



MUHAFIZ

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Abstract

Muhaffiz is a comprehensive app for medical emergency transportation that functions similarly to popular ride-hailing or ride-sharing services, with the added convenience of a ride-later option for non-emergency situations. The app is equipped with three major modules to cater to different needs. The first module is Advanced Life Support (ALS), which allows users to book ambulances with advanced healthcare facilities. Using the user's current location, Muhaffiz suggests the top 5 nearest hospitals based on the type of emergency, considering factors like traffic intensity and distance. The second module is Basic Life Support (BLS), which enables users to book ambulances without advanced equipment and select their own source and destination. The third module is designed for patients who need to be transferred from one hospital to another. Muhaffiz streamlines the booking process and provides a comprehensive solution for medical transportation needs

Table Of Content

List Of Figures:	8
1. Introduction:	10
1.1 Problem Statement	10
1.2 Need for Project	11
1.3 Project Scope	11
1.4 Not in Scope	12
1.5 Stakeholders	12
1.5.1 Project Developers	12
1.5.2 Project Supervisors	12
1.5.3 Users	12
1.6 Operating Environment	13
1.6.1 Operating System:	13
1.6.2 Hardware:	13
1.6.3 Development Environment:	13
1.6.4 Network Connectivity:	13
1.6.5 Data Storage:	13
1.6.6 Security:	13
1.7 System Constraints	14
1.7.1 Software Constraints and Hardware Constraints	14
1.7.2 Cultural Constraints	14
1.7.3 User Constraints	14
1.7.4 Legal Constraints	14
1.8 Assumptions and Dependencies	14
2. Requirements:	15
2.1 External Interface Requirements:	15
2.1.1 User Interface:	15
2.1.2 Driver Interface:	15
2.1.3 Hardware Interface:	15
2.1.4 Software Interface:	15
2.2 Functional Requirements:	16
2.2.1 Functional Hierarchy:	16
2.2.1.1 Functional Hierarchy of Users:	16
2.2.1.2 Functional Hierarchy of Drivers:	16
2.3 Use Cases	17
2.3.1.1 User Registration	17
2.3.1.2 User Login	18
2.3.1.3 Service Option Screen	19

2.3.1.4.	User ALS	20
2.3.1.5.	User BLS	21
2.3.1.6.	User Patient Transfer	22
2.3.1.7.	Driver Registration	23
2.3.1.8.	Driver Login	24
2.3.1.9.	Driver ALS	25
2.3.1.10.	Driver BLS/Patient Transfer	26
3.	Non-Functional Requirements.....	27
	Safety Requirements.....	27
	Security Requirements.....	27
3.	System Design	28
3.1.	Assumptions and Dependencies	28
3.2.	System Architecture.....	28
3.2.1	System Level Architecture	28
3.2.2	Software Architecture.....	29
3.3.	Design Strategy:	29
3.4.	Database Design	30
3.4.1	ER Diagram	30
3.5.	Data Dictionary.....	31
3.5.1	Data 1.....	31
3.5.2	Data 2.....	32
3.5.3	Data 3.....	32
3.5.4	Data 4.....	33
3.5.5	Data 5.....	33
3.5.6	Data 6.....	34
3.5.7	Data 7.....	34
3.5.8	Data 8.....	35
3.5.9	Data 9.....	35
3.5.10	Data 10.....	36
3.6.	Application Design	37
3.6.1	Sequence Diagram.....	37
3.1.1.1	Sequence Diagram 1	37
3.6.1.1	Sequence Diagram 2.....	37
3.6.1.2	Sequence Diagram 3.....	39
3.6.2	State Diagram	40
3.6.2.1	State Diagram 1	40
3.6.2.2	State Diagram 2	41
3.6.2.3	State Diagram 3	42
4.	Implementation	43
4.1.	System Architecture.....	43
4.2.	Development Tools.....	43
4.3.	User Interface	44

5. Testing and Evaluation	48
5.1. Purpose of Test Plan	48
5.2. Environmental Needs.....	48
5.3. Validation Testing	48
5.3.1 Items to be Tested/Not Tested	48
5.3.2 Test Cases.....	49
5.3.2.1 Test Case 1	49
5.3.2.2 Test Case 2	49
5.3.2.3 Test Case 3	50
5.3.2.4 Test Case 4	50
5.3.2.6 Test Case 6	51
5.3.2.7 Test Case 7	51
5.3.2.8 Test Case 8	52
5.3.2.9 Test Case 9	52
5.3.2.10 Test Case 10	52
5.3.1.1 Test Case	53
6. Conclusion	54
7. Reference	55

List Of Figures:

Figure 1 FUNCTIONAL HIERARCHY OF MUHAFFIZ USER	16
Figure 2 FUNCTIONAL HIERARCHY OF MUHAFFIZ DRIVER	16
Figure 3 System Level Architecture	28
Figure 4 Software Level Architecture	29
Figure 5 ER DIAGRAM OF MUHAFFIZ.....	30
Figure 6 Sequence Diagram for user using ALS.....	37
Figure 7 Sequence Diagram for user using BLS.....	38
Figure 8 Sequence Diagram for user using Patient Transfer.....	39
Figure 9 State Diagram For ALS.....	40
Figure 10 State Diagram For BLS.....	41
Figure 11 State Diagram For Patient Transfer.....	42
Figure 12 System Architecture	43
Figure 13 Registration/Login Module for a non-driver User	44
Figure 14 Depiction of User requesting an Ambulance and ETA of the Driver	44
Figure 15 Depiction of ETA of Driver and ETA to Destination	45
Figure 16 Registration/Login Module of Driver's Application.....	45
Figure 17 Requesting Details of Driver's Vehicle and Home page of Driver's Application.....	46
Figure 18 Driver receiving a ride request.....	46
Figure 19 Driver being displayed ETA to/from destination.....	47
Figure 20 Depiction of About Me, rating and fare collection of Driver's application	47

List Of Tables:

Table 1 USECASE FOR USER REGISTRATION.....	17
Table 2 USECASE FOR USER LOGIN	18
Table 3 USECASE FOR SERVICE OPTION SCREEN	19
Table 4 USECASE FOR USER ALS	20
Table 5 USECASE FOR USER BLS	21
Table 6 USECASE FOR USER PATIENT TRANSFER	22
Table 7 USECASE FOR DRIVER REGISTRATION	23
Table 8 USECASE FOR DRIVER LOGIN	24
Table 9 USECASE FOR DRIVER ALS	25
Table 10 USECASE FOR DRIVER BLS/PATIENT TRANSFER	26
Table 11 DATA DICTIONARY FOR DRIVER REGISTRATION	31
Table 12 DATA DICTIONARY FOR USER REGISTRATION	32
Table 13 DATA DICTIONARY FOR USER LOGIN INTERFACE	32
Table 14 DATA DICTIONARY FOR SERVICE SELECTION INTERFACE	33
Table 15 DATA DICTIONARY FOR ALS MAIN INTERFACE	33
Table 16 DATA DICTIONARY FOR BLS MAIN INTERFACE	34
Table 17 DATA DICTIONARY FOR PATIENT TRANSFER MAIN INTERFACE	34
Table 18 DATA DICTIONARY FOR DRIVER LOGIN INTERFACE	35
Table 19 DATA DICTIONARY FOR DRIVER MAIN INTERFACE BLS/PATIENT TRANSFER	35
Table 20 DATA DICTIONARY FOR DRIVER MAIN INTERFACE (ALS)	36
Table 21 TEST CASE FOR USER AND DRIVER REGISTRATION	49
Table 22 TEST CASE FOR USER AND DRIVER LOGIN	49
Table 23 TEST CASE FOR USER SERVICE OPTION INTERFACE	50
Table 24 TEST CASE FOR USER ALS INTERFACE	50
Table 25 TEST CASE FOR USER BLS INTERFACE	50

Table 26 TEST CASE FOR USER PATIENT TRANSFER INTERFACE	51
Table 27 TEST CASE FOR DRIVER ALS INTERFACE	51
Table 28 TEST CASE FOR DRIVER BLS/PATIENT TRANSFER INTERFACE	52
Table 29 TEST CASE FOR DRIVER EARNING INTERFACE	52
Table 30 TEST CASE FOR DRIVER RATING INTERFACE	52
Table 31 TEST CASE FOR USER RATING INTERFACE	53

1. Introduction:

With the increasing demand for emergency medical services, Muhaffiz provides a convenient platform for users to book ambulances in a few simple steps. Whether it's a medical emergency or a non-emergency situation, Muhaffiz enables users to quickly and easily request an ambulance with the tap of a button. This application is designed to provide timely assistance to those in need and to ensure that help reaches them as quickly as possible.

The user-friendly interface, real-time tracking, and secure payment options are some of the features that make this application a reliable and efficient choice for booking ambulance services.

Muhaffiz will help the users to track their booking and find the nearest hospital by doing the distance analysis. Muhaffiz also focuses on making the process of patient transfer easy, smooth and user friendly.

Muhaffiz is based on three modules which are 1-
ALS (Advanced Life Support)
2-BLS (Basic Life Support)
3-Patient Transfer

1.1 Problem Statement

The ambulance service operating in Pakistan has no option to track the status of the booked ambulances at the same time. There is no option for the driver to know the current status of the routes through which the driver has to go to reach the destination as soon as the driver can. The number of ambulances with the facility of advanced life support is also quite low. This is the reason why people who are in need of ambulances often take care of emergency situations by transporting the patient in their own transports but this availability of own transport cannot be guaranteed in some cases. In some cases, the patient is unable to know the status of their booking or unnecessary delay if the driver is stuck somewhere. Therefore, in order to tackle these issues and lessen the risk of life loss, we have come up with the idea of giving the ambulance services an online platform to provide easy access to user.

1.2 Need for Project

The need for Muhaffiz arises from the urgent requirement for a reliable and efficient way to request medical transportation in emergency situations. In times of medical emergencies, quick and timely access to emergency medical services can make all the difference in saving lives.

With the increasing number of emergencies and accidents, the demand for a streamlined ambulance booking process is more critical than ever. Traditional phone-based booking systems are often unreliable, inefficient, and prone to errors, resulting in delays and potentially fatal consequences.

Muhaffiz can bridge this gap by providing a user-friendly platform that allows users to book an ambulance in a few clicks. Such an application can offer various features such as real-time tracking of ambulance location, estimated arrival time, and quick access to emergency services.

The need for an ambulance booking application is crucial, especially for individuals with medical conditions that require immediate attention, elderly people, and those living in remote areas with limited access to medical services. The application can potentially save lives by enabling faster response times and reducing the chances of medical emergencies turning into fatal incidents.

1.3 Project Scope

Muhaffiz has two separate applications for user and driver named as Muhaffiz Driver and Muhaffiz User. In Muhaffiz User the user has the option of signup by providing simple information of name, email id, password and contact number after login the user has to select the purpose of using Muhaffiz platform which is either they want to use ALS module, BLS module or Patient Transfer Module.

