Multiplayer Snake

Software Engineering 1 & Intro to Java

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prepared for
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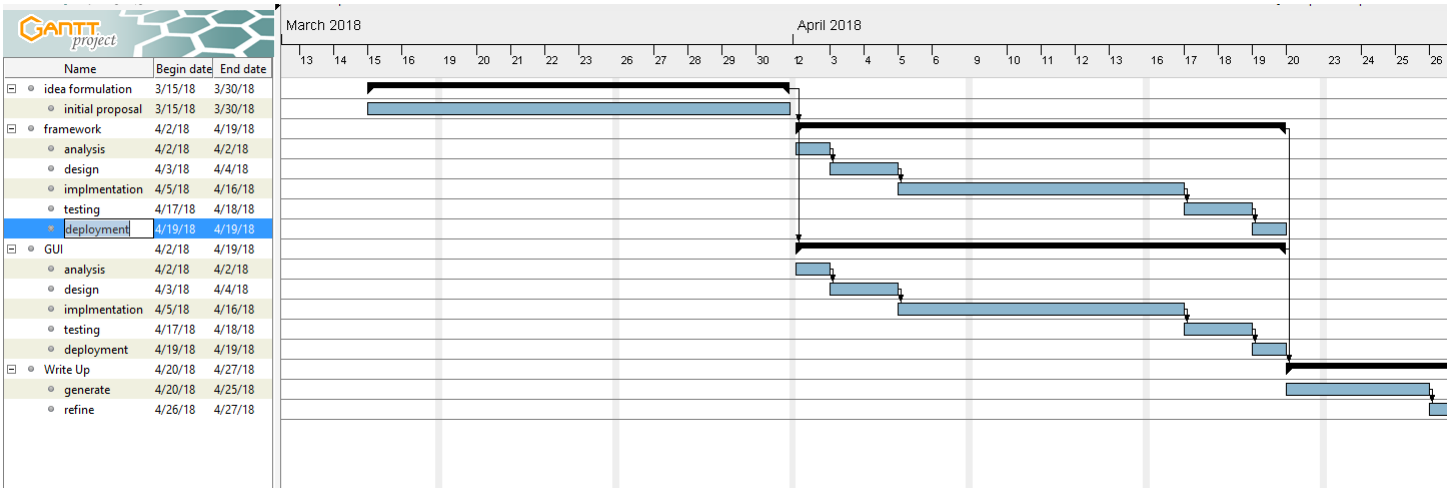
1 Outline

This game implements a 2 player version of the popular game Snake. Communication between the host and client is done using TCP. Players can pick up power ups and kill the other player to increase their score. The player scores are saved in an XML file.

2 Vision Statement

The next step in this game will be making it so that more than 2 players can play at the same time. A further iteration of the software will have a dedicated Snake server that can run multiple games with more than 2 players concurrently.

3 Gantt



4 Requirements

1. Game should run on any machine that supports Java.
2. Game should play smoothly.
3. Users should be able to view game score history.
4. Game should have a GUI.
5. Game should have a scoring system.
6. Snakes should be able to increase in length.
7. Users should be able to win/lose.
8. Users should be able to play on separate computers over the internet.
9. Users should be able to play again without restarting game.

5 Business Rules

1. Client must know the ip address of the server.
2. Each game must have two players.
3. High scores are remembered.

6 All Roles

1. Primary (Local) User - The user acting as the host for the game
2. Secondary User - The user joining the hosted game

7 Use Cases

7.1 Use Case 1

Name: UC1 – Initialize Game
Primary Actor: Local user
Secondary Actor: Secondary user
Trigger: Game is created
command.SnakeRunner Success Scenario

1 Primary and secondary users both want to play the game.
2 Network connection is established to secondary player.
3 Snakes and Tokens are generated with random locations.
4 Screen is created.
5 Game is now ready to be played.

Alternate Scenarios

1a There is no secondary player to play with the primary player.
    1 System will wait until another player connects or user closes the application.
2a network connection fails to establish.
    1 System will inform the user and then terminate.
3a There is a collision where random locations are identical or very close to each other.
    1 Snake and Token Locations will be recalculated.
    2 This process will be repeated until all positions are distinct and valid.

