IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

IBM NALAIYA THIRAN PROJECT

REPORT SUBMITTED BY

TEAM ID : PNT2022TMID30986

KOWSHIK P	**(620819104052)**
PRAGATHEESHVARAN P	**(620819104075)**
PRASANTH R	**(620819104077)**
SURYAPRAKASH M	**(620819104107)**

INDUSTRY MENTOR

(BARADWAJ)

FACULTY MENTOR

(KRISHNAKUMAR R)

Table of Contents

1. INTRODUCTION 3

Project Overview 3

Purpose 3

2. LITERATURE SURVEY 4

Existing Problem 4

References 5

Problem Statement Definition 5

3. IDEATION & PROPOSSED SOLUTION 6

Empathy map canvas 6

Ideation & Brainstorm 7

Proposed Solution 9

Problem Solution fit 9

4. REQUIREMENT ANALYSIS 11

Functional Requirement 11

Non-Functional Requirements 13

5. PROJECT DESIGN 15

Data Flow Diagrams 15

Solution & Technical Architecture 16

User Stories 17

6. PROJECT PLANNING & SCHEDULING 18

Sprint Planning & Estimation 18

7. CODING AND SOLUTIONING 20

Feature 1 and 2 20

8. RESULTS 35

OUTPUT 35

9. ADVANTAGES AND DISADVANTAGES 41

10. CONCLUSION 41

11. FUTURE SCOPE 41

12. APPENDIX 42

Source Code GitHub & Project demo link

1.INTRODUCTION

1.1 PROJECT OVERVIEW

The overall percentage of child abusements filed nowadays in the world is about 80%, out of which 74% are girl children and the rest are boys. For every 40 seconds, a child goes missing in this world. Children are the backbone of one's nation, if the future of children was affected, it would impact the entire growth of that nation. These innocent children are not responsible for what happens to them. So, parents are responsible for taking care of their own children. But, due to economic condition and aims to focus on their child's future and career, parents are forced to crave for money. Hence, it becomes difficult to cling on to their children all the time. In our system, we provide an environment where this problem can be resolved in an efficient manner. Our 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

1.2 PURPOSE

Basically, children cannot complain about abusements which they face in their daily life to their parents. They can’t even realize what actually happens to them at their age. It is also difficult for parents to identify their children are being abused. The main aim of this project is to prevent children before being attacked, by continuously monitoring the child's location. An autonomous real-time monitoring system is necessary for every child out there. In this system, the collected values from IOT device like the location value from GPS are used to detect the status of the child and alerts the respective guardians using GSM .

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

a. Gator Smart Watch

Gator, a kid's smartwatch from Gator Group Co. It comes with a SIM card and the free app is available on Play Store and Apple App Store [19]. Gator supports calling features up to 13 different numbers, enables two-way voice messages from the app and watch. The location tracking is based on GPS tracking when children are outdoors and Wi-Fi tracking when children are indoors. Notification will also be sent to parents when children leave the geofences. Pedometer sensor is included and the SOS alarm is supported which automatically calls 3 emergency contacts when pressed for 3 seconds. Other than that, school mode is available for setting up schedules to prevent callings during the school time. Not only that, Gator is splash proofing, enables remote voice monitoring and records historical routes

b. Explora Go

Explora Go, a waterproof watch phone for children branded Explora which includes pedometer, alarm clock and stopwatch. It possesses an app available at Playstore and Appstore. With GPS and multiple services, Explora Go shows children's' location and supports the setup of safety zones. Meanwhile, it contains a SIM card and acts like a phone enables voice calls from 10 pre-saved contacts. Similar to a phone, Explora Go can send and receive text messages, emojis, images and voice messages. It is also equipped with the SOS button that children can press to notify emergency contacts of their location. Beyond that, Wi-Fi and Bluetooth are available in Explora Go. It also supports the schedule function in which school schedules can be specified during which watch will only display time and make emergency calls.

2.2 REFERENCES

Title: Child Safety Wearable Device Using Raspberry Pi.Authors: Arun Francis G, Janani I, Kavya S and Ramiyadevi K.
Year: 2020

Title: Child Safety Monitoring System Based on IoT . Authors : D. Ezhilarasi, N. Senthamilarasi Bharathi and R.B. Sangavi
Year: 2019

Title: Smart Children Safety Using Wearable Device .Authors: Dr. R. Nagaraja and P. Elamathi .
Year:2019

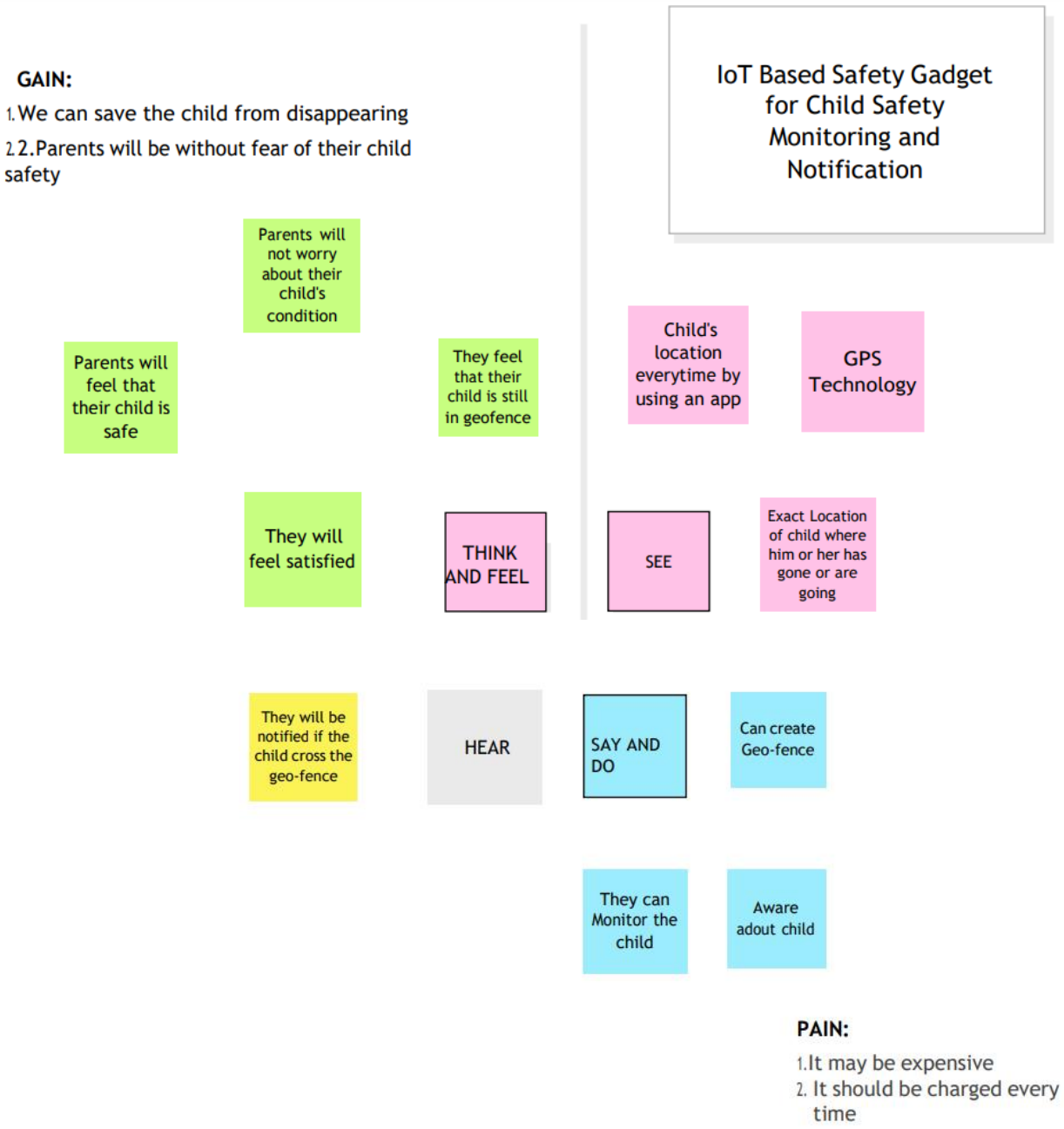
Title: Smart IOT Device for Child Safety and Tracking. Authors: E Kusuma Kumari, K N H Srinivas, M Nandini Priyanka, S Murugan and T D S Sarveswararao .
Year:2019

2.3 PROBLEM STATEMENT DEFINITION:

The main aim of this project is to prevent children before being attacked, by continuously monitoring the child's location. An autonomous real-time monitoring system is necessary for every child out there. In this system, the collected values from IOT device like the location value from GPS are used to detect the status of the child and alerts the respective guardians using GSM .

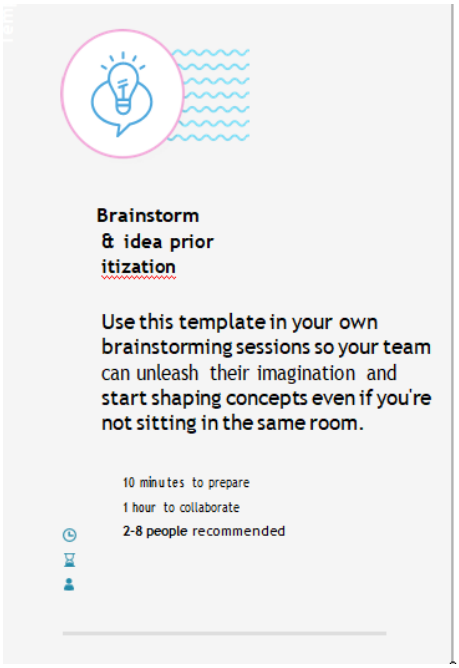
3.IDEATION & PROPOSED SOLUTION

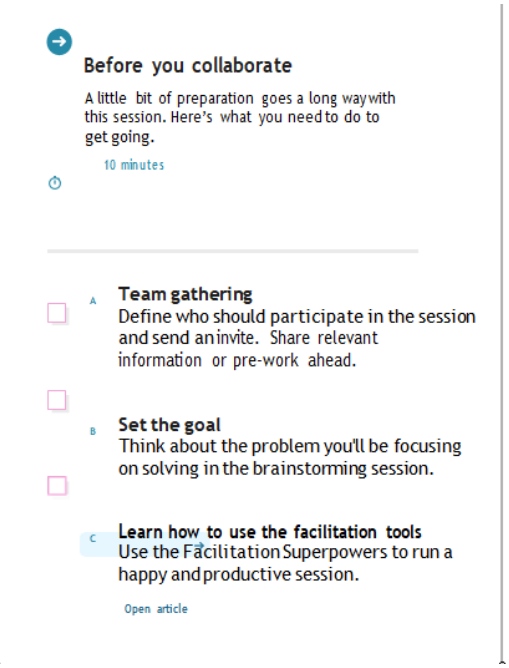
3.1 EMPATHY MAP CANVAS

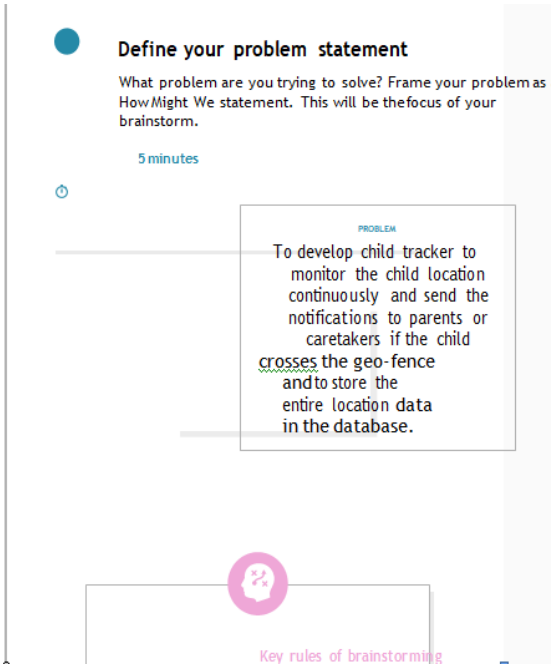


3.2 IDEATION AND BRAINSTORMING

Problem Statement (PS)	I am (Customer)	I'm trying to	But there are issues	Because of	Which makes me feel
PS-1	Responsible Parent	Make sure My Child's Safety	Child abuse	Lack of Intelligence	Disappointed
PS-2	Caretakers	Monitor My Child's Location	Kidnapping	Safety Awareness	Uncertain
PS-3	Parents	Protect My Child	Accidents	Lack of Intelligence	Insecure
PS-4	Responsible Parents	Get My Child's Accurate Location to Protect My Child	Accidents And Child Kidnapping	Lack of Ideas in Technology	Depressed







2

Brainstorm

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

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Person 1

- Development of Child Tracker
- Creation of Mobile Application
- Tracking the Child's Location Continuously
- Integration with Shoe
- Sending Notification in case of Emergency
- Storing the child location in the Database

Person 2

- Creation of Web based Application
- Tracking the Child's Location through API's
- RFID based Additional Tracking
- Integration with Mobile as PWA
- Notifying the Parents in case of Emergency

Person 3

- Brilliant UI/ UX Design for Web Application
- Integration with Smart Watches
- Notifying the Parents in case of Emergency
- Monitoring the Child's Movements
- Integration with Cloud Services

