

Assignment 3: Software Design Document (SDD) with Security by Design (SBD)

Project Name: PhoSho	Team ID: 29	Mentor(s): Niek Aukes, Lucas Pruijssers
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1. Introduction (0.5 page)

Our project is an implementation of Laser Tag with Infrared using Raspberry Pi. It will use multiple Infrared receivers, to detect getting hit, along with a Infrared transmitter, to shoot infrared lasers to hit others, all connected to the Raspberry Pi inside a chest vest. The Pi will be able to communicate with a central server. the central server will also host a website that gives users access to customization options such as changing death sounds and some fun statistics. Admins will also be able to start games and change game modes through this website.

2. Revised Requirements (if any)

- No changes have been made to the project requirements as we got the full support of the mentor for our requirements and for our project.

3. Architectural Design (1–1.5 pages)

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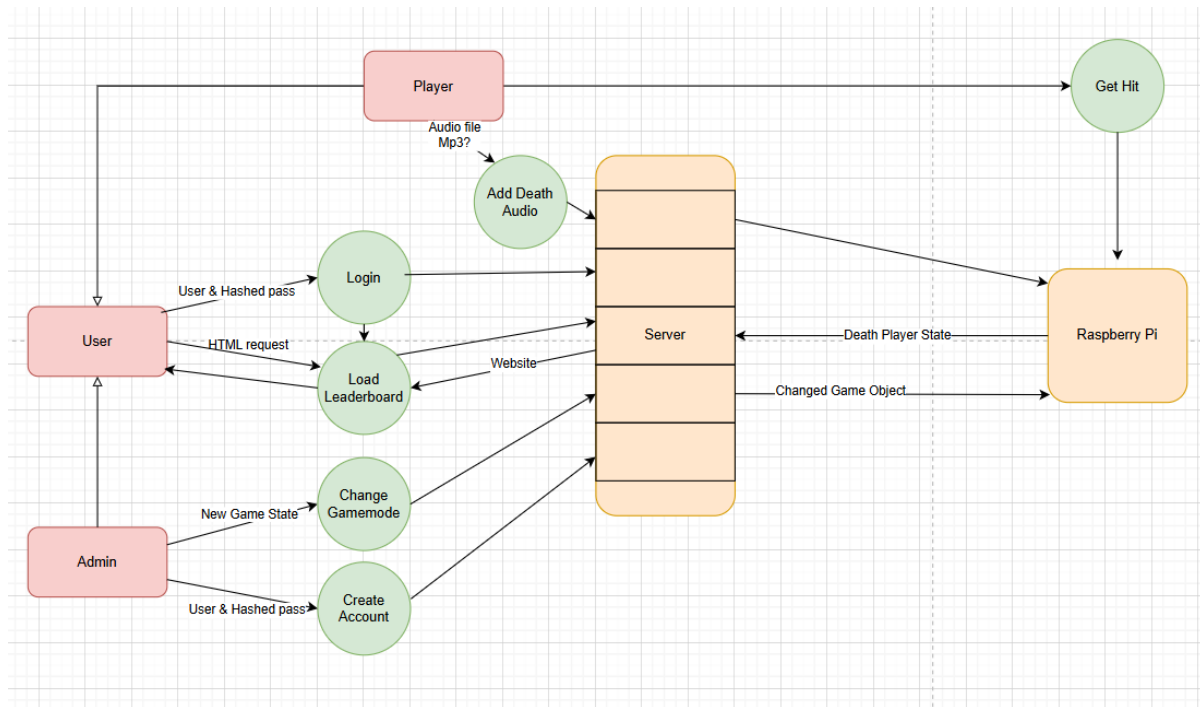
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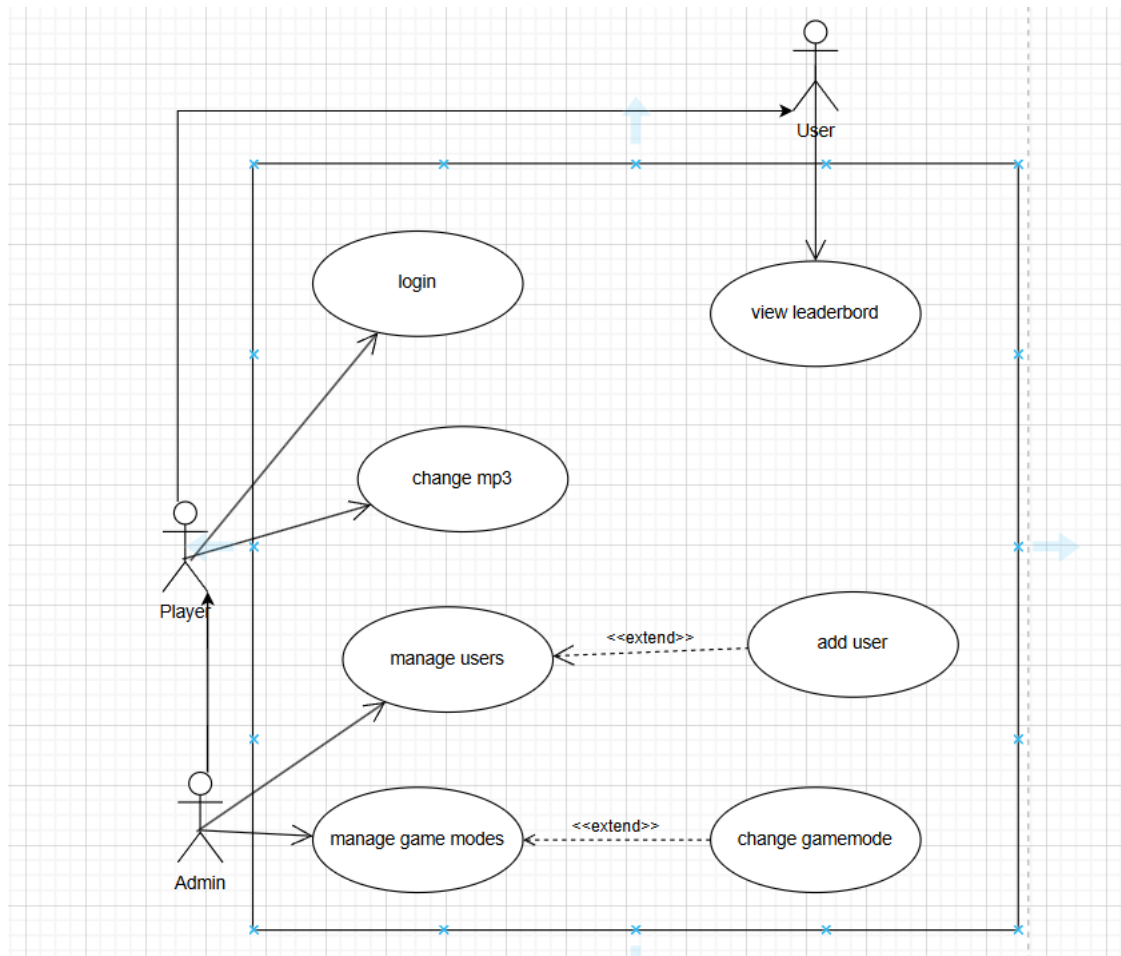
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Dipti K. Sarmah, D.K. (EEMCS)

