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1. Introduction

1a. Overview

The product is an Android application which allows users to play the code breaker game mastermind against each other over a network. Players will sign in using their google play accounts and they will be able to find matches with random people over the network or play against their friends. The product will make use of the existing google play framework and database to enable the networking aspect of the game.

Players will play for 3 rounds in each game. There will be a default of 10 tries to figure out the code and a 4 minute time limit per round. Settings such as time limit and number of tries will be customizable.

Players will have the option for a rematch or quit to main menu after the game is complete. There will be a chat box on screen during the game for both players to communicate while playing.

The Android application is being developed because there is a need in the marketplace for a head-to-head game which requires logical thinking and problem-solving. Mastermind is an excellent game to encourage the development of a person's problem solving skills, a set of skills that are crucial not just in the world of computing, but in any walk of life.

1b. Business Context

There is only one viable business context in relation to this product and that is advertisement. The product could feature advertisements as a way have generating money for the application. These advertisements could come from any businesses or organizations looking to promote their own products or services. The advertisements could be a small banner within the game that would not hinder the user's experience.

1c. Glossary

Mastermind:

Mastermind is a classic board game where 2 players compete against each other. One player sets a coloured code sequence and their opponent must try to guess the code in the allotted amount of guesses. The code breaker is given feedback on their attempts and from this they must use deduction to break the code.

Android:

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices such as smartphones and tablets.

Google Play Services:

Google Play Services is a proprietary background service and API package for Android devices.

2. General Description

2a.Product/System Functions

Here is a list of the main functions in our project:

- User Login
- Exit App
- Find Game
- Challenge Friend
- Accept Challenges
- Change Settings(Game Settings)
- Play Game
- Request Rematch
- Quit to main menu

2b.User Characteristics and Objectives

There is no defined target audience for this application, in general, just people that have some time to kill and are looking for a quick and fun way to test their problem solving abilities.

Most people that would use this application will have had some experience with similar games before, as it will follow a fairly standard design pattern of mobile app games.

The objective of the mobile app is to be fun and easy for users of all technical abilities to use, whilst honing the user's logical thinking and problem-solving skills.

The system must be fully functional with no major bugs, run at a tolerable speed and look professional on most android devices. There can be no noticeable delay between the devices.

2c.Operational Scenarios

Player searches for a game:

When a player searches for a game the app looks for another play that is looking for a game at the same time. The app matches two players and sends them both to the game setup screen.

Player challenges a friend:

If the player wishes to challenge a friend to a game then all they need to do is enter the Google Play user name of their friend. A notification is sent to the friend and upon the acceptance of the challenge both players are sent to the game setup screen.

Setting up a game:

One player is selected as the host at random and this player is in control of the settings of the game. Both players can use the chat box at this time to agree which settings should be used. Settings like time limit, number of tries and whether duplicates are allowed will all be customisable. Both ready up once settings are agreed upon.

Start of game:

Once both players are readied up player 1 is sent to the game board screen and asked to select his/her code sequence. While player 1 is selecting their code player 2 is sent waiting screen which prompts a message telling them that player 1 is currently selecting the code. Once player 1 confirms their code both players are sent to the game board screen and player 1 watches as player 2 attempts to break the code. For round 2 the process is the same but the roles of the players are reversed.

Final round of game:

In this round both players are sent straight to the game board screen. For this round the code that is to be cracked will be generated by the app. Both players will then attempt to crack the code on their own boards which will not be visible to the other player. As soon as one player figures out the code correctly the round is finished, the other player will be notified that the code has been cracked and the round ends. The points for this round go to the player that cracks the code first. In the event that both players run out of time or tries then neither player receives any points.

Try with correct colour in wrong position:

If a player tries a sequence with a correct colour but in the wrong position the app will notify them with a white peg beside their try. The number of white pegs indicates the number of correct colours that the player has in their try that are not in the correct position. The feedback from the white peg gives no indication as to which colour it refers to.

Try with correct colour in correct position:

If a player tries a sequence with a correct colour in the correct position the app will notify them with a red peg beside their try. The number of red pegs indicates the number of colours that the player has put into the correct position. The feedback from the red pegs gives no indication as to which colour it refers to.

