EECE 4520 – Software Engineering

Software Requirements Specification (SRS)
RFID Arcade

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1. Introduction

1.1 Purpose of this Document

The purpose of this document is to describe the function and performance specification requirements for an RFID Arcade, as well as to highlight the purpose of this system. This document is intended to be used by a business owner who wishes to develop their preexisting arcade into an RFID arcade.

1.2 Scope of the Development Project

The RFID Arcade is a series of machines connected with a backend that will facilitate the playing of arcade games, ticket generation, as well as prize redemption. Arcade owners will be able to view statistics of most arcade games played as well as the most popular days for each arcade game. Players will be able to "load" an RFID Arcade card using an available kiosk by exchanging currency for "Tokens," which are necessary to play arcade games. Players will be able to use their RFID card both to play arcade games and to record the number of "Tickets" they won on the backend. Additionally, players will be able to redeem their tickets for prizes, which can be selected at a "Rewards Center". Kiosks will be able to display a player's total number of tokens, tickets available for redemption, and most popular games.

1.3 Definitions, Acronyms, and Abbreviations

Term	Definition
Arcade Game	These machines can be used by players to play arcade games. They require tokens to be spent before playing, and may give tickets to the customer after a game is played, depending upon the design of the game.
Arcade Staff	Arcade staff are the people who are running the arcade as well as the people who distribute won prizes.
Backend	The backend will store all the customer IDs and associated information as well as statistics on games, which the arcade staff can view.
Customer ID	This ID will serve as the primary key for storing statistics on games won by the player, as well as total number of tickets accumulated.
Kiosk	This is a machine that players will use to put tokens on their RFID card, view statistics on games played, and view how many tickets and tokens are on their RFID card and account.
Player	A customer who will load their RFID card with tokens, play arcade games, win tickets, and redeem these tickets for prizes.
Prizes	These are the rewards players can obtain by winning enough tickets

	from arcade games. The prizes are redeemed at Reward Centers and are given to the players by the arcade staff.
Rewards Center	This is where a player can choose what prizes to get by redeeming tickets.
RFID Card	This card will store a player ID and the number of tokens that player has. Players can put on Tokens by using a Kiosk. Additionally, it is Kiosks that distribute these cards.
Tickets	These are what players win after playing an arcade game. They can be used to redeem prizes at a Rewards Center.
Tokens	These are the arcade-specific currency that is used to play arcade games

1.4 References

N/A

1.5 Overview of Document

The rest of this document contains four sections: the General Description chapter, the Specific Requirements chapter, the Other Requirements chapter, and the Appendix. The General Description chapter will describe the RFID arcade user requirements and constraints. The Specific Requirements chapter will detail the performance and functional requirements for this system. The Other Requirements chapter will elaborate on any extraneous details not covered in the Specific Requirements section.

2. General Description

This section will give a client-oriented description of the system.

2.1 User Characteristics

There are two types of people that will interact with this system: players and arcade staff. These two types of people interact with the system differently.

Players use a kiosk both to obtain an RFID card and to put tickets on their card. Additionally, players can view statistics on the most played games along with the total number of tickets tied to the card's player ID. Players spend tokens that are stored on their card to play games in the arcade in the hopes of winning tickets. Players may redeem their tickets at a Rewards Center for prizes, which the arcade staff give to the players.

The arcade staff will be able to view different statistics about the usage of the arcade on a monitor connected to the backend. This is also where they will receive updates that a customer needs to receive a prize at the Rewards Center.

2.2 Product Perspective

This system consists of five parts: the arcade games, at least one kiosk, the Rewards Center, the server backend, and the RFID cards. The arcade games, Kiosk, and Rewards Center are all connected to the backend at all times, while the RFID card would be standalone.

The RFID cards will be distributed to the players using a Kiosk. After which, the card is assigned a player ID which is stored on the card and an entry in the database is also made for that player ID. The entry in the database tracks the games a customer plays as well as keeping track of the total number of tickets a player has accumulated. A played can put tokens on the card by using the Kiosk again. In order to play an arcade game, a played must spend tokens by tapping the RFID card at the arcade game and accepting the payment of the tokens. After a player plays an arcade game, the arcade game will update the total ticket value stored under the customer's ID in the backend. At any point a player can tap their RFID card at a Kiosk to see information such as total number of tickets their account has, and the number of tokens currently on the card. Players can tap their card at the Rewards Center to view potential prizes, the ticket cost of each prize, and their current ticket balance. The Rewards Center is able to access and update all of this information on the backend.

