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Home Health Care Services (HHCS)

Student Affairs System
For College of science Al Zulfi
Department of Computer Science and Information

A REPORT SUBMITTED TO
UNIVERSITY OF MAJMAAH
In partial fulfillment of the requirements
for the degree of
BACHELOR OF COMPUTER AND INFORMATION SCIENCE
(Semester 1, 2018-19)

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Abstract

Good health is a way of good life, however, vision 2030 in Saudi Arabia aims to expand the ways of providing home health care, this application is designed to provide home health care to people in remote areas or to people who can’t go to the hospital because of their working conditions or their health doesn’t allow them to travel or go to the hospital. There are many benefits of using this application. It helps the patients to open a new file without visiting the hospital, they also can communicate with their doctors or health care providers, request home services, evaluate the services that provided by healthcare providers, pay the fees of any services received, also they can check the lab results.

By this way, the hospitals benefit from creating a new way to increase the number of patients (online or inside the hospital).

Keywords: *mHealth.*

Acknowledgement

In the name of Allah, Most Gracious, Most Merciful

All praise and glory to Almighty Allah who gave us courage and patience to carry out this work.

First, I would like to thank my family without their support and assistant I could not get to this point. And I would like to express my deepest gratitude to my supervisor T. Hajer brahim and to our teachers of computer science department for all teaching and encouragement during the study phase.

Finally, thanks to all my friends for supporting and giving me advices.

MAJMAAH UNIVERSITY,
COLLEGE OF SCIENCE AL ZULFI,
DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION

CERTIFICATE BY STUDENT

This is to certify that the project titled **“Home Health Care Services (HHCS)”** submitted by me (**Eshraq Ali Alweshail**, **351202123**) under the supervision of T. **Hajar brahim** for award of Bachelor degree of the Majmaah University carried out during the Semester 1, 2018-19 embodies my original work.

Signature in full: ----------------------------

Name in block letters: ESHRAQ ALI ALWESHAIL

Student ID: 351202123

Date: 21/ 11/ 2018

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Chapter 1 : INTRODUCTION

Health care providers, health risk carriers and third-party administrators created many solutions like telemedicine, mobile applications for patient self-assessment, and some doctors marketed their services for visiting patients at home. Nevertheless, all those are of good value, and may be of use for some people; but talking about a big population the basic need for a successful plan is communication.

mHealth –also known as mobile health- refers to the all that health services provide by using smart phones (Malvey& Slovensky, 2016).

mHealth is a part of e-health (or electronic health) which serves the health field in the field of information and communications technology.

Through the rapid development of technology as it has become a main part of our lives, our project is developing an android application to helps the patients to open a new file without visiting the hospital, they also can communicate with their doctors or health care providers, request home services, evaluate the services that provided by healthcare providers, pay the fees of any services received, also they can check the lab results.

By this way, the hospitals benefit from creating a new way to increase the number of patients (online or inside the hospital), that is consistent with Vision 2030 in Saudi Arabia.

1.1 Problem definition

Healthcare Dive published an article in November 2017 titled that Healthcare will be moving away from hospitals (Byers, 2017). This is an attempt that will be the basic approach for the new era of healthcare. Patient centered care, and Value Based Care are the new foundations of healthcare, where providers are not providing care as selling cars, or clothes; but care will be treated as a right for patients and presented to him / her with value. People come from different circumstances and budgets,

for this reason, providing health care services for patients at home which will be highly usable, less in cost, while keeping the patient relaxed at home will be one of the optimal solutions for the current undergoing change.

1.1.1 Goals

The goals of the HHCS application is to provide the right communication between health care providers and patients who's in remote areas or to patient's who can't go to the hospital because of their working conditions or their health doesn’t allow them to travel or go to the hospital.

And it aims to create a new way for hospitals to receive and serve more patients (online or inside the hospital).

1.1.2 Data collection

Although there are many ways in which data can be collected for analysis, one of the most commonly used methods is a questionnaire, which is a set of questions that is carefully formatted and placed in a paper called a questionnaire or survey.

Based on the above, we will collect the data using the questionnaire method. A random sample of the members of the community (66 people) was selected to learn about the idea of the project.

The survey is designed using Google Forms, which contains several questions about the application of home health care services.

Most people were with the idea, to see the questions and the results of the survey see the appendix (see appendix A).

After relying on God, the next step in the project is started that represents the drawing of the project plans.

1.1.3 Objectives

The expected objectives after using the HHCS application are:

❖ For the patient:

- The patient can open a new file in the hospital for those who cannot go to the hospital.
- Easy to communicate with doctor or health care provider.
- Request home service (taking injections, changing bandages, measurement of blood pressure or blood glucose, etc.).
- Evaluation of service provided by healthcare providers.
- Take a look of lab results.
- Also has the ability to pay the fees of any services received.

❖ For the hospital:

- Creating a new way for them to expand the number of patients to receive them (online or inside the hospital).
- They can also follow the assessment of services by the patient.

❖ For care provider (doctors, nurses, etc.):

- Easy communication with patients.
- Can see the patient's evaluated of the service provided to improve performance and increase productivity.

1.1.4 Critical success factors

There are many factors which will guarantee the success of the home health care Application. Those first are portrayed in the new articles by great health care workers emphasizing on Value Based Care, “Locating services in a patient’s home or somewhere close by and easily accessible is more convenient for patients, but also produces more comprehensive and effective care” (Byers 2017). Second, it is widely spread in the Kingdom of Saudi Arabia, the idea of using mobile applications for everything; even in healthcare for example Suleiman Al Habib Hospital in Riyadh already created an application for patients to get appointments .Third this application will help patients to get more centered and specific care, which they will like; for instance, they will prefer waiting for a doctor at home to visit them, instead of waiting for him in the clinic or emergency department. The application as well will serve patients’ needs by helping patients being aware of their treatment.

Last but not least, this home health care application will allow decreasing the rate of unemployment, in which many nurses, lab technicians and even doctors will be happy to serve patients outside the hospital premises.

1.1.5 Organization chart and responsibilities

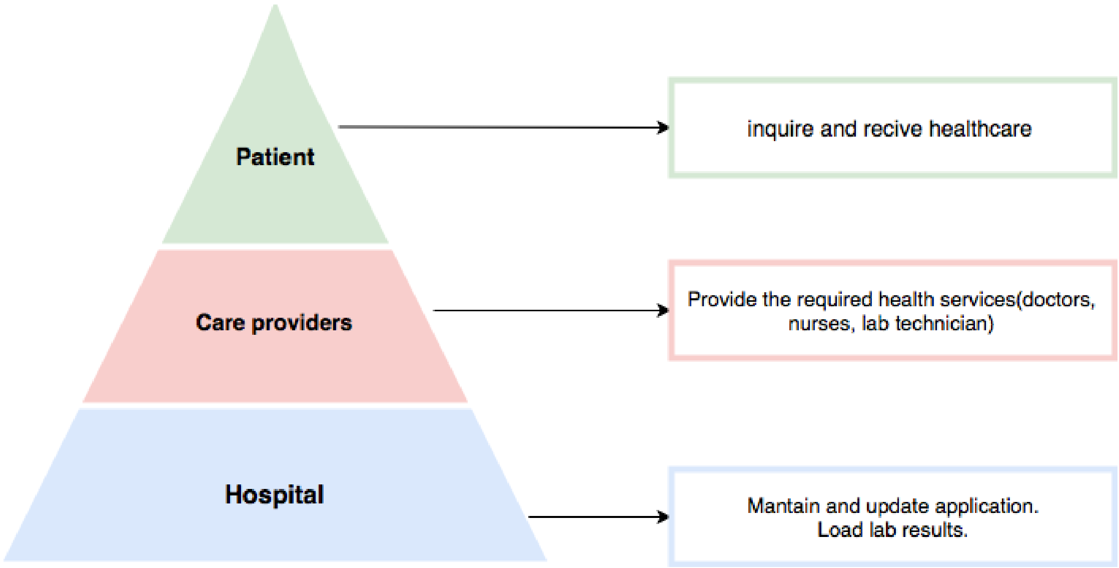

Patient
inquire and recive healthcare
Care providers
Provide the required health services(doctors, nurses, lab technician)
Hospital
Mantain and update application.
Load lab results.

Figure 1-1 Organization chart

1.2 General rules (Assumptions)

In order to use the home health care application, the patients should be able to use smart phones, and the hospitals in turn should market the application in way for patients to be informed about it. In the next level, hospitals must familiarize the patients and the healthcare providers with the minimum knowledge in terms of using the application. If the patient is old and does not have the correct knowledge to make use of the app, an IT person should help him on the phone or visit him at home in difficult cases.

Chapter 2 : LITERATURE REVIEW

2.1 INTRODUCTION

If we look at Saudi Arabia market regarding healthcare, we can found that there is a lot of centers that provide home health care, one of them is, SALAM home health care.
Salam medical is a standalone home healthcare company and not associated with a hospital and has many services including, Elderly Care at home, neurology care at home and medication management. But in Salam center, there is no use for a mobile phone application that helps patients request health care services to home (Salam Medical, n.d., para.1).
There is also on prestigious center called “Dar Al Shifa Home Care” In Kuwait that offers a lot of post hospitalizations services for patients. However, it also lacks the use of a mobile application to do the work (Dar Al Shifa Home Care, n.d., para.1).

Mobile health applications allow healthcare providers to connect with patients and staff more quickly and easily, reaching out to them on the device of their choosing and at their convenience. Apps designed for a smartphone, tablet, or even a smartwatch also allow users to access information when and where they need it, reducing time wasted searching for that data and boosting both engagement and satisfaction rates (Malvey& Slovensky, 2016).
In this chapter, we will mention some application that have the same approach it is an m-health application such as qural, alrazy group for home healthcare and 7keema application.

2.2 LITERATURE REVIEW

2.2.1 Qural

Qural is a smart healthcare app. Qural healthcare app allows doctors to manage their entire medical practice right from patient scheduling, electronic medical records (EMR)(EHR), patient tracking etc. using any mobile device. Qural can provide telemedicine services for patients and their physicians.
One of the best features included in Qural app is that patients can manage their entire family's medical and health information. Patients also can search for doctors based on specialization or location, connect with them and keep track of their medical and health information (Qural health care. n.d., para.2).

2.2.2 Al-Razy group for home healthcare

Al-Razy Group for Home Health Care is a licensed company started its activities in March 2013. The company is regularly audited by the official Health, financial and administrative governmental authorities in Egypt. In addition to that, Al-Razy group for home healthcare work with hospitals to serve their patients after discharge (Alrazy group, n.d.)

2.2.3 7kemma

Is an application that provides home health care services through a team of licensed nurses of both sexes. It provides services 24 hours a day in Egypt by locating the patient and providing care to him by his nearest nurse (7keema, n.d., para.1).

2.3 SIMILAR TOOLS COMPARISON

Table below table shows a comparison between our application tools and other similar application tools.

Features	Qural	Al-Razy group	7kemma	HHCS
Home care services	×	√	√	√
Managed by the hospital	×	×	×	√
Direct access to lab results	×	×	×	√
Chat and communication between patient and doctors	√	√	×	√
Android mobile platform (Samsung, LG etc.)	√	√	√	√

Table 2-1 comparison with similar application table

The most important feature in our application that is managed by the hospital itself, this will help the two parties, the patient and the hospital to have good management with great communication facilities referenced by the case of the patient and his file information from the hospital. Direct access to the lab results can also add a greater value in our home healthcare services application.

Chapter 3 : SYSTEM ANALYSIS AND SPECIFICATION

3.1 Introduction

In each model of system development there are four phases, one of which is analysis, which is the most important phase in the life cycle of systems development.

System analysis describes what a system should do to meet the needs of users where system requirements are defined. The purpose of Systems Analysis is to understand a system, which enables us to understand the structure and behavior of the system.

3.2 Modeling used

In this project, we used the prototyping model which I can through its iterative development of requirements, it have many advantages and disadvantages (Sparrow, n.d., para. 1).

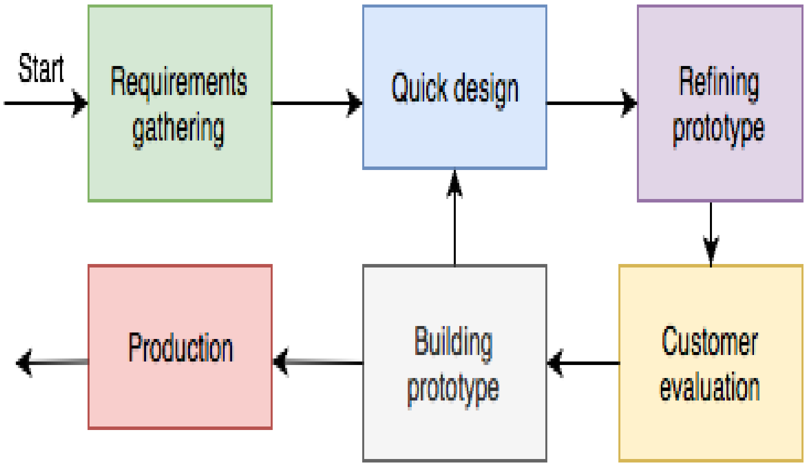


Figure 3-1 Prototyping model

❖ ***Advantages of Prototype model***

1. Users are actively involved in the development
2. Reduced time and costs
3. Errors can be detected much earlier

❖ ***Disadvantages of Prototype model***

1. User confusion.
2. Developers do not want to always involvement of clients.
3. Many changes by customers may disrupt the development team

3.3 Description of Data Flow Diagram (DFD)

The concept behind Data flow diagrams (DFDs) is to identify the relationships between components of the system. DFDs can be used to explain complex technical view of the system in a simple way that can be understood by non-technical individuals. However, DFDs can help system designers and others in the analysis stages of the system.
Data Flow Diagram consists of four major components, entities, processes, data stores and data flows (Donald, 2012).

3.3.1 Context Diagram

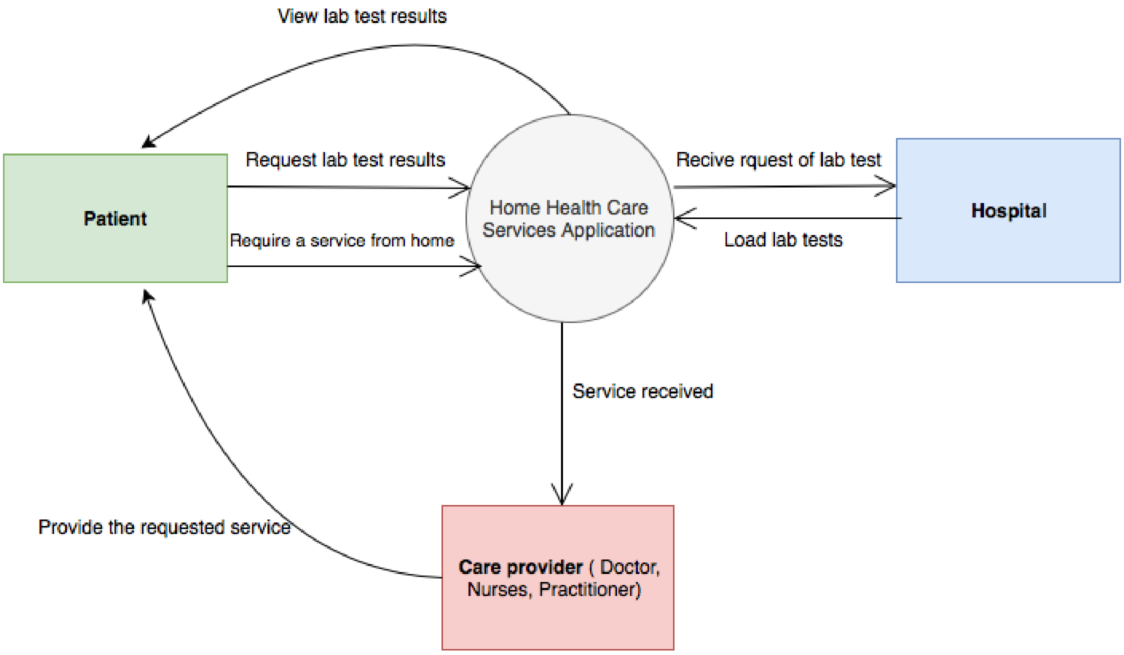

View lab test results
Request lab test results
Recive rquest of lab test
Patient
Home Health Care Services Application
Hospital
Require a service from home
Load lab tests
Service received
Provide the requested service
Care provider (Doctor, Nurses, Practitioner)

Figure 3-2 Context Diagram

A context diagram only shows the top level, As shown above (see figure3.2) in the figure the diagram describes in a general way how the system works and interact with each main component. Patients, care providers and hospital are the main components of the system; they interact with each other though the home healthcare services application.

3.3.2 Overview diagram (level 0)

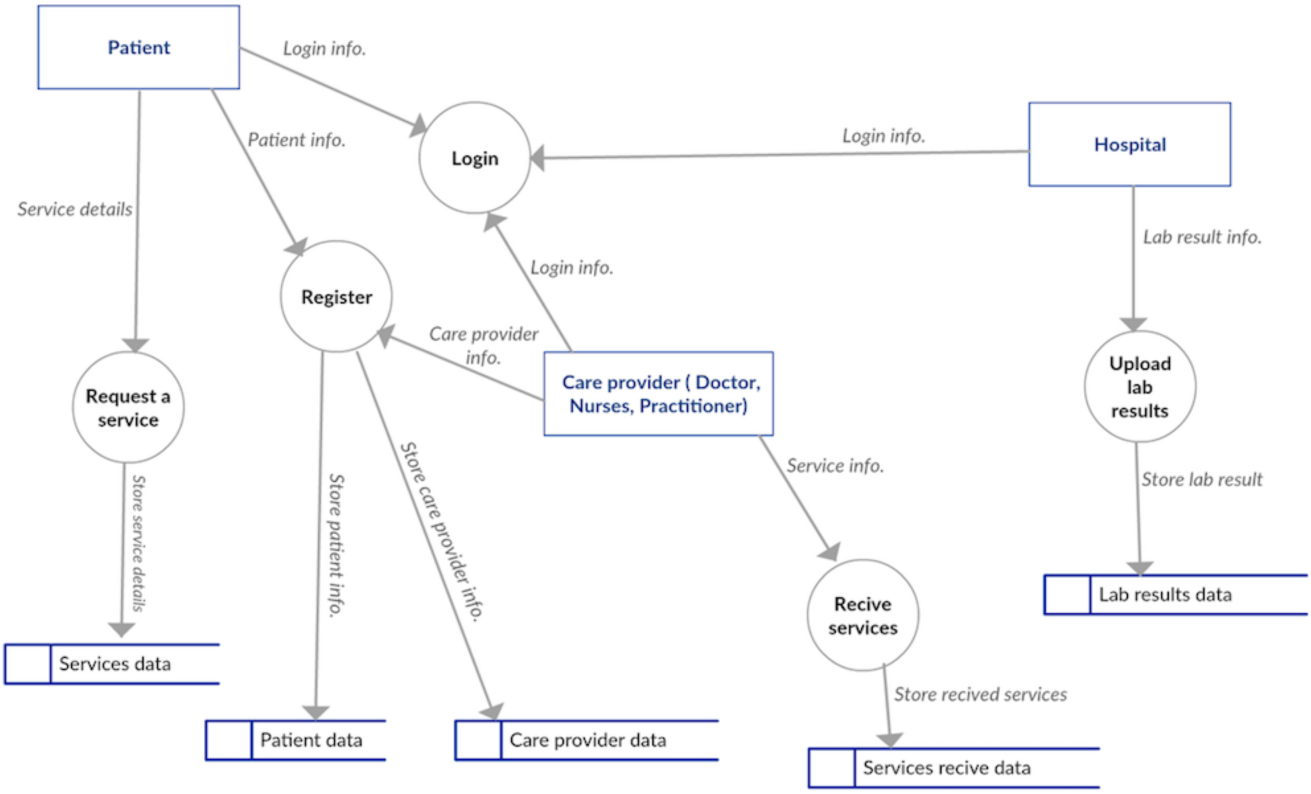


Figure 3-3 level 0 diagram

A level 0 diagram as shown above (see figure3.3) it describes how to components in the system interact in detail.

