

Project Report

Date	10 November 2022
Team ID	PNT2022TMID26475
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification

1. INTRODUCTION

1.1 Project Overview

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

1.2 Purpose

Now a day's Parents have more responsibility than older about their children's. Because Crimes rates are increasing day by day in our country, Crimes such as Child Amusement, Rapes, Murders, Illegal Relationship to avoid these kind of crimes parents must watch their children every step. Eventually mobile phones cause major allegations on our society. Many teens must be noticed by their own parents, it is our duty. But sometimes children are arguing with their parents for watching their steps, to overcome these issues, we need to watch them through online

2. LITERATURE SURVEY

2.1 Existing Solution and Problem:

2.1.1 AUTHOR: N. Manjunatha ,H. M. Jayashree, N. Komal, K. Nayana.

DESCRIPTION: This paper is mainly streamed towards child safety solution 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. Health monitoring system on gadget checking for parameters like heart beat/pulse rate and

temperature is included which can be monitored on parental app. Gadget also monitors whether it is plugged on hand or not using contact switch and alert the parent as soon as it is unplugged.

2.1.2 AUTHOR: N. Senthamilarasi, N.Divya Bharathi, D.Ezhilarasi, R.B.Sangavi

DESCRIPTION: 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. Due to the abuse cases, the emotional and mental stability of the children gets affected which in turn ruins their career and future. These innocent children are not responsible for what happens to them. So, parents are responsible for taking care of their own children. But, due to economic condition and aims to focus on their child's future and career, parents are forced to crave for money. Hence, it becomes difficult to cling on to their children all the time. In our system, we provide an environment where this problem can be resolved in an efficient manner. It makes 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.

2.1.3 AUTHOR: P.Poonkuzhailai, R.Aarthi, Yaazhini.V.M, Yuvashri.S, Vidhyalakshmi.

G DESCRIPTION: This paper presents the design and implementation of a portable IOT-based safety and health monitoring system for children through a sensor embedded health monitoring device for safety and emergency services. It is known that the technological advancements are increasing at a faster pace. But the utilization of technologies in various sectors is very low. We know that people of different age group faces different difficulties. But the security for children's is very low. There is lot of cases registered regarding child safety. Nowadays, the schools and the parents are very much worried about their school children's for school transport and other places. So, the safety and monitoring the school children is very much difficult. In this project we are introducing the IOT based embedded system is used in this project. So we propose a system to continuously monitor the parameters of the child and also their location for safety purpose. The system provides smart child tracking and monitoring system.

2.1.4 AUTHOR: Prakriti Agarwal, R Ramya, Rachana Ravikumar, Sabarish G, Sreenivasa Setty.

DESCRIPTION: Child safety is a major concern in any society due to the vulnerability of a child and consequently, higher rates of crimes against children. With this issue on our hands, a smart wearable Internet of Things sensor network for monitoring the environment of a child can be developed to help parents ensure the safety of their children. It must also necessarily include a mechanism for tracking the child. An advantage of this wearable device is that, according to its design, it can be accessed from any mobile device and does not mandate a lot of technical

knowledge from the user to operate. The purpose of this device is to facilitate the guardian or parents in locating their child with ease and ensuring its well-being. The basic mechanism of this system involves monitoring the environment through sensor nodes, acquiring real-time data and transmitting this data to a cloud server. The data can be accessed by users through a web-based interface present on this cloud server. The wearable also functions to send alerts to the user through a mobile application in case an emergency condition is detected by it. The design of this model involves developing a medium for communication between the parent/guardian and the child's wearable device. The child's location is tracked using GSM mobile communication to specify the location of the child in real time. We have surveyed relevant papers and have discussed about the different methodologies that have been used to achieve similar but different results. We later also compare these papers using their advantages and disadvantages and we try to bring out the uses from their results.

