PROJECT REPORT ON

IoT Based Safety Gadget for ChildSafety Monitoring & Notification

TEAMID : PNT2022TMID42554

SUBMITTED BY

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1.INTRODUCTION

1.1 Project Overview

As it pertains to parents monitoring their child's whereabouts, geofencing allows someone to create virtual perimeters of a geographic area that is "safe" for a child to be located. A parent can create these safe areas by using settings within a child's phone (depends on the phone), third-party apps, or phone carrier location services.

Once the geo fence is set-up, a parent will be able to view their child's real-time location data. If the child strays from a safe area, the parent will be sent push notifications in the form of a text message, pop-up, etc. Every geofencing option works differently, so the processof getting notifications may vary.

1.2 Purpose

To detect a user's location, and to use that location to serve them relevant, valuable communications. Geofencing in Action Braze customer Burger King usedthis location-based approach in a clever, fairly hilarious way.

2.LITERATURE SURVEY

2.1 Existing problem

In this year, around 3,600 children went missing in Tamil Nadu. Data releasedrecently shows that the maximum number of missing childrenwere aged 12-18years, with the number in this age group being 1,583. Policewere also able to track down 1,178 kids. With the advancement of smartphone technology, a smart location tracking application can be developed and installed to help parents to track the location of their children in real time. Its portability also facilitates parents to receive immediate notification about their children's movement at any

time.

2.2 References

[1] M. Izham Jaya,GohXin Tong,Mohd Faizal Ab Razak “Geofence Alerts Application With GPS Tracking For Children Monitoring (CTS)” 2021 International Conference on Software Engineering & Computer Systems and 4th International Conference on Computational Science and Information Management (ICSECS- ICOCSIM).

[2]. Bernama.com. ‘Cases of MissingChildren & Teenagers’, 2019. [Online].Available:https://bernama.com/en/infographics/index.php?v =3678.[Accessed: 20-February-2021].

[3]. Allahham, A. A. and Rahman, M. A., “A Smart Monitoring System for CampusUsing Zigbee Wireless Sensor Networks,” Journal of Software Engineering and Computer Systems (IJSECS), 2018, 4(1), pp. 1-14, doi: 10.15282/ijsecs.4.1.2018.1.0034

[4]. M.T.Kamisan, A.A.Aziz, W.R.W. Ahmad and N. Khairudin, "UiTM campus bus tracking system using Arduino based and smartphone application,"2017 IEEE 15th Student Conference on Research and Development (SCOReD),Wilayah Persekutuan Putrajaya, Malaysia,2017, pp.137-141, doi:10.1109/SCORED.2017.8305406.

