

TEAM ID : PNT2022TMID18458

PROJECT NAME : IOT Based Safety Gadget for Child Safety Monitoring and Notification

1. INTRODUCTION

1.1 Project Overview

The term "internet of things" (IoT) describes a collection of hardware and software that connects to the internet and real-world sensors. The safety of children is in danger today more than ever, so it's critical to offer them a technology-based solution that will support them in emergency circumstances and allow for smart device monitoring. The proposed system uses IoT and sends all the monitoring metrics to the cloud for android app monitoring on the parental phone. It is equipped with GSM and GPS modules for alarm sending and receiving between safety device and parental phone. Using the GPS coordinates on the parental phone's android app, an Android application can be used to track the current location of a safety device. It emphasizes on the crucial idea that a missing child can be helped by those who are close to them and can play a significant part in ensuring their safety until they are reunited with their parents. Additionally, it updates the parental app via the cloud.

1.2 Purpose

These days, kids lack a sense of security and face numerous security-related challenges. Many family members spend more time working and fulfilling their societal obligations, which include caring for their children. The situation in our nation right now is unsuitable for keeping an eye on kids. It is challenging to keep an eye on the kids constantly in the absence of a child surveillance system. Where Young children may act impulsively and choose impulsive locations. Most of the human behaviour is formed during the formative years, necessitating the need of a child monitoring system. Accidents and events frequently involve children. Due to their inability to defend themselves, children's safety is essential. Kids are the lifeblood of any parent, as we all know, and parents need to take particular care with children who have special needs. They must give their youngster special attention.

- Parents may always follow their children's whereabouts with the aid of a child tracker.
- They may easily set up a geofence around the site and leave their kids in play areas or schools.
- If the child crosses the geofence, alerts will be generated by continuously monitoring the child's position. Parents or caregivers will receive notifications based on the child's location.
- The database will contain all the location information.
- Enable the tracking of the child's location and the remote collection of data, including the child's position and other factors to display actual data from the child together with reference values.
- Enable notification transmission if the youngster is missing or if the device detects an unusual circumstance or condition.

2. LITERATURE SURVEY

2.1 Existing problem

Kids are the lifeblood of any parent, as we all know, and parents need to take particular care with children who have special needs. They must give their youngster special attention. Parents may always follow their children's whereabouts with the aid of a child tracker. They only need to set up a geo-fence around the site and leave their kids in play areas or schools. If the child crosses the geo-fence, notifications will be generated by continuously monitoring the child's position. Parents or caregivers will receive notifications based on the child's location. The database will contain all the location information. If there is a danger, the child can also alert the parents in an emergency.

This study shows how smart IoT devices can be used to track and protect children while also assisting parents in finding and keeping an eye on them. Alerts sent to mobile phones if the sensor detects any unusual readings. updated the parental app over the cloud as well. For communication between the safety device and the parent's phone, the system has GSM and GPS modules. The IoT system also includes a Wi-Fi module that transmits all the tracked parameters to the cloud for parental phone android app monitoring.

2.2 Reference

- 1.Mahajabeen Budebhai, "IOT based child and women protection", *International Journal of computer science and mobile Computing*, no. 7, pp. 141-146, August 2018.
- 2.Jonnadulal, Bhanu Prasad Davu, Hari Kishore Kandula, Vinod Donepudi, Sivaiah Etukuri and Gopinadh, "Child security wearable gadget", *VVIT Guntur Andhra Pradesh India Global Journal for Research in Applied Science and Engineering Technolgy(IJRASET)*, vol. 6, no. 2, February 2018.
- 3.Cassandra Dsouza, Dhanashree Rane, Anjanette Raj, Supriya Murkar and Namita Agarwal, "Design of Child Security Method", *International conference for convergence in tehnology*, 2018.
- 4.Moodbidri, A., Shahnasser, H.: Child safety wearable device. In: 2017 International Conference on Information Networking (ICOIN), pp. 438–444. IEEE (2017)
- 5.Niti shree, "A review on IOT Based Smart GPS device for Child and Women Safety applications", *International journal of engineering research and general science*, no. 4, May-June 2016.
- 6.Jatti Anand, Kannan Madhvi, M Alisha, R Vijayalakshmi and P Sinha, Structure and improvement of an IOT based wearable gadget for the wellbeing and security of ladies and young lady youngsters, 2016.
- 7.Huang, Z., Gao, Z., Lu, H., Zhang, J., Feng, Z., Xia, H.: An mobile safety monitoring system for children. In: 10th International Conference on Mobile Ad-hoc and Sensor Networks, pp. 323–328. IEEE (2014)

