IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

IBM NALAIYA THIRAN

PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

KSR COLLEGE OF ENGINEERING

(AUTONOMOUS)

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NOVEMBER 2022

Team ID	PNT2022TMID12112
Project Name	IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION
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INTRODUCTION

The internet of things (IOT) refers to the set of devices and system that stay interconnected with real-world sensor and to the internet. During years' Child safety is under threat and it is very important to provide a technology-based solution which will help them under panic situations and monitor them using a smart gadget. Internet of things (IOT) refers to networked interconnection of objects featured with Immense intelligence . In IOT, objects are connected via internet for communication and interaction and also for exchanging the data and also for making decisions automatically correct at anywhere and anytime. IOT is a revolution in advancing technology causing transformation in IT, human's lifestyle, and also in businesses processes. The advancements of IOT make it possible to be used in organizations for automating and monitoring business processes .In term of society, IOT can be used for simplifying daily tasks, creating smart homes, smart cities, devices or application which improves the quality of life. However, security and privacy are the main challenges of IOT which need to be solved as it gathers much personal data capable of revealing sensitive information.

1.1 Project Overview

The internet of things (IoT) refers to the set of devices and system that stay interconnected with realworld sensor and to the internet. During years' Child safety is under threat and it is very important to provide a technology-based solution which will help them under panic situations and monitor them using a smart gadget. 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 geo-fence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geo-fence. 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

This IOT based child safety gadget for child safety monitoring and notification project 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. And also it refers to protecting children from or any perceived or real danger/risk. It helps to reduce their vulnerability in harmful situations. It also means protecting children against social,psychological and emotional insecurity and distress. Basically, children cannot complain about abusements which they face in their daily life to their parents.

1. LITERATURE SURVEY

1.1 Existing Problem

1. .RFID-based System for School Children Transportation Safety Enhancement This paper presents a system to monitor pick-up/drop-off of school children to enhance the safety of children during daily transportation from and to school. The system consists of two main units, a bus unit, and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. The system has a developed web-based database-driven application that facilities its management and provides useful information about the children to authorized personnel. A complete prototype of the proposed system was implemented and tested to validate the system functionality. The results show that the system is promising for daily transportation safety.

2. Parents need not have a smart mobile. Set of keywords are used to gain information from the kit. LOCATION keyword is used to obtain the location of the child. UV keyword is used to obtain the temperature of the surroundings. BUZZ keyword is used to turn on the buzzer which is fixed in that device.

3. A portable device which will have a pressure switch. As soon as an assailant is about to attack the person or when the person senses any insecurity from a stranger, he/she can then put pressure on the device by squeezing or compressing it. Instantly the pressure sensor senses this pressure and a conventional SMS, with the victim's location will be sent to their parents/guardian cell phone numbers stored in the device while purchasing it, followed by a call. If the call is unanswered for a prolonged time, a call will be redirected to the police and the same message will be sent. Additionally, if the person crosses some area which is usually not accessed by the person then a message with the realtime location is sent to the parent/guardian's phone via conventional SMS.

1.2 REFERENCES

[1] M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari, 'Smart IoT Device for Child Safety and Tracking' International Journal of Innovative Technology and Exploring Engineering, Volume 8, Issue 8, June 2019.

[2] Akash Moodbidri, Hamid Shahnasser (Jan. 2017) 'Child safety wearable device', International Journal for Research in Applied Science & Engineering Technology, Vol. 6 Issue 2, pp. 438-444.

[3] Aditi Gupta, Vibhor Harit, 'Child Safety & Tracking Management System by using GPS, GeoFencing & Android Application: An Analysis,' 2016 Second International Conference on Computational Intelligence & Communication Technology.

[4] Dheeraj Sunehera, Pottabhatini Laxmi Priya, 'Children Location Monitoring on Google Maps Using GPS and GSM, 2016 IEEE 6th International Conference on Advanced Computing.

[5] Asmita Pawar, Pratiksha Sagare, Tejal Sasane, Kiran Shinde (March- 2017) 'Smart security solution for women and children safety based on GPS using IoT', International Journal of Recent Innovation in Engineering and Research, vol. 2, Issue 3, pp. 85-94.

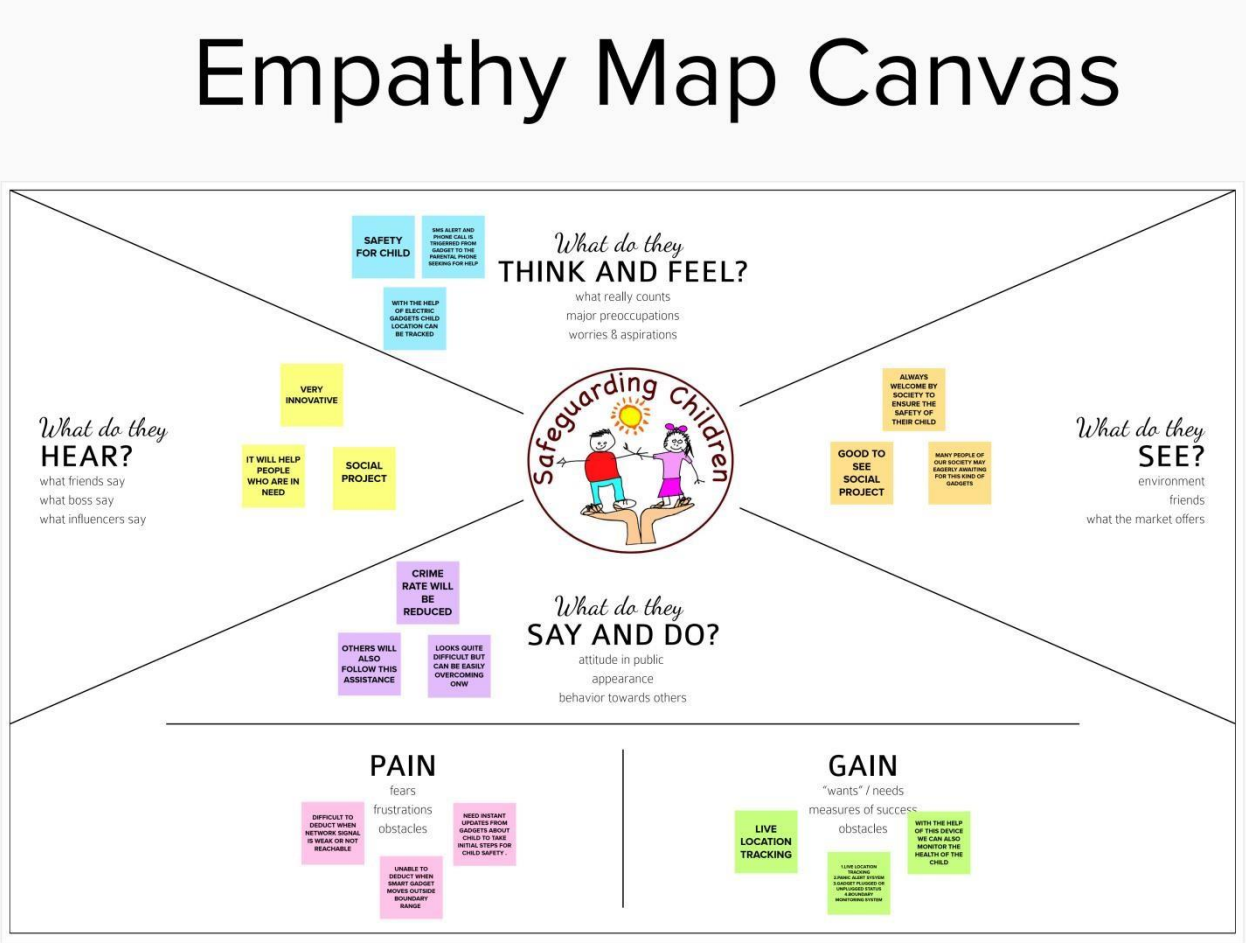
[6] Nitishree, (May-June, 2016) A Review on IOT Based Smart GPS Device for Child and Women Safety', International Journal of Engineering Research and General Science, Vol. 4, Issue 3, pp. 159164.

