

CSE 326  
Information System Design Sessional  
Report on  
**Bus Radar**

Group B2 G5

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# 1 Introduction

The main object of the CSE 326 course is to teach us how to come up with a Information System based solution to a real life problem. Keeping this in mind we chose to tackle the problems faced by citizens of Dhaka when they use local public buses for transportation. We performed this task step by step following proper software engineering principles and conventions. We started by identifying the problems precisely and coming up with concise high level solutions to tackle them. Then we developed our proposed solution further and represented it using a BPMN diagram. Then a Mock UI was developed to help us visualize the final goal better. Next we developed Class Diagram, ERD, Sequence Diagram and Collaboration Diagram to ensure we had a proper plan in mind before we actually implemented our proposed solution in code. Finally, we fully implemented a functional module of our proposed solution.

## 2 Motivation

The Information that we developed is called Bus Radar. It aims to tackle the common problems faced by passengers of local buses in Dhaka by implementing some key features; we identified these key features by analysing the problems and the existing solutions.

### 2.1 Problems Bus Radar Aims to Tackle

- Local bus data not readily available
  - Route data
  - Fare Data
  - Stoppage
- Uncertain waiting at bus stops
  - no idea of bus location
  - no idea of ETA
- No automated payment system for local bus
- Lack of customer feedback system

### 2.2 Major Features of Bus Radar

- Bus suggestion based on destination
- Optimal route selection based on traffic data
- Map based guide to bus stoppage
- Live location and ETA of bus arrival
- Reliable bus fare system
- Automated cashless payment system

## **2.3 Relevant Existing Solutions**

- Route and fare data - static & outdated websites
- Automated payment - only inter district bus
- Live bus location - not available

### 3 BPMN Diagram

In our BPMN diagram we have created three different pools for showing the customer side, payment side and company side.

#### 3.1 Customer Side

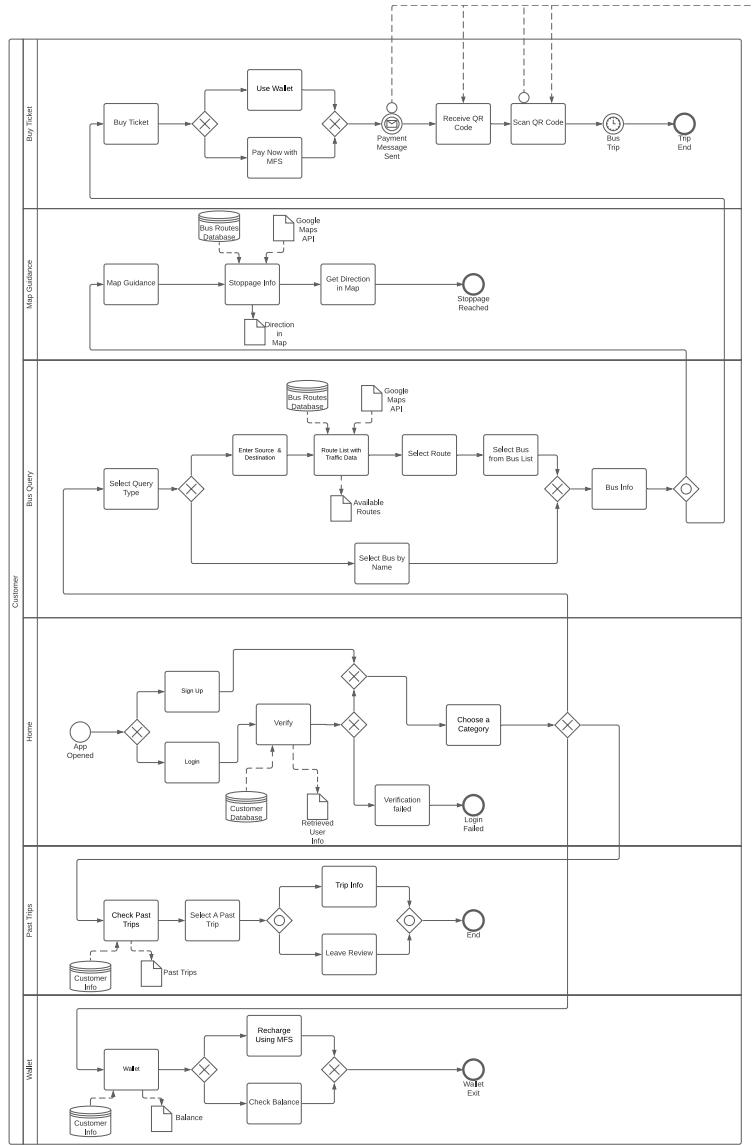


Figure 1: Customer Side

The customer pool gives us a glimpse of the all the options a customer will have after logging in such as checking past trips, recharging or checking wallet, searching for a bus etc.

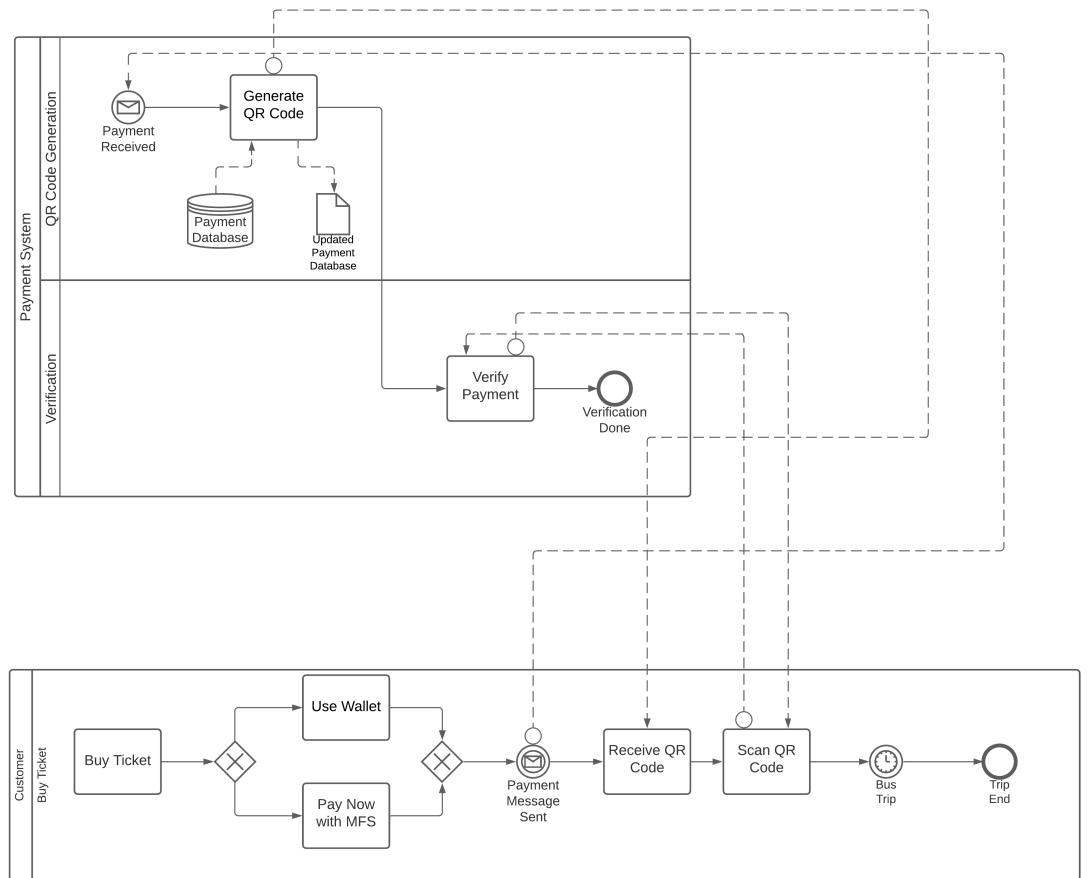


Figure 2: Payment System

The Bus Query lane here eventually takes us to the map guidance module and buying ticket and starting a journey.

### 3.2 Payment System

The payment system includes three lanes Buy Ticket, QR code generation and verification. The customer would first buy a ticket and receive a QR code from the payment system pool, finally verifying that code communicating with the verification lane of payment system pool.

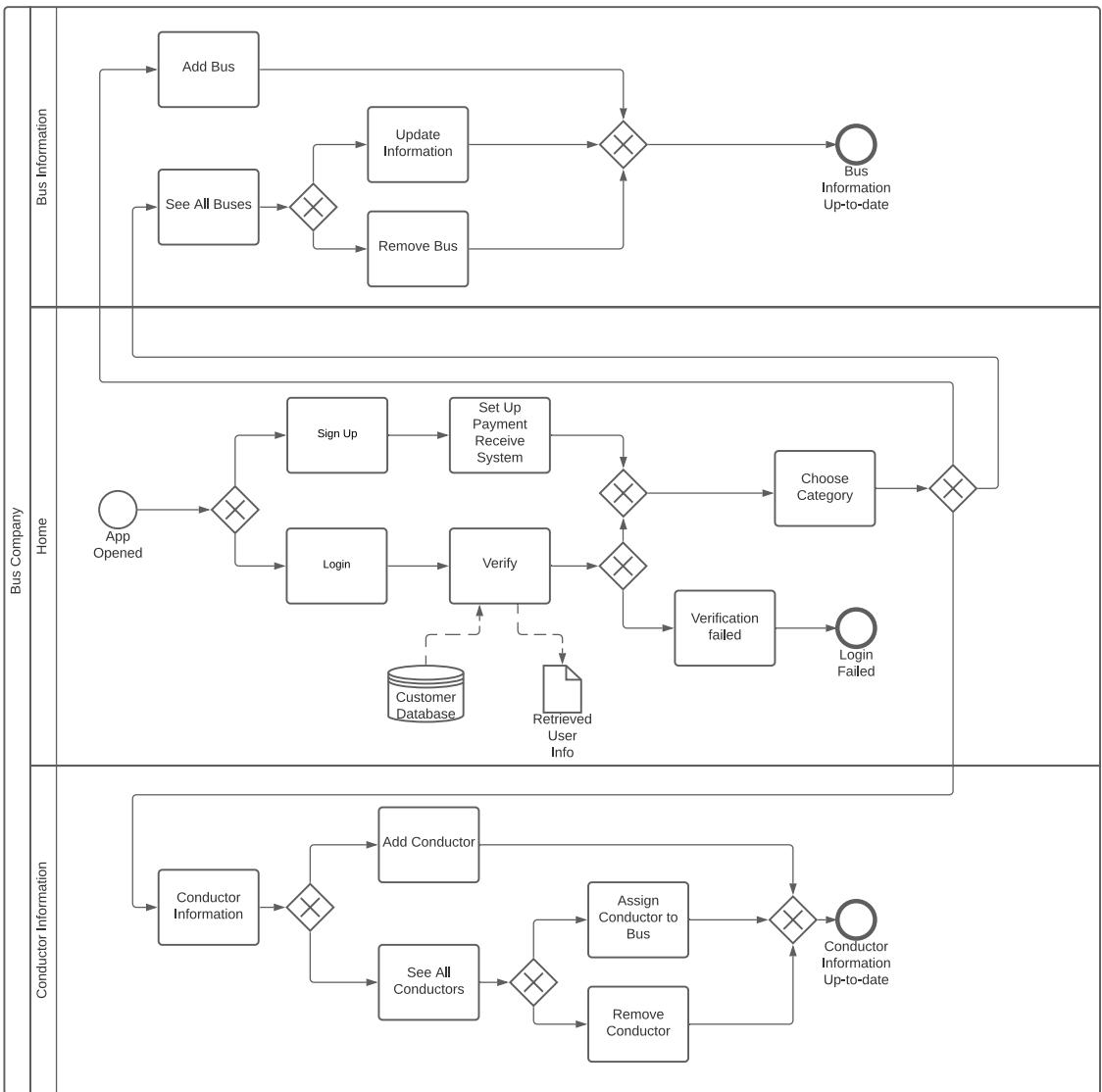


Figure 3: Company Side

### 3.3 Company side

In the company side the companies can login and update bus and conductor information. They can assign conductors to individual buses as well.

### 3.4 Complete BPMN

Merging all three pools we get the complete BPMN.

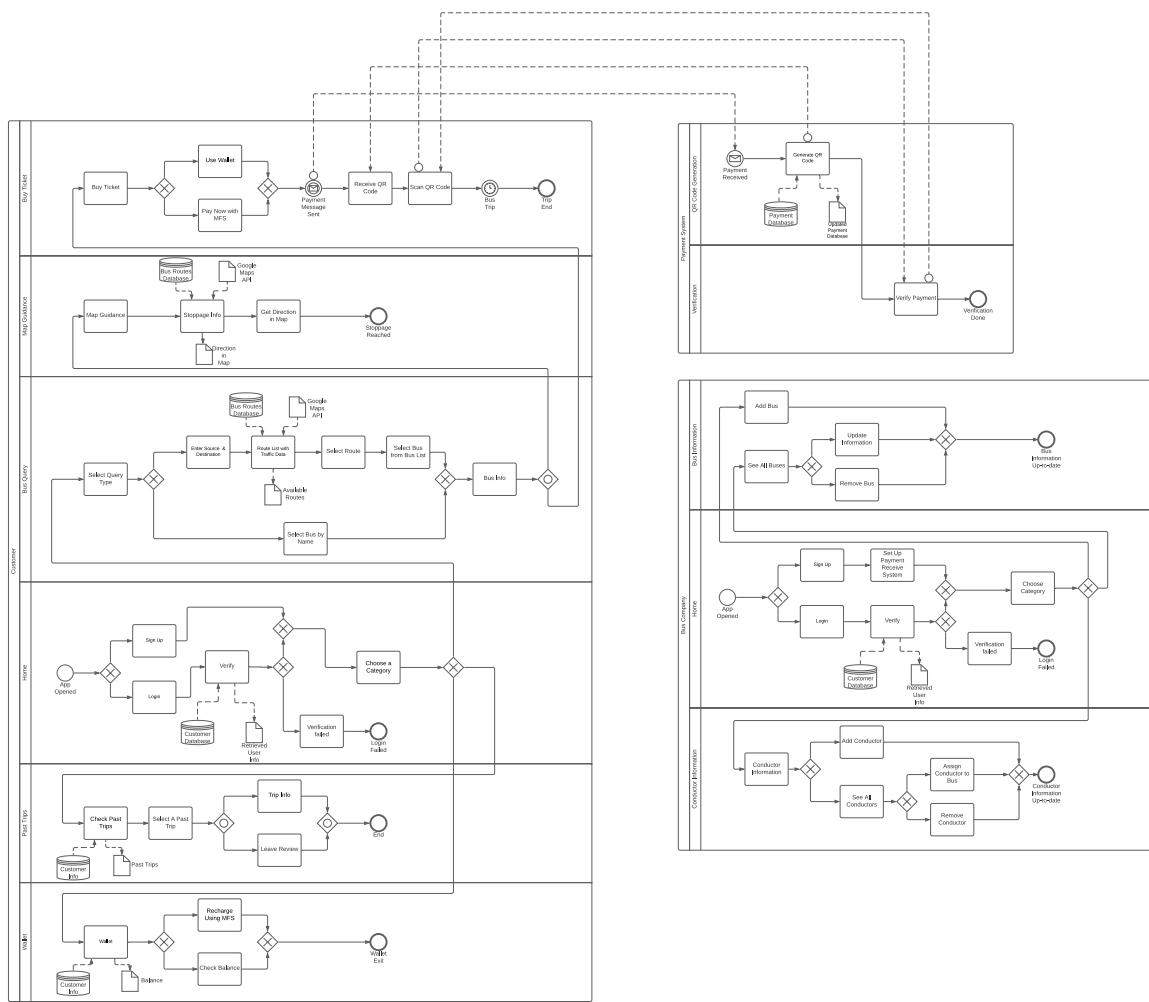


Figure 4: Complete BPMN

## 4 Mock UI

The mock UI has three different view for three different users. Mobile app views for the customer and conductor and a website for the bus company.

