Securing Military Data By Privatizing Communication

Prepared by

Kowser Alam Sady

2015-1-60-193

Monjurul Islam Bappy

2015-1-60-182

Under the guidance of

Khan Mohammad Habibullah

Senior Lecturer

East West University

Statement

We, hereby, declare that the work presented in this thesis is the outcome of the investigation performed by me under the supervision of Khan Mohammad Habibullah, Senior Lecturer, Department of Computer Science and Engineering, East West University. We also declare that no part of this thesis has been or is being submitted elsewhere for the award of any degree or diploma.

Signature of Supervisor

.....

Khan Mohammad Habibullah
Senior Lecturer
Department of Computer Science and Engineering
East West University Dhaka, Bangladesh.

Signature of Chairperson:

.....

Dr. Taskeed Jabid
Associate Professor and chairperson
Department of Computer Science and Engineering
East Went University, Dhaka, Bangladesh.

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We would like to thank Bangladesh Military for allowing us to research about them. We wish to express our deepest gratitude to the officers and soldiers who helped us in this research and provided us with valuable insights in the military life.

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Signature of student:

…….	…….
Kowser Alam Sady	Monjurul Islam Bappy
2015-1-60-193	2015-1-60-182

Department of Computer Science and Engineering

East West University, Dhaka, Bangladesh.

Abstract

In this fast growing tech world, data is slowly taking its throne as the next most valuable resource. Possession of data, information is the new statement of wealth & power. Every day, the world is getting a little more uncomfortable about if their data is in the right hands or not. Currently our military uses mainstream social media & cellular texts to communicate & organize their day to day schedules. So in theory, all of the military's day to day operation data are in the hands of private multinational companies & stored in their servers. A nation's military should be private & secured. This paper proposes an alternative to the social media for the officers, while changing the possession of the data. Our android app provides a better, easier way to organize regular schedules, orders and commits. The app follows the hierarchy & chain of command of a typical army unit, providing every officer & soldier access to the right amount of features based on their ranks. Since this is a research on military, a formal permission for it was asked & received from the army headquarters at Dhaka, Bangladesh.

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Chapter 1

Introduction

1.1 Bangladesh Army

The Bangladesh Army is the land forces branch and the largest of the three defense service of the Bangladesh Armed Forces. The primary mission of the Army is to provide necessary forces and capabilities in support of Bangladesh's security and defense strategies including defense of the nation's territorial integrity against external attack. Control and operations are administered by the Department of the Army of the Armed Forces Division. In addition to its primary mission the Bangladesh Army is also constitutionally obligated to assist the civilian government during times of national emergency. Bangladesh Army is known as one of the most prestigious and decorated military force around the world. They are ranked 3rd in Military and Police contributions to UN operations, marking them as a well-respected peacekeeping force. The performance of Bangladesh's contingents has been described as being of the "highest order" and the appointment of several senior Bangladesh military officers as the Commander of UN peacekeeping missions and Senior Military Liaison Officers, may be seen as further recognition of the Bangladesh Army's growing esteem in the peacekeeping community. In January 2004, BBC described the Bangladeshi UN Force as "Cream of UN Peacekeepers". Not only abroad, the contribution of Bangladesh Army within our country is undeniable. They have shown exceptional performance in aiding on every natural or manmade disasters that ever occurred.

After the liberation war Bangladesh Army has seen a rapid growth. Bangladesh armed forces are going through a long term modernization plan named Forces Goal 2030. Bangladesh army is under a massive expansion and modernization drive as per the plan. The force is being divided into three corps — Central, Eastern and Western.[30] Three new infantry divisions have been raised, the 17th infantry division at Sylhet, 10th infantry division at Ramu in Cox's Bazar and 7th infantry division at Barishal-

Patuakhali to make the number of total infantry divisions ten. The soldiers are being equipped with modern gear like Night Vision Goggles (NVG), Ballistic helmets, Eye protective gear, Bulletproof vest, person to person communicators, palmtop GPS device and BD-08 assault rifles with Collimator sight.

To increase special operation capabilities, 2nd Commando Battalion has been raised. The two battalions formed sole the para-commando brigade of the country. Bangladesh Army procured 44 MBT-2000 tanks from China in 2011. Bangladesh army engineers have completed the upgrade of Type 69 tanks to Type 69IIG standard. They are now upgrading 174 Type 59 tanks to Type 59G Durjoy standard. To increase the mobility of the infantry forces, 300 armoured vehicles such as BTR-80 APC, Otokar Cobra LAV and BOV M11 ARV have been procured.

To modernize the artillery forces, Nora B-52 K2 self-propelled artillery system have been procured from Serbia. Their firepower is further increased by the addition of two regiment of WS-22 Guided Multiple Rocket Launcher System. For anti-tank role Metis-M missile systems and PF-98 rocket systems were procured. Two regiments of FM 90 surface to air missile were added in 2016 to enhance air defence capabilities. The army aviation wing is also being modernized. Two Eurocopter AS365 Dauphins were put into service in 2012. Six Mil Mi-171Sh were procured in 2016. One C-295W transport aircraft was ordered from Spain which was delivered in 2017. Bangladesh Army also procured 36 Bramor C4EYE battlefield reconnaissance UAV from Slovenia in 2017. So, it is safe to say, the number of active personnel in Bangladesh Army is quite high.

1.2 Overview and Motivation

The life of an officer in the Bangladesh Army is never idle. Even when there is no war, no UN peacekeeping mission or natural disaster, they continue to live by a routine. This routine usually consists of training for different situations. We can divide their work into two categories. The work

they plan for the next day, are called orders. They work they plan for further future are call commitments.

An order can contain information such as:

- PT training
- Weapons Training
- Cultural Program
- Travel Documents
- War training such as artillery firing
- Games

A commitment is like a plan for the future. It can be for either operation or training. A commitment usually carries information like:

- Officers list decided for the event
- Soldiers list decided for the event
- Required weapons list
- Ammo requirements
- Required equipment list
- Vehicle description

Officers in charge of issuing these orders or commitments use social media such as Facebook Messenger, Whatsapp or Viber chatrooms to pass the information amongst themselves.

1.3 Problem Statement

The problem with an officer using social media for work purposes is with the data. The information passed in these orders & commitments are often, if not always, confidential. These messages contain battle strategies, weapons & equipment lists, new training methods etc. These information are not public knowledge and the military always try to make sure of that. The irony here is, to prevent the leak of information to public or any other third parties, they use the same form of communication as public. They use social media such Facebook, Whatsapp, Viber messengers just like everyone else. So, their data is just as secure as a regular person's personal data.

