

4 Design and Architecture

4.1 System Architecture

Keeping in view the demand of access and usability of hardware devices, we are also implementing a hardware within our proposed system. Layered and 3-tier architectures are used for development of this project, a hybrid approach keeping in view the benefits of both architectures together. 3-tier architectures provide many benefits for production and development environments by modularizing the user interface, business logic, and data storage layers. Doing so gives greater flexibility to development teams by allowing them to update a specific part of an application independently of the other parts.

A Presentation Layer that sends content to browsers in the form of HTML/JS/CSS. This might leverage frameworks like React, Angular, Ember, Aurora, etc.

An Application Layer that uses an application server and processes the business logic for the application. This might be written in C#, Java, C++, Python, Ruby, etc.

A Data Layer which is a database management system that provides access to application data. This could be MSSQL, MySQL, Oracle, or PostgreSQL, Mongo, etc.

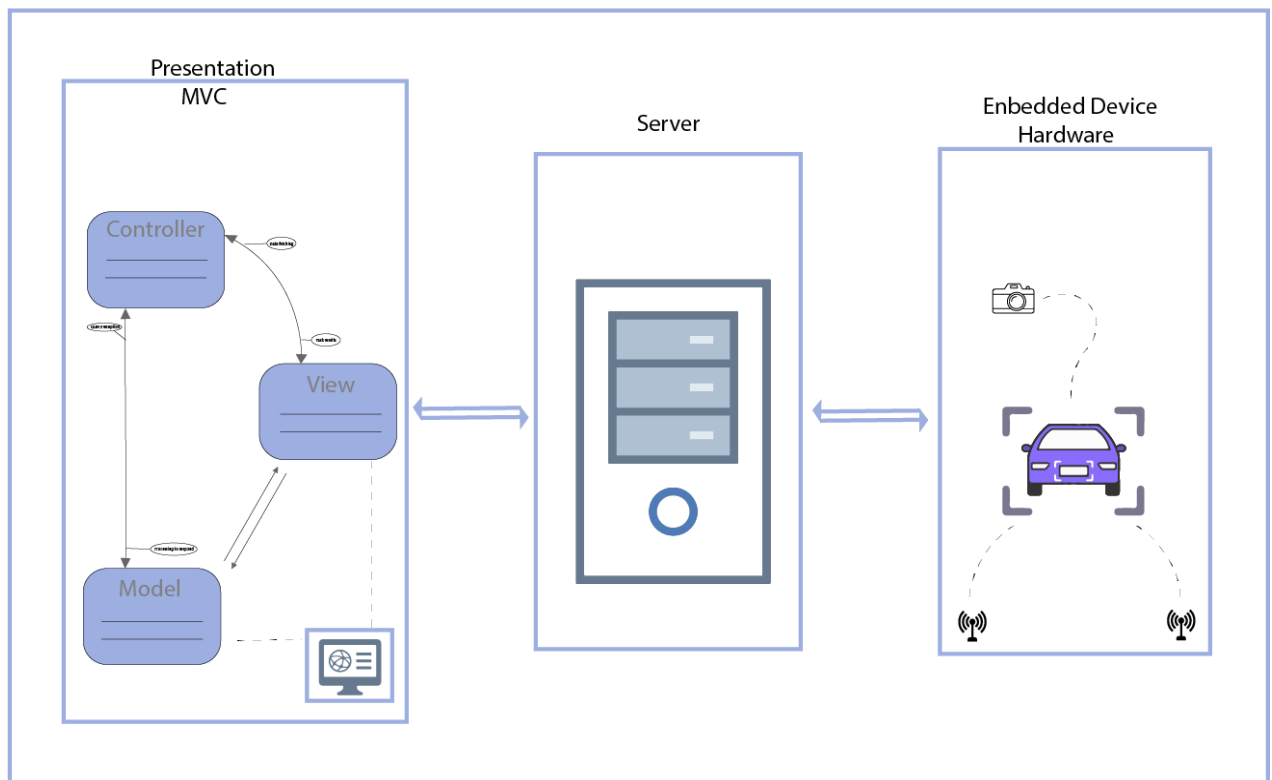


Figure 2: 3tier Architecture

4.2 Data Representation

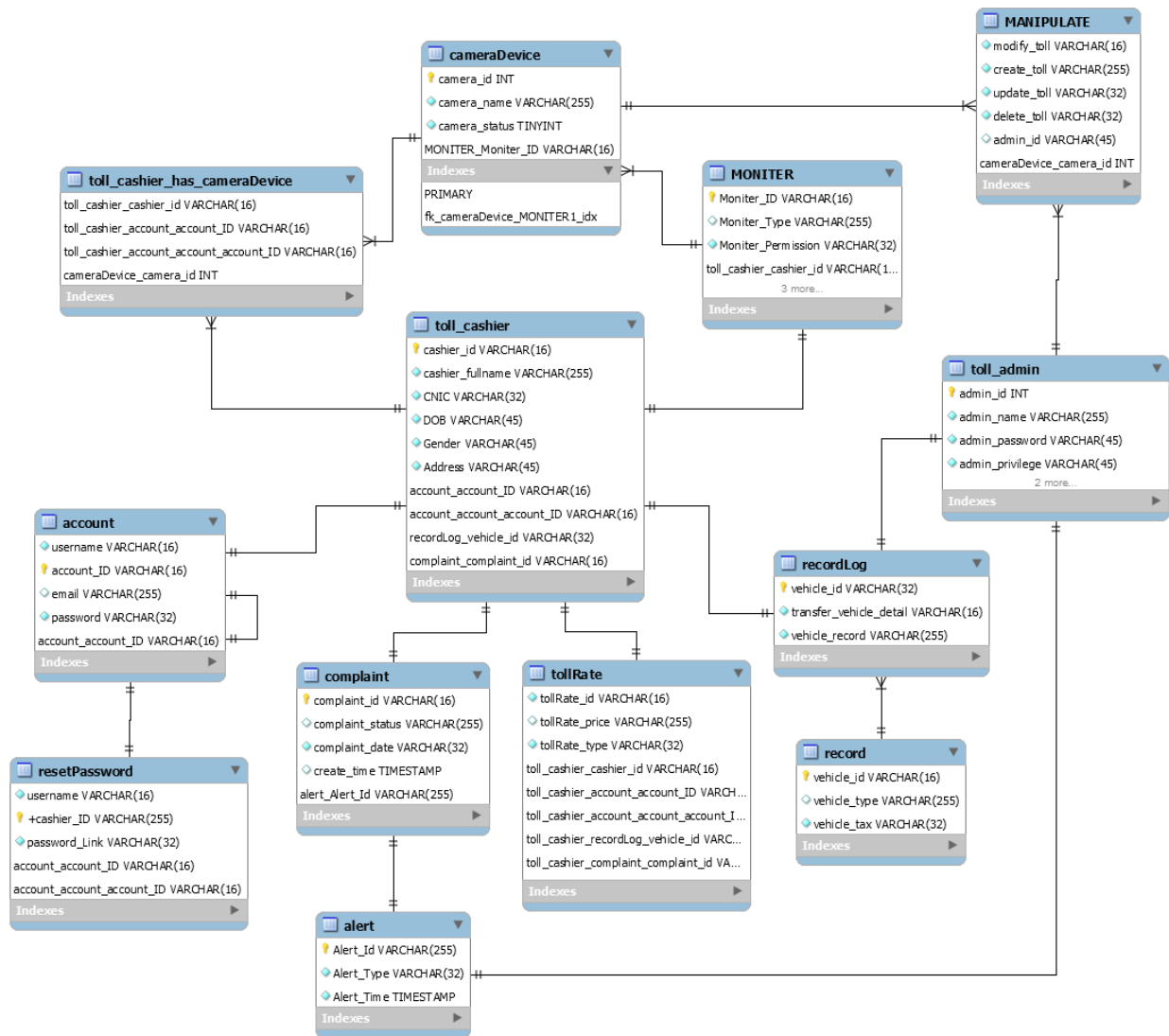


Figure 3: EERD Diagram

4.3 Process Flow/Representation

4.3.1 Structural Diagram

Following Class Diagram for RCS is classified on basis Model View Controller architecture:

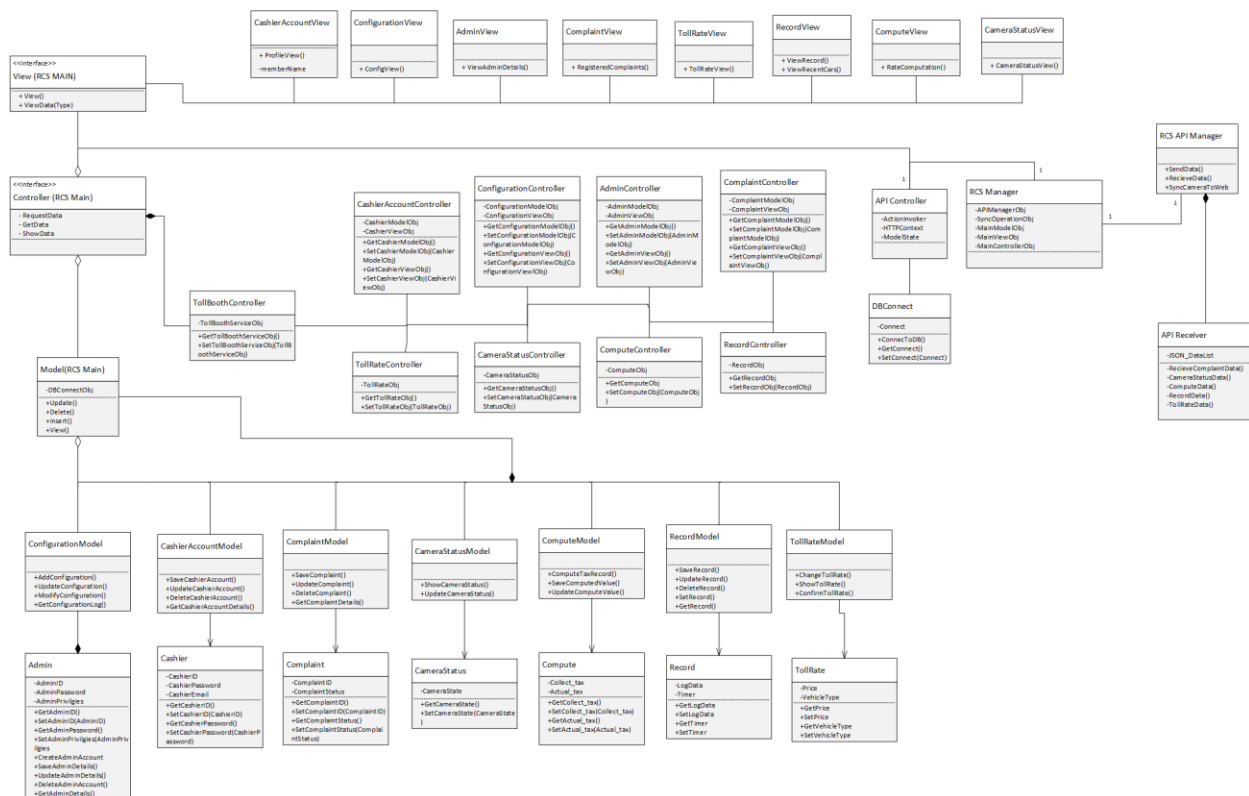


Figure 4: Class Diagram

4.3.2 Behavioral Diagrams

Following are the activity Diagrams of major modules of the system.

