Bilkent University

Department of Computer Engineering

Senior Design Project

Project short-name: Pandora

Project Analysis Report

Taner Baygün – 21300987

Mert Armağan Sarı – 21401861

Berfu Anıl – 21401502

Serhan Gürsoy – 21400840

Ege Yosunkaya – 21402025

Supervisor: Halil Altay Güvenir

Jury Members:

Özgür Ulusoy

Muhammet Mustafa Özdal

Innovation Expert: Cem Çimenbiçer

Website: https://thepandora.github.io/boxproject/

Nov 10, 2017

This report is submitted to the Department of Computer Engineering of Bilkent University in partial fulfillment of the requirements of the Senior Design Project course CS491/2.

Table of Contents

1. Introduction

Technology and its impacts on the society are always an interesting topic for many researchers. It is found that with new technological improvements people tend to spend more time with their machines such as smartphones, computers and etc. Since people can't exclude the technology from their lives, they build deeper connections with them [1]. Especially when people want to play games with their friends, machines hook them on screens to give a visual pleasure. Moreover, in a social manner, people stop talking with each other when they play games. The reason is that they need to follow the game's state every minute from their computers or smartphones. So, this creates a more asocial environment for many of those who wants to play simple games with their friends.

2. Proposed System

2.1. Overview

In this project we tried find practical solutions for the problems that we encounter when interacting with technology. It is obvious that we are dependent on our screens when we tend to play any kind of games with our someone else. In order to solve this problem, we aim to provide a device which alters this social interaction to maximum while a group of people play simple games such as Werewolf or Secret Hitler [2],[3]. We focus on implementing and hosting the games that involve more social interaction among players within a group. The reason we chose to build such a device is because nowadays mobile applications and programs are less valuable for us than physical devices that change our lives. We aim to give a new aspect of social game playing to people who uses our devices and shares the experience.

2.2. Functional Requirements

- The owner of the box should be able to set-up the Pandora box with the initial connection.
  - The user should be able to connect to the box's wifi with the password given with the product.
  - The user should be able to follow the instructions in the tutorial to change the password for the admin user.
  - The user should be able to follow the instructions in the tutorial to change the password for the WiFi connection to the box.
- The user should be able to choose to login as an admin or a guest user.
  - The user should be able to see the prompt to select the user type.
  - The user should be able to enter the admin password if the admin type is selected in the prompt.
- The admin should be able to see the control panel of the box.
  - The admin should be able to go to create game screen.
  - The admin should be able to go to settings screen.
  - The admin should be able to go to existing games screen.
- The admin should be able to create a game room.
  - The admin should be able to choose the game from a list.
  - The admin should be able to set the game room name.
  - The admin should be able to set the game options.(if any)
  - The admin should be able to create the lobby for other players to join.

- The admin should be able to load a saved game room from the previously saved games in the box.
  - The admin should be able to choose the saved game from the list to load.
  - The admin should be able to create a lobby for the selected game for other players to join.
- The player should be able to connect to the box with the password given by admin.
- The player should be able to see and connect to the active game room.
  - The player should be able to enter his/her username if the game is newly created.
  - The player should be able to pick one of the previous player nicknames if the game room is loaded from a saved game.
- The admin should be able to start the game session after all players are joined to the game room.
- The admin should be able to play along with the other players.
- The admin should be able to exit from the game.
  - The admin should be able to save the game session before exit.
  - The admin should be able to exit without saving the game session.
- The admin should be able to see a prompt message by the system when one of the players is disconnected.
  - The admin should be able to continue the game without player(s).
  - The admin should be able to finish the game.
- The system should be able to stop the game when the admin is disconnected.
  - The admin should reconnect in a certain time otherwise the game session will be finished without saving.
- The system should prompt a message to admin whether to save game's current state or not when it reaches the low battery and get ready to execute self-shut down.

2.3 Non-functional Requirements

- **Compatibility:** The box should be connectable by iOS and Android phones. Moreover, interfaces should support Chrome and Safari browsers.

- **Robustness:** Our product should be able to handle at least 3-4 different connections without any delay or disconnection problems. Game interfaces will be responsive without putting too much work to the mobile browsers.

- **Performance:** System should run fast and pages should load quickly. Framework that runs in the box's should handle at most 10 people , which is a relatively small number compared the servers that run in web.

- **Maintainability:** There will be a web service for Pandora box owners to update their boxes' software and download new games. The update service will give us the ability to solve the future problems that users reported.

- **Portability:** Size of the box should be as small as possible to be easy to carry. Moreover, battery life of the box of the should be long enough to play several hours.

- **Documentation:** A well documented user guide should be provided with the box for owner to understand how to use box's features. Moreover, there should be printed game guide contains descriptions of the games(included in the box) and online version of the game guide for users to read online.

- **Usability:** The system must provide a captive portal to prevent user to request other websites from the browser while connected to the Pandora box's wifi.

- **User-friendliness:** We will develop nice-looking user interface to provide a better experience to the user. Matching themes and designs should be used for different games. Interfaces would be easy to read and track to minimize time that user looks at the screen.

2.4 Pseudo Requirements (Constraints)

2.4.1 Implementation Constraints

- Pandora is the name of the box.

- We will install linux operating system.

- There will be an admin interface to setup the game rooms and user interfaces for playing the games. The interfaces will be served from the box. To serve the html files a framework will run on the linux.
- Admin and user interfaces will be implemented with Html5 , Css3, and Javascript.
- To provide a fine user experience, a captive portal will be set in the machine and user will be directed to game domain without explicitly entering url to browser.
- For the version control, GitHub and Git will be used in order to collaborate within our group.

2.4.2 Economic Constraints

- We will buy a power source which will included in the box.

- The box and the power source will be printed by a 3D printer for the prototype.

- The price of the product will be in range of the current board games. For now, the expected cost is 25$(approximately 92 TL) and target selling price is between 130 and 160 TL.

- The libraries and technologies that will be used in the system do not require any purchasing.

2.4.3 Ethical Constraints

- We will not share users' information with any third-parties.

- Users will get a unique ID with the box at purchase. After they can change or continue with the id to access admin settings of the Pandora box.

2.4.4 Sustainability Constraints

- In the future, we are planning to set up a update server to connect the Pandora box to a computer and update box software or download new games.
- After making the prototype, we are planning to buy parts of the product as bulk to decrease the cost of the box.
- We are planning to implement custom game tools for specific genres to give users ability to design and play their games.

2.4.5 Social Constraints

- The box will be released in English and Turkish languages.

- The system will be designed such a way that users will interact with each other more than the interfaces of the game to provide a fun and distinctive experience compared to other gaming platforms.

2.5 System Models

2.5.1 Scenarios

Use Case Name: Set up the Pandora with initial connection
Actors: Owner Joe
Entry Conditions:
- Owner Joe's phone is capable to connect WiFi
- Owner Joe has the default password for the WiFi connection

Exit Conditions:
- Owner Joe finishes the tutorials and successfully set up the *Admin* user and WiFi passwords

Main Flow of Events:
1. Owner Joe finds WiFi name of Pandora from his phone's interface
2. Owner Joe types password to his phone's WiFi password field after selecting to connect Pandora's WiFi
3. Connection establishes, captive portal page of Pandora's pops up immediately
4. The Pandora system displays a tutorial for Owner Joe
5. Owner Joe follows the tutorial and set a password for *Admin* user within the system
6. Owner Joe follows the tutorial and set a new password for WiFi connection with the system

See Also: Figure 1.

Use Case Name: Login as Admin
Actors: User Frank
Entry Conditions:

- User Frank has connected to the Pandora.

Exit Conditions:

- Admin Frank is logged in as admin.

Main Flow Of Events:

1. Pandora redirects the User Frank to the select login type screen.
2. User Frank selects login as admin.
3. Pandora asks for the admin password.
4. User Frank enters the admin password and clicks login.
5. Pandora verifies the password and redirect User Frank to control panel screen.

See Also: Figure 2

Use Case Name: Login as Guest
Actors: User Mark
Entry Conditions:

- User Mark has connected to the Pandora.

Exit Conditions:

- User Mark has redirected to the game room selection screen..

Main Flow Of Events:

1. Pandora redirects the User Mark to the select login type screen.
2. User Mark selects login as guest.
3. Pandora redirects the User Mark to the game room selection screen.

See Also: Figure 2.

Use Case Name: Using Control Panel
Actors: Admin Mark
Entry Conditions:

- Admin Mark has made a selection and redirected according to his selection.

Exit Conditions:

- Admin Mark has redirected to the game room selection screen.

Main Flow Of Events:

1. Pandora redirects the Admin Mark to the control panel screen.
2. Admin Mark selects one of the following.
    a. Create games
    b. Existing games
    c. Settings
3. Pandora redirects the Admin Mark according to his selection.

See Also: Figure 3.

Use Case Name: Creating Game Room
Actors: Admin Frank
Entry Conditions:

- Admin Frank connected to Pandora

Exit Conditions:

- Game lobby is created.

Main Flow Of Events:

1. Admin Frank selects create game from Pandora's control panel.
2. Admin Frank chooses a game from the list.
3. Admin Frank names the game room.
4. Pandora display game settings to Admin Frank.
5. Admin Frank changes initial game rules.(Optional)
6. Admin Frank creates game lobby for other player to join.

See Also: Figure 4.

Use Case Name: Load a Saved Game
Actors: Admin Frank, User Joe
Entry Conditions:

- Admin Frank connected to Pandora.
- Pandora has saved games.

Exit Conditions: Game lobby is created.
Main Flow Of Events:

1. Admin Frank selects load game from Pandora's control panel.
2. Admin Frank chooses a game from saved game list.
3. Pandora loads game informations.
4. Admin Frank creates game lobby for other players to join.

See Also: Figure 6.

Use Case Name: Connect to the Pandora
Actors: User Joe, Admin Frank
Entry Conditions:

- User Joe's phone is capable to connect WiFi

Exit Conditions:

- User Joe connects to Pandora

Main Flow of Events:

1. User Joe asks for the WiFi password of Pandora from Admin Frank
2. User Joe finds WiFi name of Pandora from his phone's interface
3. User Joe types password to the it's phone's WiFi password field after selecting to connect Pandora's WiFi
4. Connection establishes, captive portal page of Pandora's pops up immediately OR whenever User Joe tries to types in his phone's browser, captive portal redirects him to there.
5. User Joe selects *Player* type from the role selection page.

Use Case Name: Connecting to Game Room
Actors: User Joe, Admin Frank
Entry Conditions:

- User Joe is connected to the Pandora
- User Joe is selected *Player* role

Exit Conditions:

- User Joe connects to Game Room with typed nickname
- User Joe connects to Game Room with previous nickname

Main Flow of Events:

1. User Joe sees the active game room in game room page
2. User Joe selects the game room
3. User Joe types his desired nickname to prompt OR User Joe selects his previous nickname from the dropdown list if Admin Frank loaded game from a saved game

See Also: Figure 5.

Use Case Name: Starting Game Session
Actors: Admin Frank
Entry Conditions:

- Admin Frank is connected to the Pandora
- Admin Frank is logged in as *Admin* role
- Admin Frank created or loaded a game room

Exit Conditions:

- Admin Frank Starts game session

Main Flow of Events:

1. Admin Frank checks connected players from game lobby
2. Admin Frank starts game session by clicking the start button or Admin Franks clicks the start button, but system prompts a message that indicates user count is not enough for selected game and Frank waits.

