Creating A Bingo System

CA400 Functional Spec

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10/11/2022

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1. Introduction

1.1 **Overview**

We are developing our project to be a fully functional Bingo system with added extras of Pongo, our system will support two types of users: Hosts and Players. Hosts will be able to schedule and create games of Bingo using their balance to provide the funds for prizes which will be an amount set by the host. Players are the users who participate in the Bingo and can win prizes. The backend for this project will be designed using Python, Javascript and potentially R studio code for probability related to Random Number Generation and Ticket generation and the front end will be designed using Node.js. Server to client full duplex communication will be achieved using Javascript and websockets.

1.2 **Business Context**

There is no business organisation supporting our project but the idea of where this product could be deployed to is Bingo halls and other organisations who use bingo to fundraise such as GAA clubs and more. We have reached out to a few Bingo halls in the hopes of some form of testing within their business and are awaiting responses.

1.3 **Glossary**

Bingo - Is a game of chance in which players mark numbers off their tickets as the organiser calls out randomly generated numbers, the goal of the player is to be the first to successfully mark off a single-line, double-line or full house to win prizes.

Pongo - Is a variation of Bingo in which the number range is set to 80 instead of 90 and players tickets consist of a 4x4 box of numbers in which they race to be the first player to complete a line or full house. A line in Pongo has 16 variations of Diagonal, Horizontal, Vertical and other patterned lines.

Books - Books consist of 6 tickets a piece and tickets are 15 random numbers in lines for the purpose of playing bingo.

Packages - Packages in the context of Bingo are a set amount of books for a set price.

Check - A claim that a user has won a game of Bingo that must be validated to transfer funds to the players account.

PRNG - Pseudo Random Number Generation, which is in laymen terms the way random number generation occurs on a computer due to it’s inability to

generate truly random numbers.

AWS - Amazon Web Services

Paypal Sandbox - The PayPal sandbox is a self-contained, virtual testing environment that simulates the live PayPal production environment.

AWS Cognito - Authentication service provided by amazon web services

Jest - Jest is a universal testing platform, with the ability to adapt to any JavaScript library or framework.

2. General Description

2.1 Product / System Functions

The functionality of the game will differ based on whether the user is a host or a player. The general overview of the functionality is that there is an ability to create, play and complete games of Bingo and Pongo.

The Hosts Functionality will be as follows:

- Approve/Deny Players from joining their Bingo games.
- Create a Bingo Schedule
- Create Packages to allow the sale of Tickets to players
- Sell Packages to players
- Call Numbers
- Validate winners
- Add funds to their account

The Players Functionality will be as follows:

- Apply for approval to play under a particular host
- Add funds to account
- Purchase Bingo Packages on a given night
- Mark numbers as they are called out
- Customise the UI
- Check
- Withdrawal of funds

The Servers Functionality will be as follows:

- Responsible for PRNG Number Generation for calling numbers
- Bingo Book generation
- Communication between Player and Host

2.2 User Characteristics and Objectives

The target demographic for our bingo application will be anybody who loves to play bingo as a hobby, which going by averages tends to be an older age group. Keeping these people in mind the UI we design should be simple and easy to use as we cannot assume they have extensive knowledge on technology.

The application will be designed for people to be able to play bingo remotely this is aimed at those who may not be able to travel to the bingo halls due to numerous reasons such as pandemics like covid, stuck in the hospital due to illness, etc.
The app is also aimed at being used as a fundraising tool. The app can be used to host games for local GAA clubs for example, they could host an online bingo game for the members of the club to fundraise.

2.3 Operational Scenarios

Use Case 1: An Organization wants to Host Bingo through our application

This use case is focused on users who wish to become hosts within our Bingo Application, The user would have to register for a host account. Once the user has successfully registered with a host account they will be able to carry out the functionality of a host as specified in Section 2.1.

Use Case 2: A person wants to play Bingo through our application

This use case is aimed at the people who wish to play a game of bingo through our application. The user would register and be given a user id to their account, when they wish to play the will be able to carry out the functionality as specified in Section 2.1.

2.4 Constraints

Time Constraints:

As with any project there may be some time constraints, we have two people to develop and test this application before the deadline and issues and technical difficulties may add time to the development process. To combat this we will need to plan our time effectively and not over estimate our ability.