2.3 Problem Statement Definition

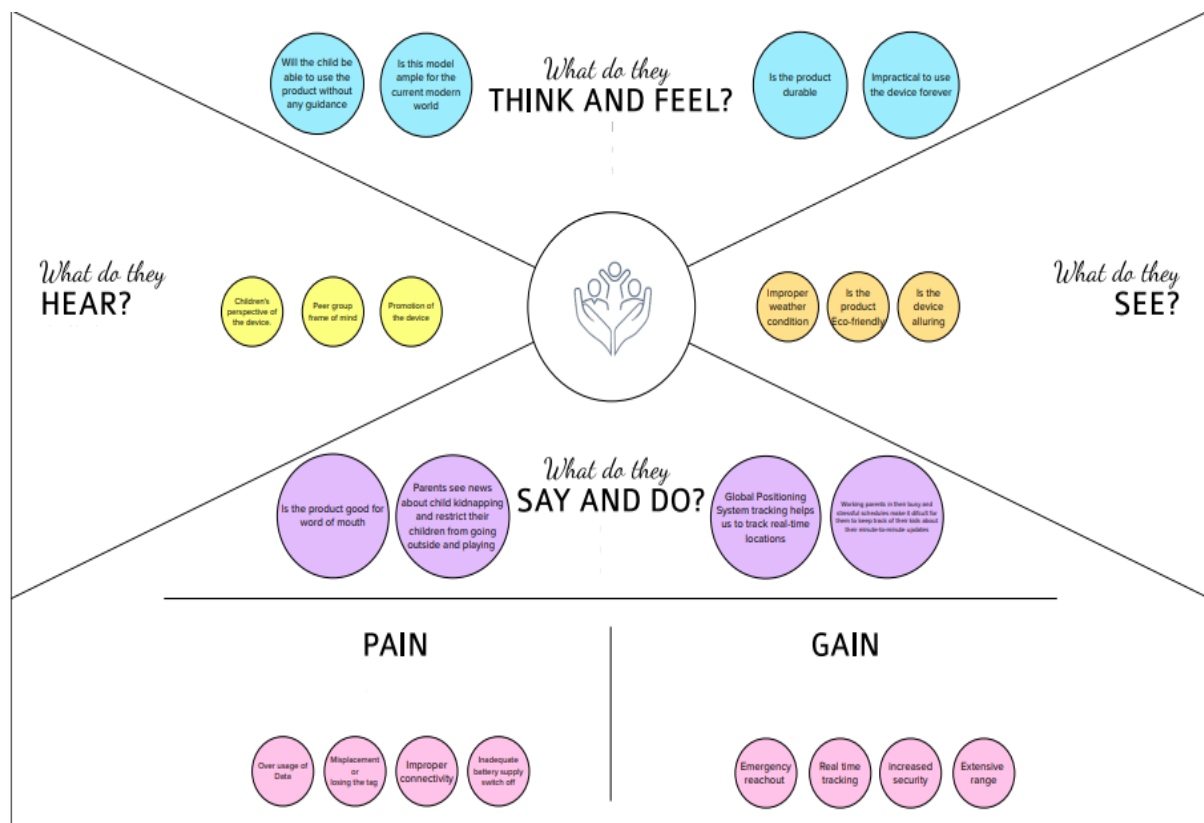
Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love. A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

Customer Problem Statement Template:

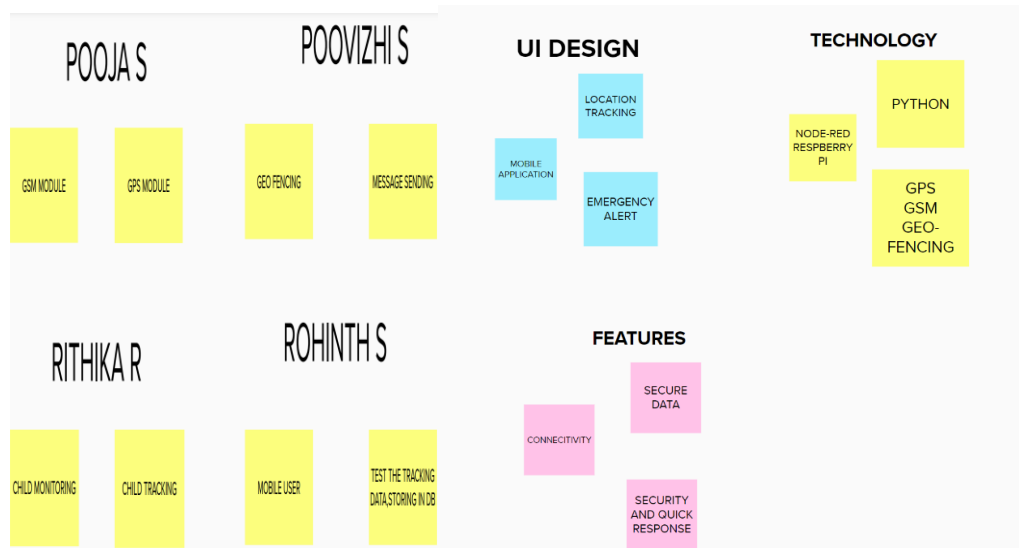
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Parent	To detect child location	lack of information n about child location	Because the location of the child is not exactly known by the parent	Frightening, scary , fearful , uneasy , worry, terrifying , unpleasant , anxious

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

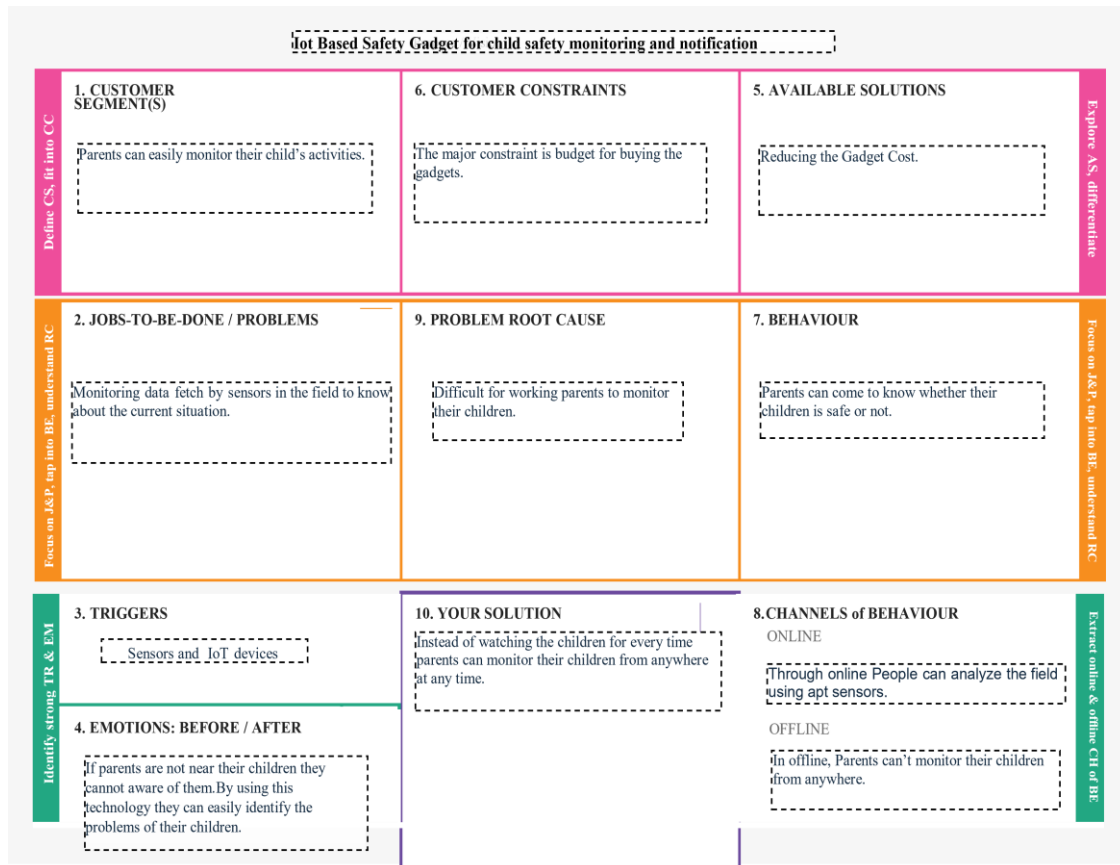


3.3 Proposed Solution

Proposed Solution Template:

