

# **IoT Based Safety Gadget for Child Safety Monitoring and**

## **Notification**

### **NALAIYA THIRAN PROJECT BASED LEARNING**

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## **1.INTRODUCTION**

### **1.1. PROJECT OVERVIEW**

Parents may follow their children's whereabouts at all times with the aid of a child tracker. They can easily set up a geofence around the specific location and leave their kids in play areas or schools. Notifications will be continually updated by checking the child's whereabouts. If the child enters the geofence, produced. Parents or caregivers will receive notifications based on the child's location. The database will contain all of the location information.

### **1.2. PURPOSE**

The objective of the project is to prevent kids from disappearing or being taken away. It makes the parents feel secure and stop worrying about the safety of their children. The main aim in this project is to establish a secure environment, by regularly monitoring the child's activity and if the child goes beyond the geofence, location notifications will be generated. The generated notification messages will be sent to the child's parents or guardians based on where they are located. The data will be stored in the database. This is mainly created for the parents who are working day and night and are not able to take care of their children.

## **2. LITERATURE SURVEY**

### **2.1 Existing problem**

1. The entry and exit of the child inside and outside of the bus is not determined, so it may lead to the missing of the child.
2. Signals can be sent to the parents even if they simply play and beat their friends.
3. The doctor needs to monitor the information sent by the device. In any critical situation then the doctor must be there with the patient.
4. High cost is required to implement in case of hardware equipment.

### **2.2 References**

[1] Dr. M. V. Vyawahare, et .al (2019) proposed the work related to “IOT Based School Bus Monitoring and Security System”, this scheme uses an alcoholic and a panic switch for the safety of the children. The status of the bus is sent to the school as well as parents in case of any emergency conditions. They proposed algorithm that the device is placed inside the bus to determine the position of the bus using global positioning system and GSM module.

[2] Poonam Gupta, et.al (2016) proposed the work related to “An IoT Framework for Addressing Parents Concerns about Safety of School Going Children”, in this paper a technology is developed to ensure safety of the children boarding to school

and gets down the bus at home's doorstep. Parents also get notification when the child enters their classroom first time in a day. Child can disseminate the signal to the parent Single point of contact (SPOC) at school to make them aware about emergency.

[3] V Santhi, et .al (2017) proposed the work related to "IOT Based Health Monitoring System for Pregnant Ladies Using CC3200", in this paper a technology a wearable device will continuously monitor the patient and do data logging continuously.

[4] M Nickson, et .al (2021) proposed the work related to "A Review of security standard and frameworks for IOT Based Smart Environments", in this paper presents a review of existing security standards and assessment frameworks which also includes several NIST special publications on security techniques highlighting their primary areas of focus to uncover those that can potentially address some of the security needs of IoT-based smart environments.

[5] Lien-Wu Chen, et .al (2019) proposed the work related to "Crowdsourced Children Monitoring and Finding with Holding Up Detection Based on Internet of Things Technologies", In this paper, they propose a crowdsourced children monitoring and finding (CCMF) framework to detect holding up behaviours and find missing children using wearable devices and surrounding smartphones based on Internet of Things (IoT) technologies.

[6] XIANG LI, et .al (2018) proposed the work related to the “Enhancing Cloud-Based IoT Security Through Trustworthy Cloud Service: An Integration of Security and Reputation Approach”, in this paper, they proposed this framework enables the trust evaluation of cloud services in order to ensure the security of the cloud-based IoT context via integrating security and reputation based on trust assessment methods. The security -based trust assessment method employs the cloud security metrics to evaluate the security of a cloud service.

[7] Shruti Anant Tiwarkar, et .al (2020) proposed the work related to “IOT based school child tracker system”, in this paper proposed a system which focus on children safety by tracking them and providing the live location of child with the help of GPS module and sending information through SMS notification.

[8] Nada Abdul Al-Balushi, et .al (2018) proposed the work related to “Transport Safety Mechanism of school children using IOT based smart system” in this paper present IOT smart transportation system for a children school. The system consists of IR sensors to calculate the number of students, RFID card and RFID reader to read student data and attendance recording.

### **2.3 Problem Statement Definition**

In Today’s world technology has improved our quality of life. The Children have direct access to this growing technology. By using these technologies, security also improves for them. Now days most of the parents are doing more than one job after the pandemic, so parents need to keep the children happy with their friends and also with their friend and also with security. In such a case they need to

monitor the children's location in a certain interval of time.

