EXPLORING FIREBASE CLOUD CHARACTERISTICS FOR MOBILE STORAGE

Submitted in partial fulfillment of the requirements

Of the degree of

Bachelor of Engineering In Computer Engineering

by

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Guide:

Prof. Sonali A. Bhutad

COMPUTER DEPARTMENT

SHAH & ANCHOR KUTCHHI ENGINEERING COLLEGE

(2016-2017)

Project Report Approval for B.E. Semester VIII

This project report entitled **"EXPLORING FIREBASE CLOUD CHARACTERISTICS FOR MOBILE STORAGE" by**

SHIVANGEE D. KULKARNI

BHUMI P. LODAYA

MANALI R. PATIL

SHWETA K. SHIMPI

is approved for semester VIII in partial fulfilment of the requirement for the award of the degree of **BACHELOR OF COMPUTER ENGINEERING**.

Name and Signature of the Examiner

1. _____
   ( )

2. _____
   ( )

Date :

Place :

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all the principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea / data/ fact / source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(SHIVANGEE D. KULKARNI BED-50)

(BHUMI P. LODAYA BED-51)

(MANALI R. PATIL BED-59)

(SHWETA K. SHIMPI BED-73)

Date :

Attendance Certificate

Date :

To,
The Principal
Shah and Anchor Kutchhi Engineering College,
Chembur, Mumbai-88

Subject: Confirmation of Attendance

Respected Sir,

This is to certify that Final year (BE) students from your college

Shivangee Kulkarni	**BED**	**50**
Bhumi Lodaya	**BED**	**51**
Manali Patil	**BED**	**59**
Shweta Shimpi	**BED**	**73**

have duly attended the sessions on the day allotted to them during the period from 25th January, 2017 to 29th March,2017 for performing the Project titled "Exploring firebase cloud characteristics for mobile storage".

They were punctual and regular in their attendance. Following is the detailed record of the student's attendance.

Attendance Record:

Date	Shivangee Kulkarni	Bhumi Lodaya	Manali Patil	Shweta Shimpi
25/01/2017	Present	Present	Present	Present
01/02/2017	Present	Present	Present	Present
08/02/2017	Present	Present	Present	Present
15/02/2017	Present	Present	Present	Present
08/03/2017	Present	Present	Present	Present
22/03/2017	Present	Present	Present	Present
29/03/2017	Present	Present	Present	Present

(MRS. SONALI A. BHUTAD)

Signature and Name of Internal Guide

ABSTRACT

Nowadays technology is advancing very rapidly and due to these new inventions, our life has changed tremendously. As a result, security of our smartphones and social networking sites becomes a very important issue. New cloud services are emerging and people are inquisitive about the upcoming technologies like Firebase. Amazon Web Service (AWS) is a largely used cloud service and Firebase is an emerging technology. Firebase is a google provided API for database storage and syncing into your android, iOS or web application. A real-time database is one which stores data to database and fetches data from it very quickly but Firebase is not just a real-time database, it is much more than that. Google firebase have many features like Authentication, database, storage, hosting, notification etc. This project focuses on use of two cloud services as per user's choice. Usually smart phones provide one specific cloud services of their own company. But what if the user is not satisfied with that one cloud service? That is where this software plays a role in deciding the rating of different cloud services so that user can use more than one cloud to store data as per his wish. Our application will be useful for common people as well as investigators.

TABLE OF CONTENTS

Chapter 7

Chapter 8

Chapter 9

TABLE OF FIGURES

Chapter 1

Introduction

Firebase is a database backend for android, iOS and web applications. Firebase is google provided API to create a database and fetch from it in real time with only a few lines of code. Data is stored as JSON and is accessible from all the platforms. Firebase is a paid service and you get 200 MB of storage space for free. Most of the people in today's world are addicted to smartphones, so our mobile data contains a lot of sensitive data. This application also targets the local user to get back their data from cloud. Currently we can see that most of the cloud platforms are having some limitations. This project provides a platform for storing and retrieving data from cloud as and when required. Once firebase API included into android or iOS application, one can use the firebase features with simple lines of code.

1.1.Objective

The objective of this project is to help the local users and investigators to store and retrieve their data from the cost-efficient cloud. It is also useful for crime investigation to search for the evidence of the suspect. Here we aim to upload and download different types of data such as images, audios(.gpp) on the cloud with a user friendly GUI.

1.2. Methodology Used

The methodology used in this project is an Object-Oriented Approach. The implementation is done in Android programming language using the Android Studio. This is the alpha version of our application. The new features can be easily upgraded in our application.

Chapter 2

Literature Survey

George Grispos, William Bradley Glisson and Tim Storer proposed a system which acted as a two-folded system. First, it provides a proof of concept that end-devices can be used to provide a partial view of the evidence in a cloud forensics investigation. This contribution focuses on tools currently available to practitioners providing a novel approach to practical solutions for emerging problems in the cloud. Second, it contributes to the documentation and evidentiary discussion of the artifacts created from specific cloud storage applications on Android smartphones. From an evidentiary perspective, the smartphone can be considered a treasure trove of forensic evidence. A recent study recovered more than 11,000 data artifacts from just 49, predominately low end, Devices. The experiment was performed on HTC Desire smart phone for analysis. The whole experiment was broken into 6 stages:

1) preparing the smartphone device and installing the cloud application.
2) Loading a data set to a cloud storage provider.
3) Connect to the data through the application on the Smartphone.
4) Perform various file manipulations to the data set and smartphone device.
5) Process the device using the Universal Forensic Extraction Device (UFED).
6) Use a number of forensic tools to extract the files and artifacts from the resulting memory dumps UFED and its associated application the 'Physical Analyzer' along with FTK Imager were used in this experiment. The memory card used in the HTC Desire (Android phone used for experiment) was processed using FTK. A forensically wiped 16 GB USB flash drive was used to save the resulting memory dumps. The process took 4 hours to complete. The artifacts recovered include data stored in the storage service. This is provided that the user of the device has accessed these files in some way using the cloud storage provider's application. Files which were not viewed on the mobile phones were not recovered.

The results also show that the recovery of mp3 and mp4 files was not very successful. All the files marked for offline access were recovered from both devices. The SD memory card used in the Android device contained files which were either deleted by the user or deleted as a result of the application cache being cleared. Android-based devices allow files to be stored on either the device itself or on the SD memory card . Clearing the application's cache has an adverse effect on the recovery of files.

Firebase is also a database backend for android, iOS and web applications. Firebase is google provided API to create a database and fetch from it in real time with only a few lines of code. Data is stored as JSON and is accessible from all the platforms. Firebase provided features as listed below:

1. **Analytics:** This feature enables the application developer to understand how users are using his application. The SDK capture events and properties on its own and allows you to get custom data.
2. **Authentication:** Auth feature in firebase let you let only authorized users access your application. Firebase provides login through Gmail, GitHub, Twitter, Facebook and let the developer create custom authentication.
3. **Messaging:** Firebase cloud messaging lets you to deliver messages to different platforms at no cost. Messaging is also used for notifications purposes.
4. **Real-time Database:** Database in firebase is a cloud-based database and does not need SQL-based queries to store and fetch data.
5. **Storage:** Firebase also provides storage facility. It can store and retrieve content like images, videos and audio directly from client SDK.
6. **Hosting:** Firebase is also used for hosting purposes. Firebase delivers web content very fast and content is always delivered securely.
7. **Crash reporting:** Crash reporting feature on firebase creates reports of error in your app after its release. Errors are grouped into different groups according to how severe error is.

Chapter 3

Problem Statement

Due to the growing technology, the sources of data are increasing. Mobile memory is not sufficient to store this huge amount of data. To preserve this large data there was a need of storage system which does not have any memory bound. Also, the data which gets deleted accidently or purposely is difficult to retrieve back from the smart phone and if retrieved it is not optimized. Users also have a threat of someone misusing their sensitive data. Lack of authentication and insufficient storage of data are the main problems the users are facing now-a-days. If user wants to avail services of specific cloud then how to use that cloud except the one which mobile provides by default. Therefore, to explore the characteristics of different clouds and choosing the best one is done here in the form of Firebase. Firebase is a mobile and web application platform with tools and infrastructure designed to help developers build high-quality apps. So, we have to design an application that will upload the data on the cloud and enable the users to download their data as and when required.

