# IoT Based Safety Gadget for Child Safety Monitoring and Notification

Team id:PNT2022TMID08717

SUBMITTED BY

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**In partial fulfilment for the award of the degree of
BACHELOR OF ENGINEERING
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Dr. MAHALINGAM COLLEGE OF ENGINEERING AND TECHNOLOGY An
Autonomous Institution Affiliated to ANNAUNIVERSITY CHENNAI – 600 025**

# CHAPTER-I

# INTRODUCTION

## 1.1 PROJECT OVERVIEW

The project is IoT Based Safety Gadget for Child Safety Monitoring & Notification. It is mainly streamed towards child safety solutions by developing gadget that can be used to monitor the child.

## 1.2 PURPOSE

Child safety and tracking has been a huge concern due to the surge of the number of crimes on children. Hence the purpose of this project is to provide an application that can be used to ensure the safety of a child.

## 2. LITERATURE SURVEY

### 2.1 Existing problem

In today's world the crime rate associated with children keeps increasing on a large scale due to which a lot of attention has to be given on child's safety. Reports say that for every 40 seconds, a child goes missing in this world. The crime rate associated with children has been constantly increasing. Hence there is a need to find a solution which monitors the child's activities. The application constantly tracks the child and notifies their parent.

### 2.2 References

#### 2.2.1 Paper 1:

Smart IOT Device for Child Safety and Tracking

Child safety and tracking is a major concern as the number of crimes on children are reported nowadays. With this motivation, a smart IoT device for child safety and tracking is developed to help the parents to locate and monitor their children. The system is developed using Link It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules.

Paper 2:

Child Safety Monitoring System Based on IoT

The overall percentage of child abuse filed nowadays in the world is about 80%, out of which 74% are girl children and the rest are boys.

For every 40 seconds, a child goes missing in this world. Children are the backbone of one's nation, if the future of children was affected, it would impact the entire growth of that nation.In our system, we provide an environment where this problem can be resolved in an efficient manner. It allows parents to easily monitor their children in real time just like staying beside them as well as focusing on their own career without any manual intervention.

Paper 3:

IoT-based Child Security Monitoring System

Nowadays, the crime rate associated with children keeps increasing due to which draws peoples' attention regarding child safety. This research is conducted to propose a child security smart band utilizing IoT technology. Online questionnaires and semi-structured interviews are methodologies used to collect data. Through information obtained, a smart band has been proposed to monitor the safety of children. By this, parents know what is happening remotely and can take actions if something goes wrong.

Paper 4:

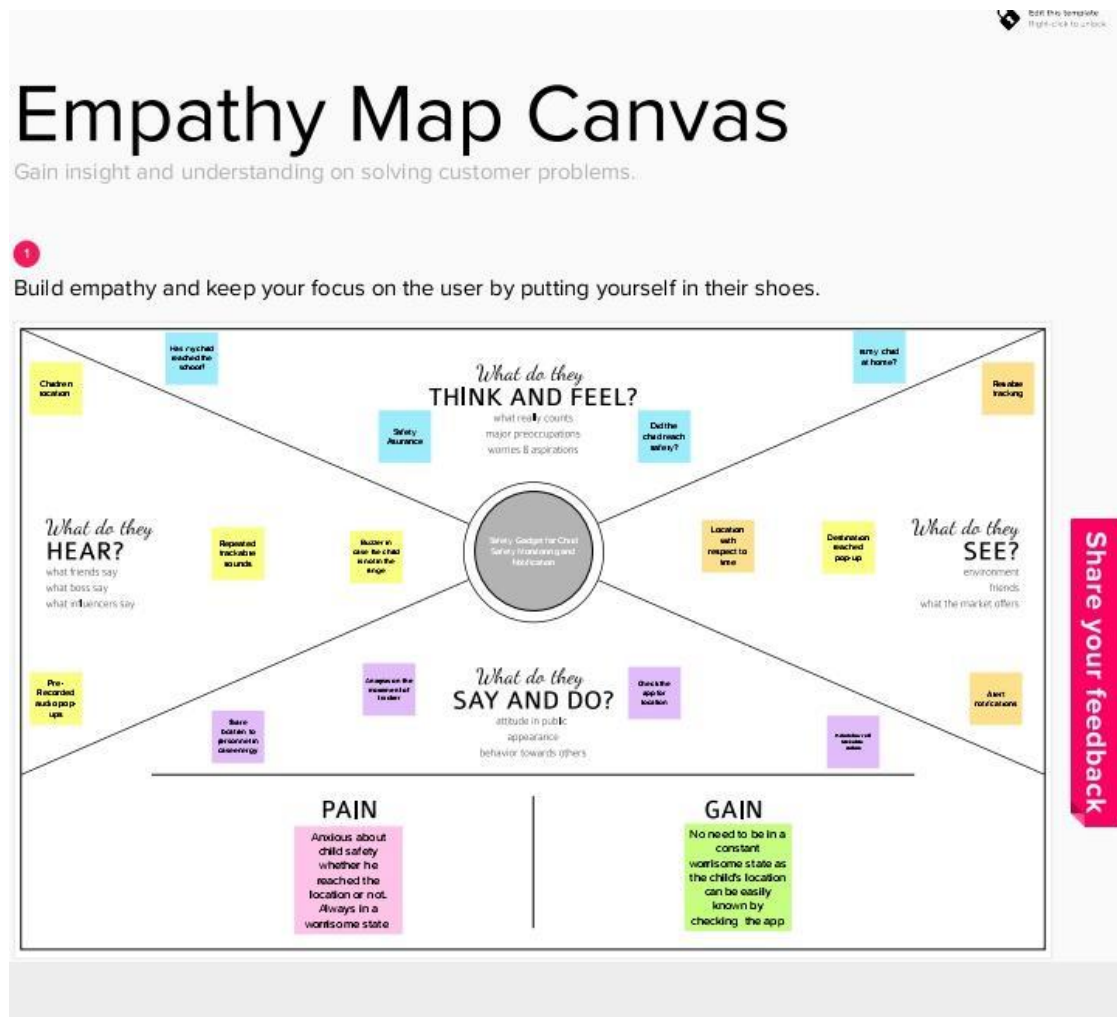IoT Based Smart Gadget for Child Safety and Tracking