### 3.IDEATION & PROPOSED SOLUTION

#### 3.1Empathy map canvas

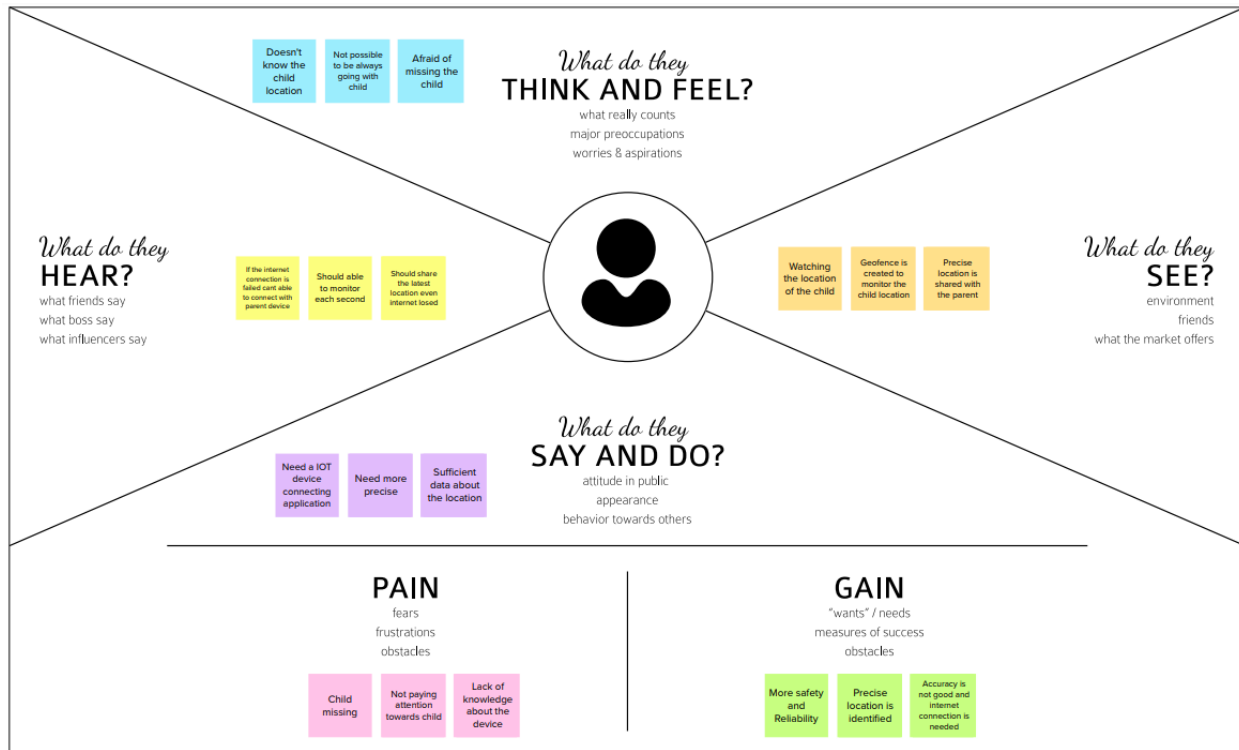


Figure3.1 Empathy Map Canvas

In empathy map canvas the effective ways to protect the children is mentioned and what are issues faced by the children when they are away from their parents, also on the other hand since both the parents are in job it is difficult for them to monitor their children 24 hours so to overcome this and to safeguard the children a child safety monitoring system is proposed in order to increase the safety of the children. It shows us the point of view from parent's side and children's side and also from the public side.



[illegible]

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. In brain storming the issues faced by the children when they are away from their parents are discussed and also the points given by the individuals in the team are explained and are used to improve the projects and the ideas are discussed to improve the project. A graph is designed to project the ideas of the individuals and to display the order according to the order.

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. In brain storming the issues faced by the children when they are away from their parents are discussed and also the points given by the individuals in the team are explained and are used to improve the projects and the ideas are discussed to improve the project. A graph is designed to project the ideas of the individuals and to display the order according to the order.

### 3.3 Proposed Solution

The app will push the live location of children and alert messages when the child is near the geo fence and also it helps to find the psychological behaviour of the present condition of the child. This device will cause an impact on many people as it concerns child safety. Because in today's society children are susceptible to danger. They need to be secured by this advanced technology so parents need not worry about their kid's safety so they will look at their future. The app is also available offline for known locations by downloading offline maps. There will be no ads as it is user friend, also it has subscriptions for different aspects like behavioural condition and others.

