SafeDrive -Vehicle Damage App

Higher National Diploma in Software Engineering

Final Project Report

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Declaration

I certify that this project does not incorporate without acknowledgement any material previously submitted for a Higher National Diploma in any institution and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my project report, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations.

Date: 2025/05/15

Mr. Keerthi

(Module Leader)

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M.T.M Amjath	----------

Preamble

i. Abstract

SafeDrive is a smart, AI-powered Vehicle Damage Estimation App designed to revolutionize how users handle car accidents and insurance claims. By leveraging cutting-edge technology, SafeDrive introduces an innovative approach to vehicle inspection, providing instant damage analysis, repair cost estimation, and insurance claim assistance – all from your mobile device.

To achieve this, we have developed a powerful and user-friendly mobile application with a range of advanced features such as user management, AI-driven damage detection, claim tracking, and insurance integration. These features have been implemented to enhance the efficiency, reliability, and convenience of the vehicle damage reporting and repair process.

The application includes a modern and intuitive user interface designed with an appealing color scheme, making it not only attractive to users but also highly functional and easy to navigate. It ensures smooth user experience while matching all required functional specifications for both customers and insurance agents.

SafeDrive emphasizes security and privacy with robust authentication mechanisms and encrypted data transmission. The system ensures high-level protection for all users, enabling them to confidently use the app without concerns about data breaches or unauthorized access. Features such as two-factor authentication, encrypted image uploads, and secure claim processing highlight our commitment to user security.

In summary, SafeDrive – Vehicle Damage App stands out as a secure, intelligent, and user-centric solution offering seamless vehicle damage assessment and claim handling. With excellent features, enhanced security, and a user-friendly interface, SafeDrive is poised to attract a wide customer base and redefine the future of vehicle damage management.

ii. Acknowledgement

We extend our sincere gratitude to all those who contributed to the successful completion of our *SafeDrive – Vehicle Damage App* project.

Although this project was completed without formal supervisor meetings, we are especially thankful to Mr. Keerthi for his valuable assistance and guidance throughout the development process. His support, suggestions, and encouragement were instrumental in helping us move forward and complete the project successfully.

We also express our heartfelt appreciation to NIBM for giving us the opportunity to participate in the Higher National Diploma Program, which enabled us to undertake and complete this project.

A special thanks goes to our classmates and team members for their cooperation, ideas, and teamwork, which played a key role in the success of our project.

Lastly, we are truly grateful to our parents for their continued support, motivation, and the many ways in which they helped us during this journey.

Thank you!

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Chapter 1 – Introduction

1.1 Introduction to the Application

The automotive industry in Sri Lanka faces significant challenges in vehicle damage assessment and insurance claim processing. Traditional methods are time-consuming, prone to fraud, and inefficient. Our AI-powered Vehicle Damage Assessment App aims to solve this by leveraging AI and computer vision to streamline the process, enhance efficiency, and ensure transparency. This aligns with the global environmental challenge by reducing paper-based documentation, optimizing resource utilization, and minimizing fraudulent claims that lead to unnecessary repairs and waste.

Empathize:

Target Users

Who are they:

Regular vehicle owners who need to assess damage and file insurance claims. May not have technical knowledge about car damage estimation.

Pain points & Needs:

- Frustration with Manual Claims: Users find traditional claim processes slow, requiring physical inspection and long waiting times.
- Lack of Transparency: They struggle with unclear repair costs and insurance policies.
- Time-Sensitive Situations: In cases of accidents, they need quick assessments to plan repairs or claim insurance.
- Easy-to-Use Interface: Users want a simple way to upload car images and receive instant analysis.

Solution:

- Provide a seamless mobile app where users can upload photos, get AI-driven damage assessments, and receive instant estimated repair costs.
- Show transparent breakdowns of damage levels, possible repair costs, and insurance claim eligibility.
- Offer claim tracking so users can see the status of their submissions.

Target Admin

Who are they:

Employees from insurance companies handling claims verification and approval.

Need to validate AI-generated damage reports before approving or rejecting claims.

Pain points & Needs:

- High Workload & Fraud Detection: Admins need an efficient way to verify claims and reduce fraudulent submissions.
- Inconsistent Damage Reports: Manually reviewing photos can lead to errors and delays.
- Clear Communication with Users: Users often reach out for claim updates, requiring better tracking systems.
- Regulatory Compliance: Insurance companies must ensure claim approvals follow legal policies.

Solution:

- A web-based or mobile Admin App to review AI-generated reports, compare with uploaded photos, and approve/reject claims efficiently.
- Automated fraud detection flags suspicious claims for manual review.
- A dashboard to track claim history, user interactions, and pending approvals.
- Built-in communication system to update users on their claim status.

1.2 Problem Definition

The traditional process of assessing vehicle damage involves experts manually inspecting the vehicle which can lead to:

- Lengthy claim processing times
- Human error in damage estimation
- Potential for fraudulent claims
- Inconvenience for customers in filing and tracking claims

These inefficiencies result in increased costs for insurance companies and frustration for customers

1.3 Project Objectives

- **Streamline the vehicle damage assessment process** by allowing users to report vehicle damage through a mobile application instead of going through manual, time-consuming inspections.
- **Simplify insurance claim initiation** by providing users with clear steps and tools to submit vehicle damage reports for claim processing.
- **Enhance user convenience** by enabling easy image uploads, real-time service location search, and damage tracking through an intuitive interface.
- **Improve transparency and trust** by displaying clear breakdowns of estimated repair costs and damage severity before users make a claim.
- **Prevent fraudulent claims** by ensuring only registered users with valid insurance can access and submit damage reports.
- **Provide real-time claim tracking** so users can monitor the progress of their reports and insurance status.
- **Assist users with in-app guidance and chatbot support** through a virtual assistant for better usability and support.
- **Support multi-vehicle users** by enabling them to manage multiple vehicle records and damage reports within one account.
- **Secure user data** through reliable authentication processes for both users and admins, ensuring system integrity.

1.4 Proposed Solution

The proposed mobile application, SafeDrive - Vehicle Damage App, aims to simplify vehicle damage assessment and insurance claim processing. The app allows users to upload images of their damaged vehicles and receive estimated repair costs. It also provides a transparent view of the damage severity, claim eligibility, and real-time claim tracking. By offering a user-friendly interface and streamlining the entire process, the app eliminates the need for lengthy manual inspections and improves the overall experience for vehicle owners

Core Features

- **Admin approved Damage Assessment:** Users can upload the image and make report unless the admin approval is granted only.
- **Fraud Prevention:** Only Registered Users and Vehicles with insurance only can make report.
- **Real – Time Location Tracking:** Users can search any district nearby their current location and predict the list of nearby locations for their vehicle services unless their insurance is expired.
- **Multi-Vehicle Damage Estimation:** Enable users to assess damages and make reports.
- **AI auto response Virtual Assistant:** Added a chatbot in order to help the users.

Common Features

- **User Authentication**: Sign up, login, log out and password recovery
- **Admin Authentication:** Login
- **Profile Management**: Update User & Admin Information.
- **Settings:** Access the guidance through the settings option.

1.5 Chapter Summary

- **Problem**: Lengthy and inefficient vehicle damage assessment and insurance claim processing.
- **Solution**: SafeDrive mobile app for automated damage detection, fraud prevention, and instant claim processing.
- **Impact**: Faster claims, reduced fraud, improved user experience, and better resource utilization.

Chapter 2 – Methodology

2.1 Introduction

This chapter outlines the methodology followed to develop the SafeDrive – Vehicle Damage App. It describes the approach used for collecting data, the software process model chosen, the tools and technologies applied, the testing strategies implemented, and the overall implementation plan for the application.

2.2 Data Collection Method

To gather the necessary information for system design and user needs, the following data collection methods were used:

- **Surveys & Questionnaires**: Collected responses from vehicle owners to identify common issues in insurance claims and damage assessments.
- **Interviews**: Conducted discussions with insurance agents and service center staff to understand their workflows and pain points.
- **Online Research:** Reviewed similar vehicle damage reporting systems and insurance claim platforms to identify best practices and potential improvements.

2.3 Software Process Model

The Agile Software Development Model was adopted for this project. Agile allowed for:

- Incremental development with continuous user feedback.
- Quick adaptation to changing requirements.
- Regular review of each functional module such as damage reporting, user authentication, and claim tracking.

  Each sprint focused on a particular feature, ensuring faster iterations and improvements.

2.4 Software Devolopment Tools

Frontend

- **XML** (for cross-platform mobile development)
- **Figma UI/UX** (for designing)

Backend

- **Kotlin** – Backend development options.
- **Firebase** – For Realtime tracking

APIs

- **Google SDK API** – Maps Loaded
- **Places API (new)** – Auto fetches places nearby current location.
- **Geocoding –** Gives coordinates of the places.
- **Geolocation -** Current Location.
- **Google Translation –** Voice Recording purpose.
- **Google Signin –** For easiest way of authenticating the users into the system.

Other Integration

- **Firebase –** Tracking Realtime data.
- **Google Maps** - Opening the Real Google Map
- **Phone Book –** Opens the phone book with an admin number automatically.
- **Camera –** Capture and send the image via chat or for making report upload the images.
- **Voice Integration -** Applying voice into chat for easier communication with admin via chat.

2.5 Testing Strategies

Multiple testing strategies were used to ensure the quality and functionality of the app:

- **Unit Testing:** Individual functions and modules were tested (e.g., image upload, location fetch).
- **Integration Testing:** Ensured all modules (e.g., authentication + report generation) worked together correctly.
- **UI Testing:** Verified the user interface worked smoothly and was responsive.
- **User Testing:** A small group of users tested the app and gave feedback for improvements.

2.6 Implementation Planning

The implementation plan is from March to May 2025. The above-mentioned things are being done during this period.

Phase	Description
Requirement Gathering	Designed user requirements and gather some data
Designing	Created wireframes and user flow diagrams
Development	Built modules such as registration, damage report, admin approval etc.…
Testing	Performed bug fixing and user feedback integration
Deployment	Deployed to the android mobile phone
Maintenance	Regular updates and bug fixes after deployment

2.7 Chapter Summary

This chapter presented the methodological foundation of the SafeDrive – Vehicle Damage App development. It covered the data collection methods, Agile model implementation, tools and technologies used, testing strategies followed, and the phased implementation plan. This structured methodology ensured the successful and efficient development of the application.

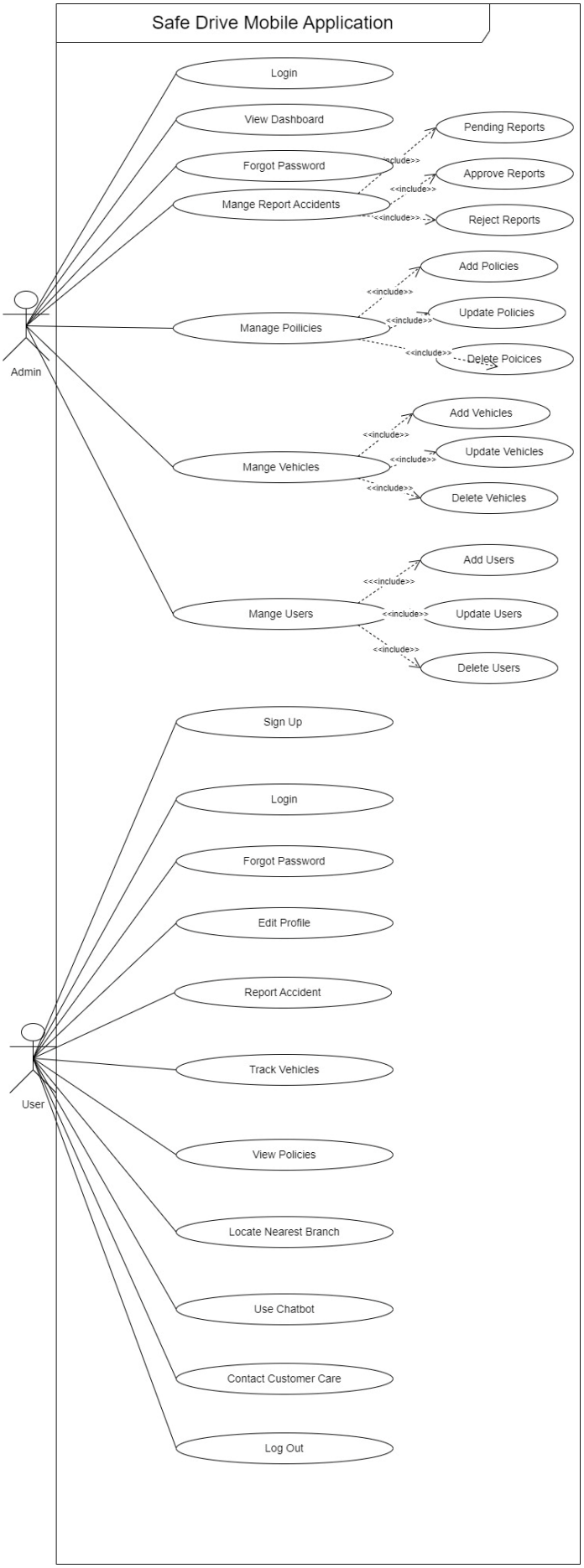
Chapter 3 – Analysis

3.1 Introduction

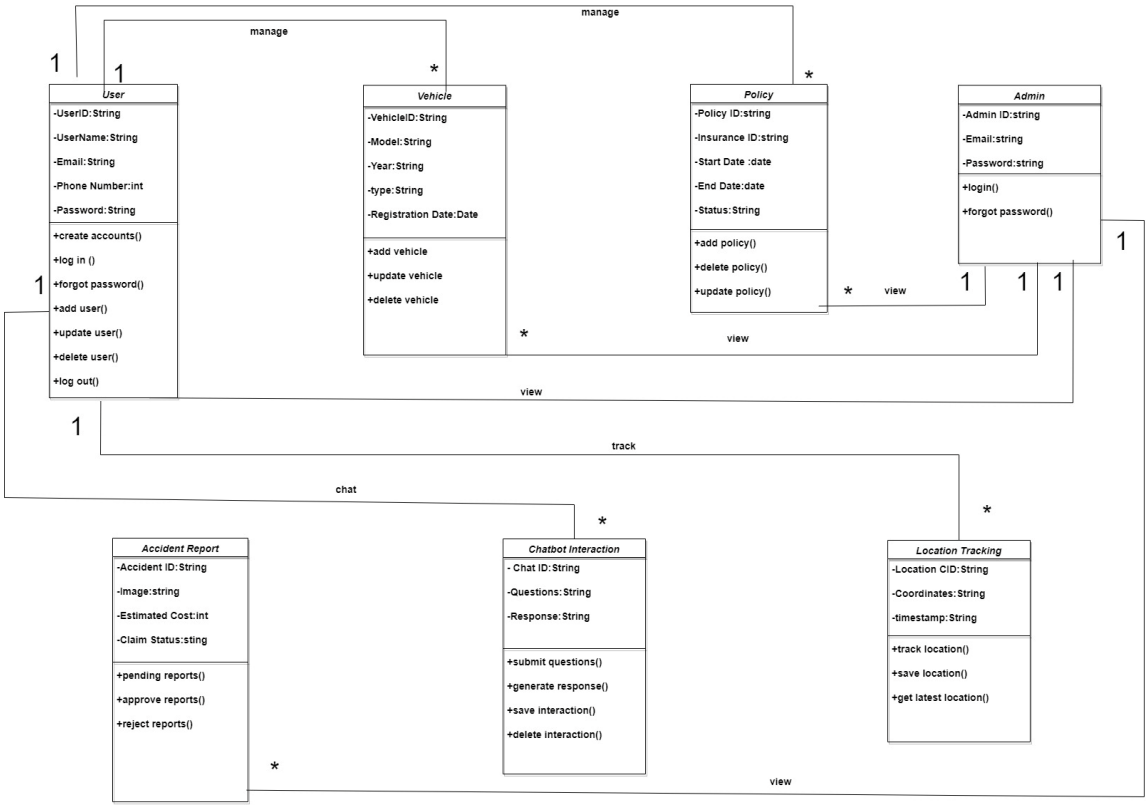
This chapter focuses on the system analysis of the SafeDrive - Vehicle Damage App. It includes an overview of the system's structure using UML diagrams, the software architecture selected for the project, and an Entity-Relationship (ER) diagram to represent the database design. These components form the foundation for the implementation phase.

