
# AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

Project On

# Padma Bridge Toll Management System.

Supervised By

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Object Oriented Analysis and Design [K]

Submitted By ***Group: 4***

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| 2. Tonoy Chandra Sarker | 20-43804-2 | Problem statement, Use case diagram, Prototype. |
| 3. Rowjatul Jannat | 20-43976-2 | Propose solution, Use case specification, Class diagram. |
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# Table of Contents

# Abstract

Padma bridge will play a vital role in Bangladesh's economy. If any difficulty arises for poor toll management system, it will be harmful for the economy. So, we need to participate smart tolling system.

# Problem Statement

Padma bridge is a very important infrastructure in Bangladesh. It is now under construction. When completed, it will be the largest bridge in Bangladesh. It connected 21 southern districts of Bangladesh with capital. This kind of bridge take toll from the vehicles. This process is more analog. So, it's a lengthy process and sometimes when heavy flow of vehicles it became a long traffic jam as it sees in last Eid period in Jamuna bridge.

Another problem in the toll system is vehicle classification. In toll plaza every type of vehicle has each toll rate. In analog system, a person all time confirm the vehicle class. But sometimes it become difficult for a person. For this reason, the government loss huge amount of revenue.

Smart toll collection system can try to remove those problem. It can save people's most valuable time and collect more revenue for the country. Here user can pay the toll through mobile banking from anywhere. In the toll plaza, user shows only the QR code from the device. Users must create an account with their name, NID, driving license number and vehicle license number. Then if he or she want to cross the bridge, they can pay it in the way of the toll plaza without any trouble.

Vehicle classification problem solves by staff who can identify the vehicle size and the number plate. Then the system provides a payment slip. The staff give it to the vehicle owner and give permission to cross the bridge.

# Objectives

- ✓ Will allow people to pay their bridge toll without facing any problem.
- ✓ Cashless transaction at toll plaza.
- ✓ Saving valuable time.
- ✓ Plug revenue leakages from toll collection.
- ✓ To improve quality of work and accuracy.
- ✓ To improve work speed.
- ✓ To provide easy and user-friendly environment.
- ✓ Get instant information from a single terminal.

# Proposed Solutions

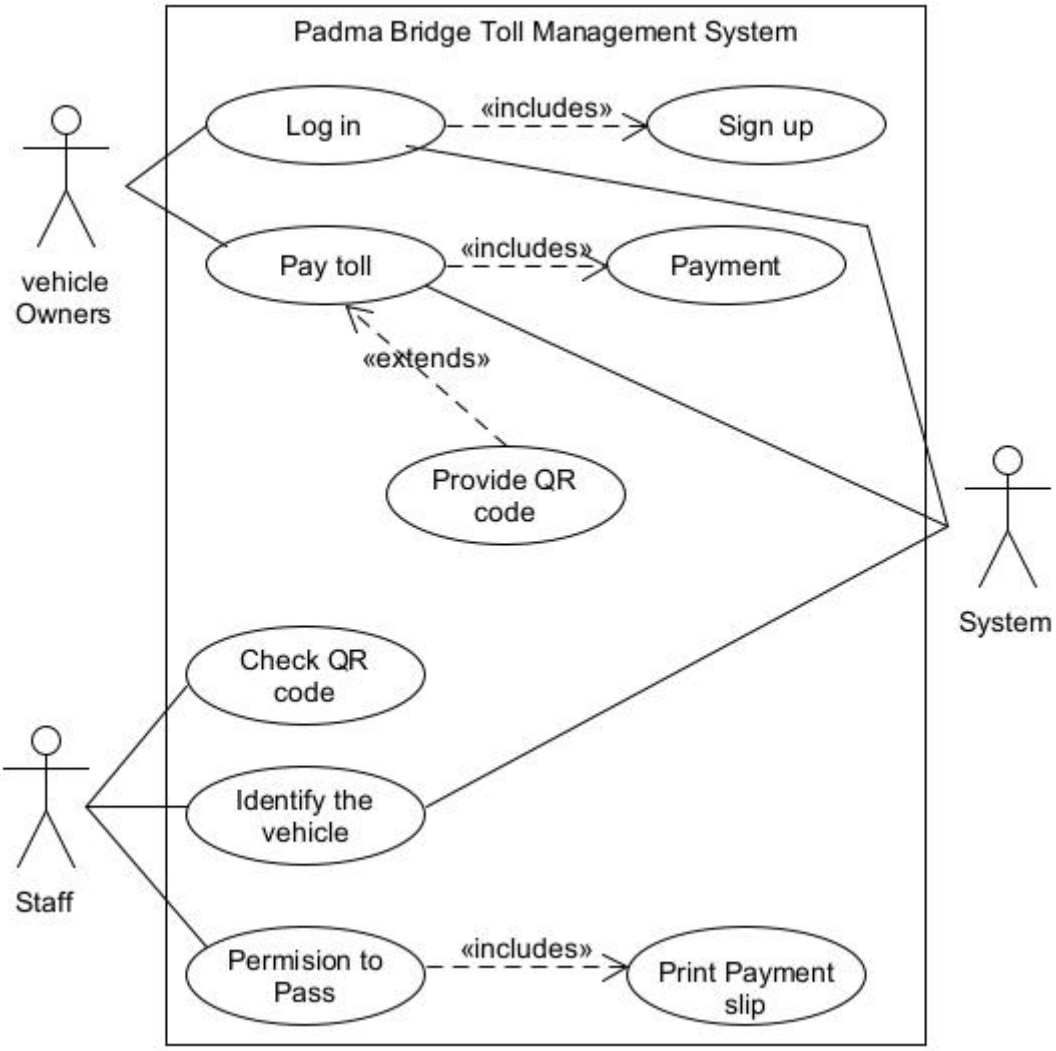
**A web based mobile app:**
This application is for the collection the toll of the bridge. Here a person has an account. There will have information of the person's name, NID, vehicles license number, driving license number. After creating account, the person can pay the toll of the vehicle on the way of toll plaza. The payment will do through the mobile banking like Bkash, Nagad, Ucash etc. After payment the app provide a receipt. When the person reaches at plaza the staff is only verify the receipt with QR code.

**Database:**
Database is very important for this project. It will store the vehicles record and verify the apps customer information through BRTA server.

## Risks and Constraints

- ➢ In this system each schedule can be tracked from the start till the end of the Project cycle.
- ➢ User friendliness is provided in the application with various controls.
- ➢ There is no risk of data mismanagement at any level while the project is being developed.

# Use Case Diagram



# Use Case Specification

## Log in

| | | |
|---|---|---|
| **Use Case Name:** | Log in | |
| **Actor(s):** | Vehicle Owner, System | |
| **Description:** | The use case is about the toll collecting system. The use case is for the vehicle owners. They enter to the account with User ID and Password. The system will manage if user in any difficulties. | |
| **Reference ID:** | **TCS-01** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Initial the login process.<br>**Step 2:** Enter user name and password. <<include sign up>><br><br>**Step 5:** User had logged into the system. | **System Response**<br><br>**Step 3:** The system will check the vehicle owners record is exist or not.<br>**Step 4:** The system will send the notification to the user. |
| **Alternative course of events:** | **Step 3a:** If account is not existing the system will return the error massage to user. The system may reminder user to sign up an account or ask them 'forgot password.' **(Back to Step 2)** | |
| **Precondition:** | Vehicle owner should have sign up any account in the system previously. | |
| **Postcondition:** | Vehicle owner has logged into the system. | |

## Sign up

| | | |
|---|---|---|
| **Use Case Name:** | Sign up | |
| **Actor(s):** | Vehicle Owner | |
| **Description:** | This use case describes to create a new account process. | |
| **Reference ID:** | **TCS-02** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Initial the sign up process.<br>**Step 2:** Enter personal information with vehicle number.<br><br>**Step 6:** User will receive the notification massage from the system. | **System Response**<br><br>**Step3:** Then the system will check the member record exist or not.<br>**Step 4:** The system will add the new member information into database.<br>**Step 5:** The system will send the notification to the user. |
| **Alternative course of events:** | If account is exist, the system will return the error massage to user and requires user to edit the personal information. **(Back to Step 2)** | |
| **Pre-condition:** | User should not have registered any account in the system previously. (Duplicate account is not allowed) | |
| **Post-condition:** | The new account will be registered. | |

# Pay toll

| | | |
|---|---|---|
| **Use Case Name:** | Pay toll | |
| **Actor(s):** | Vehicle owner, System | |
| **Description:** | This use case describes the process of a vehicle owners pay their toll to the system and system will record it to the database. | |
| **Reference ID:** | **TCS-03** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** This use case is initiated that an owner can show all the vehicle category and the amount.<br>**Step 2:** Select the vehicle category. | **System Response**<br><br><br>**Step 3:** System will transfer to the payment system.<br><<include payment>><br><<extend provide QR code>> |
| **Alternative course of events:** | | |
| **Pre-condition:** | The vehicle owners must have the registered account. | |
| **Post-condition:** | After selecting the vehicle, the user must pay the toll. | |

