

CMPE 277 – Smartphone Application Development

Project Report

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Topic: IReport - Litter Reporting App

Group #8

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IReport - Litter Reporting App

1. Introduction

iReport is an android application that helps the common public to report littering incidents around the city to the government. Similarly, government officials can also use the same application to view reported incidents and take proper action upon it. The person who reported the incident can continuously be informed through email about the status of his/her report. If the person is not satisfied with the service of a government official, he/she can again file the same report by changing the status. The common public can use their Facebook credentials to use the application, while officials use Gmail credentials respectively. The application directly communicates with a cloud-based database server.

The user can report the littering incident by taking photographs of the spot. These photographs help government officials to prepare cleaning process. The user also fills some basic information about littering such as title, description, address, size, and severity level of littering. App automatically sends date-time and location of the incident in the background. The User can see his/her past reports in list view. From there, he/she can go to a detail view of the report and change the status if one is not satisfied with service. But, the user should be within 30 feet vicinity of reported location. The user can also view his/her reports in map view.

Government officials also using the same application to view the reports, search the reports, filter some reports from a list and change the status of the report. When government official changes the status of the report, the user who reported receives email and push notification confirmation. The official also sees the map view of all reports as well as the heat map of reports. So that government official can predict the area from where the most reports filed.

The application using camera, images, internet and location based services in android operation system. This application works on Android API level 23 or later.

2. Motivation:

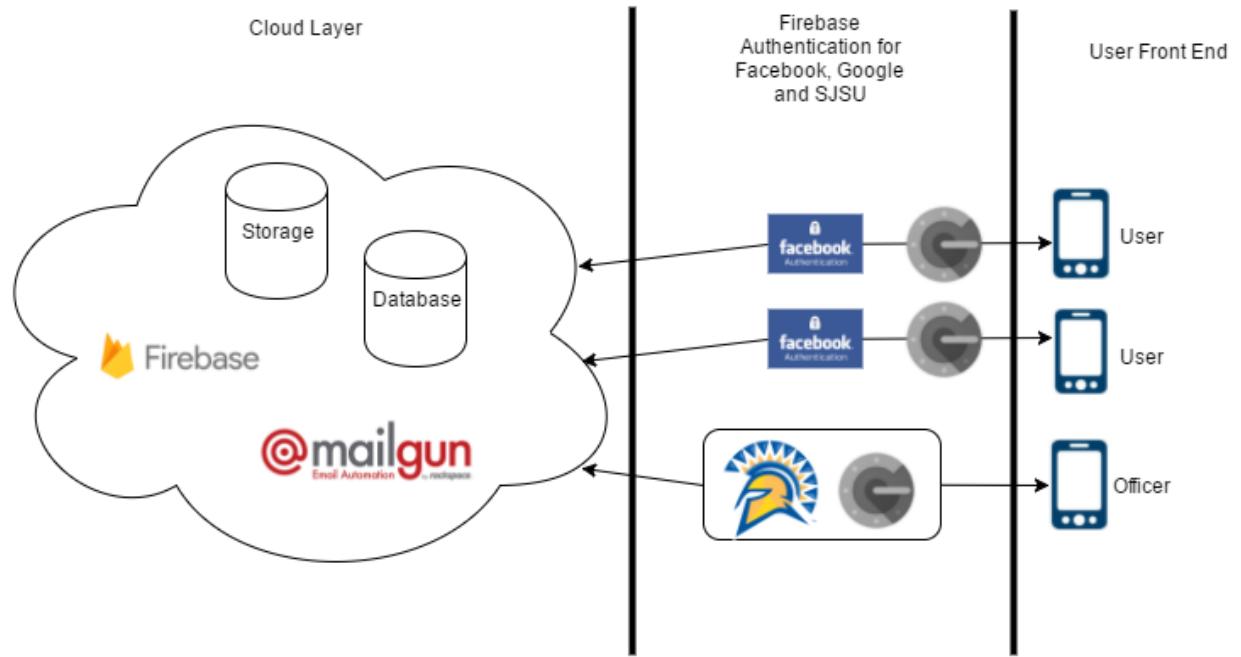
Nowadays, it is very important to make places clean and beautiful especially public places. The world we live in today is deteriorating by the day. Littering public places, throwing garbage on streets and poor waste management are the major causes for it. Unless we take steps quickly to reverse this, there isn't going to be a planet Earth for the future generations. Most of these issues need to be tackled with care and combated with good technologies. Technology can help the human beings to reduce the littering incidents. Having an online facility to report the littering incident and view the status of past incidents could solve many problems and make the city and country green. City or government officers can also use the same system to take proper action on reported incidents and help people by cleaning the spots.