3.2 UML Diagram

Use Case Diagram of the Proposed System.

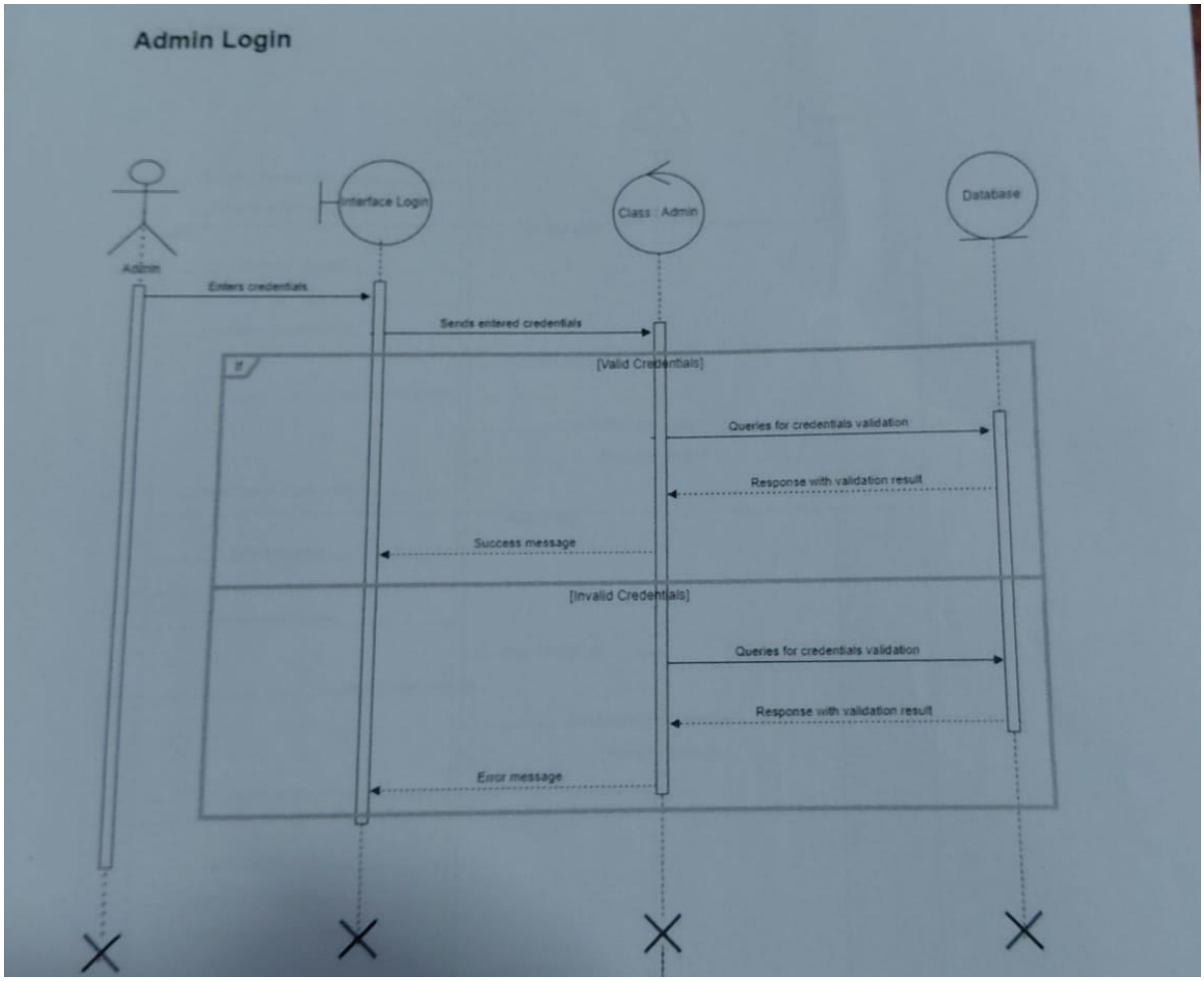

Safe Drive Mobile Application
Login
View Dashboard
Forgot Password
Mange Report Accidents
Pending Reports
Approve Reports
Reject Reports
<<include>>
Admin
Manage Poilicies
Add Policies
Update Policies
Delete Poicices
Mange Vehicles
Add Vehicles
Update Vehicles
Delete Vehicles
Mange Users
Add Users
Update Users
Delete Users
Sign Up
Login
Forgot Password
Edit Profile
Report Accident
Track Vehicles
View Policies
Locate Nearest Branch
Use Chatbot
Contact Customer Care
Log Out
User

Class Diagram of the Proposed System.

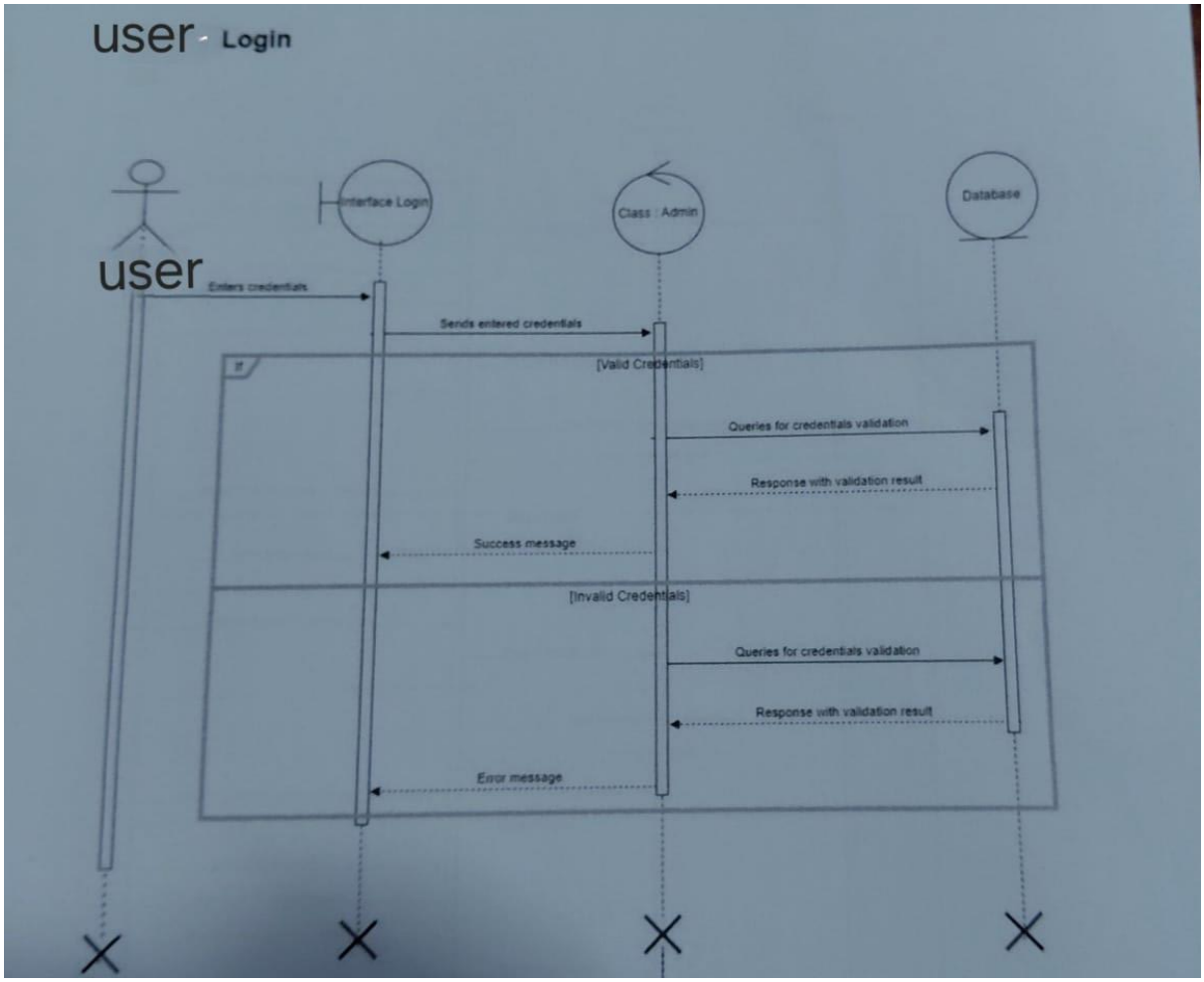


Sequence Diagram of the Proposed System.

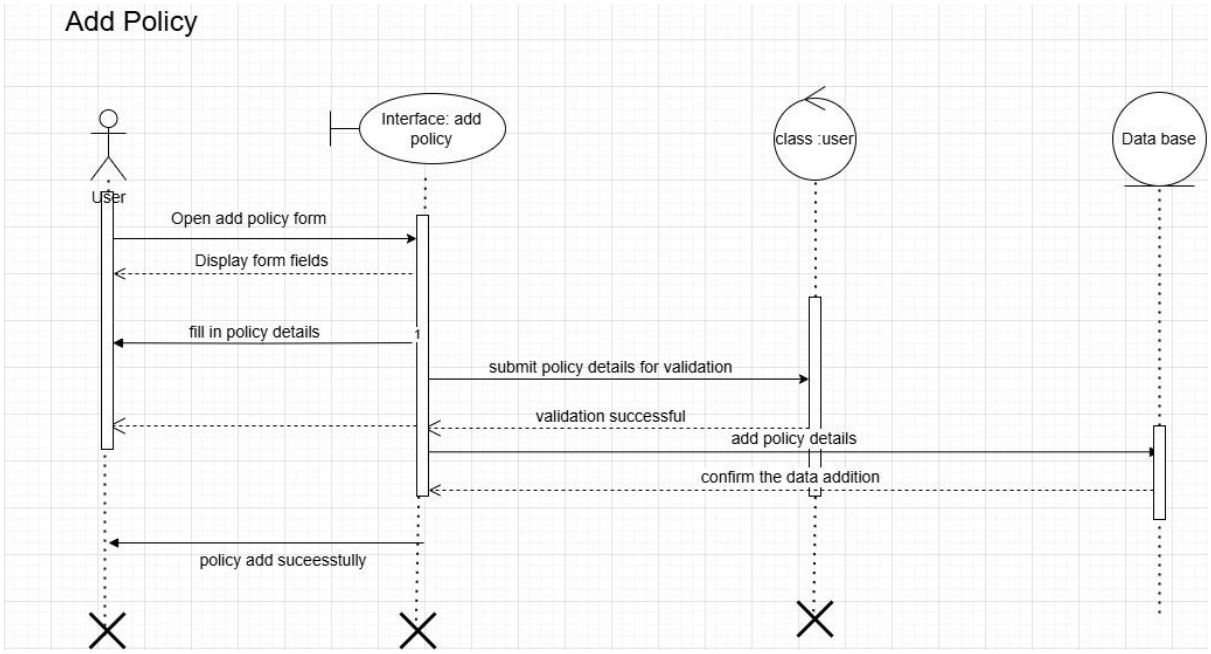
Admin Login



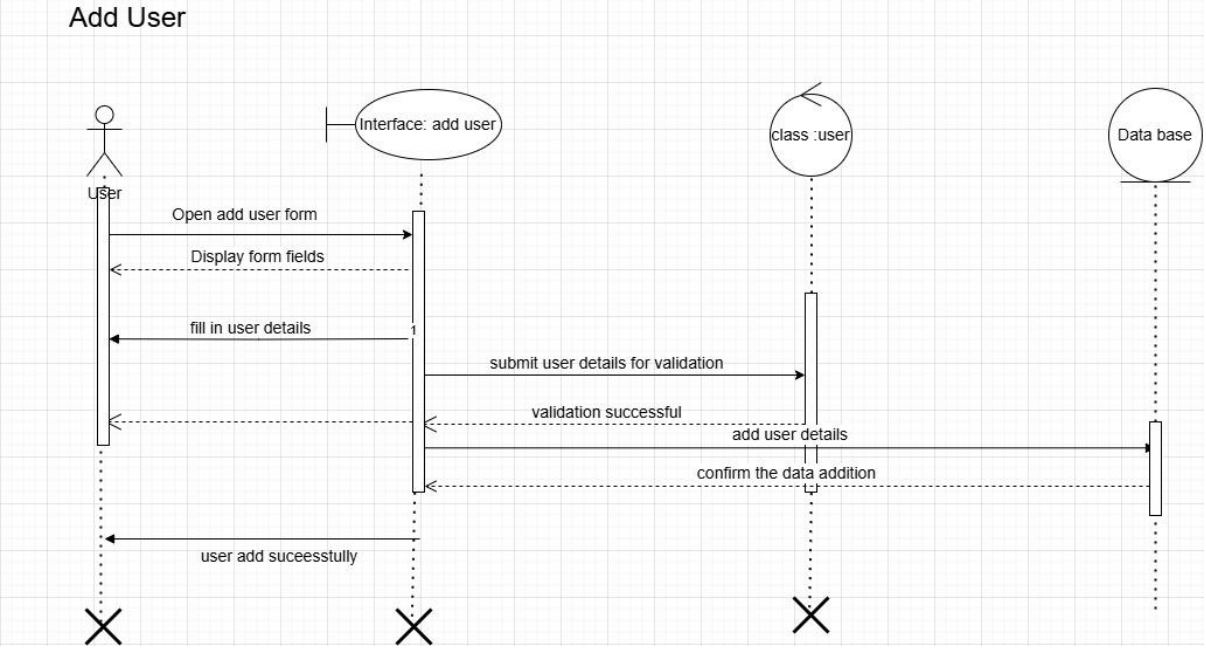
User Login


user - Login
user
Interface Login
Class : Admin
Database
Enters credentials
Sends entered credentials
[Valid Credentials]
Queries for credentials validation
Response with validation result
Success message
[Invalid Credentials]
Queries for credentials validation
Response with validation result
Error message

