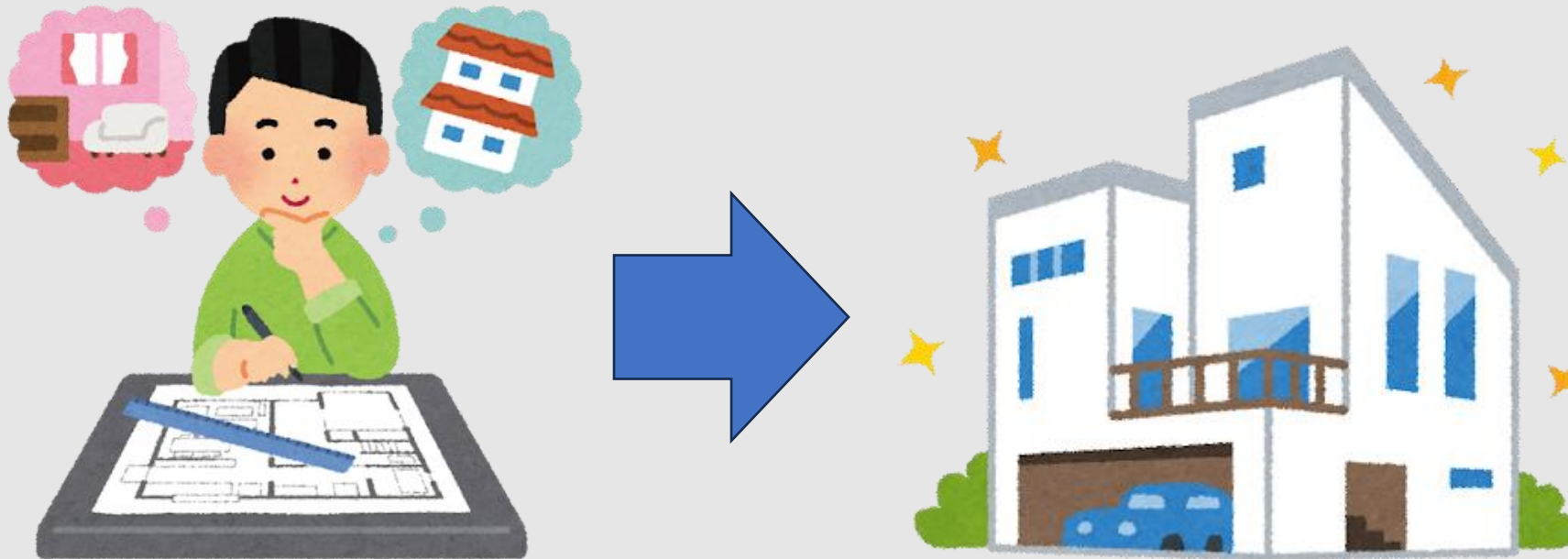


Unity

Software Architecture

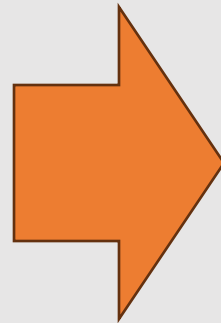
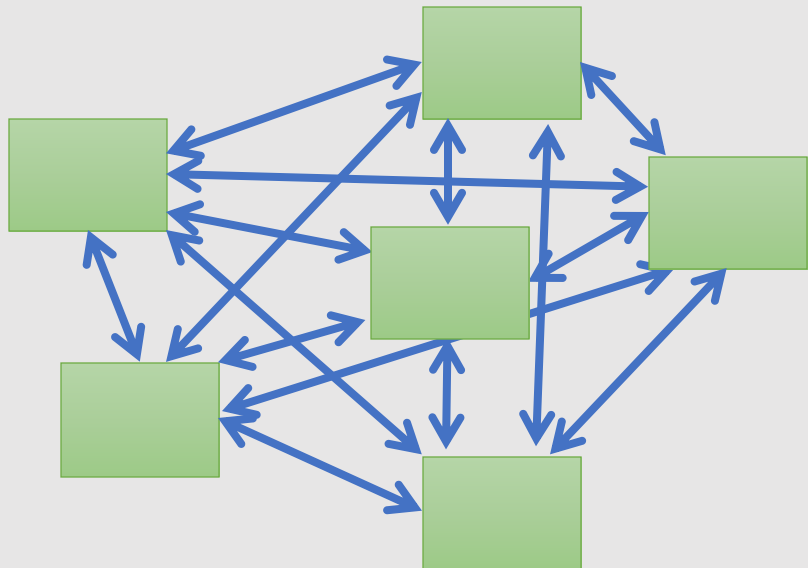
- Architecture = how to organize independent **components**
- Large scale software development needs good architecture



Why Architecture is Necessary?

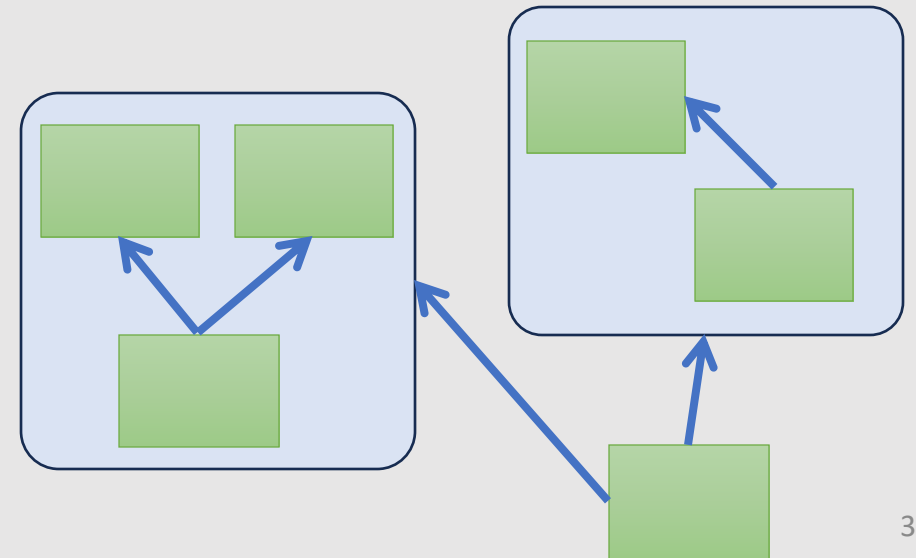
Without architecture

- All variables *depend* each other → difficult to maintainance



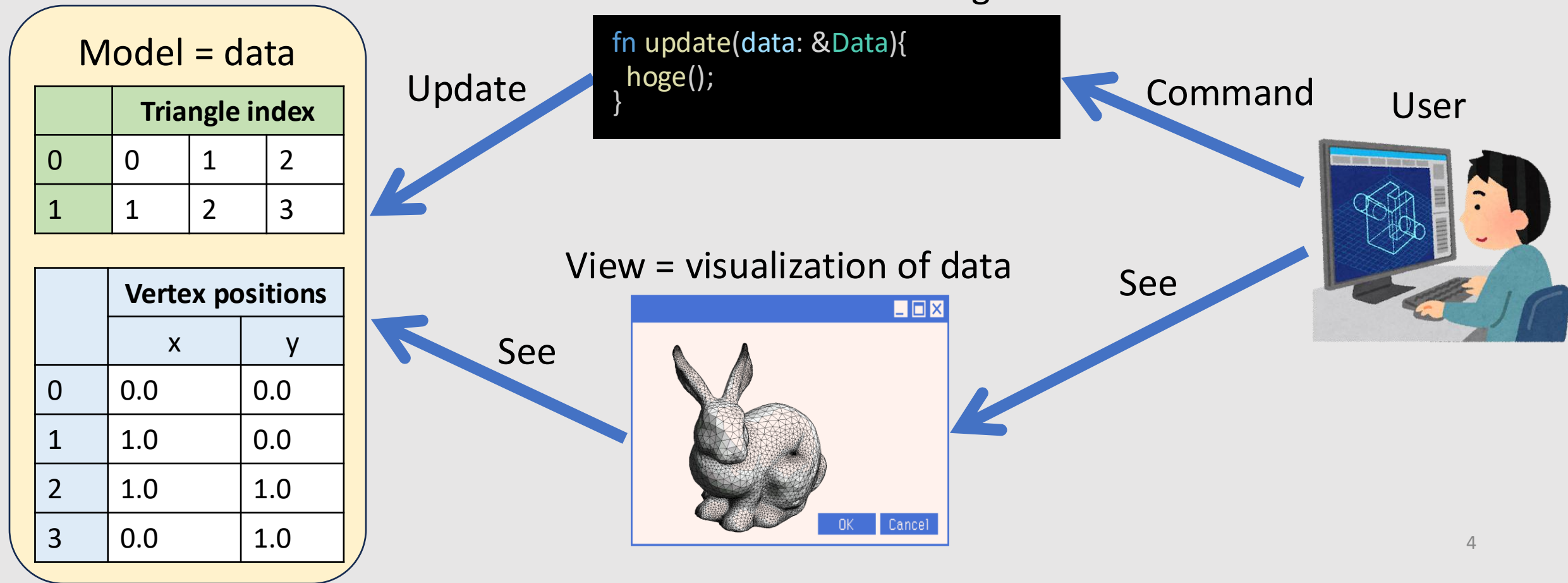
With architecture

- Every variables has *minimum dependency*
- Hierarchy (e.g., class, structure)
- Abstraction (e.g., Inheritance)



