

Project Report

Date	25 November 2022
Team ID	PNT2022TMID14667
Project Name	Project – IOT-Based Safety Gadget for Child Safety Monitoring and Notification

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1. INTRODUCTION

1.1 Project Overview

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.

1.2 Purpose

It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken. Through this, child safety can be ensured. By this, parents know what is happening remotely and can take actions if something goes wrong. It provides parents with the real-time location to monitor the child. It makes parents to make monitor their child from their workplace. Parents can be relax and calm by using this device.

2. LITERATURE SURVEY

2.1 Existing Problem

Parents need to ensure safety of their children but in realtime they need to get to work and need to worry about their child whether he/she is safe or not. So to ensure safety they need to monitor & to notify their child what he/she is doing and to know whether they are in safe atmosphere or not to ensure the safety of the child.

2.2 References

- A. Jatti, M. Kannan, R. M. Alisha, P. Vijayalakshmi and S. Sinha, "Design and development of an IOT based wearable device for the safety and security of women and girl children," 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, 2016, pp. 1108-1112.
- David Hanes, Gonzalo, Patrick Grosetete, Robert, Barton, Jerome Henry "IoT Fundamental and Networking Technologies, Protocols".

2.3 Problem Statement Definition

The objective of this project is to safeguard the child from threads. Now a days the safety measures of children has been reduced in huge number. Thus the violence against children increasing day by day. Our project mainly focus on sensing the children's Temperature and Heartbeat. By monitoring the activities the state of the child is analyzed. By using GSM, if child reaches the critical state then the latitude and longitude of that particular location is sent as an alert message to the parents.

Sl.No	AUTHOR	YEAR	JOURNAL NAME	ABOUT
1	N. Senthamilarasi N. Divya Bharathi	2012	Child Safety Monitoring System Based on IoT	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	M Nandini Priyanka, S Murugan, K N H Srinivas, T D S Sarveswararao, E Kusuma Kumari.	2019	International Journal of Innovative Technology and Exploring Engineering (IJITEE) Smart IOT Device for Child Safety and Tracking https://www.ijitee.org/wp-content/uploads/papers/v8i8/H6836068819.pdf	The novelty of the work is that the system automatically alerts the parent/caretaker by sending SMS, when immediate attention is required for the child during emergency
3	Mr.Vinod Mane, Durgesh Musale, Rohan Joshi, Aditya Toney, Anand Pande, Shashank Kohade	2020	IoT Enabled Children Safety System (International Research Journal of Engineering and Technology (IRJET)) https://www.irjet.net/archives/V7/i1/IRJET-V7I143.pdf	It is a IOT based project and their approach is to monitor school bus in this new era of smart cities
4	Lai Yi Heng, Intan Farahana Binti Kamsin	2021	(Proceedings of the 3rd International Conference on Integrated Intelligent Computing Communication & Security (ICIIC 2021)) IoT-based Child Security Monitoring System	Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more. To show the child's actual data with reference values.●
5	Fathima, N., Ahammed, A., Banu, R.,	2017	Optimized neighbor discovery in Internet of Things (IoT).	This device helps in optimized discovery of the child using data collected

	Parameshachari, B.D Naik, N.M		(International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques (ICEECCOT) (pp. 1-5). IEEE.)	
6	Prakriti Agarwal, R Ramya, Rachana Ravikumar, Sabarish G, Sreenivasa Setty	2020	Survey on Child Safety Wearable Device Using IoT Sensors and Cloud Computing (International Journal of Innovative Science and Research Technology)	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.
7	Mrs. P Chitra, Aarthi S, Anitha K, Angammal R, Abinaya D	2022	Monitoring and Prevention of Child Abuse Using IoT https://www.ijraset.com/research-paper/monitoring-and-prevention-of-child-abuse-using-iot	This paper focuses on the important issue of how people surrounding a missing child can assist the youngster and play a crucial role in the child's safety and health monitoring until they are reunited with their parents.
8	Dr. T. VP. Sundararajan	2018	Activity Tracker Wrist Band for Children Monitoring using IOT	The children with Activity Tracker that has access to IOT monitoring and GSM technology keeps monitoring the children. The system has sensors interfaced with the processor which keeps sensing the vital signals such as heart beat rate, temperature, etc. So whenever some perilous situations arise there may be an indication to parents
9	Pietro Battistoni *ORCID, Monica SebilloORCID	2021	An IoT-Based Mobile System for Safety Monitoring of Lone Workers	This paper proposes a distributed solution of Smart Personal Protective Equipment for the safety

