**A PROJECT REPORT ON**

# NARI
# (Native Application for Rescue India)

**REPORT SUBMITTED TOWARDS PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF**

## BACHELOR OF TECHNOLOGY
**IN**
## Computer Science

SUBMITTED BY


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**(A CONSTITUENT OF SYMBIOSIS INTERNATIONAL UNIVERSITY)**


**2016-17**

# CERTIFICATE

The project titled **NARI – Native Application for Rescue India** submitted to the Symbiosis Institute of Technology, Pune for the final year project in Computer Science is based on our original work carried out under the guidance of **Mrs. Smita Mahajan**. The report has not been submitted elsewhere for the award of any degree.

The material borrowed from other source and incorporated in the report has been duly acknowledged and/or referenced.

We understand that we could be held responsible and accountable for plagiarism, if any, detected later on.

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## Abstract

Woman safety in India has always been an issue and it has greatly aggravated with advent of 21st century. However, there is a new hope with the rise in the technology and increase in the awareness; people have started paying attention towards these flaws in the society. There is an immediate need for an easy and effective solution for this situation. Individuals have been trying to get rid of this problem in India, however the growing crime rate against woman indicate otherwise. NARI (Native Application for Rescue, India) aims at delivering a simple yet operational elucidation to this problem.

During earlier times, crimes against women did not receive enough importance, as it should have. Especially in India where unruly practices such as sati, dowry and female infanticide were predominant, the thought of female empowerment was a taboo. These practices in the Indian society was due to lack of education, awareness and stubbornness. The Indian society failed to adapt to the changing times and as a result, the female population had to suffer which led to the degradation of the Indian society as a whole. However, in recent years, the Indian society has grown and becoming open-minded and is working towards woman empowerment. The literacy rate for woman, which was 39.3% in the 1960s, has risen to 65% by 2011. In 2012, the female workers got 182.04 Rs. /day as casual labors against 110.62 Rs. /day given to their male counterparts. The workforce participation rate of women in urban areas has risen from 14.0 in 2000 to 14.7 by 2012. In 1985, there was only one female cabinet minister out of a total 15 ministers; this number has now risen to six out of a total 23 ministers. During the third general elections (1962), the total number of female electors were 102.4 million. By the sixteenth general elections (2014), the number of female electors were 397.0 million. All these facts and figure point to the fact that the female population in India has undergone a massive transformation for the better. Several schemes by the government underline the importance of woman empowerment.

Table 0.1. Number of electors and percentage voting in various general election

| General Election | Year | Total number of electors (Figures in Millions) | | | Percentage of electors participating in the election | | |
|---|---|---|---|---|---|---|---|
| | | Female | Male | Total | Female | Male | Total |
| First | 1952 | NA | NA | 173.2 | NA | NA | 61.2[a] |
| Second | 1957 | NA | NA | 193.7 | NA | NA | 62.2[a] |
| Third | 1962 | 102.4 | 113.9 | 216.4 | 46.6 | 62.0 | 55.0 |
| Fourth | 1967 | 119.4 | 129.6 | 249 | 55.5 | 66.7 | 61.3 |
| Fifth | 1971 | NA | NA | 274.1 | NA | NA | 55.3 |
| Sixth | 1977 | 154.2 | 167.0 | 321.2 | 54.9 | 65.6 | 60.5 |
| Seventh | 1980 | 170.3 | 185.2 | 355.6 | 51.2 | 62.2 | 56.9 |
| Eighth | 1984 | 192.3 | 208.0 | 400.3 | 59.2 | 68.4 | 64.0 |
| Ninth | 1989 | 236.9 | 262.0 | 498.9 | 57.3 | | 61.9 |
| Tenth | 1991 | 234.5 | 261.8 | 498.4 | 51.4 | 61.6 | 56.7 |
| Eleventh | 1996 | 282.8 | 309.8 | 592.6 | 53.4 | 62.1 | 57.9 |
| Twelfth | 1998 | 289.2 | 316.7 | 605.9 | 57.9 | 65.7 | 61.9 |
| Thirteenth | 1999 | 295.7 | 323.8 | 619.5 | 55.6 | 63.9 | 59.9 |
| Forteenth | 2004 | 322.0 | 349.5 | 671.5 | 53.6 | 62.2 | 58.1 |
| Fifteenth | 2009 | 342.2 | 374.7 | 716.9 | 55.8 | 60.3 | 58.1 |
| Sixteenth | 2014 | 397.0 | 437.0 | 834.1 | 65.6 | 67.1 | 66.4 |

As stated earlier, the recent times have acted as a boon as well as a bane for female population. India has seen a growth in the literacy rate of women as well as a rise in the female workforce and in the decision-making councils. However, there has also been an upsurge in the crimes committed against woman. Under Section 376 of the Indian Penal Code (IPC), the number of rape cases have grown from 16496 in 2000 to 36735 in 2014. The number of kidnapping and abductions, under section 363 to 373 of the Indian Penal code, has risen from 15023 to 57311 from 2000 to 2014 respectively. The number of cases of cruelty by husband or relative, under section 498-A of IPC, have augmented from 45778 in 2000 to 122877 in 2014. On one hand, we get optimistic hope through a list of facts pertaining to woman empowerment, but on the other hand, we are chastise due to the crimes against women.

Table 0.2. Representation of women in central council of minister

| Year | Number of Ministers | | | Number of Women Ministers | | |
|---|---|---|---|---|---|---|
| | Cabinet Minister | MOS* | Deputy Minister | Cabinet Minister | MOS* | Deputy Minister |
| 1985 | 15 | 25 | 0 | 1 | 3 | 0 |
| 1990 | 17 | 17 | 5 | 0 | 1 | 1 |
| 1995 | 12 | 37 | 3 | 1 | 4 | 1 |
| 1996 | 18 | 21 | 0 | 0 | 1 | 0 |
| 1997 | 20 | 24 | 0 | 0 | 5 | 0 |
| 1998 | 21 | 21 | 0 | 1 | 3 | 0 |
| 2002 | 32 | 41 | 0 | 2 | 6 | 0 |
| 2004 | 29 | 39 | 0 | 1 | 6 | 0 |
| 2003 | 30 | 48 | 0 | 1 | 5 | 0 |
| 2009 | 40 | 38 | 0 | 3 | 4 | 0 |
| 2011 | 32 | 44 | 0 | 2 | 6 | 0 |
| 2012 | 31 | 43 | 0 | 2 | 6 | 0 |
| 2013 | 31 | 47 | 0 | 3 | 9 | 0 |
| 2014 | 23 | 22 | 0 | 6 | 1 | 0 |
| 2015 | 23 | 22 | 0 | 6 | 2 | 0 |

Source: Lok Sabha Secretariat, New Delhi. MOS: Minister of State.
*Including Ministers of State with independent charge

There have been a few applications already in the market, which are dedicated towards this noble cause, however somehow due to their bad interface or problems in connectivity; they are unable to deliver to the expectation. Most of the applications tend to incorporate many different aspects into their application but in doing that they tend to forget the crux of the application. NARI aims at developing a simple yet effective solution for empowering womanhood as well as installing a sense of awareness amongst the society.

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## List of Abbreviations

| Abbreviated Word | Expansion |
|---|---|
| NARI | Native Application for Rescue, India |
| APK | Android Application Package |
| API | Application Program Interface |
| FCM | Firebase Cloud Messaging |
| GC | Google Console |
| OS | Operating System |
| RPi | Raspberry Pi |
| SDK | Software Developmental kit |
| IDE | Integrated Developmental Environment |
| ADT | Android Developmental Tool |
| JDK | Java Developmental Kit |
| JRE | Java Runtime Environment |
| NDK | Native Developmental Kit |
| RMMM | Risk Management Mitigation & Monitoring |
| GPS | Global Positioning System |
| RAM | Random Access Memory |
| WSS | Woman Safety Survey |
| SDLC | Software Development Lifecycle |

# 1. Introduction

There has been a rise in the female workforce in the urban areas. There has also been an increase in the MNCs hiring individuals in India and because of that are many female employees, which work, and their shifts are regulated as per the MNCs' schedule. This leads to female employees commuting at disproportionate time, hence leading to vulnerability. Factors that negatively affect the female population are:

- Rape
- Kidnapping & Abduction
- Dowry deaths
- Assault
- Trafficking

Flimsy police regulation as well as parochial mind-set of the society has further exacerbated the situation. NARI tries to connect the person in danger directly to their loved ones with just the press of a button. Without even using the phone, a distress signal could be directly sent from the user's wristband to the subscribers' phones along with their current location. The subscriber on the other hand does not need to open the application and check every time. The application opens up automatically when the distressed signal is pressed. Once the application opens, it displays a map along with a map that shows the fastest route from the subscriber to the person in distress and hence he/she could be saved in time.

## 1.1 Overview

The Thompson Reuters Foundation released a list today of the most dangerous countries to be born a woman. According to Reuters, 213 experts from five continents were asked to rank the world's nations on their overall perception of danger as well as six high-risk categories: "health

threats, sexual violence, non-sexual violence, harmful practices rooted in culture, tradition and/or religion, lack of access to economic resources and human trafficking."

Female feticide, child marriage and high levels of trafficking and domestic servitude make the world's largest democracy the fourth most dangerous place for women, the poll showed.

- 100 million people, mostly women and girls, are involved in trafficking in one way or another, according to former Indian Home Secretary Madhukar Gupta.
- Up to 50 million girls are "missing" over the past century due to female infanticide and feticide.
- 44.5 % of girls are married before the age of 18.

Last year, over three lakh women were kidnapped, raped, molested—and in some extreme cases, killed—by men across the country. That's almost a 27 percent increase since 2012—and a year since the world's attention was drawn to the problem of sexual violence against women in India.

According to data from the National Crime Records Bureau—the government agency that keeps track of the country's crime rate—cases of violent abuse of women have steadily increased since 2009. By 2013, the number of such cases has increased by over 50 percent. That's over 848 women who are either harassed, raped or killed after abduction every single day. Some are sold off to traffickers.

Some shocking data:

1. A new case is registered regarding crime against women every 20 minutes in India.
2. According to the National Crime Records Bureau, 206 rape cases were registered in India in 2011. According to reports rape cases in the country doubled between 1990 and 2008.
3. According to a BBC report in February 2013, more than 7,200 children are raped each year in India.

4. In April 2013, Parliament introduced amendments in the Indian Penal Code making various changes to the anti-rape laws in India after the Delhi gang- rape case in December 2012.
5. A look at the data of the NCRB shows that Maharashtra ranks among the 10 worst states in terms of conviction rates for most offences against women.
6. In 98 percent of registered cases of rapes in the country, close relatives and acquaintances are the accused, National Crime Records Bureau (NCRB) said in its 2012 report.
7. A total of 24,923 rape cases were registered in India in 2012.
8. Lakshadweep is the only administrative division in the country where no rape of minors has been reported since 2007, as per the NCRB report.
9. On an average, spending on safety nets accounts for 1 to 2 percent of GDP across developing and transition countries, though sometimes much less or much more.
10. Nearly 68,000 rape cases were registered across the country during the period 2009. However, out of them only 16,000 rapists were sentenced to prison.
11. In 2012, reports of rape, dowry deaths, sexual harassment, kidnapping, trafficking and other crimes against women in the country rose by 6.4 percent from the previous year. The highest numbers of rapes were recorded in Delhi.

**1.2 Purpose**

NARI (Native application for rescue, India) mainly aims at providing a simple and effective interface to help a person in distress by sending SOS signal to their loved ones as well as to their guardian, along with the location. There have been cases where the location of victim is unknown and due to this, help could not be dispatch timely. The main purpose of this application is to:

- Provide a fully functioning application, which is able to receive signal from a wristband to generate location. This location is then sent to the subscribers' phone along with the fastest route to reach the victim.

### 1.3 Significance

We focus on the mind-set of the person in distress. Just the press of a button is far easier than calling the police. We make sure that that wristband and the victim's phone are connected to the same network in order for them to communicate.

### 1.4 Problem Statement

To develop a fully functional android application for women safety to provide recue and help when a need arises. The victim can send the distress signal whenever there's any danger. The application has been developed on android platform.

### 1.5 Contribution

NARI tries to connect the person in danger directly to their loved ones with just the press of a button. Without even using the phone, a distress signal could be directly sent from the user's wristband to the subscribers' phones along with their current location. The subscriber on the other hand does not need to open the application and check every time. The application opens up automatically when the distressed signal is pressed. Once the application opens, it displays a map along with a map that shows the fastest route from the subscriber to the person in distress and hence he/she could be saved in time. NARI (Native application for rescue, India) mainly aims at providing a simple and effective interface to help a person in distress by sending SOS signal to their loved ones as well as to their guardian, along with the location. There have been cases where the location of victim is unknown and due to this, help could not be dispatch timely.

### 1.6 Objective

- Fetching real-time location of the victim with just the press of a button
- Sending the location to the subscribers' phone.
- Achieve near about accuracy while sending the location.
- Auto boot the application when receiving the location.

- Use of cost effective technology.
- Help the people in distress.

### 1.7 Platform and Technology

- Java SE Development Kit 8


**Figure 1.1 JDK**

- Android sdk 24.4.1


**Figure 1.2 SDK**

- Android Studio 2.3


**Figure 1.3 Android Studio**

- Python 2.7.3


**Figure 1.4 Python**

- Raspberry Pi IIIB

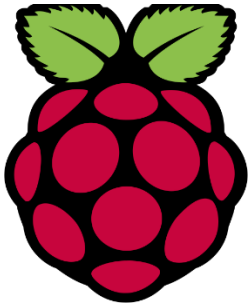

**Figure 1.5 Raspberry Pi**

## 2. Literature Review

Throughout the making of this project, we came across various shocking facts about the condition of female population in India and how it should be given more importance. The government of India releases datasets as well as detailed statistics on various aspects of India and how it has changed. Since these government figures, there might be some deviation from the actual figures however, an estimate could be generated just by looking at these statistics.