Chapter 4

System Requirements

4.1. Software Requirement Specification

4.1.1. Introduction

4.1.1.1. Purpose

The purpose of this "Firebase Cloud Application" system is to help the users upload and download the data from firebase cloud. It will be useful for the common man as well as the investigators.

4.1.1.2. Scope

The scope of this project is to upload the data on the firebase cloud before deleting it from our smart phones and explore the characteristics of firebase cloud. Due to this we can access that data which is stored on cloud as and access it as and when required. Thus, the primary scope of this project is to enable the users store the data on the cloud before deleting it (i.e. thereby providing the backup of their data).

4.1.2. System Features

- Successful uploading and downloading of Audio and image files.
- User friendly GUI.
- Security is provided through Google Sign-in.
- The system is cost-effective and efficient.

4.1.3. External Interface Requirements

4.1.3.1. User Interfaces

- Frontend Software: Java, Android Studio.
- Backend Software: SQLite, Firebase Real time database, Firebase Storage, Firebase Auth Storage.

4.1.3.2. Hardware Interfaces

- Android Smartphone.
- Laptop.
- Data Cable.

4.1.3.3. Software Interfaces

- Android Operating System on Mobile Devices.
- Windows 7, Windows 8.
- Browser supporting HTML, JAVA.

4.1.4. Other Non-Functional Requirements

4.1.4.1. Performance Requirements

The application should have quick response time i.e. time required for uploading the data to the firebase cloud should be less. Also, the time required for downloading the data from the cloud should be less. The Google Sign-in process should also be done in few seconds.

4.1.4.2. Safety Requirements

The data should not be leaked to an unauthorized user so that the privacy and security is maintained.

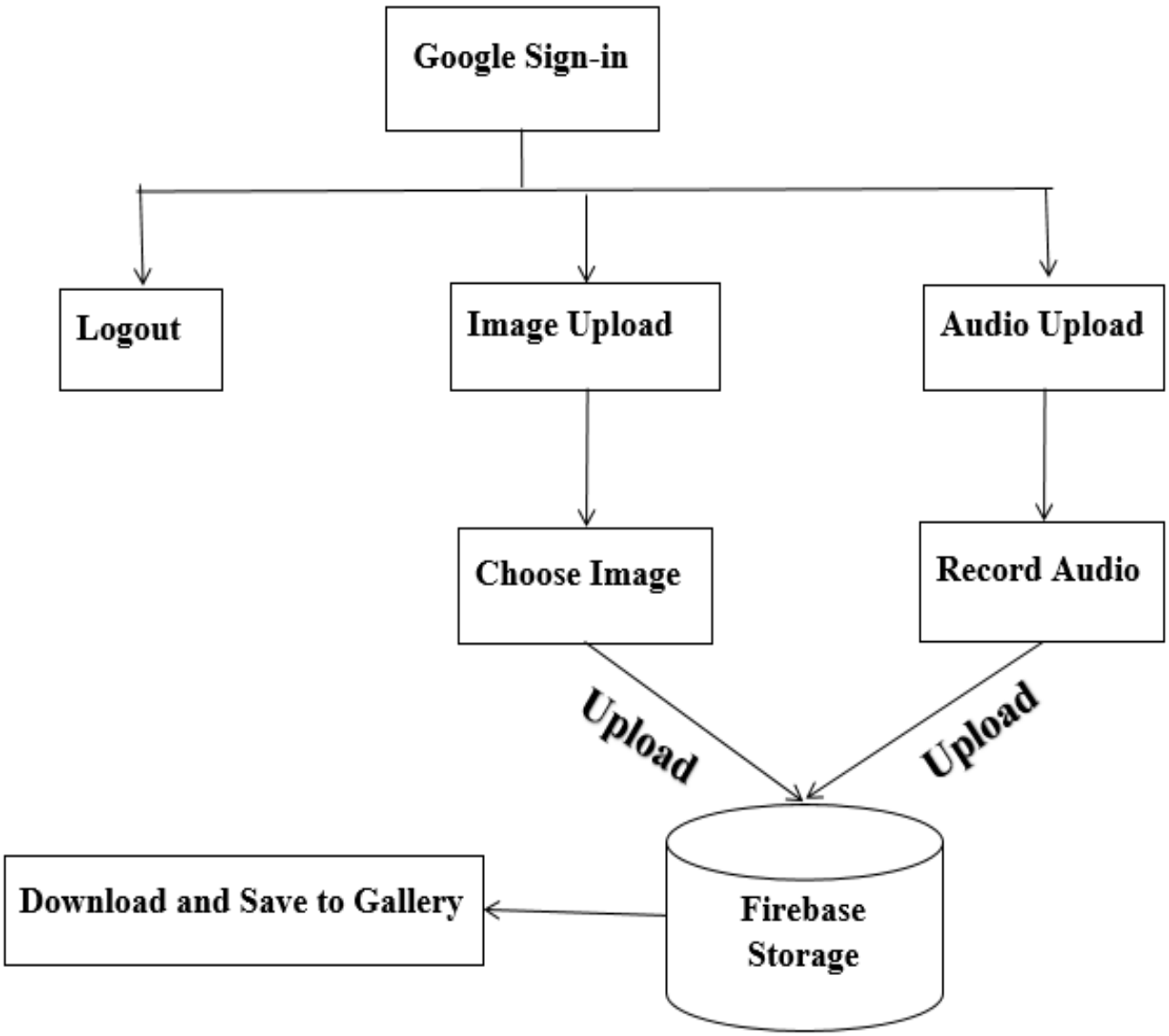
4.1.4.3. Security Requirements

When we upload the data on the cloud, care should be taken that the data of other users should not be visible to the current user. Thus, this can be achieved by creating different folders on the cloud for each user.

