

# **Project Report Format**

## **1. INTRODUCTION**

### **1.1 Project Overview**

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

### **1.2 Purpose**

- 1.2.1 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**

- 2.1.1 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 it's 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 LinkIt 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 cases 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

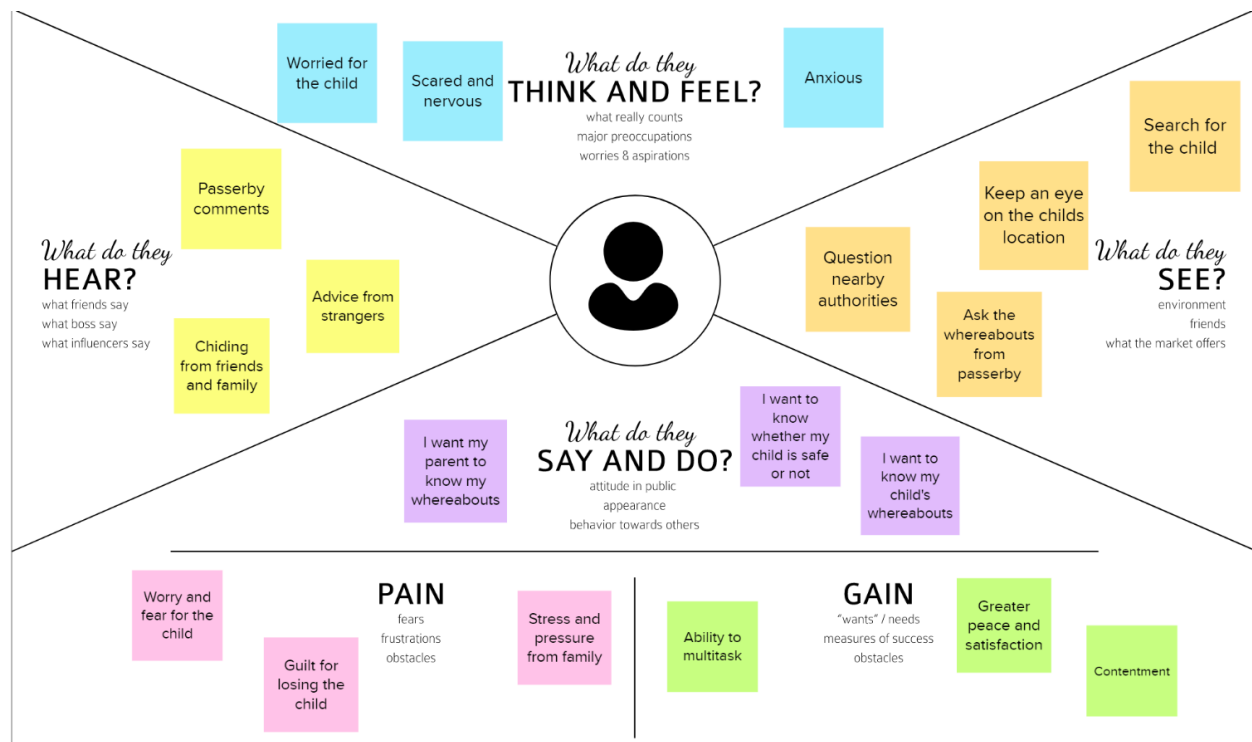
This paper is mainly streamer towards child safety solutions by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM module calling for help. Parental android app is developed to manage and track the device anytime. Smart 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 focussed on ensuring the safety of children. It helps parent or guardian to constantly track their child's whereabouts. 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



### 3.2 Ideation & Brainstorming

# Brainstorm

Write down any ideas that come to mind that address your problem statement.

## PROBLEM STATEMENT

How can we ensure a child's location?

Collect information about the child from the parents	Keep track of all the places that the child is to travel in a particular day	Collect details of the parents if they both parents are working
In case both the parents of the child are working, then get the information of the caretaker who takes care of the child.	Get the daily routine habits of the child.	Keep track of all the activities of the child.
Enable the parents to fix a geofence for the child.	Generate notifications if the child crosses the geofence.	Notify the parents about the child's location.