Table 2.1. Literacy rates in post independent India

| Year | Rural | | | Urban | | | Combined | | |
|---|---|---|---|---|---|---|---|---|---|
| | Female | Male | Total | Female | Male | Total | Female | Male | Total |
| 1951 | 4.87 | 19.02 | 12.1 | 22.33 | 45.6 | 34.59 | 8.86 | 27.15 | 18.32 |
| 1961 | 10.1 | 34.3 | 22.5 | 40.5 | 66 | 54.4 | 15.35 | 40.4 | 28.31 |
| 1971 | 15.5 | 48.6 | 27.9 | 48.8 | 69.8 | 60.2 | 21.97 | 45.96 | 34.45 |
| 1981 | 21.7 | 49.6 | 36 | 56.3 | 76.7 | 67.2 | 29.76 | 56.38 | 43.57 |
| 1991 | 30.17 | 56.96 | 36 | 64.05 | 81.09 | 67.2 | 39.29 | 64.13 | 52.21 |
| 2001 | 46.7 | 71.4 | 59.4 | 73.2 | 86.7 | 80.3 | 53.67 | 75.26 | 64.83 |
| 2011 | 58.75 | 78.57 | 67.8 | 79.92 | 89.67 | 84.1 | 65.46 | 82.14 | 74.04 |
| **% Increase in 2011 over 2001** | **26%** | **10%** | **14%** | **9%** | **3%** | **5%** | **22%** | **9%** | **14%** |

The above figure gives a clear idea about the literacy rate of female population in India. There has been a continuous rise in the female literacy rate and this leads to greater female contribution in the workforce. This contribution is mainly in the urban areas since the work in urban areas are not attributed to the physical strength. In rural areas, physical strength plays a vital role.

Table 2.2 Workforce participation rates

| Year | Rural | | Urban | |
|---|---|---|---|---|
| | Female | Male | Female | Male |
| 2000-2001* | 28.7 | 54.4 | 14.0 | 53.1 |
| 2001-2002* | 31.4 | 54.6 | 13.9 | 55.3 |
| 2002* | 28.1 | 54.6 | 14.0 | 53.4 |
| 2004-05 | 32.7 | 54.6 | 16.6 | 54.9 |
| 2005-06* | 31.0 | 54.9 | 14.3 | 54.0 |
| 2007-08* | 28.9 | 54.8 | 13.8 | 55.4 |
| 2009-10 | 26.1 | 54.7 | 13.8 | 54.3 |
| 2011-12 | 24.8 | 54.3 | 14.7 | 54.6 |

Source : Census 2011

The workforce participation rate has steadily increased in the urban areas that is directly proportional to the rise in the literacy rate of the female population. In rural areas, we can see a decline in participation of woman while the participation of men remain constant.

Table 2.3 Year wise status of crime committed against women

| Crime Head | 2000 | 2005 | 2010 | 2011 | 2012 | 2013 | 2014 | % Share in 2014 |
|---|---|---|---|---|---|---|---|---|
| Rape (Sec. 376 IPC) | 16496 | 18359 | 22172 | 24206 | 24923 | 33707 | 36735 | 11% |
| Kidnapping & Abduction (Sec.363 to 373 IPC) | 15023 | 15750 | 29795 | 35565 | 38262 | 51881 | 57311 | 17% |
| Dowry Deaths (Sec.302/304 IPC) | 6995 | 6787 | 8391 | 8618 | 8233 | 8083 | 8455 | 3% |
| Cruelty by Husband and Relatives (Sec.498-A IPC) | 45778 | 58319 | 94041 | 99135 | 106527 | 118866 | 122877 | 36% |
| Assault on women with intent to outrage her modesty (Sec.354 IPC) | 32940 | 34175 | 40613 | 42968 | 45351 | 70739 | 82235 | 24% |
| Insult to the modesty of women (Sec.509 IPC) | 11024 | 9984 | 9961 | 8570 | 9173 | 12589 | 9735 | 3% |
| Importation of Girls from foreign country (Sec.366-B IPC) | 64 | 149 | 36 | 80 | 59 | 31 | 13 | 0% |
| Immoral Traffic (Prevention) Act, 1956 | 9515 | 5908 | 2499 | 2435 | 2563 | 2579 | 2070 | 1% |
| Indecent Representation of Women (Prevention) Act, 1986 | 662 | 2917 | 895 | 453 | 141 | 362 | 47 | 0% |
| Dowry Prohibition Act, 1961 | 2876 | 3204 | 5182 | 6619 | 9038 | 10709 | 10050 | 3% |
| **Total Crime Against Women** | **141373** | **155552** | **213585** | **228649** | **244270** | **309546** | **337922** | 100% |
| **Total Cognizable Crimes Under IPC + SLL** | 5938104 | 6675217 | 6750748 | 6252729 | 6041559 | 6640378 | 7229193 | |
| **% Crime Against Women to Total Crime** | 2% | 2% | 3% | 4% | 4% | 5% | 5% | |

*Source: Crime in India, National Crime Records Bureau, Ministry of Home Affairs.*

IPC : Indian Penal Code & SLL : Special and Local Laws

**Table 2.4 Disposal of crime committed against women cases by police during 2014**

| CrimeHead | Cases Reported during the year | Total Cases for investigation | Cases in which charge-sheets were submitted | Total cases Disposed off by police | % Disposed of total cases for Investigation |
|---|---|---|---|---|---|
| Rape | 36735 | 51623 | 30840 | 35590 | 69% |
| Attempt to commit Rape | 4234 | 4672 | 2781 | 3369 | 72% |
| Kidnapping & Abduction of Women | 57311 | 84685 | 26044 | 49150 | 58% |
| Dowry Deaths | 8455 | 13270 | 7653 | 8597 | 65% |
| Assault on Women with intent to outrage her Modesty | 82235 | 101164 | 66462 | 76388 | 76% |
| Insult to the Modesty of Women | 9735 | 12970 | 8144 | 9077 | 70% |
| Cruelty by Husband or his Relatives | 122877 | 168760 | 97081 | 117822 | 70% |
| Importation of Girls from Foreign Country | 13 | 59 | 20 | 35 | 59% |
| Abetment of Suicides of Women | 3734 | 4267 | 2403 | 2598 | 61% |
| Dowry Prohibition Act, 1961 | 10050 | 15931 | 9007 | 10770 | 68% |
| Indecent Representation of Women (Prohibition) Act, 1986 | 47 | 105 | 54 | 66 | 63% |
| Protection of Women from Domestic Violence Act, 2005 | 426 | 457 | 312 | 349 | 76% |
| Immoral Traffic (Prevention) Act (Women Cases only) | 2070 | 2702 | 1881 | 1911 | 71% |
| **Total Crimes against Women** | **337922** | **460665** | **252682** | **315722** | 69% |

**Table 2.5 Disposal of crime committed against women cases by court during 2014**

| Crime Head | Cases Sent for Trial during the Year | Total no. Of Cases for Trial during the Year | Cases Convicted | Cases Acquitted or Discharged | % cases convicted of total no. of cases for trial |
|---|---|---|---|---|---|
| Rape | 30840 | 125433 | 4944 | 12705 | 10% |
| Attempt to Commit Rape | 2781 | 4806 | 149 | 867 | 18% |
| Kidnapping & Abduction of Women | 26044 | 109035 | 2655 | 9136 | 8% |
| Dowry Deaths | 7653 | 40477 | 1672 | 3389 | 8% |
| Assault on Women with Intent to Outrage | 66462 | 258104 | 8422 | 21573 | 8% |
| Insult to the Modesty of Women | 8144 | 36734 | 1212 | 4566 | 12% |
| Cruelty by Husband or his Relatives | 97081 | 499642 | 6425 | 40428 | 8% |
| Importation of Girls from Foreign Country | 20 | 224 | 6 | 24 | 11% |
| Abetment of Suicides of Women | 2403 | 9151 | 154 | 860 | 9% |
| Dowry Prohibition Act, 1961 | 9007 | 31741 | 472 | 4145 | 13% |
| Indecent Representation of Women | 54 | 980 | 79 | 90 | 9% |
| Protection of Women from Domestic | 312 | 481 | 9 | 38 | 8% |
| Immoral Traffic (Prevention) Act (Women | 1881 | 6614 | 461 | 488 | 7% |
| **Total Crimes against Women** | **252682** | **1123423** | **26660** | **98310** | 9% |

With the rise in female workforce contribution, there is surprising rise in crime committed against women. This is surprising because such a culture exist where people are unaware and uneducated. In a developing country, such as India, these statistics are cringe worthy.

One of the major factors on developing this application is by looking at these statistics only. A country that has been tormented by the shackles of social stigmas, something is not in place when it comes to woman safety. It may be due to negligence of administration or due to carelessness of the police force. A clear solution must be carved out for the woman of India- 'Nari'.

# 3. Experiment Work

## 3.1 Software Requirement Specification (SRS)

### 3.1.1 Introduction

Woman safety in India has always been an issue and it has greatly aggravated with advent of 21st century. However, there is a new hope with the rise in the technology and increase in the awareness; people have started paying attention towards these flaws in the society. There is an immediate need for an easy and effective solution for this situation. Individuals have been trying to get rid of this problem in India, however the growing crime rate against woman indicate otherwise. NARI (Native Application for Rescue, India) aims at delivering a simple yet operational elucidation to this problem.

### 3.1.2 System Specification

This application helps to generate the location of the person in distress. It enables the victim to send his/her location to previously subscribed family members in case of an emergency with just the press of a button. This application is made using android SDK, hence enabling it to run on various android OS. The user interface is kept very basic, showing just the essential features while hiding the complicated features.

The boot screen contains two buttons

- User Registration
- Subscriber Registration

Users are the victims whereas; subscribers are those who will receive the distress signal.

### 3.1.3 System Requirement

- Java Environment

- 500 mb RAM
- Internet Connectivity
- GPS
- SDK
- Windows 7 and above
- Raspberry pi
- Apache Tomcat server
- Firebase

### 3.1.4 User characteristics

User must be familiar about how to use a mobile phone, which, can be connected to the internet.

### 3.1.5 User Interfaces

- Start page
- Menu page
- Subscriber page
- User page
- Panic mode
- Directions

### 3.1.6 Operating Environment

The major modules are developed using Java in android SDK as well as python which is used via configuring the hardware. The integration between the module is done at both ends.

### 3.1.7 Users of the application

This application has been developed for female population. This application could be easily installed in an android phone and the wristband module could be configured very easily. Any other individual looking for help could also use this application.

### 3.1.8 Functional Requirements

- The wristband module and the victim's phone will connect via socket.
- On the press of the button, the victim's application will receive the signal.
- At the same time, the ip address, date and time is stored in the firebase via the wristband module that could be analysed later.
- The victim's application will generate current location using google map's api and send that location via firebase notification service.
- The subscriber's application on receiving the location of victim will generate its current location via google map's api and use direction api to send both the location to google console.
- Google console generates a JSON object, which contains different points along the route from victim to rescuer as well as the encoded polyline that will give us the exact route.
- On receiving this JSON file, we extract the different points and store it in an array list. We then draw the different points on the map and connect them using drawing functionality.

### 3.1.9 Assumption and Dependencies

The assumptions are:

- The device will always be having internet connectivity.
- The User will be having and android device.

- The device will be having OS above android 4.0.
- The user has the basic knowledge about operating smart phone.
- The user is familiar with Google Maps.
- The device is functional.

The dependencies are:

- Internet
- Firebase
- Google maps auth credentials
- The firebase auth credentials
- Google console
- Direction API credentials