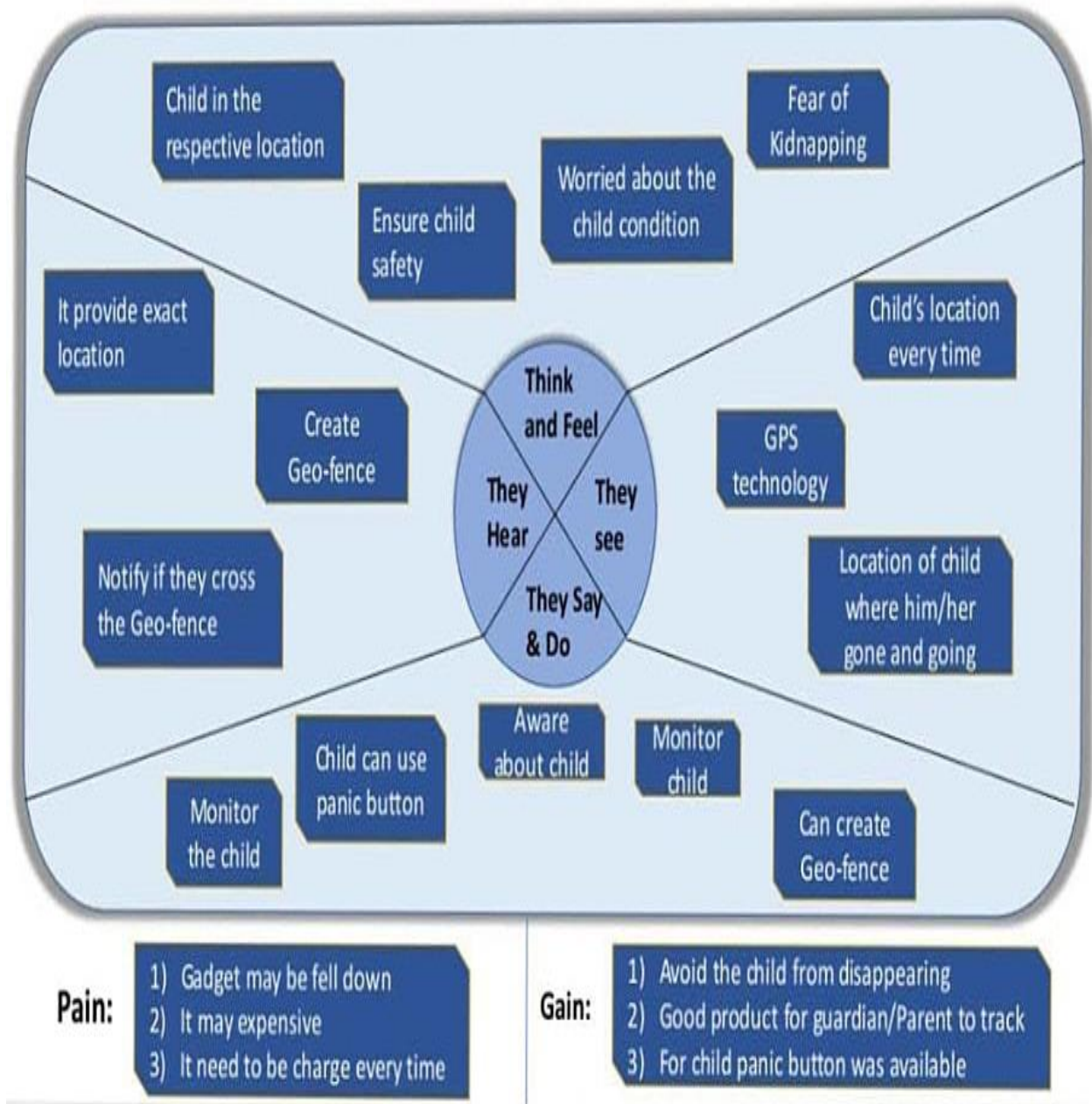
2.1.5 AUTHOR: Lai Yi Heng¹, Intan Farahana Binti Kamsin.

DESCRIPTION: Nowadays, 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 questionnaire and semi-structured interview are methodologies used to collect data. The online questionnaire gains feedbacks by sending questions electronically, where answers need to be submitted online. In the semi-structured interview, researcher meets and asks respondents some predetermined questions while other being asked are not planned in advanced. Through information obtained, a smart band have been proposed to monitor the safety of children. By this, parents know what is happening remotely and can take actions if something goes wrong. The future improvements of this device will be adding functions and software to make it works like a phone such as messaging, gallery, Google, YouTube, meanwhile, adding more child security features so that child safety is guaranteed.

