Unify: All Access Key

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I Project Description

1 Project Overview

Unify - All Access Key is an application that uses a card that is connected to the application. This card is all in one card that allows users to store all of their cards that use RFID and tickets in the application which can then be used by both the application on the phone and the single card that has RFID which stores all the cards. This application also shows you all of your recurring payments which makes it easier to manage all of your subscriptions. This also has a chatting feature that can be used to talk to people who have similar interests as you do or are going to similar places as you are going to on daily basis.

2 The Purpose of the Project

The purpose of this project is to make it easier for people to carry all of their cards in one single card that can be used with either a physical card or their phone.

2a The User Business or Background of the Project Effort

Other than the users this application will be used by all kinds of businesses which require cards or passes to enter like a gym. Businesses can offer their memberships on the application. What this will do is not only promote the business but also help the users to get a membership easily. This ends up saving the gym money and makes it easier for them to sell memberships. The promotion will also be done when people use the chatting feature in the application to talk to more people and help promote the business. Entertainment and other events can also use this in a similar way as they would not have to worry about other applications charging the customers a huge ticket fee which is why a lot of people decide not to buy a ticket and this will help eliminate the middleman.

2b Goals of the Project

The primary goal of this project will be to make an application that allows users to carry all of their cards and memberships into one card and make it easier to for them to do the things they love with less hassle by using a card or their phone. This would also allow the users to view what they are paying for as well as talk to people with similar interests and get more recommendations. We want to give the customers the opportunity to store all of their cards into one.

2c Measurement

The way we plan to measure the success of the application would be to see and talk to the customers and ask them about the difference in the number of cards they carry now vs the number of cards they carried before using this application. Another method we would use is to gather data about how users have changed their passes/memberships all in one place and if that led to them cancelling some of them.

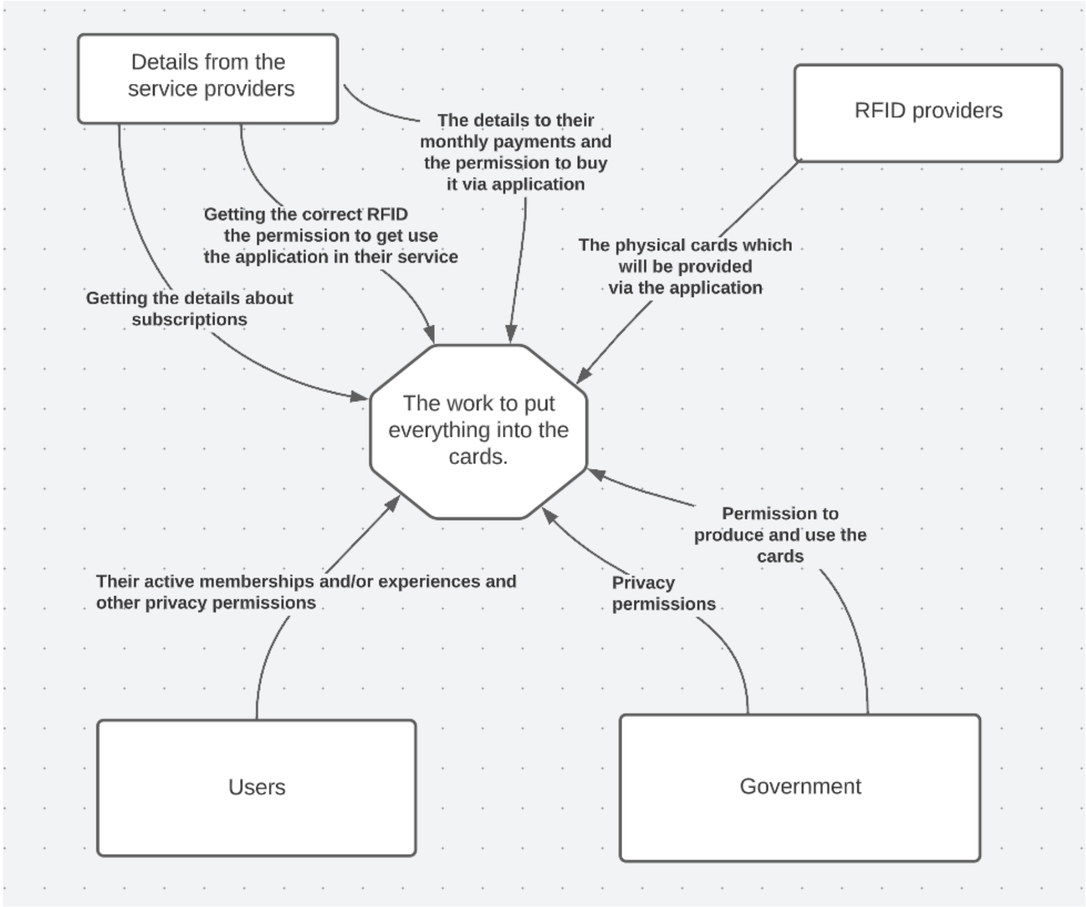
3 The Scope of the Work

The scope of this project is to make the lives of people easier by combining all of their cards and subscriptions into one making it easier for them to travel around places without forgetting their cards or carrying too many cards with them. This also helps to maintain all the subscriptions more easily.

3a The Current Situation

Without this application, currently a person has to carry all of their cards like their credit cards, gym membership cards, travel pass, car parking pass, concert tickets, office id card, college id card, and all of the other cards which they need day to day. What this does is makes people's wallets very big and force them to carry bigger wallets. Also, a lot of the time people forget to bring their membership cards or the pass to the place which wastes time and money. A lot of times people forget to pay for their monthly gym membership or due to auto payment they pay for the month they do not intend to work out or for any other subscription they pay for.

3b The Context of the Work


Details from the service providers
The details to their monthly payments and the permission to buy it via application
RFID providers
Getting the correct RFID the permission to get use the application in their service
The physical cards which will be provided via the application
Getting the details about subscriptions
The work to put everything into the cards.
Permission to produce and use the cards
Their active memberships and/or experiences and other privacy permissions
Privacy permissions
Users
Government

1 Context figure showing all the context of the work

In this “work” the people who are trying to reduce the number of cards when they are traveling in their day-to-day life and visiting different places and doing different things in a single day that requires them to carry a lot of cards. But this is not a place where you can completely take over the cards and get rid of them as the applications would still require them to be active and this is not something that would act like PayPal that could give customers the opportunity to replace the whole banking system when paying to the business.

3c Work Partitioning

Event Name	Input and Output
User Sign Up	User Input (in) Payment Information (in)
User accesses an event and/or place	Payment information (in) Location (in) RFID Access to gym, Public Transports, Theater Access
User pays for a product	Payment information (in) Location (in) One tap payments, Ticket Booking, Extending Subscriptions

1 Event and input/output table

3d Competing Products

There are a few applications in application marketplaces which are built to perform some individual operations that Unify performs. For example, Simplifi keeps track of any subscriptions, Ventra app manages the Ventra account and membership, AMC is used for ticket booking and etc.

4 The Scope of the Product

The scenario goes about describing the use of the application by a new user. The user downloads this application to experience the benefits of having multiple operations under the umbrella of a single application and RFID card.

The user starts by downloading the application via any application marketplace like play store, app store etc. If the user already has an account, they proceed to log in or else they sign up in the application and develop a personal profile. The personal profile setup consists of more than 1 step.

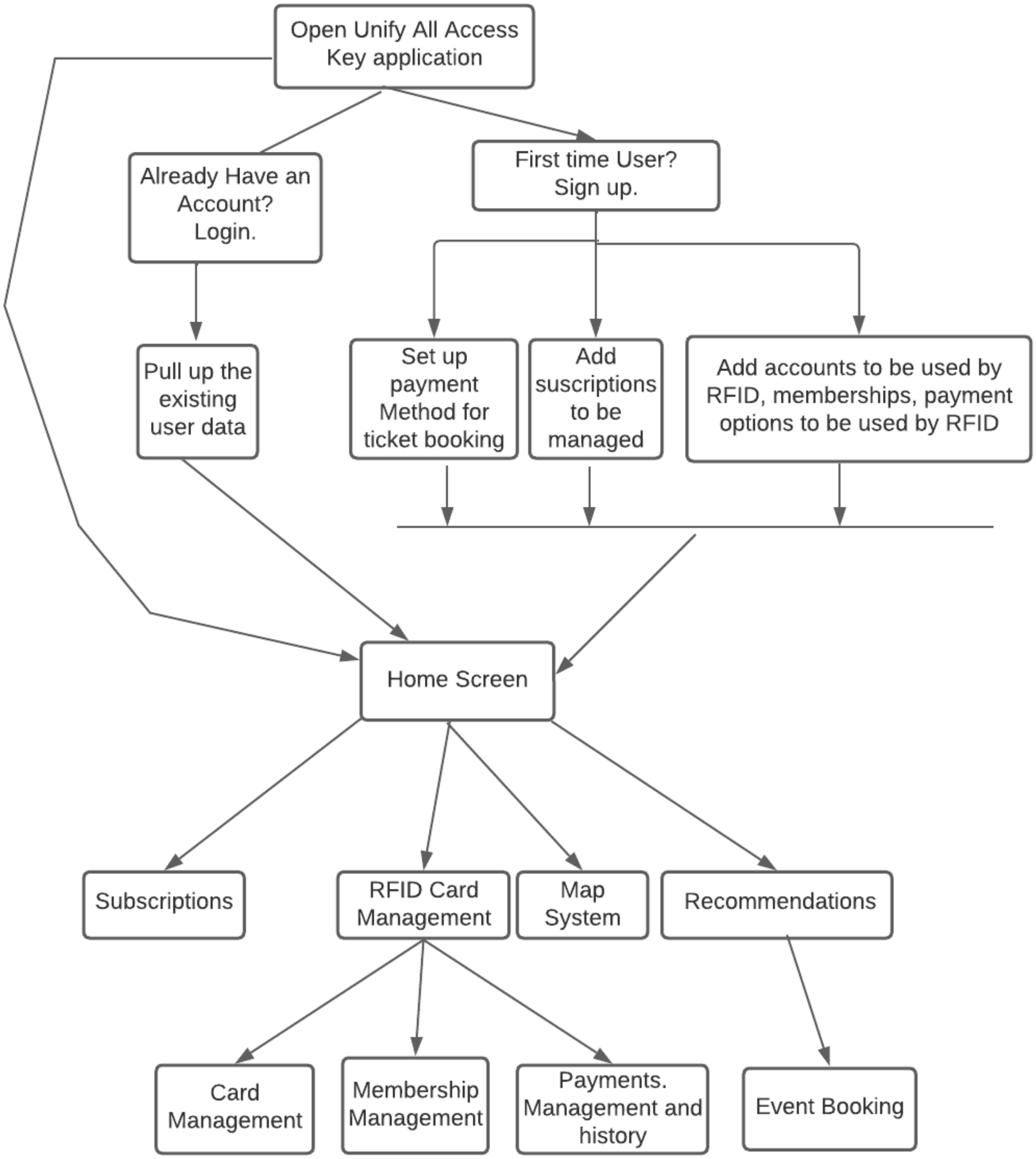
The basic first step is to use an email address and set up a corresponding password. Then the user is displayed multiple things to set up like linking the card to the RFID card, selecting movie preferences, linking the RFID card to the bank account to be used for payments, entering the information about subscribed services like amazon prime, or setting up payments for one tap ticket booking.