3.3.3 Detailed DFDs

Basically, a DFD is a picture of movement of data between external entities, processes and data store within a system.

- External Entity: Represents a human, subsystem or system (rectangle).
- Process: A process is a business activity or function where the manipulation and transformation of data takes place (circle).
- Data Store: Represents the storage of persistent data required or/and produced by the process.
- Data Flow: Represents the flow of information, with its direction represented by an arrow head that shows at the end of flow connector.

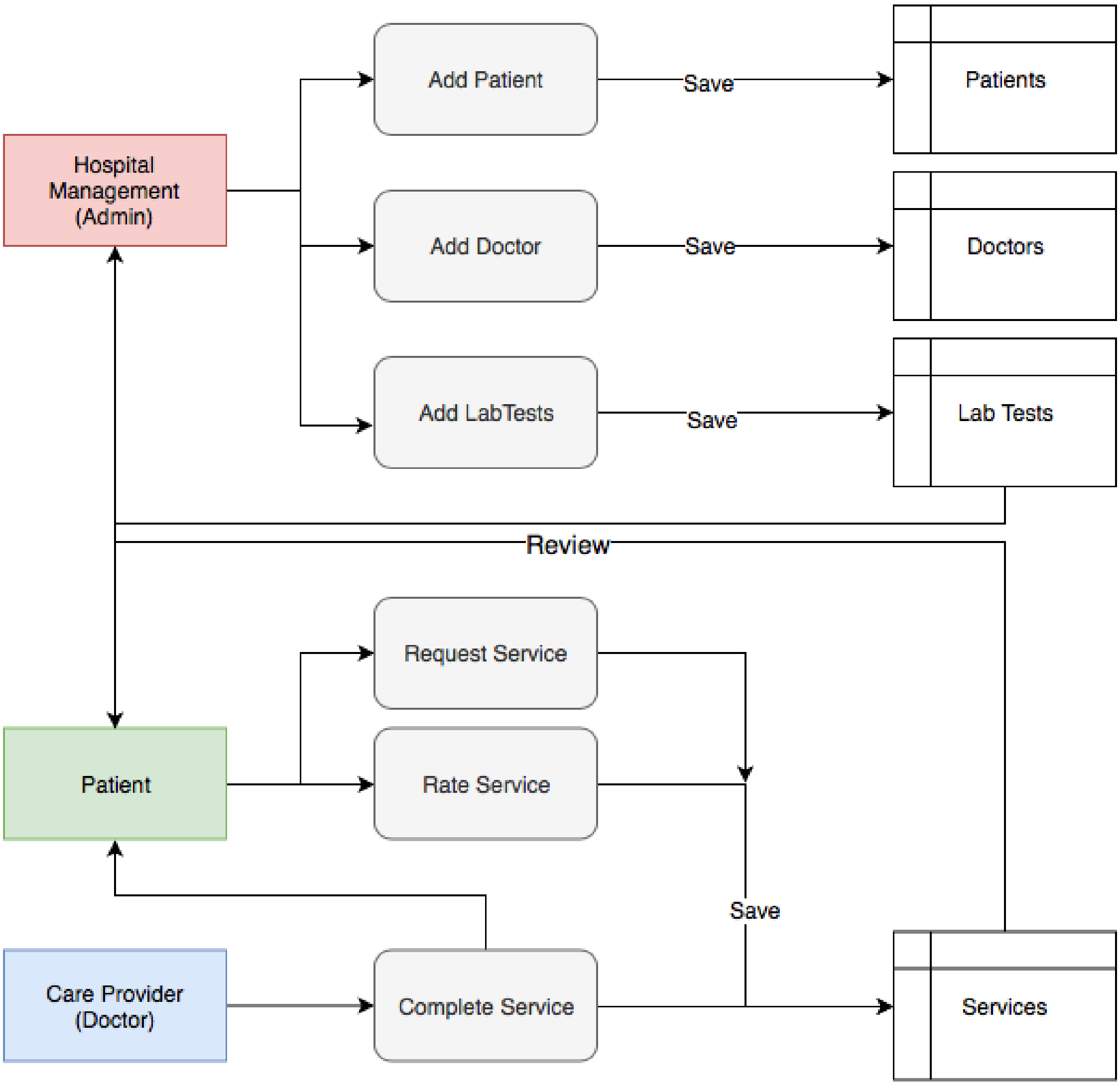


Figure 3-4 Data Flow Diagram (DFD)

As shown in figure above (see figure 3.4) after the authentication process is done correctly,

hospital can add patient, add doctor or add lab tests then it will be stored in database.

patient login to the application with his email and password and after that he can chose a service request if it home based service it should select the doctor and schedule the time and date with address, or if the service is to check the lab results it dependent on the hospital has added or not, also patients can evaluate services that will be used in improving the system.

Care provider can complete the requested services to patient.

3.4 Unified Modelling Language (UML) Diagram

The Unified Modeling Language (UML) is a general-purpose, developmental, modeling in the field of software engineering which is intended to provide a standard way to visualize the design of a system (Unified Modeling Language User Guide,2005, p. 496). We prepare UML diagrams to understand HHCS system in better and simple way. Also, a single diagram is not enough to cover all aspects of the system. So, structures various kinds of diagrams including structural and behavioral diagrams to cover most of the aspects of a system.

3.4.1 Usecase Diagram

Use Cases describe the behavior of the system, it is an effective requirement capture technique that makes requirements available for review by avoiding any implementation bias in the requirements.

Use Case itself is an interaction that a User or other System has with the system that is being designed, in order to achieve a goal. The term Actor is used to describe the person or system that has the goal, this term is used to emphasize the fact that any person or system could have the goal. In addition to that they are used to describe the relationships among the functionalities and their internal/external actors (WhatIs, n.d., para. 1).

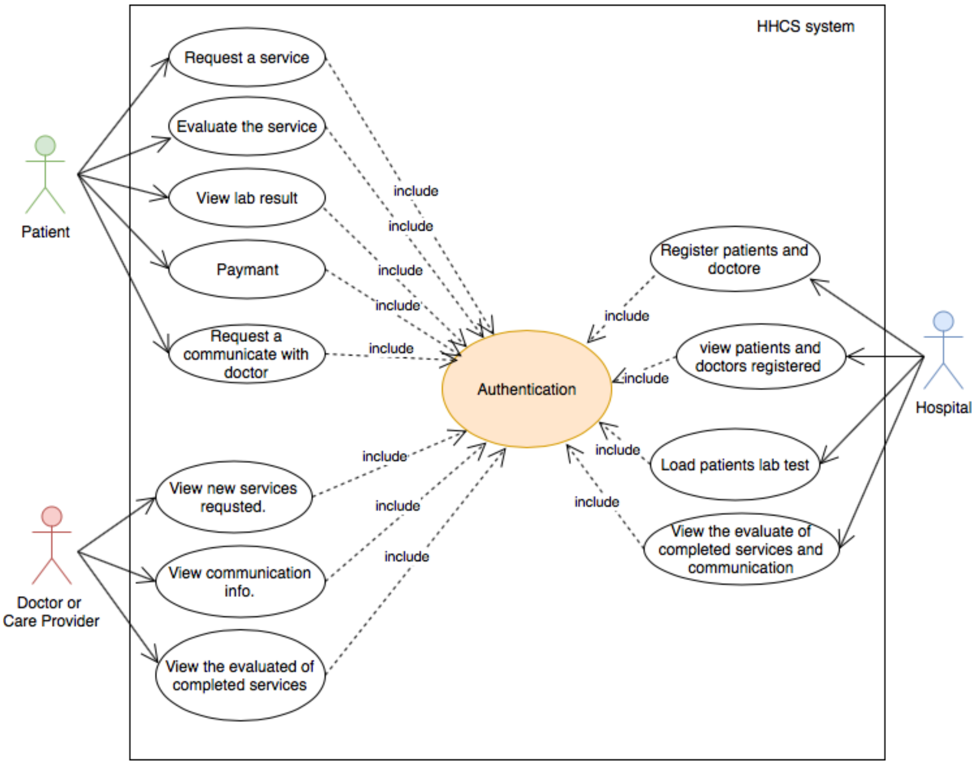


Figure 3-5 Use case diagram

3.4.1.1 Patient usecase diagram

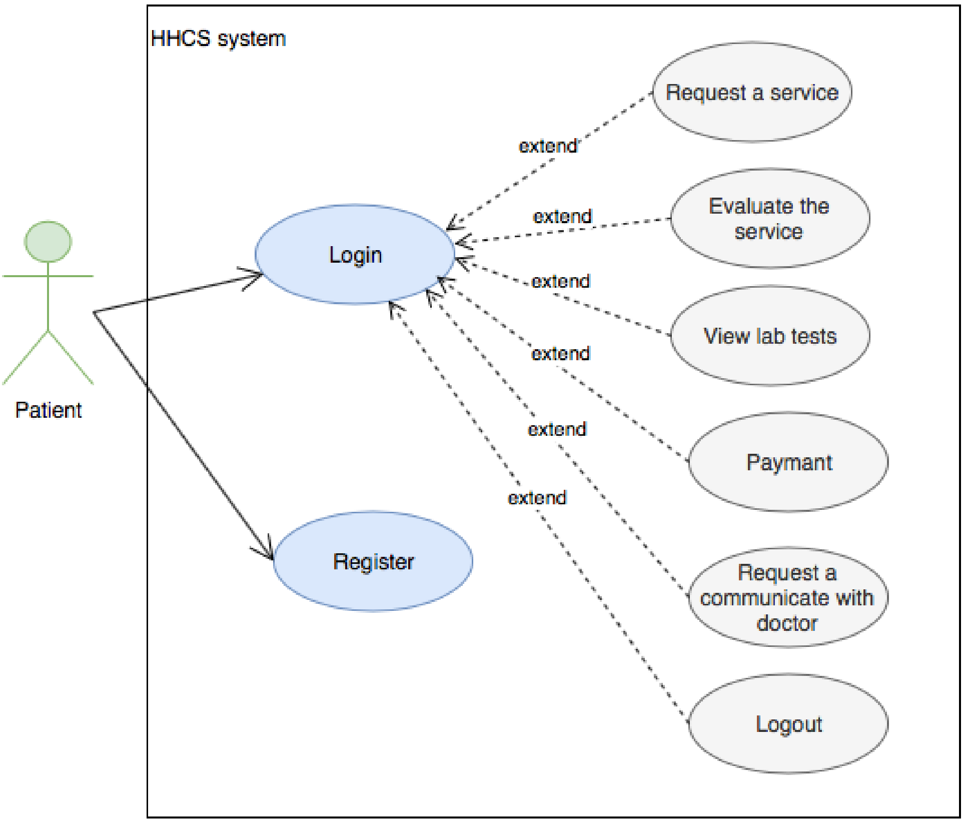


Figure 3-6 Patient use case diagram

3.4.1.2 Care Provider usecase diagram

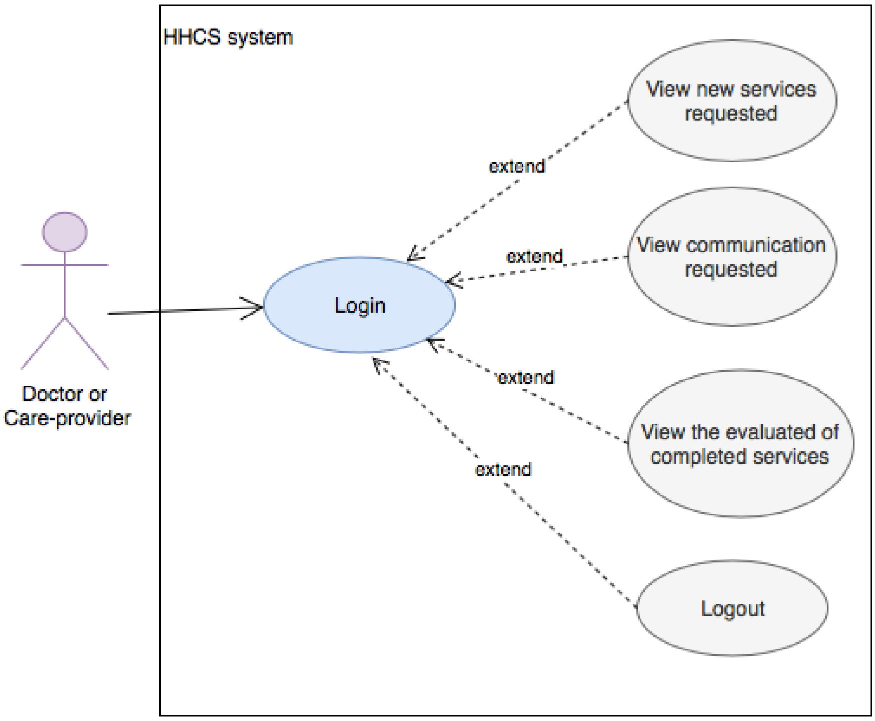

HHCS system
View new services requested
extend
View communication requested
extend
Login
Doctor or Care-provider
extend
View the evaluated of completed services
extend
Logout

Figure 3-7 Doctor usecase diagram

3.4.1.3 Hospital usecase diagram

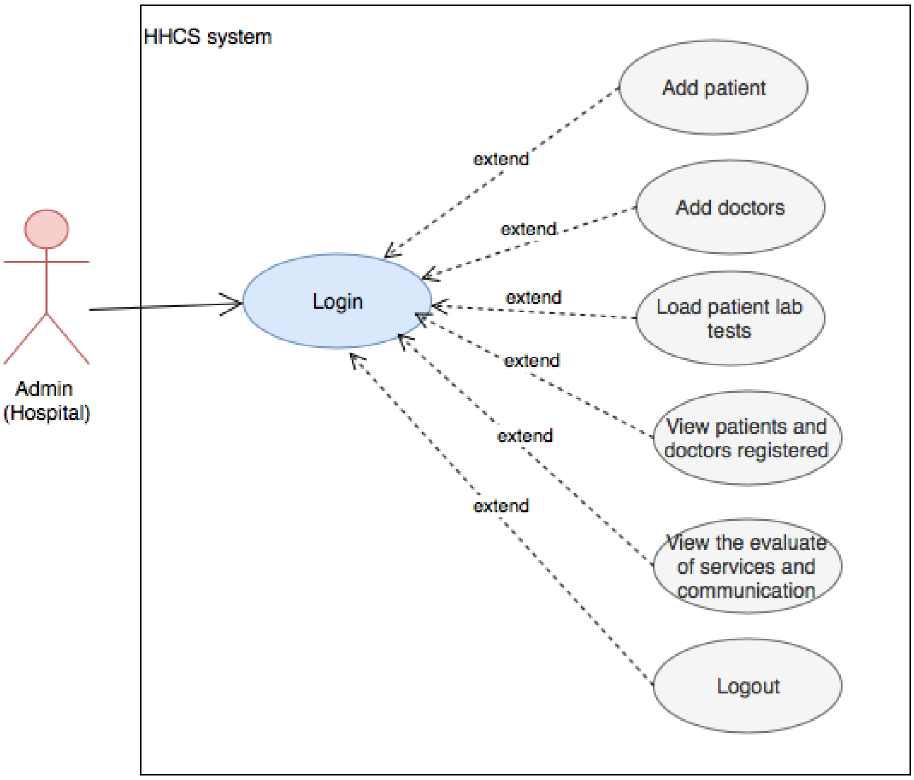


Figure 3-8 Hospital (admin) usecase diagram

3.4.2 Class Diagram

A class diagram describes the structure of the system and defines the methods and variables in an object (Lucidchart, 01 November,2018).

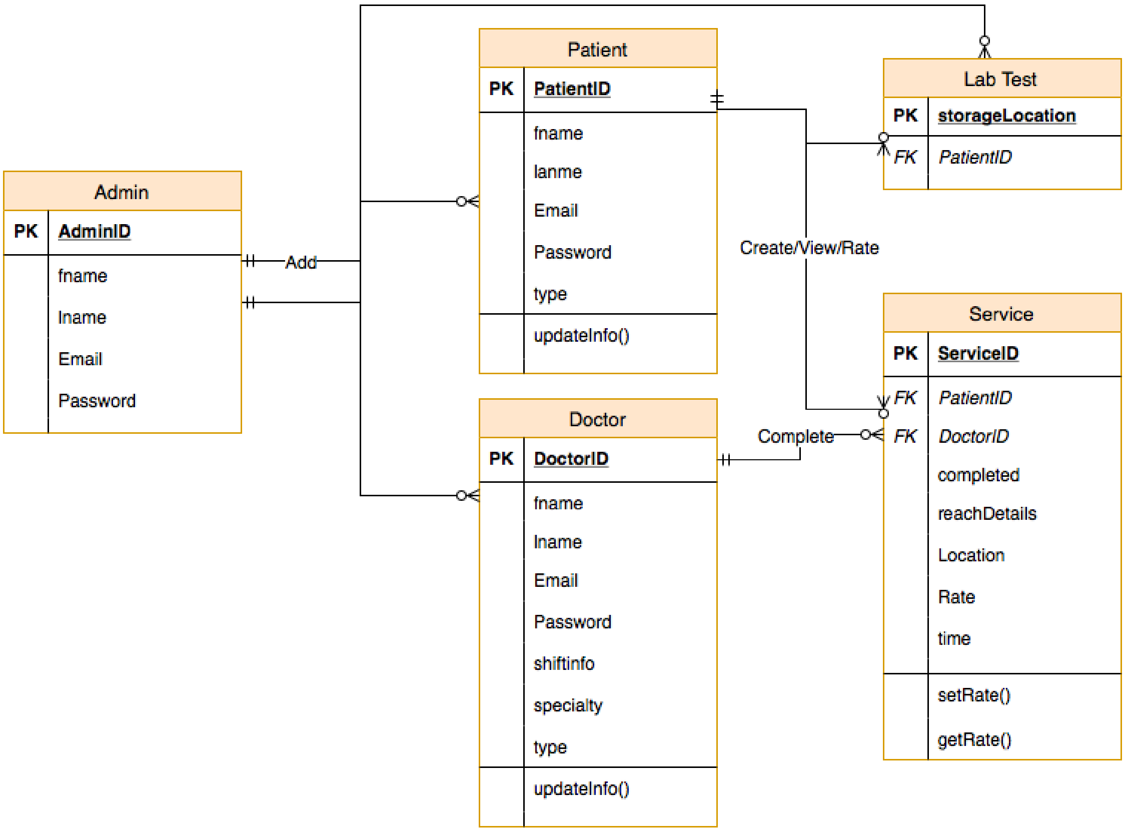


Figure 3-9 Class diagram

3.4.3 Sequence Diagram

Sequence diagrams are a kind of interaction diagram, because they describe how—and in what order—a group of objects works together. Sequence diagrams are sometimes known as event diagrams or event scenarios.

