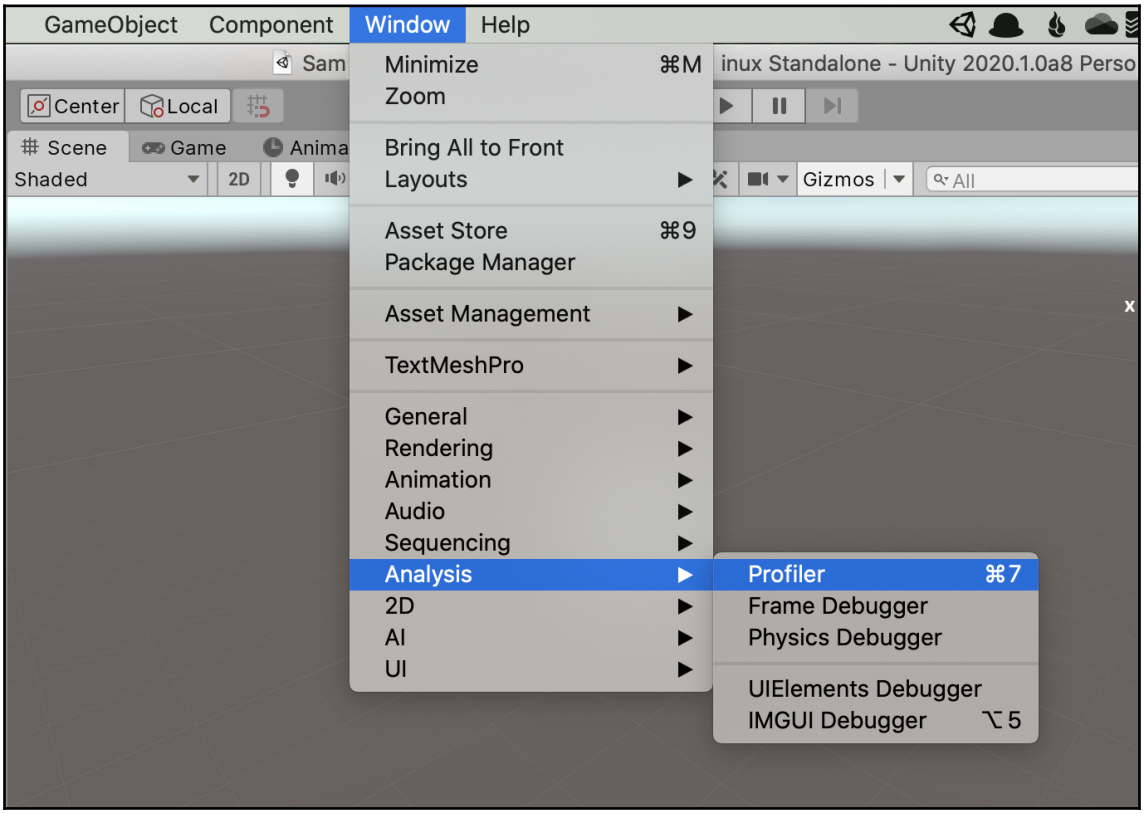
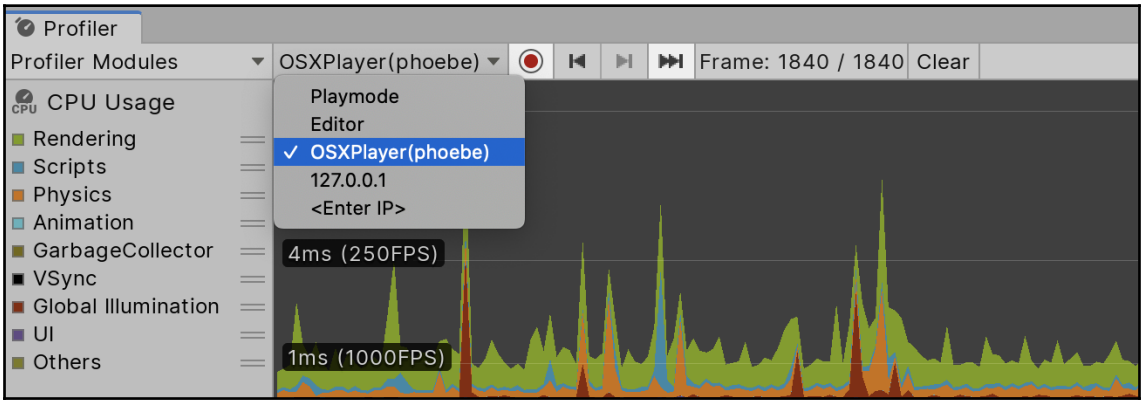
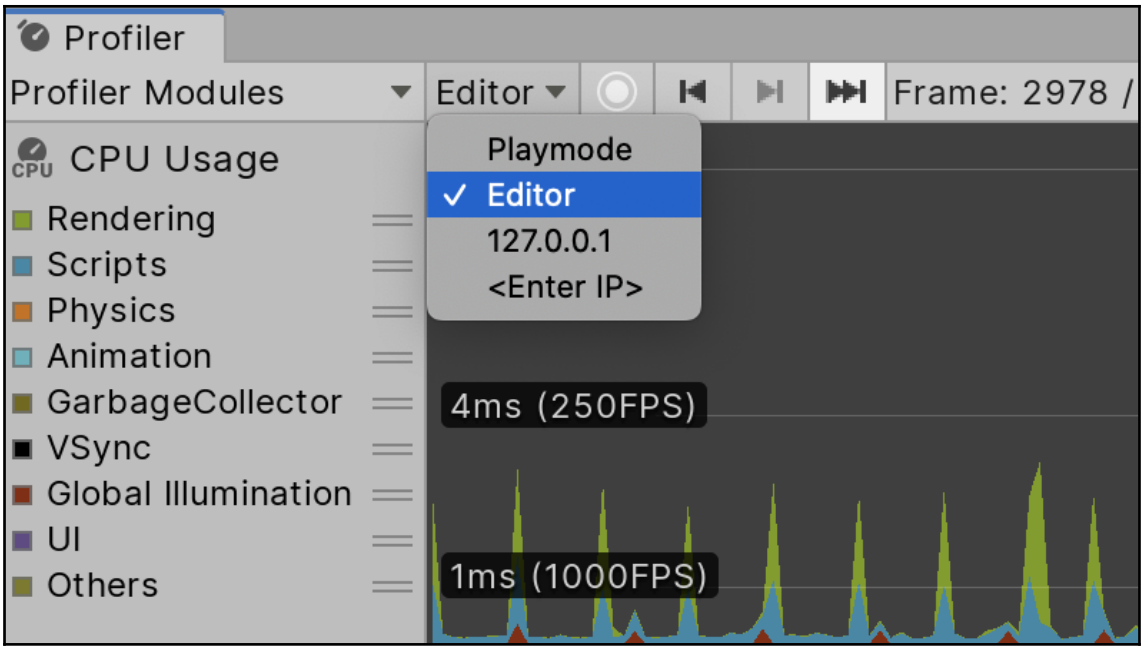
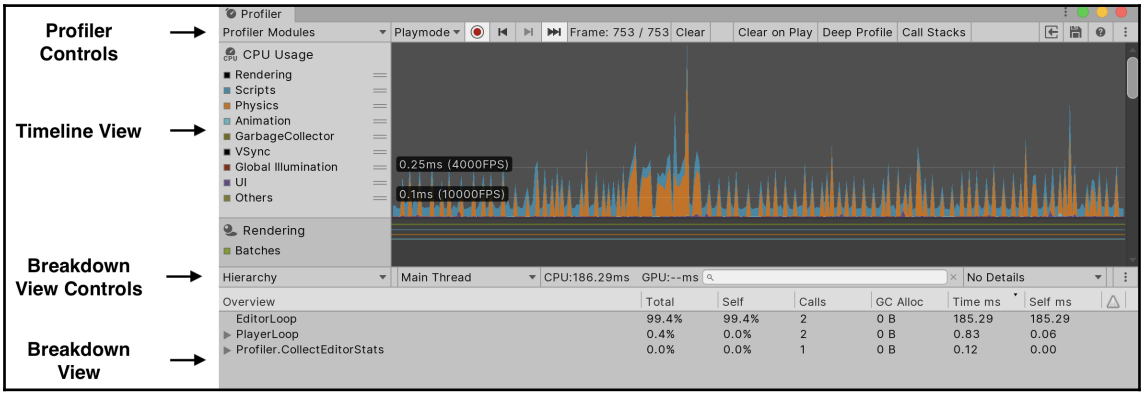
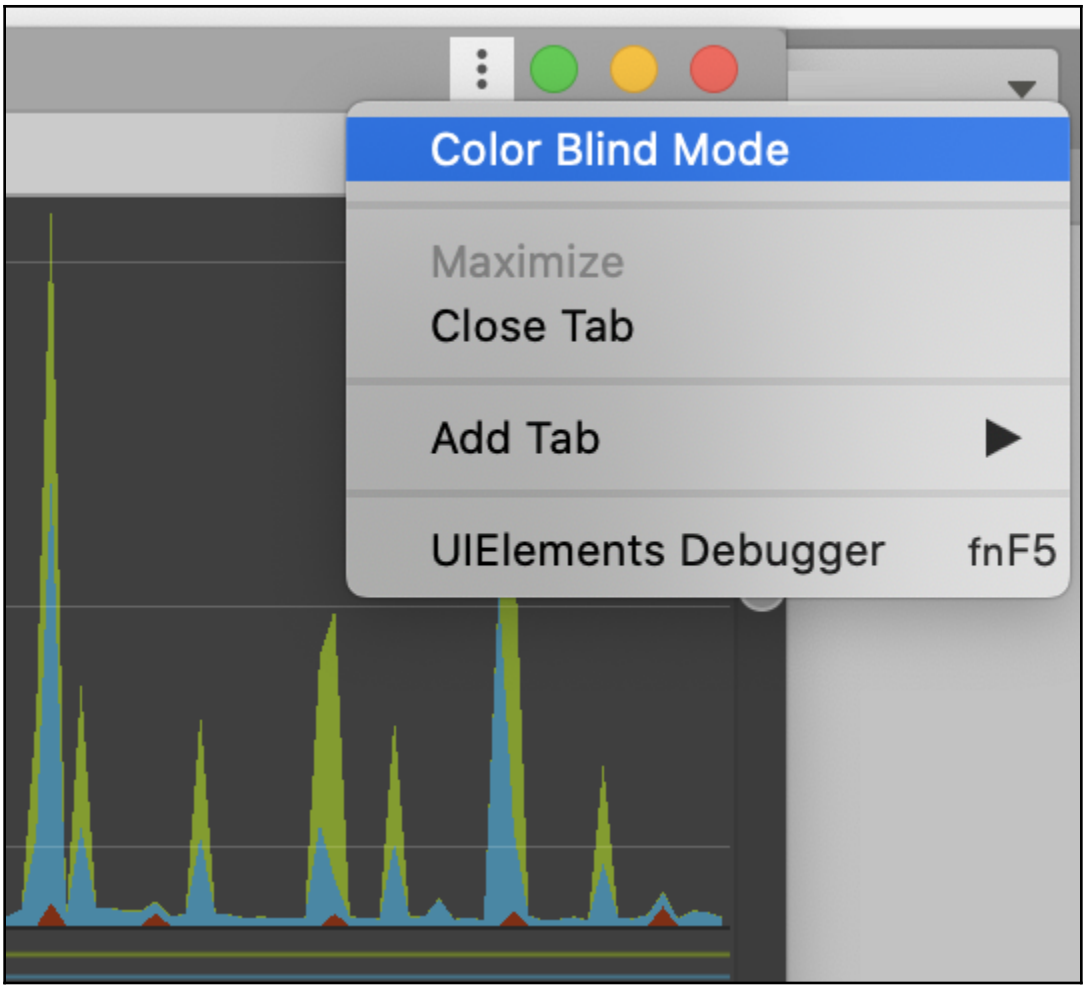
Chapter 1: Evaluating Performance Problems

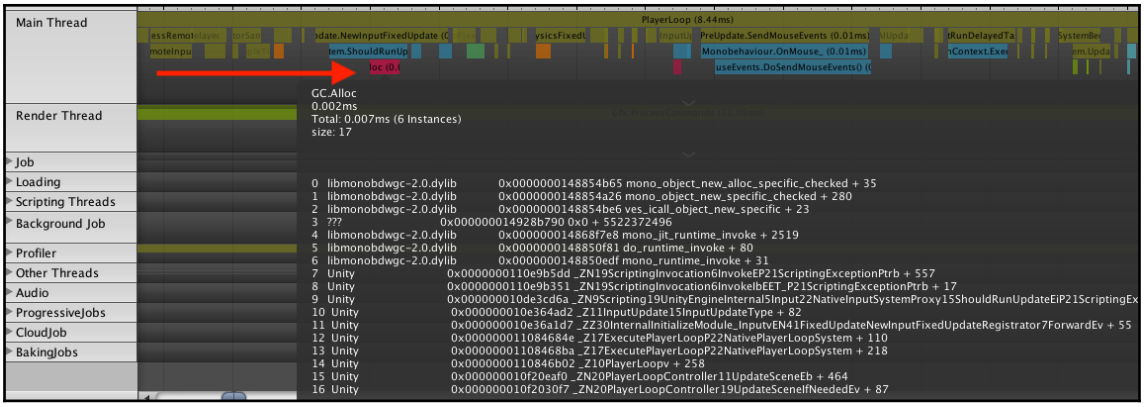


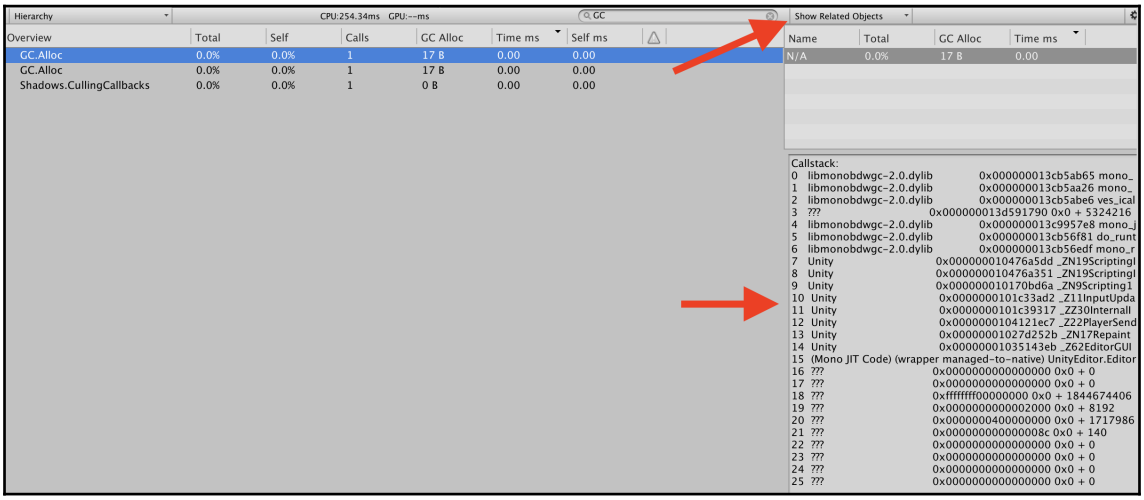


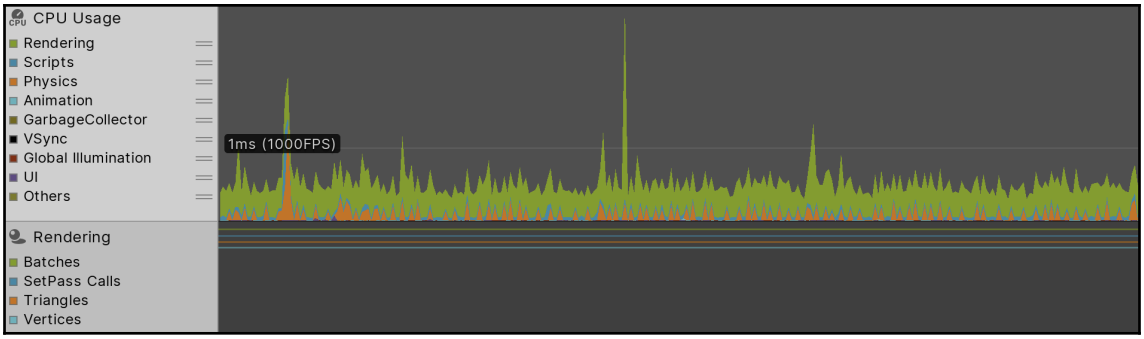

Profiler
Profiler Modules
Editor
Frame: 2978 /
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
Playmode
Editor
127.0.0.1
<Enter IP>
4ms (250FPS)
1ms (1000FPS)

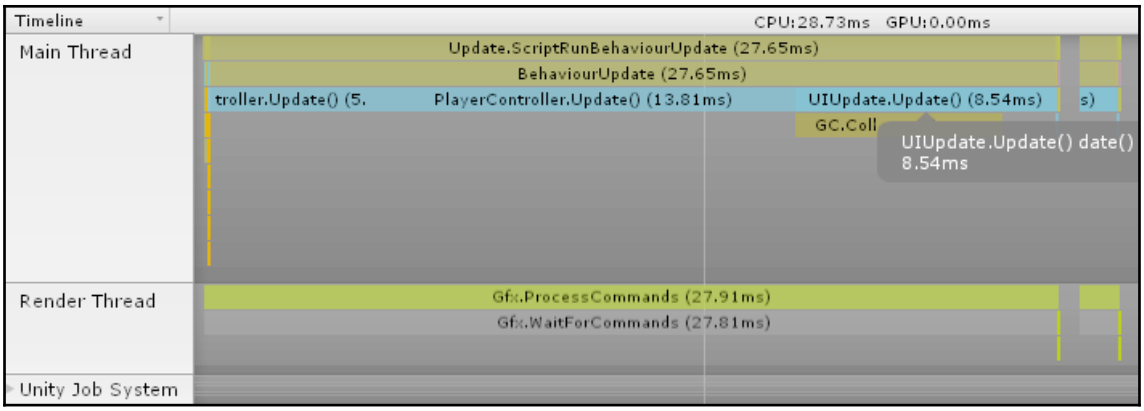

Profiler Controls
Timeline View
Breakdown View Controls
Breakdown View
Profiler
Profiler Modules
Playmode
Frame: 753 / 753
Clear
Clear on Play
Deep Profile
Call Stacks
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
0.25ms (4000FPS)
0.1ms (10000FPS)
Rendering
Batches
Hierarchy
Main Thread
CPU:186.29ms
GPU:--ms
No Details
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
EditorLoop 99.4% 99.4% 2 0 B 185.29 185.29
PlayerLoop 0.4% 0.0% 2 0 B 0.83 0.06
Profiler.CollectEditorStats 0.0% 0.0% 1 0 B 0.12 0.00