After finishing the personal profile setup, the application will prompt the user to home screen of the application where the user will be able to -

1. Manage their subscriptions. This user would be able to see when any particular subscription is going to expire and how much the user will be charged.
2. Recommendations for events and/or services that the user would be interested in.
3. An option to go to the inbuilt map system to input any desired location and the app will display different modes of transportation to the destination.
4. Display the user’s memberships.

5. A social feature for the user to connect with other people using the application including those with similar interests.

4a Scenario Diagram(s)


Open Unify All Access Key application
Already Have an Account? Login.
First time User? Sign up.
Pull up the existing user data
Set up payment Method for ticket booking
Add suscriptions to be managed
Add accounts to be used by RFID, memberships, payment options to be used by RFID
Home Screen
Subscriptions
RFID Card Management
Map System
Recommendations
Card Management
Membership Management
Payments. Management and history
Event Booking

2 Scenario diagram for the app

4b Product Scenario List

1. Creating a user account
2. Adding a payment method.
3. Linking a payment option and existing accounts with an RFID Card.
4. Experience recommendations.
5. Inbuilt Social Platform.

6. Map.
7. Manage Memberships

4c Individual Product Scenarios

Creating a User Account: A new user will create an account with their email address and a corresponding, at least, 8-digit long password. The user will then be prompted to enter some personal information like name, age, city etc. The application will be using the same given information in the chatting feature of the application.

Setting up payment method for one tap ticket booking: The user after making an account will add a payment option to the application which will be used for booking of movie tickets via application.

Linking a payment option and Ventra account with an RFID Card: The user will have an option to link up their Ventra account with their RFID card to be used in public CTA transportation. They will be able to add fares and buy passes by setting this.

Movie Recommendations: In the home screen of the application the user will be displayed the information on latest movies shows at the nearest theater.

Inbuilt Chatting Platform: For the users who use the same application (ex - met at the same gym) want to stay connected, they will be able to make private conversations using the chatting option of the app.

Map: To go to any desired location, the application provides a feature of map, where upon entering the desired location, will show the fastest route from the current location to the destination via a personal vehicle, walk or public transportation.

Manages Memberships: Apart from managing the Ventra account, the user can also add any other subscriptions to be managed inside the app. The user will be displayed useful information about any particular subscription.

5 Stakeholders

5a The Client

This application would not be developed for a specific client. Therefore, the developing organization would be the client.

5b The Customer

The customers of this product would be anyone in the general public. That’s because this product can be used by anyone that wishes to simplify their cards and passes.

5c Hands-On Users of the Product

- The first, and most important group of users would be the actual people using the software with the app. They would use the application and card in their daily lives to simplify and make their life more hassle free and convenient. Their subject matter experience would range from novice to master since it would include people just getting started with the app to those who have already mastered it and are using it daily. The technological experience with relevant technology would also range from novice to master. The people using this technology could already have experience with RFID from other similar systems or they could be completely new to this technology. The attitude towards technology of these users would be one that sees technology to simplify and make life easier, not more complicated.

- The second group of users would be businesses that are providing experiences and/or memberships through the software with the app. They would use the application to create experiences and/or memberships that users could purchase in exchange for access to those said things. Their subject matter experience would be master since it would be the actual people going into the app and configuring, setting up, and implementing the actual postings that the actual users could purchase. The technological experience with relevant technology would also range from novice to master. The people using this technology could range since it could be a businessman that wants to expand his companies.

5d Maintenance Users and Service Technicians

None

5e Other Stakeholders

Other stakeholders include corporate sponsors. The corporate sponsors would be from a broad range of industries that could all benefit from such a product. They would have to have a low degree of involvement in order to use such a product for the events and experiences that they would sponsor.

An additional stakeholder would be businesses that list their products and/or services on the app. Their degree of involvement would be high as they would to setup and manage their businesses online presence.

5f User Participation

User participation will be necessary in order to test the product before it ships officially. The users participating will be the ones that will actually end up using the product, so that will be daily users and businesses. They would help establish what works and what doesn't work with the app. They can report what the real-world performance is like of the product and whether it satisfies their performance requirements.

5g Priorities Assigned to Users

Key users: the ones providing the products for purchase on the application. Without any existing products such as memberships, experiences etc. the product would have nothing to offer to users. The users use the product as a way to enjoy the things they already love and use. They are also very important as they will be the ones used daily in their lives.

Secondary users: the ones that have set up the app but have not yet connected subscriptions and/or purchases.

Unimportant users: the ones that do not possess a membership, are attempting to misuse the product for fraudulent purposes.

6 Mandated Constraints

6a Solution Constraints

1. Legalities:
    1. Description: The user shall adhere to the rules and regulations that are set
    2. Rationale: The app shall display a Terms and Conditions contract for the user to agree.
    3. Fit Criterion: The user must accept the terms and conditions displayed on the contract in order to continue using the app.
2. Operating system:
    1. Description: The product shall work in different devices that have different operating systems
    2. Rationale: The user shall not need to install or change their operating system because the product shall be available in the website if it does not comply with their operating system requirements
    3. Fit Criterion: The development team shall create different user interfaces for at least the IOS, Android and the web application and must look the same.
3. Download:
    1. Description: The product shall be obtained through an application marketplace like the App Store for IOS Devices or Google Play for Android devices.
    2. Rationale: The user does not need to set up an application marketplace because the phone should already have an application marketplace available in their phone and could simply download the app.
    3. Fit Criterion: The product shall be available in the application marketplace for the different involved.
4. Security:
    1. Description: The product shall protect all user information
    2. Rationale: The user should be able to input their information (like their username, password, bank account, etc.) and their information is encrypted and stored in a safe database
    3. Fit Criterion: The product shall have extra steps in increasing the layers of security. It shall have integrated techniques such as two-factor

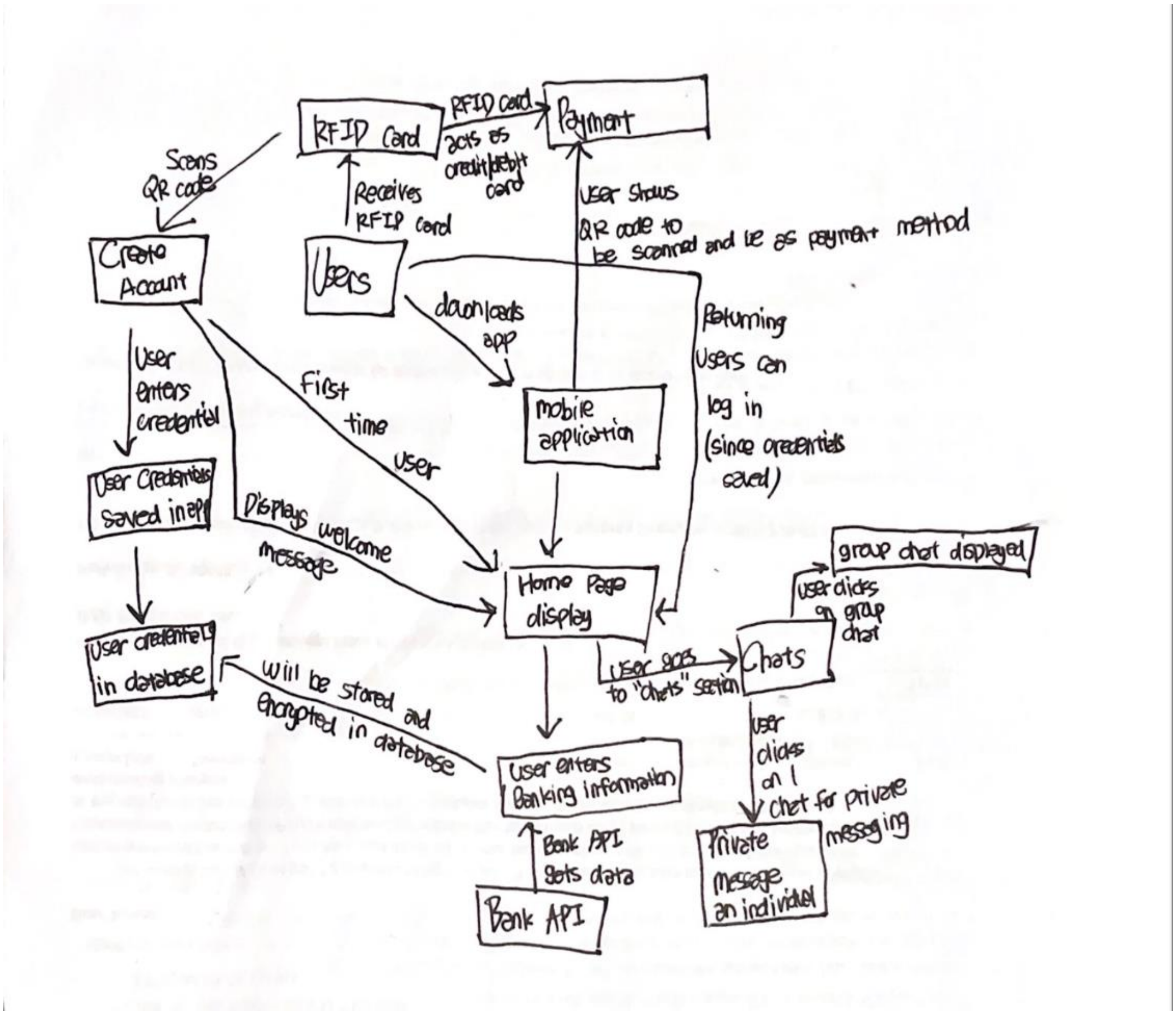
authentication which can be done using SMS or email verification codes, regular security updates when the app needs to update for better security against newly discovered vulnerabilities, increasing layers of encryption so that only a dedicated user would be able to access their data stored safely in the app.