## 3.2 Diagrams

### 3.2.1 Use case

Iteration 1

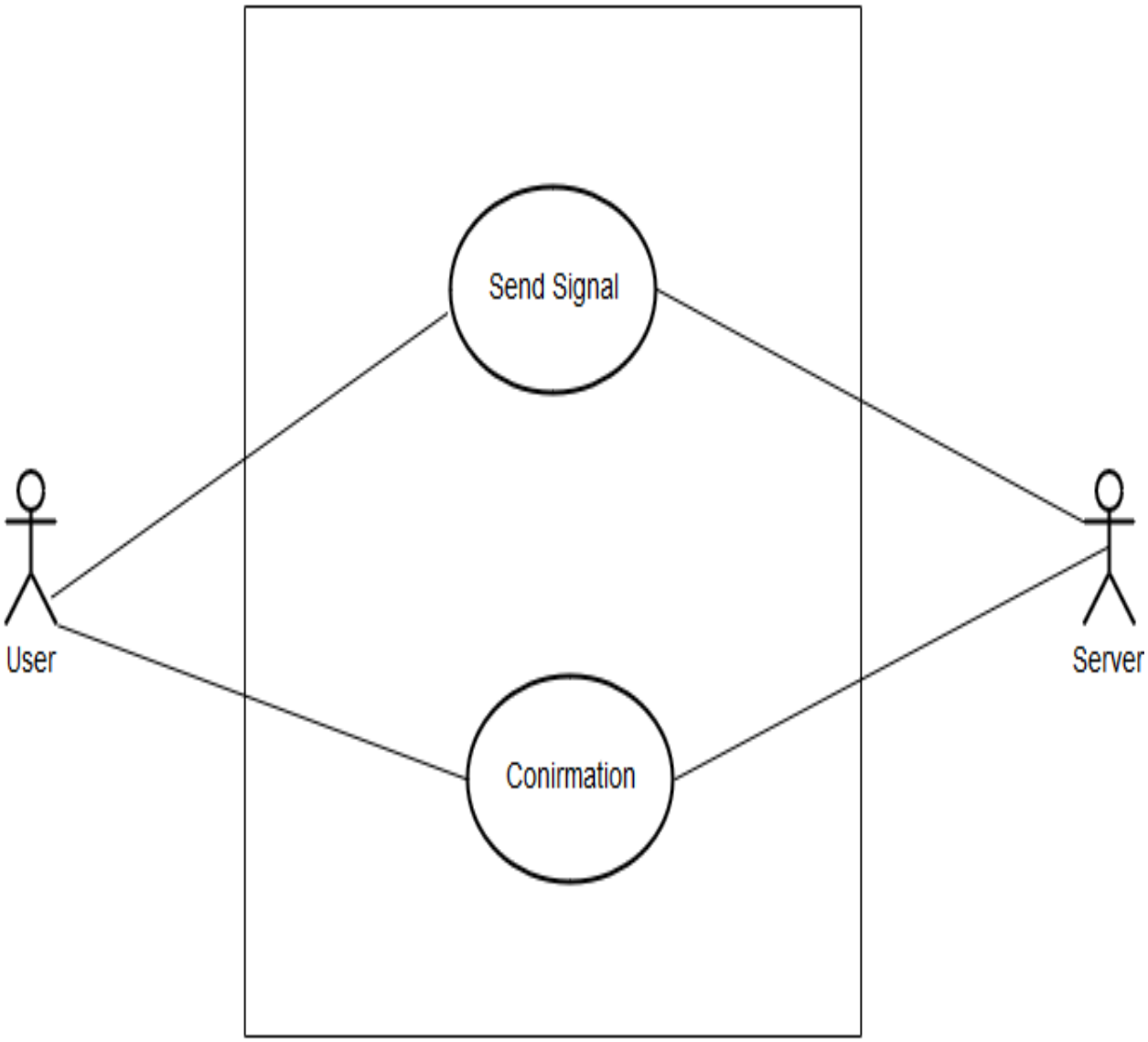


**Figure 3.1 Use Case Iteration 1**

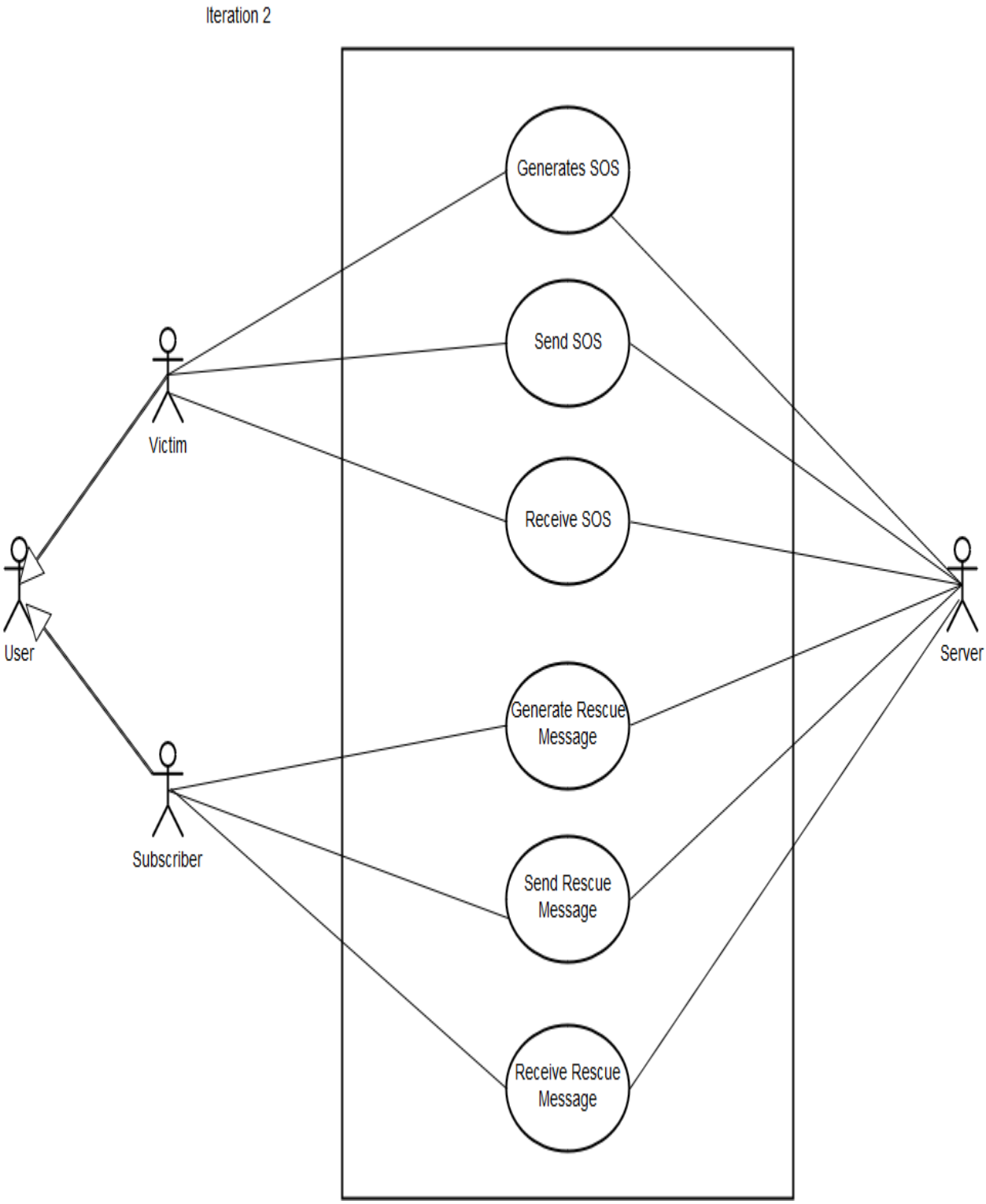


**Figure 3.2 Use Case Iteration 2**

### 3.2.2 State Transition

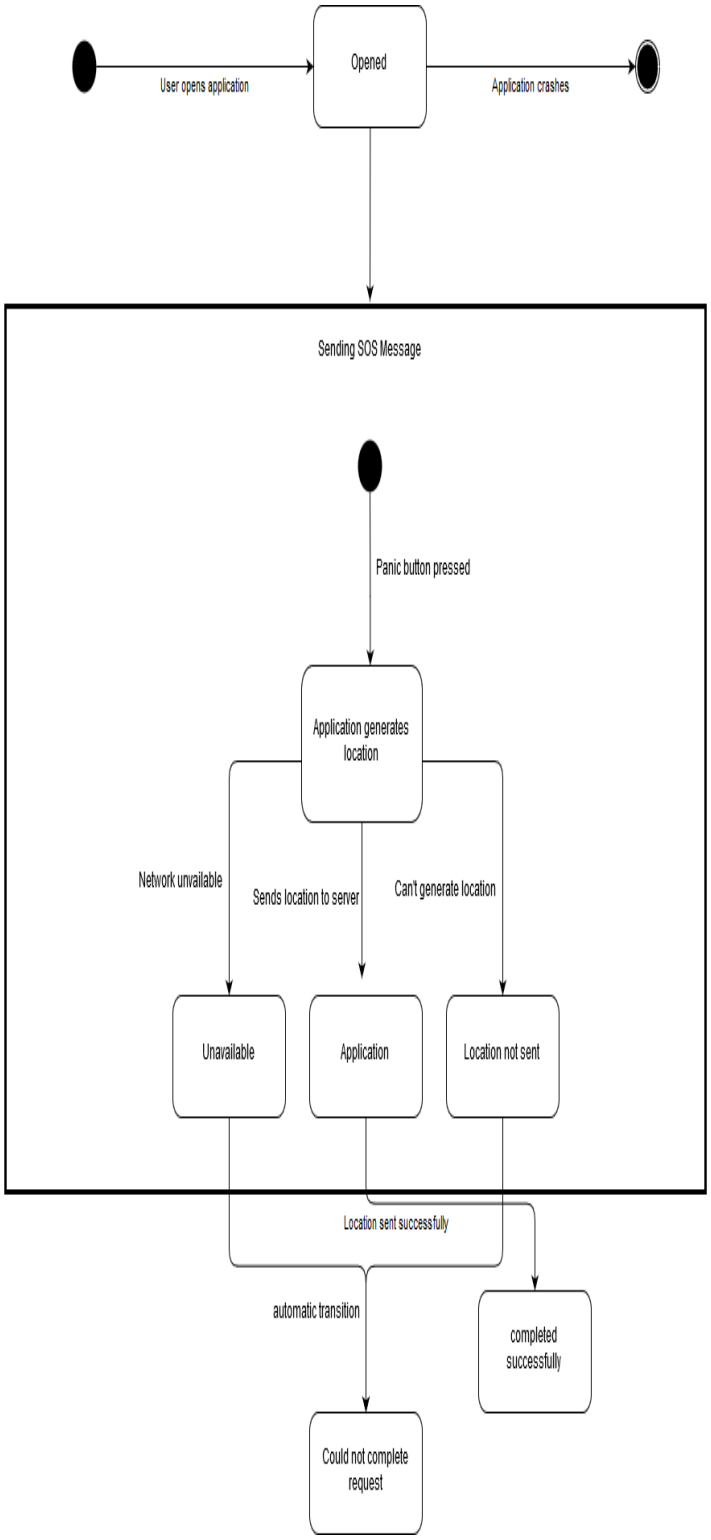


**Figure 3.3 State Transition**

### 3.2.3 Data Flow Diagram

**Level 0**

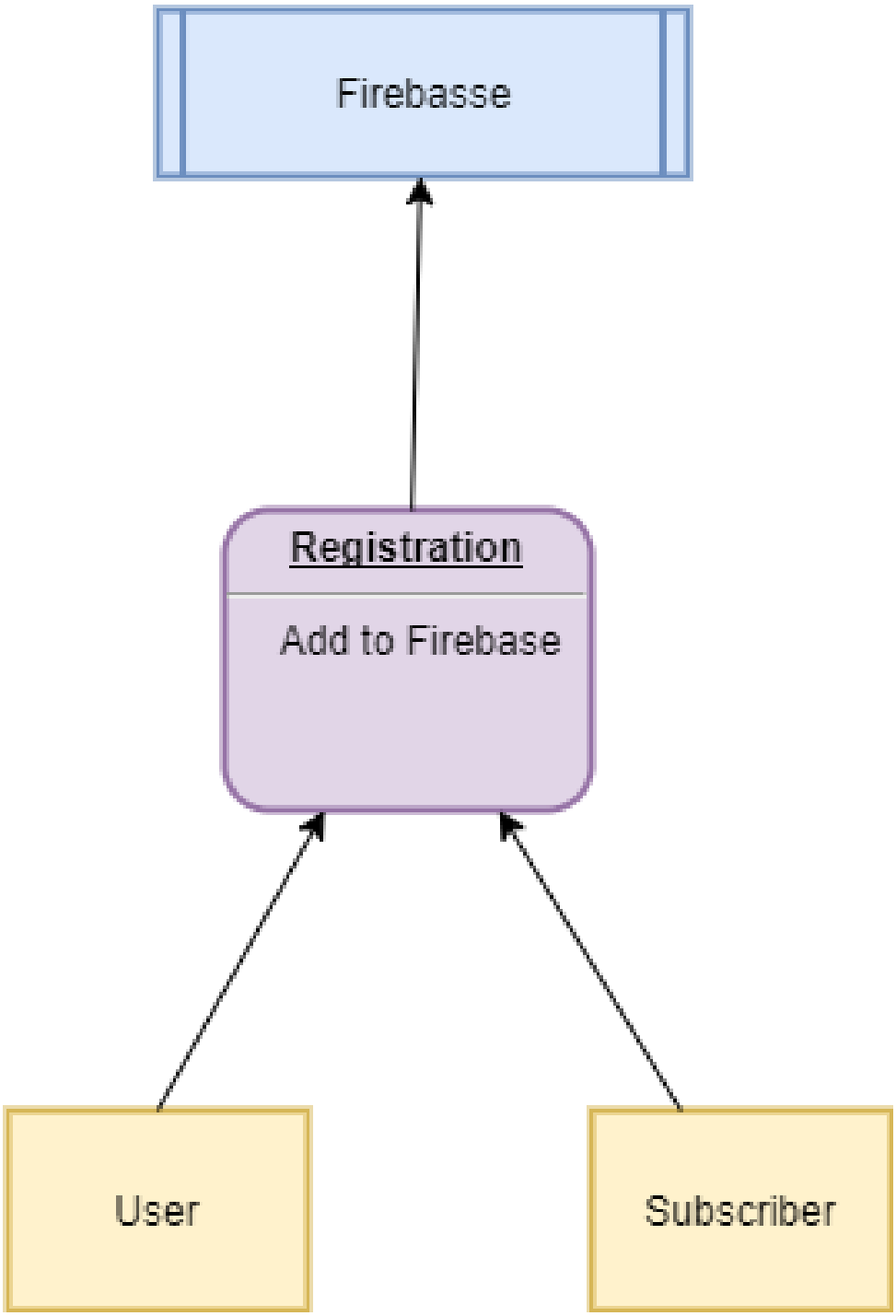


**Figure 2.4 DFD Level 0**

**Level 1**

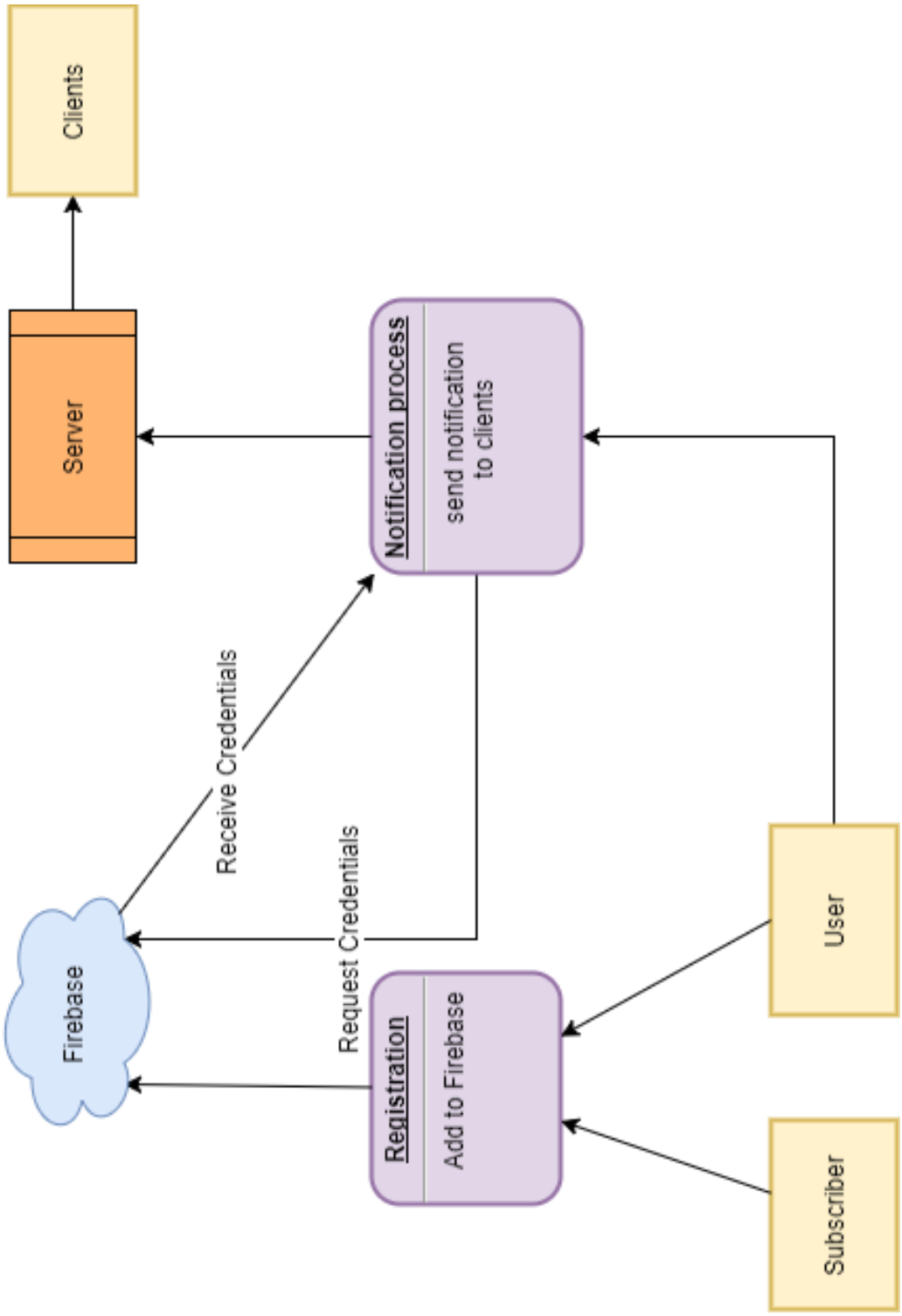


**Figure 3.5 DFD Level 1**

**Level 2**

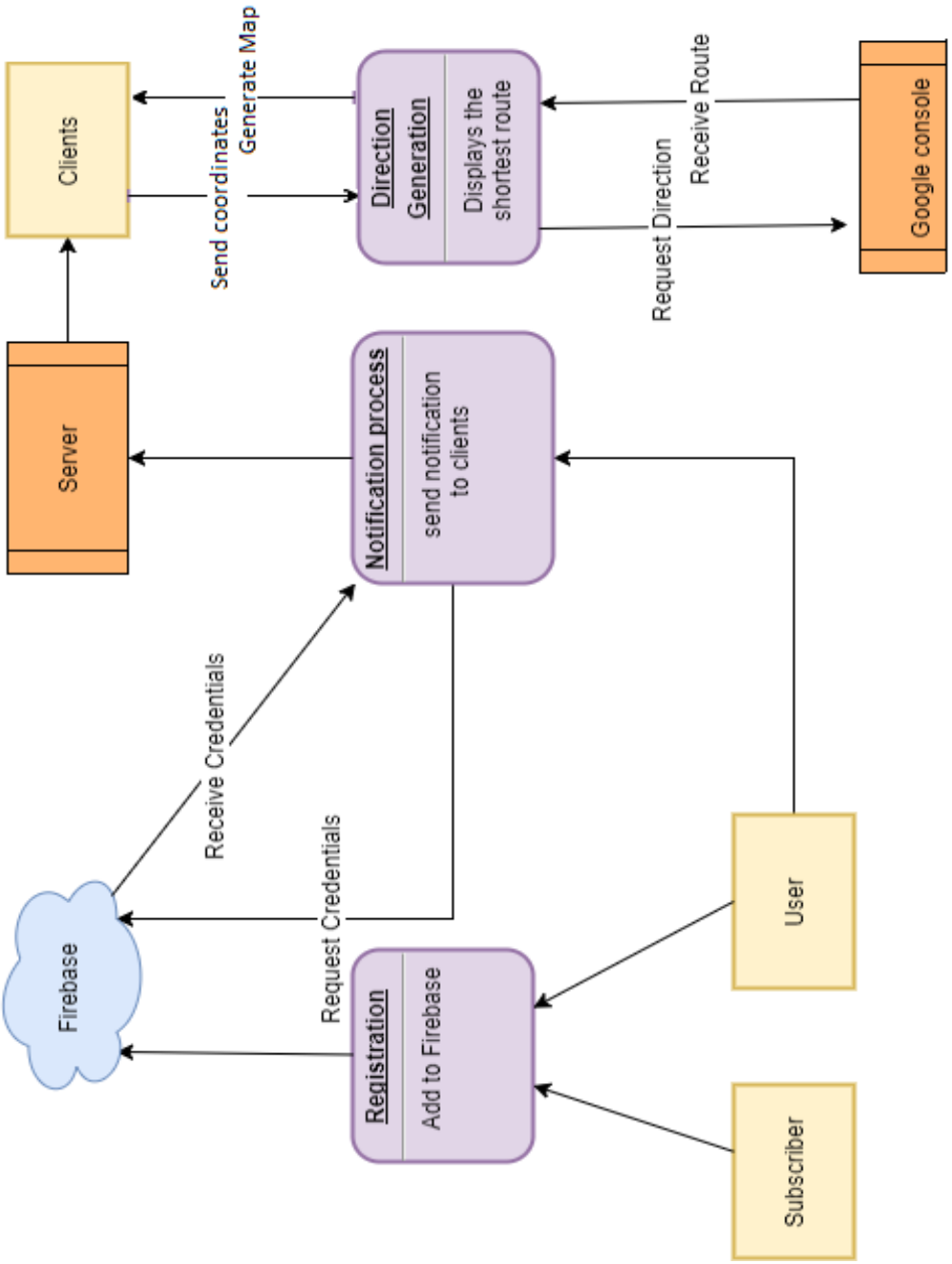


**Figure 3.6 DFD Level 2**

## 3.3 Software Project Plan

### 3.3.1 Software Development Plan

For this project we have used SDLC Incremental Model.

The project involved creation several small separate modules one after the other and integrating the newly created one to the previous module. Each iteration consist of the following phases: analysis, design, implementation, testing, deployment, maintenance. The first iteration involved the development of notification module than the google maps were integrated to for sending and receiving location through notification. The third phase required the integration of direction service to map the direction between the two coordinates. The phase involved integrating the band module to serve sending the distress sign.