1. Main Detection Module

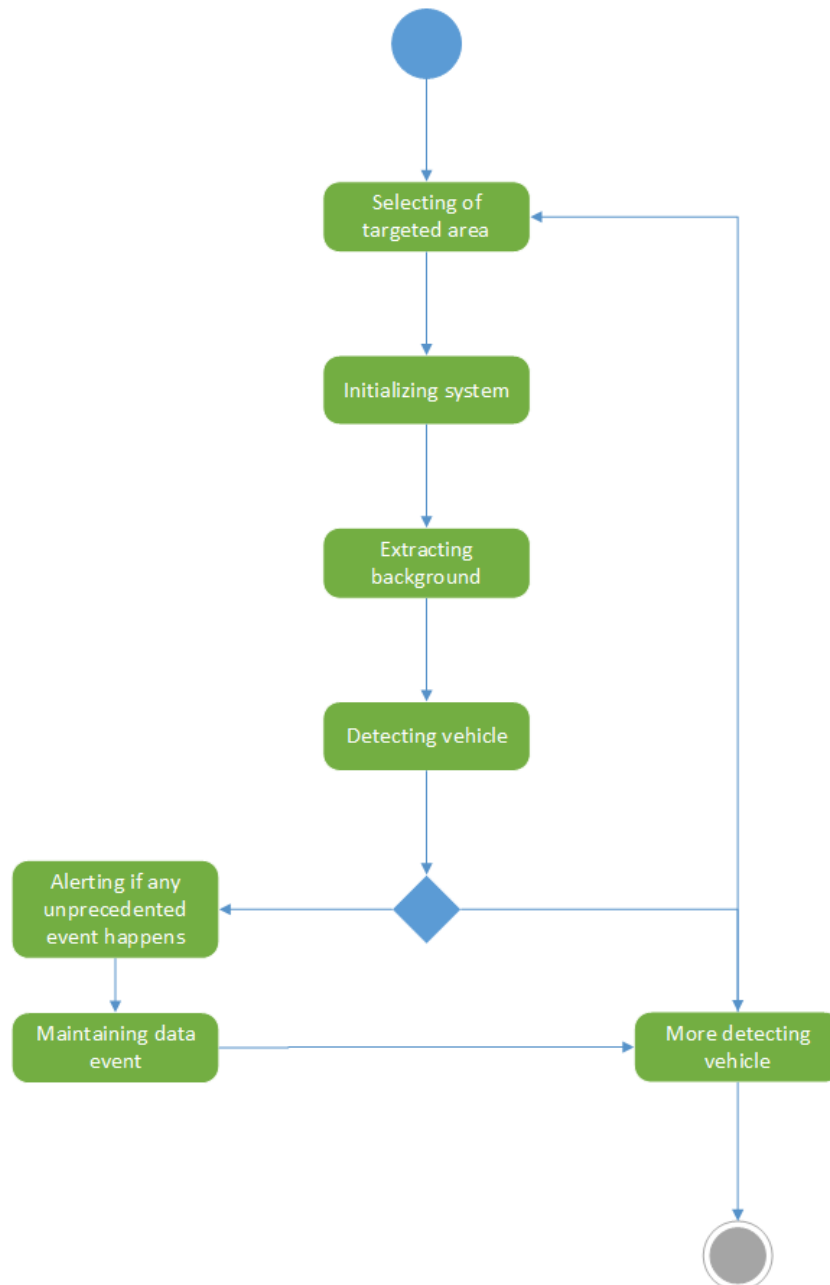


Figure 5: Main Detection Module

2. Main Camera Module

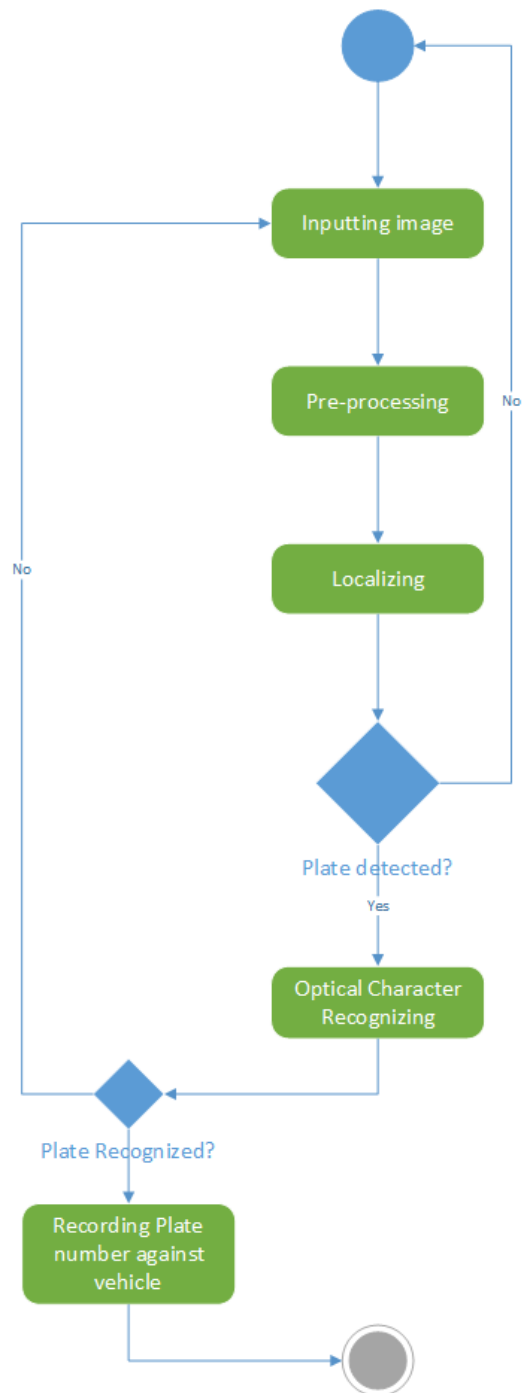


Figure 6: Main Camera Module

3. Main Admin Module

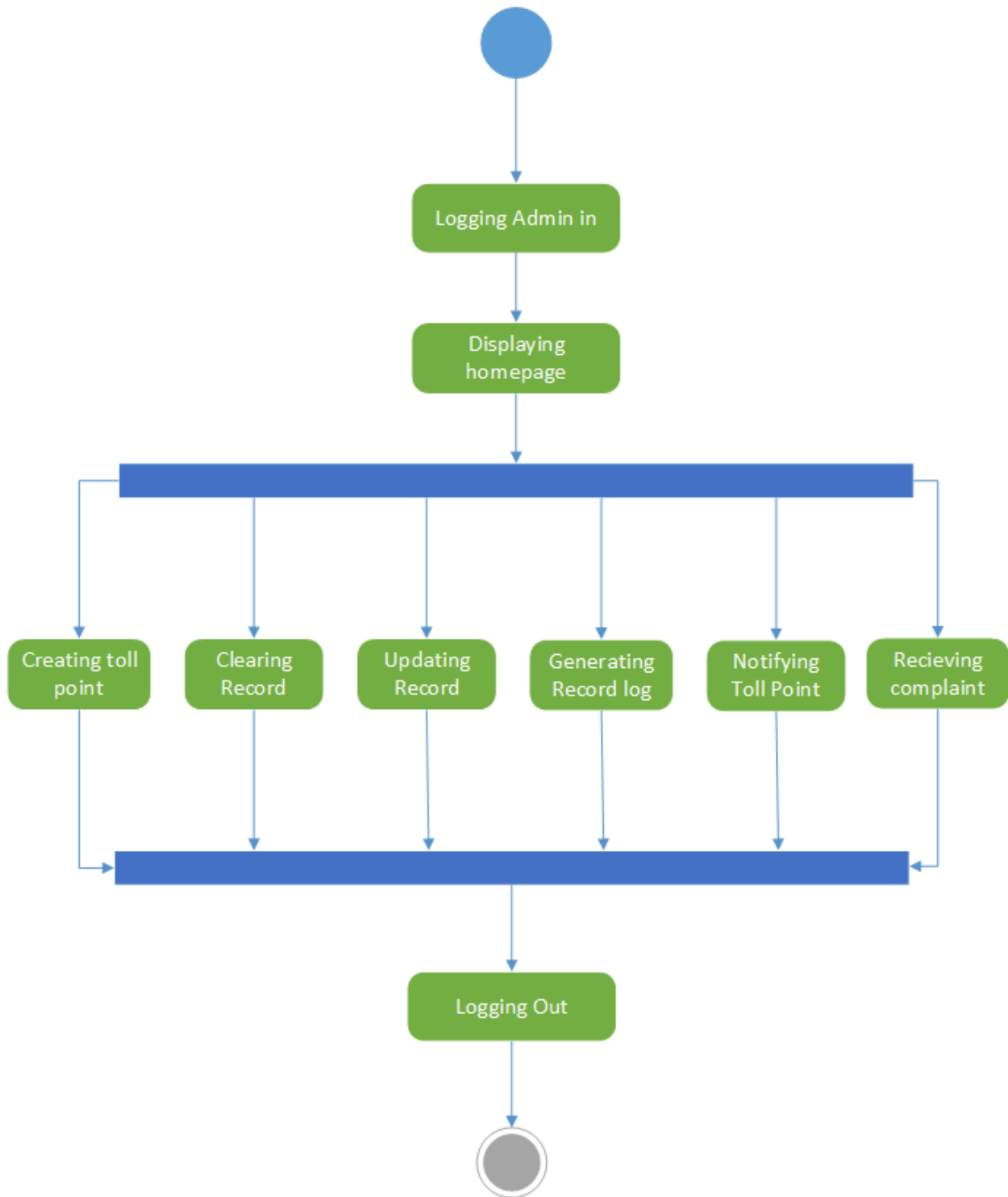


Figure 7: Main Admin Module

4. Log In