5. Respectful communication:
    1. Description: As the application contains the social component, the product shall have respectful users
    2. Rationale: The user must be respectful towards other users on the app
    3. Fit Criterion: The app shall have a reporting system in place to have inappropriate content or disrespectful users removed from the app.
6. Usability:

    1. Description: The app shall be user friendly and easy to use
    2. Rationale: The user shall be able to set up their own accounts and be able to use it intuitively

    3. Fit Criterion: The app shall have buttons that show them exactly where to go in order to set up.

6b Implementation Environment of the Current System


RFID Card
RFID card acts as credit/debit card
Payment
Scans QR code
Receives RFID card
User shows QR code to be scanned and be as payment method
Create Account
Users
downloads app
Returning Users can log in (since credentials saved)
User enters credential
First time user
mobile application
User Credentials saved in app
Displays welcome message
group chat displayed
Home Page display
user clicks on group chat
User credentials in database
user goes to "chats" section
Chats
will be stored and encrypted in database
user clicks on 1 chat for private messaging
User enters Banking information
Bank API gets data
Private message an individual
Bank API

3 Implementation environment of the system

6c Partner or Collaborative Applications

1. Social media apps: since the application has a social component in it, the posts can be shared to other social media apps and not only limited to Unify
2. Payment platforms: payment apps/websites such as PayPal, Venmo, etc. could accept payments made by users through Unify. As the users enter their banking information, their cards can be from different apps and users should be able to request and make payments in the Unify app through the different payment systems.
3. Transit cards: this will be used when accessing their passes when getting on to the trains/buses for users. It's a one-tap method for the users to seamlessly enter their desired transit vehicles.

4. Security platforms: since Unify has an integrated security system, other apps could use the security API that Unify has developed especially for banking because security is very important in storing sensitive information like their bank account number, how much money they have, etc.

6d Off-the-Shelf Software

- Smartphone:
  - Smartphones with Android and IOS operating systems could run the application.
- Laptop/Computer:
  - Since the app is available as a website, users can access their information through the website as well.

6e Anticipated Workplace Environment

Since this app will be used with the card to grant access to different places, it must work whenever and wherever people are relying on it to access and/or experience the things they want to do.

This app will be primarily an online app therefore it must be resistant to viruses or malware that could potentially cause problems to the database or server.

6f Schedule Constraints

In order to create an application of this scope, this will require collaboration between software engineers, salesmen, marketers, and corporate sponsors in order to get the job done. This means there will be a short window of time for all these people to get the work needed done in order to have a fully functioning product up and running. Software development will have to be quick in order to accommodate bug fixes. Ideally, the product should be built from the ground up and released within a year or two before being made available to the public. Any longer than that and it might risk causing the product to lose traction in market interest.

The app should be released in the holiday season when everyone is going to travel and we plan on finishing everything by the end of this year which will be Christmas. Since everyone will use trains, buses, airplanes, to go home to their families, the Unify app can be utilized for their payments. We feel like the holiday season is the best time to finally utilize the app because students are out of school, parents are on vacation and they will try to find a place to go to and schedule dinners with friends and family.

6g Budget Constraints

This app will need funding from investors willing to invest in our product. RFID cards will need to be produced. An application will need to be created. Therefore, it will cost around anywhere from a range of $250,000 to $500,000 in total to compensate for the software engineering team, marketing, sales, research and development, and other costs.

7 Naming Conventions and Definitions

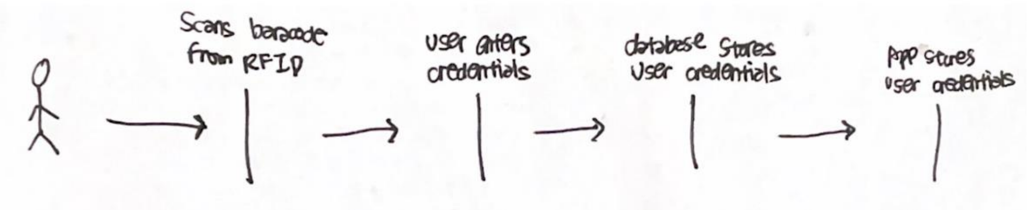
7a Definitions of Key Terms

RFID: (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person.

Card: the actual card that will be used by the hands on users in order to pay, access and enjoy the things they want to purchase and/or experience.

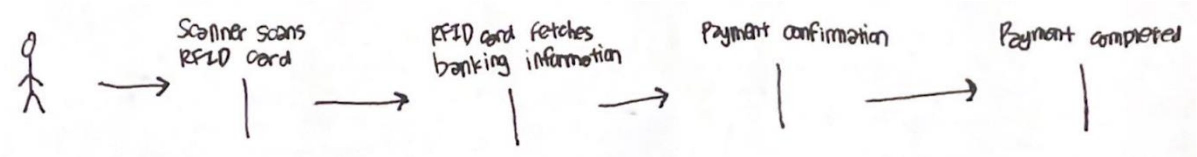
7b UML and Other Notation Used in This Document

Sequence diagram for user creation:



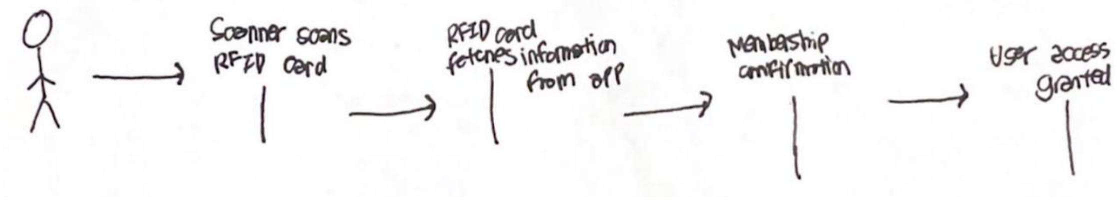
4 User creation sequence diagram

Sequence diagram for payment using the RFID card:



5 Payment sequence diagram

Sequence diagram for membership access using RFID card:



6 Membership sequence diagram

7c Data Dictionary for Any Included Models

The contents of the users and their memberships. The contents would have to store whether a user membership is active. If it is, it would have to have some sort of unique identifier. It would also have to have an expiration date. The payment details would be included. The underlying issuer of the subscription/service.

8 Relevant Facts and Assumptions

8a Facts

- 65.3% of the U.S population uses digital banking services.
- 25% Americans are reported to have more fun at venues that combined food and drinks together (such as arcade games, bowling, etc.)
- It is reported in 2016 that the Ventra app was downloaded more than 1 million times.
- The RFID cards cost up to $25.
- 44% of Americans would rather do banking via mobile apps.

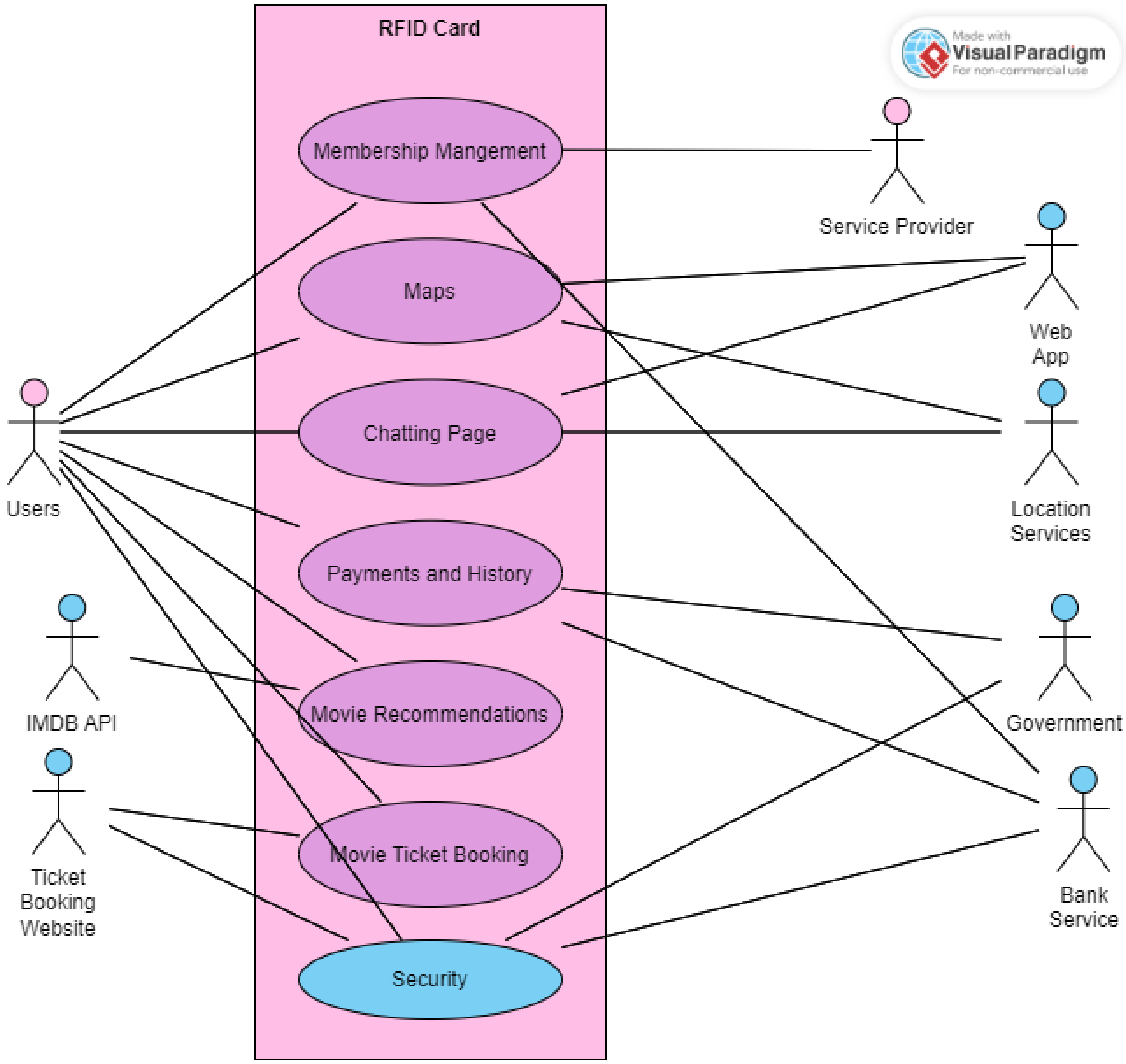
8b Assumptions

- Users must be able to afford the fares (bus fares, train fares, etc.)
- Users should already have a credit/debit card set up to be input to the Unify app.
- Users live in an area where public transport is available throughout the week.
- Users must have a unique username to identify their account easily if other users might add them to their contacts.
- Users are responsible for what they post in the app and will result in termination of usage if they have broken any rules.

II Requirements

9 Product Use Cases

9a Use Case Diagrams



7 Use case diagram

9b Product Use Case List

NOT Applicable.

9c Individual Product Use Cases

Use case ID: 1 Name: Adding payment method

pre-conditions: User has the app installed and created/logged in their respective account.

post-conditions: N/A

Initiated by: User

Triggering Event: User selects the option to add a payment method linking to their RFID card.

Additional Actors: Government, Bank Service for authentication.