Target User Constraints:

As previously mentioned the users that this application is aimed at tend to be on the older side, as such we must aim our project user experience to be easy to use and must not have complicated features. From a design perspective this limits what we can have and show to the users.

Device Constraints:

This application will be a web application so while the users are able to play in person they will need tablets or some sort of smart device to connect them to the server to play the bingo game, but also the users playing remotely will need a device as well that can access the internet.

Learning Constraints:

We will be using technology that we have limited/no exposure to when developing this web application such as JEST, this limited exposure could cause some constraints within our project as we will be required to learn new frameworks in short periods of time.

2.5 Testing

JEST Testing:
In regards to our JS code we are planning on using the JEST testing framework to achieve a high level of testing. This will be the main tool used for testing our front-end and will be a challenge as we have never used JEST before.

User Testing:
We originally had permission and planned to test the Bingo application in Let's Bingo Dundalk but unfortunately it is shutting down in the next two weeks and this will not be available. We have reached out to a few other Bingo halls and organisations in the hopes of finding a functional business to test our product in but if this cannot be done we will still implement user testing to some degree.

Load Testing:
We will be using AWS services to host the server for our Bingo application, AWS has a lot of built in load testing tools and we will be using this to try to determine the upper echelon of limits that our system will be able to preform well at. We will be looking at this in terms of how much work it can handle without dramatic reduction in performance.

2.6 Cyber Security

Due to the nature of a Bingo application being an online gambling application the importance of cyber security within our application cannot be understated. Due to this we spent a lot of time researching the standards around the world

in relation to online gambling security and we came up with several results that would be required within our application.

DDOS Attacks
DDoS can be defined as an attack in which the attacker intends to make a machine or entire network unavailable to its intended users. This is important to our application as a denial of service would completely interrupt any games ongoing and any games to take place in the future thus we will need to develop security measures that prevent DDoS attacks from occuring or limit any possible damage that could occur due to a DDoS attack.

Game Integrity
Game integrity is a very important issue when talking about online gambling this is due to the laws in place around gambling ensuring there is a fair chance at winning in relation to our bingo application the Random Number Generation is the be all and end all of our games integrity. As mentioned previously and in our approval panel the method of which we will be generating numbers is using Pseudo Random Number Generation where a key/seed is used to determine the number generated, we proposed using the user input of the host pressing a button to call the number as our arbitrary randomness to determine the seed used in the PRNG generator. This along with some external security for the algorithm itself should prevent the games integrity being broken and should ensure that the game is indeed fair.

Account Information Security
The security of account information is also an important issue when discussing any online gambling application. For the storage of our account information we will be using an AWS cognito database. This iteself provides a secure place to store user information and thus eliminates the need for our own implemented security measures around account information.

Anti Money Laundering
All online casinos must implement their own compliance porgrams to prevent Money Laundering or Terrorist Funding. The standard for this is generally using KYC so that an account indeed has an identity and proof of said identity as well as a home address and proof of home address associated with their account. On top of this there must be some level of Account monitoring to ensure that any account that is suspicious or is suspected of breaching these terms can be terminated and relevant authorities can be informed. We will need to implement this KYC system and potentially we can look into developing some algorithm which helps monitor customer accounts and does have some method to determine suspicious activity on an account.

3. Functional Requirements

3.1 Bingo Book Generation

- **Description -** The Bingo Book generation will be the algorithm used to generate the tickets for users, there are several things that need to be considered when talking about this generation. The first of these things is the appearance of randomness, although this will be generated using random numbers there will be instances where it would appear as if it was not random to users that we would like to avoid an example of this would be having a lot of sequential numbers on a single ticket such as 1, 2 and 3. The second thing to consider is that in ireland the laws for this require that before 1000 tickets be made there can be no duplication of tickets, so we will have to introduce some conditions to prevent that from occuring.

- **Criticality -** We would define this as highly critical as it is one of two components that ensure fair odds to players and it failing could directly affect user experience

- **Technical issues -** This functional requirement will need to be preformed at a high speed such as Olog(N) or O(N)Log(N) to ensure that the bingo books are being generated fast enough to keep up with demands

- **Dependencies with other requirements -** This will have some level of dependency on our PRNG for Calling Numbers as both require randomness and will implement the same measures to ensure PRNG is occurring.