However, an argument could be made that these social media's network or storage security isn't something laugh about or neglect. They store and protect millions to billions of people's data every day. They rarely have any issues with their security such as hacking. They provide their services nonstop without any problems so there is no problem such as server crash. They are banks of people's information. So the question comes to mind, if their system is so rock solid, why bother or feel uncomfortable with whether we store military data in them.

The answer to that question is simple, data harvesting. Companies like Google, Facebook always offer services to their customers for free. So the common question arises, why free? What profits are they getting out of it? Well, they may not be charging cash to their customers, but they are taking away something much more valuable in return, their data. Facebook has over 2.41 billion monthly active users all over the planet. They practically hold all the personal information of almost everyone who uses internet. The source of profit in their business is data harvesting & trading. They create characteristics profile on every profile and then target those profiles with appropriate advertisements based on those characteristics. They also allow other companies to use these data to better market their product and target key customers on Facebook more efficiently.

Goggle on the other hand is the king of data of all sorts. Even on Google's most basic and popular feature, its search engine, it receives over 63,000 search requests every second. Google is the developer & owner of the android operating system. So basically, they have access to majority of the smartphones in the world. If installed the right services, they have access to those phone's contacts, gallery contents, text messages, location and every possible data available through the phone. Google also harvest user data for product advertisements. They also use it improve their AI projects, meaning any confidential data can be more dangerous in Google's hands. Google is currently one the best if not the best company at utilizing machine learning. In theory, they can just use the military data as training data and predict future military schedules and events.

One cannot be blamed if he feels a little paranoid about their data in someone else's hand who might use it for their own purposes. We can see its signs in western world already. In recent years, both Mark Zuckerburg and Sundar Pichai, CEO of Facebook & Google were asked to stand before congress & address their concerns about how these companies handle public data.

Both Google & Facebook claim they harvest user data to better improve the user experiences for their platforms. Even so, whether harvesting user data like this is justifiable of not, military data is not public information. They must not be used for any purposes by anyone other than the military themselves.

1.4 Thesis Objective

Our thesis objective is to keep the same level simplicity the officers are familiar with using social media, while owning the entire system to keep the data private. We'll also have to create the UI with the right professionalism one might come to expect from Bangladesh Army.

Chapter 2

Literature Review

2.1 Introduction

In this part we're going to discuss about previous researches that has been done in similar category to ours. Our research revolves around the military, which is very rare. Since, civilians don't have access to military data nor they ever get the permission for that access. So, it was quite difficult to find any research work similar to ours.

2.2 Existing Work on Military Software

Military softwares are usually developed by large companies specialized on the military domain. They specialize in network and database security. So it's nigh impossible for any civilian entity to develop any software or research about developing software for the military.

In [3], the authors have concurred with the idea that civilian developers don't get to work with the military. Their paper presents the concept of an open process for software development in classified environments which supports the idea of a military app store. The approach builds on the interface-based software development paradigm and gives independent developers the opportunity to implement applications for classified environments without the need of disclosing confidential information to them.

Chapter 3

Methodology

3.1 Requirements Gathering

In any software or application development, a developer must collect all functional and non functional requirements [1][2]. For our application, we're required to collect requirements from our clients. For that we've visited three different cantonment.

3.1.1 Feasibility

In order to make an app that provides its services to hundreds of thousands of military personnel, there are two requirements that must be considered. Such as,

- **Servers**
- **Access to smartphones**

In order to store data & users, we need servers. These servers needs to be built & placed inside the country. The whole idea is to keep the data to ourselves, so we need to be owners of these servers. Building and maintaining these servers may get expensive but Bangladesh Army should be more than able to afford it. These servers should also have sufficient storage capability. Even though most of our data is basically texts, when combined, years of everyday entries from thousands of units from cantonments from all over the country will require a database with massive storage capacity. This theory will also require every single officer, soldier, JCO in the entire country to own a smartphone of their own.

3.1.2 Interviews & Surveys

We have interviewed several officers of different ranks about their everyday job. We asked them about how they schedule & organize their tasks. Also, if it will be helpful if they had an app specifically designed for them. An app that focuses on their way of doing things and making it easier & optimized. The response was positive. We also surveyed the soldiers, in order check if every soldier has a

smartphone. We found out, unlike the officers not all soldiers have smartphones. However, this shouldn't be too big of a problem as acquiring a smartphone is getting easier every day. Some officers suggested if such an app is to be made, there should be a chatting feature in it. So if they had to chat casually about work, they can do using the app.

3.1.3 Accessibility

In a cantonment, there are always multiple units. Each unit has a Commanding Officer (CO) leading them. Members of one unit do not need to know activities of another unit. That is why, when using social media for work communication, officers create their own private chatrooms for their unit.

