IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION

A PROJECT REPORT

Submitted by

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(Autonomous Institution)

SALEM.

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1. INTRODUCTION

1.1 Project Overview

- A Web page is designed for the public where they can book tickets by seeing the available seats.
- After booking the train, the person will get a QR code which has to be shown to the Ticket Collector while boarding the train.
- The ticket collectors can scan the QR code to identify the personal details.
- A GPS module is present in the train to track it. The live status of the journey is updated in the Web app continuously
- All the booking details of the customers will be stored in the database with a unique ID and they can be retrieved back when the Ticket Collector scans the QR Code.

1.2 Purpose

The Purpose of our Project is

- ✓ To reduce the work load of the parents.
- ✓ To monitoring the children via. Online notification
- ✓ To track the live location of children.
- ✓ To ensure the safety of the children
- ✓ To maintain proper pampering of children when parent is not present.

2. LITERATURE SURVEY

2.1 Existing Problem :

- Real-Time Child Abuse and Reporting System

In the existing system, we use a voice recognition module in which the alert commands from the child are stored and kept for further reference. If the same child delivers the same command, it will compare with the alert command which was previously stored and sets an emergency level according to the alert command. The GSM has a SIM which is used to send an alert message or an alert call to the trusted peoples. GPS is used to track the live location and it is used when needed. The server will search the respective device ID from the database and search for respective contacts according to that device ID and helps in alerting the registered guardians.

2.2 References :

☆ 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. 85-9.

☆Anwaar Al-Lawati, Shaikha Al-Jahdhami, 'RFID-based System for School Children Transportation Safety Enhancement', Proceedings of the 8th IEEE GCC Conference and Exhibition, Muscat, Oman, 1-4 February 2015.

☆Starner, T Schiele, B and Pentland, A. (1998) 'Visual contextual awareness in wearable computing', Second International Symposium on Wearable Computers, Pittsburgh, PA, IEEE Computer Society, pp. 50-57.

☆AkashMoodbidri, Hamid Shahnasser (Jan 2017) 'Child safety wearable device', International Journal for Research in Applied Science & Engineering Technology, Vol. 6 Issue II, IEEE, pp. 438-444.

☆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. 159-164.

2.3 Problem Statement definition :

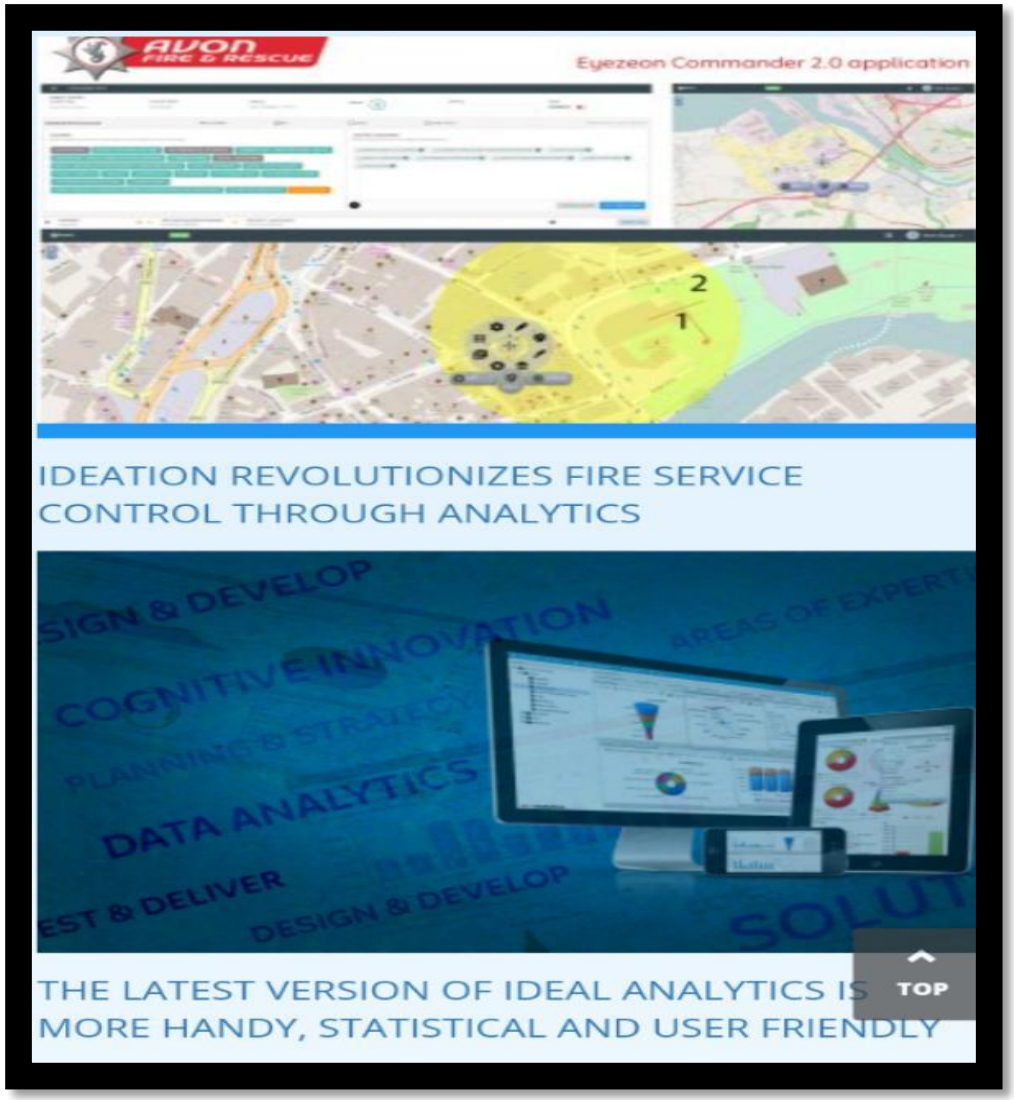
Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.

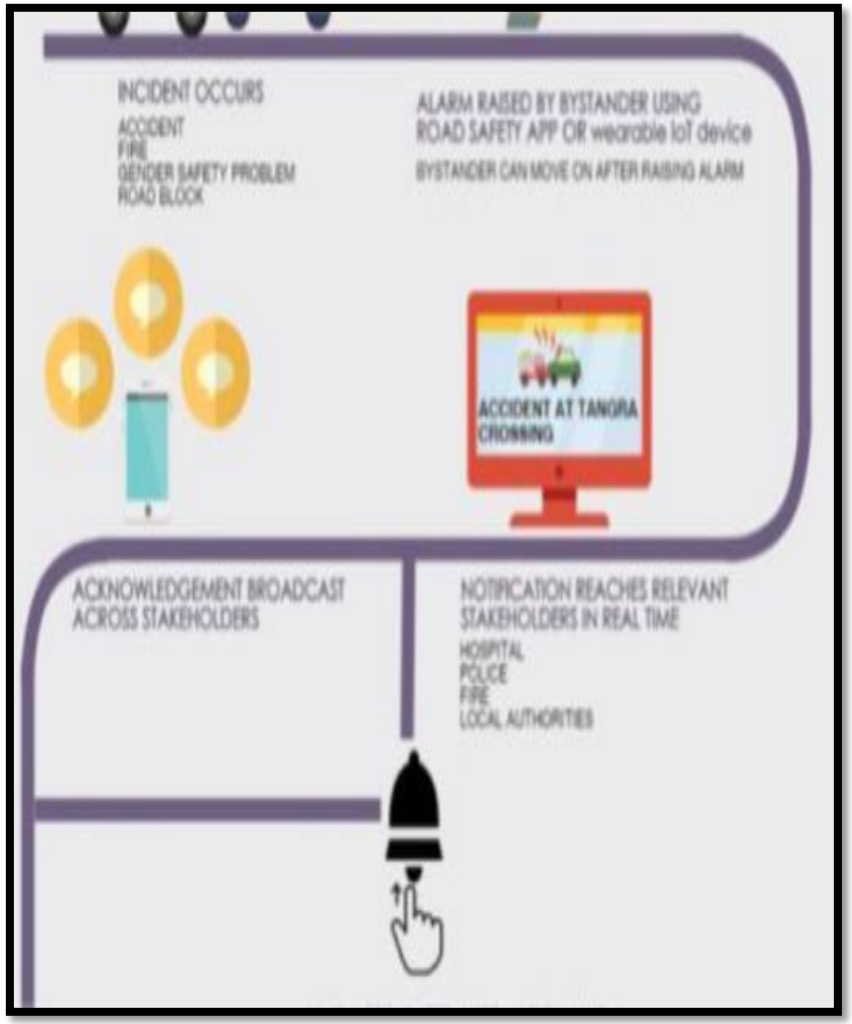
- To show the child's actual data with reference values.
- Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations.
- To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps.
- Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

3.2 Ideation phase





3.3 Proposed Solution

S.No .	Parameter	Description
1	Problem Statement (Problem to besolved)	*As we all know, kids are the heartbeat of everyparent, and when it comes to a child with special needs, parents have to be extra careful.They have to take extra care of the child. *Parents will not be able to monitor their children's whereabouts at all times and can'trelax without knowing the exact location of them. *Parents cannot know if their children are in ahazardous or unsafe environment. *Parents cannot know the previous locationhistory of their children to find any lost belongings of them. *Parents can neither contact nor instruct theirchildren when they are far away from them
2	Idea / Solution description	*Child tracker helps the parents in continuouslymonitoring the child's location. They can simplyleave their children in school or parks and create a geofence around the location. *By continuously checking the child's location notifications will be provided if the child crossesthe geofence. Notifications will be sent according to the child's location to their parentsor caretakers. The entire location data will be stored in the database. *Child can also initiate emergency notifications to the parents incase of unsafe situation.
3	Novelty / Uniqueness	*Easily understandable UI *Highly scalable *Security *Economical *24/7 monitoring *Waterproof *Fast tracking
4	Social Impact / Customer Satisfaction	*Cases of child disappearances, kidnapping ,child accidents can be reduced drastically. *Provide liberty for children, especially childrenwith special needs. *Parents can be relaxed knowing their child's status especially when they are at a far distancefrom them. *Parents can act quickly when their children arein a danger. *Economical and waterproof features , long - lasting battery and consistent performance ofthe tracker improves customers satisfaction.
5	Business Model (Revenue Model)	*Selling the product directly to the parents(Device + Monthly subscription) *Selling the product to child care organizationsor centers. *Selling the product via e-commerce.

6	Scalability of the Solution	*Increase and decrease of resources like memory and computing power with the help of cloudant db.