### 4.1 Customer Side

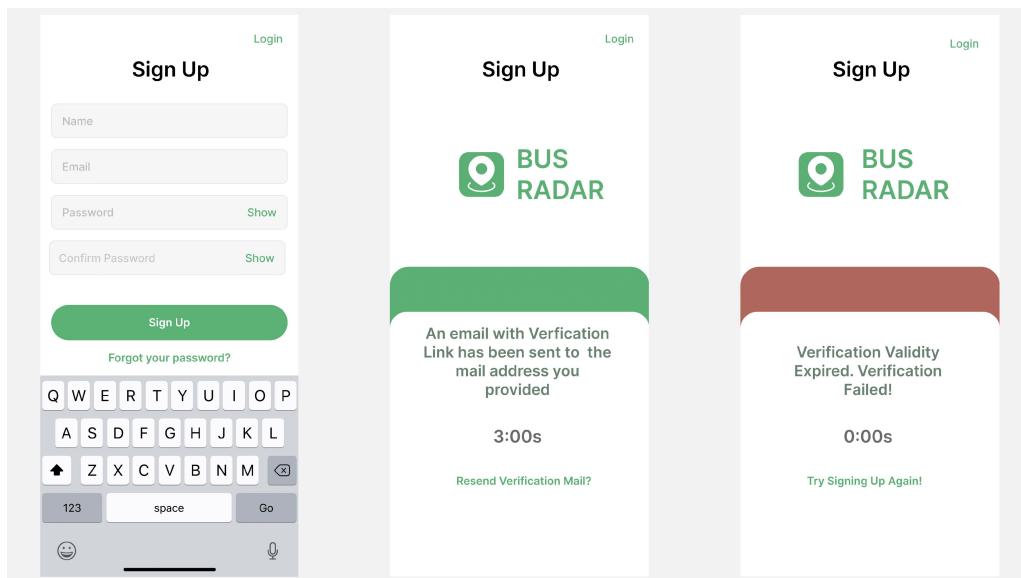


Figure 5: Conductor Login and Home

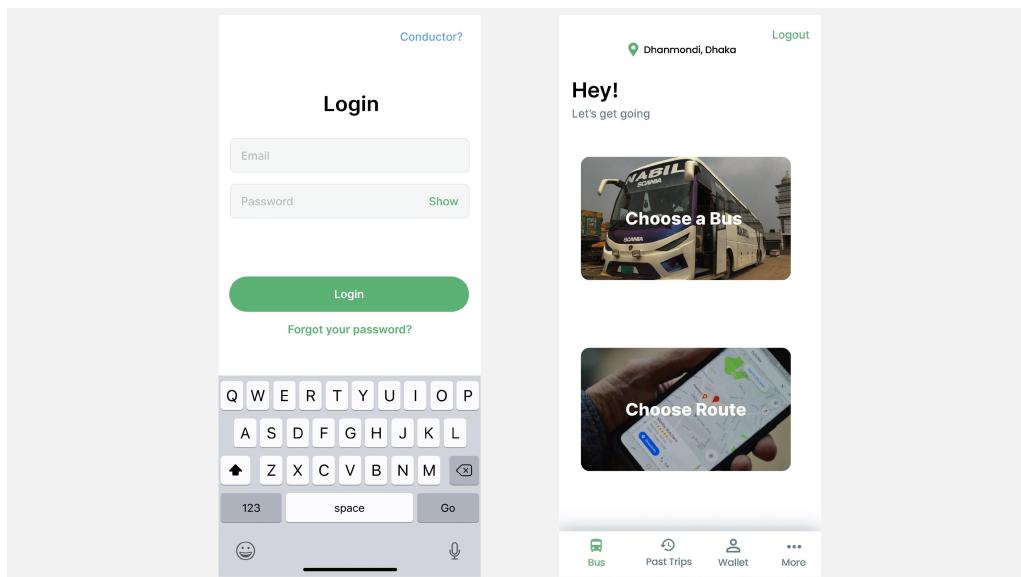


Figure 6: Customer Login and Home

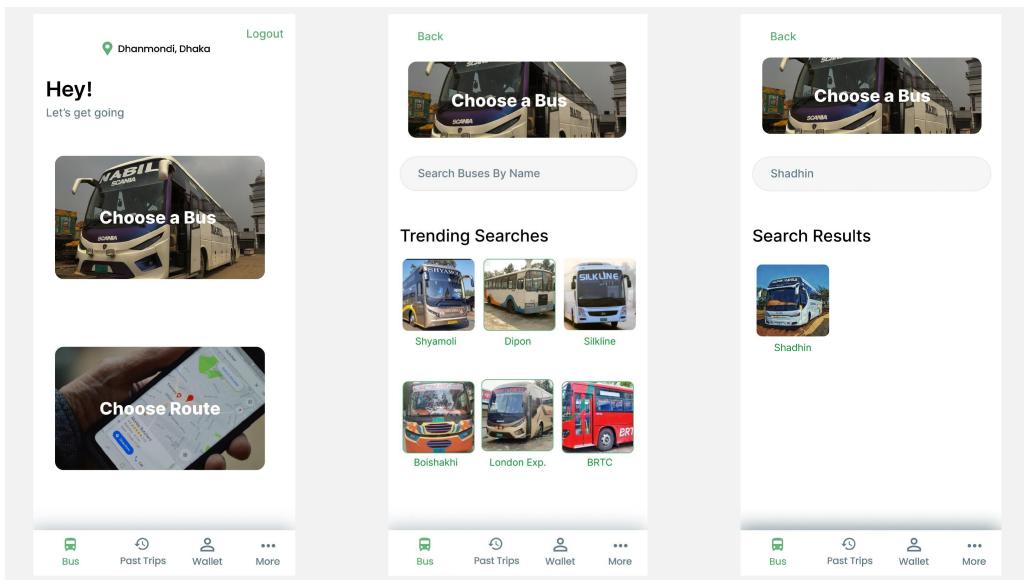


Figure 7: Customer Choose Bus

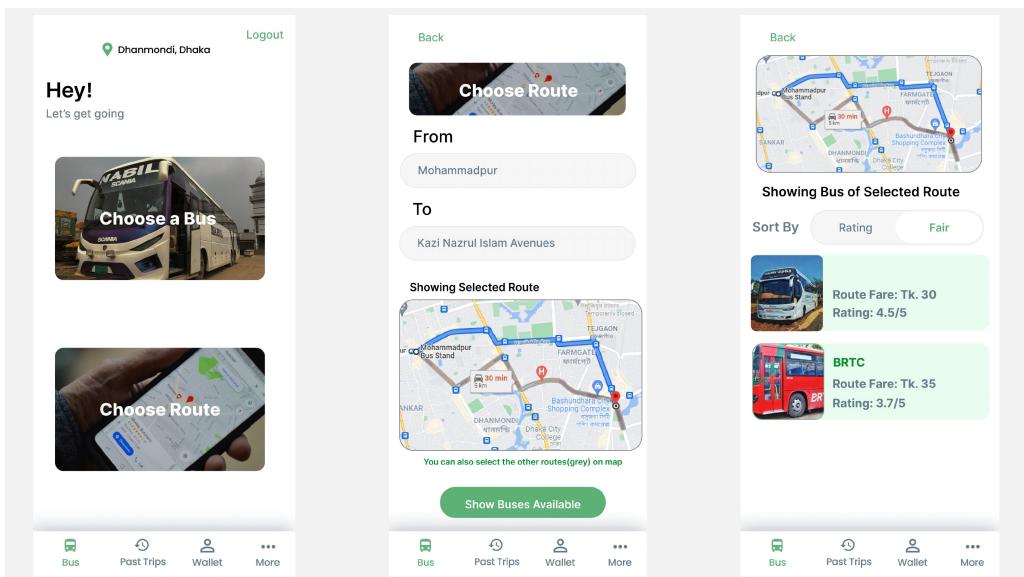


Figure 8: Customer Choose Route

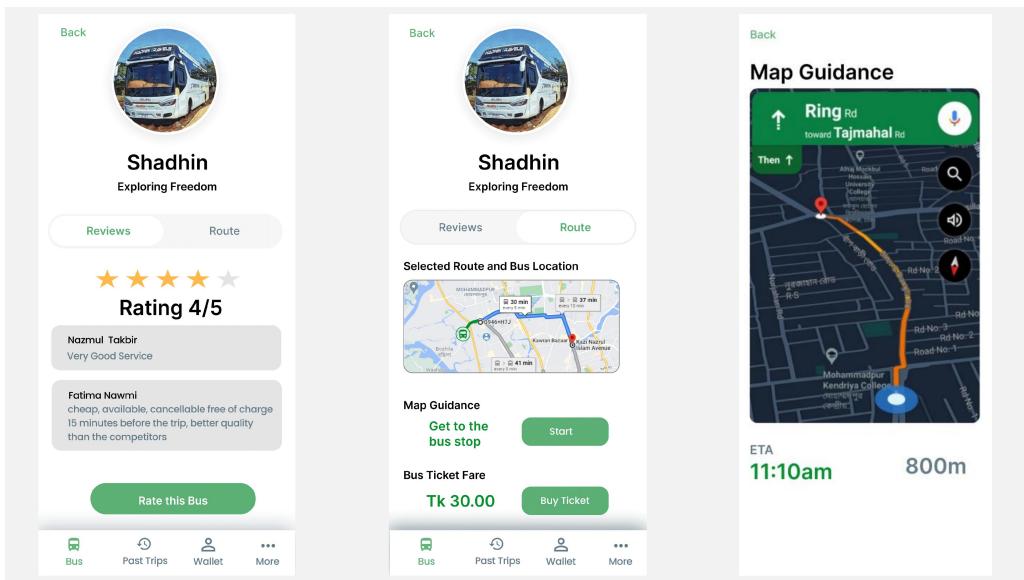


Figure 9: Customer Bus Information

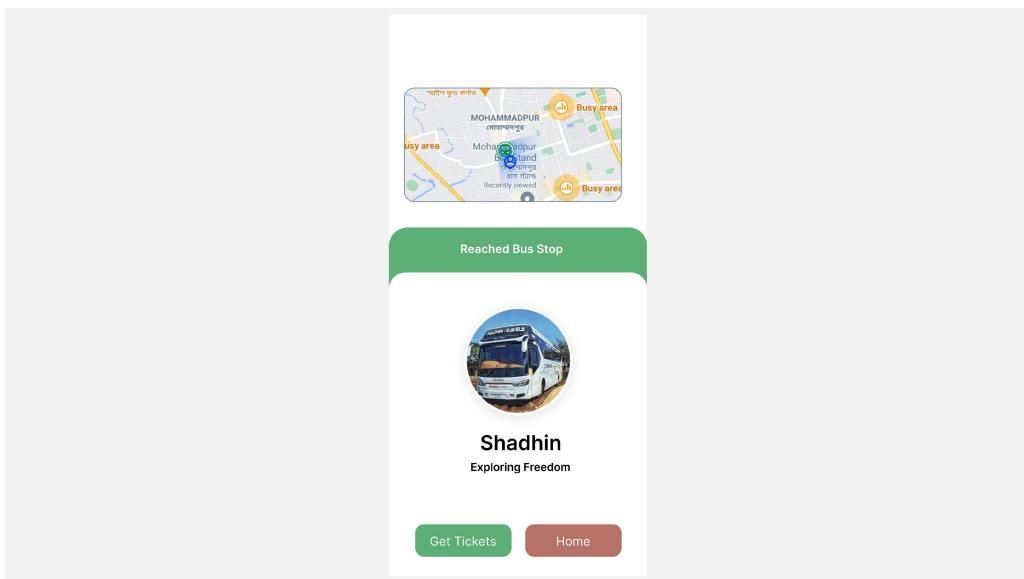


Figure 10: Customer Reached Bus Stand

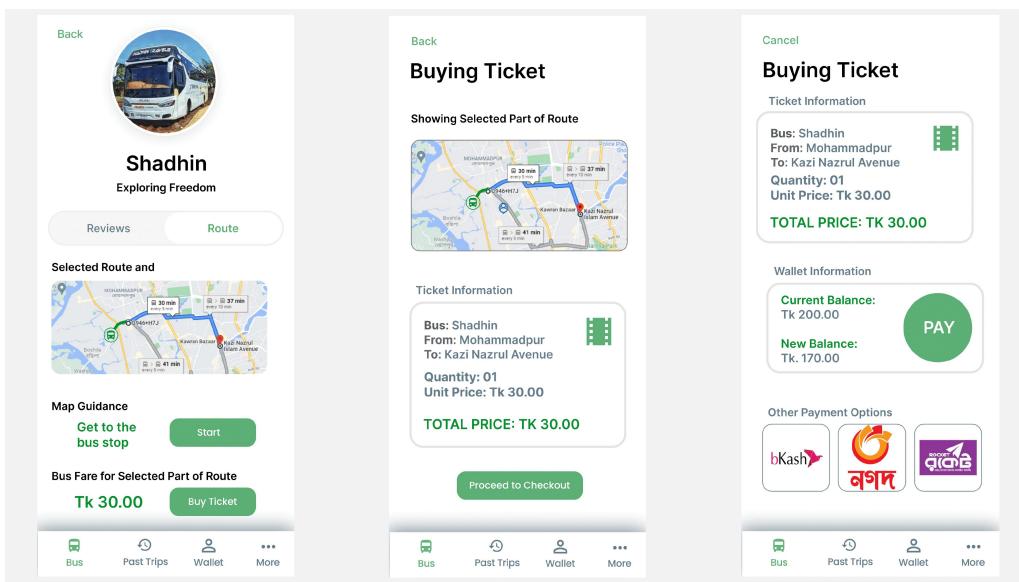


Figure 11: Customer Buying Tickets

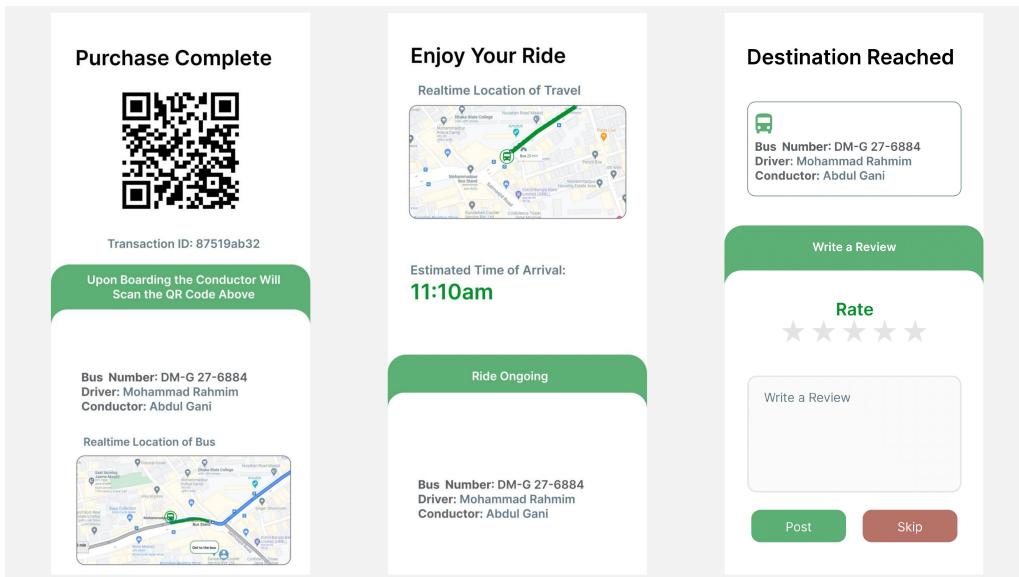


Figure 12: Customer Taking a Ride

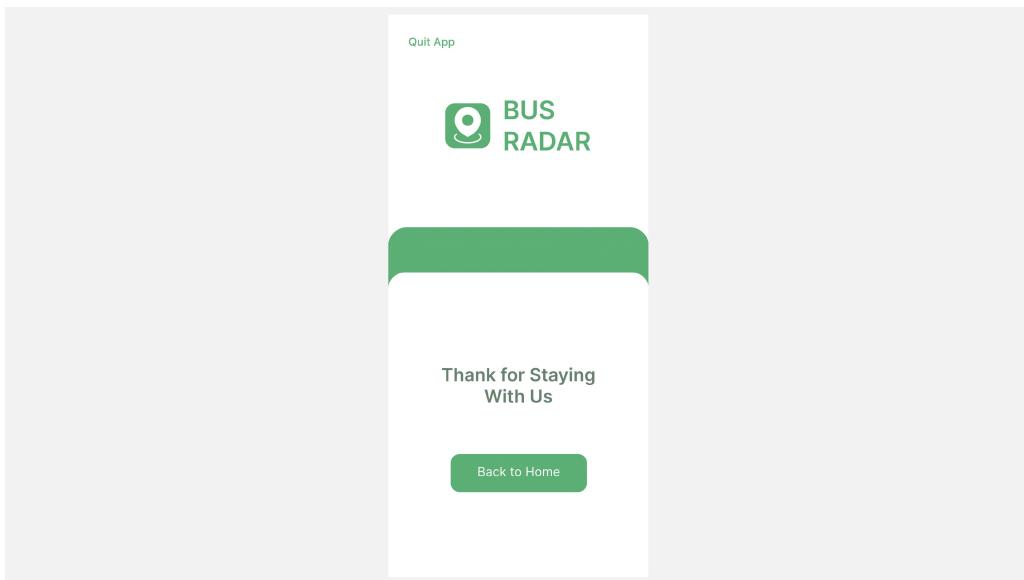


Figure 13: Customer Thank You Pop up

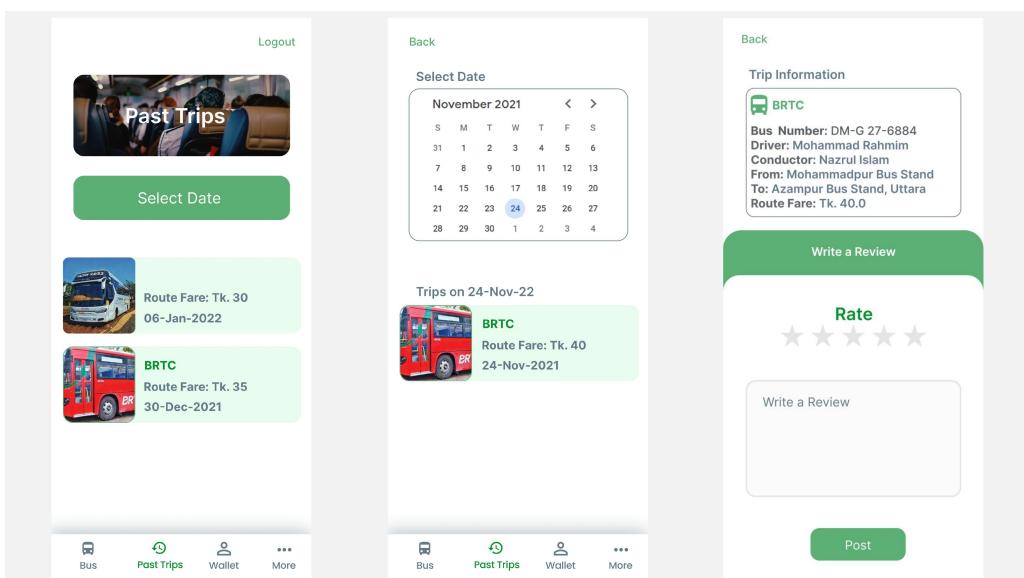


Figure 14: Customer Past Trips

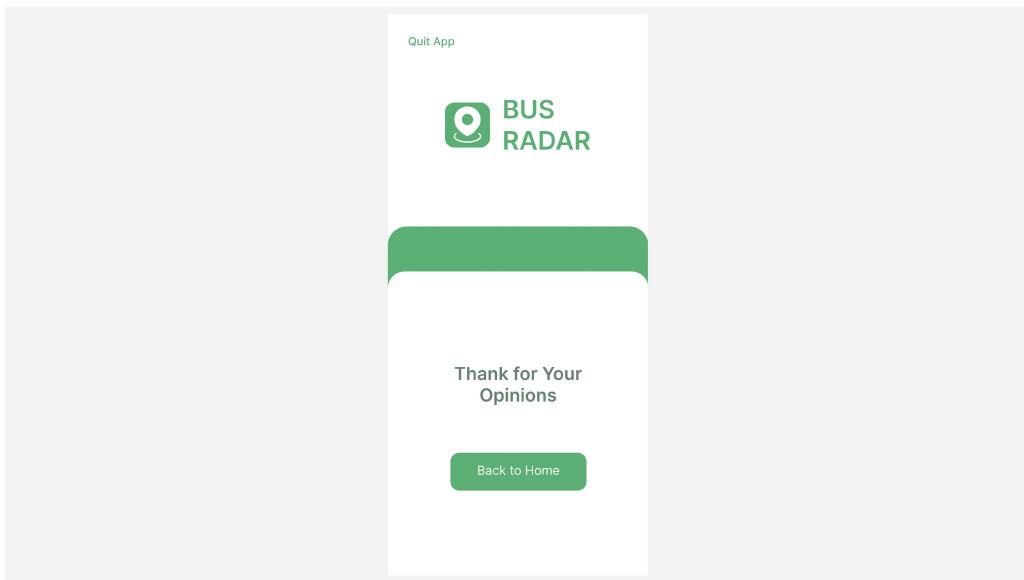


Figure 15: Customer Review Post Popup

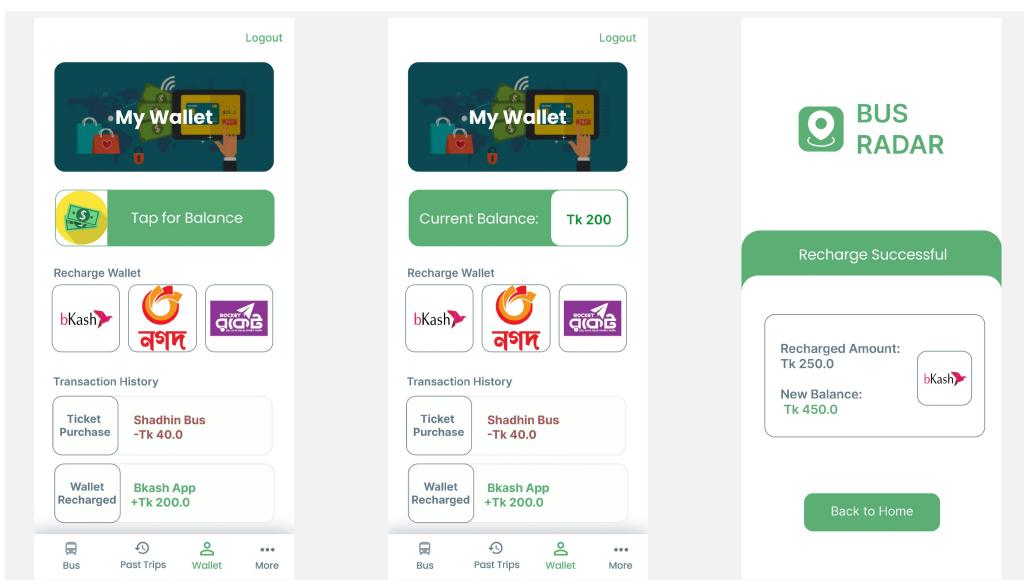


Figure 16: Customer Wallet

## 4.2 Conductor Side

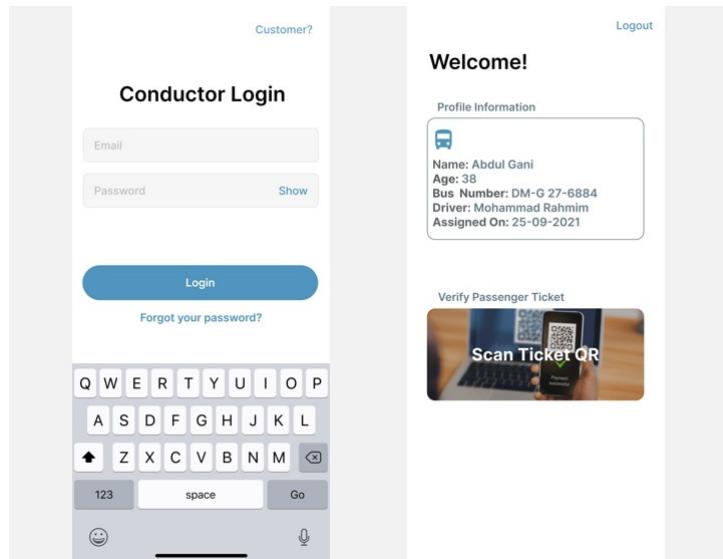


Figure 17: Conductor Login and Home

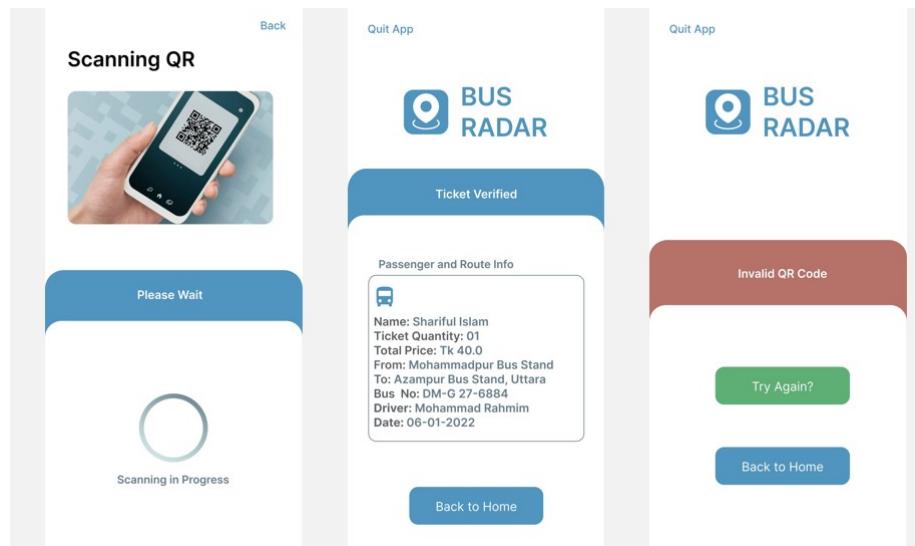
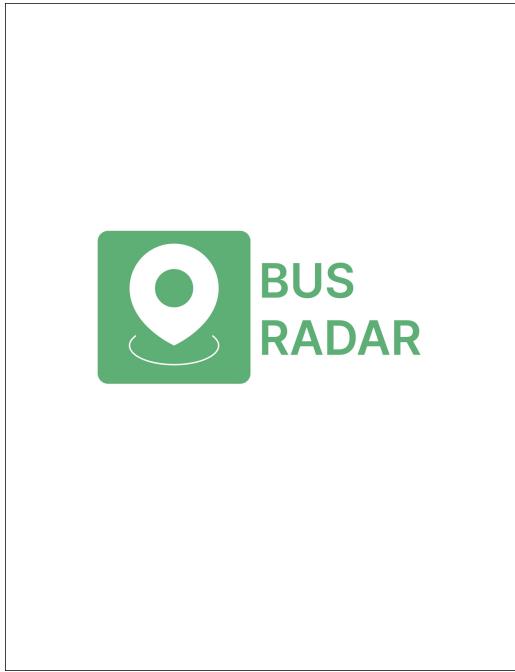


Figure 18: Conductor Scanning QR

### 4.3 Bus Company Side



Welcome back  
**Login to your account**

Email  
John.snow@gmail.com

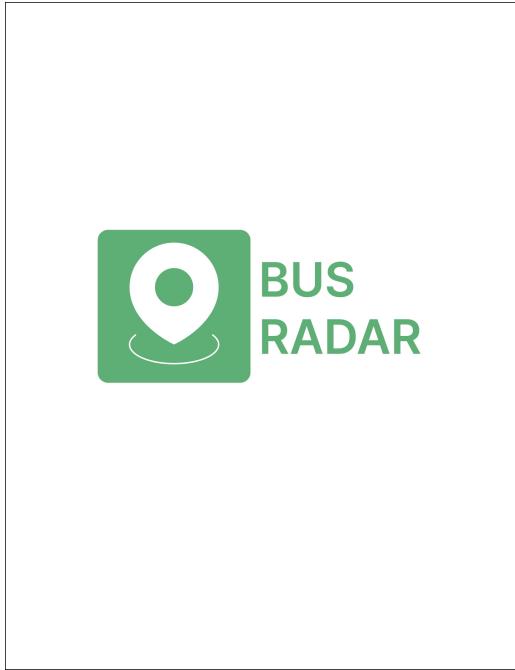
Password  
\*\*\*\*\*

Remember me [Forgot password?](#)

**Login now**

Don't have an account? [Join free today](#)

Figure 19: Bus Company Login



**Register a new company**

Company Name

Email

Password

Confirm Password

**Sign up**

Already Have a Company? [Login Now](#)

Figure 20: Bus Company Register

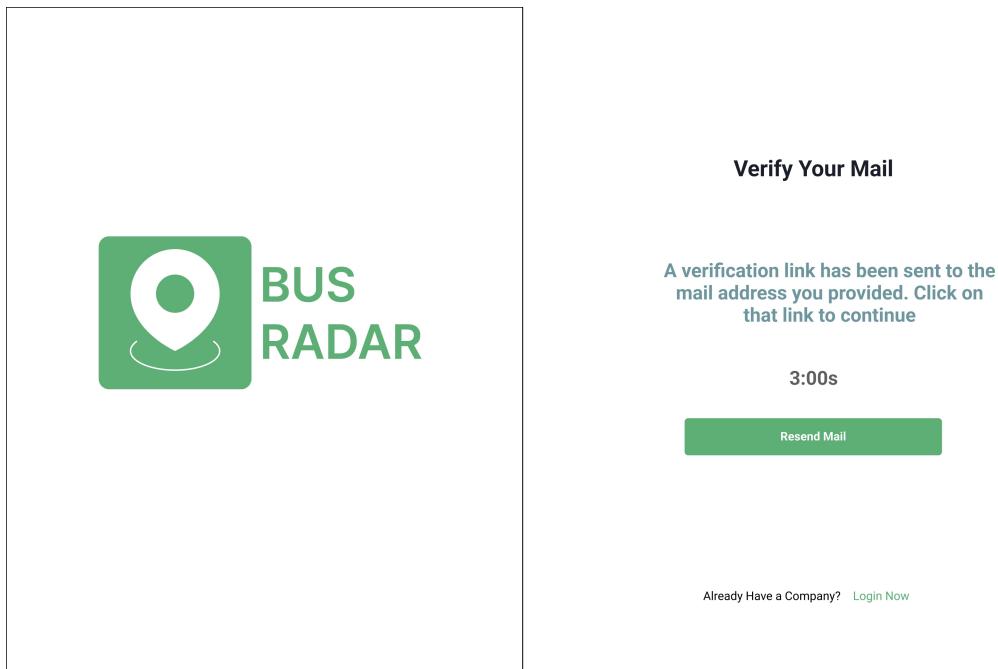


Figure 21: Bus Company Verify Mail

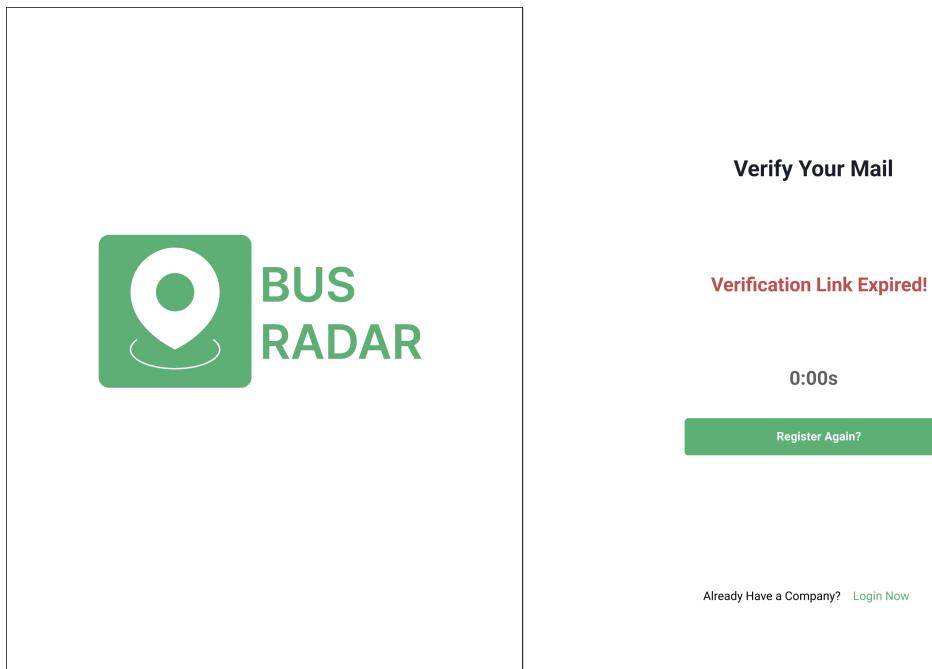


Figure 22: Bus Company Verification Failed

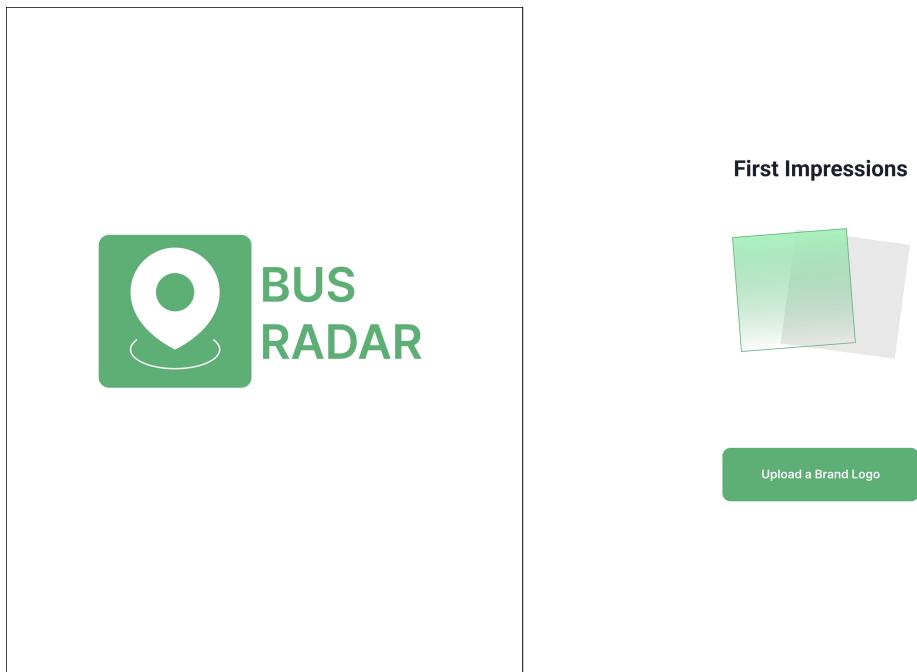


Figure 23: Bus Company Add Brand Logo

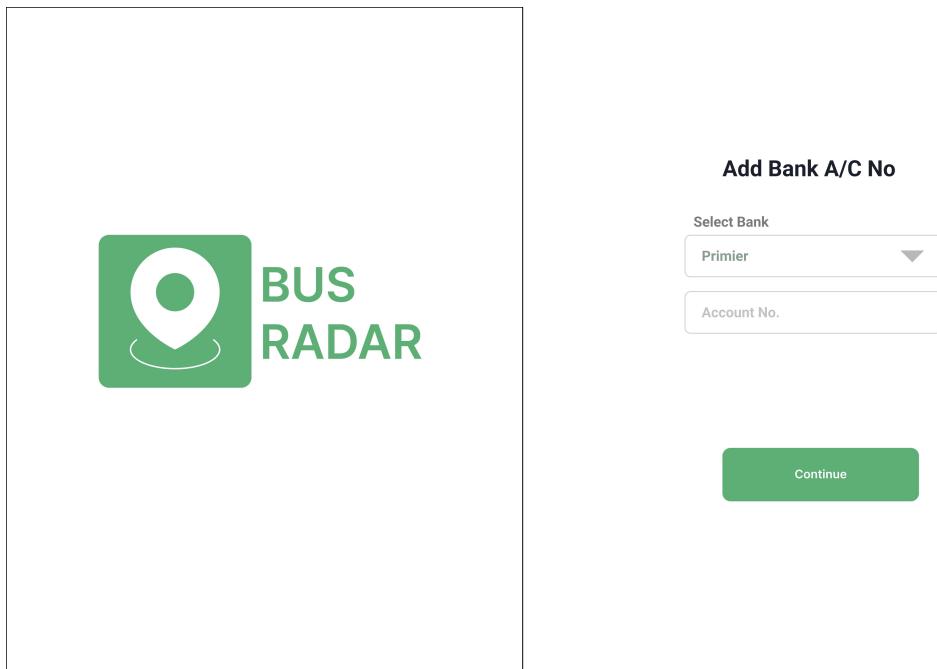


Figure 24: Bus Company Add Bank Account

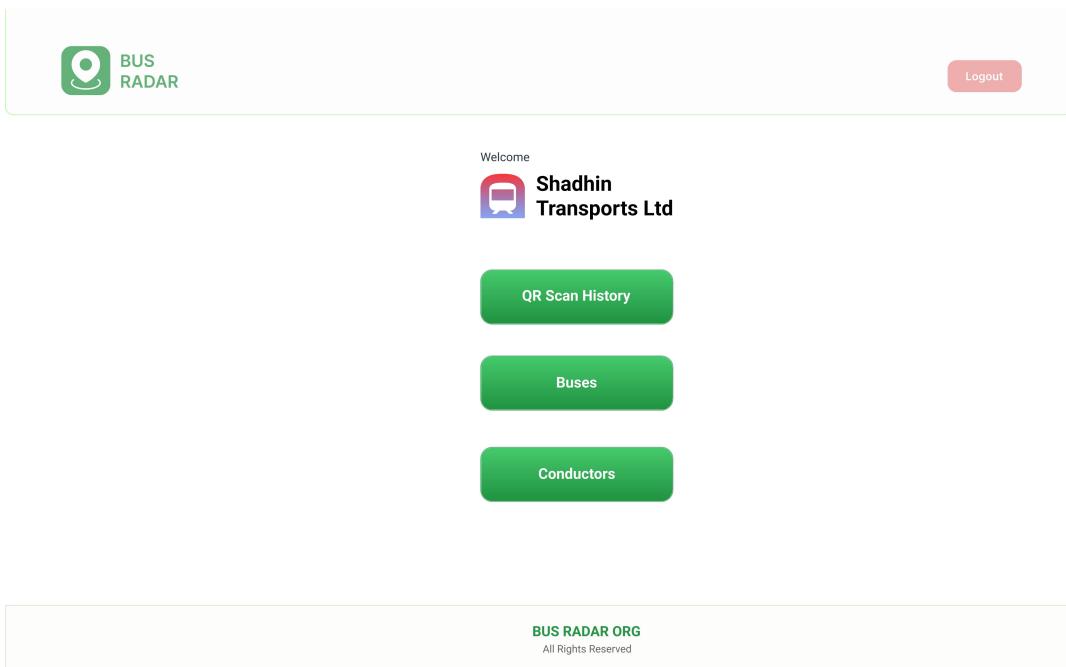


Figure 25: Bus Company Home page

| ID | Bus Number  | Conductor  | Route        | Bus Stands                           | Actions   |