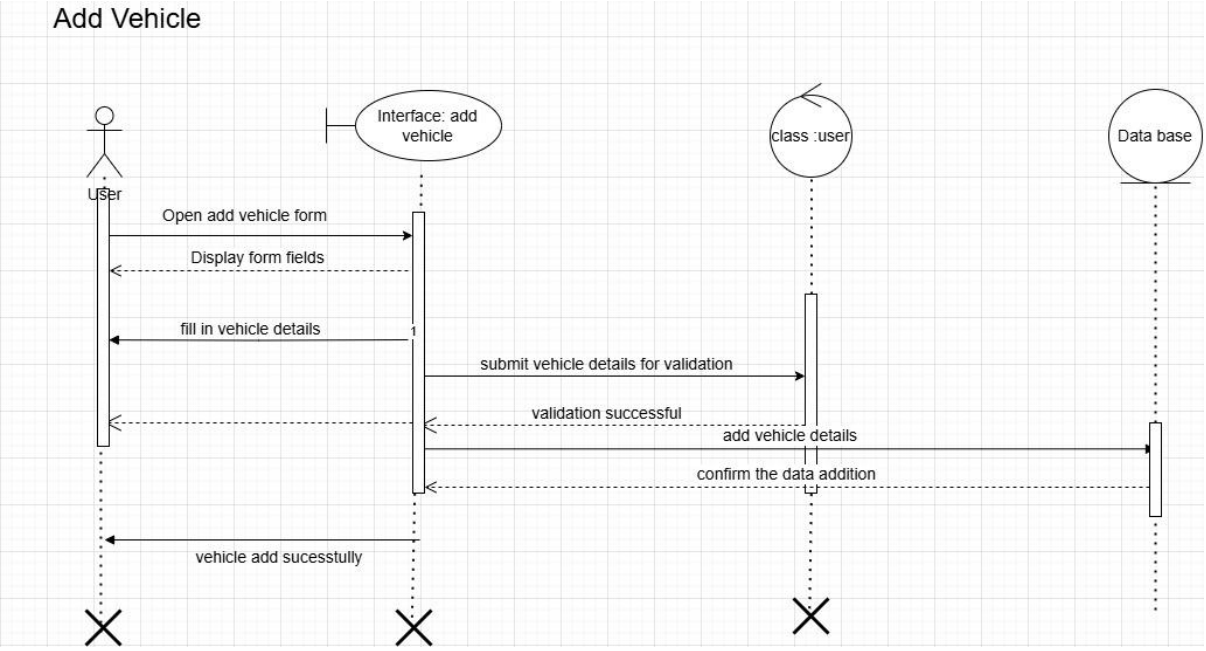
Add Policy


Add Policy
User
Interface: add policy
class :user
Data base
Open add policy form
Display form fields
fill in policy details
submit policy details for validation
validation successful
add policy details
confirm the data addition
policy add suceesstully