Having a web application would have been an option, but since the technology is changing and people preferring mobile devices over laptop or PC; building a mobile application for the above purposes is the best choice.

The common problem of reporting a littering incident to government officials has motivated us to build an application that could help both the people as well as city government officials. Since android is growing the market, we choose to build the application on android platform

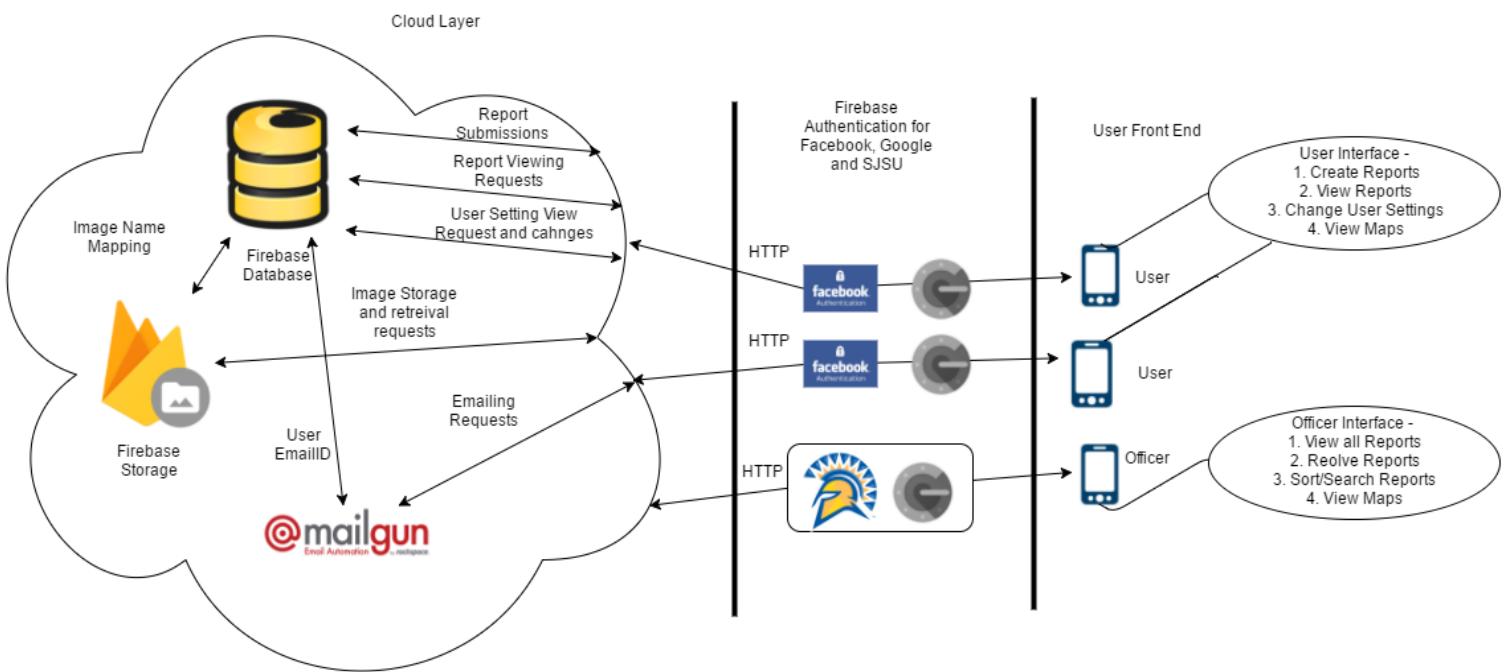
3. High Level Design:

This project consists of two layers, The Cloud layer and the User Front end. User data storage, processing and mailing is managed on the cloud. All user transactions are authenticated via Facebook, Google or Google + SJSU authentication.



