

BUS-Y: A Smart Bus Tracking System

BY

MD.FAHAD AL AMIN NOUMAN

ID: 142-15-3475

MD. ABIR IBNA ROUF

ID: 142-15-3841

MD. ARIFUL ISLAM

ID: 142-15-3516

JANNATUL FERDOUSH

ID: 142-15-3496

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

Supervised By

Mr. Raja Tariqul Hasan Tusher

Lecturer

Department of CSE

Daffodil International University

Co-Supervised By

Mr. Saiful Islam

Lecturer

Department of CSE

Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY

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APPROVAL

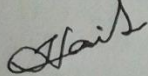
This Project titled “BUS-Y,” submitted by Md. Fahad Al Amin Nouman, ID No: 142-15-3475, Md. Abir Ibna Rouf, ID No: 142-15-3841, Jannatul Ferdoush, ID No: 142-15-3496 and Ariful Islam, ID No: 142-15-3516 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 6th May 2018.

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Professor and Head

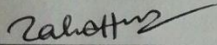
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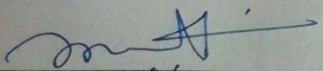
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Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



Md. Zahid Hasan
Assistant Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



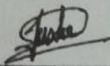
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Professor
Department of Computer Science and Engineering
Jahangirnagar University

External Examiner

DECLARATION

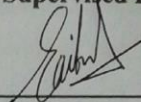
We hereby declare that; this project has been done by us under the supervision of **Mr. Raja Tariqul Hasan Tusher, Lecturer, Department of CSE Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree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

Supervised By



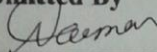
Mr. Raja Tariqul Hasan Tusher
Lecturer
Department of CSE, FSIT
Daffodil International University

Co-Supervised By

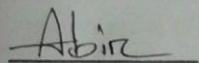


Mr. Saiful Islam
Lecturer
Department of CSE, FSIT
Daffodil International University

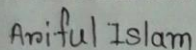
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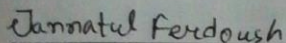
Md. Fahad Al Amin Nouman
ID: 142-15-3475
Department of CSE
Daffodil International University



MD. Abir Ibna Rouf
ID: 142-15-3841
Department of CSE
Daffodil International University



Md. Ariful Islam
ID: 142-15-3516
Department of CSE
Daffodil International University



Jannatul Ferdoush
ID: 142-15-3496
Department of CSE
Daffodil International University

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ABSTRACT

This project “**BUS-Y**” is an android application which helps the passengers of Dhaka city by showing the available route, available bus and their exact location. It also helps the user by informing them about the traffic situation of the road. Our aim is to create an easier and better communication for both passengers and the transport company. When a passenger search for his destination the app will provide best fit for him along with the route and the traffic situation with traffic situation. This also provide the exact location of that desired bus to the passenger so that one can choose the bus for their destination and also can save their valuable time. In this system the transporter can provide their bus routes and share their location. Our aim is to use one of the easiest and secure authentication with mobile number to authenticate the user. Our aim is the App support on the least expensive Android device so that it can be useful to mass people. And for internet our idea is keep the data flow minimal so that the data expense acceptable and can work on any network condition whether its 2G, 3G or LTE.

To develop this project, the most essential tool is Android SDK and Jason Tree & java coding and Firebase server. We also need Firebase spark administration tool for handling Jason tree database.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The world is changing with rapid transformation with technological advancement we achieved through out time. Like other countries Bangladesh is in that trend too with reach process data and new tools. Now we have pretty smart devices on our hand with some vast powerful tools. Devices with so many possibilities with GPS, Gyroscope, Proximity, Light and other sensors. So with little tweaking we can make our daily life smart and better. In our everyday life in Dhaka city we have to ride bus for communication purposes. People have to ride bus from different places for official, casual, educational purposes. But to get a bus timely is not an easy task. Everyday people waste their valuable time standing on the road for their desirable buses. For this reason, they can't reach their destination timely. The roads of Dhaka city are highly affected by heavy traffic jam.

This project is Android Base Online Bus management system which is a platform that provide an easy interface between the user and bus companies. In this system we provide the better transportation managing and help those who are new in the city to get their destination according to their preference. We created a location tracking system that helps the user to get the right information where about the bus is currently locating. In this system we developed a traffic awareness system that helps the user to know about traffic situation on the road before hitting the road.

1.2 Motivation of work

Private transportation is very popular now a day causing more traffic jam and pollution. Due to lack of up gradation or digitalization the public transportation system is becoming more and more subtle. When looking to the available Bus management system we found they are only some listed information about the bus system without any location tracking and whereabouts with the traditional search approach. We think this is a good opportunity for both company and the user to interact more effectively. Most of the people use bus so that information will be helpful for them. We face those problems regularly on our own lives. That's why we think to build a platform where we can get the information fast and most accurate to make these problems easier for us all.

1.3 Objectives

- Both Users and companies can operate it via Android and need the help of internet.
- Premium mobile authentication.
- User can search their route by source and destination and also bus names
- Company can easily provide their information and location with dedicated interface.
- Company can share their Bus location.
- User can get information about traffic on the road.
- User can select the easiest route among all the routes
- User can easily select the bus they want to ride

1.4 Expected Outcome

This project is to develop an app that help user to find their routes and to help the company to upgrade their management system. In this system user can search route, can search the source and destination can see the exact location of their desirable buses and finally they can choose the better route. The bus company can register their information with their bus route and name. Admin can manage the bus routes and user information. User can authenticate their user id using mobile number.

