

Impostors - Runtime Optimization

1.0.0

Documentation

Online documentation:

<https://docs.google.com/document/d/1hoP7m5lvUSQYHzIAz6Hwr4DeooZOhYBylGPXxyEgcDY/edit?usp=sharing>

Forum:

<https://forum.unity.com/threads/released-impostors-runtime-optimization.759110/>

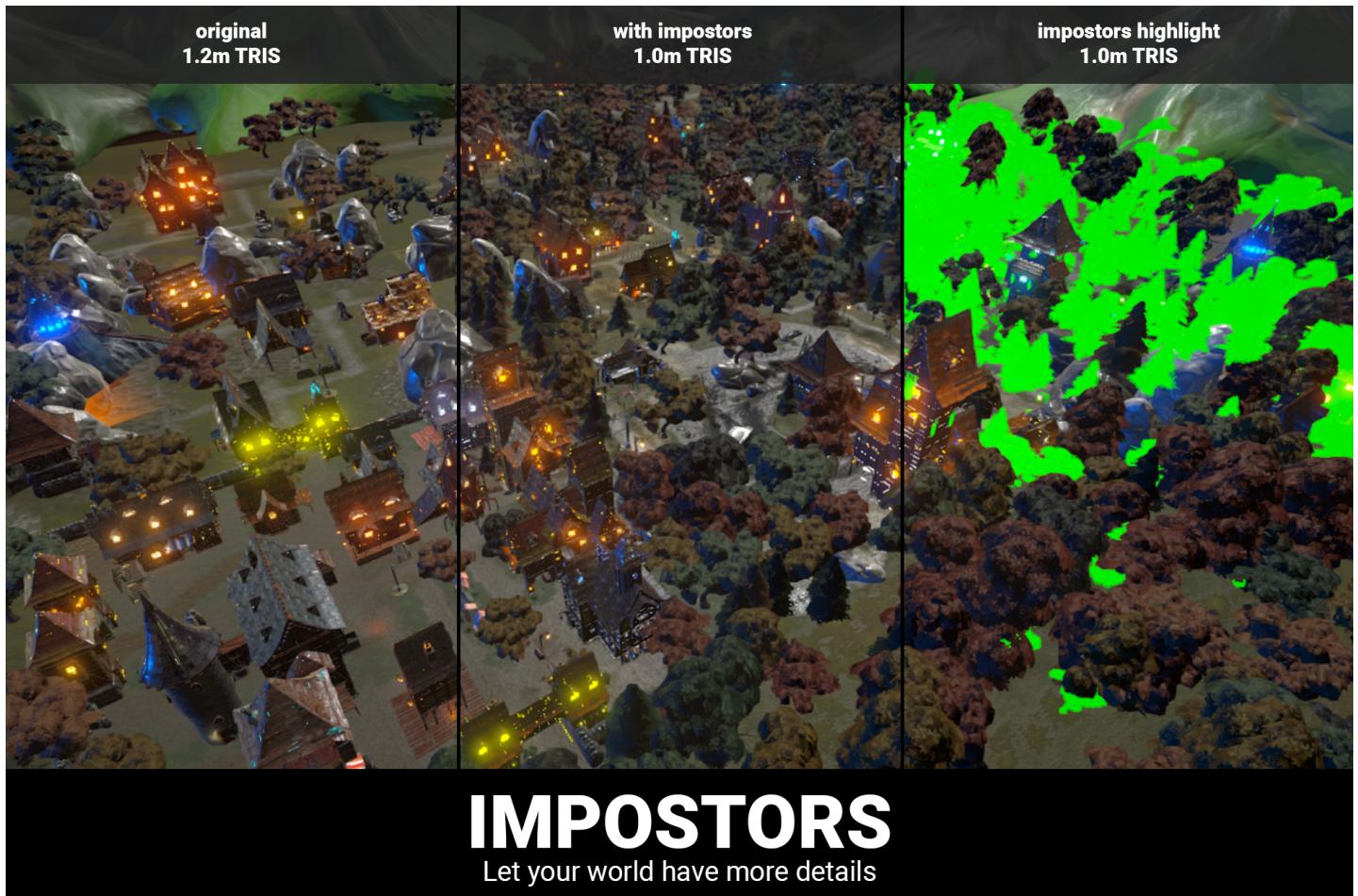


Table of contents

Table of contents	2
Dependencies	3
Known issues	3
Installation	4
Delete “Example” folder	4
Import as embedded package	4
How to use	5
Example scene	5
Setup your scene	6
GameObject setup	7
Prefab setup	8
Menu items for automatic setup	8
Create Scene Managers	8
Create Camera Manager(s)	8
Setup Impostor(s)	8
Remove Impostor(s)	8
Playmode menu items	9
Optimize Scene menu item	9
Enable Impostors	9
Disable Impostors	9
Render Pipelines	10
Built-In Render Pipeline	10
Universal Render Pipeline (URP)	11
Custom Scriptable Render Pipeline	12
Best practices	13
Mobile devices	13
Manual update mode	13
FAQ	14
Bottom part of the impostor is under the ground. How to fix?	14
How to spawn/destroy objects with ImpostorLODGroup at runtime?	14
How to setup object to use the ImpostorLODGroup component at runtime?	14
Impostors have outlines. How to fix?	15

Dependencies

IMPORTANT: package works only with **Unity 2019.4+**. It uses the new mesh API introduced in this unity release.

