VR AND UNITY

Corso Realtà Virtuale 2022/2023

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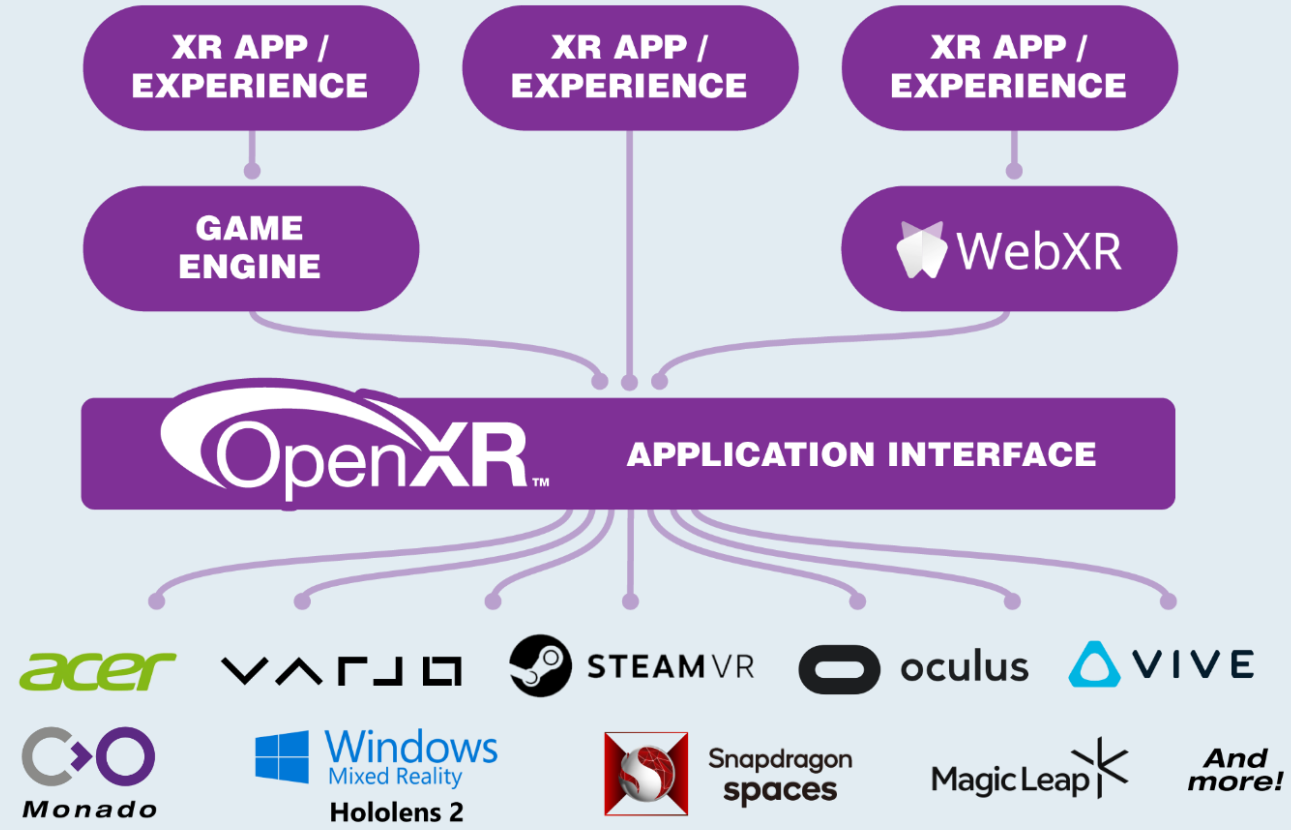
WITH UNITY V2020.3.0