3.4 Problem Solution fit

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional Requirements:

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 Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Login	Validate username Validate password Take to homepage
FR-4	Track child location	Get the map Get the coordinates of the child's location Display result
FR-5	Create geo fence	Get the map Create the geofence Store the geofence in db
FR-6	View location history	Fetch history from db Display history
FR-7	Get child's weather condition	Get the coordinates of the child's location Get the weather updates Display results
FR-8	Receive out of safe zone notification	Get the coordinates of the child's location Check and notify if out of safeZone
FR-9	Receive emergency notification from the child	Listen to child emergency notification API If notification initiated , notify the user
FR-10	Communicate with the child	Connect with the device Transmit the voice data

4.2 Non-Functional requirement

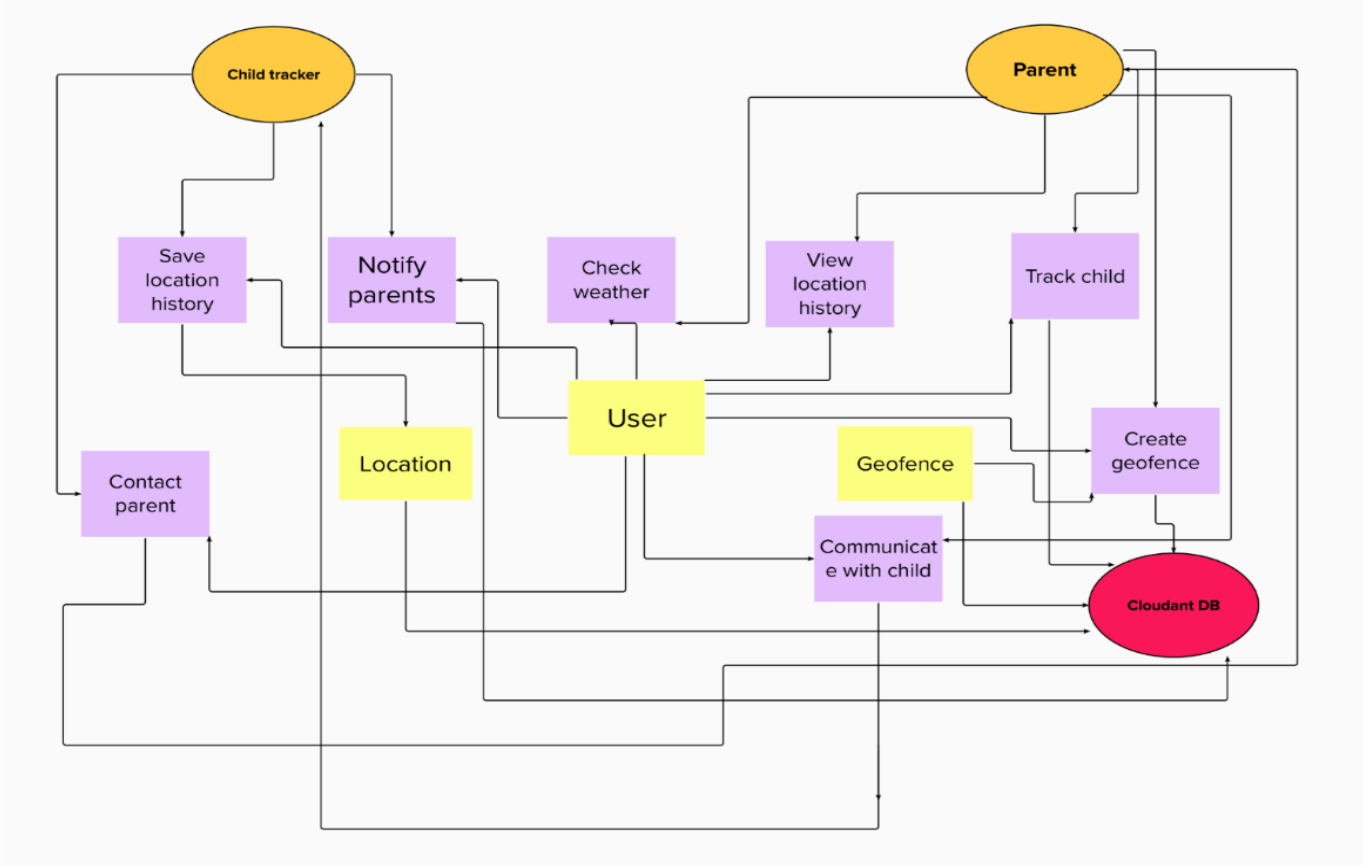
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Attractive and effective UI that gives complete enjoyable and user friendly experience.
NFR-2	**Security**	Protecting the users data and storing their children's location history safely
NFR-3	**Reliability**	Ever consistent API that never fails and gives proper response to the user.
NFR-4	**Performance**	Fast tracking and providing instant updates about the child's location to his/her parent.
NFR-5	**Availability**	The APIs should be readily available to satisfy the users' needs.
NFR-6	**Scalability**	Ability to process and update thousands of users data instantly

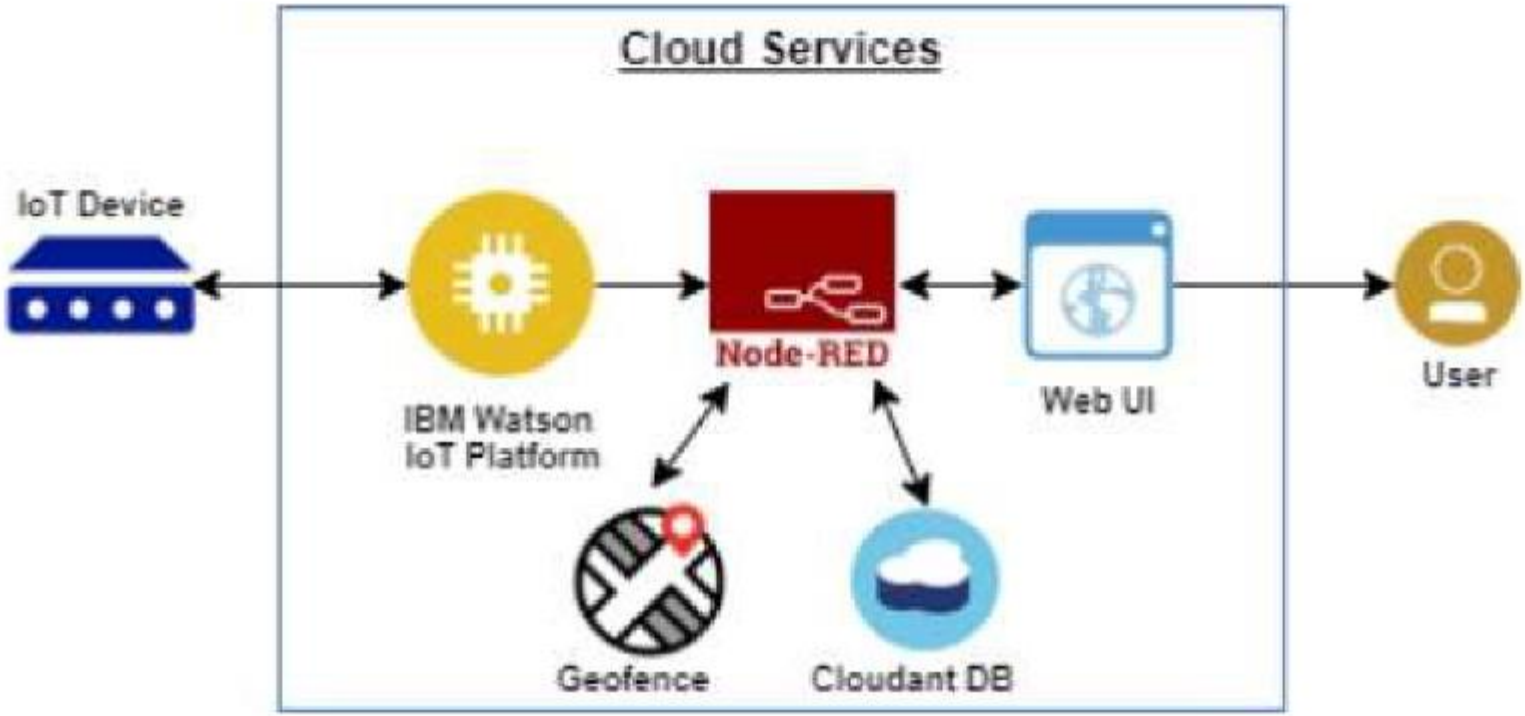
5. PROJECT DESIGN

5.1 Data Flow Diagram



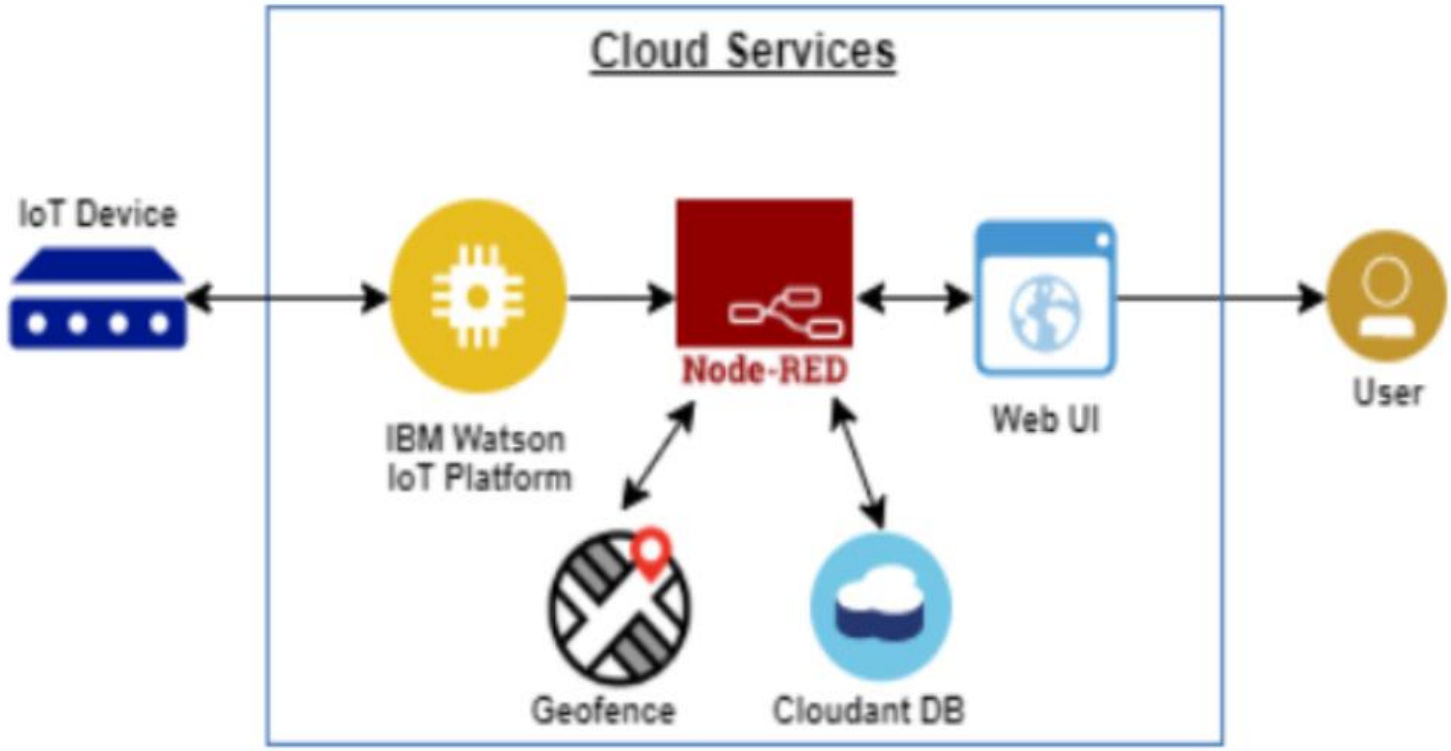
5.2 Solution and Technical Architecture

Solution Architecture:



Technical Architecture:

Technical Architecture:



5.3 User Stories

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Parent	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 Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-5	As a user , I need to be able to view the functions that I can perform		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 db.		Medium	Sprint-2
	Communication	USN-3	I should be able to communicate with my parents		Low	Sprint-3