4. Component Level Design:

This project is made up of several components. The users are able to use this application using an android device consisting of a GPS. All user transactions are authentication using firebase authentication. All user data is stored on Firebase Storage. The images are stored on firebase storage and the image names are mapped in the database.



The different components of this project are:

1. **Firebase Database:** This database is used to store all user data, report data and user settings. Firebase stores all values in JSON format and requests and responses are performed using JSON strings.
2. **Firebase Storage:** Firebase storage is a fast and reliable way to store images. The name and address of the file is mapped in the database. Only authenticated and authorized users can access these files.
3. **MailGun:** Mail Gun is an emailing service provided by rackspace. It is used to send notification emails to users when required.
4. **Android Phone:** The app is based on android and a user requires to enable GPS in order to use this app. A high end mobile is phone necessary but the user must have access to decent internet otherwise the application would not be able to fetch images and might lag.

5. Technology Choices:

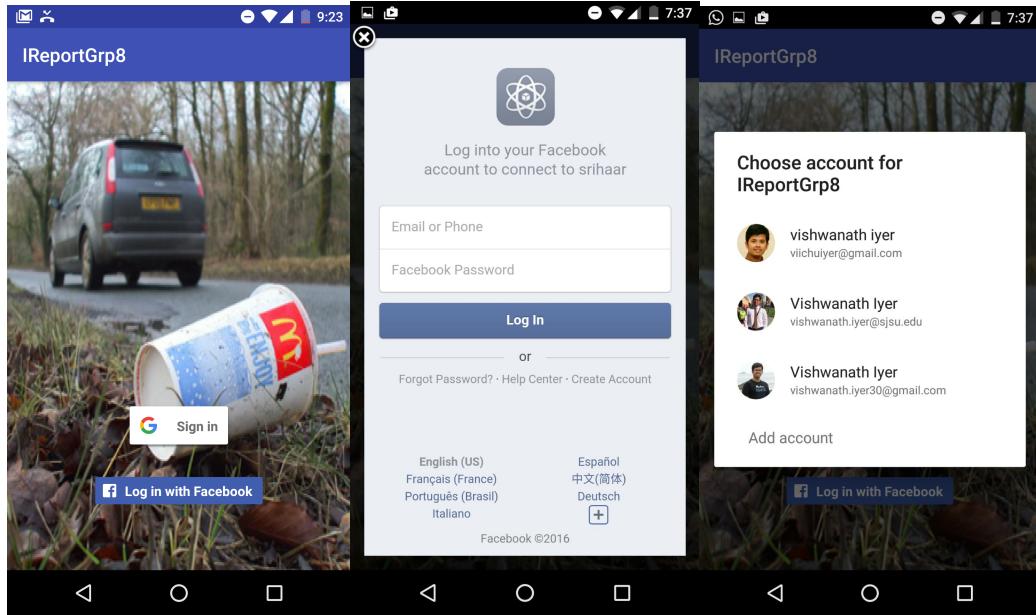
We have built an android application using the following set of technologies.

- Application / Operating System: Android
- Cloud Server: Firebase
- Database: Firebase real-time database/storage
- Image viewer: Picasso, Glide
- Map: Google Map API
- Mail Server: MailGun Email API service
- Distributed Source Code Management: GitHub

6. Project Features and Screenshots:

1. Authentication:

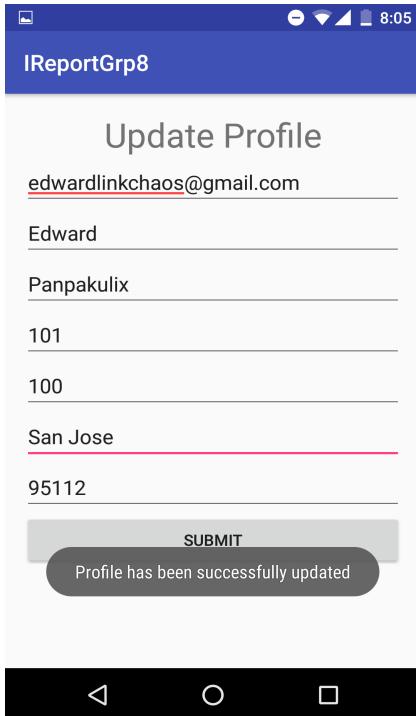
The application supports Google and Facebook authentication using Firebase. The users authenticating using Google are deemed as City officials and the ones using Facebook are deemed as Residents.



