VR and AI Serious Security Game

User Manual

Group 8

Prepared by:

Livia Brookes

Fusuke Minagi

Caitlin Walters

Haochen Xie

Change Log

Version	Date	Changes
1.0	17/3/2022	• Overview of the system • Installation instructions • Troubleshooting • System Maintenance • Safety Warnings • System Development

Contents

1 - Introduction and Intended Use

This is a user manual for the VR and AI Serious Security Game, created for and alongside IBM. The game acts as a prerequisite to IBM's Introduction to Cybersecurity Tools and Cyber Attacks badge, so users have a base level of understanding before they start the course. The game aims to use VR to educate users on the risk of common threats and how to defend against the threats using various pieces of software provided by IBM.

The purpose of this document is to deliver a comprehensive overview that details the subtle functionalities of the game, while also providing insight into the main features of the implementation and how they can be interacted with. Additionally, the document will detail how users of the system will be able to manage system maintenance as well as how to operate the system in a manner that is safe and as risk free as possible.

We hope you enjoy the VR and AI Serious Security Game.

2 - Installation Instructions

2.1 - System Requirements

2.1.1 - Compatible VR Headsets

The system is compatible on the following VR headsets and controllers:

- Oculus Quest 2 devices

2.1.2 - Compatible Operating Systems

The system is compatible with

- Windows 10 and any later Windows versions

2.1.3 - Supported Languages

The system is supported in

- English

2.1.4 - Dependency Versions

- Unity
    - Unity 2020.3.22f1
    - Unity Hub 2.4
    - Assets
        - TV / Arm Amount 1.0
        - UI Samples 1.2.3
        - Oculus XR plugin 1.10.0
        - OpenXR Plugin 1.2.8
        - XR Interaction Toolkit 1.0.0-Pre 3
        - XR Plugin Management 4.0.1
        - Watson Speech-to-Text
            - Unity-SDK 5.0.1
            - Unity-SDK-core 1.2.2
    - Android Studio 2021.1.1 Patch-2, Windows 64-bit
        - Android SDK Build-Tools 29.0.3
        - Android SDK Platform-Tools for Windows 33.0.0

2.2 - Other Requirements

2.2.1 - Physical Environment

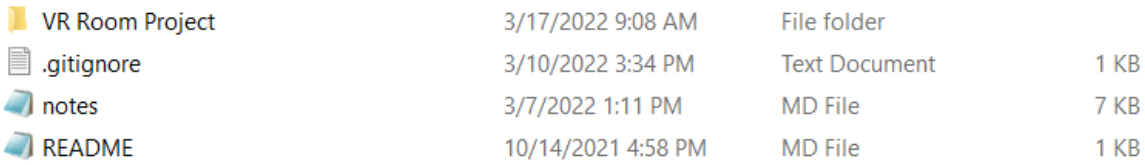
Before setting up the system for use, the user should confirm that they have a sufficiently sized open space that is free of any potentially bothersome obstructions. The given space should allow for the user to be able to fully extend their arms around them from a given seated position without being physically obstructed.

2.2.2 - Maintenance Requirements

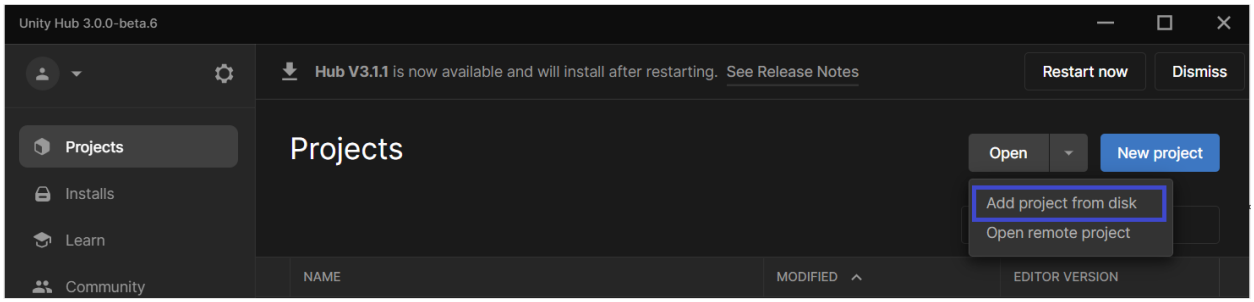
Individuals who wish to develop or maintain the project must be sufficiently proficient at C# language and Unity 3D.
Furthermore, they are required to have some form IDE compatible to Unity and C#, such as “Microsoft Visual Studio 2019”, along with user’s preferred plugins.

2.3 Step-by-step Installation Guide

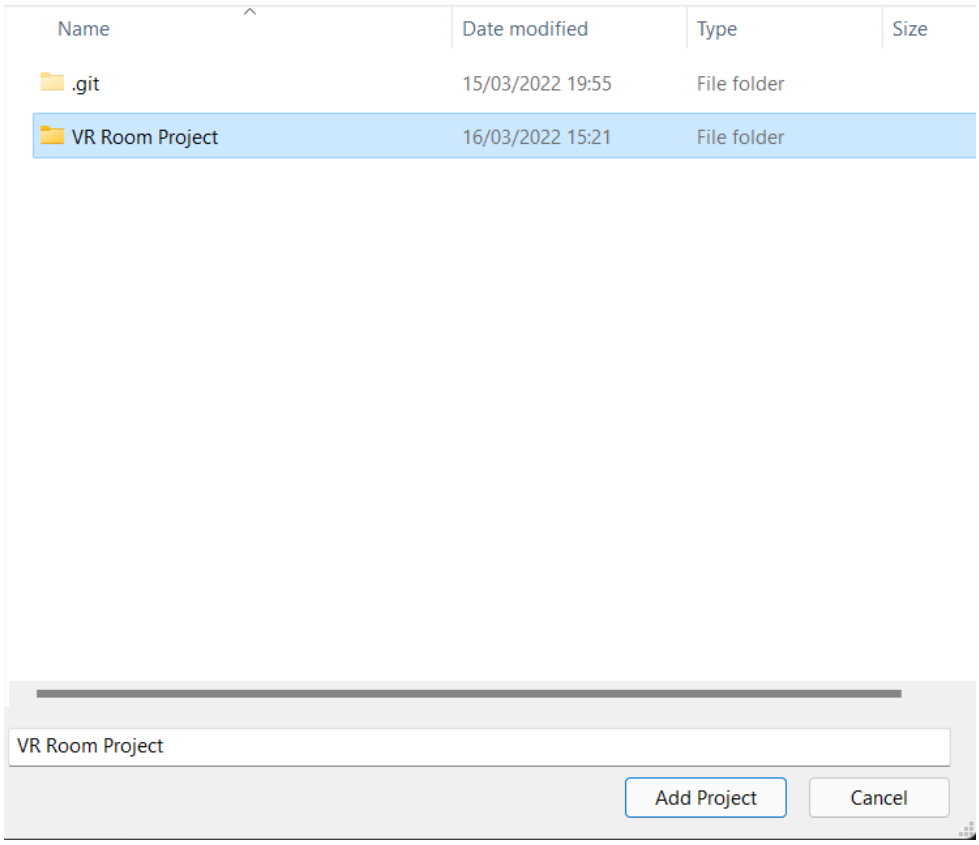
1. Place the project in the desired directory.



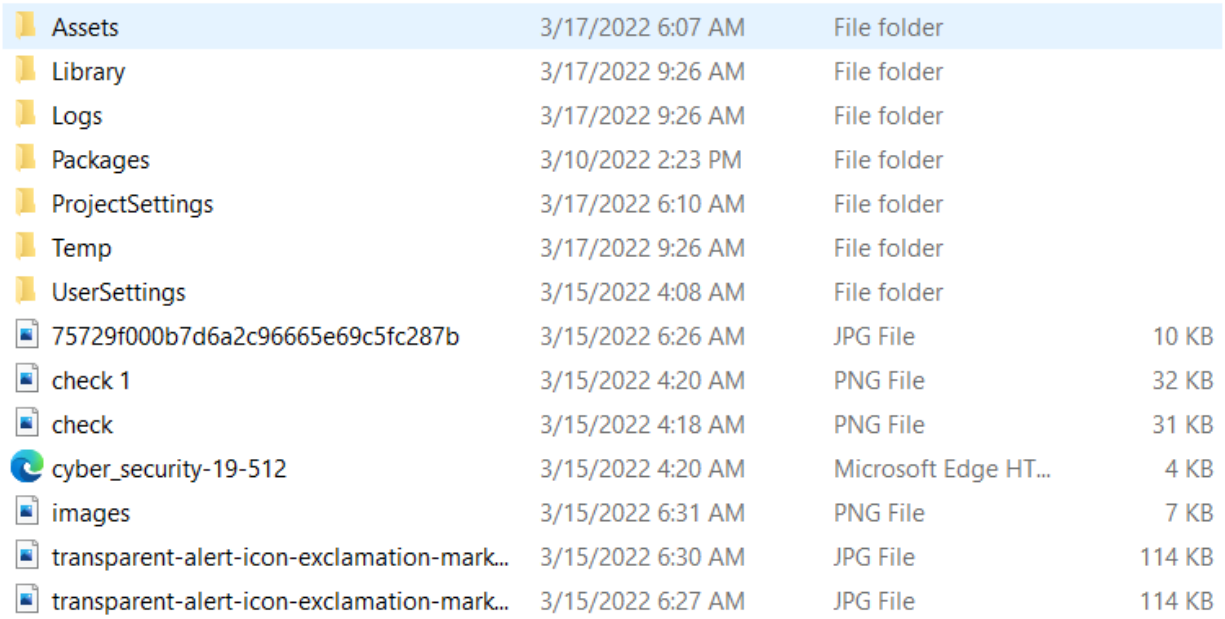
2. Place the project into Unity Hub’s Project field, and run the project. The initial loading will be significantly slower than subsequent loading as it is constructing the missing “Library” folder. This can be done by clicking **Open**, then **Add project from disk**.