6. PROJECT PLANNING & SCHEDULING

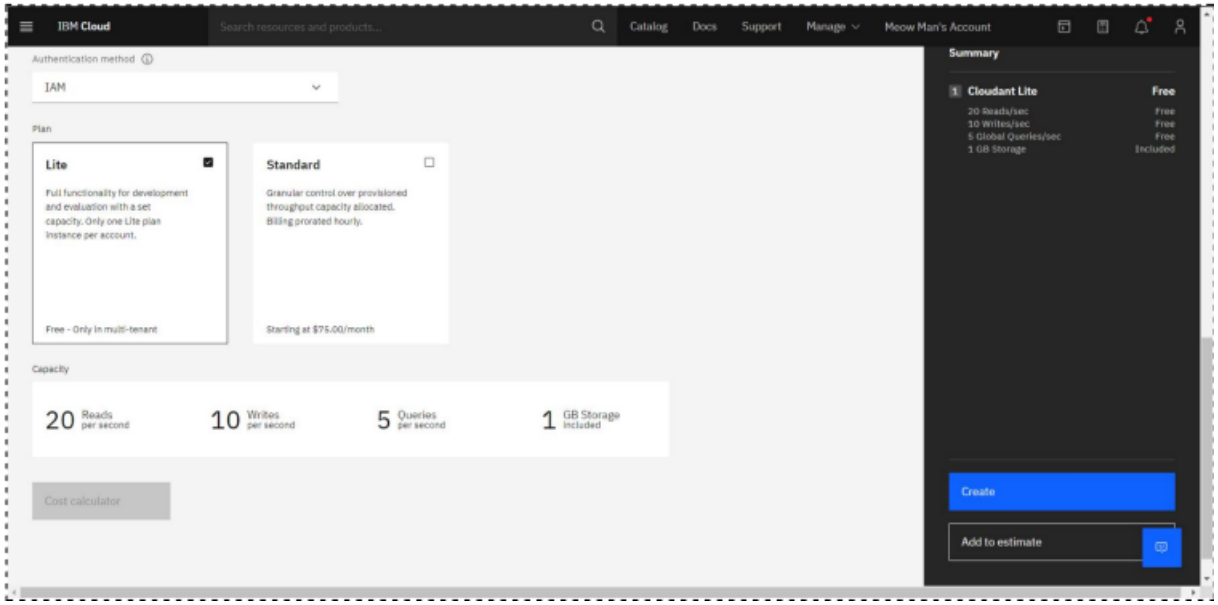
6.1 Sprint Planning , Estimation & Sprint Delivery Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
SPRINT 1					
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
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High

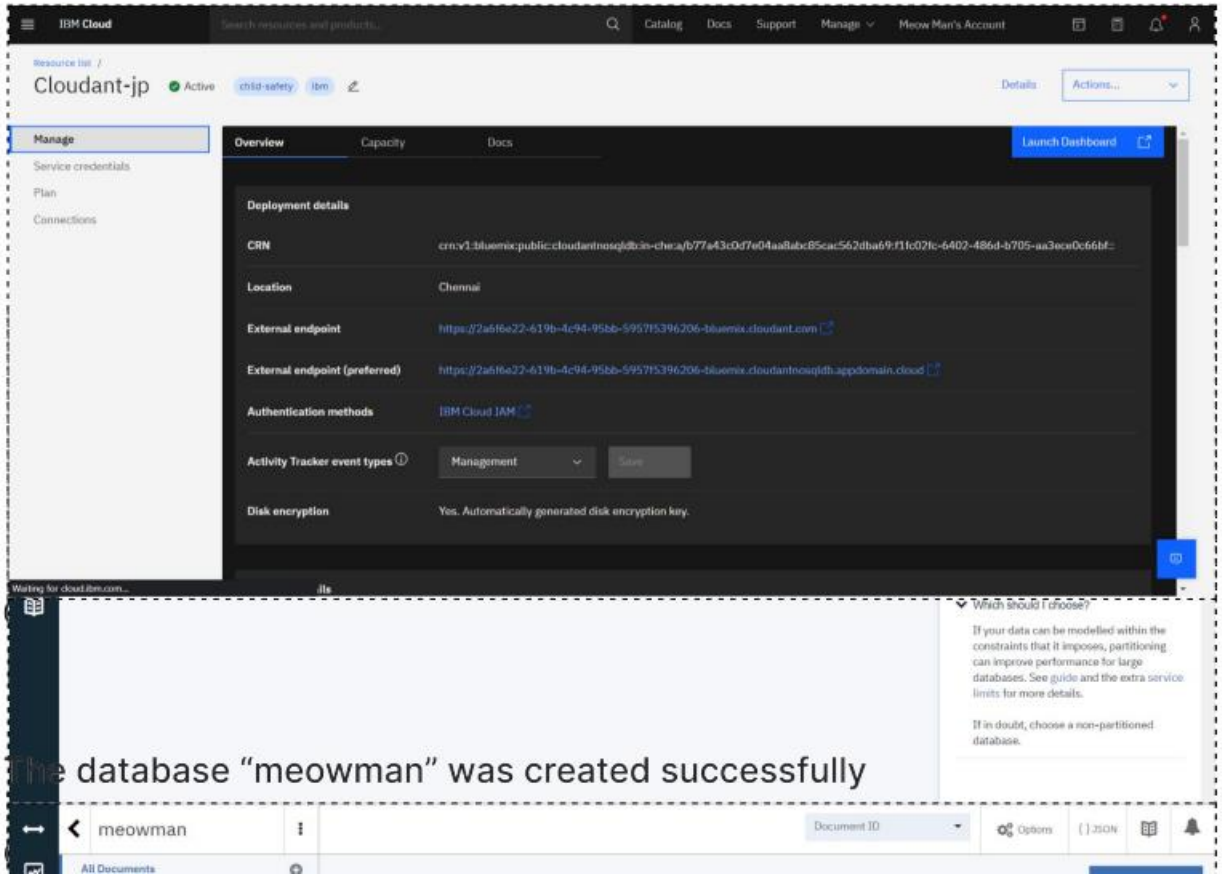
Sprint-1	Dashboard	USN-1	As a user, I need to be able to view the functions that I can perform	4	High
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium
Sprint-3	Communication	USN-1,3	I should be able to communicate with my parents	6	Low
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium
Sprint-3	Node RED-Cloudant DB communication	USN-1,2	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	High
Sprint-4	User – Web UI interface	USN-1,4	The Web UI should get inputs from the user	6	High
Sprint-4	Geofencing	USN-1,3,4	The geofencing of the child should be done based on the geographical coordinates	7	High

6.2 Database and Cloudant:

- Chose the “Lite Version” and clicked on “Create”



- The Cloudant database resource was created successfully

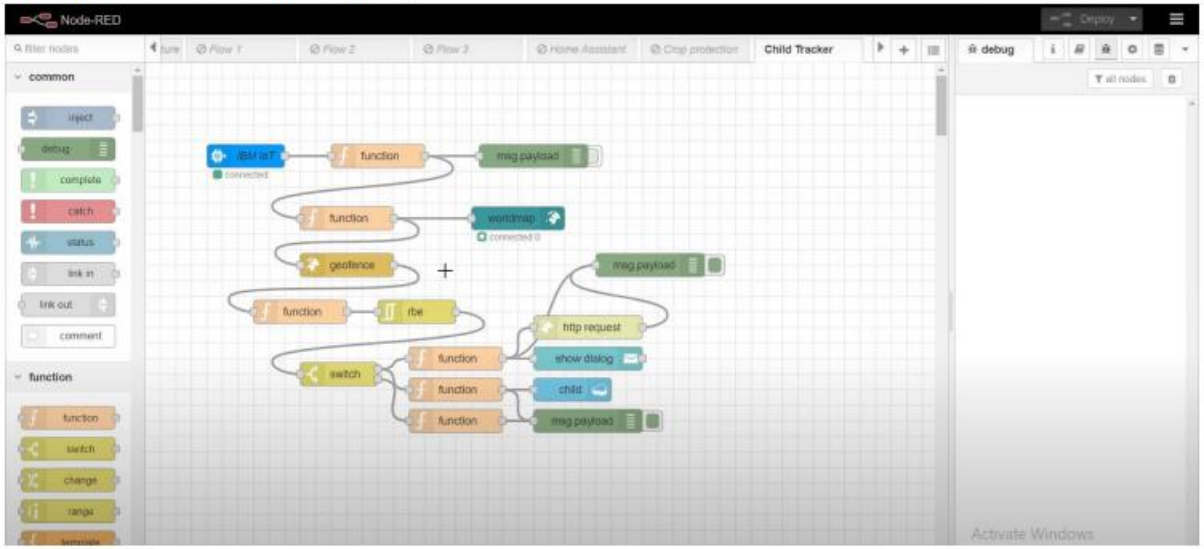


- The database “meowman” was created successfully

6.3 DEVELOP WEB APPLICATION USING NODE RED:

Steps Followed:

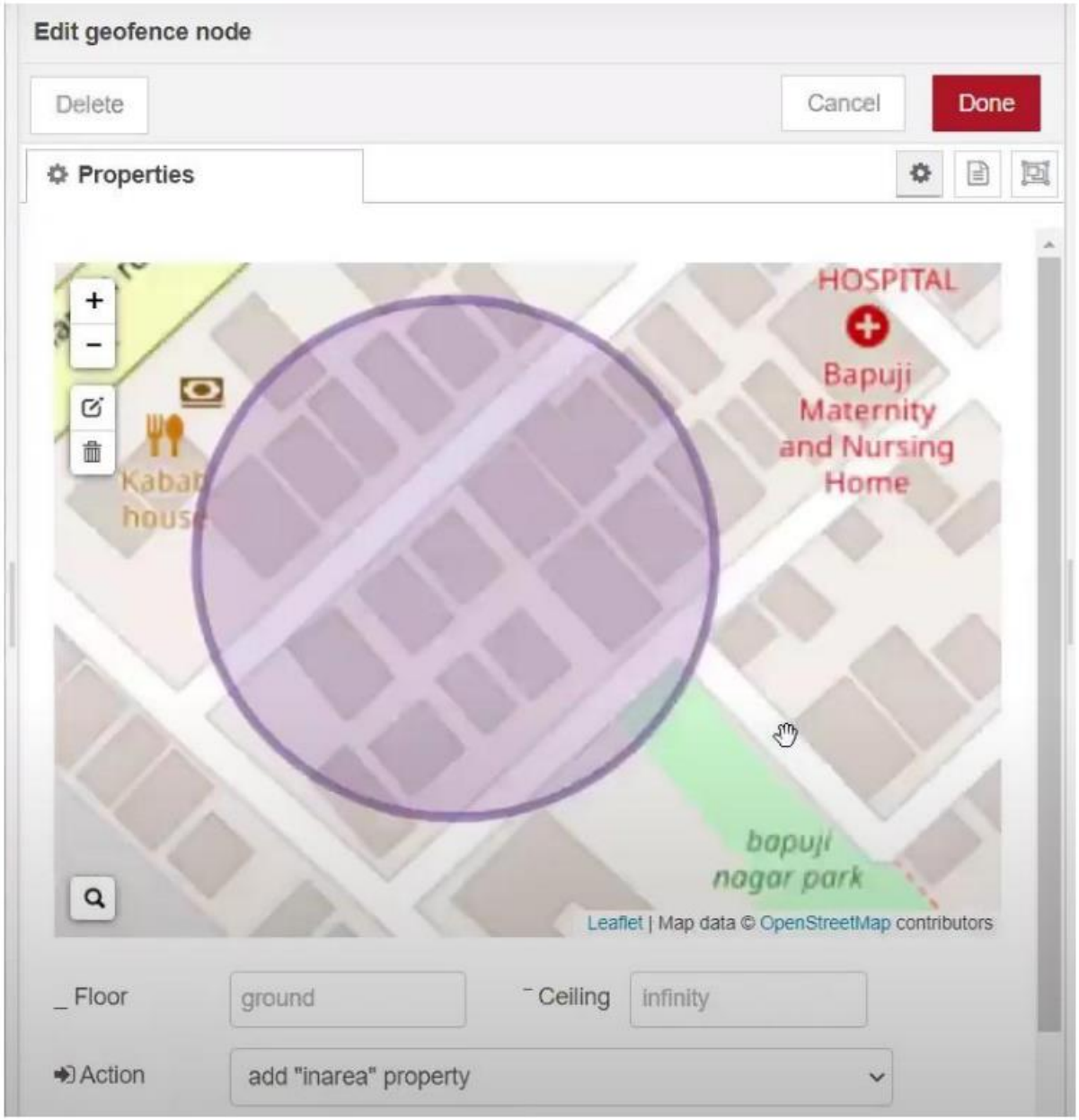
- Opened a Node-RED project



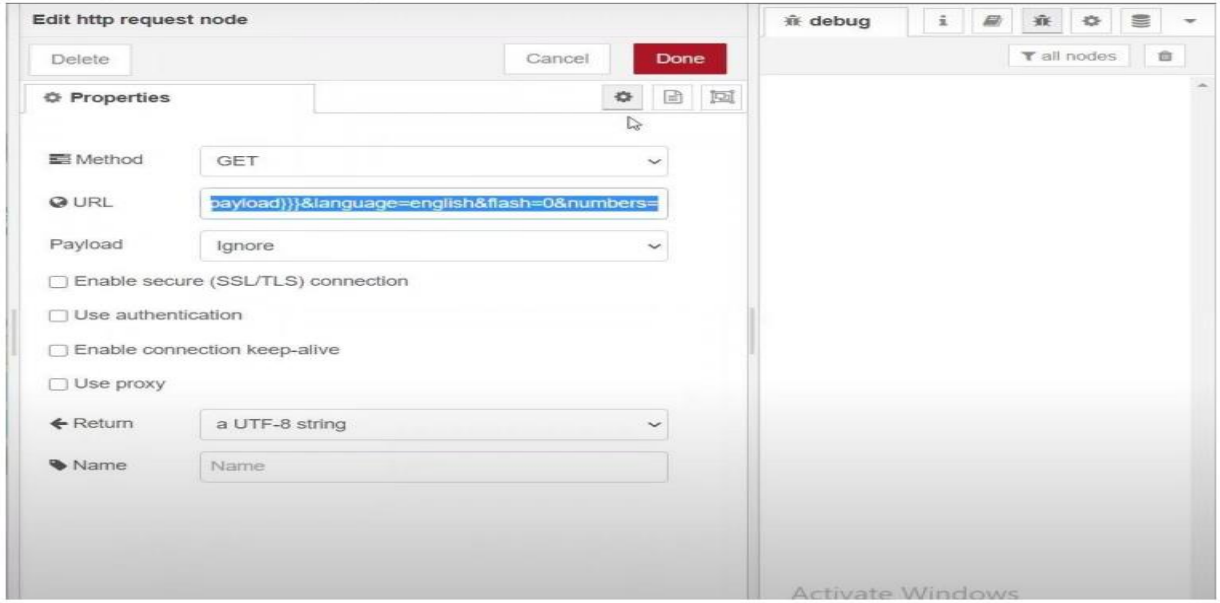
- Added code to get child location in python

```
import json
import wiotp.sdk.device
import time

myConfig = {
    "identity": {
        "orgId": "hj5fmy",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
        name= "Smartbridge"
        #in area location

        latitude= 17.4225176
        longitude= 78.5458842

        #out area location

        #latitude= 17.4219272
        #longitude= 78.5488783
        myData={'name': name, 'lat':latitude,'lon':longitude}
        client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
        print("Data published to IBM IoT platfrom: ",myData)
        time.sleep(5)

client.disconnect()
```