Person 4

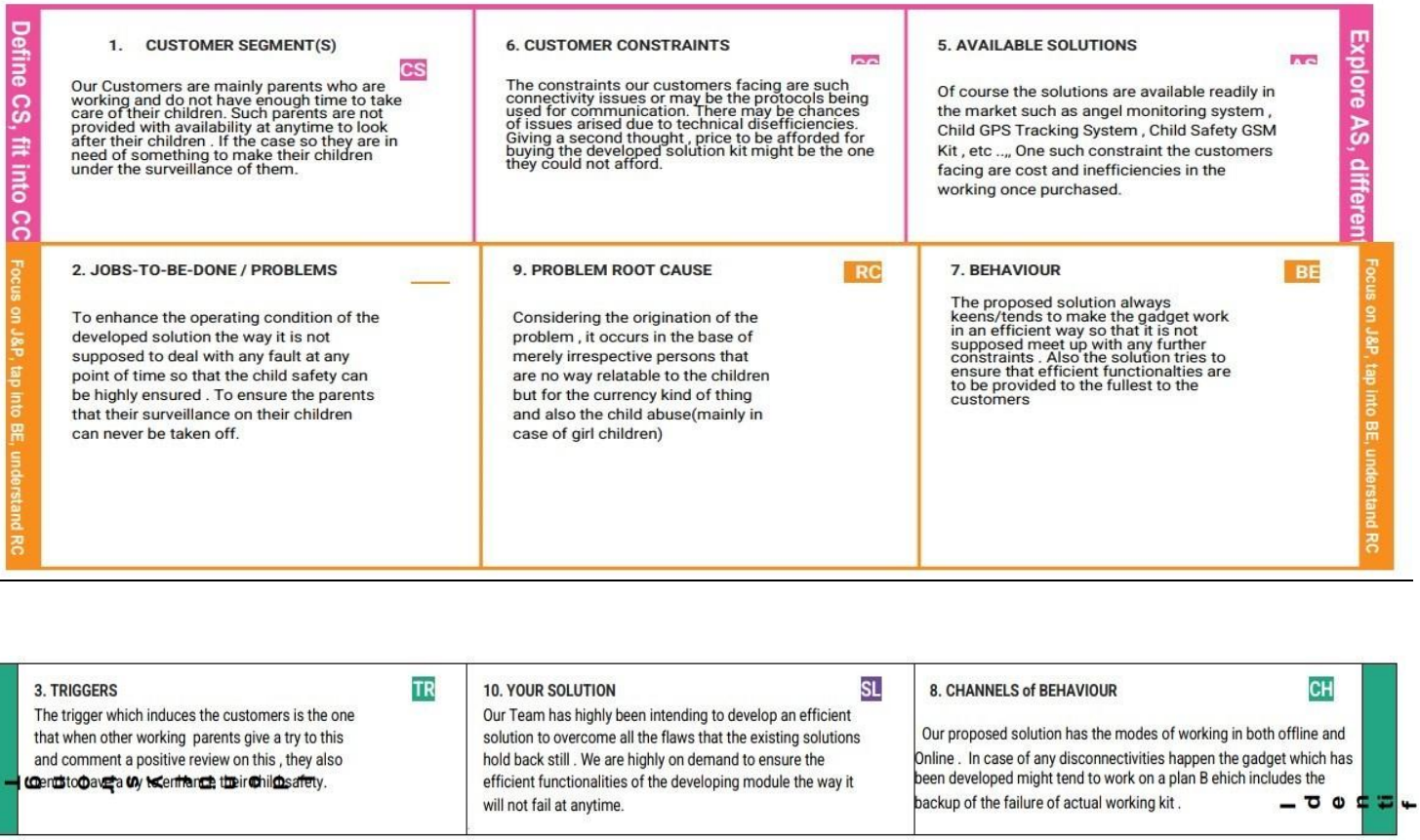
- RFID based Tracking
- GPS Integrated Shoe
- Notifying the Police and Caretakers in case of Emergency
- GPS Integrated Bag
- GPS Integrated Watch

3.3 PROPOSED SOLUTION:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Children are facing a lot of crimes nowadays in society such as kidnapping , Accidents and Child abuse.
2.	Idea / Solution description	The idea is to develop an IOT-based safety gadget to continuously monitor the children and ensure their safety and send the notification to the parents or caretakers.
3.	Novelty / Uniqueness	To create a device that is easily carriable, wearable, comfortable, cost-effective and safe for children touse.
4.	Social Impact / Customer Satisfaction	The user will be able to track their children throughout the day. if any emergency ,they will be intimated about it. The user will get the exact information about their child.
5.	Business Model (Revenue Model)	Portable,cost-effective, comfortable and small in size. To ensure that the device is safe for children to use.
6.	Scalability of the Solution	Reliable and cost-effective.

3.4 PROBLEM SOLUTION FIT :



	4. EMOTIONS: BEFORE / AFTER EM Customers(Parents) are being frustratesd that their children are doing safe or not before using the gadget designed . Once they start to use the developed solution they might feel free to focus on their work and also the surveillance of their children would happen with ease at any point of time .			

4. REQUIRMENT ANALYSIS

4.1 FUNCTIONAL REQUIRMENT

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 Gmail ✓Registration through phone number
FR-2	User Confirmation	✓ Confirmation via EmailConfirmation via OTP
FR-3	App installation	Installation through link Installation through play store
FR-4	Detecting child location	✓ Detecting the child location through an android application ✓ Detecting the child location through SMS
FR-5	User Interface	✓ User Login Form. ✓ Admin Login Form.
FR-6	Database	✓ Stored in cloud for seamless connectivity. Parents and kids link with the distance and the location values obtained from the mobile devices are stored here. ✓ The values include parent id ,kid id, distance, longitude, latitude etc.

	Functional Requirement	Sub Requirement
FR-7	Server	It connects the database and the front end application. The backend server has been implemented to run as a service and is deployedin an IBM cloud instance. The backend server has been implemented torun as a service and is deployed in an IBM cloud instance.
	GPS tracking	The system is implemented with a GPS module, which acquires the location information of the user and stores it to thedatabase.
FR-9	API	The value collected is sent to the databaseusing an API.
FR-10	React JS	We are using react js as front end for ourproject. Node JS for the back end we are using node js
FR-11	GPS modules	It receives data directly from satellites.

FR-12	Battery Life	If the child or parent forgets to charge the device for a whole day then also the device will work. That's why we aim to make this device lastthe whole day with one charge. It should belong-lasting.
FR-13	Location History	The location history will help to track the child's activity so that the aren't will be updated. Location history will be there for 30 days. For example if the child gets missing with the help of location history the aren't can track down their child's activity and also can find their child.

4.2 NON-FUNCTIONAL REQUIRMENTS

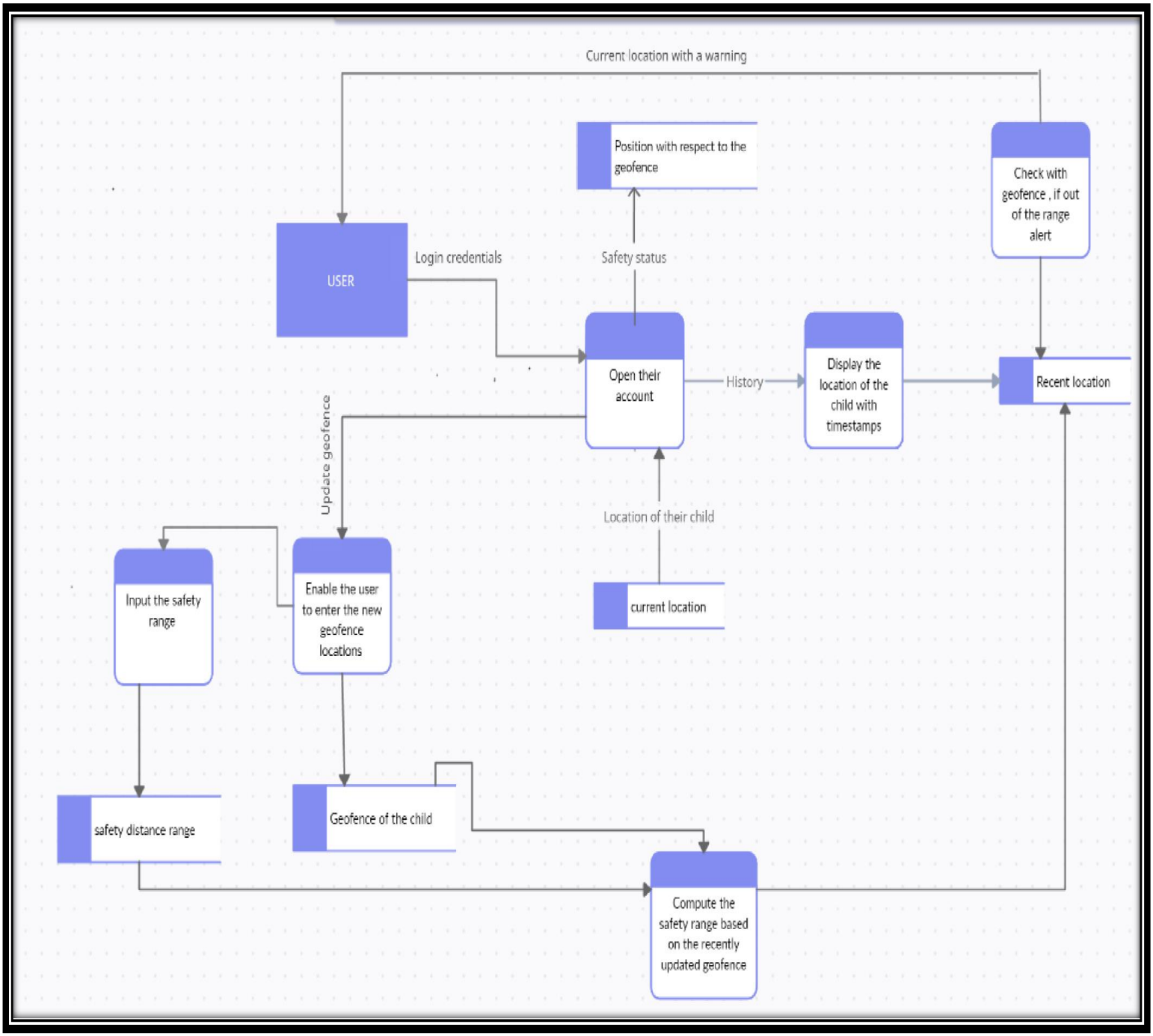
Following are the non-functional requirements of the proposed solution.

FR No.	Non-functional Requirements	Description
NFR-1	Usability	✓ Device have GSM can help to inform the parents or relatives about the current situations of the child by deliver the message immediately to save the child.
NFR-2	Security	✓ Make children parents more assure about their kid's security, we have a feature in our device called Geo-Fence. ✓ Whenever your child crosses that specific area, you will get an instant notification on your phone.
NFR-3	Reliability	Portable Easy to use Flexibility
NFR-4	Dynamicity	✓ IoT devices may have the capability to adapt dynamically and change based ontheir conditions.
NFR-5	Desirability	✓ Navigation should be made easy. ✓ The user should be able to search and find the information he needs withoutmuch hassle.

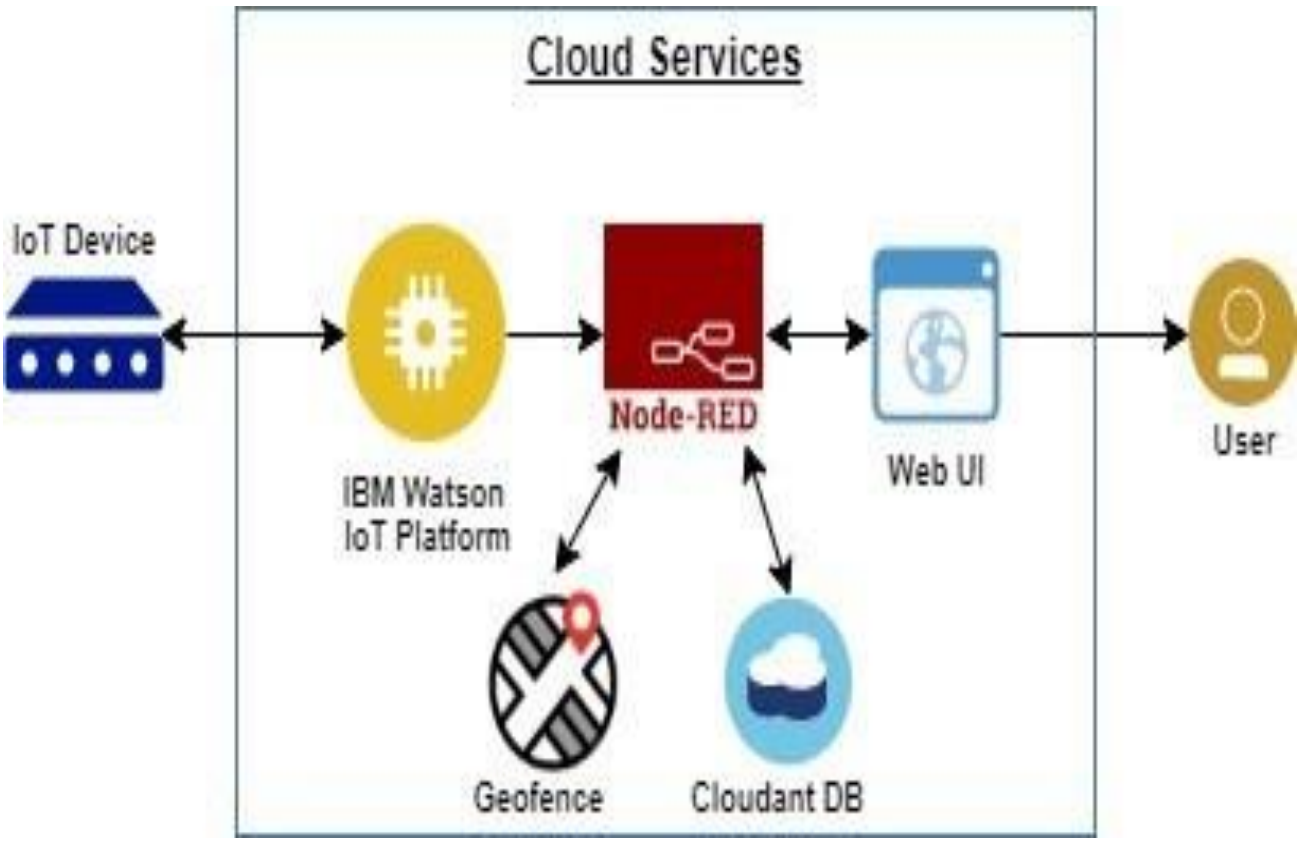
NFR-6	Performance	✓ Create a Child tracker which helps the parents with continuously monitoring thechild's location. The notification will be sent according tothe child's location to their parents or caretakers. The entire location data will be stored in thedatabase
NFR-7	Availability	Track your child even in a crowd Get travel details of kids at any meKnow the current location
NFR-8	Scalability	Gadget ensures the safety and tracking ofthe children. Parents need not worry about their children.
NFR-9	Valuability	The system should be able to deliver promptly to the financing authority. In the case of non-profit organizations, the solution should be 'advancing the mission'.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION & TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)and (Web user)	Registration	USN-1	As a user, I can register my account byentering 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 myself	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through apple account	I can register & accessthe dashboard with apple account Login	High	Sprint-2
	Login	USN-4	As a user, I can log into the application by entering user id & password		High	Sprint-1
	Login	USN-5	As a user, I can log into the application through google account		High	Sprint-1
Customer Care Executive	Login		As I enter I can view the working of the application and scan for any glitches andmonitor the operation and check if all the users are authorized.	I can login only with myprovided credentials	Medium	Sprint - 3
Administrator	Login		Maintaining and making sure the database containing the locations are secure and accurate and updated constantly.	I can login only with my provided credentials	High	Sprint - 3