3.2 PRNG for calling Numbers

- **Description -** The PRNG for calling numbers is basically the way in which our system will carry out PRNG, the main way we have planned to do this is to use the user input as a level of randomness to decide upon the key used to determine the number to be generated.

- **Criticality -** We would determine this as highly critical as without this aspect for PRNG the system would fail as a whole as it would not truly be a fair game.

- **Technical issues -** We have limited exposure to using PRNG within an application and this could cause some issues for us.

- **Dependencies with other requirements -** This has no dependency on any other requirements

3.3 Accessible/Customisable UI

- **Description -** The web application is how the users will interact with our bingo application. We intend to make this application for all users with a specific emphasis on the older generation who make up most of the people who currently play bingo. A web application can be used anywhere as long as you have a device and internet connection. The application will need to be streamlined and easy to access and play our bingo game, so the login and accessing of a game need to be intuitive and the ui of the bingo game needs to be simple and easy to read.

- **Criticality -** This requirement is not critical but is important as we will need the web application to be streamlined and the UI to be easy to use.

- **Technical issues -** There aren't many technical issues linked to this requirement however there could be some issues with having a web application work on both mobile and desktop, there may be some bugs to fix.

- **Dependencies with other requirements -** There is no dependency with other requirements.

3.4 Check Validation/ Checking Algorithm

- **Description -** This algorithm will be used to validate whether a player has indeed a valid check, this will be carried out using some sort of Data Structure (List, Dictionary) to store numbers that have been called out and then validate that the user has these numbers and the check is valid. After confirming that a check is valid this algorithm will be responsible for the transfer of funds from the host to the user of the prize amount.

- **Criticality -** This Functional requirement has a high level of criticality due to the fact that games of bingo cannot be played without having some way of checking and validating those checks.

- **Technical issues -** We don’t foresee any technical issues arising with this functional requirement

- **Dependencies with other requirements -** This has no dependency to any other requirements.

3.5 Logging In/ Logging Out

- **Description -** This requirement is where the user will be able to access the application. Users will first be required to create an account and be given a unique user ID. Once the account has been created the data will be securely stored on our database. When the user wishes to log into our application they will be required to login using the email and secured password. When the user wishes to log out there will be a button for the function which will log them out of the application and bring them back to our login page.

- **Criticality -** This functional requirement is very critical to our application as without the ability to login, register and log out the users will not be able to access our application and play bingo.

- **Technical issues -** We do not foresee many technical issues arising from this functional requirement.

- **Dependencies with other requirements -** This functional requirement does not have any dependencies.

3.6 Host/Join Bingo Games

- **Description -** This functional requirement will be dependent on the type of user that is attempting to do it. A player can join bingo games whereas a Host has the ability to host bingo games. Hosting a game will consist of aspects such as: Scheduling a Bingo game, Starting the Bingo Game, Calling Numbers, Closing the game after it’s finish. For Players joining a game will consist of joining a bingo game, marking tickets and leaving the game upon its completion.

- **Criticality -** The level of criticality for this is high as an inability to host or join bingo games will make our app redundant

- **Technical issues -** We do not see any technical issues arising under this functional requirement.

- **Dependencies with other requirements -** This does not have any dependencies on other functional requirements