This paper is mainly streamed towards child safety solutions by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM module calling for help. Parental android app is developed to manage and track the device anytime. Smart gadget device is always connected to parental phone which can receive and make phone calls and also receive SMS on gadget via GSM module, also a wireless technology is implemented on device which is useful to bound the device within a region of monitoring range, if device is moving out of monitoring range then an alert will be triggered on binding gadget, this helps you keep a virtual eye on child.

2.3 Problem Statement Definition

2.3.1 To design a child monitoring device using Internet of Things. This application is focused on ensuring the safety of children. It helps parent or guardian to constantly track their child's whereabout. It uses geo-positioning system that sends a notification to the parent or guardian whenever the child crosses the geofence.

# 3. IDEATION & PROPOSED SOLUTION

## 3.1 Empathy Map Canvas

# Ideation & Brainstorming

3.2 Proposed Solution

### 3.2.1 Problem Statement

A tracker that helps parents track a child's location so that the child does not get into dangerous situations.

### 3.2.2 Idea / Solution description

Child tracker helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geofence. Notifications will be sent according to the child's location to their parents or caretakers. The entire location data will be stored in the database.

### 3.2.3 Novelty / Uniqueness

A tracker used for child's safety and protection, such that it won't interfere with the day- to- day life of the child as well as be a very easy to use interface for parents has not been developed yet. Hence, the proposed solution will ensure that there is a device that can be used in all areas, and uses different sorts of software integrated together to maintain accuracy and ensure the safety of the child.

### 3.2.4 Social Impact / Customer Satisfaction

Reduce the anxiety, worry and nervousness of a parent when they are not around the child. Having a peace of mind on the child's whereabouts will increase customer

satisfaction, as well as the inclusion of an easy to use and interactive user interface. The reduction of child kidnappings, injuries, accidents, and missing children in the country.

3.2.5 Business Model (Revenue Model)Business to Consumer Model Licensing model Subscription Model Freemium Model

3.2.6 Scalability of the Solution

By adopting multiple data storage technologies, controlling the IoT data pipeline, and using automated bootstrapping we ensure that the device is highly scalable.