OPENXR AND
XR INTERACTION TOOLKIT

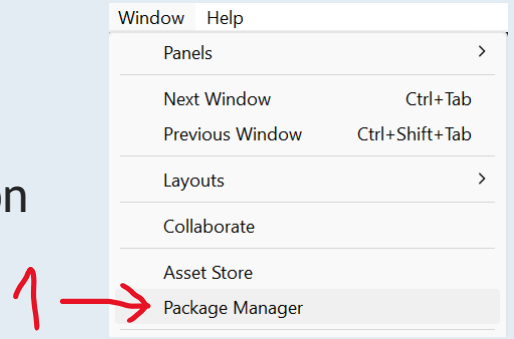
OPENXR

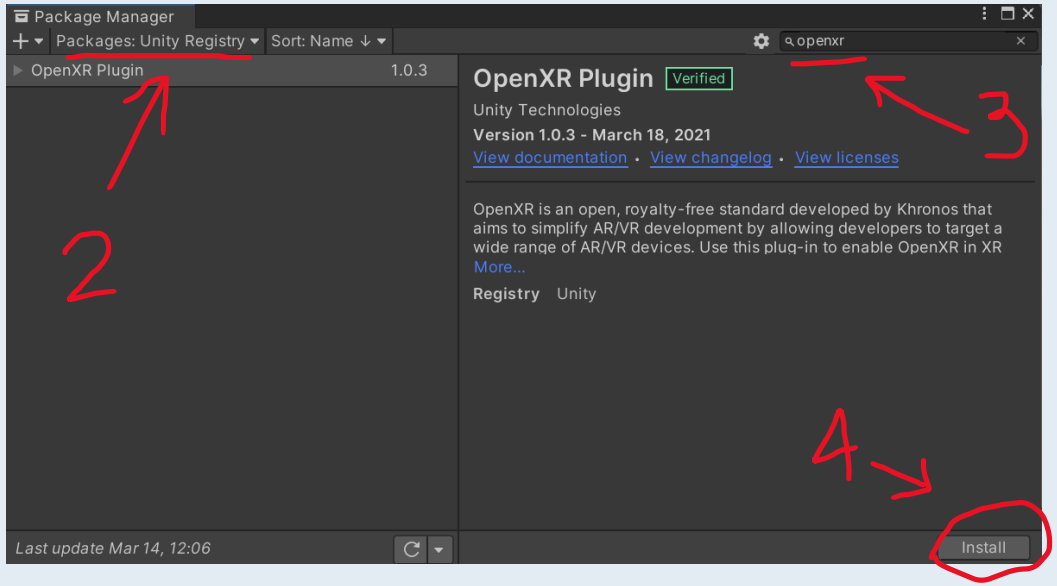


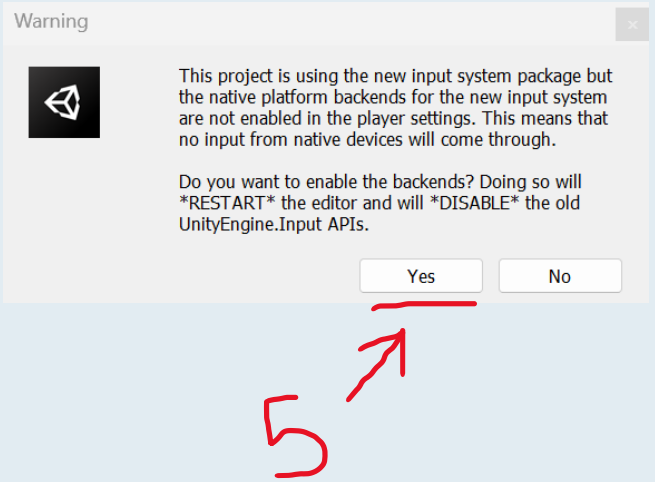
OpenXR provides a single cross-platform, high-performance API between applications and all conformant devices.

IMPORT OPENXR

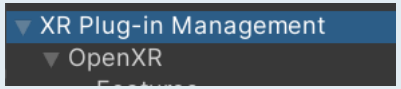
1. Open the Unity Hub and create a new Unity project
2. Open the Window > Package Manager
3. In the top-left, select Packages: Unity Registry
4. On the right, search for ‘openxr’ and click on Install button
5. When the warning pops-up, click on ‘Yes’

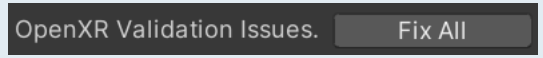


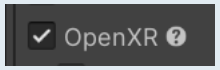




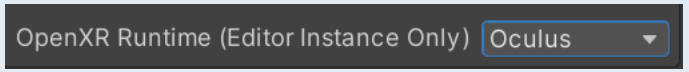
CONFIGURE OPENXR

1. Open Edit > Project Settings and select XR Plug-in Management 

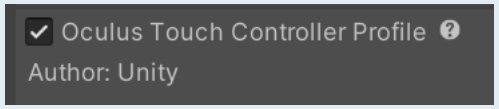
2. If there are issues, fix the issues clicking on the Fix All button 

and close the issue window
3. Select XR Plug-in Management
4. Select OpenXR in ‘Plug-in Providers’ 

5. Fix the issues selecting the red (!) and clicking on the Fix All button
6. Select OpenXR and, in OpenXR Runtime (Editor Instance Only) select Oculus

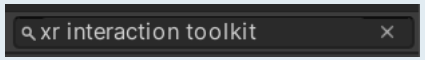


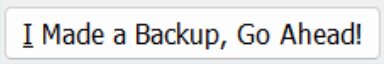
7. Select OpenXR > Features, you can select your device’s profile in the list: in our case, Oculus Touch Controller Profile



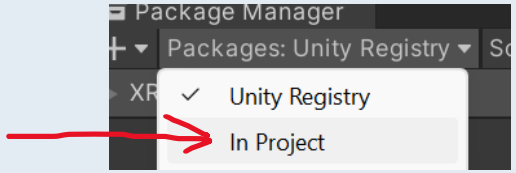
8. Close the window

XR TOOLKIT

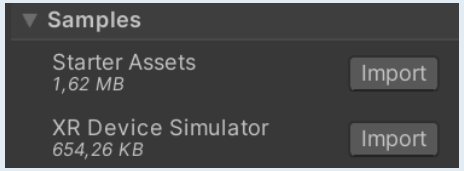
1. Open Window > Package Manager
2. Search for ‘xr interaction toolkit’ and click on Install button 

3. In the pop-up window, select ‘I Made a Backup, Go Ahead!’ 

4. On the top-left of the Package Manager window, select Packages: In Project



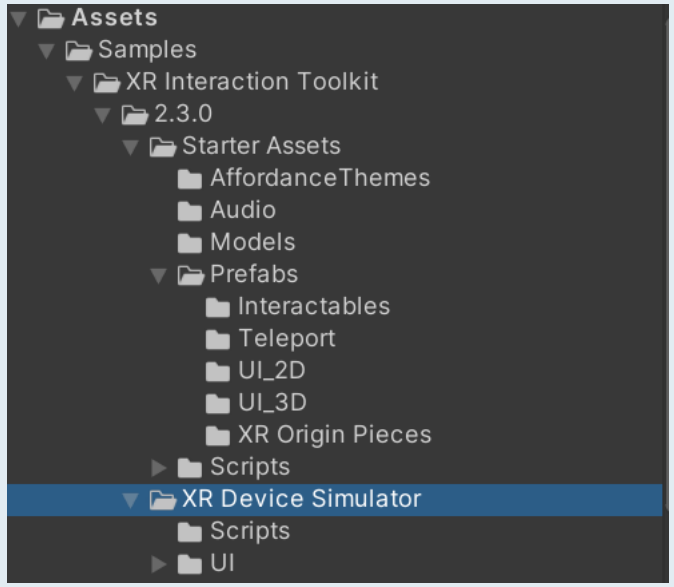
5. Select the XR Interaction Toolkit Package, click on ‘Samples’