Chapter 5

Project Design

5.1. System Block Diagram



5.2. Use Case Diagram

5.2.1. Use Case diagram of the front end

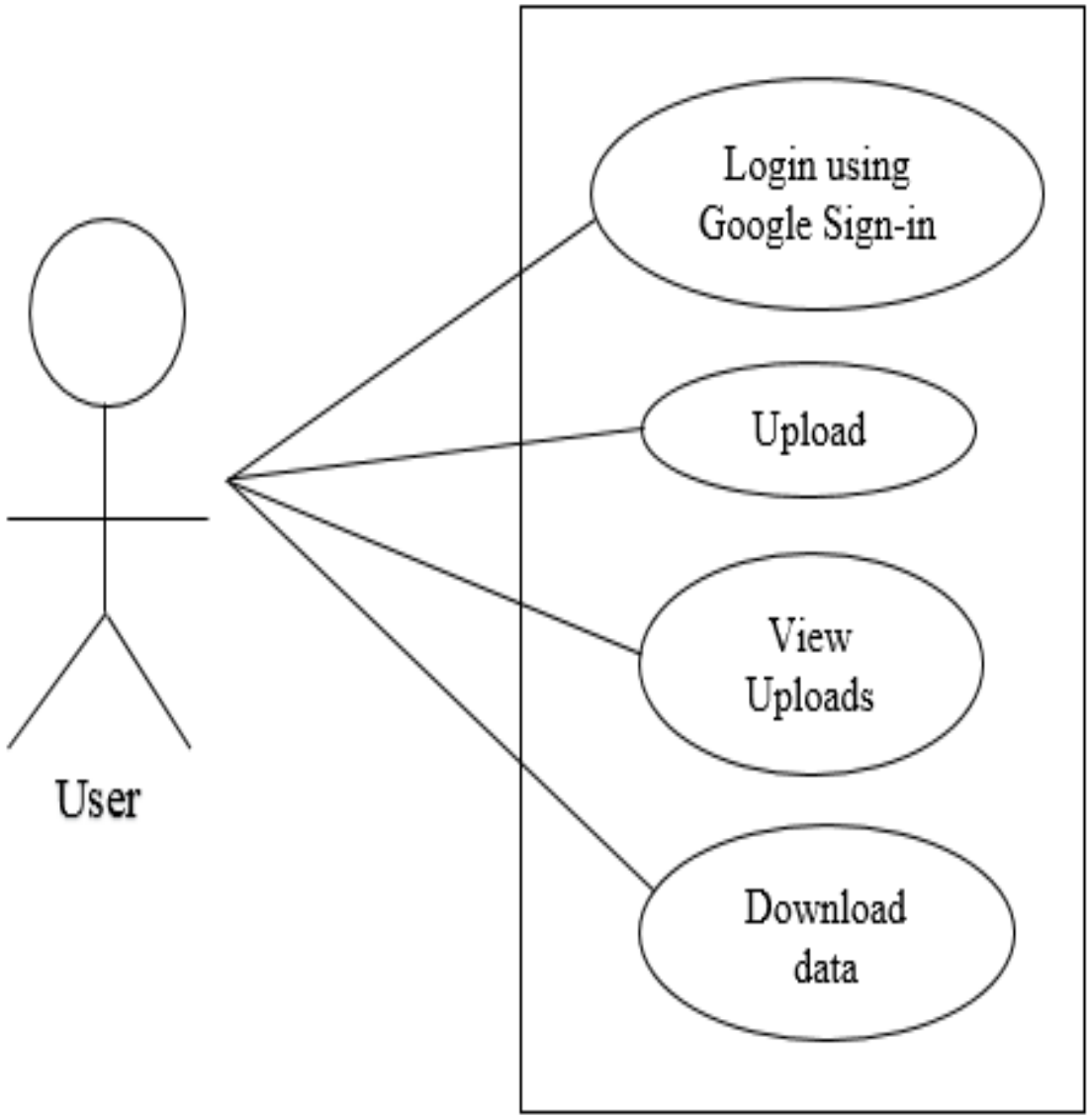


Fig: 1.2. Use Case diagram of the front end

5.2.2. Use Case diagram of the back end

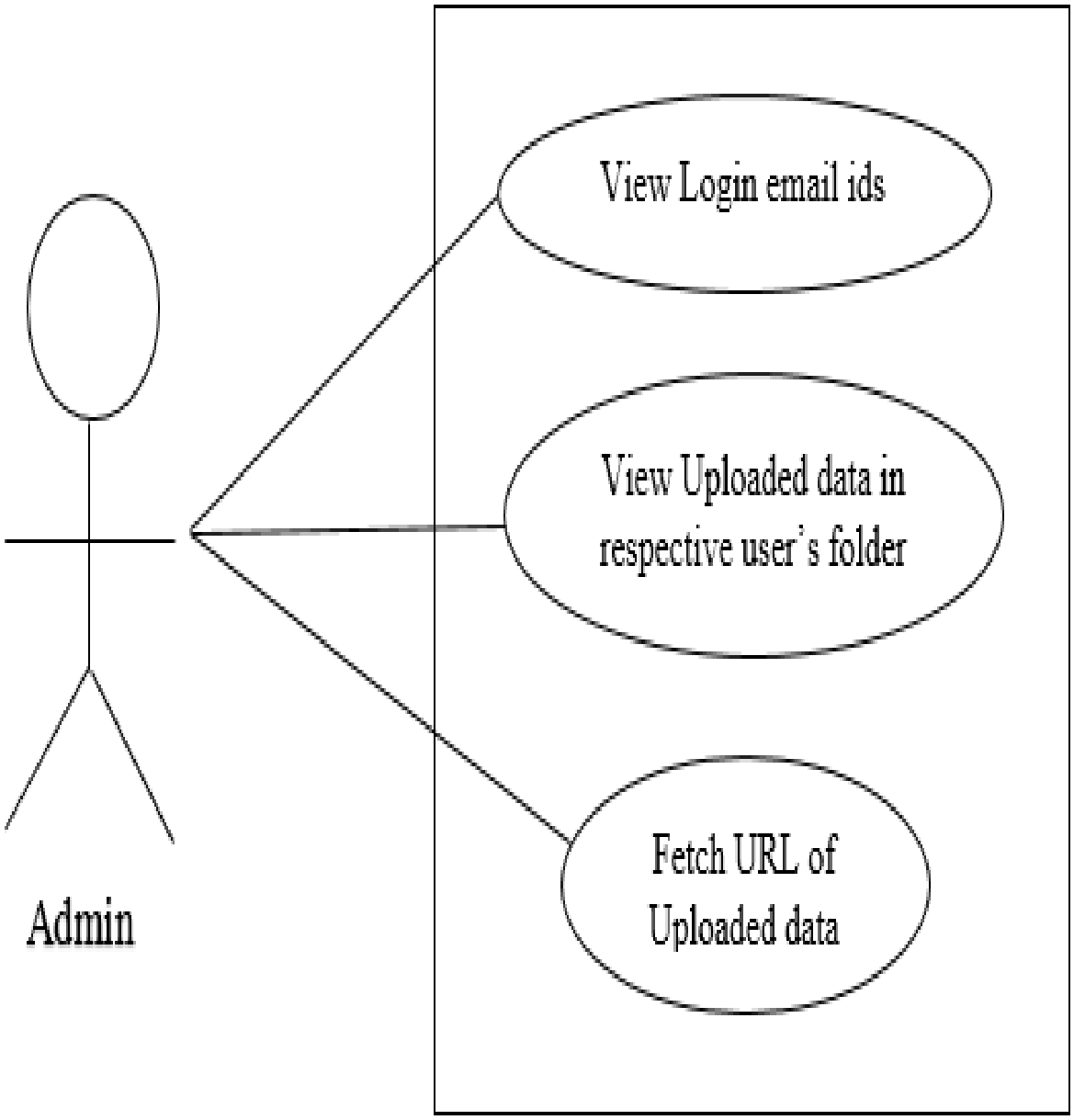


Fig: 1.3. Use Case diagram of the back end

5.3. Activity Diagram

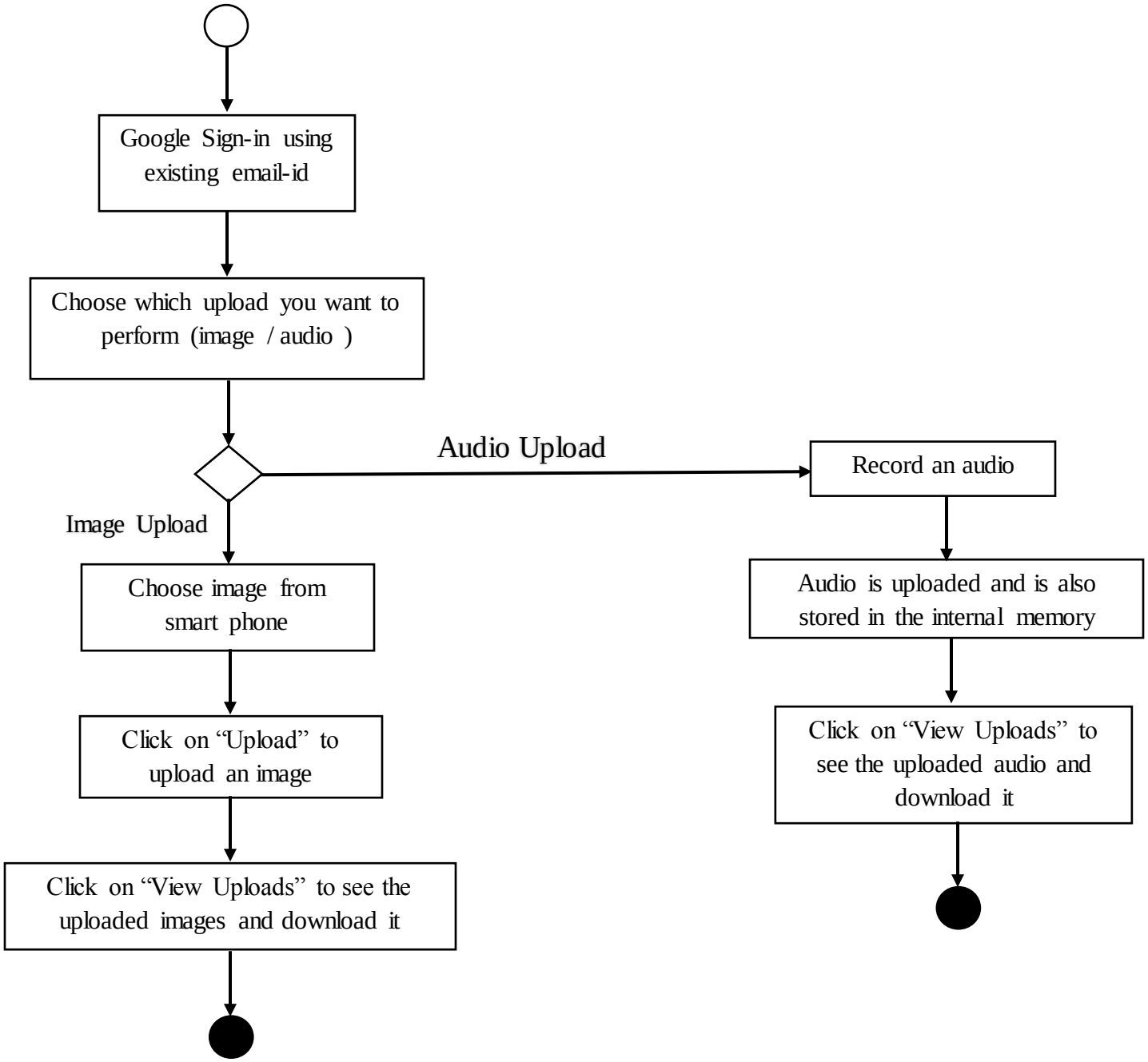


Fig: 1.4. Activity diagram of the system

5.4. Sequence Diagram

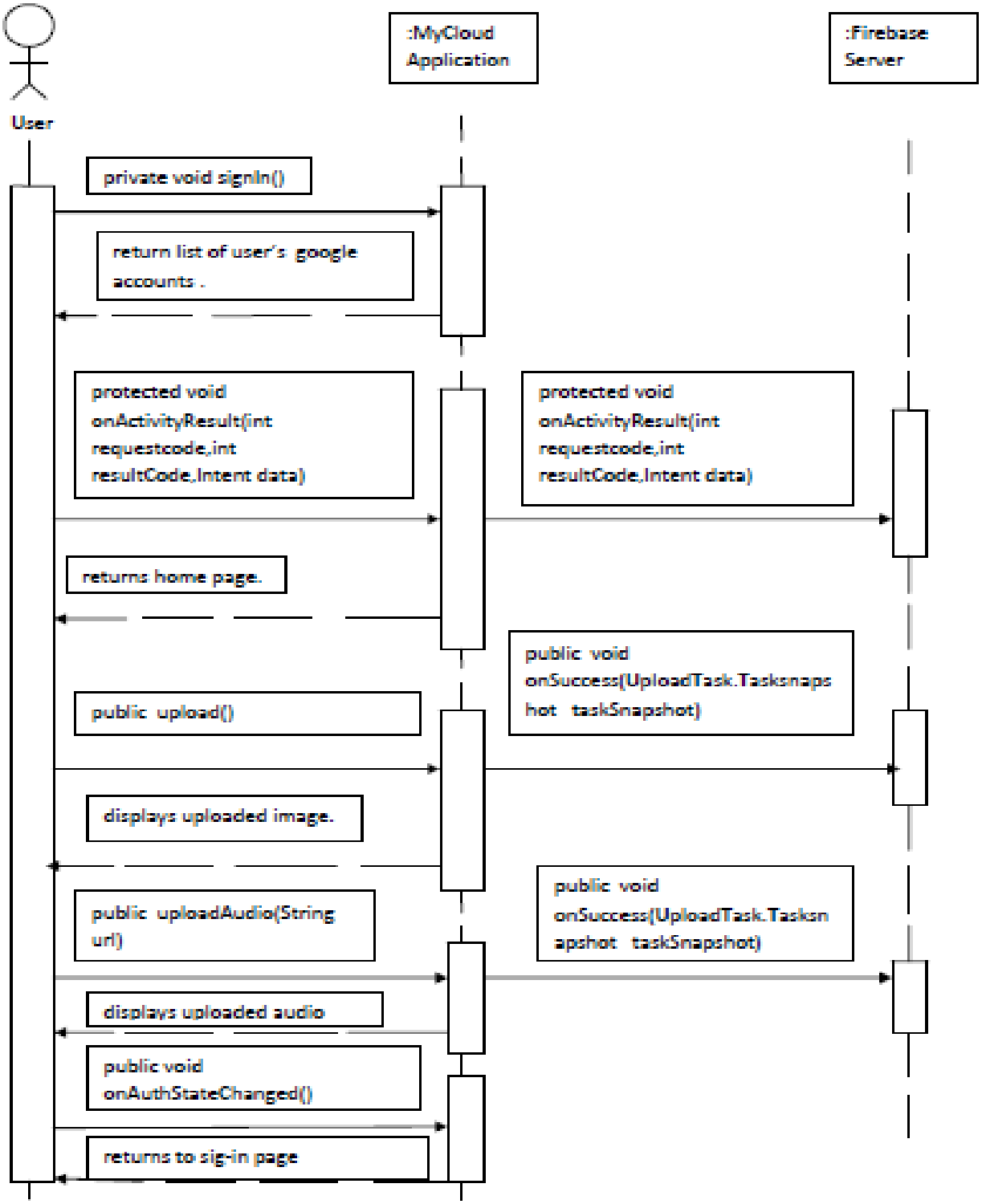


Fig: 1.5. Sequence diagram of the system

5.5. Flow Chart

5.5.1. Flow Chart for Uploading data

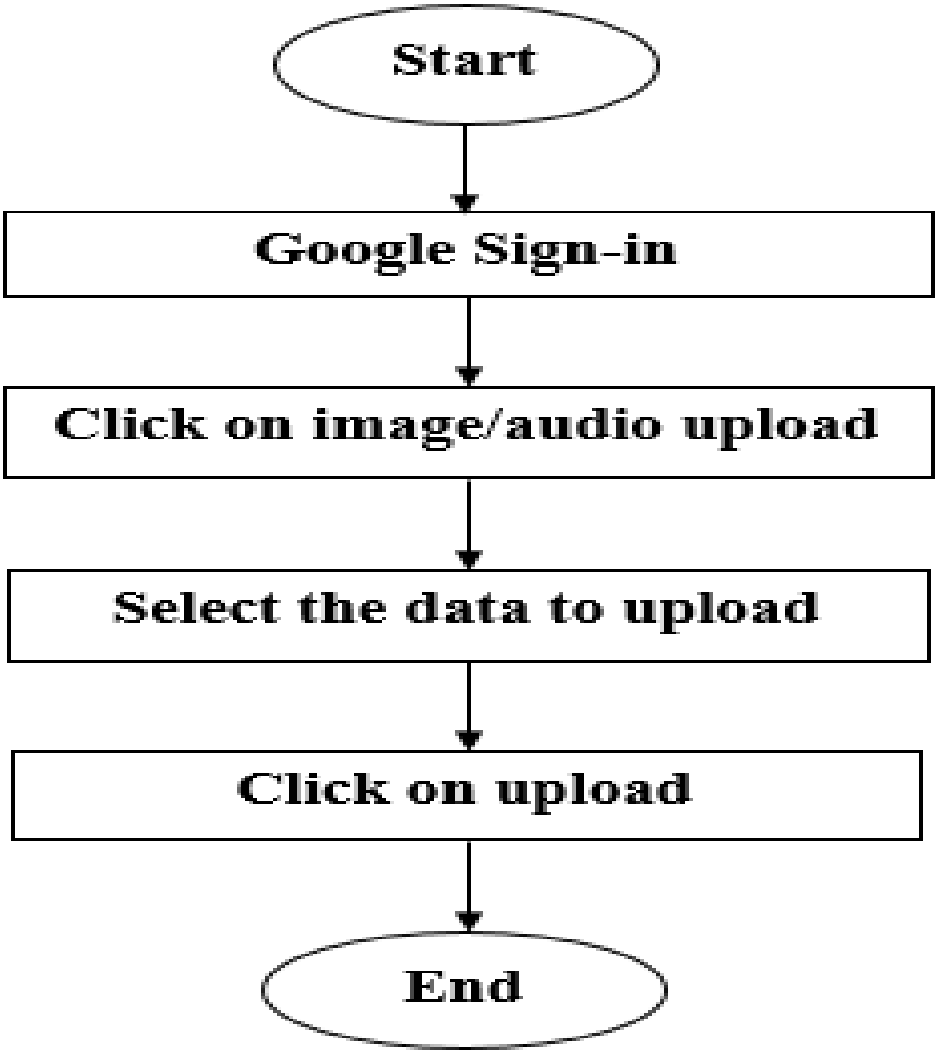


Fig: 1.5. Flow Chart for Uploading data

5.5.2. Flow Chart for Downloading Data

Fig: 1.6. Flow Chart for Downloading data

5.6. Algorithm

5.6.1. Algorithm for uploading an image and audio on the firebase cloud

1. If filepath != null then display an uploading progress bar.

2. Create a StorageReference object with the Firebase Auth , filepath , current time in milliseconds attributes and put the file in the StorageReference object.
   i. If the file is selected toast message is displayed as "File Uploaded".
   ii. We collect the URL of the data in upload object of class Upload. Add the value in uploadid variable to store it in database.
   iii. If the file is not selected then an exception message is displayed.

5.6.2. Algorithm for downloading an image and audio on the firebase cloud

1. Create a class that extends RecyclerView.Adapter<MyAdapter.ViewHolder>. Add the overridden methods.

2. Add the data in the object of View class and pass that object to the ViewHolder class.

3. Then we have to get the position of the image in the object of the Upload class. With the help of Glide get the URL of the image and place it in the image view.

