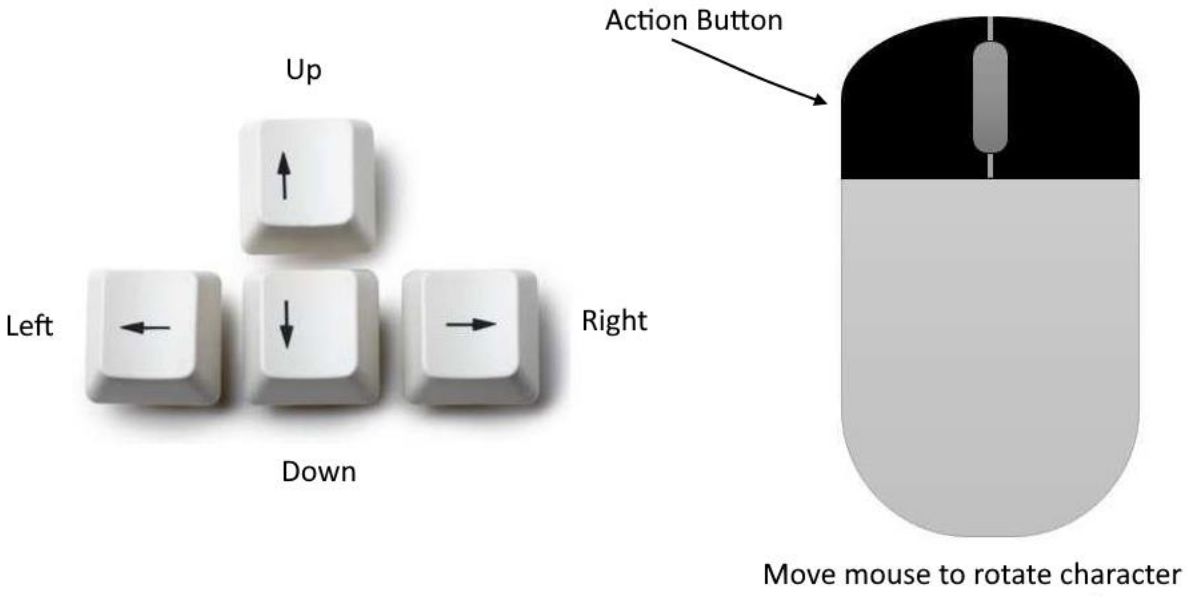
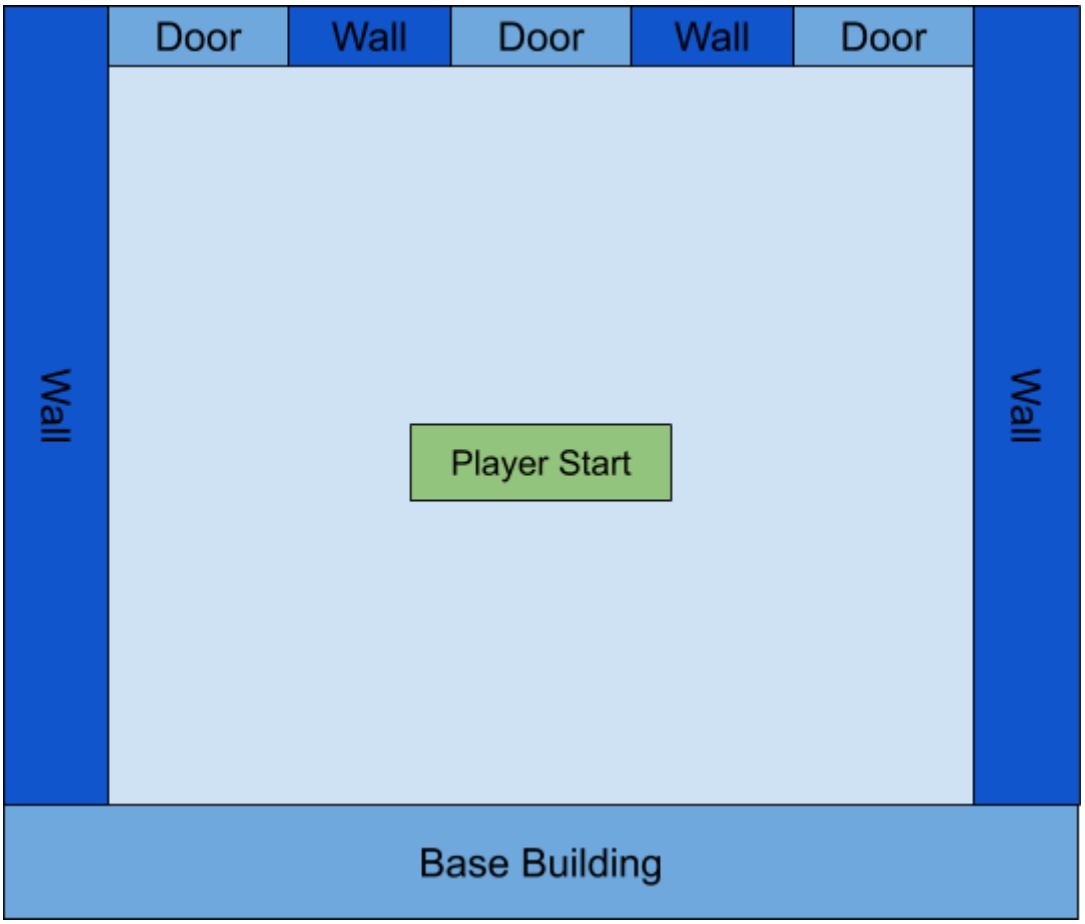
Chapter 1: Designing a Game from Scratch

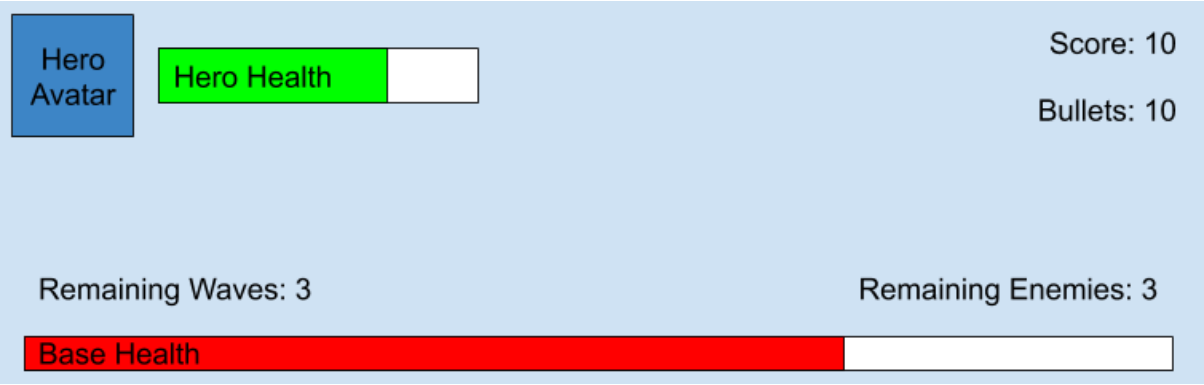


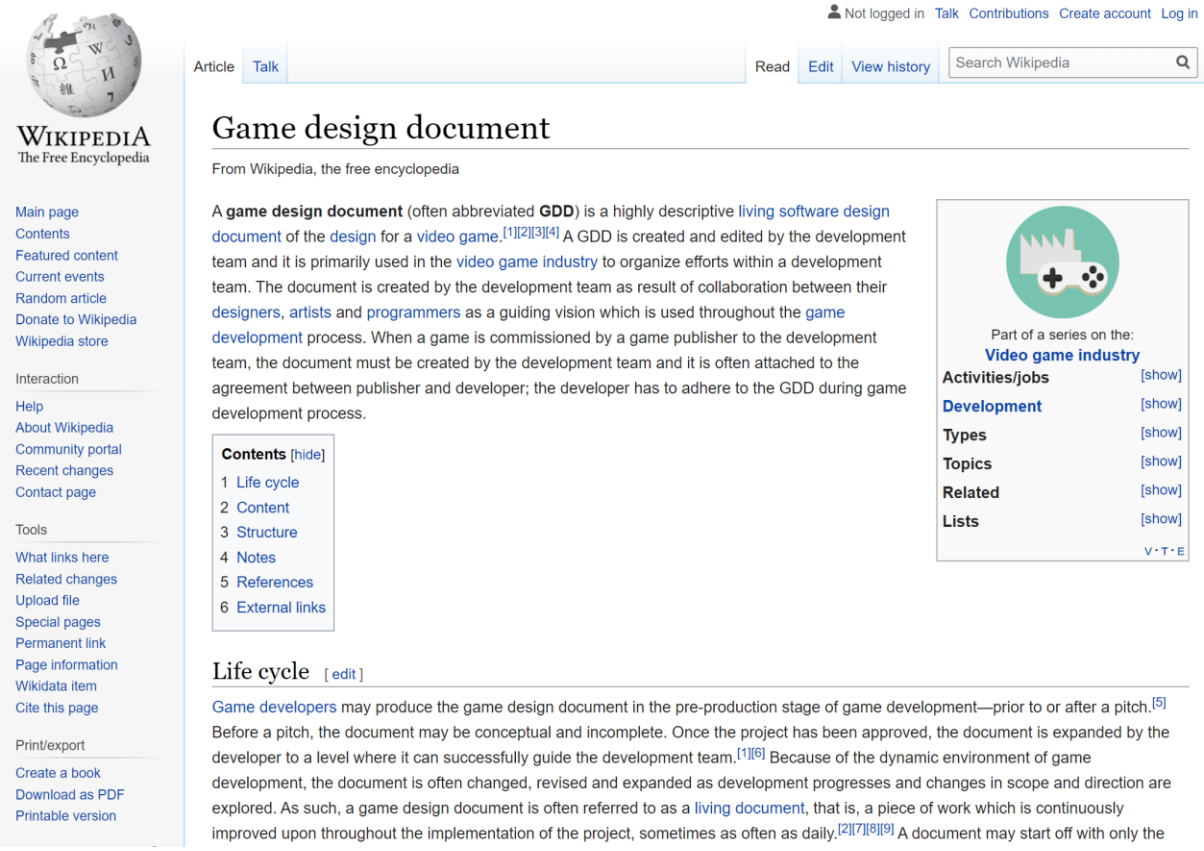
Keyboard input	**Action**
Up arrow	Move forward
Down arrow	Move back
Left arrow	Move left
Right arrow	Move right
W	Move forward
S	Move back
A	Move left
D	Move right

Mouse input	**Action**
Mouse movement	Rotate character
Left mouse button	Shoot bullet



Condition number	End-of-game condition	Outcome
1	Remaining Waves == 0	Hero wins
2	Base Health == 0	Enemies win
3	Player Health == 0	Enemies win





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The Free Encyclopedia

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Featured content
Current events
Random article
Donate to Wikipedia
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About Wikipedia
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Related changes
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Special pages
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Page information
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Printable version

Game design document

From Wikipedia, the free encyclopedia

A **game design document** (often abbreviated **GDD**) is a highly descriptive living software design document of the design for a video game.[1][2][3][4] A GDD is created and edited by the development team and it is primarily used in the video game industry to organize efforts within a development team. The document is created by the development team as result of collaboration between their designers, artists and programmers as a guiding vision which is used throughout the game development process. When a game is commissioned by a game publisher to the development team, the document must be created by the development team and it is often attached to the agreement between publisher and developer; the developer has to adhere to the GDD during game development process.

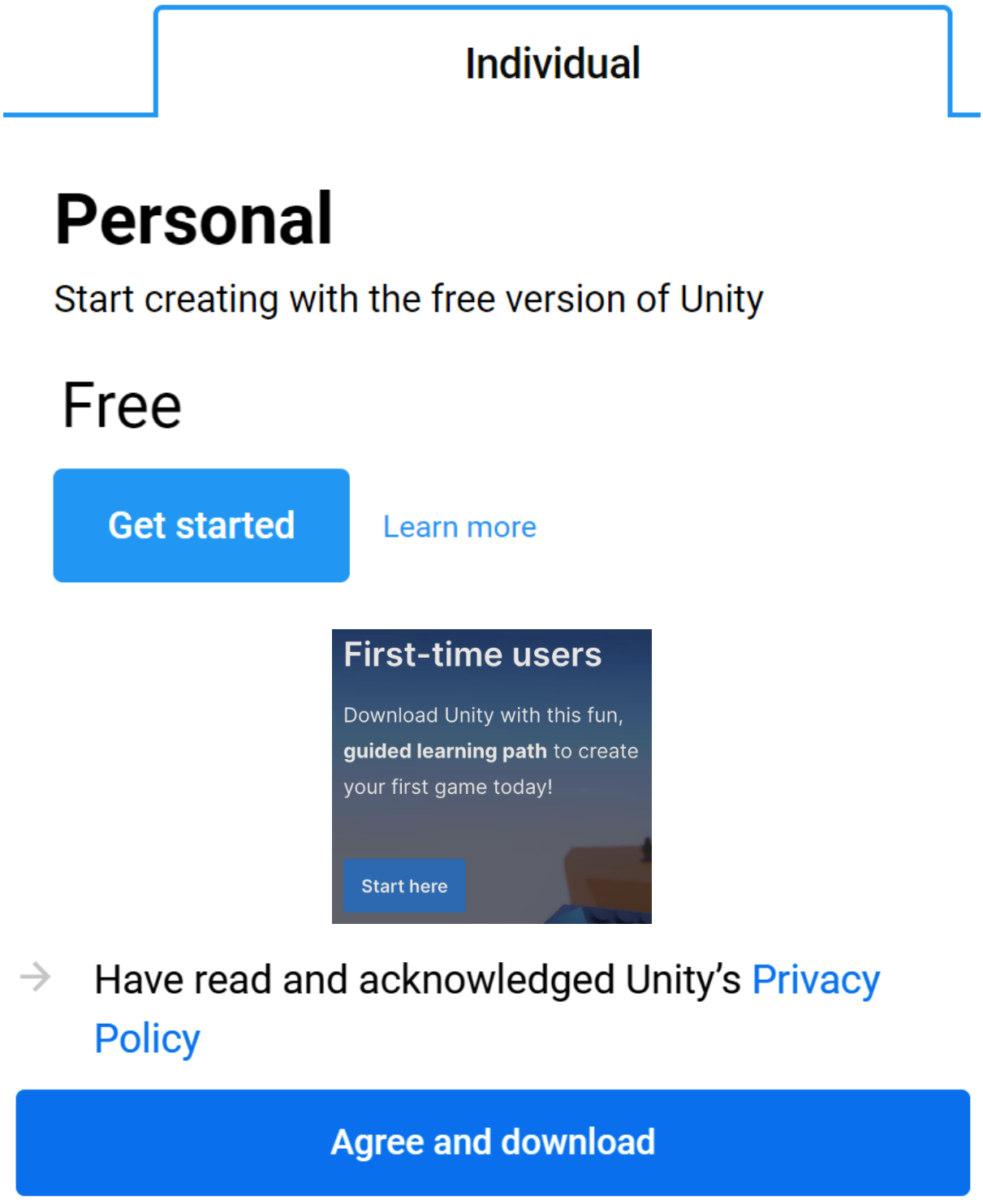
Part of a series on the:
Video game industry
Activities/jobs [show]
Development [show]
Types [show]
Topics [show]
Related [show]
Lists [show]
V · T · E

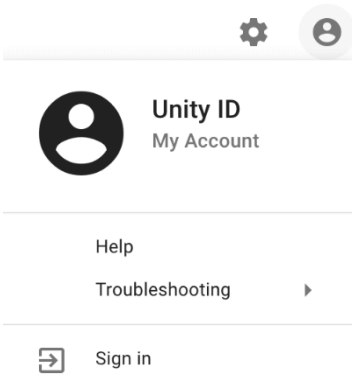
Contents [hide]
1 Life cycle
2 Content
3 Structure
4 Notes
5 References
6 External links

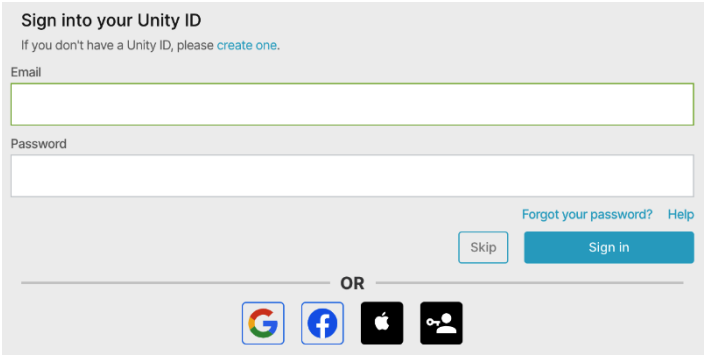
Life cycle [edit]

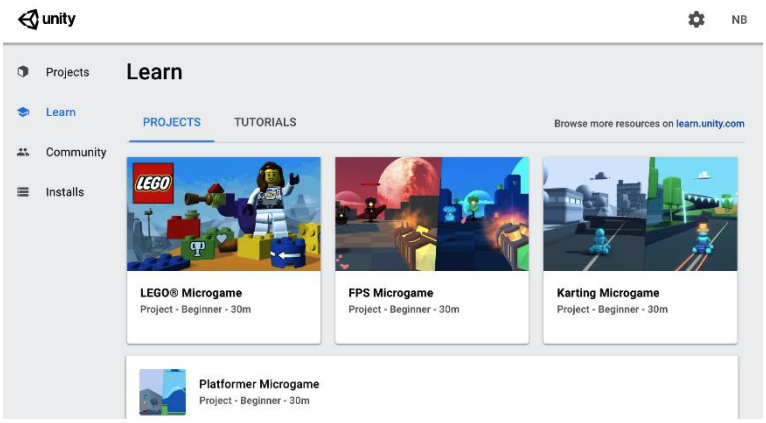
Game developers may produce the game design document in the pre-production stage of game development—prior to or after a pitch.[5] Before a pitch, the document may be conceptual and incomplete. Once the project has been approved, the document is expanded by the developer to a level where it can successfully guide the development team.[1][6] Because of the dynamic environment of game development, the document is often changed, revised and expanded as development progresses and changes in scope and direction are explored. As such, a game design document is often referred to as a living document, that is, a piece of work which is continuously improved upon throughout the implementation of the project, sometimes as often as daily.[2][7][8][9] A document may start off with only the

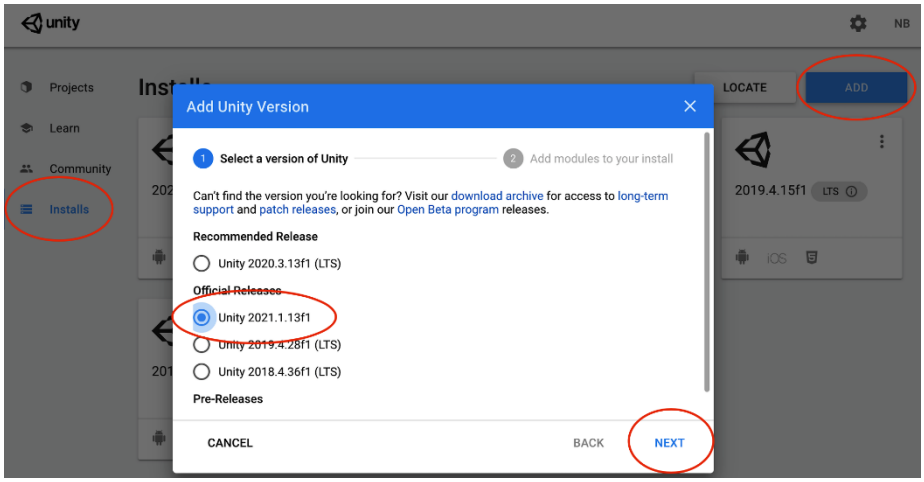
Chapter 2: Setting Up Unity




Unity ID
My Account
Help
Troubleshooting
Sign in


Sign into your Unity ID
If you don't have a Unity ID, please create one.
Email
Password
Forgot your password?
Help
Skip
Sign in
OR


unity
NB
Projects
Learn
Community
Installs
Learn
PROJECTS
TUTORIALS
Browse more resources on learn.unity.com
LEGO® Microgame
Project - Beginner - 30m
FPS Microgame
Project - Beginner - 30m
Karting Microgame
Project - Beginner - 30m
Platformer Microgame
Project - Beginner - 30m

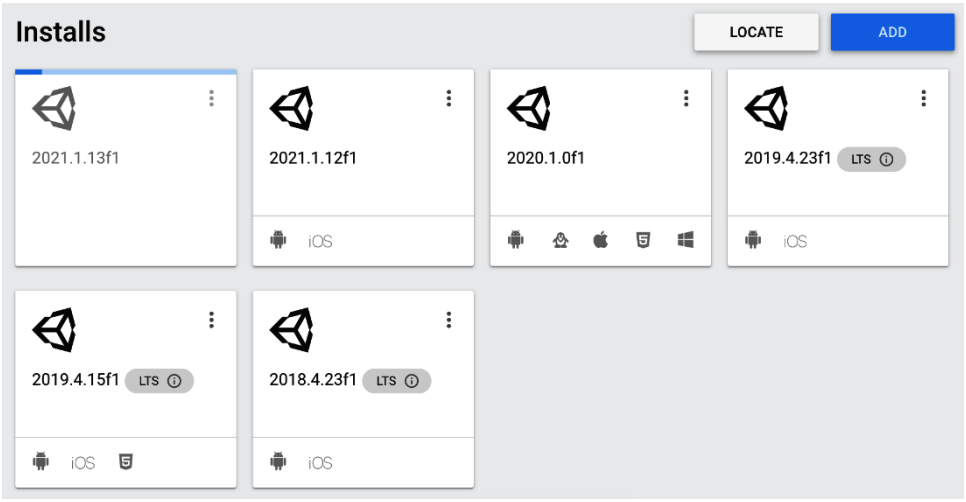

unity
NB
Projects
Learn
Community
Installs
LOCATE
ADD
Add Unity Version
Select a version of Unity
Add modules to your install
Can't find the version you're looking for? Visit our download archive for access to long-term support and patch releases, or join our Open Beta program releases.
Recommended Release
Unity 2020.3.13f1 (LTS)
Official Releases
Unity 2021.1.13f1
Unity 2019.4.28f1 (LTS)
Unity 2018.4.36f1 (LTS)
Pre-Releases
CANCEL
BACK
NEXT
2019.4.15f1
LTS

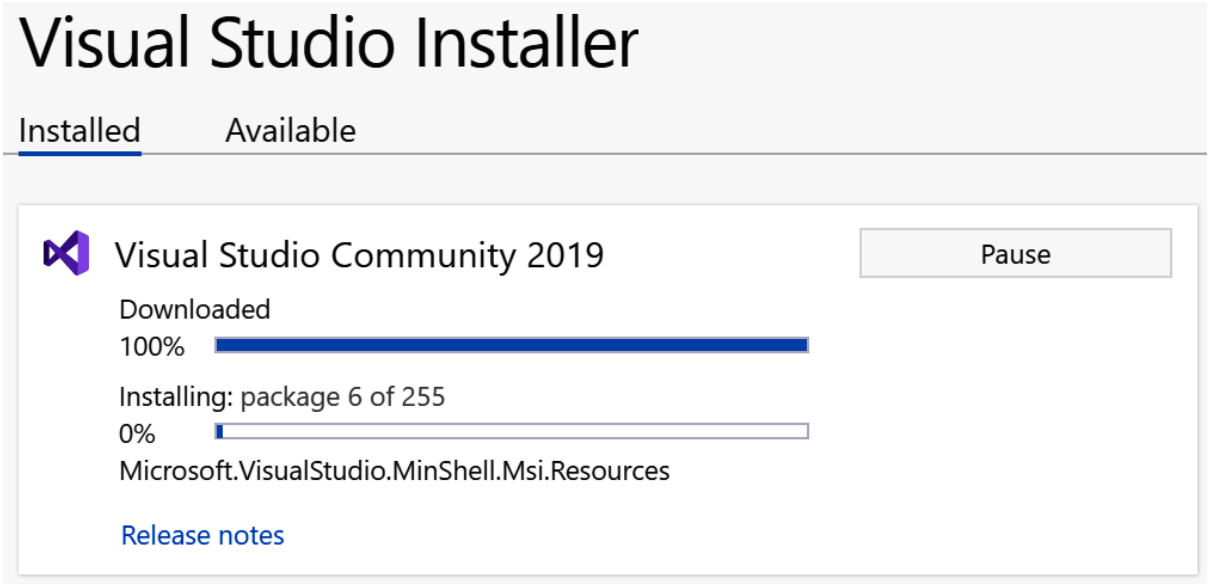
Microsoft Visual Studio Community 2019	1.4 GB	1.3 GB
Platforms		
Android Build Support	243.1 MB	1.1 GB
iOS Build Support	365.8 MB	1.6 GB
tvOS Build Support	362.2 MB	1.6 GB
Linux Build Support (Mono)	59.0 MB	274.7 MB
Mac Build Support (Mono)	92.4 MB	480.2 MB

CANCEL BACK NEXT

I have read and agree with the above terms and conditions

CANCEL DONE




Visual Studio Installer
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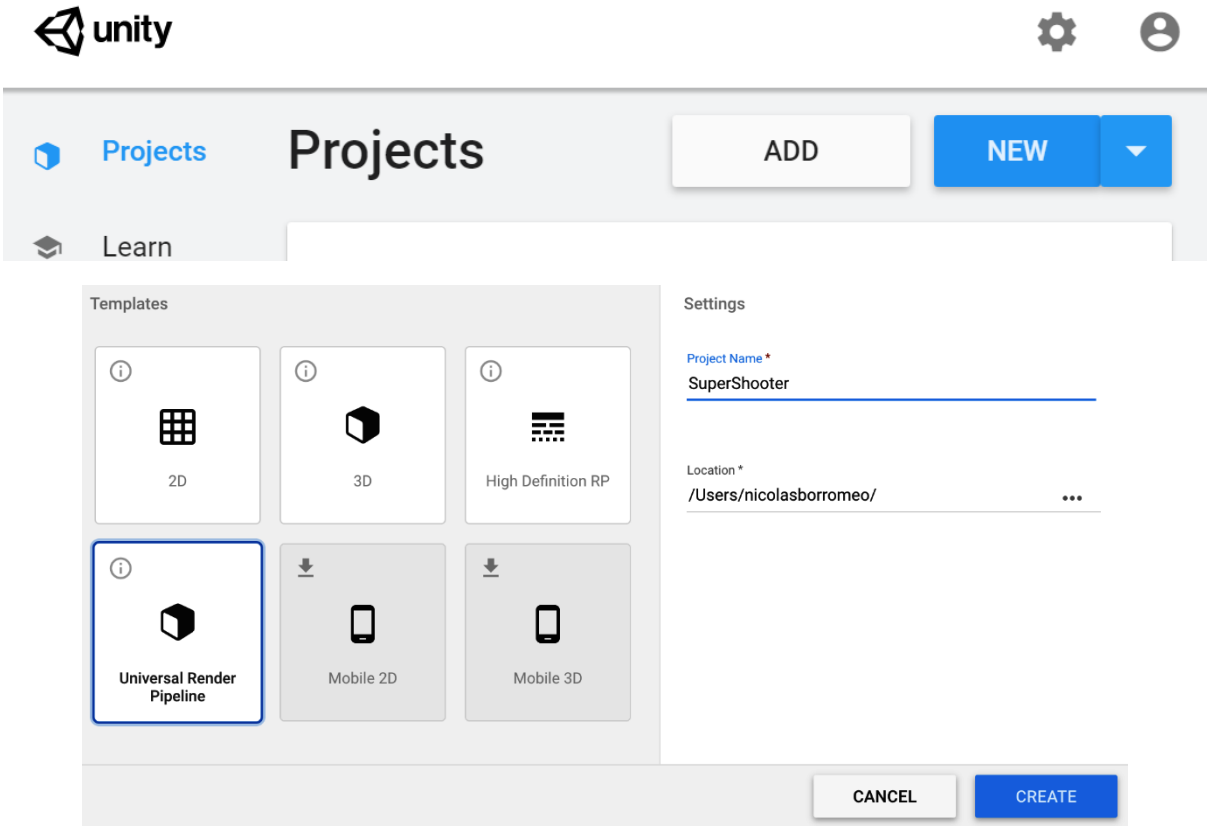
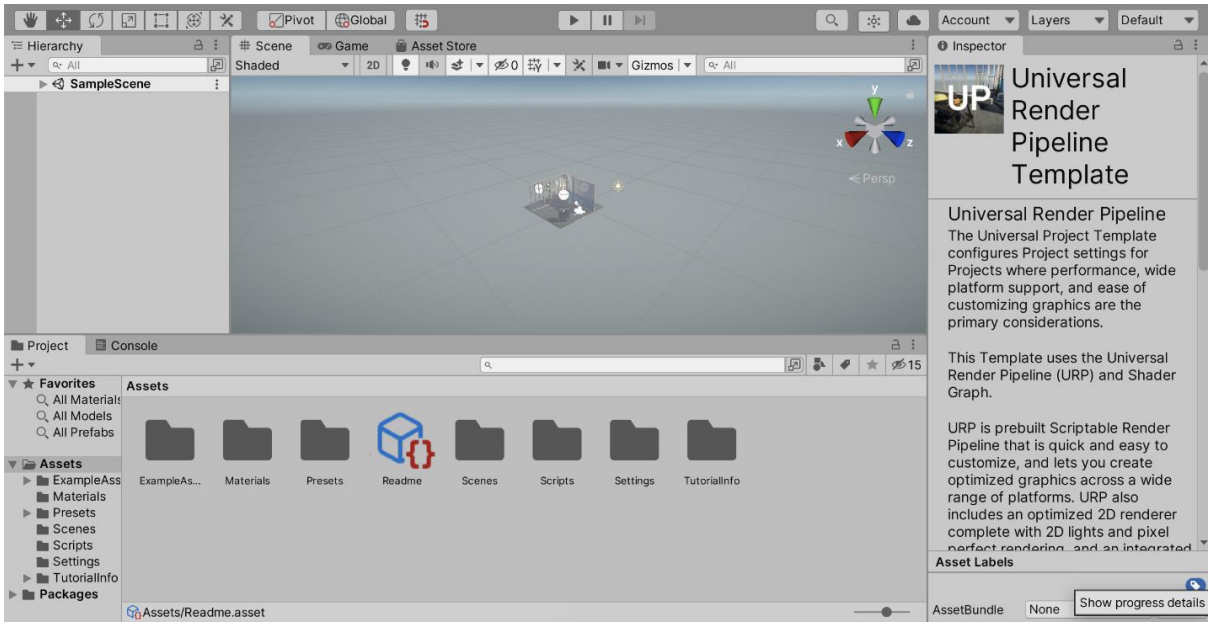
Available
Visual Studio Community 2019
Pause
Downloaded
100%
Installing: package 6 of 255
0%
Microsoft.VisualStudio.MinShell.Msi.Resources
Release notes


unity
Projects
Projects
ADD
NEW
Learn
Templates
2D
3D
High Definition RP
Universal Render Pipeline
Mobile 2D
Mobile 3D
Settings
Project Name *
SuperShooter
Location *
/Users/nicolasborromeo/
CANCEL
CREATE

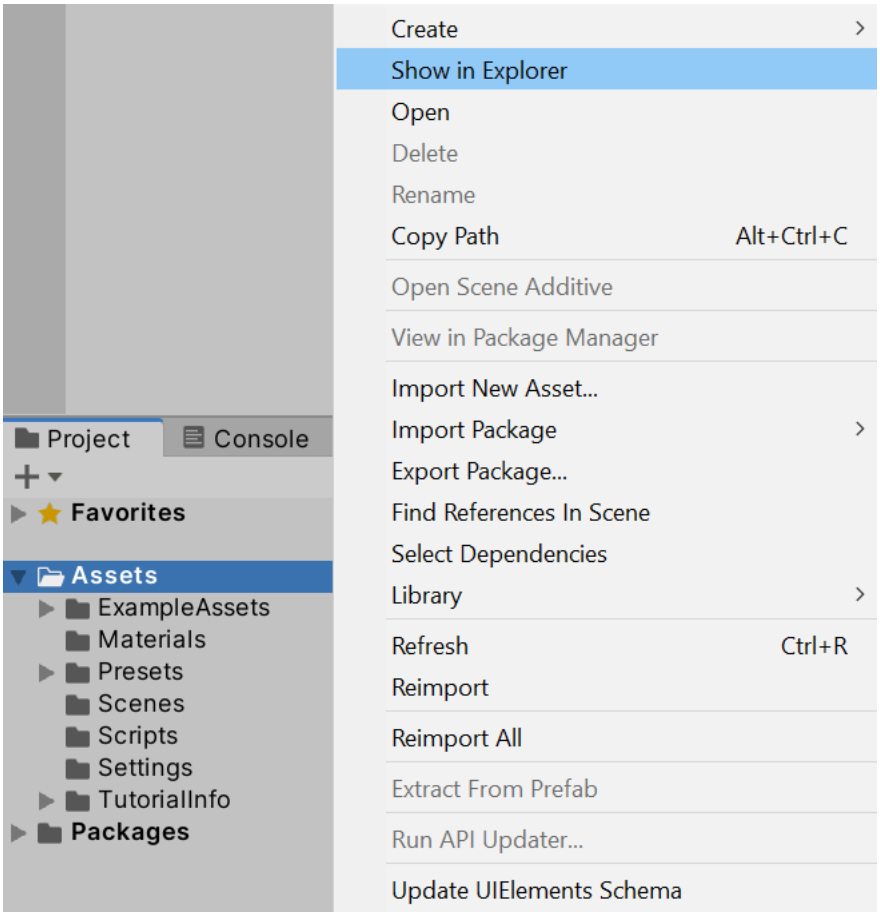

Pivot
Global
Account
Layers
Default
Hierarchy
SampleScene
Scene
Game
Asset Store
Shaded
2D
Gizmos
Persp
Inspector
Universal Render Pipeline Template
Universal Render Pipeline
The Universal Project Template configures Project settings for Projects where performance, wide platform support, and ease of customizing graphics are the primary considerations.
This Template uses the Universal Render Pipeline (URP) and Shader Graph.
URP is prebuilt Scriptable Render Pipeline that is quick and easy to customize, and lets you create optimized graphics across a wide range of platforms. URP also includes an optimized 2D renderer complete with 2D lights and pixel
Project
Console
Favorites
All Materials
All Models
All Prefabs
Assets
ExampleAss
Materials
Presets
Scenes
Scripts
Settings
TutorialInfo
Packages
Assets
ExampleAs...
Materials
Presets
Readme
Scenes
Scripts
Settings
TutorialInfo
Assets/Readme.asset
Asset Labels
AssetBundle
None
Show progress details

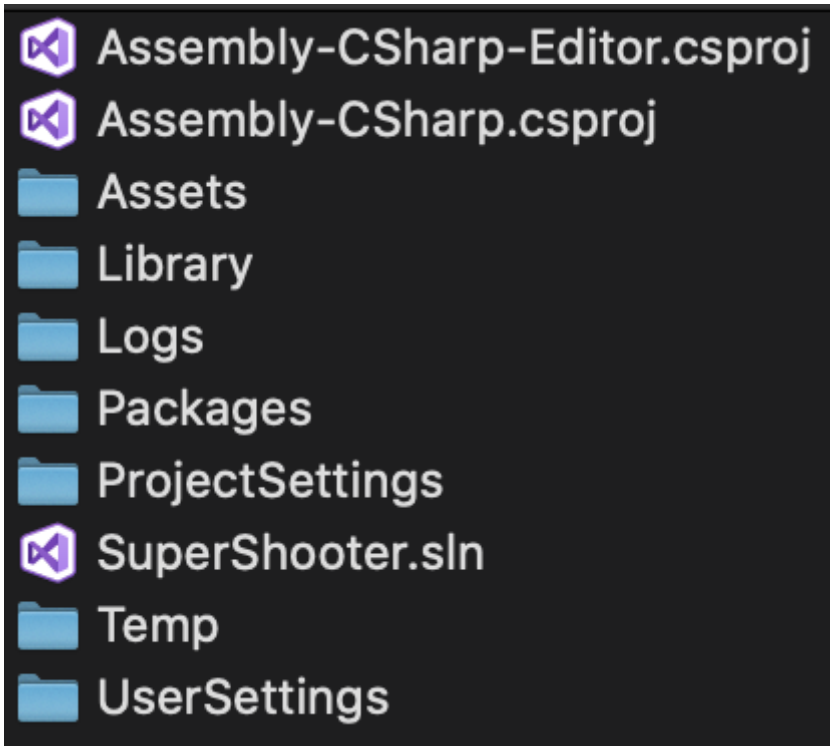
Projects

Project Name	Unity Version
SuperShooter C:\Users\Nicolas\Desktop\SuperShooter Unity Version: 2019.2.4f1	2019.2.4f1

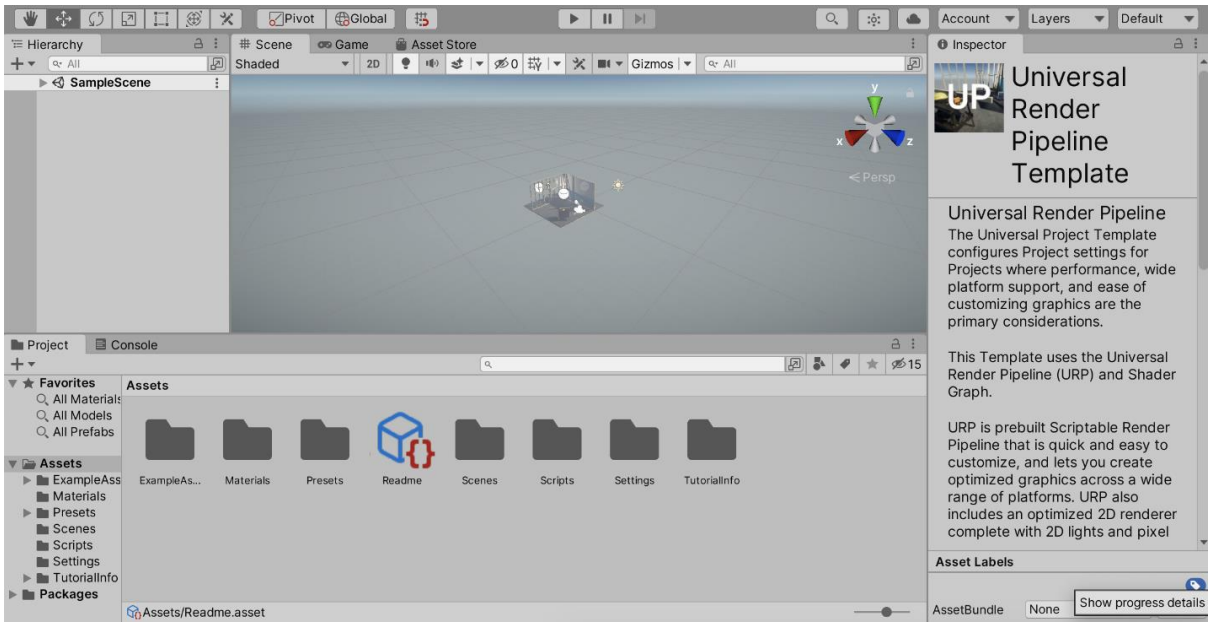
Projects

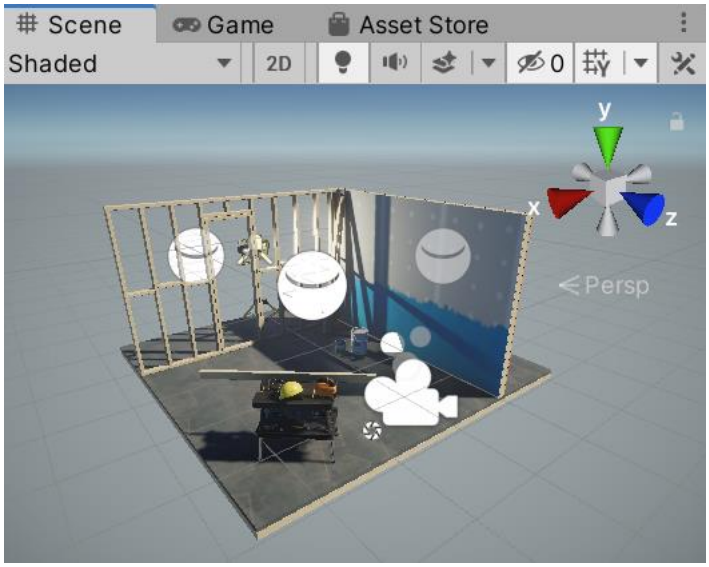
Project Name
SuperShooter /Users/nicolasborromeo/Desktop/SuperShooter Unity Version: 2021.1.13f1

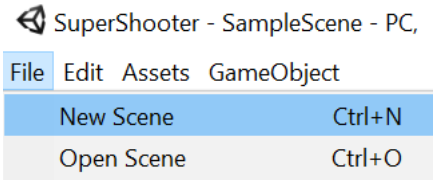

Project
Console
Favorites
Assets
ExampleAssets
Materials
Presets
Scenes
Scripts
Settings
TutorialInfo
Packages
Create
Show in Explorer
Open
Delete
Rename
Copy Path
Alt+Ctrl+C
Open Scene Additive
View in Package Manager
Import New Asset...
Import Package
Export Package...
Find References In Scene
Select Dependencies
Library
Refresh
Ctrl+R
Reimport
Reimport All
Extract From Prefab
Run API Updater...
Update UIElements Schema

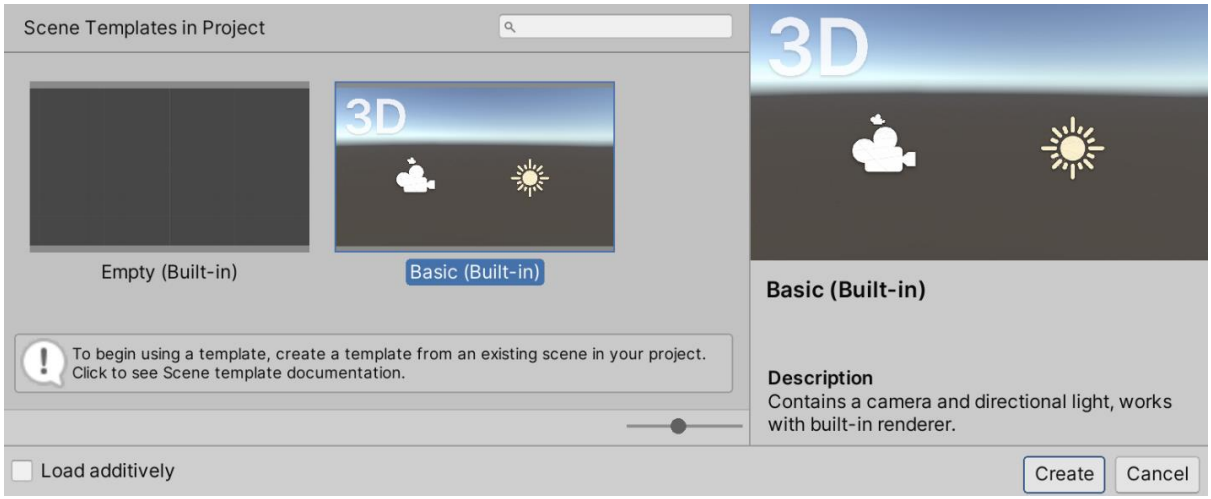

Assembly-CSharp-Editor.csproj
Assembly-CSharp.csproj
Assets
Library
Logs
Packages
ProjectSettings
SuperShooter.sln
Temp
UserSettings

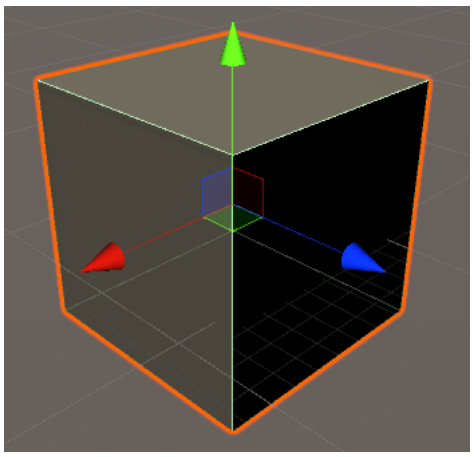
Chapter 3: Working with Scenes and Game Objects

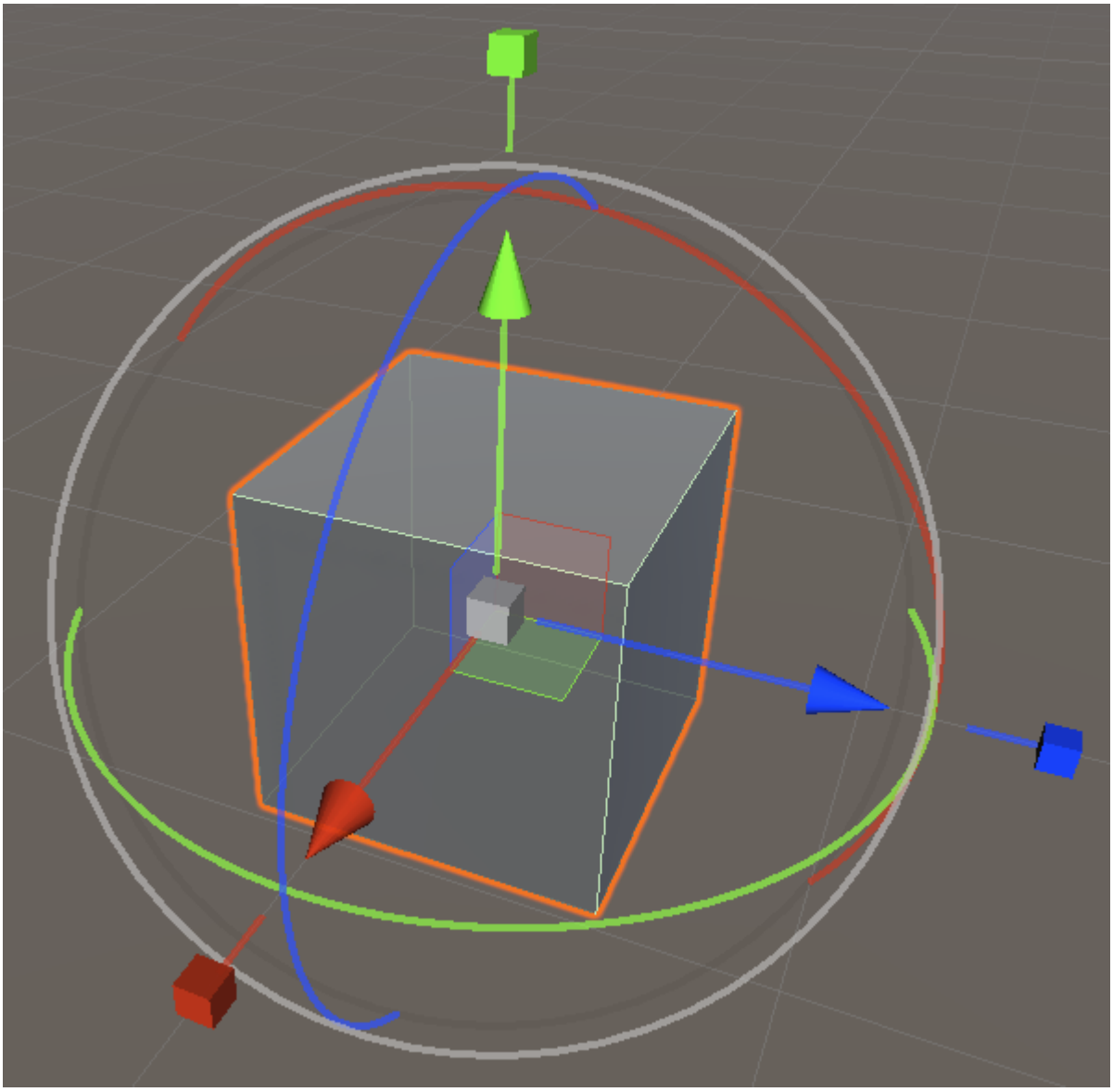


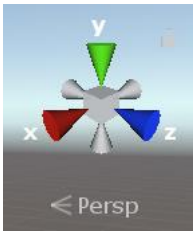




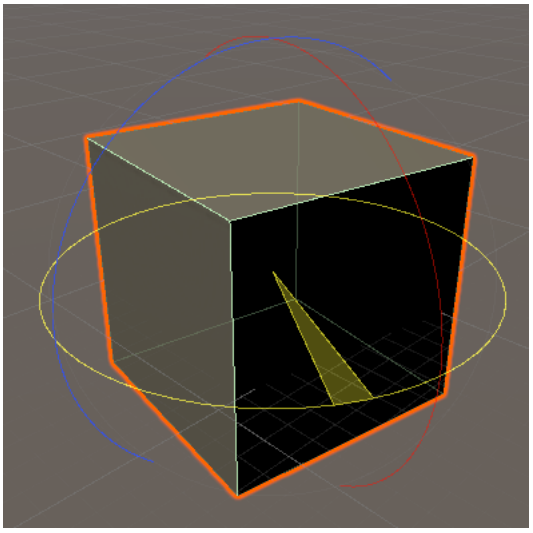

Scene Templates in Project
3D
Empty (Built-in)
3D
Basic (Built-in)
To begin using a template, create a template from an existing scene in your project.
Click to see Scene template documentation.
3D
Basic (Built-in)
Description
Contains a camera and directional light, works with built-in renderer.
Load additively
Create
Cancel

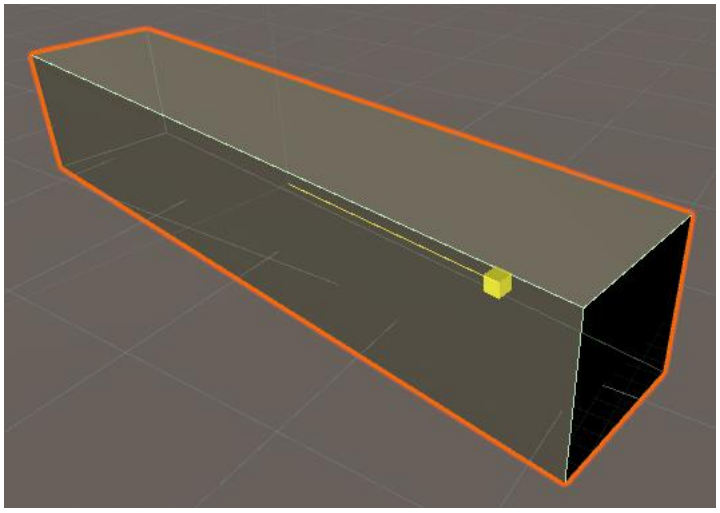


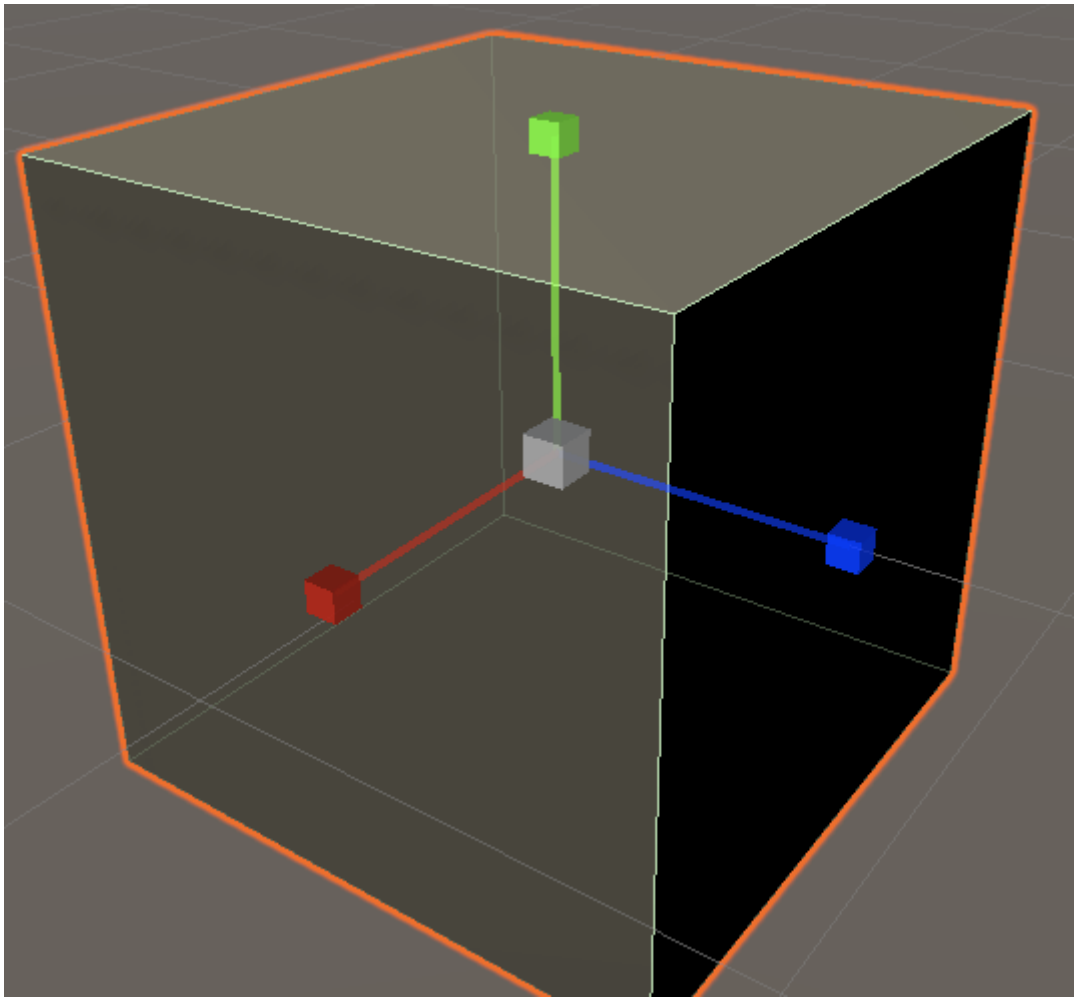


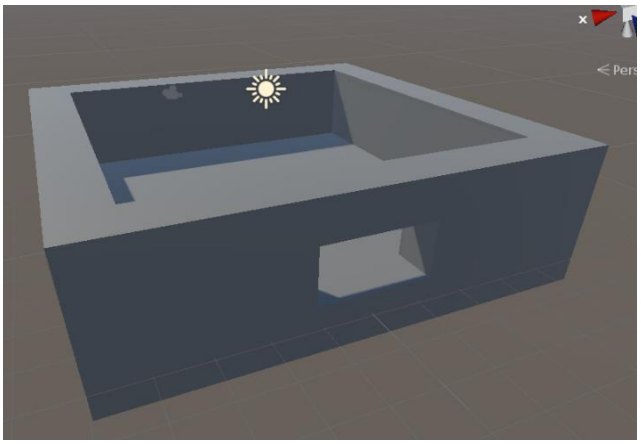


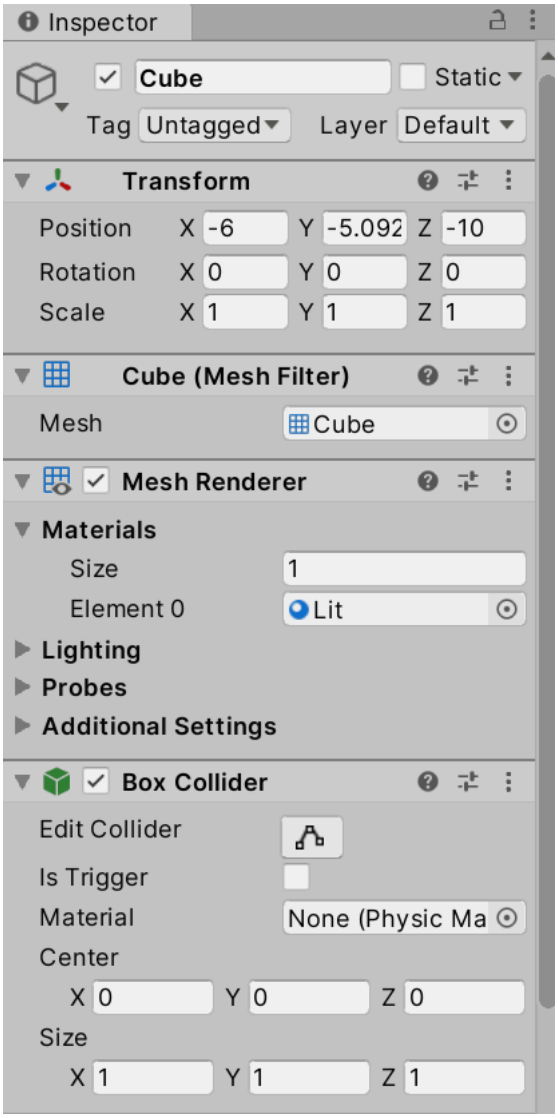
Tutorial Window Help

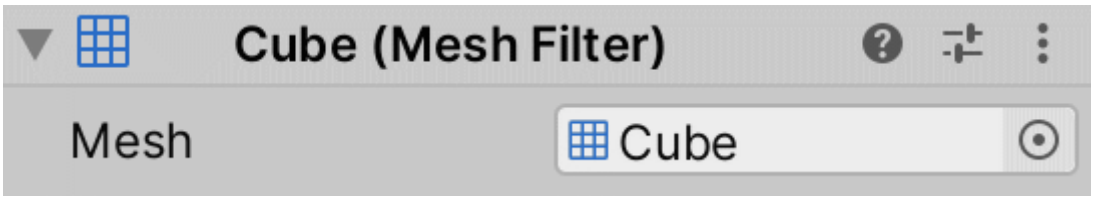


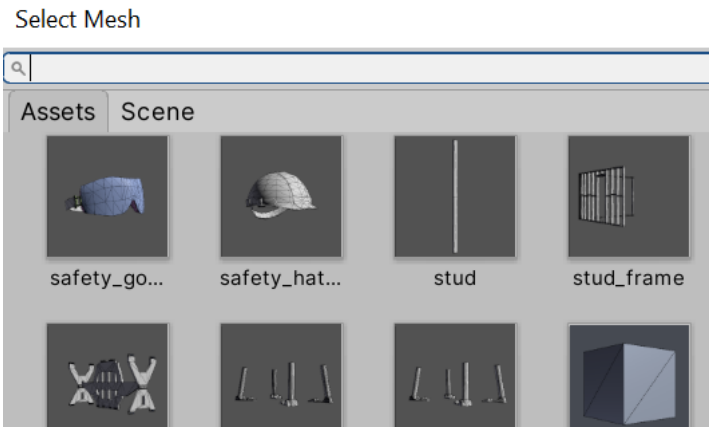


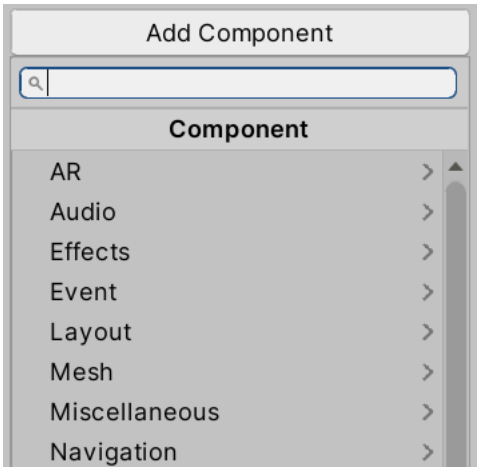


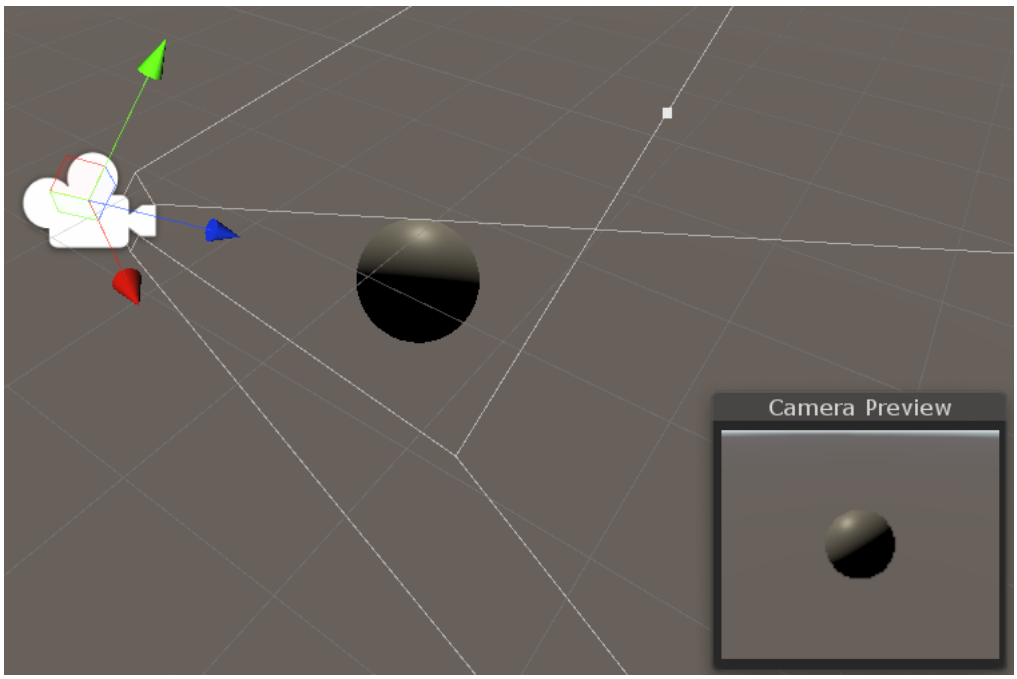


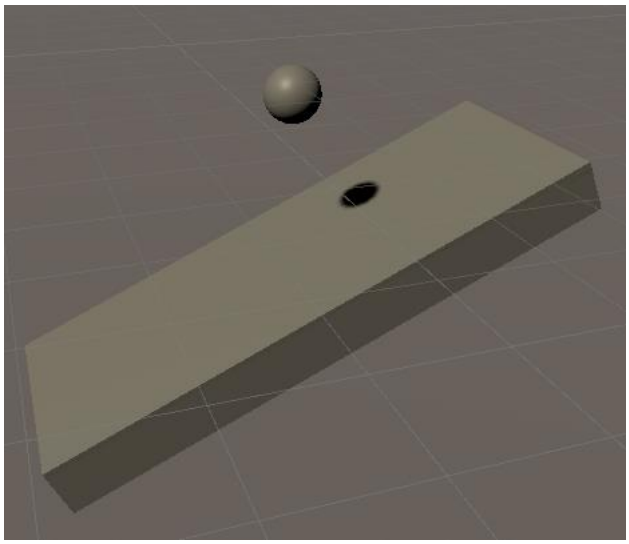

Inspector
Cube
Static
Tag Untagged
Layer Default
Transform
Position X -6 Y -5.092 Z -10
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Cube (Mesh Filter)
Mesh Cube
Mesh Renderer
Materials
Size 1
Element 0 Lit
Lighting
Probes
Additional Settings
Box Collider
Edit Collider
Is Trigger
Material None (Physic Ma
Center
X 0 Y 0 Z 0
Size
X 1 Y 1 Z 1

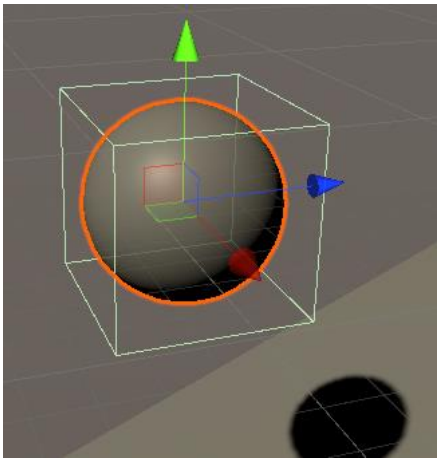

Cube (Mesh Filter)
Mesh
Cube

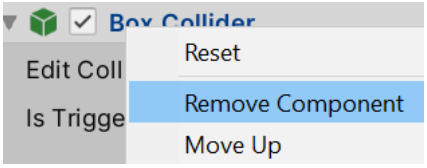

Select Mesh
Assets
Scene
safety_go...
safety_hat...
stud
stud_frame

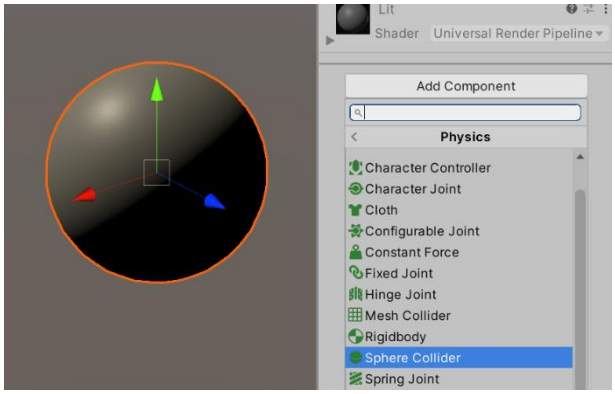

Add Component
Component
AR
Audio
Effects
Event
Layout
Mesh
Miscellaneous
Navigation

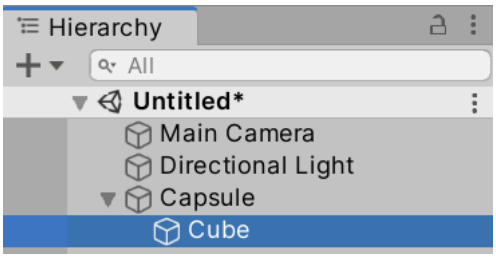

Camera Preview

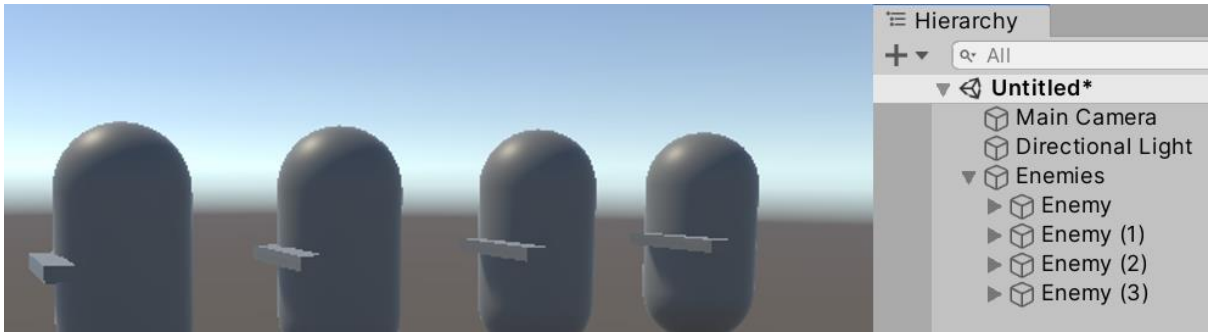


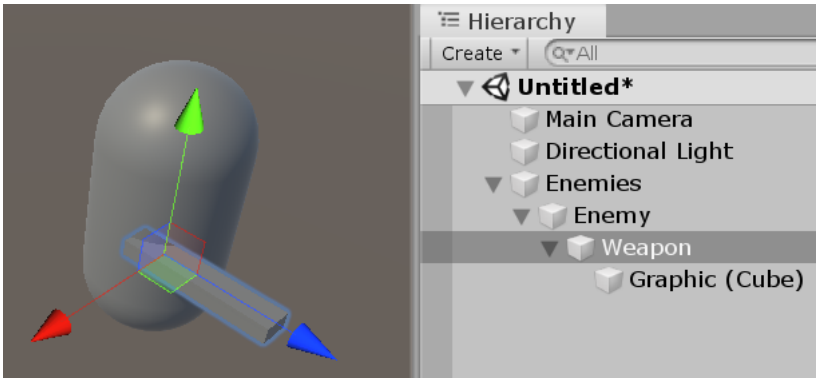


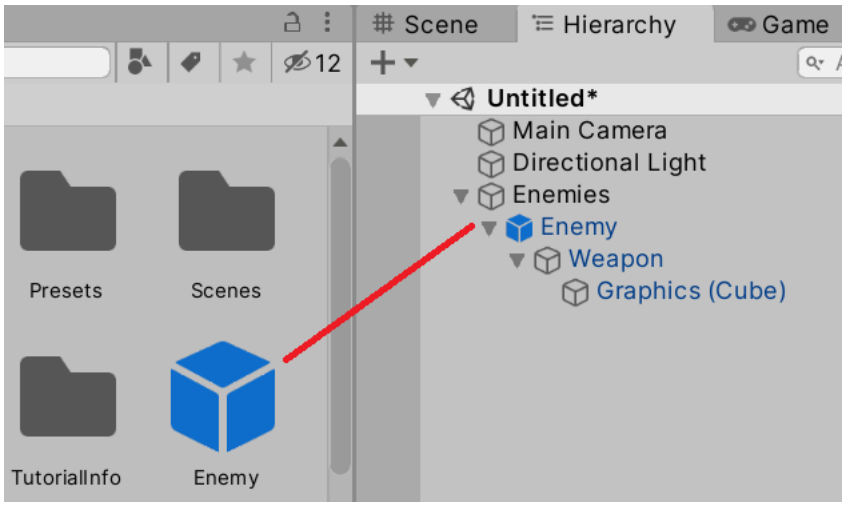

Box Collider
Edit Coll
Is Trigge
Reset
Remove Component
Move Up

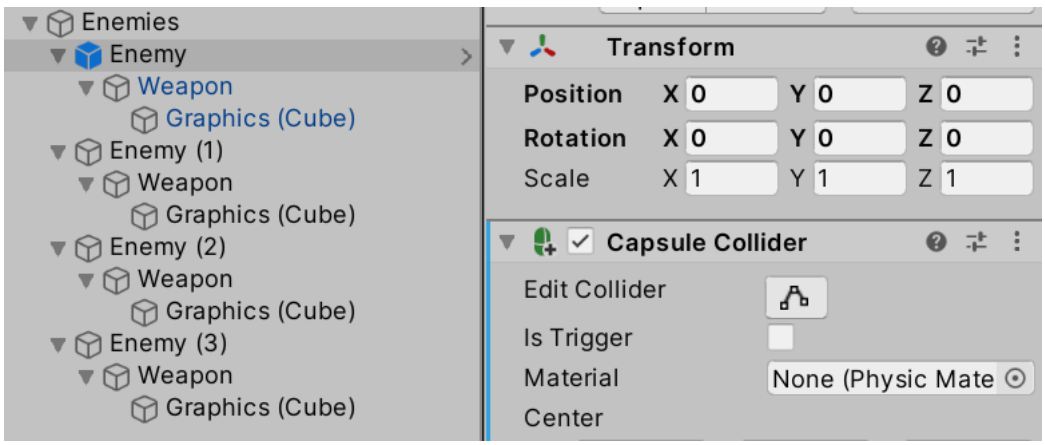

Lit
Shader
Universal Render Pipeline
Add Component
Physics
Character Controller
Character Joint
Cloth
Configurable Joint
Constant Force
Fixed Joint
Hinge Joint
Mesh Collider
Rigidbody
Sphere Collider
Spring Joint

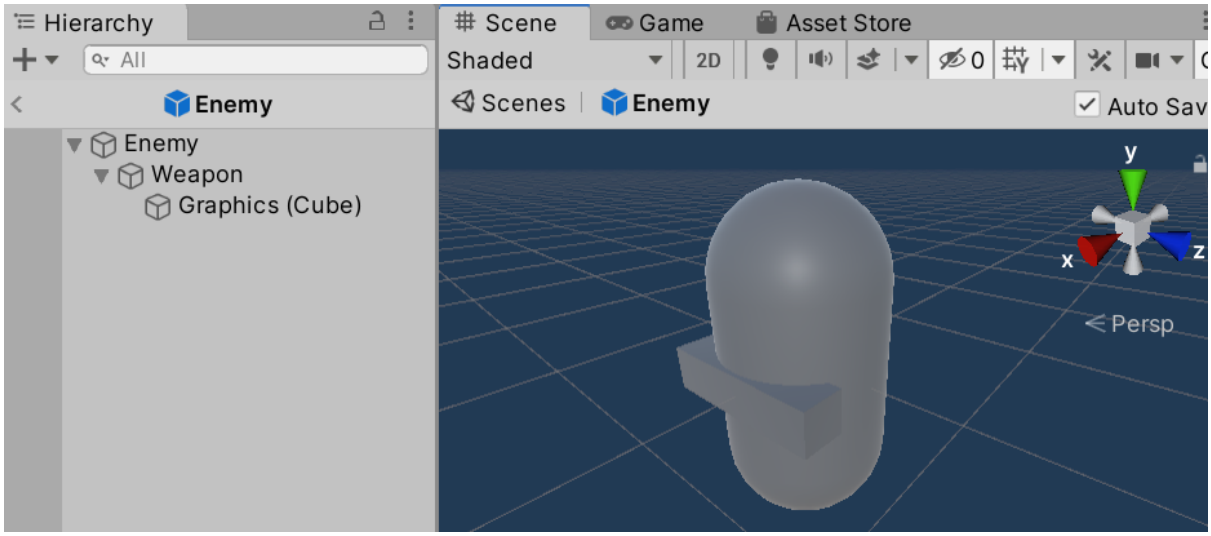

Hierarchy
All
Untitled*
Main Camera
Directional Light
Capsule
Cube

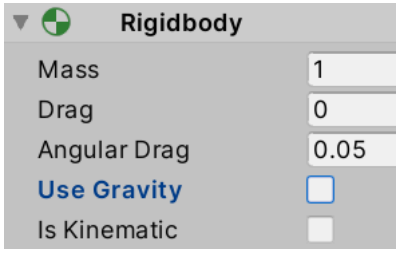

Hierarchy
All
Untitled*
Main Camera
Directional Light
Enemies
Enemy
Enemy (1)
Enemy (2)
Enemy (3)

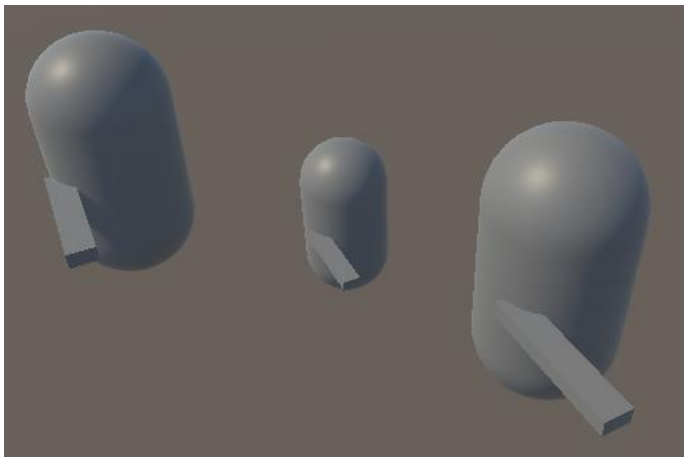

Hierarchy
Create
All
Untitled*
Main Camera
Directional Light
Enemies
Enemy
Weapon
Graphic (Cube)

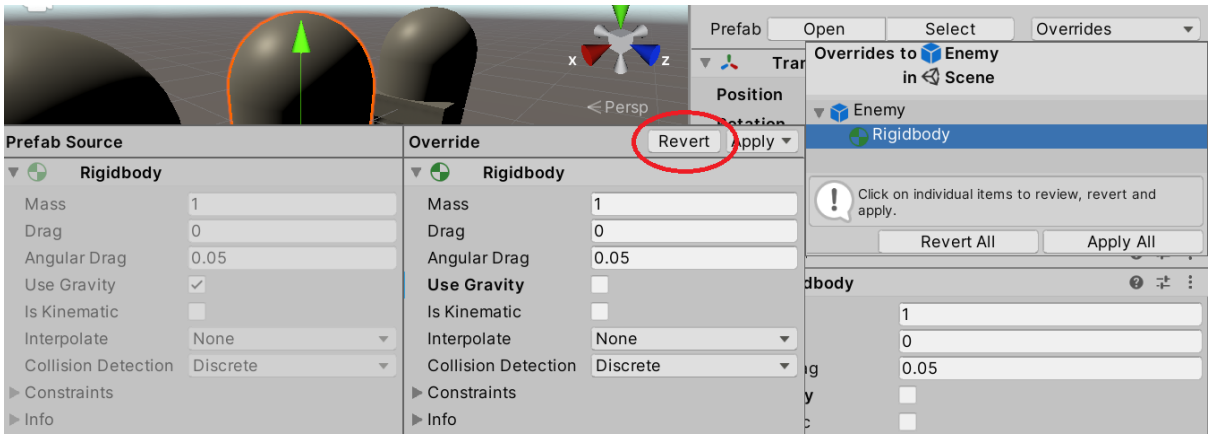

Scene
Hierarchy
Game
12
Untitled*
Main Camera
Directional Light
Enemies
Enemy
Weapon
Graphics (Cube)
Presets
Scenes
TutorialInfo
Enemy

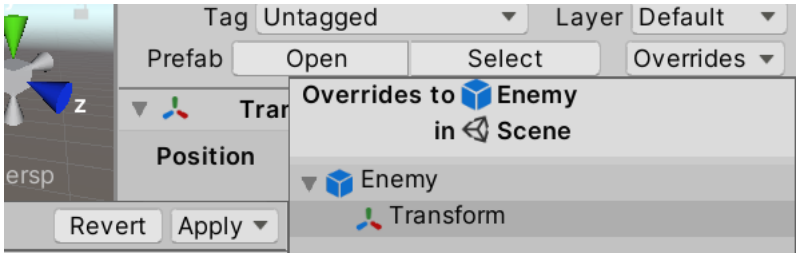

Enemies
Enemy
Weapon
Graphics (Cube)
Enemy (1)
Weapon
Graphics (Cube)
Enemy (2)
Weapon
Graphics (Cube)
Enemy (3)
Weapon
Graphics (Cube)
Transform
Position X 0 Y 0 Z 0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Capsule Collider
Edit Collider
Is Trigger
Material
None (Physic Mate
Center

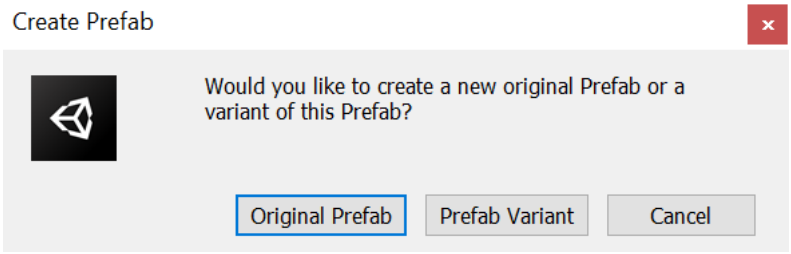

Hierarchy
All
Enemy
Enemy
Weapon
Graphics (Cube)
Scene
Game
Asset Store
Shaded
2D
Scenes
Enemy
Auto Sav
y
x
z
Persp

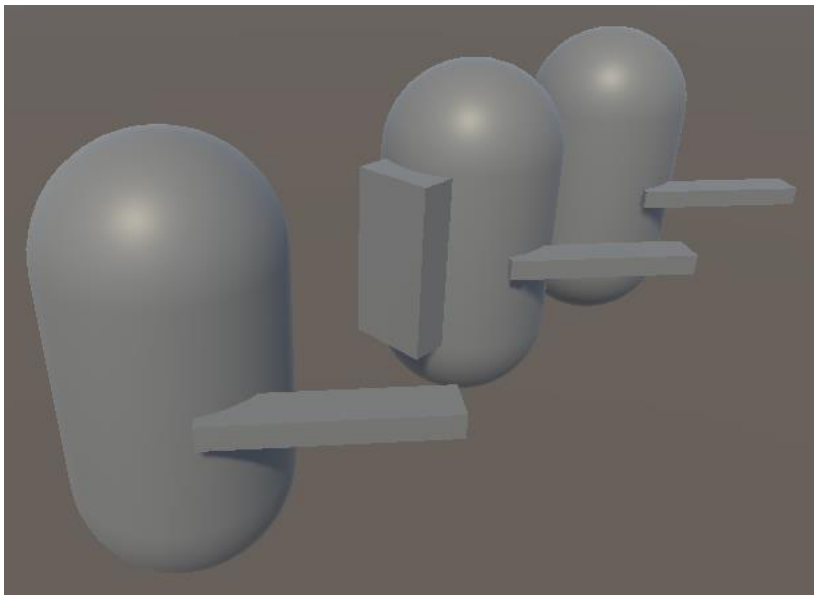

Rigidbody
Mass
1
Drag
0
Angular Drag
0.05
Use Gravity
Is Kinematic

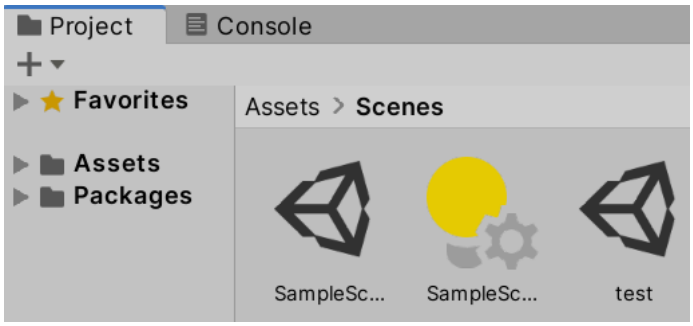


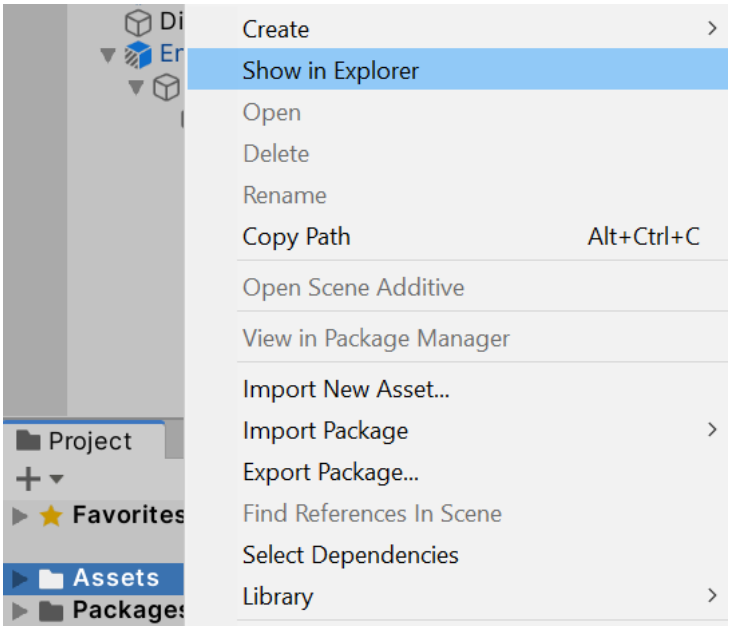

Persp
Prefab
Open
Select
Overrides
Position
Overrides to Enemy
in Scene
Enemy
Rigidbody
Click on individual items to review, revert and apply.
Revert All
Apply All
Prefab Source
Override
Revert
Apply
Rigidbody
Mass
Drag
Angular Drag
Use Gravity
Is Kinematic
Interpolate
Collision Detection
Constraints
Info
None
Discrete

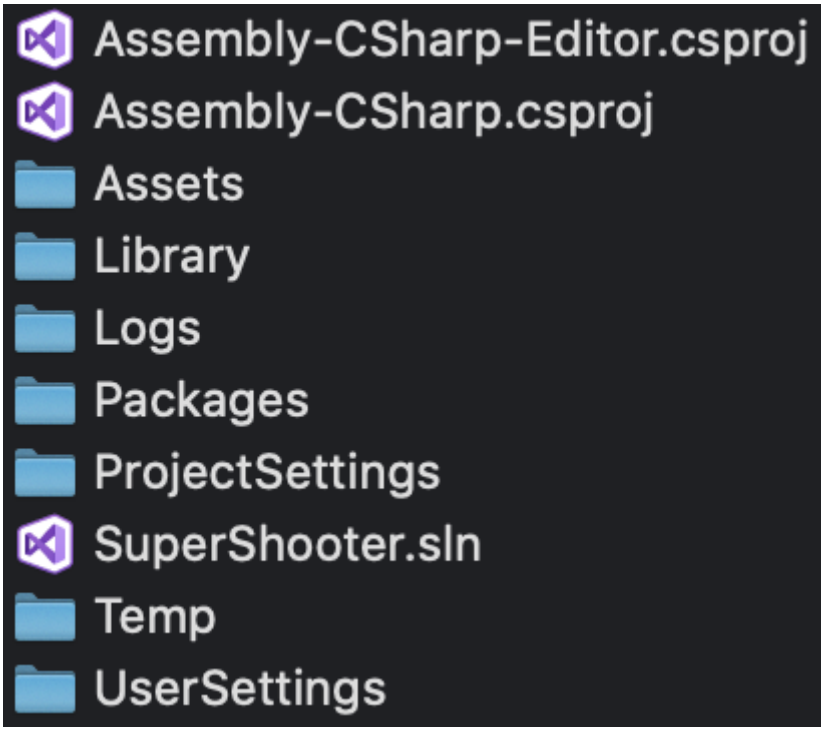

Tag Untagged
Layer Default
Prefab
Open
Select
Overrides
Overrides to Enemy
in Scene
Position
Enemy
Transform
Revert
Apply

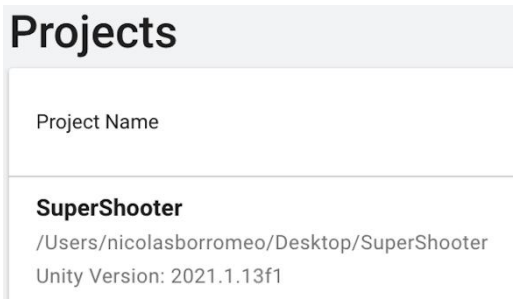

Create Prefab
Would you like to create a new original Prefab or a variant of this Prefab?
Original Prefab
Prefab Variant
Cancel



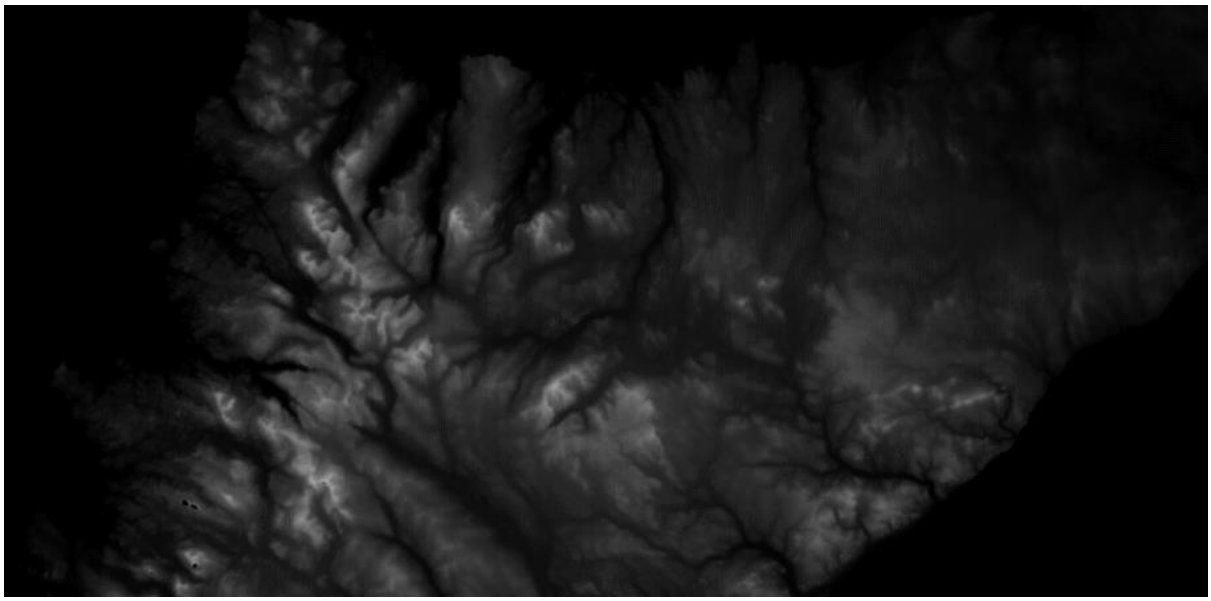

Project
Console
Favorites
Assets
Packages
Assets > Scenes
SampleSc...
SampleSc...
test

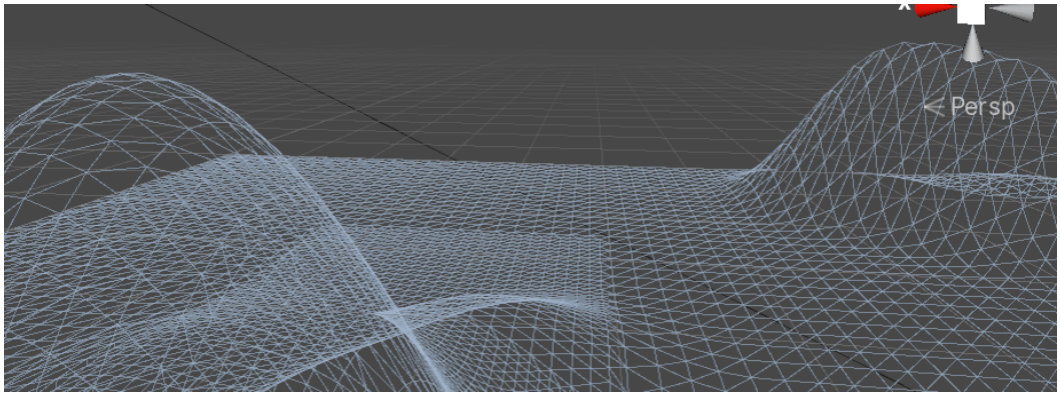

Create
Show in Explorer
Open
Delete
Rename
Copy Path
Alt+Ctrl+C
Open Scene Additive
View in Package Manager
Import New Asset...
Import Package
Export Package...
Find References In Scene
Select Dependencies
Library
Project
Favorites
Assets
Packages

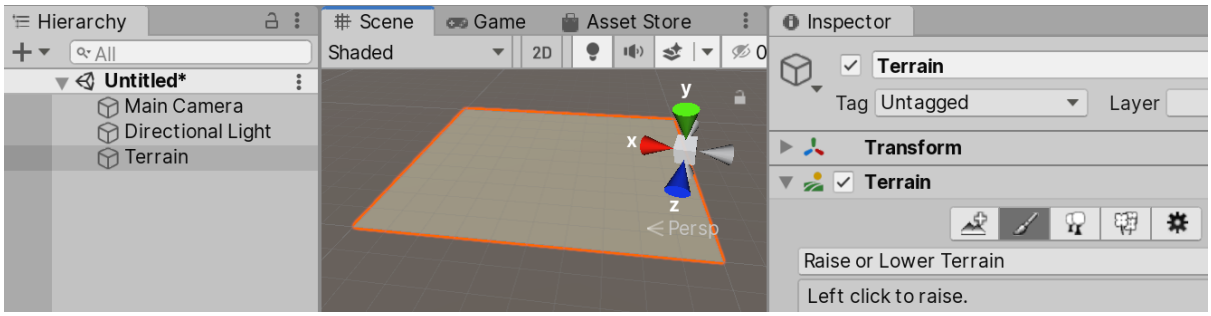

Assembly-CSharp-Editor.csproj
Assembly-CSharp.csproj
Assets
Library
Logs
Packages
ProjectSettings
SuperShooter.sln
Temp
UserSettings

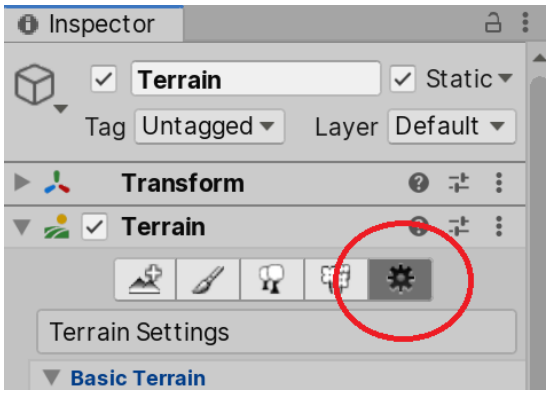

Projects
Project Name
SuperShooter
/Users/nicolasborromeo/Desktop/SuperShooter
Unity Version: 2021.1.13f1

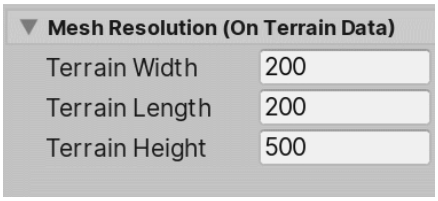
Chapter 4: Grayboxing with Terrain and ProBuilder

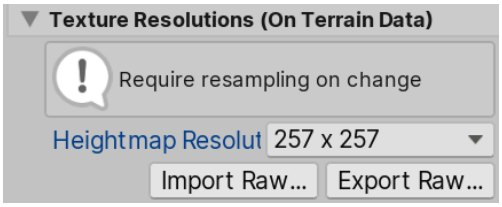


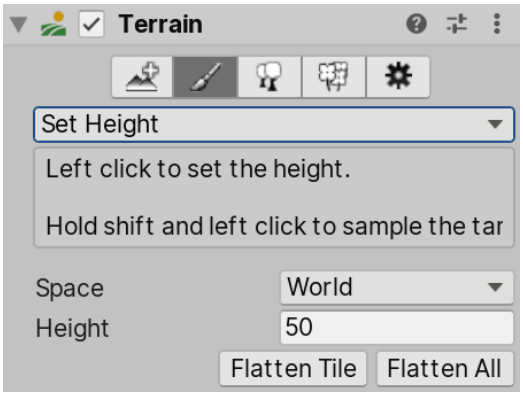


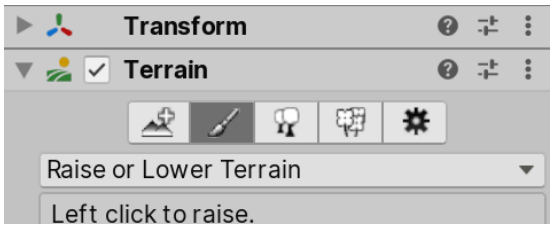


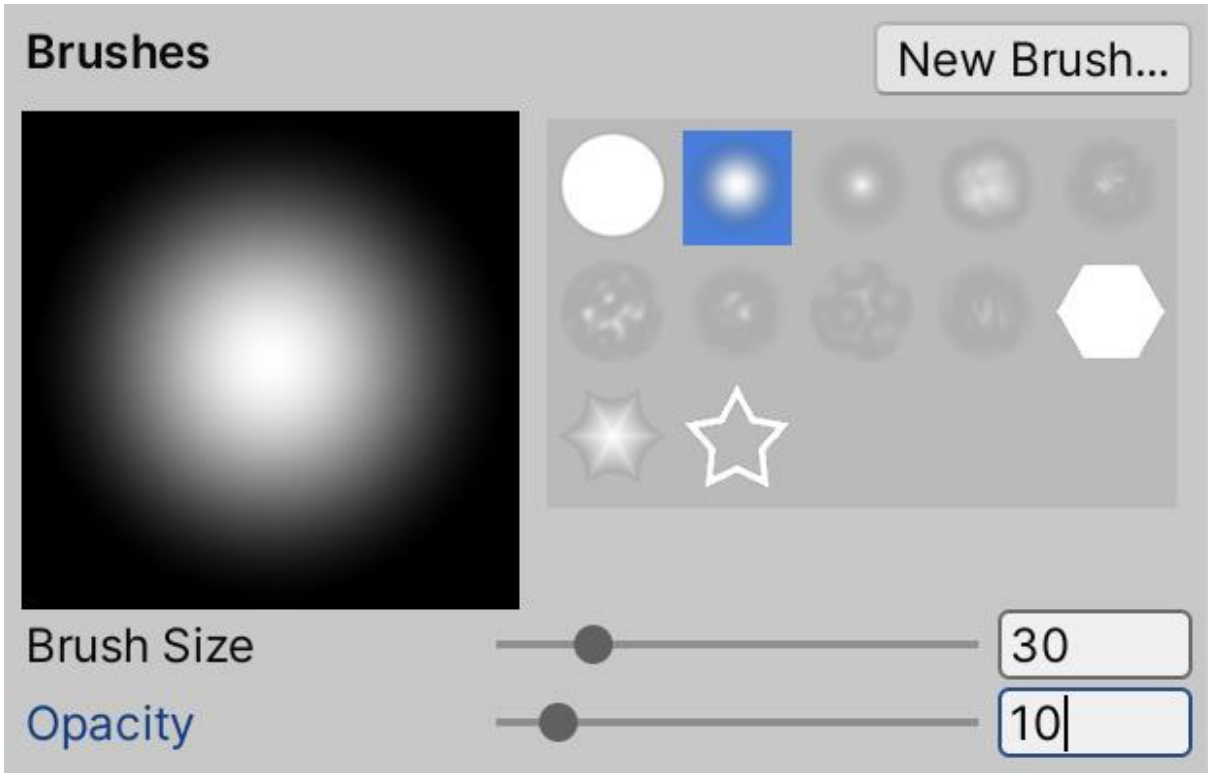


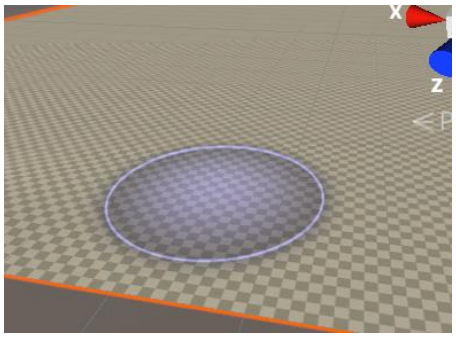

Mesh Resolution (On Terrain Data)
Terrain Width
200
Terrain Length
200
Terrain Height
500

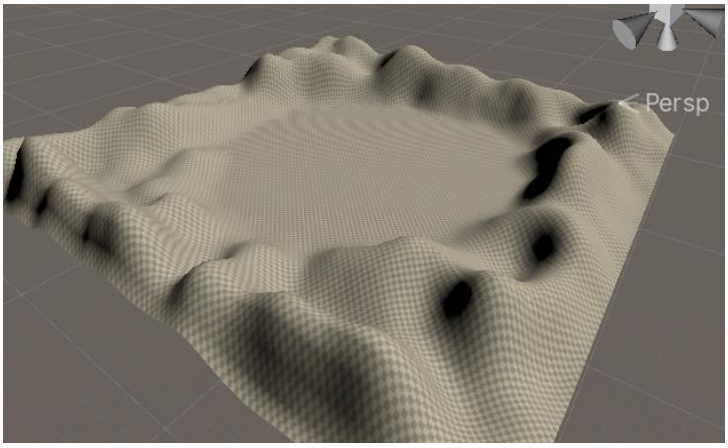

Texture Resolutions (On Terrain Data)
Require resampling on change
Heightmap Resolut
257 x 257
Import Raw...
Export Raw...

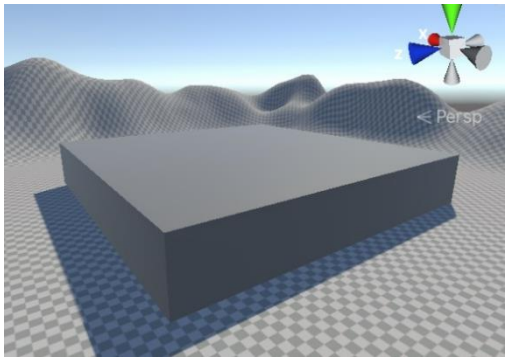

Terrain
Set Height
Left click to set the height.
Hold shift and left click to sample the tar
Space
World
Height
50
Flatten Tile
Flatten All

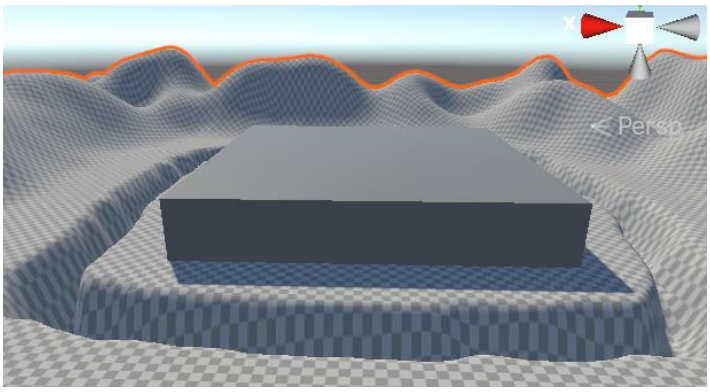

Transform
Terrain
Raise or Lower Terrain
Left click to raise.

