CS 319 - Object-Oriented Software Engineering

Analysis Report

Ping the Risk

GROUP-3J

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1. Introduction

Ping the Risk is based on the original RISK Table Game but it is not like the RISK you know! We are living in the Cyber Era. Even the governments rely on the internet to operate but what if the internet becomes a tool that causes conquest by enemies.

Ping the Risk is a turn based multiplayer cyberwarfare simulator which will be played on desktop. The hackers of the different countries attack the other countries to conquer. Depending on the roll of the dice, a player will either defeat the enemy or be defeated. Players need to defeat all the hackers in one territory to conquer that territory and become the conqueror of the world. Apart from RISK in Ping the Risk players can attack any region on the map regardless of the distance. However, it is riskier for players to attack distant regions because of the higher levels of ping. If a player captures at least one territory, the player will earn one random card that will be used to get more hackers to be used to reach the purpose of global conquest. Whoever willing to risk it all will take over the world!

2. Overview

“Ping the Risk” is simply a strategy game for 2 to 8 people. The main purpose in the game is to take control of the web on the whole world by hacking different countries. To win the game, the most important thing for the players is to understand the other players’ playing styles from the past turns and to make his/her movements after thinking carefully about the coming attack possibilities. The player who successfully combines these two things and benefits from them is most probably the winner of the game. The game consists of four basic elements namely “map”, “hackers”, “cards” and “the battle system”.

2.1. Map, Areas and Provinces

The map of the game is the real world map. The map consists of seven different continents. There are 40 countries located on different places on the

map. There are lakes, seas and oceans in the map. There is no functional purpose behind them, they are just for the view.

2.2. Hackers

The second basic element of the game is “hackers”. For a player, the more hackers means the bigger rate for the chance to successfully hack the enemies’ countries. All players are given 5 hackers at the beginning of each turn. Other than this, the only way to hire new hackers is using the cards which are given after a successful hacking.

2.3. Cards

Sometimes, after a successful hack attack, players may gain a card as a gift. The player who gained a card can either use a single card or wait for the new cards to combine them to hire a multiplied number of hackers. To explain in detail, if a player has only one card and wants to use this card for the next turn, the card is considered as 3 hackers, and in the next turn the player is given 3 additional hackers to 5 hackers given every turn. If this player waits and wins another card and uses these two cards together, then each card is worth 3.5 hackers and in the next turn, he/she receives 7 additional hackers. If the player does not use these two cards and combines them with the third card, then each card corresponds to 4 hackers and in the next turn, the player gets 12 additional hackers.

Here the most important point for a player is the emergency for a hacker in the countries which will be chosen as attacker by player. The player should evaluate this situation in a logical way.

2.4. Battle System

For every player, the war consists of 3 respective stages. These stages are “HIRE”, “HACK” and “FORTIFY”, respectively.

2.4.1. Hire Stage

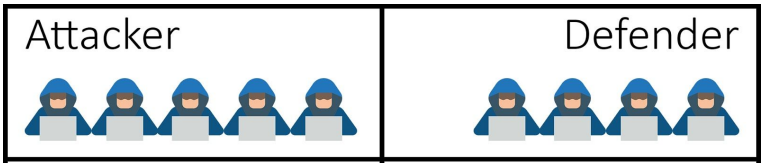
In this stage, by considering the locations and the possibilities of his/her countries to be a target, the player can hire the 5 hackers that are given at the beginning of every turn in any country he/she has. In this way, if there is a high probability that one of the countries owned by the player will be defeated in a possible attack, the player is given the right to strengthen this country even more. Likewise, if the player wants to attack one of the enemy countries and take control of the whole web of that country, he/she will recruit more hackers in the country to be used for the attack, increasing the possibility that the attacker country can capture the opponent country.

2.4.2. Hack Stage

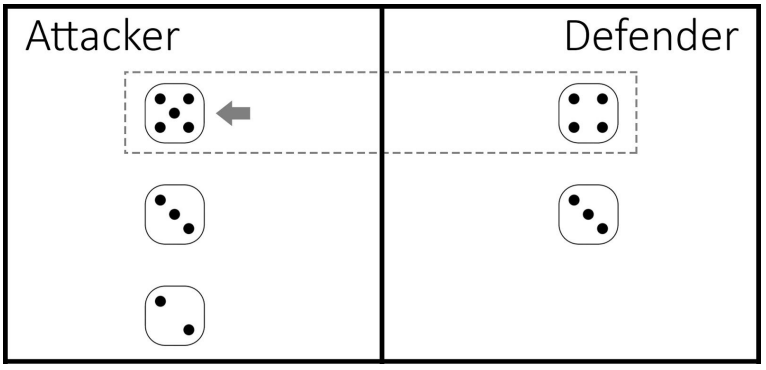
In this stage, the player chooses one of her/his own countries as the base and one of the rival countries as the target. Later, the player launches an attack on the target country from the country he/she has chosen as the base. The outcome of the attack depends on the dice which are thrown according to the number of hackers of two countries. The attack can be done with a maximum of 3 hackers. At the same time, at least one hacker must remain idle in the attacking country. For example, if there are 3 hackers in the attacking country, the attack can be done with a maximum of 2 hackers. Regardless of the number of soldiers in the defence country, it can defend with a maximum of 2 hackers. The attacking country throws as many dice as the number of hackers used in the attack. The defending country throws dice as much as the number of hackers it uses in defence(maximum 2). The two highest dice rolled are compared. At the end of this comparison, if the number on the dice of the attacker is higher than the number on the dice of the defender, then the defender loses 1 hacker and vice versa. If two numbers are equal to each other, then this is in favour of the defender and the attacker loses 1 hacker. The country whose hackers are run out first is the loser of this war.