The sequence diagram is used primarily to show the interactions between objects in the sequential order that those interactions occur (smartdraw, n.d., para. 1).

3.4.3.1 Hospital (Admin) Sequence diagram

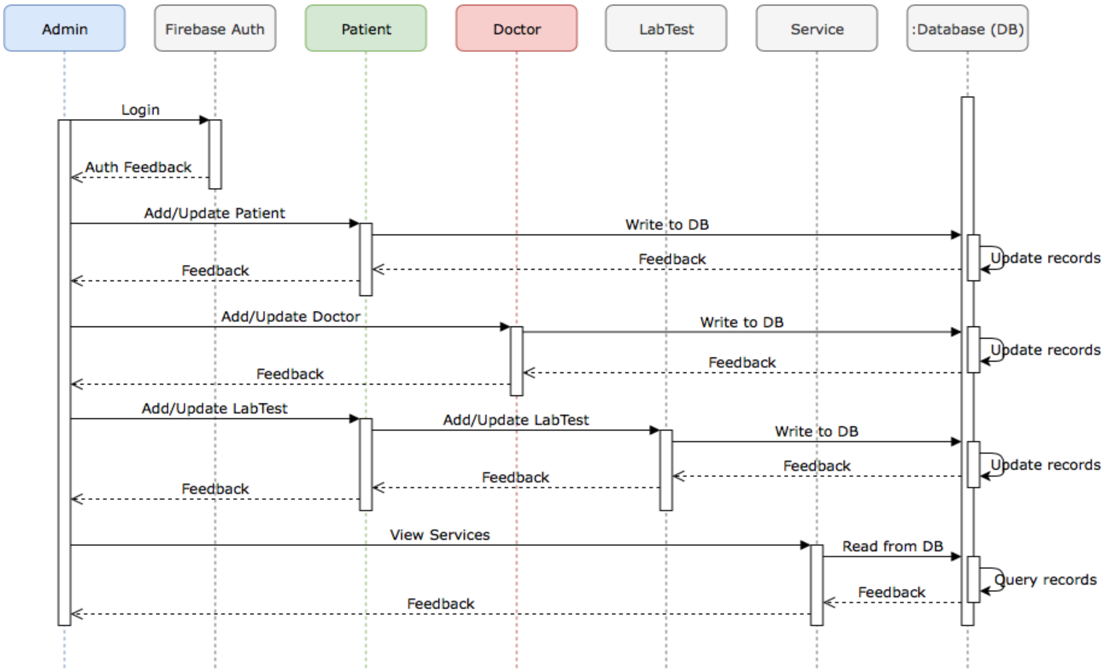


Figure 3-10 Hospital sequence diagram

3.4.3.2 Patient Sequence diagram

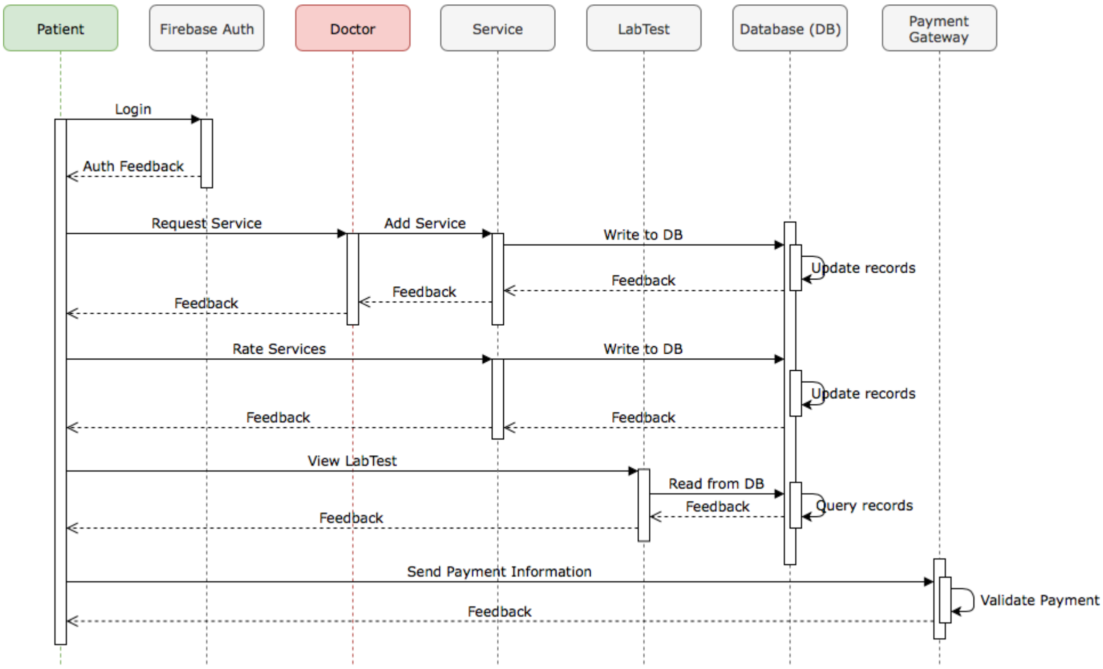


Figure 3-11 Patient sequence diagram

3.4.3.3 Doctor Sequence diagram

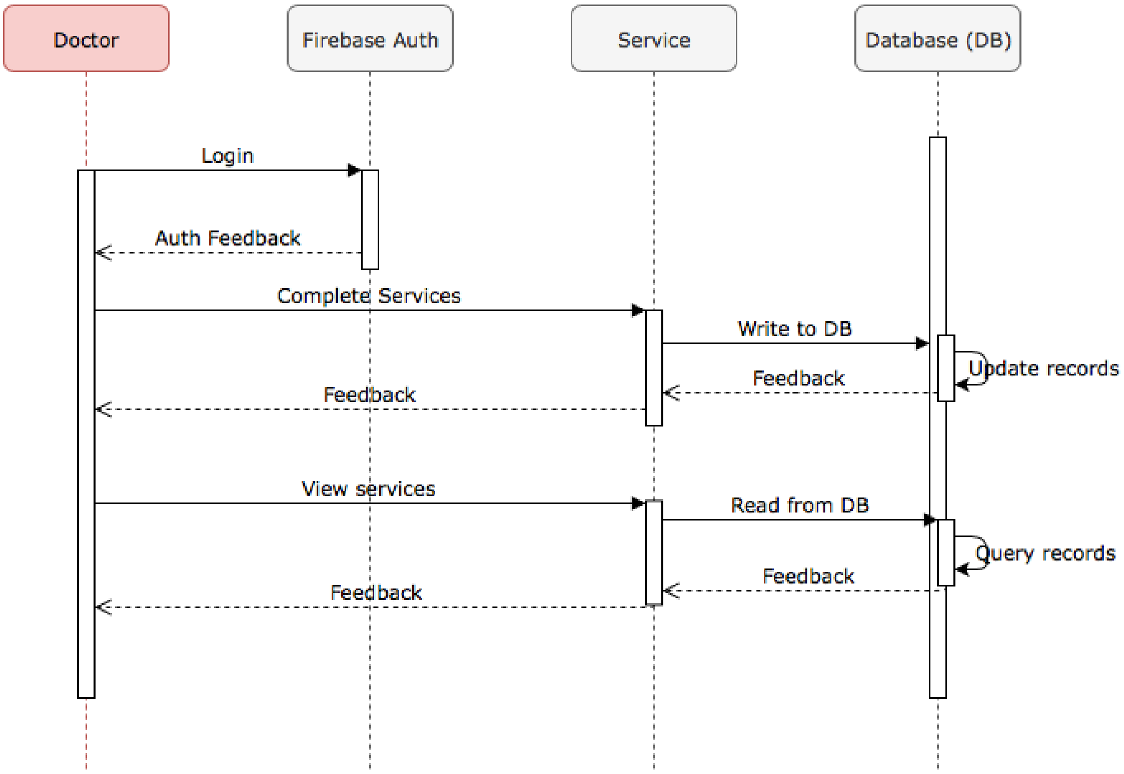


Figure 3-12 Doctor sequence diagram

3.4.4 Activity Diagram

An activity diagram describes the behavior of the system and visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram (Lucidchart, 06 September, 2018).

3.4.4.1 Hospital (Admin) activity diagram

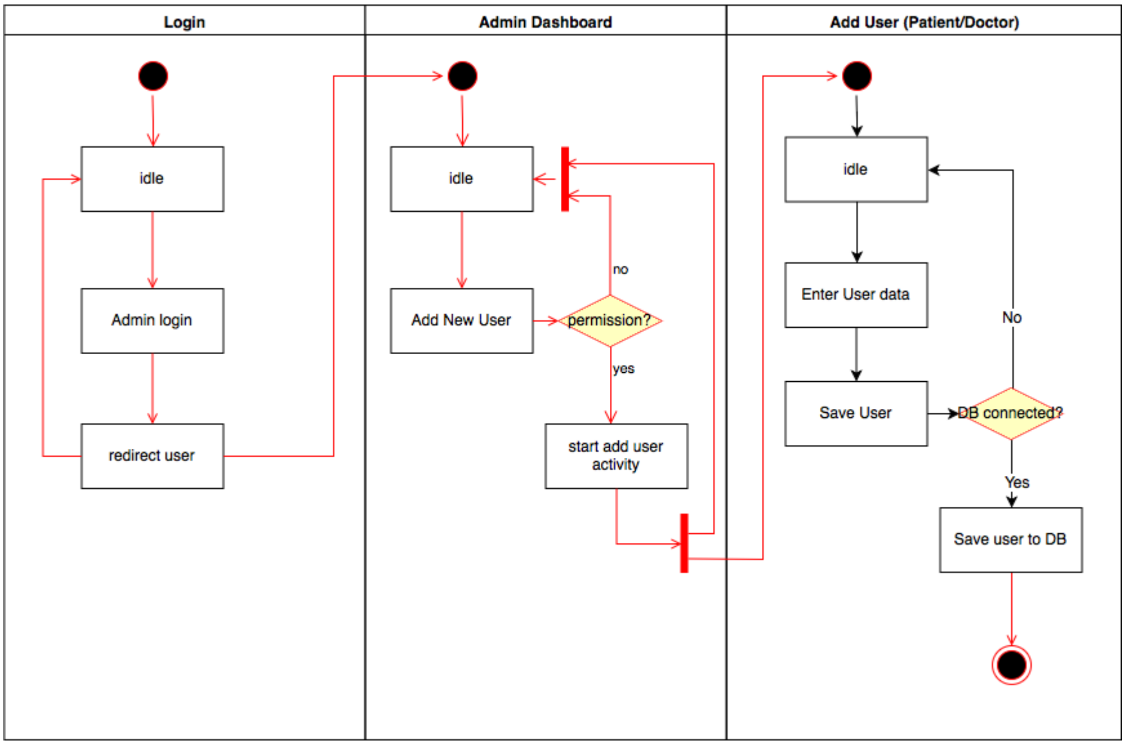


Figure 3-13 Hospital activity diagram

3.4.4.2 Patient activity diagram

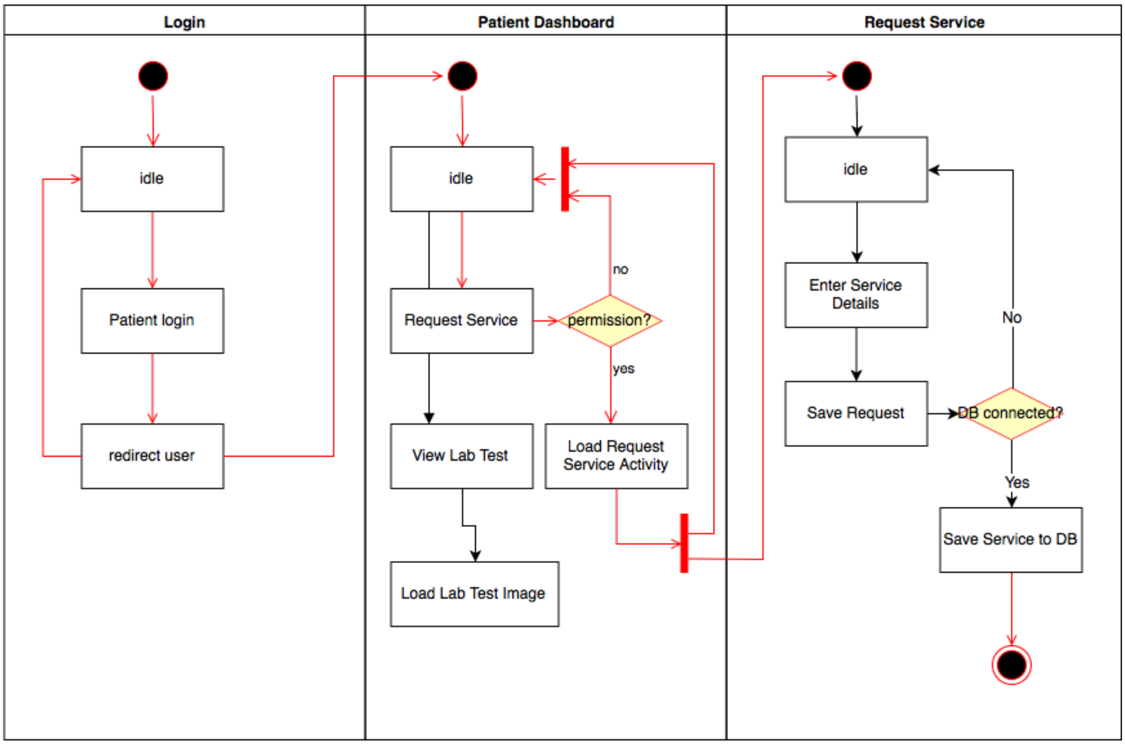


Figure 3-14 Patient activity diagram

3.4.4.3 Doctor activity diagram

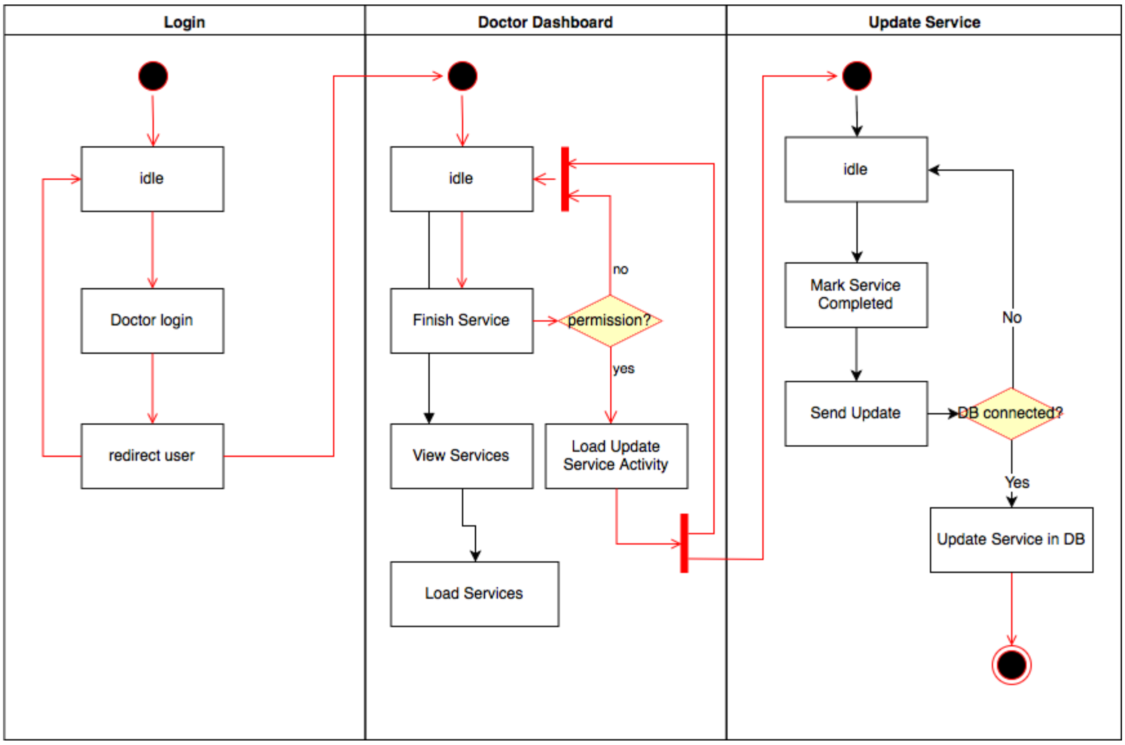


Figure 3-15 Doctor activity diagram

3.5 Entity Relationship Diagram (ERD)

An entity relationship diagram (ERD) shows the relationships of entity sets stored in a database. An entity in this context is a component of data. In other words, ER diagrams illustrate the logical structure of databases (Rouse, 2018).

The ER data model has three basic notions: entity-sets, relationship sets and attributes.

3.5.1 Description of Entities

1. **Name:** Hospital (admin)

Attributes: AdminID: Unique ID

Email: the email of hospital.

Password: hospital password to login to application.

Fname: the first name of the hospital.

Lname: the last name of the hospital.

2. **Name:** Patient

Attributes: patientID: Unique ID

fname: the first name of patient.

Lname: the last name of the patient.

Email: the email of patient.

Password: patient password to login to application.

Type: the type of the user.

3. **Name:** Doctor

Attributes: doctorID: Unique ID

fname: the first name of doctor.

Lname: the last name of the doctor.

Email: the email of doctor.

Password: doctor password to login to application.

Shiftinfo: the shift of doctor.

Specialty: specialty of the doctor.

Type: the type of the user.

4. **Name:** Service

Attributes: ServiceID: Unique ID

Completed: the service is completed or not

DoctorID: the doctor ID

PatientID: the patient ID

Rate: rate or evaluate of services

Location: location of patient

Time: the time of service.

reachDetails: details of the appointment whether a mobile number or skype account

5. **Name:** Lab Test

Attributes: storagelocation: Unique ID

PatientID: the patient ID

3.5.2 Description of relations

- Admin Account

In our application, we have only one (and only one) admin account which can add zero or many (Patients, Doctors and LabTests results for the patients).