1.5 Report Layout

Report layout describes a summary of all the chapters. A brief summary of all chapters is given below:

- **Chapter 1:** We have discussed about the motivation, objectives and the expected outcome of the project. Later followed by the report layout. We also discussed about the apps potential and future possibilities.
- **Chapter 2:** In this chapter we discuss about background circumstances of our project. We also talk about the related work, comparison to other candidate systems, the scope of the problem and challenges of the project.
- **Chapter 3:** This chapter is all about the requirements like business process modeling, the requirement collection and analysis, the use case model of the project and their description, the logical relational database model and the design requirements.
- **Chapter 4:** In this chapter all the designs of the project. Front-end design, back-end design, interaction design and UX and the implementation requirements.
- **Chapter 5:** This chapter contains the implementation of database, front-end designs, interactions and the test results of the project.
- **Chapter 6:** We discussed about the conclusion and the scope for further developments which pretty much derive about the project.

CHAPTER 2

BACKGROUND

2.1 Introduction

Android is now detecting the smartphone market with one of the highest revenue. It is cheaper price and versatility of tools makes the android most accessible and useful tech in the world. Now in Bangladesh its available too with the help of 4G connectivity it's never been better.

The growth of Android App development recruitment has been driven by a combination of actual cost savings in the recruitment process, increased ease and efficiency for the companies and users. It is easier to income through ads from google that user can get the high-quality staff for free. Android also give the top most security features with their regular security patch update. Google play store and google development community helps a lot as it is an open source.

2.2 Related Works

There is no Bus management system with the support of location tracking yet. The closest thing is Dhaka wheels which is a list of bus information and google map image addition.

2.2.1 Dhaka Wheels

Dhaka wheels is a user-friendly app with list of buses on their route with only listed information and map image also maintaining a 4.8 rating out of 5 with 10 thousand downloads. User can search their desirable destination by providing source and destination and also can search by the bus name. If user search by providing source and destination then the search result shows the respectable bus and if user search by bus name then he can see the bus routes and map image. Though its lack in dynamic range of current information this is the best yet.

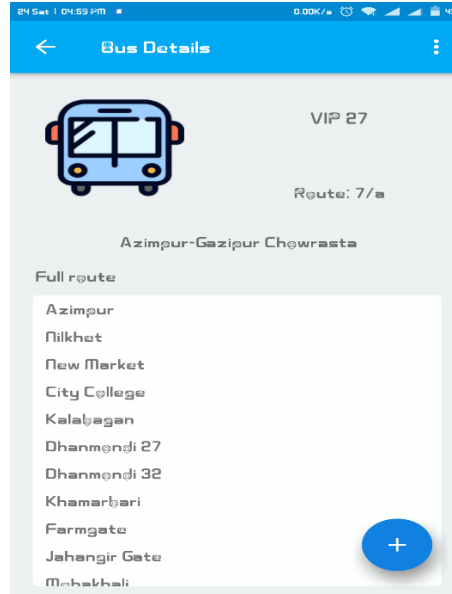


Figure: 2.1

2.2.1 Pathao & Uber



Figure 2.2

Though both pathao and uber is very popular in their respective area of transportation system but they are not a Bus transportation management app. However, both has their own location tracking system with their service provider bike riders or car drivers respectively. User can request ride by providing their source and destination. Driver accept and give them ride.

2.3 Comparative Studies

There are some systems which are related to our work but most of the systems are just Giving the user the route, the bus list of that route. But in our system we are also providing the current location of that bus so that the user can take the quick decision in choosing the route and bus.

2.4 Challenges

During working on this project, we faced some challenges and here we listed some of them:

- Huge data collection
- Database handling
- Google map API integration

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

Business process modeling (BPM) in systems engineering is the activity of representing processes of an enterprise, so that the current process may be analyzed or improved by subject matter experts. , the process model can be derived directly from events' logs using process mining tools [1]. Redesigning a process and implementing it is not a speedy enterprise. It can take months and occasionally years, depending on the extent of the process and sub-processes, how many people and systems are involved and how much of it needs to be redesigned. We used a UML Use Case Model as a business process model.

3.2 Analysis

In our everyday life we move one place to another, so we need transports. Bus is the most common transport system for us. But in Dhaka city we face many problems to get a bus, because of lots of population. Specially at office time it become very tough for us to get a bus. And sometimes we need to wait a long time for a bus. To solve this problem we decide to make a application which can be useful for us.

This application is not only for passenger but also for transporter. Both of the parties will get many benefit from it.

3.3 Feasibility Study

To make this possible we collect data from the possible user of the apps, and hear their preferences. And from it we acquire that this feature will be helpful for them.

For passenger:

- Can search required transport.
- What's the traffic situation in the road.
- Which public transports are available?
- Can know their exact location
- Search bus by transport name
- Search bus by route
- VIP services are available
- All the routes from his destination
- He can easily choose his transport he want.

For transporter:

- Can modify information about the transport
- If the transport is new, then transporter can add his information
- Can add route.

3.4 Requirement and procedure

At first user have to download this application from google play store, and install it. After installation user have to registration, and before registration he have to make sure that if he want to registration as a passenger or transporter. It is a mobile (android base apps) So all it need to run is:

- A GPS Activated Android phone.
- Working internet connection.

To use the app both passenger and transporter have to give some information:

As a passenger:

- Passenger need to provide name and address.
- After registration the passenger will automatically logged in the user.
- Then passenger can search by route or transport name
- Then this application will show how many routes from his destination and how many busses are available
- From those busses he can choose his utile transport.

As a transporter:

- Transporter need to provide transport name, id, and routes.
- If the transport's information is already available in the application then transporter can easily find it by search the transport name, and also can modify the information.
- Transporter need to share their location on so that passenger can find the location of this transport.
- Transporter need to open their data connection and background data on to keep sharing their location.

