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.
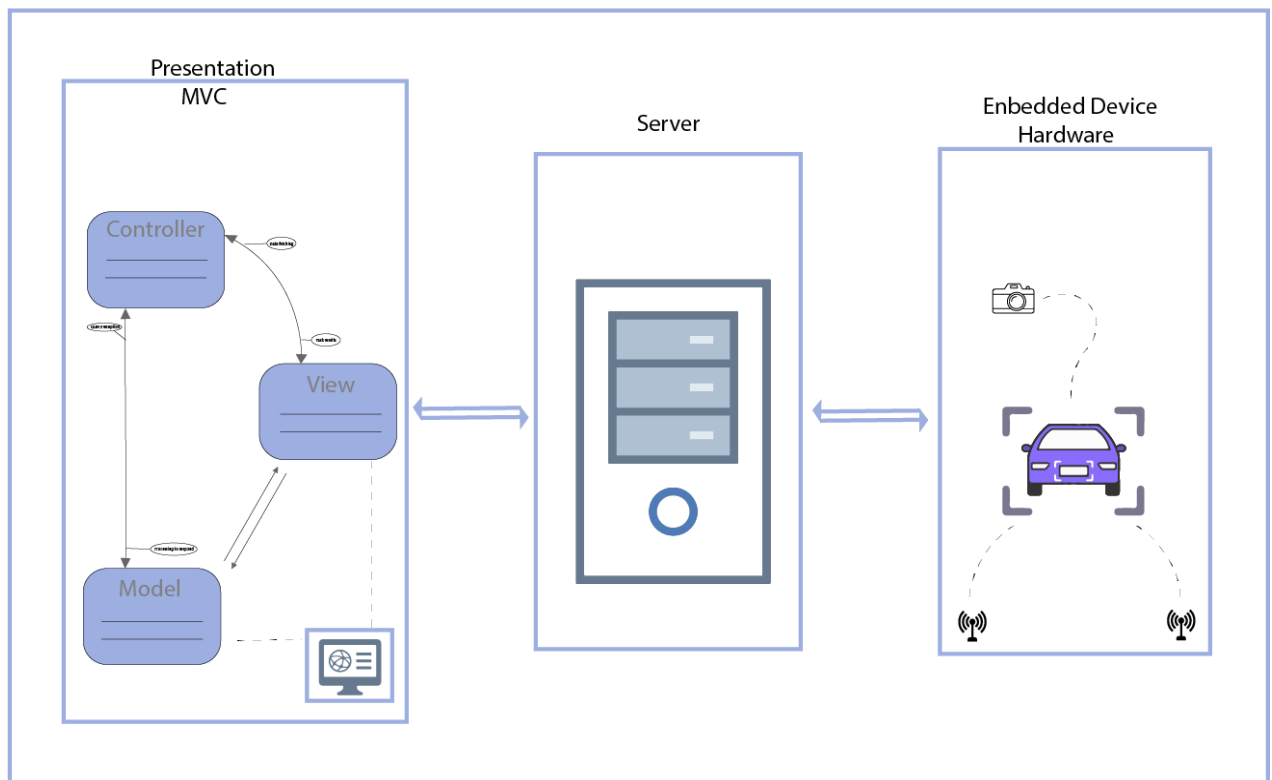

Figure 2: 3tier Architecture
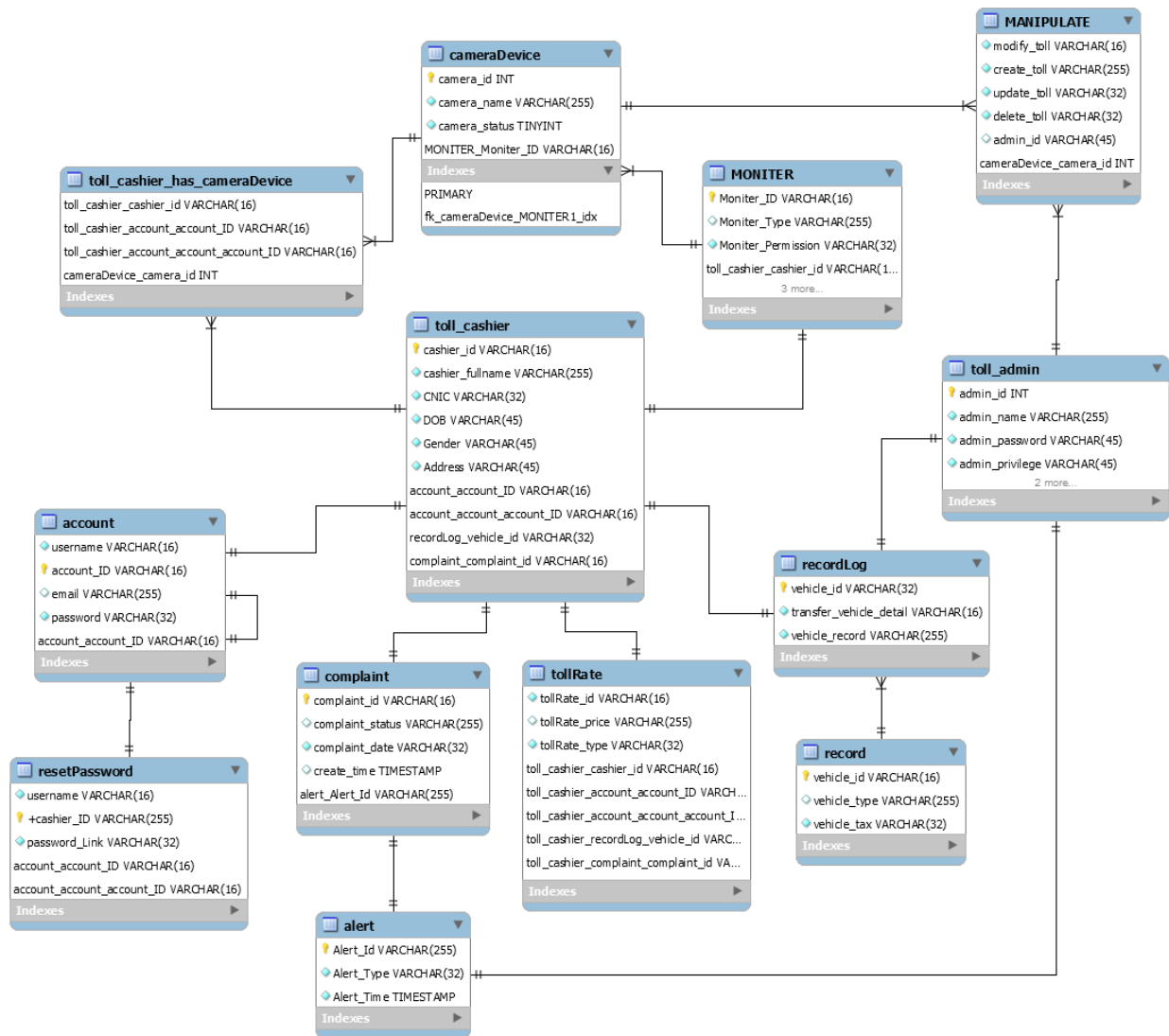
4.2 Data Representation

Figure 3: EERD Diagram

4.3 Process Flow/Representation

4.3.1 Structural Diagram

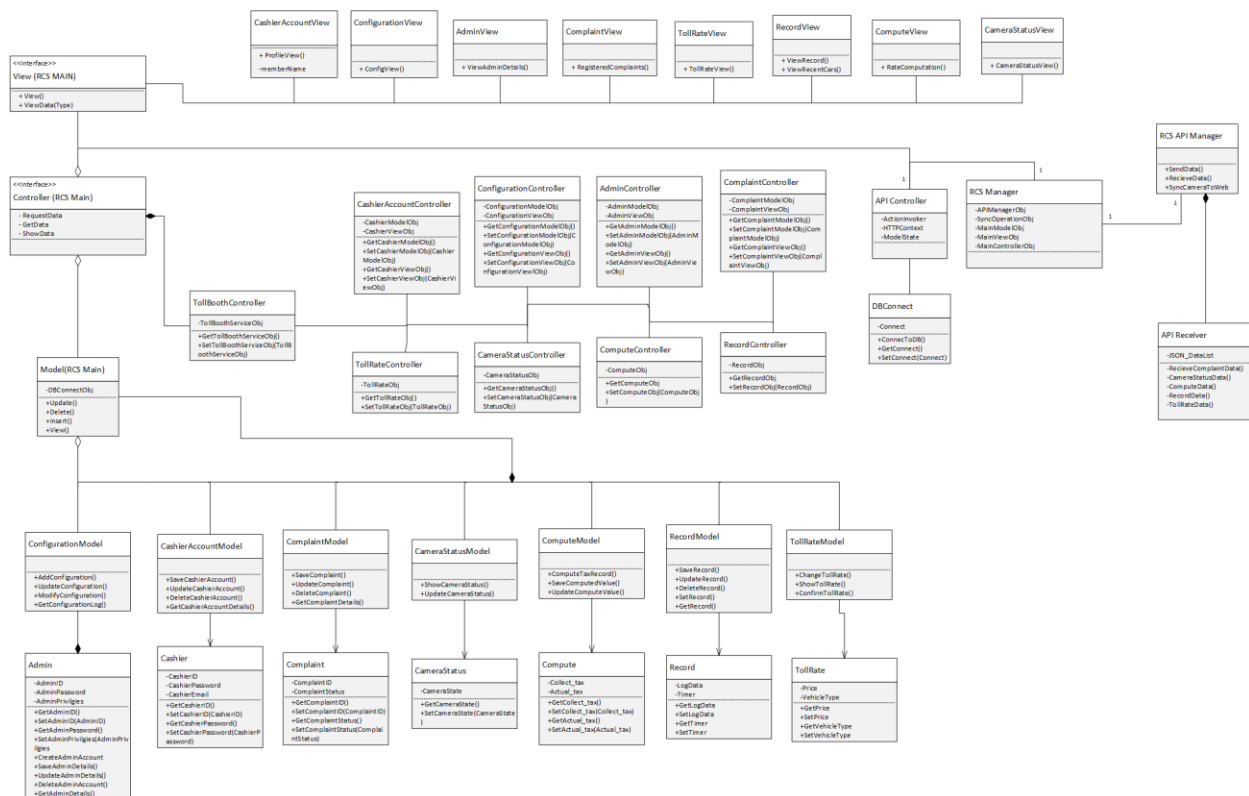Following Class Diagram for RCS is classified on basis Model View Controller architecture:

4.3.2 Behavioral Diagrams

Following are the activity Diagrams of major modules of the system.
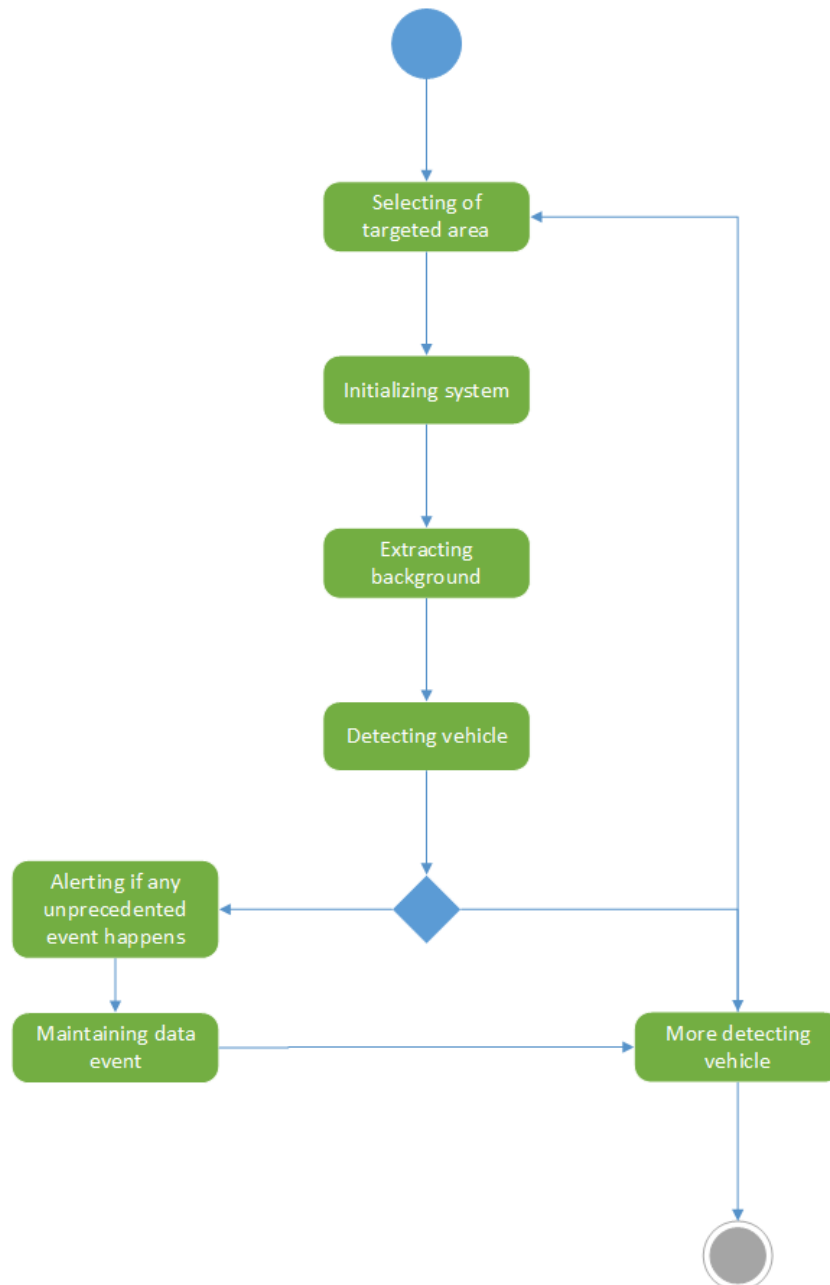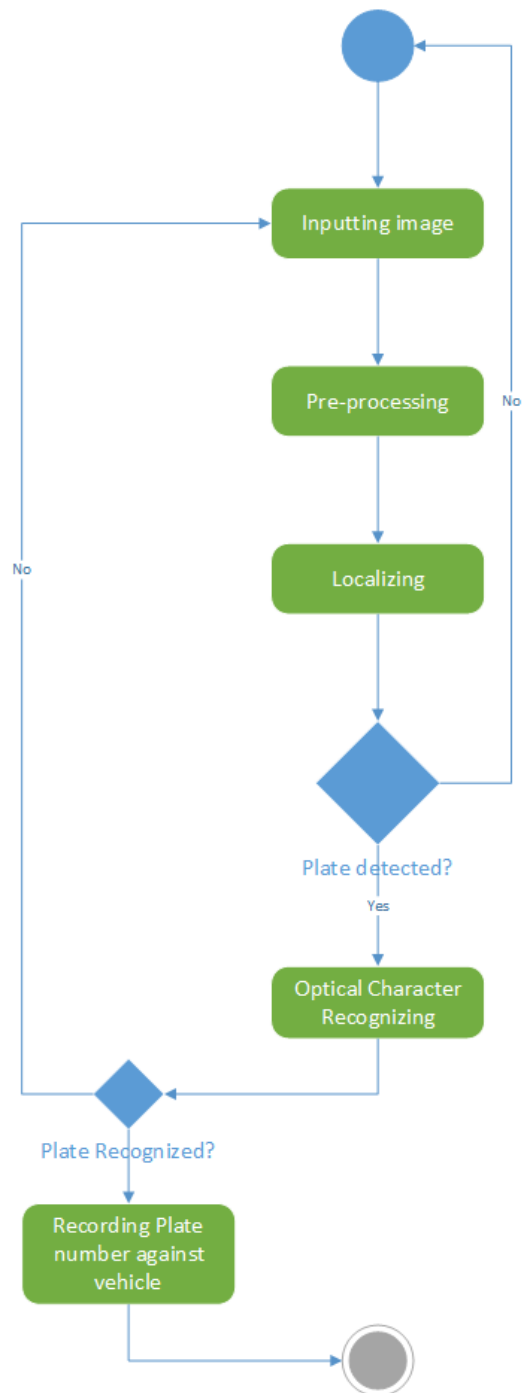
1. Main Detection Module