|----|-------------|------------|--------------|--------------------------------------|---|
| 1  | DM-G-145067 | Abdul Gani | Mdpur-Uttara | Mdpur-Dmd-Farmgate-Ban-Shewra-Uttara | <button>update</button> <button>remove</button> |
| 2  | DM-G-145066 | Rahmin Md  | Mdpur-Uttara | Mdpur-Dmd-Farmgate-Ban-Shewra-Uttara | <button>update</button> <button>remove</button> |
| 3  | DM-G-145045 | Rahim Miya | Mdpur-Shewra | Mdpur-Dmd-Farmgate-Ban-Kakali-Shewra | <button>update</button> <button>remove</button> |
| 4  | DM-G-145034 | Asif Ajrof | Mdpur-Uttara | Mdpur-Dmd-Farmgate-Ban-Shewra-Uttara | <button>update</button> <button>remove</button> |

At the bottom right of the main content area is a footer box containing 'BUS RADAR ORG' and 'All Rights Reserved'.

Figure 26: Bus Company List of Buses

| Name       | Email                | Phone            | Date Joined | Assigned to Bus | Actions   |
|------------|----------------------|------------------|-------------|-----------------|---|
| Abdul Gani | abdulgani@gmail.com  | +880 1912-112282 | 23-08-20    | DM-G-145067     | <button>update</button> <button>remove</button> |
| Rahim Miya | rahmi52619@gmail.com | +880 1515-102982 | 23-08-20    | DM-G-145065     | <button>update</button> <button>remove</button> |
| Md. Kuddus | kudosmd@gmail.com    | +880 1945-112345 | 24-08-20    | DM-G-145068     | <button>update</button> <button>remove</button> |
| Asif Ajrof | asaj007@gmail.com    | +880 1815-112892 | 24-08-20    | DM-G-145070     | <button>update</button> <button>remove</button> |

Next Page >

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Figure 27: Bus Company List of Conductors

**Add New Bus**

Bus no 1

Conductor for bus1 +/-

Route Source      Route Destination

Press green markers📍 to indicate bus stands:

**ADD BUSES**

**BUS RADAR ORG**  
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Figure 28: Bus Company Add New Bus

Welcome

**Shadhin  
Transports Ltd**

[Home](#) [Logout](#)

**Add New Conductor**

Name

Email

Phone

Assign to Bus no.

