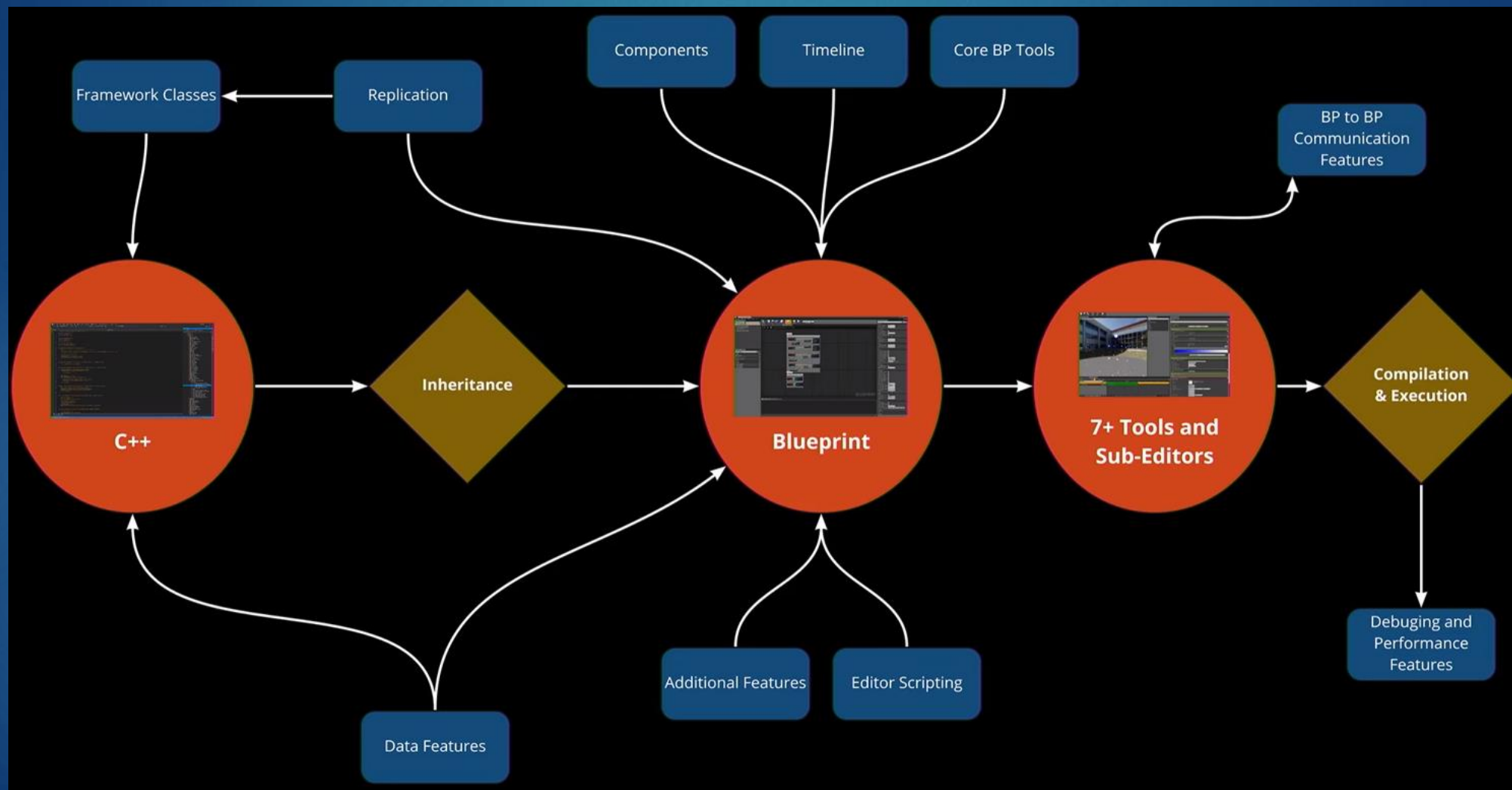
- Doc: Materials
- Course: Getting to Know Materials for Design Visualization
- Course: Interactive Material Swaps Using Blueprints
- Course: Materials - Understanding the Production Workflow
- Course: Materials - Exploring Essential Concepts
- Course: Creating PBR Materials
- Course: Materials Master Learning
- Course: Materials Kickstart
- Video: Introduction to Materials