6. Import the Starter Assets and the XR Device Simulator

XR DEVICE SIMULATOR

The XR Device Simulator allows to simulate controllers and HMD using mouse and keyboard inputs



1. In the Project Panel, search for the XR Device Simulator prefab and drag it in the Hierarchy

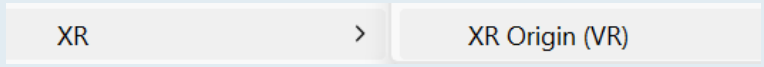
2. Press play and you will see the UI with controls:
   - You can move with WASD
   - You can press grip button with hold [G]
   - You can press trigger button with hold left mouse button

XR Device Simulator overview | XR Interaction Toolkit | 2.3.0 (unity3d.com)

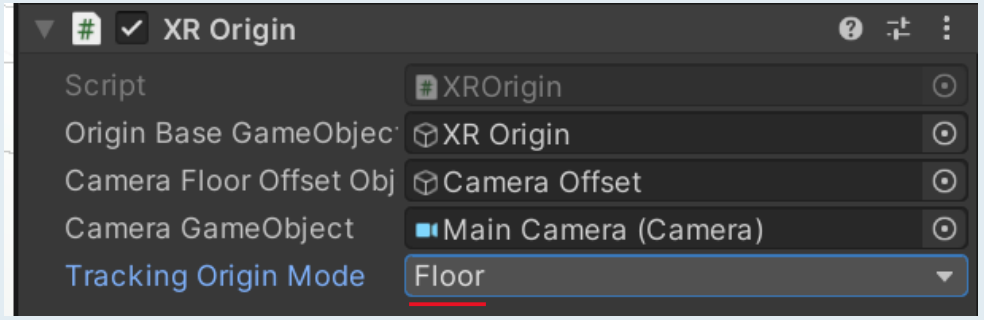
XR ORIGIN

Right click on the Hierarchy panel to create a 3D Object > Plane, which will be our floor

Delete the Camera GO

1. Right click on the Hierarchy panel and select XR > XR Origin 

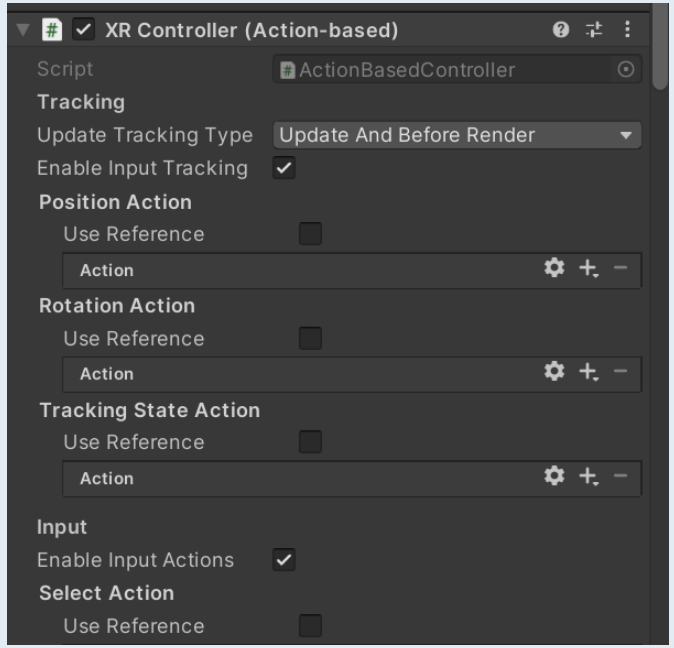
2. The XR Origin is the center of worldspace in an XR scene; select the XR Origin component of the XR Origin GO, change the Tracking Origin Mode parameter to *Floor*:
    1. Device: relative to the device
    2. Floor: relative to the floor



XR CONTROLLER

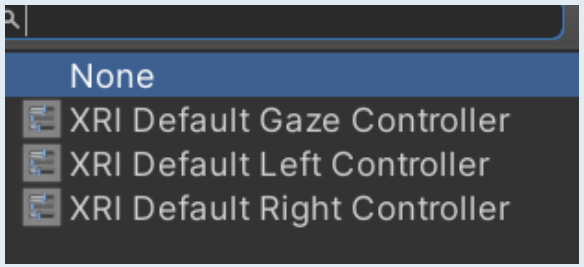
In XR Origin's children, you can find the LeftHand Controller and RightHand Controller GOs

- Each one has an XR Contoller Component attached
- Different actions are defined (position, rotation, haptics, selecting…)



In order to use the default preset from the imported folder 'Starter Assets':

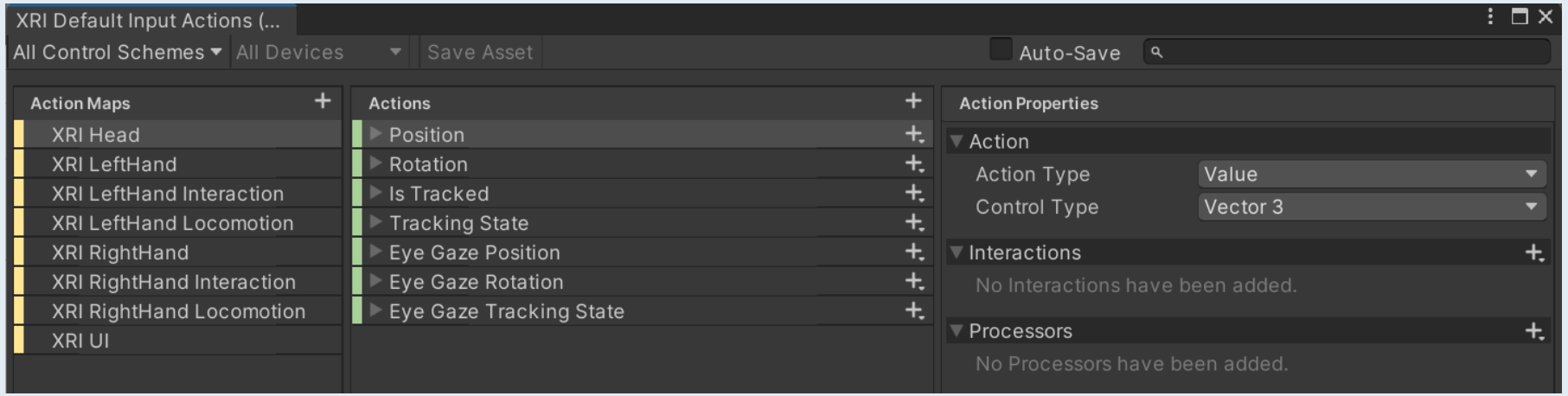
1. Click on ⚙ near the XR Component's name
2. Select the preset:
    1. *XRI Default Left Controller* for the LeftHand Controller
    2. *XRI Default Right Controller* for the RightHand Controller