Sequence of Events:

1. User selects the option to add a new payment method.
   2. System directs the user to the bank web page i.e. payment gateway to enter the bank information.
3. User enters their personal and Bank information and once finished submits the page.
   4. System verifies the entered information and adds the payment method.

Alternatives: N/A

Exceptions: If the data entered by the user is invalid and does not pass the authentication, the user will be shown a dialog box with options to “retry” and “cancel”.

2 Adding payment method

Use case ID: 2 Name: Movie Recommendations

pre-conditions: User has the app installed and created/logged in their respective account.

post-conditions: N/A

Initiated by: User

Triggering Event: User selects the option to view the home screen of the application.

Additional Actors: IMDB API.

Sequence of Events:

1. User selects the option to view the home screen of the application.
2. System makes a request to the IMDB API and receives the response of the latest movies which are shown to the user.
2. On selecting any of the movies the user directed to a web page displaying more information on booking a ticket for that movie.

Alternatives: In the event where the user makes an search for a movie which is not recognized by the API, the system will display a dialog box with option to “retry” or “go back to home page”

Exceptions: N/A

3 Movie recommendations

Use case ID: 3 Name: Membership Management

pre-conditions: User has the app installed, created/logged in their respective account, and set up their RFID card.

post-conditions: N/A

Initiated by: User

Triggering Event: User selects the option to add a new membership from one of the displayed options or using the search bar.

Additional Actors: Service Provider, Bank Service.

Sequence of Events:

1. User selects the option to add a new membership.
2. System displays recommended memberships to add ex- Netflix, gym membership, etc.
3. User is directed to the respective webpage for verification of the membership.
4. On successful verification, the system links the membership to the RFID and adds it to the memberships list of the application.

Alternatives: N/A

Exceptions: N/A

4 Membership management

Use case ID: 4 Name: Social Platform

pre-conditions: User has the app installed and created/logged in their respective account. User has enabled location in the device.

post-conditions: N/A

Initiated by: User

Triggering Event: User selects the option to chat with other app users.

Additional Actors: Location Service, Web App.

Sequence of Events:

1. User selects the “Chat” option from the home screen.
2. The system develops a social profile for the user using the current profile.
3. User is directed to a web app which is a chatting platform.
4. System shows a preview of other users of the application utilizing the location services.

Alternatives: N/A

Exceptions: N/A

5 Social platform

Use case ID: 2 Name: Maps

pre-conditions: User has the app installed and created/logged in their respective account. Users have enabled location in their device.

post-conditions: N/A

Initiated by: User

Triggering Event: User selects the option to view Maps in the application.

Additional Actors: Location Services, GPS, Web App.

Sequence of Events:

1. User selects “Maps” from the home screen.
2. System directs the user to the web app consisting of their current location.
3. Users have the option to enter their desired destination.
4. System will display users the fastest route to their destination via Public transport, private vehicle, walking or bike.

Alternatives: N/A

Exceptions: N/A

***6* Maps**

10 Functional Requirements

1 - Validation

Description: The system shall be able to validate if the user has valid credentials to be able to sign in to their account and then this will activate their card

Rationale: This is important because we need to have the users be able to use their card when their credentials are used to sign in.

Fit Criterion: The user must sign up/sign in (depending if the user has used the account before) on the app when they want to use the card.

Acceptance Tests: Validation Test

2 - System Database

Description: The system database shall store the user’s personal information

Rationale: This is important because multiple users will use the app and you would need to remember which user that signed up.

Fit Criterion: The system shall have a database ready to store the user’s information and it should be able to insert a new user when a new user is signed up.

Acceptance Tests: Database Test

3 - Encryption

Description: The user’s information will be encrypted when they are stored

Rationale: The user's information must be encrypted because they are not only entering their username and passwords but also their banking information which needs a high level of security to prevent their money from being stolen.

Fit Criterion: The system must already have an encryption mechanism when the user enters their personal information in the app.

Acceptance Tests: Encryption Test.

11 Data Requirements

4 - User Information

Description: The system shall need to store the user's information

Rationale: This is important because every user's username, password, banking details, etc. are different and the system shall be able to store them separately for each unique user.

Fit Criterion: The user shall already sign up to the application and they should already input their details upon signing up (which will be stored in the database of the system)

Acceptance Tests: Account Creation Test

5 - Card Information

Description: The system shall store the user's card information

Rationale: This is important because every user that has their credentials logged in have their own cards that they own and that card is to be used to access different places that they need to go to. The card information needs to be stored and encrypted as well to prevent other people from using it without the user's consent. Some cards may be lost/stolen and that the users can report it.

Fit Criterion: The card must already be registered by the system database but not yet with the user's information if the card is still not used/will not be used by a user.

Acceptance Tests: Card Information Test

6 - Location Records

Description: The system shall store the locations that uses Unify for access

Rationale: This is important because the database needs to identify which stores are using the Unify keycards as access keys since it helps ensure the legitimacy of the keycards being presented by users that want to enter. By storing the locations that Unify uses for access, this could help prevent unauthorized access from certain users that might have sensitive information that is stored at the location.

Fit Criterion: The location must be registered in the app so that their area is recorded in the database.

Acceptance Tests: Location Test

7 - Access Levels

Description: The system shall store the access levels of each RFID card

Rationale: This is important because not everyone wants to have the same level of access to each location. An example of this would be when different employees have different roles, and they should have different access to the different parts of a building.

Fit Criterion: The user must already have their description of what use they are going to have when using the Unify keycard.

Acceptance Tests: Access Level Test.

12 Performance Requirements

12a Speed and Latency Requirements

8 - Processing Multiple Users Requests

Description: When multiple users are simultaneously using the app, we want to make sure that the app will still function properly without any delays while serving multiple users.

Rationale: This is important to the app because we want every user to experience the app in its highest performance with minimal lag.

Fit Criterion: The system shall have an efficient algorithm to process requests with minimal delays.

Acceptance Tests: Lag Test

9 - Card Authentication Latency

Description: The product shall grant/deny access to a user almost instantaneously once the card is tapped on a scanner

Rationale: This is important to the because we want fast response time for the user to enter a particular building

Fit Criterion: The system shall have an efficient searching and validation algorithm to find the user’s access.

Acceptance Tests: Latency Test.

12b Precision or Accuracy Requirements

10 - Data Encoding

Description: The system shall ensure that the information stored in the card is encoded with precision.

Rationale: This is important because we need to ensure that the information stored in the card can be accurately read by the system to prevent misuse of the keycard.

Fit Criterion: The keycard should be standardized. It must follow the standard protocol for data encoding so that different scanners/systems that follow the set standard protocol can read the data.

Acceptance Tests: Data Encoding Test

11 - Error Handling

Description: The system shall implement precise error handling.

Rationale: This is important because when an error occurs, we want to ensure that the system shall have a precise error handling mechanism to diagnose the error caused and take the appropriate actions needed.

Fit Criterion: The system shall have an error handling mechanism in place.

Acceptance Tests: Error Handling Test.

12c Capacity Requirements

12 - Simultaneous Key Card Access

Description: The system shall cater to more simultaneous users in the day than in the night.

Rationale: This is important because a lot of users will have to travel to different places during the day and less people will be traveling at night.

Fit Criterion: The system shall be able to process up to 200 simultaneous users during the day and 150 simultaneous users at night.

Acceptance Tests: Simultaneous Access Test.

13 Dependability Requirements

13a Reliability Requirements

13 - No long downtime

Description: The app should be available to the users all of the time and should not go down for longer than 60 minutes as we try to replace all of the cards with this application.

Rationale: When the application is down the users cannot add new memberships or cards to their application

Fit Criterion: We expect the application to go under maintenance every month but during very odd times to maintain the reliability and the security of the user data.

Acceptance Tests: Reliability Test.

13b Availability Requirements

14 - Available time

Description: The app will only go down once a month for maintenance during late hours from 2am to 3am and will be available 99% of the time without failure.

Rationale: The users will get an error message when they try to use the application also, they will have a notification 2 days before the maintenance.

Fit Criterion: The system will go under maintenance every month.

Acceptance Tests: Availability Test.

13c Robustness or Fault-Tolerance Requirements

15 - Offline use

Description: The users will be able to use all of the cards and memberships even when not connected to the internet.

Rationale: Cards can only be added when the user is online. Memberships cannot be renewed if the user is offline.

Fit Criterion: The cards should be added when the application is connected to the internet.

Acceptance Tests: Robustness Test.

13d Safety-Critical Requirements

16 - Money safety

Description: The application will be programmed in such a way that user data and their bank account details do not go out. Also, other people cannot use their application to pay.

Rationale: The app will be active in one device only and any suspicious login will be reported to the user

Fit Criterion: The user has to set up a 2-factor authentication.

Acceptance Tests: Safety Test.

14 Maintainability and Supportability Requirements

14a Maintenance Requirements

17 - Account management

Description: All of the accounts which are not being used for over a year will be sent an email confirmation to continue their accounts and if not responded within 2 months of the email the account will be terminated

Rationale: By removing users who do not use their accounts their personal information will be deleted, and the database will be cleared.

Fit Criterion: Check for inactive accounts every month.

Acceptance Tests: Maintenance Test.

14b Supportability Requirements

18 - 24/7 helpdesk

Description: There will be a 24/7 helpdesk which will be in both email and phone calls.

Rationale: The users will be able to get help with any technical issue at any time of the day.

Fit Criterion: The users will be able to submit their complains as well as get help with any part they are having trouble with

Acceptance Tests: Support Test.

14c Adaptability Requirements

19 - Application usage

Description: Users can use this application on any operating system.

Rationale: The application will run on any given platform such as android and IOS. It will also be available as a web application.

Fit Criterion: The account can only be running on one device at a time for security reasons.

Acceptance Tests: Adaptability Test.

14d Scalability or Extensibility Requirements

20 - Expanding

Description: The product will be launched with the capacity of 100,000 users

Rationale: The application will be ready to take 20-25% more users than the number which it is released with.

Fit Criterion: The application will keep growing as the number of users crosses the 100,00 mark.

Acceptance Tests: Expanding Test.

14e Longevity Requirements

21 - Application life

Description: The application will work for an indefinite time and is expected to run for no less than 10 years.

Rationale: The application will not die because there are infinite users who want to have their cards and memberships in their phones.

Fit Criterion: The features and functionality of the application will always be growing, and new business and services will be expanded.

Acceptance Tests: Longevity Test.

15 Security Requirements

15a Access Requirements

22 - 2 Factor authentication

Description: The user will have to use 2fa to get into the application.

Rationale: This would minimize the risk of the account being compromised.

Fit Criterion: User has to use an application which supports 2fa like duo.

Acceptance Tests: Access test.

15b Integrity Requirements

23 - Fraud prevention

Description: The application will prevent fraud/unverified businesses from selling their services.