The ALS module will be used for critical emergency purposes. In ALS module the user has to enter their area and type of emergency that Muhaffiz will do is that using this information first using the type of emergency it will sort hospitals under the radar of 5 kms from the current location after sorting hospitals it will apply and distance and will recommend the nearest top 5 hospitals for that user. After that the user has to select from that top 5 hospitals and that hospital location will be set as the destination of the ride.

BLS is for non emergency purposes. In BLS the user has to pick and select their own destination, algorithm for the nearest hospital will not be used. However, the source will be selected automatically.

Patient Transfer is for transferring the patient from one hospital to another. In Patient Transfer the user can set the source and destination according to their own wish.

In the Driver's App the driver has to first register by providing some personal information and information about their vehicle. The driver is given the option to select the services they want to provide.

If the driver is serving in BLS or Patient Transfer they can cancel the ride if they don't want it but if the driver is serving in ALS there is no option but to accept it and reach the destination as soon as they can.

1.4 Not in Scope

Will not be dealing with any online money transfer, will not be collaborating with any healthcare organization for data. Will not maintain info related to any organization, only specific records of users and drivers will be maintained.

1.5 Stakeholders

This project contains several stakeholders as well. They will be accounted for in the following list:

1.5.1 Project Developers

This project has three developers who are working on all the needed tasks for the project which includes project planning, development, documentation, and validation of the objectives.

1.5.2 Project Supervisors

The project supervisor is Ms. Anaum Hamid. She has the role to supervise the project and guide the project developers.

1.5.3 Users

The users of the project are Muhaffiz Users (Users booking the ambulance) and the Muhaffiz Drivers.

1.6 Operating Environment

1.6.1 Operating System:

The application can run on Android devices, which means the operating environment must support these operating systems.

1.6.2 Hardware:

The application is compatible with a range of devices, including smartphones and tablets, with varying hardware specifications. The operating environment must support the required hardware components, such as GPS, camera, and network connectivity.

1.6.3 Development Environment:

The application will require a development environment that supports Flutter framework development, such as Android Studio or Visual Studio Code, with Flutter SDK and relevant plugins installed.

1.6.4 Network Connectivity:

The application requires an active internet connection to function correctly. The operating environment must support the necessary network connectivity, including 3G, 4G, and Wi-Fi.

1.6.5 Data Storage:

The application will store user data, including personal information, booking history, and other details. The operating environment must support secure data storage, i.e cloud-based storage.

1.6.6 Security:

The application must ensure the security of user data. The operating environment must support secure protocols and standards for encryption, authentication, and authorization.

1.7 System Constraints

1.7.1 Software Constraints and Hardware Constraints

The application can run on Android devices, which means the operating environment must support these operating systems. The application is compatible with a range of devices, including smartphones and tablets, with varying hardware specifications. The operating environment must support the required hardware components, such as GPS, camera, and network connectivity.

1.7.2 Cultural Constraints

The user must comprehend the English Language because all the Interfaces are designed with English understanding in mind. Furthermore, the user should know the working of an application and how an application works; so that means we require our users to be literate with mobile phones.

1.7.3 User Constraints

To use the application, we require that the user knows how to operate mobile phones which means our users should be literate with phones. Therefore, very small kids are not the target audience and we require that people older than 18 should use the application. The User must also understand and comprehend English Language because all the Interfaces are designed with English understanding in mind.

1.7.4 Legal Constraints

Copyright is our rights that protect our idea from being copied or stolen by any other individual and gain profits and frame our intellectual property. Copyright protects our idea from being recreated as Copyright violation is a punishable offense and is frowned upon in society.

1.8 Assumptions and Dependencies

- Users have access to a compatible Android device with an active internet connection.
- Users are familiar with the basic functionalities of a mobile application, such as registration, login, and navigation.
- Users can provide accurate and timely information about their location, destination, and medical condition.
- The application is dependent on the availability of reliable and fast internet connectivity to function correctly.
- The application is dependent on third-party APIs and services to provide functionalities such as real-time tracking.

2. Requirements:

2.1 External Interface Requirements:

2.1.1 User Interface:

- Splash Screen
- Login/Sign Up Interface
- Selection Screen
- ALS Main Interface
- BLS Main Interface
- Patient Transfer Interface
- ALS Ride Booking Interface
- BLS Ride Booking Interface
- Patient Transfer Ride Booking Interface
- Ride Tracking Interface
- Ride History Interface
- Profile Interface
- Ratings Interface
- Nearest Driver Interface

2.1.2 Driver Interface:

- Splash Screen
- Login Interface
- Sign Up Interface
 - Personal Details Interface
 - Vehicle Interface
 - Service Interface
- Ride Request Interface
- During Ride Interface
- Ride Completion Interface
- Ride History Interface
- Earning Interface
- Profile Interface
- Ratings Interface

2.1.3 Hardware Interface:

The operating environment must support the required hardware components, such as GPS, camera and network connectivity.

2.1.4 Software Interface:

- I. Operating System
- II. Database
- III. Flutter
- IV. Dart
- V. Android Studio

2.2 Functional Requirements:

2.2.1 Functional Hierarchy:

2.2.1.1 Functional Hierarchy of Users:

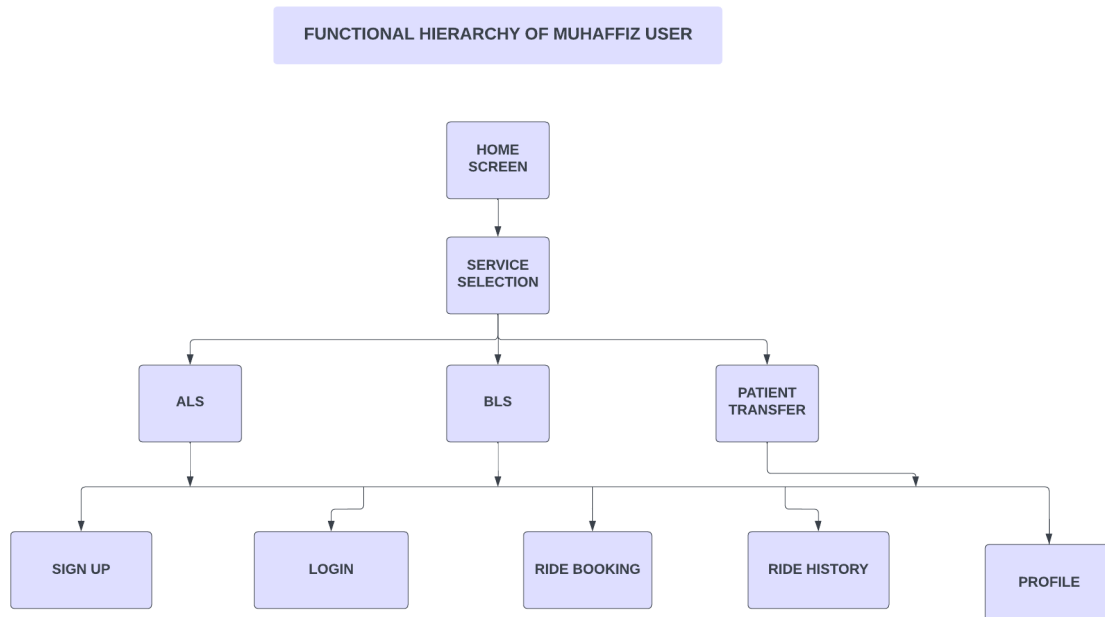


Figure 1 FUNCTIONAL HIERARCHY OF MUHAFFIZ USER

2.2.1.2 Functional Hierarchy of Drivers:

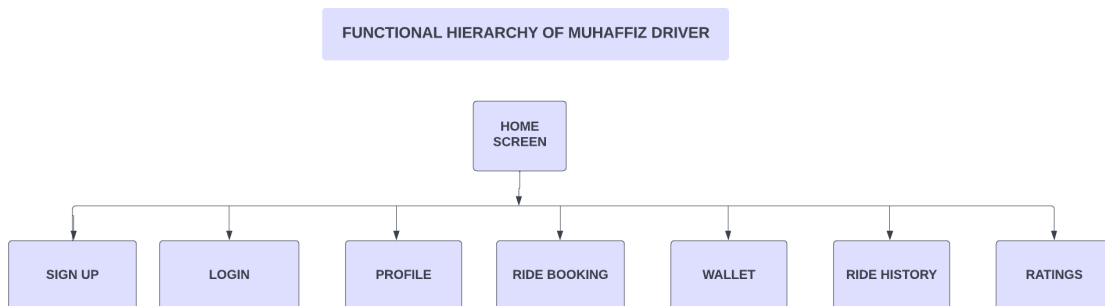


Figure 2 FUNCTIONAL HIERARCHY OF MUHAFFIZ DRIVER

2.3 Use Cases

2.3.1.1. User Registration

<1: User Registration>		
Use case Id:	1	
Actors: Primary: User Other Actor: - Stakeholder: Project Developer		
Feature: User will register in to the system		
Pre-condition:	1. User Must be present 2. Internet should be available	
Scenarios		
Step#	Action	Software Reaction
1.	User access the application	Splash screen is shown
2.	User click on register option	Registration Screen opens
3.	User fills the required information.	Profile is created and Registration Completed
Alternate Scenarios: 1a. Incorrect Information		
1a: User is asked to re-enter the particular detail.		
2a:		
Post Conditions		
Step#	Description	
1.	Registration is completed.	
2.	Account created in Database.	
3.	Login Screen is displayed.	
Use Case Cross referenced		User Login

Table 1 USE CASE FOR USER REGISTRATION

2.3.1.2. User Login

<2: User Login>		
Use case Id:	2	
Actors:		
Primary: User	Other Actor: -	Stakeholders: Project Developer
Feature:	User logs in to the system	
Pre-condition:	1. User Must be present 2. User must be registered	
Scenarios		
Step#	Action	Software Reaction
1.	User visits application	Splash Screen displayed
2.	Customer fills information and press Login	Service Option Screen is displayed.
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter your username and passwords.		
2a:		
Post Conditions		
Step#	Description	
1.	Service Option Screen is displayed.	
Use Case Cross referenced		User Register

Table 2 USE CASE FOR USER LOGIN

2.3.1.3. Service Option Screen

<3: Service Option Screen>		
Use case Id:	3	
Actors:		
Primary: User	Other Actor: -	Stakeholders: Project Developer
Feature:	User select the type of service (ALS, BLS, Patient Transfer)	
Pre-condition:	1. User must be logged in.	
Scenarios		
Step#	Action	Software Reaction
1.	User Logs in	Service option screen will be displayed.
2.	User selects the type of service.	Main Interface of that service will be displayed.
Alternate Scenarios: 1. User does not select any service options.		
1a: Please re-select the service option.		
2a:		
Post Conditions		
Step#	Description	
1.	Main Interface of service will be displayed.	
Use Case Cross referenced		User Login

Table 3 USE CASE FOR SERVICE OPTION SCREEN

2.3.1.4. User ALS

<4: User ALS>		
Use case Id:	4	
Actors: Primary: User Other Actor: - Stakeholders: Project Developer		
Feature: User selects the ALS service		
Pre-condition:	1. User Must be Logged In. 2. User must have selected ALS.	
Scenarios		
Step#	Action	Software Reaction
1.	User selects ALS	ALS main screen will be displayed
2.	User selects the targeted area.	Type of Emergency screen will be displayed.
3	User selects the type of emergency.	Top Nearest Hospitals will be sorted and will be displayed.
4.	User selects the desired hospital.	Destination will be set and trip will be started.
5.	Trip will start	Tracking Screen will be displayed.
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter details.		
2a:		
Post Conditions		
Step#	Description	
1.	Tracking Screen is displayed.	
Use Case Cross referenced		Tracking Screen.