INPUT ACTION MANAGER

1. Select the XR Origin GO in the Hierarchy
2. You will see an Input Action Manager component attached
3. In Action Assets, you will have the *XRI Default Input Actions* asset… double left click on it

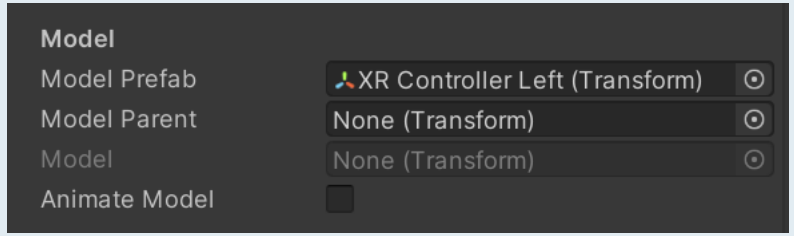
In the XRI Default Input Action asset all the values from our devices are mapped into all of the things we can use in our project



HANDS MODEL

You can add a model to your hand controllers:

1. Select LeftHand Controller and in XR Controller component, in Model section, add the prefab you want to use for the left hand in Model Prefab
2. Select RightHand Controller and in XR Controller component, in Model section, add the prefab you want to use for the right hand in Model Prefab



We will use the XR Controller prefabs available in the:

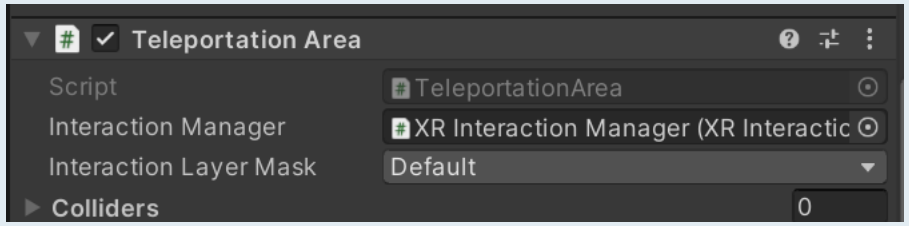
Starter Assets > XR Origin Pieces > Prefabs folder

LOCOMOTION AND TELEPORTING

SET UP 1/2

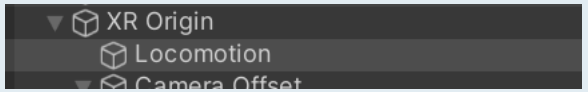
We first need an area where we can teleport:

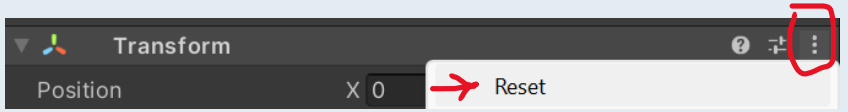
1. Select the plane GO
2. Add the ‘Teleportation Area’ component



We need now to set up a locomotion system:

3. Create a new Empty GO, and call it Locomotion
4. Make it a child of the XR Origin object and reset its Transform component