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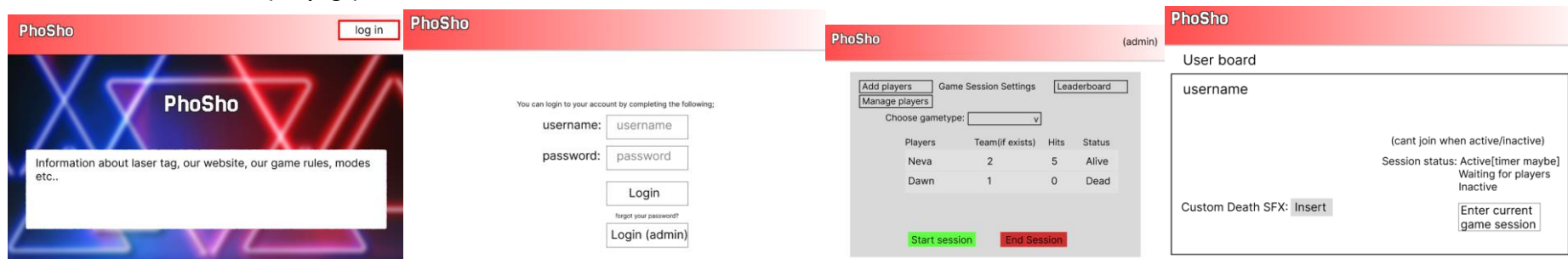


This is our dataflow diagram. It displays how data transfers through the control of the different actors; players, users (website viewers), admins. The main components of our system are the server and raspberry Pi(s) which both communicate with each other and the actors to keep the game intact.