3.5 Use Case Diagram

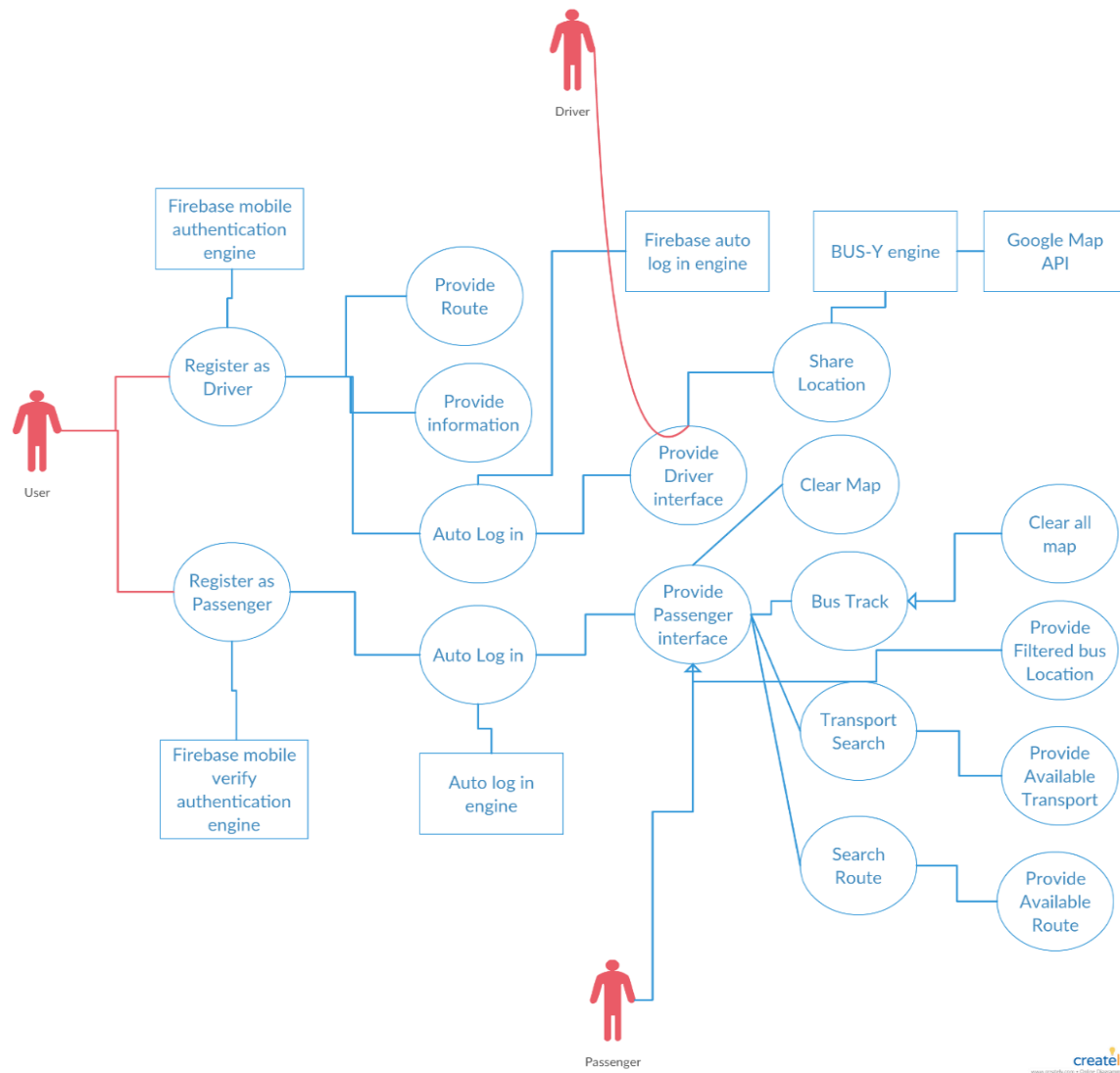


Figure 3.1: Use Case Diagram

Use Case Model Description

Table: 3.1

Use Case	Registration
Primary Actor	User, Transporter
Secondary Actor	Null
Pre-Condition	Internet Connection
Scenario	Enter Number Enter Category Enter Name
Post Condition	Registration successfully or failed

Table: 3.2

Use Case	Log In
Primary Actor	User, Transporter
Secondary Actor	Null
Pre-Condition	Must be registered
Scenario	Logged in automatically
Post Condition	Logged in successfully or warning

Table: 3.3

Use Case	Search route 01
Primary Actor	User
Secondary Actor	Null
Pre-Condition	Logged in
Scenario	Input source Input destination
Post Condition	Successfully find the route

Table: 3.4

Use Case	Search route 02
Primary Actor	User
Secondary Actor	Null
Pre-Condition	Logged in
Scenario	Get available bus
Post Condition	Successfully find the bus

Table: 3.5

Use Case	Get available route
Primary Actor	User
Secondary Actor	Null
Pre-Condition	Null

Scenario	Get available route
Post Condition	Null

Table: 3.6

Use Case	Get available bus
Primary Actor	User
Secondary Actor	Null
Pre-Condition	Null
Scenario	Get available bus
Post Condition	Null

Table: 3.7

Use Case	Get current location
Primary Actor	User
Secondary Actor	Null
Pre-Condition	Null
Scenario	Get current location
Post Condition	Successfully get current location

Table: 3.8

Use Case	Get available nearby
----------	----------------------

Primary Actor	User
Secondary Actor	Null
Pre-Condition	Null
Scenario	Get available nearby buses
Post Condition	Successfully get available nearby

Table: 3.9

Use Case	Provide current location
Primary Actor	Null
Secondary Actor	Null
Pre-Condition	Null
Scenario	Get current location of driver by Google Map API
Post Condition	Null

Table: 3.10

Use case	Database accessing
Primary Actor	Null
Secondary Actor	Null
Pre-Condition	Database must be active Required data must be available on database
Scenario	App will refresh with the latest location and data
Post-Condition	Null

Table: 3.11

Use case	Authentication
Primary Actor	User
Secondary Actor	Firebase mobile authentication
Pre-Condition	Data connection must be on
Scenario	Authentication code send to the user mobile number to verify
Post-Condition	Successfully code sent and verified.

