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

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This Report is 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 **Md. Abir HossainId No: 142-15-4044** 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 5th August 2023.

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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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Our department of computer science and engineering's honorable teacher and project supervisor, Md. Firoz Hasan sir, deserves special thanks as well. Without his expertise in the field of "Android Applications," it would have taken us a lot longer and been much more challenging to improve the project's effectiveness, dependability, and user friendliness. His experience, way to encourage, constant supportand supervision motivated us for the relentless work and effort of ours so we can make it happen. He was also the first to offer constructive feedback, good suggestions, read subpar drafts and notes, and rectify those at every stage, which is how we got to where we are today.Another person to whom wemust show the gratitude is Professor Dr. Touhid Bhuiyan,HonorableHeadofour Department of computer science, for his concern to finish our project. Also we would like to thank our other faculty members and the staffs of computer science of Daffodil International University. Last but not the least, we have to mention our course mates in Daffodil International University, with whom we learnt so many things that helped us to grow our knowledge which will help us for the rest of our journey.

ABSTRACT

From the very beginning of our education life, we heard this specific term countless times that time is the most valuable thing in our life. But how much of this precious thing we can utilize on a daily basis. Here in our country, we have to spend a specific amount of time both on the road and on rail.Bangladesh Railway is one of the three mostly used communication systems in our country which has the issue of scheduling of time due to the lacking of proper planning of scheduling and maintainingthem accordingly. The uncertain time schedule of departure and arrival of our trains, often causes an extra hassle and sufferingfor the passengers. This is the reason we felt the need of a systemthat is going to help both the passengers and the administrative stuffs with the schedule details along with the exact location of any train enlisted in the system. It is a combined system of 3 individual parts which are Super Admin, Driver, and User,interconnected through a common server. Getting on a train on time will be a lot easier for the passengers for the schedule details of the system.This system has the functionality for the Super Admin to create schedules for the trains and driverswhich will be available to the User's end having a real-time location interface. With the proper implement of the system everyone will get to know the current schedule of any trains and whether any one of it has been updated due to any certain reason or not.

CONTENT TABLE

FIGURELIST

CHAPTER 1

INTRODUCTION

1.1 Introduction

This report will outline the key accomplishments and the steps that were taken to create the system that we wanted and worked to keep in good working order to achieve. This report contains subtleties for the objectives, a visual representation of the structure and scope, crucial preconditions, and in the conclusion, the techniques and announcements that were made.

Considering past few years Bangladesh Railway has achieved a significant improvement on minimizing the time gap between the departure and arrivalof the trains and if we take a closer look almost every train this year left our Railway Stationsaccording to the scheduled time.We get to see the exceptions as well. Onthoseparticular kind of incidents it seems lot more important to know more detail right away with the help of the most used device on planet earth.

The idea of such a systemcame right there that can track any vehicle with the system on board. At the same time it will provide all the information of corresponding vehicles to the user which is us.

1.2 Motivation

Now a days looking for a particular person or any moving object with a tracking system installed or being carried on board is very easy with the help ofsystems like "Google Find My Device, GPS Tracking" etc. These apps allow people to find their lost phones that has the system installed and to track the location. With the help of the corresponding location they can retrieve it easily. But what if we want to track a vehicle that has a tracking system on board but we don't have access to it. How can we track it if we do not know which system to track.

The proposed system uses similar technology and here our target is to track the vehicles using a common application that can be accessed by any individual with the installed system.

1.3 Objectives

- This system will help us to track any train or vehicle on road and to know the live location.
- There will be three individual apps operated by admins, drivers and general users.
- Admins have the authority to set schedule for trains and drivers.
- A driver is responsible to keep the system operational from his end and by sharing his location he will let the user know his position.
- Any user having the user app will see the corresponding location shared by the driver. Also users will be able to know the schedules set by the admin.

1.4 Expected Outcome

- Using thesystem people will be able to track any vehicle having the system on board.
- If any vehicle falls into an accident we can find it right away
- This is how finding any vehicle will be less time consuming

1.5 Report Layout

This report consists of 6 more chapters as follows.

CHAPTER 2consists of background work that has made this project successful.

CHAPTER 3 has the discussion about the methodology.

CHAPTER 4 is about the designing tools and requirements.

CHAPTER 5 is regarding implementation and testing.

CHAPTER 6 talks about the impact on society and sustainability.

CHAPTER 7 contains discussion and conclusion along with the references.

CHAPTER 2

BACKGROUND

2.2 Related Works

There are some systems using the similar technology. And these applications are really helpful sometimes in the situation of an emergency. Following systems can be picked as examples.

GPS tracker and mileage log: Locating, managing and measuringthe vehicles with a tracker on board. It is used and operated by a driver.It is said by the users themselves that it works perfect while a vehicle is on move.It displays the most precise map trace.

Travel tracker pro: This app captures images while tracking. It tracks the location using Google or open street map. It also keeps track of the time and distance traveled.

Vehicle trip logbook tracker: A GPS mileage counter for private and professional use. All of the trips that are managed and scheduled appropriately are kept track in a logbook. Additionally it shows the location on the map.

2.3 Comparative Studies

There are some comparable systems out there as mentioned n the previous points. However the system's structural differences and fundamental operating principles are completely different Some of those are designed specifically for things like business growth or driving assistance. However, our system is made to be used by a large number of people. We intend to make the system accessible to anyone who wants to follow trains in Bangladesh. Even location tracking systems vary depending on the situation. While some systems employ self-built location trackers, Google Maps is the most popular map in the world. The most precise and popular map on the planet is Google Map. We trusted Google Map to track and share the real-time location of the train because of this.

2.4 Challenges

Obtaining funding and approval from the government will be a major obstacle to the project's implementation. Since Bangladesh Railway is a government-owned enterprise, we must work with the government to carry out the project. Apart from that, using it requires some training for Drivers. Despite the fact that it only takes a driver two taps to begin and one tap to end a schedule, it is extremely simple. We hope the government will readily agree to put the project into action because its main objective is to lessen human hassle. also instruct their drivers

CHAPTER 3

METHODOLOGY

3.1 Modeling of theBusiness Process

The system is made to achieve the goal of providing end users with real-time train location information. o that users can stay informed about every train schedule. For the designed system to continue working, it needs some pre-data. Because of this, the project's BPM (Business Process Model) begins with some data generation. The administrator will set up the pre-data, and the user will use it. Therefore, the system is created.

There are three different Apps that make up the entire system. These include the

- ❖ Admin app: which maintains train data, driver data, schedule data, and blog.
- ❖ Driver app: Maintain the beginning and ending of a train and disperse the location information with the driver app.
- ❖ User App: This app gives users access to the most recent news.

All trains and drivers will be registered to begin the process. The administrator will create as many schedules as needed in accordance with the needs of the train and the driver. These schedules will be tailored to each driver and train. So that a schedule can only be started or stopped by a specific driver. On the other hand, admin will have complete access to edit any information prior to launch. The principal

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components of an administrative where Another available task for the admin is to add new blogs or news for users. Following schedule creation, the driving portion will begin. The driver can view the specific schedules that are assigned to only him/her by logging in with the admin-provided account. When starting the train, he will then begin any schedule.

Here is where the user portion will begin. Users will be able to view all the schedules in their app. where the location name, start time, end time, train name, etc. can be used to filter the results. The user can see the entire path of the train with just one tap after selecting the desired schedule. Accept that he will receive information about the current location of the selected schedule as well as the distance from his current location of the train. As a result, the user will receive the information they require to stop wasting time.

The schedule will be carried out as a completed schedule after the driver simply stops the schedule after the trip is complete. This is how everything will proceed.
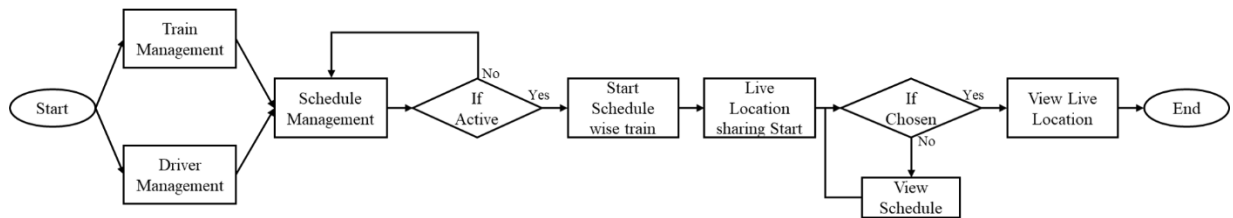

Figure 3.1: Model of Business Process

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3.2 Collection and Requirement Analysis

3.2.1 Software Requirements:

▪IDE: We have used Android Studio. The official IDE of Android. It comes with all the specialized tools for Android developers which also includes rich tools for code editing, testing, debugging, and profile creation.

▪Android Virtual Device: (AVD) It is a device configuration that runs on an Android emulator. It comes with a custom Android environment for installing and testing our Android apps for virtual devices.

▪Database (Firebase): Firebase is a very reliable and battery-efficient. A connection is built between a cloud messaging (FCM) server and our device, allowing us to send and receive free messages and notifications on iOS, Android, and the Internet. We can also send notification messages within the limit of 2 KB and data messages within the limit of 4 KB.

▪Adobe XD: This is an Adobe prototype tool for user experience and designer interaction. Here Adobe XD features are used to create wired frames.

3.2.2 Hardware Requirements:

▪   Operating System: Windows.