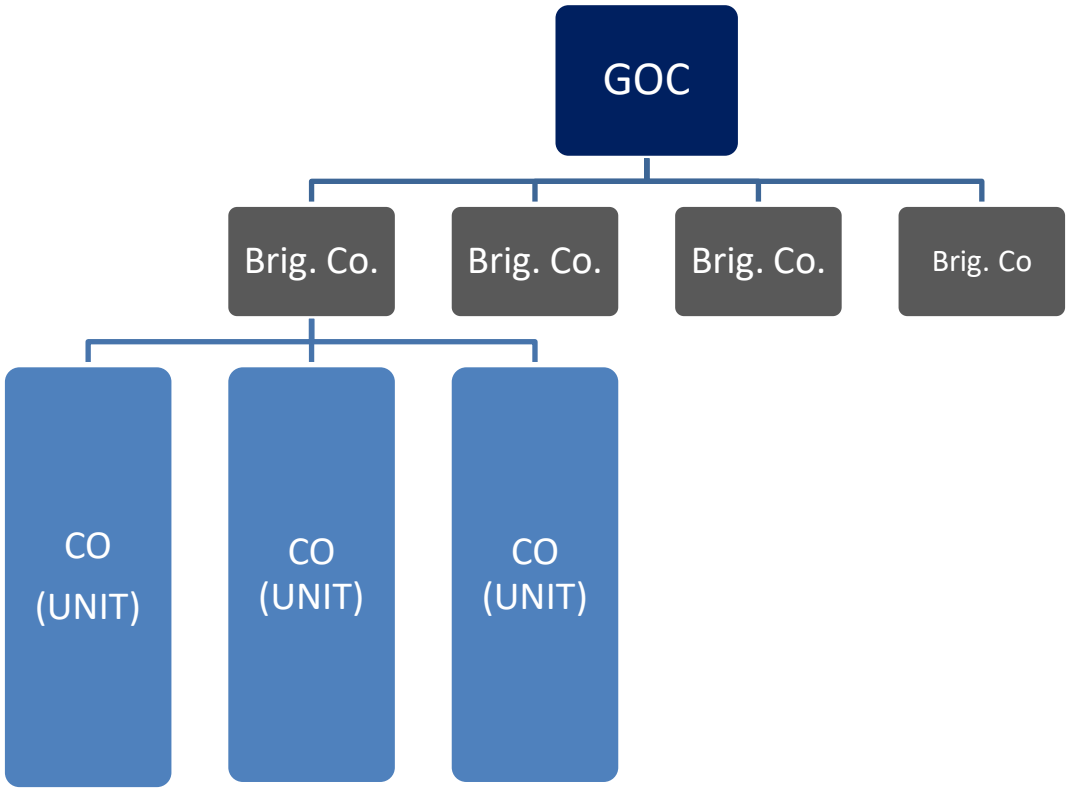

Figure 2.1: Units in a cantonment

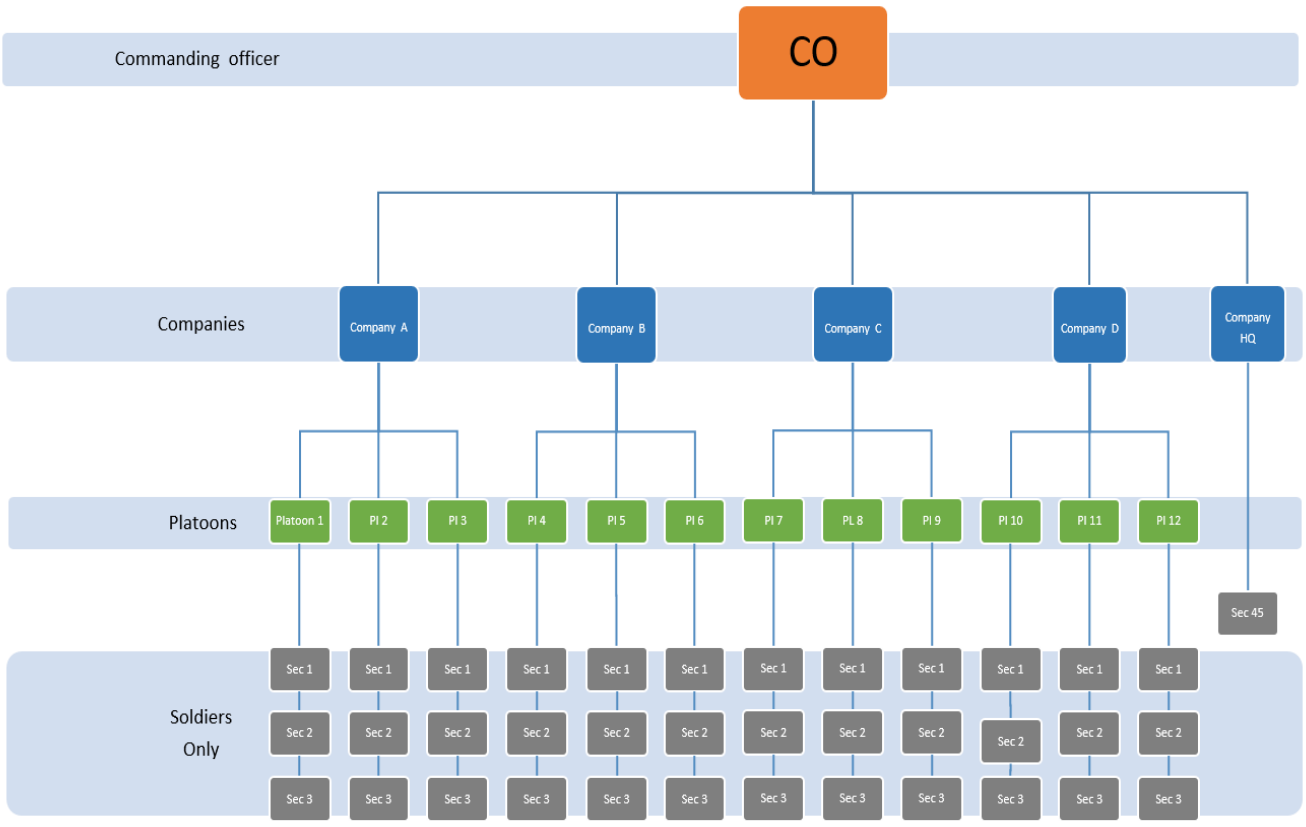

Figure 2.2: Structure of a unit

As seen in the figure shown in above, we can see bottom sector layers are filled with soldiers only. The other parts of the diagram have also soldiers in them in large numbers. Each unit will have communication reserved within its own members. Any member of a unit will have full access to all the orders/commitment data of its own unit. Even though both officers & soldiers will use the app, only officers will have the privilege to use its main function: “Issue Order”.

3.2 Developing the application

For our application, we are going to use two developer platforms: Android Studio, Firebase.

3.2.1 Android Studio:

The majority of our work will be done in Android Studio, since this is an ‘android’ app. Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is currently the best software for creating & designing android apps on the planet right now. Android Studio organizes an app’s UI by managing its components into ‘activities’. Each activity means a new panel for the user’s user interface. In our application, all activities can be separated into four categories.

- Authentication
- User Information
- Check orders/commitments
- Issue orders/commitments

Authentication Activities:

- Registration
- Login

User Information Activities:

- Profile
- My Unit

Check Orders/Commitments Activities:

- Officer Order list
- Soldier and JCO Order List
- Officer Commitment List
- Soldier and JCO Commitment List

Issue Orders/Commitments Activities:

- Issue Order

- Issue Commitment

3.2.2 Firebase

Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products, which are used by 1.5 million apps. We are going to use Firebase because of its efficiency with all its prebuilt modules. The modules we are going to use are

- Authentication

- Real Time Database

- Storage

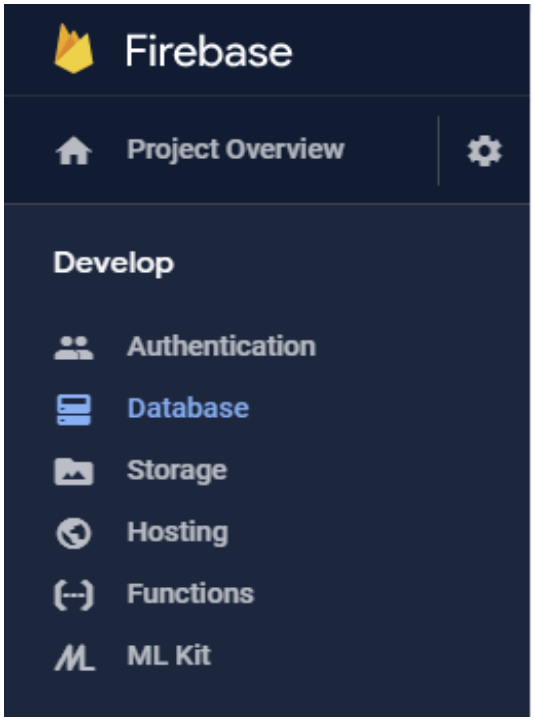

Figure 3.1: Firebase Panel

Firebase has an amazing authentication module, with predefined registration & login/logout feature. We wrote these login & logout functions into our main activity which is the login page and our

registration activities. We have three registration activities for three separate criteria: Officer, Soldier and JCO.