With an example scenario, the situation can be explained better.

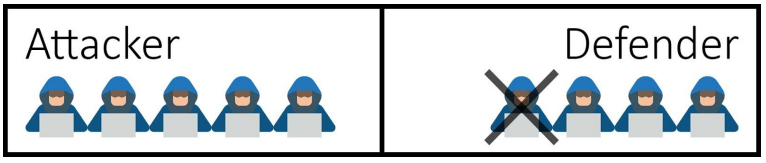
- Let's say there are 5 hackers of the attacker and 4 of the defender.



- The attacker starts hacking with 3 hackers and so rolls 3 dice. The defender rolls 2 dice. The biggest numbers on the dice of each side are compared one by one and the result is in favour of the attacker.

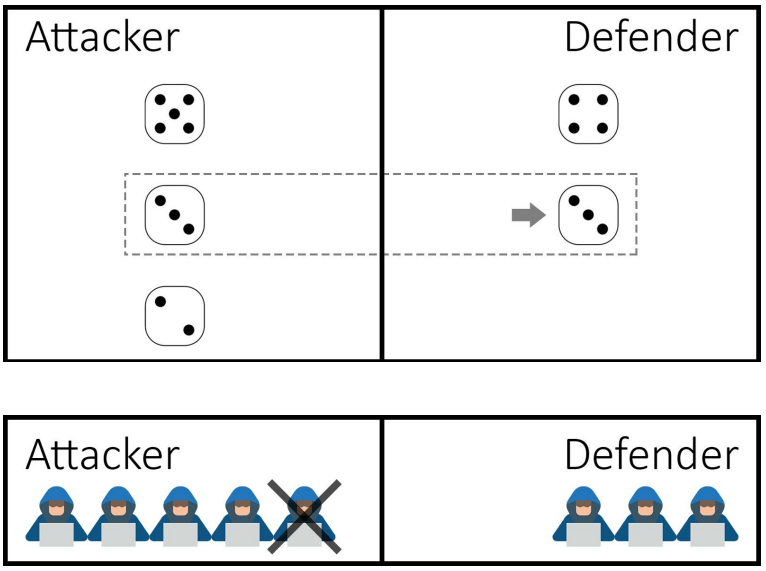


- Thus, the defender loses 1 hacker and there 3 hackers left.

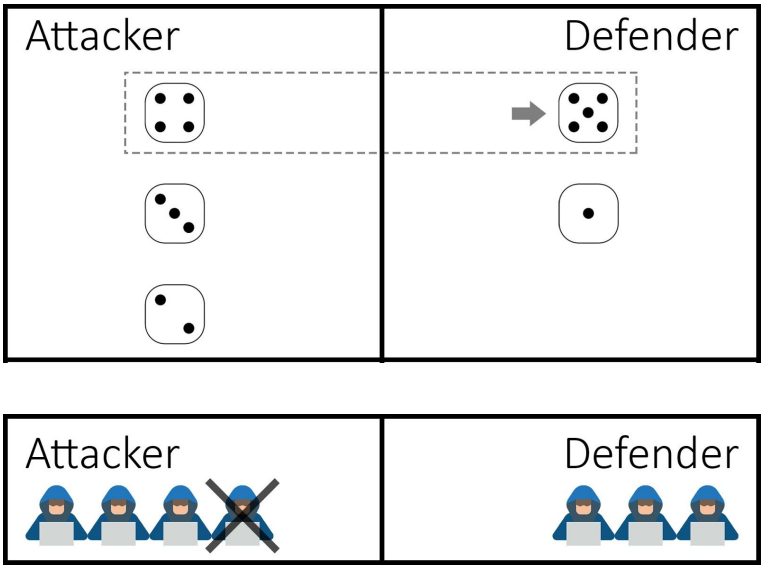


- The second biggest dice are also compared and they are equal to each other. Since the equality is considered as an advantage for the defender side, the attacker loses 1

