Train Tracker: An Android App to Get Real Time Location of Active Trains

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering.

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APPROVAL

This Project titled "**Train Tracker: An Android App to Get Real Time Location of Active Trains**", submitted by **Rakibul Islam Id No: 172-15-9911** and **Mohan Datta, Id No: 171-15-9489** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 14th September 2022.

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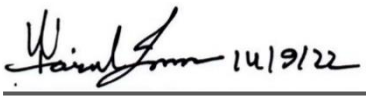

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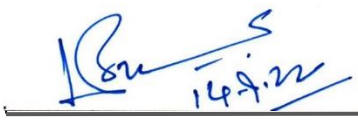

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DECLARATIONS

We hereby declare that, this project has been done by us under the supervision of **Md. Firoz Hasan, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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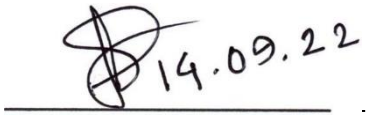

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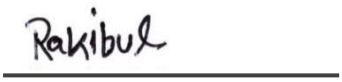

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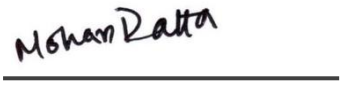

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We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents

ABSTRACT

Time is the most important part of our life. But, in Bangladesh, we waste a large portion of our precious time on the road. Unfortunately, Bangladesh Railways faces many difficulties to work on schedule and so that, passengers struggle to be on the train on time. That is why the proposed system will help general people to get the exact current location of an ongoing train and get details of any schedule. A complete system with 3 major parts like Super Admin, Driver, and User can help every train passenger to get on a train on time. From Super Admin's created schedule to Users getting real-time location, the system helps users to be on schedule and also can track their own relatives on the train. Thus, the train journey can be felt safe and scheduled.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Introduction

This report will express about the highlights and procedure to build up the application that we thought and worked well ordered to reach in the last accomplishment. This declaration especially holds in subtleties for the targets, structure display, scope, essential prerequisites, and by end announcing and watching techniques which are taken.

Bangladesh Railway has managed to minimize the gap between the actual departure time and the scheduled time, as almost all the train this year left Kamalapur Railway Station close to the scheduled time.

While visiting Kamalapur station, it was found that many passengers were waiting at the station for hours as their trains had not come to the platform on time. Especially, some of the trains departing for Southern and Northern parts of the country are creating more woeful situation for the passengers.

So we have come up with this idea of tracking our Trains or buses with our mobile application so anyone from anywhere can know the current location of regarding vehicles.

1.2 Motivation

We have been watching in the western countries they have been developing and also using Vehicle tracking systems almost in every delivery company so customers can see the information’s and updates regarding their awaiting products.

This motivated us to build something for our passengers who are waiting for their desired vehicle or their relatives can know their closed one’s current location and estimate their arrival time.

1.3 Objectives

Our system is going to help people who are waiting for their desired vehicle by letting them know the actual location. This system is combined of three individual apps operated by admins, drivers and general users. Admins will set the schedule for each and every vehicle, drivers will start their system by pressing the start button and allow their locations to be visible for everyone and users are going to see the locations on their interface.

1.4 Expected Outcome

This project will allow people to track any vehicle from anywhere through their smart phones or computers. Thus anyone will be able to reduce time waste. Besides that anyone can track the current location of relative travelling with train. This will reduce mental thinking if any older relative travel with train.

So that, the final outcome of the project is to reduce people hastle on train scheduling and delayes.

1.5 Report Layout

This project contains two chapters so far. In the first chapter named Introduction, we will talk about Introduction, Motivation, Objectives, Expected Outcome, and Report Layout. Also, the final chapter named Conclusion and Future scope of our project. In this chapter, we will talk about Discussion and Conclusion and Scope for Further Development. In this report, we talk about our application and its various problem, solution, and use of the project.

CHAPTER 2

BACKGROUND

2.1 Introduction

People who travel train in Bangladesh faces huge problems on scheduling. They have wait a lot or misses train a lot because of irregularity of trains in Bangladesh. Some other countries have implemented various types of solution to make people up to date. We have planned to design a solution related to our country. As our driver of train is less active in tech our system is more user friendly and easy for users to use.

2.2 Related Works

Around the some related services are available. We believe that, the available services are serving users properly and so that this type of solutions can be effective in our country also. Some of those services are given below.

GPS tracker and milage log: Locate, manage and measure our vchicles with a tracking platform. It is a drivers app. One off it is user stated this as an absolute cracker of an app properly works when people are in a car are moving. Shows user the most accurate map trace. But the pro version is a bit expensive if useris not at business with a fleet of vechicles to manage [1].

Travel tracker pro: This app records tracker with taking pictures .It uses open street map or google to track the location it also records duration and distance that has been covered [2].

Vehicle trip logbook tracker: A GPS mileage tracker for personal business purposes.This app keeps a logbook containing all the trips that is managed and sehduled accordingly.It also displays the current rule and location on the map [3].

2.3 Comparative Studies

According to previous points there are some similer system available. But, basic working principal is totally different and structurally, the systems have deference.

Some of those are build for specific porpose like business development or driver aid. On the other hand our system is designed to be used for mass people. We are planning to make the system available for any people who wants to track Bangladeshi trains. Even location tracking system is also defferent in cases. Some system uses self build location trackers where we are using worlds mostly used map Google map. Google Map is the most accurate and widely used map all around the world. That is why, we believed in Google map to track and share live location of train.

2.4 Challenges

A big challenge to implement the project is getting government funding and government permission. As we know Bangladesh Railway is a governmet company so that, we have to deal with government to implement the project. Except that, Drivers also need some training to use it. Though it is very easy to where driver only need 2 taps to start and one tap to end a schedule.

We wish as the project's main goal is to reduce human hastle, Government will be easily aggreed to implement it on action. And train their drivers

CHAPTER 3

METHODOLOGY

3.1 Business Process Modeling

The system is designed fullfill the perpose of sharing live train location to the end users. So that, users will be able to be updated with every schedule of train. The designed system must have have some pre data to continue it's tasks. That is why the complete flow of the BPM (Business Process Model) of this projects starts with some data generation. The pre-data will be set up by admin and the user will enjoy the data. Thus the system is designed.

To complete the full system we have 3 different Apps. The apps are,

- Admin App: Maintain Train Data, Driver Data, Schedule Data and Blog
- Driver App: Maintain the starting and Ending of a train and spread out the location information.
- User App: End users will enjoy the Lates information with this app.

The process will be started by Registering all Trains and Drivers. According to train and drivers admin will create as many Schedules as want. This schedules will be Driver and Train Specific. So that only specific Driver will be able to Start or end a schedule. One the other hand, before starting Admin will have full access to edit any information. These are the main part of an Admin where Add new blog or news for users is another available task for admin.

After creating the schedule, The part of driver will start. Driver will login with their admin provided account and will be able to see the specific Schedules only appointed to him/her. Then he will start any schedule when starting the train. Then the system automatically will start sharing the live location of the train. This is how main part of location sharing will start.

Here the part of users will start. In the users app users will be able to see all of the schedules. Where they can filter with location name, start time, end time, train name,

etc. After choosing the desired schedule just a tap user will see the full path of the train. Accept that he will get the info of current location of selected schedule and distance of the train from his current location also. Thus the user will get information what they needed to stop time wasting.

After completing the journey, driver will just stop the schedule and schedule will be conducted as a completed schedule. This is how the whole process will go on.

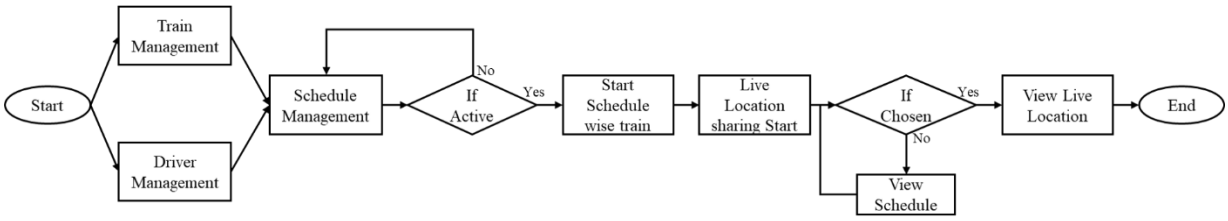

Figure 3.1: Business Process Model

3.2 Requirement Analysis and Collection

3.2.1 Software Requirements:

- Android Studio IDE: Android Studio is the official Android IDE. It provides specialized tools for Android developers, including rich tools for code editing, debugging, testing, and profile creation.
- Android Virtual Device: Android Virtual Device (AVD) is a device configuration that runs on an Android emulator. It provides a custom Android environment where we can install and test our Android apps for virtual devices.
- Database (Firebase): Firebase provides a reliable and battery-efficient connection between a cloud messaging (FCM) server and your device, allowing you to send and receive free messages and notifications on iOS, Android, and the Internet. You can send notification messages (2 KB limit) and data messages (4 KB limit).
- Adobe XD: Adobe XD is an Adobe prototyping tool for user experience and designer interaction. Use Adobe XD features to create wired frames.

3.2.2 Hardware Requirements:

- Windows Operating System.
- A device that supports Android.
- Computer configuration:
    - 8 GB RAM
    - 520 GB HDD
    - 2.1 GHz Processor.

3.3 Use Case Modeling and Description

A Use Case model is a graphical representation of the relationships between the components of a system. Use cases are methods used in systems analysis to identify, describe, and manage system requirements. User interaction is an example of how different types of users interact with problem-solving systems. For example, select Users, Users, Applications, and Systems to achieve this goal [4]. Figure 3.2 shows the application usage pattern.