2.3 Overview of Functional Requirements

- Kiosks should be able to distribute RFID Cards with matching played ID's in the backend
- Kiosks should be able to add tokens to RFID Cards
- Kiosks should be able to display the last played game, total number of tickets, and total number of tokens
- Arcade games should be able to decrease the number of tokens on a card
- Arcade games should be able to increase the total number of tickets a player has based upon their performance in the game
- The Rewards Center should be able to decrease the total number of tickets a player has

- The Rewards Center should be able to display available prizes with their matching ticket prices
- The Rewards Center should be able to alert a staff member that a player has redeemed tickets for a specific prize
- The staff members should be able to view statistics that the backend provides such as most played game, most popular days, and most popular games for a given date and time

2.4 Overview of Data Requirements

Only two components in the system store any information: the player's RFID card and the backend. The RFID card stores a player ID that corresponds to metrics in the backend, and locally stores the total number of tokens in the player's account. The backend has a record of each customer, their played games, the games in which they won the most tickets, the total number of tickets a player has, and which prizes the customer has purchased.

The kiosk can display information from the backend such as total number of tickets available for use. The kiosk can also read the number of tokens stored on the RFID card and display this back to the customer. A kiosk can also increase the number of tokens on an RFID card when the customer purchases them.

An arcade game can decrease the number of tokens on an RFID card, as well as increment the total number of tickets a customer has stored in their backend entry. Additionally an arcade game can display how many tokens a customer currently has on their card, and after a game will display how many tickets the player won for that game and how many total tickets they have.

A Rewards Center can display how many tickets a player has by querying the database, as well as how many tickets each available prize costs. All of this information is stored in the backend. A Rewards Center can also decrease the number of tickets a customer has in the database, once the player decides to redeem their tickets for a prize.

2.5 General Constraints, Assumptions, Dependencies, Guidelines

This system necessitates an arcade with at least one game, and is really designed to be retrofitted onto an already existing arcade. Additionally, at least one staff member is required at the arcade to distribute prizes. At least one kiosk is also required, which is stocked with at least one RFID card which can be dispensed to players. At least one Rewards Center is required for customers to choose prizes they wish to redeem accrued tickets for. Additionally, a maximum RFID card recognition time of three seconds is required at the arcade games, the kiosks, and the Rewards Center. The Rewards Center, kiosks, and arcade games need to always be connected to the backend. There needs to be at least one prize for redemption at all times. The backend needs to take less than three seconds to update a single entry.

2.6 User View of Product Use

The players will use blank white RFID Cards. They will scan these on an RFID reader for each game. Each game will have a different appearance depending on what the game is. The user will be able to use a Kiosk to check their remaining tokens and total number of tickets. For example, a user might tap their RFID card on a reader and see the following output below:

Remaining Tokens: 12
Total Tickets: 235

3. Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

When a player touches a Kiosk they should see the following options: "Dispense New RFID Card", "Add more Tokens to Card", and "Display Card Information". When the "Dispense New RFID Card" option has been selected the player will be asked to type in a player name using the touchscreen keypad. After which a new RFID card will be dispensed, with the accompanying user entry in the server backend. When the "Add more Tokens to Card" option has been selected the player will be prompted to put in money, and display the equivalent token amount. Once the player has finalized the number of tokens they want to put on their card, they are prompted again to tap the Kiosk with their card. Lastly, when the "Display Card Information" option has been selected, players are prompted to tap the Kiosk with their card. After which, player information will be displayed.

When a player touches an arcade game, they are informed of how many tokens the game costs to play. The arcade game also prompts the player to tap their card if they would like to play. If a player taps their card again, they are asked if they would like to play the game. If a player accepts they are prompted to tap their card one last time in order to decrease the number of tokens on the card. After the game is over, the game displays how many tickets they won for that game and their new ticket value as well as their new token value after the price of the game has been paid.

When a player touches a Reward Center, the Reward Center displays all available prizes and their corresponding ticket costs. If a player picks a prize the Reward Center asks if the player would like to redeem the prize. If the player accepts, the Reward Center prompts the player to tap their card in order to validate they have enough tickets on their player account, and the staff are alerted to who won which prize.