Minimum required versions. Latest versions are also supported and tested.

Package Dependencies:

- Jobs 0.1.1 - preview
 - Collections 0.1.1 - preview
 - Mathematics 1.1.0
- Burst 1.1.2

Known issues

1. For now, it is not tested with HDRP.
2. There might be issues with HDR. If so, please contact me with details.
3. Deferred rendering supported, but Impostors will be rendered in hacky way.
If this causes problems, then please, contact me with details.
4. Built-in Render Pipeline with Scheduled impostors rendering in VR projects doesn't work properly and may cause issues. Fix: use Immediately impostors rendering.

Installation

First of all, **backup your project.**

Also, you may use a new empty project to play around with the Impostors package, set required technologies and target platforms and see if it works.

After downloading and importing asset from the Asset Store you are good to go.

If you have troubles or compilation errors, make sure that the importing process included upm dependencies:

- Jobs
- Burst
- Mathematics
- Collections

Also you can:

Delete “Example” folder

You are safe to delete the “Impostors/Example” folder if you don’t need it anymore.

Import as embedded package

If you want you can import Impostors as the upm-embedded package:

<https://docs.unity3d.com/Manual/upm-embed.html>

How to use

Example scene

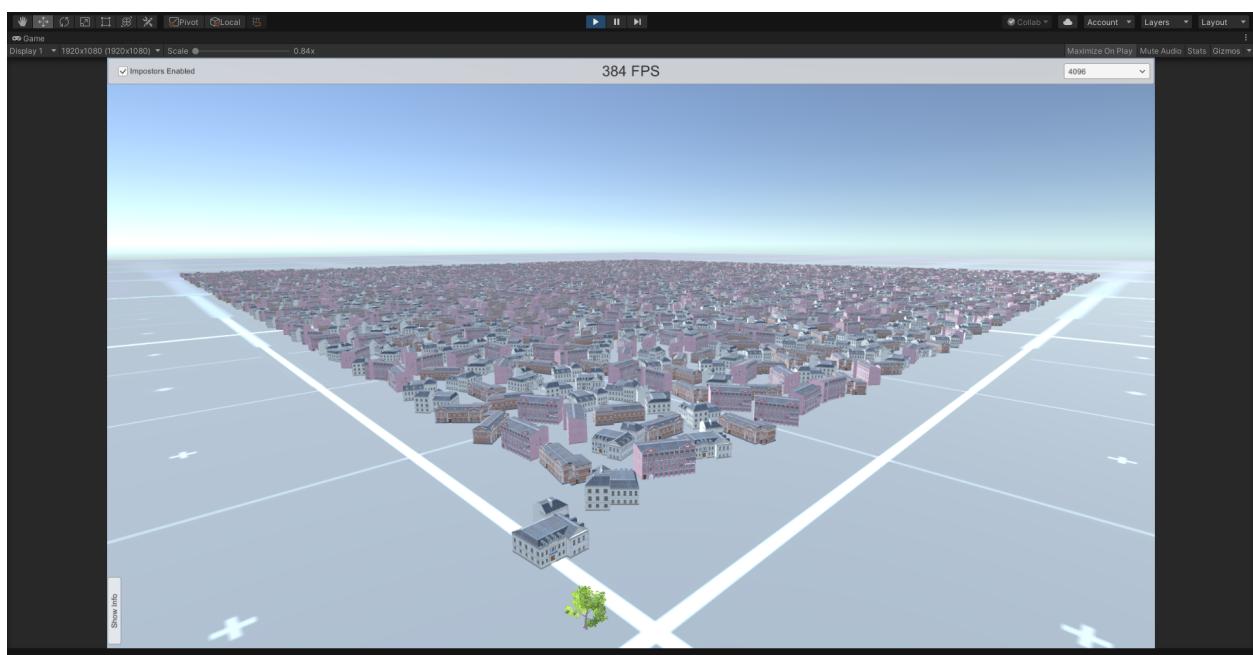
Open scene at “..../Impostors/Example/Scenes/example.scene”.

If your project uses URP then look at [setup for Universal Render Pipeline](#).

Enter playmode.