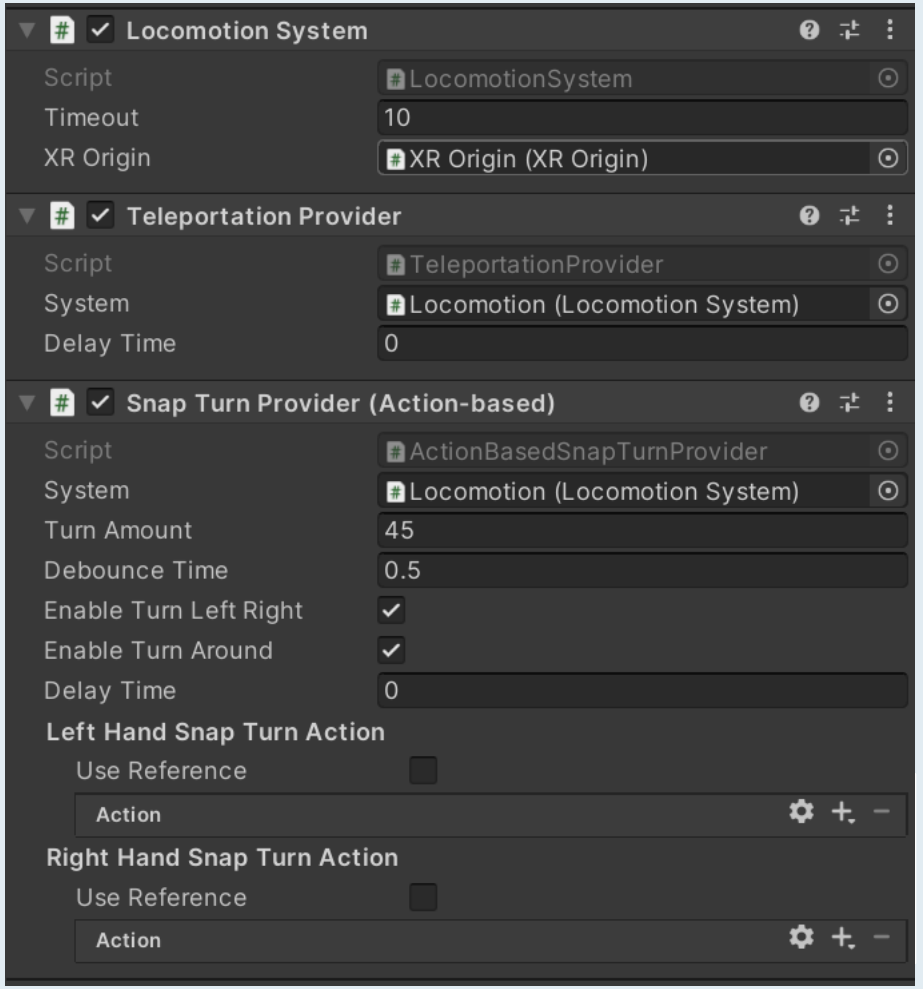


SET UP 2/2

5. Select the Locomotion GO, and add to it a Locomotion System component and select our XR Origin object in the XR Origin field

6. Add the Teleportation Provider component and drag the attached Locomotion System component into the System field

7. Add the Snap Turn Provider (Action-based) and drag the attached Locomotion System component into the System field

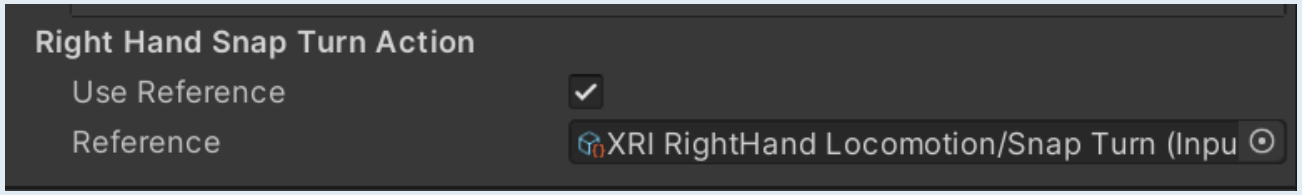


SNAP TURN

1. In the Snap Turn Provider component select the Right Hand Snap Turn Action and check Use Reference

5. Click on the circle near the Reference field and search for *XRI RightHand Locomotion/Snap Turn*

6. Select it

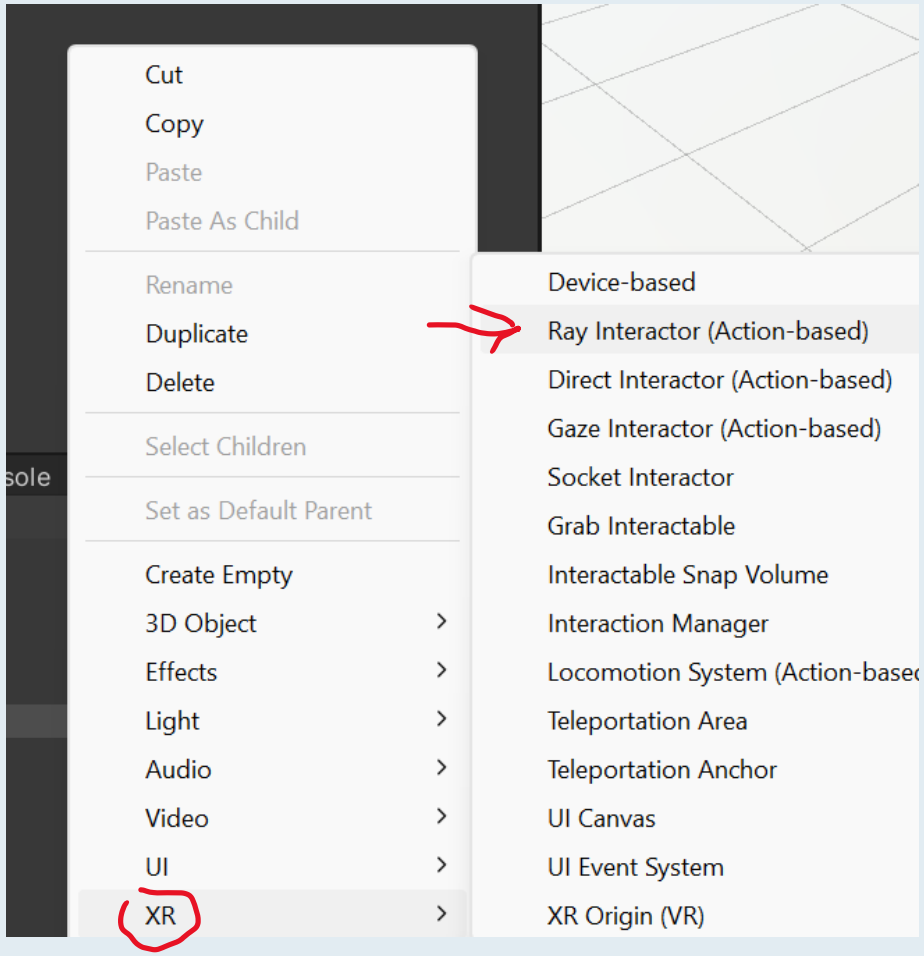


RAY INTERACTOR

If we want to work with teleportation, we need a Ray Interactor:

1. The default hands of the XR Origin have an XR Interactor component

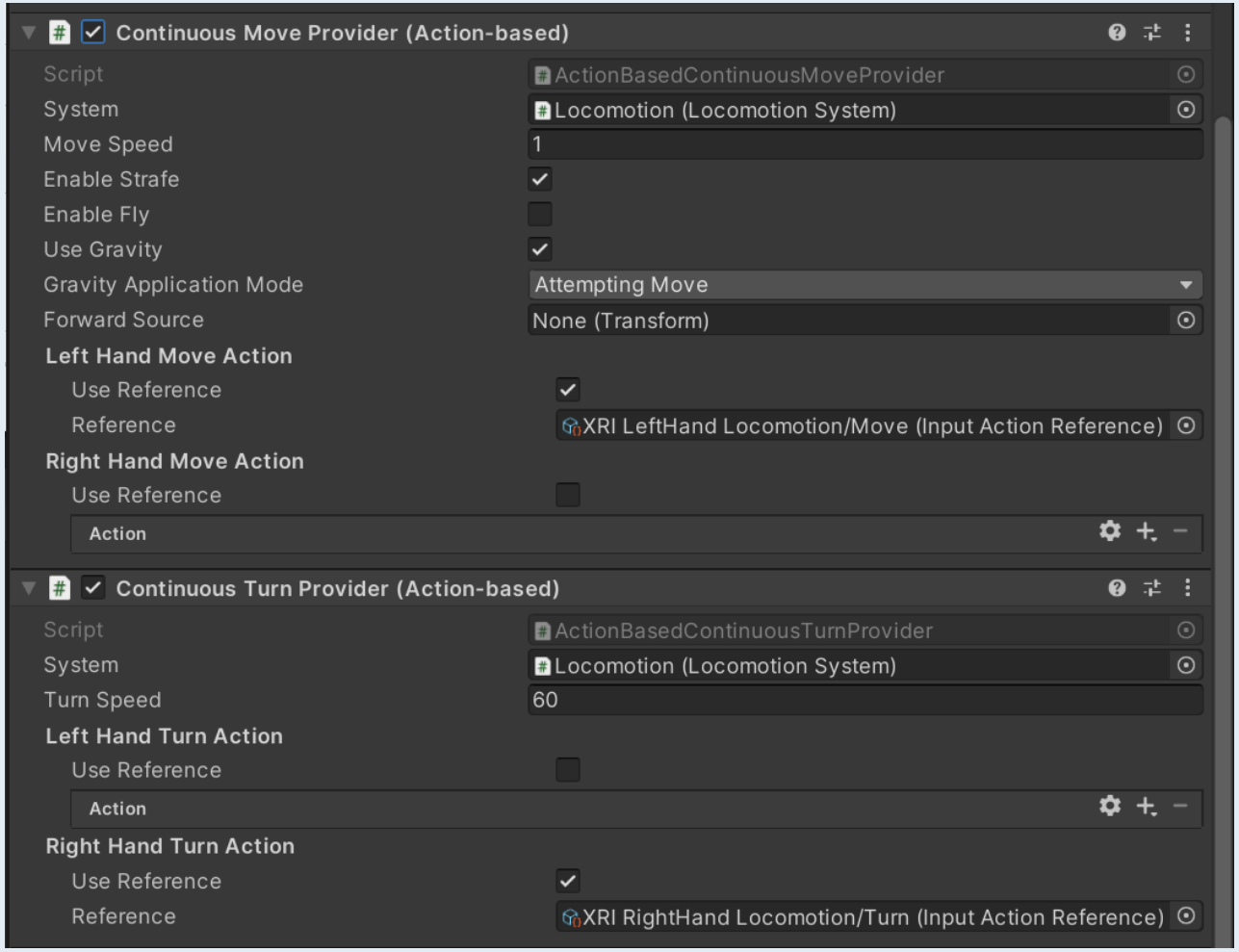
2. To create a new Ray Interactor GO: click with right mouse button in the Hierarcy > XR > RayInteractor



CONTINUOUS MOVEMENT

You can have a continuous locomotion or a continuous turn using:

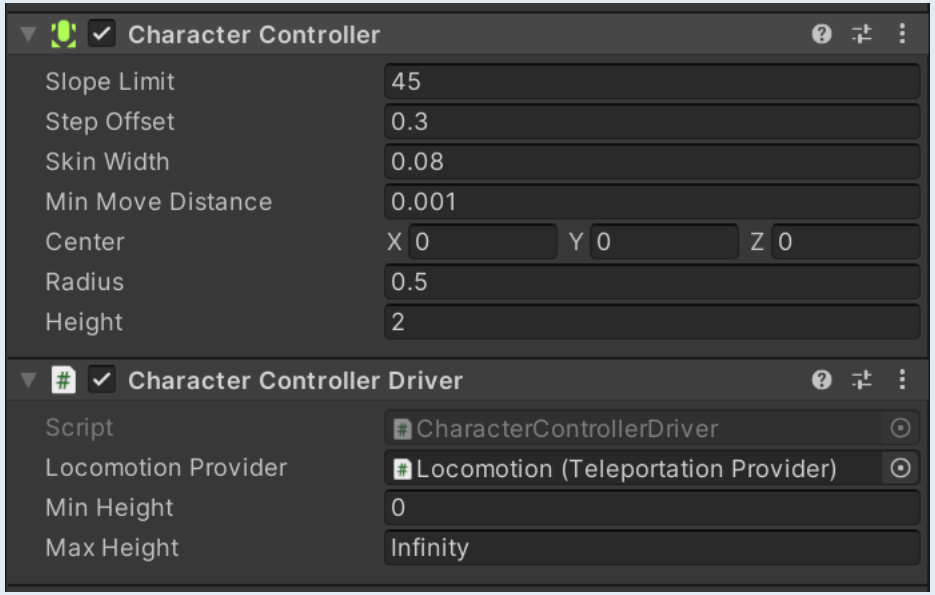
- the Continuous Move Provider (Action-based) component
- the the Continuous Turn Provider (Action-based) component



PHYSICS VR PLAYER

In order to have a physics VR player controller, we need to add to our XR Origin:

- A Character Controller Driver component
- A Character Controller component, which will define the player's collider