S. No	Parameter	Description
1.	Problem Statement (Problem to be solved)	Design a device which is used to track the child and to notify it to their parents
2.	Idea / Solution description	We are going to design a device which sends the current location of the children and also parents can make a geofence to protect their child
3.	Novelty / Uniqueness	Geofence - Parent can create a geofence at specified time like scheduling activities so that they can accurately monitor their children
4.	Social Impact / Customer Satisfaction	It is very compact and with good quality. It can be easily affordable by all.
5.	Business Model (Revenue Model)	Collected data can be used to predict the flow of children.
6.	Scalability of the Solution	The model can be able to handle many number of input and provides the respective output.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notification	Notified via Mobile Web app
FR-4	User Interface	Mobile Web App user can create the geofence
FR-5	User Interface	Mobile Web App user able to see location of children when they are out of geofence

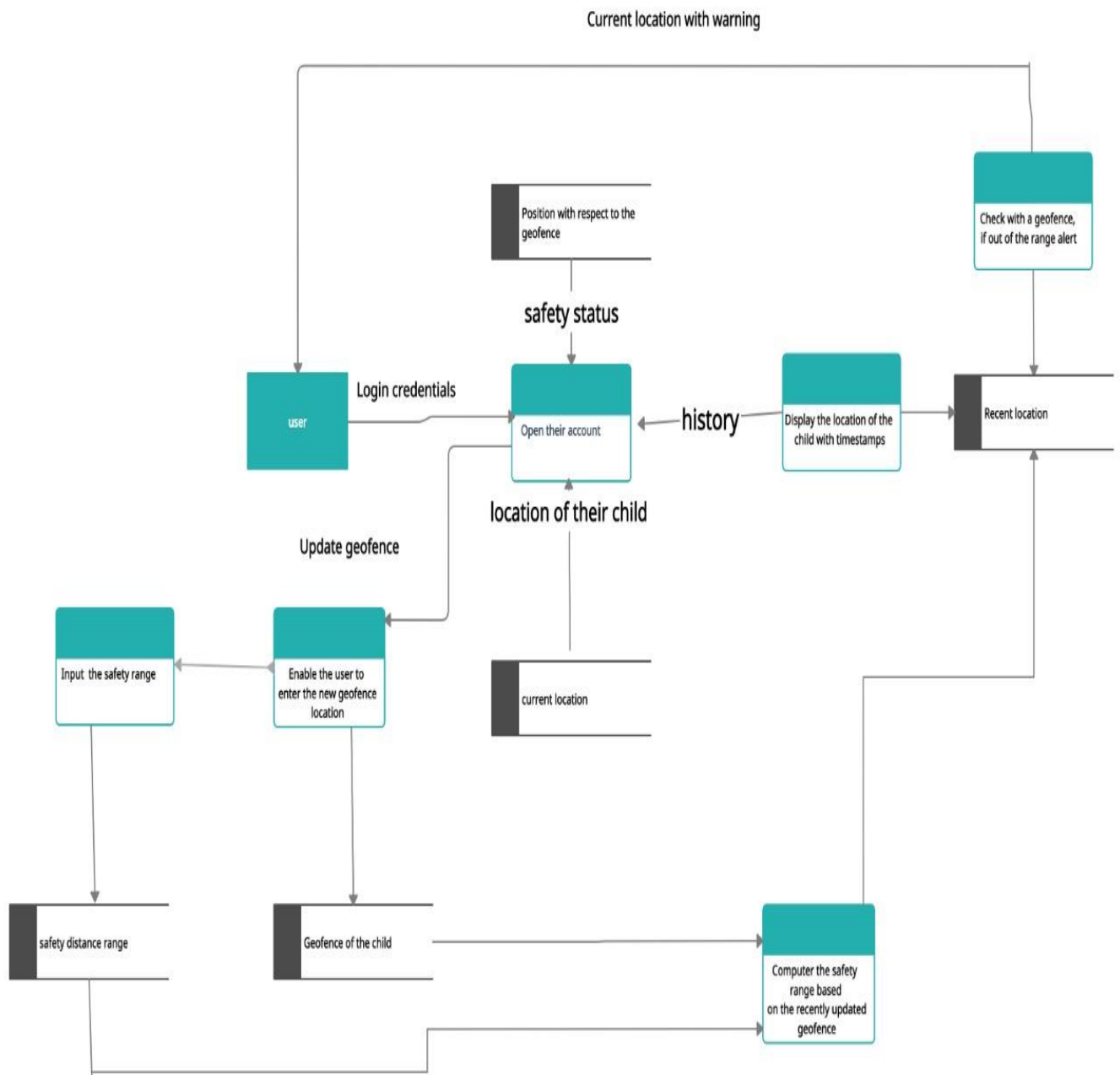
4.2 Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Accessed through Mobile Web app Showing location of the child
NFR-2	Security	Database security must meet HIPAA requirements
NFR-3	Reliability	Once logged in, webpage is available until logging out of app
NFR-4	Performance	Each page must load with minimum time
NFR-5	Availability	Must be active throughout the day and remain active at least a week for a single charge.
NFR-6	Scalability	The process must finish within 3 hours so data is available in the morning after an overnight update

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture

Technical Architecture:

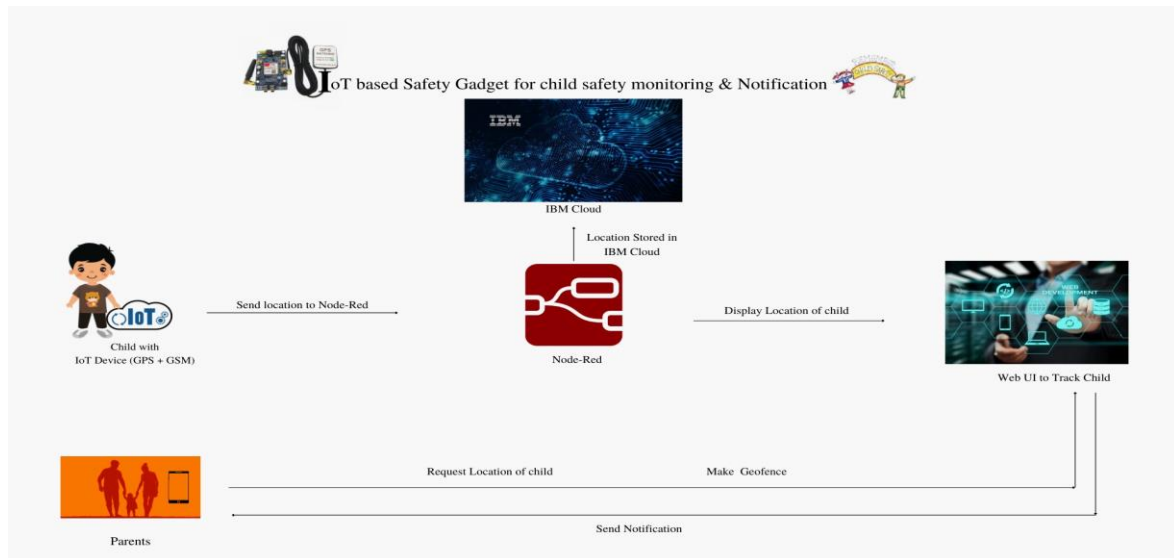


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI	HTML, CSS, JavaScript
2.	Application Logic-1	Storing Location in IBM Cloud	Python
3.	Application Logic-2	Showing the location in the Web UI	HTML / CSS / JS
4.	Application Logic-3	Making Geo fence	Node Red , JS
5.	Database	Object	NoSQL
6.	Cloud Database	Database Service on Cloud	IBM Cloudant
7.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
8.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration:	Python (Local) / IBM cloud (Cloudant)

5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	login/sign up	USN-1	User can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
Customer	Tracking	USN-2	User can view location in the website	I can view location	High	Sprint-2
Customer	Geo fence	USN-3	User can make geo fence for the child	Geo fence created	High	Sprint-3
Customer	Notification	USN-4	If the child went out from the fence the user can get notification	Notification received	High	Sprint-4

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	POOJA S
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	POOVIZHI S
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	RITHIKA R
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High	ROHINTH S
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	POOJA S, POOVIZHI S
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	RITHIKA R, ROHINTH S
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium	POOJA S, POOVIZHI S
Sprint-3	Communication	USN-3,1	I should be able to communicate with my parents	6	Low	RITHIKA R, ROHINTH S

6.2 Sprint Delivery Schedule

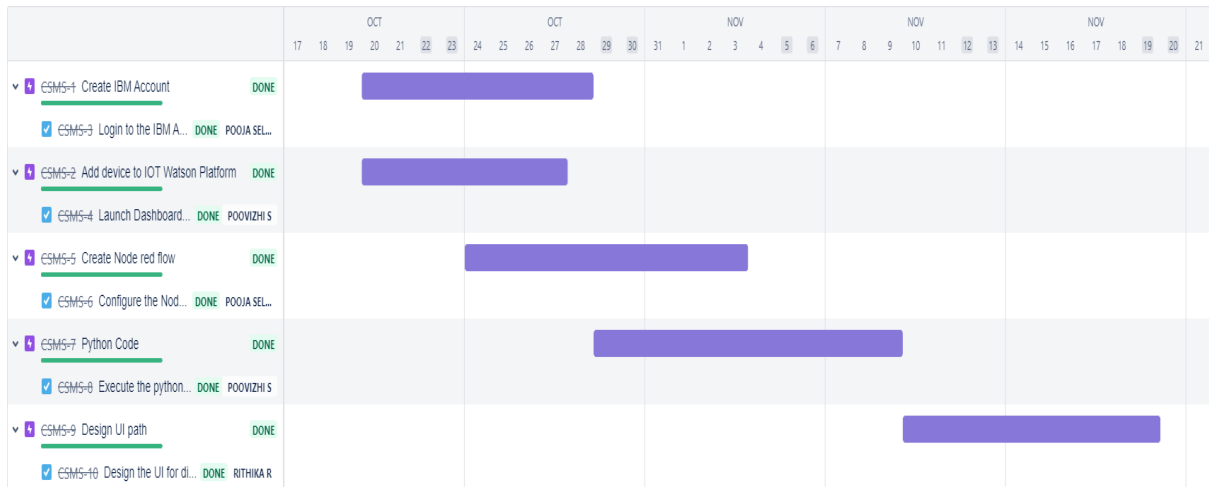
Project Tracker, Velocity & Burndown Chart: (4 Marks)

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

Velocity:

Average Velocity = $61/24 = 2.51$

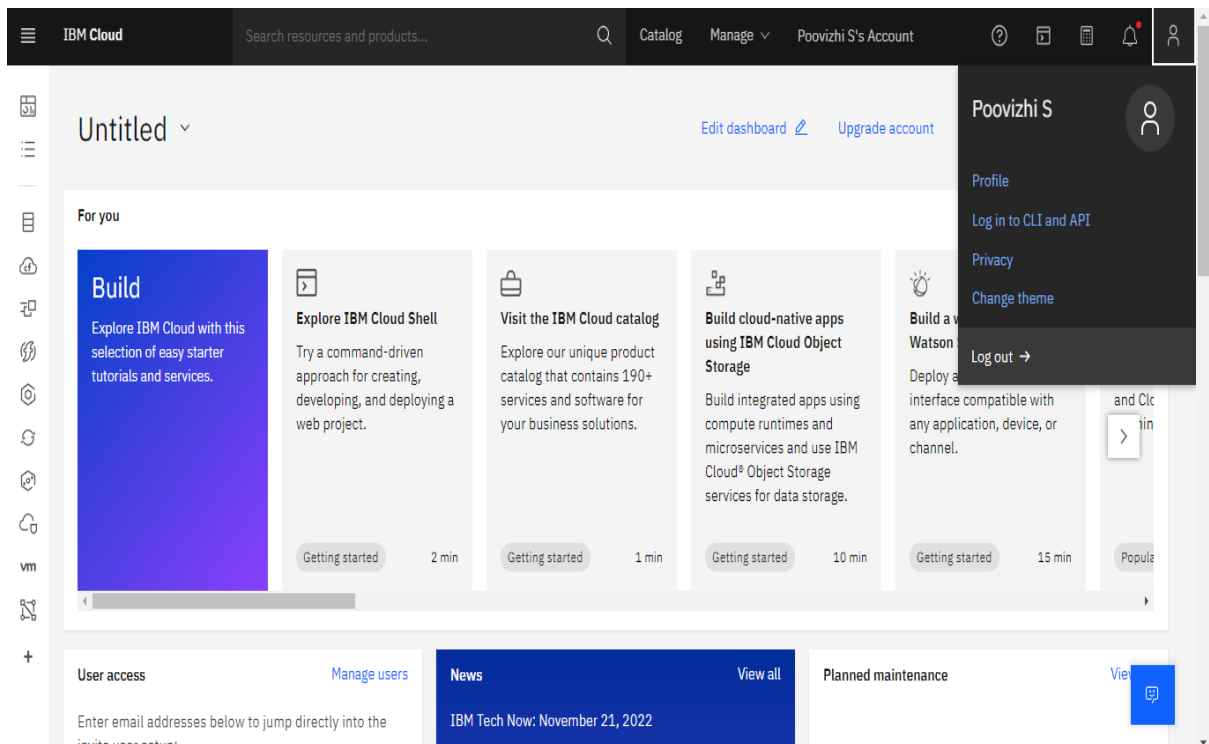
6.3 Reports from Jira



7. CODING & SOLUTIONING

7.1 Feature 1

Creating IBM Cloud Account



Connecting the Device in IOT Watson Platform

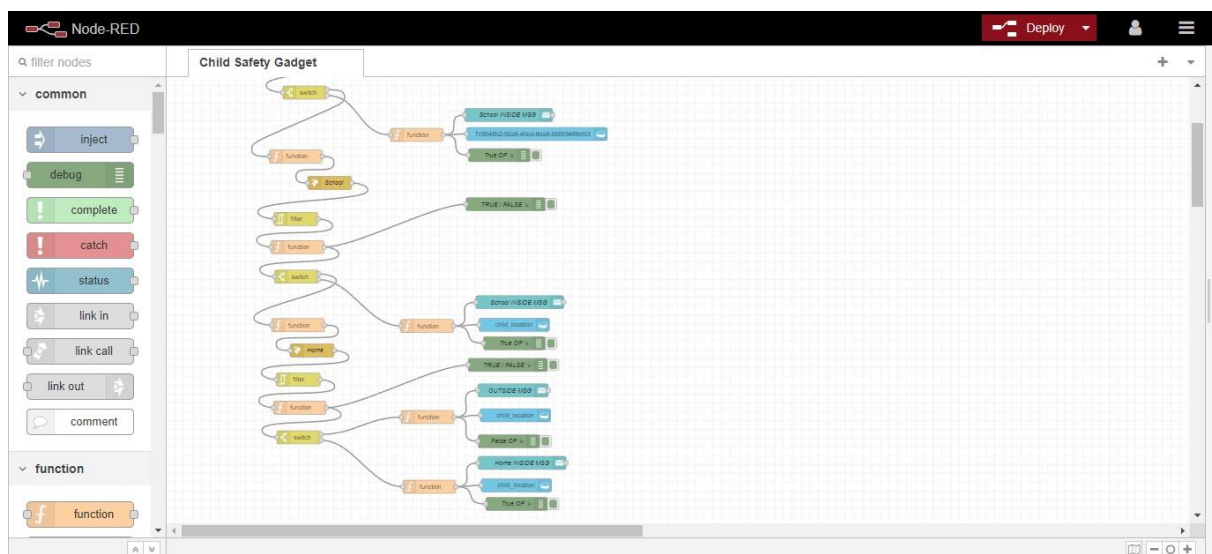
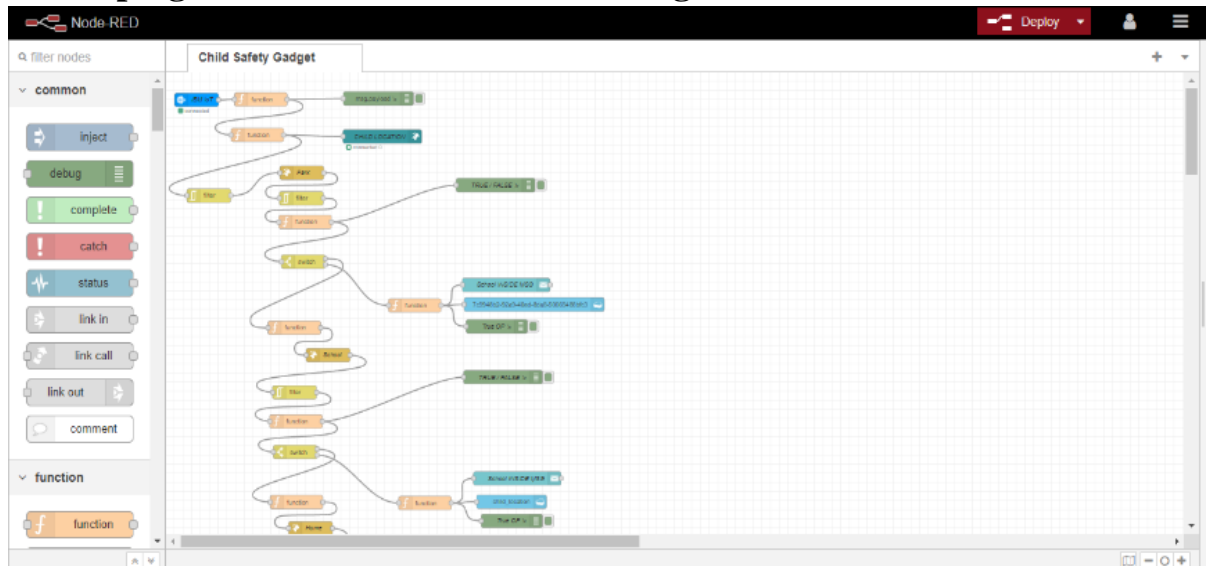
The screenshot displays the IBM Watson IoT Platform interface. At the top, there's a navigation bar with tabs: 'Browse', 'Action', 'Device Types', and 'Interfaces'. Below this is a table listing devices. The first device is 'ylse17', which is 'Disconnected', of type 'Android', with Class ID 'Device' and added on '20 Nov 2022 1:06 PM'. To the right of the table is a user profile for 'ylse17' (ID: ylse17, Bluemix Free) with links for 'Service Status', 'Terms', 'Privacy', 'Support', 'Blog', and 'Sign Out'. Below the table, there's a section for 'Identity', 'Device Information', 'Recent Events', 'State', and 'Logs'. The 'Device Information' tab is active, showing details for 'ylse17': Device ID, Device Type (Android), Date Added (20 Nov 2022 1:06 PM), Added By (poovizhiselvan4@gmail.com), and Connection Status (Disconnected). At the bottom, it shows 'Items per page: 50' and '1 of 1 page'.