Try which cracks the code:

If a player tries a sequence with all the colours in their correct positions then the code has been cracked, the game shows a prompt to both stating that the code has been broken and that the player that entered the try has won the round. The game either starts the next round or if it is the final round, displays an end game screen.

Player runs out of tries or time:

If a player uses too many tries or takes too long on their go the game will display a prompt to both players stating that the round has been won. The game either starts the next round or if it is the final round, displays an end game screen.

End game screen:

This is the screen that both players are brought to at the end of the game. This screen will display the total time of the game, the points of both players and the name of the victor. Players will be given the option on this screen to have a rematch or to quit to the main menu. If both players select rematch then both players are brought to the game setup screen. If one player picks quit to menu then both players are sent to the main menu.

2d.Constraints

Time constraints:

The project is due on the 9th of March in semester 2 which is not a lot of time to complete a project with as much features as we are trying to implement. This will mean time management and sticking to deadlines will be paramount.

Knowledge of Android:

Our knowledge of Android and the platforms used to develop the application is quite limited, which may prove challenging to learn quickly.

Device speed:

There are a whole range of Android devices on the market so our application will have to be optimised for these devices.

3. Functional Requirements

3a. User Login

Description:

Users must be able to login to their accounts before being able to play the game. The user will either be signed in on their device already, in which case, no further action is required by the user. If the user is not signed in to their account they will be prompted to sign in before the app loads.

Criticality:

This function is essential to the system as without it users would not be able to find games or challenge friends on the app. With a successful login users will be able to avail of all the services like challenging and adding friends.

Technical Issues:

The main issue here is making sure that the username and password that is entered is a valid combination and linked to a real account.

Dependencies:

None

3b. Exit App

Description:

Users must be able to quickly exit the app at any time during the duration of the app being used. This includes situations like in the main menu or in the game.

Criticality:

This function is essential to the system as if this function was not on the app then the users would almost feel trapped on the system with the only way to leave the app being to manually close the app.

Technical Issues:

The app will have to make sure that no connections with the server remain after the app after the user has exited the app. If the user exits during a game their opponent must be notified of the exit.

Dependencies:

None

3c.Find Game

Description:

Users must be able to search for a game against another user that is searching for a game at that time.

Criticality:

This function is essential to the system as if this function was not there players would not be able to actually use the apps function which is playing a game of Mastermind.

Technical Issues:

The main issue here is getting both players connected to each other after the game has been found. The connection has to be good enough for fluid gameplay between the two players.

Dependencies:

This requirement is dependent on the user login because without this the matchmaking services wouldn't be accessible to the user.

3d.Challenge Friend

Description:

Users must be able to challenge a friend to a match through the app. Users must be able to accept the challenge and both users must be brought to the game setup screen once the challenge has been accepted.

Criticality:

While this function is not essential to the app it is something that has become common throughout apps on all devices. Without this function users would feel like a function is missing that could greatly improve the app and would not be happy with only being able to play strangers.

Technical Issues:

The main issue here is making sure that both players join the same server for their game and that a challenge cannot be accepted if one of the users is no longer online on the app.

Dependencies:

This requirement is dependent on the user login because without this the player being signed in the users wouldn't be able to add friends.

3e.Change Settings

Description:

Users must be able to change the game settings like time limit, number of tries and if duplicate colours are allowed.

Criticality:

While this function is not essential to the app it is something that will greatly add to the app and will give users a greater sense of involvement in the game process as a whole.

Technical Issues:

The main issue here will be making sure that the changes like number of tries doesn't break the user interface of the code if it is increased. The settings must also be made universal between both players.

Dependencies:

This requirement is dependent on the user login because without this the Google Play services wouldn't be accessible to the user.

3f.Play Game

Description:

Users must be able to play a full game of Mastermind, this includes submitting a sequence, giving correct feedback, generating the sequence for the third round and ending when conditions are met.

Criticality:

This function is arguably the most important function as it is the purpose of the app, all other functions surrounding this are there to make the experience of playing the game more enjoyable.

Technical Issues:

The main issues here will be the visualisation of the game itself, making sure that it updates for both players simultaneously and making sure that both players end the game at the same time.

Dependencies:

This is dependent on either the find game or challenge friend functions as without at least one of them users wouldn't be able to play a game.

3g.Rematch

Description:

Users must be able to rematch each other once the game finishes. This requires players being able to send and accept rematch requests.

