

HOSPITAL REPORT & HISTORY MANAGEMENT

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

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DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

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APPROVAL

This Project/internship titled “**Hospital Report & History Management**”, submitted by **Md Zahidul Islam Sumon**, ID No: **162-15-8097** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **date**.

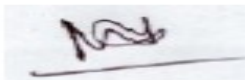
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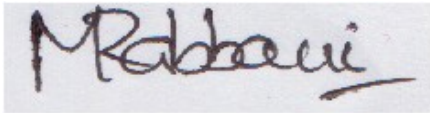
We hereby declare that, this project has been done by us under the supervision of **Dr Sheak Rashed Haider Noori, Associate Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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

ABSTRACT

My project titled “Hospital report delivery & patient history management” is aimed at providing seamless service to both patients and hospitals. The idea is to make medical histories hassle free, cost and time effective. People tends to go physically in the hospitals just to get their test reports by spending their time and money. In this age we can use properly utilize the technology to make something good and beneficial for the community. The way this project is implemented is divided in some parts, because we’ll have access to hospital database or authority. Without their concern it’s impossible to deliver the test reports to the patients. So there comes the server/backend which will interact with the hospital’s database and will process the data and will send way back to the patients email/sms/android app. Where they can see the test report in a convenient format.

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CHAPTER 1

1.1 Introduction

This project titled “Hospital report delivery & patient’s history management” implements features: processing medical test reports from a typical hospital & maintaining patient’s report histories using cloud services, email service, phone/sms & with the help of other technologies namely: Node.JS [1] as server/backend platform, Android ® [2] as the application platform which patients will be using for their realtime [3] report deliveries, and firebase’s cloud firestore [4] as cloud database. Also those reports will be delivered to their email address. Thus enabling the patients a hassle free way to maintain their histories on the cloud. On the other hand the hospital authorities will be able to track their patients seamlessly and in a convenient way.

1.2 Motivation

Now a days we notice the use of technologies almost every where [5] why don’t we use it for implementing a better way of maintaining medical data on the go? This question leads me developing this project. In fact we can improve the way how histories, reports are delivered & maintained both in typical hospitals and the histories maintained by patients.

1.3 Objectives

Objectives are obvious here, those are enabling user to maintain report histories on the cloud which they may be able to access on demand. And helping hospitals to maintain their patient's data in a convenient way and by saving cost of papers, ink for printing the reports, manpower those who are involved in this job, time wasted for processing these reports, which is pretty time wasting. Thus improving the whole report maintaining tasks both for the patients and the hospital authorities.

1.4 Expected outcomes

As far as the expected outcomes are concerned, we're concerning about the visible and usable products what we've built so far/will be building as the implementation of this project. So the outcomes are the Android ® app for end user and a server application which will be processing the data, medical test reports here, prepared by the hospital authority.

CHAPTER 2: FRONT END APPLICATION

2.1 Registration

Before user can use our application/services one needs to register in the system first, which is very obvious. S/he'll be providing some basic information in the application to begin the registration process.