Model View Controller (MVC) Architecture

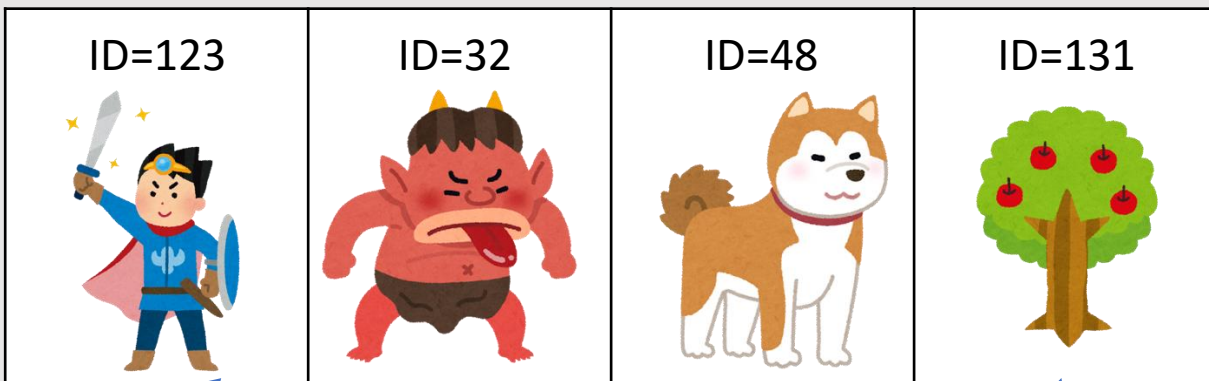
- Typical architecture for GUI software



Entity Component System (ECS) Architecture

- Typical architecture for game engine

Entity=array of unique IDs



IDs	32	48	123	131
Data	MeshA	MeshB	MeshC	MeshD

Component = array of data

System= update data in the component

```
for id in ids {  
  render(id);  
}
```

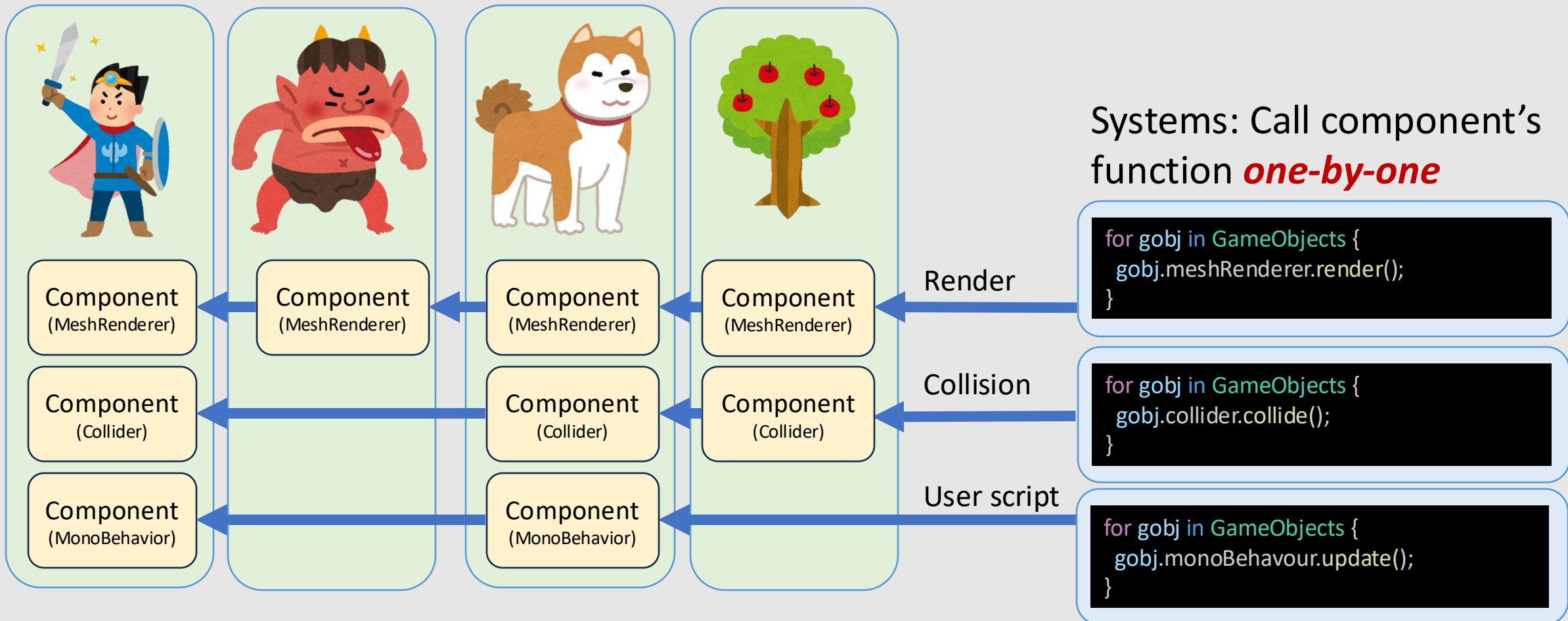
System= update data in the component

```
for id in ids {  
  collision(id);  
}
```