2.3 PROBLEM STAEMENT 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 geo-fence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geo-fence. 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.IDEATION AND PROPOSED SOLUTION

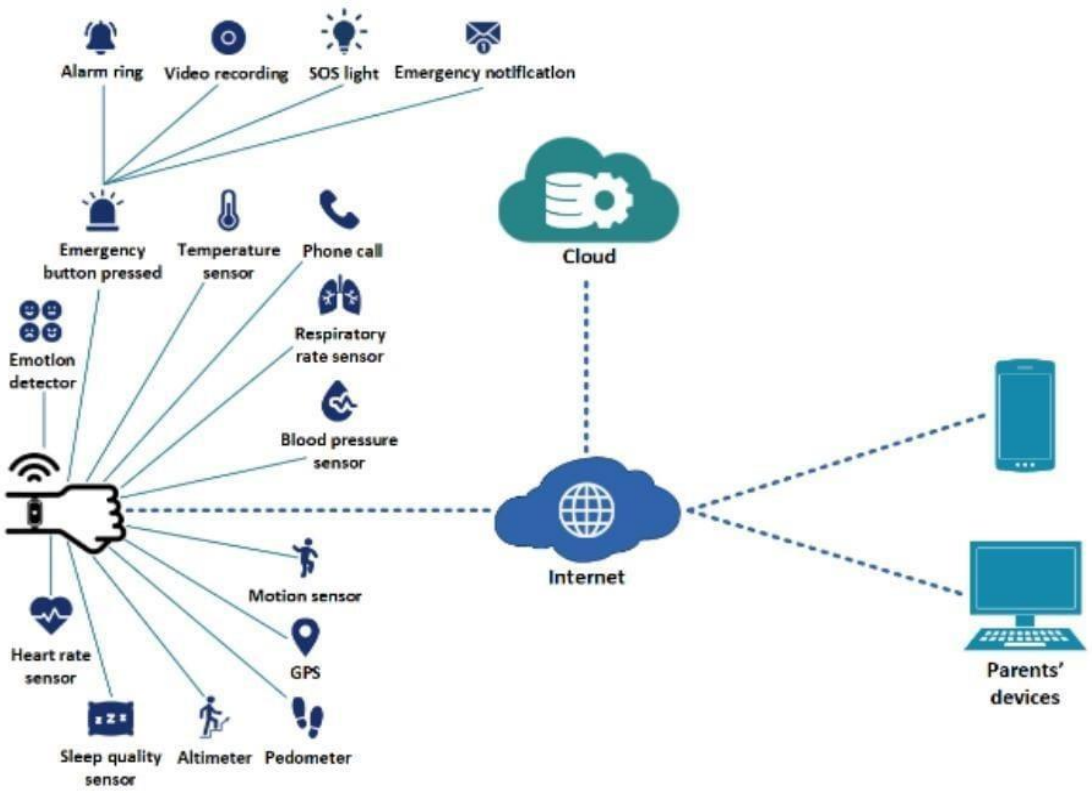
3.1 Empathy Map Canvas



3.2 Ideation and Brainstorming

Ideation helps us to gether the idea of our individual teammates and grouping them based on the possibilities and similarities.It also helps us to prioritize our ideas based on importance and feasibilityThe brainstorm represents the idea of the each individuals from our team.So this brainstorm gives a clear view about the ideas that we are going ti imply on our project and also tells whose ideas those are,then ideas are sepreated according to the technology.Some of the good are also highlighted in the brainstorm

3.3 Proposed Solution



In this current world, child safety is important. Parents cannot be in the surrounding of their children and they can't be monitored always, each and every child cannot be secured by security as they are in school they can be monitored by the teachers and staffs present there but in parks and other areas there will be no one to monitor them. This is based on child safety and a gadget is developed to monitor the child's location continuously. They can leave their children in school or parks and create a geo-fence around the particular location. Notifications will be generated if the child crosses the geo-fence. Notifications will be sent according to the child's location to their parents or care takers.