# Payment

| | | |
|---|---|---|
| **Use Case Name:** | Payment | |
| **Actor(s):** | Vehicle owner | |
| **Description:** | This use case describes the process of toll payment. | |
| **Reference ID:** | **TCS-04** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Select the payment method.<br><br>**Step 3:** Enter the mobile banking information.<br><br>**Step 5:** View the payment result. | **System Response**<br><br>**Step 2:** Ask for mobile bank account number.<br><br>**Step 4:** Send the information to the external payment gateway and display the payment result. |
| **Alternative course of events:** | **Step 4a:** if the connection timeout just asks the user to try again later.<br>**Step 4b:** if the payment failed ask the user to try again. | |
| **Precondition:** | Payment can only be done when the user selected at least one vehicle category. | |
| **Postcondition:** | The complete process will be recorded. | |

# Provide QR code

| | | |
|---|---|---|
| **Use Case Name**: | Provide QR code | |
| **Actor(s):** | Vehicle owner, System | |
| **Description:** | This use case works after completing the payment. Then the system will provide a QR code | |
| **Reference ID:** | **TCS-05** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Complete the payment.<br><br>**Step 4:** Display the QR code. | **System Response**<br><br>**Step 2:** Verify the payment of the vehicle owner.<br>**Step 3:** Provide a QR code with receive number |
| **Alternative course of events:** | **Step 2a:** If the verification is failed, send an error massage to user.<br>**(Back to step 1)** | |
| **Pre-condition:** | Payment must be done. | |
| **Post-condition:** | The complete update will be recorded. | |

# Check QR code

| | | |
|---|---|---|
| **Use Case Name**: | Check QR code | |
| **Actor(s):** | Staff | |
| **Description:** | This use case describes check the QR code which provide by the system to the user. | |
| **Reference ID:** | **TCS-06** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Scan the QR code.<br><br>**Step 3:** Display the verification result. | **System Response**<br><br>**Step 2:** Verify the QR code and verify the database. |
| **Alternative course of events:** | **Step 2a:** If the verification is failed, send an error massage to user. | |
| **Pre-condition:** | The QR code must provide by the system. | |
| **Post-condition:** | The complete update will be recorded. | |

# Identify the vehicle

| | | |
|---|---|---|
| **Use Case Name:** | Identify the vehicle | |
| **Actor(s):** | Staff, System | |
| **Description:** | This use case describes the identification of vehicle category and payment. | |
| **Reference ID:** | **TCS-07** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Look after the vehicle category.<br><br>**Step 3:** Show the verification result. | **System Response**<br><br>**Step 2:** Verify the vehicle category and payment. |
| **Alternative course of events:** | **Step 2a:** if the verification is failed, do not permission to go. They should pay the right toll in specific vehicle category. | |
| **Precondition:** | | |
| **Postcondition:** | The complete process will be recorded. | |

# Permission to pass

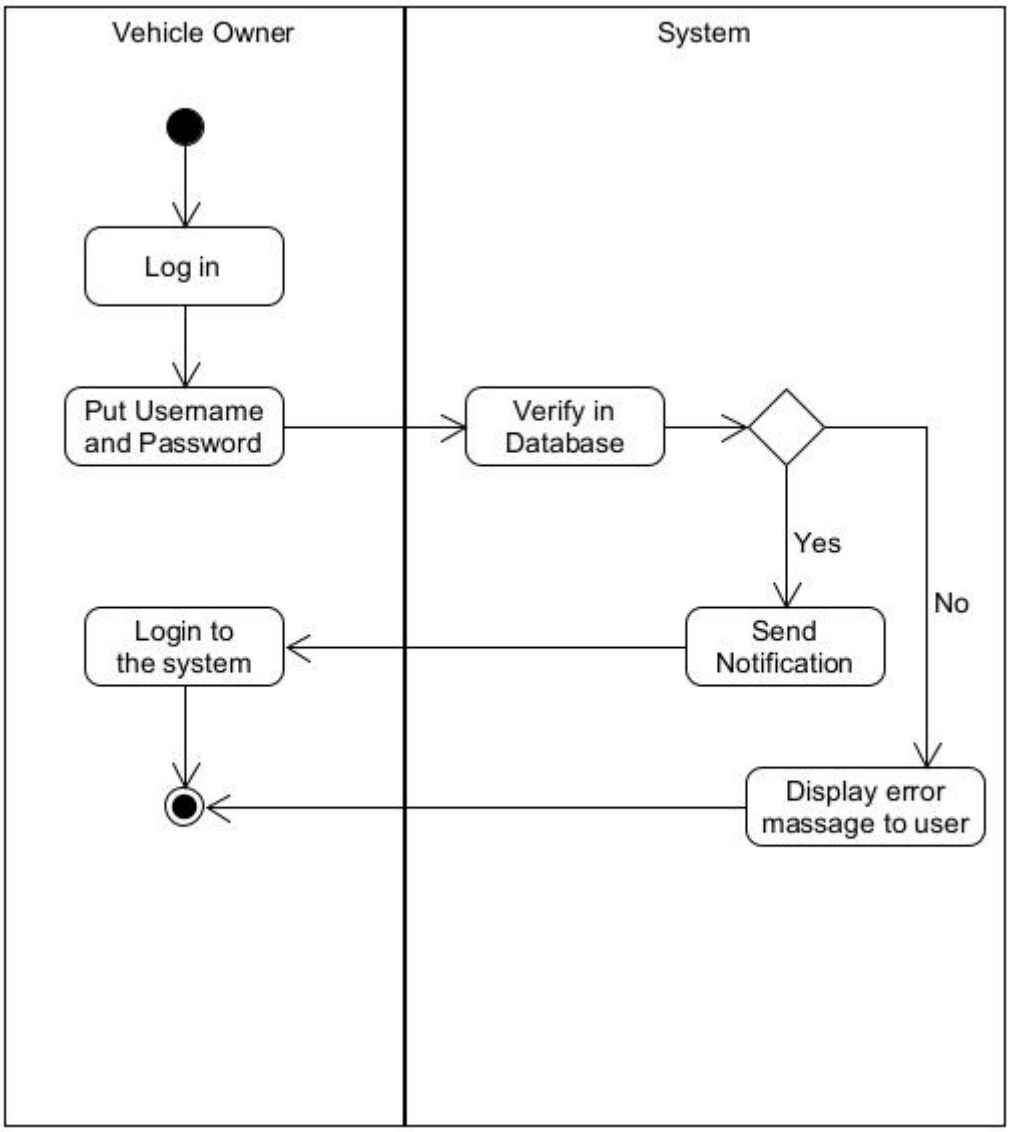
| | | |
|---|---|---|
| **Use Case Name:** | Permission to pass | |
| **Actor(s):** | Staff | |
| **Description:** | This use case give permission to cross the toll plaza. | |
| **Reference ID:** | **TCS-08** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Press the button to open the gate. | **System Response**<br><br>**Step 2:** Open the gate.<br><<include print payment slip>> |
| **Alternative course of events:** | | |
| **Precondition:** | Payment must be done. | |
| **Postcondition:** | The complete process will be recorded. | |

# Print payment slip

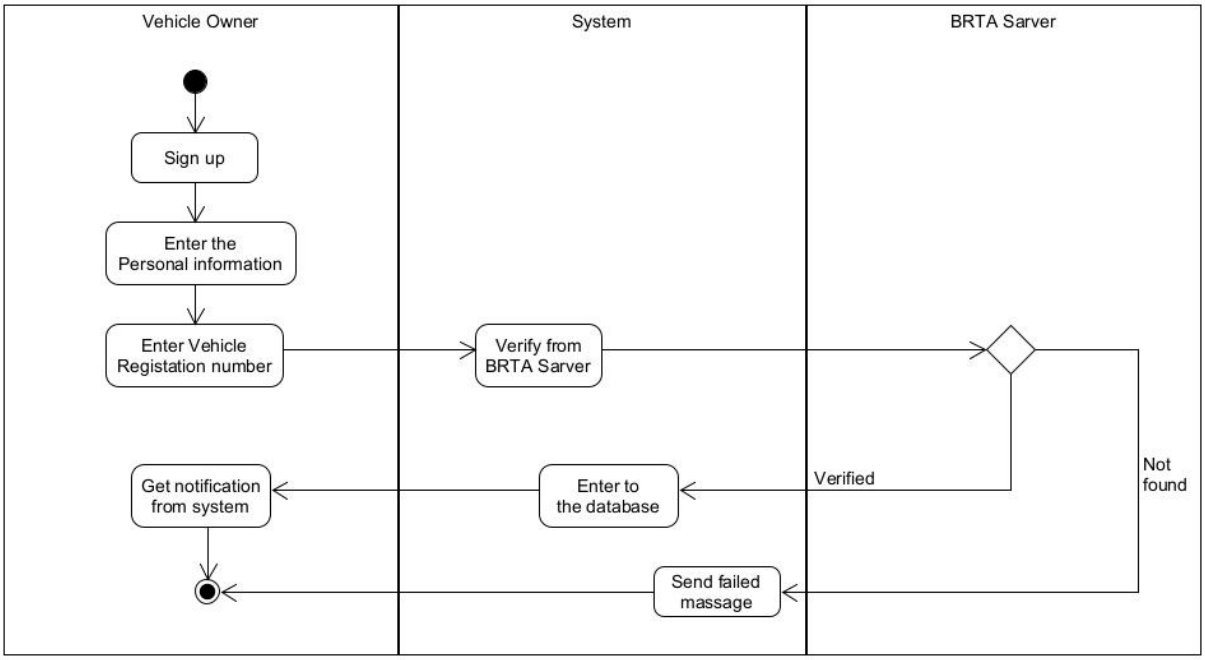
| | | |
|---|---|---|
| **Use Case Name:** | Print payment slip | |
| **Actor(s):** | Staff | |
| **Description:** | This use case give payment slip to the vehicle owners. | |
| **Reference ID:** | **TCS-09** | |
| **Typical course of events:** | **Actor Action**<br>**Step 1:** Given the payment slip to the vehicle owner. | **System Response** |
| **Alternative course of events:** | | |
| **Precondition:** | Payment must be done. | |
| **Postcondition:** | The complete process will be recorded. | |