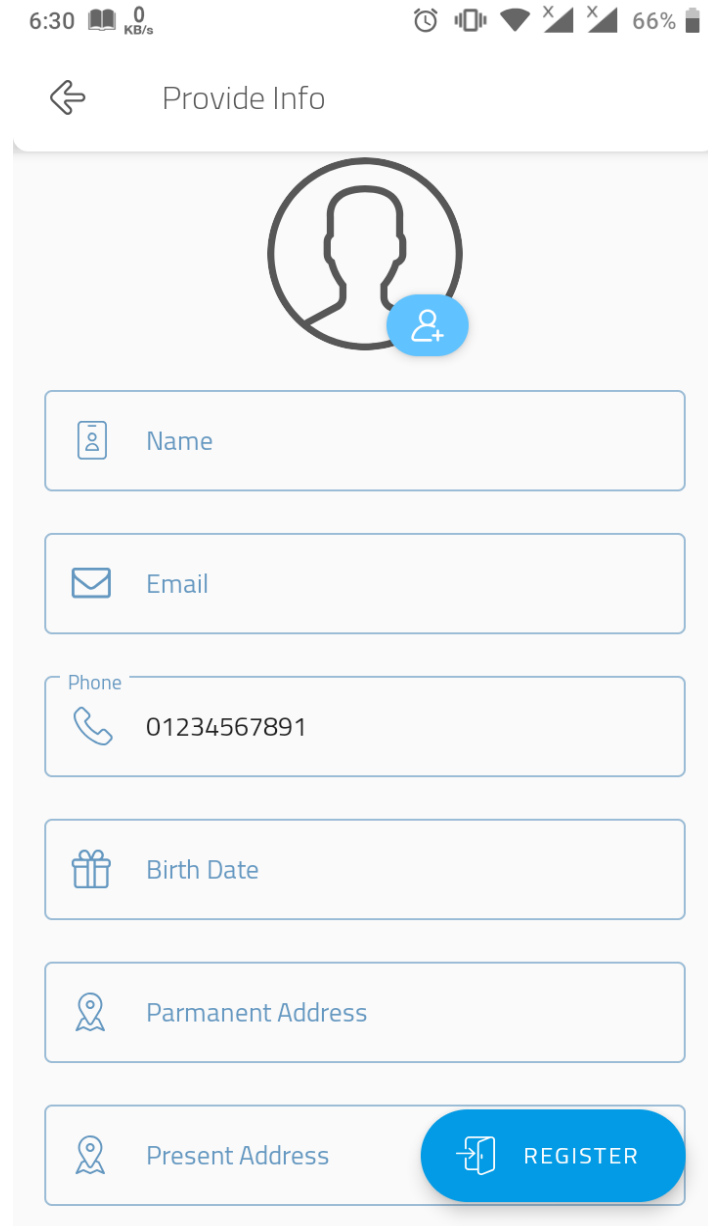


Figure 1: Registration screen

The information we collect are: Name, Email (will be used for getting the report file here), Phone (for authentication), Date of Birth, Permanent address (in case of any emergency medial contact) and Present address. Once those information are filled up and proceeded user will be asked to verify the phone number this will ensure the owner of the use r is using the correct account and will prevent fraud users from accessing others sensitive medical data.

2.2 Login

In this section we'll be discussing the authentication of our frontend or the client side or patient side application which is of course built in Android ® platform, It's important to make our application both secure and hassle free to use at the same time, that's why the phone authentication comes in! We've used the firebase phone authentication service [6] which is secure (backed by tech giant Google) and handy to use no use of password, it'll send verification codes during logging in to the app.

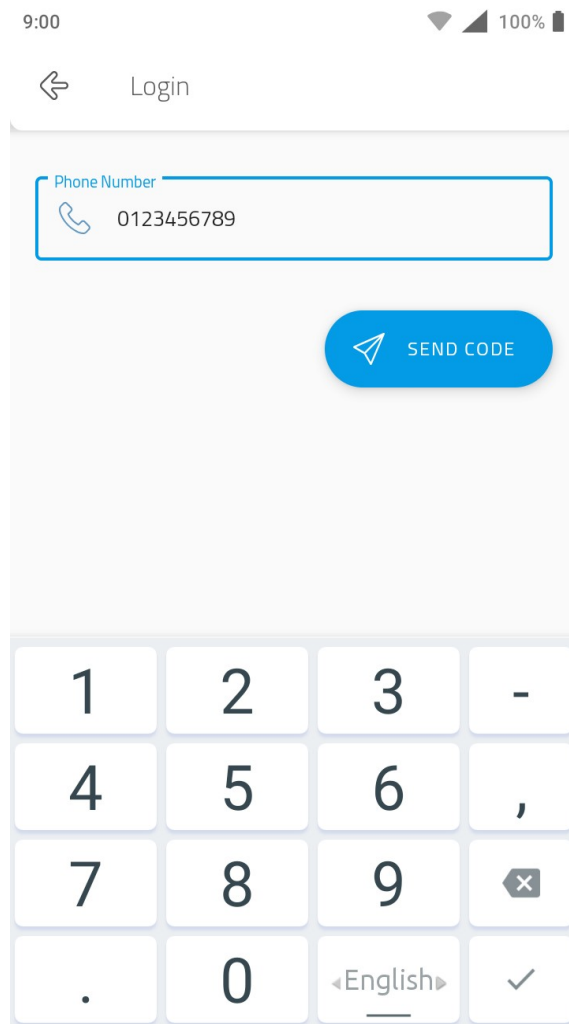


Figure 2: Login screen

2.3 VERIFICATION

Since we're using password less authentication for the sake of better user experience, hence we're using firebase's Authentication service. Once use presses send code mentioned in Figure 1, this verification screen will be visible to make the actual authentication process.