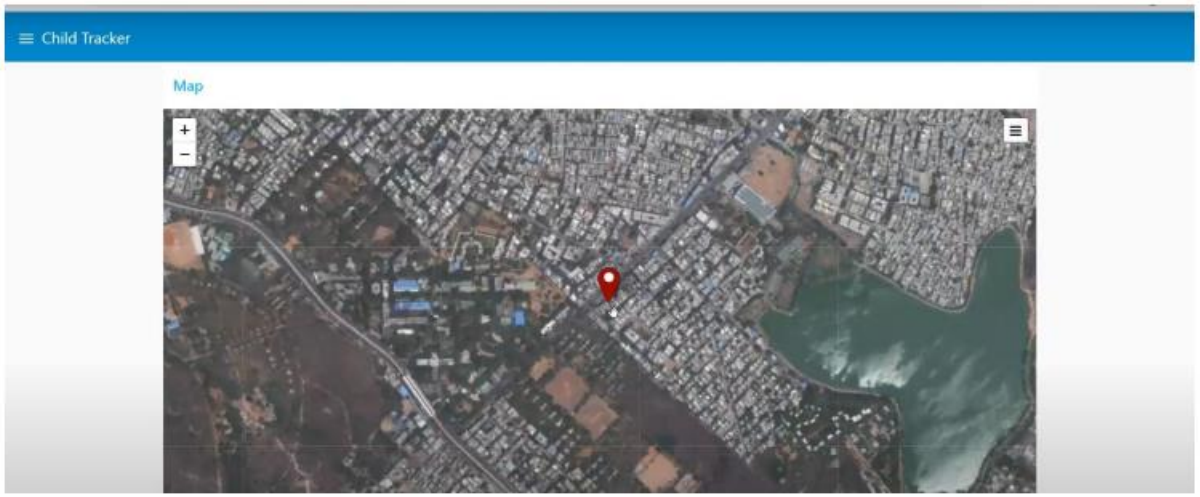
- Created the GeoFence



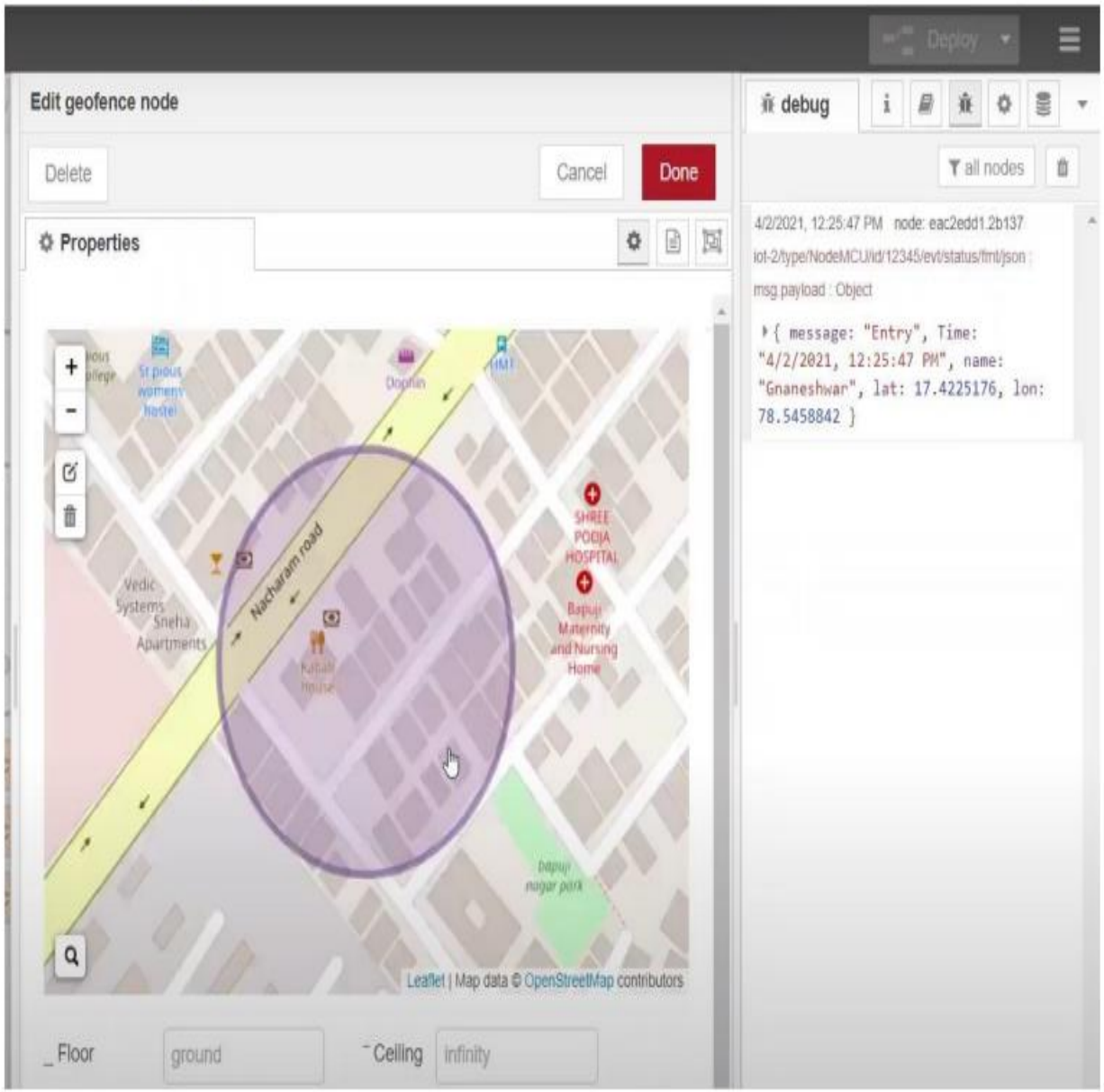
- Editing the HTTP Request URL



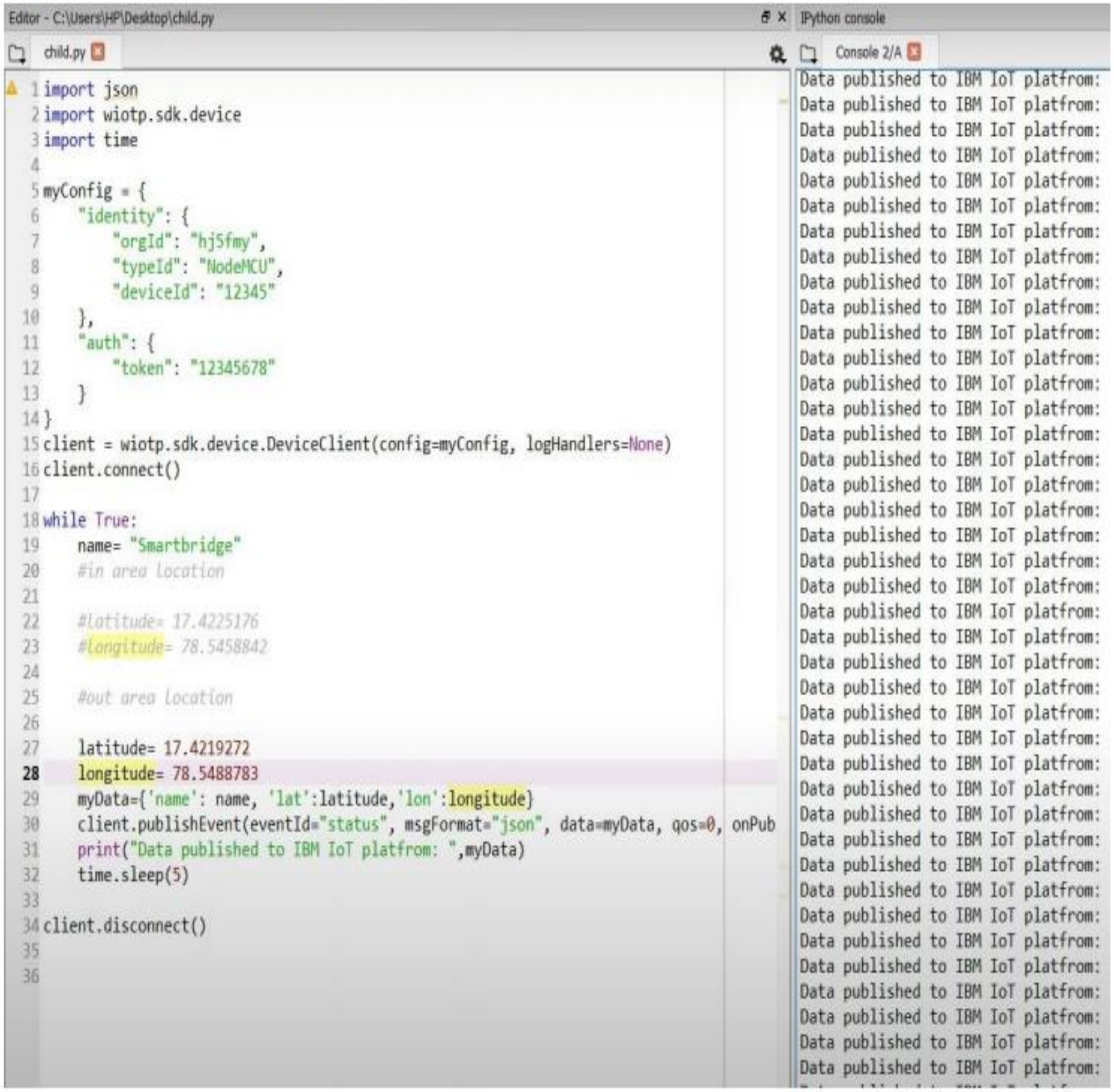
- Located the child



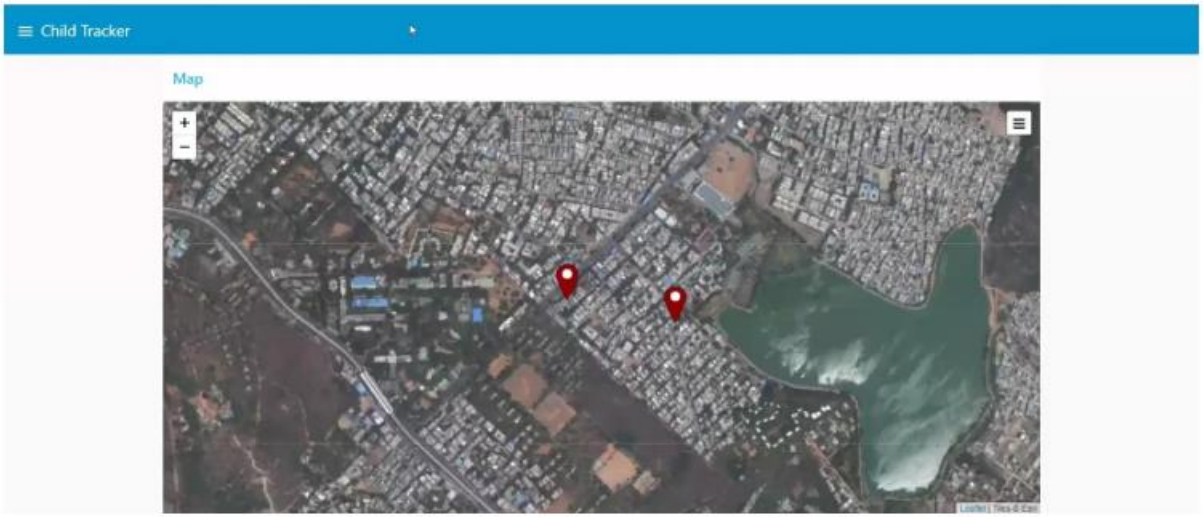
- Created the geofence node



- Python script sending requests to IBM Cloud

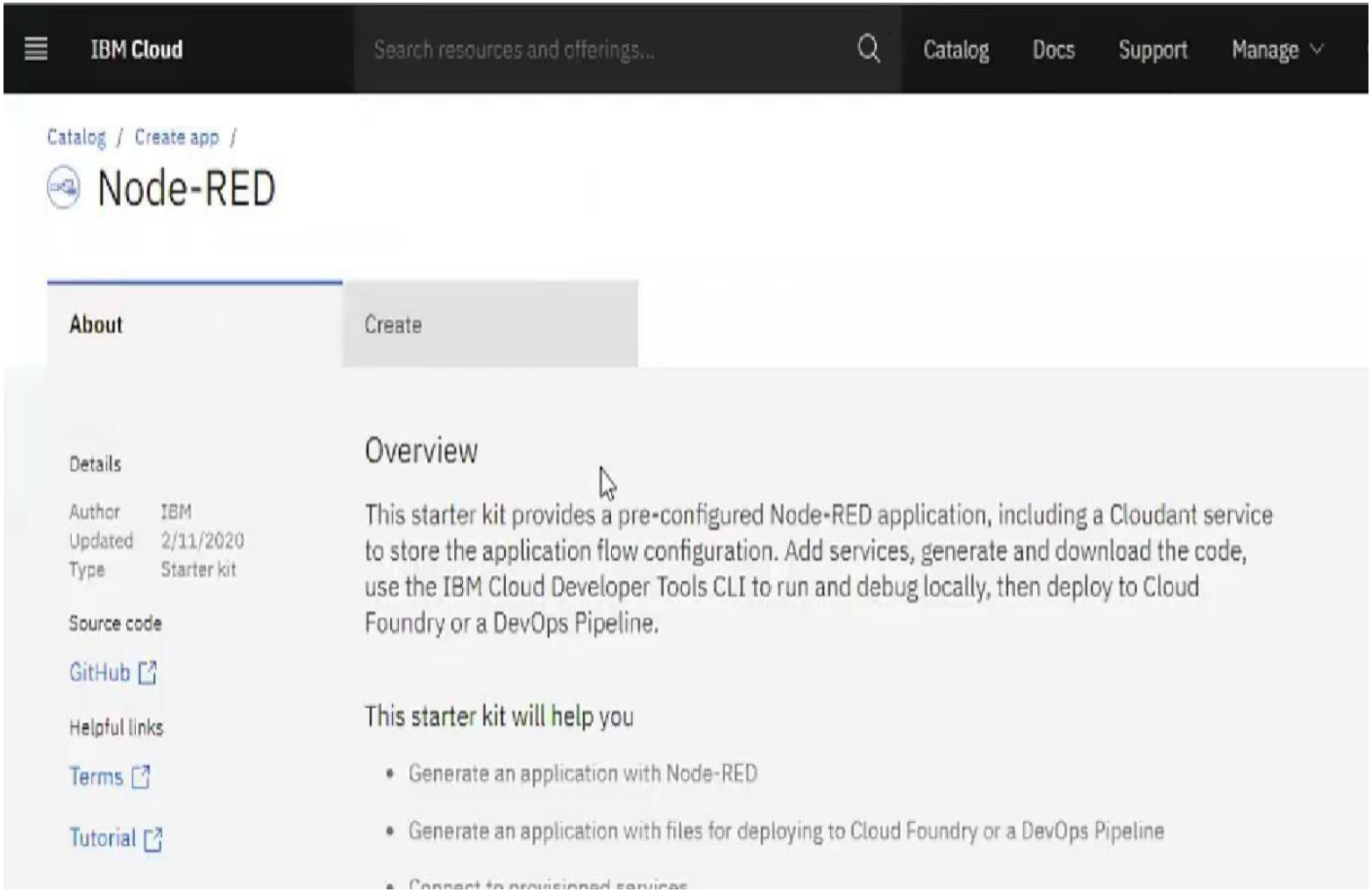


- After running the script, the web UI shows “Person is not in the particular area”