# Activity Diagram

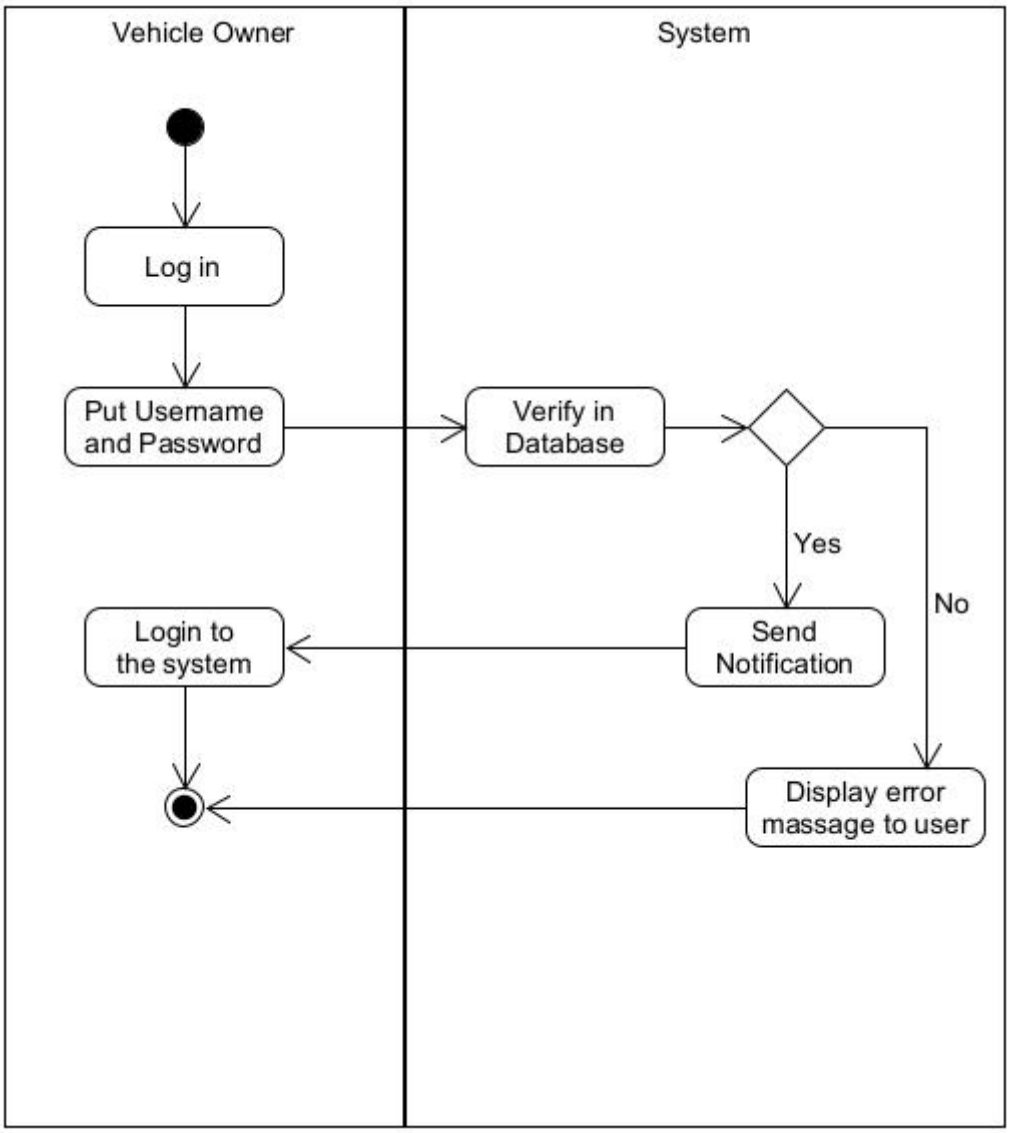
## Log in



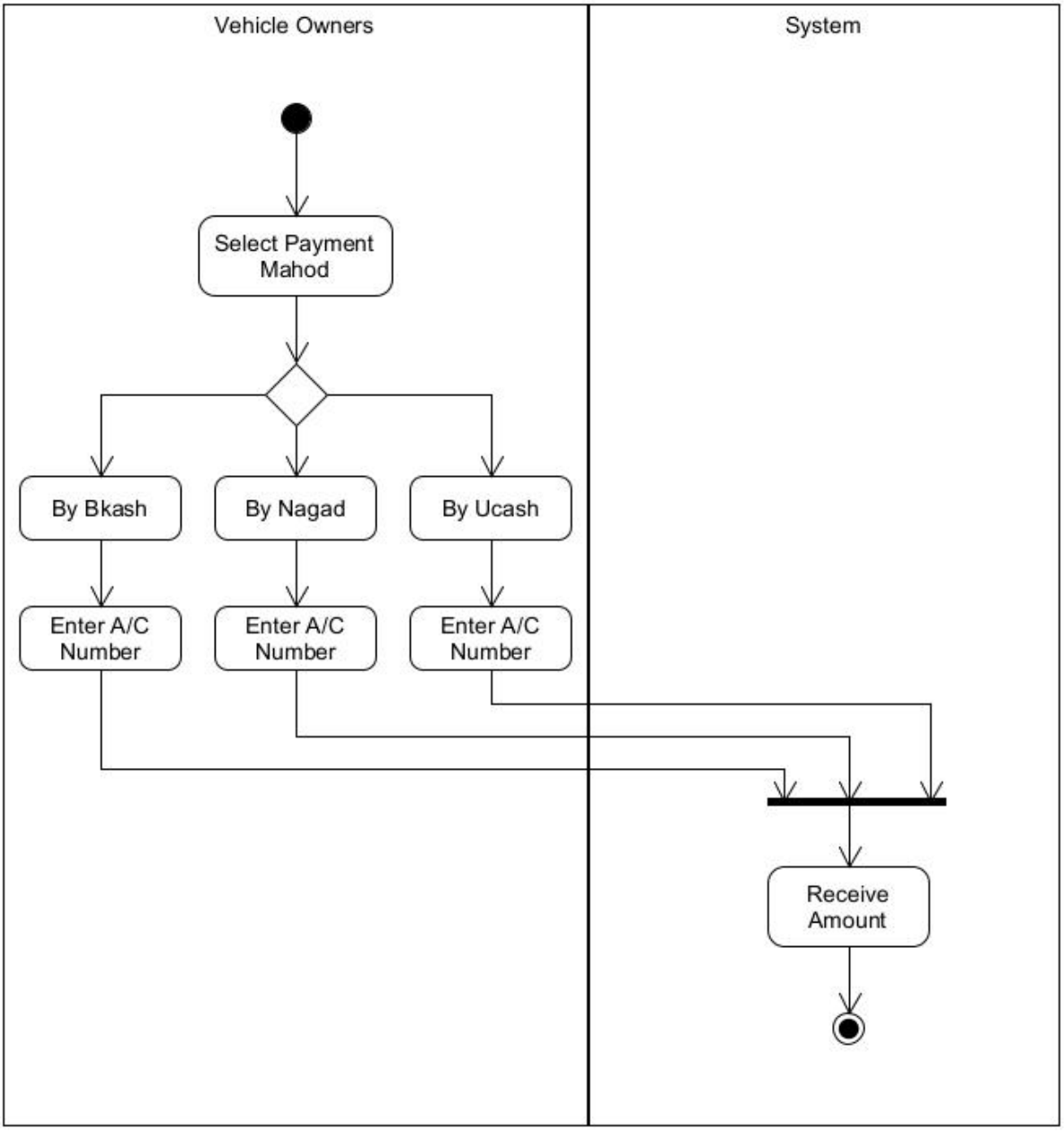
# Sign up


Vehicle Owner
System
BRTA Sarver
Sign up
Enter the Personal information
Enter Vehicle Registation number
Verify from BRTA Sarver
Verified
Not found
Get notification from system
Enter to the database
Send failed massage