### 3.4 Problem Solution fit

Team ID: PNT20221MID04693

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT (S)</b> Parents and Caretakers <b>CS</b>	<b>6. CUSTOMER</b> <ul style="list-style-type: none"> <li>They should own smart phone</li> <li>They should have sufficient amount</li> </ul> <b>CC</b>	<b>5. AVAILABLE SOLUTIONS</b> They use GSM modules to push notification in phone so they need to use active SIM card <b>AS</b>	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> Parents need to monitor the locations of their children when they are away from them. It is very costly <b>J&amp;P</b>	<b>9. PROBLEM ROOT CAUSE</b> Nowadays parents are at busy schedule in their life so they can't be always with children but they concern their safety. So by this device they leave the children alone and monitor their location from anywhere <b>RC</b>	<b>7. BEHAVIOUR</b> Parents are going to job so they can monitor their children via this app. <b>BE</b>	
Focus on J&P, J&P, fit into BE, understand RC	<b>3. TRIGGERS</b> Parents will feel at ease as they monitoring the live location of their children <b>TR</b>	<b>10. YOUR SOLUTION</b> Tracking the child location and push notification on parents mobile also the live location. Creating the geo-fence around the child location for example school if the child crosses the school parents will get alert messages. <b>SL</b>	<b>8. CHANNELS of BEHAVIOUR</b> <b>ONLINE</b> Customer can track live location of the children by internet  <b>OFFLINE</b> Customer can track the location through GPS and also have the data of past location and predictions <b>CH</b>	Extract online & offline CH & BE
	<b>4. EMOTIONS: BEFORE / AFTER</b> First of all they refuse to buy it as it is costly but after that people will feel their children is more secure by this device as it monitors live location <b>EM</b>			
Identify strong TR & EM				

Figure 3.3 Problem Solution Fit

In problem solution fit the need of the customer towards the project to improve it and the solutions that are available to improve the present ideas to improve the safety of the children. The jobs that are to be done and the problems to be solved. The root cause of the problem is also discussed to improve the prediction results. The working of it in both online and offline and to improve it. They need to be secured by this advanced technology so parents need not worry about their kid's safety so they will look at their future.

## **4.REQUIREMENT ANALYSIS**

### **4.1 Functional requirement**

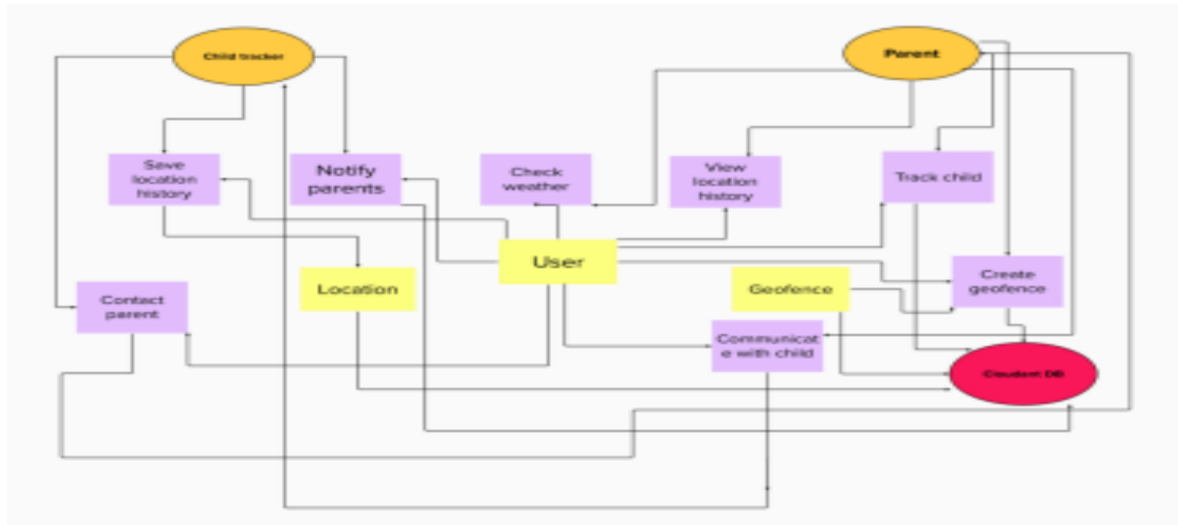
- Communication
- Continuous monitoring
- User requirement
- Mandatory
- Testing
- Application

### **4.2 Non-Functional requirements**

- Usability
- Security
- Reliability
- Performance
- Availability
- Scalability

## 5.PROJECT DESIGN

### 5.1DATA FLOW DIAGRAM



**Figure 5.1 Data Flow Diagram**

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored. This data flow diagram depicts the problems that are faced by the children and how to improve the problems and overcome them, also to send the information to the parents about the location of their children by creating a geo fence and if the child crosses the limit the notification will be sent to the parent or the caretakers so that they can view the location of the children. The data is also stored in the database so that we can get the information.