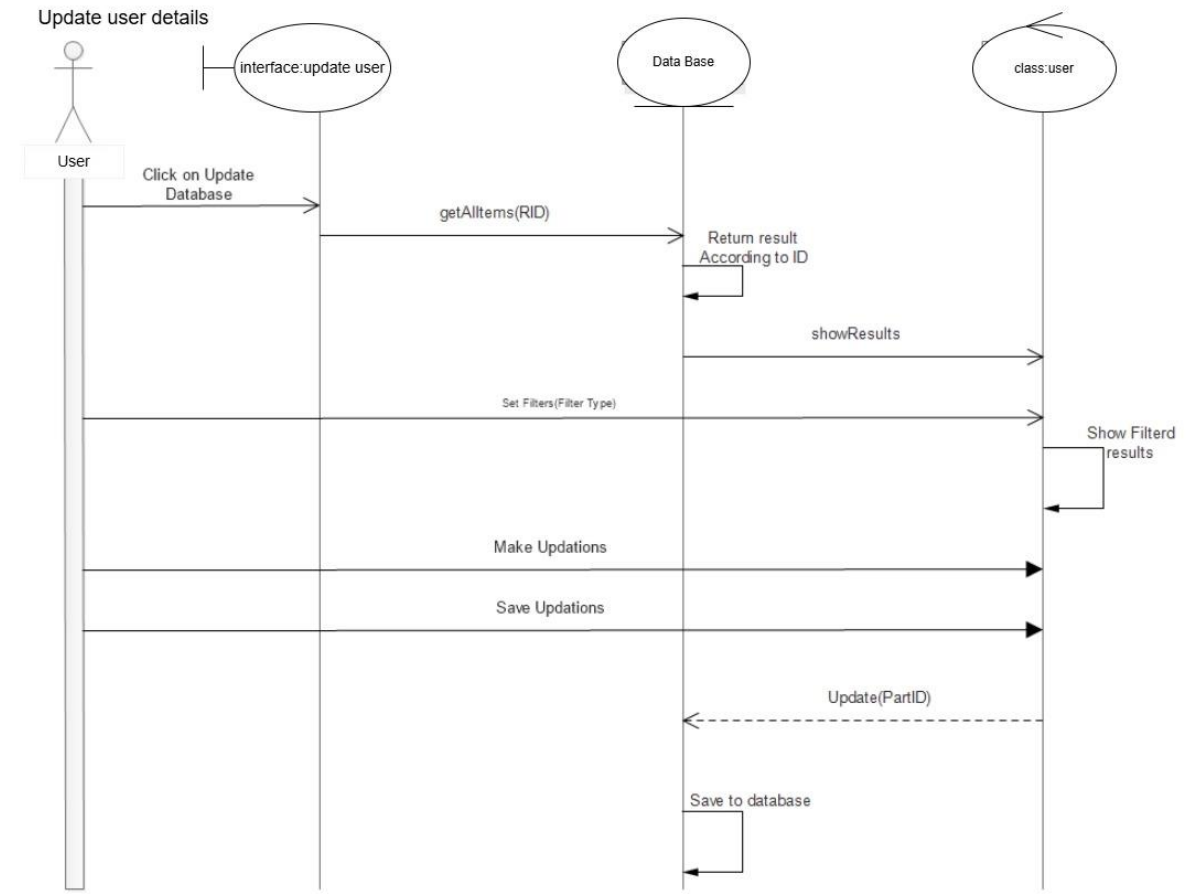
Add Users



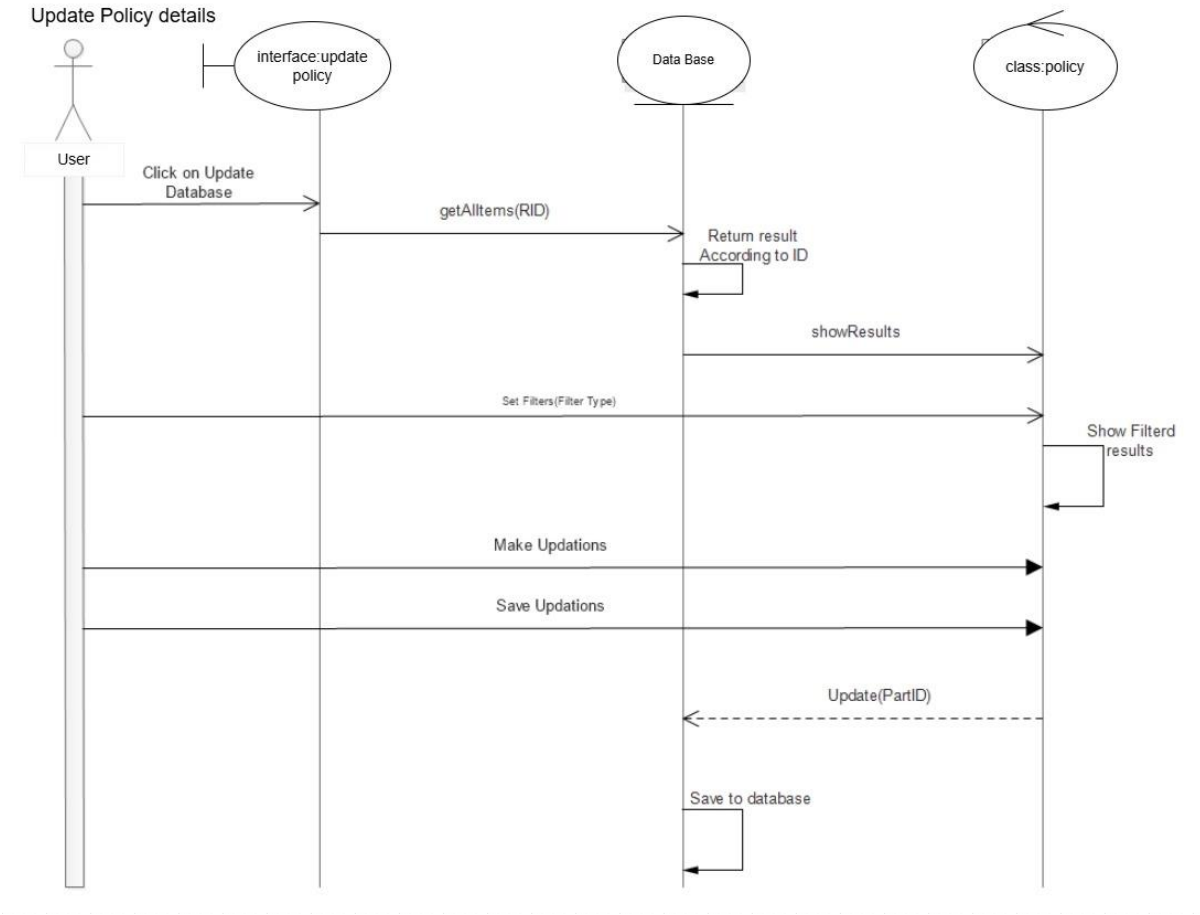
Add Vehicle



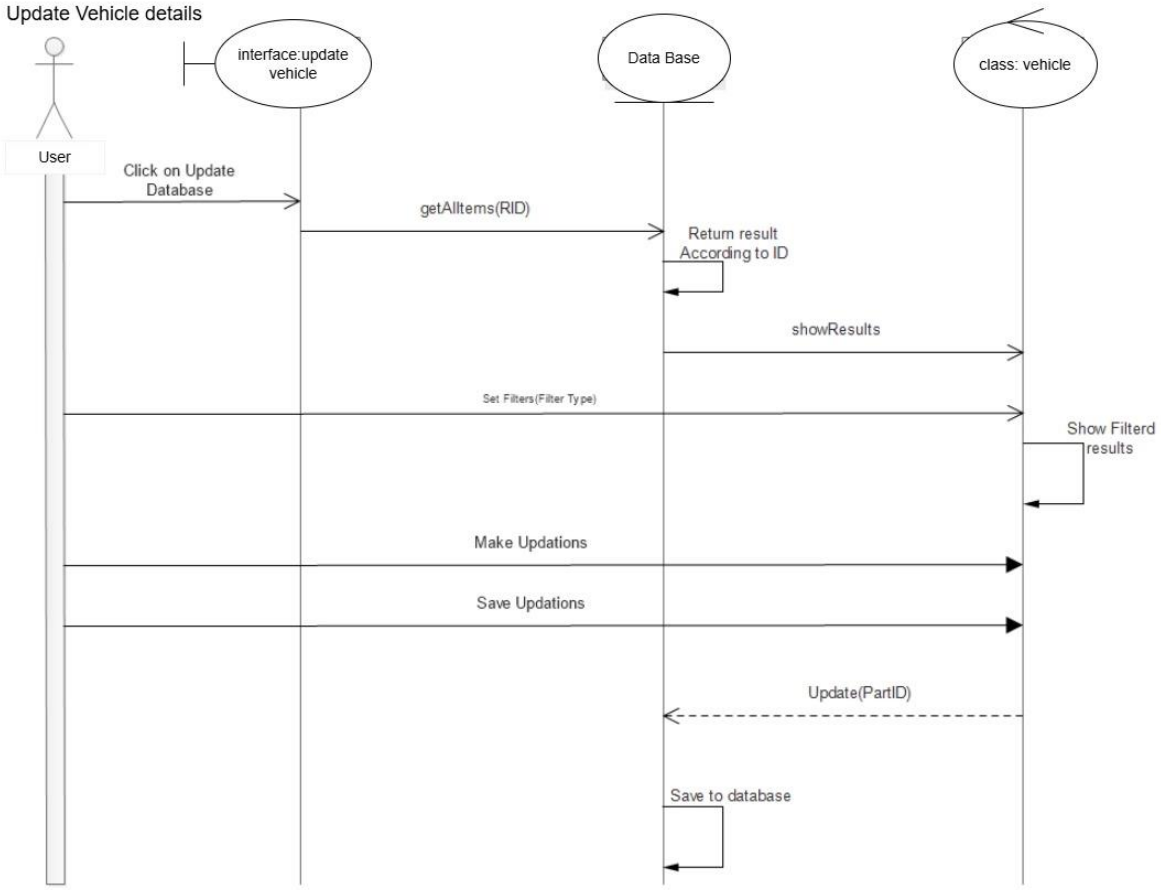
Update Policy



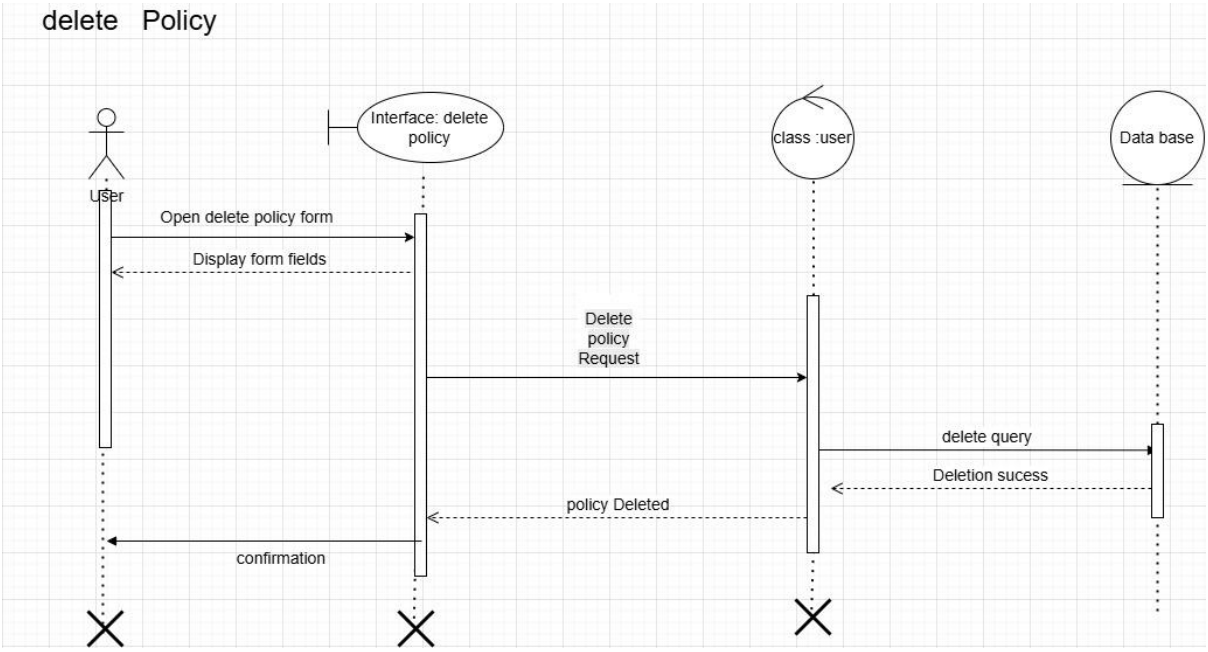
Update Users



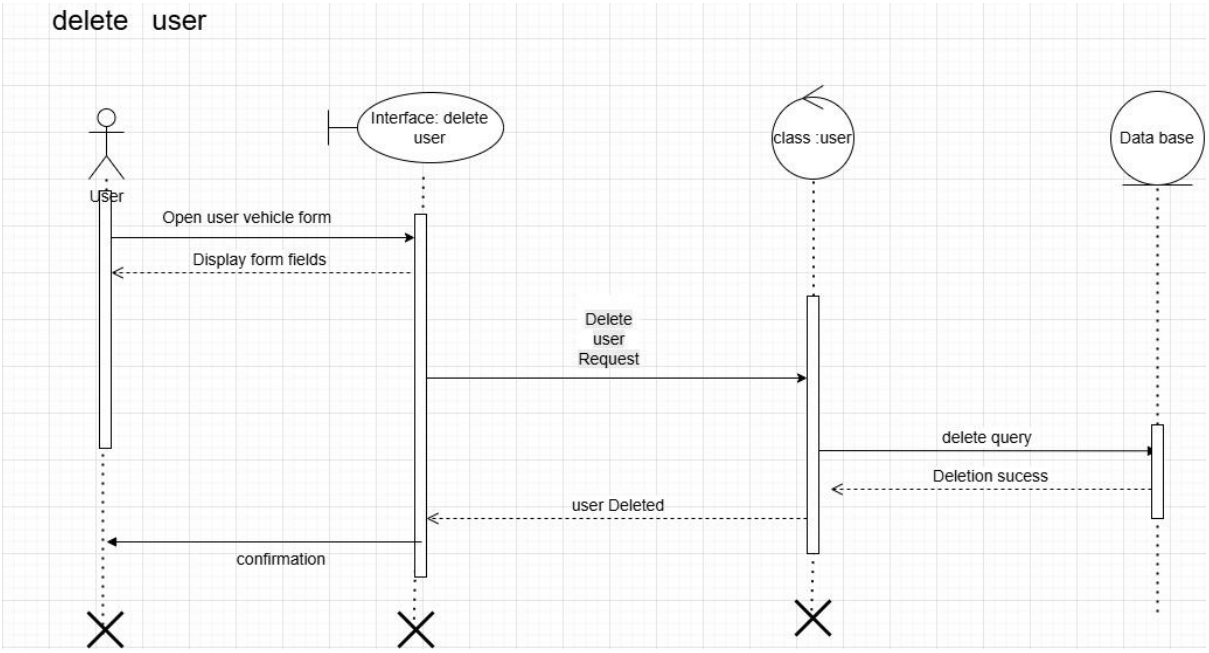
Update Vehicle



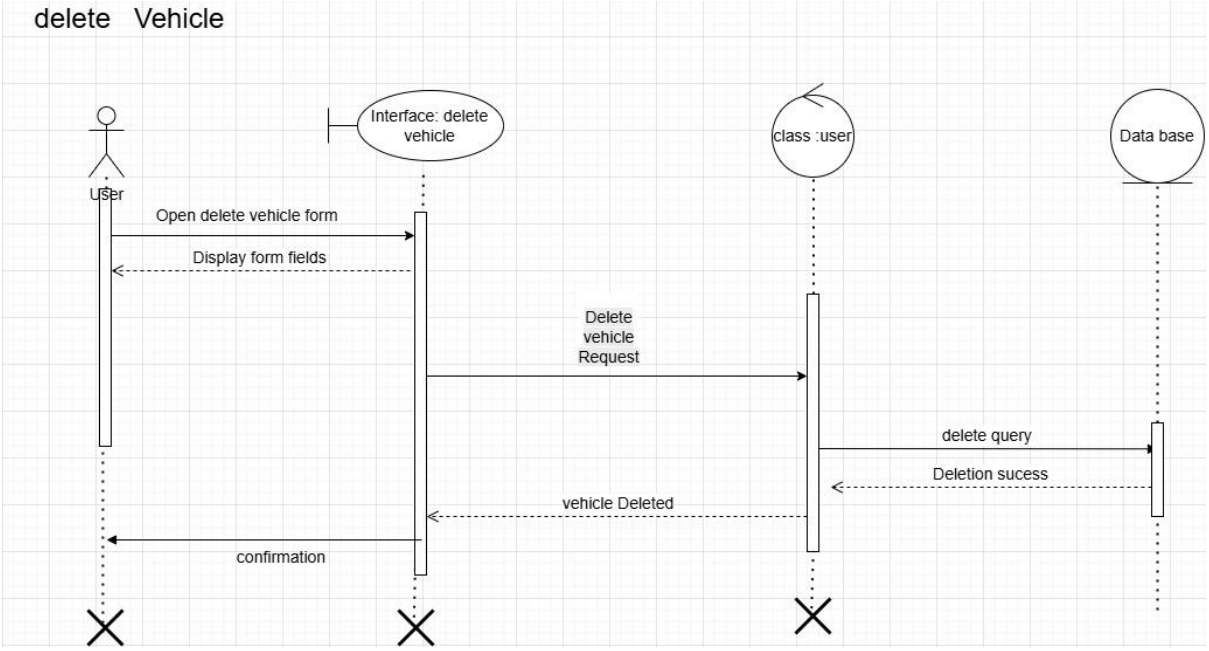
Delete Policy



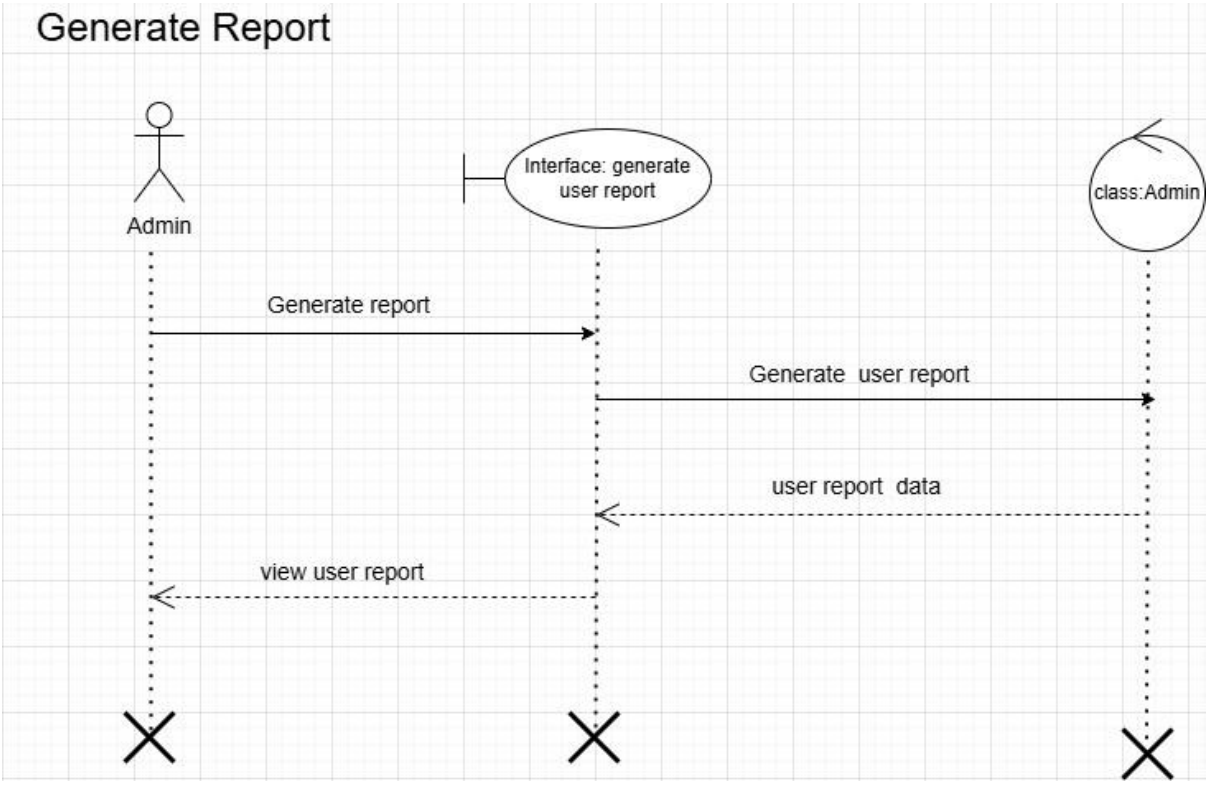
Delete Users



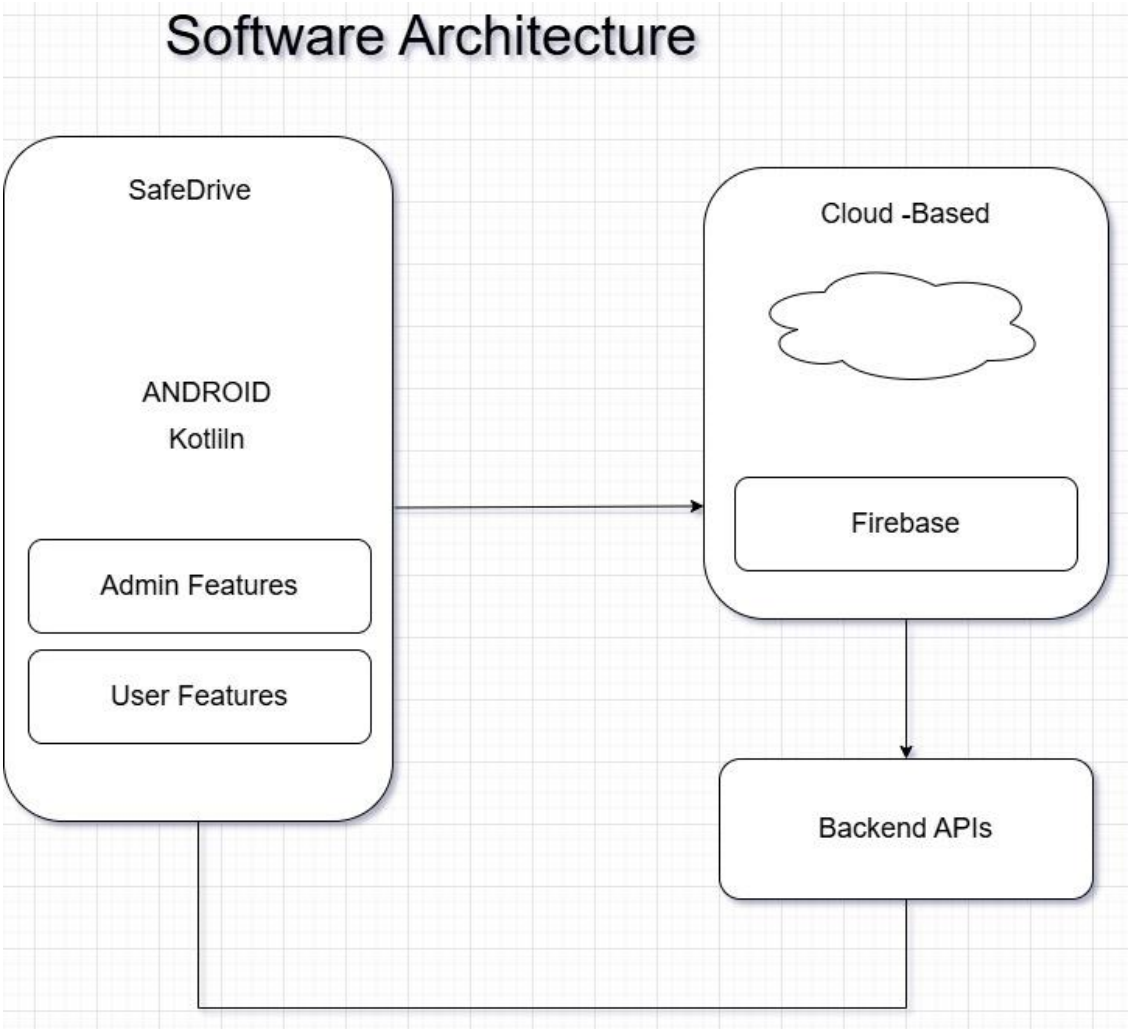
Delete Vehicles



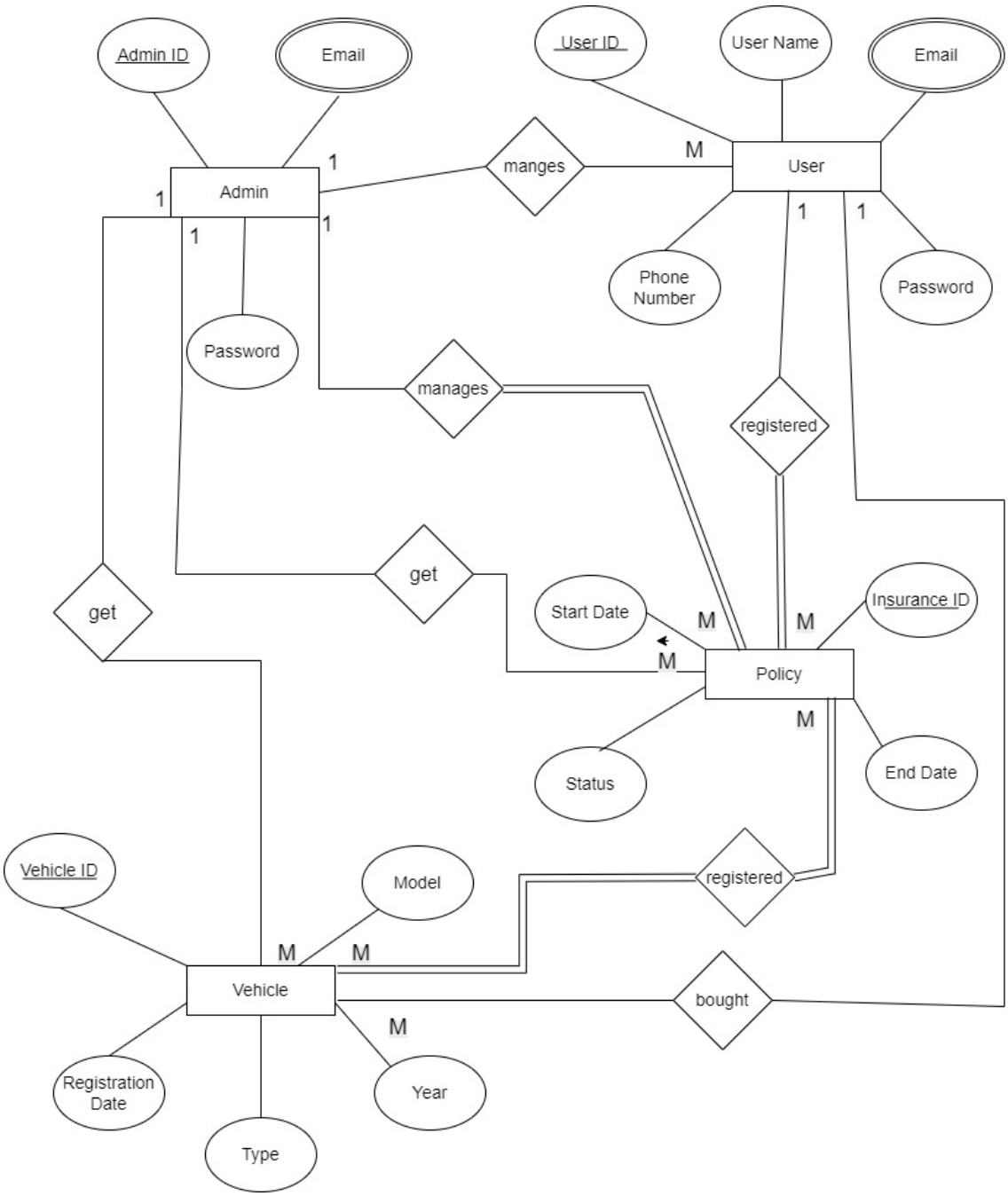
Generate Report



3.3 Software Architecture



3.4 ER Diagram of the Proposed System



3.4 Chapter Summary

This chapter presented the system analysis of the SafeDrive - Vehicle Damage App, focusing on UML diagrams, software architecture, and database structure. These analytical models guided the implementation process by providing a clear view of system interactions, responsibilities, and data flows.

Chapter 4 – Solution Design

4.1 Introduction

This chapter outlines the overall solution design of the SafeDrive – Vehicle Damage App. It focuses on the design of user interfaces, the structure of the underlying database, report generation mechanisms, and the viability of the solution in a real-world business context.