Password

Confirm Password

[Done](#)

**BUS RADAR ORG**  
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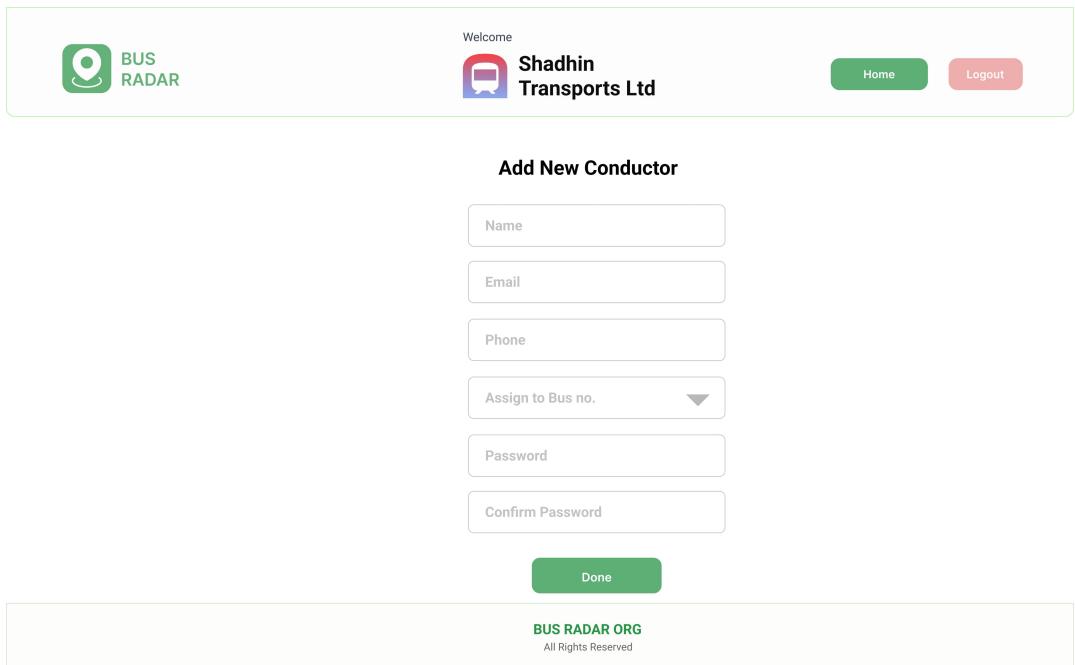


Figure 29: Bus Company Add New Conductor

Welcome

**Shadhin  
Transports Ltd**

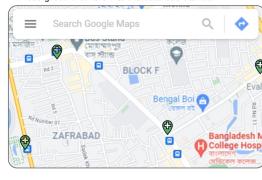
[Home](#) [Logout](#)

**Update Bus Info**

Bus no

Conductor for bus

Route Source  Route Destination

Press green markers📍 to indicate bus stands:  


[Update Info](#)

**BUS RADAR ORG**  
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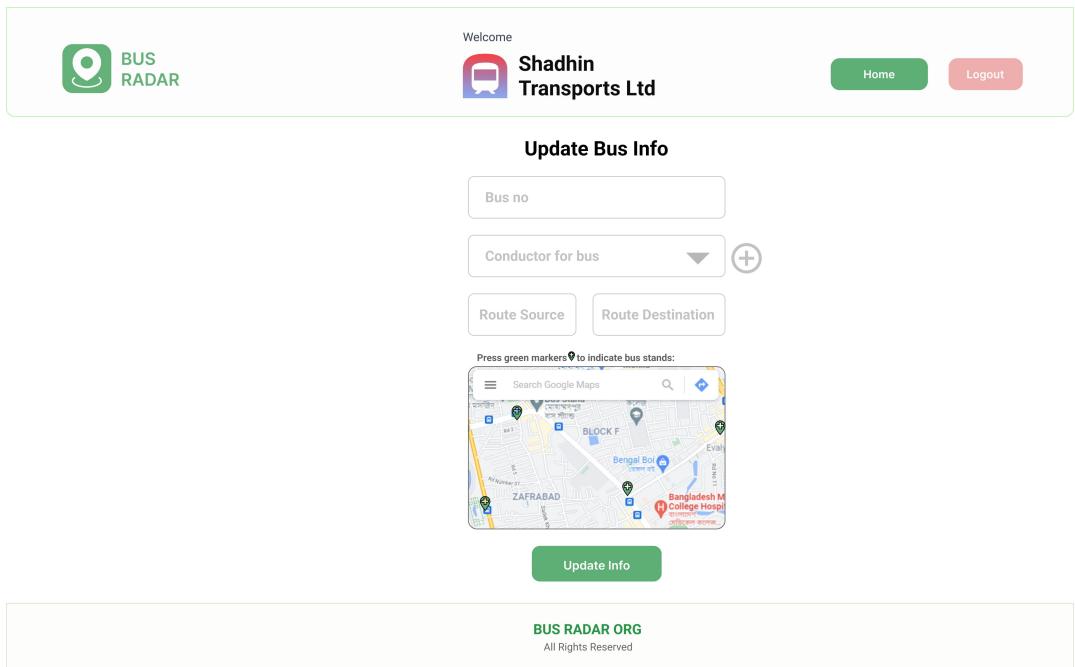


Figure 30: Bus Company Update Bus Information

Welcome

**Shadhin  
Transports Ltd**

Home Logout

**Update Conductor Info**

|                     |
|---------------------|
| Abdul Gani          |
| abdulgani@gmail.com |
| +880 1912-112282    |
| DM-G-145067         |
| *****               |
| *****               |

Update

**BUS RADAR ORG**  
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Figure 31: Bus Company Update Conductor Information

| Name | Route | Conductor | Date of Travel | Bus No | Fare |
| --- | --- | --- | --- | --- | --- |
| Saif Gani | Dmd-Bashundhara | Abdul Gani | 23-08-20 | DM-G-145067 | TK 35.0 |
| Shorif S | Mhdpur-Uttara | Rahim Miya | 04-09-20 | DM-G-145067 | TK 40.0 |
| Nawmi | Dmd-Azimpur | Kuddus | 23-09-20 | DM-G-145067 | TK 40.0 |
| Mr. Bean | Mhdpur-Uttara | Asif Ajrof | 24-09-20 | DM-G-145067 | Tk 45.0 |

 A 'Next Page >' button is at the bottom, and the footer reads 'BUS RADAR ORG All Rights Reserved'."/>

Welcome

**Shadhin  
Transports Ltd**

Home Logout

**QR Scan History**

| Name      | Route           | Conductor  | Date of Travel | Bus No      | Fare    |
|-----------|-----------------|------------|----------------|-------------|---------|
| Saif Gani | Dmd-Bashundhara | Abdul Gani | 23-08-20       | DM-G-145067 | TK 35.0 |
| Shorif S  | Mhdpur-Uttara   | Rahim Miya | 04-09-20       | DM-G-145067 | TK 40.0 |
| Nawmi     | Dmd-Azimpur     | Kuddus     | 23-09-20       | DM-G-145067 | TK 40.0 |
| Mr. Bean  | Mhdpur-Uttara   | Asif Ajrof | 24-09-20       | DM-G-145067 | Tk 45.0 |

Next Page >

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Figure 32: Bus Company QR Scan History

## 5 Class Diagram

In the design of our class diagram we have followed the Model, View, Controller architecture. The View classes (aka the Boundary classes) handle how data is presented and taken as input from the frontend. The Controller classes process and control the flow of data between the View and Model classes. The Model classes (aka the Entity classes) represent entities from the database; they allow the programmer to think at the abstraction level of entities instead of raw data types like integer and strings when implementing different algorithms and policies in the Controller classes.

The entire class is rather large, so we present the class diagram 1 module at a time.

### 5.1 Customer Registration, Login

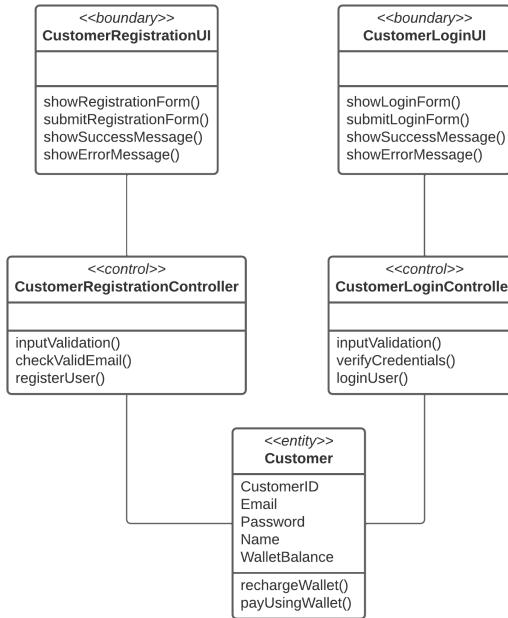


Figure 33: Customer Registration and Login

Dividing the login and registration modules into 3 different types of classes gives us more flexibility. More example, the boundary classes can focus on improving customer's user experience by providing proper message to the user during any

error, while the controller class can focus on handling the security side of user authentication.

## 5.2 Search

The search module is divided into two parts - search for a specific bus or searching for a specific route. The two parts have different boundary and controller classes which help us to keep the logics involved independent and manageable. The GoogleMapAPI class is a special type of class which uses information present in our database about the different Bus Stops and Bus Routes and displays them in an interactive map.

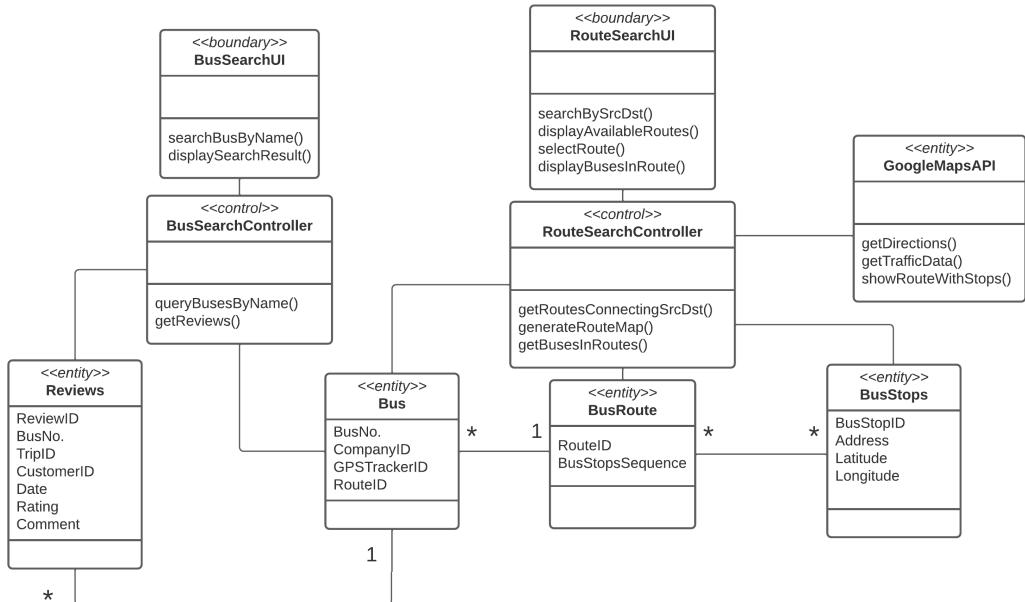


Figure 34: Bus Search & Route Search

## 5.3 Bus Info

This module deals with showing the customer the detailed information about a particular Bus. The GPSDataCollector class here is a novel addition which is involved in collecting and processing the location data being streamed by the GPS trackers on each bus. The StoppagePathUI is a class that handles navigating the customer to a nearby Bus Stop once the customer has chosen to use this feature.

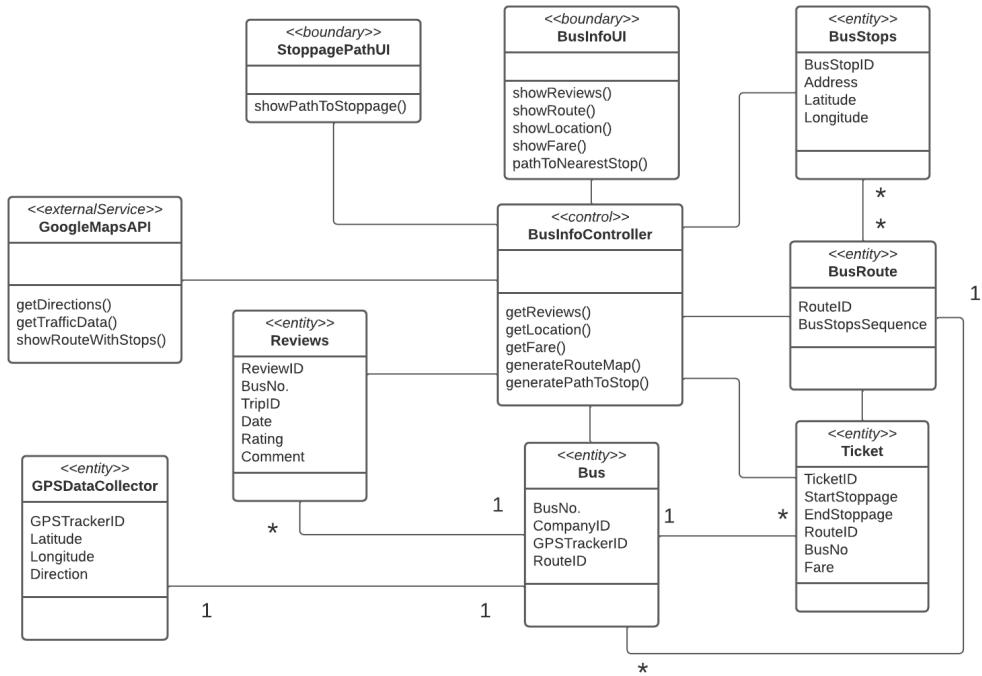


Figure 35: Bus Info

## 5.4 Ticket Purchase

The ticket purchase module allows the customer to purchase a ticket using two different types of payment method - MFS (Mobile Financial Service) or Wallet. The MFS integrator class handle the interaction of our system with MFS providers like BKash or Nagad.

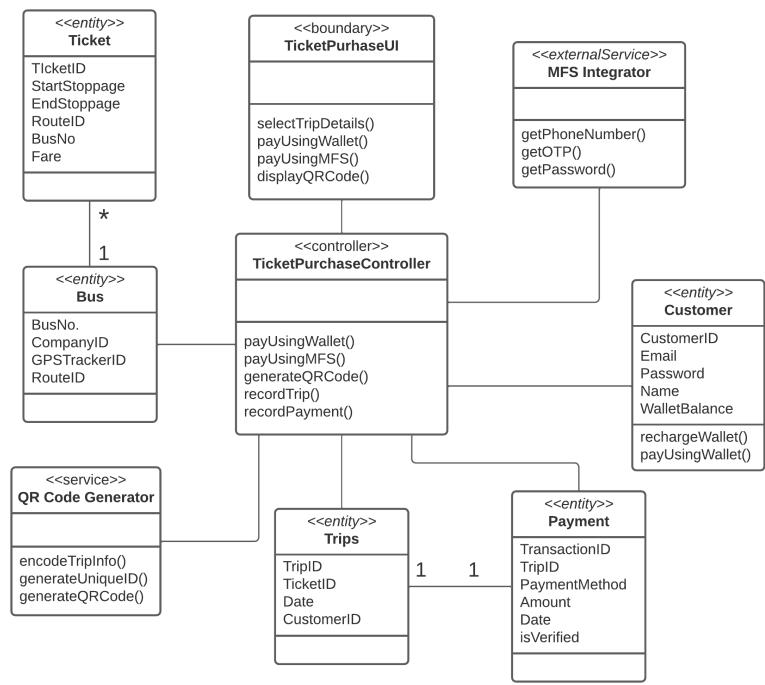


Figure 36: Ticket Purchase

## 5.5 Trips

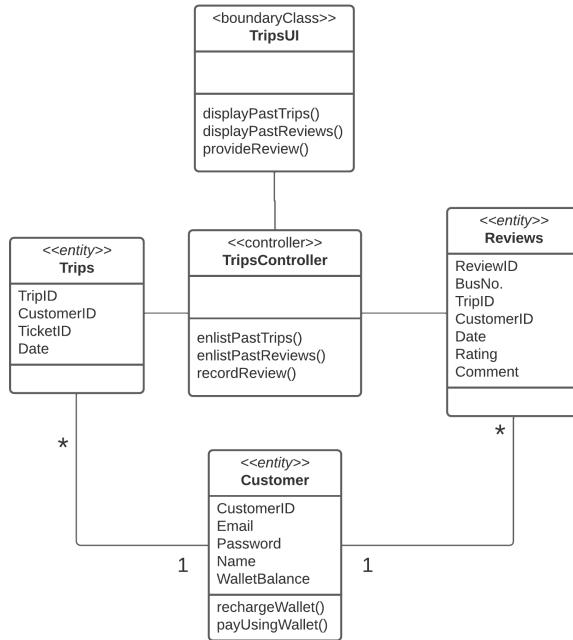


Figure 37: Trips

This module allows the customer to view his/her past trips and provide some feedback in the form of comments or ratings if he/she wants to do so.

## 5.6 Wallet

This module allows the customer to recharge his/her wallet, view the current wallet balance and get information about past transactions that he/she has made.

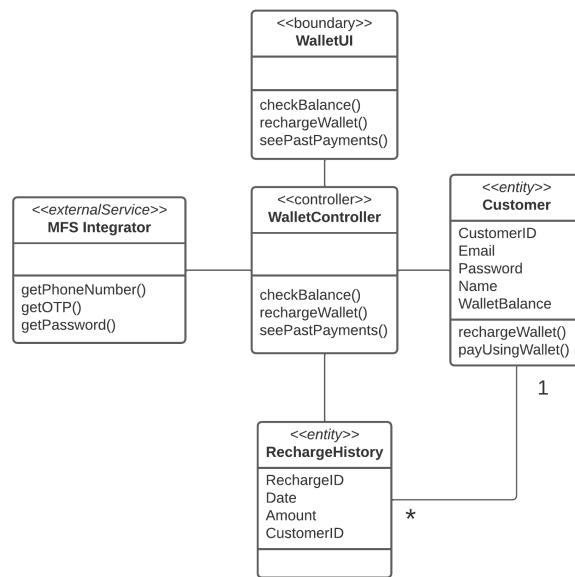


Figure 38: Wallet

## 5.7 Bus Company Registration, Login

Our module for registration and login of bus companies is separate from that for customers because the two involve different types of data being processed, and also might require different levels of security.

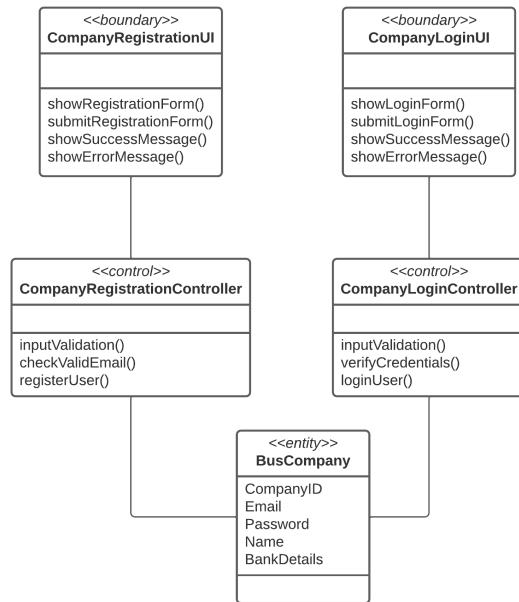


Figure 39: Bus Company Registration, Login

## 5.8 Update Bus Info

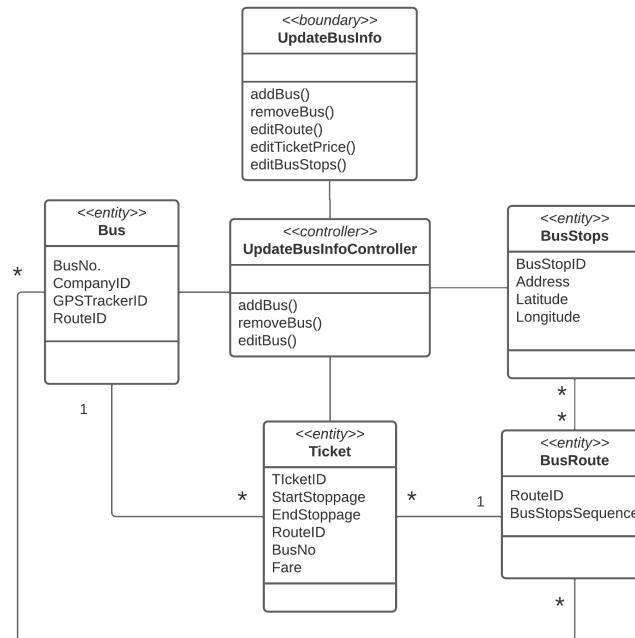


Figure 40: Update Bus Info

This module allows the bus company to update the information about the buses that they are offering.