Rationale: Before any business is listed on the application the business should pre verify all of its services

Fit Criterion: Business who are trusted will only be allowed to access the applications.

Acceptance Tests: Fraud Test.

15c Privacy Requirements

24 - Privacy policy

Description: The application will need users to accept the privacy policy.

Rationale: The privacy policy will confirm that the user is willing to share their data as well as their location with the application.

Fit Criterion: The user has to agree to give the basic private information to the application like name and ID proof.

Acceptance Tests: Privacy Test.

15d Audit Requirements

Does not apply.

15e Immunity Requirements

25 - Virus/malware Protection

Description: The application will have a virus/malware prevention feature

Rationale: The application will have a firewall which will prevent from any virus or cyber attacks

Fit Criterion: The firewall system installed in the application will protect the users data.

Acceptance Tests: Immunity Test.

16 Usability and Humanity Requirements

16a Ease of Use Requirements

26 - Step-by-Step Walkthrough of each feature

Description: During the setup process of the product, the user will be displayed dialog boxes on each step while also providing explanations of each feature.

Rationale: Users may be confused on the understanding of each feature and may find it hard to set up and link their information with features.

Fit Criterion: 90% of the users will only find the setting up phase of using the application difficult. The rest of the application is simple enough to be used by 13-year-olds.

Acceptance Tests: Walkthrough Test.

16b Personalization and Internationalization Requirements

27- Movies Sorting

Description: The product will allow users to sort movies by genre, country, ratings and review.

Rationale: Different users prefer movies of different genres and may prefer to watch it in its original language.

Fit Criterion: 90% of products user will be able to view.

Acceptance Tests: Movies Sorting Test.

16c Learning Requirements

28 - First User

Description: The product will be set up using a walkthrough for all first time users which will provide a smooth way of building a profile.

Rationale: The walkthrough is aimed to help any user above or of 13 years in age.

Fit Criterion: 90% of the users will be able to easily learn the app once it is set up.

Acceptance Tests: First User Test.

16d Understandability and Politeness Requirements

29 - Product Icons

Description: The products consist of icons which are easily recognizable and understandable by any user.

Rationale: All users will be able to understand the well known icons. For example chat icon looks like 🗨.

Fit Criterion: 95% of the users will be able to reciprocate what the icon means.

Acceptance Tests: Icon Test.

16e Accessibility Requirements

30 - Hearing Disability Test

Description: The user will be able to listen and also visualize instructions to the walkthrough instruction when setting up the product.

Rationale: To allow hearing disabled people to use the product.

Fit Criterion: The user must enable the microphone function in their device setting.

Acceptance Tests: Hearing Disability Test.

16f User Documentation Requirements

31 - Contact Us and Documentation of Walkthrough

Description: The product will have a documented walkthrough of each feature of the product and will also have an option to contact services in case of an anomaly.

Rationale: Documentation will help users understand clearly in simple terms how the feature works.

Fit Criterion: 90% of the users will find helpful and clear information on how-to's of the product.

Acceptance Tests: Contact Test and Walkthrough Test.

16g Training Requirements

32 - Training

Description: Apart from the walkthrough, the user will be able to navigate easily around the product. In the event the user needs assistance, they can refer to documentation, repeat walkthrough, or contact administrator.

Rationale: The user should be able to understand how to navigate through the product to learn and access all of its features

Fit Criterion: 90% of users will be able to easily learn to navigate around the product.

Acceptance Tests: Training Test.

17 Look and Feel Requirements

17a Appearance Requirements

33 - Color Requirements

Description: The app shall display consistent color in the different sections of the app.

Rationale: This is important because we want to eliminate muddled designs in the app that would make it unattractive to the users.

Fit Criterion: The app shall not have bright colors in the app but rather a neutral color to prevent eye strains when the user uses the app.

Acceptance Tests: Color Requirement Test.

34 - Font Requirements

Description: The app shall display consistent fonts in the different sections of the app.

Rationale: This is important because we want the users to be able to see what the text is displayed in the app. It must be of a medium sized length to ensure intuitive designs.

Fit Criterion: The app shall not have a font that is too small or too big for the user to read.

Acceptance Tests: Font Requirements Test.

17b Style Requirements

35 - Style Specifications

Description: The product shall utilize an intuitive style that allows the user to understand the flow of the app and understand how the product works.

Rationale: This is important because a lot of users would want to learn how the app works in a fast way.

Fit Criterion: The app must already follow the requirements in 17a.

Acceptance Tests: Style Test.

18 Operational and Environmental Requirements

18a Expected Physical Environment

36 - Indoor Building Environment

Description: The product shall work in an indoor environment

Rationale: Majority of the users will use the card inside the location because there might be technology that can interfere with the hardware of the card for example the keycard scanner when it is a rainy, stormy or a windy day.

Fit Criterion: More users will be able to use the product when they are indoors.

Acceptance Tests: Indoor Building Environment Test

37 - Sunny Outdoor Building Environment

Description: The product shall work in a sunny outdoor environment

Rationale: The product shall work in a sunny outdoor environment because the product shall have no interference with the sunny environment when it is in use. Since it is sunny and there is no rain, the product shall have no trouble sustaining itself.

Fit Criterion: The majority of users can use the product outside as well.

Acceptance Tests: Sunny Outdoor Building Environment test.

18b Requirements for Interfacing with Adjacent Systems

38 - Chatting Requirement

Description: As the product contains a chatting feature, it will allow users to share their phone numbers with each other.

Rationale: It is important because they would want to connect with one another and make more friends through the app. In a way, it can help bring more diversity to the app.

Fit Criterion: The product shall have a messaging system integrated already in the app.

Acceptance Tests: Chatting Test.

18c Productization Requirements

39 - App Weight

Description: The product app shall be at the most 300 MB

Rationale: This is important because users need to download the app and there might be updates for the app and we want to allow the users to not take a long time to update it.

Fit Criterion: The app must already be in either the App Store or the Google Play store for the user to download.

Acceptance Tests: App Weight Test.

18d Release Requirements

40 - Updates

Description: The app shall receive updates every month

Rationale: We aim to minimize the occurrence of bugs in the app.

Fit Criterion: The app should already be released by then and after 1 month of release, the app shall have another update test and by then we would need to see the performance report of the app to fix what bugs occur on a daily basis.

Acceptance Tests: Updates Test.

19 Cultural and Political Requirements

19a Cultural Requirements

N/A. The product can be used by anyone.

19b Political Requirements

41 - Comments and texting policy

Description: The chatting feature of the application will allow users to block or report any discriminatory, racist comments or texts.

Rationale: The chatting feature is the only platform in the app for any 2 users to interact with each other. The product is meant to be friendly and encourages other users to be a part of the same community.

Fit Criterion: Reported users will be subject to receive a permanent ban from using the app.

Acceptance Tests: Content Test.

20 Legal Requirements

20a Compliance Requirements

42 - User data

Description: This application will require the user to give its location as well as the user data.

Rationale: This makes sure that the application does not get into legal troubles because of having the user data.

Fit Criterion: We will consult a law firm and make sure that every aspect of the application will meet the legal requirements.

Acceptance Tests: User Data Test.

20b Standards Requirements

43 - Bank Legal requirements.

Description: The application should comply with all of the bank requirements.

Rationale: The application should not violate or go against any of the bank regulations or even have some feature which puts the process in a gray area.

Fit Criterion: We will take all of the necessary legal steps and meet the requirements to make the application legal and trustworthy.

Acceptance Tests: Bank Legal Test.

21 Requirements Acceptance Tests

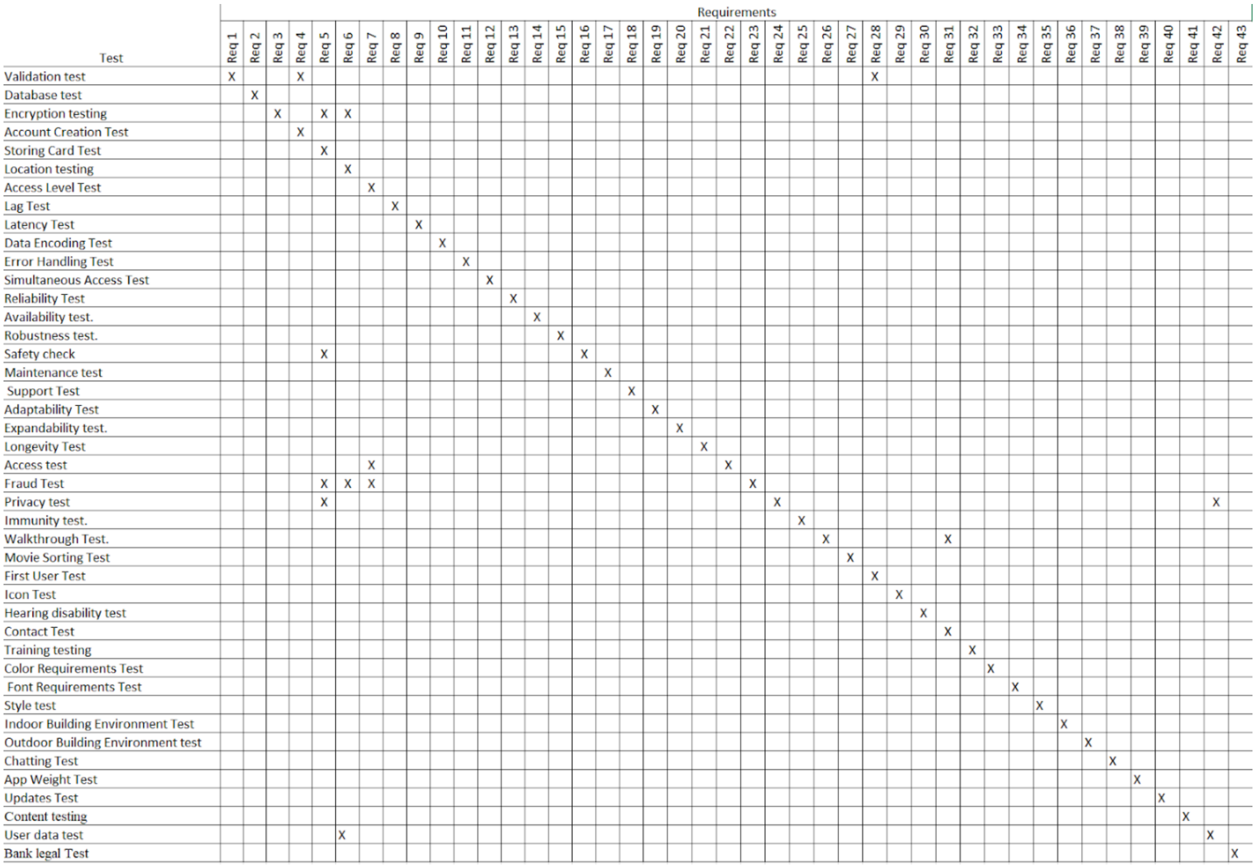
21a Requirements – Test Correspondence Summary