See Also: Figure 5.

Use Case Name: Playing Game as Admin
Actors: Admin Frank
Entry Conditions:

- Admin Frank is connected to the Pandora
- Admin Frank is logged in as *Admin* role
- Admin Frank created or loaded a game room
- Admin Frank started the game with enough player count

Exit Conditions:

- Admin Frank starts the play game like an ordinary player

Main Flow of Events:

1. Admin Frank starts to play game as an ordinary player with the game's pre-set rules.

Use Case Name: Exit from a Game in Pandora
Actors: Admin Michael
Entry Conditions:

- Admin Michael is connected to the Pandora
- Admin Michael is logged in as *Admin* role
- Admin Michael created or loaded a game room
- Admin Michael started a game

Exit Conditions:

- Admin Michael cancels the exit procedure.
- Admin Michael successfully exits from a game without saving the session
- Admin Michael successfully exits from a game with saving the session

Main Flow of Events:

1. Admin Michael presses to “Exit” button from the navigation bar on the screen.
2. The system asks Admin Michael if he wants to save the game or not.
3. Admin Michael selects to save the game session.
4. The game session is saved in the system and added to the list of previous games.
5. Admin Michael is returned to the control panel of the Pandora system.

Alternative Flow:

1. Admin Michael presses to “Exit” button from the navigation bar on the screen.
2. System asks Admin Michael if he wants to save the game or not.
3. Admin Michael selects to exit without saving the game session.
4. The game session is deleted.
5. Admin Michael is returned to the control panel of the Pandora system.

Use Case Name: User(s) are disconnected
Actors: User Jane, Admin Joe
Entry Conditions:

- User Jane is disconnected

Exit Conditions:

- Admin Joe finishes the game
- Admin Joe continues the game

Main Flow of Events:

1. Message prompt appears on the screen to the Admin Joe
2. Admin Joe decides to continue to play the game with remaining players

Alternative Flow:

1. Message prompt appears on the screen to the Admin Joe
2. Admin Joe decides to finish the game

See Also: Figure 8.

Use Case Name: Admin is disconnected
Actors: Admin Joe
Entry Conditions:

- Admin Joe is disconnected

Exit Conditions:

- System waiting time is over
- Admin Joe reconnects to Pandora

Main Flow of Events:

1. The system pauses the game
2. The system starts a timer to wait for Admin Joe's reconnect
3. The system finishes the game after the timer ends without Admin's connection

Alternative Flow:

1. The system pauses the game
2. The system starts a timer to wait for Admin Joe's reconnect
3. Admin Joe reconnects within the given time and the system unpauses the game

See Also: Figure 9.