▪   An Android supported device

▪Recquiredcomputer configuration:

- RAM: 8 GB   --HDD: 500 GB

- Processor: 2.1 GHz

3.3 Use Case Modeling and Description

A use case model is a visual representation of the connections between a system's parts. Use cases are tools for managing, identifying, and describing system needs in systems analysis. An illustration of how various user types engage with problem-solving systems is user interaction. To accomplish this, for instance, choose Users, Users, Applications, and Systems [4]. The pattern of application usage is shown in Figure 3.2.
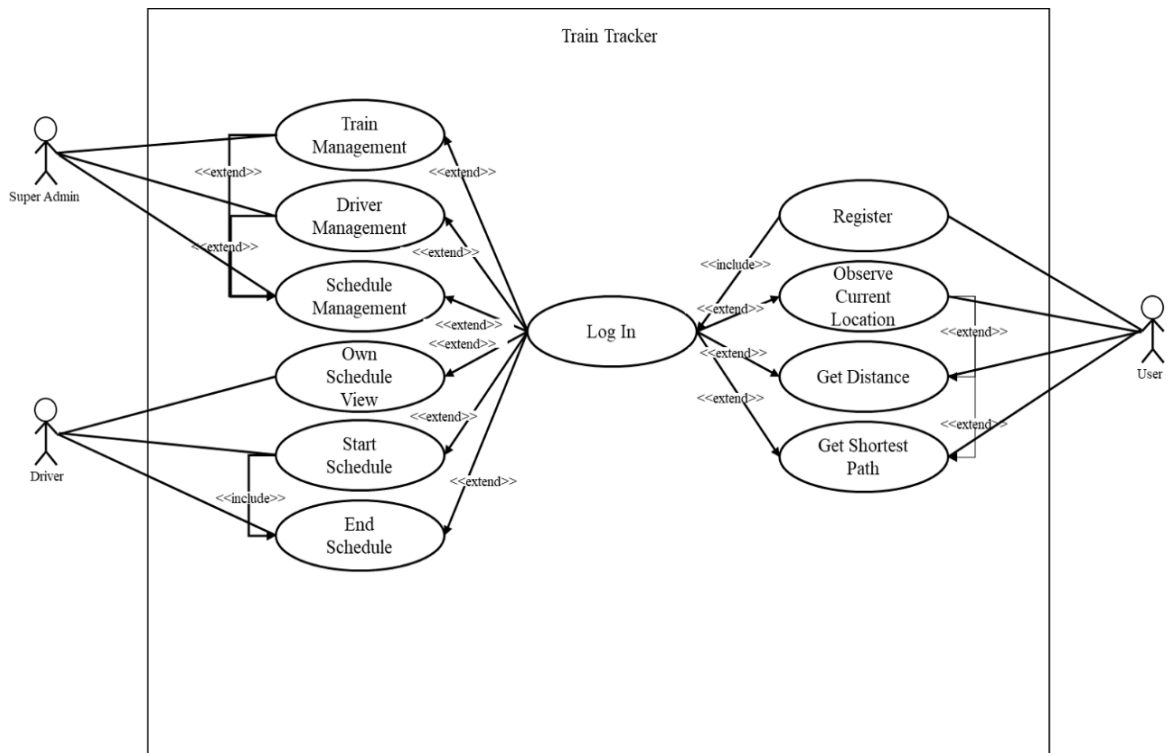
Figure 3.2: Diagram of **Use case**

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Table: 3.1

Use case details:

Use case of Driver Management:

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

Table: 3.2

Use case of Search for Start Schedule:

Use case name	Start Schedule
Use case details	The 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 want
Pre-condition	Log In
Actor	"User"
Post-condition	Get Distance, Get Shortest Path

3.4 Waterfall Model

The procedure adhered to the waterfall paradigm, where requests are gathered and carried out in order. To guarantee project success, the original SDLC paradigm was, nonetheless, frequently utilized in software development. The entire software development process is divided up into stages using the "waterfall" methodology. This model has layers upon layers of the process.

18
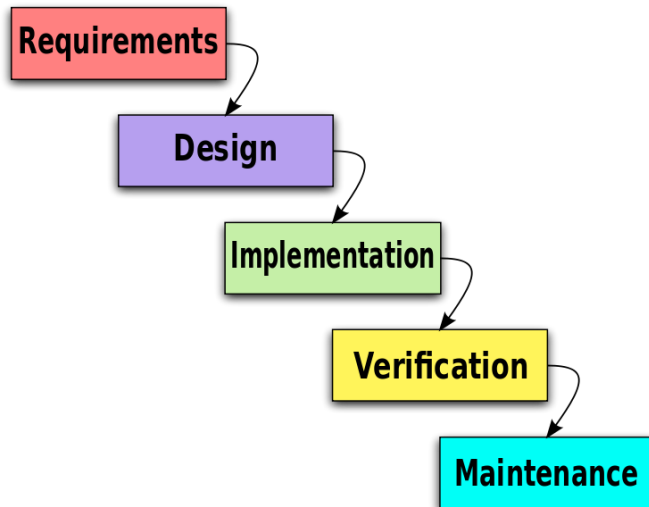
Figure 3.3: Waterfall Model Diagram

CHAPTER 4

DESIGN SPECIFICATION

4.1 Design (Front-end)

The front-end and the back-end are the two components that make up an Android app. The front end of this system can be constructed using XML, and the back end is built using Java. The user-visible portion is called the front end. It is written in XML and has user interaction [5]. The system consists of the following three apps:

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

 4.1.1 Splash Screen (Admin)

The very first thing that is displayed in the Admin app is the splash screen that follows. With just one click, it can be altered. In this screen, we sought to evoke the spirit of Train.

Figure 4.1: Splash Screen(Admin)

4.1.2 Log-In (Admin)

The super admin plays the executive role in this system. This is why this step must be authenticated properly. Without the admin password, no one can't pass this step.
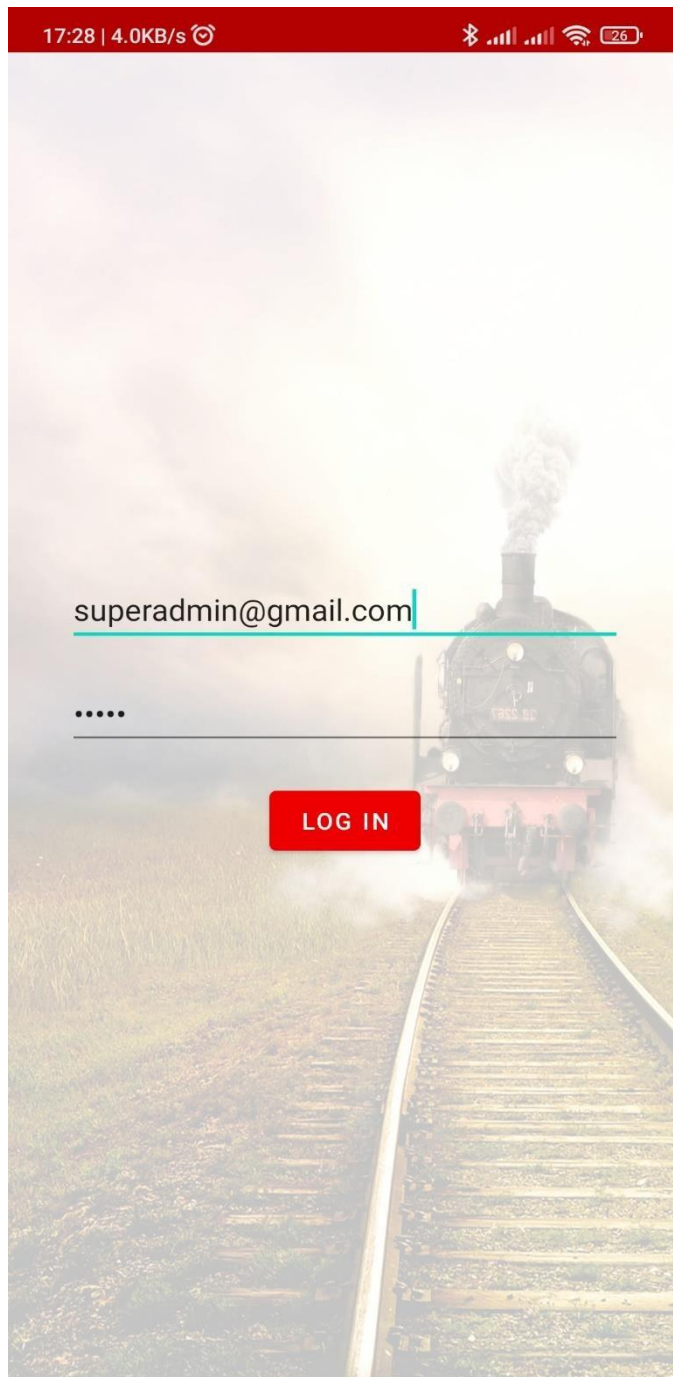
Figure 4.2: Log In(**Admin**)

4.1.3 Home Page (Admin)

The admin's home page is set up to handle every scenario. The admin homepage is created with all the required modules and shortcuts. A few modules, including Train Management, Driver Management, Schedule Management, News Management, etc., have been added to the user home page.

21
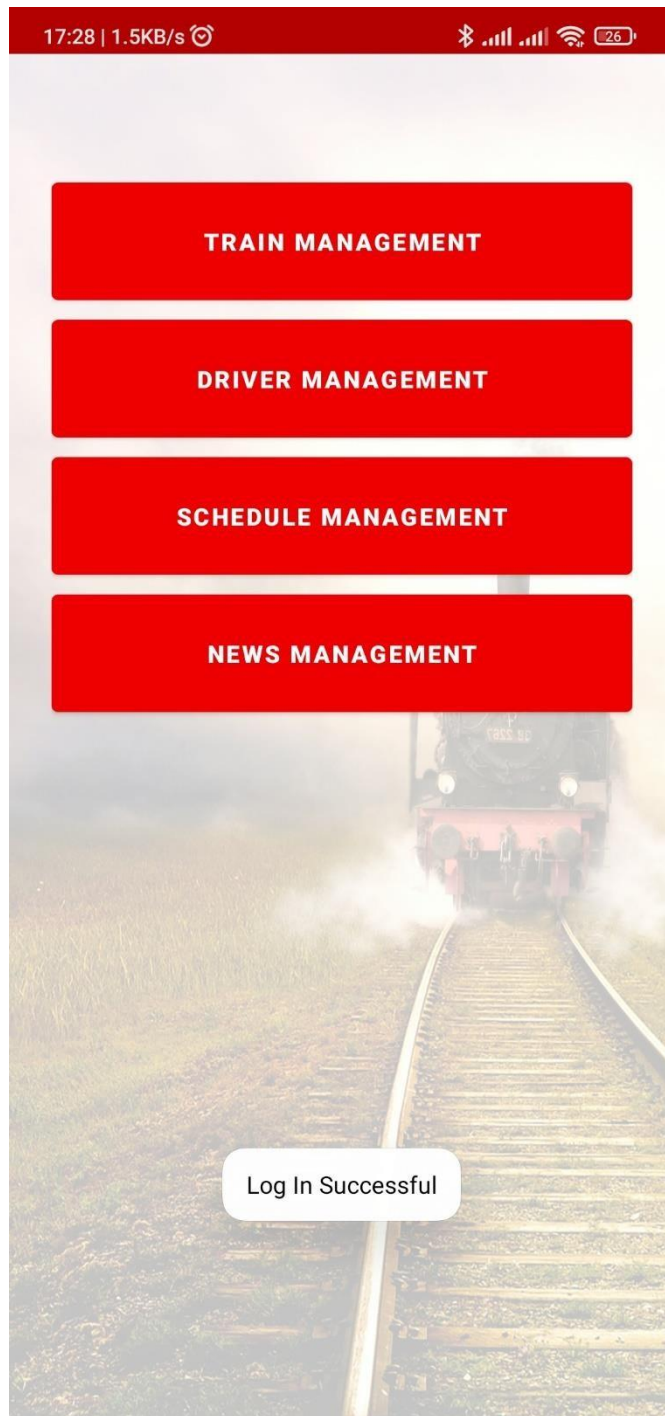
Figure 4.3: Home Page(Admin)

4.1.4 Train Management (Admin)

We can control every function a train scheduling system might possibly have thanks to this administrative activity. Here, administrators can add new trains, amend them, and delete them as needed.

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Figure 4.4: Train Management(Admin)

4.1.5 Driver Management (Admin)

In this activity admins can perform the operations of adding new driver list with their details. A driver can be deleted as well from this page.