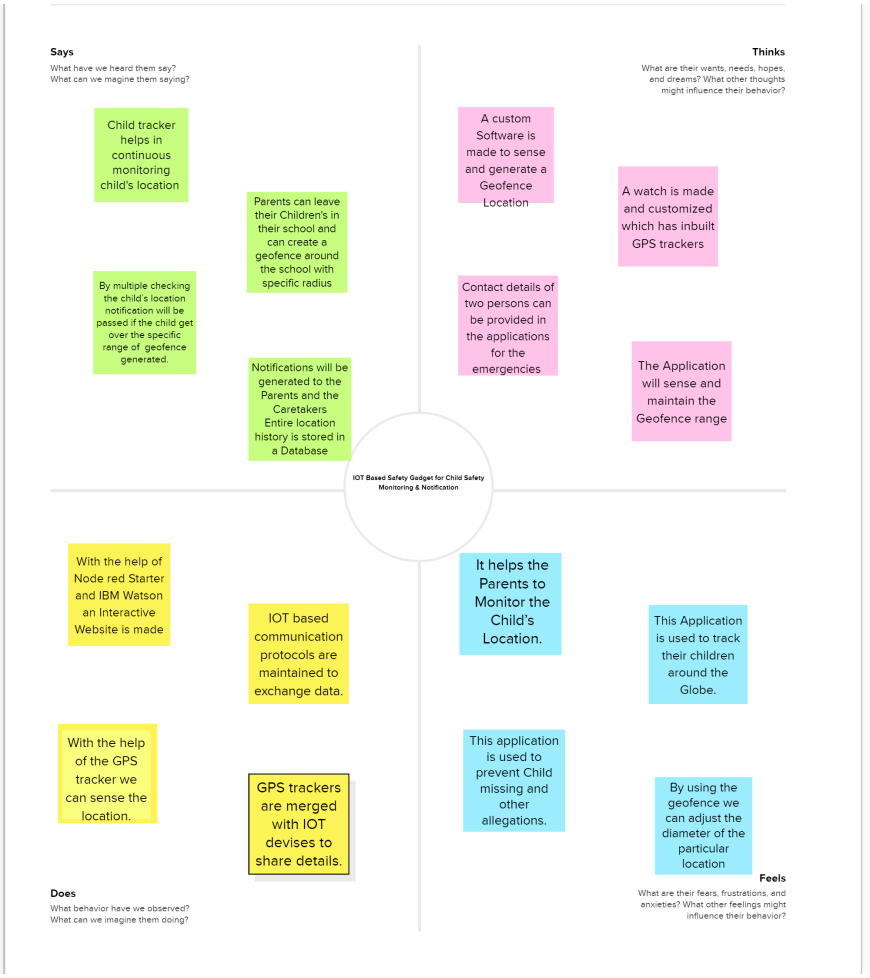
2.3 Problem Statement Definition

Today’s children are inquisitive and adventurous in their activities. They always want to move around playing with other children or explore the different

things of the entire world. However, dangers lurk everywhere and the cases of kidnapping and missing childrencontinues to rise. There also had been times your child got lost by wandering away in amusement parks or airports. These painful experience you even won't talk about. As a parent, it's your responsibility to keep an eye on your children's activities for their safety. Luckily, technology has made it easier for parents to keep track of their children with geofencealert.

3 IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Selectthe ProblemStatement

IoT or the internet of things is characterized as a forthcoming innovation that empowers us to create worldwide networked machines and also the devices that can be helped for exchangingof communication. As we all know that the real-time application has been increasing day by day, the smart connection also had increased. Rapid population growth, led to the increase in global life expectancy and the advanceof technology, paving the pathwayfor the creation of age-friendly environments. This had led to the necessityin designing new products for infantsprotection.

Infants or toddlers need parents' attention 24×7. In this present era, the cases regarding missing children have been increasing day by day, which was the main motivation that comes for the safety of little children. However, the parents cannotcontinuously monitor their babies' conditions either in normal or abnormalsituations. Still, certainincidents like infant attacks have been reported,it is necessary to protect the baby.

Step-2: Brainstorm, Idea Listingand Grouping

Team Member 1: Abitha sree K

Child and women safety is a challenging problem nowadays due to

antisocial elements in the society. The crime rate is day by day increasing. Schools and working places need high surveillance for ensuring the safety among children and women. Smart phones are playing major role for ensuring the safety, where some mobilebased applications provide alert systems. During the emergency, mobile apps alert the controlroom of nearby police station or caretakers of children. The literature shows that locationtracking devices are available in the market,but it does not provide the complete solution to the problem. The solution to this problem is to designan IoT device, which senses the child’slocation and environment and during emergency, it should send the alertto the parents automatically.

Team Member 2: Adhithya D

Thechildren are too young to take care of themselves. We cannot monitorthe children at all timesin school, play area, and outside place. In this paper, we discuss the concept of child safetydevice based on Internet of things. The aim of this device is to provide safety to the child by allowing the parent to locate the child and view their surroundings. This device can be used to monitor the temperature and motion of the child. If any problem persists, the GSM mobile communication module automatically sends a text message to the parent as SMS.

Team Member3: Akshaya S

Crimes on children keep increasing despite actions have been taken by the government. Revealedby [9], the overall percentage of child abasements worldwide is about80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world. Due to that, parents are worriedfor their childrenand perhaps, a hard challenge for them to

guarantee safetyof their children when they are out.

Enable tracking of the child’s locationand capturing of data remotelysuch as temperature, pulse, respiratory rate, quality of sleep and many more.

To show the child's actualdata with referencevalues.

Enable sending of notification if the childis out of location or when the devicerealizes abnormal conditions/situations

Team Member 4: Barath D

Develop a prototype of IoT wearablesmart band connected to parents’ mobileapps so that they can monitor the actual condition of children at anytime and anyplace.

Besides, unlikeexisting smart band, which is less focusingon child securityaspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be identified. , the information indicating children's status, along with reference values will be sent to parents’ devices with the app installed. If children’s actual data is not within the range of reference value, alert notification and some suggestions will be sent to parents’ devices. Also, when children leave geofences,notification will be sent to parents’ device.