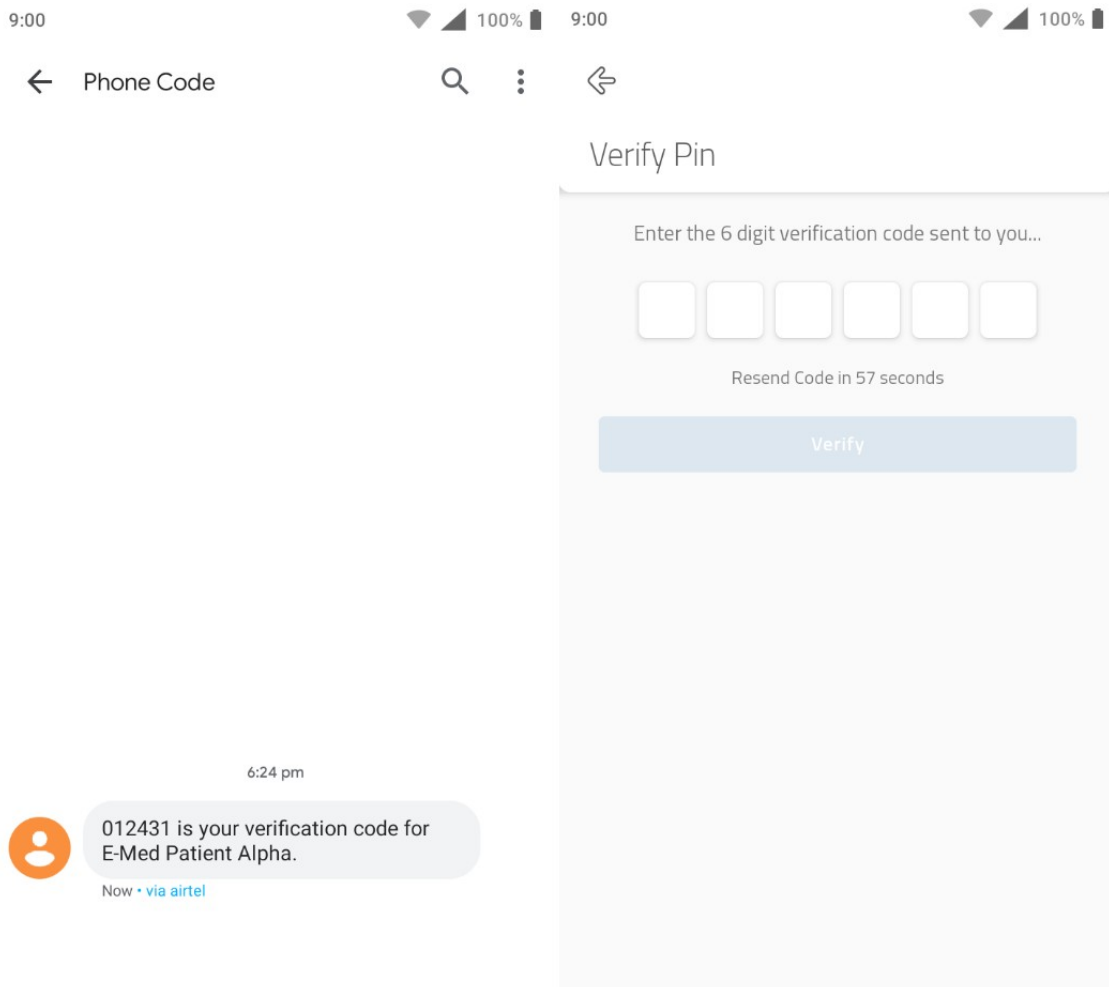


Figure 3: Verification screen

Once use completes verification steps successfully s/he will be able to access her/his data.

2.3 Reports history & Receiving reports in real-time

This is the exciting feature, the most important one actually! In this place patient will be able to see their reports histories ordered in a list. Once the data get processed form the hospital and the *server* we built, it'll be available in real-time in the app.