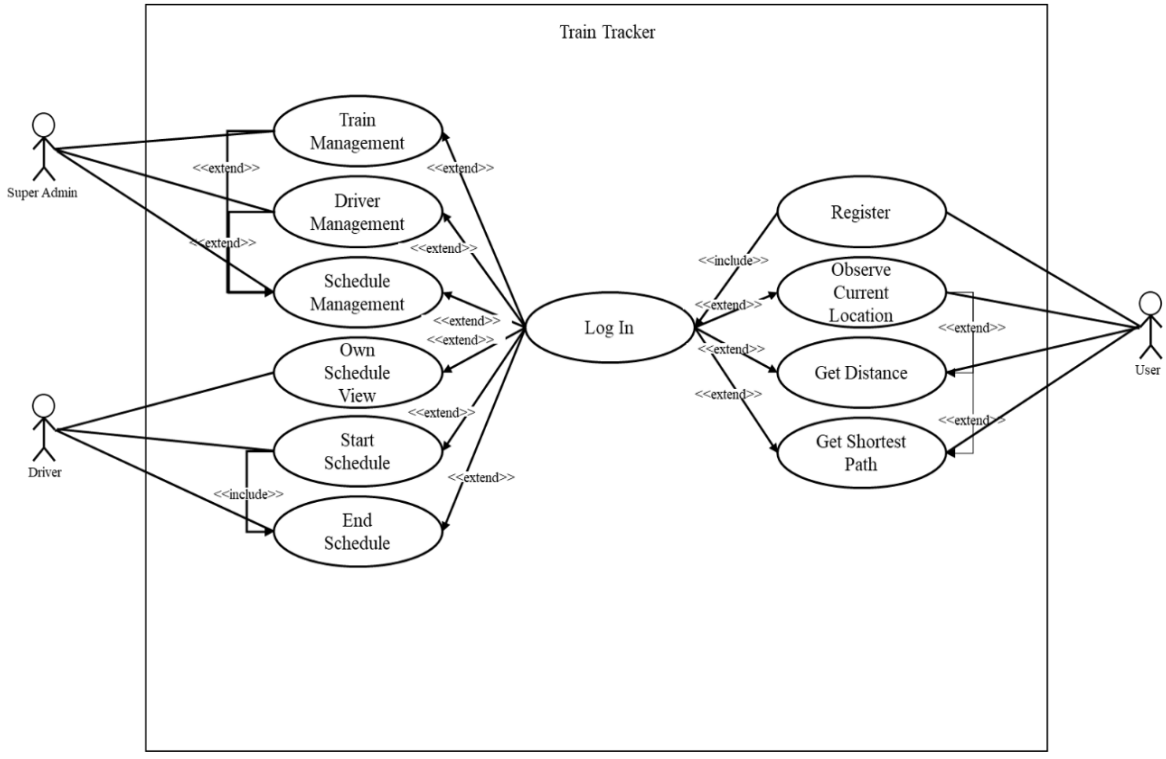

Figure 3.2: Use case Diagram

Table: 3.1

Use case details:

Use case of Driver Management:

Use case name	**Driver Management**
Use case details	Admin will create as many driver as wants. So that schedules can be controlled by specific driver.
Pre-condition	**Log In**
Actor	"Admin"
Post-condition	**Schedule Managment**

Table: 3.2

Use case of Search for Start Schedule:

Use case name	**Start Schedule**
Use case details	Driver will start a schedule and start sharing location.
Pre-condition	**Log In**
Actor	"Driver"
Post-condition	**End Schedule**

Table: 3.3

Use case of Observe Current Location

Use case name	**Observe Current Location**
Use case details	Users will be able to observe current location of any active schedule if they wants
Pre-condition	**Log In**
Actor	"User"
Post-condition	**Get Distance, Get Shortest Path**

3.4 Waterfall Model

This process is designed as a waterfall model where requests are collected and executed sequentially. However, the original SDLC model was widely used in software development to ensure project success. The "waterfall" approach divides the entire software development process into steps. In this interesting model, the layers move from one layer to another.

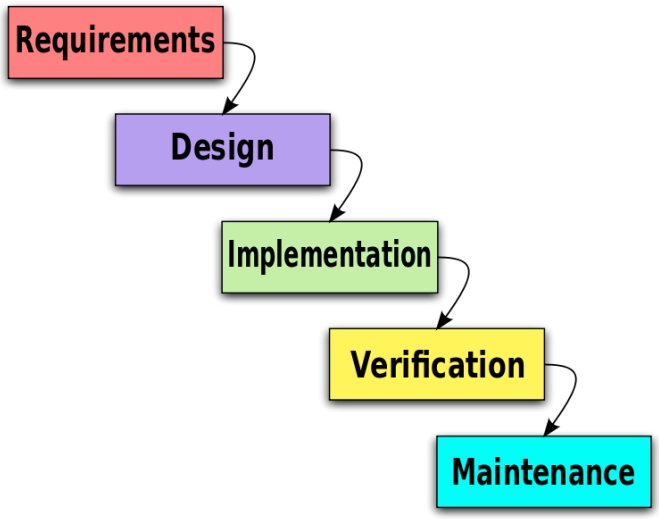

Figure 3.3: Waterfall Model Diagram

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

An Android app has two parts: The frontend part and The backend part. The frontend part is created using XML and the backend part is developed using Java. The frontend is mainly the visible part of the developed mobile app that the user interacts with it and is written in using XML [5]. The system is devided into 3 different apps. Those are.

a. Admin App
b. Driver App
c. User App

4.1.1 Admin App: Splash Screen

The very first activity that will be shown for super admin is a splash screen and that will change just with a click. From the splash screen it will start giving a vibe of train related system.

Figure 4.1: Admin App: Splash Screen

4.1.2 Admin App: Log In

As the super admin has the maximum power of managing the whole system, they must to be authenticate properly. Log in Activity will allow only super admin to log in except that no other person will be able to pass this step.

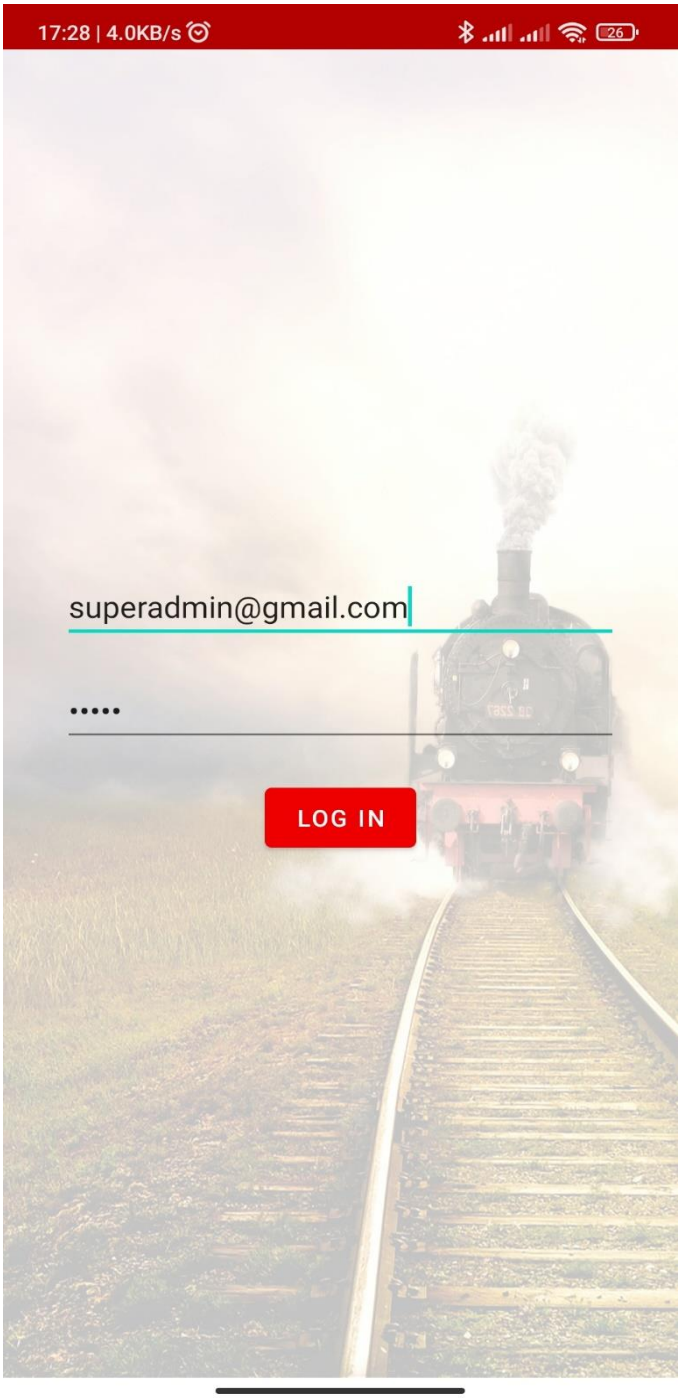

Figure 4.2: Admin App: Log In

4.1.3 Admin App: Home Page

Admin Home page is designed to manage all possible parts. All the necessary modules are shortcuted on admin homepage. Train Management, Driver Management, Schedule Management, News Management are the modules added in user home page.

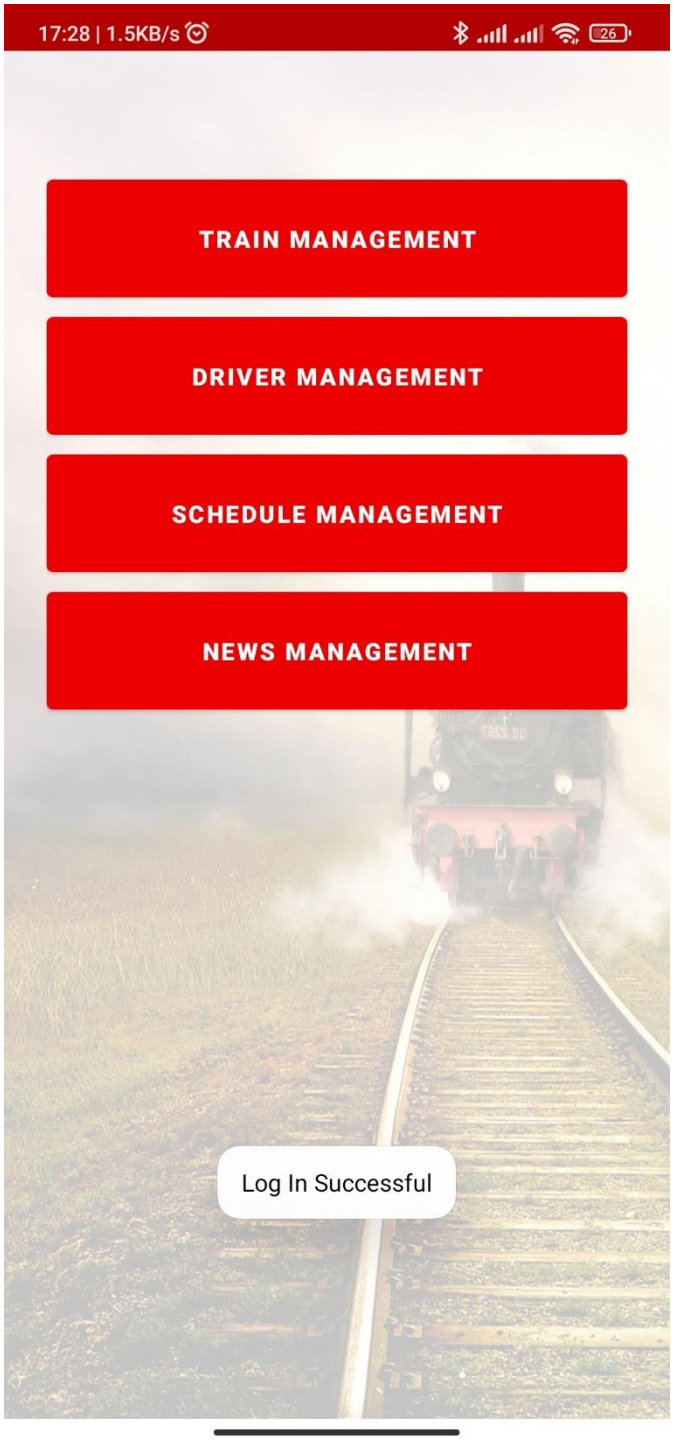

Figure 4.3: Admin App: Home Page

4.1.4 Admin App: Train Management

Train management activity will allow to manage every possible actions of a train. Here, admins will be allowed to Add new train, edit trainor delete if necessary.