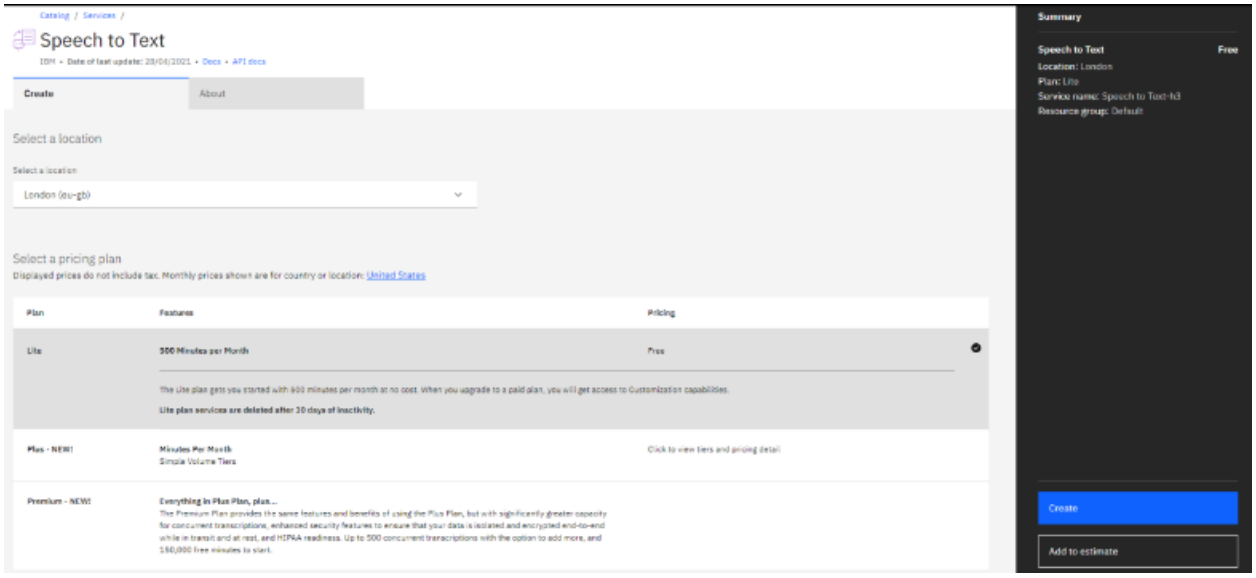
Locate the project and click **Add project**.

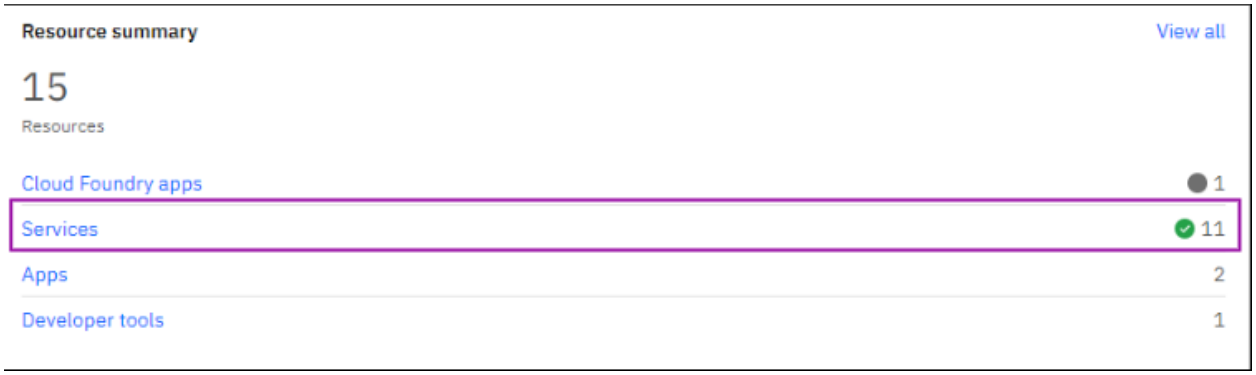


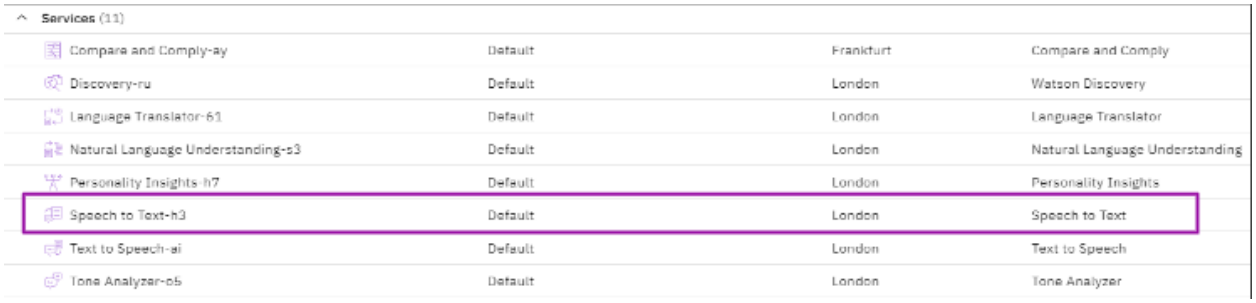
The Project directory should look like this after loading. Confirm that the content is identical before proceeding to the next step.



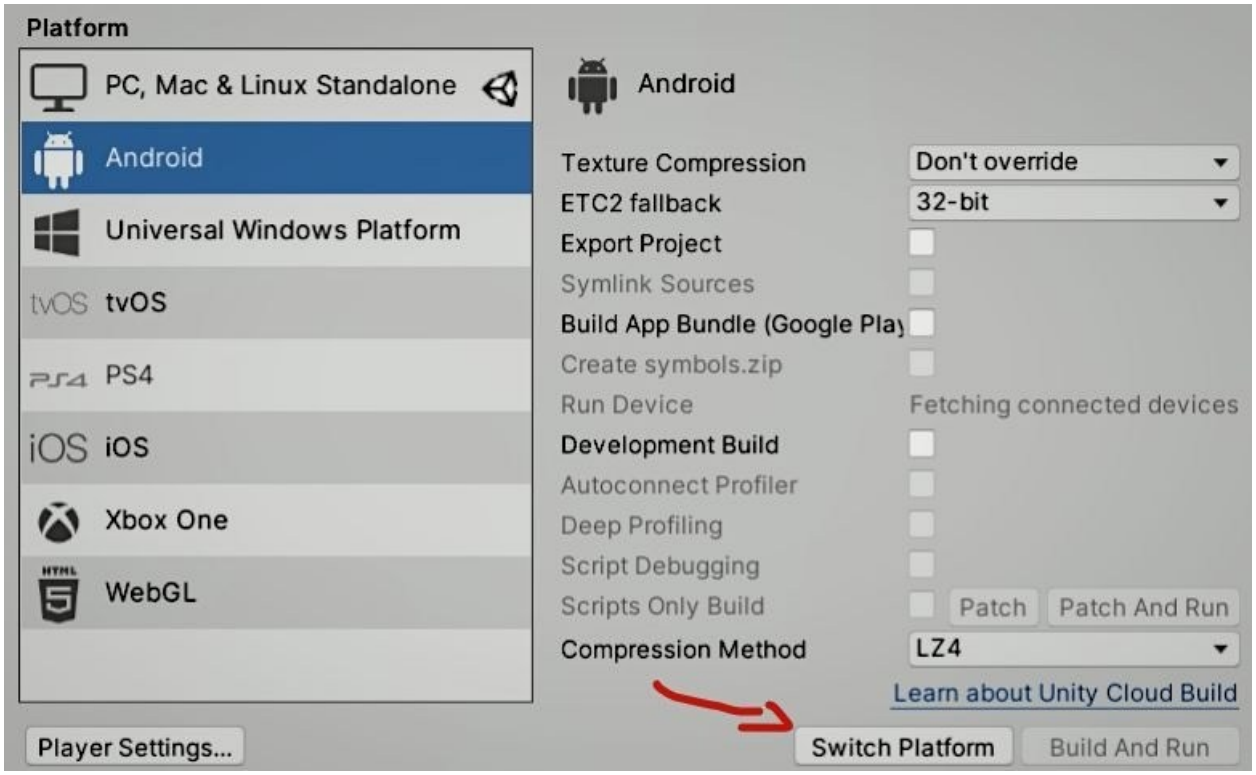
3. It is also required to get Watson Speech-To-Text API key and Service URL from https://www.ibm.com/uk-en/cloud. Though only a Lite account is necessary, a full version will also function. To create the keys, select the plan under Speech-To-Text service, and add the service to your IBM account. Here you will find your Key and URL.