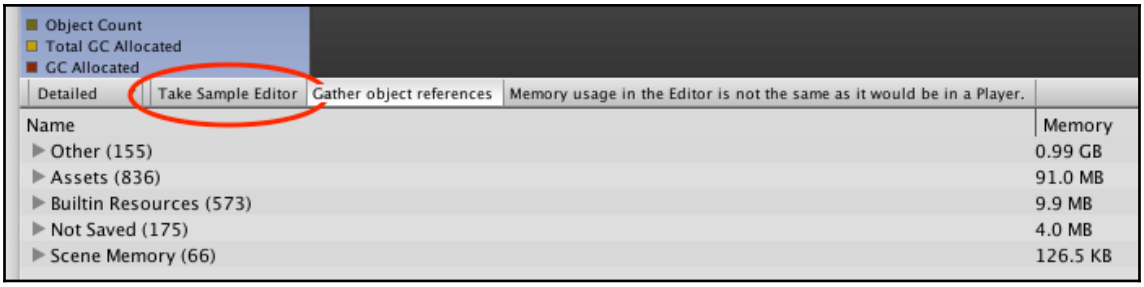

Color Blind Mode
Maximize
Close Tab
Add Tab
UIElements Debugger
fnF5

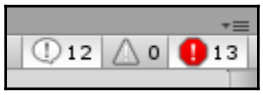

Main Thread
Render Thread
Job
Loading
Scripting Threads
Background Job
Profiler
Other Threads
Audio
ProgressiveJobs
CloudJob
BakingJobs
PlayerLoop (8.44ms)
GC.Alloc
0.002ms
Total: 0.007ms (6 Instances)
size: 17
0 libmonobdwgc-2.0.dylib 0x0000000148854b65 mono_object_new_alloc_specific_checked + 35
1 libmonobdwgc-2.0.dylib 0x0000000148854a26 mono_object_new_specific_checked + 280
2 libmonobdwgc-2.0.dylib 0x0000000148854be6 ves_icall_object_new_specific + 23
3 ??? 0x000000014928b790 0x0 + 5522372496
4 libmonobdwgc-2.0.dylib 0x000000014868f7e8 mono_jit_runtime_invoke + 2519
5 libmonobdwgc-2.0.dylib 0x000000014850f81 do_runtime_invoke + 80
6 libmonobdwgc-2.0.dylib 0x0000000148850edf mono_runtime_invoke + 31
7 Unity 0x0000000110e9b5dd _ZN19ScriptingInvocation6InvokeEP21ScriptingExceptionPtrb + 557
8 Unity 0x0000000110e9b351 _ZN19ScriptingInvocation6InvokeIbEET_P21ScriptingExceptionPtrb + 17
9 Unity 0x000000010de3cd6a _ZN9Scripting19UnityEngineInternal5Input22NativeInputSystemProxy15ShouldRunUpdateEiP21ScriptingEx
10 Unity 0x000000010e364ad2 _Z11InputUpdate15InputUpdateType + 82
11 Unity 0x000000010e36a1d7 _ZZ30InternalInitializeModule_InputvEN41FixedUpdateNewInputFixedUpdateRegistrator7ForwardEv + 55
12 Unity 0x000000011084684e _Z17ExecutePlayerLoopP22NativePlayerLoopSystem + 110
13 Unity 0x00000001108468ba _Z17ExecutePlayerLoopP22NativePlayerLoopSystem + 218
14 Unity 0x0000000110846b02 _Z10PlayerLoopv + 258
15 Unity 0x000000010f20eaf0 _ZN20PlayerLoopController11UpdateSceneEb + 464
16 Unity 0x000000010f2030f7 _ZN20PlayerLoopController19UpdateSceneIfNeededEv + 87

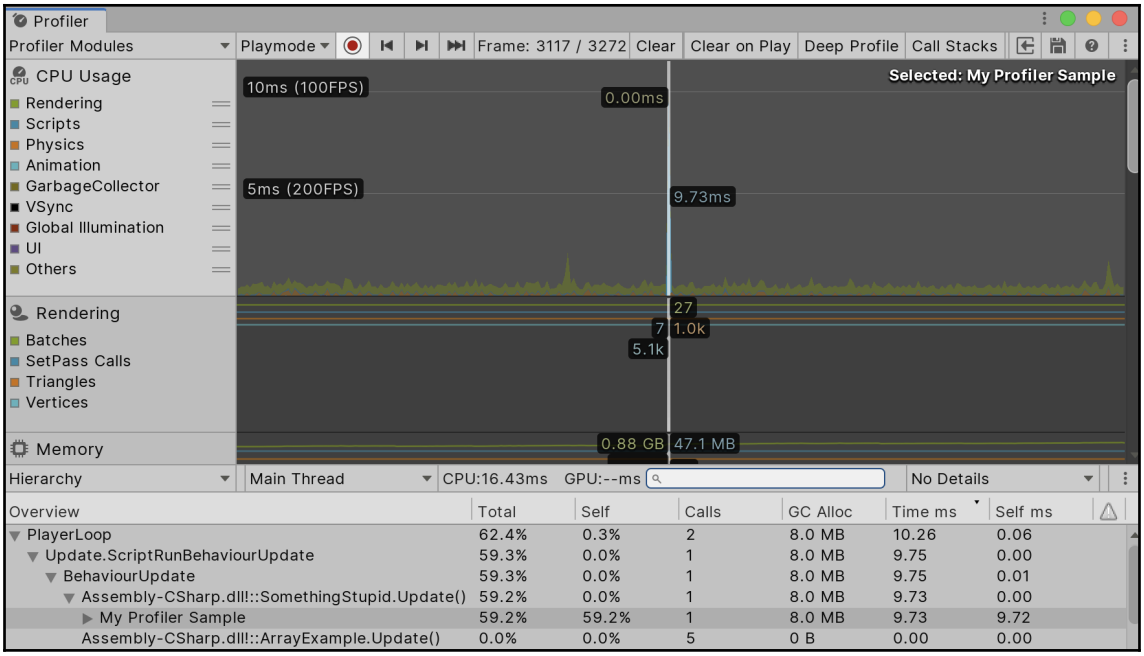

Hierarchy
CPU:254.34ms GPU:--ms
GC
Show Related Objects
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
GC.Alloc 0.0% 0.0% 1 17 B 0.00 0.00
GC.Alloc 0.0% 0.0% 1 17 B 0.00 0.00
Shadows.CullingCallbacks 0.0% 0.0% 1 0 B 0.00 0.00
Name
Total
GC Alloc
Time ms
N/A 0.0% 17 B 0.00
Callstack:
0 libmonobdwgc-2.0.dylib 0x000000013cb5ab65 mono_
1 libmonobdwgc-2.0.dylib 0x000000013cb5aa26 mono_
2 libmonobdwgc-2.0.dylib 0x000000013cb5abe6 ves_ical
3 ??? 0x000000013d591790 0x0 + 5324216
4 libmonobdwgc-2.0.dylib 0x000000013c9957e8 mono_j
5 libmonobdwgc-2.0.dylib 0x000000013cb56f81 do_runt
6 libmonobdwgc-2.0.dylib 0x000000013cb56edf mono_r
7 Unity 0x0000000110476a5dd _ZN19ScriptingI
8 Unity 0x0000000110476a351 _ZN19ScriptingI
9 Unity 0x0000000110170bd6a _ZN9Scripting1
10 Unity 0x0000000101c33ad2 _Z11InputUpda
11 Unity 0x0000000101c39317 _ZZ30Internall
12 Unity 0x0000000104121ec7 _Z22PlayerSend
13 Unity 0x00000001027d252b _ZN17Repaint
14 Unity 0x0000000103514 3eb _Z62EditorGUI
15 (Mono JIT Code) (wrapper managed-to-native) UnityEditor.Editor
16 ??? 0x0000000000000000 0x0 + 0
17 ??? 0x0000000000000000 0x0 + 0
18 ??? 0xffffffff00000000 0x0 + 1844674406
19 ??? 0x0000000000002000 0x0 + 8192
20 ??? 0x0000000400000000 0x0 + 1717986
21 ??? 0x000000000000008c 0x0 + 140
22 ??? 0x0000000000000000 0x0 + 0
23 ??? 0x0000000000000000 0x0 + 0
24 ??? 0x0000000000000000 0x0 + 0
25 ??? 0x0000000000000000 0x0 + 0


CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
1ms (1000FPS)
Rendering
Batches
SetPass Calls
Triangles
Vertices


Timeline
CPU:28.73ms GPU:0.00ms
Main Thread
Update.ScriptRunBehaviourUpdate (27.65ms)
BehaviourUpdate (27.65ms)
troller.Update() (5.
PlayerController.Update() (13.81ms)
UIUpdate.Update() (8.54ms)
s)
GC.Coll
UIUpdate.Update() date()
8.54ms
Render Thread
Gfx.ProcessCommands (27.91ms)
Gfx.WaitForCommands (27.81ms)
Unity Job System

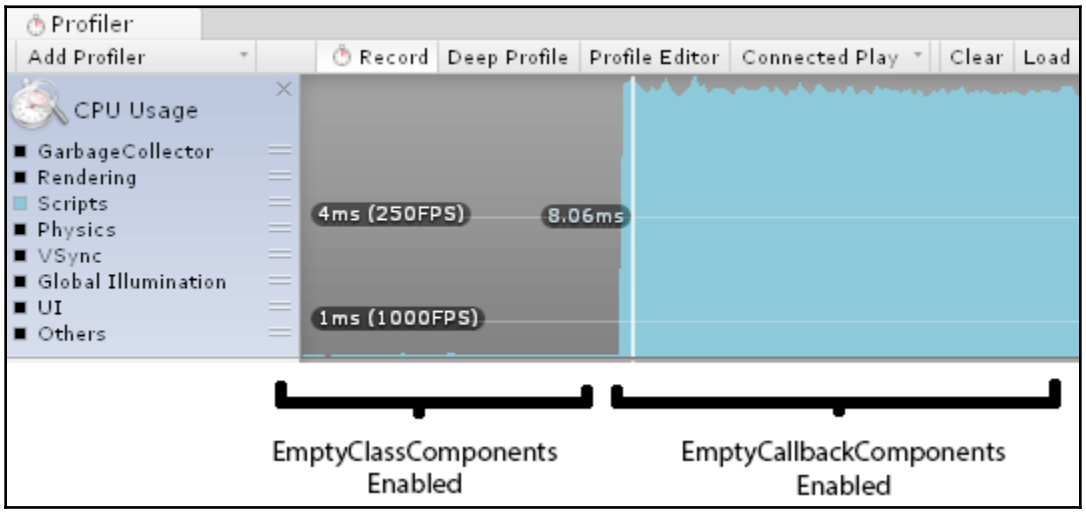

Object Count
Total GC Allocated
GC Allocated
Detailed
Take Sample Editor
Gather object references
Memory usage in the Editor is not the same as it would be in a Player.
Name
Memory
Other (155)
0.99 GB
Assets (836)
91.0 MB
Builtin Resources (573)
9.9 MB
Not Saved (175)
4.0 MB
Scene Memory (66)
126.5 KB

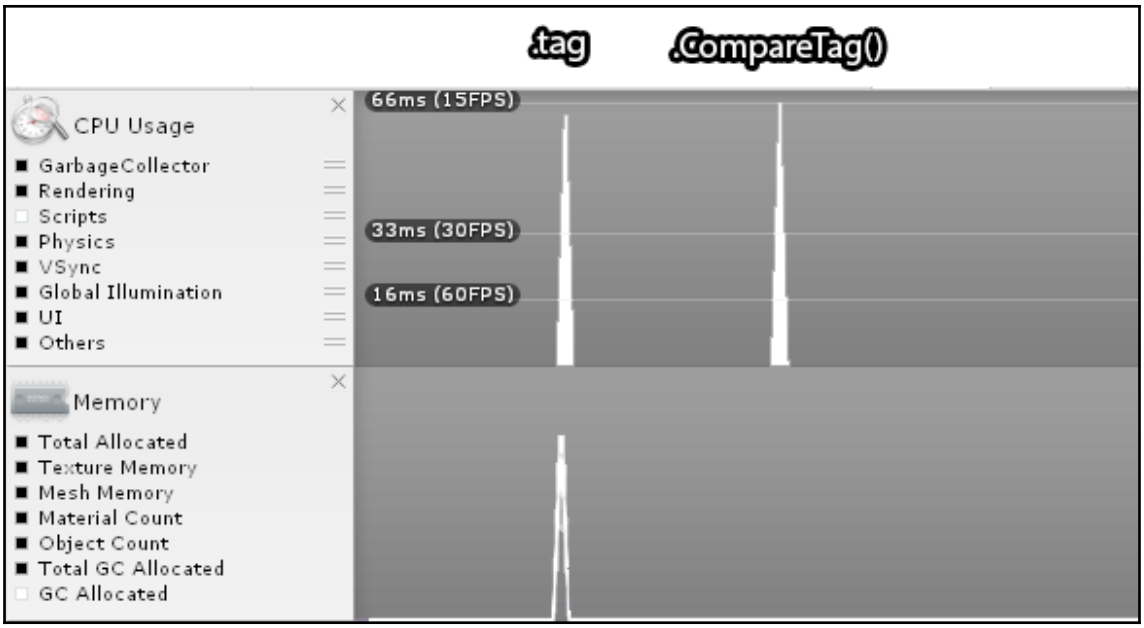

12
0
13

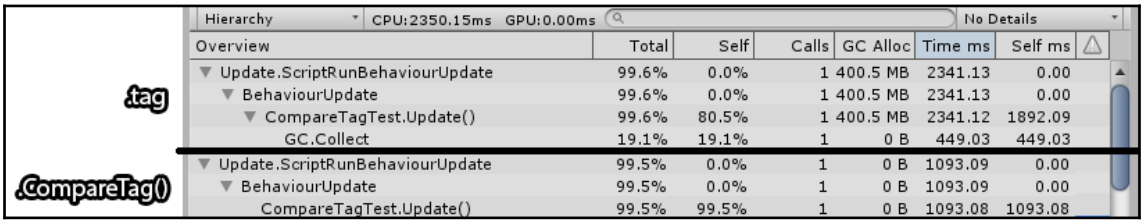

Profiler
Profiler Modules
Playmode
Frame: 3117 / 3272
Clear
Clear on Play
Deep Profile
Call Stacks
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
10ms (100FPS)
5ms (200FPS)
0.00ms
9.73ms
Selected: My Profiler Sample
Rendering
Batches
SetPass Calls
Triangles
Vertices
27
7
1.0k
5.1k
Memory
0.88 GB
47.1 MB
Hierarchy
Main Thread
CPU:16.43ms
GPU:--ms
No Details
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
PlayerLoop 62.4% 0.3% 2 8.0 MB 10.26 0.06
Update.ScriptRunBehaviourUpdate 59.3% 0.0% 1 8.0 MB 9.75 0.00
BehaviourUpdate 59.3% 0.0% 1 8.0 MB 9.75 0.01
Assembly-CSharp.dll!::SomethingStupid.Update() 59.2% 0.0% 1 8.0 MB 9.73 0.00
My Profiler Sample 59.2% 59.2% 1 8.0 MB 9.73 9.72
Assembly-CSharp.dll!::ArrayExample.Update() 0.0% 0.0% 5 0 B 0.00 0.00

Chapter 2: Scripting Strategies

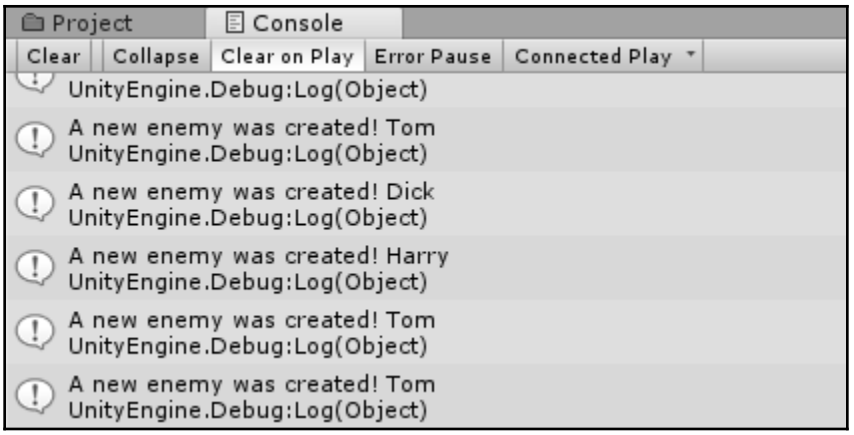
```
GetComponent(string) finished: 6413.00ms total, 0.006413ms per test for 1000000 tests
UnityEngine.Debug:Log(Object)
GetComponent<ComponentName> finished: 89.00ms total, 0.000089ms per test for 1000000 tests
UnityEngine.Debug:Log(Object)
GetComponent(typeof(ComponentName)) finished: 95.00ms total, 0.000095ms per test for 1000000 tests
UnityEngine.Debug:Log(Object)
```



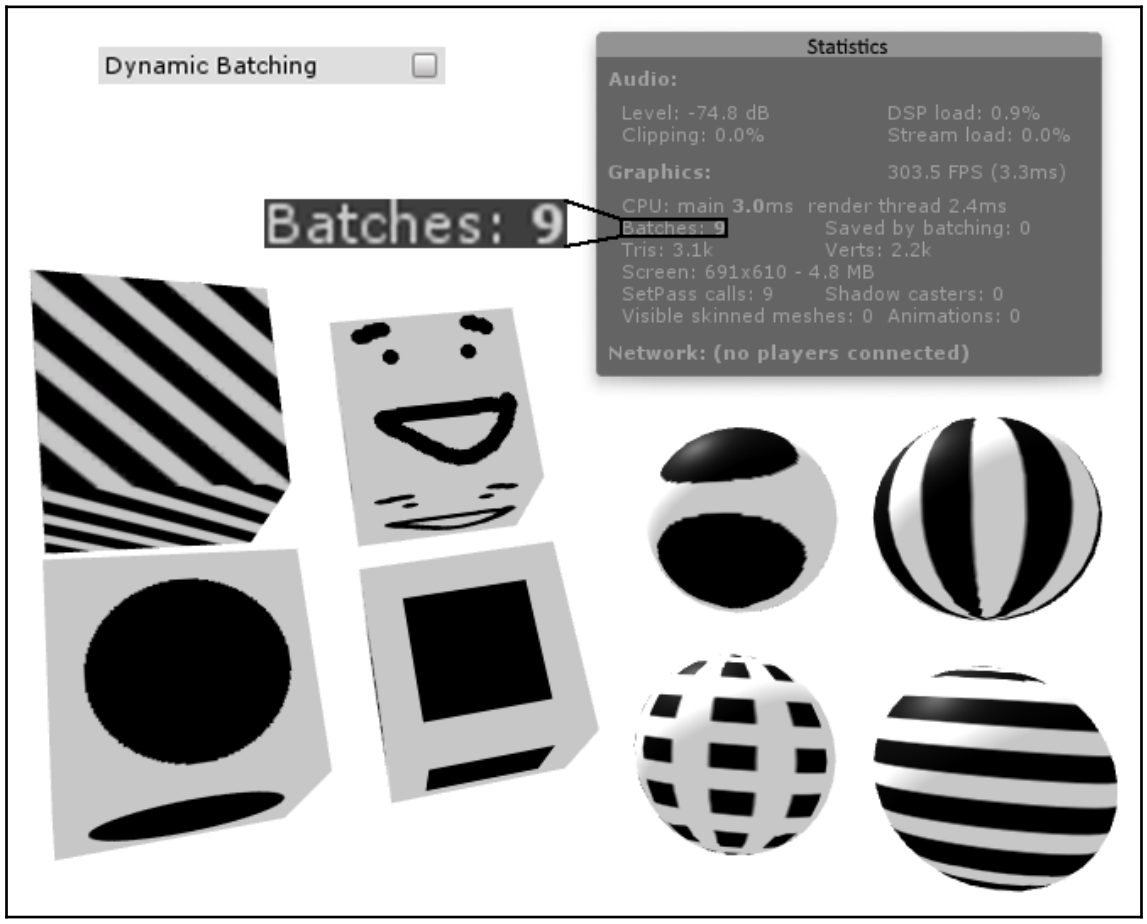

.tag
.CompareTag()
CPU Usage
GarbageCollector
Rendering
Scripts
Physics
VSync
Global Illumination
UI
Others
66ms (15FPS)
33ms (30FPS)
16ms (60FPS)
Memory
Total Allocated
Texture Memory
Mesh Memory
Material Count
Object Count
Total GC Allocated
GC Allocated