## 5.2 Solution and Technical Architecture

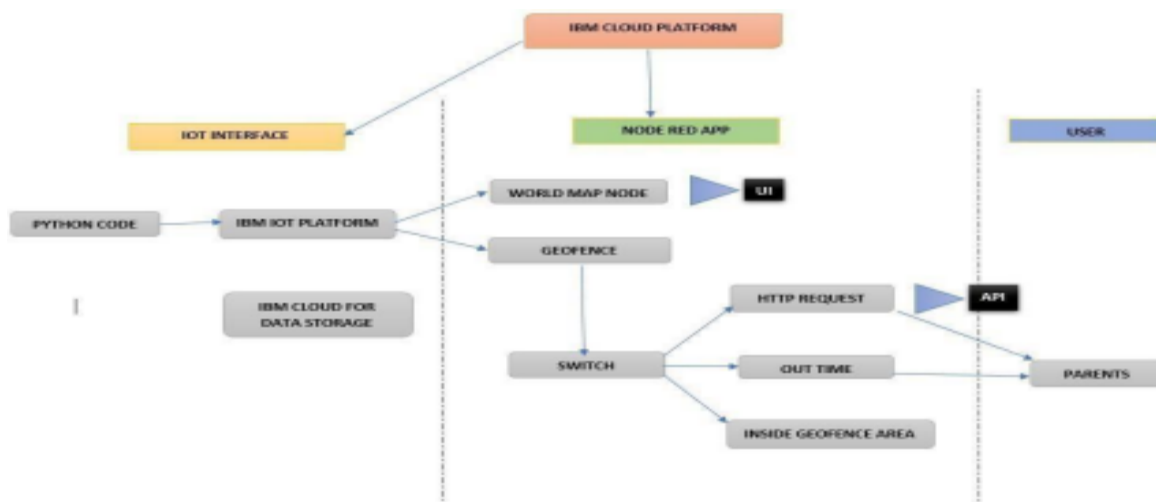


Figure 5.2 Technical Architecture

In Technical Architecture what are the services required to develop the child safety monitoring system are depicted the data flow here shows the things to be executed so that the parents can view the location of the children at every moment and situation. By creating a geo fence and if the child crosses the limit the notification will be sent to the parent or the caretakers so that they can view the location of the children.

Solution architecture is a complex process with many sub processes that bridges the gap between business problems and technology solutions.

- Find the best tech solution to solve existing business problems.\
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stake holders.
- Define features, development phases, and solution requirements. • Provide specifications according to which the solution is defined, managed, and delivered.

## 5.3 User Stories

User Type	Functional Requirement	User Story Number	User Story/Task	Acceptance Criteria	Priority	Release
Parents and caretakers	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
-	-	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-3	As a user, I can log into the application by entering email & password	Now I can monitor the child's location using the device	High	Sprint-1
	Dashboard	USN-4	As a user, I need to be able to view the functions that I can perform	Now I can receive the alert message from the device	High	Sprint-1
Child	Notification	USN-1	As a user, I should be able to notify my parent in emergency situations		High	Sprint-2
	Store data	USN-2	As a user, I need to continuously store my location data into the database.		Medium	Sprint-2
	Communication	USN-3	I should be able to communicate with my parents		Low	Sprint-3

## 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	Login	USN-1	As a customer, I might ensure login credential through gmail ease manner for the purpose of sending alert message to the parents or guardians (or) informing through normal message.	2	High	POOJA V G, PRAGADISH SELVAN R, RAMYA M, SABARISHWARAN R
Sprint-2	Dashboard	USN-3	As a user, In case of any emergency situation parents(I) must get the alert notification and location of the child.	3	Medium	POOJA V G, PRAGADISH SELVAN R, RAMYA M, SABARISHWARAN R
Sprint-3	Dashboard	USN-4	As a user, I(parent) need to safeguard child and tracking the child's location and it is important to notify near police station Incase of more emergency .	2	High	POOJA V G, PRAGADISH SELVAN R, RAMYA M, SABARISHWARAN R
Sprint-3	Dashboard	USN-5	As a user, Its good to have a IOT based system to safeguard monitoring without presence of parent.	2	High	POOJA V G, PRAGADISH SELVAN R, RAMYA M, SABARISHWARAN R

### 6.2 Sprint Delievery 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	4	6 Days	23 Oct 2022	28 Oct 2022	4	28 Oct 2022
Sprint-2	3	6 Days	29 Nov 2022	03 Nov 2022	3	03 Nov 2022
Sprint-3	4	6 Days	04 Nov 2022	09 Nov 2022	4	09 Nov 2022
Sprint-4	4	6 Days	10 Nov 2022	15 Nov 2022	4	15 Nov 2022



## **7.CODING & SOLUTIONING**

### **7.1 Feature 1**

#### **1) Live Location Tracking:**

GPS installed in the device is used to trace the contemporary location and we can keep tabs on it through the android app and SMS requests sent from the safety gadget to the parent's phone. The child's precise locations are found by parents through the Wearable gadget which in turn employs Global Positioning System to track real-time locations. The software along with relinquishing it allows you to trace down your wards when they're within Bluetooth limit, it also works when your kids go farther afield. Its adroitness as a tracker is exceptional if you live in densely colonised neighbourhoods like cities.