Comparisons

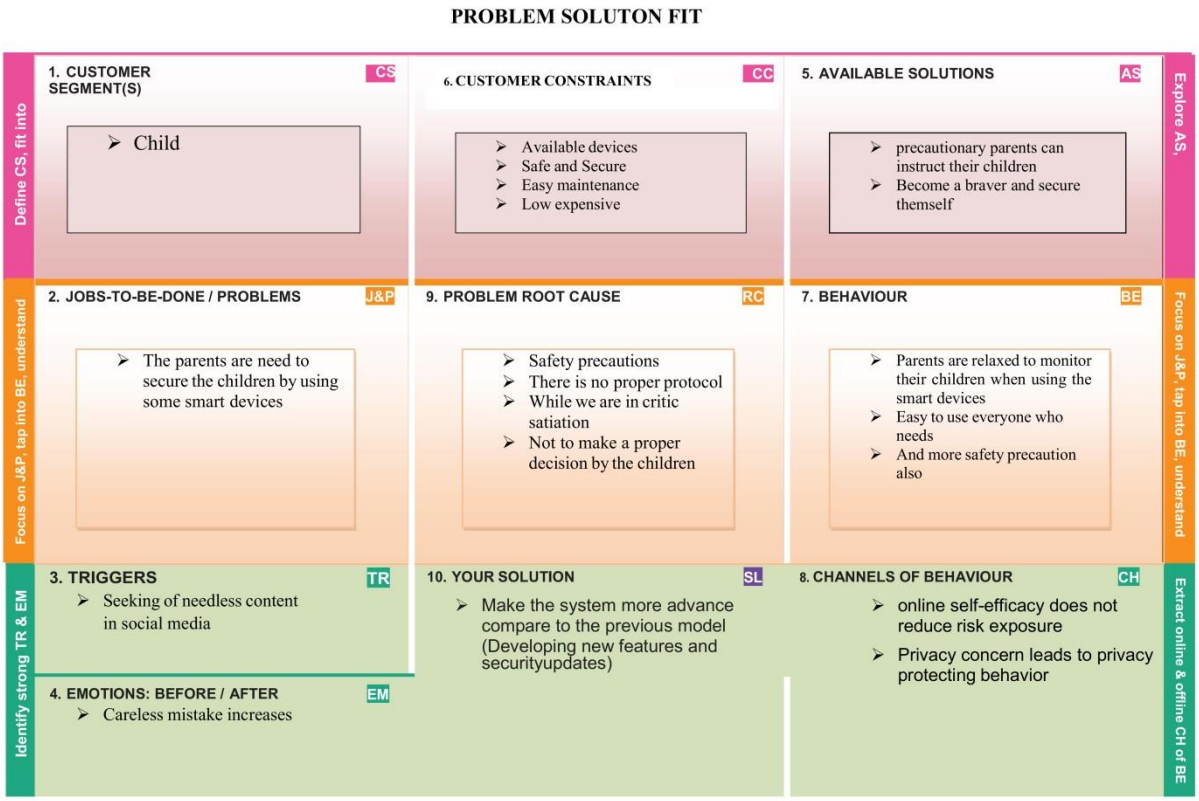
	Gator	Explora Go	Proposed System
Wifi	✓	✓	✓
Phone Calls	✓	✓	✓
Waterproof	X	✓	✓
Camera	X	✓	✓
Video Record	X	X	✓
Text Messages	X	✓	X
Schedule	✓	✓	X
GPS	✓	✓	✓
Safety Zones	✓	✓	✓
Emergency Button	✓	✓	✓
SOS Light	X	X	✓
Altimeter	X	X	✓
Blood Pressure Sensor	X	X	✓
Emotion Detector	X	X	✓
Heart Rate Sensor	X	X	✓
Motion Sensor	X	X	✓
Pedometer	✓	✓	✓
Respiratory Sensor	X	X	✓
Sleep Quality Sensor	X	X	✓
Temperature Sensor	X	X	✓

3.3 PROPOSED SOLUTION

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	In this current world, child safety is important.Parents cannot be in the surrounding of their children and they can't be monitored always, each and every child cannot be secured by security as they are in school they can be monitored by the teachers and staffs present there but in parks and other areas,there will be no one to monitor them.
2.	Idea/Solution description	This is based on child safety and a gadget is developed to monitor the child's location continuously. They can leave their children in school or parks and create a geo-fence around the particular location. Notifications will be generated if the child crosses the geo-fence. Notifications will be sent according to the child's location to their parents or caretakers.
3.	Novelty/Uniqueness	The Novelty of the work is that the system automatically alerts the parents/caretaker by sending SMS, when immediate attention is required for the child during an emergency. The parameters such as touch,temperature, heartbeat of the child are used for parametric analysis and results are plotted for the same.
4.	Social Impact / Customer Satisfication	The main aim of this project is to assists the 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, crime rate is reduced

5.	Business Model (Revenue Model)	We can generate revenue by offering subscriptionbased applications to the people. We can notify the child using an application where they can get the
		safety related notifications.
6.	Scalability of the Solution	Even if the number of users increases the system will perform well. The output is optimal and it can be accessible anywhere and anytime

3.4 Problem Solution Fit



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

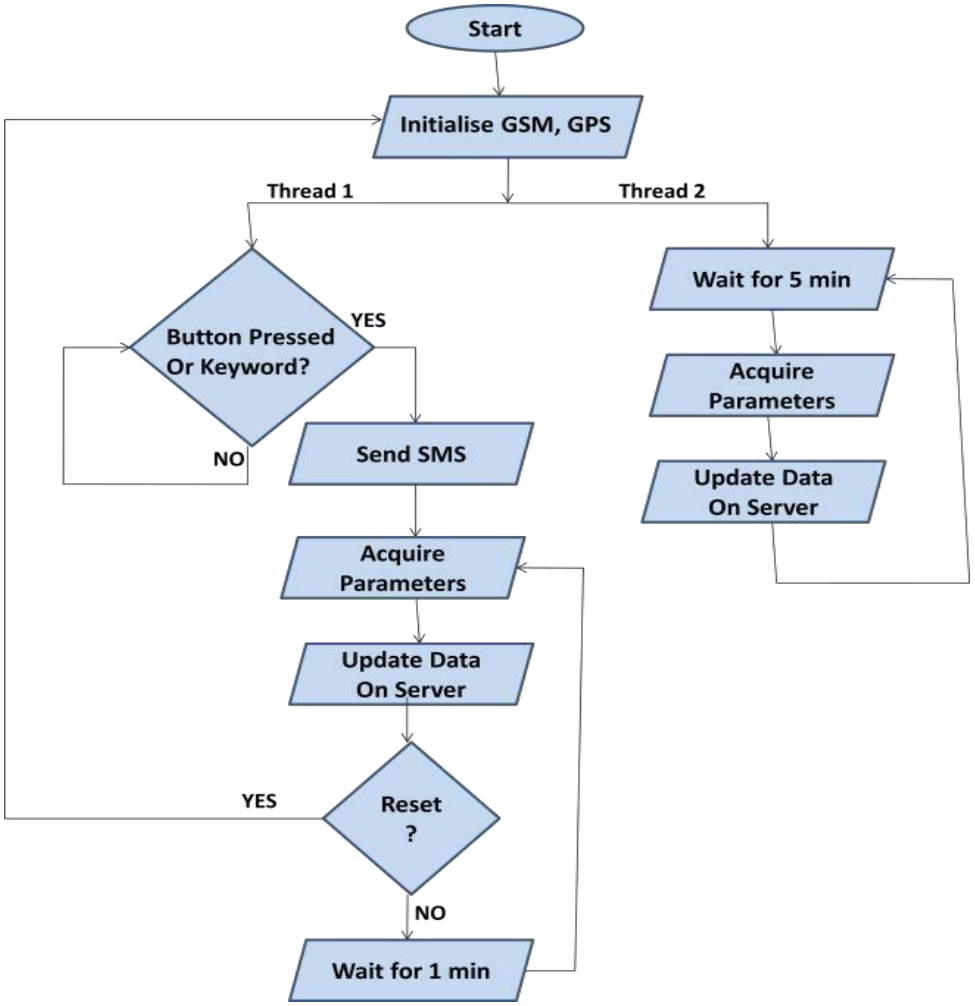
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / SubTask)
FR-1	**User Registration**	➢ Registration through Phone ➢ Registration through Gmail
FR-2	**User Confirmation**	➢ Confirmation through Email ➢ Confirmation through Mobile Alert
FR-3	**App installation**	➢ Installation through website APK's ➢ Installation through play store.
FR-4	**Detecting child**	➢ Detecting location through SMS ➢ Detecting location through mobile app
FR-5	**Set Geofence**	➢ Setting by user to find child location
FR-6	**User End Result**	➢ Parents need not worry about their children.
FR-7	**User Objective**	➢ Easy to monitor the child anywhere ➢ Helps to identify the child.

