Unity IoC Tutorials

Programmer & document writer: Vinh Vu Thanh
Contact email: Mrthanhvinh168@gmail.com
My public repositories: https://github.com/game-libgdx-unity

Version: 1.0

Thanks for using Unity3d IoC assets!

Here are some tutorials about using this asset. You can email me for any question you have.

Getting Started

1. Get this unity asset at http://u3d.as/1rQH
2. Download then import it to your projects.
3. Locate the UnityIoC/Sample folder inside your project panel.
4. Open each of scene file in this folder to see how it works, and also to follow this document. Don't worry, the sample code is extremely simple and well-documented with a lot of comments.

Create your unity assembly definition files

It's not mandatory to create C# namespace and unity assembly definition files to use this asset.

However I would suggest to create them, since they will help organize your source code more effectively.

You can refer to this docs to see what is the unity assembly definition files

https://docs.unity3d.com/Manual/ScriptCompilationAssemblyDefinitionFiles.html

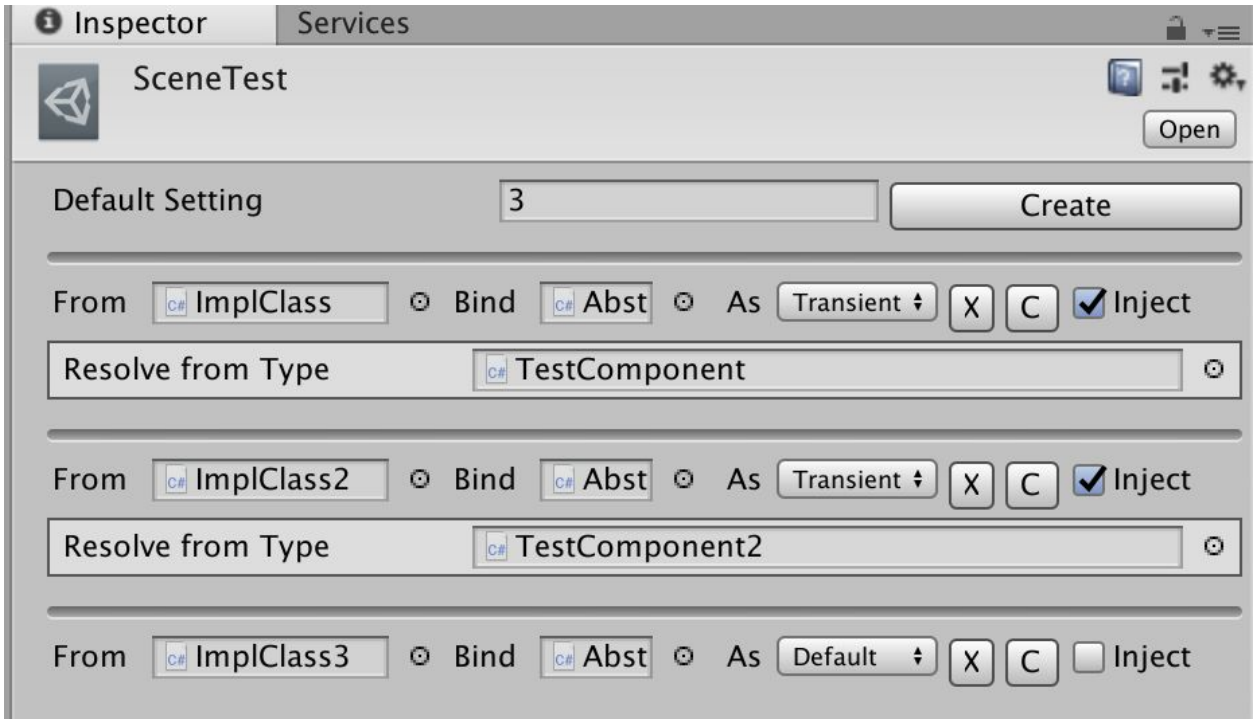
After you got these unity assembly definitions, it's time to create binding setting.

create binding setting.

