PROJECT REPORT

Project Name: IoT Based Safety Gadget for Child Safety Monitoring and Notification

Team Name: PNT2022TMID04717

Team:

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Naveena Priya M

Ravi Kumar P

Sanjanaa C

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1.INTRODUCTION

1.1 Project Overview

To make ease of monitoring children remotely by parents, this system is proposed. Parents often worry about their children and they found difficulties in monitoring their children 24x7. To overcome this, we are going to design an application through which parents can monitor them, set geofence for them and notified when children go out of the range. This can be done using MIT app inventor, Node-Red, IBM cloud, python IDE etc. This system requires internet or WiFi connectivity, GPS to lively monitor.

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 and crime rate will be reduced. This is done by sharing the live location frequently and verifying it whether it is present inside the safe zone or not. Sharing live location can be done through smartphones using GPS and mobile network. Child's surroundings can be located with the help of accurate and precise real-time location.

2.LITERATURE SURVEY

2.1 Existing problem

Having live location of children through whatsapp or any other apps is not efficient and satisfactory. The project aims to create a system that allows the parents to keep a track of their child when they are out of sight using geofence. Geofence is defined as geographical boundaries set up to watch out for the child's location. When the child goes out of geofence it sends the exact coordinates to the parent using the application. In this method there is no certain flow setup to watch out for the child's exact location

2.2 References

[1]. Gao, Zhigang, Hongyi Guo, Yunfeng Xie, Yanjun Luo, Huijuan Lu, and Ke Yan. "ChildGuard: A child-safety monitoring system." IEEE MultiMedia 24, no. 4 (2017): 48-57.

[2]. Kaur, Deepinder, Ravita Chahar, and Jatinder Ashta. "IOT Based Women Security: A Contemplation." In 2020 International Conference on Emerging Smart Computing and Informatics (ESCI), pp. 257-262. IEEE, 2020.

[3]. Nagamma, H. "IoT based smart security gadget for women's safety." In 2019 1st International Conference on Advances in Information Technology (ICAIT), pp. 348-352. IEEE, 2019.

[4]. Kathiravan, M., M. Pavan Kumar Reddy, Muthukumaran Malarvel, A. Amrutha, P. Harshavardhan Reddy, and S. Kavitha. "IoT-based Vehicle

Surveillance and Crash Detection System." In 2022 International Conference on Applied Artificial Intelligence and Computing (ICAAIC), pp. 1523-1529. IEEE, 2022.

[5]. Roy, Sulochana. "IOT Enabled Security System for Android users." In 2018 International Conference on Recent Innovations in Electrical, Electronics & Communication Engineering (ICRIEECE), pp. 2312-2317. IEEE, 2018

[6]. Noorin, Maviya, and K. V. Suma. "IoT based wearable device using WSN technology for miners." In 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), pp. 992-996. IEEE, 2018.

[7]. Gull, Hina, Dalal Aljohar, Reem Alutaibi, Dalia Alqahtani, Muna Alarfaj, and Rahaf Alqahtani. "Smart School Bus Tracking: Requirements and Design of an IoT based School Bus Tracking System." In 2021 5th International Conference on Trends in Electronics and Informatics (ICOEI), pp. 388-394. IEEE, 2021.

2.3 Problem statement Definition

The Problem Statement is, a parent who often worried about safety of their children. They trying to monitor their children for safety. But having their live location through whatsapp is not satisfactory. Because it is not that much accurate and they should have a look whenever they want to have and so they may not aware when they face any kind of danger.

If the kid is trying to inform their parents when they face any kind of danger. But communicating their parents through call or text is not possible in some situations. Because when someone restricts to communicate they wont be able to call and there may be lost signal sometimes. Then which makes feel they are not much safer without their parents.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy map Canvas

3.2 Ideation & Brainstorming
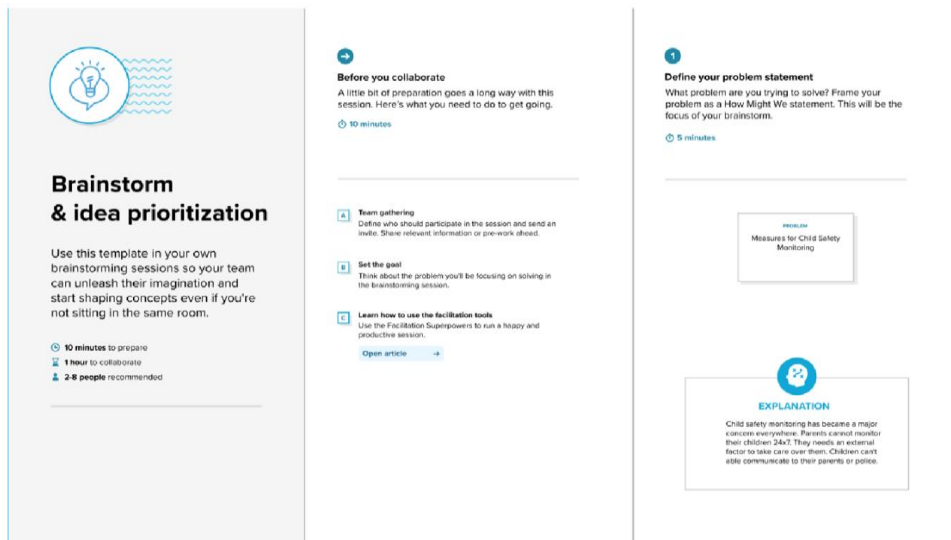
2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

⏱ 10 minutes

Person 1	Person 2	Person 3	Person 4
To create an application that updates location of their children 24x7	Send notofications to the caretakers when users are in danger	To create a boundary similar to geofence	Online security should also be provided
Children should be able to use it at ease and there shouldn't be any malfunction	Also can record mobile activity time for digital wellbeing of children	A application that shows the precise activity of the child	Notify parents when their children are going to new places

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

⏱ 20 minutes

To create an application that provides live location of children 24x7.

Online security and digital wellbeing should be provided.

Notifications to be sent to parents when they are in danger or when they do abnormal activities

Notify when they are out of their geofence

Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⏱ 20 minutes

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Notify when they are out of their geofence

Notify parents when they are in danger

To create an application that provides live location of children 24x7.

Online security and digital wellbeing should be provided.

Feasibility

Regardless of their importance, which tasks are more feasible than others? (cost, time, effort, complexity, etc.)

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To notify parents about activity of their children to ensure their safety
2.	Idea / Solution description	A IoT based safety location tracking gadget backed with IBM cloud which sends their current location status to their parents.
3.	Novelty / Uniqueness	IBM cloud is used to save the priority location of children where the children are allowed to go(similar to a geofence).
4.	Social Impact / Customer Satisfaction	It improves the security of children and make parents feel that their children are safe.
5.	Business Model (Revenue Model)	Unlike other gadgets it provides the more categories like silver, gold and platinum in which features differ for each category.
6.	Scalability of the Solution	By using the IoT its totally done online and parents no need to worry about their child's safety.

In this proposed solution the parents about activity of their children to ensure their safety. An Iot based safety location tracking gadget backed with IBM cloud which sends their current location status to their parents. Then IBM cloud is used to save the priority location of children where the children are allowed to go. By using IoT it is totally done in online and parents no need to worry about their child's safety.

3.4 Problem Solution Fit

1. CUSTOMER SEGMENT(S) `CS`

1. Parents who are concerned about the safety of their child.
2. Parents who are not able to monitor their child due to their work.