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND 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 applicationby entering my email, and password, and confirming my password.	4	High	KOWSHIK P
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmationemail once I have registered for the application	4	High	KOWSHIK P
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	SURYA PRAKASH, PRASANTH
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High	PRAGATHEESHVARAN , PRASANTH
Sprint-1	Dashboard	USN-5	As a user, I am able to view the functions that I can perform	4	High	KOWSHIK, PRAGATHEESVARAN
Sprint-2	Notification	USN-1	As a user, I can notify my parent and guardian in emergency situations	10	High	KOWSHIK

Sprint-2	*Store data*	*USN-2*	*As a user, I need to continuously store my location data into the database.*	*10*	*Medium*	*PRAGATHEESVARAN*
Sprint-3	*Communication*	*USN-3,1*	*I can communicate with my parents*	*6*	*Low*	*PRASANTH, SURYAPRAKASH*
Sprint	***Functional Requirement (Epic)***	***User Story Number***	***User Story / Task***	***Story Points***	***Priority***	***Team Members***
Sprint-3	*IoT Device – Watson communication*	*USN-1,4*	*The data from IoT device should reach IBM Cloud*	*7*	*Medium*	*KOWSHIK*
Sprint-3	*Node RED- Cloudant DB communication*	*USN-5,2*	*The data stored in IBM Cloud should beproperly integrated with Cloudant DB*	*7*	*High*	*PRAGATHEESVARAN, SURYA PRAKASH*
Sprint-4	*User – WebUI interface*	*USN-1,4*	*The Web UI should get inputs from theuser*	*6*	*High*	*PRAGATHEESVARAN, PRASANTH, SURYA PRAKASH*
Sprint-4	*Geofencing*	*USN-2,3,5*	*The geofencing of the child should be donebased on the geographical coordinates*	*7*	*High*	*KOWSHIK, PRAGATHEESVARAN, PRASANTH, SURYA PRAKASH*

7.CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 FEATURES 1

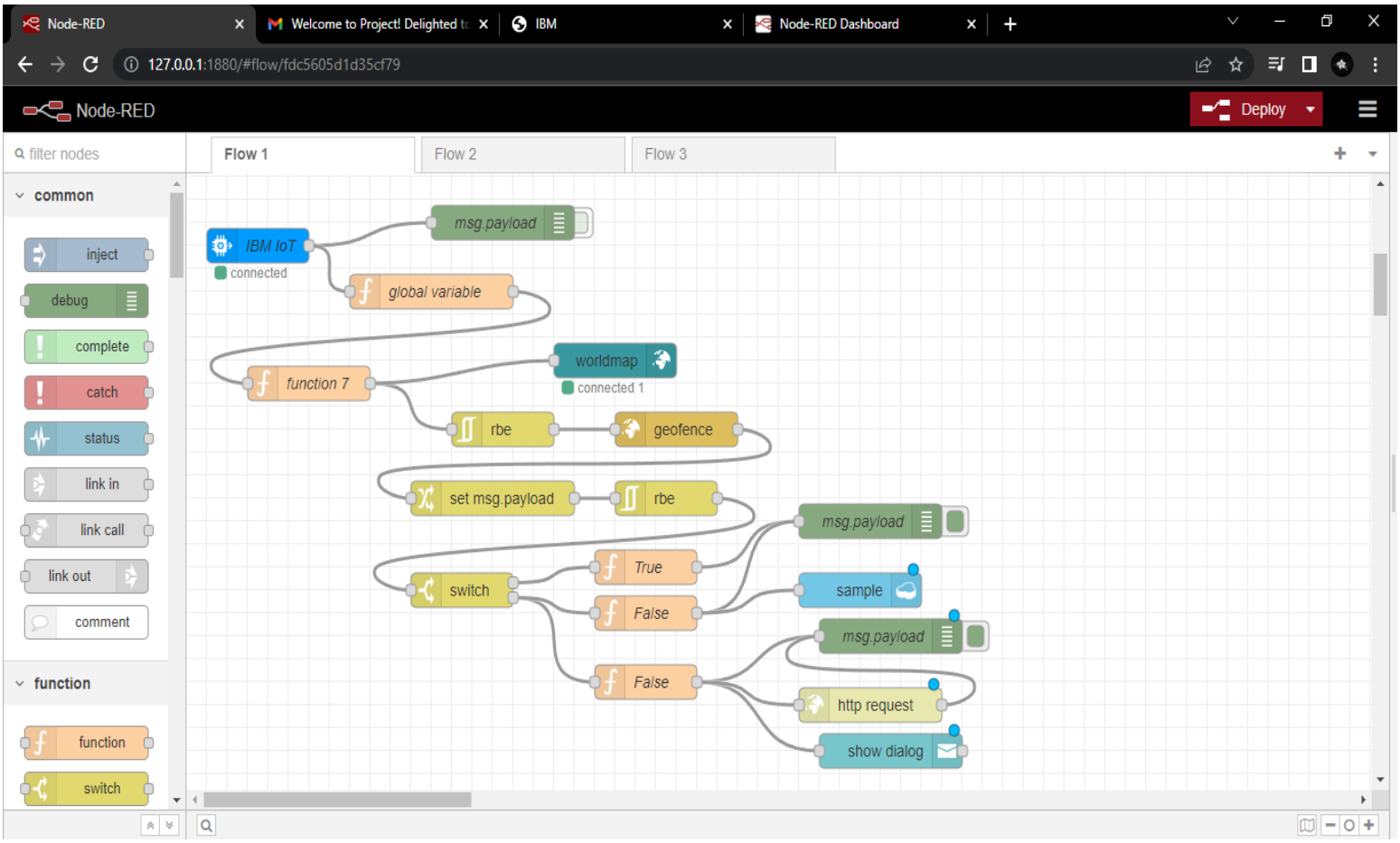
PYTHON CODE:

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

organization="mkgfko"
deviceType="raspberrypi"
deviceId="12345"
authMethod="token"
authToken="12345678"

try:
deviceOptions={"org":organization,"type":deviceType,"id":deviceId,"authmethod":authMethod,"authtoken":
 authToken}
deviceCli=ibmiotf.device.Client(deviceOptions)
except Exception as e:
   print("caught exception connecting device:%s" % str(e))
   sys.exit()

deviceCli.connect()
while True:
        #in data
        name="kowshik"
        lattitude=11.229592;
        longtitude=  78.171158;
        #out data
        #lattitude=11.664325;
        #longtitude=78.146011;

        data={'lat':lattitude,'lon':longtitude,'name':name}
        def myOnPublishCallback():
          print("publishedlattitude=%d"%lattitude,"longtitude=%d"%longtitude,"to ibm watson")