Blueprints

- Doc: Blueprints Visual Scripting
- Learning Path: Exploring Blueprints
  - Course: Blueprints - Essential Concepts
  - Course: Interactive Material Swaps Using Blueprints
  - Course: Making a Blueprint Product Configurator
- Course: AEC Blueprints by Example
- Course: Blueprint Kickstart
- Example: Blueprint Examples Showcase
- Video: Blueprint Essentials
- Video: Blueprint Quickshot
- Video: Blueprint Communications
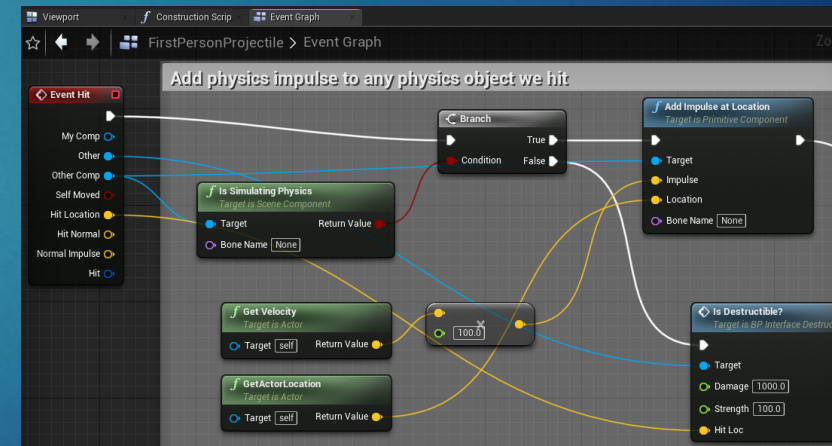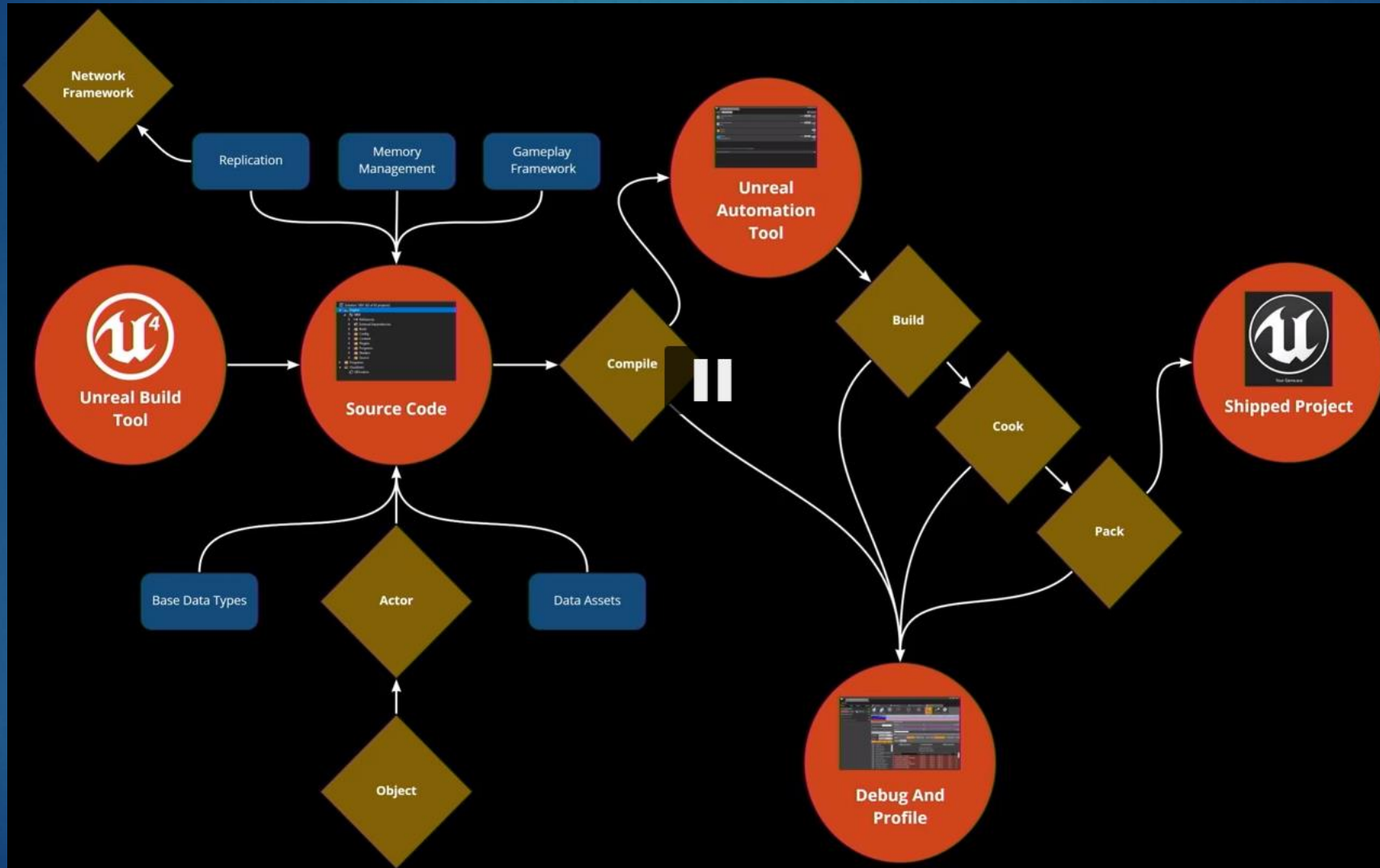
Programming