2. Resident

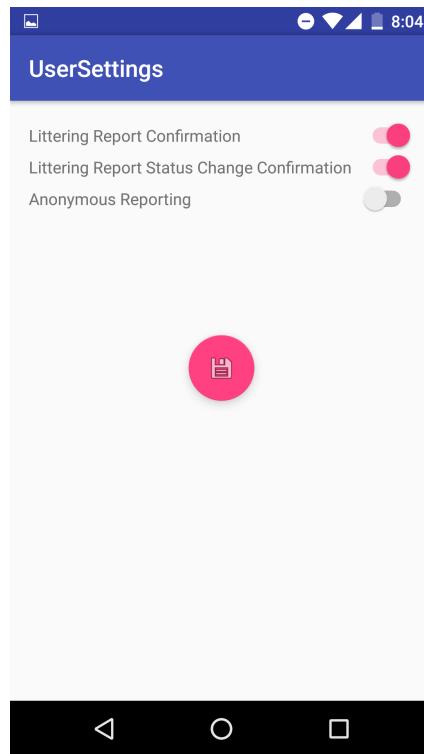
a. Resident User Profile:

The Resident user can update his profile details, the screen name defaults to user email address.



b. Resident User Settings

The user can set up his notification and anonymous preferences in the setting tab from the menu.



c. Report Litter

The user clicks up to three pictures of the litter he want to report and then describes the litter its size and severity.

What would you like to do?

TAKE A PICTURE OF THE LITTERING

DESCRIBE WHAT YOU SEE

Title

The duster on the chair

Give a short description of the litter

This was the demo litter used during presentation

Size

small med large extra

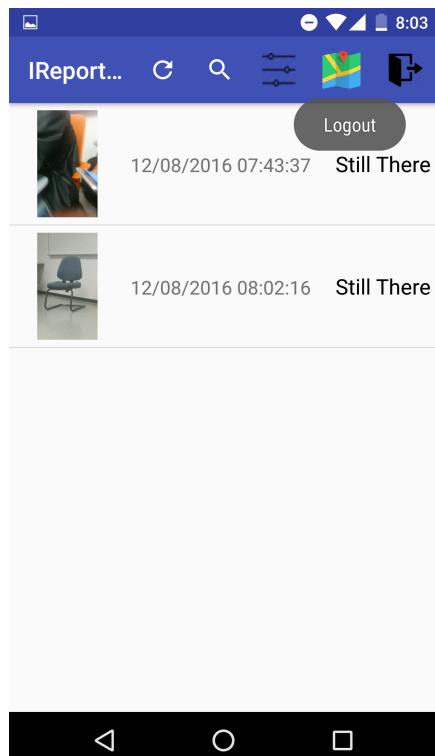
Severity

minor medium urgent

SUBMIT

d. View Past Reports

Users can view their past reports in form of a list and get a detailed view on a report is selected.



e. Map View

User can see his posted reports on Google maps

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**f. Detail View**

The below screen shows the details of the report selected by the user from the list view.

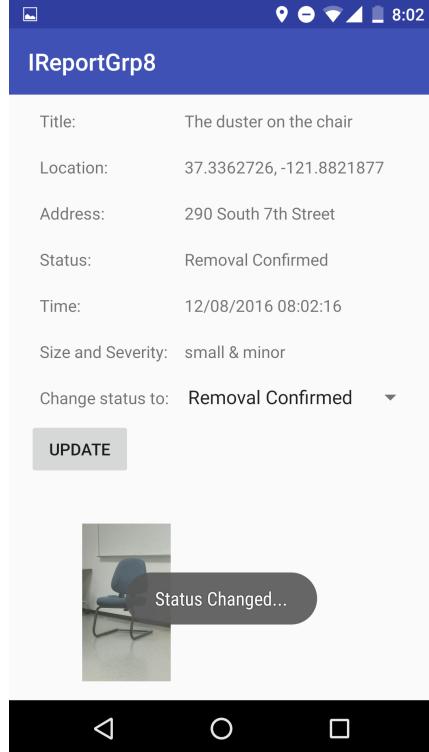
Title:	The duster on the chair
Location:	37.3362726, -121.8821877
Address:	290 South 7th Street
Status:	Still There
Time:	12/08/2016 08:02:16
Size and Severity:	small & minor
Change status to:	Still There

g. Change Report Status

The user can change the status of the report to 'Removal Confirmed' if the litter has been successfully clean up.