3.3 Problem Solution fit

# 4. REQUIREMENT ANALYSIS

4.1 Functional requirement

| CUSTOMER SEGMENT | CUSTOMER CONSTRAINTS | AVAILABLE SOLUTION |
|---|---|---|
| Government and Industries | • Lack of accurate information<br>• insufficient Technology | • Referring past experience/scenario<br>• Statistics modelling by formula<br>• Writing problem to find exact matching situation of past incidents |
| **JOBS-TO-BE-DONE / PROBLEMS**<br><br>• Need to know fall or rise in crude oil price of fore coming days<br>• Need to know approximated value of future crude oil price. | **PROBLEM ROOT CAUSE**<br><br>Instability of crude oil price otherwise called uncertainty about its behaviour which leads to loss of revenue that affects growth in GDP and industry of respective country. | **BEHAVIOUR**<br><br>Focus their major concentrate on precautions/ safety measure to make avoid unwanted losses |
| **TRIGGERS**<br><br>Sudden loss due to crude oil price falling.<br>**EMOTIONS**<br><br>BEFORE : Insecure, Ambiguity, Confused<br>AFTER : Anxiety, Sorrow, Hopeless | **YOUR SOLUTION**<br><br>By building neural network model with high accuracy, it will give certain about fall or rise in crude oil prices and predicts its upcoming value | **CHANNELS of BEHAVIOUR**<br>ONLINE :<br>Information will be conveyed rapidly to avoid further loss<br>OFFLINE :<br>Situation will be out of control, it will be too difficult to avoid loss. |

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|--------|-------------------------------|-------------------------------------|
| FR-1 | User Registration | Registration through Form<br>Registration through Email<br>Registration through Mobile number<br>Registration in person |
| FR-2 | User Confirmation | Confirmation via Email<br>Confirmation via OTP |
| FR-3 | Notifications | Email and SMS message |
| FR-4 | User Interface | Mobile app for parents<br>Web interface for registrations, record tracking, information and payment |

# 4.2 Non-Functional requirements

**Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

| FR No. | Non-Functional Requirement | Description |
|--------|----------------------------|-------------|
| NFR-1 | **Usability** | To find out whether the child crosses the geofence or not, upon which the parent/guardian of the child gets an alert. |
| NFR-2 | **Security** | Database security must meet HIPAA requirements. Extra security protocols and measures are also in place. |
| NFR-3 | **Reliability** | Webpage gets automatically logged out unless password has been saved in the Google account. In case of server crash data gets backed up beforehand. |
| NFR-4 | **Performance** | Site gets updated every 1 hour. Speed per transaction depends on the internet strength. |
| NFR-5 | **Availability** | Available world wide, and requires an internet source. |
| NFR-6 | **Scalability** | Short term scalability where memory is stored and erased, can be scaled to keep records in the future. |

# 5.PROJECT DESIGN

## 5.1Data Flow Diagrams

**DATA FLOW DIAGRAM:**



IoT Based Safety Gadget for Child Safety Monitoring & Notification
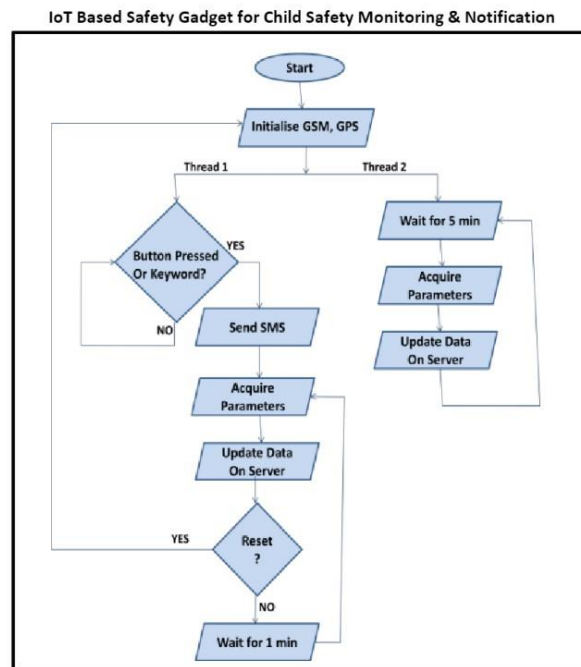
## 5.2Solution & Technical Architecture

**Technical Architecture:**

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2
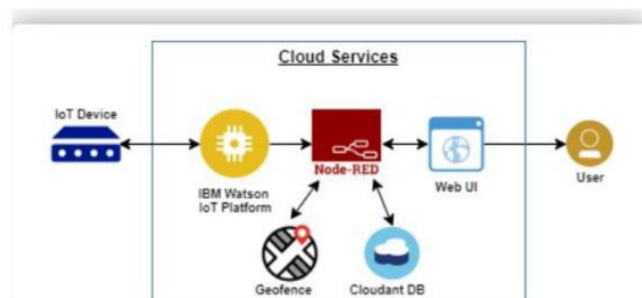
**Table-1 : Components & Technologies:**