- Requirements: Visual Studio 2017
    - Must Have Extensions
        - IncrediBuild
        - Visual Assist
- Doc: Programming Guide
- Doc: Balancing Blueprint and C++
- Doc: Coding Standard
- Course: Converting Blueprints to C++
- Course: Programming Kickstart
- Video: Getting Started with C++
- Video: Exposing C++ to Blueprints
- Link: Unreal Engine 4 C++ Tutorials
- Video: Unreal Engine Beginner C++ Tutorial
- Video: 2019 Ultimate Unreal C++ Guide
- Books
    - Learning C++ by Creating Games with UE4
    - Unreal Engine 4 Scripting with C++ Cookbook
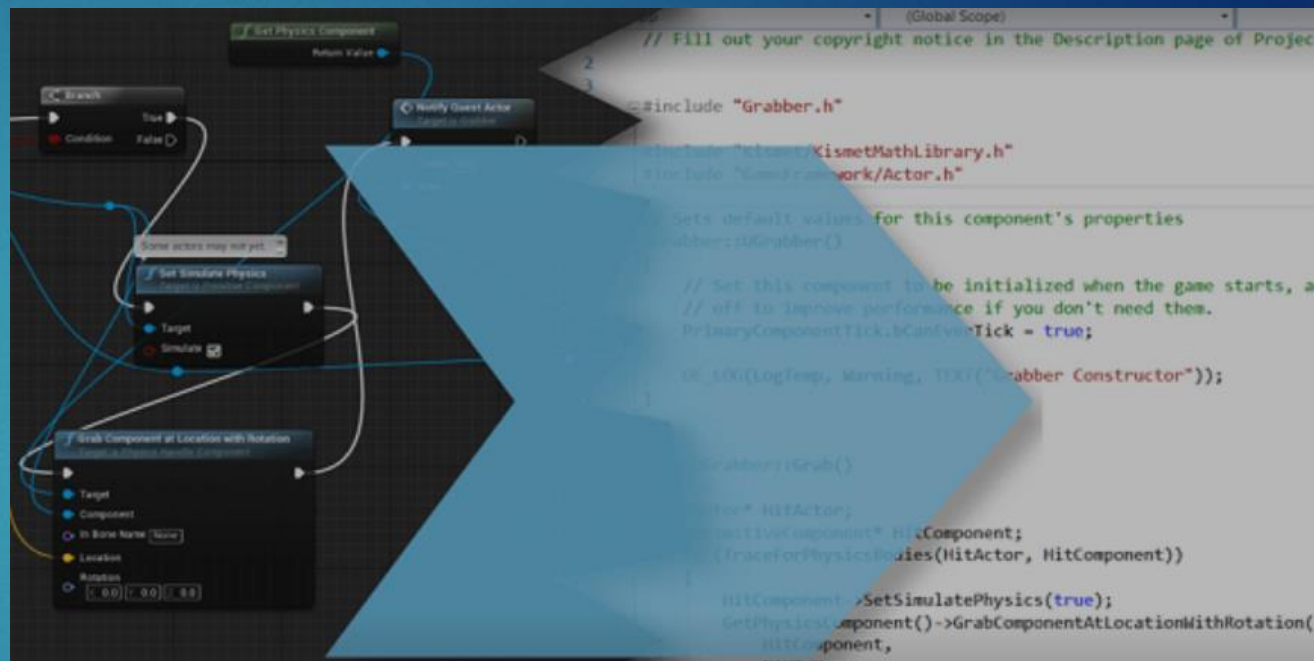
Rendering
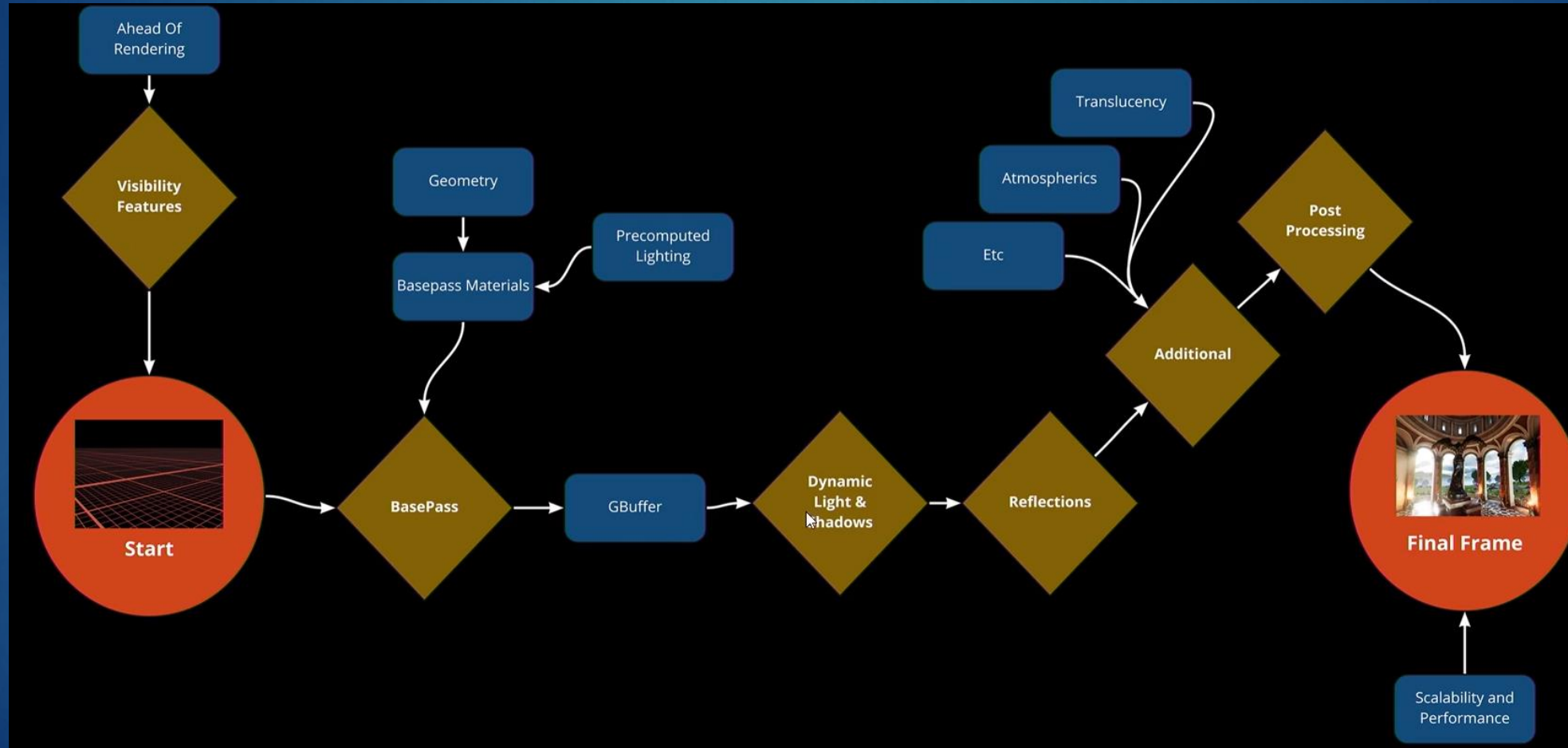
- Doc: Rendering and Graphics
- Doc: Post Process Effects
- Doc: Visibility and Occlusion Culling
- Learning Path: Introducing the Principles of Real-time
  - Course: Real-Time Rendering Fundamentals
  - Course: An In-Depth look at Real-Time Rendering
- Course: Rendering Kickstart
- Video: Exterior Rendering and Vegetation Look Development
- Video: Rendering Best Practices | Live Training
- Video: Unreal Engine by Epic Games: Lighting and Rendering

Lighting

- Doc: Lighting the Environment
- Learning Path: Constructing Believable Environments
  - Introducing Global Illumination
  - Lighting Essential Concepts and Effects
  - Creating an Architectural Interior Real-Time Project
  - Understanding Global Illumination for Architectural Visualization
  - Creating an Architectural Exterior Real-Time Project
  - Understanding The Essential Concepts of Lighting for Architectural Projects
  - Using Camera Sequencer for Architectural Visualization
- Video: Lighting with Unreal Engine Masterclass
- Video: Lighting Techniques & Guides
- Video: Lighting Techniques and Guides 2: Dynamic Lighting

Landscape

- ▶ Doc: Open World Tools
- ▶ Doc: Landscape Outdoor Terrain
- ▶ Doc: Foliage Tool
- ▶ Course: Landscape Essential Concepts
- ▶ Video: Getting Started with Landscapes | Live Training
- ▶ Video: Getting Started with Landscapes Materials and Foliage
- ▶ Video: Creating the Open World Kite Real-Time Demo in UE4
- ▶ Video: Creating "A Boy and His Kite" | 01
- ▶ Video: Creating "A Boy and His Kite" | 02