Use top-right dropdown to spawn objects.

Use top-left toggle to enable/disable Impostors.



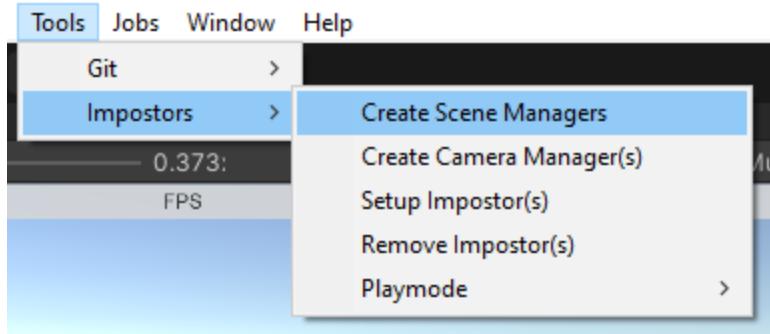
Verify everything works.

If you have a problem on this step, please contact me and we will solve the issue if any.

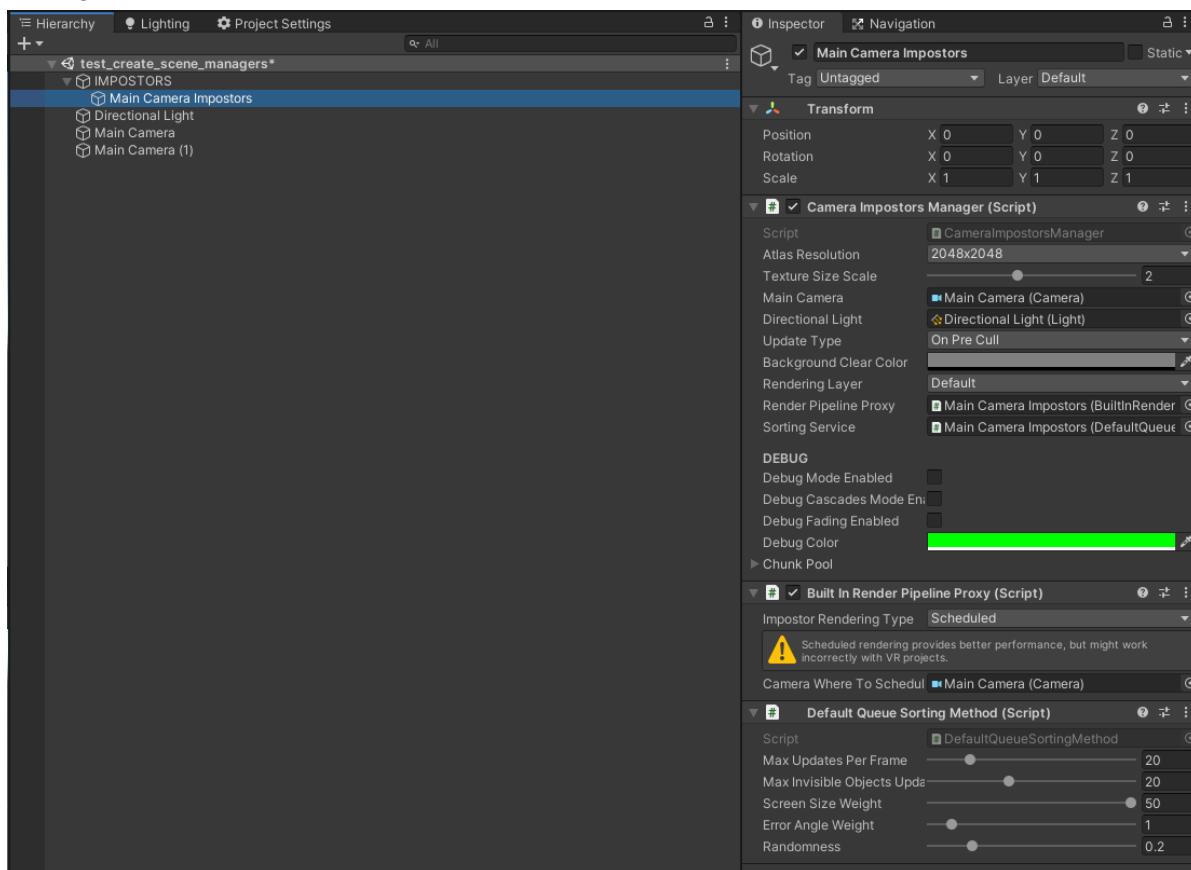
Setup your scene

IMPORTANT! Please, make a **back-up before proceeding with this step.**

Use “Tools/Impostors/Create Scene Managers” to set up your scene to use impostors.