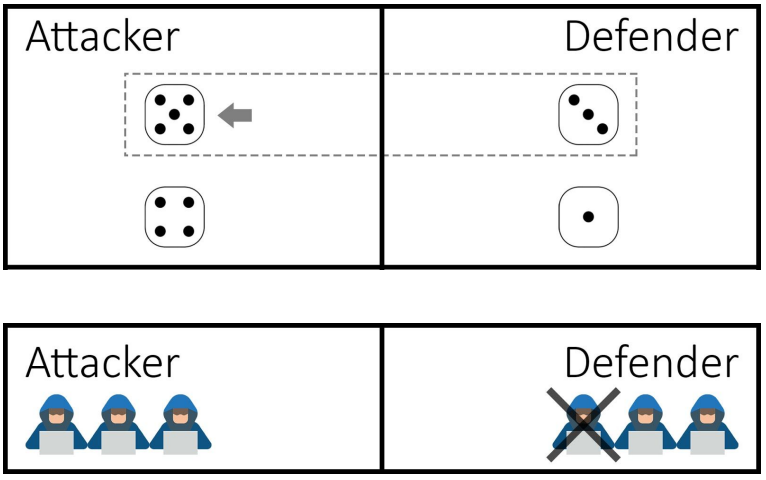
hacker and there are 4 hackers left.



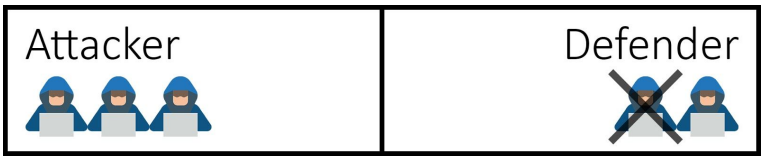
- Again, the attacker and defender roll 3 and 2 dice respectively. This time, the number of the dice of the defender is bigger and so the attacker loses one more hacker. Now he/she will continue hacking with only 3 hackers.



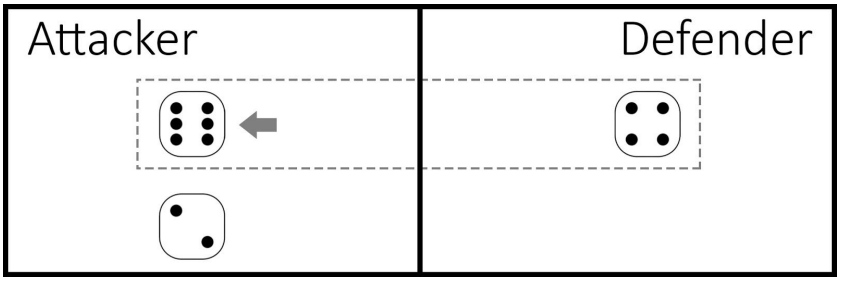
- From now on, the attacker can roll only 2 dice and continue hacking with only 2 hackers because at least one hacker has to be kept out of the war in order to ensure that even if all attacker hackers are lost, the country is not lost.
- In the next rolling stage, both sides are rolled 2 dice. The number on the attacker's highest dice is greater than the number on the defender's highest dice. Now, there are 3 hackers left for attacker and 2 for defender.



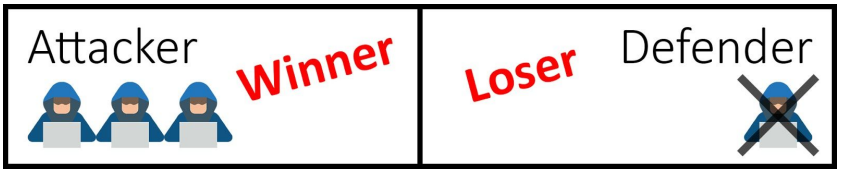
- The second biggest dice are also compared and the attacker's number is greater than the defender's number, again. Thus, there is only one hacker left for the defender.



- From now on, the defender cannot roll 2 dice because there is only 1 hacker left and if the player loses this hacker, then the country will be lost.
- In the next rolling stage, the attacker rolls 2 dice and defender rolls 1 dice. Attacker's dice is greater than the defender's dice, so the defender loses his/her last hacker.



- In this scenario, the winner is the attacker.



2.4.3. Fortify Stage

In this stage, by considering the locations and the possibilities of being attacked by his/her countries, the player can move the hackers from one country to another. In this way, there are more or less hackers in the countries according to their importance order. This stage gives a chance to the player to share all hackers to countries in a more efficient and logical way.

2.5. Gameplay

At the beginning of this multiplayer game, players will be given randomly selected regions by game, which are close to or distant from each other. After that, starting from the first player, all players will have 3 parts in their turn; hire, hack, and fortify respectively.

The player will gain cards and extra hackers after gaining full control of a continent so the player should prevent any other player gaining a region in that continent.

If a player loses all the regions they own, they will be defeated and knocked out from the game. The last standing player who controls the whole map wins the game.

3. Functional Requirements

3.1. Entrance

After the game starts running, the player will be welcomed with an entrance screen. In this screen; the player can choose to start a new game, change the settings of the game, see the credits and learn how to play the game using the buttons provided. All of these functions should be simple and useful enough to make the game user friendly.

3.2. Online Gameplay

Ping the Risk offers the players to create or connect to an online lobby which can be joined by other online players using a password provided by the game. After using the password and joining the game, the game will be started when the lobby has enough players and the host presses “Start”. The game data will be kept and processed in an online server and Amazon Web Services it will be updated.

