

IoT Based Safety Gadget for Child Safety Monitoring and Notification

PROJECT REPORT

Submitted By

Team ID : PNT2022TMID21372

Team Leader : KAURI SHEETAL P (917719D038),

Team Member : HARIPPRIYADHARSHINI J (917719D027),

Team Member : HARSHAVARDHINI C (917719D029),

Team Member : HITHAYATHUN NIHMA J (917719D033).

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1. INTRODUCTION:

1.1 Project Overview:

The internet of things (IoT) refers to the set of devices and systems that stay interconnected with real-world sensors and to the internet. For years' Child safety has been under threat and it is very important to provide a technology-based solution which will help them under panic situations and monitor them using a smart gadget. It is observed that more families are now spending time on work and social duties, resulting in a lack of interaction with their children. This causes increased concerns towards their safety and whereabouts which has made keeping a track of their activities quite challenging. the proposed system must alert the parents when the child walks too far away and/or outside the geofence in their absence. In today's world, children are the most precious resources as they are imminent of the country. The parents always look forward to having their children in a safeguarded place where they can make their time without any complications. Unluckily children are threatened. The violation has been growing increasingly. The security of children is unsafe. During children's transit to and from the school, there are many miserable cases observed in the media. Due to the absence of preventative considerations children seem to be nowhere to be found and later end up in trouble. During the transit of the children to and from school, and playing outside parents are anxious. Therefore, in current days, the security issue of children is to be given supreme significance. This Child Monitoring system helps monitor or track the child and their activities .

1.2 Purpose:

The purpose of the proposed solution is to periodically track the kid's location and update the same to the parent whenever the child crosses the geofence area. The aim of this system is to develop a Tracking system which provides the details of entry and exit of the child from geofence. The proposed system provides a facility to track the exact location of the child using the smart gadget thereby sending notification to the parent when the child exits the geofence. This system helps the parents to track their child which inturn guarantees much needed peace of mind. This system plays an important role. It tracks whether the children are safe. Some prominent features of this system are Geo-fencing, Long battery life, Real-Time Tracking.

2.LITERATURE SURVEY:

2.1 Existing problem:

The solutions that are available in the market today are not able to address all the issues in one device. There are a few ways that the existing solutions work. First, with the use of a smartphone. This method might seem handy, but providing a young child with a smartphone in hand is not an ideal case, counter to the monetary investment for the phone, and the additional responsibility that the child has to take to handle and take care of the phone. This makes it a less feasible solution. The other way is via smartwatches that a child wears on the wrist. This may seem like an ideal solution, but the problem with this arises when the kidnapper is aware of such a device, and immediately removes the device from the child's wrist and destroys it. With the proposed solution, we make a discreet-looking device that doesn't look like a tracking device but is always with the child. Because of the way it looks, it does not distract the child, and with its small size.

2.2 Reference:

Paper-1:

NAME OF PAPER: Application of machine learning and IoT to enable child safety at home environment.

NAME OF AUTHOR: V. Shenbagalakshmi , T. Jaya

JOURNAL PUBLISHED: The Journal of Supercomputing, Volume 78, Issue 8 MONTH AND

YEAR PUBLISHED: January 2022

OBJECTIVE OF THE PROJECT:

Safety of children is of utmost importance in any home environment. IoT when combined with machine learning is found to offer tremendous benefits in creating smart and safe homes to the society. The aim of this research is to apply machine learning models, in order to detect the anomaly on the dataset gathered from three IoT devices. The environmental parameters for which the anomaly is detected are smoke emission, light illumination, LPG gas emission, CO emission, motion detection, humidity changes and temperature-level changes. The research makes use of three machine learning models namely K-Means clustering, Isolation Forest and Interquartile Range to detect anomalies. In addition to that, it also uses Facebook Prophet Model to predict the daily trends in the data predicted by the three models. The evaluation of performance shows that

the accuracy of predicting anomaly is greater for the Interquartile range model when compared with that of the remaining two machine learning models. The accuracy obtained by the IQR model is 99% whereas the models K-means and Isolation Forest render an accuracy of 94% each. The study also provides a scheme of hardware as a part of the future work that could be implemented in order to implement child safety in a better way in the near future.