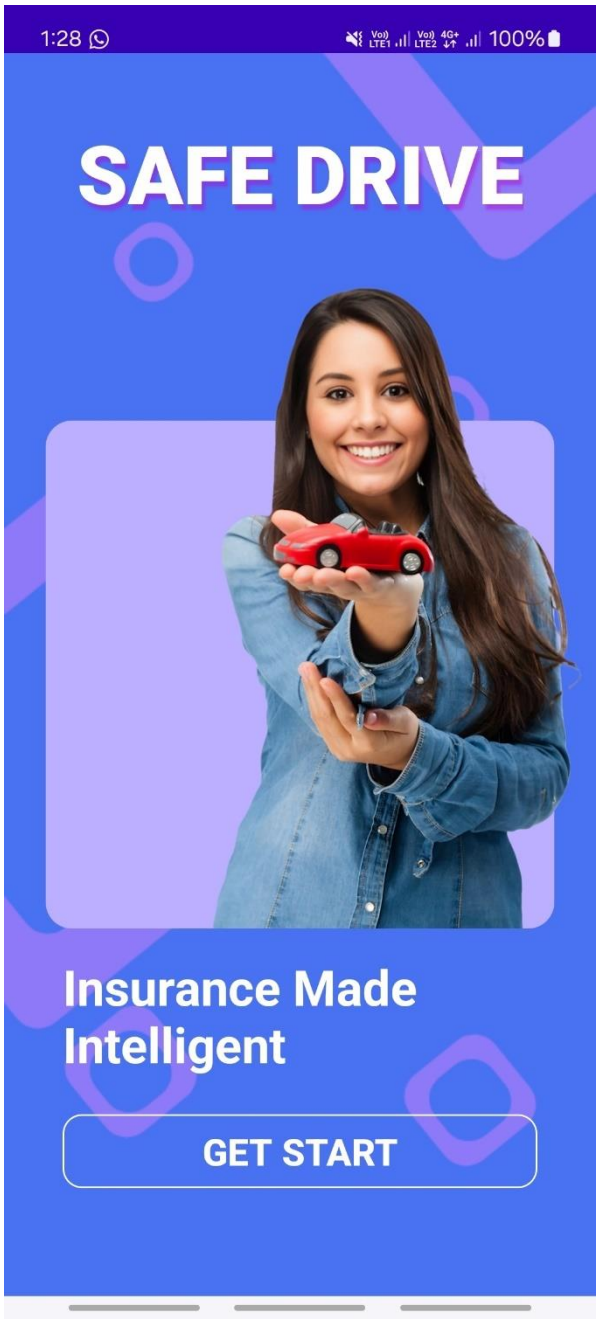
4.2 Interface Design

The application offers a user-friendly and intuitive interface to ensure smooth navigation and usability. The interface is designed using modern UI principles with consistent color themes and accessible layouts.

Interface Number: 01

Interface Name: Splash Screen

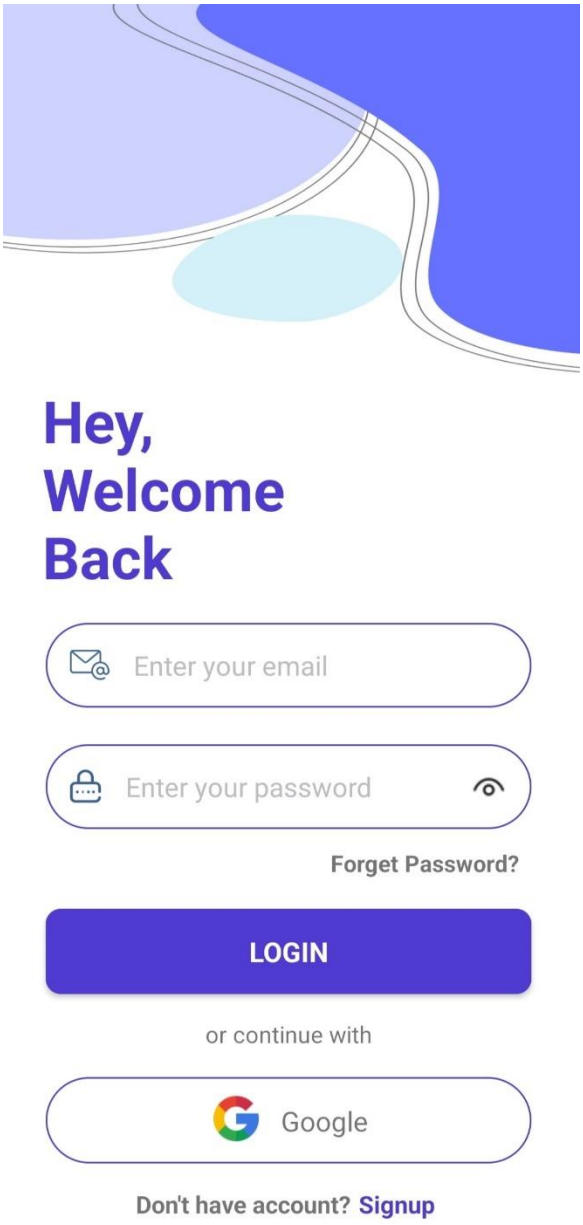
Description: View of the App



Interface Number: 02

Interface Name: Login

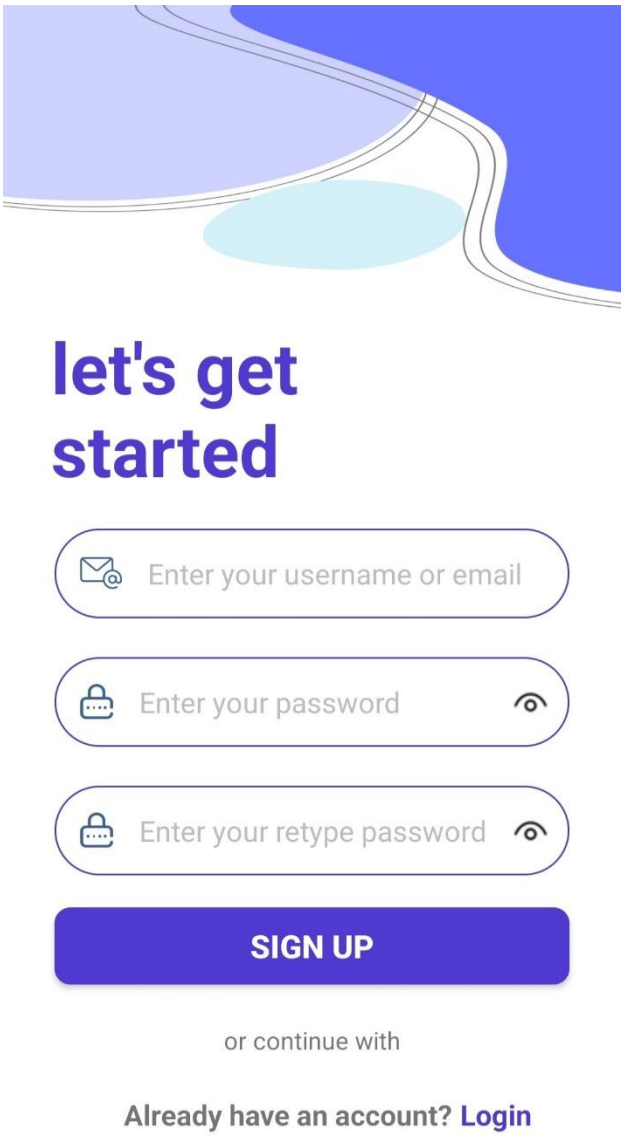
Description: Authentication of the app



Interface Number: 03

Interface Name: Sign Up

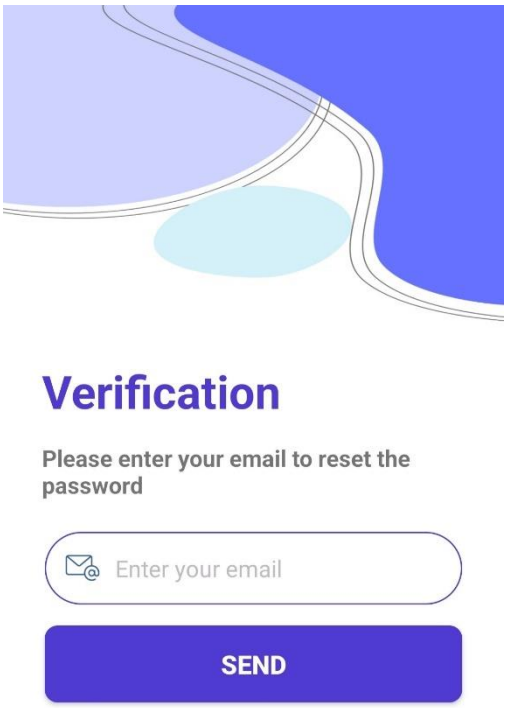
Description: Create an account if the user is not created or login is invalid



Interface Number: 04

Interface Name: Verification

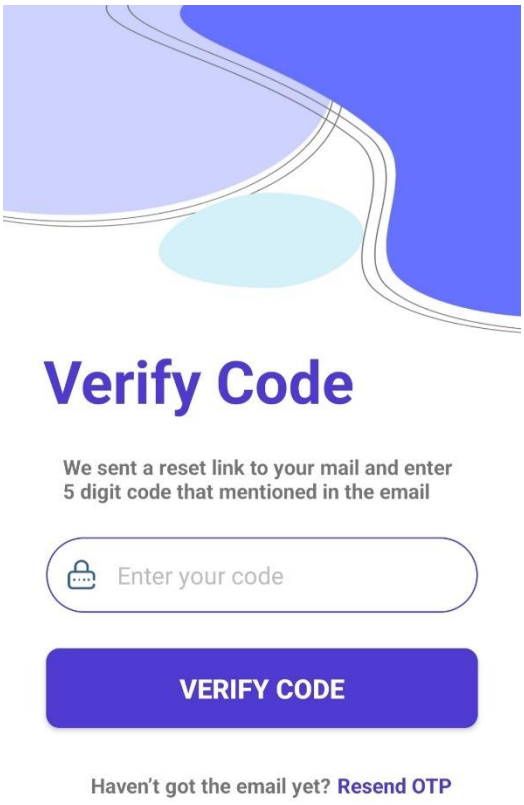
Description: User must be verified before resetting the password.



Interface Number: 05

Interface Name: Verify Code

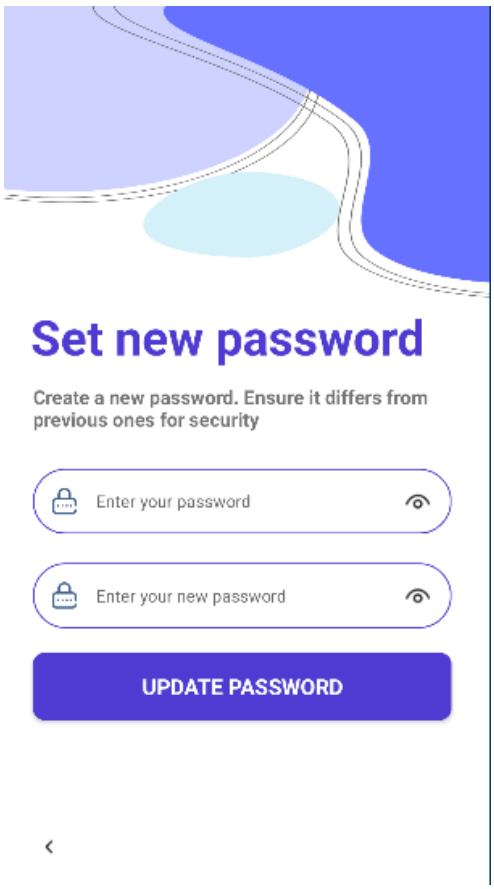
Description: User must be verified with code before resetting the password.