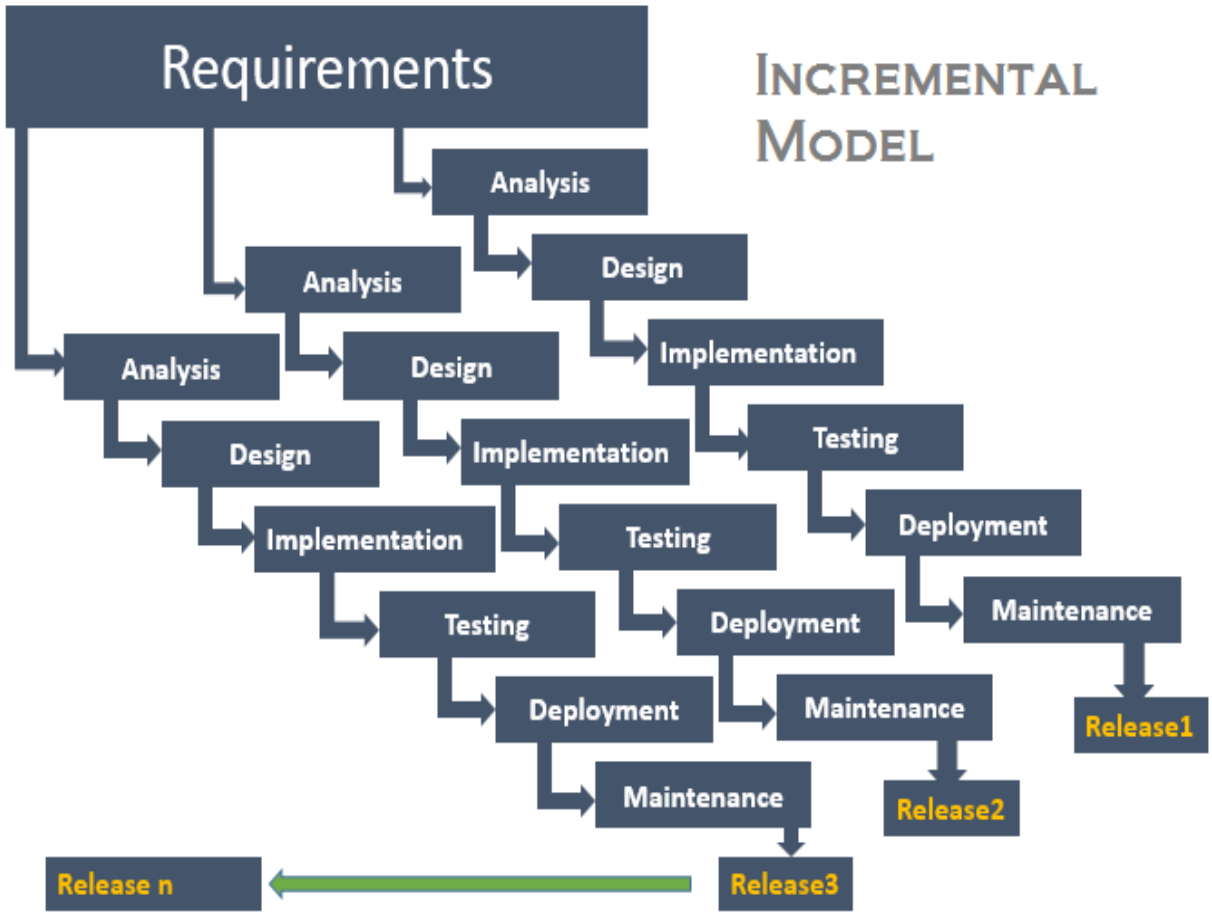


**Figure 3.7 Incremental Model**

Each phase consist of the following:

1. Analysis: This step involves analyzing the concept and goal of the development in that phase. The requirements are specified in requirement specification document. The literature comprised one of the most important part of this phase. The resultant of this phase must address the requirement of the phase.
2. Design: This phase helps in providing and describing the various software and hardware requirement of the phase. The various UML diagrams are prepared to describe the system model efficiently.
3. Construction: This phase involves the actual development of the module. The software is coded to serve the requirements. Each unit was developed and tested for its functionality.
4. Testing: During this phase the module was tested to check if it served its functionality and to check if any bugs and error persist. The errors are resolved and bugs are fixed in this phase.
5. Deployment: After both functional and non-functional testing is performed the module is deployed.
6. Maintenance: There are some issues that always persist in the module hence it is always kept in check and timely maintenance is performed to check the reliability of software and its functioning.