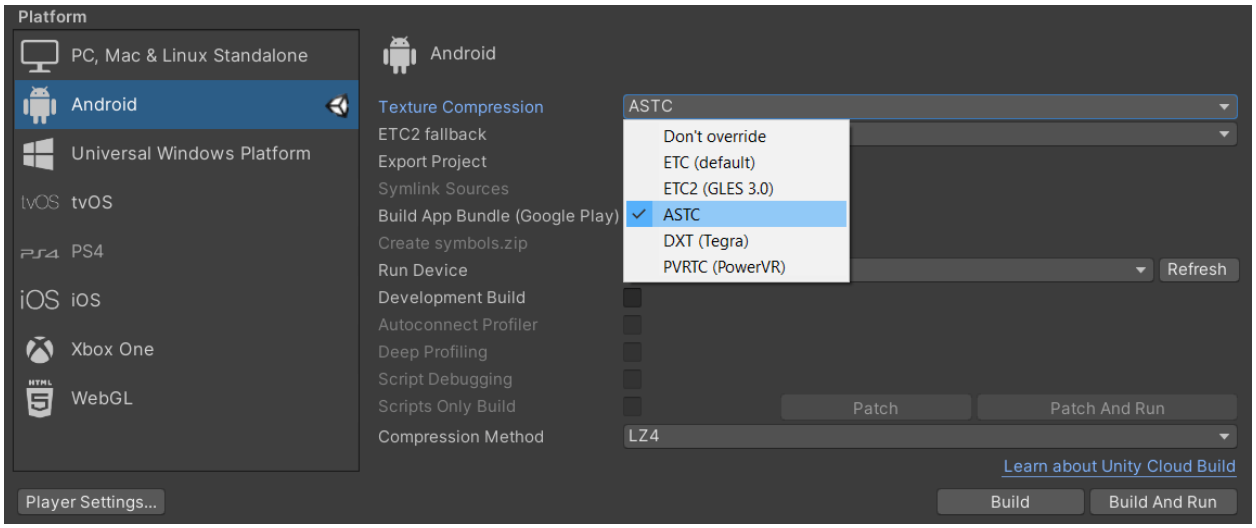




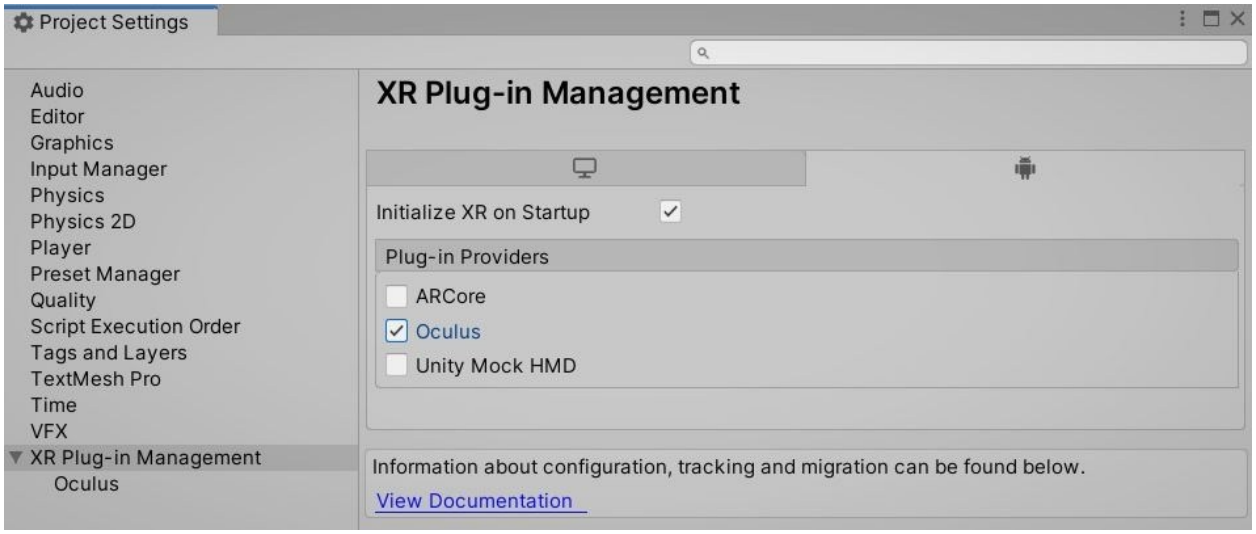


4. Going back into the opened project in Unity, under “Hierarchy” on the left side of the window, select an object named “watson_speech_to_text”. In it’s inspector field on the right side of the screen, copy and paste your Service URL in “Service URL”, API key into “Iam APIKEY”. Additionally, if either or both of “unity-sdk-5.01” and “unity-sdk-core-1.2.2” are missing from “Assets” folder, import them from https://github.com/watson-developer-cloud/unity-sdk/releases/tag/v5.0.1 and https://github.com/IBM/unity-sdk-core/releases/tag/v1.2.2
5. Then, ensure Edit > Project Settings > Player > Other Settings > Configuration > API Compatibility Level is set to “.NET 4.x”. Then, sign into IBM Cloud Account.
6. In Unity, under File > Build Settings, change the device to Android, then confirm through “switch platforms”. Then in the Build5 setting which should now be accessible, change “Texture Compression” to “ASTC”.

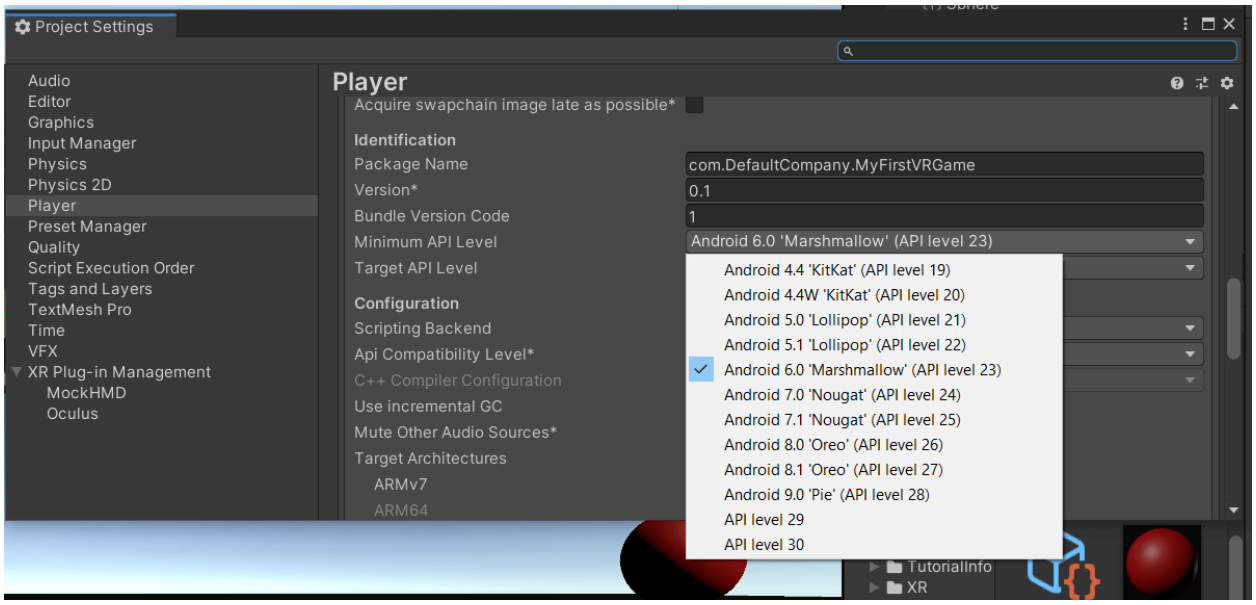




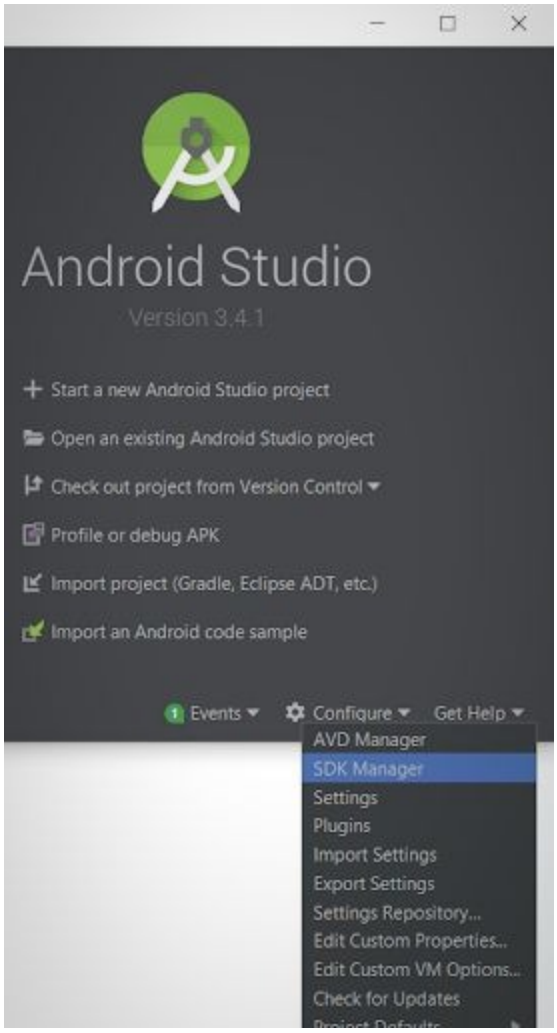
7. Also in Unity, under Edit > Project Settings > XR Plugin Management. Tick the box next to "Oculus" under the standalone plugin field. Note that it may take a few minutes to import.