Table 4 USE CASE FOR USER ALS

2.3.1.5. User BLS

<5: User BLS>		
Use case Id:	5	
Actors:		
Primary: User	Other Actor: -	Stakeholders: Project Developer
Feature:	User selects the BLS service	
Pre-condition:	1. User Must be Logged In. 2. User must have selected BLS.	
Scenarios		
Step#	Action	Software Reaction
1.	User selects BLS	BLS main screen will be displayed
2.	User selects the desired hospital.	Destination will be set and the trip will be started.
3.	Trip will start	Tracking Screen will be displayed.
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter details.		
2a:		
Post Conditions		
Step#	Description	
1.	Tracking Screen is displayed.	
Use Case Cross referenced		Tracking Screen.

Table 5 USE CASE FOR USER BLS

2.3.1.6. User Patient Transfer

<6: User Patient Transfer>		
Use case Id:	6	
Actors:		
Primary: User	Other Actor: -	Stakeholders: Project Developer
Feature:	User selects the Patient Transfer service	
Pre-condition:	1. User Must be Logged In. 2. User must have selected Patient Transfer.	
Scenarios		
Step#	Action	Software Reaction
1.	User selects patient transfer service.	Patient Transfer main screen will be displayed
2.	User selects the desired source.	Source will be set and the trip will start.
2.	User selects the desired hospital.	Destination will be set and the trip will be started.
3.	Trip will start	Tracking Screen will be displayed.
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter details.		
2a:		
Post Conditions		
Step#	Description	
1.	Tracking Screen is displayed.	
Use Case Cross referenced		Tracking Screen.

Table 6 USE CASE FOR USER PATIENT TRANSFER

2.3.1.7. Driver Registration

<7: Driver Registration>		
Use case Id:	7	
Actors: Primary: Driver Other Actor: - Stakeholder: Project Developer		
Feature: Driver will register in to the system		
Pre-condition:	1. Driver Must be present 2. Internet should be available	
Scenarios		
Step#	Action	Software Reaction
1.	Driver accesses the application	Splash screen is shown
2.	Driver clicks on register option	Registration Screen opens
3.	Driver fills the required personal information.	vehicle detail screen will be displayed.
4.	Driver fills the required vehicle information and service type.	Profile is created and login screen will be displayed.
Alternate Scenarios: 1a. Incorrect Information		
1a: User is asked to re-enter the particular detail.		
2a:		
Post Conditions		
Step#	Description	
1.	Registration is completed.	
2.	Account created in Database.	
3.	Login Screen is displayed.	
Use Case Cross referenced		Driver Login

Table 7 USE CASE FOR DRIVER REGISTRATION

2.3.1.8. Driver Login

<8: User Login>		
Use case Id:	8	
Actors:		
Primary: Driver	Other Actor: -	Stakeholders: Project Developer
Feature:	Driver logins to the system	
Pre-condition:	1. Driver Must be present 2. Driver must be registered	
Scenarios		
Step#	Action	Software Reaction
1.	Driver visits application	Splash Screen displayed
2.	Driver fills information and press Login	Main Interface of selected service type will be displayed.
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter your username and passwords.		
2a:		
Post Conditions		
Step#	Description	
1.	Main Interface of Selected service type is displayed.	
Use Case Cross referenced		User Register

Table 8 USE CASE FOR DRIVER LOGIN

2.3.1.9. Driver ALS

<9: Driver ALS>		
Use case Id:	9	
Actors:		
Primary: Driver	Other Actor: -	Stakeholders: Project Developer
Feature:	Driver selects the ALS service	
Pre-condition:	1. Driver Must be Logged In. 2. Driver must have selected ALS.	
Scenarios		
Step#	Action	Software Reaction
1.	Driver selects ALS	ALS main screen will be displayed
2.	Driver selects the online status.	Driver is now online and will accept ride requests.
3.	Upon receiving the ride request the driver is automatically connected.	Route Screen will be displayed
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter details.		
2a:		
Post Conditions		
Step#	Description	
1.	Route Screen will be displayed.	
Use Case Cross referenced		Route Screen.

Table 9 USE CASE FOR DRIVER ALS

2.3.1.10. Driver BLS/Patient Transfer

<10: Driver BLS/Patient Transfer>		
Use case Id:	10	
Actors:		
Primary: Driver	Other Actor: -	Stakeholders: Project Developer
Feature:	Driver selects the BLS service/Patient Transfer service.	
Pre-condition:	1. Driver Must be Logged In. 2. Driver must have selected BLS/patient Transfer.	
Scenarios		
Step#	Action	Software Reaction
1.	Driver selects BLS/Patient Transfer.	BLS/Patient Transfer main screen will be displayed
2.	Driver selects the online status.	Driver is now online and will accept ride requests.
3.	Accept/Decline Ride Request.	If accepted, Route Screen will be displayed
Alternate Scenarios: 1. Incorrect Information		
1a: Please re-enter details.		
2a:		
Post Conditions		
Step#	Description	
1.	Route Screen will be displayed.	
Use Case Cross referenced		Route Screen.

Table 10 USE CASE FOR DRIVER BLS/PATIENT TRANSFER

3. Non-Functional Requirements

2.3.1. Performance Requirements

- The system shall be able to respond instantly on different user interfaces
- The booking and arrival of ambulance will be smooth
- The application must be able to respond in low connectivity
- The transition between numerous pages should be rigorous

Safety Requirements

- The data of the driver must be verified before hiring them
- The application should be used in known areas
- The ambulance must be checked weekly
- The users should be able to bear the mishap of the system

Security Requirements

- The system shall be able to authenticate the user at the time of Login
- The system should be able to verify the user, if forgotten the password
- The system should be able to verify the driver, if forgotten the password

3. System Design

3.1. Assumptions and Dependencies

Our application is designed for Android devices, therefore a mobile device having Android OS would be required for the smooth running of the application. A stable internet connection (Wi-Fi/4G) is also required for users to operate the application. A major chunk of our application is dependent on the smooth functioning of Google Maps, therefore any hindrance in the working of servers of Google will paralyze this application.

3.2. System Architecture

3.2.1 System Level Architecture

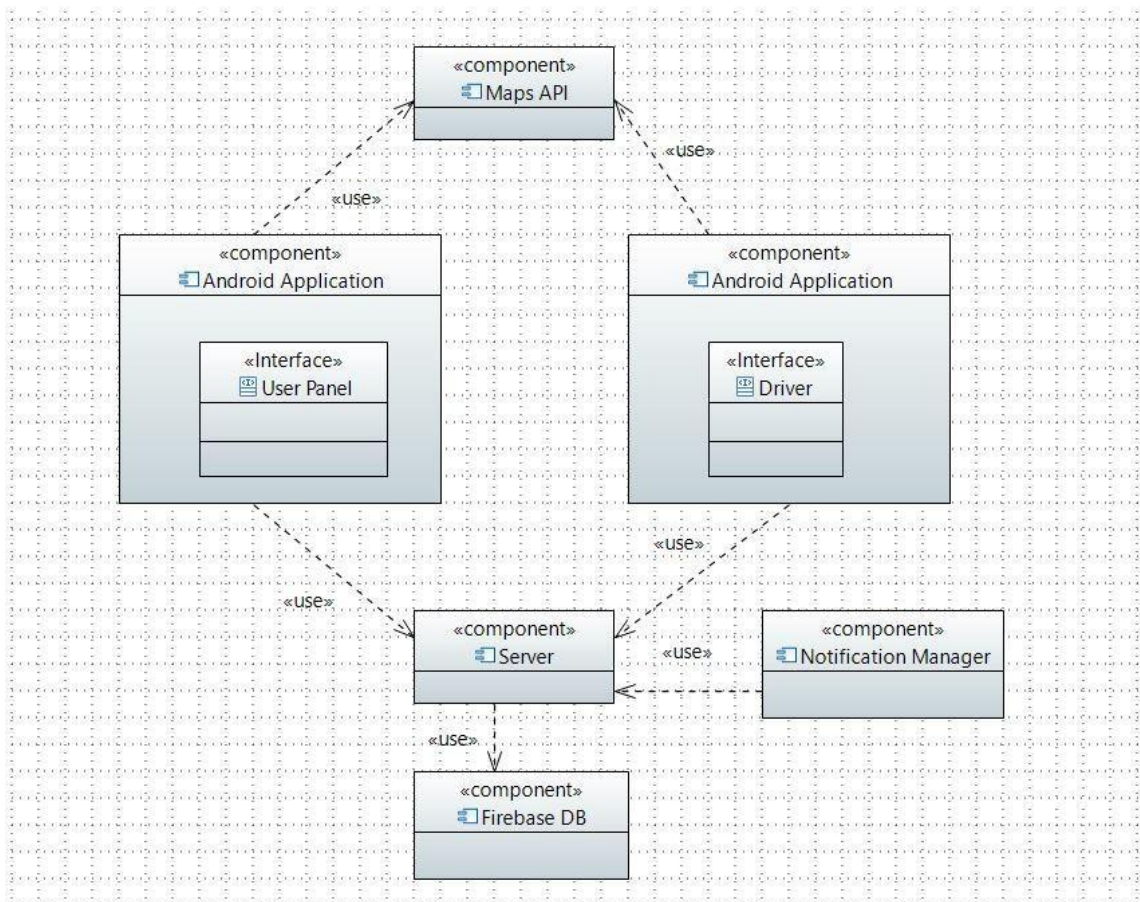


Figure 3 System Level Architecture

3.2.2 Software Architecture

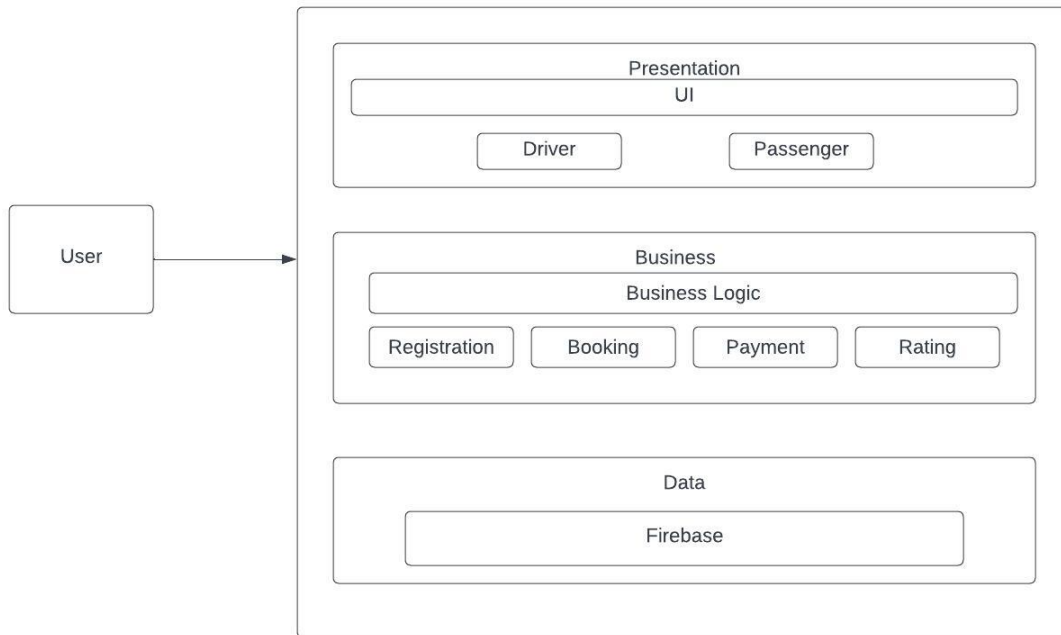


Figure 4 Software Level Architecture

3.3. Design Strategy:

The technology stack used for developing ‘Muhaffiz’ is Flutter. For potential users, namely patients and drivers, there are two distinct applications developed. Following the input of the required data, ranging from a contact number and CNIC, they can register themselves on the application. Drivers go through a separate degree of scrutiny where information about their vehicle is needed to determine whether they are qualified for providing certain services.