## 5.9 Update Conductor Data

This module allows the bus company to assign/unassign conductors to different buses in their fleet.

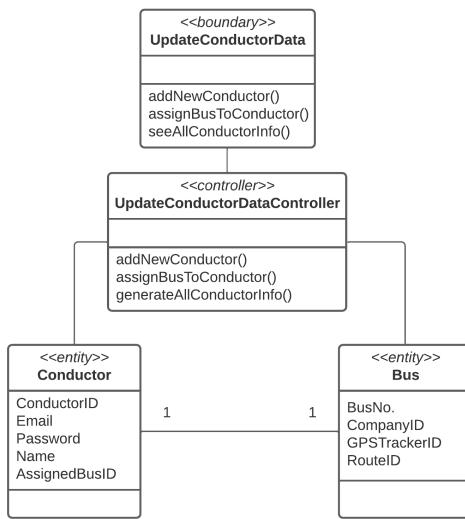


Figure 41: Update Conductor Data

## 5.10 Conductor Actions

In our system, the bus company provides the conductor with an account. The conductors can then login into those accounts and personalize it for themselves. The conductors can use their account to verify the tickets presented to them by the customers.

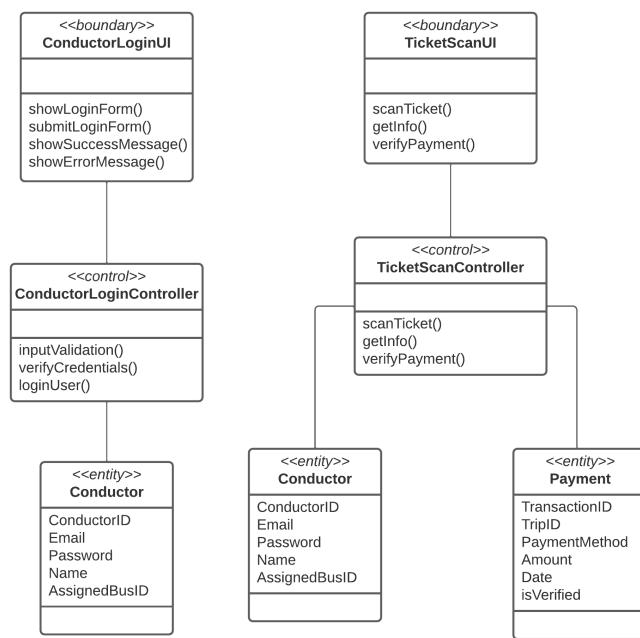


Figure 42: Conductor Actions

## **6 Entity-Relationship Diagram (ERD)**

Our Entity-Relation diagram is comprised of four components:

1. Company Side
2. Bus Information Side
3. Customer-Trip Side
4. Recharge Side

## 6.1 Company Side

In our company side, each company has many conductors and and buses. Bus assigning to conductors is maintained with ‘Bus Assignment’ entity. To help keep track of bank account information of companies, Bank entity is introduced.

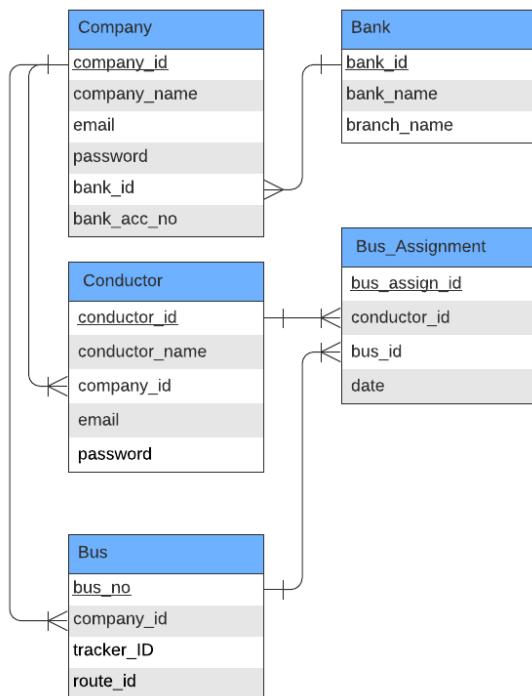


Figure 43: Company Side of ERD

## 6.2 Bus Information Side

Each ‘Bus’ has a particular ‘Bus Route’ which consists of some ‘Bus Stops’. For making a trip between two bus stops, the required information e.g. source and destination bus stop, price, bus-no etc. are stored in ‘Ticket’ entity. To update ticket-price and maintain price history, ‘Ticket Price’ has a many to one relation with ‘Ticket’.

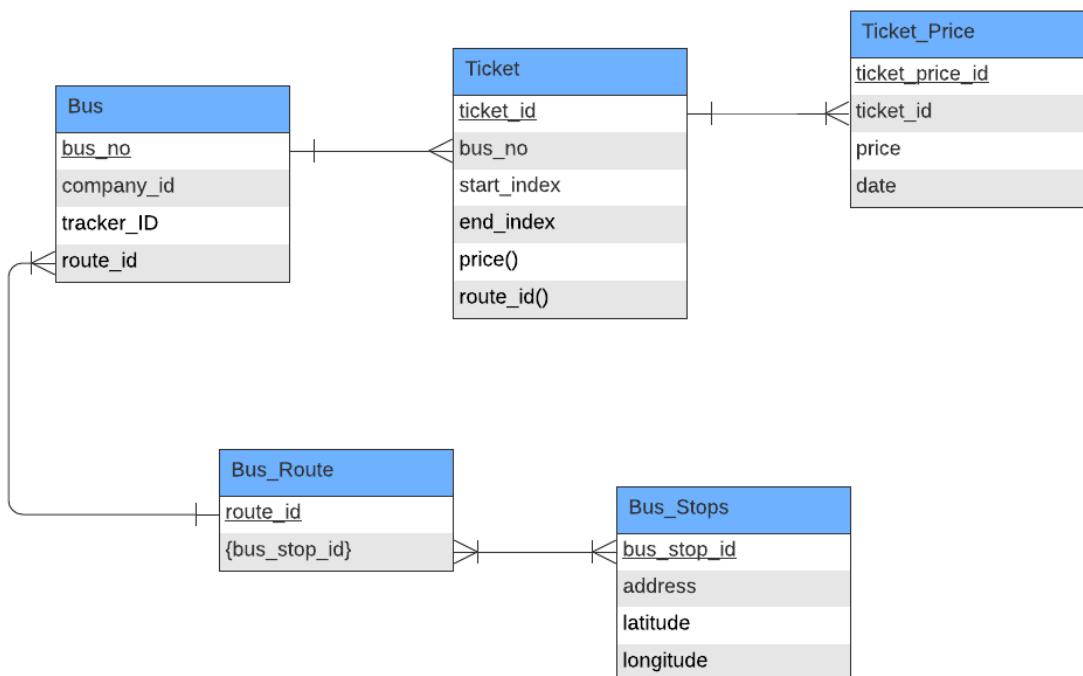


Figure 44: Bus Information Side of ERD

### 6.3 Customer-Trip Side

A ‘Customer’ can make a ‘Trip’ buying a type of ‘Ticket’. For each ‘Trip’, a ‘Payment’ must be done using a ‘Payment Method’. There may be at most one optional ‘Review’ for a particular ‘Trip’.

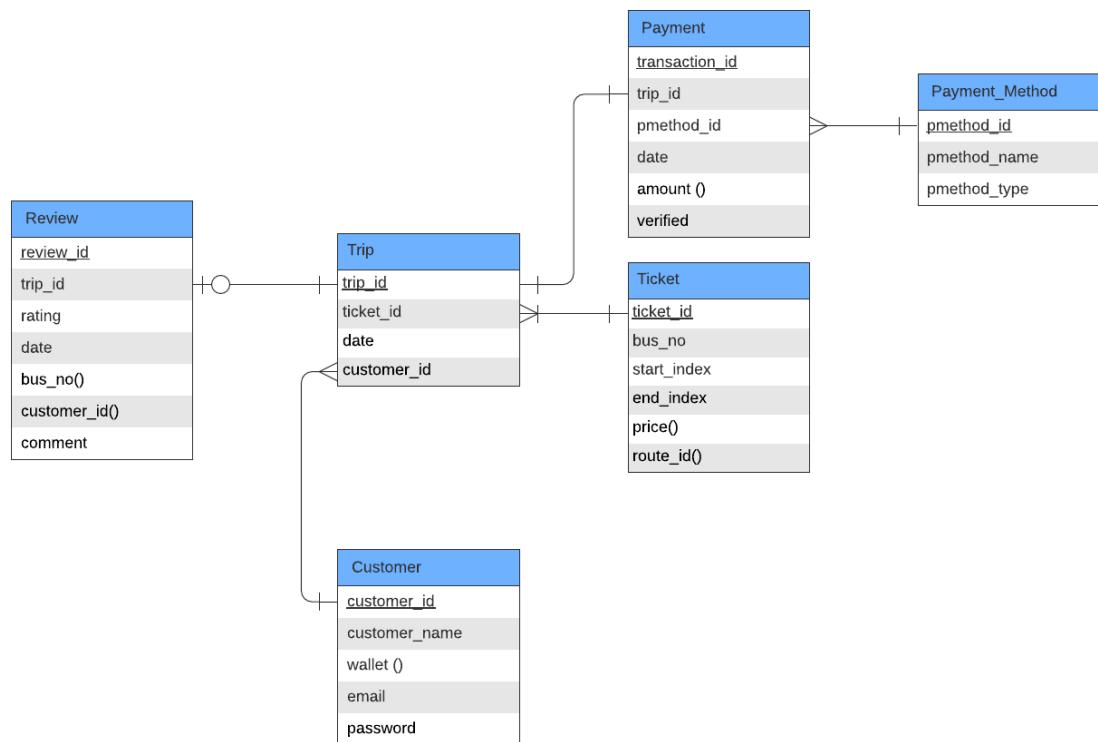


Figure 45: Customer-Trip Side of ERD

## 6.4 Recharge Side

A customer needs to recharge his account to buy tickets. Recharge records are saved inside ‘RechargeHistory’

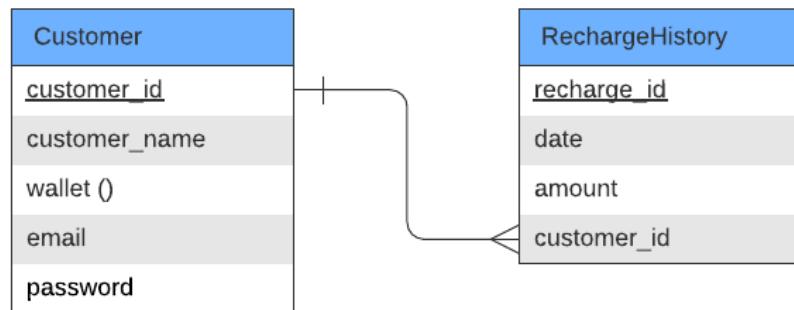


Figure 46: Recharge Side of ERD

## 6.5 Complete ERD

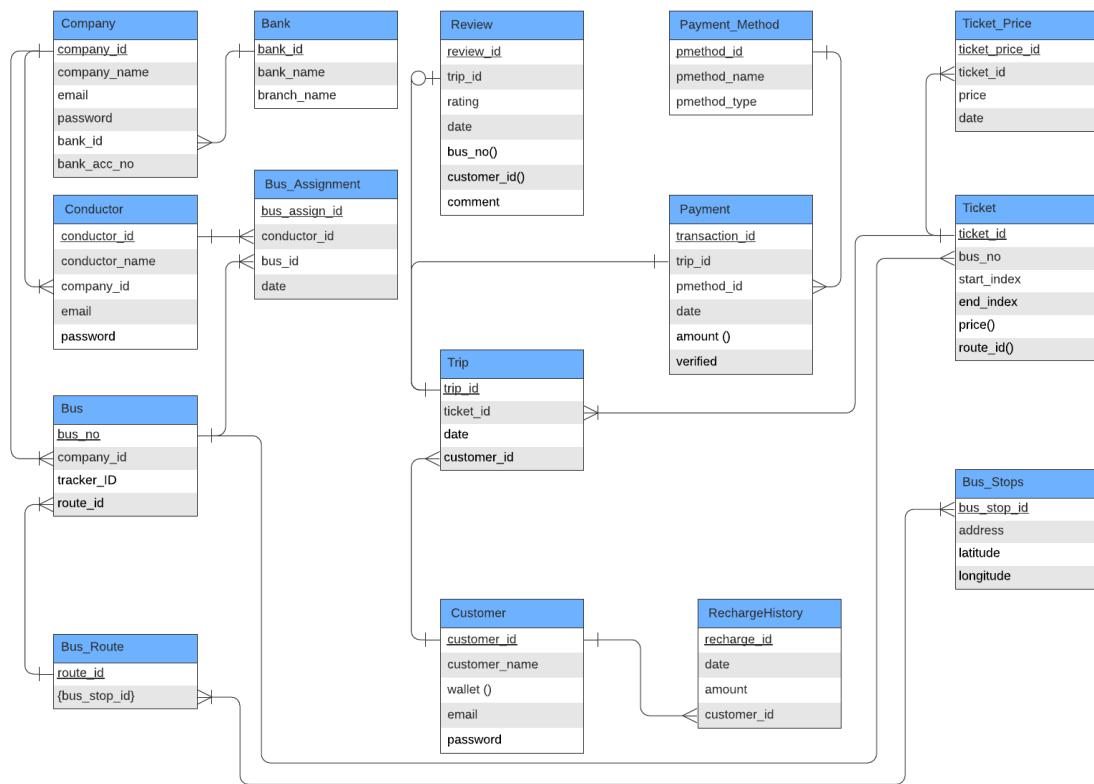


Figure 47: Complete ERD

## 7 Sequence Diagram

We designed sequence diagram for all the major use cases of our project.