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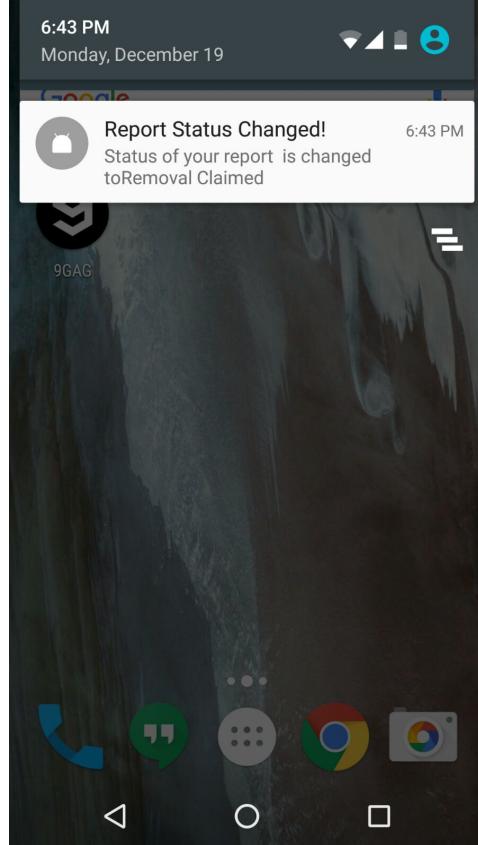
h. Email Notification

The user gets an email notification once the city official resolves the issue.



i. Push Notification

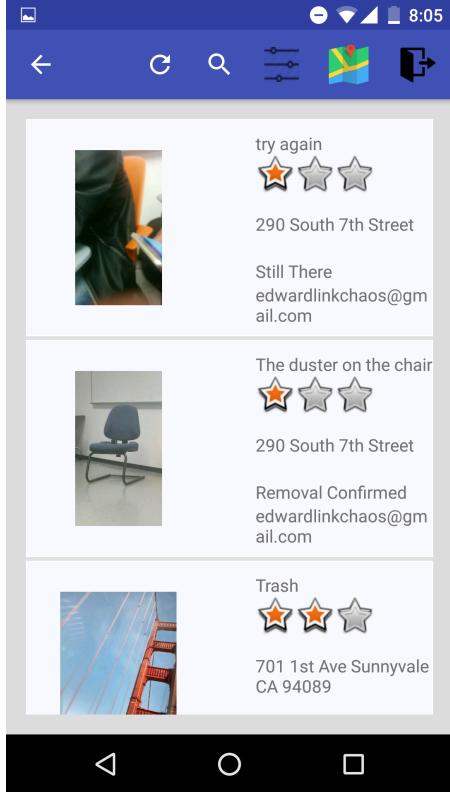
The user gets a push notification once the city official resolves the issue.



3. City official

a. View Reports

The city official sees a list of all the reports submitted by the Residents.



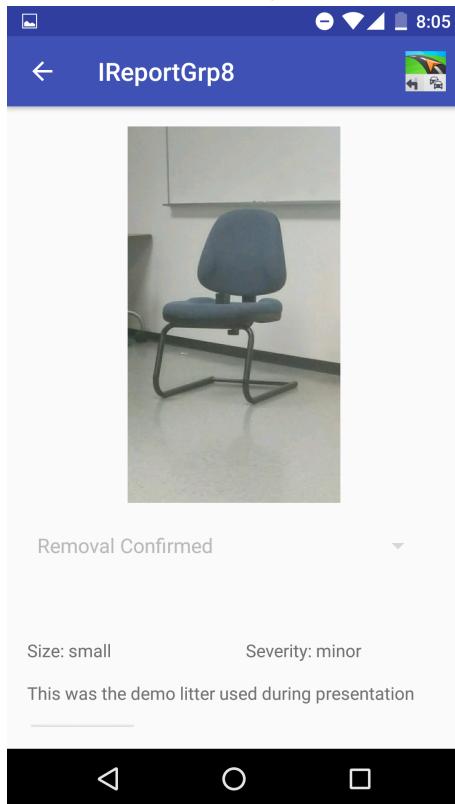
b. Map View

He can choose to view the reported issues on Google Maps.