Niagara & Cascade

- Doc: Niagara Visual Effects
- Example: Niagara Content Examples
- Doc: Cascade Particle Systems
- Course: VFX and Particle Systems with Unreal Engine
- Blog: How Epic is integrating Niagara into Fortnite
- Video: Programmable VFX with Unreal Engine's Niagara
- Video: An Introduction To Niagara(4.20)
- Video: Niagara: What's New | Live Training(4.22)
- Video: Niagara in 4.25 | Inside Unreal(4.25)
- Video: Intro to Unreal's Niagara System
- Video: Building advanced effects in Niagara
- Video: Cascade to Niagara
- VFX Showcase: CGHOW
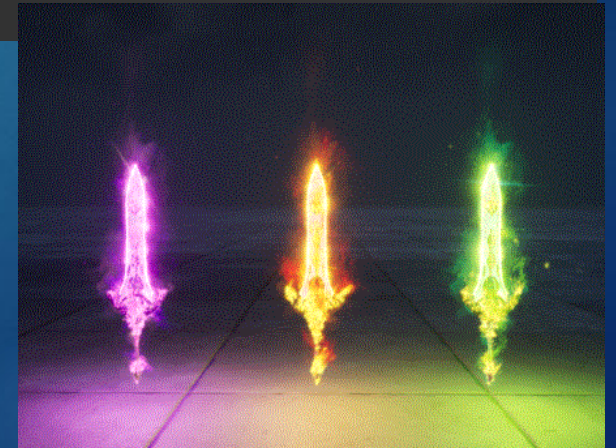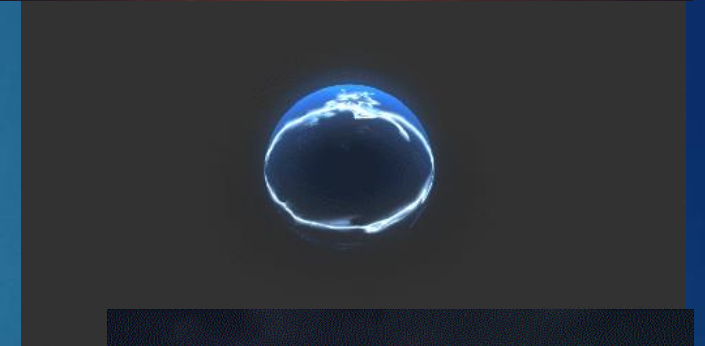
Weather

- Tutorial
  - Dynamic Weather
  - Rain
  - Snow
- Marketplace
  - trueSKY
  - SHADERSOURCE - Weather Tool
  - Procedural Nature Seasons Pack

UMG
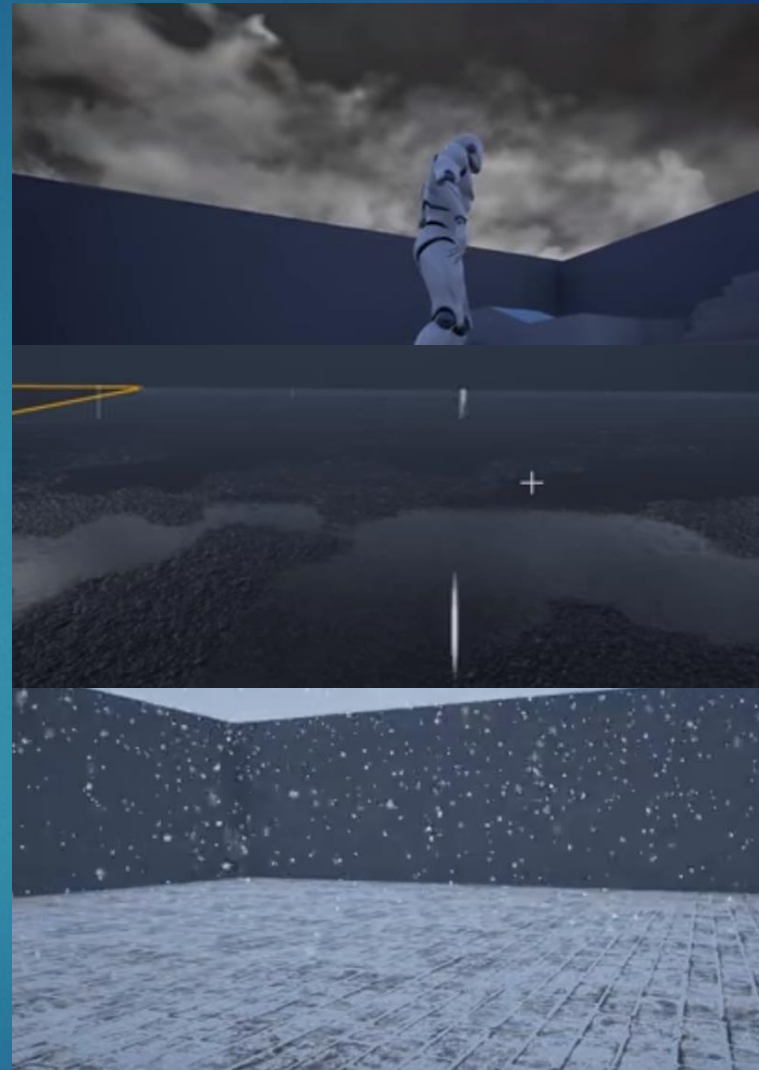
- Doc: UMG UI Designer
- Course: Your First Hour with UMG
- Course: Making a Blueprint Product Configurator
- Course: Interactive Material Swaps Using Blueprints
- Blog: UMG Best Practices
- Video: UMG UI Inventory
- Video: Developing Interactive UI
- Video: Drag & Drop with UMG
- Marketplace: Pro HUD Pack
- NoesisGUI
- Tips
  - How to adjust text spacing