#### **2) Panic Alert Systems:**

The panic alert mechanism on the device is set off during emergencies; the system software involuntarily alerts the parent/guardian by redirecting a text message where expeditious scrutinization is essential for the child during a catastrophe. The alert is also refurbished to the cloud for the motive of app monitoring.

#### **3) Ceaseless Surveillance:**

The gadget ensures utmost security and ensures live tracking for their kids. The device instills child safety through smartphones that can track their children's location and give the precise coordinates of the child's location in real-time anywhere. By monitoring the activities the security state of the child is examined.

#### **4) Cloud Database:**

The safety device is equipped with GSM and GPS modules for sending and receiving calls, and SMS between the gadget and the parental phones. The system also consists of a Wi-Fi/cellular data module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on the parental phones. The panic alert system is used during panic situations alerts are sent to the parental phone, seeking help also the alert parameters are updated to the cloud. The history of the location can be stored in the cloud. The wearable devices should feature the child's exact locations and be updated continuously without being interpreted in the cloud database.

#### **5) Security Implementations:**

To activate the alarm and facilitate video recording whenever the emergency button is pressed. We can use the cloud to accumulate the surveillance data of the children. The wifi modules are of assistance in sending the monitoring particulars, the user will be notified with an update if any errors are found, for the efficient functioning of the device.

#### **6) Extensive range monitoring system:**

The application aside from conceding you to track down your children when they're within Bluetooth range, also functions when your kids go farther afield. Its competence as a tracker is outstanding if you live in densely populated areas like cities or big towns. This means you will be able to see the identity of the participating devices and it helps to diminish their vulnerability in harmful situations and also protects the children in emergency situations.

## 7.2 Feature 2

```
import timeimport
sys
import ibmiotf.applicationimport
ibmiotf.device import random
#Provide your IBM Watson Device Credentialsorganization = "zwx6lb"
deviceType = "ABCD" deviceId = "13"
authMethod = "token" authToken =
"12345678"
#api key {a-illza1-mbdxqo6z0s} #api token
{zSYzISuAWF&F_x7GkT}
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method":
authMethod, "auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)#.....
except Exception as e:
print("Caught exception connecting device: %s" % str(e))sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an
event of type"greeting" 10 times
print("power on ")
print("checking connection to waston iot...")time.sleep(2)
deviceCli.connect()
print("dear user ... welcome to IBM-IOT ")
print("i can provide your children live location and temperature ")print()
```

```

name=str(input("enter your child name:"))while True:
temperature=random.randint(20,50)#random temperature for your child
latitude=random.uniform(10.781377,10.78643)#random latitude
for your child longitude=random.uniform(79.129113,79.134014)#random
longitude for your childa="Child inside the geofence" b=" Child
outside the geofence" c="High
temperature"
d="Low temperature"
x={'your_child_Zone':a}
y={'your_child_Zone':b}

z={'temp_condition':c}
w={'temp_condition':d}
data = { 'temp' : temperature, 'lat': latitude,'lon':longitude,'name':name }#print data
def myOnPublishCallback():
print ("Published Temperature = %s C" % temperature, "latitude = %s %" %
latitude,"longitude = %s %" % longitude, "to IBM Watson")
print("\n")
success = deviceCli.publishEvent("IoTSensorgpsdata", "json", data,
qos=0,on_publish=myOnPublishCallback)
if latitude>=10.78200 and latitude<=10.786000 and longitude >=79.130000 and
longitude
<=79.133000:
deviceCli.publishEvent("IoTSensorgpsdata","json",data=x,qos=0,on_publish=myO
nPublishCallb ack)

```

```
print(x) print("\n")
```

```
else:
```

```
deviceCli.publishEvent("IoTSensorgpsdata","json",data=y,qos=0,on_publish=myO  
nPublishCallb ack)
```

```
print(y) print("\n")
```

```
if (temperature>35):
```

```
deviceCli.publishEvent("IoTSensorgpsdata","json",data=z,qos=0,on_publish=myO  
nPublishCallb ack)
```

```
print(c) print("\n")
```

```
else:
```

```
deviceCli.publishEvent("IoTSensorgpsdata","json",data=w,qos=0,on_publish=my  
OnPublishCall back)
```

```
print(d) print("\n")
```

```
if not success:
```

```
print("Not connected to IoTF")print("\n")
```

```
time.sleep(3)
```