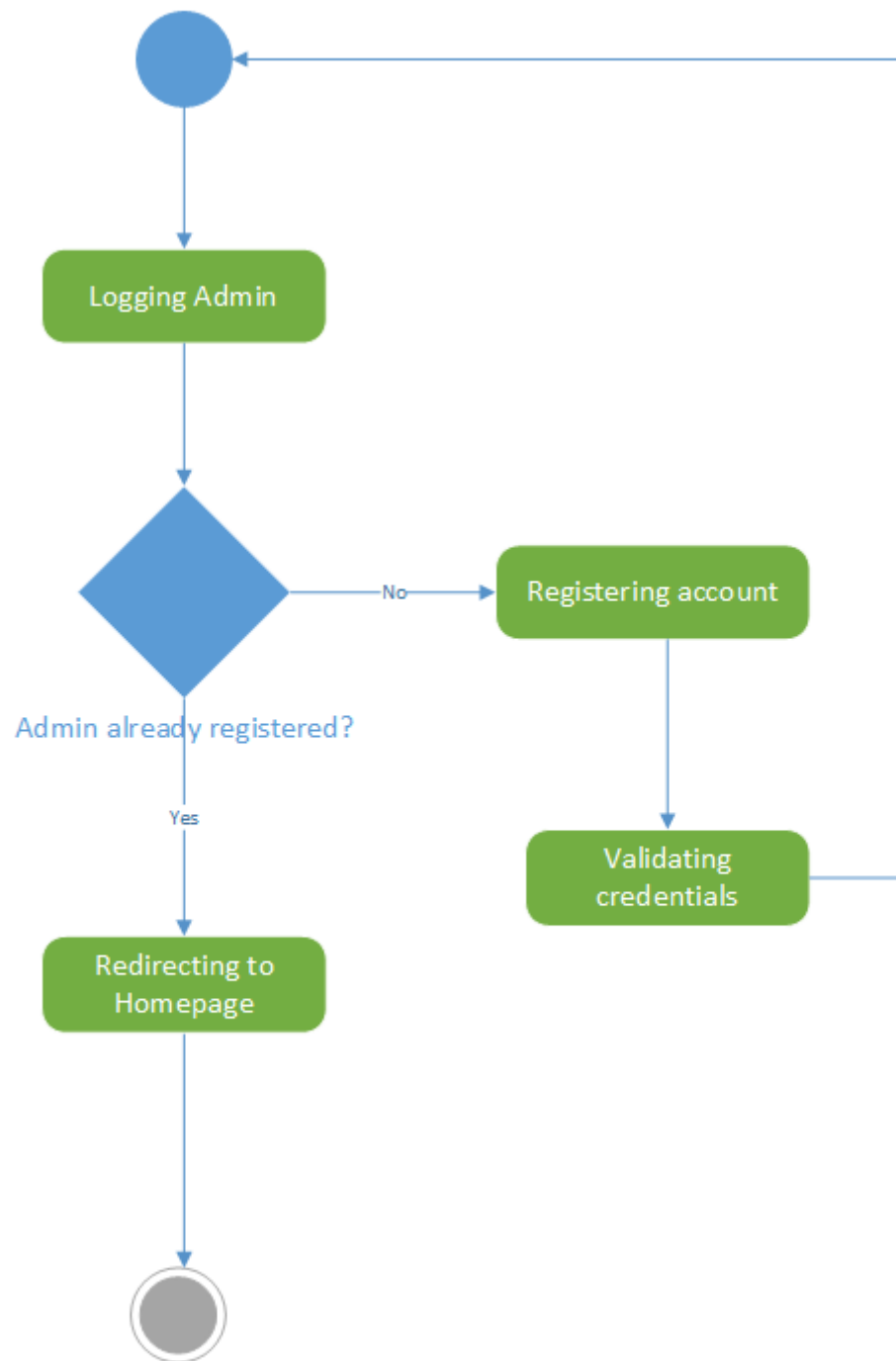


Figure 8: Login

5. Generate tax record

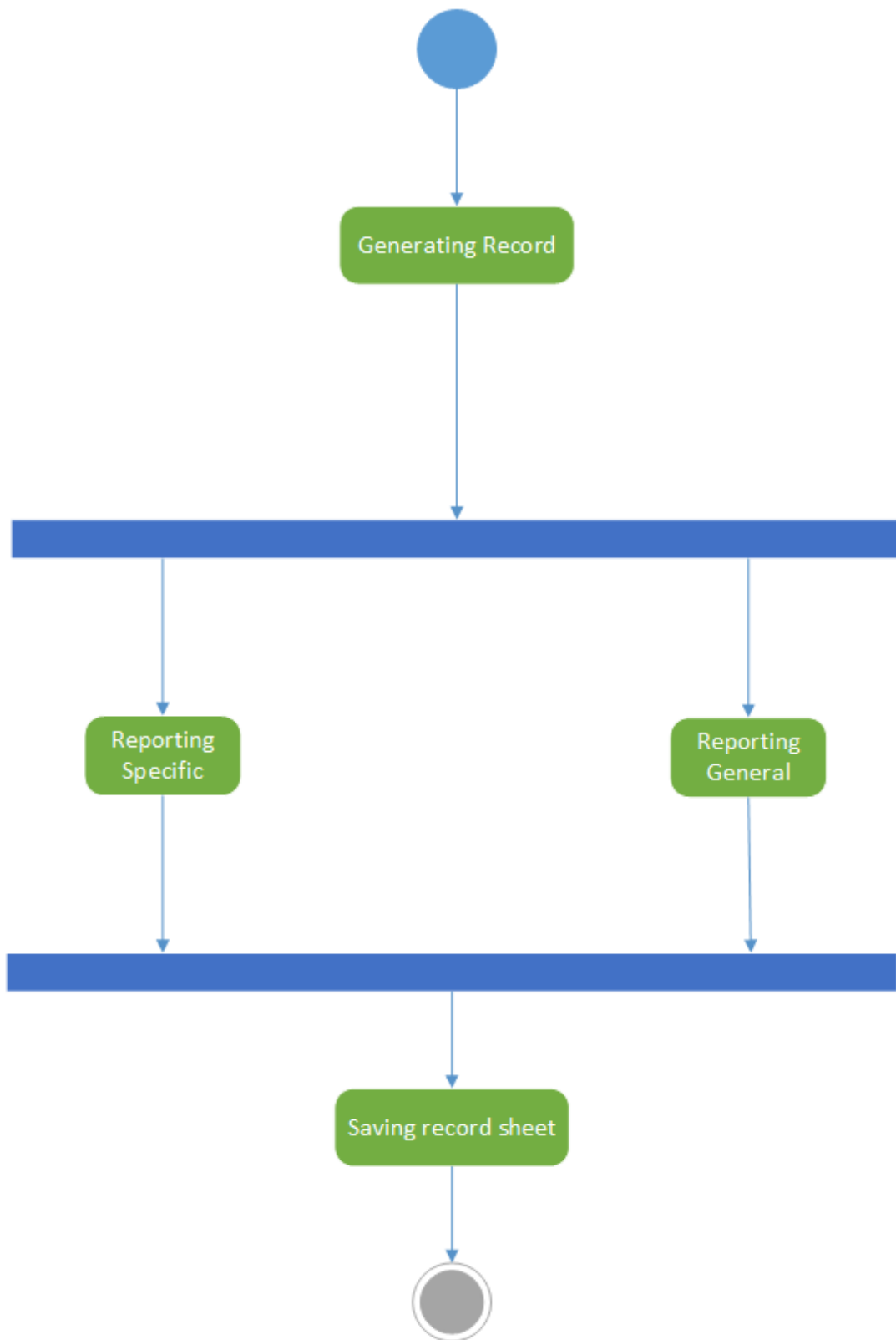


Figure 9: Tax Record

6. Update Toll booth record

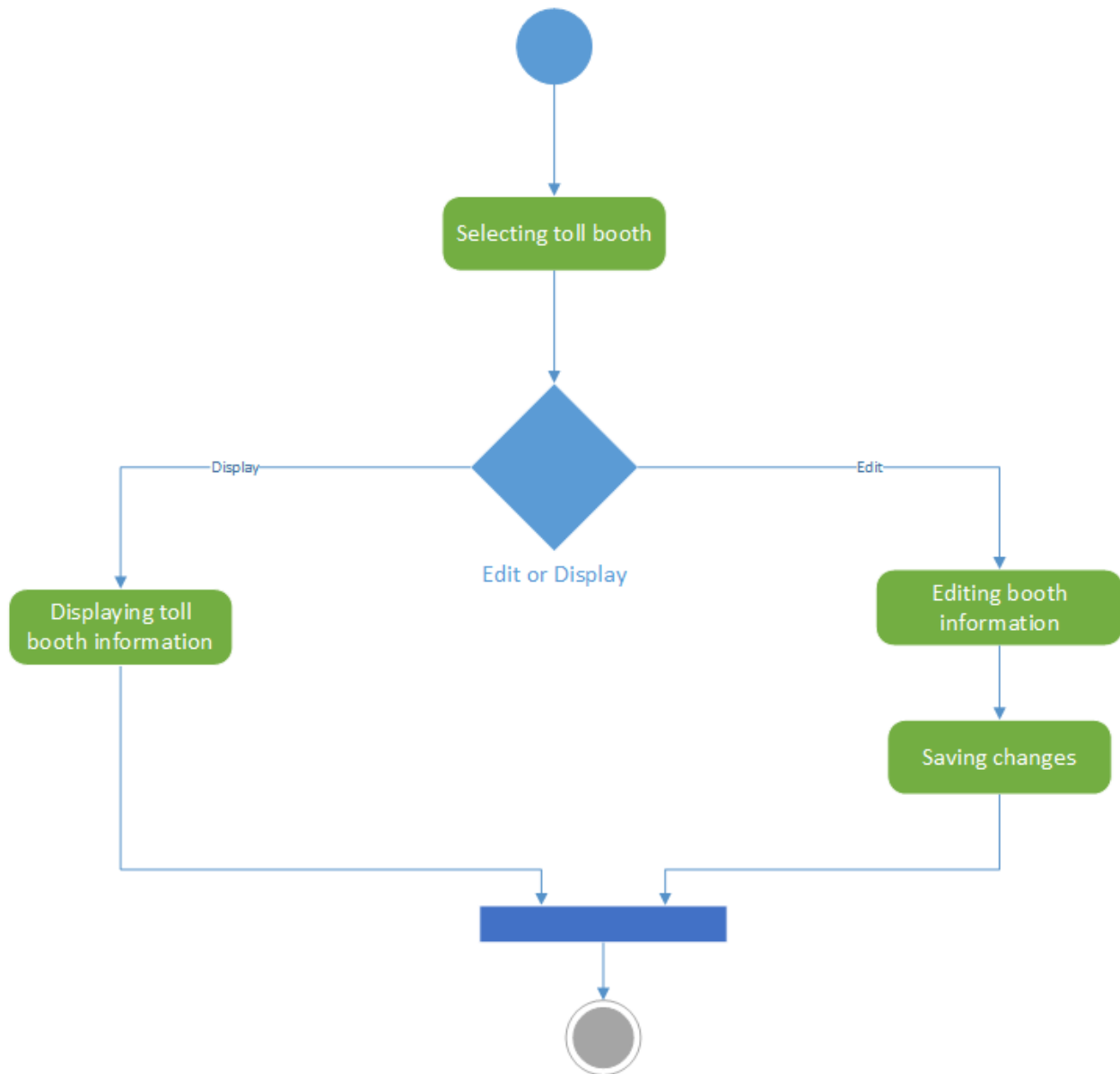


Figure 10: Update Tax Record

7. Clear Toll booth record

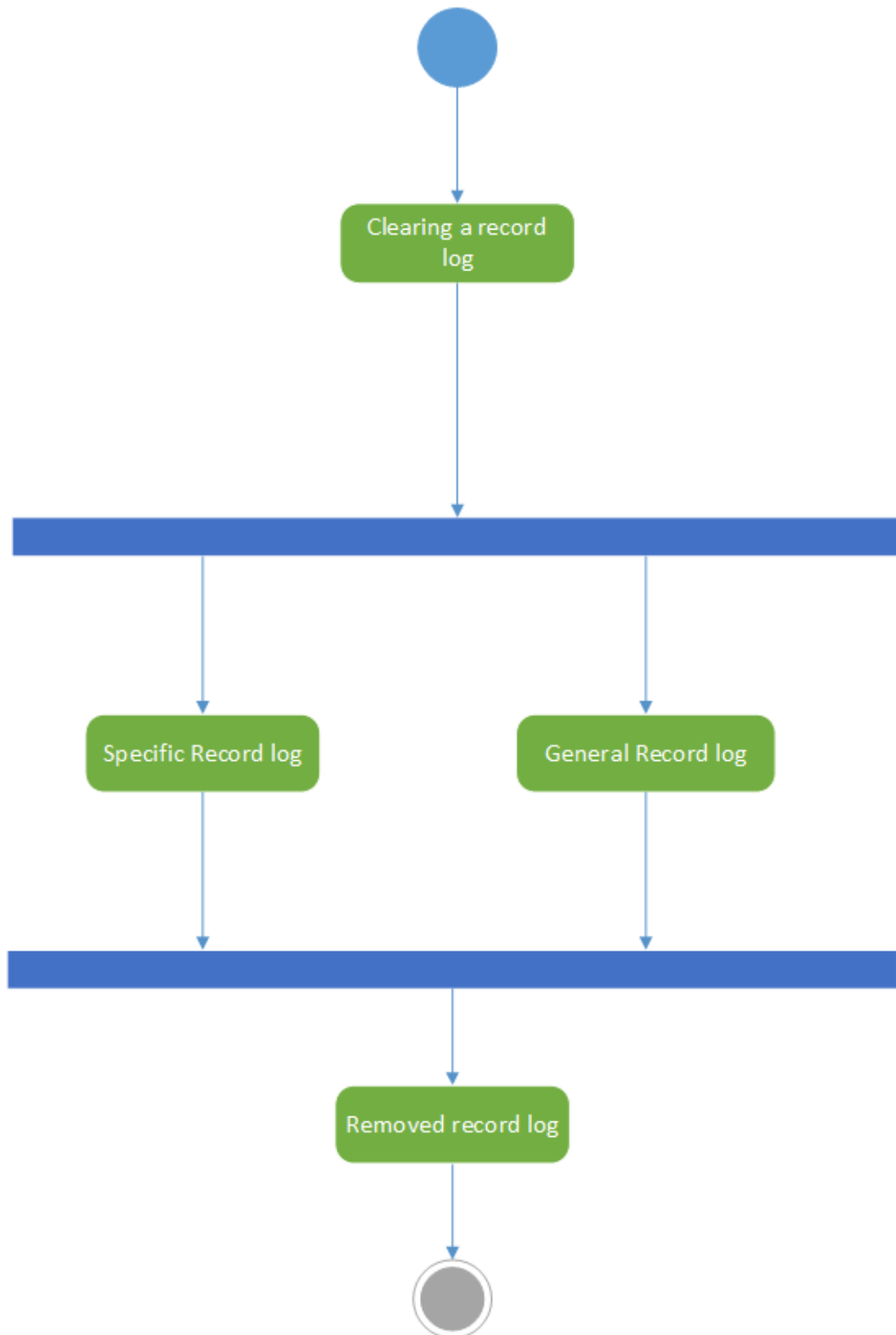