Chapter 6

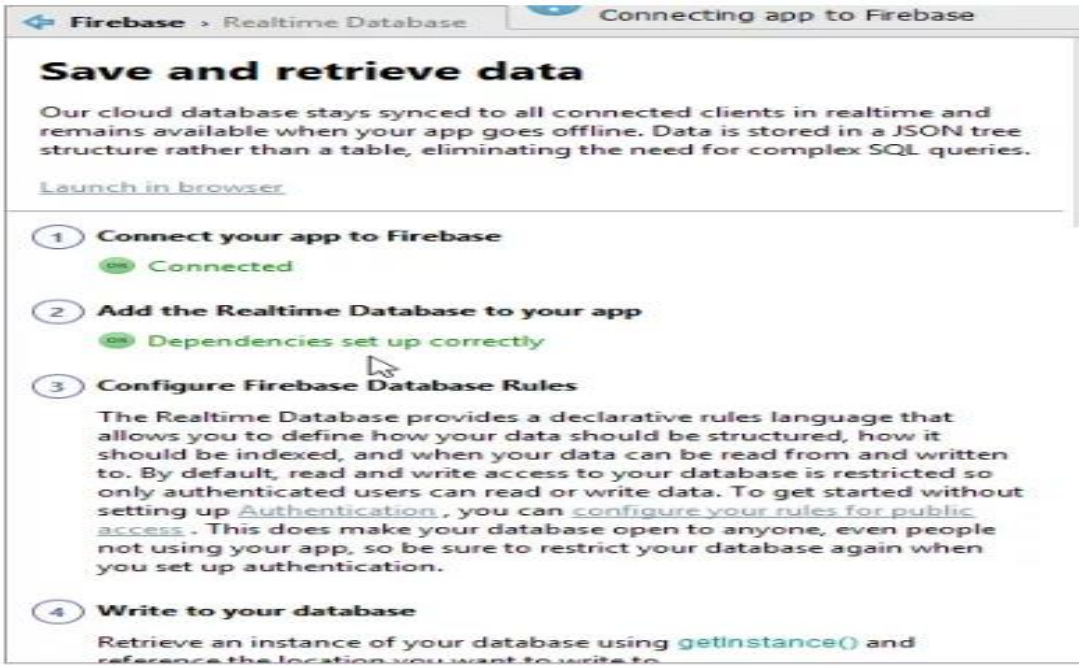
Implementation Details

6.1. Implementation Details

6.1.1. Procedure for implementation

1. Connect to the firebase – Firstly sign in to your Gmail account. Then open the firebase console in the new tab. In the Android Studio version 2.2.3 or above go to the Tools option and choose Firebase. An assistant tab will open in that various options are available such as Analytics, Authentication, Real-time Storage, Storage, etc. Select on any of the options and click on "Connect your app to Firebase".

2. Add firebase storage, real-time database to your app – Click on "Add the Real-time database to your app" and then click on accept changes then the dependencies will be added in our app.



3. Create a reference – To store the data on the firebase cloud we need to create a database reference of DatabaseReference class.

```
private DatabaseReference mDatabase;
// ...
mDatabase = FirebaseDatabase.getInstance().getReference();
```

4. Upload a file – To upload the file on the firebase cloud we need to include this code.

```
Uri file = Uri.fromFile(new File("path/to/images/rivers.jpg"));
StorageReference riversRef = storageRef.child("images/"+file.getLastPathSegment());
uploadTask = riversRef.putFile(file);

// Register observers to listen for when the download is done or if it fails
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, and d
        Uri downloadUrl = taskSnapshot.getDownloadUrl();
    }
});
```

5. Download a file - To download the file on the firebase cloud we need to include this code.

```
// Reference to an image file in Firebase Storage
StorageReference storageReference = ...;

// ImageView in your Activity
ImageView imageView = ...;