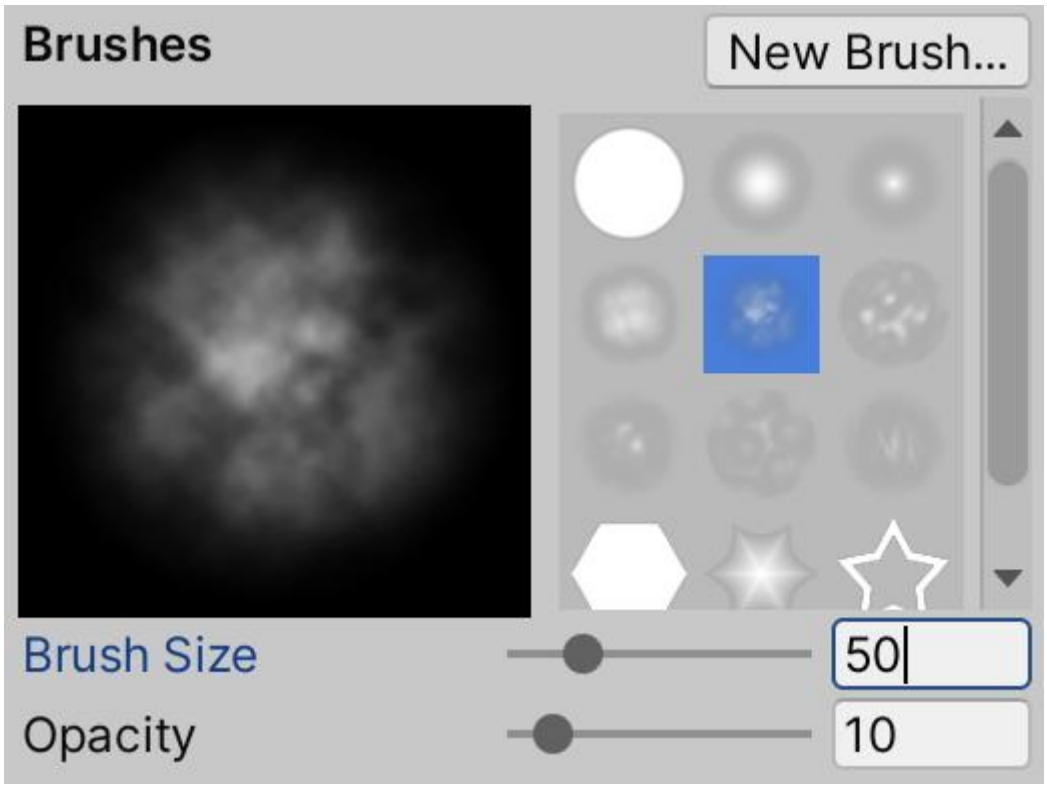

Brushes
New Brush...
Brush Size
30
Opacity
10

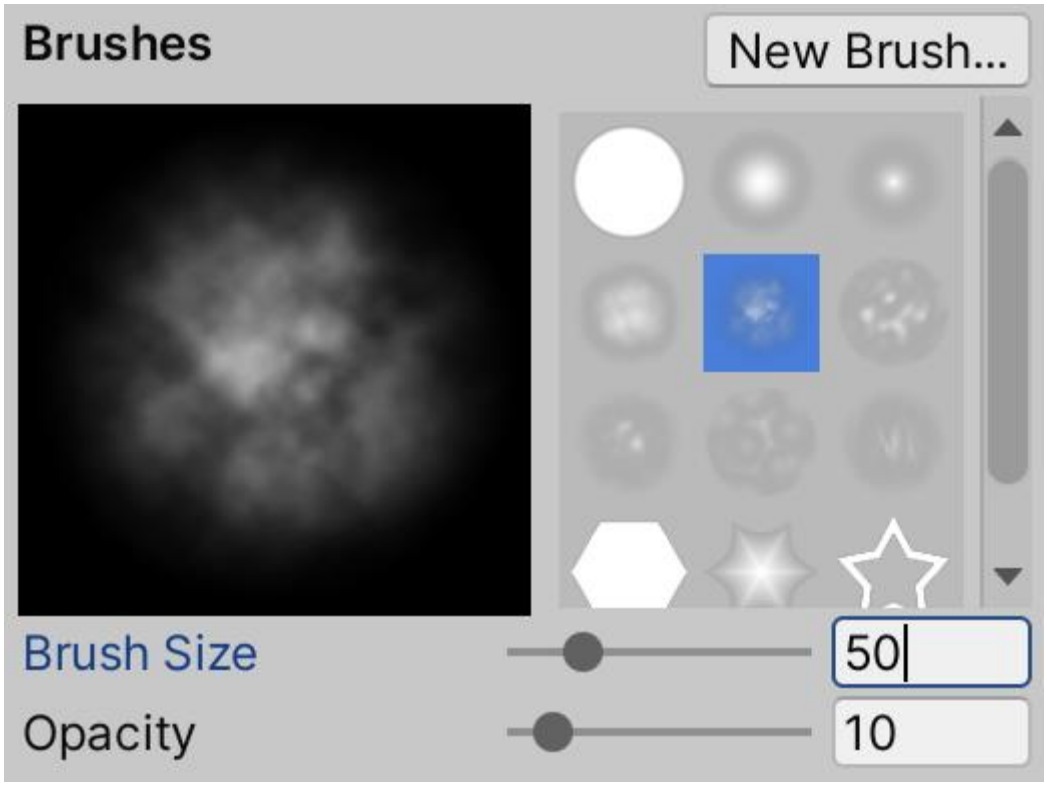

X
Z

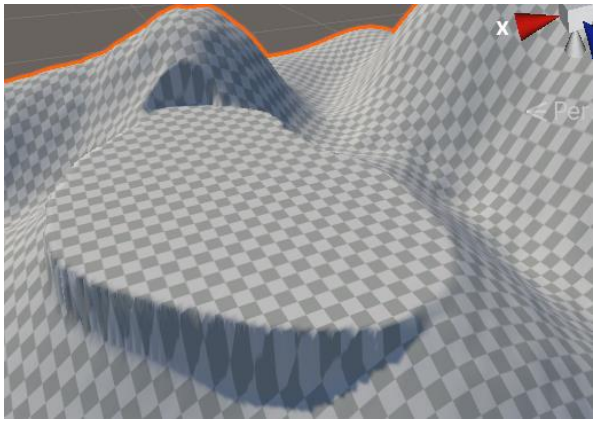

Persp

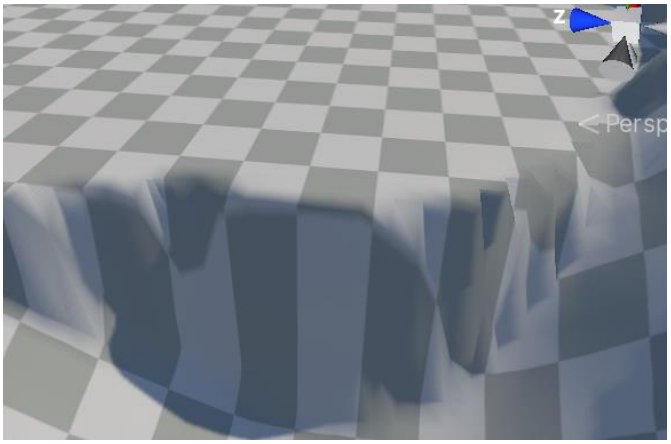

Persp

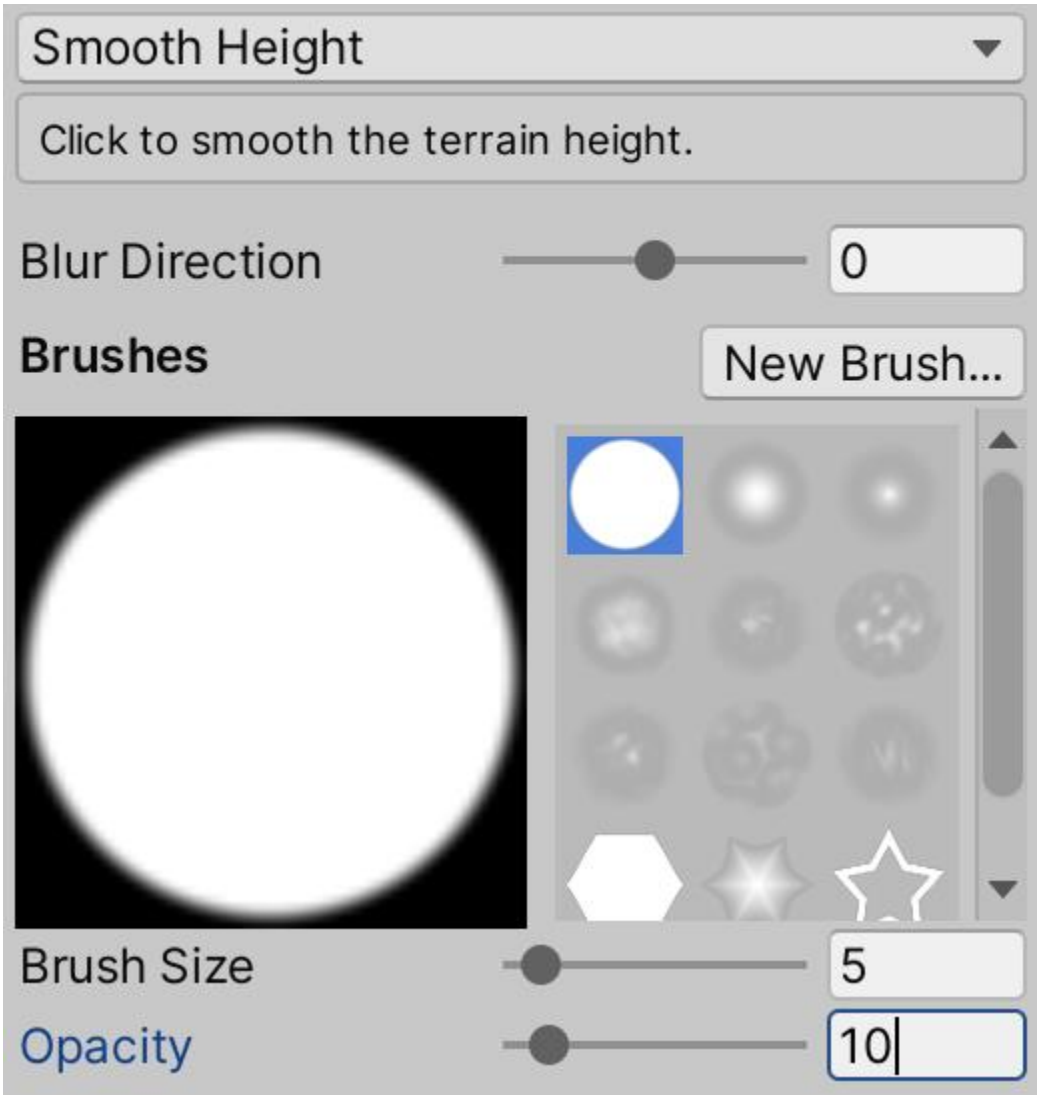

Persp

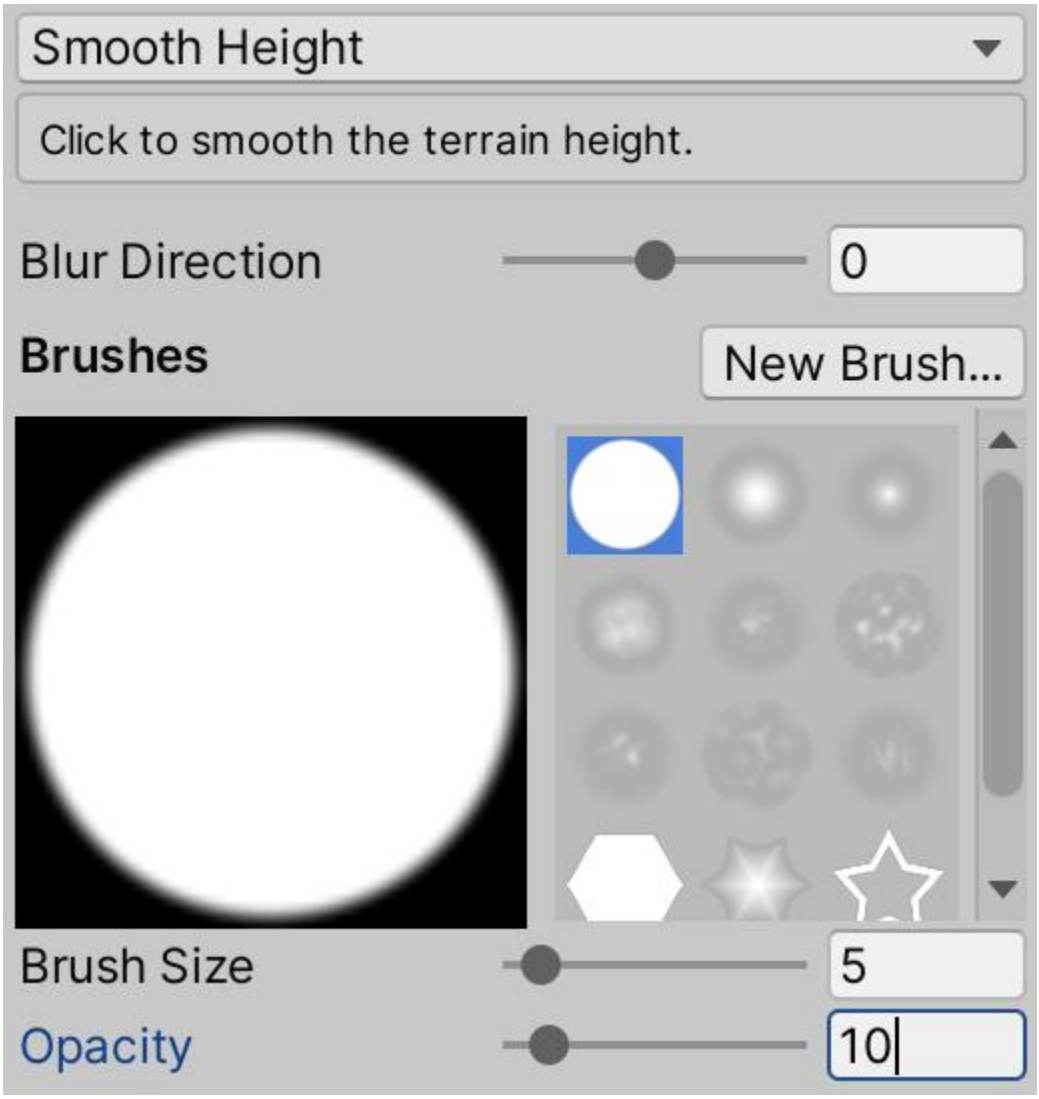

Brushes
New Brush...
Brush Size
50
Opacity
10

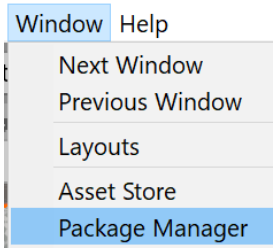

Brushes
New Brush...
Brush Size
50
Opacity
10

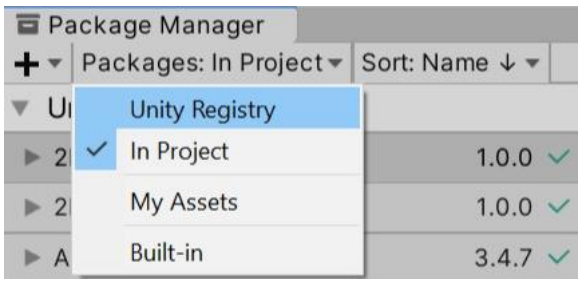

x

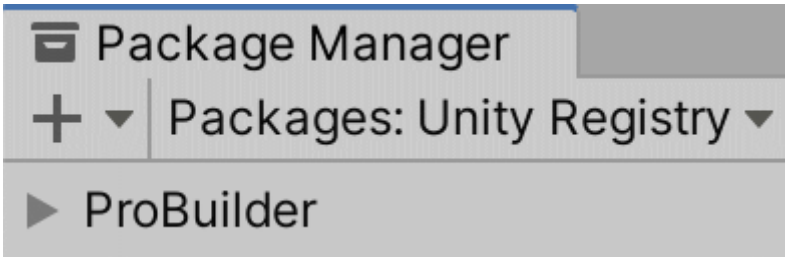

z


Smooth Height
Click to smooth the terrain height.
Blur Direction
0
Brushes
New Brush...
Brush Size
5
Opacity
10

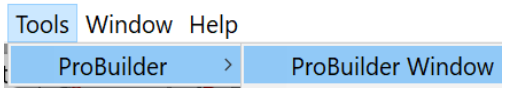

Smooth Height
Click to smooth the terrain height.
Blur Direction
0
Brushes
New Brush...
Brush Size
5
Opacity
10

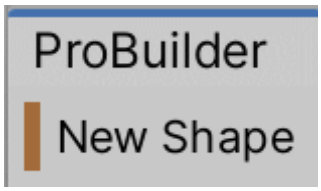

Window
Help
Next Window
Previous Window
Layouts
Asset Store
Package Manager

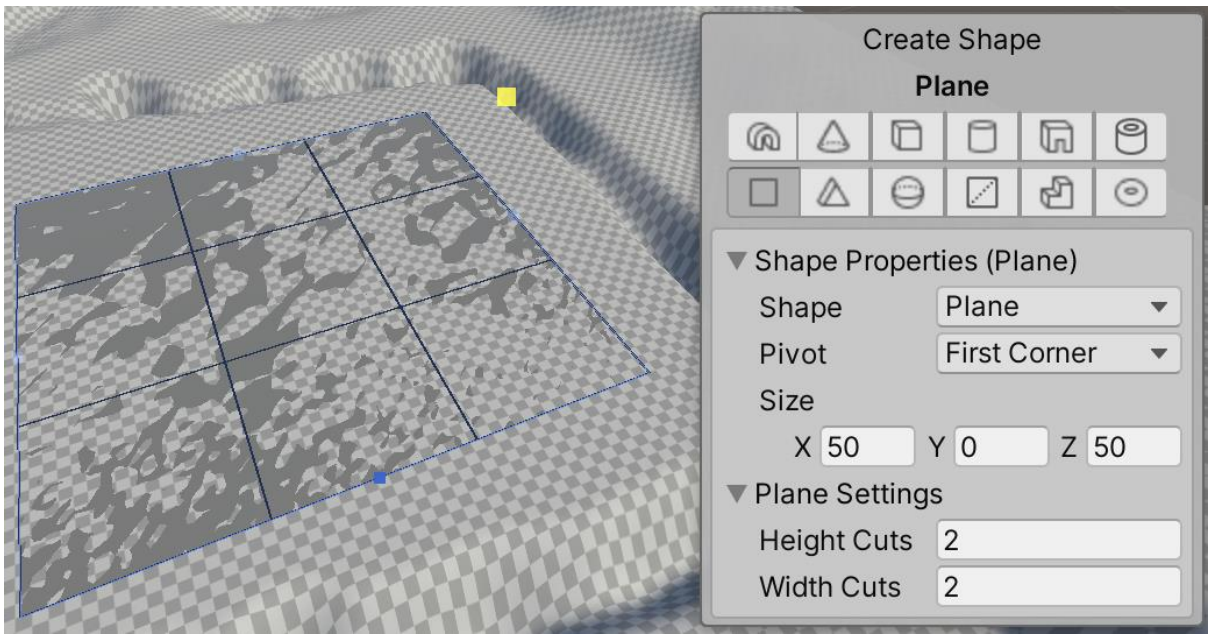

Package Manager
Packages: In Project
Sort: Name
Unity Registry
In Project
My Assets
Built-in
1.0.0
1.0.0
3.4.7

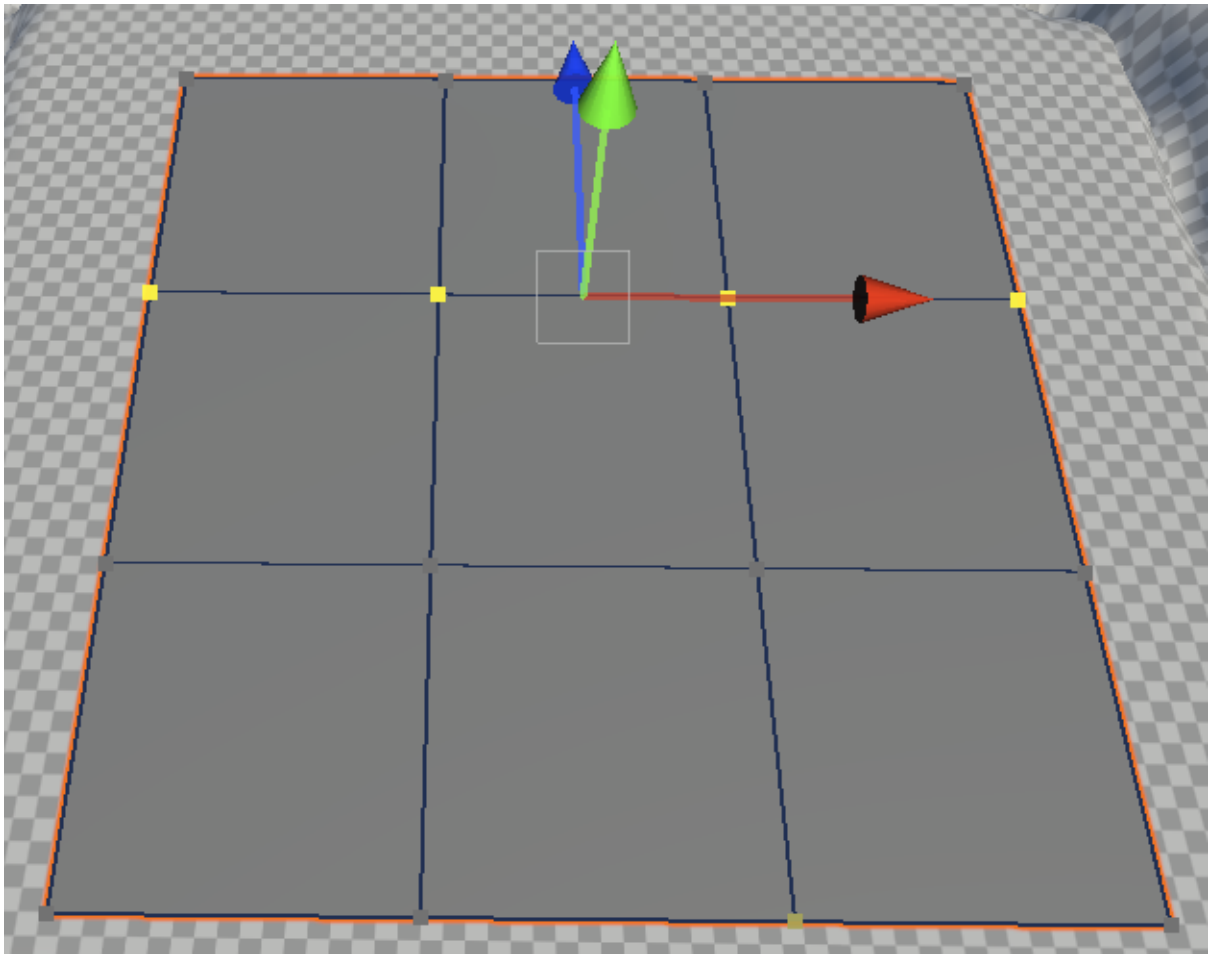

Package Manager
Packages: Unity Registry
ProBuilder

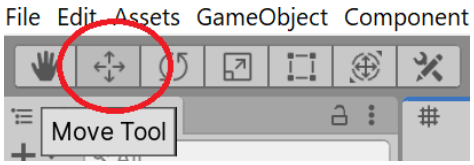

Install

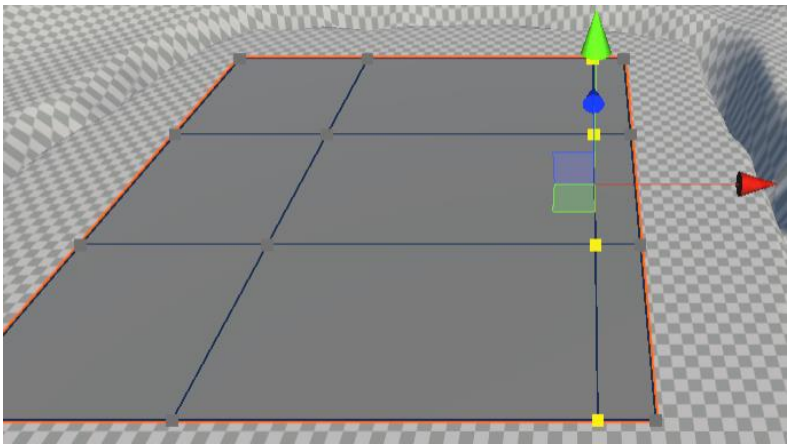

Tools
Window
Help
ProBuilder
ProBuilder Window

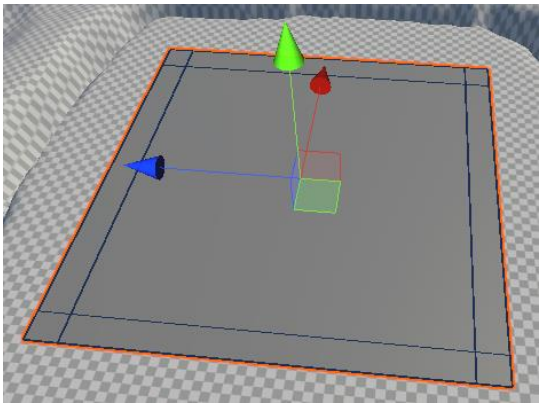

ProBuilder
New Shape

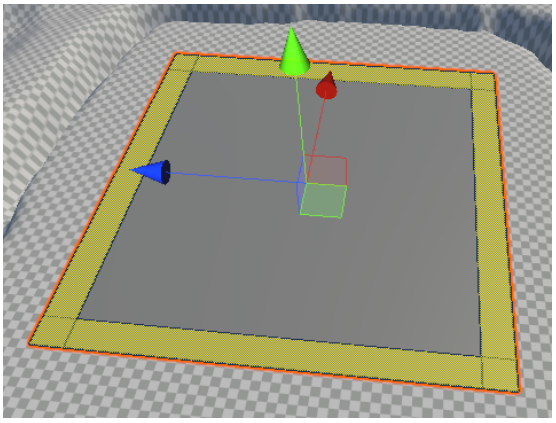

Create Shape
Plane
Shape Properties (Plane)
Shape
Plane
Pivot
First Corner
Size
X 50
Y 0
Z 50
Plane Settings
Height Cuts
2
Width Cuts
2

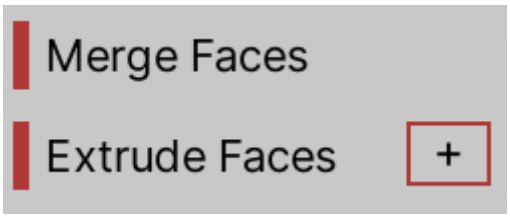


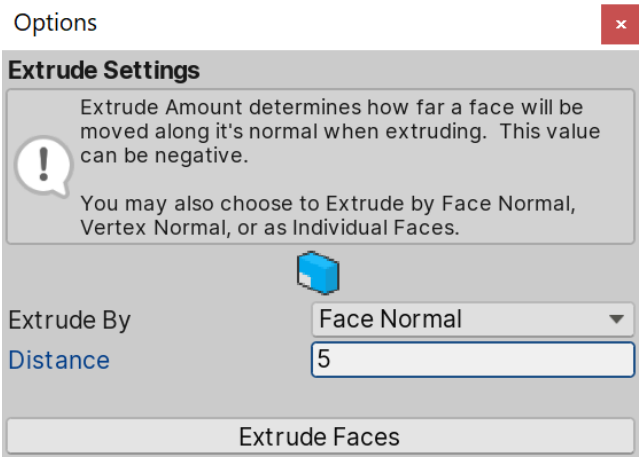

File Edit Assets GameObject Component
Move Tool

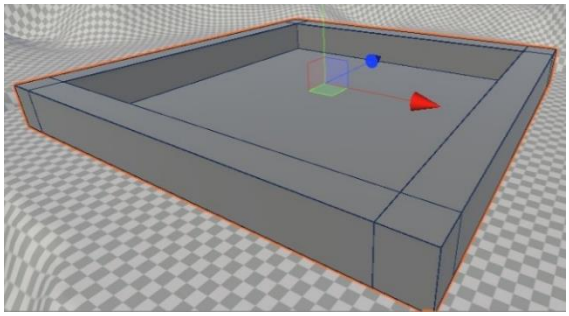


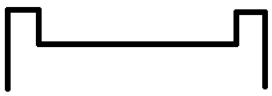


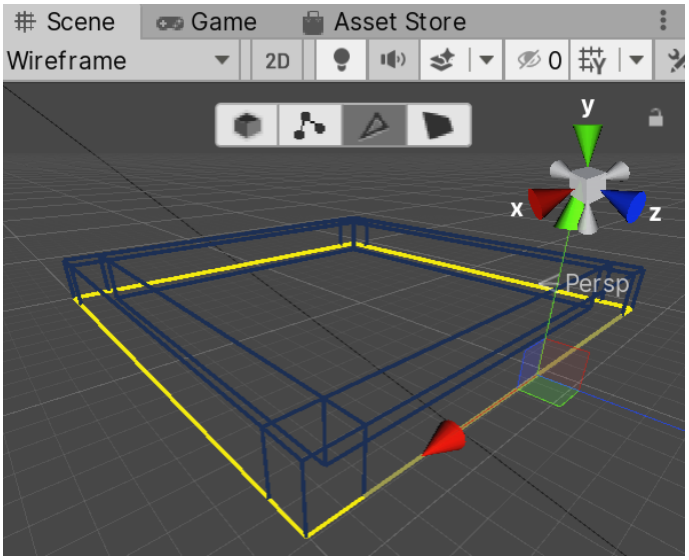


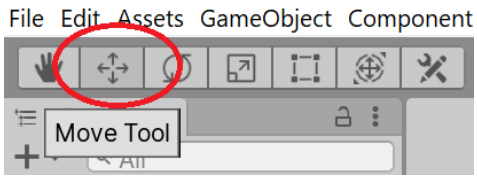

Merge Faces
Extrude Faces
+

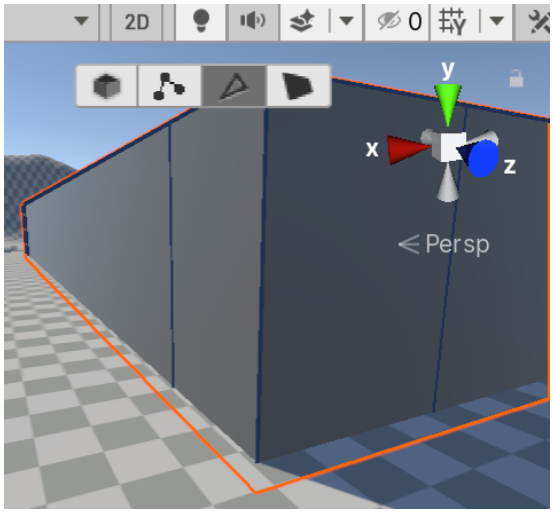

Options
Extrude Settings
Extrude Amount determines how far a face will be moved along it's normal when extruding. This value can be negative.
You may also choose to Extrude by Face Normal, Vertex Normal, or as Individual Faces.
Extrude By
Face Normal
Distance
5
Extrude Faces

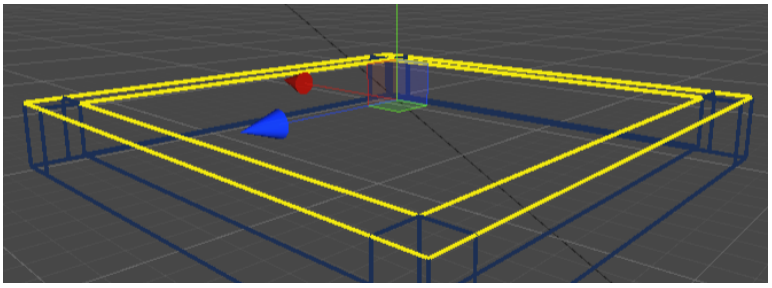


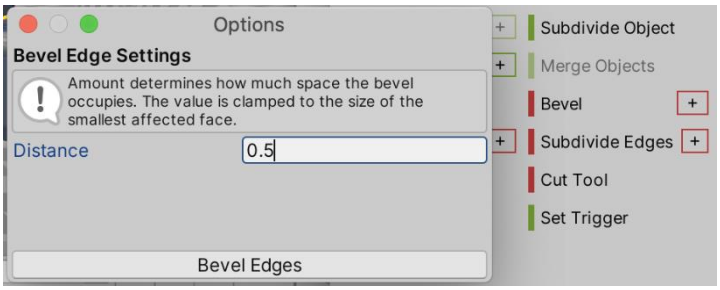


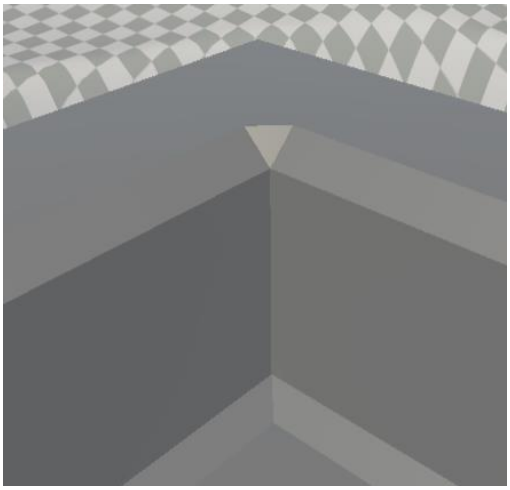

Scene
Game
Asset Store
Wireframe
2D
0
y
x
z
Persp

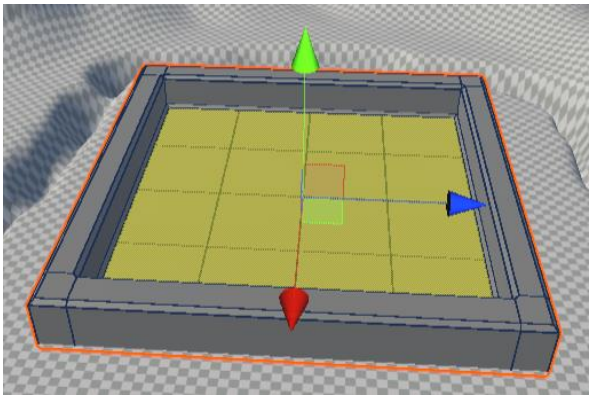

File Edit Assets GameObject Component
Move Tool

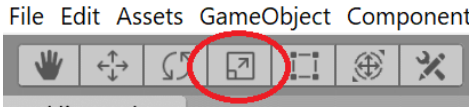

2D
0
y
x
z
Persp

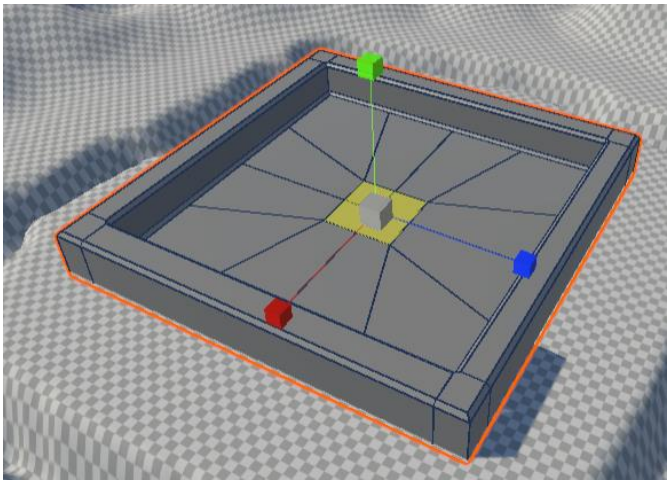


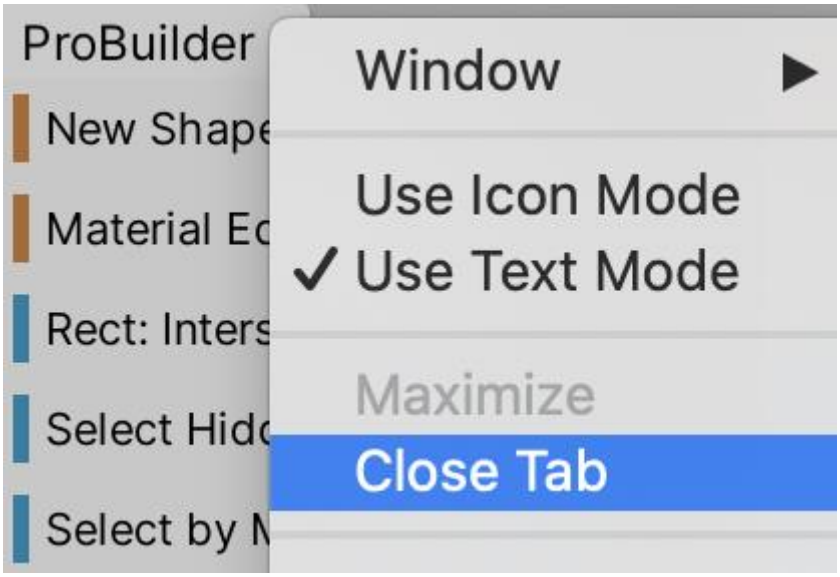

Options
Bevel Edge Settings
Amount determines how much space the bevel occupies. The value is clamped to the size of the smallest affected face.
Distance
0.5
Bevel Edges
Subdivide Object
Merge Objects
Bevel
Subdivide Edges
Cut Tool
Set Trigger

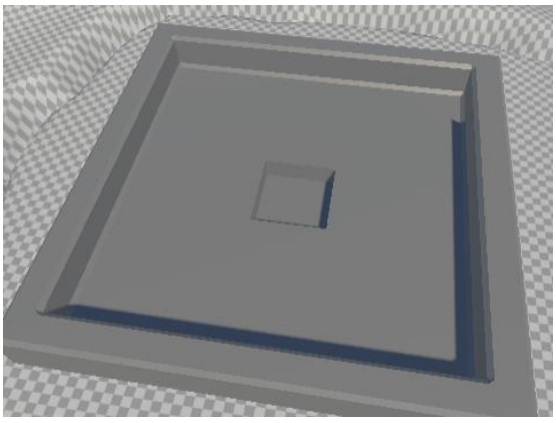




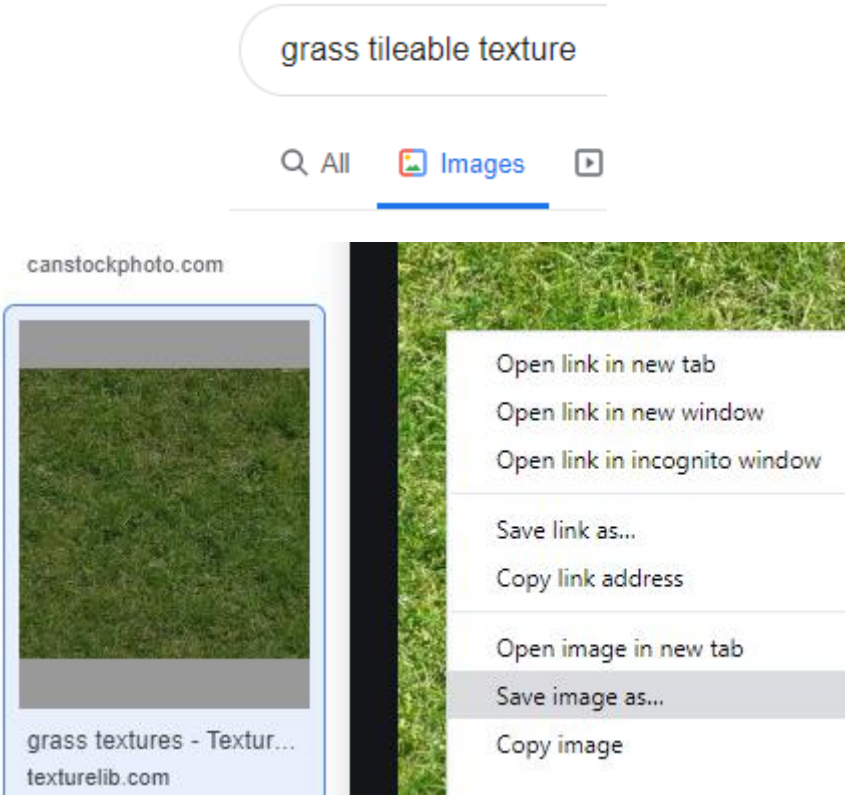

File Edit Assets GameObject Component

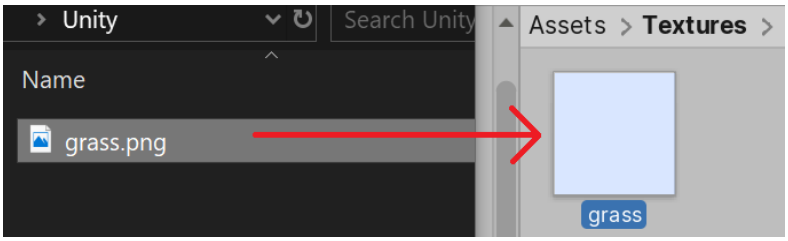


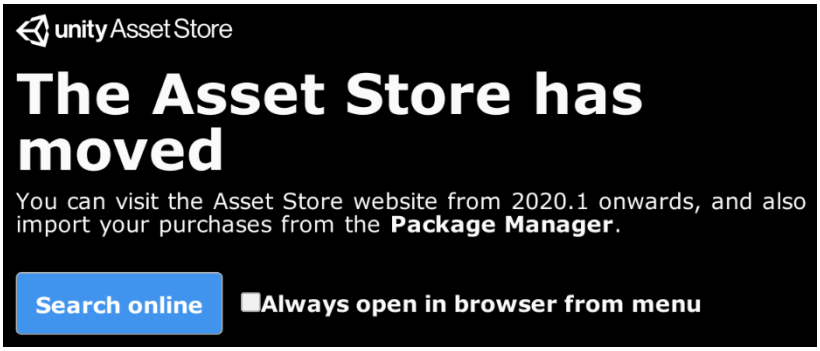

ProBuilder
New Shape
Material Ec
Rect: Inters
Select Hidc
Select by M
Window
Use Icon Mode
Use Text Mode
Maximize
Close Tab

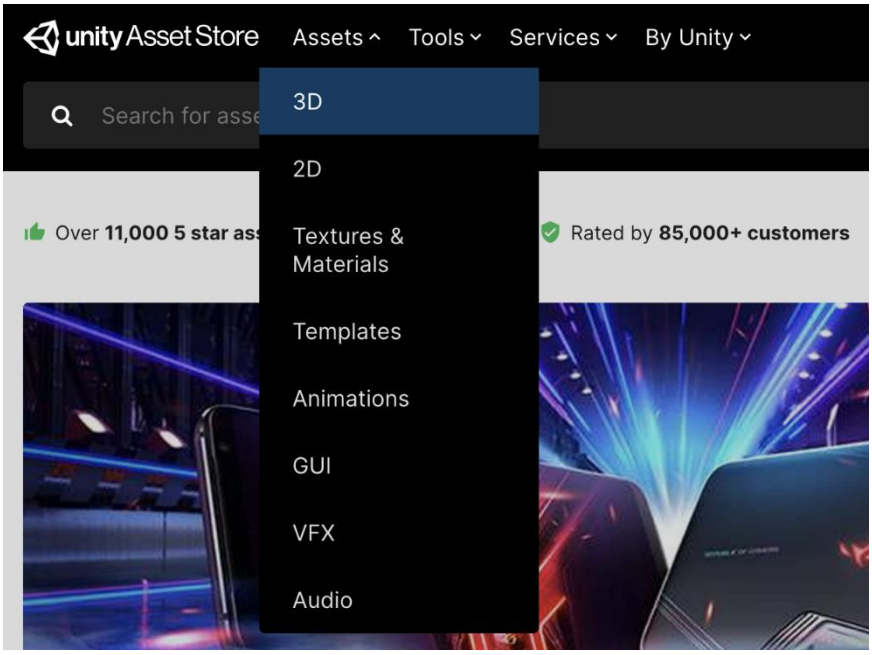


Chapter 5: Importing and Integrating Assets






unity Asset Store
The Asset Store has moved
You can visit the Asset Store website from 2020.1 onwards, and also import your purchases from the Package Manager.
Search online
Always open in browser from menu


unity Asset Store
Assets
Tools
Services
By Unity
Search for asse
3D
2D
Textures & Materials
Templates
Animations
GUI
VFX
Audio
Over 11,000 5 star ass
Rated by 85,000+ customers

All Categories

- [x] 3D (37191)
  - [ ] Animations (723)
  - [ ] Characters (10524)
  - [ ] Environments (7576)
    - [ ] Dungeons (319)
    - [ ] Fantasy (1128)

Pricing

$ 0 — $ 199

Free Assets (53)

Pricing

$ 0 — $ 199

Free Assets (53)

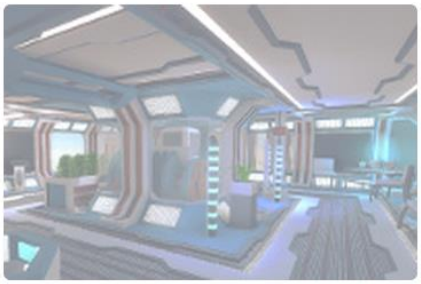
New

ASSET STORE ORIGINALS

Snaps Prototype | Sci-Fi / In...

★★★★★ (13)

FREE



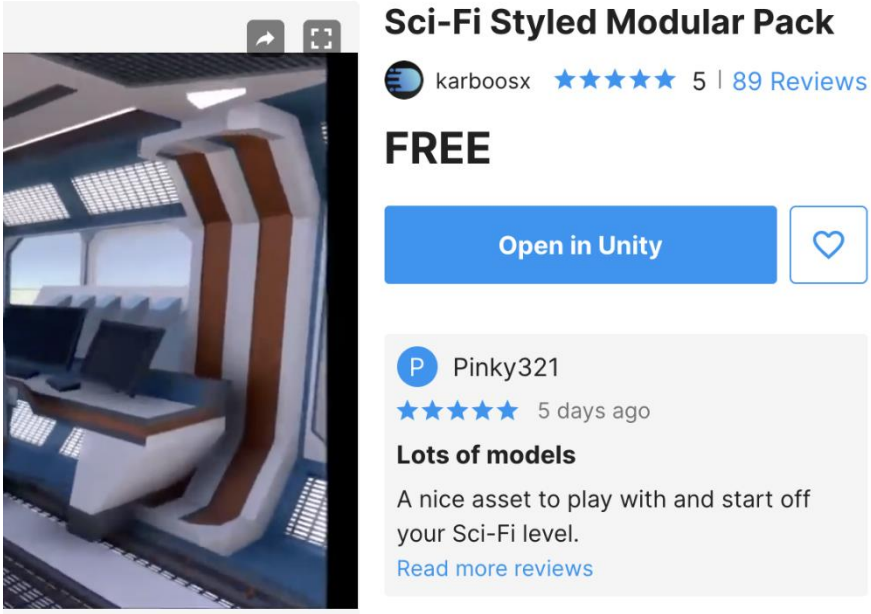
Purchased

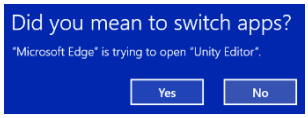
KARBOOSX

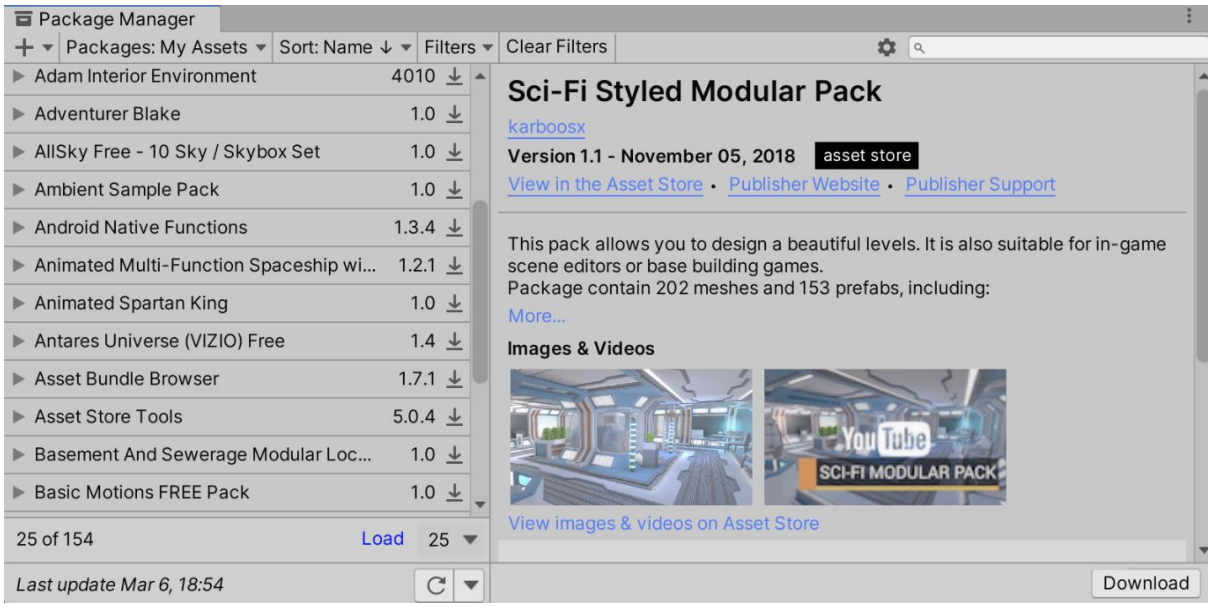
Sci-Fi Styled Modular Pack

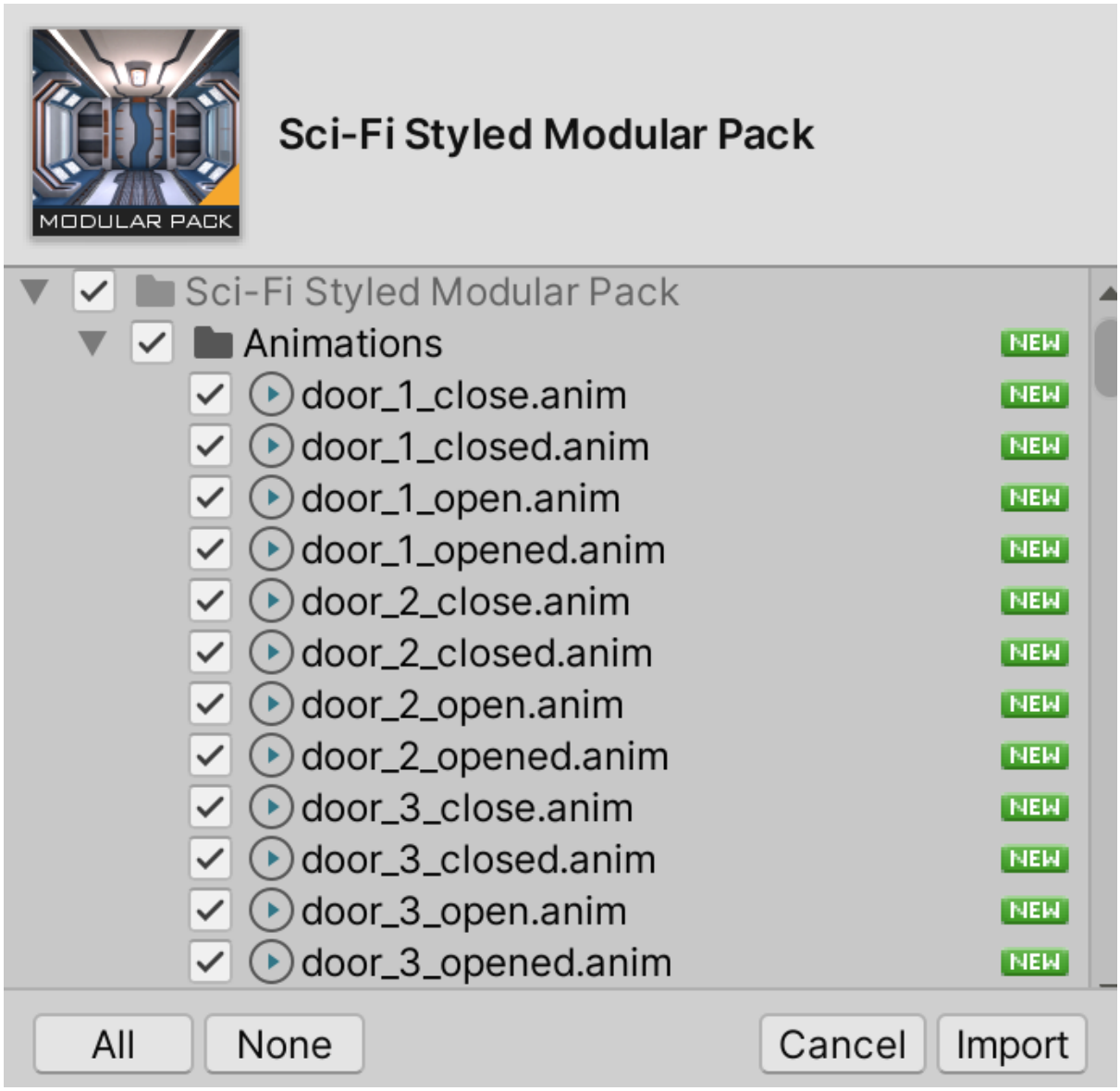
★★★★★ (92)

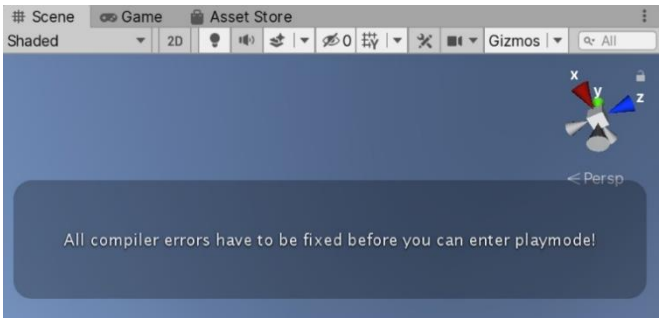
FREE

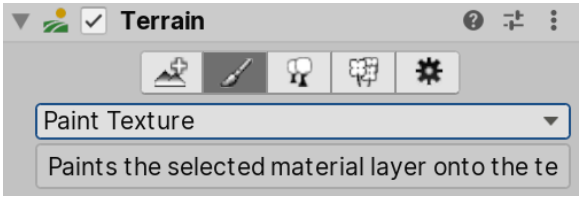

Sci-Fi Styled Modular Pack
karboosx
5 | 89 Reviews
FREE
Open in Unity
Pinky321
5 days ago
Lots of models
A nice asset to play with and start off your Sci-Fi level.
Read more reviews

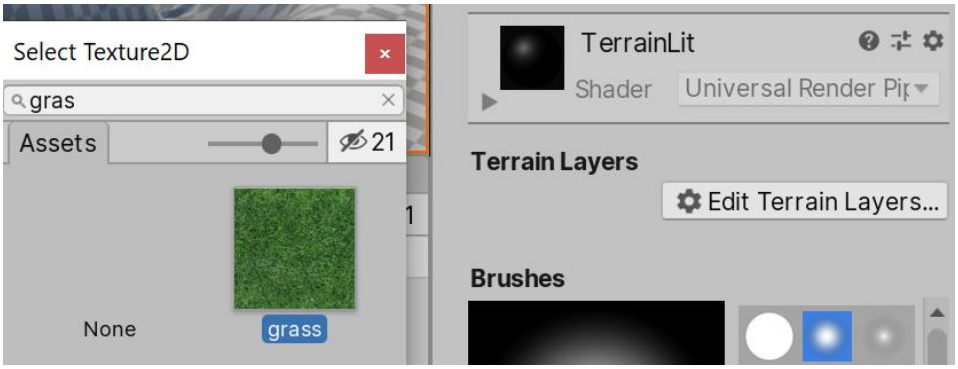

Did you mean to switch apps?
"Microsoft Edge" is trying to open "Unity Editor".
Yes
No

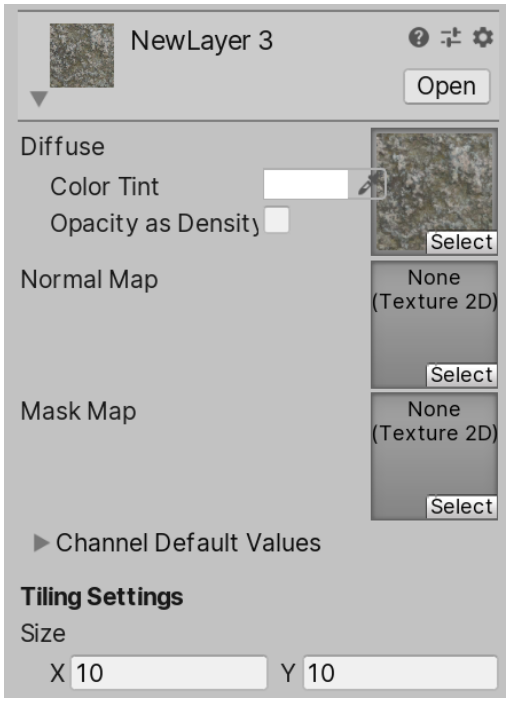

Package Manager
Packages: My Assets
Sort: Name
Filters
Clear Filters
Adam Interior Environment 4010
Adventurer Blake 1.0
AllSky Free - 10 Sky / Skybox Set 1.0
Ambient Sample Pack 1.0
Android Native Functions 1.3.4
Animated Multi-Function Spaceship wi... 1.2.1
Animated Spartan King 1.0
Antares Universe (VIZIO) Free 1.4
Asset Bundle Browser 1.7.1
Asset Store Tools 5.0.4
Basement And Sewerage Modular Loc... 1.0
Basic Motions FREE Pack 1.0
25 of 154
Load
25
Last update Mar 6, 18:54
Sci-Fi Styled Modular Pack
karboosx
Version 1.1 - November 05, 2018
asset store
View in the Asset Store
Publisher Website
Publisher Support
This pack allows you to design a beautiful levels. It is also suitable for in-game scene editors or base building games.
Package contain 202 meshes and 153 prefabs, including:
More...
Images & Videos
YouTube
SCI-FI MODULAR PACK
View images & videos on Asset Store
Download

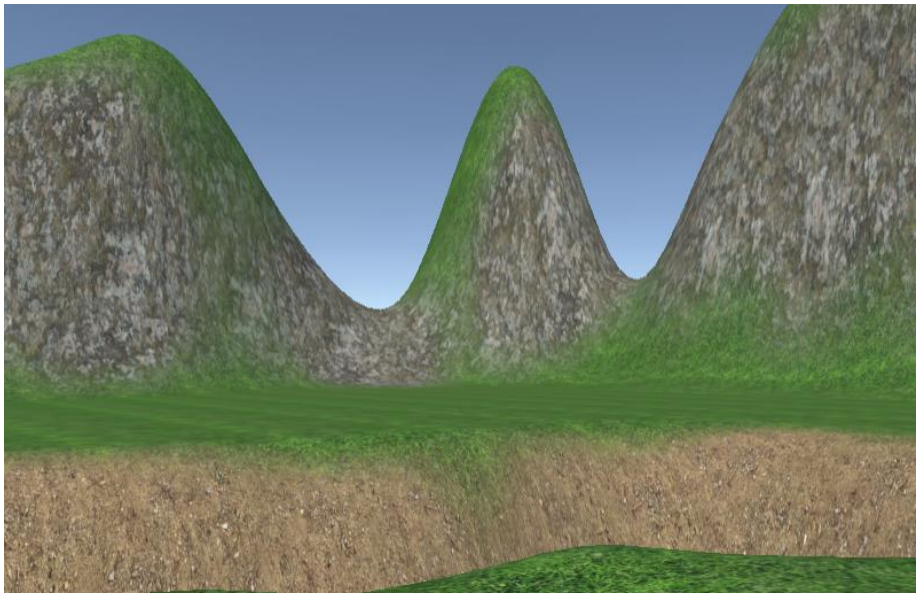

Sci-Fi Styled Modular Pack
MODULAR PACK
Sci-Fi Styled Modular Pack
Animations
NEW
door_1_close.anim
door_1_closed.anim
door_1_open.anim
door_1_opened.anim
door_2_close.anim
door_2_closed.anim
door_2_open.anim
door_2_opened.anim
door_3_close.anim
door_3_closed.anim
door_3_open.anim
door_3_opened.anim
All
None
Cancel
Import

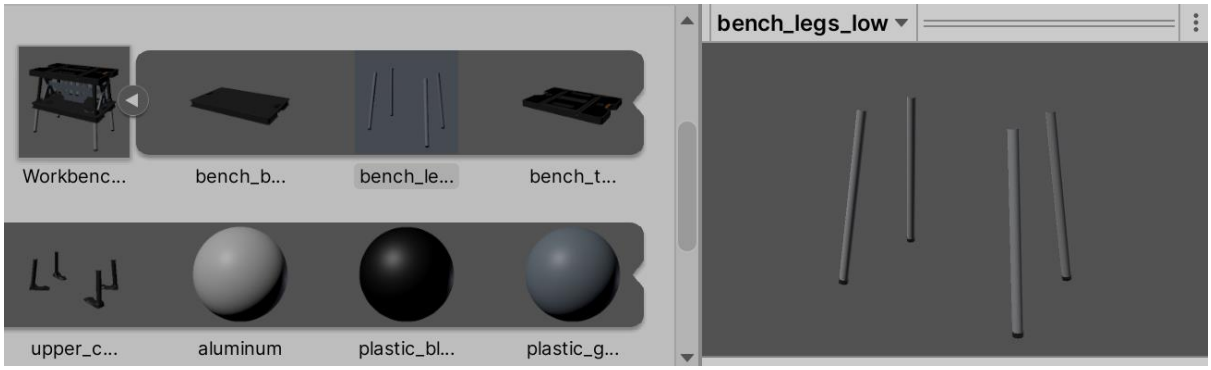

Scene
Game
Asset Store
Shaded
2D
Gizmos
Persp
All compiler errors have to be fixed before you can enter playmode!

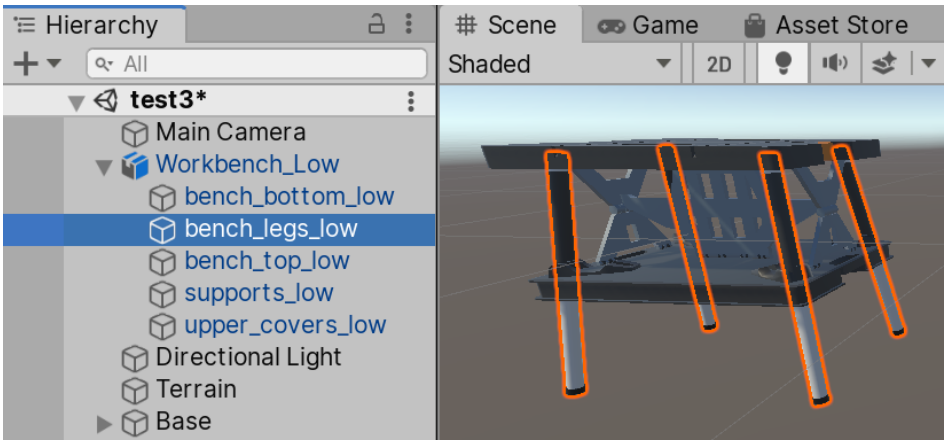

Terrain
Paint Texture
Paints the selected material layer onto the te

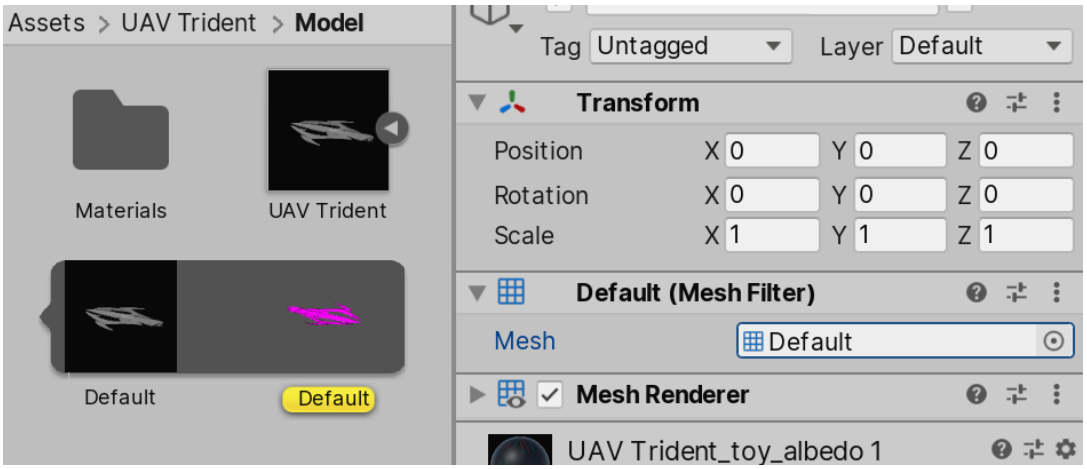

Select Texture2D
gras
Assets
21
None
grass
TerrainLit
Shader
Universal Render Pi
Terrain Layers
Edit Terrain Layers...
Brushes

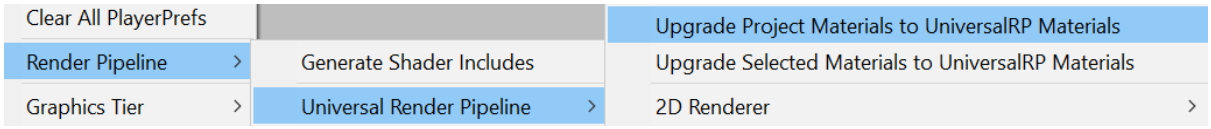

NewLayer 3
Open
Diffuse
Color Tint
Opacity as Density
Select
Normal Map
None
(Texture 2D)
Select
Mask Map
None
(Texture 2D)
Select
Channel Default Values
Tiling Settings
Size
X 10
Y 10

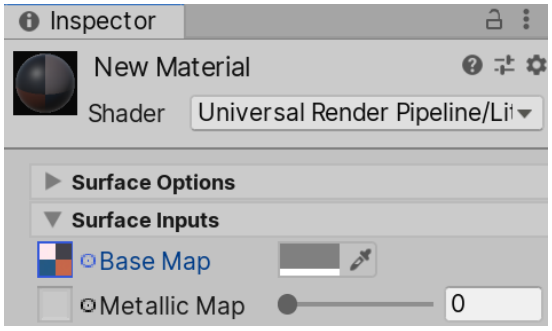


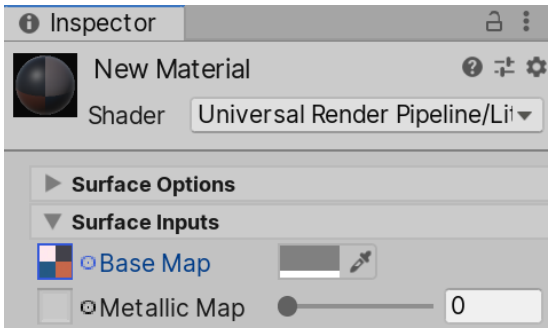

Workbenc...
bench_b...
bench_le...
bench_t...
upper_c...
aluminum
plastic_bl...
plastic_g...
bench_legs_low

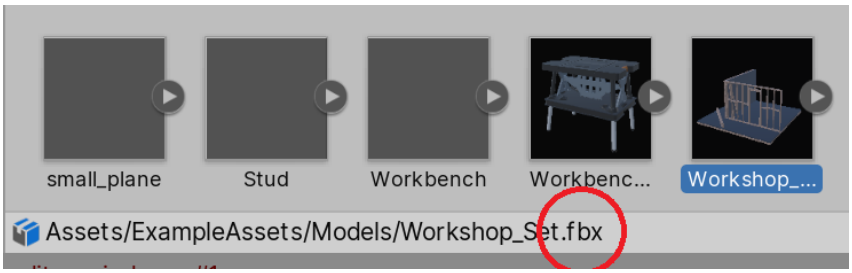

Hierarchy
All
test3*
Main Camera
Workbench_Low
bench_bottom_low
bench_legs_low
bench_top_low
supports_low
upper_covers_low
Directional Light
Terrain
Base
Scene
Game
Asset Store
Shaded
2D

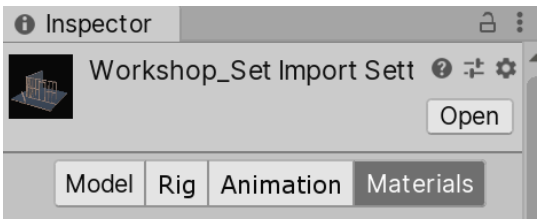

Assets > UAV Trident > Model
Materials
UAV Trident
Default
Default
Tag Untagged
Layer Default
Transform
Position X 0 Y 0 Z 0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Default (Mesh Filter)
Mesh Default
Mesh Renderer
UAV Trident_toy_albedo 1

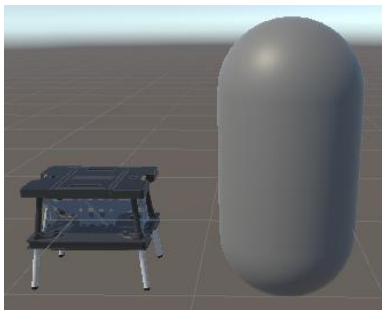

Clear All PlayerPrefs
Render Pipeline
Graphics Tier
Generate Shader Includes
Universal Render Pipeline
Upgrade Project Materials to UniversalRP Materials
Upgrade Selected Materials to UniversalRP Materials
2D Renderer

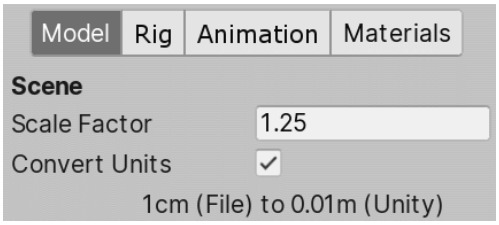

Inspector
New Material
Shader
Universal Render Pipeline/Lit
Surface Options
Surface Inputs
Base Map
Metallic Map
0

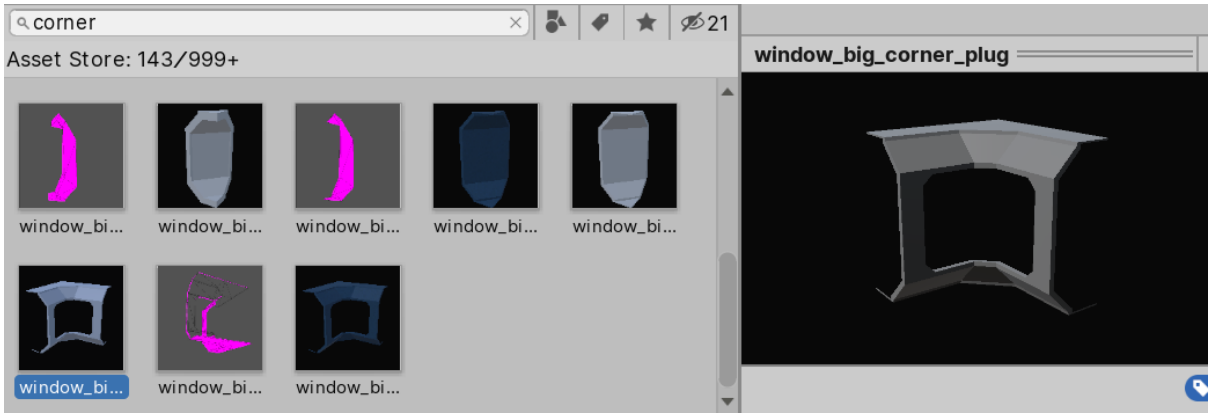

Inspector
New Material
Shader
Universal Render Pipeline/Lit
Surface Options
Surface Inputs
Base Map
Metallic Map
0

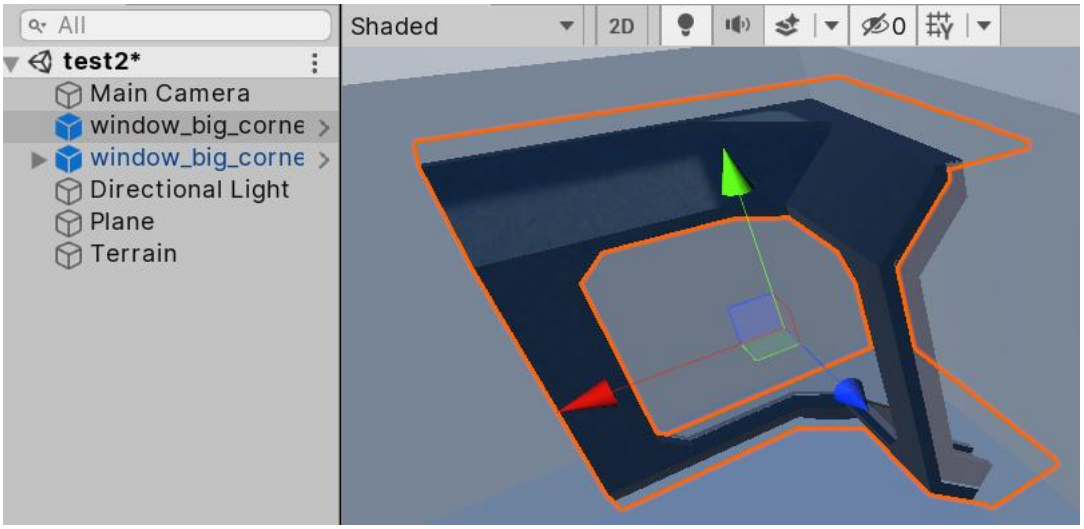

small_plane
Stud
Workbench
Workbenc...
Workshop_...
Assets/ExampleAssets/Models/Workshop_Set.fbx

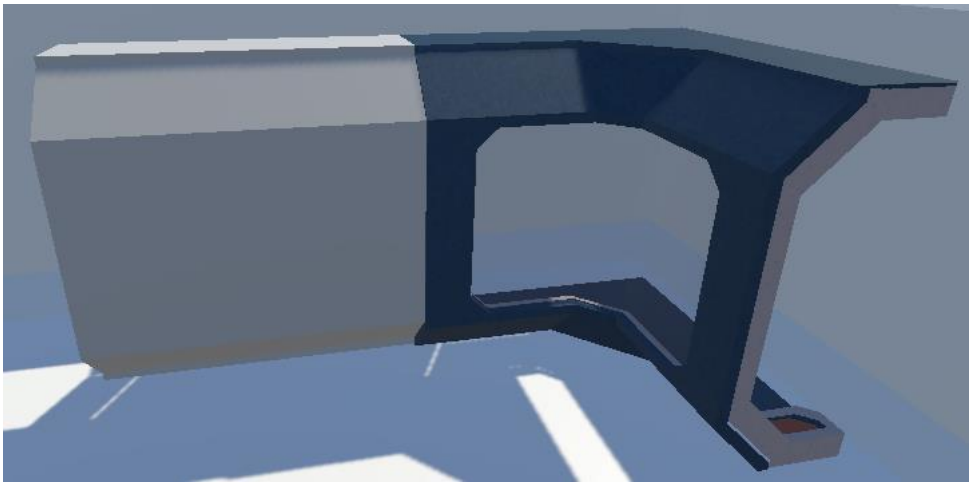

Inspector
Workshop_Set Import Sett
Open
Model
Rig
Animation
Materials

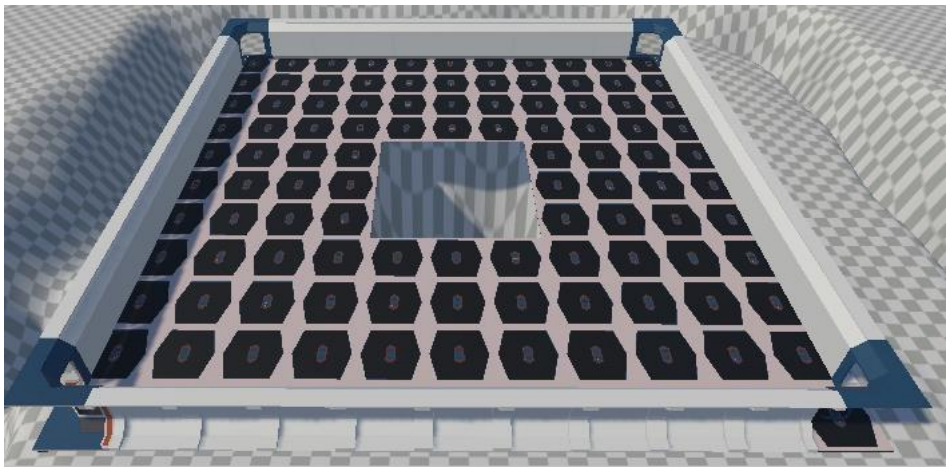



Model
Rig
Animation
Materials
Scene
Scale Factor
1.25
Convert Units
1cm (File) to 0.01m (Unity)


corner
21
Asset Store: 143/999+
window_bi...
window_big_corner_plug

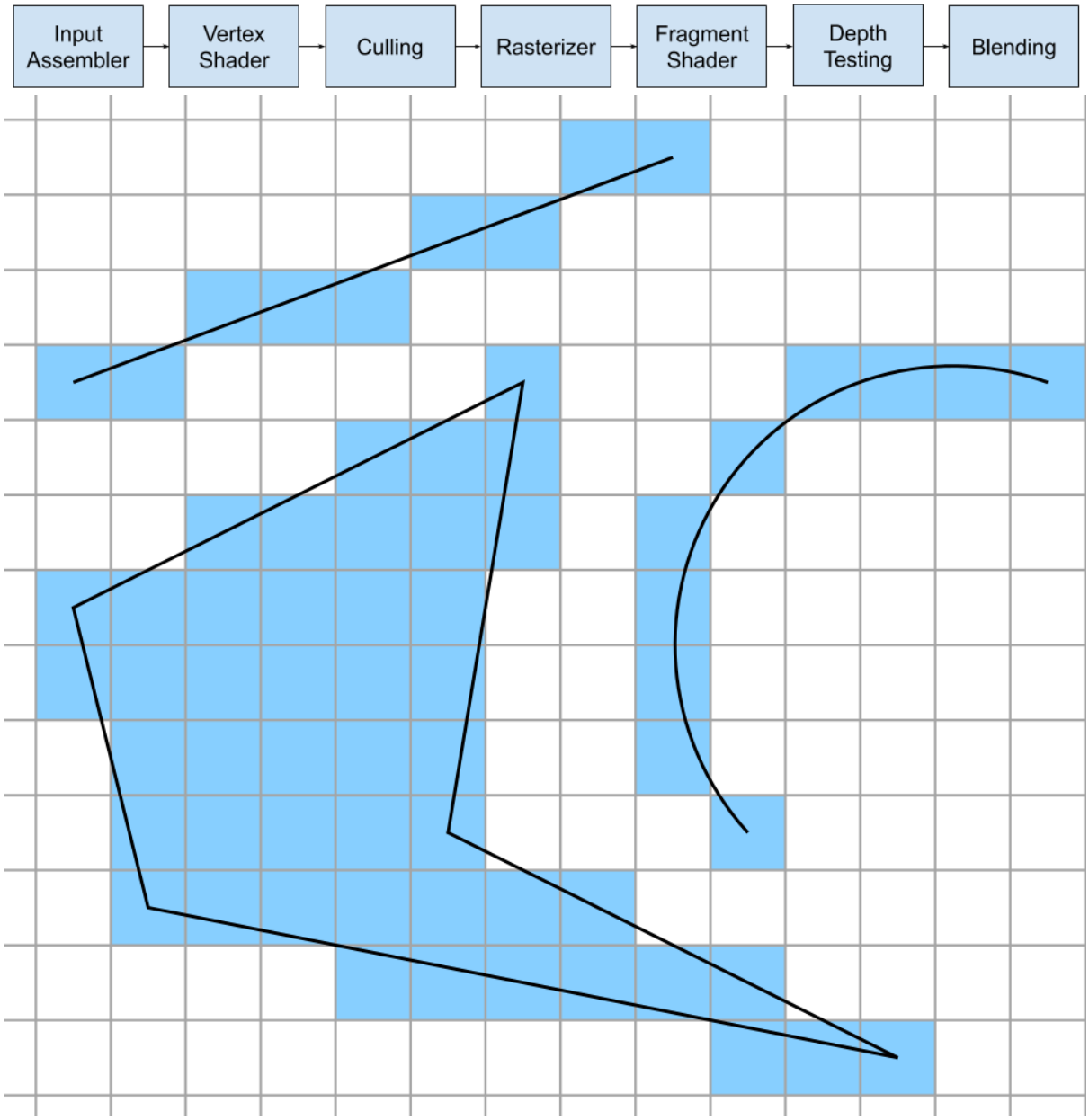

All
Shaded
2D
0
test2*
Main Camera
window_big_corne
window_big_corne
Directional Light
Plane
Terrain

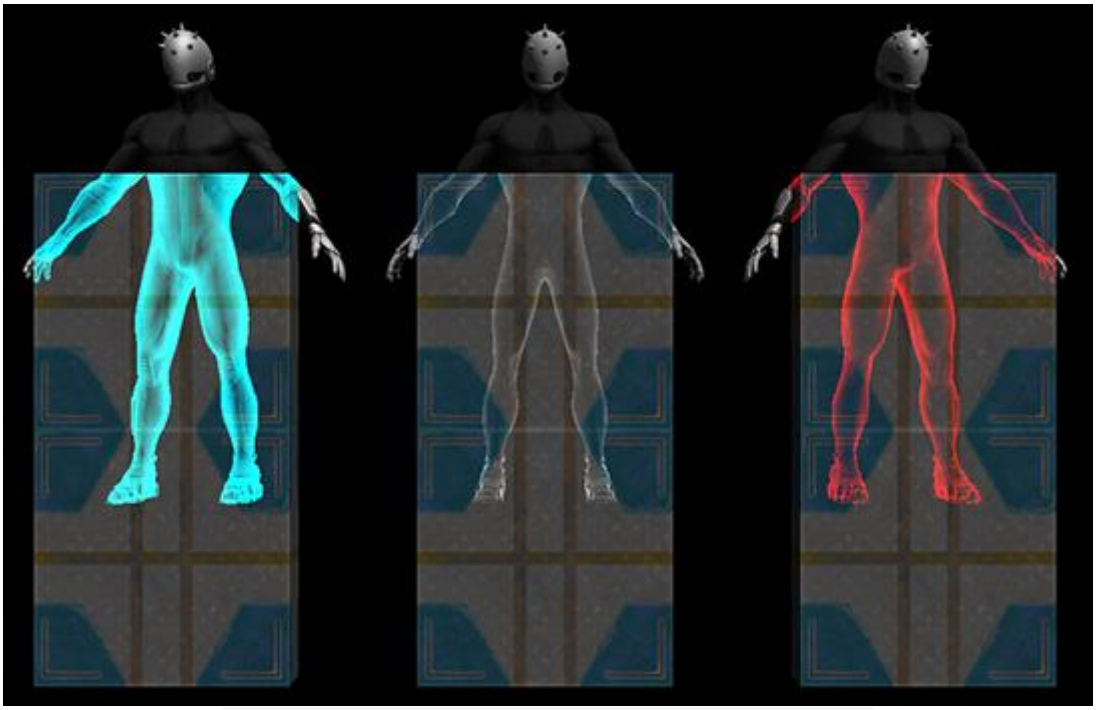


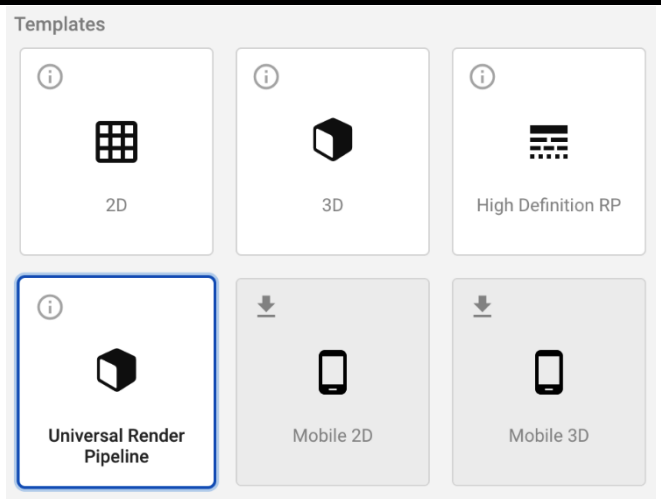


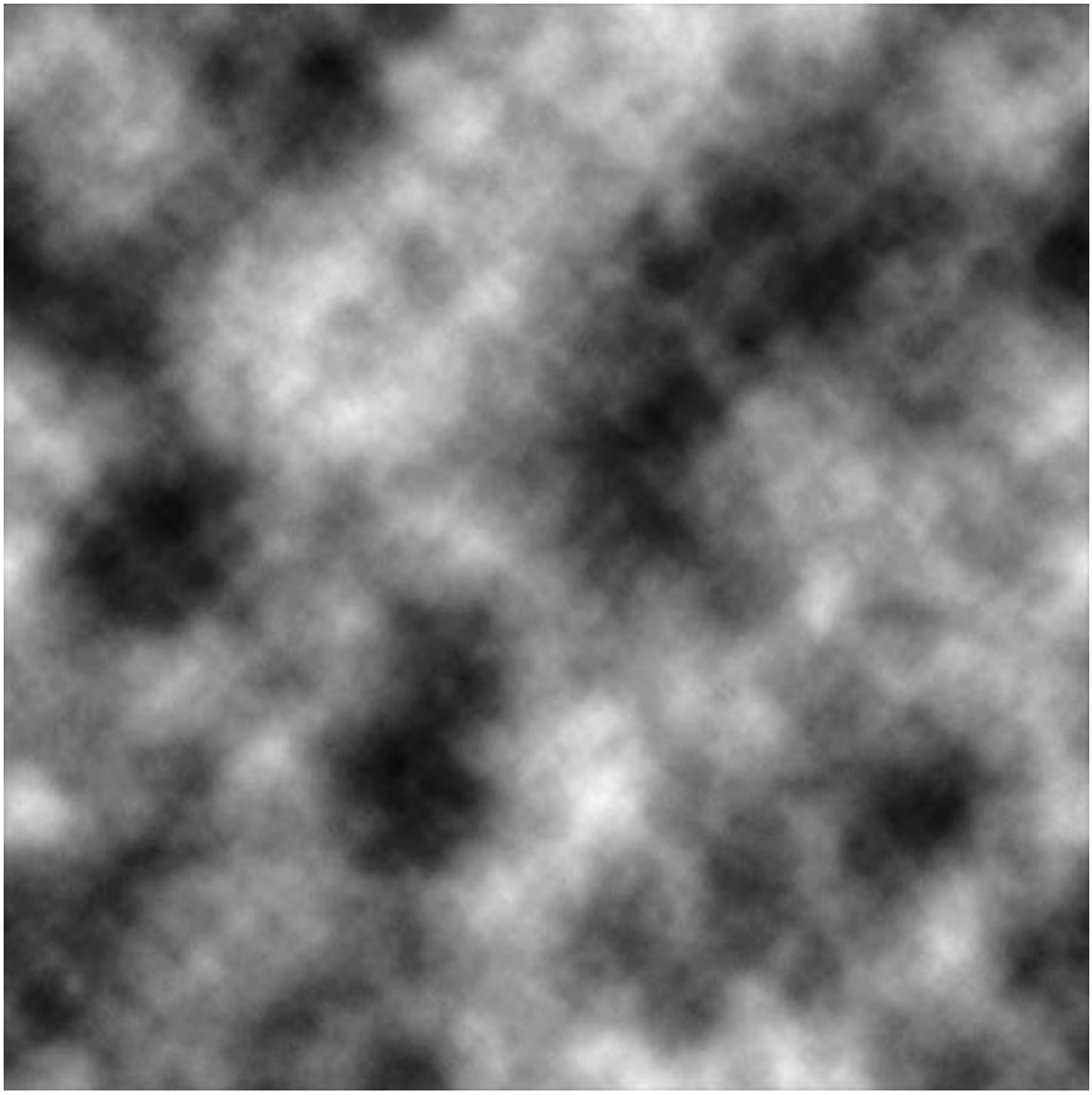

Main Camera
Directional Light
Terrain
Base
wall_big_no_side
window_big_c
window_big_c
wall_big_no_side
wall_big_no_side
wall_big_no_side
wall_big_no_side

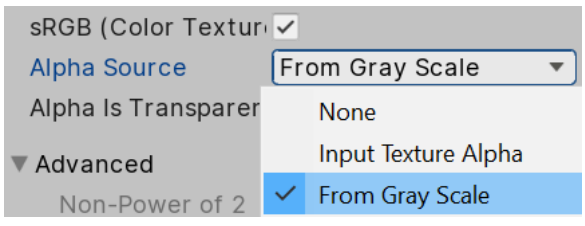
Chapter 6: Materials and Effects with URP and Shader Graph

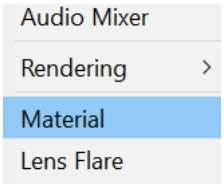


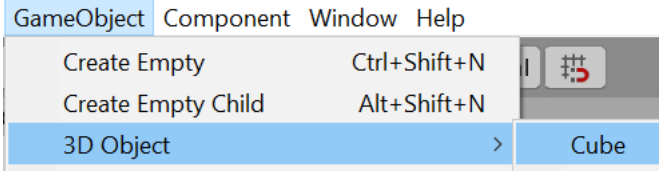


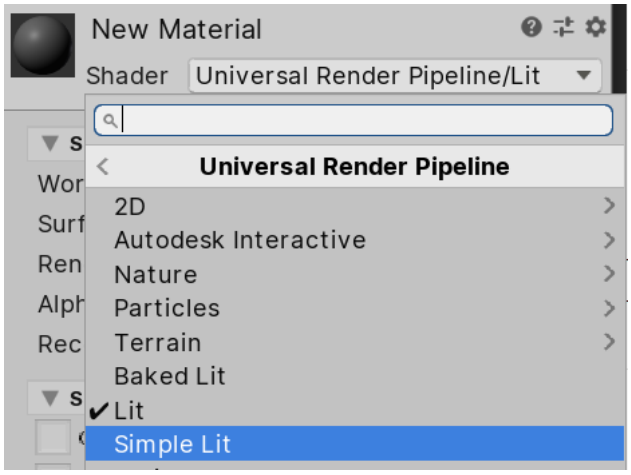

Templates
2D
3D
High Definition RP
Universal Render Pipeline
Mobile 2D
Mobile 3D

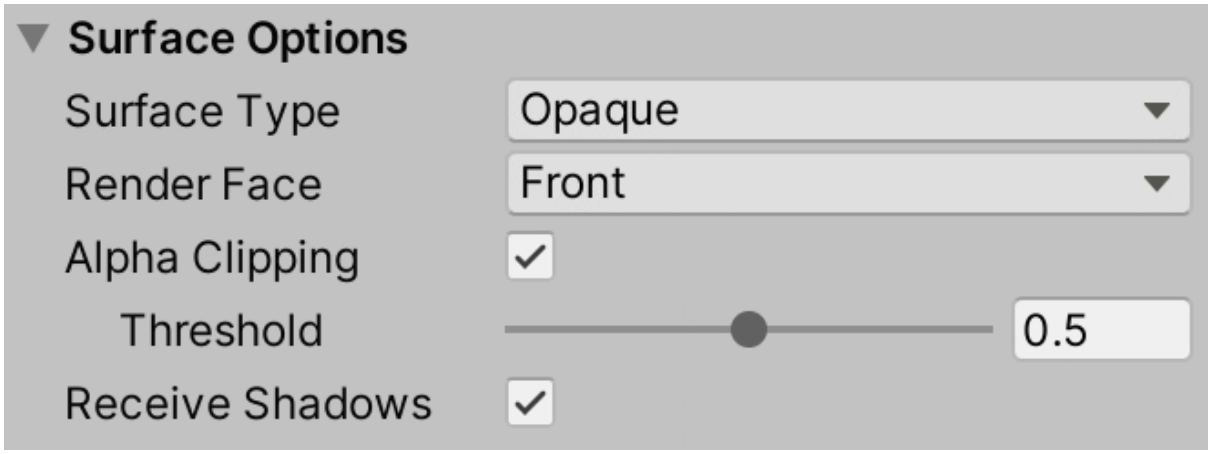


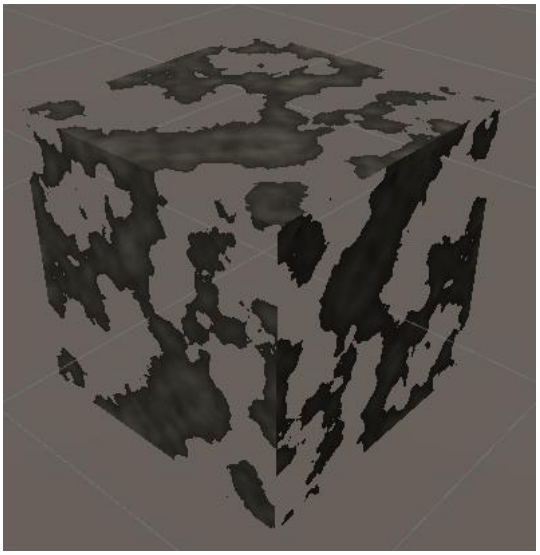

sRGB (Color Textur
Alpha Source
From Gray Scale
Alpha Is Transparer
None
Input Texture Alpha
Advanced
From Gray Scale
Non-Power of 2


Audio Mixer
Rendering
Material
Lens Flare

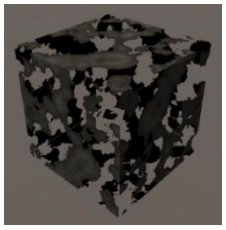

GameObject
Component
Window
Help
Create Empty
Ctrl+Shift+N
Create Empty Child
Alt+Shift+N
3D Object
Cube

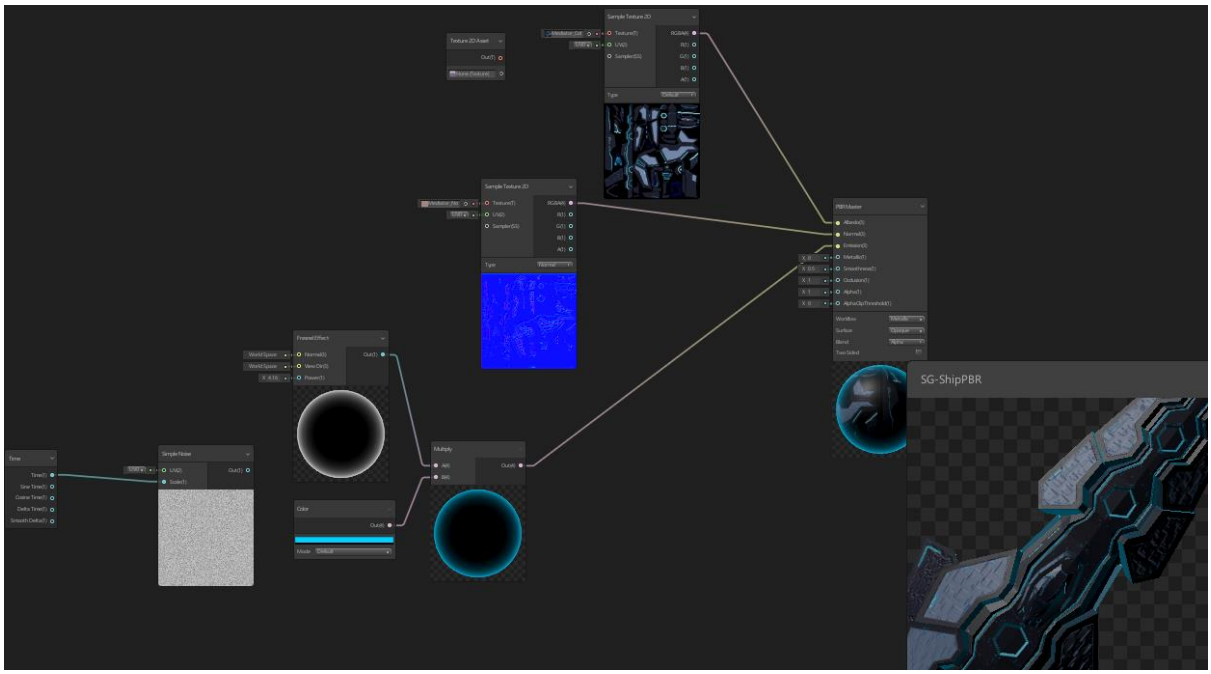

New Material
Shader
Universal Render Pipeline/Lit
Universal Render Pipeline
2D
Autodesk Interactive
Nature
Particles
Terrain
Baked Lit
Lit
Simple Lit

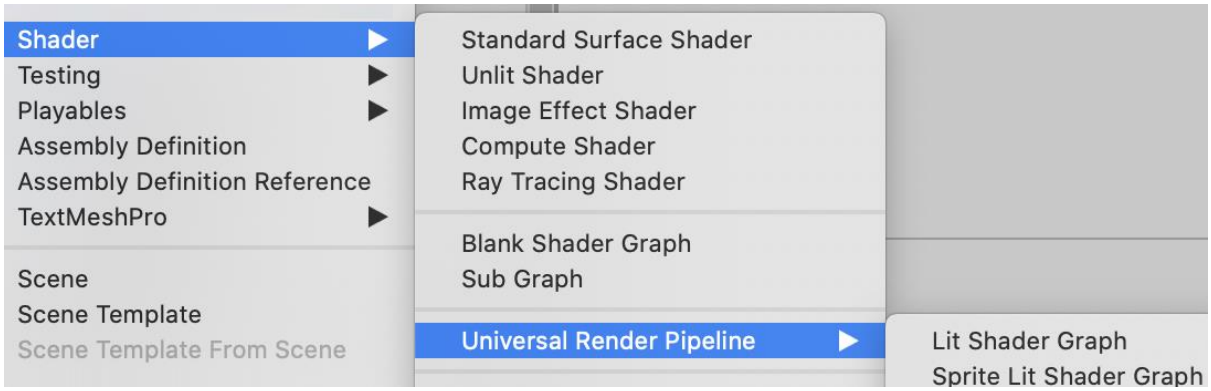

Surface Options
Surface Type
Opaque
Render Face
Front
Alpha Clipping
Threshold
0.5
Receive Shadows



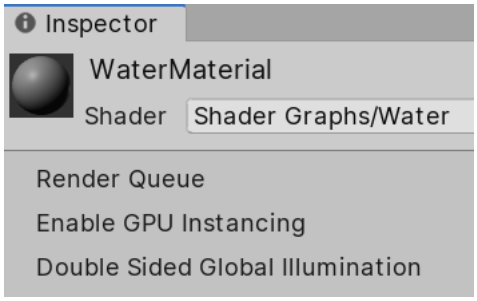

Surface Options
Surface Type
Opaque
Render Face
Both

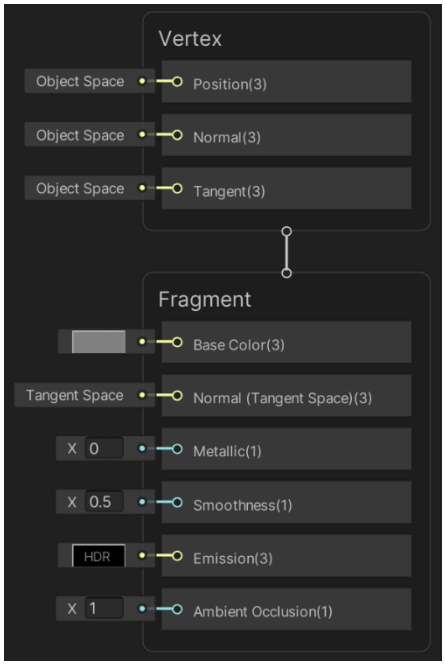


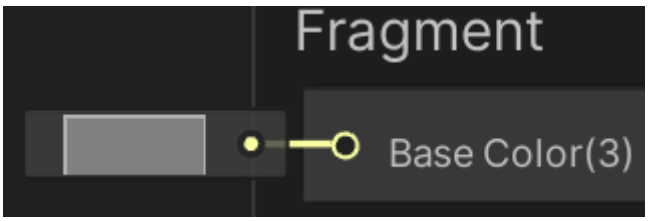

SG-ShipPBR

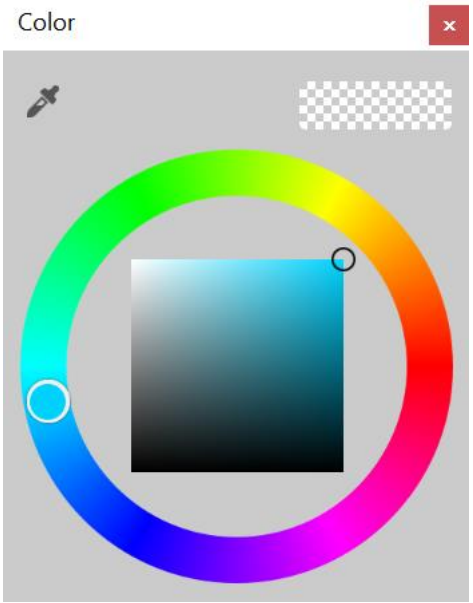

Shader
Testing
Playables
Assembly Definition
Assembly Definition Reference
TextMeshPro
Scene
Scene Template
Scene Template From Scene
Standard Surface Shader
Unlit Shader
Image Effect Shader
Compute Shader
Ray Tracing Shader
Blank Shader Graph
Sub Graph
Universal Render Pipeline
Lit Shader Graph
Sprite Lit Shader Graph

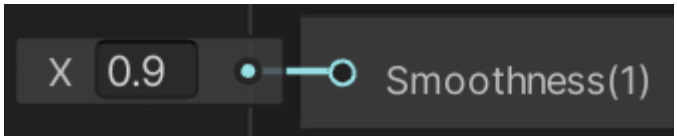

Water

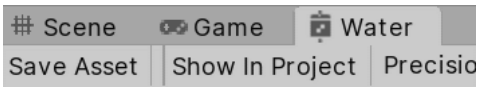

Inspector
WaterMaterial
Shader
Shader Graphs/Water
Render Queue
Enable GPU Instancing
Double Sided Global Illumination

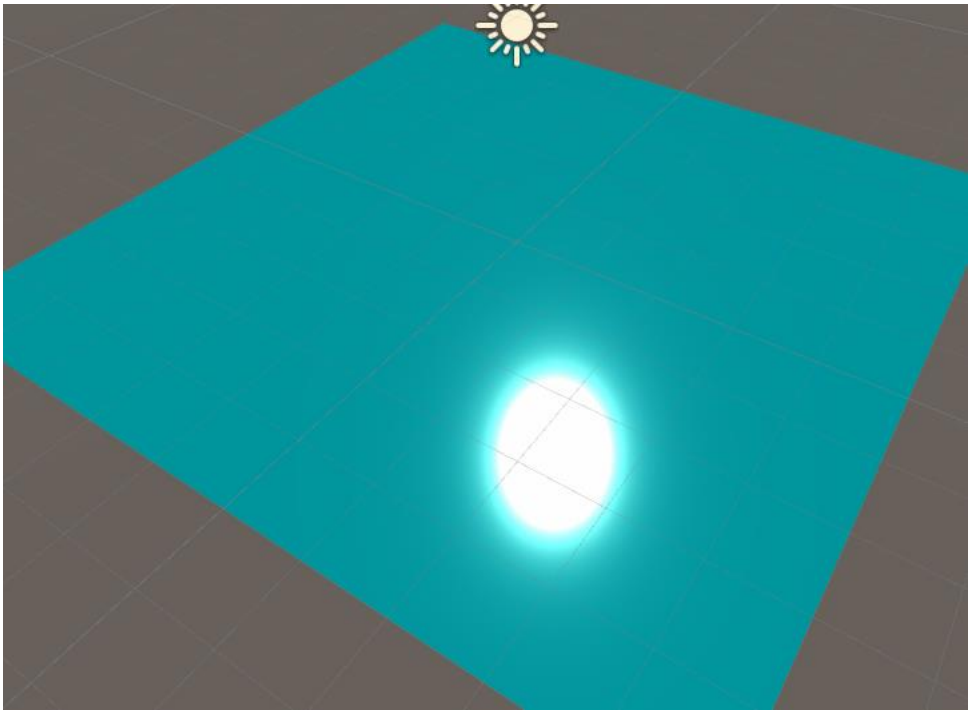

Vertex
Object Space
Position(3)
Object Space
Normal(3)
Object Space
Tangent(3)
Fragment
Base Color(3)
Tangent Space
Normal (Tangent Space)(3)
X 0
Metallic(1)
X 0.5
Smoothness(1)
HDR
Emission(3)
X 1
Ambient Occlusion(1)

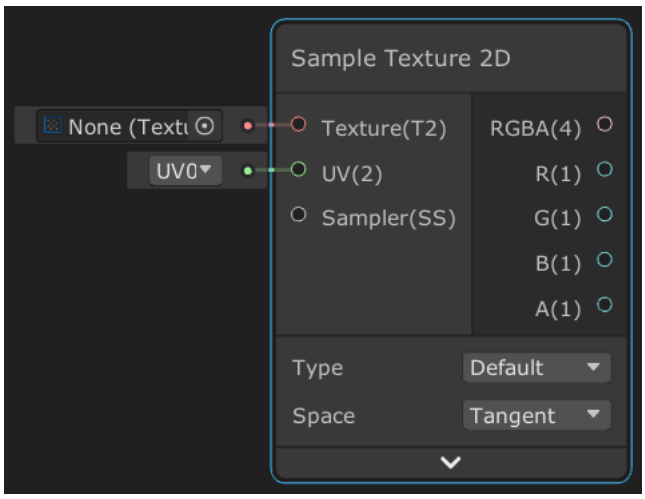

Fragment
Base Color(3)


Color

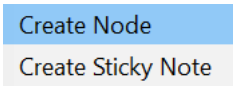

X 0.9
Smoothness(1)

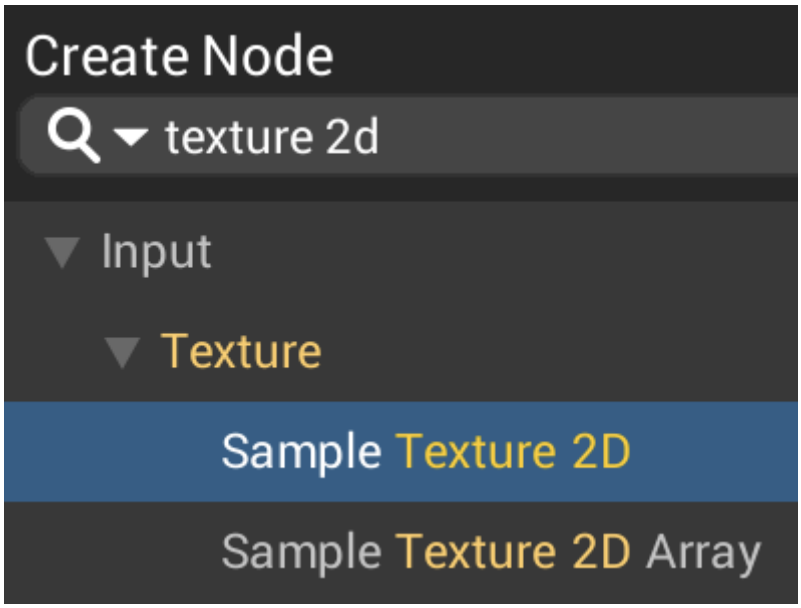

Scene
Game
Water
Save Asset
Show In Project
Precisio

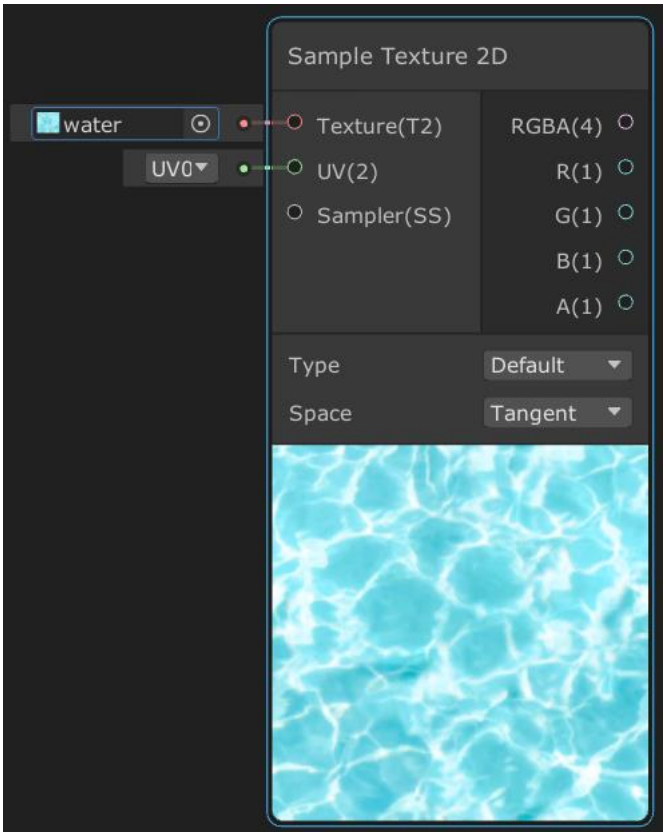


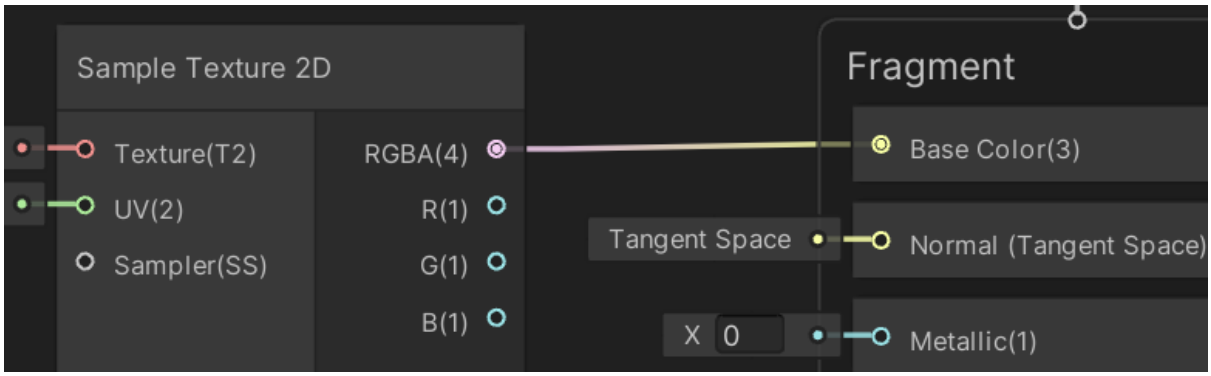

Sample Texture 2D
None (Texti
UV0
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent

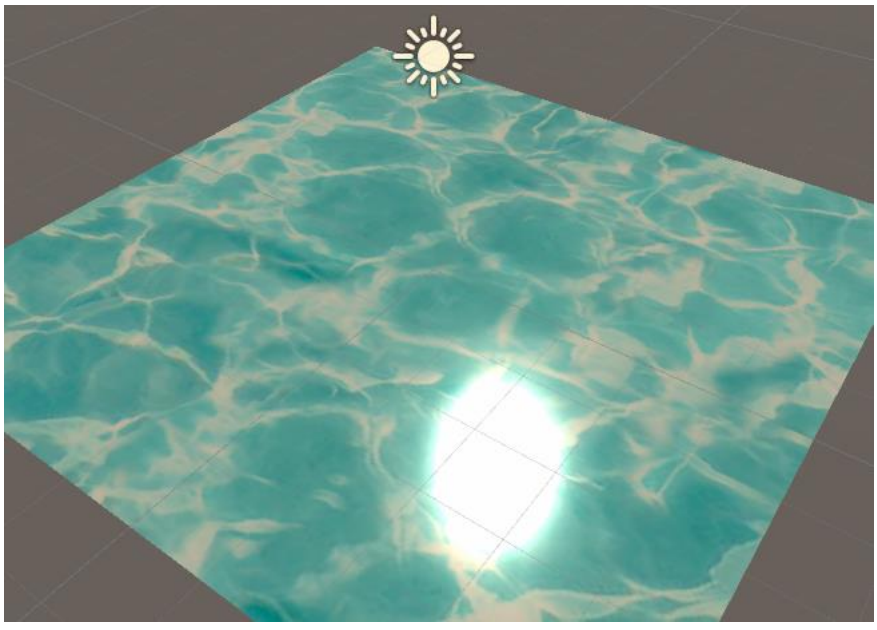

Wrap Mode
Repeat

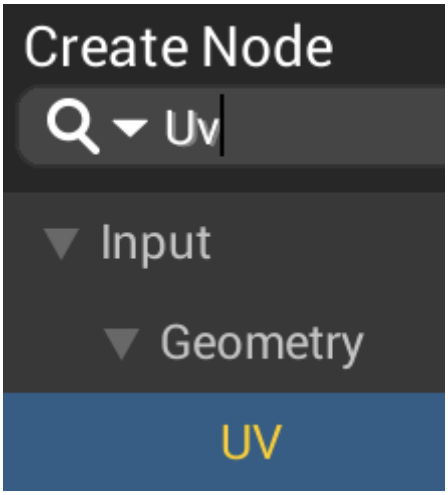

Create Node
Create Sticky Note


Create Node
texture 2d
Input
Texture
Sample Texture 2D
Sample Texture 2D Array

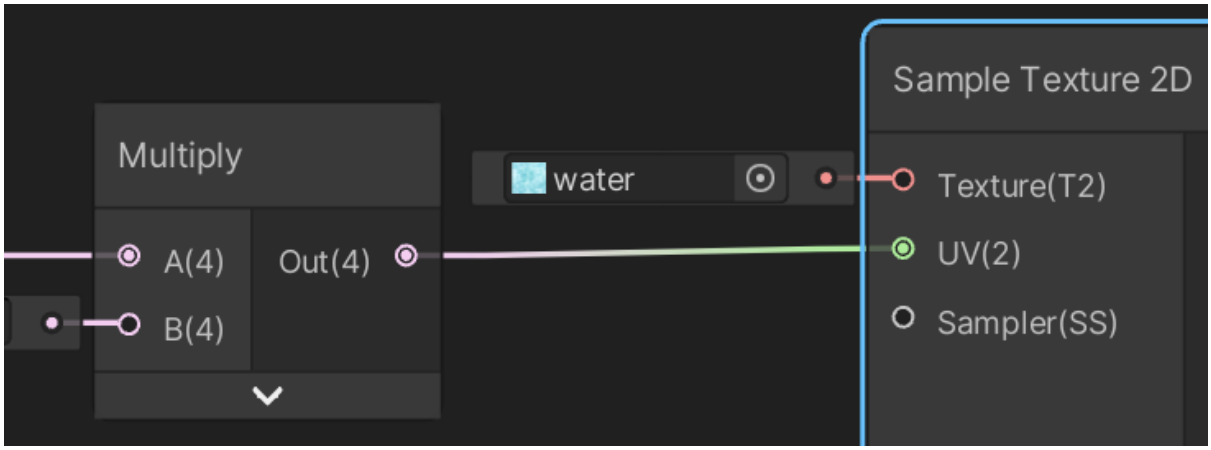

Sample Texture 2D
water
UV0
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent

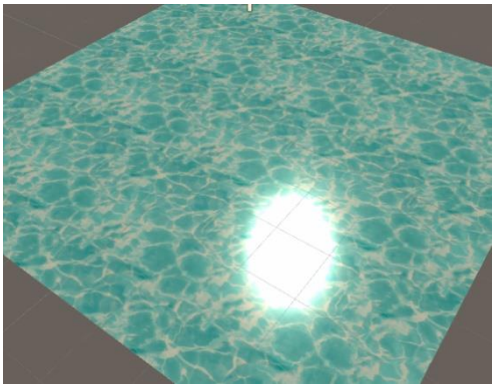

Sample Texture 2D
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
Fragment
Base Color(3)
Tangent Space
Normal (Tangent Space)
X
0
Metallic(1)

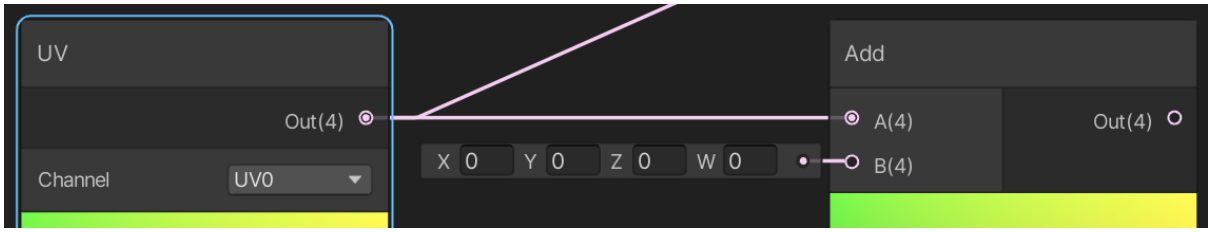


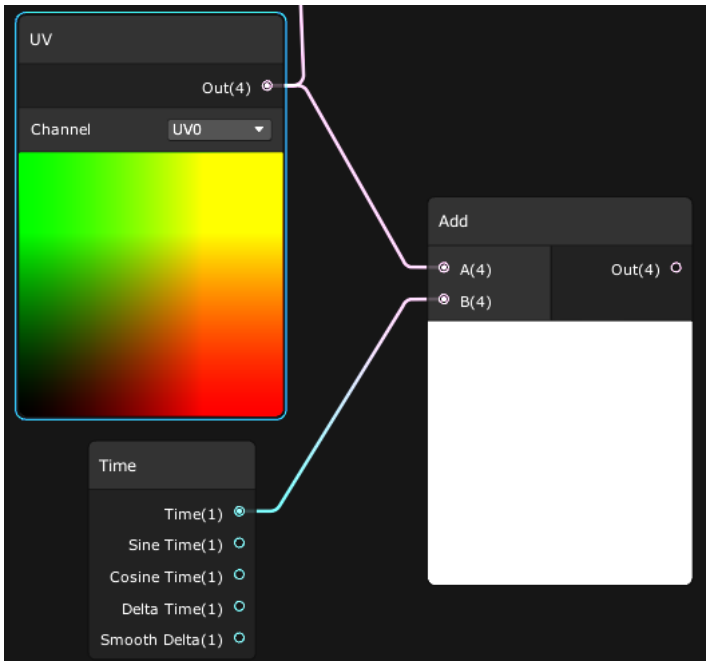

Create Node
Uv
Input
Geometry
UV

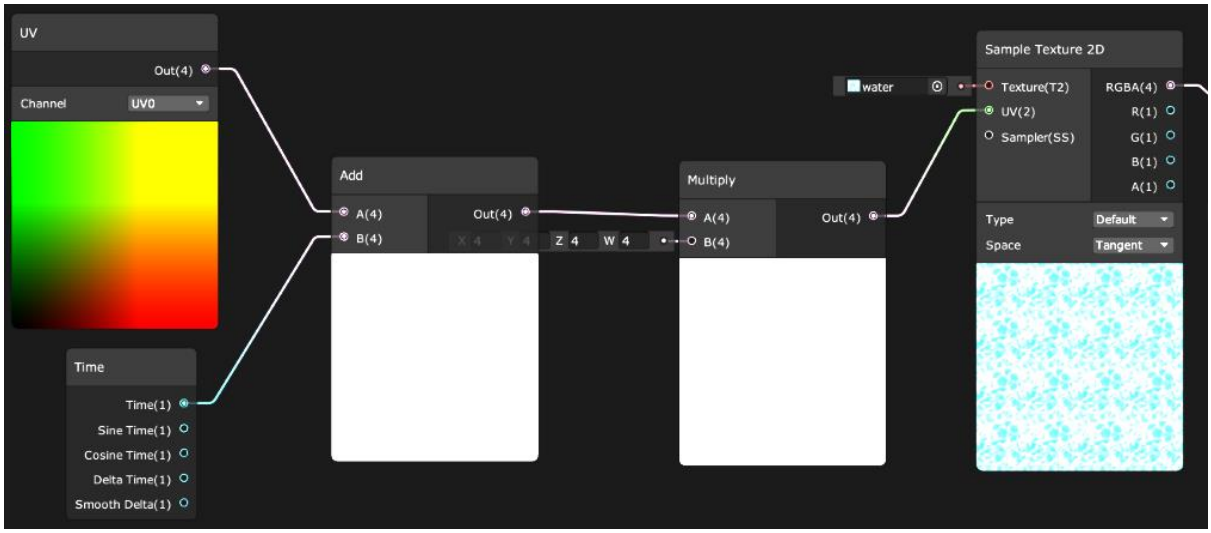

UV
Out(4)
Channel UV0
X 4 Y 4 Z 4 W 4
Multiply
A(4)
B(4)
Out(4)

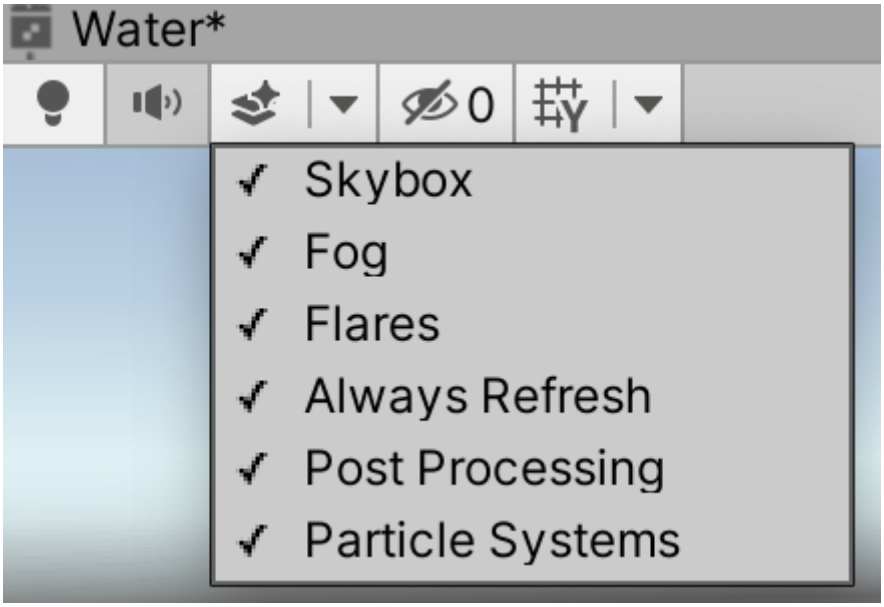

Multiply
A(4)
B(4)
Out(4)
water
Sample Texture 2D
Texture(T2)
UV(2)
Sampler(SS)

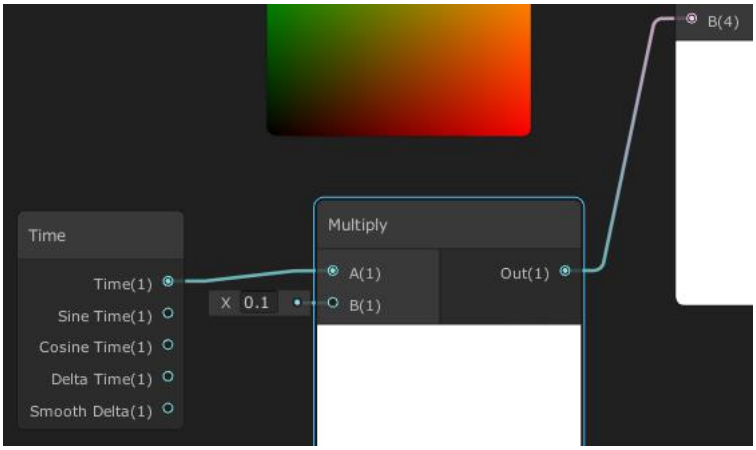



UV
Out(4)
Channel
UV0
X 0
Y 0
Z 0
W 0
Add
A(4)
B(4)
Out(4)

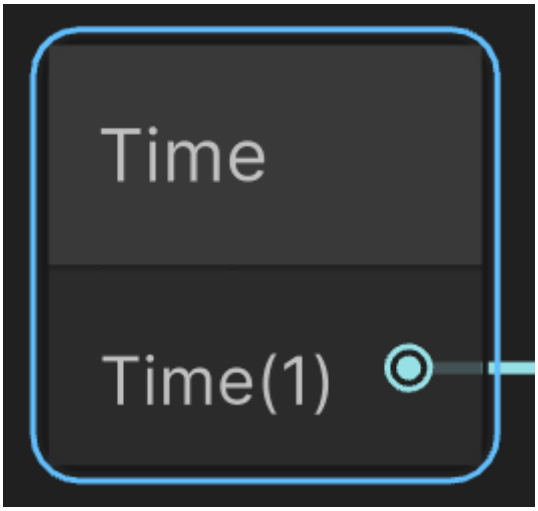

UV
Out(4)
Channel
UV0
Add
A(4)
B(4)
Out(4)
Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)

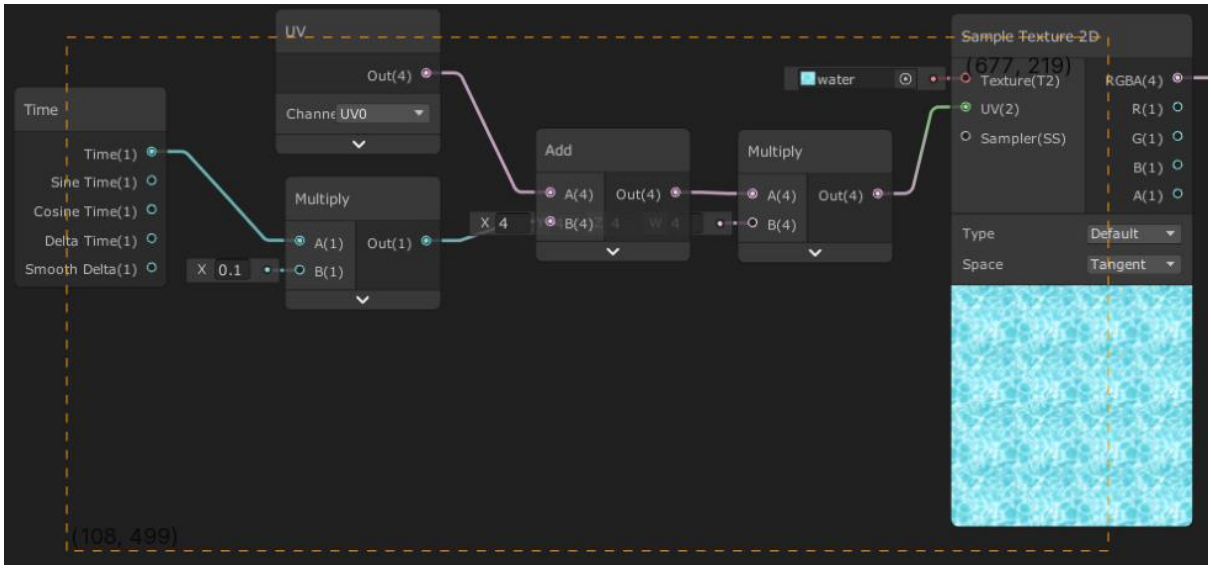

UV
Out(4)
Channel
UV0
Add
A(4)
B(4)
Out(4)
Multiply
A(4)
B(4)
Out(4)
water
Sample Texture 2D
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent
Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)

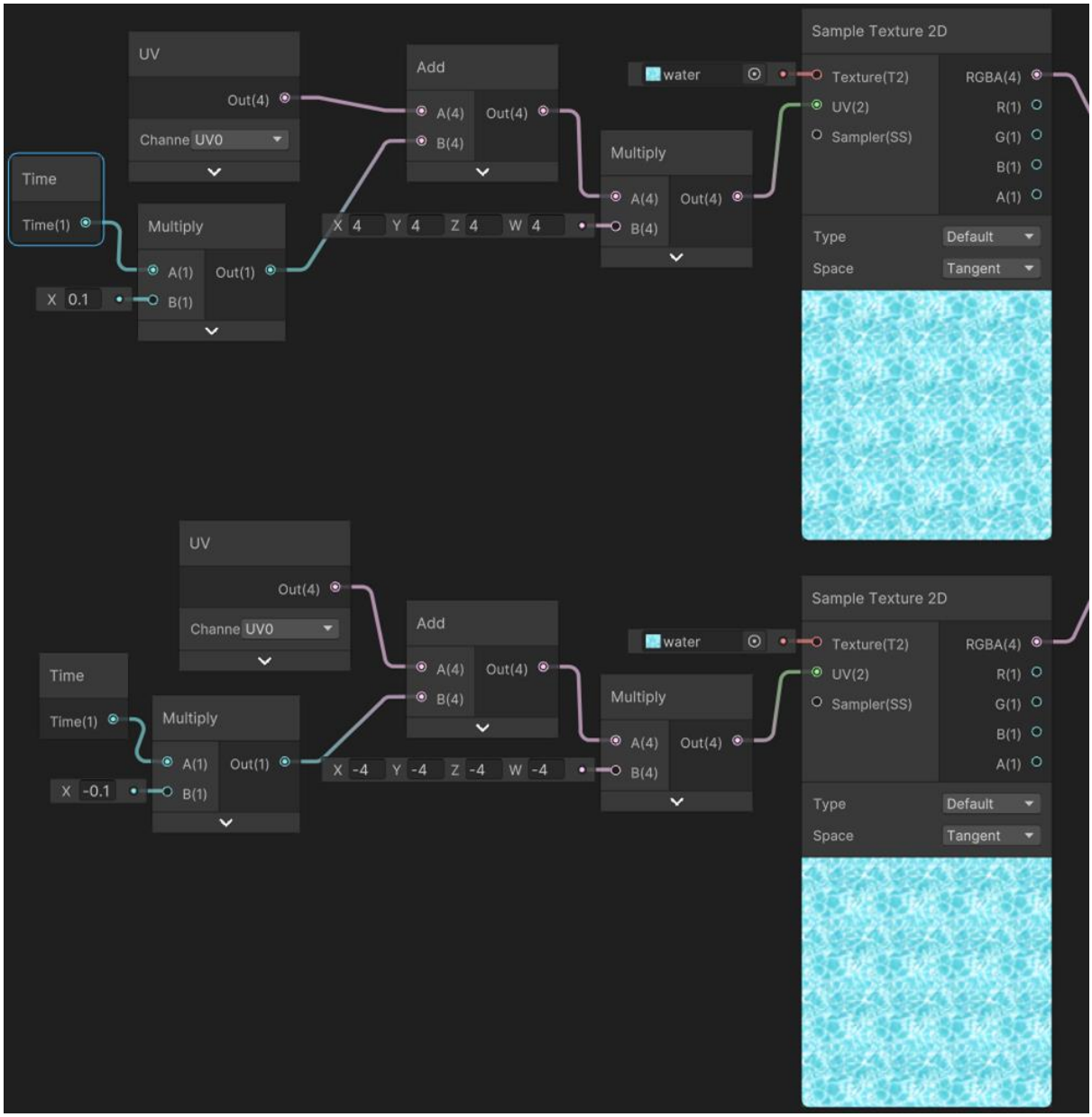

Water*
0
Skybox
Fog
Flares
Always Refresh
Post Processing
Particle Systems

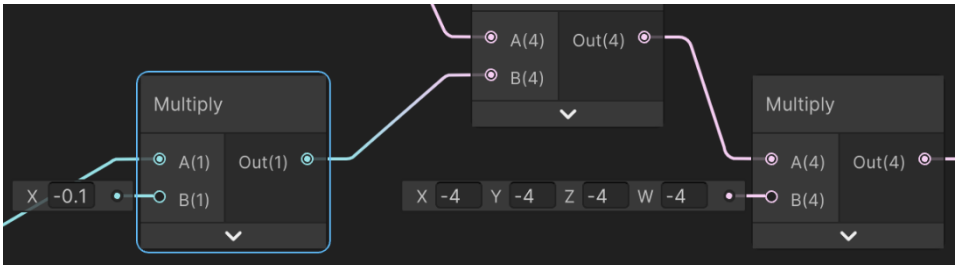

B(4)
Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)
X 0.1
Multiply
A(1)
B(1)
Out(1)