success=deviceCli.publishEvent("IotSensor","json",data,qos=0,on_publish=myOnPublishCallback)
        if not success:
           print("Not connected to IoTF")
```

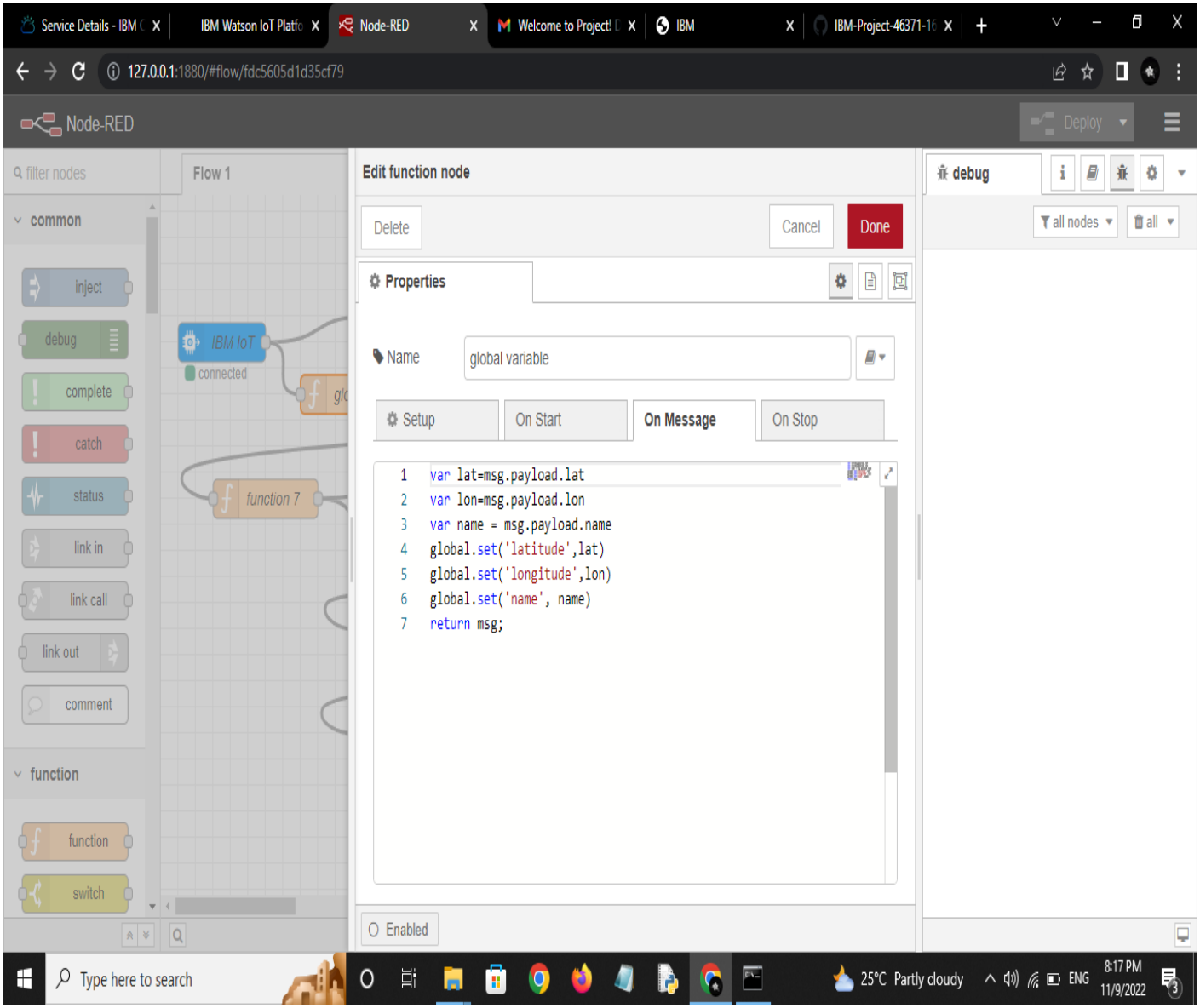
```
        time.sleep(3)
deviceCli.disconnect()
```

7.2 FEATURES 2

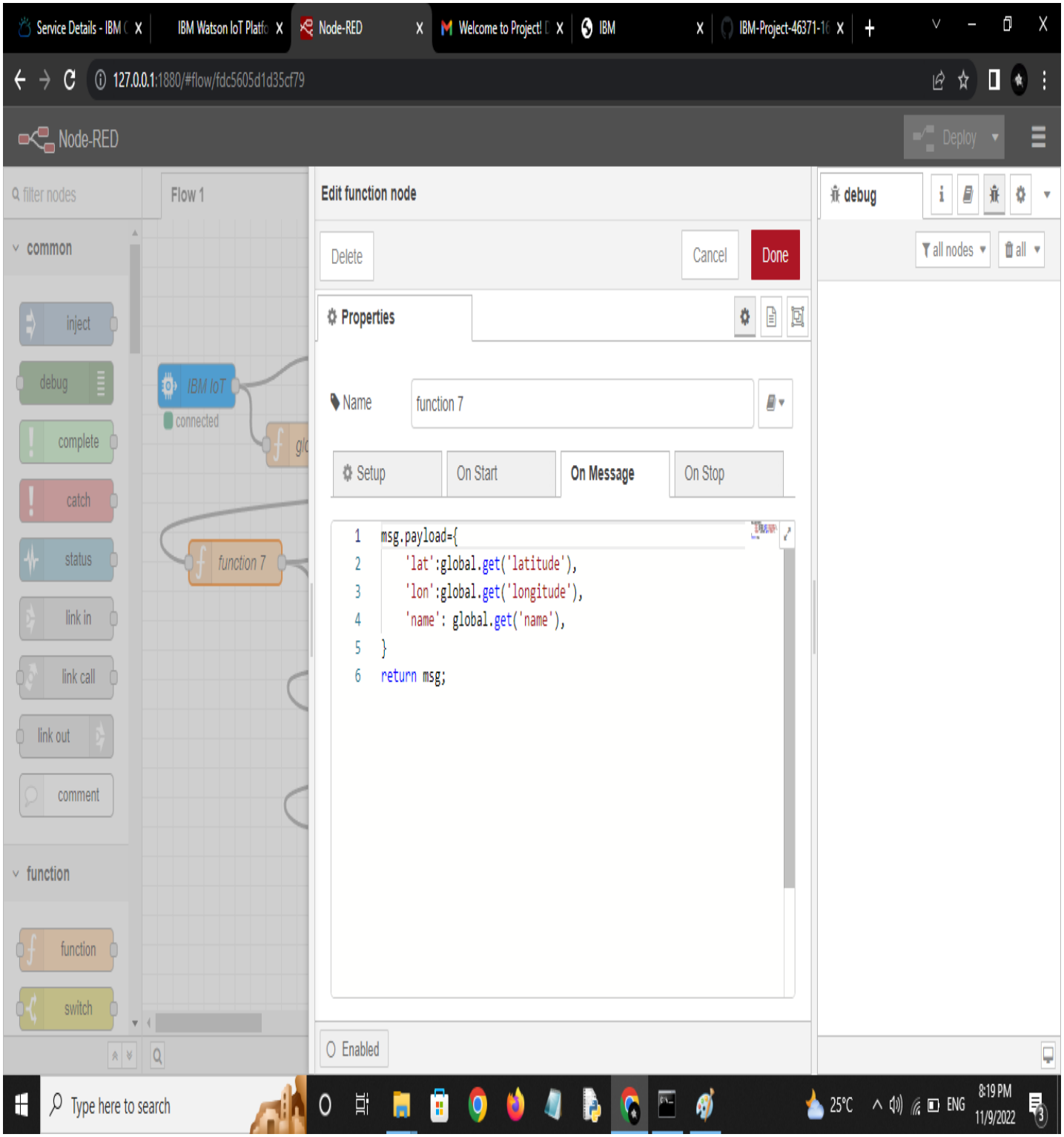
NODE-RED :



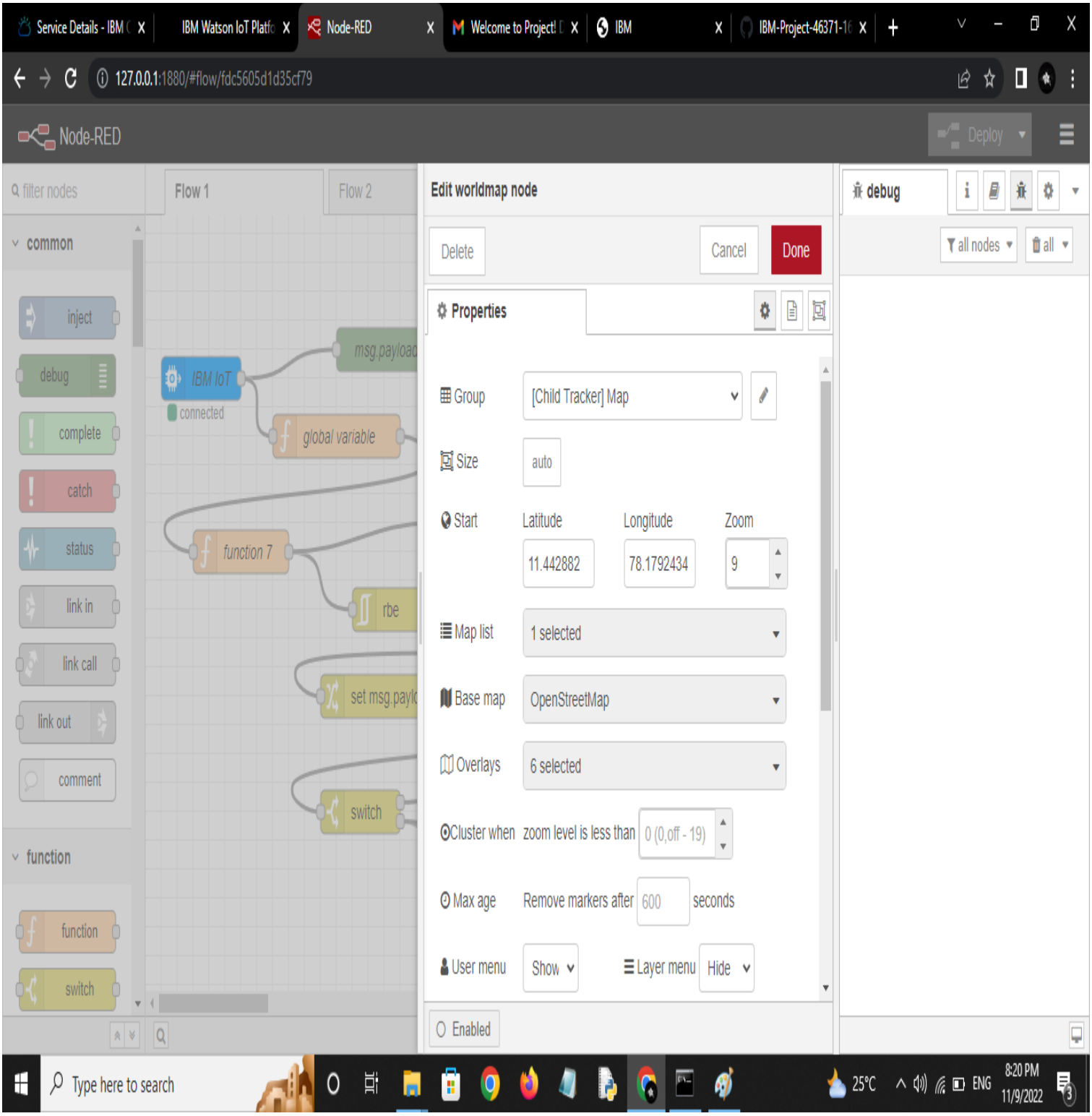
GLOBAL VARIABLE NODE :



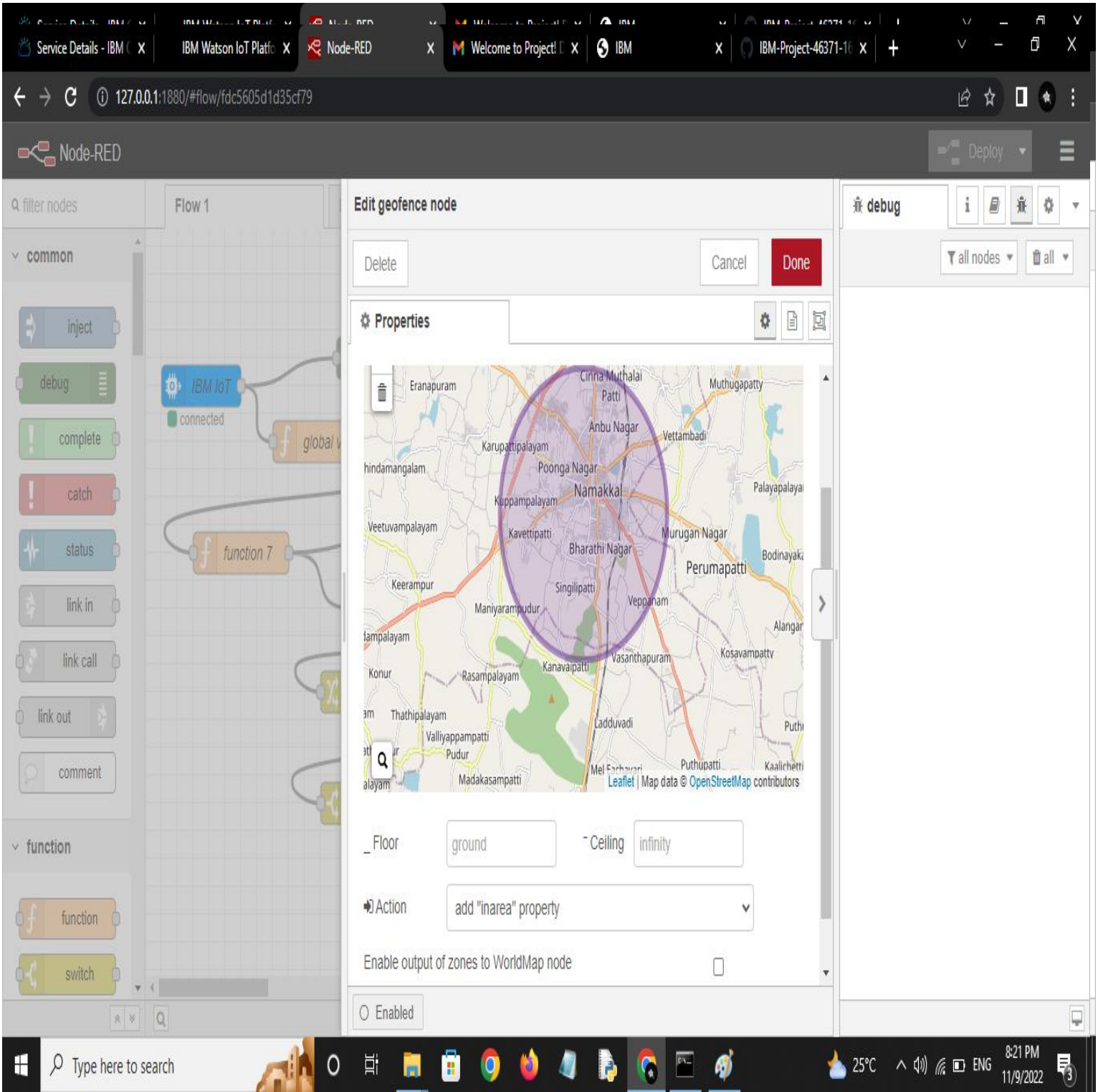
FUNCTION 7 NODE:



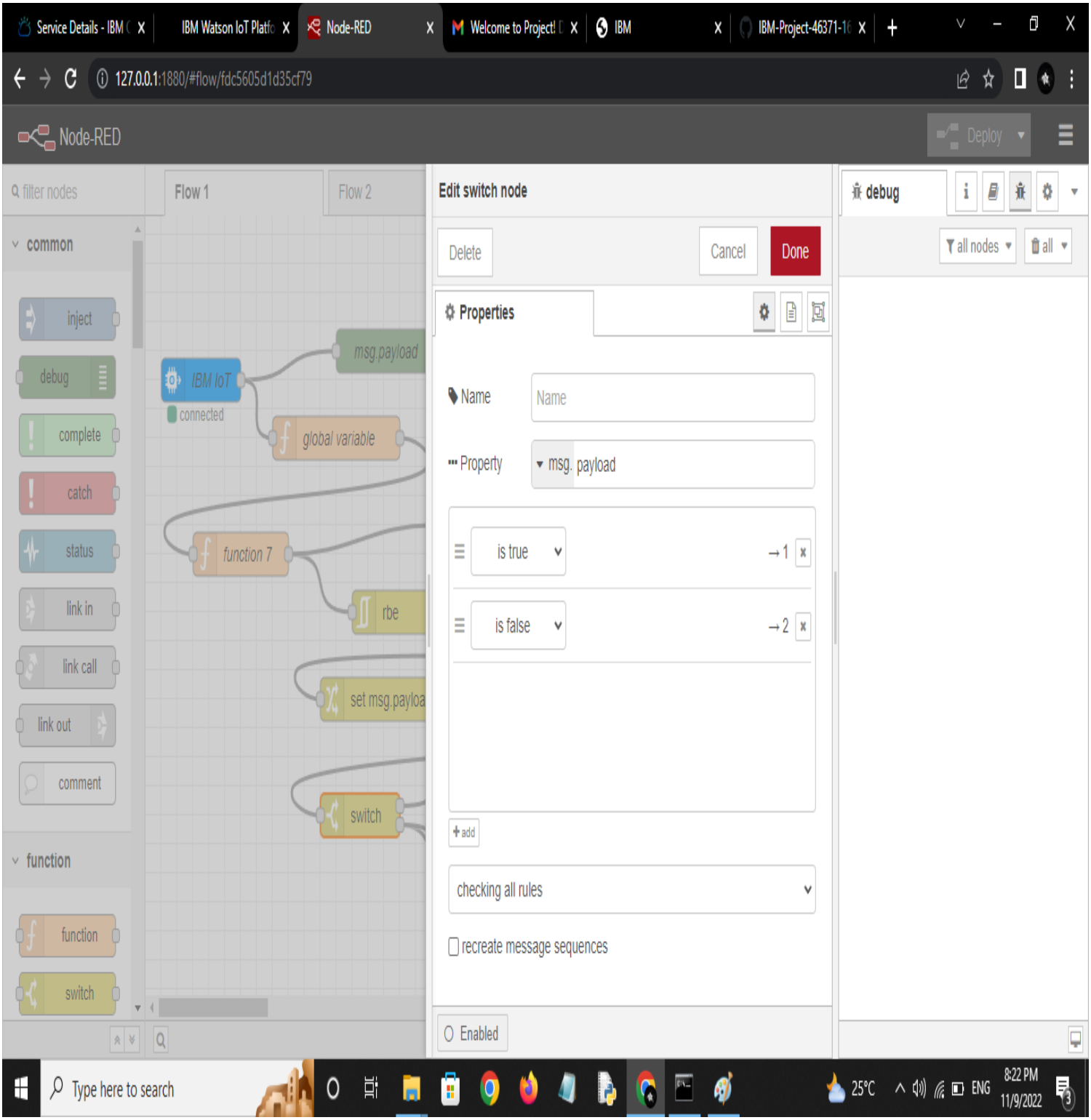
WORLD MAP NODE:



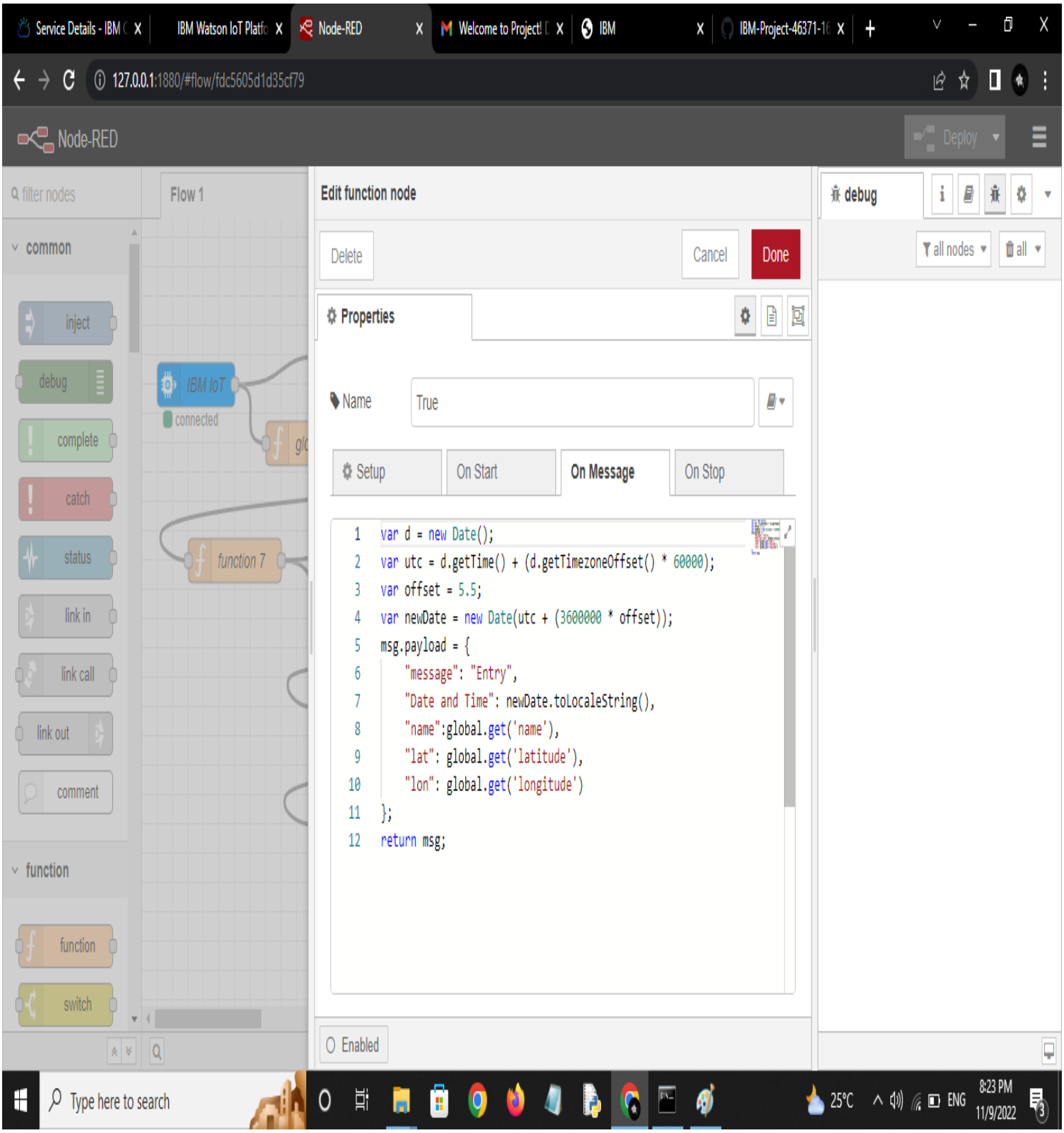
GEOFENCE NODE :



SWITCH NODE :


Service Details - IBM
IBM Watson IoT Platfo
Node-RED
Welcome to Project!
IBM
IBM-Project-46371-16
127.0.0.1:1880/#flow/fdc5605d1d35cf79
Node-RED
Deploy
filter nodes
Flow 1
Flow 2
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
IBM IoT
connected
msg.payload
global variable
function 7
rbe
set msg.payloa
switch
Edit switch node
Delete
Cancel
Done
Properties
Name
Name
Property
msg. payload
is true
→1
is false
→2
add
checking all rules
recreate message sequences
Enabled
debug
all nodes
all
Type here to search
25°C
ENG
8:22 PM
11/9/2022

TRUE NODE :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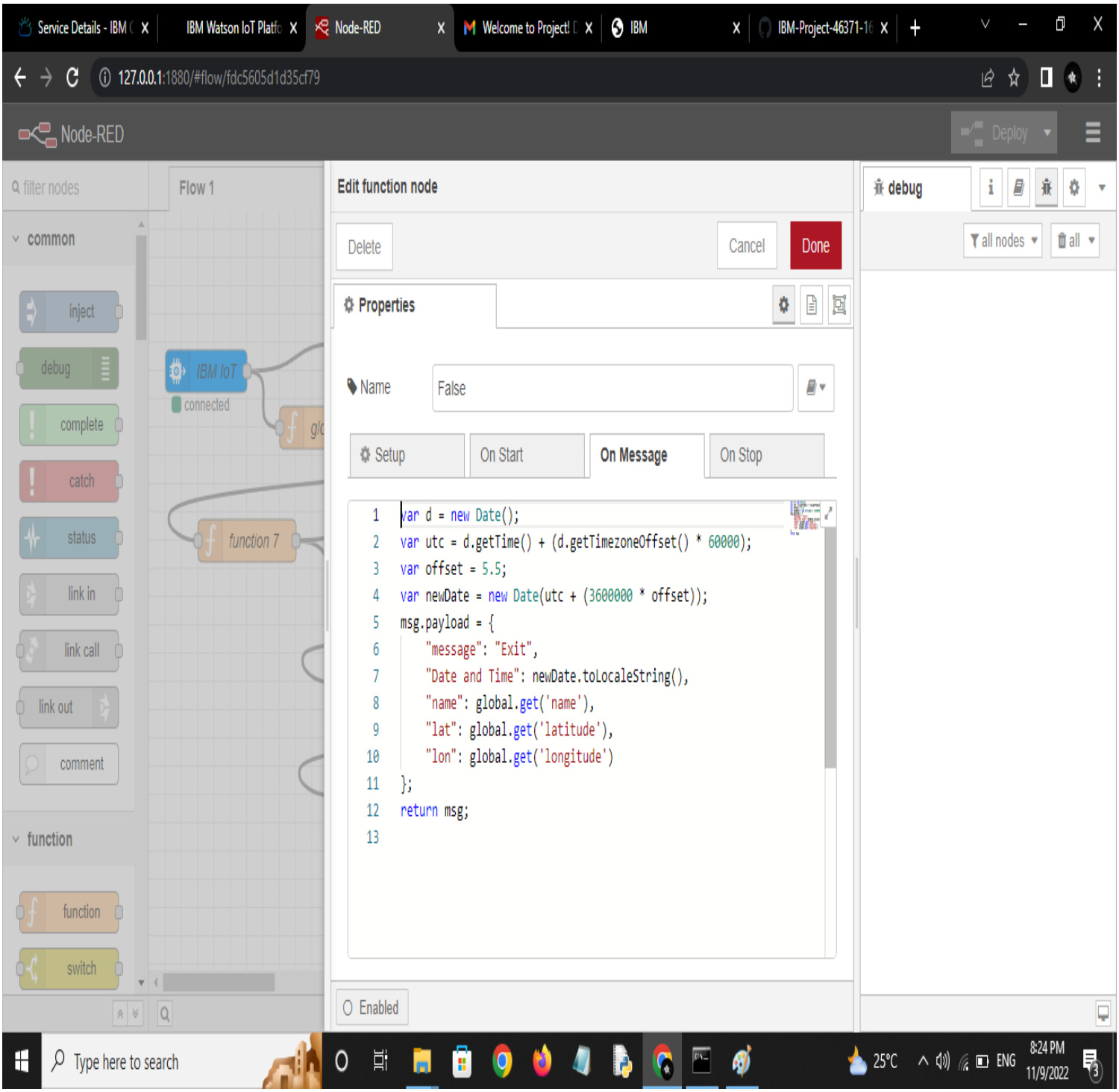
Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
IBM IoT
connected
function 7
Edit function node
Delete
Cancel
Done
Properties
Name
True
Setup