3.1.2 Hardware Interfaces

The Kiosks, arcade games, and Reward Centers will all have touch screens for interfacing with the players. The staff backend will be a more traditional software interface using a keyboard and mouse setup. Additionally, the Kiosks will have hardware for accepting and dispensing money.

3.1.3 Communication Interfaces

All machines will be connected via an ethernet cable to the server backend. Additionally, this connectivity is what allows the Rewards Center to alert the staff machines of prize winnings.

3.2 Detailed Description of Functional Requirements

3.2.1 Template for describing functional requirements

Component Name:

- *Purpose:*
- *Inputs to the Component:*
- *Processing:*
- *Outputs:*

3.2.2 Functional requirements from 2.3

- Kiosks should be able to distribute RFID Cards with matching played ID's in the backend
- Kiosks should be able to add tokens to RFID Cards
- Kiosks should be able to display last played game, total number of tickets, and total number of tokens
- Arcade games should be able to decrease the number of tokens on a card
- Arcade games should be able to update the total number of tickets a player has
- Reward Centers should be able to decrease the total number of tickets a played has
- Reward Centers should be able to display available prizes with their matching ticket prices
- Reward Centers should be able to alert staff that a player wants a specific prize
- Staff should be able to view statistics that the backend provides such as most played game, and most popular days

3.2.2.1 Functional Requirement 2.3.1

Dispense RFID Cards:

- Purpose: A kiosk should be able to give a player an RFID card with no tokens on it that is tied to an entry in the backend.
- Inputs: A player pressing the "Dispense New RFID Card" button on the kiosk. The kiosk will also ask for a player name for display purposes.
- Processing: A random player ID is generated and a new entry with this player ID and player name is created in the backend. Lastly, the card will be wiped and start with 0 Tokens.
- Outputs: A functional RFID card with a starting token balance of 0

3.2.2.2 Functional requirement 2.3.2

Add tokens to card:

- Purpose: A kiosk should be able to add tokens to an RFID card.
- Inputs: A player pressing the "Add more Tokens to Card" button, and providing a payment method with sufficient funds. The player will also define the number of tokens they wish to add to their card.
- Processing: The kiosk will determine if the provided payment method has sufficient funds for the number of tokens the player has defined. If the funds are sufficient the kiosk will add this number of tokens to the card. If paper money is input into the kiosk, the sum of which is higher than the required amount to purchase the tokens, change will be dispensed from the kiosk.
- Outputs: The output result is a player's RFID card with the total number of tokens incremented by their transaction.

3.2.2.3 Functional requirement 2.3.3

Kiosk display info:

- Purpose: A kiosk should be able to display the total number of tokens on an RFID card, the total number of tickets the player has accrued, and the number of tickets the player has won playing their last game.
- Inputs: A player tapping their card and selecting “Display Card Information”.
- Processing: The kiosk will query the backend to find ticket and game information. The kiosk is able to read the number of tokens that are stored locally on the player’s card.
- Outputs: A display screen with ticket, token, and game information for the player.

3.2.2.4 Functional requirement 2.3.4

Arcade Game Payment:

- Purpose: An arcade game should be able to decrement the number of tokens on a card by the cost of gameplay
- Inputs: A player tapping an arcade game and selecting “Yes” when the game asks if the player would like to play the game at a given token price.
- Processing: The arcade game will update the entry, categorized by player ID, in the backend stating that this player has played this game, and will decrease the number of tokens on the card.
- Outputs: The player will be allowed to play an arcade game.

3.2.2.5 Functional requirement 2.3.5

Win Tickets:

- Purpose: An arcade game should provide tickets upon completion of an arcade game
- Inputs: A player who has successfully finished an arcade game without walking away
- Processing: The arcade game should query the backend to find out the current number of tickets, and add at least one ticket for playing the game.
- Outputs: The arcade game adds the tickets to the player’s account, and informs the player of how many tickets they won, and their new current ticket total.

3.2.2.6 Functional requirement 2.3.6

Reward Center Cost:

- Purpose: Reward Centers should be capable of decreasing the number of tickets a player has based upon the prize the player selects to purchase.
- Inputs: A player selecting a prize at the Reward Center.
- Processing: A Rewards Center should query the backend to see if the player has enough tickets for the prize they selected. If the player has enough tickets, then the Rewards Center should decrease the player’s total ticket count by that amount, and display the new total ticket amount to the player.