21b Acceptance Test Descriptions

- Validation Test: - This test is so that users can only access it with valid credentials.
- Database Test: - This test will make sure that the user data is stored in the database.
- Encryption Test: - This test makes sure that the user data is encrypted.
- Account Creation Test: - This makes sure that the new user is saved in the database.
- Card Information Test: - This makes sure that the card information is stored correctly and safely into the database.
- Location Test: - This test makes sure that location is being stored in the application. This would be the location of the user's activity so that the application can maintain safety as well as give further recommendations.
- Access Level Test: - This is to make sure that only people with correct access will be able to access the data and no other person using the application or providing service is able to access the user's data.
- Lag Test: - This will test that the application will run without any lag when run with multiple users as well as the application capacity.
- Latency Test: - This will make sure that the application is fast and reliable to use as a replacement to physical cards.
- Data Encoding Test: - This will make sure that any data stored in the database will be encoded.
- Error Handling Test: - This will ensure that the system is able to handle any and all kinds of errors that may occur while using the application.
- Simultaneous Access Test: - This will make sure that the application can be run by multiple users especially during the daytime.
- Reliability Test: - This will ensure that the application does not have a long downtime and it does not go offline or crash during busy hours.
- Availability Test: - This will make sure that the application only goes down for maintenance only once a month.
- Robustness Test: - This will ensure that the user can still access the cards while the application 9is not connected to the main server.
- Safety Test: - This will make sure that the user details and their bank accounts do not go out or are not misused by any other person.
- Maintenance Test: - This will make sure that the users who are inactive will be sent an email and then removed from the database to make sure that database is not filled, and the user's information is cleared for privacy reasons.

- Support Test: - This is to ensure that the user has access to the helpdesk 24/7 and via phone call and via email.
- Adaptability Test: - This will ensure that the application runs on all of the operating systems and does not have limitations on any of them.
- Expanding Test: - This is to ensure that the application will keep growing and adding new features as well as increasing the capacity.
- Fraud Test: - This will make sure that the application is fraud proof.
- Privacy Test: - This is to let the user know about the privacy policy for all of the legal reasons.
- Immunity Test: - This test is to ensure the safety of the application and the firewall so that there are no random attacks and data stealing.
- Walkthrough Test: - This test will make sure that the user will be able to understand the whole application and will get guidance to all of the features available to them.
- Movies Sorting Test: - This will make sure that the application is able to suggest the user movies and TV shows based on their location.
- First User Test: - This will make sure that the user who is logged in for the first time will have a smooth experience building the application.
- Icon Test: - This is to make sure that the user is able to figure the icon easily.
- Hearing Disability Test: - This will make sure that people with disabilities can still use this application without any issues.
- Contact Test: - This will enable the user to directly contact the business or service provider so that they can have their issues resolved.
- Training Test: - This makes sure that the user is trained to use the application without making any costly mistakes.
- Color Requirement Test: - This test checks that the color scheme is consistent throughout the application.
- Font Test: - This test checks the consistency of font based on Title, Header, and description.
- Style Test: - This test checks that the style d is consistent throughout.
- Indoor Building Environment Test: - This makes sure that the application runs correctly when used indoors.
- Outdoor Building Environment Test: - This makes sure that the application runs correctly when used Outdoor.
- Chatting Test: - This makes sure that the application runs correctly when using the chatting feature and that the messages are encrypted.
- App Weight Test: - This makes sure that the application is not too big in size.
- Updates Test: - This makes sure that the application regularly receives updates.
- Content Test: - This application makes sure that the things which are posted on the application do not hurt an individual or a community.
- User Data Test: - This makes sure that the application follows all of the legal requirements for user data.
- Bank Legal Test: - This makes sure that the application meets the bank legal

requirements



	Requirements																																									
Test	Req 1	Req 2	Req 3	Req 4	Req 5	Req 6	Req 7	Req 8	Req 9	Req 10	Req 11	Req 12	Req 13	Req 14	Req 15	Req 16	Req 17	Req 18	Req 19	Req 20	Req 21	Req 22	Req 23	Req 24	Req 25	Req 26	Req 27	Req 28	Req 29	Req 30	Req 31	Req 32	Req 33	Req 34	Req 35	Req 36	Req 37	Req 38	Req 39	Req 40	Req 41	Req 42	Req 43
Validation test	X			X																								X															
Database test		X																																									
Encryption testing			X		X	X																																					
Account Creation Test				X																																							
Storing Card Test					X																																						
Location testing						X																																					
Access Level Test							X																																				
Lag Test								X																																			
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Content testing																																									X		
User data test						X																																				X	
Bank legal Test																																											X

8 **Requirements tests**

III Design

22 Design Goals

Our main design is to be able to have users utilize the app and the RFID card wherever they want to go.

We want a seamless user experience so that they can simply walk in their desired locations and show their cards without having to input their valid credentials to enter the building.

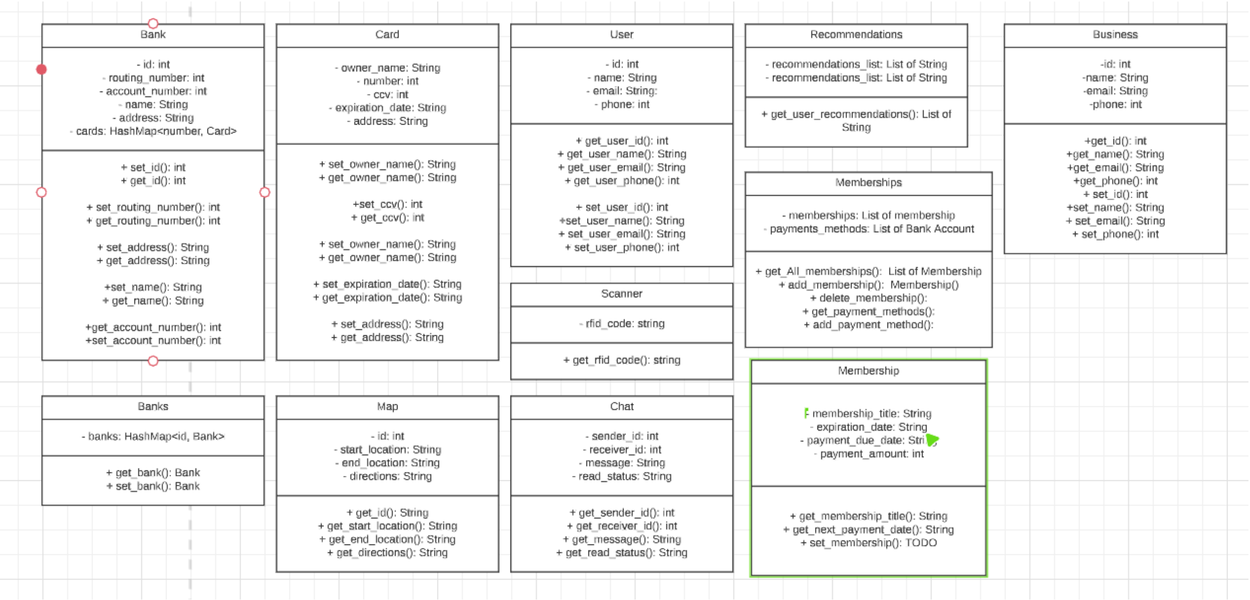
In addition to how easily the card is used; we also want the app to be secure and easy to have the user information stored/updated in the app as well. Since the app will be at their fingertips, we want to ensure that the app is intuitive and is up to date to prevent lag and this means that we plan to optimize the app for speed and performance with minimal lag and optimal data transfer.

23 Current System Design

N/A

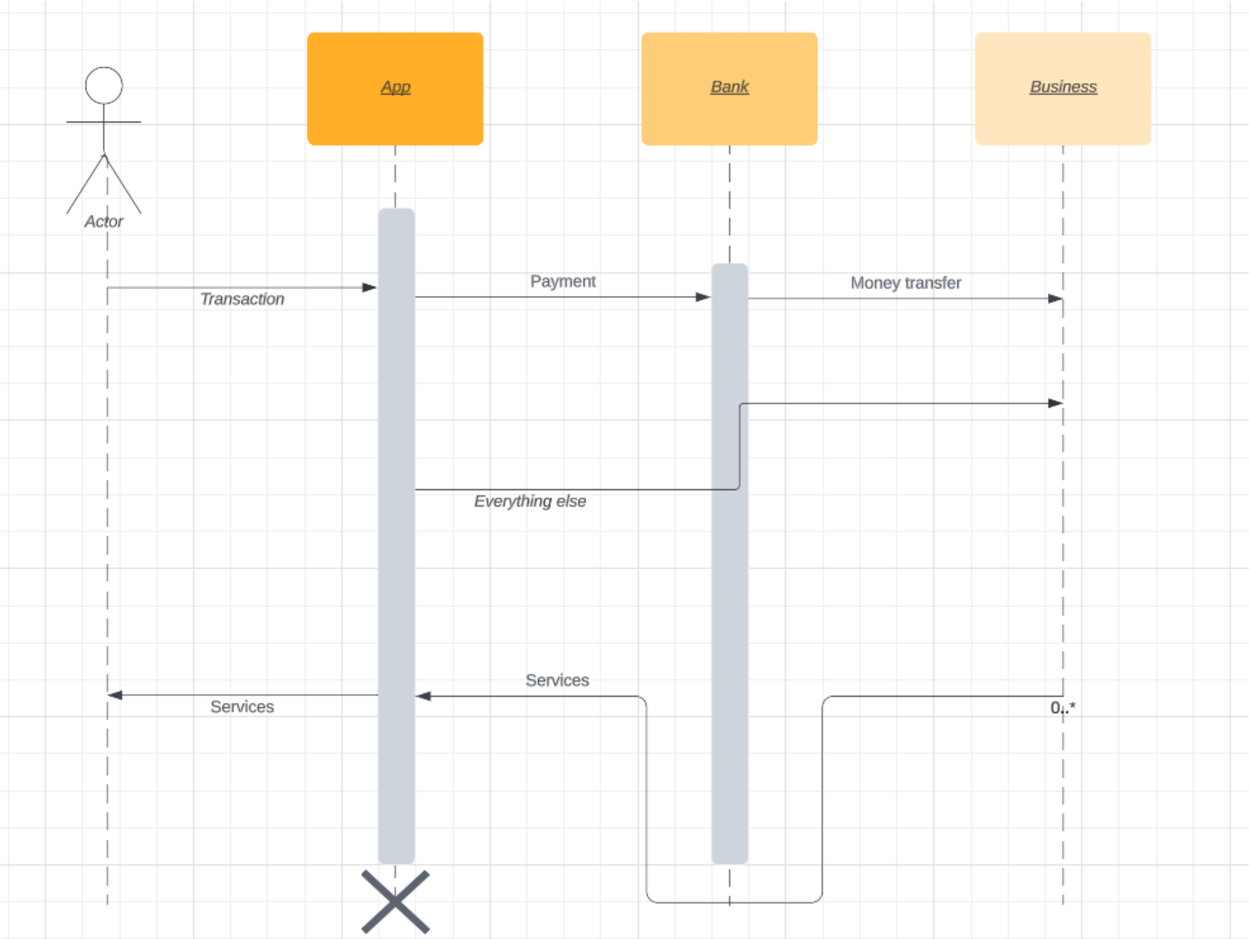
24 Proposed System Design

24a Initial System Analysis and Class Identification



9 Initial System Analysis

24b Dynamic Modelling of Use-Cases



10 **Use case**

24c Proposed System Architecture

In the case of this RFID card system, it would be the Client-Server because the client and the server sides need to work together to authenticate the users if their card can enter a specific location that has the RFID system utilized. Moreover, the client side is responsible for the user interface and sending user data to the server. For the server side, it is responsible for processing and storing the data sent from the client side such as the username, card information, bank accounts, user ID, etc. In addition to processing and storing data, the server would also need to have a security measure placed in it because of the vulnerable data stored in the server (as user information is sensitive). In this case, we would want to add a proxy that should be an intermediary between the user and the internet and by adding a proxy, we can have increased security as the users can be forwarded to the appropriate section of the internet.