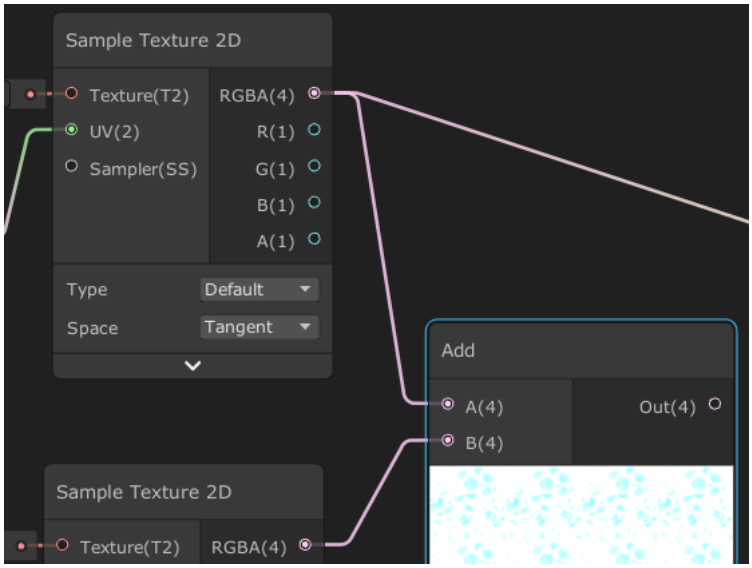

Multiply
A(1)
B(1)
Out(1)
Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)
X 0.1
UV
Out(4)
Multiply
A(1)
B(1)
Out(1)
X 4
Add
A(4)
B(4)
Out(4)
water
Multiply
A(4)
B(4)
Out(4)


Time
Time(1)

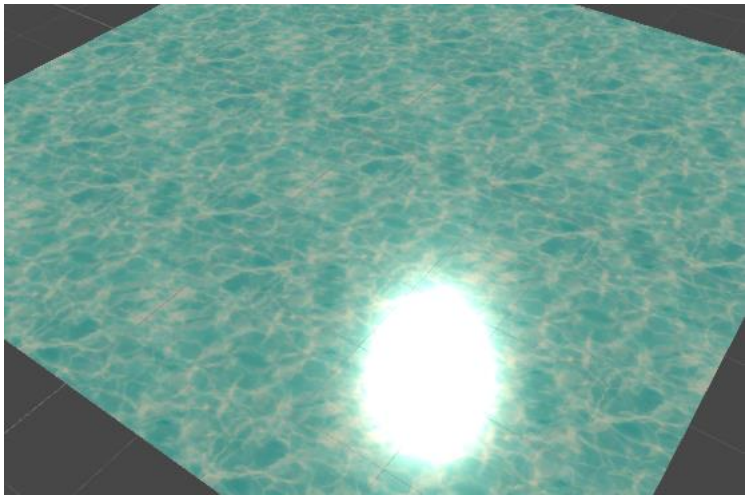

UV
Out(4)
Channe UV0
Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)
Multiply
A(1)
B(1)
Out(1)
X 0.1
X 4
Add
A(4)
B(4)
Out(4)
Multiply
A(4)
B(4)
Out(4)
water
Sample Texture 2D
(677, 219)
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent
(108, 499)

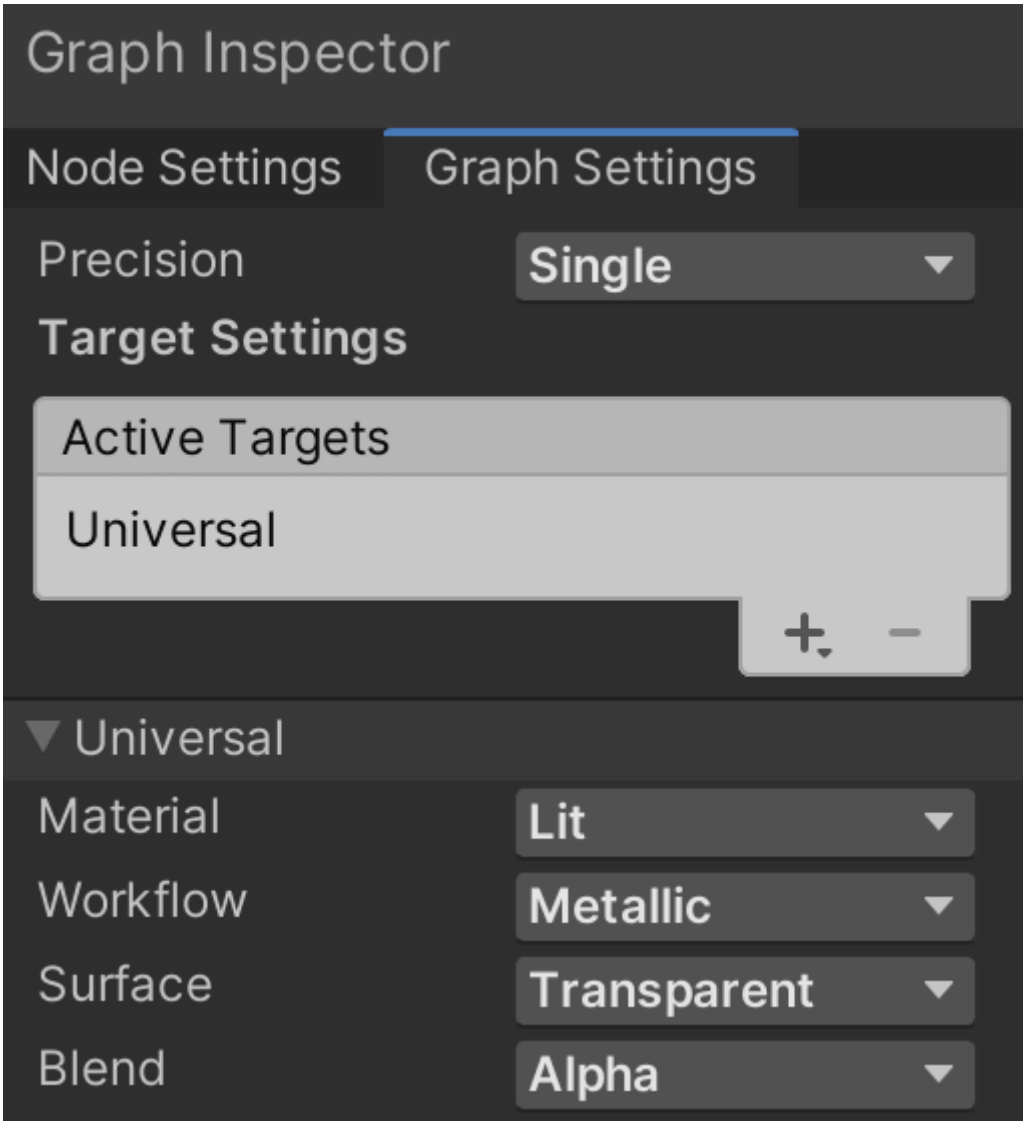

UV
Out(4)
Channe UV0
Add
A(4)
B(4)
Out(4)
water
Sample Texture 2D
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent
Time
Time(1)
Multiply
A(1)
B(1)
Out(1)
X 0.1
X 4
Y 4
Z 4
W 4
X -0.1
X -4
Y -4
Z -4
W -4

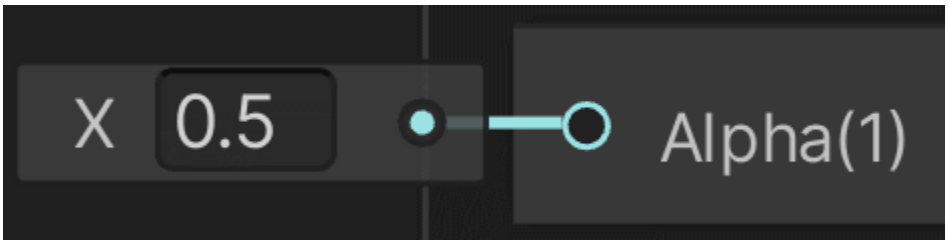

A(4)
B(4)
Out(4)
Multiply
A(1)
B(1)
Out(1)
X -0.1
X -4
Y -4
Z -4
W -4

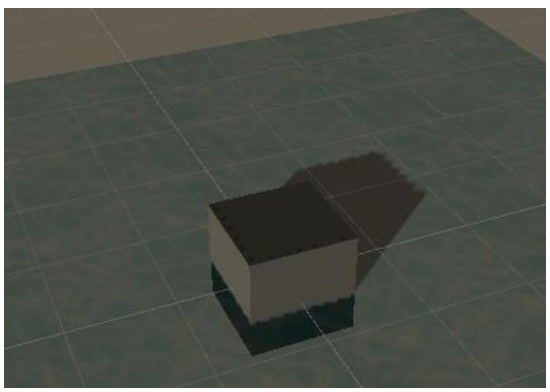

Sample Texture 2D
Texture(T2)
UV(2)
Sampler(SS)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent
Add
A(4)
B(4)
Out(4)
Sample Texture 2D
Texture(T2)
RGBA(4)


Add
A(4)
B(4)
Out(4)
X 0.5 Y 0.5 Z 0.5 W 0.5
Multiply
A(4)
B(4)
Out(4)

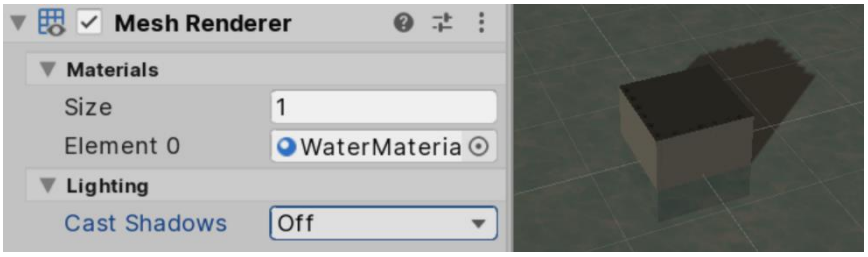


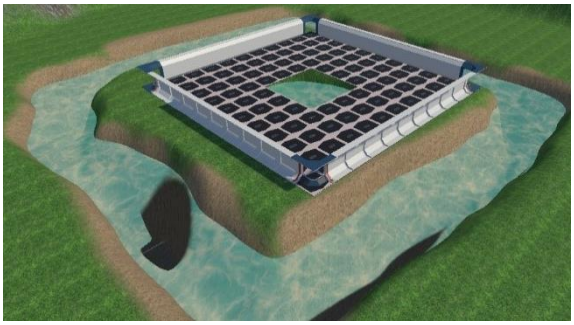

Graph Inspector
Node Settings
Graph Settings
Precision
Single
Target Settings
Active Targets
Universal
Universal
Material
Lit
Workflow
Metallic
Surface
Transparent
Blend
Alpha

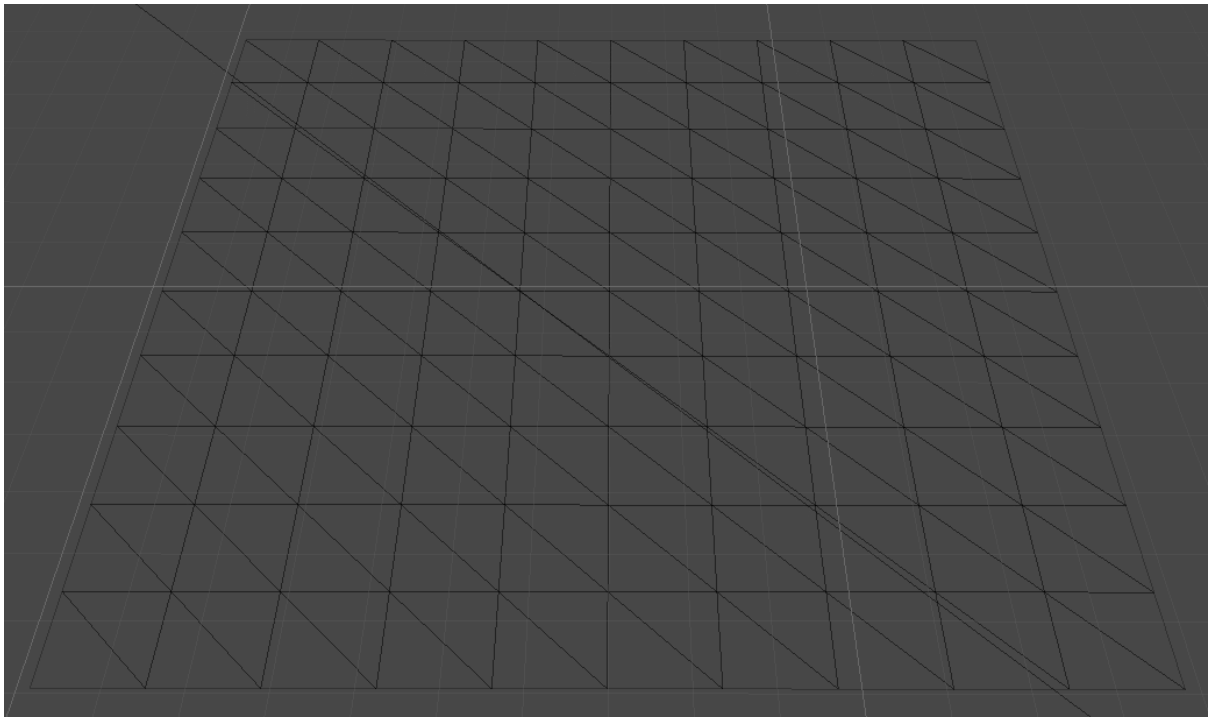

X
0.5
Alpha(1)

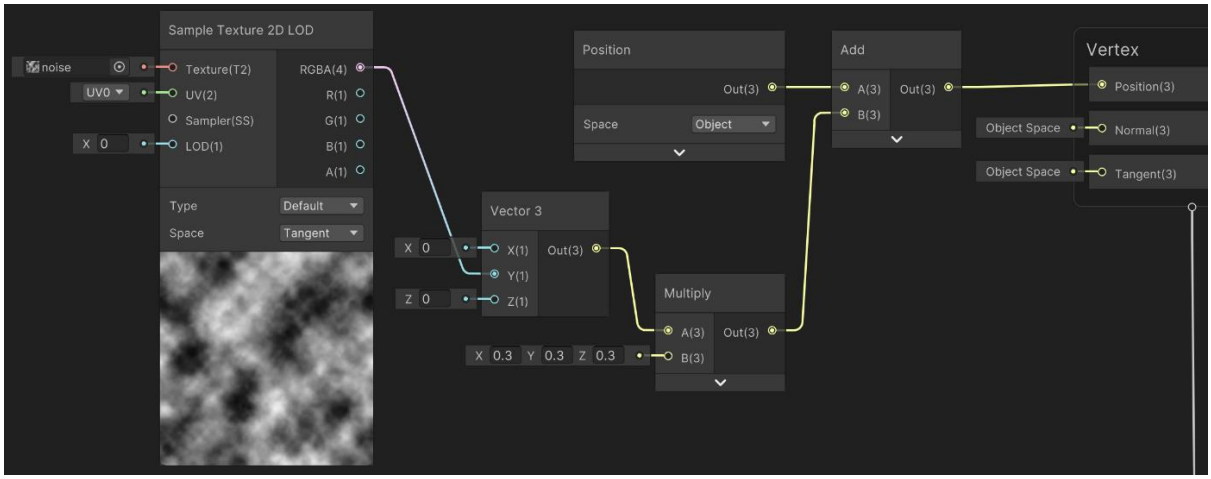


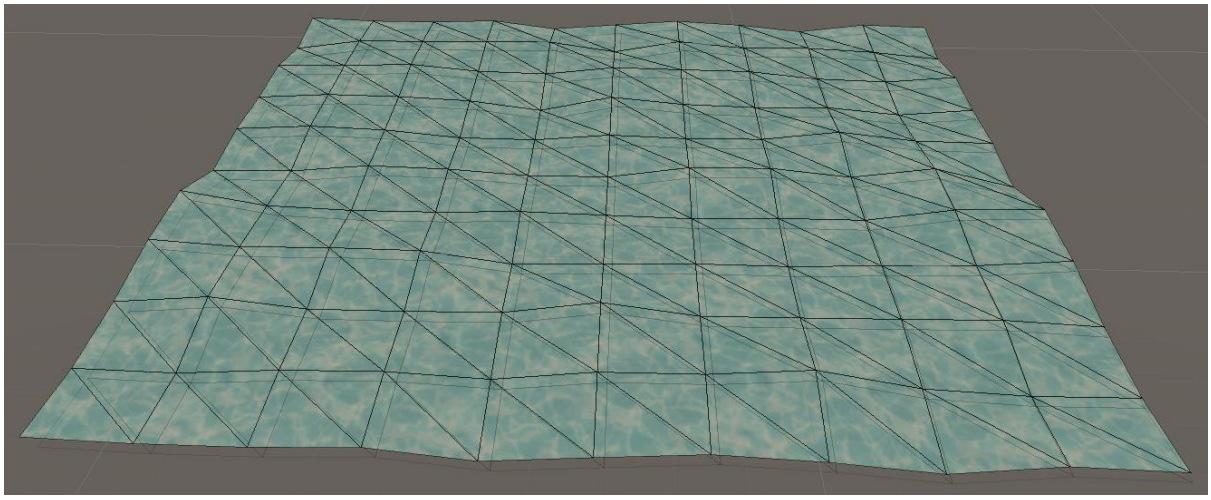

Scene
Game
Shaded Wireframe
2D

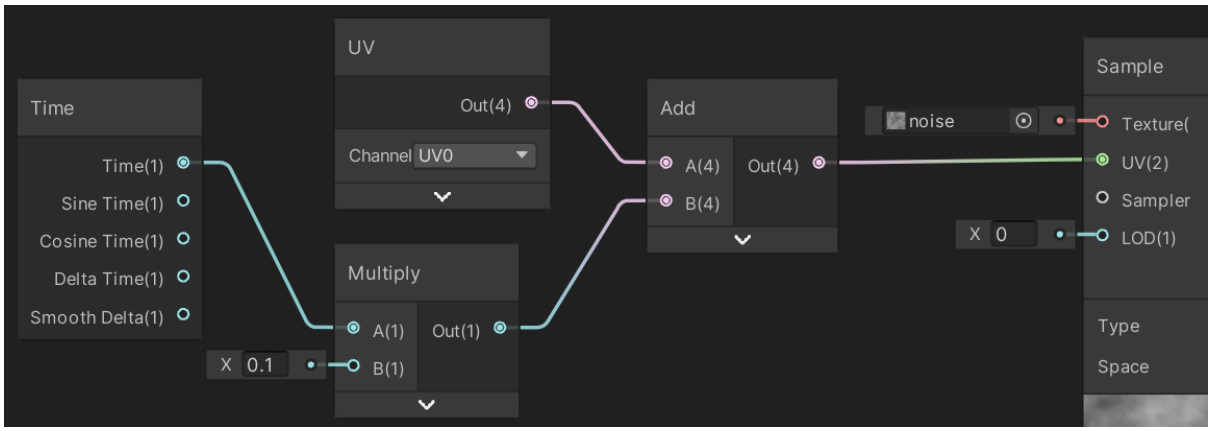

Mesh Renderer
Materials
Size
1
Element 0
WaterMateria
Lighting
Cast Shadows
Off



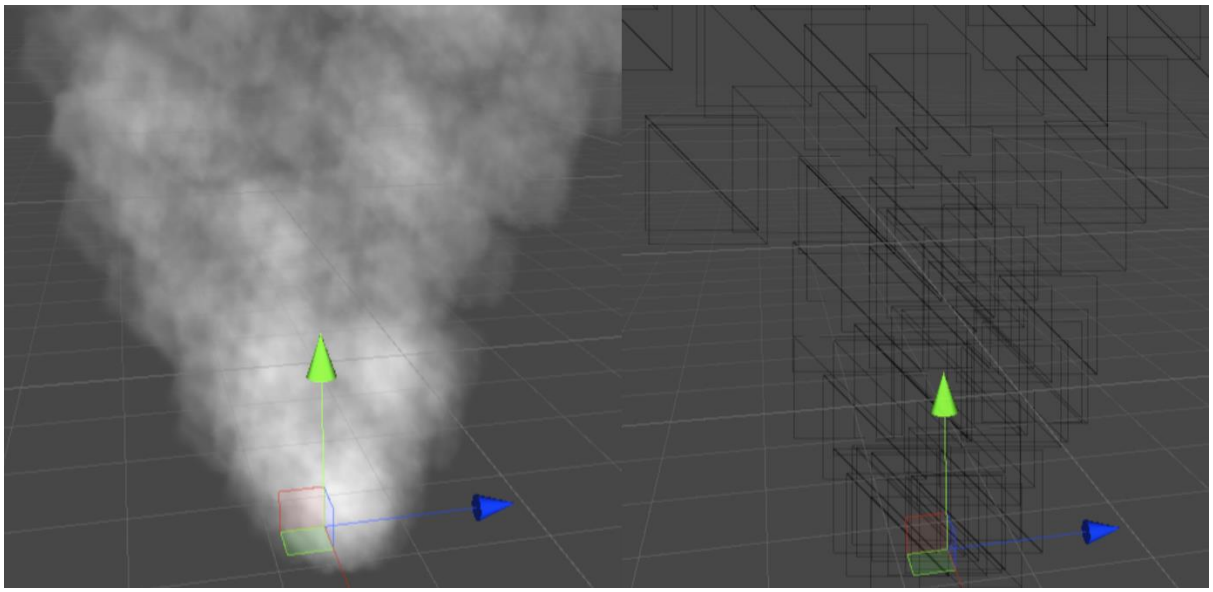


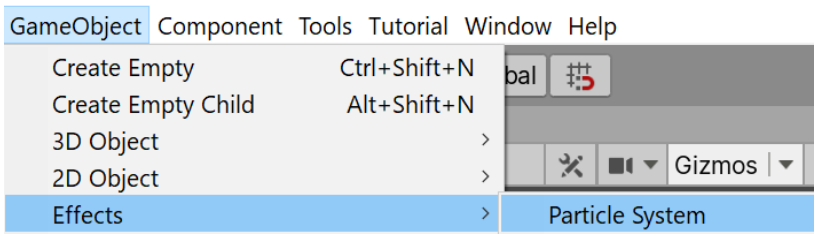

Sample Texture 2D LOD
noise
UV0
X 0
Texture(T2)
UV(2)
Sampler(SS)
LOD(1)
RGBA(4)
R(1)
G(1)
B(1)
A(1)
Type
Default
Space
Tangent
Position
Out(3)
Space
Object
Add
A(3)
B(3)
Out(3)
Vertex
Position(3)
Normal(3)
Tangent(3)
Object Space
Object Space
Vector 3
X 0
Z 0
X(1)
Y(1)
Z(1)
Out(3)
Multiply
A(3)
B(3)
Out(3)
X 0.3 Y 0.3 Z 0.3

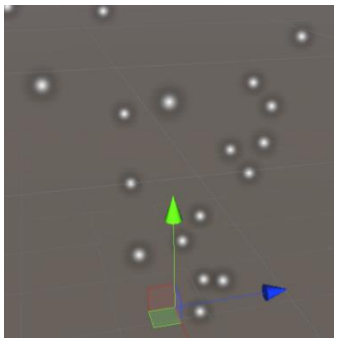


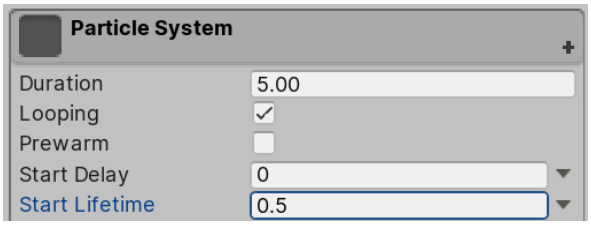

Time
Time(1)
Sine Time(1)
Cosine Time(1)
Delta Time(1)
Smooth Delta(1)
UV
Out(4)
Channel UV0
Multiply
A(1)
B(1)
Out(1)
X 0.1
Add
A(4)
B(4)
Out(4)
noise
X 0
Sample
Texture(
UV(2)
Sampler
LOD(1)
Type
Space

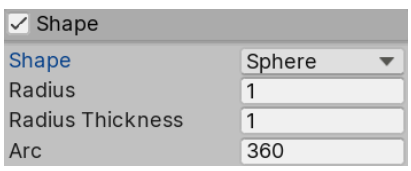
Chapter 7: Visual Effects with Particle Systems and Visual Effect Graph

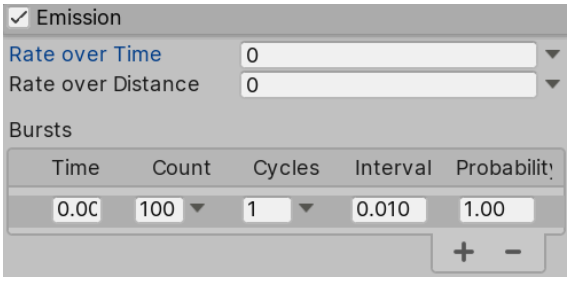


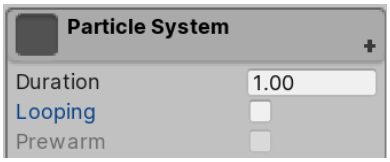


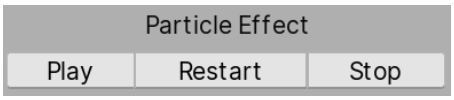


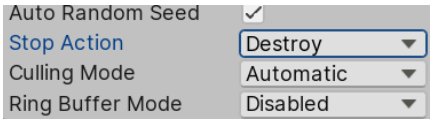





Emission
Rate over Time
0
Rate over Distance
0
Bursts
Time
Count
Cycles
Interval
Probability
0.00
100
1
0.010
1.00

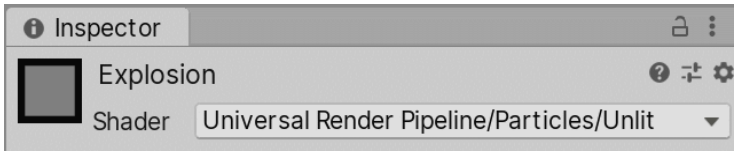

Particle System
Duration
1.00
Looping
Prewarm

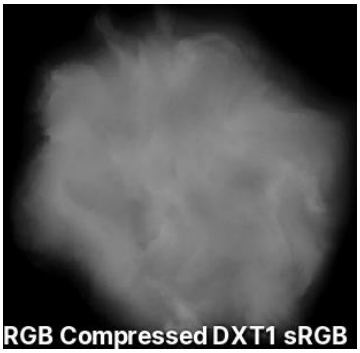

Particle Effect
Play
Restart
Stop

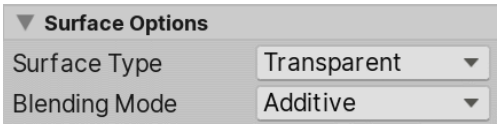

Auto Random Seed
Stop Action
Destroy
Culling Mode
Automatic
Ring Buffer Mode
Disabled


3D Start Size
Start Size
3
3D Start Rotation

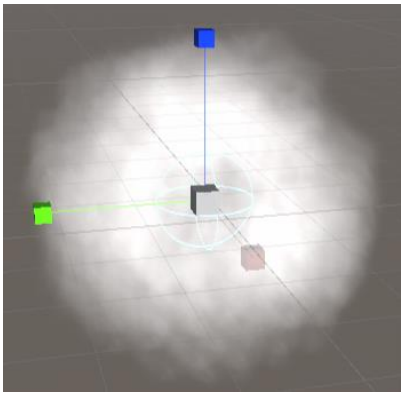

Start Rotation
0
360


Inspector
Explosion
Shader
Universal Render Pipeline/Particles/Unlit


RGB Compressed DXT1 sRGB

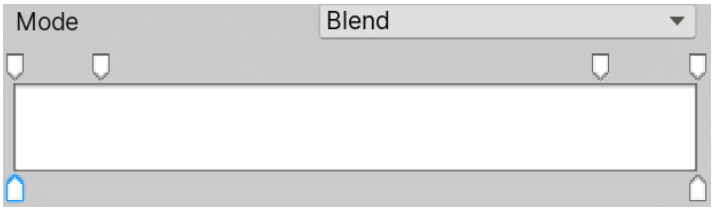

Surface Options
Surface Type
Transparent
Blending Mode
Additive

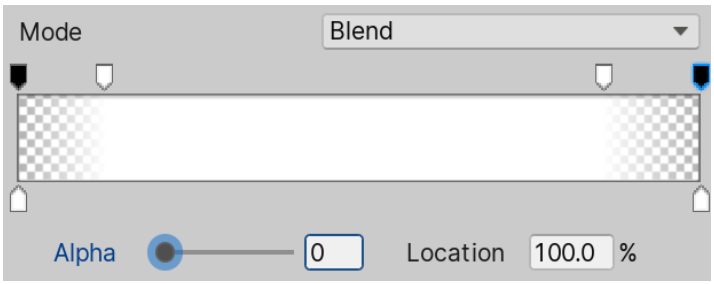

Renderer
Render Mode
Billboard
Normal Direction
1
Material
Explosion



Force over Lifetime

Color over Lifetime





Limit Velocity over Lifetime

Separate Axes	
Speed	1
Dampen	0.1
Drag	0

Rotation over Lifetime

Separate Axes		
Angular Velocity	-90	90

Shape

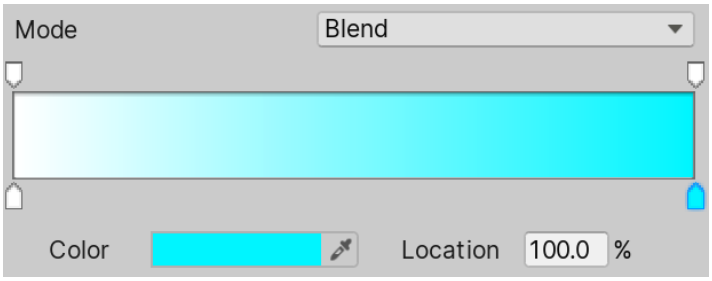
Shape	Edge
Radius	5
Mode	Random

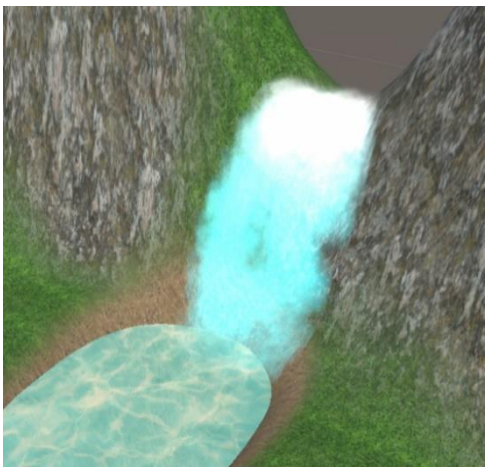
Start Lifetime	3
Start Speed	5
3D Start Size	
Start Size	3

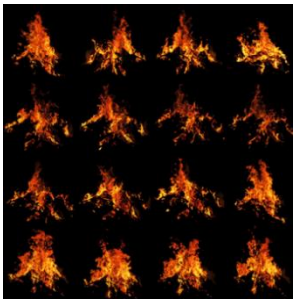
Start Color	
Gravity Modifier	0.5

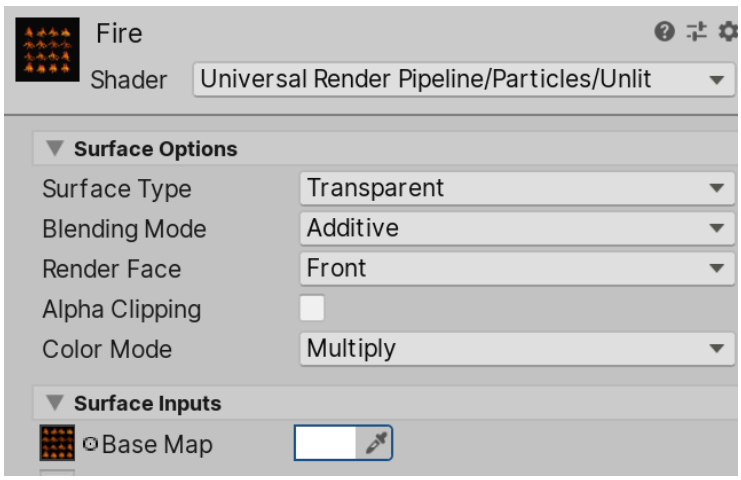
Renderer

Render Mode	Billboard
Normal Direction	1
Material	Explosion

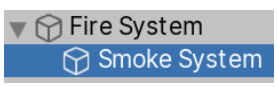

Mode
Blend
Color
Location
100.0
%

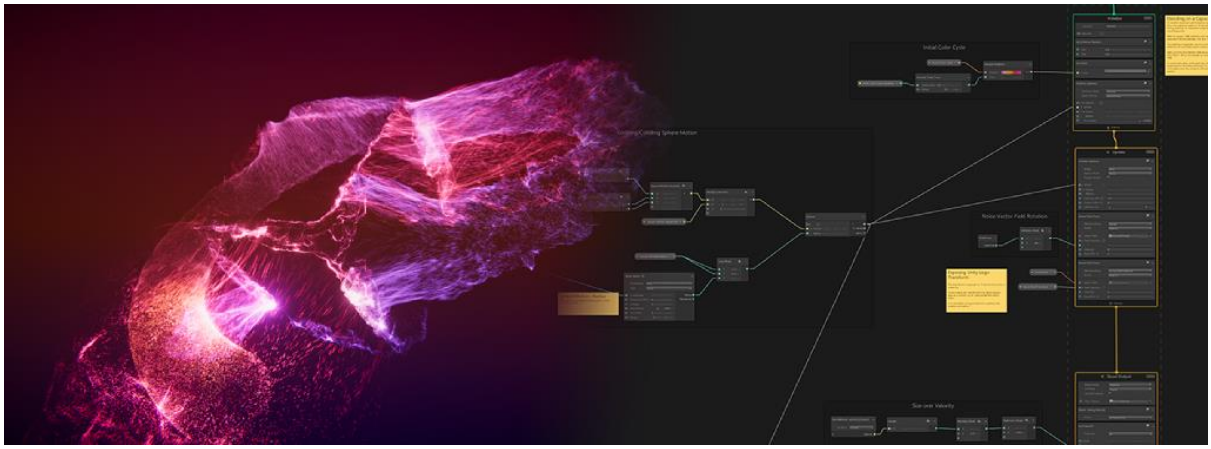


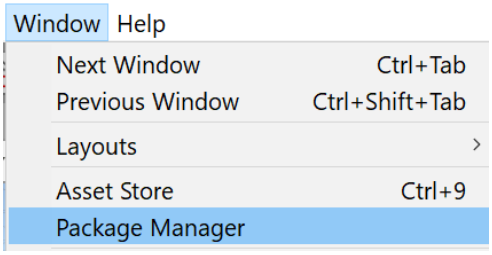


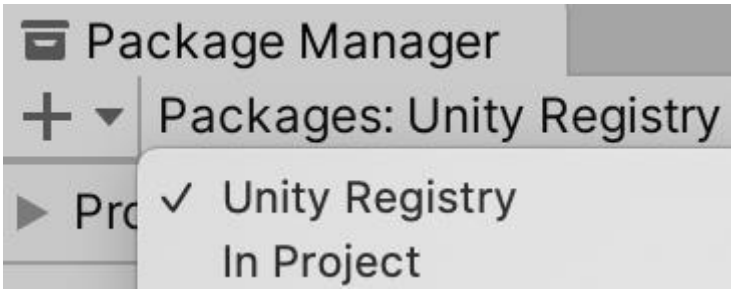

Fire
Shader
Universal Render Pipeline/Particles/Unlit
Surface Options
Surface Type
Transparent
Blending Mode
Additive
Render Face
Front
Alpha Clipping
Color Mode
Multiply
Surface Inputs
Base Map

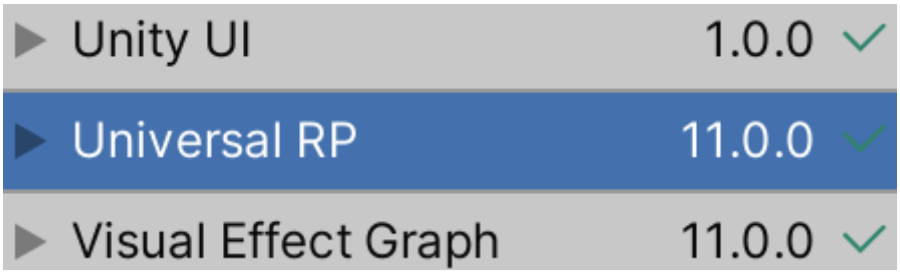

Texture Sheet Animation
Mode
Grid
Tiles
X 4
Y 4


Fire System
Smoke System




Window
Help
Next Window
Ctrl+Tab
Previous Window
Ctrl+Shift+Tab
Layouts
Asset Store
Ctrl+9
Package Manager

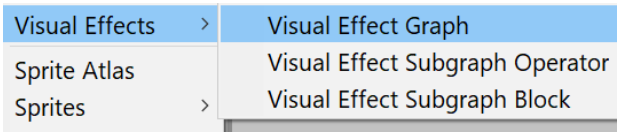

Package Manager
Packages: Unity Registry
Unity Registry
In Project

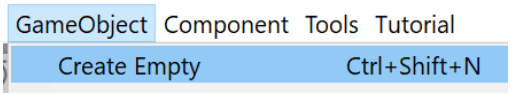

Unity UI
1.0.0
Universal RP
11.0.0
Visual Effect Graph
11.0.0

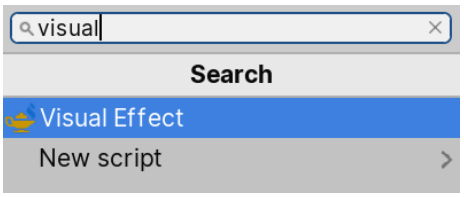

Universal RP
11.0.0
Currently Installed
11.0.0
R

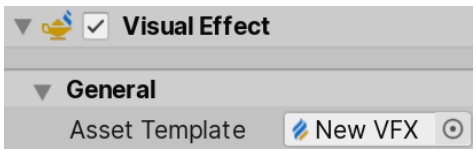

Visual Effect Graph
11.0.0
Currently Installed
11.0.0
R

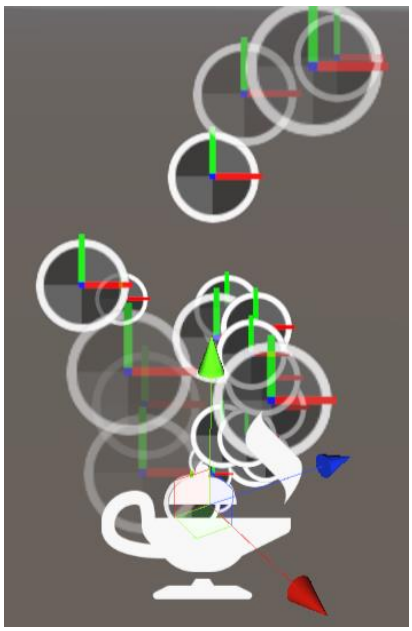

Install

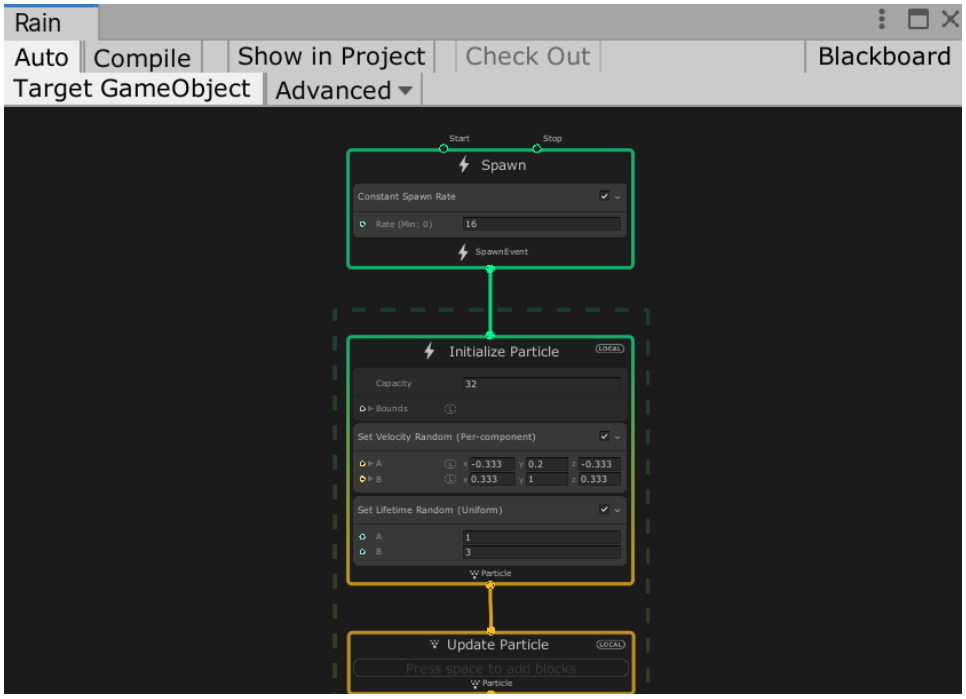

Visual Effects
Sprite Atlas
Sprites
Visual Effect Graph
Visual Effect Subgraph Operator
Visual Effect Subgraph Block

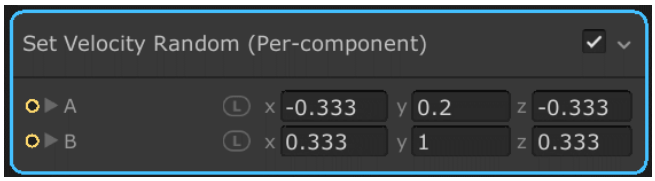

GameObject
Component
Tools
Tutorial
Create Empty
Ctrl+Shift+N

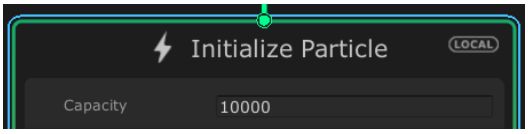

visual
Search
Visual Effect
New script

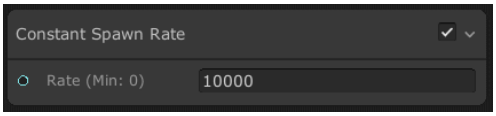

Visual Effect
General
Asset Template
New VFX

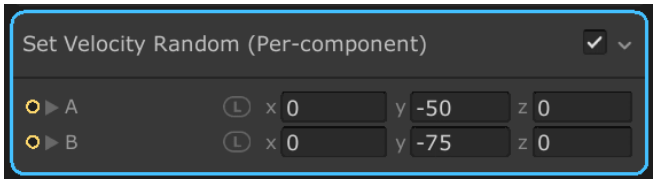


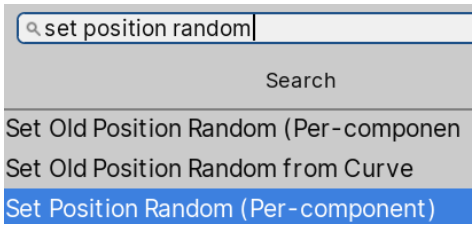

Rain
Auto
Compile
Show in Project
Check Out
Blackboard
Target GameObject
Advanced
Start
Stop
Spawn
Constant Spawn Rate
Rate (Min: 0)
16
SpawnEvent
Initialize Particle
LOCAL
Capacity
32
Bounds
Set Velocity Random (Per-component)
A
B
Set Lifetime Random (Uniform)
Particle
Update Particle
Press space to add blocks


Set Velocity Random (Per-component)
A
B
x -0.333
y 0.2
z -0.333
x 0.333
y 1
z 0.333


Initialize Particle
LOCAL
Capacity
10000


Constant Spawn Rate
Rate (Min: 0)
10000


Set Velocity Random (Per-component)
A
B
x 0
y -50
z 0
x 0
y -75
z 0


set position random
Search
Set Old Position Random (Per-componen
Set Old Position Random from Curve
Set Position Random (Per-component)

Capacity 10000

Bounds

Center x 0 y -12.5 z 0

Size x 100 y 25 z 100

Set Velocity Random (Per-component)

A x 0 y -50 z 0

B x 0 y -75 z 0

Set Lifetime Random (Uniform)

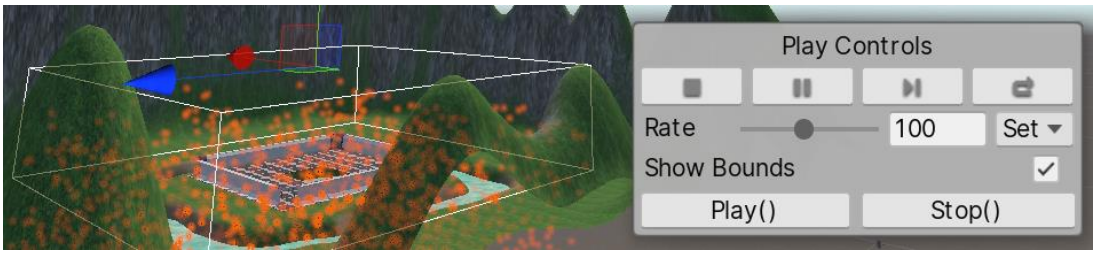
A 1

B 3

Set Position Random (Per-component)

A x -50 y 0 z -50

B x 50 y 0 z 50



Transform

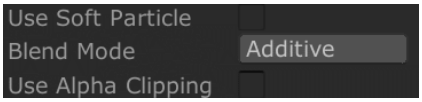
Position X 100 Y 37 Z 100

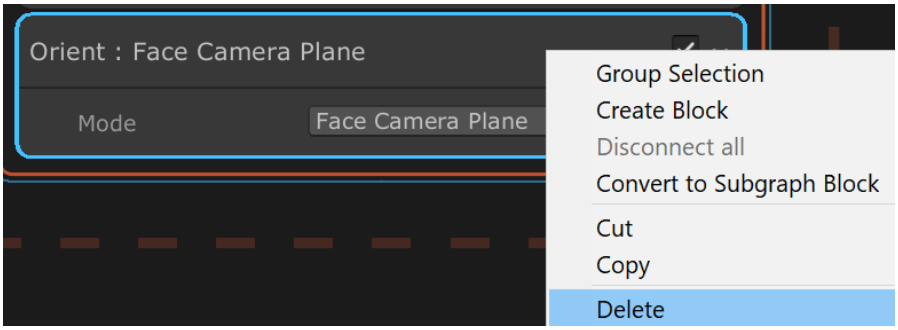
Set Lifetime Random (Uniform)

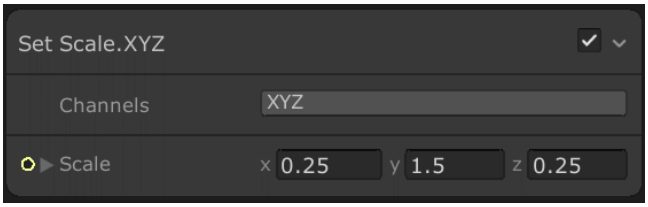
A 0.5

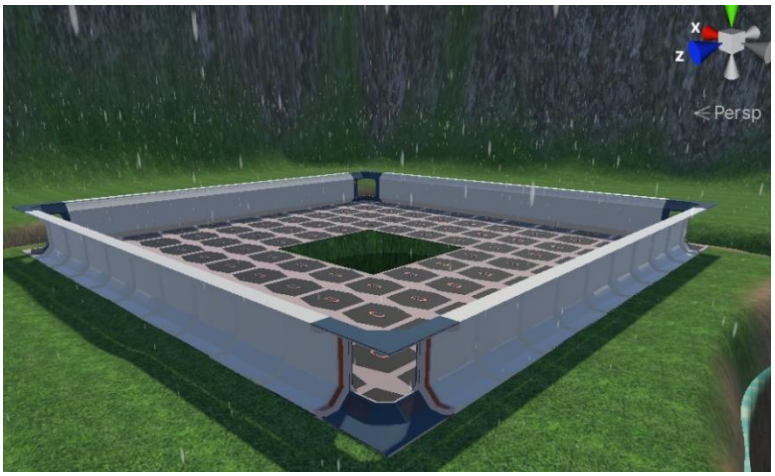
B 0.5

Main Texture smoketex









Visual Effect Graph

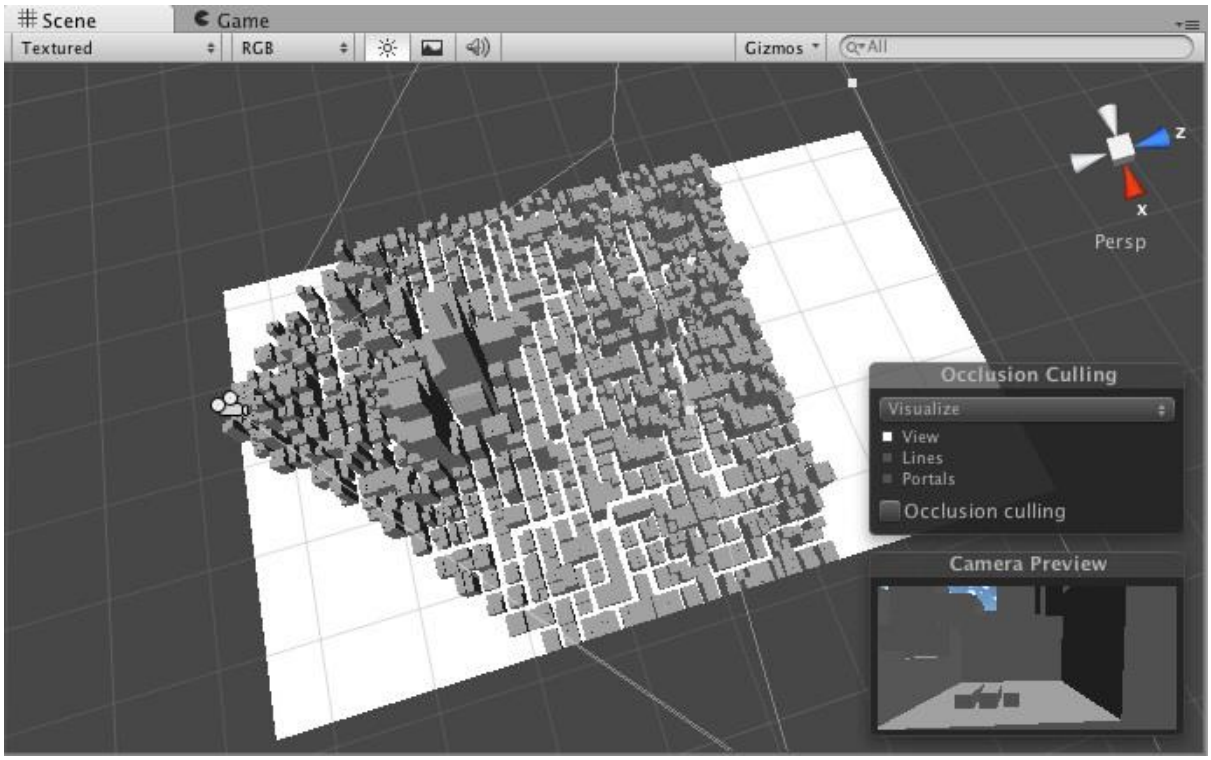
Release

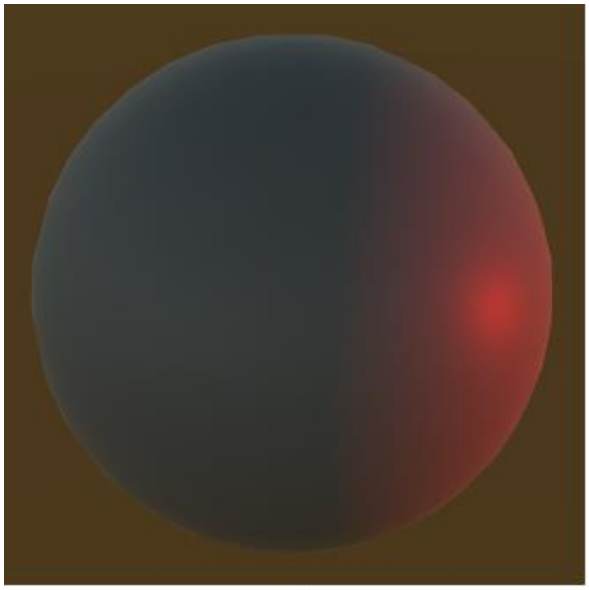
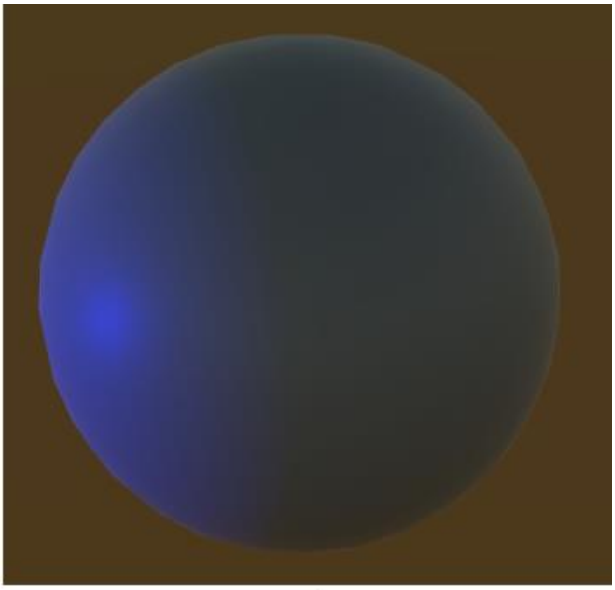
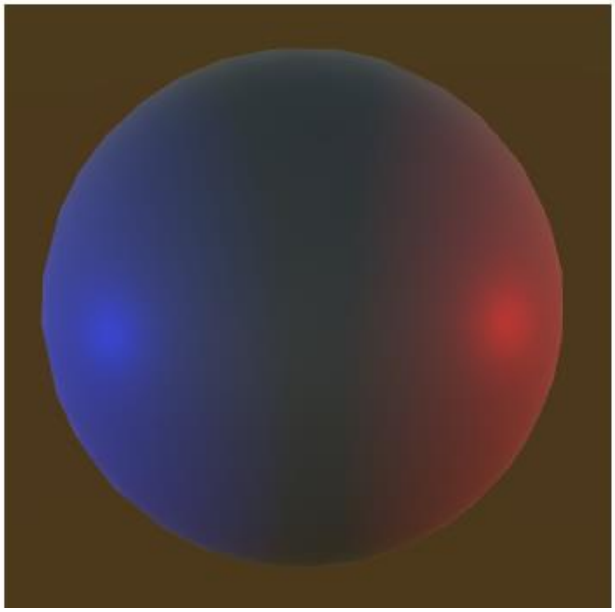
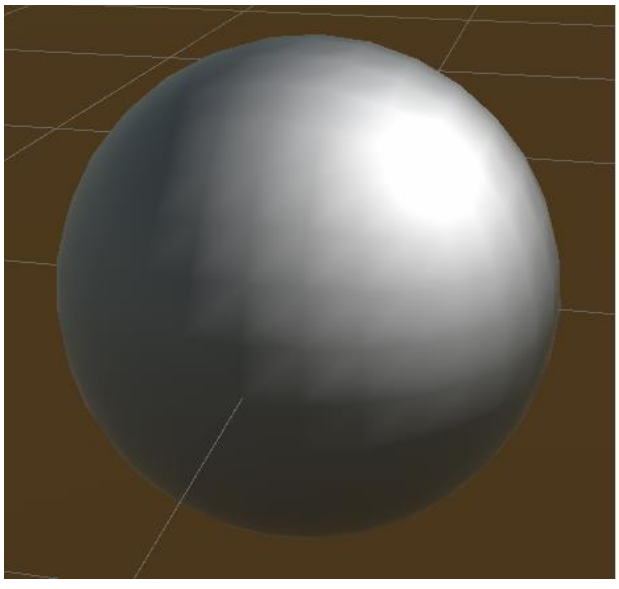
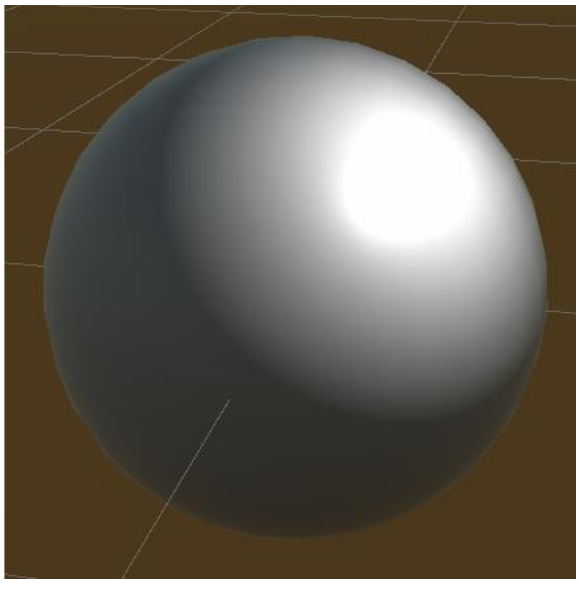
Unity Technologies

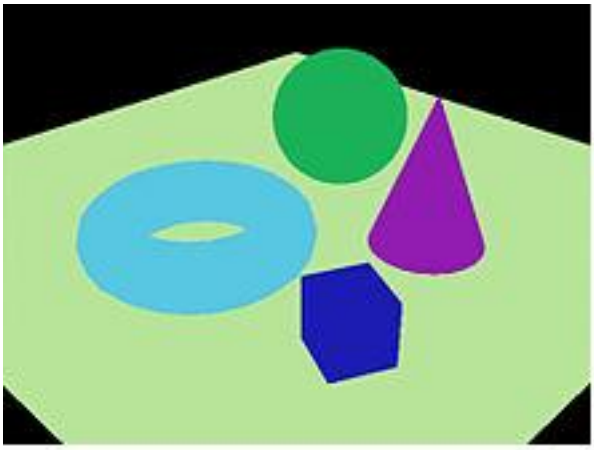
Version 11.0.0 - February 10, 2021

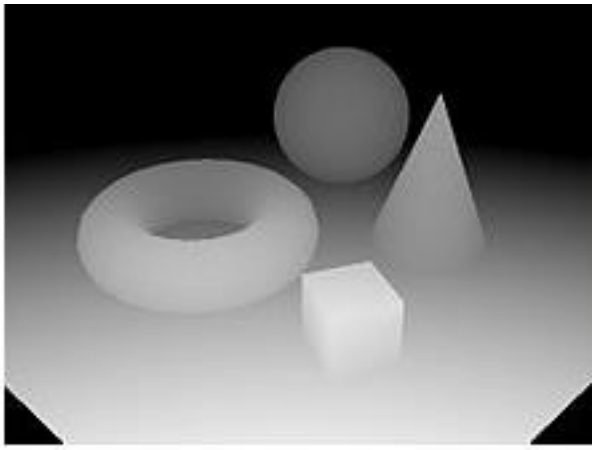
View documentation • View changelog • View

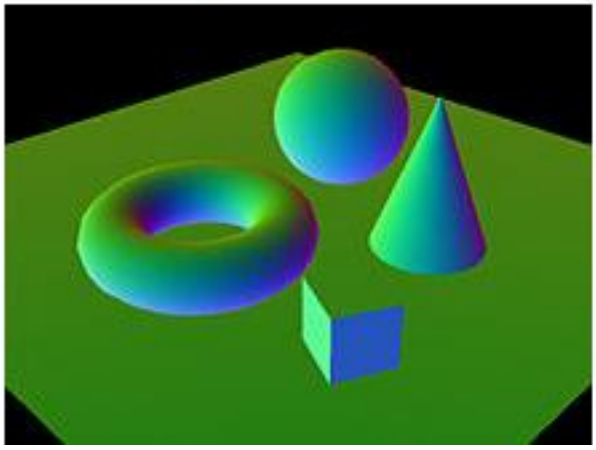
Chapter 8: Lighting Using the Universal Render Pipeline

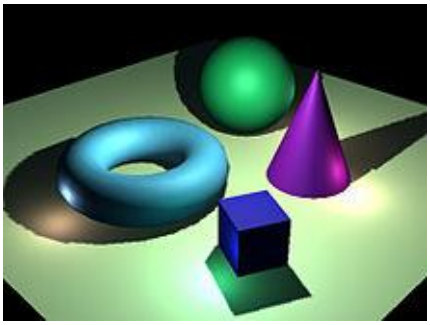


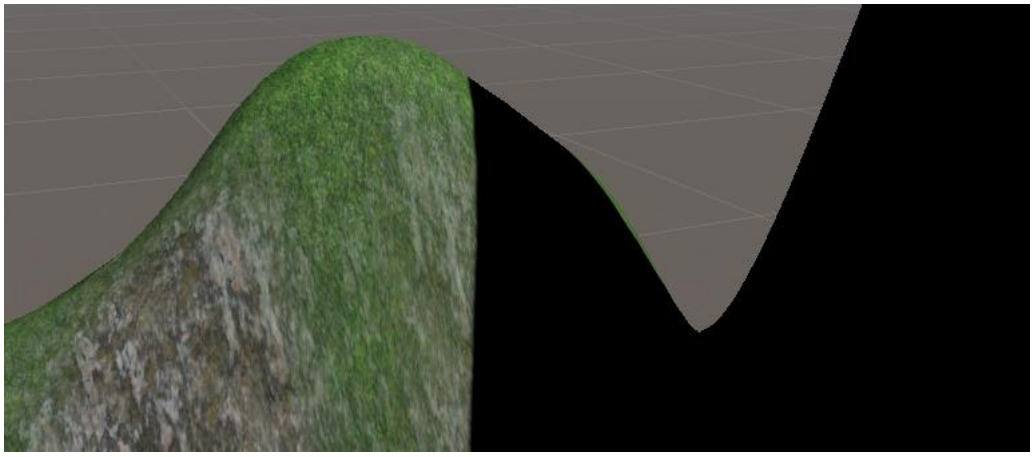






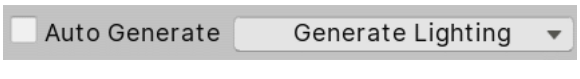


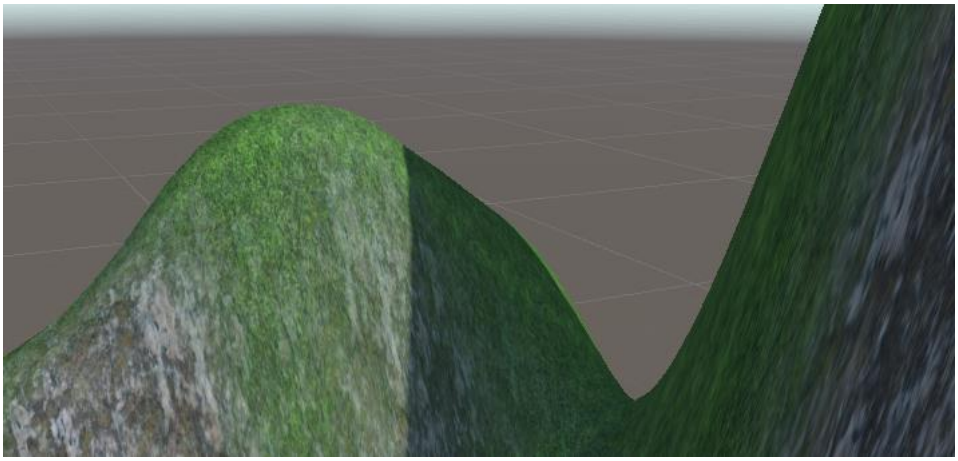


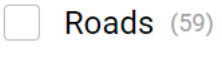


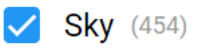


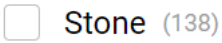




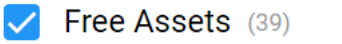








Pricing

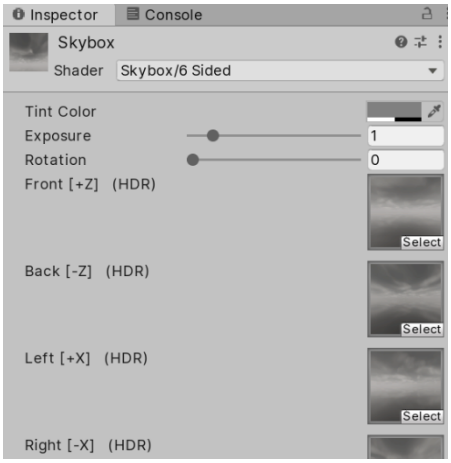


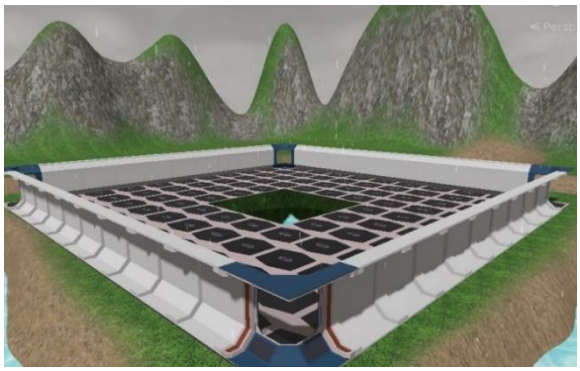
RPGWHITELOCK

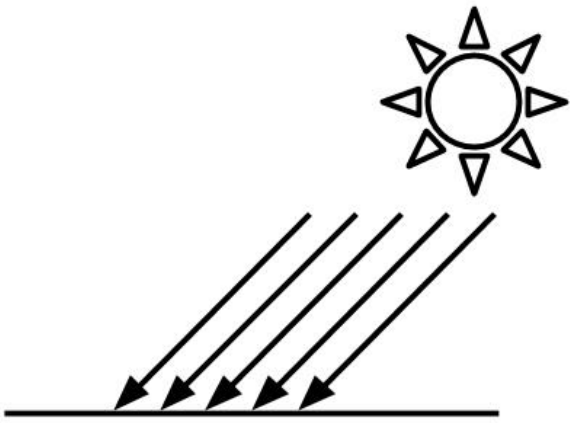
AllSky Free - 10 Sky / Skybox Set

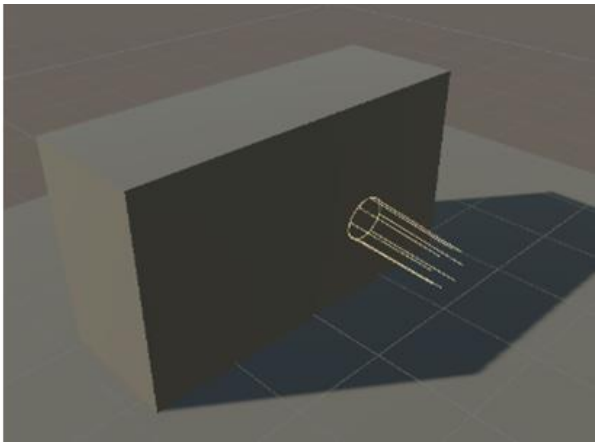
★★★★★ (13)

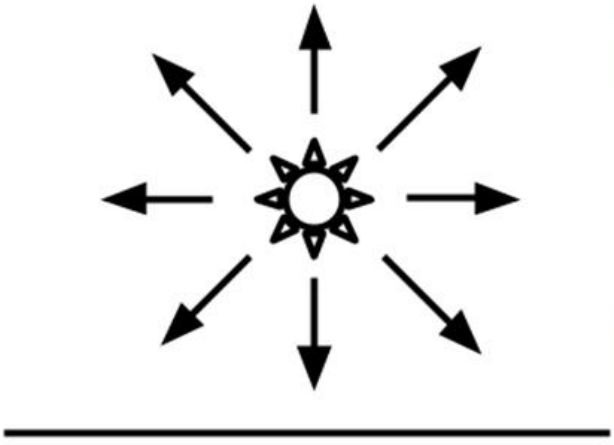
FREE

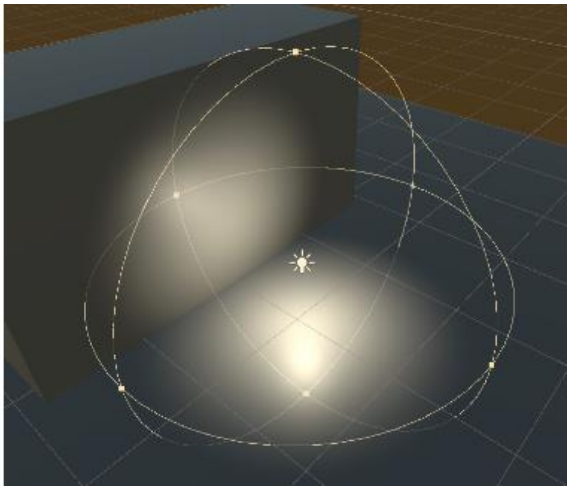

Inspector
Console
Skybox
Shader
Skybox/6 Sided
Tint Color
Exposure
1
Rotation
0
Front [+Z] (HDR)
Select
Back [-Z] (HDR)
Select
Left [+X] (HDR)
Select
Right [-X] (HDR)

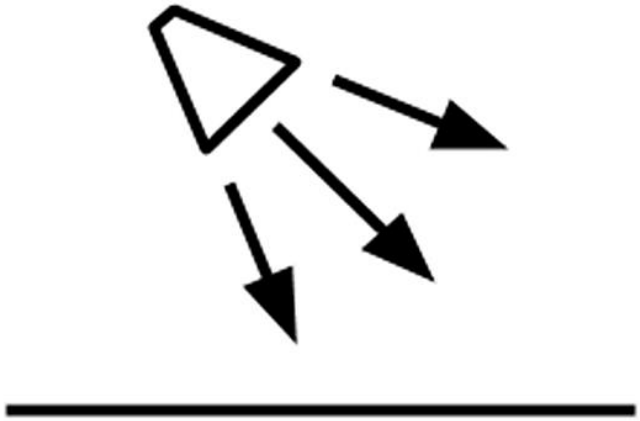


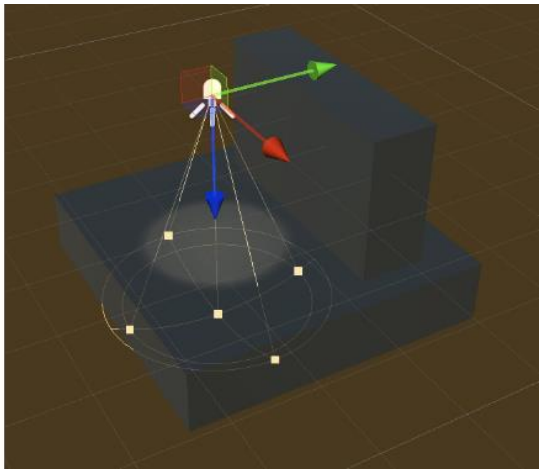


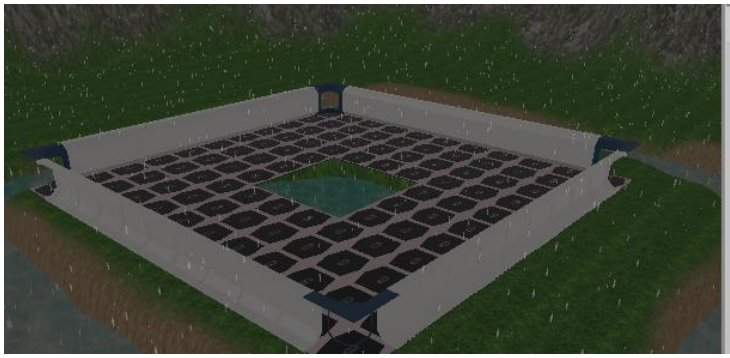


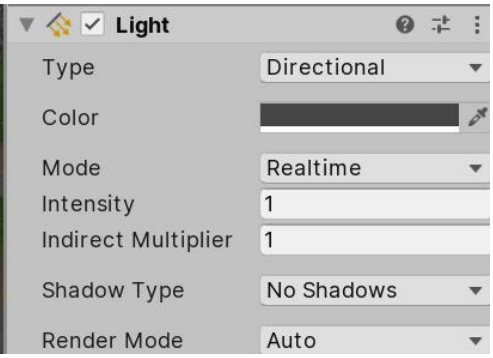








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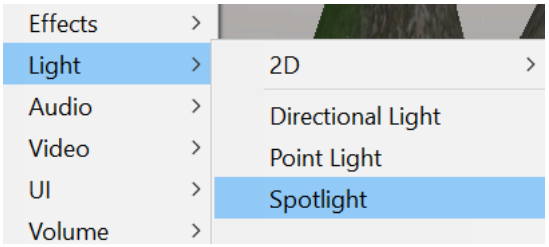
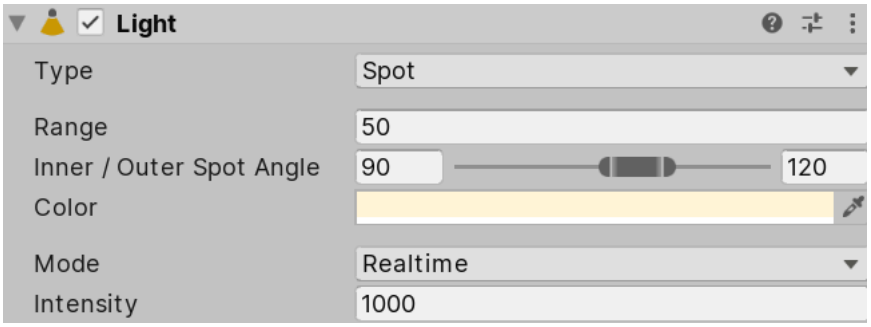
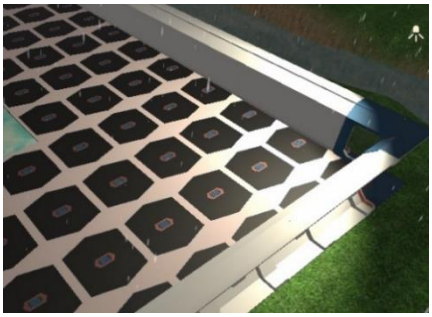
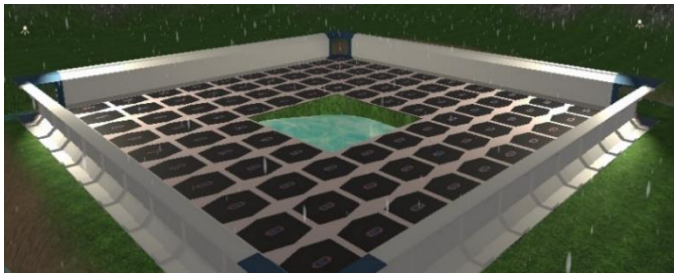
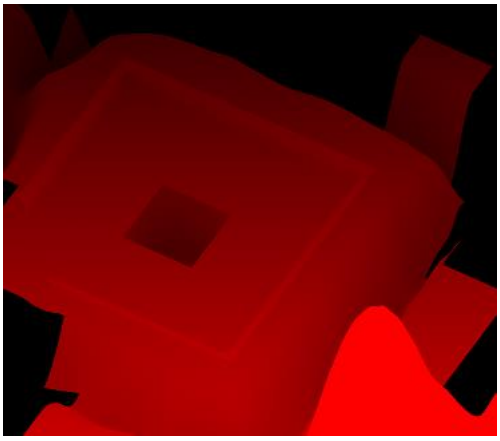
Type
Directional
Color
Mode
Realtime
Intensity
1
Indirect Multiplier
1
Shadow Type
No Shadows
Render Mode
Auto

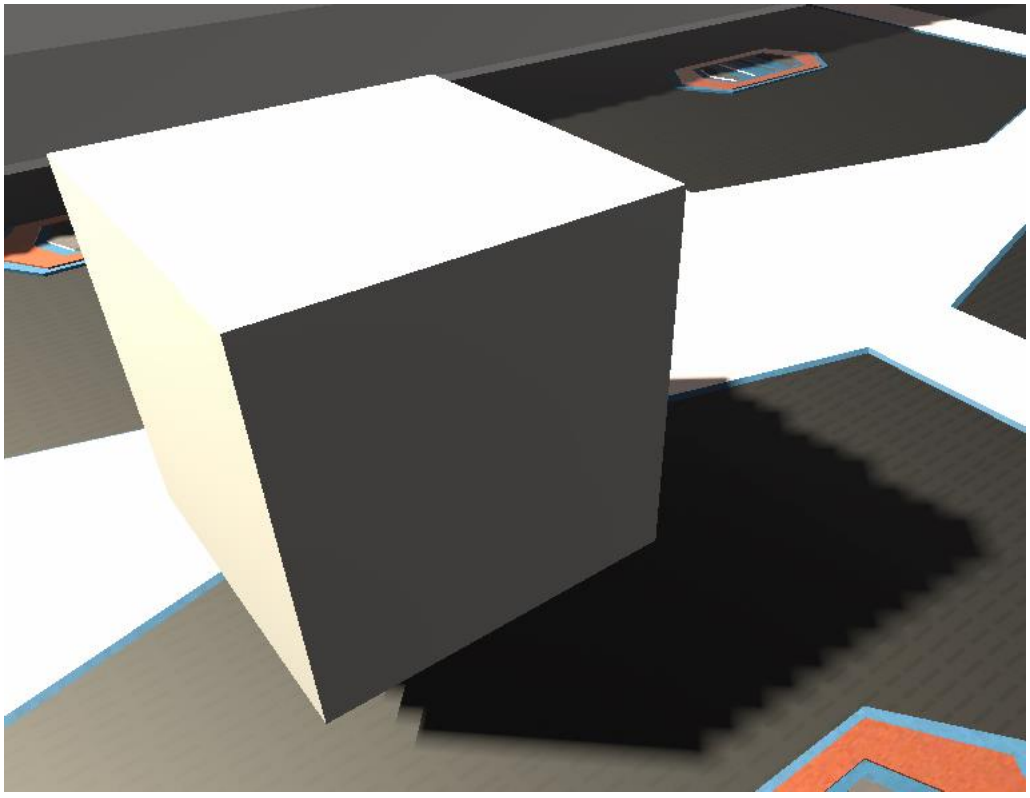

Effects
Light
Audio
Video
UI
Volume
2D
Directional Light
Point Light
Spotlight

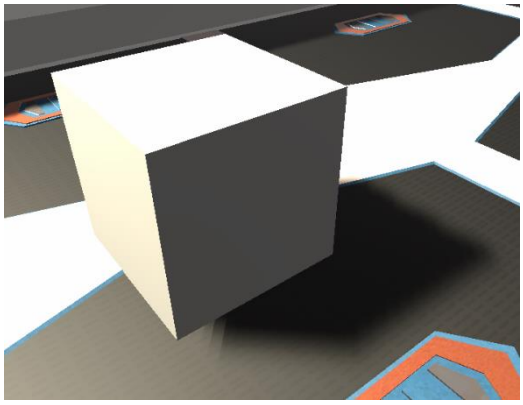

Light
Type
Spot
Range
50
Inner / Outer Spot Angle
90
120
Color
Mode
Realtime
Intensity
1000

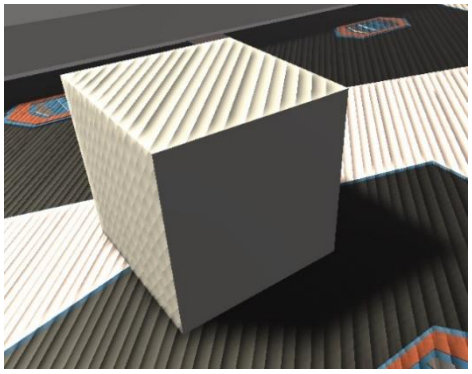


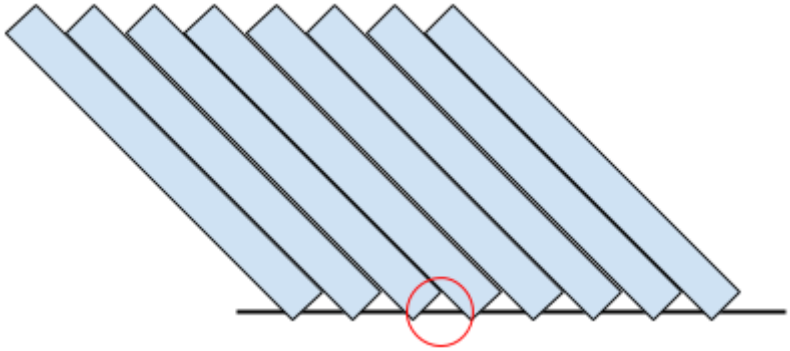


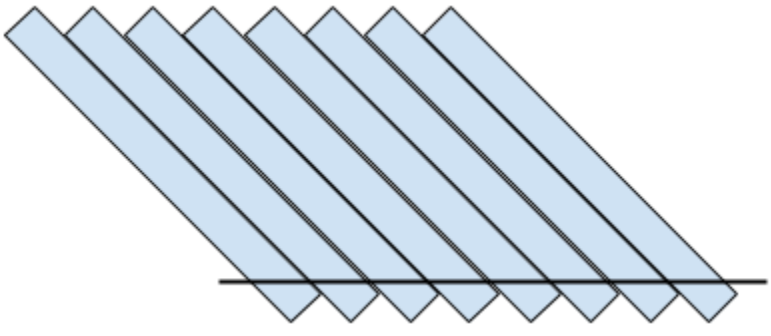


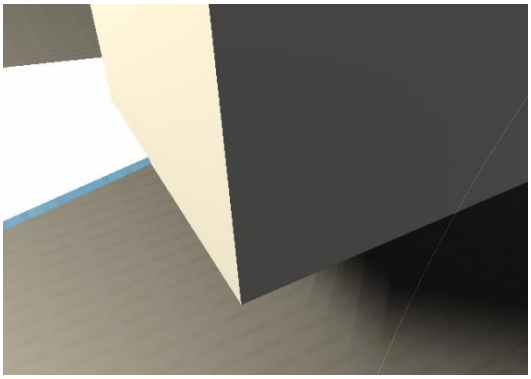


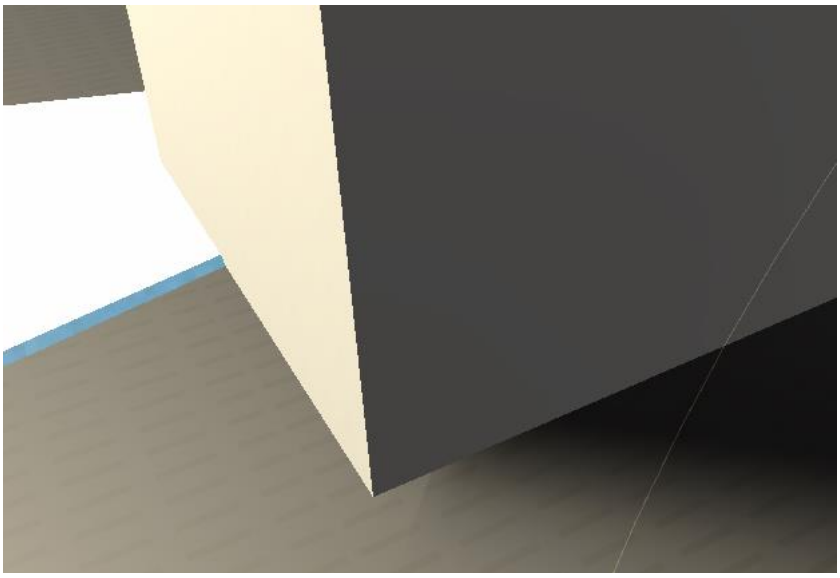




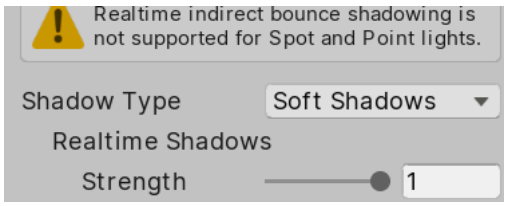




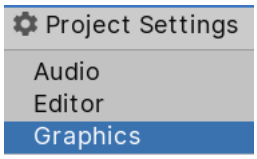


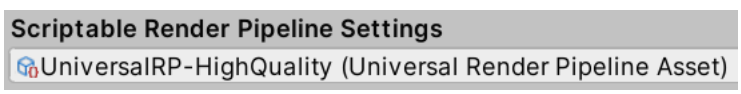


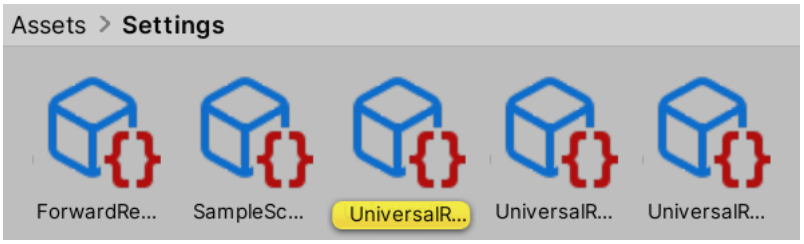

GameObject
Spot Light
Spot Light (1)

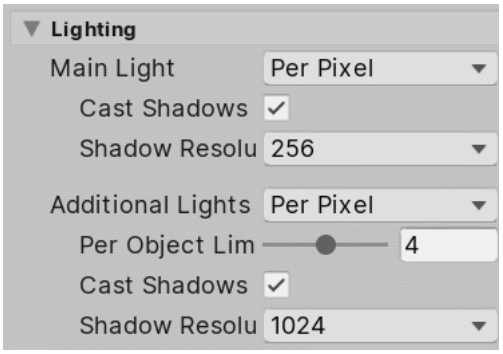

Realtime indirect bounce shadowing is not supported for Spot and Point lights.
Shadow Type
Soft Shadows
Realtime Shadows
Strength
1

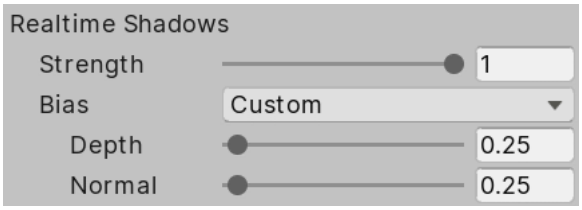

Shadow Type
No Shadows


Project Settings
Audio
Editor
Graphics

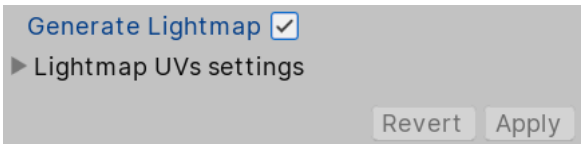

Scriptable Render Pipeline Settings
UniversalRP-HighQuality (Universal Render Pipeline Asset)

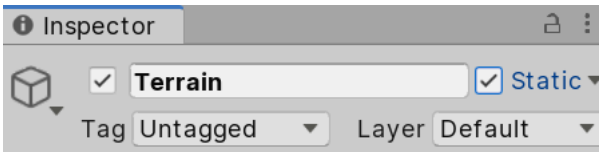

Assets > Settings
ForwardRe...
SampleSc...
UniversalR...
UniversalR...
UniversalR...

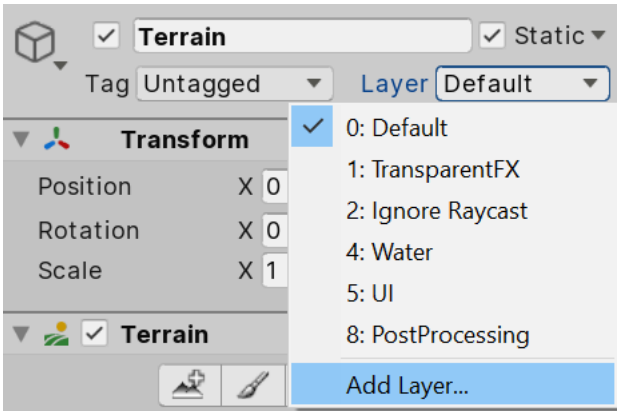

Lighting
Main Light
Per Pixel
Cast Shadows
Shadow Resolu
256
Additional Lights
Per Pixel
Per Object Lim
4
Cast Shadows
Shadow Resolu
1024

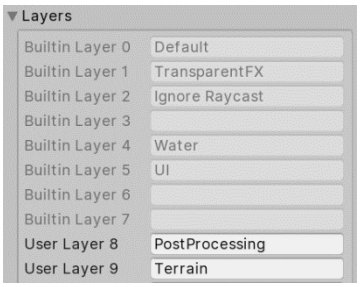

Realtime Shadows
Strength
1
Bias
Custom
Depth
0.25
Normal
0.25

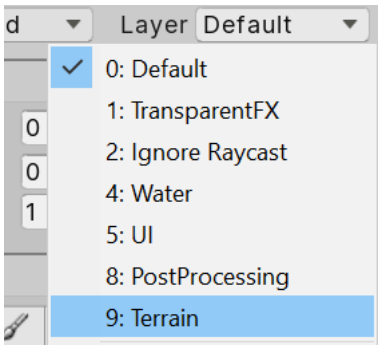

UNLIT
LIGHTMAP
RESULT

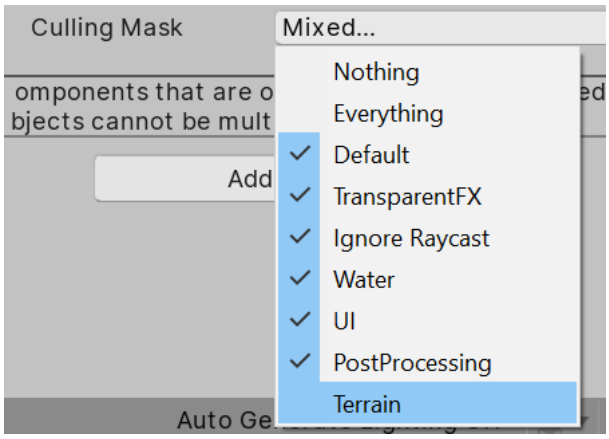

Generate Lightmap
Lightmap UVs settings
Revert
Apply

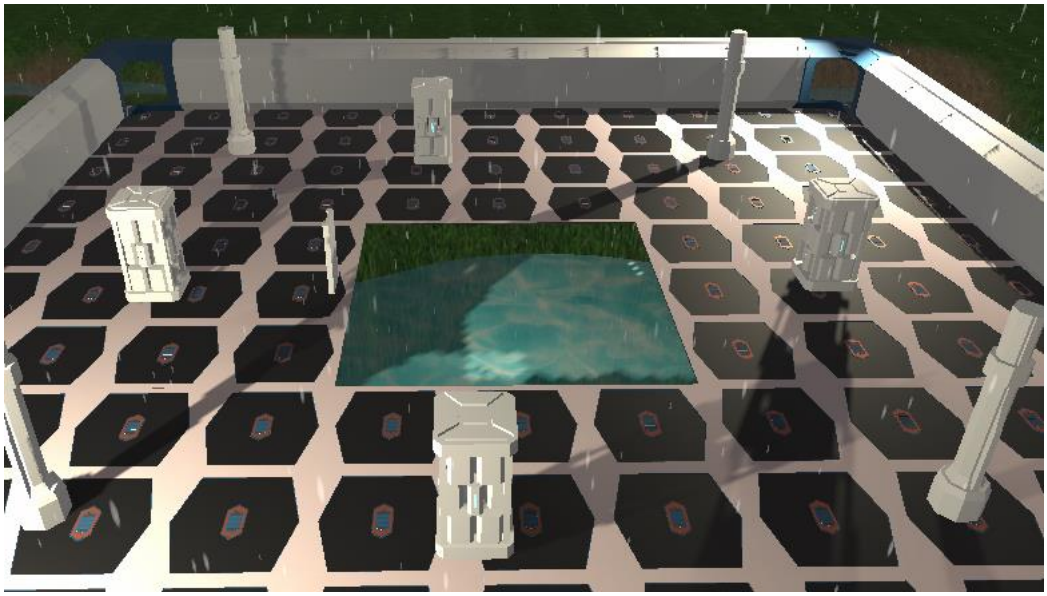

Inspector
Terrain
Static
Tag
Untagged
Layer
Default


Terrain
Static
Tag Untagged
Layer Default
Transform
Position X 0
Rotation X 0
Scale X 1
Terrain
0: Default
1: TransparentFX
2: Ignore Raycast
4: Water
5: UI
8: PostProcessing
Add Layer...


Layers
Builtin Layer 0 Default
Builtin Layer 1 TransparentFX
Builtin Layer 2 Ignore Raycast
Builtin Layer 3
Builtin Layer 4 Water
Builtin Layer 5 UI
Builtin Layer 6
Builtin Layer 7
User Layer 8 PostProcessing
User Layer 9 Terrain


Layer Default
0: Default
1: TransparentFX
2: Ignore Raycast
4: Water
5: UI
8: PostProcessing
9: Terrain


Culling Mask
Mixed...
Nothing
Everything
Default
TransparentFX
Ignore Raycast
Water
UI
PostProcessing
Terrain
Add



Inner / Outer Spot A 90 120
Color
Mode Mixed
Intensity 1000

Scene | Environment | Baked Lightmaps

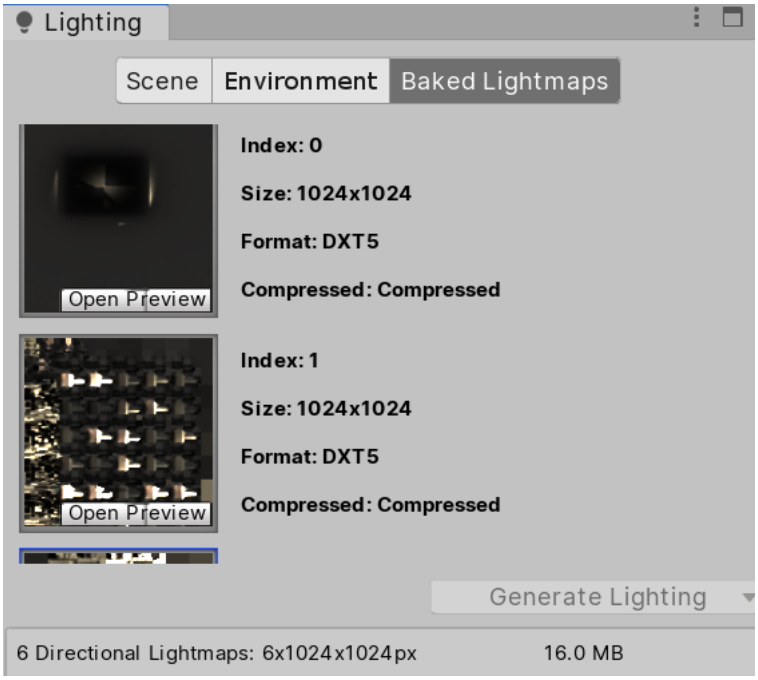
Lighting Settings New Lighting Settings

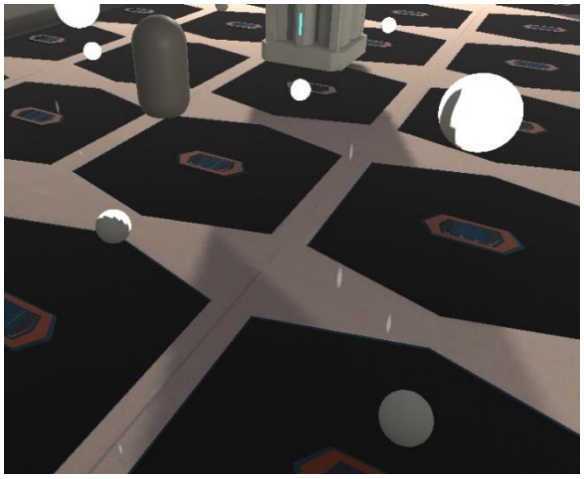
New Lighting Settings

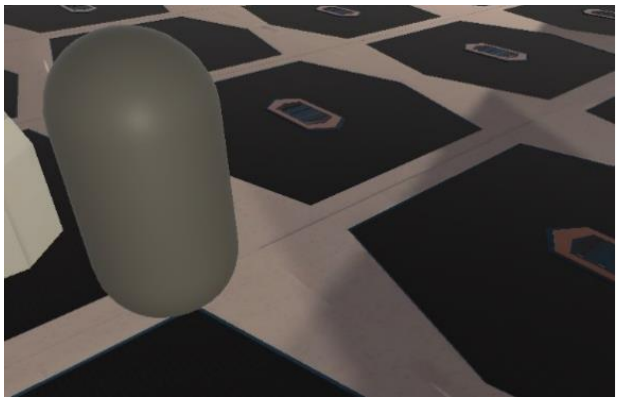
Lightmapping Settings

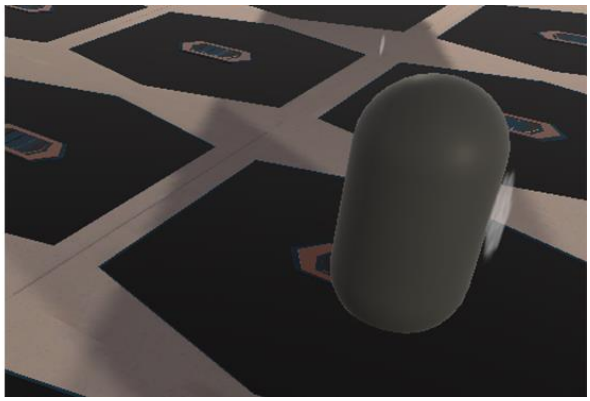
Lightmapper Progressive CPU
Progressive Updates ✓
Multiple Importance Sampling ✓
Direct Samples 16
Indirect Samples 256
Environment Samples 128
Light Probe Sample Multiplier 4
Max Bounces 1
Min Bounces 1
Filtering Auto
Lightmap Resolution 20 texels per unit

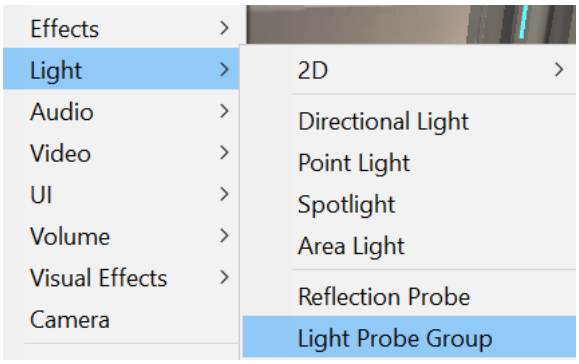
Auto Generate Lighting On | Preparing Bake...

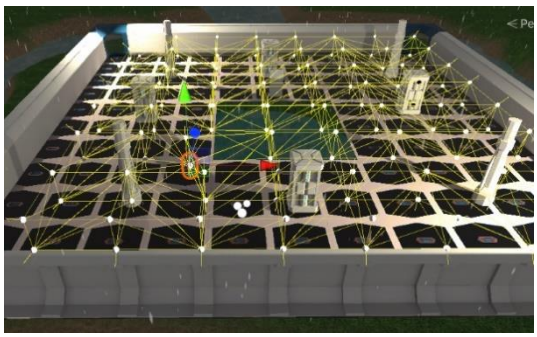

Lighting
Scene
Environment
Baked Lightmaps
Open Preview
Index: 0
Size: 1024x1024
Format: DXT5
Compressed: Compressed
Open Preview
Index: 1
Size: 1024x1024
Format: DXT5
Compressed: Compressed
Generate Lighting
6 Directional Lightmaps: 6x1024x1024px
16.0 MB

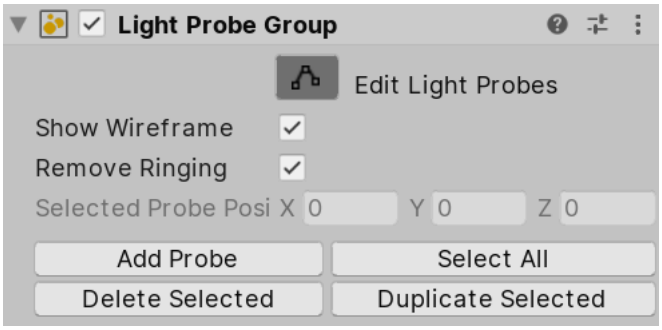




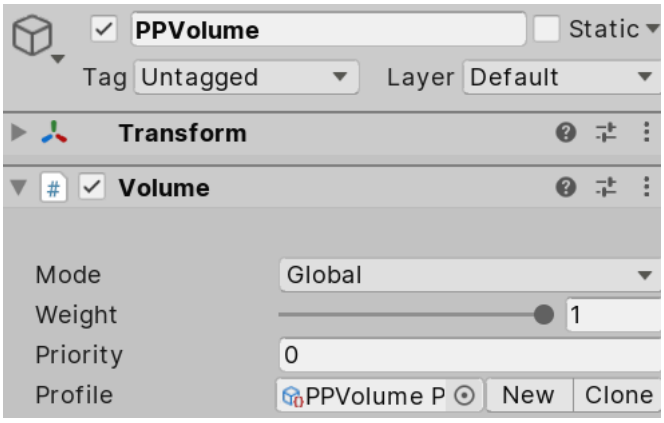


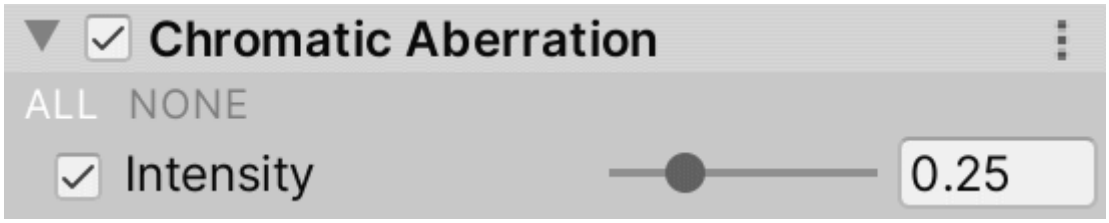

Effects
Light
Audio
Video
UI
Volume
Visual Effects
Camera
2D
Directional Light
Point Light
Spotlight
Area Light
Reflection Probe
Light Probe Group

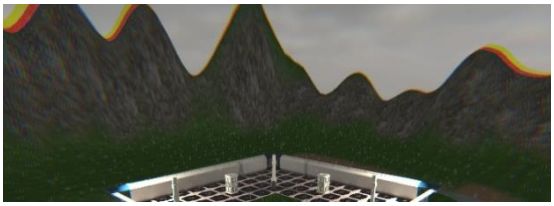


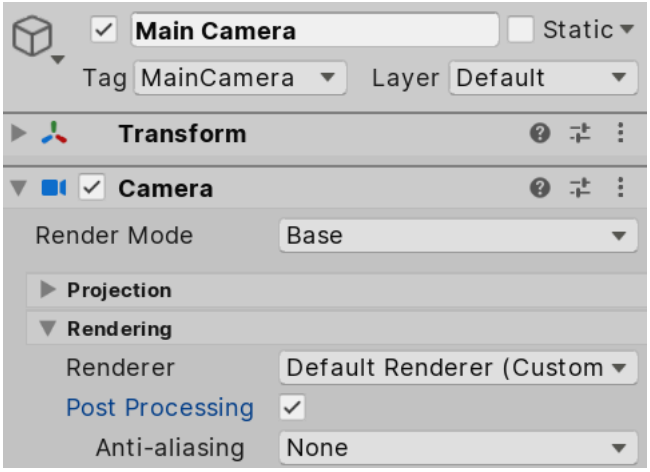

Light Probe Group
Edit Light Probes
Show Wireframe
Remove Ringing
Selected Probe Posi X 0 Y 0 Z 0
Add Probe
Select All
Delete Selected
Duplicate Selected

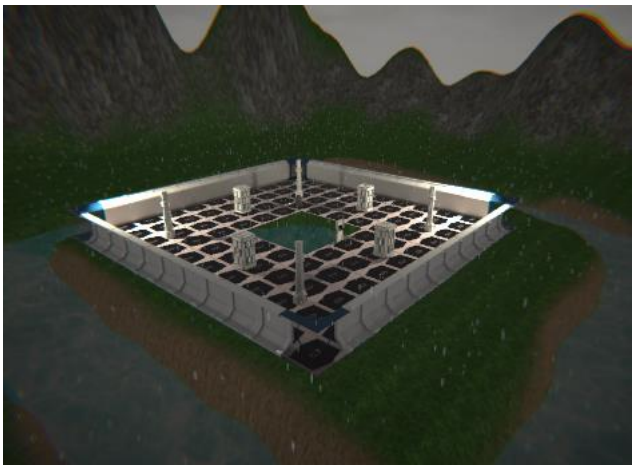
Chapter 9: Fullscreen Effects with Postprocessing

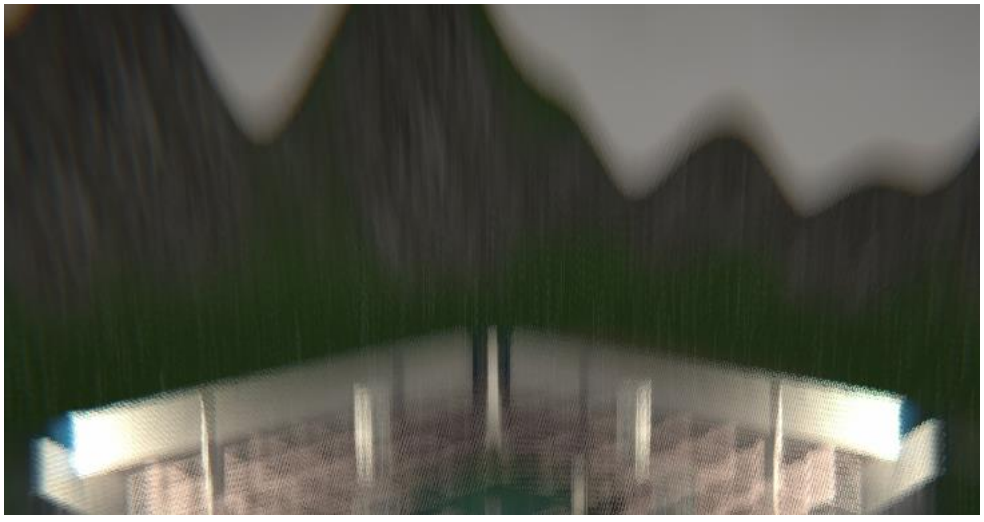


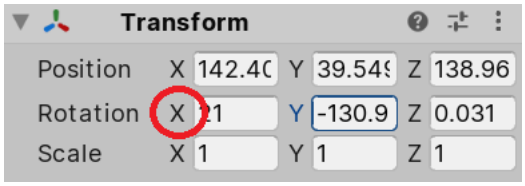


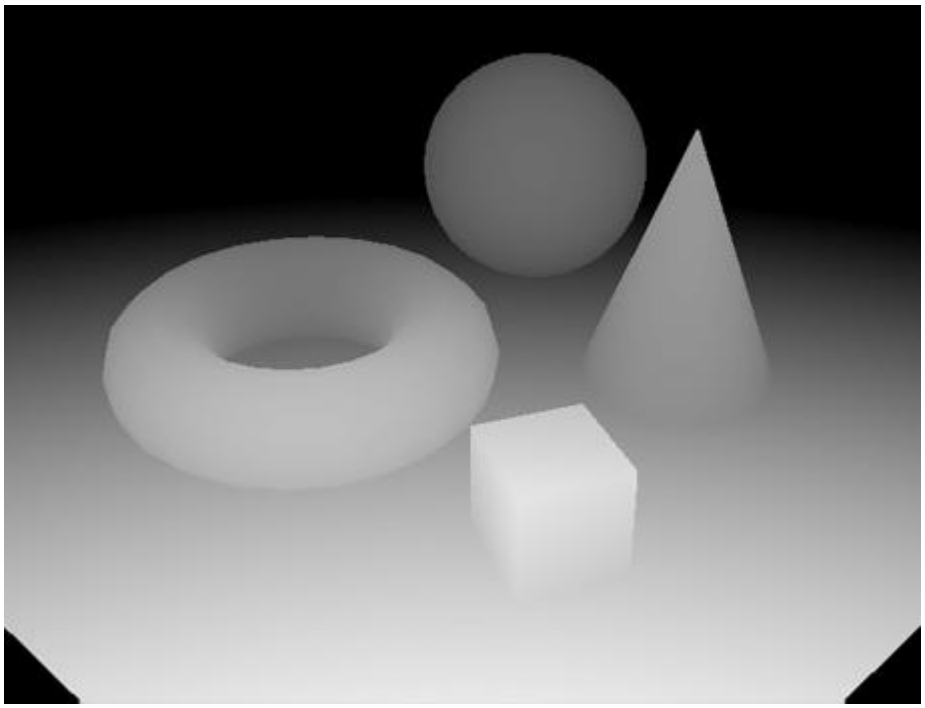


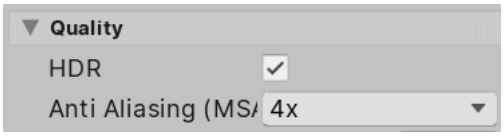


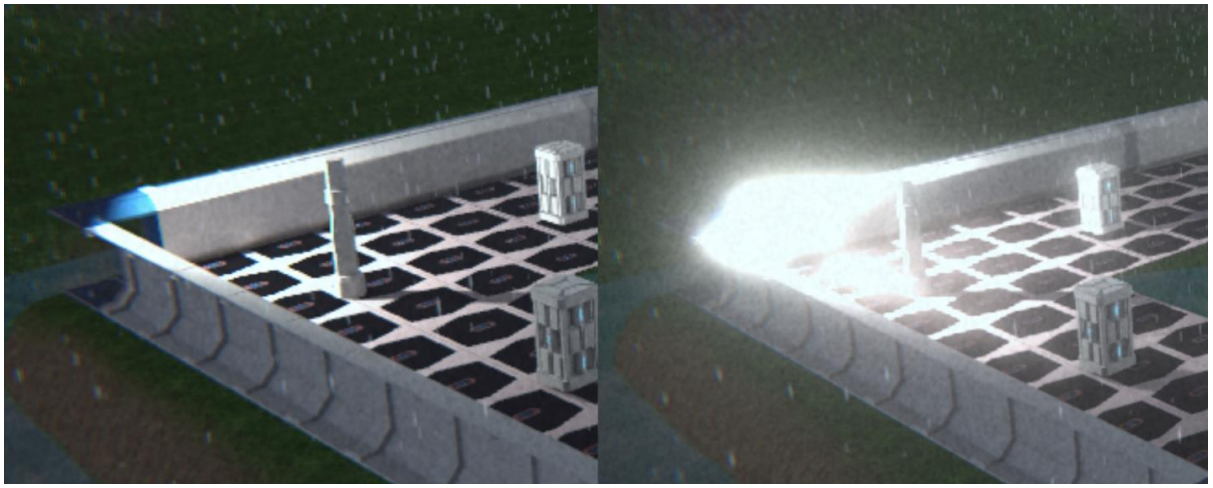


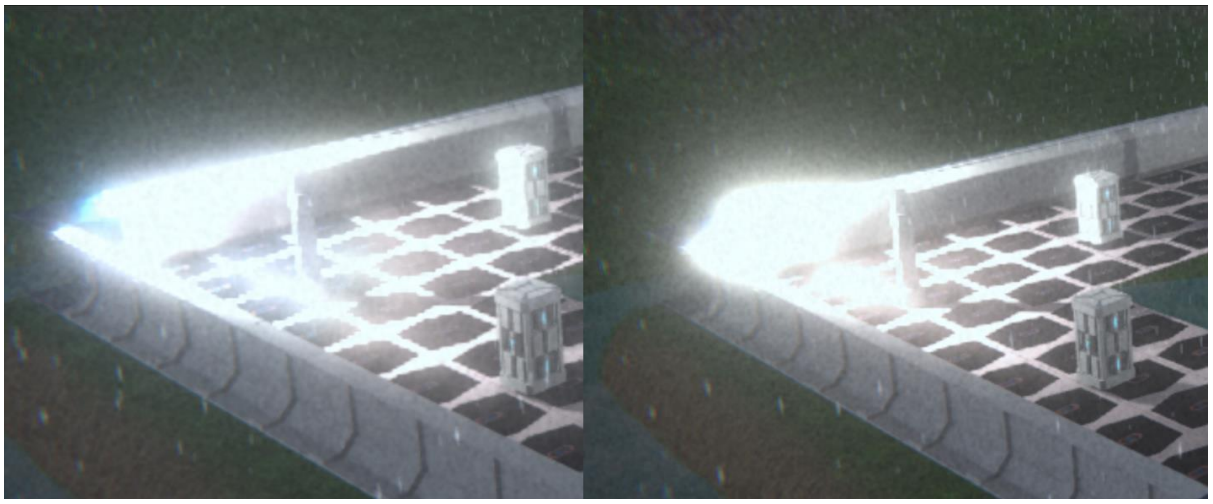


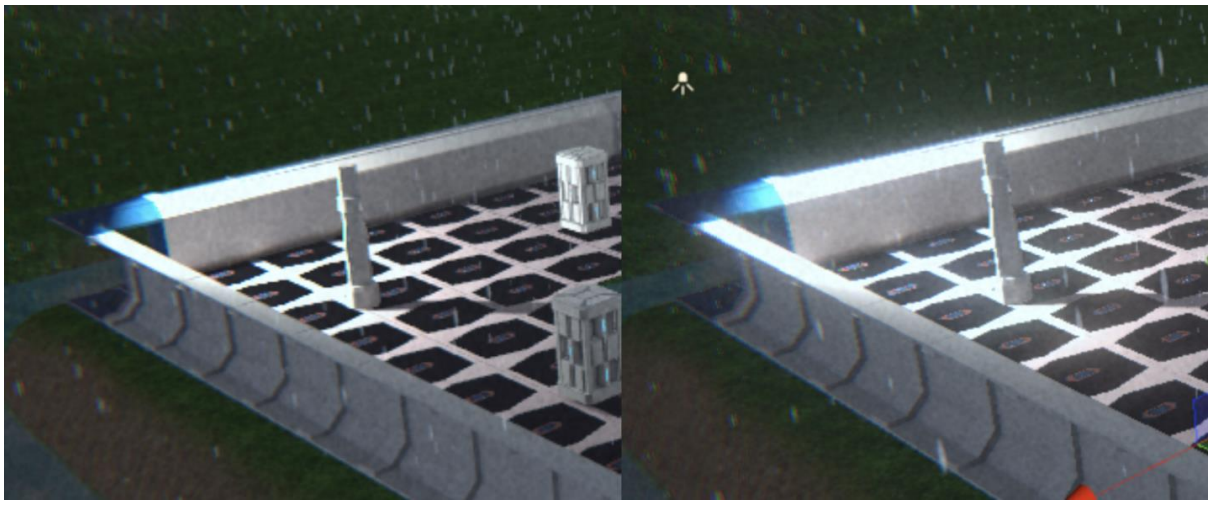

Transform
Position
X 142.4C
Y 39.54S
Z 138.96
Rotation
X 21
Y -130.9
Z 0.031
Scale
X 1
Y 1
Z 1