## **8.TESTING**

### **8.1 Test Cases**

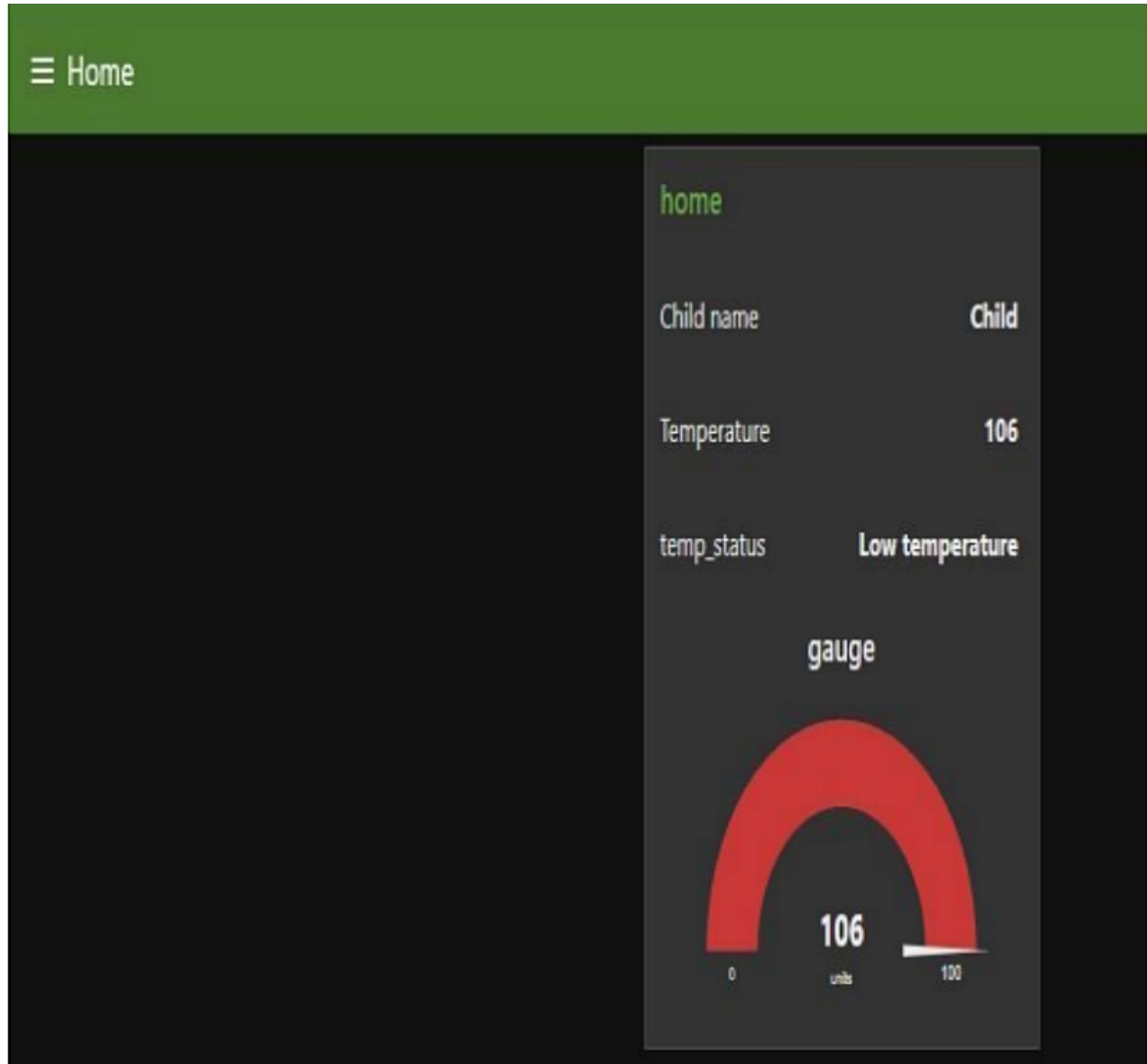
The test cases depict the various outputs for the various inputs given. It tests the program and provides the details about the safety of the child. We go for test cases to get higher accuracy and precession inorder to find the right way to safegaurd the children.

### **8.2 User Acceptance Testing**

- The user expects to know about the location of the children every time.
- The user expects the alert message in case of emergency so that they can safeguard their children.
- When the children crosses the geofence the user would expect to receive an red alert so that they can know that their children are in danger.