Google’s Firebase will be used as a database for storing data about Drivers and Users. It provides an enhanced level of security and protects user’s sensitive data from being stolen and manipulated.

For navigation purposes and providing seamless experience to the user, our application incorporates Maps API, Geolocation API, Places API provided by Google. These services will be at aid to both the driver, and the patient.

Our application provides options for Basic Life Support, Advanced Life Support and Patient Transfer. The algorithm used in the application categorizes hospitals based on emergency requests and these options. In this way, the user in distress is transported to the nearest hospital by the driver, potentially saving precious time

3.4. Database Design

3.4.1 ER Diagram

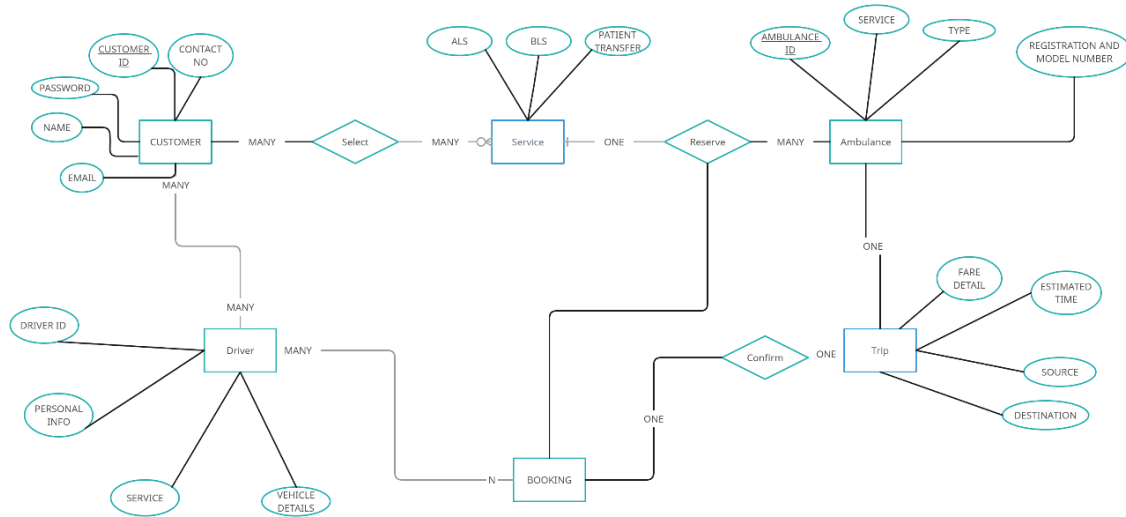


Figure 5 ER DIAGRAM OF MUHAFFIZ

3.5. Data Dictionary

3.5.1 Data 1

< Data 1>						
Name	Driver Registration					
Alias	-					
Where-used/how-used	Input=Signup Output= Driver Login Interface					
Content description	=					
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Name	Name of the driver	string	30	No	-	-
Phone Number	Contact number of the driver	string	30	No	-	-
Password	Secret Key of driver	string	30	No	-	-
Email	Email id of user	string	30	No	-	-
Model number	Model Number of Vehicle	string	30	No	-	-
Service Type	ALS, BLS, PATIENT TRANSFER	-	-	No	-	-
Model Year	Year of vehicle model	string	30	No	-	-

Table 11 DATA DICTIONARY FOR DRIVER REGISTRATION

3.5.2 Data 2

< Data 2>						
Name		User Registration				
Alias		-				
Where-used/how-used		Input=Signup Output= User Login Interface				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Name	Name of the user	string	30	No	-	-
Phone Number	Contact number of the user	string	30	No	-	-
Email	Email id of user	string	30	No	-	-
Password	Secret Key of user	string	30	No	-	-

Table 12 DATA DICTIONARY FOR USER REGISTRATION

3.5.3 Data 3

< Data 3>						
Name		User Login Interface				
Alias		-				
Where-used/how-used		Input=Login Output=Service Selection Interface				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Email ID	Email of the user	string	30	No	-	-
Password	Secret Key of user	string	30	No	-	-

Table 13 DATA DICTIONARY FOR USER LOGIN INTERFACE

3.5.4 Data 4

< Data 4>						
Name		Service Selection Interface				
Alias		-				
Where-used/how-used		Input=Service Selection Output=ALS/BLS/Patient Transfer Interface				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Service Type	Select which service to be used	-	-	No	-	-

Table 14 DATA DICTIONARY FOR SERVICE SELECTION INTERFACE

3.5.5 Data 5

< Data 5>						
Name		ALS Main Interface				
Alias		-				
Where-used/how-used		Input=Location, Type of Emergency, Hospital Selection Output=Trip Reservation				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Location	Select Targeted Area	-	-	No	-	-
Emergency Type	Select Type of Emergency patient is going through	-	-	No	-	-
Hospital Selection	Select From the top 5 nearest hospital	-	-	No	-	-

Table 15 DATA DICTIONARY FOR ALS MAIN INTERFACE

3.5.6 Data 6

< Data 6>						
Name		BLS Main Interface				
Alias		-				
Where-used/how-used		Input=Destination Location Output=Trip Reservation				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Location	Select Destination Location	-	-	No	-	-

Table 16 DATA DICTIONARY FOR BLS MAIN INTERFACE

3.5.7 Data 7

< Data 7>						
Name		Patient Transfer Main Interface				
Alias		-				
Where-used/how-used		Input=Source and Destination Location Output=Trip Reservation				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Source Location	Select Source Location	-	-	No	-	-
Destination Location	Select Destination Location	-	-	No	-	-

Table 17 DATA DICTIONARY FOR PATIENT TRANSFER MAIN INTERFACE

3.5.8 Data 8

< Data 8>						
Name		Driver Login Interface				
Alias		-				
Where-used/how-used		Input=Login Output=Main Interface				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Email ID	Email of the driver	string	30	No	-	-
Password	Secret Key of user	string	30	No	-	-

Table 18 DATA DICTIONARY FOR DRIVER LOGIN INTERFACE

3.5.9 Data 9

< Data 9>						
Name		Driver Main Interface (BLS/PATIENT TRANSFER)				
Alias		-				
Where-used/how-used		Input=Status Output=Ride Request				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Status	Select status online or not for ride requests	-	-	No	-	-

Table 19 DATA DICTIONARY FOR DRIVER MAIN INTERFACE BLS/PATIENT TRANSFER

3.5.10 Data 10

< Data 10>						
Name		Driver Main Interface (ALS)				
Alias		-				
Where-used/how-used		Input=Ride Request Output=Trip Started				
Content description		=				
Column Name	Description	Type	Length	Null able	Default Value	Key Type
Ride Request	Select Arrived if arrived at source location	-	-	No	-	-

Table 20 DATA DICTIONARY FOR DRIVER MAIN INTERFACE (ALS)

3.6. Application Design

3.6.1 Sequence Diagram

3.1.1.1 Sequence Diagram 1

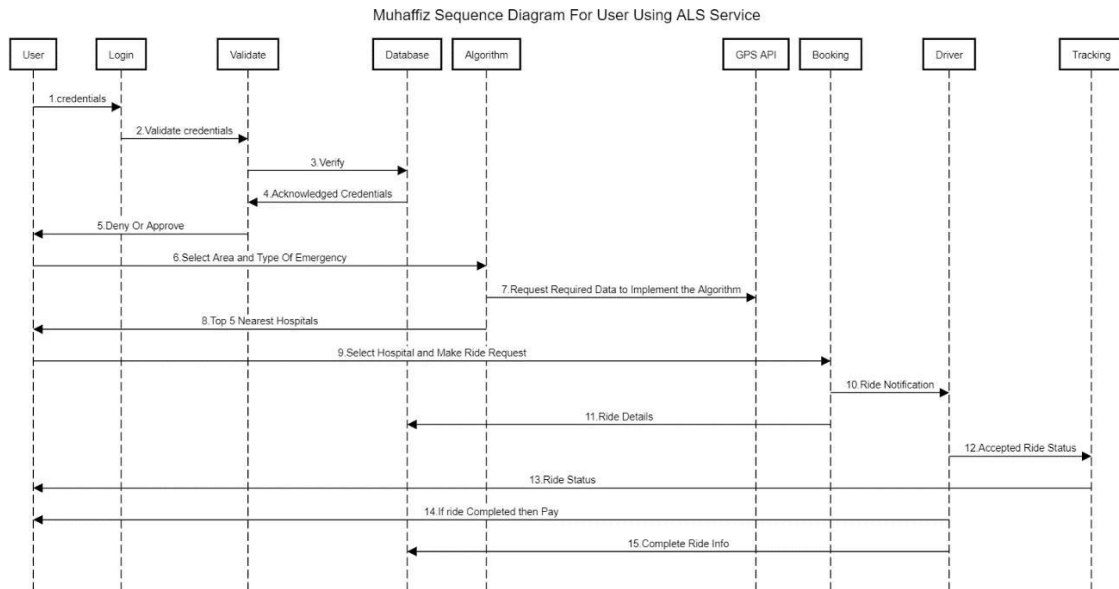


Figure 6 Sequence Diagram for user using ALS.