Step-3: Idea Prioritization

The section mainly discussed about significant of the research and why this study needs to be carried out. The child security system benefits parents as well as children. Since it aids in locating children, monitoring child’s condition and

security status instantly at anyplace and any time, parents who often tied up in work or neglect their children are gaining advantages from it. Throughthe proposed system,immediate actions can be taken forthwith in case the child is threatened. Thus, child security is guaranteed, crime rate related to children is reduced and eventually,parents can rest assured. In fact, reduction of crime rate brings about long-term positive effectssuch as improving country's reputation and quality of life, increasing community security, safety, and cohesion as well as generating economic benefits for individuals, committee and taxpayers. Besides, the proposed system makes ample use of IoT, proving IoT is evolving which can be included in multiple areas comprising the child security field.

Throughout the research, it is clearly explained the IoT concept, child safety issues and the need of using child security system. Some previous studies have been included for designing the IoT-based child security smart band. It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken.

3.3 Proposed Solution

The Geofence Alerts Application with GPS Trackingfor Children Monitoring is comprised of a GPS tracker and a web application. The GPS tracker is responsible for sending the locationof the children to the Firebase cloud database . The web application then acquired the longitude and latitude of the children’s location and provide the parents with real-time location tracking along with other functionalities such as geofence setup and time scheduling, alarm, andnotification, as well as the history route. The overview of the Geofence Alerts Application with GPS Tracking for Children Monitoring.

3.4 Problem Solution fit

1.	CUSTOMERSEGMENT(S)	Our Customers are mainly parentswho are working and do not have enough time to take care of their children. Such parentsare not provided with availability at any time to look aftertheir children. If the caseso they are in need of something to make their children underthe surveillance of them.
2.	JOBS-TO-BE-DONE/PROBLEMS	To enhance theoperating condition of thedeveloped solution the way it is not supposed to deal with any fault at any point of time so that the child safety can be highly ensured. To ensure the parents that their surveillance on their childrencan never be taken off.
3.	TRIGGERS	The trigger which induces the customers is the onethat when otherworking parentsgive a try to this and comment a positive review on this, they are also focusing on their child safetytoday.
4.	EMOTIONS:BEFORE/ AFTER	Customers are being frustrated that their children are doing safe or not before usingthe gadget designed. Once they startto usethedeveloped solution they might feel free to focus on their work and also the surveillance of their children wouldhappen with easeat any pointof time
5.	AVAILABLE SOLUTIONS	Of course the solutions are available readily in the market such as Child GPS Tracking System,Child Safety GSMKit,etc.... One such constraint thecustomers facing are costand inefficiencies in theworking once purchased.

6.	CUSTOMERCONSTRAINTS	The constraints our customers facing are such connectivity issues or may be the protocols being used for communication. Theremay be chancesof issues ariseddueto technical dis efficiencies. Giving a second thought, price to be afforded for buying thedeveloped solution kit might be the one theycould not afford.
7.	BEHAVIOUR	Our proposed solution has the modes of working in both offline and Online. In case of any dis connectivities happen the gadget which has been developed might tend to work on aplan B which includes the backup of the failure of actual workingkit.
8.	CHANNELS of BEHAVIOUR	Our proposed solution has the modes of working in both offline and Online. In case of any dis connectivities happen the gadget which has been developed might tend to work on a plan B which includes the backupof the failure of actual working kit.
9.	PROBLEM ROOTCAUSE	Considering the origination of the problem, it occurs in the base of merely irrespective persons that are no way relatable to the children but for the currency kind of thing and also the childabuse(mainly in case of girl children)
10	YOUR SOLUTION	Our Team has highly been intending to develop an efficient solution to overcomeall the flaws that the existing solutions hold back still. We are highly on demandto ensure the efficient functionalities of the developing module the way it willnot fail at anytime.