This will create a new game object “IMPOSTORS” at the top of your scene hierarchy. Under this game object will be one child, which setups the main camera to render impostors. If you want more cameras to render impostors, then use the “Tools/Impostors/Create Camera Manager(s)” command.



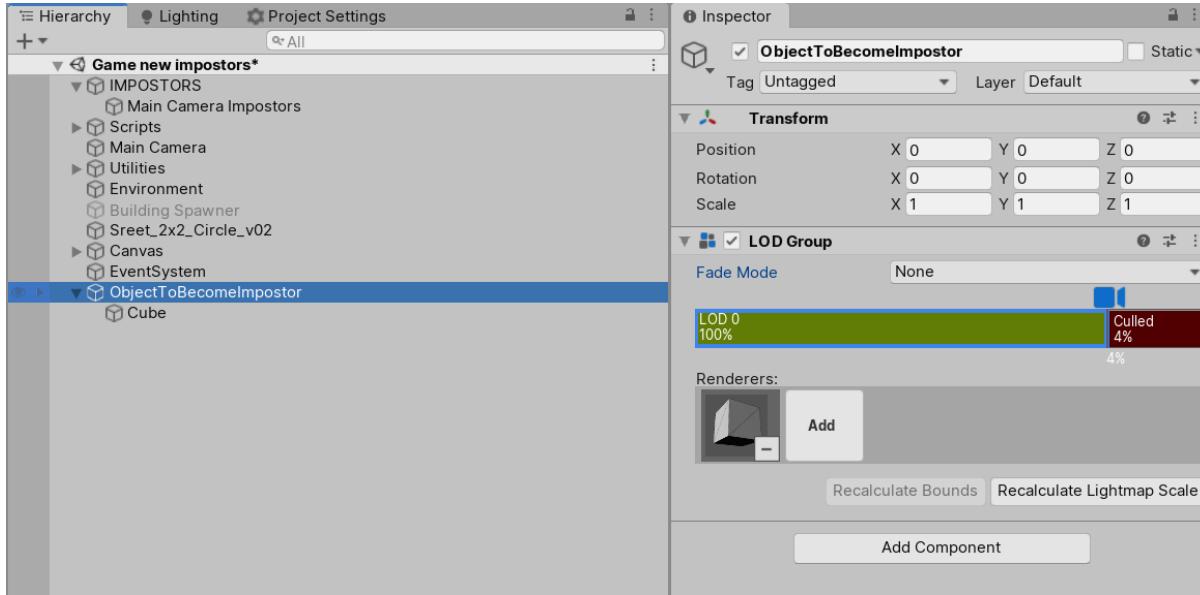
Make sure the RenderPipelineProxy is referenced in CameralImpostorsManager.

If you are using **URP** read [this](#).

GameObject setup

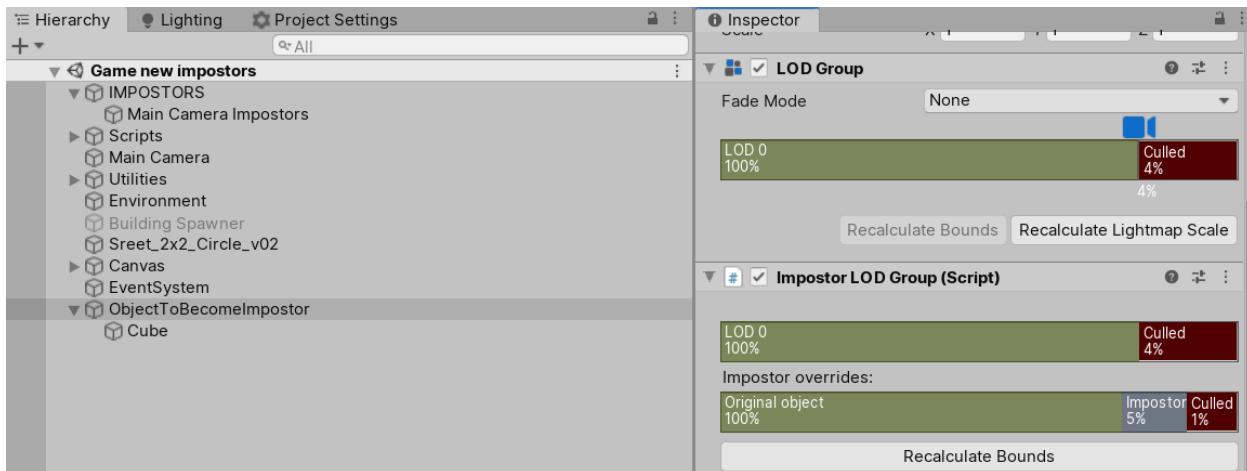
After scene setup, you need to mark objects you want to render as impostors with the **ImpostorLODGroup** component.