.tag
.CompareTag()
Hierarchy
CPU:2350.15ms GPU:0.00ms
No Details
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
Update.ScriptRunBehaviourUpdate 99.6% 0.0% 1 400.5 MB 2341.13 0.00
BehaviourUpdate 99.6% 0.0% 1 400.5 MB 2341.13 0.00
CompareTagTest.Update() 99.6% 80.5% 1 400.5 MB 2341.12 1892.09
GC.Collect 19.1% 19.1% 1 0 B 449.03 449.03
Update.ScriptRunBehaviourUpdate 99.5% 0.0% 1 0 B 1093.09 0.00
BehaviourUpdate 99.5% 0.0% 1 0 B 1093.09 0.00
CompareTagTest.Update() 99.5% 99.5% 1 0 B 1093.08 1093.08

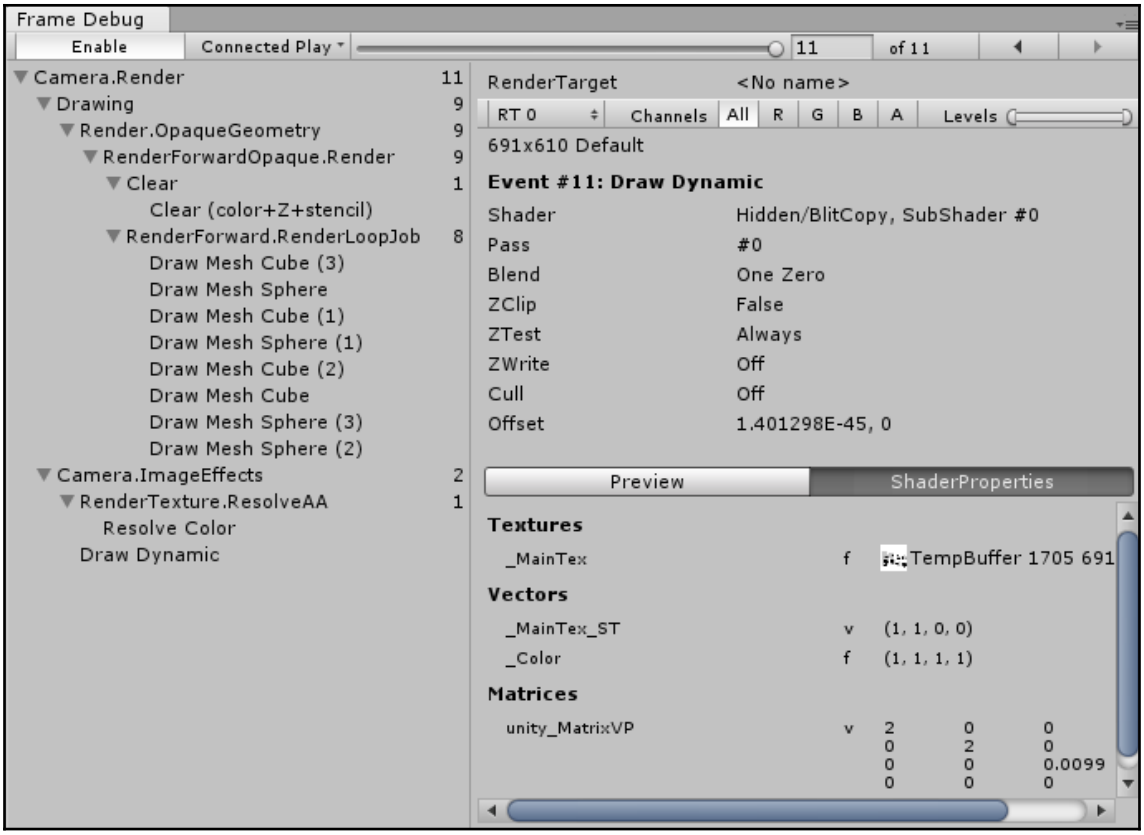

Enemy Spawner Component (Script)
Script
EnemySpawnerComponent
Num Enemies
0
Enemy Prefab
None (Game Object)
Enemy Manager
None (Enemy Manager Component

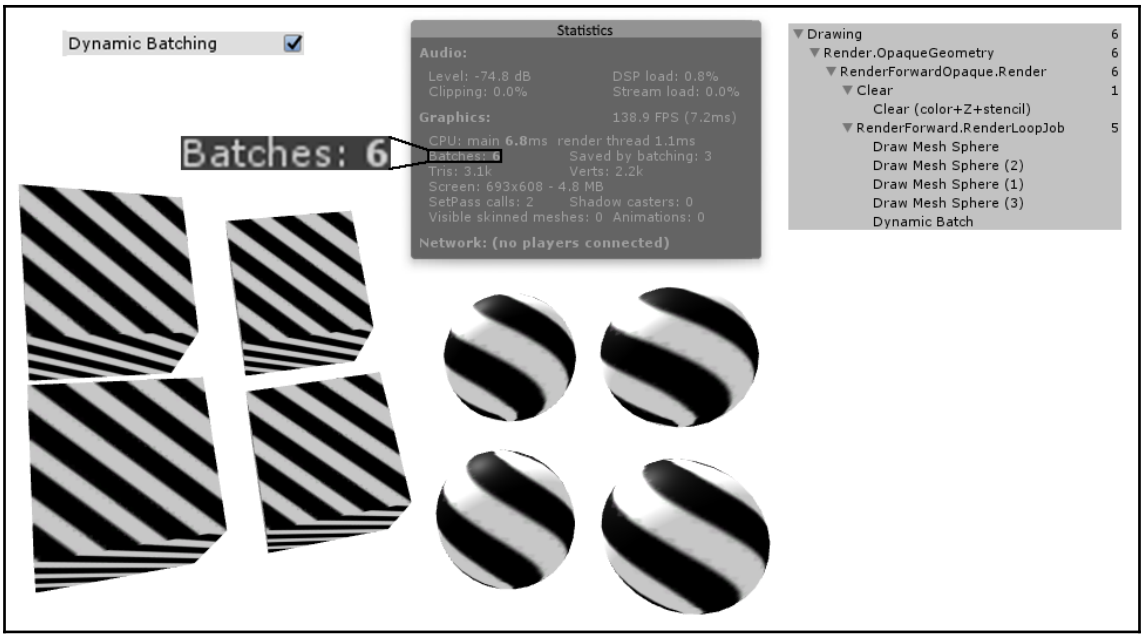

Project
Console
Clear
Collapse
Clear on Play
Error Pause
Connected Play
UnityEngine.Debug:Log(Object)
A new enemy was created! Tom
UnityEngine.Debug:Log(Object)
A new enemy was created! Dick
UnityEngine.Debug:Log(Object)
A new enemy was created! Harry
UnityEngine.Debug:Log(Object)
A new enemy was created! Tom
UnityEngine.Debug:Log(Object)
A new enemy was created! Tom
UnityEngine.Debug:Log(Object)

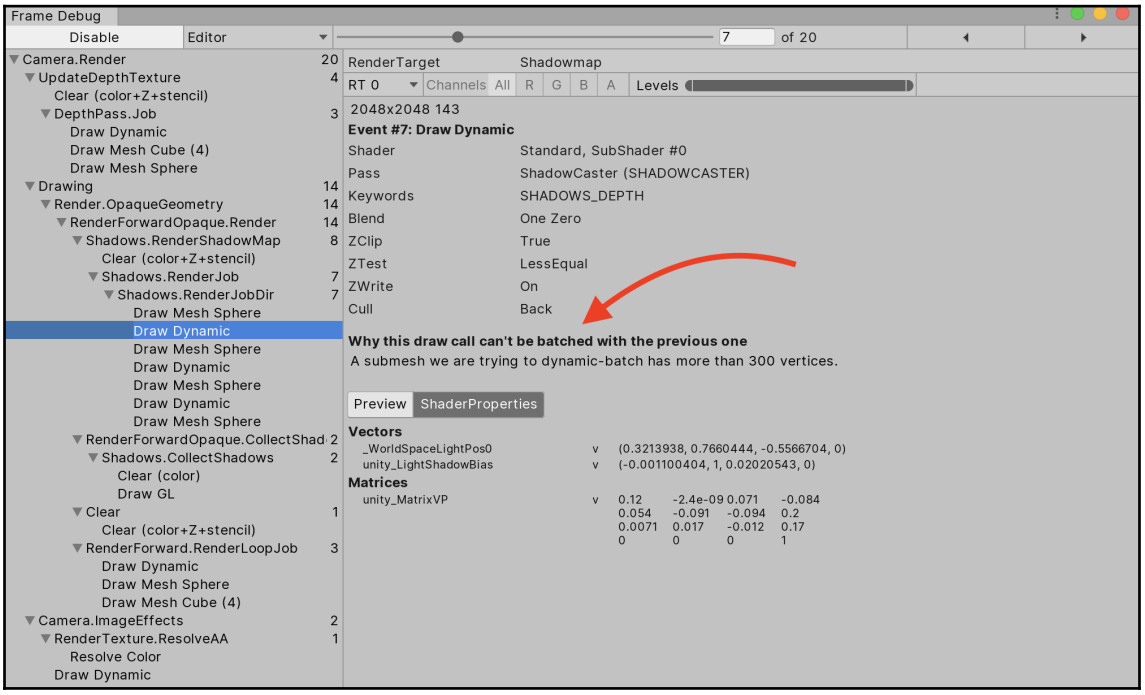
Chapter 3: The Benefits of Batching



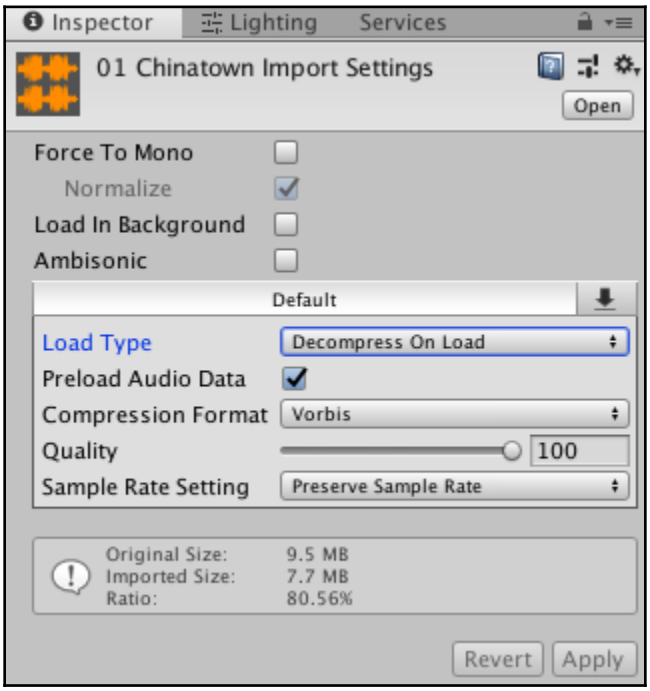

Dynamic Batching
Batches: 9
Statistics
Audio:
Level: -74.8 dB
DSP load: 0.8%
Clipping: 0.0%
Stream load: 0.0%
Graphics:
303.5 FPS (3.3ms)
CPU: main 3.0ms render thread 2.4ms
Batches: 9
Saved by batching: 0
Tris: 3.1k
Verts: 2.2k
Screen: 691x610 - 4.8 MB
SetPass calls: 9
Shadow casters: 0
Visible skinned meshes: 0
Animations: 0
Network: (no players connected)

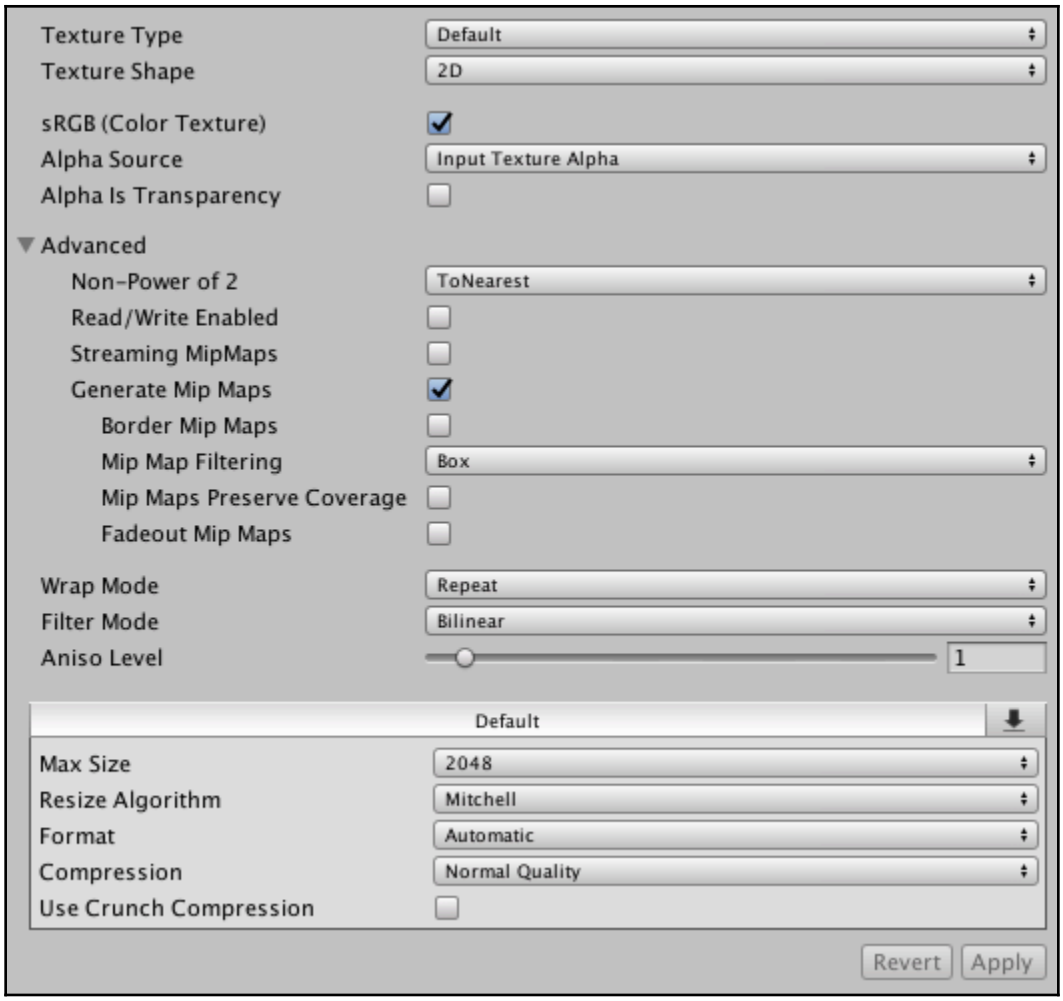

Frame Debug
Enable
Connected Play
11
of 11
Camera.Render 11
Drawing 9
Render.OpaqueGeometry 9
RenderForwardOpaque.Render 9
Clear 1
Clear (color+Z+stencil)
RenderForward.RenderLoopJob 8
Draw Mesh Cube (3)
Draw Mesh Sphere
Draw Mesh Cube (1)
Draw Mesh Sphere (1)
Draw Mesh Cube (2)
Draw Mesh Cube
Draw Mesh Sphere (3)
Draw Mesh Sphere (2)
Camera.ImageEffects 2
RenderTexture.ResolveAA 1
Resolve Color
Draw Dynamic
RenderTarget
<No name>
RT 0
Channels
All
R
G
B
A
Levels
691x610 Default
Event #11: Draw Dynamic
Shader
Hidden/BlitCopy, SubShader #0
Pass
#0
Blend
One Zero
ZClip
False
ZTest
Always
ZWrite
Off
Cull
Off
Offset
1.401298E-45, 0
Preview
ShaderProperties
Textures
_MainTex
f
TempBuffer 1705 691
Vectors
_MainTex_ST
v
(1, 1, 0, 0)
_Color
f
(1, 1, 1, 1)
Matrices
unity_MatrixVP
v
2 0 0
0 2 0
0 0 0.0099
0 0 0

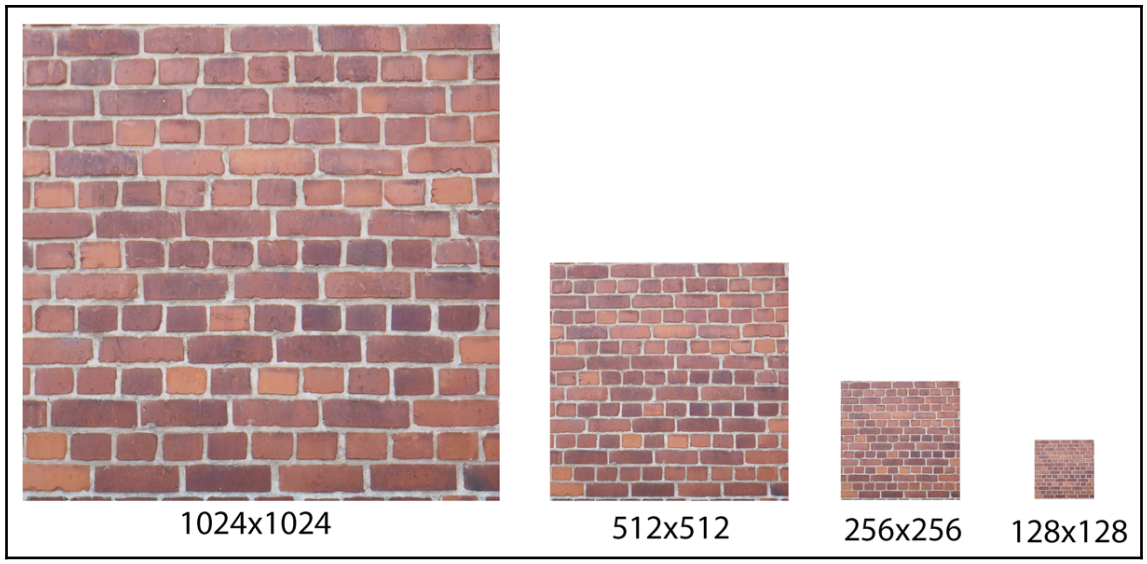

Dynamic Batching
Batches: 6
Statistics
Audio:
Level: -74.8 dB
Clipping: 0.0%
DSP load: 0.8%
Stream load: 0.0%
Graphics:
138.9 FPS (7.2ms)
CPU: main 6.8ms render thread 1.1ms
Batches: 6
Saved by batching: 3
Tris: 3.1k
Verts: 2.2k
Screen: 693x608 - 4.8 MB
SetPass calls: 2
Shadow casters: 0
Visible skinned meshes: 0 Animations: 0
Network: (no players connected)
Drawing 6
Render.OpaqueGeometry 6
RenderForwardOpaque.Render 6
Clear 1
Clear (color+Z+stencil)
RenderForward.RenderLoopJob 5
Draw Mesh Sphere
Draw Mesh Sphere (2)
Draw Mesh Sphere (1)
Draw Mesh Sphere (3)
Dynamic Batch