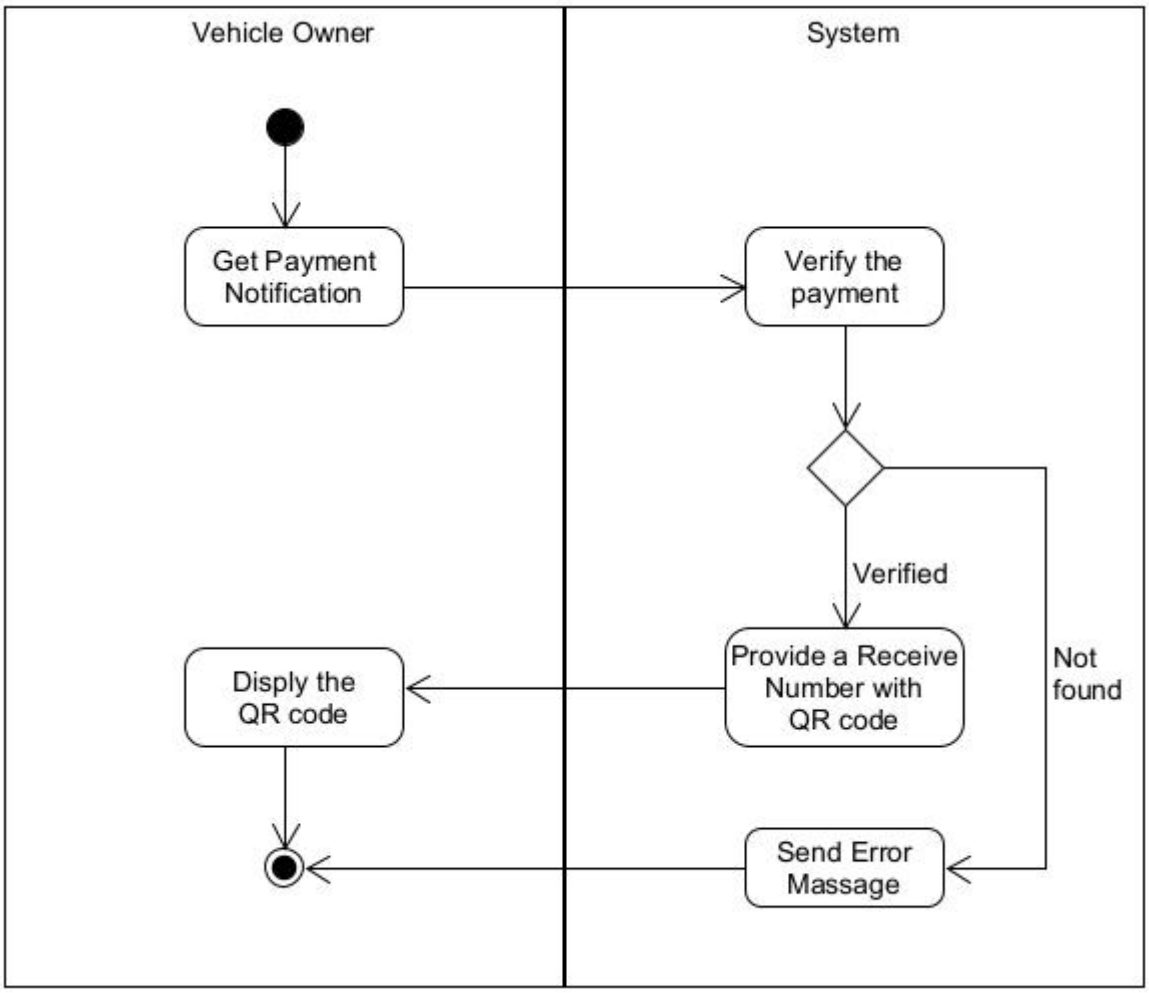
# Pay toll


Vehicle Owner
System
Log in
Put Username and Password
Verify in Database
Yes
No
Login to the system
Send Notification
Display error massage to user

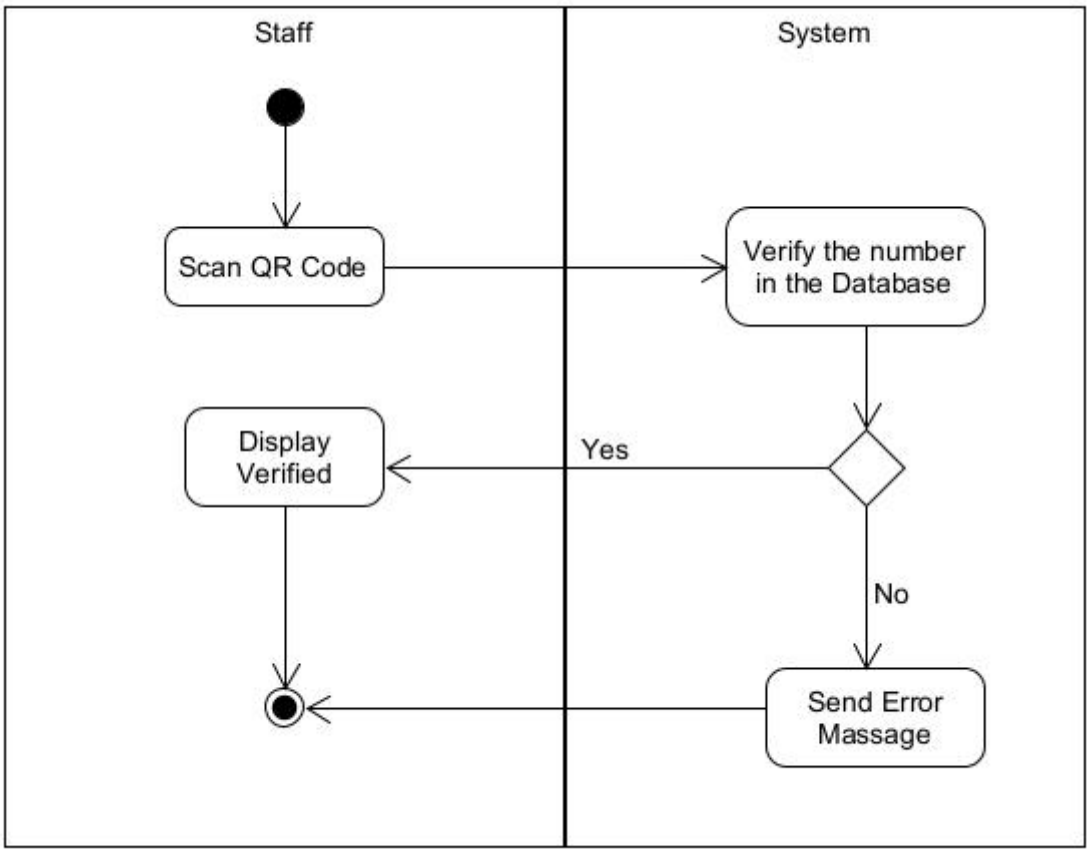
# Payment


Vehicle Owners
System
Select Payment Mahod
By Bkash
By Nagad
By Ucash
Enter A/C Number
Enter A/C Number
Enter A/C Number
Receive Amount