## 9.RESULTS

### 9.1 Performance Metrics



**Figure 9.1 Performance metrics**

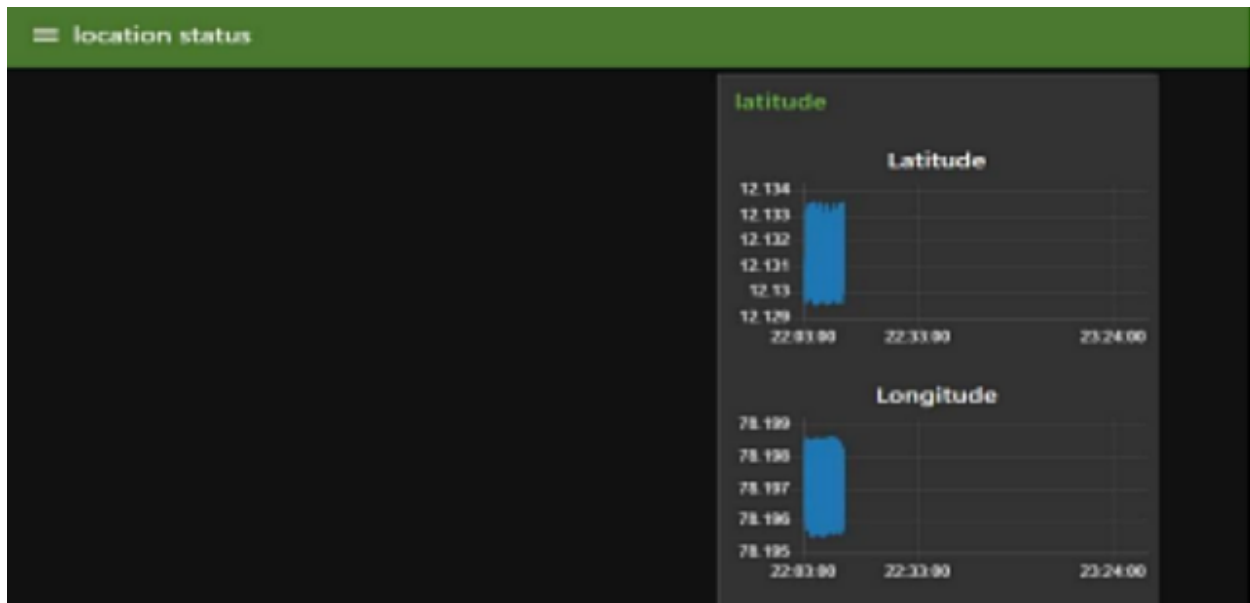


Figure 9.2 Performance metrics

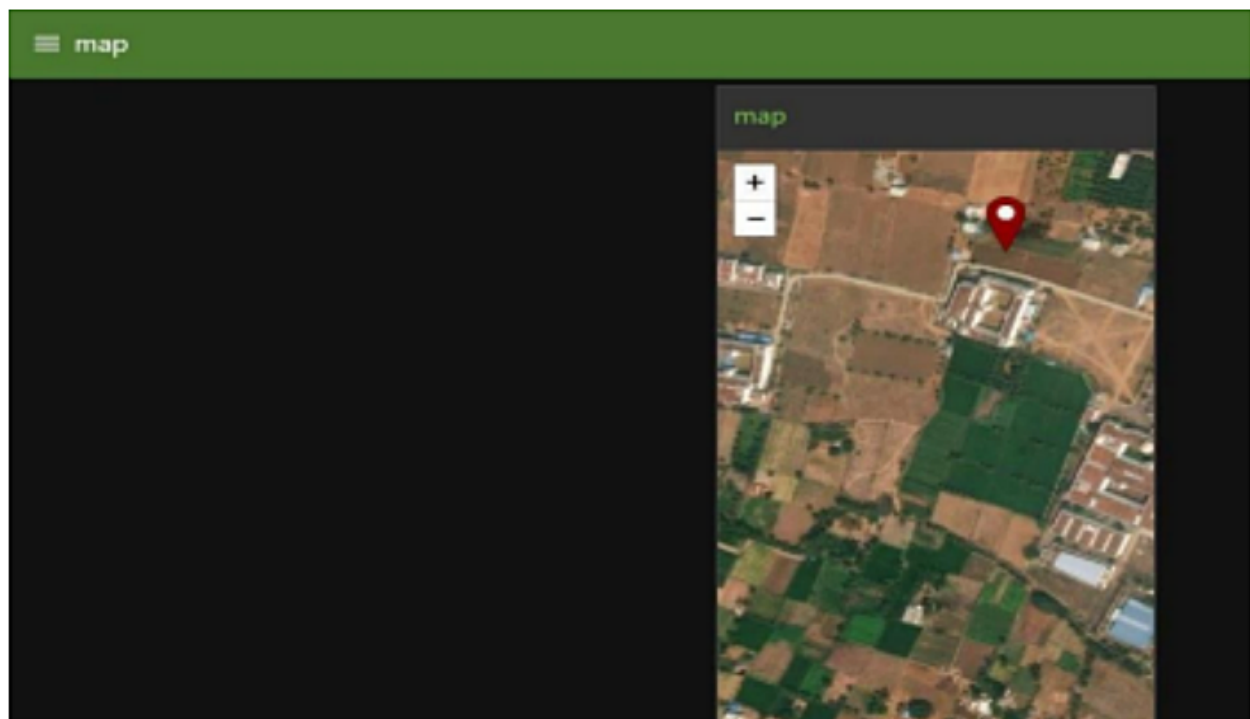


Figure 9.3 Performance metrics



## **10.ADVANTAGES & DISADVANTAGES**

### **ADVANTAGES**

- The GPS system is used it is easy to track the vehicle of the child.
- Low maintenance cost
- Technology evolution
- Security and Privacy
- Database storage