Criticality:

While this function is not essential to the app it is something that will greatly add to the app as it will mean if users want to play a stranger again they can and if they want to play a friend again they don't have to go through the challenge menu each time.

Technical Issues:

The main issue here will be making sure that if only one person wants a rematch that person is notified that the other person has left the room. This ensures users aren't left to decide for themselves if an opponent has left or not.

Dependencies:

This function is dependent on the play game function as the rematch option will be on the end game screen, this screen will not be available if a game has not been played.

3h.Quit to Main Menu

Description:

Users must be able to quit to the main menu during setup of the game, at any stage of the game or in the end game screen.

Criticality:

This function is essential to the app as without it users would be stuck in the game once they have found a game with the only way to leave being to restart the app. This would be a massive inconvenience which could make a large number of users stop using the app.

Technical Issues:

The main issue here will be similar to exiting the app. If the user quits to the menu their opponent must be notified quickly so to avoid the opponent waiting in a pointless game.

Dependencies:

None

4. System Architecture

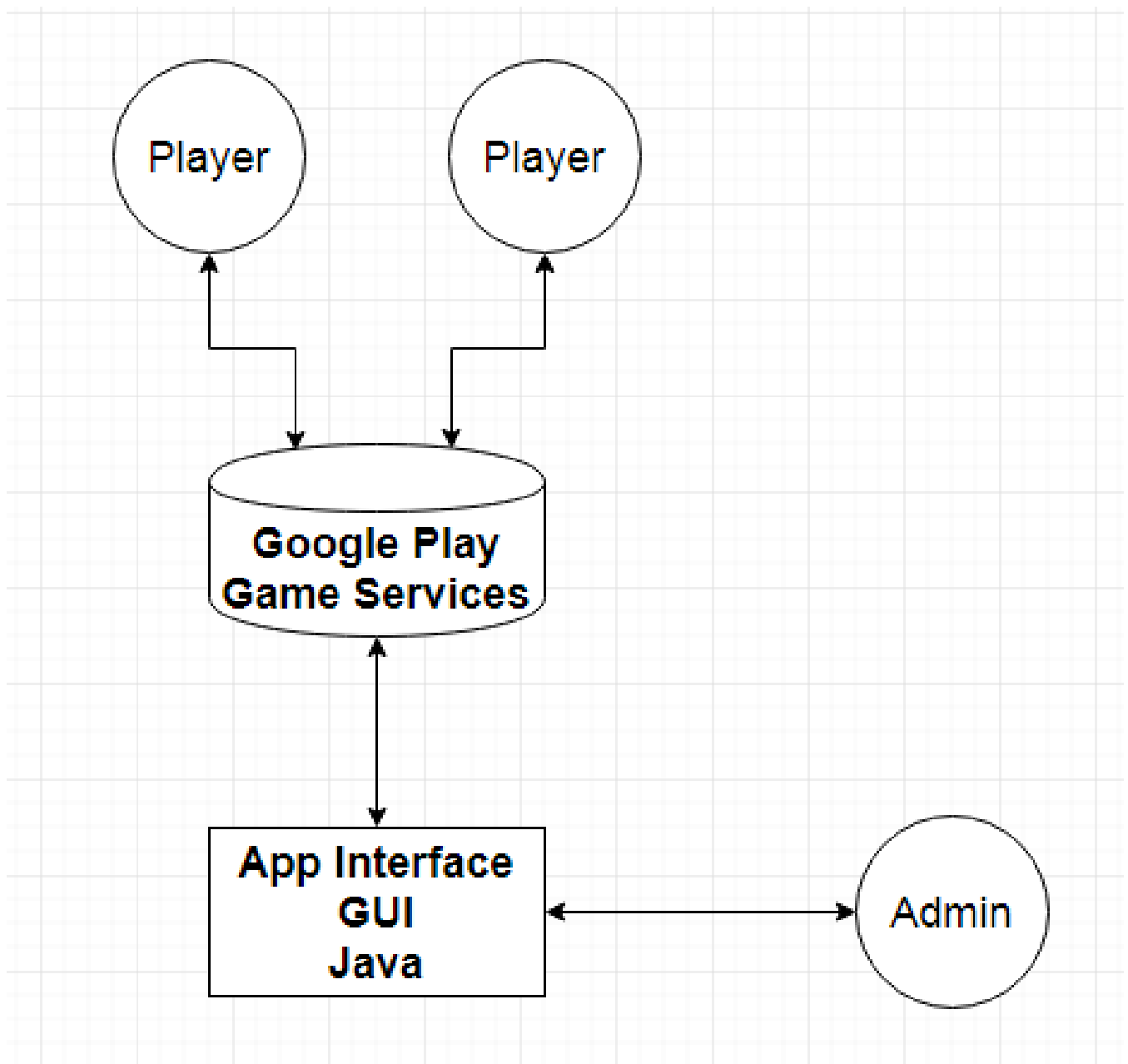


Figure A

5. High Level Design

5a.High Level Design Diagram

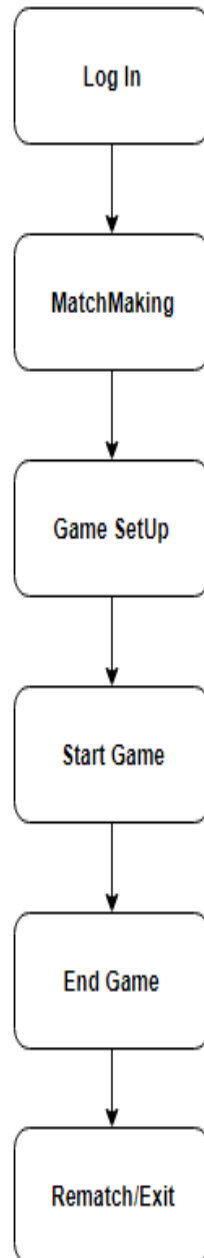


Figure B

5b. High Level Design Descriptions

Descriptions for figure B:

- **Log In**
Log into your account using username and password.
- **Matchmaking**
Search for a game and connect both users into a lobby.
- **Game Setup**
Allow users to agree upon the game settings such as time limit.
- **Start Game**