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Figure 4.5: Driver Management(Admin)

4.1.6 Schedule Management (Admin)

The admin's most crucial task is about to begin. The administrator has the ability to update and remove any schedule here. Any time slot that is active might potentially be dormant. The administrator can keep an eye on all the schedules from this point and take appropriate action. Three categories—Active Schedules, Ongoing Schedules, and Inactive Schedules—are used to categorize these schedules.
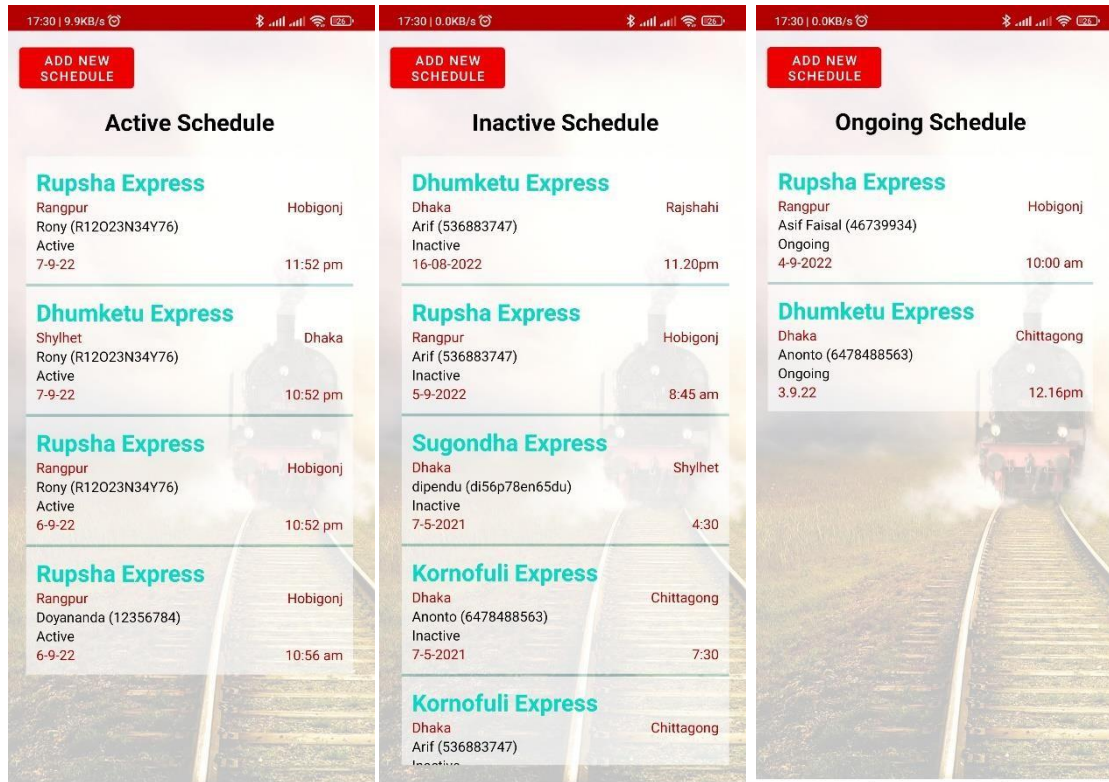
Figure 4.6: Schedule Management(Admin)

4.1.7 News Management (Admin)

This module serves as an additional system functionality in this case. Any news that is added, modified, or deleted here will be immediately displayed on the user's end.

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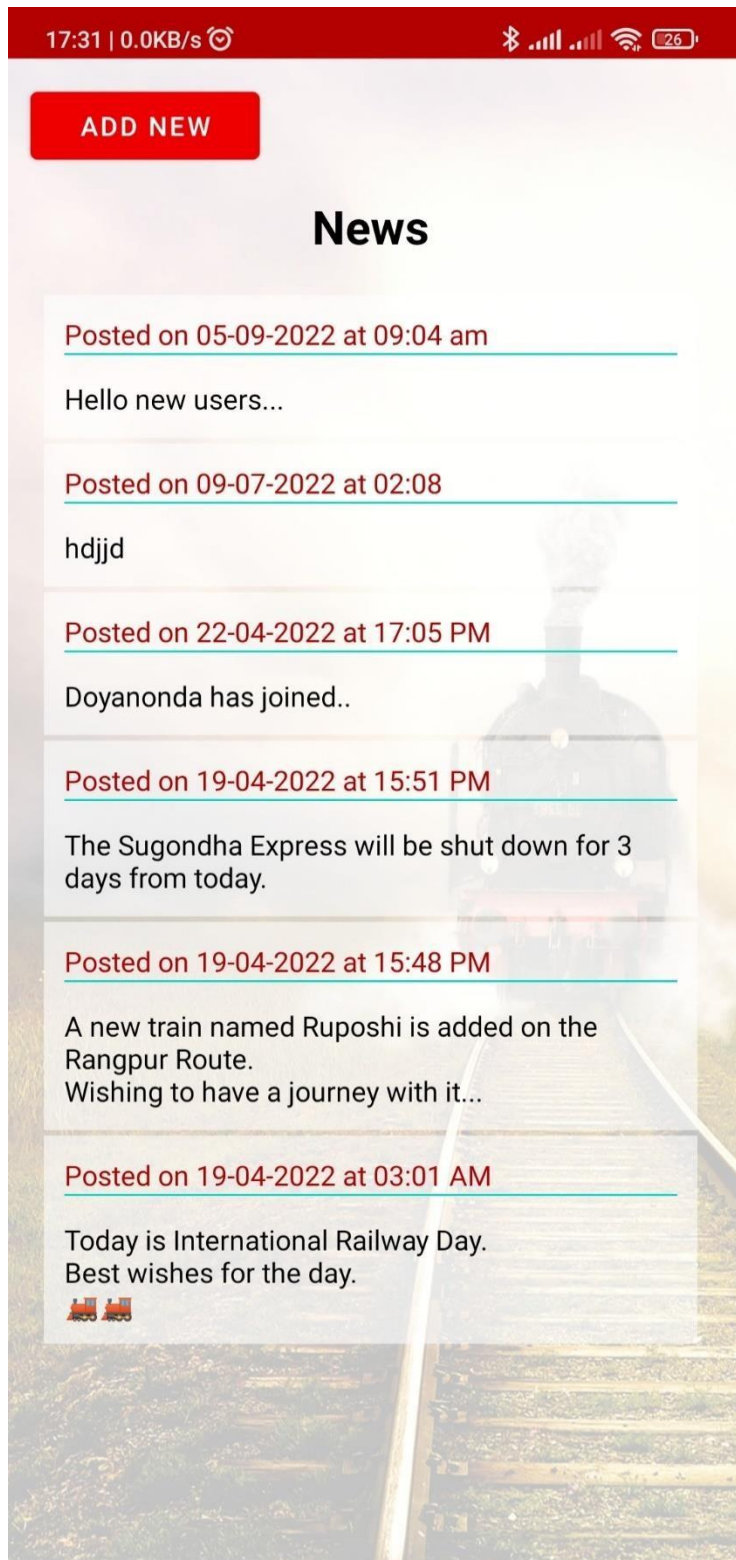
Figure 4.7: News Management(Admin App)

4.1.8 Splash Screen (Driver)

This part of the app is for the driver which also has the vibe of a train.

The driver will also have to log in to access the system.

Figure 4.8: Driver App: Splash Screen

4.1.9 Log-In (Driver)

A driver will also be needing to access the system through authentication. This app shares the live location of the train once the driver clicks on Start.
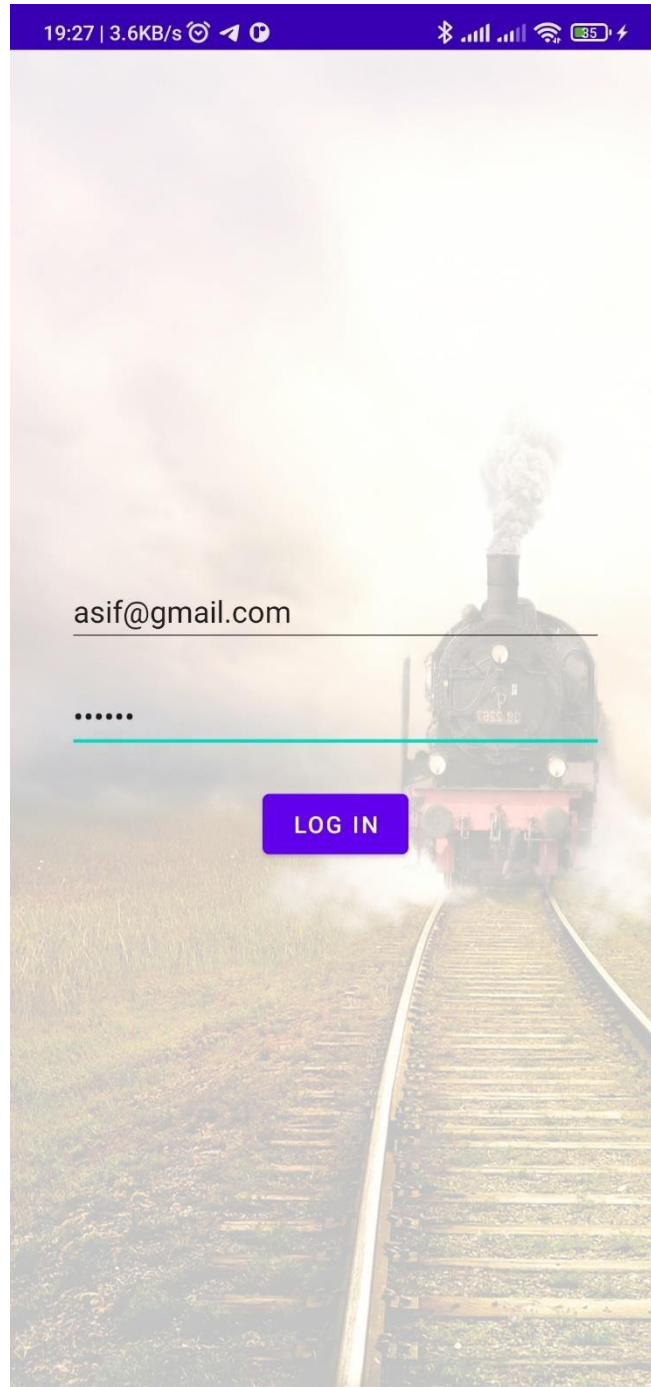
Figure 4.9: Driver App: Log In