2.5.2 Use Case Model

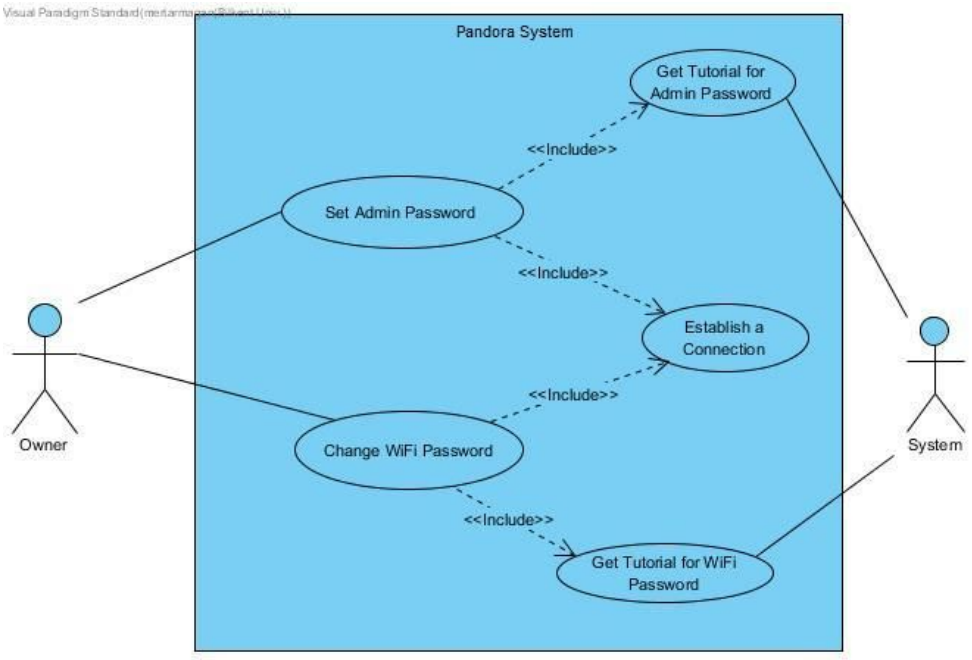


Figure 1: Use Case Model of Initial Setup

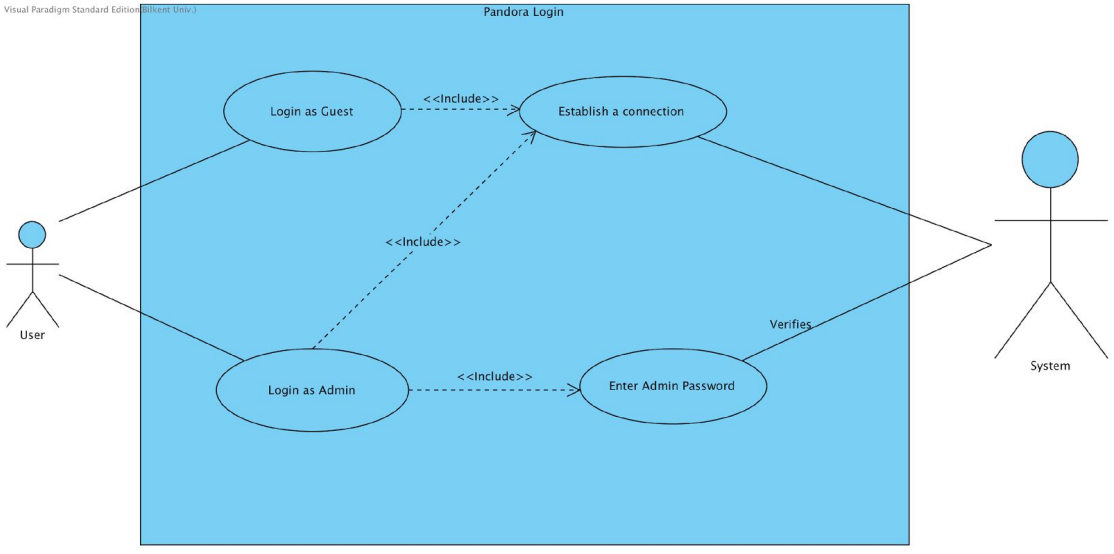


Figure 2: Use Case Model of Login

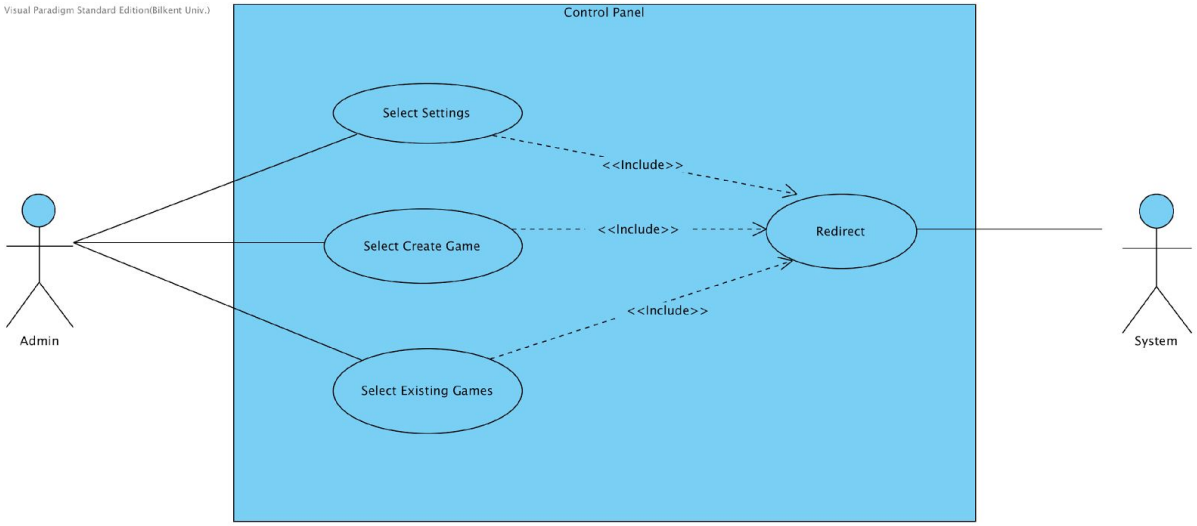


Figure 3: Use Case Model of Admin Control Panel

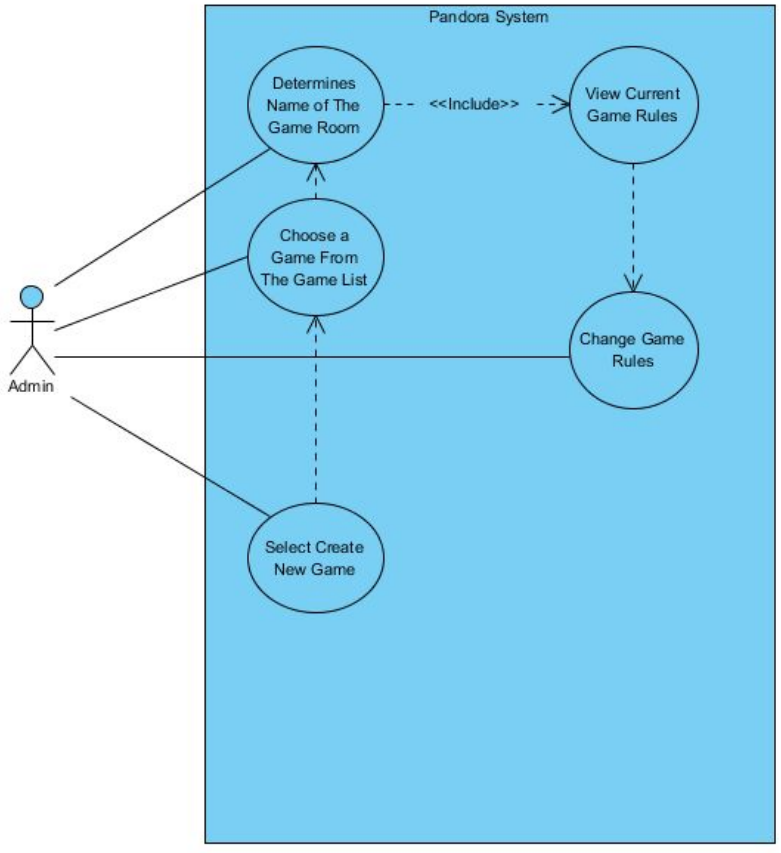


Figure 4: Use Case Model of Creating a Game

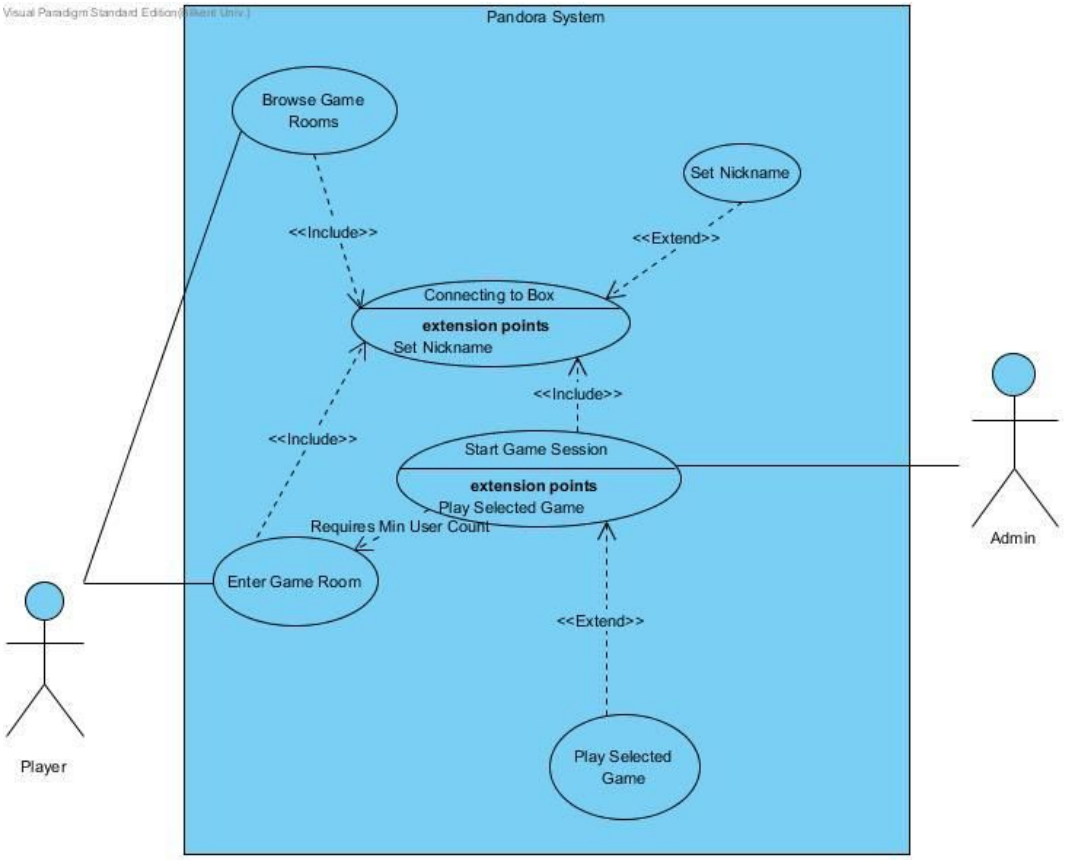


Figure 5: Use Case Model of Joining a Game

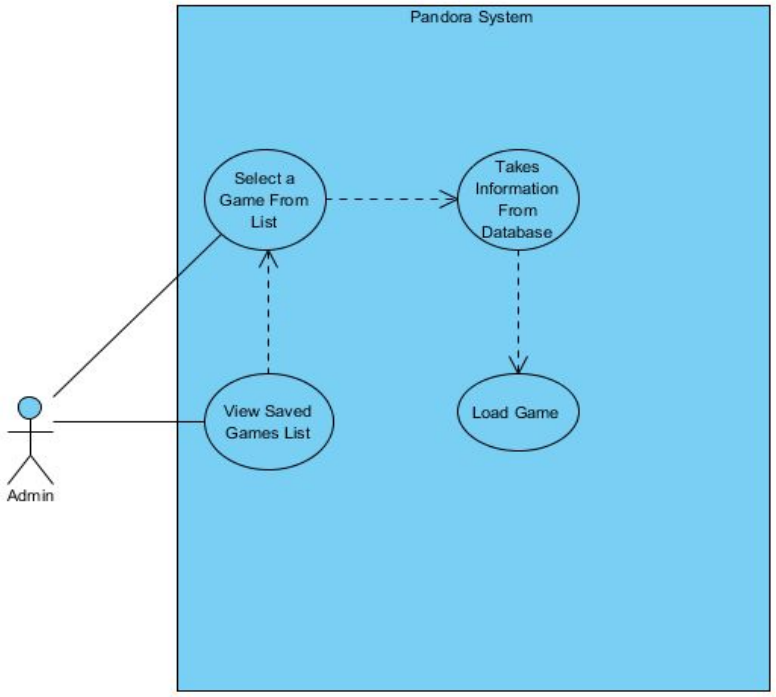


Figure 6: Use Case Model of Loading a Game

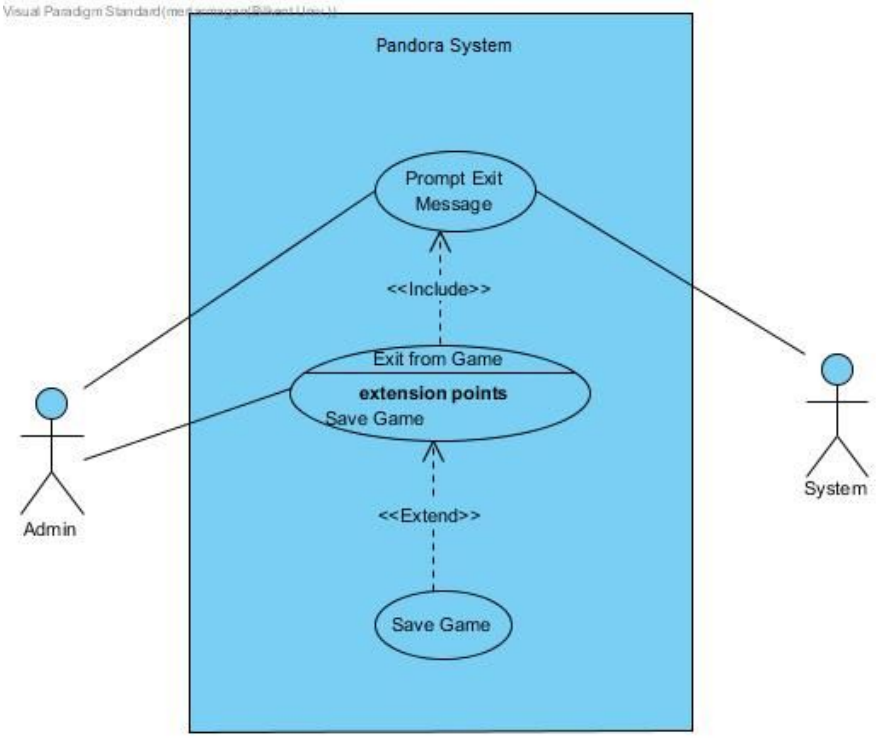


Figure 7: Use Case Model of Saving a Game

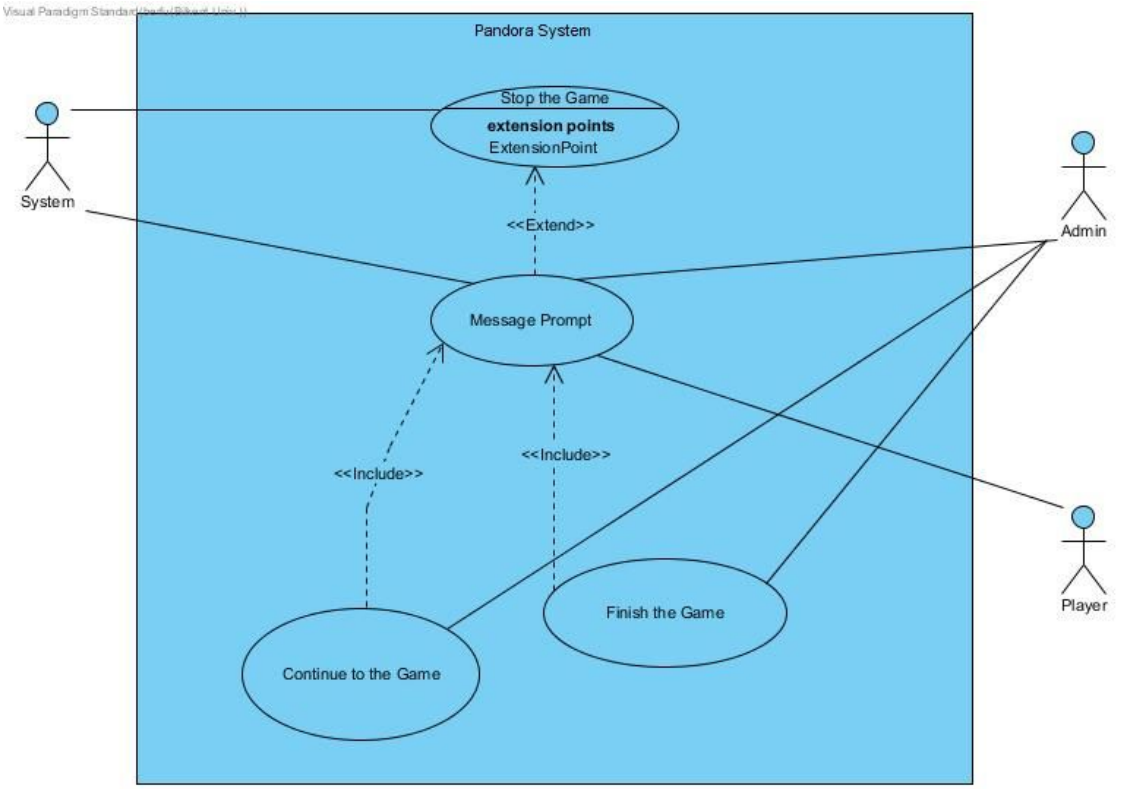


Figure 8: Use Case Model of Player Disconnection

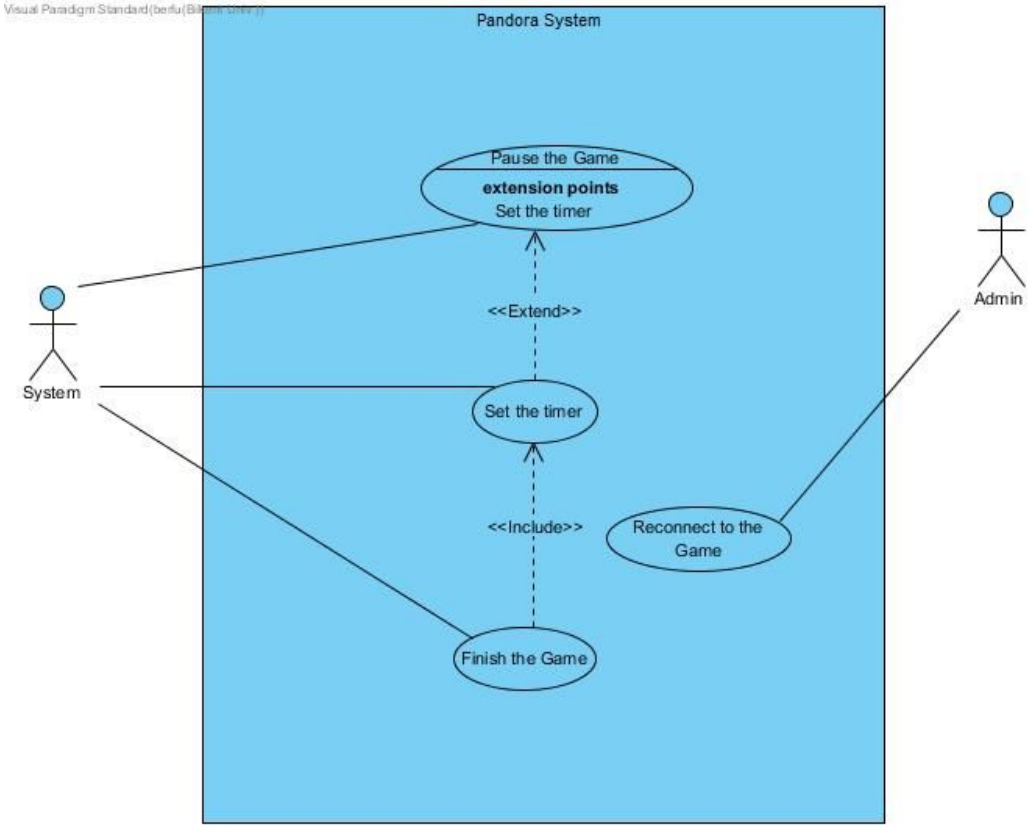
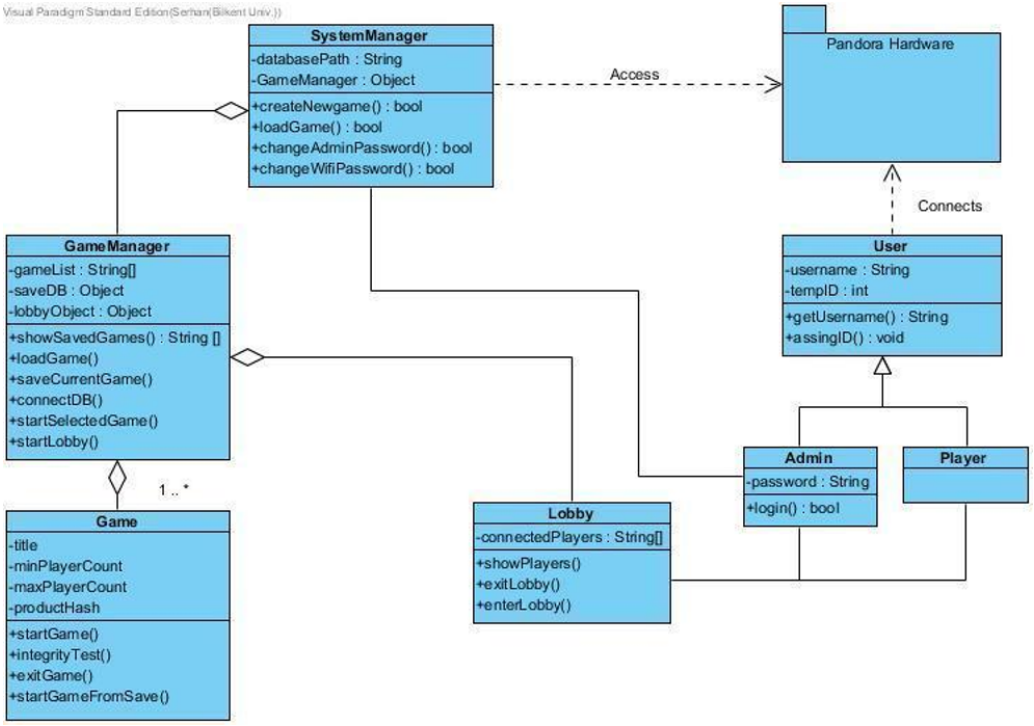


Figure 9: Use Case Model of Admin Disconnection

2.5.3. Object and Class Model

Class Diagram



- **System Manager Class**

  System Manager Class is a middleware between the hardware and database of the Pandora Hardware and the Game logic. It provides a simple API for the Game Manager for database operations and accessing some system settings.

  createNewGame() -> accesses to the database and creates a entry for the new game, returns true if successful

  loadGame() -> access to the database and returns the information about the saved game, returns if the game is found and accessible.

  changeAdminPassword() -> changes admin password for the system.Returns true if successful.

  changeWifiPassword() -> changes WiFi password of the system. Returns true if successful.

- **Game Manager Class**

  Game Manager Class administrates how the games integrate with the system , saving and loading operations, starting games and lobbies. Moreover it provides a database access method for games to prevent direct access to database from the game logic.
  showSavedGames() -> Returns the information about the saved games.