4.2 NON-FUNCTIONAL REQUIREMENTS

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	➢ The device has GSM can help to inform the parents about the current situation of the child, alert by message immediately to save the child. ➢ Seamless communication is possible between people, processes, and things.
NFR-2	**Security**	➢ Make children parents more assure about their kid's security, we have a feature in our device called GeoFence. ➢ Securing your IoT devices and network as you scale up production and deployment can be challenging one, we have a feature like storing all data in the database.
NFR-3	**Reliability**	➢ The reliability of an item is to perform a required function in a correct manner.It is easy to use and more flexible.
NFR-4	**Performance**	➢ Create a Child tracker which helps the parents with continuously monitoring the child's location. ➢ The website's load time should not be more than one second for users. ➢ The notification will be sent according to the child's location to their parents. The overall data is stored in the database database.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION & TECHNICAL ARCHITECTURE

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	The communication protocol being used in the proposed solution might act as an interface the way like WiFi, Bluetooth and ZigBee	MIT app
2.	Application Logic	The data to be collected and sent to the authenticator's(parent) via GSM providing the GPS coordinates to easily locate access and monitor the Child	IBM Watson STT service, python etc
3.	Database	Data to be segregated and secured in the form of relational DBMS	MySQL
4.	Cloud Database	IBM	IBM Cloudent
5.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
6.	External API-1	To access the children location	GPS location monitoring
7.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration	Cloud Foundry

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The proposed solution being framed in the form an android application providing the end user an easysurveillance of their children (preferably users are parents)	UI/UX design development
2.	Security Implementations	The developed application should be accessible in the way it can only respond to the comments of the relevant users	Encryptions, IAM Controls.
3.	Scalable Architecture	The app format comes the way easier to handle and operate.	Not yet determined
4.	Availability	The developed solution tends to be available in the market at any time	Not yet determined
5.	Performance	Highly proper and betterment functionalities are to be ensured in the designed solution	Not yet determined

5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer(Parents 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 and receive confirmation email & click confirm	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	Medium	Sprint -2
	Login	USN-4 (if required)	Same function to be performed as in previous cases.	Same function to beperformed as in previous cases.	Not Yet Determined	--
	Dashboard	USN-5 (if required)	Same function to be performed as in previous cases.	Same function to be performed as in previous cases.	Not Yet Determined	----

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

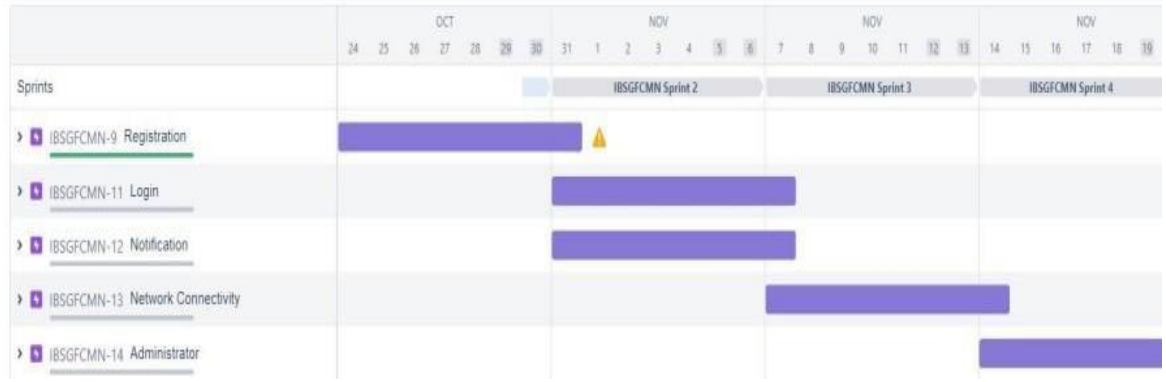
Sprint	Functional Requirement	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user,I can register for the application by enerting my email,password,and confirming my password	3	High	ThivakaranP
Sprint-1		USN-2	As a user,I will receive confirmation email once I have registered for the application.	3	High	Suganeswaran P
Sprint-1		USN-4	As a user,I can register for the application	3	Medium	Someshwaran S
Sprint-1	Login	USN-3	As a user,I can log into the application by entering email and password	3	Low	Kavaskar B
Sprint-2		USN-5	As a user,I can logout of the application	5	High	Thivakaran P
Sprint-4	Dashboard	USN-6	As a user,I can receive alert notifications if the movements is beyond the geofence	13	High	Suganeswaran P Someshwaran S
Sprint-2		USN-7	As a user I can enter the coordinates and monitor the child's movement.	5	Medium	Kavaskar B Thivakaran P
Sprint-3		USN-8	As a user I can update the coordinates whenever necessary.	13	Medium	Suganeswaran P

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date	Sprint Points Completed (as on planned end date)	Sprint Release Date (Actual)
Sprint-1	12	6 Days	24 Oct 2022	29 Oct 2022	12	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	13	6 Days	07 Nov 2022	12 Nov 2022	13	12 Nov 2022
Sprint-4	13	6 Days	14 Nov 2022	19 Nov 2022	13	19 Nov 2022

6.3 REPORTS FROM JIRA

JIRA Roadmap Progress:



7. CODING 7 SOLUTIONING

7.1 FEATURE 1

The system also consists of Wi-Fi module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on parental phone.