| S.No | Component | Description | Technology |
|------|-----------|-------------|------------|
| 1. | User Interface | How user interacts with application e.g. Web UI, Mobile App, Chatbot etc. | HTML, CSS, JavaScript / Angular Js / React Js etc. |
| 2. | Application Logic-1 | Logic for a process in the application | Java / Python |
| 3. | Application Logic-2 | Logic for a process in the application | IBM Watson STT service |
| 4. | Application Logic-3 | Logic for a process in the application | IBM Watson Assistant |
| 5. | Database | Data Type, Configurations etc. | MySQL, NoSQL, etc. |
| 6. | Cloud Database | Database Service on Cloud | IBM DB2, IBM Cloudant etc. |
| 7. | File Storage | File storage requirements | IBM Block Storage or Other Storage Service or Local Filesystem |
| 8. | External API-1 | Purpose of External API used in the application | IBM Weather API, etc. |
| 9. | External API-2 | Purpose of External API used in the application | Aadhar API, etc. |
| 10. | Machine Learning Model | Purpose of Machine Learning Model | Object Recognition Model, etc. |
| 11. | Infrastructure (Server / Cloud) | Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration : | Local, Cloud Foundry, Kubernetes, etc. |

**Table-2: Application Characteristics:**

| S.No | Characteristics | Description | Technology |
|------|-----------------|-------------|------------|
| 1. | Open-Source Frameworks | List the open-source frameworks used | Technology of Opensource framework |
| 2. | Security Implementations | List all the security / access controls implemented, use of firewalls etc. | e.g. SHA-256, Encryptions, IAM Controls, OWASP etc. |

| S.No | Characteristics | Description | Technology |
|------|-----------------|-------------|------------|
| 3. | Scalable Architecture | Justify the scalability of architecture (3 – tier, Micro-services) | Technology used |
| 4. | Availability | Justify the availability of application (e.g. use of load balancers, distributed servers etc.) | Technology used |
| 5. | Performance | Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc. | Technology used |

# 5.3 User Stories

**User Stories**

Use the below template to list all the user stories for the product.

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|-----------|-------------------------------|-------------------|-------------------|---------------------|----------|---------|
| Customer (Mobile user) | Registration | USN-1 (FATHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Father. | I can access my account / dashboard and receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-2 (MOTHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Mother. | I can access my account / dashboard and receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-3 (GUARDIAN/ CARETAKER) | As a user, I can also monitor the children's activities using a safety gadget monitoring system. | I can access my account / dashboard and receive confirmation email & click confirm | Medium | Sprint-1 |
| | Login | USN-4 | As a user, I can log into the application by entering email & password. | I can access my account / dashboard. | Medium | Sprint-2 |
| | Dashboard | USN-5 | As a user, I can fix the geofence for my child's location so that I will receive alerts if my child crosses the geofence. | I can monitor the current location of my child. | High | Sprint-2 |
| Customer (Web user) | Registration | USN-1 (FATHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Father. | I can access my account / dashboard and receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-2 (MOTHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Mother. | I can access my account / dashboard and receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-3 (GUARDIAN/ CARETAKER) | As a user, I can also monitor the children's activities using a safety gadget monitoring system. | I can access my account / dashboard and receive confirmation email & click confirm | Medium | Sprint-1 |

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|---|---|---|---|---|---|---|
| | Login | USN-4 | As a user, I can log into the application by entering email & password. | I can access my account / dashboard. | Medium | Sprint-2 |
| | Dashboard | USN-5 | As a user, I can fix the geofence for my child's location so that I will receive alerts if my child crosses the geofence. | I can monitor the current location of my child. | High | Sprint-2 |
| Customer Care | Dashboard | USN-6 | As a customer care service person, whenever I receive a complaint, I forward the complaint and ensure that the complaint is resolved. | I can keep track of all the complaints and the status of the complaints received. | Medium | Sprint-3 |
| Administrator | Admin Dashboard | USN-7 | As an administrator, I will take care of all the payment processes, queries and complaints and login credentials. | I can access all the customer details, payment details and complaints received. | High | Sprint-4 |

# 6.PROJECT PLANNING & SCHEDULING

## 6.1Sprint Planning & Estimation

| TITLE | DESCRIPTION | DATE |
|---|---|---|
| **Literature Survey & Information Gathering** | Gather/collect the relevant information on project use case, refer the existing solutions, technical papers, research publications etc. | 30 AUGUST 2022 |
| **Prepare Empathy Map** | Prepare the empathy map canvas to capture the user Pains & Gains, Prepare list of problem statements | 5 SEPTEMBER 2022 |
| **Ideation** | List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance. | 12 SEPTEMBER 2022 |
| **Proposed Solution** | Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc. | 23 SEPTEMBER 2022 |