This is our use case diagram. It shows the use cases and actors of the system. This diagram only encompasses the website. It shows that anybody can look at the leaderboard while a player / admin can login and modify settings.

4. Product User Interface (0.5 page)



To produce the draft of our user interface, we used Figma as a tool. Also note that this is just a draft we will make it more user-friendly while coding by changing the buttons etc. Brief explanation of the pages is;

Main Page: In the main page, with a cool background information about the game can be seen such as game modes etc. Users can login to their account by this page via the login button.

Login Page: Both players and the admin can login using that page.

Game Session: Admins can manage the sessions of the game on this page. Admins can manage the players and start/end the game session.

Create Account: For safety, admins create accounts for the players and give them the account.

User board: The user board page contains the info about their account, they can enter the session, and they can upload their desired death sound effect.

Link for Figma: <https://www.figma.com/design/udcPhFZPnaiaJ8UKWJ6KbS/M5---PhoSho?node-id=1-24&t=IHsOMc9am3jD7nkT-0>

5. Prevention / Mitigation Criteria (Security Controls) (0.5 page)

- What to include:
 - Prevention: How do you stop a threat before it happens?
 - Sanitizing user input to prevent SQL injection and code injection attacks.
 - We will prevent any data flow from nefarious or untrusted sources by authenticating raspberry pi's with a UUID and serial number.
 - Mitigation: How do you reduce the impact if a threat occurs?

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- We will hash user account passwords, so if the database gets leaked, no credentials leaked.

Cost Involved (less than 0.5 page)

- Implementing hashing password can slow down the login, as the password first needs to go through hash function, which based on the complexity can take few milliseconds.
- Implementing the authentication of Pis, will probably slow down the time between registering the IR signal and the server updating the state of the game.
- The implementation time of the password hashing will not take much time, a couple hours at most
- The implementation time of the authentication protocol of the Pis will take a couple days (1-2)
- The implementation time of website security (XSS prevention / SQL injection) will take the most time and will take between 2-4 days.

6. Conclusion (less than 0.5 page)

The design of our project aims to provide the requirements that we created in the first phase and structure them in abstraction that will be used during the development. We decided that there will be a central server connecting to every player around our playing environment which could one day encompass the whole world. Our design ensures a competitive environment, one capable of the same feats as international championships in similar sports, providing every single human the ability to check our leaderboards. Although we realize the greatness of this project, it cannot come without challenges. Challenges include balancing performance with unique working features! Another challenge could pose the user experience as this is the first version of the product. One humongous challenge that we realized recently is the encoding of information into the Infrared transmitters to be able to distinguish the shooters and count kills per player!

7. References– List research papers, articles, and tools referred to during your design.

Draw.io (for the diagrams)

Figma (for the UI)

<https://www.lirc.org/> (a commonly used library for encoding IR signals)

8. Usage of AI Tools (less than 0.5 page)

We have not used AI to create this document.

Security by Design Checklist (To be completed by the team)

Sr. No.	Security Review Point	Completed (✓)	Comments	Security Controls	Completed (✓)	Comments
1	Check trust boundaries (e.g., privilege levels)	✓		Prevention criteria identified	✓	
2	Identify data flows from untrusted sources.	✓		Mitigation measures defined	✓	
3	Review entry and exit points of the system	✓		Data flow diagram created	✓	

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4	Completed architecture review	✓		Cost analysis performed	✓	
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Team members reviewed:

Richard Šimoník – Yes, Berk Ayermolali – Yes, Marciano Brouwer – Yes, Muhammad Ahmed – Yes, Orbay Kanioglu - Yes, Peter Pilon - Yes