Lab 1: Building the Environment

Welcome to Monster Shooter! Over the course of 4 lab sections, you'll be building a game that looks like this:

These labs will not be a comprehensive overview of everything that Unity and VR has to offer. However, they will touch upon a lot of different topics so that you get a taste of what is possible. The labs will also serve as practice for creating a project from start to finish, something that will be valuable for the final project.

The Game

Monster Shooter is a survival shooter game. Set in a small desert town, you use your trusty pistol to fend off hordes of monsters until you reach your eventual demise.

We can divide the game into several distinct chunks. Each lab will focus on a single one.

1. The **environment**. The world that you see around you when you put on the headset. All the props, textures, skyboxes, models, etc. Most of it will be static and stationary for the game, with the sole exception of the gun.
2. The **gun**. Namely, being able to pick it up and shoot it. This sounds simple, but requires scripting, animations, particle effects, sound effects, and input management from the controller in order to create that split second experience when you pull the trigger.
3. The **monsters**. They must be able to navigate the environment and make their way towards the player, where they'll attack when in range.
4. The **manager**. This manages the spawning of monsters over the course of the game, and also what happens when you take too much damage and die.

For this lab, we will focus on the initial setup of the project and the creation of the environment.

Project Setup

First, download the project skeleton here. This is a unitypackage that contains all the assets and resources needed to build the project. Next, create a new project and import the downloaded unitypackage. You can do this through *Assets* > *Import Package* > *Custom Package*.

Importing might take a while, as Unity will have to load and configure a lot of textures and libraries. In particular, if you see Unity getting stuck importing something called "AvatarSurfaceShader", don't be alarmed - that particular asset will usually take a long time.

Once it's finished, you'll see in your Project view a bunch of folders, which we'll briefly give a rundown for below.

The folders you start off with.

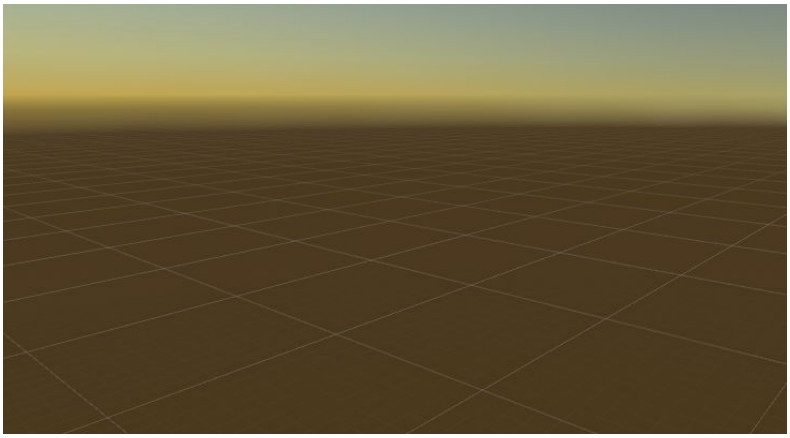
- **Animations:** Contains animation data for the gun and monsters.
- **Materials:** Contains the materials that help define what each object looks like in game.
- **Models:** Contains the 3D models.
- **OVR and OvrAvatar:** Library folders that provide support for the Oculus Rift.
- **Prefabs:** Premade objects that you can drop or spawn into a scene. Some of these are akin to just models, but others have other components or functionality attached.
- **Resources:** Another auto-generated folder. This one only contains some data for the Oculus.
- **Scripts:** Contains the scripts that help run and drive the game.
- **Sounds:** Contains the sound files.
- **Textures:** Contains the images that feed into the materials in the Materials folder.

A final thing before we delve into creating the scene: go ahead and reset your editor layout via *Window* > *Layouts* > *Default*. Any screenshots shown (like the one above) will be using this layout and will make following along easier. This has no effect on the actual project, so if you prefer using a different layout, you are free to do so.