Table: 3.12

Use Case	Bus-Y Auto log in
Primary Actor	Database Verification
Secondary Actor	Null
Pre-Condition	Previous log in authentication required
Scenario	Check existing data available on user ID on database.
Post-condition	User will be automatically log in .

3.6 Logical Data Model

3.6.1 Class Diagram

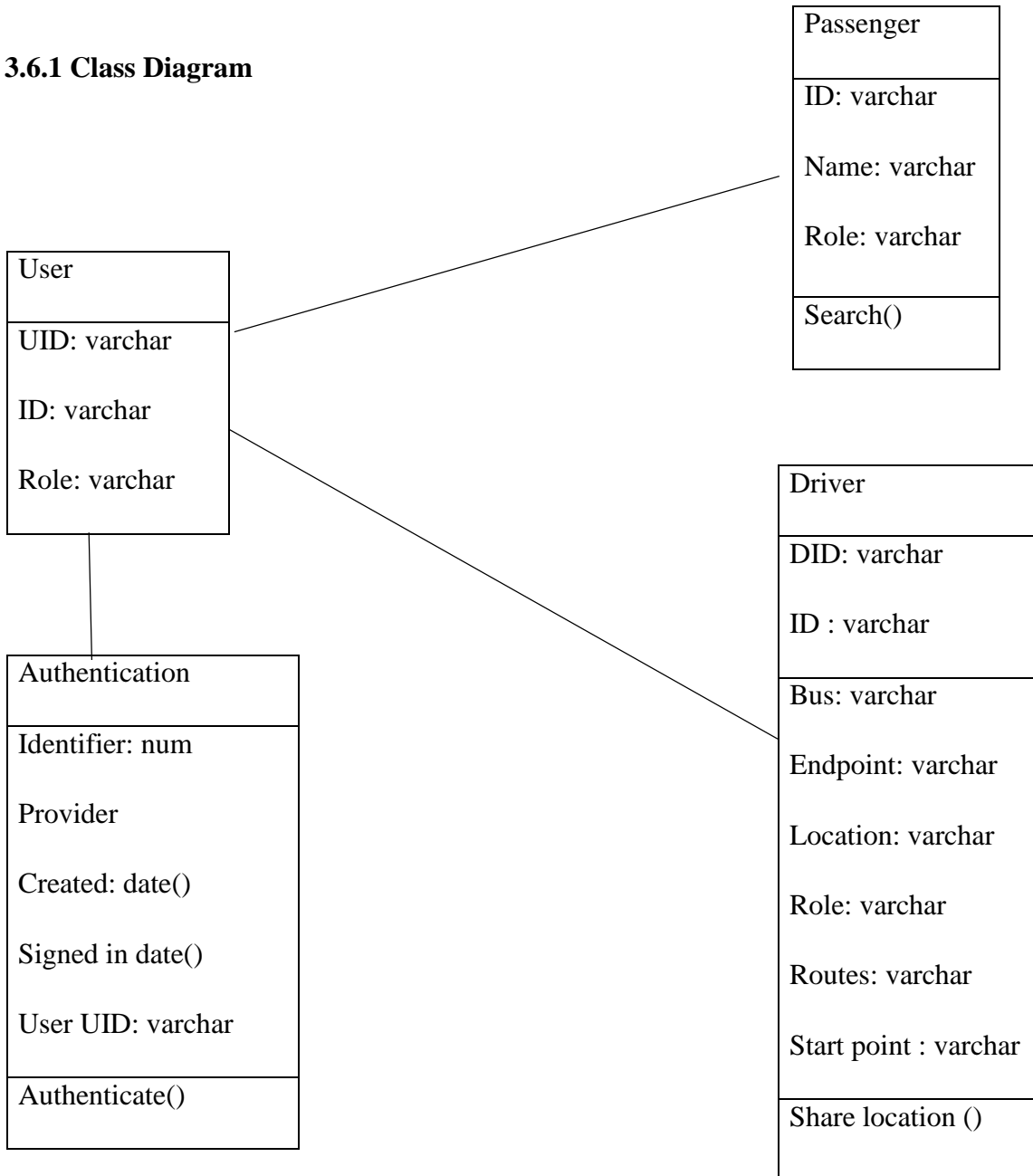


Figure 3.2: Class Diagram

3.6.2 ER Diagram

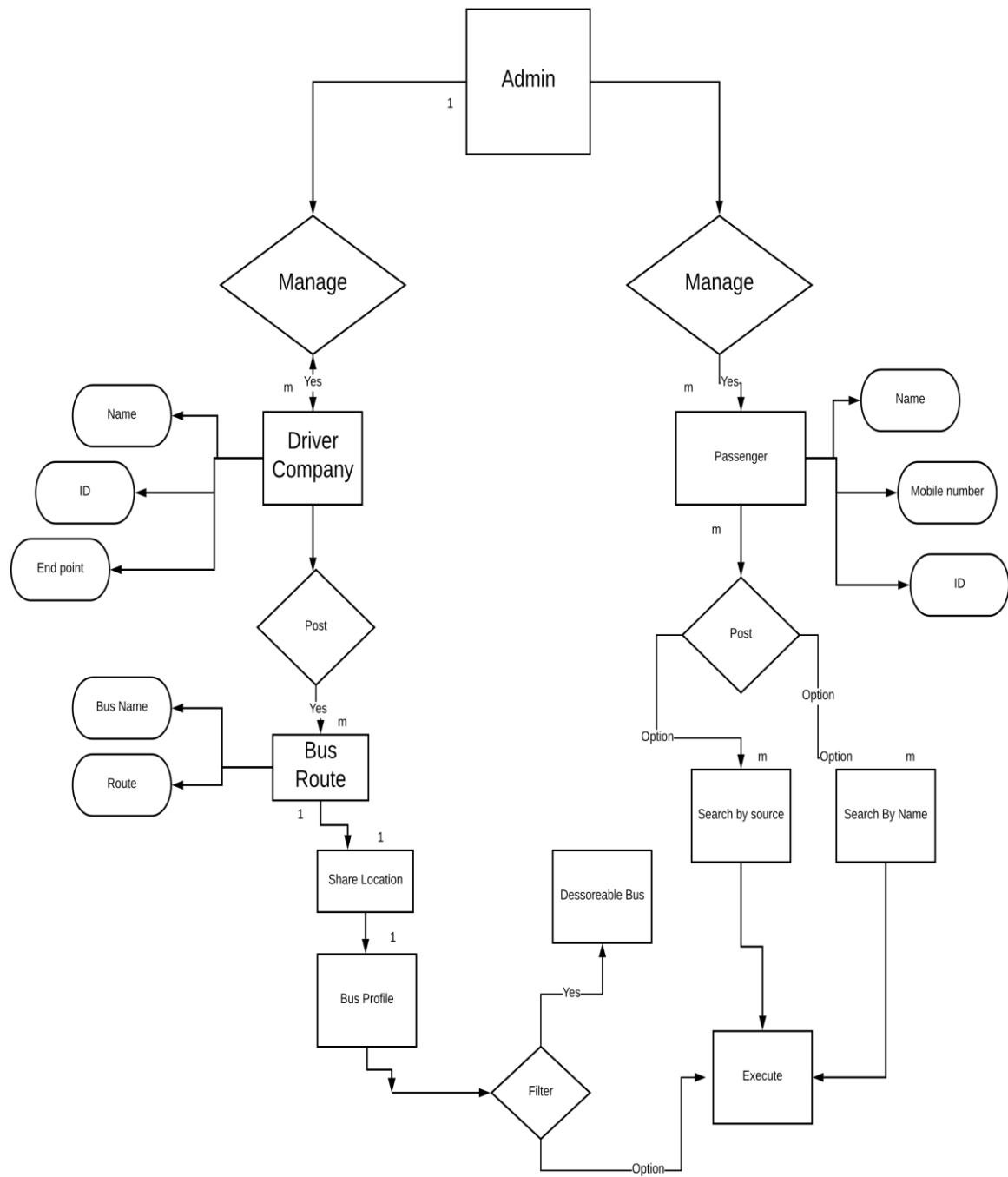


Figure 3.3

CHAPTER 4

DESIGN SPECIFICATION

4.1 User Interface Design

Front end design is about user interface of the application, a way of interaction between user and the application server. Design is known as a client-side development. To make a good app the front-end design must be user friendly and should be interactive. We created a simple front-end user interface.