## IDEAS

Get the parent details of the child.	Determine and make note of all the spots and locations that a child visits on a daily basis.	Keep track of all the locations and time spent in the places that a child visits along with the distance of those places.
Get the occupation details of the child's parents.	Collect the statistics and determine whether both the parents are working or not.	In case both the parents are full-time workers then get the child's guardian details.
Make note of the habits of the child and establish a geofence for the child.	The child's activity is constantly monitored by making use of the GPS technology.	Push notifications or alert messages if a child crosses its geo-fence

## PROPOSED SOLUTION

Observe all the places that the child visits and keep track of it.	Roughly keep track of the timings that a child is present in a particular place.	Make note of the distance of all the places that a child frequently visits from its house.
Get the child's parent's details and collect the child's details alongside.	After collecting the details make note of the parent's occupation.	If both the parents are working then collect the information of the child's caretaker or guardian.
After making note of all the locations that a child visits, create a geofence for the child after asking for consent from their parents.	Use GPS technology to regularly monitor the child's location during its active hours.	Send alerts or warnings to the parent/guardian when the child supposedly moves out of the geofence.

Collect the medical information about the child to know if about the child's medical status.	Get the details of who is with the child taking care of the child at a particular time period.	Make note of the places that the child travels regularly and the distance of those places from the child's house.
Have an option to automatically fix the geofence for the child to well on the places visited by the child regularly.	Keep a security pin to fix the geofence so that only the parents can set the geofence of the child.	If the child moves out of the geofence notify through message.
If the child moves 50 meters away from the geofence notify through call.	In case of emergency that is if the parents and guardian's mobile phones are not reachable notify the caretaker via instant message for child moving along with the child and its parent details.	The entire location details that is all the locations that the child has traveled will get stored in the database.

## Data Collection and Preparation

Collect the data  
of the child,  
child's parents,  
and the  
guardian or  
caretaker

Get the details of  
the locations that  
the child travels  
regularly and the  
time of visit to a  
particular location.

Store entire  
location data  
of the child in  
the Cloudant  
DB

## Connection, Testing and Implementation

Objects are connected  
via internet for  
communication,  
interaction, exchanging  
data and making  
decisions automatically  
at anywhere and  
anytime.

Test whether the  
notification to  
the parent works  
when the child  
crosses the  
geofence.

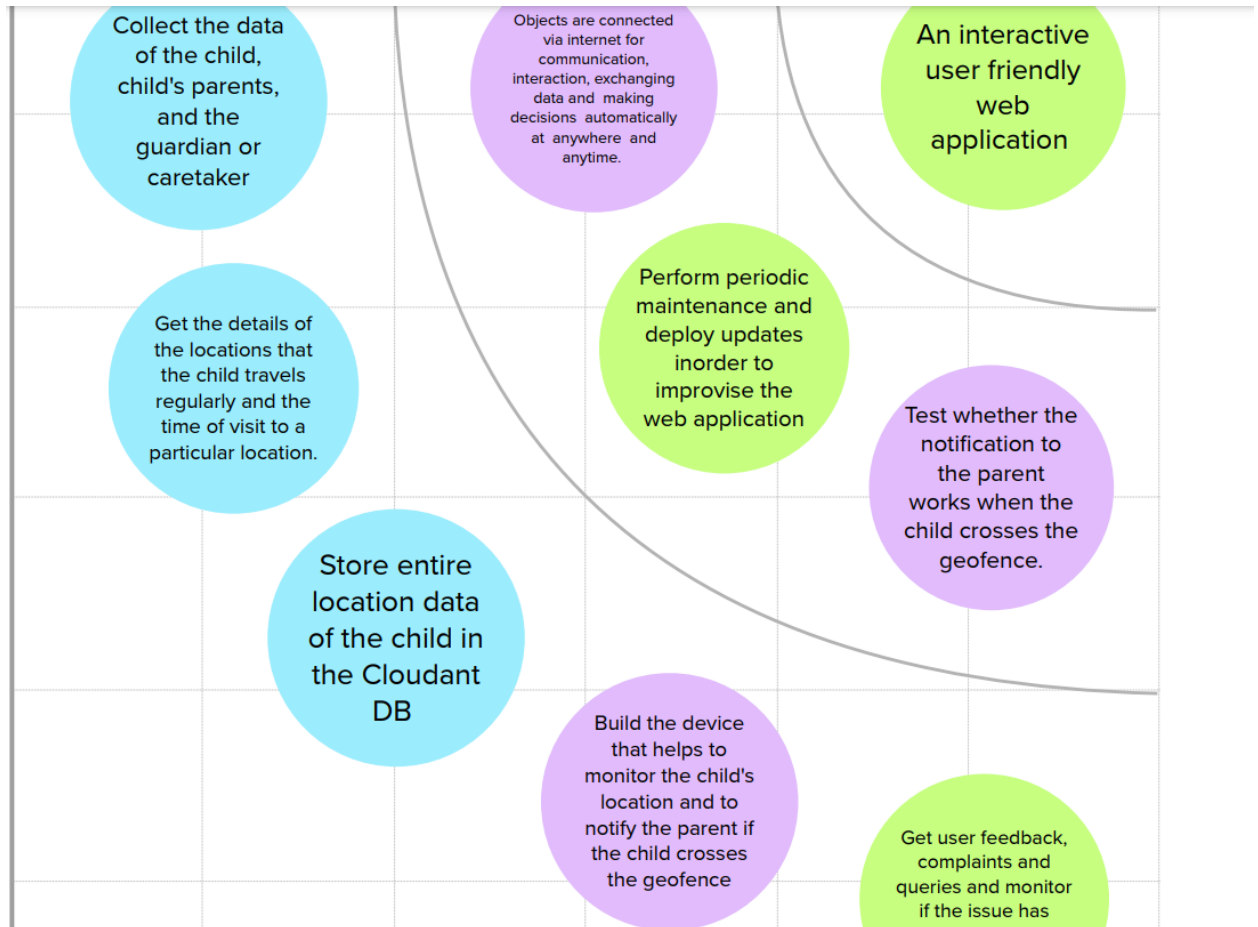
Build the device  
that helps to  
monitor the child's  
location and to  
notify the parent if  
the child crosses  
the geofence