3.6.1.1 Sequence Diagram 2

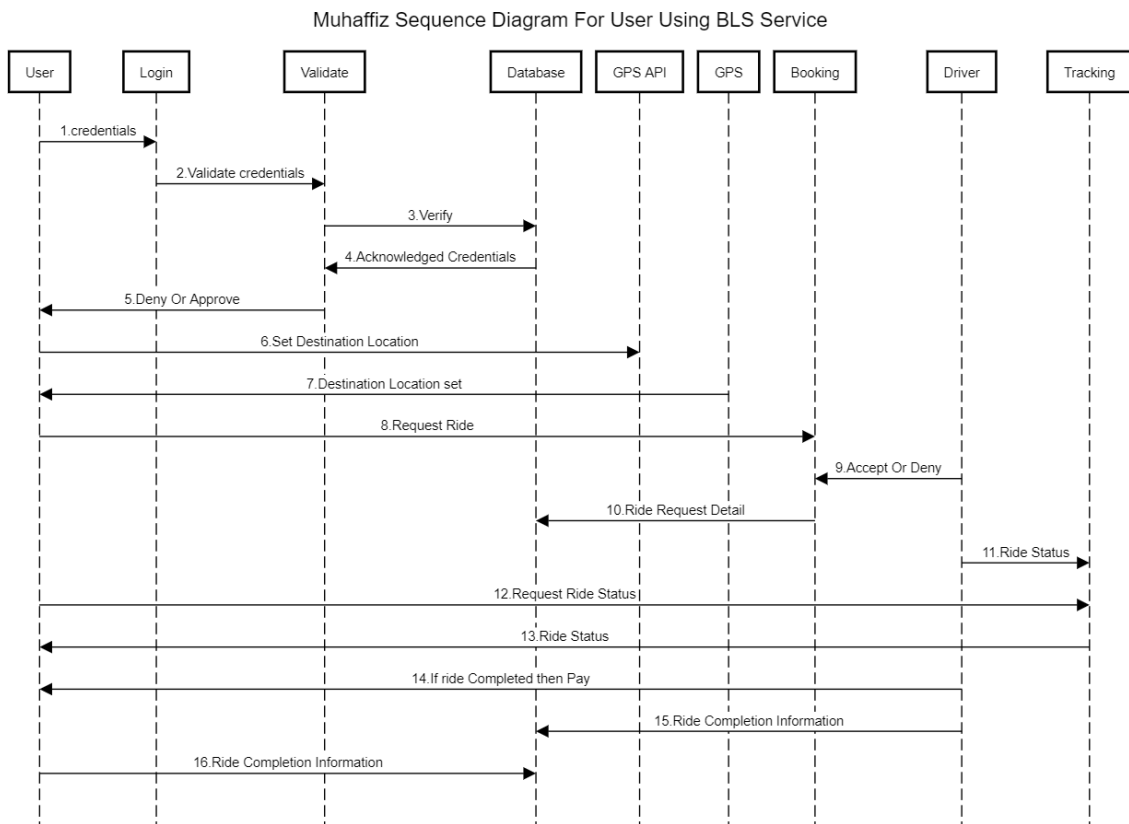


Figure 7 Sequence Diagram for user using BLS.

3.6.1.2 Sequence Diagram 3

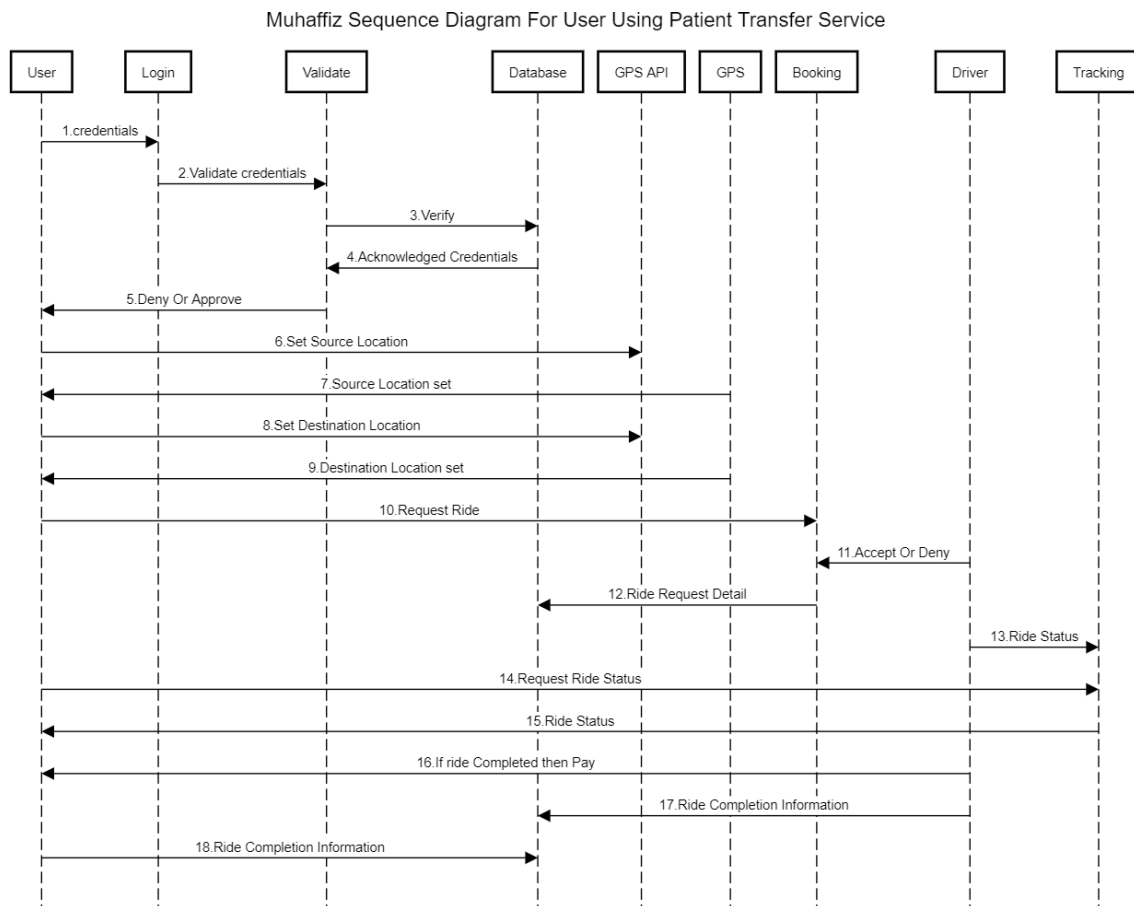


Figure 8 Sequence Diagram for user using Patient Transfer.