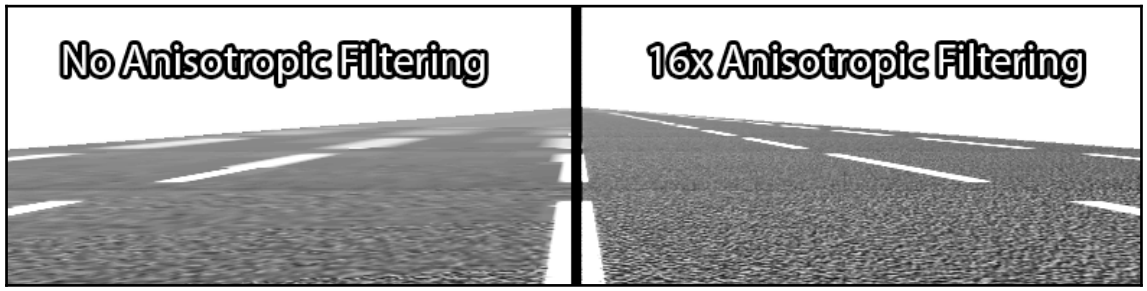

Frame Debug
Disable
Editor
7 of 20
Camera.Render 20
UpdateDepthTexture 4
Clear (color+Z+stencil)
DepthPass.Job 3
Draw Dynamic
Draw Mesh Cube (4)
Draw Mesh Sphere
Drawing 14
Render.OpaqueGeometry 14
RenderForwardOpaque.Render 14
Shadows.RenderShadowMap 8
Clear (color+Z+stencil)
Shadows.RenderJob 7
Shadows.RenderJobDir 7
Draw Mesh Sphere
Draw Dynamic
Draw Mesh Sphere
Draw Dynamic
Draw Mesh Sphere
Draw Dynamic
Draw Mesh Sphere
RenderForwardOpaque.CollectShad 2
Shadows.CollectShadows 2
Clear (color)
Draw GL
Clear 1
Clear (color+Z+stencil)
RenderForward.RenderLoopJob 3
Draw Dynamic
Draw Mesh Sphere
Draw Mesh Cube (4)
Camera.ImageEffects 2
RenderTexture.ResolveAA 1
Resolve Color
Draw Dynamic
RenderTarget Shadowmap
RT 0 Channels All R G B A Levels
2048x2048 143
Event #7: Draw Dynamic
Shader Standard, SubShader #0
Pass ShadowCaster (SHADOWCASTER)
Keywords SHADOWS_DEPTH
Blend One Zero
ZClip True
ZTest LessEqual
ZWrite On
Cull Back
Why this draw call can't be batched with the previous one
A submesh we are trying to dynamic-batch has more than 300 vertices.
Preview ShaderProperties
Vectors
_WorldSpaceLightPos0 v (0.3213938, 0.7660444, -0.5566704, 0)
unity_LightShadowBias v (-0.001100404, 1, 0.02020543, 0)
Matrices
unity_MatrixVP v 0.12 -2.4e-09 0.071 -0.084
0.054 -0.091 -0.094 0.2
0.0071 0.017 -0.012 0.17
0 0 0 1

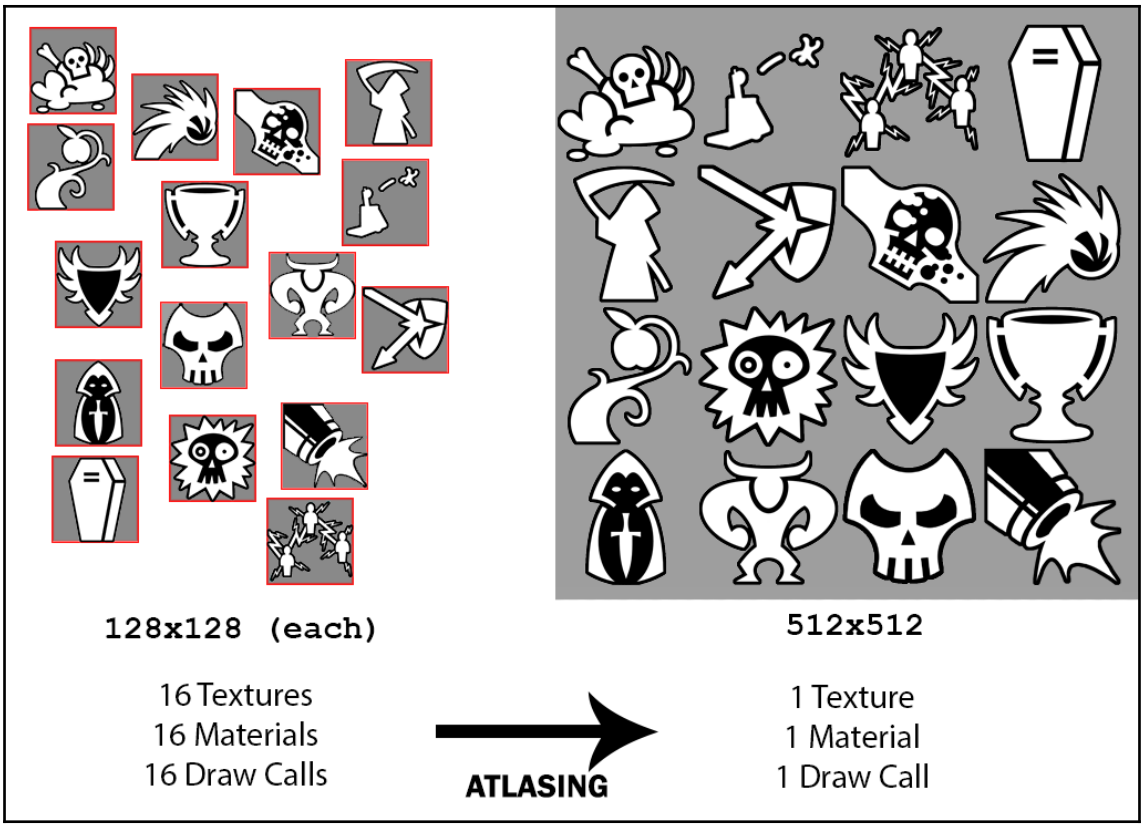
Chapter 4: Optimizing Your Art Assets



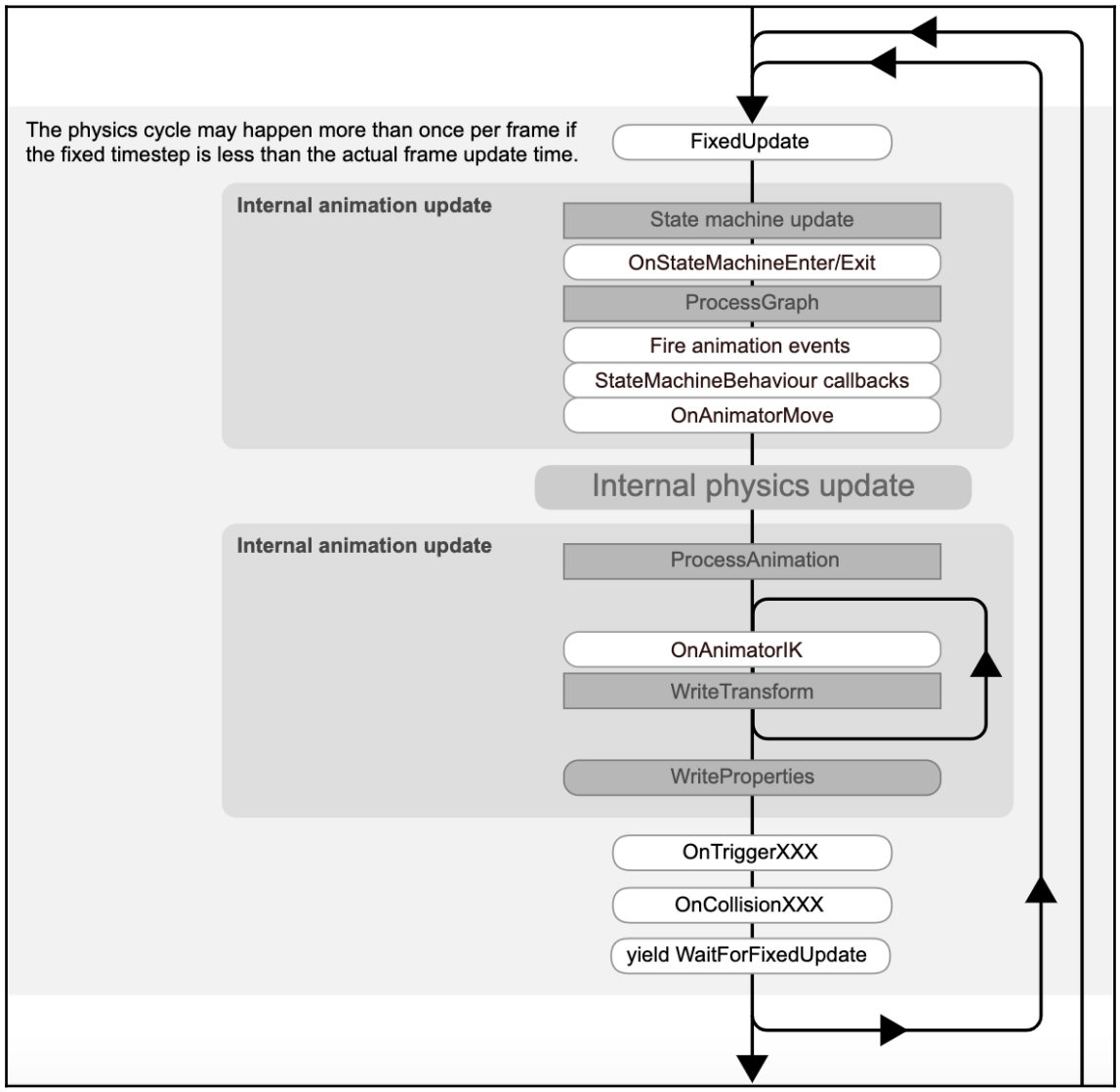

Texture Type
Default
Texture Shape
2D
sRGB (Color Texture)
Alpha Source
Input Texture Alpha
Alpha Is Transparency
Advanced
Non-Power of 2
ToNearest
Read/Write Enabled
Streaming MipMaps
Generate Mip Maps
Border Mip Maps
Mip Map Filtering
Box
Mip Maps Preserve Coverage
Fadeout Mip Maps
Wrap Mode
Repeat
Filter Mode
Bilinear
Aniso Level
1
Default
Max Size
2048
Resize Algorithm
Mitchell
Format
Automatic
Compression
Normal Quality
Use Crunch Compression
Revert
Apply

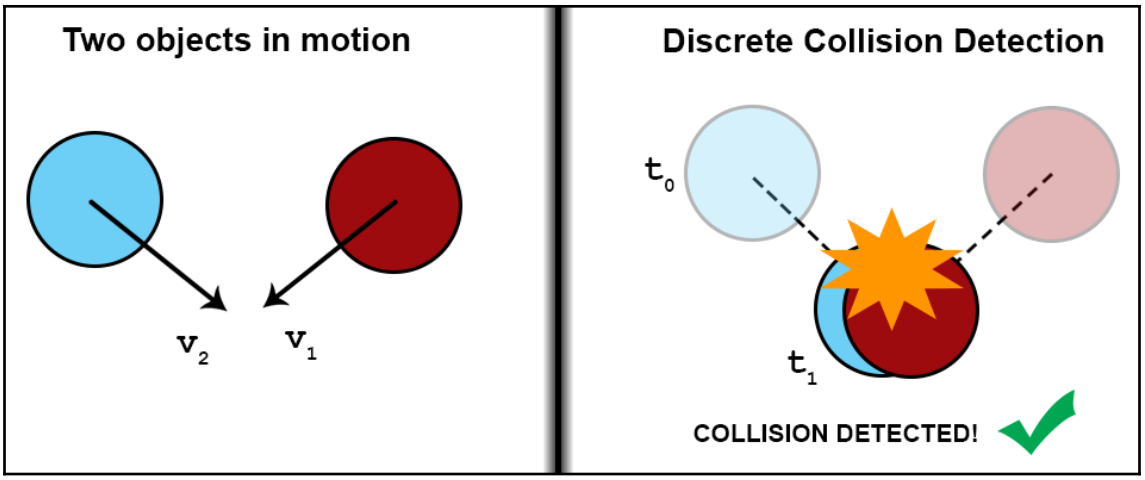

1024x1024
512x512
256x256
128x128

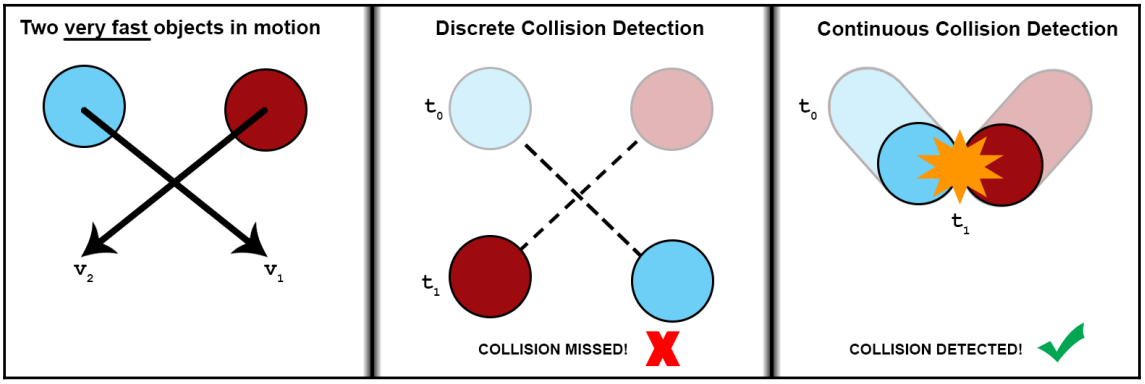

No Anisotropic Filtering
16x Anisotropic Filtering

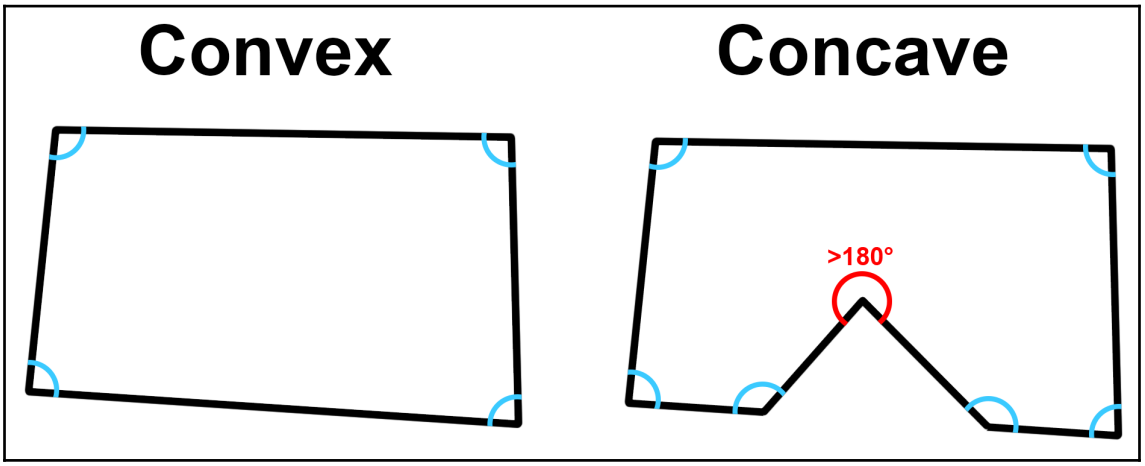

128x128 (each)
512x512
16 Textures
16 Materials
16 Draw Calls
ATLASING
1 Texture
1 Material
1 Draw Call

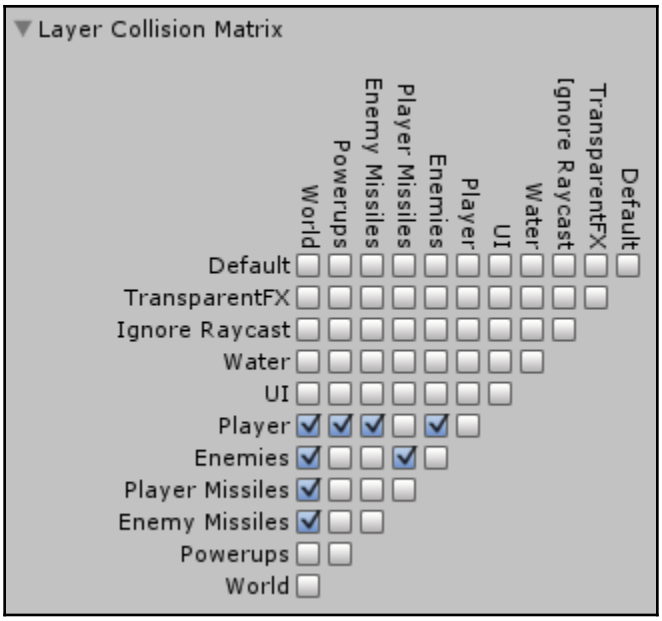
Chapter 5: Faster Physics

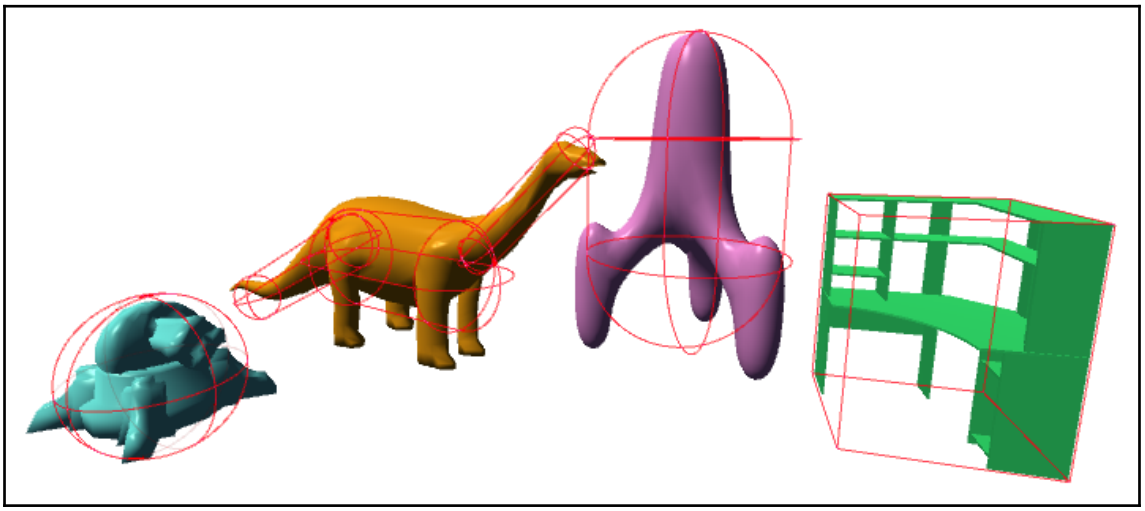


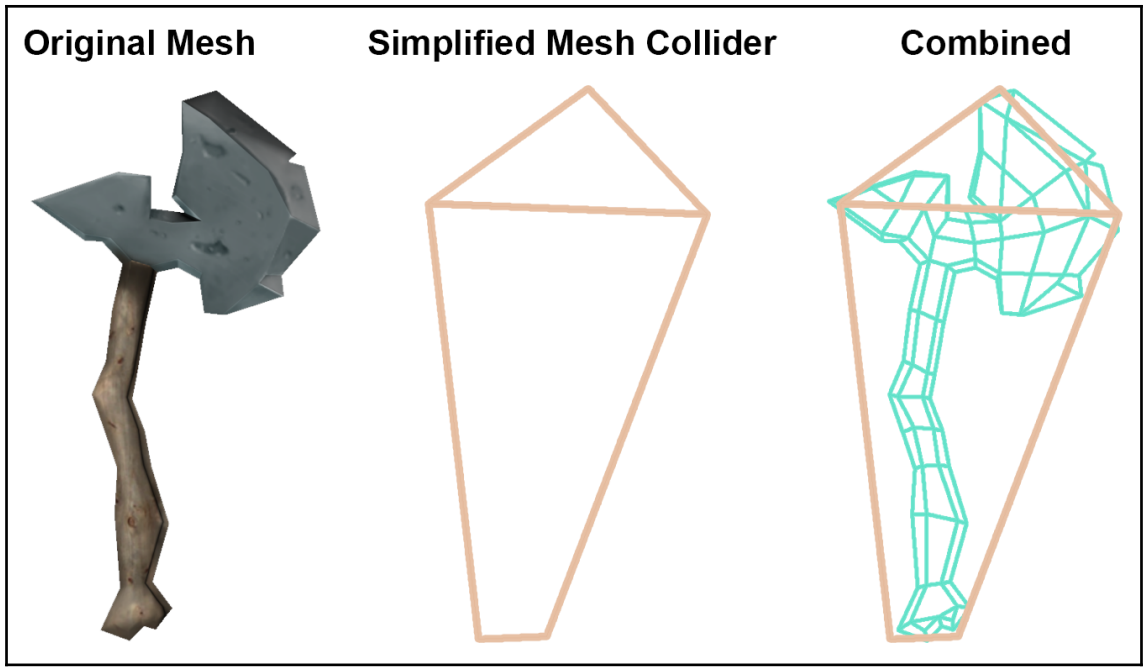

Two objects in motion
v_2
v_1
Discrete Collision Detection
t_0
t_1
COLLISION DETECTED!