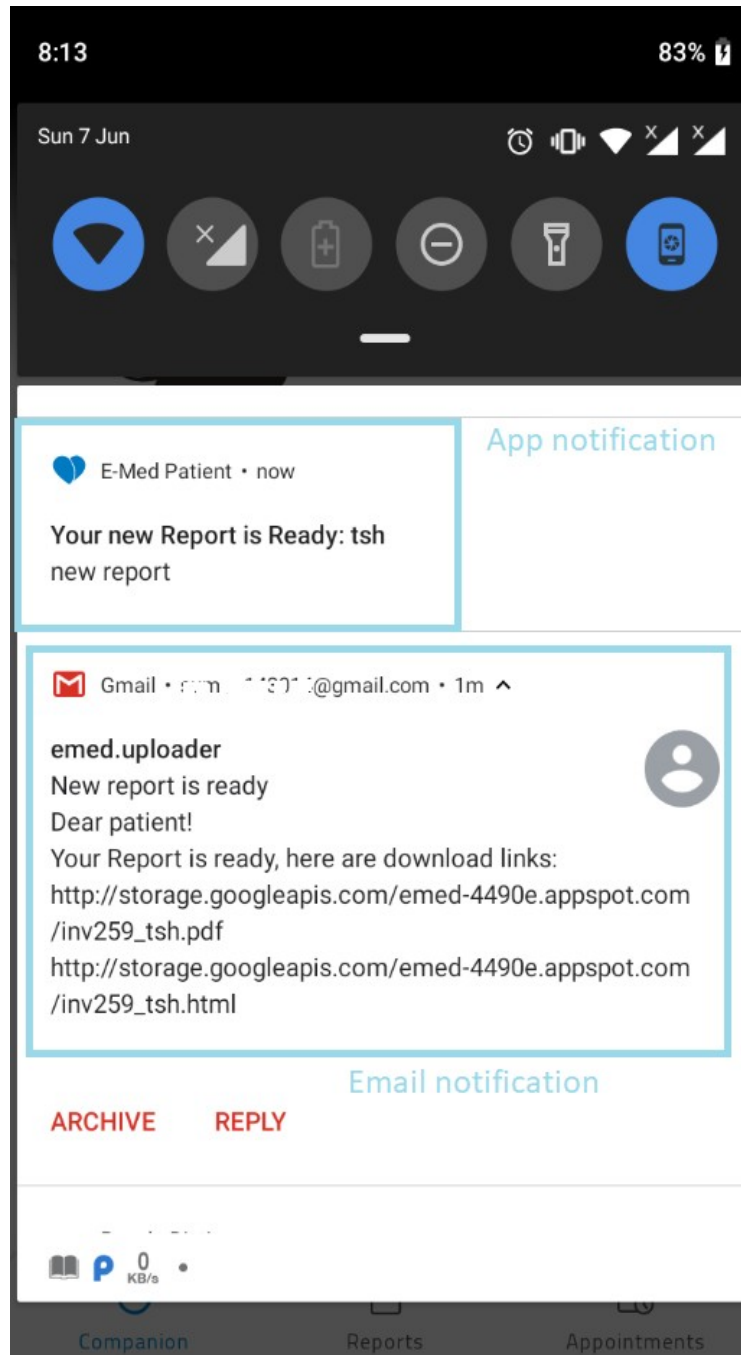


Figure 4: Realtime app & mail notification



Reports

Name : inv10188_tsh.pdf
Hospital ID : bPL8ydaOUPQLLAeuARyN90tgn...
Creation Date : Sun Jun 07 12:34:52 GMT+06:00...
Report Type : pdf

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Name : iin112_tsh.pdf
Hospital ID : bPL8ydaOUPQLLAeuARyN90tgn...
Creation Date : Sun Jun 07 12:36:31 GMT+06:00...
Report Type : pdf

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Name : inv101_tsh.pdf
Hospital ID : bPL8ydaOUPQLLAeuARyN90tgn...
Creation Date : Sun Jun 07 12:31:53 GMT+06:00...



Companion



Reports



Appointments

Figure 5: Report history/list

By clicking the “Reports” menu/item user will be able to access their reports easily. There s/he will see the report name/invoice id hospital id, the creation date of the report, report file type etc. Reports are available to download or view within the app.