Figure 11: Clear Toll Record

8. Complaints Handling

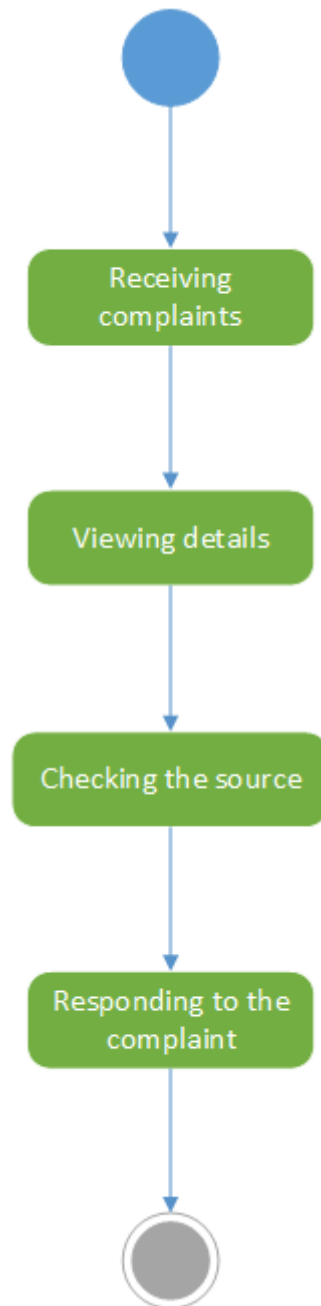


Figure 12: Complaints Handle

9. Main Toll Booth App Module

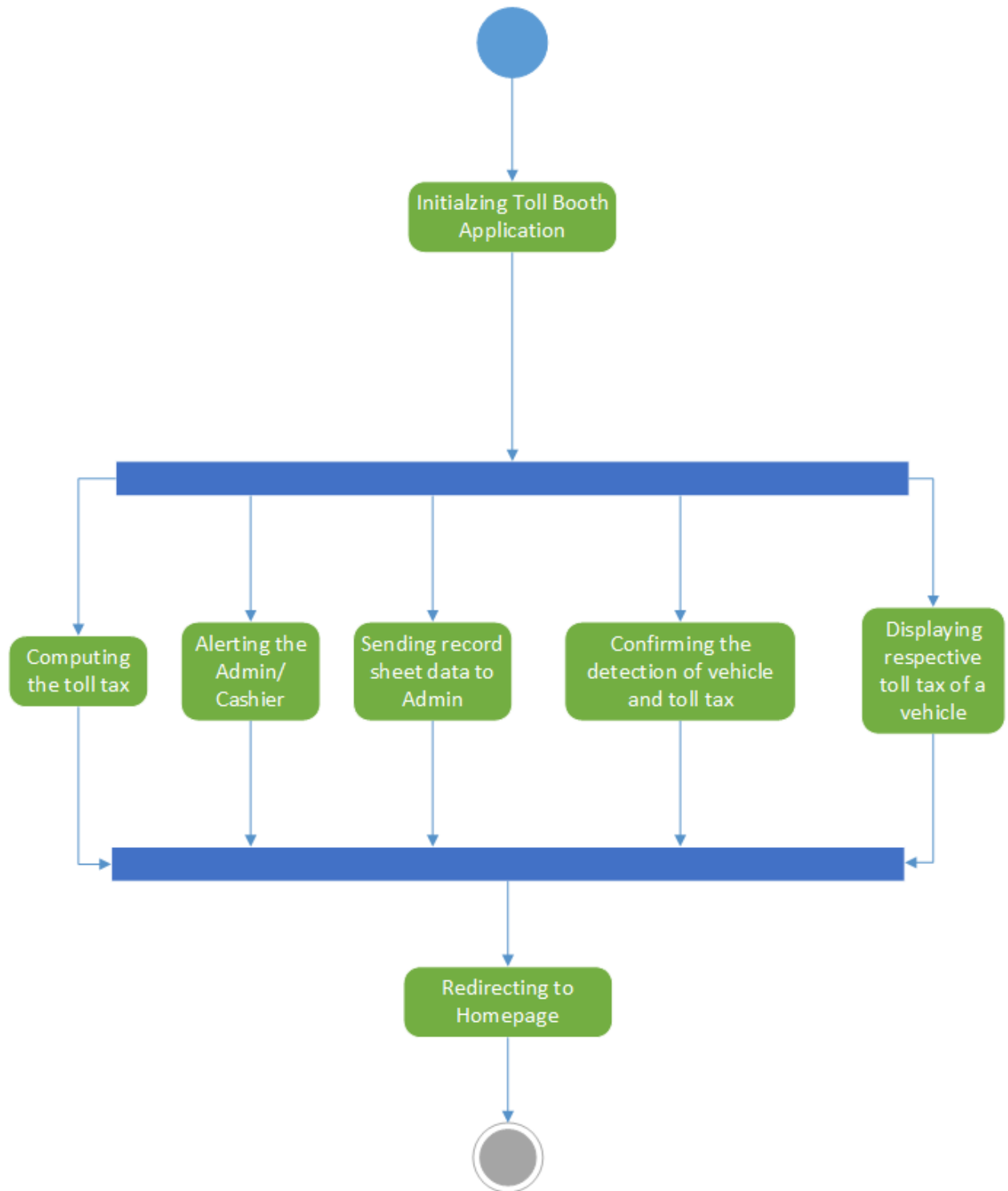


Figure 13: Main App Module

10. Alert

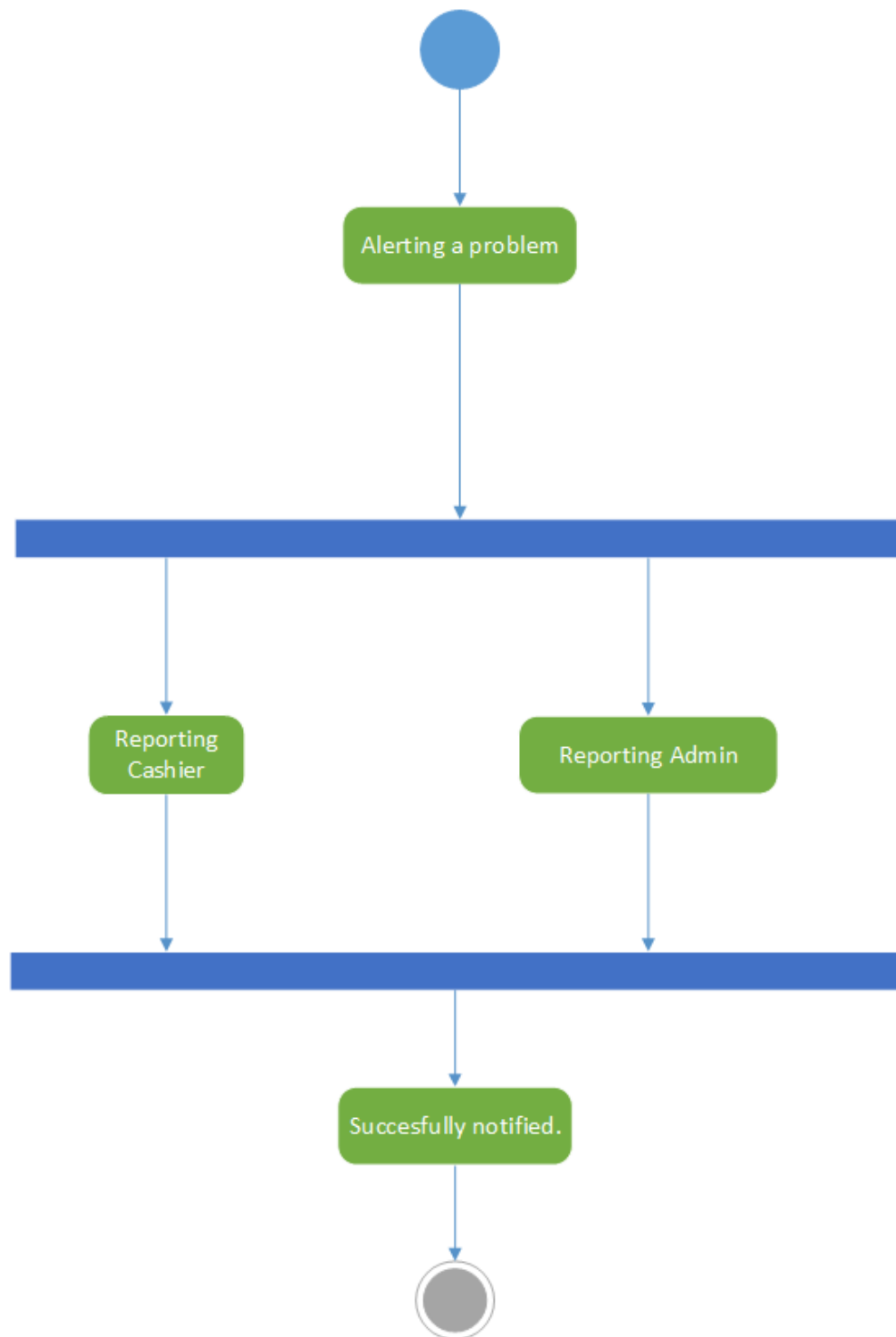


Figure 14: Alert