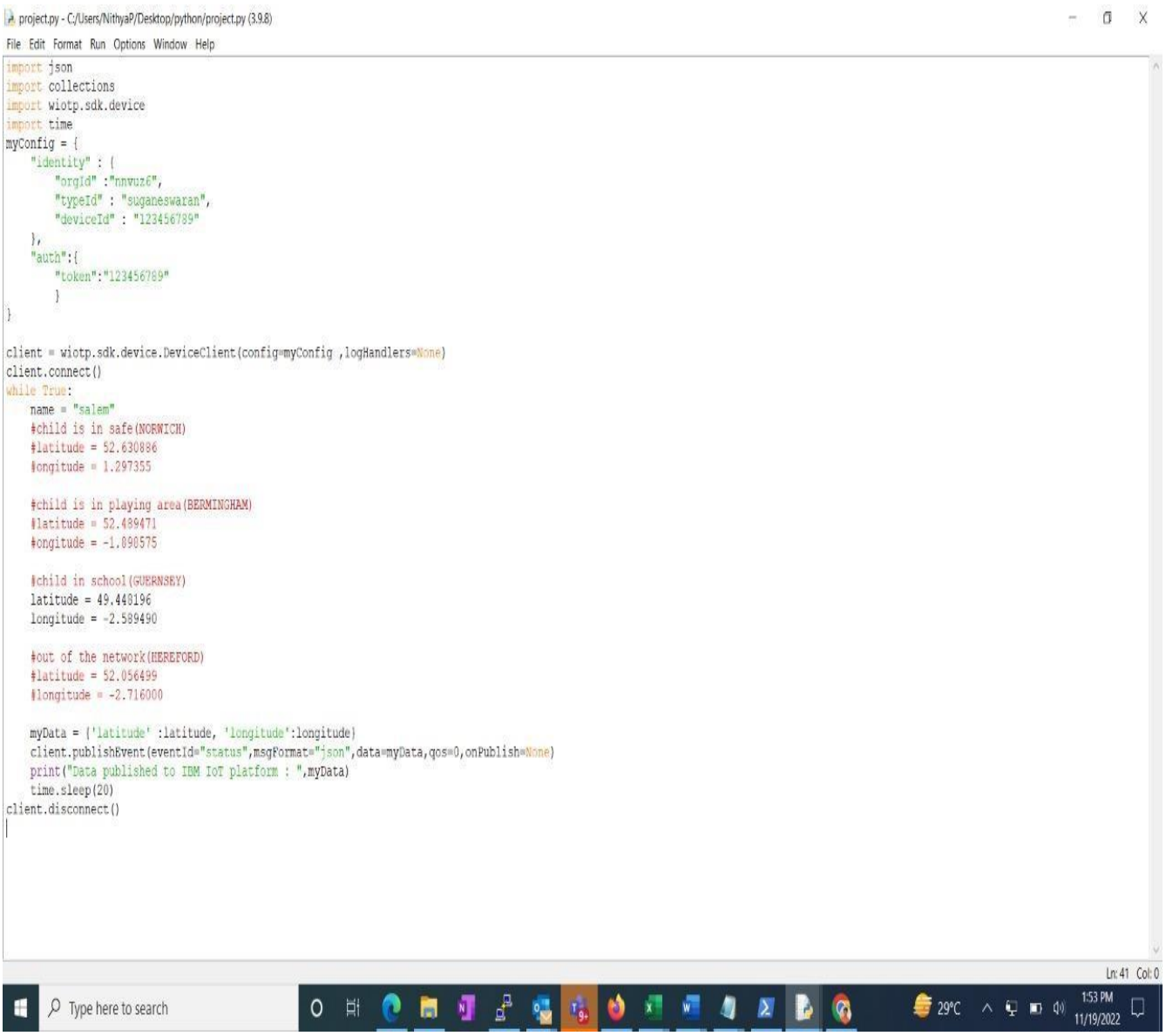
Panic alert system is used during panic situations alerts are sent to the parental phone, seeking for help also the alert parameters are updated to the cloud.

To protecting children from or against any perceived or real danger/risk. It helps to reduce their vulnerability in harmful situations.

7.2 FEATURE 2

Child Protection must ensure that no child falls out of the social security and safety net and those who do, receive necessary care and protection to be brought back into the safety.

While protection is a right of every child, some children like street children, children with disabilities, children of commercial sex workers, child labourers etc. are more vulnerable than others and need special attention. Child Protection is relevant for all settings-home, school, neighborhood, community, and institutional/ residential care**.**


project.py - C:/Users/NithyaP/Desktop/python/project.py (3.9.8)
File Edit Format Run Options Window Help
import json