4.1.10 Home Page (Driver)

A driver's page is simply organized where he can see the schedules of himself. Which one should start right now or if his train is ongoing or notalso whether the journey is completed or not. An individual driver has no access to other Driver's Information from this Driver-end.
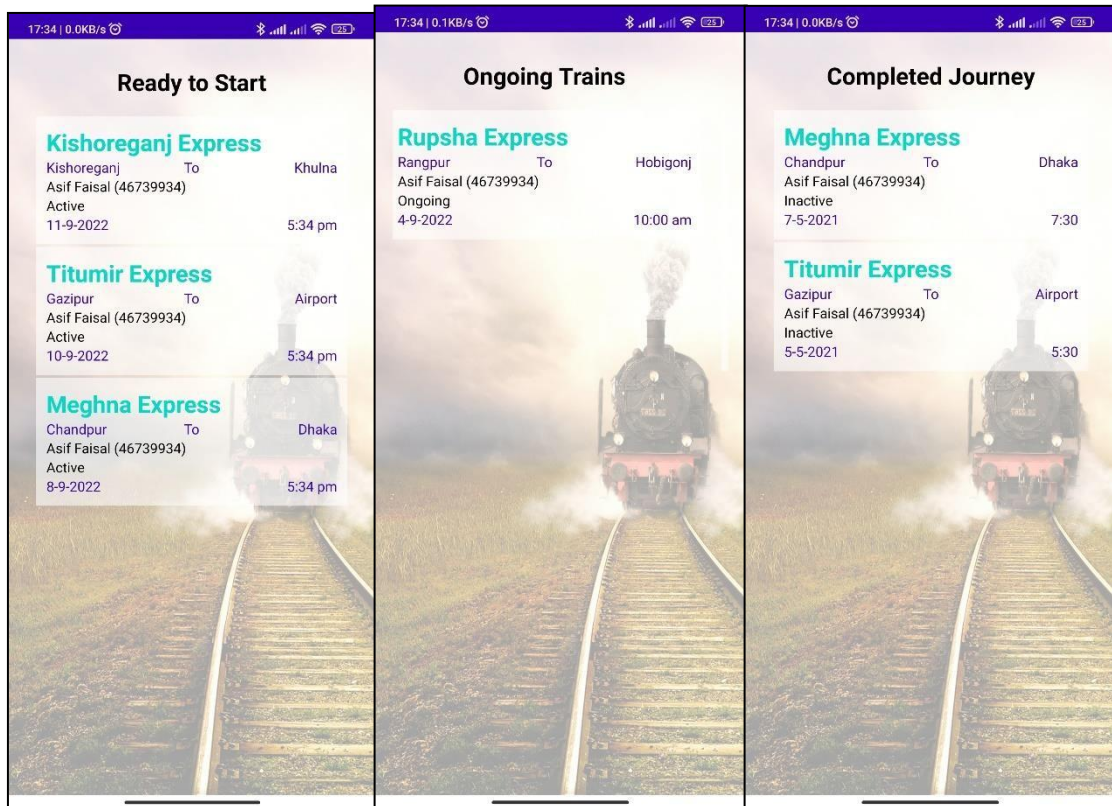
Figure 4.10: Home Page (Driver)

4.1.11 Start Schedule (Driver)

The Driver is responsible for starting and ending his schedule. Here he has to select a schedule and the system will automatically ask for confirmation. After confirmation the schedule will be started and ready to share live location.

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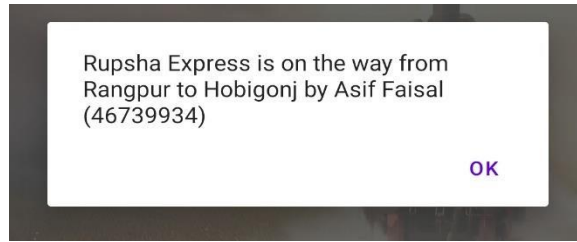
Figure 4.11: Start Schedule(Driver)

4.1.12 Map View (Driver)

This map view is for the Driver to check whether the location is shared perfectly or not. The same location will be visible for the users as well. The database gets the location information from this activity.

Figure 4.12: Map View (Driver)

4.1.13 End Schedule (Driver)

Here the Driver will press the button End Journey button once he reach his destination.The life cycle of a schedule is finished here in this page.

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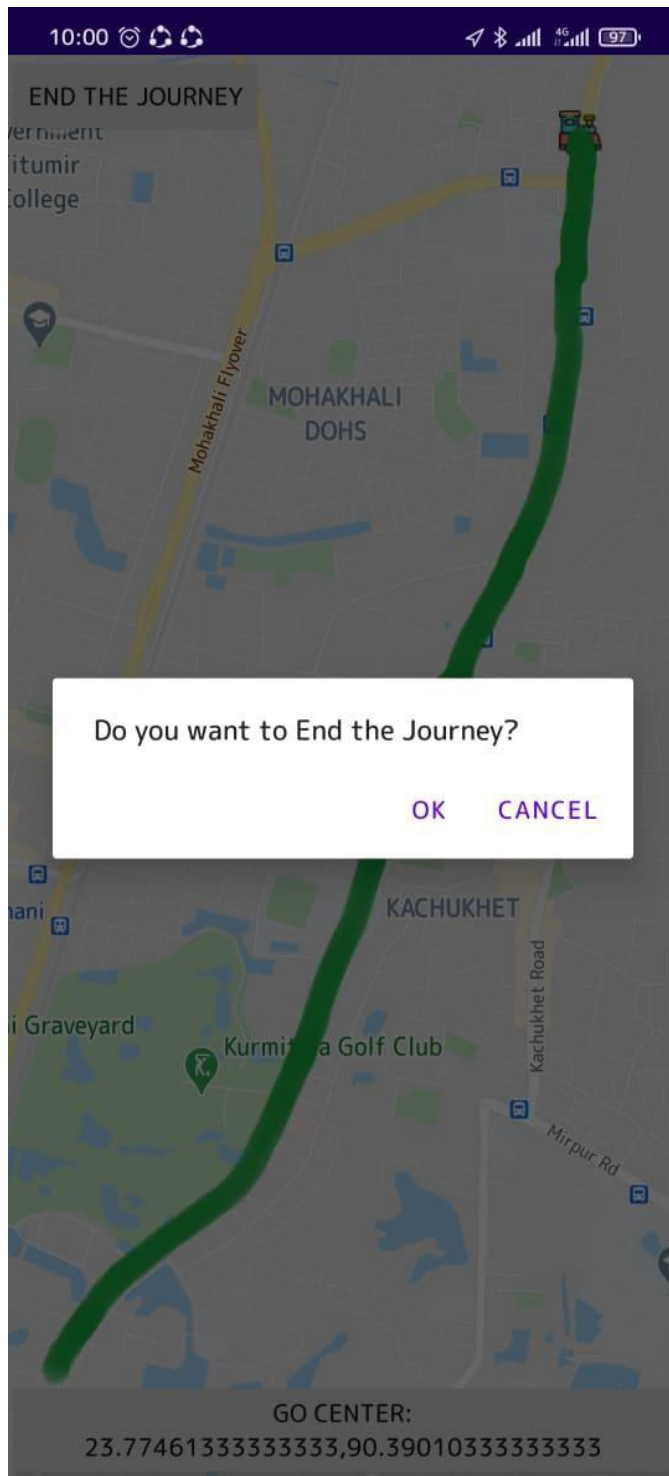
Figure 4.13: End Schedule

4.1.14 Splash Screen (User)

This app is designed with an animated splash screen where a train comes and stops at a platform. The Users will log in on this page.

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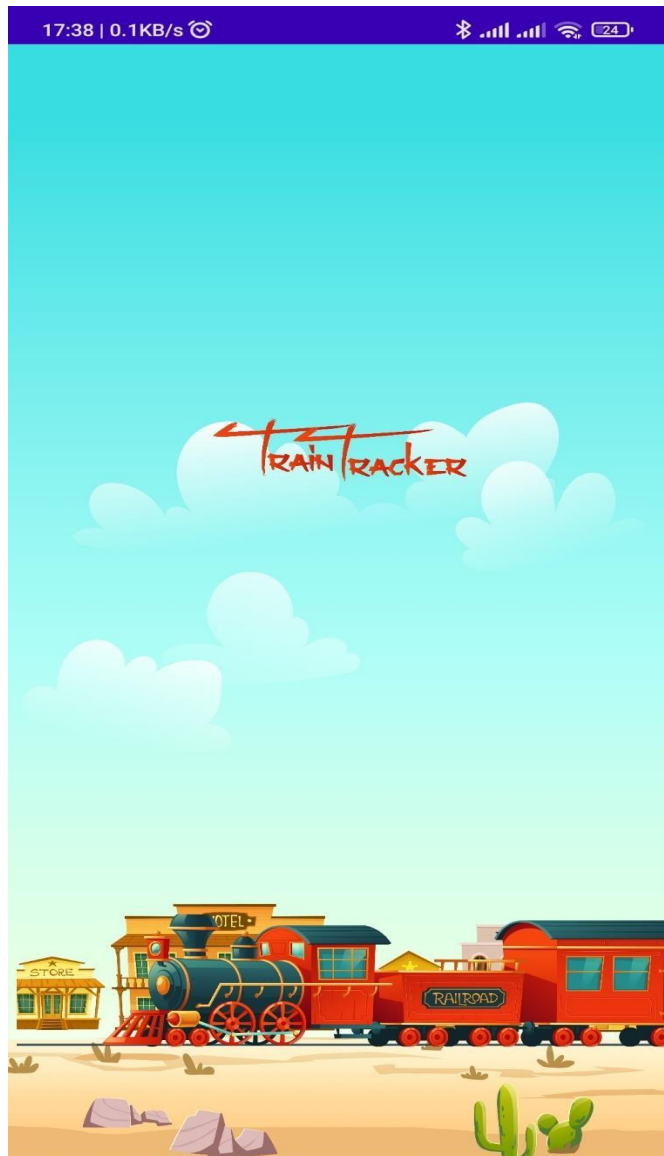
Figure 4.14: Splash Screen(User)