Initialise the game and bring both players to the game screen.
- **End Game**
As the game is completed, bring both players to the end game screen.
- **Rematch/Exit**
Give both players the choice to have a rematch or exit to the main menu.

6. Preliminary Schedule

6a. Overview of schedule

In this section is an early estimate at the timeline that our project will use while we complete it. This timeline includes the tentative start and stop dates, task interdependence and major task to be completed. This timeline is represented using a task list (**Fig C**) and GANTT chart (**Fig D**). The software needed for this project will include Google Play Services, Android and Eclipse for java/ Android Studio.

6b. Task list





















		Task Mode ▾	Task Name ▾	Duration ▾	Start ▾	Finish ▾	Predecessors ▾
1			Draft Proposal	2 days	Sun 22/10/17	Mon 23/10/17	
2			Submit Proposal	0 days	Tue 24/10/17	Tue 24/10/17	1
3			Create Presentation	2 days	Mon 06/11/17	Tue 07/11/17	
4			Give Presentation	0 days	Wed 08/11/17	Wed 08/11/17	3
5			Draft Functional Spec	4 days	Thu 23/11/17	Tue 28/11/17	
6			Submit Functional Spec	0 days	Fri 01/12/17	Fri 01/12/17	5
7			Study Period/Christmas	23 days	Sat 09/12/17	Tue 09/01/18	
8			Exam Period	10 days	Tue 09/01/18	Sat 20/01/18	
9			Familiarise with tools	2 days	Mon 22/01/18	Tue 23/01/18	
10			Implement Google Play Services	10 days	Wed 24/01/18	Tue 06/02/18	9
11			Exiting the app	2 days	Wed 07/02/18	Thu 08/02/18	10
12			Login	3 days	Fri 09/02/18	Tue 13/02/18	11
13			Matchmaking	4 days	Wed 14/02/18	Sun 18/02/18	12
14			Challenging Friends	3 days	Mon 19/02/18	Wed 21/02/18	13
15			Play Game	7 days	Thu 22/02/18	Fri 02/03/18	14
16			Rematch	2 days	Mon 05/03/18	Tue 06/03/18	15
17			Quit to Menu	2 days	Wed 07/03/18	Thu 08/03/18	15
18			Test Full Project	3 days	Thu 08/03/18	Mon 12/03/18	
19			Project Demo	1 day	Mon 12/03/18	Mon 12/03/18	