3.7 Cyber Security

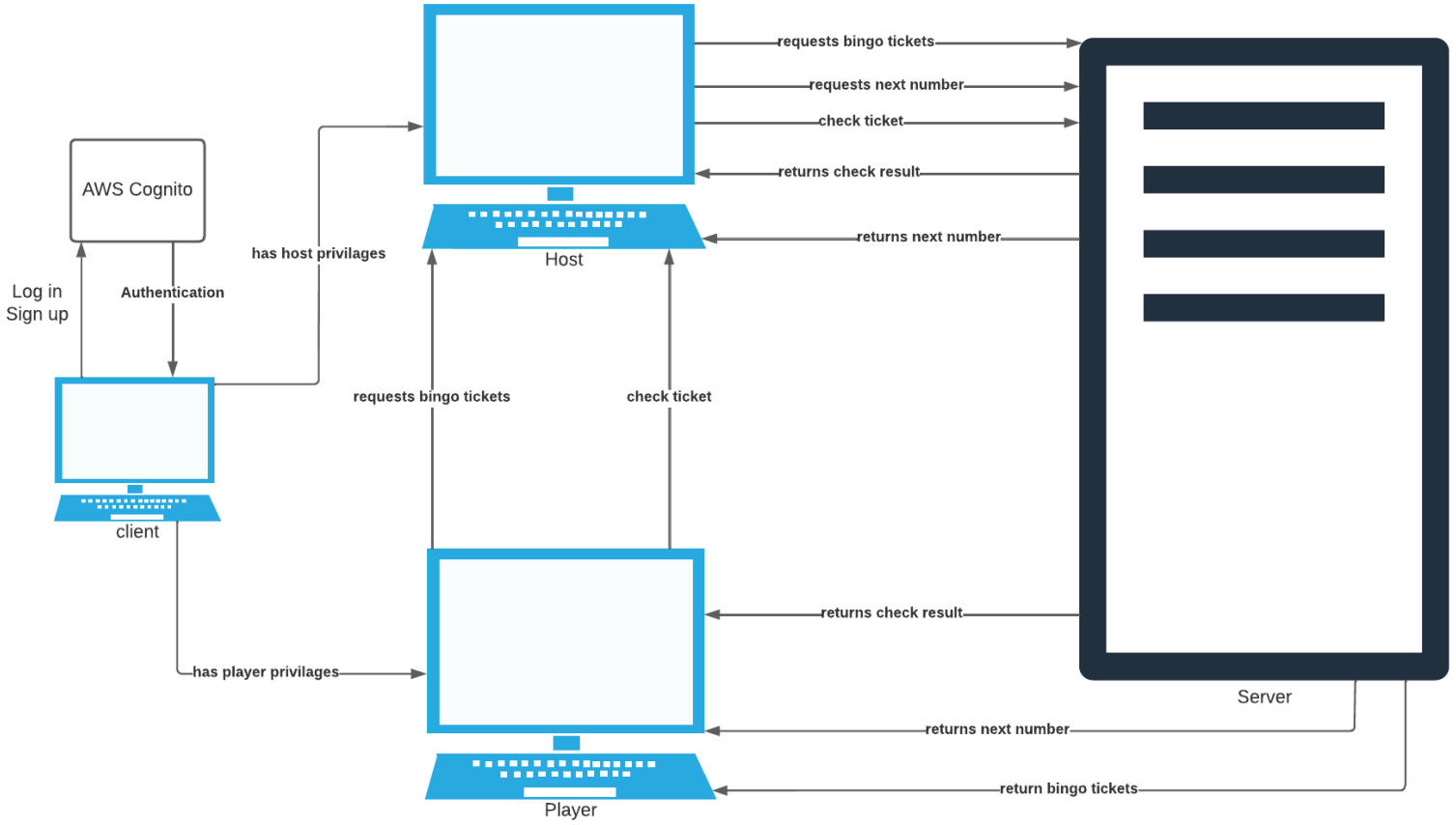
- **Description -** Cyber security will be a focus for this project as the project will use real money to play bingo. For this we plan to take several precautions such as using HTTPS requests, using aws cognito to ensure proper user storage, as well as using paypal as our money handling for both deposit and withdrawal.

- **Criticality -** This is very critical to our project as protecting our users money and data is the most important thing to this project besides providing a working bingo game.

- **Technical issues -** There may be a lot of technical issues arising from this area as we are unfamiliar with this technology and as such will require extensive research and testing to ensure a safe application.

- **Dependencies with other requirements -** This requirement is dependent on all aspects of the application.