## Work and Delivarables

An interactive  
user friendly  
web  
application

Get user feedback,  
complaints and  
queries and monitor  
if the issue has  
been resolved at  
the earliest.

Perform periodic  
maintenance and  
deploy updates  
inorder to  
improvis the  
web application



### 3.3 Proposed Solution

#### 3.3.1 Problem Statement

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

#### 3.3.2 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.

#### 3.3.3 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 softwares integrated together to maintain accuracy and ensure the safety of the child.

#### 3.3.4 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.

### 3.3.5 Business Model (Revenue Model)

Business to Consumer Model

Licensing model

Subscription Model

Freemium Model

### 3.3.6 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.

## 3.4 Problem Solution fit

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> Who is your customer? The customers are:- Working parents of 0-5 y.o. Kids Family members, caretakers, guardians and babysitters. <div>CS</div>	<b>6. CUSTOMER CONSTRAINTS</b> What constraints prevent your customers from taking action or limit their choices of solutions? The possible constraints are: Spending power Budget No cash Network connection Available devices Geo Positioning System (GPS) <div>CC</div>	<b>5. AVAILABLE SOLUTIONS</b> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking Whenever the child goes to a location other than its geofence, its parent gets a notification stating that his/her child is in danger. Earlier the customer tried to contact their nearest police station. Now the customer uses this application. Pros and cons of previous solution: Pro: Human insight. Con: Unnecessary hassle and a cumbersome process. Child's location is not easily accessible. Pros and cons of current solution: Pro: Child's location is very easily accessible because the parent gets the notification. Con: Parents who don't have access to smart phone cannot make use of this application. <div>AS</div>	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. Creating a geofence around the child after monitoring its activities. With the help of geofence, the child's parent get a notification whenever the child crosses the geofence. <div>J&amp;P</div>	<b>9. PROBLEM ROOT CAUSE</b> What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations The root cause of this problem is that the child not informing its parents whenever it goes out. More and more children go missing and only some children are recovered. Child trafficking <div>RC</div>	<b>7. BEHAVIOUR</b> What does your customer do to address the problem and get the job done? (i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) After the customer gets access to the child's location, he/she can go to the specified location and find their child. <div>BE</div>	Focus on J&P, tap into BE, understand RC

## 4. REQUIREMENT ANALYSIS

### 4.1 Functional requirement

**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 Registration through Email Registration through Mobile number Registration in person
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notifications	Email and SMS message
FR-4	User Interface	Mobile app for parents Web interface for registrations, record tracking, information and payment