7.2 Use Case 2

Name: UC2 – Play Game
Primary Actor: Local user
Secondary Actor: Secondary user
Pre-condition: Game is created
command.SnakeRunner Success Scenario

1 Primary user makes and sends move.
2 Primary user receives secondary users move.
3 Each snake is replotted with the new position as the head.

Alternate Scenarios

a Connection to other player is lost.
    1 System will notify player and terminate.
3a Player is dead after move.
    1 Defeat screen is displayed.
    2 Both players choose to play again and play resumes.

3b Secondary player is dead after move.

1 Victory screen is displayed.
2 Both players may choose to play again.

3ab.2a Player chooses to not play again.

1 High scores are updated.
2 Game terminates.

3ab.2b Player 2 chooses to not play again.

1 High scores are updated.
2 Game terminates.

7.3 Use Case 3

Name: UC3 – Play Again
Primary Actor: Local user
Secondary Actor: Secondary user
Pre-condition: Game over
Post-condition: Game is not over
command.SnakeRunner Success Scenario

1 Snakes and Tokens are generated with random locations.
2 Screen is redrawn.

Alternate Scenarios

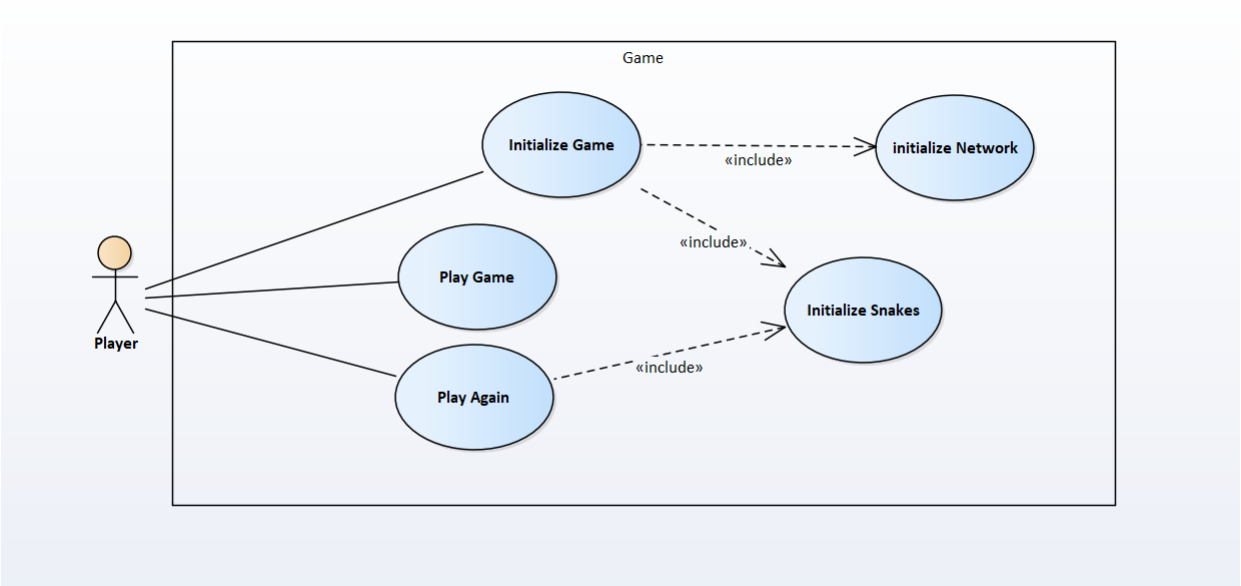
a Connection to other player is lost.