// Load the image using Glide
Glide.with(this /* context */)
        .using(new FirebaseImageLoader())
        .load(storageReference)
        .into(imageView);
```

6.1.2. Module and Description

Nowadays technology is advancing very rapidly and due to these new inventions, our life has changed tremendously. As a result, security of our smartphones and social networking sites becomes very important. So, there is a need to design such a system on which we could upload our data on cloud securely and retrieve it as and when it is required. The different modules of our system are as follows –

1. **Login Module** - The user needs to login using his/her email id. The user is allowed to login if the email id is valid. The user also has an option to choose an email id from his multiple email ids.

2. Image Module

In this the user can choose an image from his smartphone and upload it by clicking on upload button. This image gets uploaded on the firebase cloud database as well as in firebase real-time database. The user can view the uploaded images by clicking on view uploads button in which the images are displayed in a card view. The user can download the images by clicking it and selecting save to gallery option.

3. Audio Module

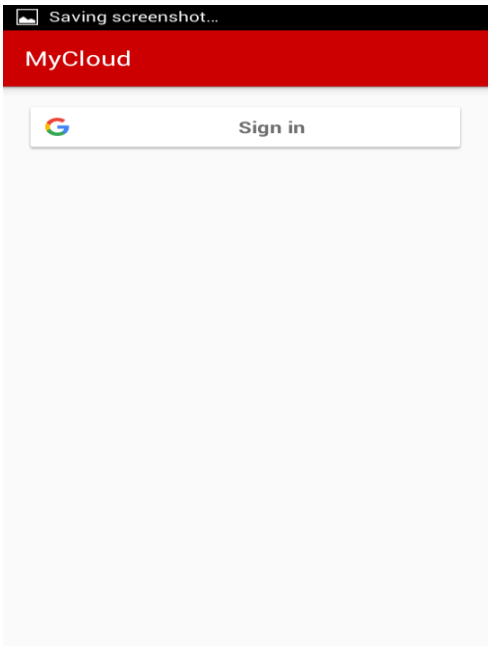
In this the user can record the audio by tapping and holding a button. Then this audio is uploaded on the firebase cloud and also saved in internal memory of a smartphone. This audio gets uploaded on the firebase cloud database as well as in firebase real-time database. The user can view the uploaded audios by clicking on view uploads button in which the audios are displayed in a card view. The user can download the audios by clicking it and selecting save to gallery option.