- Outputs: The player has less tickets in their account, and have been informed how many tickets they have left.

3.2.2.7 Functional requirement 2.3.7

Reward Center Display Prizes:

- Purpose: A Rewards Center should be able to display all available prizes with their corresponding ticket prices.
- Inputs: A player tapping their RFID card at a Rewards Center.
- Processing: The Rewards Center should query the backend to get a list of all prizes that are available with their respective prices and display this information to the player.
- Outputs: A display screen showing all available prizes with their corresponding ticket costs.

3.2.2.8 Functional requirement 2.3.8

Reward Center Alert Staff:

- Purpose: A Rewards Center should be able to alert the staff when a player redeems their tickets for a prize.
- Inputs: A player selecting a prize to spend their accrued tickets on.
- Processing: A Rewards Center should send a popup message to the staff's monitor detailing the prize requested, the player making the request, and the Rewards Center this request originated from.
- Outputs: A staff member should be informed of which Rewards Center sent the popup, which prize was won, and which player purchased the prize.

3.2.2.9 Functional requirement 2.3.9

View Staff Metrics:

- Purpose: The backend should let staff view certain metrics such as most popular game, and which games generate the most tickets.
- Inputs: A staff member clicking on "View Stats" on their backend computer.
- Processing: The backend will compile information for the staff member. Some metrics it will pay attention to is most popular games played, and total number of tickets awarded by an arcade game during its lifespan.
- Outputs: Arcade staff will be more aware of which arcade games are most popular, and which arcade games distribute the most amount of tickets.

3.3 Performance Requirements

- All machines, when dinged with an RFID Card, need to respond within three seconds.
- All Kiosk machines needs to have at least one RFID Card on hand, just in case a player wants a new card.
- At least one staff should be on hand at all times in order to maintain order in the arcade, as well as award prizes from the Reward Center

- There should always be at least one working Kiosk, Arcade game, and Rewards Center
- There should always be at least one available prize for redemption
- The backend should take three or less seconds to query

3.4 Quality Attributes

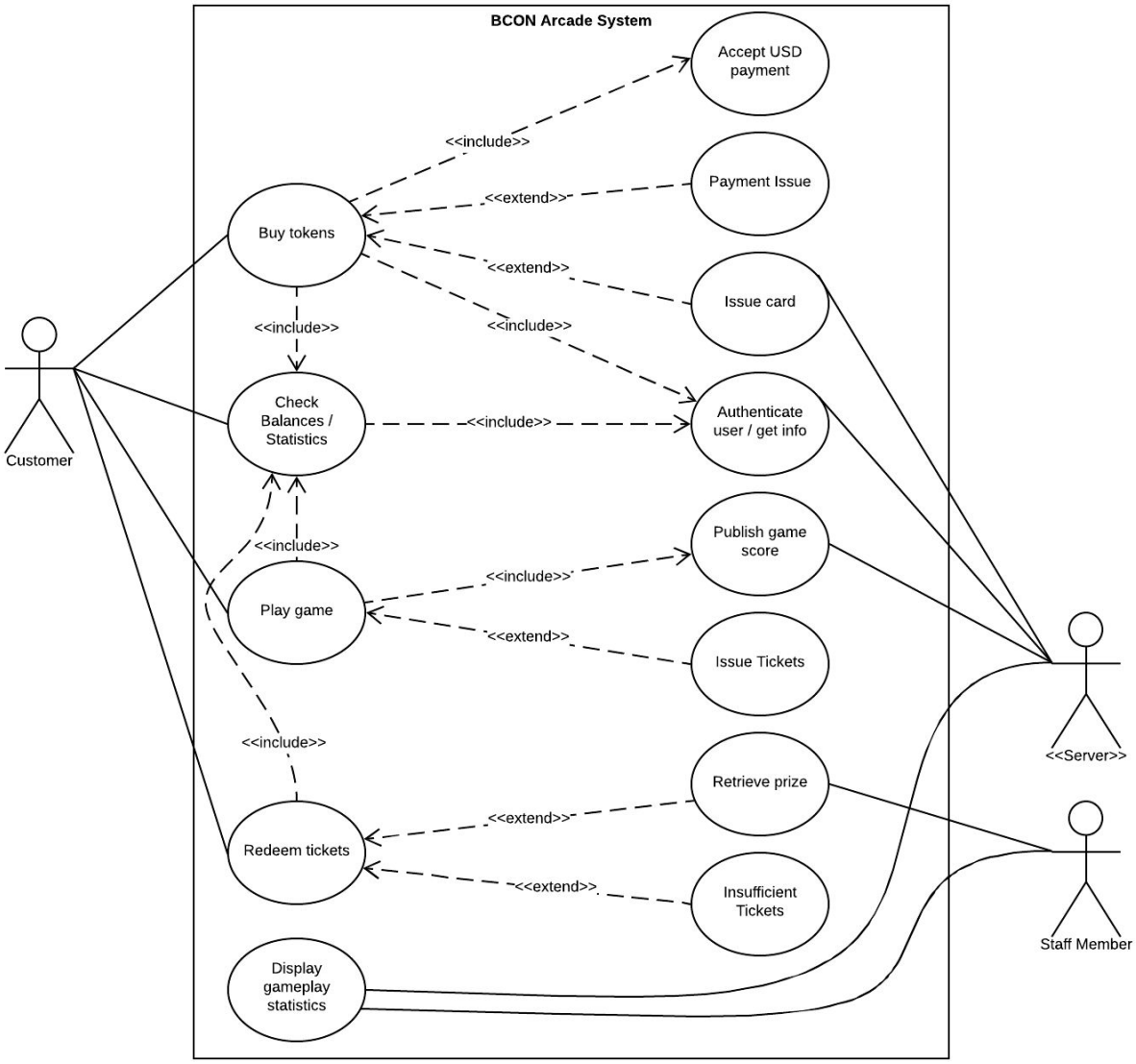
Kiosk machines must be 100% accurate when adding funds to an RFID card. RFID readers need to be 100% accurate when scanning an RFID card. The data stored on an RFID card should be entirely secure in the sense that a user cannot access another user's data without having their card. The backend should be able to maintain over a hundred cards at once without losing any data or modifying data under an incorrect player ID.