This component **requires a built-in LODGroup component** on the game object to work. Your LODGroup has to contain at least one LOD. For example, this setup is fine:



When your object has a LODGroup component, use “Tools/Impostors/Setup Impostor(s)” to automatically handle setup of the ImpostorLODGroup component.

After this command gameObject's inspector must look like this:



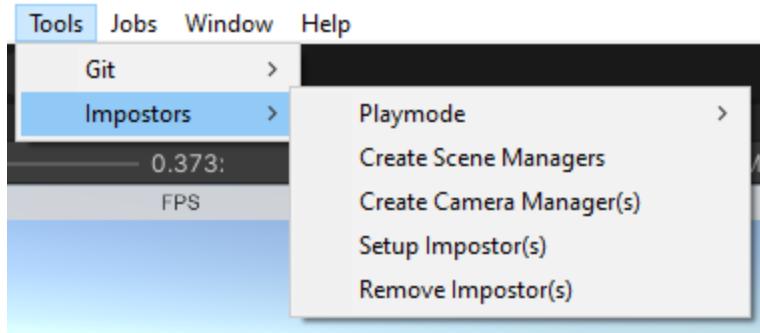
You can change properties as you want. But these properties are cached in `OnEnable()`, so changes are not reflected at runtime.

Now run the scene and the object will turn into impostor at some distance.

Prefab setup

You can set up prefab the same way as the regular GameObject from the [previous section](#). If you are doing this in the scene, don't forget to apply changes to prefab asset.

Menu items for automatic setup



Create Scene Managers

Creates managers in the current scene that are required for Impostors to function.

Create Camera Manager(s)

Impostors package supports multiple cameras. To set up additional cameras: select game object(s) with Camera component and run this command.

Setup Impostor(s)

you can select one or multiple game objects in the hierarchy, and this command will try to automatically set up the ImpostorLODGroup components onto selected objects.

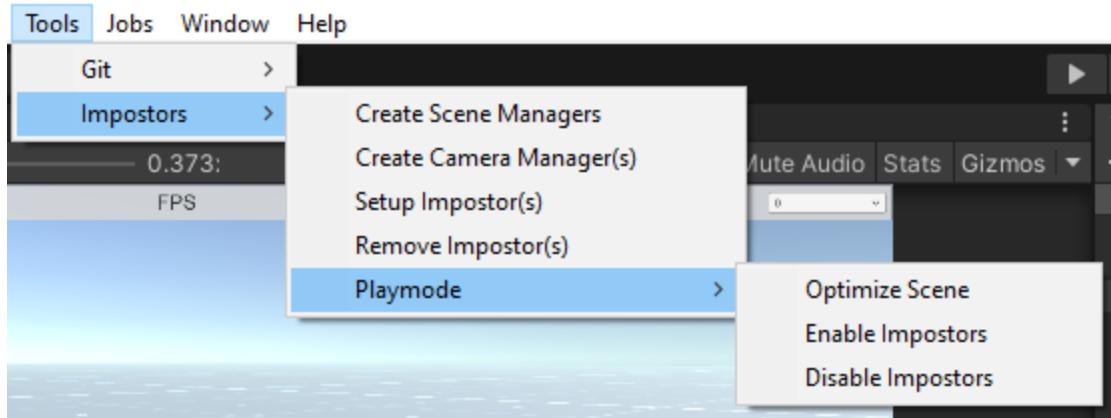
Note: objects must have unity's built-in LODGroup component to work properly with this command.

Remove Impostor(s)

Opposite command that removes all Impostors components from selected objects.

Playmode menu items

Under “Tools/Impostors/Playmode/...” you can find helpful operations and shortcuts.



Optimize Scene menu item

In a nutshell, it finds all LODGroup components in the current scene and applies the “Setup Impostor(s)” command on each of them.

Warning: this command is quite heavy and might take a lot of time. For example on 10k objects it may take 20 seconds. But don't be afraid, this setup process is required only once and doesn't impact runtime performance.

Use at play mode

This command is **designed to be used at runtime**, when you are running your scene. This way is preferable, because you can undo all setup operations just by stopping the play mode and prevent any chances to corrupt your scene.

This is handy when you want to quickly look at what Impostors can do with your scene.

Enable Impostors

enables all ImpostorLODGroup components in the game.

Disable Impostors

opposite command that disables all ImpostorLODGroup components in the game. Useful when you want to look at your scene without Impostors.