Text

- **UMG (Runtime Font is ok)**
  - [Importing Fonts](#)
- **Text Render (Need Offline Font)**
  - [Unreal Engine 4 Tutorial - Floating Text](#)
  - [Offline Font](#)
- **Text 3D (Need Offline Font)**
  - [Enabling the 3D Text Plugin](#)
  - Edit -> Plugins -> Text -> Enable Text 3D -> Restart
- **Tips:**
  - Ctrl + Shift + Enter to create a new line
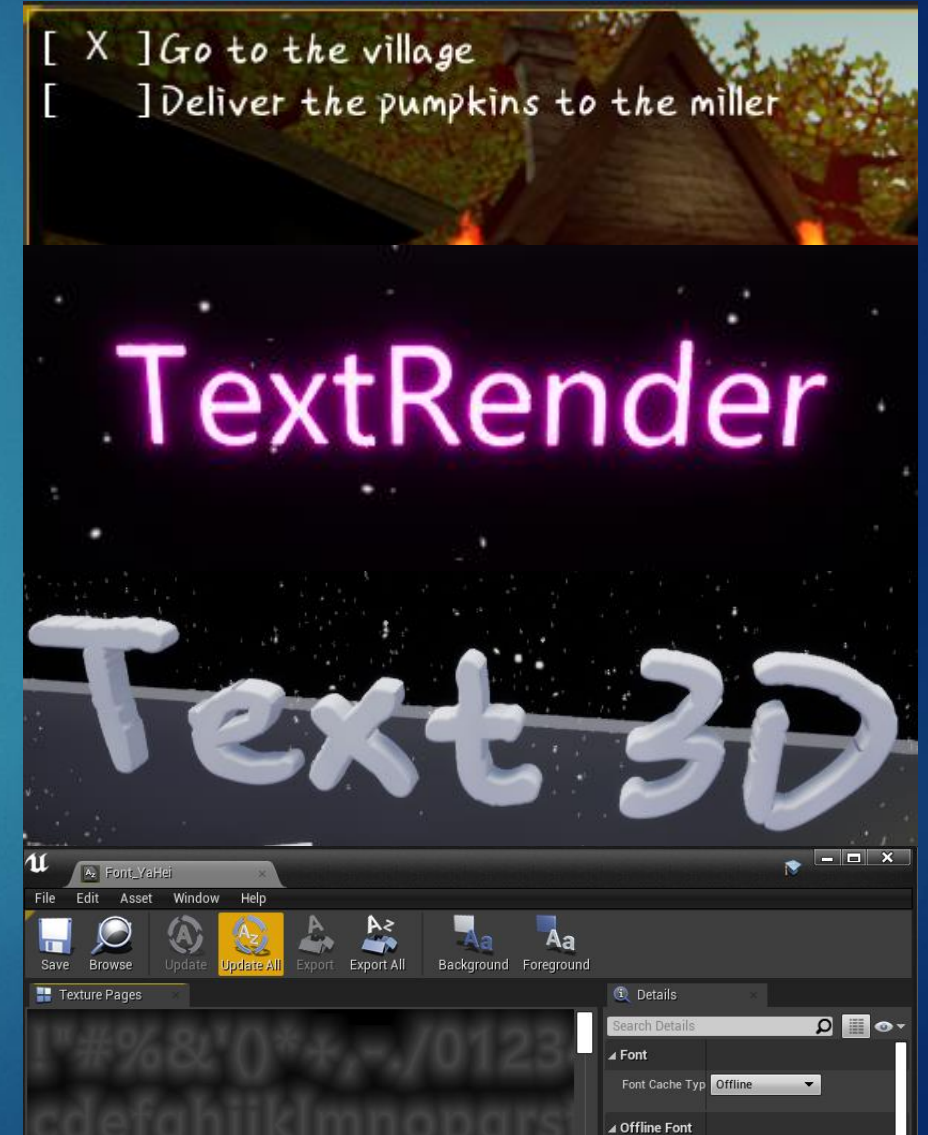
Chaos Destruction

▶ Doc: Chaos Destruction Overview

▶ Video: Chaos Fundamentals

▶ Doc: Apex Destruction

   ▶ Edit -> Plugins -> Search APEX Destruction -> Enable -> Restart

   ▶ Video: UE4 - Tutorial - Destructible Mesh

   ▶ Video: Destructible Editor Features & Guide | Live Training
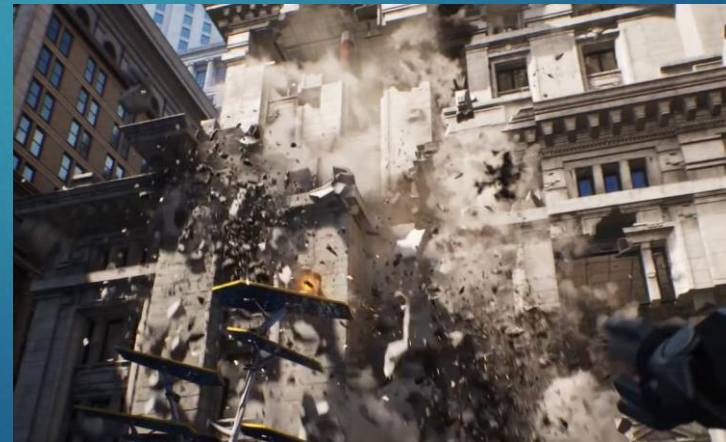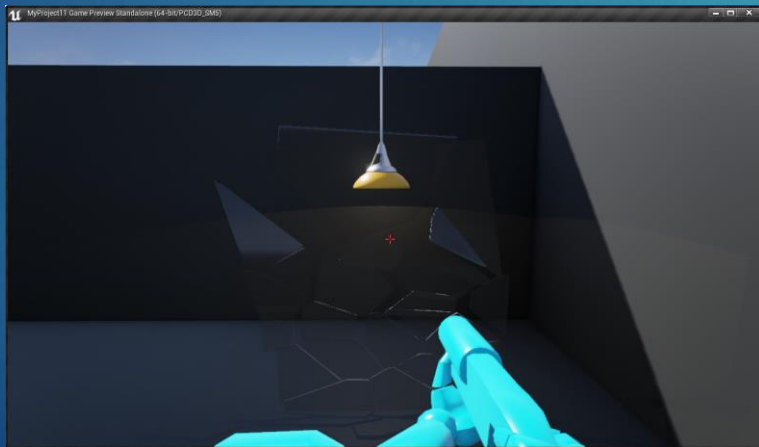
VR, AR, MR