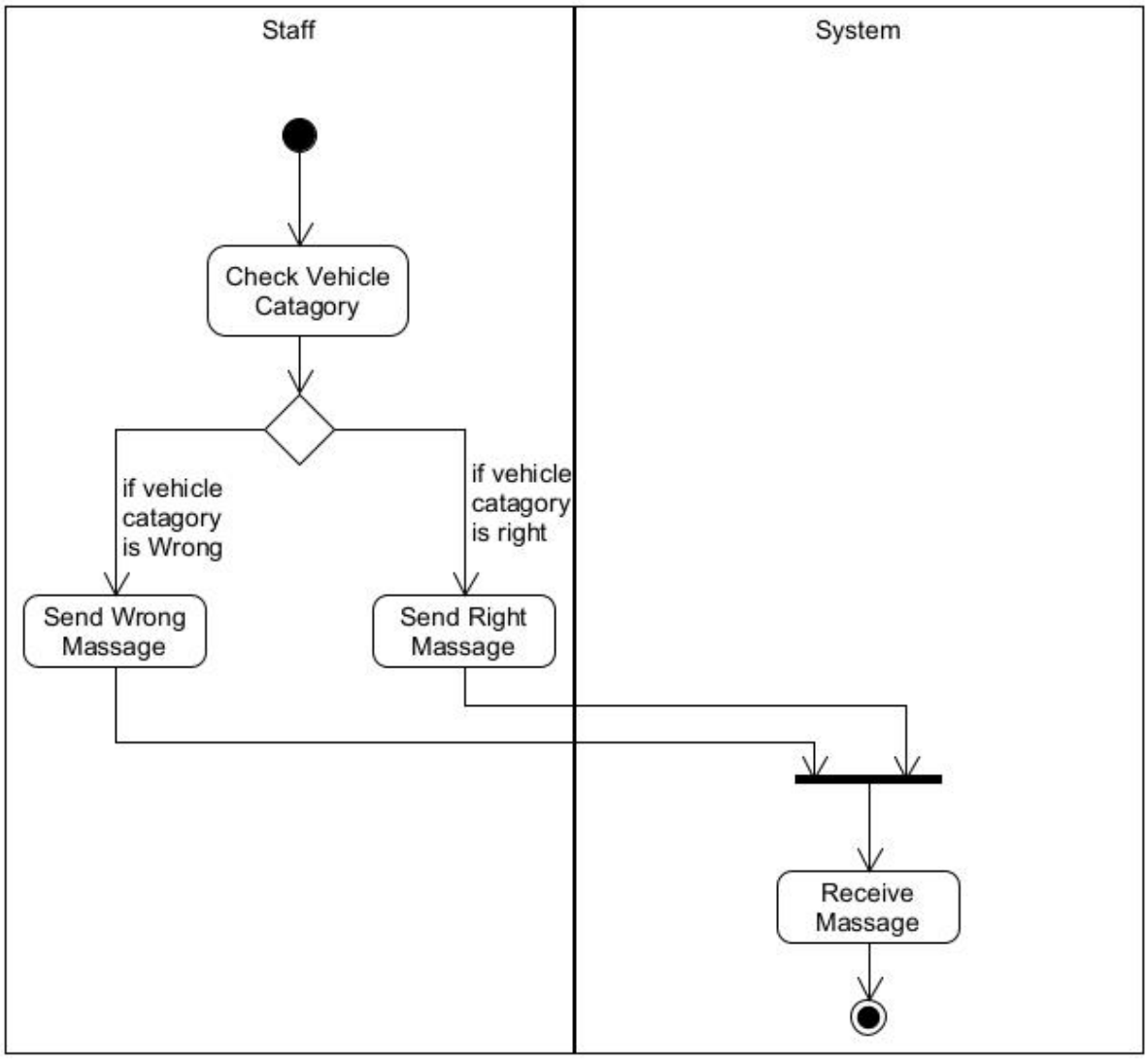
# Provide QR code



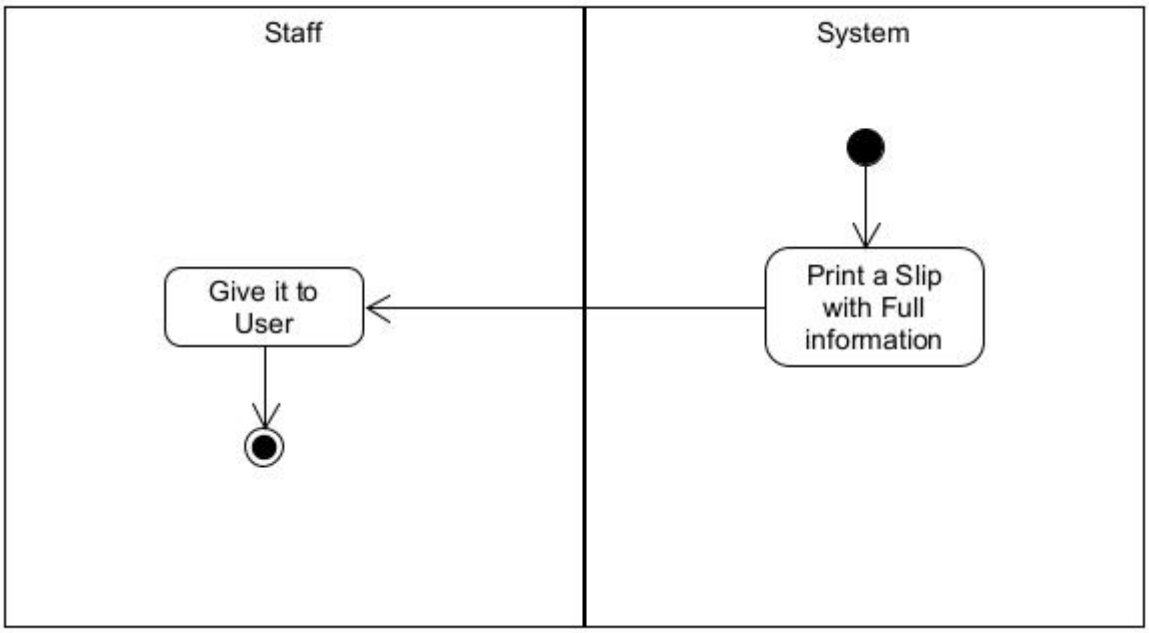
# Check QR Code



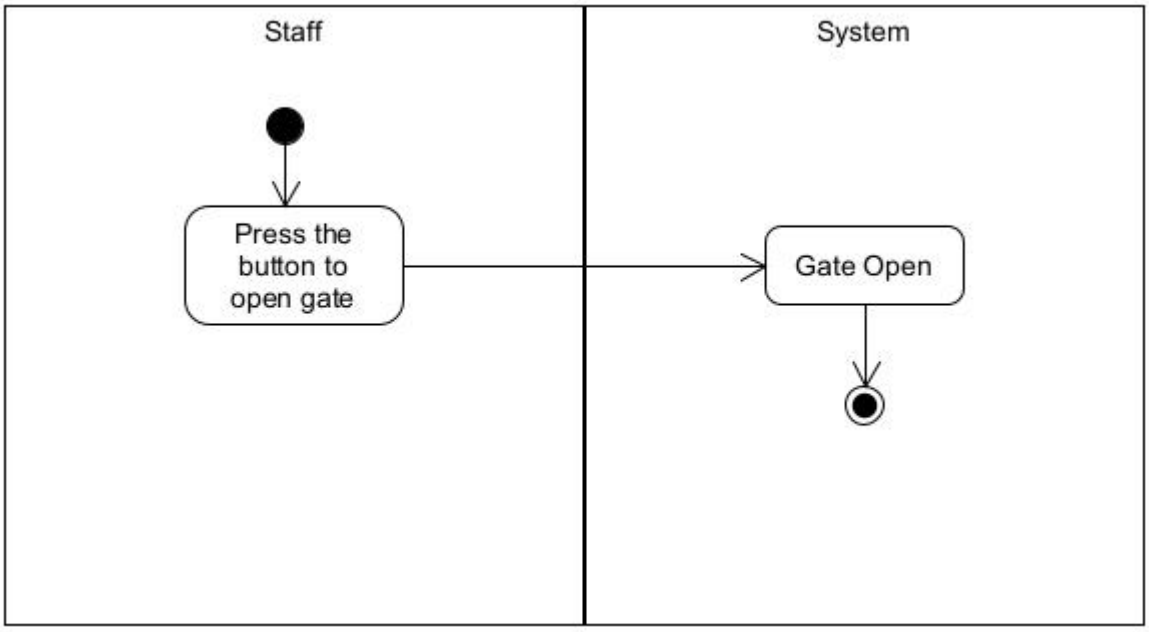
# Identify the vehicle



# Print Payment Slip

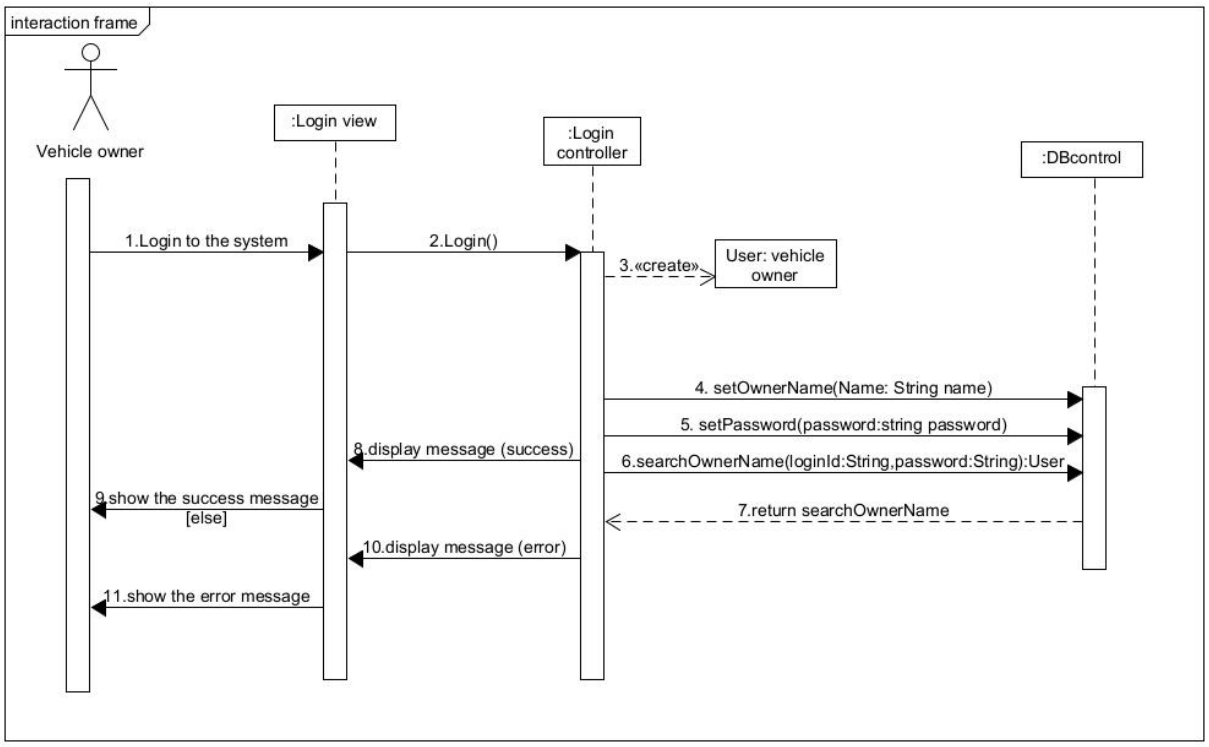


# Permission to pass



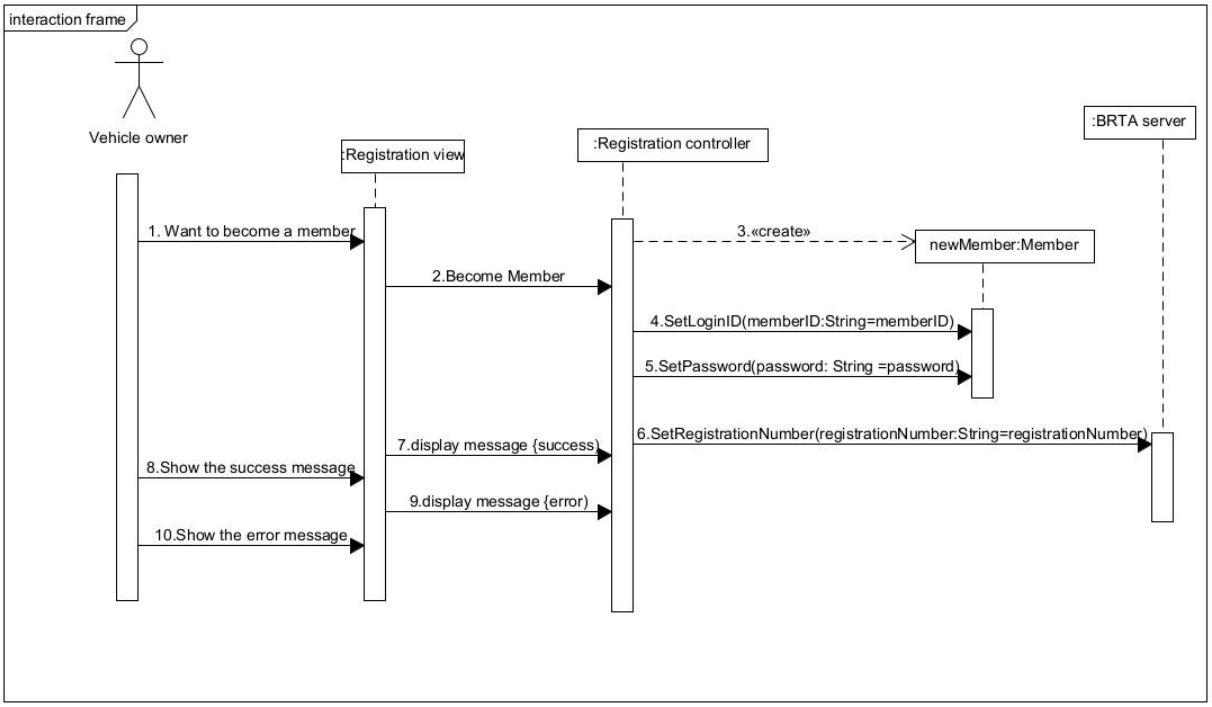
# Sequence Diagram

## Log in



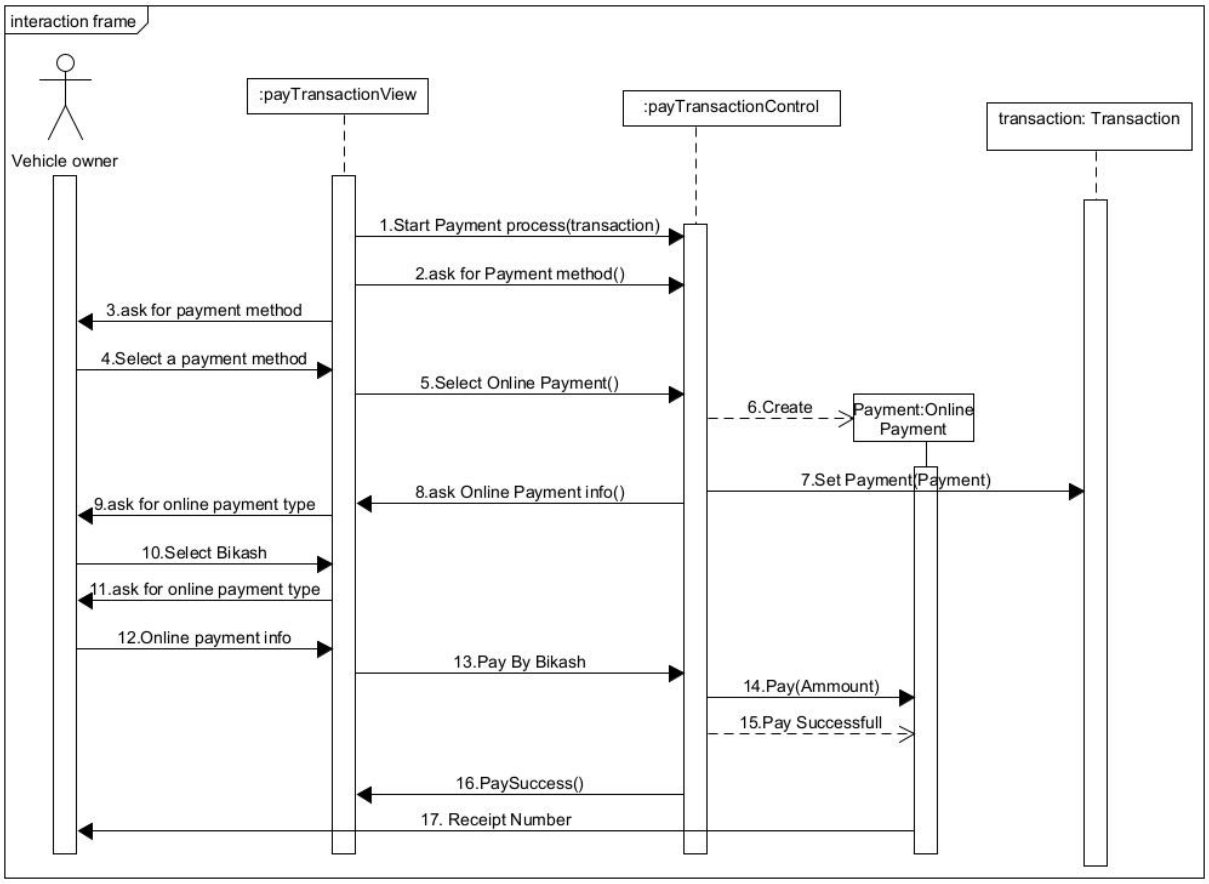

**Description:** The sequences diagram that vehicle owner requires to login the system. Firstly, the vehicle owner will provide the login ID and Password to system. After that, the system will create a member object for storing the login information that vehicle owner has provided. Therefore, the system will enquiry the database, to check the account whether exist or not. If the target account does not exist, the system will return the error message to owner and system may remind the vehicle owner to register an account or "forget password?" Finally, the database will retrieve other information to the system and the system will store them into the created User object if login successfully. When staff or operator need to login, the process of staff login should be same as owner login. However, the staff and operator account are created by administrator manually, the option of Register account is not suitable for staff and operator.