11. Display Toll rate of vehicle

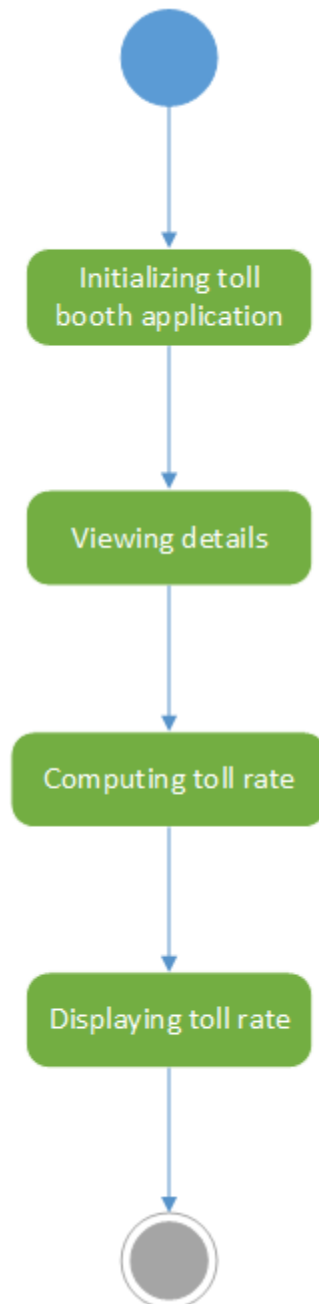


Figure 15: Display Toll Rate

4.3.3 Sequence diagram

Following are the Sequence Diagrams for RCS:

Sequence Diagram for View Cashier Account:

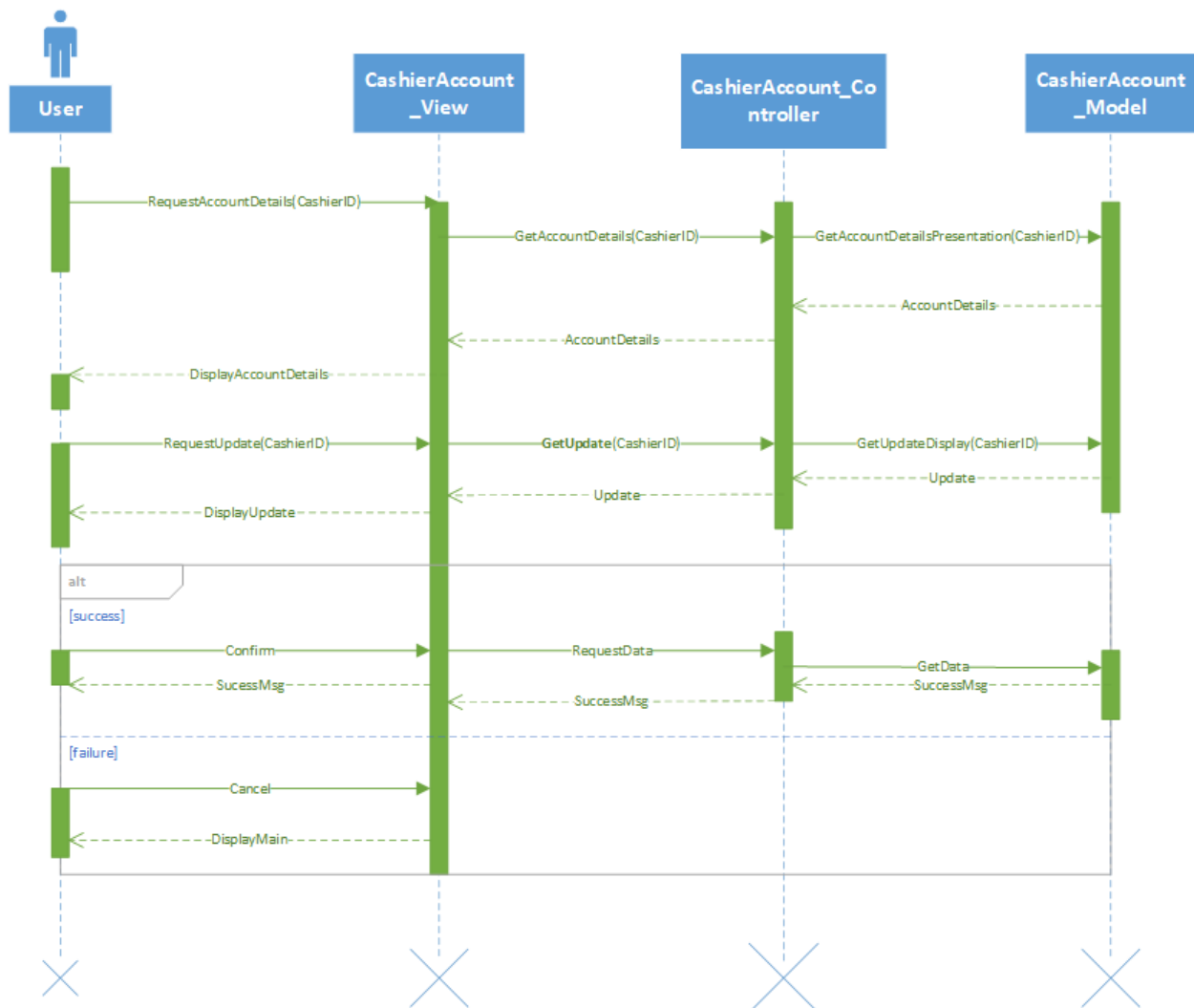


Figure 16: View Cashier Account

Sequence Diagram for Enter Tax:

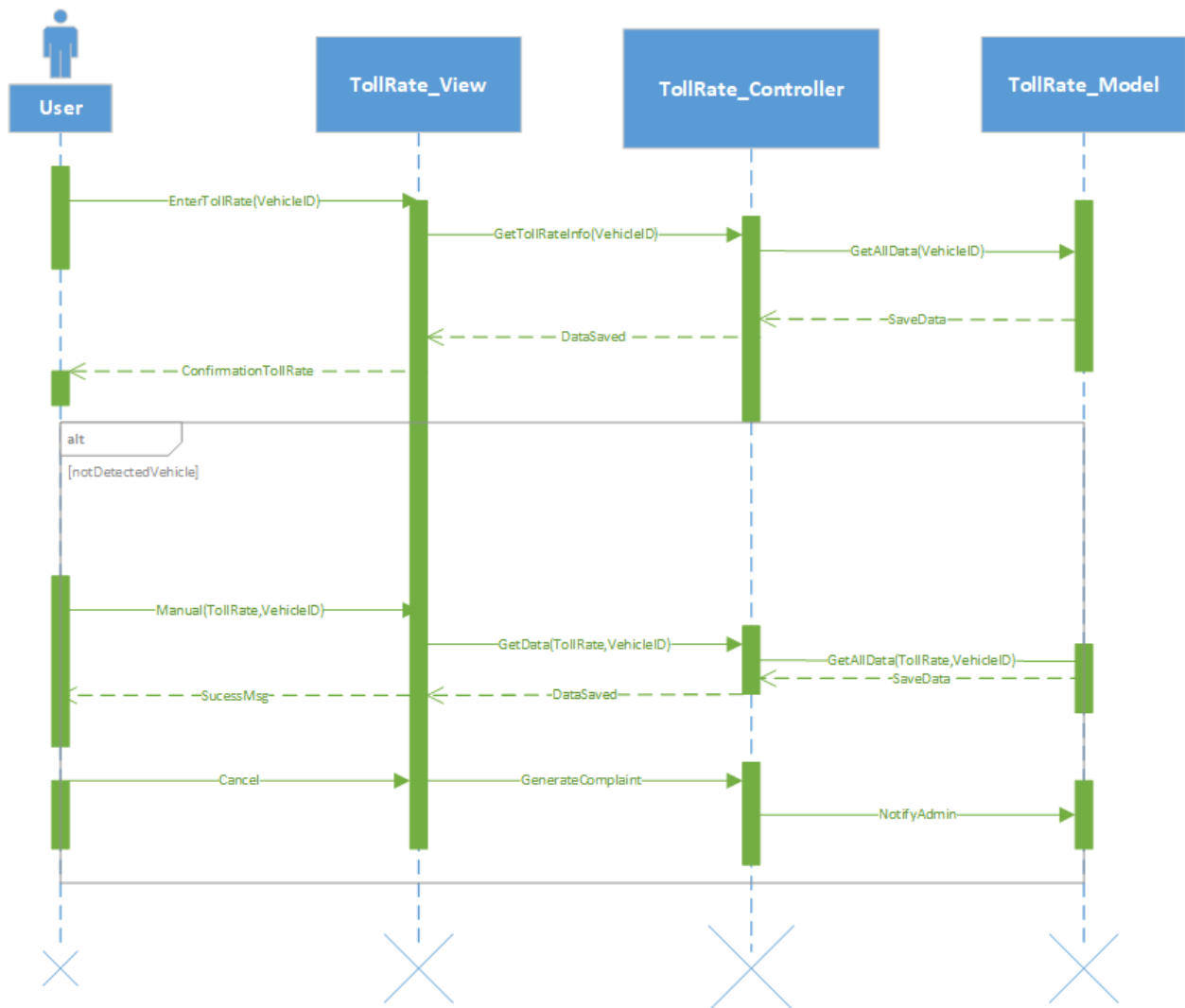


Figure 17: Enter Tax

Sequence Diagram for View Record:

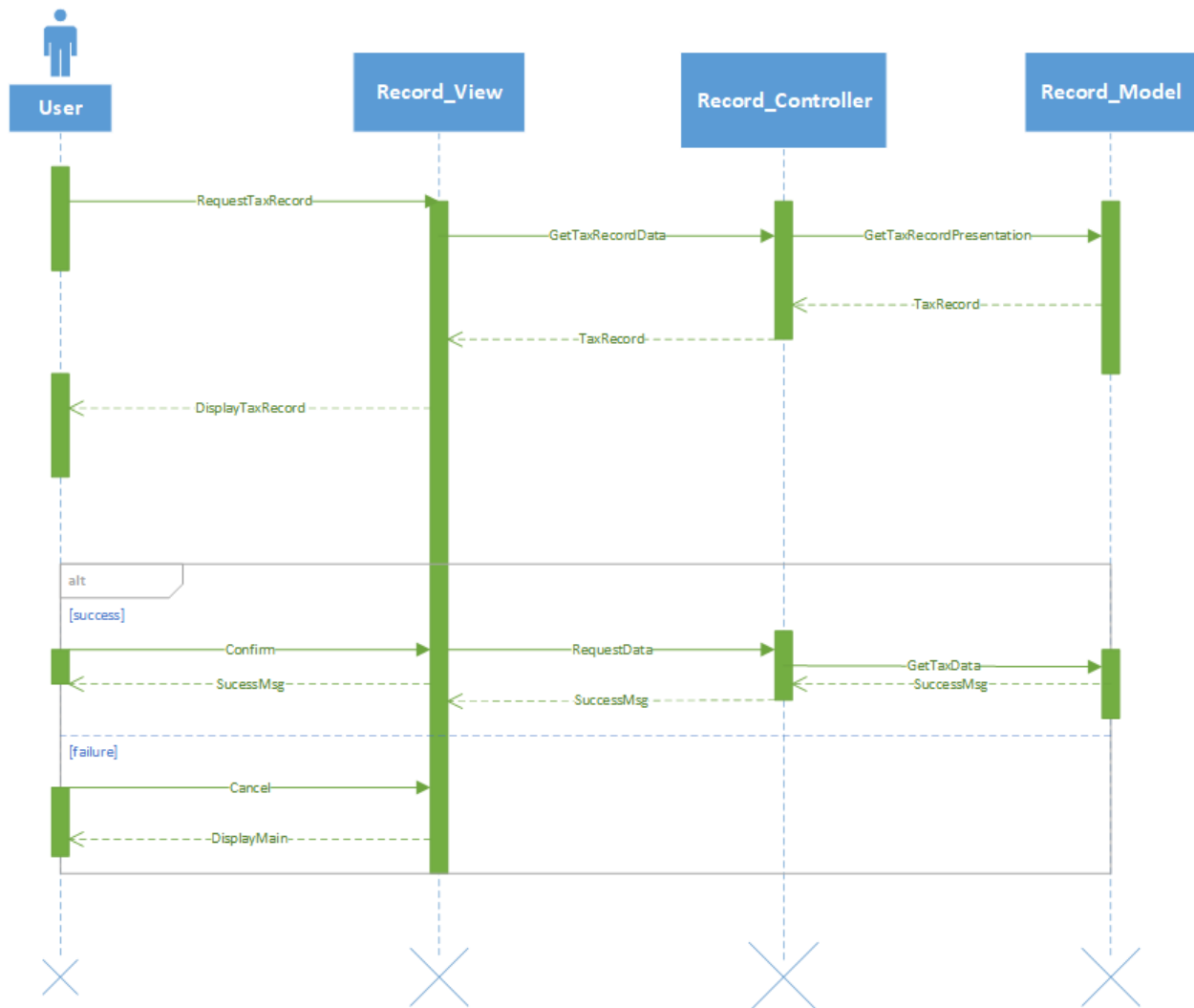


Figure 18: View Record

Sequence Diagram for Registering Complaint:

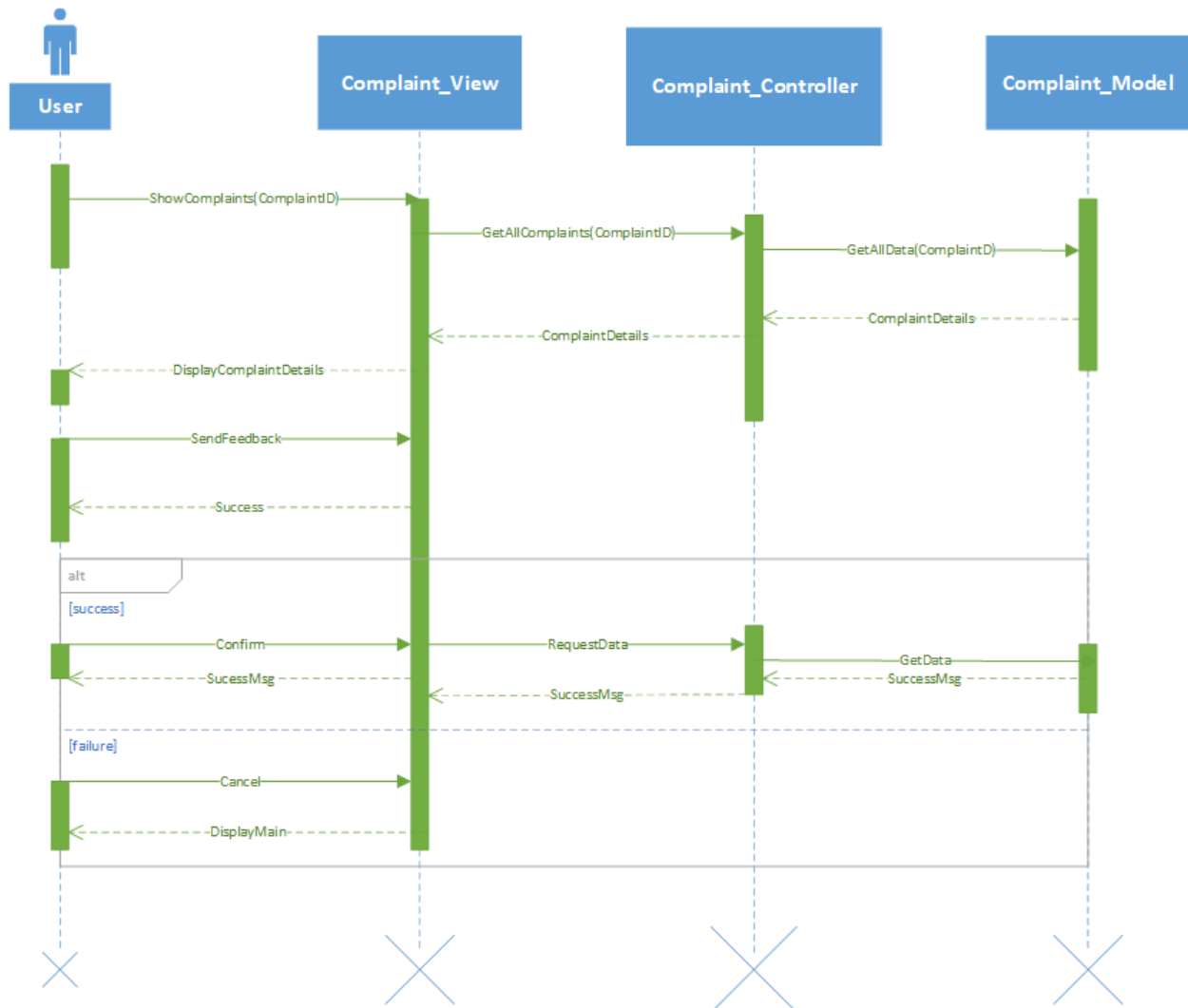


Figure 19: Complaint

Sequence Diagram for Camera Status:

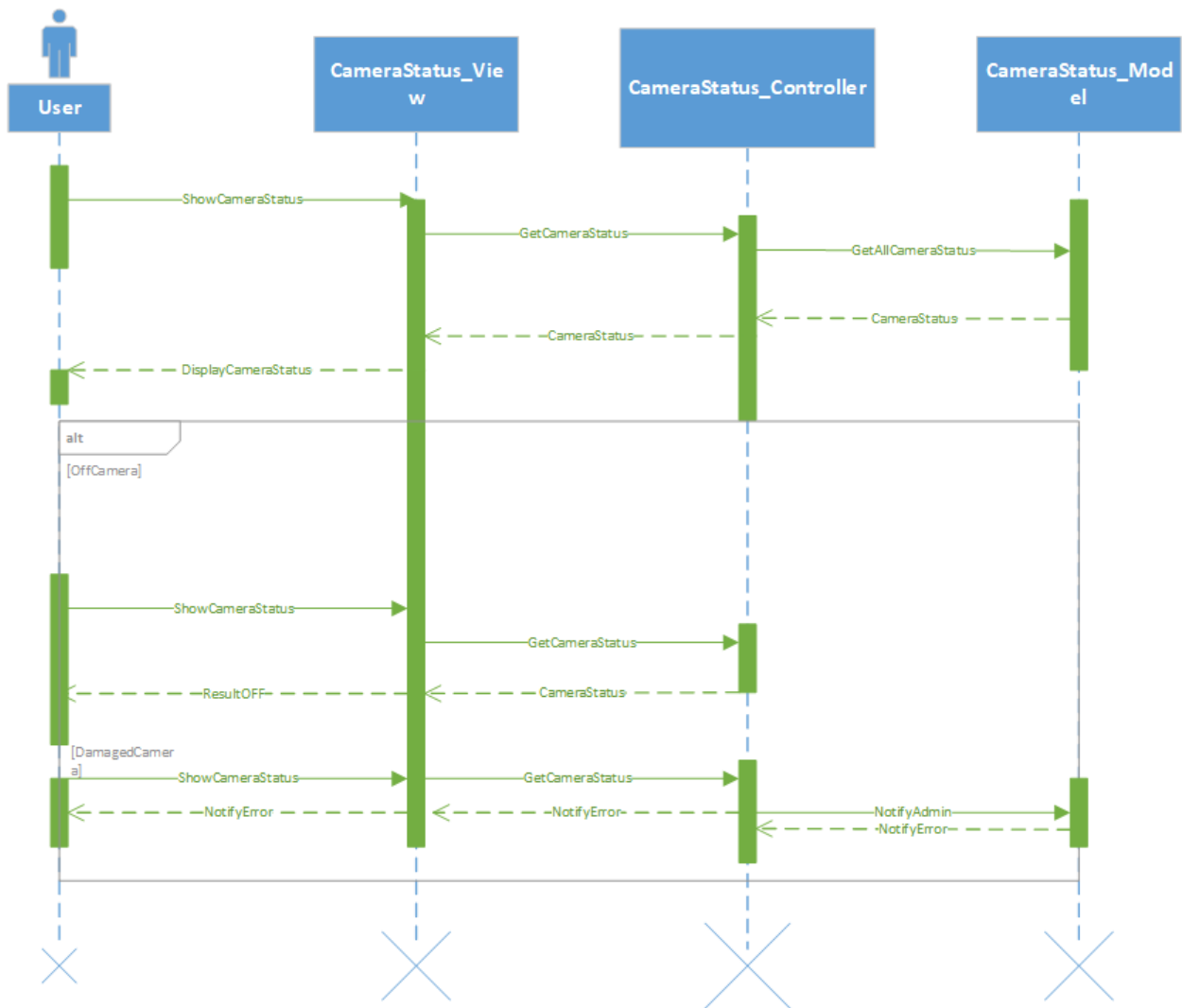


Figure 20: Camera Status

5.3 User Interface

5.3.1 Admin

First look to web application

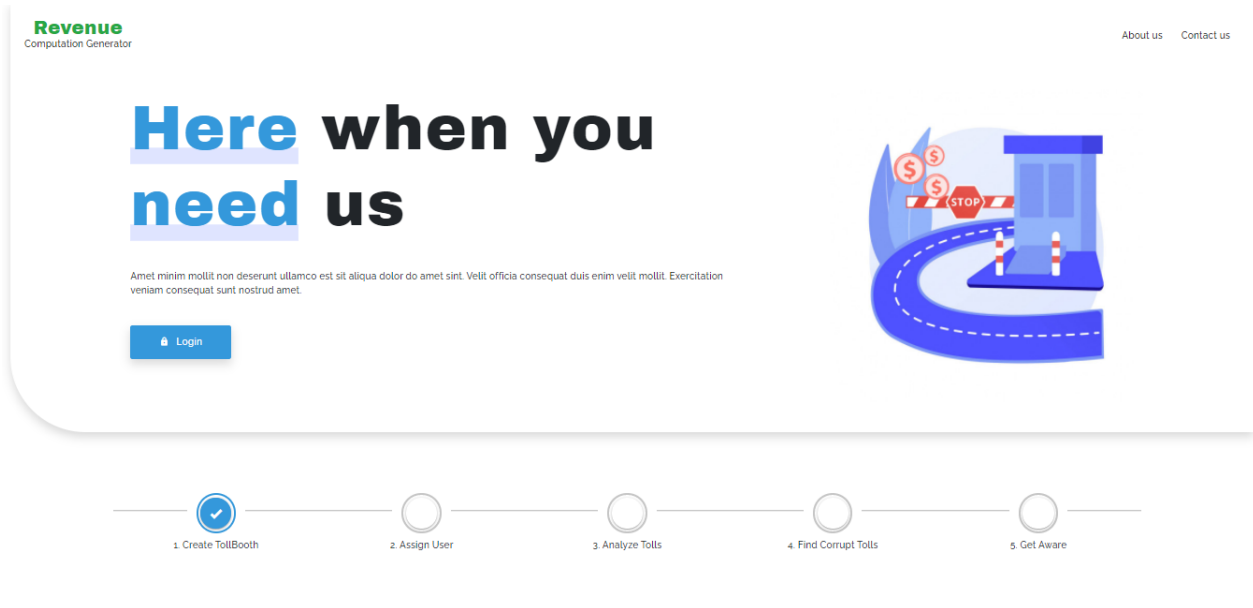
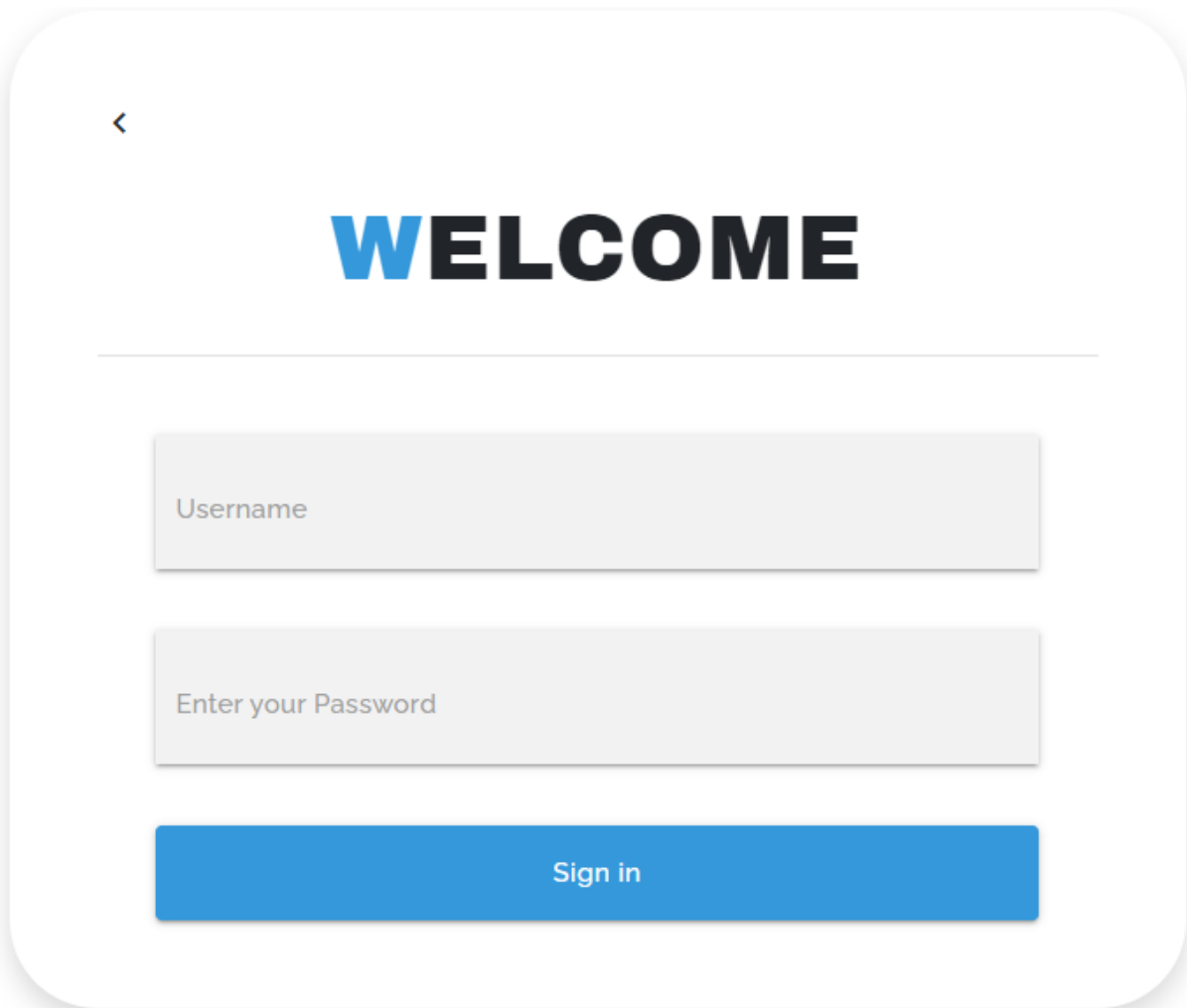


Figure 21: Homepage

Admin Login



The image shows a login form with a white background and rounded corners. At the top left is a small grey back arrow. In the center is the word 'WELCOME' in large, bold, blue and black letters. Below this is a horizontal line. There are two light grey input fields: the first is labeled 'Username' and the second is labeled 'Enter your Password'. Below these fields is a solid blue button with the text 'Sign in' in white.