Unity Architecture

- Game object has components (data & func) and system call them

Game Objects

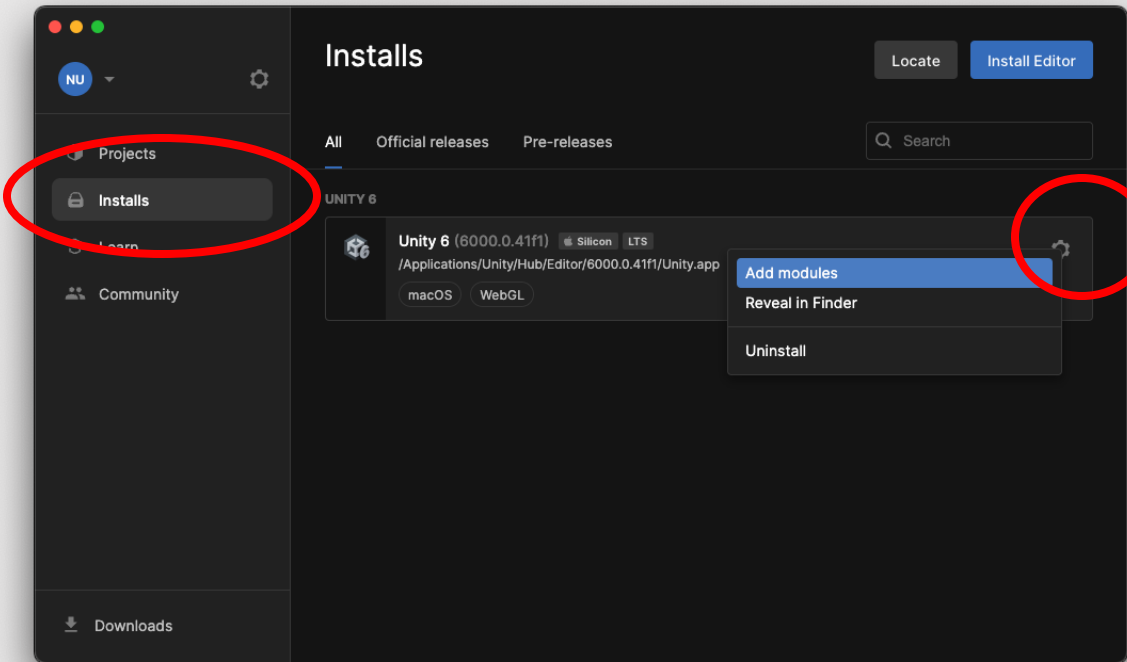


Unity

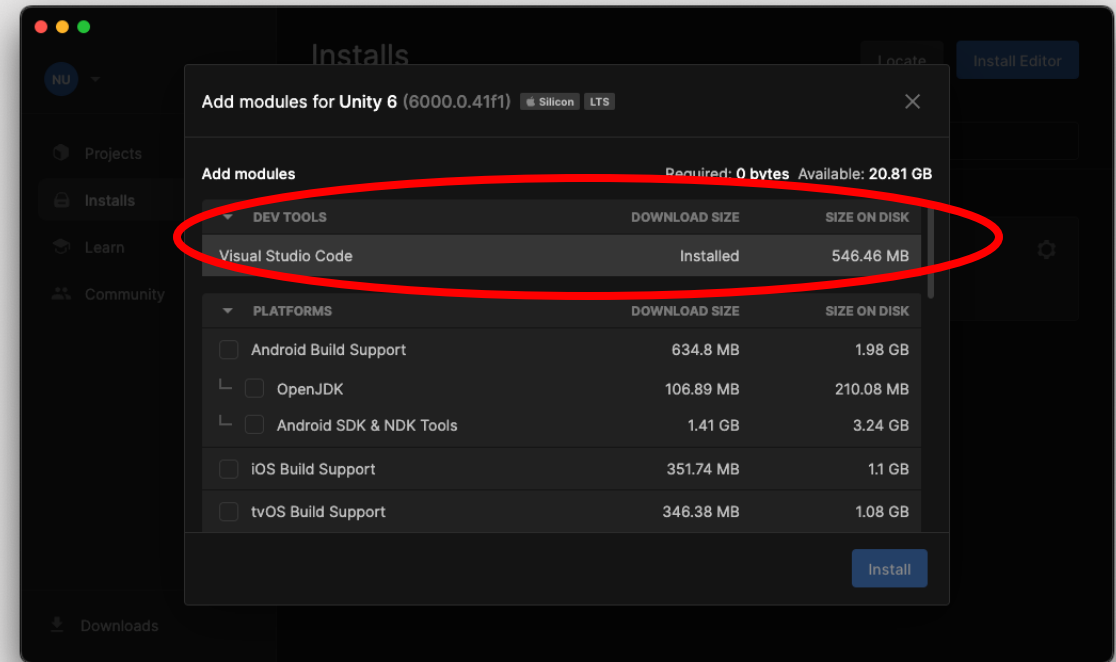
Make Sure **Visual Studio Code** is Installed

- Check in the **Unity Hub**

Click here

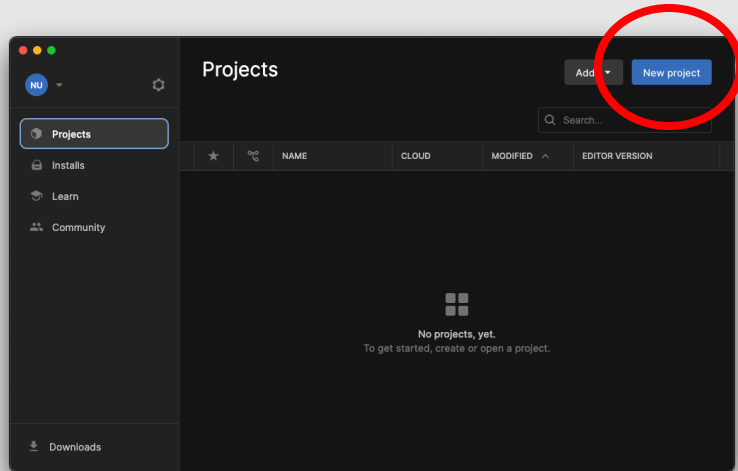


Click here

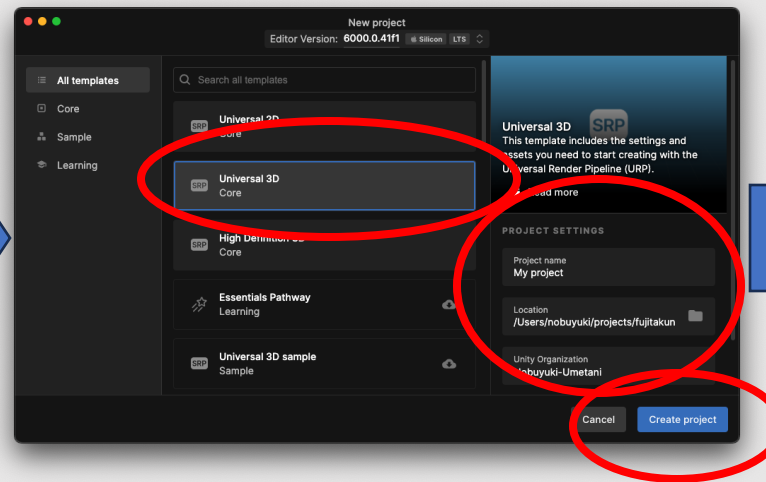


Let's Make a Project in the **Unity Hub**

Click here

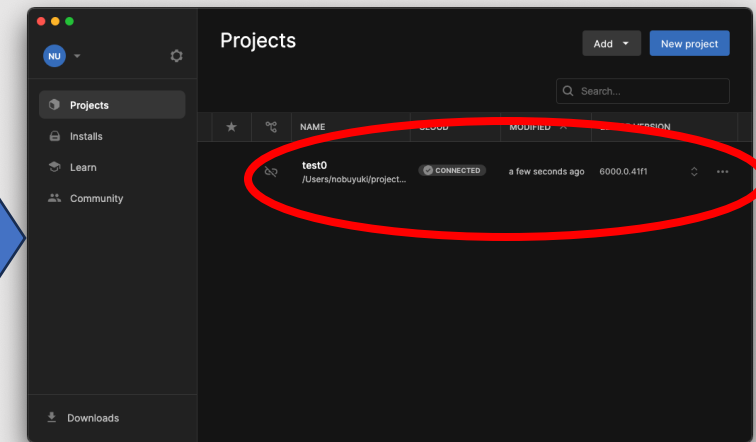


Check "Universal 3D",
Specify some name, e.g., "test"