On Start
On Message
On Stop
1 var d = new Date();
2 var utc = d.getTime() + (d.getTimezoneOffset() * 60000);
3 var offset = 5.5;
4 var newDate = new Date(utc + (3600000 * offset));
5 msg.payload = {
6 "message": "Entry",
7 "Date and Time": newDate.toLocaleString(),
8 "name":global.get('name'),
9 "lat": global.get('latitude'),
10 "lon": global.get('longitude')
11 };
12 return msg;
Enabled
debug
all nodes
all
Type here to search
25°C
ENG
8:23 PM
11/9/2022

FALSE NODE :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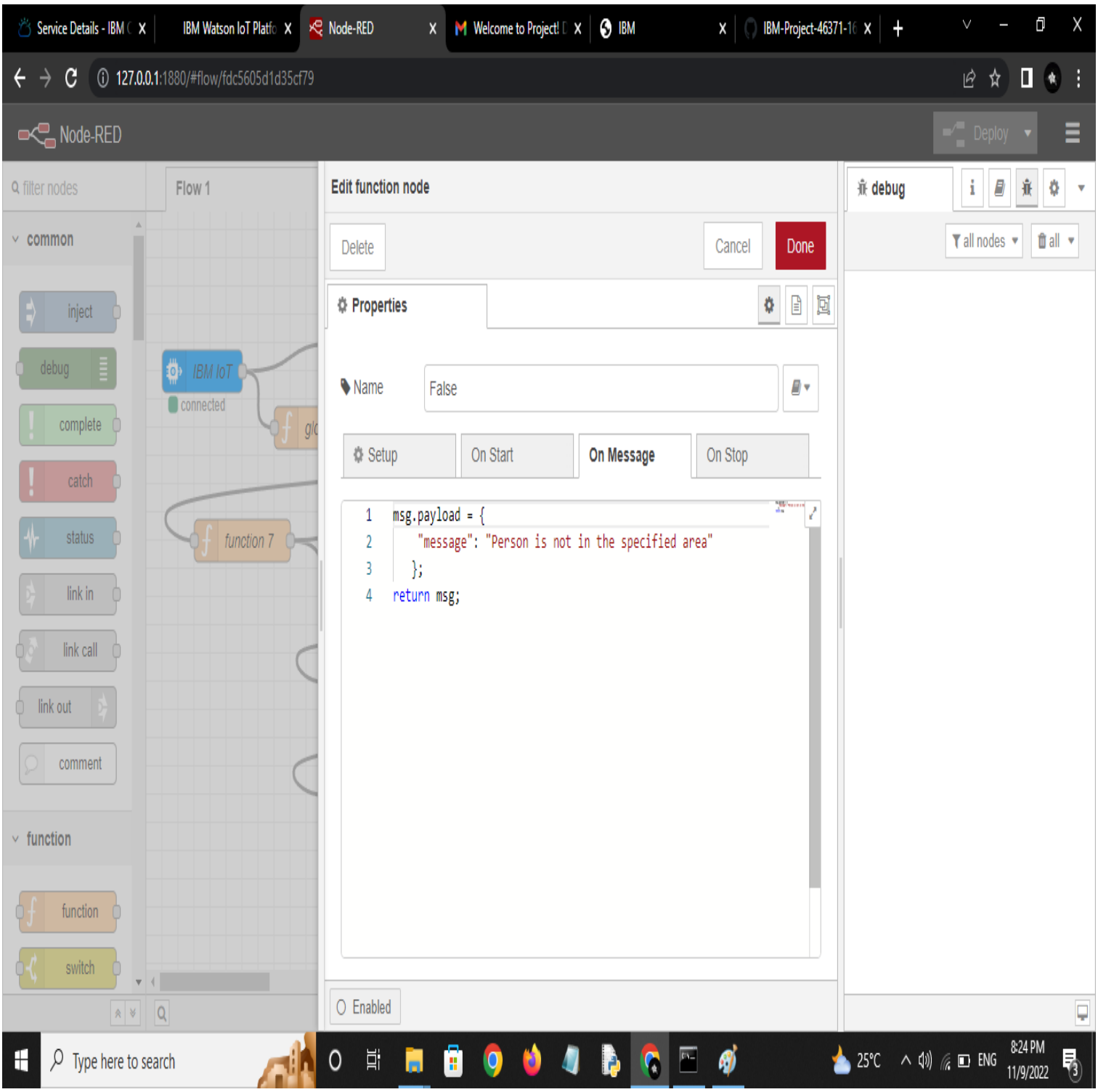
comment
function
function
switch
IBM IoT
connected
function 7
Edit function node
Delete
Cancel
Done
Properties
Name
False
Setup
On Start
On Message
On Stop
var d = new Date();
var utc = d.getTime() + (d.getTimezoneOffset() * 60000);
var offset = 5.5;
var newDate = new Date(utc + (3600000 * offset));
msg.payload = {
"message": "Exit",
"Date and Time": newDate.toLocaleString(),
"name": global.get('name'),
"lat": global.get('latitude'),
"lon": global.get('longitude')
};
return msg;
Enabled
debug
all nodes
all
Type here to search
25°C
ENG
8:24 PM
11/9/2022

FALSE NODE :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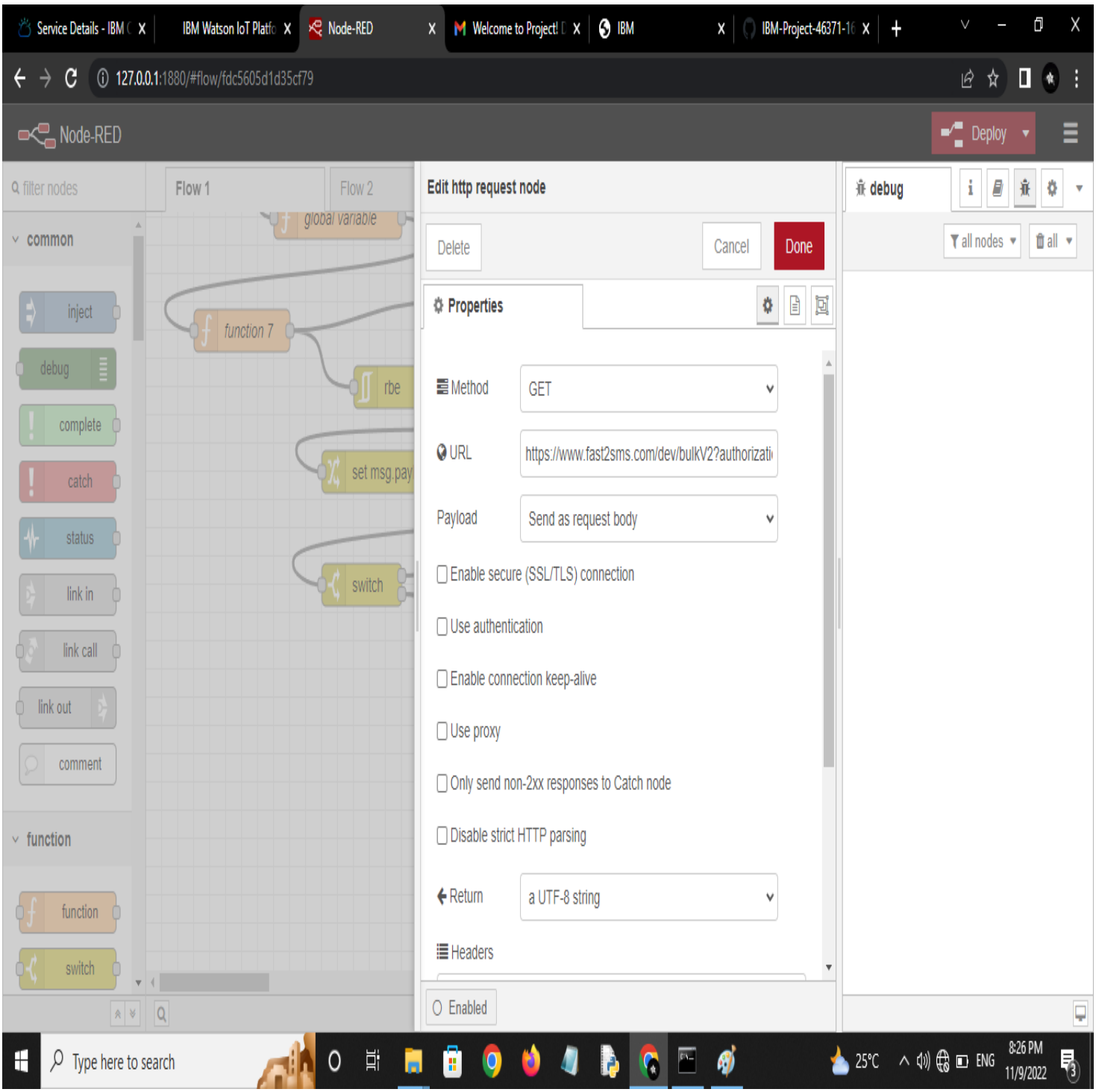
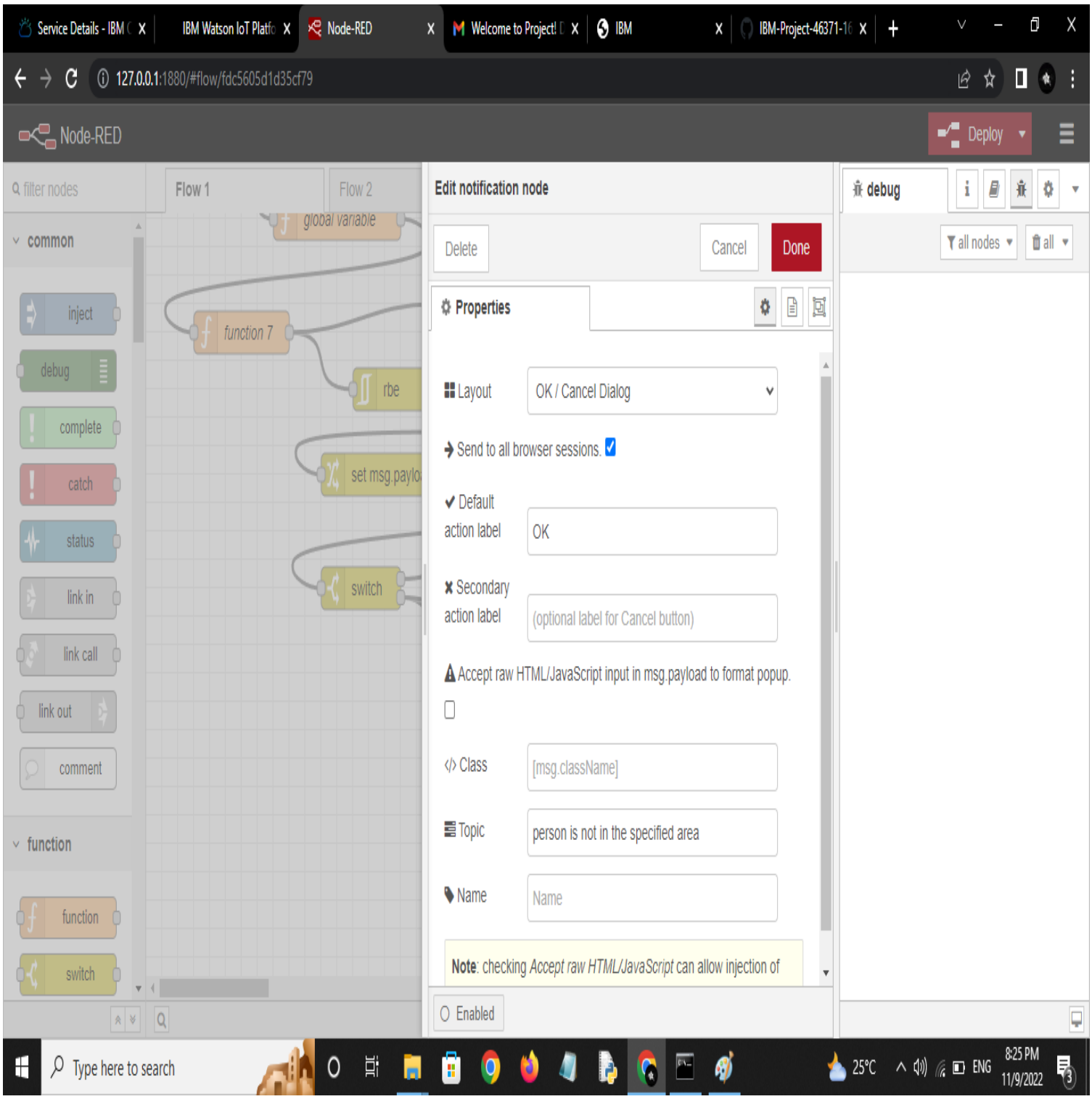
Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
IBM IoT
connected
function 7
Edit function node
Delete
Cancel