	andGiuliana Vitiello			<p>monitoring of Lone Workers by adopting low-cost electronic devices. In addition to the same hazards as anyone else, Lone Workers need additional and specific systems due to the higher risk they run on a work site. To this end, the <i>Edge-Computing</i> paradigm can be adopted to deploy an architecture embedding wearable devices, which alerts safety managers when workers do not wear the prescribed Personal Protective Equipment and supports a fast rescue when a worker seeks help or an accidental fall is automatically detected.</p>
10	Fei Mingming , Shi Yanli	2014	Design and implementation anti-lost children system based on internet of things	<p>In this paper, the current rapid development of society for children brought to this reality is lost, combined with existing and emerging technologies, Internet of Things inlife related application solutions proposed, which can be determined at any location to avoid the safety of children parents worry about other issues. Although at present no specific implementation, and the idea is still preliminary stage, but levels of the method, rationality, practicality and applicability have good theoretical basis, and the method utilizes advanced technology, with good</p>

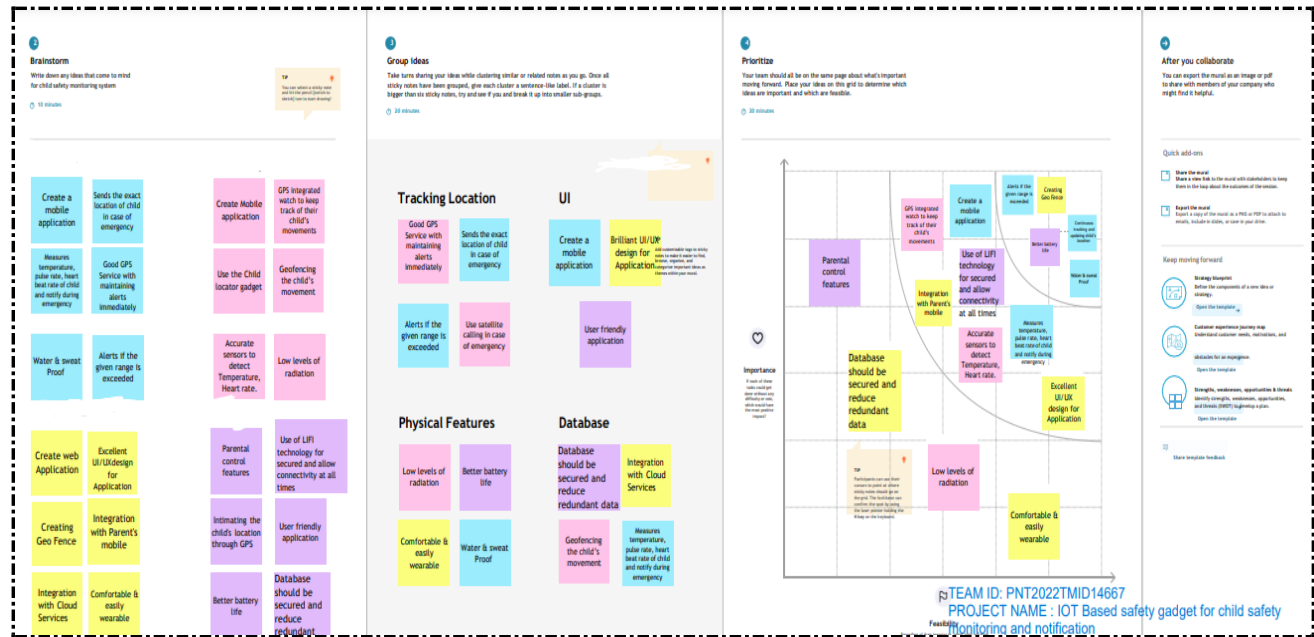
				scalability and adaptability, with some room for development, there is a certain profit margin.
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3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



Step-1: Team Gathering, Collaboration and Select the Problem Statement

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 exchanging of 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 advance of technology, paving the pathway for the creation of age-friendly environments. This had led to the necessity indesigning new products for infants protection.