- Doctor Account

The Doctor account could be added by the admin, as explained previously, and able to complete zero or many services (which were created by the patient and associated with him).

- Patient Account

The patient account is the main focus of the app, hence it has many functionalities.

- Patient has zero or one LabTest result.
- Patient has zero or many Services associated with him.
- Patient can request zero or many Services.
- Patient can rate (give feedback) on zero or many Services.

3.5.3 Drawing ERD

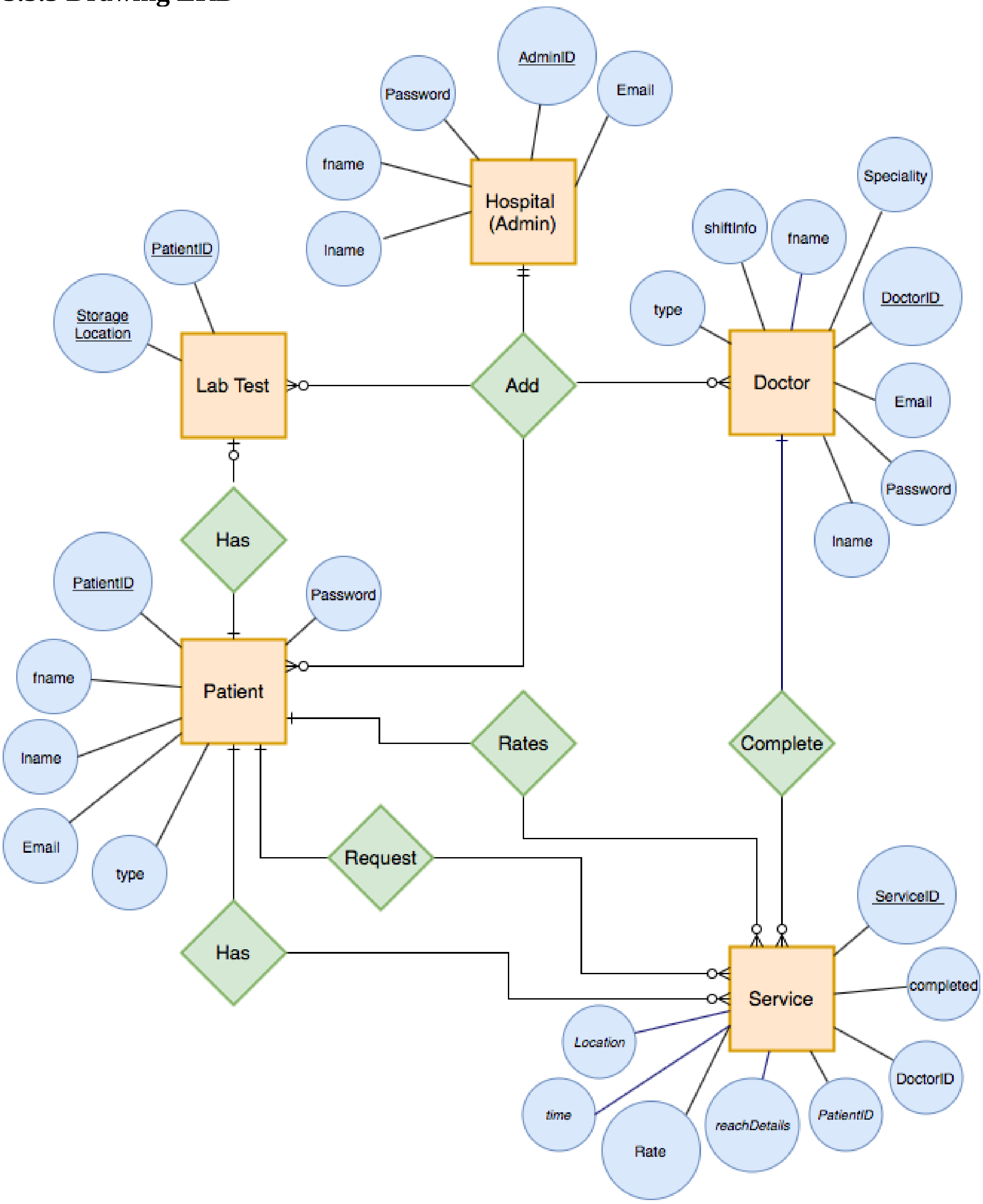


Figure 3-16 ERD diagram

Chapter 4 : SYSTEM DSIGN

4.1 Description of procedures and function

In the description of procedure and function we will draw a flowchart diagram that will clear up all the procedures and function of patient's in the system (Lucidchart, 06 September, 2018).

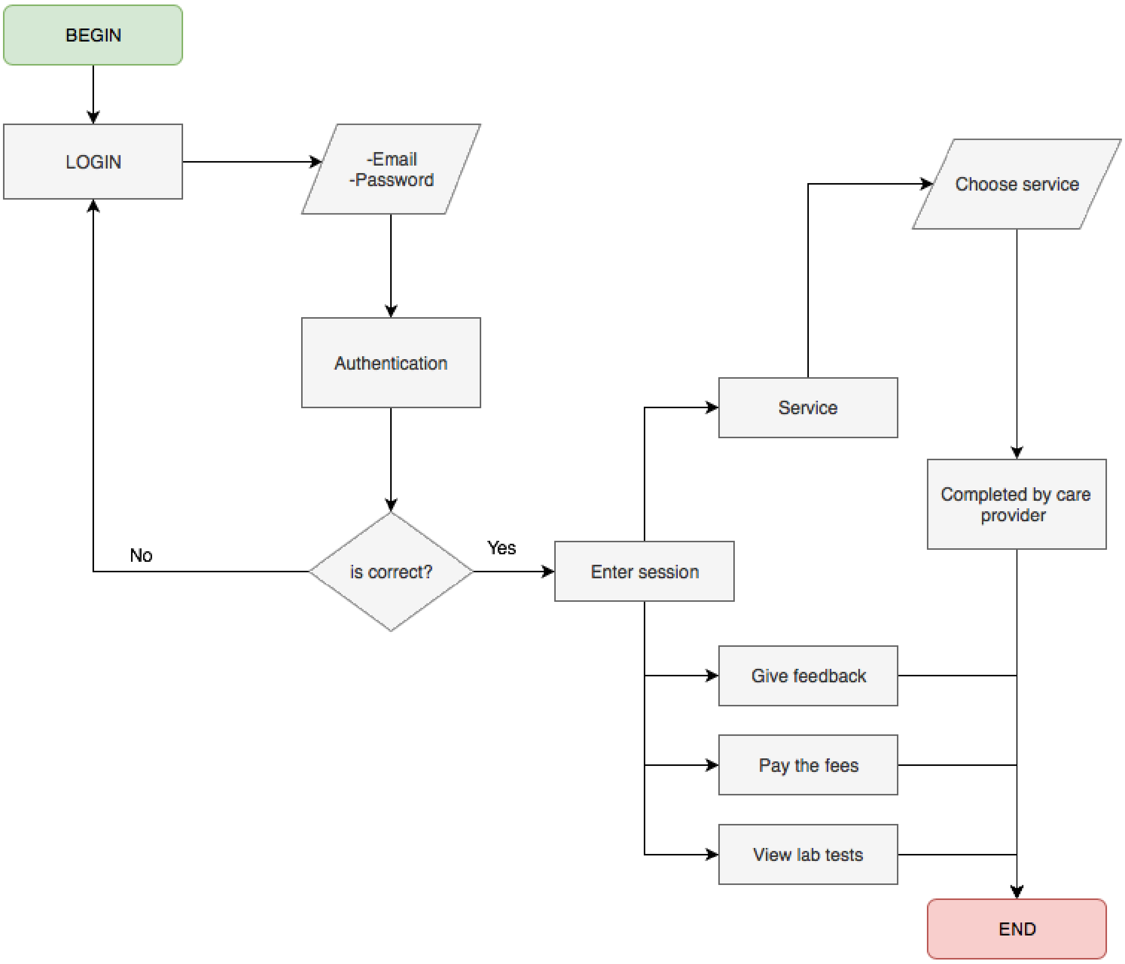


Figure 4-1 Flowchart diagram

In the above figure (see fig. 4.1), after the login and correct authentication, the user (patient) will have the choice to either give a feedback or suggestion about something or choose a service. The healthcare application will call other system in the hospital to check the availability of the service. If it is available the care will be provided for the patient.

4.2 Relation database schema

A relational database is a group of data organized in the form of tables. These tables will help programs to add, fetch, and remove data from them. Data can be accessed or reassembled in many different ways without having to rebuild or reorganize the database tables (Nguyen, 04 October, 2017).

4.2.1 Tables

Several tables are required to implement our system the following is the list tables:

- Hospital (Admin) table: The hospital table contains hospital information and login information for hospital.
- Patient table: contains patient information and login information for patient.
- Doctor table: contains doctor information and login information for doctor.
- Services table: represents all data related to services that could offer for care provider.
- Lab test table: represents information about the result of lab test that uploaded by the hospital.

4.2.2 Attributes

4.2.2.1 Hospital (Admin) Attributes

Attribute Name	Data Type	Constraints
Admin ID	String	Primary key
fname	String	
lname	String	
Email	String	
Password	String	

Table 4-1 Hospital attributes table

4.2.2.2 Patient Attributes

Attribute Name	Data Type	Constraints
Patient ID	String	Primary key
fname	String	
lname	String	
Email	String	
Password	String	
type	String	

Table 4-2 Patient attributes table

4.2.2.3 Doctor Attributes

Attribute Name	Data Type	Constraints
Doctor ID	String	Primary key
fname	String	
lname	String	
Email	String	
Password	String	
Shiftinfo	String	
specialty	String	
type	String	

Table 4-3 Doctor attributes table

4.2.2.4 Services Attributes

Attribute Name	Data Type	Constraints
Service ID	String	Primary key
Completed	Boolean	
Doctor ID	String	Foreign key
Patient ID	String	Foreign key
reachDetails	String	
Rate	number	
Location	String	
time	String	

Table 4-4 Services attributes table

4.2.2.5 Lab test Attributes

Attribute Name	Data Type	Constraints
storagelocation	String	Primary key
Patient ID	String	Foreign key

Table 4-5 Lab test attributes table

4.2.3 Relations

The relation between all tables is set by the use of primary key and foreign keys.

In order for two tables to be linked together, a primary key attribute in the first one should be a foreign key in the second one and vice versa. A draw of a relational database schema will show the relations between tables.

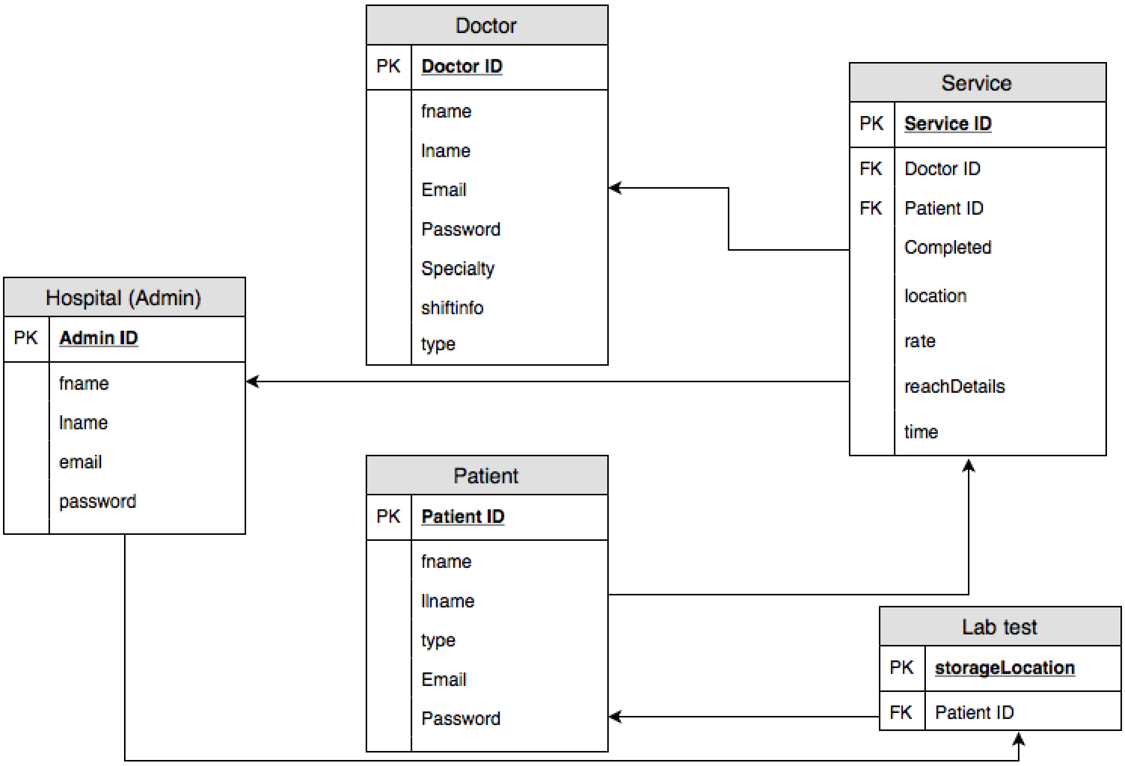


Figure 4-2 Relational Database Schema

4.3 Hardware and software requirements

- Software requirements:

Android studio

Android Studio is the official integrated development environment (IDE) for developing for the Android platform. It was announced on May 16, 2013 at the Google I/O conference. Android Studio is freely available under the Apache License 2.0.

Android emulator:

An Android emulator is an Android Virtual Device (AVD) that represents a specific Android device. The emulator gives the look, feel and functionality of an android device virtually. You can use an Android emulator as a target platform to run and test your Android applications on your PC without the need of an android phone or any android device

Firebase:

Firebase is platform which allow to build web and mobile applications without server-side programming language. It combines Analytics, Database, Authentication, Storage, Hosting, Crash Reports etc.

Google is trying to Integrate all basic services needed for an android app through Firebase.

Draw.io

Draw.io is an open source technology stack for building diagramming applications, and the world’s most widely used browser-based end-user diagramming application.

- Hardware requirements

Android phone or tablet: the android phone device will be used to install the application, open it and use it.

Chapter 5 : IMPLEMENTATION AND TESTING

5.1 Introduction

In this chapter we focus on the procedures followed in the system, the design of the interfaces and the way they are linked to the database.

5.2 Procedures

The project has so many functions that are very important. Here, we will mention the most two important functions from our point of view:

1. *SignInUsingFirebaseAuth()*

This is the most important function as without it the application won’t be working at all. All the actions and functionalities of the app (except for a patient to register himself) are limited to authenticated users only. So that, all their data are properly linked to them. This function allows the user to properly authenticate himself and login to the app to make use of its various functionalities.

2. *RequestNewService()*

In the second place comes the RequestNewService() functions. This function represents the core functionality of the app, where a patient can request the service remotely through the app.

The function takes the input data from the patient and creates a new record for the service and makes it available to the selected service provider to take the proper action.

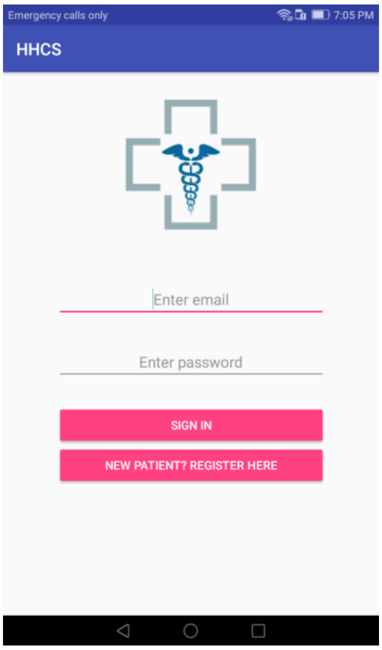
5.3 Layouts

In our system we have hospital(admin), patient and doctor, each one has a different layout.

5.3.1 Hospital (admin) layout

5.3.1.1 Hospital sign-in interface

One of the most important interfaces in our system.


Emergency calls only 7:05 PM

HHCS

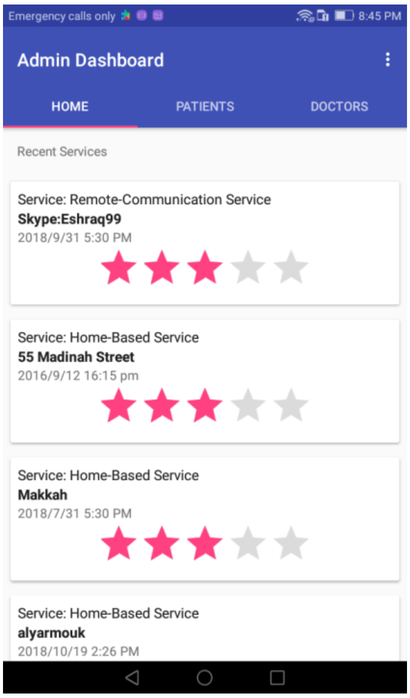
Enter email

Enter password

Figure 5-1 Sign-in interface

5.3.1.2 Hospital homepage interface

This page contains a list of all completed services and services evaluated by the patient


Emergency calls only 8:45 PM

Admin Dashboard

Recent Services

Service: Remote-Communication Service
Skype:Eshraq99
2018/9/31 5:30 PM
★★★☆☆

Service: Home-Based Service
55 Madinah Street
2016/9/12 16:15 pm
★★★☆☆

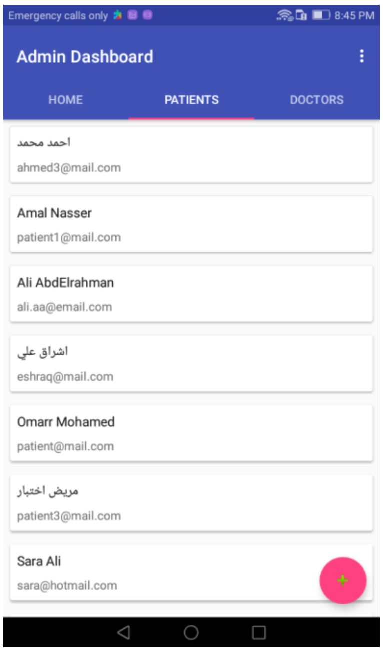
Service: Home-Based Service
Makkah
2018/7/31 5:30 PM
★★★☆☆

Service: Home-Based Service
alyarmouk
2018/10/19 2:26 PM

Figure 5-2 Hospital homepage interface

5.3.1.3 Hospital list of patient’s list interface

This interface contains a list of registered patients, and through it the hospital can add a new patient.