Two very fast objects in motion
v_2
v_1
Discrete Collision Detection
t_0
t_1
COLLISION MISSED!
Continuous Collision Detection
t_0
t_1
COLLISION DETECTED!

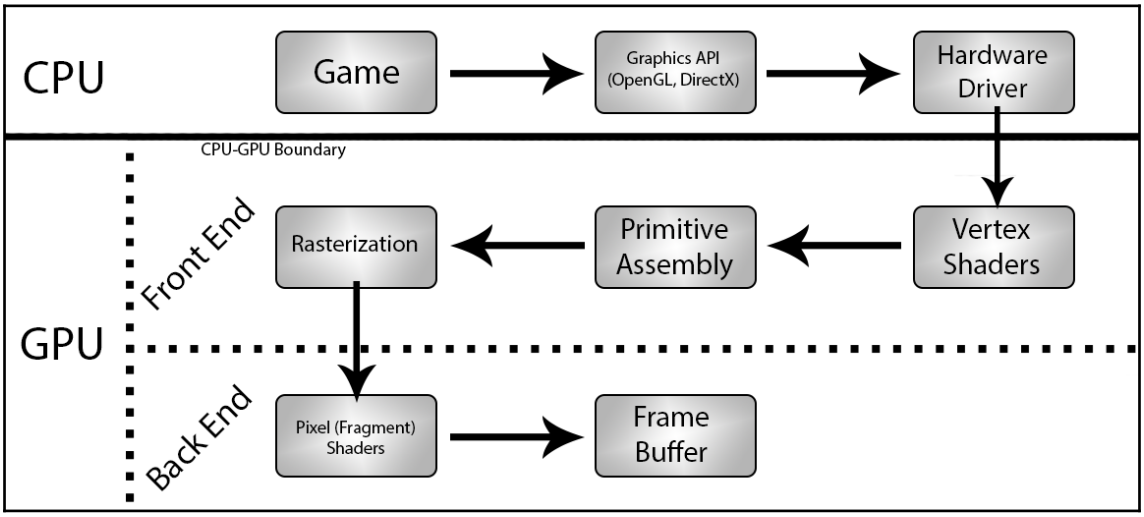

Convex
Concave
>180°

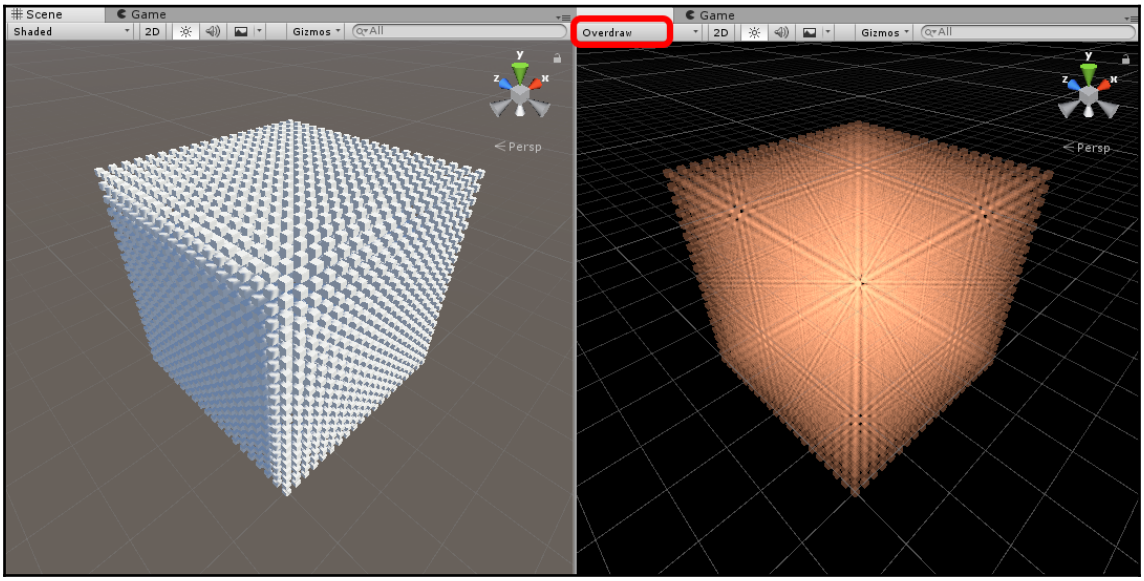

Layer Collision Matrix
World
Powerups
Enemy Missiles
Player Missiles
Enemies
Player
UI
Water
Ignore Raycast
TransparentFX
Default
Default
TransparentFX
Ignore Raycast
Water
UI
Player
Enemies
Player Missiles
Enemy Missiles
Powerups
World



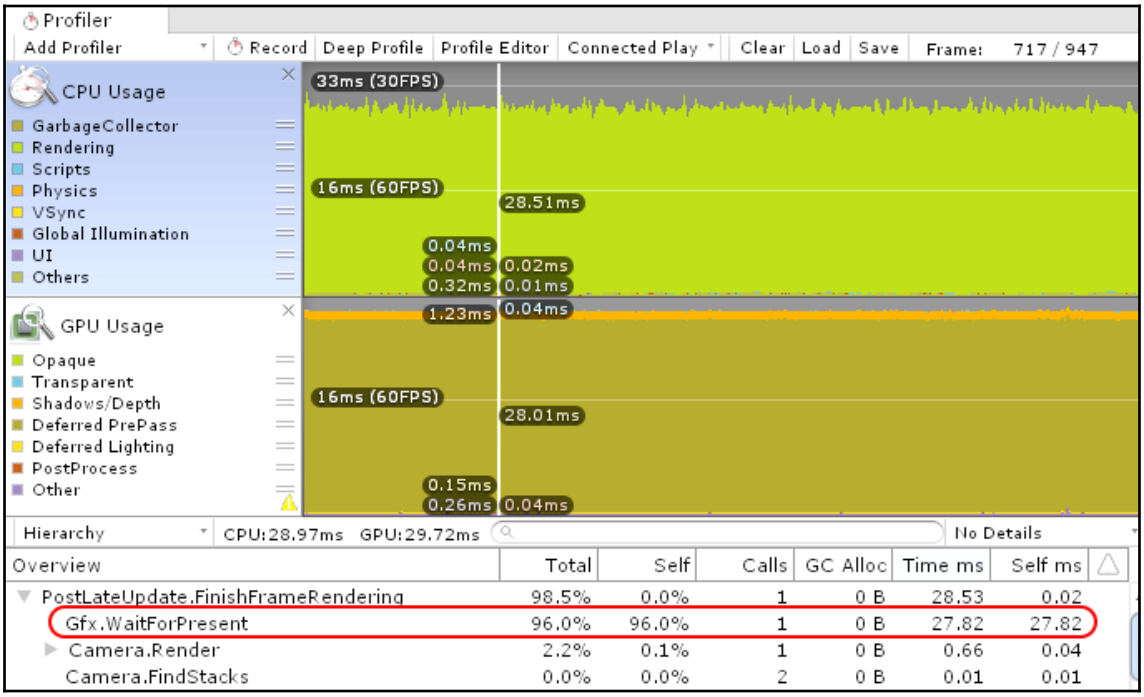

Original Mesh
Simplified Mesh Collider
Combined

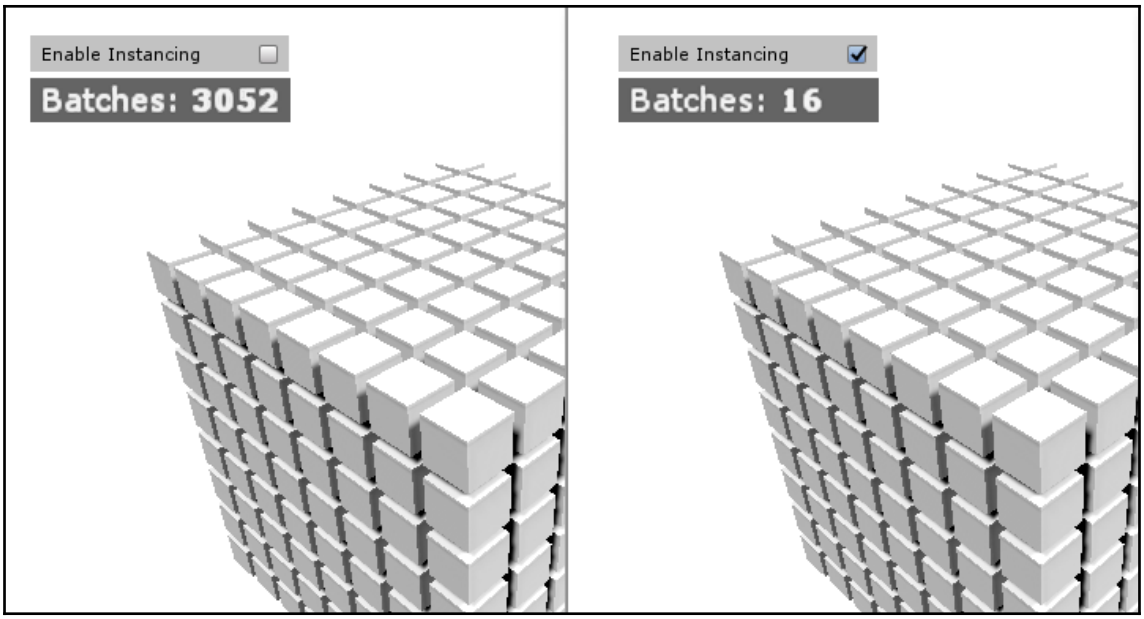
Chapter 6: Dynamic Graphics

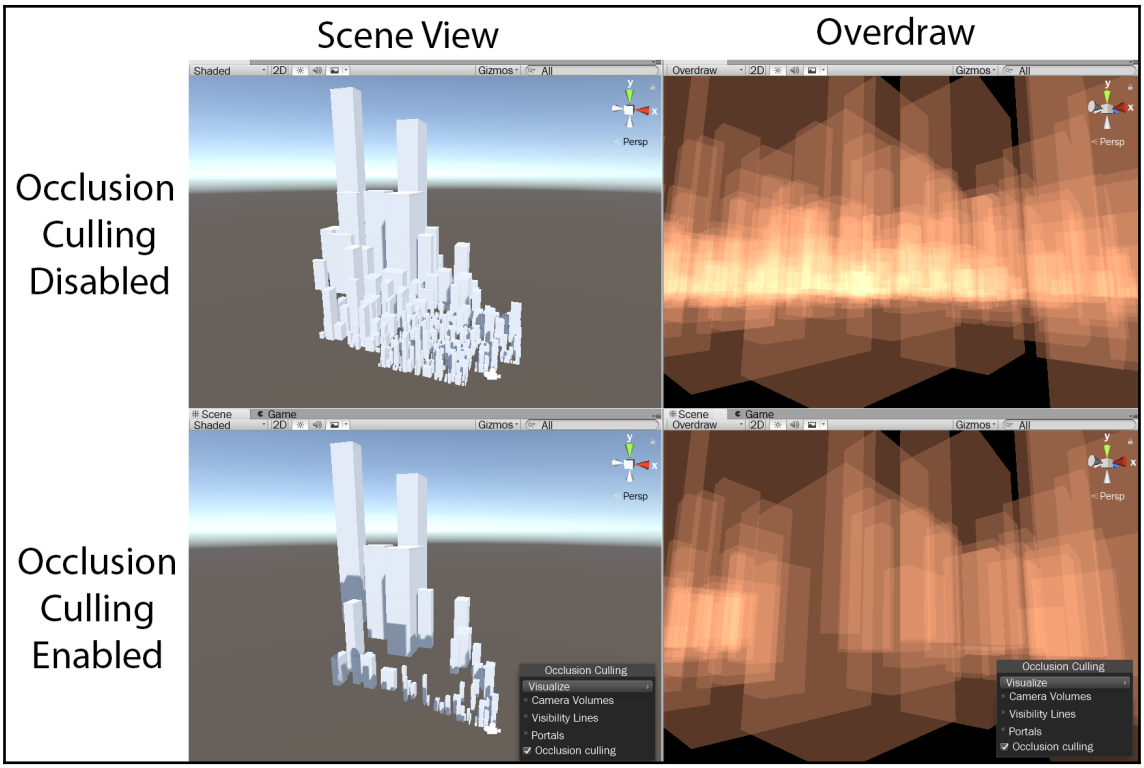


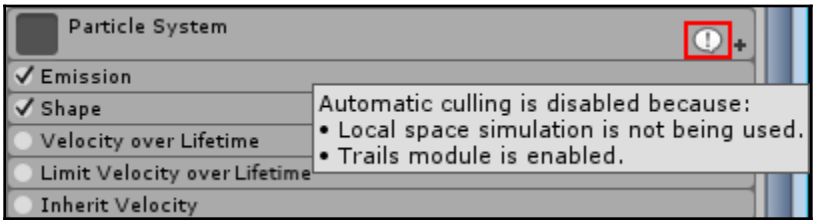


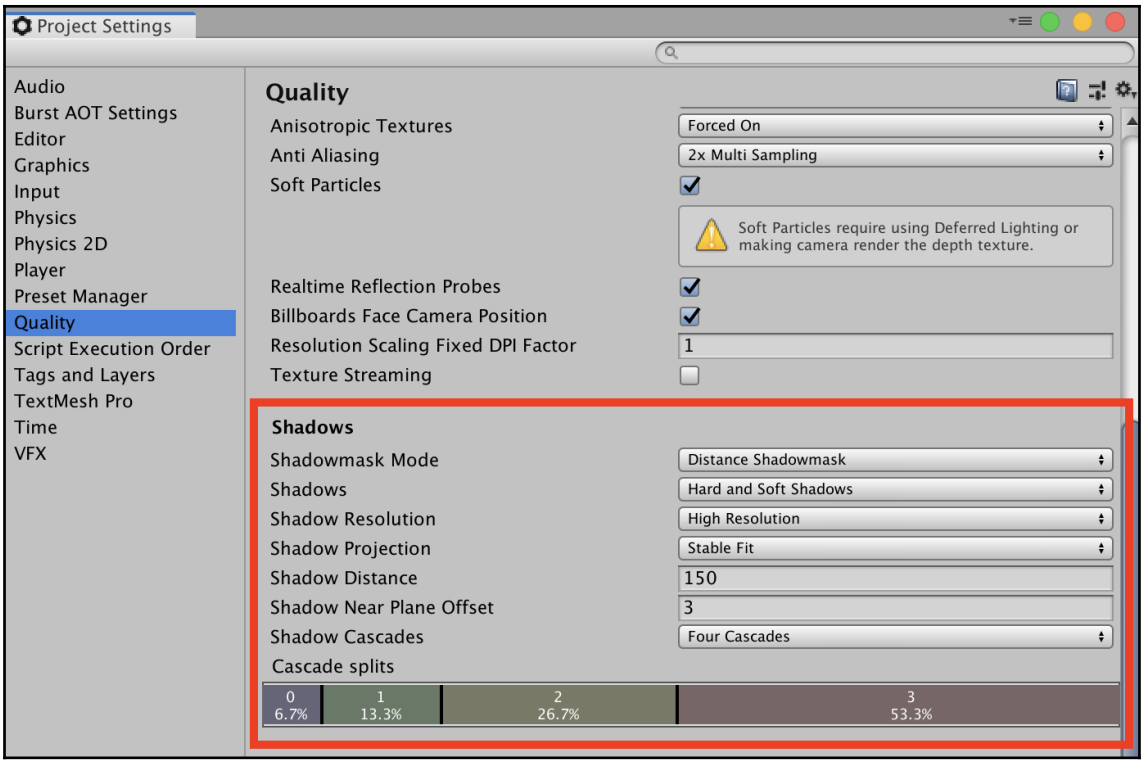

Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Connected Play
Clear
Load
Save
Frame: 1936 / 2097
CPU Usage
GarbageCollector
Rendering
Scripts
Physics
VSync
Global Illumination
UI
Others
33ms (30FPS)
16ms (60FPS)
25.41ms
0.02ms
0.01ms
0.01ms
0.00ms
10.53ms
GPU Usage
Opaque
Transparent
Shadows/Depth
Deferred PrePass
Deferred Lighting
PostProcess
Other
4ms (250FPS)
3.78ms
1ms (1000FPS)
0.02ms
0.07ms
0.24ms
0.05ms
Hierarchy
CPU: 36.01ms GPU: 4.15ms
No Details


Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Connected Play
Clear
Load
Save
Frame: 717 / 947
CPU Usage
GarbageCollector
Rendering
Scripts
Physics
VSync
Global Illumination
UI
Others
33ms (30FPS)
16ms (60FPS)
28.51ms
0.04ms
0.04ms
0.02ms
0.32ms
0.01ms
GPU Usage
Opaque
Transparent
Shadows/Depth
Deferred PrePass
Deferred Lighting
PostProcess
Other
1.23ms
0.04ms
16ms (60FPS)
28.01ms
0.15ms
0.26ms
0.04ms
Hierarchy
CPU: 28.97ms GPU: 29.72ms
No Details
Overview
Total
Self
Calls
GC Alloc
Time ms
Self ms
PostLateUpdate.FinishFrameRendering 98.5% 0.0% 1 0 B 28.53 0.02
Gfx.WaitForPresent 96.0% 96.0% 1 0 B 27.82 27.82
Camera.Render 2.2% 0.1% 1 0 B 0.66 0.04
Camera.FindStacks 0.0% 0.0% 2 0 B 0.01 0.01