4.1.15 Register User (User)

Here a user will have to register himself to get the available services. This process takes user related data so they can be verified the next time they log back in.
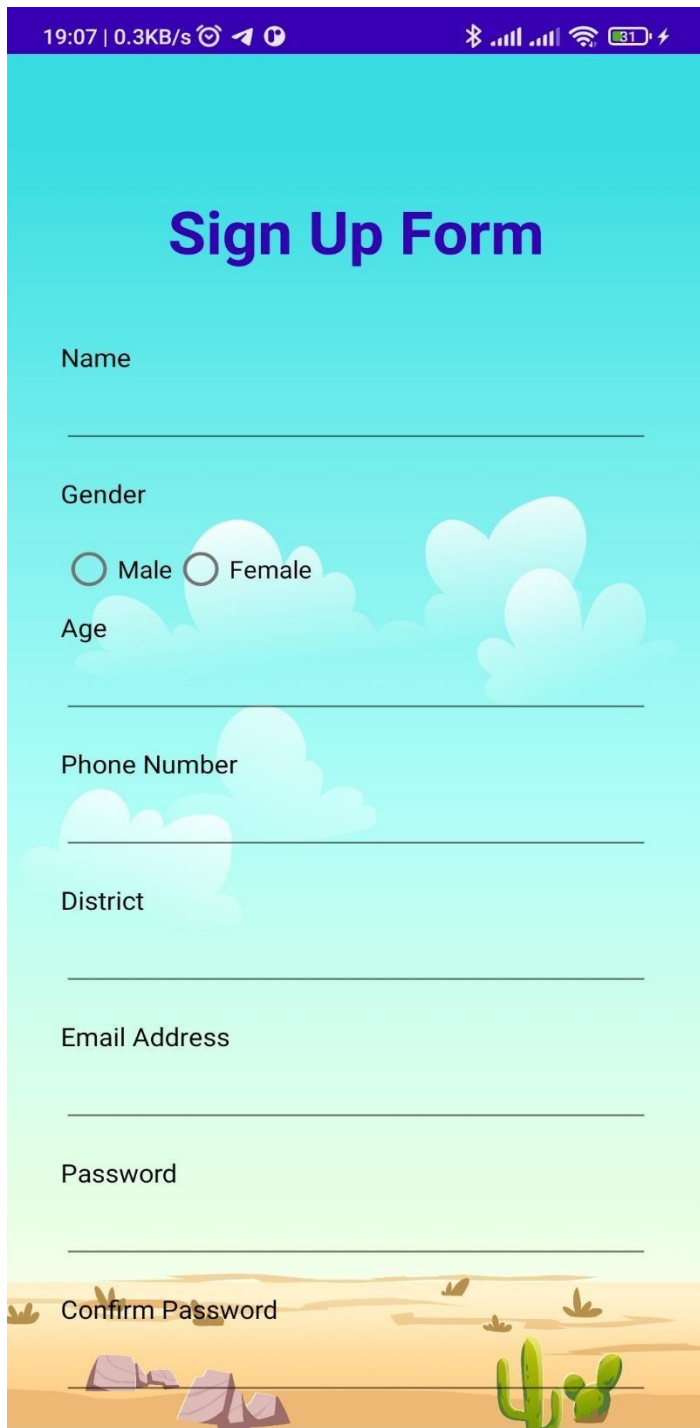
Figure 4.15: Register User(User)

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4.1.16 Home Page (User App)

User home page displays the schedule details of the trains from where they get to know which train starts when, which is ongoing and where, and which trains have already completed its journey
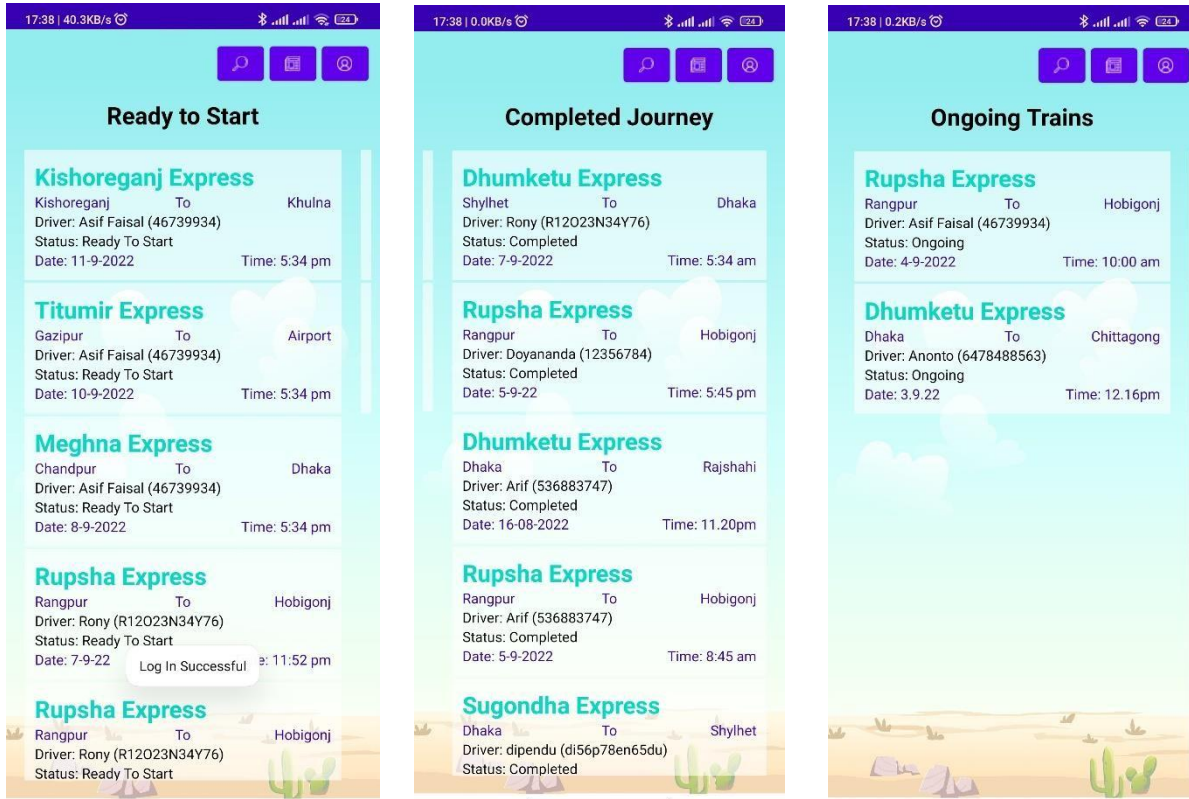
Figure 4.16: User App: Home Page

4.1.17 Search Schedule (User)

Users can also search a schedule of a particular train in this page. The search feature we used here is so smart that it can be found from a substring.Users can search a schedule by the name of train or driver or date.

© Daffodil International University
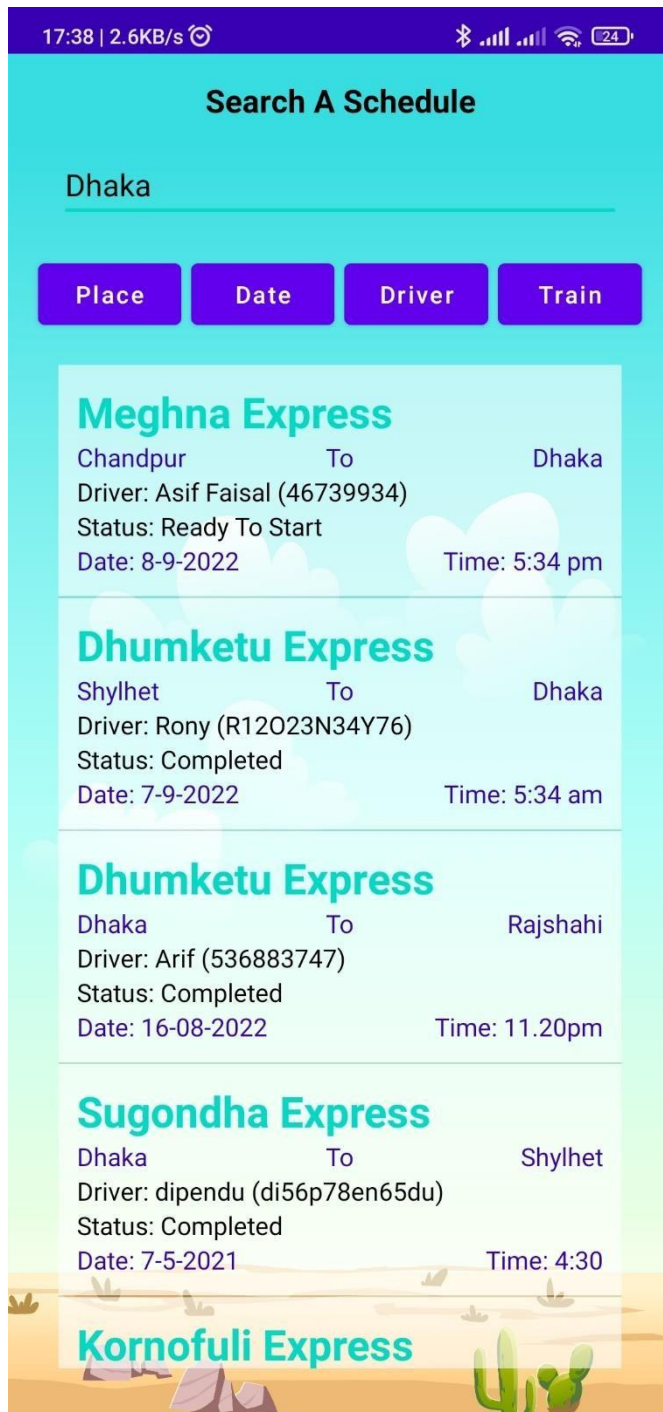
Figure 4.17: Search Schedule(User)

4.1.18 View Ongoing Schedules (User)

Here in this page the users get to see the live location of the trains which was one of our primary goals. The live location of a selected train will be visible here on this screen.
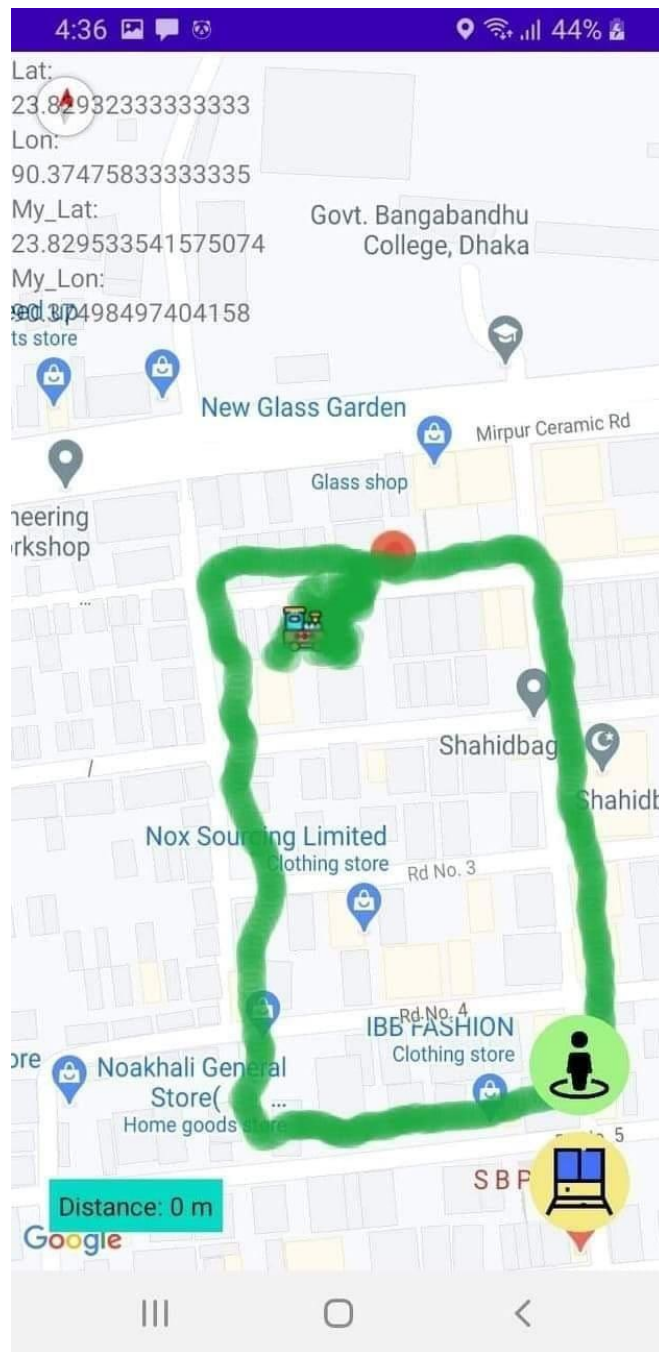
Figure 4.18: View Ongoing Schedule(User)