## 4.2 Non-Functional requirements

**Non-functional Requirements:**

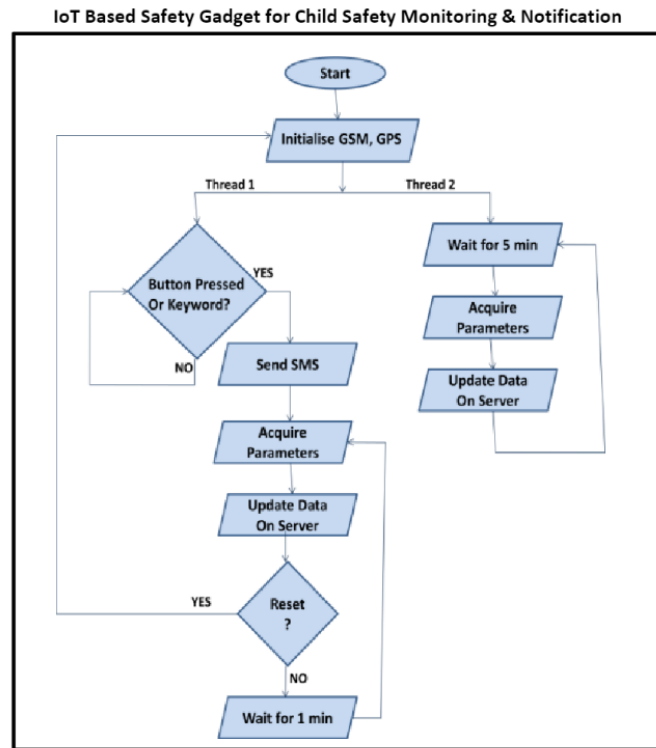
Following are the non-functional requirements of the proposed solution.

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

### 5.1 Data Flow Diagrams

## DATA FLOW DIAGRAM:

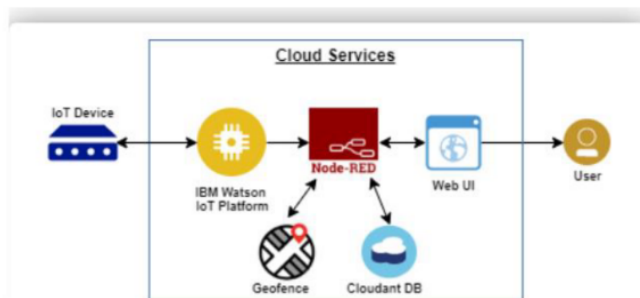


5.2

## 5.3 Solution & 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

## 5.4 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

5.5

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

5.6

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

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

<b>Problem Solution Fit</b>	Prepare problem - solution fit document.	23 SEPTEMBER 2022
<b>Solution Architecture</b>	Prepare solution architecture document.	29 SEPTEMBER 2022

6.3

<b>Customer Journey</b>	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to	03 OCTOBER 2022
-------------------------	--	-----------------

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

## Sprint Delivery Schedule

**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/CA RETAKER)	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