احمد محمد
ahmed3@mail.com

Amal Nasser
patient1@mail.com

Ali AbdElrahman
ali.aa@email.com

اشراق علي
eshraq@mail.com

Omarr Mohamed
patient@mail.com

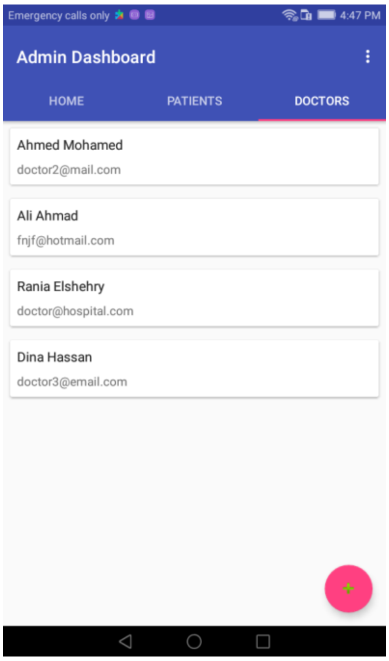
مريض اختبار
patient3@mail.com

Sara Ali
sara@hotmail.com

Figure 5-3 Hospital patients’ list interface

5.3.1.4 Hospital list of doctors’ list interface

This interface contains a list of registered doctors’, and through it the hospital can add a new doctor.



Ahmed Mohamed
doctor2@mail.com

Ali Ahmad
fnjf@hotmail.com

Rania Elshehry
doctor@hospital.com

Dina Hassan
doctor3@email.com

Figure 5-4 Hospital doctors’ list interface

5.3.2 Patient layout

5.3.2.1 Register a new patient interface

Through the homepage of the application, patient can register by select NEW PATIENT? REGISTER HERE and fill in all this information.

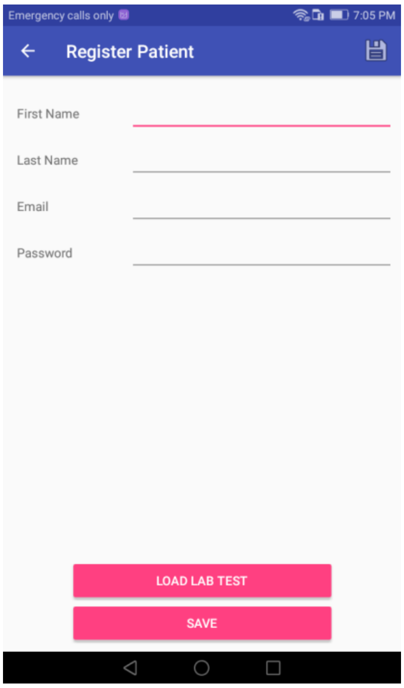
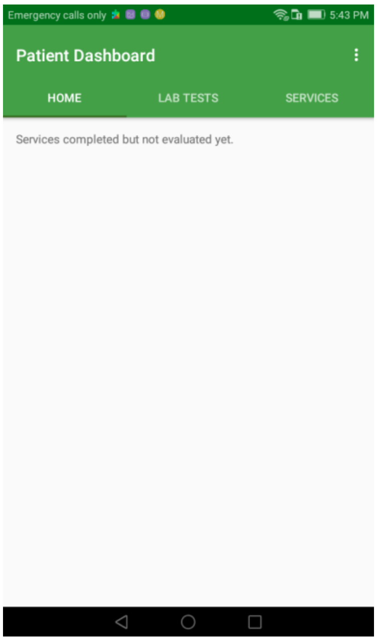


Figure 5-5 Patient register interface

5.3.2.2 Patient homepage interface

In this interface, all the completed services will be here to evaluate.

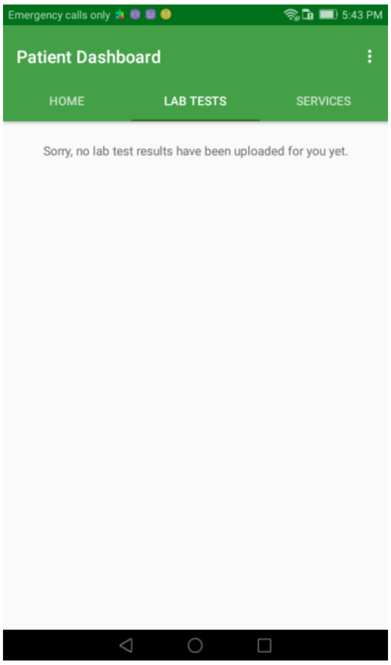


Services completed but not evaluated yet.

Figure 5-6 Patient homepage interface

5.3.2.3 Patient lab tests interface

lab tests interface contains the results of lab test you did it in hospital that will be uploaded by the hospital itself.



Sorry, no lab test results have been uploaded for you yet.

Figure 5-7 lab tests interface

5.3.2.4 Patient services interface

Services interface contains three services which you can select from them what you want.

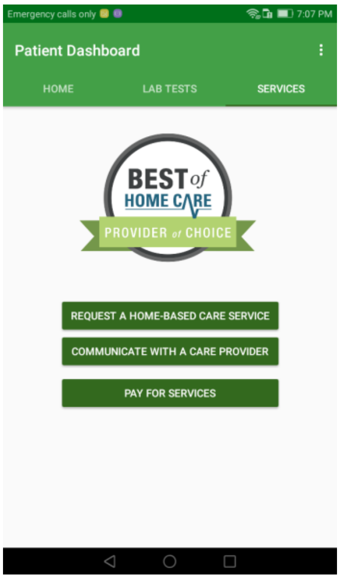
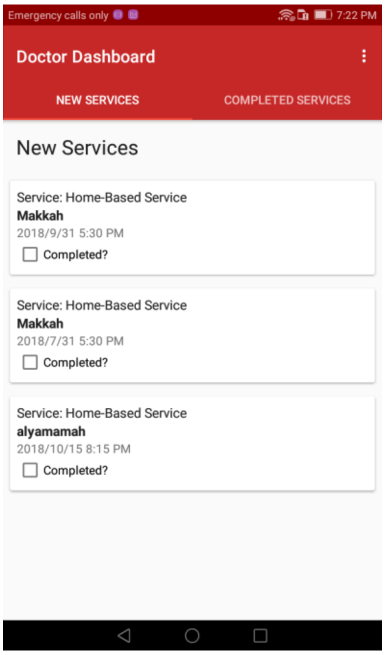


Figure 5-8 Services interface

5.3.3 Doctor layout

5.3.3.1 new services interface

After the doctor log-in by the email and password, the first interface contains a list of services requested by the patient.



Emergency calls only 7:22 PM

Doctor Dashboard

NEW SERVICES COMPLETED SERVICES

New Services

Service: Home-Based Service
Makkah
2018/9/31 5:30 PM
□ Completed?

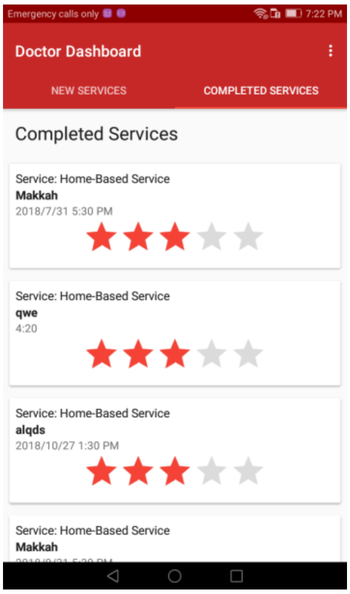
Service: Home-Based Service
Makkah
2018/7/31 5:30 PM
□ Completed?

Service: Home-Based Service
alyamamah
2018/10/15 8:15 PM
□ Completed?

Figure 5-9 New services interface

5.3.3.2 completed service interface

The second interface of the doctor is completed services interface which contain all the services completed and it evaluate.



Emergency calls only 7:22 PM

Doctor Dashboard

NEW SERVICES COMPLETED SERVICES

Completed Services

Service: Home-Based Service
Makkah
2018/7/31 5:30 PM
★★★☆☆

Service: Home-Based Service
qwe
4:20
★★★☆☆

Service: Home-Based Service
alqds
2018/10/27 1:30 PM
★★★☆☆

Service: Home-Based Service
Makkah

Figure 5-10 Completed services interface

5.4 Reports layouts

- In the hospital (admin) account, when you want to add a new patient or doctor you should to insert some information's about him then click save to create the account.

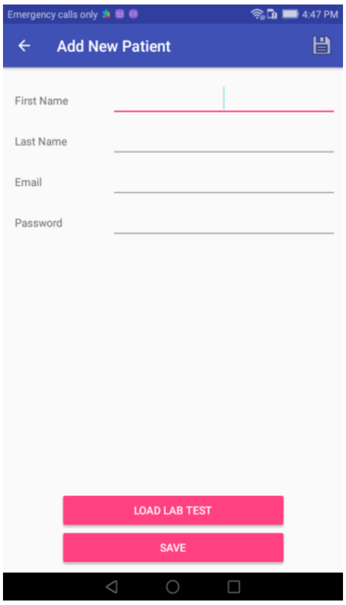


Figure 5-11 Patient registration interface

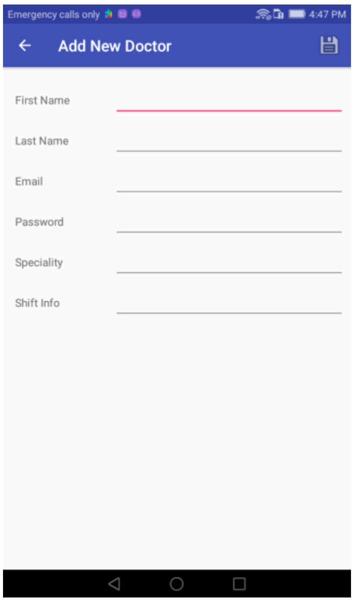
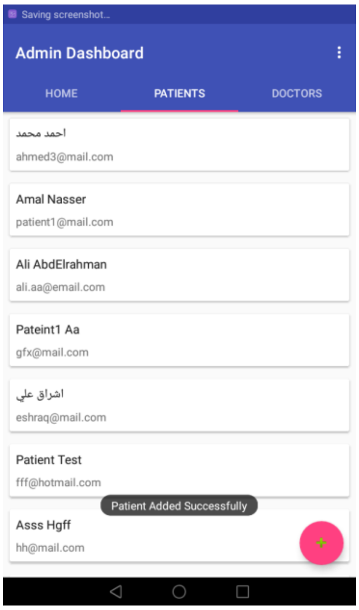


Figure 5-12 Doctor registration interface

After you register patient or doctor successfully you will get these messages,



احمد محمد
ahmed3@mail.com

Amal Nasser
patient1@mail.com

Ali AbdElrahman
ali.aa@email.com

Pateint1 Aa
gfx@mail.com

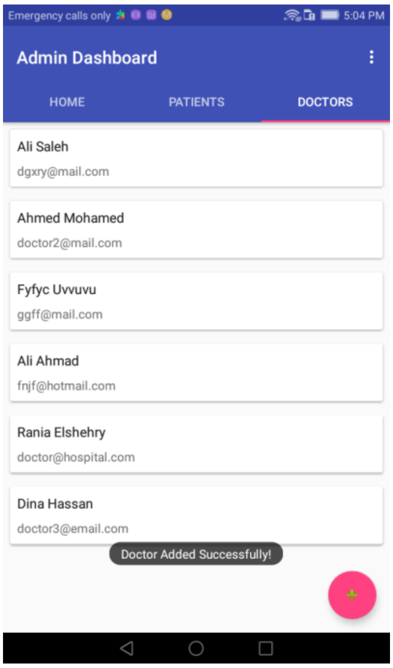
اشراق علي
eshraq@mail.com

Patient Test
fff@hotmail.com

Patient Added Successfully

Asss Hgff
hh@mail.com

Figure 5-13 Patient added successfully interface


Emergency calls only 5:04 PM

Admin Dashboard

Ali Saleh
dgxry@mail.com

Ahmed Mohamed
doctor2@mail.com

Fyfyc Uvvuvu
ggff@mail.com

Ali Ahmad
fnjf@hotmail.com

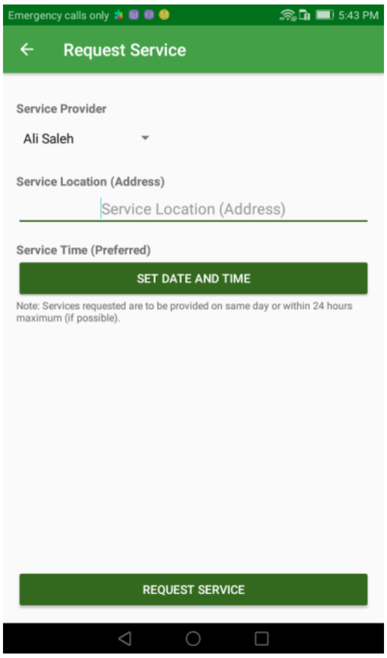
Rania Elshehry
doctor@hospital.com

Dina Hassan
doctor3@email.com

Doctor Added Successfully!

Figure 5-14 Doctor added successfully interface

- In the patient account, when you want to request a new service either home-based service or communicate with a doctor service, you should to insert all the details (include the name of care provider, address, date and time, etc.) of the requested service then click request service to send it to care provider which you previously selected.


Emergency calls only 5:43 PM

Request Service

Service Provider
Ali Saleh

Service Location (Address)
Service Location (Address)

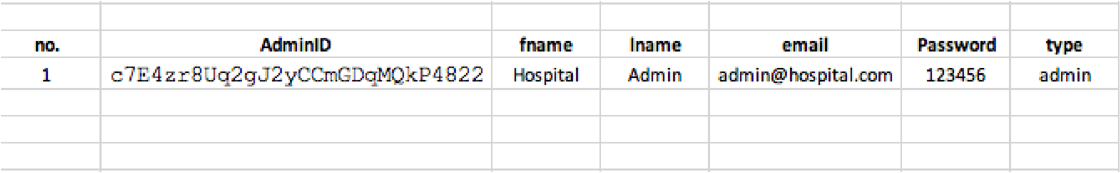
Service Time (Preferred)

Note: Services requested are to be provided on same day or within 24 hours maximum (if possible).

Figure 5-15 Request service interface

5.5 Reports

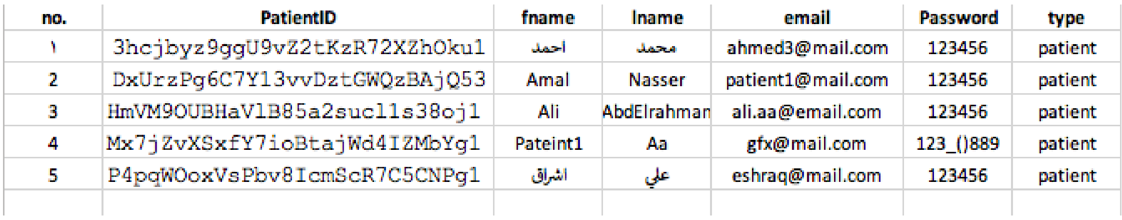
5.5.1 Hospital (admin) Database



no.	AdminID	fname	lname	email	Password	type
1	c7E4zr8Uq2gJ2yCCmGDqMQkP4822	Hospital	Admin	admin@hospital.com	123456	admin

Table 5-1 Hospital (admin) Database

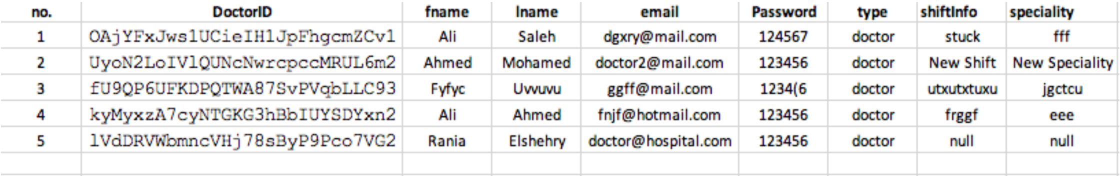
5.5.2 Patients Database



no.	PatientID	fname	lname	email	Password	type
١	3hcjbyz9ggU9vZ2tKzR72XZhOku1	احمد	محمد	ahmed3@mail.com	123456	patient
2	DxUrzPg6C7Y13vvDztGWQzBAjQ53	Amal	Nasser	patient1@mail.com	123456	patient
3	HmVM9OUBHaV1B85a2sucl1s38oj1	Ali	AbdElrahman	ali.aa@email.com	123456	patient
4	Mx7jZvXSxfY7ioBtajWd4IZMbYg1	Pateint1	Aa	gfx@mail.com	123_()889	patient
5	P4pqWOoxVsPbv8IcmScR7C5CNPg1	اشراق	علي	eshraq@mail.com	123456	patient

Table 5-2 Patients Database

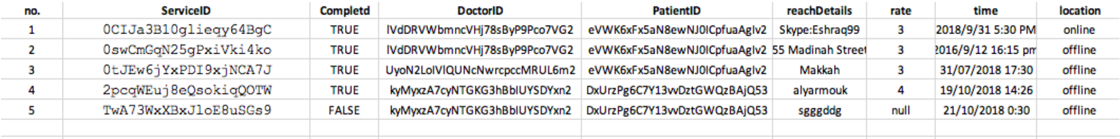
5.5.3 Doctors Database



no.	DoctorID	fname	lname	email	Password	type	shiftInfo	speciality
1	OAjYFxJws1UCieIH1JpFhgcmZCv1	Ali	Saleh	dgxry@mail.com	124567	doctor	stuck	fff
2	UyoN2LoIV1QUNcNwrcpccMRUL6m2	Ahmed	Mohamed	doctor2@mail.com	123456	doctor	New Shift	New Speciality
3	fU9QP6UFKDPQTWA87SvPVqbLLC93	Fyfyc	Uvvuvu	ggff@mail.com	1234(6	doctor	utxutxtuxu	jgctcu
4	kyMyxzA7cyNTGKG3hBbIUYSDYxn2	Ali	Ahmed	fnjf@hotmail.com	123456	doctor	frggf	eee
5	lVdDRVWbmncVHj78sByP9Pco7VG2	Rania	Elshehry	doctor@hospital.com	123456	doctor	null	null

Table 5-3 Doctors Database

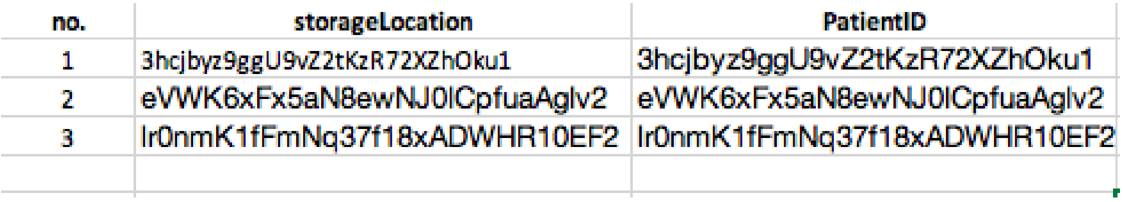
5.5.4 Services Database



no.	ServiceID	Completd	DoctorID	PatientID	reachDetails	rate	time	location
1	0CIJa3B10glieqy64BgC	TRUE	lVdDRVWbmncVHj78sByP9Pco7VG2	eVWK6xFx5aN8ewNJ0lCpfuaAglv2	Skype:Eshraq99	3	2018/9/31 5:30 PM	online
2	0swCmGqN25gPxiVki4ko	TRUE	lVdDRVWbmncVHj78sByP9Pco7VG2	eVWK6xFx5aN8ewNJ0lCpfuaAglv2	55 Madinah Street	3	2016/9/12 16:15 pm	offline
3	0tJEw6jYxPDI9xjNCA7J	TRUE	UyoN2LolVlQUNcNwrcpccMRUL6m2	eVWK6xFx5aN8ewNJ0lCpfuaAglv2	Makkah	3	31/07/2018 17:30	offline
4	2pcqWEuj8eQsokiqQOTW	TRUE	kyMyxzA7cyNTGKG3hBblUYSDYxn2	DxUrzPg6C7Y13vvDztGWQzBAjQ53	alyarmouk	4	19/10/2018 14:26	offline
5	TwA73WxXBxJloE8uSGs9	FALSE	kyMyxzA7cyNTGKG3hBblUYSDYxn2	DxUrzPg6C7Y13vvDztGWQzBAjQ53	sgggddg	null	21/10/2018 0:30	offline

Table 5-4 Services Database

5.5.5 Lab tests Database



no.	storageLocation	PatientID
1	3hcjbyz9ggU9vZ2tKzR72XZhOku1	3hcjbyz9ggU9vZ2tKzR72XZhOku1
2	eVWK6xFx5aN8ewNJ0lCpfuaAglv2	eVWK6xFx5aN8ewNJ0lCpfuaAglv2
3	lr0nmK1fFmNq37f18xADWHR10EF2	lr0nmK1fFmNq37f18xADWHR10EF2

Table 5-5 Lab tests Database

Chapter 6 : CONCULSION AND FUTURE WORK

While it is very important to mention the positive impact on the hospital and the healthcare community reflected by the development of the home healthcare service application, we can't forget its impact on patients that are being very comfortable at their home when the care provider can come to their home to help them with any service already requested. Furthermore, the mobile phone in the hand of patients is not now just a machine to call or to play games but it is a medium to see their lab results without going to archive department where records are stored and wait all day to get their results on papers where are also risk to be lost.