Figure 4.4: Admin App: Train Management

4.1.5 Admin App: Driver Management

Driver management activity will help the admin take all types of actions for driver. If new driver joins admin can add or edit whenever wants. Besides admin has full access to delete any driver if the driver leave the job.

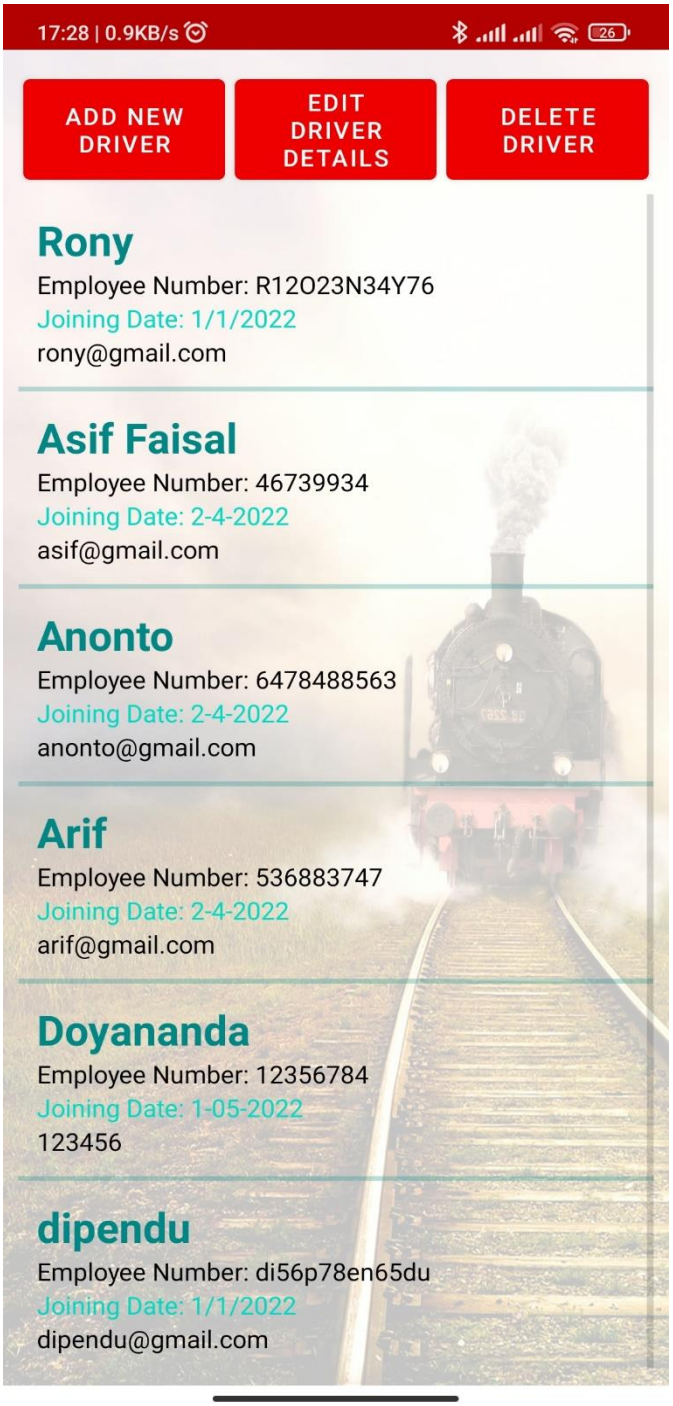

Figure 4.5: Admin App: Driver Management

4.1.6 Admin App: Schedule Management

Schedule management is the most important activity used by admin. Here admin will add, edit or delete any schedule. The admin will be able to inactive any unnecessary schedule. In this activity admin will be able to monitor all the schedules also, where all the schedules are divided into three parts. Those are, Active Schedules, Ongoing Schedules and Inactive Schedules.

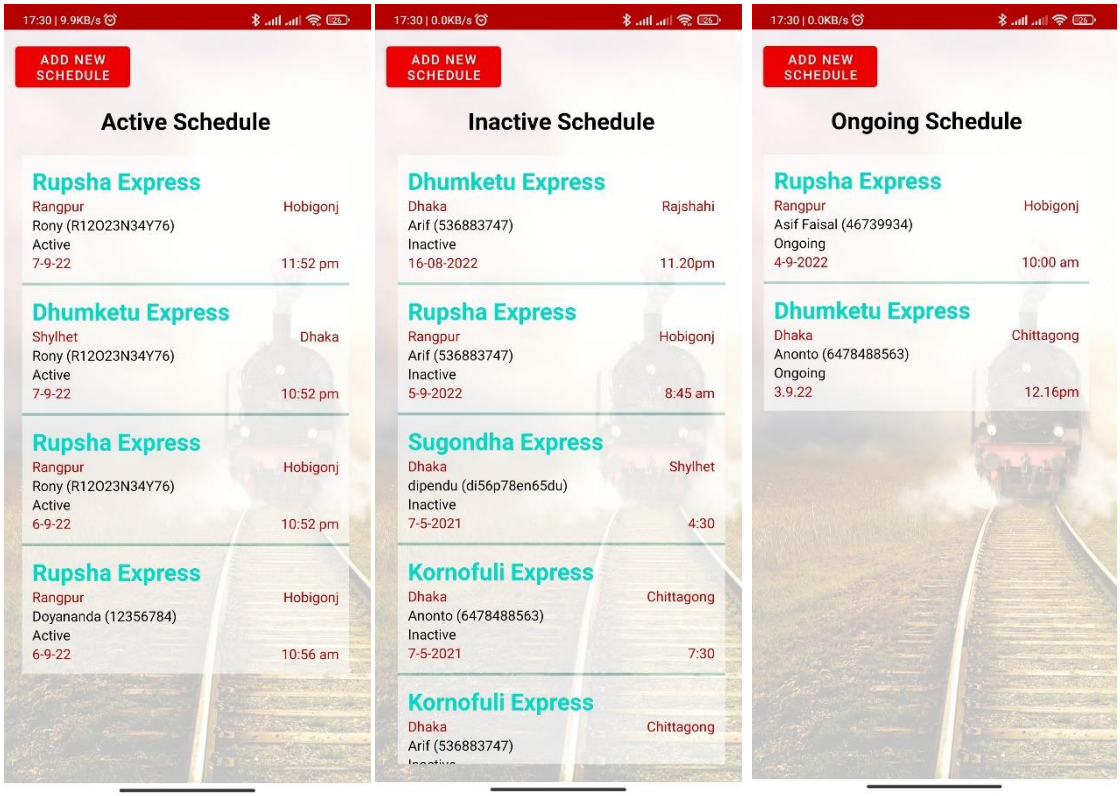

Figure 4.6: Admin App: Schedule Management

4.1.7 Admin App: News Management

This modules adds an extra feature to the system. If the admin wants to put some news to share with the end users. Admin can easily add, Edit or delete any news. The news will be presented to the user directly.

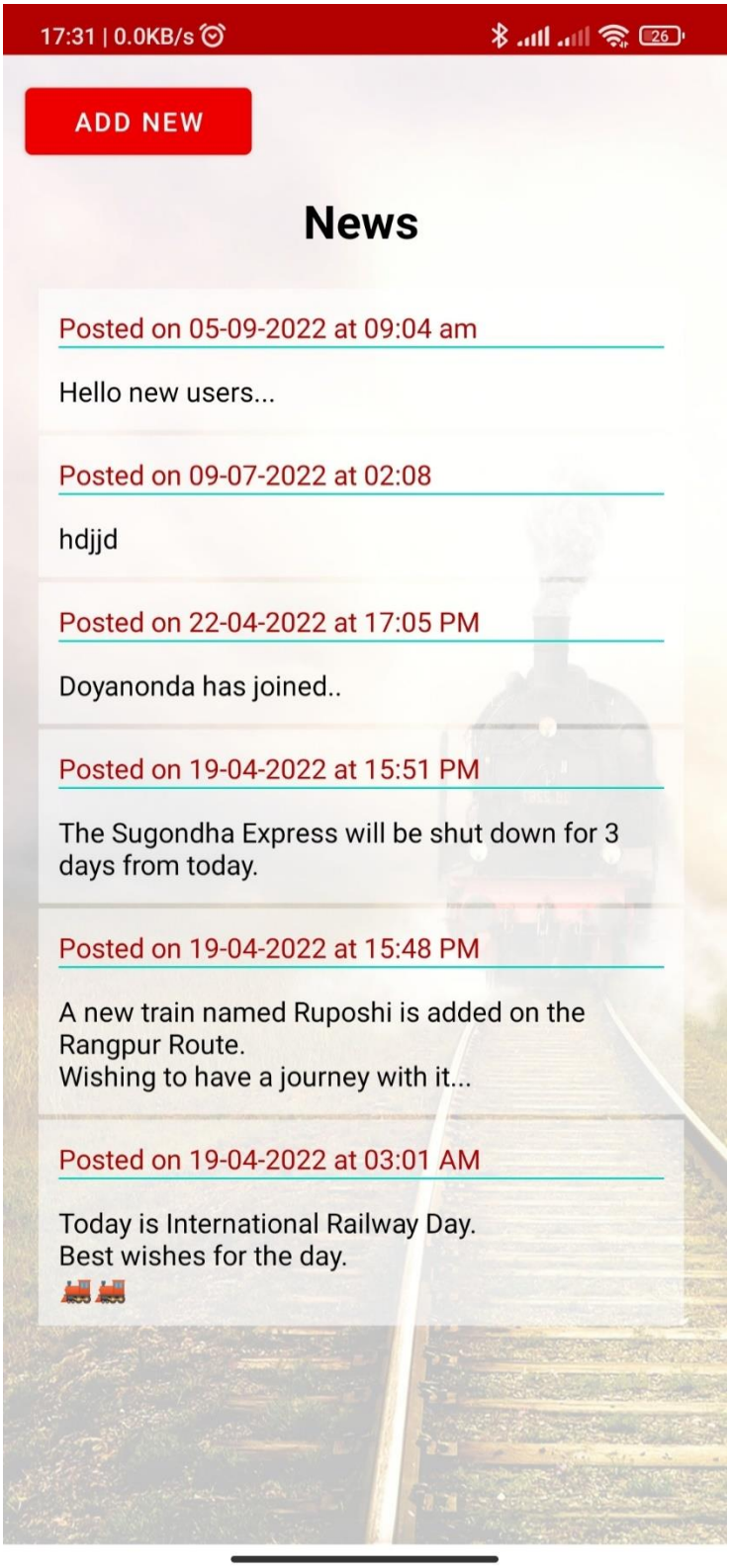

Figure 4.7: Admin App: News Management

4.1.8 Driver App: Splash Screen

Driver app splash screen also gives a great vibe of a train management related system. Here also just a touch will allow driver to go to log in part.

Figure 4.8: Driver App: Splash Screen

4.1.9 Driver App: Log In

Driver need to log in to ensure that the system is on right hand or not. The driver app will mainly share the live location data. So that it is mandatory to confirm the authentication of a driver and it will authenticate as the super admin created the driver.