Fig C

6c.GANTT chart

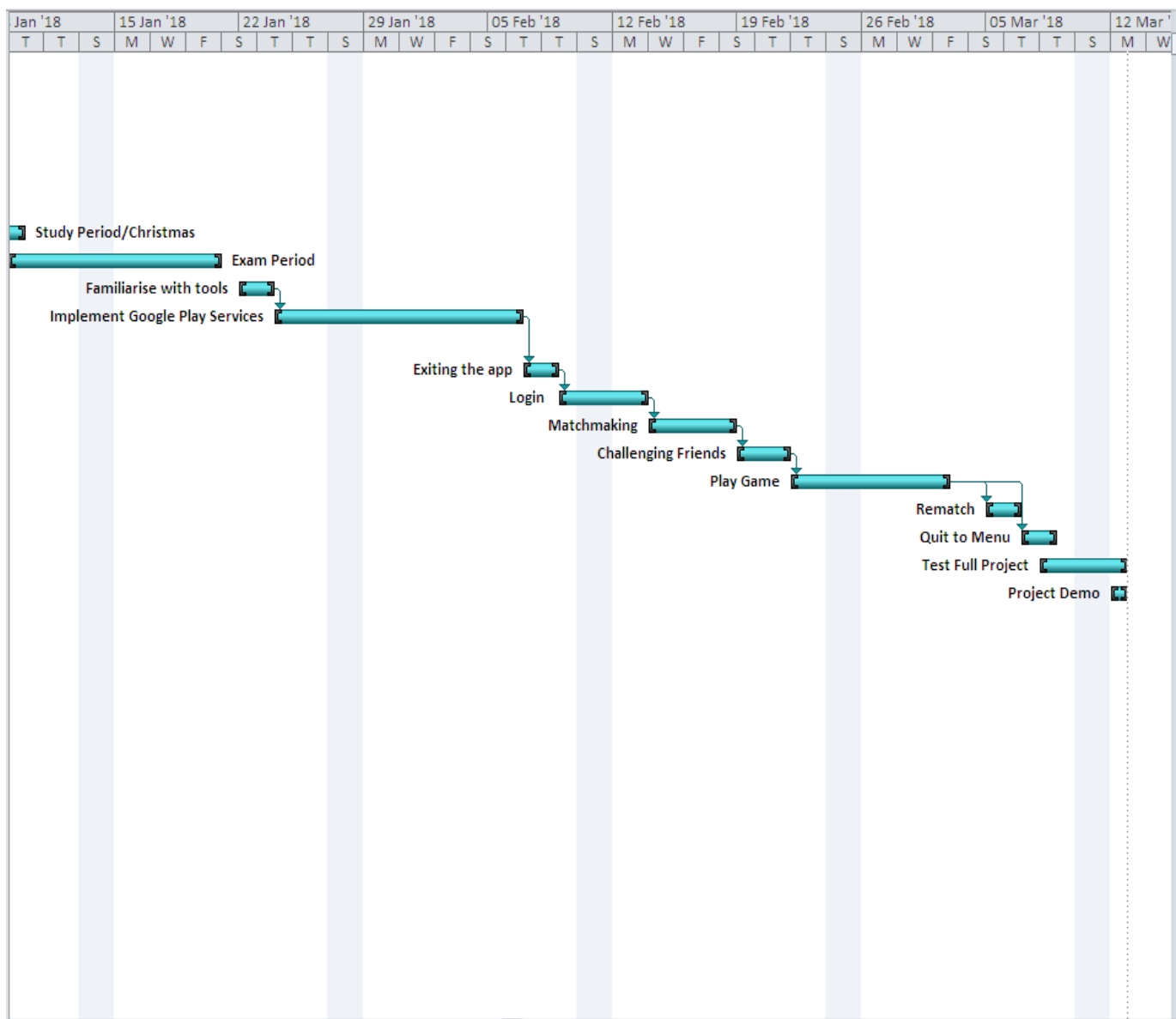


Fig D

7. Appendices

Google Play Services:

<https://developers.google.com/games/services/android/realtimeMultiplayer>

Eclipse for Java:

<https://www.eclipse.org/>

Mastermind Rules:

<http://www.boardgamecapital.com/mastermind-rules.htm>