1 System will notify player and terminate.

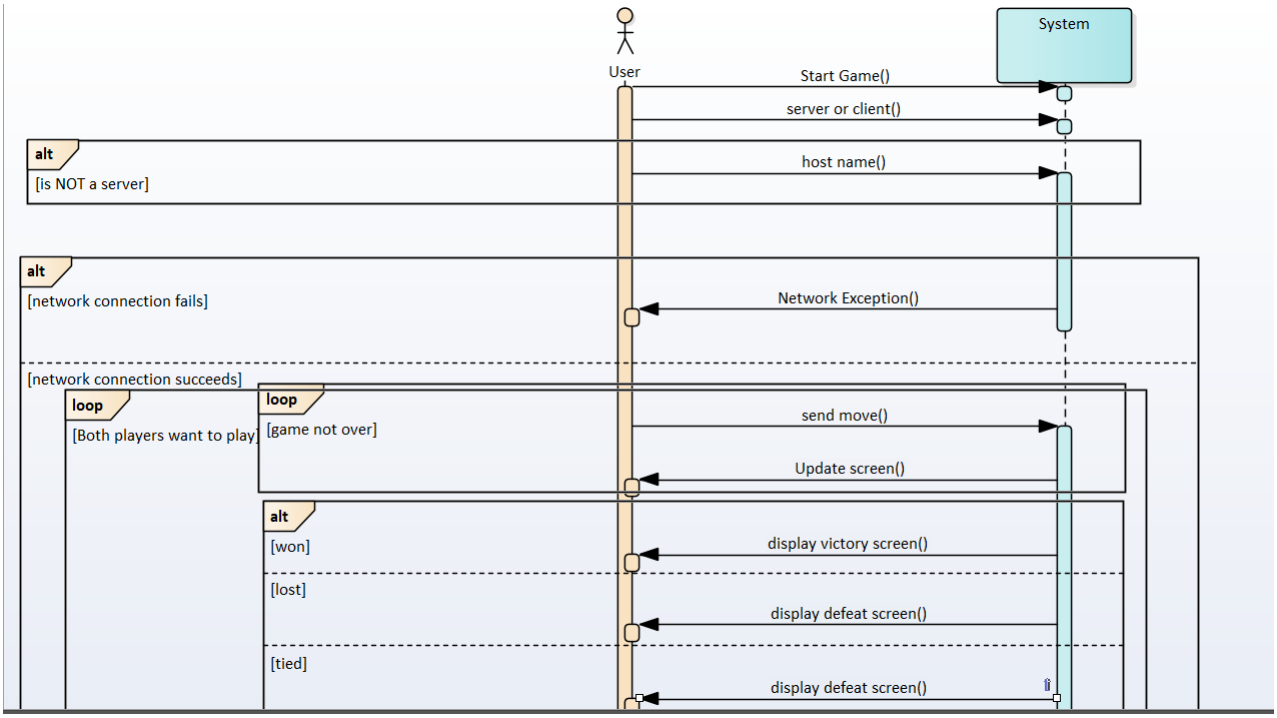
1.a Tokens and Snakes do not have independent positions.