4 REQUIREMENT ANALYSIS

4.1 Functional requirement

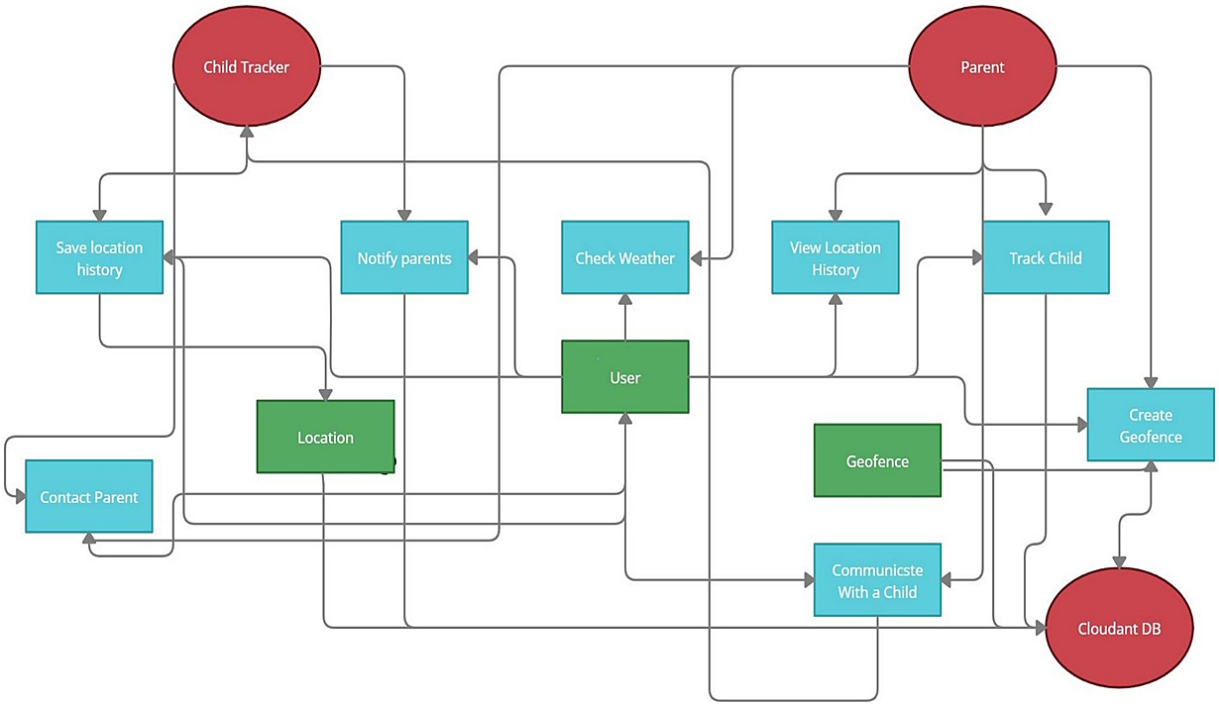
SI No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
1.	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
2.	User Confirmation	Confirmation via Email Confirmation via OTP
3.	Authentication	Only the authorized person for thatproductwill knowEnsures security
4.	User Interface	The Inventor Able to see the location of children whenthey are out of geofence willalso track the exact information about the children
5.	Notification	Notified through mobileand mail

4.2 Non- Functional requirements

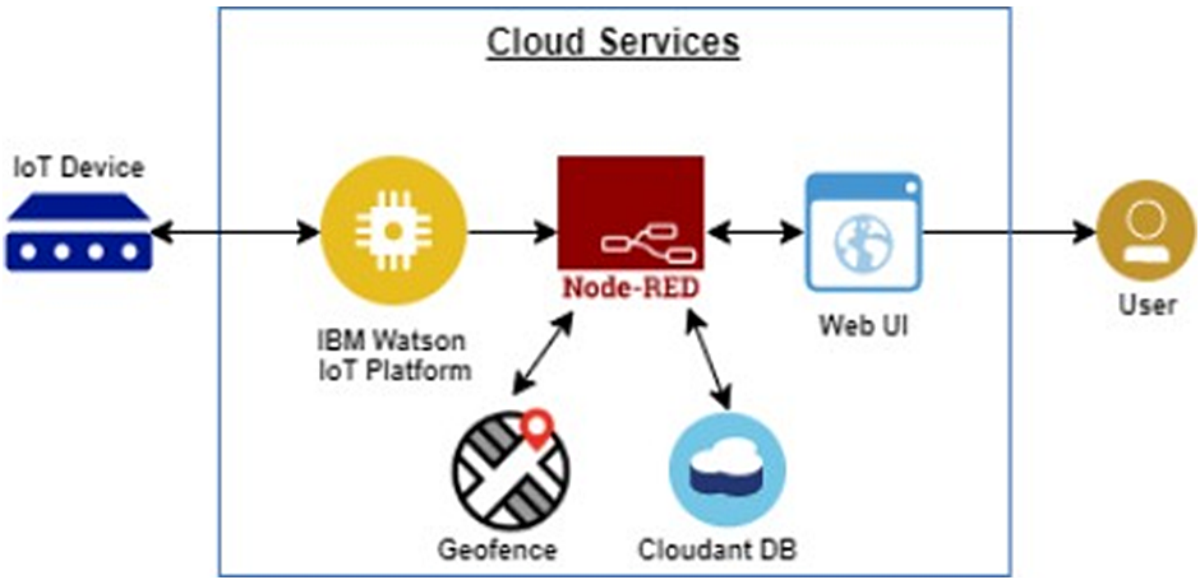
SI No.	Non-Functional Requirement	Description
1.	Usability	Accessed through Mobile App Showinglocation (latitude and longitude) of childand also other measures to ensure safetylike notification. Portable and comfortable to use.
2.	Security	Database security and ensuring thesafety of theproduct while in use.
3.	Reliability	Once logged in, the webpage is availableuntil logging out of the app, and a comfortable platform or creates a good environment for users to use.
4.	Performance	Each page must load within 4 seconds and database needs to be updated every few seconds and a notification must be sent immediately if seen a change in thechild’s location.