- ▶ Doc: Virtual Reality Development
- ▶ Doc: Augmented Reality Development
- ▶ Doc: Mixed Reality Development
- ▶ Course: Creating Virtual Reality Walkthroughs
- ▶ Demo: Mission AR
- ▶ Demo: Face AR Sample
- ▶ Video: Getting Started in VR | Live Training
- ▶ Video: Creating a VR spectator camera | Inside Unreal
- ▶ Video: In depth Tutorial - Virtual Production with Unreal Engine and HTC Vive
- ▶ Video: Making VR Games & Experiences in Unreal Engine
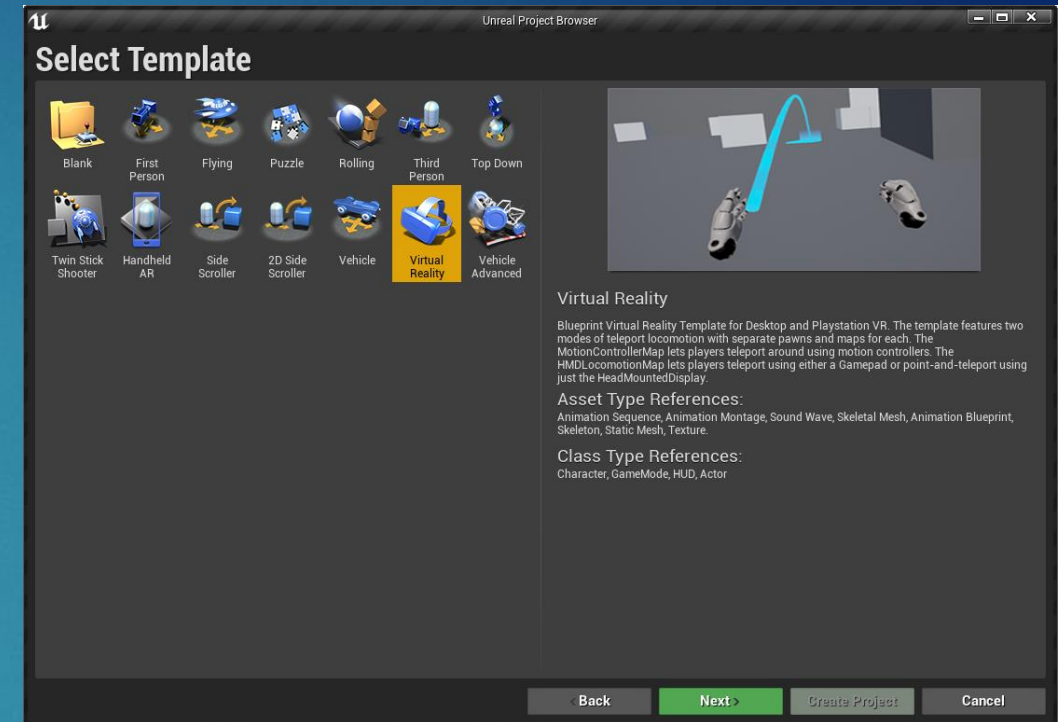
Pixel Streaming

- Doc: Pixel Streaming
- Demo: Pixel Streaming Demo
- Blog: Discover Pixel Streaming
- Video: UE4 Pixel Streaming
- Video: SETUP PIXEL STREAMING ON AWS
- Video: Pixel Streaming in Unreal Engine
- Video: SETUP REMOTE PIXEL

Technologies

- NVIDIA NVENC
  - H.264 video compression in hardware
  - 4K
- WebRTC
  - "Real-time communication"
  - H.264 video decoding hardware
  - Industry supported standard
  - No browser plugin required
  - Adaption to poor network conditions
- Standard web technologies
  - Node.js
  - JavaScript
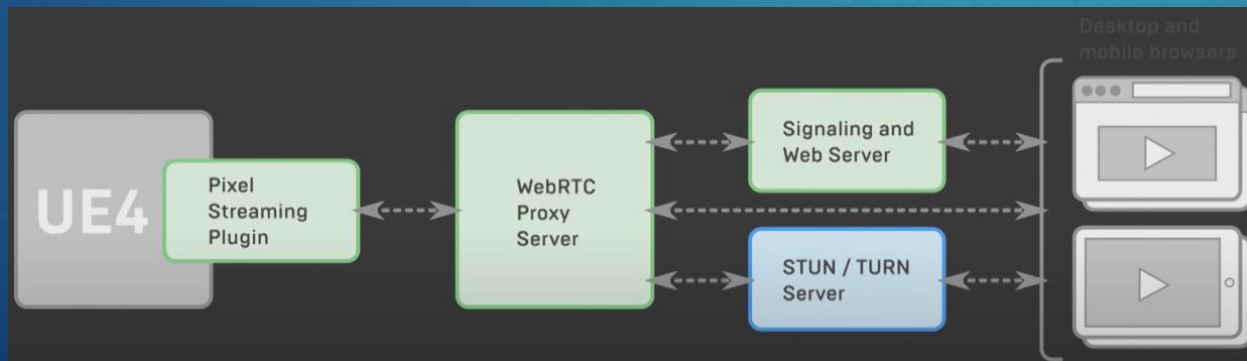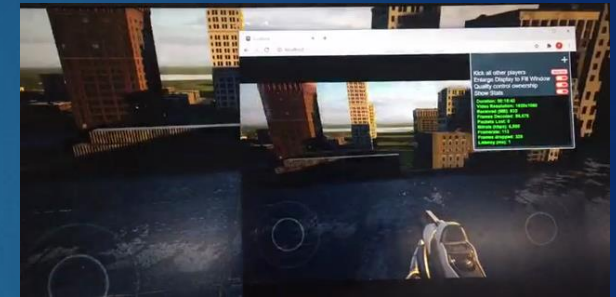
Components

- Pixel Streaming Plugin for UE4
- WebRTC Proxy
  - Browsers connect to WebRTC Proxy rather than UE4 application
- Signalling Web Server
  - Coordinates connections from browsers to WebRTC Proxy
  - Serves HTML pages
- Browser code
  - JavaScript
- STUN server and TURN server
  - For NAT issues