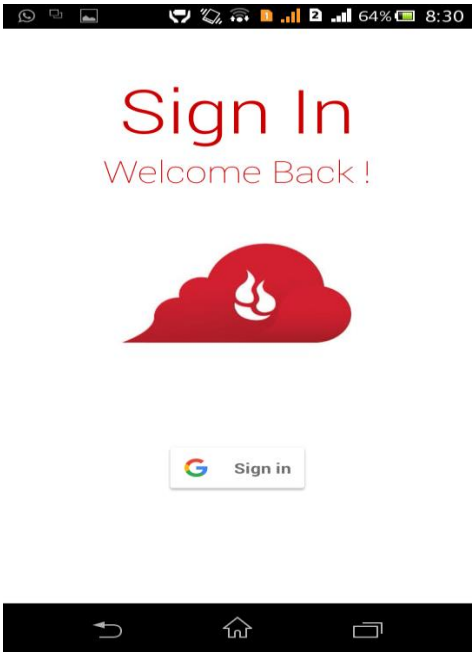
4. **Logout Module**

The user can logout from the application by clicking on logout button.

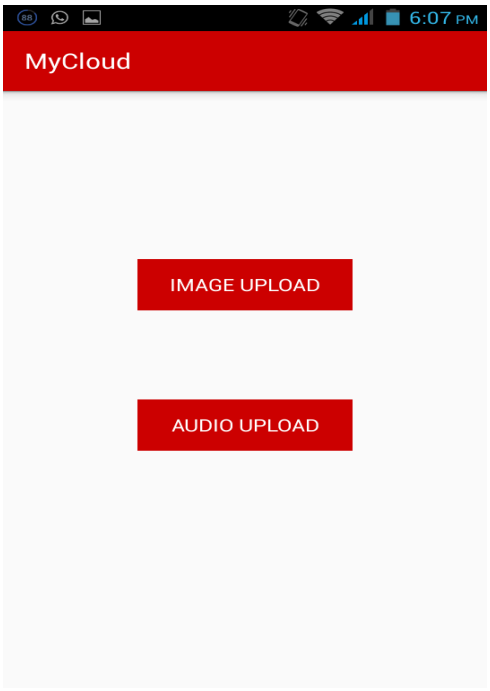
6.1.3. Snapshot

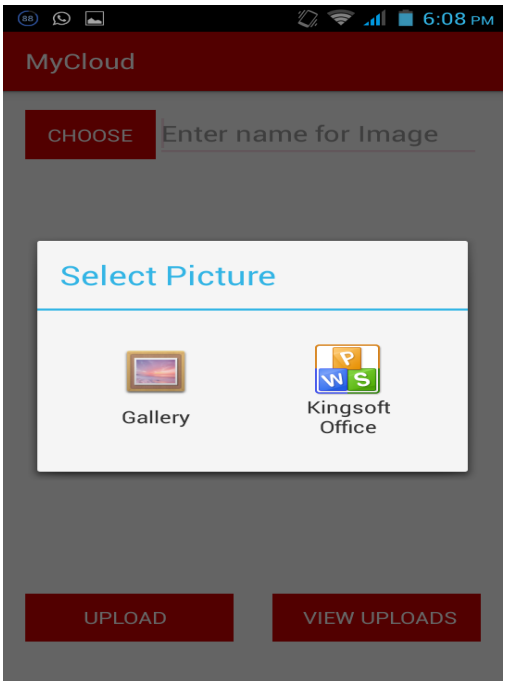
1. **Google Sign-in and Chat Sign-in**



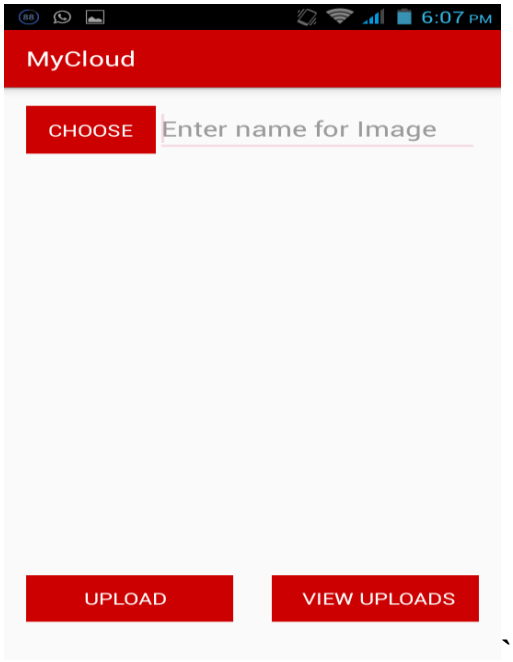


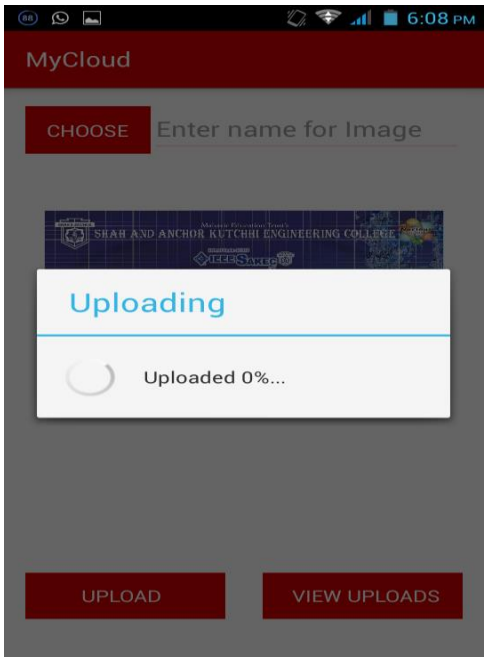
2. Choosing option for image/audio upload