Done
Properties
Name
False
Setup
On Start
On Message
On Stop
1 msg.payload = {
2 "message": "Person is not in the specified area"
3 };
4 return msg;
Enabled
debug
all nodes
all
Type here to search
25°C
ENG
8:24 PM
11/9/2022

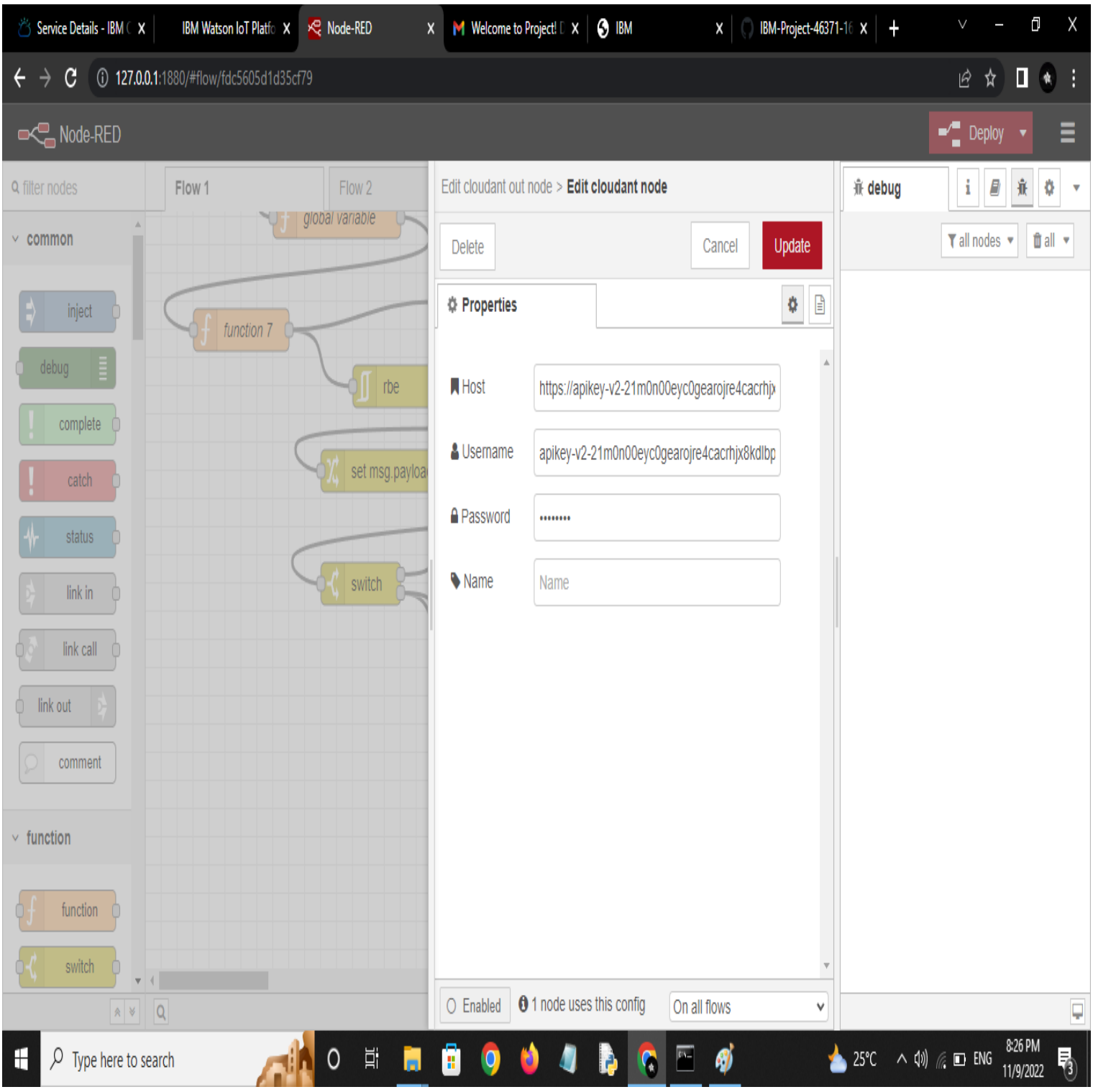
HTTP REQUEST NODE:



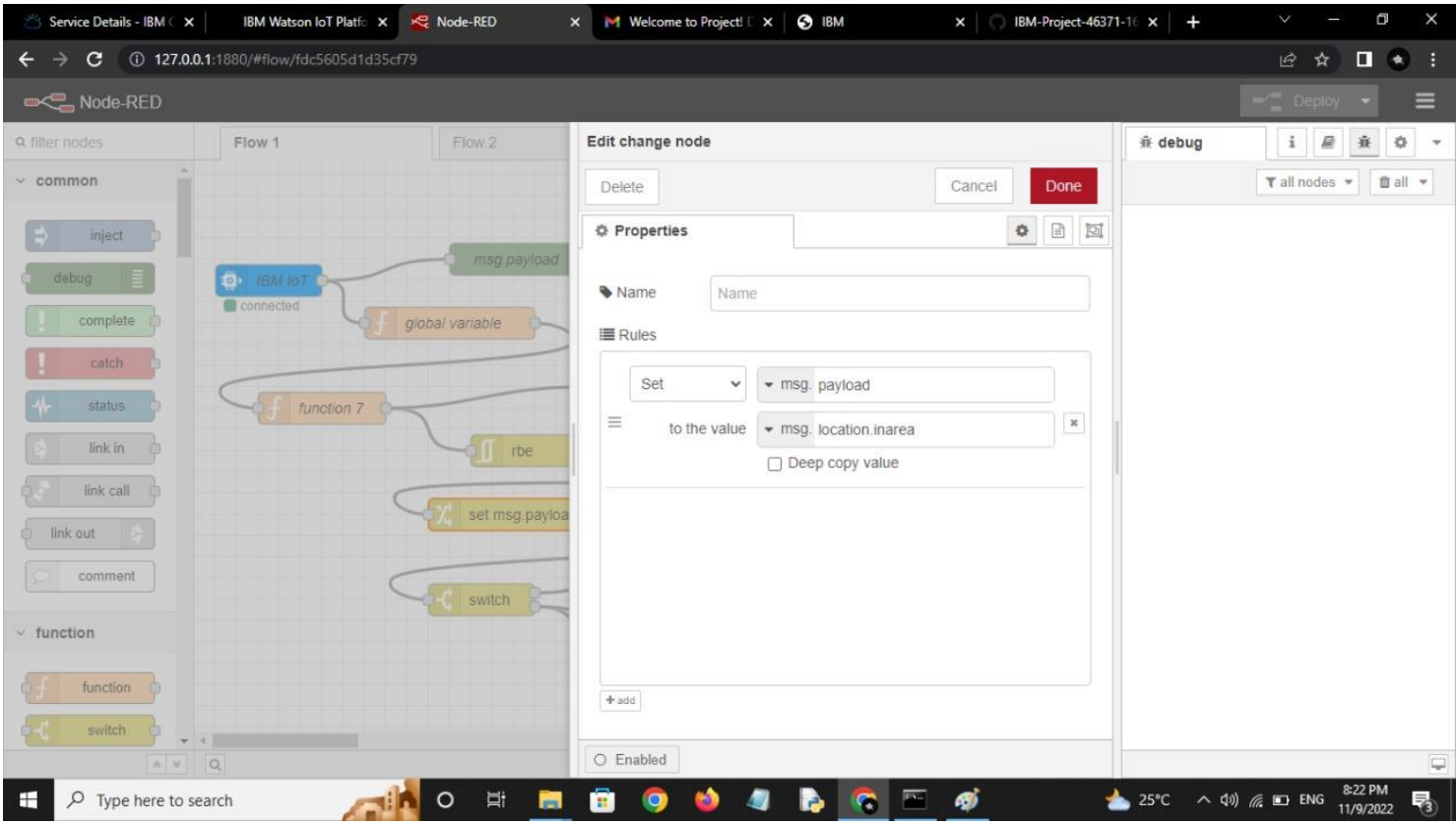
SHOW DIALOG NODE:



SAMPLE NODE (DATABASE NODE) :



SET.MSG.PAYLOAD NODE



8.RESULTS

PYTHON OUTPUT :

location data.py - C:\Users\ELCOT\AppData\Local\Programs\Python\Python37\location data.py (3.7.0)

File Edit Format Run Options Window Help

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

organization="mkgfko"
deviceType="raspberrypi"
deviceId="12345"
authMethod="token"
authToken="12345678"

try:
    deviceOptions={"org": organization,"type": d
    deviceCli=ibmiotf.device.Client(deviceOption
except Exception as e:
    print("caught exception connecting device:%s
    sys.exit()

deviceCli.connect()
while True:
        #in data
        name="kowshik"
        #lattitude=11.229592;
        #longtitude=  78.171158;
        #out data
        lattitude=11.664325;
        longtitude=78.146011;

        data={'lat':lattitude,'lon':longtitude
        def myOnPublishCallback():
          print("published lattitude=%d" %latt


        success=deviceCli.publishEvent("IotSen
        if not success:
            print("Not connected to IoTF")
```