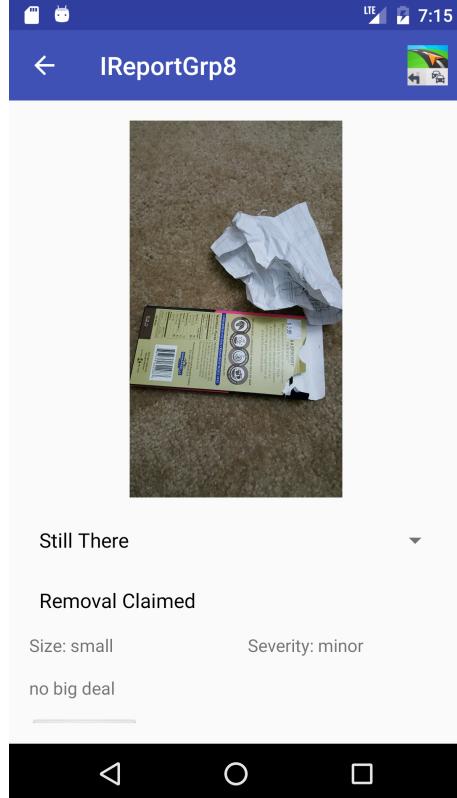
c. Detail View

The details of the report can also be seen and the user can navigate to the location by using the navigation button on the top.



d. Change Status

Once the city official removes the litter the status of the report can be updated to 'Removal Claimed'.



e. Filters and Search

The City official can filter and search the reports. In the below screenshots the user searches for 'chair' and reports containing chair are displayed. Similarly the reports can be filtered and sorted based on email, status and severity.

Left Screenshot (Search Results):

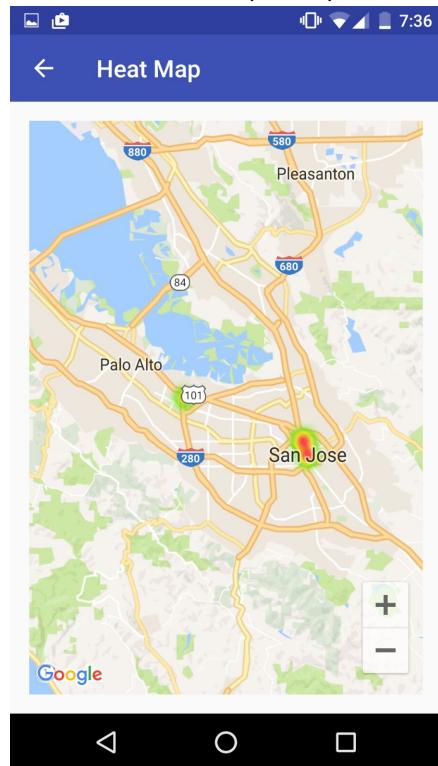
- The duster on the chair
- 290 South 7th Street
- Removal Confirmed edwardlinkchaos@gmail.com
- chair
- 290 South 7th Street
- Still There akshaymathur@rocketmail.com

Right Screenshot (Filtered Results):

- 701 1st Ave Sunnyvale CA 94089

f. Heat Map

The user can also see a heat map of reports based on their locations.