  loadGame() -> Returns the selected saved game and starts a lobby with the previous save.
  saveCurrentGame () -> saves the current game state to the database
  connectDB() -> an API method for games to connect database and make their database operations.
  startSelectedGame () -> Starts the game by preparing the system and then calling the start game function of the game object.
  startLobby() -> Creates the lobby for players to join.

- **Game Class**

  Game class is administrates how games should integrate with the system and holds some essential data for the each individual game such as title,minimum and maximum player counts and an unique product hash.
  startGame () -> starts the game logic
  integrityTest () -> Returns true if the game is compatible with the system.
  exitGame () -> System calls this function to end the game.
  startGameFromSave () -> starts the game logic with a some existing state.

- **Lobby Class**

  Lobby class represents the waiting state of the system before the game starts. Players enter the lobby and when the game starts, Game uses “connectedPlayers” for the player list. Lobby objects are created by Game Manager.
  showPlayers() -> Returns the connected player list.
  exitLobby () -> Called by a player if a player wants to leave the lobby. Removes the caller from the connected player list.
  enterLobby () -> Called by a player if a player wants to enter the lobby. Adds the caller to the connected player list.

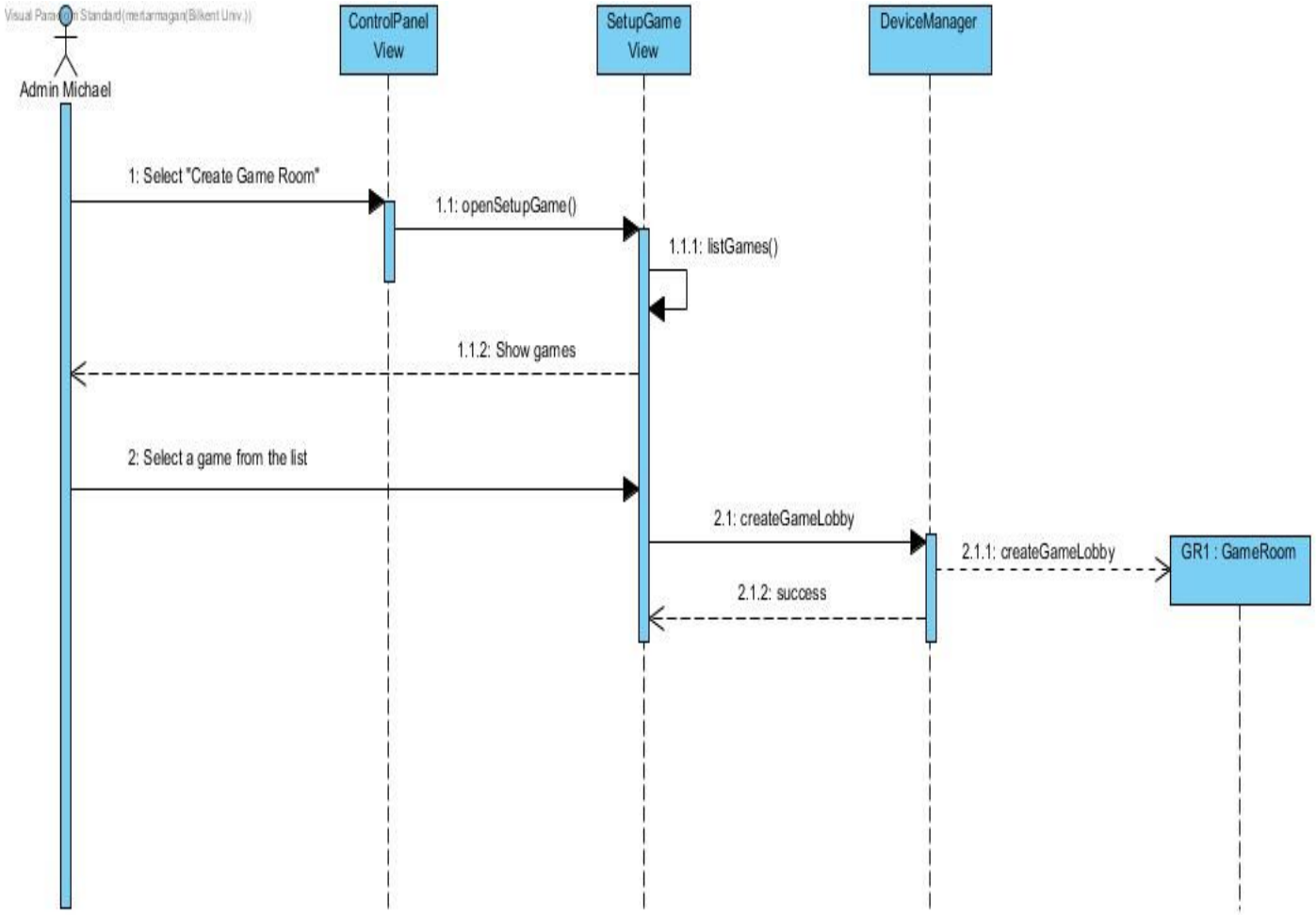
- **User Class**

  User class represents the player , a user can either be the admin or a player. Users have temporary ID's and usernames. Admin has a password in addition to ordinary user properties.
  getUsername() -> Returns the username of the user.
  setUsername() -> Sets the username of the user.
  assignID () -> Assigns a unique id for the user.