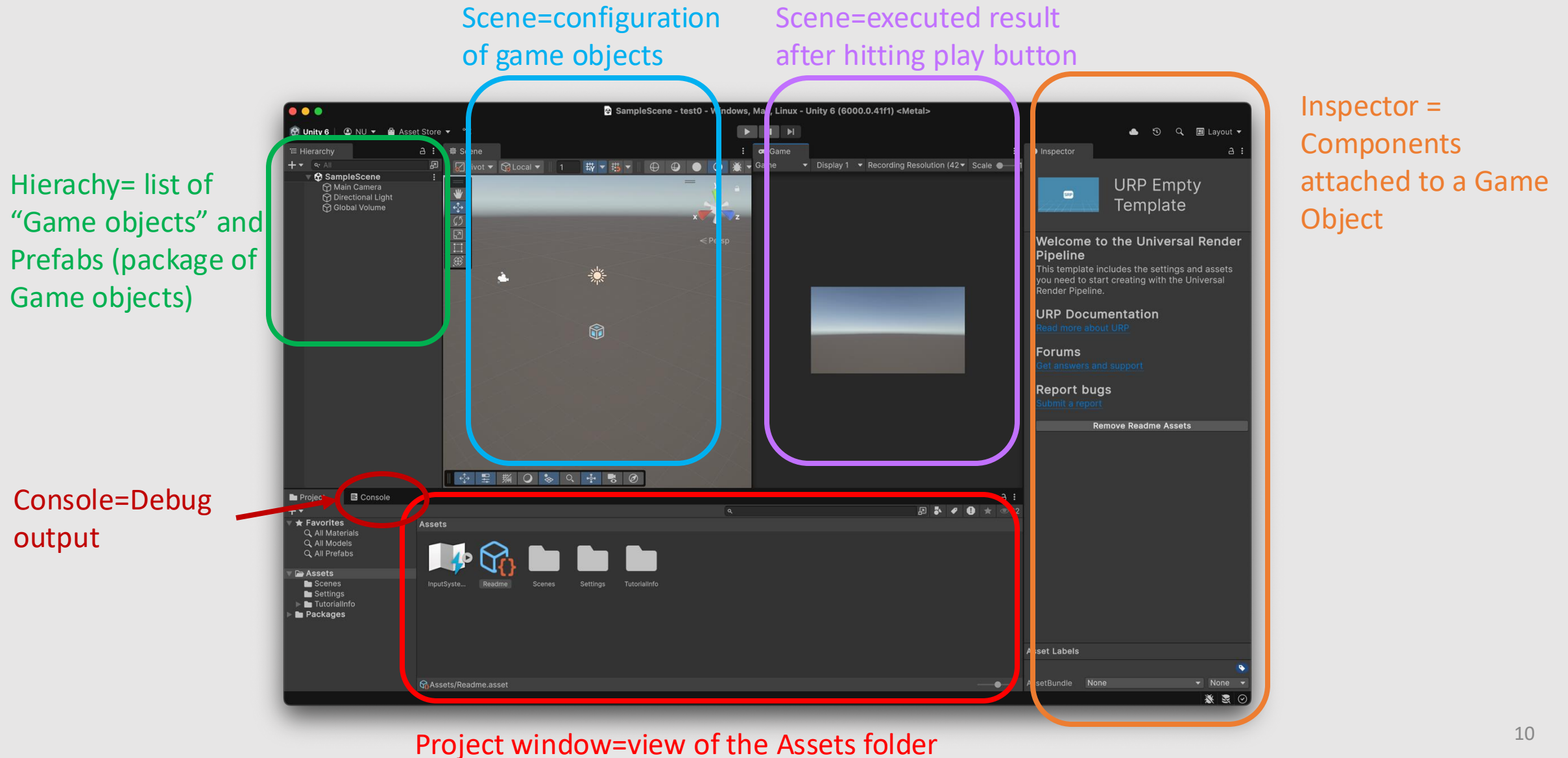


click

Single click to launch
the project

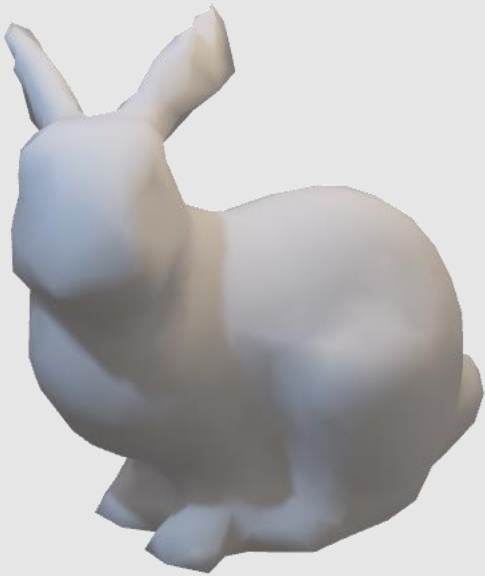


Name of the Windows in the Unity Editor

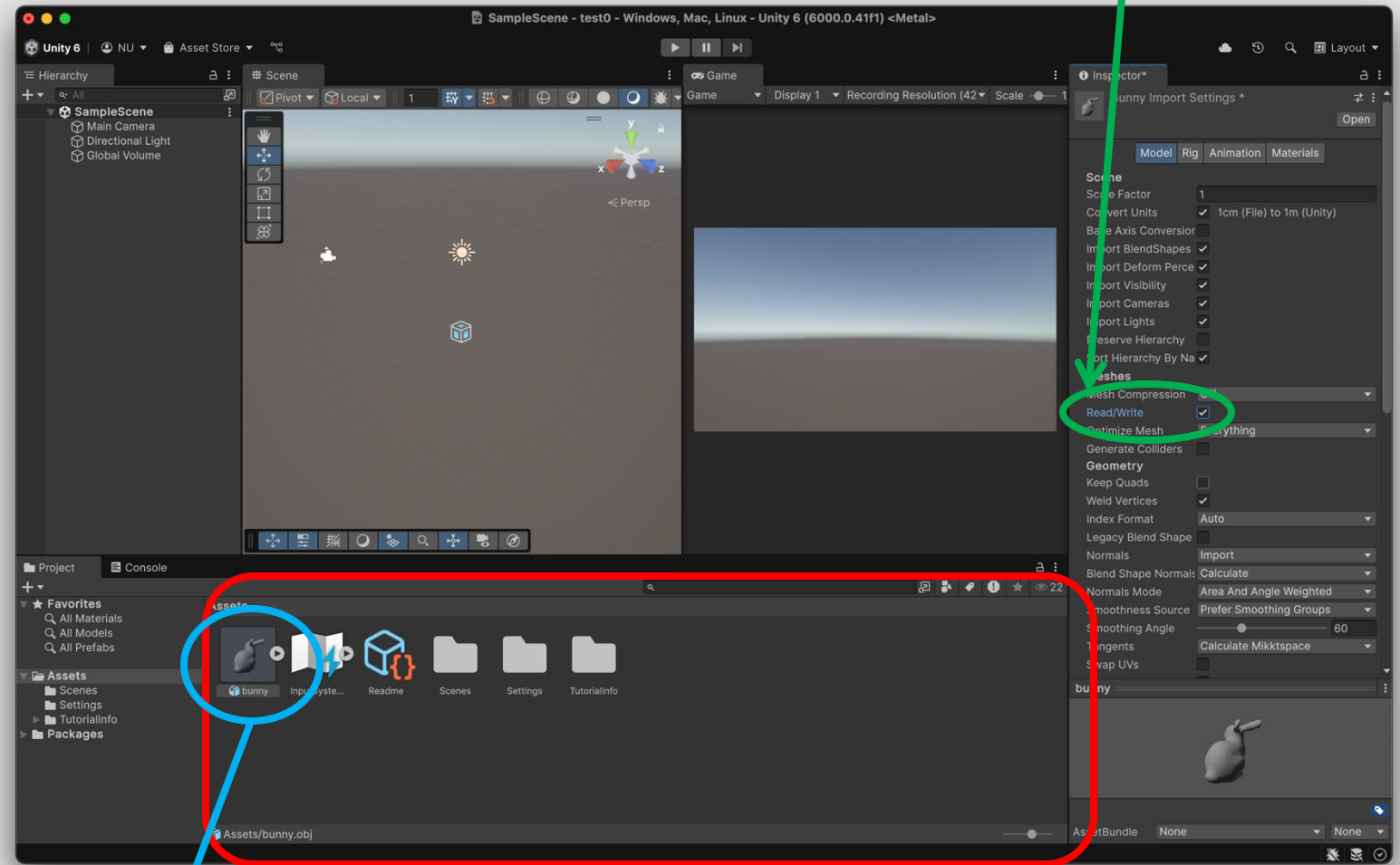


Let's Put a Triangle Mesh in the Scene 1

3. Check "Read/Write"



Download a triangle mesh from
<http://nobuyuki-umetani.com/pba2025s/bunny.obj>



1. Drag to "Project" window

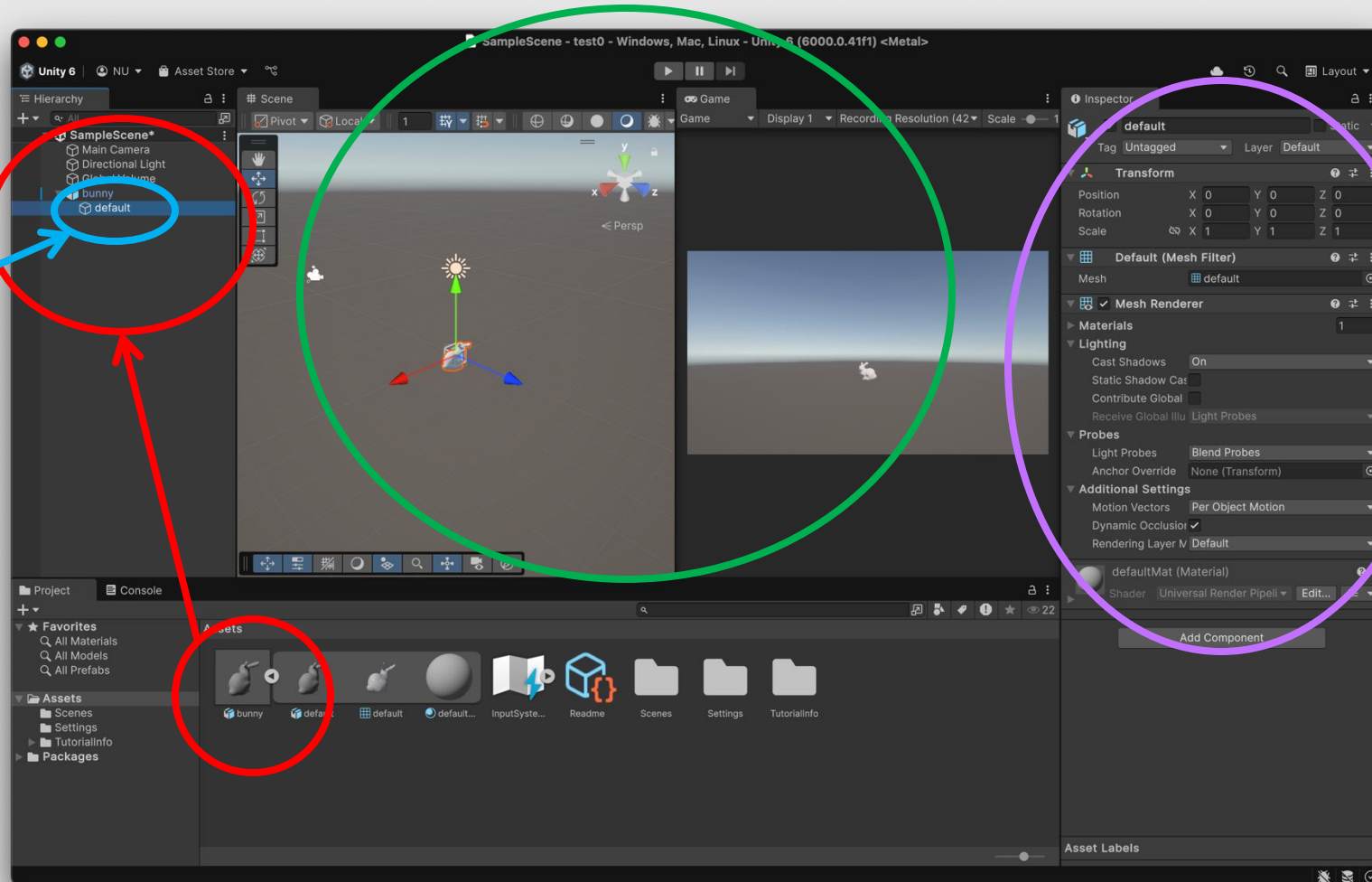
2. Click Prefab (package of parts)