2. Main Camera Module

Figure 6: Main Camera Module
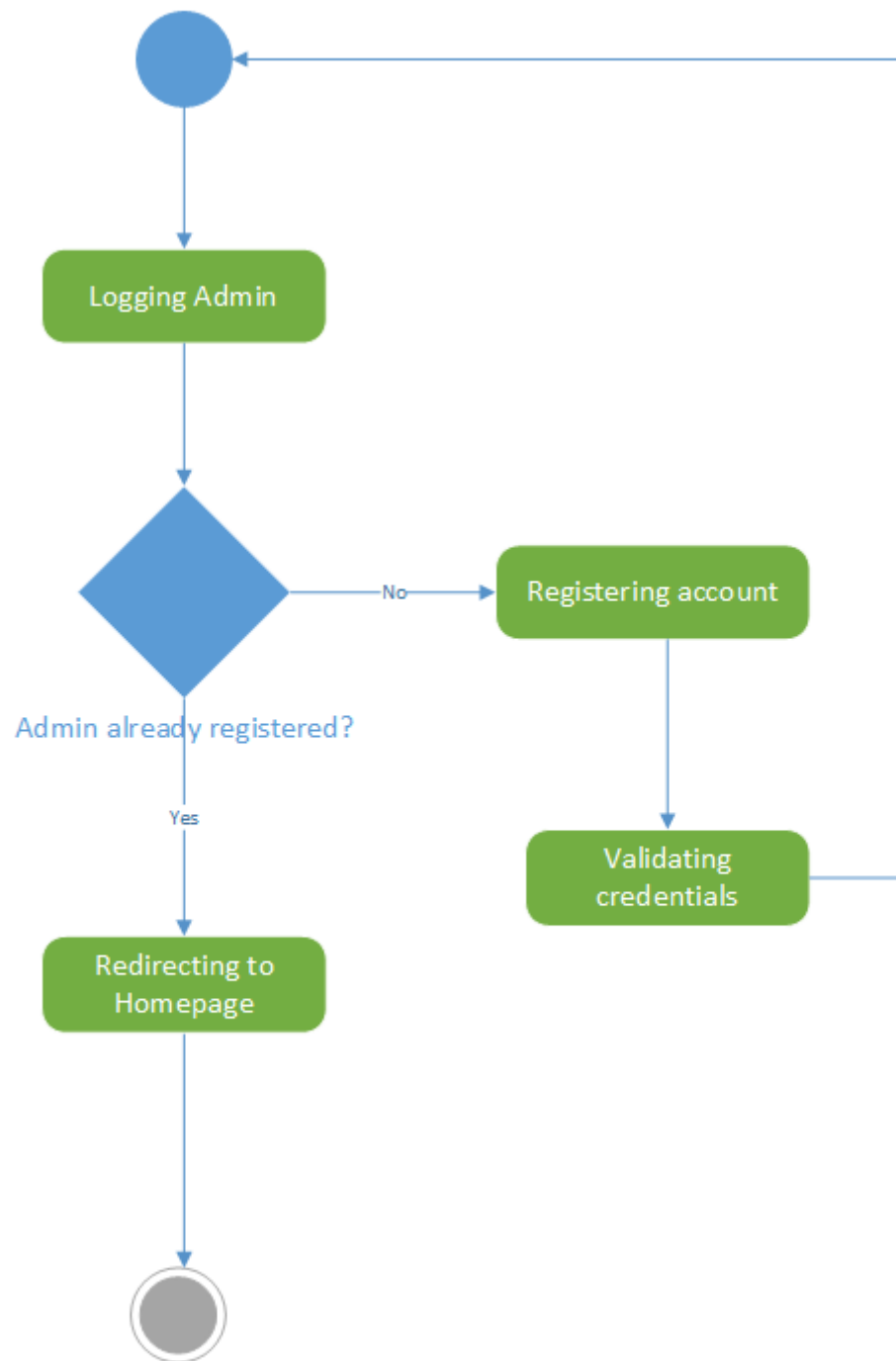
3. Main Admin Module
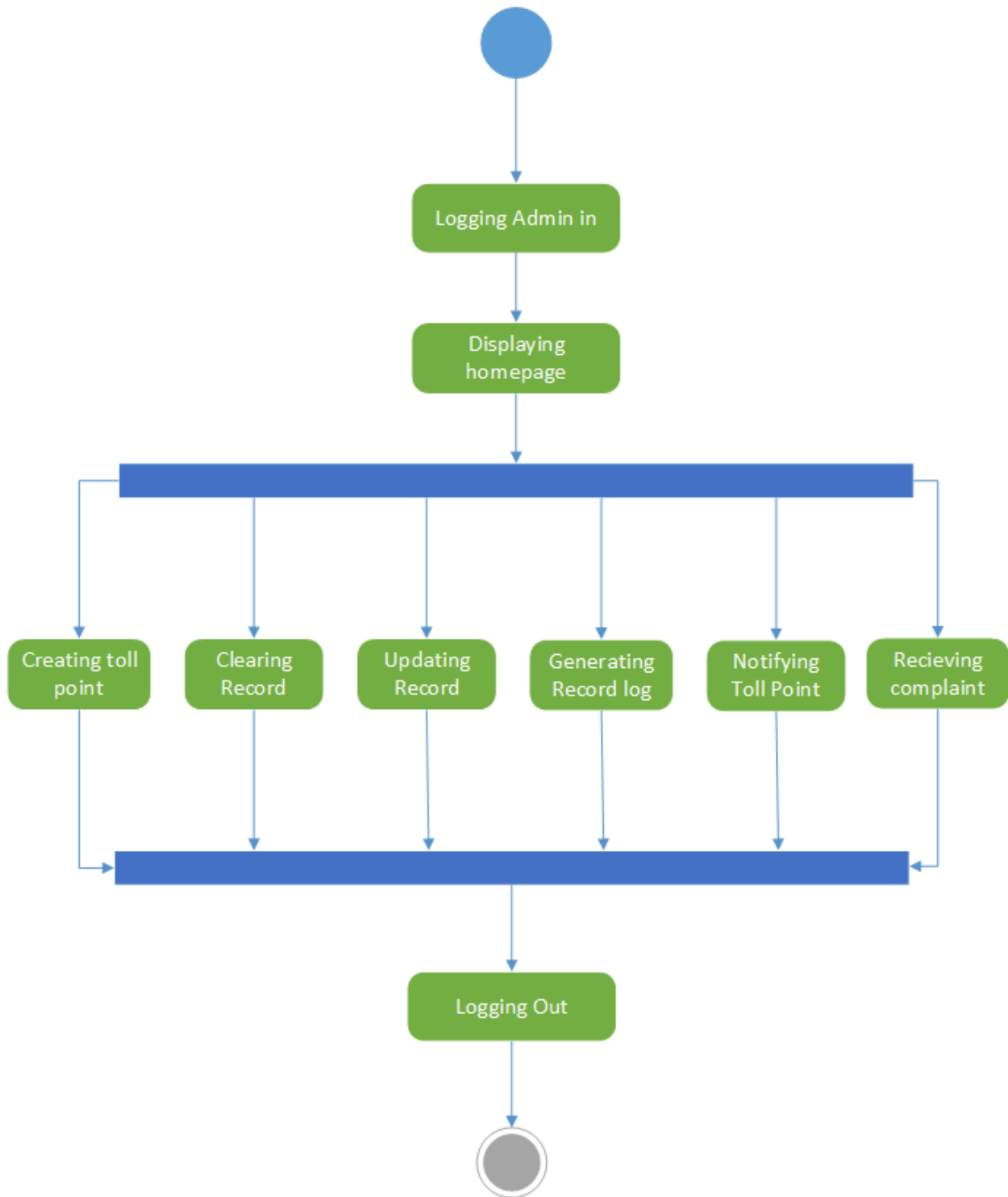
Figure 7: Main Admin Module

4. Log In

5. Generate tax record
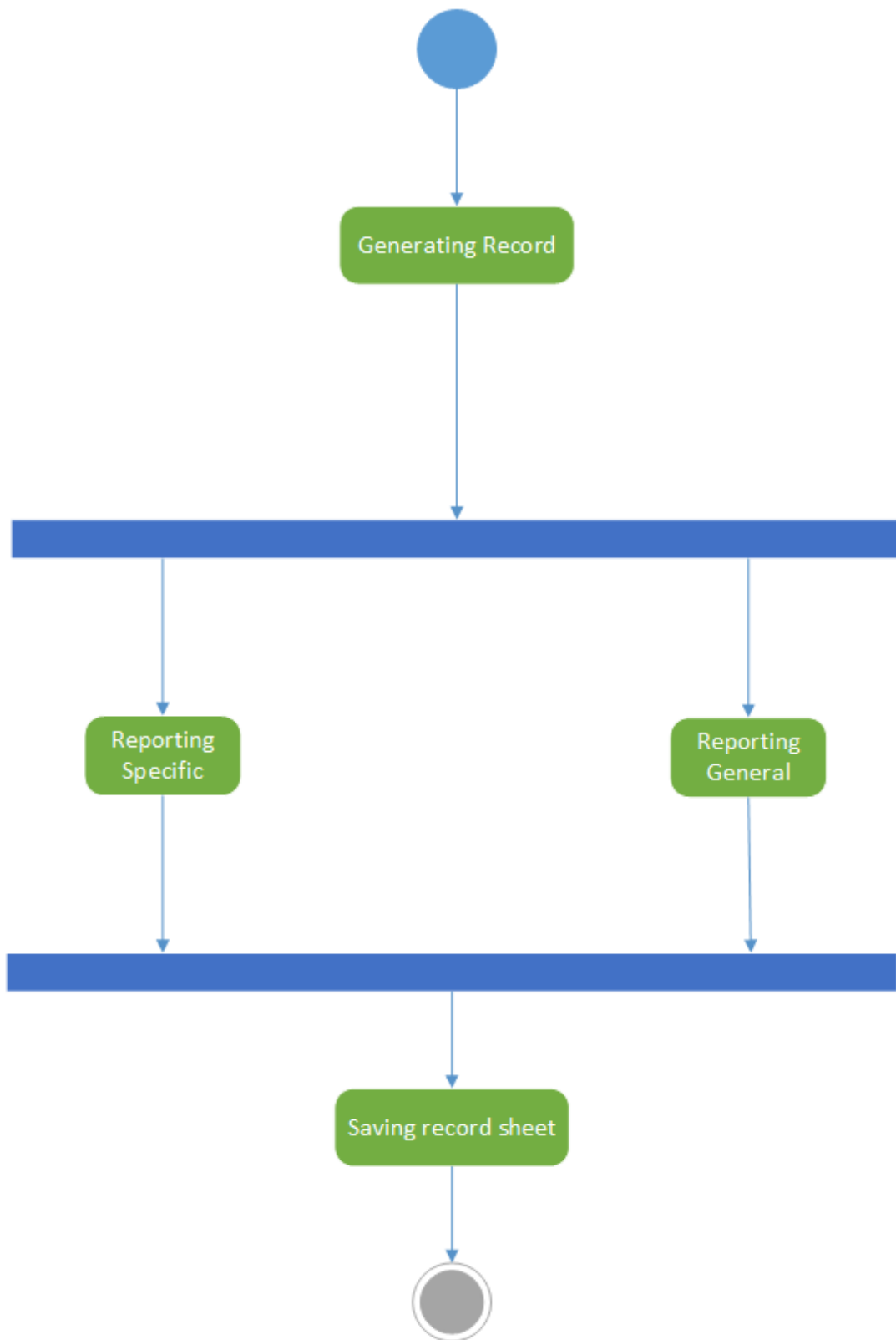
6. Update Toll booth record
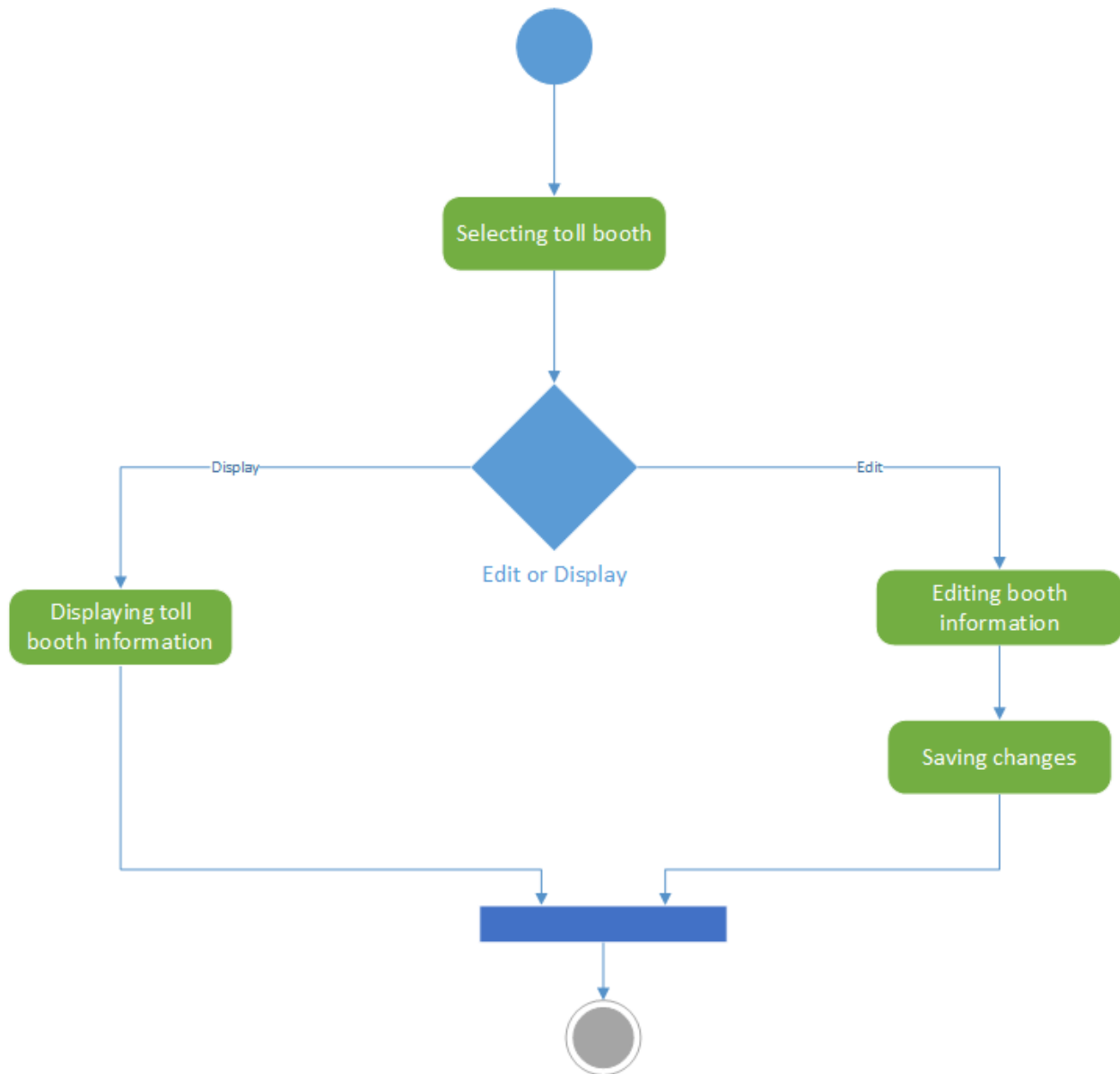
Figure 10: Update Tax Record