Here is our user interface design and interactions are given below with the respective function.

4.1.1: Starting interface

After starting the apps user will have an option to authenticate him for security and custom user experience. User have to provide his mobile number. The mobile number will be send to the firebase authentication system. A verification code will be sent to the

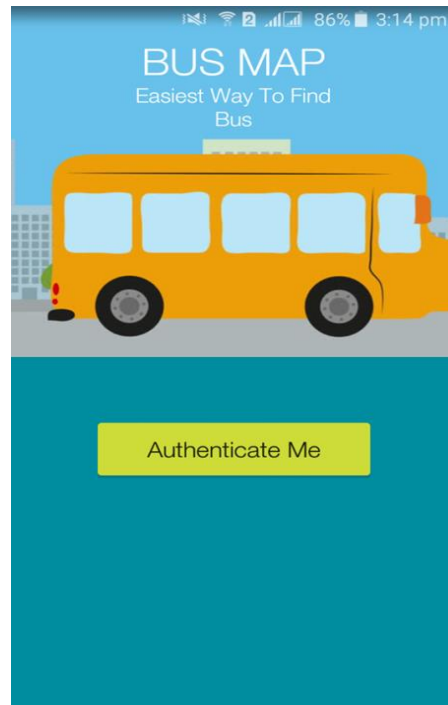


Figure : 4.1

4.1.2 Registration:

To register user have to authenticate via is mobile number. User have to put his mobile number to verify himself. A security code will be send to user from the server. For security purpose the code will be valid for only two minutes. If the mobile number is on the phone where he using the apps no need to put the code manually. The app will automatically recognize the code and pass to the next level.

