# Communication Engineering Bus Project Report:

|  |  |
| --- | --- |
| **First Name: Mahatmay**  **Last Name: Chavda**  **Student ID: N01556617** | **First Name: Swarnim**  **Last Name: Deshwal**  **Student ID:** |
| **First Name: Arth**  **Last Name: Sharma**  **Student ID:** |

Group Members:  
  
  
  
  
  
  
  
  
  
  
**Project Overview**

**Introduction:**

This report presents the networking component's implementation for the TicTacToe game with AI on a Raspberry Pi, utilizing the Sense HAT module. As a crucial segment of the Communications Engineering course (IENG 2530) and the BUS Project, this project emphasizes the fusion of hardware and software to create an engaging gaming experience.

**Project Goals:**

The primary objective of this project is to establish an online scoreboard capable of storing match scores or player moves in the cloud. Additionally, it aims to provide users with the option to retrieve and display these scores on either the Raspberry Pi's RGB LED matrix or through a web interface.

**Project Objectives:**

1. Cloud-Based Scoreboard: Implement a secure online scoreboard to store match scores or player moves in the cloud.

2. Display Flexibility: Enable seamless retrieval and display of scores on either the Raspberry Pi's RGB LED matrix or a web page.

3. Versatile Design: Carefully consider various implementation possibilities, including networking methods, cloud service providers, and display options.

4. Cloud Integration: Integrate with a selected cloud service, with preference given to Google Cloud Platform, ensuring seamless compatibility with the Raspberry Pi.

5. Python Code Development: Develop efficient Python code to transmit score or move data to the cloud database, prioritizing reliability and performance.

6. Web Interface Setup: Establish a web server on the Raspberry Pi and create an intuitive web interface to showcase game data stored in the cloud.

7. Network Optimization: Utilize networking tools such as Wireshark to analyze and optimize network parameters between the Raspberry Pi and the cloud, ensuring optimal performance.

8. Enhanced Gameplay: Enhance the gaming experience by enabling users to play TicTacToe over the web, leveraging Python web frameworks for seamless integration.

**Project Phases:**

1. Conceptualization:

- Explore various conceptual ideas, considering different approaches to implementing the online scoreboard and display options.

2. Cloud Configuration:

- Set up a dedicated cloud environment, utilizing Google Cloud Platform, and configure it to store and manage game data securely.

3. Raspberry Pi Integration:

- Install necessary software components on the Raspberry Pi, integrating Python scripts to communicate with the cloud-based scoreboard.

4. Display Interface Development:

- Develop interfaces for displaying game data, including integration with the RGB LED matrix and the creation of a web-based interface.

5. Network Optimization:

- Conduct thorough network analysis using tools like Wireshark to optimize communication between the Raspberry Pi and the cloud.

**Conclusion:**

In conclusion, the networking component of the TicTacToe game on the Raspberry Pi, enhanced with AI and the Sense HAT module, has been successfully implemented, meeting project objectives. The integration with Google Cloud Platform provides a robust cloud-based solution, and the provision of display options ensures versatility and accessibility. This project underscores the synergy between hardware, software, cloud services, and networking technologies, exemplifying practical applications of communication engineering principles in modern gaming systems.

**Photos:**