6. CUSTOMER CONSTRAINTS `CC`

1. Customer needs internet connection and IoT gadget.

5. AVAILABLE SOLUTIONS `AS`

1. Child safety are monitored only through the past location and present locations are not correctly identified.

2. JOBS-TO-BE-DONE / PROBLEMS `J&P`

1. In older methods exact locations are not easily identified.
2. In case child is in any danger their locations are not identified.

9. PROBLEM ROOT CAUSE `RC`

1. Children are not able to identify their location when they are lost their root.
2. Lack of knowledge of routes.
3. Lack of social security (Kidnapping).

7. BEHAVIOUR `BE`

1. Get access to unlimited source to monitor a child with geofence.
2. It will be easier to user to stick with IoT gadget throughout the process.

3. TRIGGERS `TR`

1. It creates awareness among the parents about the child safety is important then their work.

4. EMOTIONS: BEFORE / AFTER `EM`

BEFORE: Lack of safety of children when they are outside and more possibilities of getting into danger, and parents are not aware of their child's exact location.

AFTER: Parents are able to track the live location and safety of children is assured by geofence monitoring.

10. YOUR SOLUTION `SL`

1. This application is used to track the location of children and updated to parents frequently by the notification or by alert message.
2. This allows the parents to monitor the route travelled by their kid with the help of geographic monitoring.
3. This will provide real time security to children.

8. CHANNELS of BEHAVIOUR `CH`

8.1 ONLINE
1. Real time tracking of children's location and safety is enhanced.
2. Getting online notifications and alters.

8.2 OFFLINE
1. As this is fully online oriented, there is no online functionalities.

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

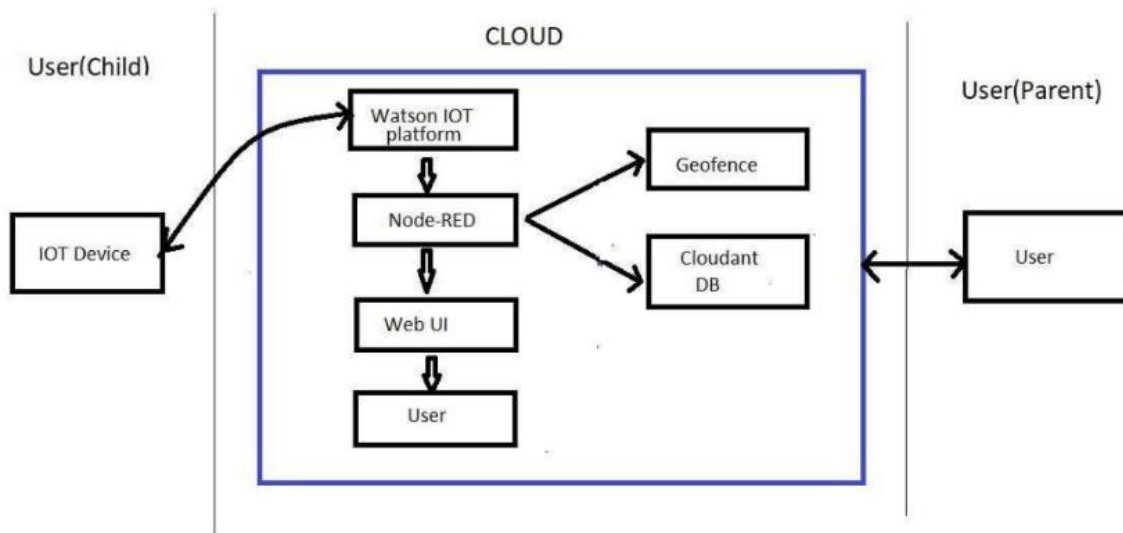| FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Register through Number or email
FR-2	User Confirmation	Confirmation via Email or message with generated OTP
FR-3	User Login	login through User Id and Password or through facebook
FR-4	Network Connectivity	Internet connection via wifi / mobile data
FR-5	IBM IoT Platform	Location coordinates are extracted from cloud
FR-6	Node-RED	Coordinates are converted into map location Geofence (Virtual boundary) to be set
FR-7	Fast2sms	Popup Notification sent through message

4.2 Non-Functional Requirements

| FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Locating and monitoring children and sending notification to parents at ease
NFR-2	**Security**	Secured data in the cloud database and prevention of data from hackers
NFR-3	**Reliability**	Safety of the children is always ensured
NFR-4	**Performance**	Notifies when the children go out of geofence
NFR-5	**Availability**	Check whether the children are present of within the geofence
NFR-6	**Scalability**	Area can be either local or larger areas based on the caretaker's preference

5.PROJECT DESIGN

5.1 Data Flow Diagrams

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.

5.2 Solutions & Technical Architecture

Technical Architecture:
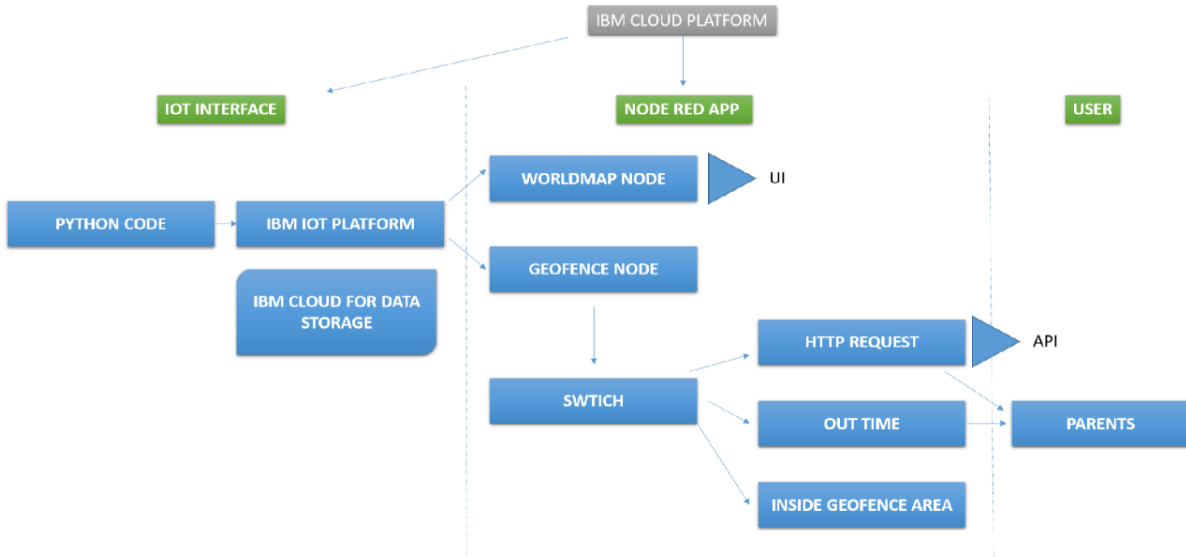
5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	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
		USN-3	As a user,I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can Check back whether the application is recieved	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	As a User, I can view the Dashboard	I can view the locations which is stored in the database of the child via dashboard	High	Sprint-2
Customer Care Executive		USN-7	As a customer care executive,I will detect the problems	I will detect the problems and correct them if the device face any	Medium	Sprint-3
Administrator		USN-8	As an administrator, I ensure the efficiency of the device	I will ensure efficiency,cost,etc	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 setting new password.	10	High	Ravi Kumar Sanjith Kumar
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	5	High	Ravi Kumar
Sprint-1	Login	USN-3	As a user, I can log into the application by entering registered email id and password.	5	Low	Naveena Priya
Sprint-2	Storing credentials	USN-4	As an admin, I can store the login credentials of users.	20	Medium	Sanjanaa
Sprint-3	Location Tracking	USN-5	As a user, I can able to watch my child's geo location	20	Medium	Sanjith Kumar
Sprint-4	Notification	USN-6	As a user, I can get notified whenever child goes out of the geofence	10	High	Sanjanaa Naveena Priya
Sprint-4	Data processing	USN-7	Location of each children need to be verified in the cloud whether they are within the geofence	10	High	Ravi Kumar Sanjith Kumar