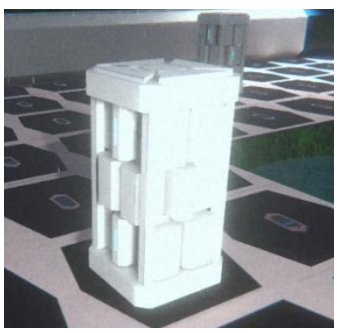


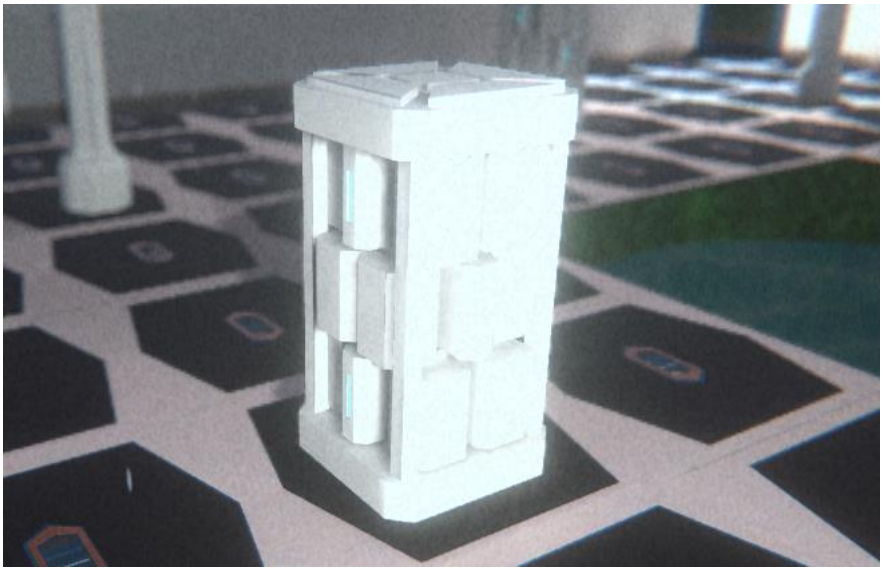

Quality
HDR
Anti Aliasing (MS/
4x

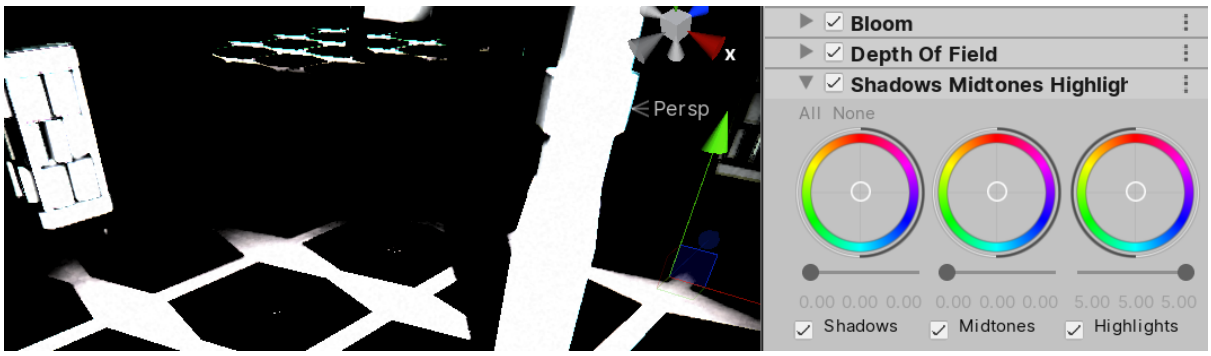


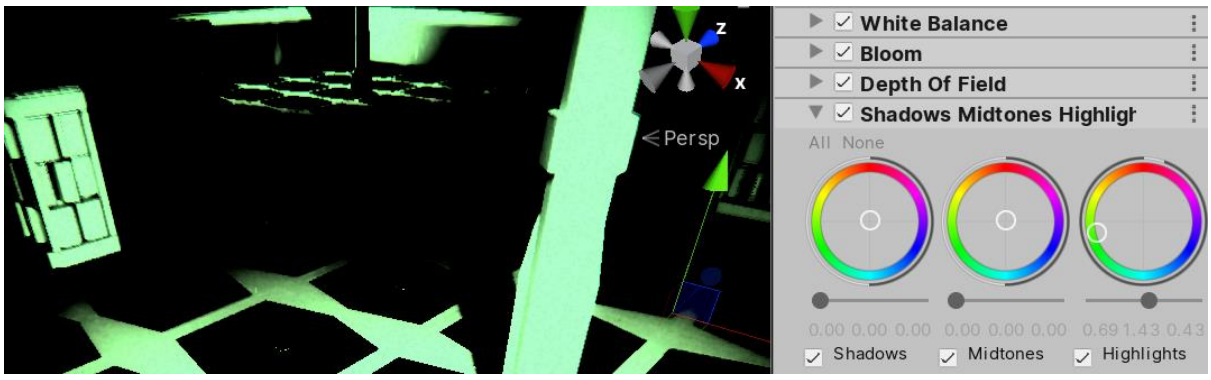


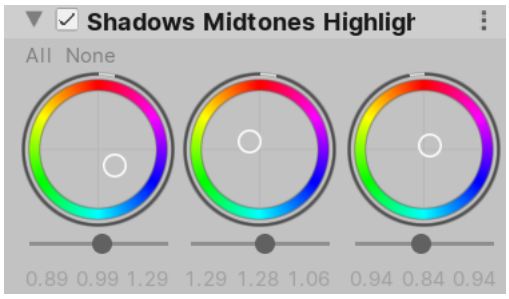


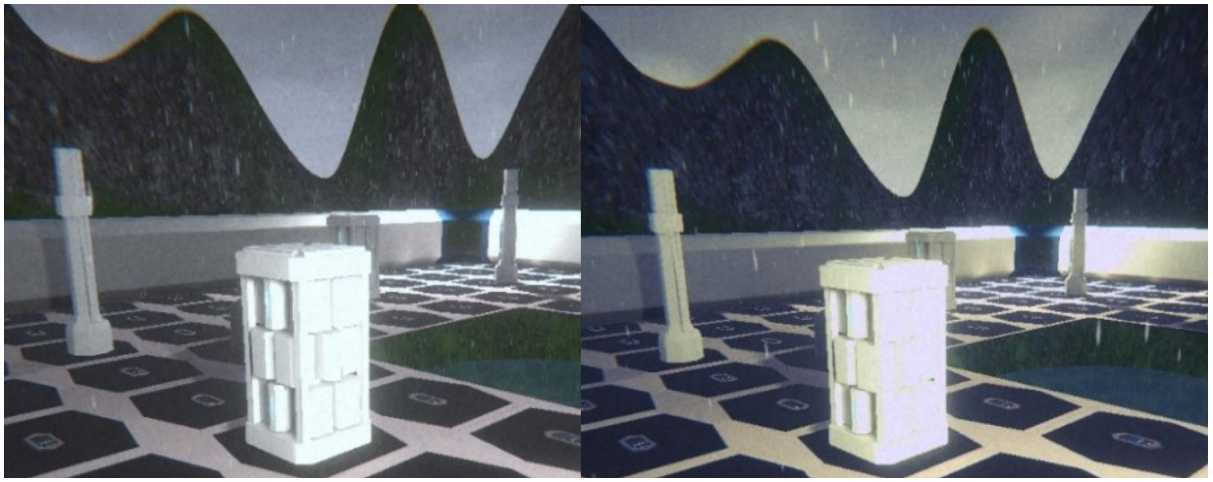




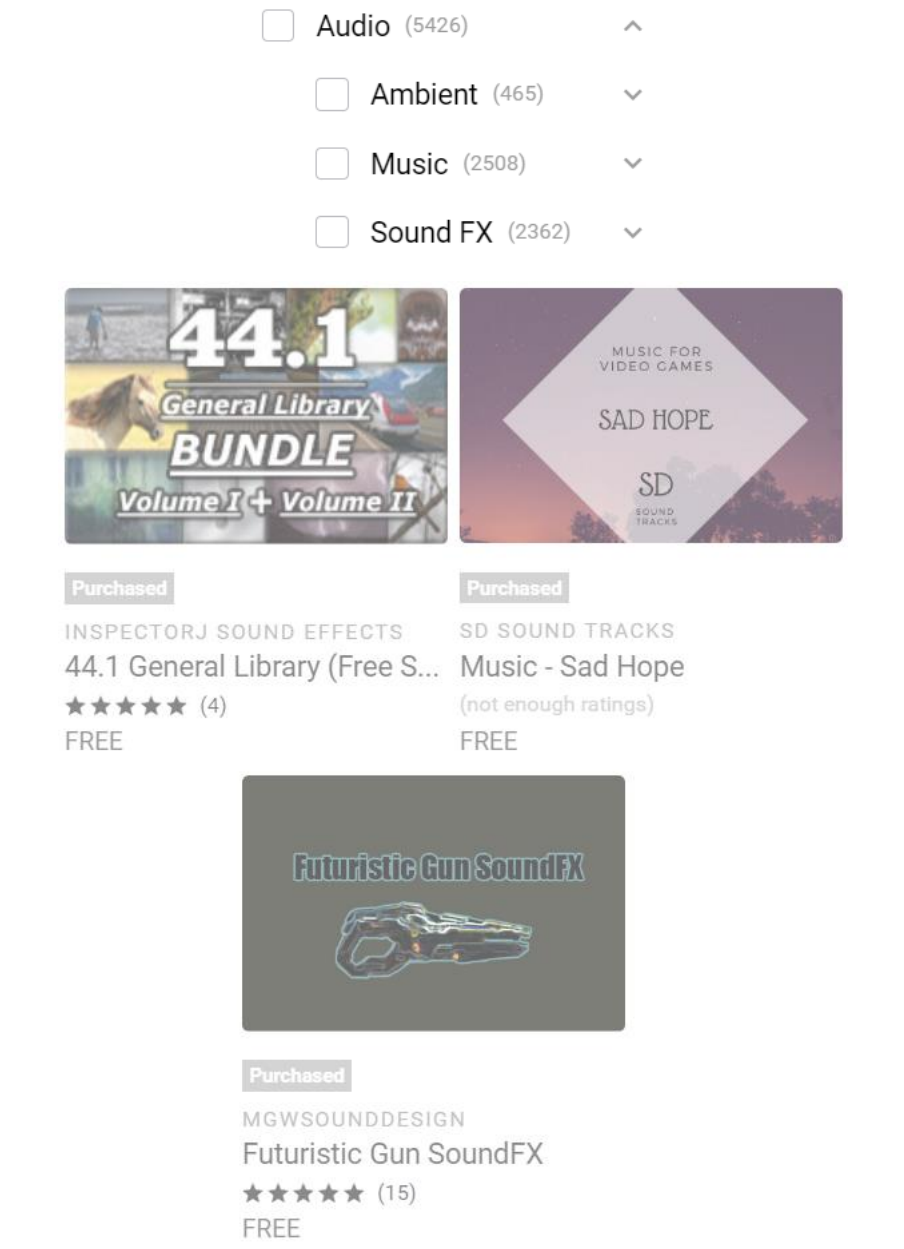

x
Persp
Bloom
Depth Of Field
Shadows Midtones Highligh
All None
0.00 0.00 0.00 0.00 0.00 0.00 5.00 5.00 5.00
Shadows
Midtones
Highlights

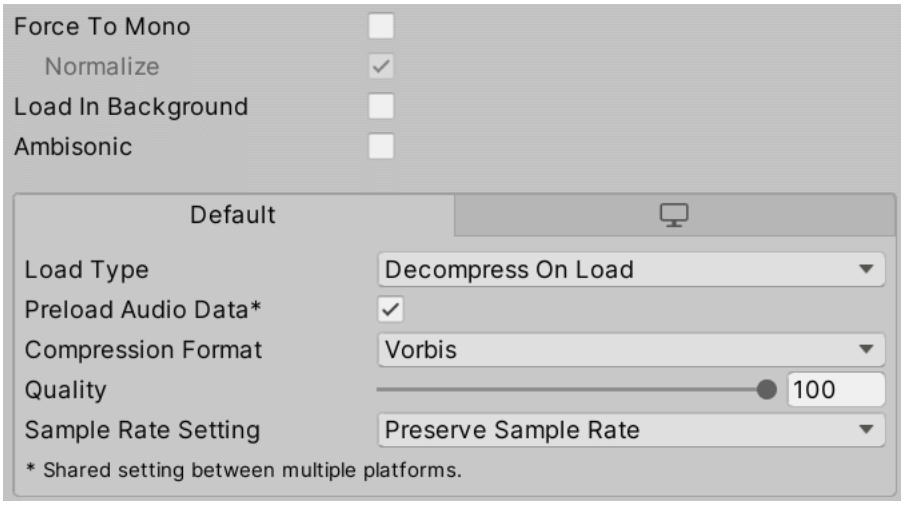

z
x
Persp
White Balance
Bloom
Depth Of Field
Shadows Midtones Highligh
All None
0.00 0.00 0.00 0.00 0.00 0.00 0.69 1.43 0.43
Shadows
Midtones
Highlights


Shadows Midtones Highligh
All None
0.89 0.99 1.29 1.29 1.28 1.06 0.94 0.84 0.94



Chapter 10: Sound and Music Integration



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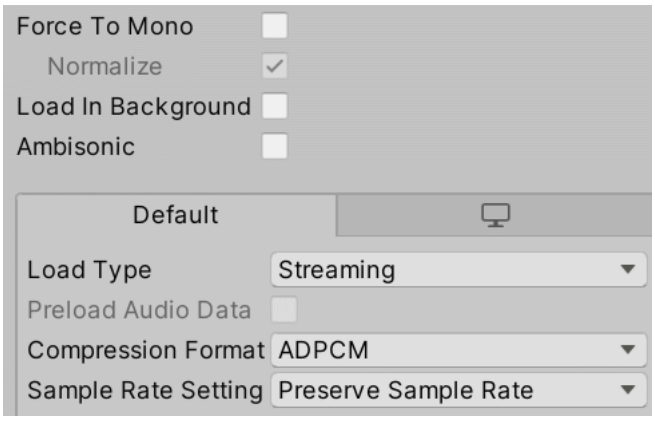
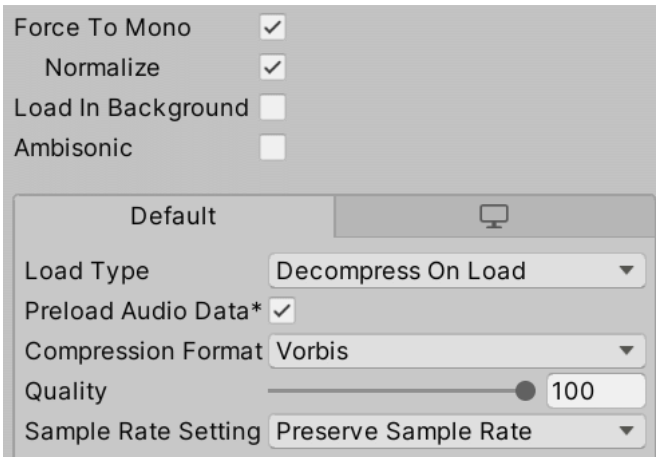
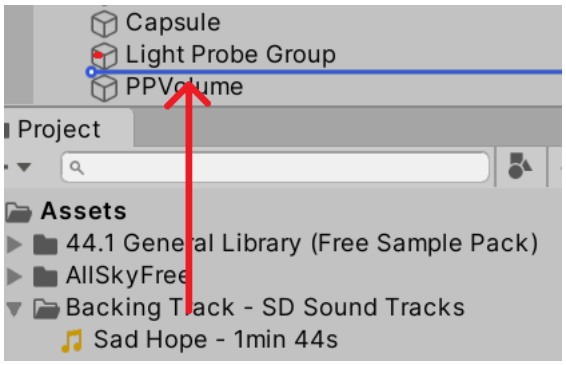
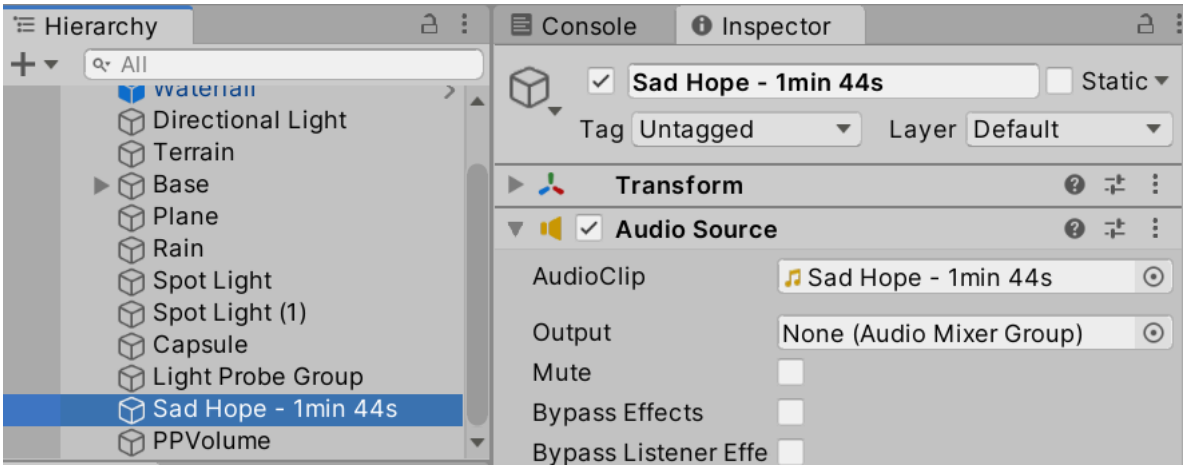
Imported Size: 72.1 KB
Ratio: 27.88%
Original Size: 258.4 KB
Imported Size: 14.8 KB
Ratio: 5.72%

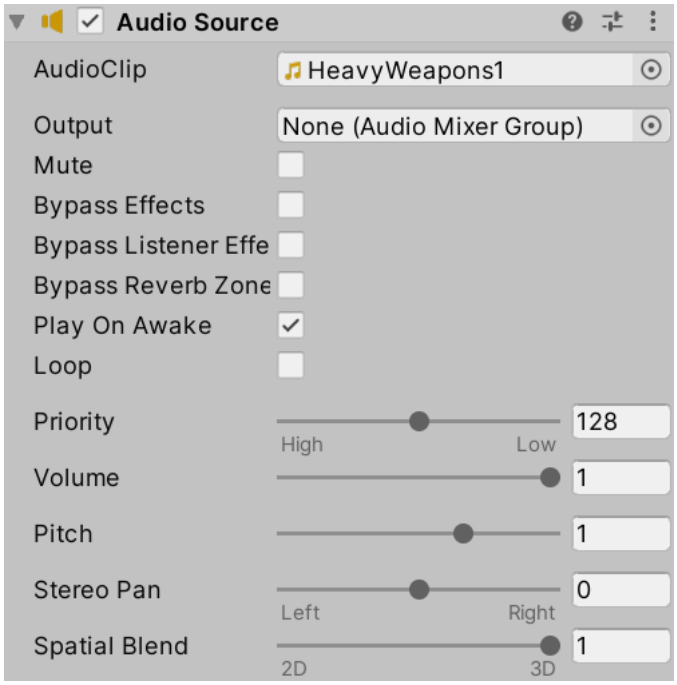

Force To Mono
Normalize
Load In Background
Ambisonic
Default
Load Type
Streaming
Preload Audio Data
Compression Format
ADPCM
Sample Rate Setting
Preserve Sample Rate

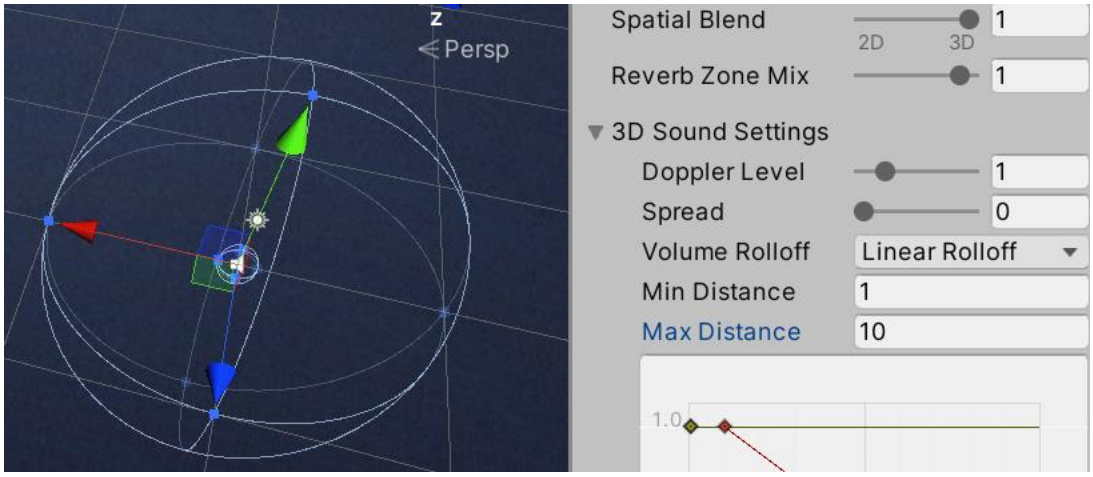

Force To Mono
Normalize
Load In Background
Ambisonic
Default
Load Type
Decompress On Load
Preload Audio Data*
Compression Format
Vorbis
Quality
100
Sample Rate Setting
Preserve Sample Rate

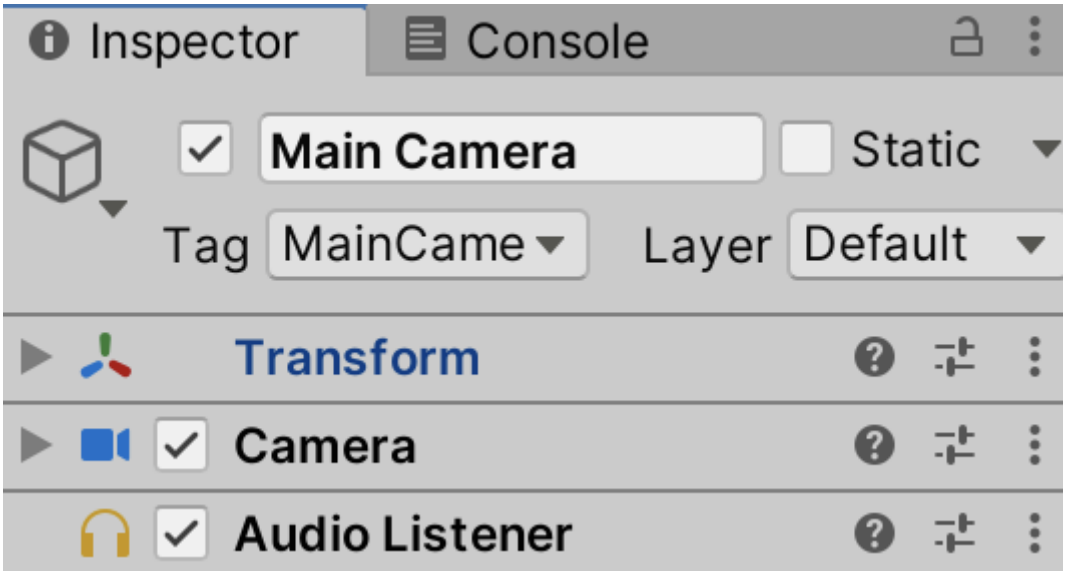

Capsule
Light Probe Group
PPVolume
Project
Assets
44.1 General Library (Free Sample Pack)
AllSkyFree
Backing Track - SD Sound Tracks
Sad Hope - 1min 44s


Hierarchy
All
Directional Light
Terrain
Base
Plane
Rain
Spot Light
Spot Light (1)
Capsule
Light Probe Group
Sad Hope - 1min 44s
PPVolume
Console
Inspector
Sad Hope - 1min 44s
Static
Tag
Untagged
Layer
Default
Transform
Audio Source
AudioClip
Sad Hope - 1min 44s
Output
None (Audio Mixer Group)
Mute
Bypass Effects
Bypass Listener Effe


Audio Source
AudioClip
Sad Hope - 1min 44s
Output
None (Audio Mixer Group)
Mute
Bypass Effects
Bypass Listener Effe
Bypass Reverb Zone
Play On Awake
Loop
Priority
128
High
Low
Volume
1
Pitch
1
Stereo Pan
0
Left
Right
Spatial Blend
0
2D
3D

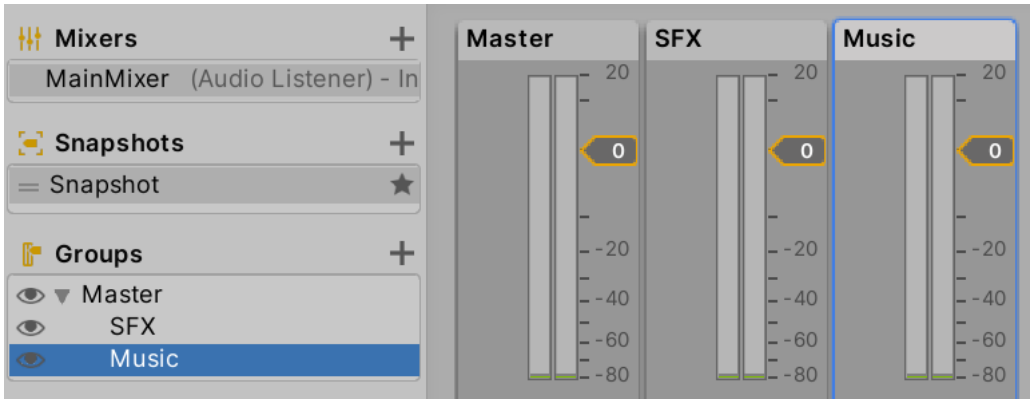

Audio Source
AudioClip
HeavyWeapons1
Output
None (Audio Mixer Group)
Mute
Bypass Effects
Bypass Listener Effe
Bypass Reverb Zone
Play On Awake
Loop
Priority
128
High
Low
Volume
1
Pitch
1
Stereo Pan
0
Left
Right
Spatial Blend
1
2D
3D

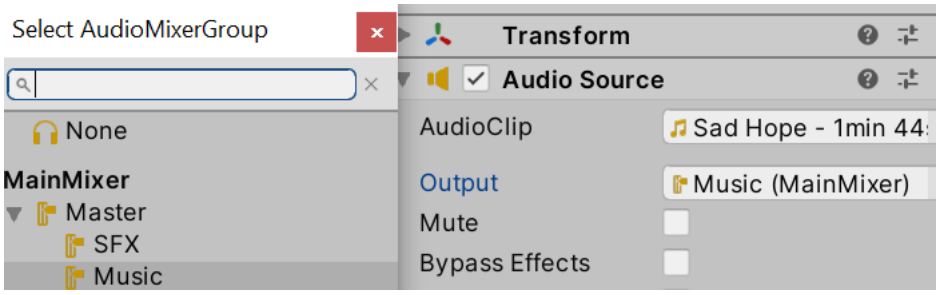

Persp
Spatial Blend
2D
3D
1
Reverb Zone Mix
1
3D Sound Settings
Doppler Level
1
Spread
0
Volume Rolloff
Linear Rolloff
Min Distance
1
Max Distance
10
1.0

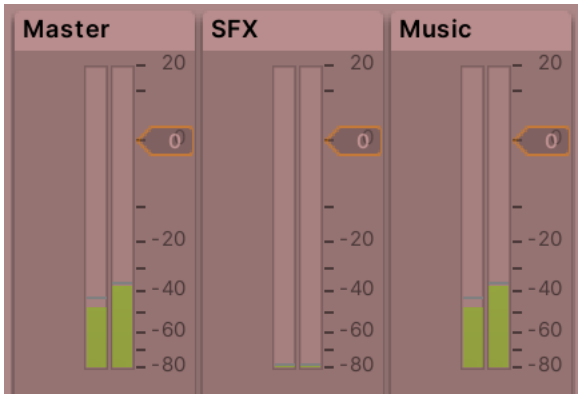

Inspector
Console
Main Camera
Static
Tag
MainCame
Layer
Default
Transform
Camera
Audio Listener

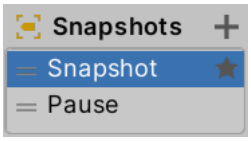

Audio Mixer
Scene
Game
Mixers
MainMixer (Audio Listener) - In
Snapshots
Snapshot
Groups
Master
Views
View
Master
20
0
-20
-40
-60
-80
-80.0 dB
S
M
B
Attenuation
Add...

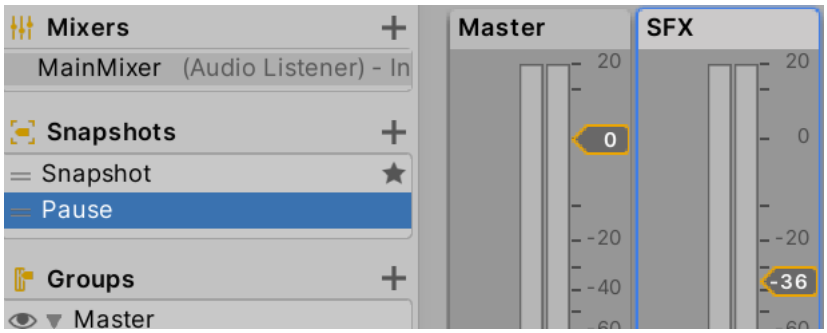

Groups

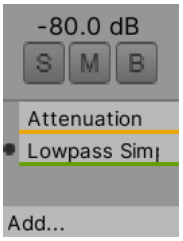

Mixers
MainMixer (Audio Listener) - In
Snapshots
Snapshot
Groups
Master
SFX
Music
Master
SFX
Music
20
0
-20
-40
-60
-80

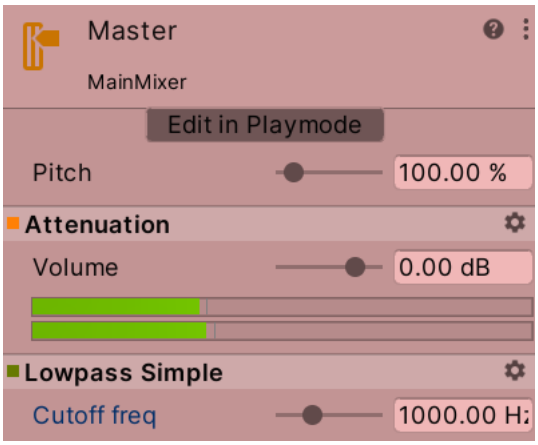

Select AudioMixerGroup
None
MainMixer
Master
SFX
Music
Transform
Audio Source
AudioClip
Sad Hope - 1min 44
Output
Music (MainMixer)
Mute
Bypass Effects


Master
SFX
Music
20
0
-20
-40
-60
-80

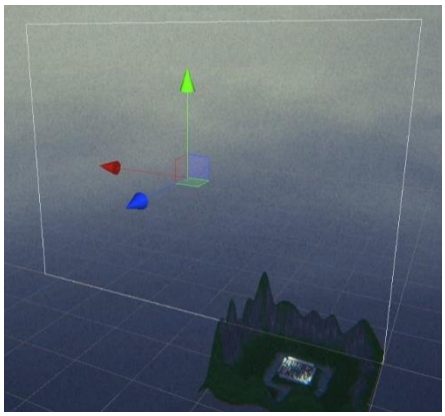

Snapshots
Snapshot
Pause

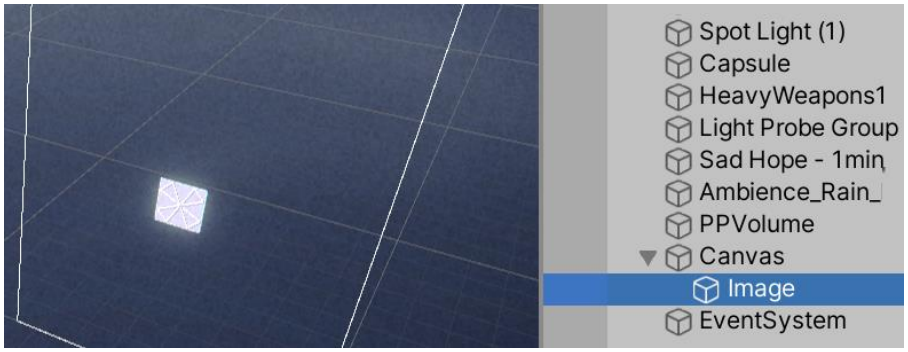

Mixers
MainMixer (Audio Listener) - In
Snapshots
Snapshot
Pause
Groups
Master
Master
SFX
20
0
-20
-40
-36

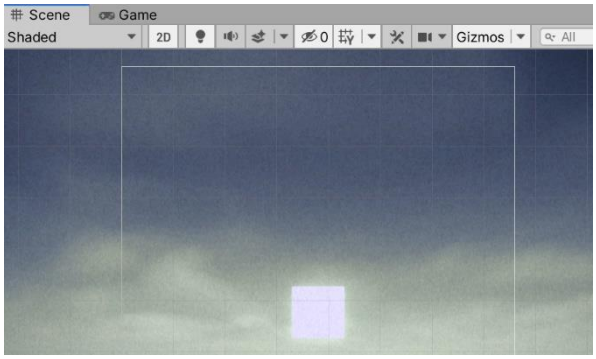

-80.0 dB
S
M
B
Attenuation
Lowpass Sim
Add...

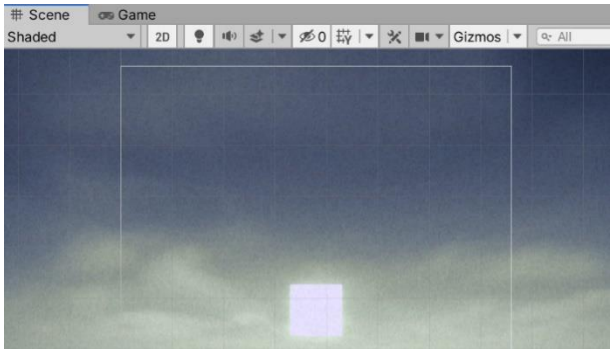

Master
MainMixer
Edit in Playmode
Pitch
100.00 %
Attenuation
Volume
0.00 dB
Lowpass Simple
Cutoff freq
1000.00 Hz

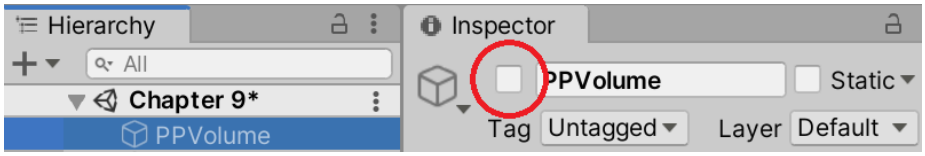
Chapter 11: User Interface Design

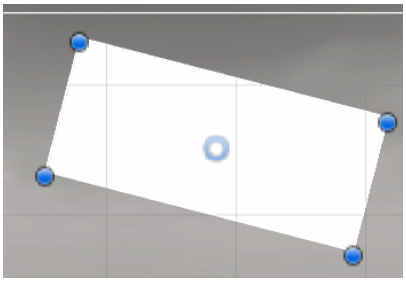




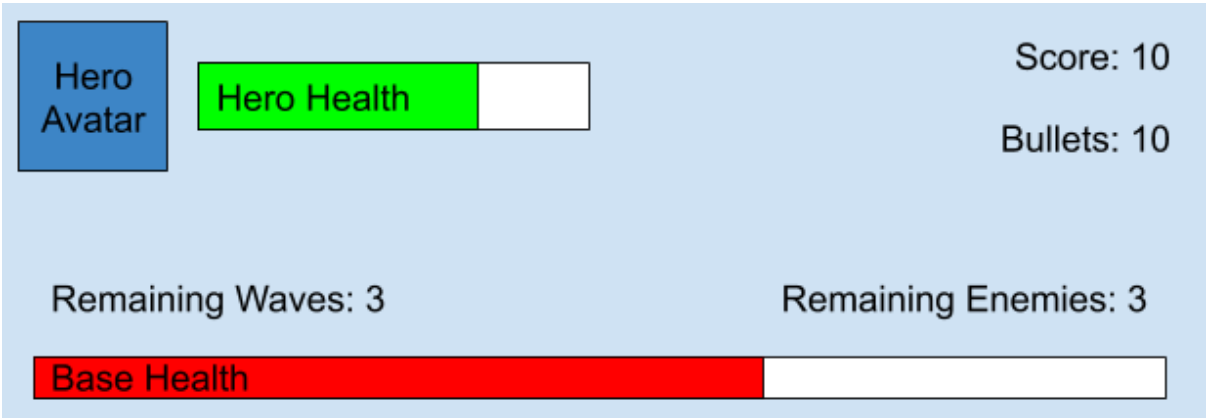


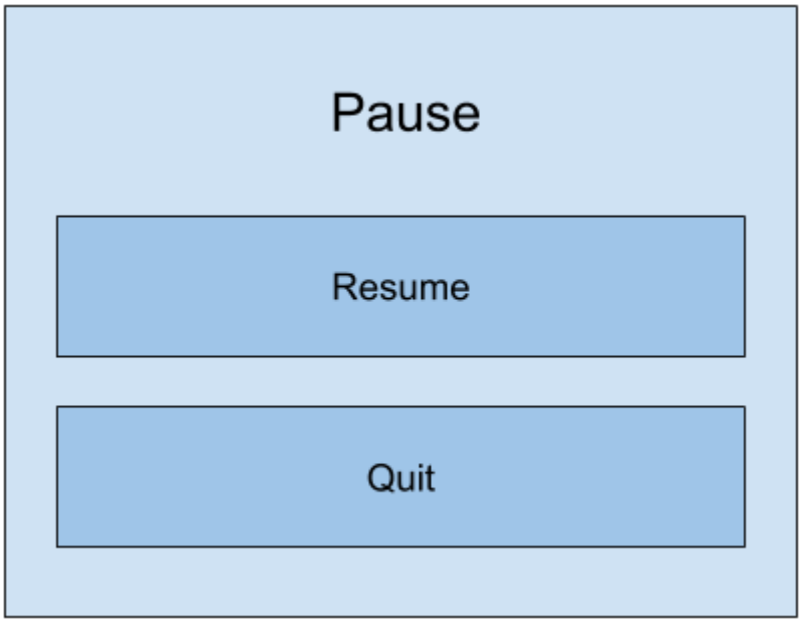

Scene
Game
Shaded
2D
Gizmos
All


Hierarchy
All
Chapter 9*
PPVolume
Inspector
PPVolume
Static
Tag
Untagged
Layer
Default




Rect Transform
center
middle
Pos X
Pos Y
Pos Z
205
377
0
Width
Height
245.7
106.5
R


Hero Avatar
Hero Health
Score: 10
Bullets: 10
Remaining Waves: 3
Remaining Enemies: 3
Base Health

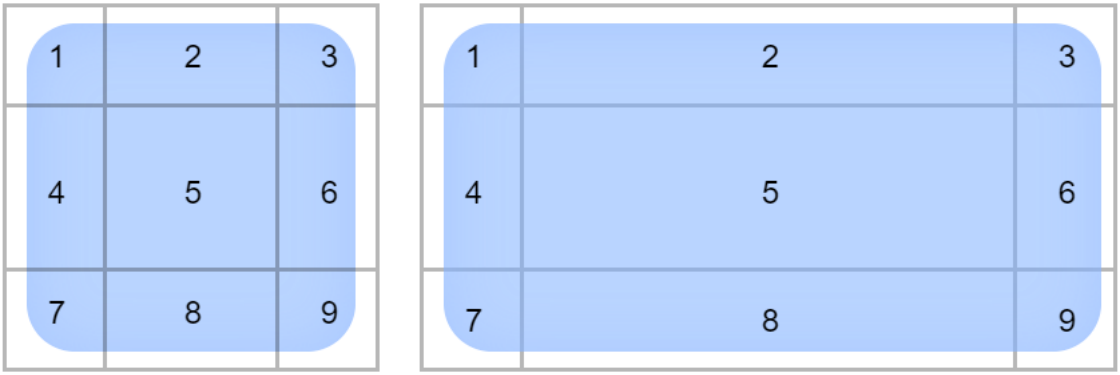


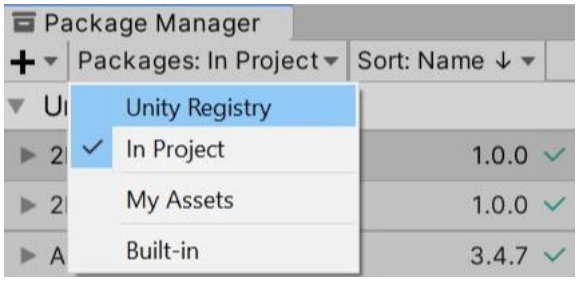
PONETI

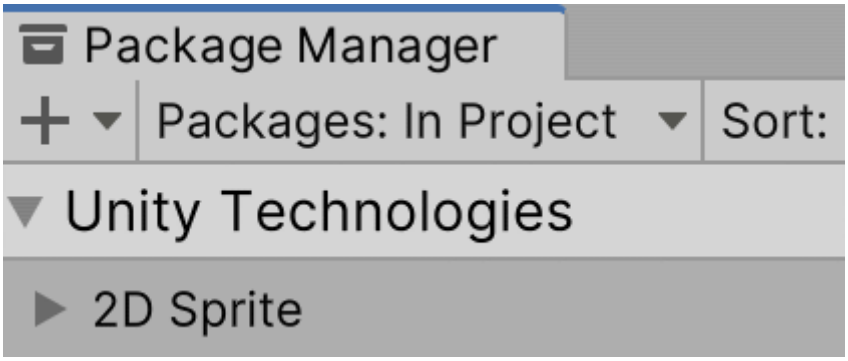
GUI Parts

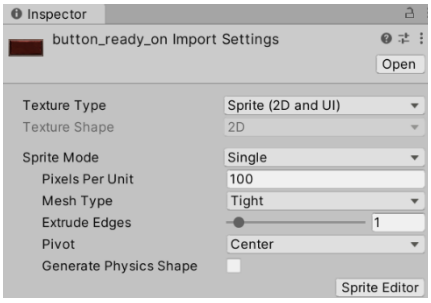
★★★★★ (4)

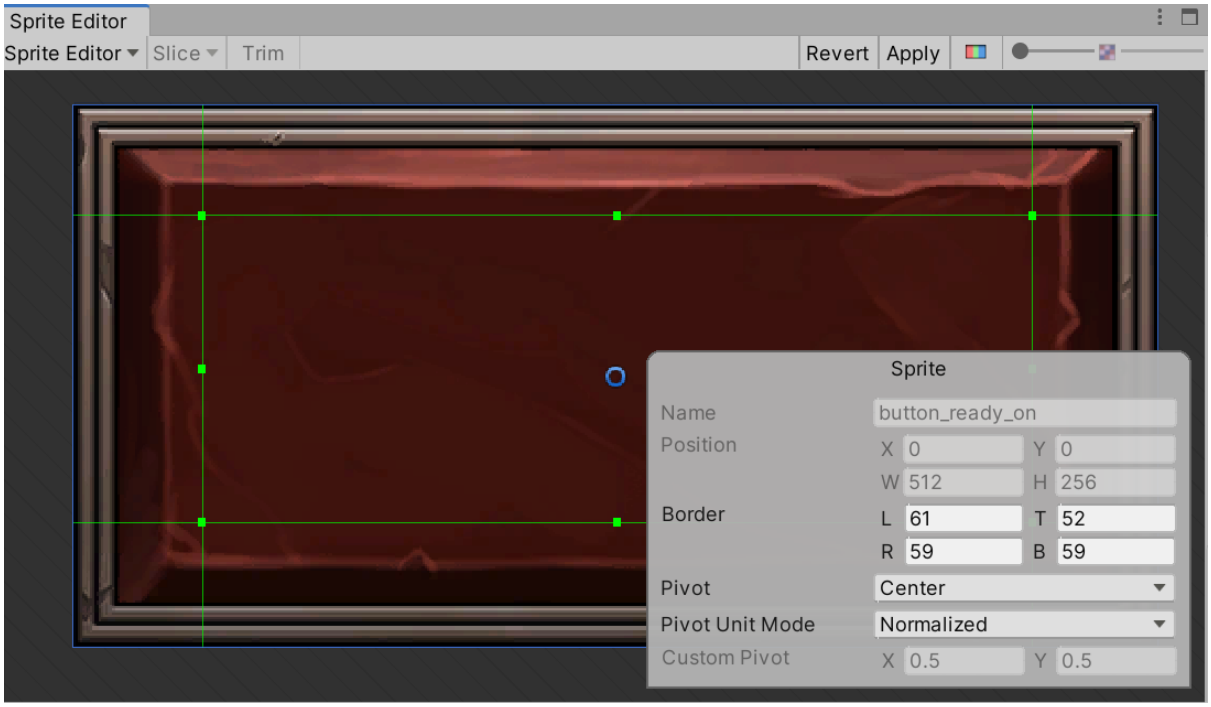
FREE

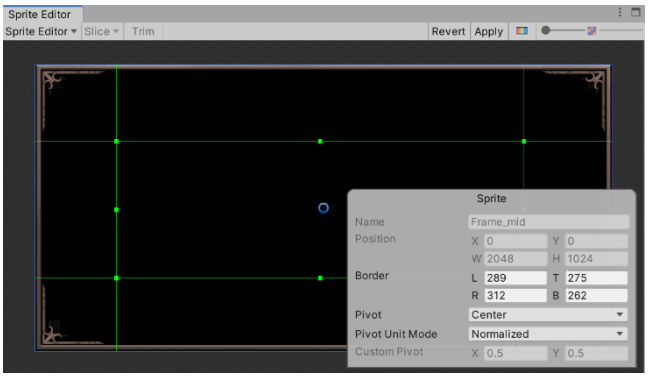

1
2
3
4
5
6
7
8
9
1
2
3
4
5
6
7
8
9


Package Manager
Packages: In Project
Sort: Name
Unity Registry
In Project
My Assets
Built-in
1.0.0
1.0.0
3.4.7


Package Manager
Packages: In Project
Sort:
Unity Technologies
2D Sprite


Inspector
button_ready_on Import Settings
Open
Texture Type
Sprite (2D and UI)
Texture Shape
2D
Sprite Mode
Single
Pixels Per Unit
100
Mesh Type
Tight
Extrude Edges
1
Pivot
Center
Generate Physics Shape
Sprite Editor



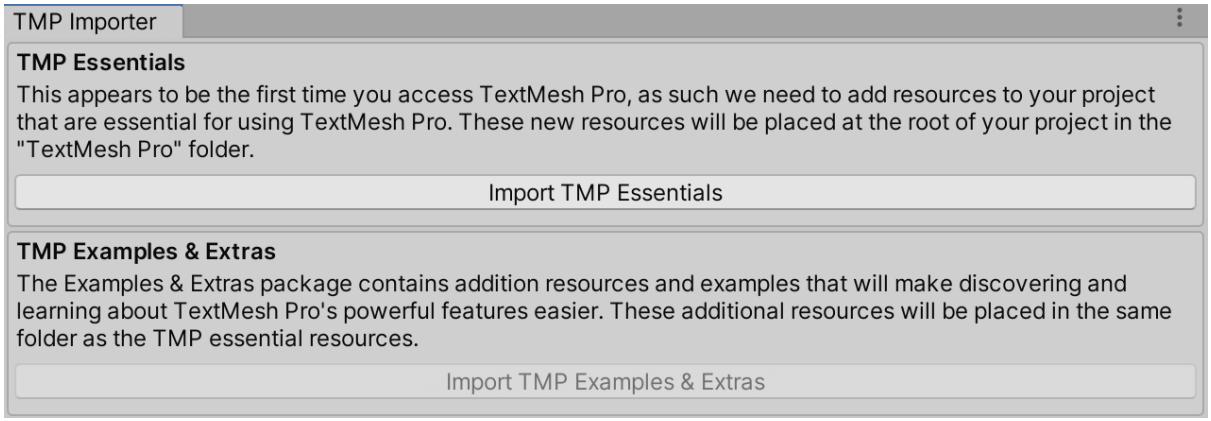


militech_r_2019-04-13.ttf

Militech

militech_o_2019-04-13.ttf

Militech


TMP Importer
TMP Essentials
This appears to be the first time you access TextMesh Pro, as such we need to add resources to your project that are essential for using TextMesh Pro. These new resources will be placed at the root of your project in the "TextMesh Pro" folder.
Import TMP Essentials
TMP Examples & Extras
The Examples & Extras package contains addition resources and examples that will make discovering and learning about TextMesh Pro's powerful features easier. These additional resources will be placed in the same folder as the TMP essential resources.
Import TMP Examples & Extras

Font Asset Creator

Font Settings

Source Font File	Aa militech_o_2019-04-13
Sampling Point Size	Auto Sizing
Padding	5
Packing Method	Optimum
Atlas Resolution	512 × 512
Character Set	ASCII
Render Mode	SDFAA
Get Kerning Pairs	☐

Generate Font Atlas

Generation completed in: 47.29 ms X

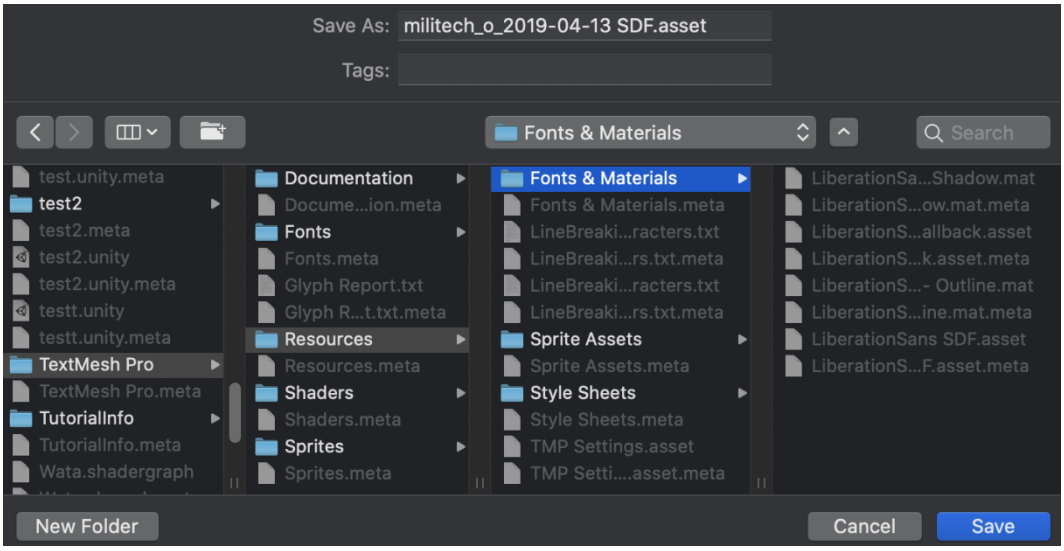
Font: Militech Style: Outlined
Point Size: 88 SP/PD Ratio: 5.7%

Characters included: 97/99
Missing characters: 2
Excluded characters: 0

Characters missing from font file:

ID: 8203	Hex: 200B	Char []
ID: 9633	Hex: 25A1	Char [□]

Save | Save as...


Save As: militech_o_2019-04-13 SDF.asset
Tags:
Fonts & Materials
Search
test.unity.meta
test2
test2.meta
test2.unity
test2.unity.meta
testt.unity
testt.unity.meta
TextMesh Pro
TextMesh Pro.meta
TutorialInfo
TutorialInfo.meta
Wata.shadergraph
Documentation
Docume...ion.meta
Fonts
Fonts.meta
Glyph Report.txt
Glyph R...t.txt.meta
Resources
Resources.meta
Shaders
Shaders.meta
Sprites
Sprites.meta
Fonts & Materials
Fonts & Materials.meta
LineBreaki...racters.txt
LineBreaki...rs.txt.meta
LineBreaki...racters.txt
LineBreaki...rs.txt.meta
Sprite Assets
Sprite Assets.meta
Style Sheets
Style Sheets.meta
TMP Settings.asset
TMP Setti....asset.meta
LiberationSa...Shadow.mat
LiberationS...ow.mat.meta
LiberationS...allback.asset
LiberationS...k.asset.meta
LiberationS...- Outline.mat
LiberationS...ine.mat.meta
LiberationSans SDF.asset
LiberationS...F.asset.meta
New Folder
Cancel
Save

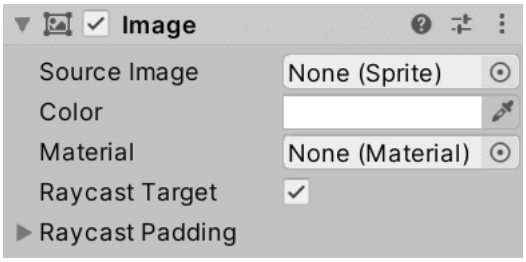
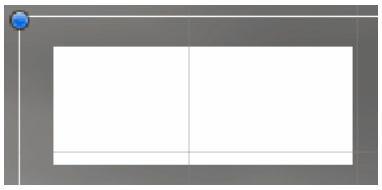


Image
Source Image
None (Sprite)
Color
Material
None (Material)
Raycast Target
Raycast Padding



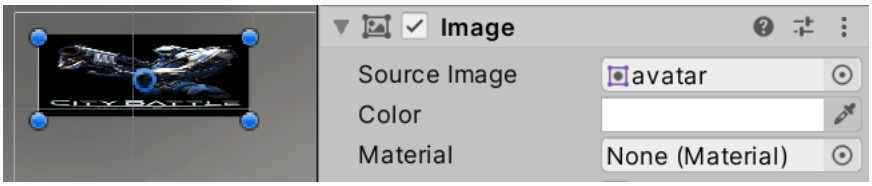
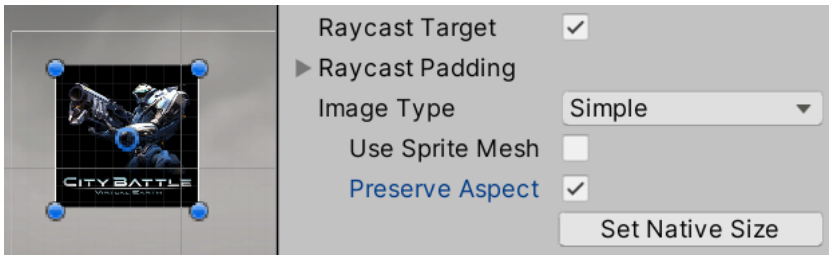


Image
Source Image
avatar
Color
Material
None (Material)


Raycast Target
Raycast Padding
Image Type
Simple
Use Sprite Mesh
Preserve Aspect
Set Native Size

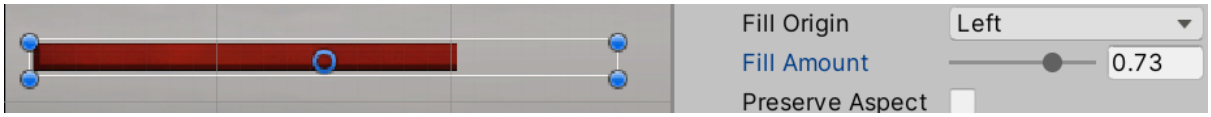
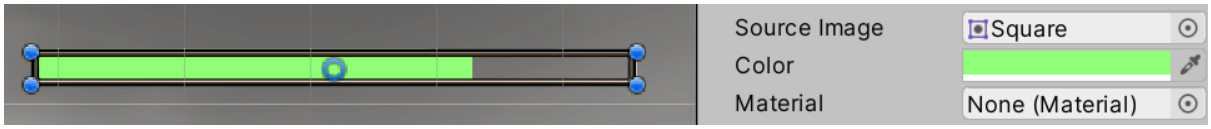
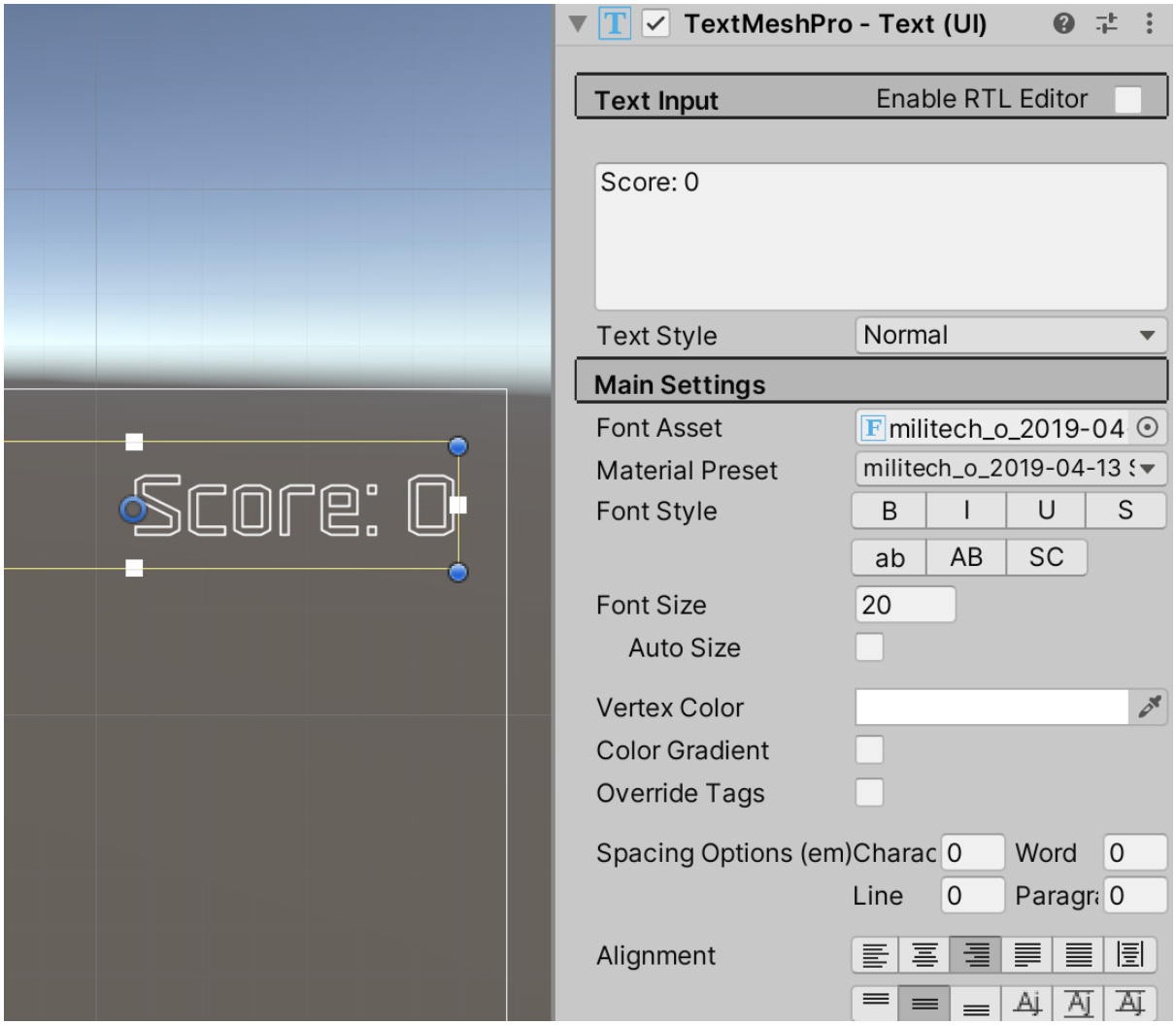
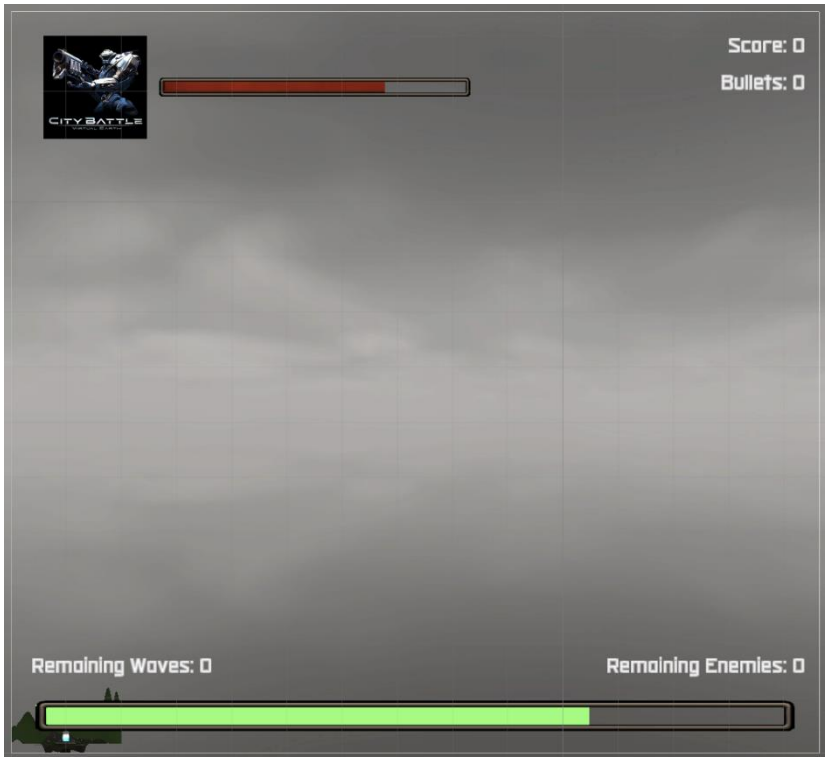
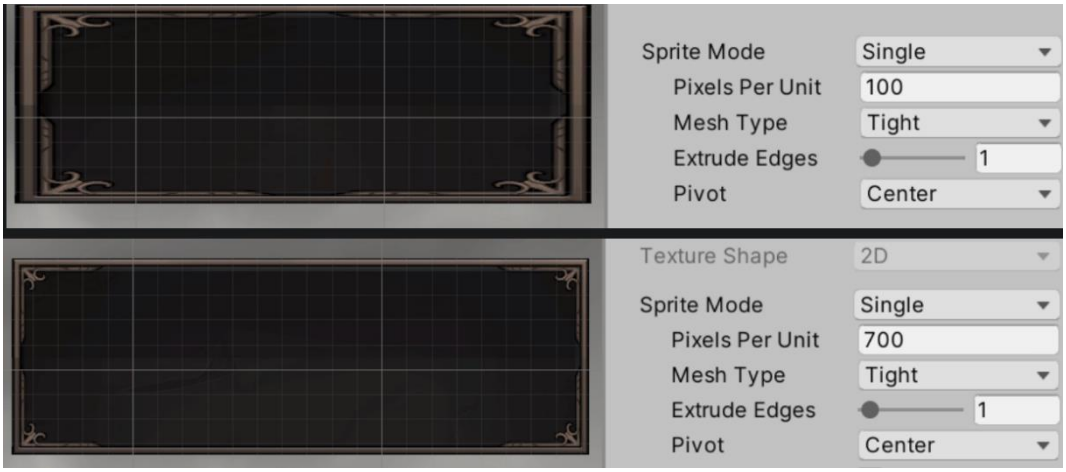

Fill Origin
Left
Fill Amount
0.73
Preserve Aspect

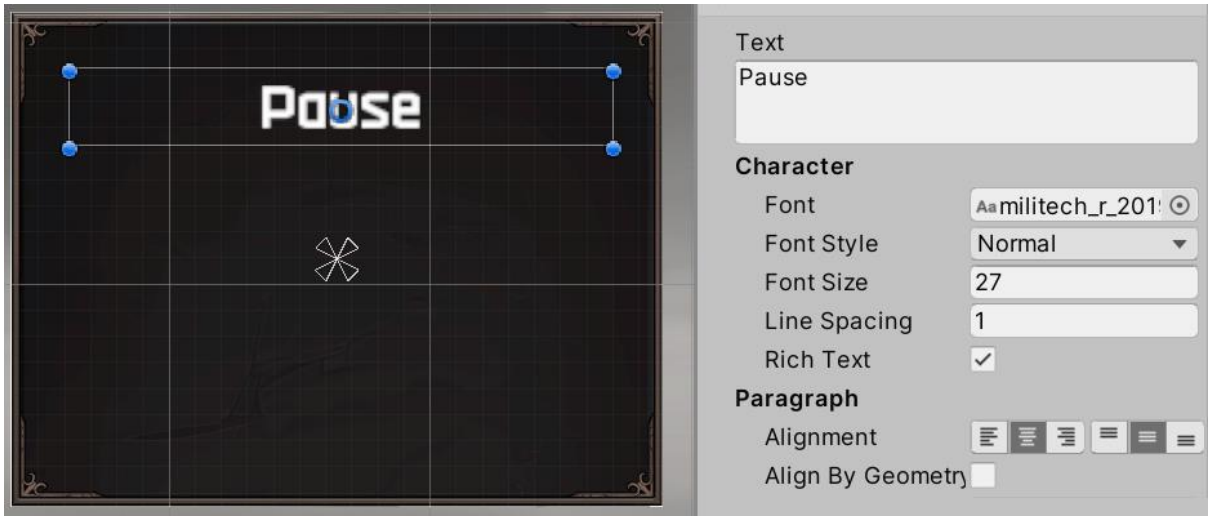

Image
HealthBar
HealthBarFrame

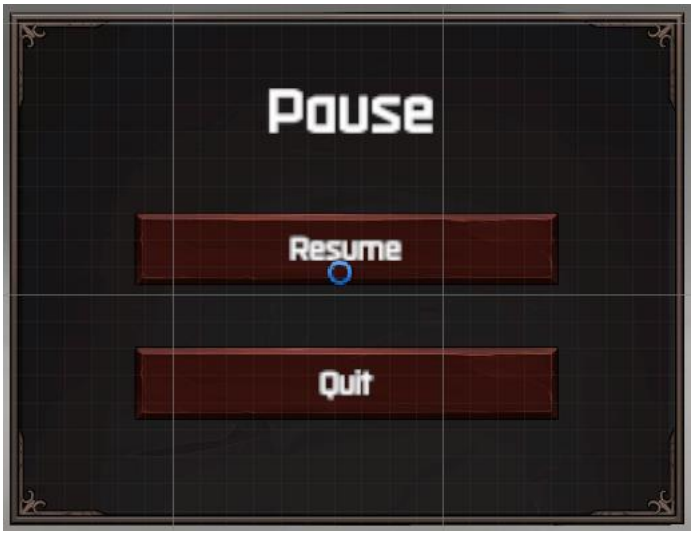

Source Image
Square
Color
Material
None (Material)

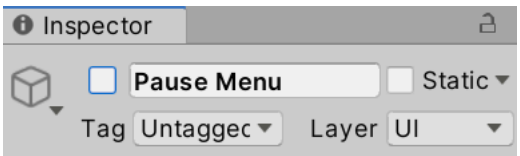

Score: 0
TextMeshPro - Text (UI)
Text Input
Enable RTL Editor
Score: 0
Text Style
Normal
Main Settings
Font Asset
militech_o_2019-04
Material Preset
militech_o_2019-04-13
Font Style
B
I
U
S
ab
AB
SC
Font Size
20
Auto Size
Vertex Color
Color Gradient
Override Tags
Spacing Options (em)
Charac
0
Word
0
Line
0
Paragra
0
Alignment

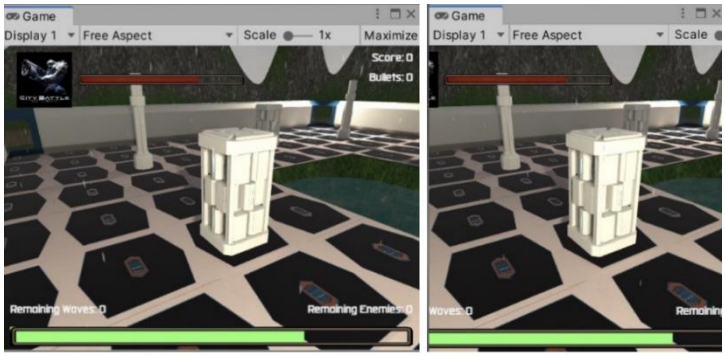

Score: 0
Bullets: 0
Remaining Waves: 0
Remaining Enemies: 0


Sprite Mode
Single
Pixels Per Unit
100
Mesh Type
Tight
Extrude Edges
1
Pivot
Center
Texture Shape
2D
Sprite Mode
Single
Pixels Per Unit
700
Mesh Type
Tight
Extrude Edges
1
Pivot
Center

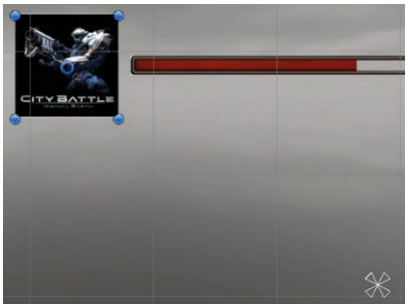

Pause
Text
Pause
Character
Font
militech_r_201
Font Style
Normal
Font Size
27
Line Spacing
1
Rich Text
Paragraph
Alignment
Align By Geometry


Pause
Resume
Quit

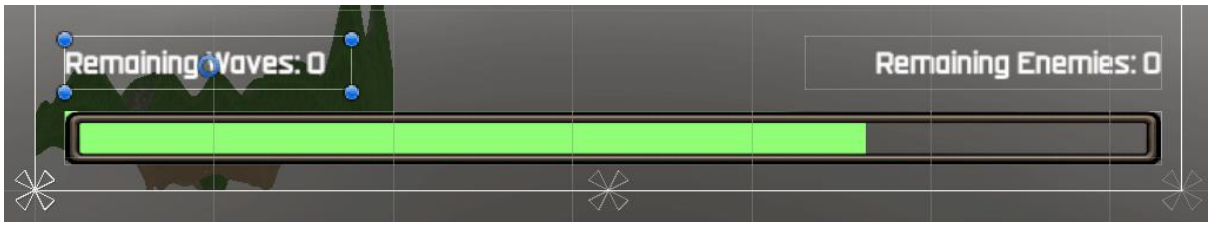

Inspector
Pause Menu
Static
Tag
Untaggec
Layer
UI


Game
Display 1
Free Aspect
Scale
1x
Maximize
Score: 0
Bullets: 0
Remaining Waves: 0
Remaining Enemies: 0


Game
Display 1
Free Aspect
Scale
1x
Maximize On Play
Mute Audio
Stats


CITY BATTLE


CITY BATTLE
VIRTUAL EARTH

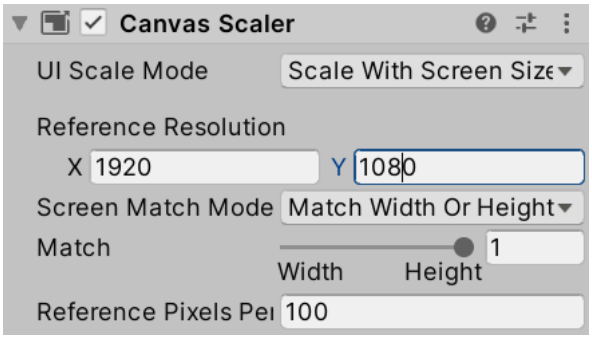

Remaining Waves: 0
Remaining Enemies: 0

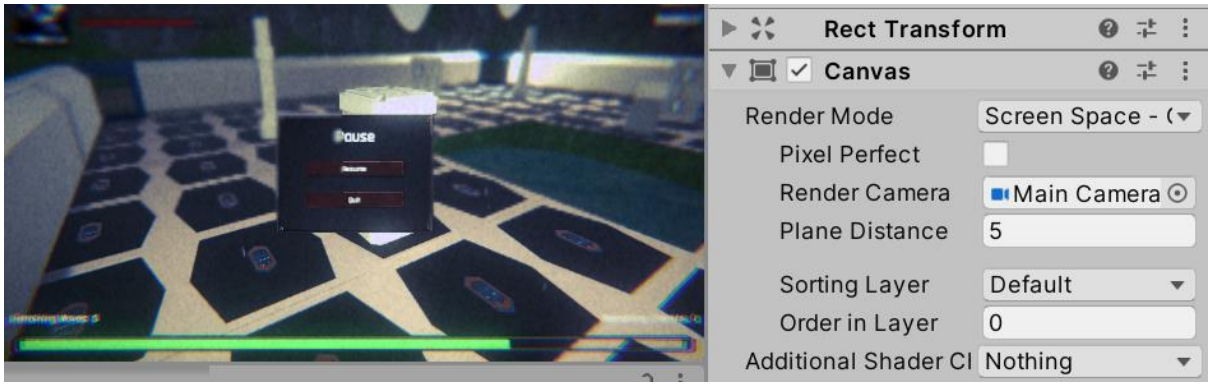

Score: 0
Bullets: 0


Score: 0
Bullets: 0
Preview
Remaining Waves: 0
Remaining Enemies: 0

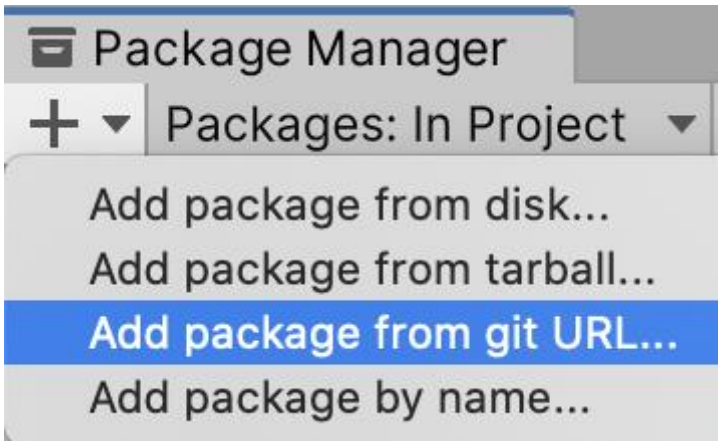

Rect Transform
stretch
bottom
Left
Pos Y
Pos Z
20
30
0
Right
Height
20
19
R

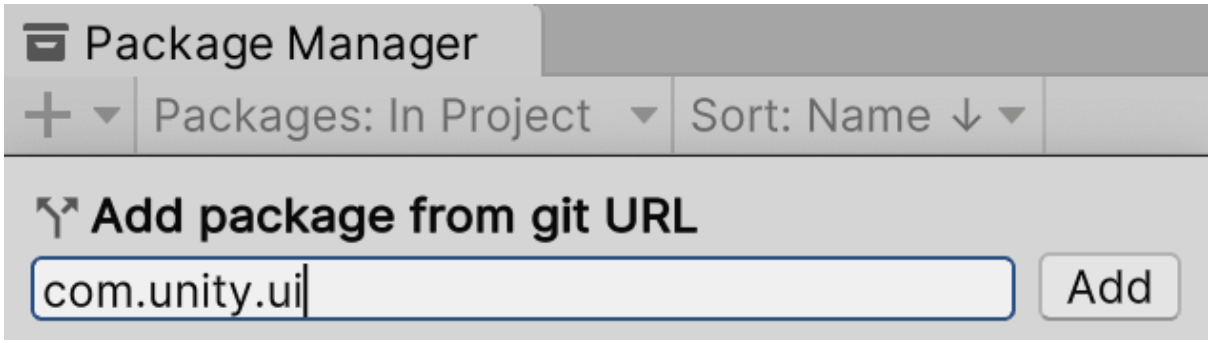

Quit


Canvas Scaler
UI Scale Mode
Scale With Screen Size
Reference Resolution
X 1920
Y 1080
Screen Match Mode
Match Width Or Height
Match
1
Width
Height
Reference Pixels Per
100


Pause
Rect Transform
Canvas
Render Mode
Screen Space - (
Pixel Perfect
Render Camera
Main Camera
Plane Distance
5
Sorting Layer
Default
Order in Layer
0
Additional Shader Cl
Nothing