### 3.3.2 Timeline Chart

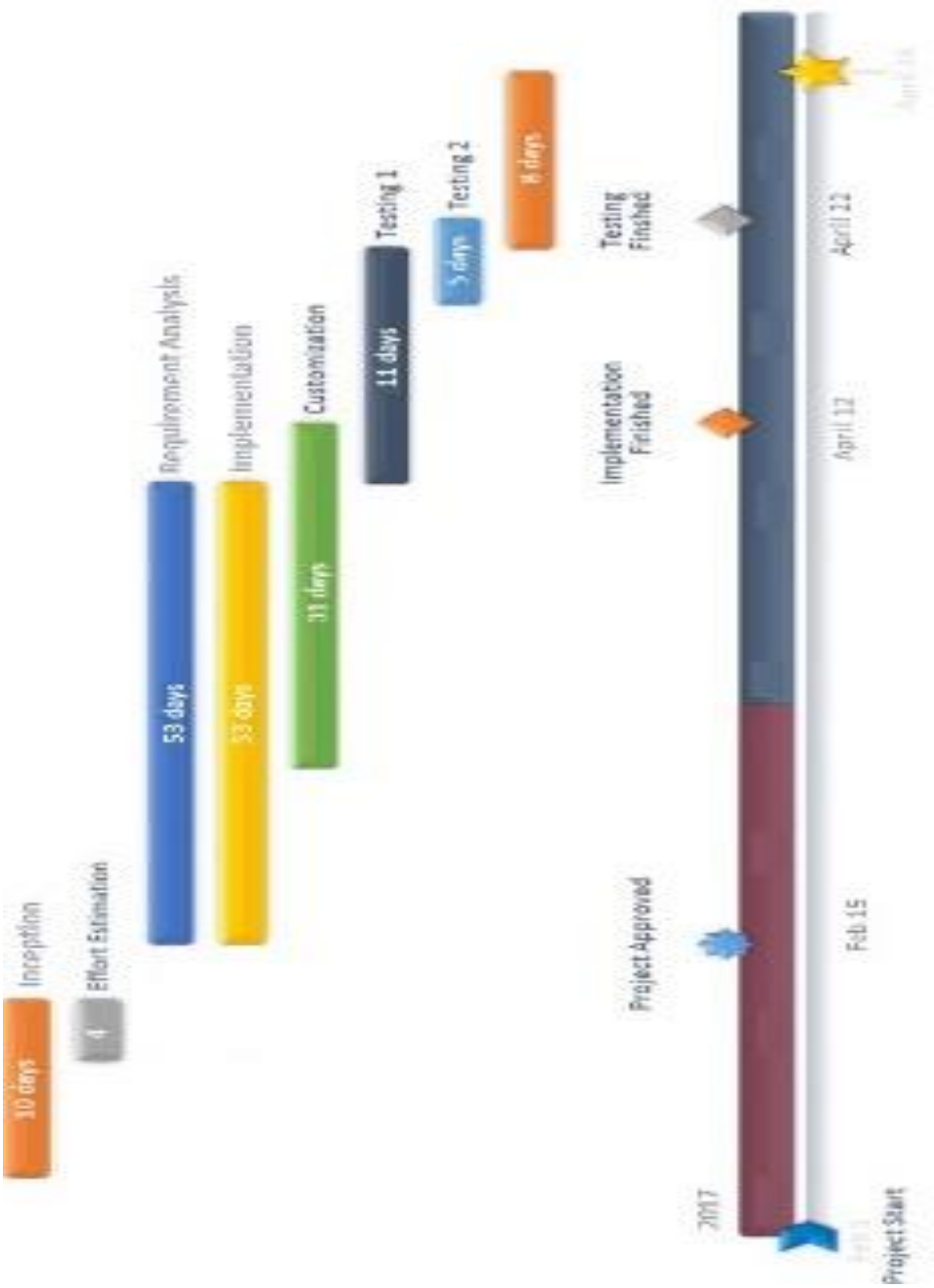


**Figure 3.8 Timeline Chart**

### 3.3.3 Risk Management

#### 3.3.3.1 Risk Description

1. Project risks: It identifies the potential budget related, scheduling, staffing and organization, resource allocation, customer related, and requirements specification risk and their overall impact on the software development. If project risks become real, it is likely that project schedule will slip and that costs will increase.
2. Technical risks: It identifies design, implementation, interface, verification, and maintenance risk. Technical risks threaten the quality and timeliness of the software to be produced. If a technical risk becomes a reality, Implementation may become difficult or impossible.
3. Network risks: This includes network related risks.
4. Support risk: The degree of uncertainty that the resultant software will be easy to correct, adapt, and enhance.

#### 3.3.3.2 Risk Table

| Risk summary | Risk category | Risk Probability | Risk impact(1-4) |
|---|---|---|---|
| Lack of data security | Technical | 25% | 1 |
| Internet failure | Network | 20% | 2 |
| Server Failure | Network | 30% | 2 |
| Deviation from software engineering standards | project | 18% | 4 |

**Table 3.1 Risk Table**

**1 – Catastrophic 2 – Critical 3 – Marginal 4 – Negligible**

### 3.3.3.3 RMMM:-

**1. Lack of Data Security**

a. Mitigation: In order to prevent this from happening, developers who are in contact with the database, and/or use functions that interact with the database, should keep in mind the possible errors that could be caused due to poor programming/error checking. These issues should be brought to the attention of each of the other members that are also in contact with the database.

b. Monitoring: Each user should be sure that the database is left in the condition it was before it was touched, to identify possible problems. The first notice of database errors should be brought to the attention of the other team members.

c. Management: Should this occur, the organization would call a meeting and discuss the causes of the database instability, along with possible solutions.

**2. Internet Failure**

a. Mitigation: In order to prevent this high speed internet connection should be ensured and network provider's service should be checked. The devices should have internet facility and should be in working state.

b. Monitoring: Each user must monitor that the internet connection is on or not. The current service provider's operation state must be ensured.

c. Management: The internet failure depends on the devices hardware and software condition or on the service provider's current state. So there aren't many management methods however we can use various software and hardware tools to in check those components and networks service.

**3. Server Failure**

a. Mitigation: In order to prevent this from happening, developers who are in contact with the server, and/or use functions that interact with the server, should keep in mind the possible

errors that could be caused due to poor programming/error checking. These issues should be brought to the attention of each of the other members that are also in contact with the server.

b. Monitoring: Each user should be sure that the server is left in the condition it was before it was touched, to identify possible problems. The first notice of server errors should be brought to the attention of the other team members.

c. Management: Should this occur, the organization would call a meeting and discuss the causes of the server instability, along with possible solutions.

**4. Deviation from Software Engineering standards**

a. Mitigation: While it is possible to deviate from software engineering standards, it is unlikely to occur. All team members have a full understanding of the software process, and how we plan to implement them in the process.

b. Monitoring: Technical reviews involving comparison between documentation and the actual project will help to determine if deviation will occur. All relevant documents must be as complete and accurate as possible to ensure that work will conform to expressed software engineering standards.

c. Management: Should deviation occur, steps must be taken to guide the project back within the standards expressed in accompanying documents. Technical reviews help to determine what must be done to keep the project in line with established software engineering standards.

## 3.4 Implementation

### 3.4.1 Modules

**Firebase Cloud Database**

A non-conventional database with key value pair as its unit, firebase provides us facility to read and write the data on cloud. It is easier format as compared to typical MySql database with an easy to understand schema and read and write operations.

The database stores unique id of each device which is registered to the application and the number of the emergency contacts of the user and the current location. Firebase uses its utility to extract the token from device. This token is further used to send notification to the devices on the press of panic button.

**Firebase Cloud Messaging**

A notification is sent to the emergency contact number registered to the user. This notification is sent via firebase cloud messaging services the token extracted from the devices is used as unique identifier to receive the notification from other devices.

It receives the data from node server hosted on google cloud platform. This data is nothing but the location of the user in distress. It feeds the location to next activity which triggers the map activity of the application.

**Application Server Node.js**

The server is connected to all the users and receives data from the device in form of JSON. This JSON contains sender and receiver toke obtained from firebase and the current location of the user in distress.

The Server then parses the JSON file to extract value where it uses the firebase SDK to send the notification further to devices or the subscribers.

**Google Cloud Platform**

A windows 2008 R2 instance runs the node.js server. It contains node.js installed on it with firebase SDK linked with node server. This helps the user stay connected all the time.

**Current Location**

To find the current location we integrated google play services in our application. It allows us to integrated google maps into the application. The current location is then found using the google maps through its functionalities.

It requires following permissions to be included in the manifest file:

1. Internet: As current location requires access to the internet permission has to be included.
2. Access Fine Location: It is included to get more refine and accurate location correct to the maximum extent.

The integration of Maps involves the acquiring of a access key to get access to google maps. The key is acquired by registering a project to the google API console to get the key to various google api's and services to be used. The access extent has to be specified that is what all functionality can the application access through its key.

The following module displays the current location sends the location to the panic activity so that it could be sent as a notification.

**Direction**

This module integrates all functionality of current location module as it too requires to generate the current location except sending the notification. It receives the notification which carries a location message. Its uses that location and the currently generated current location to find the shortest distance between the two.

It requires the integration of Direction API from google console which provides the application with a json consisting several small point the would comprise the root containing the distance

coordinates time to travel etc. between them. This json is used to decode the encode polyline that is the actual shortest route between the two. The returned json that we receive from google console is the currently available path.

It requires the same permissions as above and It also uses the API key acquired for google maps.

The json can be obtained from following link:

https://maps.googleapis.com/maps/api/directions/output?parameters

The parameters are origin, destination and the API key.

**Wristband Module**

For the wrist band module, we have used a raspberry pi 3b microcontroller that has 40 gpio pins that would be enough to incorporate all the functionalities of a wristband. We have attached a LCD screen to the raspberry pi which is used to display the date and time to the user. Library used for configuring the LCD:

- Adafruit_LCD

We could easily configure the LCD to display other features as well. We connect a button to the raspberry pi that is used to generate the distress signal. There are two ways in which a button press can be detected:

- Polling: Polling checks the state of the GPIO pin while iterating through the loop.
- Interrupts: This event fires when the state of the GPIO pin changes.

The wristband has been integrated with the firebase database. We could directly store and retrieve location without connecting it with a phone. This is helpful if we want to create a standalone product.

The wristband module uses socket programming to connect to the mobile phone and send SOS signal. The IP address along with date and time gets stored in the firebase database for future study to generate vulnerable areas.

We could also use pyfcm package of python to directly send notification to mobile phones using the API key generated by the Firebase console. Other modules could also be integrated with the wrist band to suit the user's need. Integration with a fitness band is also feasible since it could be used to track your physical activities along with sleep pattern recognition.