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 cannot continuously monitor their babies' conditions either in normal or abnormal situations. Still, certain incidents like infant attacks have been reported, it is necessary to protect the baby.

Step-2: Brainstorm, Idea Listing and Grouping

Team Member 1: **MOHANAMBIKAI A**

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 mobile based applications provide alert systems. During the emergency, mobile apps alert the control room of nearby police station or caretakers of children. The literature shows that location tracking devices are available in the market, but it does not provide the complete solution to the problem.

The solution to this problem is to design an IoT device, which senses the child's location and environment and during emergency, it should send the alert to the parents automatically.

Team Member 2: SAIGNANASRI K

The children are too young to take care of themselves. We cannot monitor the children at all times in school, play area, and outside place. In this paper, we discuss the concept of child safety device 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 Member 3: NARMADHA V

Crimes on children keep increasing despite actions have been taken by the government. Revealed by [9], the overall percentage of child abasements worldwide is about 80% 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 worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out.

To cope with the issue, the system is proposed with these objectives:

Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.

To show the child's actual data with reference values.

Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations

Team Member 4: MONIKA DEVI A

Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace. Besides, unlike existing smart band, which is less focusing on child security aspect, 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.

Team Member 5: MUNGAMURU LOHITHA REDDY

Implementation check of 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. Through this, child safety can be ensured and crime rate will be reduced. However, the proposed device is not robust enough and does not contain sufficient functions to operate like a mobile phone. Hence, the future enhancements will be adding more features, software, applications, hardware to make the proposed system capable of working more intelligently, meanwhile guarantee the safety of children.

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 advance of technology, paving the pathway for the creation of age-friendly environment.

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 any place and any time, parents who often tied up in work or neglect their children are gaining advantages from it.

Through the 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 effects such 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.

Through this, child safety can be ensured and crime rate will be reduced. However, the proposed device is not robust enough and does not contain sufficient functions to operate like a mobile phone. Hence, the future enhancements will be adding more features, software, applications, hardware to make the proposed system capable of working more intelligently meanwhile guarantee the safety of children.

Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Parents are unable to take care of their children due to office works. To avoid criminal activities towards children.
2.	Idea / Solution description	We are tracking the location of the child using GPS tracker in order to protect them. The gadget will be compact and can be comfortably used by the child.
3.	Novelty / Uniqueness	We use cloud for storing database Cloud watch would be used for monitoring purpose.
4.	Social Impact / Customer Satisfaction	It makes parents work easier to manage their children. The device will be compact and easy to handle
5.	Business Model (Revenue Model)	The device will be wearable and comfortable gadget. We use wifi connection for connectivity purpose.
6.	Scalability of the Solution	The designed system is affordable and useful to the users.

3.3 Problem Solution fit

Project Title: IoT based safety gadget for child safety monitoring and notification.		Project Design Phase-I - Solution Fit Template		Team ID: PNT2022TMID14667	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS It is useful for parents to ensure their child safety and monitor them.	6. CUSTOMER CONSTRAINTS CC They need an mobile phone with internet connectivity to get notification. They also required GPS tracker to track the location.	5. AVAILABLE SOLUTIONS AS The existing device monitor the different status of children by hand movements.	Explore AS, differentiate	
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS J&P The device should consist of proper internet connection. Loss of GPS signal.	9. PROBLEM ROOT CAUSE RC To avoid criminal activities towards children. Parents unable to take care of their children due to office works.	7. BEHAVIOUR BE Based on situation and location the person can track the child location and sort out the issue.	Focus on J&P, tap into BE, understand RC	
Identify strong TR & EM	3. TRIGGERS TR It makes their work easier to manage their children.	10. YOUR SOLUTION SL We are tracking the location of the child using GPS tracker in order to protect them. The gadget will be compact and can be comfortably used by the child.	8. CHANNELS of BEHAVIOUR CH Online :- Users get alert notification through mobile. Offline :- The Police may reach the suspected place in person and sort out the issue	Identify strong TR & EM	
	4. EMOTIONS: BEFORE / AFTER EM Before :- They will feel insecure about their children safety. After :- The harmless environment will be provided for children.				