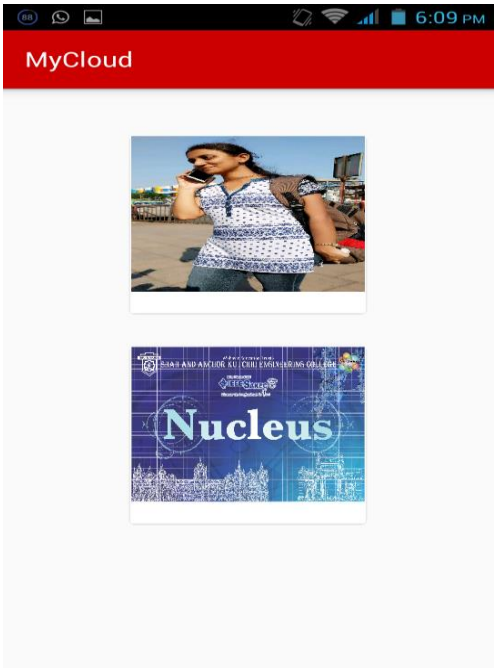


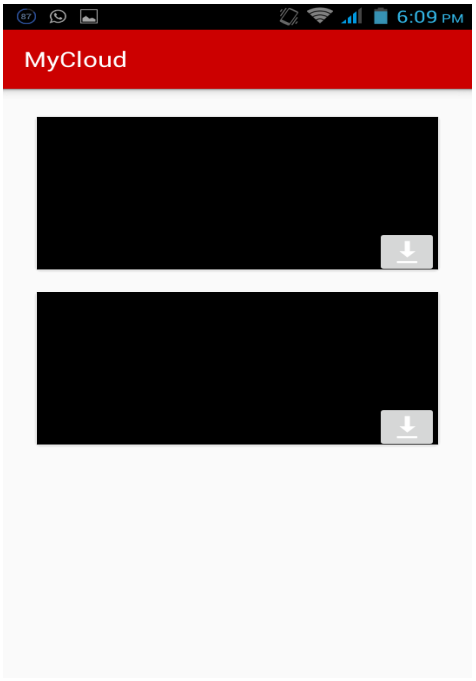
3. Image Upload



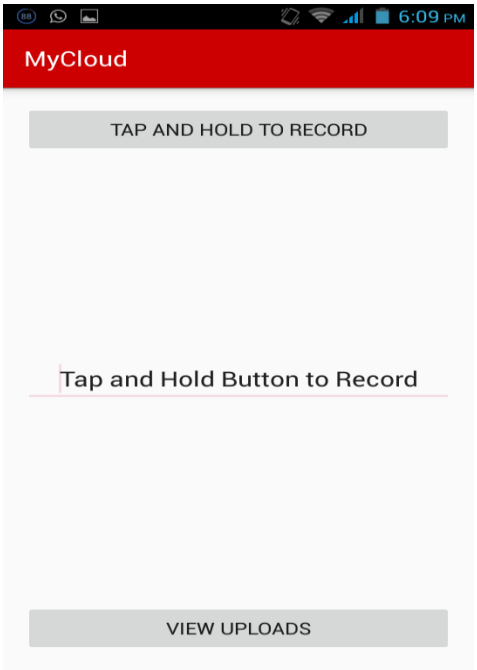


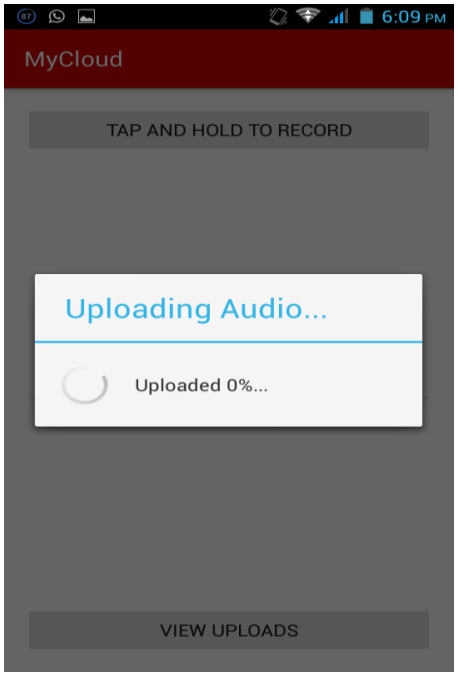
4. **Images and audios in card-view for downloading**