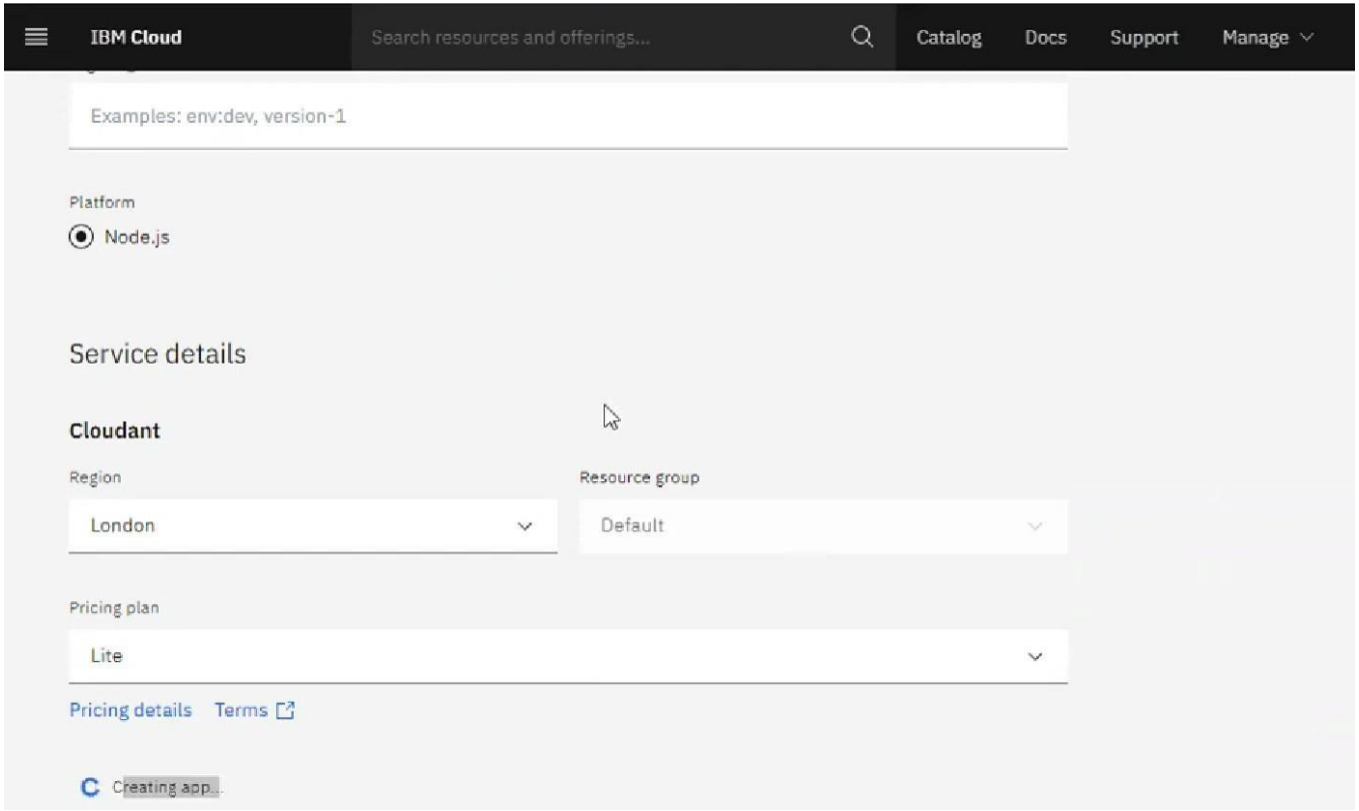


7.1 Node-RED Service:

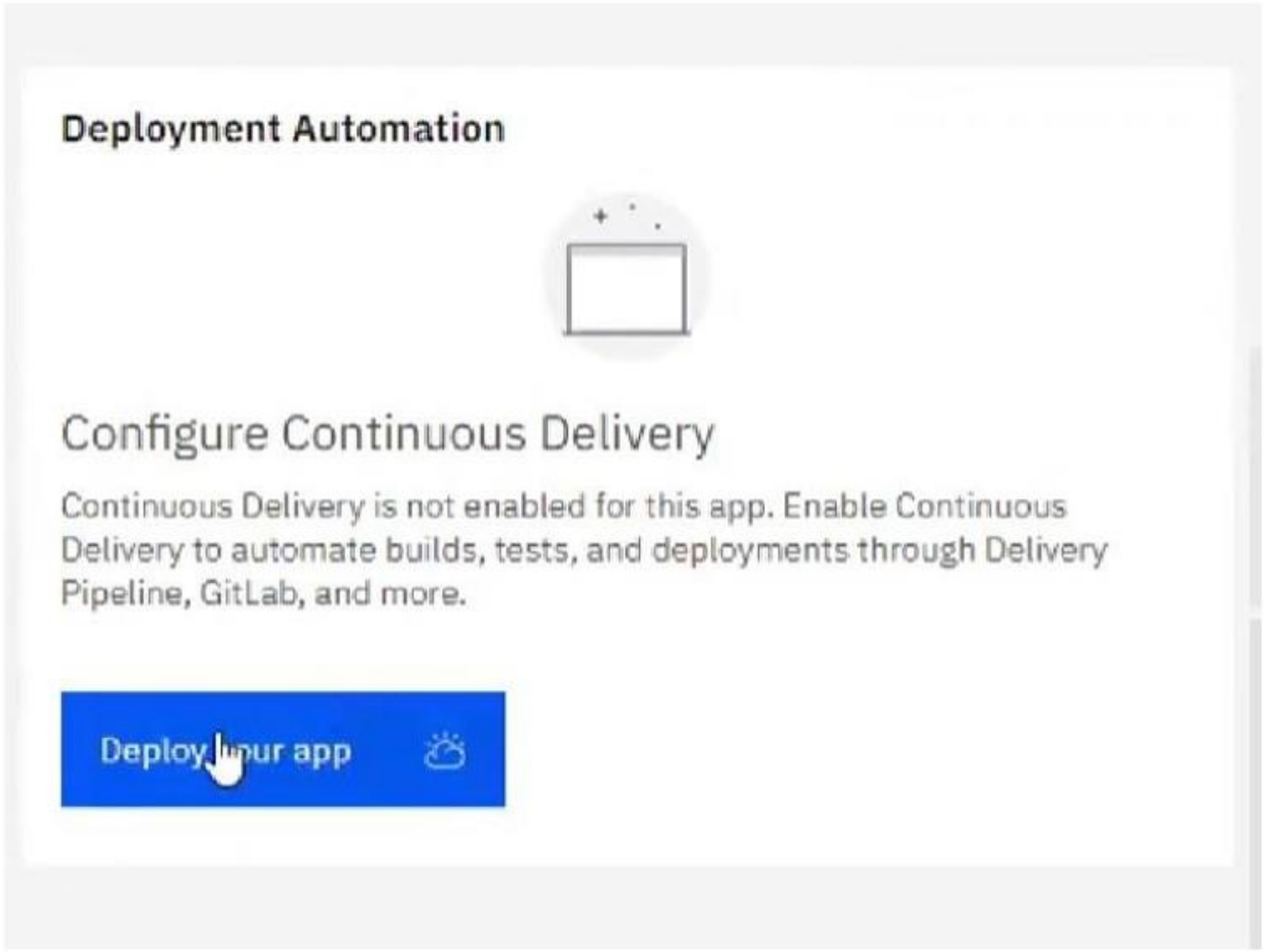
Navigated to the App creation page



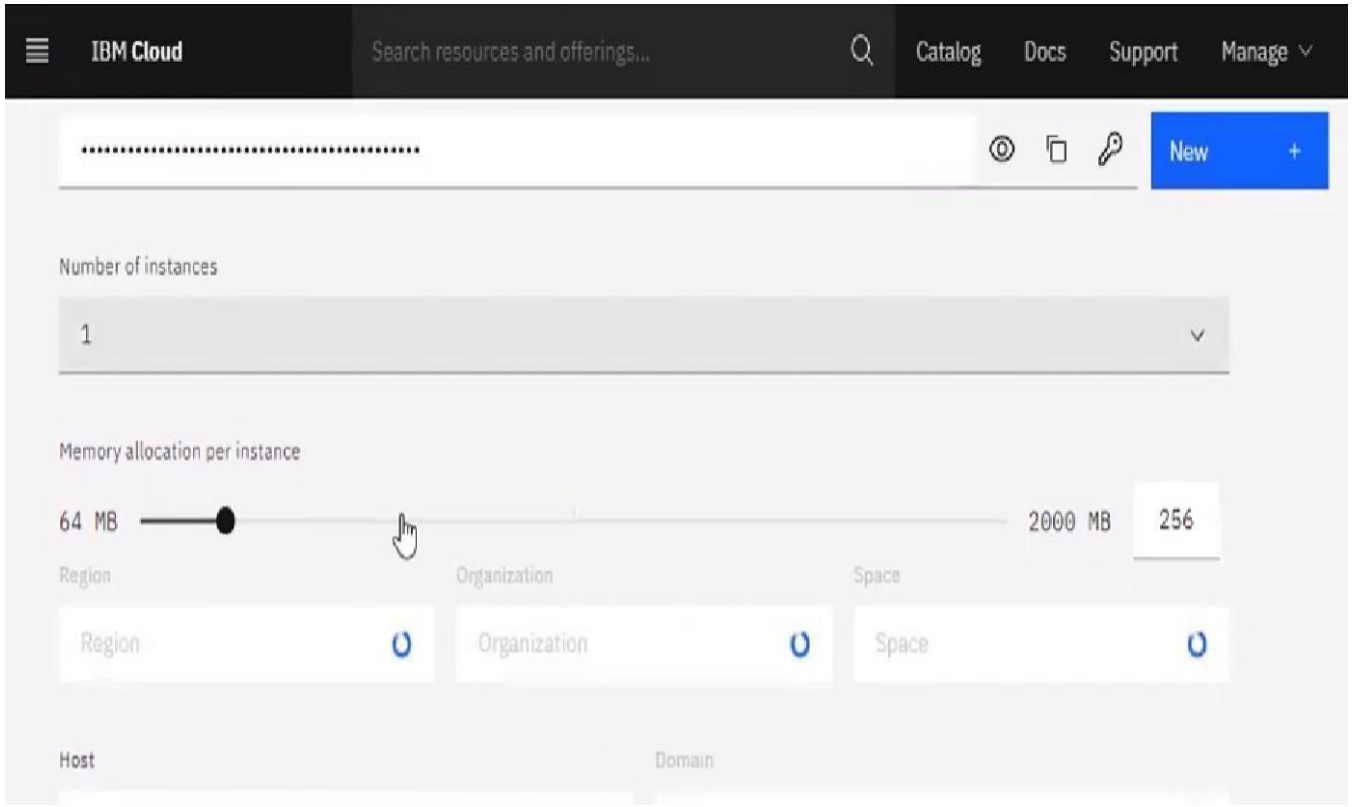
Entered project details and clicked on create


IBM Cloud
Search resources and offerings...
Catalog
Docs
Support
Manage
Examples: env:dev, version-1
Platform
Node.js
Service details
Cloudant
Region
London
Resource group
Default
Pricing plan
Lite
Pricing details
Terms
Creating app...