7. Clear Toll booth record
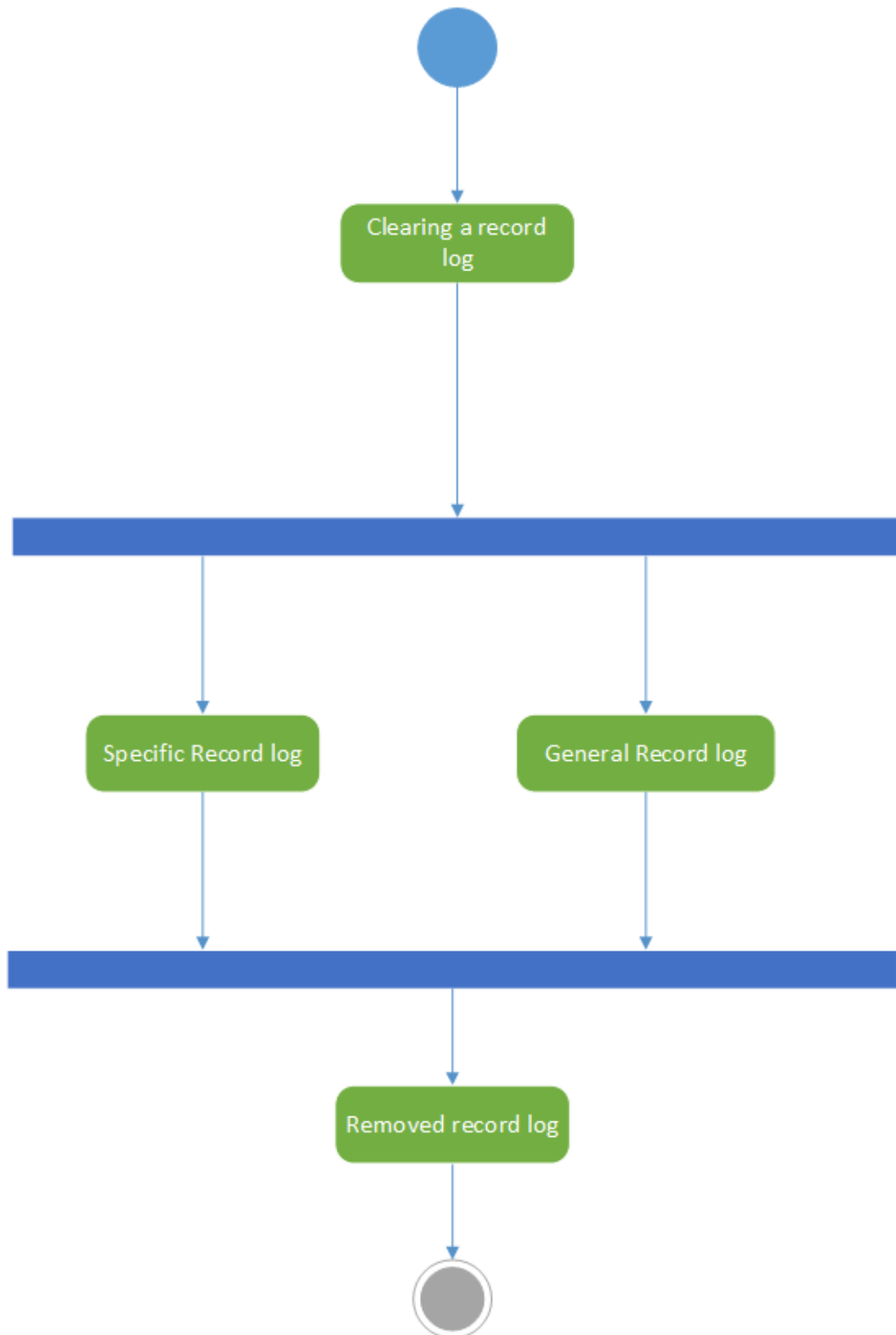
8. Complaints Handling
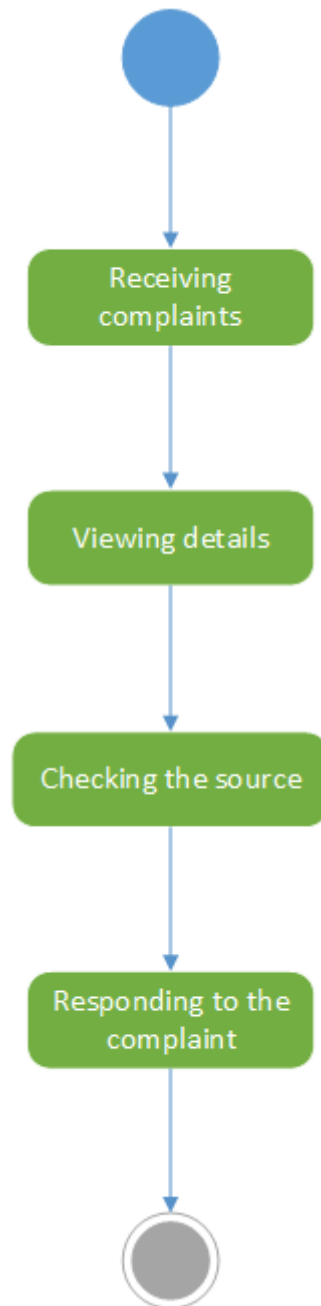
Figure 12: Complaints Handle