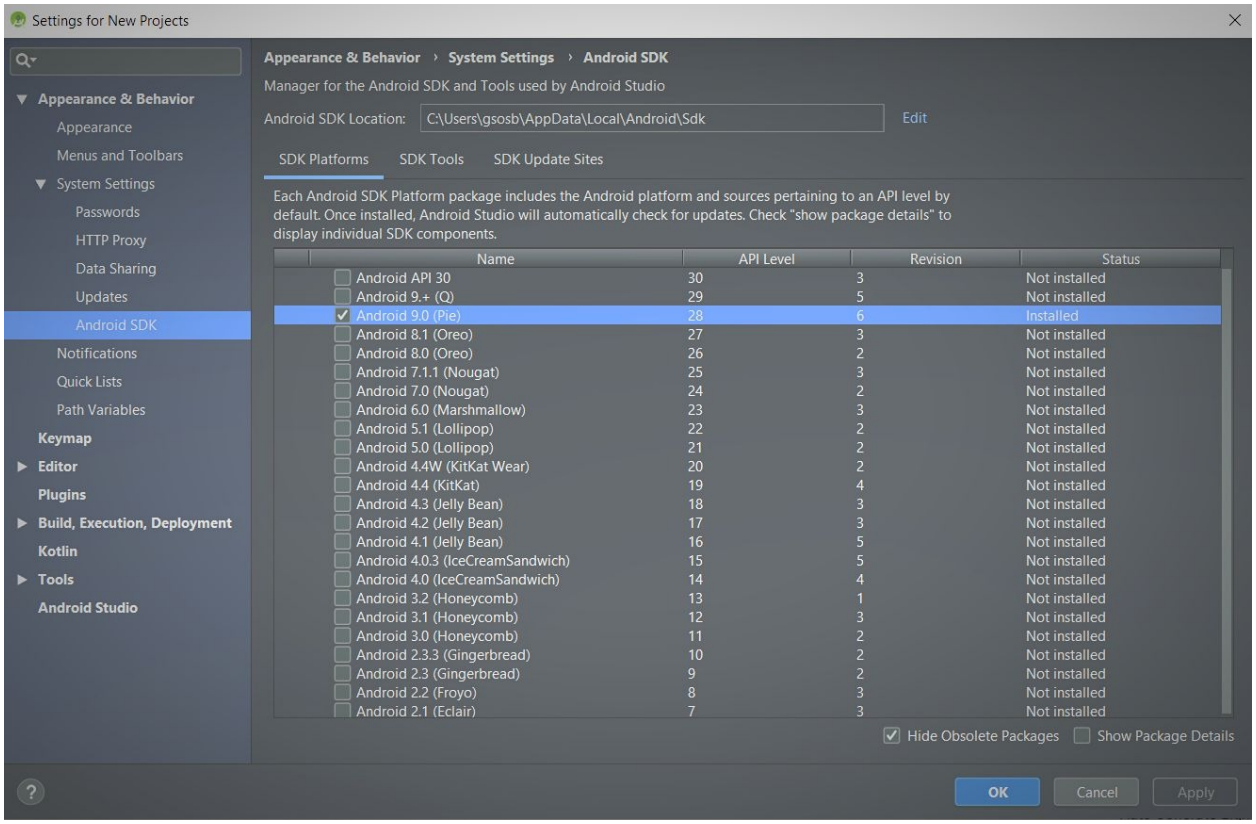


8. Then under “Player” from the same page shown above, name the project and company name to aid with identifying your project later on the oculus device. Finally, set the “Minimum API Level” to at least level 23 (6.0 marshmallow).

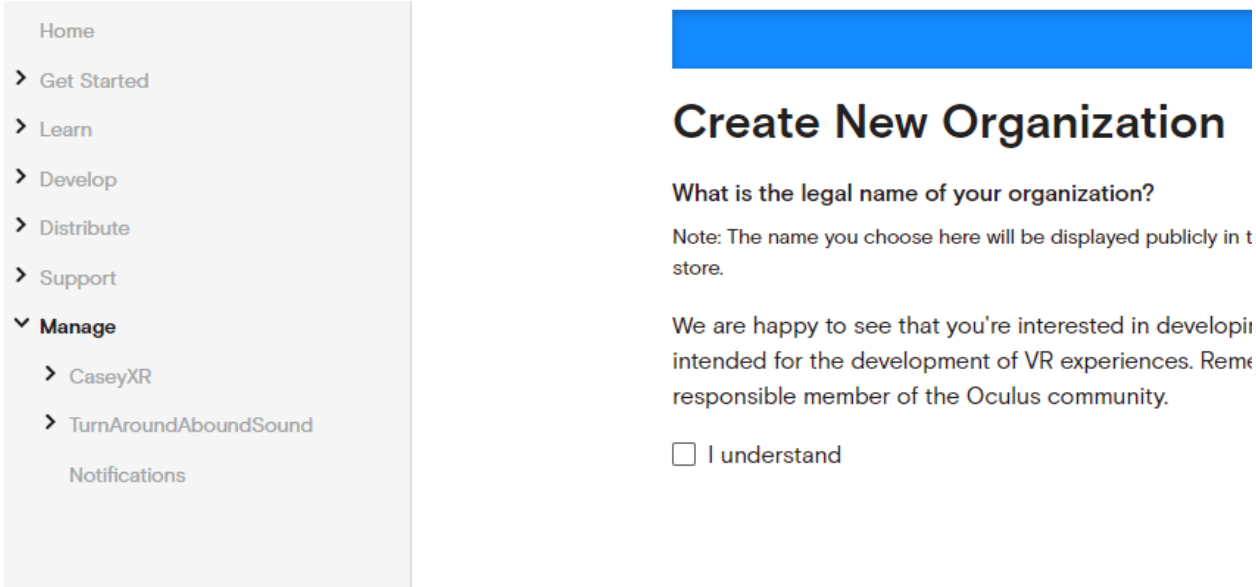


9. Download Android Studio for Windows 10 64-bit. Open the app, and go under “configuration”, and select “SDK manager”. Install any version of SDK later than 4.4 Kitkat, API Level 23 (Use Level 19 or higher otherwise). Click Apply to confirm the action. Then, confirm that SDK tools has been imported.


Android Studio
Version 3.4.1
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control
Profile or debug APK
Import project (Gradle, Eclipse ADT, etc.)
Import an Android code sample
Events
Configure
Get Help
AVD Manager
SDK Manager
Settings
Plugins
Import Settings
Export Settings
Settings Repository...
Edit Custom Properties...
Edit Custom VM Options...
Check for Updates

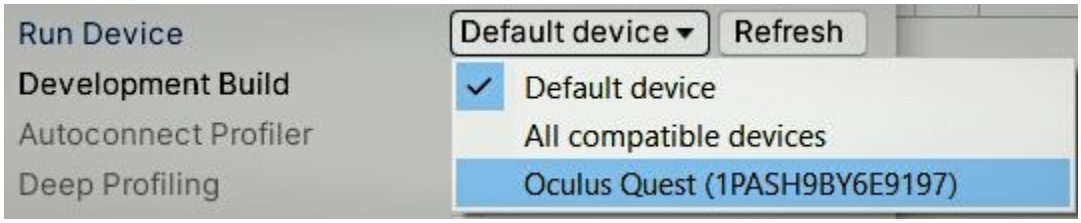


10. Setup the Oculus headset, connect to your mobile Oculus application. Then follow this official tutorial on enabling developer mode https://developer.oculus.com/documentation/native/android/mobile-device-setup/.



11. Also download ABD. to extract file, navigate to androidwinusb.file and run from there.
12. Select developer mode on the phone, create a developer certificate

13. Attach a USB-C cable to your compatible Windows device, and to the headset. You should now be able to “Allow USB debugging” through the VR hardware.
14. To confirm the headset is connected to Unity, navigate to Unity > Files > Build Settings > Run Device and confirm this option in the dropdown as shown.

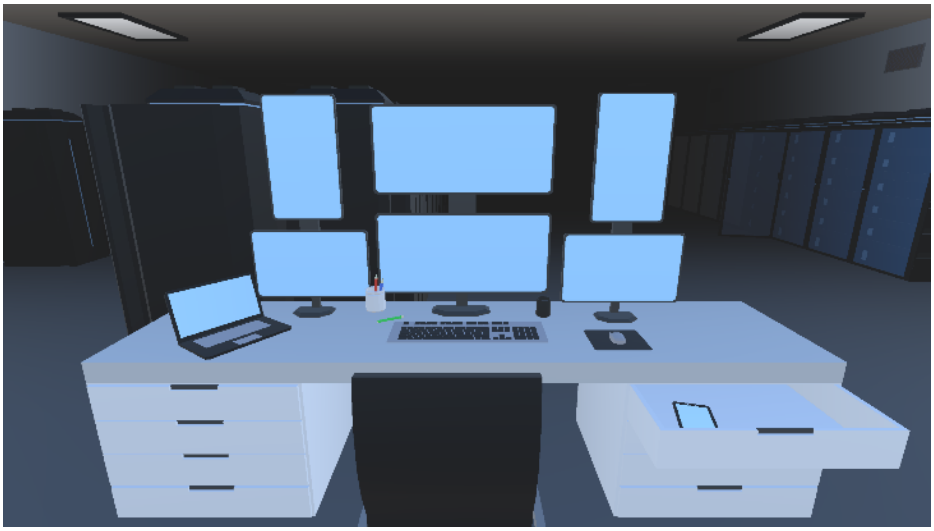


15. Now, sit back and wait for the project to load.

3 - How to Use

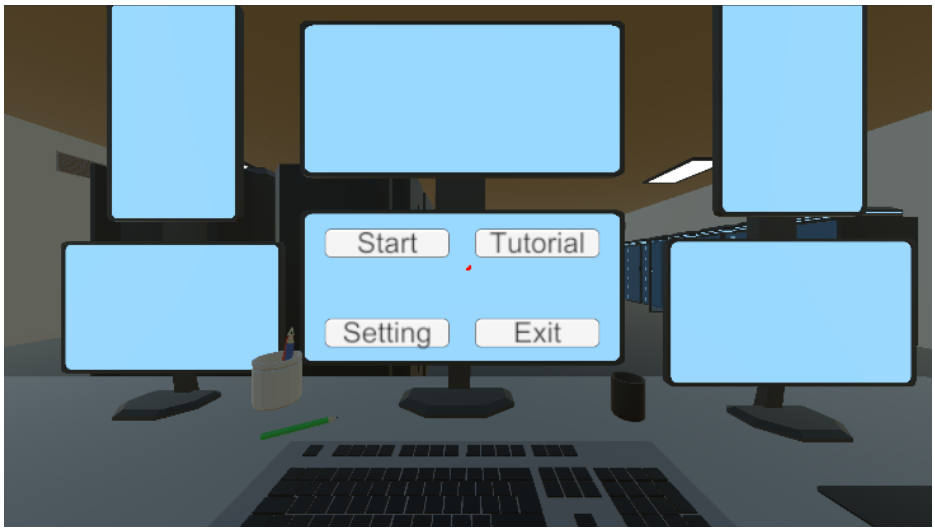
3.1 - Environment Structure

The game takes place inside the ‘command centre’ environment.