4.1.19 View News (User)

Here a user will get to see the news updates regarding the trains which is shared by the admin from admin app. Recent updated news occupies the top row.
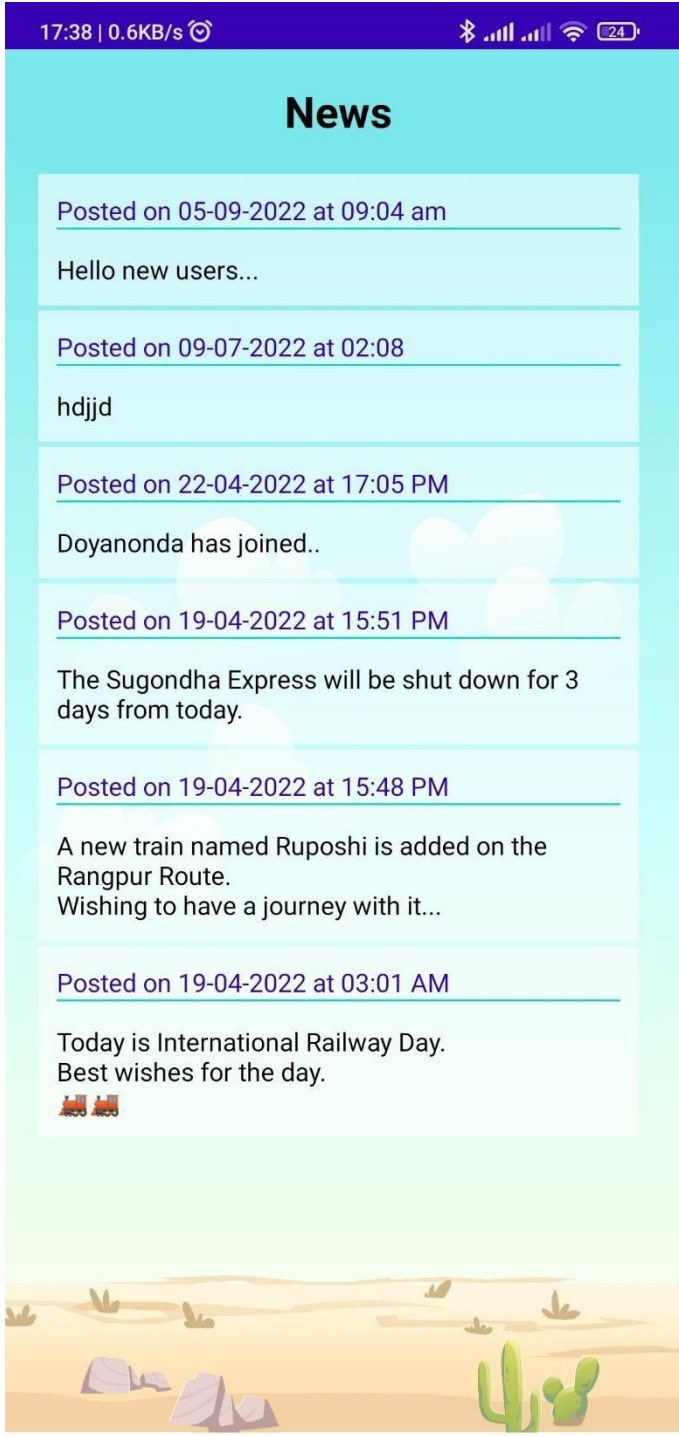
Figure 4.19: View News(User)

4.1.20 User Profile

This interface displays the saved data/information of individual users. A male image will appear here if the entered gender is male and for female the image will be appear as female.
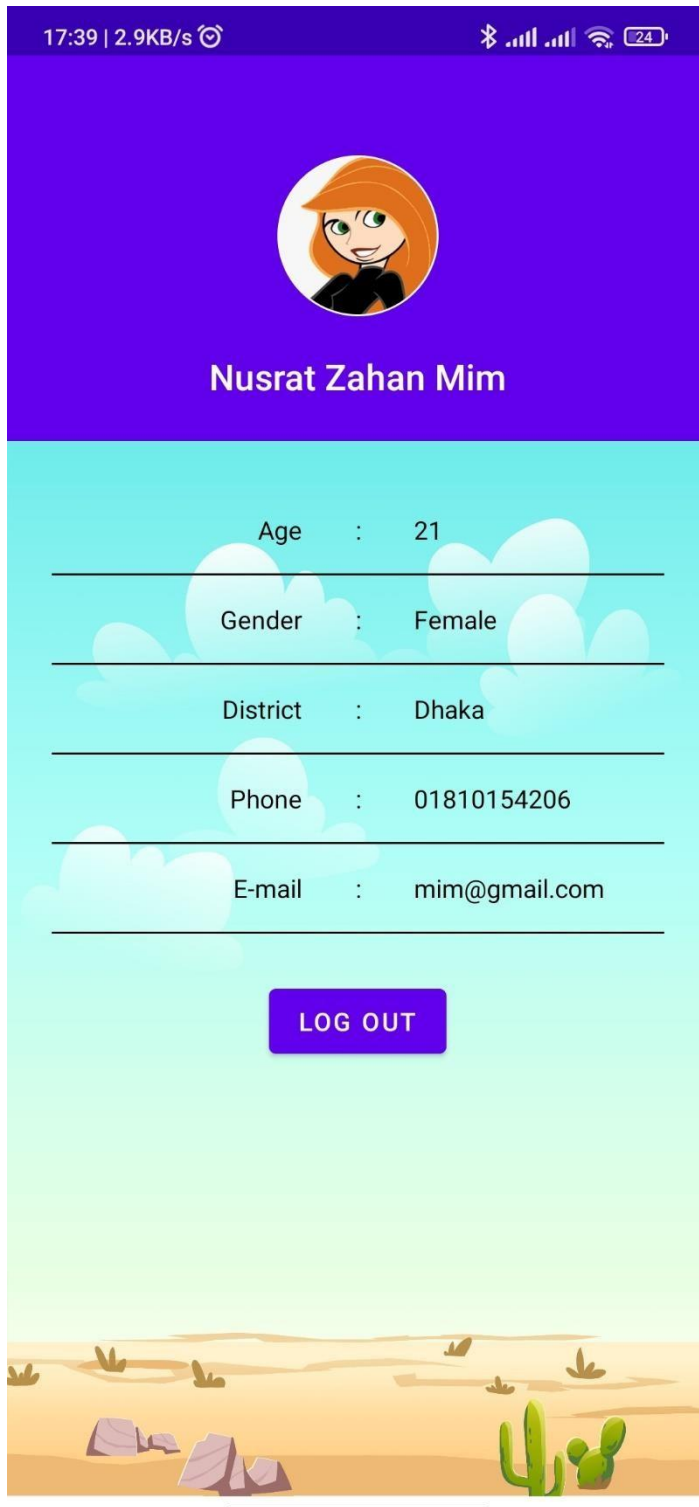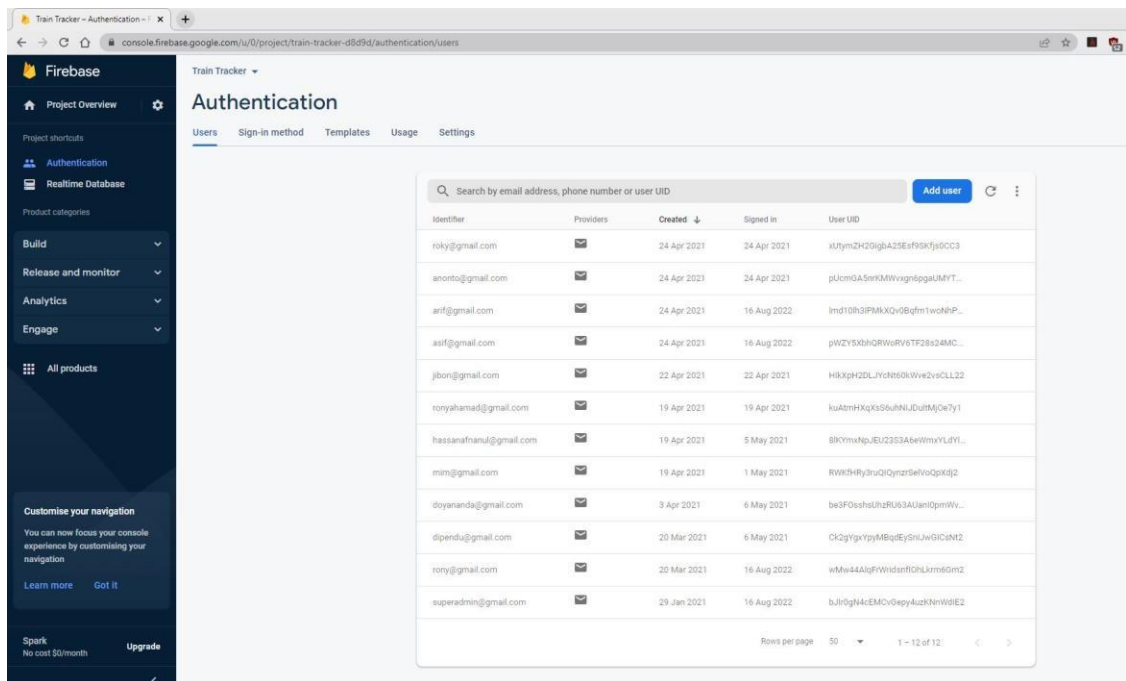
4.2 Design(Back-end)

These actions are executed without regard for the user component in the background of the user interface. Advanced mobile apps are capable of carrying out a variety of tasks, including uploading user data to the cloud, sending notifications and customer requests, and broadcasting messages for Android users via real-time chat and Google Cloud Messaging (GCM) [6]. We have access to the back-end, which functions like a cloud data center, using the Firebase database. This application must be carefully reviewed. On the desk will show up the user folder for the author.

Figure 4.**21**Contains list of people, email addresses and passwords. This feature works for login and is called Firebase Authentication.