<

WELCOME

Username

Enter your Password

Sign in

Figure 22: Admin Login

Admin Dashboard



Figure 23: Admin Dashboard

Create User

Create a Brand New User

Create a brand new toll booth, that will keep track of records

User Details

Choose your Tollbooth ▼

Username

Email

Password

NIC

Home

Create

Delete

Update

Figure 24: Create User

Toll booth List

| | | | |
|------|--------|--------|--------|
| Home | Create | Delete | Update |
|------|--------|--------|--------|

List of All Toll Booths

Create a brand new toll booth, that will keep track of records




| # | ID | Name | Location | Date & Time |
|----|-------------------|-------------------------------|--|---|
| 1. | TB# 1607789960148 | Peshawar Motoray Express 2211 |  Peshawar, KPK | 2:36:29 AM 12/15/2020 |
| 2. | TB# 1607801912213 | Islamabad Motorway Exchange |  Islamabad | 12:38:49 AM 12/13/2020 |
| 3. | TB# 1608032469702 | Ring Road |  Ring Road, Peshawar | 4:41:21 PM 12/15/2020 |

Figure 25: List of Toll Booths

Vehicle Record

 Generate Record

List of All Records

Create a brand new toll booth, that will keep track of records

[+ Add Record](#)












| # | Vechile Plate | Vechile Tax | Amount Collected | Time Of Record | |
|----|---------------|-------------|--|--------------------------------|---|
| 1. | IDF - 1213 | Rs. 100 PKR |  Rs. 50 PKR | 16:46 Hr • 17th December, 2020 |  |
| 2. | IDF - 1213 | Rs. 100 PKR |  Rs. 120 PKR | 16:43 Hr • 17th December, 2020 |  |
| 3. | IDF - 1213 | Rs. 100 PKR |  Rs. 50 PKR | 16:36 Hr • 17th December, 2020 |  |
| 4. | IDF - 1213 | Rs. 100 PKR |  Rs. 10 PKR | 16:31 Hr • 17th December, 2020 |  |



Figure 26: List of all records



User Complaints Record




Resolved Complaints


TB# 1608216150058  

TB# 1608216150058  

TB# 1608216150058  



Still Active

 Refresh List



TB# 1608216150058 ☐  

Figure 27: Complaints

Admin Logout

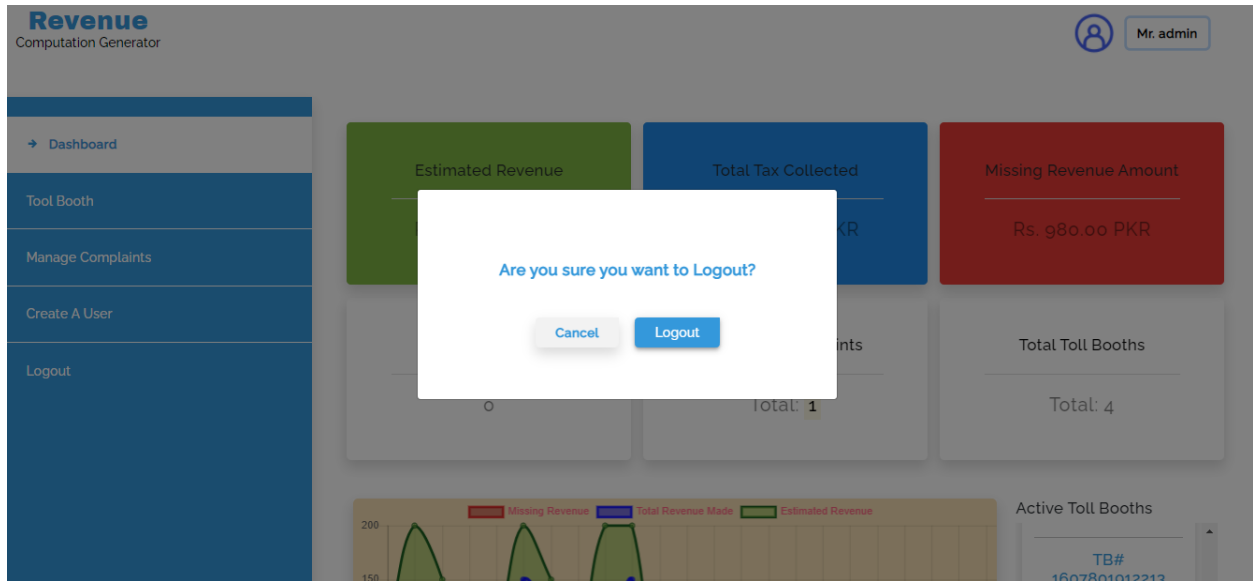
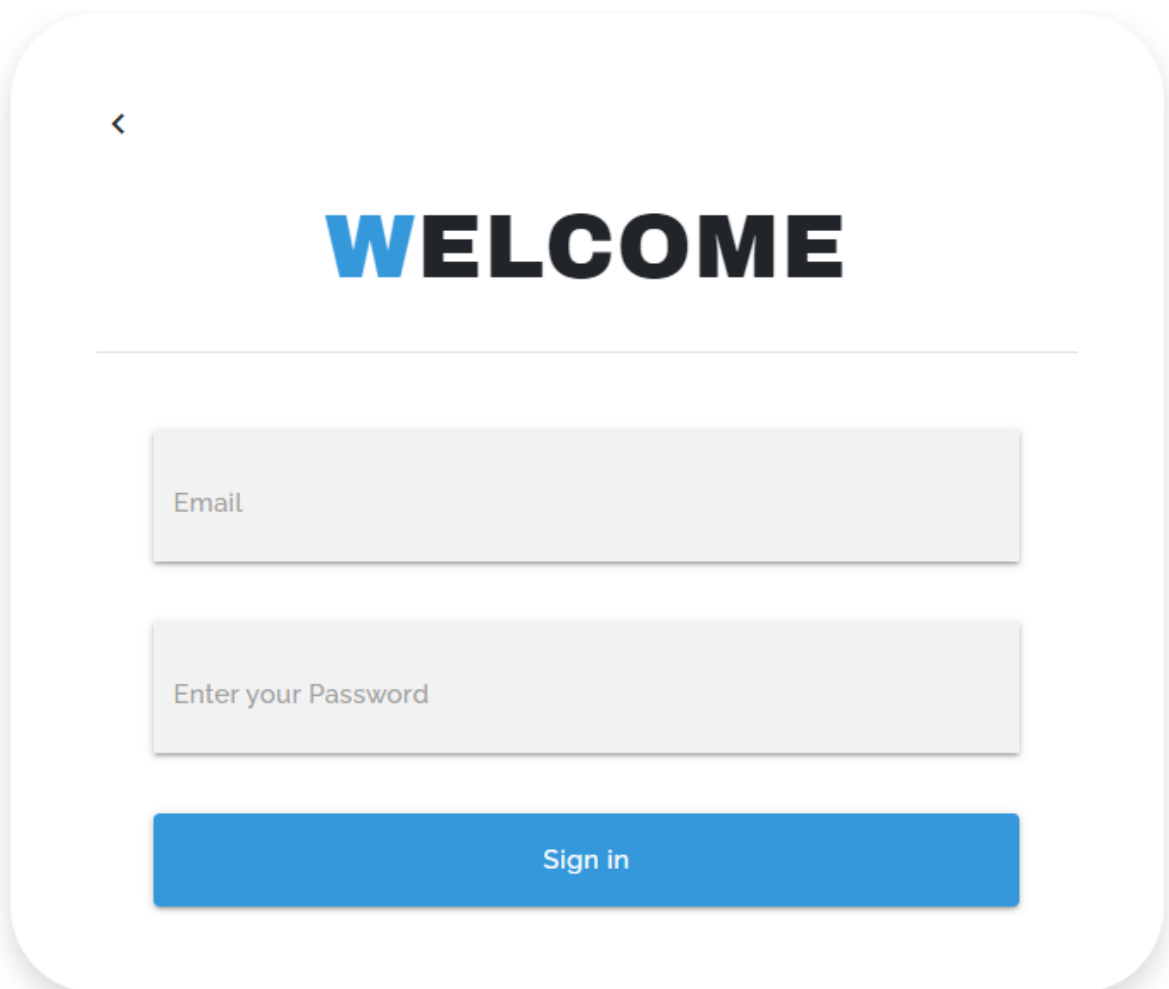


Figure 28: Admin Logout

1.3.2 Toll Booth

Staff Login



A staff login form with a white background and rounded corners. At the top left is a back arrow icon. The word "WELCOME" is centered in large, bold, blue and black letters. Below it is a horizontal line. There are two light gray input fields: the first is labeled "Email" and the second is labeled "Enter your Password". Below these fields is a blue button with the text "Sign in" in white.

<

WELCOME

Email

Enter your Password

Sign in

Figure 29: Staff Login