3.6.2 State Diagram

3.6.2.1 State Diagram 1

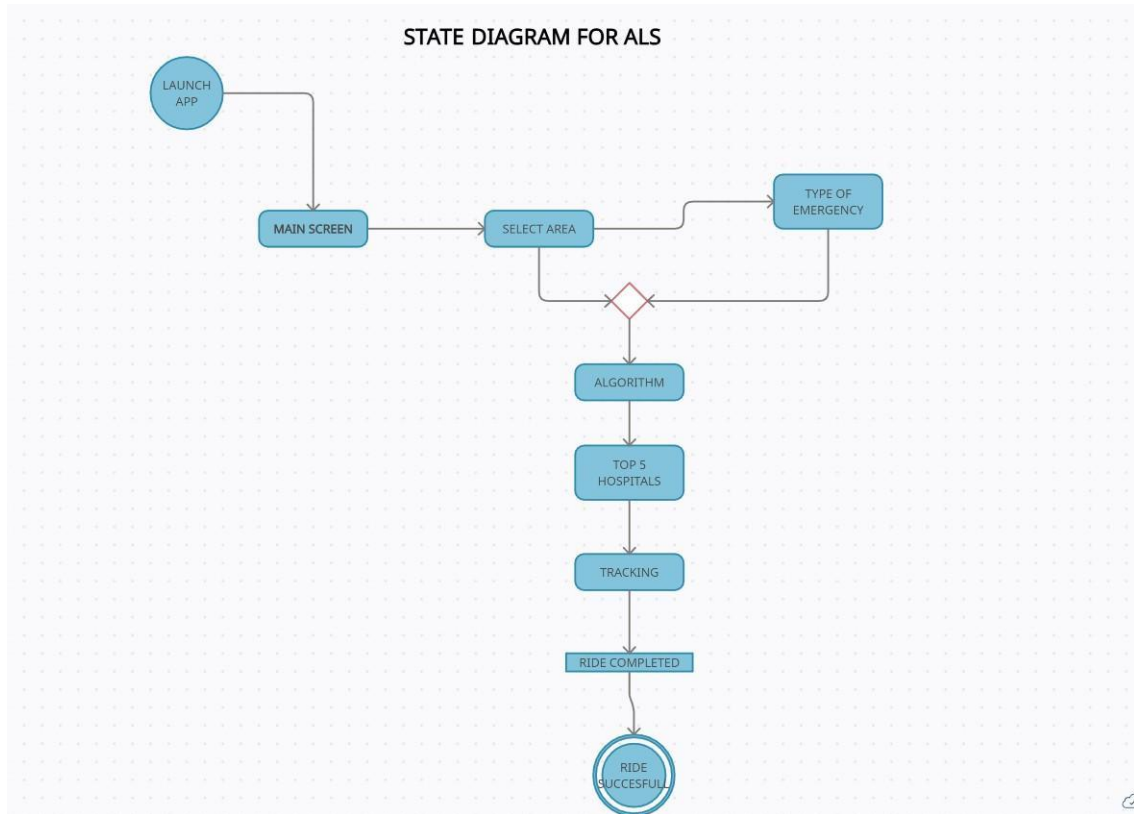


Figure 9 State Diagram For ALS

3.6.2.2 State Diagram 2

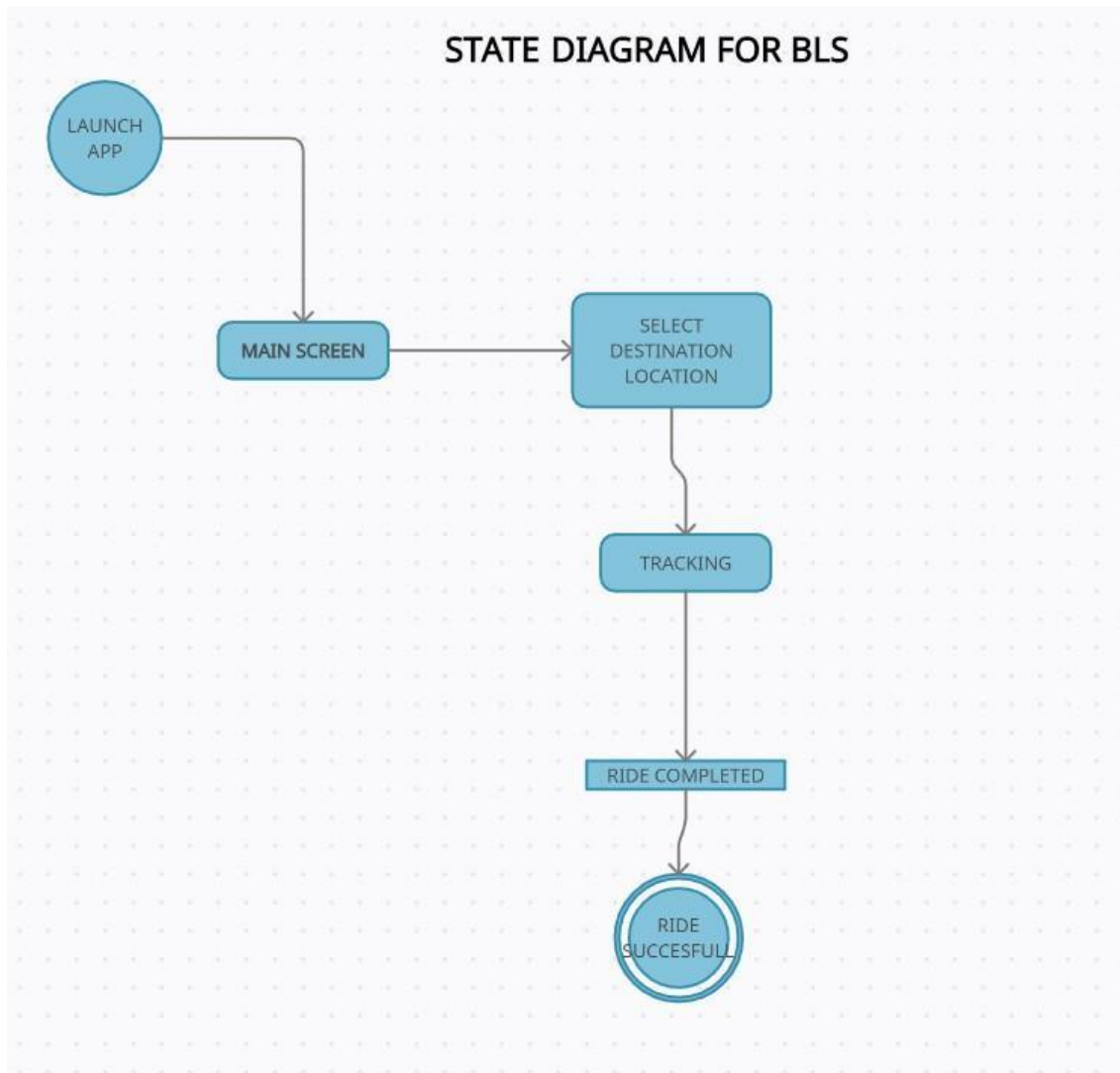


Figure 10 State Diagram For BLS

3.6.2.3 State Diagram 3

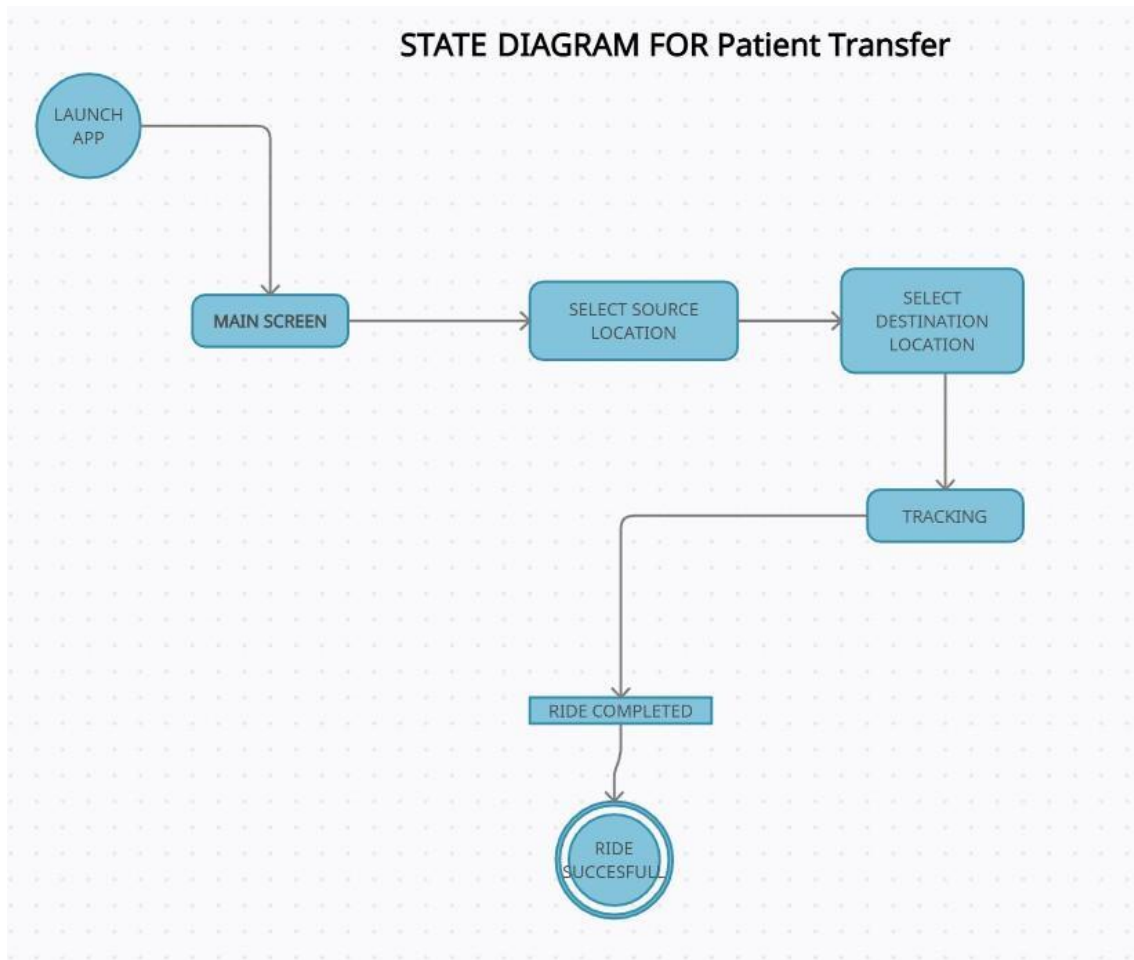


Figure 11 State Diagram For Patient Transfer

4. Implementation

4.1. System Architecture

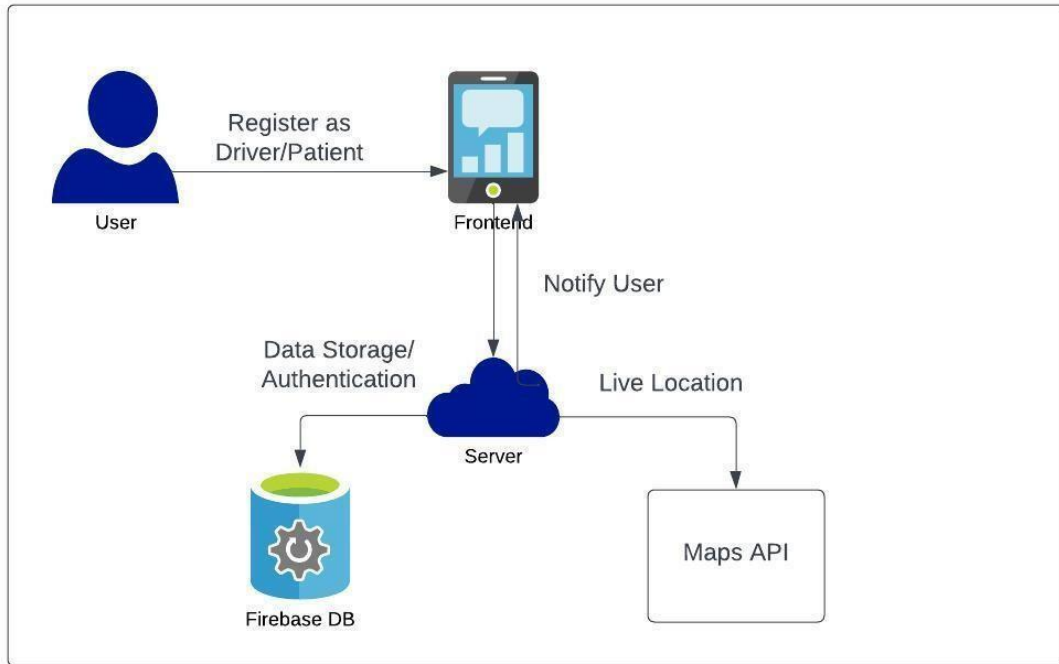


Figure 12 System Architecture

4.2. Development Tools

- Android Studio
- Flutter
- Firebase
- Google Cloud Platform

4.3. User Interface