Creating the Scene

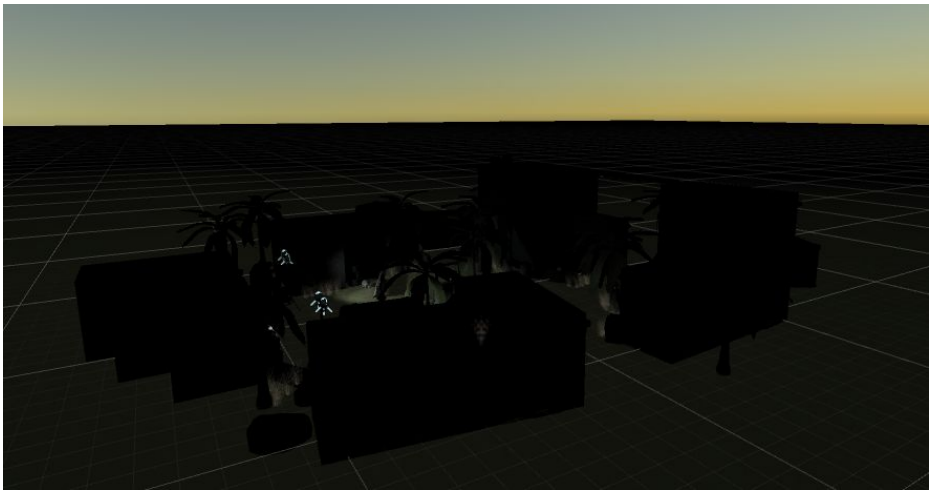
Let's start by creating a new scene. Right-click some empty space within the Project view and select *Create* > *Scene*, and call it "Lab". Double-click your newly created scene to open it.

The first thing you'll want to do is delete the Main Camera and Directional Light objects that come part of the scene - we'll add our own camera and lights in a bit.



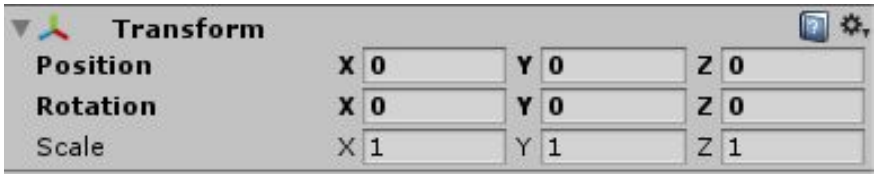
A completely empty scene.

Now go into the Prefabs folder and look for a prefab called "Environment". To save you a couple hours of work, we've created the physical map for you. Drag the prefab into the Hierarchy view on the left side to spawn an instance of it into your scene.



Scene with the environment prefab dropped in.

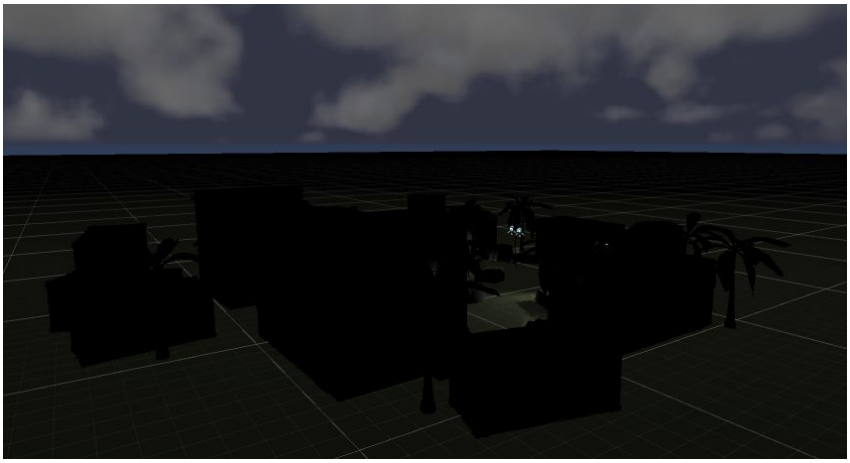
Make sure the environment's transform component in the Inspector view is zeroed out in position and rotation, and has a xyz-scale of 1.



If your values don't match, click the gear in the top right and hit "Reset".

You'll notice that the lighting is off - the buildings are way too dark and shadows aren't being cast properly. We'll fix that, but first we'll change the skybox (the textures that surround the scene) to something that looks more like the night sky.

Go to *Window* > *Lighting* > *Settings*, which will open a new window that contains all the lighting data for this scene. Look for the "Skybox Material" line, and click the little circle on its right side. This will open up a box that lets you select which skybox to use. Search for "nightsky2" and select it.



Scene with the skybox in.

With our skybox in we can now properly fix our lighting. At the bottom of Lighting window, click "Generate Lighting" to start computing the proper lighting for the scene. You can also check "Auto Generate" so that any changes you make will automatically tell Unity to adjust lighting.

Scene with the lighting computed.