Features of the ‘menu screen’ include buttons for:

- Starting the game (leading to difficulty selection)
- The tutorial
- Accessing the settings
- Exiting the system

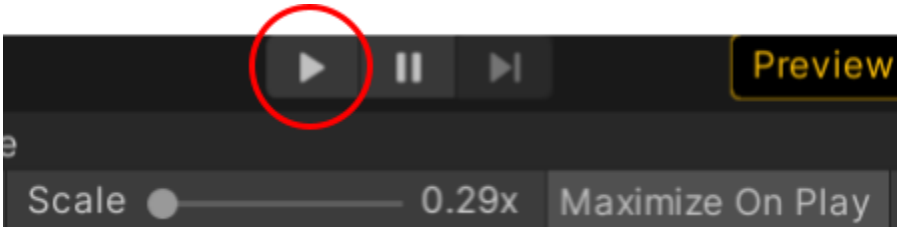


Entering settings allows the user to change the volume of the game. Starting the game allows the user to choose the difficulty they want to play, and then starts the game. The tutorial contains all the information required to answer the questions posed in the game. It goes into detail about each IBM Security Product that appears in the game.

3.2 - Main Functionalities

3.2.1 - Starting the system

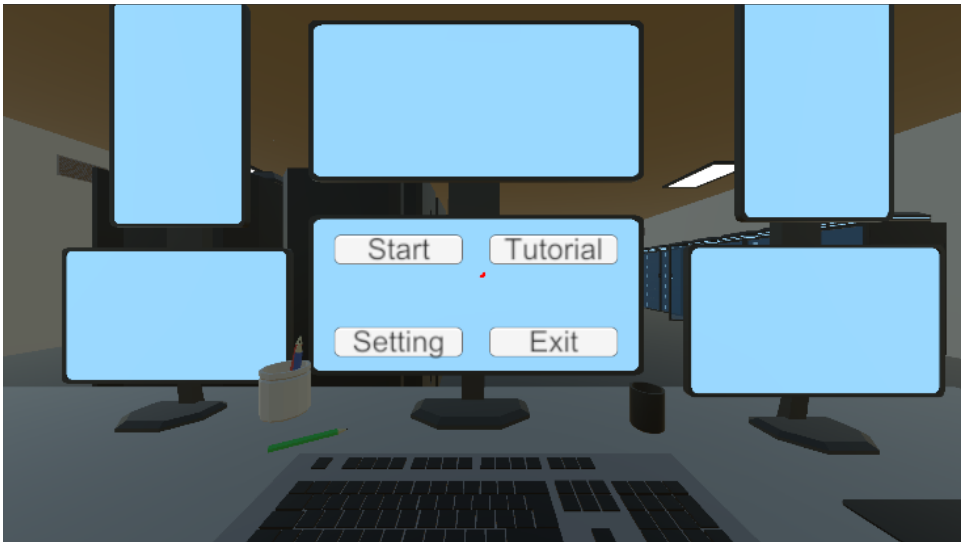
In development mode the game is run by selecting the play arrow button at the top of the Unity interface.



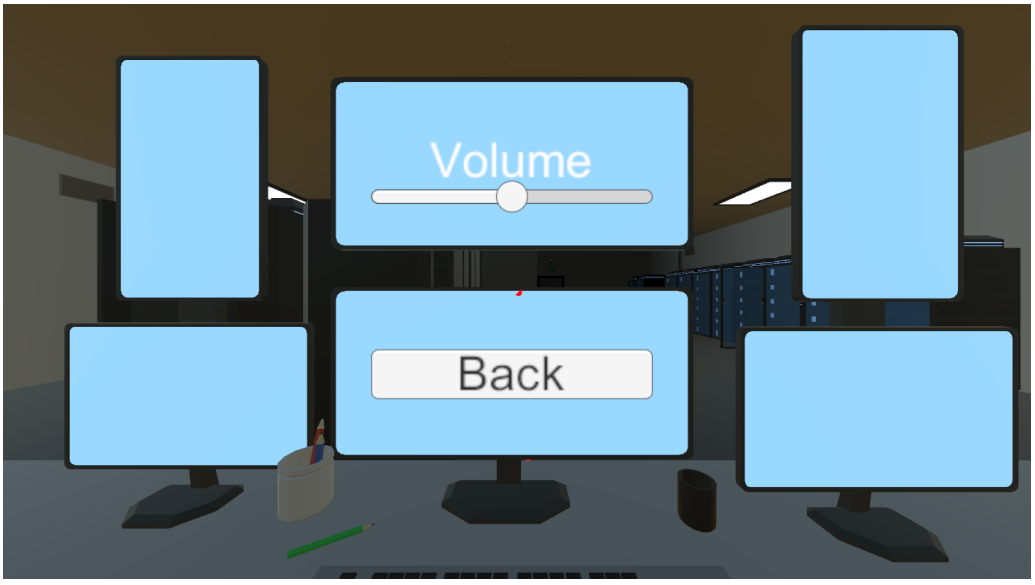
The ‘Maximize On Play’ feature should be selected if the game is being run using the XR interaction simulator in order to maximise the game window.

3.2.2 - Playing the game

The game opens on a security command centre. The user has the choice between Settings, a tutorial and starting the game. To select an option, the user should use the controls on the hand controllers.



In settings, the user is able to change the settings of the game (this currently only consists of volume, though may be updated in future development).These are adjusted using sliders, and are changed by the user using the hand controllers of the headset.



In the tutorial, the user is given information and descriptions of IBM security products, types of malware, threat actor groups and types of cyber threat. This tutorial holds all the information required to answer the questions in the game.

Upon starting the game, the user is prompted to choose between three different difficulties: easy, medium and hard. On all three difficulties, the user has two minutes to answer a certain number of questions. Each question has a certain number of options the user must choose between.

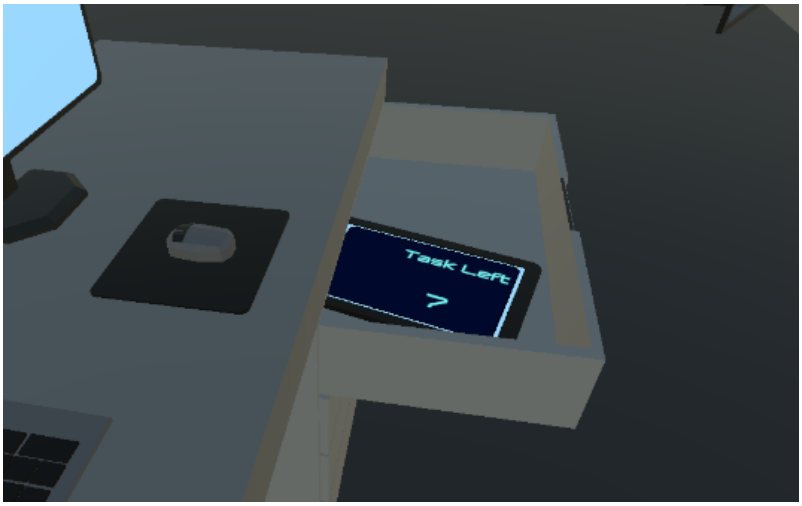
There is also a variable number of “lives” a user has - this indicates the number of questions they can get wrong before they lose the game.

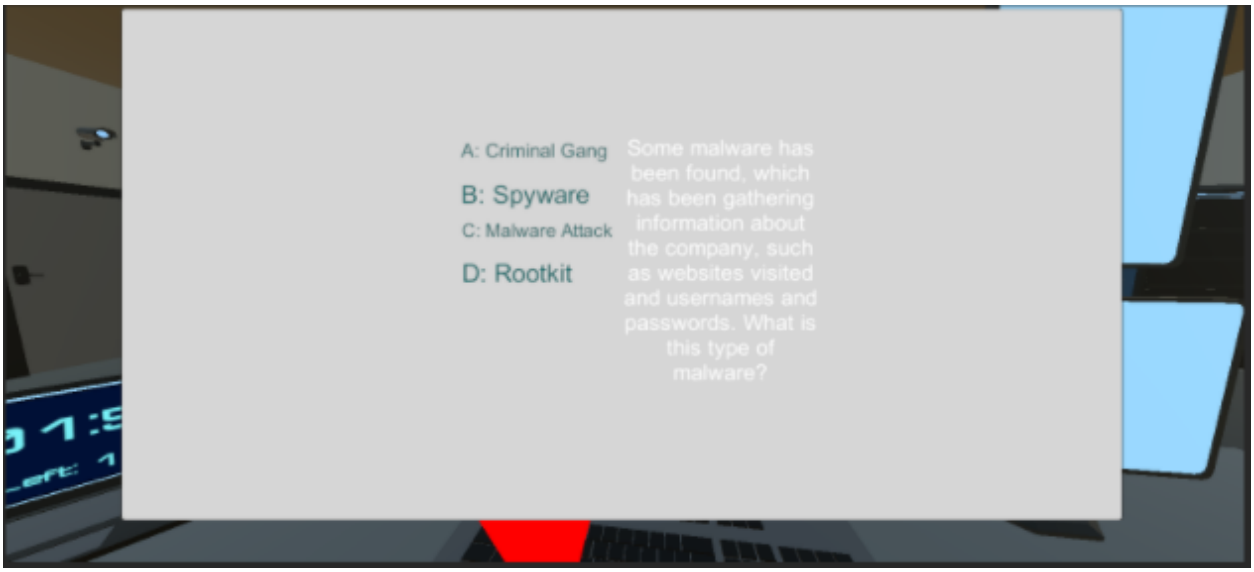
On the easy difficulty, the user must answer seven questions within the time limit, each with two options to choose between. They have three lives.