3.3. Private Game

Since the game is online the players will be able to join a game using a password. This password will be shared with the host and enable the host to make the game secure by sharing the password with the players that he/she wants which will make the game experience private for the players.

3.4. Risk Gameplay Mechanics

Ping the Risk is a hacker themed adaptation from the original “Risk” board game. Therefore mechanics like rolling a dice, conquering a region, fortifying a region and using cards which are from the original “Risk” also exist in Ping the Risk.

3.5. Adjust Sound And Display Settings

The player can change the sound and display of the game according to their preferences by pressing the options menu and choosing the desired setting.

3.6. How To Play

In order for the player to understand and learn the game, he/she can select the “How To Play” option. This option will teach the basics of this style

of risk game and teach the player how to win the game while introducing what the player can and can not do.

3.7. Leave The Game

When the player wants to exit the game he/she can click “Exit Game” to leave the game and return to the game menu.

3.8. Time Constraint

For hire, hack and fortify stages of the gameplay added a timer that forces the player to finish before the time constraint. After the time finishes the game moves to the next stage.

3.9. Additional Requirements

Added online, private game requirements and time constraints to the report . Changed titles from UI to more understandable and descriptive names. Added Risk Gameplay Mechanics as a title to explain the changed or unchanged implementation of game mechanics from the original Risk board game.

4. Non-Functional Requirements

4.1. Extendibility

The implementation of the game will consider an extendible design. The new features can be added without adjusting so much code of the game by using an object oriented design concept and design patterns.

4.2. Maintainability

The game will be maintainable in coding to ensure that contributors can understand and contribute without having difficulty to know the idea of designing and implementing. Also comments will inform the contributor about the necessary parts of the code.

4.3. Usability

The game's interface will be user friendly by ensuring that the design is simple and easy to understand throughout the gameplay. The names, sound effects and visual effects will be coherent with the real life metaphors like "HELP", "QUIT", etc. Also, the adjustability of the sound and the panel size will create more comfortable and personalised game experience. The buttons like "HELP", "SETTINGS", "QUIT" could be pressed anytime during gameplay.

4.4. Reliability

The object oriented system that will be used while programming will make the program more accurate and direct while writing so that the code will be more reliable. To test the robustness of the system lots of tests with different conditions will be considered.

4.5. Performance

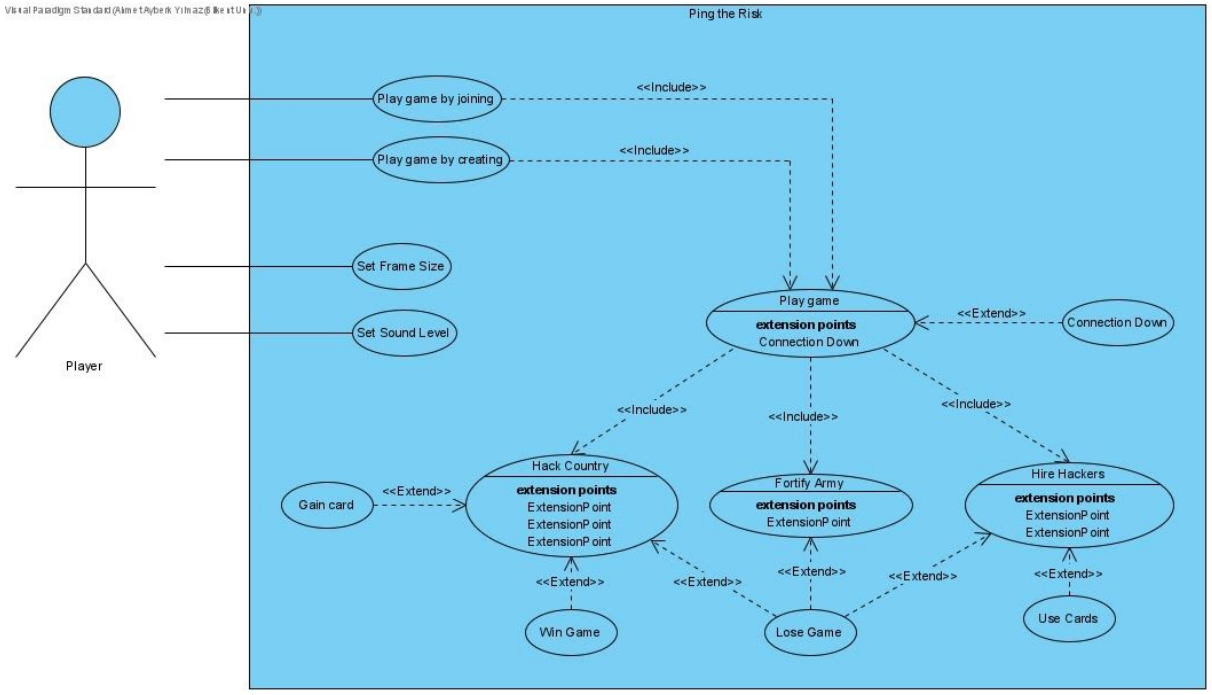
To increase the gaming quality, the extra components like sounds, visuals, etc. will be operated not to decrease the speed. The system requirements will consider better and faster gameplay by keeping the response time less than a second to ensure that they are compatible with computers that have different system requirements. The aim is running the game with 30 FPS at least while using action driven GUI for hacking, hiring and fortifying parts.