2.5.4. Dynamic Models

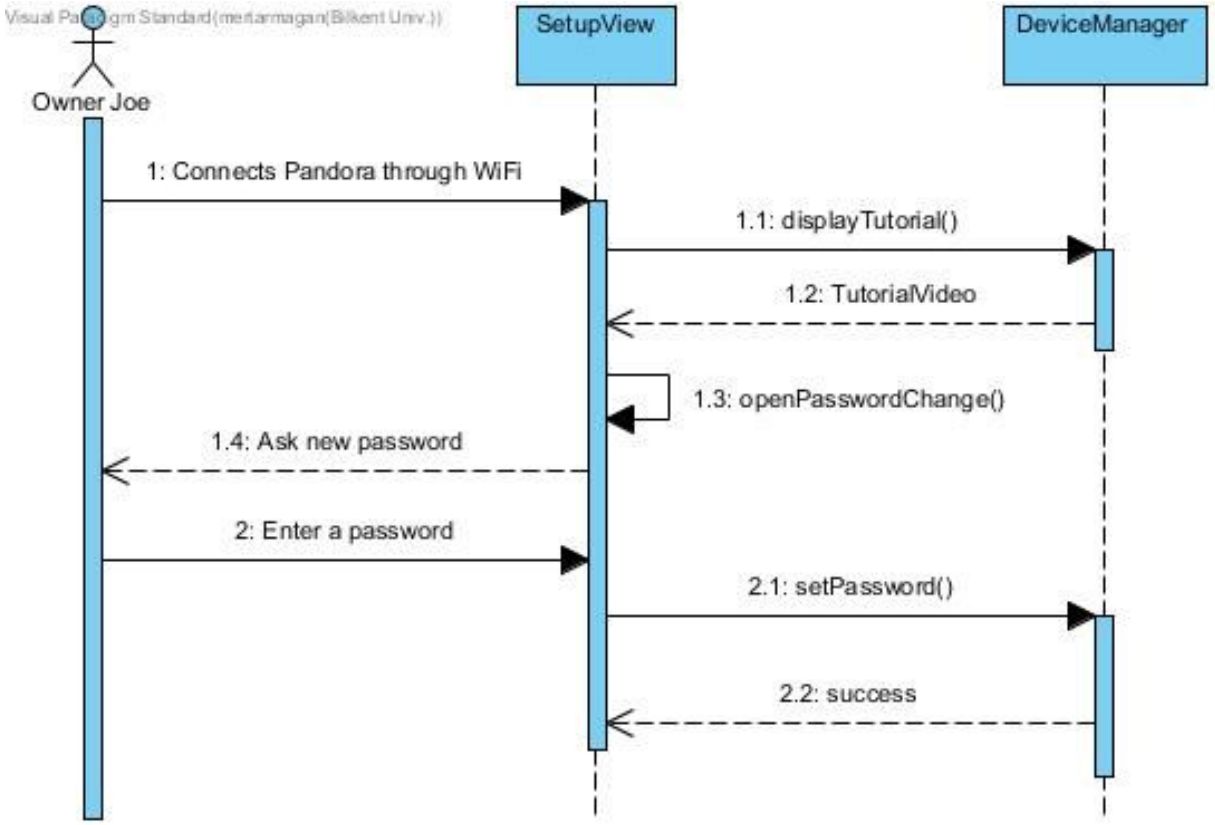
2.5.4.1. Sequence Diagrams

Create Game Sequence Diagram



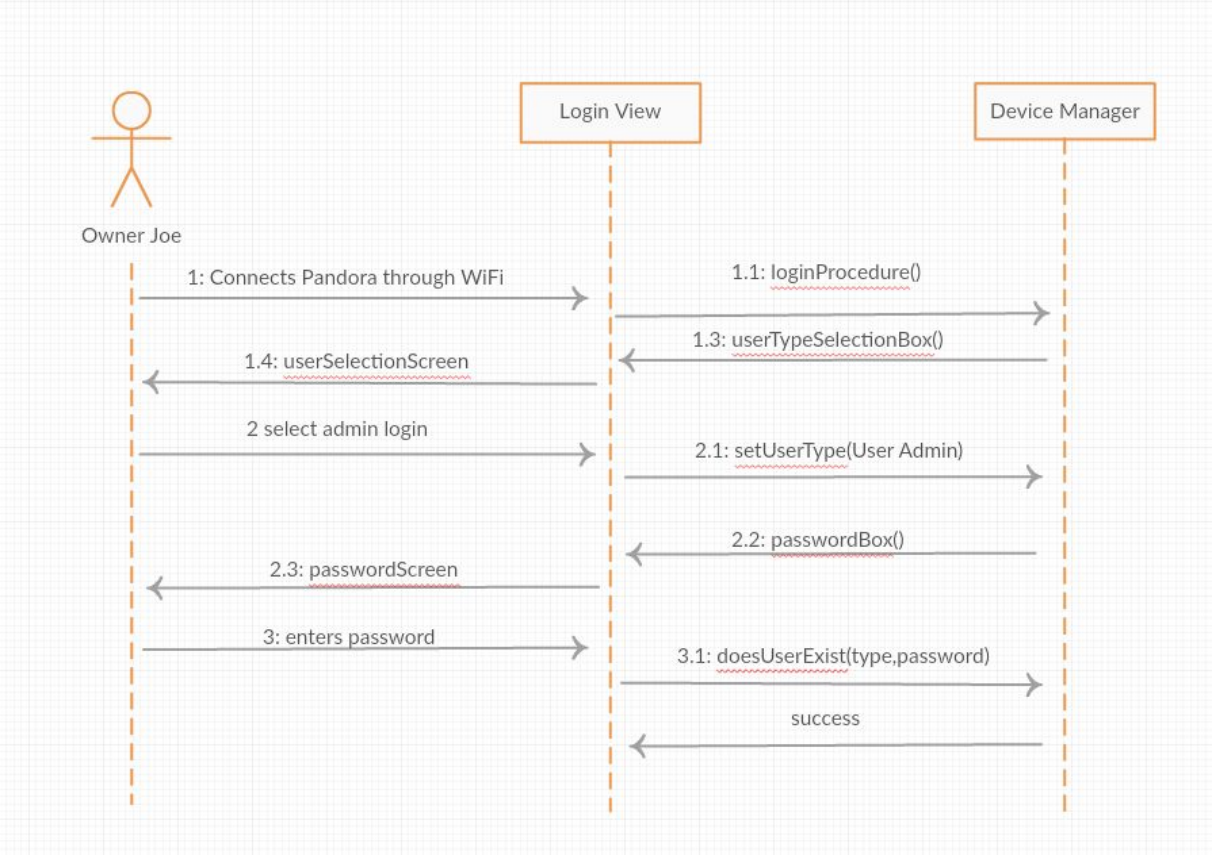
Scenario: Admin Michael wants to play game with his friends. To do that he selects Create Game Room option in Admin Control Panel. System shows the available game list to the admin ,then he selects the game from game list and press create game room. System creates a game lobby with the selected game for others users to join.

Initial Sequence Diagram



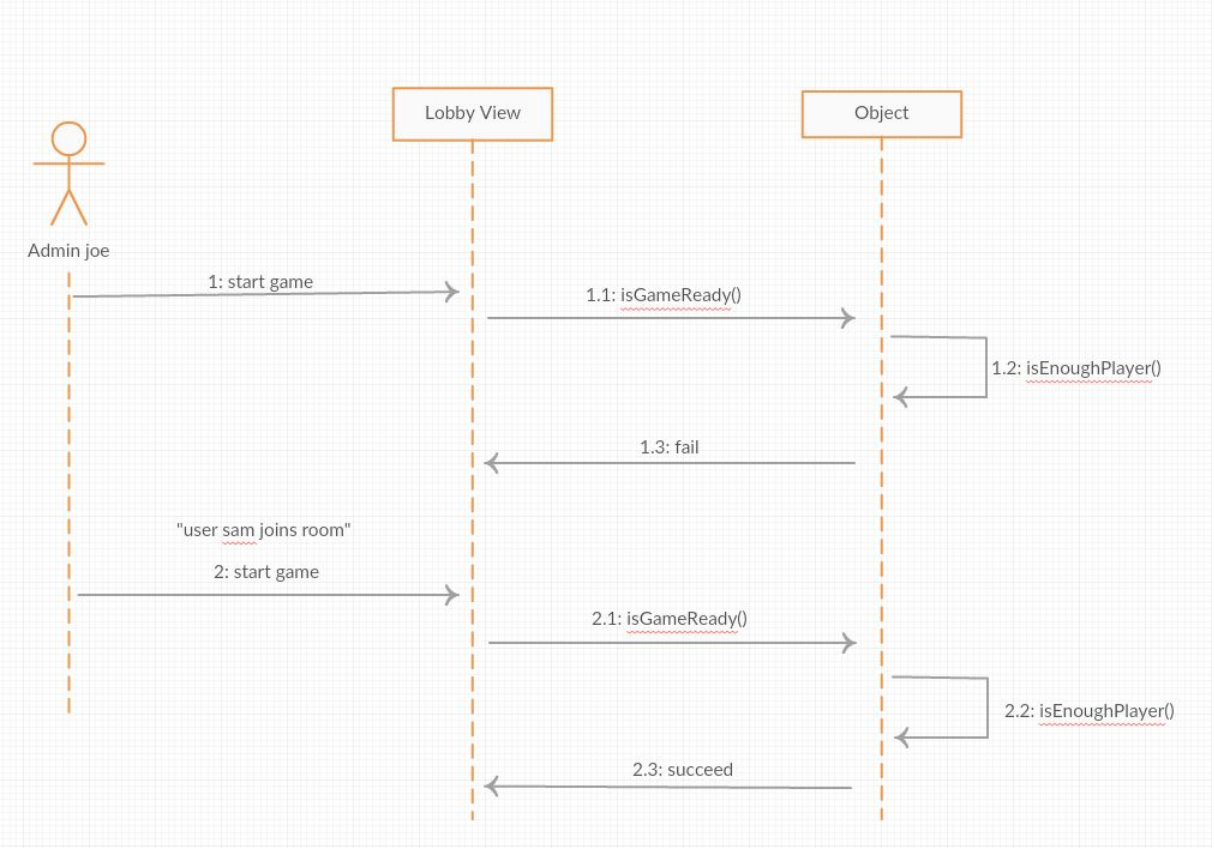
Scenario: Owner joe just bought Pandora and came home. He power up Pandora then find Pandora WiFi in his cell phone. He uses the password that come with the box to connect Pandora and his cell phone. Pandora directs Owner Joe to his phone's browser and play tutorial about how to change Pandora's Wifi password and Admin password. Then he changes passwords accordingly.