### 7.1 Sign up

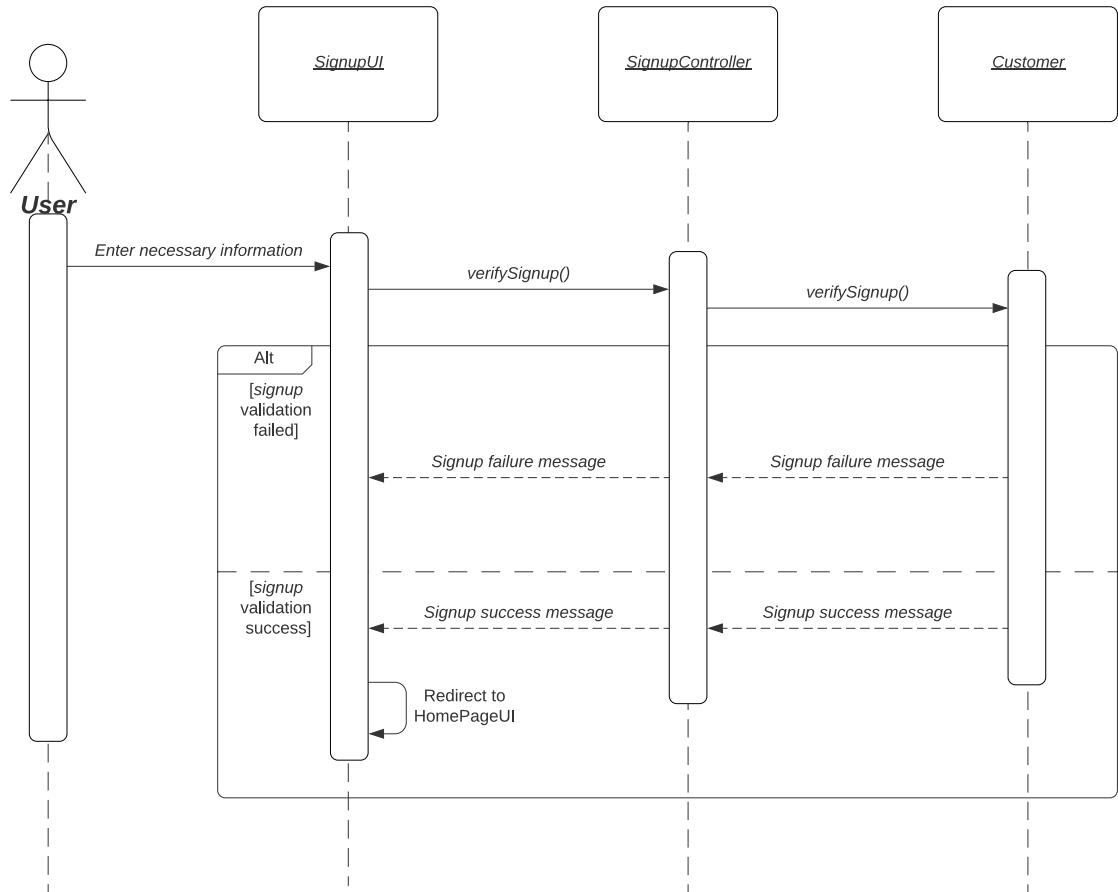


Figure 48: Sign up

## 7.2 Log in

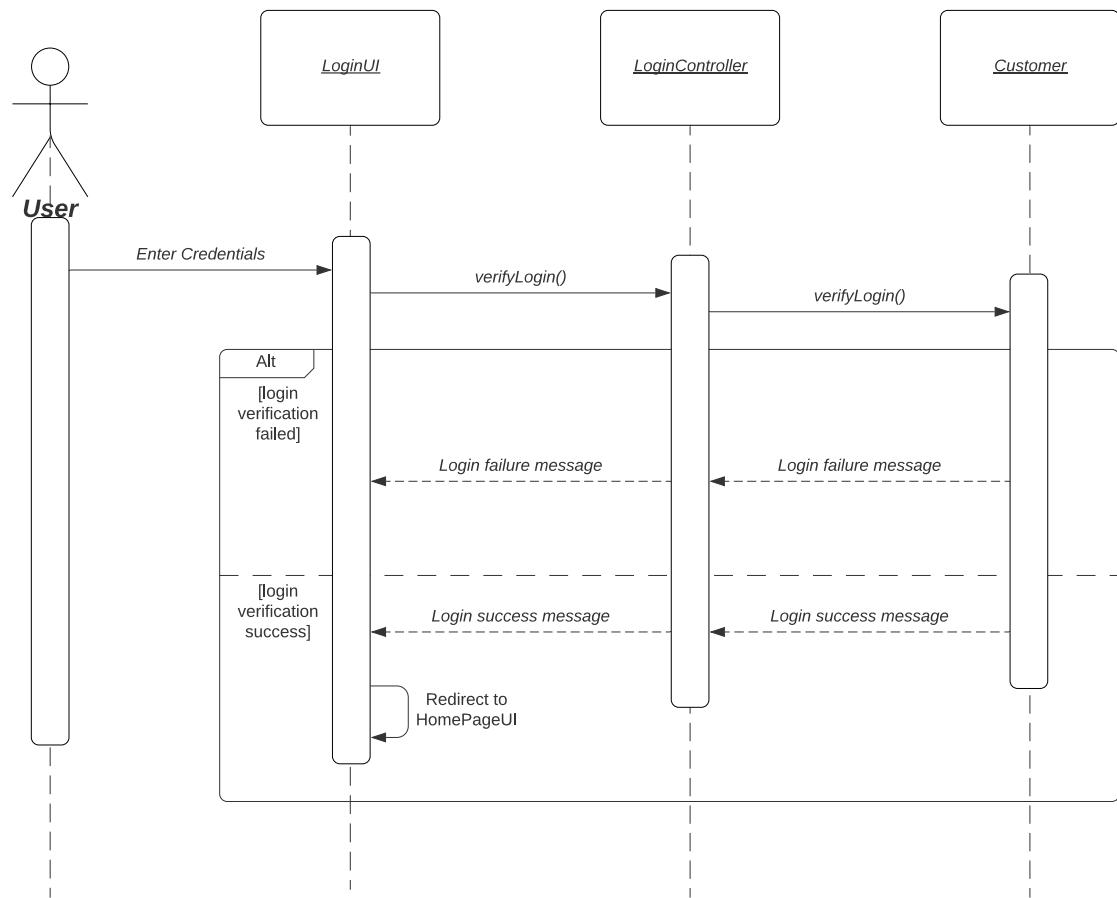


Figure 49: Log in

### 7.3 Past Trips

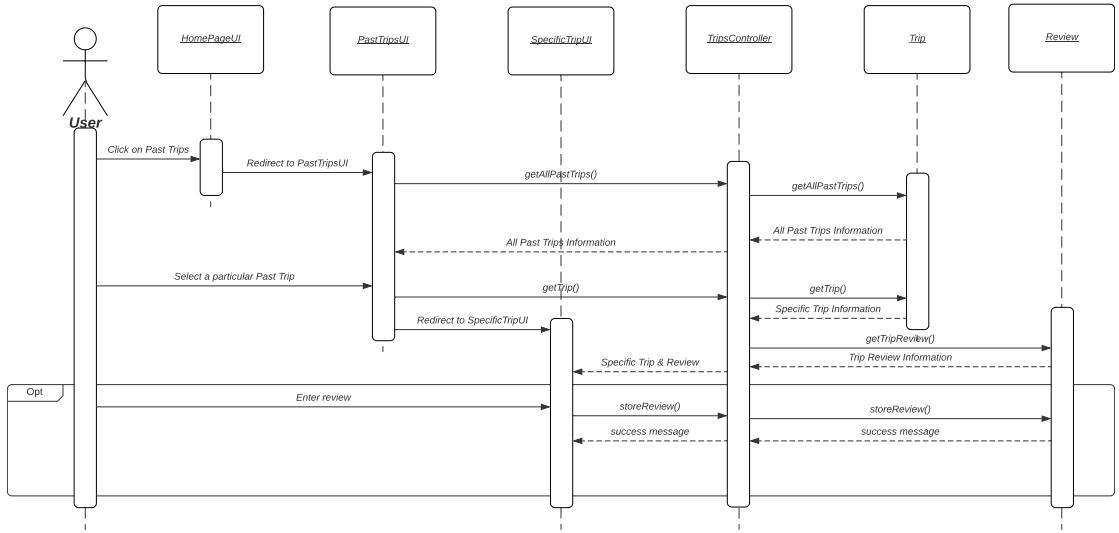


Figure 50: Past Trips

### 7.4 Wallet Management

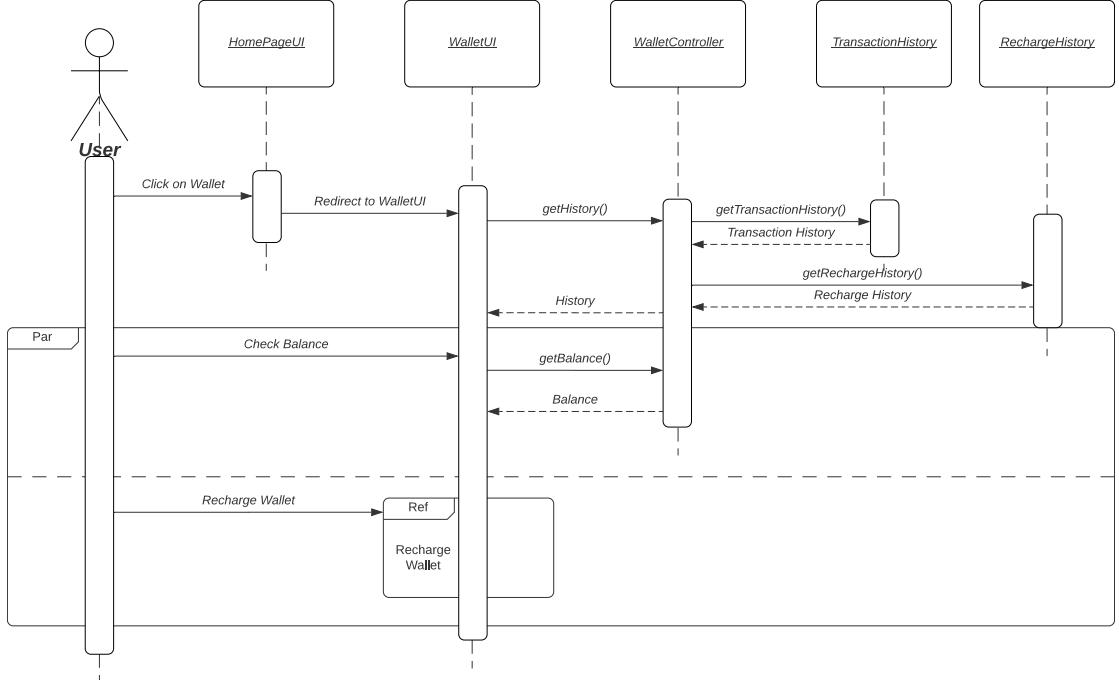


Figure 51: Wallet Management

### 7.4.1 Recharge Wallet

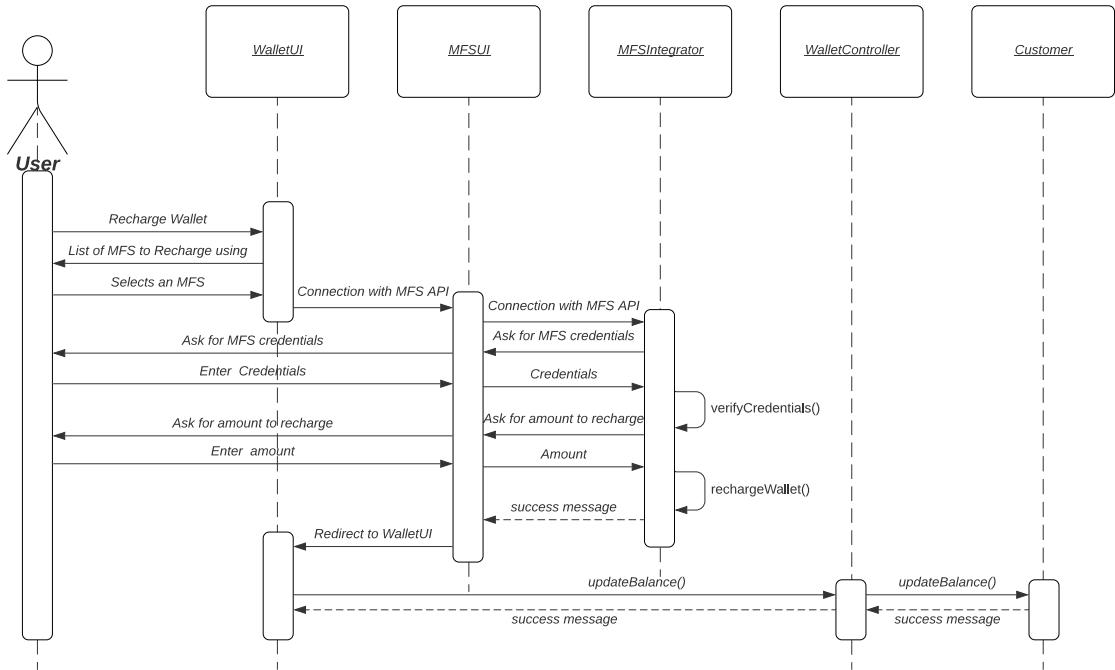


Figure 52: Recharge Wallet

### 7.5 Bus Query

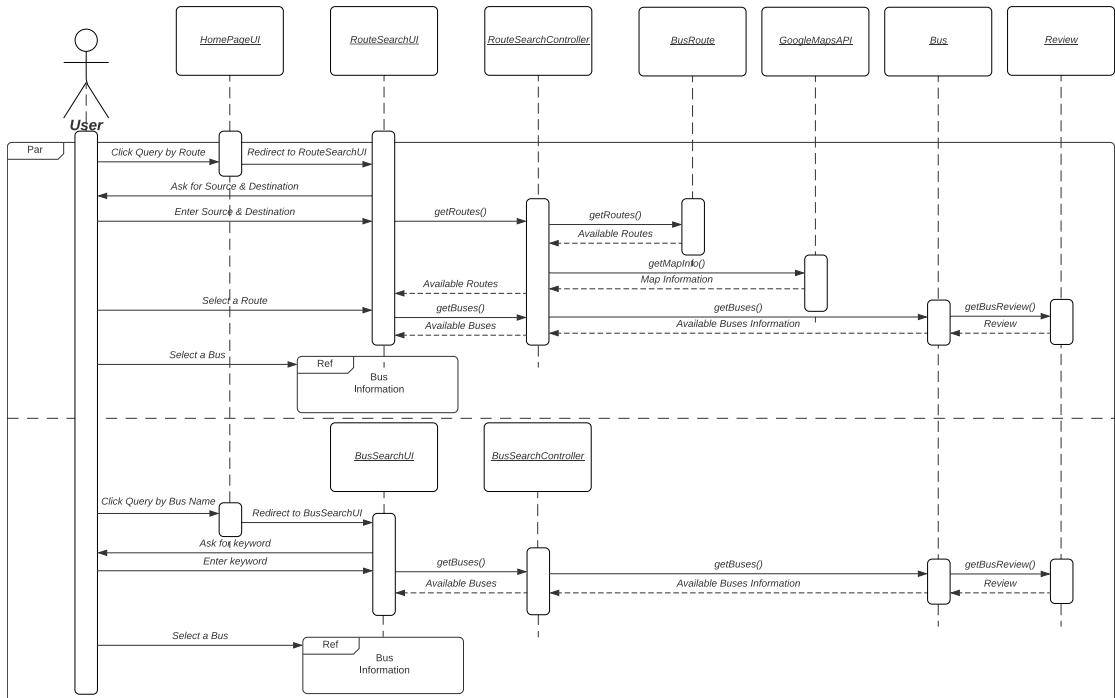


Figure 53: Bus Query

## 7.6 Bus Information

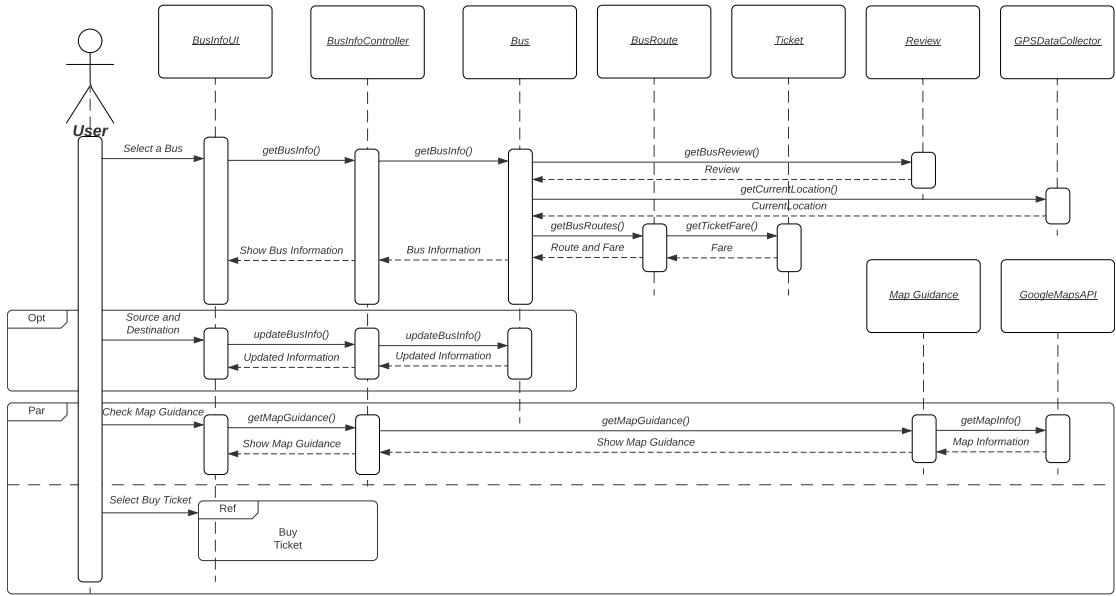


Figure 54: Bus Information