24d Initial Subsystem Decomposition

Bank

The bank class keeps track of which bank each user uses. The class keeps track of what each user's bank accounts are. They have a unique ID, routing number, each user's account number, name, address, and for each card to be identified uniquely, we plan to implement the HashMap data structure because by then, each card is identified by their number and from there, we can retrieve the card information.

Card

The card class keeps track of each physical card. For this class, you have the owner's name, the card number itself, the ccv (card code verification), expiration date, and address. This is the physical card that each user will have and each of these details will be unique to each user. This card will act as a payment method for their purchases in the stores that they shop at.

Banks

The banks class will essentially store the instance of every bank by using a key pair value (with the bank id being the key). Since every bank is different and they will have different information for each of them, you will need to have a stored list of banks. Additionally, you will see that one of the methods used is a HashMap because they are simpler to understand with a key-value pair implementation and that when you have a unique id for each bank, you will obtain the respective banks based on their ids.

Map

The map class will have the id, start location, end location and the directions between the start and end locations. The user can utilize the map section of the app to find their way from their current location and their desired location.

Scanner

This class is a simple class to keep track of the scanners each location uses. Each scanner will simply scan each RFID card and verify if the card is valid or not.

Chat

The chat class is a class which keeps track of the chatting system utilized by the app. It has the attributes of sender id, receiver id, what the sent message is, and the read status (if the message is already received and read by the receiving end of the chat). This class is needed because by then, if there are any inappropriate texts that are spotted, we can retrieve the culprit's id and eventually ban them from using the app.

User

This interface contains user information such as their unique IDs, name, email, phone number. As the User class contains methods to retrieve their individual ID, name, email, phone number, they are required to be public. Also, if the user wants to change their ID, names, phones, emails, the app has their own methods which allows them to do so.

Membership

The membership class will keep track of what membership each user is subscribed to and which plan they are currently enrolled in. The class has a membership title, expiration date, payment due date, and the payment amount that the user needs to pay in order to continue their membership.

Memberships

The memberships class is to store the list of memberships and what each bank account is related to the respective membership account.

Business

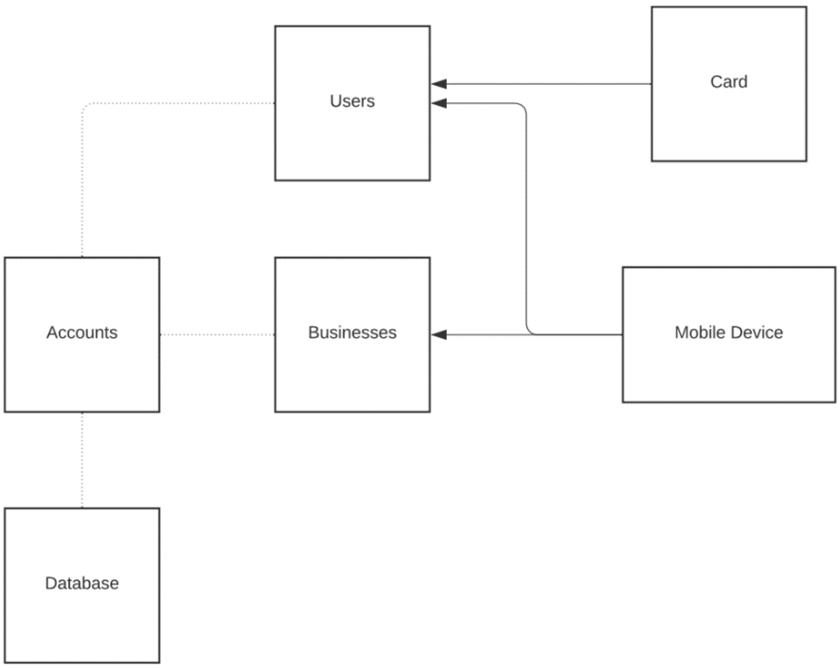
The business class are the retailers, gyms, stores, essentially locations that are willing to implement our RFID card system. Each business will have their unique id, name, email, phone number as well. As the card can be used to manage their current members that are allowed to enter inside their locations.

Recommendations

The recommendations class will have user's prior experiences and store recommendations for future experiences that the user would like.

25 Additional Design Considerations

25a Hardware / Software Mapping



11 Hardware / software mapping

In the diagram above, the arrow means contain while the dotted line means uses. Hence, based on that, we say that both the users and businesses have a mobile device that is ultimately connected to the app. However, only the users have the card.

In addition to that, both the users and businesses have accounts to which they are all connected to a database to be stored.

25b Persistent Data Management

We want to ensure data consistency across clients, users and the servers because of the large volume of data that will be processed.

One of the most important systems that we should mention is the Database systems. This system should handle the stored data for every user, business, cards that the data was input. Not only should the database system be responsible for storing data but also responsible for retrieving data.

The next system that should be integrated is the Transactions systems because even if both the users and business are responsible for their own transactions, our system should also keep track of all transactions made because we want to prevent unwanted transactions. This system shall store the transaction ID, date and time of when the transaction occurred, both the sender ID and receiver ID that was involved in the transaction.

The Membership system shall also be included to keep track of which users have which type of membership (or are currently enrolled in). The membership system shall store user's unique ID, name, email, their membership number and with the attributes involved, the system shall also have methods such as addMembership or RemoveMembership to add/remove their memberships.

The Cards systems shall keep track of who owns the individual cards. Since there will be a lot of cards for different users, one of the ways to identify a unique card is to have each card assigned with a unique ID and also the current user's name. There should also be methods to add/delete the current card from the database if at any point we want to revoke the use of their cards.

Overall, the information for these subsystems would be eventually stored in a central server which would be later processed. We also plan to have another server for backup in the case where the system shuts down and corrupts the data, we can have the other server to back it up which will then put the data back to the original server. In addition to that, we need to execute backups every week because of the numerous amounts of data that will be added/processed.

25c Access Control and Security

The first access control and security system should be the Authentication system. We want to make sure that it is the user that has valid credentials when trying to access their accounts. Not only users but also the developers who are trying to access the central database, they should have authorization to it by entering their credentials as well.

The second system that is implemented is the Encryption system. This is because we want to encrypt the data that is stored in the database to add an additional layer of security to encrypt the data. We want to prevent malicious hackers from obtaining sensitive data that is stored in the database. Only authorized developers can decrypt the data when needed.

Authorized users' systems shall store the authorized developers that can again encrypt and decrypt the data stored in the database. In this system, we shall store the developer's information and when each developer encrypts and decrypts data from the central database to keep track of each authentication process involved.

Overall, we want to integrate more layers of security while also having users easily access their accounts.

25d Global Software Control

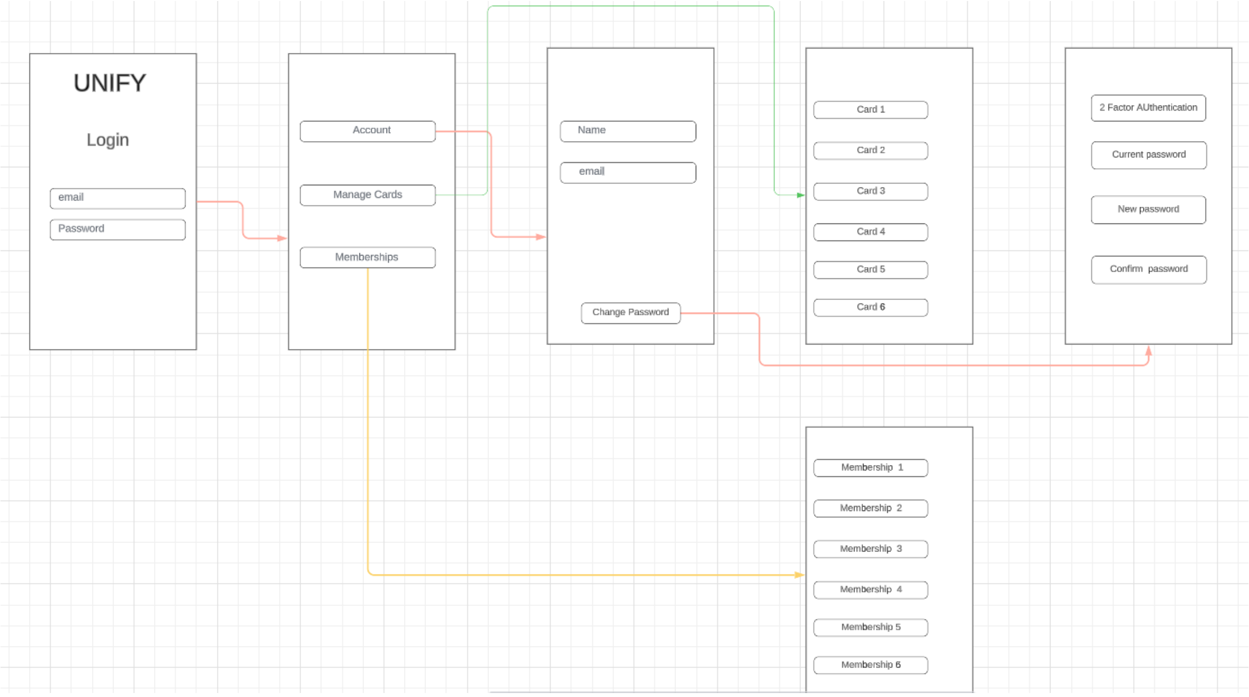
This section is left intentionally blank.