Interface Number: 06

Interface Name: Forgot Password

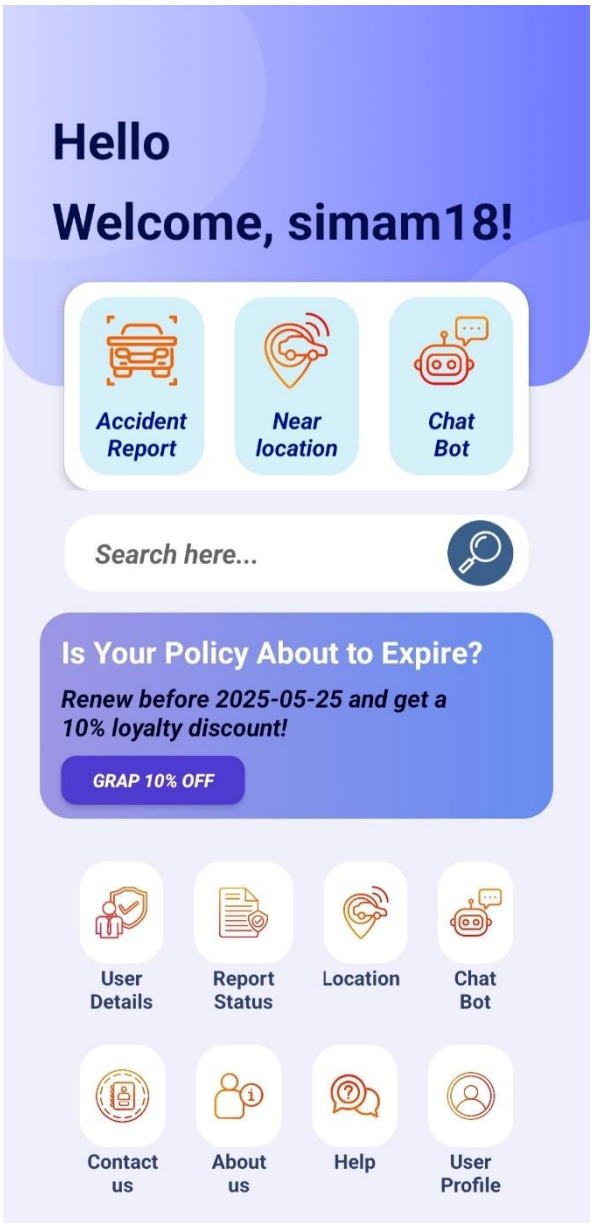
Description: User can reset the password if the password is invalid or forgotten.



Interface Number: 07

Interface Name: User Dashboard

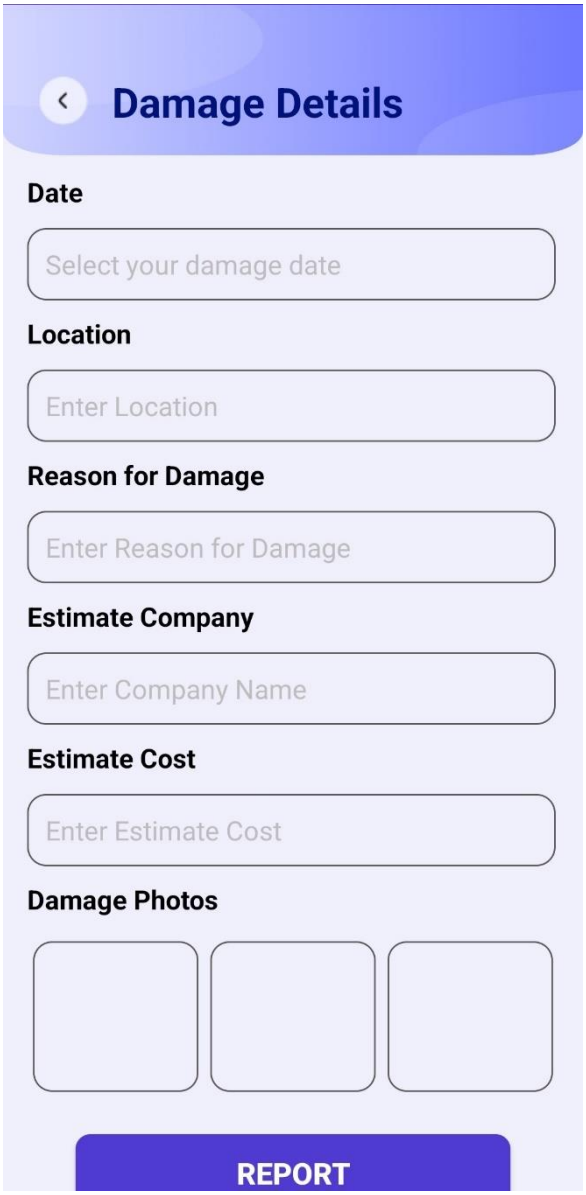
Description: User Home page with options.



Interface Number: 08

Interface Name: Accident Report

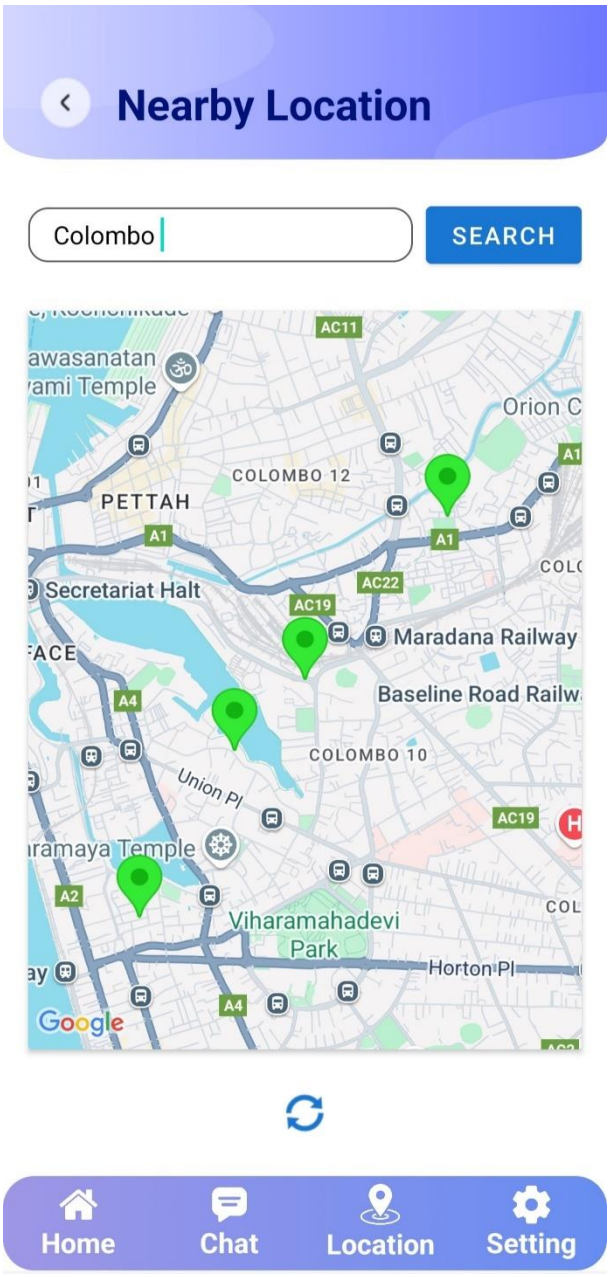
Description: User can make a report by uploading some required details if the user exists with vehicle.



Interface Number: 09

Interface Name: Near Location

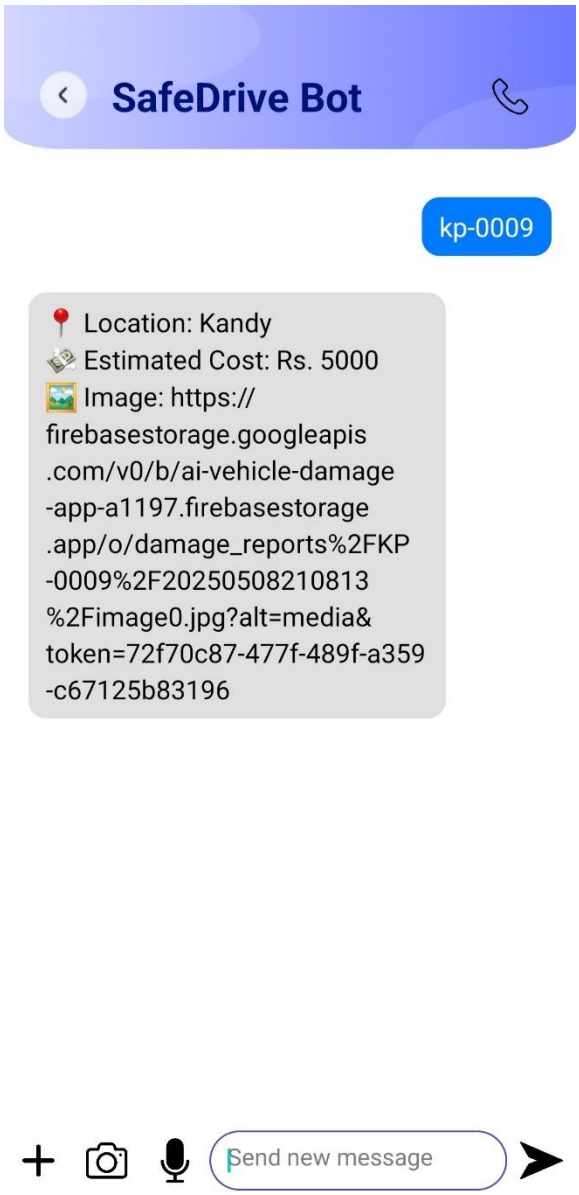
Description: Auto fetches the service centers near the current location of the user and if the user clicks on green icon on the map it will direct the user to google map to get direction.



Interface Number: 10

Interface Name: Safe Drive Chatbot

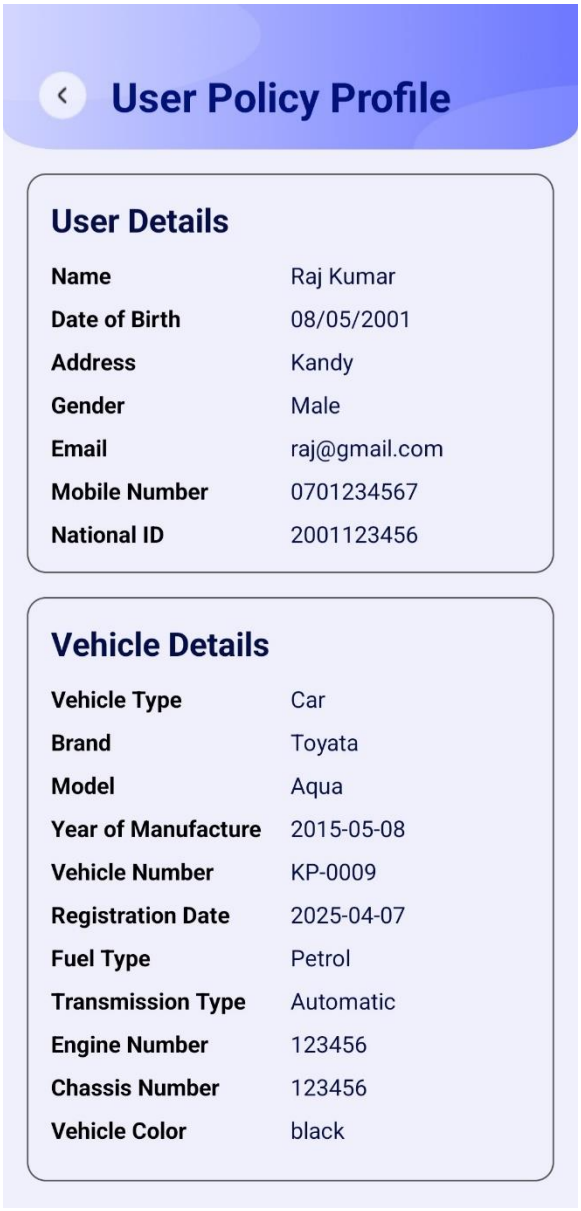
Description: Users can ask FAQ about the Accident Reports and fetches out some details related to it.



Interface Number: 11

Interface Name: Users Details

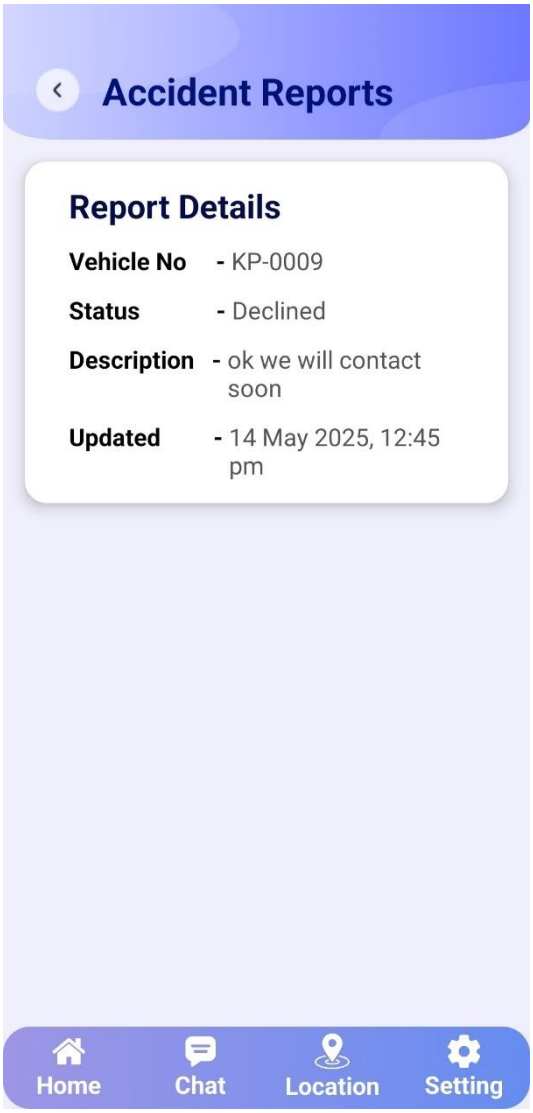
Description: Have a view on user details with Vehicle and Policy Details.