Clicking on the “Deploy your App” Button



Setting up the environment and deploying the app

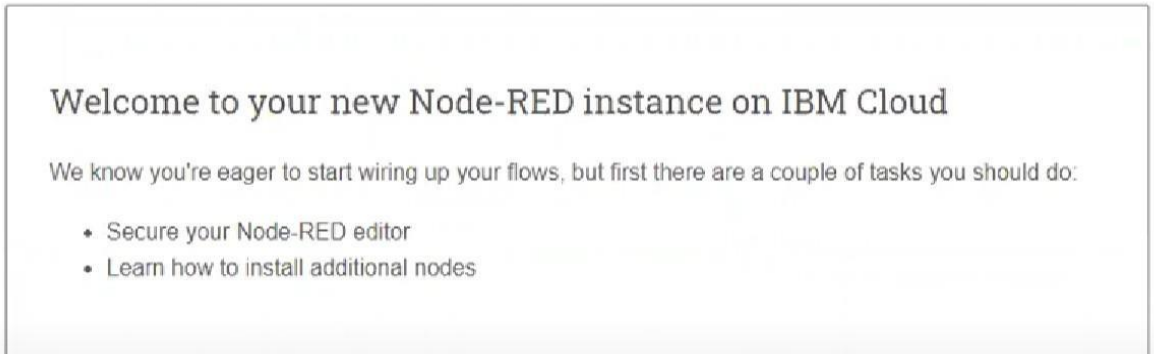


Successfully deployed the app

Delivery Pipelines

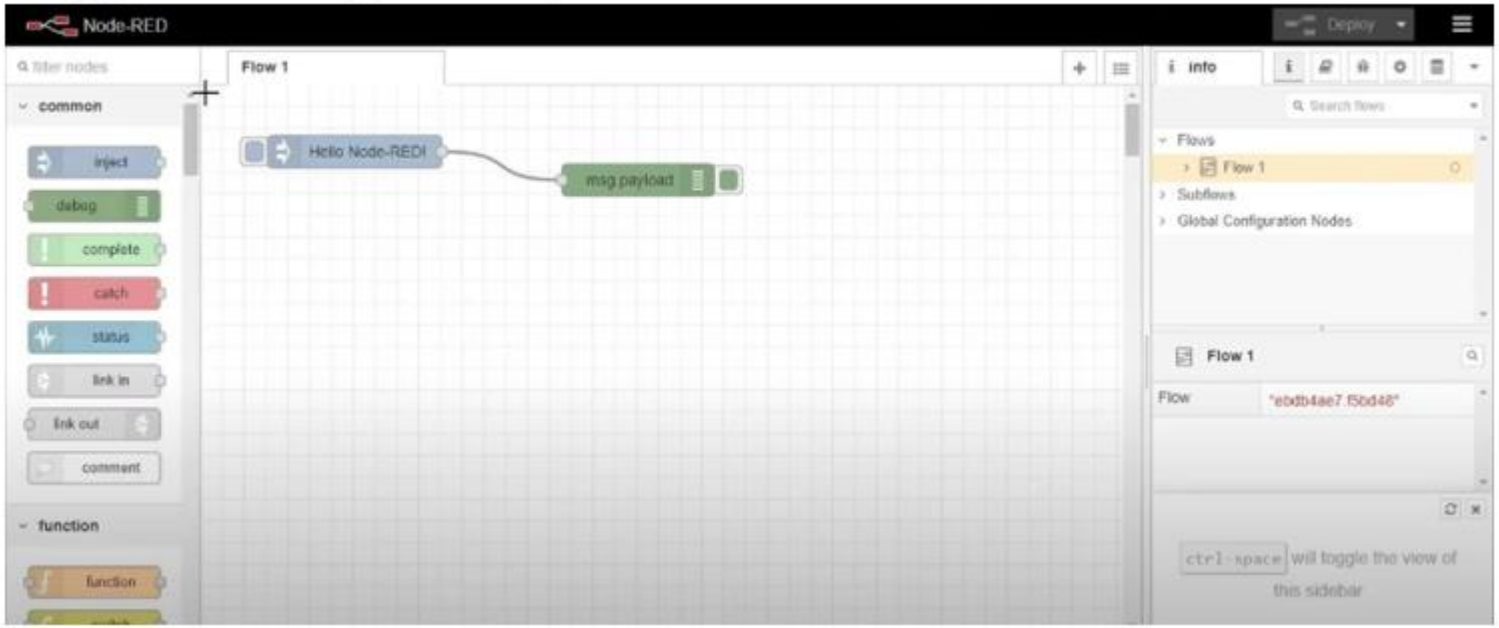
Name	ci-pipeline
Status	Success
Last input	Last commit by IBM Cloud DevOps Services (7 minutes ago) Clone from zip

- Welcomed by the instance editor

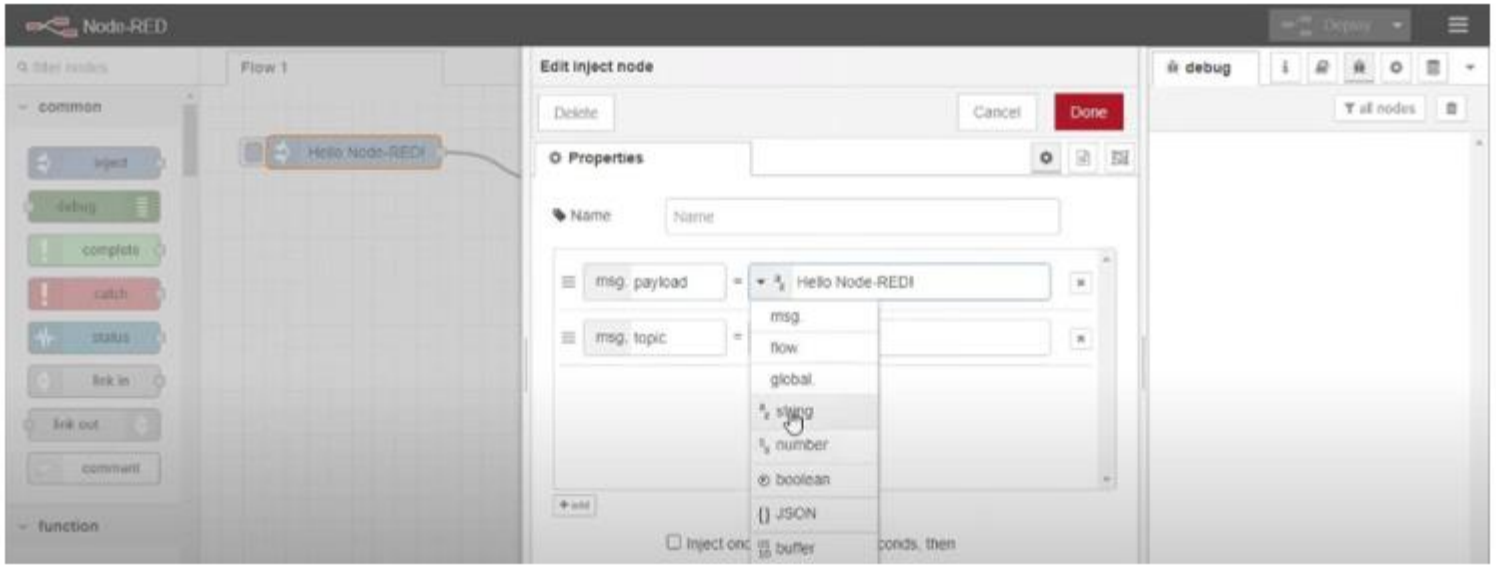


Setting up credentials

Dragged and dropped components into the editor

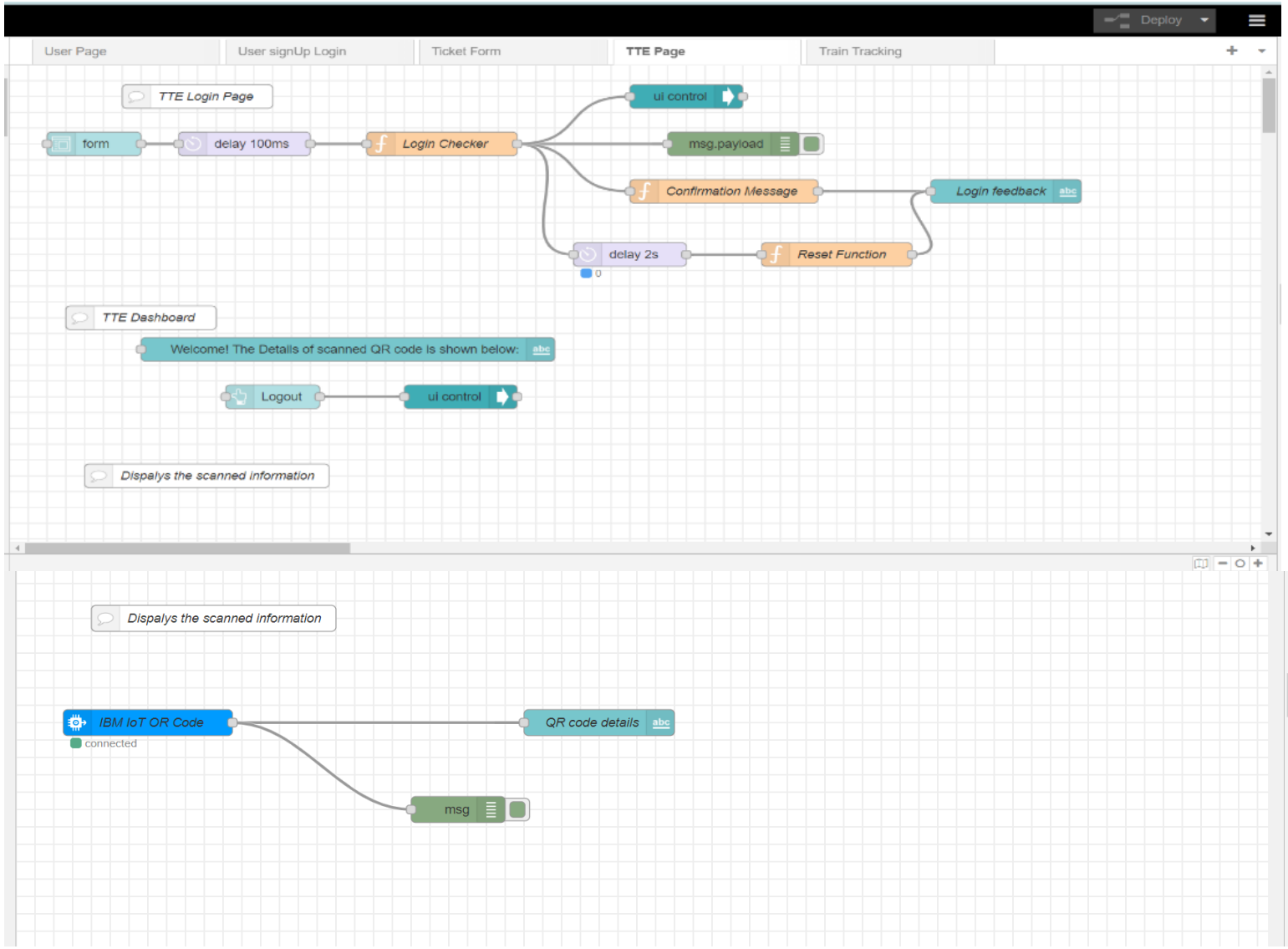


Editing some values of the properties



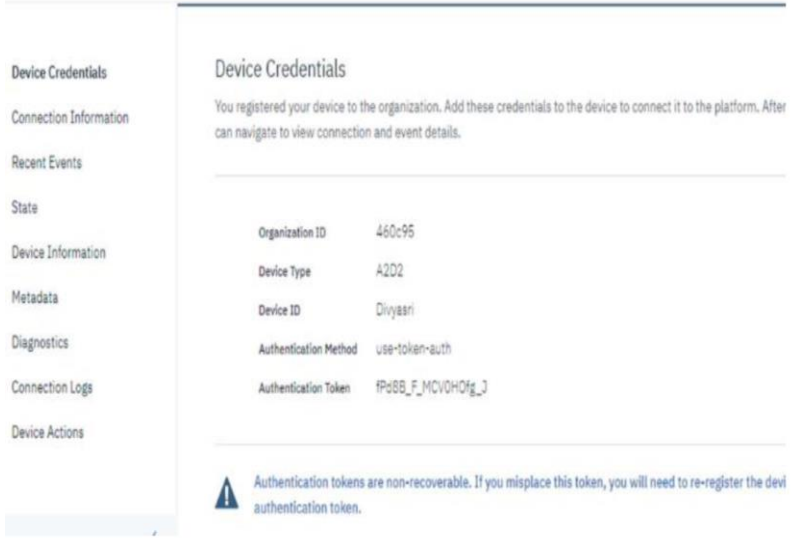
Successfully deployed the app

NODE RED FLOWS :