5. Pseudo Requirements

- This Game will be implemented in java.
- Some of the graphic objects will be designed using Adobe® Photoshop 2020.

6. System Models

6.1. Use Case Model



6.1.1. Use Case 1: Play Game by Joining

Actors: One player that creates the lobby, one or more joined player

Entry condition: Player has opened the game.

Exit condition: One player beats all of the other players.

Main Flow:

1. Game opens.
2. Player selects the “New Game”.

3. Player selects the “Join Game”.
4. Player enters the “Game ID”.
5. Player joins the game lobby.
6. Host of the lobby starts the game.
7. Players try to conquer all the regions on the map.
8. A player conquers all the area on the map.
9. Game finishes.

Alternative Flow:

1. One of the joined players chooses to exit the game.
2. Territories of that player marked as neutral.
3. Flow continues from the 7th step.

6.1.2. Use Case 2: Play Game by Creating

Actors: One player that creates the lobby, one or more joined player

Entry condition: Player has opened the game.

Exit condition:

- One player beats all of the other players.
- Host of the lobby exits the game.

Main Flow:

1. Game opens.
2. Player clicks the ‘New Game’ button.
3. Player clicks the ‘Create Game’ button.
4. Player creates the game lobby.
5. Other players join the game lobby.
6. Host of the lobby starts the game.
7. Players try to conquer all the regions on the map.
8. A player conquers all the area on the map.
9. Game finishes.

Alternative Flow:

1. Host of the lobby exits the game.
2. Game finishes.

6.1.3. Use Case 3: Set frame size

Actors: One of the players

Entry condition: Game has already opened.

Exit condition: Player clicks the ‘Exit Options’ button.

Main Flow:

1. One of the players clicks the ‘Options’ button.
2. ‘Options’ screen opens.

3. Player selects the frame size.
4. Player clicks the ‘Save Changes’ button.
5. Player clicks the ‘Exit Options’ button.

6.1.4. Use Case 4: Set sound level

Actors: One of the players

Entry condition: Game has already opened.

Exit condition: Player clicks the ‘Exit Options’ button.

Main Flow:

1. One of the players clicks the ‘Options’ button.
2. ‘Options’ screen opens.
3. Player sets the sound level.
4. Player clicks the ‘Save Changes’ button.
5. Player clicks the ‘Exit Options’ button.

6.1.5. Use Case 5: How to play

Actors: One of the players

Entry condition: Game has already opened.

Exit condition: Player presses the ‘Exit How to Play’ button.

Main Flow:

1. One of the players clicks the ‘How to play’ button.
2. A detailed information about how to play the game opens.
3. Player reads and understands.
4. Player clicks the ‘Exit How to Play’ button.

6.1.6. Use Case 6: Credits

Actors: One of the players

Entry condition: Game has already opened.

Exit condition: Player presses the ‘Exit Credits’ button.

Main Flow:

1. One of the players clicks the ‘Credits’ button.
2. The Credits screen that displays the names of people who contributed their all while the making of this game opens.
3. Player clicks the ‘Exit Credits’ button.

6.1.7. Use Case 7: Hire

Actors: One of the players

Entry condition: Game has already started.

Exit condition: Player presses the ‘Next Phase’ button.

Main Flow:

1. It is the player's turn.
2. Player selects a country of his or her own.
3. Player chooses a hacker number to hire.
4. Player presses the OK button and hires the hackers.

Alternative Flow 1:

1. Player give up on hiring hackers in selected country.
2. Player presses a non-country field of the screen.
3. Flow continues from the 2nd step.

Alternative Flow 2:

1. Player uses his or her cards.
2. Players hacker number increased.
3. Flow continues from 2nd step.

6.1.8. Use Case 8: Hack

Actors: One of the players

Entry condition: Game has already started.

Exit condition: Player presses the ‘Next Phase’ button.

Main Flow:

1. It is the player's turn.
2. Player selects a country of his or her own.
3. Player selects a target country for hacking that is not his or her own.
4. Player chooses a hacker number to hack.
5. Player presses the OK button and starts hacking.
6. Player gets the country if wins the hacking or does not gets the country if loses the hacking.
7. Flow continues from the 2nd step.

Alternative Flow:

1. Player give up on hacking the selected country.
2. Player presses a non-country field of the screen.
3. Flow continues from 2nd step.

6.1.9. Use Case 9: Fortify

Actors: One of the players

Entry condition: Game has already started.

Exit condition: Player presses the ‘Next Phase’ button.

Main Flow:

1. It is the player's turn.
2. Player selects a country of his or her own.
3. Player selects a target country of his or her own for fortifying hackers from the base country.
4. Player chooses a hacker number to fortify.
5. Player presses the OK button and sends hackers.
6. Flow continues from the 2nd step.