2.2 Problem Statement Definition 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.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

3.2.1 Brainstorming

Adhilakshmi R

Implement
child
tracking
mechanism

Create a
Geo fence

Develop
ability of
child to alert
the parent

Develop ability
for parents to
know if child
crossed the
Geo fence

Bhargavi G

Store and
display the
location
history of
child

Create
faster and
efficient
application

Develop the
ability to know
weather
conditions of
child location

Buy Best
fitted - low
cost
hardwares

Hemapriya P

Make the
product
water proof

Create a
long lasting
product

Develop web
application
using node
red

Make the
product
rechargeable

See the child
surrounding
location via
Camera

Bhuvaneshwari S

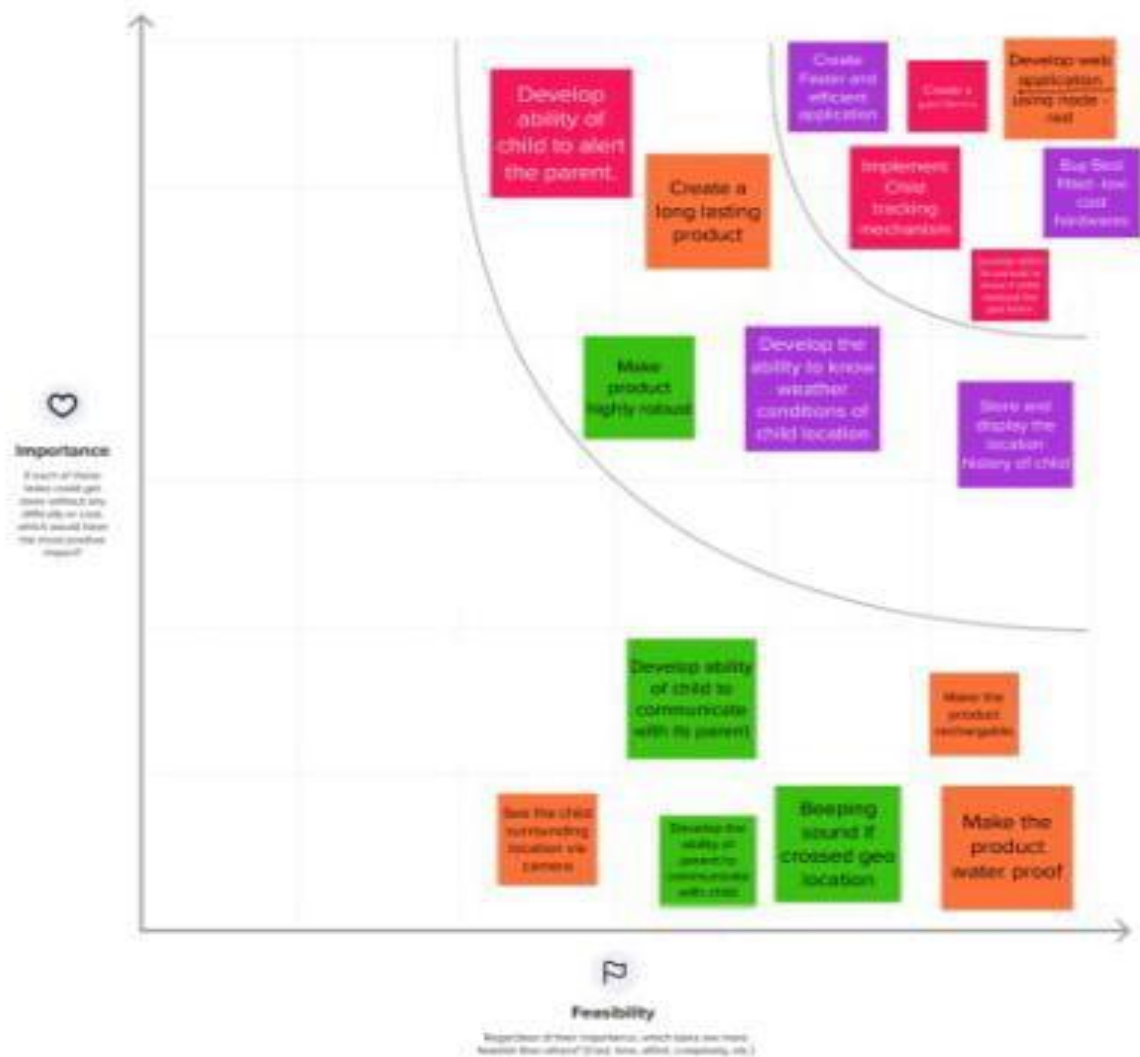
Make
product
highly
robust

Develop ability
of child to
communicate
with their
parents

Beeping
sound if
crossed
geo fence

Develop ability
of parent to
communicate
with their child

3.2.2 Ideation Prioritization



3.3 Proposed Solution

S.No.	Parameter	Description
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1.	Problem Statement (Problem to be solved)	Currently a child's security is a crucial space of concern. Trafficked children are sold-out into slavery, domestic slavery, beggary, and therefore the sex trade.(This project provides the conception of sensible wearable devices for our little ones. And to stop kid trafficking.)
2.	Idea / Solution description	The crime rate is day by day increasing. Schools and working places need high surveillance for ensuring the safety among children. The motive of this device is to assist find their kids with help of wearable device. The parents will send a text with specific keywords like "LOCATION" "TEMPERATURE" "UV" "SOS" "BUZZ" ETC. The tracking device can reply back providing the correct location of the kid and it will navigate through google maps.
3.	Novelty / Uniqueness	At the moment there are several tracking device that helps us to note our children's activity with ease and additionally notice the kid using Wi-Fi and Bluetooth. However Wi-Fi and Bluetooth seem to be unpredictable medium of communication between the parent/guardian and kid. So the main focus of the project is to possess an SMS text enabled communication between the child's wearable and also the parent .
4.	Social Impact / Customer Satisfaction	The trafficking rate is day by day increasing. Children surrounding needs high surveillance for ensuring the safety among children. As a device is small , it is comfortable to wear specific for children. It is user friendly too.

3.4 Problem Solution fit

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) 1. Working parents.	6. CUSTOMER CONSTRAINTS ➤ Mobile phone ➤ GSM ➤ GPS ➤ Mobile Communications	5. AVAILABLE SOLUTIONS To taking care of children.	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS J&P 1. GPS should be on. 2. Device should be on when it is used. 3. Cloud service has to be available all the time	9. PROBLEM ROOT CAUSE RC A child neglected, not loved or cared for has no talk to and no one is take care of.	7. BEHAVIOUR Network issue is very common as most of the problems are located at the country side. Here the contact both the developers and the service providers.	Focus on J&P, tap into BE, understand RC