Figure 3.2: Registration Activity

For this each registration activity has different sets of ranks to choose from based on those criteria. Firebase allows users to register using email addresses, Facebook id, phone no, Twitter id or even Microsoft account id. Here, we are going to use registration using email id. A new user will have to provide all the required data including a user image in the registration form and a password for the account. Uploading the image will use the storage module which we'll come back to later.

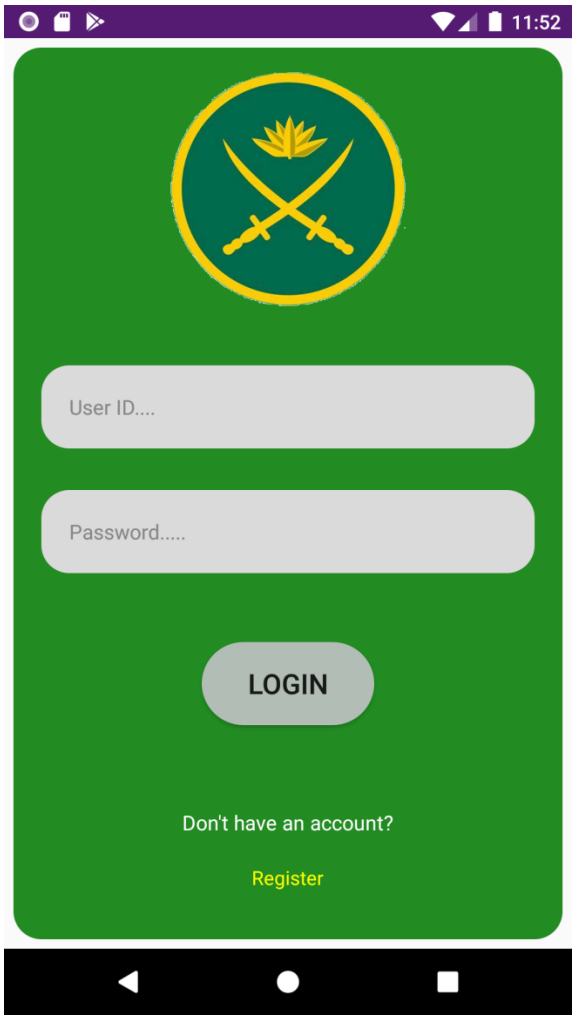

Figure 3.3: Login Activity

Once the user is registered, he can login from the main activity using the usual email, password combination.

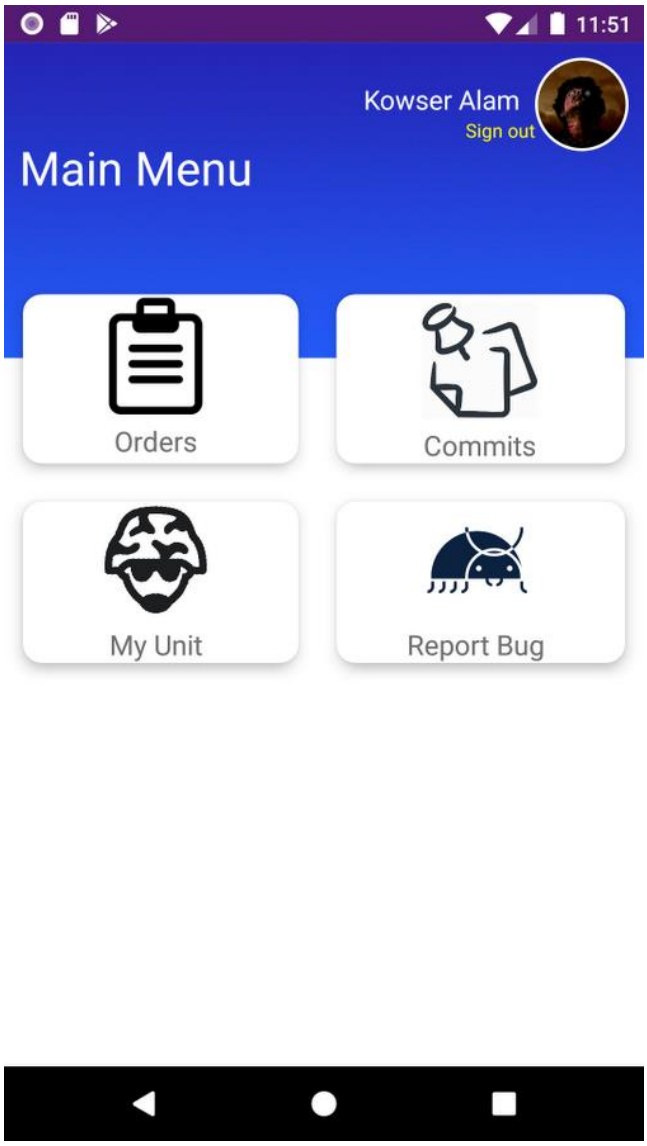

Figure 3.4: Main Menu Activity

Once the user is logged in, he'll be sent to the Main Menu activity. The main menu will show the logged in user's name and image on the upper right corner. This activity will provide 4 options to choose form: Orders, Commits, My Unit, and Report Bug. The user can also check his account detail by clicking his user name on the top right corner which will send him to the Profile activity. Below that, there is a sign-out button which will log the user out of the app.