Let's Put a Triangle Mesh in the Scene 2

2. You will see imported mesh in "Scene" and "Game"

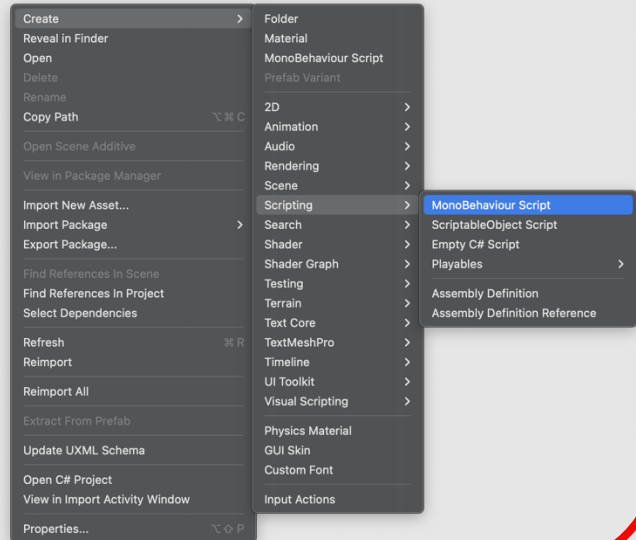
4. You see components attached to "Game Object"

1. drag prefab to "Hierarchy"
3. Click "Bunny > default" to select "Game Object"

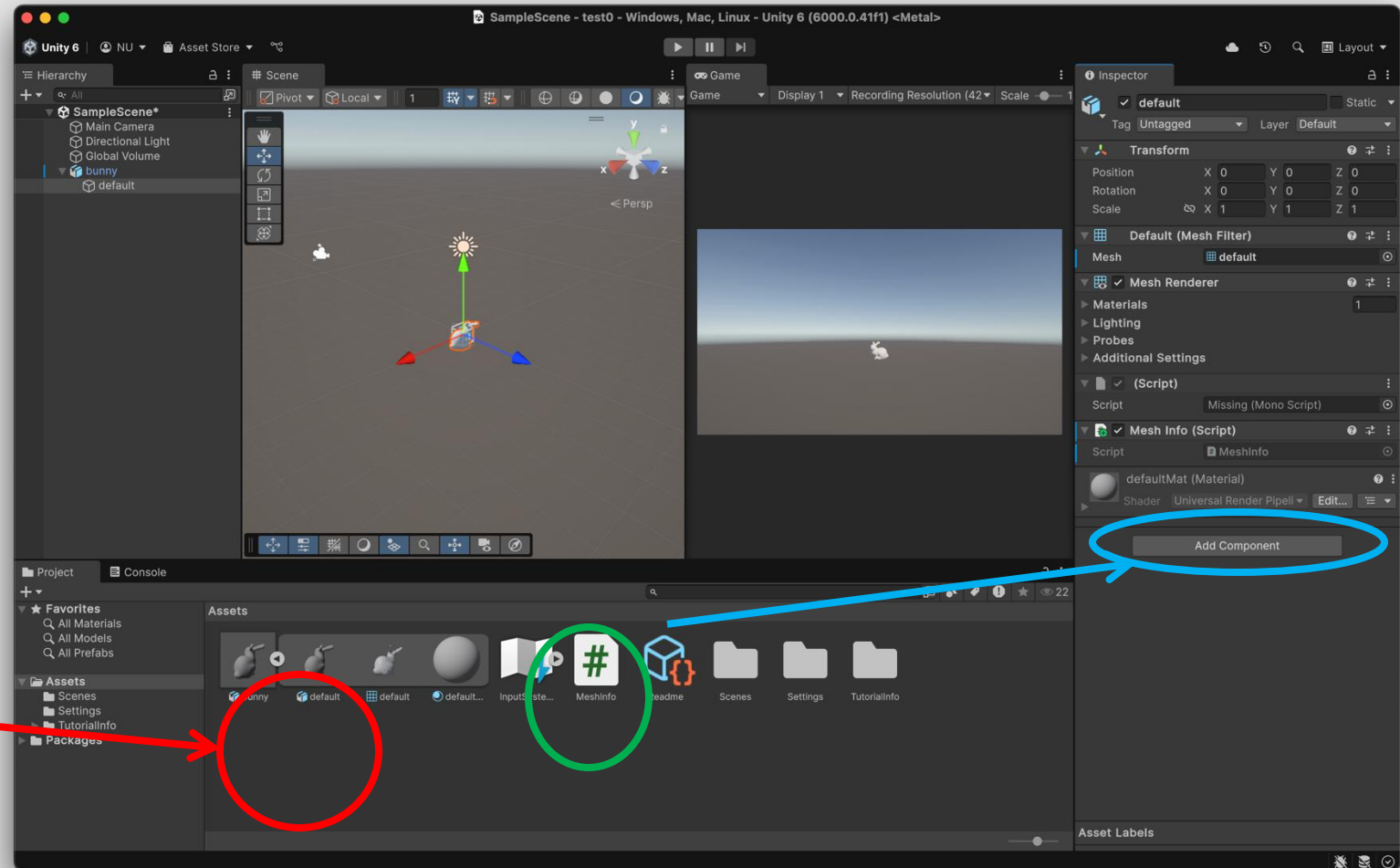


Let's Attach a Script to the Mesh 1

1. Right click and select "Create > Scripting > MonoBehaviour Script"



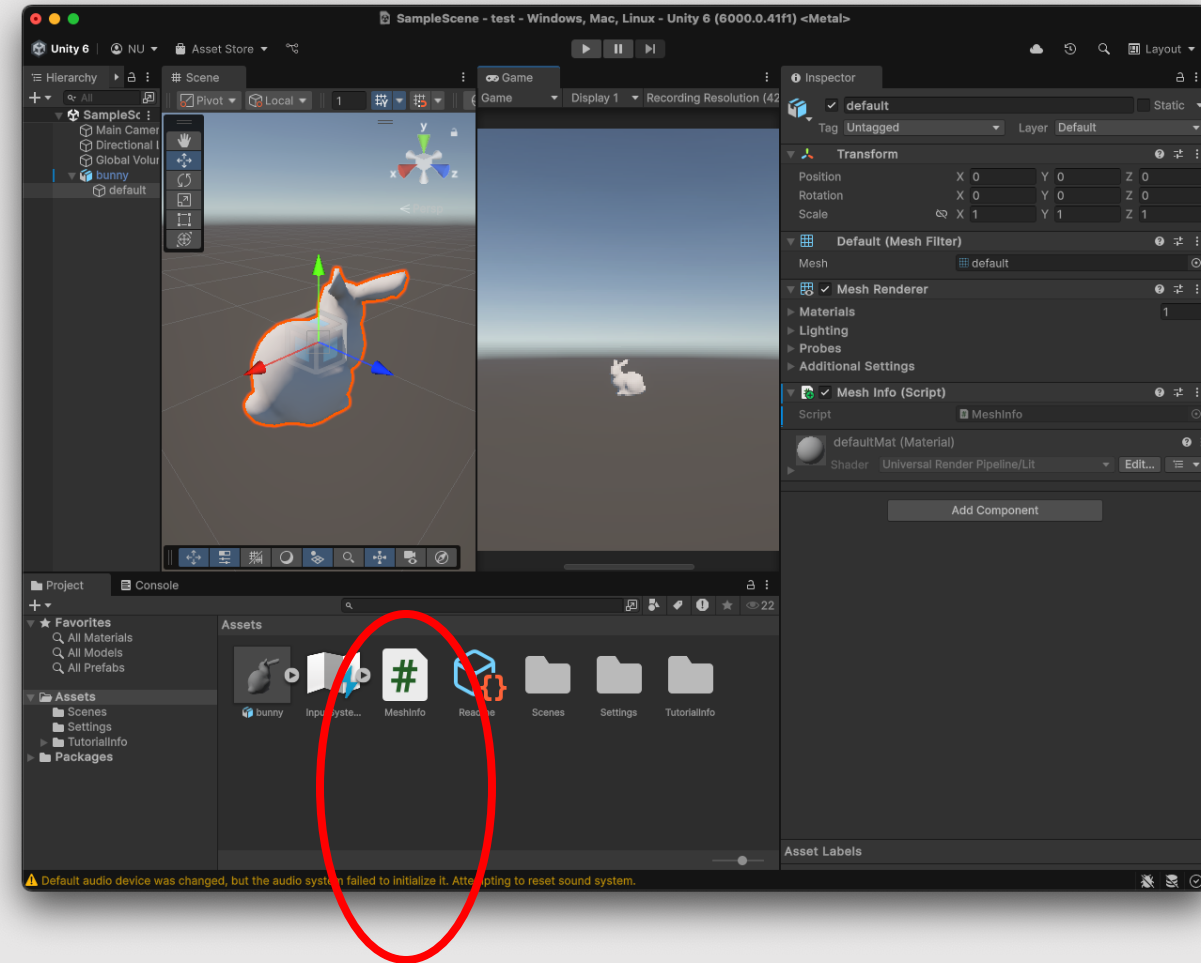
2. Name the new script as "MeshInfo"