Alternative Flow:

1. Player give up on fortifying the selected country.
2. Player presses a non-country field of the screen.
3. Flow continues from 2nd step.

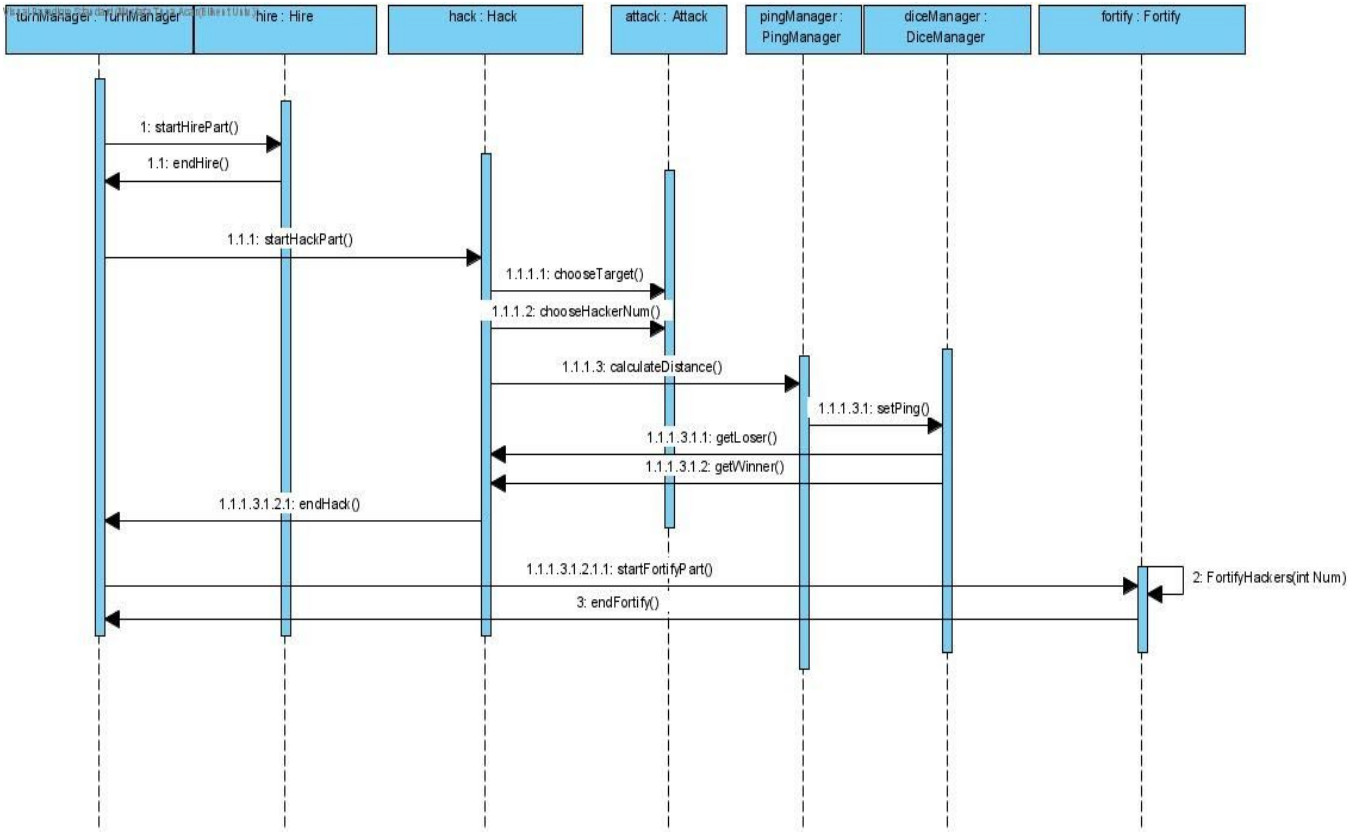
6.2. Dynamic Models

6.2.1. Sequence Diagrams

6.2.1.1. Sequence Diagram Scenario

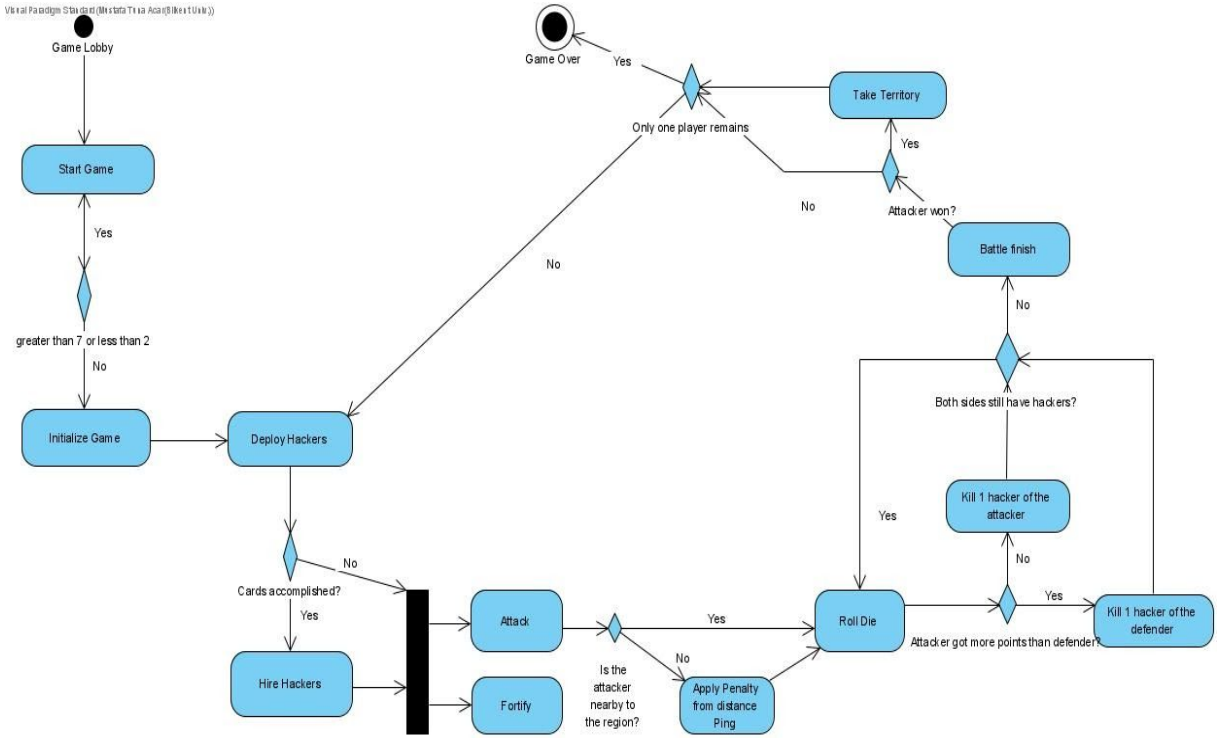
This scenario depicts which methods, classes and objects to be used during a single turn of gameplay. The player starts the hiring part but does not hire since he/she does not have any cards. Then the hacking part starts and the player chooses a target and hacker numbers to attack with. After that

the game calculates the ping with the distance between the attacking and defending countries and the dice starts with a penalty for the attacker because of the distance ping. After the winner and loser is calculated and the player chooses to end the hacking part because he/she lost. After the hacking part, the fortify part starts and the player chooses a country to fortify and finishes the fortify part.