Chapter 12: Creating a UI with the UI Toolkit






```
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    <ui:VisualElement name="PlayerLogo" style="position: absolute; height: 150px; width:
    <ui:Label text="Score: 100" display-tooltip-when-elided="true" style="position: absol
    <ui:VisualElement name="LifeBar" style="position: absolute; left: 113px; right: 126px;
        <ui:VisualElement name="LifeBarFilling" style="position: absolute; top: 0; left:
        <ui:VisualElement name="LifeBarBorder" style="position: absolute; height: auto;
    </ui:VisualElement>
    <ui:VisualElement name="LifeBar" style="position: absolute; height: 36px; width: 613px
        <ui:VisualElement name="LifeBarFilling" style="position: absolute; top: 0; left: 0
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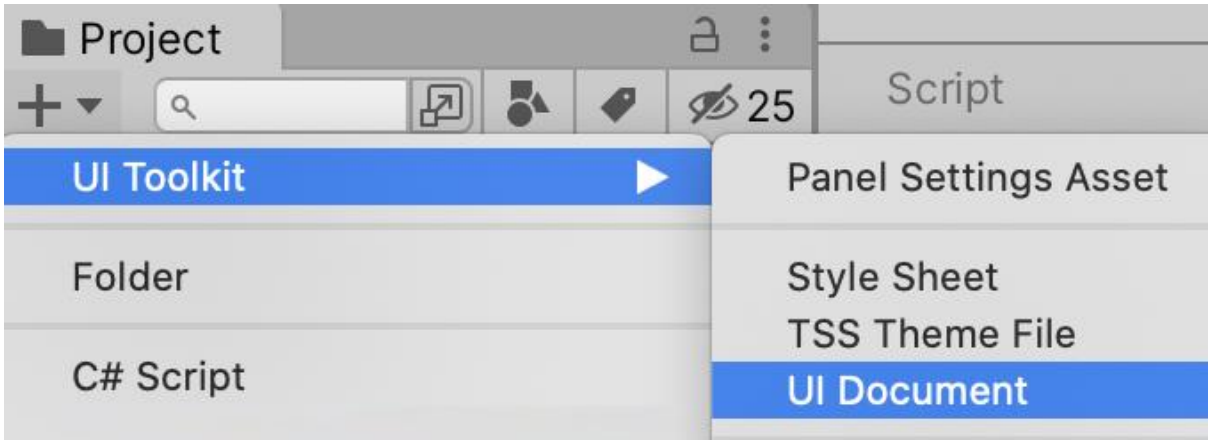
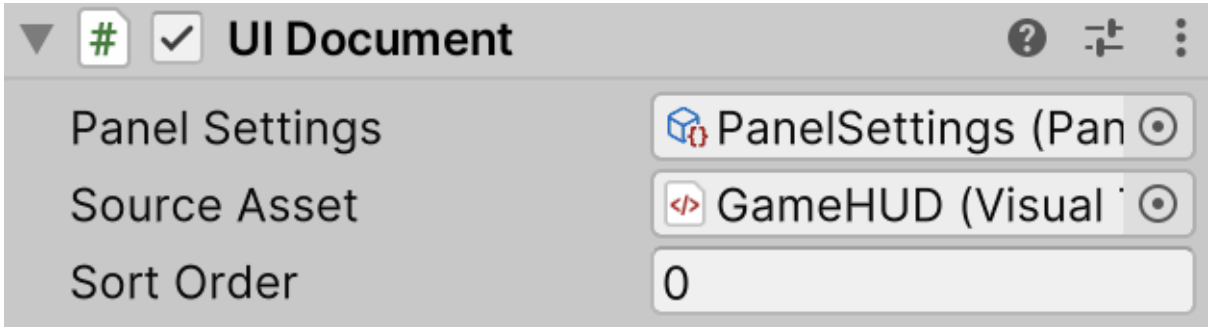
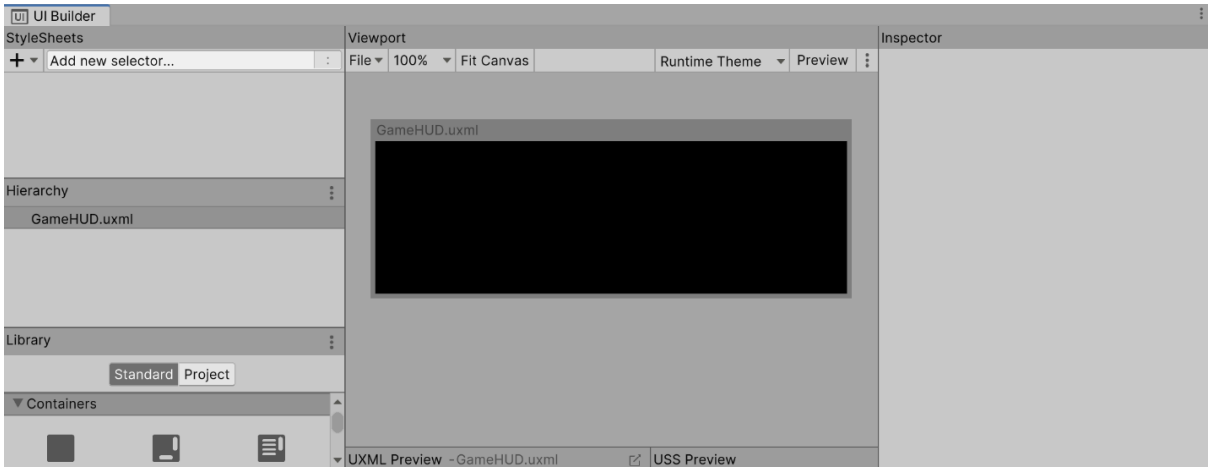
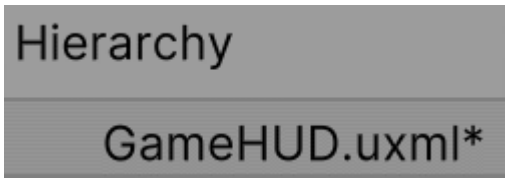
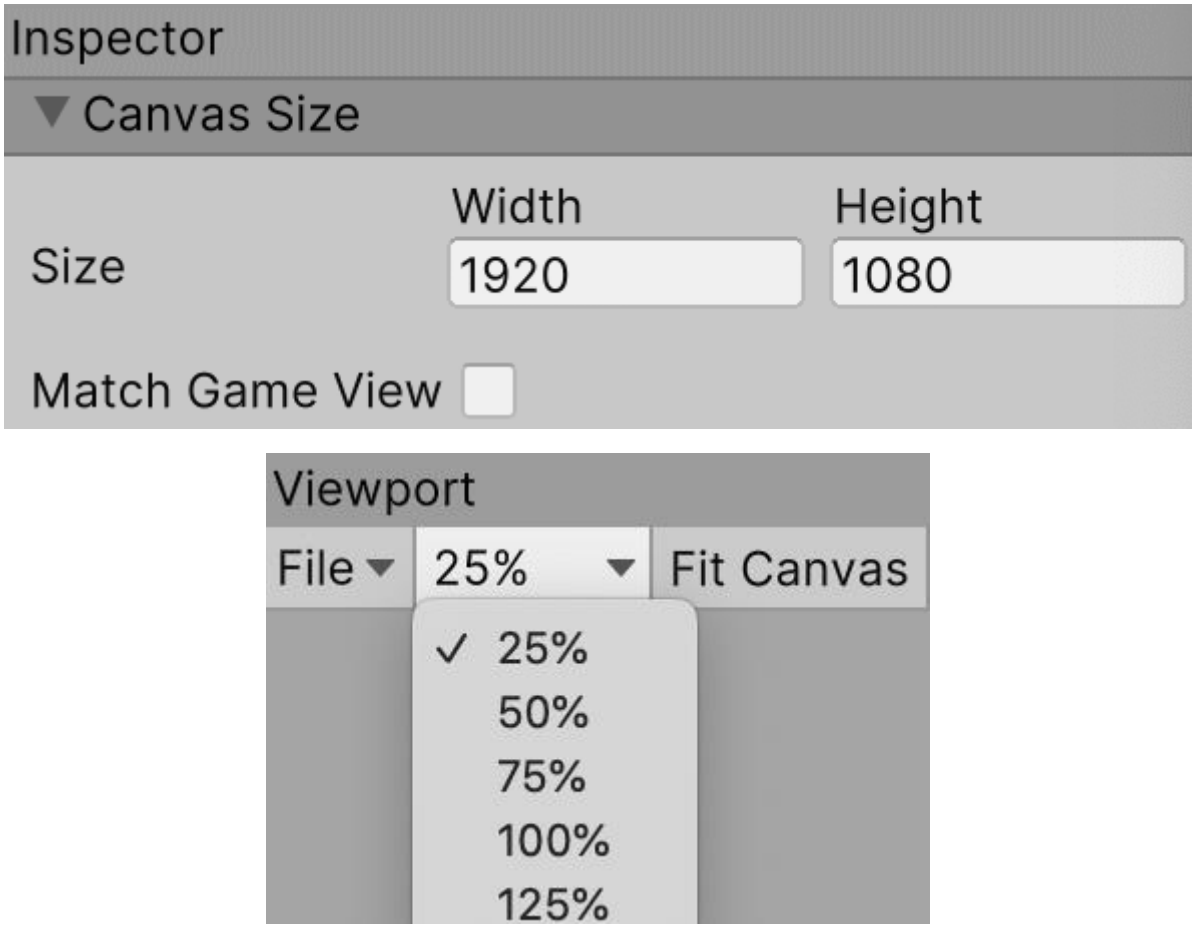
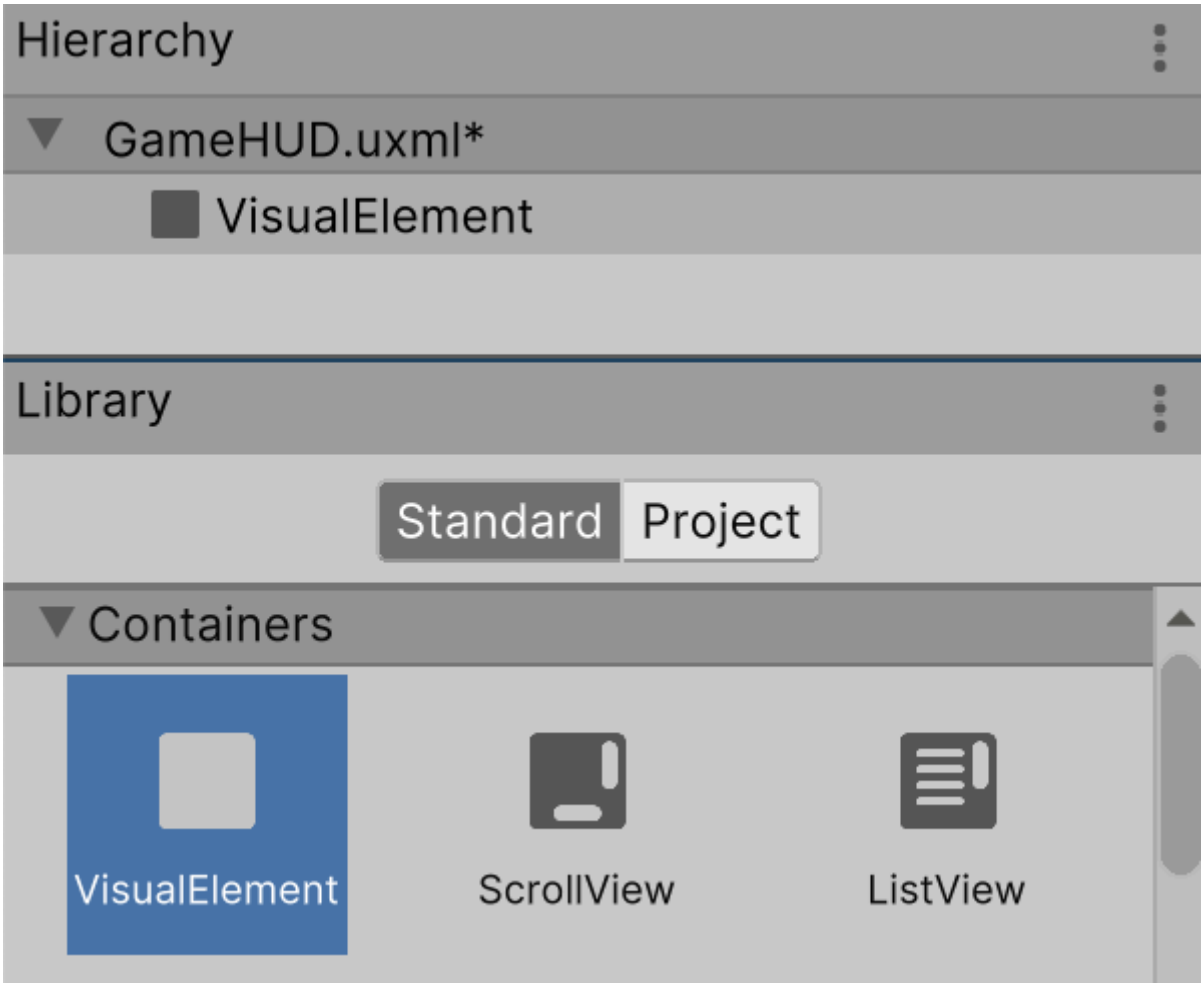

Project
25
Script
UI Toolkit
Panel Settings Asset
Folder
Style Sheet
TSS Theme File
C# Script
UI Document

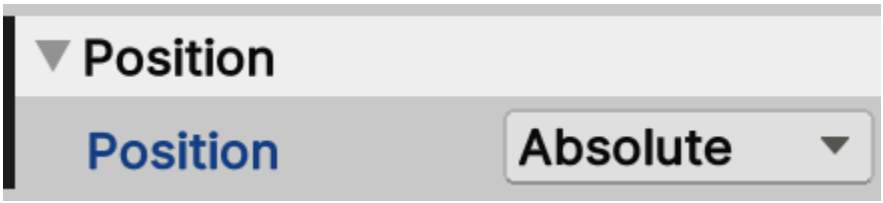

UI Document
Panel Settings
PanelSettings (Pan
Source Asset
GameHUD (Visual
Sort Order
0

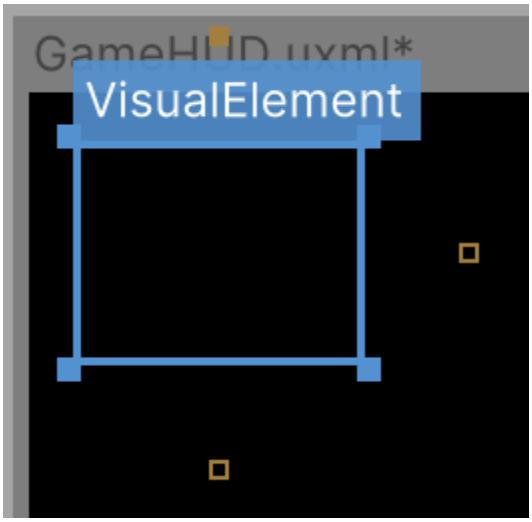

UI Builder
StyleSheets
Add new selector...
Viewport
File
100%
Fit Canvas
Runtime Theme
Preview
Inspector
GameHUD.uxml
Hierarchy
GameHUD.uxml
Library
Standard
Project
Containers
UXML Preview - GameHUD.uxml
USS Preview

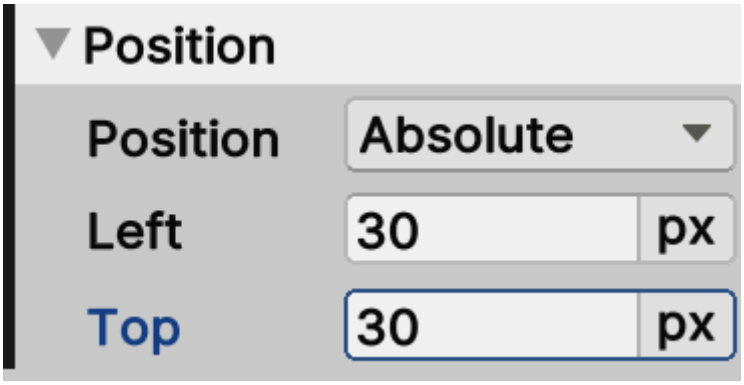

Hierarchy
GameHUD.uxml*


Inspector
Canvas Size
Width
Height
Size
1920
1080
Match Game View
Viewport
File
25%
Fit Canvas
25%
50%
75%
100%
125%


Hierarchy
GameHUD.uxml*
VisualElement
Library
Standard
Project
Containers
VisualElement
ScrollView
ListView


Position
Position
Absolute


VisualElement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Absolute
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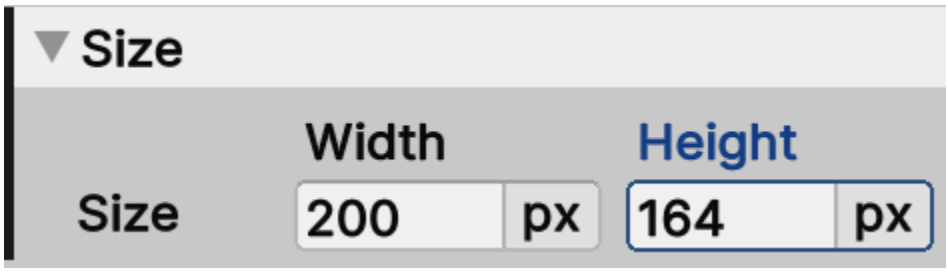
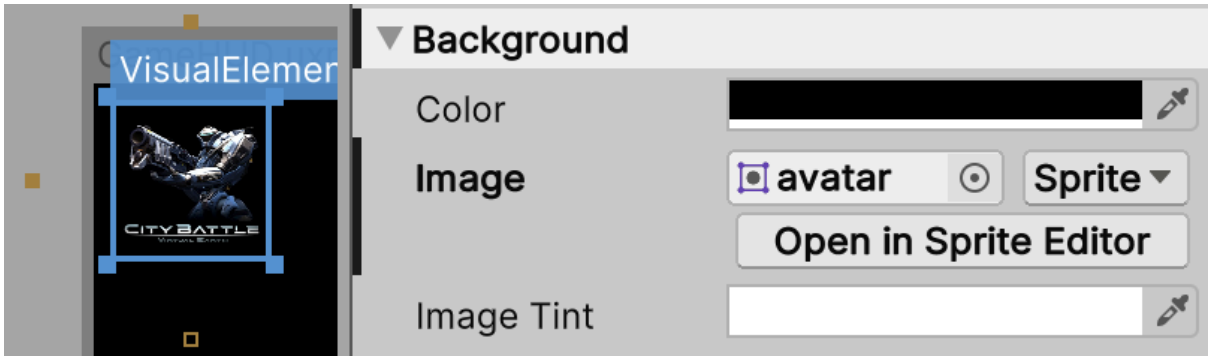
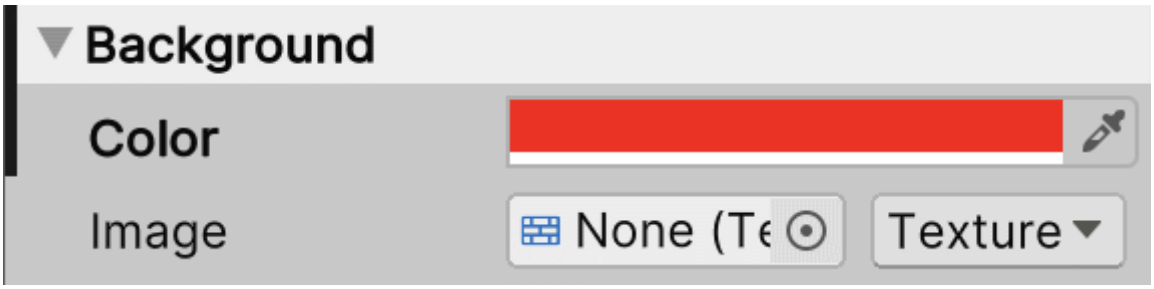
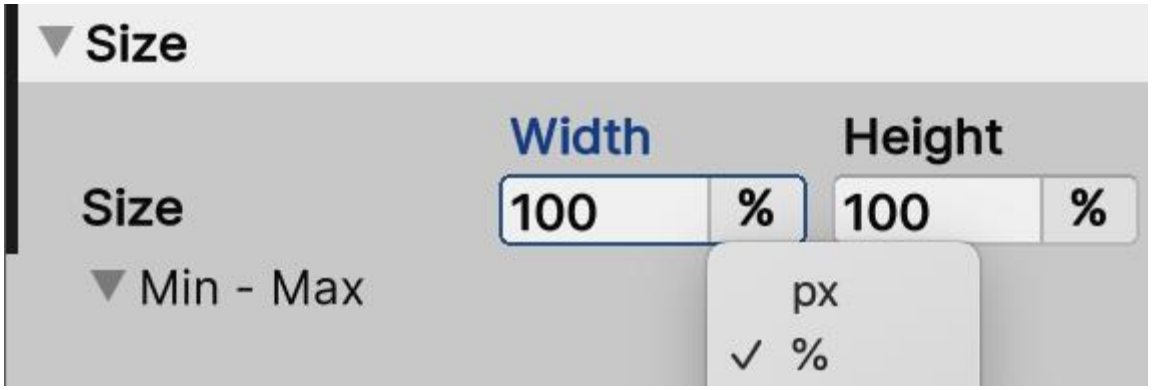
Top
30
px

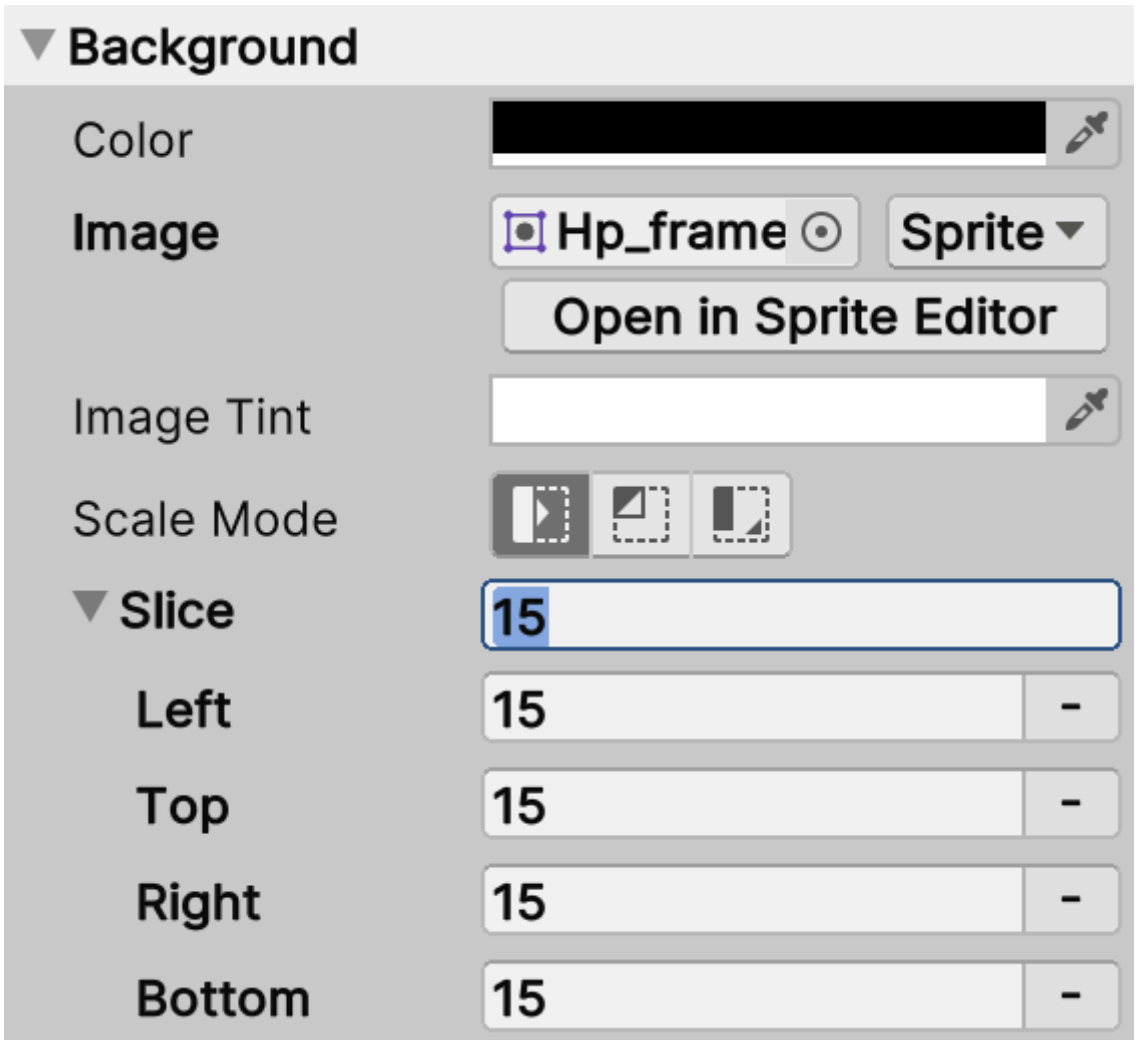

Size
Width
Height
Size
200
px
164
px

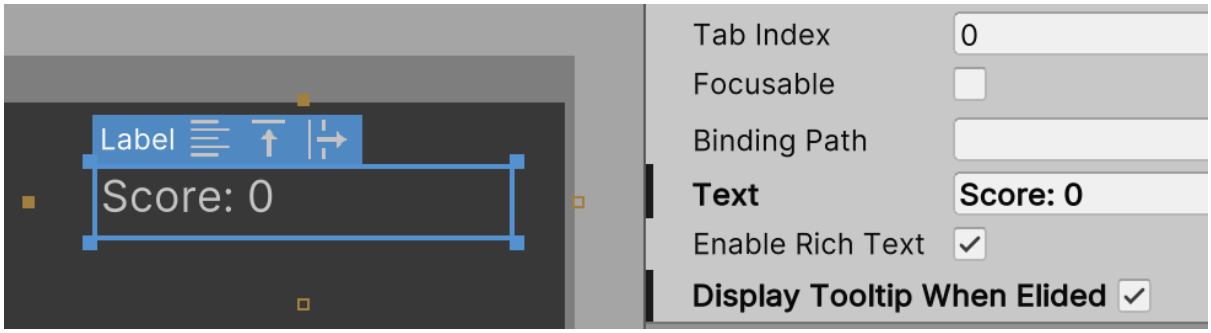

VisualElemer
CITY BATTLE
Background
Color
Image
avatar
Sprite
Open in Sprite Editor
Image Tint

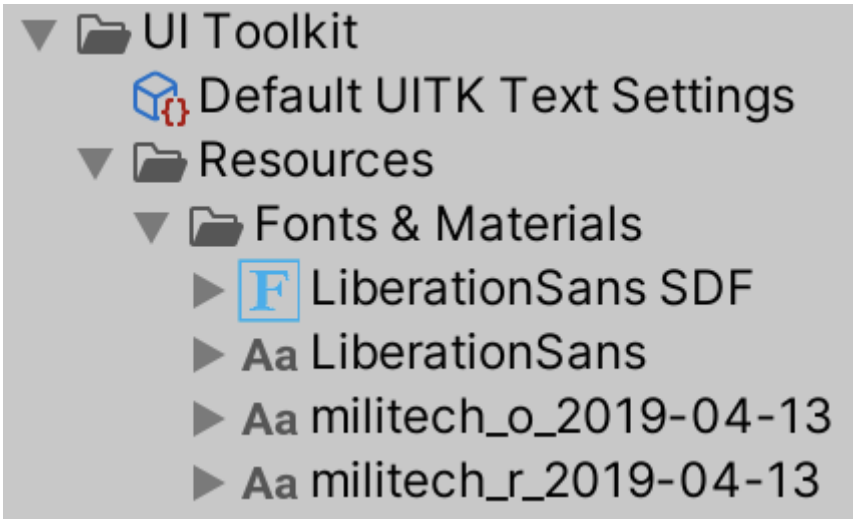

#PlayerHealth
#Filling


Background
Color
Image
None (Te
Texture

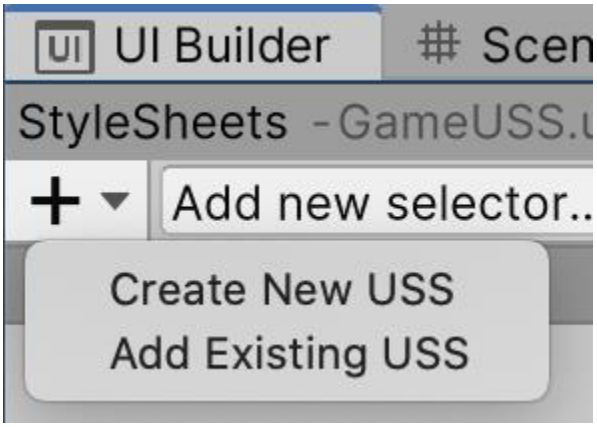

Size
Width
Height
Size
100
%
100
%
Min - Max
px
✓ %

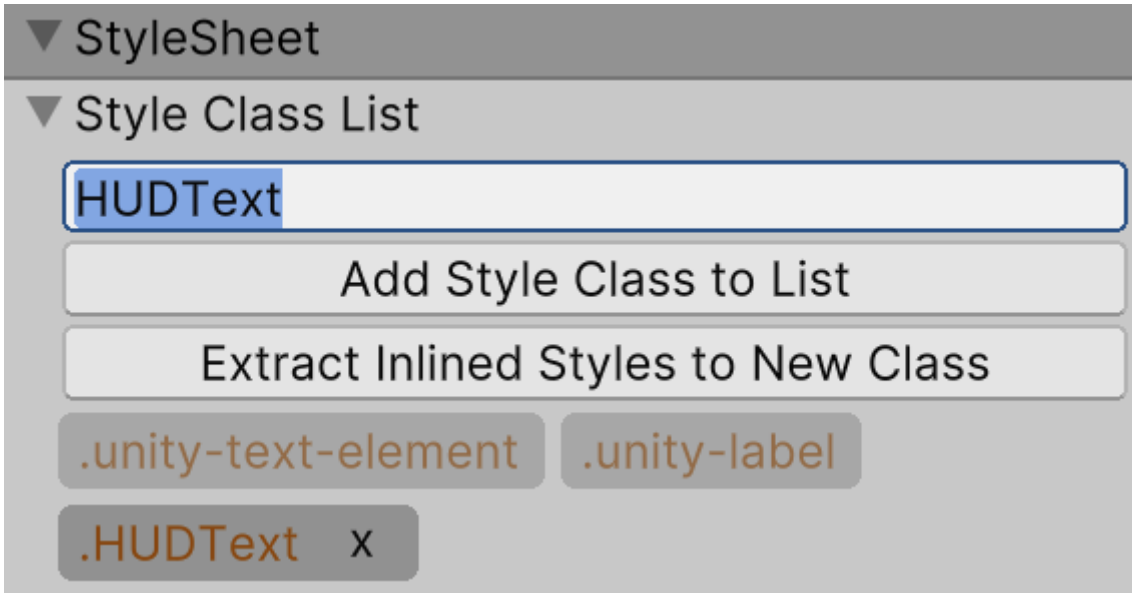

Background
Color
Image
Hp_frame
Sprite
Open in Sprite Editor
Image Tint
Scale Mode
Slice
15
Left
15
Top
15
Right
15
Bottom
15


Label
Score: 0
Tab Index
0
Focusable
Binding Path
Text
Score: 0
Enable Rich Text
Display Tooltip When Elided

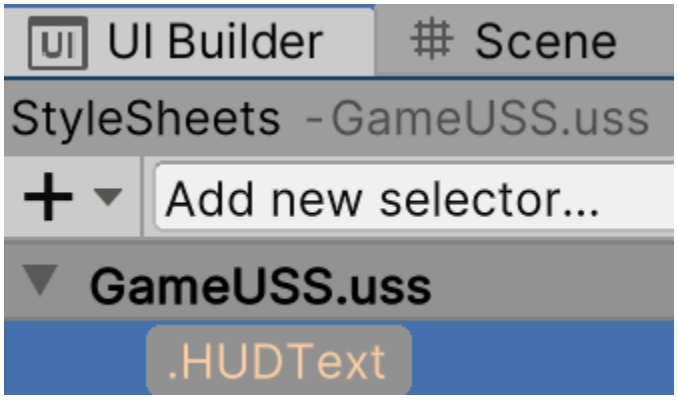

UI Toolkit
Default UITK Text Settings
Resources
Fonts & Materials
LiberationSans SDF
LiberationSans
militech_o_2019-04-13
militech_r_2019-04-13

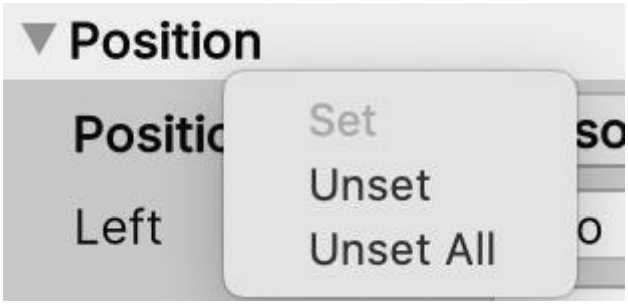

Text
Font
militech_r_2019-04-
Font Style
B
I
Size
20
px


UI Builder
Scen
StyleSheets - GameUSS.u
Add new selector..
Create New USS
Add Existing USS


StyleSheet
Style Class List
HUDText
Add Style Class to List
Extract Inlined Styles to New Class
.unity-text-element
.unity-label
.HUDText
x


Position
Positic
Left
Set
Unset
Unset All


UI Builder
Scene
StyleSheets - GameUSS.uss
Add new selector...
GameUSS.uss
.HUDText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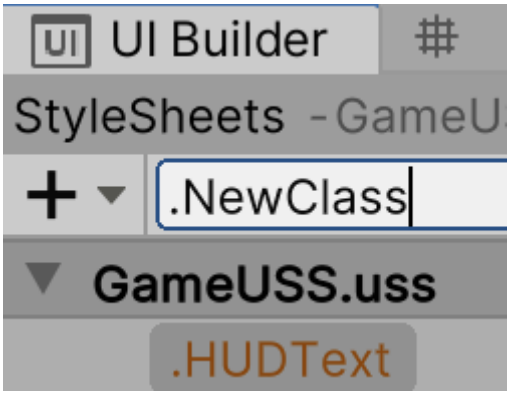
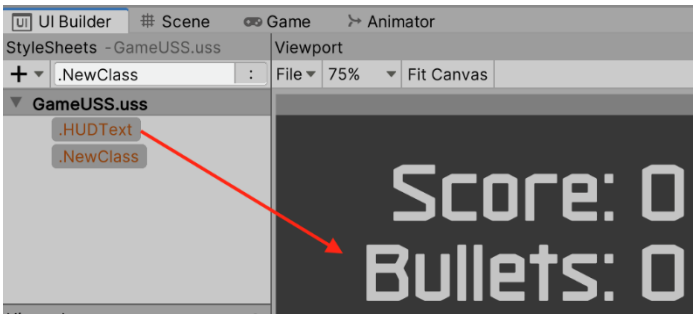
Positic
Left
Set
Unset
Unset All


UI Builder
StyleSheets - GameU
.NewClass
GameUSS.uss
.HUDText


UI Builder
Scene
Game
Animator
StyleSheets - GameUSS.uss
Viewport
.NewClass
File
75%
Fit Canvas
GameUSS.uss
.HUDText
.NewClass
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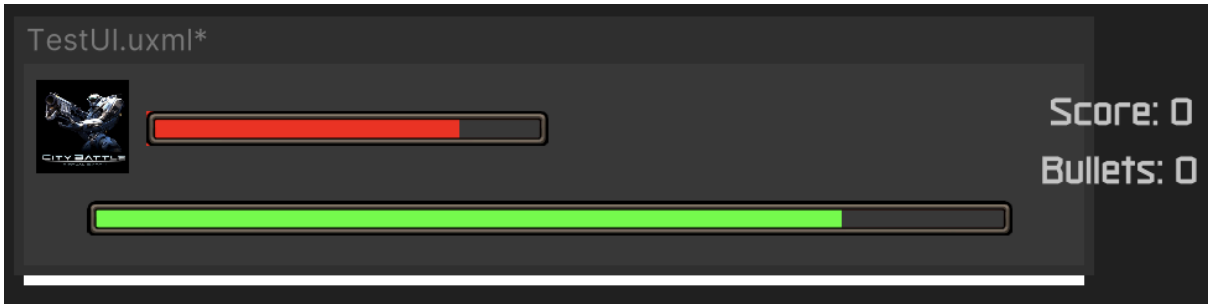
Bullets: 0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Score: 0
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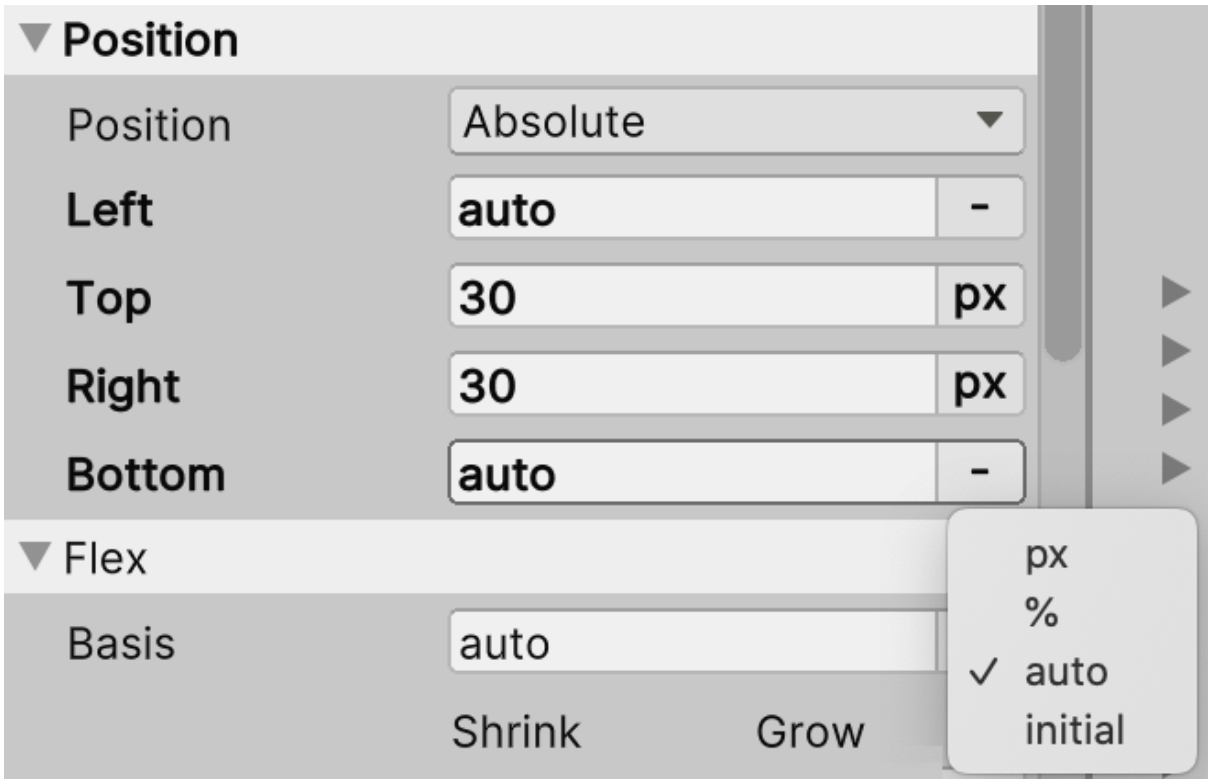
Position
Position
Absolute
Left
auto
-
Top
30
px
Right
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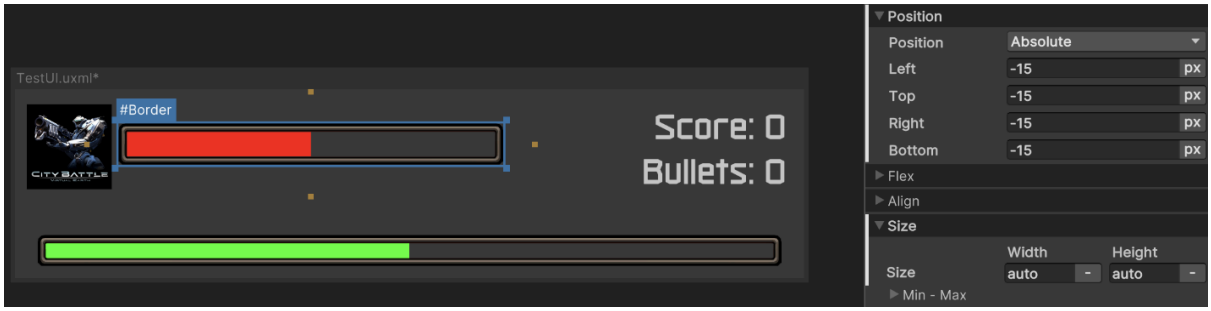
Bottom
auto
-
Flex
Basis
auto
Shrink
Grow
px
%
auto
initial


#Label
Score: 0


TestUI.uxml*
#Border
Score: 0
Bullets: 0
Position
Position
Absolute
Left
-15
px
Top
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Right
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Bottom
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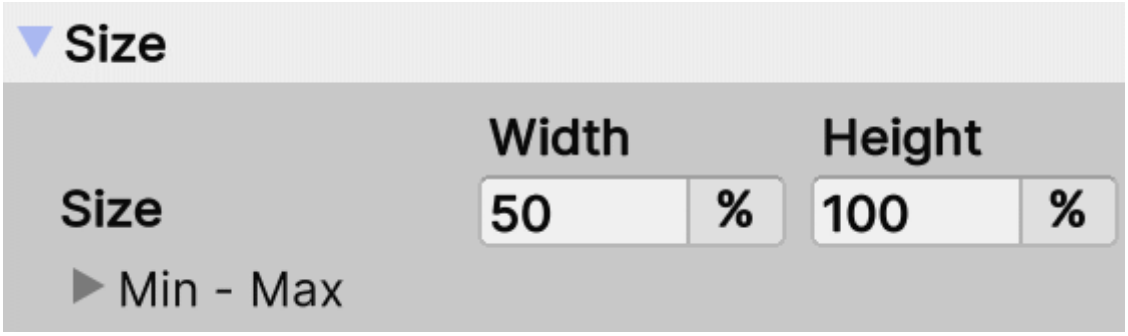
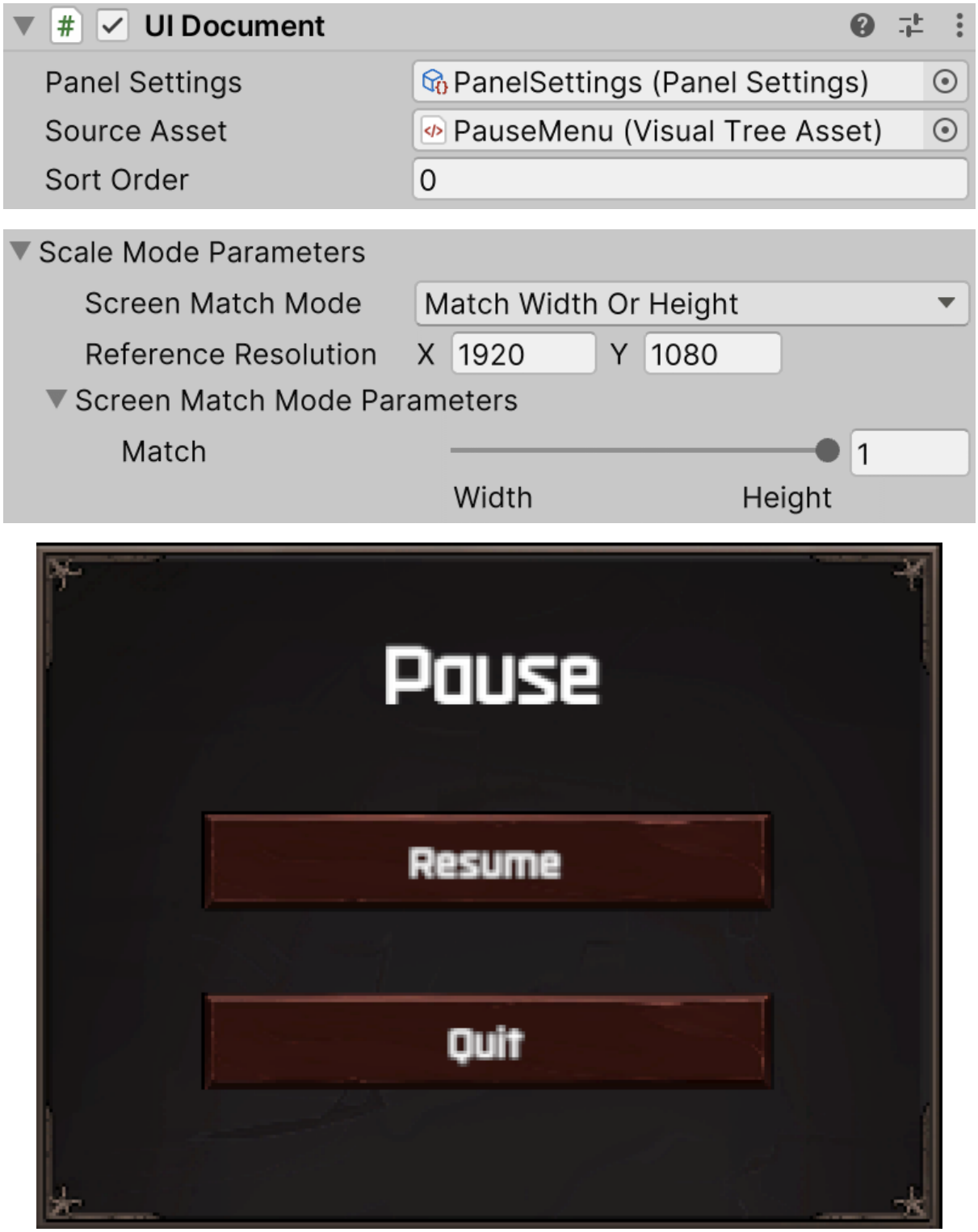
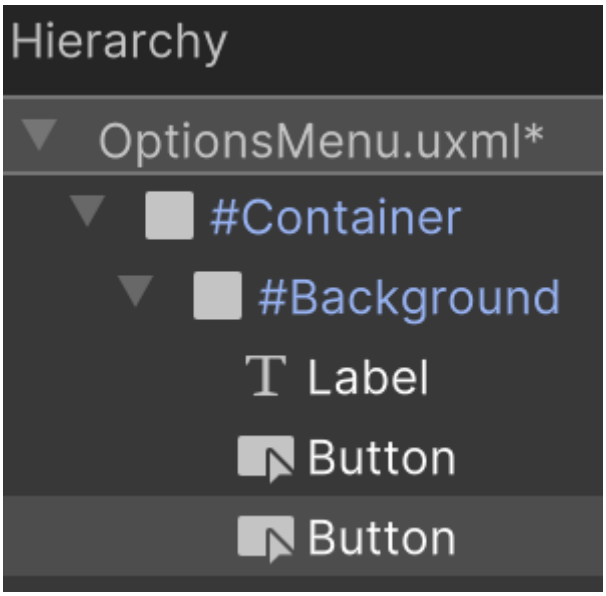
Flex
Align
Size
Width
Height
Size
auto
auto
Min - Max

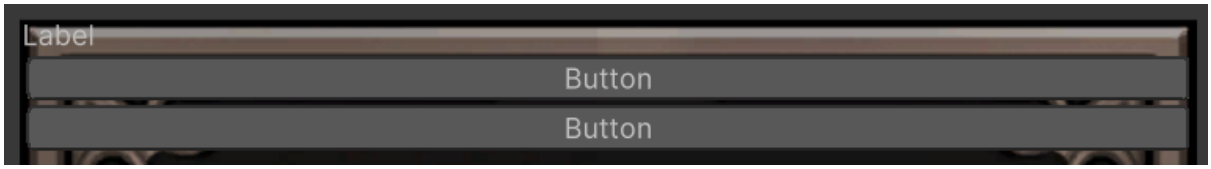

Size
Width
Height
Size
50
%
100
%
Min - Max

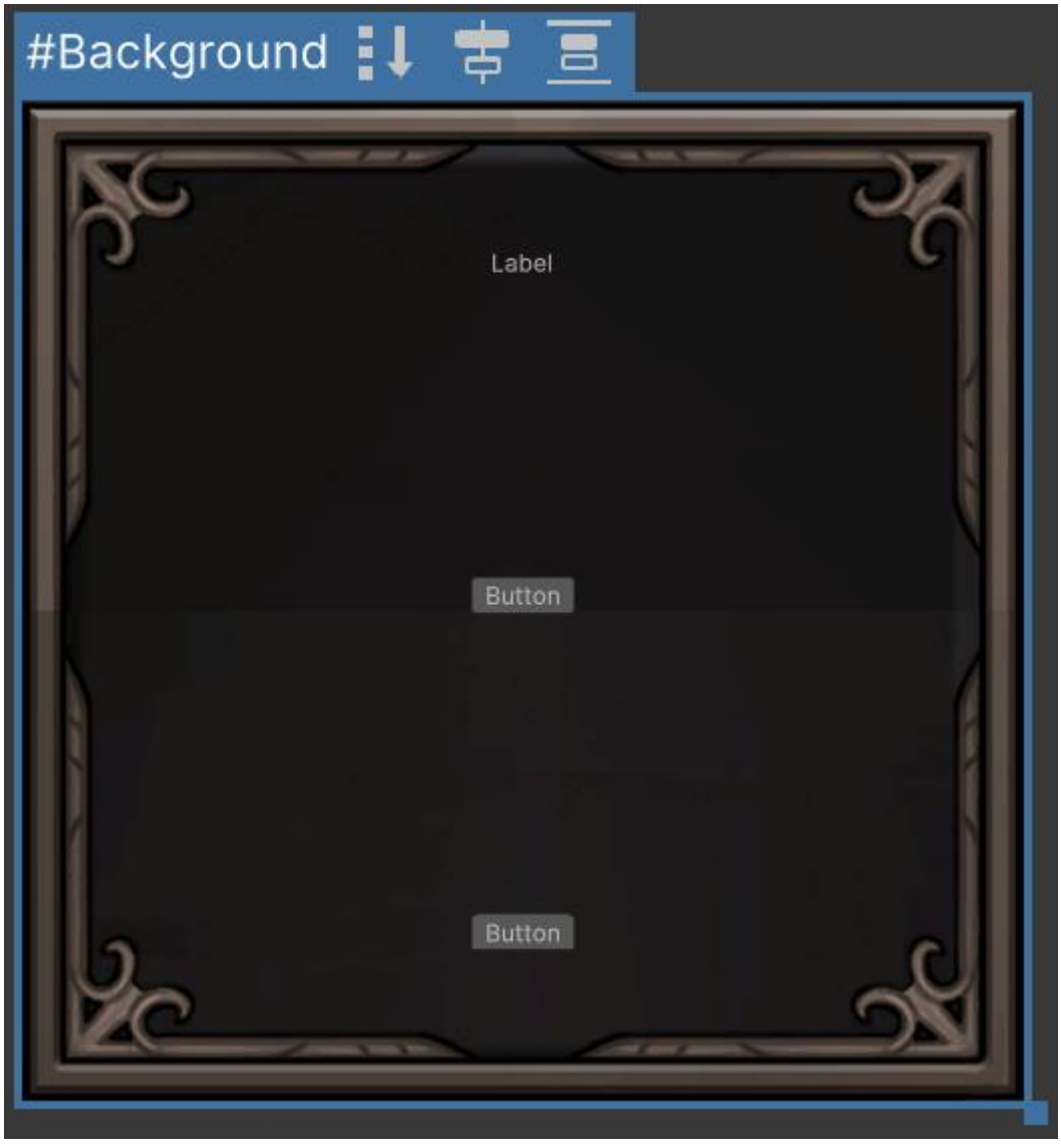

TestUI.uxml*
Score: 0
Bullets: 0


UI Document
Panel Settings
PanelSettings (Panel Settings)
Source Asset
PauseMenu (Visual Tree Asset)
Sort Order
0
Scale Mode Parameters
Screen Match Mode
Match Width Or Height
Reference Resolution
X 1920
Y 1080
Screen Match Mode Parameters
Match
1
Width
Height
Pause
Resume
Quit


#Container
Position
Absolute
Left
0
px
Top
0
px
Right
0
px
Bottom
0
px
Flex
Align
Align Items
AUTO
Justify Content
Size
Width
Height
Size
auto
auto
Min - Max
Margin & Padding
Margin
0px


Hierarchy
OptionsMenu.uxml*
#Container
#Background
Label
Button
Button


Label
Button
Button


#Background
Label
Button
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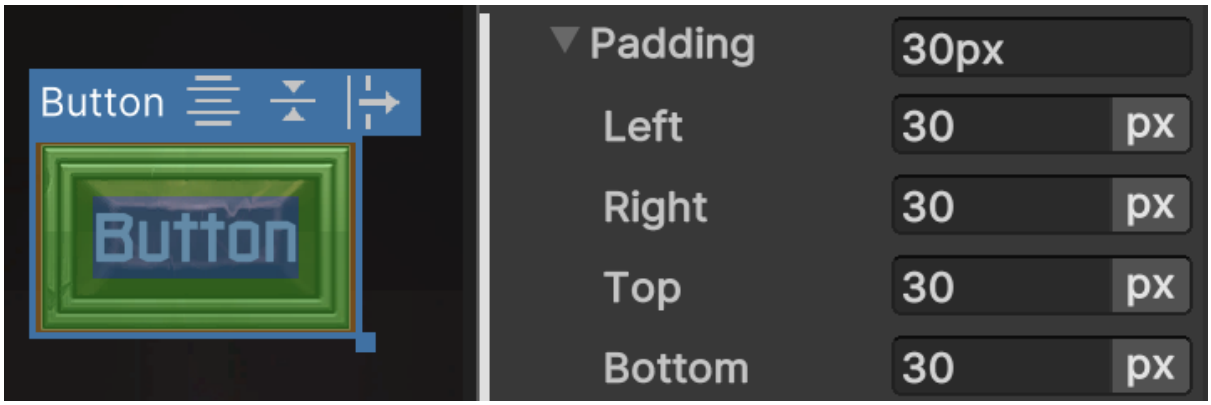
Button
Button
Padding
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Left
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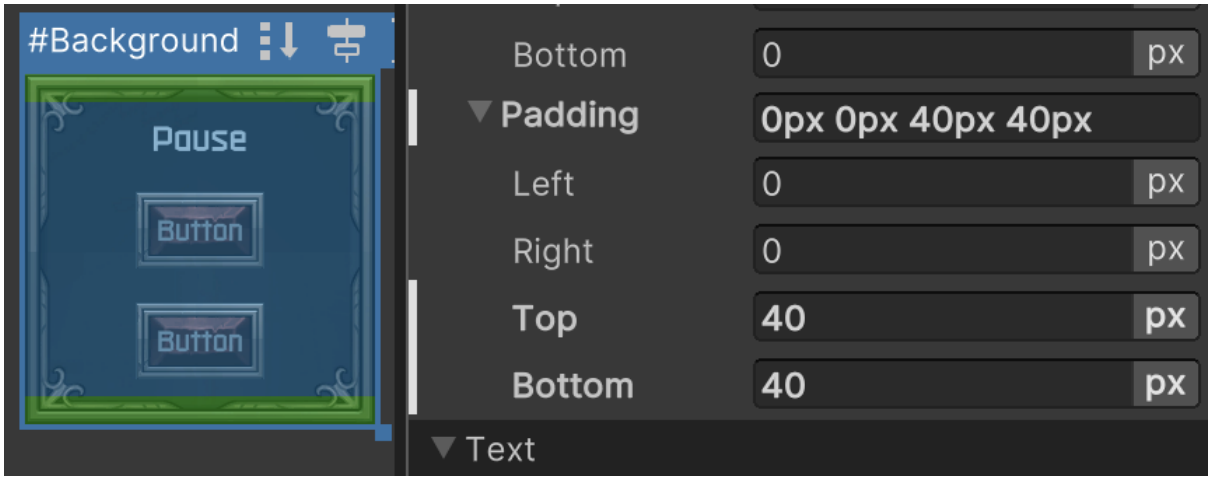
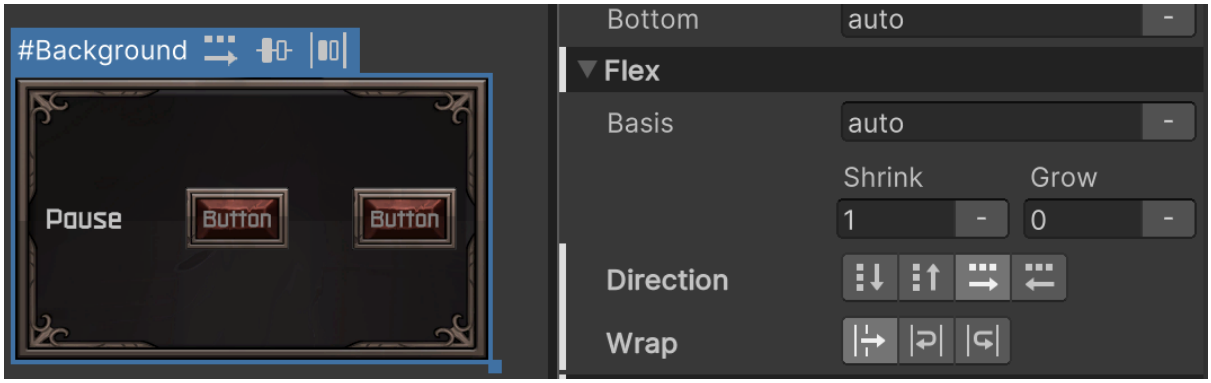
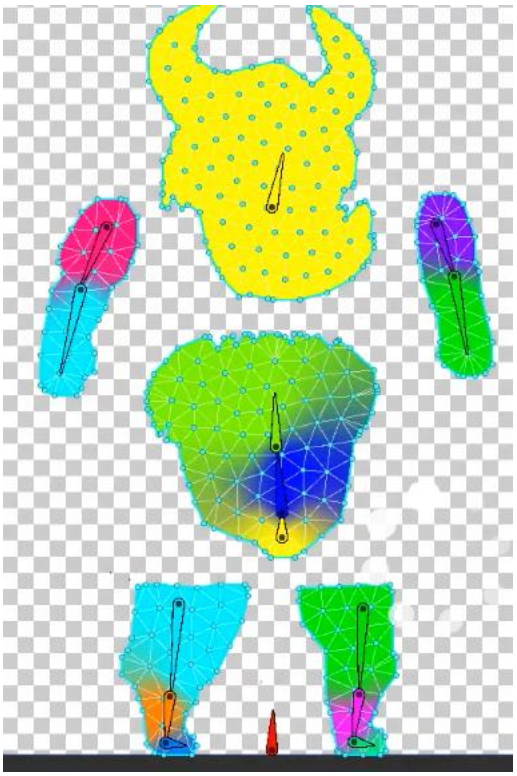
px
Right
30
px
Top
30
px
Bottom
30
px


#Background
Pause
Button
Button
Bottom
0
px
Padding
0px 0px 40px 40px
Left
0
px
Right
0
px
Top
40
px
Bottom
40
px
Text


#Background
Pause
Button
Button
Bottom
auto
Flex
Basis
auto
Shrink
Grow
1
0
Direction
Wrap

Chapter 13: Creating Animations with Animator, Cinemachine, and Timeline

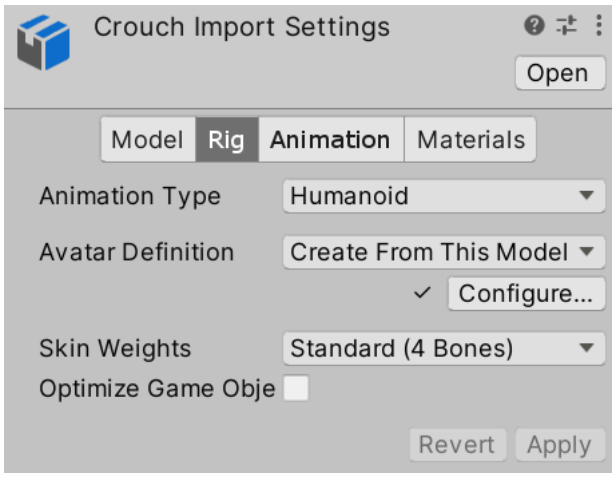


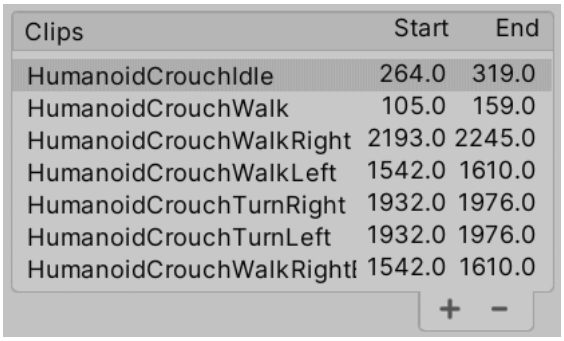
VICX GAMES

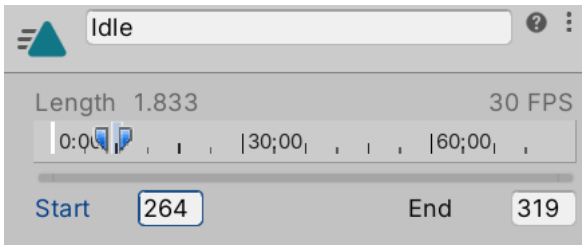
SciFi Robots

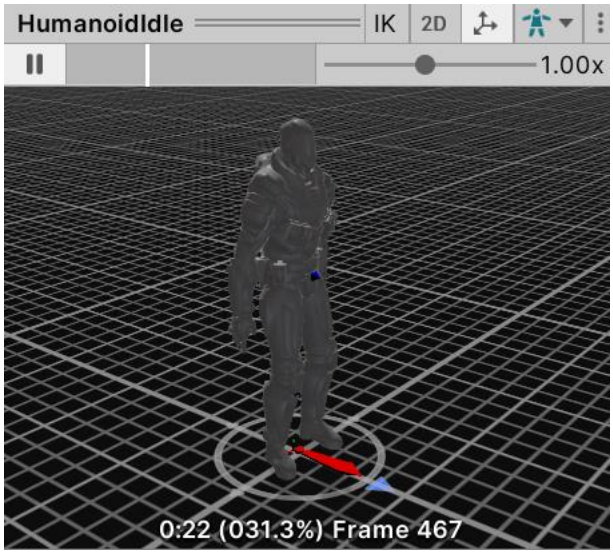
★★★★☆ (14)

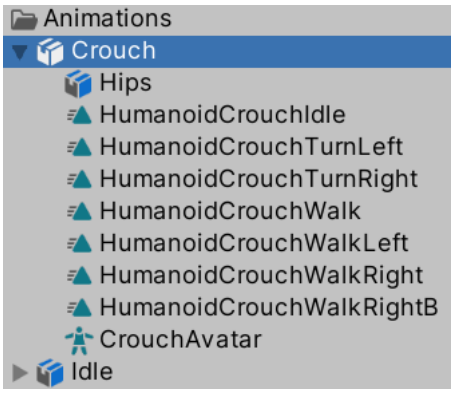
FREE

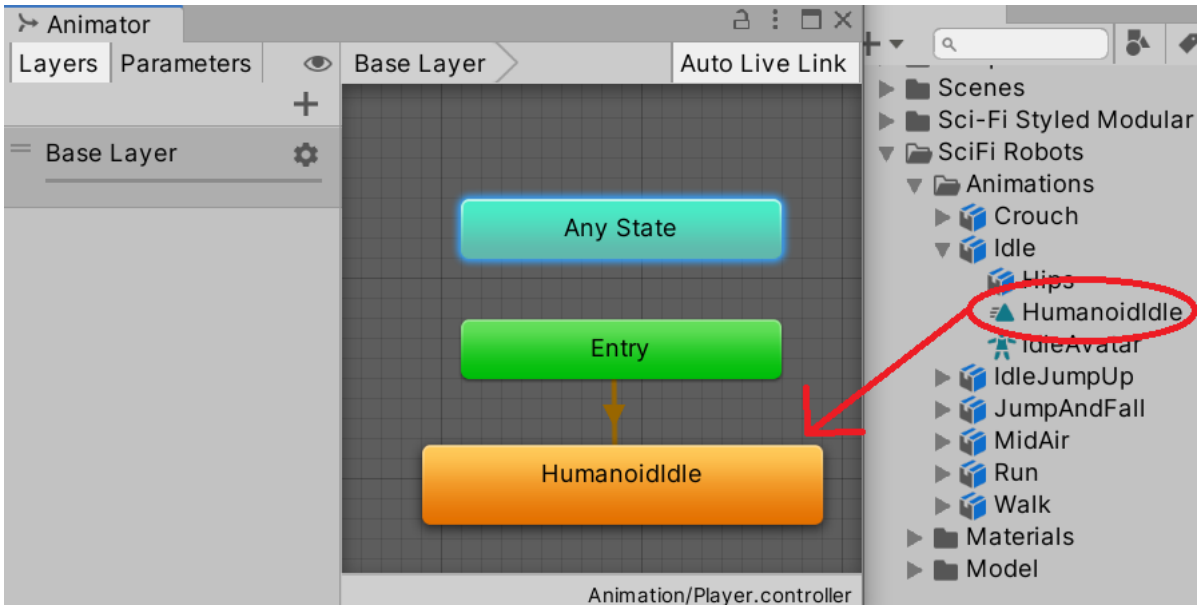


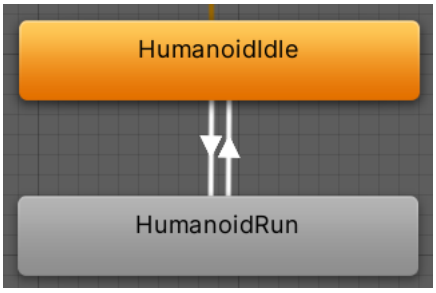


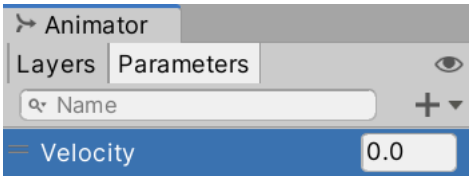


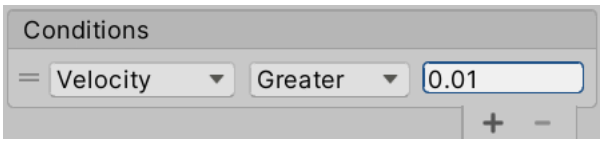

HumanoidIdle
IK
2D
1.00x
0:22 (031.3%) Frame 467

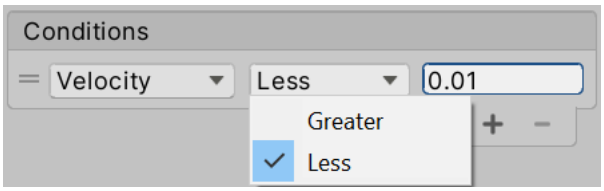

Animations
Crouch
Hips
HumanoidCrouchIdle
HumanoidCrouchTurnLeft
HumanoidCrouchTurnRight
HumanoidCrouchWalk
HumanoidCrouchWalkLeft
HumanoidCrouchWalkRight
HumanoidCrouchWalkRightB
CrouchAvatar
Idle


Animator
Layers
Parameters
Base Layer
Auto Live Link
Base Layer
Any State
Entry
HumanoidIdle
Animation/Player.controller
Scenes
Sci-Fi Styled Modular
SciFi Robots
Animations
Crouch
Idle
HumanoidIdle
IdleJumpUp
JumpAndFall
MidAir
Run
Walk
Materials
Model

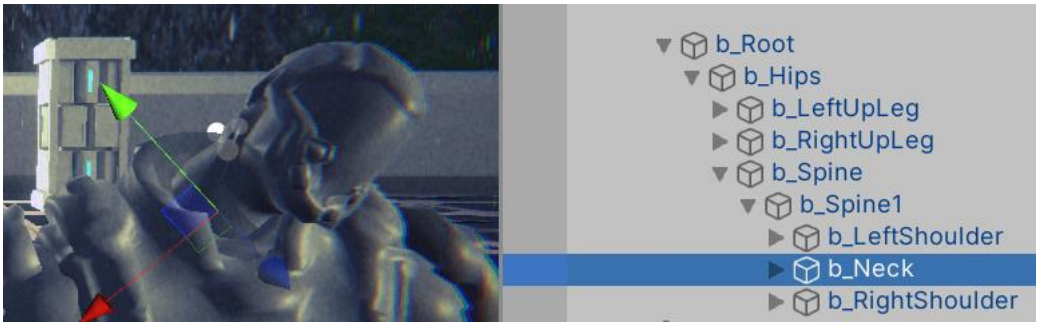

HumanoidIdle
HumanoidRun

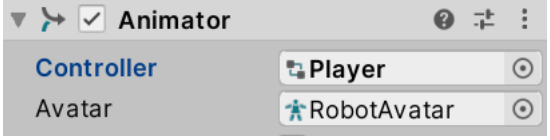

Animator
Layers
Parameters
Name
Velocity
0.0

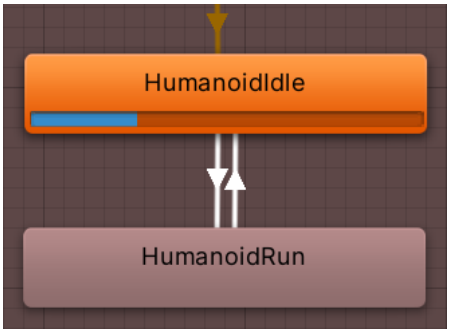

Conditions
Velocity
Greater
0.01

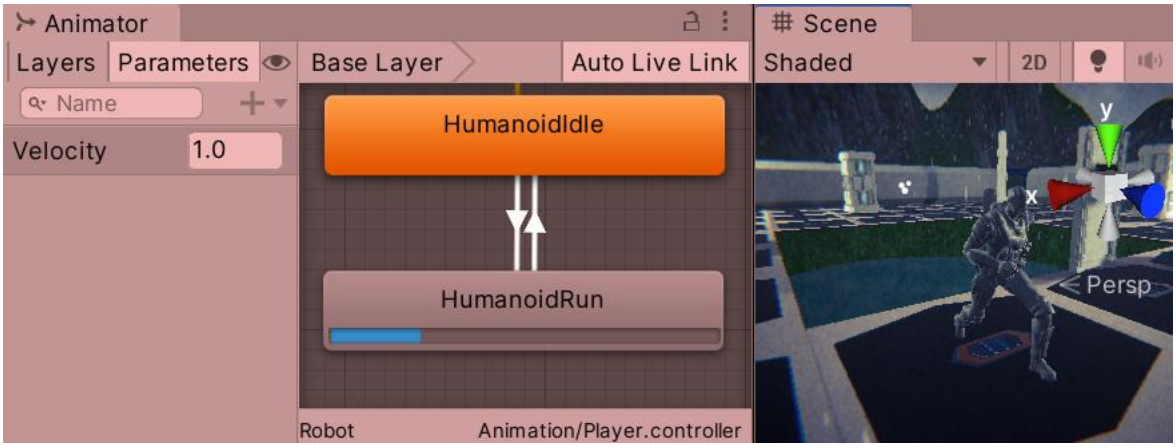

Conditions
Velocity
Less
0.01
Greater
Less

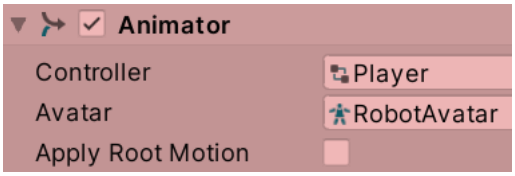

Skinned Mesh Rendere
Edit Bounds
Bounds
Center X -4.82 Y -0.19 Z -0.02
Extent X 0.665 Y 1.039 Z 0.239
Quality
Auto
Update When Offscr
Mesh
Ironman.001

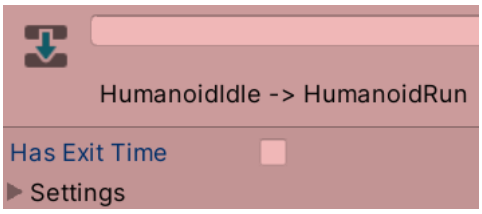

b_Root
b_Hips
b_LeftUpLeg
b_RightUpLeg
b_Spine
b_Spine1
b_LeftShoulder
b_Neck
b_RightShoulder

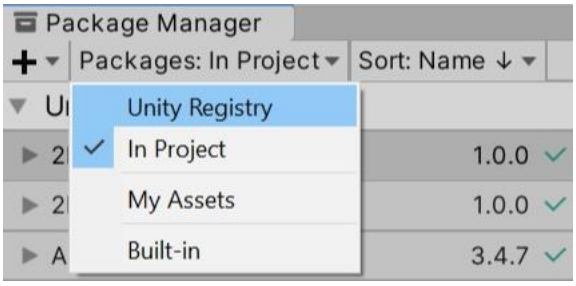

Animator
Controller
Player
Avatar
RobotAvatar

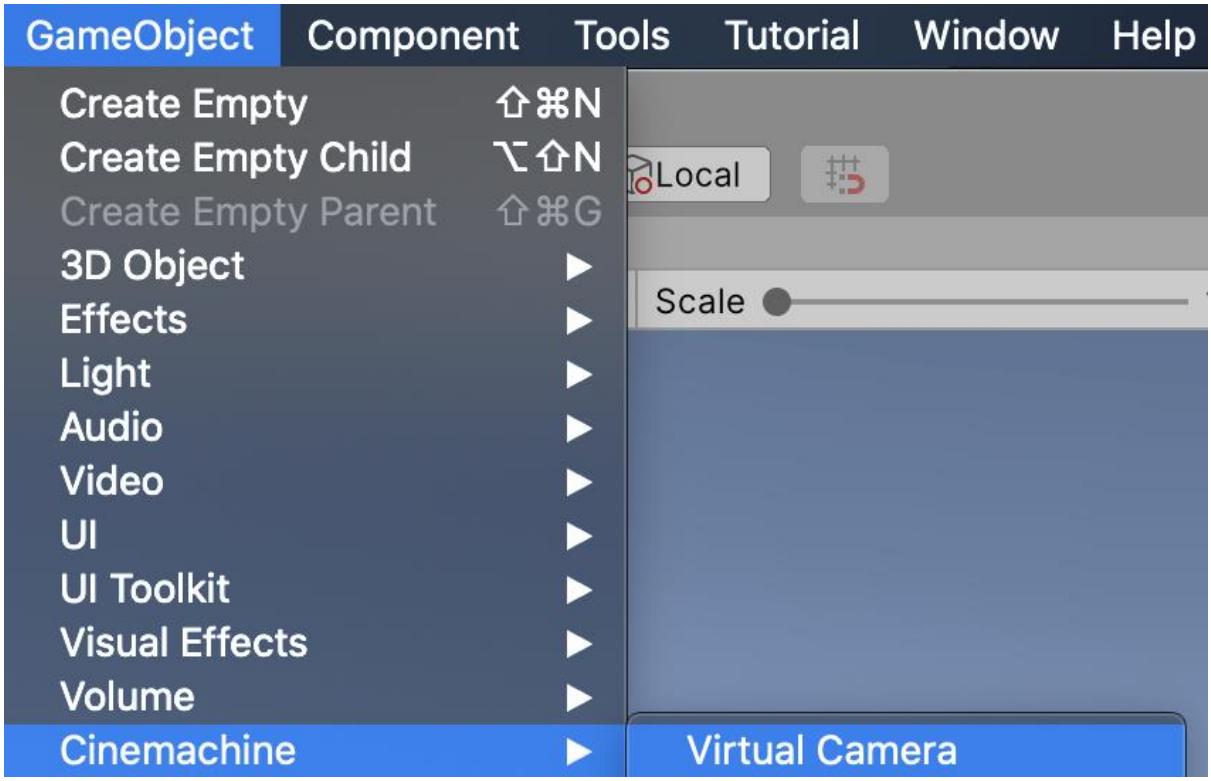

HumanoidIdle
HumanoidRun

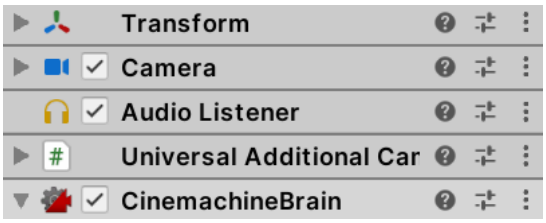

Animator
Layers
Parameters
Name
Velocity
1.0
Base Layer
Auto Live Link
HumanoidIdle
HumanoidRun
Robot
Animation/Player.controller
Scene
Shaded
2D
y
x
Persp

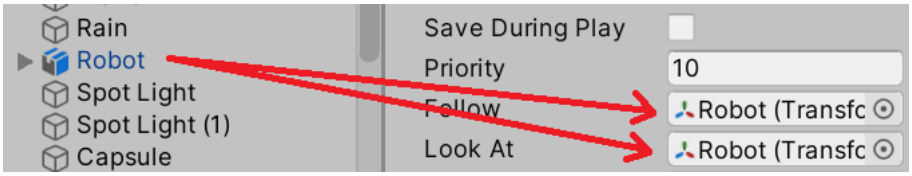

Animator
Controller
Player
Avatar
RobotAvatar
Apply Root Motion

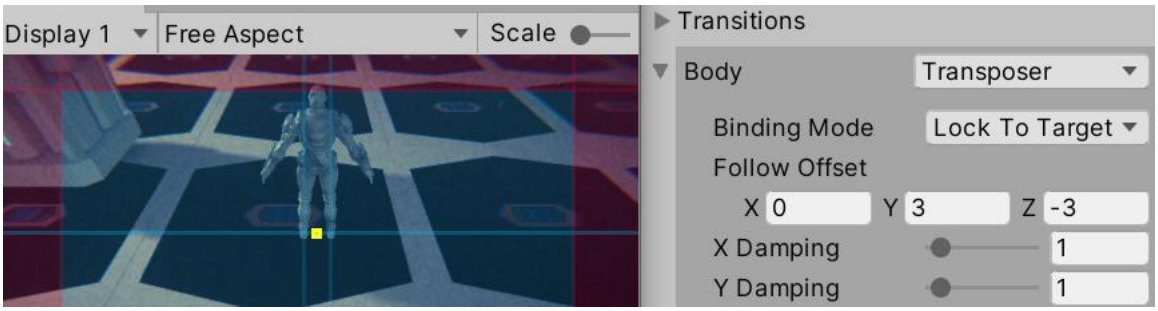

HumanoidIdle -> HumanoidRun
Has Exit Time
Settings

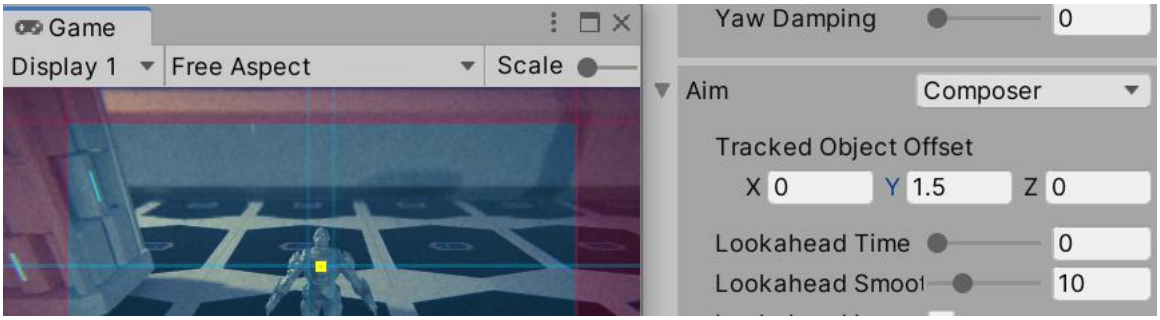

Package Manager
Packages: In Project
Sort: Name
Unity Registry
In Project
My Assets
Built-in
1.0.0
1.0.0
3.4.7


GameObject
Component
Tools
Tutorial
Window
Help
Create Empty ⇧⌘N
Create Empty Child ⌥⇧N
Create Empty Parent ⇧⌘G
3D Object
Effects
Light
Audio
Video
UI
UI Toolkit
Visual Effects
Volume
Cinemachine
Local
Scale
Virtual Camera

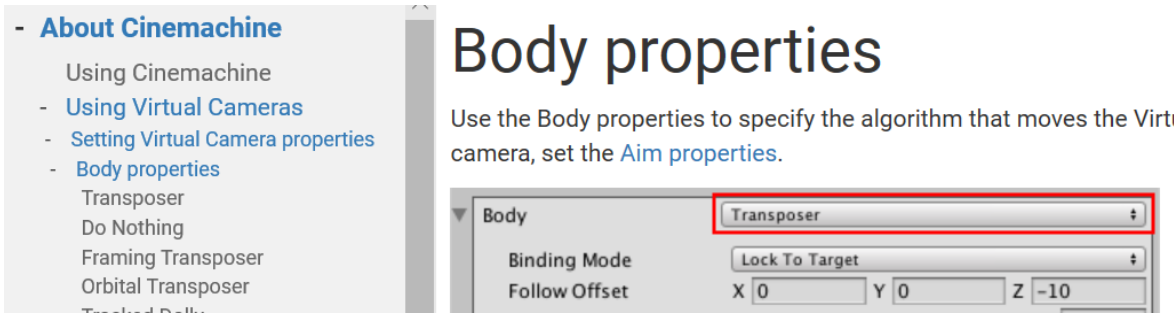

Transform
Camera
Audio Listener
Universal Additional Car
CinemachineBrain

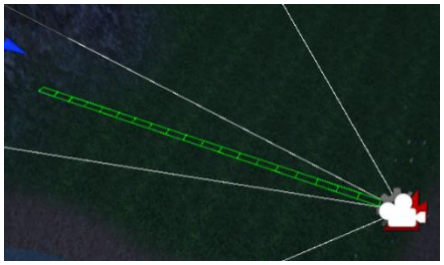

Rain
Robot
Spot Light
Spot Light (1)
Capsule
Save During Play
Priority
10
Follow
Robot (Transfc
Look At
Robot (Transfc

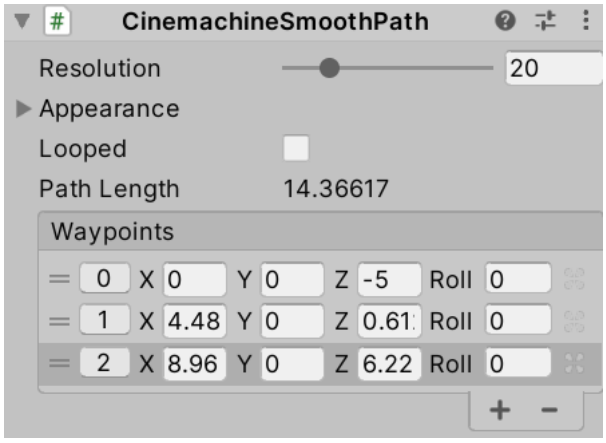

Display 1
Free Aspect
Scale
Transitions
Body
Transposer
Binding Mode
Lock To Target
Follow Offset
X 0
Y 3
Z -3
X Damping
1
Y Damping
1

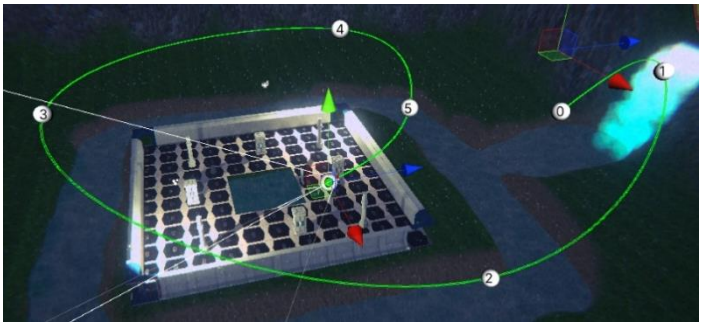

Game
Display 1
Free Aspect
Scale
Yaw Damping
0
Aim
Composer
Tracked Object Offset
X 0
Y 1.5
Z 0
Lookahead Time
0
Lookahead Smoot
10


Burst
1.5.4
Cinemachine
2.7.4
Code Coverage
1.0.1
Cinemachine
Release
Unity Technologies
Version 2.7.4 - June 08, 2021
View documentation
View changelog
View licenses

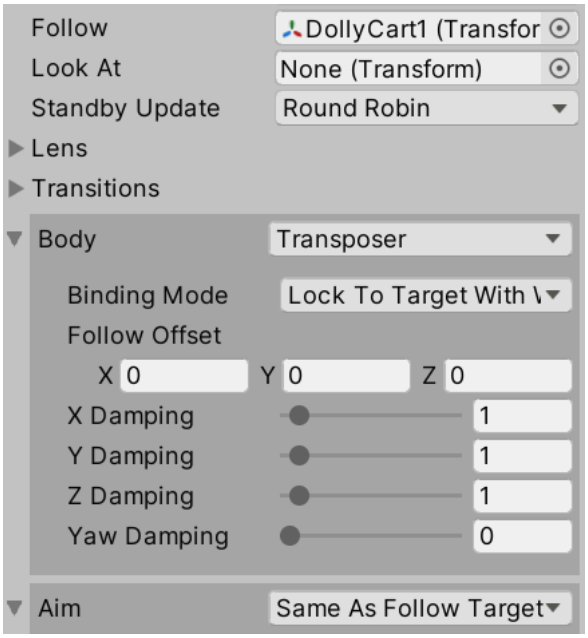

About Cinemachine
Using Cinemachine
Using Virtual Cameras
Setting Virtual Camera properties
Body properties
Transposer
Do Nothing
Framing Transposer
Orbital Transposer
Body properties
Use the Body properties to specify the algorithm that moves the Virtual camera, set the Aim properties.
Body
Transposer
Binding Mode
Lock To Target
Follow Offset
X 0
Y 0
Z -10

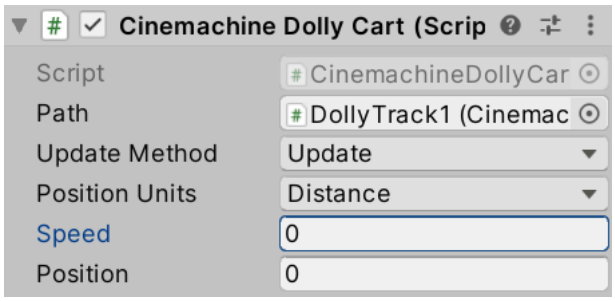


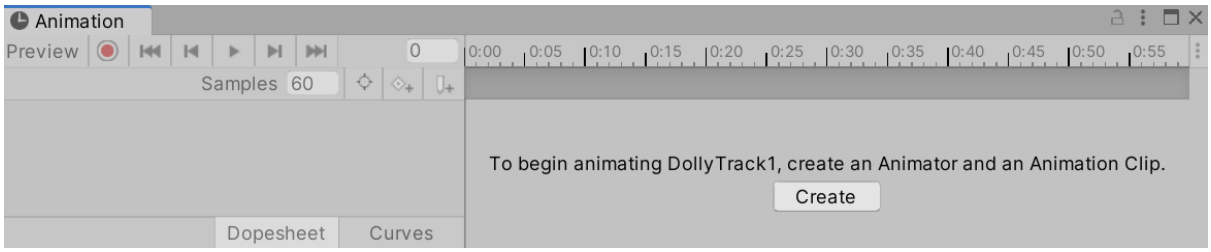

CinemachineSmoothPath
Resolution
20
Appearance
Looped
Path Length
14.36617
Waypoints
0 X 0 Y 0 Z -5 Roll 0
1 X 4.48 Y 0 Z 0.61 Roll 0
2 X 8.96 Y 0 Z 6.22 Roll 0


4
3
5
0
1
2

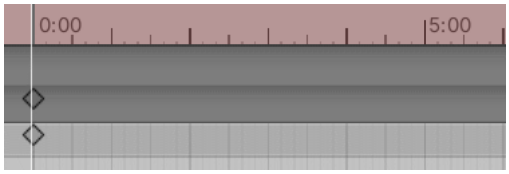

CinemachineVirtualCamera
Status: Live
Solo

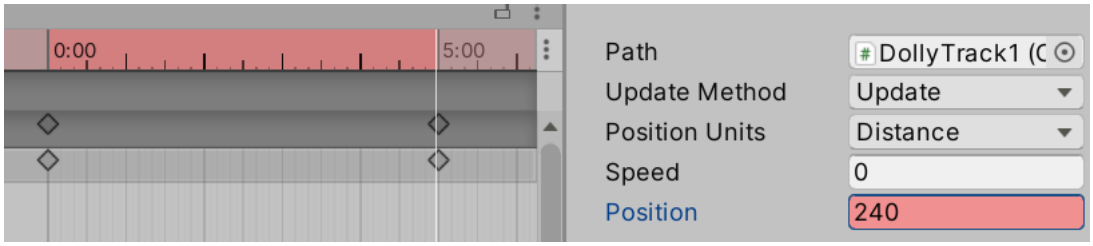

Follow
DollyCart1 (Transfor
Look At
None (Transform)
Standby Update
Round Robin
Lens
Transitions
Body
Transposer
Binding Mode
Lock To Target With
Follow Offset
X 0
Y 0
Z 0
X Damping
1
Y Damping
1
Z Damping
1
Yaw Damping
0
Aim
Same As Follow Target

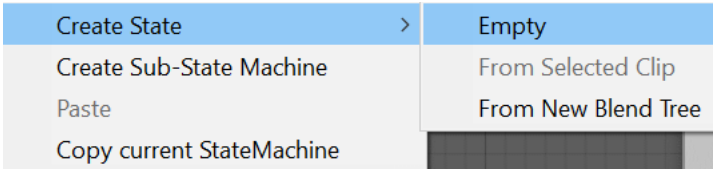

Cinemachine Dolly Cart (Scrip
Script
CinemachineDollyCar
Path
DollyTrack1 (Cinemac
Update Method
Update
Position Units
Distance
Speed
0
Position
0

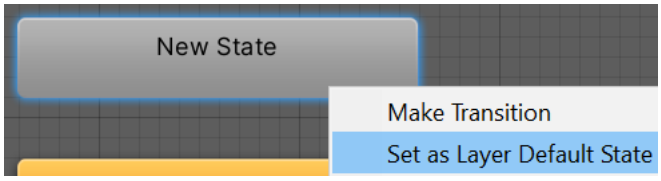

Animation
Preview
0
Samples 60
0:00
0:05
0:10
0:15
0:20
0:25
0:30
0:35
0:40
0:45
0:50
0:55
To begin animating DollyTrack1, create an Animator and an Animation Clip.
Create
Dopesheet
Curves


Animation
Timeline
Preview
IntroDollyTrack
Samples 60
DollyCart1 : Cinemachine Dc
Add Property
Script
Path
DollyTrack1 (C
Update Method
Update
Position Units
Distance
Speed
0
Position
0

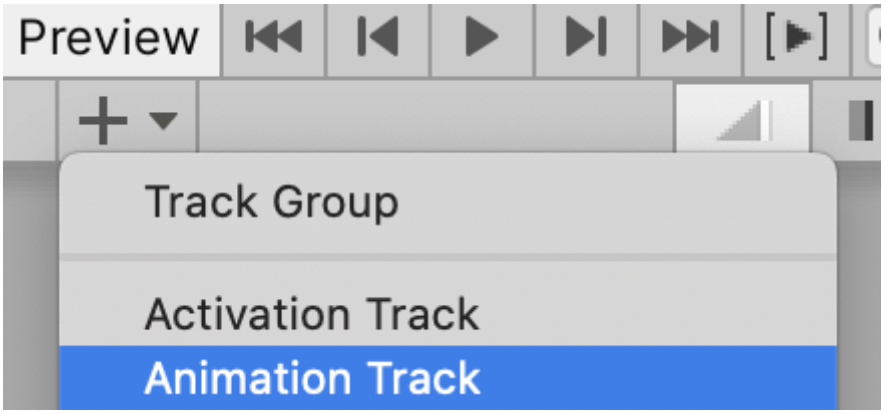

0:00
5:00

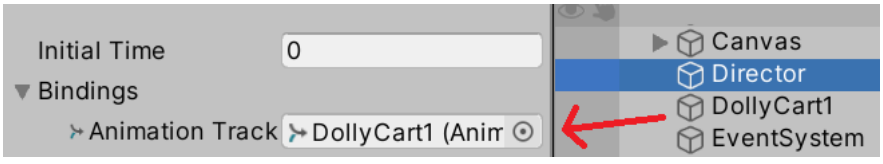

0:00
5:00
Path
DollyTrack1 (C
Update Method
Update
Position Units
Distance
Speed
0
Position
240

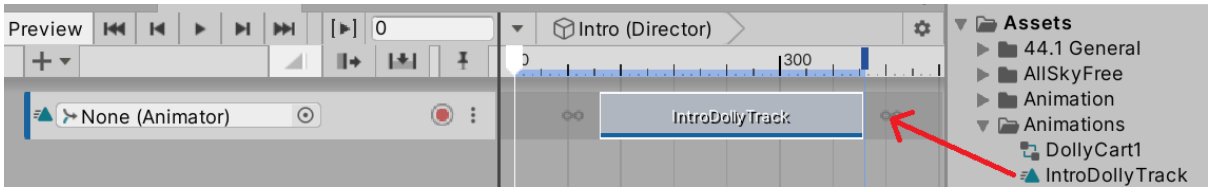

Create State
Create Sub-State Machine
Paste
Copy current StateMachine
Empty
From Selected Clip
From New Blend Tree

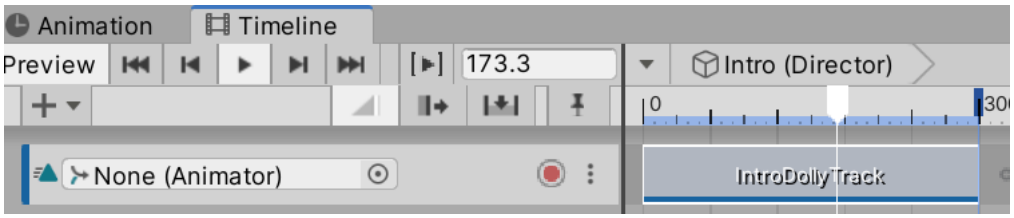

New State
Make Transition
Set as Layer Default State

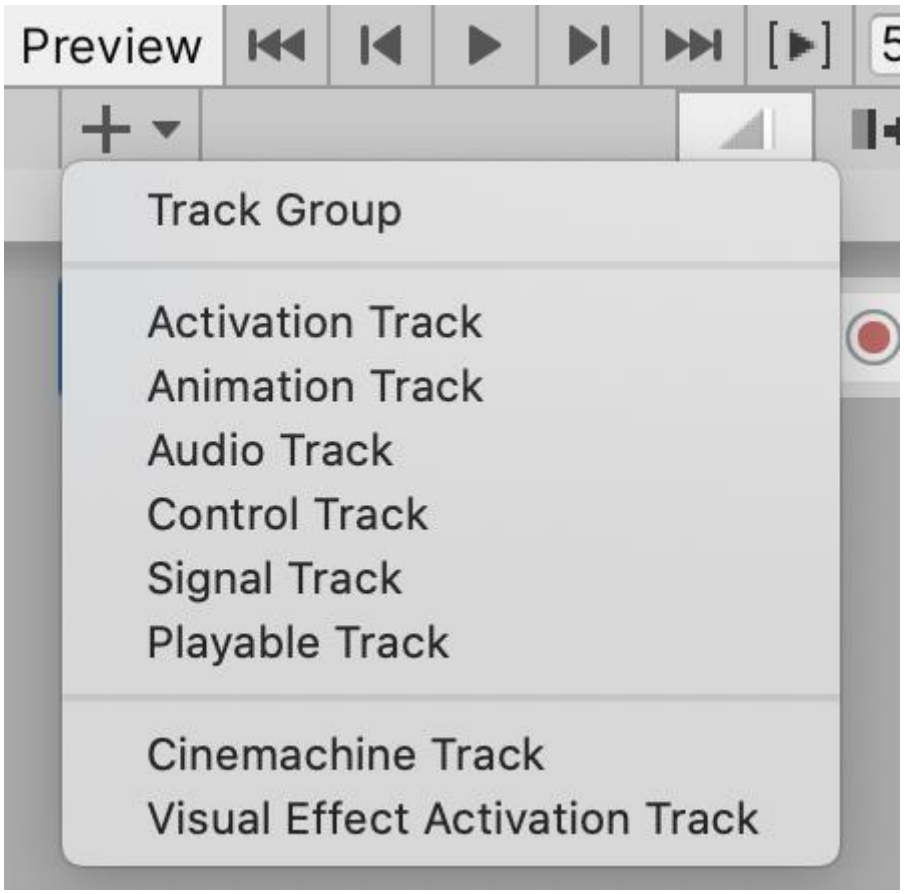

Playable Director
Playable
Intro (Timeline Asset)

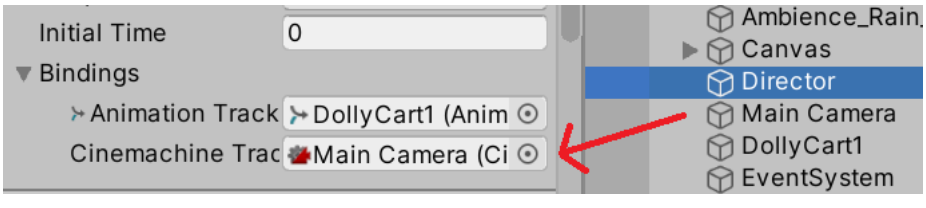

Preview
Track Group
Activation Track
Animation Track

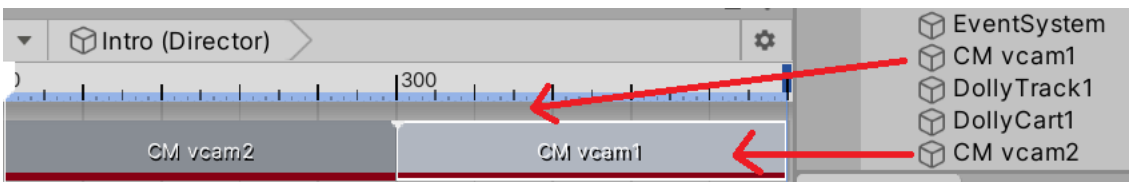

Initial Time
0
Bindings
Animation Track
DollyCart1 (Anim
Canvas
Director
DollyCart1
EventSystem

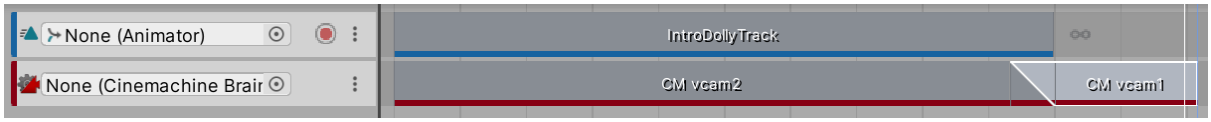

Preview
0
Intro (Director)
300
None (Animator)
IntroDollyTrack
Assets
44.1 General
AllSkyFree
Animation
Animations
DollyCart1
IntroDollyTrack

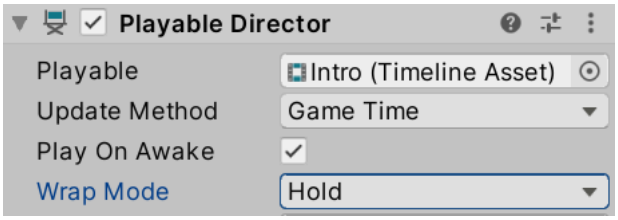

Animation
Timeline
Preview
173.3
Intro (Director)
0
None (Animator)
IntroDollyTrack


Preview
Track Group
Activation Track
Animation Track
Audio Track
Control Track
Signal Track
Playable Track
Cinemachine Track
Visual Effect Activation Track

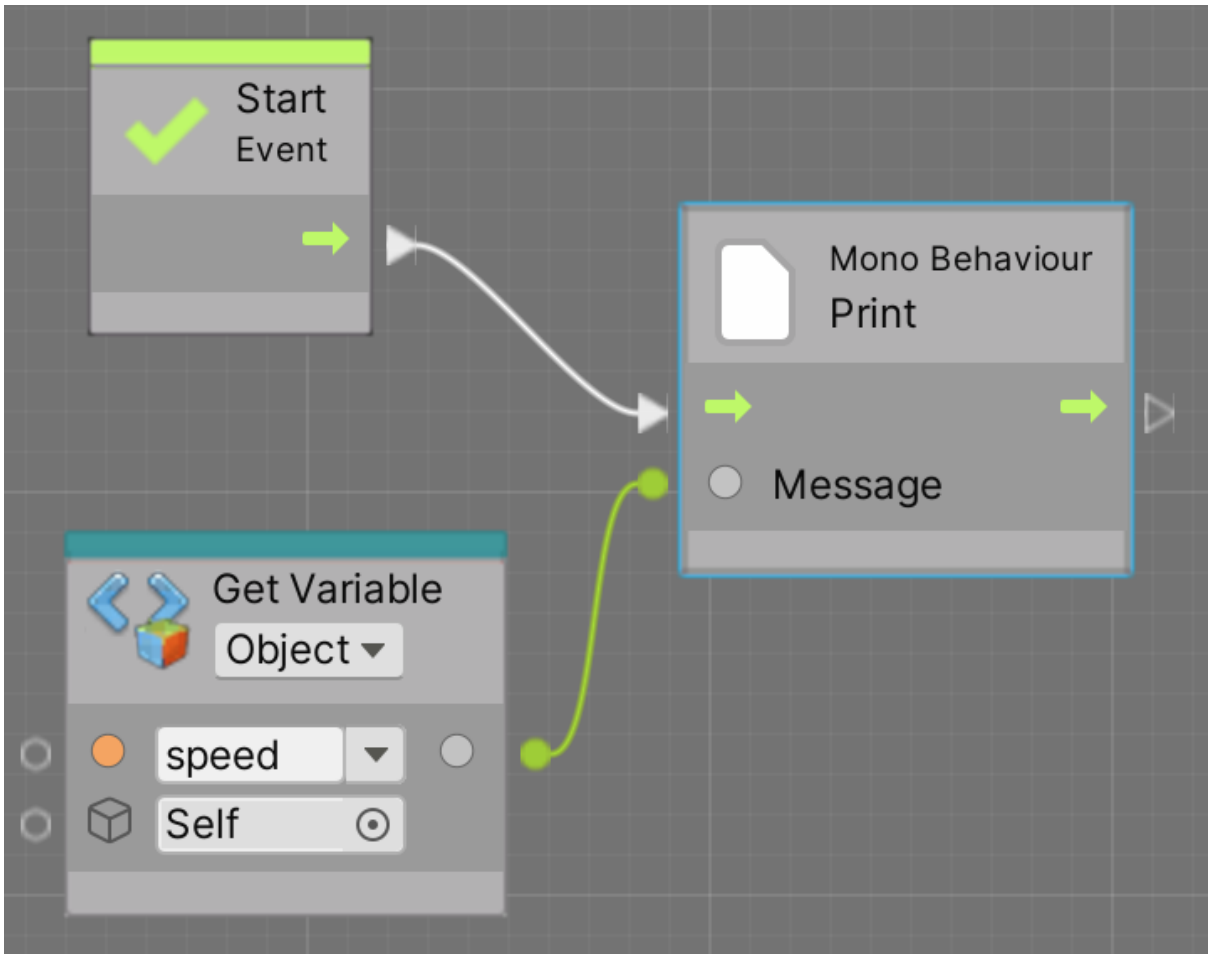

Initial Time
0
Bindings
Animation Track
DollyCart1 (Anim
Cinemachine Trac
Main Camera (Ci
Ambience_Rain
Canvas
Director
Main Camera
DollyCart1
EventSystem

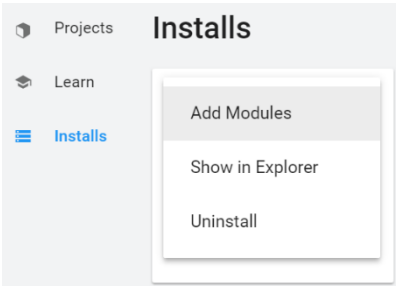

Intro (Director)
300
CM vcam2
CM vcam1
EventSystem
CM vcam1
DollyTrack1
DollyCart1
CM vcam2

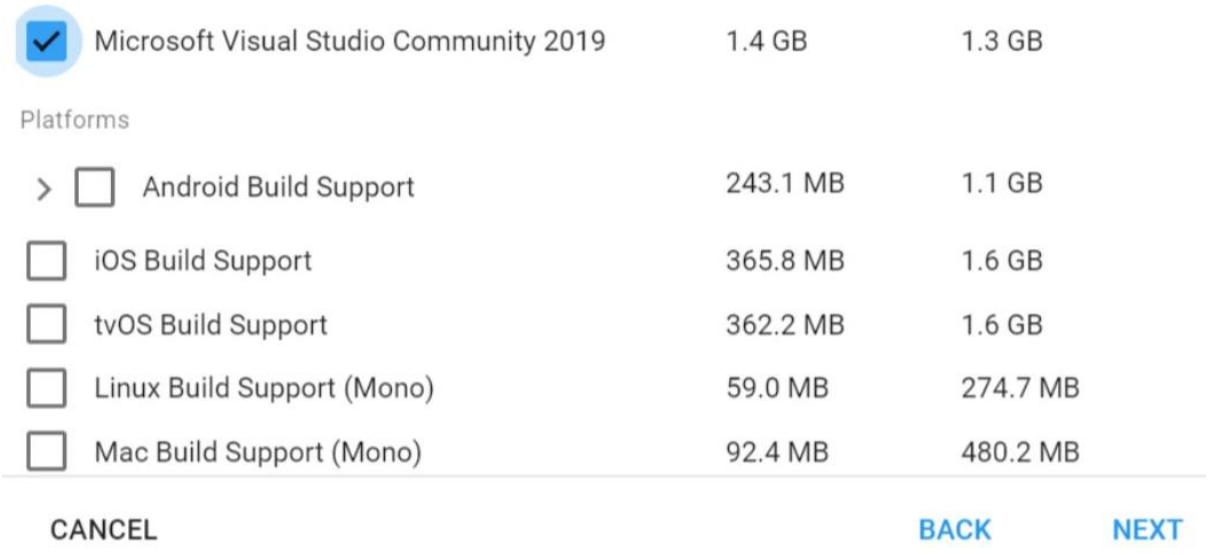

None (Animator)
None (Cinemachine Brair
IntroDollyTrack
CM vcam2
CM vcam1

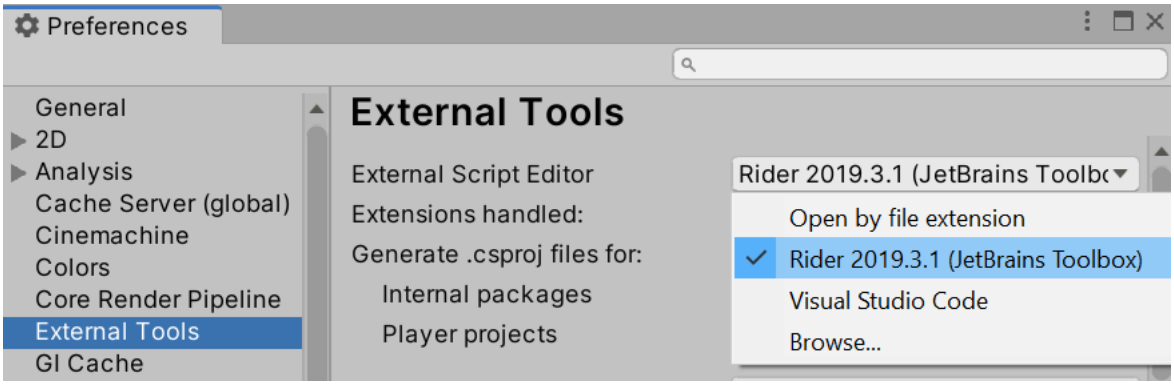

Playable Director
Playable
Intro (Timeline Asset)
Update Method
Game Time
Play On Awake
Wrap Mode
Hold

Chapter 14: Introduction to C# and Visual Scripting

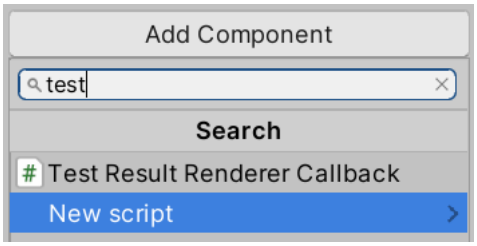


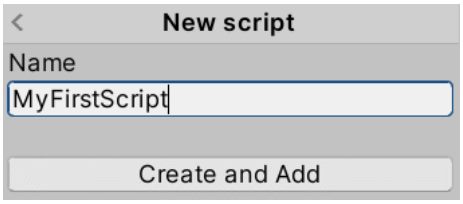



Microsoft Visual Studio Community 2019
1.4 GB
1.3 GB
Platforms
Android Build Support
243.1 MB
1.1 GB
iOS Build Support
365.8 MB
1.6 GB
tvOS Build Support
362.2 MB
1.6 GB
Linux Build Support (Mono)
59.0 MB
274.7 MB
Mac Build Support (Mono)
92.4 MB
480.2 MB
CANCEL
BACK
NEXT

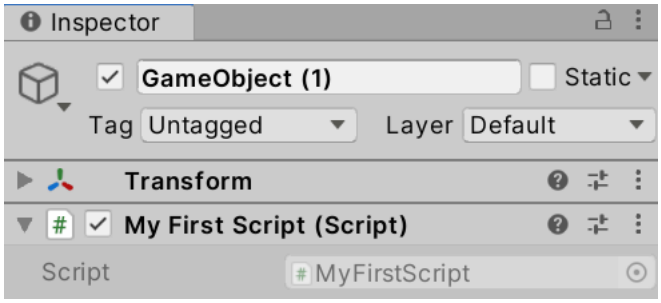

Preferences
General
2D
Analysis
Cache Server (global)
Cinemachine
Colors
Core Render Pipeline
External Tools
GI Cache
External Tools
External Script Editor
Rider 2019.3.1 (JetBrains Toolbc
Extensions handled:
Generate .csproj files for:
Internal packages
Player projects
Open by file extension
Rider 2019.3.1 (JetBrains Toolbox)
Visual Studio Code
Browse...

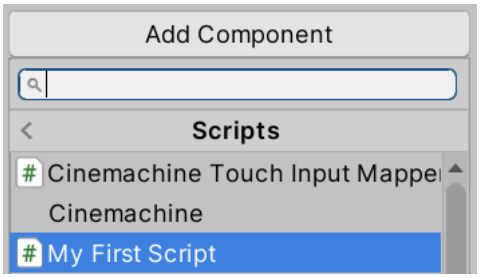

Package Manager
Packages: All
Sort: Name
Advanced
rider
JetBrains Rider Editor
1.2.1
JetBrains Rider Editor

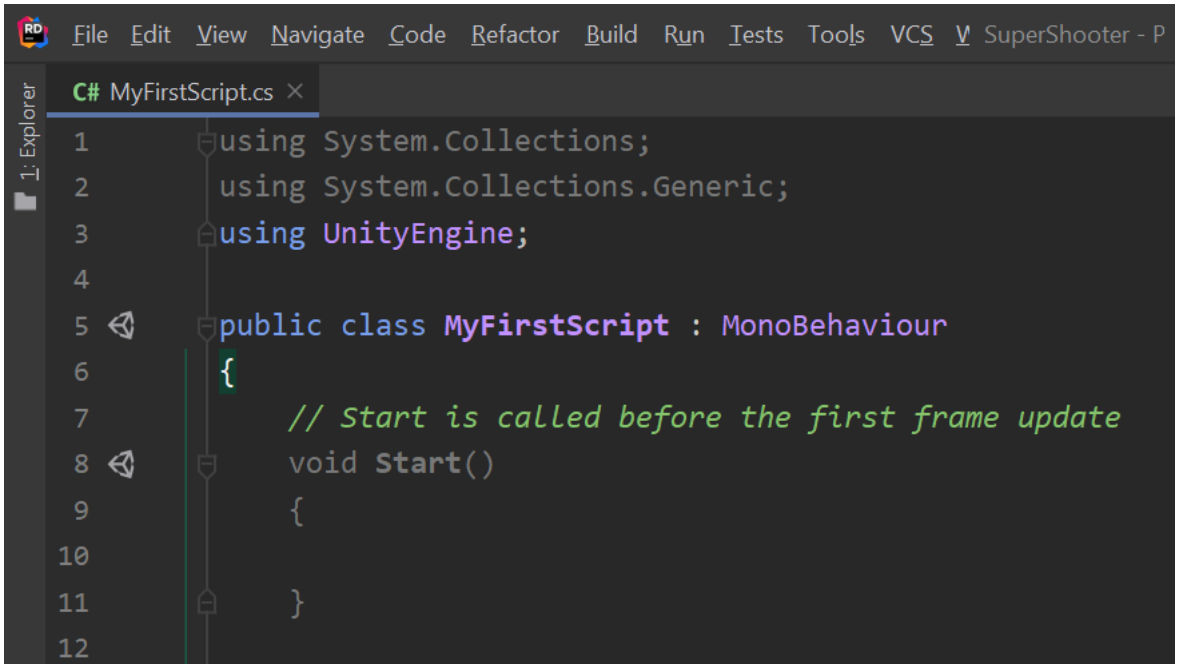

Add Component
test
Search
Test Result Renderer Callback
New script


New script
Name
MyFirstScript
Create and Add


Scripts
MyFirstScript



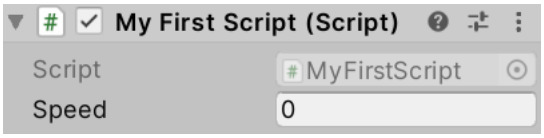





```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
```

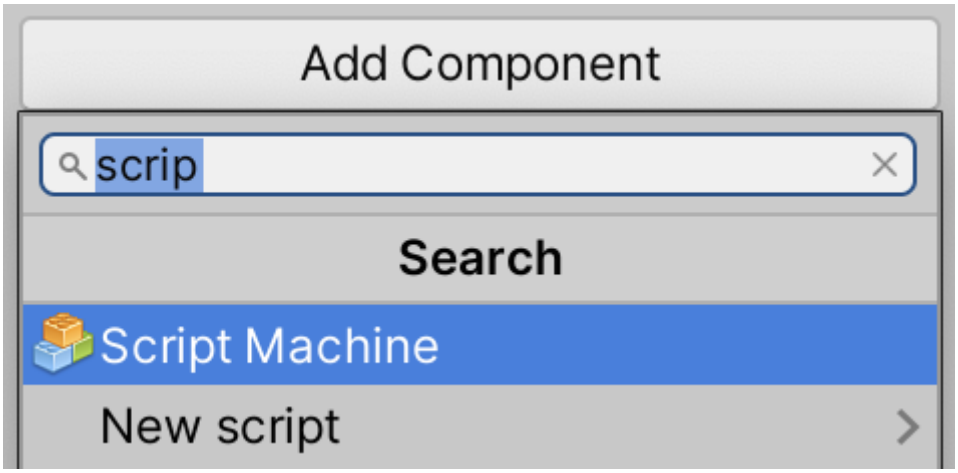
```
public class MyFirstScript : MonoBehaviour
{
```

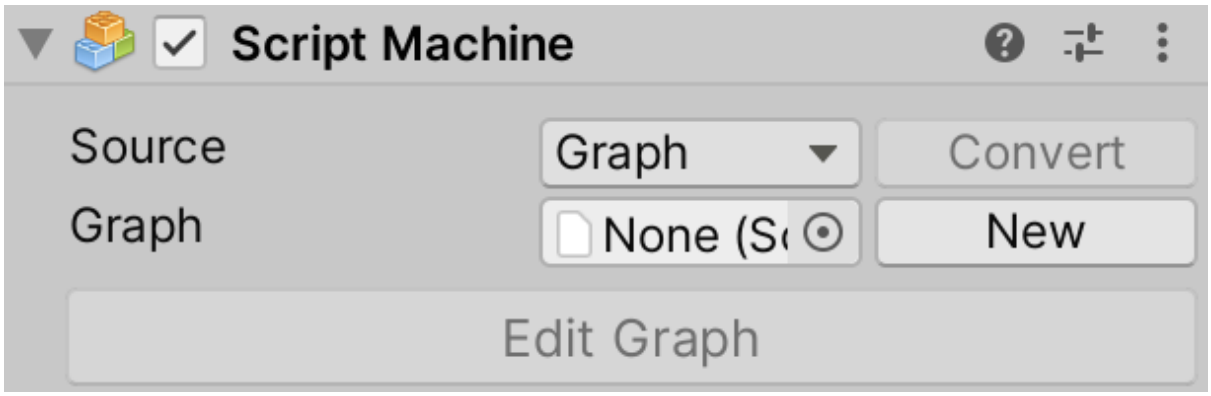
```
public class MyFirstScript : MonoBehaviour
{
    public float speed;
```

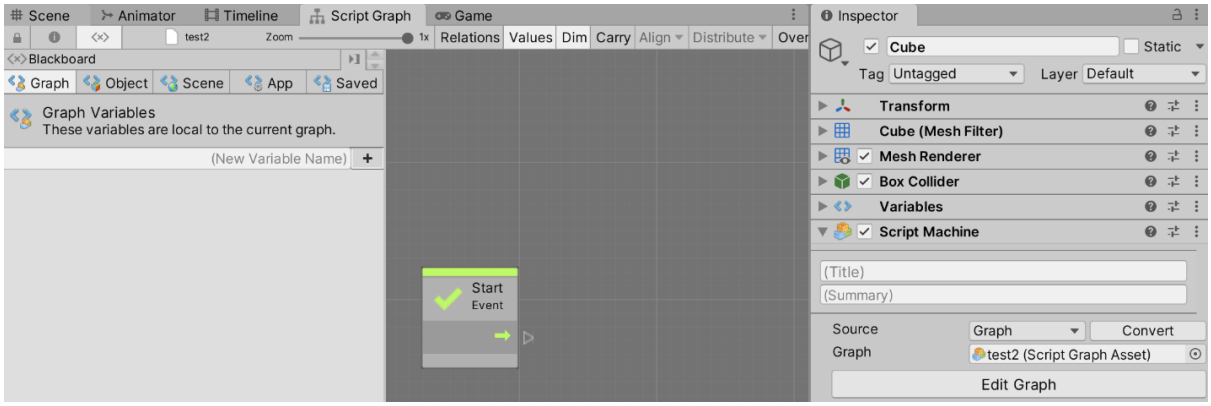


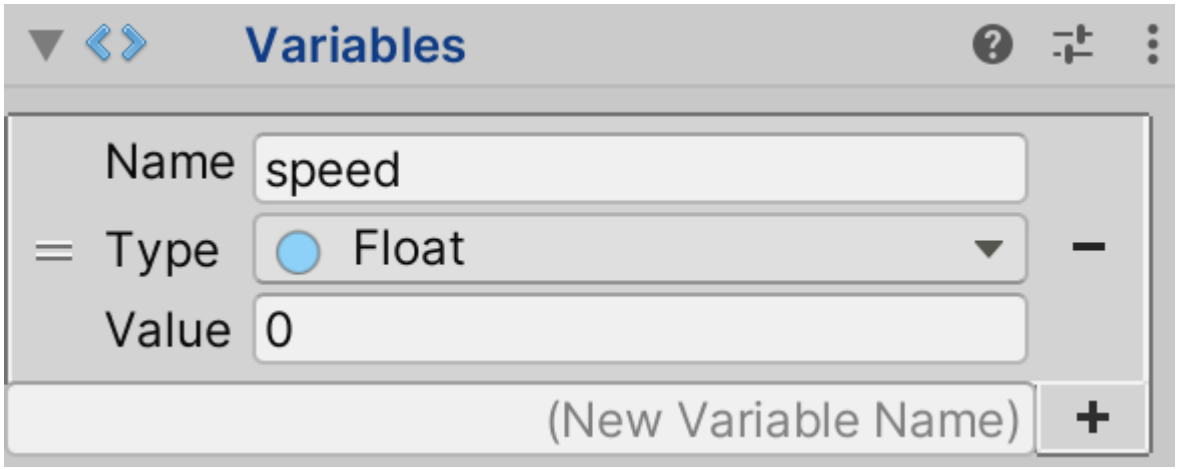

```
[SerializeField]
private float speed;
```

```
[SerializeField] float speed;
```










```
// Update is called once per frame
void Update()
{

}
```

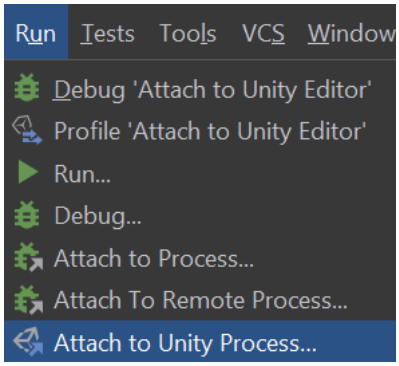
```
void Update()
{
    print("test");
}
```

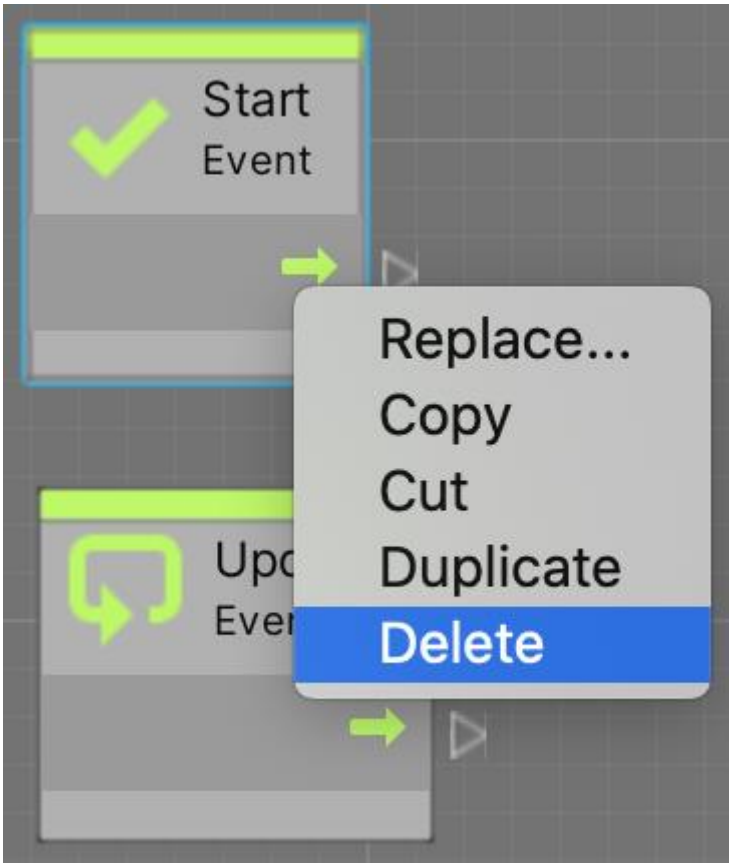
```
public class MyFirstScript : MonoBehaviour
{
    [SerializeField] float speed;

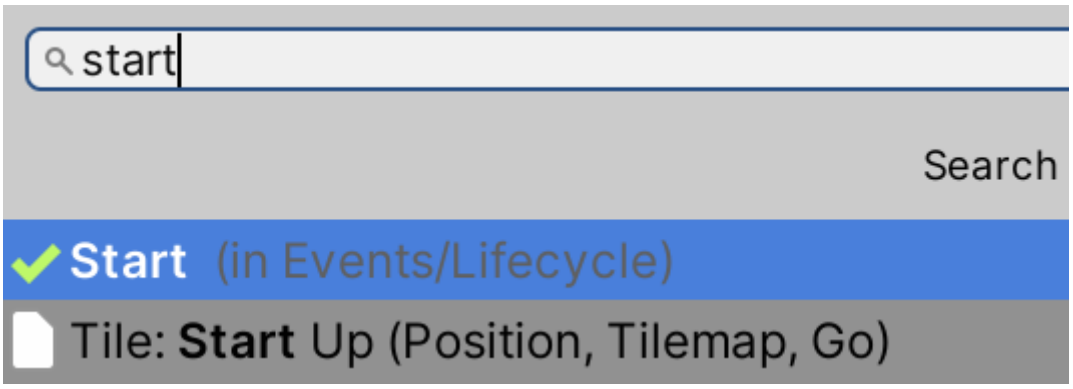
    // Start is called before the first frame update
    void Start()
    {
        print("test Start");
    }

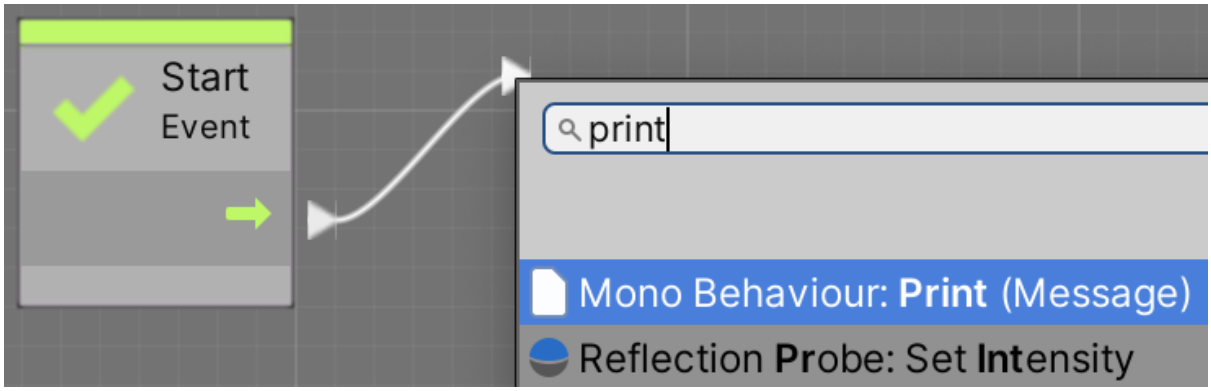
    // Update is called once per frame
    void Update()
    {
        print("test");
    }
}
```

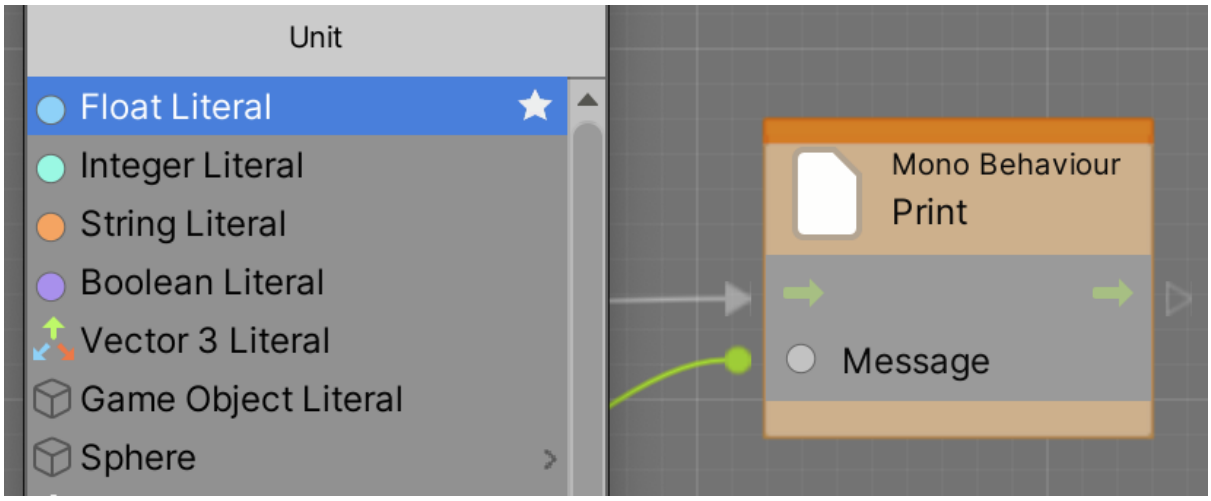
```
void Start()
{
    print("test Start");
}
```

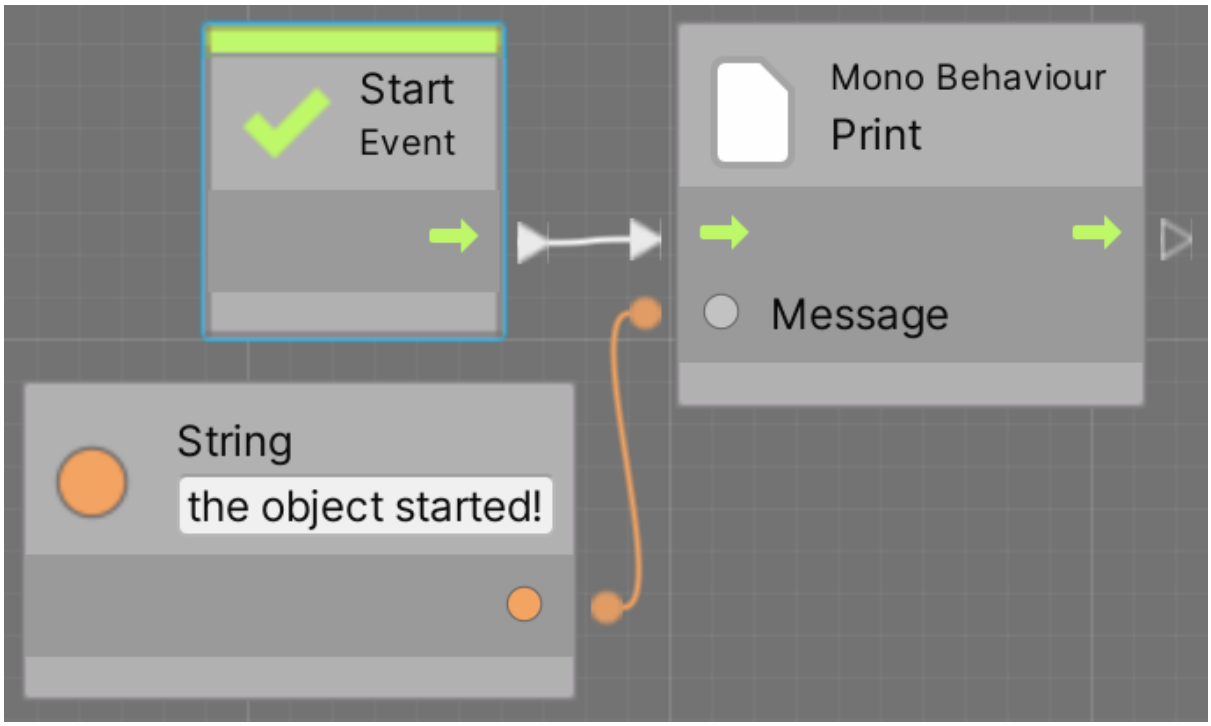






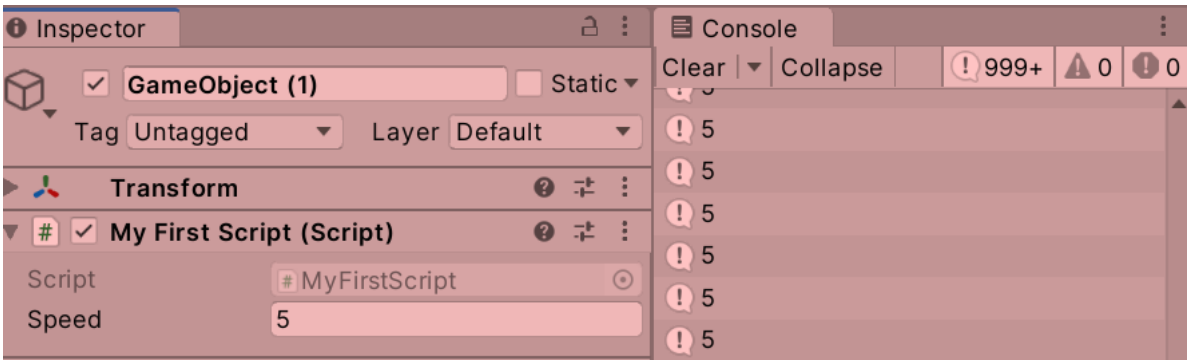

Start
Event
print
Mono Behaviour: Print (Message)
Reflection Probe: Set Intensity

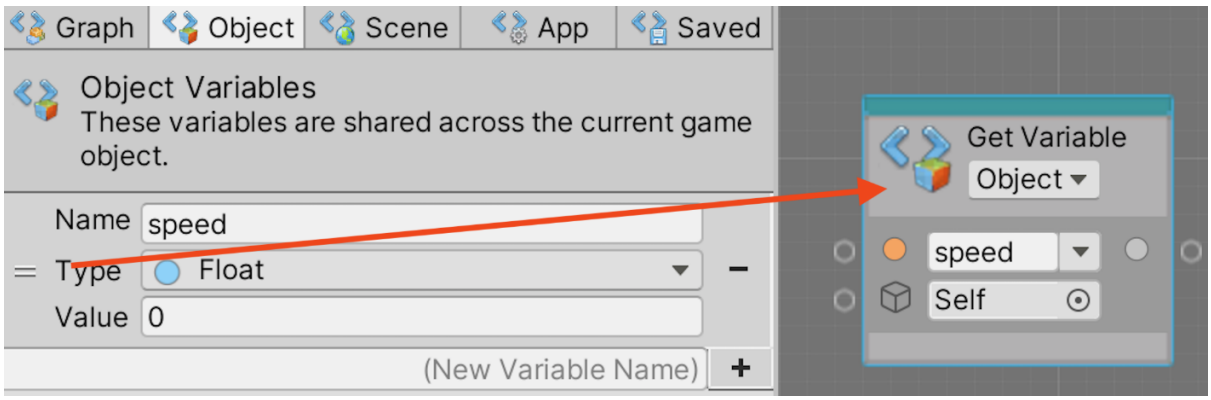

Unit
Float Literal
Integer Literal
String Literal
Boolean Literal
Vector 3 Literal
Game Object Literal
Sphere
Mono Behaviour
Print
Message

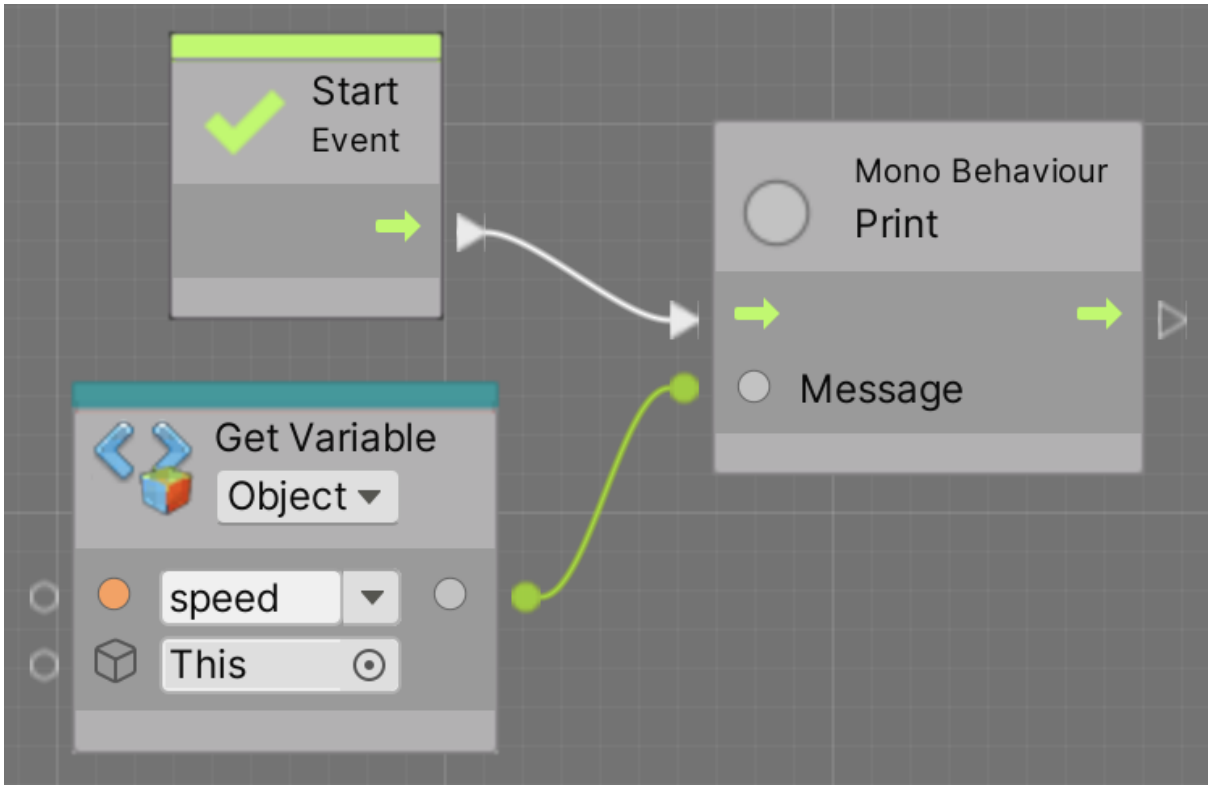

Start
Event
Mono Behaviour
Print
Message
String
the object started!

```
[SerializeField] float speed;

void Update()
{
    print(speed);
}
```







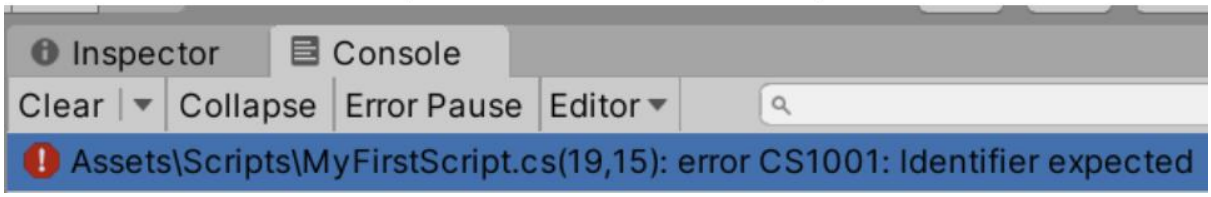
```
print("test")
```


```
Print("test");
```


```
// Update is called
void update()
{
    print("test");
}
```

```
void Update()
{
}

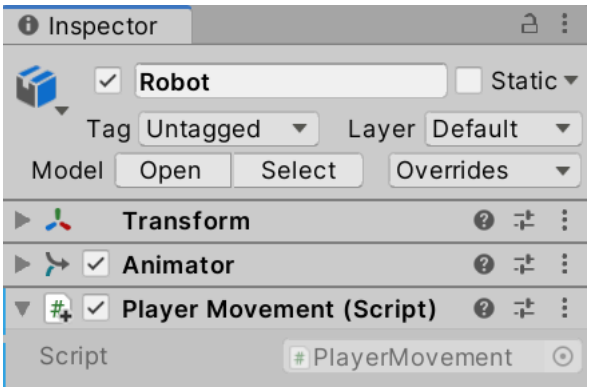
print("test");
```




```
    void Start()
    {
        print("test Start");

    void Update()
    {
        print("test");
    }
}
```

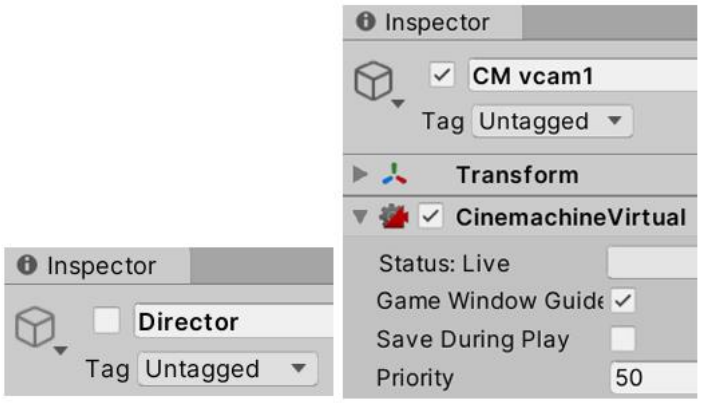
Chapter 15: Implementing Movement and Spawning




```
public class PlayerMovement : MonoBehaviour
{
    void Update()
    {

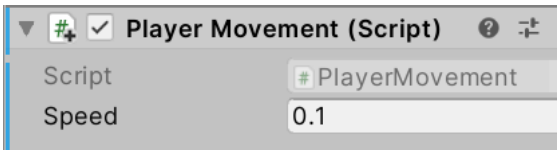
    }
}
```

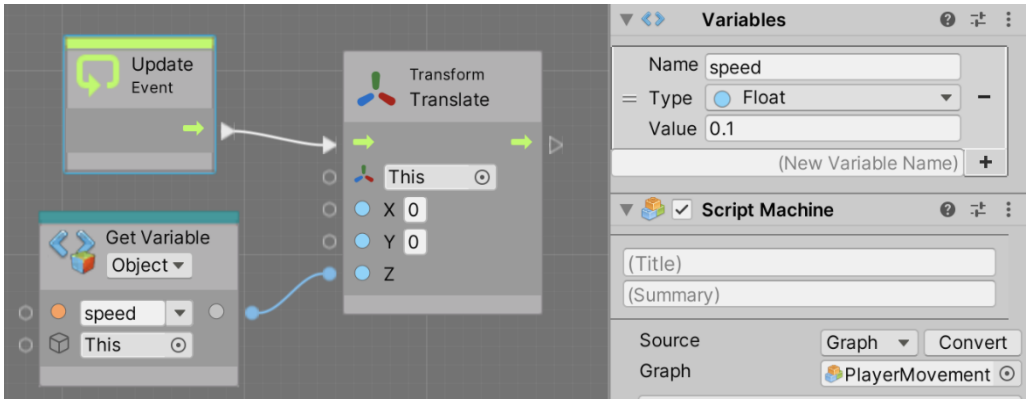
```
public class PlayerMovement : MonoBehaviour
{
    void Update()
    {
        transform.Translate(0, 0, 1);
    }
}
```



```
public float speed;

void Update()
{
    transform.Translate(0, 0, speed);
}
```





Keyboard input	**Action**
Up arrow	Move forward
Down arrow	Move back
Left arrow	Move left
Right arrow	Move right
W	Move forward
S	Move back
A	Move left
D	Move right

Mouse input	**Action**
Mouse movement	Rotate character
Left mouse button	Shoot bullet

```
void Update()
{
    if (Input.GetKey(KeyCode.W))
    {
        transform.Translate(0, 0, speed);
    }
}
```

```
if (Input.GetKey(KeyCode.W))
    transform.Translate(0, 0, speed);

if (Input.GetKey(KeyCode.S))
    transform.Translate(0, 0, -speed);

if (Input.GetKey(KeyCode.A))
    transform.Translate(-speed, 0, 0);

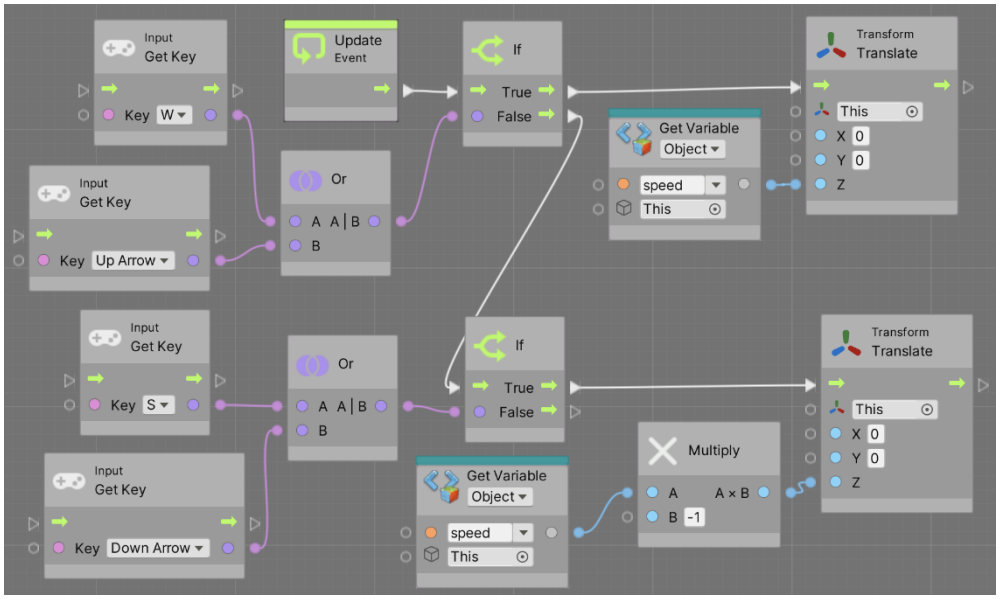
if (Input.GetKey(KeyCode.D))
    transform.Translate(speed, 0, 0);
```

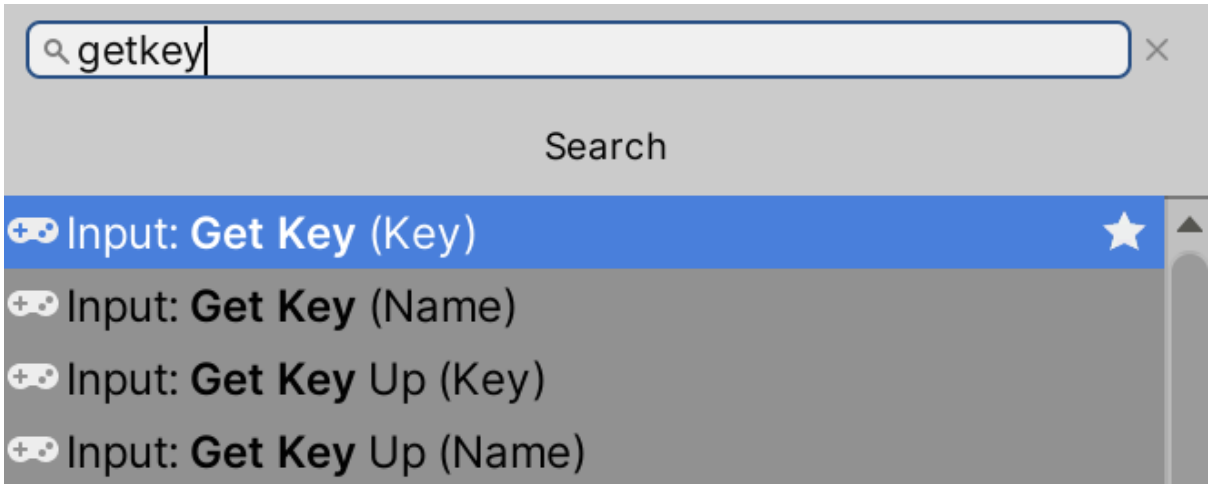
```
if (Input.GetKey(KeyCode.W) || Input.GetKey(KeyCode.UpArrow))
    transform.Translate(0, 0, speed);

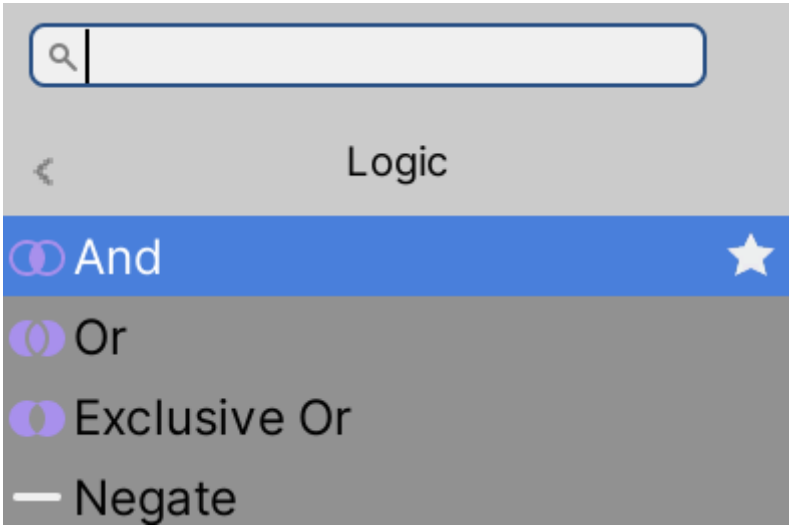
if (Input.GetKey(KeyCode.S) || Input.GetKey(KeyCode.DownArrow))
    transform.Translate(0, 0, -speed);

if (Input.GetKey(KeyCode.A) || Input.GetKey(KeyCode.LeftArrow))
    transform.Translate(-speed, 0, 0);

if (Input.GetKey(KeyCode.D) || Input.GetKey(KeyCode.RightArrow))
    transform.Translate(speed, 0, 0);
```





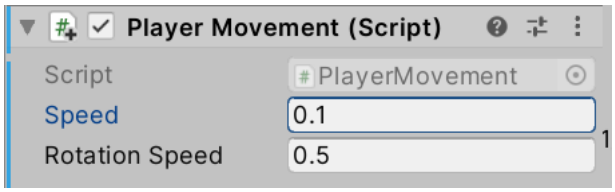


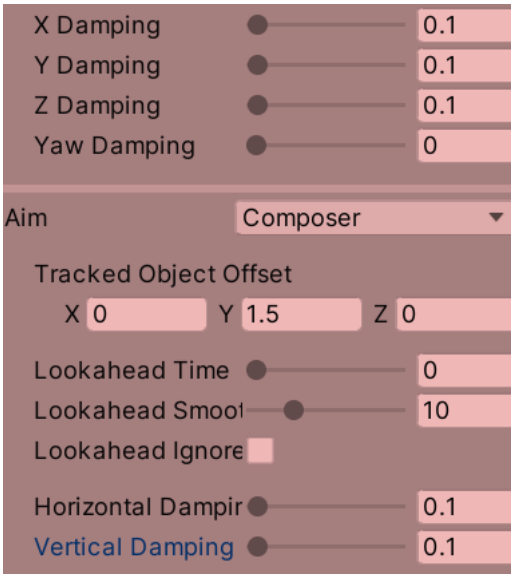

```
float mouseX = Input.GetAxis("Mouse X");
```

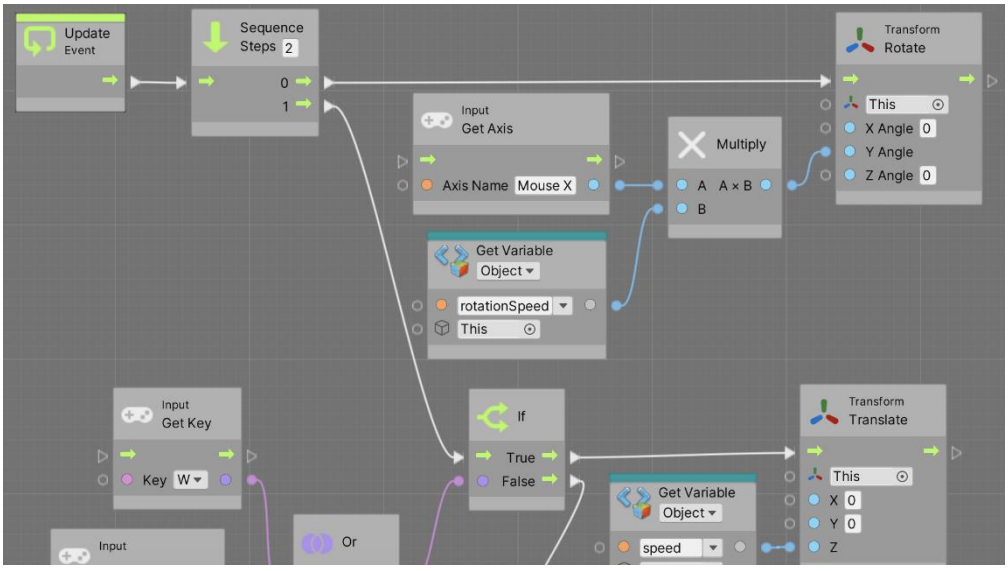
```
float mouseX = Input.GetAxis("Mouse X");
transform.Rotate(0, mouseX, 0);
```

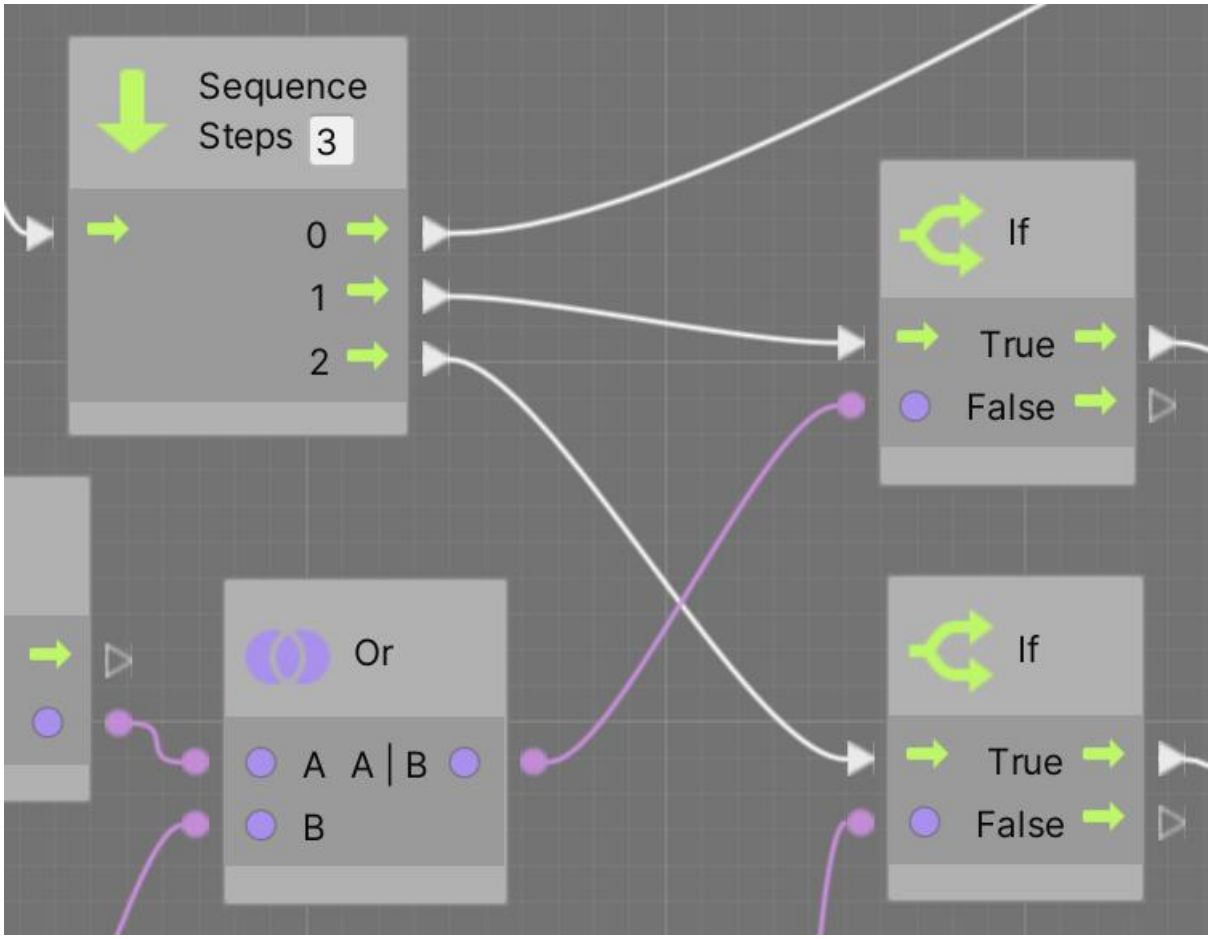
```
public float speed;
public float rotationSpeed;
```

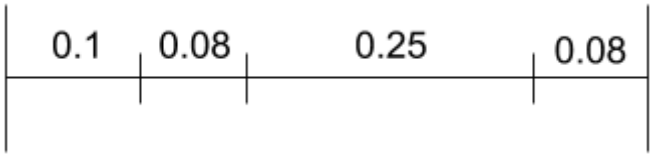
```
float mouseX = Input.GetAxis("Mouse X");
transform.Rotate(0, mouseX * rotationSpeed, 0);
```











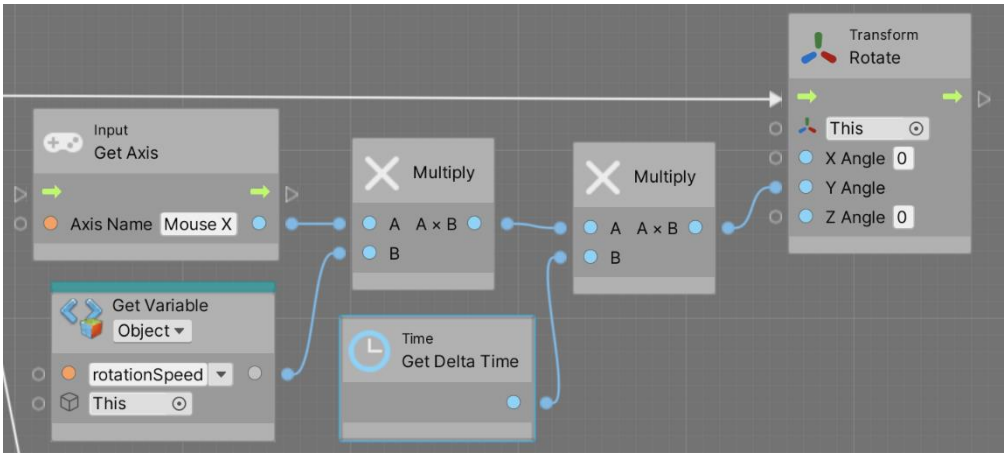

```
if (Input.GetKey(KeyCode.W) || Input.GetKey(KeyCode.UpArrow))
    transform.Translate(0, 0, speed * Time.deltaTime);

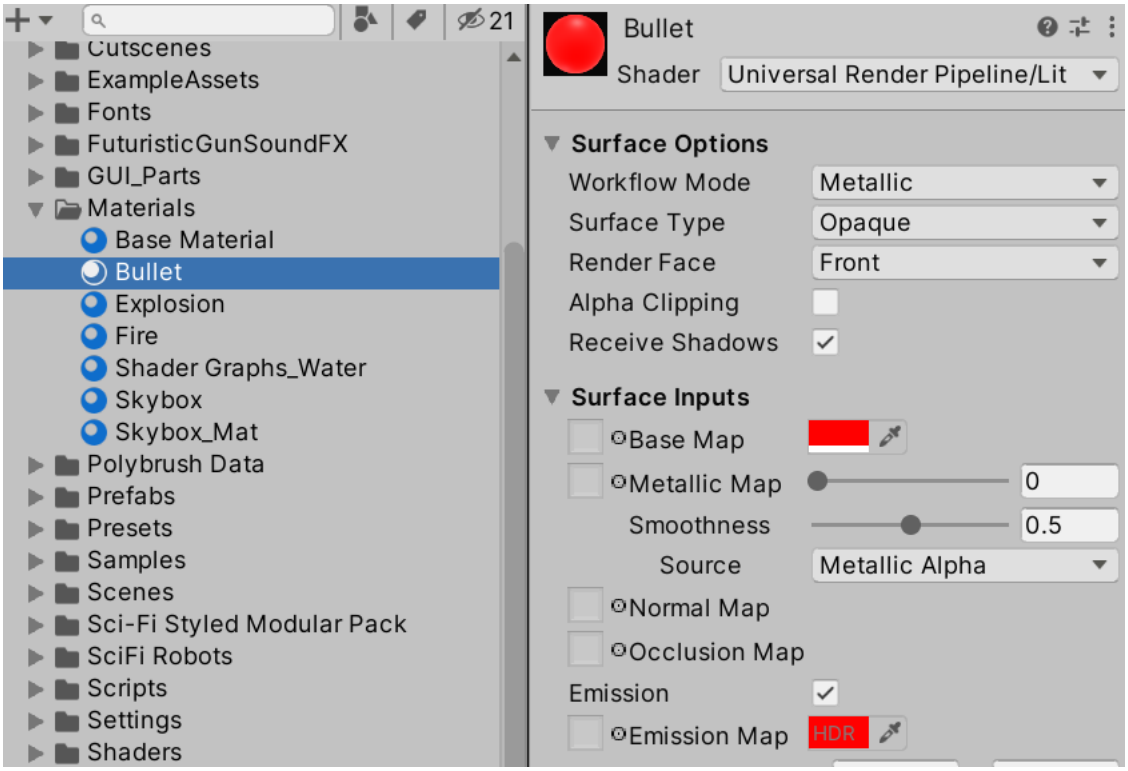
if (Input.GetKey(KeyCode.S) || Input.GetKey(KeyCode.DownArrow))
    transform.Translate(0, 0, -speed * Time.deltaTime);

if (Input.GetKey(KeyCode.A) || Input.GetKey(KeyCode.LeftArrow))
    transform.Translate(-speed * Time.deltaTime, 0, 0);

if (Input.GetKey(KeyCode.D) || Input.GetKey(KeyCode.RightArrow))
    transform.Translate(speed * Time.deltaTime, 0, 0);
```