Interface Number: 12

Interface Name: Report Status

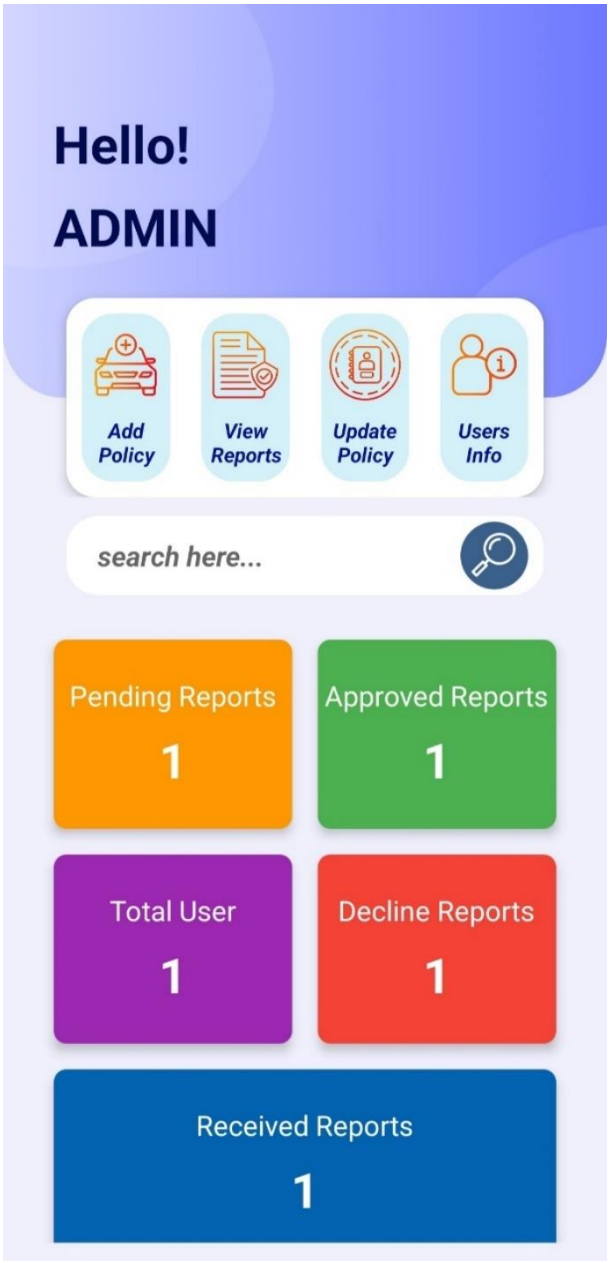
Description: Users can now view the status of the report whether it is approved or declined by the admin.



Interface Number: 13

Interface Name: Admin Dashboard

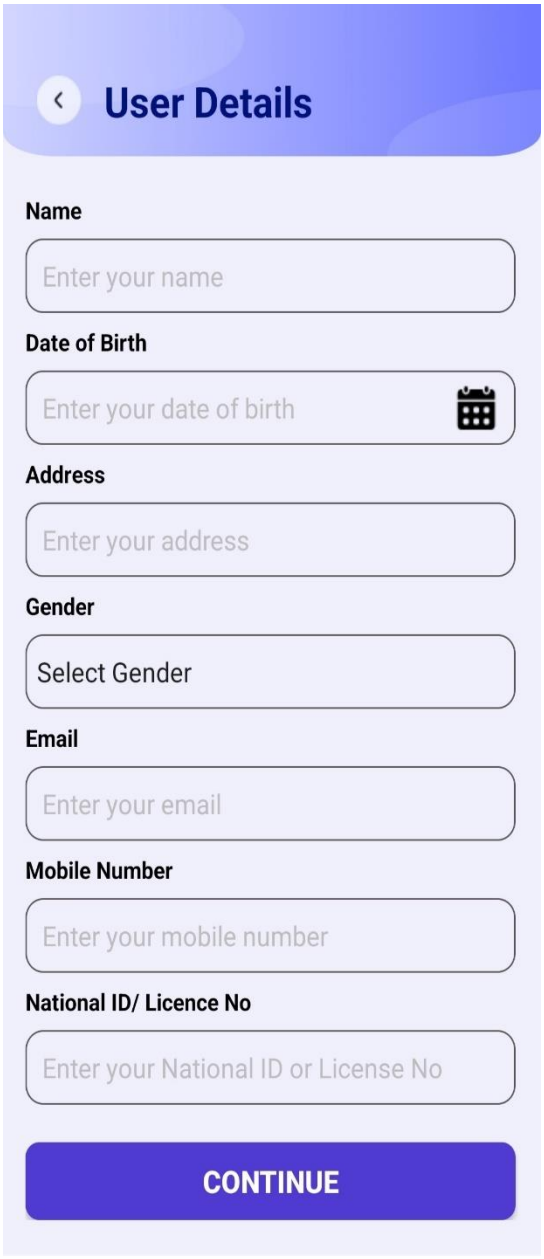
Description: View of the options for the admin to do on the app.

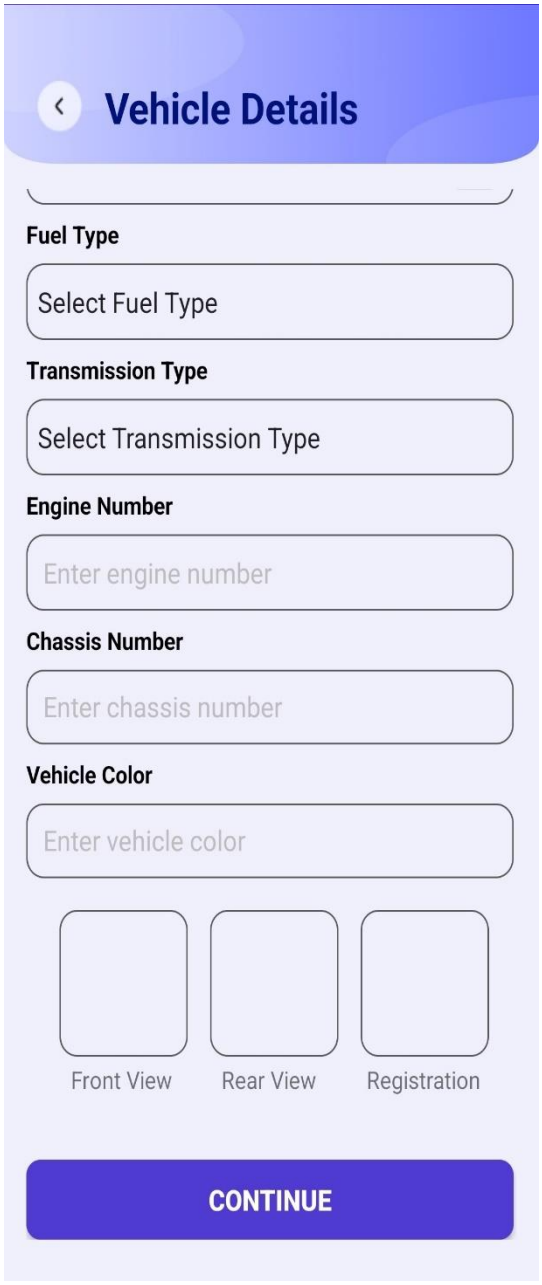


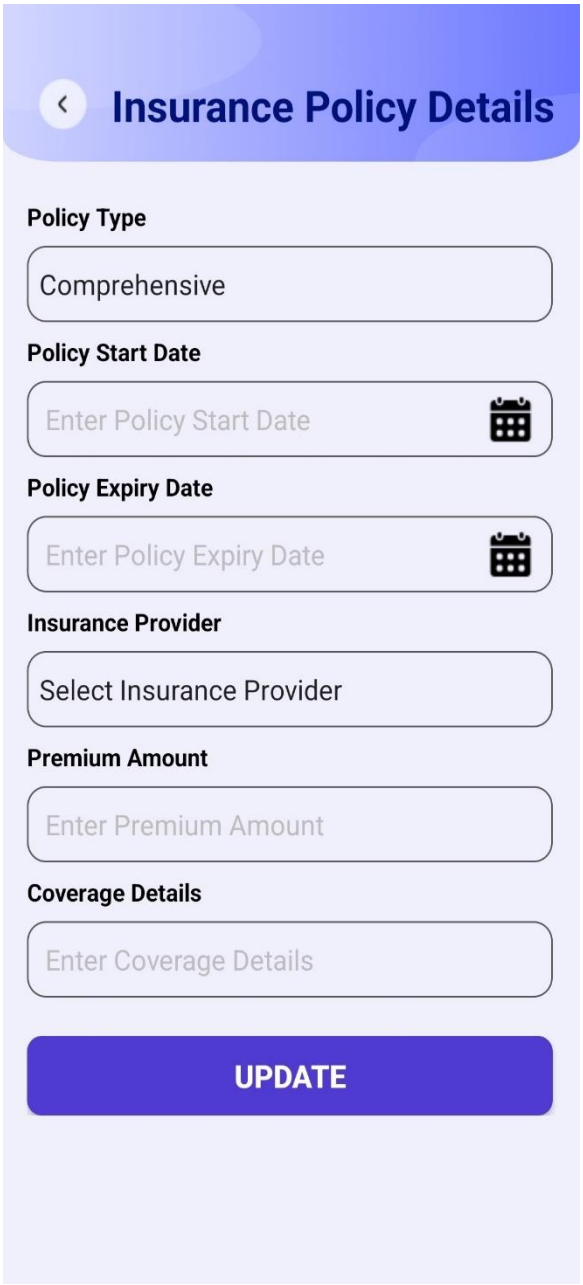
Interface Number: 14

Interface Name: Add Users

Description: Add insurance details of the users with Vehicle and Users Details.



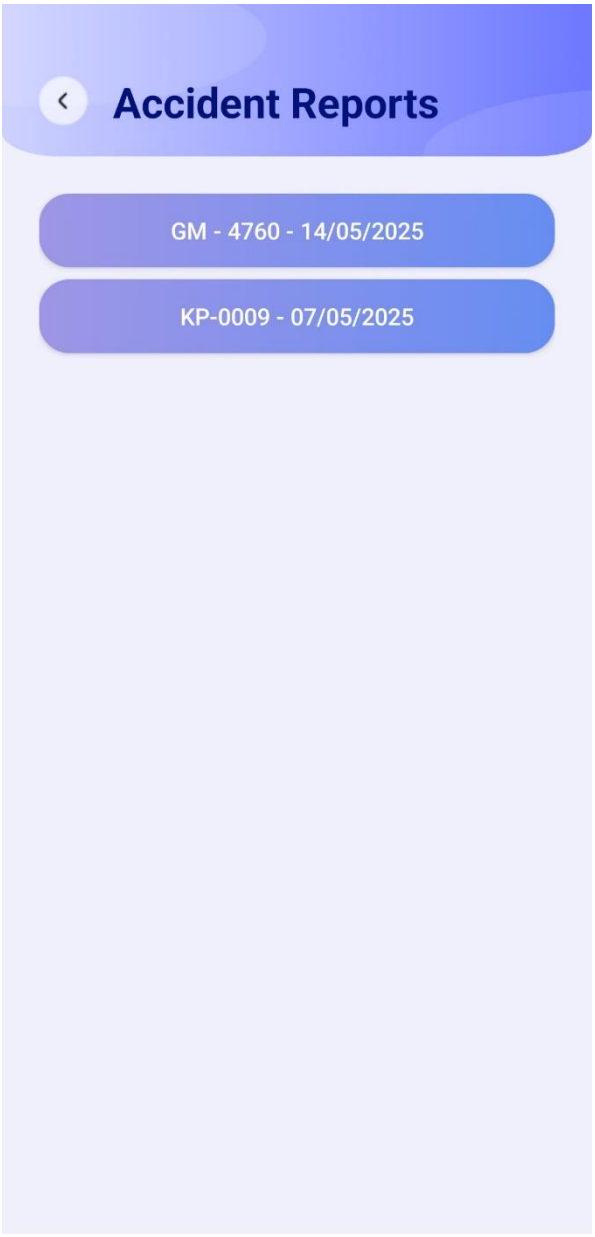

Vehicle Details
Fuel Type
Select Fuel Type
Transmission Type
Select Transmission Type
Engine Number
Enter engine number
Chassis Number
Enter chassis number
Vehicle Color
Enter vehicle color
Front View
Rear View
Registration
CONTINUE

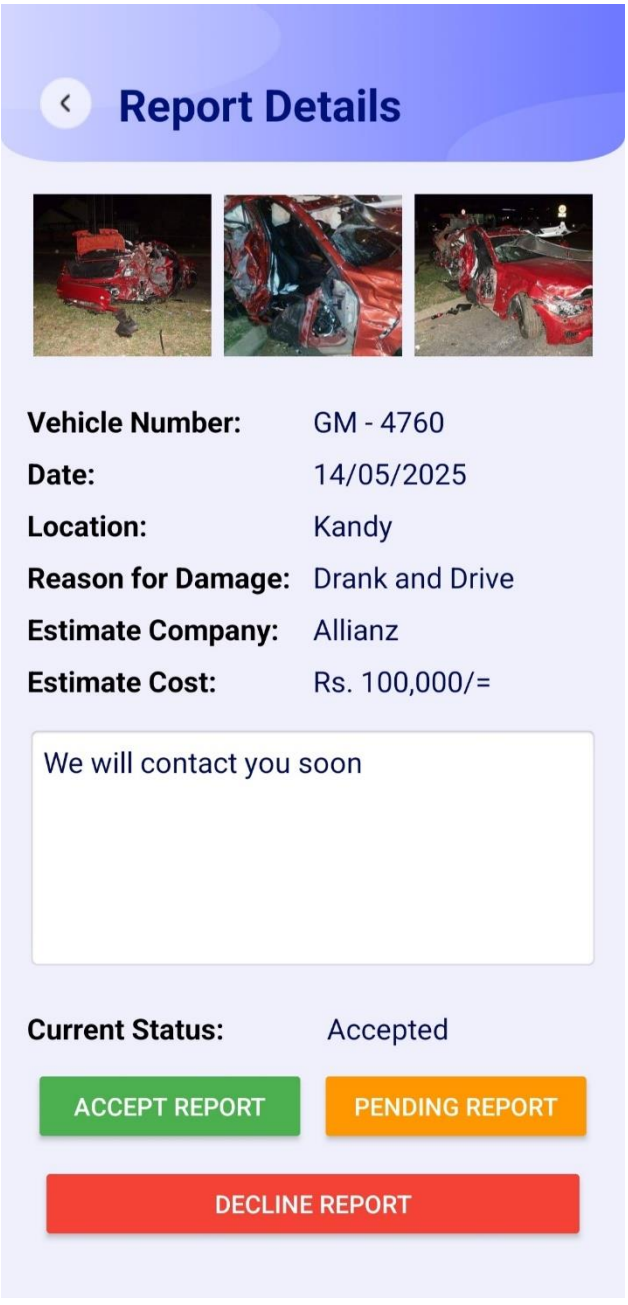

Insurance Policy Details
Policy Type
Comprehensive
Policy Start Date
Enter Policy Start Date
Policy Expiry Date
Enter Policy Expiry Date
Insurance Provider
Select Insurance Provider
Premium Amount
Enter Premium Amount
Coverage Details
Enter Coverage Details
UPDATE

Interface Number: 15

Interface Name: View Reports

Description: Admin will be able to give the approval or decline based on the user has made the report.