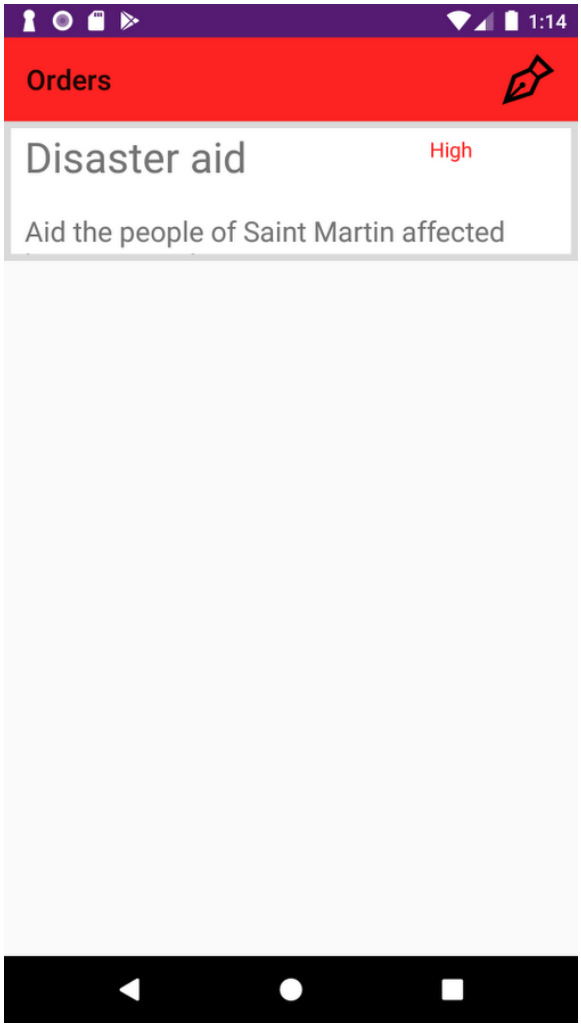

Figure 3.5: Officer Order List

The Officer Order List activity uses a recycler view to show all the available orders of the logged in user's unit in a list. Which means each unit will see different info in this activity. Each order has a specific format of several variables. However the list will only show only three: name, task and priority of that order. The list will be descending based on the issued date of the orders. There is a button on the top right corner of the activity which will bring up the Issue Order activity. Clicking any of the orders in the list will take the user to the Order Details activity.

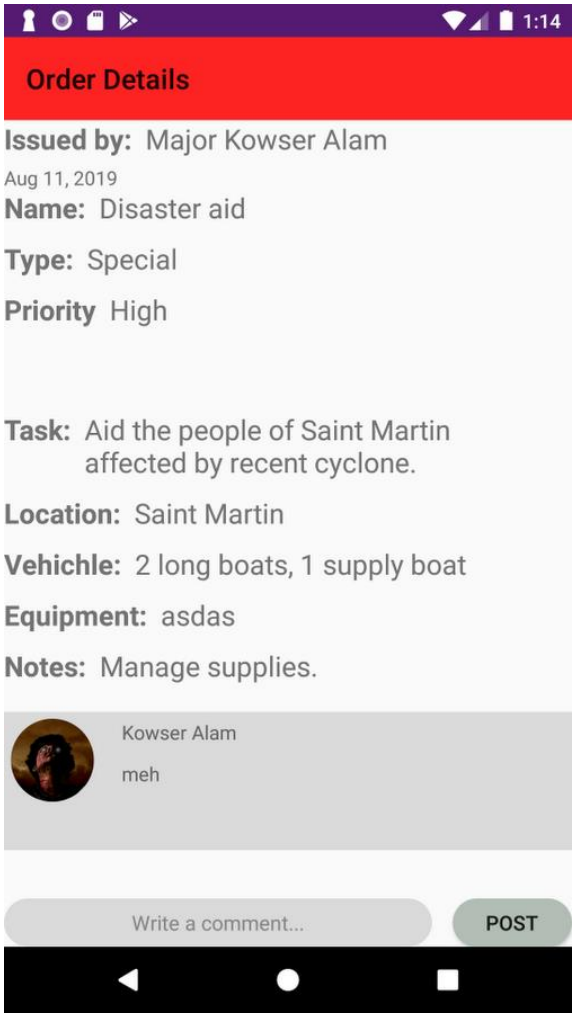

Figure 3.6: Order Details

Order Detail activity will show the detailed version on an order. While checking an order through this activity, a user might have something to say about it. If so, the user can choose to leave a comment using the comment box at the bottom of the screen.

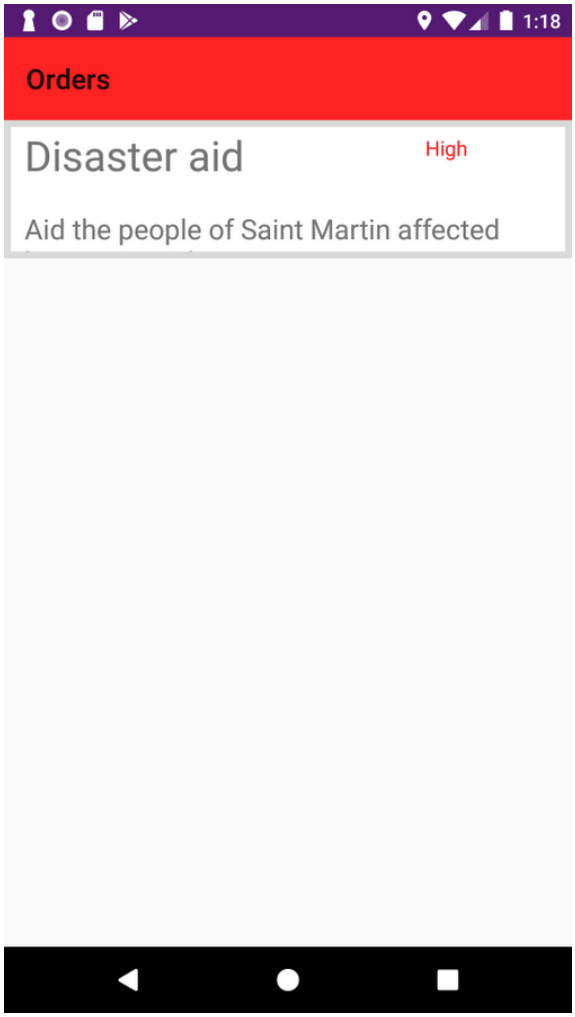

Figure 3.7: Soldier Order List

The Soldier/JCO order list activity has almost the same outlook and coding as the Officer List activity except for one tiny little detail. It doesn't have the button that starts the Issue Order activity, since soldiers or JCOs are not allowed to issue any order.