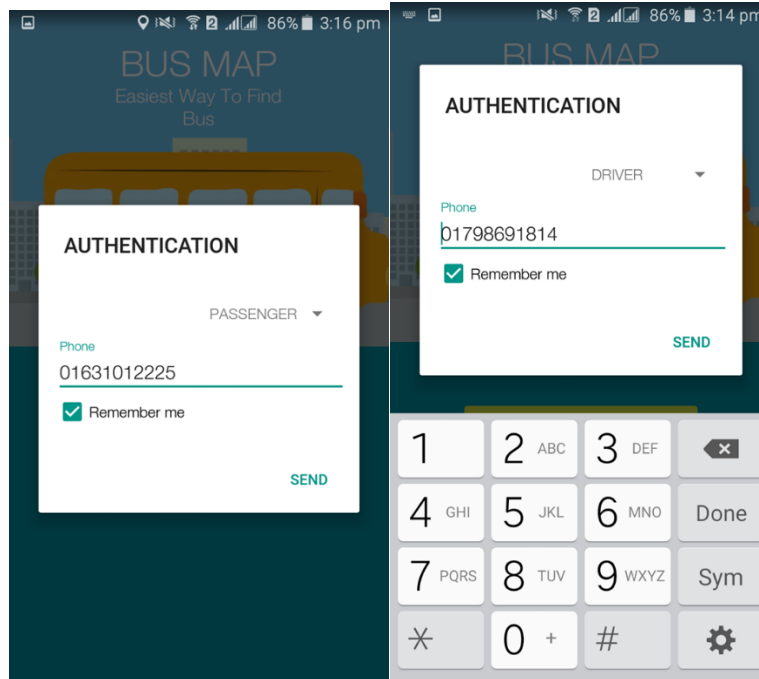


Figure: 4.2

4.1.2.1 Register as passenger: A passenger has to give his name and home address.

4.1.2.2 Register as Driver: A Driver or the respective company have to give the bus route and share their location by giving access to the GPS on the Android, if don't there is an option to directly go the location access panel on the settings of android.

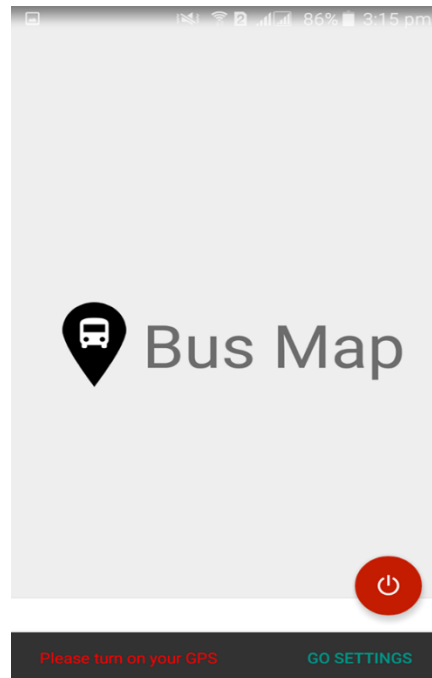


Figure: 4.3

4.1.3 Log In:

User don't have login every time they use their apps. The mobile authentication of firebase has its own security system. It is automatically recognize the device and give the user direct access like WhatsApp, imo etc.

4.1.4 Search by bus: User can search their desirable bus location by searching their name. After searching the name of bus, the server will show the bus location and the bus available on two-kilometer radius. The server will also show the bus stands nearby and also the user location that will guide the user to the bus-stand.

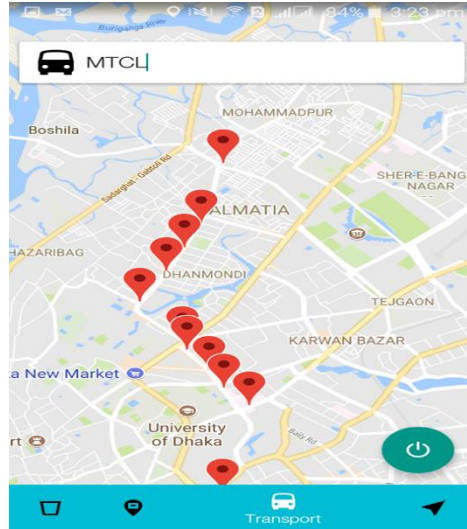


Figure: 4.4

4.1.4 Search by Route: This option helps when the user doesn't know the bus and route. In this user put their source and destination to search. The app will find suitable buses for the user and guide him through it with the bus stand and bus location.



Figure: 4.5

4.1.5 Clear Map



Figure: 4.8

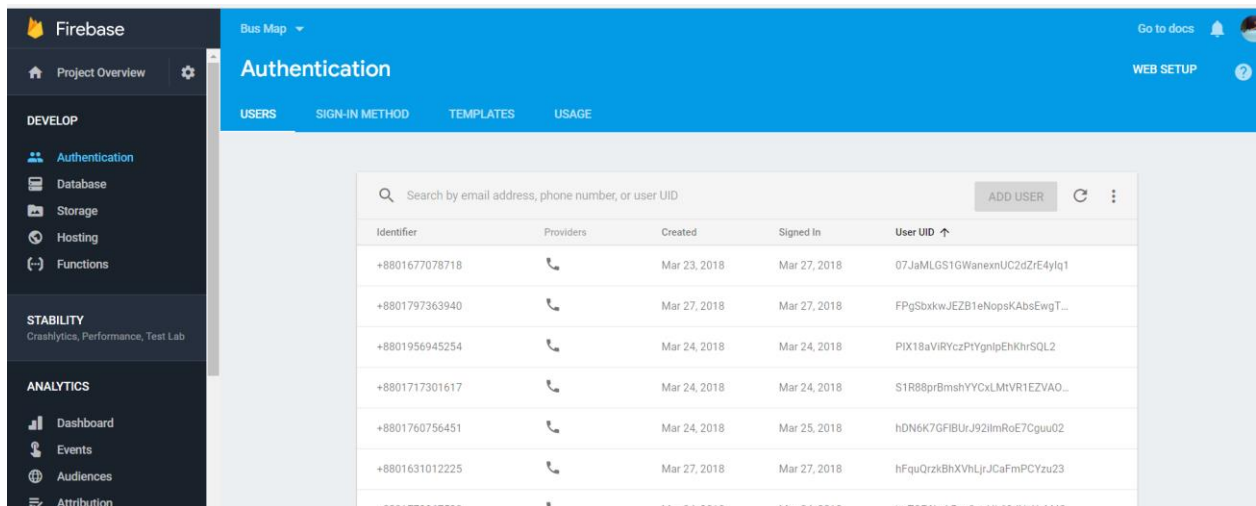
- In this option the user can clear his previous search and point on the map.