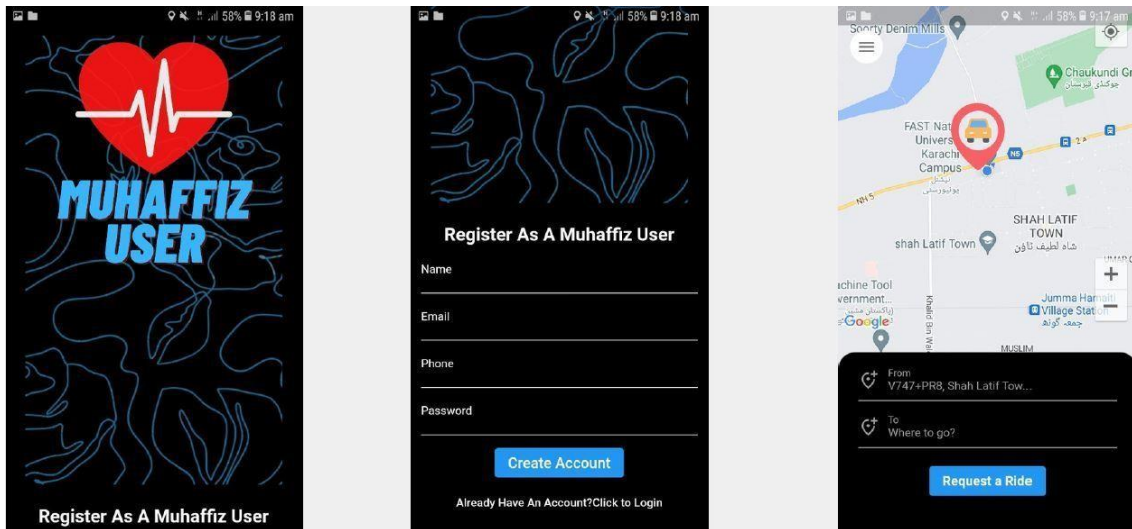


Figure 13 Registration/Login Module for a non-driver User

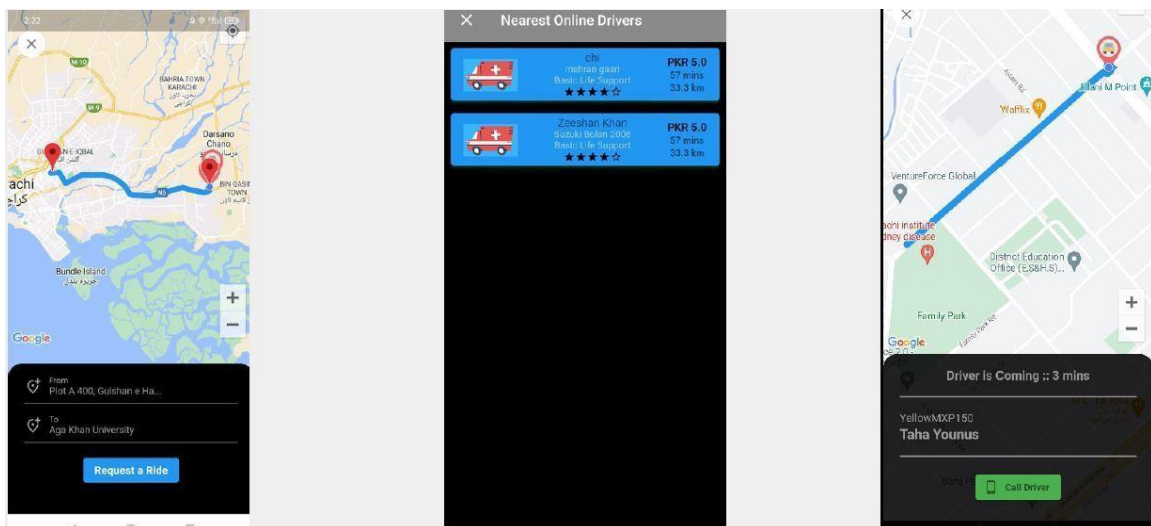


Figure 14 Depiction of User requesting an Ambulance and ETA of the Driver

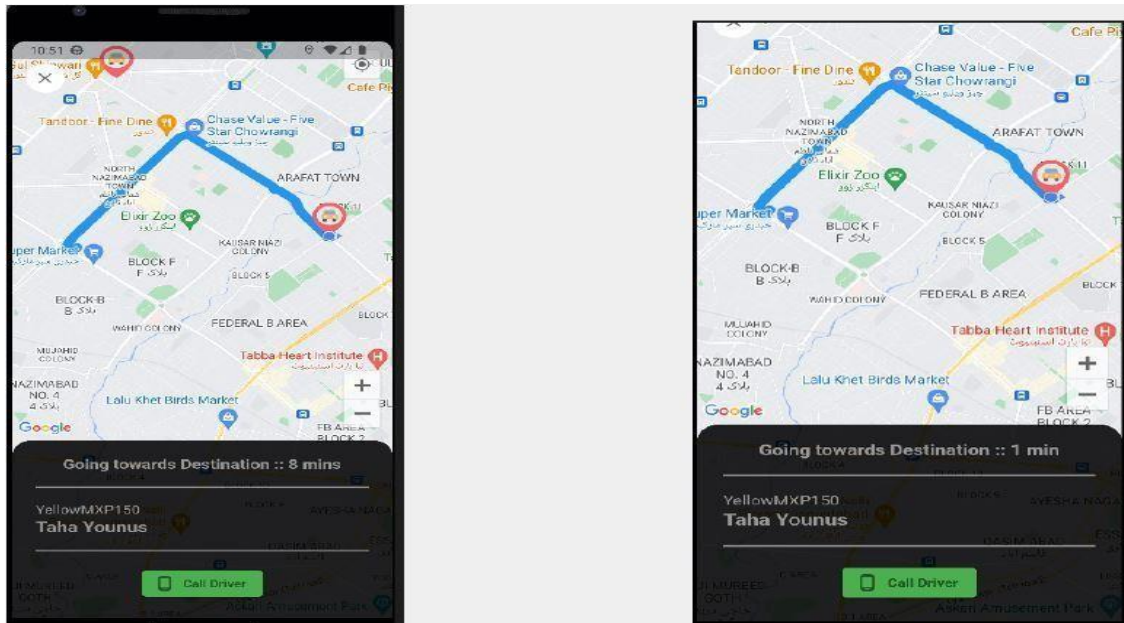


Figure 15 Depiction of ETA of Driver and ETA to Destination

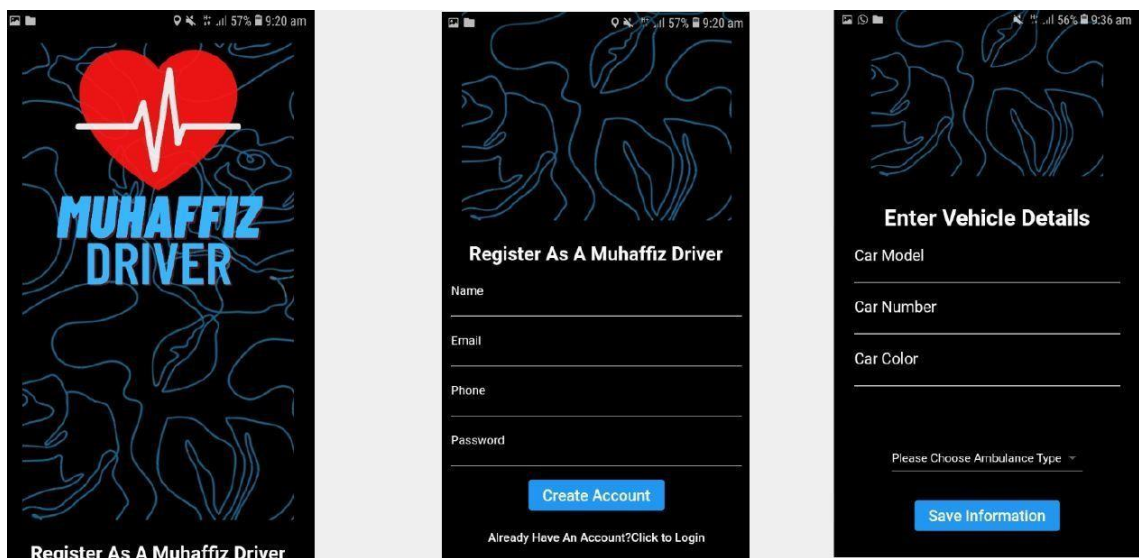


Figure 16 Registration/Login Module of Driver's Application

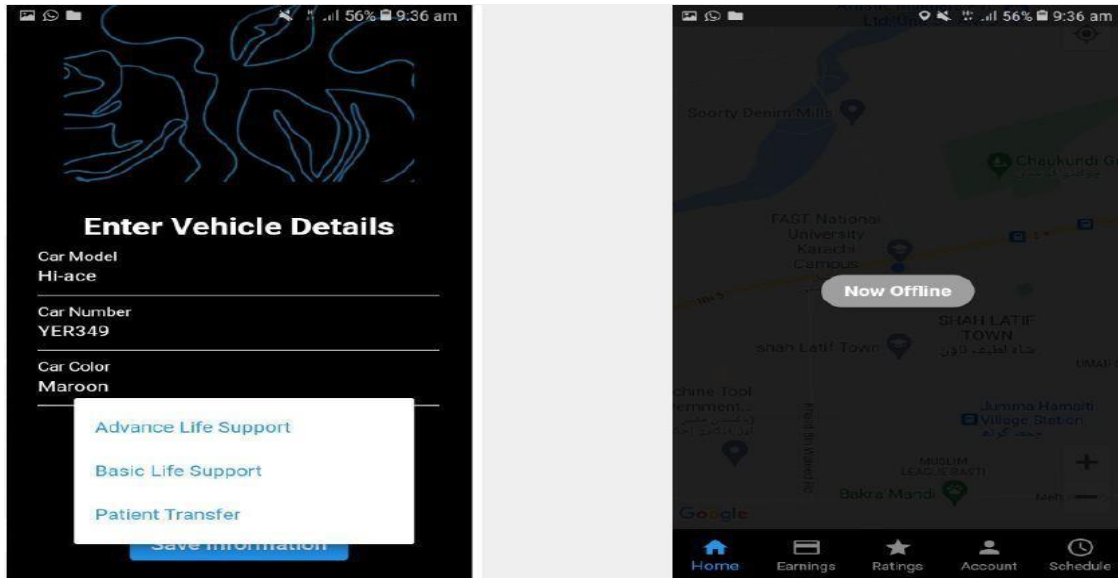


Figure 17 Requesting Details of Driver's Vehicle and Home page of Driver's Application