Python 3.7.0 Shell

File Edit Shell Debug Options Window Help

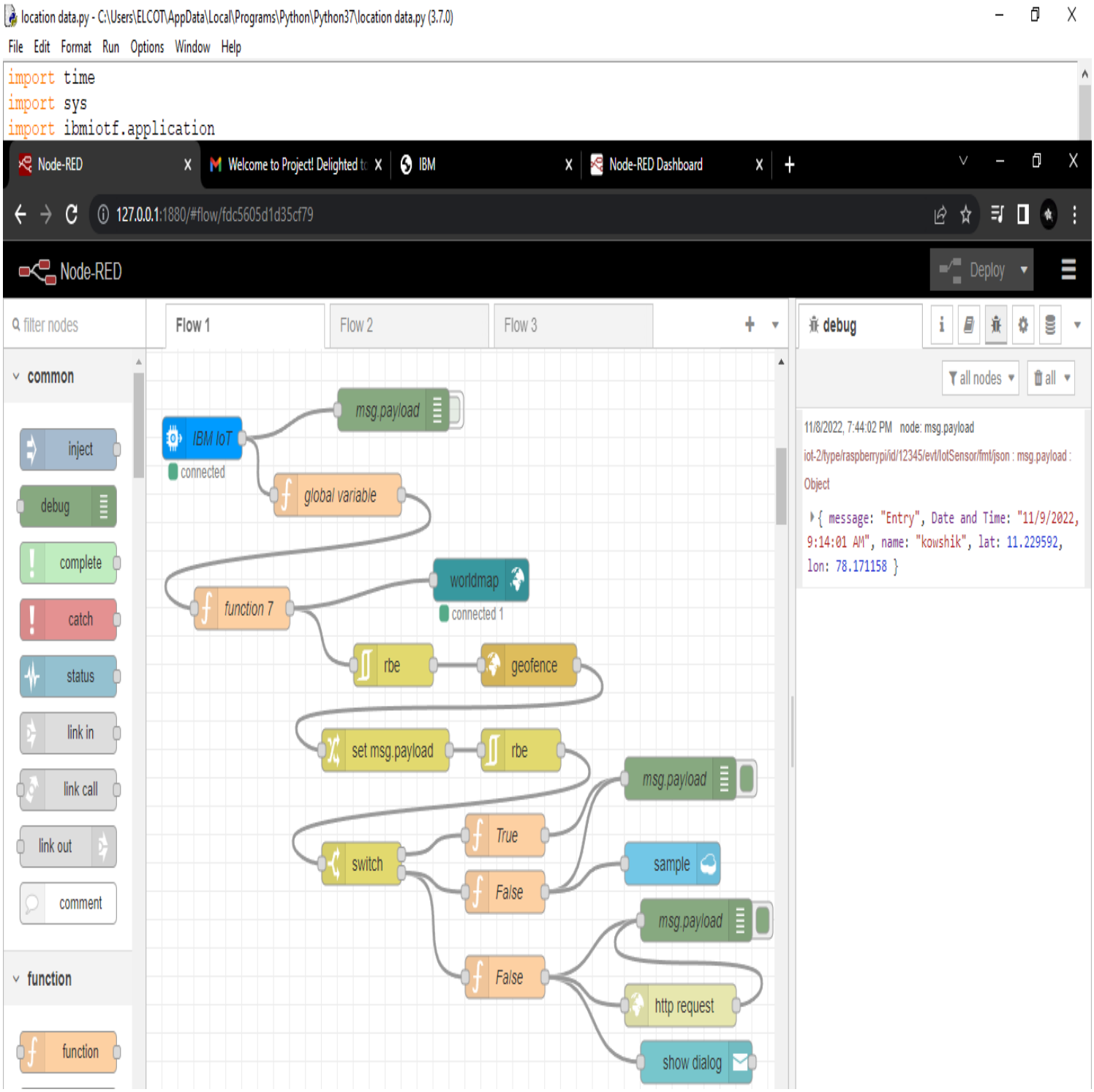
```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD6
4)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
 RESTART: C:\Users\ELCOT\AppData\Local\Programs\Python\Python37\location data.py

2022-11-19 09:24:35,170   ibmiotf.device.Client      INFO    Connected successfu
lly: d:mkgfko:raspberrypi:12345
published lattitude=11 longtitude=78 to ibm watson
published lattitude=11 longtitude=78 to ibm watson
published lattitude=11 longtitude=78 to ibm watson
```