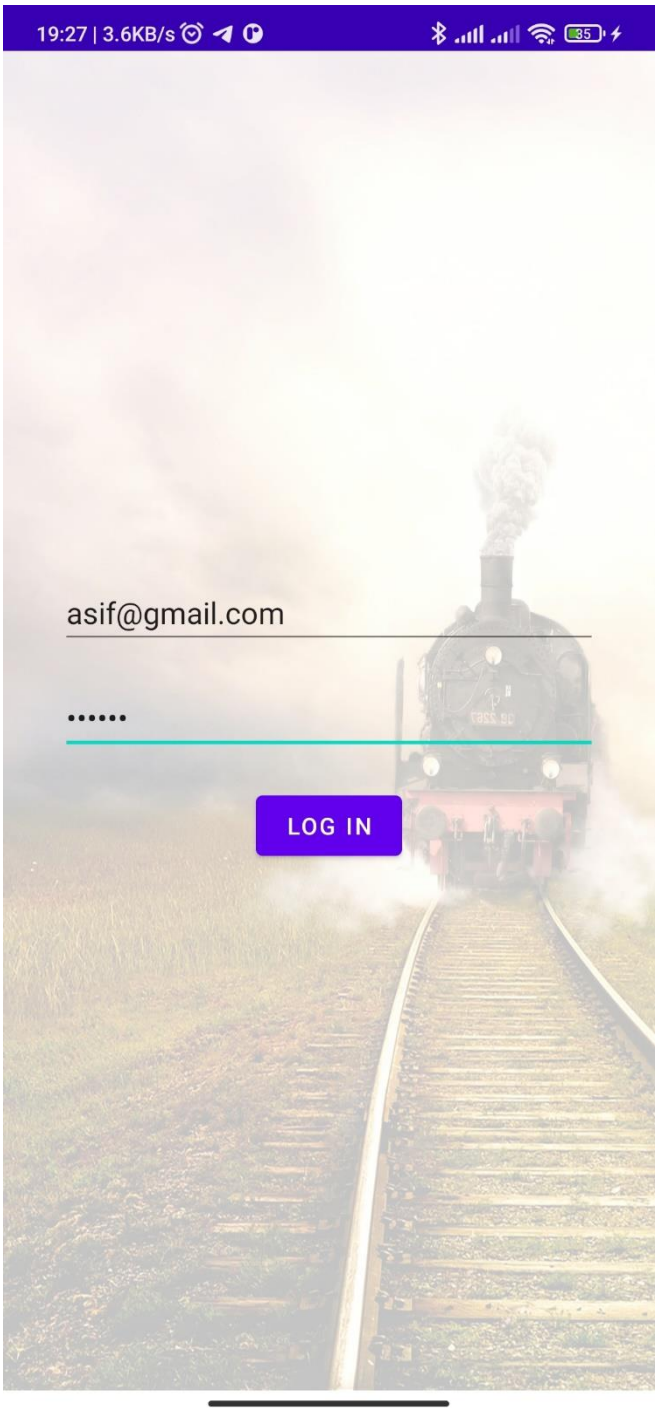

Figure 4.9: Driver App: Log In

4.1.10 Driver App: Home Page

Driver home page is simple but organized. Here driver will only see the assigned schedules of himself. No driver will be able to see another drivers' schedule data. Also the schedules are organized as per the schedule status.

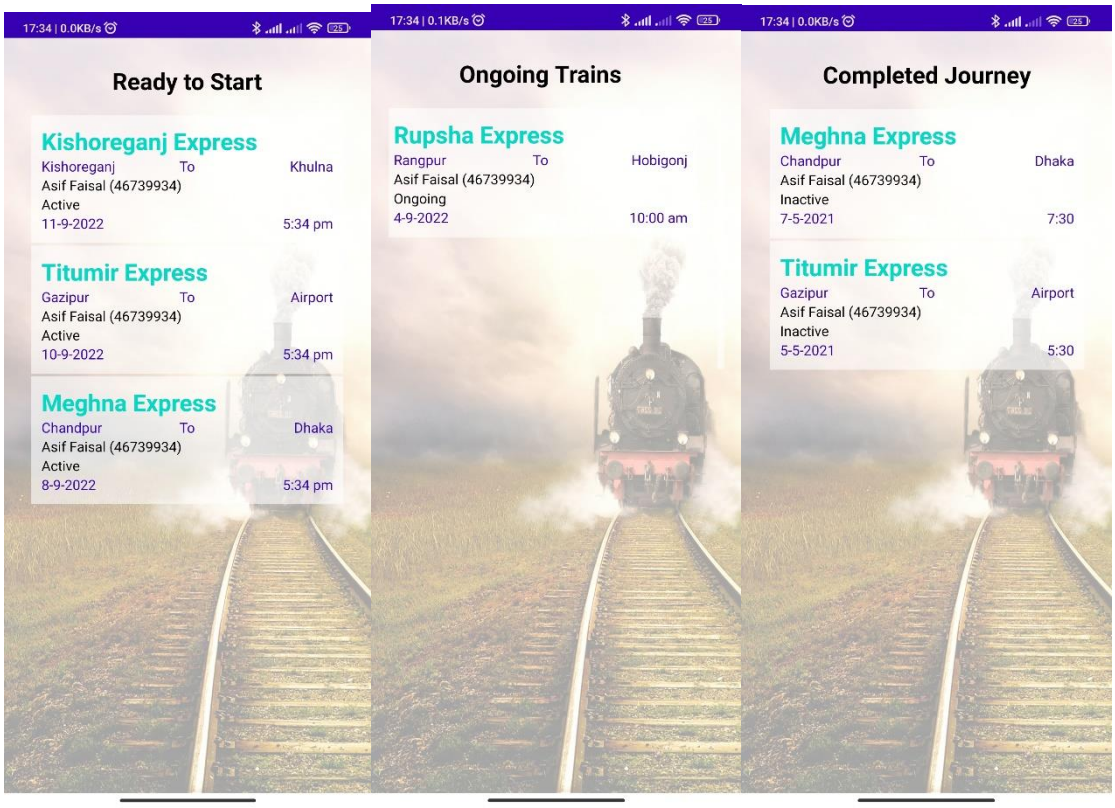

Figure 4.10: Driver App: Home Page

4.1.11 Driver App: Start Schedule

Most import task of a driver is strating a schedule. But, it has been developed as easy as possible for a driver. The driver will just select a schedule. Then the system authomatically will ask for confirmation. Then, if confirmed, the schedule will be stared and ready to share live location.

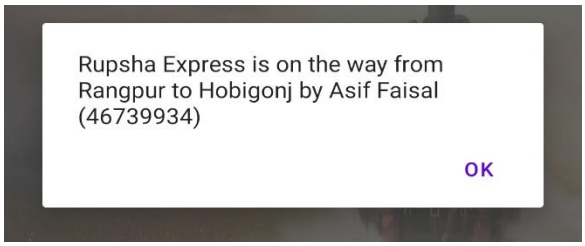

Figure 4.11: Driver App: Start Schedule

4.1.12 Driver App: Map View

Driver map view will show the driver that the train location is sharing perfectly. In this activity driver will exactly see which location is presenting to the users. And this activity is the most important activity because this activity will send the location information to the database.

Figure 4.12: Driver App: Map View

4.1.13 Driver App: End Schedule

Whenever the journey will be finished. Driver will just press a button and after a confirmation the schedule will be stopped. Thus a life cycle of a schedule will be finished.

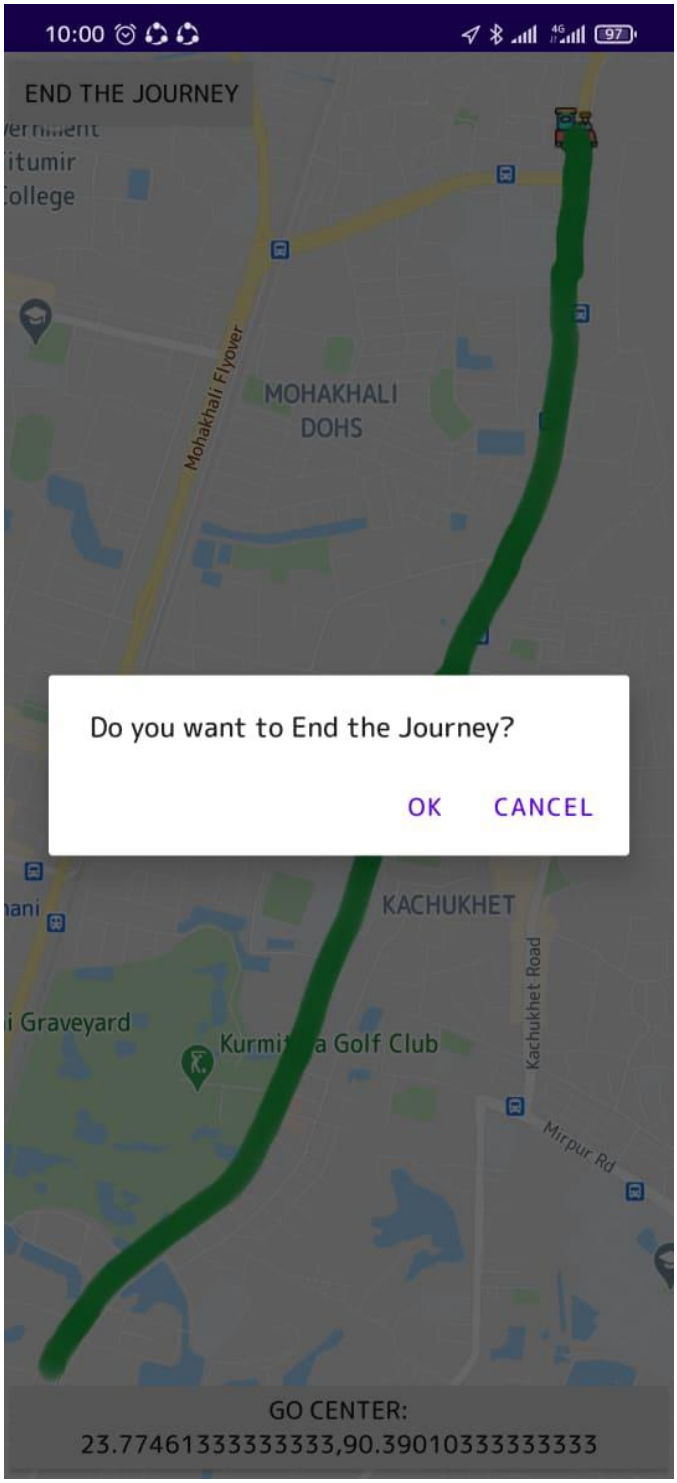

Figure 4.13: Driver App: End Schedule

4.1.14 User App: Splash Screen

Users app has a beautiful animated splash screen where a nice train comes and stops in front of a train station. Then automatically the login facility starts. In this activity user will log in.