Paper-2:

NAME OF PAPER: IoT-based Child Security Monitoring System

NAME OF AUTHOR: Lai Yi Heng, Intan Farahana Binti Kamsin

JOURNAL PUBLISHED: 3rd International Conference on Integrated Intelligent Computing Communication & Security (ICIIC 2021)

MONTH AND YEAR PUBLISHED: January 2021

OBJECTIVE OF THE PROJECT:

The crime rate associated with children keeps increasing due to which draws people's' attention regarding child safety. This research is conducted to propose a child security smart band utilizing IoT technology. Online questionnaire and semi-structured interview are methodologies used to collect data. The online questionnaire gains feedbacks by sending questions electronically, where answers need to be submitted online. In the semi structured interview, researcher meets and asks respondents some predetermined questions while other being asked are not planned in advanced. Through information obtained, a smart band have been proposed to monitor the safety of children. By this, parents know what is happening remotely and can take actions if something goes wrong. The future improvements of this device will be adding functions and software to make it works like a phone such as messaging, gallery, Google, YouTube, meanwhile, adding more child security features so that child safety is guaranteed.

Paper-3:

NAME OF PAPER: IoT-Enabled Smart Child Safety Digital System Architecture

NAME OF AUTHOR: Madhuri Madhuri; Asif Qumer Gill; Habib Ullah Khan

JOURNAL PUBLISHED: 2020 IEEE 14th International Conference on Semantic Computing (ICSC) **MONTH AND YEAR PUBLISHED:** February 2020

OBJECTIVE OF THE PROJECT:

Safety of a child in a large public event is a major concern for event organizers and parents. This paper addresses this important concern and proposes an architecture model of the IoT-enabled smart child safety tracking digital system. This IoT-enabled digital system architecture integrates the Cloud, Mobile and GPS technology to precisely locate the geographical location of a child on an event map. The proposed architecture model describes the people, information, process, and technology architecture elements, and their relationships for the complex IoT-enabled smart child safety tracking digital system. The proposed architecture model can be used as a reference or guide to assist in the safe architecture driven development of the various child tracking digital systems for different public events.

Paper-4:

NAME OF PAPER: iBaby: A Mobile Children Monitoring and Finding System with Stranger Holding Detection Based on IoT Technologies

NAME OF AUTHOR: Lien-Wu Chen, Tsung-Ping Chen, Chia-Chun Weng

JOURNAL PUBLISHED: The ACM SIGCOMM 2019 Conference Posters and Demos

MONTH AND YEAR PUBLISHED: August 2019

OBJECTIVE OF THE PROJECT:

This paper designs and implements a mobile children monitoring and finding system, called iBaby, using wearable devices and nearby smartphones to detect unexpected holding and find missing children through Internet of Things (IoT) technologies, respectively. In the monitoring mode, the iBaby system can prevent young children from taking away by strangers/people with bad intentions. In the finding mode, the iBaby system can cooperatively find missing children equipped with hand wearable devices consisting of the mobile iBeacon and 3-axis accelerometer through crowdsourced sensing networks formed by smartphone users with outdoor GPS and indoor IoT localization. To accurately detect stranger holding behaviors, multi-feature based, artificial neural

network based, and convolutional neural network based posture recognition methods are designed to improve recognition success rates of iBaby as much as possible. In particular, an iOS-based prototype with Arduino wearable devices and static iBeacon nodes is implemented to verify the feasibility and correctness of our iBaby system.

Paper-5:

NAME OF PAPER: Smart IOT Device for Child Safety and Tracking

NAME OF AUTHOR: M Nandini Priyanka, S Murugan, KNH Srinivas, TDS Sarveswararao, E Kusuma Kumari.

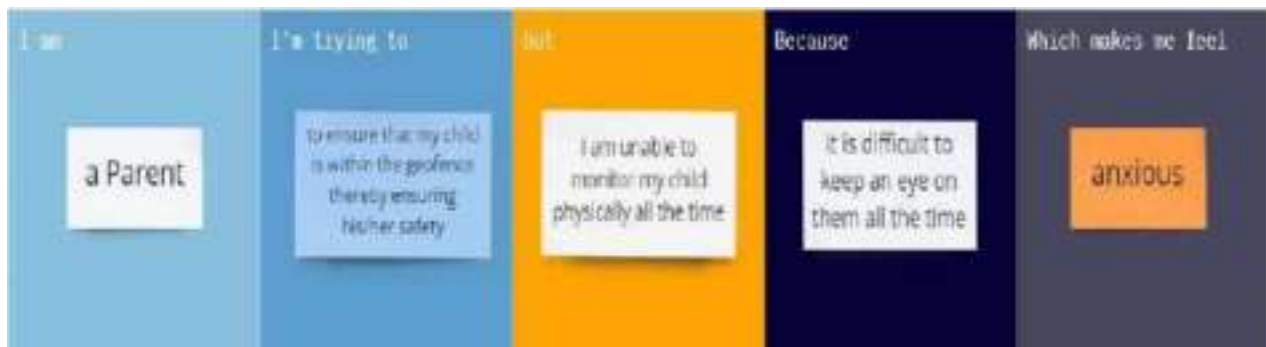
JOURNAL PUBLISHED: International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8