On the medium difficulty, the user must once again answer seven questions within the time limit, but this time with three options to choose between. They have two lives.

Finally, on the hard difficulty, the user must answer ten questions within the time limit, each with four different options. They only have one life.

If the user fails to answer the required number of questions in the time limit, or loses all their lives, then they lose the level. Otherwise, they successfully pass the level, and can go back to the main menu. There is a screen with the number of questions the user must answer before the time is up, otherwise they will lose the level. The time limit is two minutes for all levels.





Some potential questions the user could be asked include:

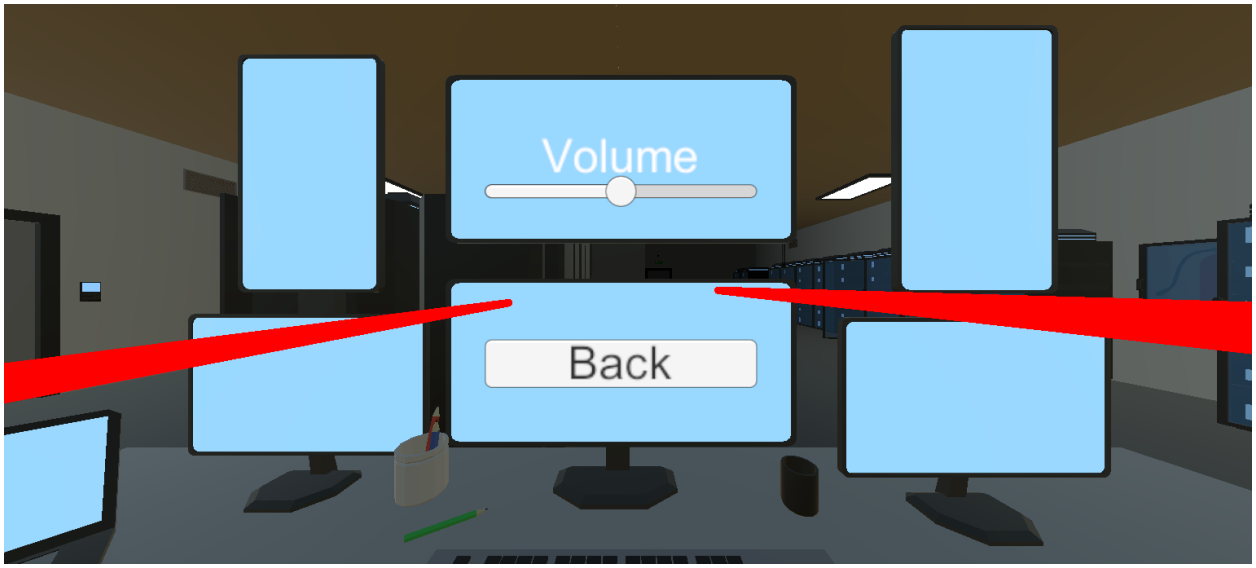
- Which of the following IBM security products calculates a risk score?
- Some malware has been found on an employees laptop after they downloaded some legitimate looking software. What is this malware called?
- This attack involves causing a system to partially crash and unable to perform work at normal levels. What is the name of this type of attack?

To answer the questions, the user must answer “A”, “B”, “C”, or “D”, depending on the answer they wish to give. The system may take several seconds to process the user’s answer before responding with whether they are correct or not.

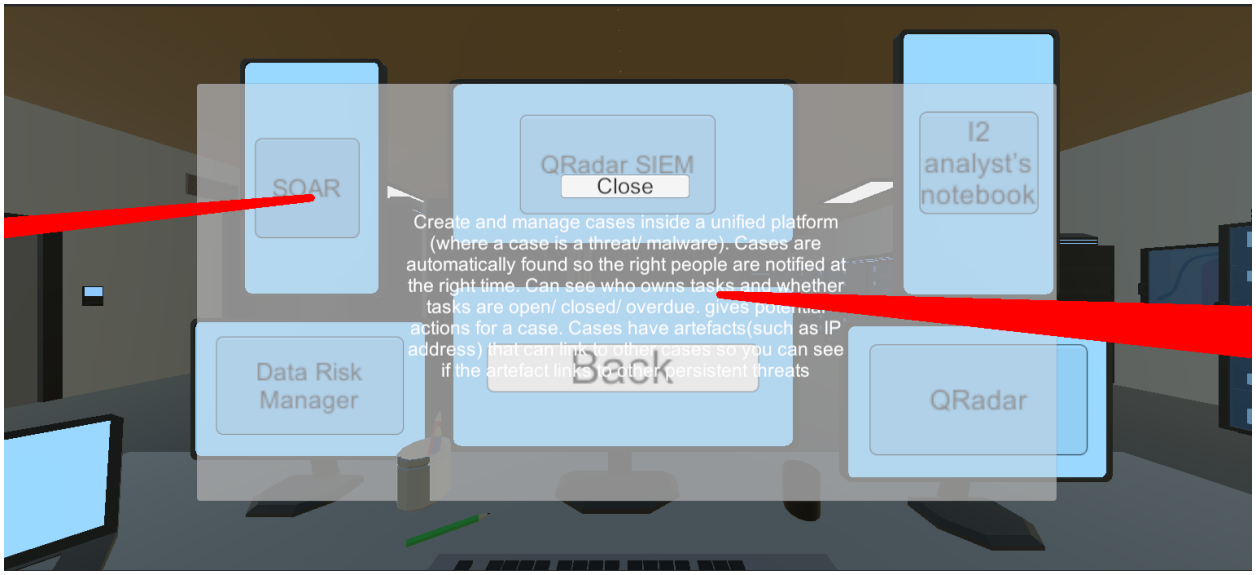
3.3 - Step-by-step Usage Guide

There are 4 buttons on the main menu. Click on them to access different pages in the game. Exit will exit you out of both the Oculus hardware, and the Unity Play mode. Setting will take you to a page with a slider for the BGM volume adjuster as shown below. Pressing Tutorial will lead you to a page with the IBM’s Security Product names displayed on the remaining five screens in front of you. Click on the names to display the information of each one as shown below. Finally pressing Start, will lead you to a page for choosing the difficulty of the main game.