Rest API

- VaRest
  - Blog: Intro to Calling Third Party AI Services in Unreal Engine
  - Video: Unreal Engine 4 Good to Know - Marketplace VaRest Plugin
  - Video: Unreal Engine 4 Tutorial: VaRest - Making HTTP requests
  - Demo: VaRest-Demo
  - Demo: BlastBestBuy
  - Demo: VaRestLogin
  - Demo: VaRestExamples
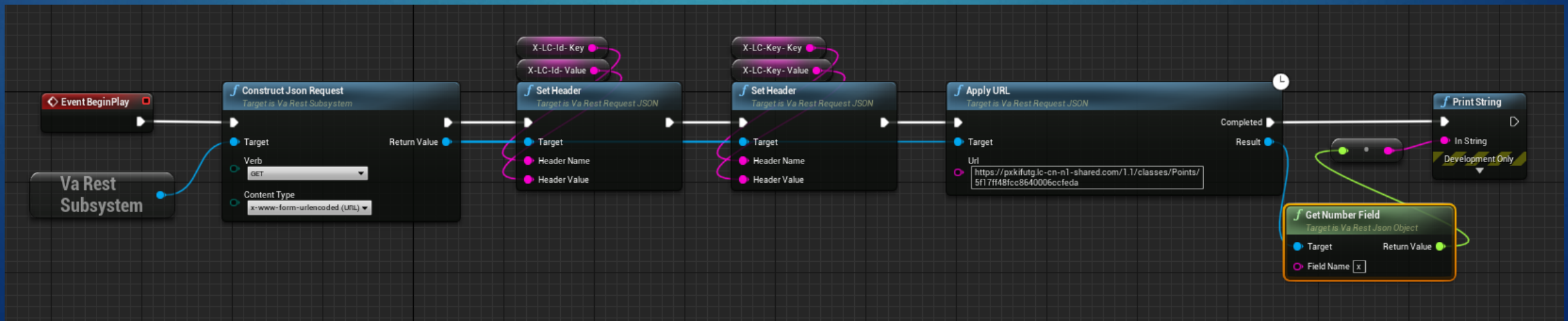
Free Assets

- Epic Games Content
- Quixel Megascans
- Free For The Month
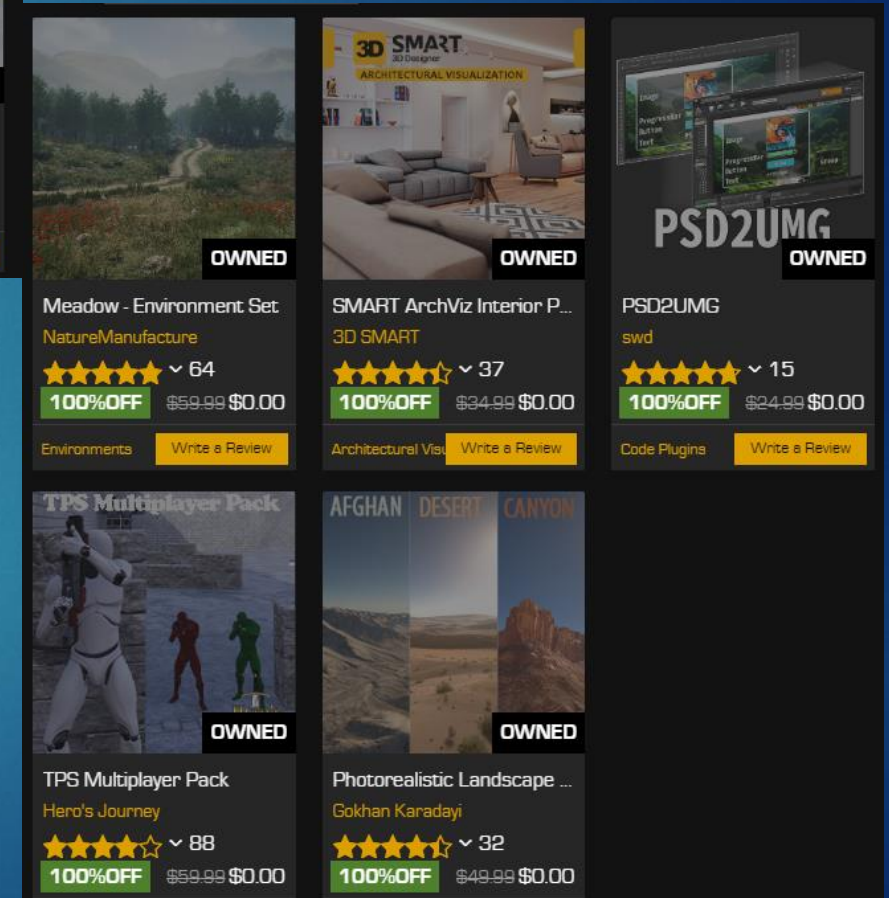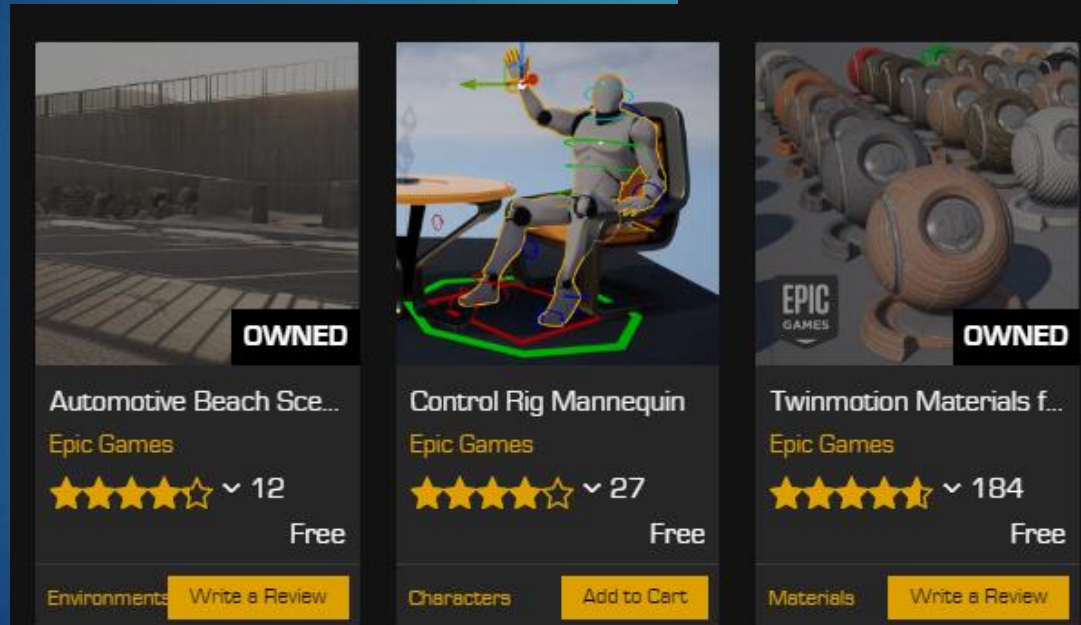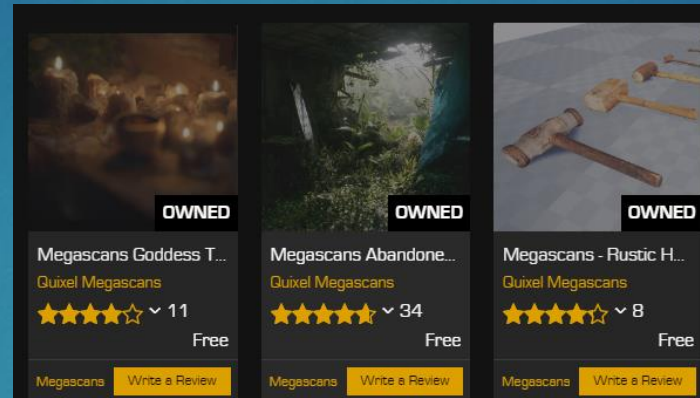
Tips