5 PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



Solution Architecture

Solution architecture is a complex process– with many sub-processes – that bridgesthe gap betweenbusiness problems and technology solutions. Its goals are to:

i. Find the best tech solutionto solve existingbusiness problems.

ii. Describe the structure, characteristics, behavior, and other aspectsof thesoftware to projectstakeholders.

iii. Define features, development phases, and solutionrequirements.

iv. Provide specifications accordingto which the solution is defined, managed,and delivered solution

6 PROJECT PLANNING& SCHEDULING

6.1 Sprint Planning& Estimation

Sprint	Functional Requirement (Epic)	User StoryNumber	User Story/ Task	Story Points	Priority	Team Members
Sprint-1	User Registration	USN-1	Registration through website Registrationthrough app	2	High	Barath D
Sprint-1	User Confirmation	USN-2	Confirmation via Email Confirmation via OTP	1	High	Barath D
Sprint-2	User login	USN-3	Setting up User Id and password	2	Low	Akshya S
Sprint-1	Apppermission	USN-4	Grant the permission for the app to access location, contact etc..	2	Medi um	Barath D
Sprint-1	Interfacewith the Device	USN-5	Connecting the device with the registered app with the device ID.	**1**	**High**	Barath D

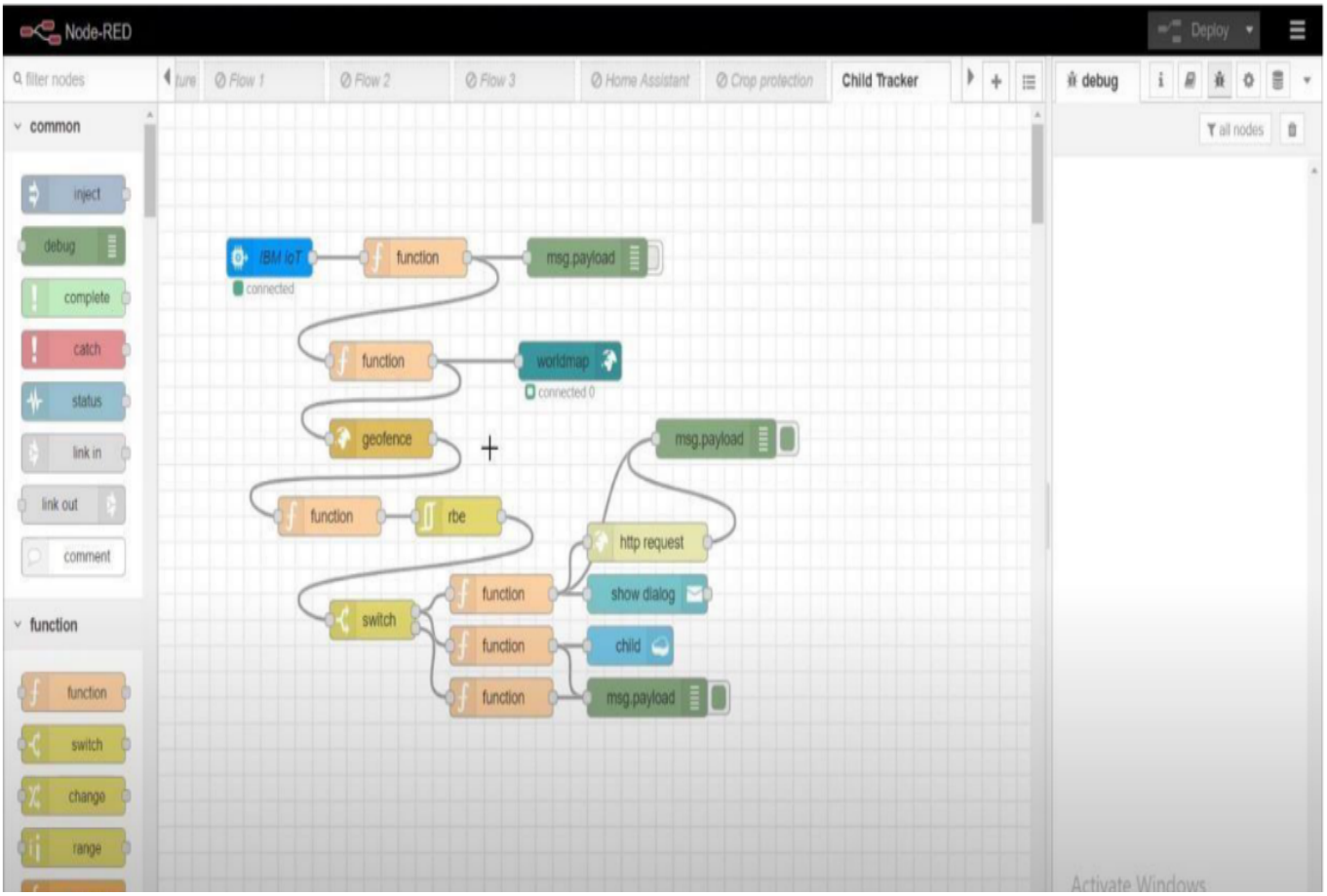
Sprint-2	Setting Geo-location	USN-6	Creating the Geo-location areain the map	**2**	**Low**	Adhithya D
Sprint-3	Database	USN-7	Location history is storedin the cloud.Can be accessed fromthe dashboard.	**2**	**High**	Abitha sree K
Sprint-4	Tracking location	USN-8	Tracking the location through app. Tracking the locationthrough website.	**2**	**High**	Abitha sree k