9. Main Toll Booth App Module

10. Alert

Alerting a problem

Reporting Cashier

Reporting Admin

Succesfully notified.
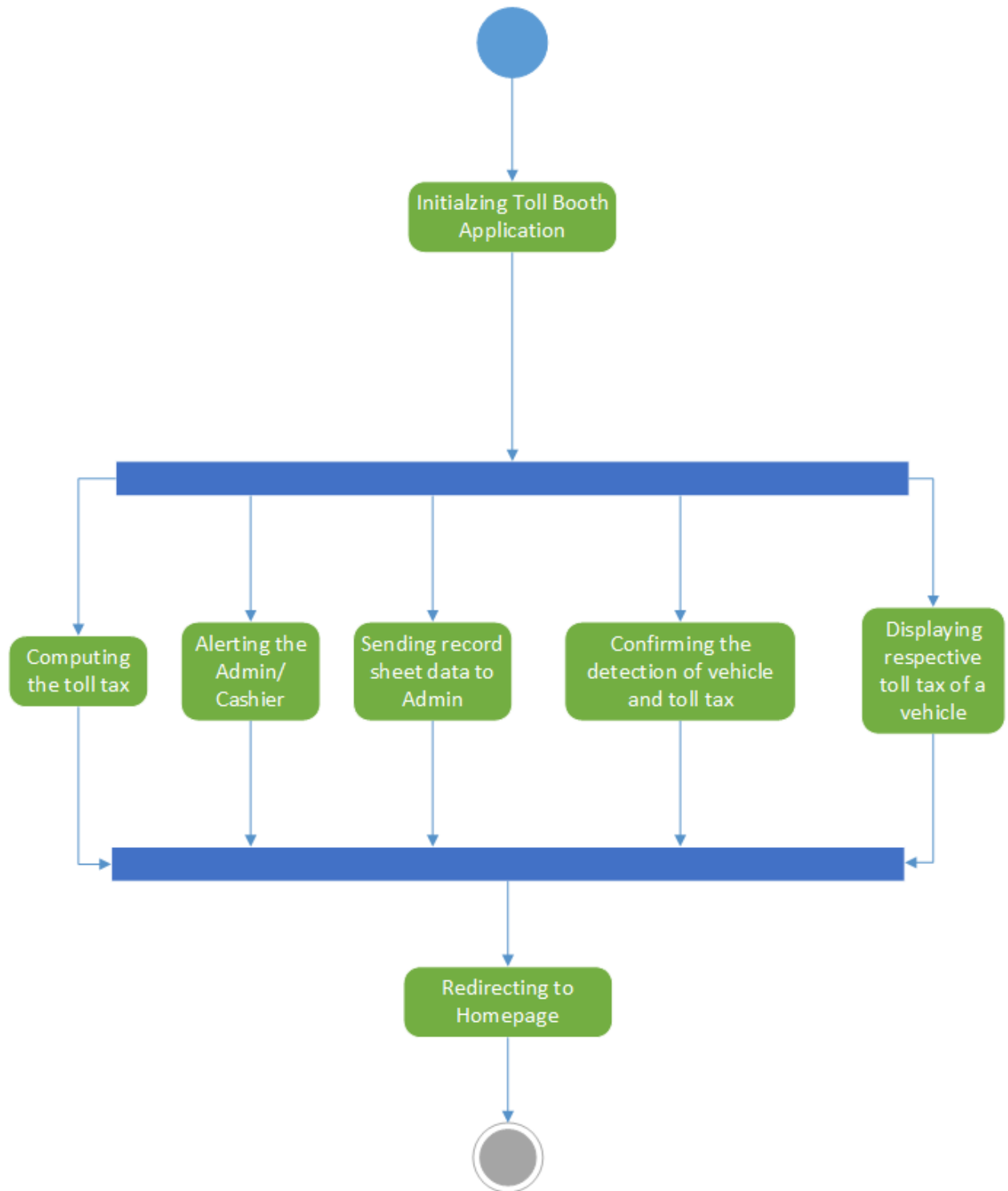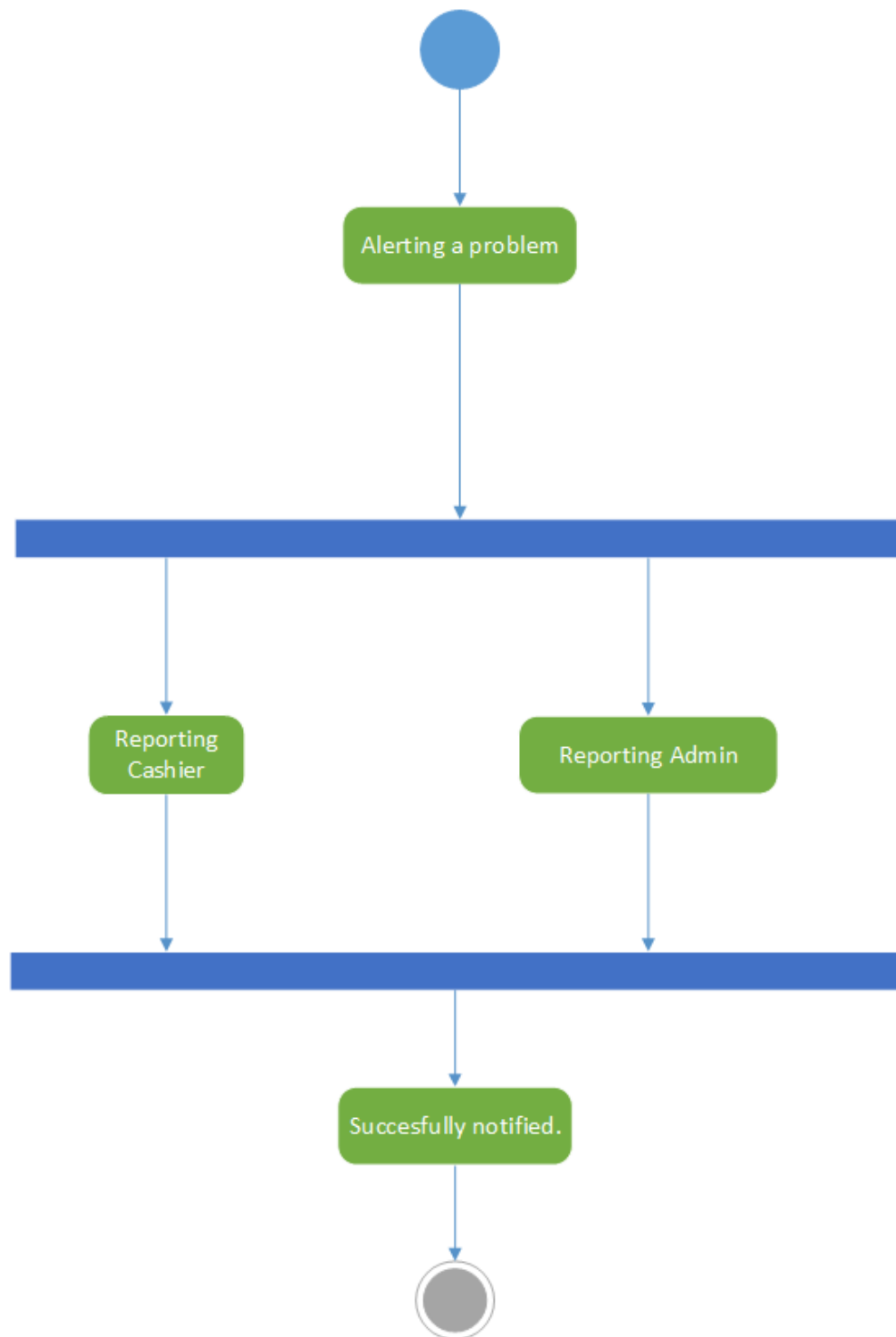
11. Display Toll rate of vehicle
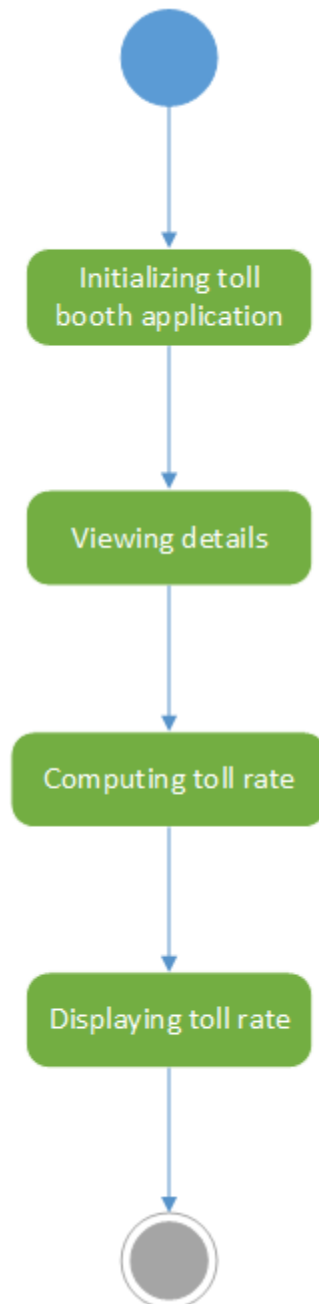
Figure 15: Display Toll Rate

4.3.3 Sequence diagram

Following are the Sequence Diagrams for RCS:

Sequence Diagram for View Cashier Account:
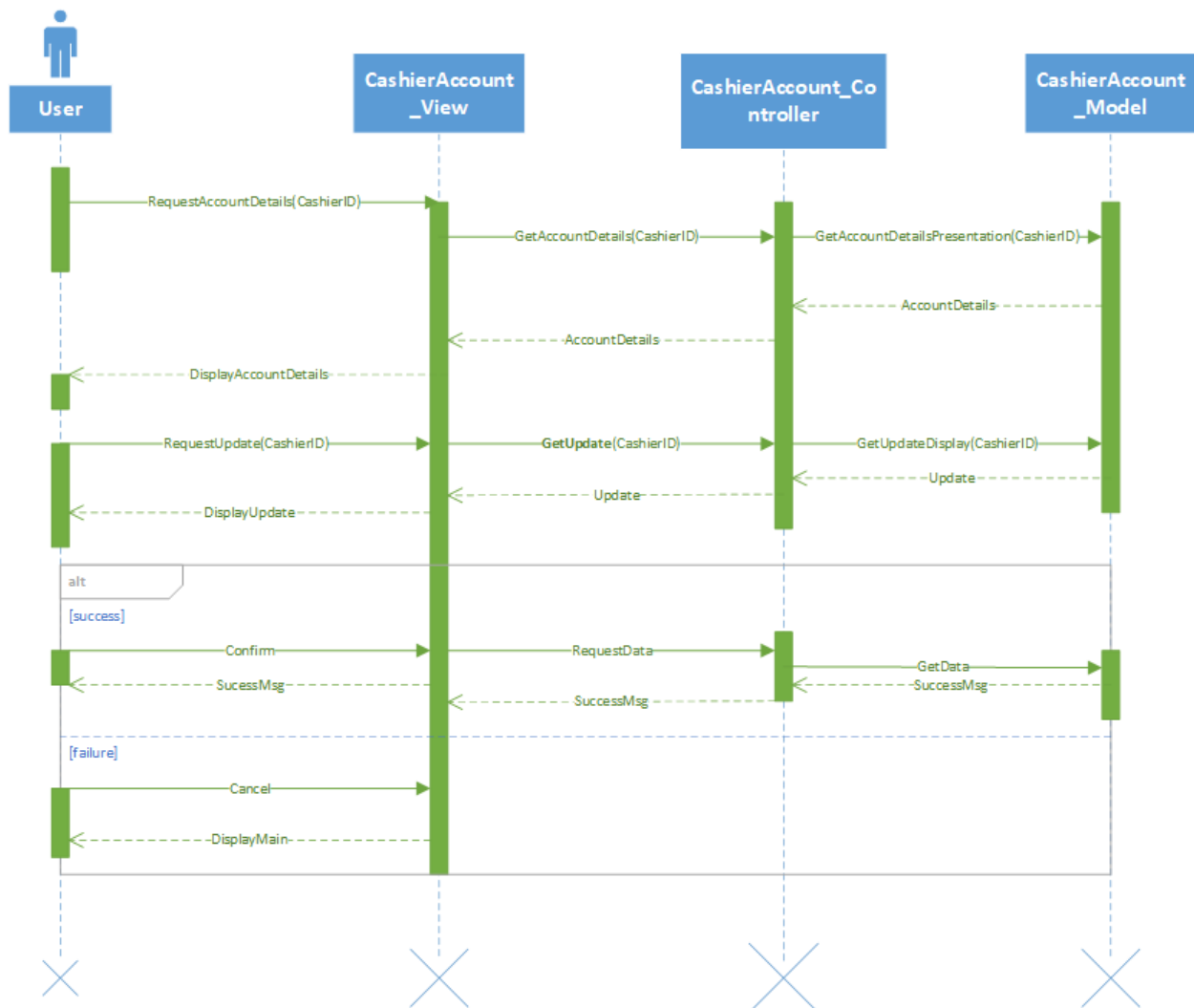
Figure 16: View Cashier Account