- Change Path for DerivedDataCache
  - Edit -> Editor Preferences -> Global -> Local Derived Data Cache -> Restart
- Designer's guide to Unreal Engine keyboard shortcuts
  - F: Focuses the camera on the selected object
  - End: Snap to floor
  - F11: Fullscreen
- Blueprint Editor Cheat Sheet
  - Ctrl + LMB Drag into Graph: Get Variable
  - Alt + LMB Drag into Graph: Set Variable
  - Ctrl + W: Duplicate Selection
  - C: Add a Comment Around Selection
  - Ctrl + LMB Drag to Pin: Move All Connections
  - Alt + Left-Click on Pin: Break All Connections
- Cheat Sheet for UE4 C++ programming
- Unreal Engine 4 Hotkeys Cheat Sheet
- Unreal Engine Hotkey Cheat sheet
- UE4 Style Guide

Unreal Engine Hotkeys Cheatsheet

GENERIC BLUEPRINT HOTKEYS
Find in Content Browser...............CTRL+B
Save in Blueprint......................CTRL+S
Redo...................................CTRL+Y
Undo...................................CTRL+Z
Find within Blueprint..................CTRL+F
Find in all Blueprints.........CTRL+SHIFT+F
Compile Blueprint............................F7

BLUEPRINT NODE ACTIONS
Rename Node.....................................F2
Toggle Breakpoint..............................F9
Clear all Breakponts.........CTRL+SHIFT+F9
Select all................................CRTL+A
Cut selection.............................CTRL+X
Copy selection............................CTRL+C
Paste selection...........................CTRL+V
Duplicate Selection.......................CTRL+W
Move selection........................Arrow Keys
Delete Selection.............................Del

BLUEPRINT NODE CREATION HOTKEYS
Graph Action menu..........................RMB
Array Get Node......................... A+LMB
Branch Node............................ B+LMB
Comment Box Node............................C
Delay Node............................. D+LMB
Sequence Node......................... S+LMB
Gate Node.............................. G+LMB
For Each Loop Node....................F+LMB
Multi-Gate Node....................... M+LMB
Do 'n' times Node..................... N+LMB
Do Once Node.......................... O+LMB
BeginPlay Node........................ P+LMB

BLUEPRINT NODE PIN ACTIONS
Pin Context Menu...................RMB on pin
Highlight connected wires.......Hover on pin
Connect to another pin.......LMB drag to pin
Filtered actions.............LMB drag to graph
Break all connections........ALT+LMB on pin
Move all connections........CTRL+LMB to pin

BLUEPRINT NAVIGATION HOTKEYS
Pan around Graph................RMB + DRAG
Zoom in/out.......................Mwheel U/D
Zoom in extra..........CTRL + Mwheel U/D
Zoom to fit selection..................Home
Go to child graph........................PgDn
Go to parent graph......................PgUp

VARIABLE ACTIONS WITHIN BLUEPRINT
VARIABLE GET......................CTRL+Drag
VARIABLE SET.......................SHIFT+Drag
REPLACE VARIABLE..............Drag to edge
GET/SET AS APPROPRIATE.....Drag to Match

MATERIAL EDITOR HOTKEYS
Constant.................................1+LMB
Constant2Vector........................2+LMB
Constant3Vector........................3+LMB
Constant4Vector........................4+LMB
Panner.................................P+LMB
TextureCoordinate.....................U+LMB
MaterialFunctionCall...................F+LMB
Add....................................A+LMB
Divide.................................D+LMB
Multiply...............................M+LMB
OneMinus...............................O+LMB
Power..................................E+LMB
ScalarParameter........................S+LMB
VectorParameter........................V+LMB
TextureSample..........................T+LMB
LinearInterpolate......................L+LMB

VIEWPORT CAMERA SHORTCUTS
Perspective View........................ALT+G
Front View..............................ALT+H
Side View...............................ALT+K
Top View................................ALT+J

PLAY WORLD HOTKEYS
Play....................................ALT+P
Pause...................................PAUSE
Fullscreen................................F11
Posses/Eject..............................F8
Command Console.....................` / ~

VIEWPORT NAVIGATION
Movement (standard)........LMB/RMB+Drag
Movement (game)..............RMB + WASD
Movement (maya)..........ALT + LMB/RMB
Zoom.........................Mwheel U/D
Focus selection................................F
Wireframe view........................ALT+2
Unlit view.............................ALT+3
Lit view...............................ALT+4
Grid size + ...SHIFT+[
Grid size - ....SHIFT+]

VIEWPORT TRANSFORMATION
Translate................................ W
Rotate................................... E
Scale.................................... R
Toggle Move/Rot/Scale............. SPACEBAR
Duplicate Selected...........ALT+[translate]
Vertex Snapping.......................... V

LEVEL EDITOR HOTKEYS
Context menu............................RMB
Save All................................CTRL+S
Rename....................................F2
Clear selection.........................ESC
Show NavMesh..............................P
Jump to bookmark.......................0-9
Set bookmark.......................CTRL + 0-9
Measure tool (otho)............. MMB + Drag
Hide selected.............................. H
Unhide all............................CTRL + H
Snap to Floor............................END
Snap Pivot to floor...............ALT+END
Snap bounds to floor........SHIFT+END
Snap Origin to grid.................CTRL+END