

VR 360-degree in Oculus using Unity

This lesson is recommended for age 13 and higher

Year Level: Years 9-10



Summary

In this lesson, students explore how to design and develop a Virtual Reality (VR) interactive 360 video experience using Unity 3D for Oculus Quest VR headset. We develop the lesson using a sample 360 video about a museum tour readily available on the web and provide guidance on how students can develop their own experience using custom 360 videos.

This lesson provides a technical summary of the processes involved in developing 360 video experiences. We provide a suggested lesson sequence at the end which is focused around developing content for a place of interest (e.g. botanical park, school area, memorial site) in which students can source their own content. This can be undertaken by students individually or in teams.

Developer requirements

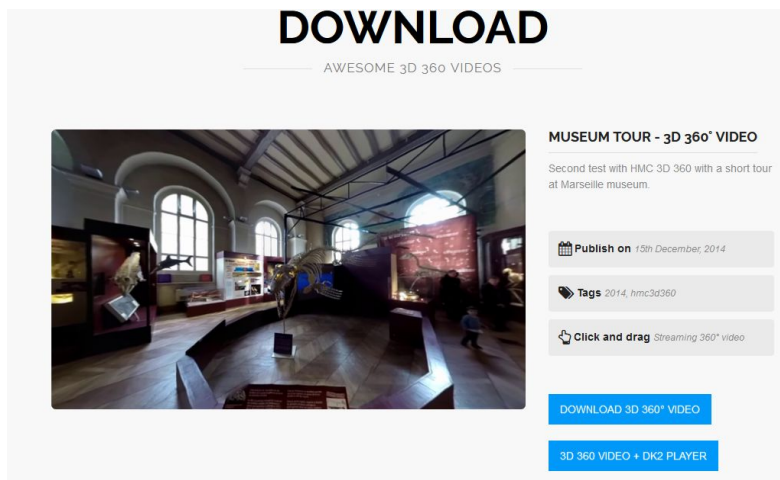
1. Unity 3D - This lesson is developed using Unity 3D (2018 4.9f1) although any new version would work
2. Free account with Unity 3d (<https://id.unity.com>)

Equipment

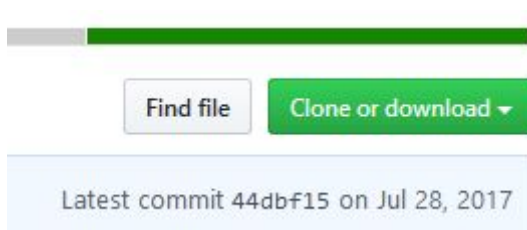
1. Oculus Quest VR headset (included in the kit)
2. iPad (included in the Kit)
3. Computer to install Unity 3D
4. USB C to USB 3.0 adaptor (included in the kit)
5. Insta 360-degree camera (optional)

Resources

1. 3D 360 video (Museum tour) - download by selecting **DOWNLOAD 3D 360 VIDEO** from here (<http://www.panocam3d.com/video3d360.html#!portfolio/project-14.html>)

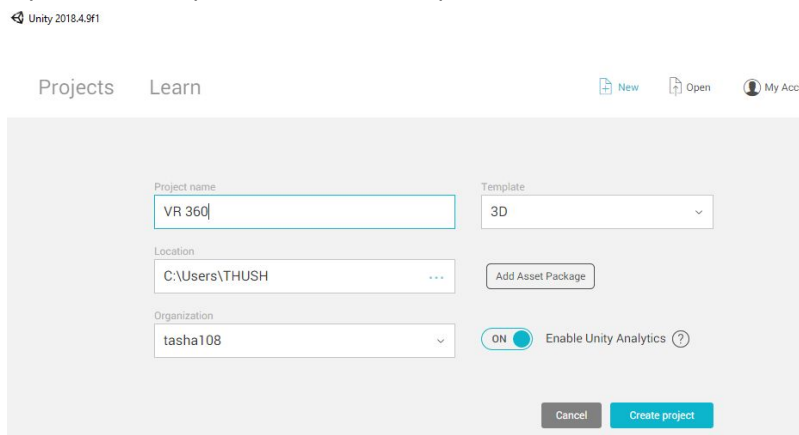


2. Script and shader - download by selecting **Clone or download** (<https://github.com/Unity-Technologies/SkyboxPanoramicShader>)