MONTH AND YEAR PUBLISHED: 8 June, 2019

OBJECTIVE OF THE PROJECT:

Child safety and tracking is a major concern as the number of crimes on children are reported nowadays. With this motivation, a smart IoT device for child safety and tracking is developed to help the parents to locate and monitor their children. The system is developed using LinkIt ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. The novelty of the work is that the system automatically alerts the parent/caretaker by sending SMS, when immediate attention is required for the child during an emergency. The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis and results are plotted for the same. The above system ensures the safety and tracking of children.

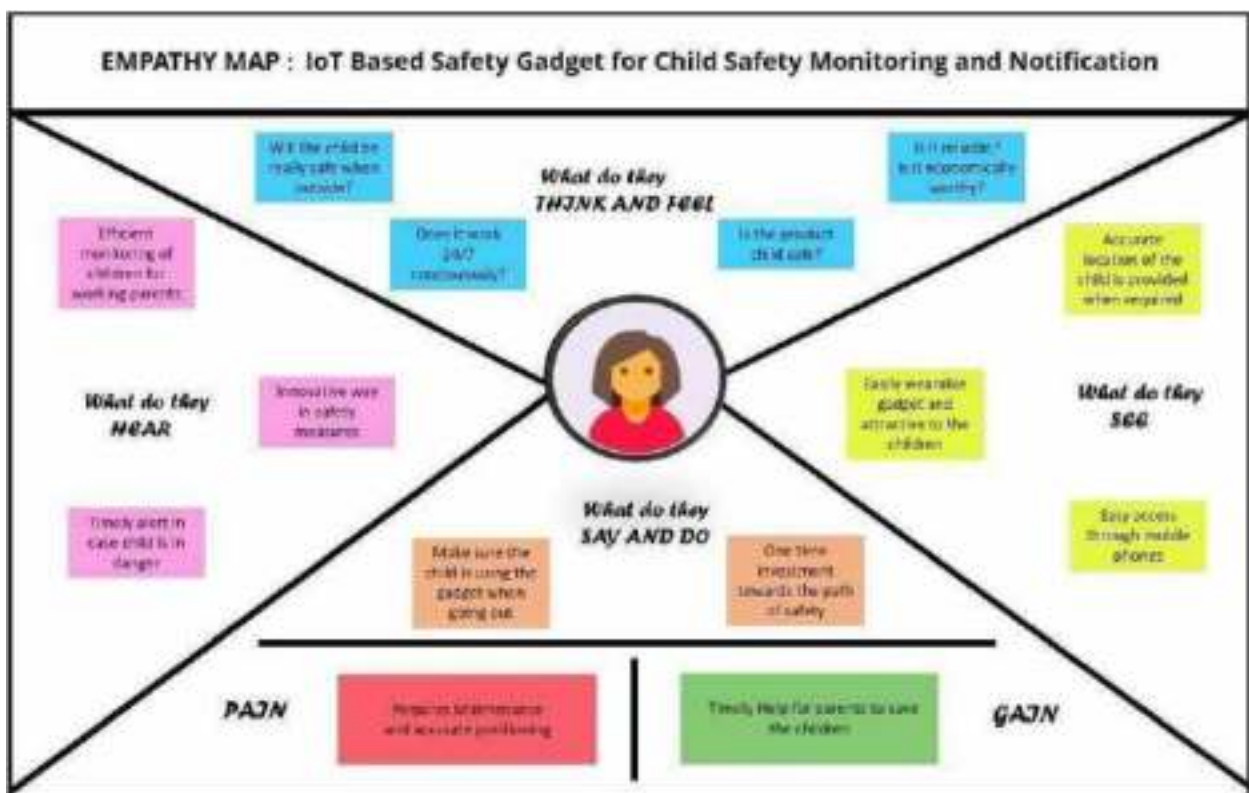
2.3 Problem Statement Definition:



3.IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges..



3.2 Ideation & Brainstorming:

Step-1: Team Gathering ,Collaboration and Select the Problem statement:

We have followed the first step of brainstorming ,we have discussed as a team to decide a problem statement,

As per the guideline the following is done

- 1.Team Gathering
- 2.Collaboration
- 3.Deciding the problem statement

2.3 Problem Statement Definition:



PROBLEM STATEMENT:

To create a smart wearable device for children that uses advanced technology to ensure their safety all the time.