4. REQUIREMENT ANALYSIS

4.1 Functional Requirements

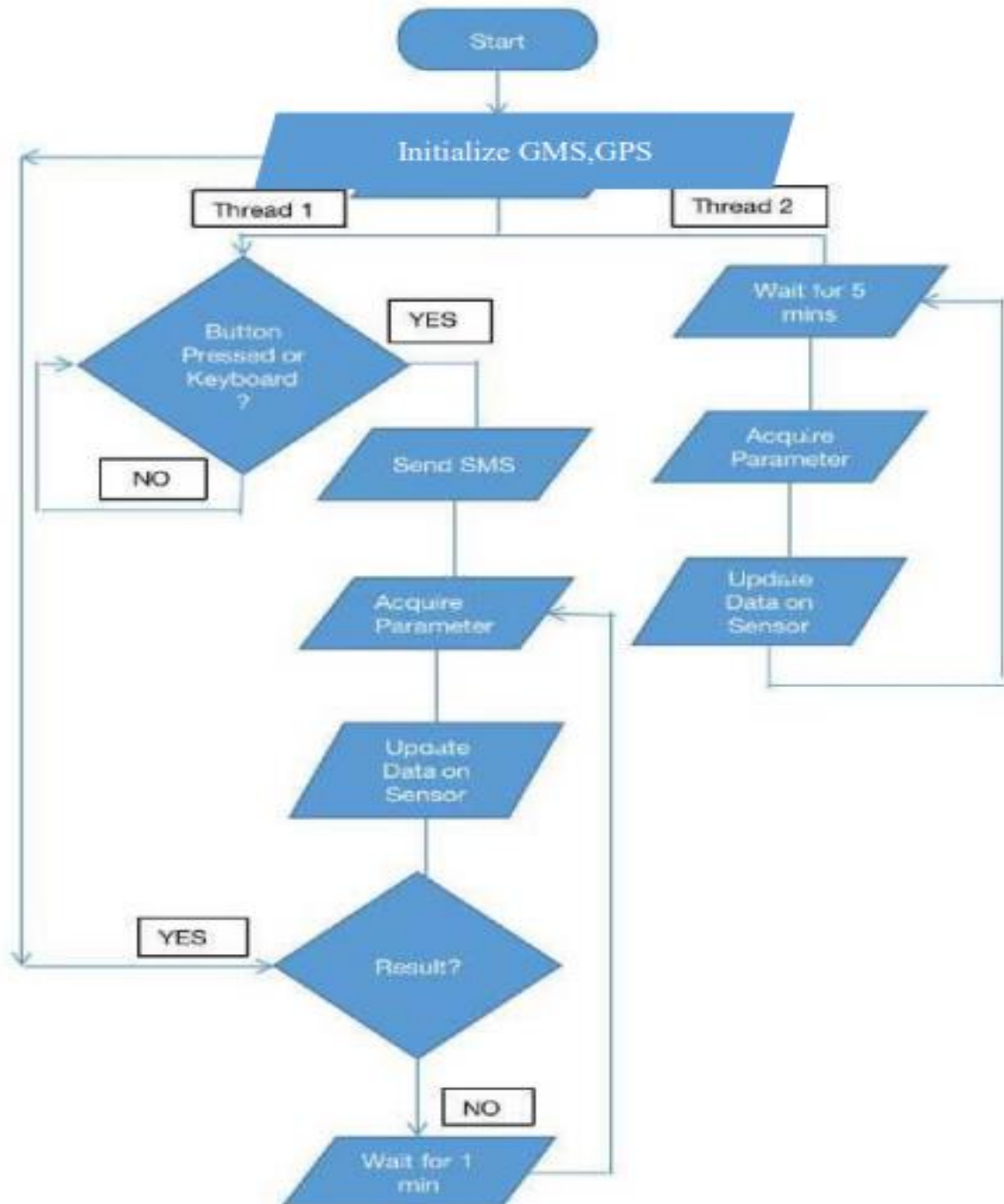
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through Mobile number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Interface	To create geofence and store it in db To show and check the current location of that user
FR-4	Notification	Via SMS contains user's current location
FR-5	SOS Emergency	Inbuilt button will be provided in the mobile app to call the emergency contact