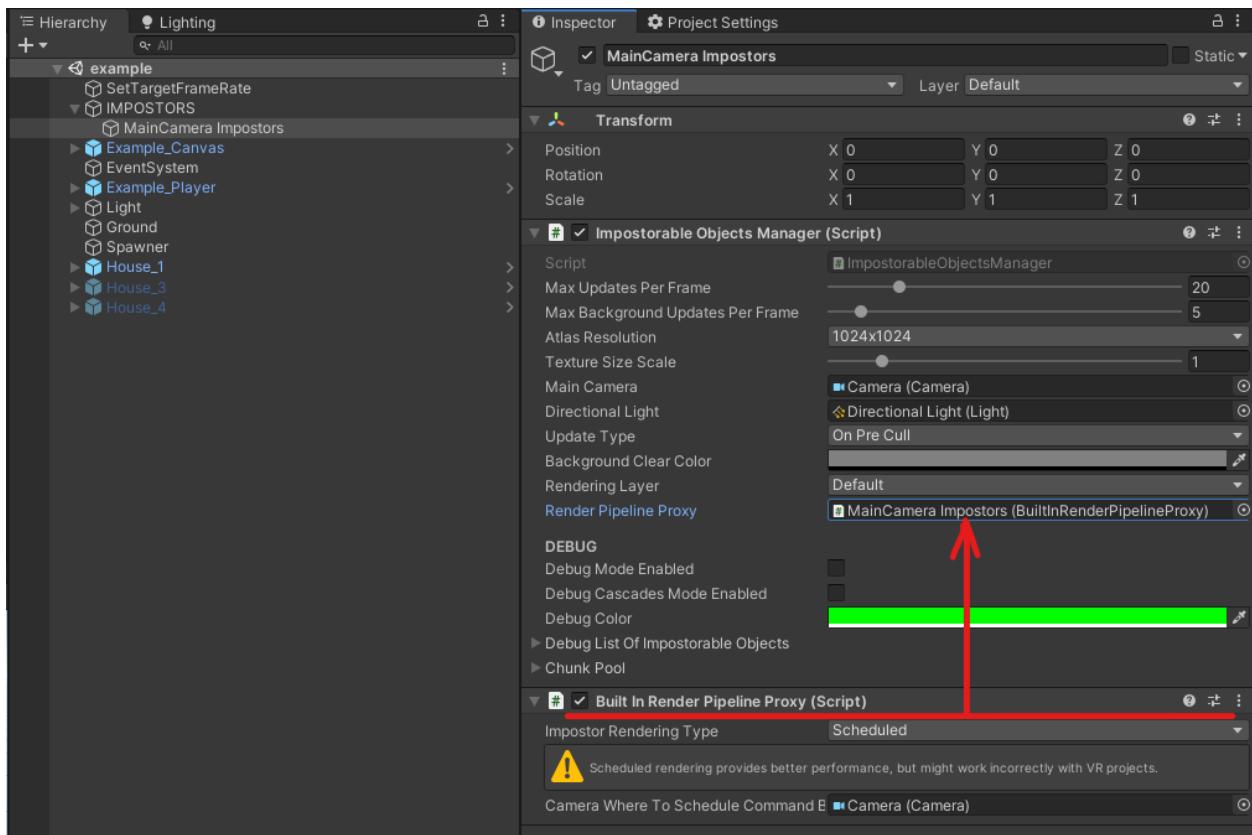
Render Pipelines

Impostors package uses RenderPipelineProxies to support multiple render pipelines. Package provide 2 pre-made proxies:

- BuiltInRenderPipelineProxy - default
- UniversalRenderPipelineProxy

Built-In Render Pipeline

Impostors package requires the BuiltInRenderPipelineProxy component to work with built-in RP. Make sure reference is set in the inspector. Drag proxy into corresponding field if required.

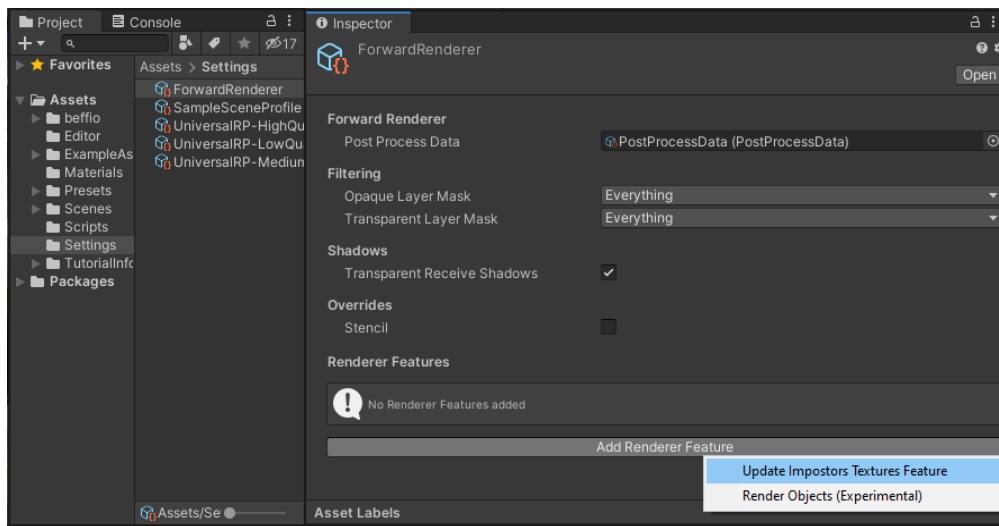


Universal Render Pipeline (URP)