## 6.2 Sprint Delivery Schedule

| | | |
|---|---|---|
| **Functional Requirement** | Prepare the functional requirement document. | 16 OCTOBER 2022 |
| **Data Flow Diagrams** | Prepare the data flow diagrams and submit for review. | 18 OCTOBER 2022 |
| **Technology Architecture** | Draw the technology architecture diagram. | 13 OCTOBER 2022 |
| **Prepare Milestone & Activity List** | Prepare the milestones & activity list of the project. | 20 OCTOBER 2022 |
| **Project Development - Delivery Of Sprint-1, 2, 3 & 4** | Develop & submit the developed code by testing it. | IN PROGRESS |

**Project Planning Phase**

**Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)**

| Date | 18 October 2022 |
|---|---|
| Team ID | IBM-Project-17289-1659633579 |
| Project Name | IoT Based Safety Gadget for Child Safety Monitoring & Notification |
| Maximum Marks | 8 Marks |

**Product Backlog, Sprint Schedule, and Estimation (4 Marks)**

Use the below template to create product backlog and sprint schedule

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint-1 | Registration | USN-1 (FATHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Father. | 2 | High | Keerthi Priya |
| Sprint-1 | | USN-2 (MOTHER) | As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Mother. | 1 | High | Namshika |
| Sprint-1 | | USN-3 (GUARDIAN/CARETAKER) | As a user, I can also monitor the children's activities using a safety gadget monitoring system. | 2 | Medium | Aadithya Hariharan |
| Sprint-2 | Login | USN-4 | As a user, I can log into the application by entering email & password | 1 | Medium | Manickam |
| Sprint-2 | Dashboard | USN-5 | As a user, I can fix the geofence for my child's location so that I will receive alerts if my child crosses the geofence. | | High | Keerthi Priya Namshika Aadithya Hariharan Manickam |

# 1. CODING & SOLUTIONING (Explain the features added in the project along with code)

## 1.1 Feature 1

1.1.1 It is a website application.

## 1.2 Feature 2

1.2.1 It can be used as a mobile application by scanning the QR Code available on the website.

## 1.3 Feature 3

1.2.2 Using an account, a parent can create multiple accounts for their multiple children.

# 2. TESTING

## 2.1 Test Cases

8.1.1

| Test ID | Test Case | Test Steps | Test Data | Expected Results | Actual Results | Pass/ Fail |
|---------|-----------|-----------|-----------|------------------|----------------|------------|
| T01 | The child resides within the geofence. | Log in to the application. Click on any of the trackers that the parent has set for a specific child. | ['pramo dsrk120 @gmail. com',' O mSaiR a m0025' ] | The child stays within the geofence. | The child stays within the geofence. | Pass |

| | | Upon clicking on any tracker the child's location can be seen and tracked. | | | | |
|---|---|---|---|---|---|---|
| T02 | The child is outside the geofence. | Log in to the application.<br><br>Click on any of the trackers that the parent has set for a specific child.<br><br>Upon clicking on any tracker the child's location can be seen and tracked. | ['rajin ik anthm ur alidha ra n@gm ai l.com' ,' Sept @2 022'] | The child is not within the geofenc e. | The child is not within the geofenc e | Pass |