Sequence Diagram for Enter Tax:
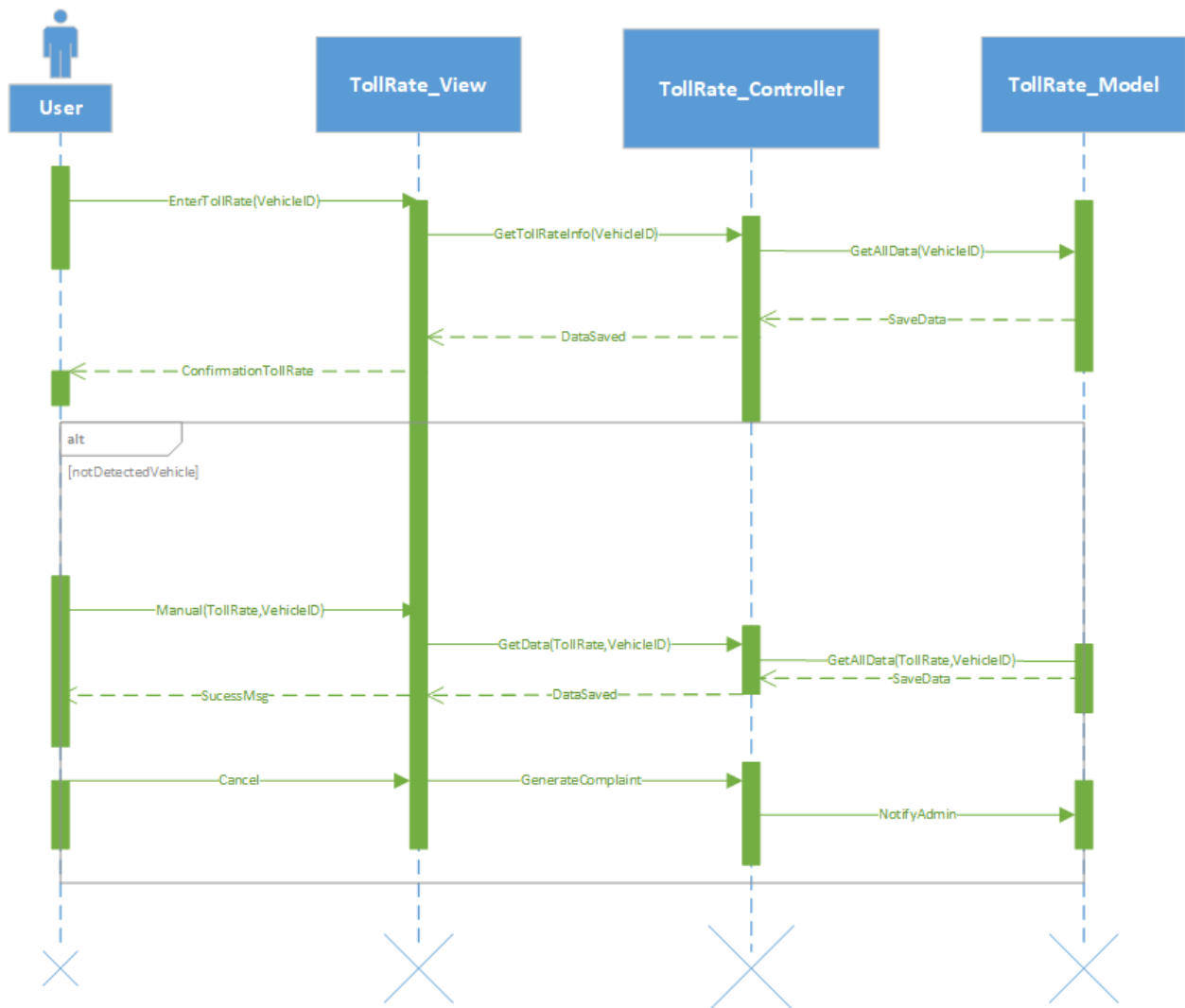
Figure 17: Enter Tax

Sequence Diagram for View Record:
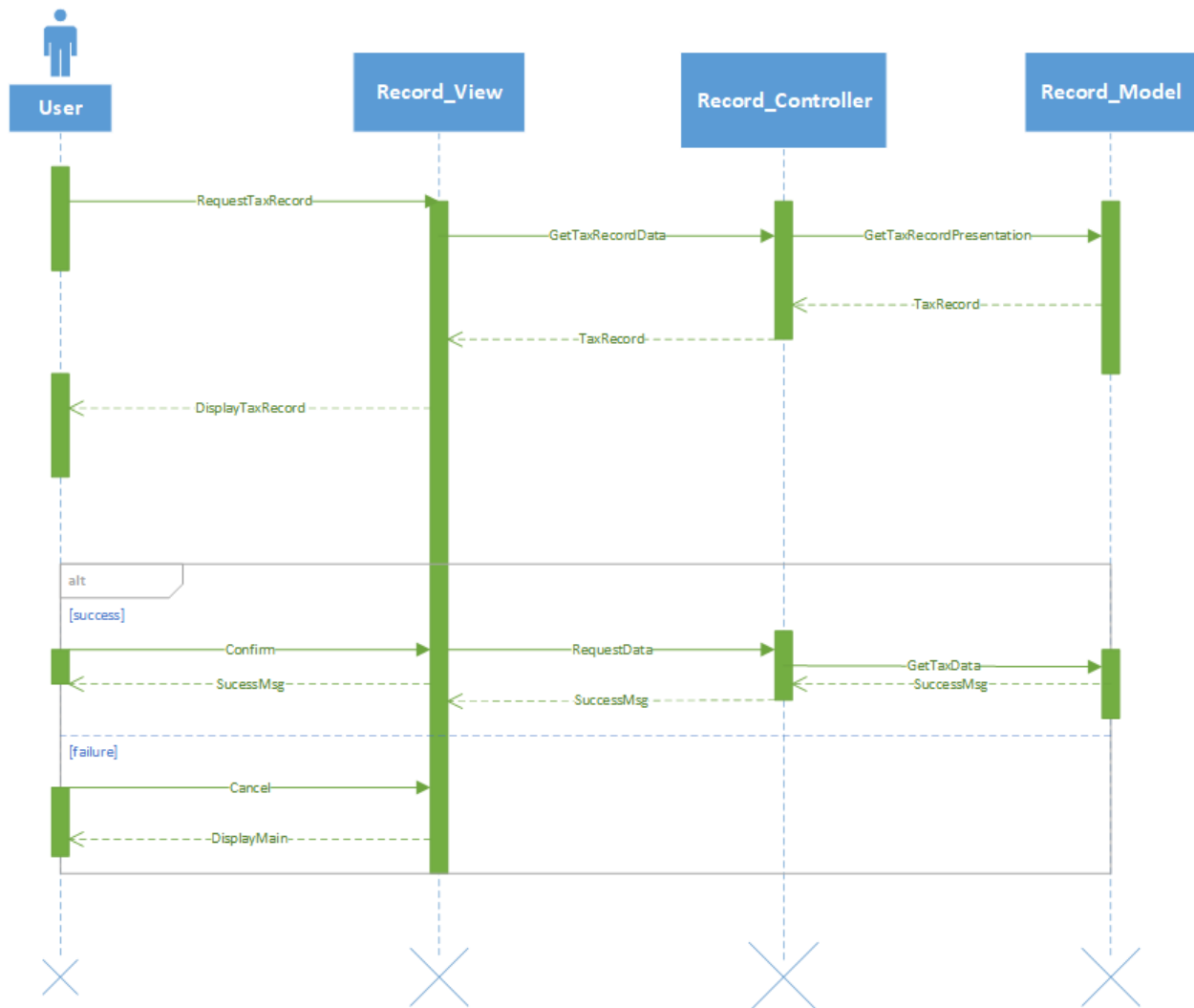
Figure 18: View Record