1 System will recalculate positions.
2 This will be repeated until all positions are independent of each other.

8 Use Case Diagram



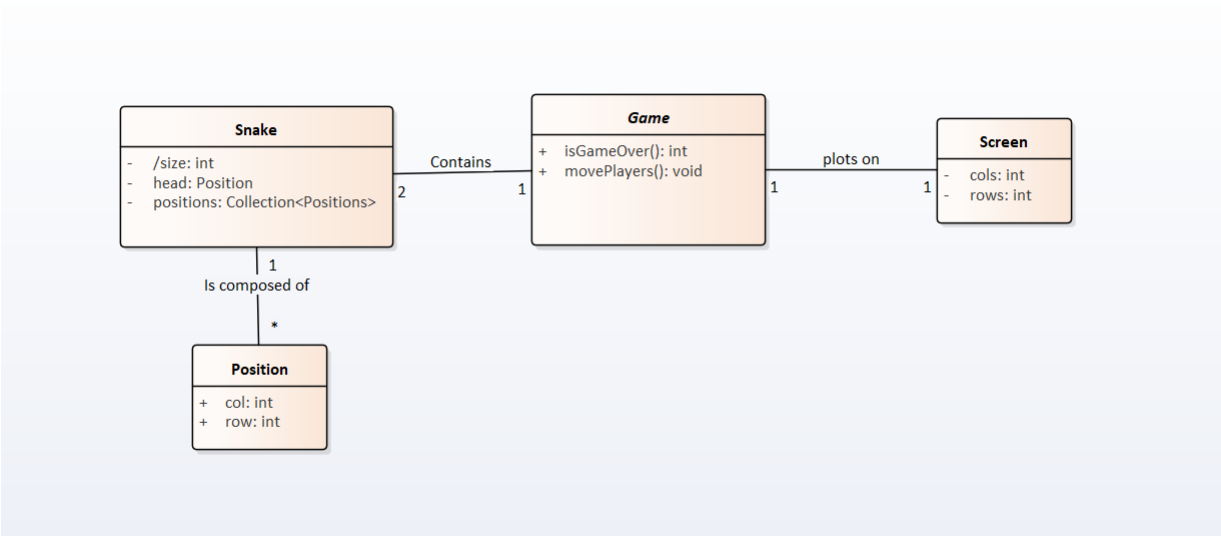
9 System Sequence Diagram



10 System Operations

1. *initGame*()
2. *serverOrClient*(*boolean mode*)
3. *sendMove*(*Direction move*)

11 Domain Model



12 Operational Contracts

12.1 Contract 1

Operation: initGame
Cross References: UC1
Pre-conditions: No instance of a Game exists
Post-conditions:

- A Game is initialized.

12.2 Contract 2

Operation: serverOrClient(boolean status)
Cross References: UC1
Pre-conditions: Game network has not been initialized previously.
Post-conditions:

- A socket has been initialized and connected to.
- If client, a connection will be made to server.
- If server, a client will be accepted.