Unity 3D installation

1. If you haven't installed Unity in your computer, please follow the comprehensive steps listed in the Unity documentation (<https://docs.unity3d.com/Manual/GettingStartedInstallingUnity.html>)
2. You will need a free account with Unity 3D to access free Unity assets. Follow the instructions to create an account (<https://id.unity.com>)
3. If you have completed the above steps, click **New** button to start developing this lesson



4. Provide a name for the project (e.g. VR 360), select **Template** as **3D** and choose a location from the computer to store the project files and click **Create project** (Note: it might take a while to import things needed for your project such as assets)

Optional Steps: Familiar with Unity 3D environment

If this is your first time working with Unity, you can try out step-by-step tutorials to become familiar with the Unity environment by downloading basic tutorials (e.g. Play & Edit Mode). These basic

tutorials are recommended for beginners prior to try out our lesson since this lesson will not provide information about features in the Unity environment (such as Assets, Objects, Inspector).

Unity 2018.4.9f1

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The screenshot shows the Unity Learn interface. At the top, there are tabs for 'Projects' and 'Learn', and buttons for 'New', 'Open', and 'My Account'. Below the tabs, there is a sidebar with 'Basic Tutorials', 'Tutorial Projects', 'Resources', and 'Links'. The main content area displays four tutorial projects, each with a thumbnail, a title, a brief description, and a 'Download' button. The projects are: 01: Play & Edit Mode, 02: Game Objects & Components - Rigidbodies to the rescue, 03: Tweaking Components - Values vs Zombies, and 04: Prefab power - Ramping up.

Virtual reality support

1. Before we start developing the project, make sure the **Virtual Reality Supported** is checked using **Edit -> Project Settings -> Player**

The screenshot shows the Unity Project Settings window, specifically the 'Player' tab. The left sidebar lists various settings categories, with 'Player' selected. The main panel shows the 'Player' settings, including 'Company Name', 'Product Name', 'Version', 'Default Icon', and 'Default Cursor'. The 'XR Settings' section is expanded, showing 'Virtual Reality Supported' checked. Below it, 'Virtual Reality SDKs' are listed, with 'Oculus' expanded to show 'Shared Depth Buffer' and 'Dash Support' checked, and 'OpenVR' listed below. At the bottom, 'Stereo Rendering Mode*' is set to 'Multi Pass', and 'Vuforia Augmented Reality Supported' and '360 Stereo Capture' are unchecked.

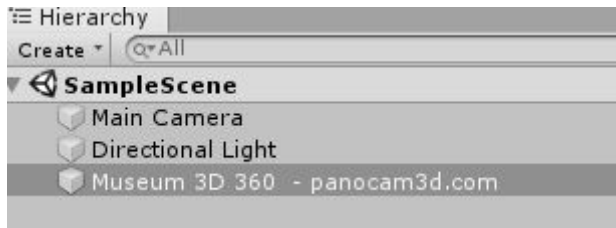
Assets

1. Place all **Resources** (see 'Resources' section above) required for this project in one folder (e.g. Museum 3D 360 - panocam3d.com, Skybox-PanoramicBeta.shader, SkyboxPanoramicBetaShaderGUI.cs)
2. Drag and drop these resources to the **asset** section of the project