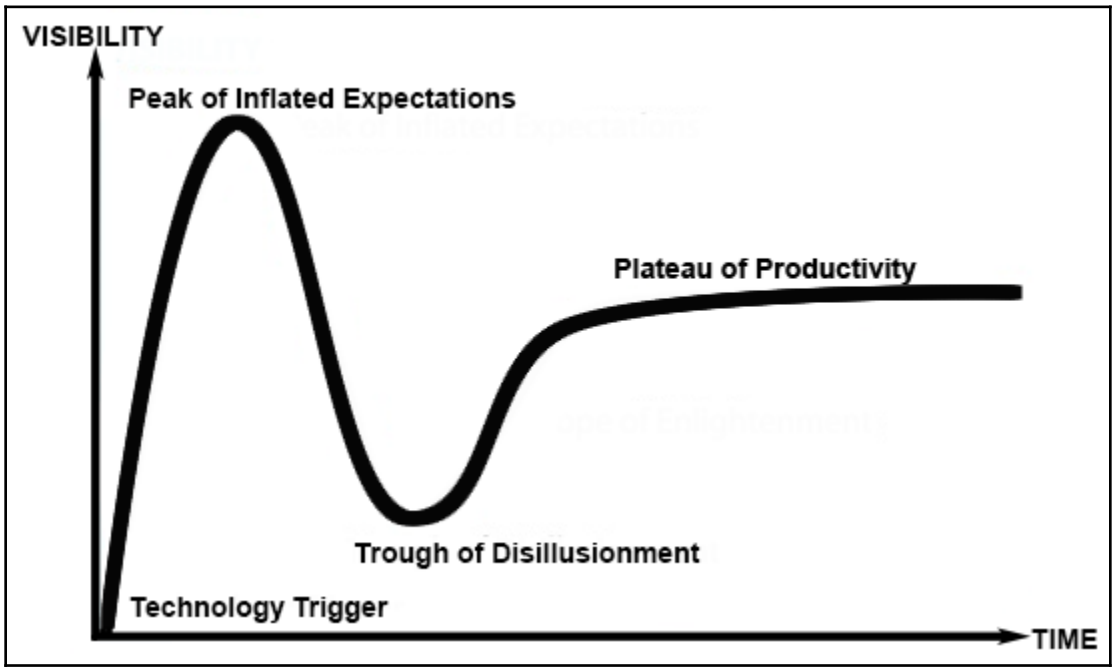

Enable Instancing
Batches: 3052
Enable Instancing
Batches: 16

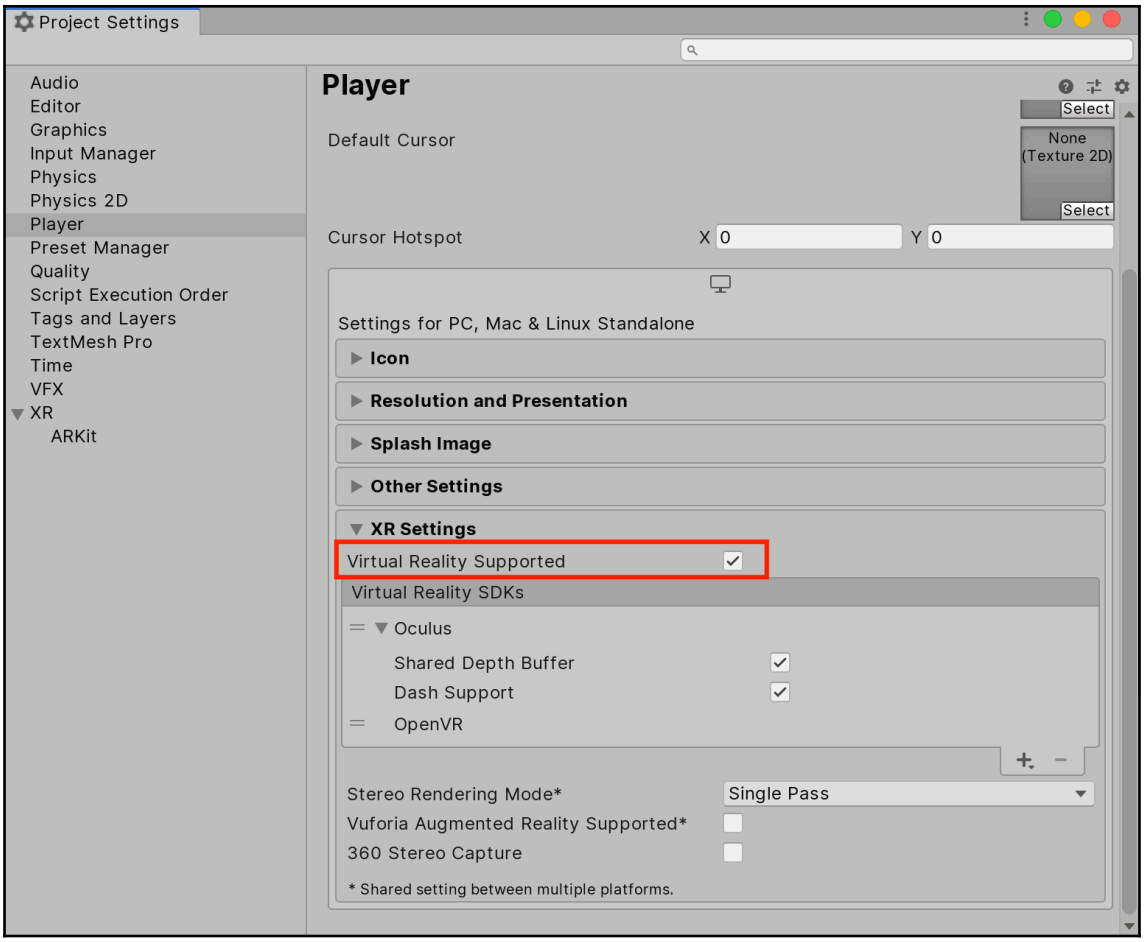

Scene View
Overdraw
Occlusion Culling Disabled
Occlusion Culling Enabled
Shaded
Overdraw
2D
Gizmos
All
Persp
Scene
Game
Occlusion Culling
Visualize
Camera Volumes
Visibility Lines
Portals
Occlusion culling

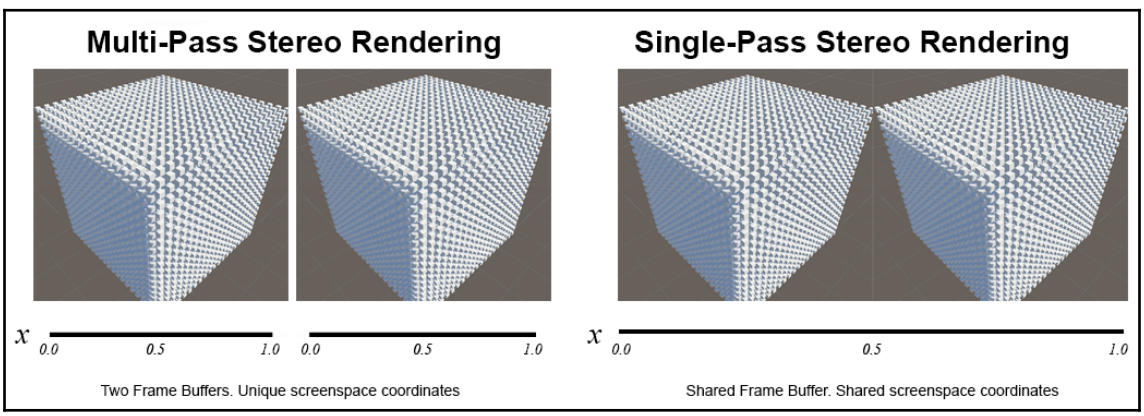

Particle System
Emission
Shape
Velocity over Lifetime
Limit Velocity over Lifetime
Inherit Velocity
Automatic culling is disabled because:
• Local space simulation is not being used.
• Trails module is enabled.


Project Settings
Audio
Burst AOT Settings
Editor
Graphics
Input
Physics
Physics 2D
Player
Preset Manager
Quality
Script Execution Order
Tags and Layers
TextMesh Pro
Time
VFX
Quality
Anisotropic Textures
Forced On
Anti Aliasing
2x Multi Sampling
Soft Particles
Soft Particles require using Deferred Lighting or making camera render the depth texture.
Realtime Reflection Probes
Billboards Face Camera Position
Resolution Scaling Fixed DPI Factor
1
Texture Streaming
Shadows
Shadowmask Mode
Distance Shadowmask
Shadows
Hard and Soft Shadows
Shadow Resolution
High Resolution
Shadow Projection
Stable Fit
Shadow Distance
150
Shadow Near Plane Offset
3
Shadow Cascades
Four Cascades
Cascade splits
0
6.7%
1
13.3%
2
26.7%
3
53.3%

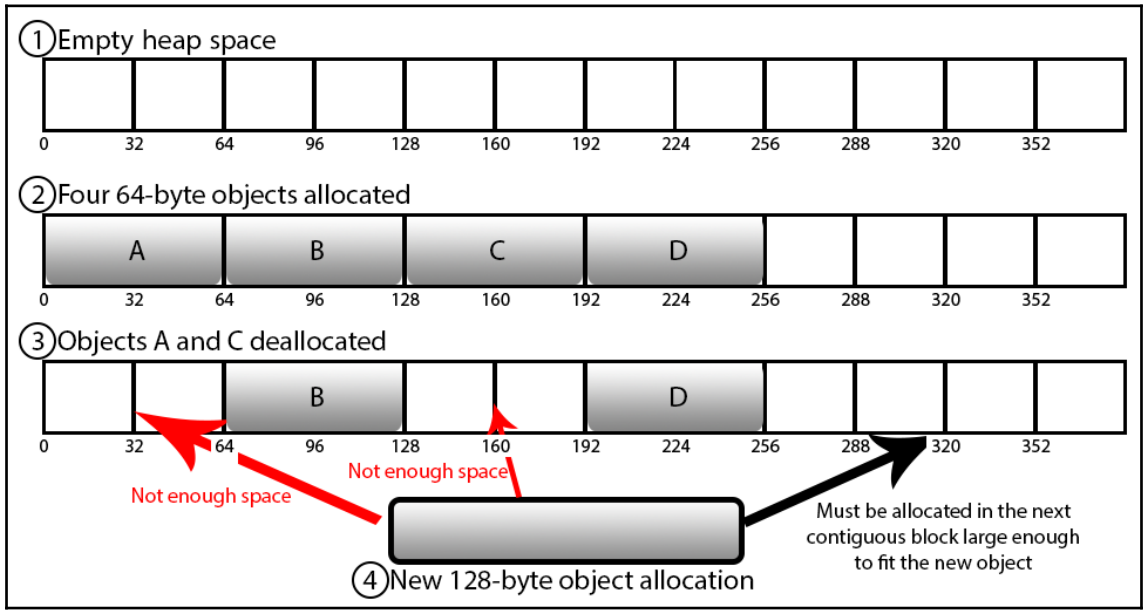
Chapter 7: Optimizations for Virtual and Augmented Reality

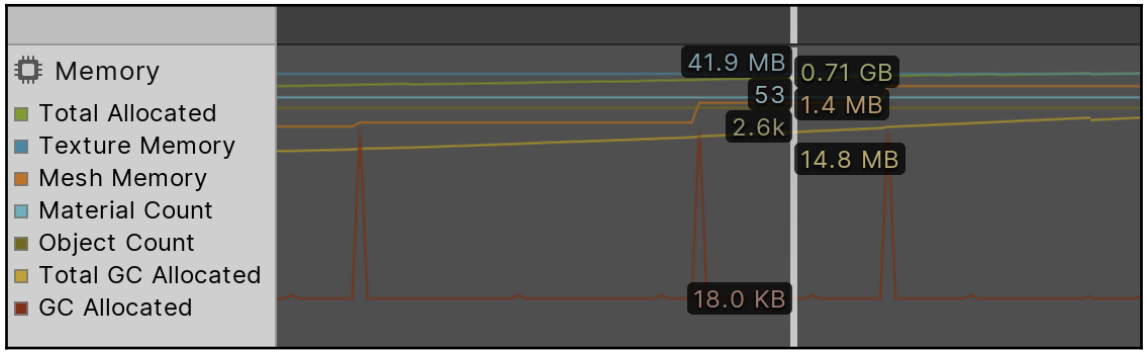


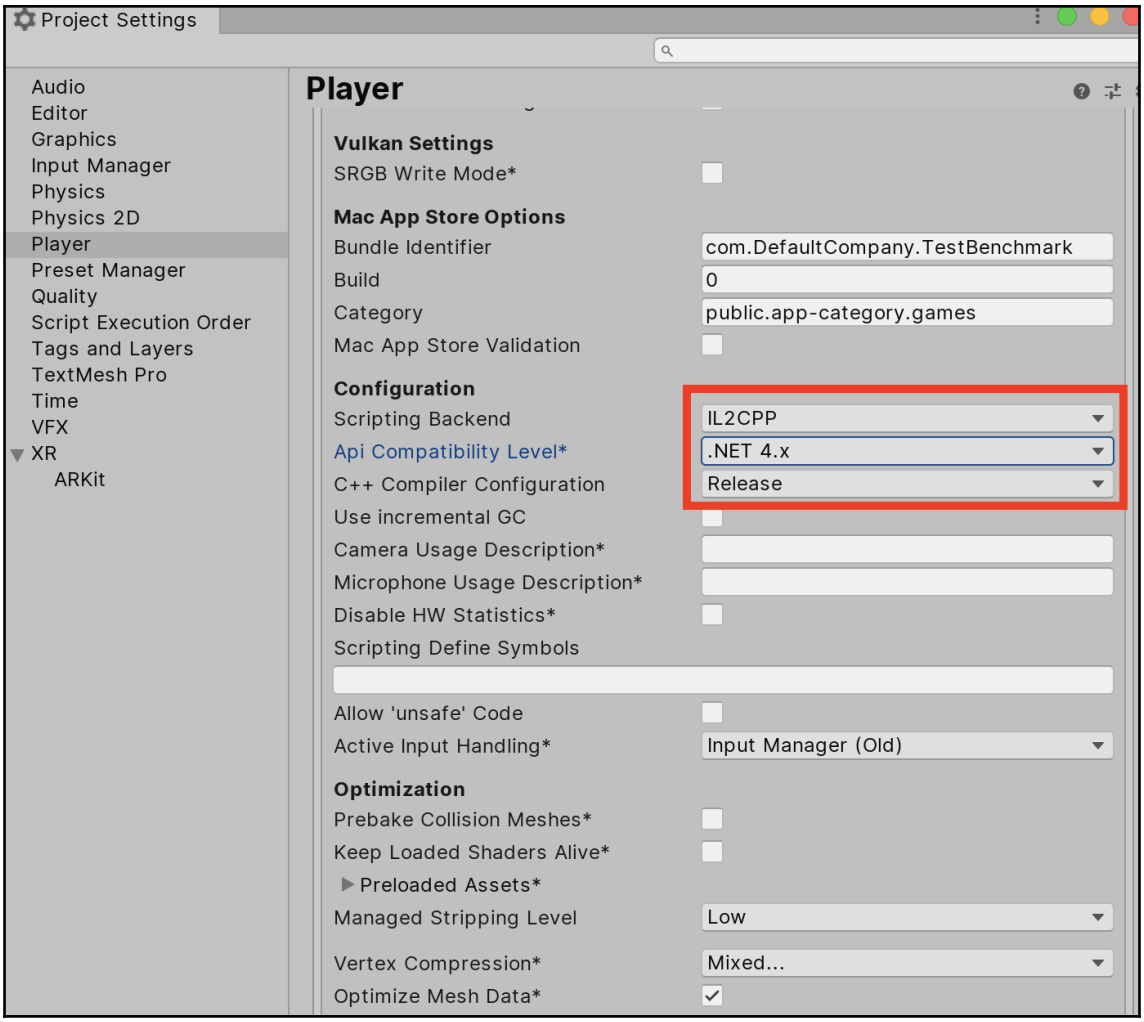

Project Settings
Audio
Editor
Graphics
Input Manager
Physics
Physics 2D
Player
Preset Manager
Quality
Script Execution Order
Tags and Layers
TextMesh Pro
Time
VFX
XR
ARKit
Player
Default Cursor
Select
None
(Texture 2D)
Select
Cursor Hotspot
X 0
Y 0
Settings for PC, Mac & Linux Standalone
Icon
Resolution and Presentation
Splash Image
Other Settings
XR Settings
Virtual Reality Supported
Virtual Reality SDKs
Oculus
Shared Depth Buffer
Dash Support
OpenVR
Stereo Rendering Mode*
Single Pass
Vuforia Augmented Reality Supported*
360 Stereo Capture
* Shared setting between multiple platforms.


Multi-Pass Stereo Rendering
Single-Pass Stereo Rendering
x
0.0
0.5
1.0
0.0
0.5
1.0
x
0.0
0.5
1.0
Two Frame Buffers. Unique screenspace coordinates
Shared Frame Buffer. Shared screenspace coordinates

Chapter 8: Masterful Memory Management





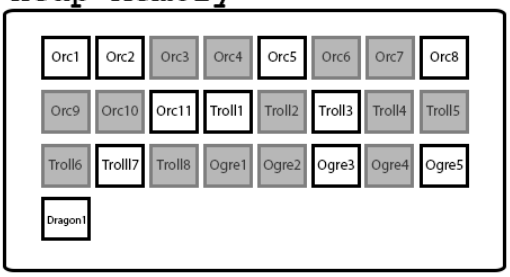

Project Settings
Audio
Editor
Graphics
Input Manager
Physics
Physics 2D
Player
Preset Manager
Quality
Script Execution Order
Tags and Layers
TextMesh Pro
Time
VFX
XR
ARKit
Player
Vulkan Settings
SRGB Write Mode*
Mac App Store Options
Bundle Identifier
com.DefaultCompany.TestBenchmark
Build
0
Category
public.app-category.games
Mac App Store Validation
Configuration
Scripting Backend
IL2CPP
Api Compatibility Level*
.NET 4.x
C++ Compiler Configuration
Release
Use incremental GC
Camera Usage Description*
Microphone Usage Description*
Disable HW Statistics*
Scripting Define Symbols
Allow 'unsafe' Code
Active Input Handling*
Input Manager (Old)
Optimization
Prebake Collision Meshes*
Keep Loaded Shaders Alive*
Preloaded Assets*
Managed Stripping Level
Low
Vertex Compression*
Mixed...
Optimize Mesh Data*


Used Total: 101.2 MB Unity: 68.1 MB Mono: 7.8 MB GfxDriver: 15.8 MB FMOD: 1.3 MB Video: 224 B Profiler: 9.5 MB
Reserved Total: 241.4 MB Unity: 199.0 MB Mono: 10.7 MB GfxDriver: 15.8 MB FMOD: 1.3 MB Video: 224 B Profiler: 16.0 MB
Total System Memory Usage: 0.78 GB

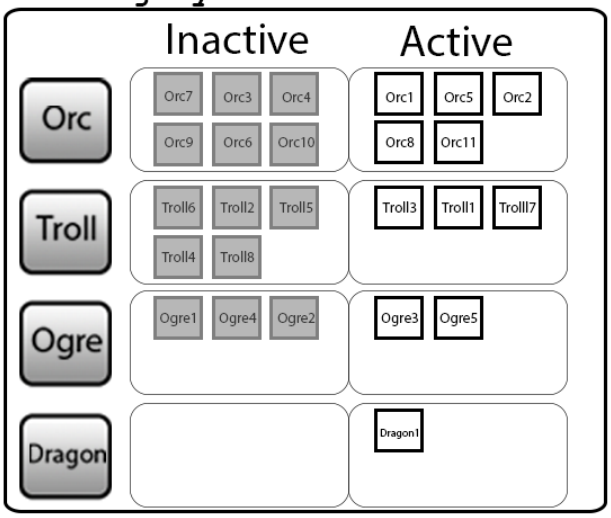

Used Total: 101.2 MB Unity: 68.1 MB Mono: 7.8 MB GfxDriver: 15.8 MB FMOD: 1.3 MB Video: 224 B Profiler: 9.5 MB
Reserved Total: 241.4 MB Unity: 199.0 MB Mono: 10.7 MB GfxDriver: 15.8 MB FMOD: 1.3 MB Video: 224 B Profiler: 16.0 MB
Total System Memory Usage: 0.78 GB

11 Orcs (5 active, 6 inactive)
8 Trolls (3 active, 5 inactive)
5 Ogres (2 active, 3 inactive)
1 Dragon (1 active)

Heap Memory



Pooling System



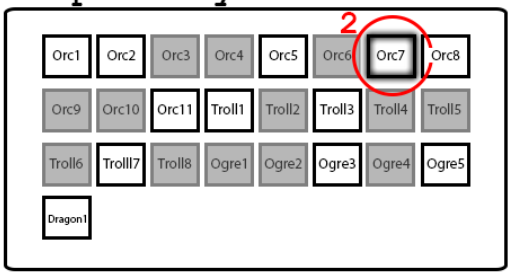
New Orc is spawned

1. Determine which Pool corresponds to the given Prefab

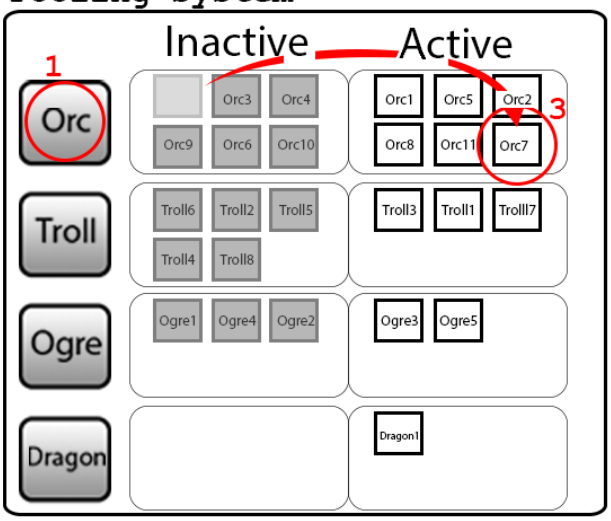
2. The first inactive Orc in the Inactive Group (Orc7) is activated - the corresponding object in the Heap is therefore activated