### 3.4.2 Process Flow

### Current Location

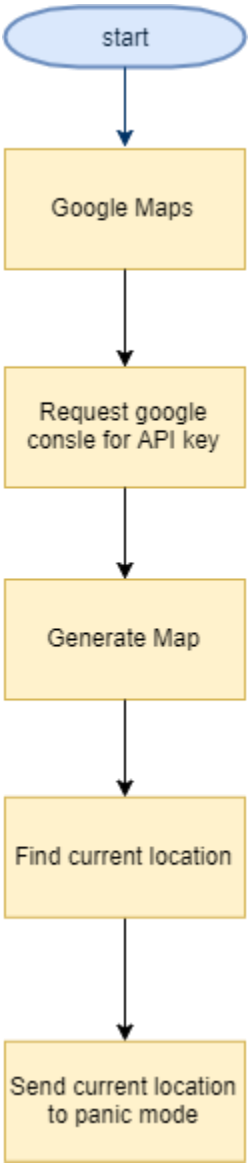


**Figure 3.9 Current Location**

**Direction**

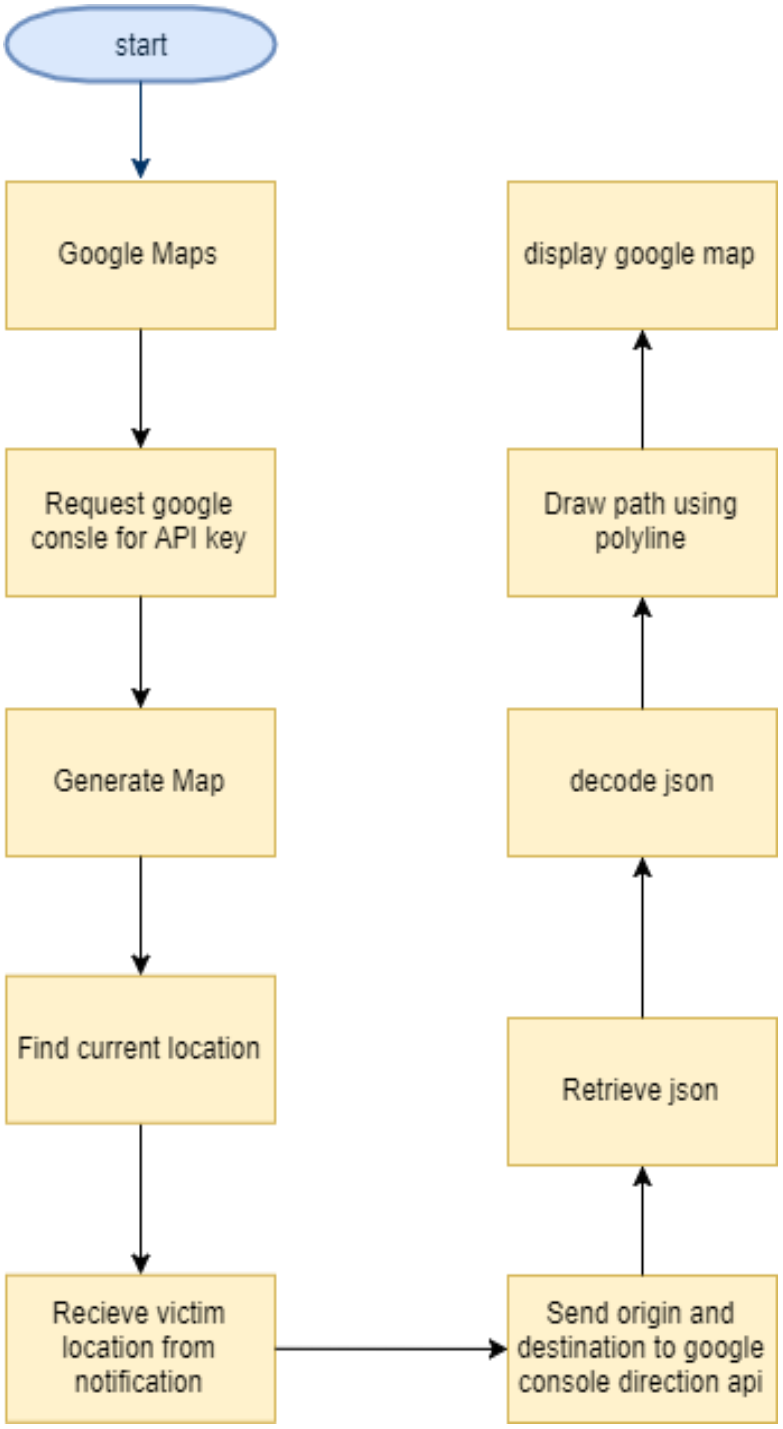


**Figure 3.10 Process flow direction**

## Wristband Module

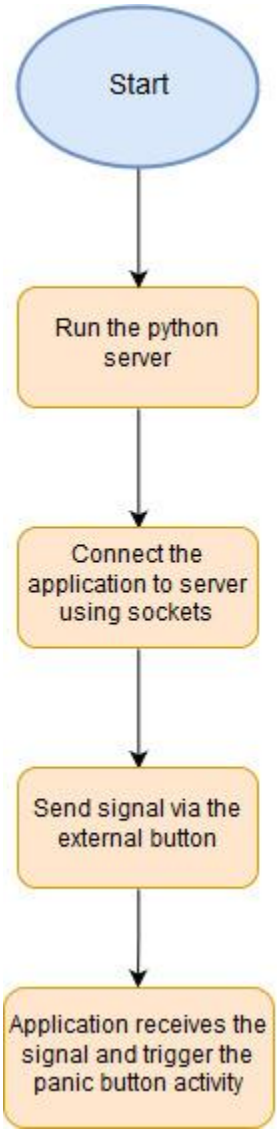


**Figure 3.11 Wristband Process Flow**

**Notification**

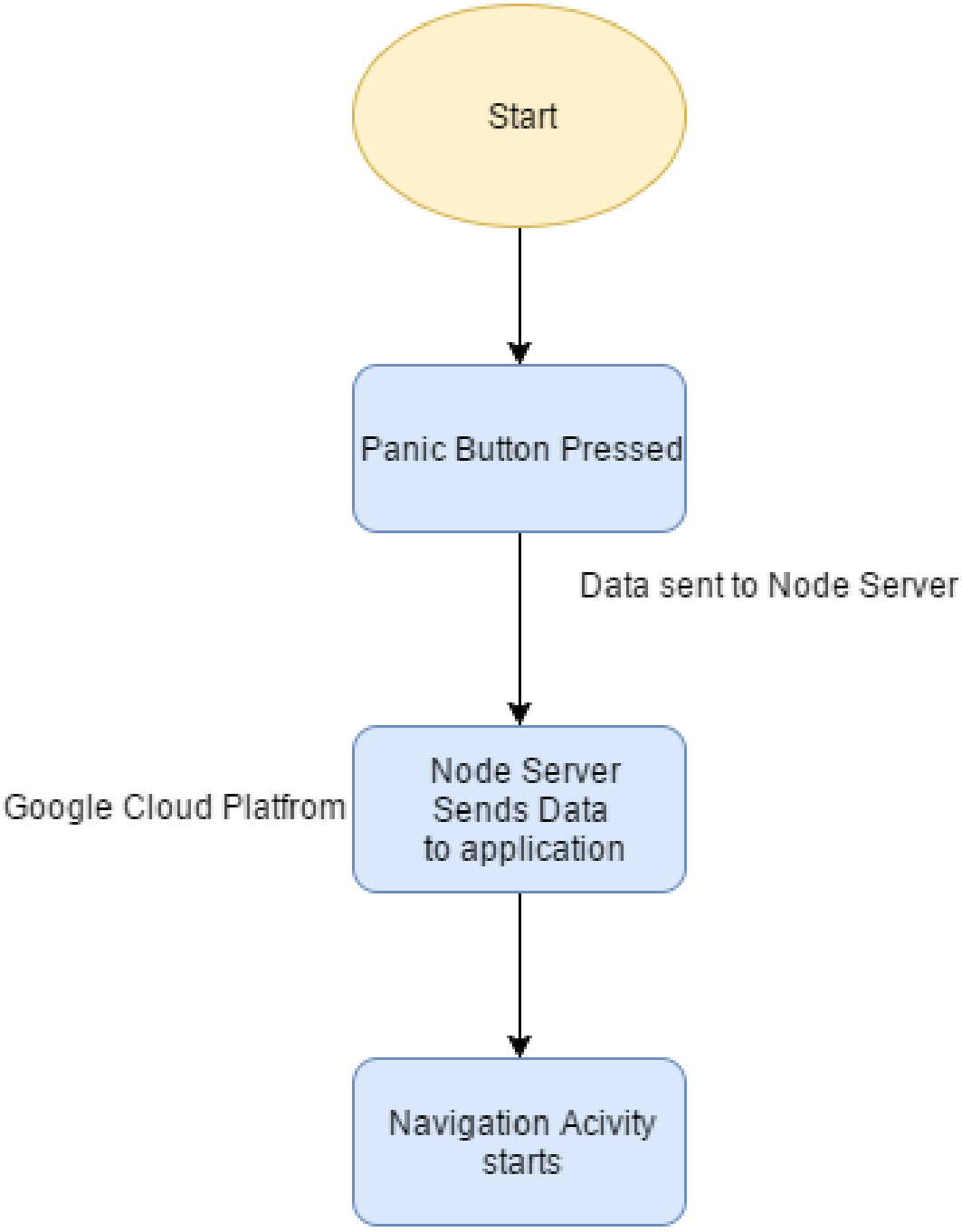


**Figure 3.12 Notification process flow**

### 3.4.3 Software System Attributes

**Reliability**

The reliability of the system depends upon the successful delivering of the location of the person in need and the success mapping of the client's location on the google maps and delivery of the shortest distance between them. The application has significantly high success rate. The API's used in the application help ensure high reliability.

**Availability**

The application is available all the time with only one specific requirement the device must be connected with whichever way possible.

**Security**

The application doesn't have a significant security requirement as it is meant for rescue operation however required data security must be ensured as the subscriber information shouldn't fall in wrong hands and any manipulation of data may lead to the distress signal being sent to wrong person that cause failure of software.

**Maintainability**

The software is a simple android application and requires only lower level of maintenance. It can be easily modified, debugged and upgraded.

**Portability**

The software is an android application which can installed and run on any android device with os above version 4.0 using the apk file.

### 3.4.4 Validation

#### 3.4.4.1 Overview

Testing is an investigation conducted about the quality of the product or service under test. It can be stated as the process of validating and verifying that a computer program/application/product: meets the requirements that guided its design and development, works as expected Success of any application depends on how it interacts with user through its user interface, how the user actions are performed to access application's features and whether application responds in functionally correct manner. An application with incorrect behavior or invalid user interaction can lead to huge problems. Testing is a process to test application's user interface and to detect if application is functionally correct. Testing involves carrying set of tasks and comparing the result of same with the expected output and ability to repeat same set of tasks multiple times with different data input and same level of accuracy.

It includes how the application handles keyboard and mouse events, how different components like menu bars, toolbars, dialogs, buttons, edit fields, list controls, images etc. reacts to user input and whether or not it performs in the desired manner. Implementing testing for our application early in the software development cycle speeds up development improves quality and reduces risks. Testing can be performed manually with a human tester.

#### 3.4.4.2 Test Cases

1. Test Name: Subscriber Registration
   Test Description: The part application add the subscriber to the firebase. It mention's the relatives phone number of the victim which must be among the users of the application.
   Result: The subscriber added to firebase
2. Test Name: User Registration
   Test Description: The part application add the user to the firebase.
   Result: The user added to firebase

3. Test Name: Current location

   Test Description: It uses google maps to generate the current location for further use.

   Result: The current location is displayed and map is generated.

4. Test Name: Panic Mode

   Test Description: The application waits for the button to be pressed so that the current location can be sent to the server for further transfer

   Result: As panic button is pressed the location is sent.

5. Test Name: Direction

   Test Description: It obtains the victims location from notification and gives beep signal to notify that help is needed. It generates the person,s location also and find the shortest route between them using direction API.

   Result: The direction are shown.