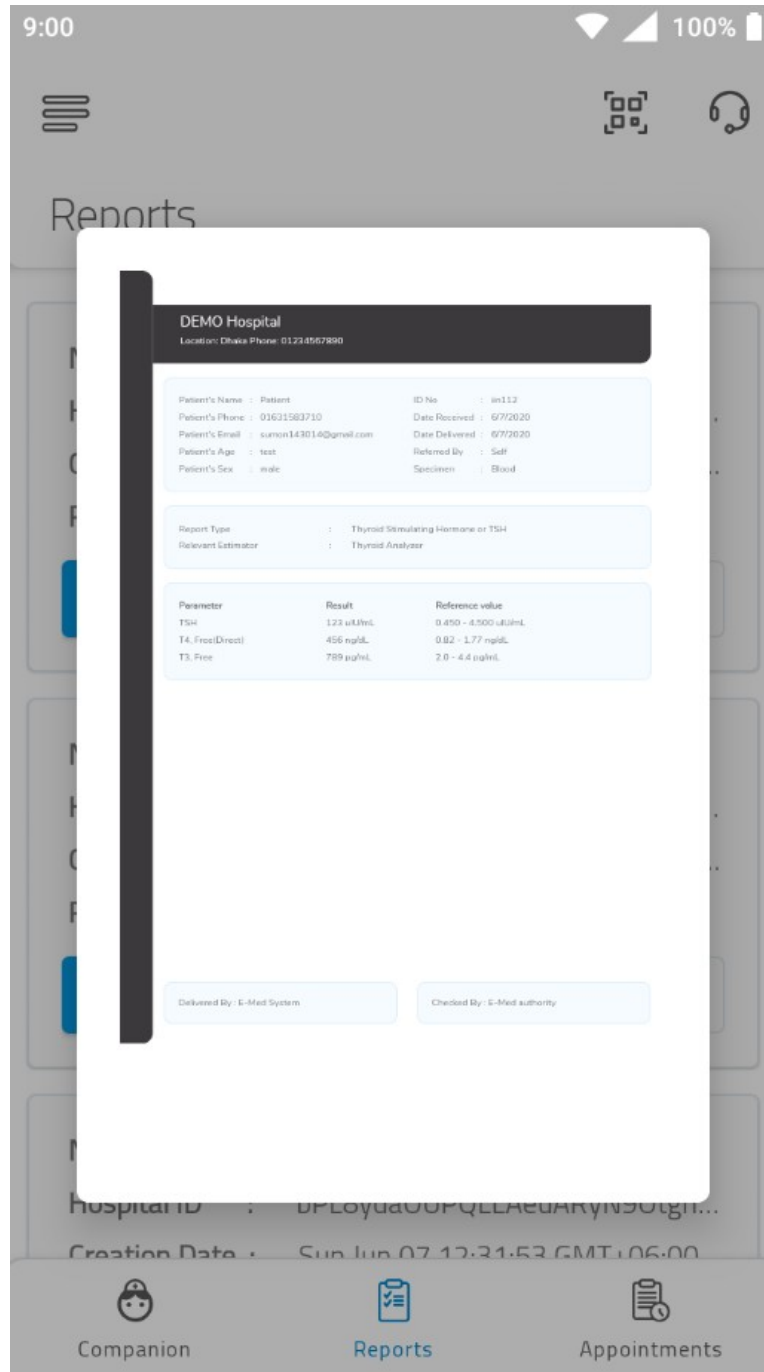


Figure 6: In app report viewing

CHAPTER 3: BACK-END APPLICATION

3.1 DATABASE STRUCTURE

As we've discussed earlier, we'll be using NoSQL [7] instead of traditional SQL [8] RDBMS [9] approach to store the data in the cloud, this is obvious as we are using the firebase cloudfirestore as our cloud DB. Each patient's info will be saved there inside patients collection [10] and each document [11] will have single patient's necessary information, this is how typical NoSQL works. So will be the structures for the report files. We'll associate patients info with the report files, thus enabling us to query the reports accordingly for specific patients. And our server will process data and upload there maintaining the structure in Figure 5