Sequence Diagram for Registering Complaint:
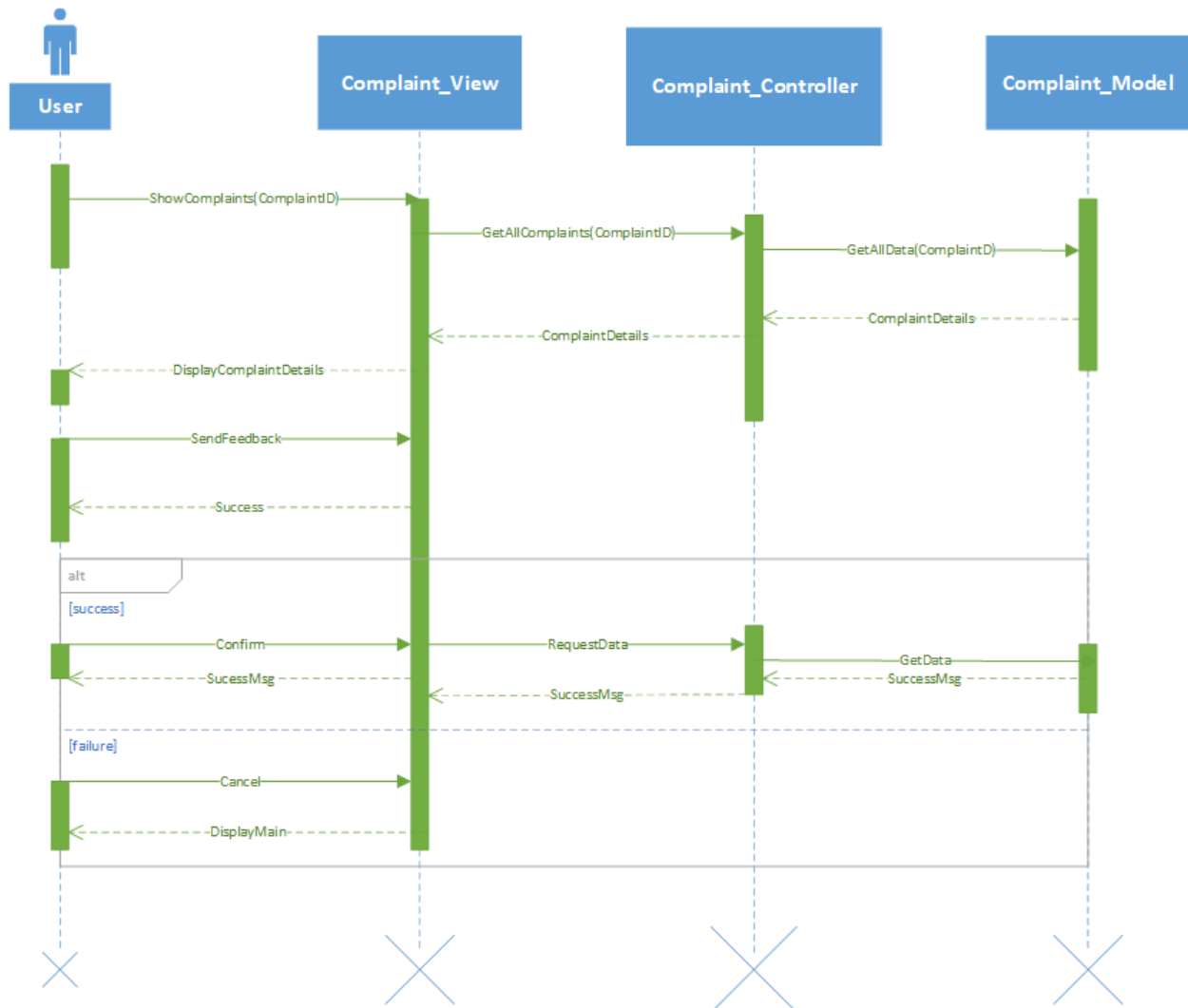
Sequence Diagram for Camera Status:
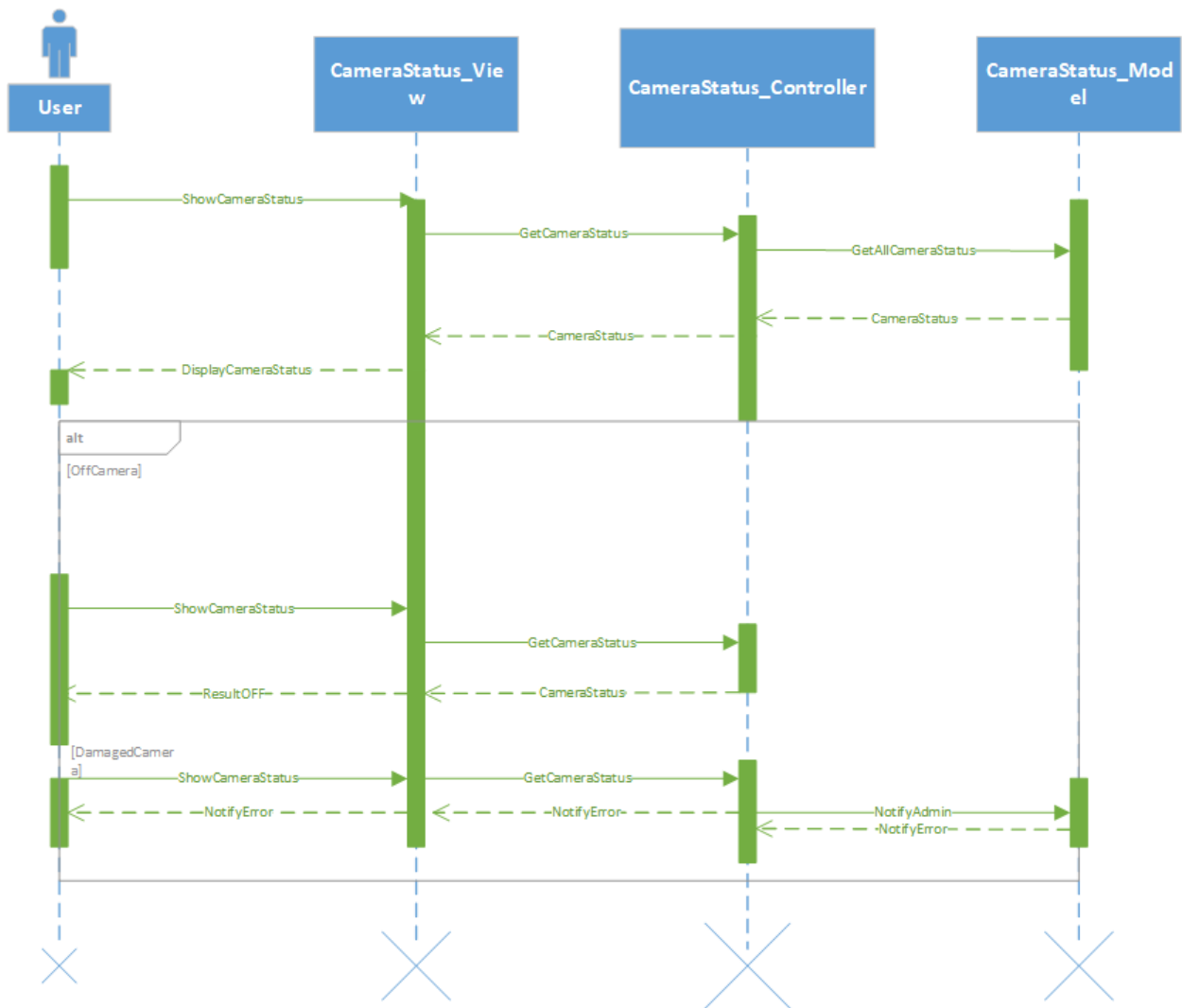
Figure 20: Camera Status