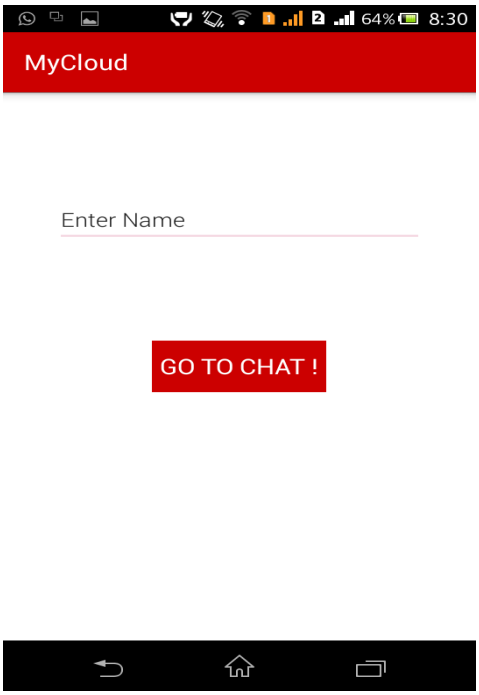


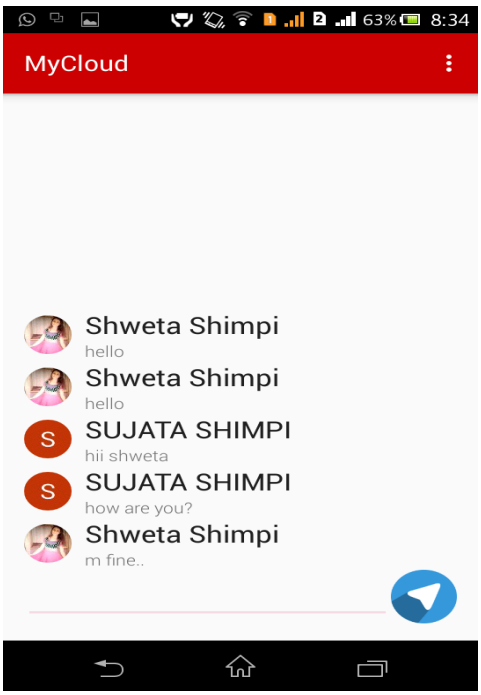
5. **Recording and uploading an audio**



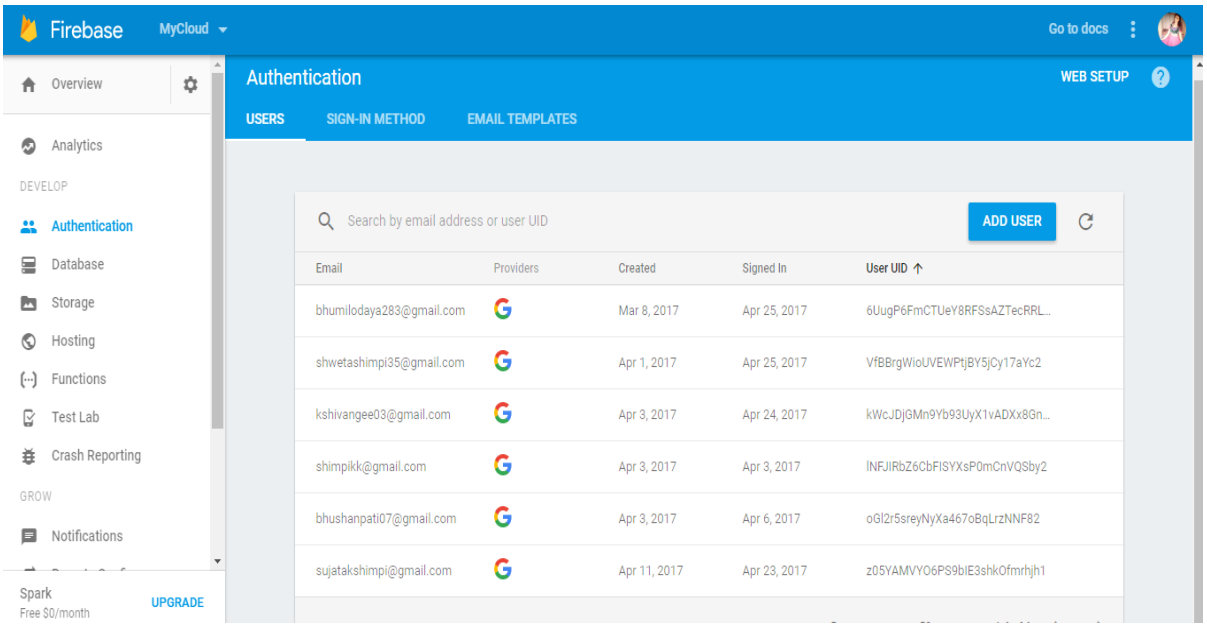


6. Chat with your friends

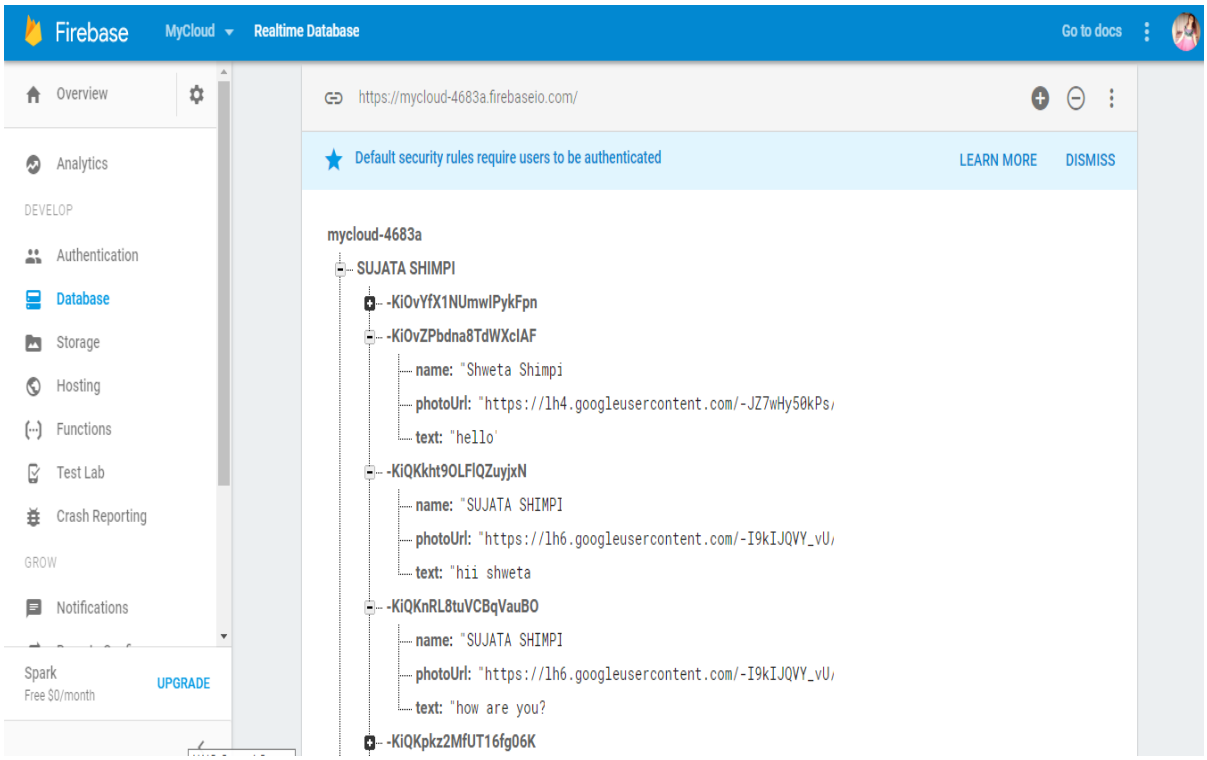




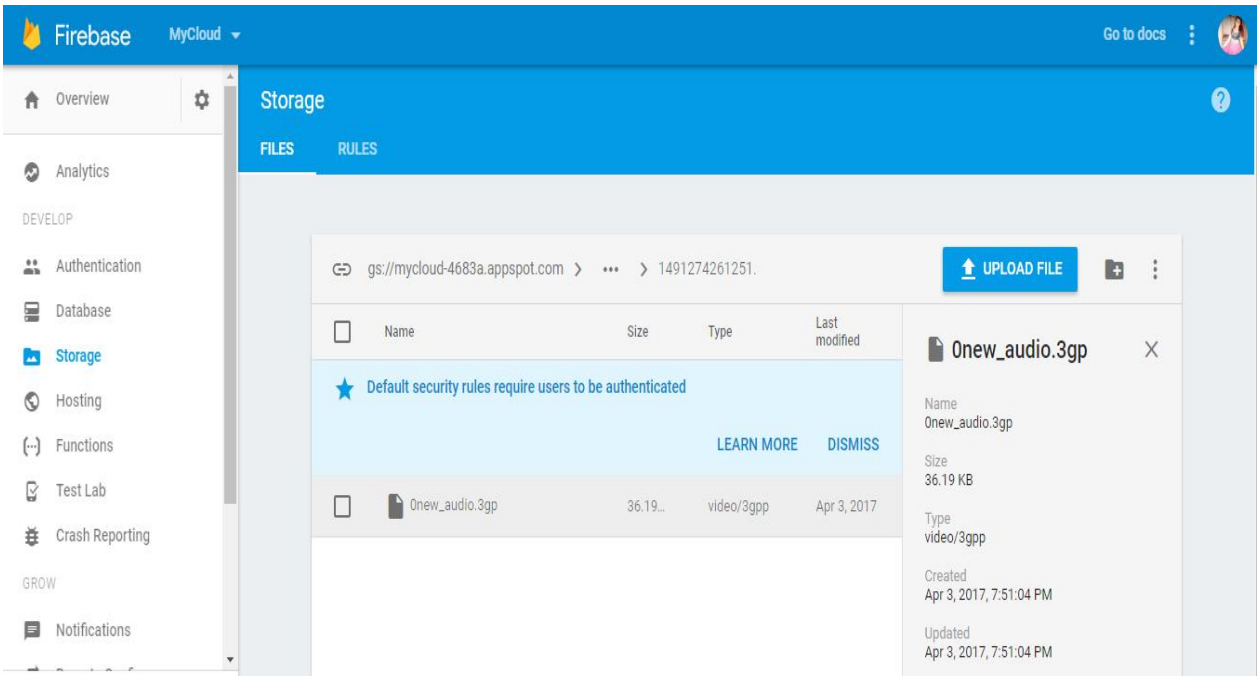
7. Firebase Authentication



8. Firebase Real time Database



9. Firebase Storage



Chapter 7

Testing

7.1. Development of Test Cases (functional)

Test Case Id	Objective	Steps / Description	Input	Expected Output	Actual Output	Result	Remarks
Sign-in	Sign-in into the application	Choose your email id for signing in.	Gmail id / Email id	Sign-in successfully	Sign-in successfully	Signed-in to the application	Success
Image Selection	Selecting an image from smart phone	Pick an image from image gallery	An image	Image appearing in the image view	Image appearing in the image view	Image is placed in the image view	Success
Image uploading	Uploading an image on firebase cloud	Click on upload button.	An image	Image uploaded on firebase cloud	Image uploaded on firebase cloud	Image is uploaded on the firebase cloud	Success
Audio recording and uploading	Recording an audio and uploading it on firebase cloud	Tap and Hold Button to Record	An audio	Audio is recorded and uploaded on firebase cloud	Audio is recorded and uploaded on firebase cloud	Audio is recorded and uploaded on the firebase cloud	Success
Downloading an image and an audio	To download an image and an audio	Click on image and audio for downloading.	Download icon touch	Image and audio downloaded successfully	Image and audio downloaded successfully	Image and audio is downloaded successfully	Failure

Chapter 8

Results and Analysis

Thus, we have successfully studied the information about the firebase cloud and tried to implement the features like Storage, Real-time Database and Authentication. We were able to upload the data on the cloud successfully but we are facing some issues to download the data.

The analysis was performed showed that the application is useful for the common users. The application is easy to use and cost-effective as well.

Chapter 9

Conclusion and Future Scope

9.1. Conclusion

We have studied about google provided firebase API and its unique features. It unfolded various new features of newly emerged advance technology of Firebase. Amazon and Azure provide lowest latency and Google Firebase provides highest throughput for both uploads and downloads. They are geared towards auto scaling, automatic traffic management and low IT cost. Testing through test labs confirmed that the data was completely secured and task of uploading and downloading of data was completed without any issues. Real-time data access was possible.

9.2. Future Scope

- This method can be extended to upload messages, videos, documents, WhatsApp starred messages, etc. Also, it can be used by the social networking sites for uploading the chats, posts, etc.
- Users can also share their data on two different clouds –
  - ✓ Mobile O.S. Cloud
  - ✓ Our Application Cloud.

9.3. Appendix

A

Android software development is the process by which new applications are created for the Android Operating System. Applications are usually developed in Java programming language using the Android software development kit (SDK). The Android (SDK) includes a comprehensive set of development tools. These include a debugger, libraries a handset emulator based on QEMU,

documentation, sample code, and tutorials. Currently supported development platforms include computers running Linux (any modern desktop), Mac OS X 10.5.8 or later, and Windows XP or later.

Android Studio is the official integrated development environment (IDE) for the Android platform. Based on JetBrains' IntelliJ IDEA software, Android Studio is designed specifically for Android development. It is available for download on Windows, MacOS and Linux and replaced Eclipse Android Development Tools (ADT) as Google's primary IDE for native Android application development.

F

Firebase is a mobile and web application platform with tools and infrastructure designed to help developers build high-quality apps. Firebase is made up of complementary features that developers can mix-and-match to fit their needs. Firebase's initial product was a real-time database, which provides an API that allows developers to store and sync data across multiple clients.

I

An **integrated development environment** (**IDE**) is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, build automation tools and a debugger. Most modern IDEs have intelligent code completion.

J

The **Java Development Kit** (**JDK**) is an implementation of either one of the Java SE, Java EE or Java ME platforms released by Oracle Corporation in the form of a binary product aimed at Java developers on Solaris, Linux, Mac OS X or Windows. The JDK includes a private JVM and a few other resources to finish the development of a Java Application.

9.4. References

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