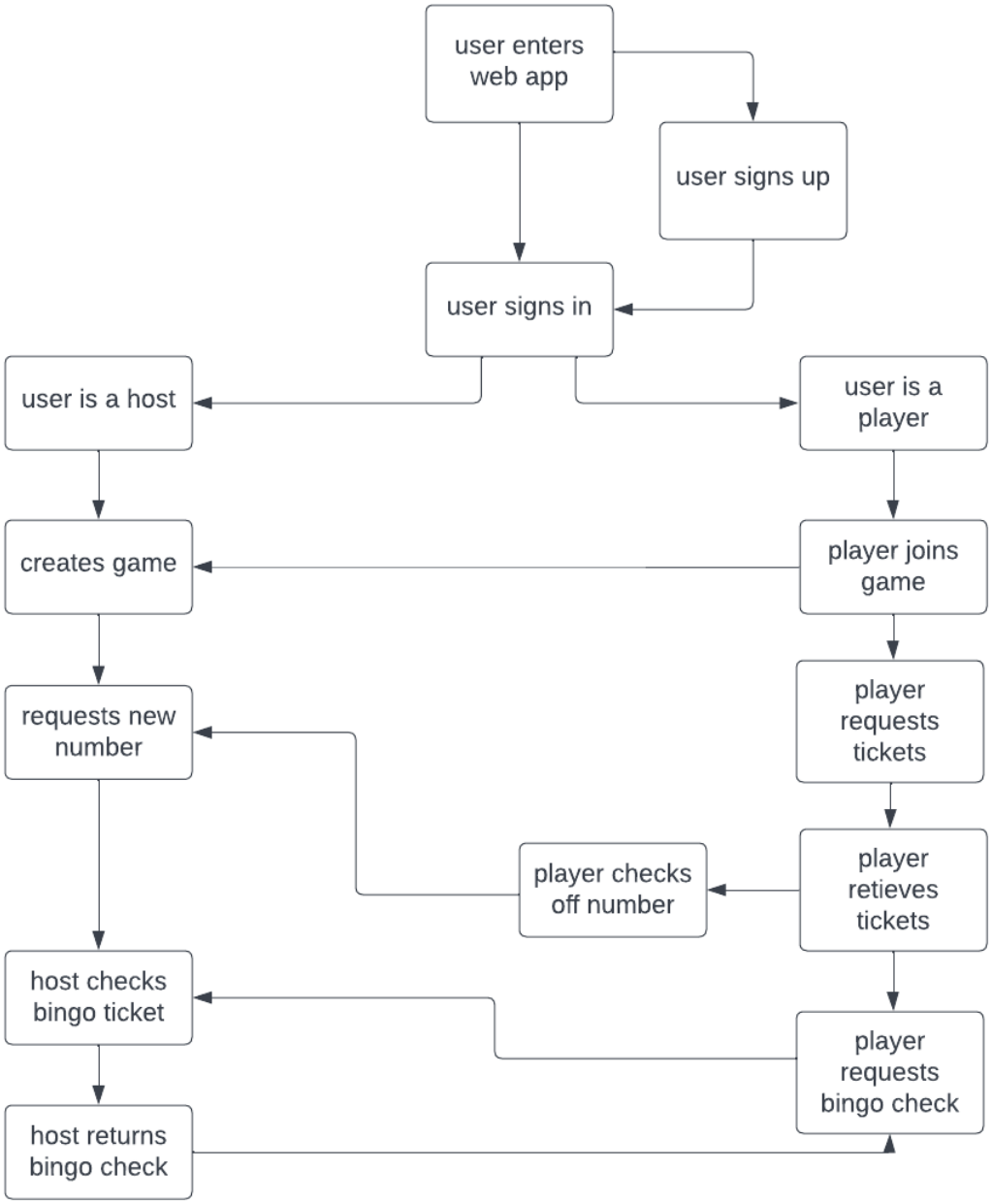
4. System Architecture



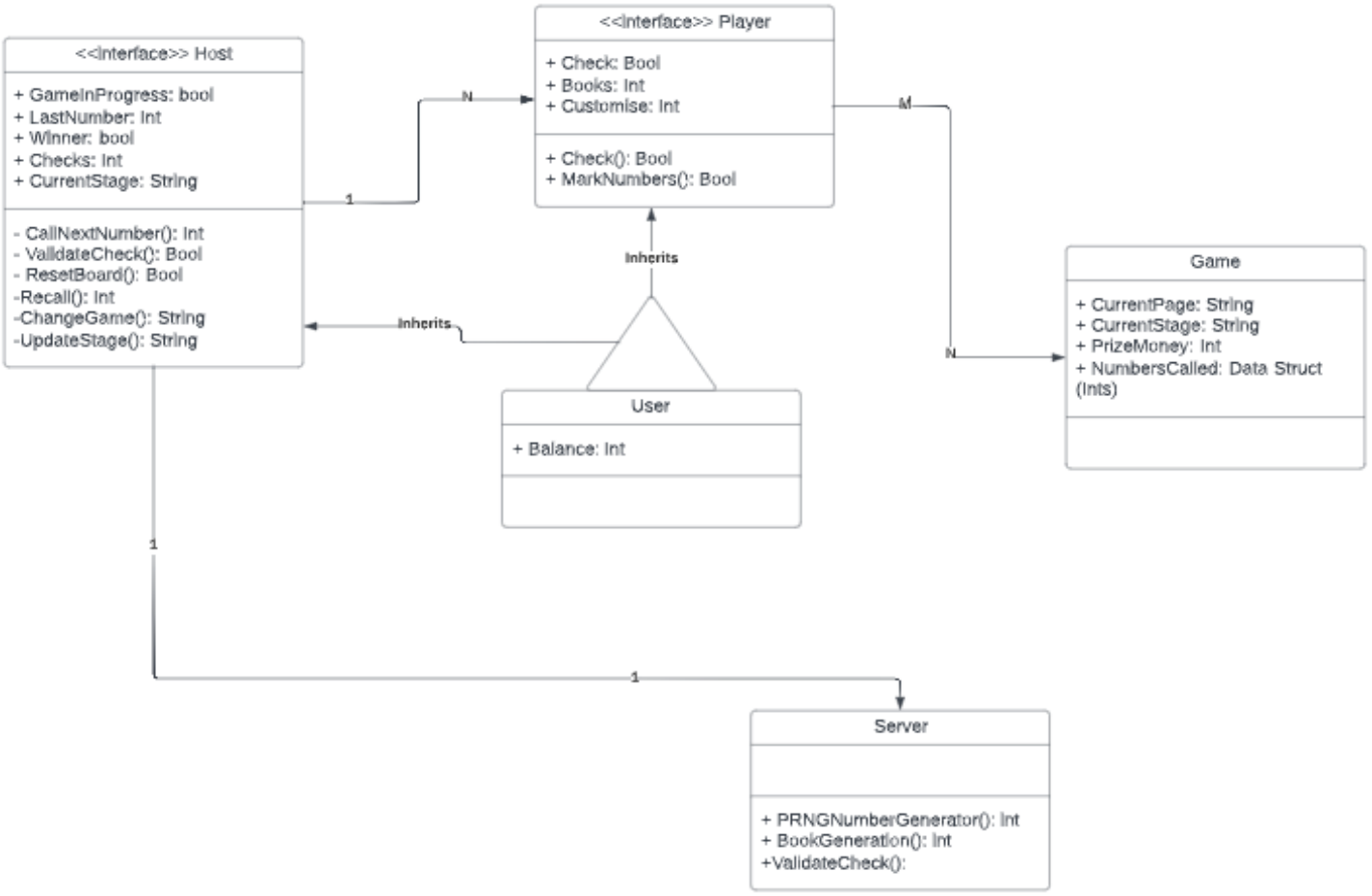
This diagram outlines the architecture our system will implement and some of the requests that may be regularly occurring between components of the system during a game of Bingo. We plan to use an AWS EC2 instance to host our server there. We will be using websockets to ensure that there is a full duplex of communication between the three components of this system: the server, the host and the players. The use of websockets will be vital for our implementation as it will allow changes to be made within the web application using JSON packets sent between the three components.