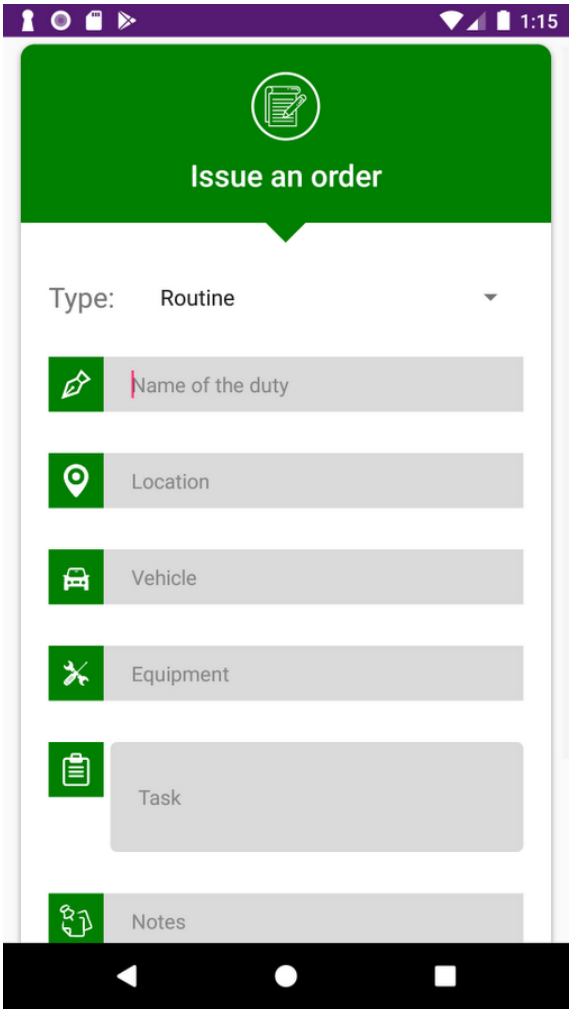

Figure 3.8: Issue Order

The Issue Order activity has a form for issuing any order. We have created the outlook of the form using a CardView. The form has all the possible input options of a typical order. We asked some officers about what a usual regular day order looks like. Their response about it was quite discrete, since these information are confidential. That being said, they did gave us some vague ideas without going inti details. From that we've created our form with variables we think are necessary for issuing any order. Once all the required fields have been filled, the user can click the post button and the app will push the new order into Firebase Realtime Database.

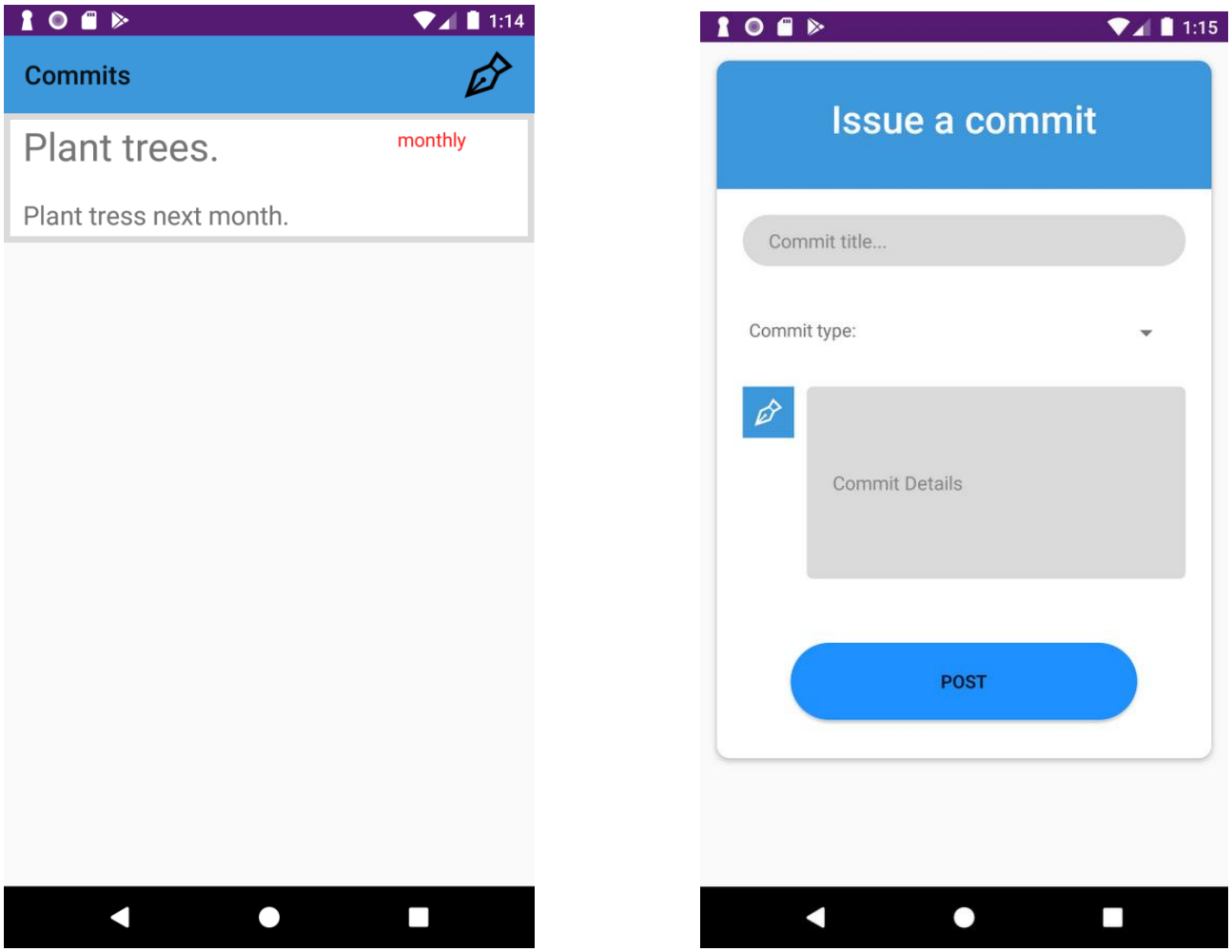

Figure 3.9:Check and issue commitment

The Check Commitment & Issue Commitment activities has the same method as the Check Orders & Issue orders activities. Just like there, the soldiers and JCOs have no access to the Issue Commitment activity.