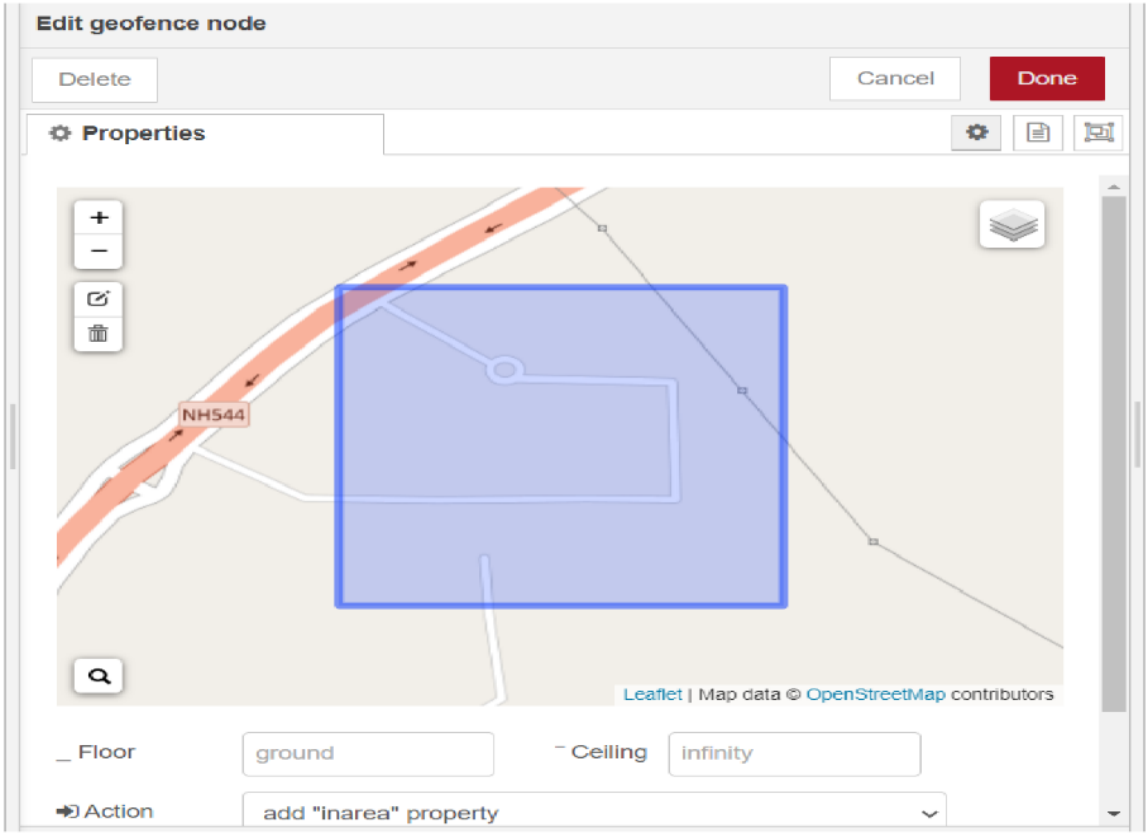
6.2 Sprint Delivery Schedule

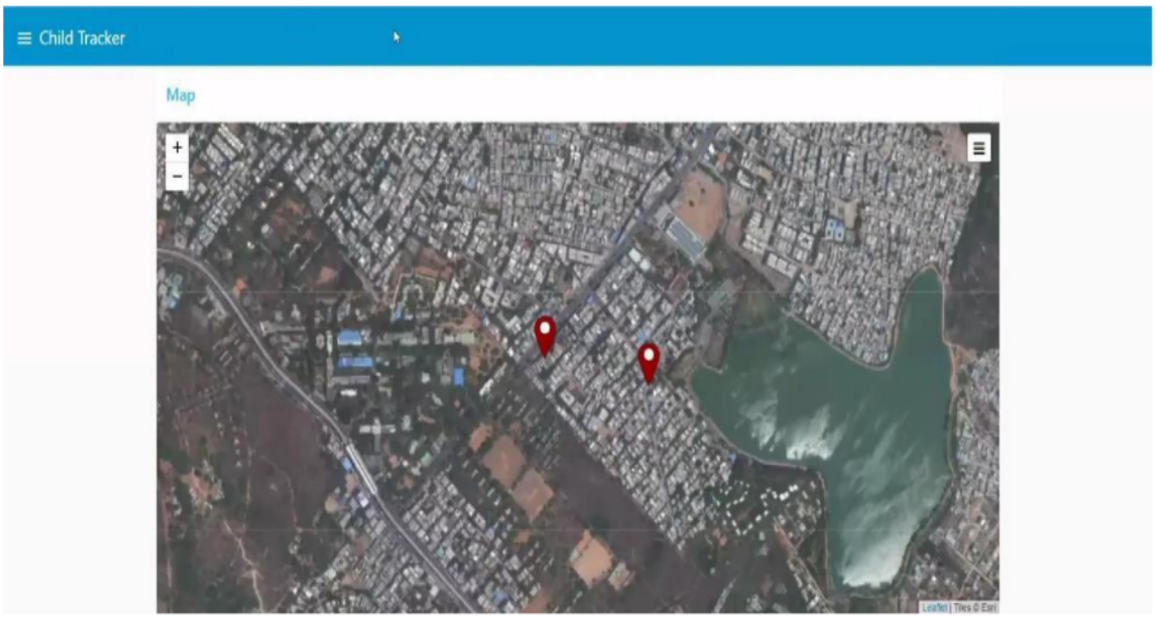
Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date(Planned)**	**Story Points Completed (ason Planned EndDate)**	**Sprint Release Date (Actual)**
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7 RESULTS

Tracking your child'slocation with geofencealert can make sure your child is safe and prevent kidnapping. When they come into an unknown place, you will receive alert and can react immediately. Moreover, it helps fight the habit of coming late and wasting time at places which are inappropriate for children.




Edit geofence node
Delete
Cancel
Done
Properties
NH544
Leaflet | Map data © OpenStreetMap contributors
Floor
ground
Ceiling
infinity
Action
add "inarea" property


Child Tracker
Map

8.TESTCASES

8.1 Test Cases:

A test case is a document which has a set of conditions or actions that are performed on the software application in order to verify the expected functionality of the feature.