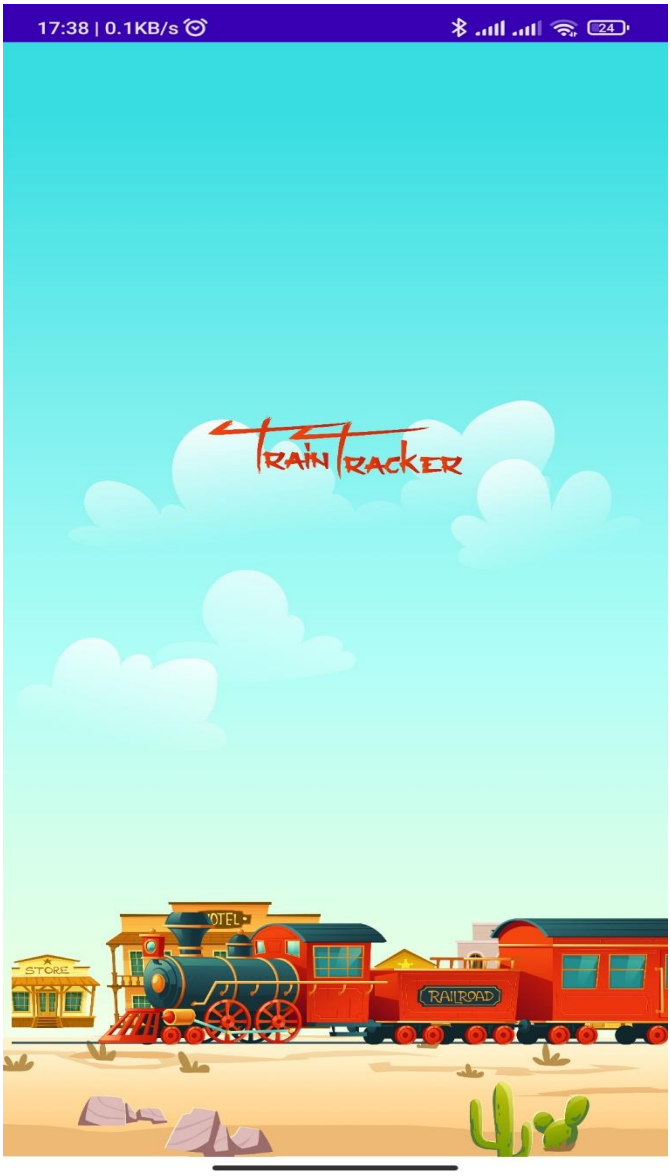

Figure 4.14: User App: Splash Screen

4.1.15 User App: Register User

User must to register himself to get the service. In this activity user will provide simple necessary data so that system can know the actual user list of the system.

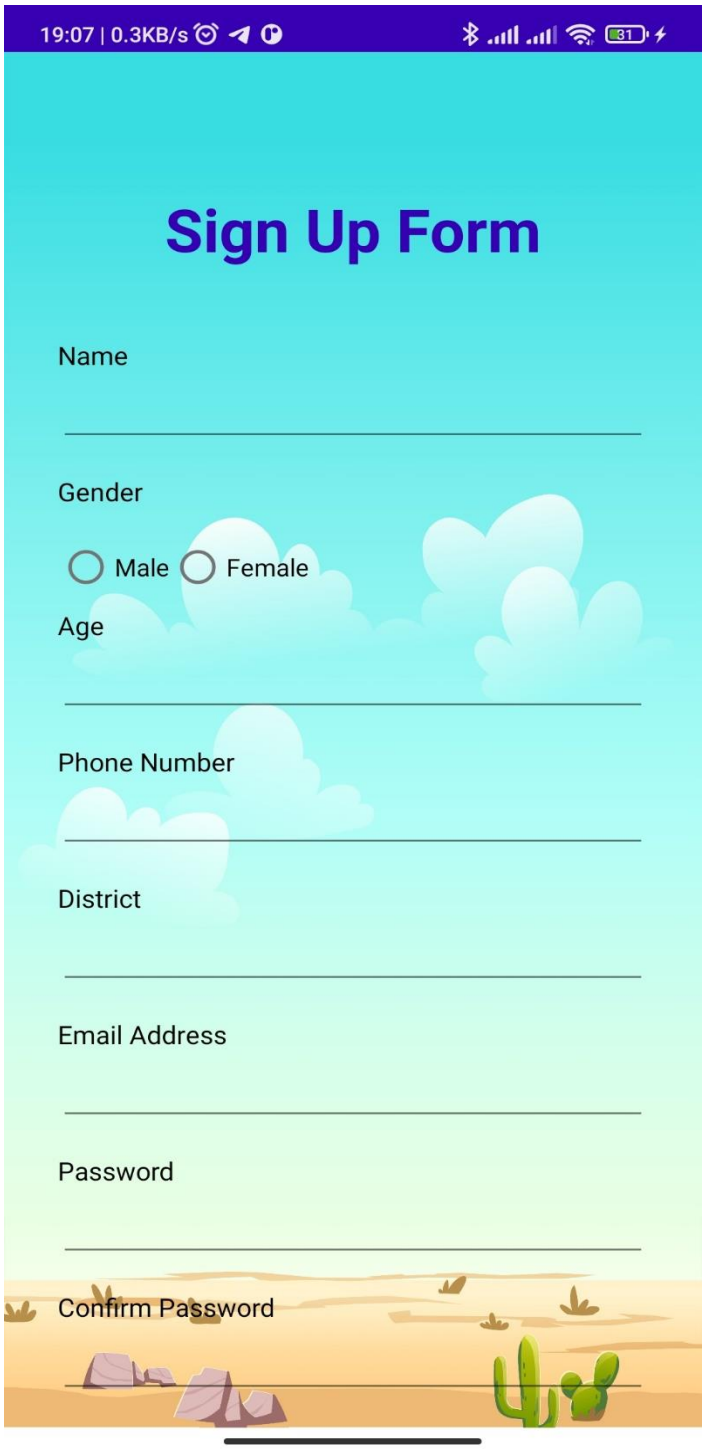

Figure 4.15: User App: Register User

4.1.16 User App: Home Page

User home is also simple but organized where all the active schedules are shown. Also the schedules are organized as per status. Those are, Ready to go, Ongoing, Completed. So that user will be able to get their desired schedule.

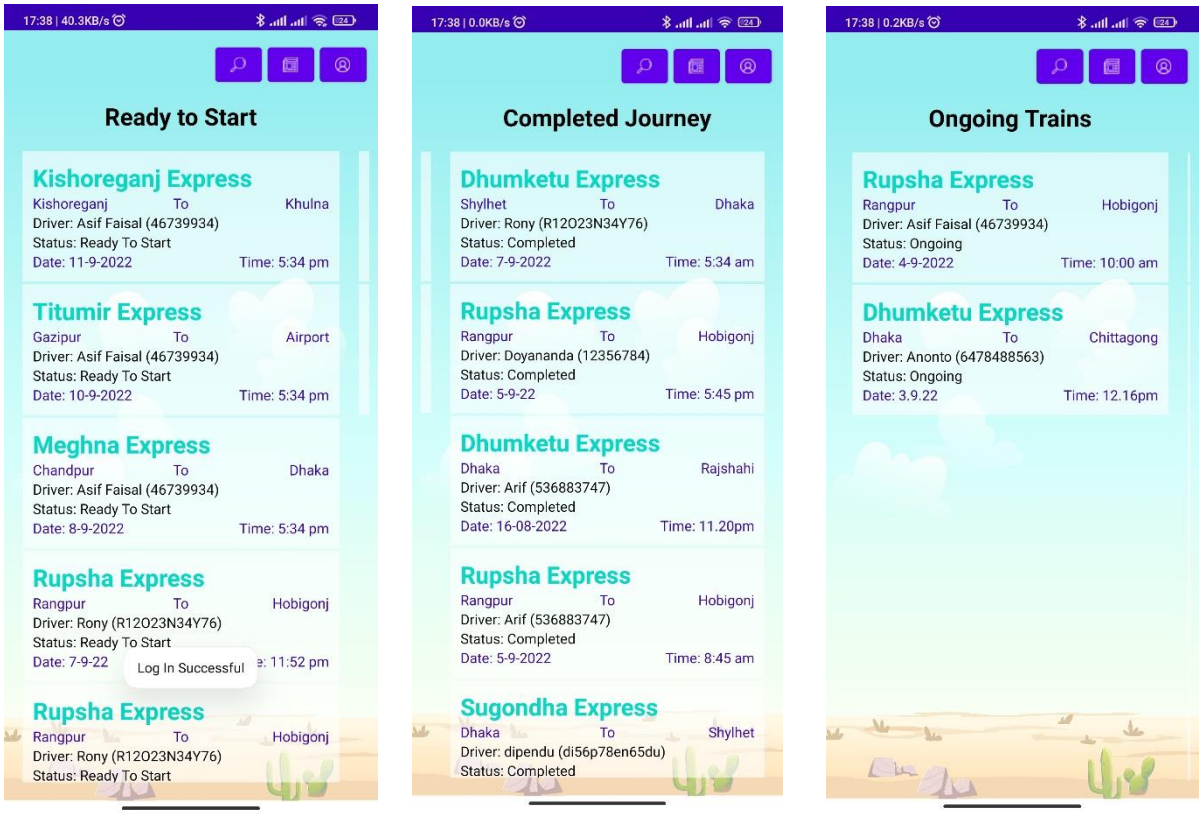

Figure 4.16: User App: Home Page

4.1.17 User App: Search Schedule

Users are specially allowed to search from schedules. The search feature is so smart that it can find from sub string and from a single activity view user will be able to search according to train name, driver name, date and location name.

Figure 4.17: User App: Search Schedule

4.1.18 User App: View Ongoing Schedules

This is most important activity for a user, where the live location of a selected schedule will be shown.User will be able to see the movement of the train and also can get the distance of himself from the train.