Step-2: Brainstorm, Idea Listing and Grouping:

BRAINSTORMING:

TEAM MEMBER	MEMBERS OPNION	IDEAS
HARSHAVARDHINI	MAY GIV...	Collecting vital signs of the child like Blood Volume Pulse(BVP) Galvanic Skin Response (GSR) to help parents to monitor child. An abrupt change in this should trigger alert.
HARIPPRIYADHARSHINI	GOOD	Detecting locations using GPS and sending the information to parents using GSM.
HITHAYATHUN NIHMA	BEST	Detecting location using GPS and sending the information to parents through cloud services.
KAURI SHEETAL P	COSTLY	Application of Machine Learning and cameras to enable child safety by monitoring every movement.

BY GROUPING IDEAS:

- 1.We have planned to use GSP for detecting location and to sent the message parents we can use GSM or Cloud.
- 2.The location will be shared in application or as message to parents
- 3.The notification is also sent incase of emergencies


Step-3: Idea Prioritization:













1. Using location trackers like GPS in order to detect the location of the child.
2. The GPS are connected to IOT application in order to notify the parents
3. Use other sensors if required for the particular application such as temperature, heart beats etc.

3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A parent has to ensure the safety of his child from anywhere in case of need
2.	Idea / Solution description	<p>Three Steps:</p> <p>1.Location tracking 2.Mapping the coordinates 3.Send message to parents</p> <p>Step 1: generally requires a GPS module and the coordinates need to be updated periodically Here we are going to use an assumed longitude latitude location in python code</p> <p>Step 2: is done using world map node in NODE RED app facility in IBM Cloud that maps the coordinates on map as a pin location This location is also fed to geofence node that checks whether the location is within the radius or not</p> <p>Step 3: ensures message is shown if location is not inside geofence area</p> <p>For real world application GPS module can be given to children in form of watch or any other sophisticated gadget</p>

3.	Novelty / Uniqueness	Parents will receive accurate location anytime anywhere (they will know if the child is in the geofence or not)
4.	Social Impact / Customer Satisfaction	Child Safety will be within reach for the parents. Gadget will be childsafe and environment friendly
5.	Business Model (Revenue Model)	<p>Technical Architecture:</p>  <p>The diagram illustrates the technical architecture. It starts with an 'IoT Device' (represented by a blue icon with four dots) connected to a 'Cloud Services' box. Inside the 'Cloud Services' box, the flow goes through 'IoT Platform (OT/IT/OT)', 'IoT Gateway', 'IoT Hub', and 'IoT Analytics'. Below the 'IoT Gateway' and 'IoT Hub' are icons for 'Device' and 'Cloud DB'. The final output is 'Data' (represented by a yellow icon with a dollar sign).</p>
6.	Scalability of the Solution	Requires proper internet connection for working with cloud

3.4 Problem Solution fit:

Define CS, TR, PM, CC	1. CUSTOMER SEGMENT(S)  <p>Parents of children who are office going or busy and desperately need to take care of the kid despite their absence are the customers of this project</p>	6. CUSTOMER CONSTRAINTS  <ul style="list-style-type: none"> • Network connection • Cost of the gadget • Power maintenance • Knowledge required to use the technology built 	5. AVAILABLE SOLUTIONS  <ul style="list-style-type: none"> • Network connection is the basic requirement as it is an IoT project instead GSM can also be used to send message without using internet • Power maintenance requires use of cell batteries similar to other home appliances setup • To develop knowledge about project a well detailed manual or demonstration can be done 	Explore AS, differentiate
Focus on AS, TR, PM, CC, understand PM	2. JOBS-TO-BE-DONE / PROBLEMS  <p>Three jobs to do 1.Child - Location tracking 2.Mapping the coordinates 3.Send the location to parents</p>	9. PROBLEM ROOT CAUSE  <p>Ensure safety of the child. Children being naughty in nature might require immediate medical help or in case child lost the way back home For such scenario it is important for parents to check on their kid from time to time</p>	7. BEHAVIOUR  <p>Parents must choose products where the GPS location of the child is shared to their devices other features like vital signs, alert messages can also be added with respect to scalability and feasibility</p>	Focus on AS, TR, PM, CC, understand PM
Identify strong TR & PM	3. TRIGGERS  <p>The necessity to ensure children are safe</p> <hr/> 4. EMOTIONS: BEFORE / AFTER  <p>BEFORE :Anxiety No idea about the status of the child AFTER : Relief After knowing about the location of the child</p>	10. YOUR SOLUTION  <p>1.Location tracking by GPS module 2.Mapping coordinates using websites that decodes the location 3.Use cloud services to provide the above information to the parents</p>	8. CHANNELS of BEHAVIOUR  <p>8.1 ONLINE Parents use internet to connect to the cloud to see location of the child so being online is a crucial step</p> <p>8.2 OFFLINE Parents must ensure that the child is wearing the gadget regularly for optimized monitoring</p>	TR & PM, Focus on PM