## 7.7 Ticket Purchase

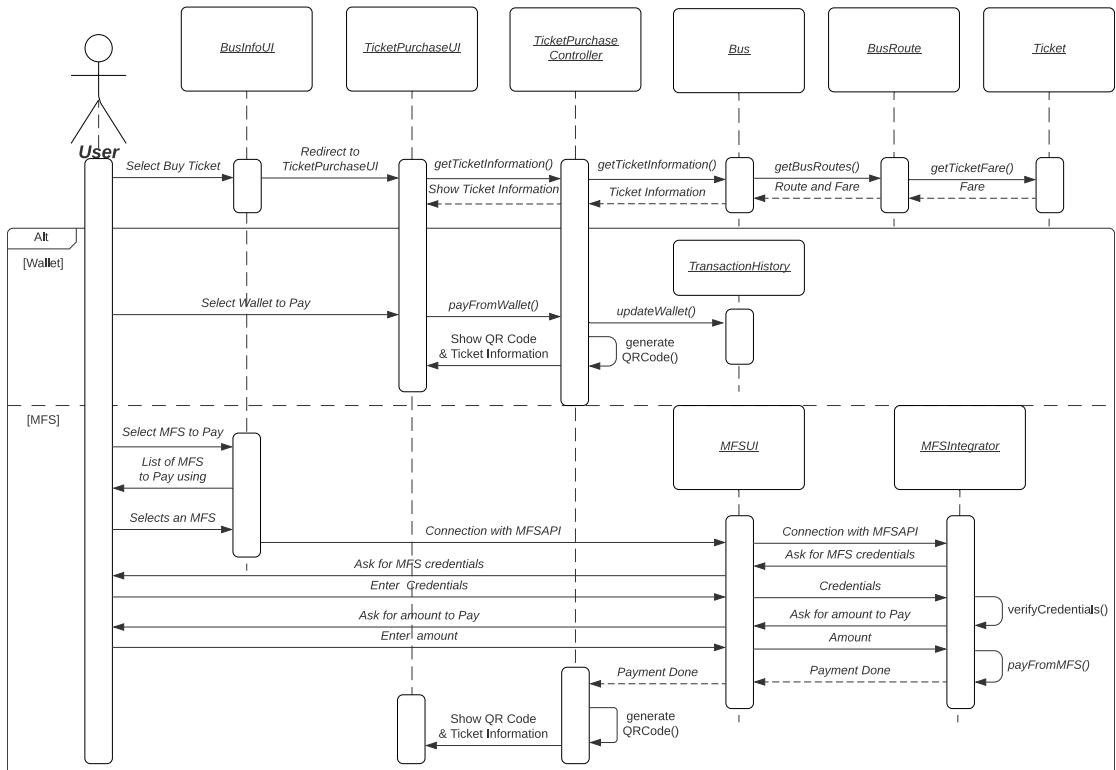


Figure 55: Ticket Purchase

## 7.8 Payment Verification

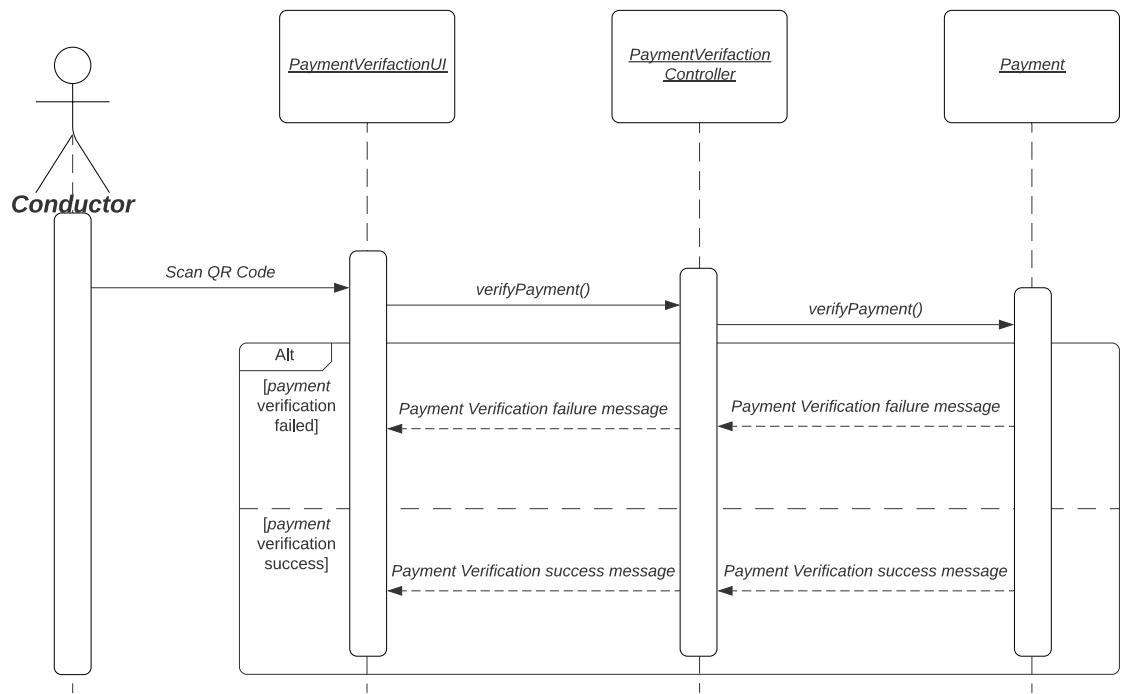


Figure 56: Payment Verification

## 7.9 Update Bus Information

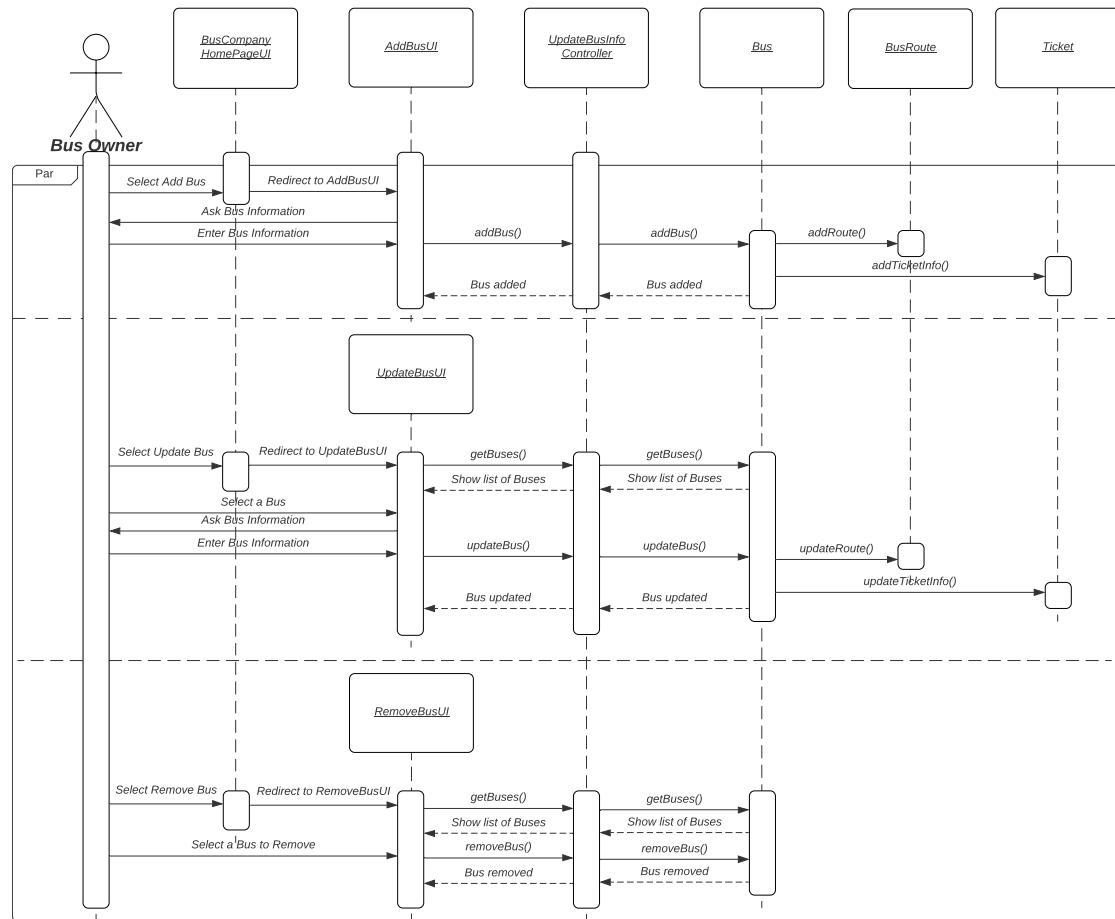


Figure 57: Update Bus Information

## 7.10 Update Conductor Information

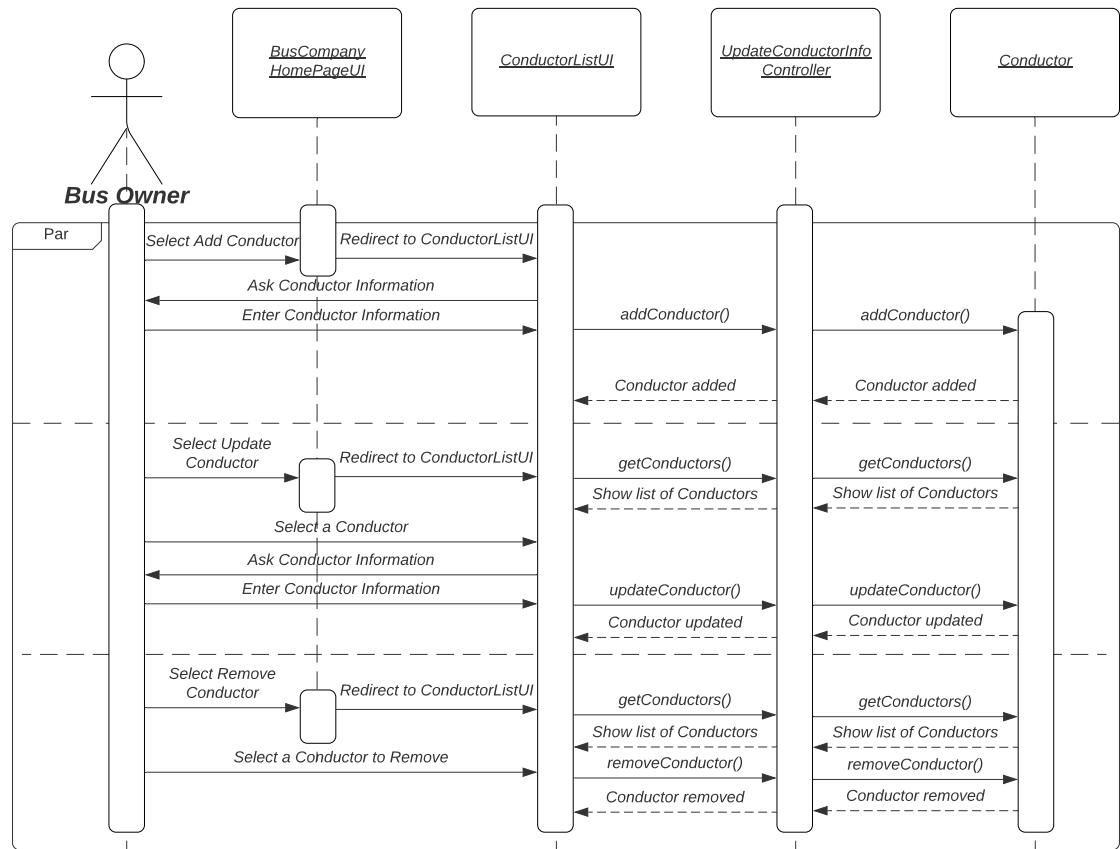


Figure 58: Update Conductor Information

## 8 Collaboration Diagram

### 8.1 Sign up

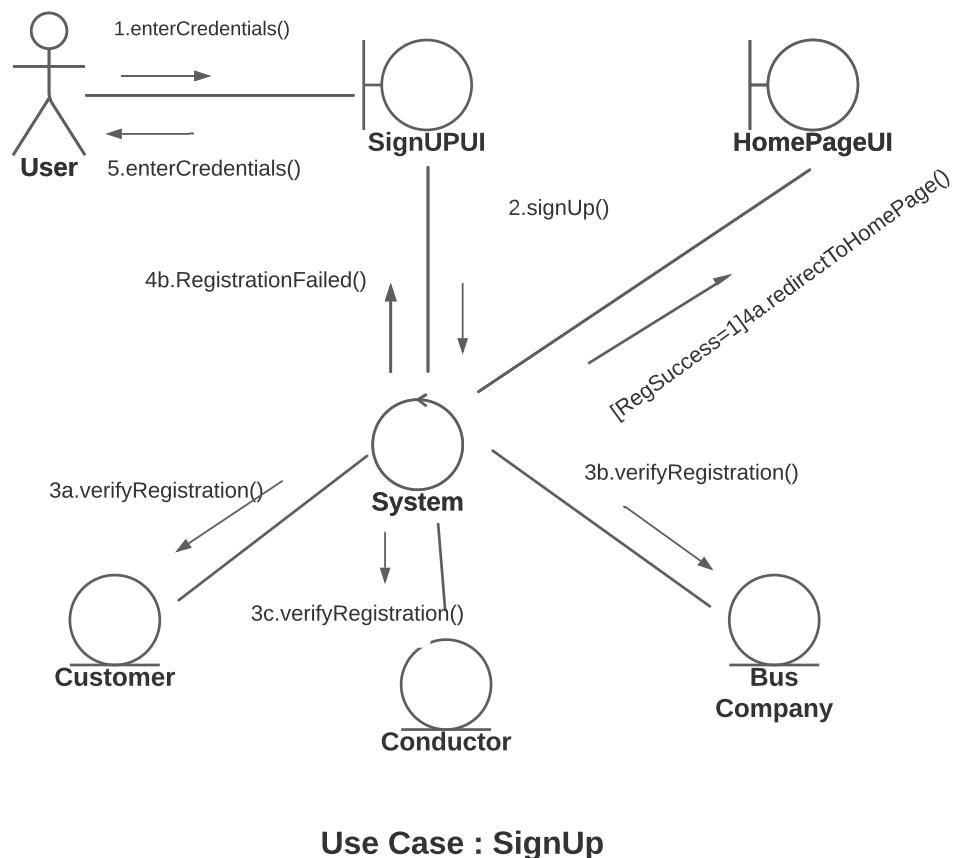


Figure 59: Sign up

## 8.2 Log in

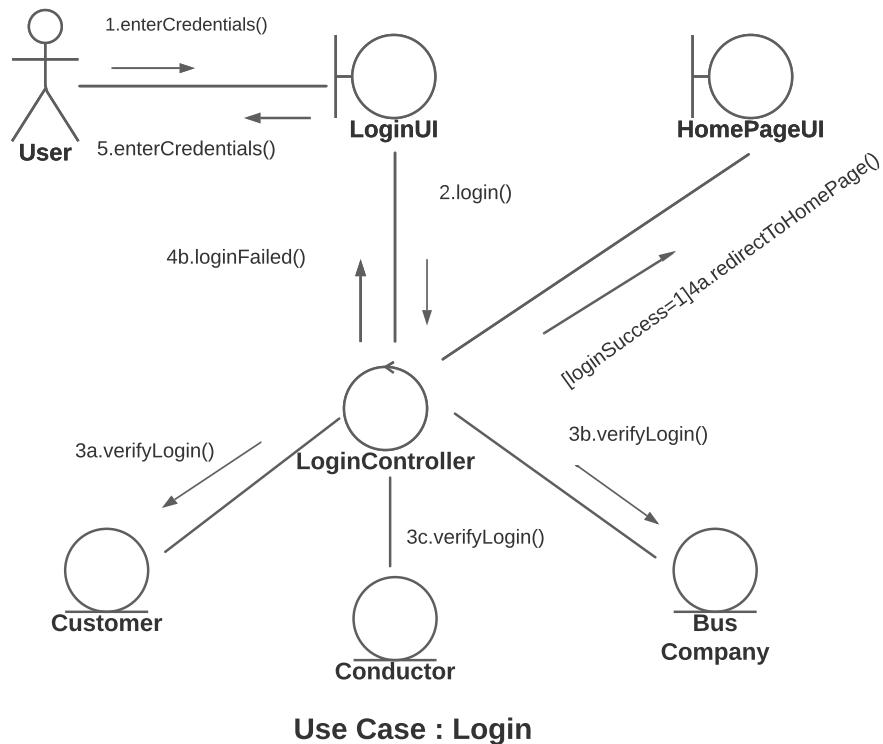
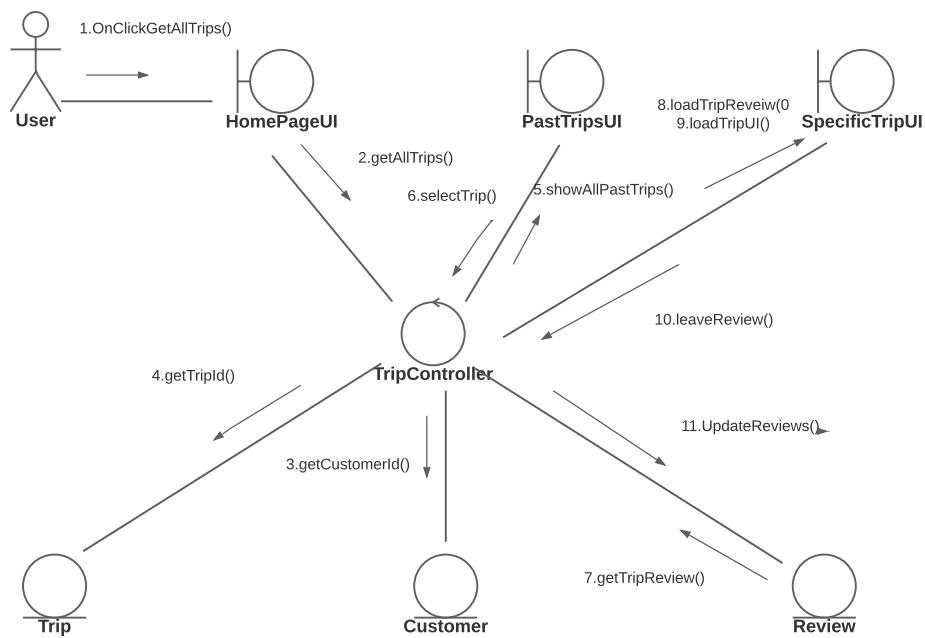