4.2 Non- Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	To create the geofence and check whether the user is within the geofence, if not. To alert the emergency contact
NFR-2	Security	Data security must meet HIPAA requirement
NFR-3	Reliability	Accurate data results must be provided at all times
NFR-4	Performance	Each button assigned with their own functionalities must provide fast and efficient service to the user
NFR-5	Availability	The data collected by the mobile app must be available at any time
NFR-6	Scalability	Ability to process and update user's data instantly

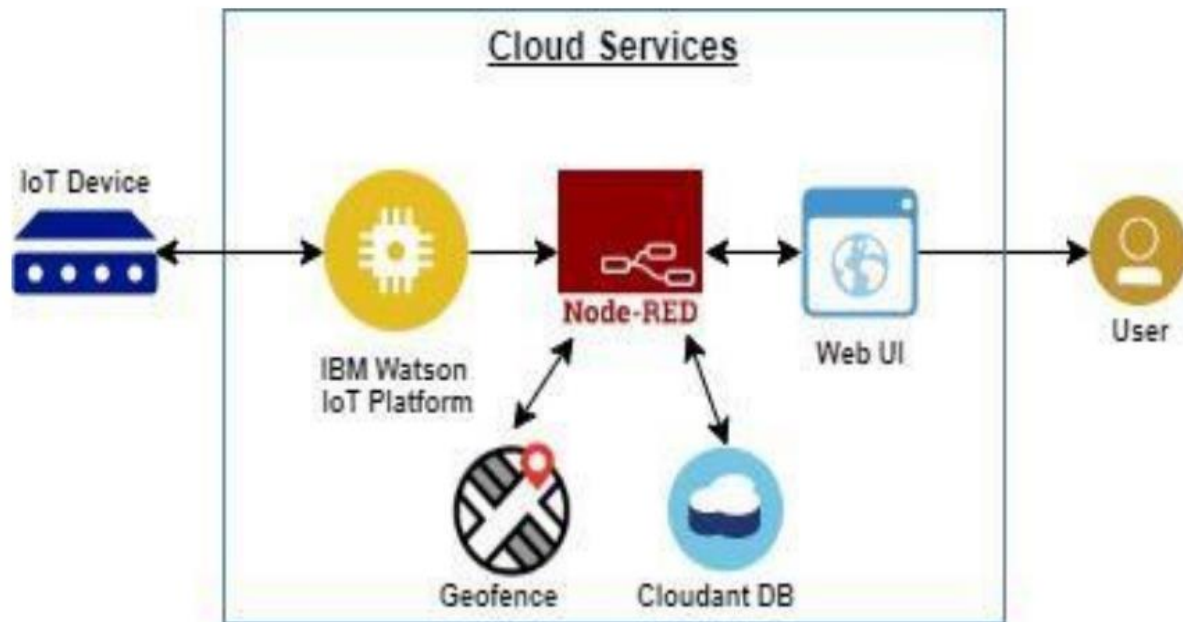
5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture

The device has IOT monitoring allows to monitor the child from anywhere with any portable devices. Ultrasonic sensor are used which sense when someone near child and alarm buzz will established SMS and dialing function is made to parent



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1 (FATHER)	I can access the location of my children using the credentials provided as a Father.	I can access my account/ dashboard	High	Sprint-1
		USN-2 (MOTHER)	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)	I too can monitor the children's activities using safety gadget monitoring system.	I can access my account / dashboard and receive confirmation email & click confirm	Low	Sprint-2
		USN-4	Same function to be performed as in previous cases.	Same function to be performed as in previous cases.	Not Yet Determined	
	Login	USN-5	Same function to be performed as in previous cases.	Same function to be performed as in previous cases.	Not Yet Determined	