7. Features finished after the Demo:

1. **Push Notifications** - Official when updates the status of a report, push notification is sent to the resident who reported that. Firebase provides different flexible ways to send push notifications, each user is identified via a unique token. This token helps identify the user uniquely and thereby send push notifications to him. When the official changes the status of a report, the unique token of the user who reported it is retrieved and push notification mechanism is invoked.
2. **Heat Map** - Presents the graphical view of the data in maps that helps in analyzing higher number of reports in geographical locations. We are providing a static view of heat map through Google Maps API which is scrollable and zoomable.
3. **Multi-Image support for reporting** - Resident has the ability to upload multiple images of the litter while reporting. Thereby providing official a clear view of the litter in various angles.
4. **30 meter validation for user confirmation** - Resident to change the status of the report to Removal Confirmed, have to be within 30 meter radius from the location of the litter.
5. **Navigation from MapView to detailed report for Residents** - Resident can view the reports they posted in Map View, so they have the ability to filter out the report based on location. Resident can also directly navigate to detailed report view by selecting the marker.
6. **Dynamic requests for permissions** - Implemented run time requests for permissions that are missing like, User turned off location sharing service, which is identified and requested dynamically.
7. **Improved application performance** - Code sanctity is improved by fixing logical bugs and crashes. Further, by including extra level of validation checks like: User device hardware failure caused the device to send null values for location will result in crash while viewing heat map or map view for reports, there by adding null value validations ensures app from crashing. Similarly, data validation for all the reports that are retrieved from firebase database.

8. Test Plan with Results:

Sl .n o	Test case	Expected Output	Result
1.	Official Login with Google	Official should be able to login using Google and redirected to home page containing all the reports submitted	Passed
2.	Resident Login with facebook	Resident should be able to login with Facebook and redirected to home page containing options to submit a report and view reports	Passed
3.	Resident Update Profile Functionality	Resident should be able to click update profile in menu and able to view and update his details like email, first name, last name and address details	Passed
4.	Resident Settings Functionality	Resident should be able to click on Settings in Menu and able to view and update settings like Littering Report Confirmation, Littering Report Status Change Confirmation and Anonymous reporting	Passed
5.	Resident submit report functionality	User should be to click the submit report button in the home page and goes to page containing options like Take a picture and describe. User should be able to submit pictures and report description.	Passed

6.	Resident Submit images functionality	After clicking on the Take a picture option, resident should be able to take multiple pictures, retake the picture and cancel the picture.	Passed
7.	Resident Report description page	In report description page, resident should see form containing title, description, size and severity and submit it by entering those details	Passed

8.	Resident Email notification functionality	Resident should be receive email when report is submitted, status is changed from still there to removal claimed by the Official.	Passed
9.	Resident Push Notification Functionality	Resident should receive push notification when official updates the status of the report.	Passed
10.	Resident View Reports Functionality	Resident should be able to see all the reports he submitted and able to filter the reports.	Passed
11.	Resident Map view of reports	Resident can see the map view containing reports, clicking on one report redirects to details page.	Passed
12.	Resident Report detail functionality	Resident must be able to click any of the reports in view page and able to see the report details like title, Location, address, status , size, severity and image,he should be able to update status of the report	Passed

13.	Update Report Within 30 feet	Resident should be able to update the status of the report if he is within 30 feet of the reported submitted location.	Passed
14.	Official Home Page	Official Should be able to see all the reports submitted, search the reports based on title, email and date, filter the reports based on parameters like email, status and priority level.	Passed
15.	Official Report details page	Official should be able to see the details of the report and update the status, this should send email to the corresponding Resident.	Passed
16.	Official Map View Page	Official can click on the map icon on the action bar in the home page and should be redirected to map view containing reports, clicking on one report redirects to details page.	Passed
17.	Official Heat Map Functionality	Official should be able to click the Heat Map option in the Menu and can see the heat map overlay based on the density of the reports.	Passed
18.	Logout Functionality	Official and resident should be to Logout of the app by clicking Logout button in the home page, redirected to the Login page of the Application.	Passed

9. Lessons learned & Future work:

Lessons learned:

- Quick and Intuitive design will help users to provide better user experience
- Retake the picture if taken picture is not good
- Learned how to use Async task instead of blocking UI thread
- OAuth2 Authentication with Google and Facebook
- Firebase real-time database: storing and retrieving data
- Firebase storage references for image
- MailGun API to send mail to huge customer base
- Google Map API for placing point and calculate distance
- Picasso and Glide to display images on load
- Push notification in android
- Heat map display

Future Scope of Work:

- Login using more social accounts than Google and Facebook
- Implement local cache for easy access of repetitive data
- Image compression algorithm to save bandwidth while uploading images
- Application support for large screen devices
- A server for optimization
- Ability to add more than 3 images while reporting
- Building similar application for iOS