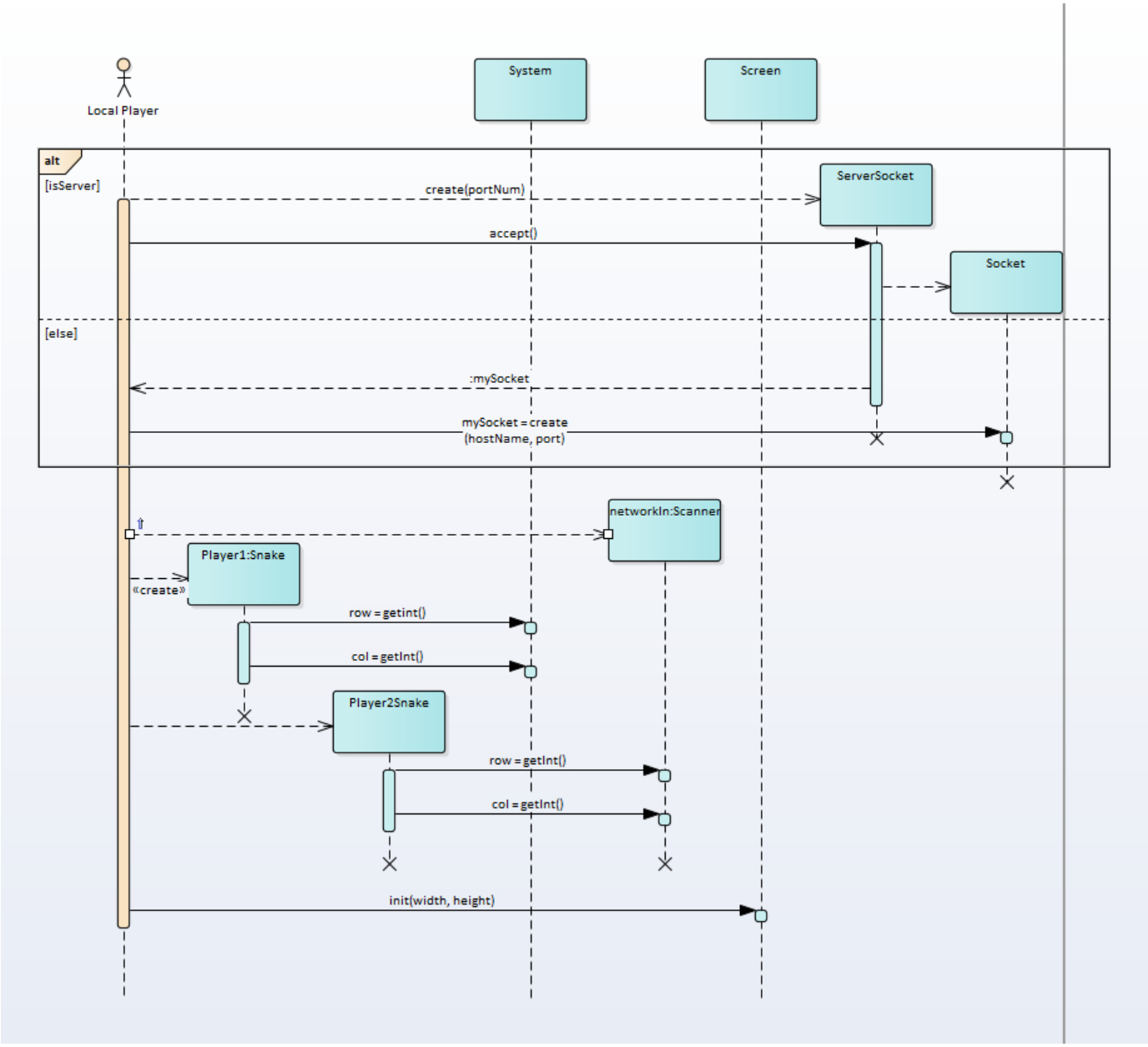
12.3 Contract 3

Operation: sendMove(Direction move)
Cross References: UC2 and UC3
Pre-conditions: Game has been initialized, and both players are still alive.
Post-conditions:

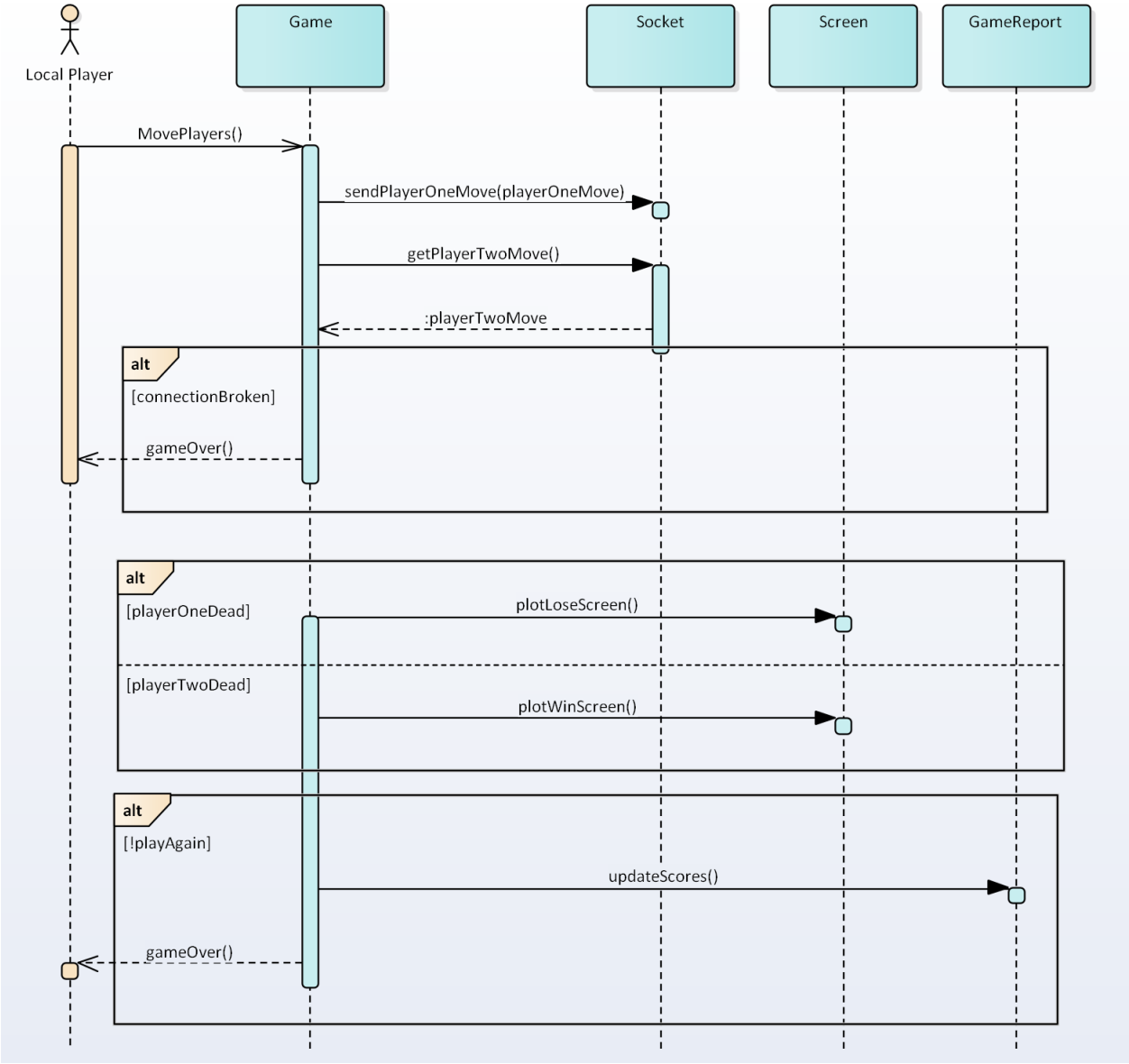
- Player one and player 2 are moved to new cells.
- If player does not make move, their last move will be repeated.
- If the received moves kill a player, that player will die. The other player will receive points.