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

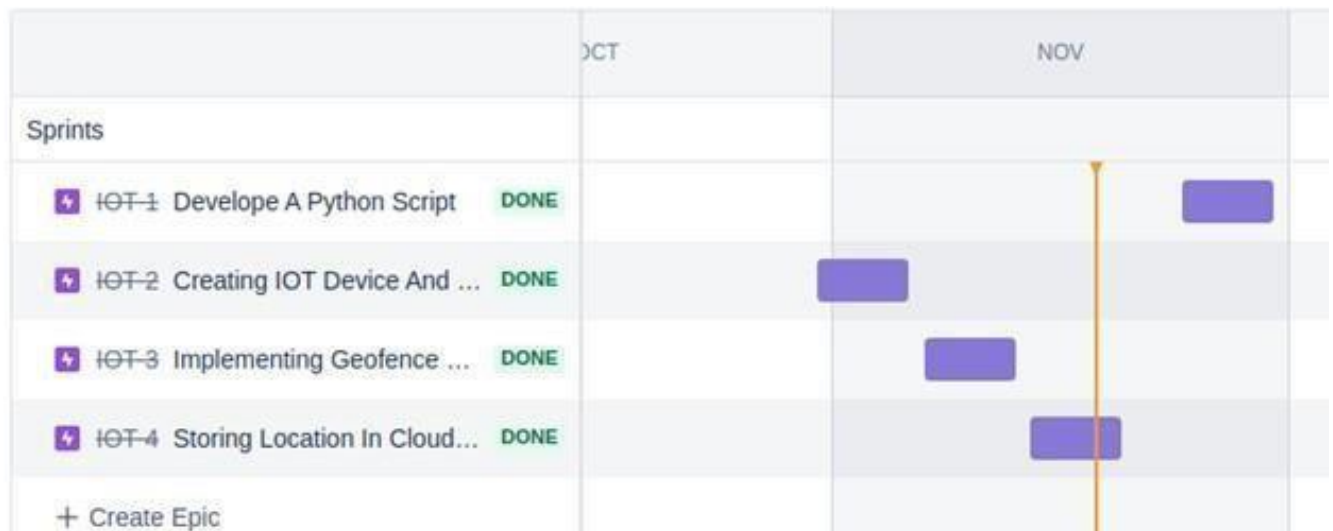
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirming my password.	4	High	Mohanambikai
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	Mohanambikai
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	Mohanambikai
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High	Monika Devi
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	Monika Devi
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	Narmadha
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium	Narmadha
Sprint-3	Communication	USN-3,1	I should be able to communicate with my parents	6	Low	Sai Gnana Sri

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium	Lohitha and Sai Gnana Sri
Sprint-3	Node RED- Cloudant DB communication	USN-5,2	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	High	Lohitha and Sai Gnana Sri
Sprint-4	User – WebUI interface	USN-1,4	The Web UI should get inputs from the user	6	High	Narmadha Monika Devi
Sprint-4	Geofencing	USN-2,3,5	The geofencing of the child should be done based on the geographical coordinates	7	High	Sai Gnana Sri Mohanambikai

Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	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	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.2 Reports from JIRA



7.CODING

7.1 Coding

```
import json
```

```
import wiotp.sdk.device
```

```
import time
```

```
myConfig = {
```

```
    "identity": {
```

```
        "orgId": "fa5hg3",
```

```
        "typeId": "safetygad",
```

```
        "deviceId": "gad1"
```

```
    },
```

```
    "auth": {
```

```
        "token": "gyg06jzil(!ITGsKxV"
```

```
    }
```

```
}
```

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

```
client.connect()
```

```
while True:

    name="CHILD"

    #in area location

    #latitude=13.145997614532394

    #longitude=80.0619303452179

    #out area location

    latitude=13.15412

    longitude=80.05729

    myData={'name':name, 'lat':latitude, 'lon':longitude}

    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)

    print("Data published to IBM lot platform: ",myData)

    time.sleep(2)

client.disconnect()
```

7.2 Geo-fence

A geofence is a virtual perimeter for a real-world geographic area.[1] A geofence could be dynamically generated (as in a radius around a point location) or match a predefined set of boundaries (such as school zones or neighborhood boundaries).The use of a geofence is called geofencing, and one example of use involves a location-aware device of a location-based service (LBS) user entering or

exiting a geofence. This activity could trigger an alert to the device's user as well as messaging to the geofence operator. This info, which could contain the location of the device, could be sent to a mobile telephone or an email account.