Device ID	Status	Device Type	Class ID	Date Added
ylse17	Disconnected	Android	Device	20 Nov 2022 1:06 PM

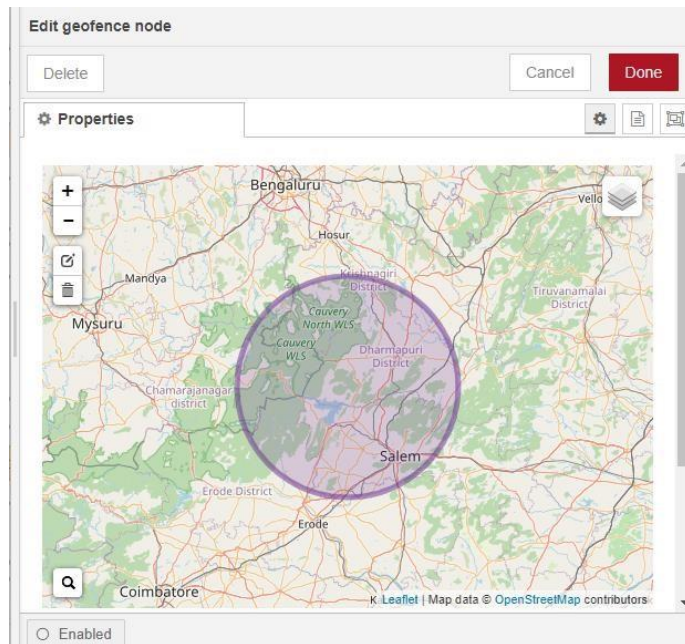
Device Information for ylse17:

- Device ID: ylse17
- Device Type: Android
- Date Added: 20 Nov 2022 1:06 PM
- Added By: poovizhiselvan4@gmail.com
- Connection Status: Disconnected

Developing Node Red flow and Connecting it to the IOT Device



Created the Geofence in Node Red



Code: [Python](#), [Node Red](#), [JavaScript](#), [IBM Cloudant](#)

7.2 Feature 2

Added code to get child location in python using IDLE

```
File Edit Format Run Options Window Help
import json
import collections
import wiotp.sdk.device
import time
myConfig = {
    "identity": {
        "orgId": "ylsel17",
        "typeId": "Android",
        "deviceId": "ylsel17"
    },
    "auth": {
        "token": "WORLDSPretty@1811"
    }
}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    name = "salem"
    #child is in safe(Salem)
    #latitude = 11.664325
    #longitude = 78.146011

    #child is in playing area(Coimbatore)
    #latitude = 11.004556
    #longitude = 76.961632

    #child in school(Chennai)
    latitude = 13.067439
    longitude = 80.237617

    myData = {'latitude':latitude, 'longitude':longitude}
    client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPu
    print("Data published to IBM IoT platform : ",myData)
    time.sleep(20)
client.disconnect()
```

Ln: 26 Col: 5

[illegible]

[←](#)
[→](#)
[↺](#)
<https://ylse17.internetofthings.ibmcloud.com/dashboard/devices/browse>

Gmail
 YouTube
 Maps

IBM Watson IoT Platform

poovizhiselvan4@gmail.com
 ID: ylse17

[Browse](#)
[Action](#)
[Device Types](#)
[Interfaces](#)

[Add Device](#)

	Device ID	Status	Device Type	Class ID	Date Added	
▼	ylse17	Disconnected	Android	Device	20 Nov 2022 1:06 PM	→ ...