```
float mouseX = Input.GetAxis("Mouse X");
transform.Rotate(0, mouseX * rotationSpeed * Time.deltaTime, 0);
```

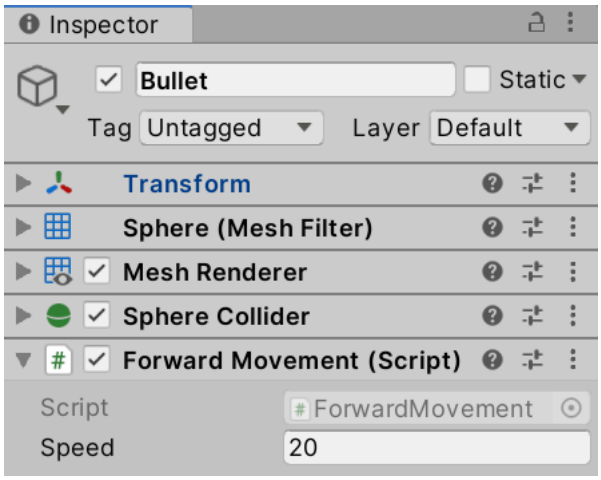

Input
Get Axis
Axis Name Mouse X
Multiply
A A × B
B
Multiply
A A × B
B
Transform
Rotate
This
X Angle 0
Y Angle
Z Angle 0
Get Variable
Object
rotationSpeed
This
Time
Get Delta Time

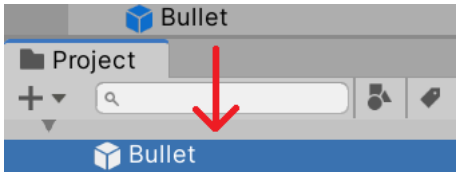

21
Cutscenes
ExampleAssets
Fonts
FuturisticGunSoundFX
GUI_Parts
Materials
Base Material
Bullet
Explosion
Fire
Shader Graphs_Water
Skybox
Skybox_Mat
Polybrush Data
Prefabs
Presets
Samples
Scenes
Sci-Fi Styled Modular Pack
SciFi Robots
Scripts
Settings
Shaders
Bullet
Shader Universal Render Pipeline/Lit
Surface Options
Workflow Mode Metallic
Surface Type Opaque
Render Face Front
Alpha Clipping
Receive Shadows
Surface Inputs
Base Map
Metallic Map 0
Smoothness 0.5
Source Metallic Alpha
Normal Map
Occlusion Map
Emission
Emission Map
HDR

```
using UnityEngine;

public class ForwardMovement : MonoBehaviour
{
    public float speed;

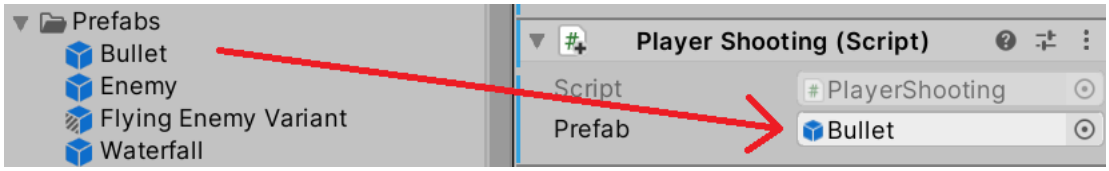
    void Update()
    {
        transform.Translate(0,0,speed * Time.deltaTime);
    }
}
```






```
using UnityEngine;

public class PlayerShooting : MonoBehaviour
{
    public GameObject prefab;
}
```



```
void Update()
{
    if (Input.GetKeyDown(KeyCode.Mouse0))
    {

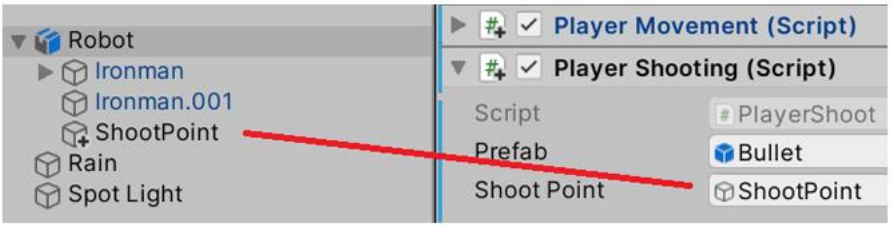
    }
}
```

```
if (Input.GetKeyDown(KeyCode.Mouse0))
{
    Instantiate(prefab);
}
```

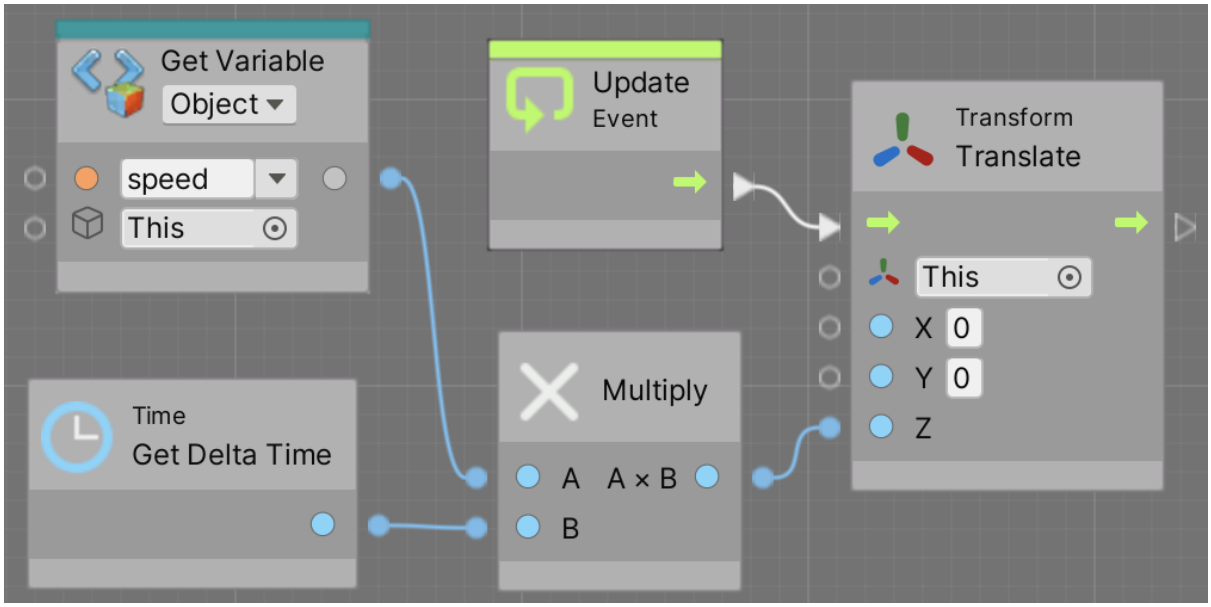
```
Instantiate(prefab, transform.position, transform.rotation);
```

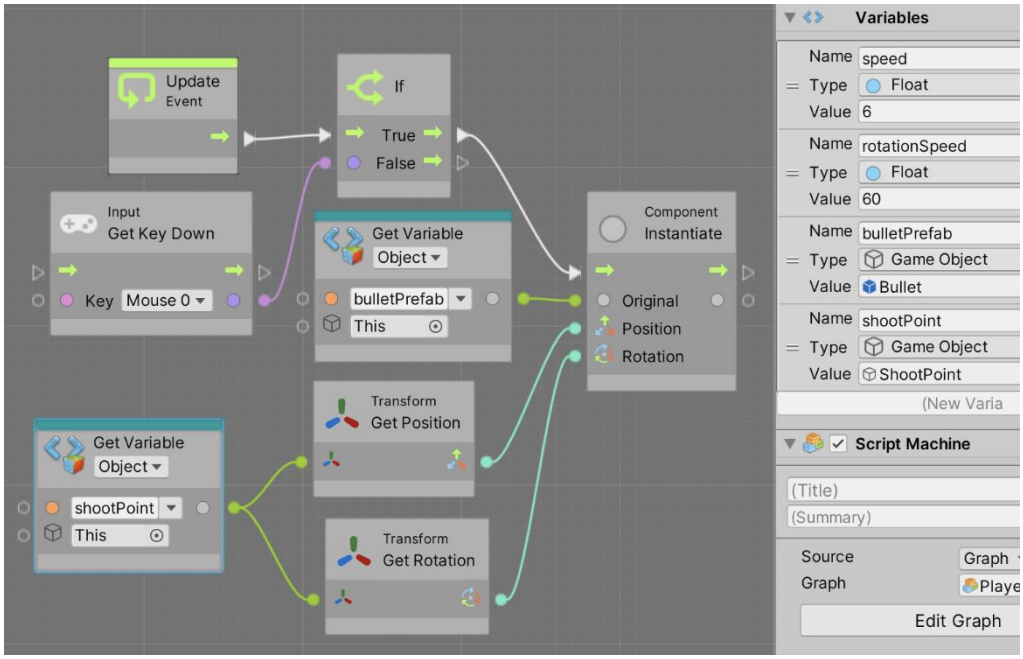
```
GameObject clone = Instantiate(prefab);
clone.transform.position = transform.position;
clone.transform.rotation = transform.rotation;
```


```
public GameObject prefab;
public GameObject shootPoint;
```

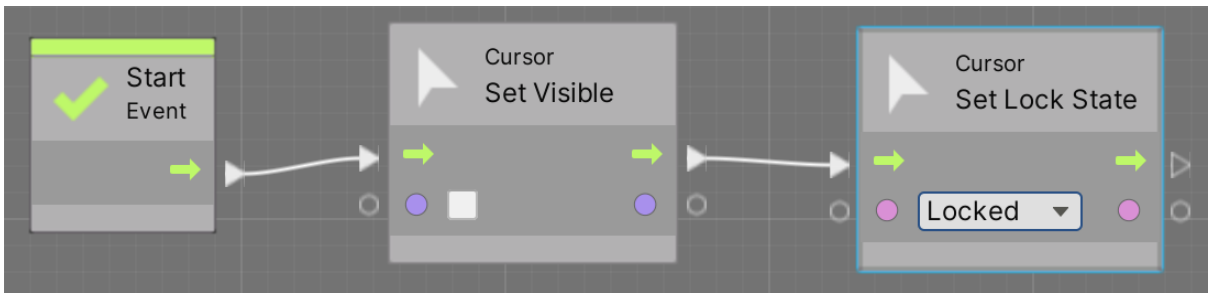



```
GameObject clone = Instantiate(prefab);
clone.transform.position = shootPoint.transform.position;
clone.transform.rotation = shootPoint.transform.rotation;
```






```
void Start()
{
    Cursor.visible = false;
    Cursor.lockState = CursorLockMode.Locked;
}
```



```
public GameObject prefab; //Prefab to spawn
public float startTime; //Time to start the wave spawning
public float endTime; //Time to end the wave spawning
public float spawnRate; //Time between each spawn
```

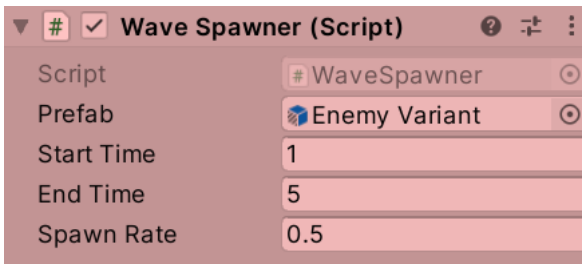
```
void Start()
{
    InvokeRepeating("Spawn", startTime, spawnRate);
}

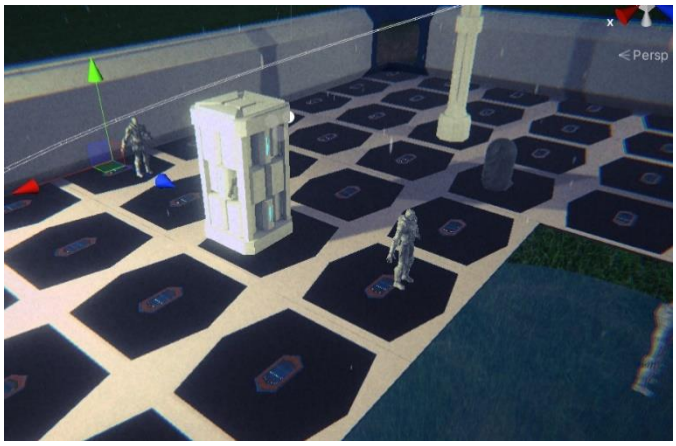
void Spawn()
{

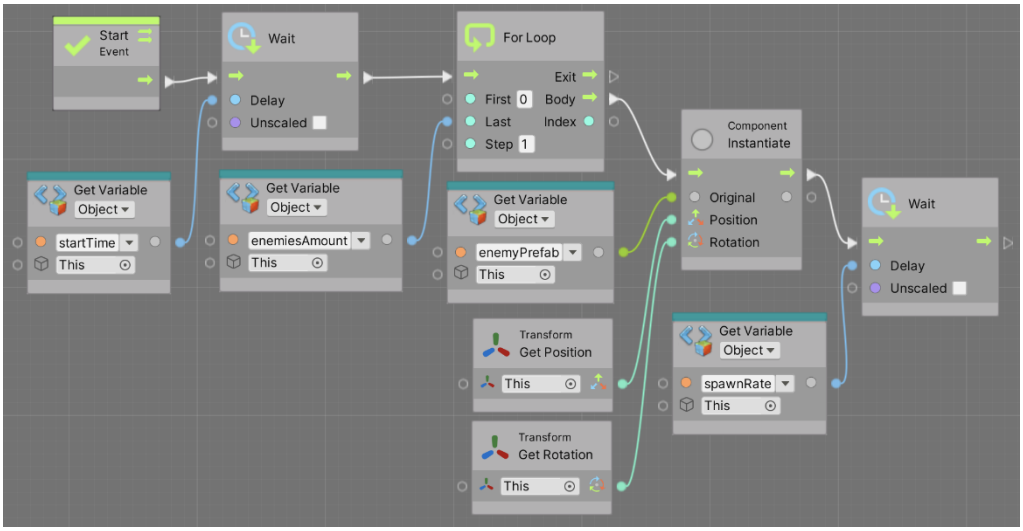
}
```

```
void Spawn()
{
    Instantiate(prefab, transform.position, transform.rotation);
}
```

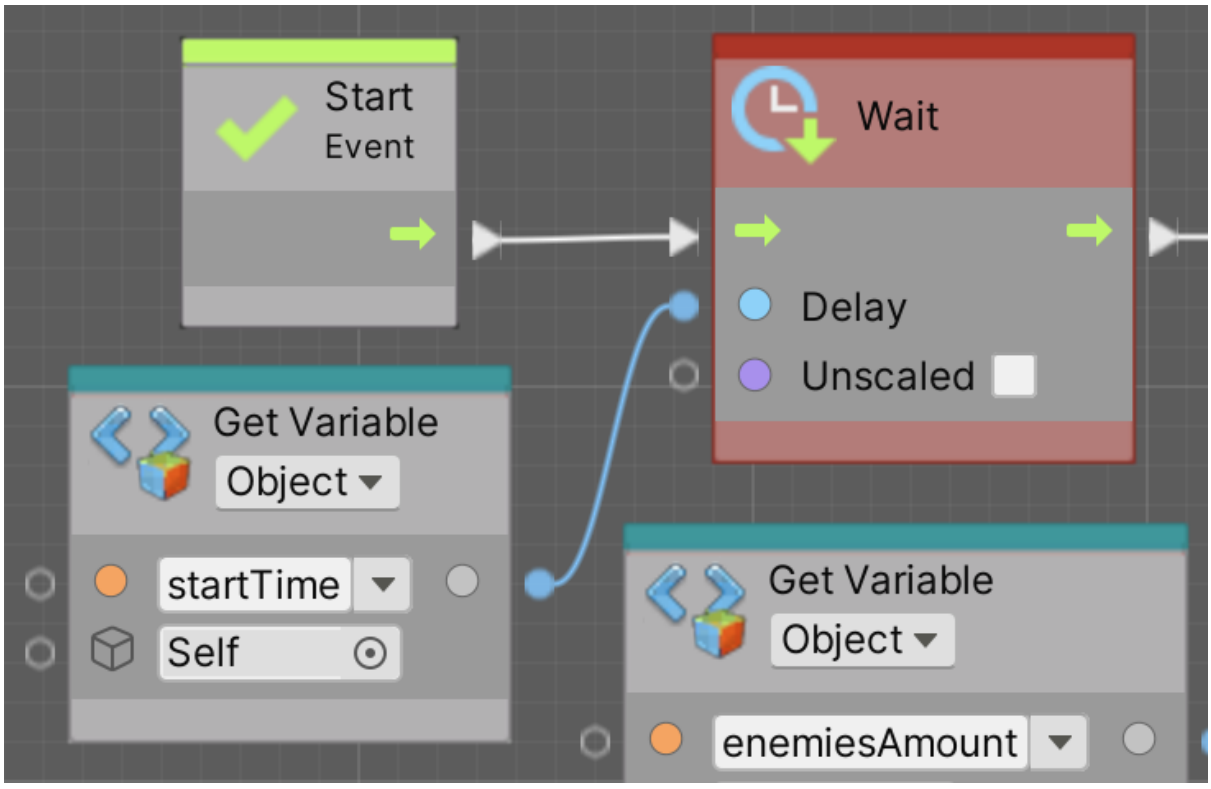
```
void Start()
{
    InvokeRepeating("Spawn", startTime, spawnRate);
    Invoke("CancelInvoke", endTime);
}
```







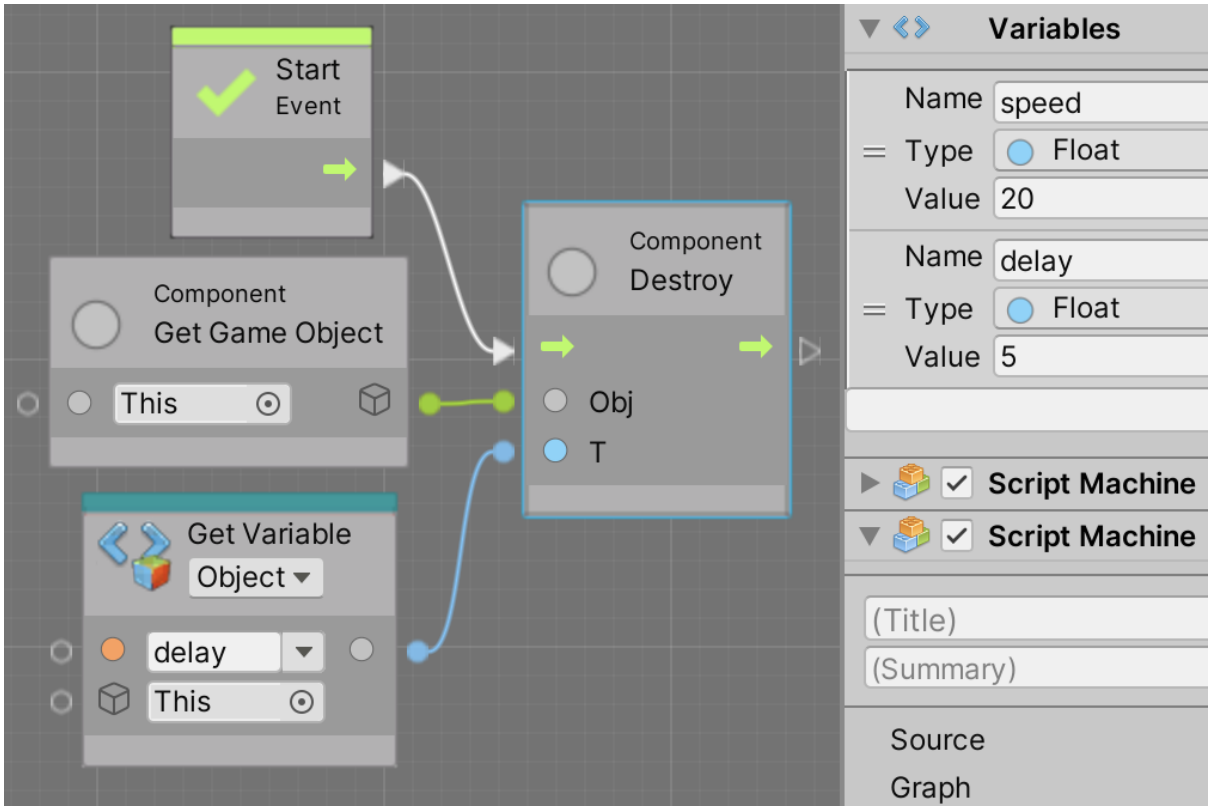
[20:23:45] InvalidOperationException: Port 'enter' on 'WaitForSecondsUnit#ed5f4...' can only be triggered in a coroutine.
Unity.VisualScripting.Flow.InvokeDelegate (Unity.VisualScripting.ControlInput input) (at Library/PackageCache/com.unity



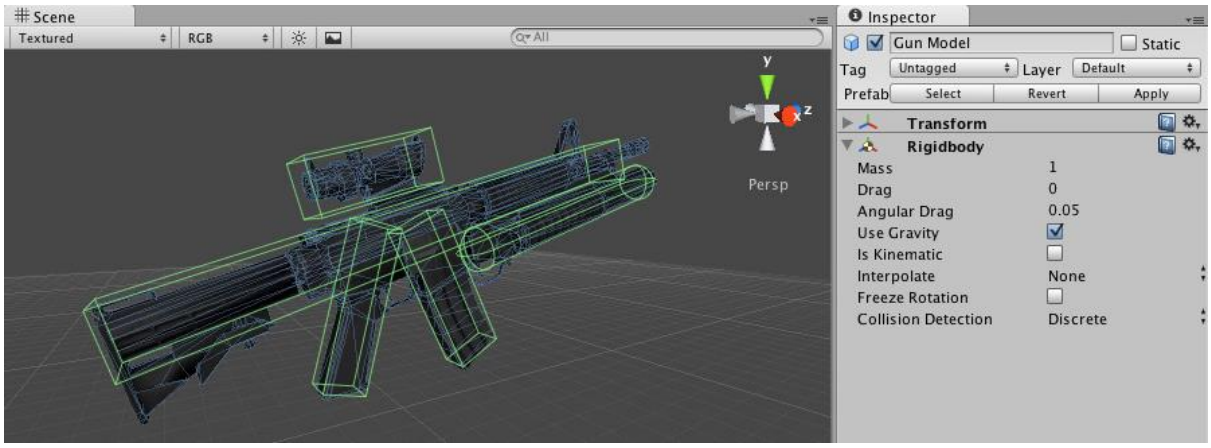
```
void Start()
{
    Destroy(gameObject);
}
```

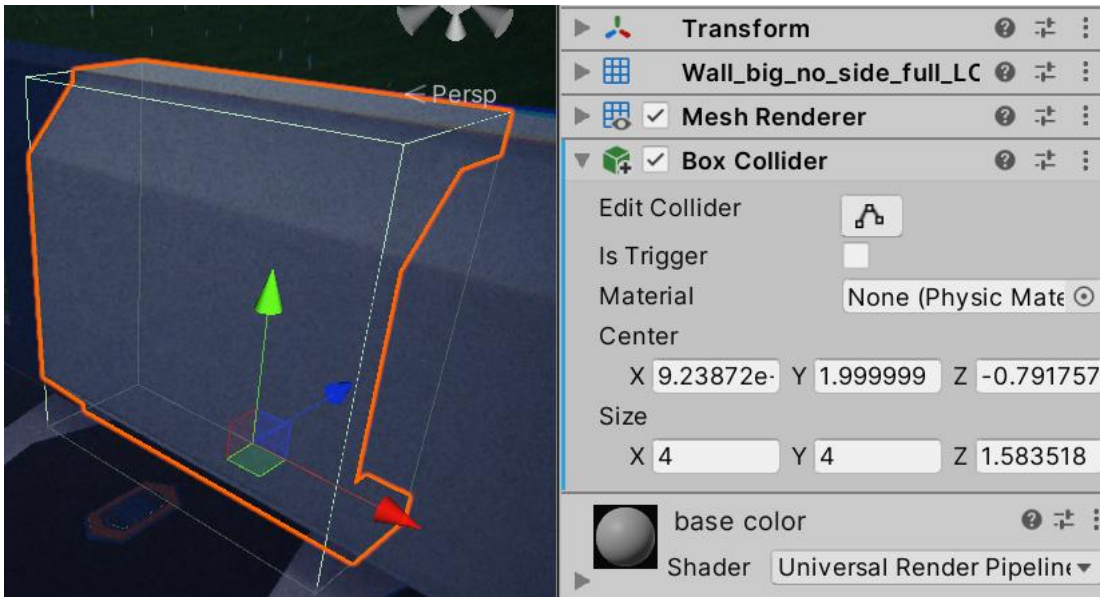
```
public float delay;

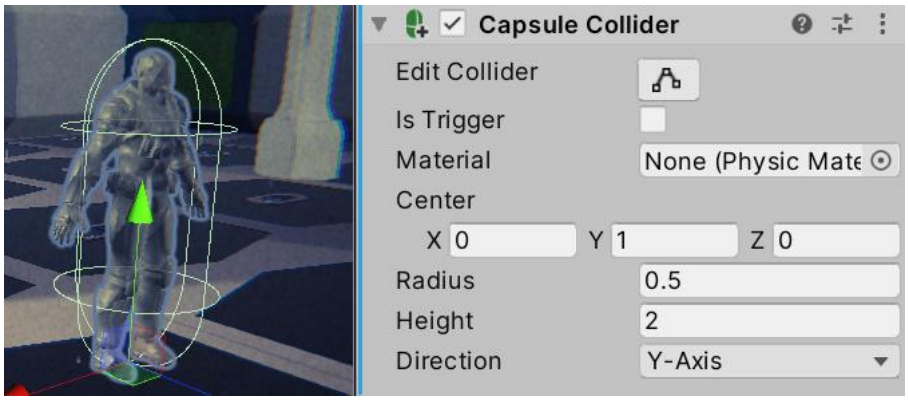
void Start()
{
    Destroy(gameObject, delay);
}
```



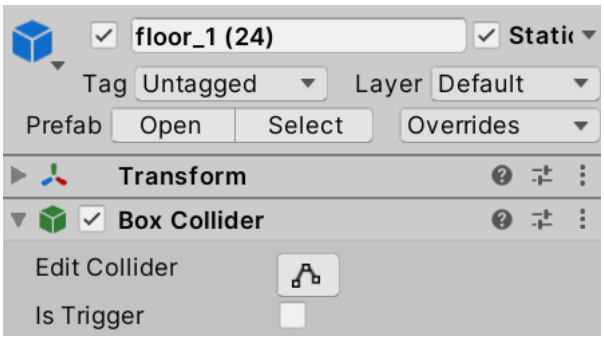
Chapter 16: Physics Collisions and Health System

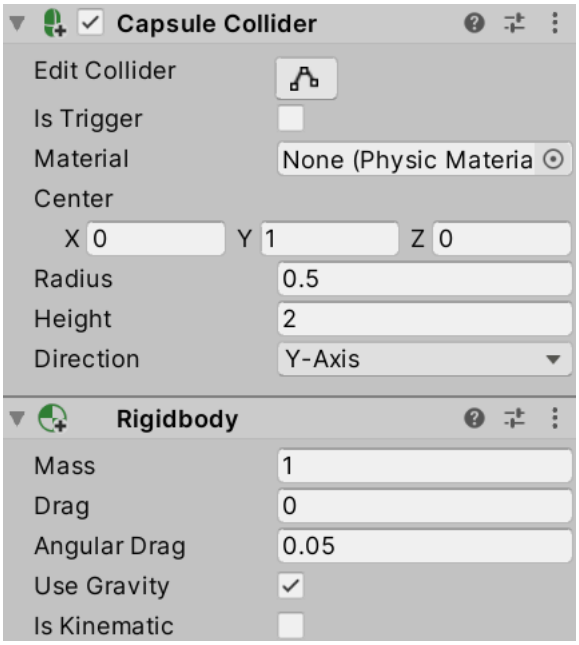


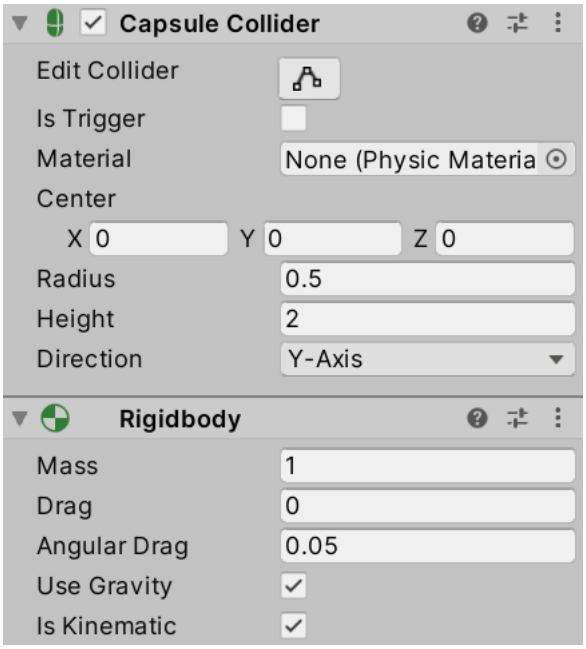


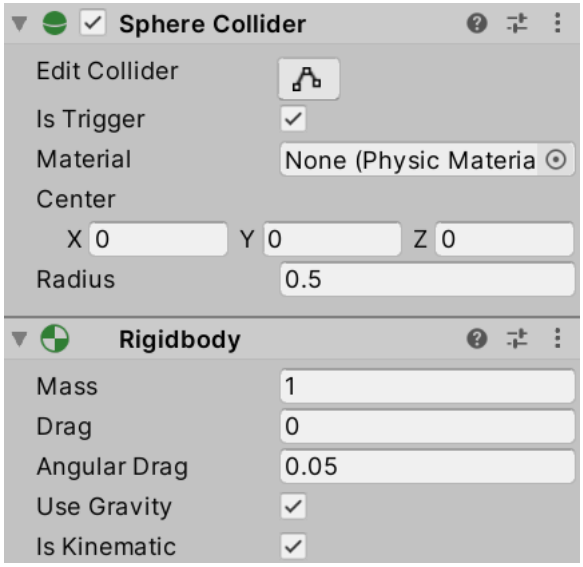


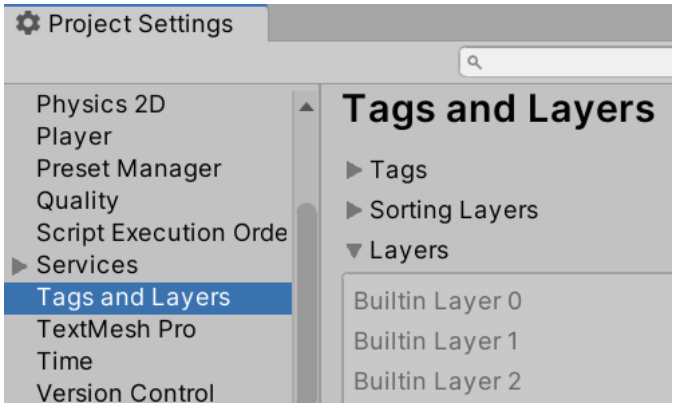
	Collides with Static	Collides with Dynamic	Collides with Kinematic	Collides with Trigger Static	Collides with Trigger Kinematic
Dynamic	Collision	Collision	Collision	Trigger	Trigger
Kinematic	Nothing	Nothing	Nothing	Trigger	Trigger
Trigger Kinematic	Trigger	Trigger	Trigger	Trigger	Trigger

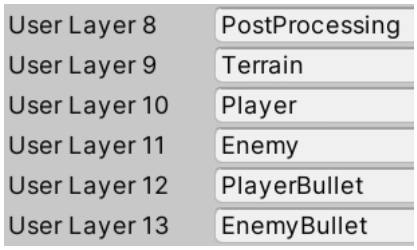


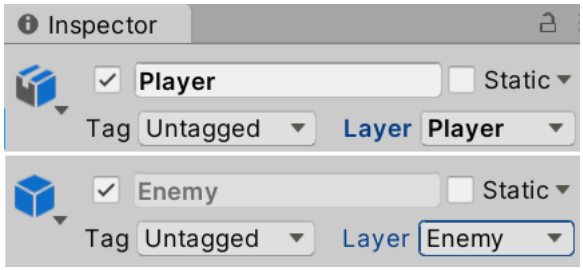


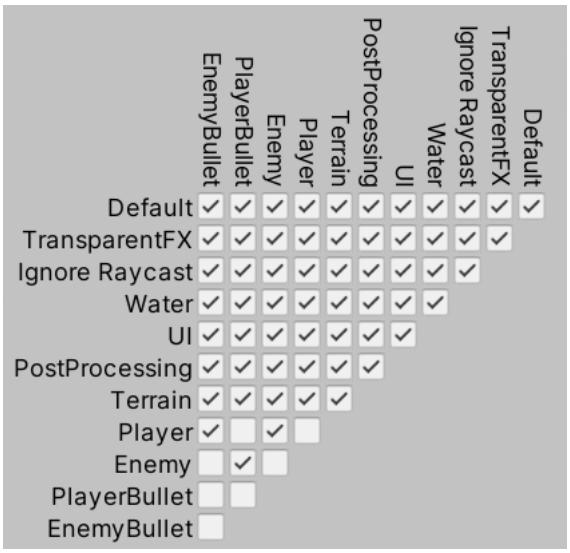

Capsule Collider
Edit Collider
Is Trigger
Material
None (Physic Materia
Center
X 0
Y 0
Z 0
Radius
0.5
Height
2
Direction
Y-Axis
Rigidbody
Mass
1
Drag
0
Angular Drag
0.05
Use Gravity
Is Kinematic


Sphere Collider
Edit Collider
Is Trigger
Material
None (Physic Materia
Center
X 0
Y 0
Z 0
Radius
0.5
Rigidbody
Mass
1
Drag
0
Angular Drag
0.05
Use Gravity
Is Kinematic


Project Settings
Physics 2D
Player
Preset Manager
Quality
Script Execution Orde
Services
Tags and Layers
TextMesh Pro
Time
Version Control
Tags and Layers
Tags
Sorting Layers
Layers
Builtin Layer 0
Builtin Layer 1
Builtin Layer 2



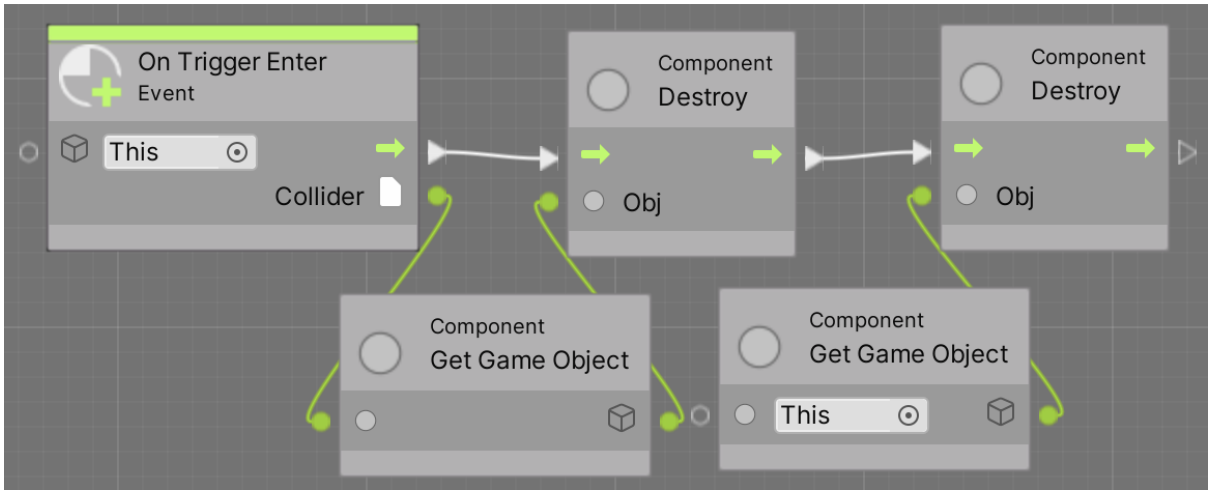





```
public class ContactDestroyer : MonoBehaviour
{
    void OnTriggerEnter()
    {
        Destroy(gameObject);
    }
}
```

```
void OnTriggerEnter(Collider other)
```

```
void OnTriggerEnter(Collider other)
{
    Destroy(gameObject);
    Destroy(other.gameObject);
}
```




```
public class Life : MonoBehaviour
{
    public float amount;
}
```

```
Life life = other.GetComponent<Life>();
```

```
using UnityEngine;

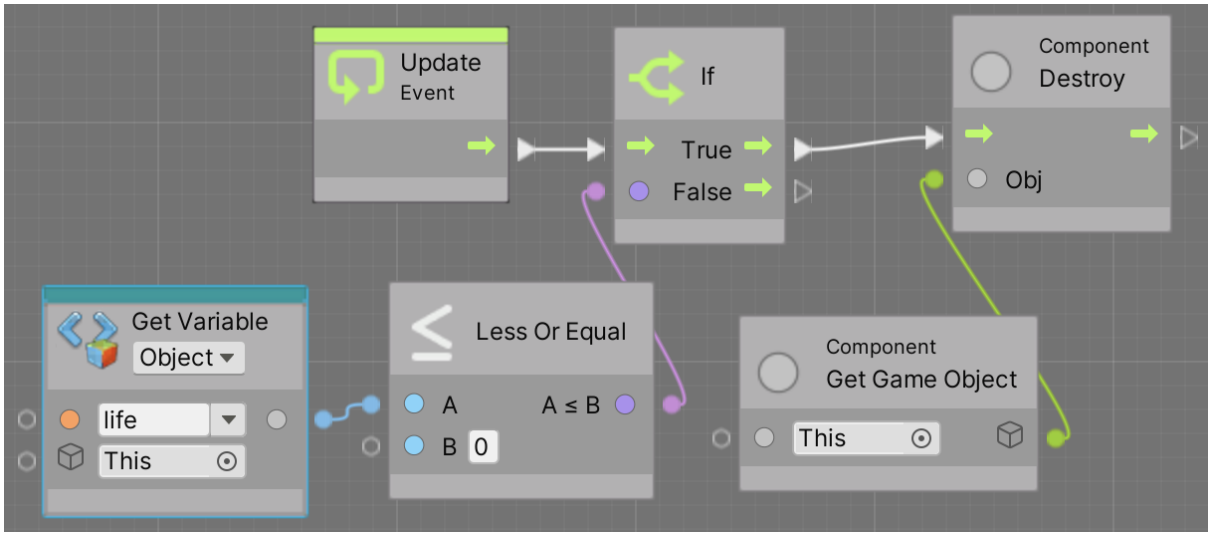
public class ContactDamager : MonoBehaviour
{
    public float damage;

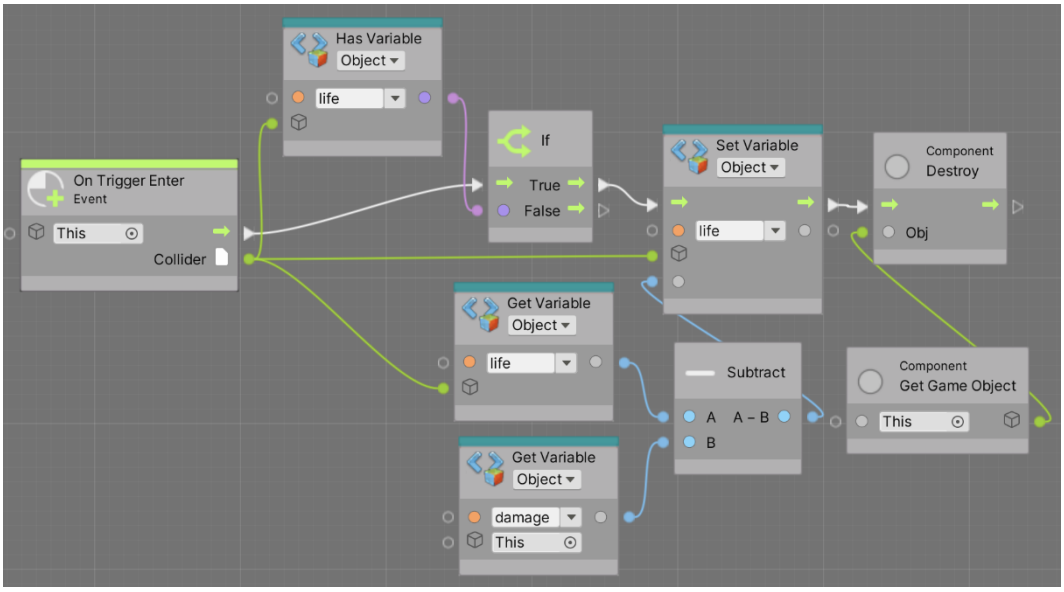
    void OnTriggerEnter(Collider other)
    {
        Destroy(gameObject);

        Life life = other.GetComponent<Life>();
        if (life != null)
        {
            life.amount -= damage;
        }
    }
}
```

```
public class Life : MonoBehaviour
{
    public float amount;

    void Update()
    {
        if (amount < 0)
        {
            Destroy(gameObject);
        }
    }
}
```






```
private Rigidbody rb;
```

```
void Start()
{
    Cursor.visible = false;
    Cursor.lockState = CursorLockMode.Locked;

    rb = GetComponent<Rigidbody>();
}
```

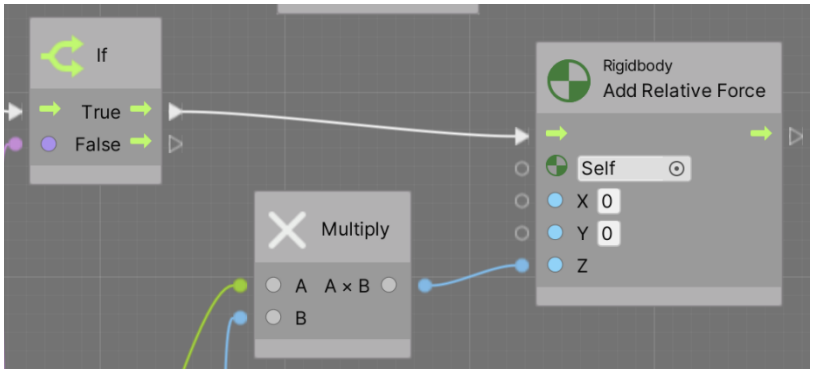
```
if (Input.GetKey(KeyCode.W) || Input.GetKey(KeyCode.UpArrow))
    rb.AddRelativeForce(0, 0, speed * Time.deltaTime);

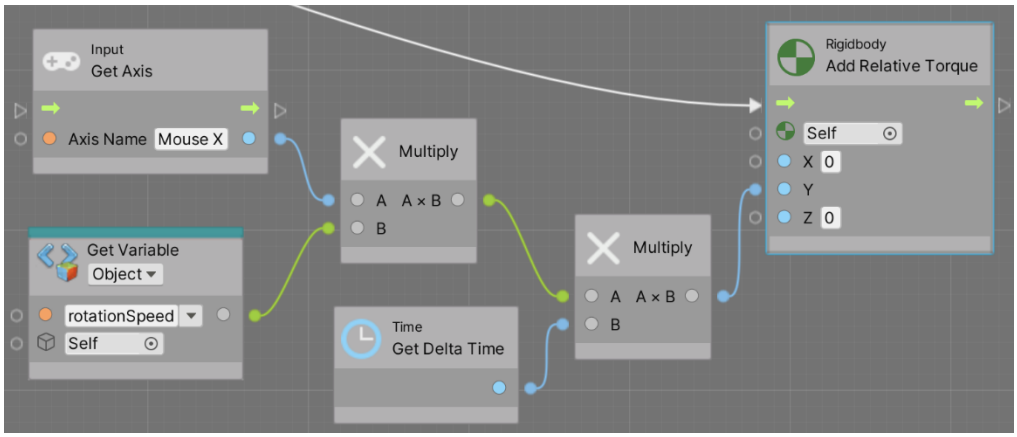
if (Input.GetKey(KeyCode.S) || Input.GetKey(KeyCode.DownArrow))
    rb.AddRelativeForce(0, 0, -speed * Time.deltaTime);

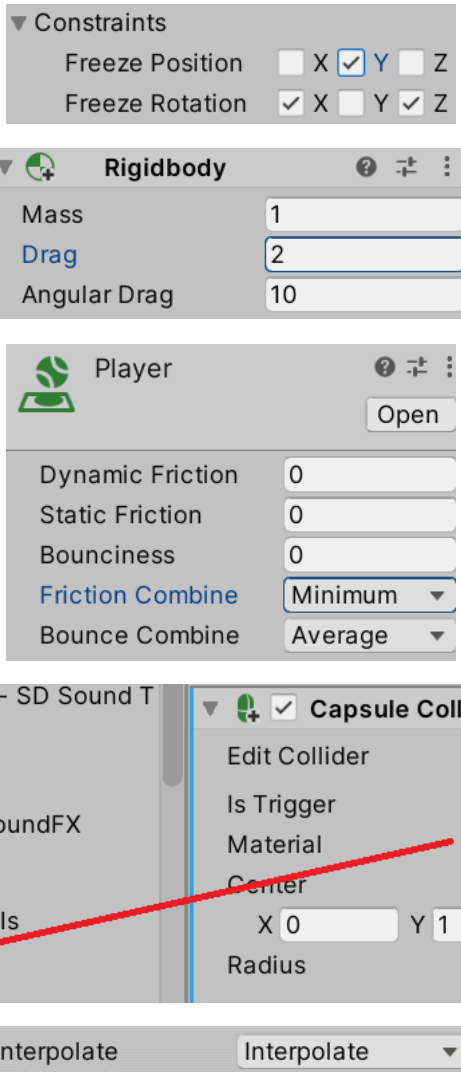
if (Input.GetKey(KeyCode.A) || Input.GetKey(KeyCode.LeftArrow))
    rb.AddRelativeForce(-speed * Time.deltaTime, 0, 0);

if (Input.GetKey(KeyCode.D) || Input.GetKey(KeyCode.RightArrow))
    rb.AddRelativeForce(speed * Time.deltaTime, 0, 0);

float mouseX = Input.GetAxis("Mouse X");
rb.AddRelativeTorque(0, mouseX * rotationSpeed * Time.deltaTime, 0);
```






Constraints
Freeze Position X Y Z
Freeze Rotation X Y Z
Rigidbody
Mass 1
Drag 2
Angular Drag 10
Player
Open
Dynamic Friction 0
Static Friction 0
Bounciness 0
Friction Combine Minimum
Bounce Combine Average
Backing Track - SD Sound T
Cutscenes
ExampleAssets
Fonts
FuturisticGunSoundFX
GUI_Parts
Materials
PhysicsMaterials
Player
Polybrush Data
Capsule Collider
Edit Collider
Is Trigger
Material Player
Center
X 0 Y 1 Z 0
Radius 0.5
Interpolate Interpolate

Chapter 17: Win and Lose Condition

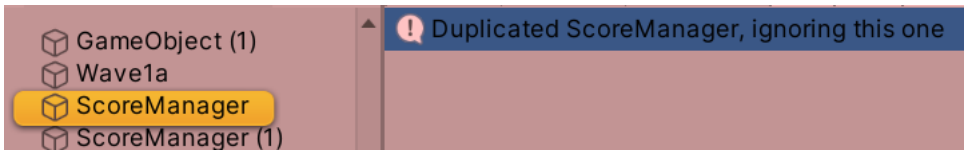
```
using UnityEngine;

public class ScoreManager : MonoBehaviour
{
    public static ScoreManager instance;

    public int amount;
}
```

```
void Awake()
{
    if (instance == null)
    {
        instance = this;
    }
    else
    {
        print("Duplicated ScoreManager, ignoring this one");
    }
}
```

```
Debug.Log("Duplicated ScoreManager, ignoring this one", gameObject);
```



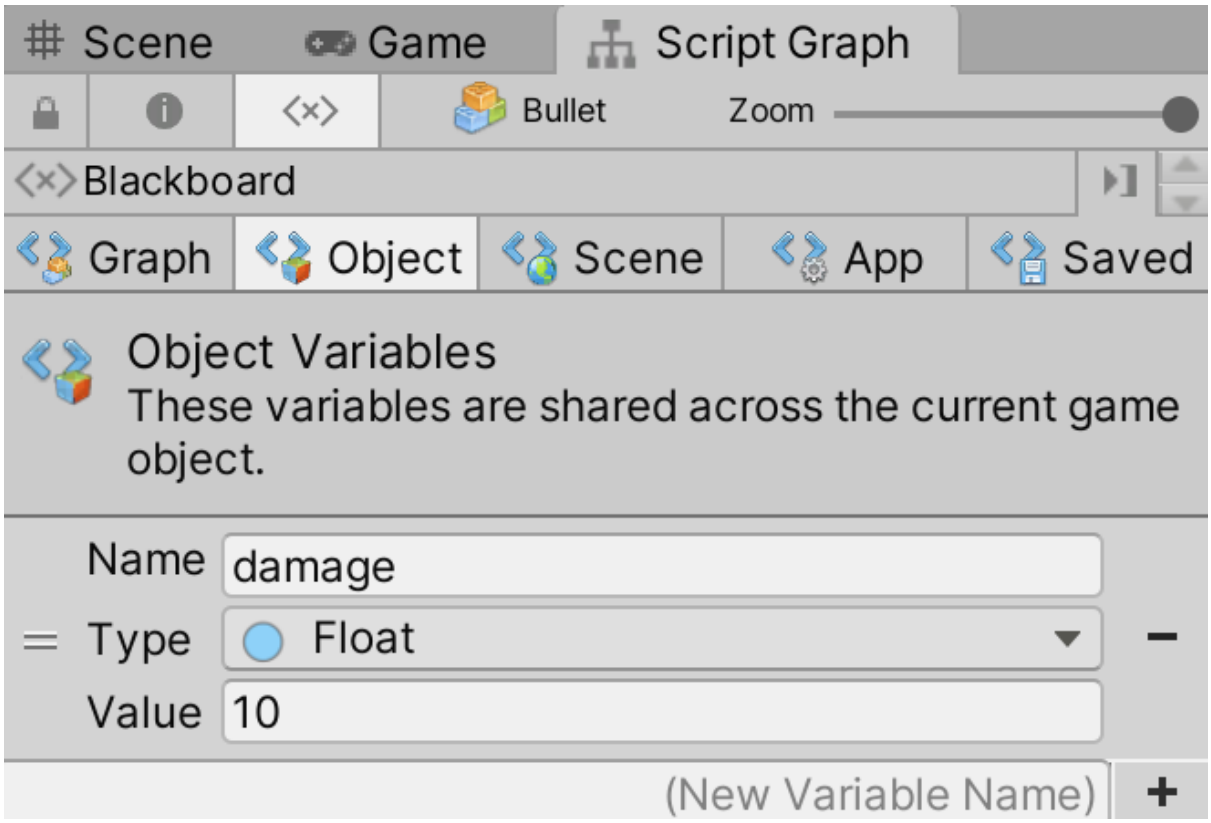

```
Debug.LogError("Duplicated ScoreManager, ignoring this one", gameObject);
```

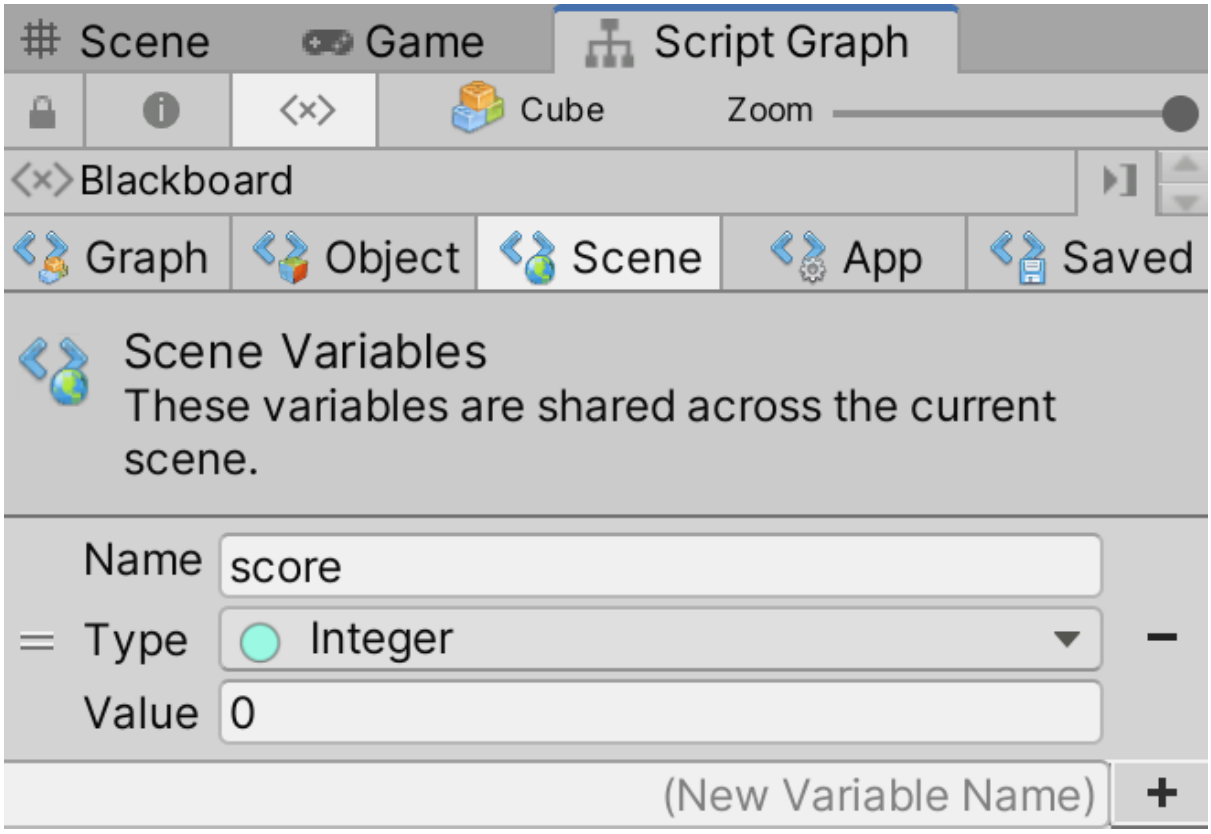

```
void OnDestroy()
{

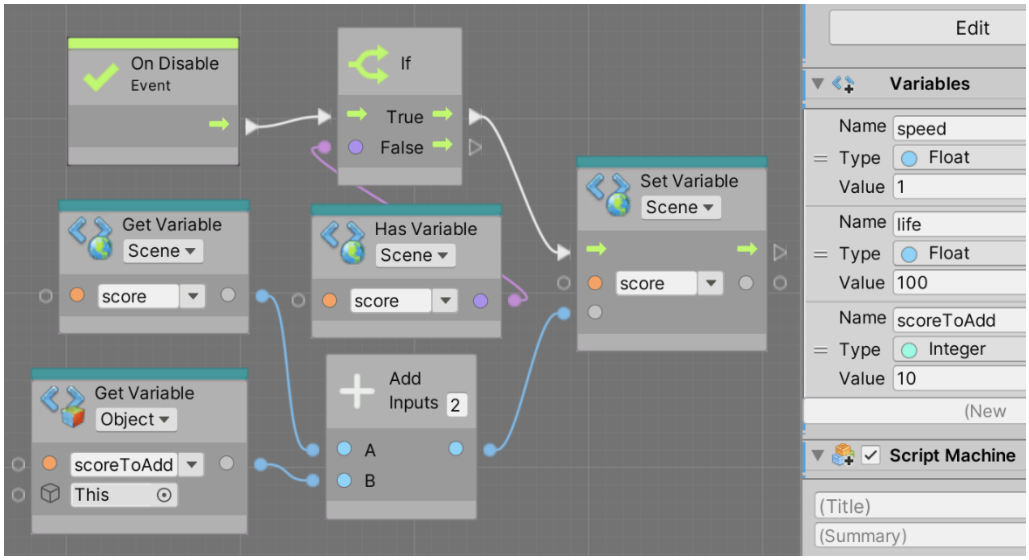
}
```

```
public int amount;

void OnDestroy()
{
    ScoreManager.instance.amount += amount;
}
```








```
public List<Enemy> enemies;
```

```
public class Enemy : MonoBehaviour
{
    void Start()
    {
        EnemyManager.instance.enemies.Add(this);
    }

    void OnDestroy()
    {
        EnemyManager.instance.enemies.Remove(this);
    }
}
```

```
using System.Collections.Generic;
using UnityEngine;

public class WavesManager : MonoBehaviour
{
    public static WavesManager instance;

    public List<WaveSpawner> waves;

    void Awake()
    {
        if (instance == null)
            instance = this;
        else
            Debug.LogError("Duplicated WavesManager", gameObject);
    }
}
```

```
using UnityEngine;

public class WaveSpawner : MonoBehaviour
{
    public GameObject prefab;
    public float startTime;
    public float endTime;
    public float spawnRate;

    void Start()
    {
        WavesManager.instance.waves.Add(this);
        InvokeRepeating("Spawn", startTime, spawnRate);
        Invoke("EndSpawner", endTime);
    }

    void Spawn()
    {
        Instantiate(prefab, transform.position, transform.rotation);
    }

    void EndSpawner()
    {
        WavesManager.instance.waves.Remove(this);
        CancelInvoke();
    }
}
```

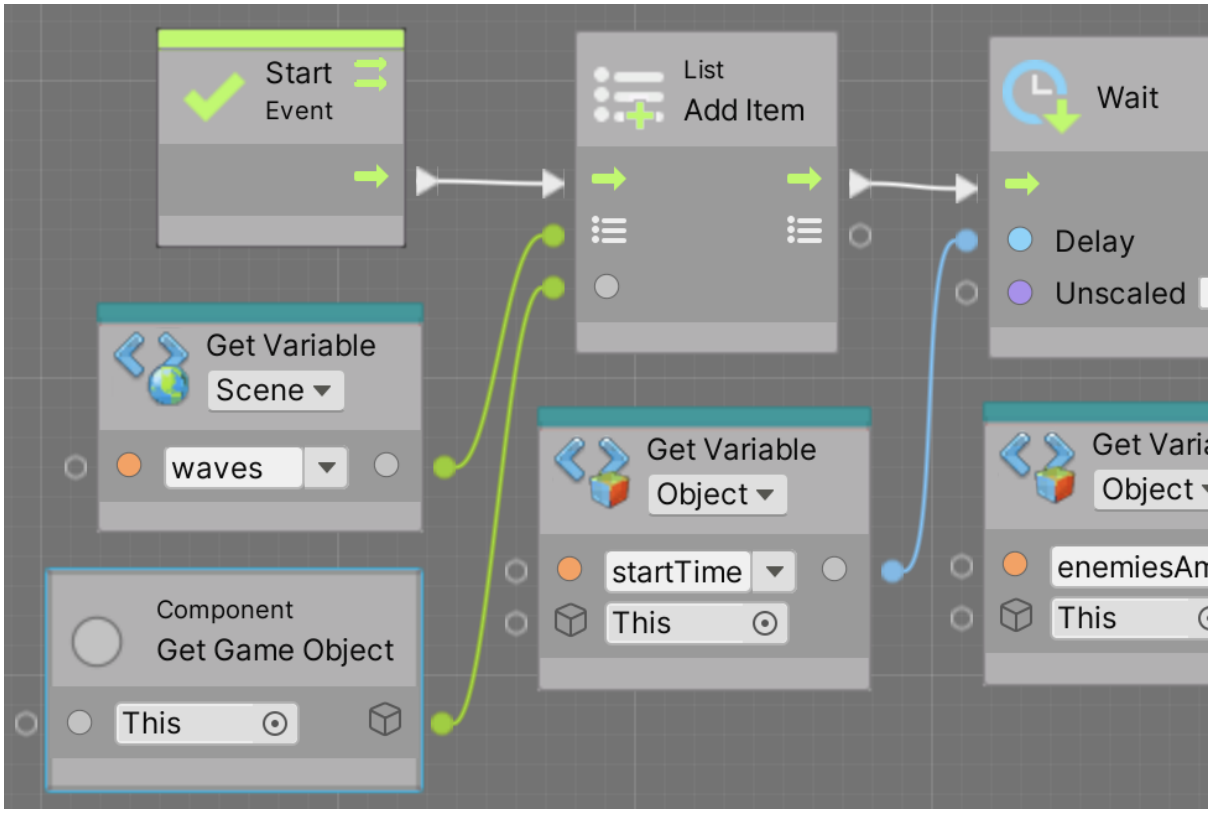
```
using UnityEngine;

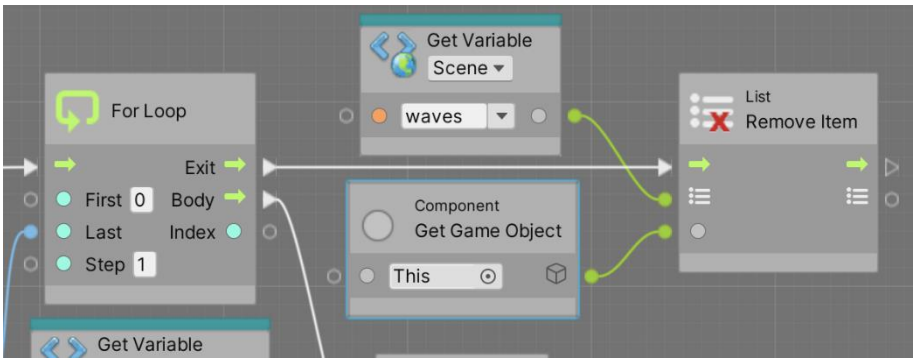
public class WaveSpawner : MonoBehaviour
{
    public GameObject prefab;
    public float startTime;
    public float endTime;
    public float spawnRate;

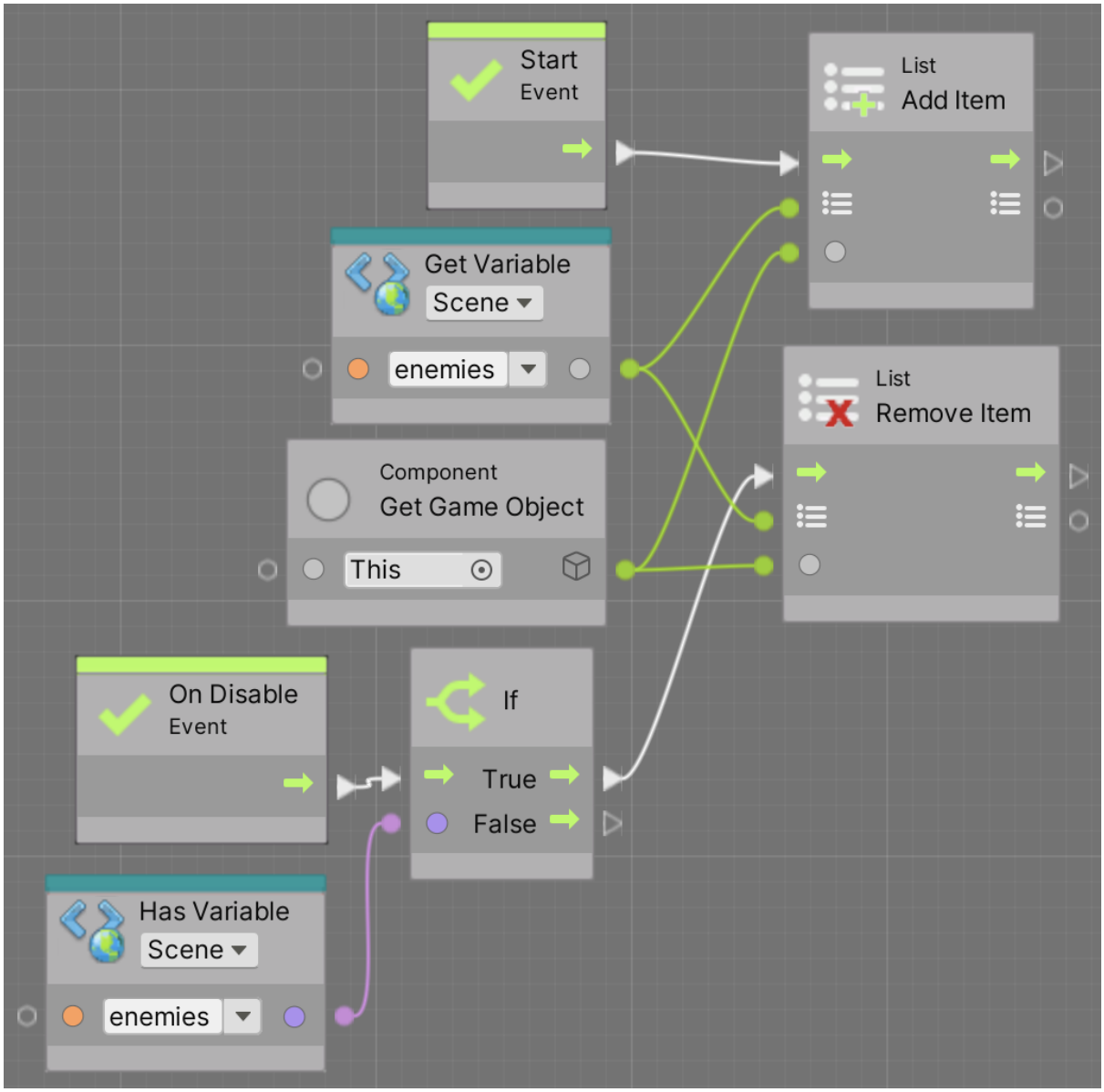
    void Start()
    {
        WavesManager.instance.waves.Add(this);
        InvokeRepeating("Spawn", startTime, spawnRate);
        Invoke("EndSpawner", endTime);
    }

    void Spawn()
    {
        Instantiate(prefab, transform.position, transform.rotation);
    }

    void EndSpawner()
    {
        WavesManager.instance.waves.Remove(this);
        CancelInvoke();
    }
}
```


Start
Event
List
Add Item
Wait
Delay
Unscaled
Get Variable
Scene
waves
Get Variable
Object
startTime
This
Component
Get Game Object
This

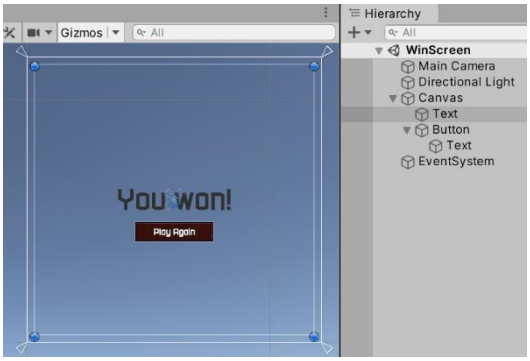

Get Variable
Scene
waves
For Loop
Exit
First 0
Body
Last
Index
Step 1
List
Remove Item
Component
Get Game Object
This
Get Variable

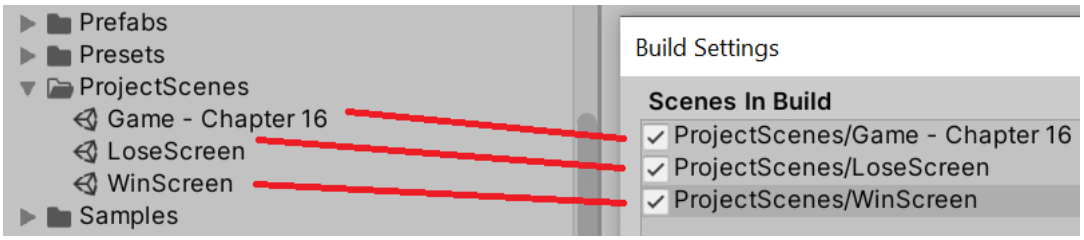



```
[SerializeField] Life playerLife;

void Update()
{
    if (EnemyManager.instance.enemies.Count <= 0 && WavesManager.instance.waves.Count <= 0)
    {
        print("You win!");
    }

    if (playerLife.amount <= 0)
    {
        print("You lose!");
    }
}
```



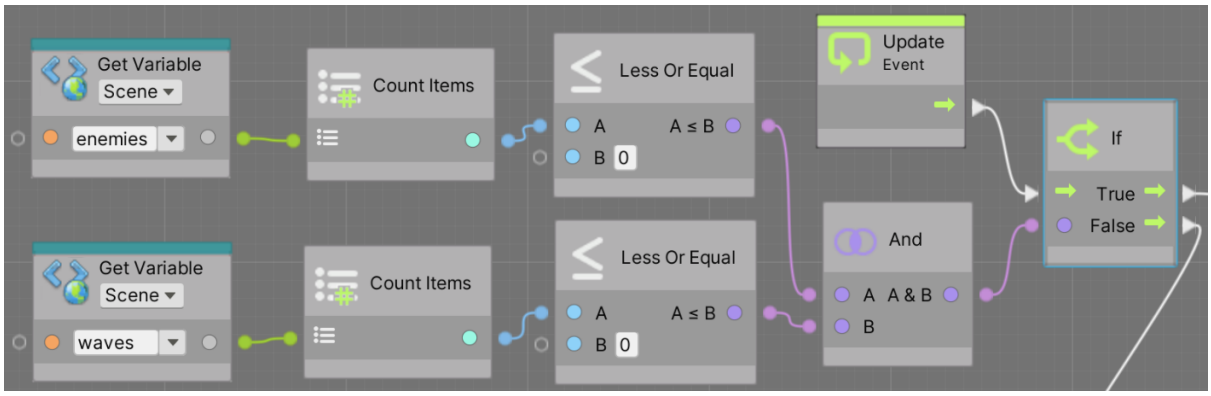


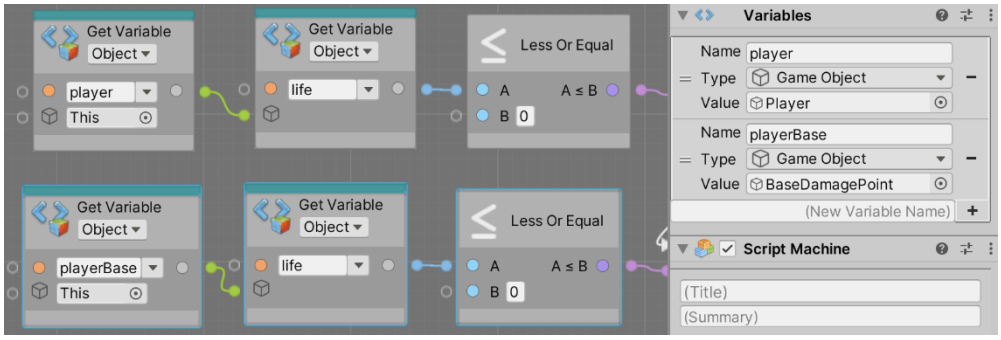

```
using UnityEngine;
using UnityEngine.SceneManagement;

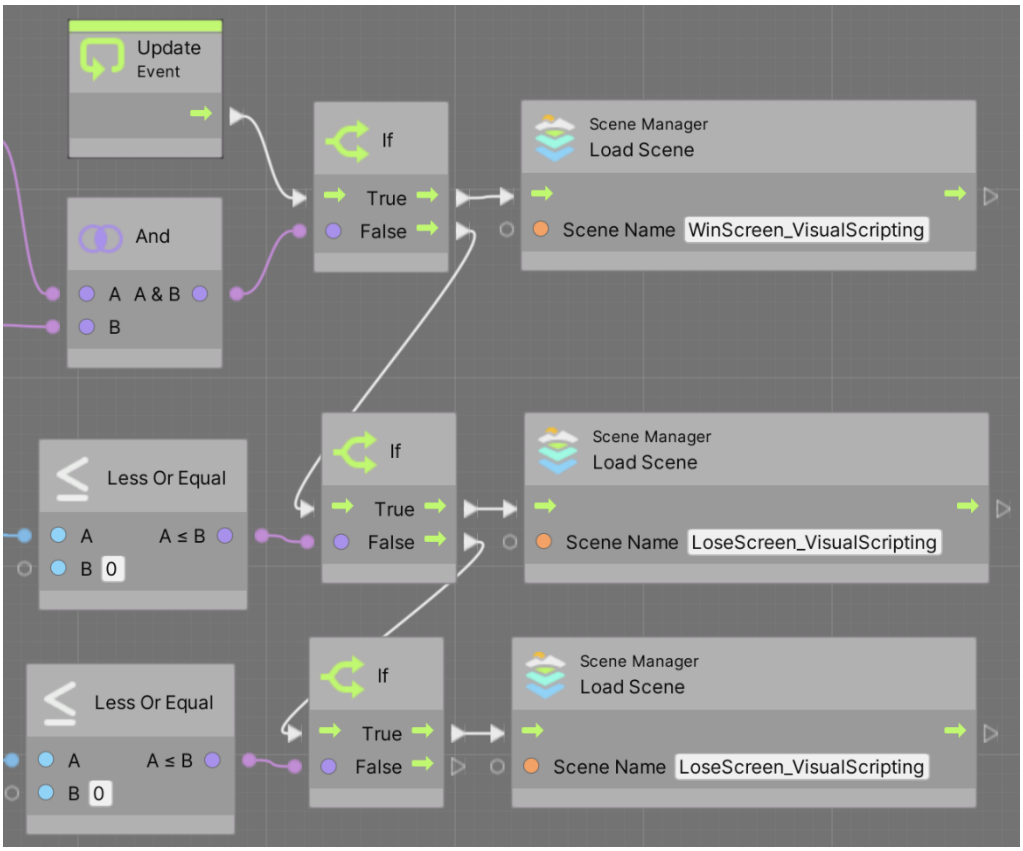
public class WavesGameMode : MonoBehaviour
{
    [SerializeField] Life playerLife;

    void Update()
    {
        if (EnemyManager.instance.enemies.Count <= 0 && WavesManager.instance.waves.Count <= 0)
        {
            SceneManager.LoadScene("WinScreen");
        }

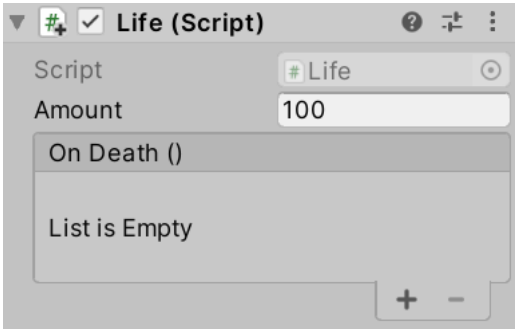
        if (playerLife.amount <= 0)
        {
            SceneManager.LoadScene("LoseScreen");
        }
    }
}
```








```
public class Life : MonoBehaviour
{
    public float amount;
    public UnityEvent onDeath;
```



```
public float amount;
public UnityEvent onDeath;

void Update()
{
    if (amount <= 0)
    {
        onDeath.Invoke();
        Destroy(gameObject);
    }
}
```

```
void Awake()
{
    var life = GetComponent<Life>();
    life.onDeath.AddListener(GivePoints);
}

void GivePoints()
{
    ScoreManager.instance.amount += amount;
}
```

```
void Awake()
{
    playerLife.onDeath.AddListener(OnPlayerLifeChanged);
}

void OnPlayerLifeChanged()
{
    if (playerLife.amount <= 0)
    {
        SceneManager.LoadScene("LoseScreen");
    }
}
```

```
[SerializeField] Life playerLife;
[SerializeField] Life playerBaseLife;

void Start()
{
    playerLife.onDeath.AddListener(OnPlayerLifeChanged);
    playerBaseLife.onDeath.AddListener(OnPlayerBaseLifeChanged);
}

void OnPlayerLifeChanged()
{
    if (playerLife.amount <= 0)
    {
        SceneManager.LoadScene("LoseScreen");
    }
}

void OnPlayerBaseLifeChanged()
{
    if (playerBaseLife.amount <= 0)
    {
        SceneManager.LoadScene("LoseScreen");
    }
}
```

```
public UnityEvent onChanged;

public void AddEnemy(Enemy enemy)
{
    enemies.Add(enemy);
    onChanged.Invoke();
}

public void RemoveEnemy(Enemy enemy)
{
    enemies.Remove(enemy);
    onChanged.Invoke();
}
```

```
public class Enemy : MonoBehaviour
{
    void Start()
    {
        EnemyManager.instance.AddEnemy(this);
    }

    void OnDestroy()
    {
        EnemyManager.instance.RemoveEnemy(this);
    }
}
```

```
public class WavesManager : MonoBehaviour
{
    public static WavesManager instance;

    public List<WaveSpawner> waves;
    public UnityEvent onChanged;

    public void AddWave(WaveSpawner wave)
    {
        waves.Add(wave);
        onChanged.Invoke();
    }

    public void RemoveWave(WaveSpawner wave)
    {
        waves.Remove(wave);
        onChanged.Invoke();
    }

    void Awake()
    {
        if (instance == null)
            instance = this;
        else
            Debug.LogError("Duplicated WavesManager", gameObject);
    }
}
```

```
public class WaveSpawner : MonoBehaviour
{
    public GameObject prefab;
    public float startTime;
    public float endTime;
    public float spawnRate;

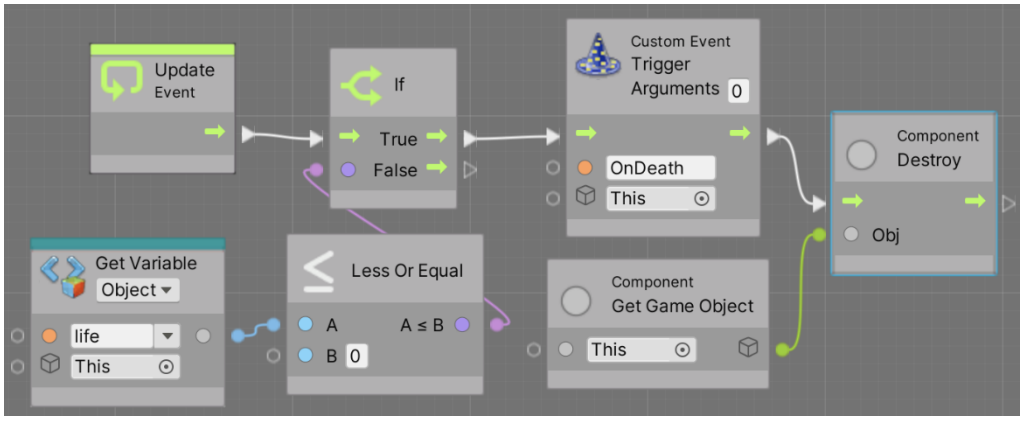
    void Start()
    {
        WavesManager.instance.AddWave(this);
        InvokeRepeating("Spawn", startTime, spawnRate);
        Invoke("EndSpawner", endTime);
    }

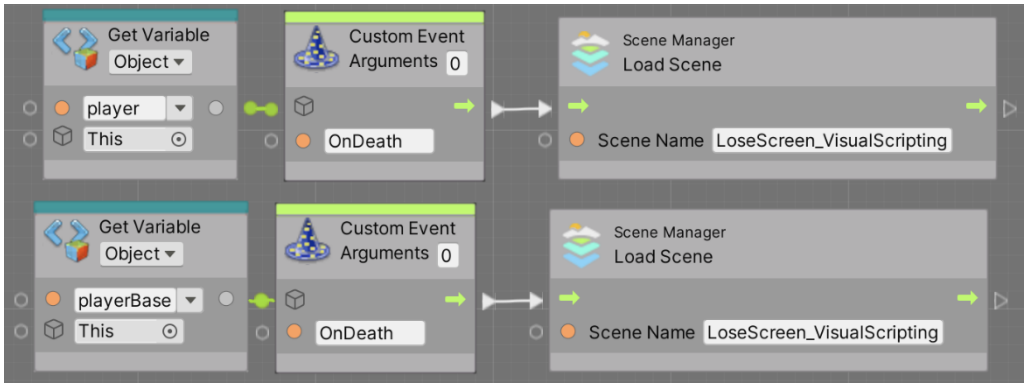
    void Spawn()
    {
        Instantiate(prefab, transform.position, transform.rotation);
    }

    void EndSpawner()
    {
        WavesManager.instance.RemoveWave(this);
        CancelInvoke();
    }
}
```

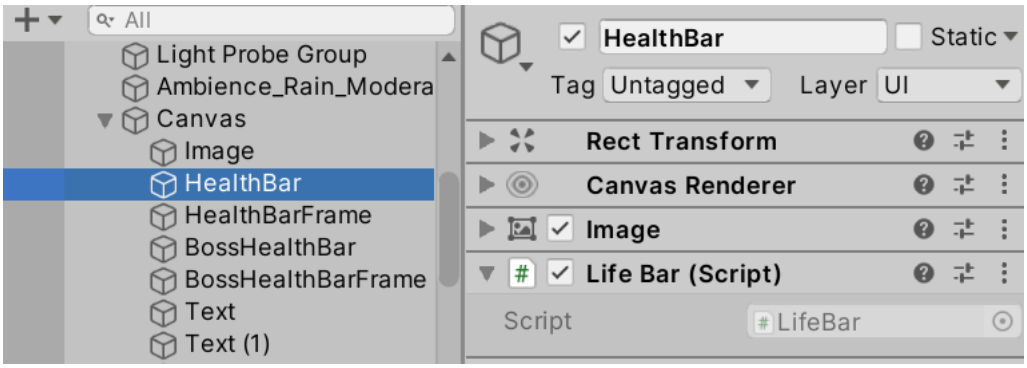
```
void Start()
{
    playerLife.onDeath.AddListener(OnPlayerLifeChanged);
    playerBaseLife.onDeath.AddListener(OnPlayerBaseLifeChanged);
    EnemyManager.instance.onChanged.AddListener(CheckWinCondition);
    WavesManager.instance.onChanged.AddListener(CheckWinCondition);
}

void CheckWinCondition()
{
    if (EnemyManager.instance.enemies.Count <= 0 && WavesManager.instance.waves.Count <= 0)
    {
        SceneManager.LoadScene("WinScreen");
    }
}
```

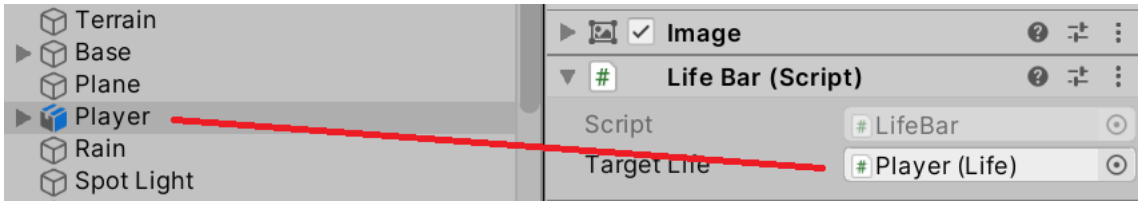

Update
Event
If
True
False
Custom Event
Trigger
Arguments 0
OnDeath
This
Component
Destroy
Obj
Get Variable
Object
life
This
Less Or Equal
A
A ≤ B
B 0
Component
Get Game Object
This


Get Variable
Object
player
This
Custom Event
Arguments 0
OnDeath
Scene Manager
Load Scene
Scene Name LoseScreen_VisualScripting
Get Variable
Object
playerBase
This
Custom Event
Arguments 0
OnDeath
Scene Manager
Load Scene
Scene Name LoseScreen_VisualScripting

Chapter 18: Scripting the UI, Sounds, and Graphics




```
public class LifeBar : MonoBehaviour
{
    public Life targetLife;
}
```




```
using System;
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
```

```
Image image;
public Life targetLife;
```

```
void Awake()
{
    image = GetComponent<Image>();
}
```

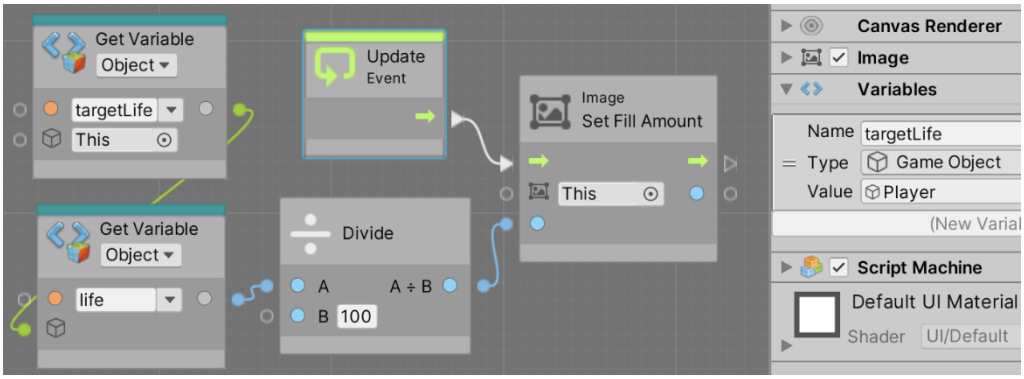
```
void Update()
{
    image.fillAmount = targetLife.amount / 100;
}
```

```
using UnityEngine;
using UnityEngine.UI;

public class LifeBar : MonoBehaviour
{
    Image image;
    public Life targetLife;

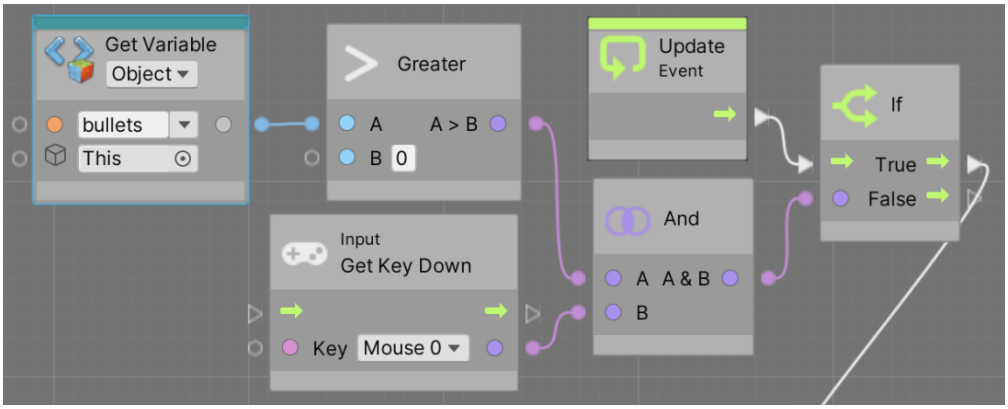
    void Awake()
    {
        image = GetComponent<Image>();
    }

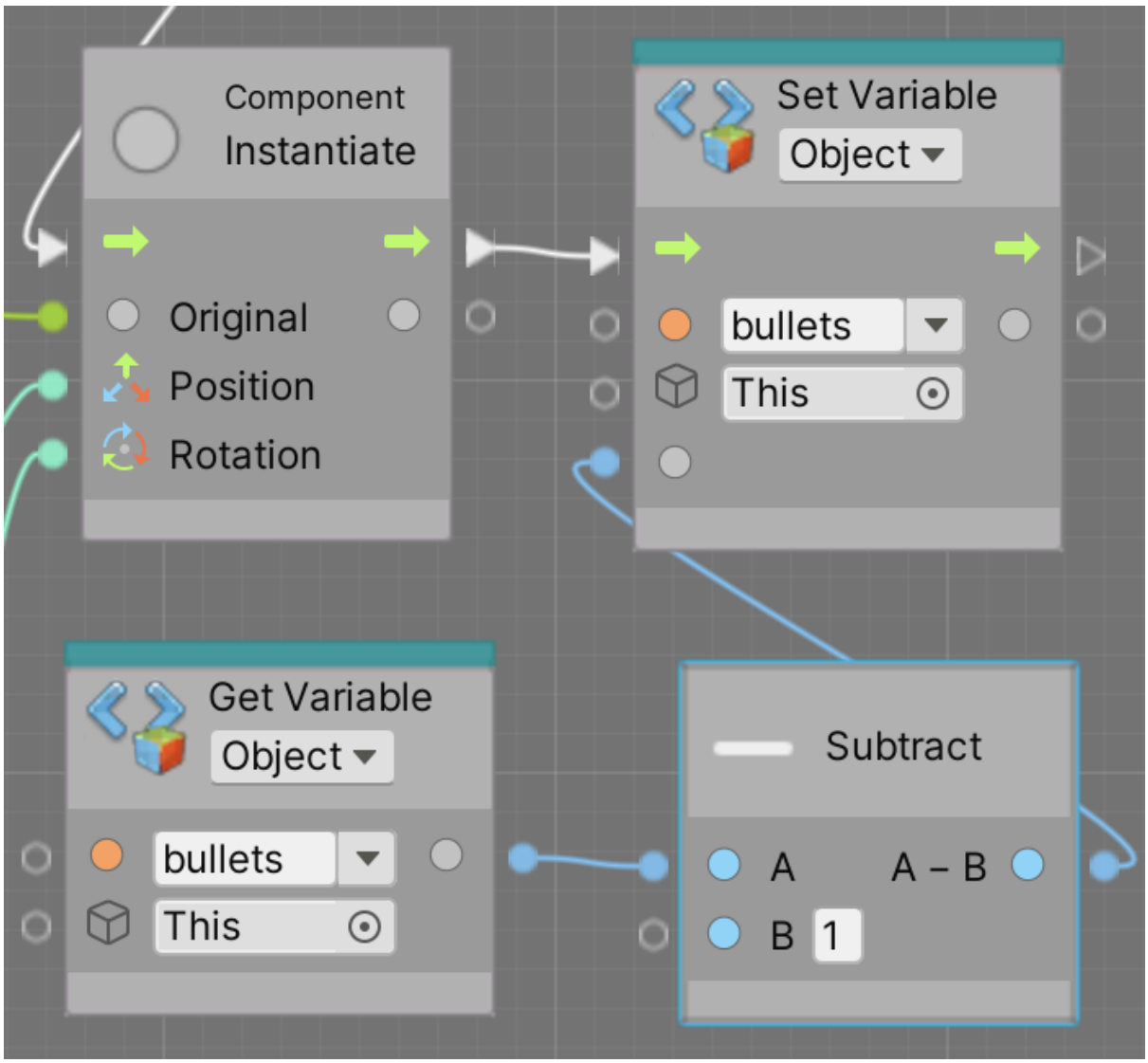
    void Update()
    {
        image.fillAmount = targetLife.amount / 100;
    }
}
```




```
void Update()
{
    if (Input.GetKeyDown(KeyCode.Mouse0) && bulletsAmount > 0)
    {
        bulletsAmount--;

        GameObject clone = Instantiate(prefab);
        clone.transform.position = shootPoint.transform.position;
        clone.transform.rotation = shootPoint.transform.rotation;
    }
}
```


Get Variable
Object
bullets
This
Greater
A
A > B
B
0
Update
Event
If
True
False
Input
Get Key Down
Key
Mouse 0
And
A
A & B
B

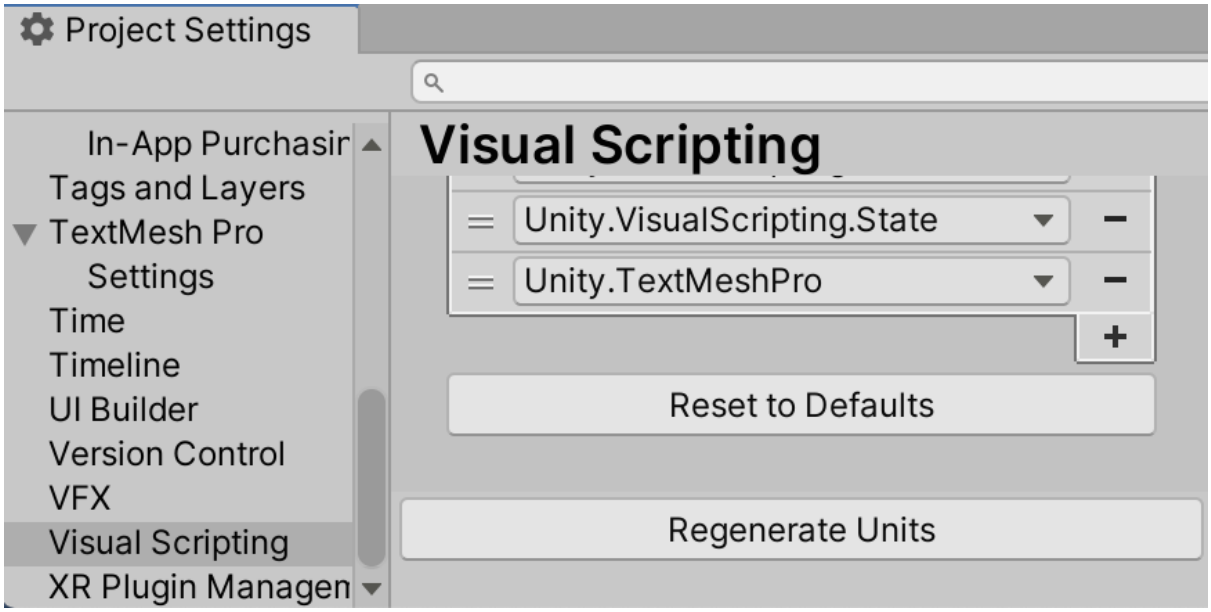

Component
Instantiate
Original
Position
Rotation
Set Variable
Object
bullets
This
Get Variable
Object
bullets
This
Subtract
A
A – B
B
1

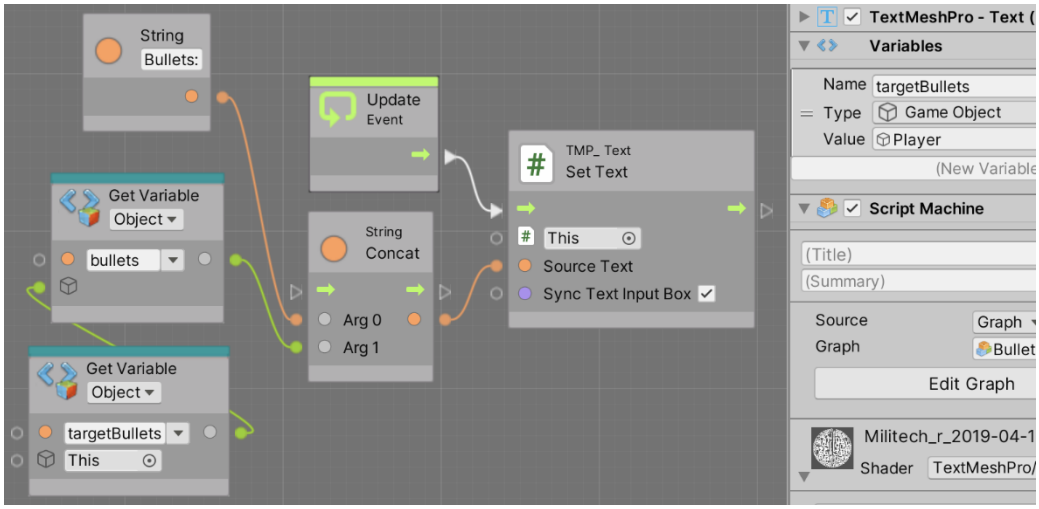
```
using UnityEngine;
using UnityEngine.UI;

public class PlayerBulletsUI : MonoBehaviour
{
    Text text;

    void Awake()
    {
        text = GetComponent<Text>();
    }
}
```

```
void Update()
{
    text.text = "Bullets: " + targetShooting.bulletsAmount;
}
```






```
using UnityEngine;
using UnityEngine.UI;

public class ScoreUI : MonoBehaviour
{
    Text text;

    void Awake()
    {
        text = GetComponent<Text>();
    }

    void Update()
    {
        text.text = "Score: " + ScoreManager.instance.amount;
    }
}
```

```
using UnityEngine;
using UnityEngine.UI;

public class WavesUI : MonoBehaviour
{
    Text text;

    void Start()
    {
        text = GetComponent<Text>();
        WavesManager.instance.onChanged.AddListener(RefreshText);
    }

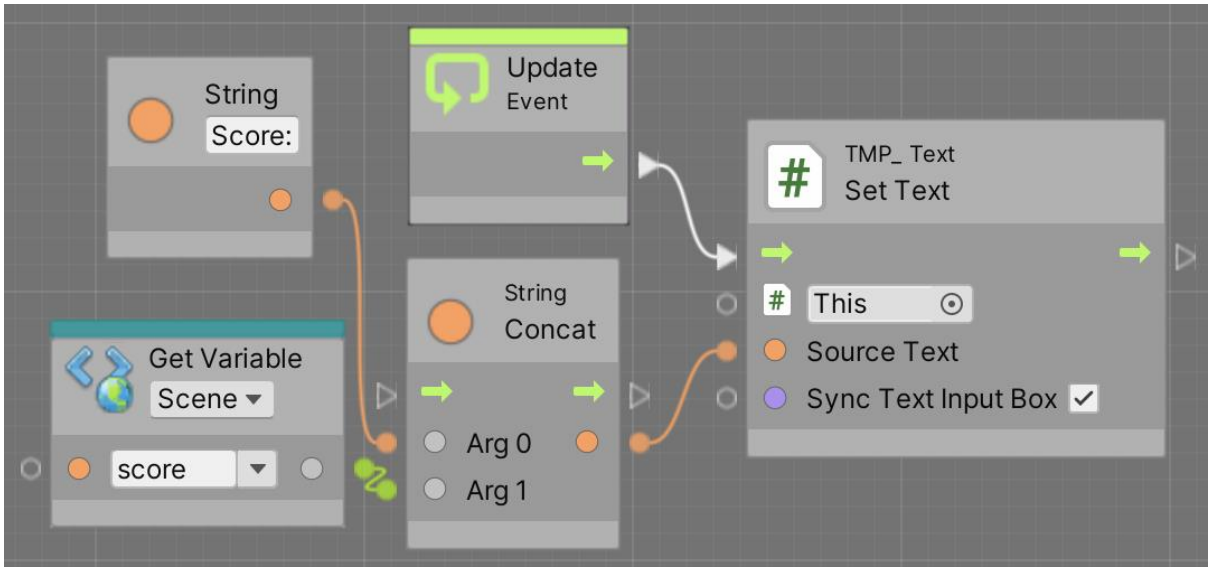
    void RefreshText()
    {
        text.text = "Remaining Waves: " + WavesManager.instance.waves.Count;
    }
}
```

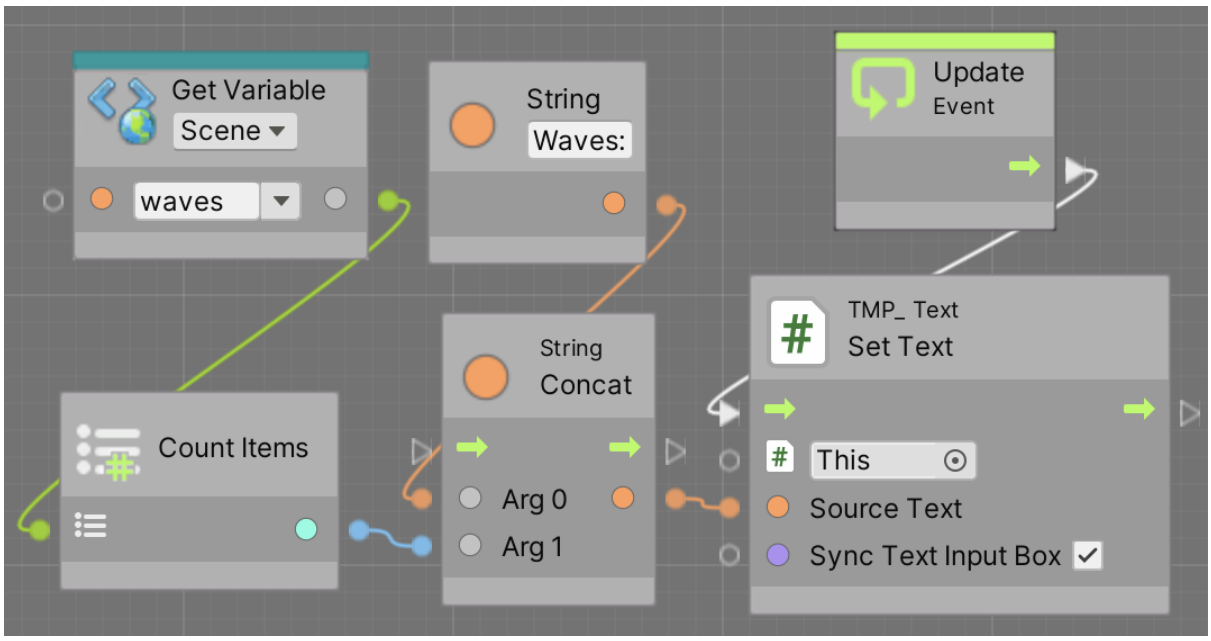
```
using UnityEngine;
using UnityEngine.UI;

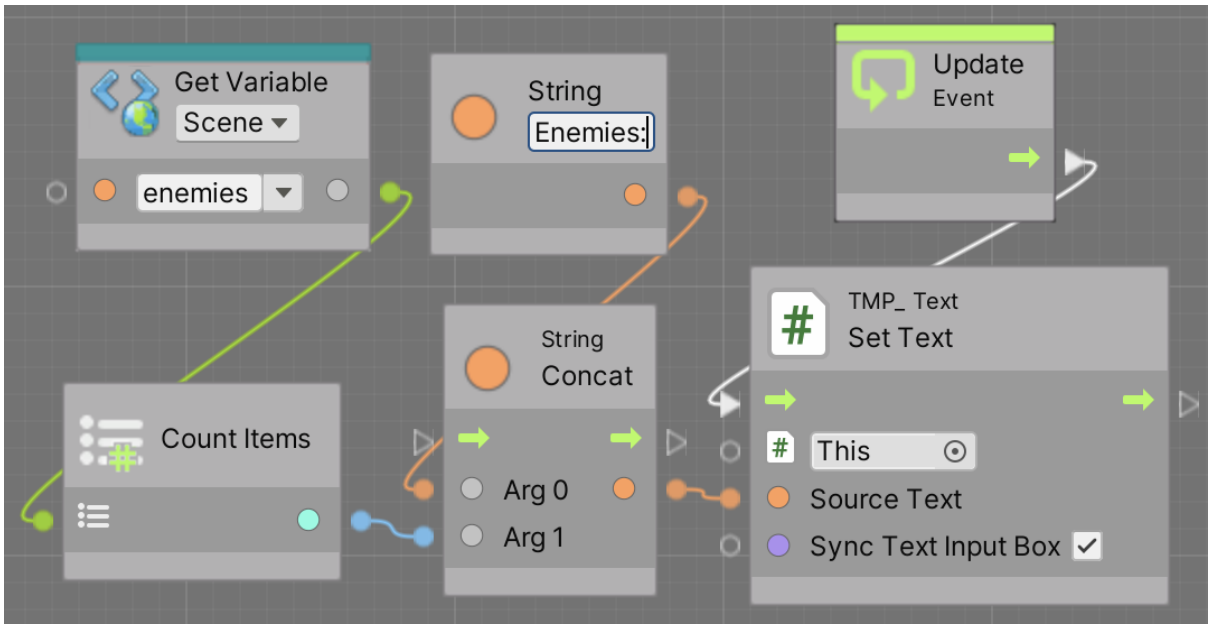
public class EnemiesUI : MonoBehaviour
{
    Text text;

    void Start()
    {
        text = GetComponent<Text>();
        EnemyManager.instance.onChanged.AddListener(RefreshText);
    }

    void RefreshText()
    {
        text.text = "Remaining Enemies: " + EnemyManager.instance.enemies.Count;
    }
}
```


String
Score:
Update
Event
TMP_ Text
Set Text
This
Source Text
Sync Text Input Box
String
Concat
Arg 0
Arg 1
Get Variable
Scene
score


Get Variable
Scene
waves
String
Waves:
Update
Event
TMP_ Text
Set Text
This
Source Text
Sync Text Input Box
String
Concat
Arg 0
Arg 1
Count Items


Get Variable
Scene
enemies
String
Enemies:
Update
Event
TMP_ Text
Set Text
This
Source Text
Sync Text Input Box
String
Concat
Arg 0
Arg 1
Count Items

```
public class Pause : MonoBehaviour
{
    void Update()
    {
        if (Input.GetKeyDown(KeyCode.Escape))
        {
            Time.timeScale = 0;
        }
    }
}
```

```
if (Input.GetKeyDown(KeyCode.Mouse0) && bulletsAmount > 0 && Time.timeScale > 0)
{
    bulletsAmount--;
```

```
public class Pause : MonoBehaviour
{
    public GameObject pauseMenu;

    void Awake()
    {
        pauseMenu.SetActive(false);
    }

    void Update()
    {
        if (Input.GetKeyDown(KeyCode.Escape))
        {
            pauseMenu.SetActive(true);
            Time.timeScale = 0;
        }
    }
}
```

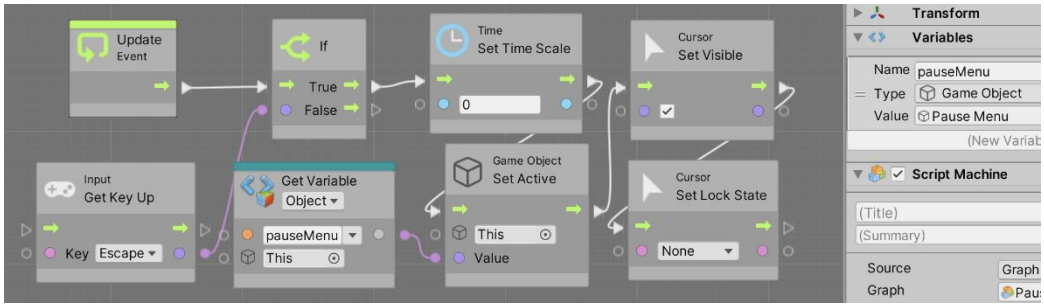
```
public GameObject pauseMenu;
public Button resumeButton;

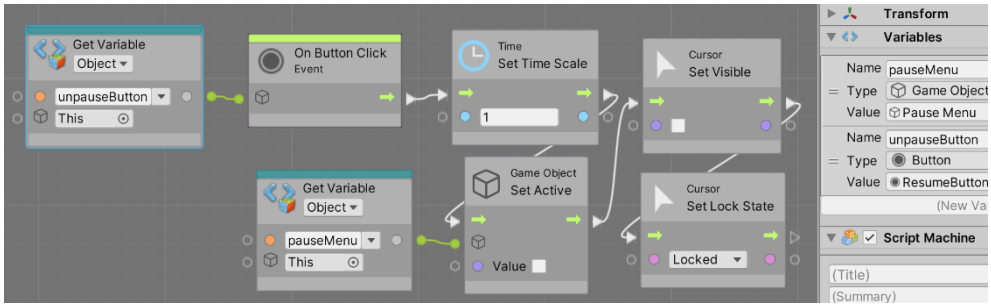
void Awake()
{
    pauseMenu.SetActive(false);
    resumeButton.onClick.AddListener(OnResumePressed);
}

void OnResumePressed()
{
    pauseMenu.SetActive(false);
    Time.timeScale = 1;
}
```

```
void OnResumePressed()
{
    pauseMenu.SetActive(false);
    Time.timeScale = 1;
    Cursor.visible = false;
    Cursor.lockState = CursorLockMode.Locked;
}

void Update()
{
    if (Input.GetKeyDown(KeyCode.Escape))
    {
        Cursor.visible = true;
        Cursor.lockState = CursorLockMode.None;
        pauseMenu.SetActive(true);
        Time.timeScale = 0;
    }
}
```



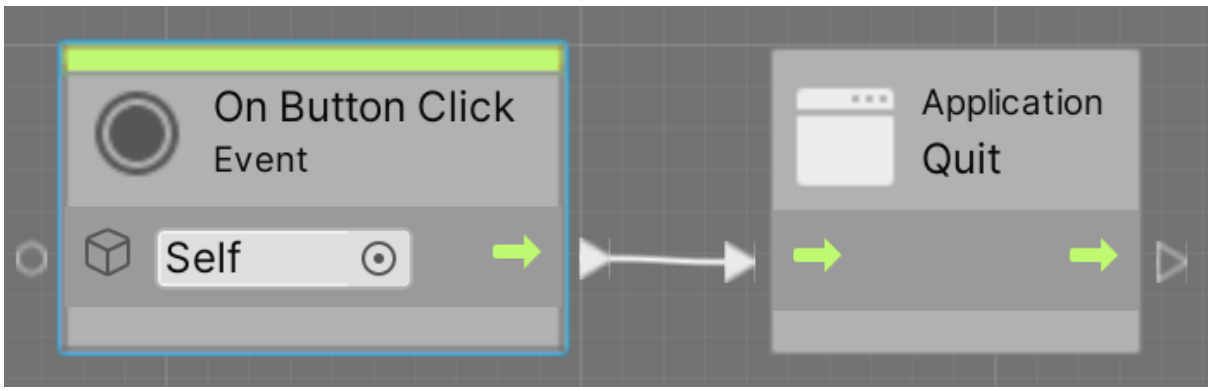



```
using UnityEngine;
using UnityEngine.UI;

public class QuitButton : MonoBehaviour
{
    Button button;

    void Awake()
    {
        button = GetComponent<Button>();
        button.onClick.AddListener(Quit);
    }

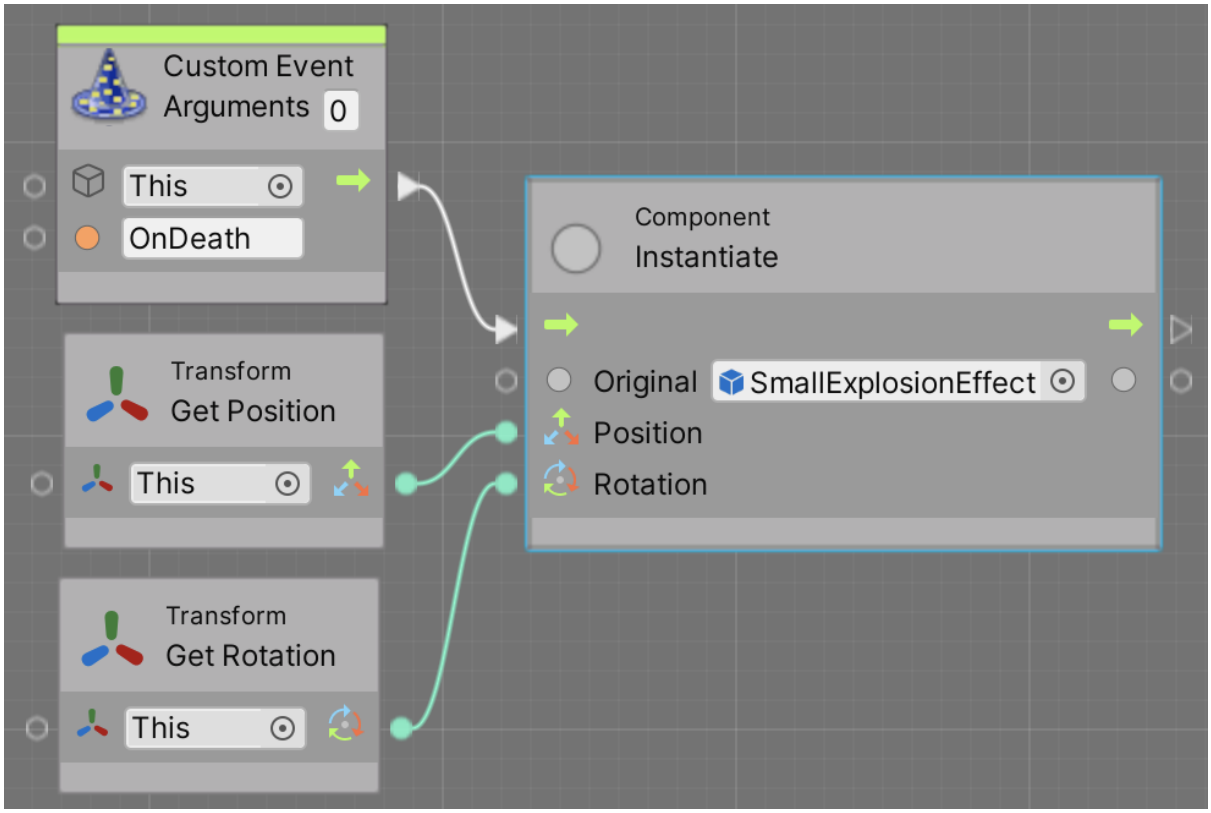
    void Quit()
    {
        print("Quitting");
        Application.Quit();
    }
}
```

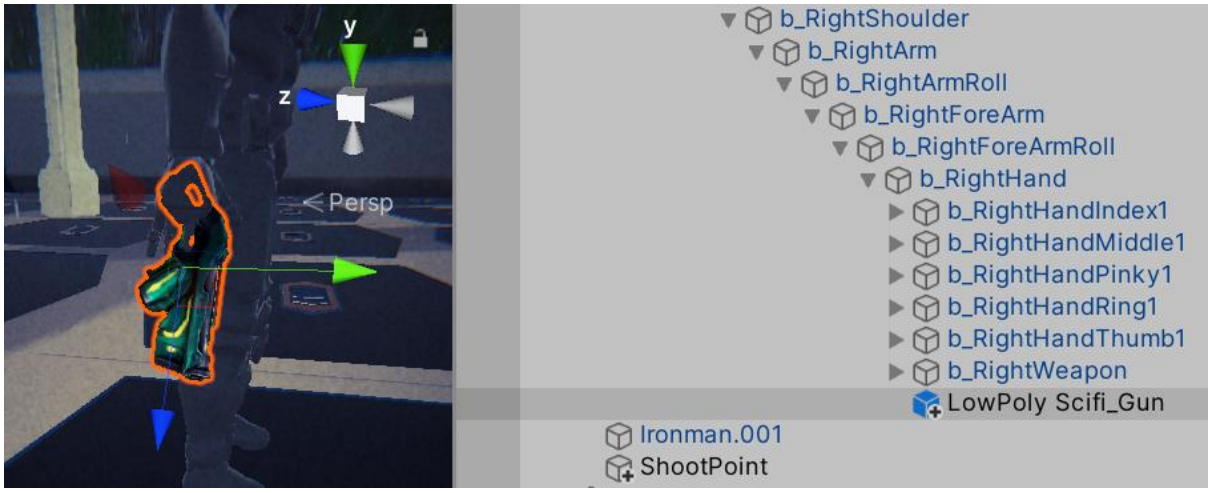


```
public class ExplosionOnDeath : MonoBehaviour
{
    public GameObject particlePrefab;

    void Awake()
    {
        var life = GetComponent<Life>();
        life.onDeath.AddListener(OnDeath);
    }

    void OnDeath()
    {
        Instantiate(particlePrefab, transform.position, transform.rotation);
    }
}
```

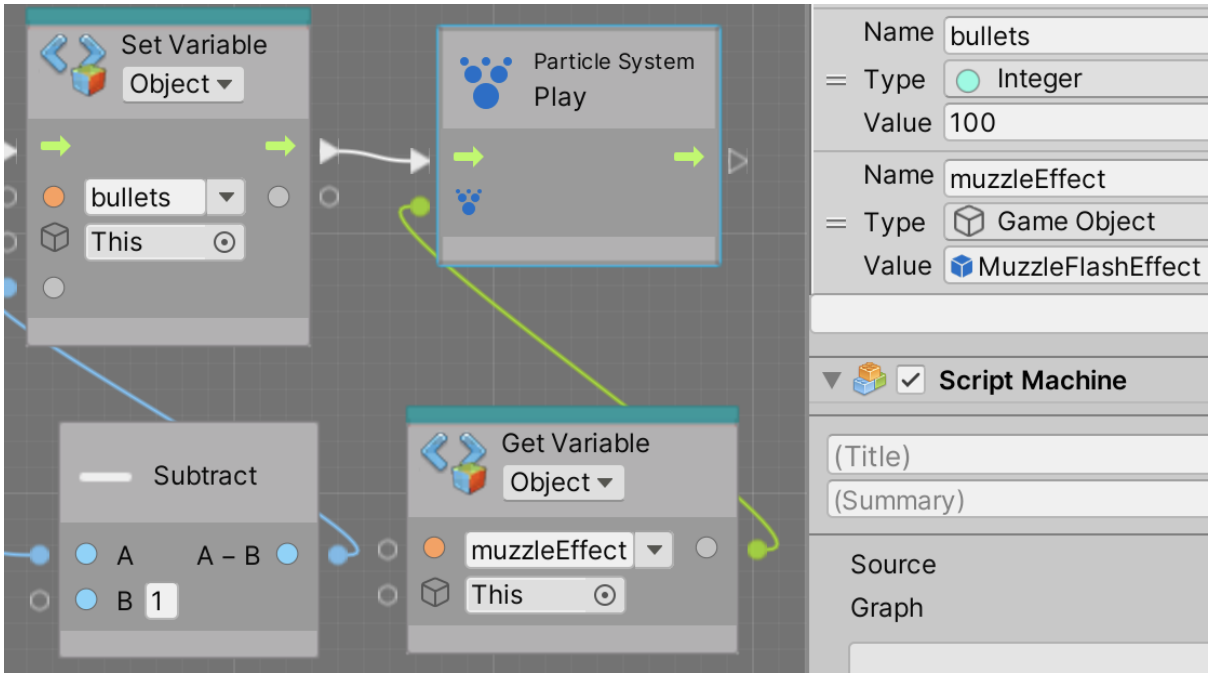


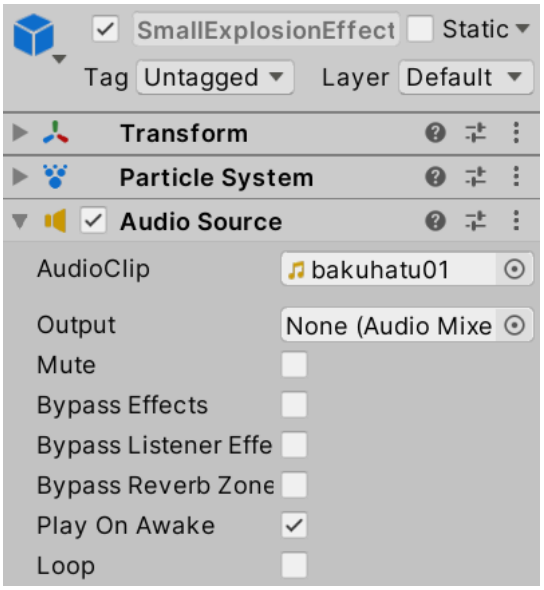