You can create your own binding setting by go to menu

"Assets/Create/IoC/Binding Setting" to create a new binding setting file.

You can see there are some fields in a binding setting from inspector panel:



You can bind a concrete class for an abstract interface as Transient/Singleton/component as you prefer.

Also you can tick on Inject to show “Resolve from type” context.

For instance, the above picture, It will resolve:

- any Abstract object as ImplClass if you resolve it inside TestComponent class.
- any Abstract object as ImplClass2 if you resolve it inside TestComponent2 class.
- any Abstract object as ImplClass3 if you resolve it inside other classes.

Assembly Context

You will see this asset has assembly context class to resolve things.

AssemblyContext objects attach to the assembly definination files you created. They are used to resolve objects when you no need to resolve objects in a particular context. (inside some class, etc)

AssemblyContext will automatically find a binding setting files with the same name as the assembly.

In the sample code, you can see I created assembly named “SceneTest” and I have the setting for it in resources folder. They have the same name.

How to deal with default setting files (Which has the same name with assembly name) ?

Have a look at sample folder, open scene TestBindingSetting

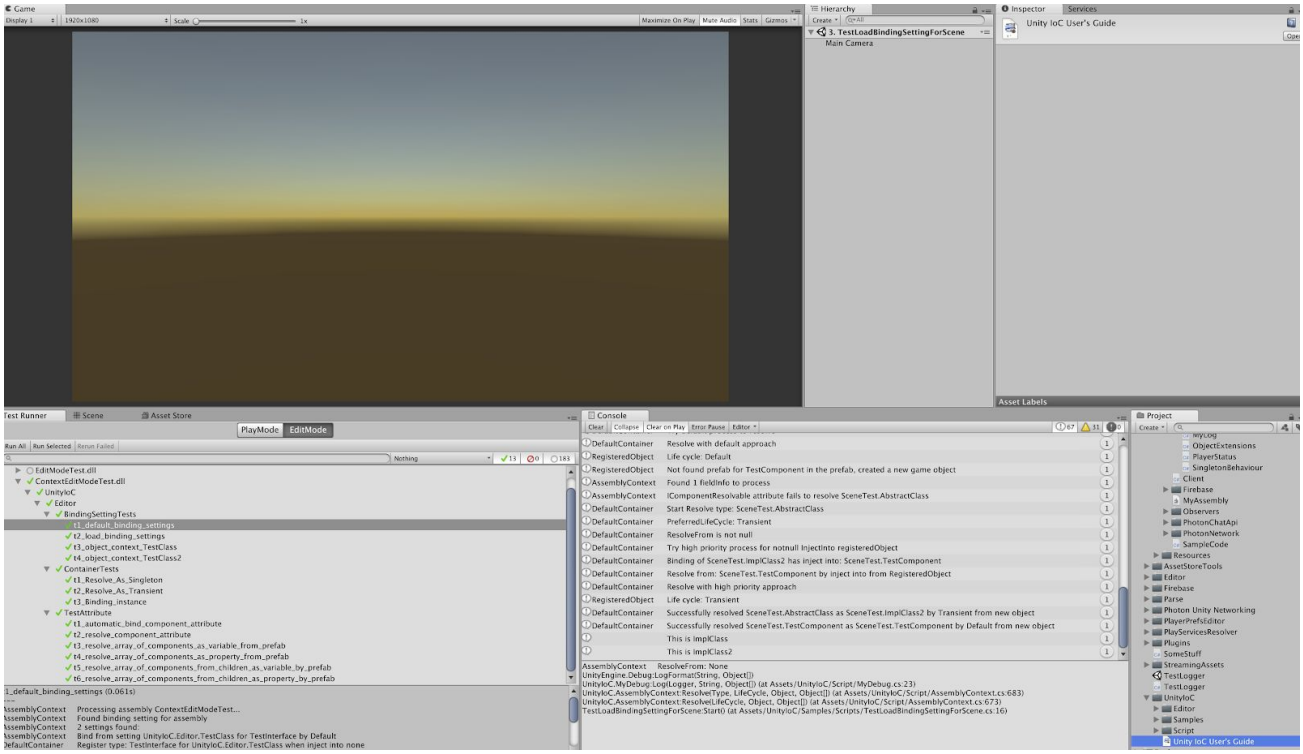
They are running on an assembly name “SceneTest” with a monobehaviour below:

```
void Start () {
  //create context with automatic load binding setting from assembly name
  //in this case, please refer to SceneTest setting from the resources folder.
  var assemblyContext = new AssemblyContext(GetType());

  //try to resolve the object by the default settings of this SceneTest assembly
  var obj = assemblyContext.Resolve<AbstractClass>();

  //you should see a log of this action in unity console
  obj.DoSomething();
}
```