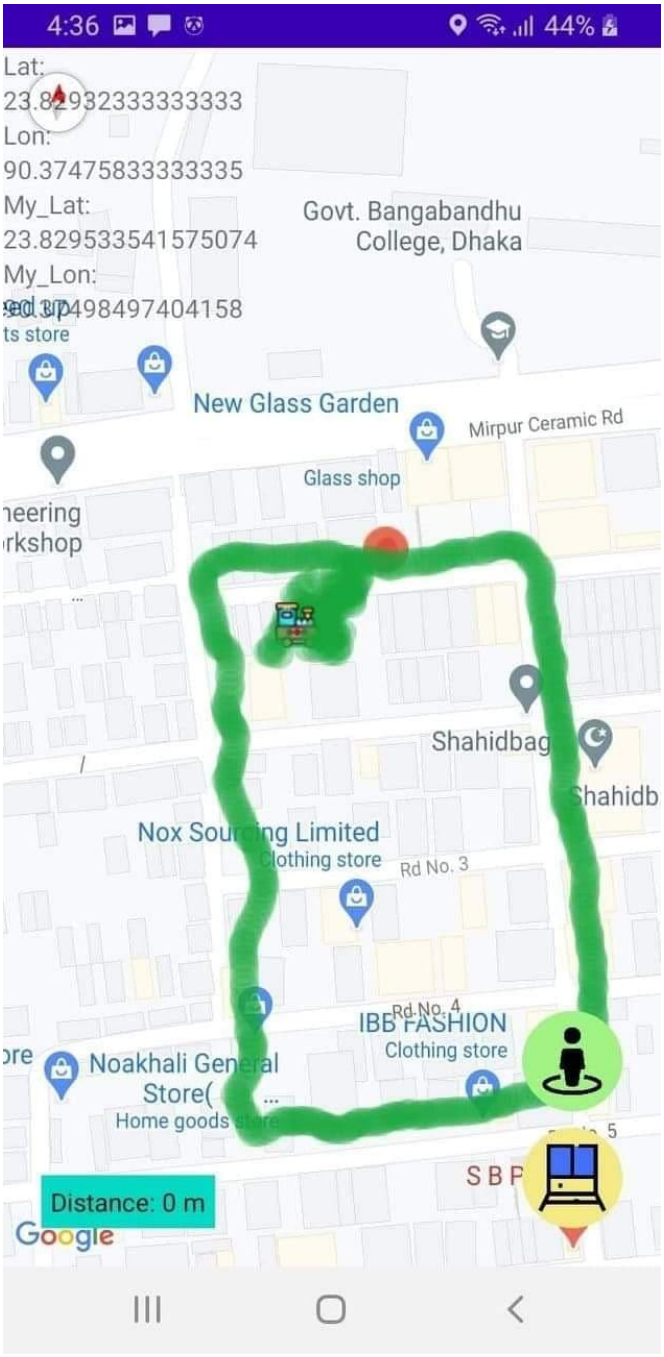

Figure 4.18: User App: View Ongoing Schdule

4.1.19 User App: View News

The news shared the super admin himself will be presented in this activity. Here, Users will see the lates news first and all the news also together.

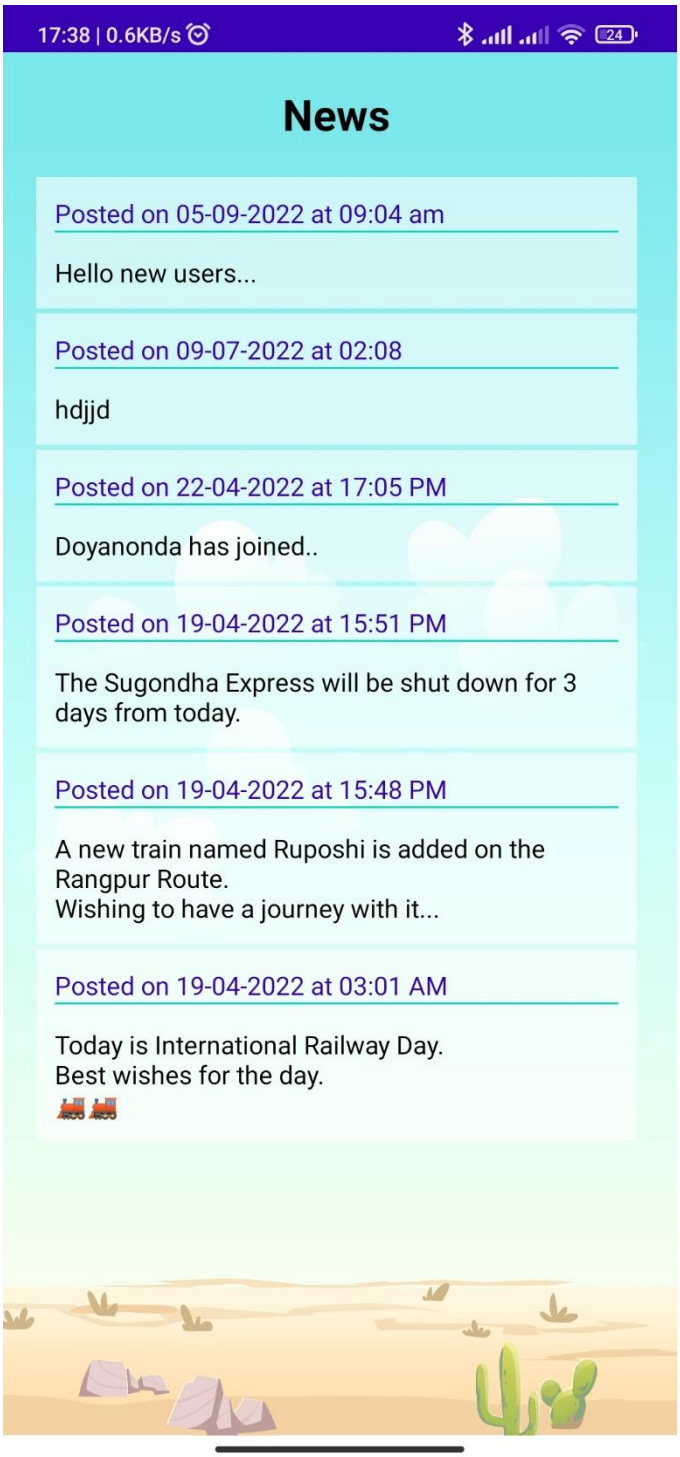

Figure 4.19: User App: View News

4.1.20 User App: User Profile

User profile is a regular activity where user user will be able to see his/her data saved in the system. Here the profile picture is gender dependant. As per the gender the profile picture will be changed.

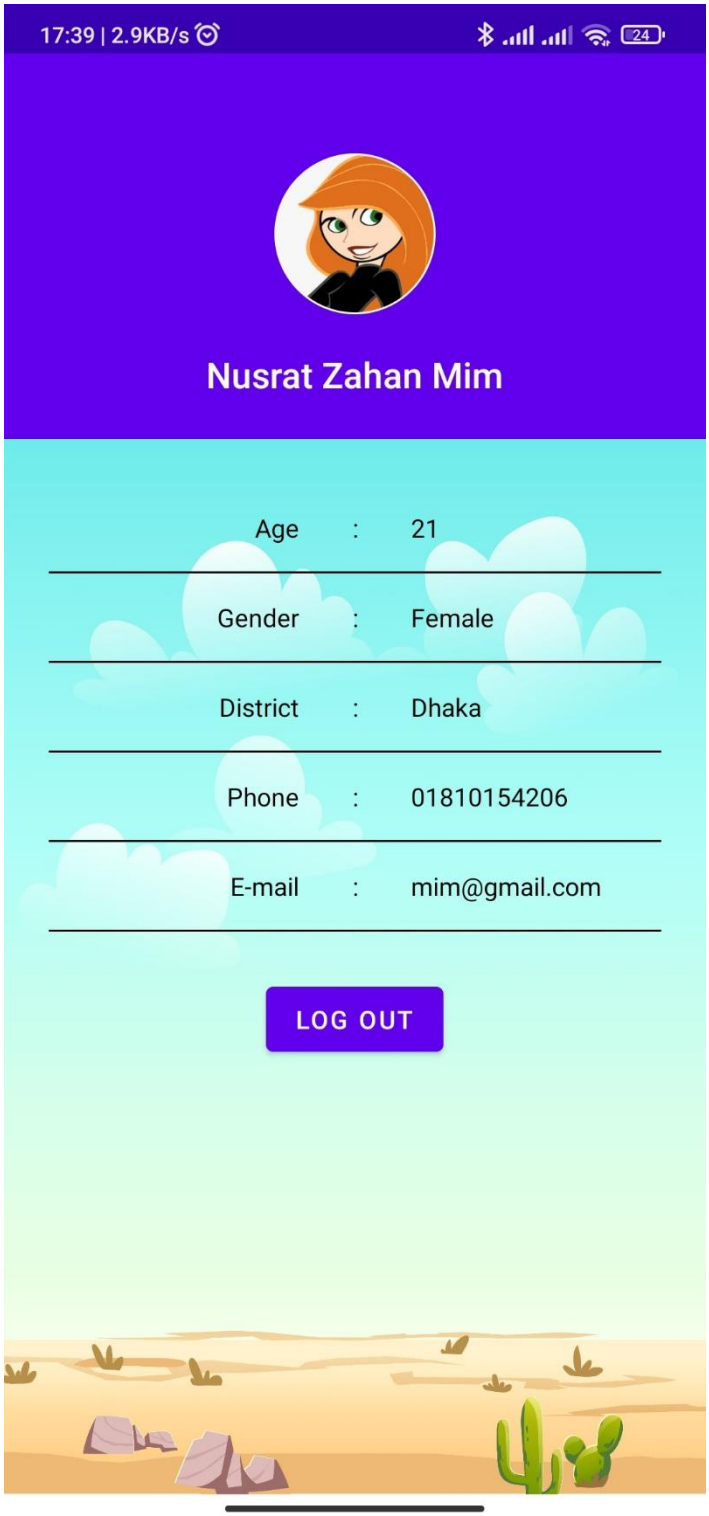

Figure 4.20: User App: User Profile

4.2 Back-end Design

It works in the background of the user interface without being aware of the user component. An advanced mobile app that can transfer user data to the cloud, deliver notifications and customer requests, broadcast messages for Android via real-time chat, Google Cloud Messaging (GCM), and more [6]. Using the Firebase database to access the back end like a cloud data center. We must use the application or consent form carefully. The author user folder will appear in the table.

Figure 4.21 shows a list of people with email addresses and passwords. This feature is called Firebase Authentication and it works for login.

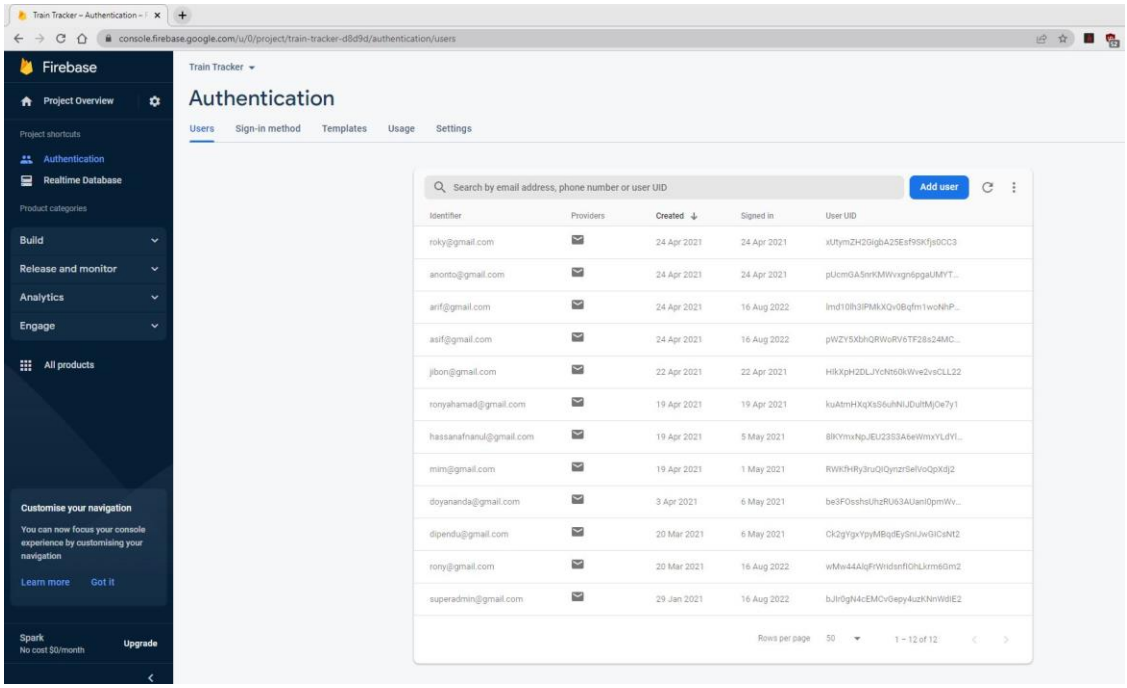

Figure 4.21: User Table

Fig. 4.22 shows the every needed information of users. The details data related to the user is saved in the following tree.