25e Boundary Conditions

The system should handle normal shutdowns in the case of a system restart or other administrative work. In the case of an unexpected shutdown the system should handle to the best of its ability to recover when the system restarts after being unexpectedly shutdown.

Maintenance should be performed on the database(s) that hold user information as it is top priority for our customers and ensuring that the database(s) are in good order will help prevent unexpected issues with data access.

25f User Interface

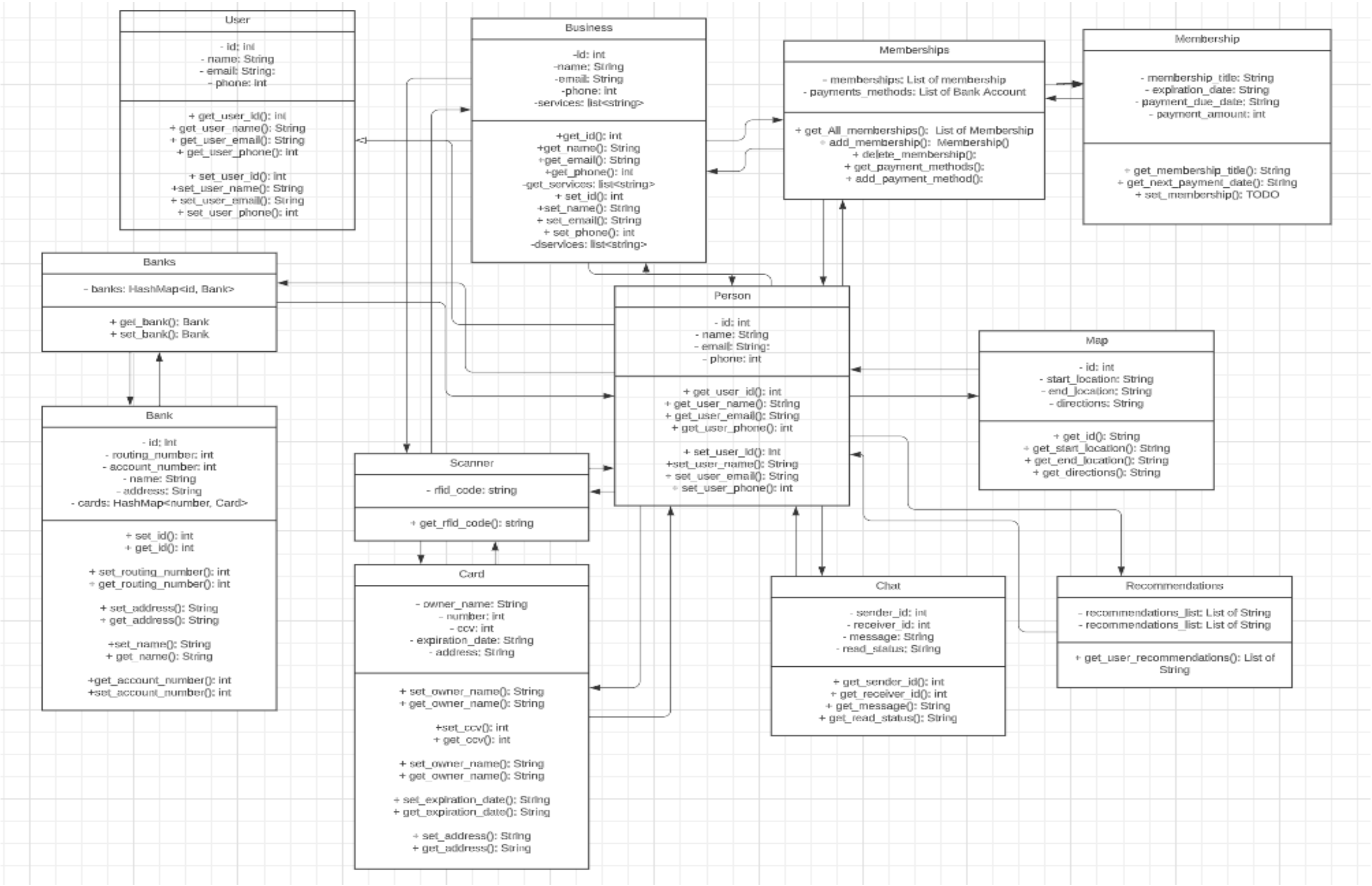


12 User interface

25g Application of Design Patterns

Not applicable.

26 Final System Design



13 Final System Design

27 Object Design

27a Packages

We will need to implement a package that sends a request to certain APIs that we need to implement to have a fully functional application. In addition to that, we will also need a security package where the database can be secure, and that the data can be encrypted to prevent other malicious users from obtaining sensitive data from the database.

IV Project Issues

28 Open Issues

The biggest issue that is not addressed is creating an RFID card that could transmit multiple signals. By design RFID cards can only transmit the information that is encoded on the chip attached to the antenna. RFID cards can have read-write memory that can contain additional information. This memory could then in theory be used to design an RFID card that can be accepted anywhere by updating the data inside the memory. [5]

29 Off-the-Shelf Solutions

There are programmable RFID tags that contain memory banks which can hold user information. UHF Gen 2 RFID tags are an example of such a product which is used commercially in the supply chain industry. [6]

29a Ready-Made Products

UHF Gen 2 RFID tags are a product that is used throughout the supply chain industry to inventory and as such could theoretically be used to achieve our goal. However, something to consider is that for practicality purposes, the hands-on user of a such product would not have an RFID programmer and specialized computer software to program the card.

29b Reusable Components

Left intentionally blank.

29c Products That Can Be Copied

Left intentionally blank.

30 New Problems

30a Effects on the Current Environment

This system could in part replace people that work jobs that typically consist of scanning inventory in a commercial setting. Examples include the gym (gym passes), grocery store (food barcodes) and musical events (event passes).

This system should not, however, completely replace the jobs of the people that work those jobs as such systems would still in part need overwatch and maintenance performed on the underlying systems. An RFID scanner system for example would still need employees to ensure that it’s working properly and resolve any potential issues that could arise.

30b Effects on the Installed Systems

Since the technology for RFID cards and scanners already exists a potential system would be a modified implementation of the current technology that already exists. As such, the technology would be compatible with existing RFID scanner technology.

30c Potential User Problems

No. Adaptation of RFID technology is already widespread. In the US, RFID technology is used for transit passes, Apple Pay and festival wrist bands just to name a few implementations. Since the technology is straightforward to use because it all requires is tapping your card, it has made adoption rapid.

30d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

The real big limitation that could occur would be the system expanding so fast that we would not be able to keep up with growth. Each additional user of the system would in theory imply that a payment method, contact information and other user information should be added to the existing database. On a small scale that wouldn’t present a huge issue.

With that being said, if the system begins to grow rapidly, the system could rapidly begin to fail with millions of users trying to access data. That’s because this system in design is built to provide users with convenience which requires storing large amounts of data about their contact information, payment methods, and other related information.

30e Follow-Up Problems

There could possibly be a lot of people trying to scam money, posting false advertisements on the application, and trying to get into other people’s accounts.

Another problem that could come up is multiple people trying to use the same monthly pass by sharing one account. This can be prevented by only allowing one account to be active at a time, but this would put a limitation on the application.

31 Migration to the New Product

Not applicable.

32 Risks

Failure to produce the card with RFID which is approved by the government.

Failure to meet the rules and regulations set by the banks for transactions.

Failing to produce a card and application system that works effectively reliably for the hands-on user.

33 Costs

$500,000 - $1,000,000.

Cost of a development team to develop and implement the system.

Research and development of an RFID enabled card that can carry out all the requirements that have been set.

Cost of maintaining the system including the database.

All other costs associated with obtaining regulatory approval for such a product so that it can be accepted at retail locations such as stores.

34 Waiting Room

An idea that we plan to implement is to utilize voice-enabled features that could incorporate the user’s voice so that the app can be more user friendly and efficient in accessing their desired data and that they do not need to even tap in the app. In addition to that, we also want to have the app translatable to other languages so that it can reach to other regions of the world and that the voice-enabled features are available in other languages as well.

We also plan to utilize the geolocation services because we want to show users nearby areas who already use our systems (RFID card and scanners) in their stores. As the geolocation requires a map section, we would also need to have a map feature in the app and in that app, we want to have the user’s location, and it could show the user the directions from their current location to a specific location.

We also want to implement the payment methods to not only locations but also partner with bigger transportation companies like the CTA, Uber, Lyft so that users can simply access the app and pay for their rides there. Moreover, we also want to have a “share the cost” type of payment if 2 or more users plan to share a ride together and want to divide the cost equally. For this type of payment method, they could either use their cards or scan the app to pay for it.

We also plan to utilize a rewards program of some sort. This is to incentivize users to use the app more and eventually attract more people to our product.

Finally, a section of the app where users can voice their concerns to help improve our app.

35 Ideas for Solutions

To get this system off the ground, there needs to be first and foremost an RFID card developed. As discussed previously, the ideal candidate for an RFID card would be one that has read-write memory so that the user is able to load different account credentials on their card and therefore have access to all sorts of locations and not limit themselves to just one. Along with that, a system needs to be developed so that the RFID card can be reprogrammed with new values. This system could take on the form in an app, which in the case could be integrated into the app that needs to be developed already. From a logical point of view this would make the most sense as it would be the simplest and most efficient option. Additionally, as a backup the user should be able to use their phone as the RFID card as well in the case, they do not have their card.

For the underlying system there are a few potential candidates for programming languages. Since this project makes use of object design, an object-oriented programming language would be ideal. Therefore, languages like C# and Java would work well. Other languages such as Python can be used as well, although for a large-scale system there are drawbacks.

For the creation of the user interface for a mobile application there are also a few good options. Flutter is developed by Google and works on both iOS and Android. Swift can be used for iOS development. Kotlin can be used with Android Studio for Android development.

For the database side since this system would need to scale, a professional system such as MS SQL would work well.

36 Project Retrospective

Reflecting on the whole semester, we as a team worked very well, everyone showed up at the meeting on time. The team was very well organized, and everyone made their contribution on the semester. There was nothing major during the semester that went very wrong or not as planned. One of the most difficult things during the development project was public speaking during the semester. Another challenging aspect of the project was trying to keep a boundary between the user privacy and the safety.

V Glossary

VS Code: Open-source text editor developed by Microsoft.

Flutter: Framework used for building mobile applications on both iOS and Android.

Firebase: Software development tool used to build mobile applications.

Kotlin: Programming language used for the development of Android apps.

RFID: Technology that uses radio waves to identify people or objects.

MS SQL: Microsoft SQL, a database management system.

VI References / Bibliography

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