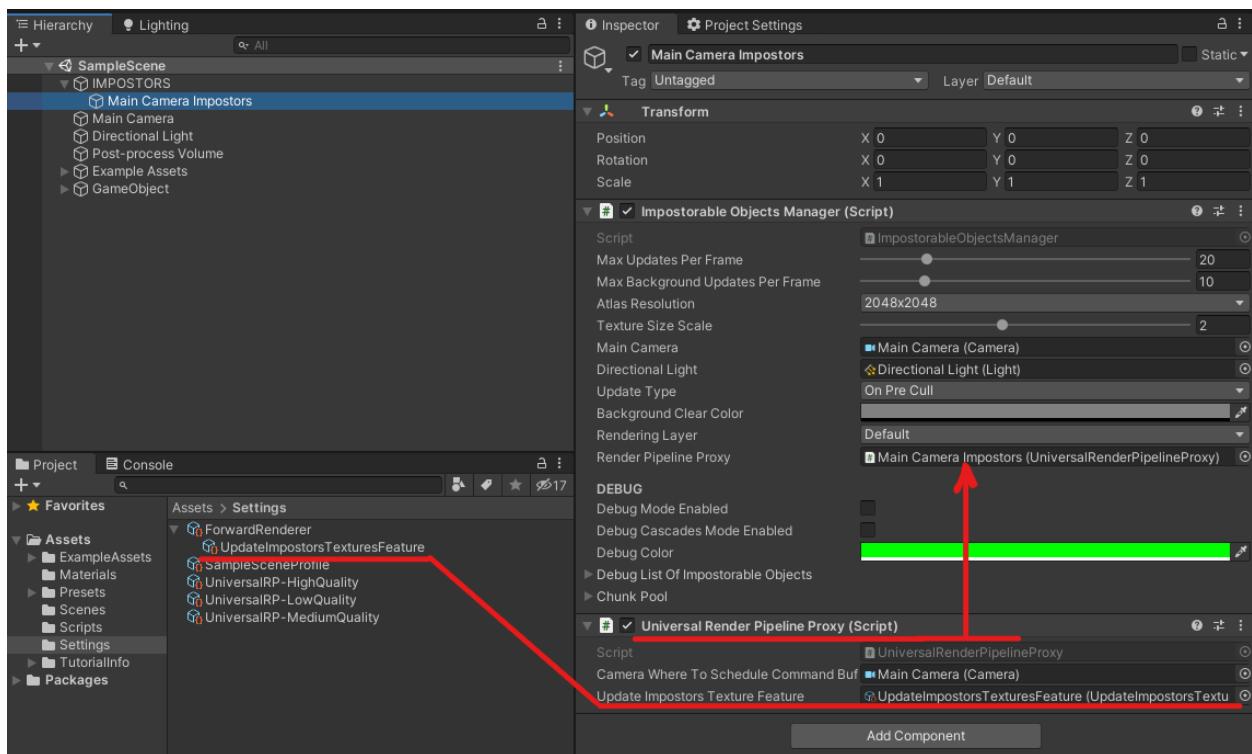
Impostors package supports URP but requires additional setup.

Select your Renderer Data asset. By default it is at path “Assets/Settings/ForwardRenderer”.

Click on “Add Renderer Feature” and select “Update Impostors Textures Feature”.



Then in the scene select “CameraImpostorsManager”. Make sure there is a “UniversalRenderPipelineProxy” component, and assign feature to corresponding field:



Custom Scriptable Render Pipeline

Impostors package doesn't officially support custom SRPs.

But you can provide custom Render Pipeline Proxy.

For this you just need to extend the `RenderPipelineProxyBase` class with your own implementation.

Don't forget to set reference to proxy in the `CameralImpostorsManager`.

Best practices

Mobile devices

Mobile GPUs are very different from standalone GPUs, so it requires additional know-hows on setting up your project using the Impostors package.

1. Don't use HDR impostors if you can.
2. Don't use Atlas Resolution bigger than 2048. 1024x1024 provides best performance on mobile devices.
3. Limit MaxUpdatesPerFrame to something like 20, not more.
4. It's better to use TextureSizeScale = 1. Or you can use values below 1 to save some memory. You can use debugCascadesModeEnabled on device to investigate impostors' texture sizes.
5. On mobile devices scheduled impostors rendering is crucial to achieving max performance.
6. In my tests and on my devices I got better performance using OpenGL ES3 Graphics API in comparison to Vulkan. It depends on your project and devices you are targeting so it's worth testing.