3. TRIGGERS Currently a child's security is a crucial space of concern. Trafficked children are sold-out into slavery, domestic slavery, beggary, and therefore the sex trade. these acts triggers the people to use this device.	10. YOUR SOLUTION To possess an SMS text enabled communication between the child's wearable and also the parent because the GSM mobile communication is nearly present everywhere. The parents will send a text with specific keywords like "LOCATION". The tracking device can reply back providing the correct location of the kid and it will navigate through google maps.	8. CHANNELS of BEHAVIOUR CH Online: <ul style="list-style-type: none"> • Mobile calls. SMS.
4. EMOTIONS: BEFORE / AFTER Before-Insecure After-Secure		

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement(Story /Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through phone number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	App installation	Installation through link Installation through play store
FR-4	Settings geofence	Setting by user to find childlocation
FR-5	Detecting childlocation	Detecting location via app Detecting location via SMS
FR-6	User Interface	User LoginForm. Admin Login Form.
FR-7	Database	Stored in cloud for seamless connectivity. Parents and kids linkwith the distance and the location values obtained from the mobile devices are stored here. The values include parent id,kid id,distance,longitude,latitude etc.

FR No.	Functional Requirement	Sub Requirement
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FR-8	Server	<p>It connects the database and the frontend application.</p> <p>The backend server has been implemented to run as a service and is deployed in an IBMcloud instance.</p> <p>The backend server has been implemented to run as a service and is deployed in an IBMcloud instance.</p>
FR-9	GPS tracking	<p>The system is implemented with a GPS module, which acquires the location information of the user and stores it to the database.</p>
FR-10	API	<p>The value collected is sent to the database using an API.</p>
FR-11	React JS	<p>We are using react js as frontend for our project.</p> <p>Node JS for the back end we are using node js.</p>
FR-12	GPS modules	<p>It receives data directly from satellites.</p>
FR-13	Battery Life	<p>If the child or parent forgets to charge the device for a whole day then also the device will work. That's why we aim to make this device last the whole day with one charge.</p> <p>It should be long-lasting.</p>
FR-14	Location History	<p>The location history will help to track the child's activity so that they won't be updated. Location history will be there for 30 days.</p> <p>For example if the child gets missing with the help of location history they won't be able to track down their child's activity and also can find their child.</p>