### **DISADVANTAGES**

- Complex network
- The entry and exit of the child inside and outside of the bus is not determined, so it may lead to the missing of the child.

## **11.CONCLUSION**

Thus, 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. This helps in keeping track of the child and avoids risks of missing children.

## **12. FUTURE SCOPE**

Nowadays compact GPS devices are smaller than a cell phone but the experts predict that continuous development may shrink the sizes of these devices further. The size of the tracker depends on the battery, while a thumbnail sized receiver can be improved, it needs to be big enough to accommodate the battery. As the battery technology unfolds, in the future, we may be able to see GPS trackers getting smaller in size.

GPS trackers are no longer a luxury only enjoyed by large companies and government groups. Due to the affordable price points, small businesses and even individuals may now afford it. Every business needs GPS vehicle tracking, and the increased production and efficiency make it cost-effective. A future where a child's wearable is connected to the parents, school, insurance companies, doctors, hospitals, and brands is closer than we might imagine in a world of connected electronics. Anyone involved in a child's care has access to critical information about the child's wellbeing in today's highly linked society. As a result, daycare expenses might drop dramatically, and parents would have strong motivation to modify their kids' behaviour.

## 13. APPENDIX

### SOURCE CODE

```
import timeimport
sys
import ibmiotf.applicationimport
ibmiotf.device import random
#Provide your IBM Watson Device Credentialsorganization = "zwx6lb"
deviceType = "ABCD" deviceId = "13"
authMethod = "token" authToken =
"12345678"
#api key {a-illza1-mbdxqo6z0s} #api token
{zSYzISuAWF&F_x7GkT}
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method":
authMethod, "auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)#.....
except Exception as e:
print("Caught exception connecting device: %s" % str(e))sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an
event of type"greeting" 10 times
print("power on ")
print("checking connection to waston iot...")time.sleep(2)
deviceCli.connect()
```

```

print("dear user ... welcome to IBM-IOT ")
print("i can provide your children live location and temperature ")print()
name=str(input("enter your child name:"))while True:
temperature=random.randint(20,50)#random temperature for your child
latitude=random.uniform(10.781377,10.78643)#random latitude
for your child longitude=random.uniform(79.129113,79.134014)#random
longitude for your childa="Child inside the geofence" b=" Child
outside the geofence" c="High
temperature"
d="Low temperature"
x={'your_child_Zone':a}
y={'your_child_Zone':b}

z={'temp_condition':c}
w={'temp_condition':d}
data = { 'temp' : temperature, 'lat': latitude,'lon':longitude,'name':name }#print data
def myOnPublishCallback():
print ("Published Temperature = %s C" % temperature, "latitude = %s %" %
latitude,"longitude = %s %" % longitude, "to IBM Watson")
print("\n")
success = deviceCli.publishEvent("IoTSensorgpsdata", "json", data,
qos=0,on_publish=myOnPublishCallback)
if latitude>=10.78200 and latitude<=10.786000 and longitude >=79.130000 and
longitude
<=79.133000:

```

```
deviceCli.publishEvent("IoTSensorgpsdata","json",data=x,qos=0,on_publish=myO
nPublishCallb ack)
print(x) print("\n")
else:
deviceCli.publishEvent("IoTSensorgpsdata","json",data=y,qos=0,on_publish=myO
nPublishCallb ack)
print(y) print("\n")
if (temperature>35):
deviceCli.publishEvent("IoTSensorgpsdata","json",data=z,qos=0,on_publish=myO
nPublishCallb ack)

print(c) print("\n")
else:
deviceCli.publishEvent("IoTSensorgpsdata","json",data=w,qos=0,on_publish=my
OnPublishCall back)
print(d) print("\n")
if not success:
print("Not connected to IoTF")print("\n")
time.sleep(3)
```

## **GITHUB LINK AND DEMO LINK**

Github link:

**<https://github.com/IBM-EPBL/IBM-Project-305-1658249494>**

Demo link:

<https://drive.google.com/drive/folders/1M1CQq2KrZClZAgwRPuAqsxzklxrWJJmz>