```
public GameObject prefab;
public GameObject shootPoint;
public ParticleSystem muzzleEffect;
public int bulletsAmount;

void Update()
{
    if (Input.GetKeyDown(KeyCode.Mouse0) && bulletsAmount > 0 && Time.timeScale > 0)
    {
        bulletsAmount--;
        muzzleEffect.Play();

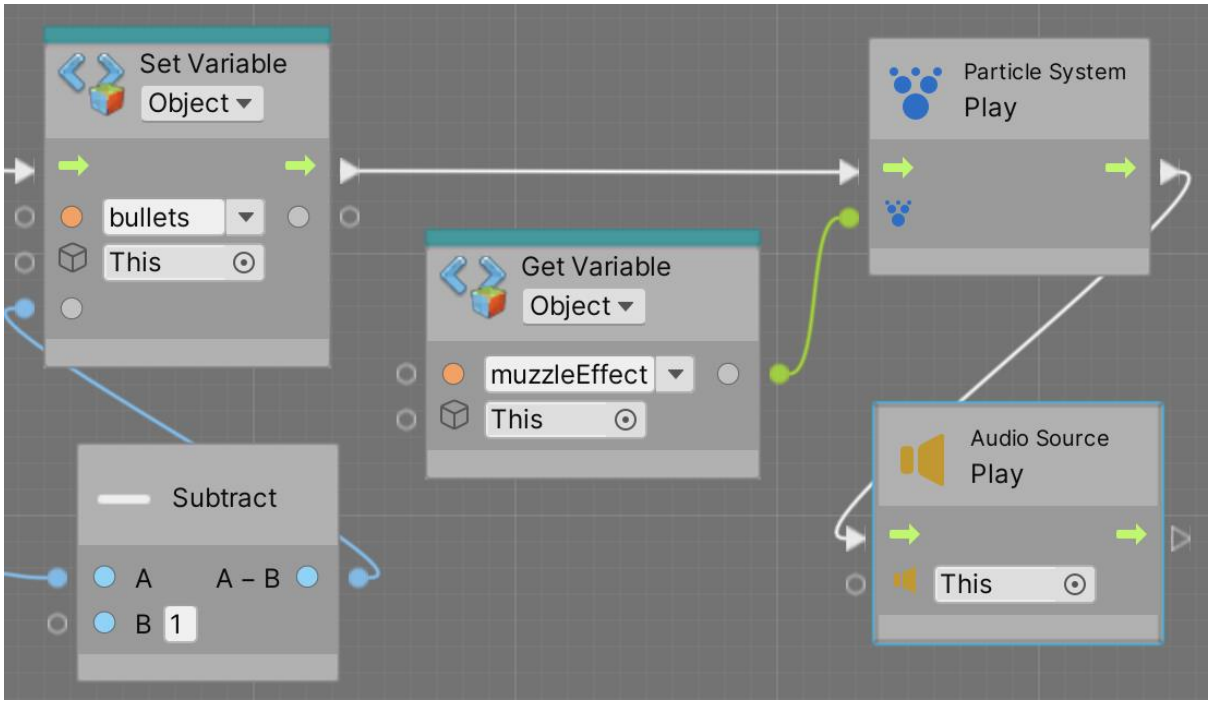
        GameObject clone = Instantiate(prefab);
        clone.transform.position = shootPoint.transform.position;
        clone.transform.rotation = shootPoint.transform.rotation;
    }
}
```






```
public GameObject prefab;
public GameObject shootPoint;
public ParticleSystem muzzleEffect;
public AudioSource shootSound;
public int bulletsAmount;

void Update()
{
    if (Input.GetKeyDown(KeyCode.Mouse0) && bulletsAmount > 0 && Time.timeScale > 0)
    {
        bulletsAmount--;
        muzzleEffect.Play();
        shootSound.Play();
```




```
Animator animator;

void Awake()
{
    animator = GetComponent<Animator>();
}
```

```
void Update()
{
    if (Input.GetKeyDown(KeyCode.Mouse0) && bulletsAmount > 0 && Time.timeScale > 0)
    {
        animator.SetBool("Shooting", true);
        bulletsAmount--;
        muzzleEffect.Play();
        shootSound.Play();

        GameObject clone = Instantiate(prefab);
        clone.transform.position = shootPoint.transform.position;
        clone.transform.rotation = shootPoint.transform.rotation;
    }
    else
    {
        animator.SetBool("Shooting", false);
    }
}
```

```
float lastShootTime;
public float fireRate;

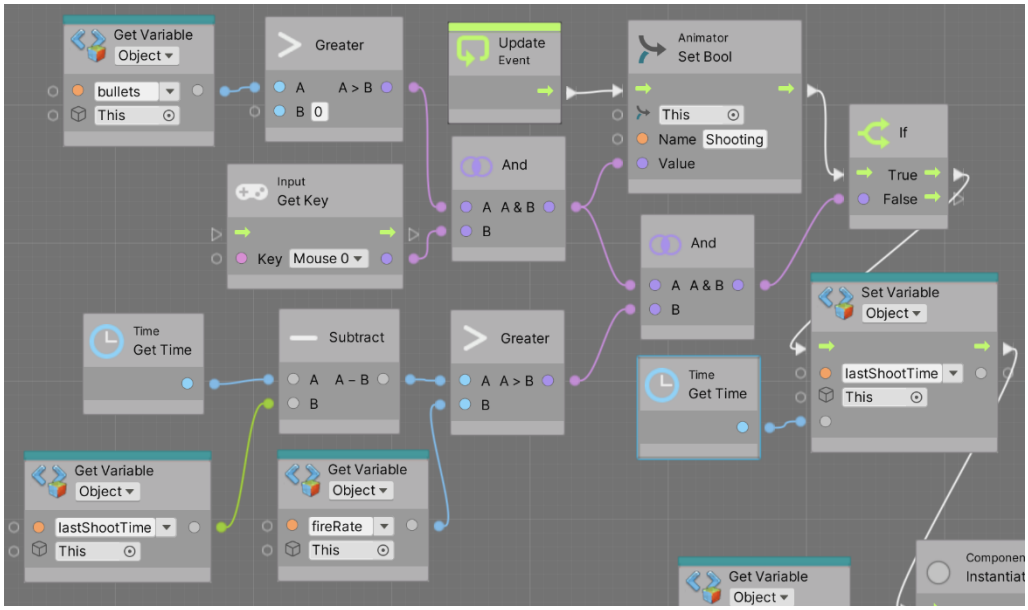
void Update()
{
    if (Input.GetKey(KeyCode.Mouse0) && bulletsAmount > 0 && Time.timeScale > 0)
    {
        animator.SetBool("Shooting", true);

        var timeSinceLastShoot :float  = Time.time - lastShootTime;
        if(timeSinceLastShoot < fireRate)
            return;

        lastShootTime = Time.time;

        bulletsAmount--;
        muzzleEffect.Play();
        shootSound.Play();

        GameObject clone = Instantiate(prefab);
        clone.transform.position = shootPoint.transform.position;
        clone.transform.rotation = shootPoint.transform.rotation;
    }
    else
    {
        animator.SetBool("Shooting", false);
    }
}
```

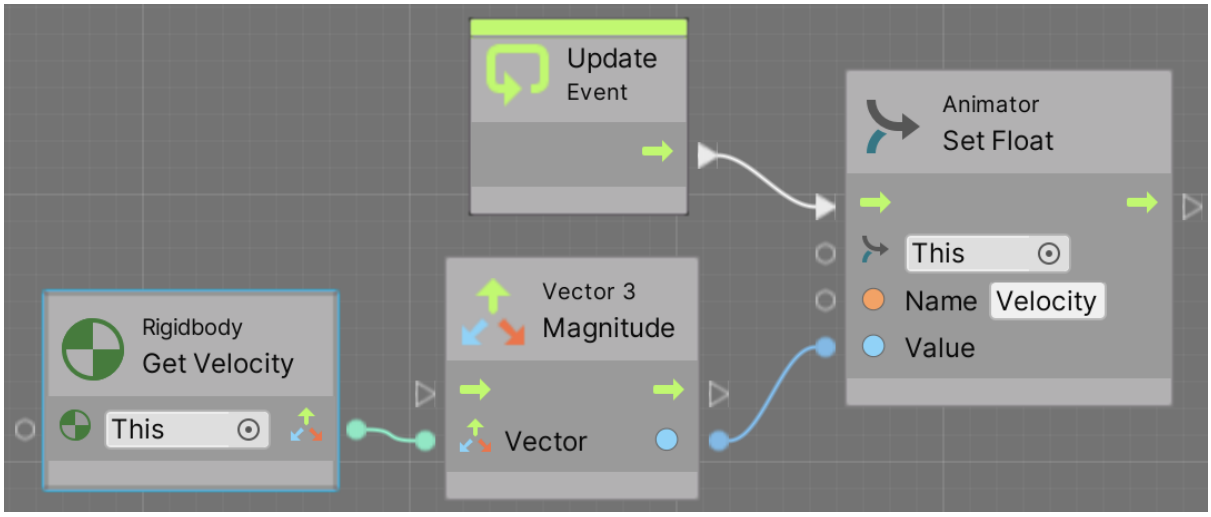


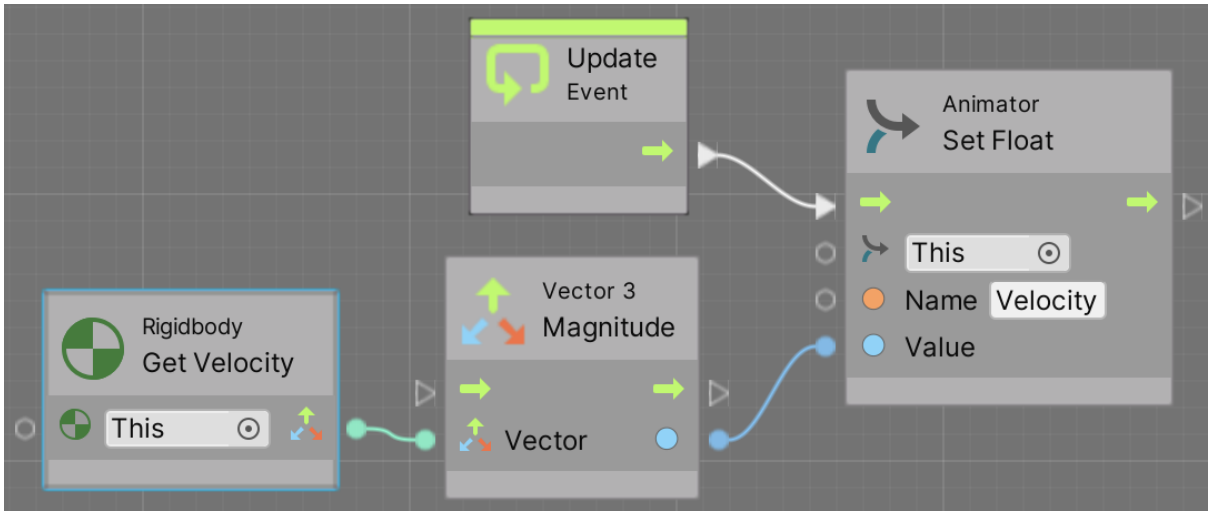
```
using UnityEngine;

public class VelocityAnimator : MonoBehaviour
{
    Rigidbody rb;
    Animator animator;

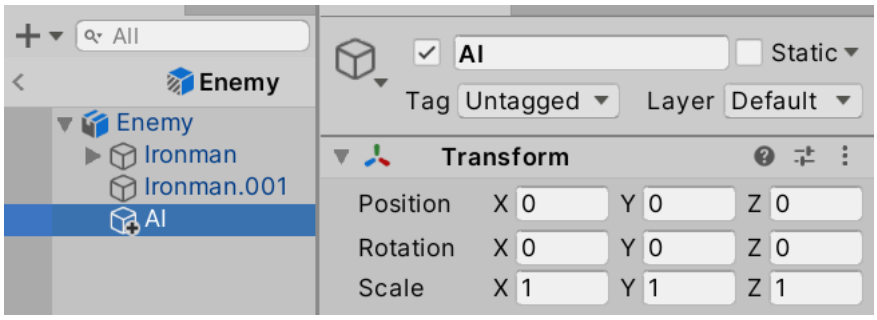
    void Awake()
    {
        rb = GetComponent<Rigidbody>();
        animator = GetComponent<Animator>();
    }

    void Update()
    {
        animator.SetFloat("Velocity", rb.velocity.magnitude);
    }
}
```




Update
Event
Animator
Set Float
This
Name
Velocity
Value
Vector 3
Magnitude
Vector
Rigidbody
Get Velocity
This

Chapter 19: Implementing Game AI for Building Enemies




```
using UnityEngine;

public class Sight : MonoBehaviour
{
    public float distance;
    public float angle;
    public LayerMask objectsLayers;
    public LayerMask obstaclesLayers;
}
```

```
void Update()
{
    Collider[] colliders = Physics.OverlapSphere(transform.position, distance, objectsLayers);

    for (int i = 0; i < colliders.Length; i++)
    {
        Collider collider = colliders[i];
    }
}
```

```
Vector3 directionToCollider = Vector3.Normalize(collider.bounds.center - transform.position);
```

```
float angleToCollider = Vector3.Angle(transform.forward, directionToCollider);
```

```
if (angleToCollider < angle)
{
    if (!Physics.Linecast(transform.position, collider.bounds.center, obstaclesLayers))
    {

    }
}
```

```
public float distance;
public float angle;
public LayerMask objectsLayers;
public LayerMask obstaclesLayers;

public Collider detectedObject;

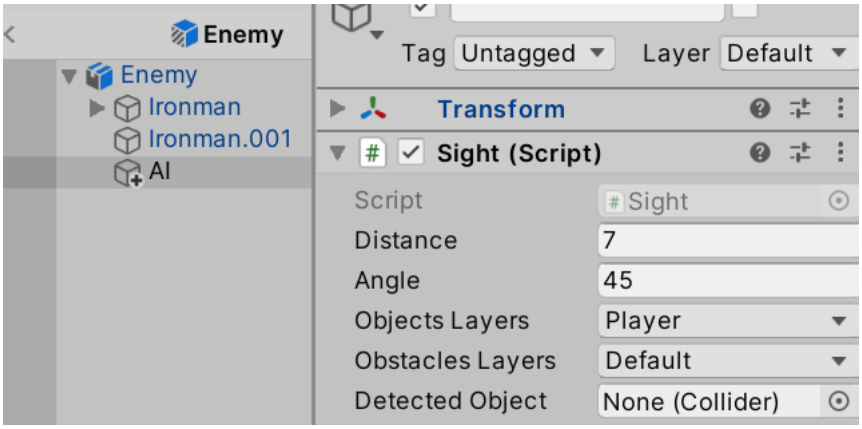
void Update()
{
    Collider[] colliders = Physics.OverlapSphere(transform.position, distance, objectsLayers);

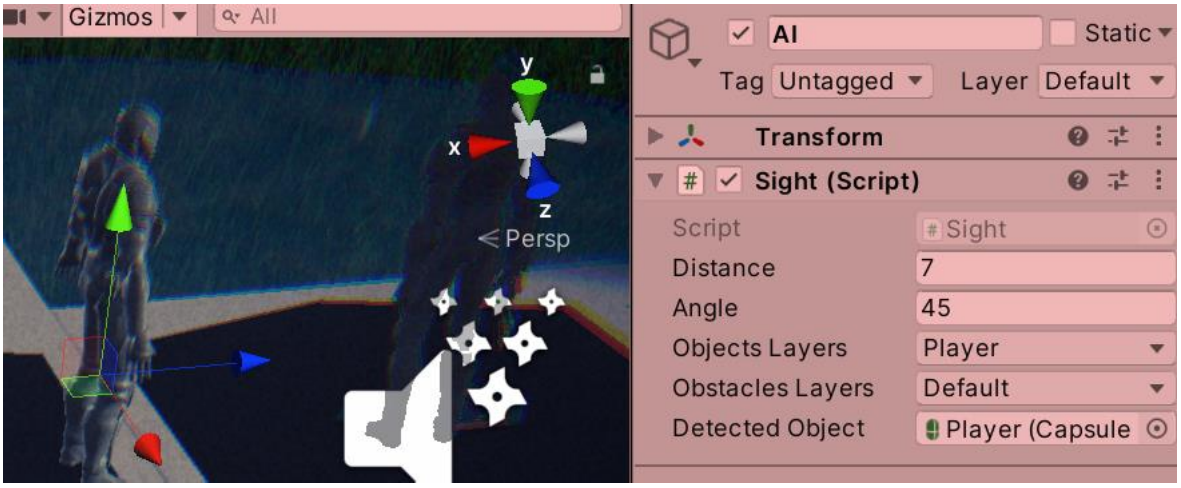
    detectedObject = null;
    for (int i = 0; i < colliders.Length; i++)
    {
        Collider collider = colliders[i];

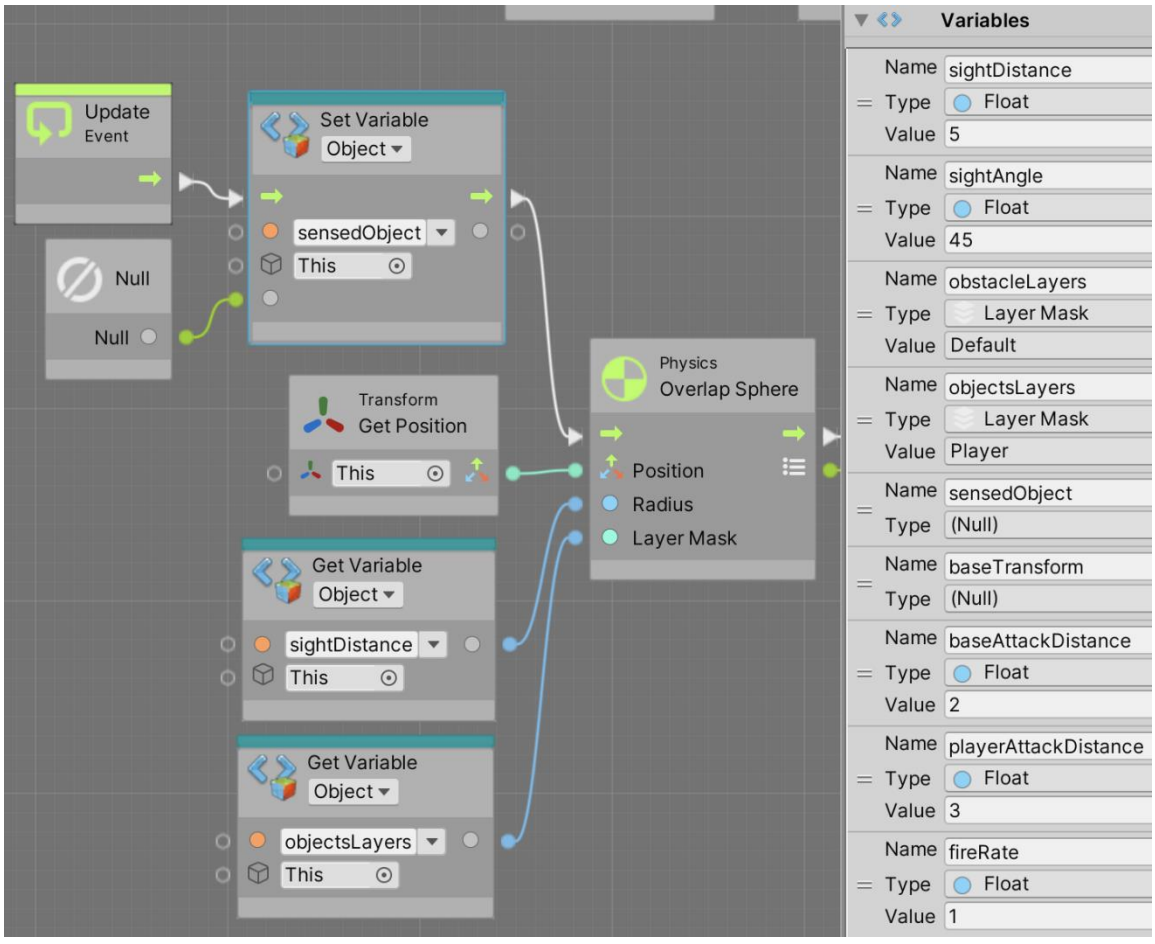
        Vector3 directionToCollider = Vector3.Normalize(collider.bounds.center - transform.position);

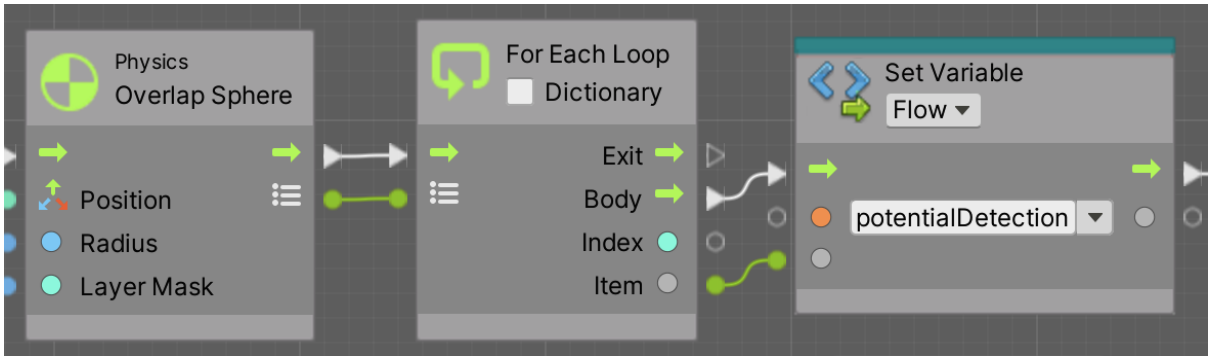
        float angleToCollider = Vector3.Angle(transform.forward, directionToCollider);

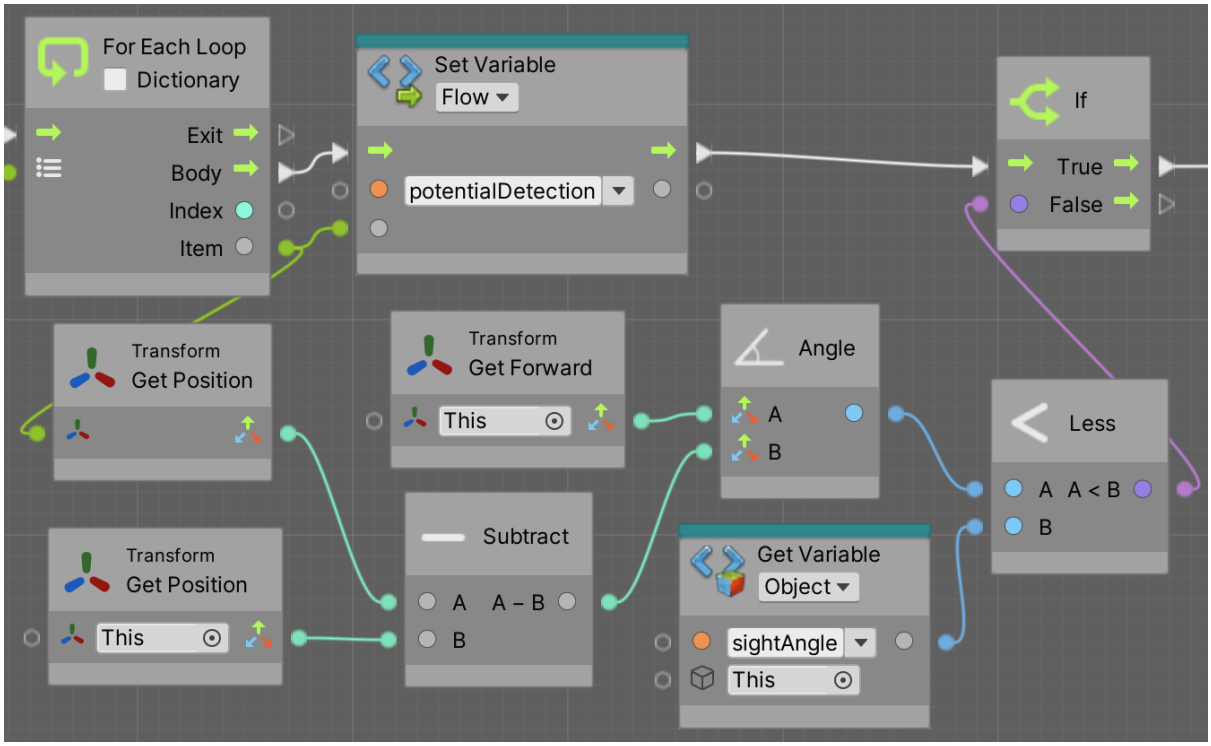
        if (angleToCollider < angle)
        {
            if (!Physics.Linecast(transform.position, collider.bounds.center, obstaclesLayers))
            {
                detectedObject = collider;
                break;
            }
        }
    }
}
```

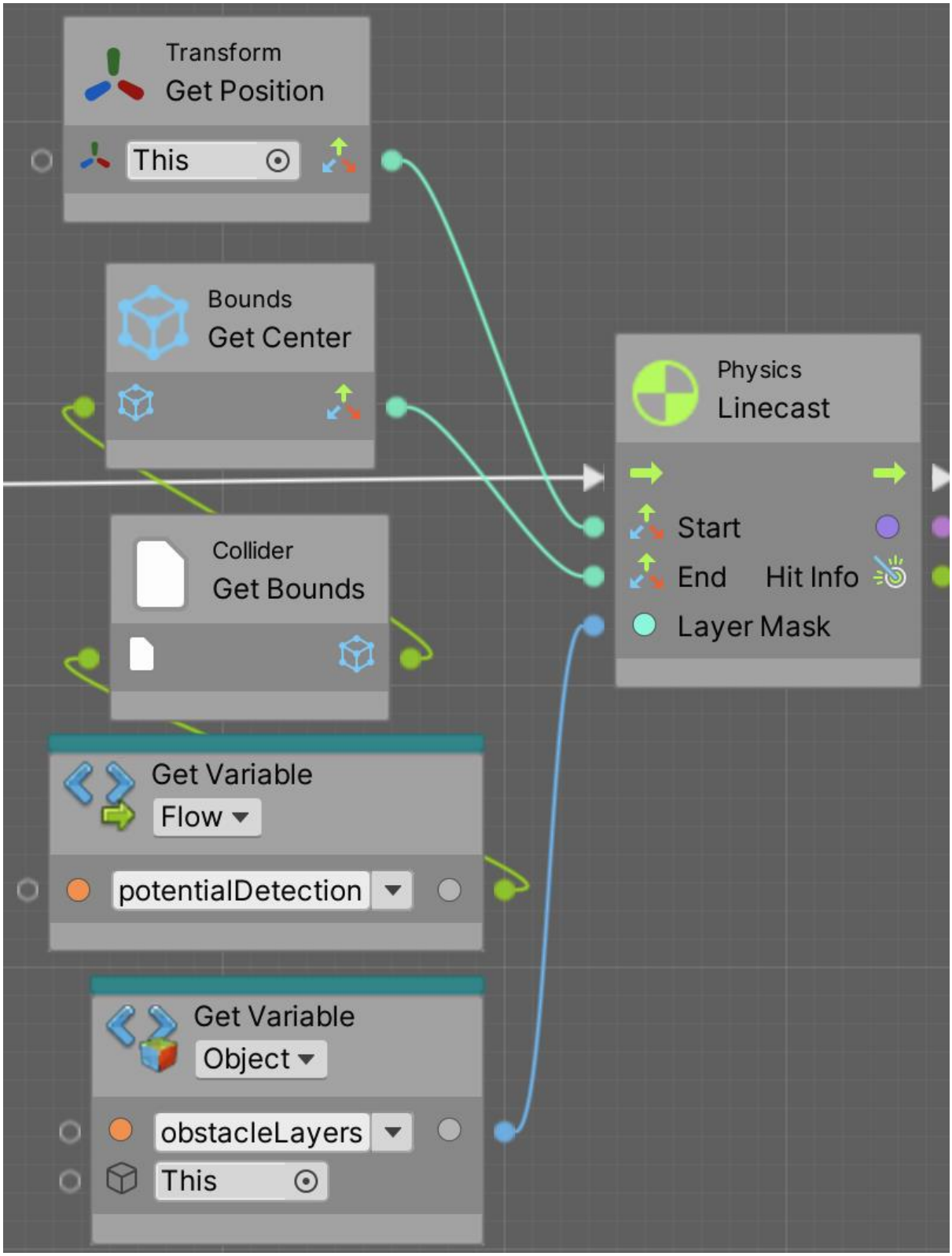


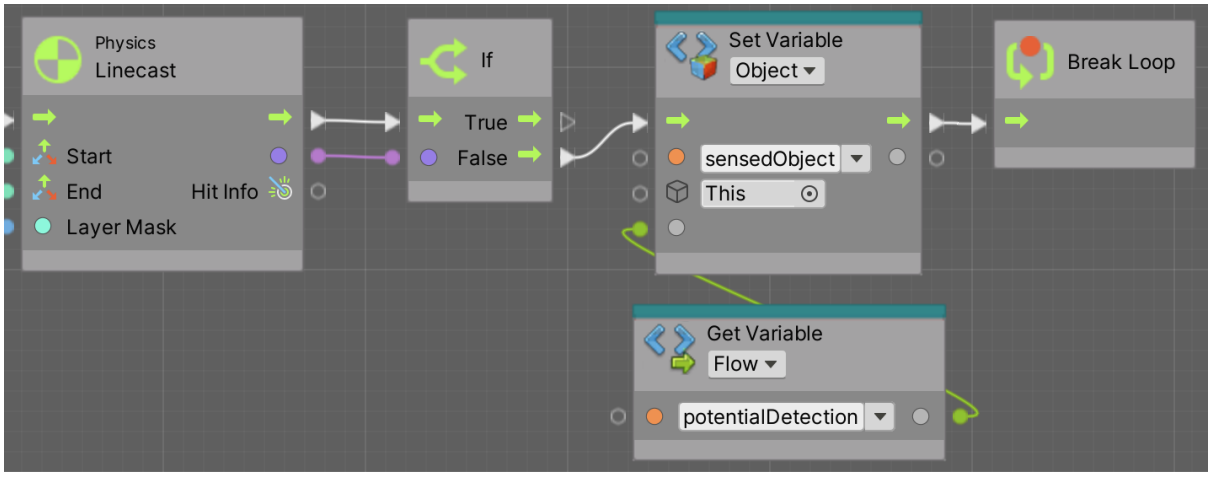

Gizmos
All
y
x
z
Persp
AI
Static
Tag Untagged
Layer Default
Transform
Sight (Script)
Script Sight
Distance 7
Angle 45
Objects Layers Player
Obstacles Layers Default
Detected Object Player (Capsule

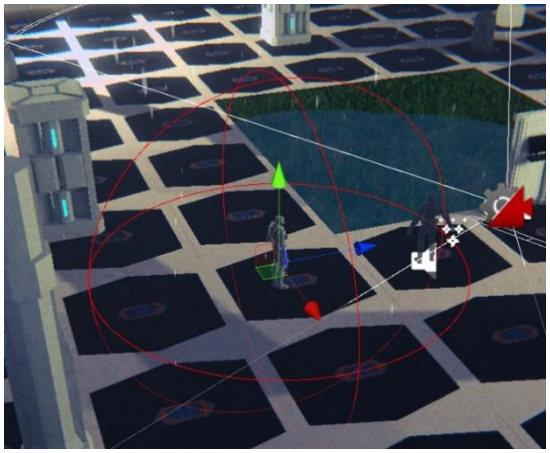

Update
Event
Set Variable
Object
sensedObject
This
Null
Null
Transform
Get Position
This
Physics
Overlap Sphere
Position
Radius
Layer Mask
Get Variable
Object
sightDistance
This
Get Variable
Object
objectsLayers
This
Variables
Name sightDistance
Type Float
Value 5
Name sightAngle
Type Float
Value 45
Name obstacleLayers
Type Layer Mask
Value Default
Name objectsLayers
Type Layer Mask
Value Player
Name sensedObject
Type (Null)
Name baseTransform
Type (Null)
Name baseAttackDistance
Type Float
Value 2
Name playerAttackDistance
Type Float
Value 3
Name fireRate
Type Float
Value 1


Physics
Overlap Sphere
Position
Radius
Layer Mask
For Each Loop
Dictionary
Exit
Body
Index
Item
Set Variable
Flow
potentialDetection


For Each Loop
Dictionary
Exit
Body
Index
Item
Set Variable
Flow
potentialDetection
If
True
False
Transform
Get Position
Transform
Get Forward
This
Angle
A
B
Less
A A < B
B
Transform
Get Position
This
Subtract
A A – B
B
Get Variable
Object
sightAngle
This


Transform
Get Position
This
Bounds
Get Center
Physics
Linecast
Start
End
Hit Info
Layer Mask
Collider
Get Bounds
Get Variable
Flow
potentialDetection
Get Variable
Object
obstacleLayers
This

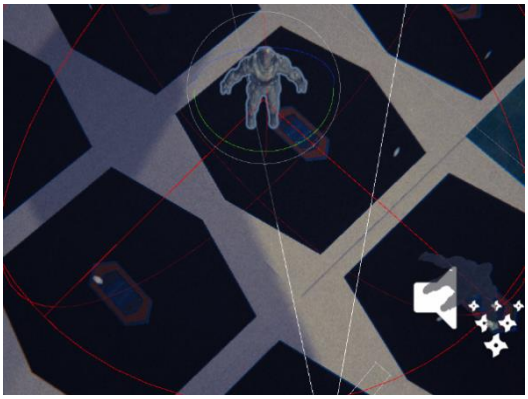




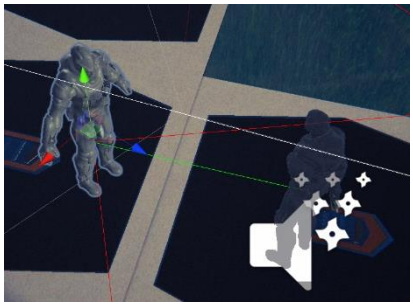
```
void OnDrawGizmos()
{
    Gizmos.color = Color.red;
    Gizmos.DrawWireSphere(transform.position, distance);
}
```

```
Vector3 rightDirection = Quaternion.Euler(0, angle, 0) * transform.forward;
Gizmos.DrawRay(transform.position, rightDirection * distance);

Vector3 leftDirection = Quaternion.Euler(0, -angle, 0) * transform.forward;
Gizmos.DrawRay(transform.position, leftDirection * distance);
```

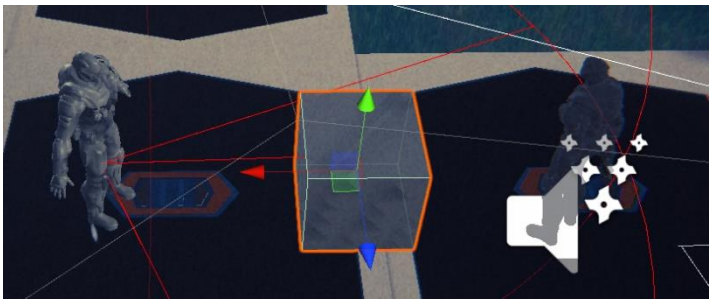


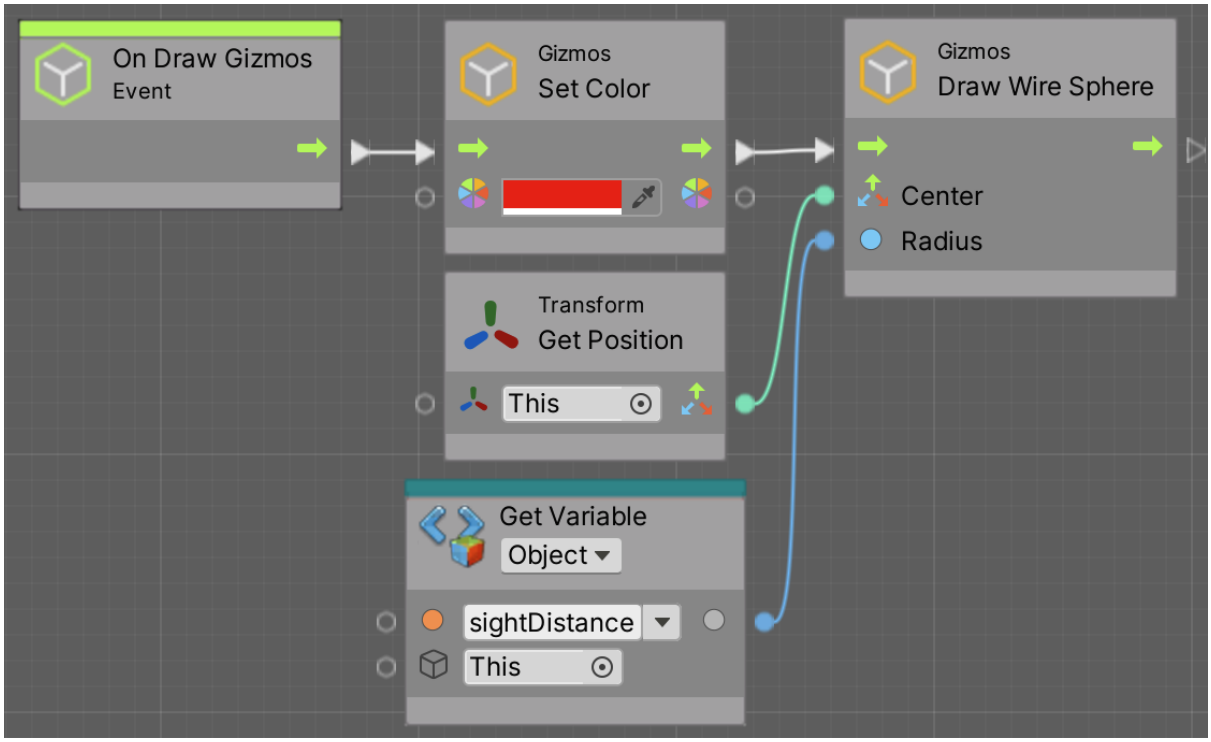
```
if (!Physics.Linecast(transform.position, collider.bounds.center, obstaclesLayers))
{
    Debug.DrawLine(transform.position, collider.bounds.center, Color.green);
    detectedObject = collider;
    break;
}
```

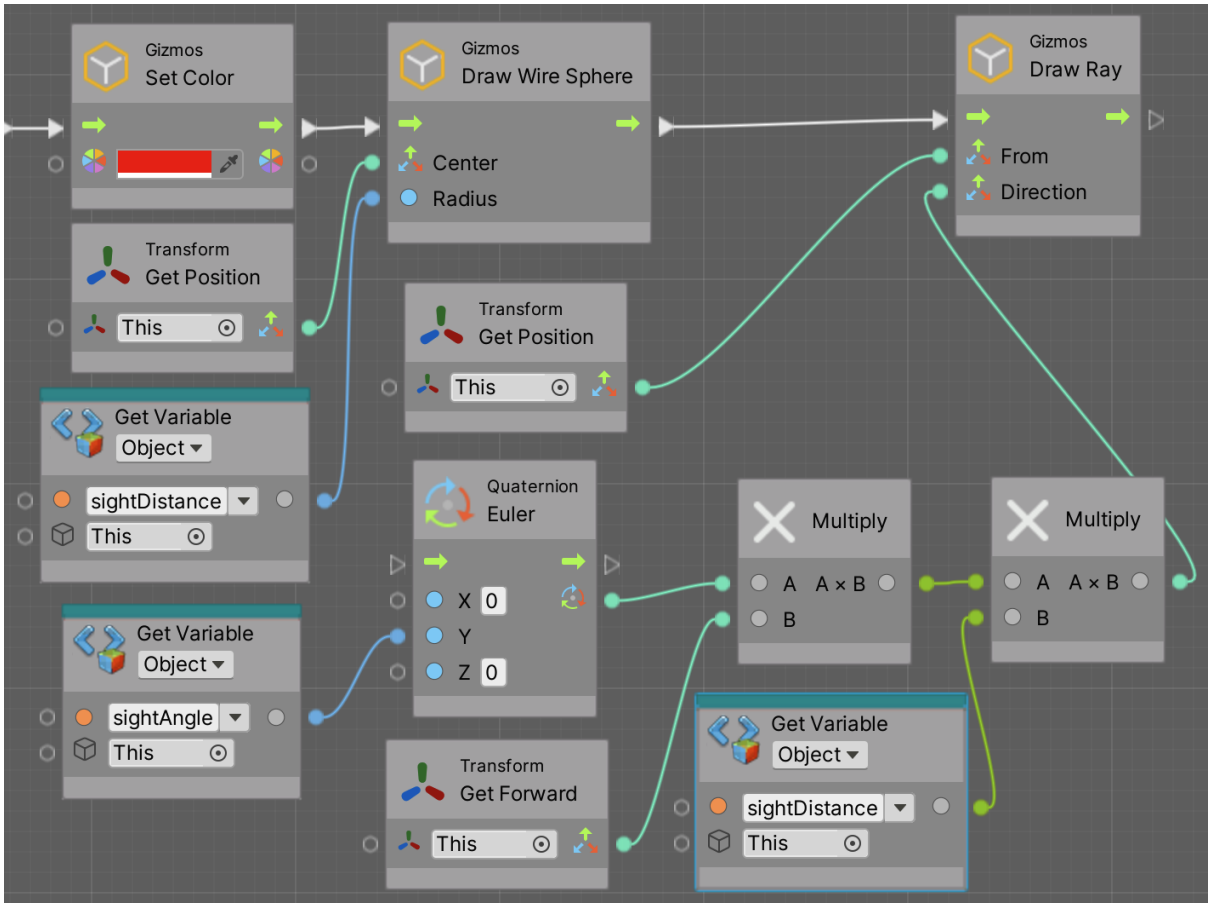


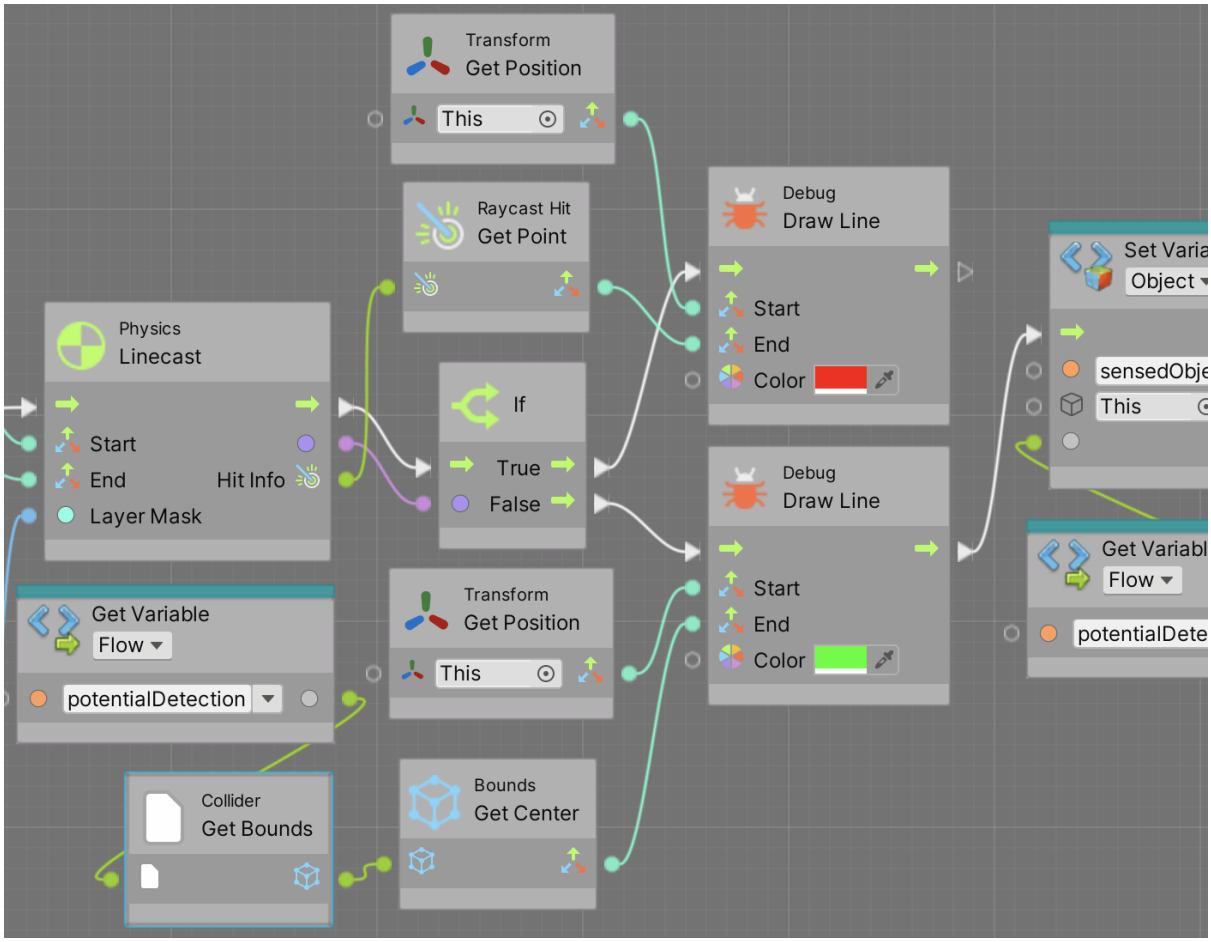
```
if (!Physics.Linecast(transform.position, collider.bounds.center, out RaycastHit hit, obstaclesLayers))
{
```

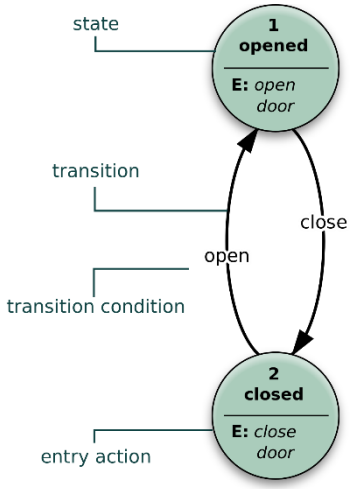
```
if (!Physics.Linecast(transform.position, collider.bounds.center, out RaycastHit hit, obstaclesLayers))
{
    Debug.DrawLine(transform.position, collider.bounds.center, Color.green);
    detectedObject = collider;
    break;
}
else
{
    Debug.DrawLine(transform.position, hit.point, Color.red);
}
```




On Draw Gizmos
Event
Gizmos
Set Color
Gizmos
Draw Wire Sphere
Center
Radius
Transform
Get Position
This
Get Variable
Object
sightDistance
This


Gizmos
Set Color
Gizmos
Draw Wire Sphere
Gizmos
Draw Ray
Center
Radius
From
Direction
Transform
Get Position
This
Transform
Get Position
This
Get Variable
Object
sightDistance
This
Quaternion
Euler
X 0
Y
Z 0
Multiply
A A × B
B
Multiply
A A × B
B
Get Variable
Object
sightAngle
This
Transform
Get Forward
This
Get Variable
Object
sightDistance
This



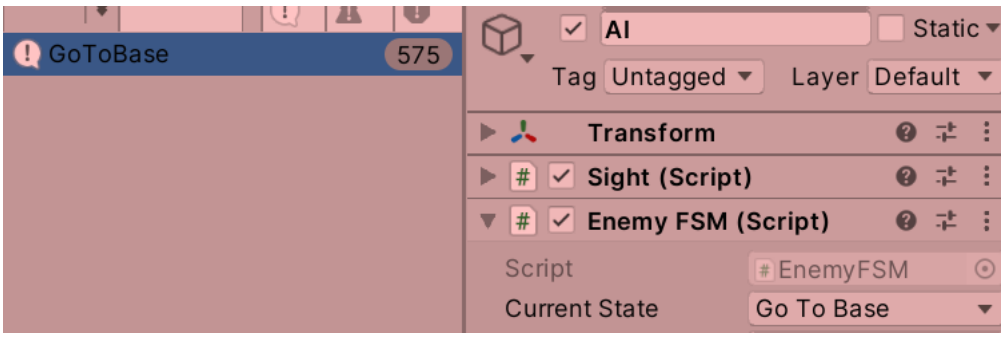



```
public class EnemyFSM : MonoBehaviour
{
    public enum EnemyState { GoToBase, AttackBase, ChasePlayer, AttackPlayer }

    public EnemyState currentState;
```

```
void Update()
{
    if(currentState == EnemyState.GoToBase)
        GoToBase();
    else if(currentState == EnemyState.AttackBase)
        AttackBase();
    else if(currentState == EnemyState.ChasePlayer)
        ChasePlayer();
    else if(currentState == EnemyState.AttackPlayer)
        AttackPlayer();
}

void GoToBase() {print("GoToBase"); }
void AttackBase() { print("AttackBase"); }
void ChasePlayer() { print("ChasePlayer"); }
void AttackPlayer() { print("AttackPlayer"); }
```




```
public Sight sightSensor;
void GoToBase()
{
    if (sightSensor.detectedObject != null)
    {
        currentState = EnemyState.ChasePlayer;
    }
}
```

```
public Transform baseTransform;
public float baseAttackDistance;

void GoToBase()
{
    if (sightSensor.detectedObject != null)
        currentState = EnemyState.ChasePlayer;

    float distanceToBase = Vector3.Distance(transform.position, baseTransform.position);
    if (distanceToBase <= baseAttackDistance)
        currentState = EnemyState.AttackBase;
}
```

```
void ChasePlayer()
{
    if (sightSensor.detectedObject == null)
    {
        currentState = EnemyState.GoToBase;
        return;
    }

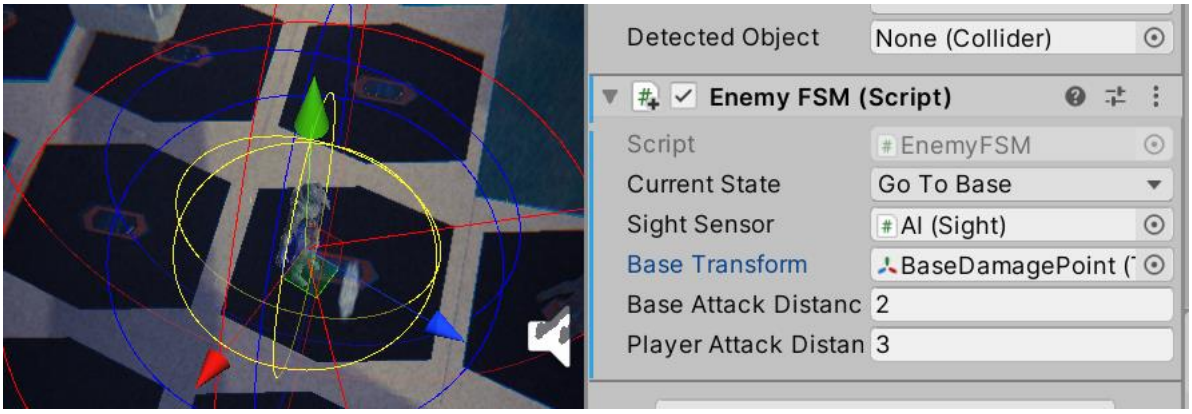
    float distanceToPlayer = Vector3.Distance(transform.position, sightSensor.detectedObject.transform.position);
    if (distanceToPlayer <= playerAttackDistance)
        currentState = EnemyState.AttackPlayer;
}
```

```
void AttackPlayer()
{
    if (sightSensor.detectedObject == null)
    {
        currentState = EnemyState.GoToBase;
        return;
    }

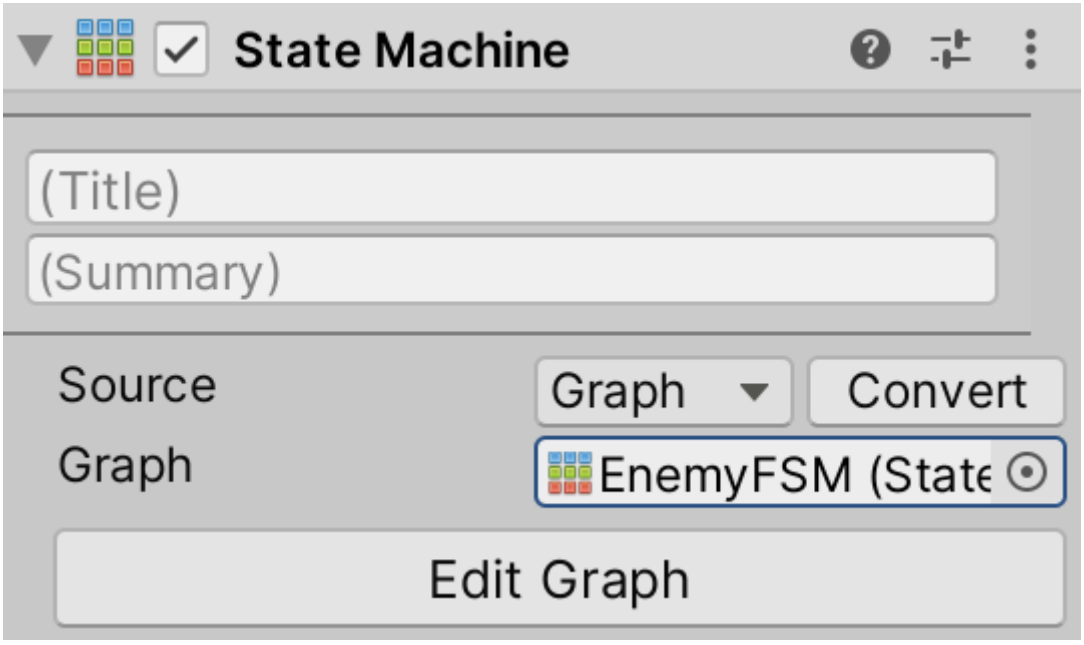
    float distanceToPlayer = Vector3.Distance(transform.position, sightSensor.detectedObject.transform.position);
    if (distanceToPlayer > playerAttackDistance * 1.1f)
        currentState = EnemyState.ChasePlayer;
}
```

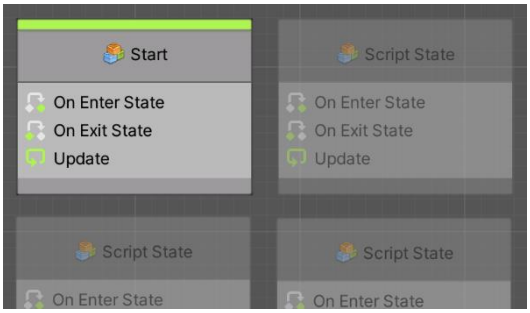
```
void OnDrawGizmos()
{
    Gizmos.color = Color.blue;
    Gizmos.DrawWireSphere(transform.position, playerAttackDistance);

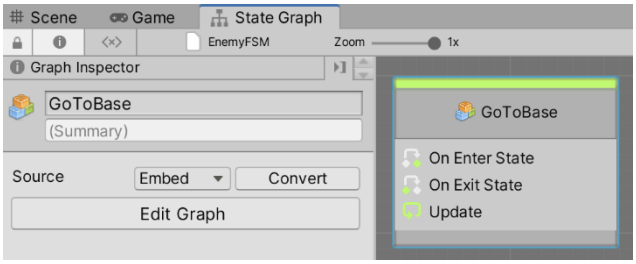
    Gizmos.color = Color.yellow;
    Gizmos.DrawWireSphere(transform.position, baseAttackDistance);
}
```

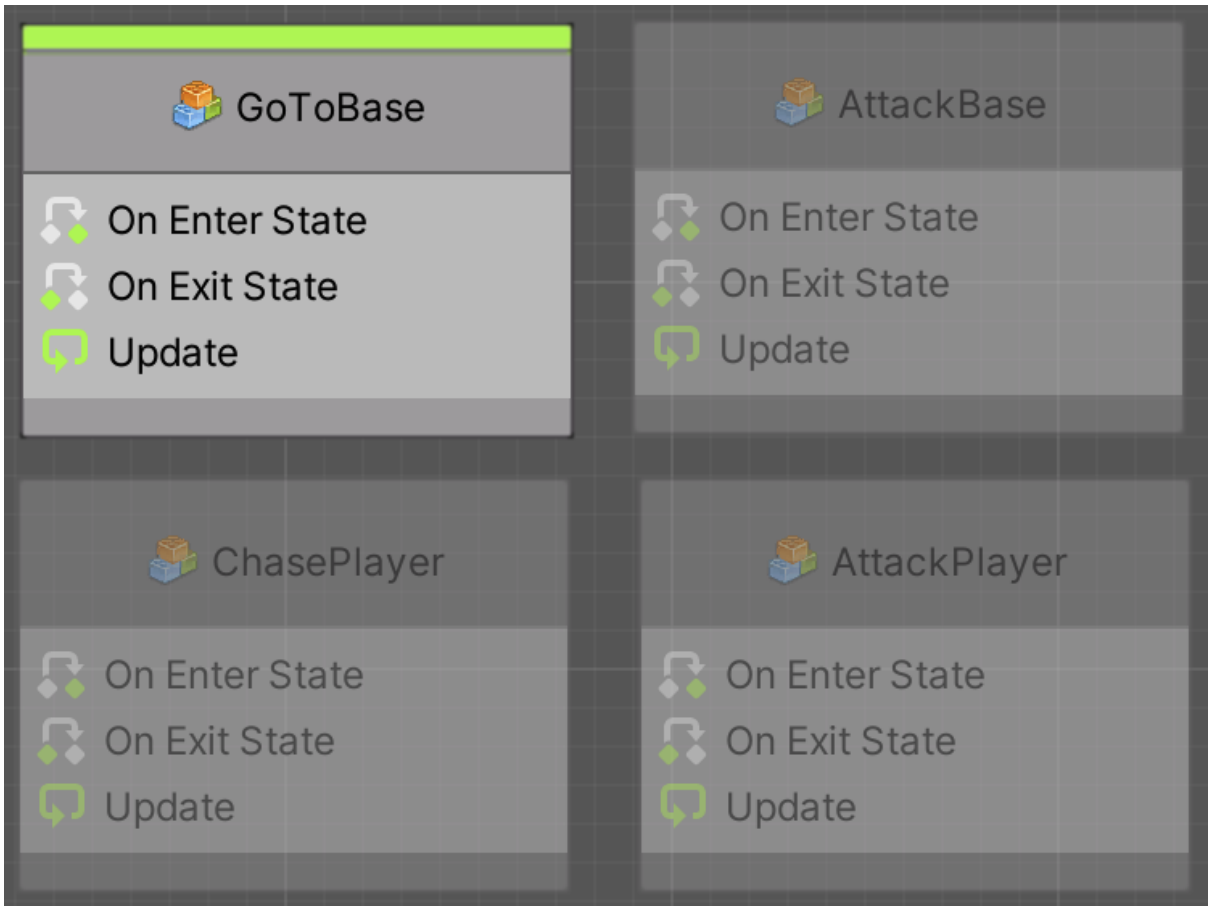


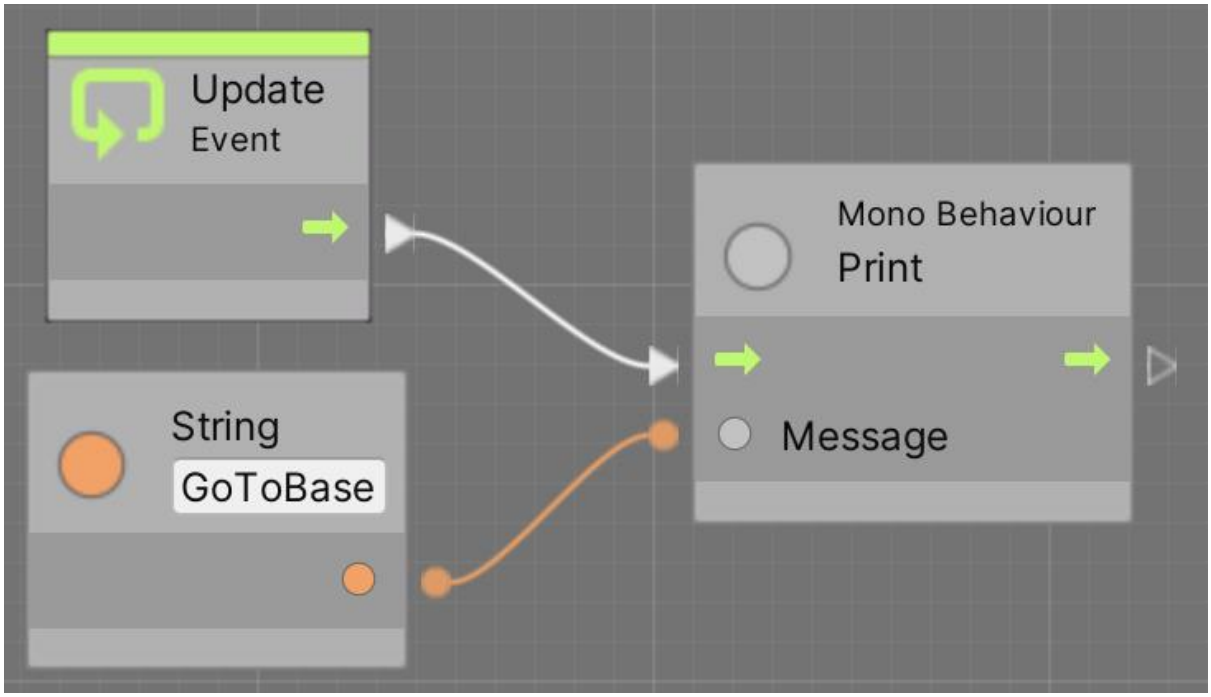

```
Transform baseTransform;
void Awake()
{
    baseTransform = GameObject.Find("BaseDamagePoint").transform;
}
```

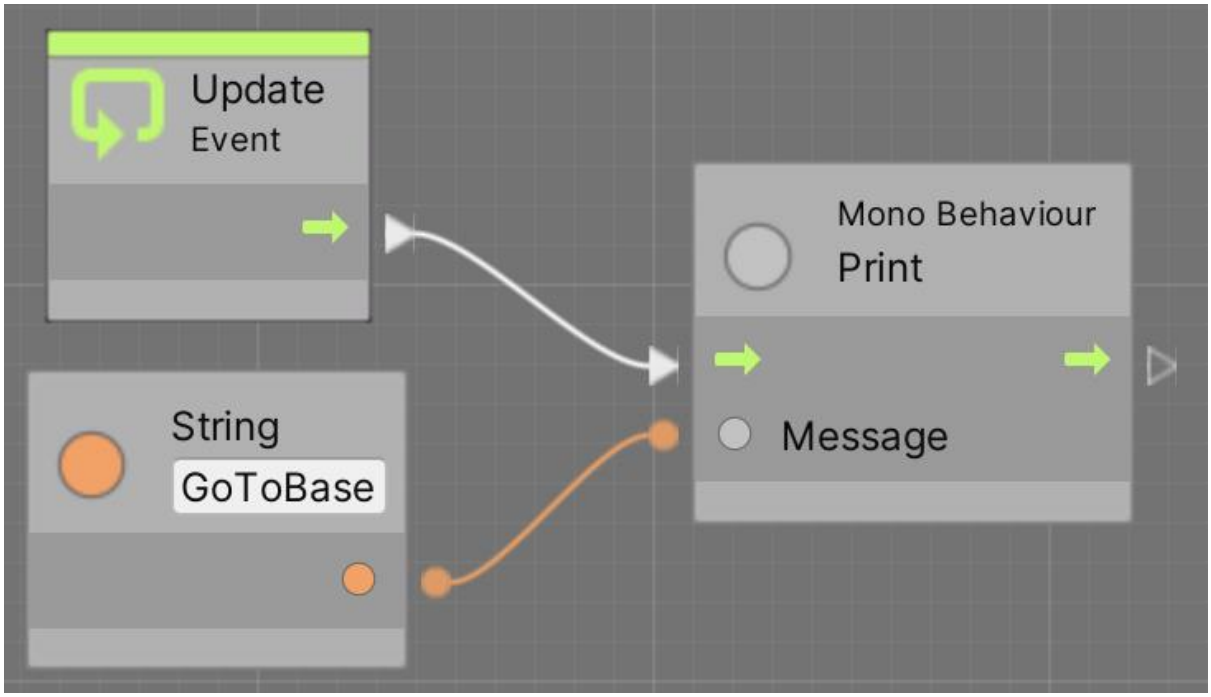


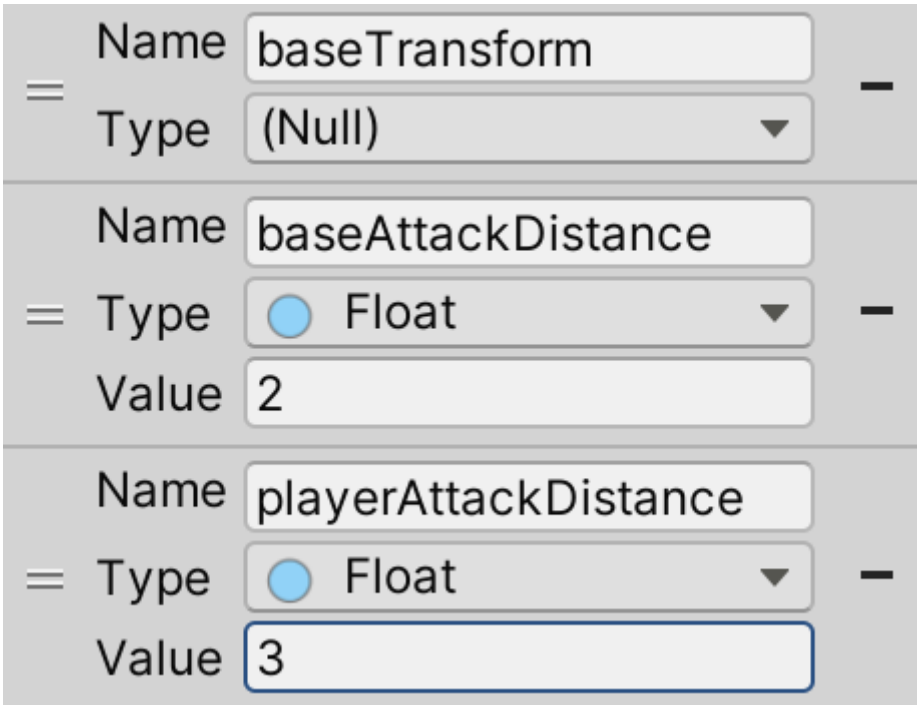

Start
On Enter State
On Exit State
Update
Script State
On Enter State
On Exit State
Update
Script State
On Enter State
Script State
On Enter State

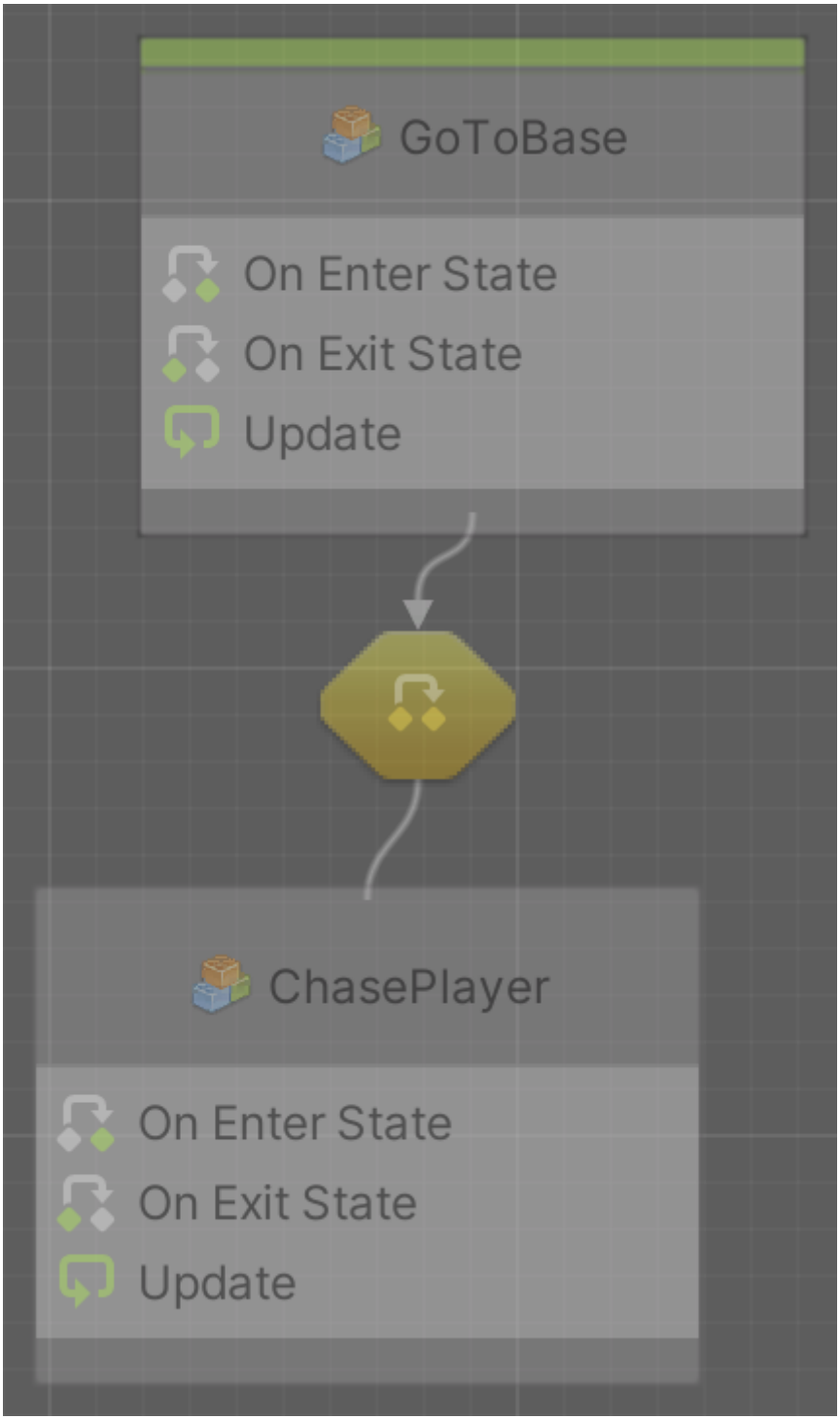

Scene
Game
State Graph
EnemyFSM
Zoom
1x
Graph Inspector
GoToBase
(Summary)
Source
Embed
Convert
Edit Graph
GoToBase
On Enter State
On Exit State
Update

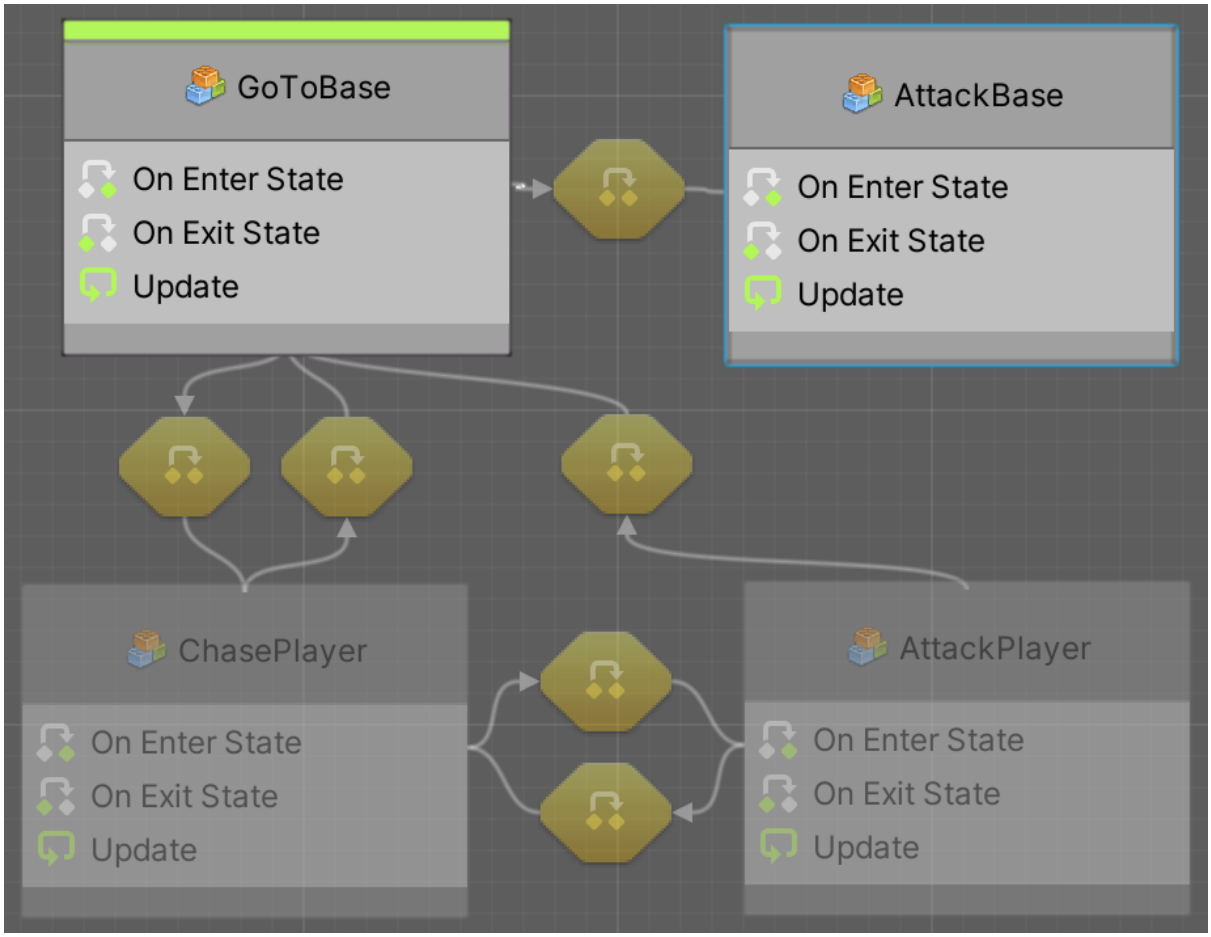

GoToBase
On Enter State
On Exit State
Update
AttackBase
On Enter State
On Exit State
Update
ChasePlayer
On Enter State
On Exit State
Update
AttackPlayer
On Enter State
On Exit State
Update

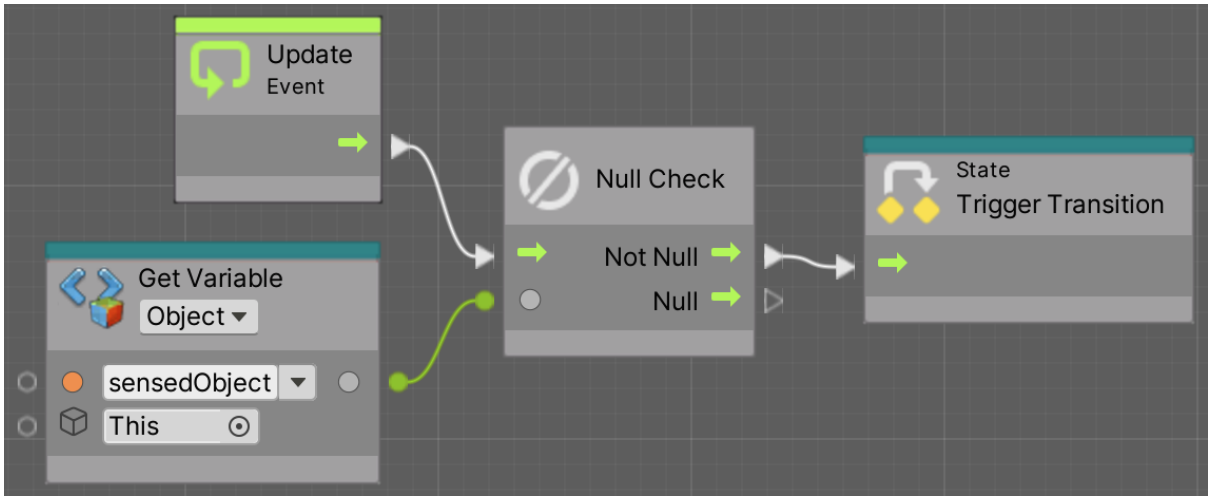

Update
Event
Mono Behaviour
Print
String
GoToBase
Message

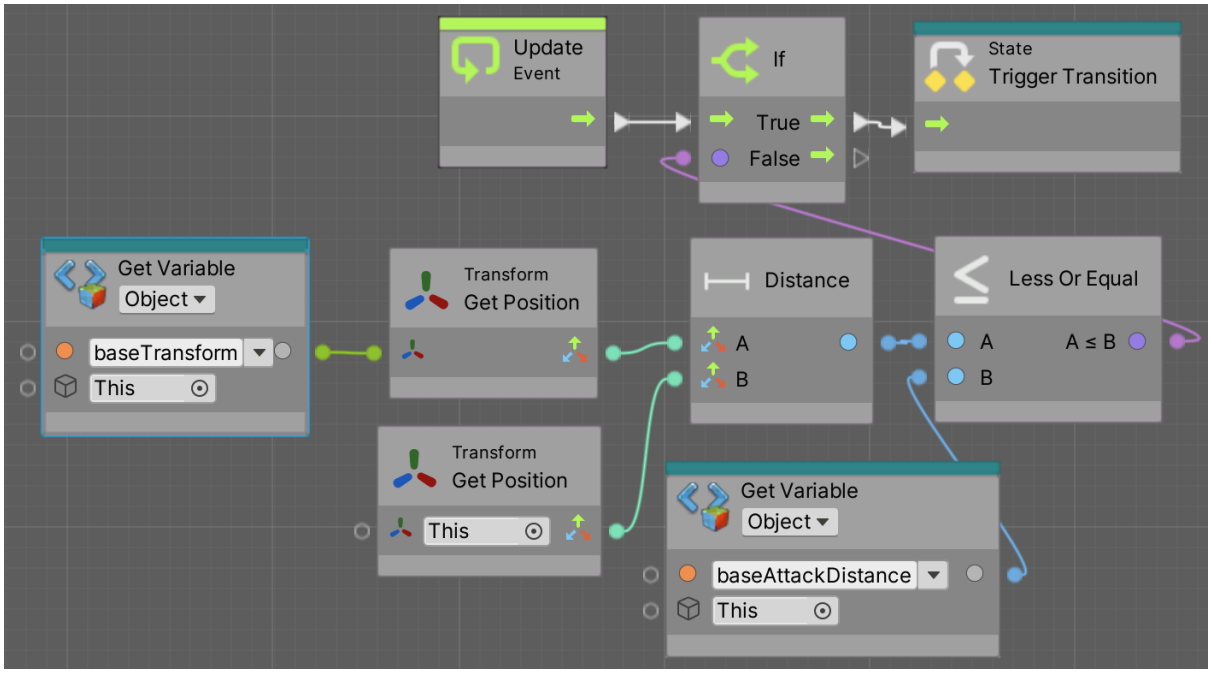

Update
Event
Mono Behaviour
Print
String
GoToBase
Message

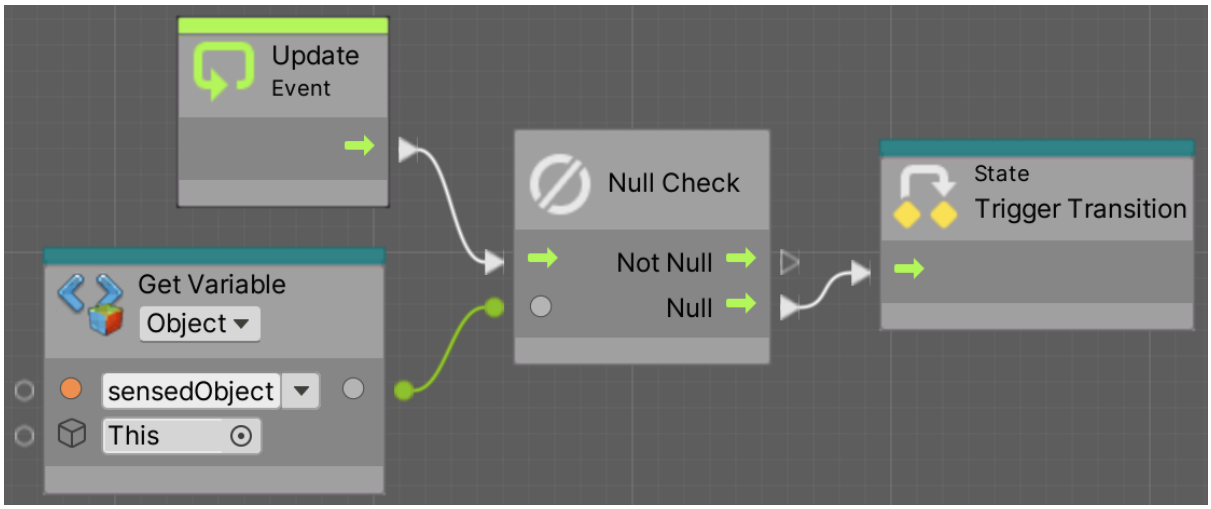

Name
baseTransform
Type
(Null)
Name
baseAttackDistance
Type
Float
Value
2
Name
playerAttackDistance
Type
Float
Value
3

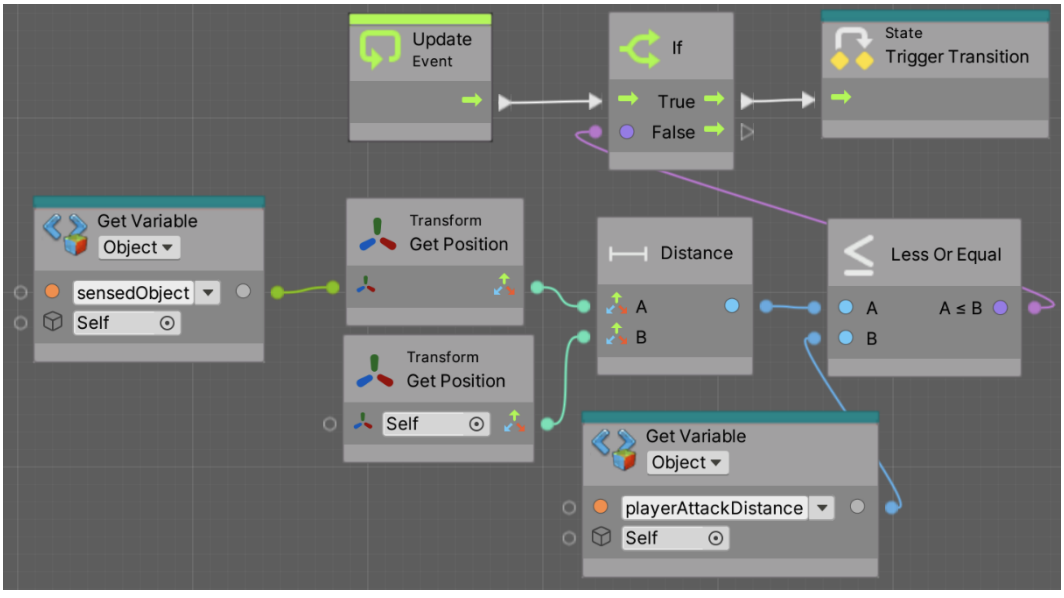

GoToBase
On Enter State
On Exit State
Update
ChasePlayer
On Enter State
On Exit State
Update

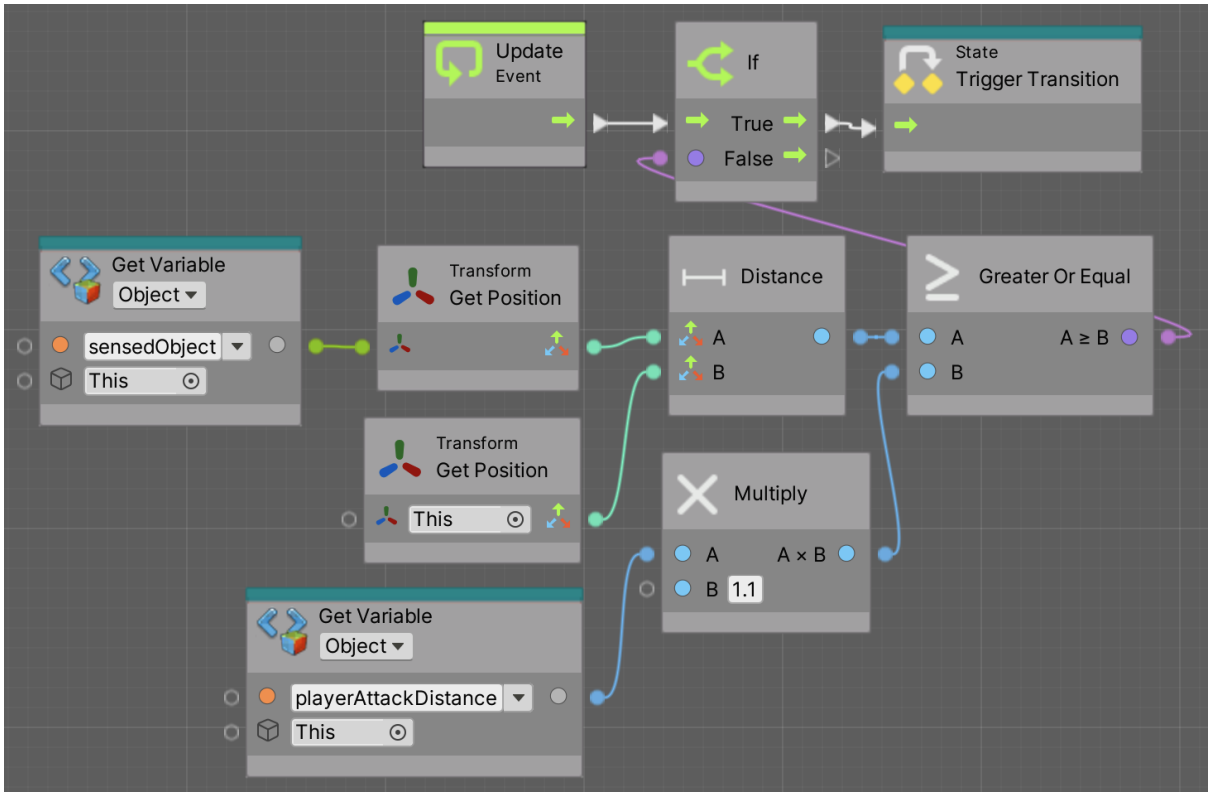

GoToBase
On Enter State
On Exit State
Update
AttackBase
On Enter State
On Exit State
Update
ChasePlayer
On Enter State
On Exit State
Update
AttackPlayer
On Enter State
On Exit State
Update

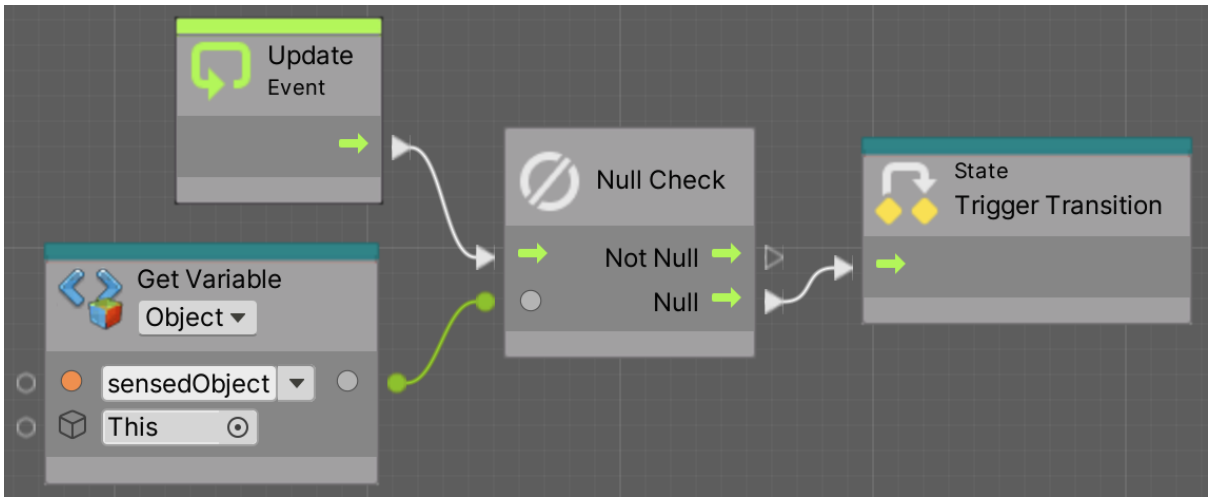

Update
Event
Null Check
Not Null
Null
State
Trigger Transition
Get Variable
Object
sensedObject
This

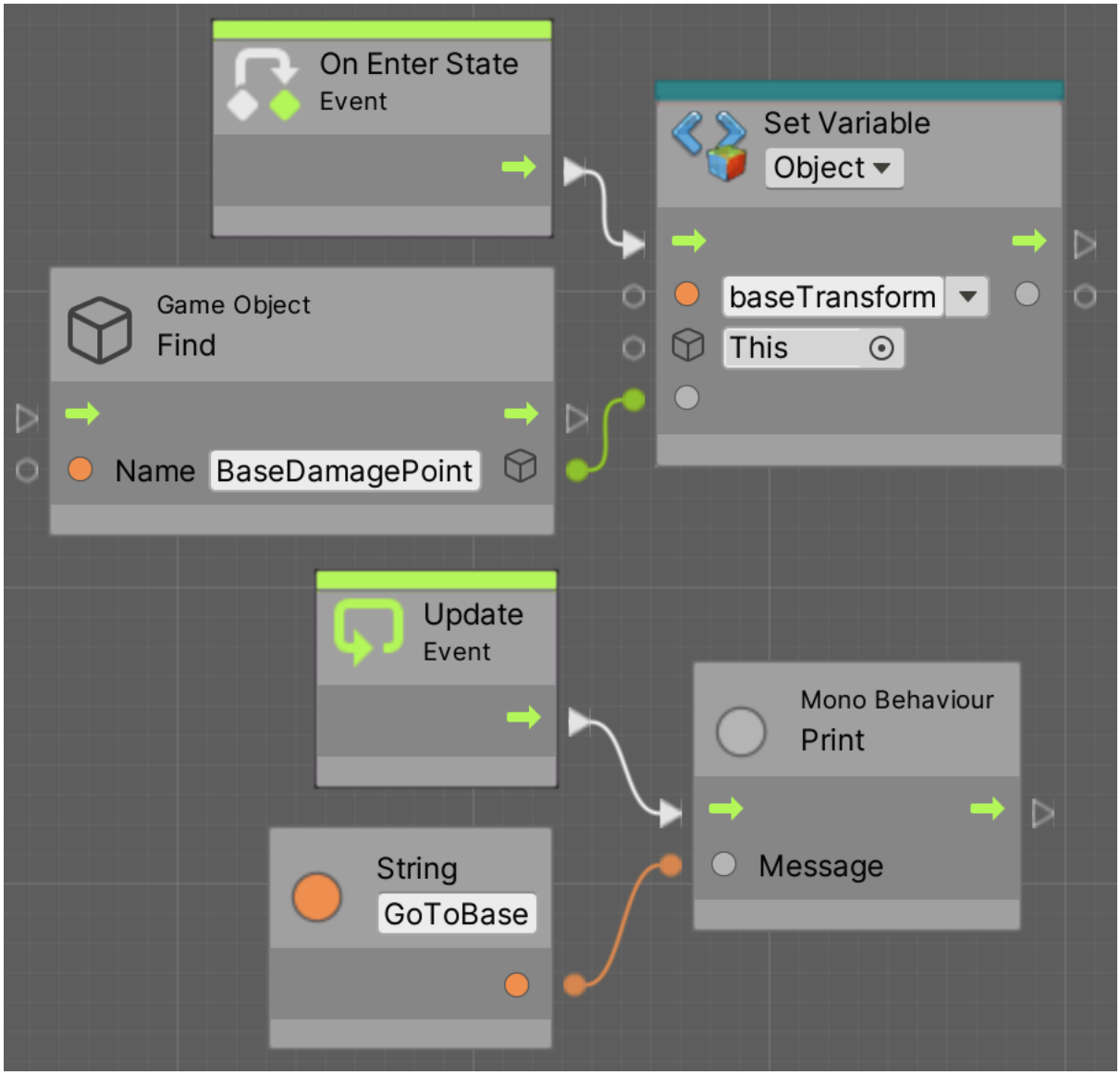

Update
Event
If
True
False
State
Trigger Transition
Get Variable
Object
baseTransform
This
Transform
Get Position
Distance
A
B
Less Or Equal
A
B
A ≤ B
Transform
Get Position
This
Get Variable
Object
baseAttackDistance
This

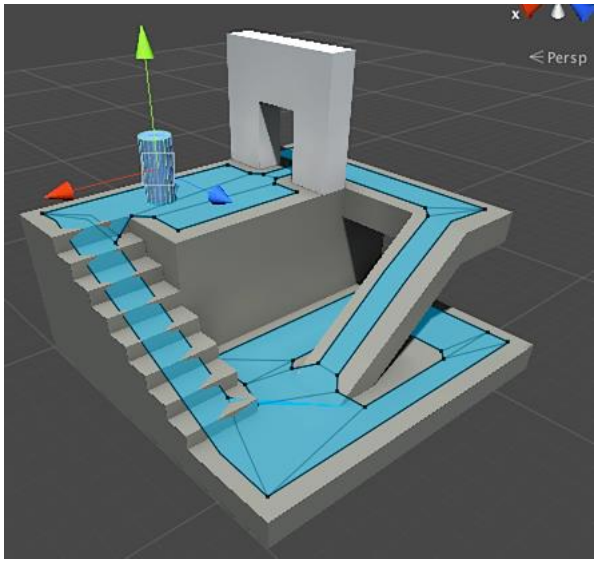

Update
Event
Null Check
Not Null
Null
State
Trigger Transition
Get Variable
Object
sensedObject
This

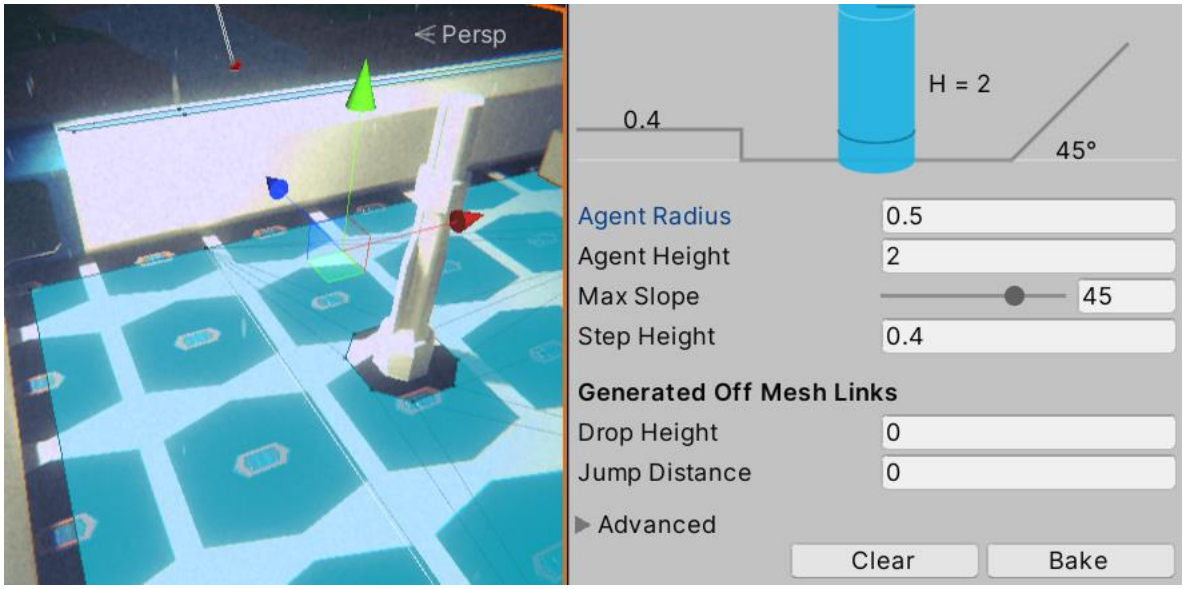

Update
Event
If
True
False
State
Trigger Transition
Get Variable
Object
sensedObject
Self
Transform
Get Position
Distance
A
B
Less Or Equal
A
B
A ≤ B
Transform
Get Position
Self
Get Variable
Object
playerAttackDistance
Self

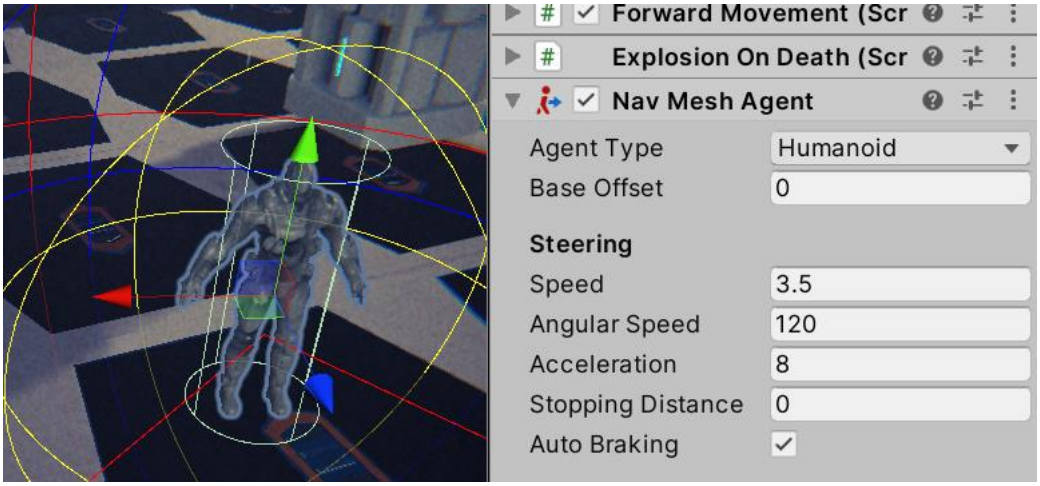

Update
Event
If
True
False
State
Trigger Transition
Get Variable
Object
sensedObject
This
Transform
Get Position
Distance
A
B
Greater Or Equal
A
B
A ≥ B
Transform
Get Position
This
Multiply
A
B
1.1
A × B
Get Variable
Object
playerAttackDistance
This


Update
Event
Null Check
Not Null
Null
State
Trigger Transition
Get Variable
Object
sensedObject
This


On Enter State
Event
Set Variable
Object
baseTransform
This
Game Object
Find
Name
BaseDamagePoint
Update
Event
Mono Behaviour
Print
Message
String
GoToBase


Persp






```
NavMeshAgent agent;

void Awake()
{
    baseTransform = GameObject.Find("BaseDamagePoint").transform;
    agent = GetComponentInParent<NavMeshAgent>();
}
```

```
void GoToBase()
{
    agent.SetDestination(baseTransform.position);
```

```
void AttackBase()
{
    agent.isStopped = true;
}
```

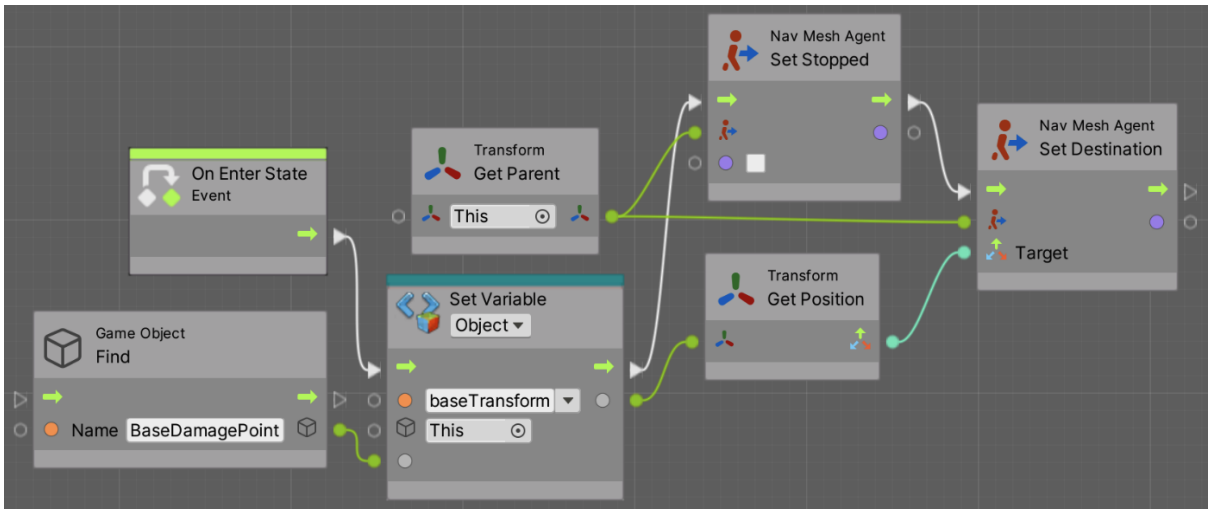
```
void GoToBase()
{
    agent.isStopped = false;
    agent.SetDestination(baseTransform.position);
```

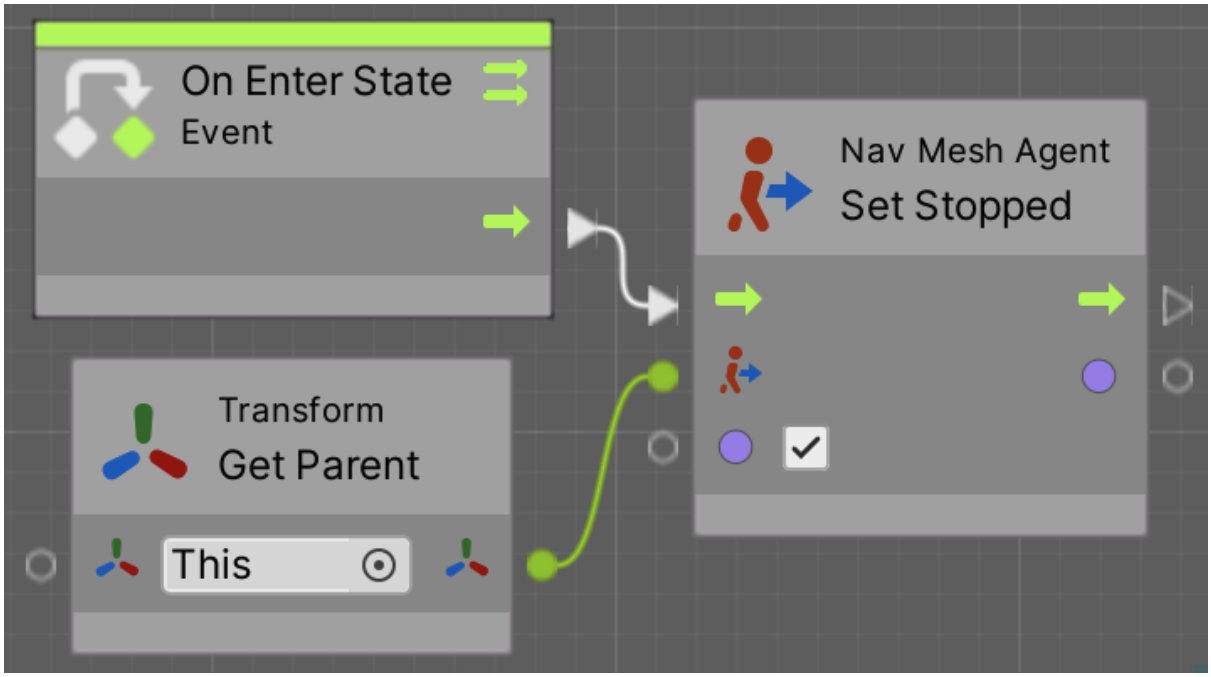
```
void ChasePlayer()
{
    agent.isStopped = false;

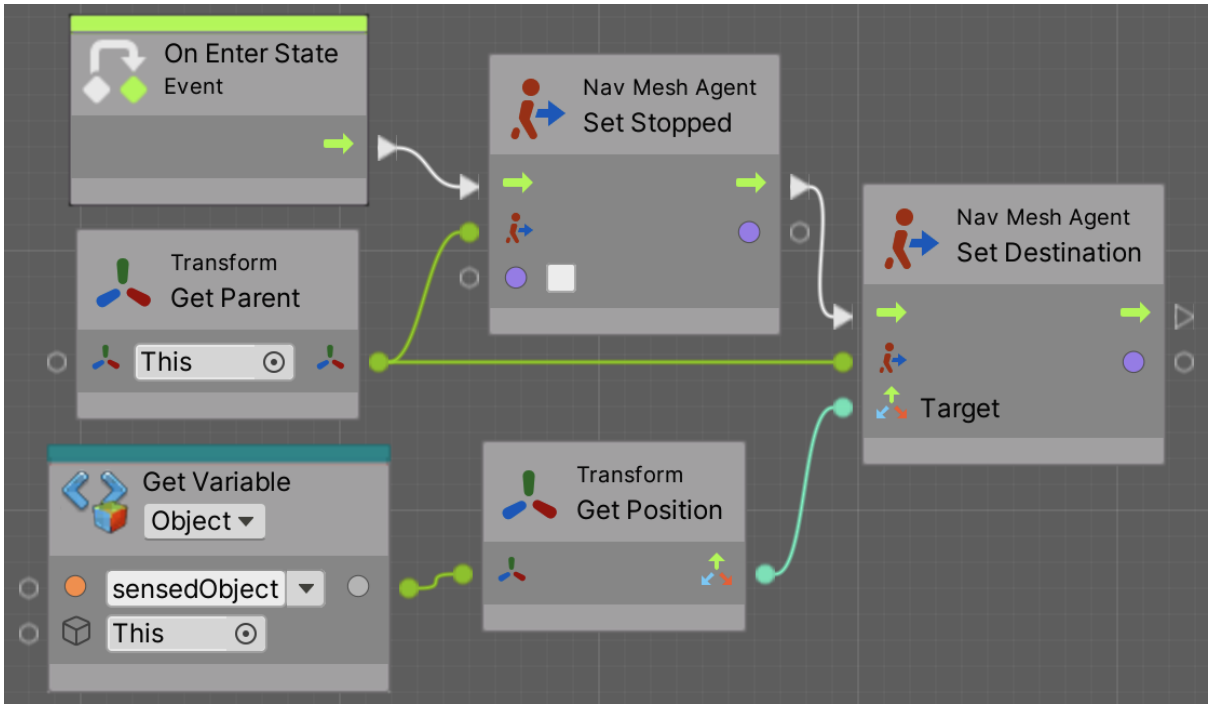
    if (sightSensor.detectedObject == null)
    {
        currentState = EnemyState.GoToBase;
        return;
    }

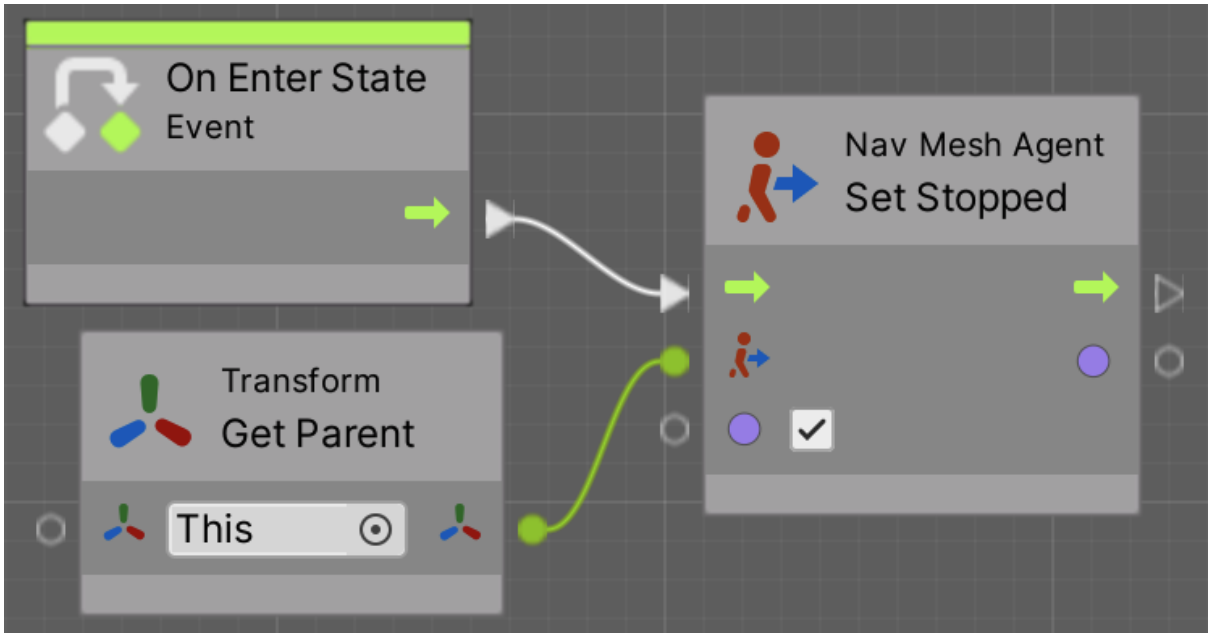
    agent.SetDestination(sightSensor.detectedObject.transform.position);
```

```
void AttackPlayer()
{
    agent.isStopped = true;
```




On Enter State
Event
Nav Mesh Agent
Set Stopped
Transform
Get Parent
This


On Enter State
Event
Nav Mesh Agent
Set Stopped
Nav Mesh Agent
Set Destination
Transform
Get Parent
This
Target
Get Variable
Object
sensedObject
This
Transform
Get Position




```
void AttackPlayer()
{
    agent.isStopped = true;

    if (sightSensor.detectedObject == null)
    {
        currentState = EnemyState.GoToBase;
        return;
    }

    Shoot();

    float distanceToPlayer = Vector3.Distance(transform.position, sightSensor.detectedObject.transform.position);
    if (distanceToPlayer > playerAttackDistance * 1.1f)
        currentState = EnemyState.ChasePlayer;
}

void AttackBase()
{
    agent.isStopped = true;
    Shoot();
}

void Shoot()
{

}
```

```
void Shoot()
{
    if (Time.timeScale > 0)
    {
        var timeSinceLastShoot :float  = Time.time - lastShootTime;
        if(timeSinceLastShoot < fireRate)
            return;

        lastShootTime = Time.time;
        Instantiate(bulletPrefab, transform.position, transform.rotation);
    }
}
```

```
    LookTo(sightSensor.detectedObject.transform.position);
    Shoot();

    float distanceToPlayer = Vector3.Distance(transform.position, sightSensor.detectedObject.transform.position);
    if (distanceToPlayer > playerAttackDistance * 1.1f)
        currentState = EnemyState.ChasePlayer;
}

void AttackBase()
{
    agent.isStopped = true;
    LookTo(baseTransform.position);
    Shoot();
}

void LookTo(Vector3 targetPosition)
{

}
```

```
void LookTo(Vector3 targetPosition)
{
    Vector3 directionToPosition = Vector3.Normalize(targetPosition - transform.parent.position);
    directionToPosition.y = 0;
    transform.parent.forward = directionToPosition;
}
```

```
using UnityEngine;
using UnityEngine.AI;

public class NavMeshAnimator : MonoBehaviour
{
    Animator animator;
    NavMeshAgent agent;

    void Awake()
    {
        animator = GetComponent<Animator>();
        agent = GetComponent<NavMeshAgent>();
    }

    void Update()
    {
        animator.SetFloat("Velocity", agent.velocity.magnitude);
    }
}
```

```
Animator animator;

void Awake()
{
    baseTransform = GameObject.Find("BaseDamagePoint").transform;
    agent = GetComponentInParent<NavMeshAgent>();
    animator = GetComponentInParent<Animator>();
}
```

```
void Shoot()
{
    animator.SetBool("Shooting", true);
```

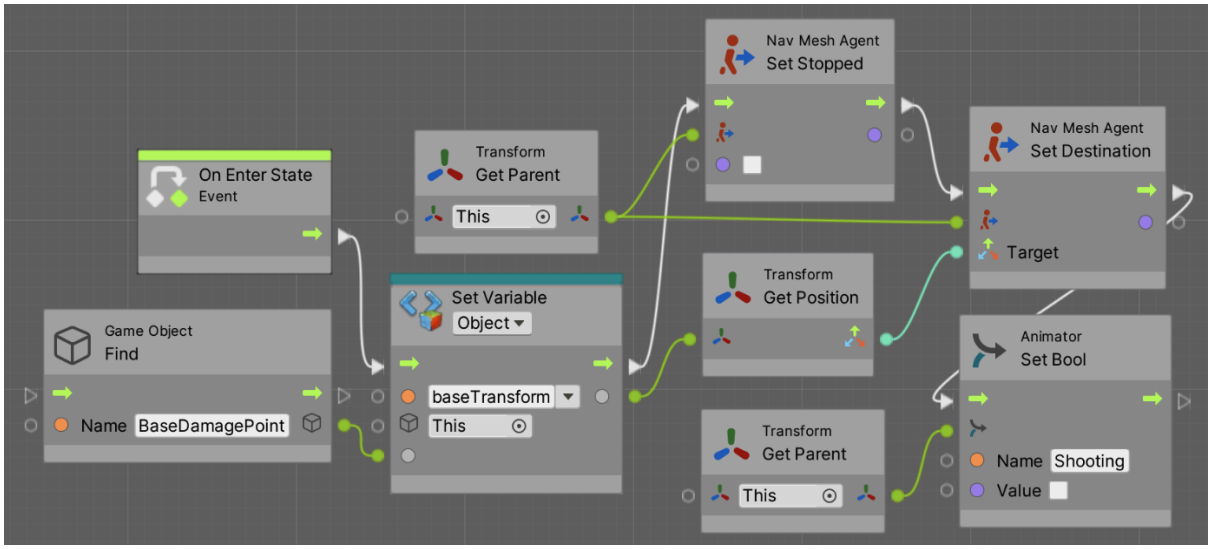
```
void GoToBase()
{
    animator.SetBool("Shooting", false);
    agent.isStopped = false;