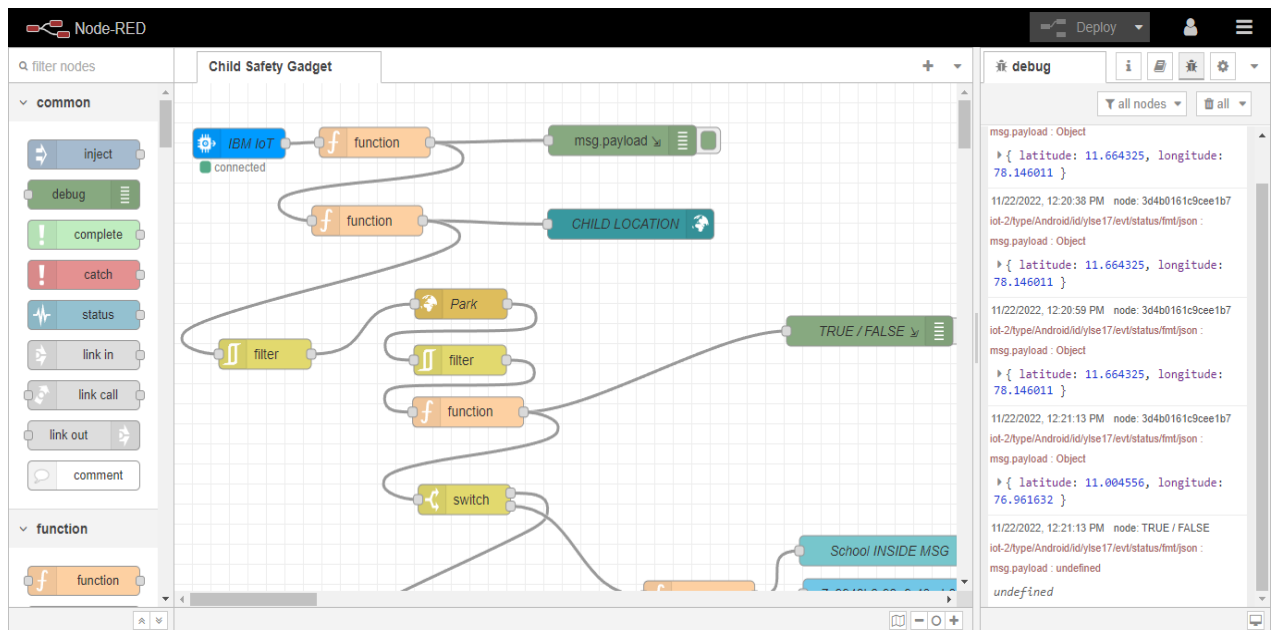
[Identity](#)
[Device Information](#)
[Recent Events](#)
[State](#)
[Logs](#)

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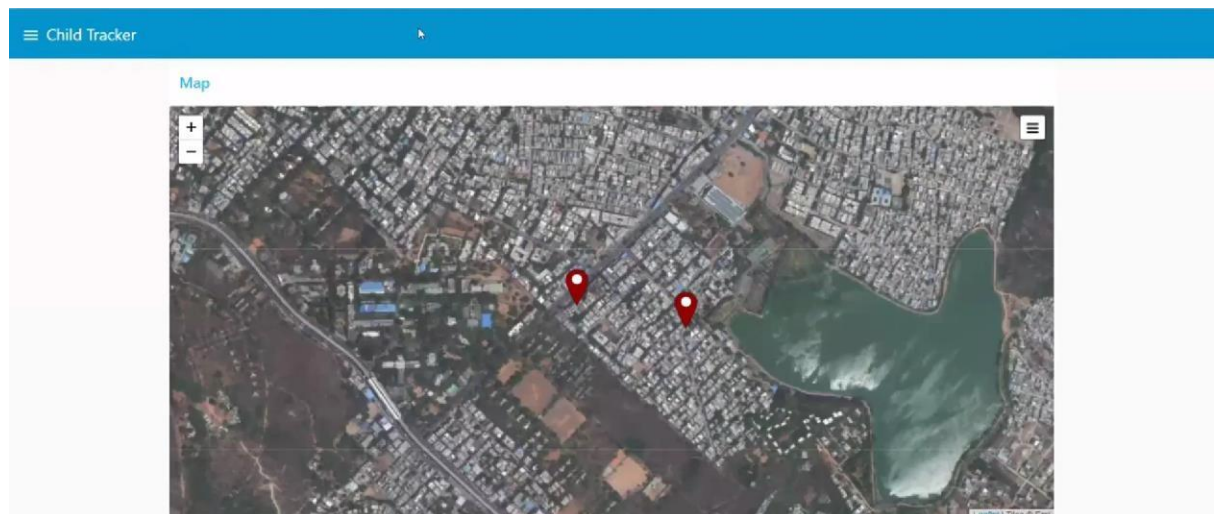
The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
status	{"latitude":11.664325,"longitude":78.146011}	json	a few seconds ago
status	{"latitude":11.664325,"longitude":78.146011}	json	a few seconds ago
status	{"latitude":11.664325,"longitude":78.146011}	json	a few seconds ago

Information Received by Node Red from Watson device



Located the Child in UI Dashboard



Code: [HTML](#), [CSS](#), [Python](#), [JavaScript](#)

8. TESTING

8.1 Test Cases

				Team ID	PNT2022TMD18488								
				Project Name	Project - IoT Based Safety Gadget								
				Maximum Marks	4 marks								
Test case ID	Feature Type	Component	Test Scenario	Pre-Requirement	Steps To Execute	Test Data	Expected Result	Actual Result	Status	TC for Automation(Y/N)	BUG ID	Executed By	
IBM Cloud_TC_001	Functional	IBM Cloud Service	Verify the login cloud services	Software	1. Open IBM.cloud.login 2. Enter IBM Mail ID 3. Enter Password 4. Login to the account	Username: poovithiselvan4@gmail.com password: Poovithi\$4	Successfully Created the IBM Account	Working as expected	Pass	Yes	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	
IBM Watson IoT Platform_TC_002	Functional	IBM Cloud Service	Verify device in the IBM Watson IoT platform and get the device credentials	IBM Cloud Service	1. Open lot watson login 2. Login using IBM cloud account 3. Launch the lot watson Platform 4. Create a device & configure the Device Type and ID 5. Generate the API key	Create a device and integrate with code	Data published to IBM IoT platform : ('latitude': 11.664325, 'longitude': 78.146011)	Working as expected	Pass	Yes	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	
Python Code_TC_003	Code	Python 3.0	Verify whether the python code is wit	Software	1. Download the python version 3.11.0 2. Type the program and save it 3. Compile the code	import json import collections import random deviceimport time myConfig = { "identity": { "orgid": "y0e17", "typeid": "Android", "deviceid": "y0e17" }, "auth": { "token": "WORLDSpetty@1811" } } password: Testing123	Data published to IBM IoT platform : ('latitude': 11.664325, 'longitude': 78.146011) Data published to IBM IoT platform : ('latitude': 11.664325, 'longitude': 78.146011) Data published to IBM IoT platform : ('latitude': 11.664325, 'longitude': 78.146011)	Working as expected	Pass	Yes	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	