## 2.2 User Acceptance Testing
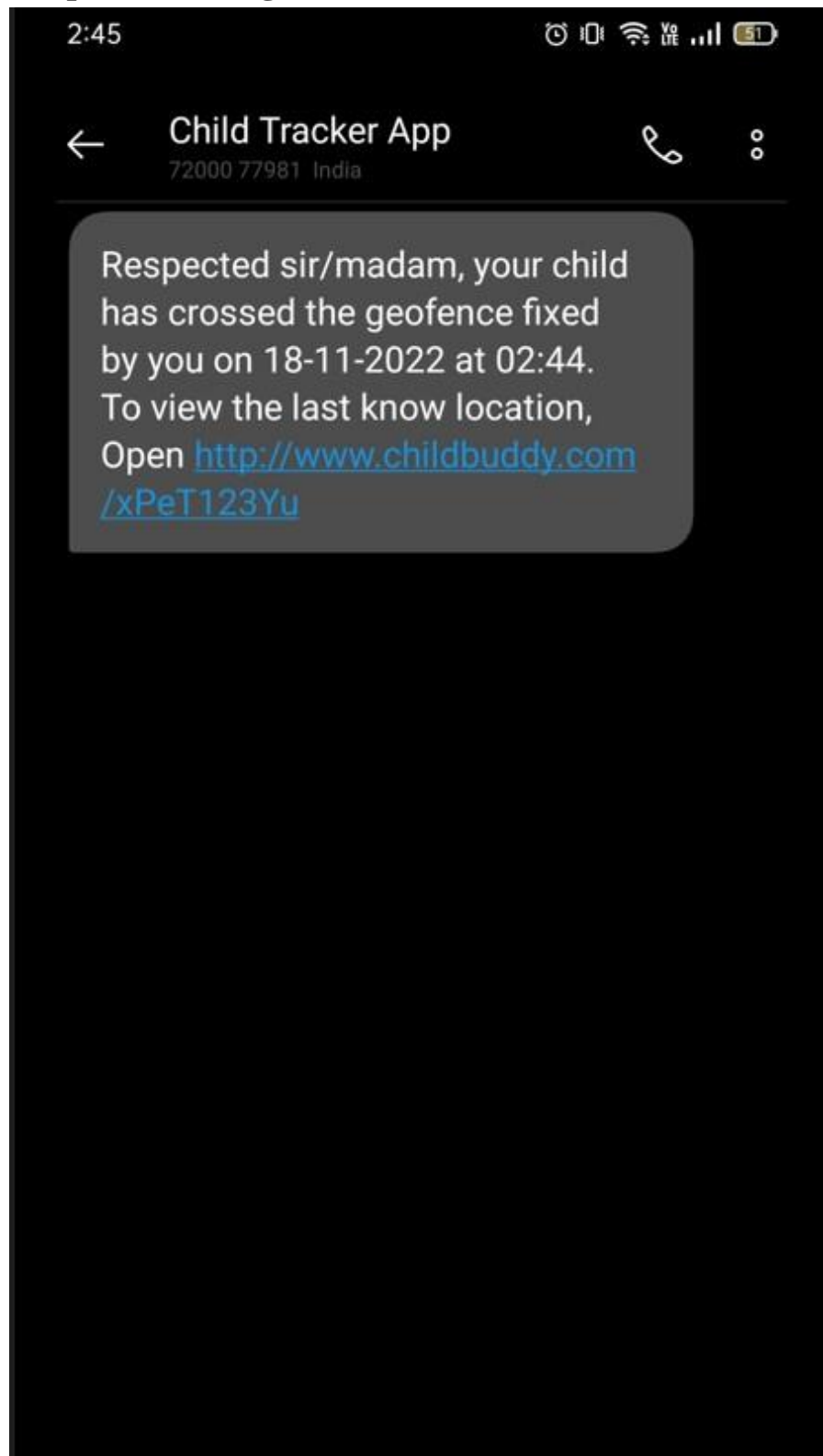
# 3. RESULT

## 3.1    Performance Metrics

- Fast update of child's location
- User Friendly interface
- Low data involvement

# 4. ADVANTAGES & DISADVANTAGES

## 4.1    Advantages

4.1.1    A parent can access the child's location 24x7.

4.1.2    It provides real time detection.

4.1.3    Parent receives instant notification when the child crosses the geofence.

4.1.4    Easy to use interface.

4.1.5    A parent can create as many as nodes for multiple children.

## 4.2    Disadvantages

4.2.1    Our application cannot be used without internet connection.

4.2.2    To access the child's location the parent has to access the web application.

# 5. CONCLUSION

5.1 A parent can access their child's location in a realtime way.The child tracker frequently updates the location of the child.Any parent can make use of this application to track their child after establishing a geofence around their child.Hence, this application serves as a platform that can be used to monitor a child and ensure safety of the child 24x7.

# 6. FUTURE SCOPE

6.1 The application can be made an offline application inorder for people to access their child's location in the absence of internet connection.

6.2 The application is currently a web based application.It has scope to be made into a hybrid application by making it into a native application.

# 7. APPENDI

**X Source**

**Code :-**

**GitHub**

**Link:-**

https://github.com/IBM-EPBL/IBM-Project-17289-1659633579

**Project Demo Link :-**

https://drive.google.com/file/d/1avAEVGkd5VMSJ0KSg0lKI6_g6TPiEu-Z/view?usp=sharing