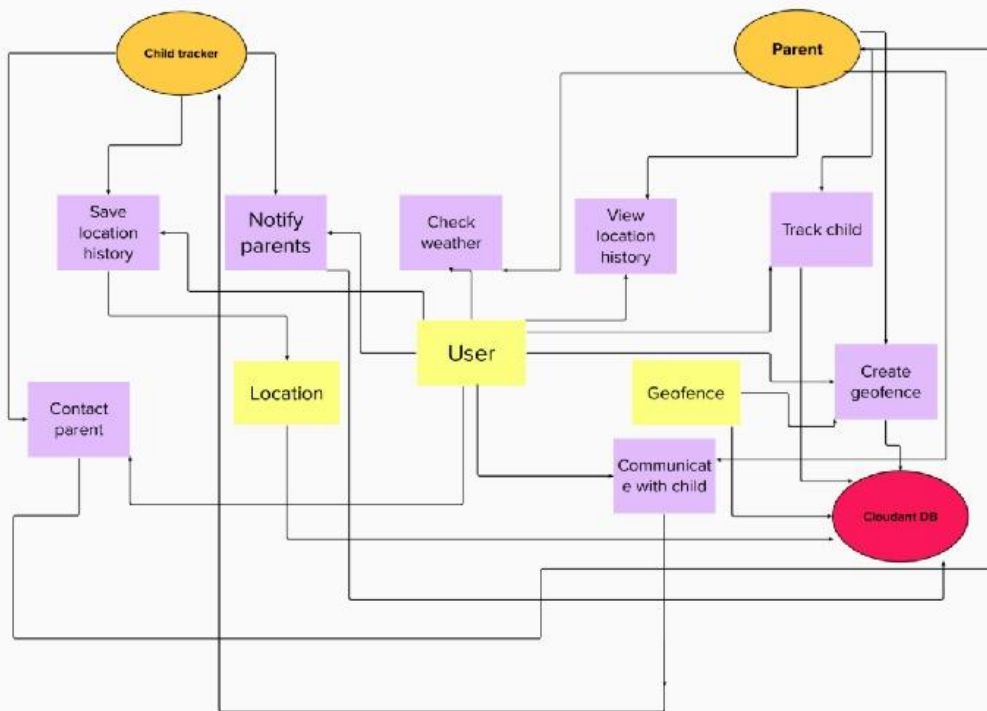
Non-functional Requirements:

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

FR No.	Non-functional Requirements	Description
NFR-1	Usability	Device have GSM can help to inform the parents or relatives about the current situations of the child by deliver the message immediately to save the child.
NFR-2	Security	Make children parents more assure about their kid's security, we have a feature in our device called Geo-Fence. Whenever your child crosses that specific area, you will get an instant notification on your phone.
NFR-3	Reliability	Portable Easy to use Flexibility
NFR-4	Performance	Create a Child tracker which helps the parents with continuously monitoring the child's location. The notification will be sent according to the child's location to their parents or caretakers. The entire location data will be stored in the database.
NFR-5	Availability	Track your child even in a crowd Get travel details of kids at anytime Know the current location
NFR-6	Scalability	Gadget ensure the safety and tracking of the children. Parents need not worry about their children.

5. PROJECT DESIGN

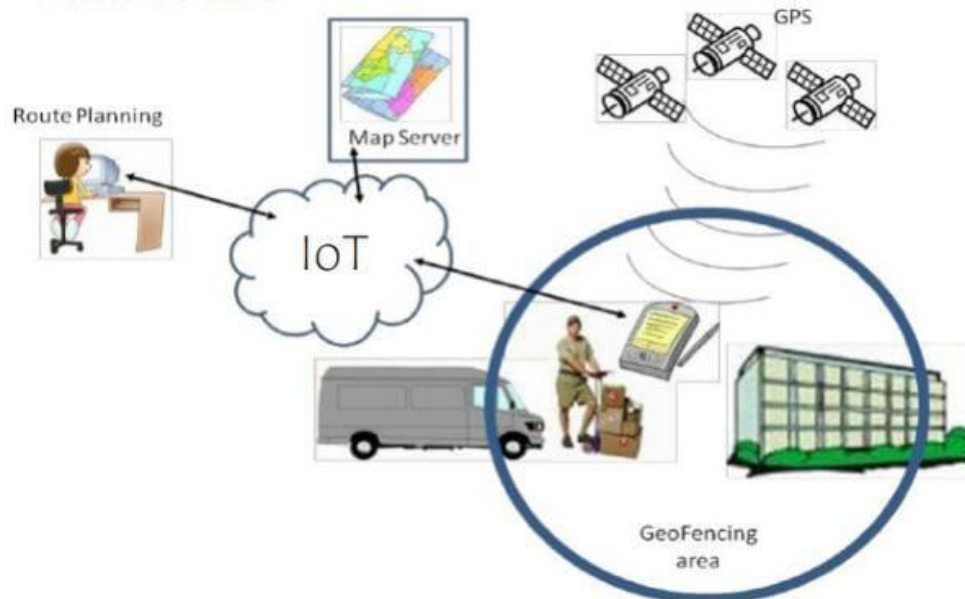
5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture

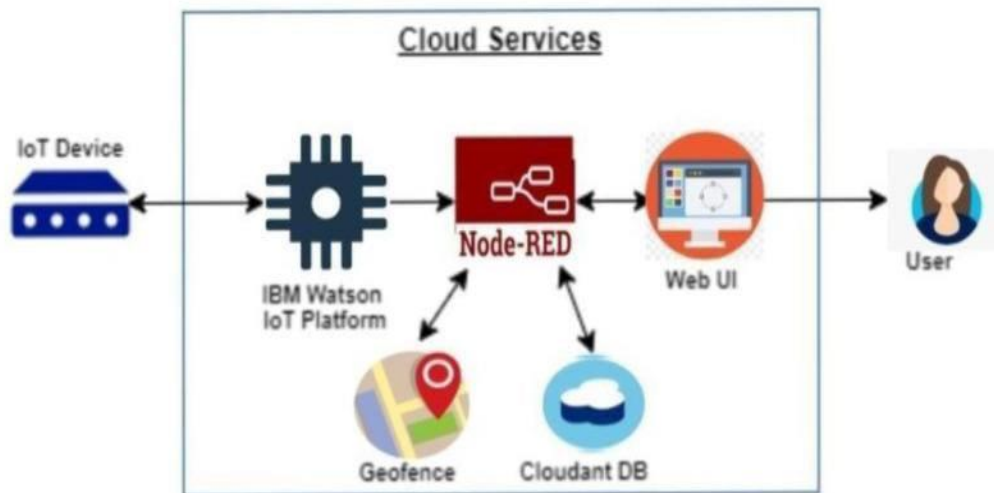
→Solution Architecture

5.2 Solution & Technical Architecture →Solution Architecture

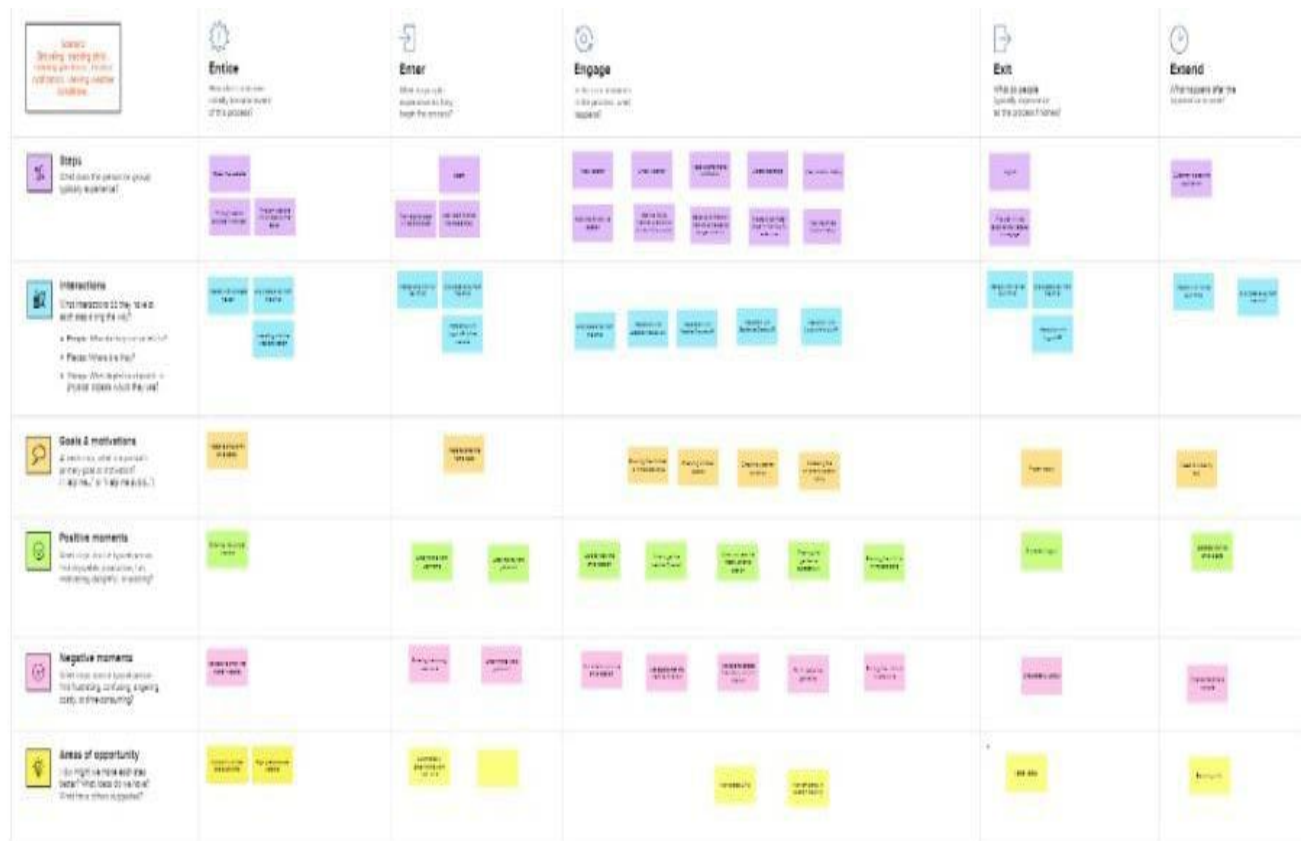


Architecture

è Technical



Customer Journey:



6.PROJECTPLANNING & SCHEDULING

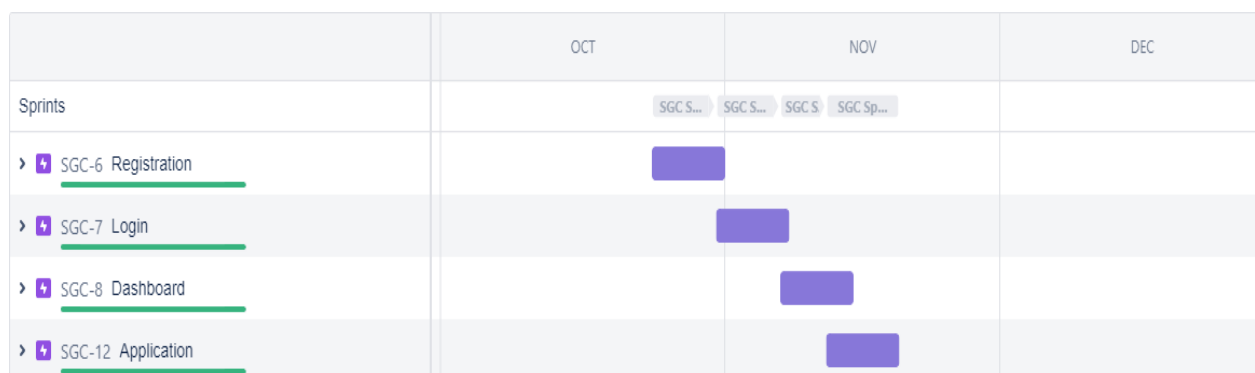
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Bhargavi
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Bhuvaneshwari
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Bhargavi
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Hemapriya
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Adhilakshmi
Sprint-3	Dashboard	USN-6	I can access dashboard of mine.	5	Low	Bhuvaneshwari
Sprint-3		USN-7	As a user I can access Geofence..	3	Medium	Adhilakshmi

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3		USN-8	As a user I can access geofence whenever it is in necessary.	3	High	Hemapriya

Sprint-4	Application	USN-9	To design applications That meet's users Desires.	2	Low	Bhuvaneshwari
Sprint-4		USN-10	To make thisas more efficient.	5	Medium	Hemapriya