5.3 User Interface

5.3.1 Admin

First look to web application
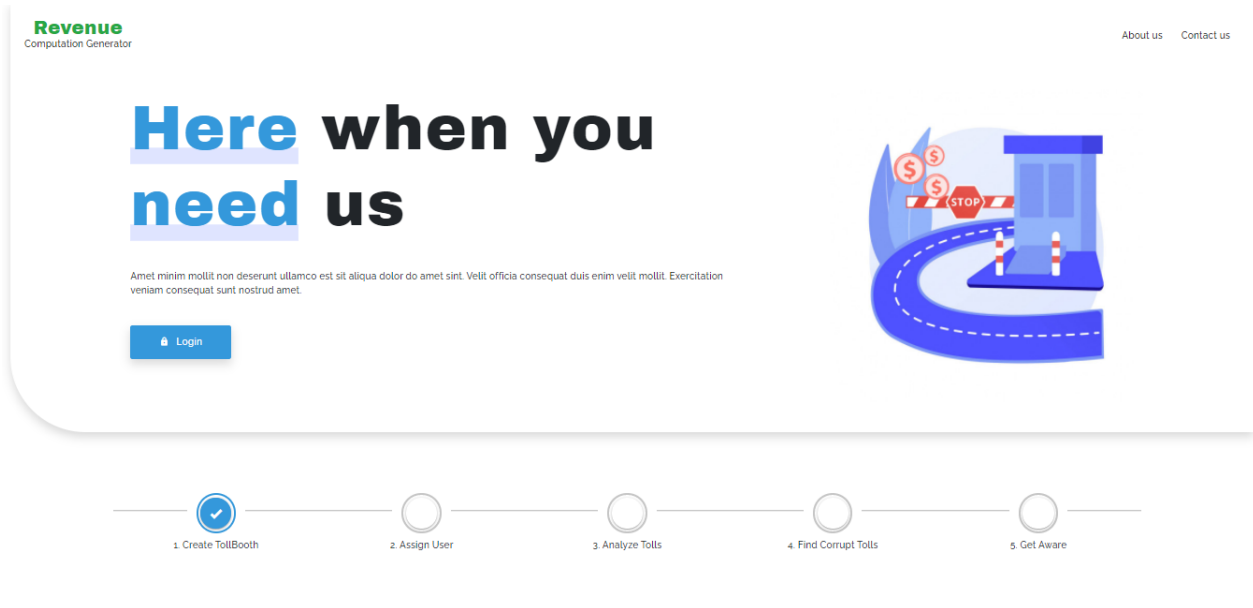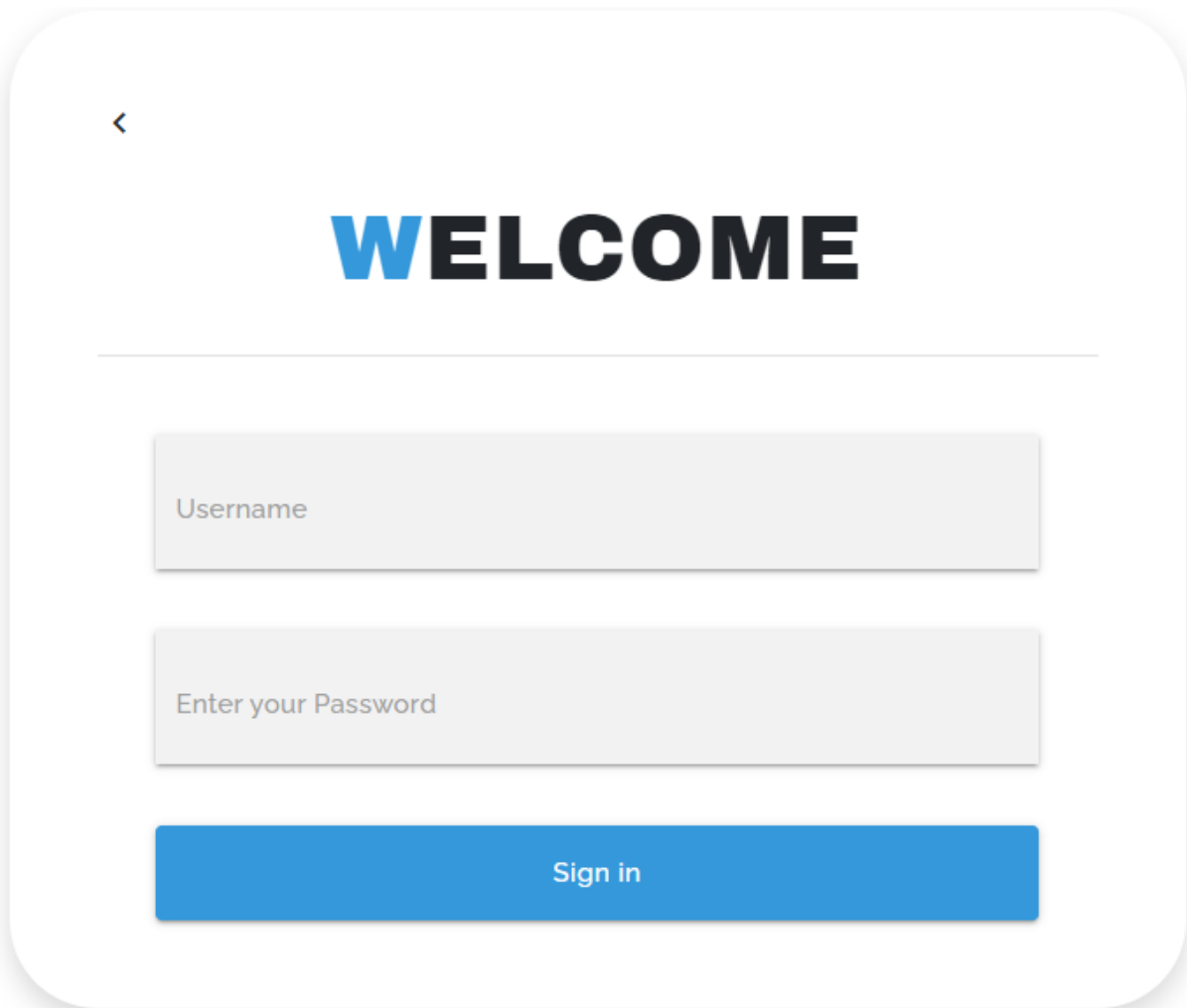
Admin Login

Admin Dashboard

Figure 23: Admin Dashboard

Create User

Figure 24: Create User

Toll booth List

#	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

List of All Records

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

Generate Record

+ 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 *i* ×

TB# 1608216150058 *i* ×

TB# 1608216150058 *i* ×

Still Active

⟳ Refresh List

TB# 1608216150058 ☐ *i* ×

Figure 27: Complaints

Admin Logout
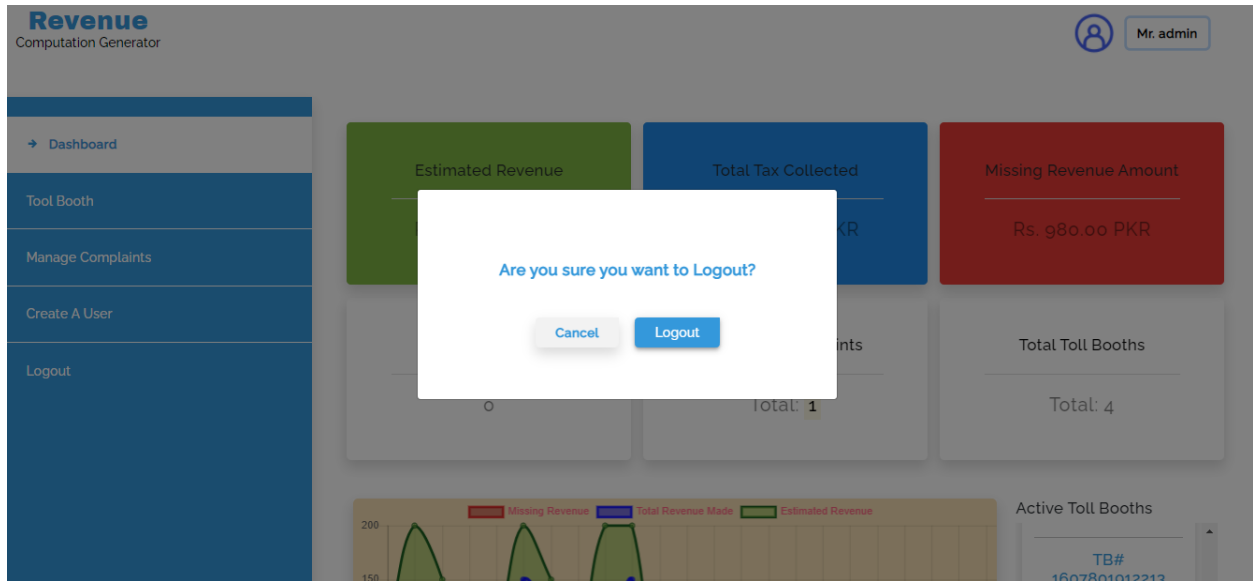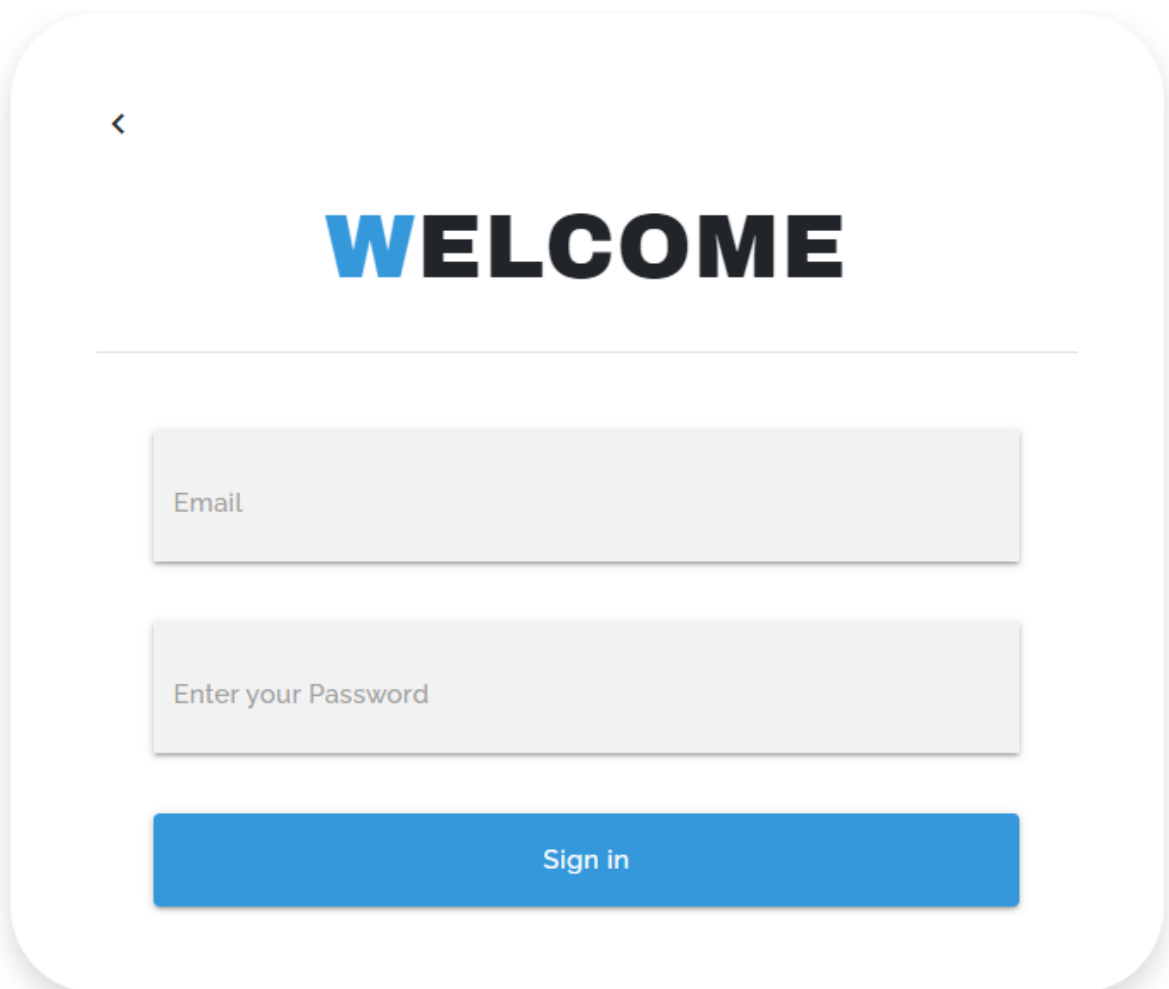
Figure 28: Admin Logout

1.3.2 Toll Booth

Staff Login