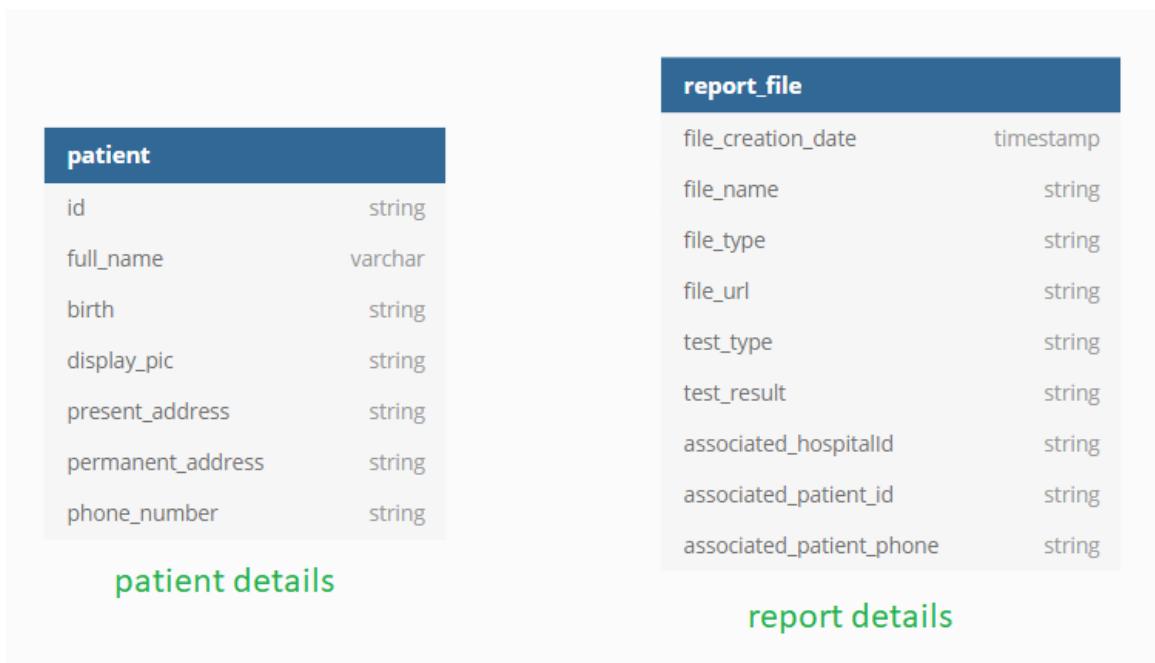


Figure 7: CloudFirestore (TM) structure for storing file & patient information

3.2 SERVER SIDE REPORT PROCESSING

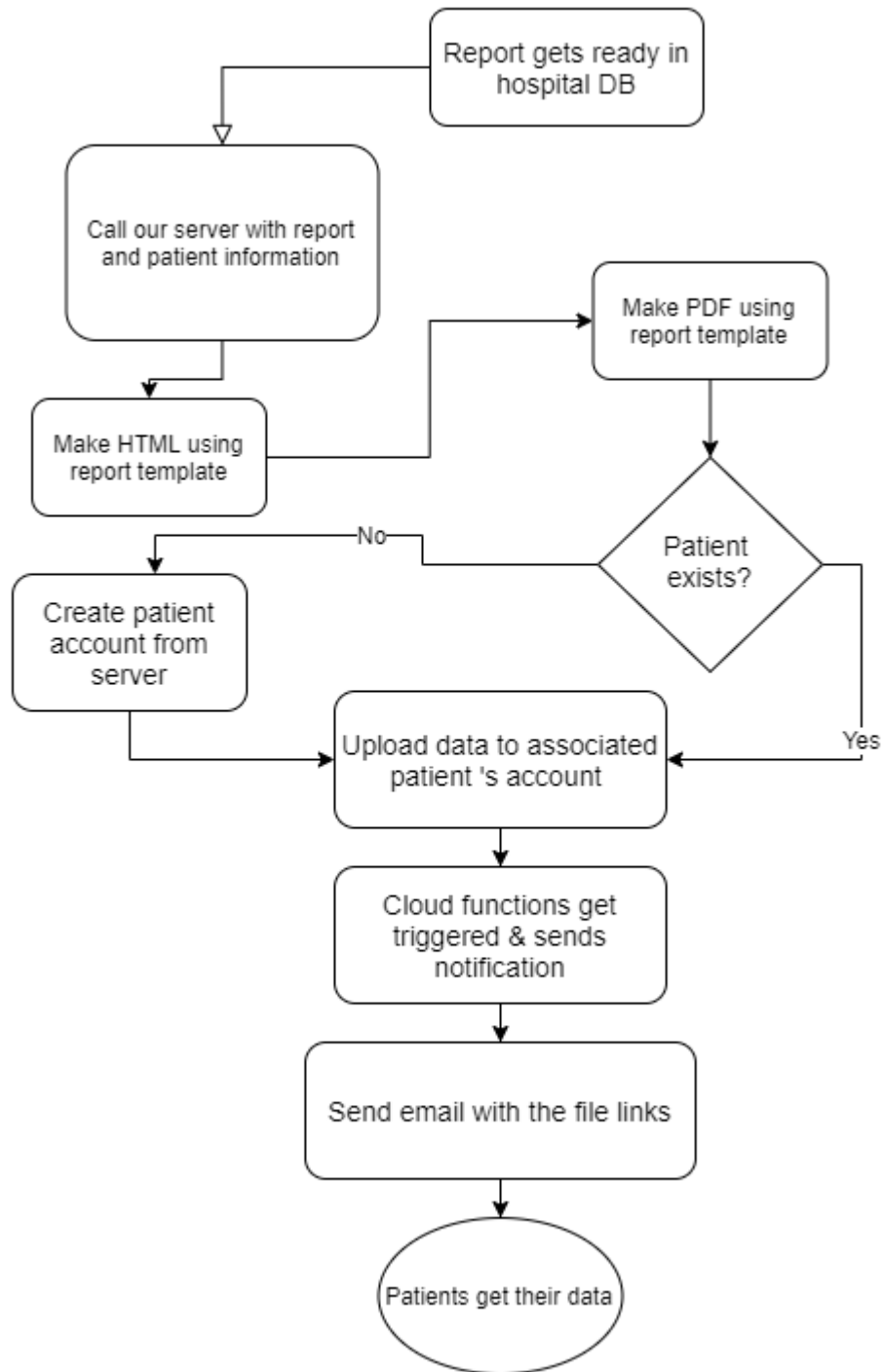


Figure 8: Server side workflow/processing diagram

First the report data gets updated or prepared in the hospital database, then *configured* hospital database will *call* our application server or the backend with the necessary data related to the report & patient. With those data our sever can proceed further and make

necessary renderings and will send it to the patient's email and write the *processed* data to the cloud account of that patient. Once data are written successfully, which may fail sometimes because of internet connectivity problems, cloud functions will get triggered and will search for the registered patient by phone number and eventually notify him/her.