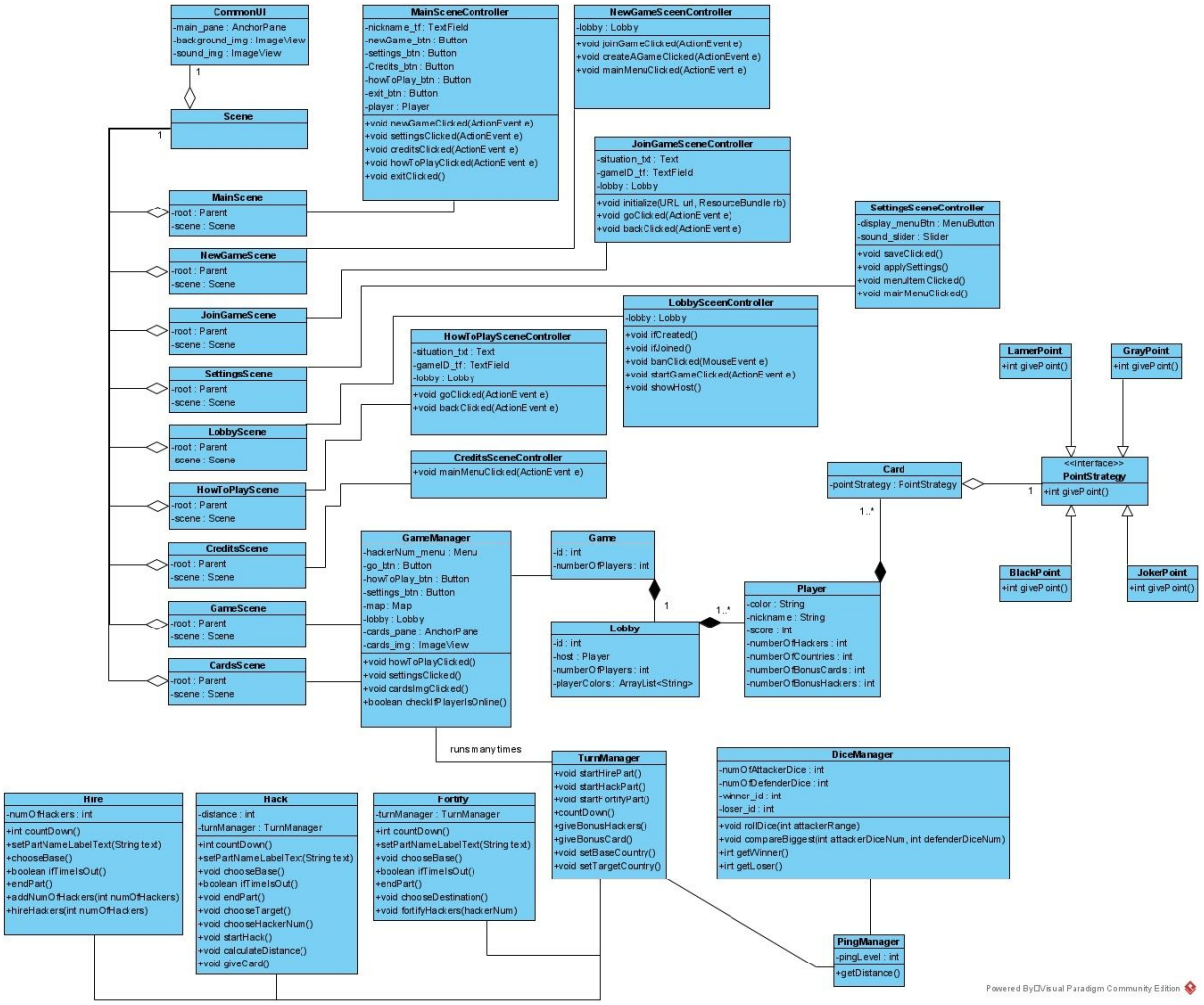


6.2.2. Activity Diagram

This activity diagram explains how the gameplay mechanics work with each other and how the ending game condition is reached.



6.3. Object and class model



6.3.1. Main Menu:

Above, on the left, there is the main menu. The game starts with the main menu, and from the menu user can view the settings, how to play, and credit parts. Also, a user can create a lobby or join a lobby from the main menu.

6.3.2. Settings:

In the settings the user can change sound and the panel size. Then the user can save the options to maintain the changes. Users can go back to the main menu anytime.

6.3.3. How to Play:

In the how to play the user can read the descriptions about how to play the game. Users can go back to the main menu anytime.

6.3.4. Credits

In the how to play the user can read the credits. Users can go back to the main menu anytime.

6.3.5. Lobby

In the lobby the user can adjust the number of players, and can access credits, settings, and how to play. Users can start the game from the lobby.

After the lobby, users start the game, and the gameplay part starts. There are the components of the map, the map itself, and players. Then, the gameplay starts with phases.

6.3.6. Phase

There are 3 different Phases named: Hire, Movement and Execution. In the Hire Phase, hackers are put on different owned places on the map. In the Movement Phase, there are two parts named fortify and hack. Both parts have their own interface. Finally, in the Execution Phase, there are no interfaces but there are Order child classes FortifyOrder and HackOrder that orders the parts that are given in the movement part. HackOrder uses Hacking System to decide the province taking results, and simulate them.

6.3.7. Hacking System

The hacking system is based on the hacker and anti hacker. hacker is the attacker (hacker) side and the anti hacker is defender (anti hacker) side. They both have their advantages based on their numbers. When the both sides' values as a whole are calculated and compared a dice based result system gives the result.

6.4. User interface - navigational paths and screen mock-ups

When the game is opened by the player, the first screen he/she will see is shown in figure 1.