4. Other requirements

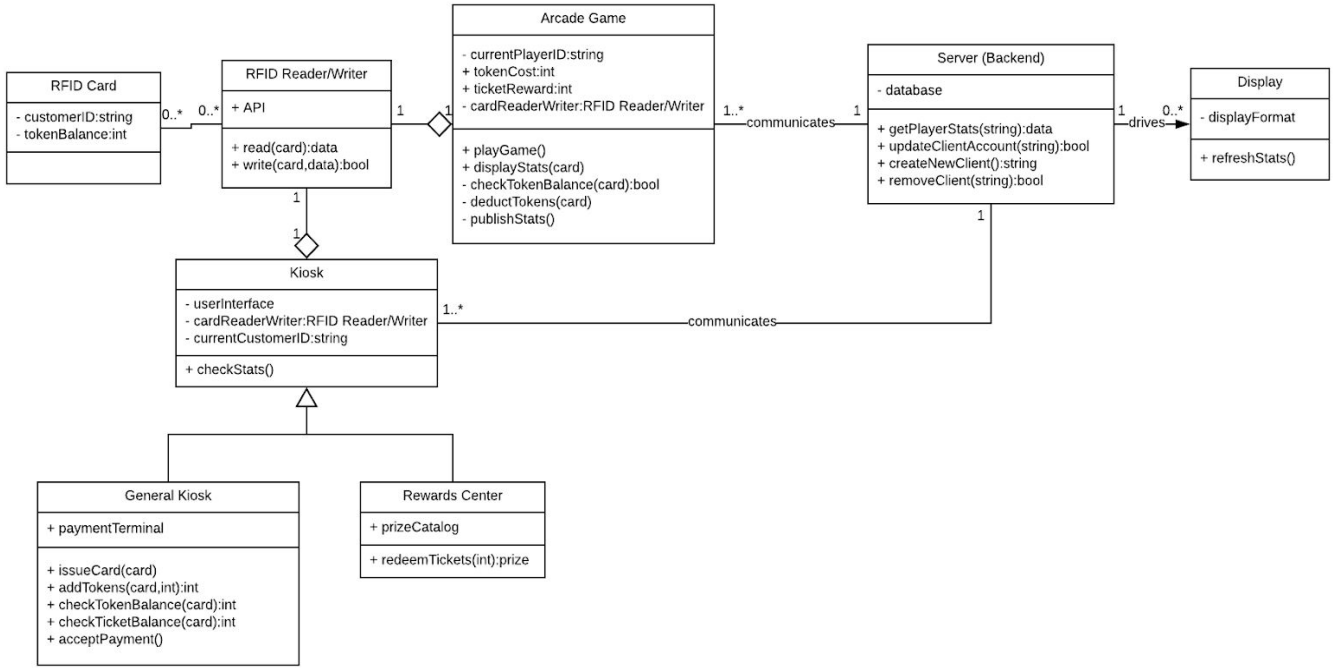
N/A

5. Appendix

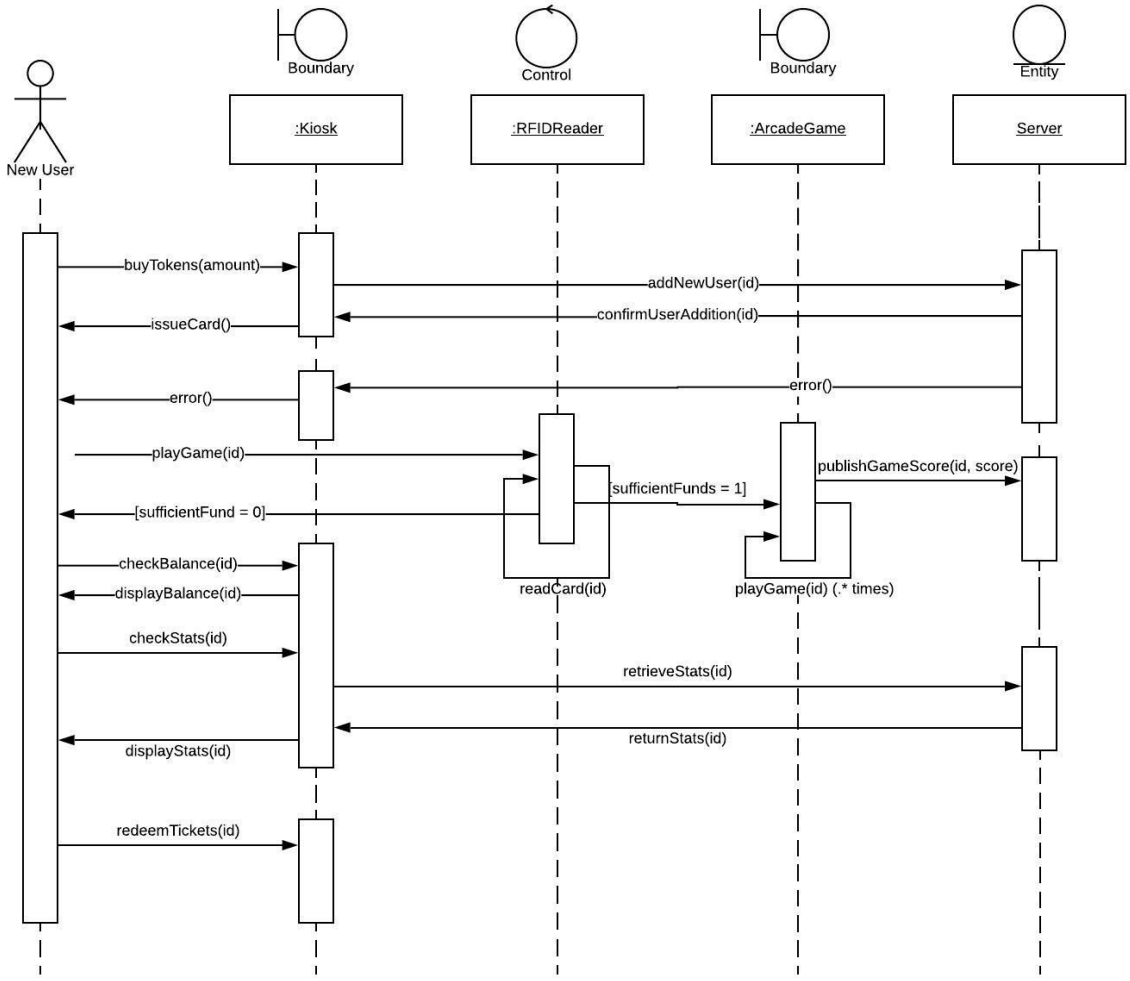
Appendix A: Use Case Diagram



Appendix B: Class Diagram



Appendix C: Sequence Diagram



Appendix D: RFID Reader, Game, and Kiosk State Diagram