3. Newly-spawned Orc is moved to Active group

Heap Memory



Pooling System



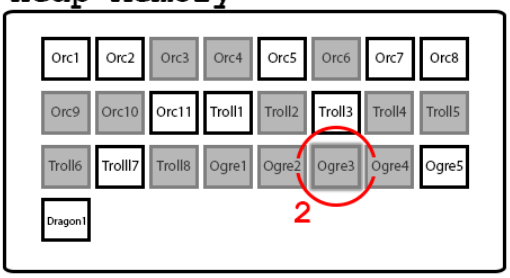
Ogre3 is despawned

1. Determine which Pool corresponds to the given object

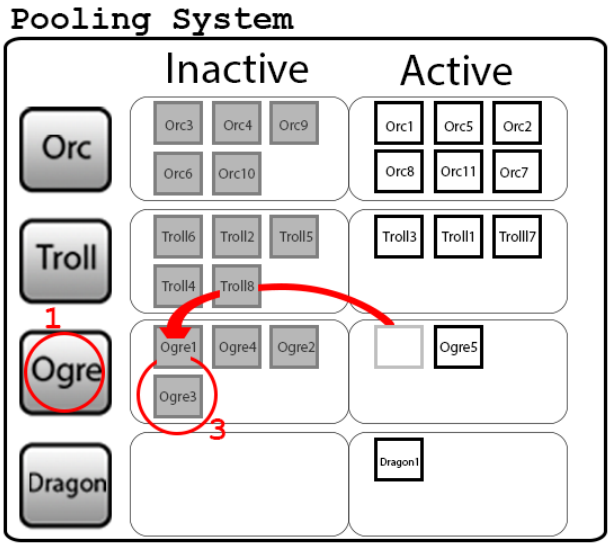
2. Deactivate Ogre3 - the corresponding object in the Heap is therefore deactivated

3. Move Ogre3 to Inactive group

Heap Memory



Pooling System



New Dragon is spawned

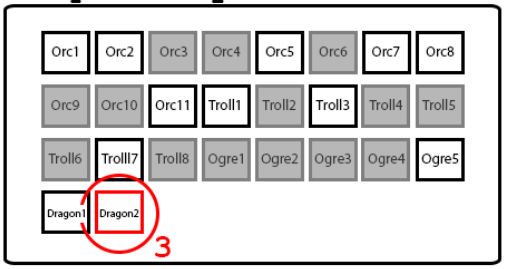
1. Determine which Pool corresponds to the given Prefab

2. Inactive group is empty, so a new instance of Dragon must be created

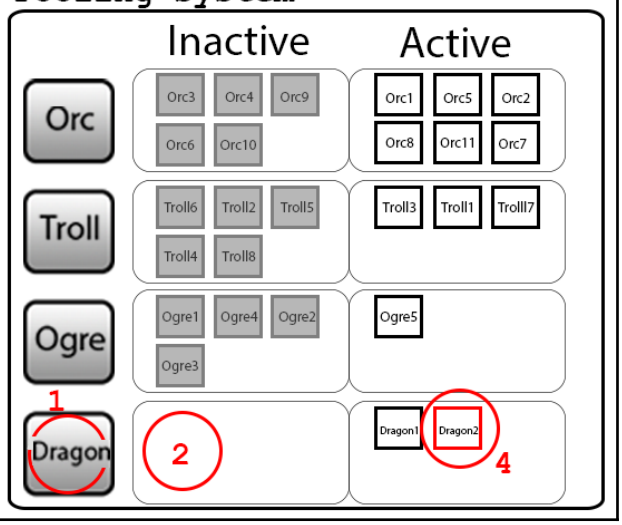
3. Instantiate a new Dragon from the Prefab on the heap

4. Add the newly created Dragon to the Active list

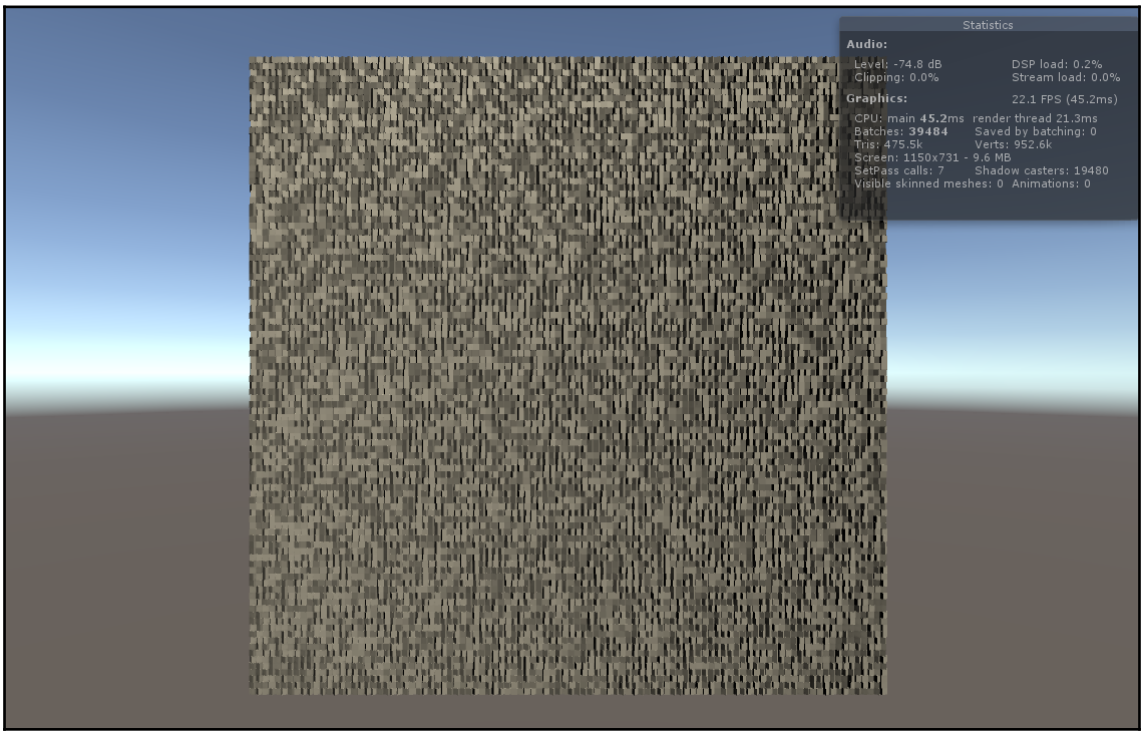
Heap Memory

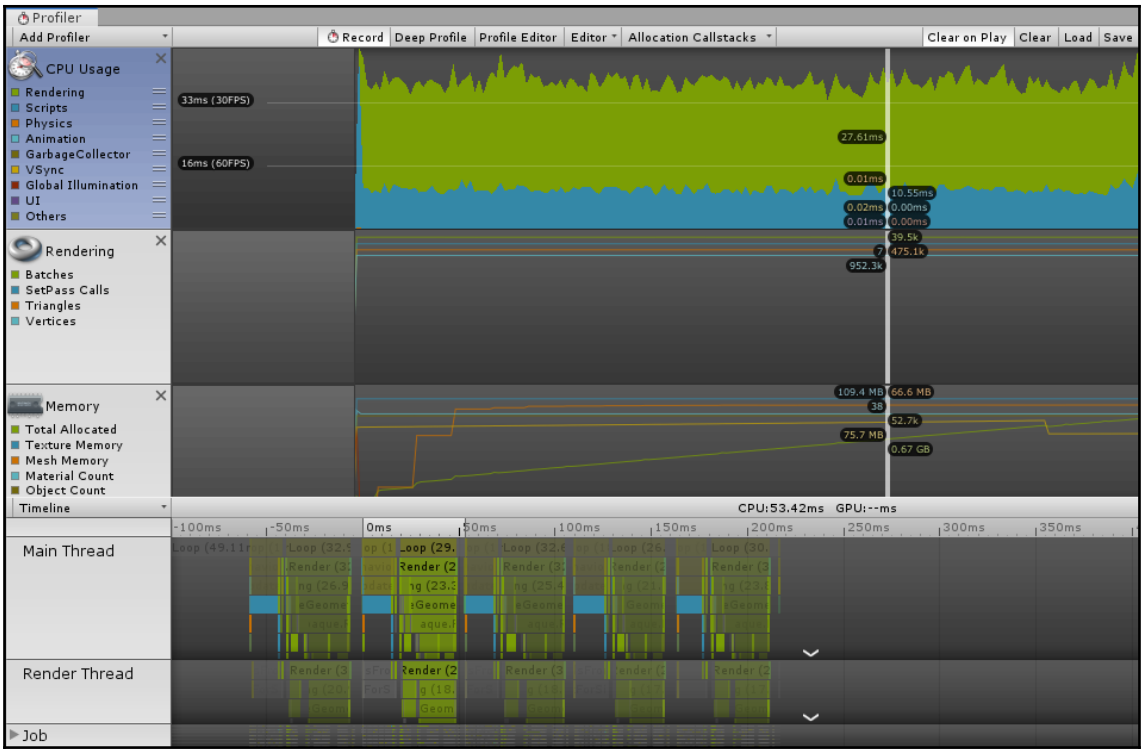


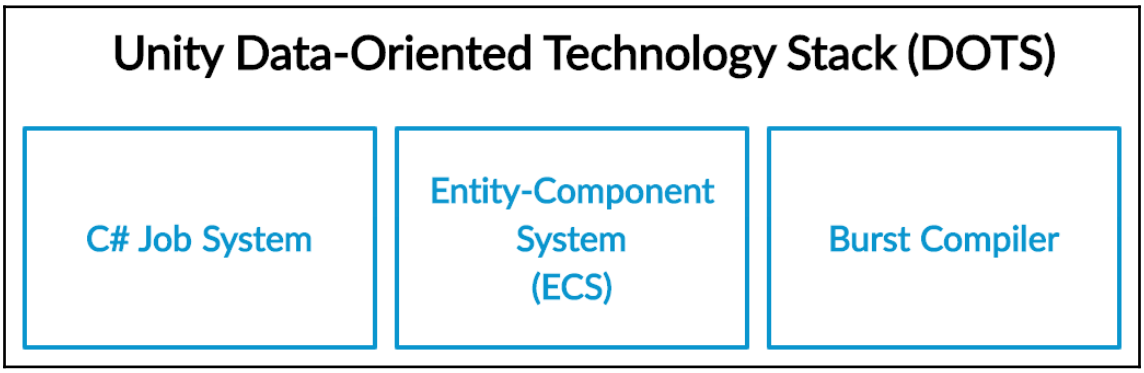
Pooling System

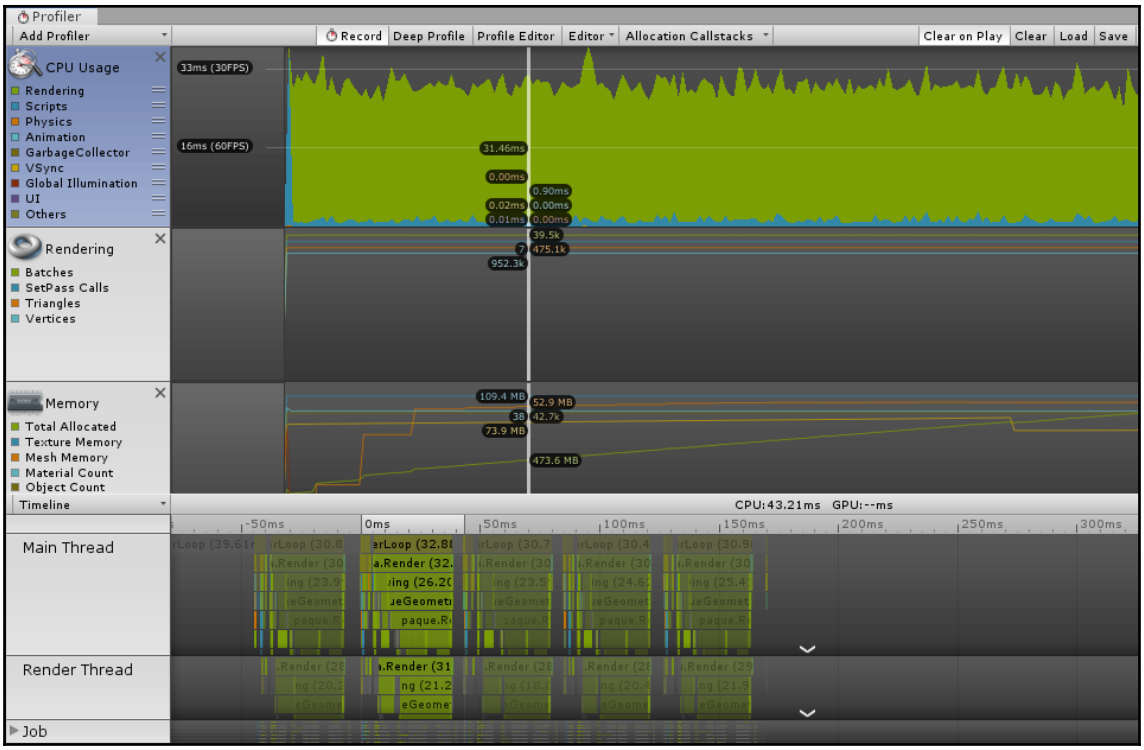


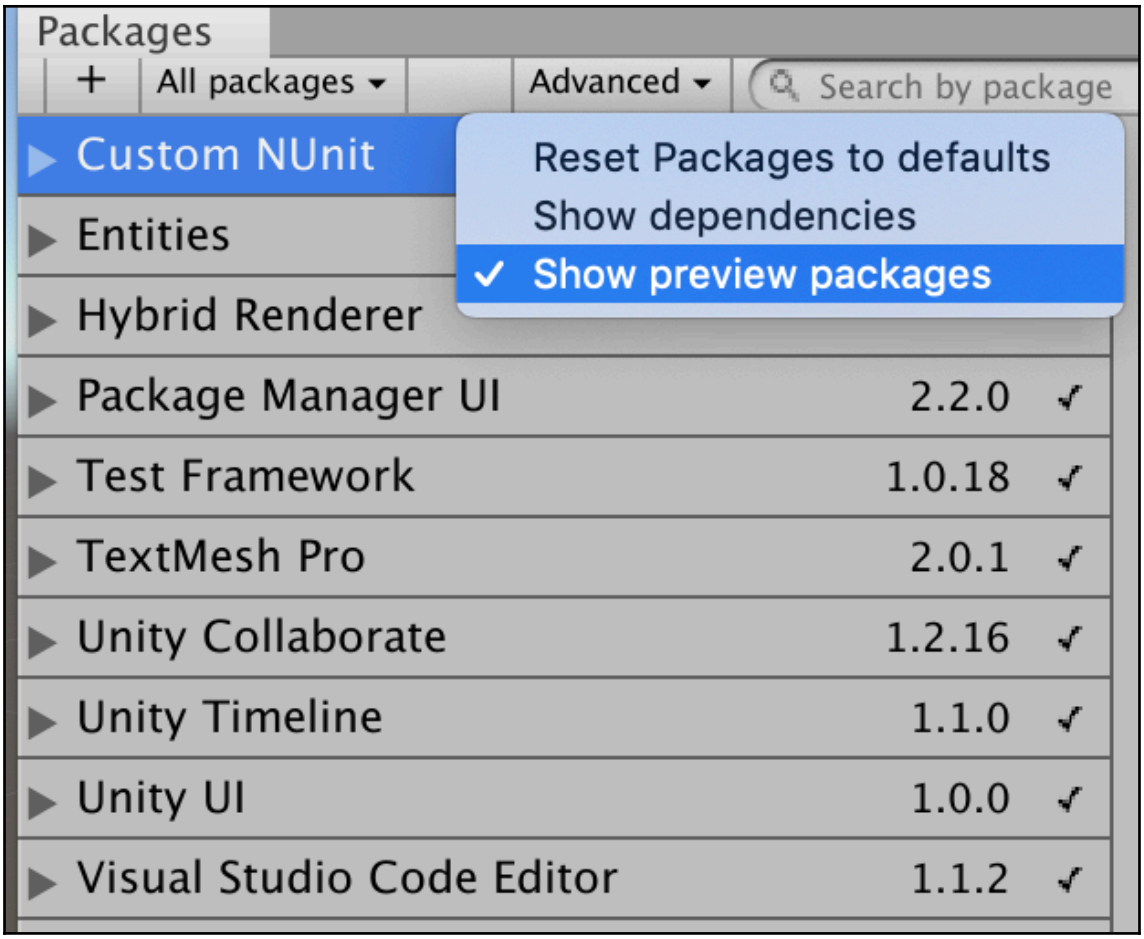
Chapter 9: The Data-Oriented Technology Stack

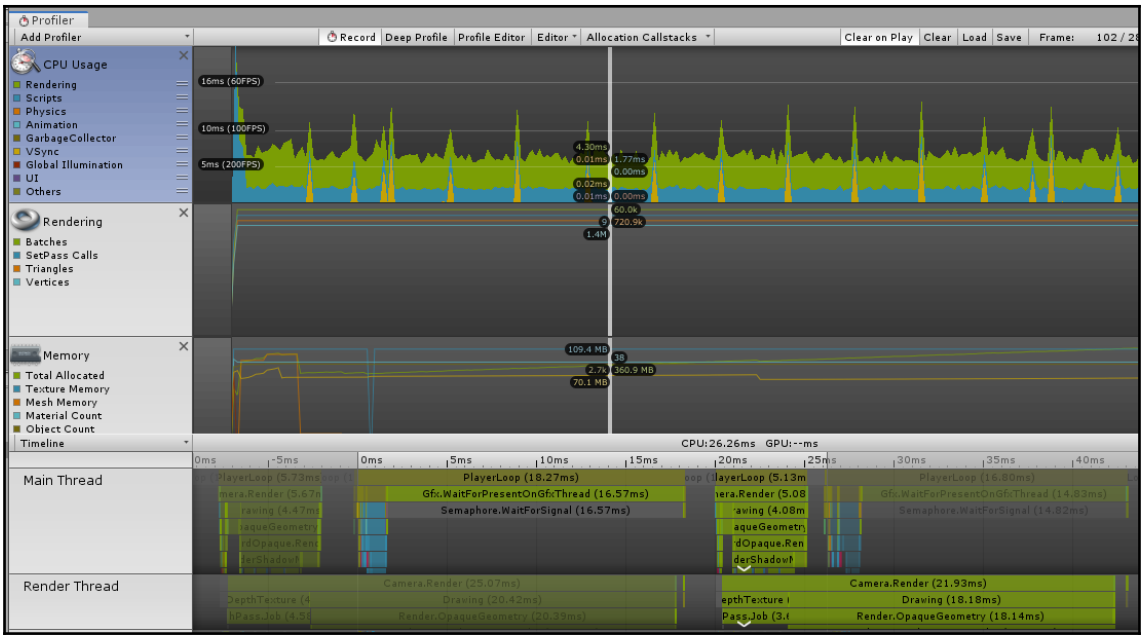



Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Editor
Allocation Callstacks
Clear on Play
Clear
Load
Save
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
33ms (30FPS)
16ms (60FPS)
27.61ms
0.01ms
10.55ms
0.02ms
0.00ms
0.01ms
0.00ms
Rendering
Batches
SetPass Calls
Triangles
Vertices
39.5k
475.1k
952.3k
Memory
Total Allocated
Texture Memory
Mesh Memory
Material Count
Object Count
109.4 MB
66.6 MB
38
52.7k
75.7 MB
0.67 GB
Timeline
CPU:53.42ms GPU:--ms
-100ms
-50ms
0ms
50ms
100ms
150ms
200ms
250ms
300ms
350ms
Main Thread
Render Thread
Job