Sprint-4		USN-11	As a user I canregister and login easily.	3	High	Bhargavi

Sprint	Total StoryPoints	Duration	Sprint Start Date	Sprint EndDate (Planned)	Story Points Completed (ason Planned End Date)	Sprint Release Date(Actual)
Sprint-1	5	7 Days	24 Oct 2022	31 Oct 2022	5	31 Oct 2022
Sprint-2	3	7 Days	31 Oct 2022	07 Nov 2022	3	07 Nov 2022
Sprint-3	11	7 Days	07 Nov 2022	14 Nov 2022	11	14 Nov 2022
Sprint-4	10	7 Days	12 Nov 2022	19 Nov 2022	10	19 Nov 2022

6.3 Reports from JIRA



6.3.1 Backlog:

← → ↻ childsafty.atlassian.net/jira/software/projects/SGC/boards/3/backlog

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Safety Gadget Child Sa... Software project

PLANNING

Roadmap

Backlog

Board

DEVELOPMENT

Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

Learn more

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Projects / Safety Gadget Child Safety

Backlog

Q A + Epic ▾ Insights

SGC Sprint 5 Add dates (0 issues) 0 0 0 Start sprint

Plan your sprint

Drag issues from the **Backlog** section, or create new issues, to plan the work for this sprint. Select **Start sprint** when you're ready.