This application has more dimensions as it can be expanded, more features can be added. The idea of building more features on top of this application like a history health book for the whole family shared with family parties and the family doctors. Other feature could be the way to upgrade and enhance the application is the video call between the patient and his doctor so they speak face to face like an online consultation. In addition to that one area that will improve greatly the application is to integrate a diet system of foods specific for the patient.

Healthcare is the mirror of the society, if the healthcare is good the society is good. We should serve patients by the all possible ways because nobody knows, one day we might be at their places.

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Appendixes

Appendix A

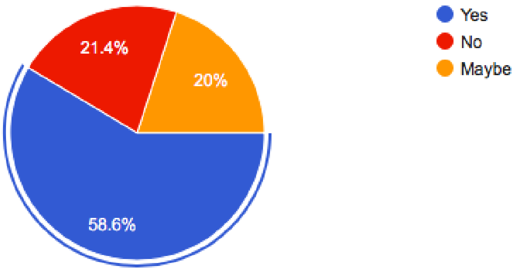
A sample of the questionnaire containing five questions was answered by 70 members of the community

Good health is a way of good life, however, vision 2030 in Saudi Arabia aims to expand the ways of providing home health care, this application is designed to provide home health care to people in remote areas or to people who can't go to the hospital because of their working conditions or their health doesn't allow them to travel or go to the hospital.

Q1: Do you have a cost problem for the hospital?

- **Yes**
- **No**
- **Maybe**

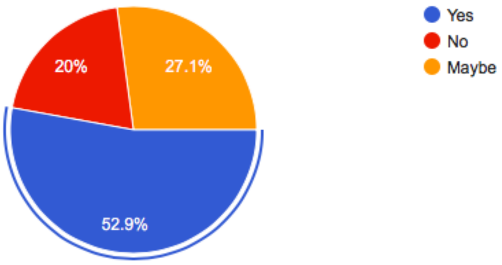
Result:



Q2: Do you have a problem when you go to the hospital because you live in remote areas or working conditions?

- **Yes**
- **No**
- **Maybe**

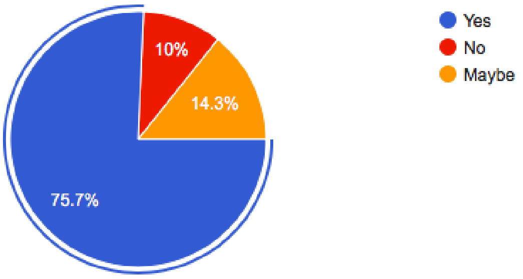
Result:



Q3: What do you think of keeping the lab results or imaging reports of patient and send it through the application without going to the hospital to receive?

- **Yes**
- **No**
- **Maybe**

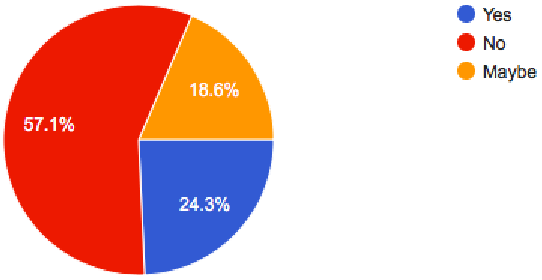
Result:



Q4: Have you ever heard of an application that helps patients without going to the hospital?

- **Yes**
- **No**
- **Maybe**

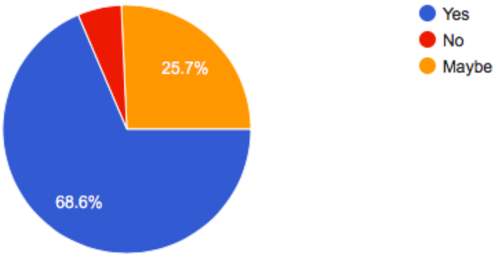
Result:



Q5: If this application is implemented, do you think it will ease the burden of the patient even slightly?

- **Yes**
- **No**
- **Maybe**

Result:

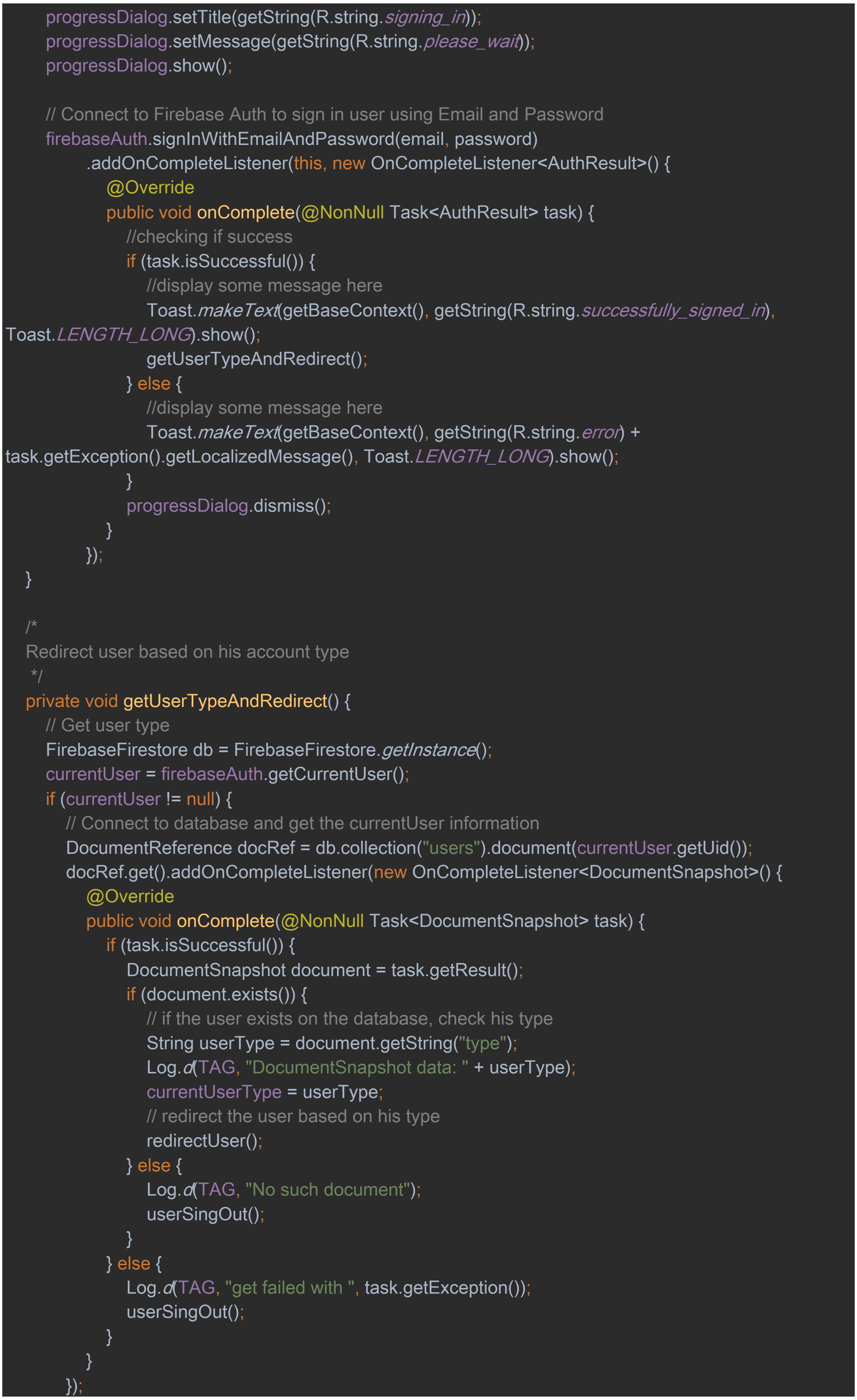


Appendix B

1. Program written in Java language to main activity in our project to sign-in and sign-out.

```java
import android.app.ProgressDialog;
import android.content.Intent;
import android.os.Bundle;
import android.support.annotation.NonNull;
import android.support.v7.app.AppCompatActivity;
import android.text.TextUtils;
import android.util.Log;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.ProgressBar;
import android.widget.Toast;

import com.google.android.gms.tasks.OnCompleteListener;
import com.google.android.gms.tasks.Task;
import com.google.firebase.auth.AuthResult;
import com.google.firebase.auth.FirebaseAuth;
import com.google.firebase.auth.FirebaseUser;
import com.google.firebase.firestore.DocumentReference;
import com.google.firebase.firestore.DocumentSnapshot;
import com.google.firebase.firestore.FirebaseFirestore;

public class MainActivity extends AppCompatActivity {

    private String TAG = "MainActivity";
    //defining view objects
    private EditText editTextEmail;
    private EditText editTextPassword;
    private ProgressDialog progressDialog;

    //defining firebaseauth object
    private FirebaseAuth firebaseAuth;
    private FirebaseUser currentUser;
    private String currentUserType;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        //initializing firebase auth object and get current user
        firebaseAuth = FirebaseAuth.getInstance();
        currentUser = firebaseAuth.getCurrentUser();

        //check if user is signed in or not
        if (currentUser != null) {
            // user already signed in
            // get user type and redirect if user already signed in
            getUserTypeAndRedirect();
        } else {
```

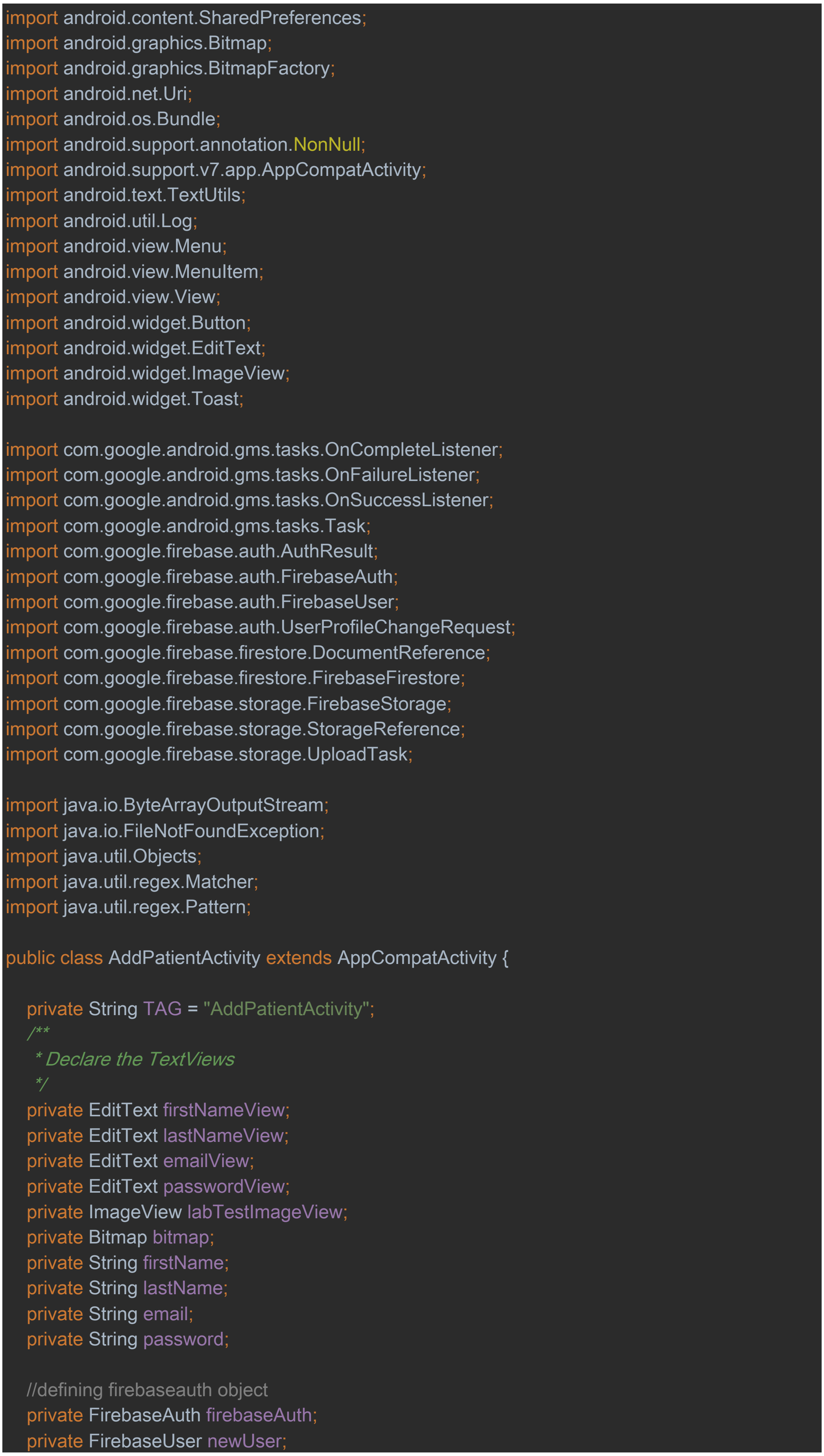
```
        //initializing views
        progressDialog = new ProgressDialog(this);
        editTextEmail = findViewById(R.id.editTextEmail);
        editTextPassword = findViewById(R.id.editTextPassword);

        // hide the progressbar
        ProgressBar signInProgressBar = findViewById(R.id.signInProgressBar);
        signInProgressBar.setVisibility(View.GONE);

        // define the sign in button and its action
        Button signInButton = findViewById(R.id.signInButton);
        signInButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                //calling sign in method on click
                signInUser();
            }
        });

        // define the register button and its action
        Button registerButton = findViewById(R.id.registerButton);
        registerButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                //calling sign in method on click
                Intent addPatient = new Intent(getBaseContext(), AddPatientActivity.class);
                addPatient.putExtra("isAdmin", false);
                startActivity(addPatient);
            }
        });
    }


}

/*
Helper method to Sign In user using Firebase Auth
Using Email and Password
 */
private void signInUser() {
    //getting email and password from edit texts
    String email = editTextEmail.getText().toString().trim();
    String password = editTextPassword.getText().toString().trim();

    //checking if email and passwords are empty
    if (TextUtils.isEmpty(email)) {
        Toast.makeText(this, R.string.please_enter_email, Toast.LENGTH_LONG).show();
        return;
    }

    if (TextUtils.isEmpty(password)) {
        Toast.makeText(this, R.string.please_enter_password, Toast.LENGTH_LONG).show();
        return;
    }

    //if the email and password are not empty
    //displaying a progress dialog
```