**7. CODING & SOLUTIONING (Explain the features added in the project along with code)****7.1 Feature 1**

7.1.1 It is a website application.

**7.2 Feature 2**

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

**7.3 Feature 3**

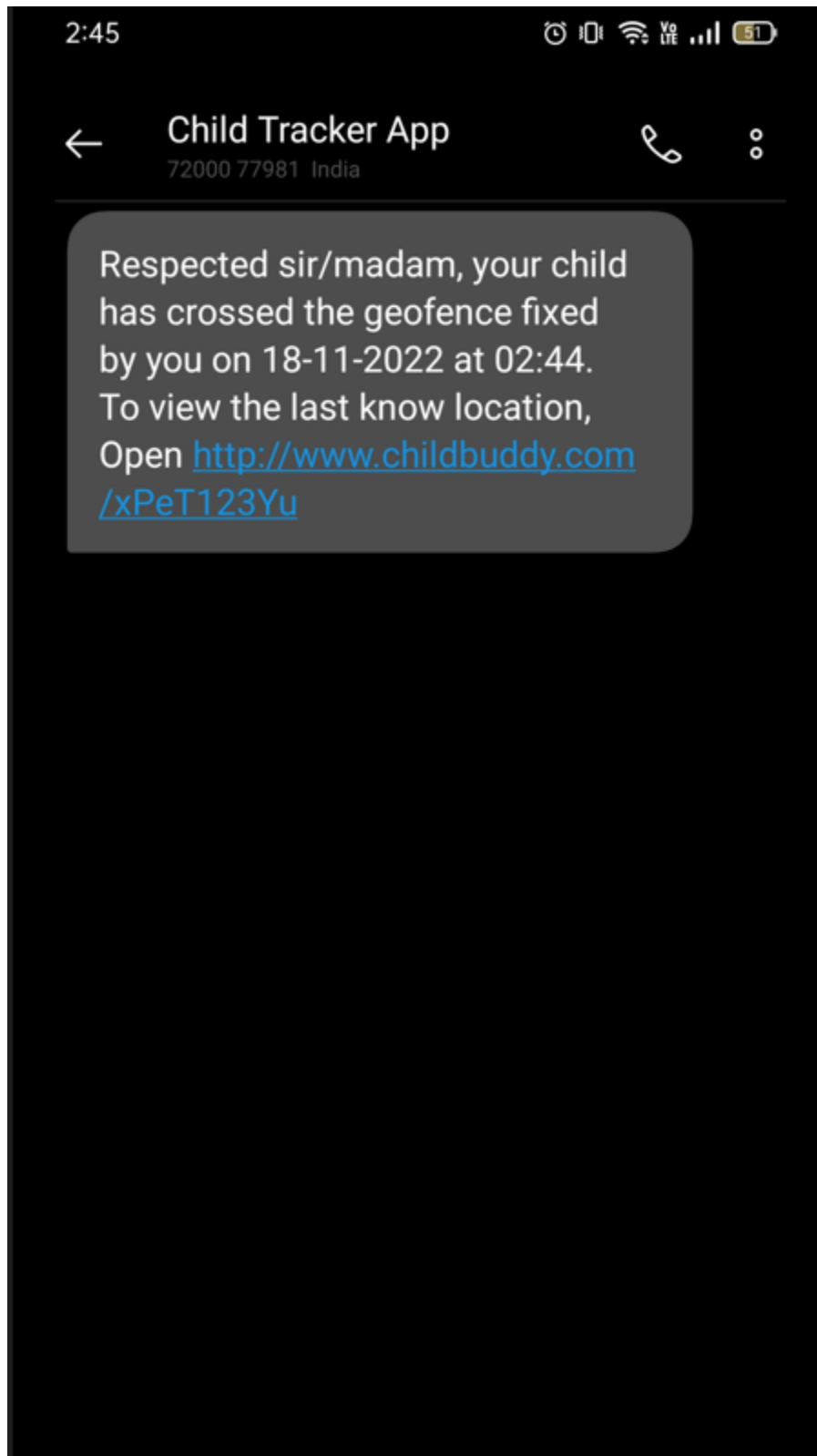
7.3.1 Using an account, a parent can create multiple accounts for their multiple children.

**8. TESTING****8.1 Test Cases****8.1.1**

Test ID	Test Case Description	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.	['pramodsrk120@gmail.com', 'OmSaiRam0025']	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.	<p>Log in to the application.</p> <p>Click on any of the trackers that the parent has set for a specific child.</p> <p>Upon clicking on any tracker the child's location can be seen and tracked.</p>	['rajinik anthmur alidhara n@gmail.com', 'Sept@2022']	The child is not within the geofence.	The child is not within the geofence	Pass

## 8.2 User Acceptance Testing



## **9. RESULT**

### **9.1 Performance Metrics**

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

## **10. ADVANTAGES & DISADVANTAGES**

### **10.1 Advantages**

- 10.1.1 A parent can access the child's location 24x7.
- 10.1.2 It provides real time detection.
- 10.1.3 Parent receives instant notification when the child crosses the geofence.
- 10.1.4 Easy to use interface.
- 10.1.5 A parent can create as many as nodes for multiple children.

### **10.2 Disadvantages**

- 10.2.1 Our application cannot be used without internet connection.
- 10.2.2 To access the child's location the parent has to access the web application.

## **11. CONCLUSION**

- 11.1 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.

## **12. FUTURE SCOPE**

- 12.1 The application can be made an offline application in order for people to access their child's location in the absence of internet connection.
- 12.2 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.