Figure 4.21: User Table

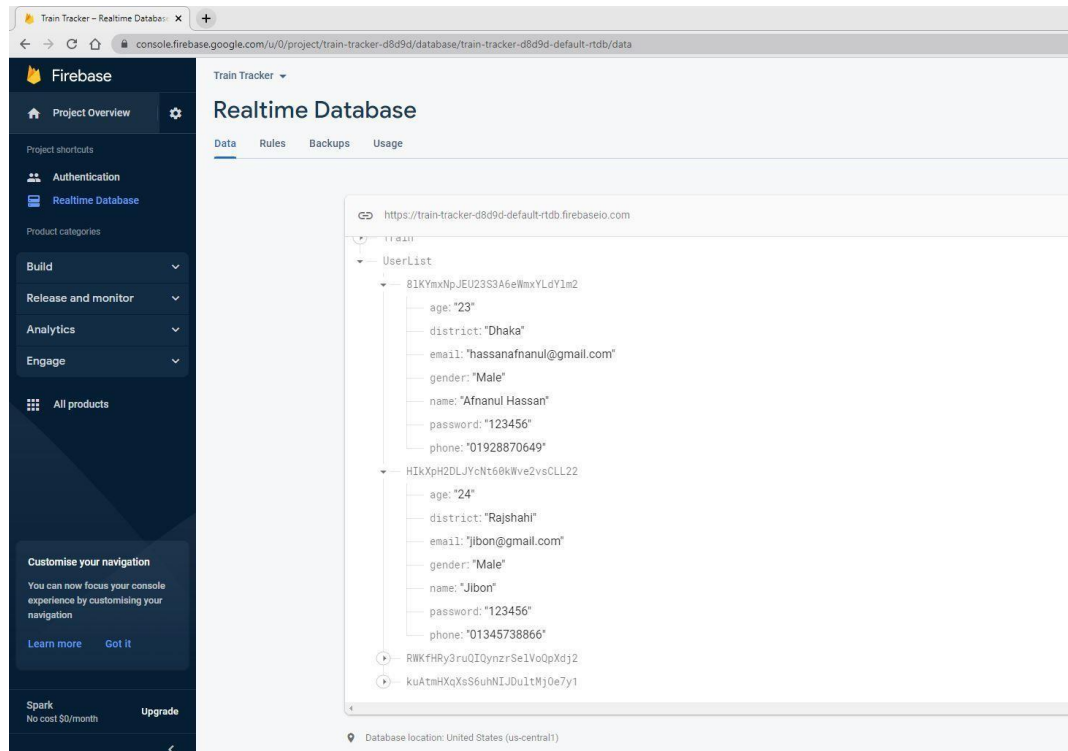Fig. 4.22 shows information saved by users. The tree contains the saved data related to the user .

Figure 4.22: Details of User

Figure. 4.23 shows the details of trains. All necessary information related to the trains is saved here.

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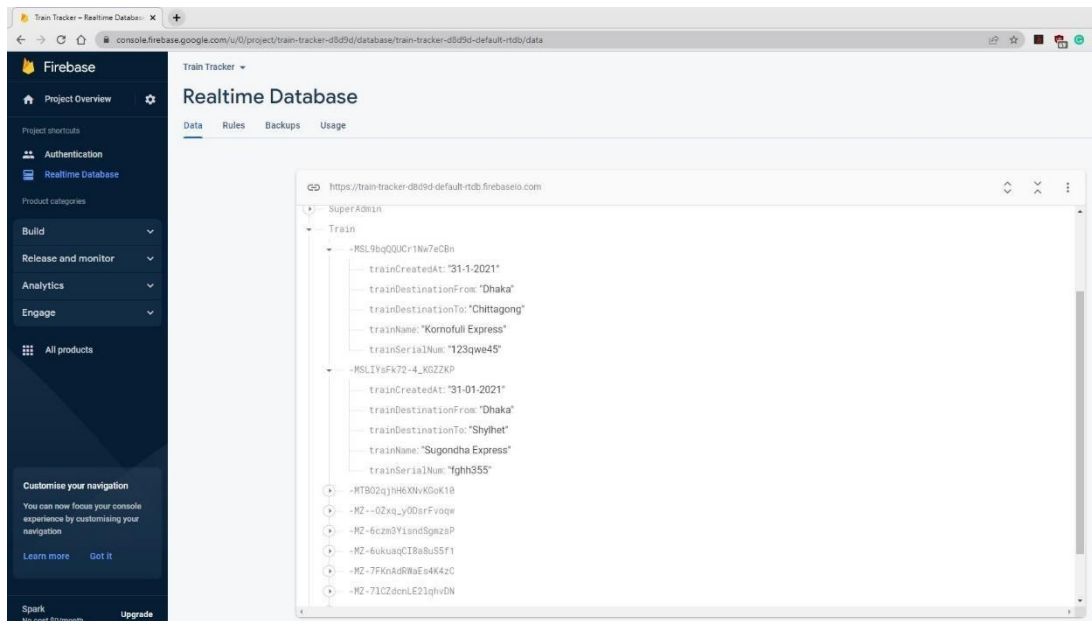
Figure 4.23: Details of trains.

Fig. 4.24 has the tree with every necessary information of every Drivers.
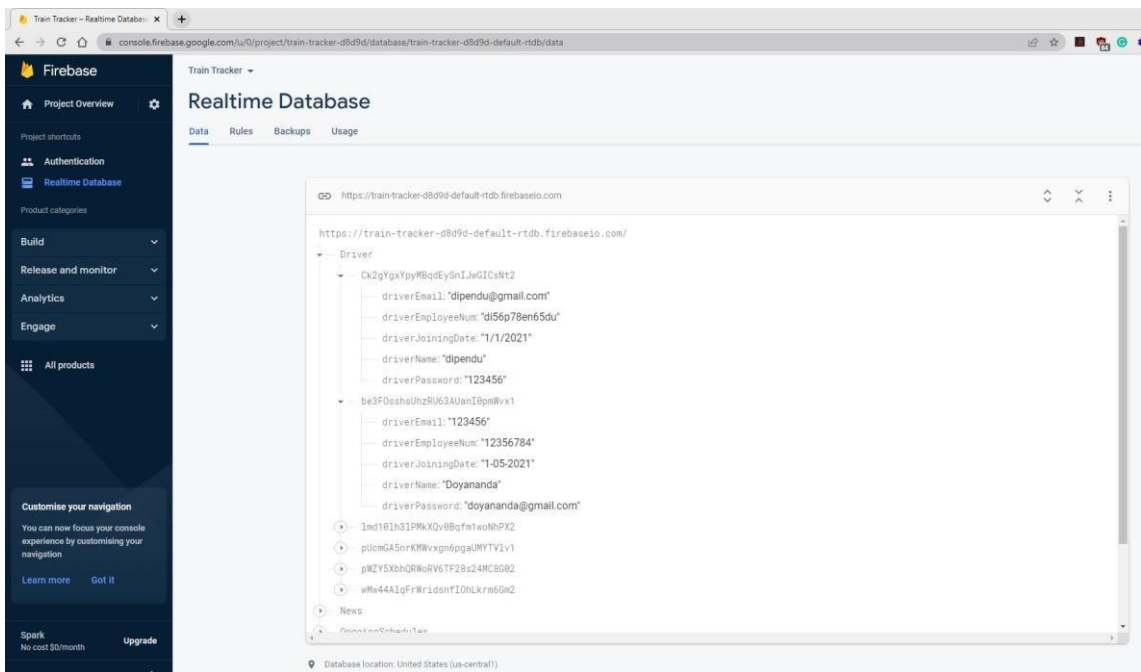

Figure 4.24: Drivers Details

Fig 4.25 Shows schedule information. There are regular schedules and ongoing Schedules.
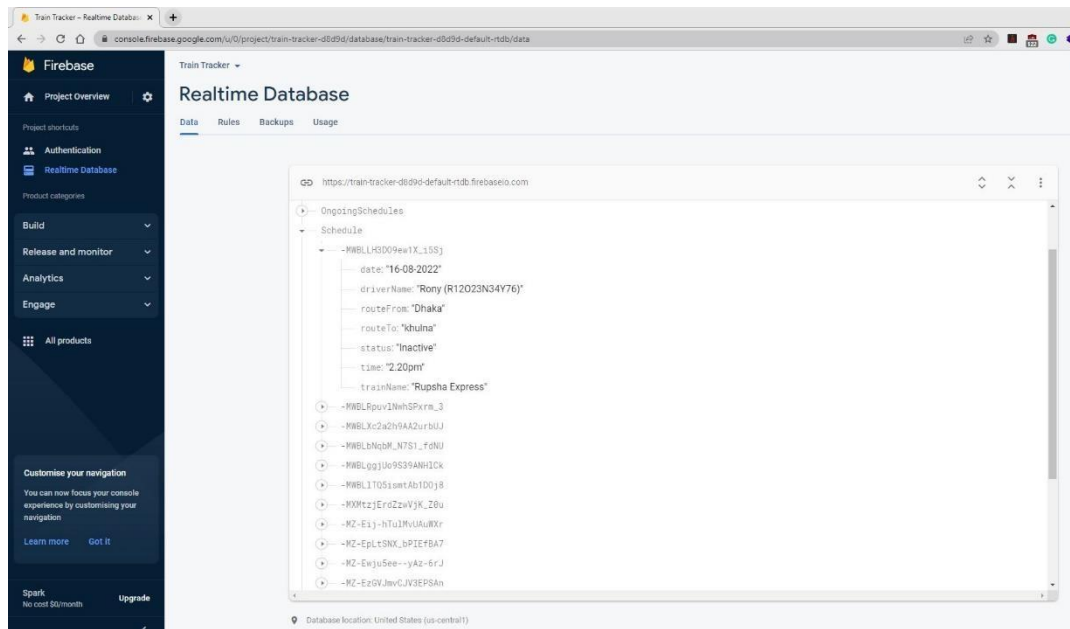
Figure 4.25: Schedules details