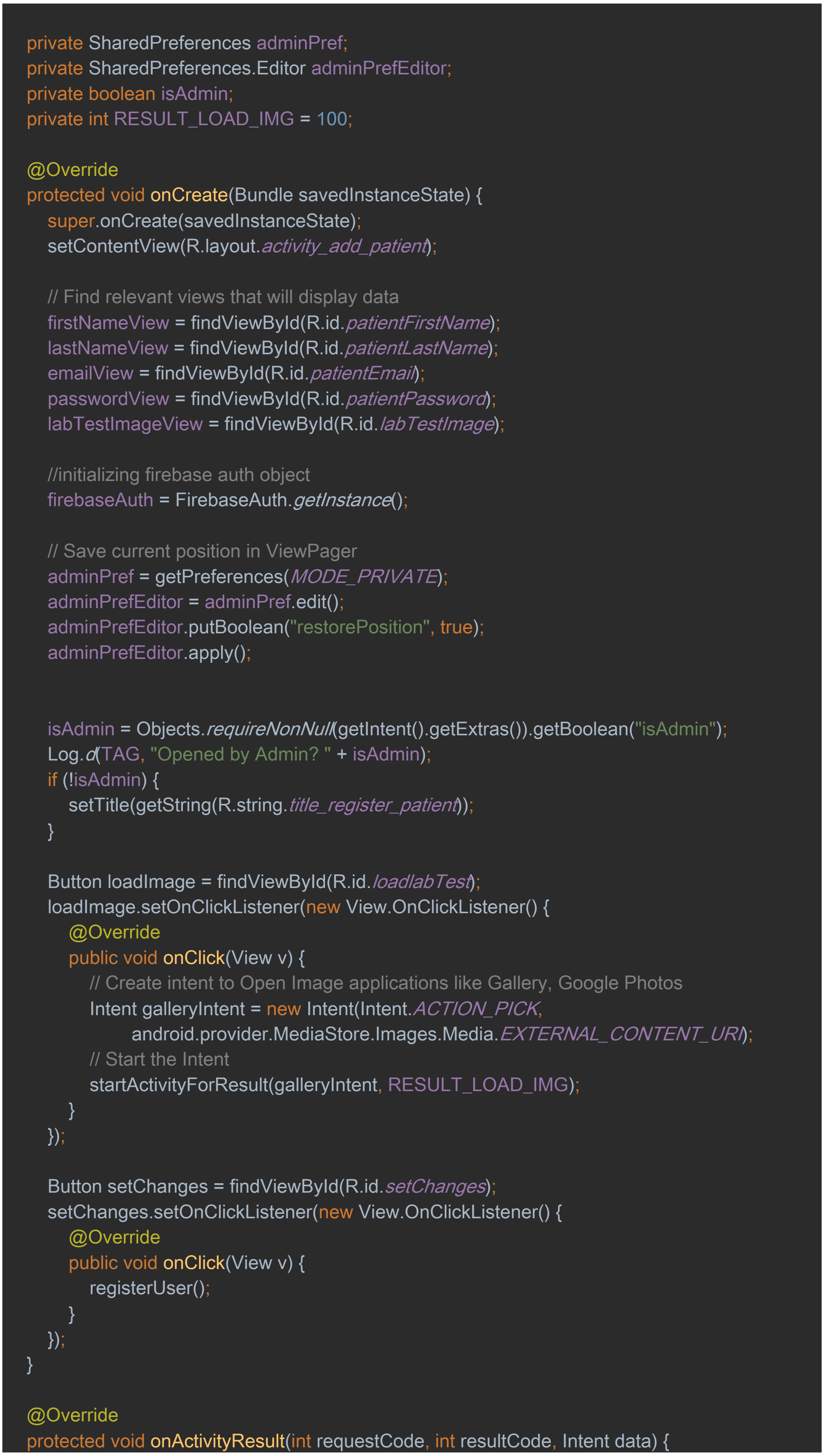
```
        progressDialog.setTitle(getString(R.string.signing_in));
        progressDialog.setMessage(getString(R.string.please_wait));
        progressDialog.show();

        // Connect to Firebase Auth to sign in user using Email and Password
        firebaseAuth.signInWithEmailAndPassword(email, password)
                .addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
                    @Override
                    public void onComplete(@NonNull Task<AuthResult> task) {
                        //checking if success
                        if (task.isSuccessful()) {
                            //display some message here
                            Toast.makeText(getBaseContext(), getString(R.string.successfully_signed_in),
Toast.LENGTH_LONG).show();
                            getUserTypeAndRedirect();
                        } else {
                            //display some message here
                            Toast.makeText(getBaseContext(), getString(R.string.error) +
task.getException().getLocalizedMessage(), Toast.LENGTH_LONG).show();
                        }
                        progressDialog.dismiss();
                    }
                });
    }

    /*
    Redirect user based on his account type
     */
    private void getUserTypeAndRedirect() {
        // Get user type
        FirebaseFirestore db = FirebaseFirestore.getInstance();
        currentUser = firebaseAuth.getCurrentUser();
        if (currentUser != null) {
            // Connect to database and get the currentUser information
            DocumentReference docRef = db.collection("users").document(currentUser.getUid());
            docRef.get().addOnCompleteListener(new OnCompleteListener<DocumentSnapshot>() {
                @Override
                public void onComplete(@NonNull Task<DocumentSnapshot> task) {
                    if (task.isSuccessful()) {
                        DocumentSnapshot document = task.getResult();
                        if (document.exists()) {
                            // if the user exists on the database, check his type
                            String userType = document.getString("type");
                            Log.d(TAG, "DocumentSnapshot data: " + userType);
                            currentUserType = userType;
                            // redirect the user based on his type
                            redirectUser();
                        } else {
                            Log.d(TAG, "No such document");
                            userSingOut();
                        }
                    } else {
                        Log.d(TAG, "get failed with ", task.getException());
                        userSingOut();
                    }
                }
            });
        }
    }

    /*
    Helper method to redirect the user to the proper Activity
    based on the user type
     */
    private void redirectUser() {
        Log.d(TAG, "Current userType: " + currentUserType);
        if (currentUserType != null) {
            switch (currentUserType) {
                case "admin":
                    // goto home activity
                    Intent adminIntent = new Intent(getBaseContext(), HomeAdminActivity.class);
                    startActivity(adminIntent);
                    finish();
                    break;
                case "doctor":
                    // goto home activity
                    Intent doctorIintent = new Intent(getBaseContext(), HomeDoctorActivity.class);
                    startActivity(doctorIintent);
                    finish();
                    break;
                case "patient":
                    // goto home activity
                    Intent patientIntent = new Intent(getBaseContext(), HomePatientActivity.class);
                    startActivity(patientIntent);
                    finish();
                    break;
                default:
                    Toast.makeText(this, R.string.invalid_user_type, Toast.LENGTH_LONG).show();
                    userSingOut();
                    break;
            }
        }
    }

    /*
    Helper method for user sign ou
     */
    public void userSingOut() {
        try {
            firebaseAuth.signOut();
            Intent intent = new Intent(getBaseContext(), MainActivity.class);
            startActivity(intent);
        } catch (Exception e) {
            e.printStackTrace();
        }
    }

}
```

2. Program written in Java language to add patient in the application.

```
import android.content.Intent;
```

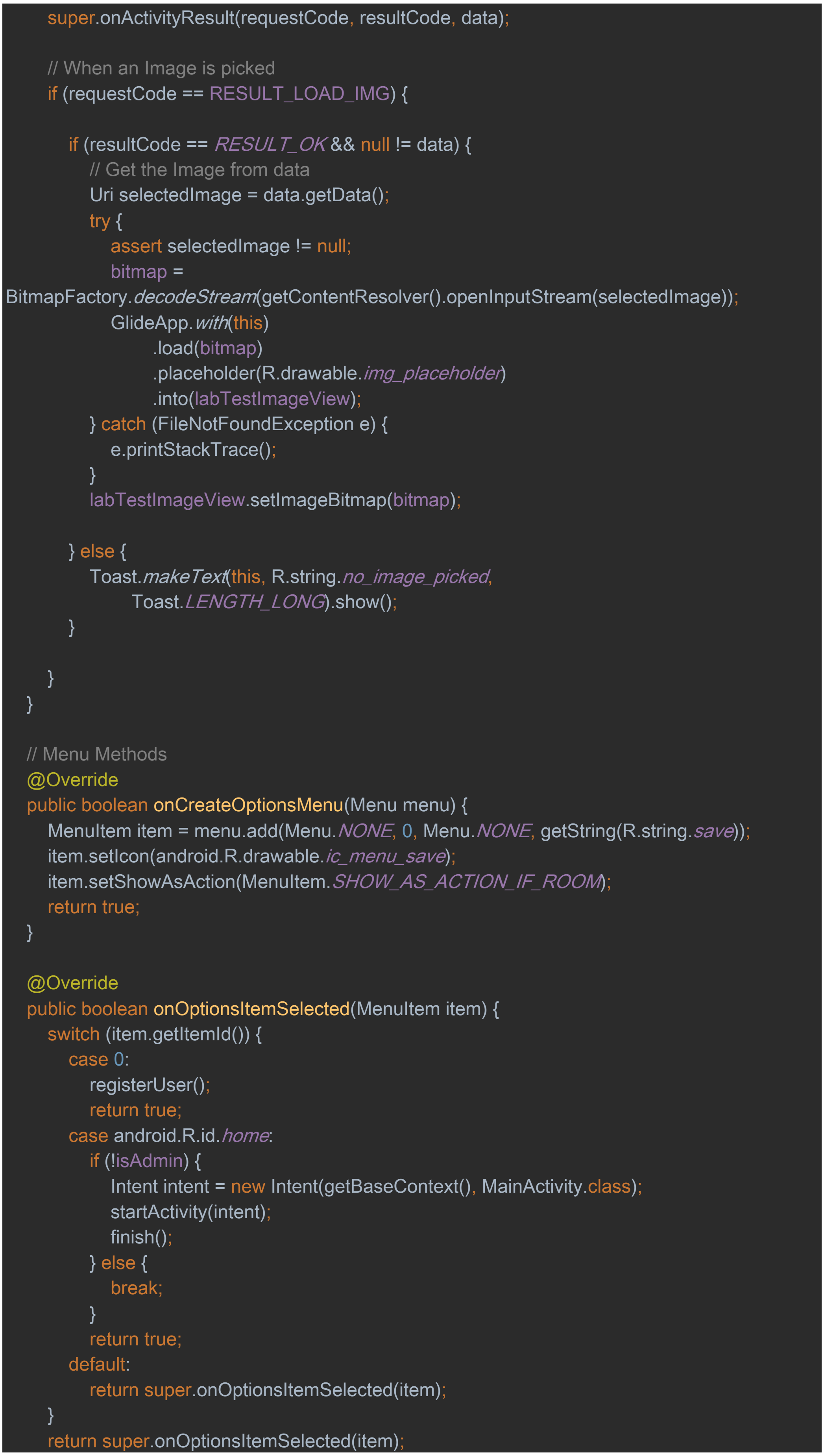


```java
import android.content.SharedPreferences;
import android.graphics.Bitmap;
import android.graphics.BitmapFactory;
import android.net.Uri;
import android.os.Bundle;
import android.support.annotation.NonNull;
import android.support.v7.app.AppCompatActivity;
import android.text.TextUtils;
import android.util.Log;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.ImageView;
import android.widget.Toast;

import com.google.android.gms.tasks.OnCompleteListener;
import com.google.android.gms.tasks.OnFailureListener;
import com.google.android.gms.tasks.OnSuccessListener;
import com.google.android.gms.tasks.Task;
import com.google.firebase.auth.AuthResult;
import com.google.firebase.auth.FirebaseAuth;
import com.google.firebase.auth.FirebaseUser;
import com.google.firebase.auth.UserProfileChangeRequest;
import com.google.firebase.firestore.DocumentReference;
import com.google.firebase.firestore.FirebaseFirestore;
import com.google.firebase.storage.FirebaseStorage;
import com.google.firebase.storage.StorageReference;
import com.google.firebase.storage.UploadTask;

import java.io.ByteArrayOutputStream;
import java.io.FileNotFoundException;
import java.util.Objects;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class AddPatientActivity extends AppCompatActivity {

    private String TAG = "AddPatientActivity";
    /**
     * Declare the TextViews
     */
    private EditText firstNameView;
    private EditText lastNameView;
    private EditText emailView;
    private EditText passwordView;
    private ImageView labTestImageView;
    private Bitmap bitmap;
    private String firstName;
    private String lastName;
    private String email;
    private String password;

    //defining firebaseauth object
    private FirebaseAuth firebaseAuth;
    private FirebaseUser newUser;
```

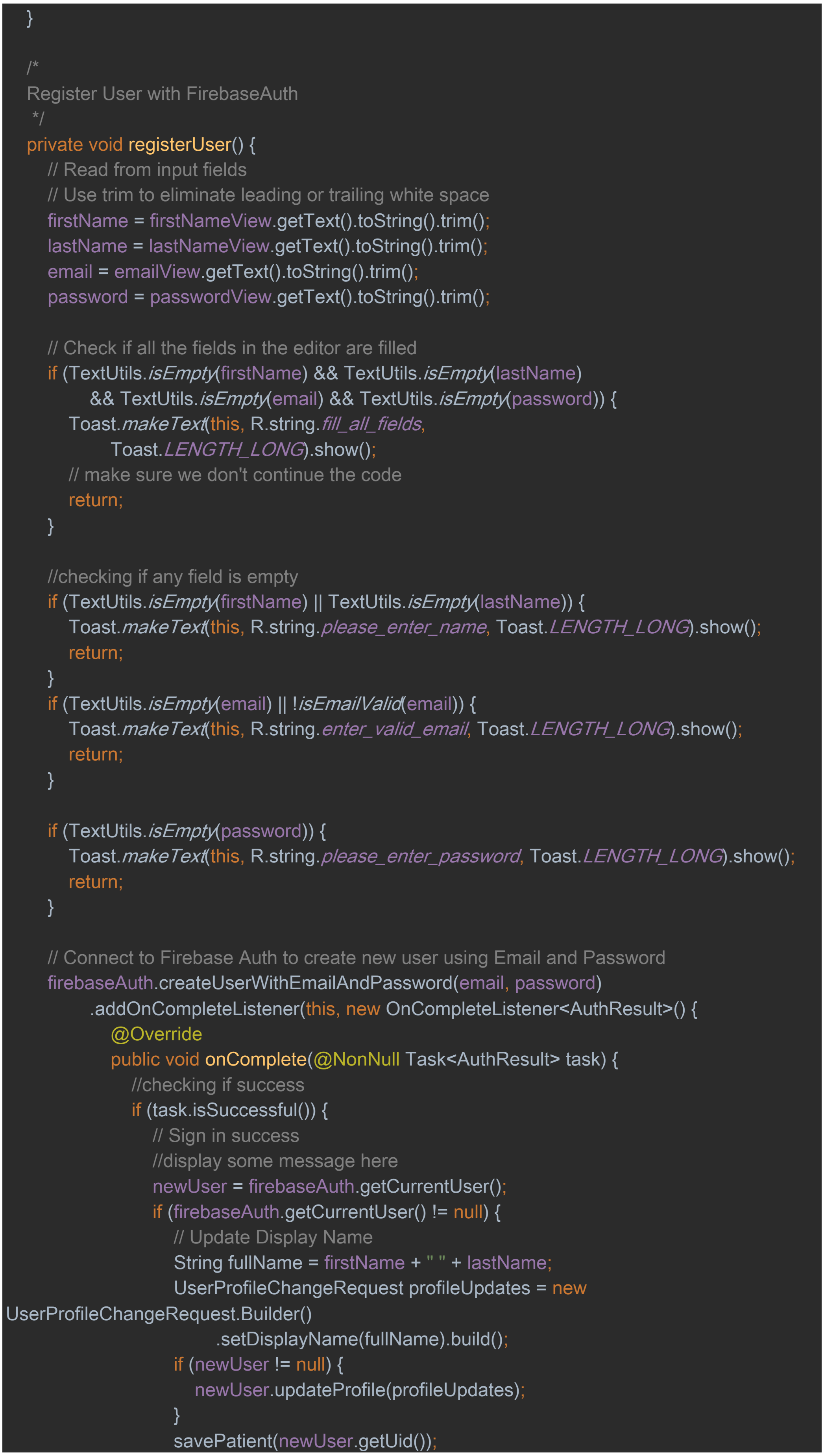


```
private SharedPreferences adminPref;
private SharedPreferences.Editor adminPrefEditor;
private boolean isAdmin;
private int RESULT_LOAD_IMG = 100;

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_add_patient);

    // Find relevant views that will display data
    firstNameView = findViewById(R.id.patientFirstName);
    lastNameView = findViewById(R.id.patientLastName);
    emailView = findViewById(R.id.patientEmail);
    passwordView = findViewById(R.id.patientPassword);
    labTestImageView = findViewById(R.id.labTestImage);

    //initializing firebase auth object
    firebaseAuth = FirebaseAuth.getInstance();

    // Save current position in ViewPager
    adminPref = getPreferences(MODE_PRIVATE);
    adminPrefEditor = adminPref.edit();
    adminPrefEditor.putBoolean("restorePosition", true);
    adminPrefEditor.apply();


    isAdmin = Objects.requireNonNull(getIntent().getExtras()).getBoolean("isAdmin");
    Log.d(TAG, "Opened by Admin? " + isAdmin);
    if (!isAdmin) {
        setTitle(getString(R.string.title_register_patient));
    }

    Button loadImage = findViewById(R.id.loadlabTest);
    loadImage.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Create intent to Open Image applications like Gallery, Google Photos
            Intent galleryIntent = new Intent(Intent.ACTION_PICK,
                    android.provider.MediaStore.Images.Media.EXTERNAL_CONTENT_URI);
            // Start the Intent
            startActivityForResult(galleryIntent, RESULT_LOAD_IMG);
        }
    });

    Button setChanges = findViewById(R.id.setChanges);
    setChanges.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            registerUser();
        }
    });
}

@Override
protected void onActivityResult(int requestCode, int resultCode, Intent data) {
```

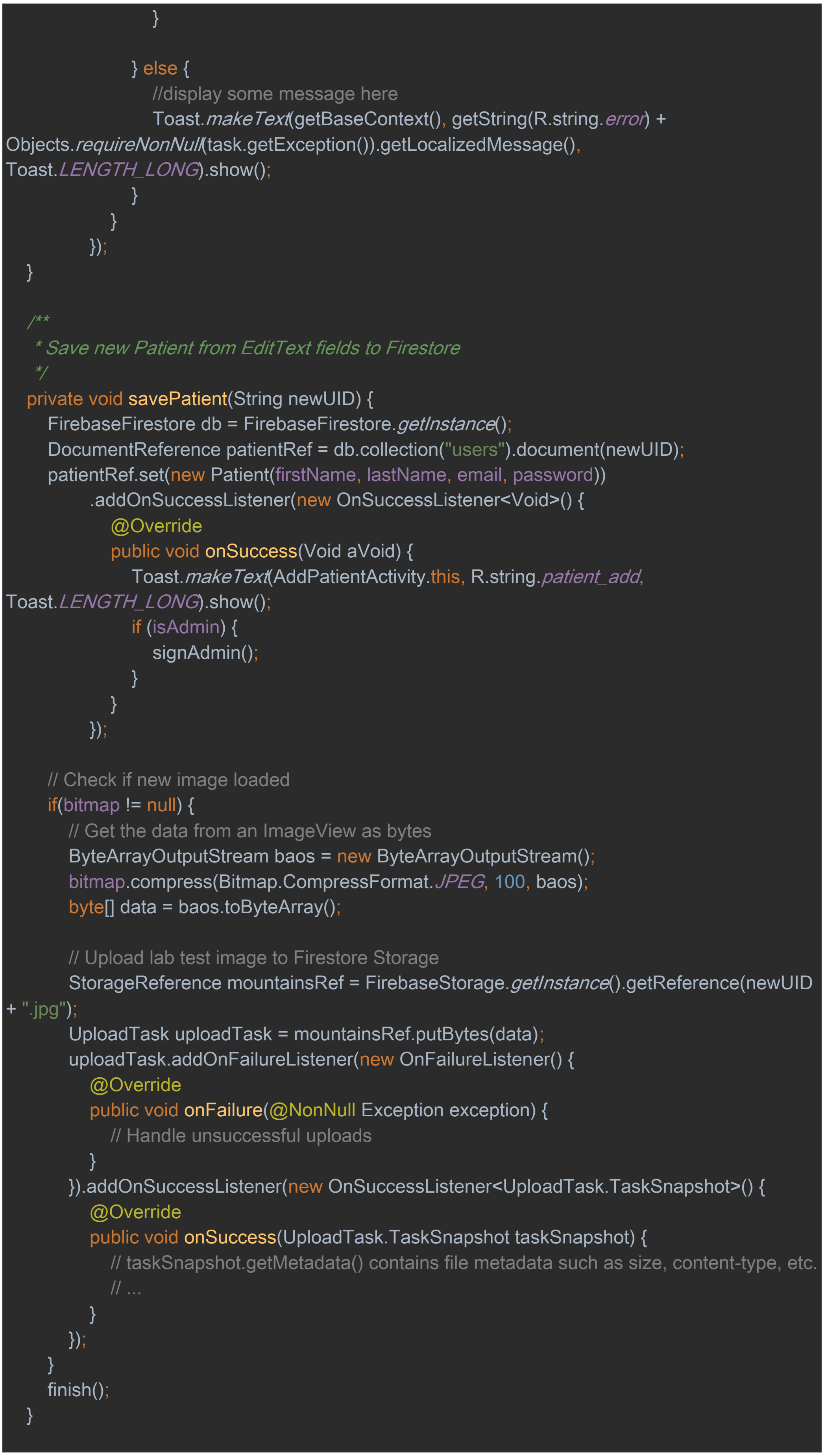
]