Run this code, you will resolve AbstractClass as ImplClass3 from SceneTest setting.

Also there are a lot of sample to use the Unity IoC assets, please feel free to investigate them.

This is a sample of the code running on Unity:



So, what is the IoC?

Inversion of Control (IoC) means to create instances of dependencies first and latter instance of a class (optionally injecting them through constructor), instead of creating an instance of the class first and then the class instance creating instances of dependencies. Thus, inversion of control **inverts** the **flow of control** of the program. **Instead of** the **callee controlling** the **flow of control** (while creating dependencies), the **caller controls the flow of control of the program**.

https://stackoverflow.com/questions/3058/what-is-inversion-of-control

Don't worry if you still don't get it, I'll show you how it works by examples & actions :)

Why should I need an IoC?

Well if you have been using DI (Dependency Injection) for a while, maybe this is the first question you have. So why do you need an IoC container as opposed to straightforward DI code?

I can give you an example of DI:

In a good day, You just realize that you need an instance of ProductLocator for your ShippingService class.

Okay then create it by var pl = new ProductLocator();

Why you need to create it? Because you have another object is ShippingService and you need to pass a ProductLocator to the ShippingService's constructor!

So this is how you should create ShippingService: new ShippingService(new ProductLocator());

Wait, what if ShippingService's constructor have more than one parameter? E.g they have 5 or 10, even these parameters also have their own dependencies? And finally you may end up your code like this

```
var svc = new ShippingService(new ProductLocator(),
  new PricingService(), new InventoryService(),
  new TrackingRepository(new ConfigProvider()),
  new Logger(new EmailLogger(new ConfigProvider())));
```

Ridiculously crazy, right?

I know this example maybe too exceeding, just to show you benefits of an IoC. However if you have used an IoC, then you can let the IoC create the instance of ShippingService for you simply:

```
IoC context = new IoC();
var svc = context.Resolve<ShippingService>();
```

Ridiculously simple, right?

As you can see everything done with the help from a simple IoC container, it resolves every dependencies of your objects for you magically!

That's one of goals I want to achieve from developing this project!

Other benefits can be

1. You write Loose coupling classes, they are dependent from each other.
2. Your code is testable, using unity test runner or other automatic test tools.
3. Testable code is the good code. If you are not sure why, you should google it :)
4. Reduce lines of code you have to write (or copy & paste)
5. You don't waste your time to resolve the dependency for your class anymore, let IoC handle it!

How to get the source code?

All of my source code are free to download at my github, this repository
https://github.com/game-libgdx-unity/Unity-IoC-inverse-of-control-dependency-injection-

Can I see a game built by using Unity IoC framework?

In the repository, you will see a unity scene located at Assets/IoC/SampleGame/Scene/Game.unity

It's a game version of mine sweeper written in unity IoC

Before that, I already developed a similar project using Zenject, then I realized zenject is a overkill for what I need, so I started developing a new one more fit to my needs. Here is a link to the old project

https://github.com/game-libgdx-unity/minesweeper

Where can I found more tutorials about Unity IoC?