Fig 4.26 shows the ongoing schedules. These ongoing schedules have the location data of latitude and longitude.
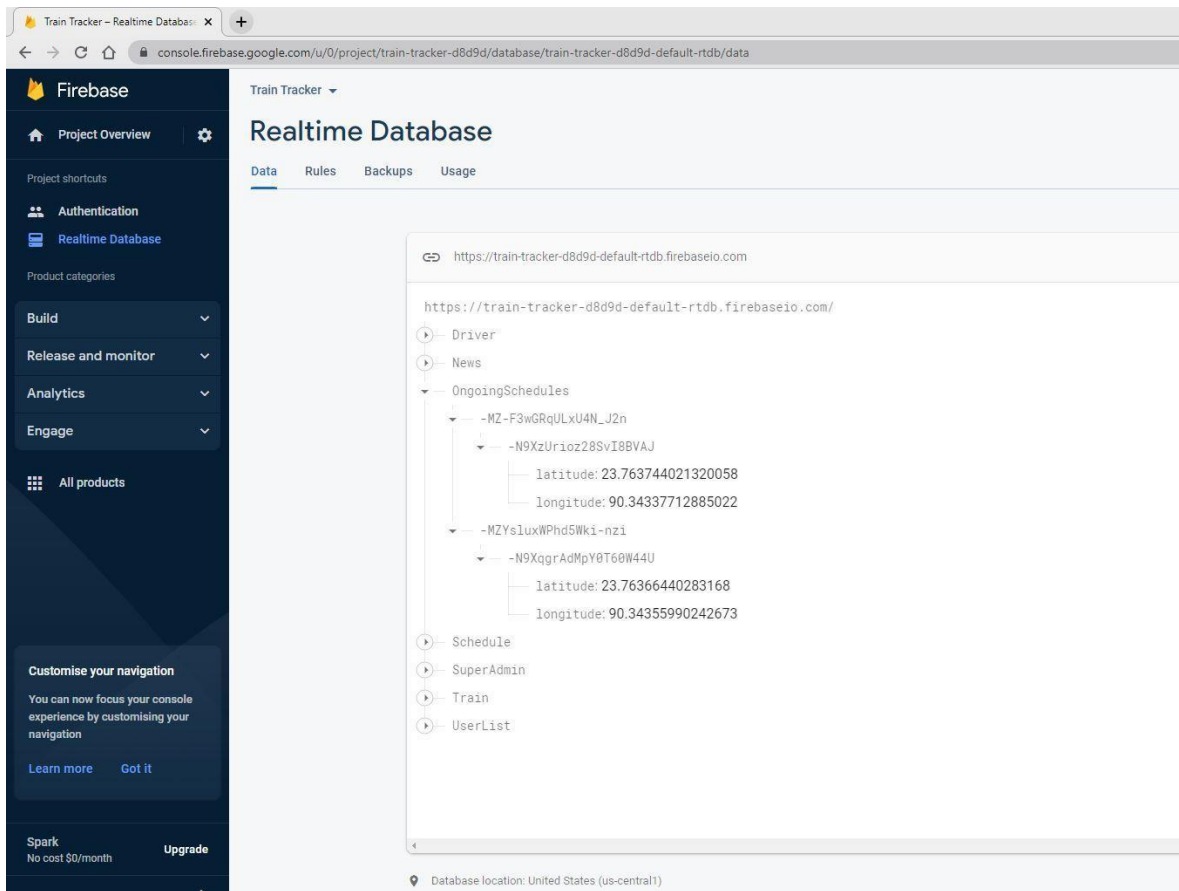
Figure 4.26: On-Going Schedule details

4.3 Implementation Requirements

Some straightforward and well-known approaches are employed to carry out the operation. The most popular operating system for mobile applications is Android. There are various ways to create an Android app, but we choose to use the simplest fundamental framework. Any project's framework development is crucial. The framework establishes the ideal atmosphere for syncing the operating system with the system. We used the Android Framework in this case to make our system mostly mobile-friendly. Java and Kotlin are specifically supported by the Android Framework. The most popular programming language is JAVA, thus we decided to utilize it. The Android framework accepts XML for interface design. which primarily aims to design each activity by producing several viewpoints. The names of each entity used to construct an activity are primarily represented by these views. Since Firebase is a noSQL database, Android may connect to it instantly. We choose Firebase Database to store our data because of this.

❖ 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 used the Firebase database for storage, networking, and navigation. When tools and connections are used, the data changes and is stored in the JSON format (e.g. JSON). Three database modes are available here: Data, Real Data, and Manual.
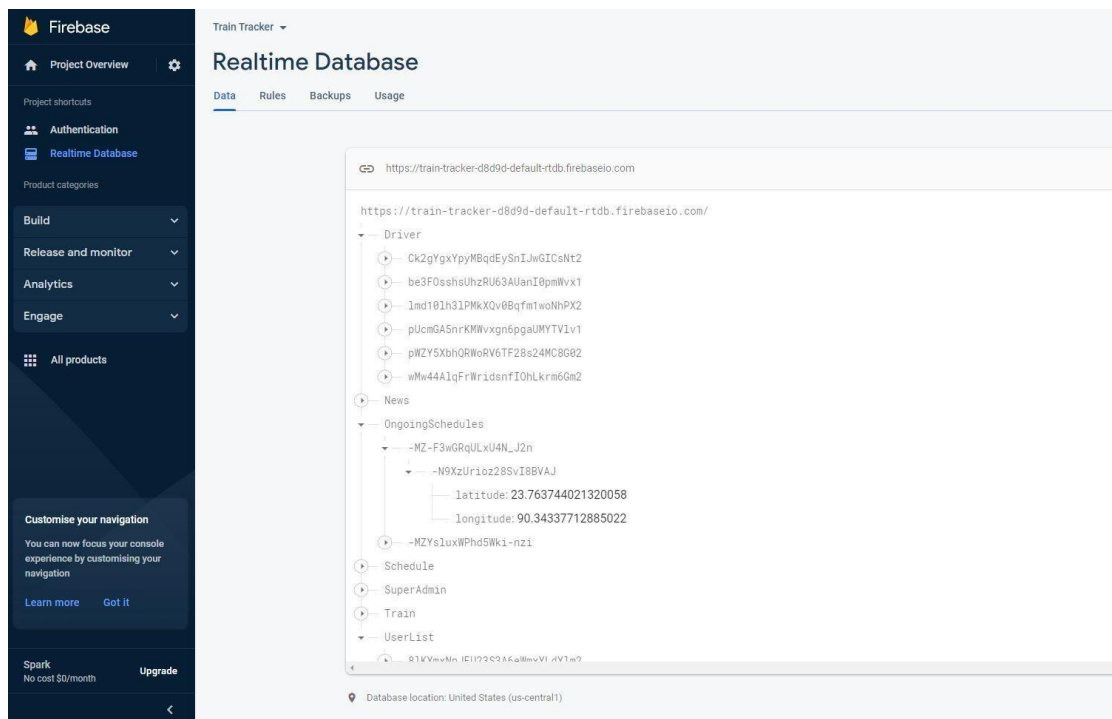

Figure 5.1: Collection of Database

5.2 Implementation of Interaction

The user interface is as straightforward as it can be. An application system with a user-friendly interface is what we plan to implement. This confirms a satisfying user experience. For instance, we used spinners and

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other common visuals. Thanks to its gorgeous and straightforward user interface, the application is easy to use.

5.3 Software Testing Methodology

A test is run in this section. Before publishing the software, you can test it continuously to ensure its usability, functionality, and quality [7]. Android testing comes in a variety of forms, including usability testing, hardware testing, and testing on home devices. Simply use Android Studio and JVM to execute a unit test on your home PC. The logical testing of uncompiled Java code is done using these tests for code analysis. Build test apps using Android APIs to hone your testing skills. One such tool is Mokito.
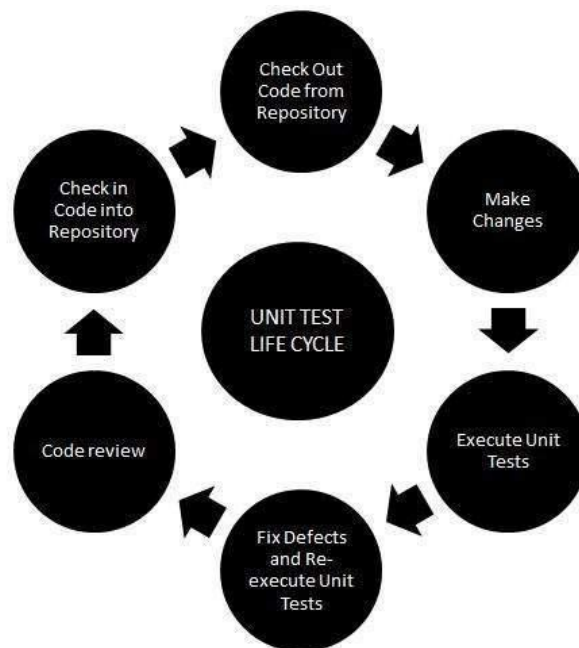

Figure 5.2: Unit Testing Diagram

To finish the unit, we chose various modules as distinct units. In our situation, we have taken great care to treat each module and the map activity as separate components. The units we have are therefore,

- Train Management.
- Driver Management
- Schedule Management

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- News Management
- Map Activity

To ensure that the system is faultless, the most appropriate test cases have been selected for each unit and independently tested.

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

In Bangladesh, trains are a widely used kind of transportation. The best choice for everyone in the case of a protracted train ride. However, due to erratic train timetables, many waste time waiting for trains. Therefore, by letting everyone know the specific location of a train so that everyone can plan their journeys properly, our technology can have a huge impact on society.

6.2 Impact on Environment

Nowadays, acquiring the most recent information on a train requires physical labor. To receive the most recent information on a train or the precise time of the timetable, people must go to the rail station. However, by employing this technology, users will be able to access the most recent data from their homes, which will cut down on their need to travel to the station and possibly their carbon footprint.

6.3 Ethical Aspect

The only data used is the location of a train, and the system will be monitored and maintained with the proper authorities. Which must not be harmful in any way, and the authority will freely reveal its location. This makes the system morally upright.

6.4 Sustainability Plan

The most common and well-established mode of transportation is train travel. Additionally, our system is made to verify the location of trains, which makes it extremely necessary. In addition, this technique can be employed in launch and bus systems. As a result, the system has proved extremely useful and sustainable.

CHAPTER 7

CONCLUSION

7.1 Discussion

With the aid of XML, Java, and Firebase database, the project is completed. Using a Smartphone and an internet connection, users can access it from any location. In order to assist those who are waiting for the arrival of their chosen autos, the system was created.

The system operates by enrolling as an administrator, driver, or user who will update locations and manage user locations.

7.2 Scope for Developments

Although the application is already user-friendly, we are considering adding a few more features to make it even more so in the future. There are various restrictions on our use that we can improve, such as minimizing the driver's option. If we put a system in every car that updates its location when it starts or stops, that would be great.

REFERENCES

1. GPS Tracker & Mileage Log app details accessed on 1st August 2022; 06:20 pm available at <https://play.google.com/store/apps/details?id=com.nomanprojects.mycartracks&hl=en>.

2. Travel Tracker Pro – GPS app details accessed on 1st August 2022; 06:20 pm available at <https://play.google.com/store/apps/details?id=vitalypanov.phototracker.pro&hl=en&gl=US>.

3. Vehicle Trip Logbook Tracker app details accessed on 1st August 2022; 06:20 pm available at <https://play.google.com/store/apps/details?id=ee.prey.triplog&hl=en&gl=US >.

4. Conceptual discussion: Use-Case Model, accessed on 1st August 2022; 06:20 pm available at <https://www.utm.mx/~caff/doc/OpenUPWeb/openup/guidances/concepts/use_case_model_C D178AF9.html >.

5. Business Process Modeling: Definition, Benefits and How to, accessed on 1st August 2022; 06:20 pm, available at <https://kissflow.com/bpm/business-process-modeling/>.

6. Adding a Backend to Your App in Android Studio, accessed on 1st August 2022; 06:20 pm, available at <https://android-developers.googleblog.com/2013/06/adding-backend-to-yourhttps://android-developers.googleblog.com/2013/06/adding-backend-to-your-app-in-android.html?m=1app-in-android.html?m=1>.

7. Benefits of testing in software development, accessed on 1st August 2022; 06:20 pm, available at <https://developer.android.com/training/testing/fundamentals>.

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