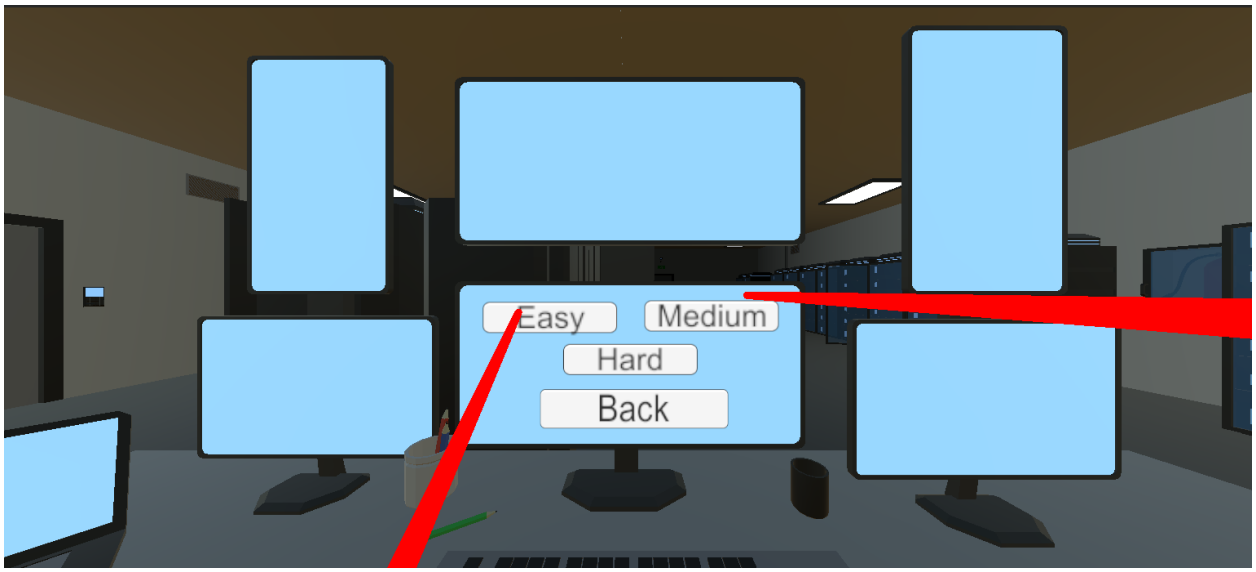
Settings page for Volume adjusting



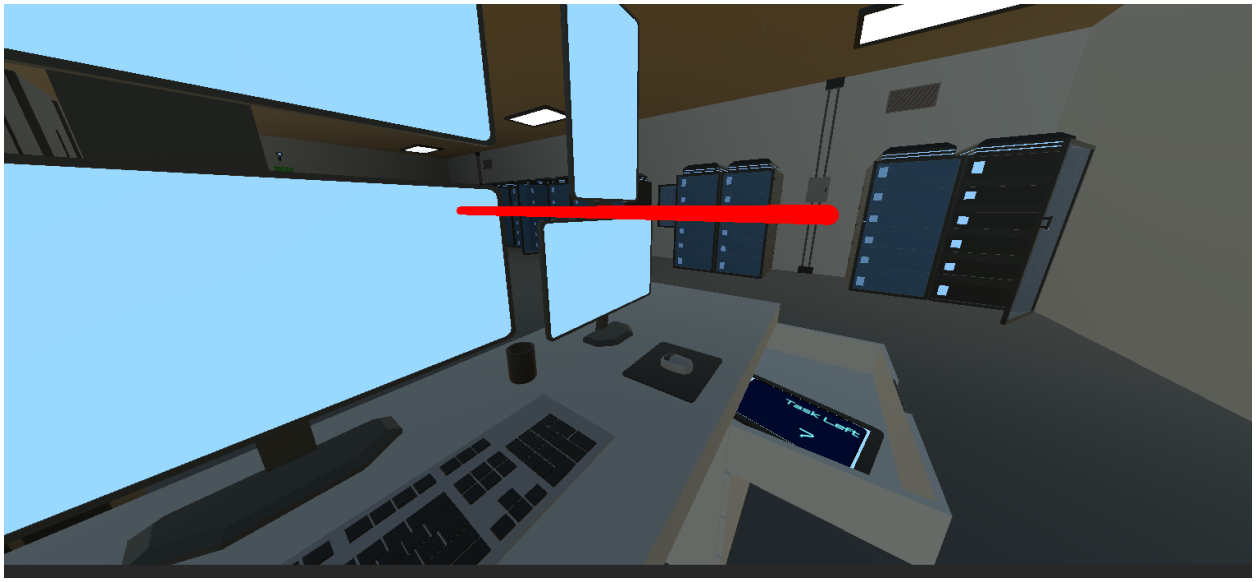
Tutorial page with brief information of each IBM Cyber Security product as a popup.



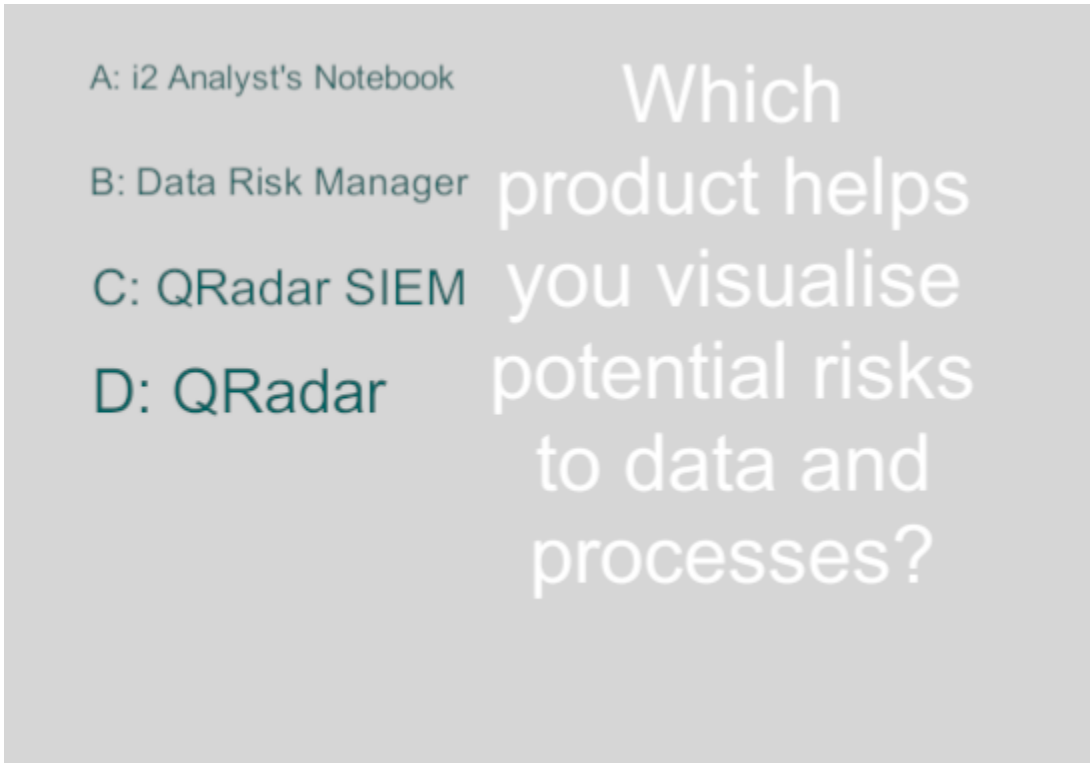
Page directed to after pressing Start. Click on one of the difficulty to start the game with tuned settings to suit each difficulty. The difficulty is configured with the number of mistakes you are allowed (lives), number of tasks to complete in two minutes, and the number of choices given for every question.



Click on the “Read Prompt” to start answering questions. Keep in mind the timer is already ticking at this point. Lives and time left are displayed on the side monitor, and number of tasks remaining is displayed in the right side table drawer.



Sample question for Medium Difficulty. The user must now decide on an answer, and say out clearly the letter corresponding to the answer of choice. E.g. If I believe QRadar is the answer, I will say “A”, towards the device.



4 - Troubleshooting

4.1 - Potential Issues

Issue	Suggested Solution(s)
Module Deprecation, or accidental change of dependencies.	Manually install correct dependencies, adhering to user manual 2.1.4. OR Remove project folder, clear Cache if any, and pull the project once more, or uncompress from the base zip folder again.
Oculus Quest 2's "Back" button is not functioning.	Consider changing the source code under menu_manager and menu
Cannot open project file in Unity Hub after uploading it.	Check that the folder selected when uploaded contains the right file path. (This should be the folder *directly* containing the folders for 'Assets', 'Logs', 'Packages', etc.)
There is a compilation error after a question and answer has been added to the script.	Ensure a comma has been put on the end of the line on the question above. Furthermore, ensure there is both a question and answer added to the dictionary.
There is a compilation error after an answer has been added to the answers list.	Ensure there is a comma between the previous answer and the one that was added. Furthermore, ensure there isn't a comma at the end of the list.

5 - System Maintenance

5.1 - Development Modes

Default access to the system is done through Unity's development mode, meaning that project scripts can be accessed and subsequently modified as needed.

This allows for changes to be made to the system, such as updating the question bank should the information there become outdated or if additional questions need to be added [*see section 7.1.1 - Adding Questions for more information]*.

Development can be performed whilst using XR interaction simulator tools as opposed to using the headset and controllers as a matter of convenience.This is done through Unity > File > Build Setting and selecting PC, Mac & Linux Standalone. Confirm the Architecture is applicable. Now the user can simulate VR movement via mouse and keyboard.

5.2 - Dependency Updates

The current version of the system relies on the specified versions of dependencies located under section *2.1.4 - Dependency Versions*. Should updates be made to these dependencies, please refer to the individual documentations of each dependency to determine if newer versions are compatible.

5.3 - Components and Descriptions

Under the project's Asset folder, there are Assets_TVs, Unity UI Samples, and XR folders. These are important assets which must be included.
The etc folder contains miscellaneous, non-script files such as audio, or png images to be used as textures of UIs or props of scenes. The Scripts folder holds every script I introduced.

The visual of the game consists of the Cyber Security Command Centre visual, and 2 separate canvas, the main game canvas, and main menu canvas. Within each, there are multiple panels which they can manage

All components with the suffix "_manager" are tied with its corresponding script to handle various things including Watson, Timer, BGM, and main game flow.

It is also worth mentioning that the Main Camera is placed within XR Rig, but its position in the world space is dependent on the values of Camera Offset rather than Main Camera. The purpose of the XR Rig is to represent the perspective of the user in VR.

There are 3 different popups, each for its own section of the game. "popup" is a generic popup Canvas UI element, used for displaying tutorials in the main menu. Game_popup displays the question and list of answers the user can choose from during gameplay. Finally, end_popup is to display if the user has won, or lost the game.

The components named ordinally under Main_game represent the six main displays, with 0 being the top left, 2 being the top right, 3 being the bottom left, and 5 being the bottom right display. Tablet component represents the smaller display inside the cabinet to the right, and side_display represents the smaller laptop on the desk to the left. It is to be noted, these components are UI elements, and actual prop mesh is beneath the Main_game component.

The parameters of fog in the background are easily altered through windows > rendering > lighting > environment > other settings.

If the user wishes to include Library directory and its DB files during some project folder transfer, it is recommended to either clone from repo and build onsite, as the size of the library folder is relatively larger than other files in the project.

Upon working on the project, the user may wish to test it in development mode, i.e. using XR interaction simulator with mouse and keyboard. In which case, the user must either hold "T" or "SPACE" and move the mouse, to move one of the simulated motion controllers, in order to be able to click UI elements, for example, with the mouse, significantly speeding up development / testing.

It is heavily recommended to not manipulate the following files due to their complexity. They are XR Interaction Manager, XR Device Simulator, XR Rig and EventSystem.