4. REQUIREMENT ANALYSIS

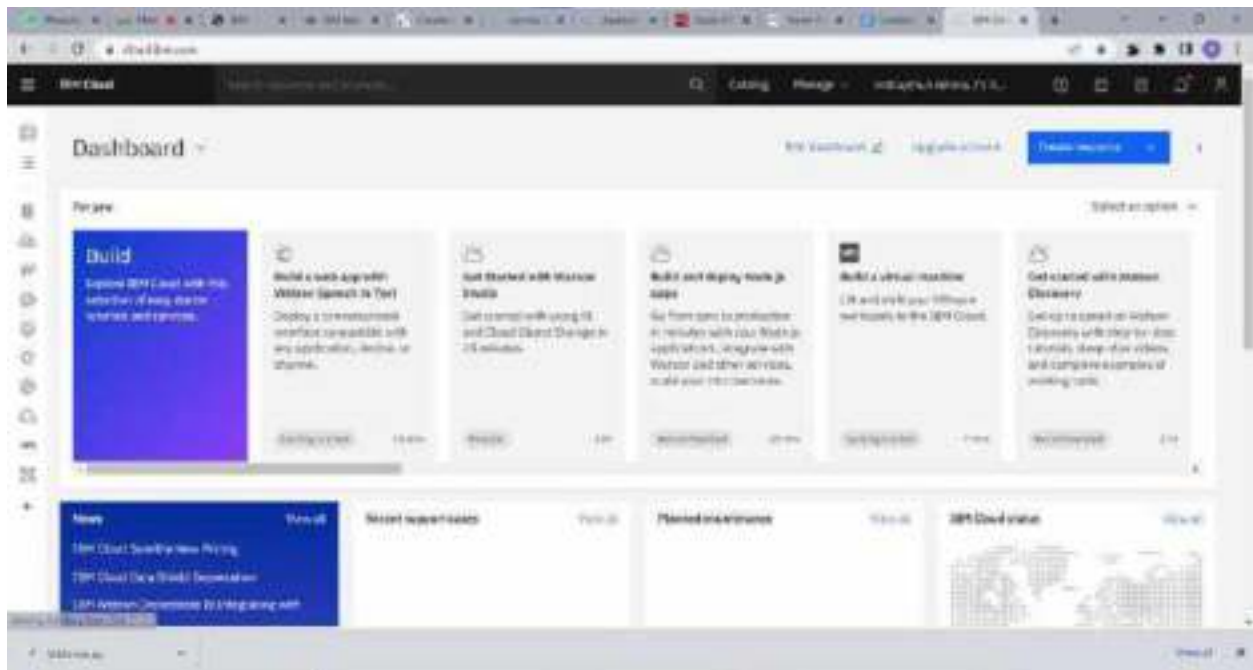
4.1 Functional requirement

Following are the functional requirements of the proposed solution

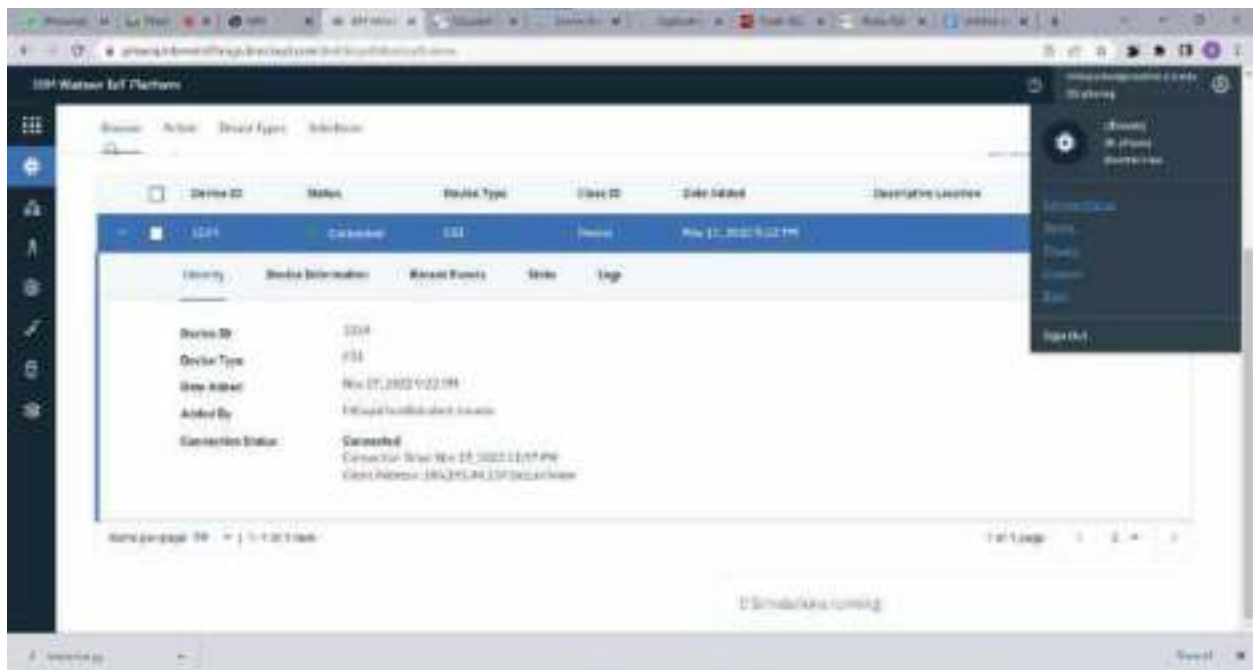
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through Number
FR-2	User Confirmation	Confirmation via Email and OTP
FR-3	User Login	login through User Id and Password
FR-4	Network Connectivity	via wifi/mobile data Internet connection with at least 10 to 20 kbps
FR-5	IBM IoT Platform	Access cloud storage via internet and it gives coordinates
FR-6	Node-RED	World Map node- Coordinates are converted into map location. Geofence - ensures the child is within the geofence
FR-7	Fast2sms	used to send pop up messages.