Ln: 11 Col: 11

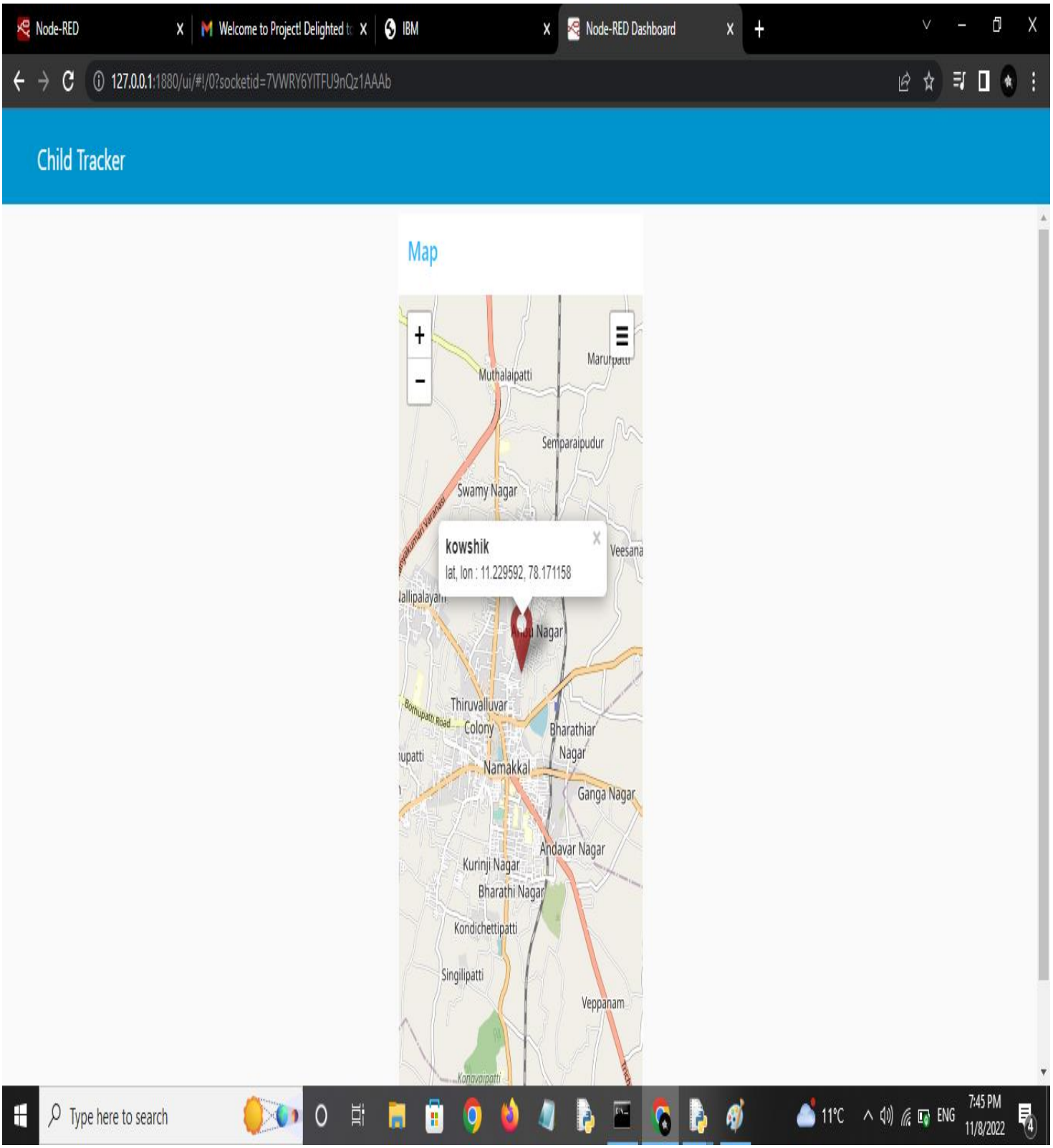
Type here to search

28°C ENG 9:24 AM 11/19/2022

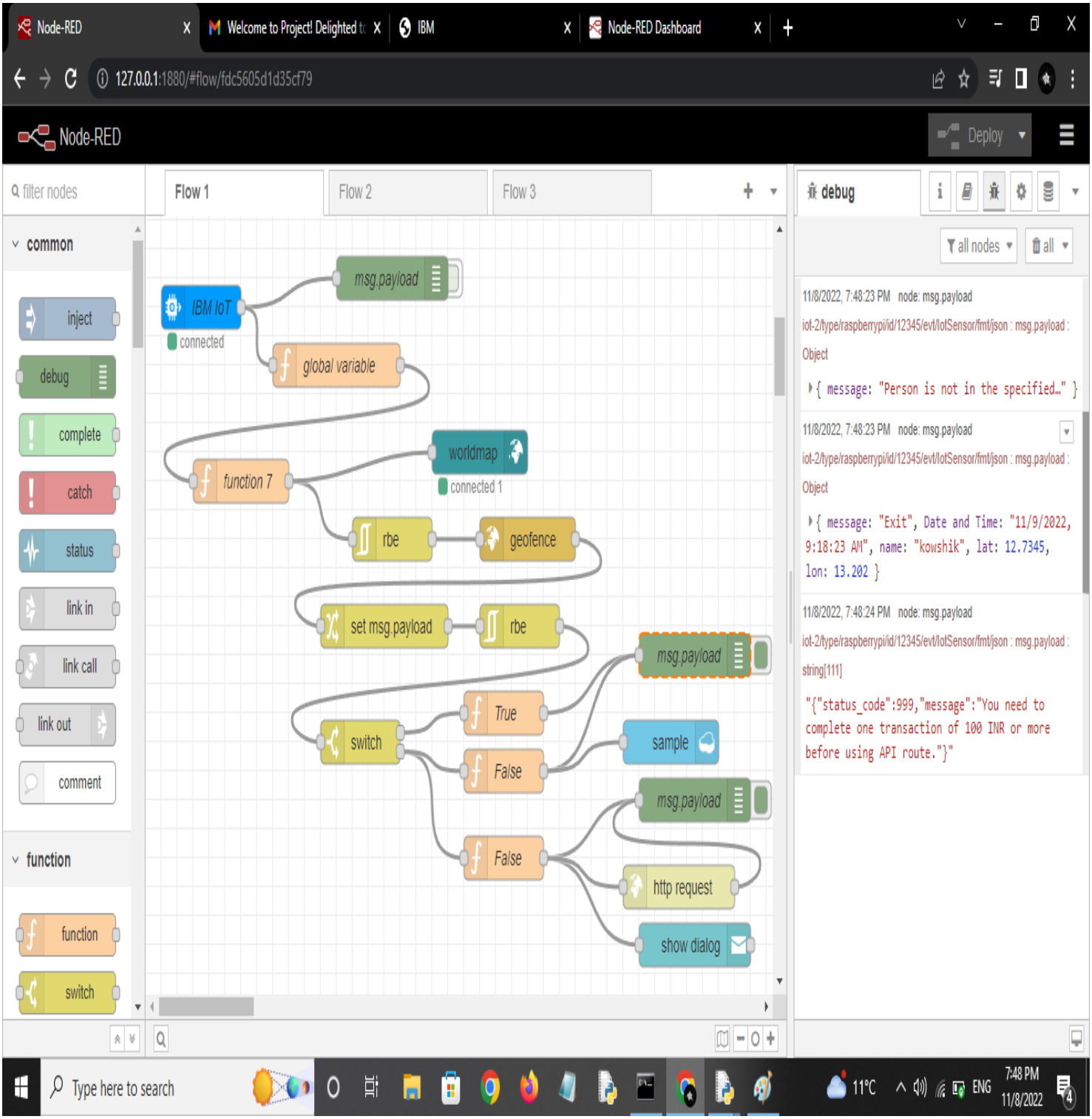
Node- RED IN AREA OUTPUT :



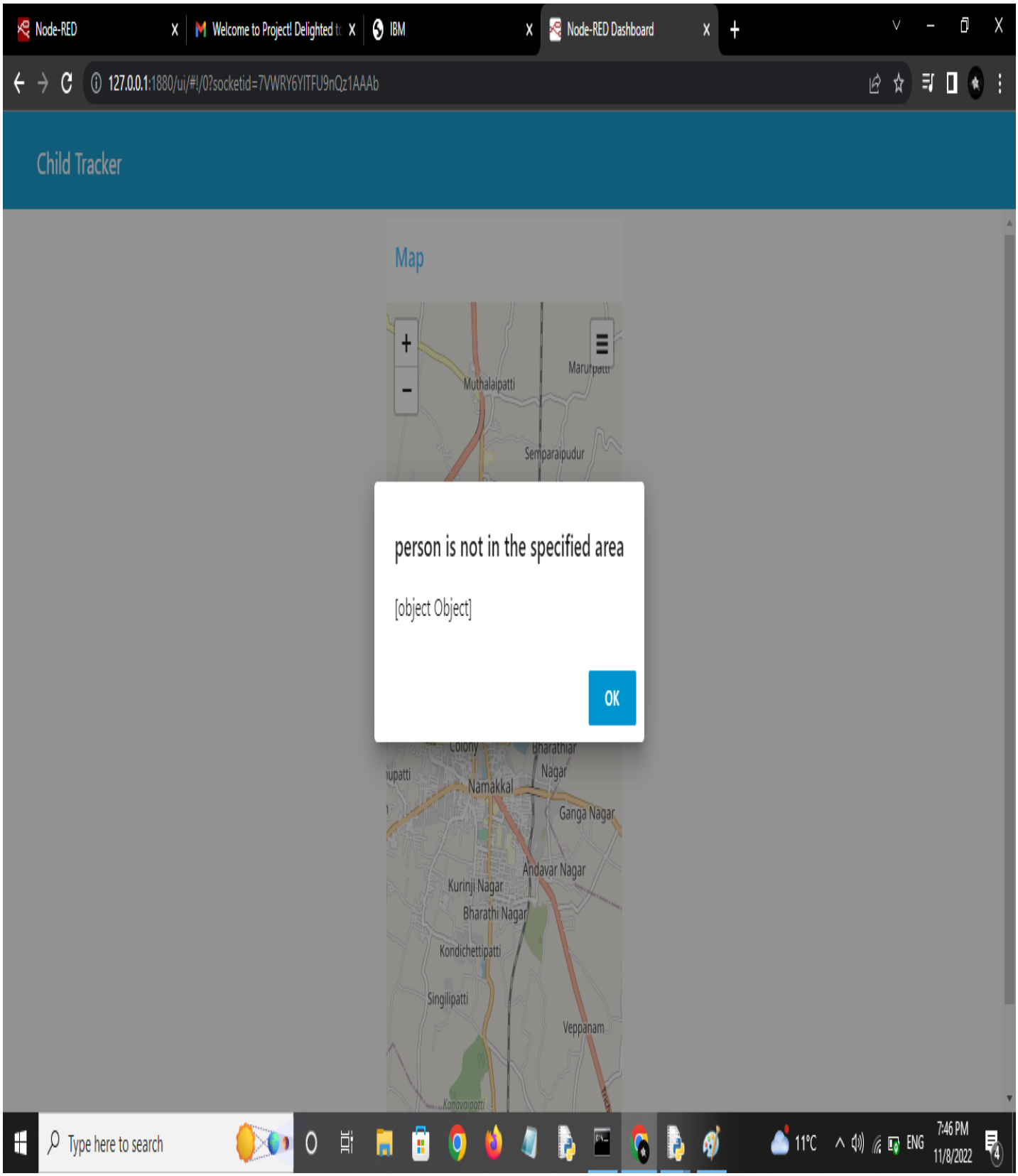
IN AREA WEB UI:



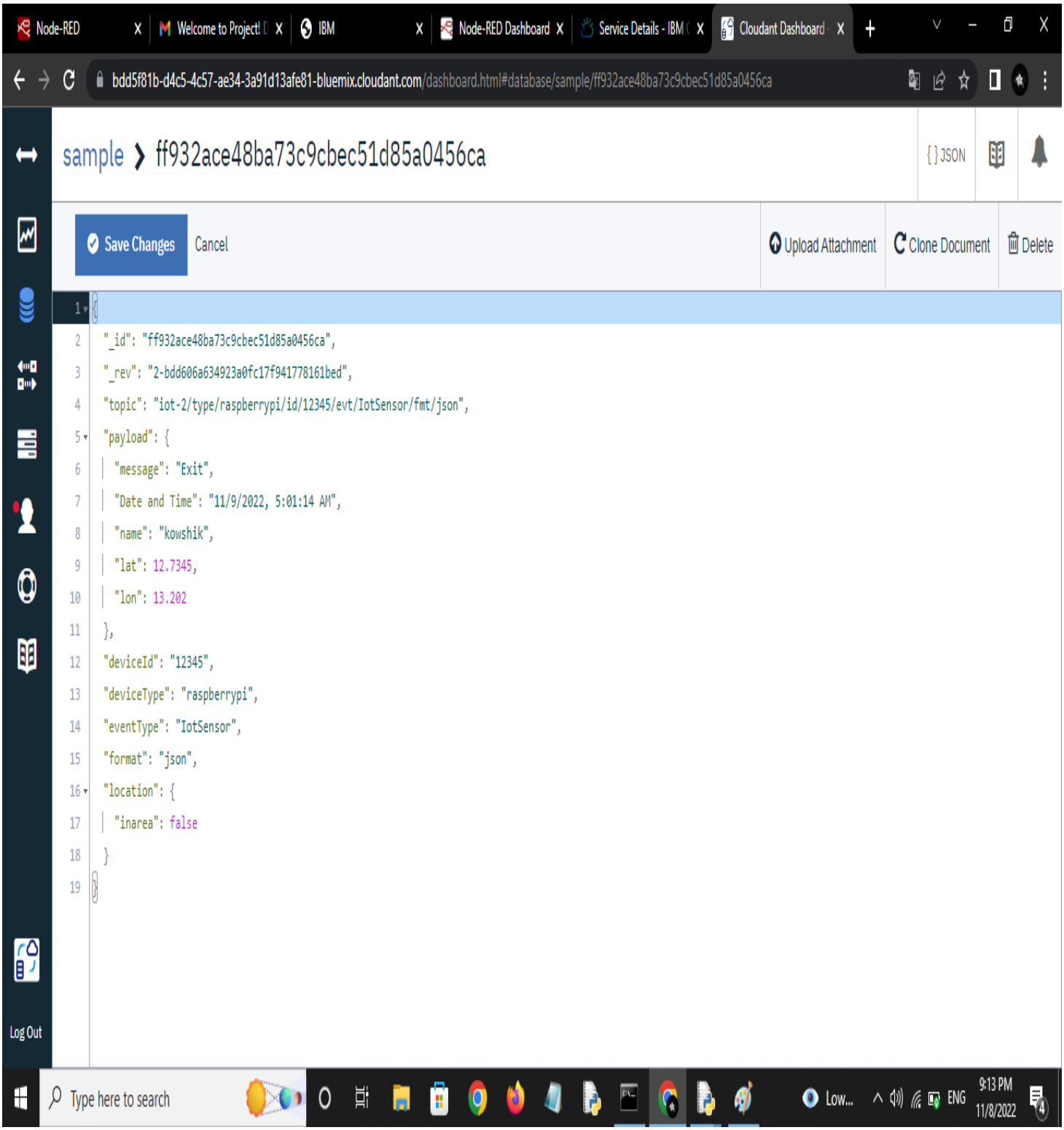
Node – RED OUT AREA OUTPUT:



OUT AREA WEB UI:



STORED DATA IN CLOUDANT DB:



9.ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Gives exact location of child where him or his has gone or are going
- Quick and Reliable output
- Parents do not need to worry about condition of their childrens

DISADVANTAGES:

- Requires internet connection

10. CONCLUSION

The word Future resembles the word Children. As Dr. A.P.J Abdul Kalam's words "Youngsters are thefuture pillars of one's nation", today's children are tomorrow's youngsters, preserving their dreams andlife for a better future is necessary. Therefore, each and every parent should take care of their ownchildren, without letting them to fall into the dark world of abusements, which entirely ruin themphysically, mentally and emotionally destroying our future. Hence, considering the importance of ourfuture, our project makes it easy for parents to track their children and to visually monitor them onregular basis, which makes them ensure the safety of their children and reduces the rate of incidents of child abuse.

11 . FUTURE SCOPE

In our system, we automatically monitor the child in real time using Internet of Things, with the helpof 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 tomonitor when there occurs any hindrance to satellite communication or any network issue. There alsooccurs 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.

12.APPENDIX

SOURCE CODE

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

organization="mkgfko"
deviceType="raspberrypi"
deviceId="12345"
authMethod="token"
authToken="12345678"

try:
deviceOptions={"org":organization,"type":deviceType,"id":deviceId,"authmethod":authMethod,"authtoken":
authToken}
deviceCli=ibmiotf.device.Client(deviceOptions)
except Exception as e:
   print("caught exception connecting device:%s" % str(e))
   sys.exit()

deviceCli.connect()
while True:
        #in data
        name="kowshik"
        lattitude=11.229592;
        longtitude=  78.171158;
        #out data
        #lattitude=11.664325;
        #longtitude=78.146011;

        data={'lat':lattitude,'lon':longtitude,'name':name}
        def myOnPublishCallback():
          print("publishedlattitude=%d"%lattitude,"longtitude=%d"%longtitude,"to ibm watson")

success=deviceCli.publishEvent("IotSensor","json",data,qos=0,on_publish=myOnPublishCallback)
        if not success:
           print("Not connected to IoTF")
        time.sleep(3)
deviceCli.disconnect()
```

GITHUB LINK: https://github.com/IBM-EPBL/IBM-Project-46371-1660746244

DEMO LINK: https://github.com/IBM-EPBL/IBM-Project-46371-1660746244/blob/main/Final%20Deliverables/ibm%20project%20demo%20video/IBM%20DEMO%20VIDEO.mp4