INTERACTABLE AND INTERACTORS

HOVER, SELECT, ACTIVATE

An interactable is each object you can interact with and use

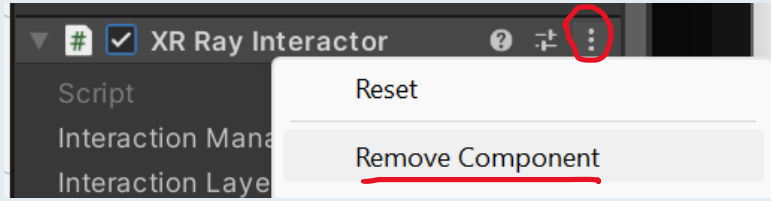
The interactor is what you use to interact with the interactable: the hands

- HOVER = when your hand touch an interactable
- SELECT = when your hand grab (GRIP) an interactable
- ACTIVATE = when your hand hold (TRIGGER) an interactable

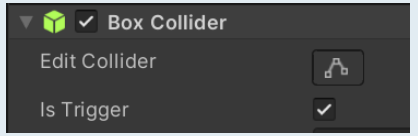
INTERACTOR

We need to add an Interactor component to our hands:

1. Select the LeftHand Controller and [shift] select the RightHand Controller GOs, in the XR Ray Interactor component click on the trhee points on the right and Remove Component



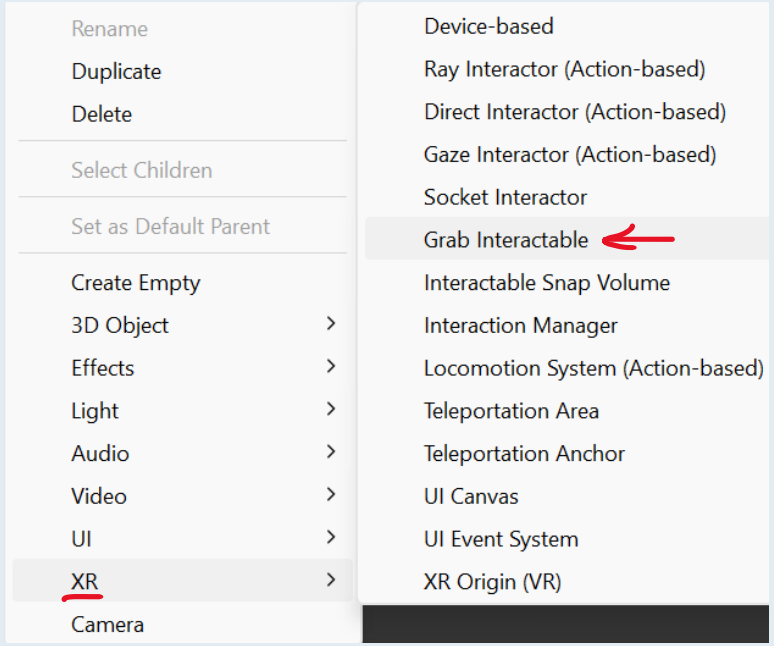
2. Remove also the XR Interactor Line Visual and the Line Renderer components
3. click on ‘Add Component’ and select *XR Direct Interactor*
4. We also need a collider set to trigger:
    1. add a Box Collider component for each hand and check ‘Is Trigger’



INTERACTABLE

We need to add an Interactable object:

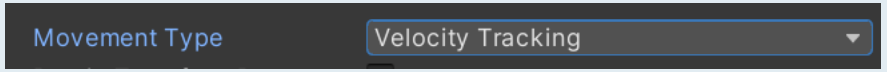
1. Right click in the Hierarchy panel and select XR > Grab Interactable



Each interactable need a collider, a rigidbody and an XR Grab Interactable component

In the XR Grab Interactable you can change the type of movement of the object, in Movement Type field:

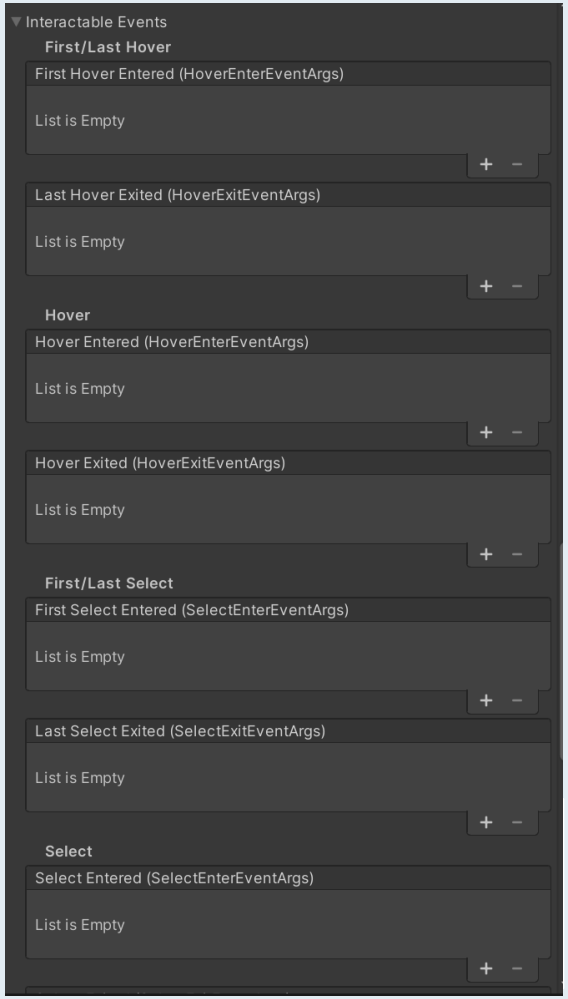
- Instantaneous: no collision, no physics
- Kinematic: can interact with other objects
- Velocity Tracking: can collide with any object with collider