3.3 USE CASE DIAGRAM

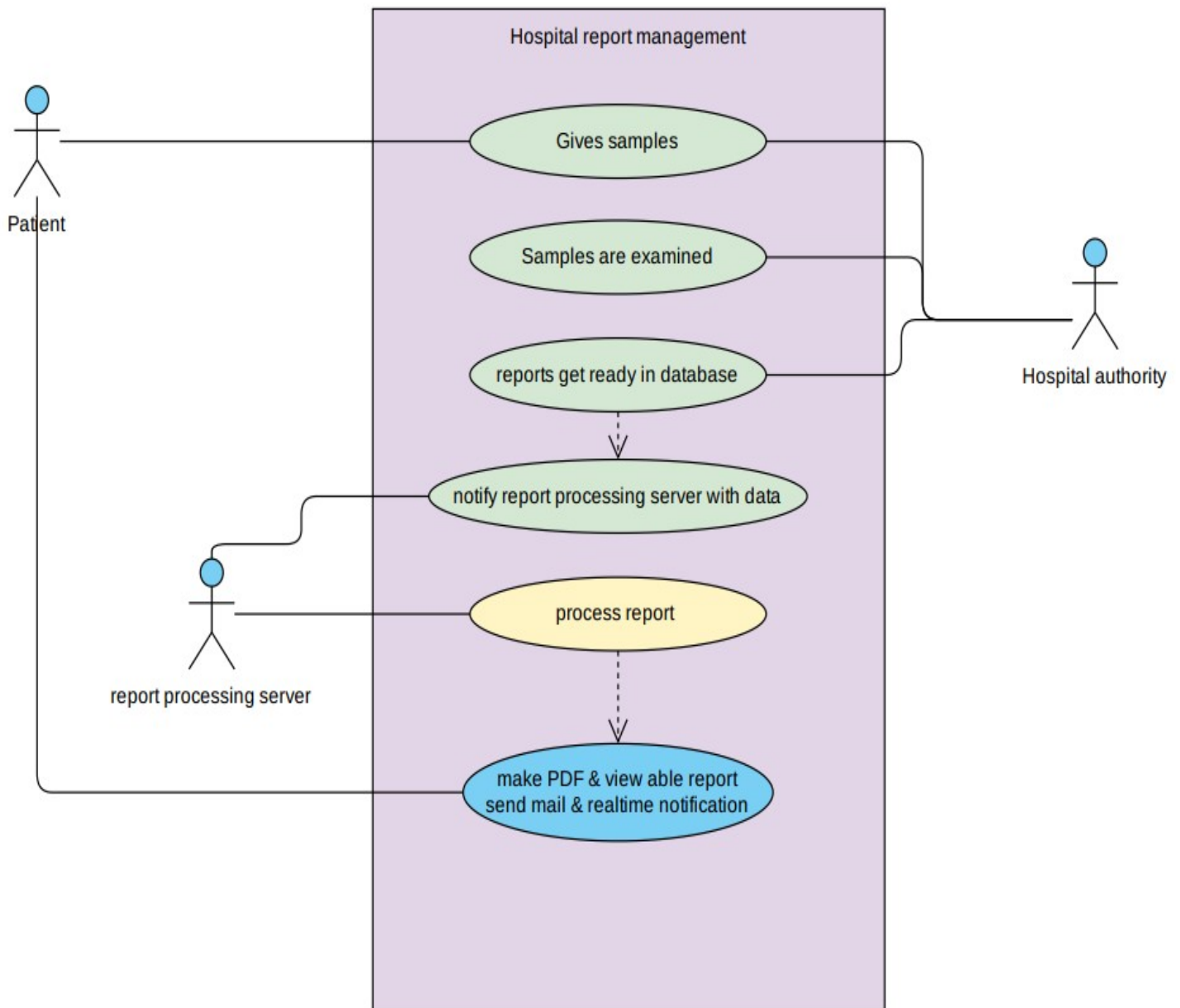


Figure 9: Use case diagram

CHAPTER 4: FURTHER DEVELOPMENT

4.1 PREDICTING DISEASE WITH AI

Over the times, each patient maintain their own data and their personal data are organized in the cloud, this really opens the door of possibilities! Because data are real treasure to dig in, in fact medical data are really valuable to mine. What we can do by mining the data stored in the cloud? Well that's the future scope for our project. We can analyze patients data including patients age, gender, test date, test type, test results everything about that particular test, what we can do is, build a sophisticated disease predictor, that will analyze the data and will make predictions about what disease the patient might have been suffering from. As the data in the cloud increases in amount, our ML/AI classifier will get stronger by training those large amount of datasets.

4.2 AI COMPANION / VIRTUAL DOCTOR

Another feature that relates to the ML/AI field is the virtual doctor, this is a great feature, previously we discussed about analyzing the data sets or the report results of the patients, now we want to build AI Companion.

This companion will work as virtual doctor. It may seem like virtual chat bot, but it's more than that. It's possible to build more sophisticated AI assistants in medical field. We might have heard about the mobile assistants i.e: Siri [12] and GoogleAssistant [13] etc. What those programs do are assisting user by using voice or text input, it analyzes the data and predicts the most probable outcome/action. In fact it does NLP [14] acronym for Natural Language Processing and that enables the machine to process the commands of the users. We can build something like that in the medical field.