Login Procedure Sequence Diagram



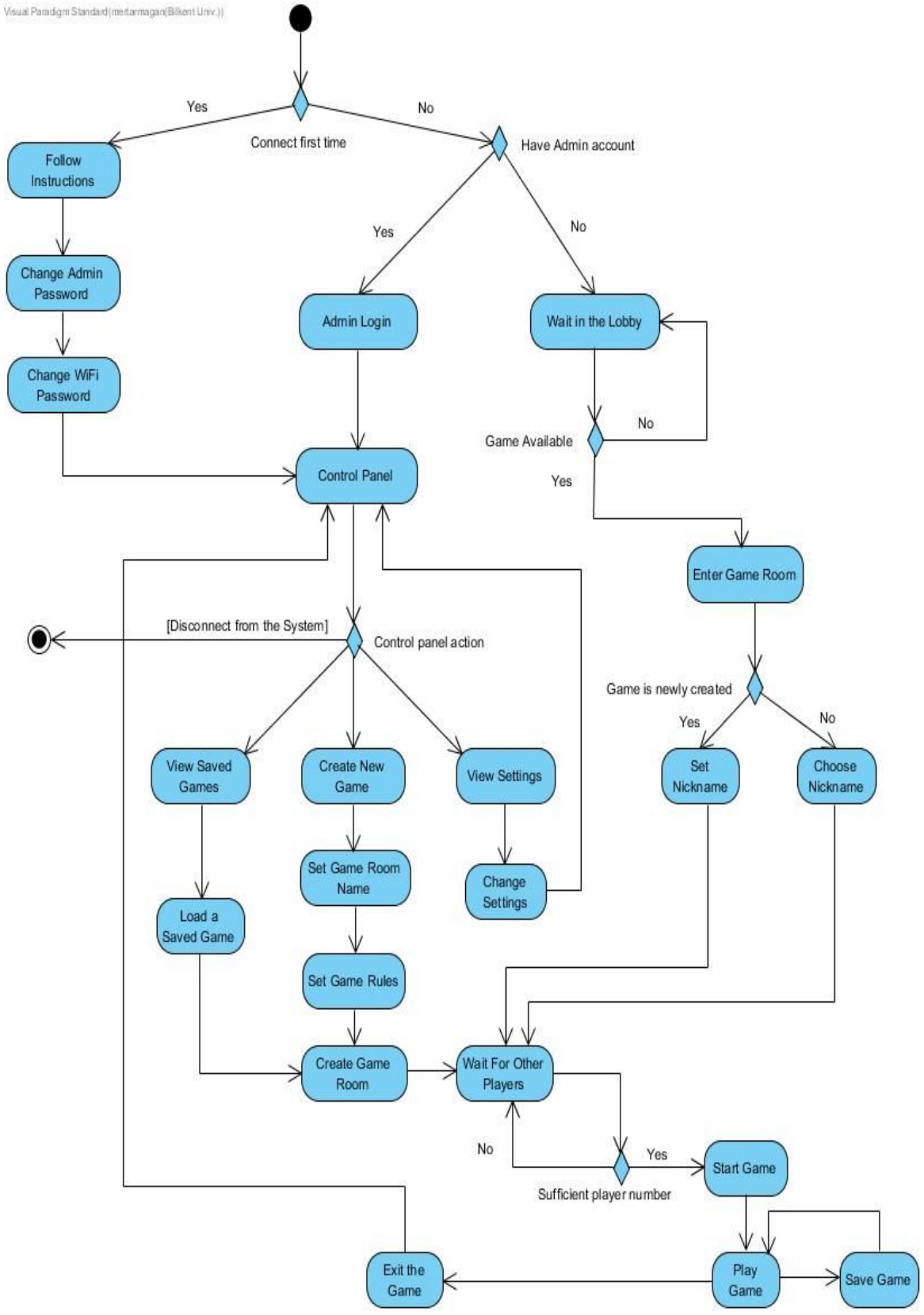
Scenario: Owner Joe power up Pandora then find Pandora WiFi in his cell phone. He uses the password he determined to connect Pandora and his cell phone. Pandora direct Owner Joe to login screen. Owner Joe is the admin of the box therefore he choose Admin Login. Pandora asks his password for admin login. Owner Joe enters the password. System checks for admin - password match and after confirmation Owner Joe login as Admin.

Game Start/Game Failure Sequence Diagram



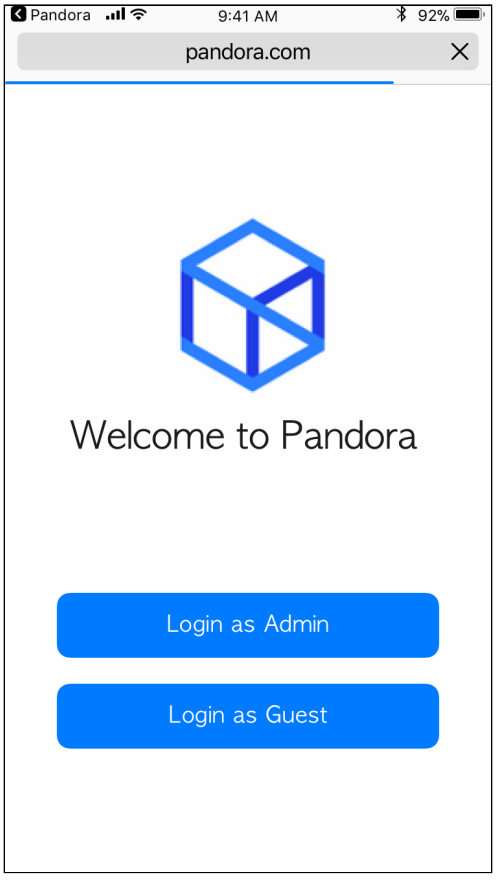
Scenario: In this diagram, Admin Joe starts the game and directed to Lobby View. User Sam joins the room and directed to the Lobby View. Game is ready if there is enough player and Object returns successful, if not lobby closed, Object fails.

2.5.4.2. Activity Diagram



2.5.5. User Interface

2.5.5.1 Login Screen

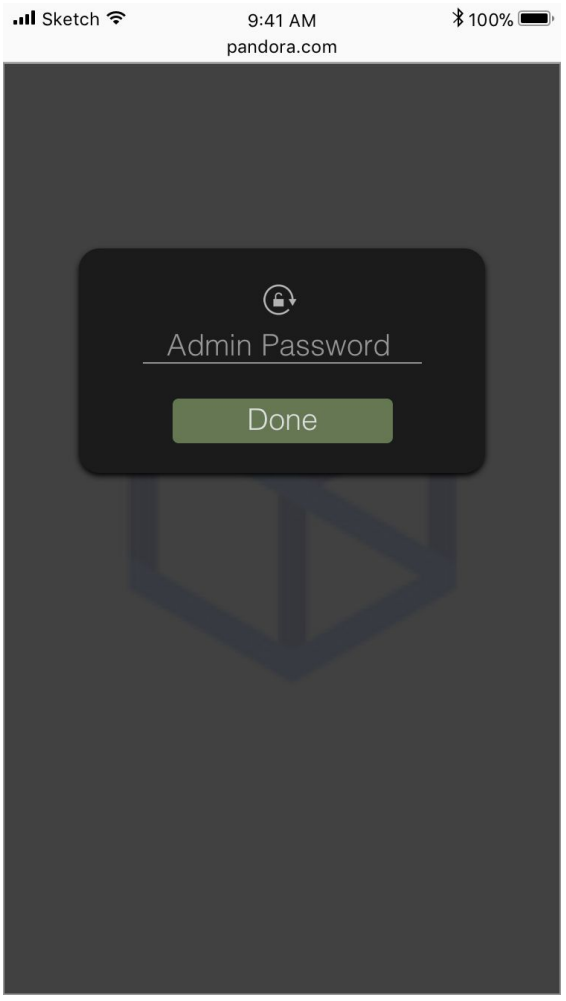


Screen 1

The welcome screen is the first screen that a user sees after connecting to the Pandora's WiFi. The system redirects user to the welcome screen by its captive portal. There are two options for the user. User can either "login as admin" or "login as guest".

1. Login as admin shows the prompt shown in Screen 2.
2. Login as guest redirects user to the game room selection in Screen 4.

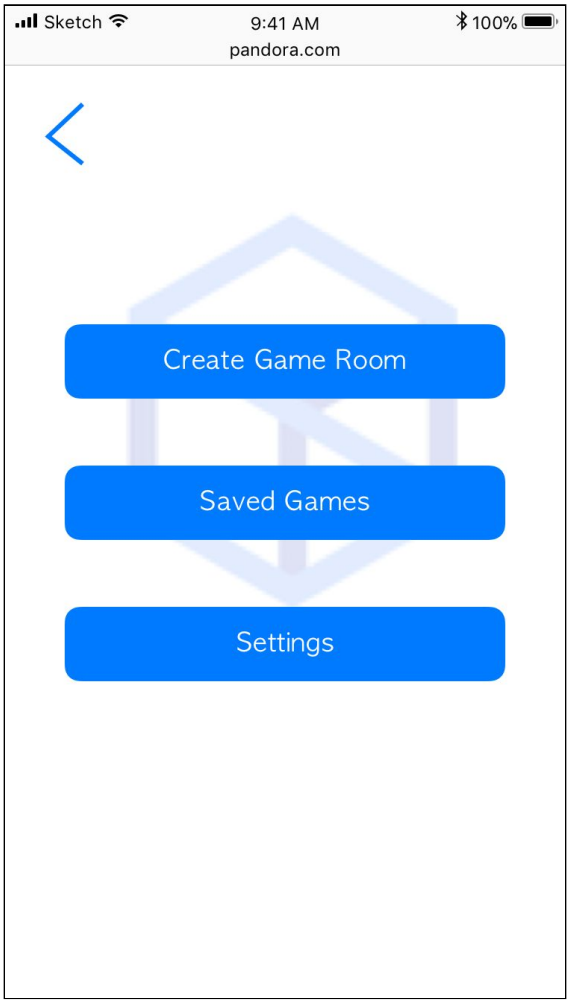
2.5.5.2 Admin Login



Screen 2

If user selects “login as admin”, a prompt pops up for user to enter his/her admin password. To close the prompt user simply touches anywhere except the prompt on the screen. After typing the password user can click to the done button.

Successful login redirects user to the Screen 3.



2.5.5.3 Admin Control Panel

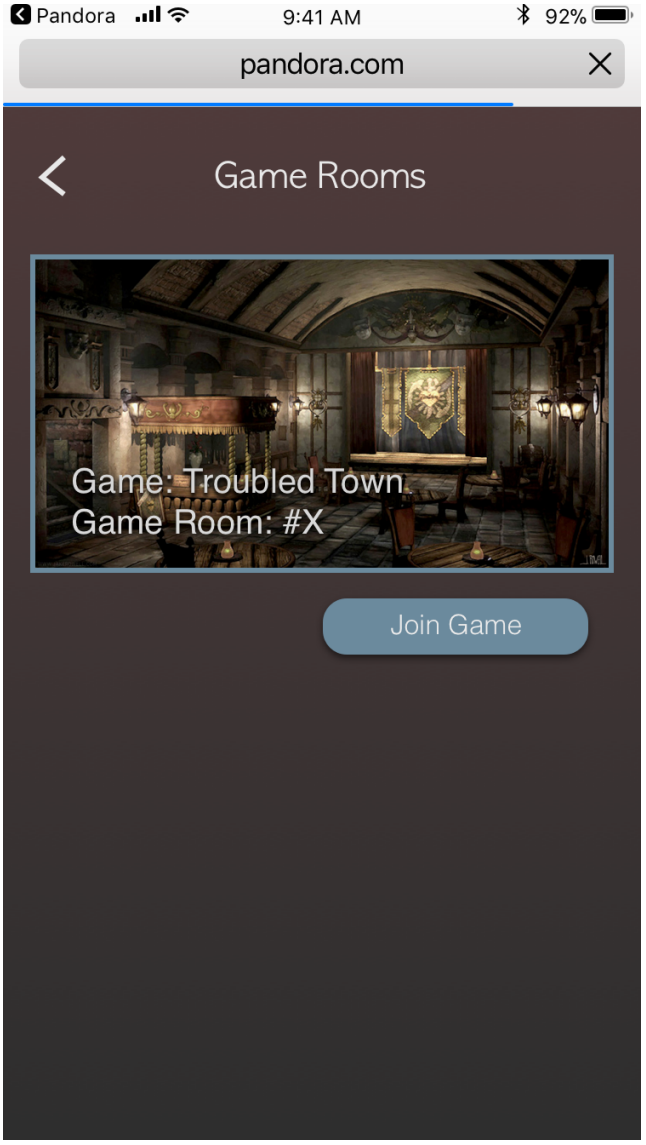
Screen 3

Admin is redirected to the control panel screen after the successful login. In this screen admin can choose to:

1. Create a game room (Screen 8)
2. See previously saved games (Screen 9)
3. Go to the settings menu

Admin can go back to the login screen by pressing the arrow on the top left corner.