Node Red_TC_004	Non-Functional	Node Red Service	Verify node red services	IBM Cloud Service	1. In IBM cloud go to catalog 2. Search for Node red 3. Create nodes and Configure it 4. Verify the App URL 5. Connect the Node Red with IBM watson	Geofence Node	Successfully created the node red	Working as expected	Pass	No	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	
Cloudant Db_005	Functional	IBM Cloud Service	Verify the events is stored in the data base	IBM Cloud Service	1. Go to IBM cloud services 2. In Resource list search cloudant service 3. Launch the dashboard to redirect to the cloud DB 4. Click on create to create DB	Document Tracker	Successfully created the node Database	Working as expected	Pass	No	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	
UI_TC_006	Functional	Node Red Service	To create a web UI to interact with user	Node Red Service	1. Go to node red dashboard 2. Deploy node red 3. Copy the URL for displaying the Location in UI	Locating the Child	Display the Location of the child	Working as expected	Pass	No	Nil	1.Pooja.S 2.Poovithi.S 3.Rithika.R 4.Rohinith.S	

Test Scenarios

- 1) Verify the login cloud services
- 2) Verify device in the IBM Watson IOT platform and get the device credentials
- 3) Verify whether the python code is without error by running it
- 4) Verify node red services
- 6) To create a web UI to interact with user

8.2 User Acceptance Testing

Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	4	4	2	0	10
Duplicate	0	0	0	1	1
External	2	0	0	1	3
Fixed	7	2	0	0	9
Not Reproduced	0	1	1	0	2
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	13	7	3	2	2

Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested.

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	1	0	0	1
Client Application	1	0	0	1
Security	1	0	0	1
Outsource Shipping	1	0	0	1
Exception Reporting	1	0	0	1
Final Report Output	1	0	0	1
Version Control	1	0	0	1

9. RESULTS

9.1 Performance Metrics

NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Risk Score	Justification
1	IoT Based Safety Gadget for Child Safety Monitoring & Notification	New	No Changes	No Changes	GREEN	As we have completed the project successfully
NFT - Detailed Test Plan						
S.No	Project Overview	NFT Test Approach				
1	This project proposes a model for 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.	Load Test				
End Of Test Report						
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	Approvals/SignOff	
1	The application aside from conceding you to track down your children when they're within Geofence range, also functions when your kids go further afield. Its competence as a tracker is outstanding if you live in densely populated areas like cities or big towns.	Load Test	Nil	Response time meet the actual Result	Approved	

NFT Test approach	
Load Test	
Scenario Name	Load Test - Location Tracker SAMPLE PROJECT
Scenario Type	Load Test - Duration 15 minutes
Scenario Objectives	To Stimulate Python Code(Location Details) and to monitor the performance of Location Tracker SAMPLE PROJECT
Steps	1. We have integrate IBM Watson IoT Platform in order to get this Location details from python program. 2. We also integrate fast SMS service in order to send an alert to guardian or parent
Entry Criteria	Test data is set-up. All the Components(software & hardware) is set-up. It is completed successfully.
Exit Criteria	Response time meets the actual Result. Test completion report is agreed upon by mentors

10. ADVANTAGES AND DISADVANTAGES

Advantages:

1. A Child's GPS Tracker reports any potential dangers and protects them in the process.
2. It acts as a communication tool for parents and can be helpful even when traveling.
3. Usually, children tend to wander a lot. With the help of GPS Tracking devices, you can easily and quickly know where your children are.
4. Parents will get all the details like their kid boarding/de-boarding school bus. Also, they can get emergency alerts when the child fails to board or de-board at the other stop.
5. Prevent abduction and let your children play and walk around safely. Our Personal GPS trackers for kids are great options for parents for monitoring their children 24/7.

Disadvantages:

1. Young children may refuse to cooperate unless allowed to play with their gadgets.
2. Excess use of electronic gadgets can lead to children spending less time outdoors and limiting their social interaction.
3. It may lead to poor concentration in studies and lack of interest in day to-day activities.
4. Excessive gadgets use can lead to poor health, a sedentary lifestyle, and bad eating habits.

11. CONCLUSION

This Android Device has a superior mode for viewing and locating the children where about with correct latitude and longitude, which is especially useful when using Google maps. This could assist to reduce the number of attacks on children while also making them feel protected and secure. The major goal of this project is to create a device that protects youngsters from risky circumstances while also assisting them in combating them.

12. FUTURE SCOPE

A camera module for surveillance of the child's surrounds can be added to improve the system's performance. It's also possible to do it with a Raspberry Pi and Lily pad. It is possible to develop a more energy-efficient type that can keep the battery for a longer period.

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.

For surveillance of the child's surroundings, to get a clearer picture of the location, this wearable can also contain a camera module incorporated in it. The camera will be collecting information in the same manner as the GPS module. It will be on standby conserving power waiting for the particular keyword "SNAPSHOT" to be sent from the user's smart phone to the GSM shield will activate the camera to start clicking a snapshot of the surrounding and save the file temporarily on the external micro-SD card. After which Arduino UNO will access the saved image from the micro SD storage and transfer it to the GSM module which send it to the user via SMS/MMS text.

13. APPENDIX

Source Code:

Python Script

```
import json
import collections
import wiotp.sdk.device
import time
myConfig = {
    "identity": {
        "orgId": "ylse17",
        "typeId": "Android",
        "deviceId": "ylse17"
    },
    "auth": {
        "token": "WORLDSpretty@1811"
    }
}

client = wiotp.sdk.device.DeviceClient(config=myConfig ,logHandlers=None)
client.connect()
while True:
    name = "salem"
    #child is in safe(Salem)
    #latitude = 11.664325
    #ongitude = 78.146011

    #child is in playing area(Coimbatore)
    latitude = 11.004556
    longitude = 76.961632

    #child in school(Chennai)
    #latitude = 13.067439
    #ongitude = 80.237617
```

```
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()
```

GitHub LINK:

<https://github.com/IBM-EPBL/IBM-Project-24506-1659943952>

Project Demo Link:

https://drive.google.com/file/d/1Cu_1vEFex7RDilr-bbErjD1Tw6sPSKt/view?usp=share_link