import collections
import wiotp.sdk.device
import time
myConfig = {
"identity" : {
"orgId" :"nnvuz6",
"typeId" : "suganeswaran",
"deviceId" : "123456789"
},
"auth":{
"token":"123456789"
}
}
client = wiotp.sdk.device.DeviceClient(config=myConfig ,logHandlers=None)
client.connect()
while True:
name = "salem"
#child is in safe(NORWICH)
#latitude = 52.630886
#ongitude = 1.297355
#child is in playing area(BERMINGHAM)
#latitude = 52.489471
#ongitude = -1.898575
#child in school(GUERNSEY)
latitude = 49.448196
longitude = -2.589490
#out of the network(HEREFORD)
#latitude = 52.056499
#longitude = -2.716000
myData = {'latitude' :latitude, 'longitude':longitude}
client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)
print("Data published to IBM IoT platform : ",myData)
time.sleep(20)
client.disconnect()
Ln: 41 Col: 0
Type here to search
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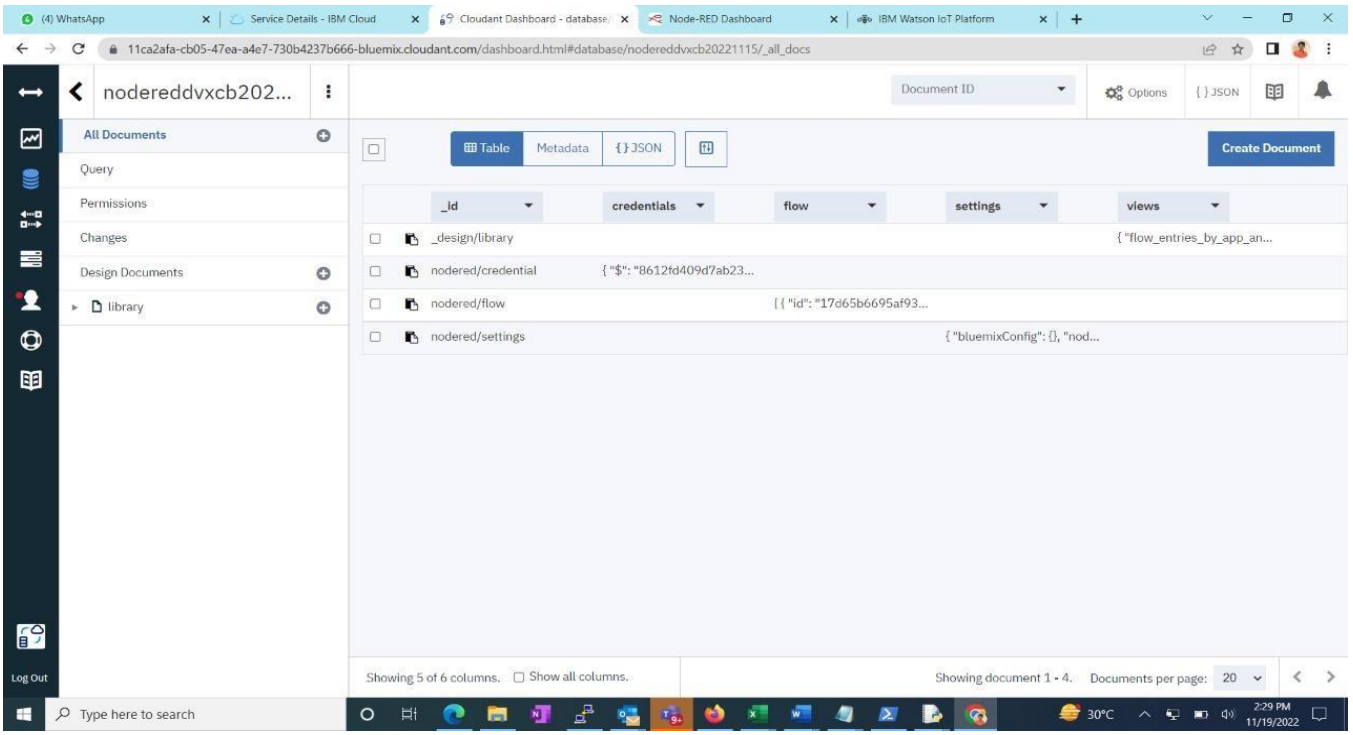
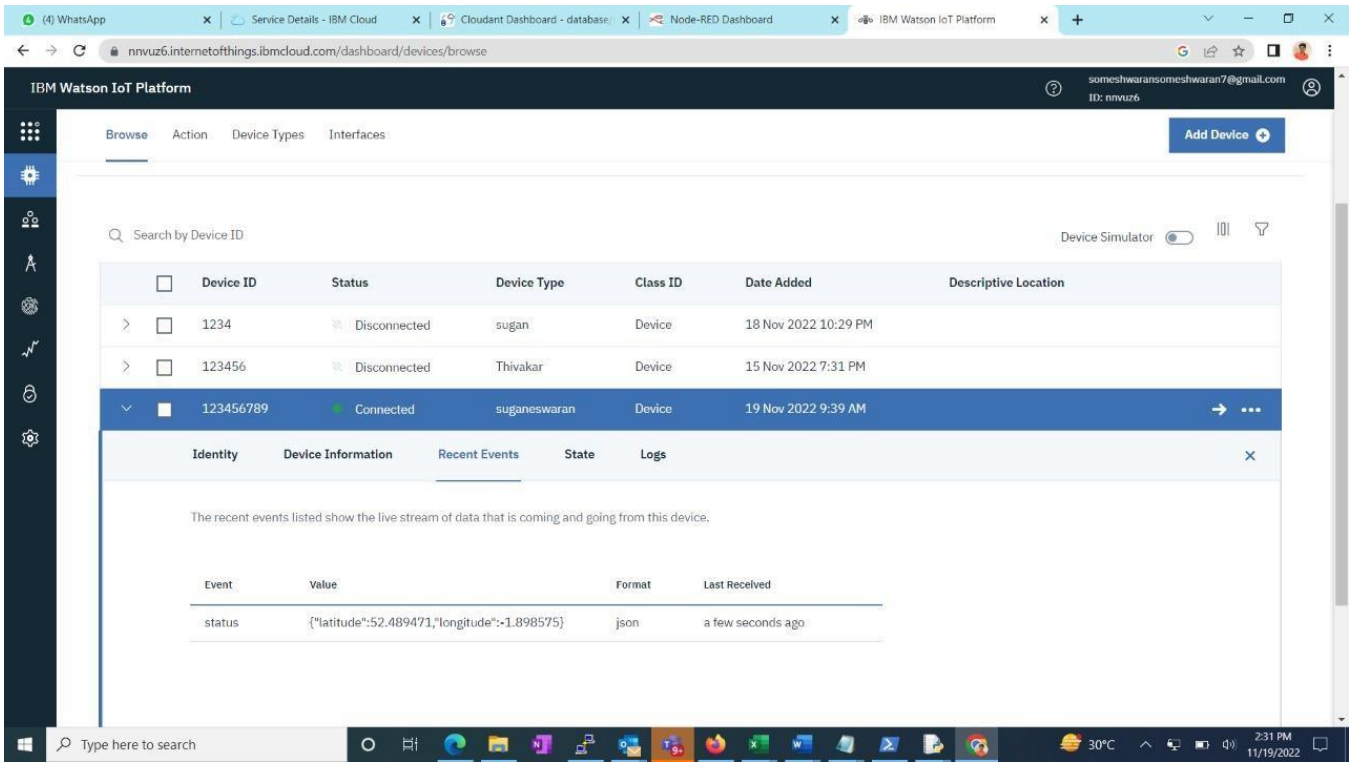
1:53 PM
11/19/2022