13 Sequence Diagrams

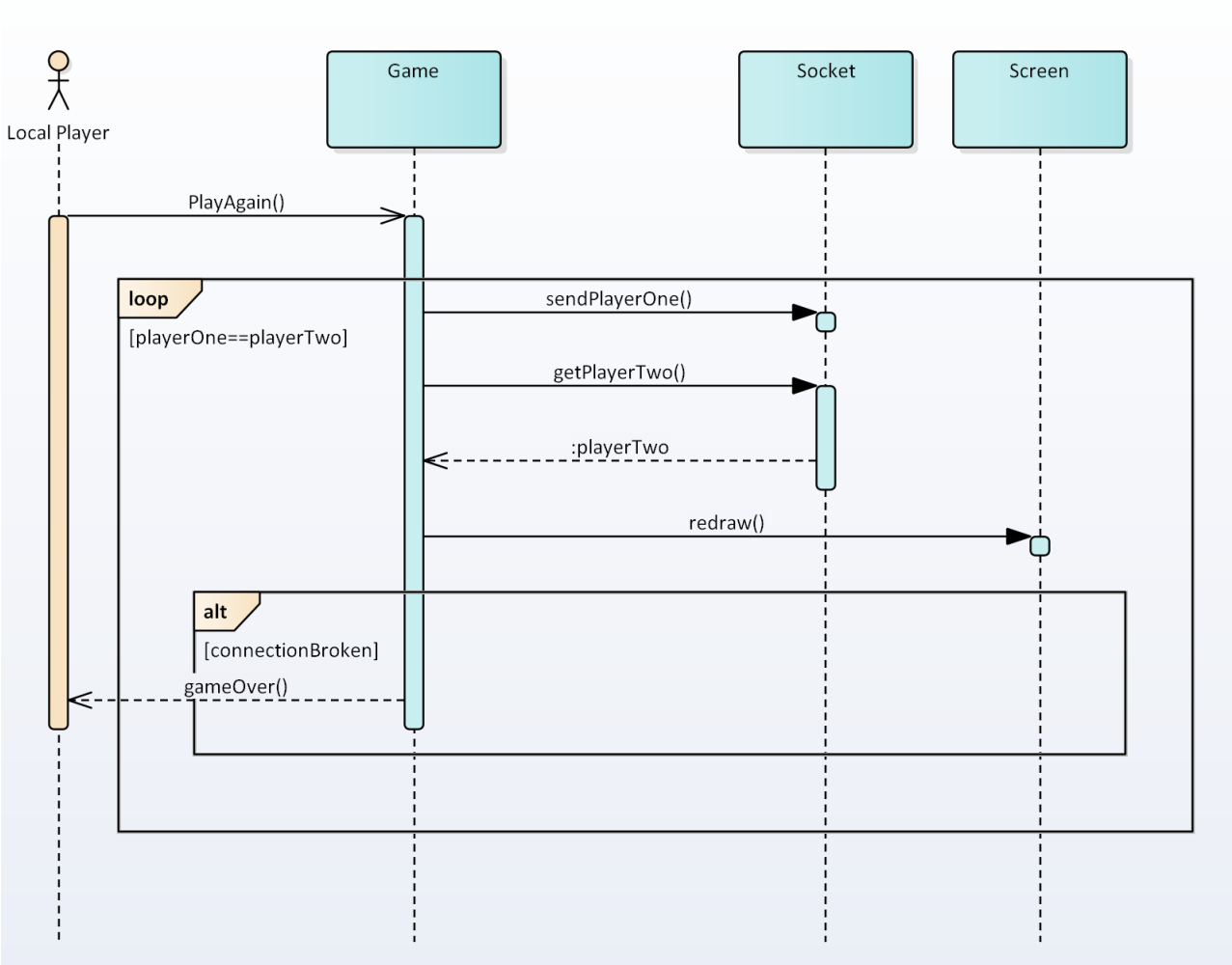
13.1 Sequence Diagram 1 : Initialize Game