2.5.5.4 Game Room Selection Screen / Join Game

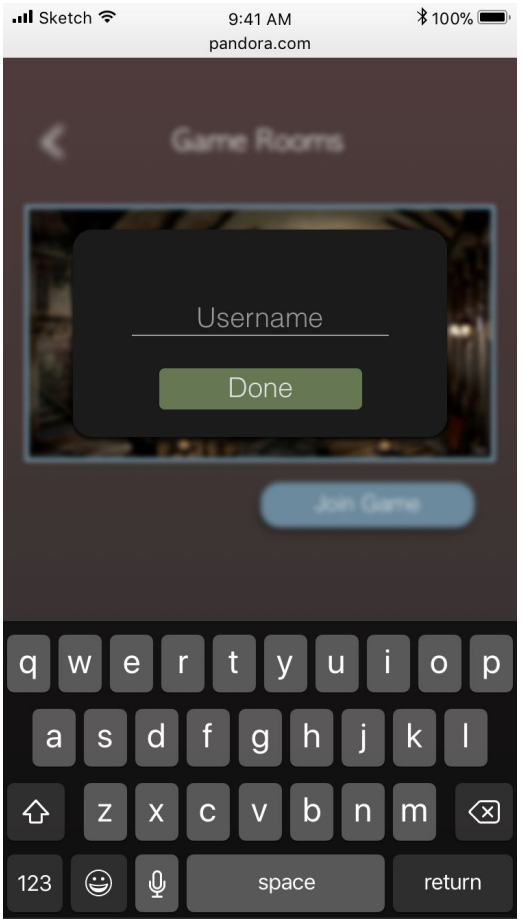


Screen 4

User is redirected to the game room selection screen after logging in as guest. In this screen user can see the active game room details such as name of the game and the name of the game room.

User can join the game lobby by join game button (See Screen 5).

2.5.5.5 Join Game / Username Prompt

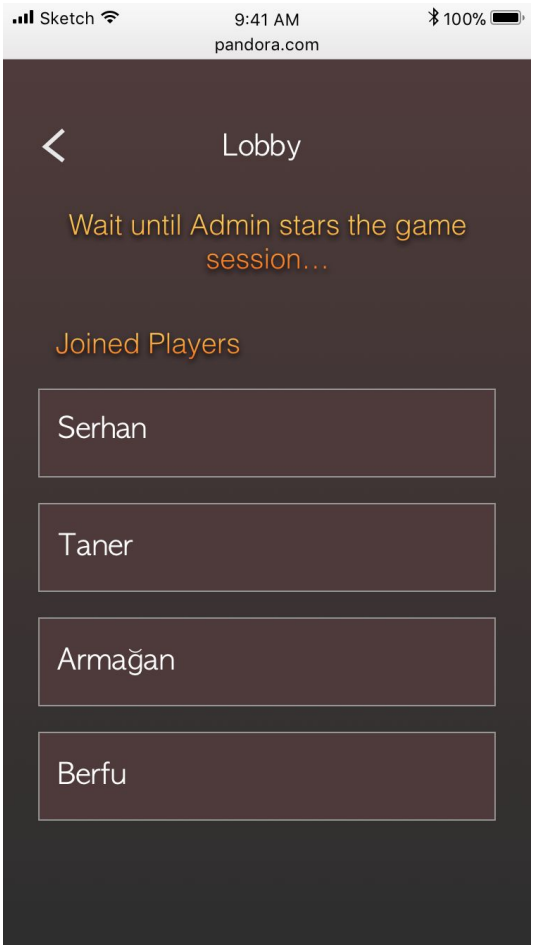


Screen 5

After clicking the join game button for the game room, a prompt is shown for user to types his/her nickname for the specific game. Usernames are not persistent and related to a game session. Users are asked to select a username (might be same or different) for each game. For loaded games, users select a username from the list rather than typing and play as the selected character.

Clicking “done” button takes user to the game lobby (See screen 6).

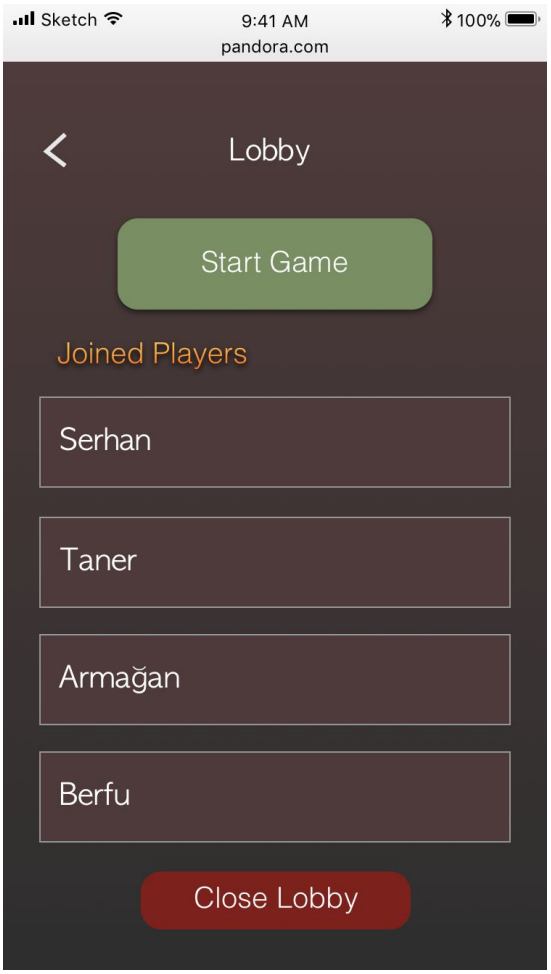
2.5.5.6 Lobby Screen / Normal User Perspective



Screen 6

In lobby, players (except from admin) waits for other players to join and admin to start the game session.

2.5.5.7 Lobby Screen / Admin Perspective



Screen 7

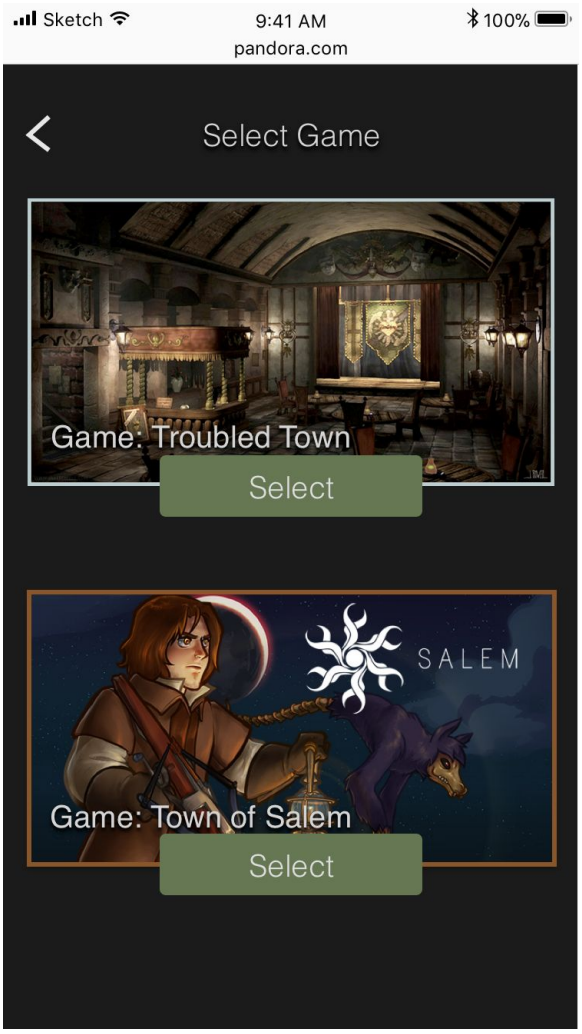
Admin can see connected players in the lobby.

The “Start Game” button appears after required amount of players joined to the game (Number of required players might be different for each game).

After “Start Game” button appears, admin can choose to start the game or wait until everyone is connected.

Admin can close the lobby and go to game creation screen (Screen 8) by “Close Lobby” button. All connected players are redirected to the game room selection screen (Screen 5) if the lobby is closed.

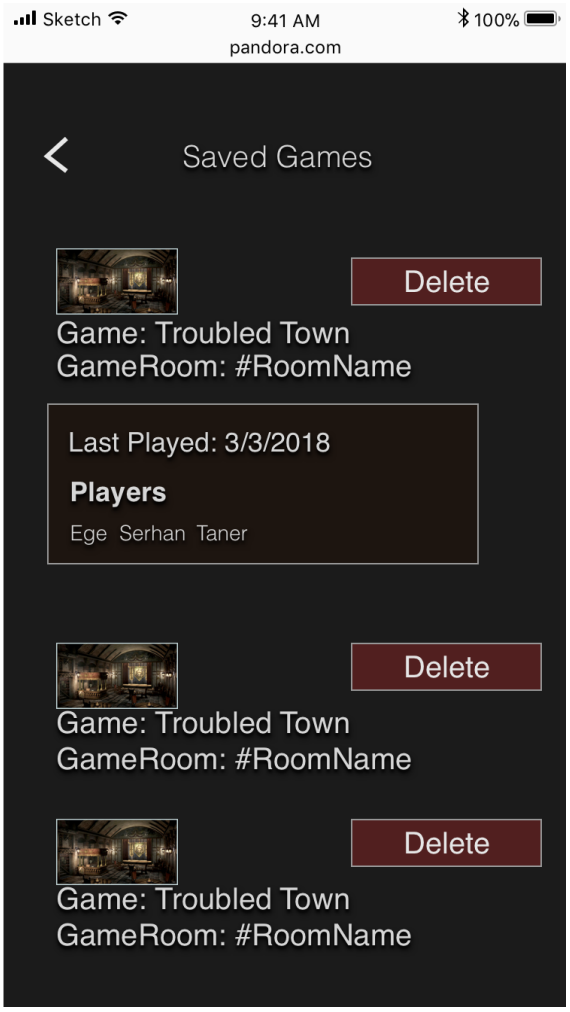
2.5.5.8 Create Game Screen



Screen 8

Admin can choose a game to create from the create game screen. After selecting a game and go over creation steps the game room will appear in the game room screen (Screen 4) for other players to join.