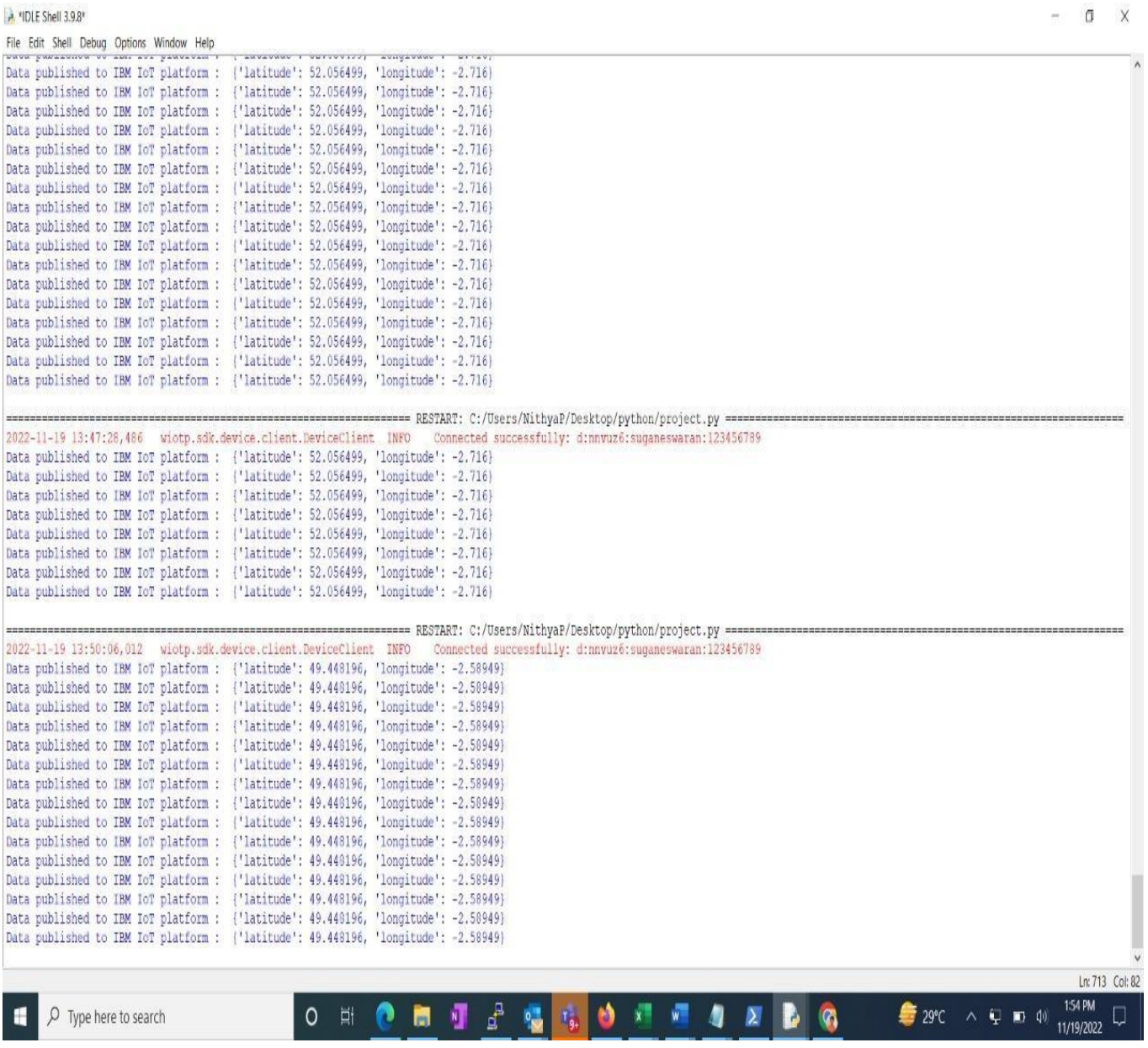
7.3 DATABASE SCHEME





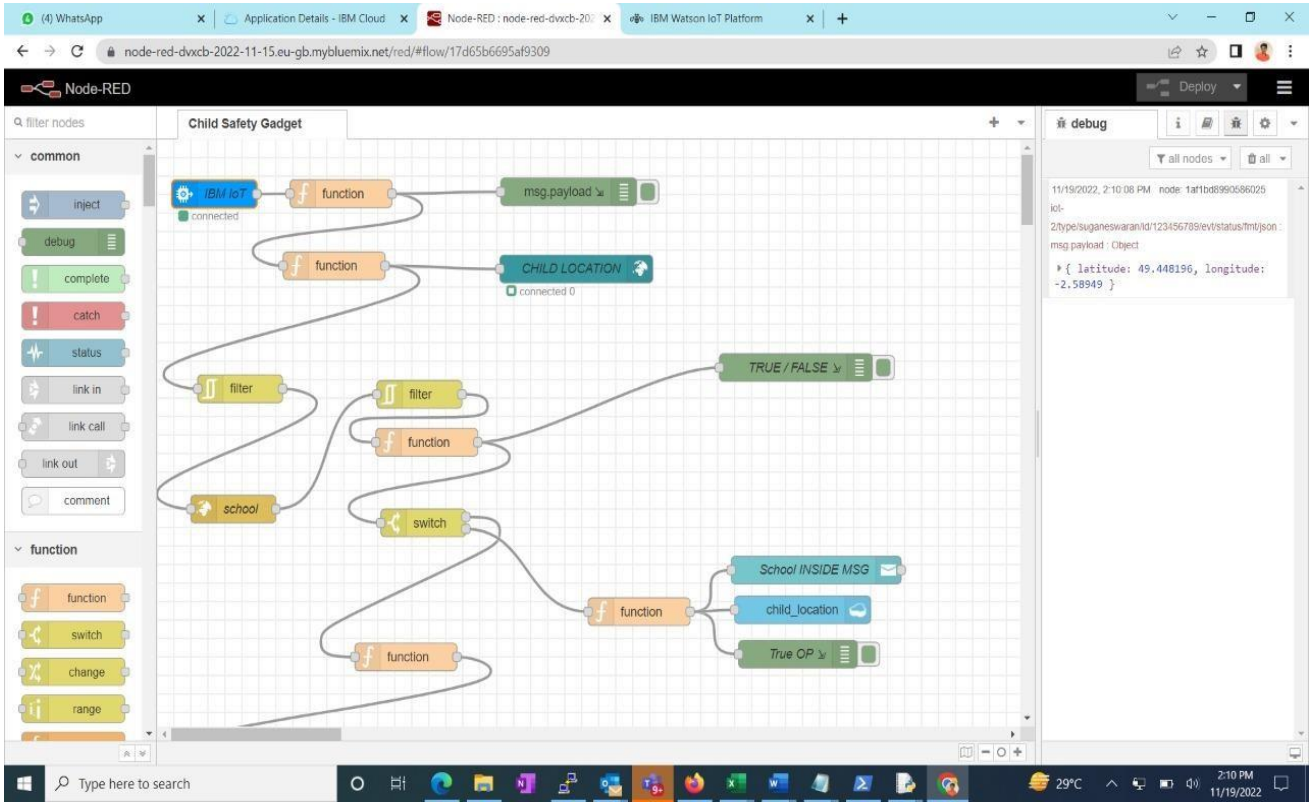
8. TESTING

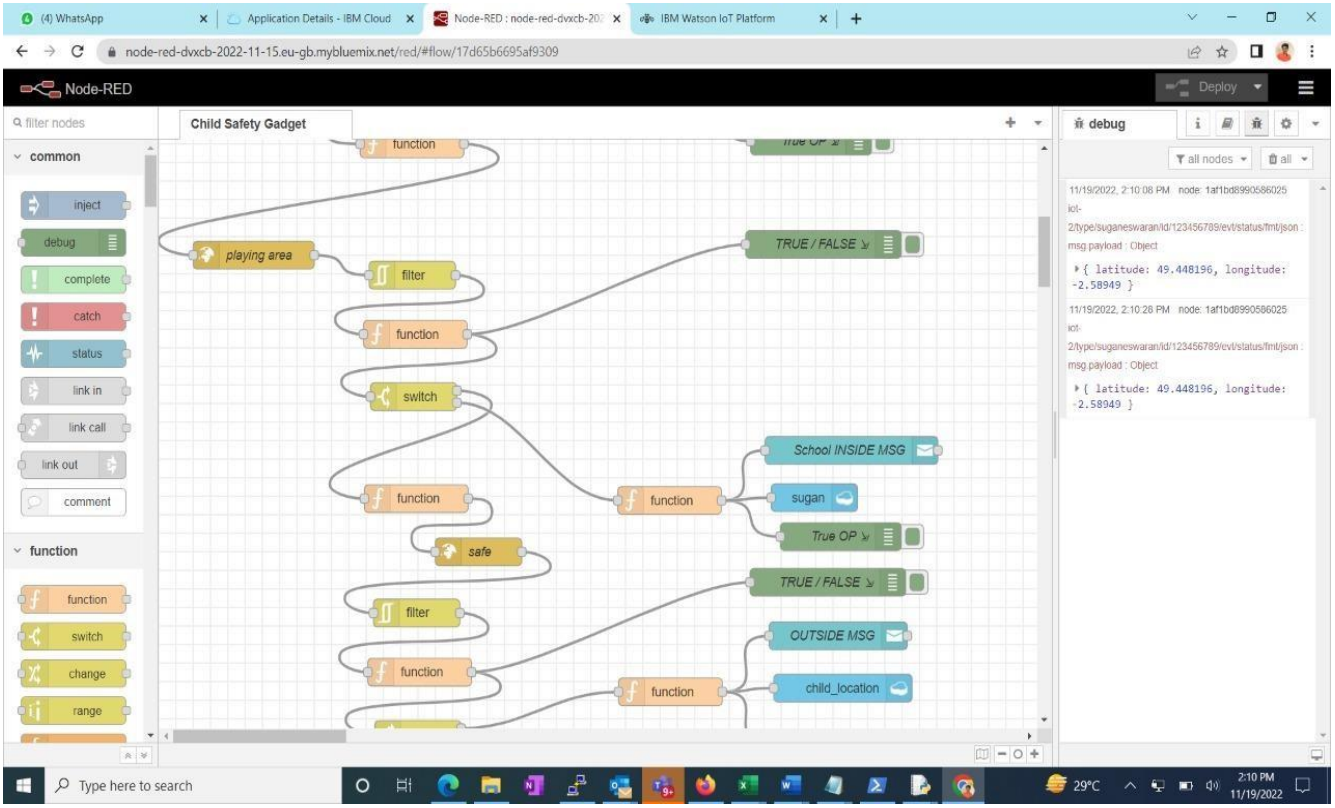
8.1 TEST CASES

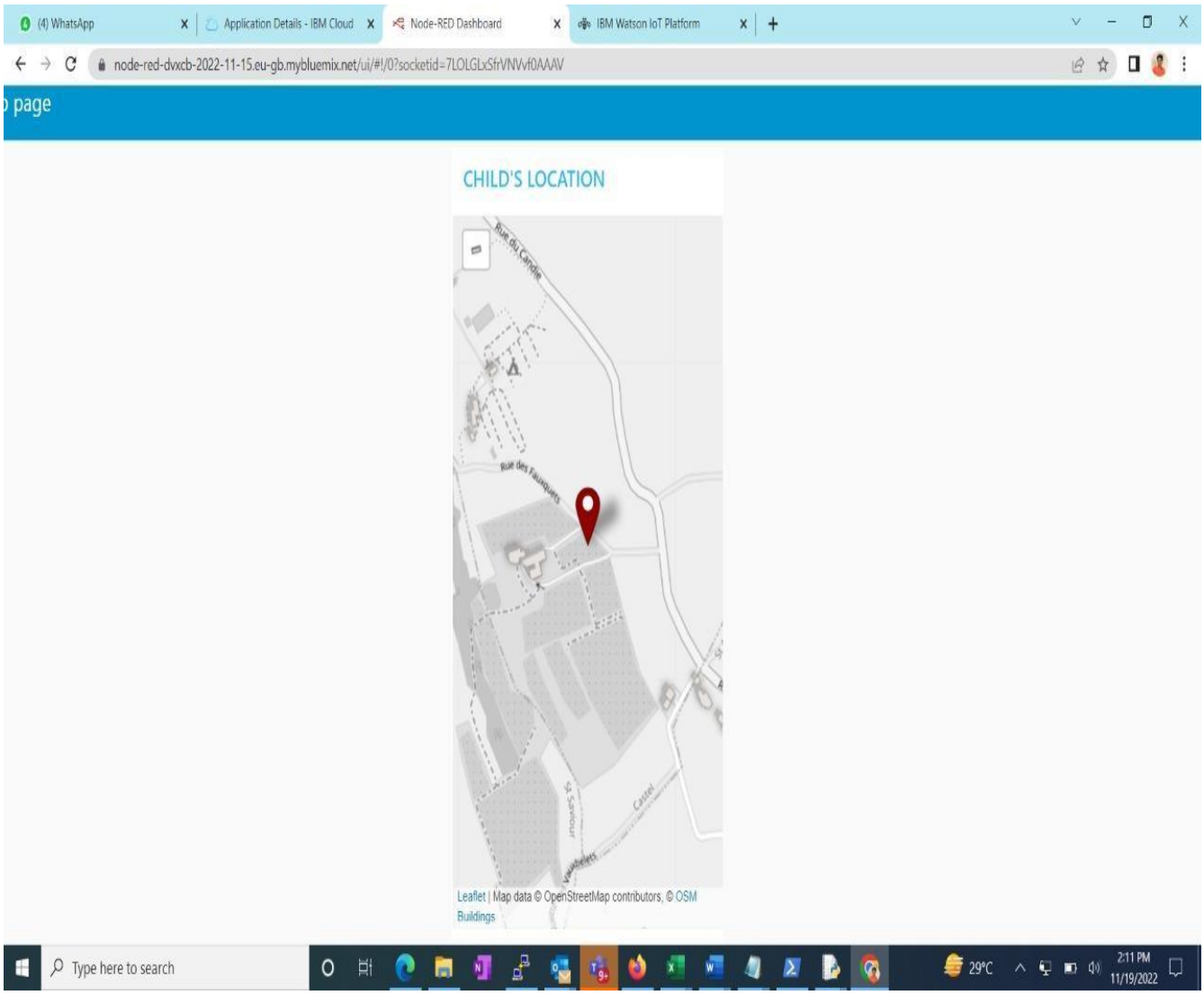


9. RESULTS

9.1 PERFORMANCE METRICS






(4) WhatsApp
Application Details - IBM Cloud
Node-RED Dashboard
IBM Watson IoT Platform
node-red-dvxcb-2022-11-15.eu-gb.mybluemix.net/ui/#!/0?socketid=7LOLGLxSfrVNVvf0AAAV
page
CHILD'S LOCATION
Rue du Candie
Rue des Fauvuets
Castel
Leaflet | Map data © OpenStreetMap contributors, © OSM Buildings
Type here to search
29°C
2:11 PM
11/19/2022

10. ADVANTAGES & DISADVANTAGES

MERITS

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.

DEMERITS

The system is dependent on communication signal/network signal for the smart gadget to trigger automatic phone call/SMS during panic situation. It can be difficult to detect when network signal is not reachable/weak/when the smart gadget moves outside the boundary range. Hence, it can be improved by increasing the range.

11. CONCLUSION

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 operates like a mobile phone. Hence, the future enchantments will be adding more features, software, applications, hardware to make the proposed system capable of working more intelligently, meanwhile guarantee the safety of children.

FUTURE SCOPE

The future scope of the work is to implement the IoT device which ensures the complete solution for child safety problems. This system can be further enhanced by installation of mini- camera 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 gadget to gain maximum battery backup.

12. APPENDIX

12.1 SOURCE CODE

```
import json import
collections import
wiotp.sdk.device import
time myConfig = {
    "identity" : {
        "orgId" :"nnvuz6",
        "typeId" : "suganeswaran",
        "deviceId" : "123456789"
    },
    "auth":{
        "token":"123456789"
        }
}


client = wiotp.sdk.device.DeviceClient(config=myConfig ,logHandlers=None)
client.connect() while True:
    name = "salem"
    #child is in safe(NORWICH)
    #latitude = 52.630886
    #longitude = 1.297355
```

```
    #child is in playing area(BERMINGHAM)
latitude = 52.489471      longitude = -
1.898575

    #child in school(GUERNSEY)
    #latitude = 49.448196
    #longitude = -2.589490

    #out of the network(HEREFORD)
    #latitude = 52.056499
    #longitude = -2.716000

    myData = {'latitude' :latitude, 'longitude':longitude}
client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)
print("Data published to IBM IoT platform : ",myData)      time.sleep(20) client.disconnect()
```