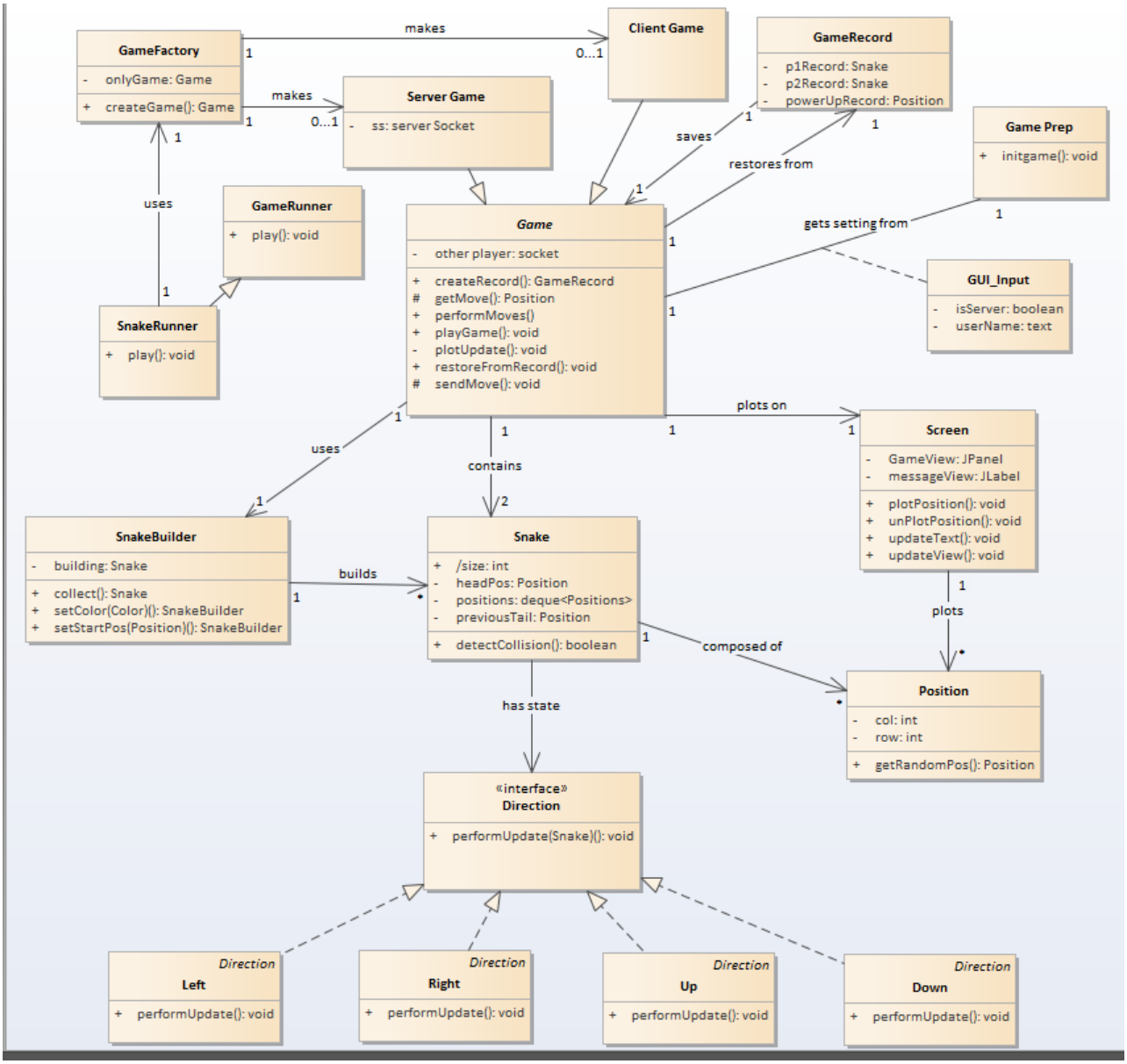
13.2 Sequence Diagram 2 : Play Game



13.3 Sequence Diagram 3 : Play Again



14 Design model



15 GRASP

1. **High Cohesion:**
   For high cohesion we focused on making sure the functions were delegated to the proper functions. For example the Game will handle all of the game logic and delegates display features, like printing to the screen, to the Screen object.

2. **Pure Fabrication:**
   An example of pure fabrication in our project is our Wrapper class which is a container around the components and is then slotted into the Screen object.

3. **Information Expert:**
   We delegated the creation of objects to the classes who know the required information. For example, the Wrapper is created by the Screen since the Screen knows what the width and height of the Wrapper need to be.

4. **Polymorphism:**
   The Game uses polymorphism for if it is a client game or a server game.

16 Design Patterns

1. **Singleton:**
   Singleton was the most used design pattern in this project. Many of the objects used lent themselves to only letting one instance exist at any time. The game screen and the game itself were both singletons.

2. **Factory method:** Factory method was used to remove the need to use new to create instances of a Snake. The Cell method also had a getRandom method that functioned much like a factory.

3. **Abstract Factory:** Abstract factory was used to create instances of a Game Object. Because there were multiple subtypes of the Game Object the abstract factory made it simpler to create an instance. Also the abstract factory allowed only one instance of any of game's subtypes to exist.

4. **Builder:** A Builder is used to create instances of a Snake. Because the snake is a complex object builder lets the application customize them. It allows Snake location and color to be both be customized.

5. **State:** State is used in the Screen to represent movement direction as determined by user keystrokes. It uses polymorphism to avoid using a switch statement in calculating the new snake position.

6. **Command:**
   Command is used to represent the Game being executed. In this project there is only class that implements the GameRunner interface but it makes it so that new games you could easily be added to the project. The Main class runs a SnakeRunner which extends the abstract class GameRunner, and starts the SnakeGame;

7. **Memento:**
   The memento design pattern is used when the players wish to restart the Game. It allows a version of the Game to be saved even though the Game is a singleton.

17 Stats

17.1 Hours Spent per User

Ian Laird: 20 hours
Andrew Walker: 23 hours

17.2 Logical Lines from Each User

Ian Laird: 574 lines
Andrew Walker: 523 lines