1. Proper network facility is required to import and export tracking information of the child's location to and from the IBM cloud and Cloudant database
2. The Python Script developed should be running all the time in order to detect the inarea and out area location of the child which will be sent to the IBM cloud and pass through several functions and from which the result will be shown in the World Map node.
3. Since the Python code keeps on running the data keeps on updating in the IBM cloud which leads to increase in power consumption and also we need a reset option to clear data in cloudant whenever not in use.
4. The fast2sms connection should be ensured in order to send sms to the respective parent whenever the child crosses the geofence area.

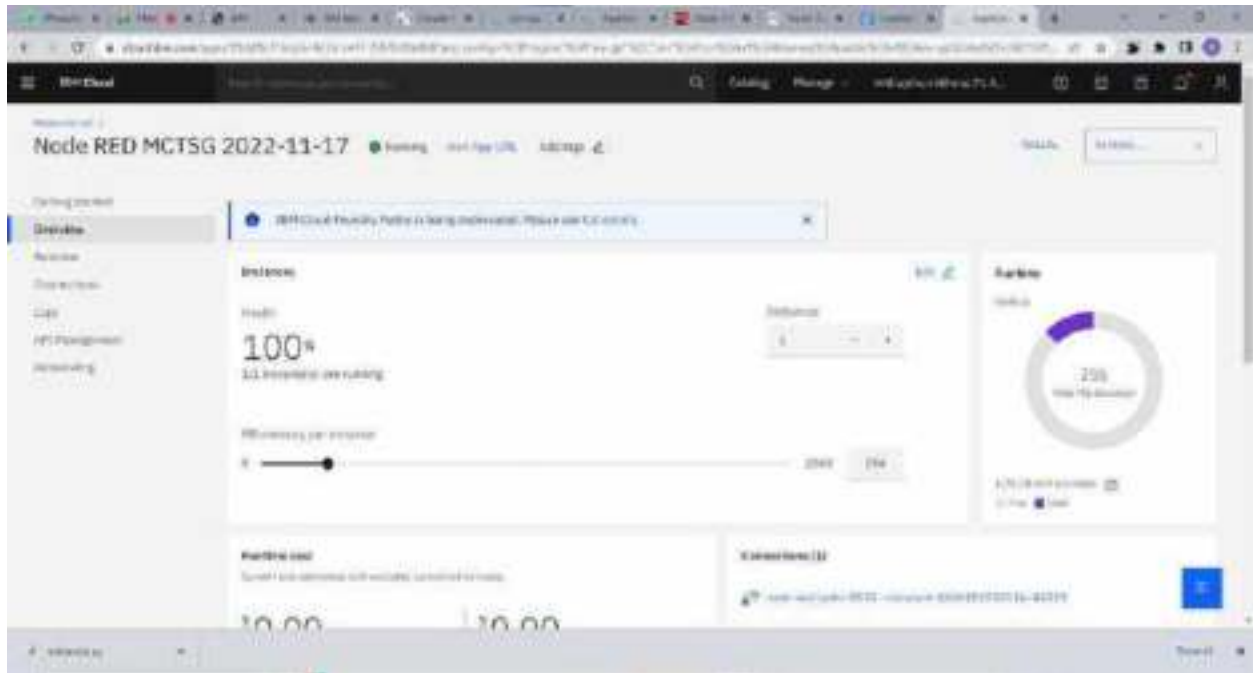
IBM CLOUD:



IBM IoT Platform: (Device Creation)



NODERED:



CLOUDANT DATABASE:

The screenshot shows the IBM Cloud Cloudant Databases page. A sidebar on the left contains navigation links for Monitoring, Databases, Replicate, Active Tasks, Account, Support, and Documentation. The main area is titled "Databases" and displays a table of existing databases.

Name	Size	Full Size	Full Size	Actions
university	20 bytes	3	No	[Icons]
university-2022-11-17	203.40	4	No	[Icons]
university	203.40	4	No	[Icons]

At the bottom of the table, it indicates "Showing 3 of 3 databases" and "Databases per page: 10".

4.2 Non-Functional requirement

Following are the non functional requirements of proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	It can easily track and monitor the location of the child and share the information to parents
NFR-2	Security	The cloud database is highly secured and it prevent data from hacking issues
NFR-3	Reliability	Safety of the children is assured all the time.
NFR-4	Performance	Monitoring the child whether he/she is within the geofence
NFR-5	Availability	To check the presence of child within the geofence area
NFR-6	Scalability	It can be adapted to both local and also larger areas based on the customer preference.

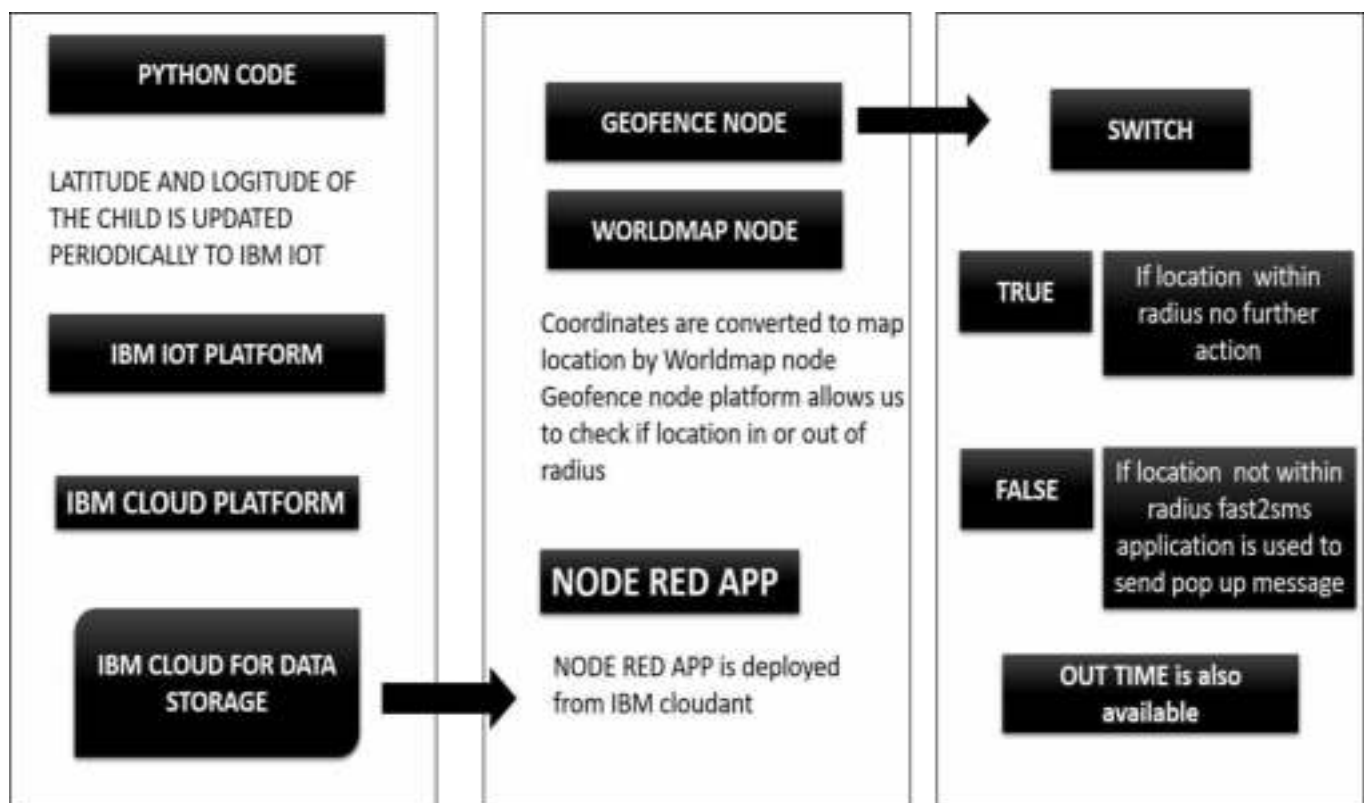
- 1.The child should wear the tracking gadget all time so that the location information is updated periodically.
 - 2.The parent should have access to fast2sms api inorder to get location information of the child.
 - 3.The gadget should consume less power and it should have long battery life.
- Incase of losing the gadget by playfulness of children is a drawback that cannot be technically met.
- 4.To overcome this a backup device can be used without the knowledge of the child.GPS Module should be placed in the gadget to get the latitude and longitude details of the child.