8.RESULTS

8.1 Performance Metrics

It is being used as it allows the correct sample of respondents to be selected due to which becomes convenient to obtain results. Besides, the results offered are affordable and usable. Since the respondents are properly chosen, the results tend to be more accurate, precise and reliable.

9.ADVANTAGES & DISADVANTAGES

9.1 Advantages

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.

9.2 Disadvantages

It can be easily removed or damaged while playing and by any intruders.This requires internet connectivity to get monitored and to notify alert messages to parents.

10. CONCLUSION

The word Future resembles the word Children. As Dr. A.P.J Abdul Kalam's words "Youngsters are the future pillars of one's nation", today's children are tomorrow's youngsters, preserving their dreams and life for a better future is necessary. Therefore, each and every parent should take care of their own children, without

letting them to fall into the dark world of abusements, which entirely ruin them physically, mentally and emotionally destroying our future. Hence, considering the importance of our future, our project makes it easy for parents to track their children and to visually monitor them on regular basis, which makes them ensure the safety of their children and reduces the rate of incidents of child abuse.

11. FUTURE SCOPE

In our system, we automatically monitor the child in real time using Internet of Things, with the help of GPS, GSM, and Raspberry Pi. This system requires network connectivity, satellite communication, and high-speed data connection when we use web camera and GPS to lively monitor. It is difficult to monitor when there occurs any hindrance to satellite communication or any network issue. There also occurs time delay in video streaming through the server. Hence in the future, these issues can be overcome by using Zigbee concept or accessing the system without internet and using high-speed server transmission.

12. APPENDIX

Source Code

Code for IN Area Location:

```
import json
import wiotp.sdk.device
import time
myConfig={
    "identify":{
        "orgId":"fa5hg3",
        "typeId":"safetygad",
        "deviceId":"gad1"
    },
    "auth":{
        "token":"gyg06jzil(!ITGsKxV"
    }
}
client=wiotp.sdk.device.DeviceClient(config=myConfig,logHandlers=None)
client.connect()
```

```

while True:
    name="CHILD"
    #in area location
    #latitude=13.145997614532394
    #longitude=80.0619303452179
    #out area location
    latitude=13.15412
    longitude=80.05729
    myData={'name':name,'lat':latitude,'lon':longitude}
    client.publishEvent(eventId="status",msgFormat="json",data=myData,gos=0,onpublish=None)
    print("Data published to IBM lot platform:",myData)
    time.sleep(2)
    client.disconnect()

```

code for OUT area location:

```

import json
import wiotp.sdk.device
import time
myConfig={
    "identify":{
        "orgId":"fa5hg3",
        "typeId":"safetygad",
        "deviceId":"gad1"
    },
    "auth":{
        "token":"gyg06jzil(!ITGsKxV"
    }} client=
    wiotp.sdk.device.DeviceClient(config=myConfig,
    logHandlers=None)client.connect()
    while True:
        name="CHILD"

#out area location
latitude=13.15412
longitude=80.05729
myData={'name':name,'lat':latitude,'lon':longitude}
client.publishEvent(eventId="status",msgFormat="json",data=myData,gos=0,onpublish=None)
print("Data published to IBM lot platform:",myData)
time.sleep(2)

```


client.disconnect()

GITHUB LINK: <https://github.com/IBM-EPBL/IBM-Project-31255-1660198221>

PROJECT DEMO LINK:

https://drive.google.com/file/d/1cD7hcDNZ2B5JZmo29dO_cLgzMNZZGd9b/view?usp=drivesdk

GitHub Link: <https://github.com/IBM-EPBL/IBM-Project-31255-1660198221>

Project Demo link:

https://drive.google.com/file/d/1cD7hcDNZ2B5JZmo29dO_cLgzMNZZGd9b/view?usp=drivesdk