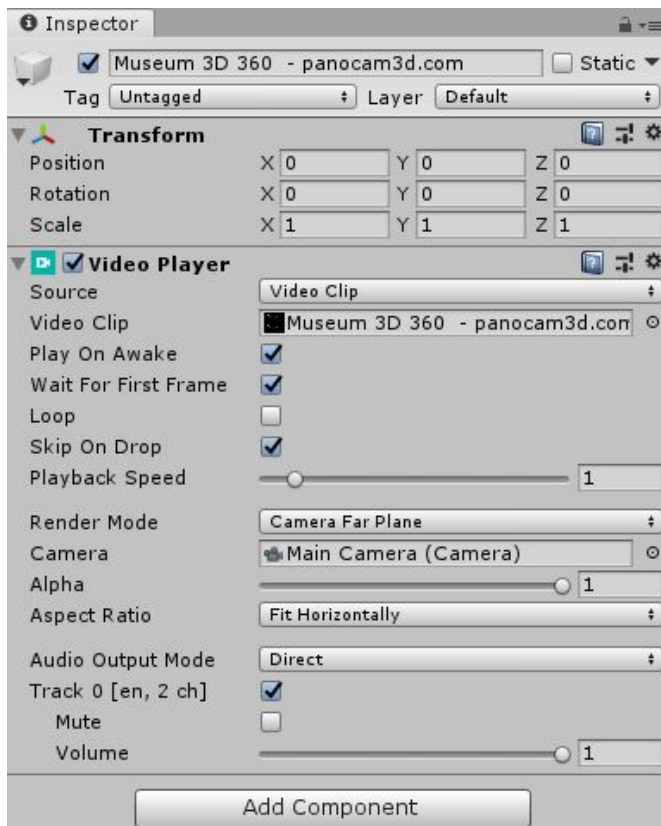
The screenshot shows the Unity Project window. The left sidebar has 'Project' and 'Console' tabs, and a 'Create' dropdown. Below that, there are 'Favorites' (All Materials, All Models, All Prefabs), 'Assets' (Scenes), and 'Packages'. The main area shows the 'Assets' section with a folder icon labeled 'Scenes' and four files: 'Museum 3D...', 'Skybox-Pa...', and 'SkyboxPan...'.

360 videos

1. 360-degree videos are immersive videos that is projected onto a sphere. They are usually recorded using 360-degree cameras or a group of omnidirectional cameras
2. Drag and drop the 360 video (e.g. Museum 3D 360 - panocam3d.com) to **Hierarchy** window



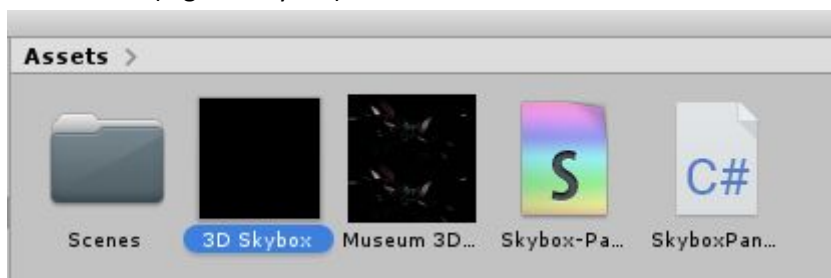
3. This will automatically creates a **Video player** and assigns the video clip into it in the right hand section of the Unity editor (**Inspector**)



Alternatively, you can create your own 360 videos using the Insta 360 camera included in the kit and upload to the project.

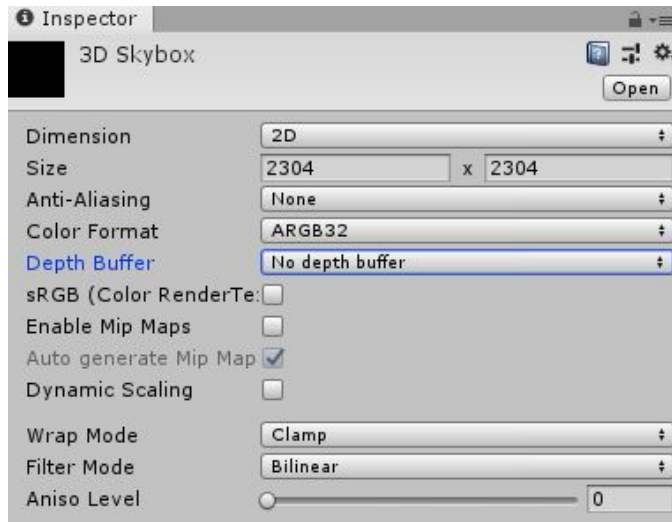
Render Texture

1. To create **Render Texture**, right click **Assets** window and select **Create -> RenderTexture** and name it (e.g. 3D Skybox)