3. Drag the script into default's "Add Component"

Let's Edit Script

Script open in Visual Studio Code



1. Double-click script



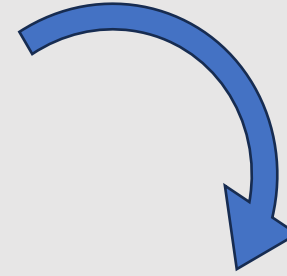
```
using UnityEngine;

public class MeshInfo : MonoBehaviour
{
    // Start is called once before the first execution of Update after the
    // MonoBehaviour is created
    void Start()
    {
    }

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


Let's Get the Mesh's Information

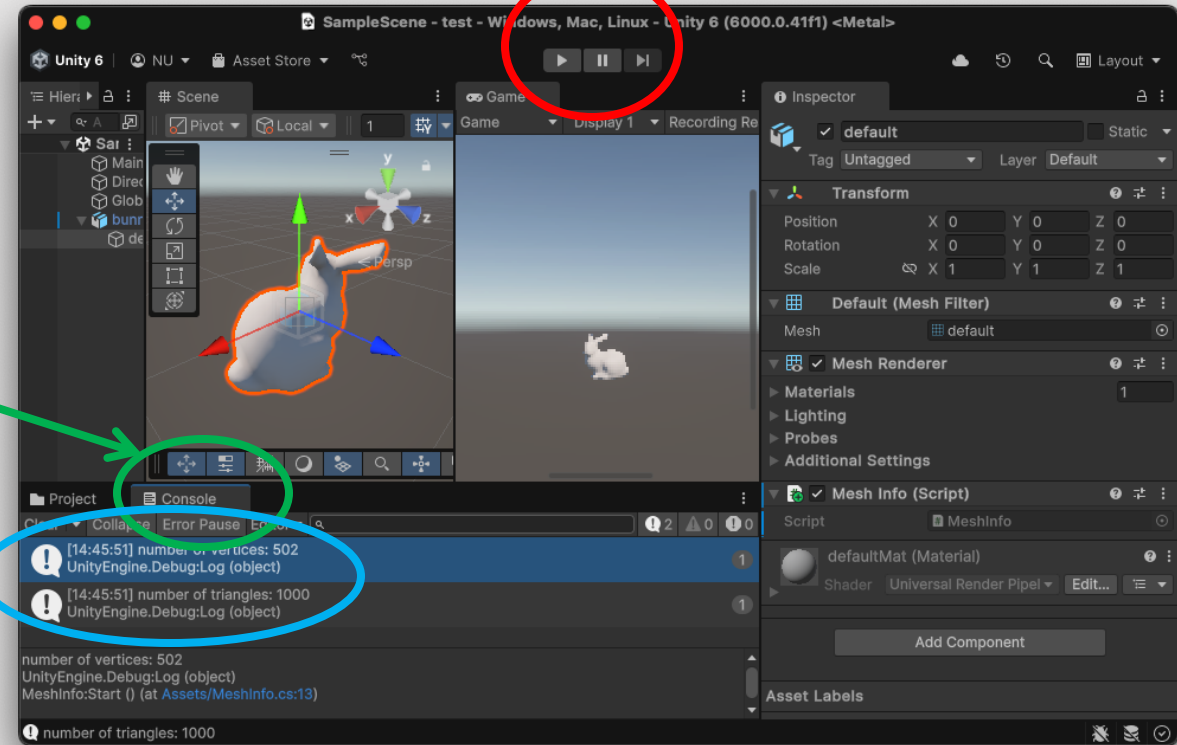
```
void Start() {  
    MeshFilter mf = GetComponent<MeshFilter>();  
    Mesh mesh = mf.mesh;  
    Vector3[] vertices = mesh.vertices;  
    int[] triangles = mesh.triangles;  
    Debug.Log("# of vertices: " + vertices.Length);  