5. High-Level Design

5.1 High-Level Design Diagram:

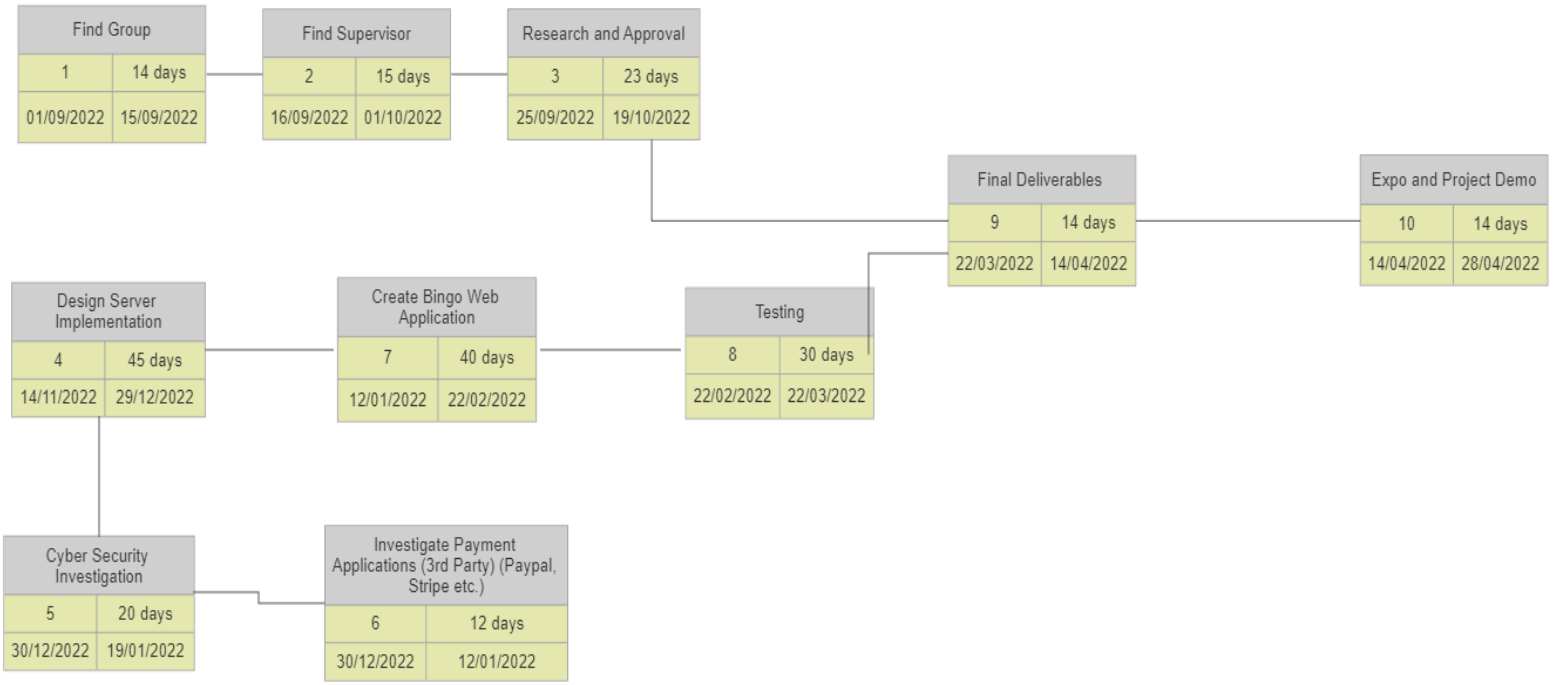


5.2 Class Design Diagram



This is a diagram exploring the visualisation of our project using different objects to see how the system will interact and the static relationships between the classes within our systems design. It also outlines a rough estimate on the attributes and functions that will be required by each object within our system.

6. Preliminary Schedule



7. Appendices

- **Amazon Web Services - https://aws.amazon.com/**
- **JEST - https://jestjs.io/docs/en/testing-frameworks**
- **Online Gambling Security Standards and regulation from different countries - https://sumsub.com/blog/a-complete-guide-to-casino-compliance-aml-responsible-gambling-and-data-protection**
- **Cyber Security for Online gambling - https://www.itgovernance.co.uk/gambling-cyber-security**
- **Importance of cyber security in online gambling - https://www.hardwaretimes.com/why-cybersecurity-is-critical-to-the-success-of-online-casinos/**
- **Bingo Application Standards from Minnesota - https://mn.gov/gcb/assets/infosheetelbstandardschecklist.pdf**
- **AWS Cognito - https://aws.amazon.com/cognito/**