After test scripts, test cases are the second most detailed way of documenting testing work. They describe a specific idea that is to be tested, without detailing the exact steps to be taken or data to be used. This doesn't mention how to apply the coupons or whether there are multiple ways to apply. It also doesn't mention if the tester uses a link to apply a discount, or enter a code, or have a customer service apply it. They give flexibility to the tester to decide how they want to execute the test.

Benefits of Writing Test Cases

The key purpose of a test case is to ensure if different features within an application are working as expected. It helps tester, validate if the software is free of defects and if it is working as per the expectations of the end users. Other benefits of test cases include:

i. Test cases ensure good test coverage

ii. Help improve the quality of software,

iii. Decreases the maintenance and software support costs

iv. Help verify that the software meets the end user requirements

v. Allows the tester to think thoroughly and approach the tests from as many angles as possible

vi. Test cases are reusable for the future – anyone can reference them and execute the test.

So, these are a few reasons why test cases are extremely useful in software testing. Test

cases are powerful artifacts that work as a good source of truth for how a system and a particular feature of software works. However, before we deep dive into the lessons for writing top-notch test cases, let us have a basic idea on the terminologies associated with them.

Test Case Format

The primary ingredients of a test case are an ID, description, bunch of inputs, few actionable steps, as well as expected and actual results. Let's learn what each of them is:

a. **Test Case Name:** A test case should have a name or title that is self-explanatory.

b. **Test Case Description:** The description should tell the tester what they're going to test in brief.

c. **Pre-Conditions:** Any assumptions that apply to the test and any preconditions that must be met prior to the test being executed should be listed here.

d. **Test Case Steps:** The test steps should include the necessary data and information on how to execute the test. The steps should be clear and brief, without leaving out essential facts.

e. **Test Data:** It's important to select a data set that gives sufficient coverage. Select a data set that specifies not only the positive scenarios but negative ones as well.

f. **Expected Result:** The expected results tell the tester what they should experience as a result of the test steps.

g. **Actual Result:** They specifies how the application actually behaved while test cases were being executed.

h. **Comments:** Any other useful information such as screenshots that tester want's to specify can be included here.

9. ADVANTAGES

☆ It helps in targetting customers in shops or retailoutlets with appropriateads as well as direct them to desiredsections in order to increase sales.
☆ Ithelps in influencing purchase decisions.
☆ It does not requireadditional hardware to implement it. Mobile apps are available for android and iOS operating systems.
☆ It is very easy to implement and usewith the help of googlemaps.
☆ It is very cheaper due to less costly mobile phones and availability of freeapps.

10. DISADVANTAGES

☆ The size and accuracy of the geofencesdepends on the location and positioning technologies used. The geofencing positioning technologies such as GPS, cellular and wifi deliver accuracies from 20 meters to 50 meters. Smaller geofencing use bluetooth positioning technologies such as iBeacons and Eddystone beacons. These technologies deliver accuracies of about 2 meters.☆ GPS positioning technique can also be used for geofencing but due to higherpower consumption it is not recommended for battery hungrydevices.

11. CONCLUSION

The System proposedin this paperis to ensure safety of children and increase their confidence. Many researchers are working in this area and have developed different technologies to help the children. The solution represented in this paper takes the advantage of smart phones which offers rich features like Google maps, SMS, etc. The child safety device is capable of acting as a smart IOT device. It provides parents with real-time location. This paper describes the

basic design concept and functionality along with the expectedoutcomes.

12. FUTURE SCOPE

This system can be further enhanced by installation of minicamera inside smart gadget for better security so that live footage can be seen on parental phone during panic situations. The system can be modified by installation of small solar panels for charging the battery of smart gadgetto gain maximum batterybackup.

13. APPENDIX

13.1 Source Code

```
import json
import wiotp.sdk.device
import time

myConfig = {
                    "identity" :
                    {
                    "orgID" : "t1sqja",
                    "typeId" : "NODEMCU",
                    "deviceId" : "12345"
                    },
                    "auth":
                    {
                    "token" : "12345678"
                    }
                }

client = wiotp.sdk.device.DeviceClient(config = myConfig, logHandlers = None)
client.connect()
```

```
while Ture:
        name = "abithasree"
        latitute = 11.114778283092631
        longitude = 77.1881467129582
        myData = ('name' : name, 'lat' : latitude, 'lon' : longtide)
        client.publishEvent(eventId = "status", msgFormat = "json", data-myData, qos=0,
onPublish=None)
        print("Data published to IBM Iot platfrom : ",myData)
        time.sleep(5)

client.disconnect()
```