6.2 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

7.CODING & SOLUTIONING

7.1 Feature

```python
import time
import random
#import ibmiotf.application
import ibmiotf.device
import sys

config= {"org":" 6l9i71",
            "type":" IoT ",
            "id":"12344321",
            "auth-method":"use-token-auth",
            "auth-token":"12345678"}

client= ibmiotf.device.Client (config)
client.connect()

def myCommandCallback (cmd):
    a=cmd.data
    if len(a["command"])==0:
        pass
    else:
        print(a["command"])
def pub (data):
 client.publishEvent (event="status", msgFormat="json",data=data, qos=0)
 print("Published data Successfully: %s",data)
```

```
while True:
    name= "Childtracker"
    #in area
    #latitude= 9.8796
    #longitude= 78.0810
    #out area latitude= 9.95143 longitude= 78.1158
     data={'name': name, 'lat':latitude,'lon':longitude}   pub(data)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```
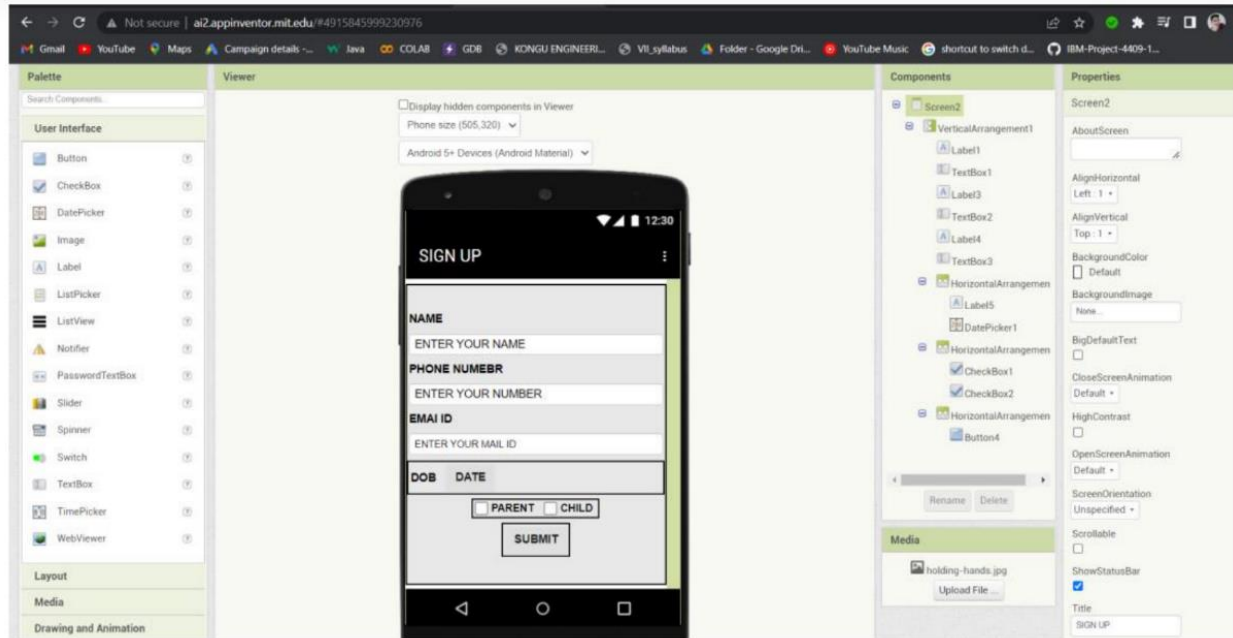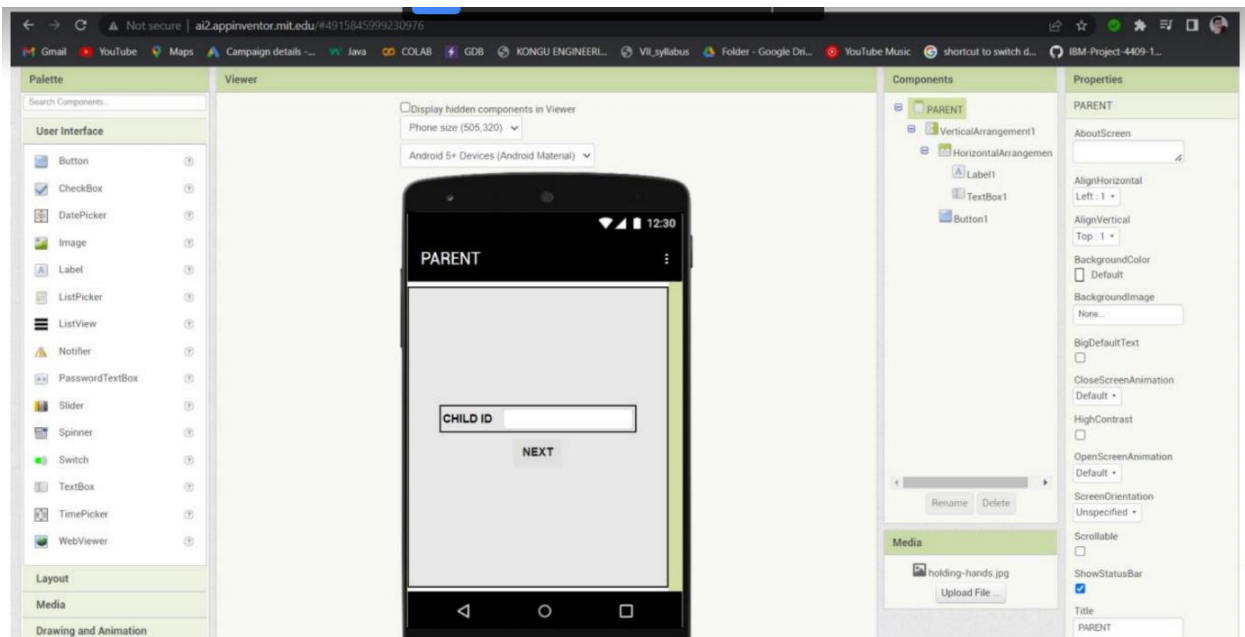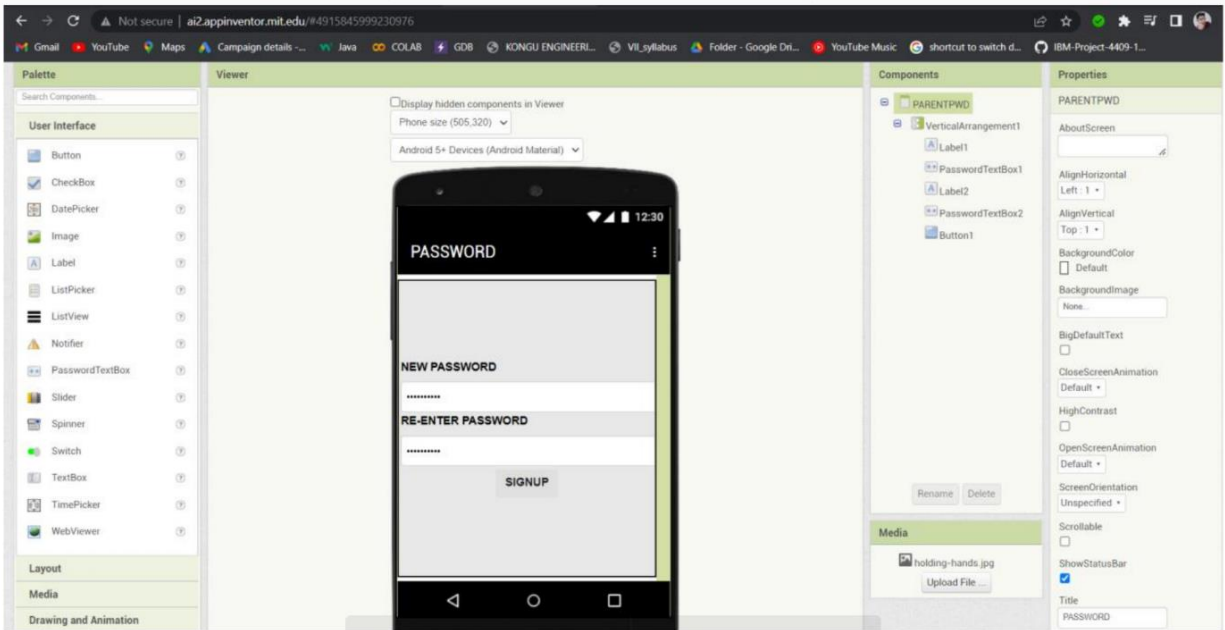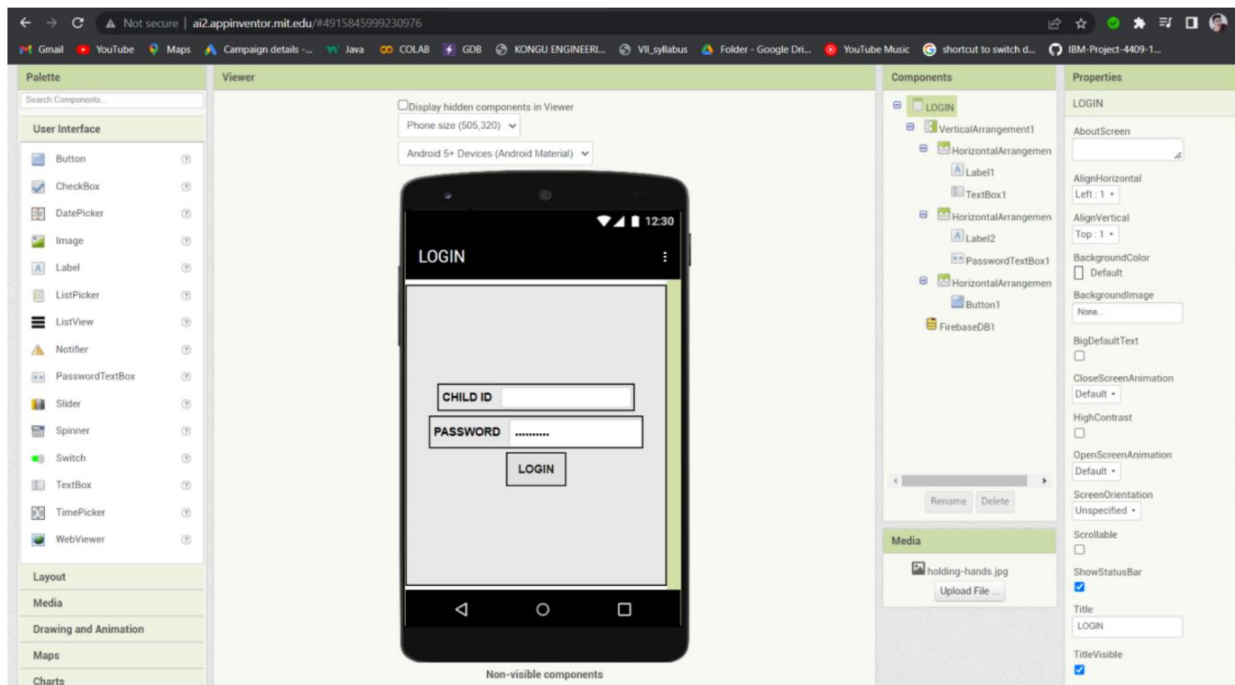
7.2 Solutioning
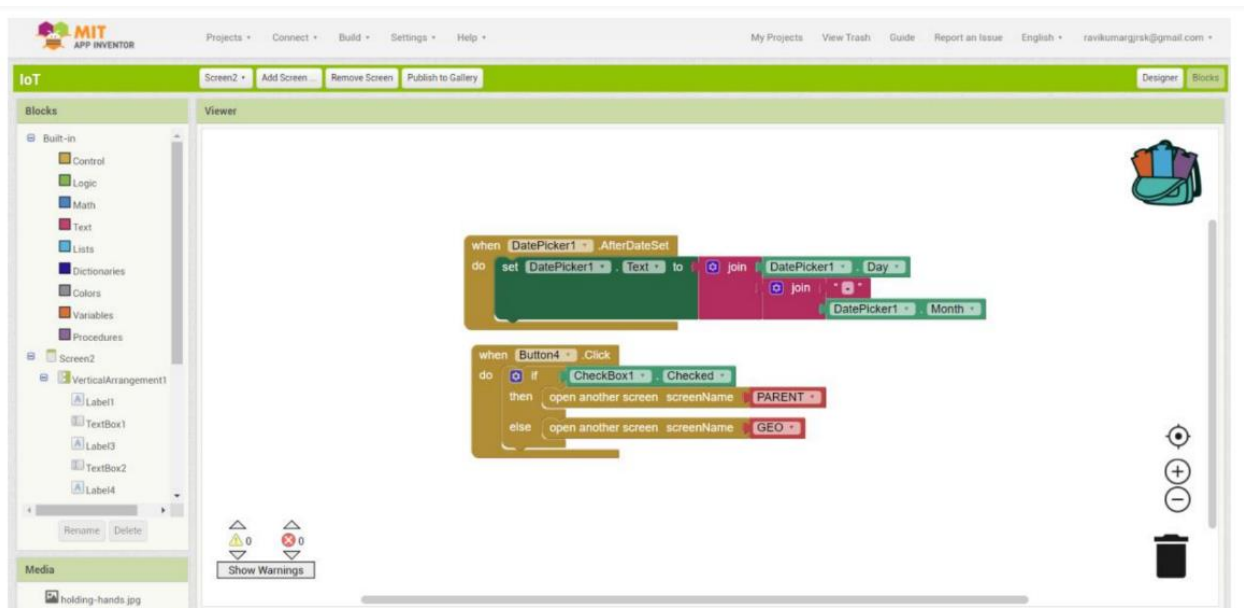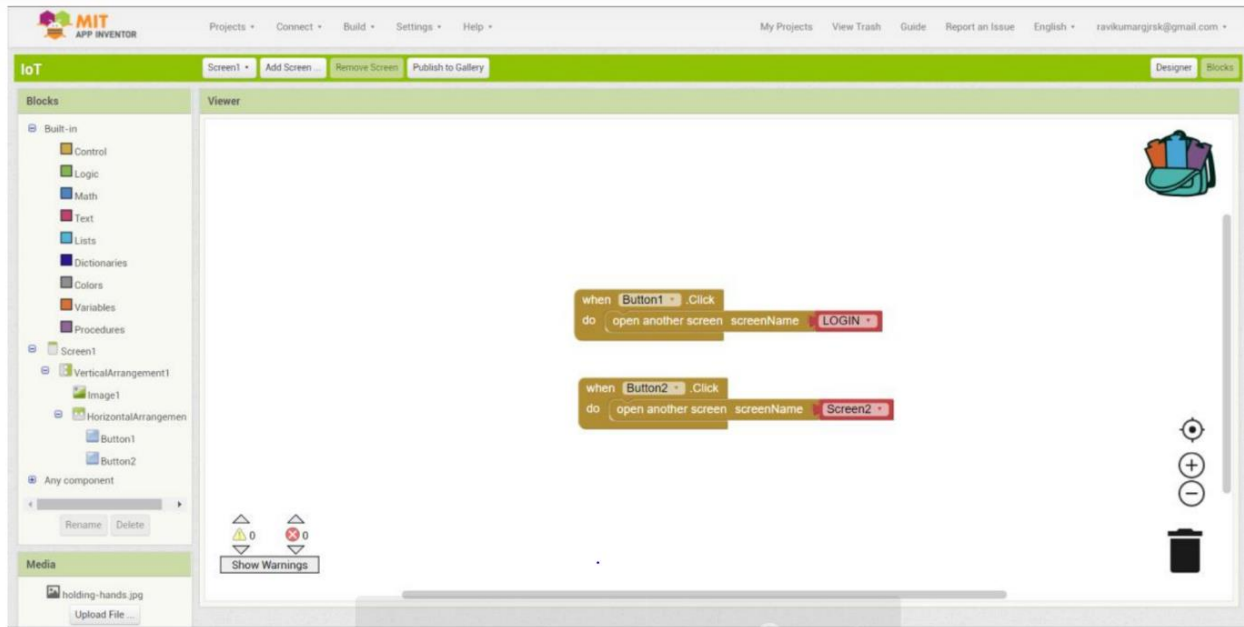
SPRINT 1
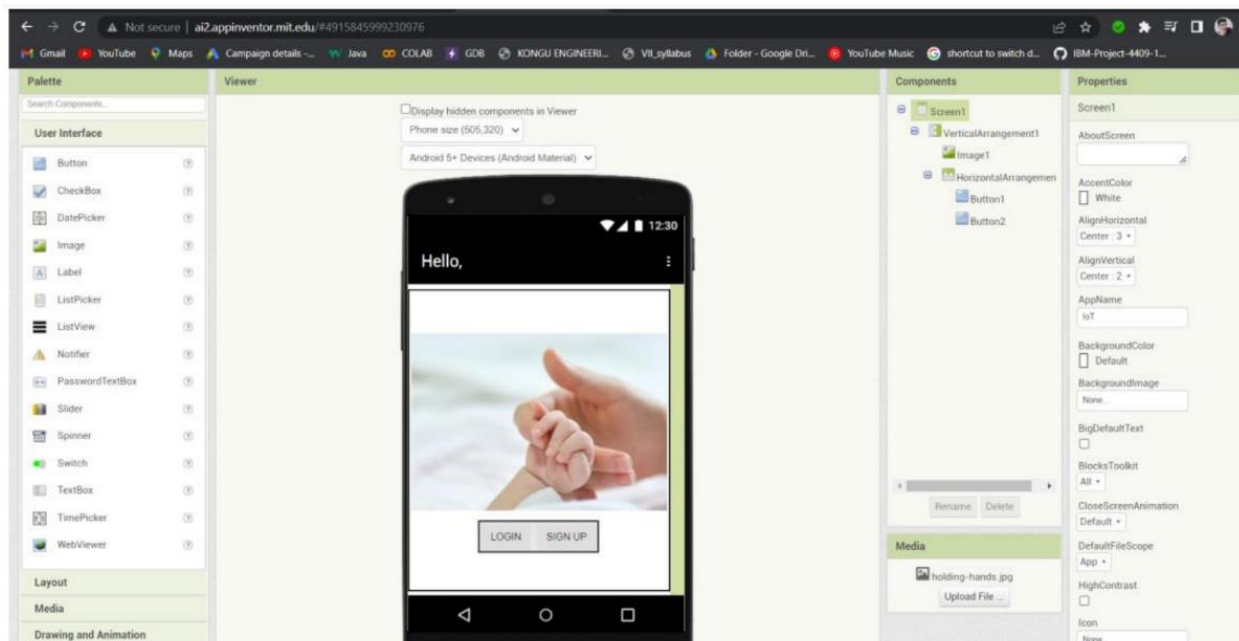
Sign up page:
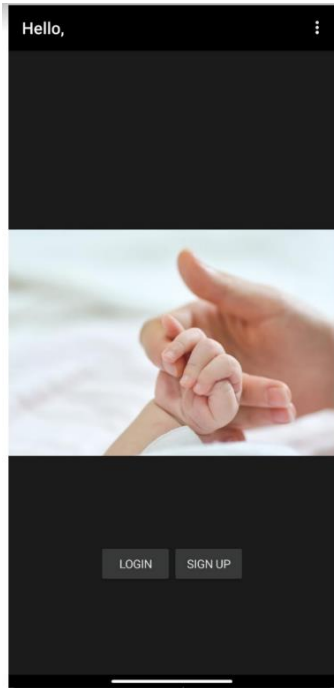
Parent application screen:

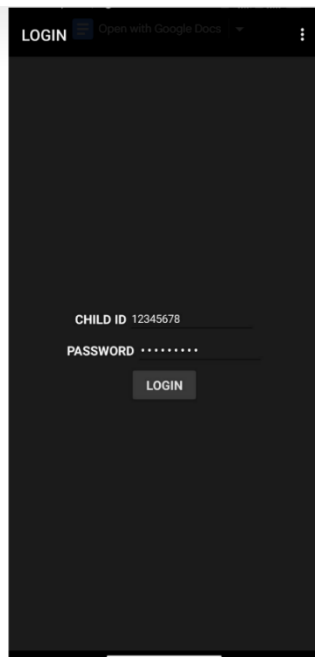Password setup:

Login page:

Page Navigations:

SPRINT 2

Mobile app screen 1:

Mobile app screen 2:

```
1    {
2      "rules": {
3        ".read": true,
4        ".write": true
5      }
6    }
```
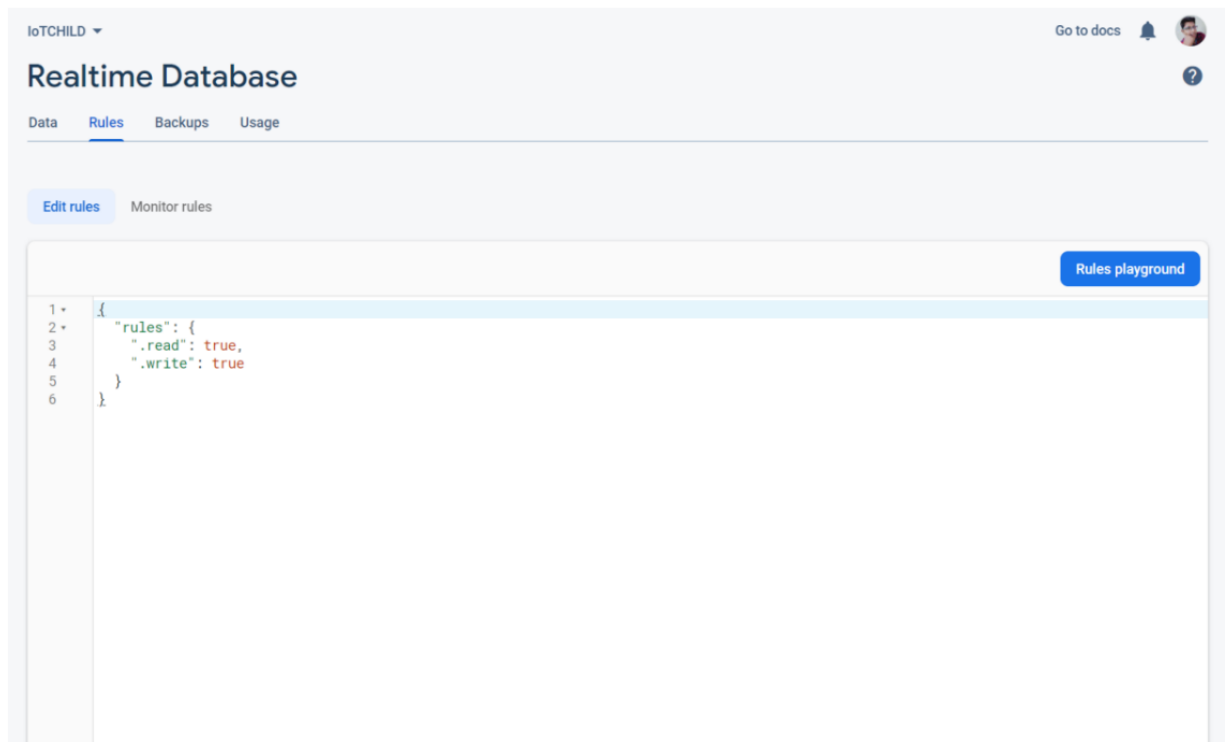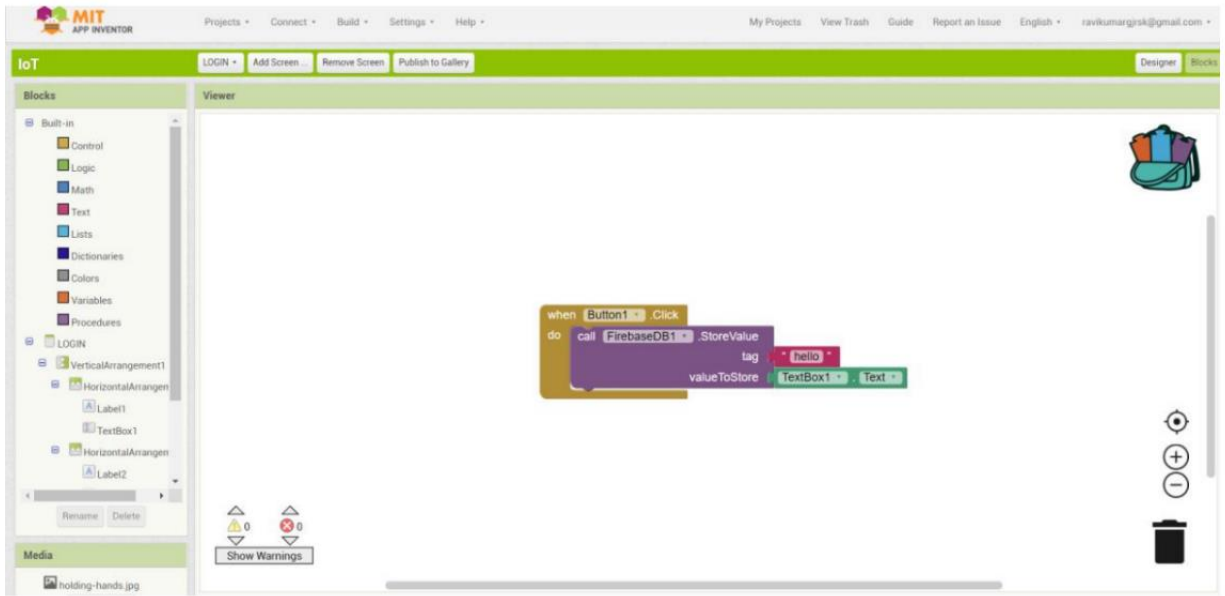
Realtime Database

🛡 Protect your Realtime Database resources from abuse, such as billing fraud or phishing   **Configure App Check**   ✕

🔗 https://iotchild-default-rtdb.firebaseio.com   ⌄ ⌄ ⋮