    Debug.Log("# of triangles: " + (triangles.Length / 3));  
}
```



1. Click play button

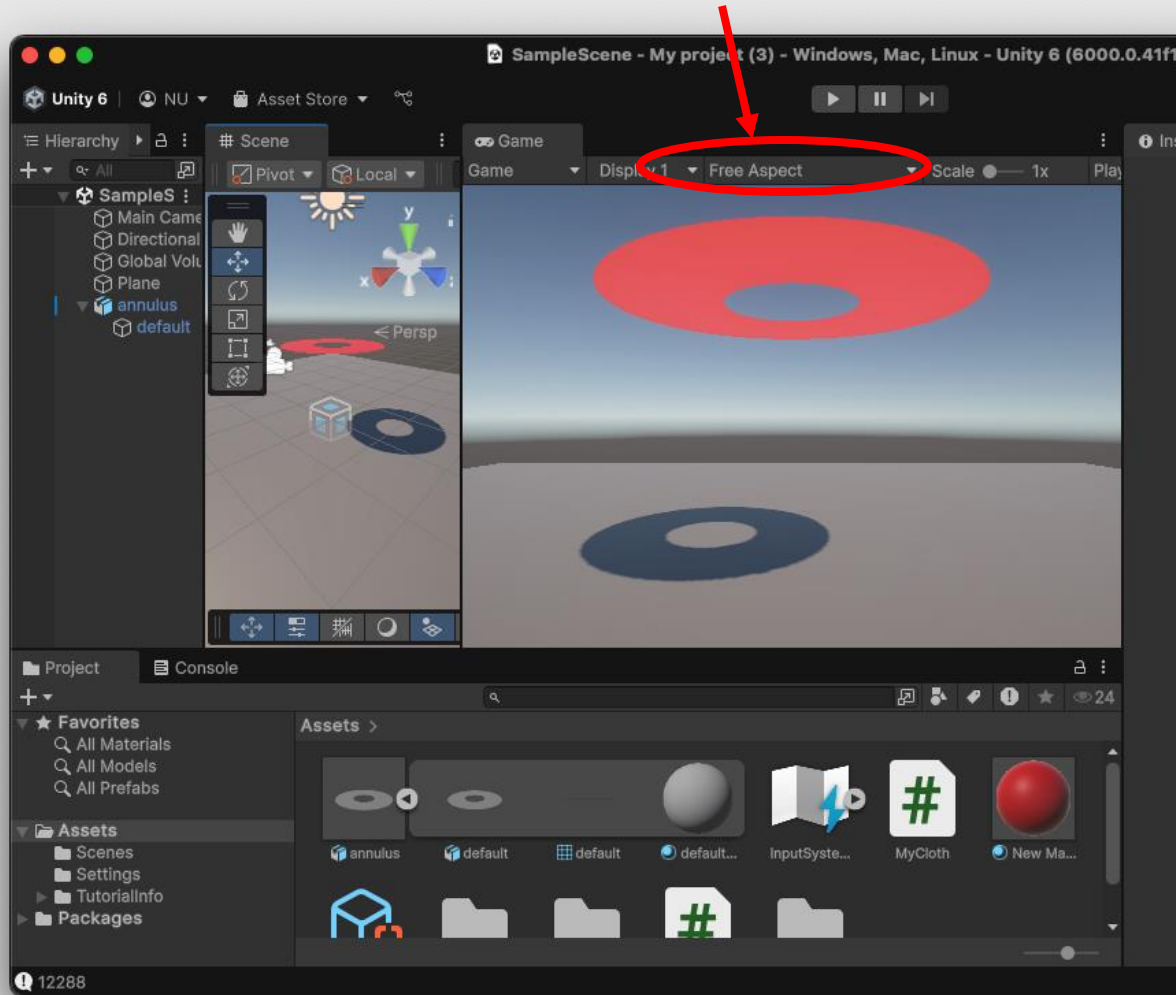
2. Choose "Console" tab

3. You see debug log output here

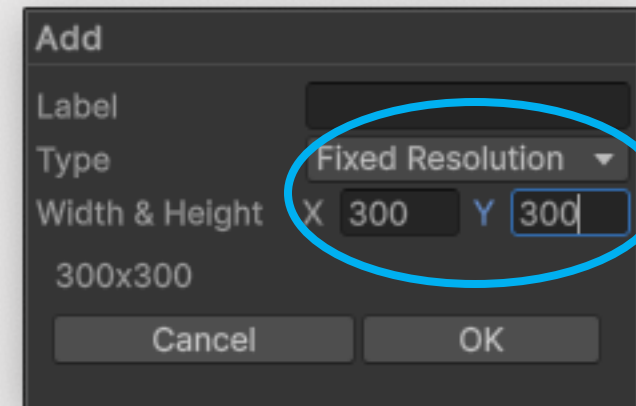
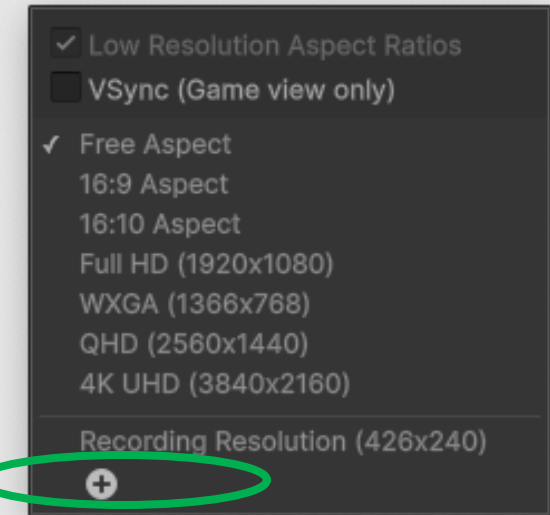


Set **Resolution** in Game Window

1. Select Package Manager



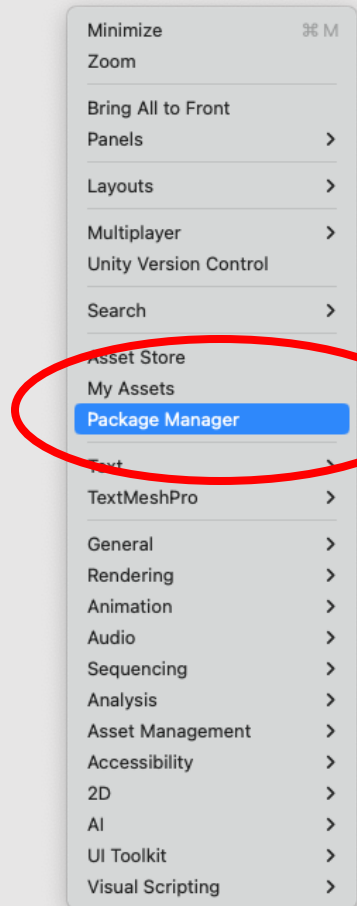
2. Add "Add New Item"



3. Set Resolution

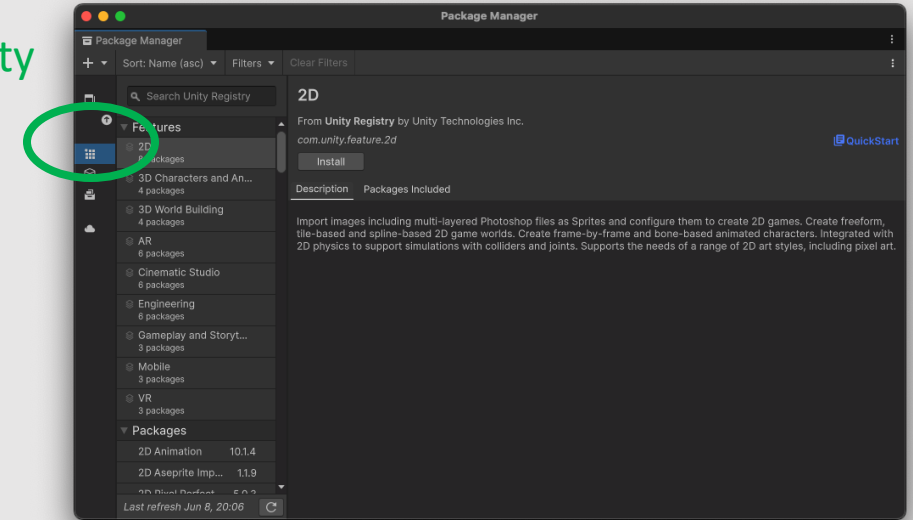
Install Recorder to Take a Screenshot

Click the **Window > Package Manager** menu in the **Unity Editor**

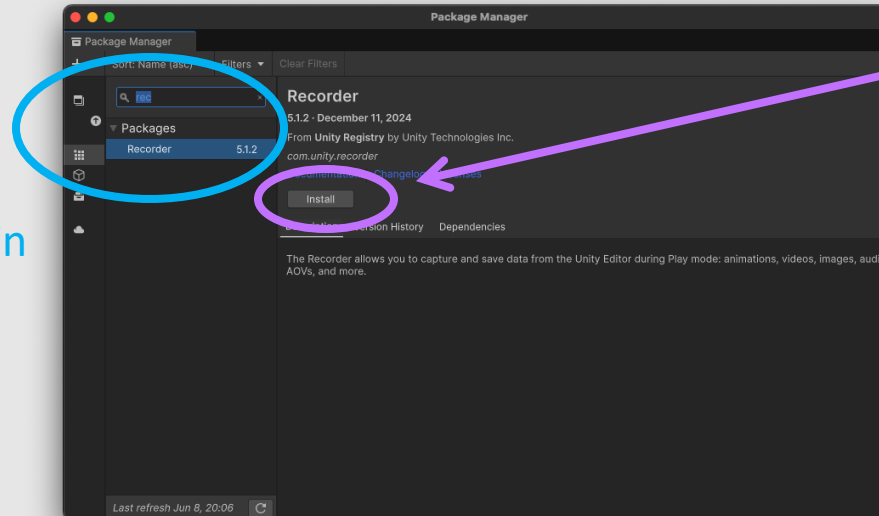


1. Select Package Manager

2. Select Unity Registry



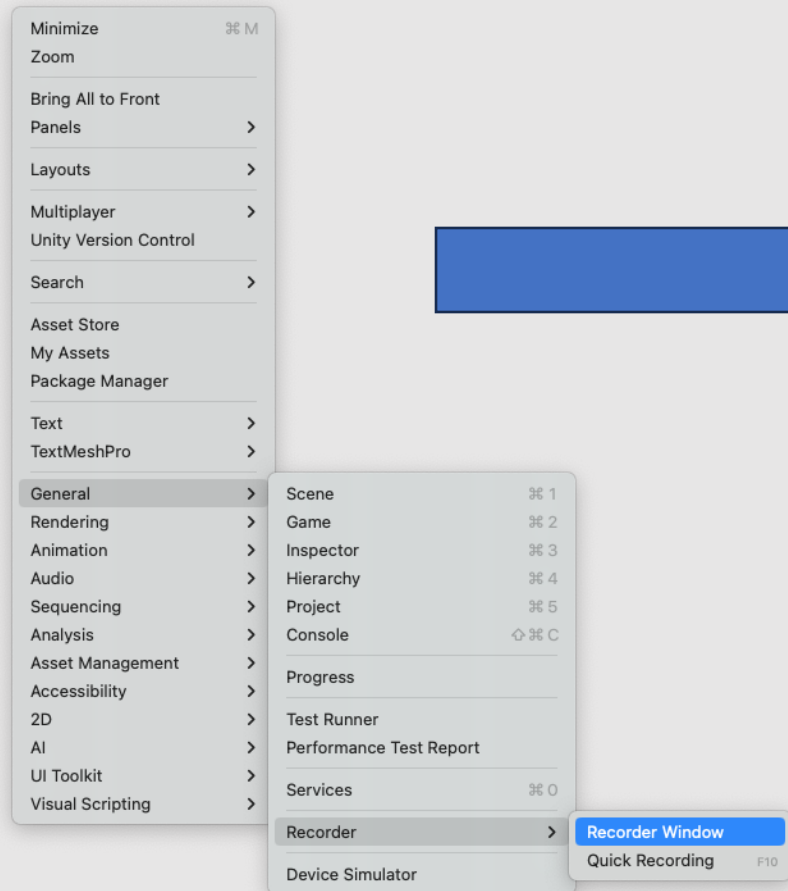