# SignUp



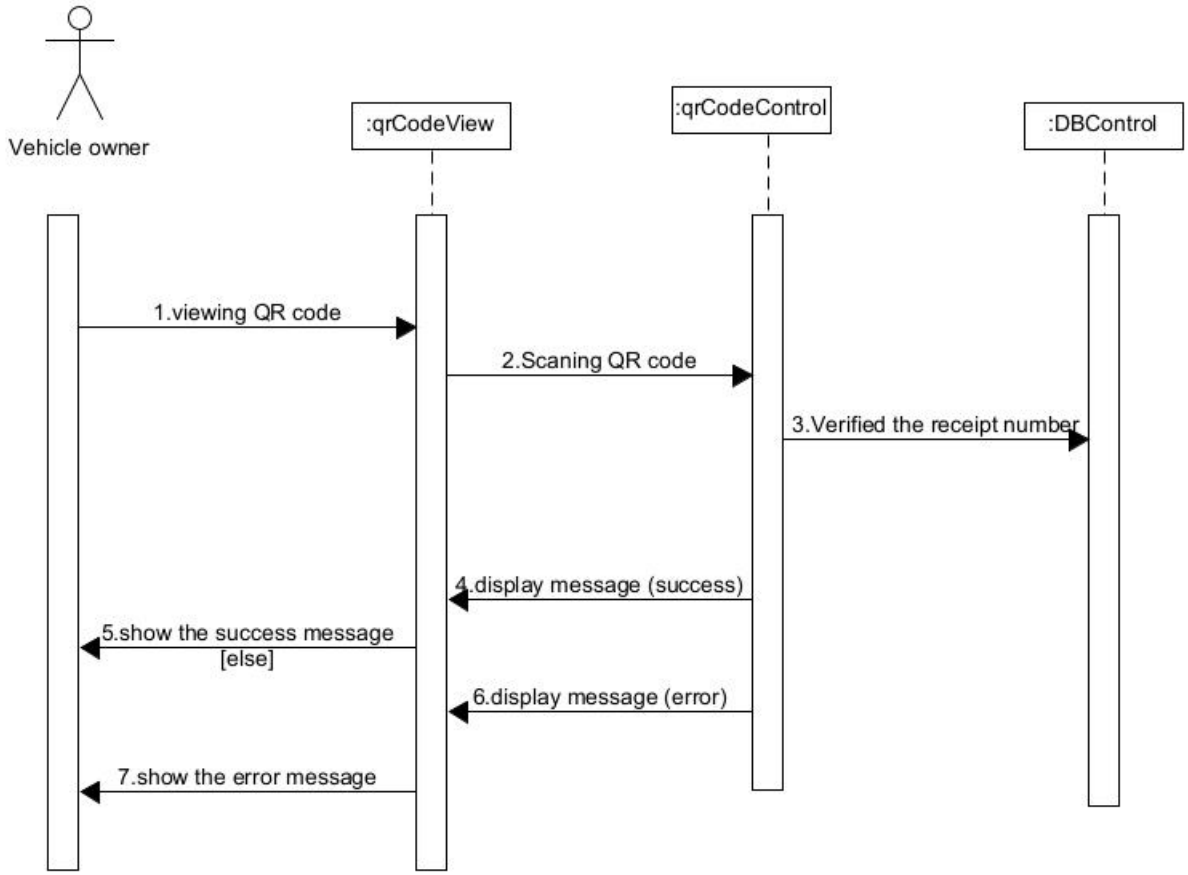

**Description:** About the sequence diagram of register account, it is very similar as login process. Vehicle owner will provide the personal information to system, such as login ID, password, vehicle registration number etc. The vehicle registration number will store into BRTA server. After that, the system will create a member object for storing the NEW account information that owner has provided. Therefore, the system will enquiry the database, to check the account whether exist or not. If the target account exists, the system will return the error message to member and system may remind the customer to error message such as “this account exists, please re-enter a new login ID”. Finally, the system will return the success message to customer if register account successfully. In addition, the customer will login the system automatically.

# Pay Toll



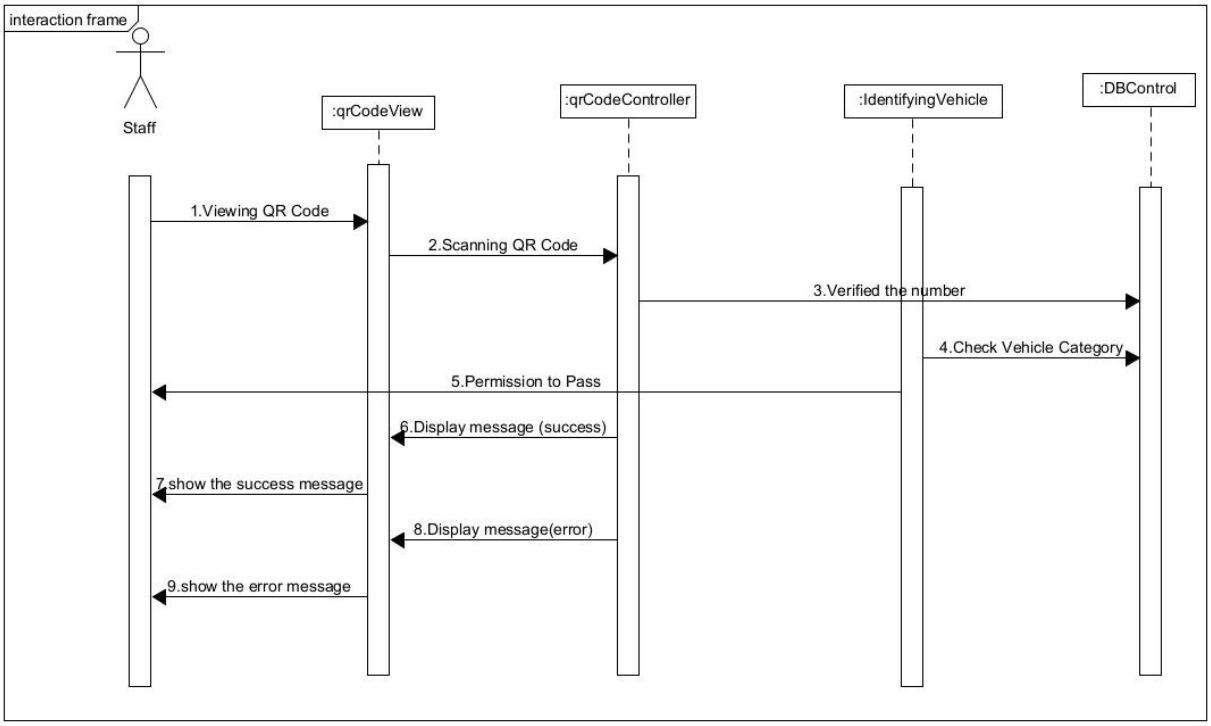

**Description:** When the payment process is triggered, the vehicle owner is required to select the payment method. Vehicle owner can deposit money in online. Then, the vehicle owner is required to provide all the information required by that particular payment method. Then, user can select any online payment method such as Bikash, Nagad, Rocket for paying the money. After paying the money, system will provide him/her a number that will convert into the QR code.