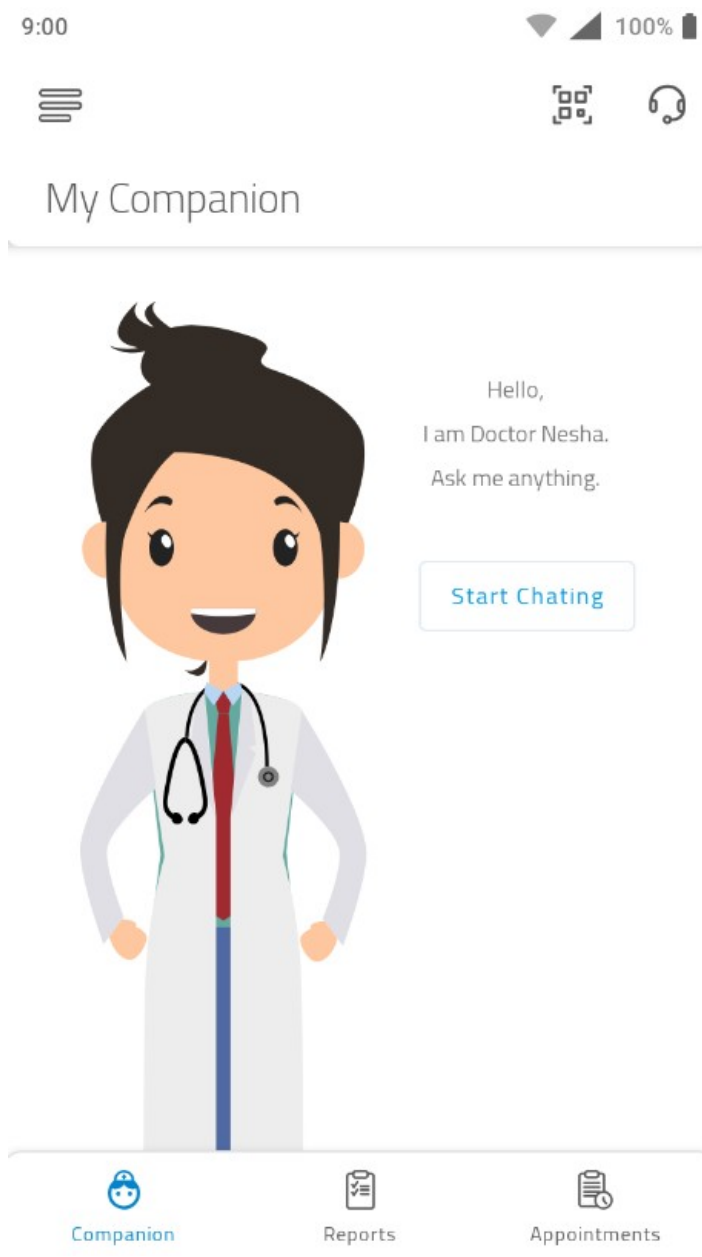


Figure 10: AI Companion feature proposal

4.3 APPOINTMENT

Another feature comes in mind that every patients eagerly want to get, that is online appointment. Online appointment can be done via our frontend application. The outcomes are obvious, patient will make appointments with their desired specialist any time, they can look up details of doctor's schedules, specialties, etc.

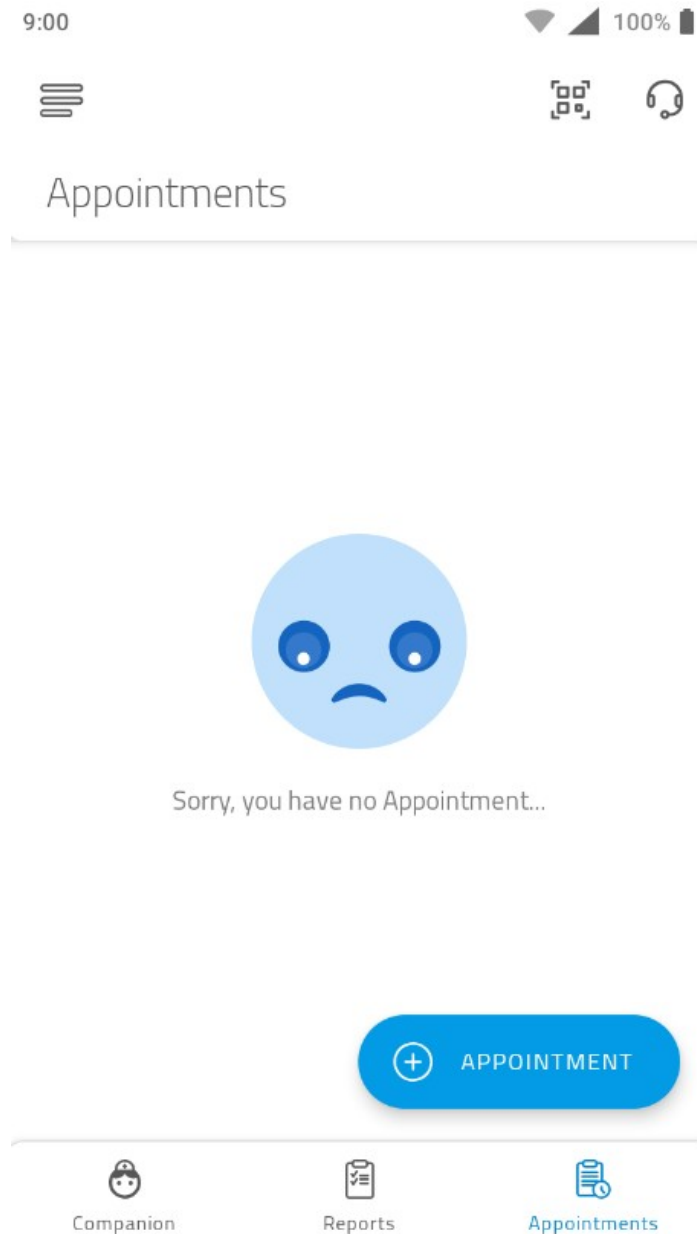


Figure 11: Online Appointment feature proposal

People will be able to make appointments by clicking appointment button and then maybe specifying some criteria to get the best matched doctor list. And their appointments will be shown accordingly as a list ordered by appointment dates. And whenever the patient decides to make an appointment, they just can request one, and corresponding hospital authority will respond them accordingly or automatically they will get a slot depending on patient's request time, and queue size, also the availability of the doctor etc. This feature can be great in terms of saving time, money and hassle people have to suffer to get a typical appointment with traditional approach.

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