6 - Safety Warnings

6.1 - Virtual Reality

6.1.1 - Motion sickness

Given the nature of the system as a game using virtual reality technology, a commonly recorded symptom of use that may occur would be motion sickness. This may occur during system use and could persist for a short while even after the headset has been removed. While this risk is minimised due to the lack of physical movement required by the game, it is still recommended that, in order to reduce this risk, the user should remain seated during use as well as limiting time spent in the headset and taking breaks between sessions.

6.1.2 - Head / neck discomfort

Continuous use of the headset while playing the game may cause minor discomfort in the user's head, neck and/or lower back. While the user would not be required to physically exert themselves in any way during use, it is possible that any prolonged usage of the system will result in these symptoms and thus sessions of usage should be kept relatively short.

6.1.3 - Discomfort with VR, disorientation, seizures

If, at any point during use, the user begins to experience dizziness, nausea or disorientation, they should proceed to exit the system immediately and take a break to recover. If these symptoms persistently occur over multiple play sessions then it is advised to avoid use. In addition to this, any users with a history of experiencing seizures as a product of similar systems should avoid use. Unfortunately, while uncommon, these risks are unavoidable to certain users when it comes to the use of VR.

6.1.4 - Electric shock

While highly unlikely to occur, the user should take caution as to not allow the physical equipment to overheat or be used in a state of disrepair as this may introduce the danger of causing permanent damage to either the hardware, or the user themself. The system should not be used for prolonged periods of time.

6.2 - Physical Environment

6.2.1 - Spatial Awareness

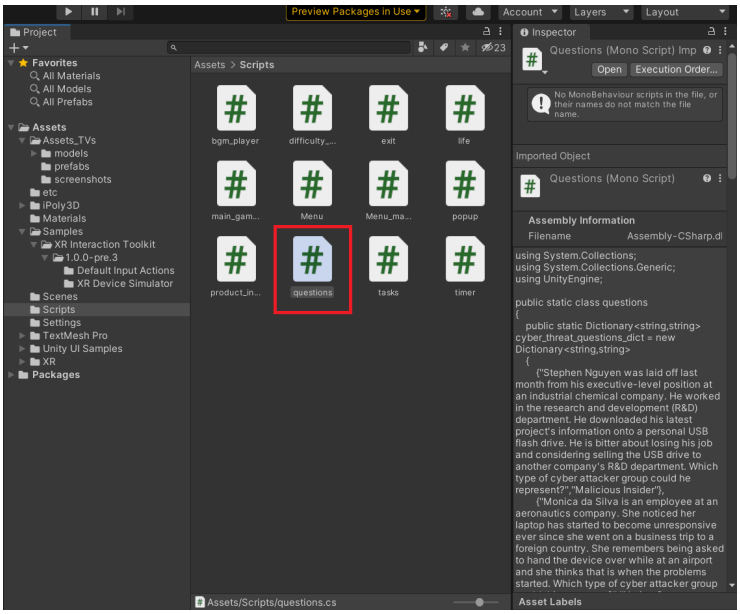
Physical coordination and spatial awareness may be impacted while wearing the headset and so caution should be taken during use to ensure that the user is not in danger of causing harm to themselves or their surroundings. For this reason, it is recommended that the user remain seated in a clear open space with few obstructions while wearing the headset.

7 - System Development

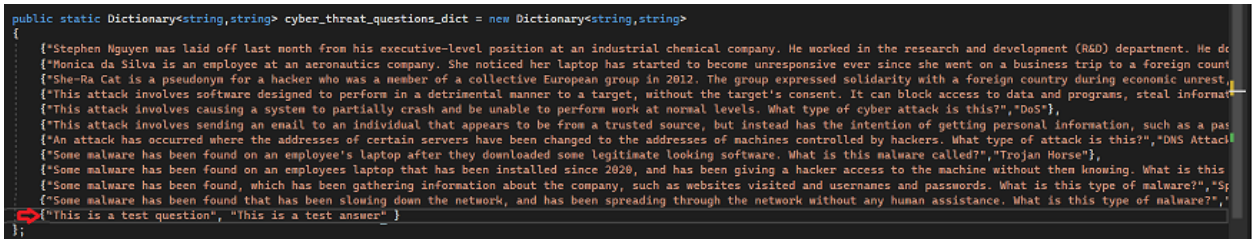
7.1 - System Expansion

7.1.1 Adding Questions

The system can be expanded by adding questions to the question bank. This can be done by locating the scripts folder in Unity, and selecting questions.



Opening this script gives you access to all the questions and answers in the game. To add a new question, identify the appropriate topic for the question: “cyber threats”, “cyber attacks”, or “other”. Add the question at the bottom of the dictionary, followed by the answer. The question will then be integrated into the game. An example can be seen below.



The format of the new question should be “**{“Question”, “Answer”}**”.

7.1.2 Adding answers

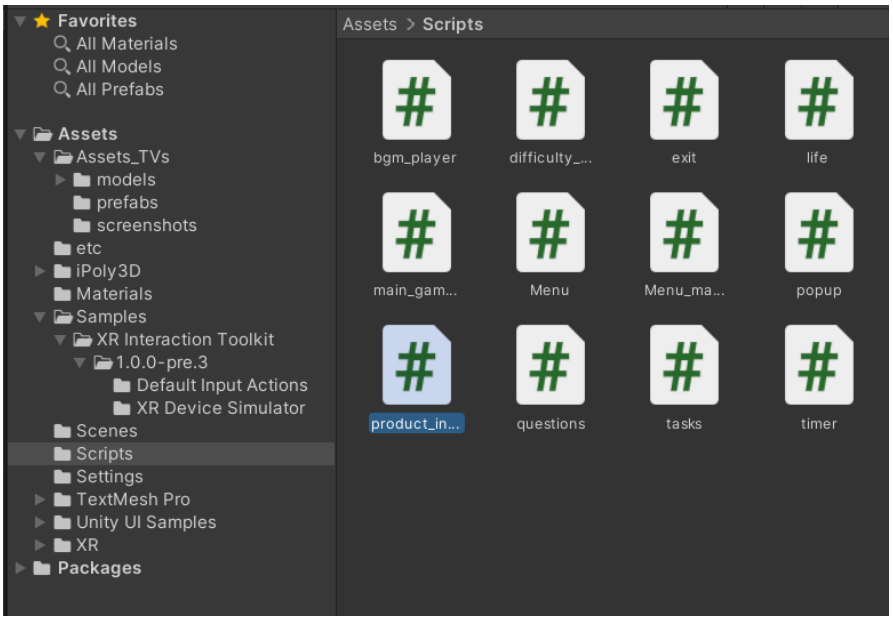
Open the question script, as above. At the bottom of the script, there are 3 dictionaries containing answers.

```
ic static string[] cyber_threat_names = new string[] {
"Malicious Insider","Hacktivist","Criminal Gang","Nation State Hacker","Spear Phishing Attack",
"Malware Attack","DNS","DoS","Credential Stuffing Attack","MITM","SQL Injection","Phishing",
"Rootkit","Spyware","Trojan Horse","Worm"
};
ic static string[] cyber_product_names = new string[] {
"QRadar","i2 Analyst's Notebook","QRadar SIEM","Data Risk Manager","SOAR","X-force Exchange"
};
ic static string[] other_solution_names = new string[] {
"Configure Access Control",
"Firewall"
};
```

Changing these dictionaries changes the answers the user will see in the game. To add an answer, identify the appropriate category of question, then add the answer in the following format: **,"[Answer]"**. Do not add a comma after this insertion, as it will cause an error.

7.1.3 Tutorial

The system can be expanded by adding to the tutorial. This can be done by finding and opening the product_info script in Unity. This can be done by locating Assets > Scripts..



Identify the correct category to add to, and simply add the name of cyber threat/ security product / cyber attack, and the definition, such as below.

```
public static Dictionary<string,string> dict = new Dictionary<string,string
{
    {"qradar","Detect known and unknown threats\nIdentify and prioritize p
    {"i2","Intelligence analysis platform\nTrack critical missions across
    {"qradar_siem","Analyses log and flow data across multiple environment
    {"data_risk_manager","Focuses on critical assets\nHelps unify a protec
    {"soar","Create and manage threats inside a unified platform\Threats a
    {"Example", "Example definition" },
};
```

The format of the new information should be "**{"Example", "Definition"},**"

7.2 - Future Development

There are several features with the potential to be developed in the future. These potential features mostly stem from current system limitations.

7.2.1 - Improved Device Compatibility

Currently, the system is only compatible with the Oculus Quest 2 VR headset. In order to make the system accessible to more users, this could be expanded to other headsets, such as

- Microsoft HoloLens 2 and the Windows Mixed Reality headsets
- Valve SteamVR

7.2.2 - Additional Backup Controls

There may be situations where additional control options such as keyboard inputs may be preferable for use; however this option is not yet currently available.

7.2.3 - Multiplayer

To make the game more interactive and fun, there is potential to add a multiplayer feature. Users could add friends and play against them, competing to answer the questions as quickly as possible. Leaderboards within groups could be available, with users and their scores for each level.

7.2.4 - Accessibility

Not everyone is able to use the system how it is currently designed. For example, not everyone is able to use the handset or the speech to text function. In the future, the game could be expanded to include accessibility for everyone. Another option that could be explored is a colourblind mode in the settings.

7.2.5 - Multilingual / Accent Compatibility

Watson API is naturally compatible with other languages including Spanish, Chinese and Japanese, and even functions with intonations changes such as that in between American and British English. Automatic translations and multilingual compatibility in the gameplay will allow the software to be more widely usable, and thus educate users of a wider variety of ethnicity.

8 - Glossary

AI:

Artificial Intelligence

Sideload:

File transfer to android device through a USB cable

VR:

Virtual Reality

XR:

Extended Reality, superset including VR and AR