4.1.6: Exit

The exit button successfully closes the app and also clear the map.

4.2 Back End

The logical part & the data attribute of a software happened in the back-end. It is the most crucial part of a software. The whole system depends on it. Usually back-end refers server side. In backend there are many factor consists like the scripting languages or the server side language, database management, security, authentication, authorization, data parsing, data validating, data backups and so on. Here we use firebase database system using Jason language. Firebase is real time database which will update the database frequently if any changes happened to the user front. And for logical use we use android sdk java to develop the logic along with google map API.



The screenshot displays the Firebase Authentication console. On the left is a dark sidebar with the 'Firebase' logo and navigation links for 'Project Overview', 'DEVELOP' (Authentication, Database, Storage, Hosting, Functions), 'STABILITY' (Crashlytics, Performance, Test Lab), and 'ANALYTICS' (Dashboard, Events, Audiences, Attribution). The main area has a blue header with 'Bus Map' and 'Authentication' tabs. Below the header are sub-tabs: 'USERS', 'SIGN-IN METHOD', 'TEMPLATES', and 'USAGE'. The 'USERS' tab is active, showing a table of users with columns: Identifier, Providers, Created, Signed In, and User UID. A search bar at the top of the table allows searching by email address, phone number, or user UID. An 'ADD USER' button and a refresh icon are also present. The table lists six users with their respective phone numbers, creation and sign-in dates, and their User UIDs.

Identifier	Providers	Created	Signed In	User UID ↑
+8801677078718	Phone	Mar 23, 2018	Mar 27, 2018	07JaMLGS1GWanexnUC2dZrE4ylq1
+8801797363940	Phone	Mar 27, 2018	Mar 27, 2018	FPgSbtkwJEZB1eNopsKAbsEwgT...
+8801956945254	Phone	Mar 24, 2018	Mar 24, 2018	PIX18aViRYczPYgnipEhKhrSQL2
+8801717301617	Phone	Mar 24, 2018	Mar 24, 2018	S1R88prBmshYYCxlMtvR1EZVAO...
+8801760756451	Phone	Mar 24, 2018	Mar 25, 2018	hDN6K7GF8UrJ92ilmRoE7Cguu02
+8801631012225	Phone	Mar 27, 2018	Mar 27, 2018	hFquQrzkBhXVhLjrJCaFmPCYzu23

Figure: 4.6

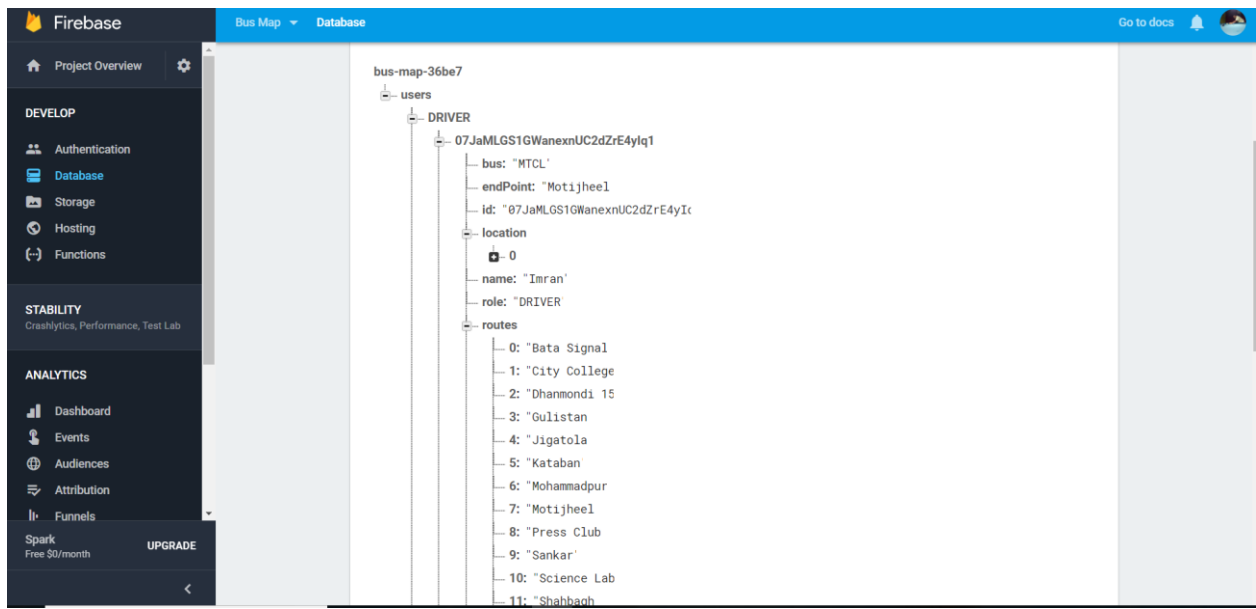


Figure: 4.7

4.3 Implementation of Requirements

- The design needed to implement in Android SDK: JAVA.
- Database have to be real time (Engine: Firebase)
- Design to be hosted on google play store.
- Real time access from the server.
- Authentication problem must be recognized.
- Any wrong information should be notified to the user.
- Unauthenticated attach needed to prevent with maximum attach limit.
- Invalid data input must show error messages.
- For specific design must be accessible for any android higher above 5. Lollipop.
- For visual aspect font and other icons collected from google.
- Authentication & validation by firebase mobile authentication system.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

The Firebase Real time Database is a cloud-hosted database. Data is stored as JSON and synchronized in Real time to every connected client. All clients share one Real time Database instance and automatically receive updates with the newest data.