2.5.5.9 See Existing Games / Saved Games Screen

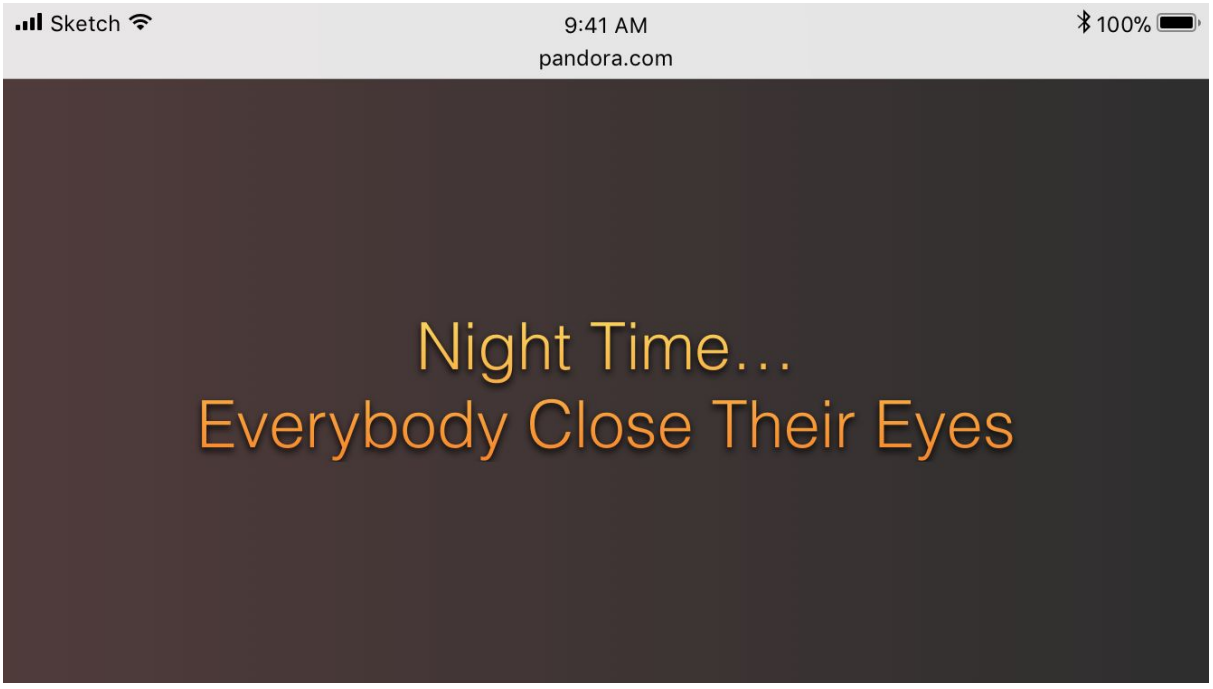


Screen 9

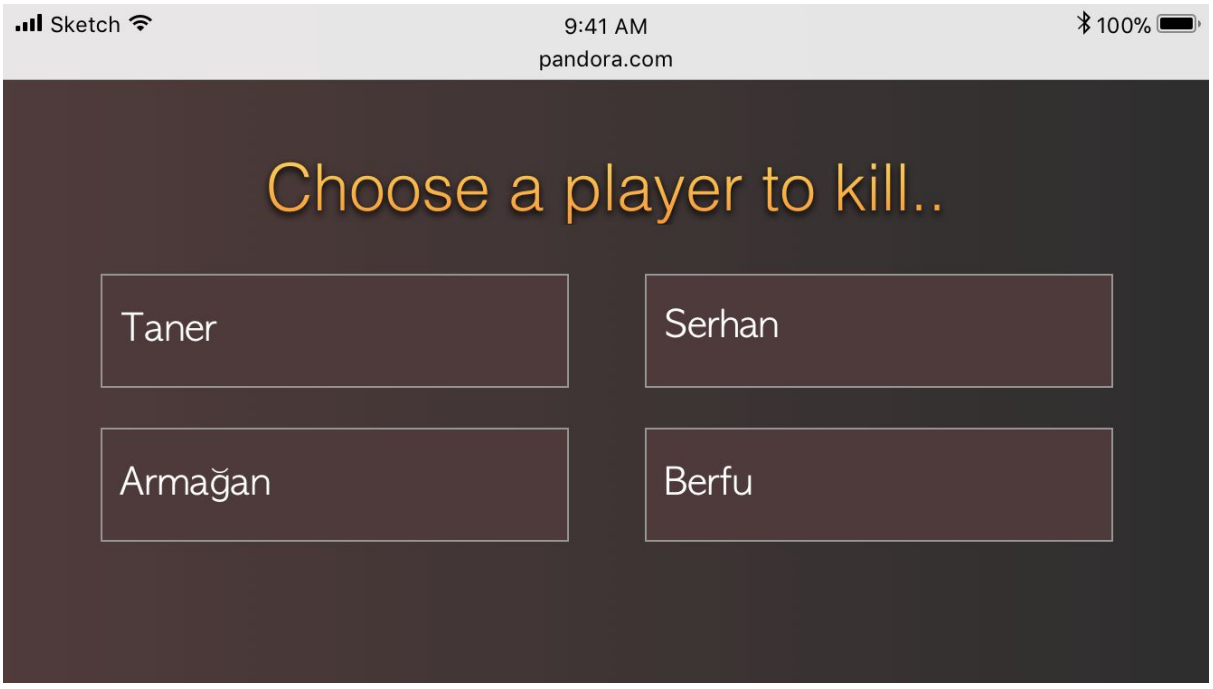
Admin can see the saved games and their details from the saved games screen.
Admin can see last played date and players of a save game by clicking on it.
Admin can delete a save game by clicking the “Delete” button of a save game.

2.5.5.10 Gameplay Example

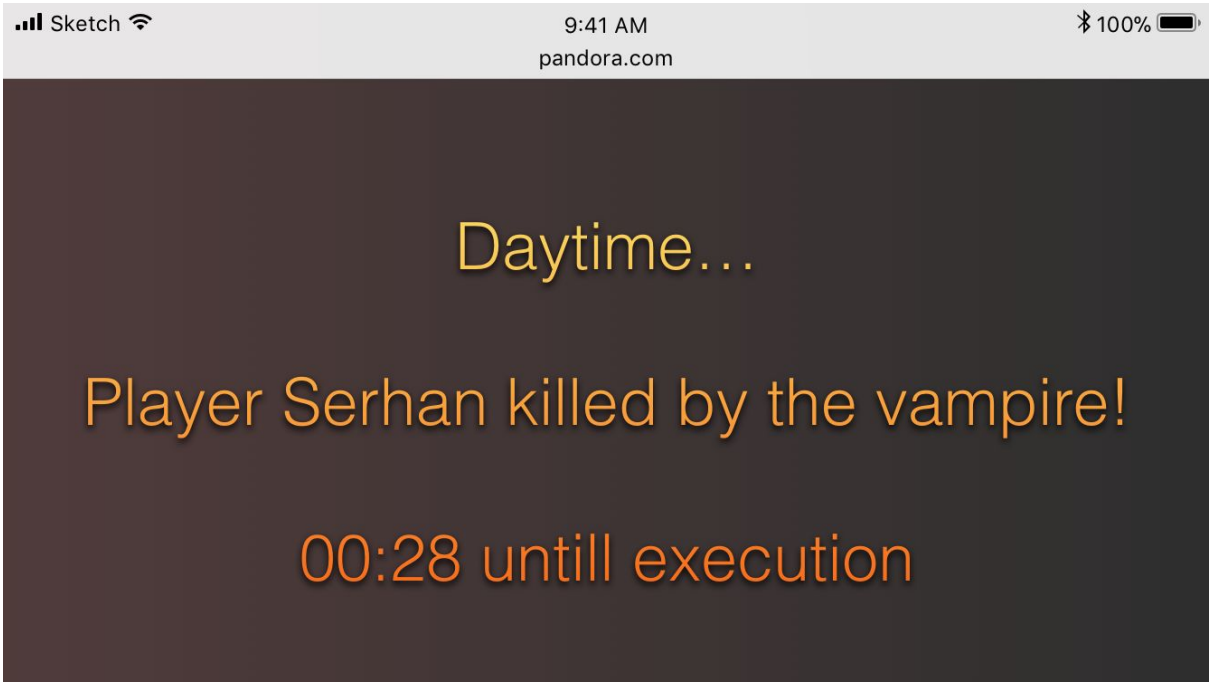
An example of a gameplay can be seen in the following screens. The mobile phones are used only for tracking the game and perform actions. However, the most of the gameplay depends on the human interaction. Pandora is designed to emphasize the human interaction rather than isolating the person.



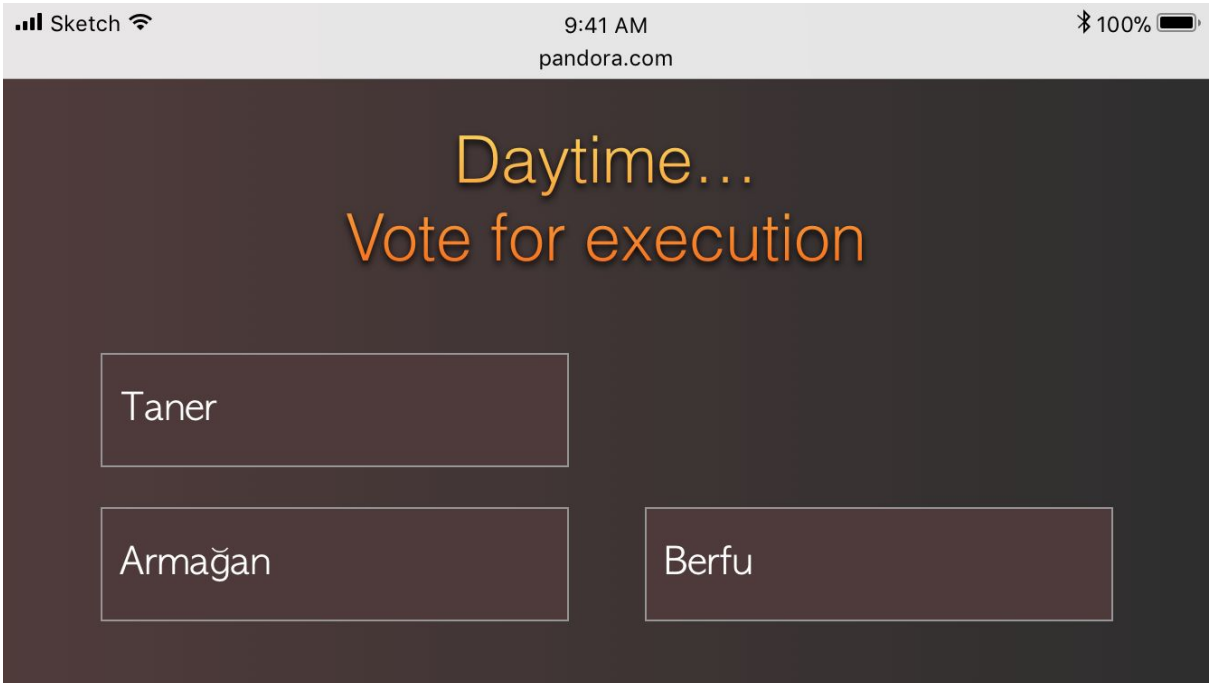
Screen 10



Screen 11



Screen 12



Screen 13

4. References

[1]K. Pretz, "Medical Experts Say Addiction to Technology Is a Growing Concern", *The Institute*, 2016.[Online].Available: http://theinstitute.ieee.org/ieee-roundup/blogs/blog/medical-experts-say-addiction-to-technology-is-a-growing-concern. [Accessed: 04- Nov- 2017].

[2]"Secret Hitler the Game", *Secrethitler.com*, 2017. [Online]. Available: http://secrethitler.com/assets/Secret_Hitler_Rules.pdf. [Accessed: 10- Nov- 2017].

[3]"How to Play", *Werewolf*, 2017. [Online]. Available: https://www.playwerewolf.co/rules/. [Accessed: 01- Nov- 2017].