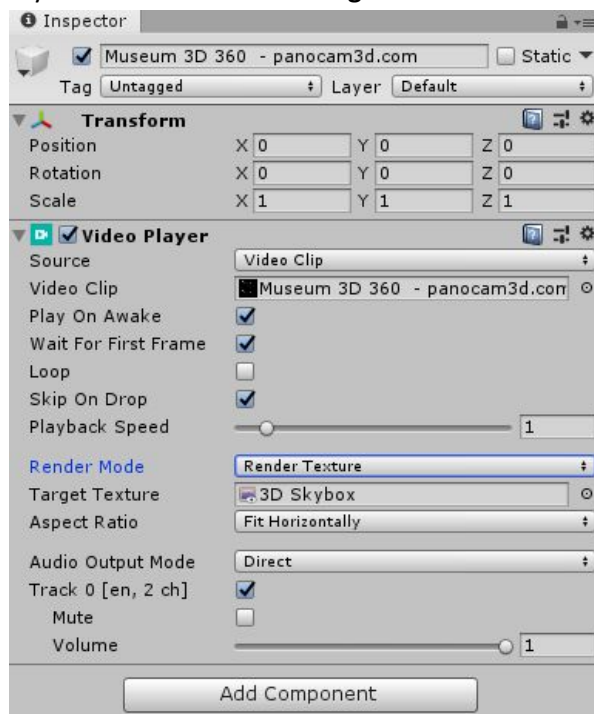


2. The size of the **Render Texture** should be the same as the 360 video's dimensions. In order to get the dimensions of the video, click on it (**Asset** window) and configurations should be demonstrated in the **Inspector** window (e.g. '2304 X 2304')

3. You will need to change the **Depth Buffer** to **No depth buffer**. This will disable halves the amount of memory the render texture will need



4. Select **Video Player** again to set the **Render Mode** as **Render Texture**. Next, drag the 3D Skybox render texture to **Target Texture**

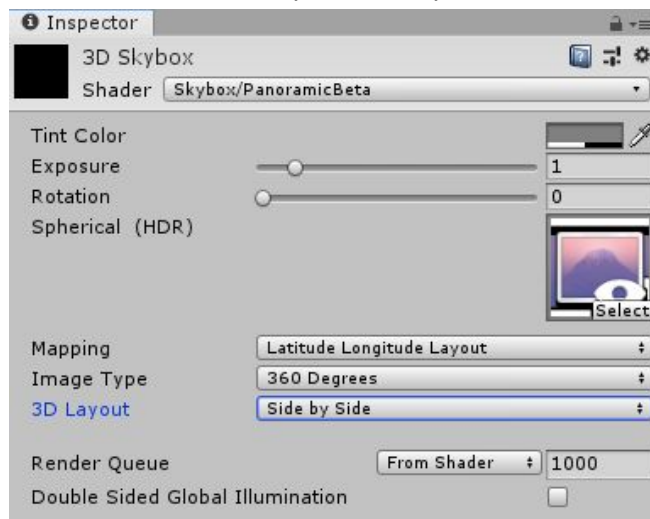


Materials

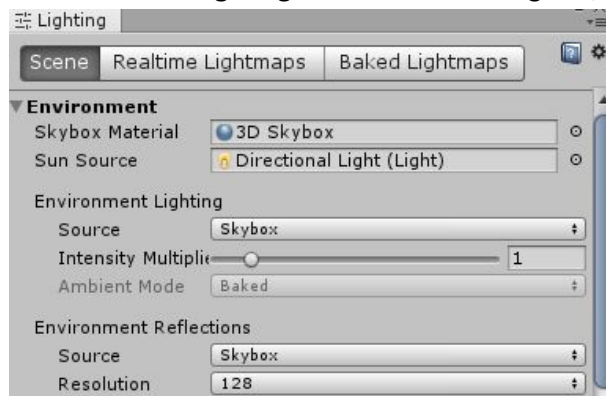
1. Unity scenes come with a skybox by default. Skybox is a large sphere. The player is placed inside the skybox on which the video is projected. The Render Texture needs a way to be displayed on the SkyBox. For this, you'll need **Materials**.
2. Right click **Assets** window, **Create -> Material** and provide a name (e.g. 3D Skybox)