3. Find Recorder by putting "Recorder" in the search



4. Hit "Install"

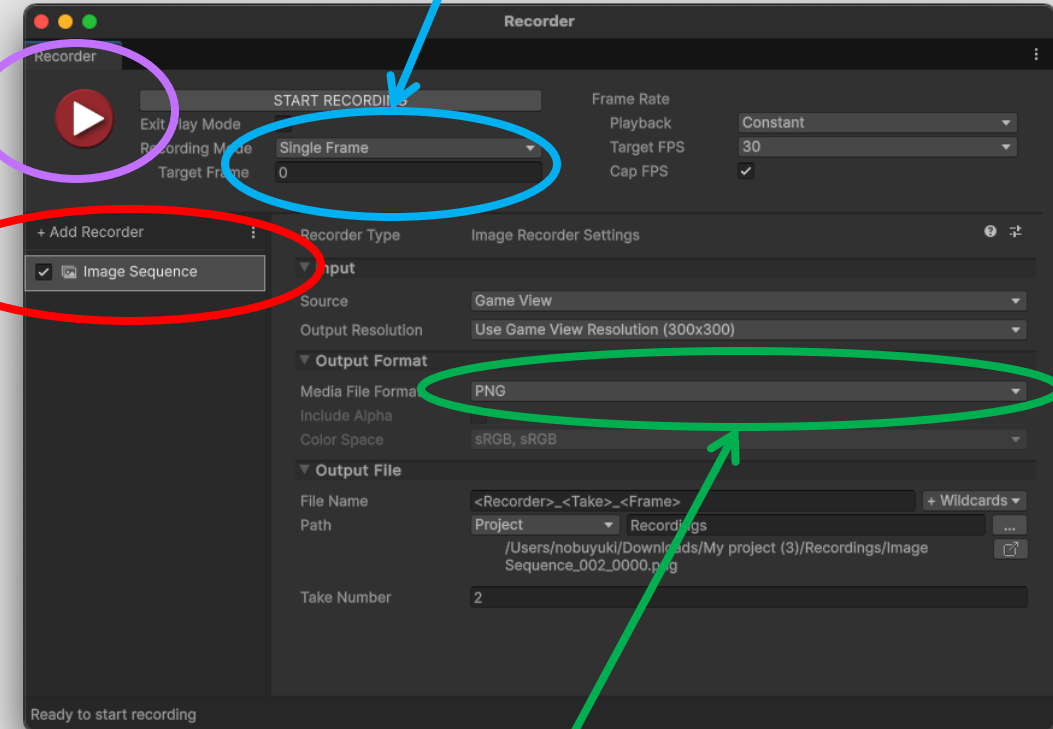
Take a Screenshot Image using Recorder

Click in the **Window > General > Recorder > Recorder Window** menu



4. Hit the Play button

1. Click "Add Recorder" and select "Image Sequence"

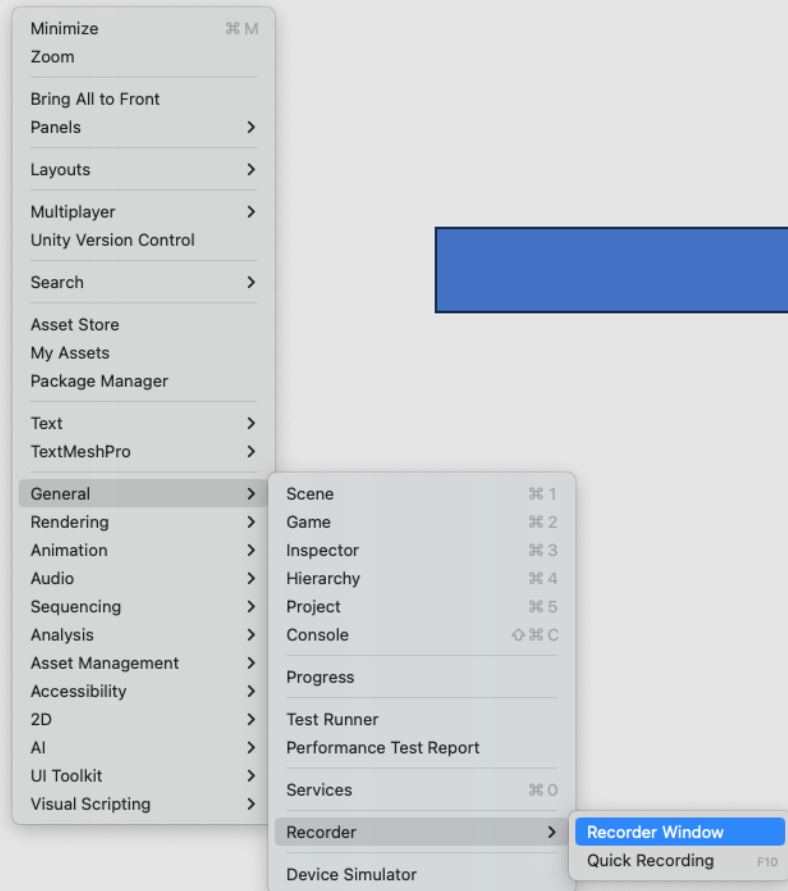


2. Select PNG format

You will see the PNG image in the "<Project Name>/Recording" folder

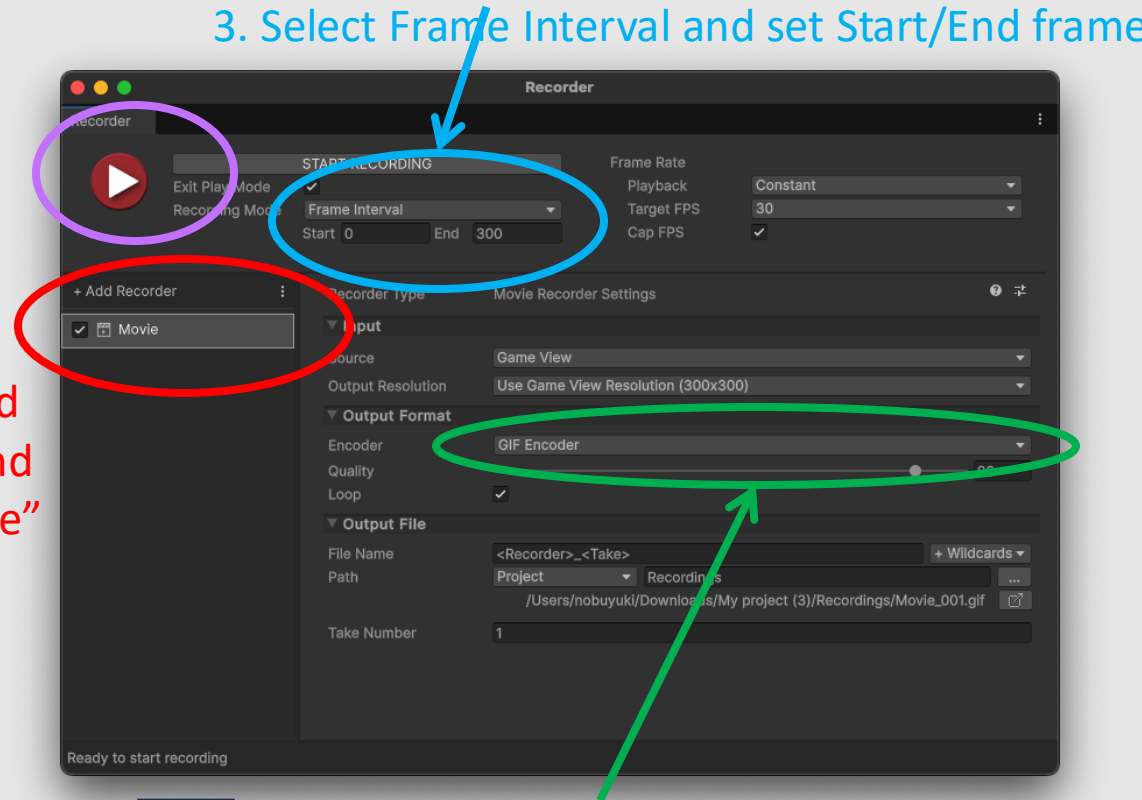
Take a Screenshot Image using Recorder

Click in the **Window > General > Recorder > Recorder Window** menu



4. Hit the Play button

1. Select "Add Recorder" and Select "Movie"



2. Select GIF Encoder

You will see the GIF animation in the "<Project Name>/Recording" folder