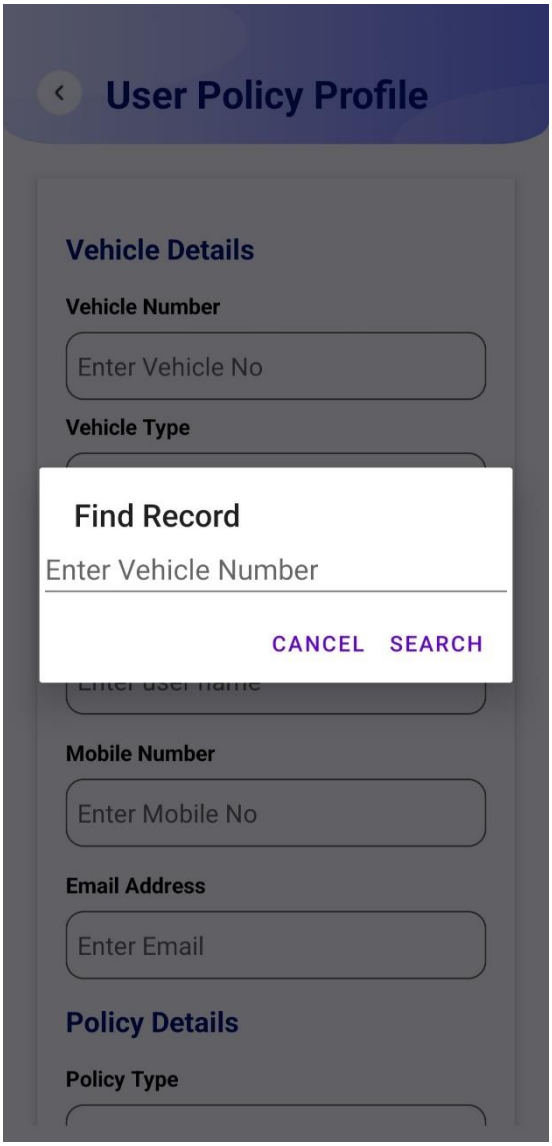


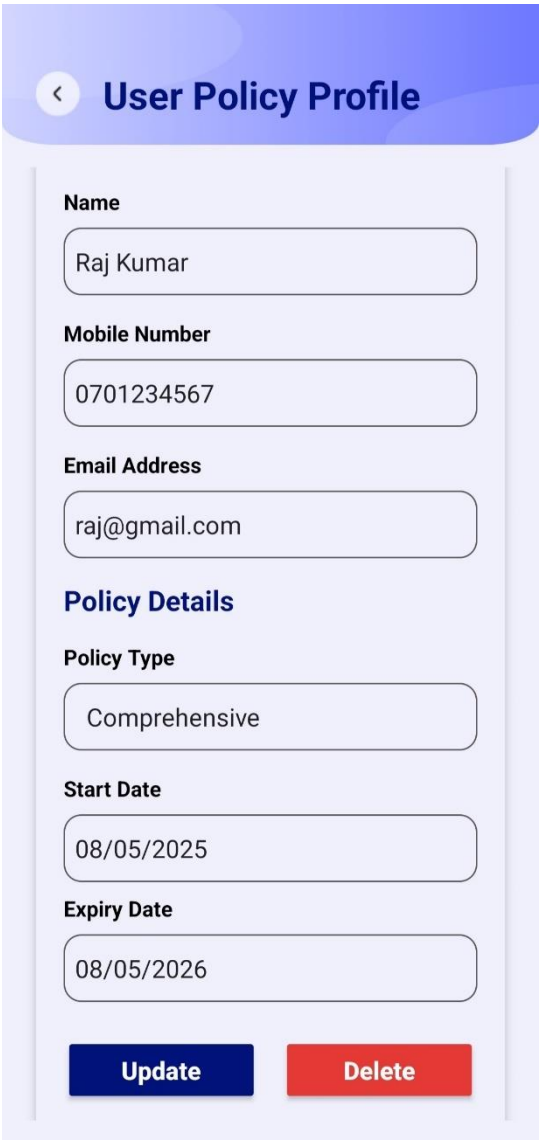

Report Details
Vehicle Number: GM - 4760
Date: 14/05/2025
Location: Kandy
Reason for Damage: Drank and Drive
Estimate Company: Allianz
Estimate Cost: Rs. 100,000/=
We will contact you soon
Current Status: Accepted
ACCEPT REPORT
PENDING REPORT
DECLINE REPORT

Interface Number: 16

Interface Name: Update Policy

Description: Admin can now update policy details if there is an change in user perspective before it asks for the popup message.

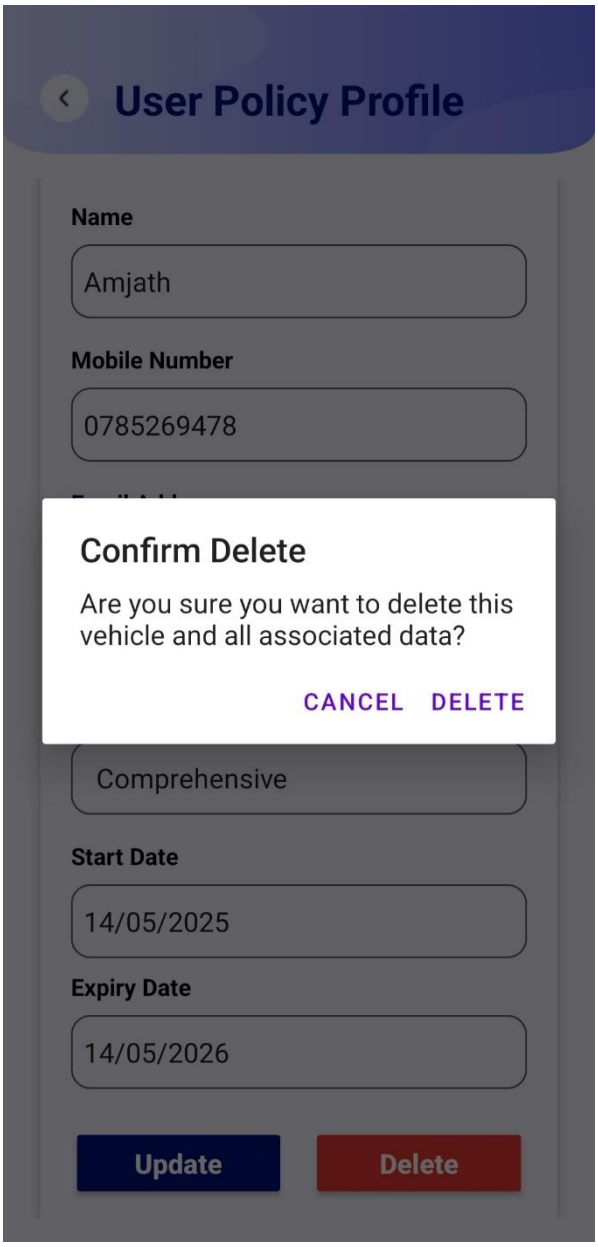




Interface Number: 17

Interface Name: Delete Policy

Description: Admin can now delete policy details if there is an change in user perspective before it asks for popup message.



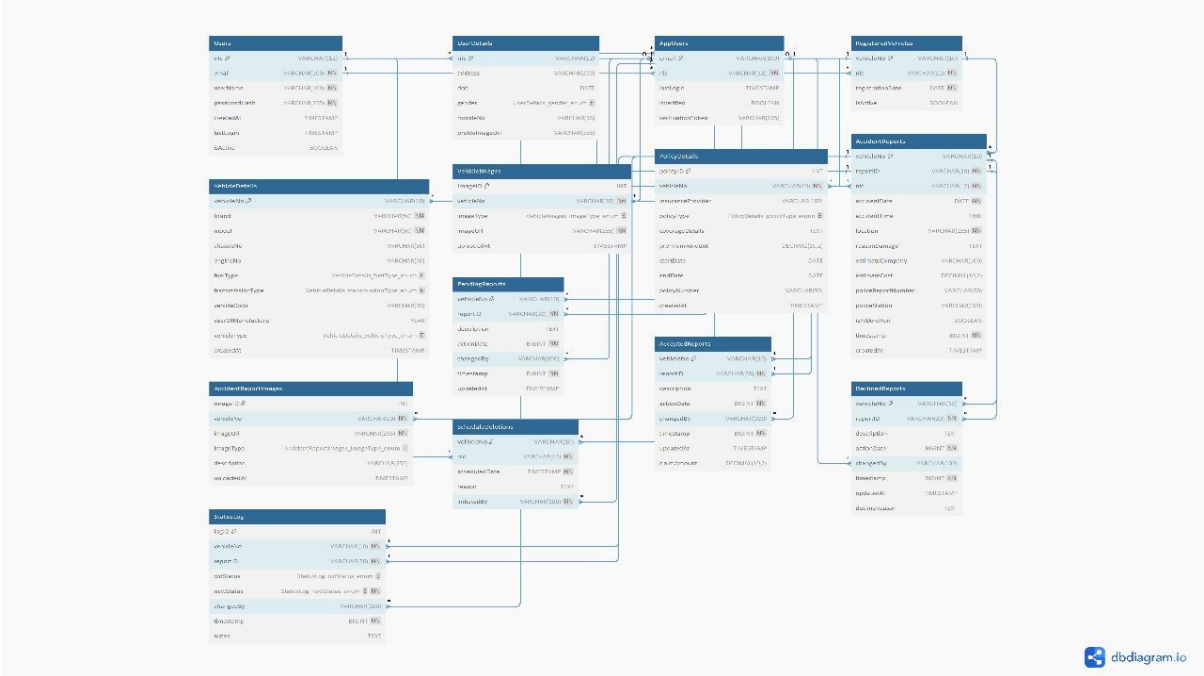
Interface Number: 18

Interface Name: View Users Details

Description: Admin can view Users' details.

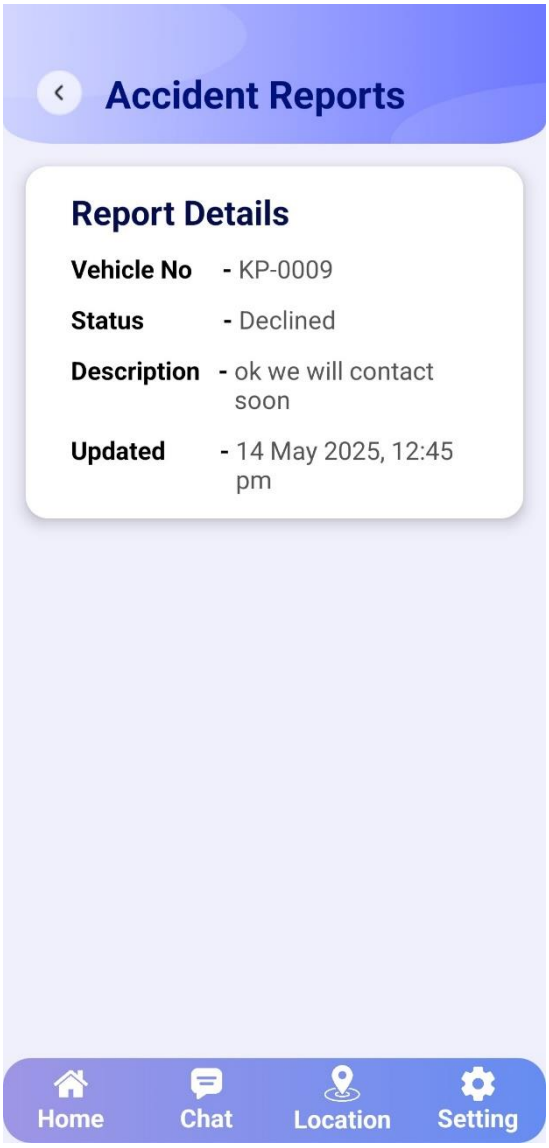
4.3 Database Design

The database structure is designed to support efficient storage and retrieval of data related to users, vehicles, reports, and admin actions. The app uses SQLite for lightweight, local database operations.



4.4 Report Layout Design

The app includes a simple but informative report layout, generated after each damage submission.


Accident Reports
Report Details
Vehicle No - KP-0009
Status - Declined
Description - ok we will contact soon
Updated - 14 May 2025, 12:45 pm
Home
Chat
Location
Setting

4.5 Business Viability

- **Problem-Solving**: Automates and simplify a commonly frustrating manual process.
- **Scalability**: Can be expanded to include more features like garage integration, insurance APIs, and cloud data sync.
- **Revenue Models**:
    - Subscription plans for vehicle owners and garages.
    - Insurance company partnerships.
    - Premium features such as full reports, history logs, or instant estimation tools.
- **Target Market**:

  Regular vehicle owners, fleet managers, and insurance companies

Chapter 4 – Conclusion

The *SafeDrive – Vehicle Damage App* successfully addresses key challenges in vehicle damage reporting and insurance claim processes by offering a streamlined, efficient, and user-friendly mobile solution. By leveraging API integrations, real-time tracking, and secure authentication, our system simplifies the flow of information between users and insurance administrators, enhancing both usability and transparency.

Throughout the development process, we focused on minimizing manual effort, reducing paperwork, and improving communication between customers and insurance providers. With features such as admin-based damage approval, repair cost estimation via API, and a chatbot assistant for user support, SafeDrive presents a faster and more reliable alternative to traditional claim handling methods.

This project allowed us to demonstrate the practical application of skills acquired during our Higher National Diploma in Software Engineering. From mobile app development to backend integration, UI/UX design, and API consumption, our team worked collaboratively to develop a fully functional prototype aligned with real-world needs.

Looking ahead, the app can be further enhanced by integrating with external insurance systems, adding support for image uploads for remote assessments, and improving user engagement features. Scalability and deployment in production environments can also be achieved with cloud support and more secure data handling.

In conclusion, SafeDrive shows how a well-designed, mobile solution can modernize conventional insurance workflows. It stands as a testament to our ability to transform real-world problems into practical digital solutions through teamwork, planning, and technical expertise.

References

- ✓ https://console.cloud.google.com/apis/library?inv=1&invt=AbxXBA
- ✓ https://github.com/SAJIDMIM/SafeDrive---Vehicle-Damage-App