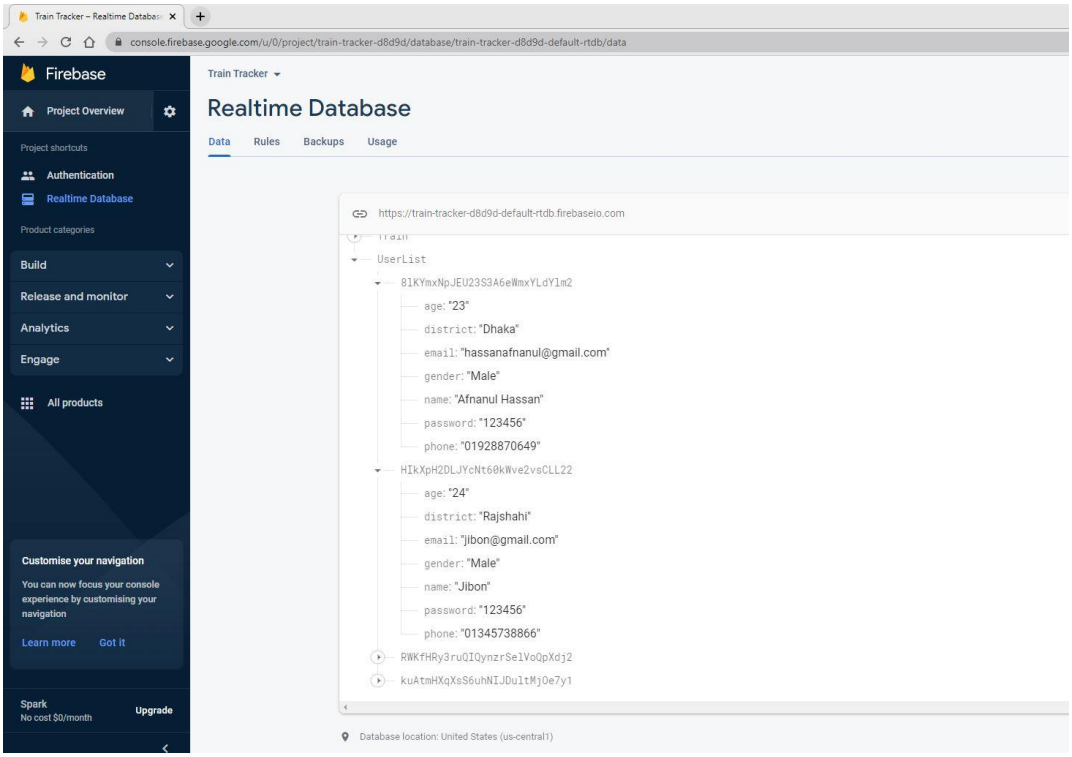

Figure 4.22: User Details

Figure. 4.23 shows the details of trains . Every necessary information related to the trains are saved here.

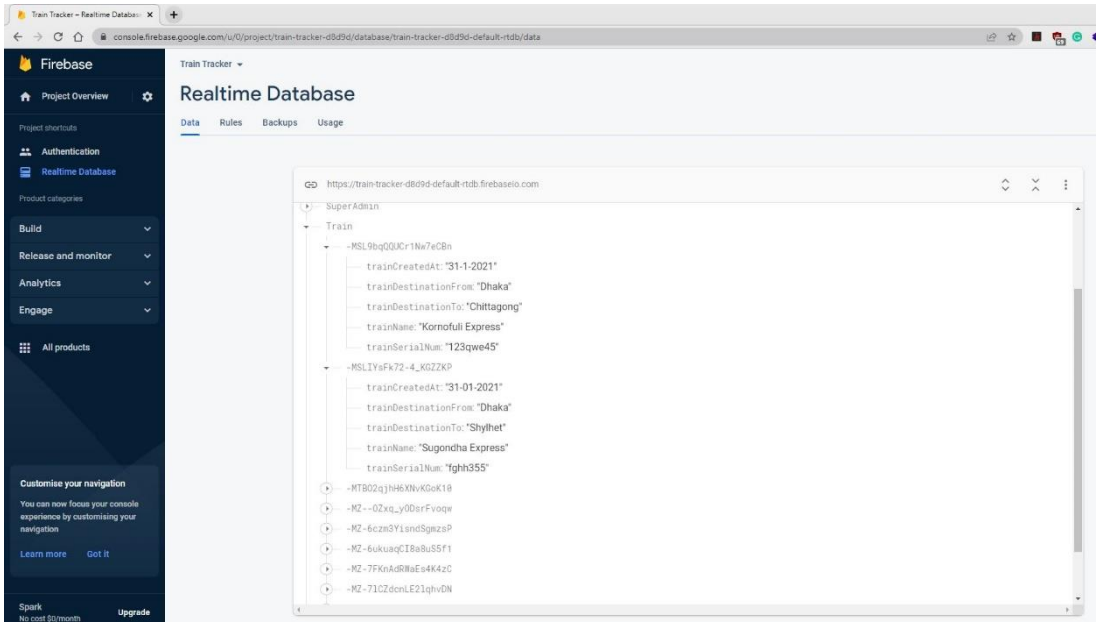

Figure 4.23: Details of trains.

Without drivers the system is incomplete. Fig. 4.24 is showing the tree with every necessary information of every Drivers.

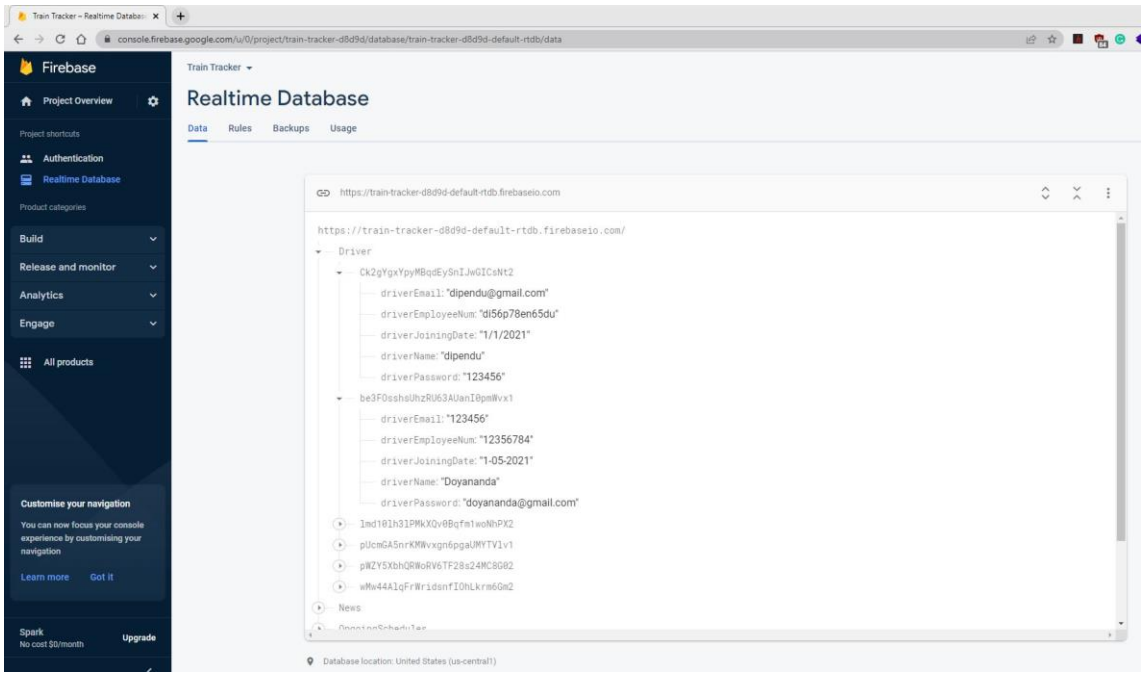

Figure 4.24: Details of Drivers

Fig 4.25 has schedule information. There are regular schedules and ongoing Schedules. Regular schedules have schedule information all are needed.

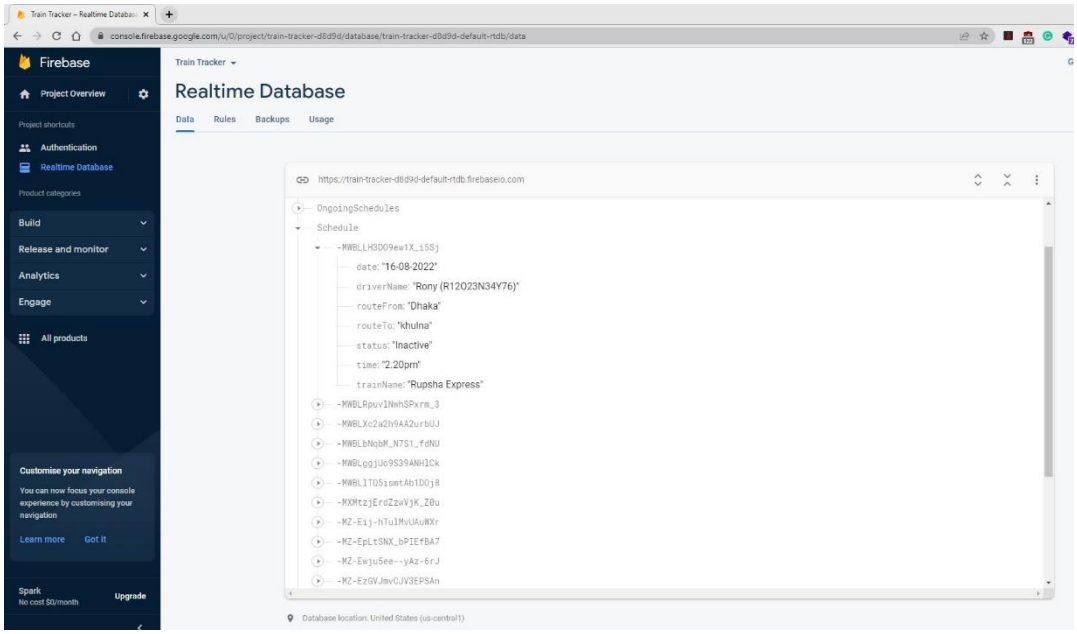

Figure 4.25: Details of Schedules

On the other hand, Fig 4.26 is showing the on going schedules. This on going schedules have the location data of latitude and longitude.