# Provide QR Code



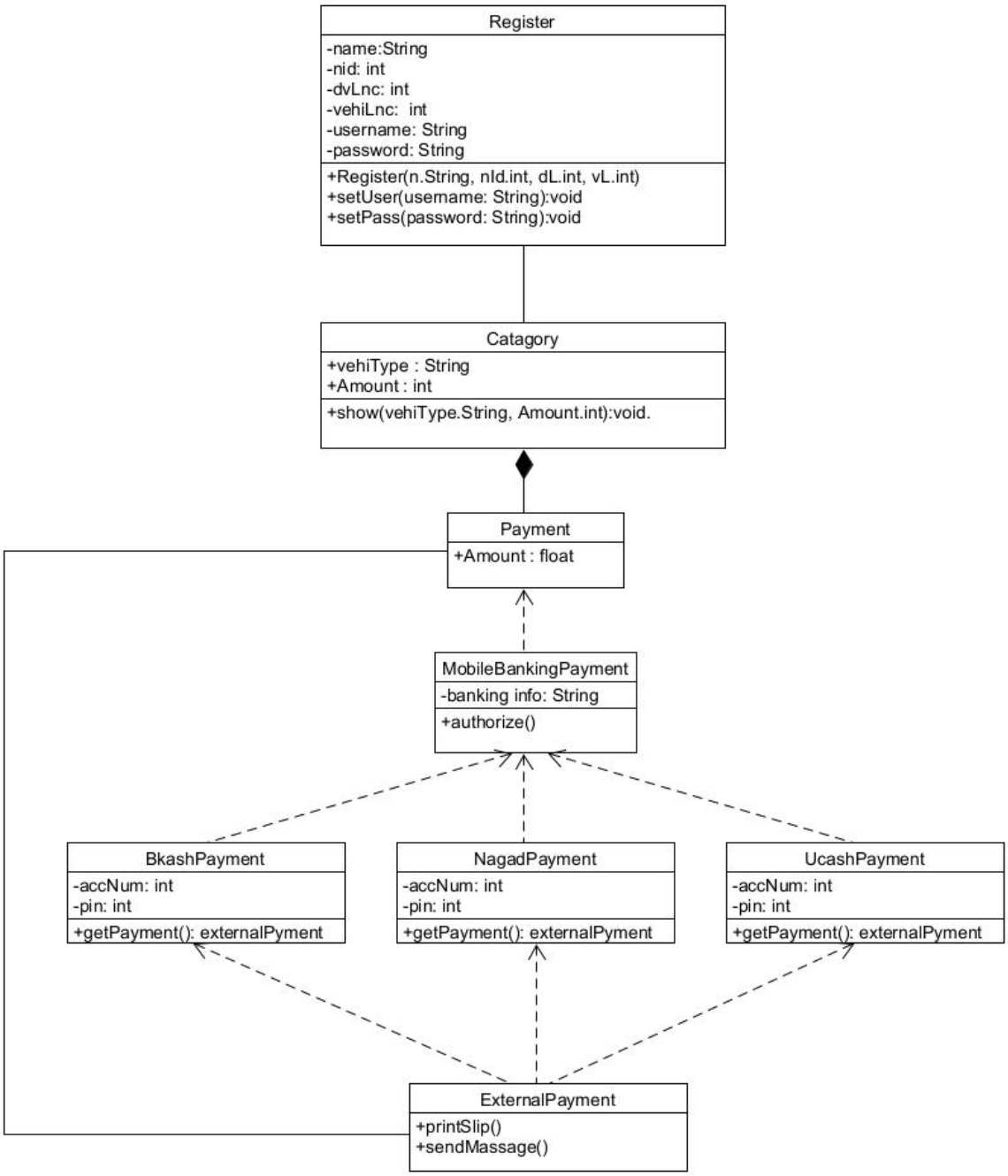

**Description:** After paying the money, system will provide a number that will convert into the QR code. Then vehicle owner can view the QR code. And scan it in the system by the receipt number which is stored into the database. If the number is correct, then system will show the success message and if it wrong then it will show the error message.

# Permission To Pass




**Description:** Staff can scan the vehicle owner QR code. If the QR code is valid then he can check the category of the vehicle and give the permission to pass the vehicle.

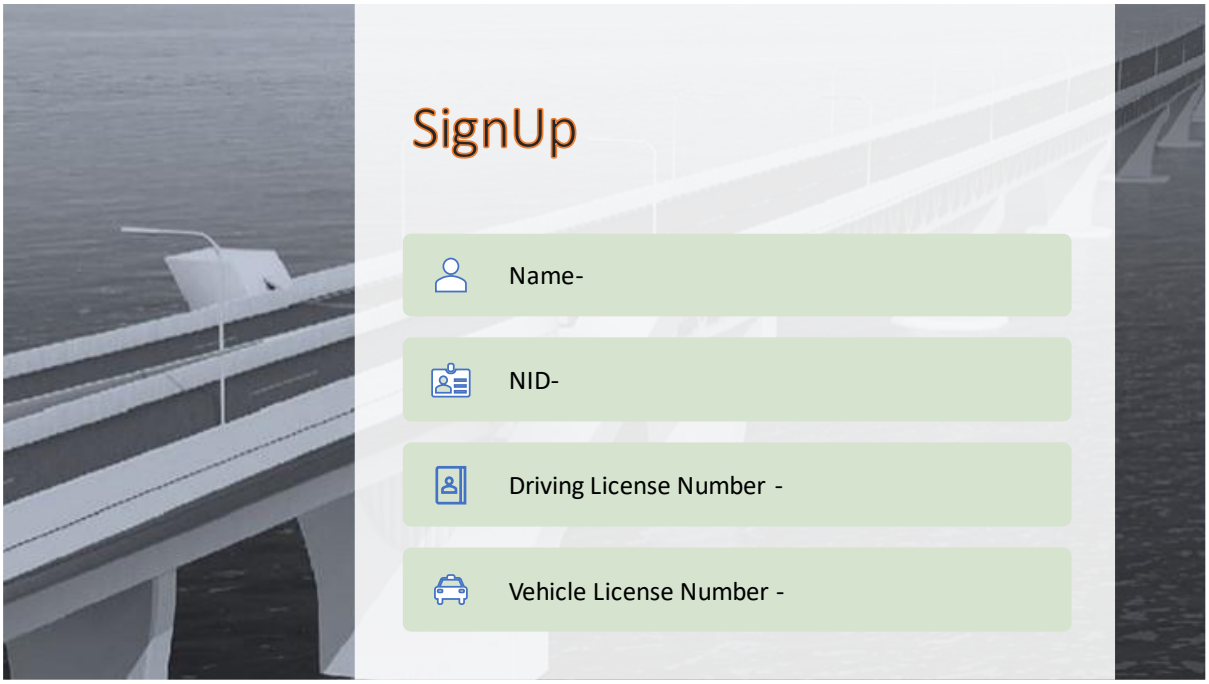
# Class Diagram

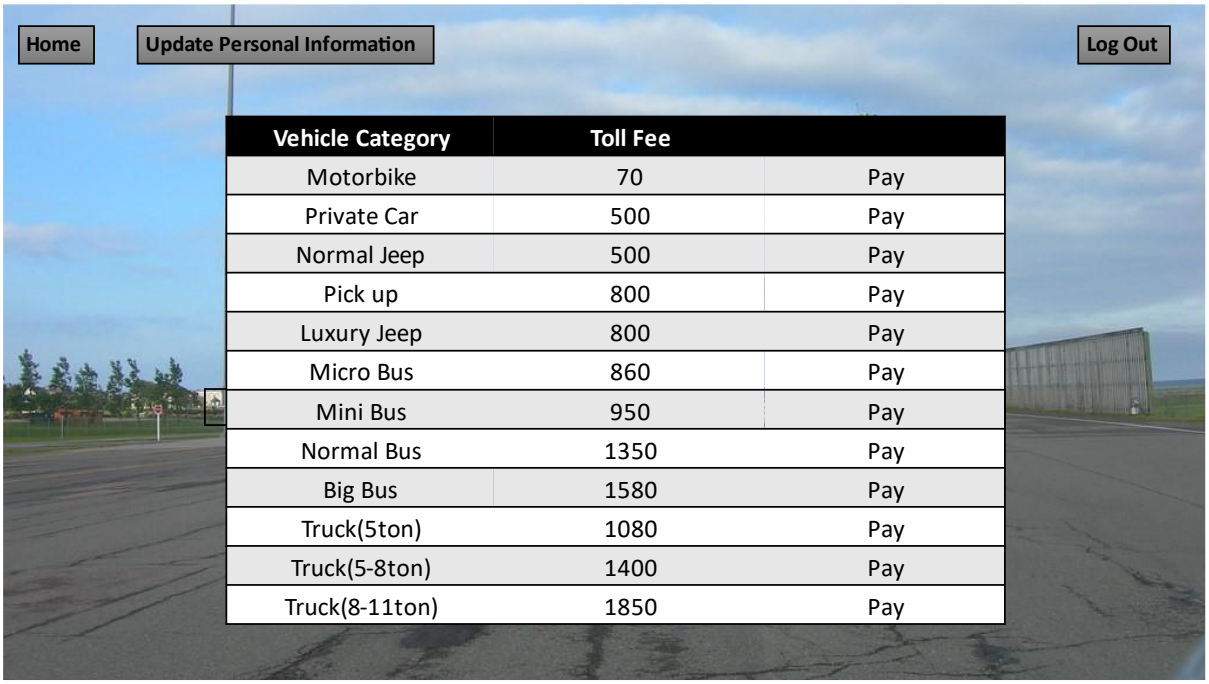


**Description:** For every transaction, there is owned by a member at most or own by none while an owner can make many transactions. One transaction has at most one payment and one payment can only settle one transaction. There are different states for a transaction. For the payment method, there are only one kind of payment method which is pay by online. In this payment method, the vehicle owner can choose either a Bikash or a Nagad or a Ucash. Our design of the class diagram can demonstrate the above scenario and provide appropriate flexibility for the system to be extended.

# Prototype


Padma Bridge Toll Management System
Log In
Sign Up
Username
Password
Forgot your username or password?
Log In


SignUp
Name-
NID-
Driving License Number -
Vehicle License Number -


Home
Update Personal Information
Log Out
Vehicle Category
Toll Fee
Motorbike 70 Pay
Private Car 500 Pay
Normal Jeep 500 Pay
Pick up 800 Pay
Luxury Jeep 800 Pay
Micro Bus 860 Pay
Mini Bus 950 Pay
Normal Bus 1350 Pay
Big Bus 1580 Pay
Truck(5ton) 1080 Pay
Truck(5-8ton) 1400 Pay
Truck(8-11ton) 1850 Pay


Payment
Motorbike 70 Pay
Select Payment Method
bKash
a BRAC BANK company
নগদ
UCash
MOBILE FINANCIAL SERVICE


Payment Slip
Name: Anik Sarker
Vehicle Type: Motor Bike
Toll fee : 70 Taka
Receipt Number: 05489761237
Passed

# Conclusion

In this report, we have included the design phase of development the Padma Bridge Toll Management System from gathering user requirement and UML modeling. This report demonstrates our solution to solve the existing problems of toll management and it will save our valuable time.