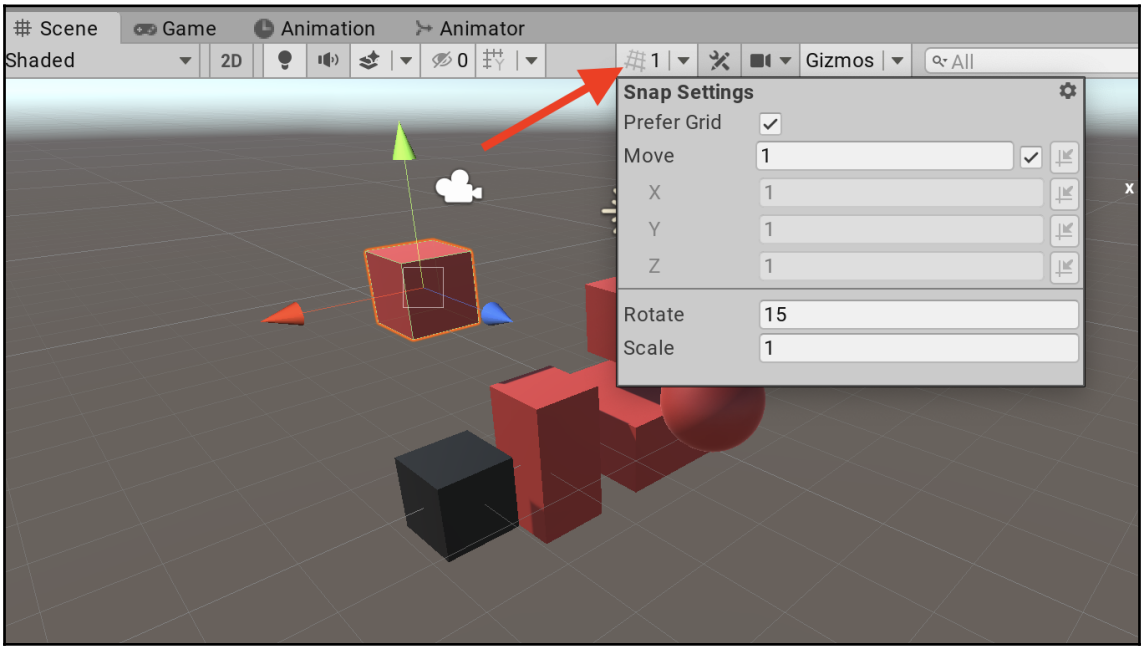

Unity Data-Oriented Technology Stack (DOTS)
C# Job System
Entity-Component System (ECS)
Burst Compiler

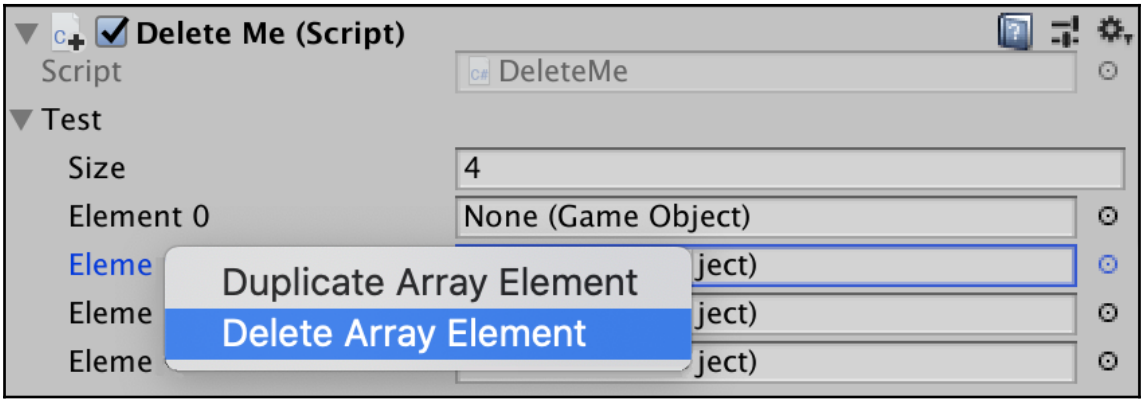

Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Editor
Allocation Callstacks
Clear on Play
Clear
Load
Save
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
33ms (30FPS)
16ms (60FPS)
31.46ms
0.00ms
0.90ms
0.02ms
0.00ms
0.01ms
0.00ms
Rendering
Batches
SetPass Calls
Triangles
Vertices
39.5k
475.1k
952.3k
Memory
Total Allocated
Texture Memory
Mesh Memory
Material Count
Object Count
109.4 MB
52.9 MB
42.7k
73.9 MB
473.6 MB
Timeline
CPU:43.21ms GPU:--ms
-50ms
0ms
50ms
100ms
150ms
200ms
250ms
300ms
Main Thread
Render Thread
Job

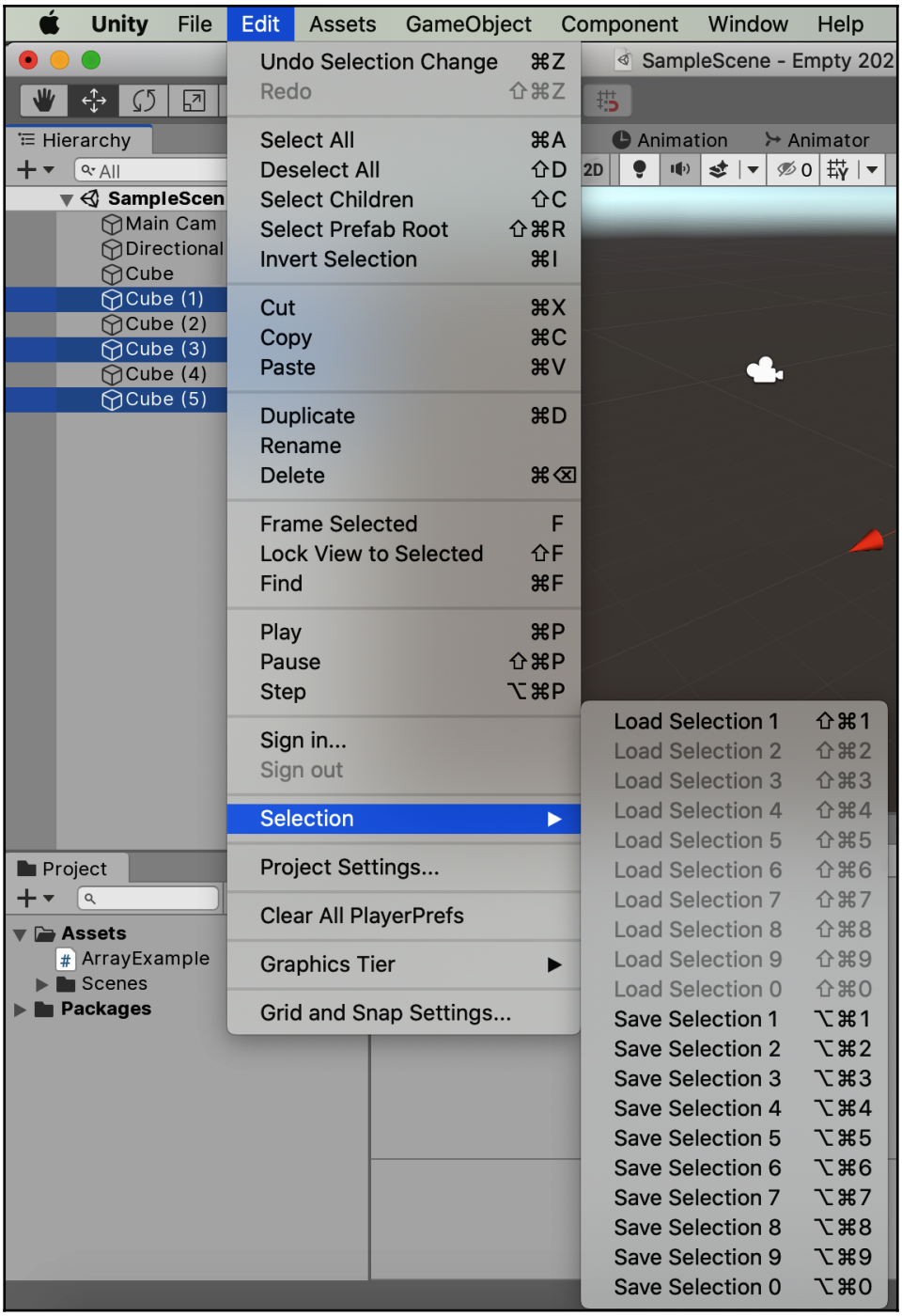

Packages
+
All packages
Advanced
Search by package
Custom NUnit
Entities
Hybrid Renderer
Package Manager UI 2.2.0
Test Framework 1.0.18
TextMesh Pro 2.0.1
Unity Collaborate 1.2.16
Unity Timeline 1.1.0
Unity UI 1.0.0
Visual Studio Code Editor 1.1.2
Reset Packages to defaults
Show dependencies
Show preview packages

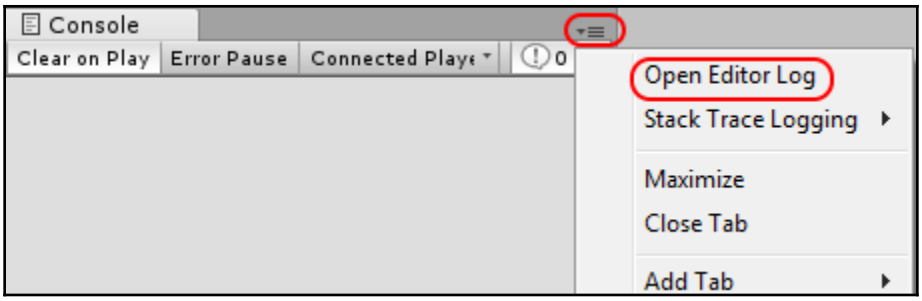

Profiler
Add Profiler
Record
Deep Profile
Profile Editor
Editor
Allocation Callstacks
Clear on Play
Clear
Load
Save
Frame:
CPU Usage
Rendering
Scripts
Physics
Animation
GarbageCollector
VSync
Global Illumination
UI
Others
16ms (60FPS)
10ms (100FPS)
5ms (200FPS)
Rendering
Batches
SetPass Calls
Triangles
Vertices
Memory
Total Allocated
Texture Memory
Mesh Memory
Material Count
Object Count
109.4 MB
360.9 MB
70.1 MB
Timeline
CPU:26.26ms GPU:--ms
Main Thread
PlayerLoop (18.27ms)
Gfx.WaitForPresentOnGfxThread (16.57ms)
Semaphore.WaitForSignal (16.57ms)
PlayerLoop (16.80ms)
Gfx.WaitForPresentOnGfxThread (14.83ms)
Semaphore.WaitForSignal (14.82ms)
Render Thread
Camera.Render (25.07ms)
Drawing (20.42ms)
Render.OpaqueGeometry (20.39ms)
Camera.Render (21.93ms)
Drawing (18.18ms)
Render.OpaqueGeometry (18.14ms)

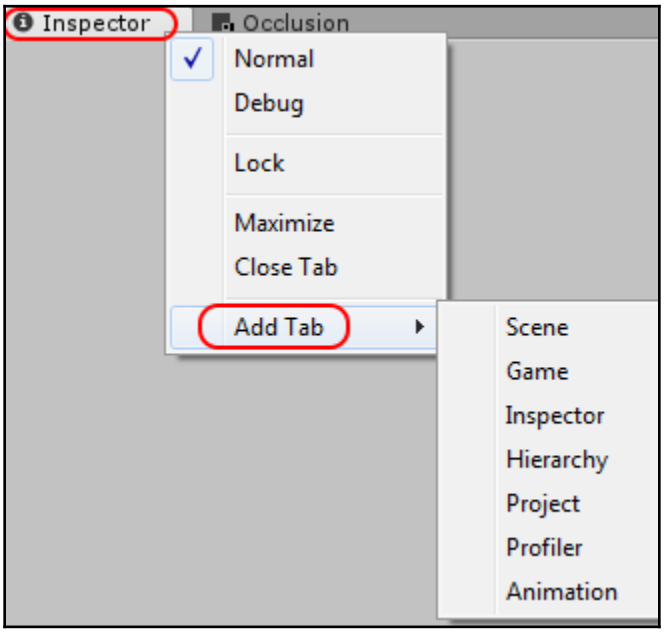
Chapter 10: Tactical Tips and Tricks



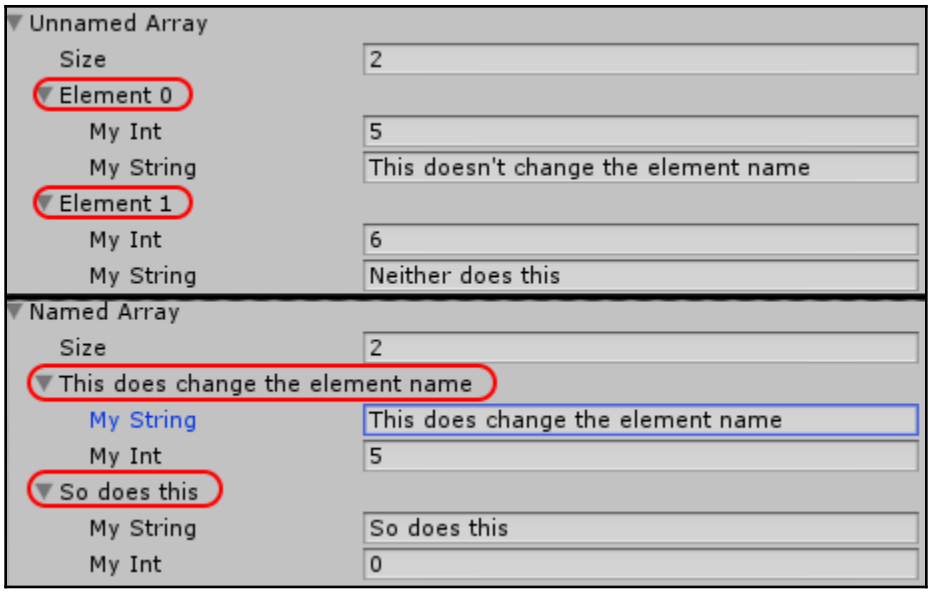


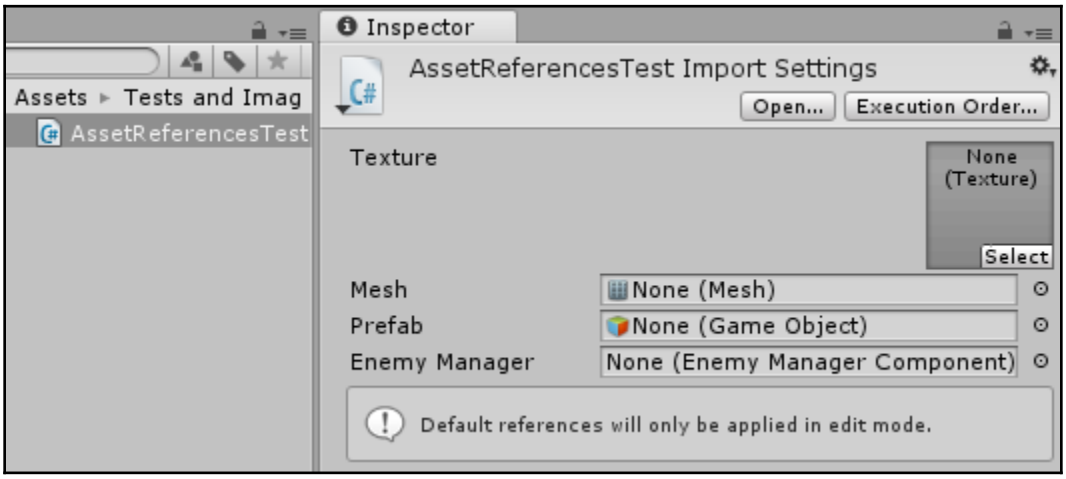

Unity
File
Edit
Assets
GameObject
Component
Window
Help
Undo Selection Change ⌘Z
Redo ⇧⌘Z
Select All ⌘A
Deselect All ⇧D
Select Children ⇧C
Select Prefab Root ⇧⌘R
Invert Selection ⌘I
Cut ⌘X
Copy ⌘C
Paste ⌘V
Duplicate ⌘D
Rename
Delete ⌘⌫
Frame Selected F
Lock View to Selected ⇧F
Find ⌘F
Play ⌘P
Pause ⇧⌘P
Step ⌥⌘P
Sign in...
Sign out
Selection
Project Settings...
Clear All PlayerPrefs
Graphics Tier
Grid and Snap Settings...
Load Selection 1 ⇧⌘1
Load Selection 2 ⇧⌘2
Load Selection 3 ⇧⌘3
Load Selection 4 ⇧⌘4
Load Selection 5 ⇧⌘5
Load Selection 6 ⇧⌘6
Load Selection 7 ⇧⌘7
Load Selection 8 ⇧⌘8
Load Selection 9 ⇧⌘9
Load Selection 0 ⇧⌘0
Save Selection 1 ⌥⌘1
Save Selection 2 ⌥⌘2
Save Selection 3 ⌥⌘3
Save Selection 4 ⌥⌘4
Save Selection 5 ⌥⌘5
Save Selection 6 ⌥⌘6
Save Selection 7 ⌥⌘7
Save Selection 8 ⌥⌘8
Save Selection 9 ⌥⌘9
Save Selection 0 ⌥⌘0
Hierarchy
SampleScen
Main Cam
Directional
Cube
Cube (1)
Cube (2)
Cube (3)
Cube (4)
Cube (5)
Project
Assets
ArrayExample
Scenes
Packages
SampleScene - Empty 202
Animation
Animator

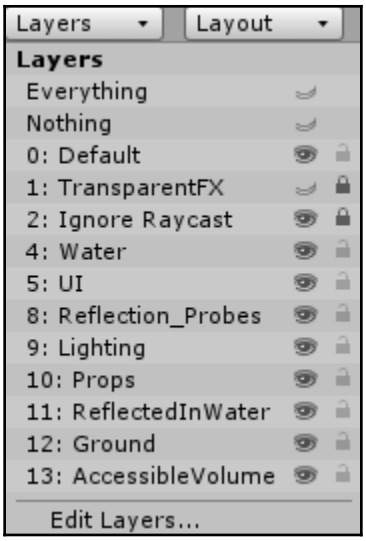

Console
Clear on Play
Error Pause
Connected Playe
0
Open Editor Log
Stack Trace Logging
Maximize
Close Tab
Add Tab


Inspector
Occlusion
Normal
Debug
Lock
Maximize
Close Tab
Add Tab
Scene
Game
Inspector
Hierarchy
Project
Profiler
Animation


Inspector


Unnamed Array
Size
2
Element 0
My Int
5
My String
This doesn't change the element name
Element 1
My Int
6
My String
Neither does this
Named Array
Size
2
This does change the element name
My String
This does change the element name
My Int
5
So does this
My String
So does this
My Int
0


Inspector
Assets ▸ Tests and Imag
AssetReferencesTest
AssetReferencesTest Import Settings
Open...
Execution Order...
Texture
None (Texture)
Select
Mesh
None (Mesh)
Prefab
None (Game Object)
Enemy Manager
None (Enemy Manager Component)
Default references will only be applied in edit mode.


Layers
Layout
Layers
Everything
Nothing
0: Default
1: TransparentFX
2: Ignore Raycast
4: Water
5: UI
8: Reflection_Probes
9: Lighting
10: Props
11: ReflectedInWater
12: Ground
13: AccessibleVolume
Edit Layers...


[ERROR]This is a very specific kind of log message