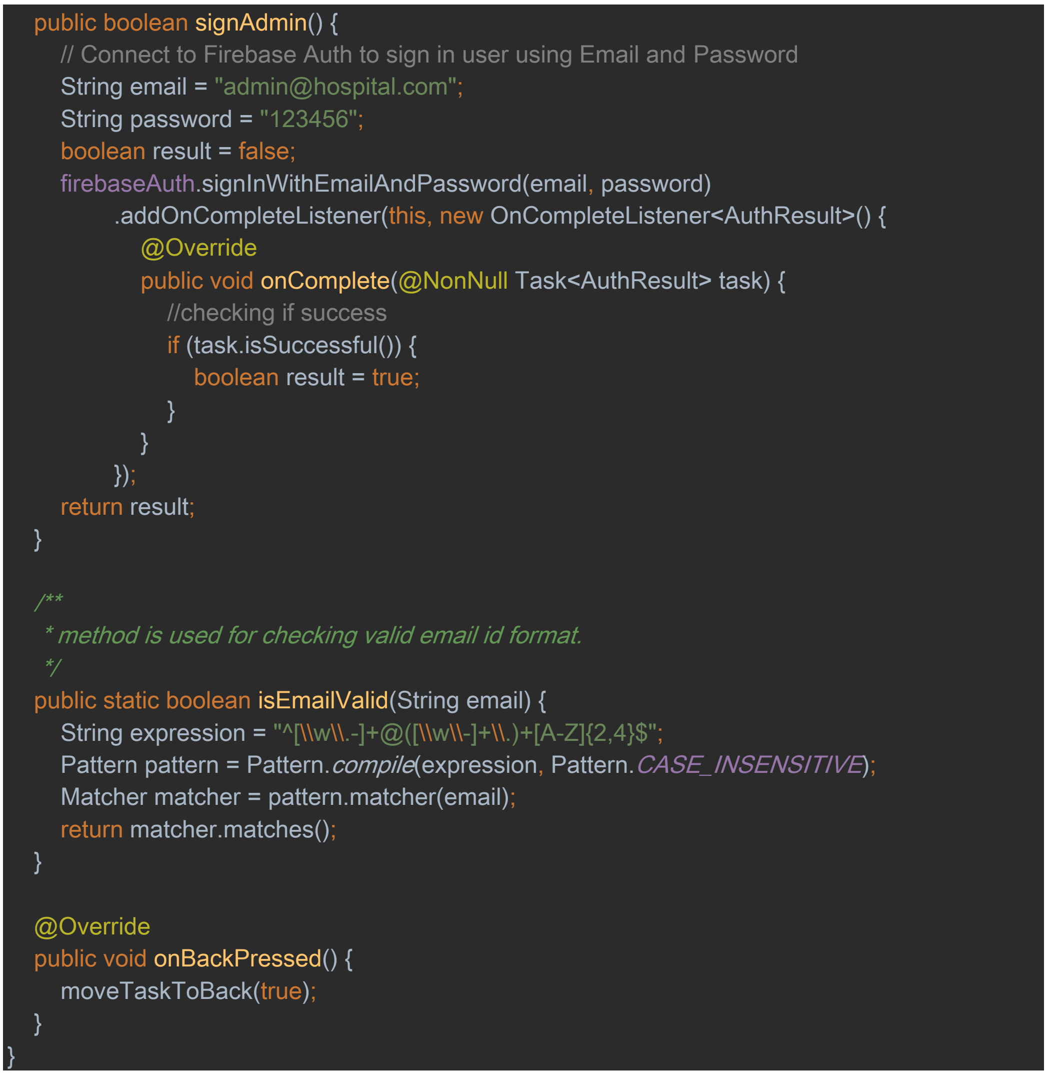
```
        super.onActivityResult(requestCode, resultCode, data);

        // When an Image is picked
        if (requestCode == RESULT_LOAD_IMG) {

            if (resultCode == RESULT_OK && null != data) {
                // Get the Image from data
                Uri selectedImage = data.getData();
                try {
                    assert selectedImage != null;
                    bitmap =
BitmapFactory.decodeStream(getContentResolver().openInputStream(selectedImage));
                    GlideApp.with(this)
                            .load(bitmap)
                            .placeholder(R.drawable.img_placeholder)
                            .into(labTestImageView);
                } catch (FileNotFoundException e) {
                    e.printStackTrace();
                }
                labTestImageView.setImageBitmap(bitmap);

            } else {
                Toast.makeText(this, R.string.no_image_picked,
                        Toast.LENGTH_LONG).show();
            }

        }
    }

    // Menu Methods
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        MenuItem item = menu.add(Menu.NONE, 0, Menu.NONE, getString(R.string.save));
        item.setIcon(android.R.drawable.ic_menu_save);
        item.setShowAsAction(MenuItem.SHOW_AS_ACTION_IF_ROOM);
        return true;
    }

    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
        switch (item.getItemId()) {
            case 0:
                registerUser();
                return true;
            case android.R.id.home:
                if (!isAdmin) {
                    Intent intent = new Intent(getBaseContext(), MainActivity.class);
                    startActivity(intent);
                    finish();
                } else {
                    break;
                }
                return true;
            default:
                return super.onOptionsItemSelected(item);
        }
        return super.onOptionsItemSelected(item);
```



```
    }

    /*
    Register User with FirebaseAuth
     */
    private void registerUser() {
        // Read from input fields
        // Use trim to eliminate leading or trailing white space
        firstName = firstNameView.getText().toString().trim();
        lastName = lastNameView.getText().toString().trim();
        email = emailView.getText().toString().trim();
        password = passwordView.getText().toString().trim();

        // Check if all the fields in the editor are filled
        if (TextUtils.isEmpty(firstName) && TextUtils.isEmpty(lastName)
                && TextUtils.isEmpty(email) && TextUtils.isEmpty(password)) {
            Toast.makeText(this, R.string.fill_all_fields,
                    Toast.LENGTH_LONG).show();
            // make sure we don't continue the code
            return;
        }

        //checking if any field is empty
        if (TextUtils.isEmpty(firstName) || TextUtils.isEmpty(lastName)) {
            Toast.makeText(this, R.string.please_enter_name, Toast.LENGTH_LONG).show();
            return;
        }
        if (TextUtils.isEmpty(email) || !isEmailValid(email)) {
            Toast.makeText(this, R.string.enter_valid_email, Toast.LENGTH_LONG).show();
            return;
        }

        if (TextUtils.isEmpty(password)) {
            Toast.makeText(this, R.string.please_enter_password, Toast.LENGTH_LONG).show();
            return;
        }

        // Connect to Firebase Auth to create new user using Email and Password
        firebaseAuth.createUserWithEmailAndPassword(email, password)
                .addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
                    @Override
                    public void onComplete(@NonNull Task<AuthResult> task) {
                        //checking if success
                        if (task.isSuccessful()) {
                            // Sign in success
                            //display some message here
                            newUser = firebaseAuth.getCurrentUser();
                            if (firebaseAuth.getCurrentUser() != null) {
                                // Update Display Name
                                String fullName = firstName + " " + lastName;
                                UserProfileChangeRequest profileUpdates = new
UserProfileChangeRequest.Builder()
                                        .setDisplayName(fullName).build();
                                if (newUser != null) {
                                    newUser.updateProfile(profileUpdates);
                                }
                                savePatient(newUser.getUid());
```



```
                            }

                        } else {
                            //display some message here
                            Toast.makeText(getBaseContext(), getString(R.string.error) +
Objects.requireNonNull(task.getException()).getLocalizedMessage(),
Toast.LENGTH_LONG).show();
                        }
                    }
                });
    }

    /**
     * Save new Patient from EditText fields to Firestore
     */
    private void savePatient(String newUID) {
        FirebaseFirestore db = FirebaseFirestore.getInstance();
        DocumentReference patientRef = db.collection("users").document(newUID);
        patientRef.set(new Patient(firstName, lastName, email, password))
                .addOnSuccessListener(new OnSuccessListener<Void>() {
                    @Override
                    public void onSuccess(Void aVoid) {
                        Toast.makeText(AddPatientActivity.this, R.string.patient_add,
Toast.LENGTH_LONG).show();
                        if (isAdmin) {
                            signAdmin();
                        }
                    }
                });

        // Check if new image loaded
        if(bitmap != null) {
            // Get the data from an ImageView as bytes
            ByteArrayOutputStream baos = new ByteArrayOutputStream();
            bitmap.compress(Bitmap.CompressFormat.JPEG, 100, baos);
            byte[] data = baos.toByteArray();

            // Upload lab test image to Firestore Storage
            StorageReference mountainsRef = FirebaseStorage.getInstance().getReference(newUID
+ ".jpg");
            UploadTask uploadTask = mountainsRef.putBytes(data);
            uploadTask.addOnFailureListener(new OnFailureListener() {
                @Override
                public void onFailure(@NonNull Exception exception) {
                    // Handle unsuccessful uploads
                }
            }).addOnSuccessListener(new OnSuccessListener<UploadTask.TaskSnapshot>() {
                @Override
                public void onSuccess(UploadTask.TaskSnapshot taskSnapshot) {
                    // taskSnapshot.getMetadata() contains file metadata such as size, content-type, etc.
                    // ...
                }
            });
        }
        finish();
    }
```



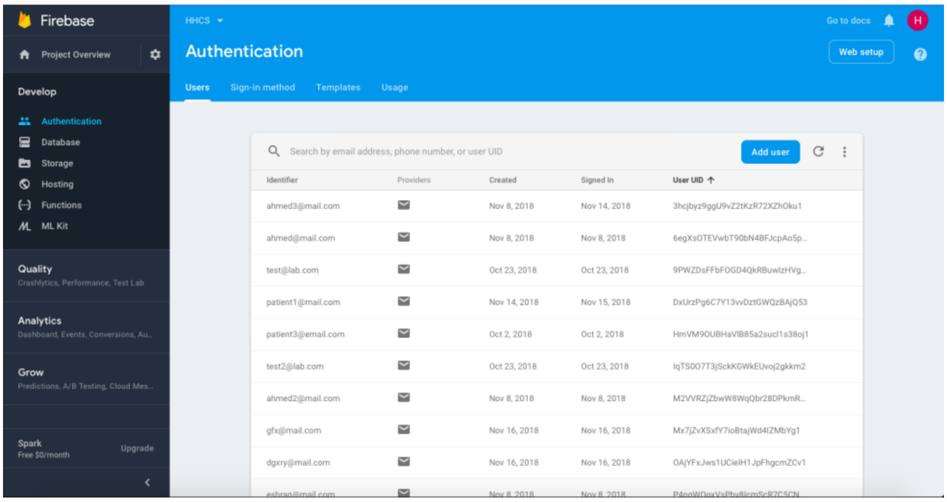
```
    public boolean signAdmin() {
        // Connect to Firebase Auth to sign in user using Email and Password
        String email = "admin@hospital.com";
        String password = "123456";
        boolean result = false;
        firebaseAuth.signInWithEmailAndPassword(email, password)
                .addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
                    @Override
                    public void onComplete(@NonNull Task<AuthResult> task) {
                        //checking if success
                        if (task.isSuccessful()) {
                            boolean result = true;
                        }
                    }
                });
        return result;
    }

    /**
     * method is used for checking valid email id format.
     */
    public static boolean isEmailValid(String email) {
        String expression = "^[\\w\\.-]+@([\\w\\-]+\\.)+[A-Z]{2,4}$";
        Pattern pattern = Pattern.compile(expression, Pattern.CASE_INSENSITIVE);
        Matcher matcher = pattern.matcher(email);
        return matcher.matches();
    }

    @Override
    public void onBackPressed() {
        moveTaskToBack(true);
    }
}
```

Appendix C

This appendix contains a screenshot of database which used in this project, we user authentication, cloud storage and firestore in Firebase platform.

- **Authentication interface**

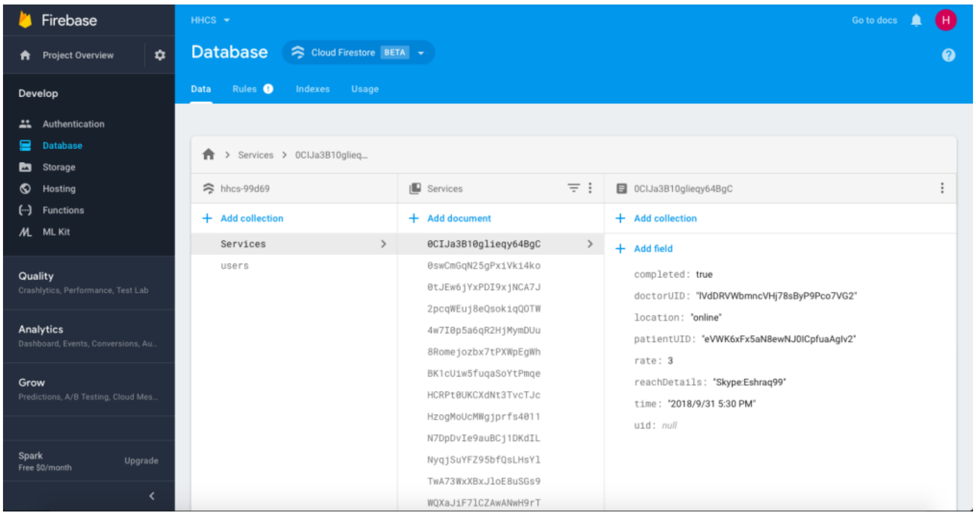
We used it authenticate for log-in.



Identifier	Providers	Created	Signed In	User UID ↑
ahmed3@mail.com	✉	Nov 8, 2018	Nov 14, 2018	3hcjbyz9ggU9vZ2tKzR72XZhOku1
ahmed@mail.com	✉	Nov 8, 2018	Nov 8, 2018	6egXsOTEVwbT90bN4BFJcpAo5p...
test@lab.com	✉	Oct 23, 2018	Oct 23, 2018	9PWZDsFFbFOGD4QkRBuwlzHVg...
patient1@mail.com	✉	Nov 14, 2018	Nov 15, 2018	DxUrzPg6C7Y13vvDztGWQzBAjQ53
patient3@email.com	✉	Oct 2, 2018	Oct 2, 2018	HmVM9OUBHaVlB85a2sucl1s38oj1
test2@lab.com	✉	Oct 23, 2018	Oct 23, 2018	IqTS0O7T3jSckKGWkEUvoj2gkkm2
ahmed2@mail.com	✉	Nov 8, 2018	Nov 8, 2018	M2VVRZjZbwW8WqQbr28DPkmR...
gfx@mail.com	✉	Nov 16, 2018	Nov 16, 2018	Mx7jZvXSxfY7ioBtajWd4IZMbYg1
dgxry@mail.com	✉	Nov 16, 2018	Nov 16, 2018	OAjYFxJws1UCielH1JpFhgcmZCv1
eshraq@mail.com	✉	Nov 8, 2018	Nov 8, 2018	P4nqWOoxVsPhv8lcmScR7C5CN

- **cloud storage interface**

We used it to store the information of users and services.



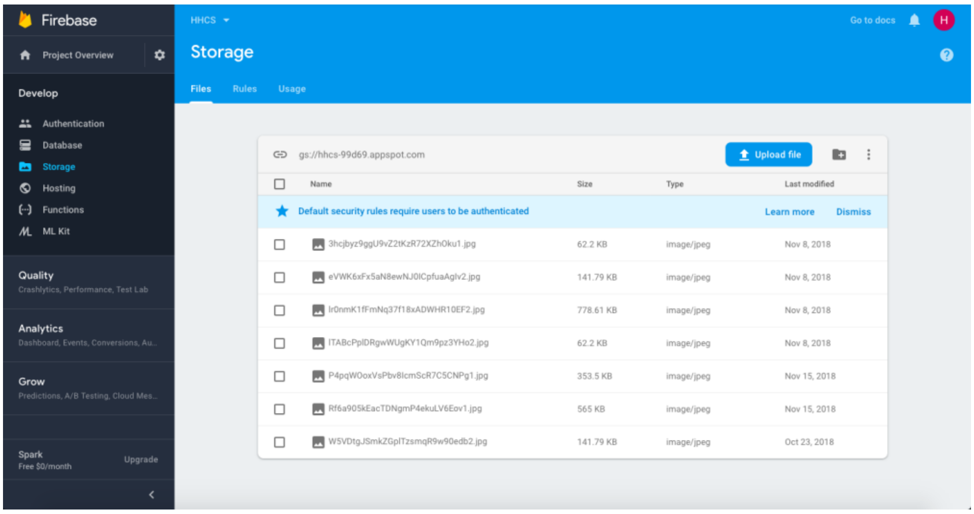
Services
users

0CIJa3B10glieqy64BgC
0swCmGqN25gPxiVki4ko
0tJEw6jYxPDI9xjNCA7J
2pcqWEuj8eQsokiqQOTW
4w7I0p5a6qR2HjMymDUu
8Romejozbx7tPXWpEgWh
BK1cUiw5fuqaSoYtPmqe
HCRPt0UKCXdNt3TvcTJc
HzogMoUcMWgjprfs4011
N7DpDvIe9auBCj1DKdIL
NyqjSuYFZ95bfQsLHsYl
TwA73WxXBxJloE8uSGs9
WQXaJiF71CZAwANwH9rT

completed: true
doctorUID: "lVdDRVWbmncVHj78sByP9Pco7VG2"
location: "online"
patientUID: "eVWK6xFx5aN8ewNJ0ICpfuaAglv2"
rate: 3
reachDetails: "Skype:Eshraq99"
time: "2018/9/31 5:30 PM"
uid: *null*

- **firestore**

We used it to store lab tests results.



gs://hhcs-99d69.appspot.com

Default security rules require users to be authenticated

□	Name	Size	Type	Last modified
□	3hcjbyz9ggU9vZ2tKzR72XZhOku1.jpg	62.2 KB	image/jpeg	Nov 8, 2018
□	eVWK6xFx5aN8ewNJ0ICpfuaAglv2.jpg	141.79 KB	image/jpeg	Nov 8, 2018
□	Ir0nmK1fFmNq37f18xADWHR10EF2.jpg	778.61 KB	image/jpeg	Nov 8, 2018
□	ITABcPplDRgwWUgKY1Qm9pz3YHo2.jpg	62.2 KB	image/jpeg	Nov 8, 2018
□	P4pqWOoxVsPbv8IcmScR7C5CNPg1.jpg	353.5 KB	image/jpeg	Nov 15, 2018
□	Rf6a905kEacTDNgmP4ekuLV6Eov1.jpg	565 KB	image/jpeg	Nov 15, 2018
□	W5VDtgJSmkZGplTzsmqR9w90edb2.jpg	141.79 KB	image/jpeg	Oct 23, 2018