Figure 1: Initial Scene

As it can be seen, there is a box at the top in which the name of the game is written. Below it, there is another box for entering a nickname and some other buttons for other menus like creating a new game, viewing settings, viewing credits, viewing how to play or exiting from the game.

When the “New Game” option is clicked in figure 1, then the screen will be as figure 1.1.

Figure 1.1: New Game Scene

From this screen a new game (new lobby) can be created or an already existing lobby will be joined.

When the “Join a Game” option is clicked in figure 1.1, then the screen will be as figure 1.1.1.

Figure 1.1.1: Joining a Game Scene

The game id will be entered on that spot next to the “GAME ID”. According to the id’s accuracy, the user will enter an existing lobby.

After the Game Id is entered and pressed the “enter” button (for all players) , the user will go to the specified lobby (Figure 1.1.2).

Figure 1.1.2: Lobby Scene

Figure 1.1.3 shows an instant in which player “Denizhan” is in the hack stage.

Figure 1.1.3: In-game Hack Phase

When the “Settings” option is clicked in figure 1, then the screen will be as figure 1.2.

Figure 1.2: Settings Scene

In the setting, display screen size and the audio level can be adjusted.

When the “Credits” option is clicked in figure 1, then the screen will be as figure 1.3.

Figure 1.3: Credits Scene

Credits can be read by the user on that screen.

When the “How to Play” option is clicked in figure 1, then the screen will be as figure 1.4.

Figure 1.4: How to Play Scene

The description of how to play the game can be read by the user on that screen.

7. Improvement Summary

The “Help”, “Settings”, and ”Out” buttons are added during the gameplay for making a more user-friendly game environment. A specified FPS goal is added for game actions.

Use case model updated with a more accurate one. It is now more comprehensible and includes the gameplay related use cases. Also added gameplay related use cases.

Sequence use case model was updated with the currently used methods and classes. It shows the gameplay stages like Hire, Hack and Fortify rather than the UI elements in the previous iteration. Activity diagram was updated with more detail.