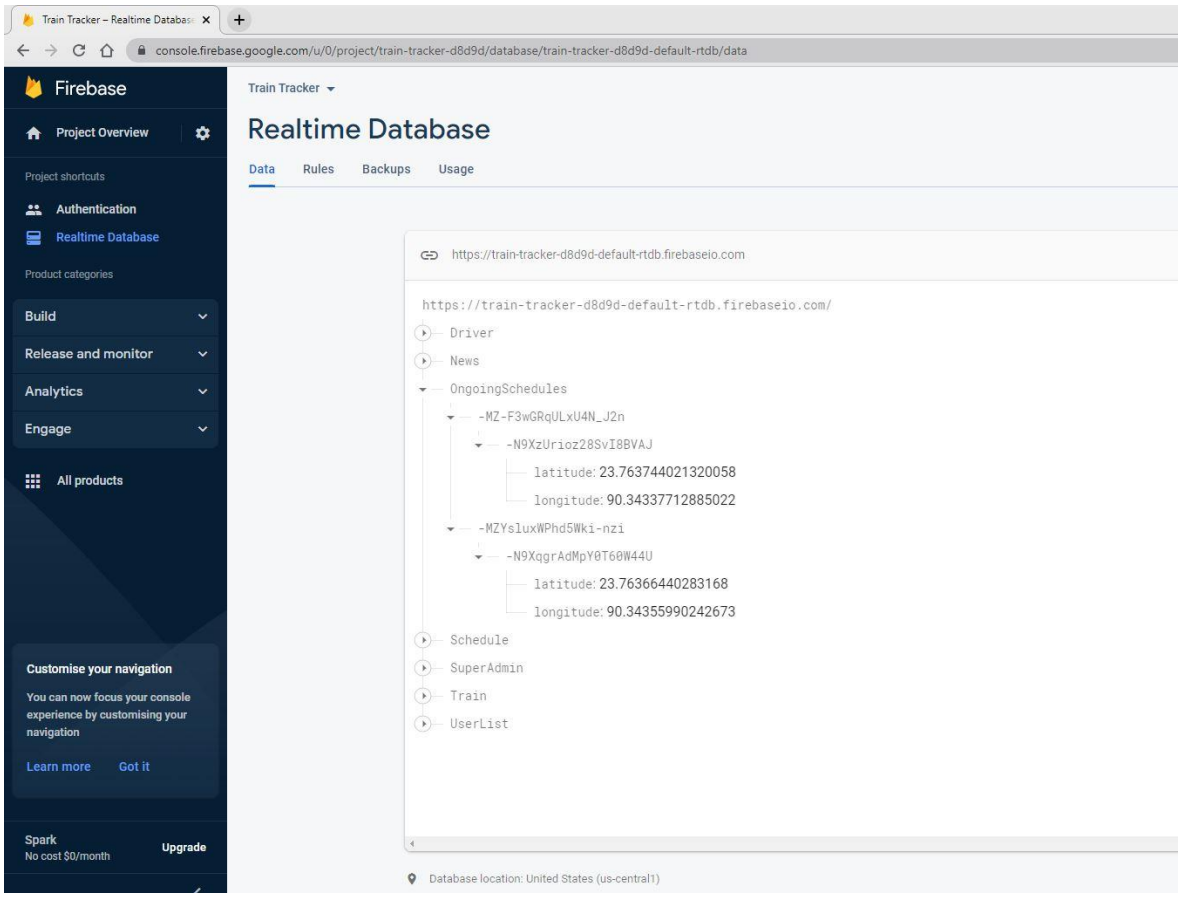

Figure 4.26: Details of On Going Schedules

4.3 Implementation Requirements

The process is done using some simple and widely used techniques. Android is the most used operating system for mobile applications. There are many ways to develop an Android app, but we use the least complex basic framework to develop our app.

To develop any project framework palys a significant role. The framework creates the proper environment to sync the system with operating system. Here to make our system mainly available for mobile we used Android Framework. Android Framework specially works with JAVA and Kotlin programming Language. We have choosen JAVA as a programming language because it is the mostly used one. For interface design android framework accepts XML. Which mainly works to design every activity by creating different views. Views are mainly common name of every entity to design an activity. Firebase database is a noSQL database which can be automatically connected with android. That is why we have used firebase database to store our data.

- The technology used as follows:
  - ❖ Framework: Android.
  - ❖ Programming Languages: JAVA.
  - ❖ Front-end Design: XML.
  - ❖ Database: Firebase.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

In this project, we are using Firebase database for storage, navigation and connectivity. Here, data is stored in JSON format (eg JSON), and data changes when tools and connections are used. We have three database modes: Data, Real Data and Manual.

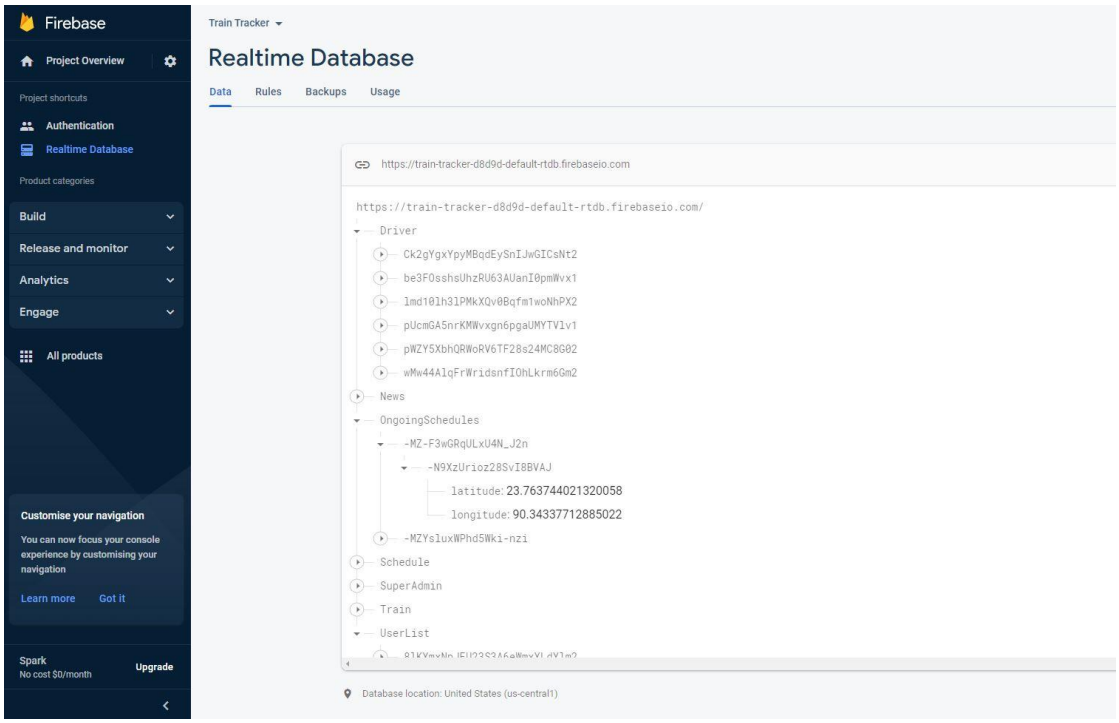

Figure 5.1: Collection of Database

5.2 Implementation of Interaction

The system is as user friendly as possible. Our plan is to implement an application system with a friendly user interface. This confirms a good user experience. General graphics; Instance; we have used spinners and other things. A beautiful and easy-to-understand user interface makes the application easy to run.

5.3 Software Testing Methodology

Fundamentals of evaluation programming. In this section, tests are performed. Through continuous testing, you can check the quality, functionality, and usability of the software before releasing it [7]. There are different types of Android testing, such as home device testing, hardware testing, and device usability testing. To run a unit test on your home computer, just use Android Studio and the JVM. These tests are used for code analysis (logical testing of raw Java code). Improve your testing skills by integrating testing tools like Mokito to build test apps for Android APIs.

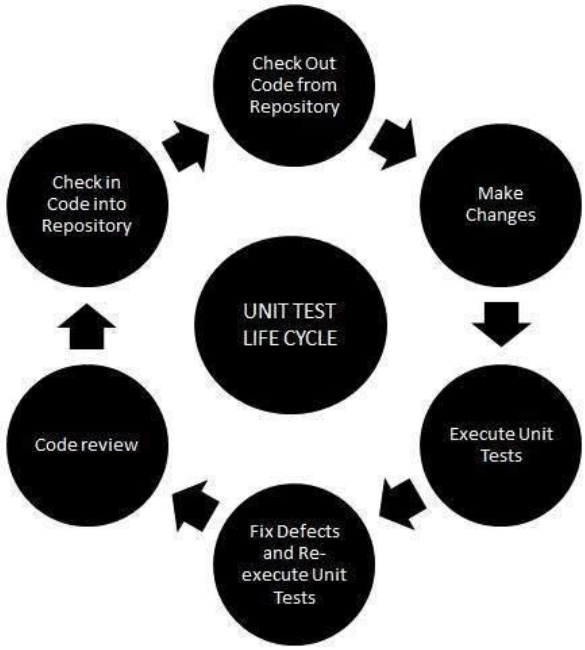

Figure 5.2: Unit Testing Diagram

To complete unit we have selected deferent modules as defferent units. In our case, we have specially taken every module and the map activity as units differently. So, the units we have are,

- Train Management.
- Driver Management
- Schedule Management
- News Management
- Map Activity

In all units most appropriate tase cases have been choosen and testes independently to make the system flawless.

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

A large number of Bangladeshi population uses train as their transport. I case of long travel train has been the best solution to everyone. But, Due to irregular time schedule of train people waste many time waitng for train. That is why our developed system can create a big impact on society by making people aware of the exact location of a train so that, every one canmake a proper schedule of their journey.

6.2 Impact on Environment

When getting latest update of a train is manual process this days. People need to go to railstation get latest update of a train or the perfect time of train schedule. But, using this system user will be able to get latest data from home, this will reduce there travel to station and might be less amount but it will reduce a cardon emission and use of fossil fuel.

6.3 Ethical Aspect

With the proper authority the system will be monitored and maintained and the data which is being used is just the location of a train. Which must not harmful anyhow and authority will share it’s location by choise. That is why, there is no etical problem on this system.

6.4 Sustainability Plan

Train journey is the most popular and long time used transportation system. And our system is designed to check out train location that is why the nessecity of our system is high. Except that this system can be used in Bus system, lonch system also. Thus the system has been very sustainable and useful.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Discussion and Conclusion

The project is finished with the help of XML, Java, and Firebase database. People can use it from anywhere by using a Smartphone with the help of an internet connection. The system designed with the aim of helping those who are waiting for the arrival of their desired vehicles.

The system works with registering as admin or driver or user who are going to maintain update locations and user is going to have the location.

7.2 Scope for Further Developments

It is already a user-friendly application, but in the future, we are thinking about adding some more features to make this application more user friendly. There are some limitations in our use which we can come up with some betterment like the driver's option can be minimized. If we install a system in each vehicle that updates it's location automatically whenever the vehicle is started or stopped.

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An Android App to Get Real Time Location of Active Trains

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