Putting in VR Support

If you try pressing play now, you'll just get a black screen telling you that no cameras are rendering. This is because we took out the Main Camera that comes with every new scene. Let's fix that now.

Go into the OVR/Prefabs folder to find the "OVRCameraRig" prefab and drag it into your hierarchy. This camera is from Oculus' SDK and connects to the display on the Oculus Rift headset. Make sure its transform is also set to 0s and 1s, just like the environment prefab.

There's one final thing we need to do before we can put on the headset. Go to *Edit* > *Project Settings* > *Player* and check "Virtual Reality Supported" if it's not already enabled. Then put on the headset and press play!

Well, that's not right.

You're in the ground, which we clearly don't want. To fix this, select your OVRCameraRig within your hierarchy and, in the Inspector view, change Tracking Origin Type from Eye Level to Floor Level. Now try it again.

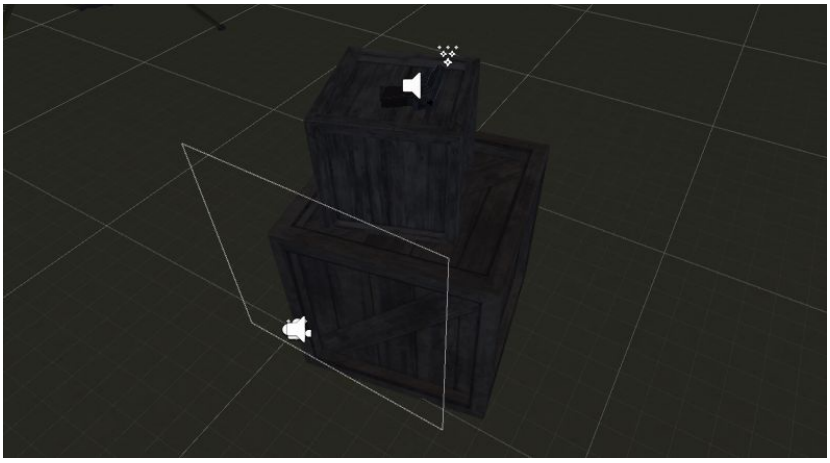
Much better.

The reason for this bug and fix comes from how Oculus relates your position in physical space to a point within your scene in Unity. Note that the position of your OVRCameraRig is (0, 0, 0), which, if you view it in scene view, is on the ground.

With eye level tracking, Oculus puts your "eyes", aka the headset display, exactly where the OVRCameraRig is located, which is why your view was on the ground. But with floor level tracking, Oculus matches up the OVRCameraRig position with your physical floor in real life instead, which pushes your headset display up to the correct height.

Adding Hands and the Stand

We now want to hands and the gun to our game so we can build interactivity between the two. Before adding the gun, however, we're going to add a stand to put the gun on so that it's within arm's reach when you start the game.



It'll look like this.

Let's start with your hands. Go into the OvrAvatar/Content/Prefabs folder and drag in the LocalAvatar prefab. As with the Environment and OVRCameraRig, make sure its transform component has been reset. Now, when you press play, you should be able to hold the Oculus Touch controllers to see your hands.

Try messing with the controls to change your hand shape.

Next, let's create the two crates that make up the stand. If you look to the left of your starting location, you'll notice there's already a crate there we can use. Duplicate it off twice, and move the new objects out of the Environment object so that they're parentless - this will make it easier to select and move them. Rename one to "Lower Crate" and the other to "Upper Crate".

Your hierarchy should now look like this.

Use the movement (w), rotation (e), and scale (r) tools to position these crates into the shape shown in the first picture of the section. The lower crate should be just to the right of OVRCameraRig, and the upper crate should be smaller and sit on top of it. Don't worry about being exact - just keep testing it with the headset on until the top of the upper crate is comfortably within arm's reach.

Tip: With the scale tool, dragging the white cube scales all axes.