I also made some videos on my youtube channel, but my voice isn't clear, so sorry about that.

https://www.youtube.com/playlist?list=PLrxnIke4BNsTyVk2piv7PclE5aDadmfIB

Not only Unity IoC but I also talked about Photon server, Firebase, UniRx and many interesting things!

If you want to use Unity IoC, then I think my videos will be helpful for you.

Create bindings

[Binding] should be placed before class keyword

[Binding(typeof(AbstractClassOrInterface)] means you will bind the abstract code to this conrete class when you use the context to resolve the abstract type.

Resolve objects

There are some attributes to resolve object using binding you defined, they are singleton, transient, component, etc. They should be placed before a class member (fields, properties, methods, etc)

[Singleton] : If you want to context resolve an object as a singleton.

[Transient] : If you want to context resolve an object as a singleton.

[Component] : used only for unity objects. these objects will be get from the gameObject or created by adding new component to the gameObject

And more to come,...

Instead of using attributes, you can just write a line of code to resolve

Context context = new Context();

Var instance = context.Resolve<TypeOfClassYouWant>();

Then you got the instance :)

What if the instance return from context is null ???

well , in that case, first look at console to see if there is any exception thrown, I throw exceptions when there are invalid operations happened in the context.

You can copy the unity logs then email me if you cannot solve the issue. Maybe something went wrong.

What have I done so far to resolve dependencies in Unity3d?

Unity3d provides a few of ways to resolve your dependencies. Let's think about it when your mono behaviour need an instance of rigidBody!

1. You can use the modifier public fields or using [SerializeField] to expose non-public fields.

   E.g: public Rigidbody rigidBody; [SerializeField] Rigidbody rigidBody

   Then you have to select objects then drag & drop them from unity editor to resolve the rigidBody dependency which your behaviour needs.

2. You can use the GetComponent or Find... static methods from UnityEngine.Object

   Well, by this way, you can add or get component from the gameObject or from the other objects in the scene.

There are convenient methods that Unity already provided, but you also write that code time to time, and there are issues, e.g: Find... methods only work for non-disable GameObjects while GetComponent cannot get the references for some "Manager objects" that could be a singleton.

What's wrong with the Singleton?

I saw Many people love singleton, they say it's so convenient, (I think so too)

Also many people hate singleton, they say it's an anti-design pattern. (Maybe they don't tell you why)

Personally I have been using singleton for quite a long time, I also wrote generic singleton classes for unity, you can check it here

https://github.com/game-libgdx-unity/TD/blob/master/Assets/Scripts/Core/SingletonBehaviour.cs

However, using singleton is not best practice in programming. I can tell you I saw so many teams who have to fix their bugs hopelessly just because they all using SINGLETON which are public static accessible from every where in their code.

Without using it properly, Singleton will be the root of the code smell.

You also are probably writing the same “manager objects” using singleton. “Game manager, sound manager, Level manager, etc”.

Singleton is only one instance in the program, and other objects can access the singleton by a shared static instance.

It means you cannot create a second one. E.g, I want to test GameClient class by creating 2 clients and let them communicate each other. If you write the GameClient as singleton, it’s impossible to even write a unit test for the that functionality.

Yøu also will not have abstraction, polymorphism and inheritance for your OO classes. Therefore your code is not a true OOP!

By modifying the singleton from everywhere, you are making your code vulnerable for side effects which can cause the serious bugs in common cases.

You can not change the behaviour of your code at the runtime, you have to edit the source and recompile, then run again the application to see your changes.

If you still want to use singleton, it’s your decisions, I won’t make you stop using it.

Licence and contribute to this project?

It’s free to use in your projects, however I do not allow to redistribute the source code in any case, and I want to know if this IoC is helpful for your projects, please send me an email about your development when you use my source code. The same way if you want to contribute for unity IøC.

Thanks for reading!