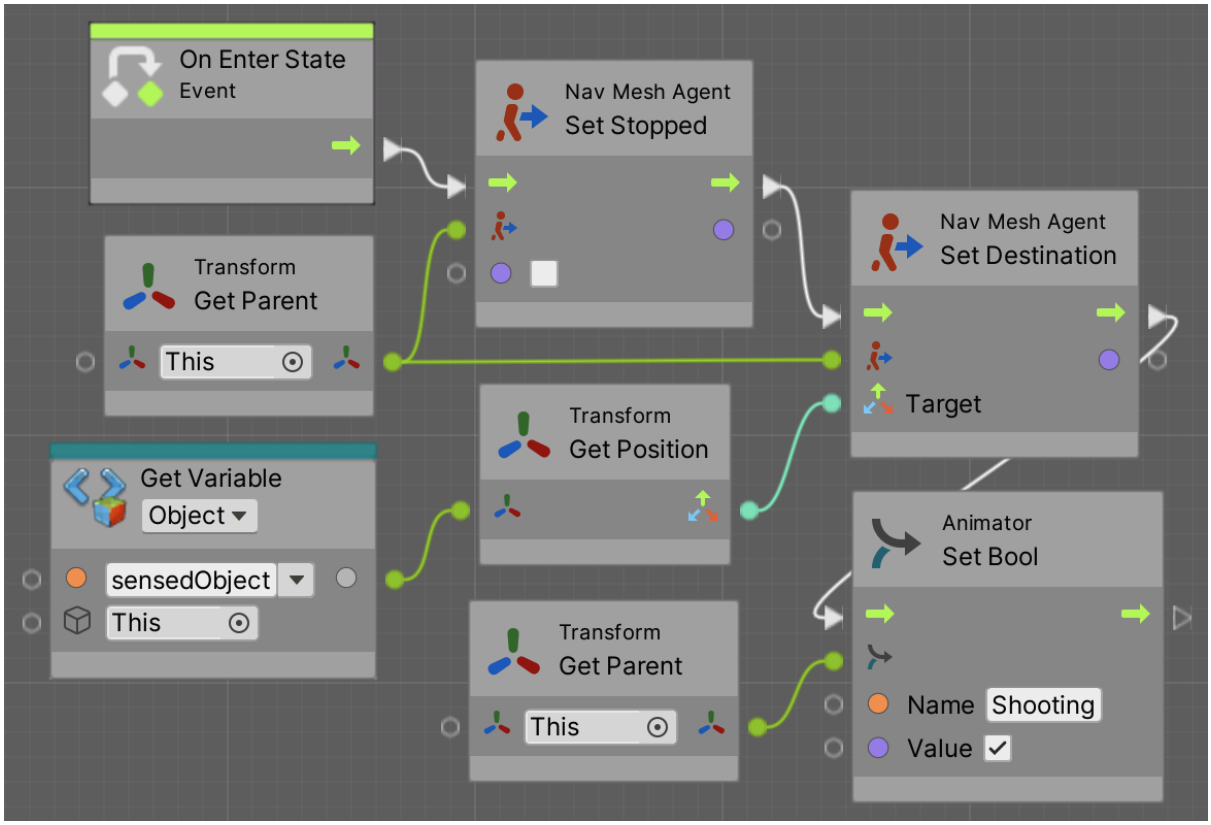
    agent.SetDestination(baseTransform.position);

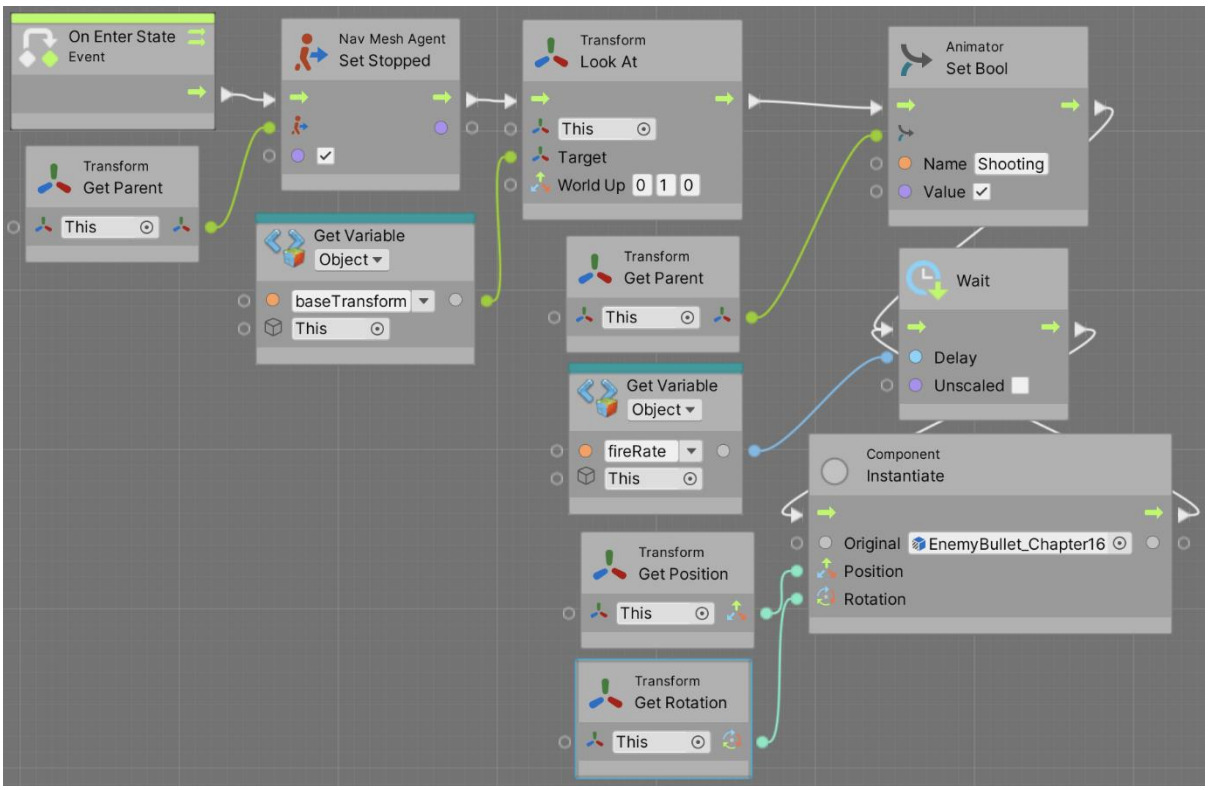
    if (sightSensor.detectedObject != null)
        currentState = EnemyState.ChasePlayer;

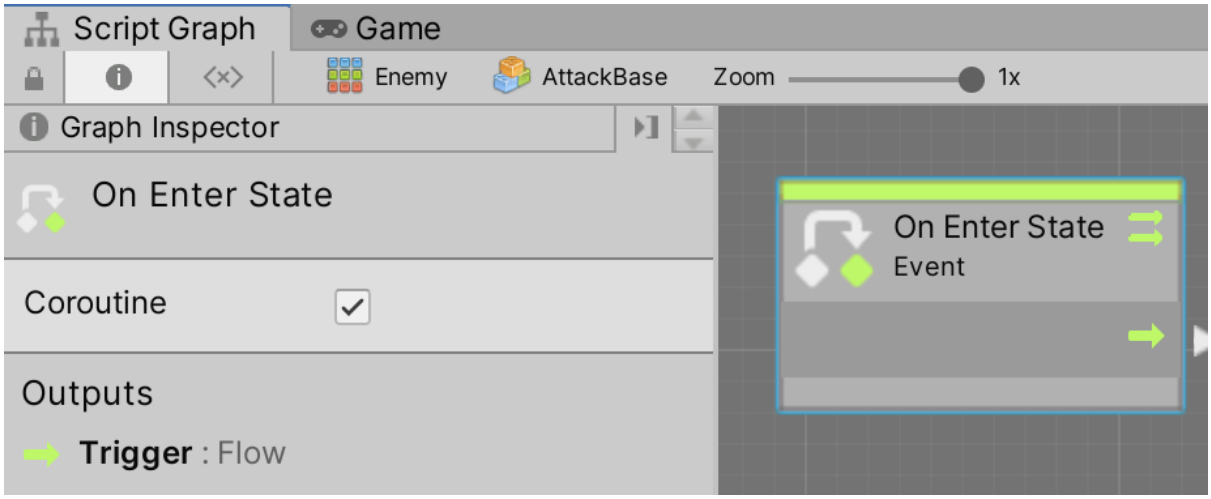
    float distanceToBase = Vector3.Distance(transform.position, baseTransform.position);
    if (distanceToBase <= baseAttackDistance)
        currentState = EnemyState.AttackBase;
}

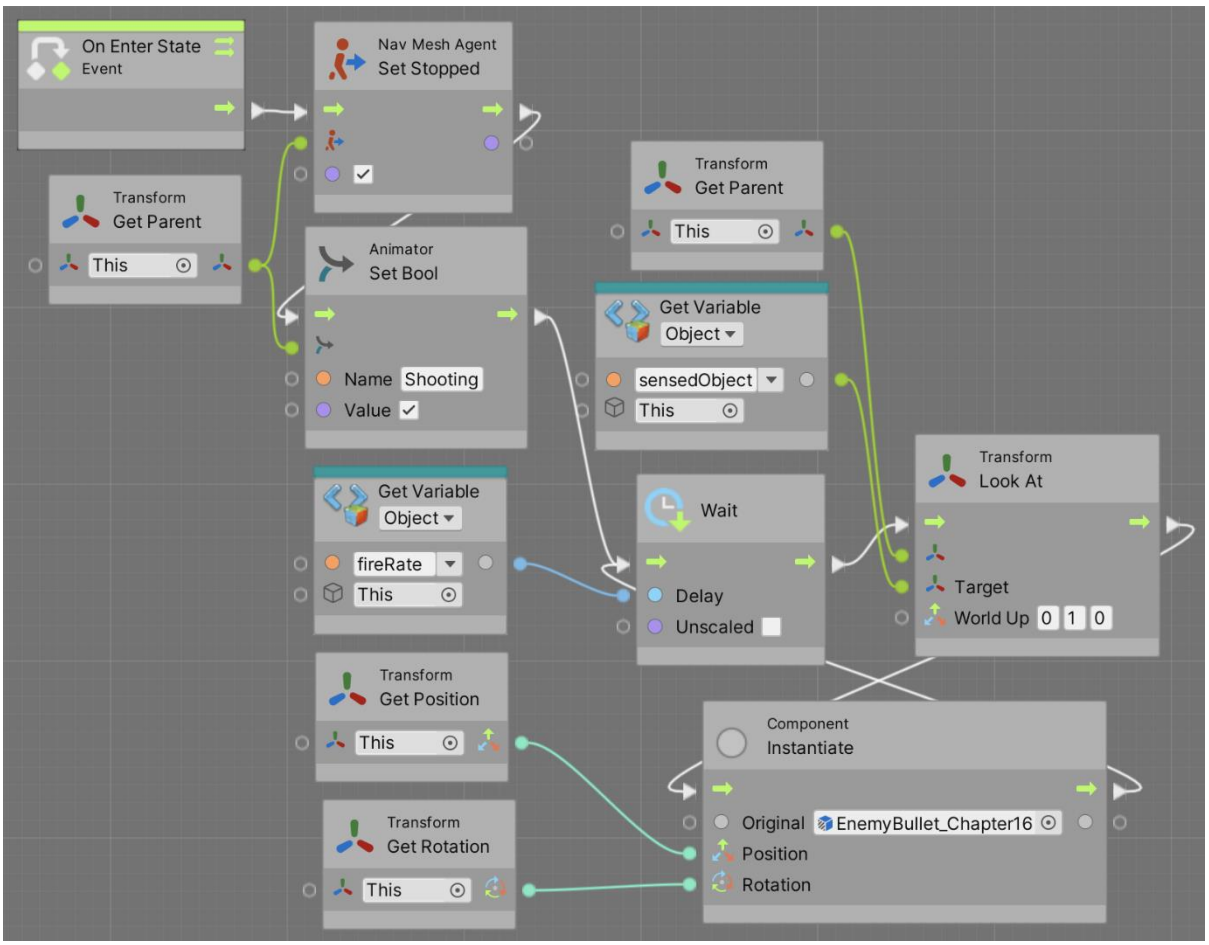

void ChasePlayer()
{
    animator.SetBool("Shooting", false);
    agent.isStopped = false;
```

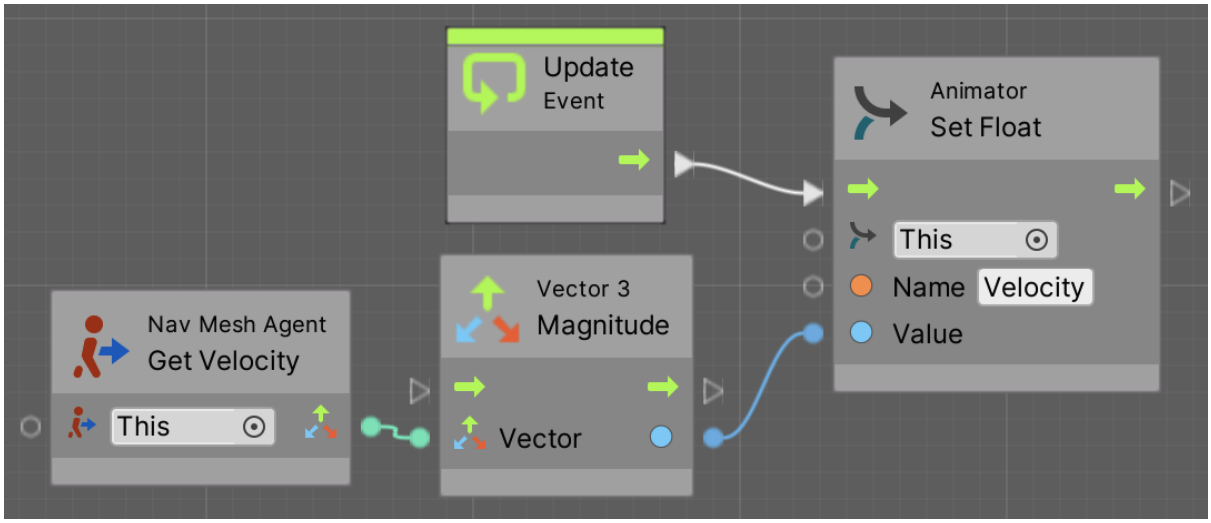



On Enter State
Event
Nav Mesh Agent
Set Stopped
Transform
Get Parent
This
Nav Mesh Agent
Set Destination
Target
Transform
Get Position
Get Variable
Object
sensedObject
This
Animator
Set Bool
Transform
Get Parent
This
Name
Shooting
Value

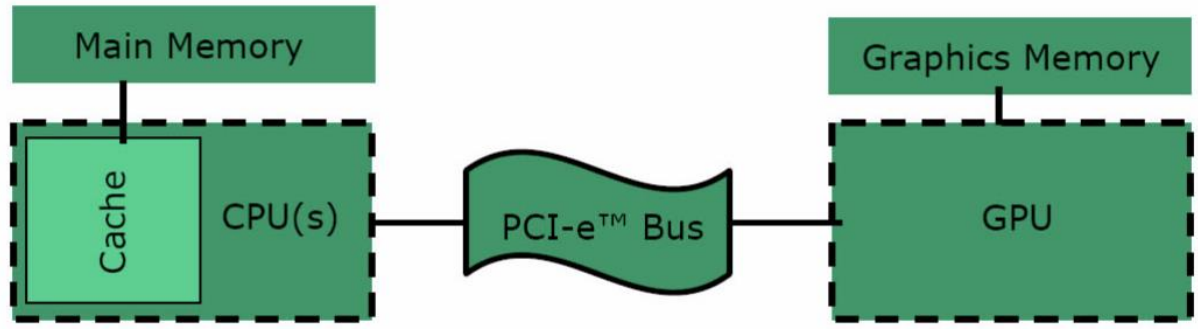

On Enter State
Event
Nav Mesh Agent
Set Stopped
Transform
Look At
This
Target
World Up 0 1 0
Animator
Set Bool
Name Shooting
Value
Transform
Get Parent
This
Get Variable
Object
baseTransform
This
Transform
Get Parent
This
Wait
Delay
Unscaled
Get Variable
Object
fireRate
This
Component
Instantiate
Original EnemyBullet_Chapter16
Position
Rotation
Transform
Get Position
This
Transform
Get Rotation
This

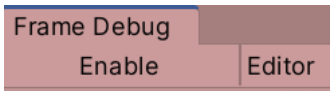

Script Graph
Game
Enemy
AttackBase
Zoom
1x
Graph Inspector
On Enter State
Coroutine
Outputs
Trigger : Flow
On Enter State
Event

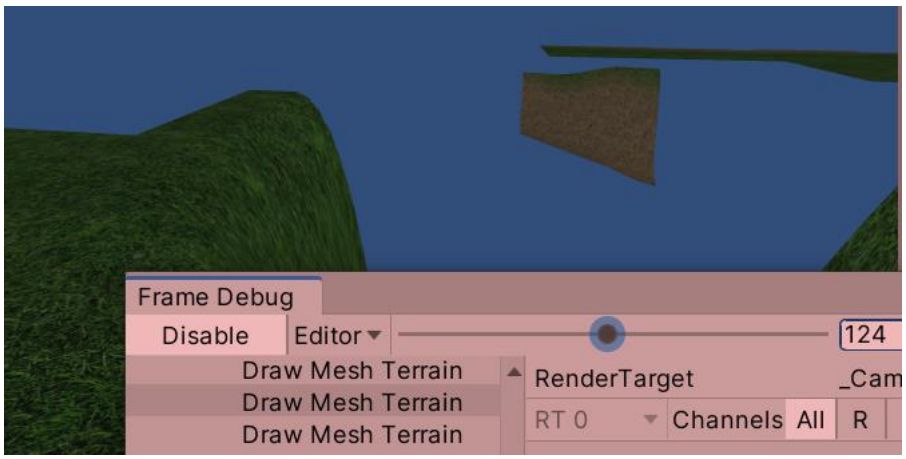

On Enter State
Event
Nav Mesh Agent
Set Stopped
Transform
Get Parent
This
Animator
Set Bool
Name Shooting
Value
Get Variable
Object
sensedObject
This
Get Variable
Object
fireRate
This
Wait
Delay
Unscaled
Transform
Look At
Target
World Up 0 1 0
Transform
Get Position
This
Transform
Get Rotation
This
Component
Instantiate
Original EnemyBullet_Chapter16
Position
Rotation

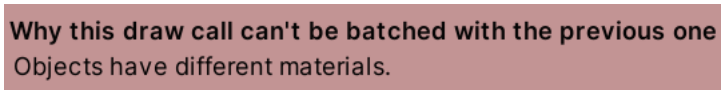

Update
Event
Animator
Set Float
This
Name
Velocity
Value
Vector 3
Magnitude
Vector
Nav Mesh Agent
Get Velocity
This

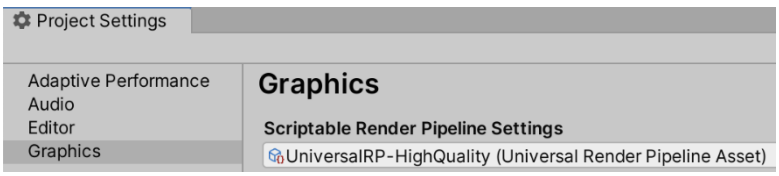
Chapter 20: Scene Performance Optimization

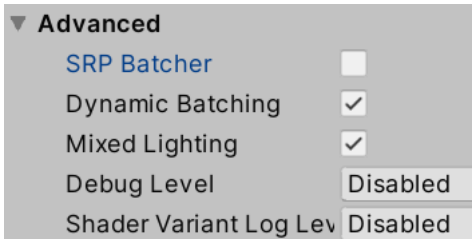


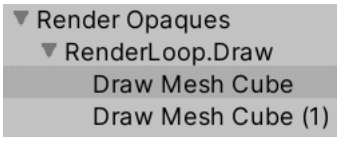


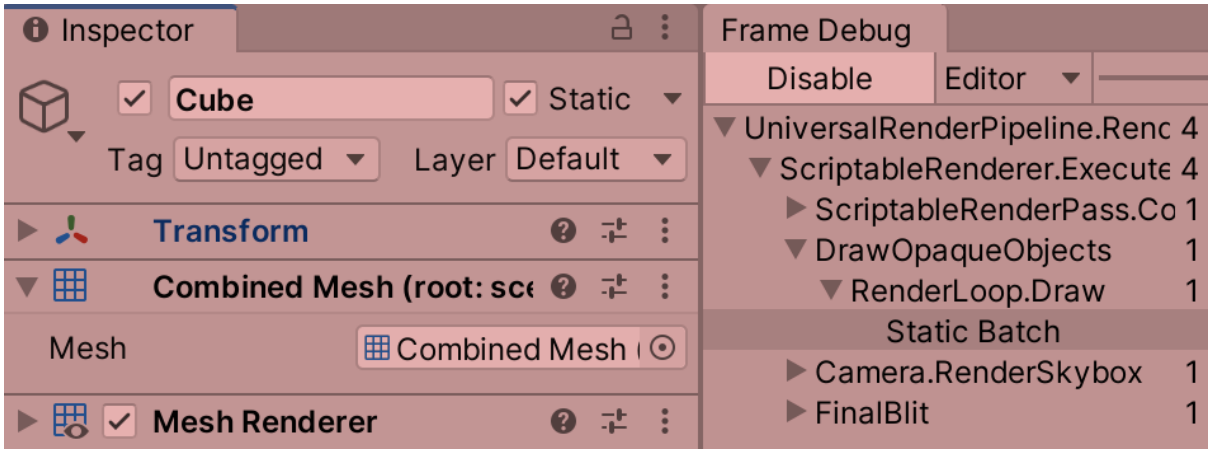


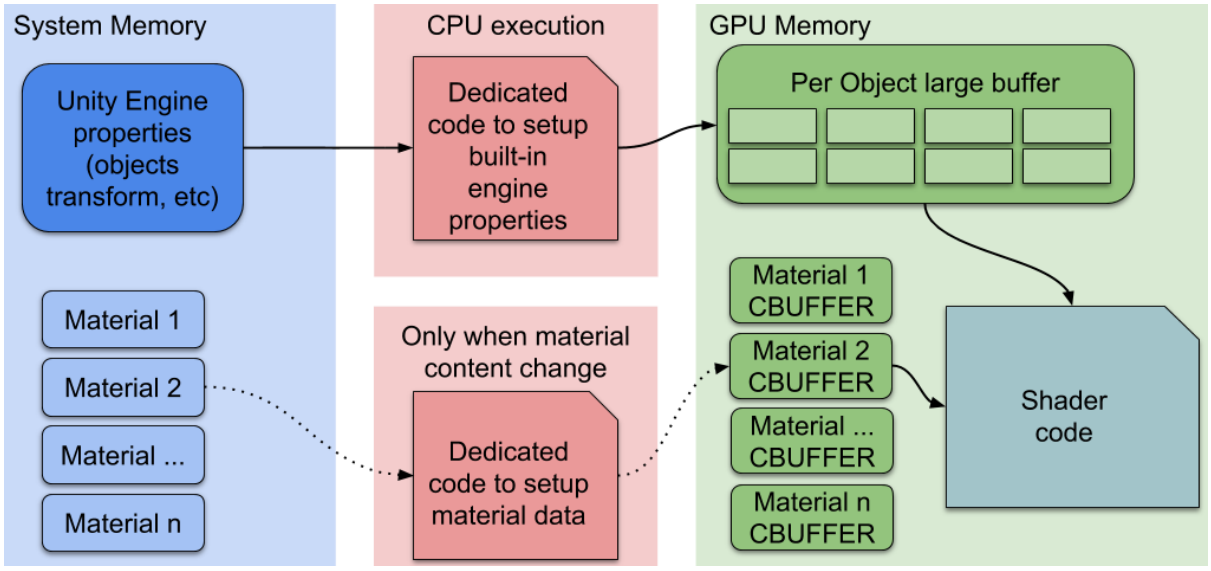


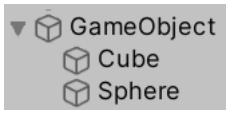


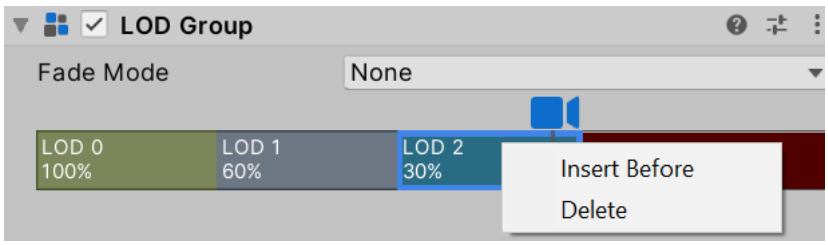

Advanced
SRP Batcher
Dynamic Batching
Mixed Lighting
Debug Level
Disabled
Shader Variant Log Lev
Disabled

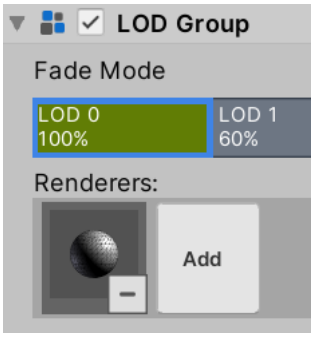

Render Opaques
RenderLoop.Draw
Draw Mesh Cube
Draw Mesh Cube (1)

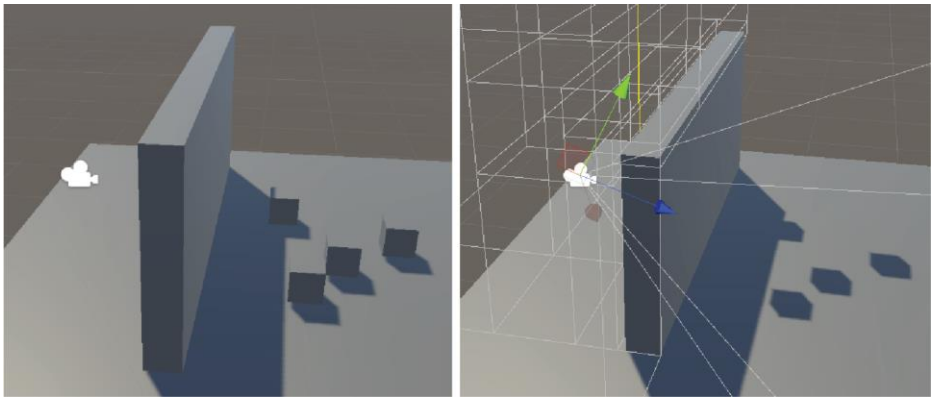

Inspector
Cube
Static
Tag
Untagged
Layer
Default
Transform
Combined Mesh (root: sce
Mesh
Combined Mesh
Mesh Renderer
Frame Debug
Disable
Editor
UniversalRenderPipeline.Renc 4
ScriptableRenderer.Execute 4
ScriptableRenderPass.Co 1
DrawOpaqueObjects 1
RenderLoop.Draw 1
Static Batch
Camera.RenderSkybox 1
FinalBlit 1

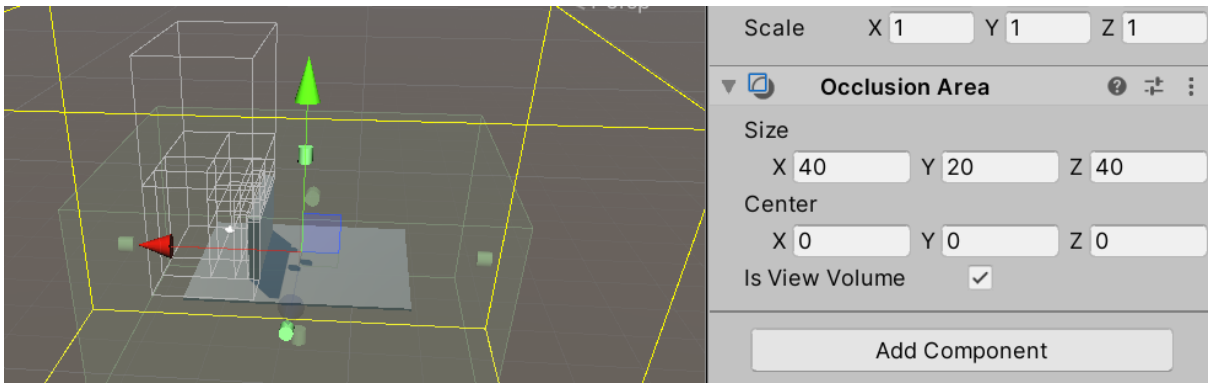

System Memory
Unity Engine properties (objects transform, etc)
Material 1
Material 2
Material ...
Material n
CPU execution
Dedicated code to setup built-in engine properties
Only when material content change
Dedicated code to setup material data
GPU Memory
Per Object large buffer
Material 1 CBUFFER
Material 2 CBUFFER
Material ... CBUFFER
Material n CBUFFER
Shader code

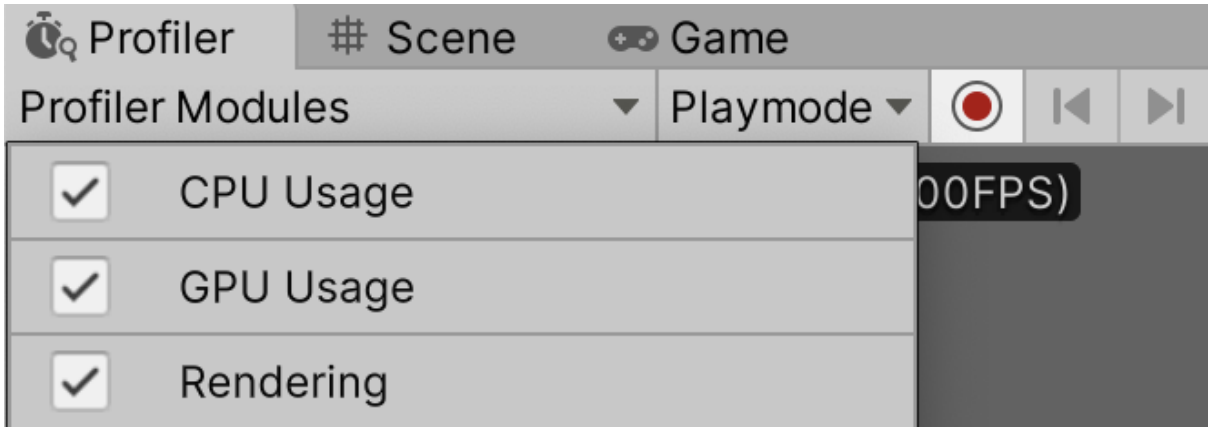

GameObject
Cube
Sphere


LOD Group
Fade Mode
None
LOD 0
100%
LOD 1
60%
LOD 2
30%
Insert Before
Delete

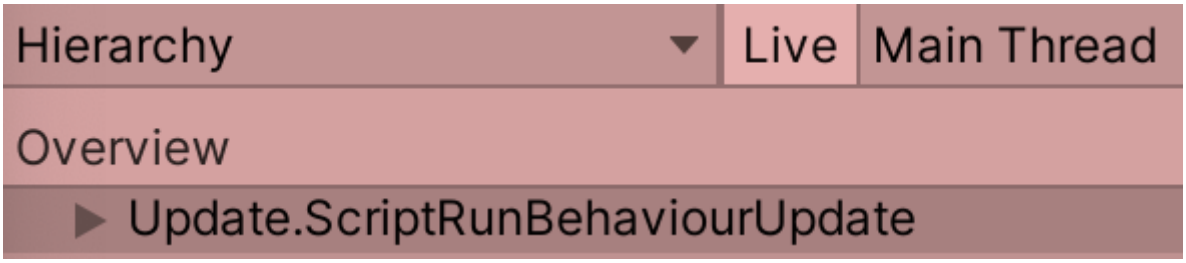

LOD Group
Fade Mode
LOD 0
100%
LOD 1
60%
Renderers:
Add

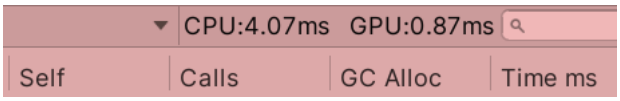


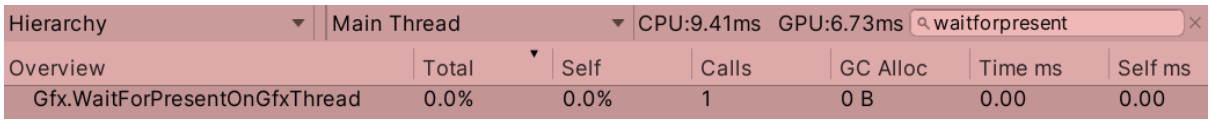

Scale
X 1
Y 1
Z 1
Occlusion Area
Size
X 40
Y 20
Z 40
Center
X 0
Y 0
Z 0
Is View Volume
Add Component

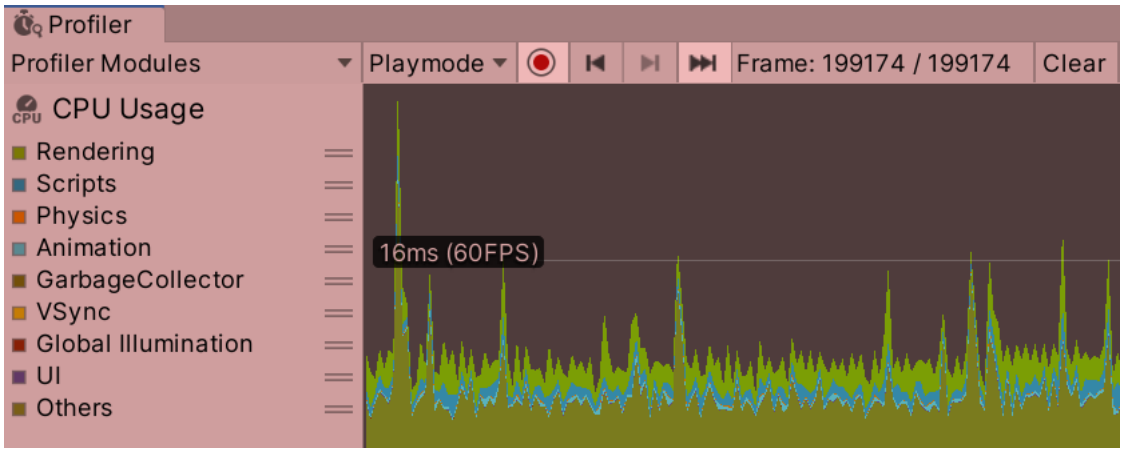

Profiler
Scene
Game
Profiler Modules
Playmode
CPU Usage
GPU Usage
Rendering
00FPS)

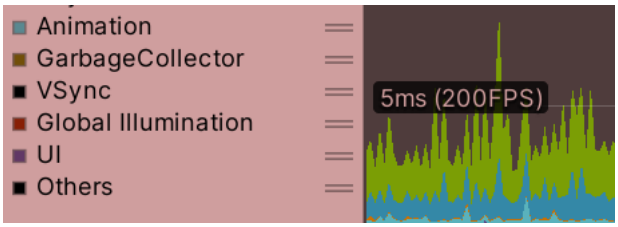

Profiler
Scene
Game
Profiler Modules
Playmode

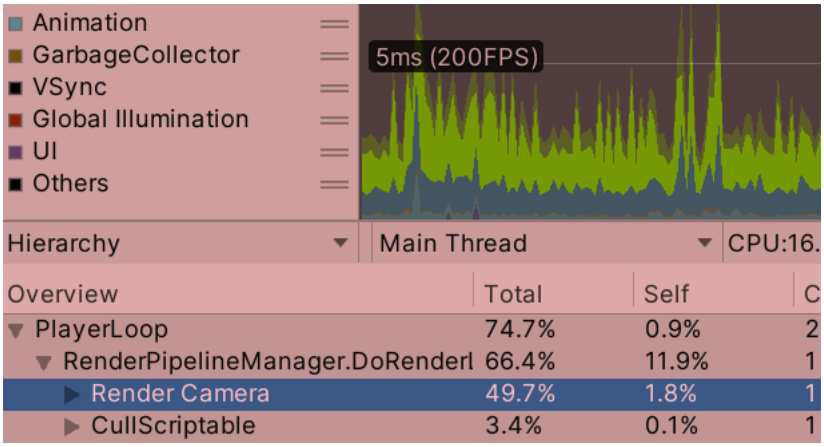

Hierarchy
Live
Main Thread
Overview
Update.ScriptRunBehaviourUpdate


CPU:4.07ms GPU:0.87ms
Self
Calls
GC Alloc
Time ms

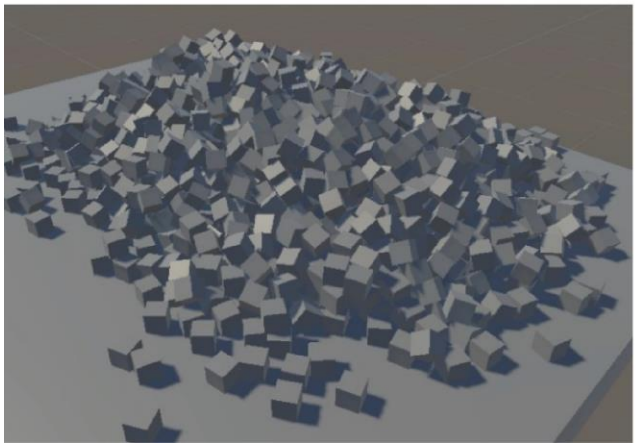

Hierarchy
Main Thread
CPU:9.41ms GPU:6.73ms
waitforpresent
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
Gfx.WaitForPresentOnGfxThread
0.0%
0.0%
1
0 B
0.00
0.00

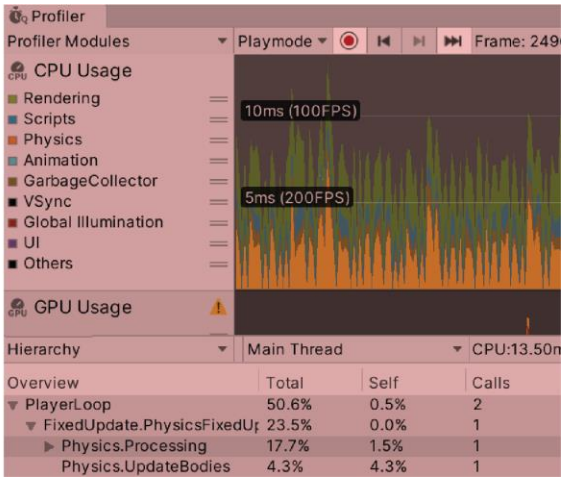

Profiler
Profiler Modules
Playmode
Frame: 199174 / 199174
Clear
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
16ms (60FPS)

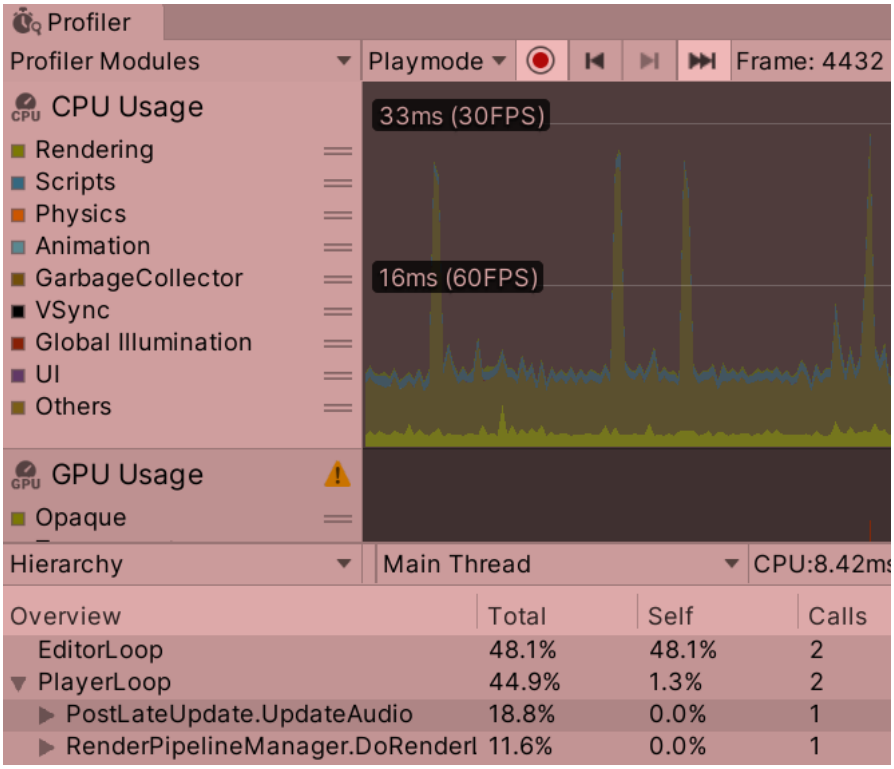

Animation
GarbageCollector
VSync
Global Illumination
UI
Others
5ms (200FPS)

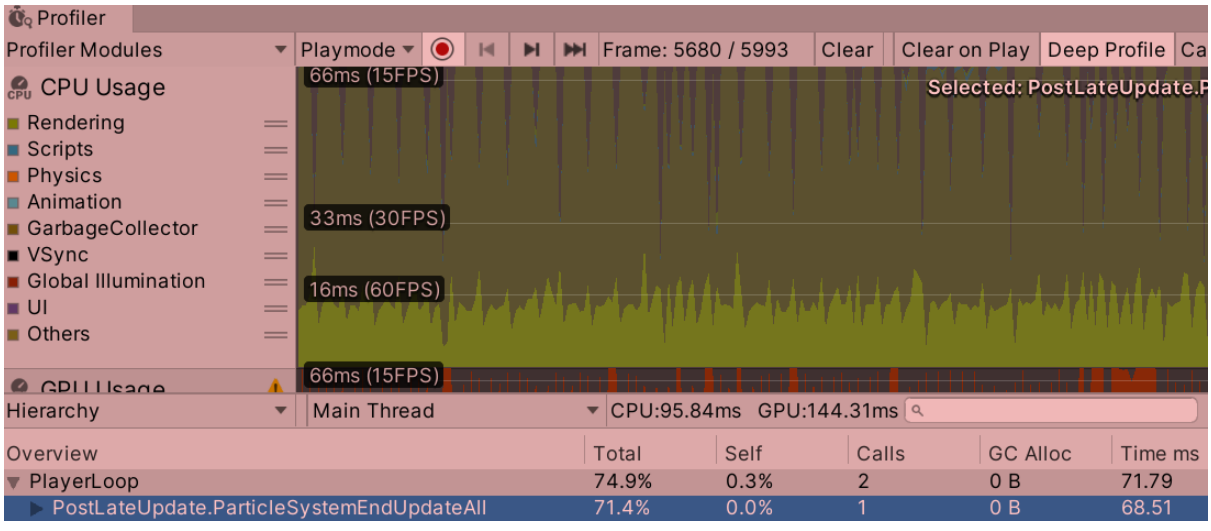

Animation
GarbageCollector
VSync
Global Illumination
UI
Others
5ms (200FPS)
Hierarchy
Main Thread
CPU:16.
Overview
Total
Self
C
PlayerLoop
74.7%
0.9%
2
RenderPipelineManager.DoRenderI
66.4%
11.9%
1
Render Camera
49.7%
1.8%
1
CullScriptable
3.4%
0.1%
1


Clear on Play
Deep Profile
Call Sta
Selected: Re




Profiler
Profiler Modules
Playmode
Frame: 249
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
10ms (100FPS)
5ms (200FPS)
GPU Usage
Hierarchy
Main Thread
CPU:13.50m
Overview
Total
Self
Calls
PlayerLoop
50.6%
0.5%
2
FixedUpdate.PhysicsFixedU
23.5%
0.0%
1
Physics.Processing
17.7%
1.5%
1
Physics.UpdateBodies
4.3%
4.3%
1


Profiler
Profiler Modules
Playmode
Frame: 4432
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
33ms (30FPS)
16ms (60FPS)
GPU Usage
Opaque
Hierarchy
Main Thread
CPU:8.42ms
Overview
Total
Self
Calls
EditorLoop
48.1%
48.1%
2
PlayerLoop
44.9%
1.3%
2
PostLateUpdate.UpdateAudio
18.8%
0.0%
1
RenderPipelineManager.DoRenderI
11.6%
0.0%
1


Profiler
Profiler Modules
Playmode
Frame: 5680 / 5993
Clear
Clear on Play
Deep Profile
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
66ms (15FPS)
Selected: PostLateUpdate.P
33ms (30FPS)
16ms (60FPS)
66ms (15FPS)
Hierarchy
Main Thread
CPU:95.84ms
GPU:144.31ms
Overview
Total
Self
Calls
GC Alloc
Time ms
PlayerLoop
74.9%
0.3%
2
0 B
71.79
PostLateUpdate.ParticleSystemEndUpdateAll
71.4%
0.0%
1
0 B
68.51

```
#if UNITY_EDITOR || DEVELOPMENT_BUILD
print("Informative Message");
#endif
```

Overview	Total	Self	Calls	GC Alloc
▼ Update.ScriptRunBehaviourUpdate	6.4%	0.0%	1	2.3 KB
▼ BehaviourUpdate	6.4%	1.2%	1	2.3 KB
▼ Sight.Update()	2.0%	0.5%	69	2.2 KB
Physics.OverlapSphere	1.4%	1.4%	69	0 B
GC.Alloc	0.0%	0.0%	69	2.2 KB
Physics.Raycast	0.0%	0.0%	1	0 B

```
static Collider[] colliders = new Collider[100];

void Update()
{
    int detectedAmount= Physics.OverlapSphereNonAlloc(transform.position, distance, colliders, objectsLayers);

    detectedObject = null;
    for (int i = 0; i < detectedAmount; i++)
```

```
string name = "John";
string score = "100";
string template = "{0} has won {1} points";

print(string.Format(template, name, score)); //John has won 100 points
print($"{name} has won {score} points."); //John has won 100 points

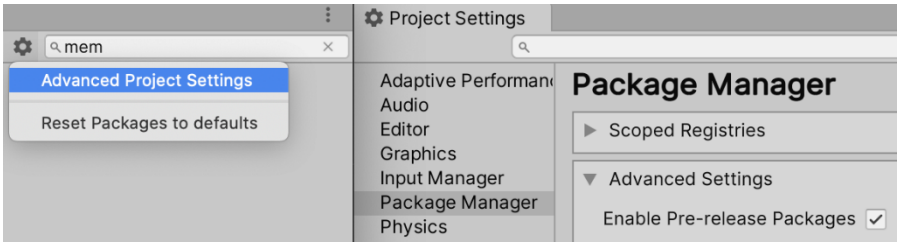

StringBuilder builder = new StringBuilder();
builder.Append("My ");
builder.Append("name ");
builder.Append("is ");
builder.Append("Neo.");
print(builder.ToString()); //My name is Neo.
```

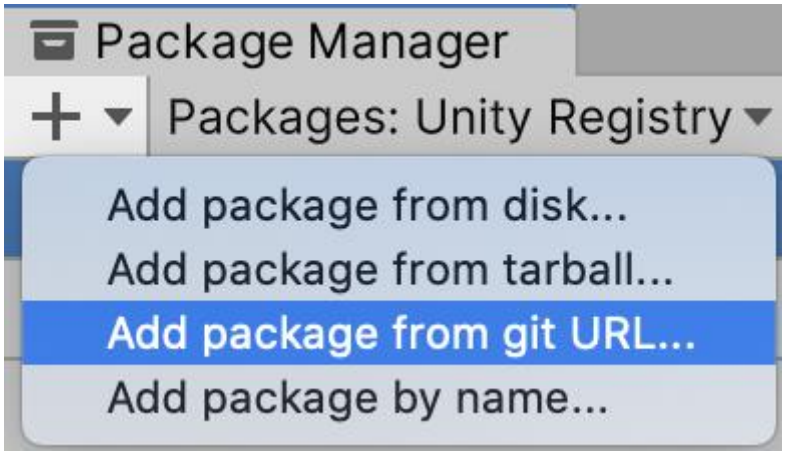
```
public class Pool : MonoBehaviour
{
    List<GameObject> storedObjects = new List<GameObject>();

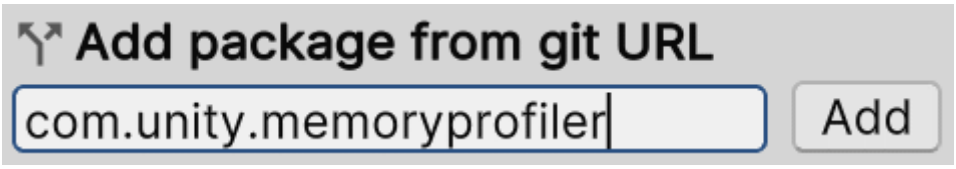
    [SerializeField] GameObject prefab;

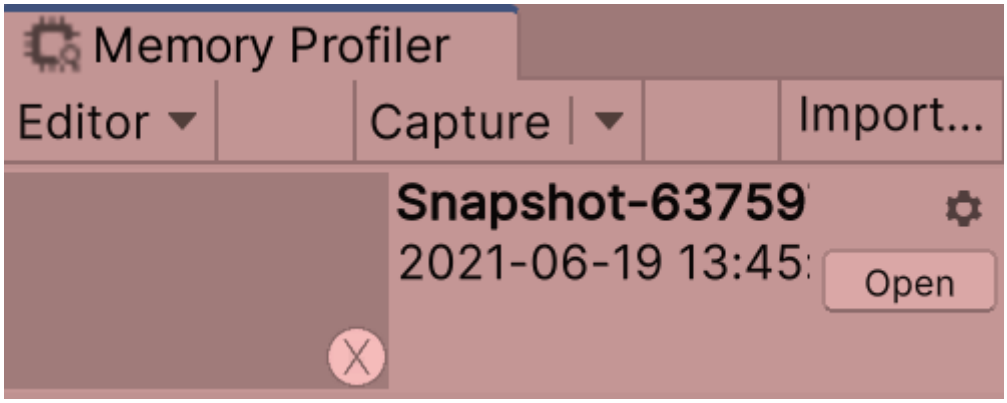
    public GameObject Get()
    {
        if (storedObjects.Count > 0)
        {
            var obj :GameObject  = storedObjects[0];
            storedObjects.RemoveAt(0);
            obj.SetActive(true);
            return obj;
        }
        else
        {
            return Instantiate(prefab);
        }
    }

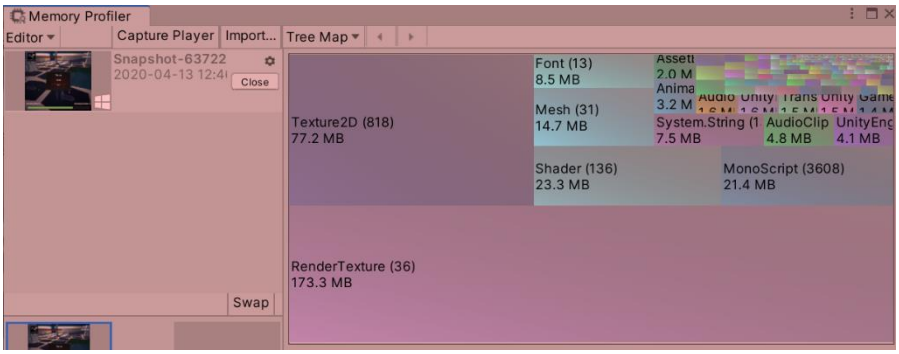
    public void Return(GameObject obj)
    {
        obj.SetActive(false);
        storedObjects.Add(obj);
    }
}
```

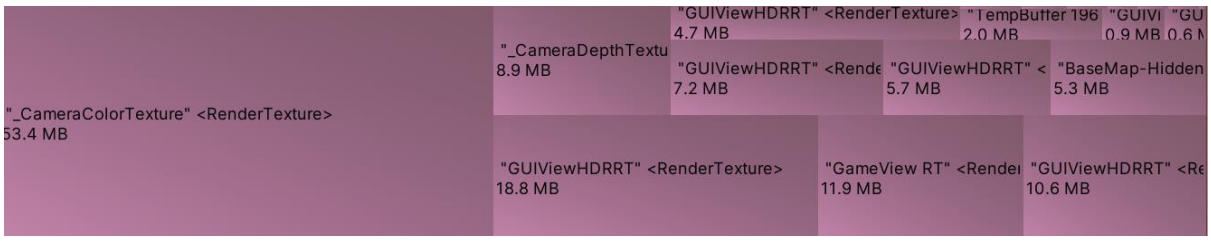



Package Manager
Packages: Unity Registry
Add package from disk...
Add package from tarball...
Add package from git URL...
Add package by name...


Add package from git URL
com.unity.memoryprofiler
Add


Memory Profiler
Editor
Capture
Import...
Snapshot-63759
2021-06-19 13:45:
Open


Memory Profiler
Editor
Capture Player
Import...
Tree Map
Snapshot-63722
2020-04-13 12:4
Close
Swap
Texture2D (818)
77.2 MB
Font (13)
8.5 MB
Mesh (31)
14.7 MB
Shader (136)
23.3 MB
MonoScript (3608)
21.4 MB
AudioClip
4.8 MB
4.1 MB
RenderTexture (36)
173.3 MB

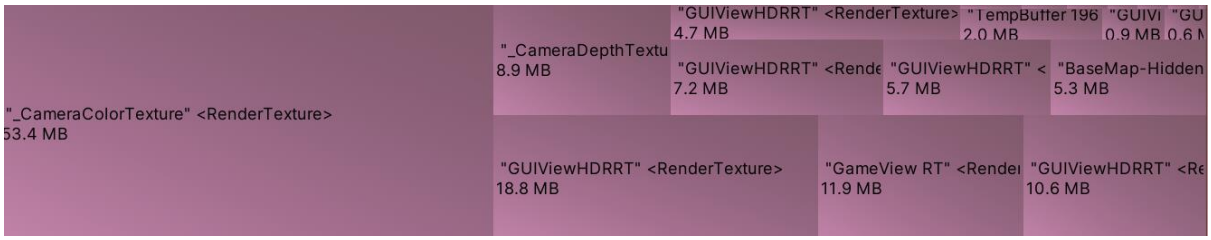

"_CameraColorTexture" <RenderTexture>
53.4 MB
"_CameraDepthTextu
8.9 MB
"GUIViewHDRRT" <RenderTexture>
4.7 MB
"GUIViewHDRRT" <Rende
7.2 MB
"GUIViewHDRRT" <
5.7 MB
"BaseMap-Hidden
5.3 MB
"GUIViewHDRRT" <RenderTexture>
18.8 MB
"GameView RT" <Render
11.9 MB
"GUIViewHDRRT" <Re
10.6 MB

Detailed | Take Sample Playmode | Gather object references | Memory usage in the Editor is not the same as it would be in a Player.

Name	Memory	Ref count
▶ Other (431)	0.71 GB	
▼ Assets (4296)	116.6 MB	
▼ Texture2D (90)	61.4 MB	
rocks	10.7 MB	1
base-color-normal	5.3 MB	1
mud	2.7 MB	1

Referenced By:

- ▼ base color(Material)
  - ▼ floor_1_LOD0(MeshRenderer)
    - ▶ floor_1_LOD0(GameObject)
      - Scene Object()
  - ▶ floor_1_LOD0(MeshRenderer)
  - ▶ floor_1_LOD0(MeshRenderer)



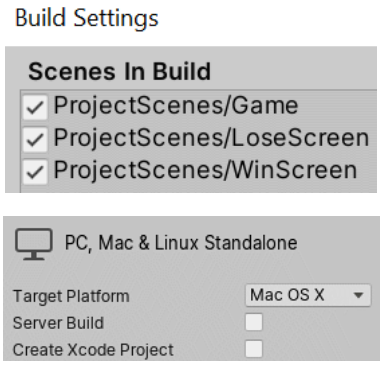
Detailed | Take Sample Playmode | Gather object references | Memory usage in the Editor is not the same as it would be in a Player.

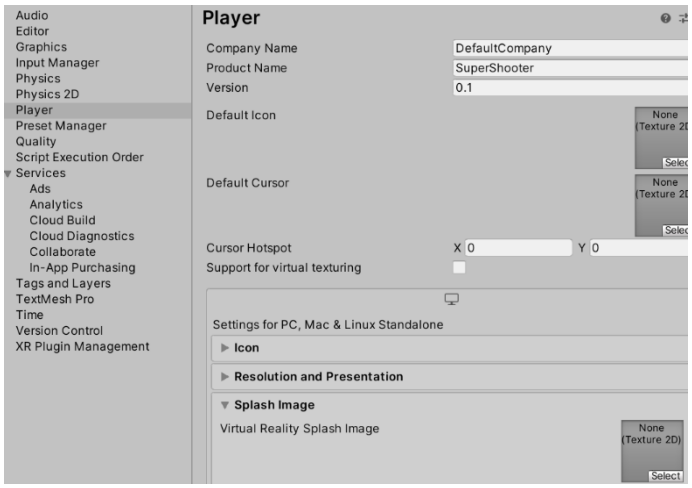
Name	Memory	Ref count
▶ Other (431)	0.71 GB	
▼ Assets (4296)	116.6 MB	
▼ Texture2D (90)	61.4 MB	
rocks	10.7 MB	1
base-color-normal	5.3 MB	1
mud	2.7 MB	1

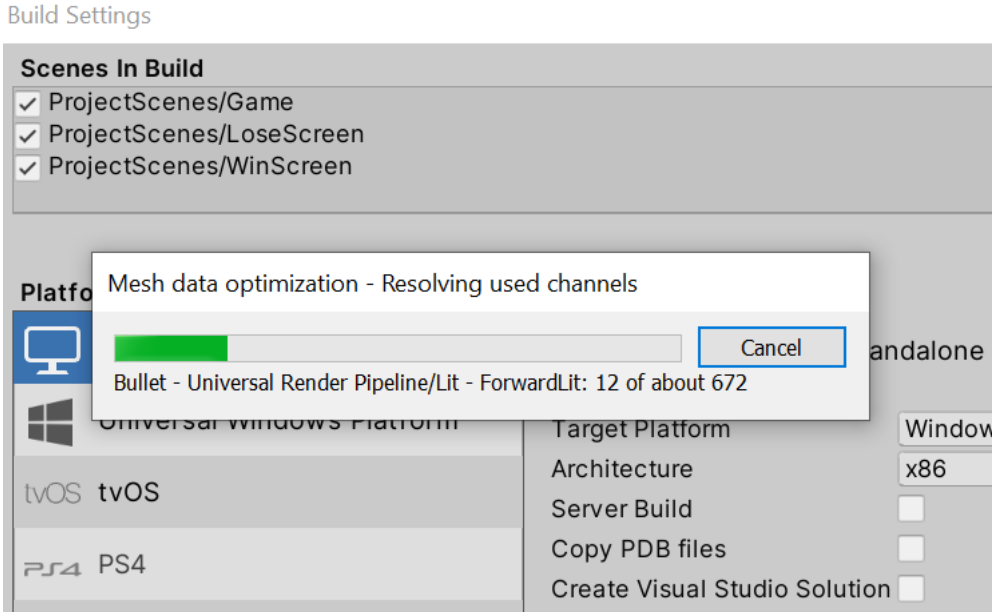
Referenced By:

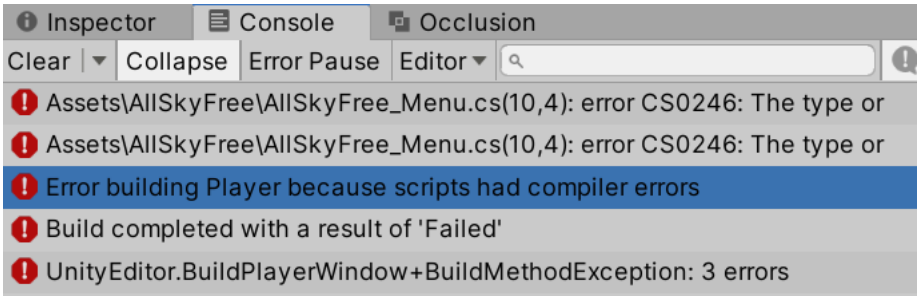
- ▼ base color(Material)
  - ▼ floor_1_LOD0(MeshRenderer)
    - ▶ floor_1_LOD0(GameObject)
      - Scene Object()
  - ▶ floor_1_LOD0(MeshRenderer)
  - ▶ floor_1_LOD0(MeshRenderer)

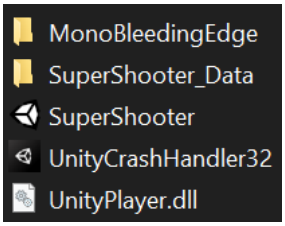
Chapter 21: Building the Project

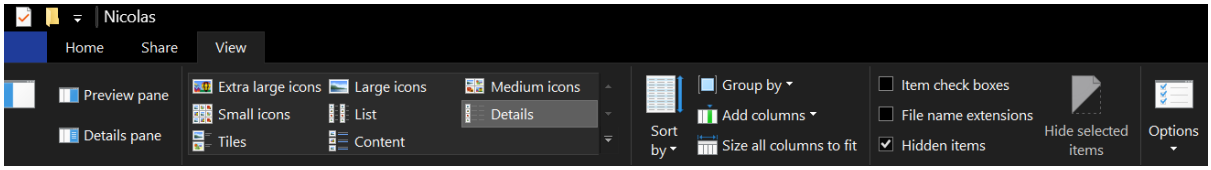


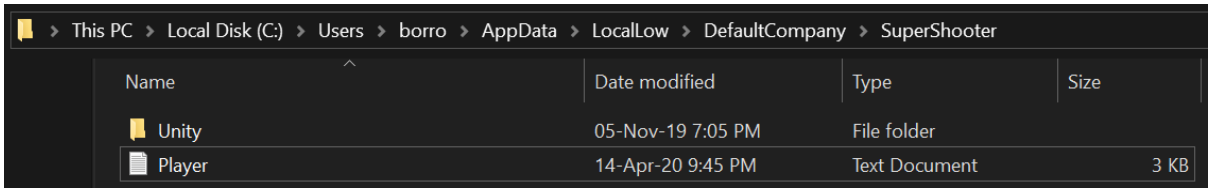


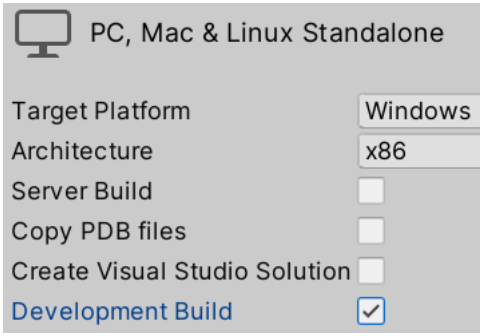




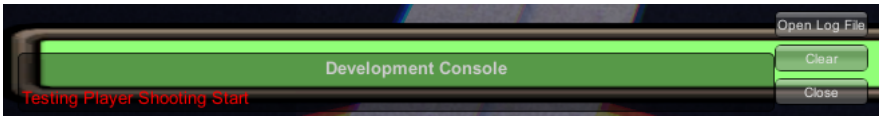


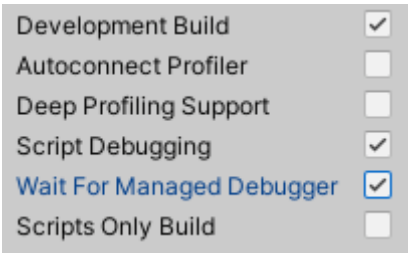


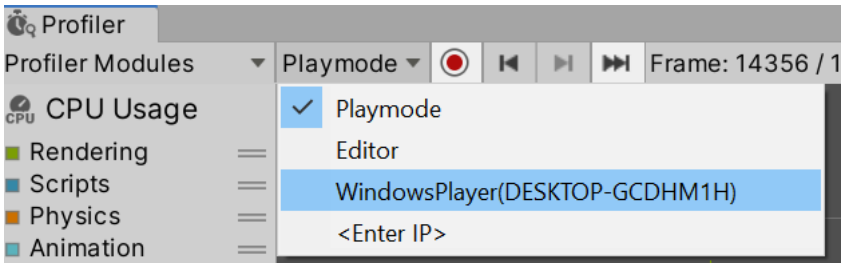


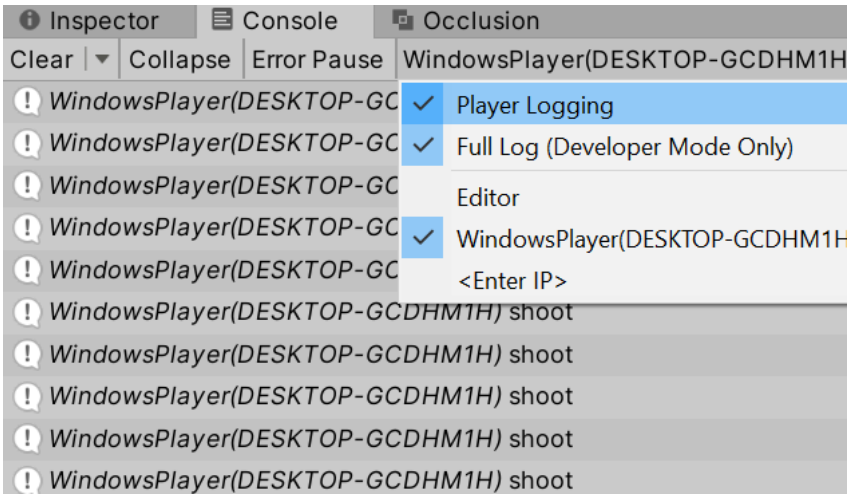


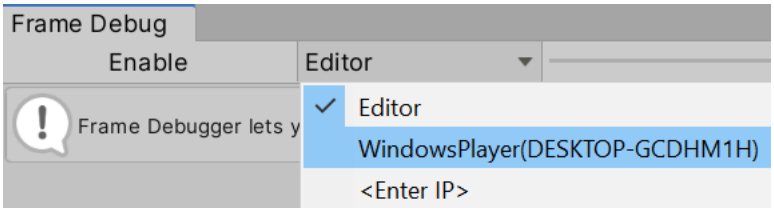

```
public class PlayerShooting : MonoBehaviour
{
    void Start()
    {
        Debug.LogError("Testing Player Shooting Start");
    }
```

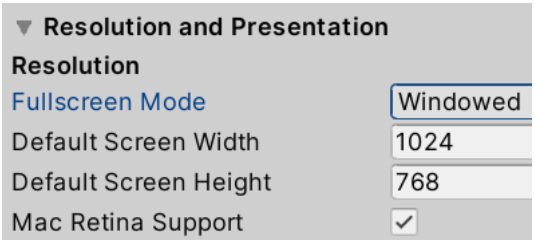


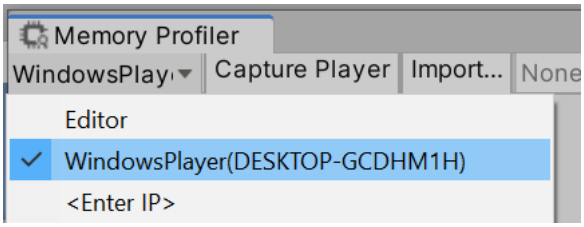

Development Build
Autoconnect Profiler
Deep Profiling Support
Script Debugging
Wait For Managed Debugger
Scripts Only Build


Profiler
Profiler Modules
Playmode
Frame: 14356 / 1
CPU Usage
Rendering
Scripts
Physics
Animation
Playmode
Editor
WindowsPlayer(DESKTOP-GCDHM1H)
<Enter IP>

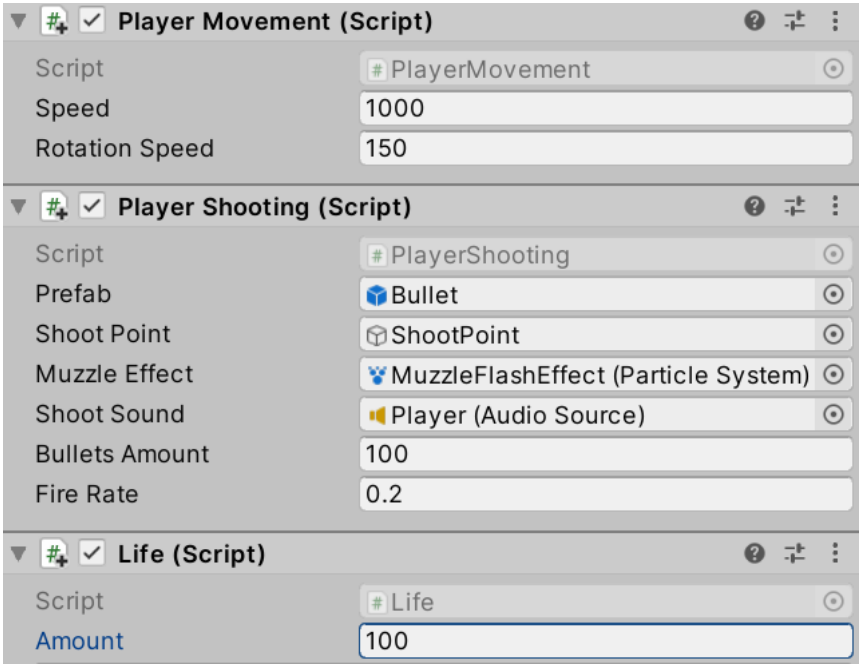

Inspector
Console
Occlusion
Clear
Collapse
Error Pause
WindowsPlayer(DESKTOP-GCDHM1H
Player Logging
Full Log (Developer Mode Only)
Editor
WindowsPlayer(DESKTOP-GCDHM1H
<Enter IP>
WindowsPlayer(DESKTOP-GCDHM1H) shoot
WindowsPlayer(DESKTOP-GCDHM1H) shoot
WindowsPlayer(DESKTOP-GCDHM1H) shoot
WindowsPlayer(DESKTOP-GCDHM1H) shoot
WindowsPlayer(DESKTOP-GCDHM1H) shoot


Frame Debug
Enable
Editor
Frame Debugger lets y
Editor
WindowsPlayer(DESKTOP-GCDHM1H)
<Enter IP>

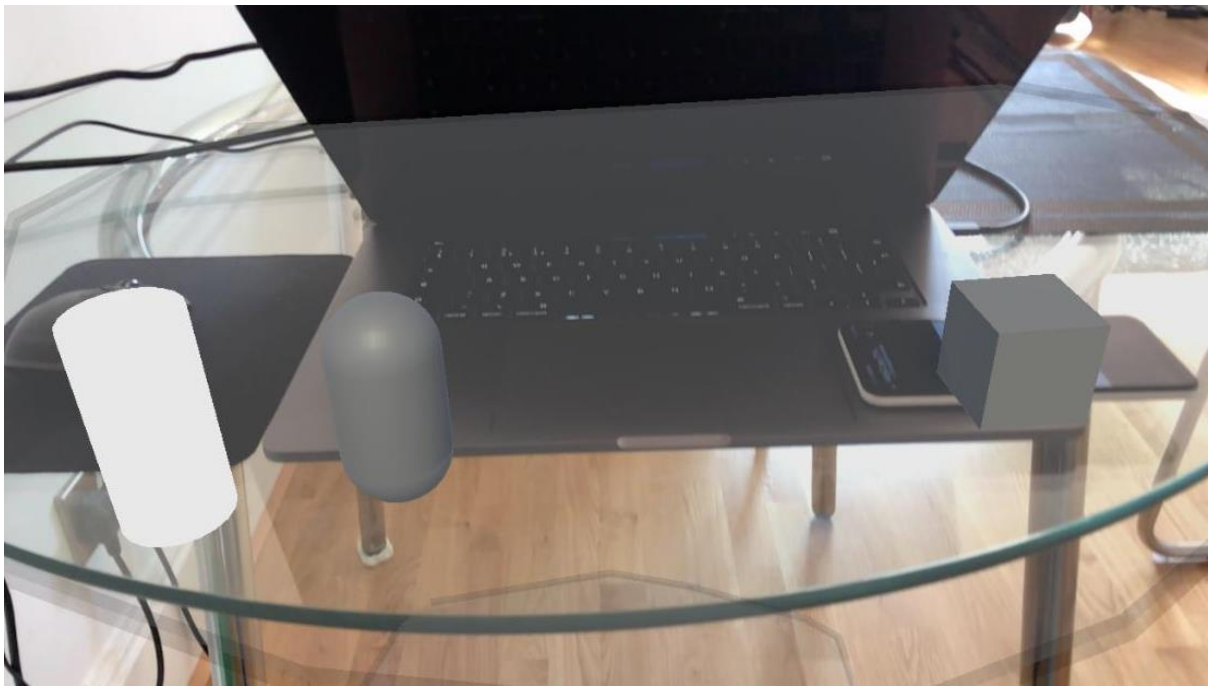

Resolution and Presentation
Resolution
Fullscreen Mode
Windowed
Default Screen Width
1024
Default Screen Height
768
Mac Retina Support

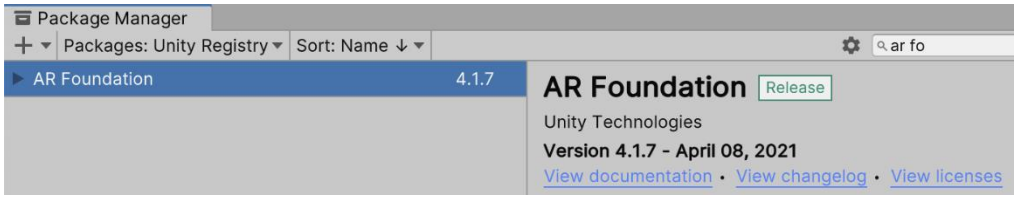

Memory Profiler
Capture Player
Import...
Editor
WindowsPlayer(DESKTOP-GCDHM1H)
<Enter IP>

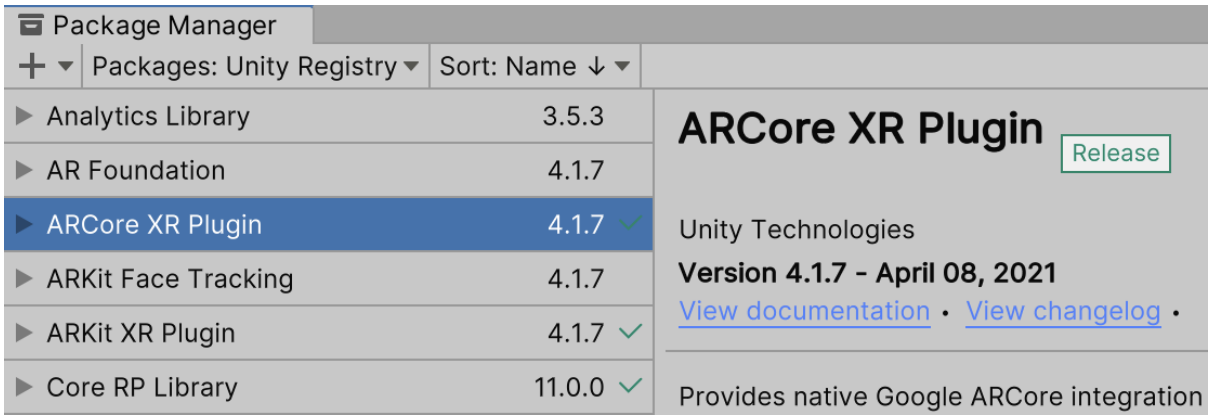
Chapter 22: Finishing Touches

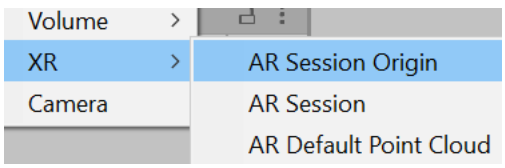


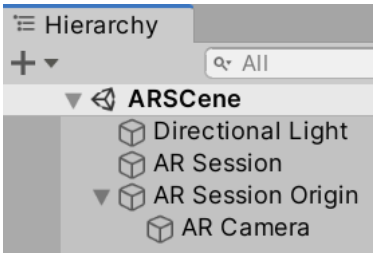
Chapter 23: Augmented Reality in Unity

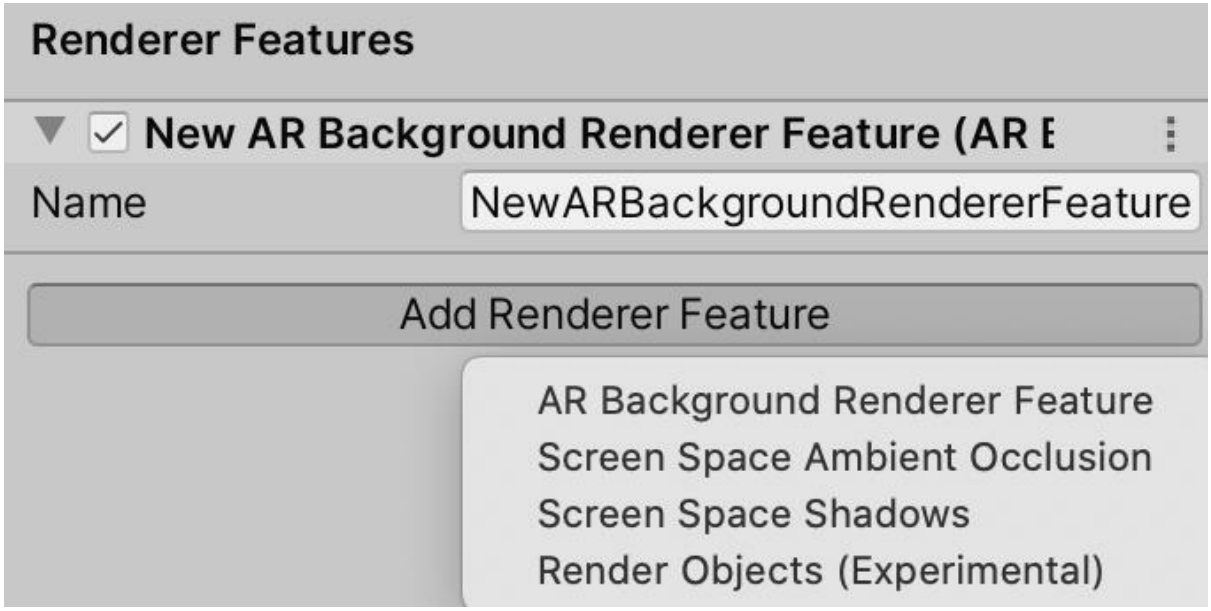


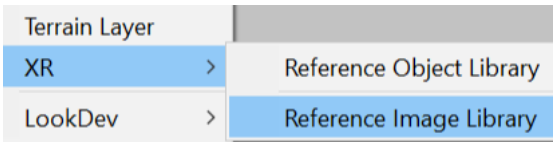


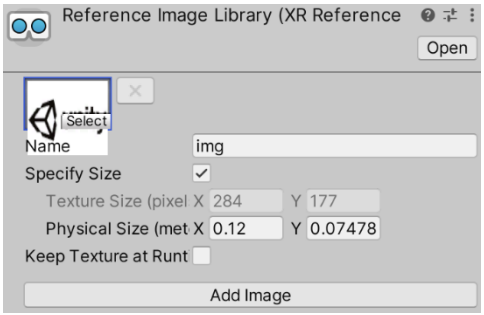


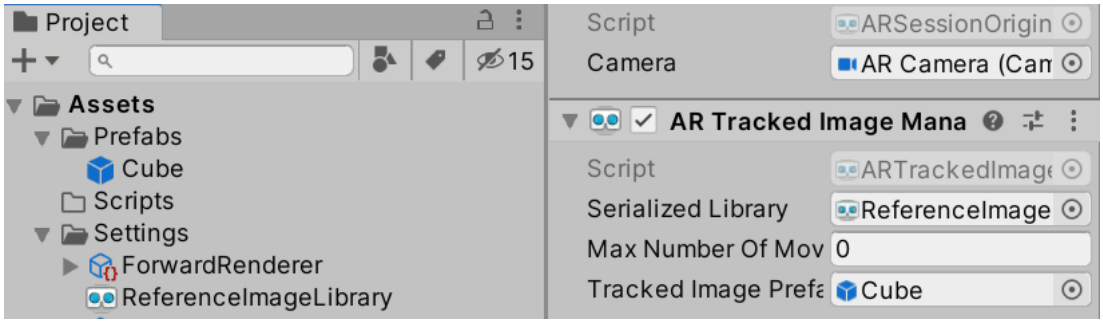


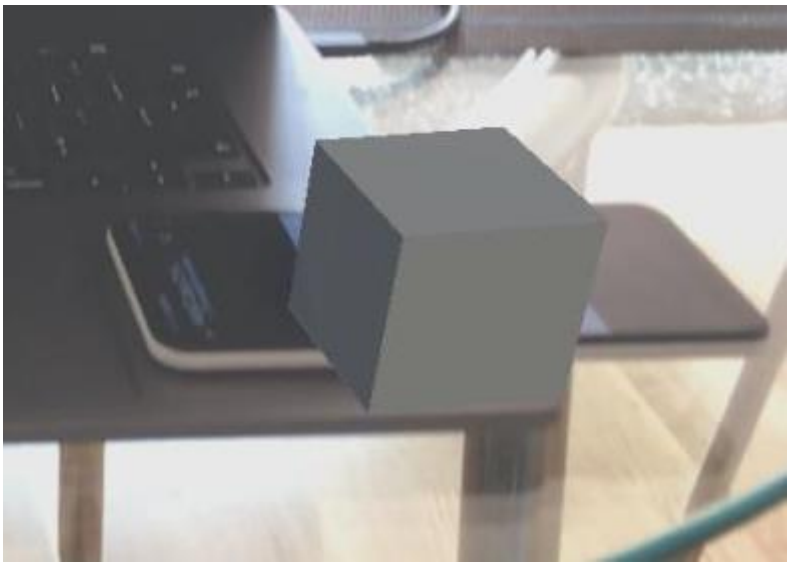

Hierarchy
All
ARSCene
Directional Light
AR Session
AR Session Origin
AR Camera

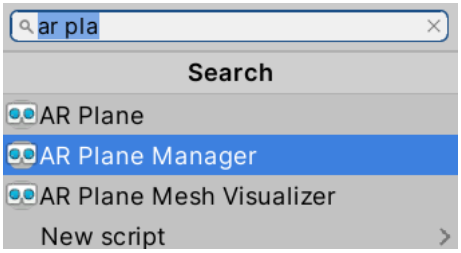

Renderer Features
New AR Background Renderer Feature (AR E
Name
NewARBackgroundRendererFeature
Add Renderer Feature
AR Background Renderer Feature
Screen Space Ambient Occlusion
Screen Space Shadows
Render Objects (Experimental)

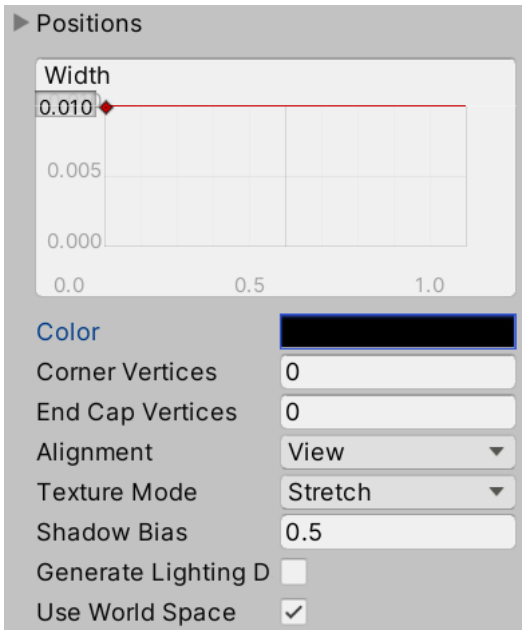

Terrain Layer
XR
LookDev
Reference Object Library
Reference Image Library

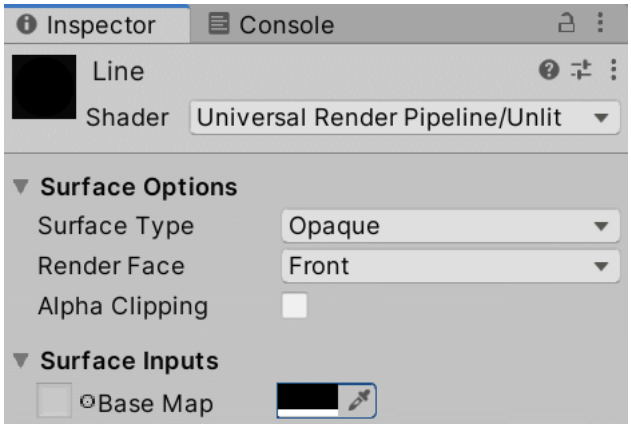

Reference Image Library (XR Reference
Open
Select
Name
img
Specify Size
Texture Size (pixel X
284
Y
177
Physical Size (met X
0.12
Y
0.07478
Keep Texture at Runt
Add Image

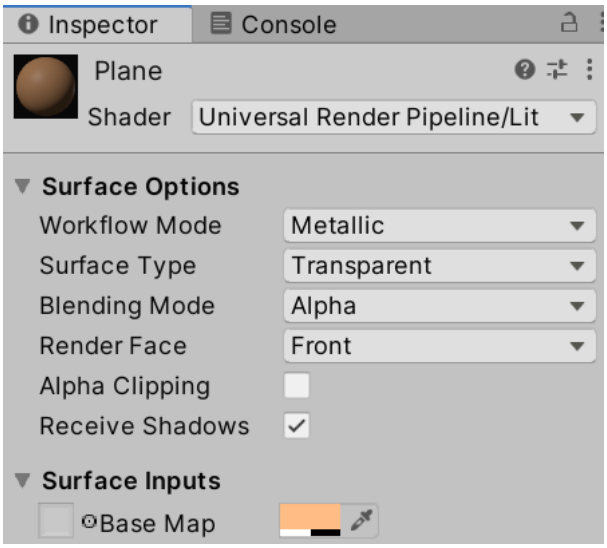

Project
15
Assets
Prefabs
Cube
Scripts
Settings
ForwardRenderer
ReferenceImageLibrary
Script
ARSessionOrigin
Camera
AR Camera (Can
AR Tracked Image Mana
Script
ARTrackedImage
Serialized Library
ReferenceImage
Max Number Of Mov
0
Tracked Image Prefa
Cube

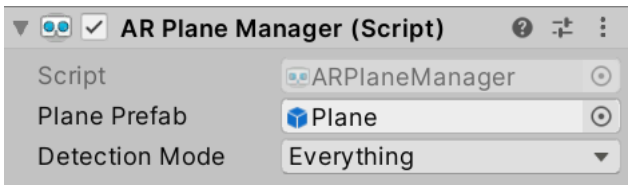



ar pla
Search
AR Plane
AR Plane Manager
AR Plane Mesh Visualizer
New script


Positions
Width
0.010
0.005
0.000
0.0
0.5
1.0
Color
Corner Vertices
0
End Cap Vertices
0
Alignment
View
Texture Mode
Stretch
Shadow Bias
0.5
Generate Lighting D
Use World Space








```
List<ARRaycastHit> hits = new List<ARRaycastHit>();
```

```
if (Input.GetKeyDown(KeyCode.Mouse0) && raycastManager.Raycast(Input.mousePosition, hits))
{

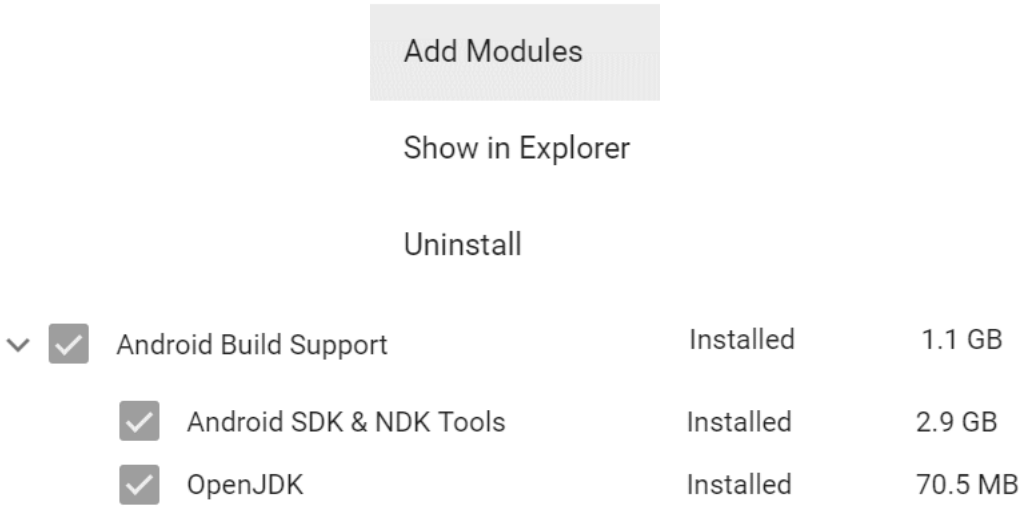
}
```

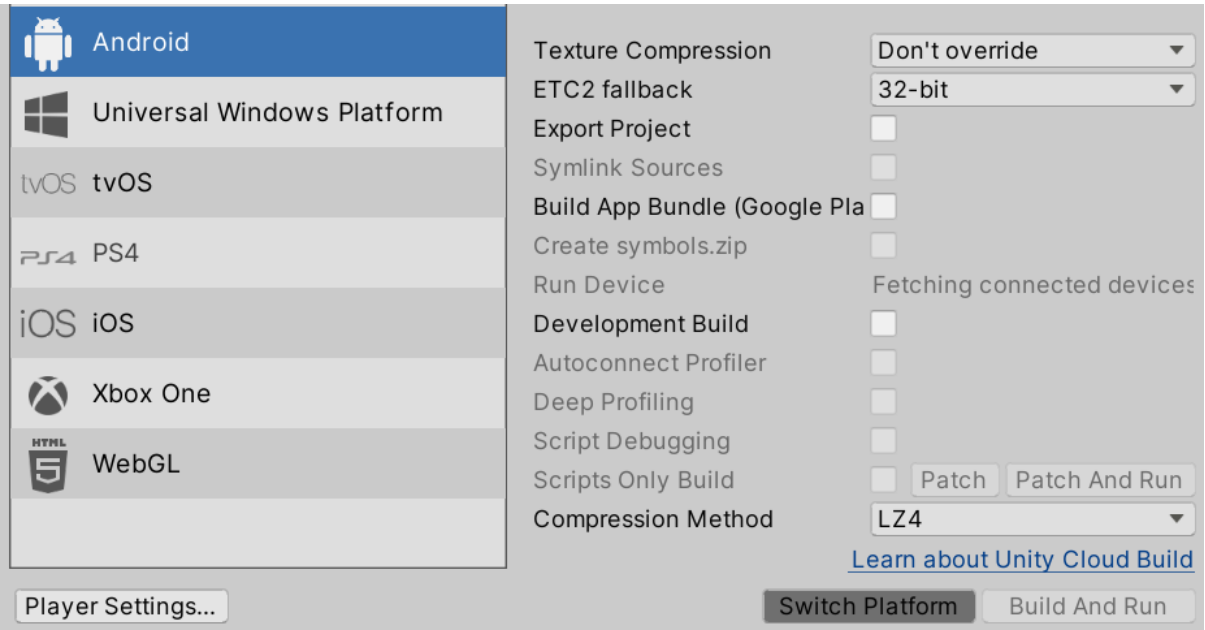
```
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.XR.ARFoundation;

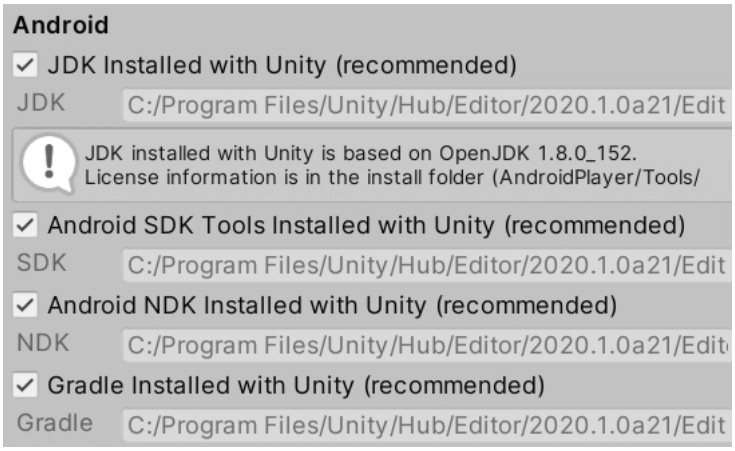
public class InstanceOnPlane : MonoBehaviour
{
    List<ARRaycastHit> hits = new List<ARRaycastHit>();
    ARRaycastManager raycastManager;
    public GameObject prefab;

    void Awake()
    {
        raycastManager = GetComponent<ARRaycastManager>();
    }

    void Update()
    {
        if (Input.GetKeyDown(KeyCode.Mouse0) && raycastManager.Raycast(Input.mousePosition, hits))
        {
            Instantiate(prefab, hits[0].pose.position, hits[0].pose.rotation);
        }
    }
}
```




Android
Universal Windows Platform
tvOS tvOS
PS4
iOS iOS
Xbox One
WebGL
Texture Compression
Don't override
ETC2 fallback
32-bit
Export Project
Symlink Sources
Build App Bundle (Google Pla
Create symbols.zip
Run Device
Fetching connected devices
Development Build
Autoconnect Profiler
Deep Profiling
Script Debugging
Scripts Only Build
Patch
Patch And Run
Compression Method
LZ4
Learn about Unity Cloud Build
Player Settings...
Switch Platform
Build And Run


Android
JDK Installed with Unity (recommended)
JDK
C:/Program Files/Unity/Hub/Editor/2020.1.0a21/Edit
JDK installed with Unity is based on OpenJDK 1.8.0_152.
License information is in the install folder (AndroidPlayer/Tools/
Android SDK Tools Installed with Unity (recommended)
SDK
C:/Program Files/Unity/Hub/Editor/2020.1.0a21/Edit
Android NDK Installed with Unity (recommended)
NDK
C:/Program Files/Unity/Hub/Editor/2020.1.0a21/Edit
Gradle Installed with Unity (recommended)
Gradle
C:/Program Files/Unity/Hub/Editor/2020.1.0a21/Edit

Auto Graphics API

Graphics APIs

OpenGLES3

Require ES3.1

Require ES3.1+AEP

Require ES3.2

Color Gamut*

sRGB

DisplayP3

Multithreaded Rendering*

Static Batching

Compute Skinning*

Graphics Jobs (Experimental)

Lightmap Encoding: Low Quality

Lightmap Streaming

Streaming Priority: 0

Frame Timing Stats

Vulkan Settings

SRGB Write Mode*

Number of swapchain buffers: 3

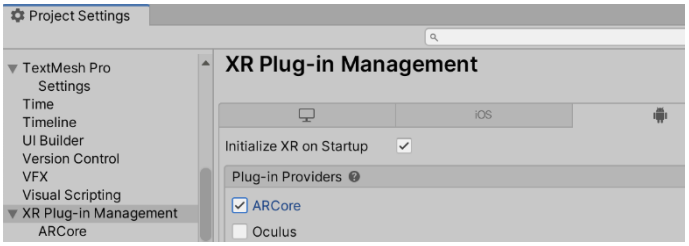
Identification

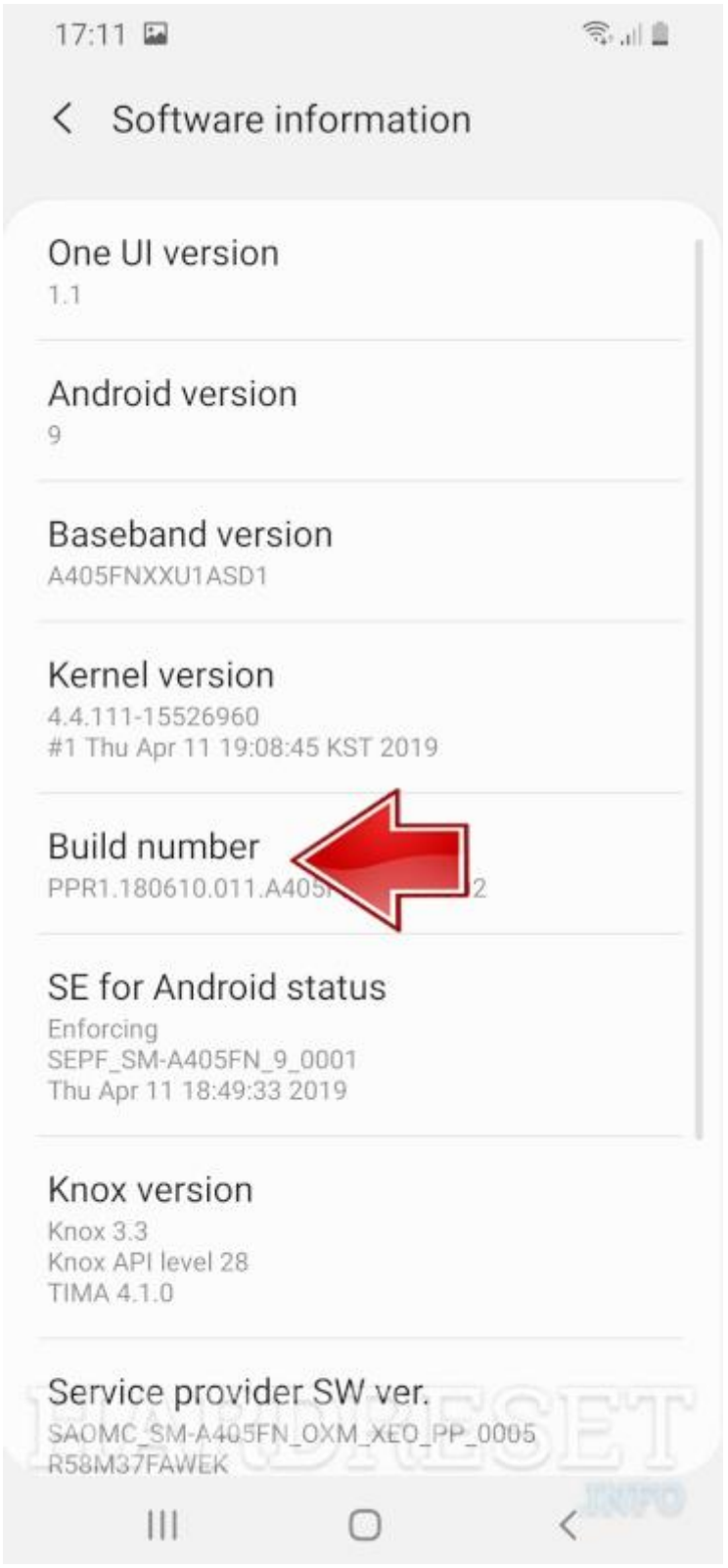
Package Name: com.DefaultCompany.ARProject

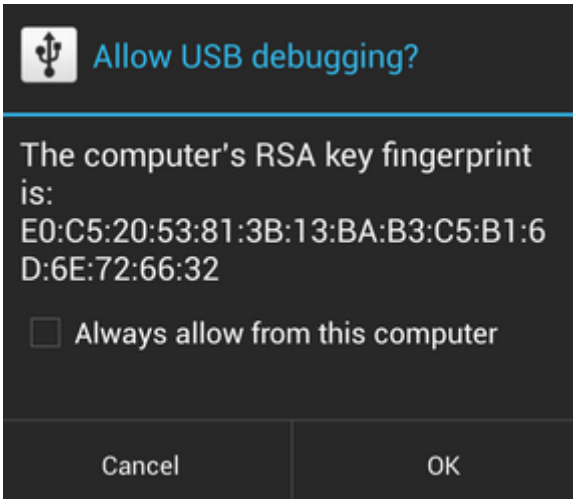
Version*: 0.1

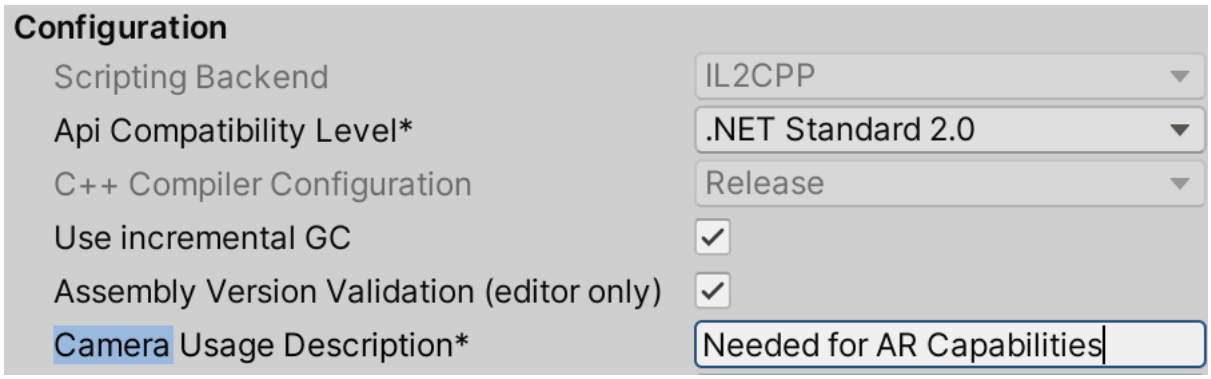
Bundle Version Code: 1

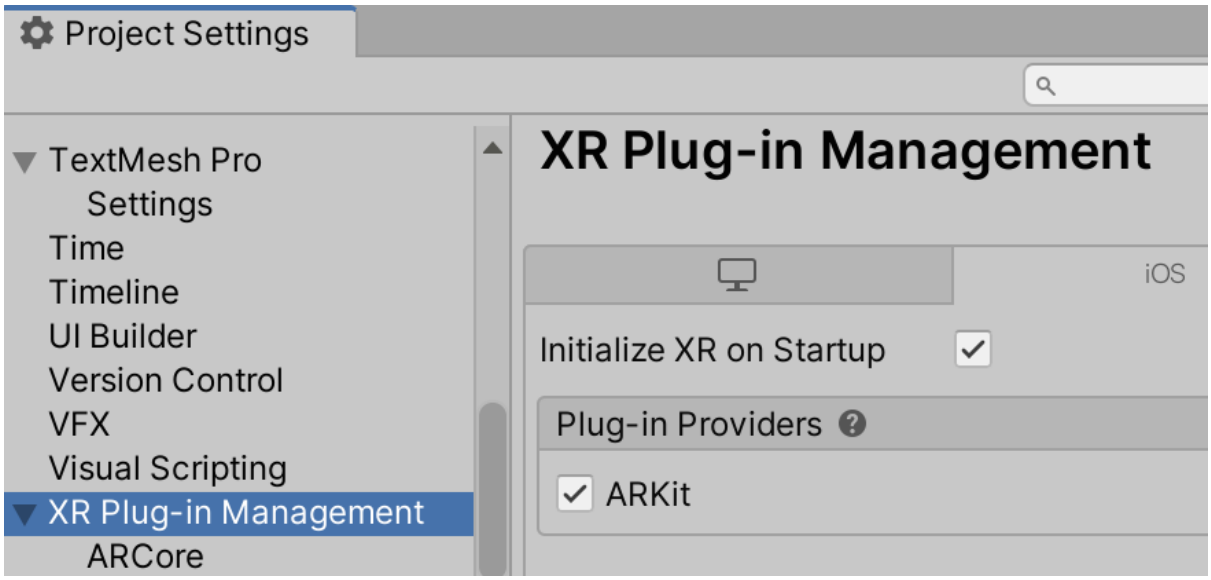
Minimum API Level: Android 7.0 'Nougat' (API level 24)

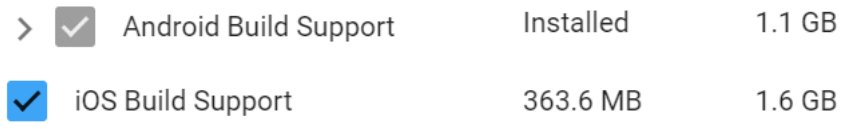


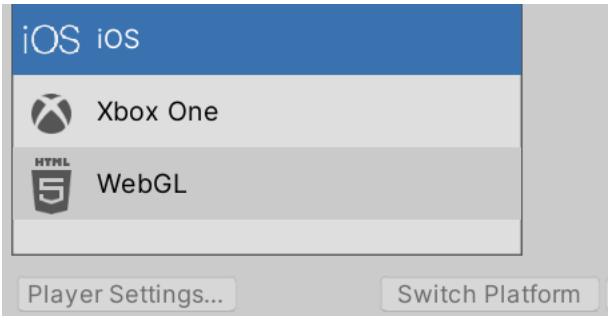

17:11
Software information
One UI version
1.1
Android version
9
Baseband version
A405FNXXU1ASD1
Kernel version
4.4.111-15526960
#1 Thu Apr 11 19:08:45 KST 2019
Build number
PPR1.180610.011.A405
2
SE for Android status
Enforcing
SEPF_SM-A405FN_9_0001
Thu Apr 11 18:49:33 2019
Knox version
Knox 3.3
Knox API level 28
TIMA 4.1.0
Service provider SW ver.
SAOMC_SM-A405FN_OXM_XEO_PP_0005
R58M37FAWEK

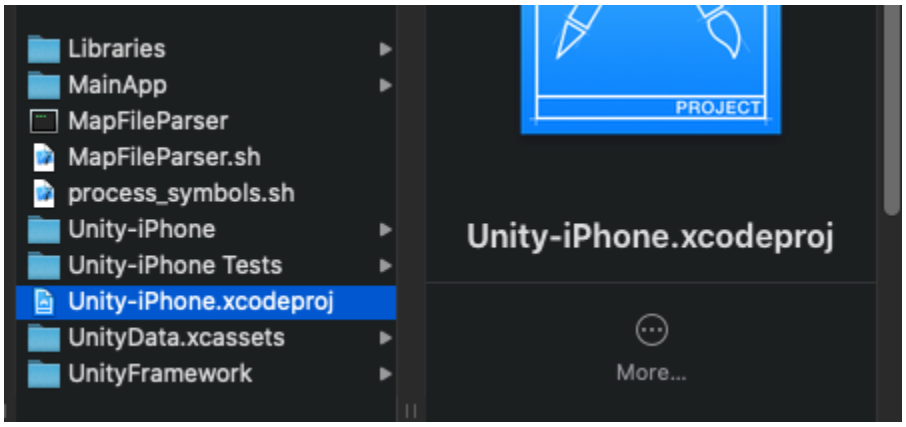

Allow USB debugging?
The computer's RSA key fingerprint is:
E0:C5:20:53:81:3B:13:BA:B3:C5:B1:6D:6E:72:66:32
Always allow from this computer
Cancel
OK

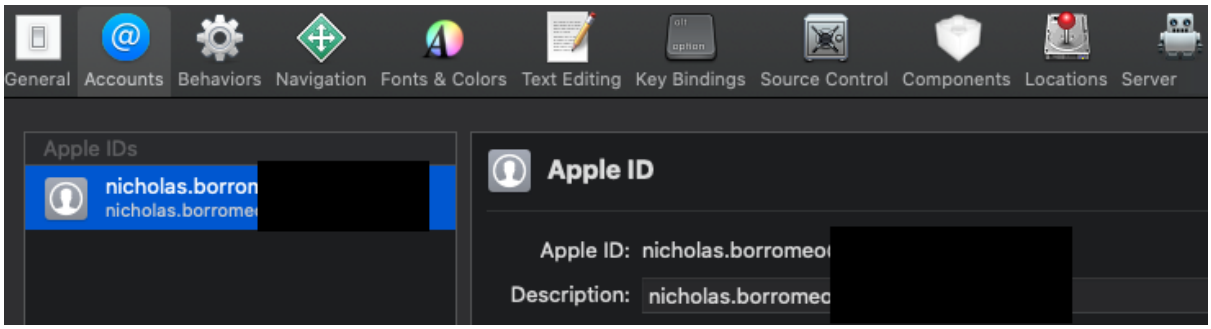

Configuration
Scripting Backend
IL2CPP
Api Compatibility Level*
.NET Standard 2.0
C++ Compiler Configuration
Release
Use incremental GC
Assembly Version Validation (editor only)
Camera Usage Description*
Needed for AR Capabilities


Project Settings
TextMesh Pro
Settings
Time
Timeline
UI Builder
Version Control
VFX
Visual Scripting
XR Plug-in Management
ARCore
XR Plug-in Management
iOS
Initialize XR on Startup
Plug-in Providers
ARKit

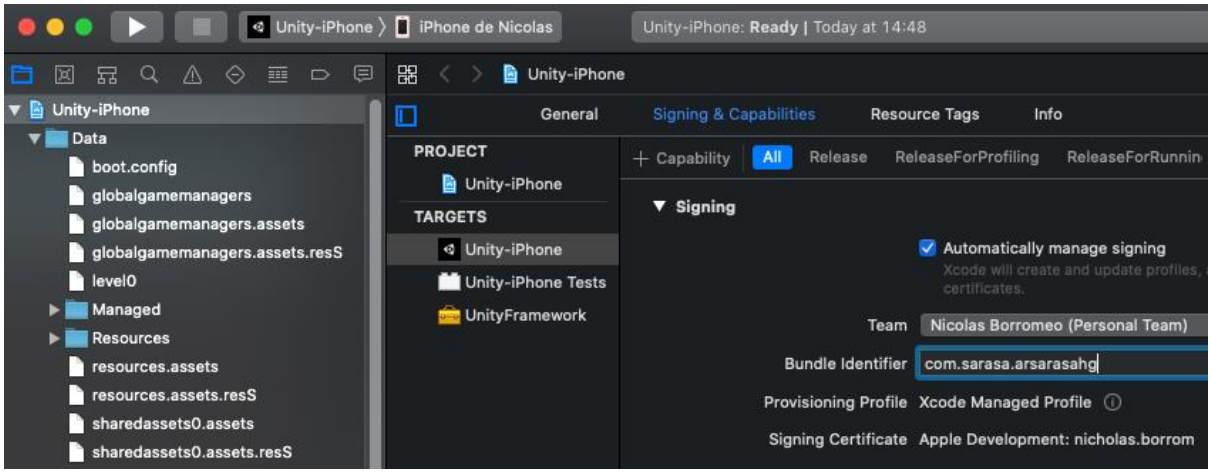

Android Build Support
Installed
1.1 GB
iOS Build Support
363.6 MB
1.6 GB

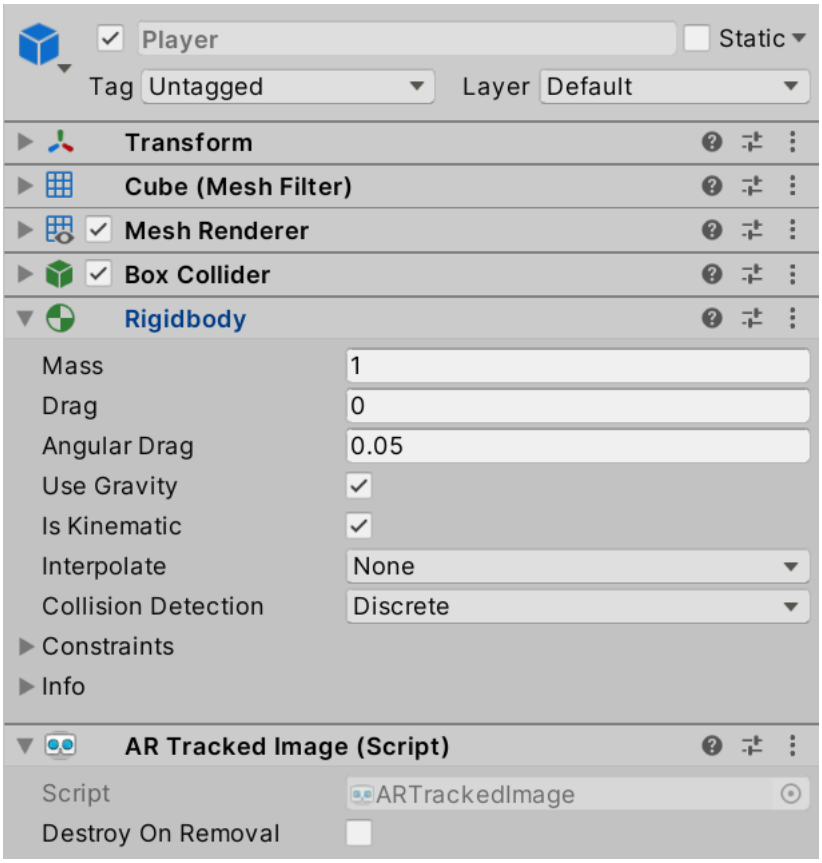

iOS iOS
Xbox One
WebGL
Player Settings...
Switch Platform


Libraries
MainApp
MapFileParser
MapFileParser.sh
process_symbols.sh
Unity-iPhone
Unity-iPhone Tests
Unity-iPhone.xcodeproj
UnityData.xcassets
UnityFramework
PROJECT
Unity-iPhone.xcodeproj
More...


General
Accounts
Behaviors
Navigation
Fonts & Colors
Text Editing
Key Bindings
Source Control
Components
Locations
Server
Apple IDs
Apple ID
Apple ID:
Description:


Unity-iPhone
iPhone de Nicolas


Unity-iPhone
iPhone de Nicolas
Unity-iPhone: Ready | Today at 14:48
Unity-iPhone
Data
boot.config
globalgamemanagers
globalgamemanagers.assets
globalgamemanagers.assets.resS
level0
Managed
Resources
resources.assets
resources.assets.resS
sharedassets0.assets
sharedassets0.assets.resS
General
Signing & Capabilities
Resource Tags
Info
PROJECT
Unity-iPhone
TARGETS
Unity-iPhone
Unity-iPhone Tests
UnityFramework
Capability
All
Release
ReleaseForProfiling
Signing
Automatically manage signing
Team
Nicolas Borromeo (Personal Team)
Bundle Identifier
com.sarasa.arsarasahg
Provisioning Profile
Xcode Managed Profile
Signing Certificate
Apple Development: nicholas.borrom




```
using UnityEngine;

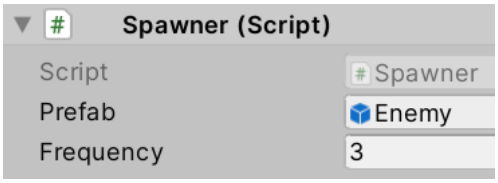
public class Spawner : MonoBehaviour
{
    public GameObject prefab;
    public float frequency;

    void Awake()
    {
        InvokeRepeating( methodName: "Spawn",  time: frequency,  repeatRate: frequency);
    }

    void Spawn()
    {
        var obj :GameObject  = Instantiate(prefab, transform.position, transform.rotation);

        var myCollider = GetComponentInChildren<Collider>();
        var spawnedCollider = obj.GetComponentInChildren<Collider>();

        //Check if both objects have collider
        if (myCollider != null && spawnedCollider != null)
        {
            Physics.IgnoreCollision(myCollider, spawnedCollider);
        }
    }
}
```




```
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.XR.ARFoundation;

public class SpawnerPlacer : MonoBehaviour
{
    List<ARRaycastHit> hits = new List<ARRaycastHit>();
    public GameObject spawnerPrefab;

    void Update()
    {
        if (Input.GetKeyDown(KeyCode.Mouse0) &&
            GetComponent<ARRaycastManager>().Raycast(Input.mousePosition, hits))
        {
            Instantiate(spawnerPrefab, hits[0].pose.position, hits[0].pose.rotation);
        }
    }
}
```

```
using UnityEngine;

public class PlayerManager : MonoBehaviour
{
    public static PlayerManager instance;

    void Awake()
    {
        instance = this;
    }
}
```

```
using UnityEngine;

public class LookAtPlayer : MonoBehaviour
{
    void Update()
    {
        if(PlayerManager.instance == null) return;

        transform.forward = PlayerManager.instance.transform.position - transform.position;
    }
}
```

```
using UnityEngine;

public class MoveForward : MonoBehaviour
{
    public float speed;

    void Update()
    {
        transform.Translate(0, 0, speed * Time.deltaTime);
    }
}
```

```
using System.Collections.Generic;
using UnityEngine;

public class EnemyManager : MonoBehaviour
{
    public static EnemyManager instance;

    public List<Enemy> all = new List<Enemy>();

    void Awake()
    {
        instance = this;
    }
}
```

```
using UnityEngine;

public class Enemy : MonoBehaviour
{
    void OnEnable()
    {
        EnemyManager.instance.all.Add(this);
    }

    void OnDisable()
    {
        EnemyManager.instance.all.Remove(this);
    }
}
```

```
using UnityEngine;

public class LookAtNearestEnemy : MonoBehaviour
{
    void Update()
    {
        if(EnemyManager.instance.all.Count <= 0) return;

        var nearestEnemy = EnemyManager.instance.all[0];

        for (var i = 1; i < EnemyManager.instance.all.Count; i++)
        {
            var enemy = EnemyManager.instance.all[i];
            var distToNearest :float  = Vector3.Distance(nearestEnemy.transform.position, transform.position);
            var distToEnemy :float  = Vector3.Distance(enemy.transform.position, transform.position);

            if (distToEnemy < distToNearest)
                nearestEnemy = enemy;
        }

        if (nearestEnemy)
            transform.forward = nearestEnemy.transform.position - transform.position;
    }
}
```

```
using UnityEngine;

public class Life : MonoBehaviour
{
    public int amount;

    public void Damage(int damageAmount)
    {
        amount -= damageAmount;
        if(amount <= 0)
            Destroy(gameObject);
    }
}
```

```
using UnityEngine;

public class Damager : MonoBehaviour
{
    public int amount;

    void OnTriggerEnter(Collider other)
    {
        other.GetComponent<Life>()?.Damage(amount);
        Destroy(gameObject);
    }
}
```

```
using UnityEngine;

public class AutoDestroy : MonoBehaviour
{
    public float time;

    void Awake()
    {
        Destroy(gameObject, time);
    }
}
```