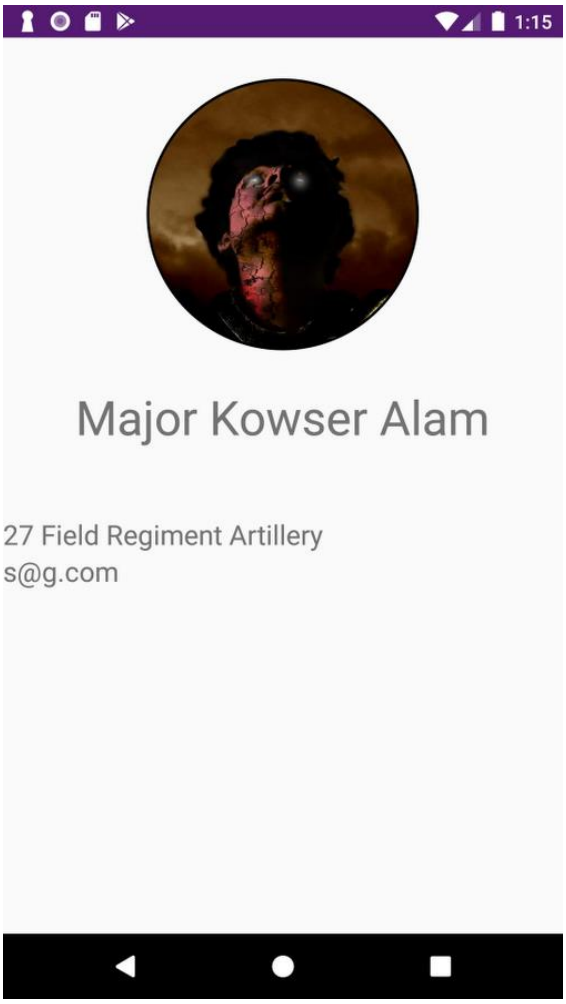

Figure 3.10: Profile

The profile activity will allow users to check their own and anyone else's profile in his unit.

Through the main menu the user can also check his other unit members. There will also be an option for reporting application bugs on the main menu.

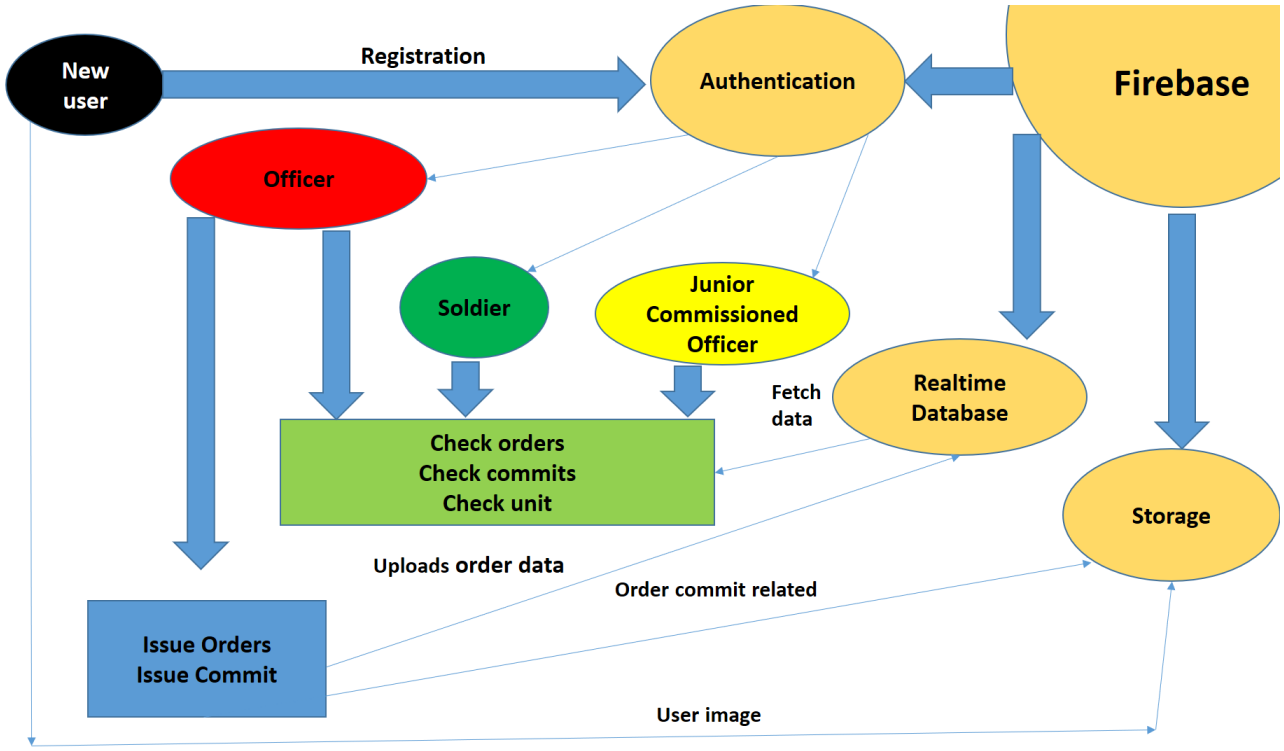

Figure 3.11: Application Diagram

Every time a user uploads an image, we are going to use Firebase's storage module. A user will upload image when registering for the app or issuing an order/commitment.