Instead of typical HTTP requests, the Firebase Real time Database uses data synchronization every time data changes, any connected device receives that update within milliseconds. Provide collaborative and immersive experiences without thinking about networking code.

Firebase apps remain responsive even when offline because the Firebase Real time Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state. The Firebase Real time Database can be accessed directly from a mobile device or web browser; there's no need for an application server. Security and data validation are available through the Firebase Real time Database Security Rules, expression-based rules that are executed when data is read or written.

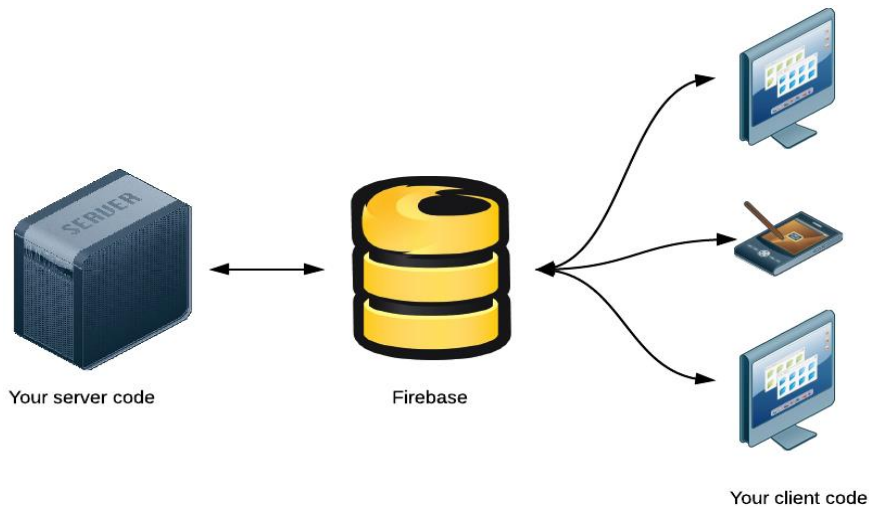


Figure: 5.1

5.2 Implementation of the database

User: Main node of the Jason tree table.

Driver: All recodes of the driver and the bus company recorded on this class of the database.

bus: Bus name which the driver driving with the company name.

endpoint: it stores the bus's final destination point.

Id: A unique id generated by the database to keep the track of the bus for further purpose.

Name: Name of the user.

Role: Role of the user.

Passenger: All records of the passenger recorded in this class of the database.

Name: Name of the user

Role: role of the user.

Verify Id: A unique id generated by the database to keep the track of the user for further Authentication.

5.3 Testing Implementation

Testing implementation is a process of a system in where a tester or an architect of that system will check cases and its specification. It may have some limitation too.

Table 5.1

Test Case	Test Input	Expected Outcome	Obtained Outcome	Passed/Failed	Tested on
1.Registration	Registered by phone number	Successfully registered	Successfully registered	Pass	25-03-18
2. Registration	Authentication with fake phone number	Failed with a warning to re-enter	Registration Denied	Pass	25-03-18
3. Registration	Registration with any field left empty	Failed with a warning to Re-enter	Registration Denied	Pass	25-03-18
4. Log in	Login via various devices such as tablet, pc ,cell phones supports	Successfully logged in	Successfully logged in	Pass	26-03-18
5.Location sharing	Location sharing is off.	Warn and gave a direct link to location sharing	Sharing location worked	Pass	27-03-18

6.Search Route	Input source & Destination	Successfully got	Successfully got	Pass	28-03-18
7.Search Bus	Input source & Destination	Successfully got	Successfully got	Pass	28-03-18
8.traffic jam	Input source & Destination	Successfully got	Successfully got	Pass	28-03-18

5.4 Test Results and Report

Test report is a formal way to represent the tested result. It is away to estimate the testing result. Data is recorded in an organized manner and describes the conditions of operating. Comparing with the test objectives it shows the test result. A system is ready or not for implementation it can be examined through a test report.

There are many types of testing:

- Functionality
- Regression
- Security
- Performance
- Scalability
- Usability
- System interoperability
- Localization
- Disaster recovery
- Installation/ upgrade

CHAPTER 6

CONCLUTION AND FUTURE SCOPE

6.1 Discussion and conclusion

The system will build up communication between passenger and transporter. This project helps the passenger to find the better route, better transport and current decision to choose the transport. It helps the passenger to save his valuable time by providing the current location of that desirable bus. It is an user friendly android application. It will make an easier and smarter communication in Dhaka city. The system will be come with more upgrades and new feature in future. It will be upgraded with its web interface layout. This application will inspire people to use bus instead of private car in the road of Dhaka city.

6.2 Limitation

Our application has some limitation. Those are

1. Not work in offline mode
2. People can have fun by providing wrong information in the disguise of transporter.
3. The database of this application is weak due to obsolete to the user.

6.3 Future Scope

1. Create an offline version of the app with basic features.
2. Add an option to call 999 for security purpose.
3. Adding sitting buses seat capability.

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