```
https://iotchild-default-rtdb.firebaseio.com/
▾— IoT
      └— hello: ""12345678""
```

◀

📍 Database location: United States (us-central1)

8 TESTING

8.1 Test cases

STEPS TO GET LIVE LOCATION OF THE CHILDREN:

1. Press Login

2. It navigates to login page.

3. Enter child ID

4. And then enter the Password.

5. Press shortly to store data in the cloud.

6. Long press the login button in login page to navigate to live location tracking page (GEO).

7. Finally, it navigates to the Live location tracking page.

8. Then in the bottom the click "GET LOCATION" button.

9. And the live location of the child is tracked.

HOME PAGE:

1. Click on "Login" to navigate to login page.
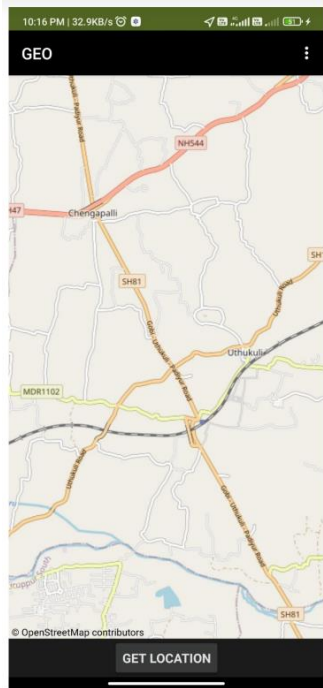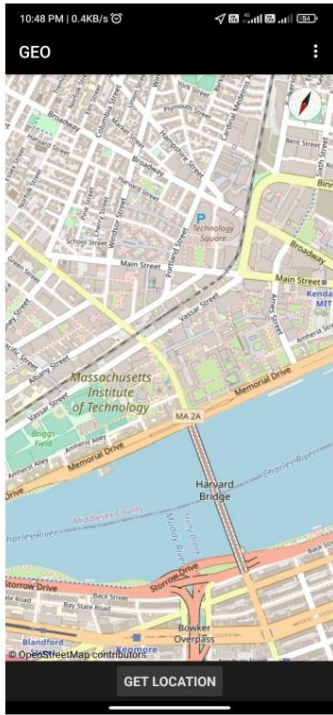
LOGIN PAGE:

1. Enter child ID and password.

2. Small press on login button is used to store data in cloud and long press is used to navigate to "GEO" page.
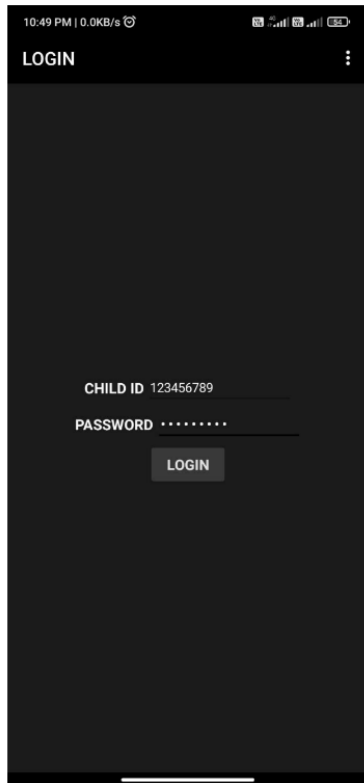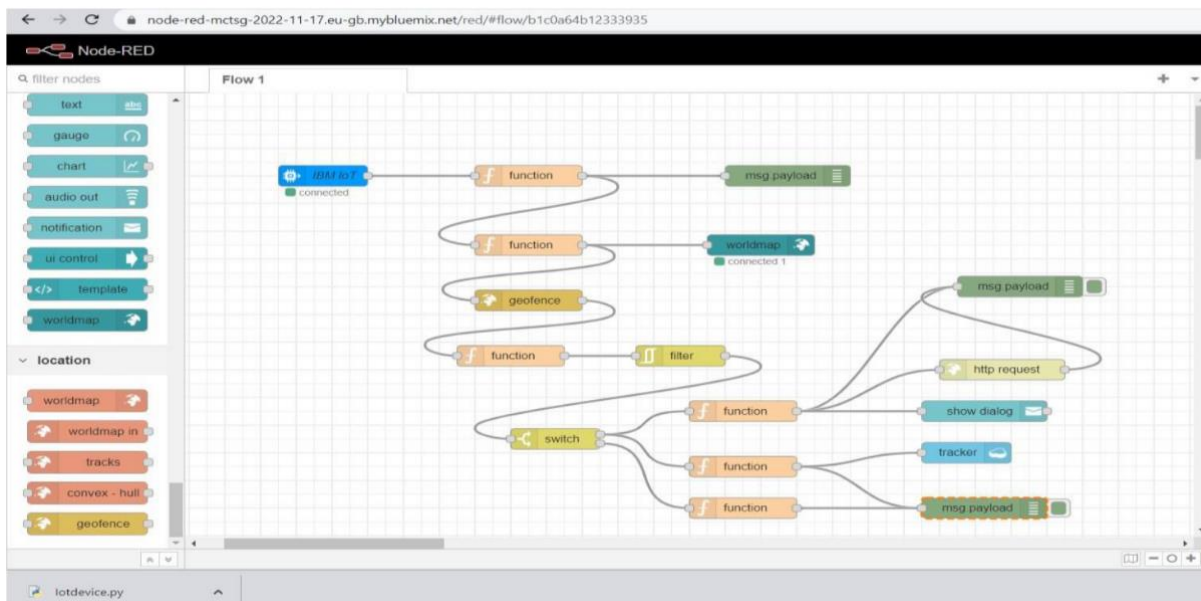

LIVE TRACKING PAGE (GEO):

1.Initial display without clicking "GET LOCATION" button

2. After clicking "GET LOCATION" but is shows the actual location of the child.

9.RESULT

9.1 PERFORMANCE METRICS

- Node Red flow:

- Python Code:

```
Python 3.10.6 (tags/v3.10.6:9c7b4bd, Aug  1 2022, 21:53:49) [MSC v.1932
Type "help", "copyright", "credits" or "license()" for more information.
>>> import time
... import random
... #import ibmiotf.application
... import ibmiotf.device
... import sys
... config= {"org":" 619i71",
...  "type":" IoT ",
...  "id":"12344321",
...  "auth-method":"use-token-auth",
...  "auth-token":"12345678"}
... client= ibmiotf.device.Client (config)
... client.connect()
... def myCommandCallback (cmd):
... a=cmd.data
... if len(a["command"])==0:
... pass
... else:
... print(a["command"])
... def pub (data):
... client.publishEvent (event="status", msgFormat="json",data=data, qos=0)
... print("Published data Successfully: %s",data)
... while True:
... name= "Childtracker"
... #in area
... #latitude= 9.8796
... #longitude= 78.0810
... #out area latitude= 9.95143 longitude= 78.1158
... data={'name': name, 'lat':latitude,'lon':longitude}
... pub(data)
... client.commandCallback = myCommandCallback
... time.sleep(2)
... client.disconnect()
```

- Geo fence:

- Edit HTTP request URL:

Edit http request node

| Delete | | Cancel | Done |

⚙ **Properties**   ⚙ 📄 🔲

☰ Method   GET   ⌄

🌐 URL   %20Web%20Application%20Using%20Node-RED

Payload   Ignore   ⌄

☐ Enable secure (SSL/TLS) connection

☐ Use authentication

☐ Enable connection keep-alive

☐ Use proxy

☐ Only send non-2xx responses to Catch node

← Return   a UTF-8 string   ⌄

🏷 Name   Name

○ Enabled

- Locate the child:

- Python script sending request to cloud:
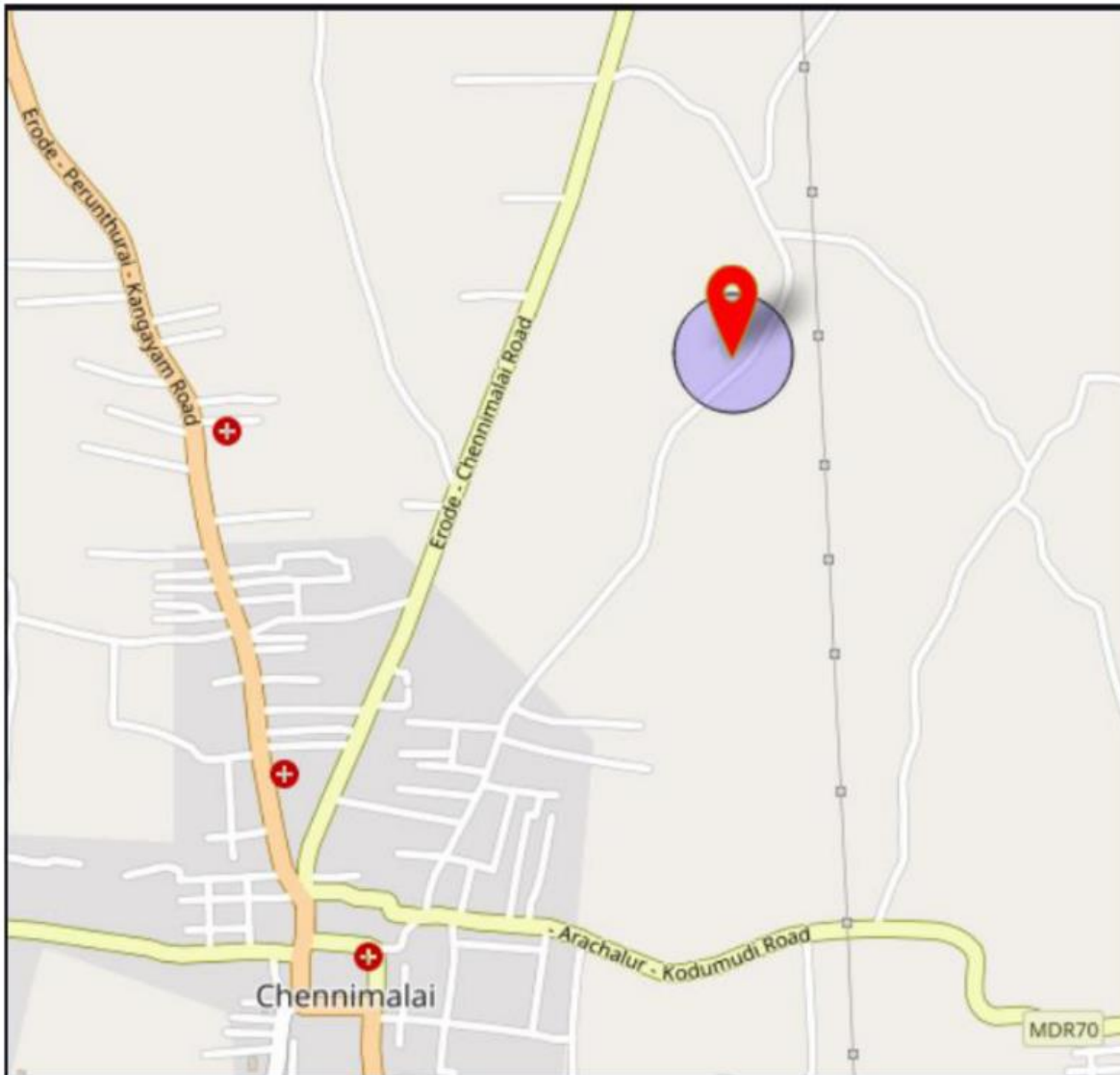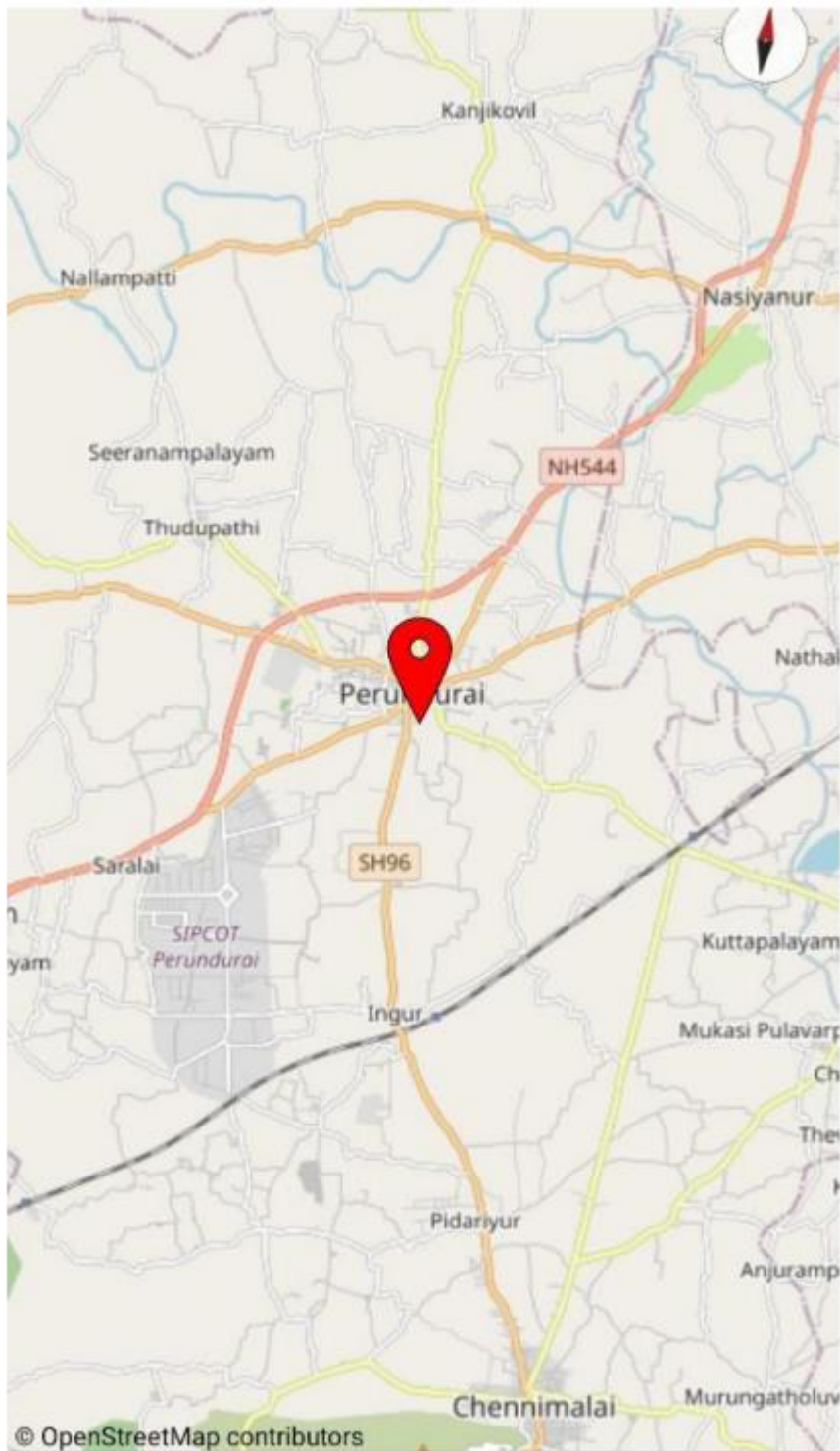
```
Python 3.10.6 (tags/v3.10.6:9c7b4bd, Aug  1 2022, 21:53:49) [MSC v.1932
Type "help", "copyright", "credits" or "license()" for more information.
>>> import time
... import random
... #import ibmiotf.application
... import ibmiotf.device
... import sys
... config= {"org":" 619i71",
...   "type":" IoT ",
...   "id":"12344321",
...   "auth-method":"use-token-auth",
...   "auth-token":"12345678"}
... client= ibmiotf.device.Client (config)
... client.connect()
... def myCommandCallback (cmd):
... a=cmd.data
... if len(a["command"])==0:
... pass
... else:
... print(a["command"])
... def pub (data):
... client.publishEvent (event="status", msgFormat="json",data=data, qos=0)
... print("Published data Successfully: %s",data)
... while True:
... name= "Childtracker"
... #in area
... #latitude= 9.8796
... #longitude= 78.0810
... #out area latitude= 9.95143 longitude= 78.1158
... data={'name': name, 'lat':latitude,'lon':longitude}
... pub(data)
... client.commandCallback = myCommandCallback
... time.sleep(2)
... client.disconnect()
```