What needs to be done?

Story

Backlog (0 issues) 0 0 0 Create sprint

7.CODING & SOLUTIONING

7.1 CODING


```

import json
import wiotp.sdk.device
import time

myConfig = {
    "identify": {
        "orgId": "hj5fmy",
        "typeID": "NodeMCU",
        "deviceID": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    name= "Smartbridge"
    #in area Location

    latitude= 17.4225176
    longitude= 78.5458842

    #out area Location
    #latitude= 17.4225176
    #longitude= 78.5458842
    myData={'name': name, 'lat':latitude, 'lon':longitude}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onpublish=None)
    print("Data published to IBM IOT platform: ",myData)
    time.sleep(5)
client.disconnect()

```

7.2 OUTPUT

Duplicate	1	1	2	0	4
External	2	3	0	1	6
Fixed	10	2	3	20	35
Not Reproduced	0	0	2	0	2
Skipped	0	0	2	1	3
Won't Fix	0	5	2	1	8
Totals	24	15	13	25	77

8.2 Test Case Analysis

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	1	4
Client Application	47	0	2	45
Security	3	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	11	0	2	9
Final ReportOutput	5	0	0	5

9 RESULTS

9.1 User Registration :

User gets registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mail id. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase authentication .

Geofence



Register

REGISTER

Already registered [Login here](#)

9.2 User Login

User with their registered mail and password will login to the account . As the details are stored in firebase, when invalid mail or password is entered a message say invalid mail or password occur

Login page :

Geofence



Login

LOGIN

Not registered yet [Register here](#)

Adding Geofence and Alert Notification

User can add geofence in the location where they want to add or where their child is going play so they can monitor the child location. Once the child enters the geofence alert notification says entered the location will be displayed. When the child leaves the geofence alert notification says exited the location will be displayed.

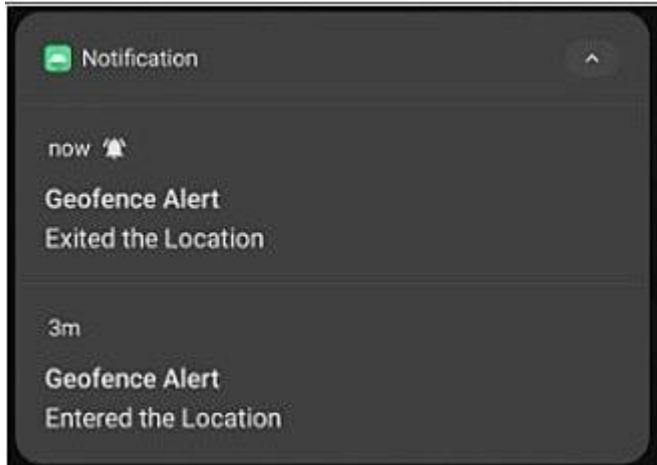
Geofence



Geofence Location

My Location

Notification



ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1. Simple and easy to use
2. Parents can feel secure because if the child leaves the desired location and immediately a notification will be sent
3. Geofence can be added easily

DISADVANTAGES:

1. Multiple geofence can be a problem

CONCLUSION

This research demonstrates a Smart IoT device for child safety and tracking, to help the parents to locate and monitor their children. Through this device, the parent can track and monitor their child with just a simple app. It is not possible to always stay beside children as most of the parents need to go for work. With this project, parents can track the location of their children and get alerts whenever the child goes out of the geofence. It becomes easy for parents to look after their child while working. This device is efficient to use. Thus, by keeping in mind the advantages and applications we are developing a child monitoring device. In order to avoid kidnapping cases, the child monitoring system is needed.

FUTURE SCOPE

The future work would be to further develop and implement the safety wearable device so that it could be worn or sewn into a fabric that could be worn, using synthetic fibers.

APPENDIX

Source Code : https://drive.google.com/file/d/12tn5o-bL4u2afBle16ls7mlhLj3yNwkl/view?usp=share_link

GitHub : <https://github.com/IBM-EPBL/IBM-Project-22921-1659861119>

Project

Demo

Link: https://drive.google.com/file/d/1OMiK145n3THm3GvPIVsNXIGFazhM4ysK/view?usp=share_link