INTERACTABLE EVENTS

1. Select the Grab Interactable

2. In the XR Grab Interactable component, search for the Interactable Events:
    1. **Hover**: is activated when the interactor enters the collider of the interactable
    2. **Select:** starts working when we hold an object with the grip button
    3. **Activate**: starts working when we hold an object with the grip and we pull the trigger button



ACTIVATE 1/3

Let’s try to add an event, we will use the Activate event

We want to spawn an object when the Grab Interactable GO is grabbed and the trigger button pressed:

1. In Hierarchy, create a GO with right mouse button > 3D Object > Sphere and add a Rigidbody component to the Object
2. Add the object into the Project’s Asset folder to transform it into a Prefab and delete it from the scene
3. Create a script called ‘ObjectInteraction’ and open it
4. Create a new public field for the prefab:

```
public GameObject objectToSpawn;
```

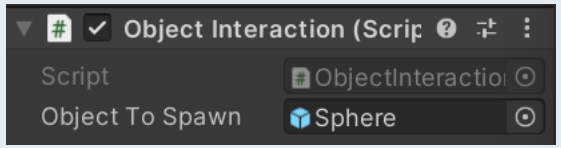
ACTIVATE 2/3

5. Create a new public function to be called when the Activate starts:

```
public void ActivateStart()

{
    GameObject newObject;
    newObject = Instantiate(objectToSpawn, new Vector3(0, 0, 0), new Quaternion(0, 0, 0, 0));
}
```

6. In Unity window, select the Grab Interactable object and attach it the ‘ObjectInteraction’ script
7. Select the Grab Interactable object and in the Inspector, in the Object Interaction script, assign the prefab to the Object To Spawn field:



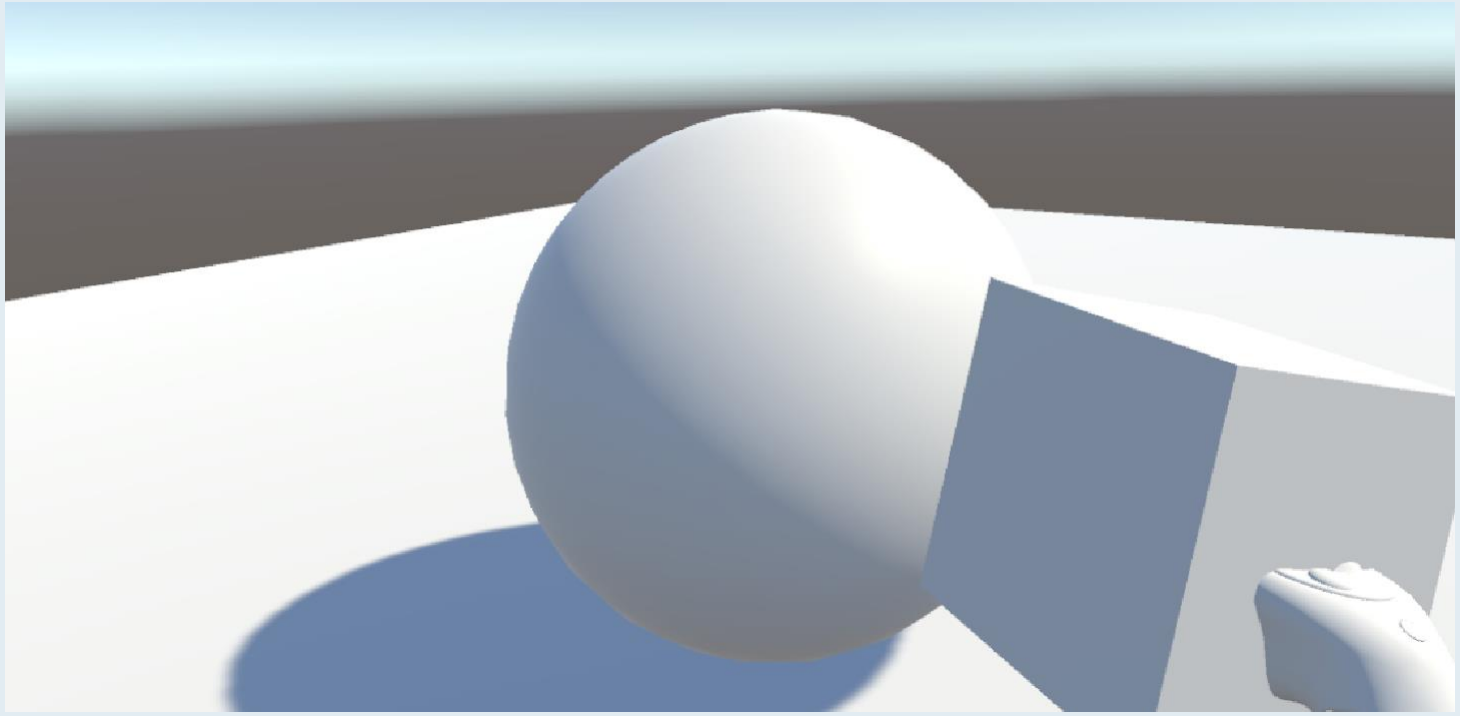
ACTIVATE 3/3

8. In the XR Grab Interactable component, search for the Interactable Events > Activate
9. Click on + on the right, and add the Grab Interactable object in the Object field
10. Select ObjectInteraction > ActivateStart() in function

ACTIVATE EVENT RESULTS

Press play and grab the grabbable object

Then, press trigger button to see the result



BUILD FOR ANDROID

BUILD FOR ANDROID

1. Make sure that the Android Build Support module is installed, otherwise:
    1. In Unity Hub, select Installs
    2. Select the gear near the Unity version you are using
    3. Select Add Module and install the Android Build Support

2. Open Edit > Project Settings
3. Open XR Plug-in Management
4. Select Android Settings  and check ‘Open XR’

5. Select File > Build > Android
6. Drag your scene into Scenes In Build and click on Build button