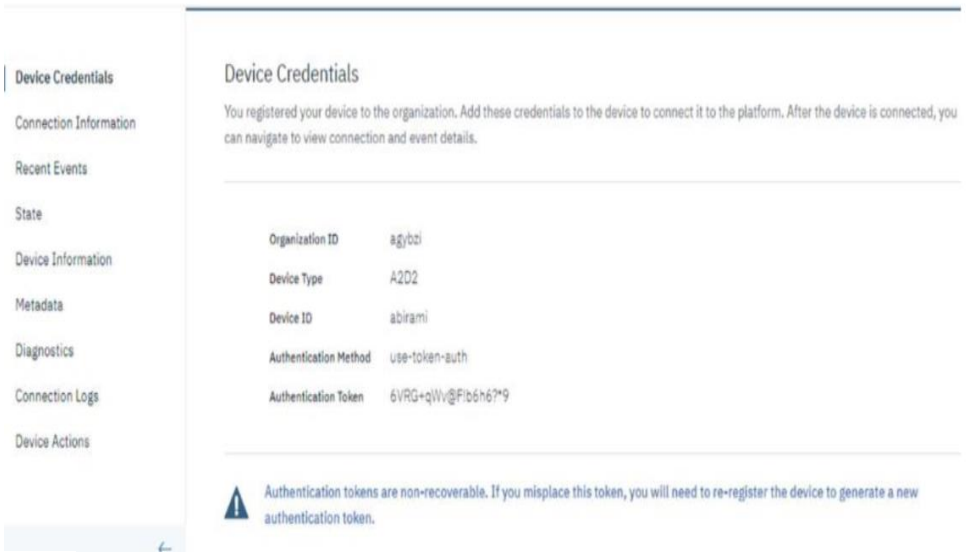


7.2 IBM Watson IOT device

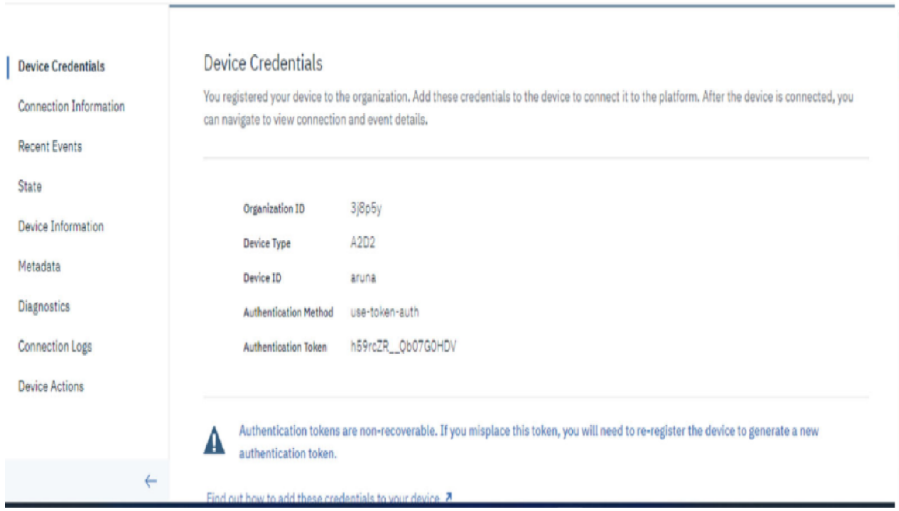
Device Drilldown - Divyasri

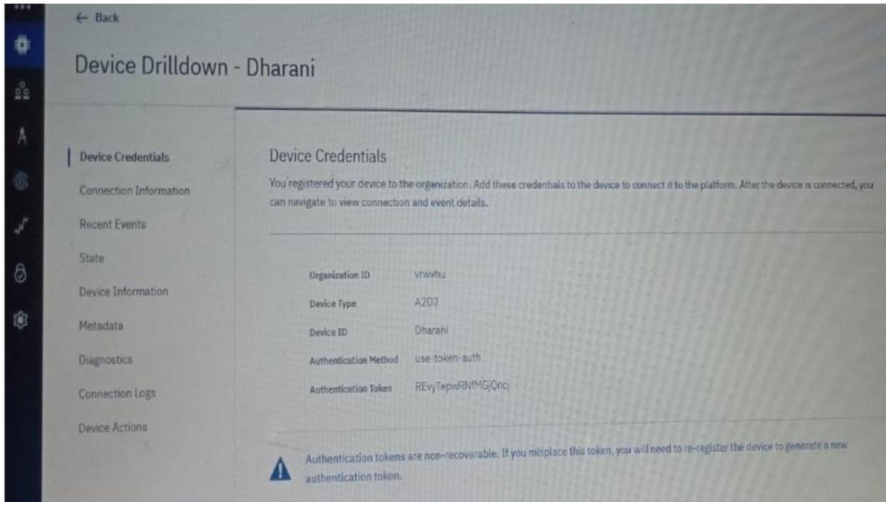


Device Drilldown - abirami



Device Drilldown - aruna





CODE AND SOLUTION:

HTML

```
<!DOCTYPE html>
<html lang="en" style="height: 100%; margin: 0;">
 <head>
 <meta charset="UTF-8" />
 <meta name="description" content="The Home Page after Logged In" />
 <meta name="viewport" content="width=device-width, initial-scale=1.0" />
 <title>IOT Based Safety Gadget for Child Safety Monitoring and Notification</title>
 <script src="./LOCALFORAGE.js"></script>
 <script>
 if (window.location.hostname !== "localhost") {
 if (location.protocol !== "https:") {
 location.replace(
 `https:${location.href.substring(
 location.protocol.length
 )}`
 )
 }
 }
 async function check() {
 let data = localforage.getItem("userData")
 if (data == null) {
 window.location.href = "/login"
 }
 }
```

```
check()
</script>
</head>
<body
style="
height: 100%;
margin: 0;
font-weight: 300;
font-family: -apple-system, BlinkMacSystemFont, 'Segoe UI', Roboto,
Oxygen, Ubuntu, Cantarell, 'Open Sans', 'Helvetica Neue',
sans-serif;
"
>
<div
class="wrapper"
style="
height: 90%;
display: flex;
flex-direction: column;
align-items: center;
justify-content: center;
text-align: center;
"
>
<div
class="details"
style="
```

```
 display: flex;
 flex-direction: column;
 align-items: center;
 gap: 20px;
 padding: 1rem;
 border-radius: 5px;
 box-shadow: 0 0 8px 0px #44444444;
 max-width: 80%;
 "
 >
 <h1 class="name" style="margin: 0"></h1>
 <div
 class="imageContainer"
 style="padding: 10px; height: 10rem; width: 10rem"
 >
 <img class="image" alt="profile picture" />
 </div>
 <h2 class="email" style="margin: 0"></h2>
 <a style="text-decoration: none;text-align: center;font-size: 1.2rem;color: #0070f3;fontweight: 400;"
href="./dashboard">Go to Dashboard ↗</a>
 </div>
 </div>
 <script>
 async function main() {
 let name = document.querySelector(".name")
 let image = document.querySelector(".image")
 let email = document.querySelector(".email")
```

```
 let userData = await localforage.getItem("userData")
 if(userData == null) {
 window.location.href = "/login"
 }
 name.innerHTML = `Welcome ${userData.firstName} ${userData.lastName}!`
 image.src = userData.profilePic
 email.innerHTML = `Your email is: <a style="text-decoration: none;color: #0072B5;"
href="mailto:${userData.email}">${userData.email}</a>`
 }
 main()
 </script>
 </body>
</html>
```

CSS

```
html,
body {
 height: 100%;
 margin: 0;
 font-weight: 300;
 font-family: -apple-system, BlinkMacSystemFont, "Segoe UI", Roboto,
Oxygen,
 Ubuntu, Cantarell, "Open Sans", "Helvetica Neue", sans-serif;
}
.wrapper {
 height: 100%;
 display: flex;
```

```
 align-items: center;
 justify-content: center;
}
.loginContainer {
 display: flex;
 flex-direction: column;
 gap: 1rem;
 min-width: 25rem;
 padding: 1rem 3rem;
 border: 1px solid #44444444;
 box-shadow: 0px 3px 2px 1px #44444444;
 border-radius: 8px;
}
.loginContainer span {
 text-align: center;
 font-size: 3rem;
 font-weight: 500;
 margin: 1rem 1rem 3rem;
}
.traditionalLoginContainer form {
 display: flex;
 flex-direction: column;
 align-items: center;
 justify-content: center;
}
.traditionalLoginContainer :is(input[type="text"], input[type="password"],
input[type="email"]) {
```

```
 margin: 0.3rem;
 padding: 0.3em 0.5em;
 border: 1px solid #44444444;
 border-radius: 5px;
 outline: none;
 min-width: 200px;
 font-size: 1.3rem;
}
.traditionalLoginContainer .loginButton {
 background-color: #0070f3;
 font-size: 1.6rem;
 padding: 0.2em 0.8em;
 color: white;
 margin: 0.4rem;
 border: none;
 border-radius: 5px;
 cursor: pointer;
 margin-top: 2rem;
}
.traditionalLoginContainer .loginButton:hover {
 background-color: #0071f3d6;
}
.loginWithFireContainer {
 display: grid;
 display: -ms-grid;
 place-items: center;
}
```

```
.fire {
 background-color: #f8f9fa;
 border: 1px solid #3c404321;
 border-radius: 4px;
 color: #3c4043;
 font-family: arial, sans-serif;
 margin: 11px 4px;
 padding: 0.4em 0.8em;
 line-height: 27px;
 min-width: 54px;
 text-align: center;
 cursor: pointer;
 user-select: none;
 font-size: 1.3rem;
 font-weight: 500;
}
.hyperLink {
 text-decoration: none;
 text-align: center;
 font-size: 1.2rem;
 color: #0070f3;
 font-weight: 400;
}
@media screen and (max-width: 480px) {
 .loginContainer {
 border: none;
 box-shadow: none;
```

```
 min-width: fit-content;
 min-width: -moz-fit-content;
 min-width: -webkit-fill-available;
 padding: 1rem;
 }
}
```

9) RESULT

1) Live Location Tracking:

GPS is installed on gadget to track its current location can be tracked on android app and via SMS request sent from parent phone to safety gadget.

2) Panic Alert Systems:

Panic alert system on gadget is triggered during panic situation, automatic call and SMS are triggered to parental phone. The alert is also updated to the cloud for purpose of app monitoring.

3)Stay Connected Feature:

Stay connected feature is used to trigger call and pre-defined SMS anytime from gadget to parental phone by just pressing a button and also parent can make SMS and call to the gadget anytime.

4)Health Monitoring System:

Health monitoring system is implemented using heart beat sensor, temperature sensor which is updated to the cloud and also can be monitored via app. The current value of sensors can be obtained using SMS request sent to gadget from parent phone. Fig. 5. Outputs of health monitoring system.

5) Gadget Plugged or Unplugged Monitoring:

Gadget plug or unplugged is monitored using contact switch installed on smart gadget, as soon as the device is unplugged, an alert is provided to parent phone via SMS and it is also updated to cloud for app monitoring.

6) Boundary monitoring system:

This is used to track the safety gadget using the binding gadget by implementing signal strength concept as soon as the safety gadget moves far away from the BLE listener gadget then an alert is provided to itself.

10)<u>ADVANTAGES :</u>

1. It assists parents to monitor their children remotely.
2. Parents will get all the details like their kid boarding and deboarding school bus.
3. By using this gadget child kidnaping is reduced.
4. Both the parents and school authorities can receive alerts, notification about the child's whereabouts through IoT.

DISADVANTAGES:

1) The system is dependent on communication signal/network signal for the smart gadget to trigger automatic phone call/SMS during panic situation.
2) 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.
3) Young children may refuse to cooperate unless allowed to play with their gadgets.
1. 4) Electronic gadgets use can lead to poor health.

11.Conclusion:

This research demonstrates Smart IoT device for child safety and tracking, to help the parents to locate and monitor their children. If any abnormal readings are detected by the sensor, then an SMS and phone call is triggered to the parents mobile. Also, updated to the parental app through the cloud. The system is equipped with GSM and GPS modules for sending and receiving call, SMS between safety gadget and parental phone. 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. Boundary monitoring system is implemented on safety gadget with the help of BEACON technology, as soon as the safety gadget moves far away from the BLE listener gadget an alert is provided to itself.

12.Future Scope:

This system can be further enhanced by installation of minicamera 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.

13) APPENDIX :

GITHUB LINK :

https://github.com/IBM-EPBL/IBM-Project-21191-1659774846.git

PROJECT DEMO LINK:

https://drive.google.com/file/d/1OrdeonIK1UVQI7c7G0PpmNuNYFR6853Z/view?usp=share_link