```
*Python 3.7.2 Shell*                                    —    □    ×
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.2 (tags/v3.7.2:9a3ffc0492, Dec 23 2018, 22:20:52) [MSC v.1916 32 bit
(Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============== RESTART: C:\Users\Lenovo\Downloads\Iotdevice.py ==============
Published data Successfully: %s2022-11-17 23:42:19,489   ibmiotf.device.Client
   INFO    Connected successfully: d:phsvnq:CS1:1234
 {'name': 'Childtracker', 'lat': 9.8796, 'lon': 78.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
Published data Successfully: %s {'name': 'Childtracker', 'lat': 9.8796, 'lon': 7
8.081}
```

- After verifying, pop up will indicate whether child is

  in geofence or not

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES

- 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.

DISADVANTAGES

- The child could not produce the exact alert command during a panic condition
- This project requires manual intervention

11.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 amusements, 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.

12. 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.

13.APPENDIX

Source code:

```
import time
import random
#import ibmiotf.application
import ibmiotf.device
import sys

config= {"org":" 6l9i71",
         "type":" IoT ",
         "id":"12344321",
         "auth-method":"use-token-auth",
         "auth-token":"12345678"}
```

```python
client= ibmiotf.device.Client (config)
client.connect()


def myCommandCallback (cmd):
    a=cmd.data
    if len(a["command"])==0:
       pass
    else:
      print(a["command"])
def pub (data):
 client.publishEvent (event="status", msgFormat="json",data=data, qos=0)
 print("Published data Successfully: %s",data)


while True:
    name= "Childtracker"
     #in area
     #latitude= 9.8796
     #longitude= 78.0810
     #out area latitude= 9.95143 longitude= 78.1158
      data={'name': name, 'lat':latitude,'lon':longitude}   pub(data)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

Github link : https://github.com/IBM-EPBL/IBM-Project-23208-1659872052