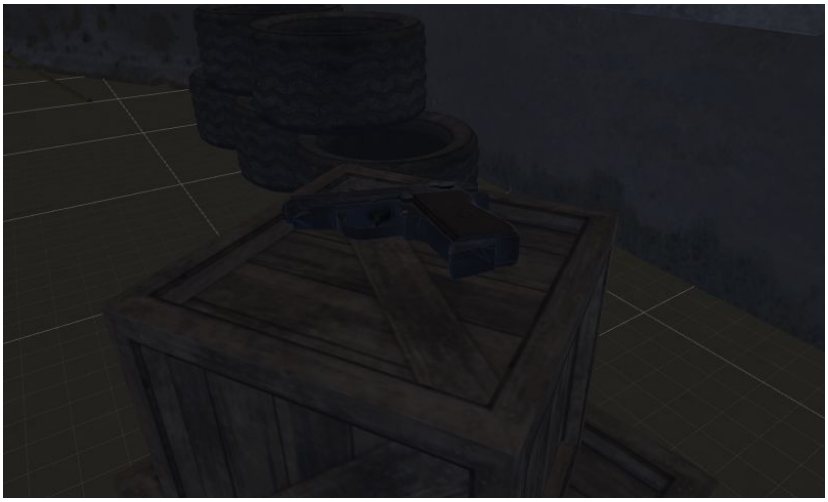
Adding the Gun

Now we can create the gun. Start by right-clicking an empty spot within the hierarchy and clicking “Create Empty”. This will create an object with nothing but a transform component, which we’ll add to and flesh out over the course of these labs. Name it “Gun”, and reset its transform - we’ll move it later.

Go into the Models folder and find the object called “makarov”. This is the 3D model for our gun. Go ahead and drag it *onto* our newly created empty object, which will parent it under Gun.

Parenting is a concept in Unity that allows us to construct complex objects out of simpler ones and have them all move together as one. An object (call it the child) parented under another object (call it the parent) will have all its transform values defined as *relative* to that of its parent. This means when the parent moves, scales, or rotates, its child will change along with it.

Let’s rename this newly childed object to “Model”. It’ll start out being far, far too large, so scale each of its axes to 0.025. Then select its parent Gun and move it around, which should now move the 3D model around as well. Position/rotate gameobject Gun so it sits on top of the upper crate.

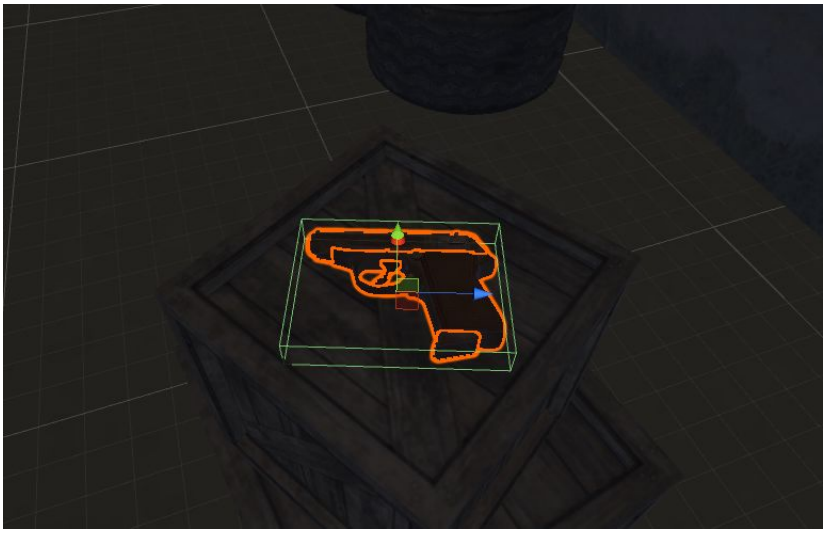


The end result should look like this.

Next, we’re going to add physics functionality to our gun, so that players can throw it if they ever want to give up in style. With Gun selected, go to the Inspector view and use the Add Component button to add a Box Collider to our object. You’ll see a green box appear around the gun.

This green box is a collider. Colliders represent the bounds of an object when doing physics calculations (like collisions), and in Unity are either boxes, sphere, or capsules. Of course, a box can't perfectly capture the bounds of a complex model like our gun, but it'll do for the circumstances.

The default size of the box collider is neither the right size or shape. Change its size values so that X = 0.03, Y = 0.15, and Z = 0.2. The result should look like this:



Now, add a Rigidbody component to Gun. Rigidbodies are what define something as a moving, physical object. It tells Unity how to treat this object in its physics calculations with variables like weight and drag. Note that an object cannot have a rigidbody component without also having a collider (since Unity needs physical bounds to perform physics calculations).

Let's test whether or not our gun is a valid physics object. Raise it up a little in the inspector, then put on the headset and press play. You should see that the gun has fallen from its original location to rest on the upper box.

Actually, it hovers a little above the crate. See if you can figure out why and fix it. (optional)

This marks the end of lab 1! To check-off successfully, just let a facilitator see your current project and show them that you've completed all of the sections successfully.