# 4. Results and Discussion (Screenshots)

## Firebase

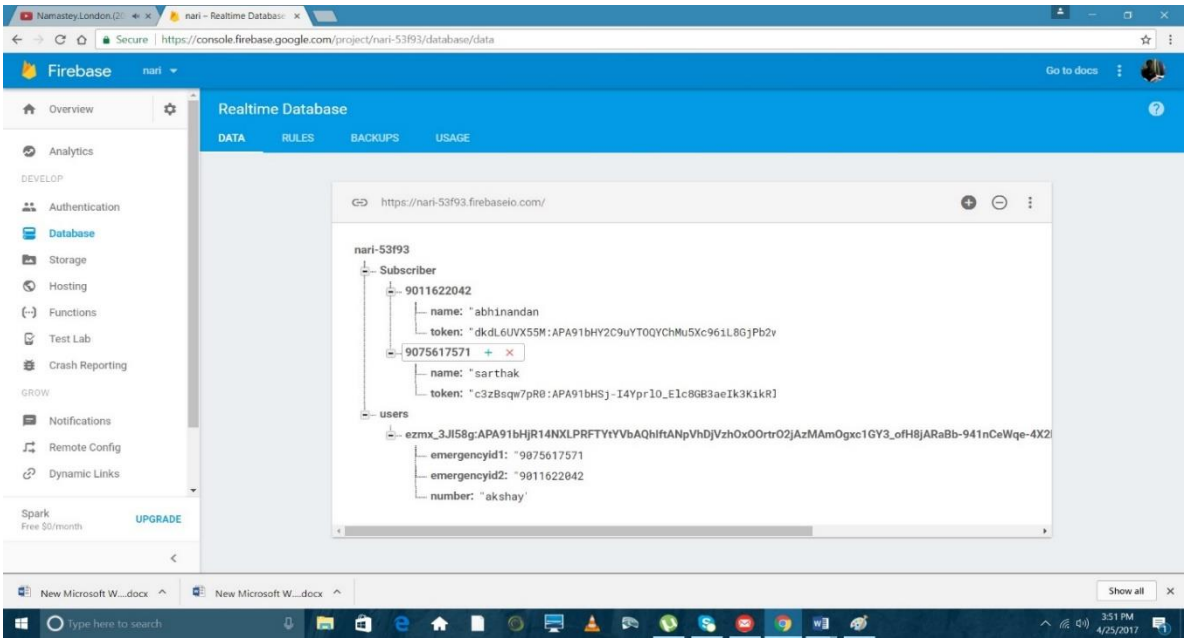


**Fig:-4.1 Firebase console**

## API Manager (API Keys)

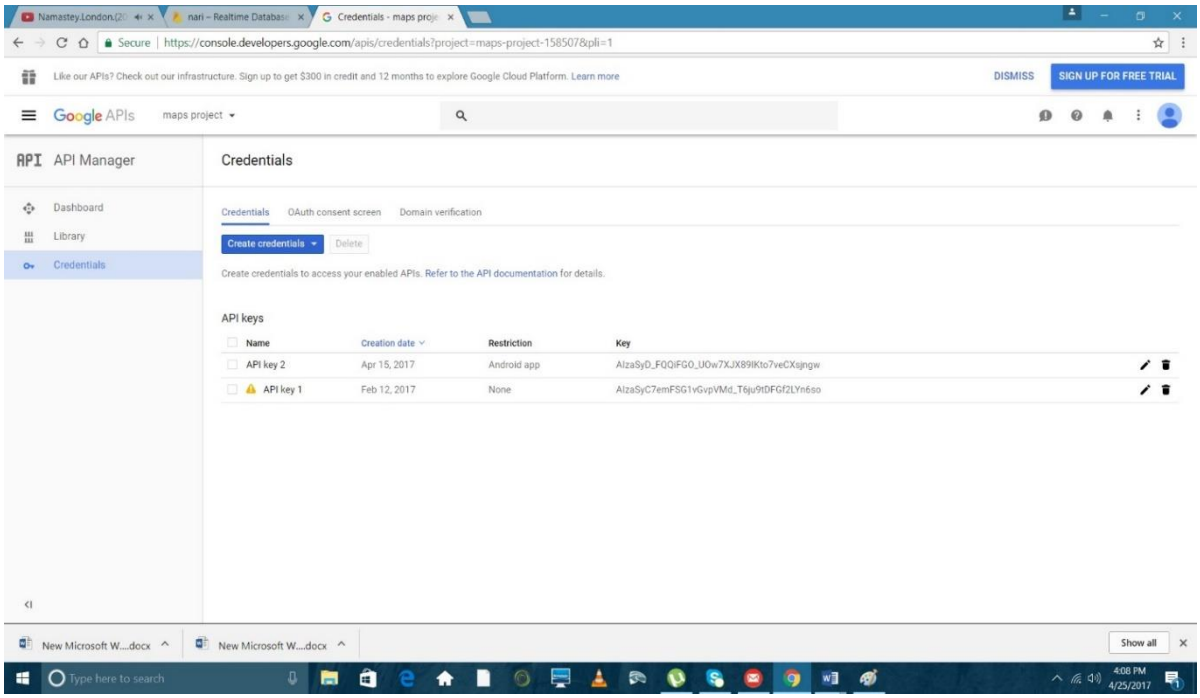

**Fig:- 4.2 API Manager**

## Application

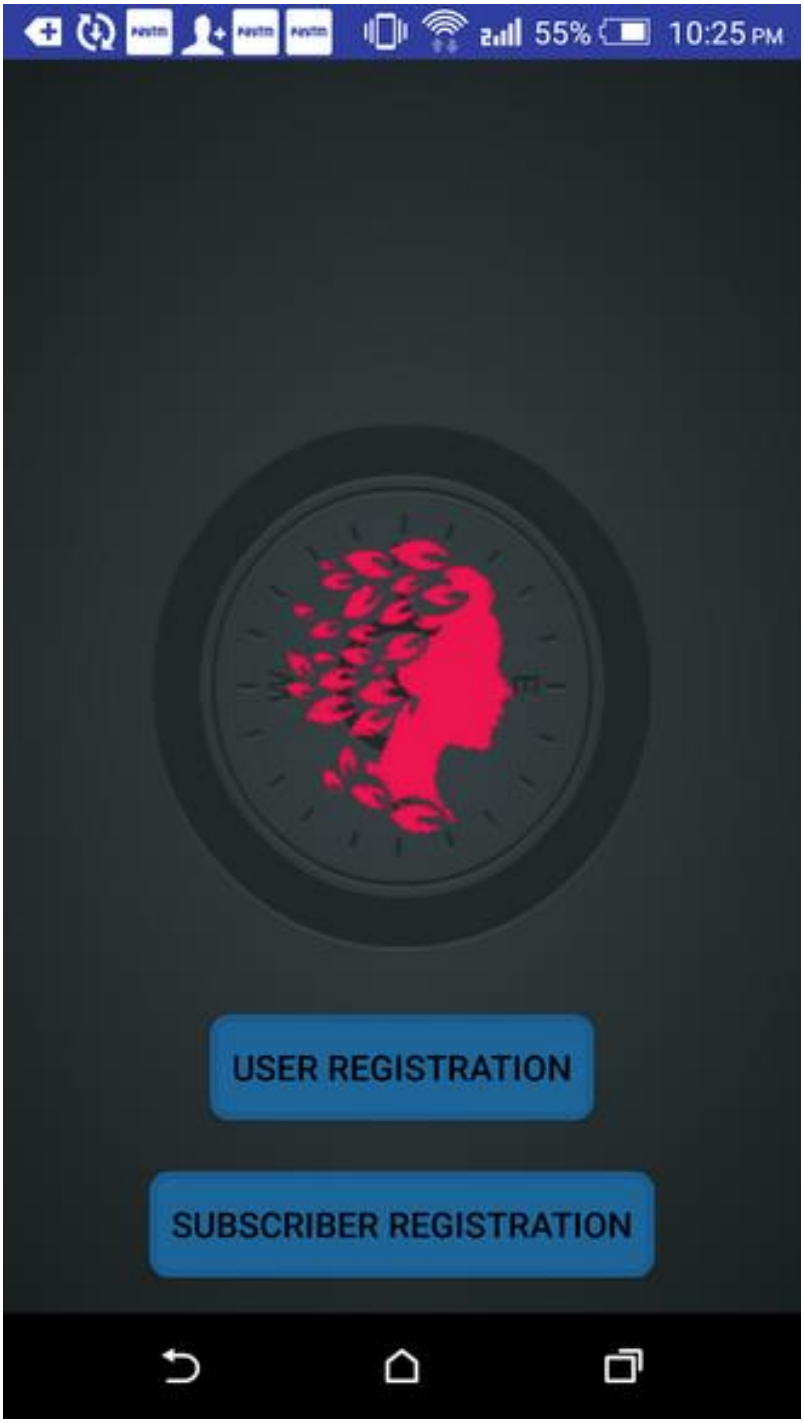


**Fig 4.3 Start Page**

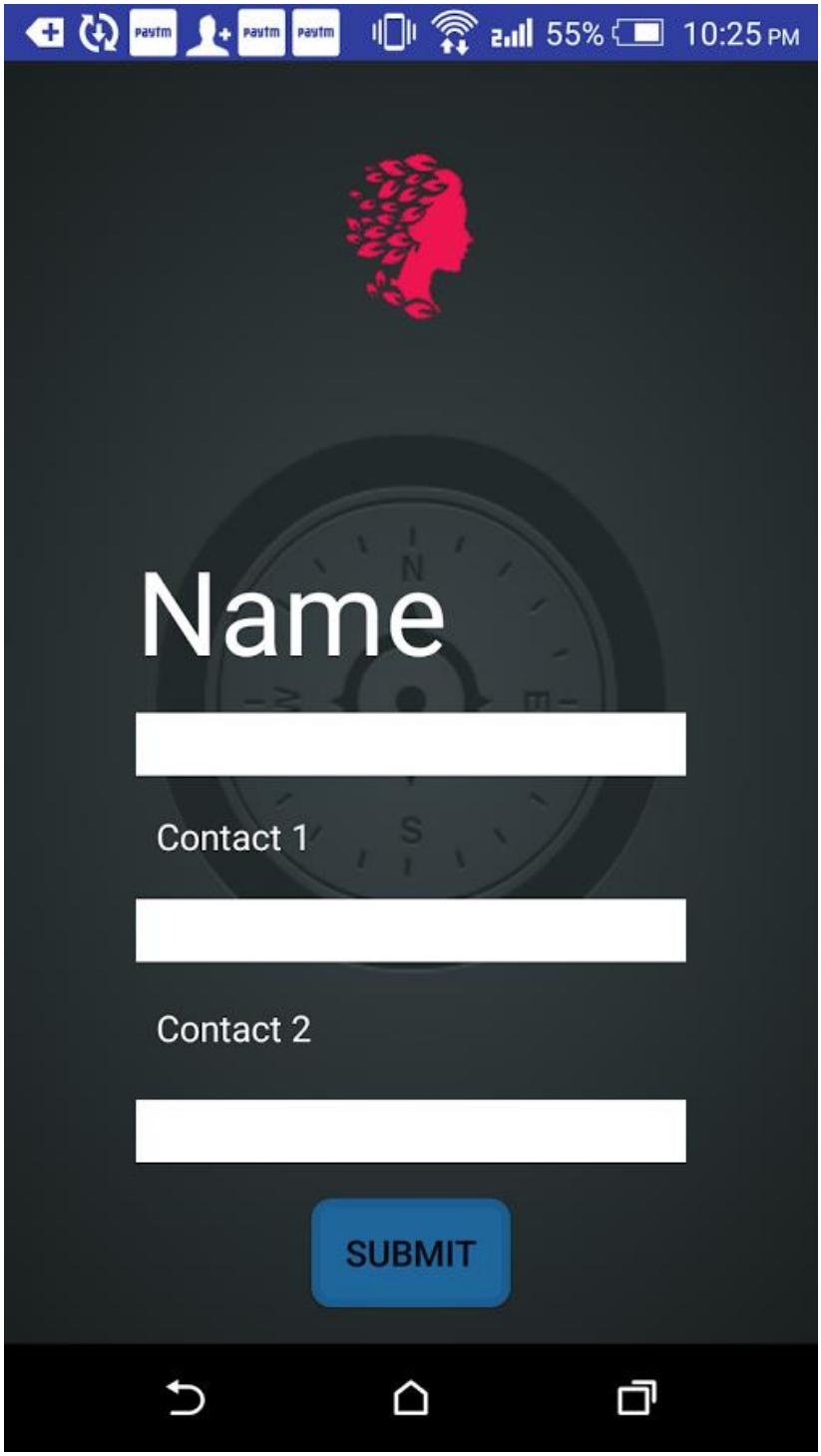


**Fig:- 4.4 User Registration**

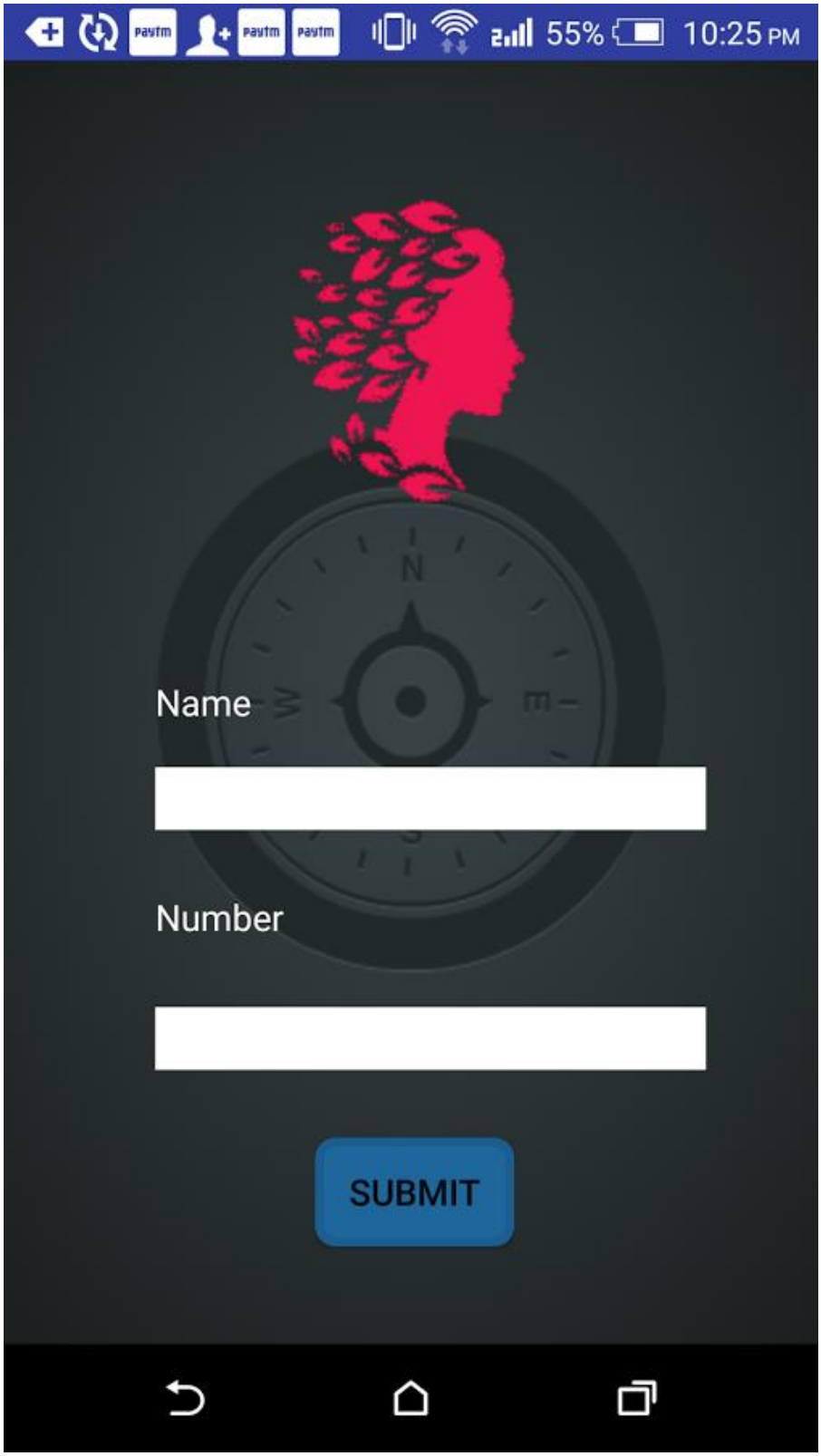


**Fig:-4.5 Subscriber Registration**

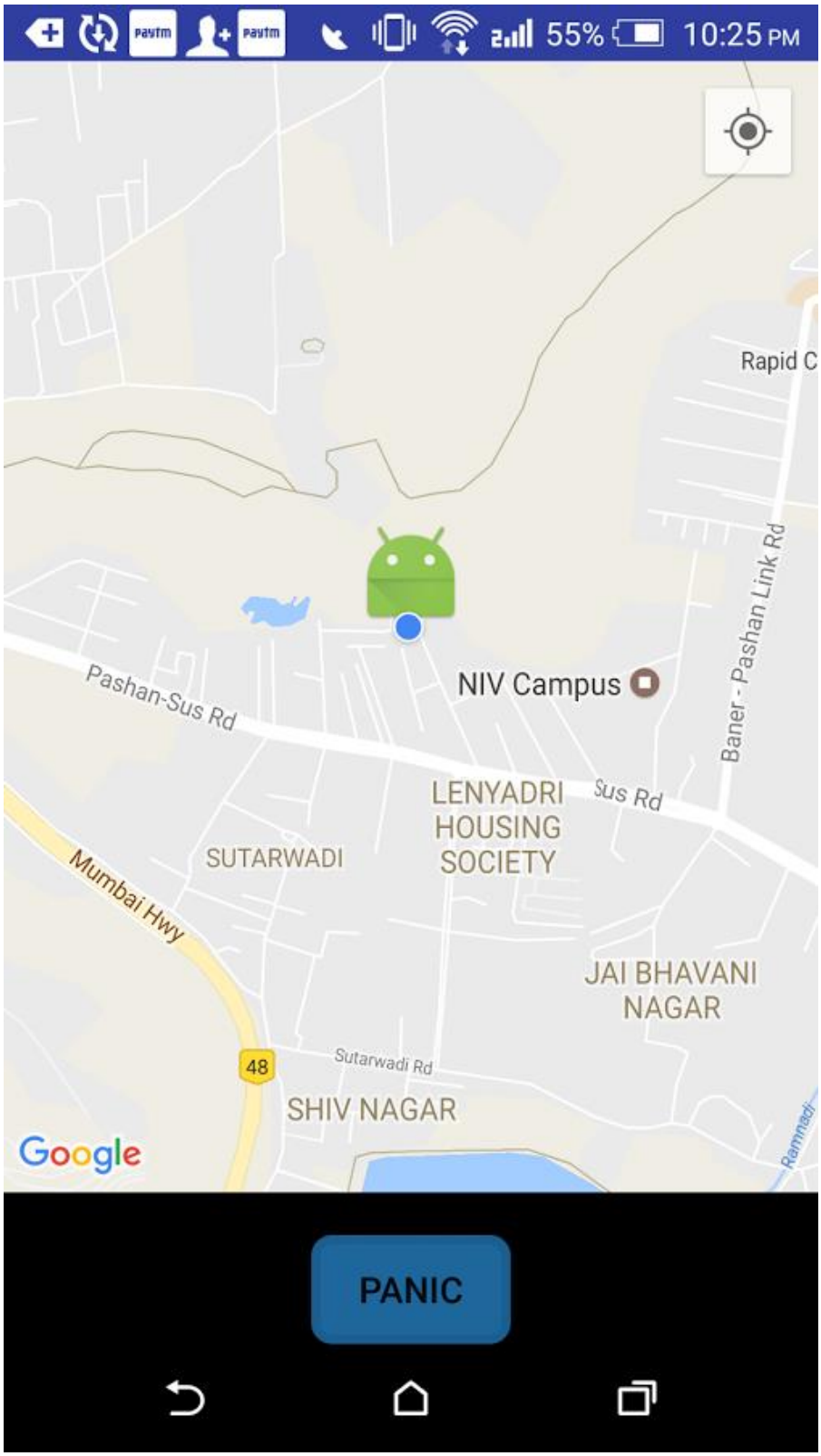


**Fig:- 4.6 Panic Button**

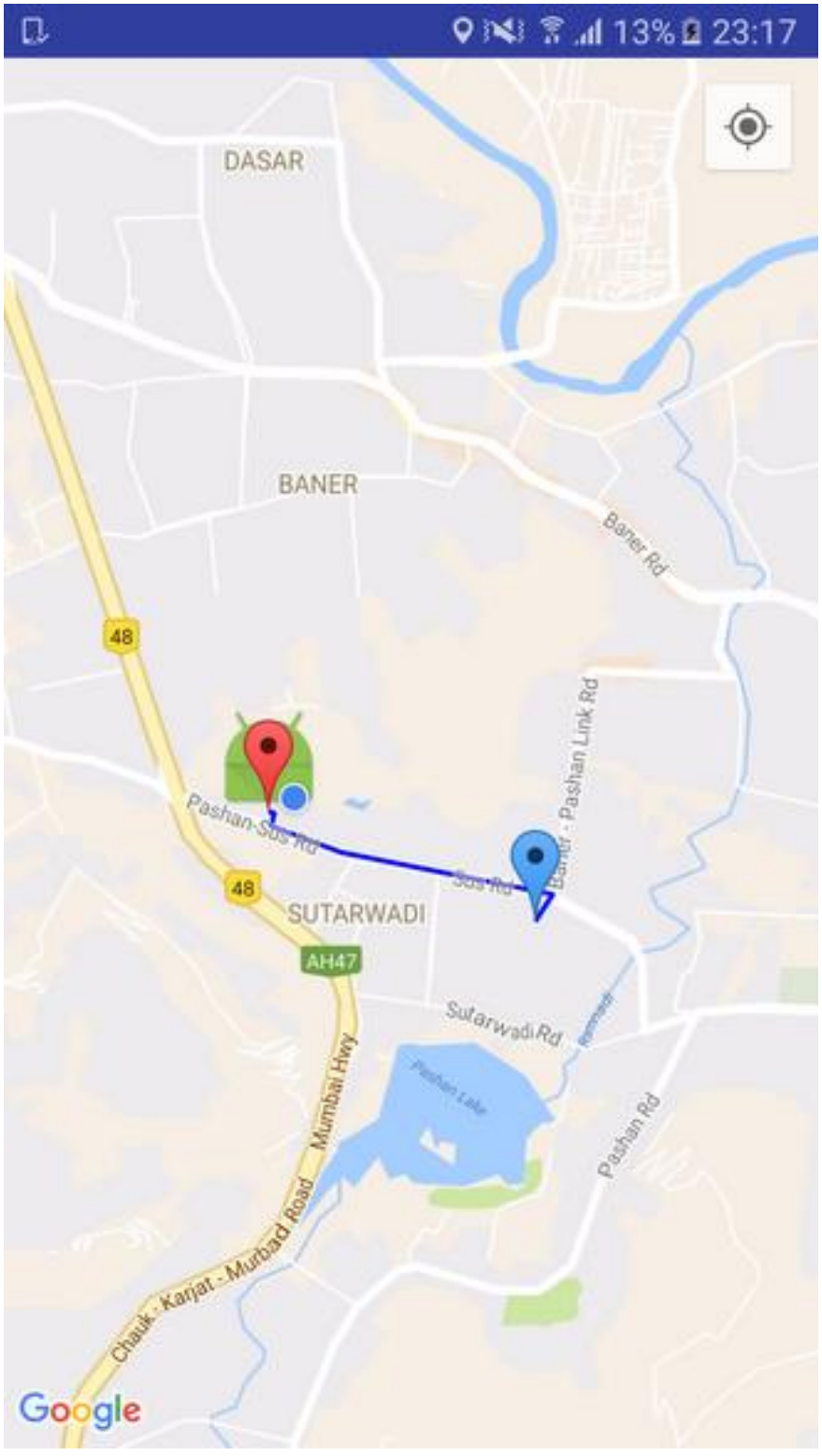


**Fig:- 4.7 Direction**

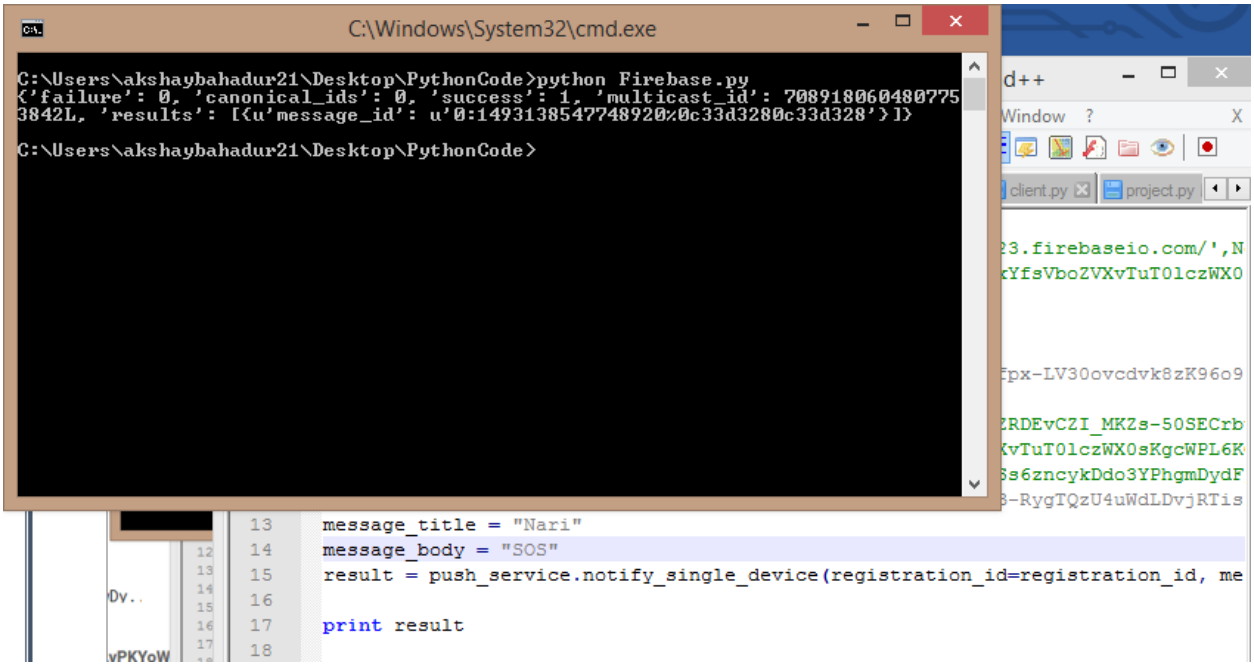


**Figure 4.8 Notification through RPi**

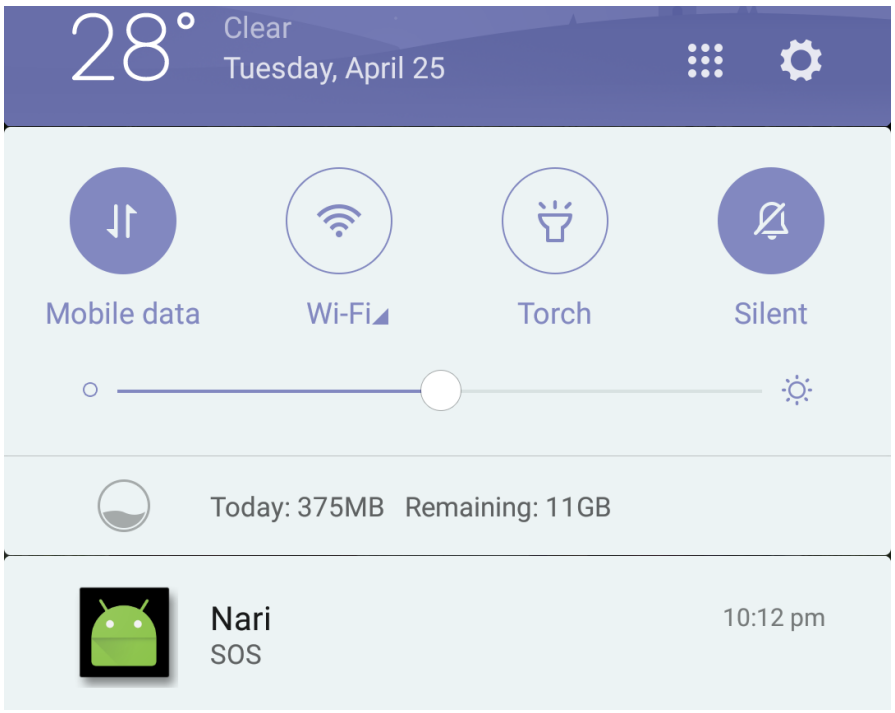


**Figure 4.9 Received Notification**

# 5. Conclusion and Future Work

## 5.1 Conclusion

The development of the project NARI has been wonderful learning experience for us as it took us through various phases of project development and application development in the world of software engineering. The thrill of tackling the problems involved and dealing with various bugs and logic issues gave us the feel developer industry.

We gained a lot of knowledge about the working, structure and uses of API's, google console like firebase, Google Maps, client and server, android OS, Raspberry pi, and several hardware component like bread-board among others and various technologies and platforms.

The was aimed to provide a safety equipment for women so that they can always stay connected to their relatives and friends and can send them a message stating their location and direction to the location whenever the need arises.

While making the application we kept in mind to make it user friendly so that everyone can use it without any significant trouble. Just like in case of software development where there are always some shortcoming and room for improvement this application has it too. Application has been analyzed, designed, developed, tested, and deployed successfully.

Other uses of application:

1. Shipment tracking
2. Alarming purpose in industry
3. Children Monitoring
4. Defence for tracking regiment location to determine strategies.
5. Rescue means for rock climbers as well as other adventure sport enthusiasts.

We sincerely hope to generate awareness amongst the society members and promote woman empowerment. Even if a fraction of previously ignorant people are educated through the means

of this application, we would consider our job to be successful. By means of this application, we hope to create a safe and stable environment for women throughout India thus helping it to achieve greater goals. Because of the advanced times, it is of paramount importance that India gives greater importance towards woman safety as well as gender equality. This application just provides a bridge to fill that gap. However, we hope to change the parochial mindset of the individuals of the society and get them to act against the social stigmas that have been crumbling the very foundation of position of women in the Indian society.

## 5.2 Future Scope

Although we tried to cover almost all of the aspects during our developmental phase, however we were forced to leave some aspects because of lack of time as well as monetary and other reasons.

Just like in the field of software development where there are always some shortcomings and room for improvement our application can be enhanced further:-

1. Size of band can be reduced and can be made slimmer and more comfortable to carry.
2. The application can include various government organization to help act faster.
3. The dataset obtained from the application can be used for predictive analysis to determine prone areas and include special method for tackling the problem in those areas.
4. Emergency signal in case of network failure and internet connection loss.
5. Tackling victim's movements.
6. Improved Google positioning system's precision.
7. The client part of application can be integrated in a single intelligent device.