Figure 60: Log in

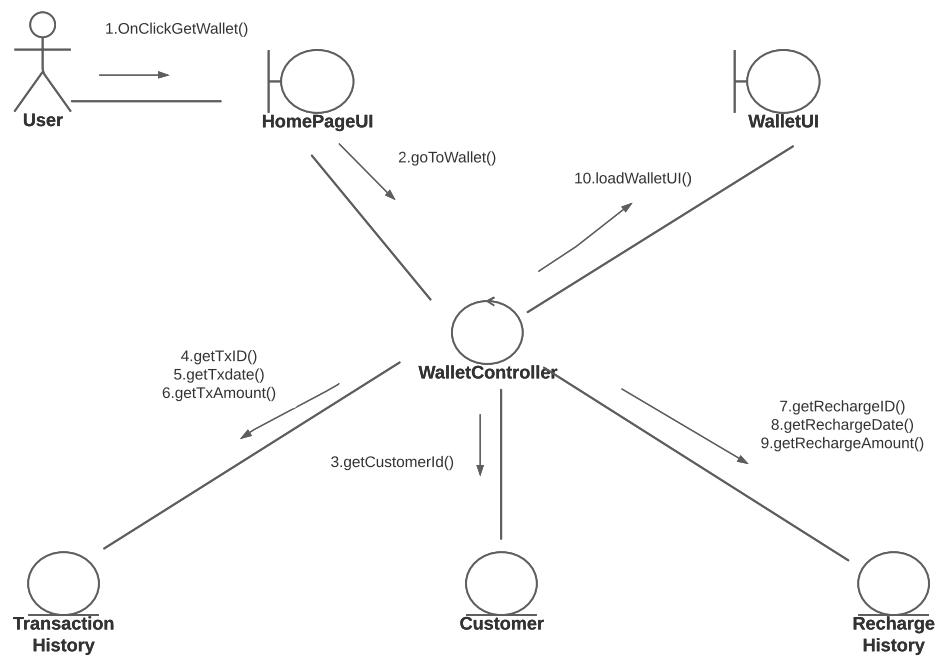
### 8.3 Past Trips



**Use Case : Past Trips**

Figure 61: Past Trips

## 8.4 Wallet Management



Use Case : Wallet Management

Figure 62: Wallet Management

### 8.4.1 Recharge Wallet

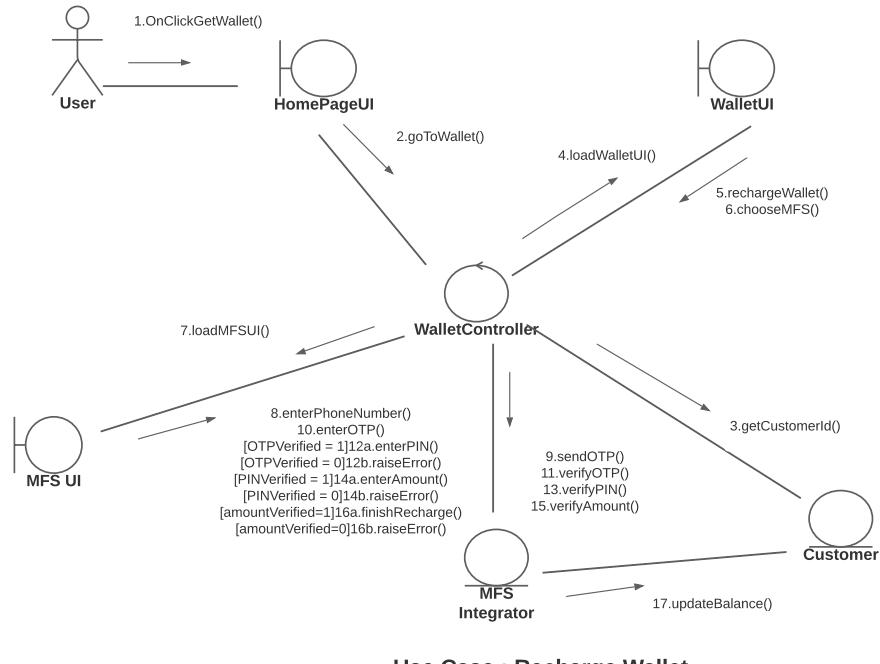


Figure 63: Recharge Wallet

## 8.5 Bus Query

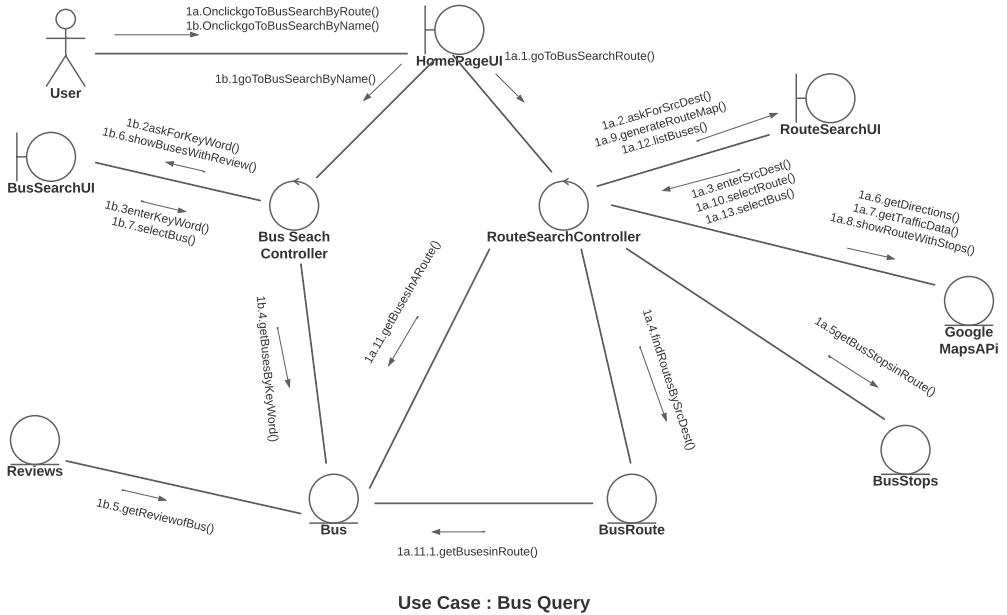


Figure 64: Bus Query

## 8.6 Bus Information

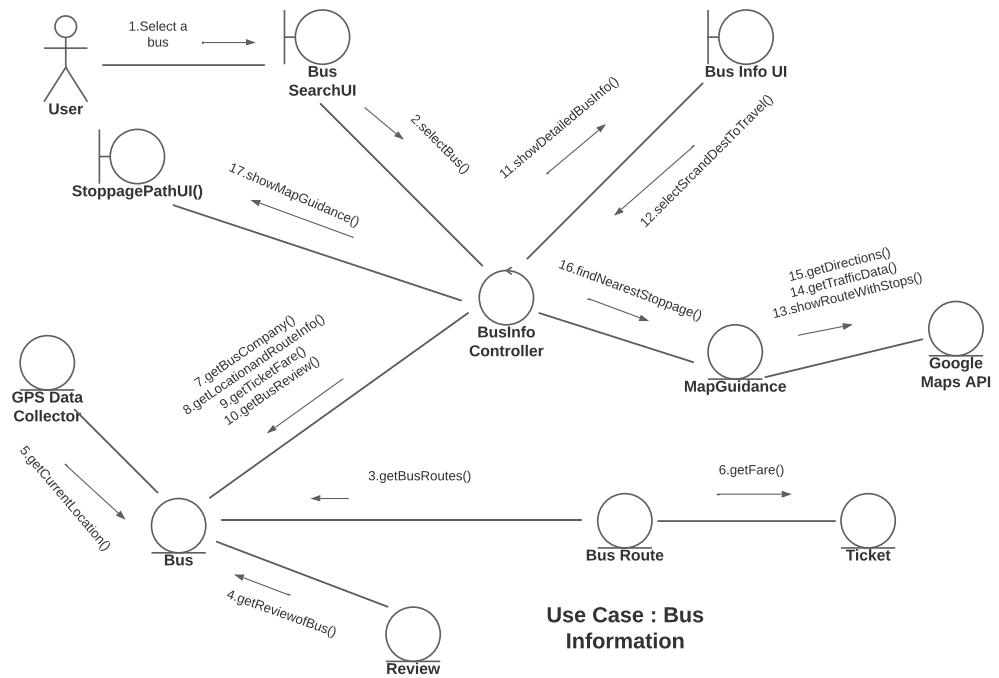


Figure 65: Bus Information

## 8.7 Ticket Purchase

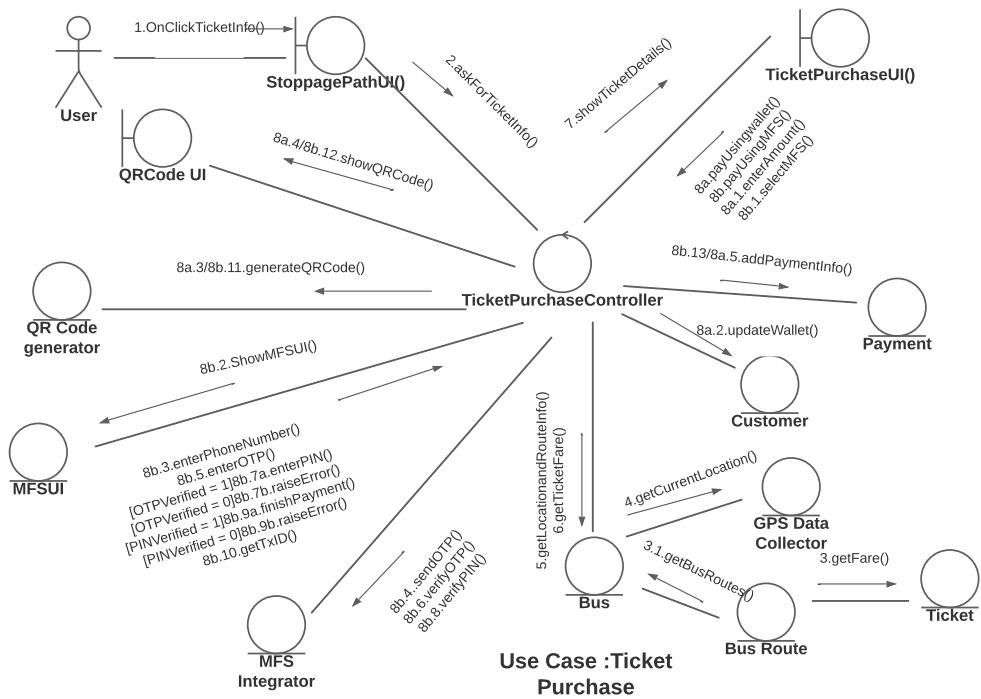


Figure 66: Ticket Purchase

## 8.8 Payment Verification

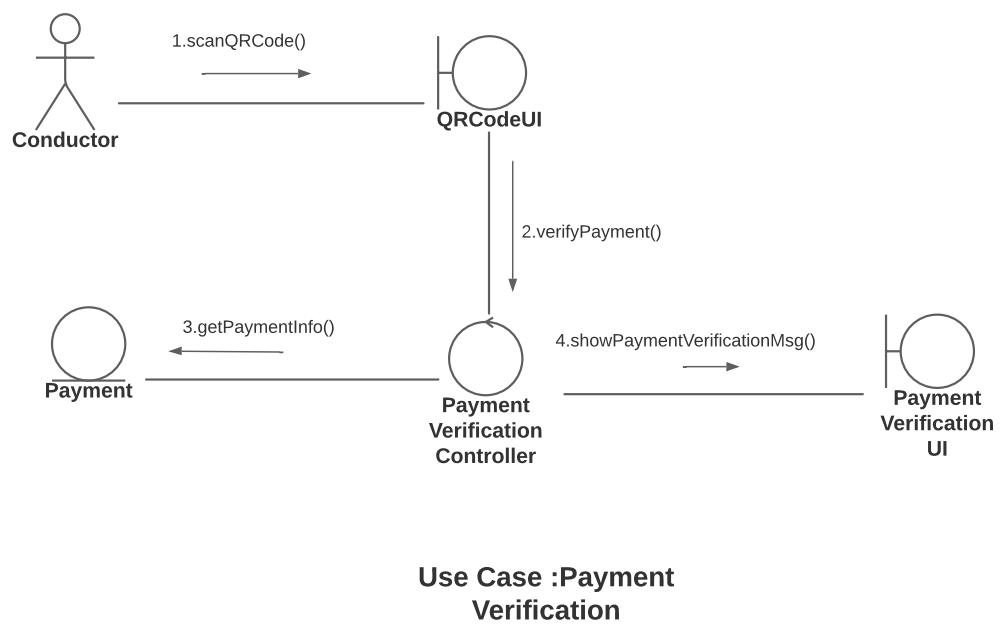


Figure 67: Payment Verification

## 8.9 Update Bus Information

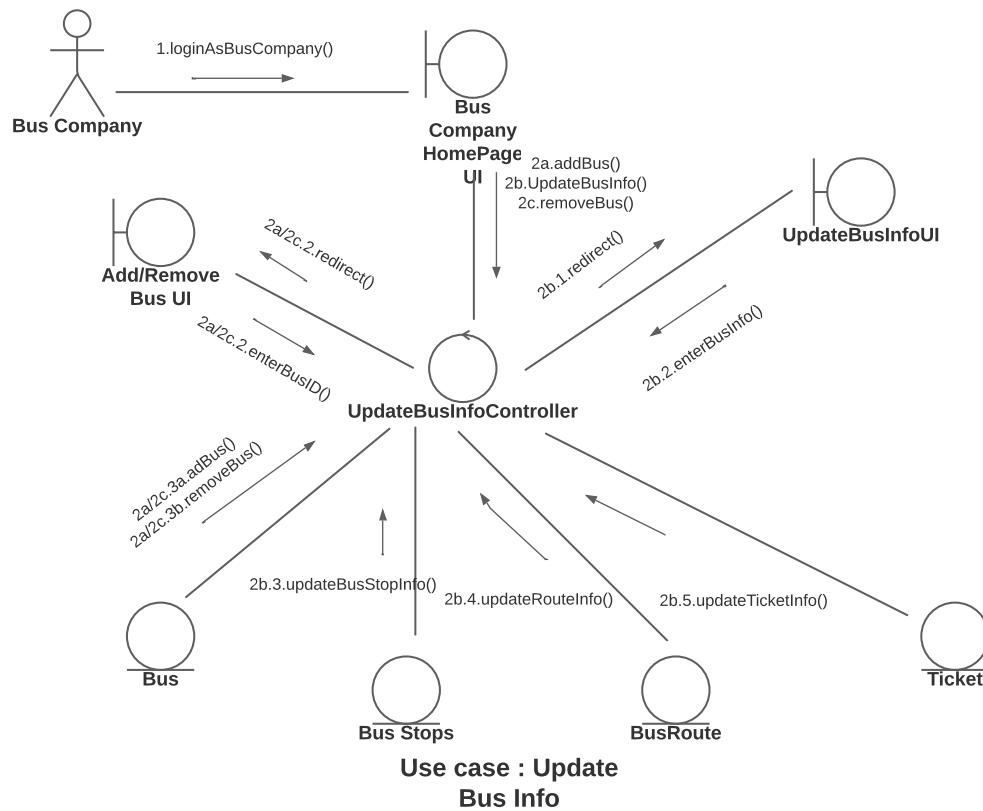


Figure 68: Update Bus Information

## 8.10 Update Conductor Information

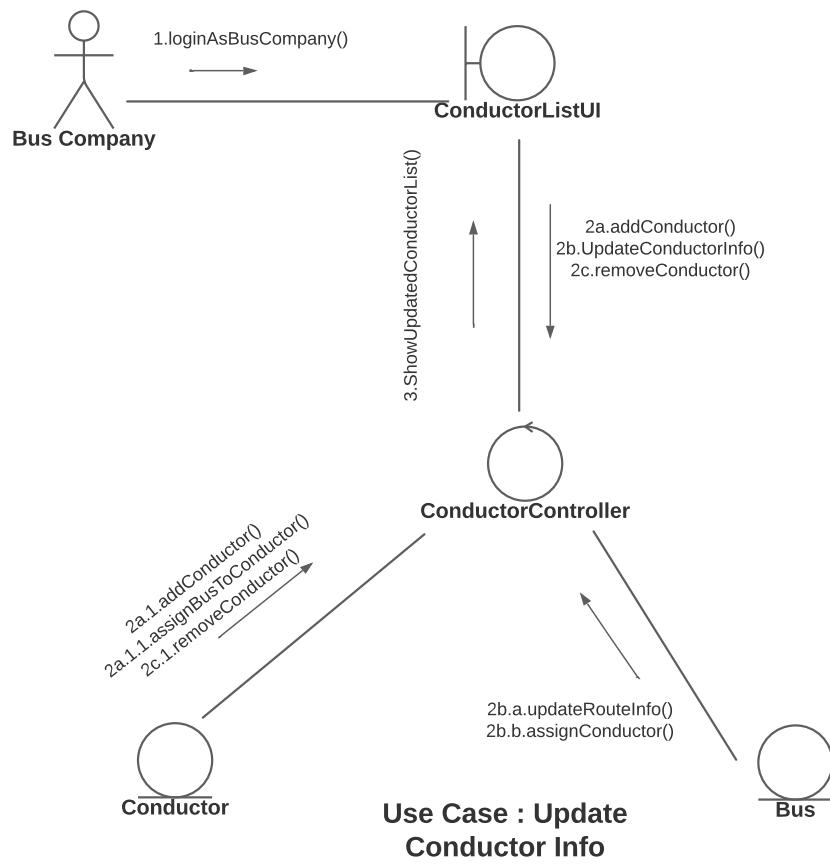


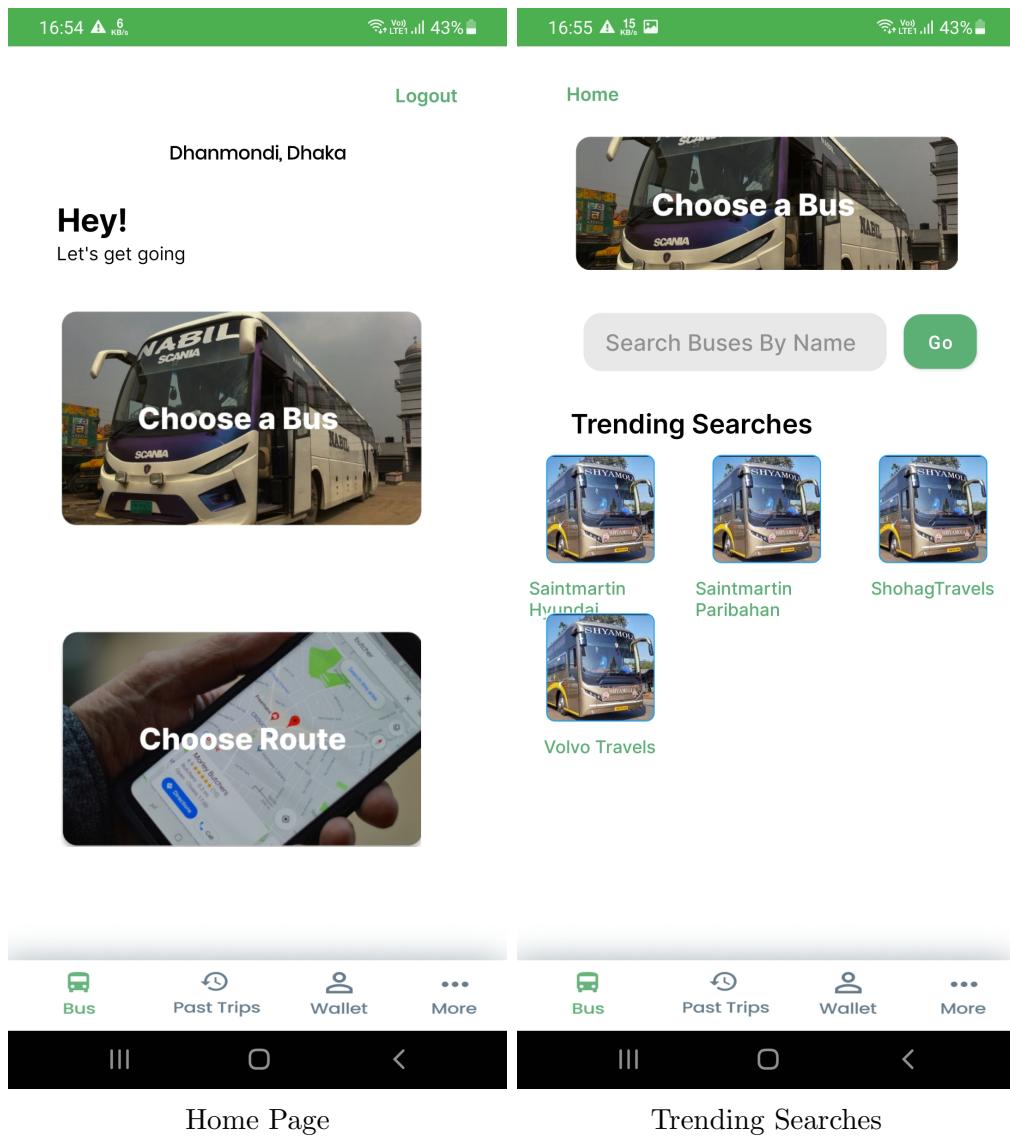
Figure 69: Update Conductor Information

## 9 Snippets of Demo

### 9.1 Tools Used

- Android Studio to develop the android app for the customer side
- PostgreSQL to host the database locally in a laptop
- Java Socket Programming to connect the android app to the database using Wireless LAN.

### 9.2 Screenshots From Android App





Home



volvo

Go

Home



**Volvo Travels**

### Search Results



Volvo Travels

Trip Reviews

Route



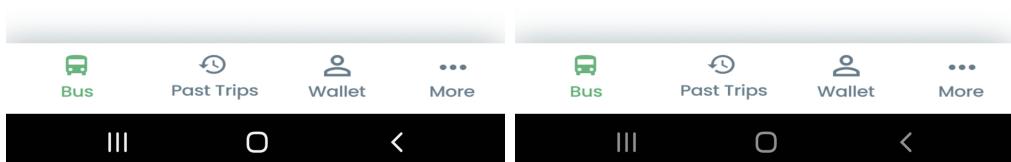
Rating: 4.5/5.0

Driver drives carefully.

Takbir

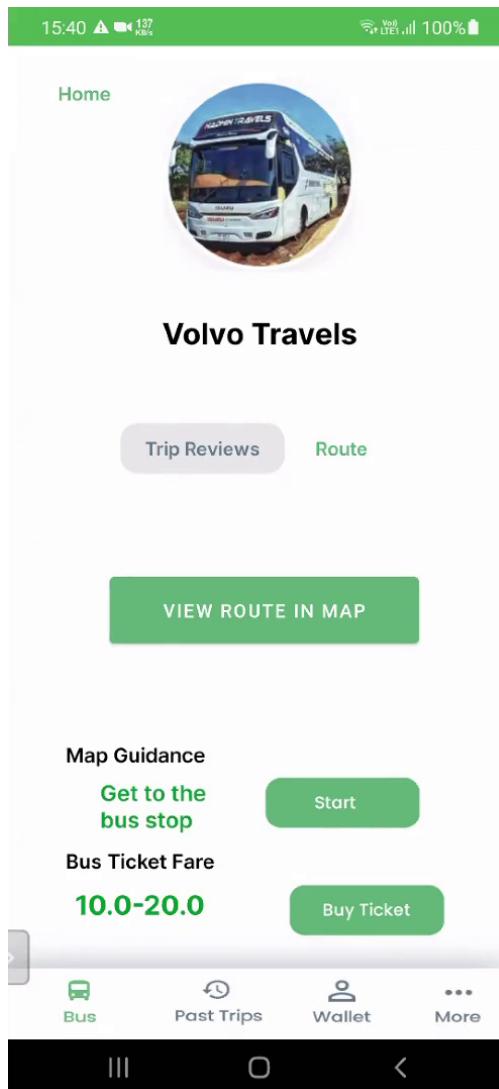
Punctuality maintained.

Sharif

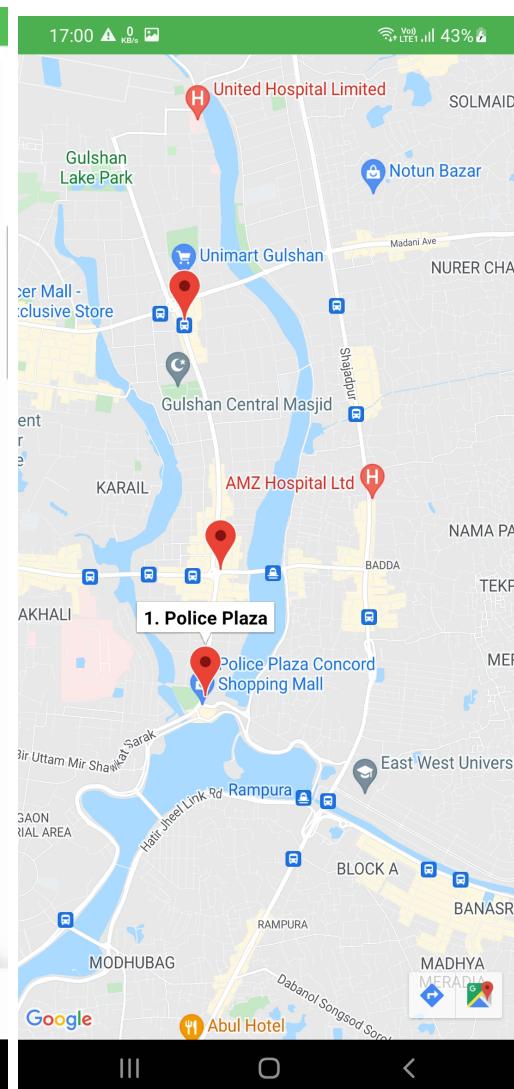


Search By Bus Name

Bus Info Page - Reviews



Bus Info Page - Fare



Bus Info Page - Route in Map



Home



From

ece

To

dhanmondi 15

**VIEW ROUTE IN MAP**

Home

ece to dhanmondi 15

**VIEW ROUTE IN MAP**

Showing Bus of Selected Route



**ShohagTravels**

Fare: 20.0

Rating: 5.0

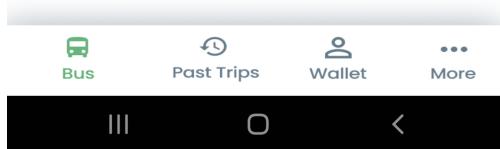


**Saintmartin Hyundai**

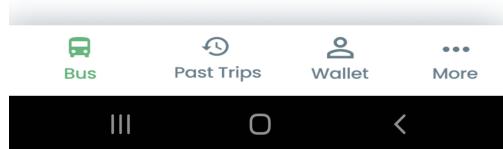
Fare: 20.0

Rating: 2.0

**Show Buses Available**



Search By Source and Destination



Buses with Source and Destination



Route Connecting Source and Destination

### 9.3 Relevant Code and Video

- [Android Studio Code Link](#)
- [Java Server Code Link](#)
- [Demo Video Link](#)

## 10 Corrections According to Feedbacks in Class

- **BPMN Diagram:** No Correction was suggested
- **Mock UI:** Setting up an MFS merchant account is rather complicated, so we decided to record the bank account details of bus company instead.

”Reviews” was renamed to ”Trip Reviews” for better specification of what the reviews were actually for.

- **ERD:** One to one relation from ’Trip’ to ’Review’ instead of one to many relation because we followed Uber model where customer provided review after trip.
- **Class Diagram:** No Correction was suggested
- **Sequence Diagram:** No Correction was suggested
- **Collaboration Diagram:** No Correction was suggested
- **Demo:** No Correction was suggested