- If selected, you will see the configurations of SkyBoxMaterial in the **Inspector** window. Make sure the **Shader** is set to **Skybox -> PanoramicBeta**. Drag and drop the render texture (i.e. 3D Skybox.renderTexture) to Spherical (HDR). Next, select the 3D layout. The video used in this lesson include 3D layout 'Side by Side'. Therefore, select **Side by Side** as 3D Layout



- Finally, we will need to set up lighting. Open lighting settings using **Windows -> Rendering -> Lighting Setting**. Drag Skybox Material (i.e. 3D Skybox.mat) to the **Environment of Skybox Material** slot in **Lighting** window. After doing this, close the lighting window.



- Now we have configured everything required for this lesson.

Testing using VR headset and Computer

- Now connect your Oculus quest headset to computer using the cable provided and click **Play** button in the Unity editor to experience the Museum tour. Enjoy!

Testing using standalone VR headset

- Advanced Unity developers should be able to launch Unity projects within VR headset instead of playing by plugged into the computer. To do this you will need the following;
 - 'Oculus app' loaded in the iPad (these are included in the kit)
 - Oculus developer free account using <https://developer.oculus.com/>
 - Android SDK
 - Android build support for Unity (~2GB of free disk space)
 - Oculus Integration for Unity plugin
- We recommend this step-by-step guided tutorial to build Unity project for Oculus - <https://circuitstream.com/blog/oculus-quest-unity-setup/>

Suggested Lesson Sequence

Following on from the technical lesson above in which students practice uploading 360 content, below we outline a lesson sequence for the classroom that allows students to apply their skills to create their own content.

1. Students, working individually or in groups, start by selecting a local place of interest that they would like to showcase in their 360 experience. For example, this could be a museum, local national botanic park, school, or other local community places of significant importance.
2. Students, using pen and paper, draw a map the area of interest in order to plan their experience and information. Students can present their sketch to the teacher or class by emphasising the benefits of their selection to experience VR, how they plan to record 360 videos and what are their learning objectives.
3. Students use the 360 camera included in the kit to record their place of interest into a small video (e.g. 5 min long). This can be done in several attempts until students are satisfied with the recorded video. Alternatively, an iPad or a mobile phone can be paired with the camera to preview while recording to save the video to computer. *This saved 360 video can be used to create 360 VR experience as suggested in technical guide above.*
4. Students write a report or record a video presentation that describes their design motivation and underpinning concept, as well as an explanation of their design process.

Why is this relevant?

Virtual Reality can enhance learning by placing students in an immersive experience. In this activity, students are engaged in creating technology with the use of Unity development framework. Students can use the museum tour VR lesson as a sample to create tour content for other subject areas such as for Biology or Science.

Assessment

[We have suggested Assessments, however, you may choose to use your own or for further advice, examples and support around assessment please visit the Digital Technologies Hub at digitaltechnologieshub.edu.au/teachers/assessment]

The following is a sample checklist of skills and knowledge that students could be asked to demonstrate through their digital project based on content descriptors.

Checklist	Yes / No / Partially	Comments
Students describe applied techniques and processes when making their VR museum tour.		
Students demonstrate project planning processes (in the form of sketches and documents) for the design and development of their tour.		
Students explain how the design of their lesson, particularly with the use of VR, enhances meaning for an audience.		
Students explain their intention behind the motivation of their lesson and use of materials to support their intention.		
Students demonstrate effective collaboration skills, including teamwork and co-management of the project.		

Curriculum links

Links with the Digital Technologies curriculum area

Year band	Strand	Content description
Years 9-10	Knowledge and Understanding	Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities (ACTDIP043) Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability (ACTDIP044)

Depending on the context of the student-directed project, this could align with a number of learning areas such as Science and Geography.



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