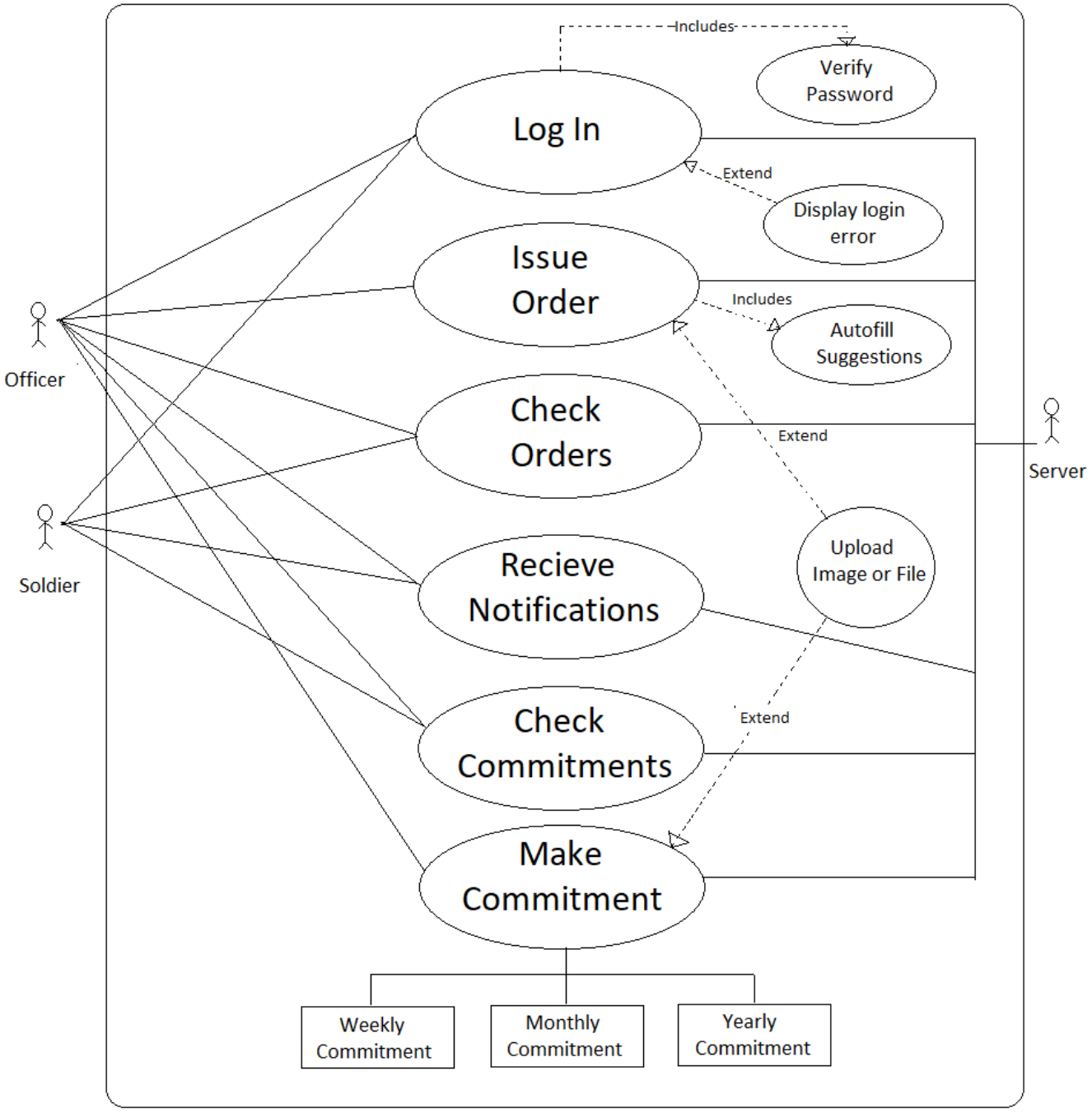

Figure 3.12: Use-Case Diagram

Chapter 4

Result and Discussion

4.1 Application Testing

We've tested our app several times for bugs. We've checked if the app runs on all android versions. We installed the app on different smartphones and checked all three firebase modules. All our tests were successful. The only thing left to do now is to give the app in the hands of its targeted consumers and see how they review it.

4.2 Client Discussion

We've asked a total 7 officers and 2 soldiers on their opinion about the application. Their reviews were positive. They all said they liked the idea for an app existing is a very good idea and it would help them in their job a lot if they had an app built specifically for them. Several officers suggested that there should be a messaging system in the app which allows to pass message to other officers within the unit.

Chapter 5

Conclusion

5.1 Conclusion

Throughout our research, we've realized over and over again that how vulnerable our military data is. This vulnerability only strengthened our belief that privatizing our military communication is the only way of securing it. We've also come to the conclusion that building this app will improve military performance & efficiency at some degree.

5.2 Future Work

Our future plan for this application is to widespread its use. We'd like to build separate versions of this app for other major military forces such as air force, navy etc. We believe every force can benefit from it. We'd also like to add new features in the future as we go along. Features that are technologically advanced & popular in modern culture such as voice recognition, speech-to-text etc. These features will benefit the app, since these features are mostly based on machine learning. Companies that usually provide these features takes customer info & input as training data, which means they harvest user data. Which is good for us, because we are trying to prevent others from harvesting our data. We'll provide these features by harvesting the data by ourselves.

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Appendix

Login function:

```
private void Signin(){
    String email = emailField.getText().toString();
    String pass = passField.getText().toString();


if (TextUtils.isEmpty(email) || TextUtils.isEmpty(pass)){
        Toast.makeText(MainActivity.this, "Fields are empty",
Toast.LENGTH_LONG).show();
    } else {


mAuth.signInWithEmailAndPassword(email,pass).addOnCompleteListener(ne
w OnCompleteListener<AuthResult>() {
@Override
public void onComplete(@NonNull Task<AuthResult> task) {
if(task.isSuccessful()){
                    Toast.makeText(MainActivity.this,"Sign in
successful",Toast.LENGTH_LONG).show();
                    startActivity(new Intent(MainActivity.this,
MainMenu.class));
                } else {
                    Toast.makeText(MainActivity.this,"Incorrect email
password combination",Toast.LENGTH_LONG).show();
                }

            }
        });
    }
}
```

Register Function:

```
mAuth.createUserWithEmailAndPassword(Email, Pass)
        .addOnCompleteListener( Registration.this, new
OnCompleteListener<AuthResult>() {
@Override
public void onComplete(@NonNull Task<AuthResult> task) {
if (task.isSuccessful()) {


final StorageReference fileReference =
storageReference.child(Email+"."+getFileExtension(mImageUri));

fileReference.putFile(mImageUri).addOnSuccessListener(new
OnSuccessListener<UploadTask.TaskSnapshot>() {
@Override
public void onSuccess(UploadTask.TaskSnapshot taskSnapshot) {

storageReference.child(Email+"."+getFileExtension(mImageUri)).getDown
loadUrl().addOnCompleteListener(new OnCompleteListener<Uri>() {
@Override
public void onComplete(@NonNull Task<Uri> task) {
url = task.getResult().toString();

                                    Data information = new Data(
FirstName,
LastName,
Email,
Unit,
Criteria,
url,
r
```

```
);


FirebaseDatabase.getInstance().getReference("Users")

.child(FirebaseAuth.getInstance().getCurrentUser().getUid())

.setValue(information).addOnCompleteListener(new
OnCompleteListener<Void>() {
@Override
public void onComplete(@NonNull Task<Void> task) {
                                                showMessage("Registration
Successful.");
                                                startActivity(new
Intent(getApplicationContext(), MainActivity.class));
                                            }
                                        });

                                    }
                                });
                            }


                        });









                    } else {
```

```
// If sign in fails, display a message to the user.

}

            }
        });
```

Issue Order:

```
post.setOnClickListener(new View.OnClickListener() {
@Override
public void onClick(View view) {
        Post();
        Toast.makeText(OrderForm.this,"Issued
Succesfully",Toast.LENGTH_LONG).show();
//startActivity(new Intent(OrderForm.this, MainMenu.class));
}
});


private void Post(){

orderData.setName(name.getText().toString().trim());
orderData.setLoc(loc.getText().toString().trim());
orderData.setVeh(veh.getText().toString().trim());
orderData.setEquip(equip.getText().toString().trim());
orderData.setNotes(notes.getText().toString().trim());
orderData.setTask(task.getText().toString().trim());
orderData.setPrio(prio.trim());
orderData.setTime(currentTime.trim());
orderData.setIssueId(userid.trim());
```

```
orderData.setType(text.trim());
orderData.setUsername(username.trim());
orderData.setUnit(unit.trim());

dbref.push().setValue(orderData);

}
```