Manual update mode

You can explicitly control when to run the impostor system and where to draw impostors.

Here is the example script:

```
using Impostors.Managers;
using UnityEngine;

public class ManualImpostorsUpdate : MonoBehaviour
{
    [SerializeField]
    public int _skipFrames = 1;

    [SerializeField]
    private CameraImpostorsManager _cameraImpostorsManager = default;

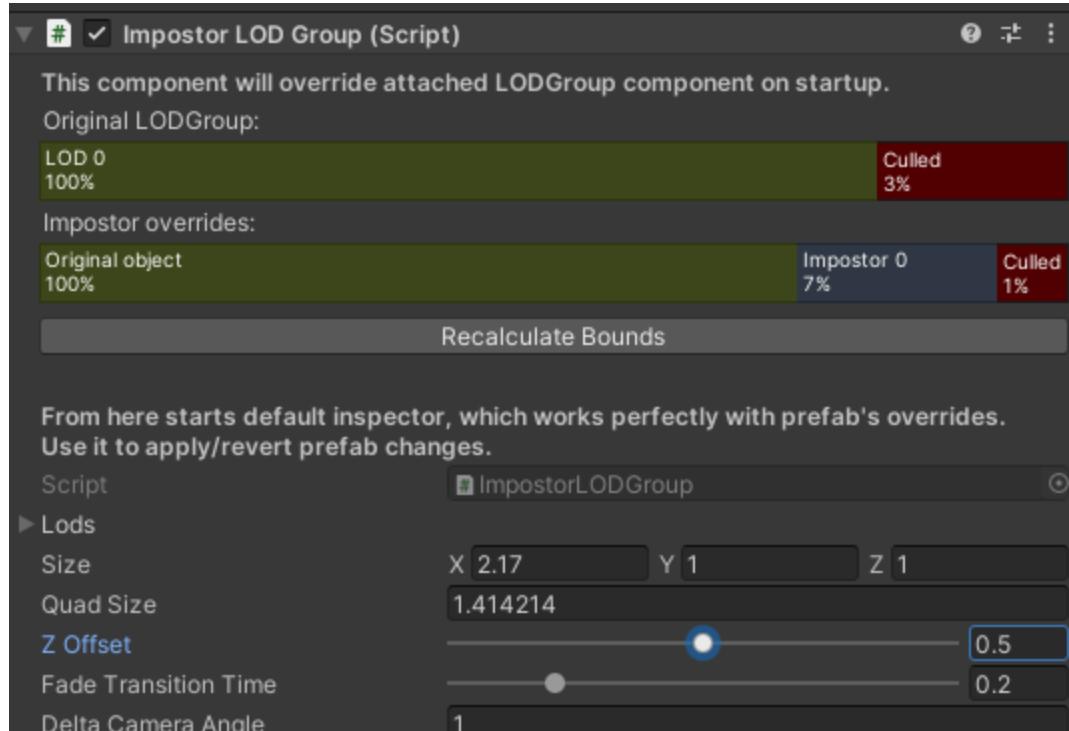
    void LateUpdate()
    {
        if (Time.frameCount % (_skipFrames + 1) == 0)
        {
            _cameraImpostorsManager.UpdateImpostorSystem();
        }

        _cameraImpostorsManager.DrawImpostorsForCamera(Camera.main);
    }
}
```

FAQ

Bottom part of the impostor is under the ground. How to fix?

It's a common issue and fix is very simple. Exit play-mode, go to your object with ImpostorLODGroup component. Increase Z Offset and try to run the scene again. Problem should be fixed.



How to spawn/destroy objects with ImpostorLODGroup at runtime?

Simply Instantiate()/Destroy() them.

Additionally, ImpostorLODGroup has method `MarkGameObjectWillBeDestroyed` that lets remove waste allocations on destroy.

How to setup object to use the ImpostorLODGroup component at runtime?

Take a look at `ImpostorsEditorTools.SetupImpostorLODGroupToObject()` method.

This is an example on how to properly add and setup ImpostorLODGroup to `gameObject` at runtime.

If you are instantiating prefabs then prefab assets could have ImpostorLODGroup [setup previously in editmode](#).

Impostors have outlines. How to fix?

By default these outlines are gray and almost invisible at well-lit scenes.

But in dark scenes these gray outlines might be noticeable. You can fix that by changing CameraImpostorsManager.BackgroundClearColor to black.

Important: make sure that the alpha channel of background color is 0.

Note: after changing this value you will not get instant feedback, you need to move camera and cause impostors updates.

If this doesn't help you can increase 'Cutout' setting on ImpostorLODGroupsManager.