For analysis purpose, we could use machine learning (ML) algorithms as well as data mining applications. There is a sub branch of machine learning known as time series analysis (TSA), which could be used to predict and analyze the data obtained through this application. Time series analysis is used to predict crop production as well as sales in different quarter.

## I. Glossary

**API (Application Programming Interface):** A set of functions and procedures that allow the creation of applications which access the features or data of an operating system, application, or other service.

**APK (Android Package Kit):** Android Package Kit (**APK**) is the package file format used by the Android operating system for distribution and installation of mobile apps and middleware. **APK** files are analogous to other software packages such as APPX in Microsoft Windows or Deb packages in Debian-based operating systems like Ubuntu.

**SDK (Software Development Kit):** A software development kit (SDK or devkit) is typically a set of software development tools that allows the creation of applications for a certain software package, software framework, hardware platform, computer system, video game console, operating system, or similar development platform.

**Server:** A server is a computer program that provides services to other computer programs (and their users) in the same or other computers. The computer that a server program runs in is also frequently referred to as a server. That machine may be a dedicated server or used for other purposes as well.

**Client:** A client is the requesting program or user in a client/server relationship. For example, the user of a Web browser is effectively making client requests for pages from servers all over the Web. The browser itself is a client in its relationship with the computer that is getting and returning the requested HTML file.

**Google Console:** Google Search Console (previously Google Webmaster Tools) is a no-charge web service by Google for webmasters. It allows webmasters to check indexing status and optimize visibility of their websites.

**GPS (Google positioning system):** GPS, which stands for Global Positioning System, is a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions, anywhere in the world.

**Firebase:** 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.

**JRE (Java Runtime Environment):** Java Runtime Environment (JRE) is a software package that contains what is required to run a Java program. It includes a Java Virtual Machine implementation together with an implementation of the Java Class Library.

**JDK (Java Development Kit):** The Java Development Kit (JDK) is an implementation of either one of the Java Platform, Standard Edition; Java Platform, Enterprise Edition or Java Platform, Micro Edition platforms[1] released by Oracle Corporation in the form of a binary product aimed at Java developers on Solaris, Linux, macOS or Windows. The JDK includes a private JVM and a few other resources to finish the development of a Java Application.

**Socket Programming:** SOCKET PROGRAMMING AND JAVA.NET CLASS. Asocket is an endpoint of a two-way communication link between two programs running on the network. Socket is bound to a port number so that the TCP layer can identify the application that data is destined.

.**Python 2.7.3:** Python is a widely used high-level programming language for general-purpose programming, created by Guido van Rossum and first released in 1991. An interpreted language, Python has a design philosophy which emphasizes code readability (notably using whitespace indentation to delimit code blocks rather than curly braces or keywords), and a syntax which allows programmers to express concepts in fewer lines of code than possible in languages such as C++ or Java.

**RPi(Raspberry Pi Model III):** The Raspberry Pi is a small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside of its target market for uses such as robotics. Peripherals (including keyboards, mice and cases) are not included with the Raspberry Pi. Some accessories however have been included in several official and unofficial bundles.

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