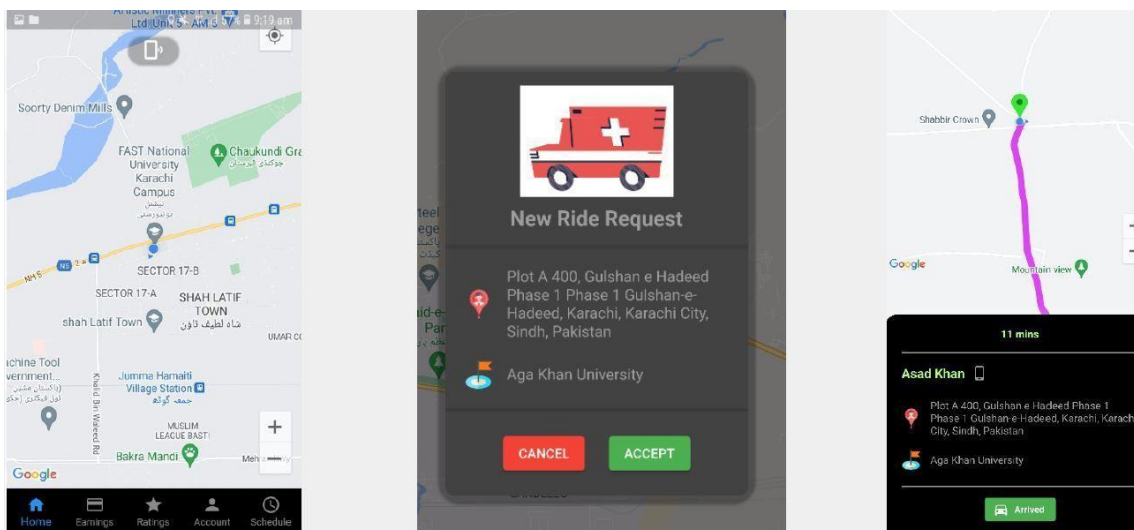


Figure 18 Driver receiving a ride request

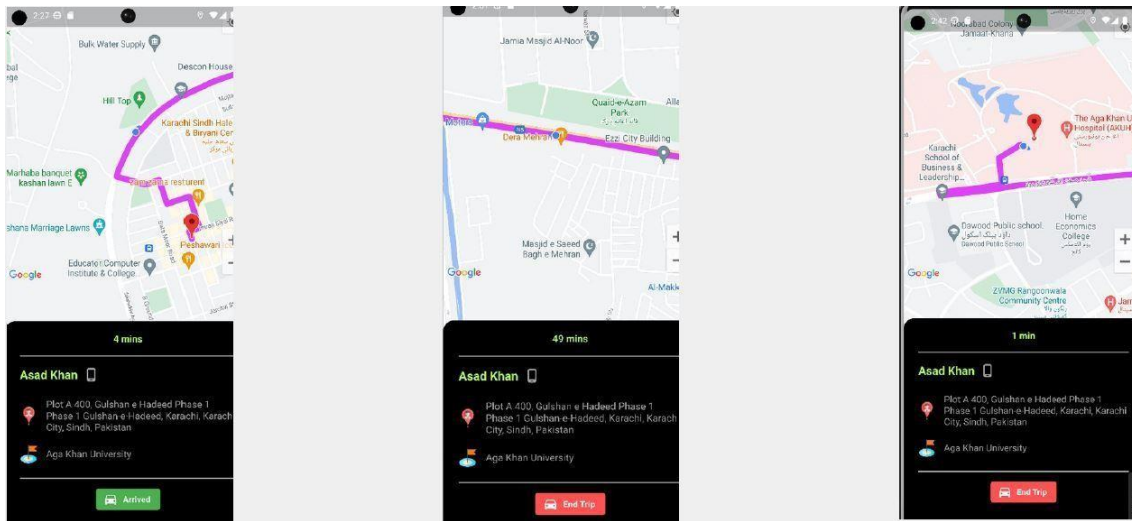


Figure 19 Driver being displayed ETA to/from destination

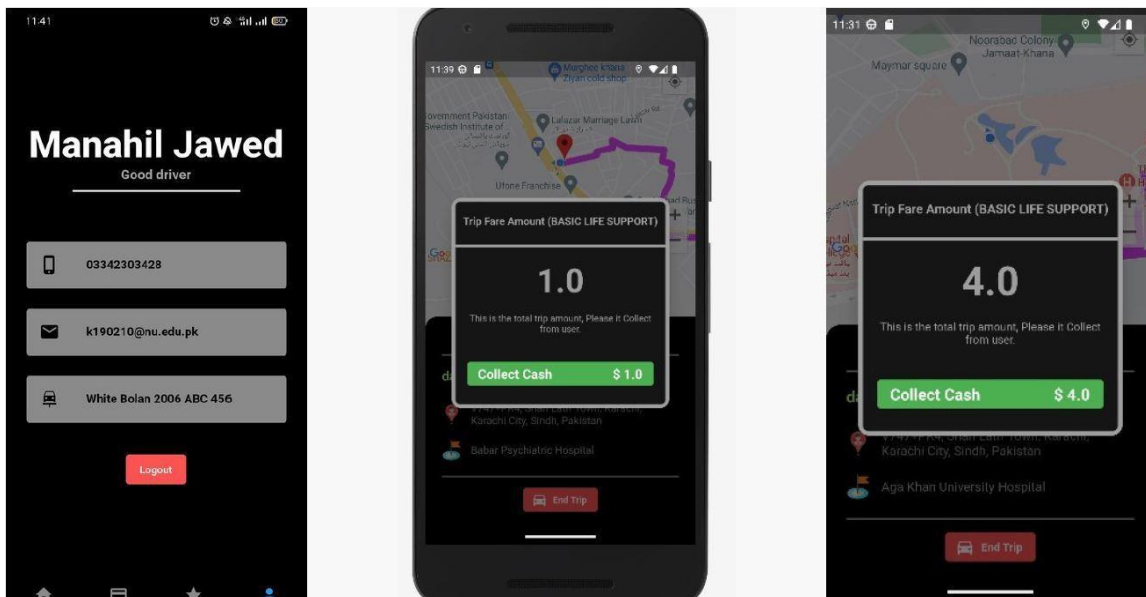


Figure 20 Depiction of About Me, rating and fare collection of Driver's application

5. Testing and Evaluation

5.1. Purpose of Test Plan

This Test Plan document tracks the necessary information required to effectively validate and the functionalities of Muhaffiz Project. The main objective is to test if the project meets its requirements. Three types of testing will be carried out.

1. Unit Testing
2. Performance Testing
3. System Testing

5.2. Environmental Needs

The project works on Android and requires:

1. A stable Internet Connection
2. Age restriction 8+
3. Only English (UK) Language Supported.

5.3. Validation Testing

5.3.1 Items to be Tested/Not Tested

Items to Test	Test Description	Test Date
User and Driver Registration	User And Driver can Register or not.	DEC 2022
User And Driver Login	User And Driver can Login or not.	DEC 2022
User Service Option Interface	Service can be Selected or not.	MAY 2023
User ALS Interface	ALS Interface is working or not	MAY 2023
User BLS Interface	BLS Interface is working or not	DEC 2022
User Patient Transfer Interface	Patient Transfer Interface is working or not	MAY 2023
Driver ALS Interface	ALS Driver Interface is working or not	MAY 2023
Driver BLS/Patient Transfer Interface	BLS/PT Driver Interface is working or not	DEC 2022
Driver Earning Interface	Driver Earning is updated or not.	FEB 2023
Driver Rating Interface	Driver Rating is updated or not.	FEB 2023
User Rating Interface	User ratings are used or not.	FEB 2023

5.3.2 Test Cases

5.3.2.1 Test Case 1

Test Case ID: 1				
Description: USER AND DRIVER REGISTRATION				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User/Driver clicks on signup	The signup page pops up	The signup page pops up	PASS
2	User selects the created account.	The system shows that the account is created successfully and user is directed to the Login Page.	The system shows that the account is created successfully and user is directed to the Login Page.	PASS
3.	Driver selects Create account	The system saves the personal info and direct driver towards the vehicle detail page.	The system saves the personal info and direct driver towards the vehicle detail page.	PASS
4	Driver selects save info	The systems save the vehicle info and service type and is directed to Login Page.	The systems save the vehicle info and service type and is directed to Login Page.	PASS

Table 21 TEST CASE FOR USER AND DRIVER REGISTRATION

5.3.2.2 Test Case 2

Test Case ID: 2				
Description: USER AND DRIVER LOGIN				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User clicks on login	The system validates the credentials and user is directed to the service option page.	The system validates the credentials and user is directed to the service option page.	PASS
2.	Driver clicks on login	The system validates the credentials and driver is directed to the selected service main page.	The system validates the credentials and driver is directed to the selected service main page.	PASS

Table 22 TEST CASE FOR USER AND DRIVER LOGIN

5.3.2.3 Test Case 3

Test Case ID: 3				
Description: USER SERVICE OPTION INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User clicks desired service option.	The system directs the user to the selected service option interface.	The system directs the user to the selected service option interface.	PASS

Table 23 TEST CASE FOR USER SERVICE OPTION INTERFACE

5.3.2.4 Test Case 4

Test Case ID: 4				
Description: USER ALS INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User selects the targeted area.	The system directs the user to select the type of emergency.	The system directs the user to select the type of emergency.	PASS
2.	User selects the type of emergency.	The system suggests 5 nearest hospitals.	The system suggests 5 nearest hospitals.	PASS
3.	User selects the desired hospital	The systems connect the user with a driver and the trip is started.	The systems connect the user with a driver and the trip is started.	PASS

Table 24 TEST CASE FOR USER ALS INTERFACE

5.3.2.5 Test Case 5

Test Case ID: 5				
Description: USER BLS INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User source location.	The system automatically sets the user current location as source location.	The system automatically sets the user current location as source location.	PASS
2.	User selects the destination location.	The system set the destination location and sends a request to the driver.	The system set the destination location and sends a request to the driver.	PASS
3.	Driver accepts the ride.	The systems connect the user with a driver and a trip is started.	The systems connect the user with a driver and the trip is started.	PASS

Table 25 TEST CASE FOR USER BLS INTERFACE

5.3.2.6 Test Case 6

Test Case ID: 6				
Description: USER PATIENT TRANSFER INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User sets source location.	The system sets the user selected location as source location.	The system sets the user selected location as source location.	PASS
2.	User selects the destination location.	The system set the destination location and sends request to the driver.	The system set the destination location and sends request to the driver.	PASS
3.	Driver accepts the ride.	The systems connect the user with a driver and the trip is started.	The systems connect the user with a driver and the trip is started.	PASS

Table 26 TEST CASE FOR USER PATIENT TRANSFER INTERFACE

5.3.2.7 Test Case 7

Test Case ID: 7				
Description: DRIVER ALS INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	Driver sets their status online.	The system makes the driver visible to users so that they can connect with them.	The system makes the driver visible to users so that they can connect with them.	PASS
2.	Driver connected with user	The system connects the driver automatically with the user and the trip is started.	The system connects the driver automatically with the user and the trip is started.	PASS

Table 27 TEST CASE FOR DRIVER ALS INTERFACE

5.3.2.8 Test Case 8

Test Case ID: 8				
Description: DRIVER BLS/PATIENT TRANSFER INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	Driver sets their status online.	The system makes the driver visible to users so that they can connect with them.	The system makes the driver visible to users so that they can connect with them.	PASS
2.	Driver receives a user request.	The system notifies the driver about the request.	The system notifies the driver about the request.	PASS
3.	Driver accepts the request.	The system connects the user and driver.	The system connects the user and driver.	PASS
4.	Driver declines the request	The system notifies the user that the driver has declined their request.	The system notifies the user that the driver has declined their request.	PASS

Table 28 TEST CASE FOR DRIVER BLS/PATIENT TRANSFER INTERFACE

5.3.2.9 Test Case 9

Test Case ID: 9				
Description: DRIVER EARNING INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	Driver clicks on the earning tab.	The system retrieves the total earning of user from database and earning is displayed.	The system retrieves the total earning of user from firebase and earning is displayed.	PASS

Table 29 TEST CASE FOR DRIVER EARNING INTERFACE

5.3.2.10 Test Case 10

Test Case ID: 10				
Description: DRIVER RATING INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	Driver clicks on the ratings tab.	The system retrieves the updated rating of driver as given by the users from database and rating is displayed.	The system retrieves the updated rating of driver as given by the users from firebase and rating is displayed.	PASS

Table 30 TEST CASE FOR DRIVER RATING INTERFACE

5.3.1.1 Test Case

Test Case ID: 11				
Description: USER RATING INTERFACE				
No.	STEPS	EXPECTED RESULT	ACTUAL RESULT	PASS/FAIL
1.	User gives the trip rating.	The system asks the user to rate the trip after completion and according to the given rating the driver's rating is updated in the database.	The system asks the user to rate the trip after completion and according to the given rating driver's rating is updated in the database.	PASS

Table 31 TEST CASE FOR USER RATING INTERFACE

6. Conclusion

Concluding, we are affirmative as a team that our project has achieved its objectives and goals.

Our application shines light on improvising the traditional system of calling Ambulances. As certain human constraints can delay the process of help reaching the patients, our aim was to overcome these by providing a platform through mobile application where users can request an ambulance on a tap, monitor their assigned ambulance drivers and be informed throughout the journey.

We successfully carried out a pilot project that produced fruitful outcomes and proved the viability of our strategy. But there are still certain issues that need to be dealt with, like compliance constraints and a lack of technological literacy.

Through the dedication and hard work that each member has put into developing this application, we hope that the application satisfies the criteria established by the jury, and we are convinced that our target audience will find it appealing.

7. Reference

- <https://www.cs.cornell.edu/courses/JavaAndDS/shortestPath/shortestPath.html>
- <https://developers.google.com/maps/documentation>
- <https://docs.flutter.dev/>
- "Where We Stand: Analysis of Ambulance Services of Karachi", by Shahid Raza (Center of Excellence for Trauma and Emergencies, Aga Khan University, Karachi. Kazi Afar Ahmed Associate Professor and Senior Management Consultant, Institute of Business Management, Karachi.
- "Role of Pre-hospital care and Ambulance services in Pakistan", by Syed Muhammad Baqir (Department of Emergency Medicine, Aga Khan University Hospital, Karachi.), Kiran Ejaz (Department of Emergency Medicine, Aga Khan University Hospital, Karachi.)