**TEMASEK POLYTECHNIC**

**SCHOOL OF INFORMATICS & IT**

**DIPLOMA IN GAME DESIGN AND DEVELOPMENT**

**ASSIGNMENT BRIEF FOR PROGRAMMING WITH GAME ENGINES (CGE2C19)**

# Game Programming Project – Game Application (35%)

**Submission Date: 18 Jan 2024 - 2100 hrs.**

Download the Unity project from your LMS. The package comprises the assets and the base code required to start your assignment. This project consists of what you have done as class worksheets from Week 1 to Week 14. Open the project in Unity, click Play and see the behaviour. Familiarise yourself with the project. You should understand the structure and the source code, as you have done all of these in your weekly worksheets.

You will extend this project by completing the following tasks as part of your assignment.

## Q1: Make at least two refactoring changes to the project (10 marks)

You have worked on code refactoring in your Worksheet 6. As part of your assignment, you will have to do a minimum of two more code refactoring. Remember that refactoring your code does not mean adding new features but making your code clean, neat, and in order.

You should refactor your code according to accepted Object-Oriented Programming and Unity’s component-based design principles. You must research these best practices yourself and document how these practices apply to this project. You will write your documentation in the Technical Report Template provided to you.

**Q2: Make any one of the following extensions to the multiplayer capability of the project (10 marks)**

As part of your Worksheet 5, you have learned how to create a multiplayer game using Photon Unity Networking. In this question, you will extend the multiplayer capability by doing either **ONE** of the following tasks:

**Option A. Port a new player that you can instantiate across the network**.

In your Assignment 1, you have created a new player with animations. You may now choose that Player and make changes to instantiate it across the network. Follow the steps in your Worksheet 5, where we make changes to SciFiPlayer to adapt it to multiplayer capabilities. You shall apply the same steps to your new Player.

You will document the steps in your Technical Report and take a video of at least two clients logged in and playing.

**------ OR -------**

**Option B. Propagate the bullets shot by the SciFiPlayer to reflect through the network**.

You have implemented Bullet dynamics and a prefab that you have used in the third-person shooter game as part of your Worksheet 3. This task will make this bullet appear across the network when the SciFiPlayer fires a shot.

You can refer to Photon Unity Networking documentation and tutorial at [this link](https://doc.photonengine.com/zh-tw/pun/v2/demos-and-tutorials/pun-basics-tutorial/player-networking#beams_fire_control). You will document the steps in your Technical Report and take a video of at least two clients logged in and shooting one another. The bullet fired by the Player must appear on other clients across the network.

**------ OR -------**

**Option C. Create a Lobby User Interface**.

In your Worksheet 5, you have implemented a simple Lobby UI that only comprises an InputField to take in the Player name and Button to join a random room. You have implemented this UI in the Multiplayer\_Launcher scene. In this task, you will extend this UI to a more complicated and robust UI implementation. You must implement the following features:

* **Server to find a matching room**: We have already implemented this by joining a random room in Worksheet 5. You must implement a new logic for the server to match a room. For example, you may choose a room based on the maximum number of players, based on region, based on skills or based on user preference. Whatever logic you select, you will have to describe it in your Technical Report.
* **Fetch a list of rooms to let the user pick one**: You must create five rooms beforehand and display the list of available rooms as a list of UI Buttons. You may choose to display different colours based on whether or not the rooms are full. The user should click on any of these buttons to join the room, provided the room is not full.

Describe how you implanted your Lobby UI in the Technical Report. Take a video and show your implementation.

## Q3: Make two aesthetic enhancements (5 marks)

1. Add a back button in the **Multiplayer\_Launcher** scene so that you can go back from the **Multiplayer\_Launcher** menu to the main **Menu** scene.
2. Add a button click sound for the menu button items.

## Q4: Make performance optimisation to the project (10 marks)

*Question 4 is a differentiating question that will allow programming savvy students to push further and test their limits on complex programming and optimisation techniques.*

You have done your self-directed learning assignment on performance optimisation. You shall now apply what you have learnt to this section.

To complete this section, you will do the following:

1. **Download the Unity project named** **For\_Optimization.zip** from your LMS. Open the project in Unity. Click Play and familiarise yourself with the code.
2. **Find where you want to apply your optimisation technique**.

Before you start writing codes or refining your prefabs and making everything performant, you need to know what is causing performance issues. You must use the Profiler to get an in-depth look at how the application is performing. You can find the Profiler under **Window->Profiler**, and it will run when you play your game. Before applying the optimisation technique, you must attach a screenshot of the profiler window with the specific section in view.

1. **Apply your optimisation technique.**

Once you have identified the section where you want to optimise, you will apply the optimisation technique. You must use what you have learnt through your self-directed learning exercise. You will have to detail the steps you take to do the optimisation in your Technical Report. Once completed, you will have to use the Profiler again to check whether the optimisation is effective. After applying the optimisation technique, you must attach a screenshot of the profiler window with the specific section in view.

## Penalty on Late Submission, Incomplete Submission & Plagiarism

All late submissions will be penalised under the three levels of lateness, as stated below. Take note that plagiarism is a severe academic offence ([See TP Plagiarism Policy](http://www.tp.edu.sg/staticfiles/TP/files/studentportal/Plagiarism%20Policy.pdf)). All submitted works should be genuine and originated from you.

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| Late < 1 day | 10% deduction from absolute mark. |
| Late >= 1 and < 2 days | 20% deduction from absolute mark. |
| Late >= 2 days | No marks will be awarded. |

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