5.PROJECT DESIGN:

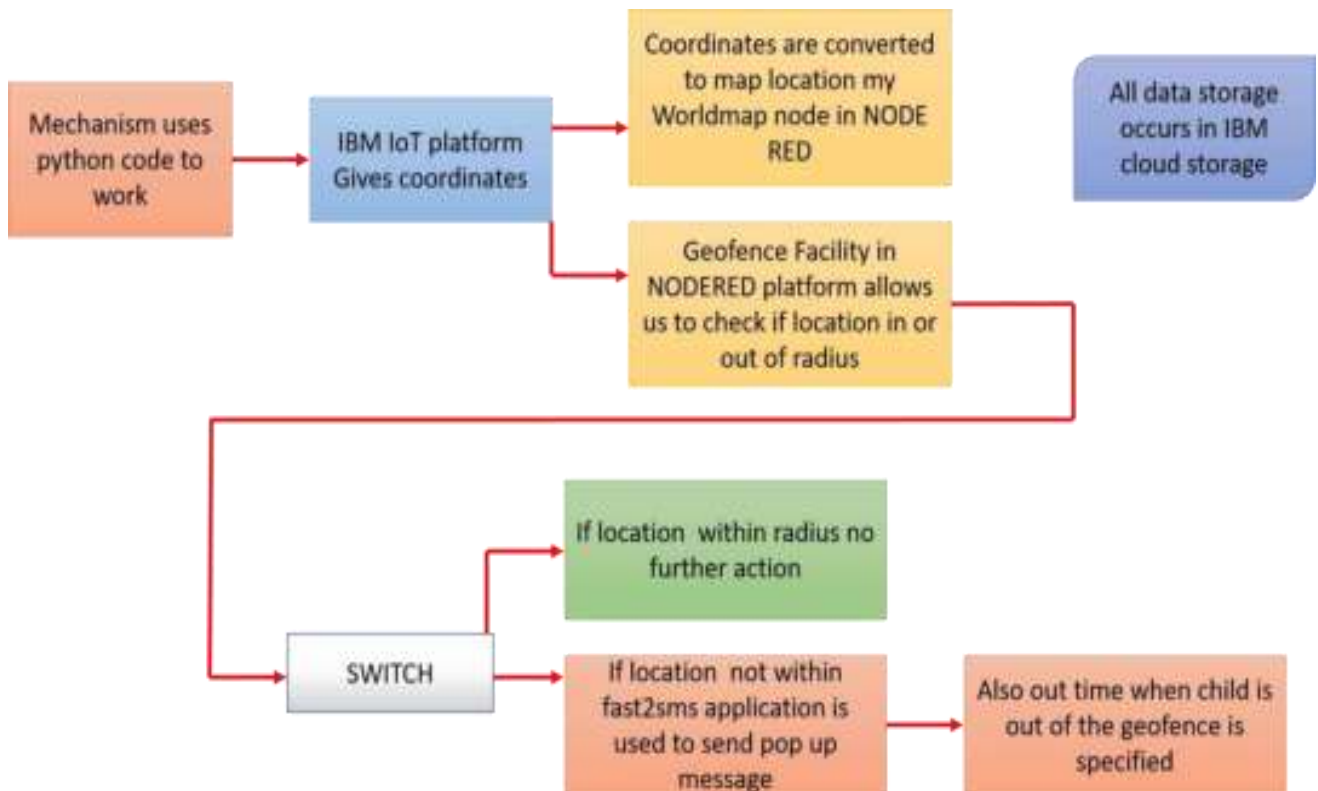
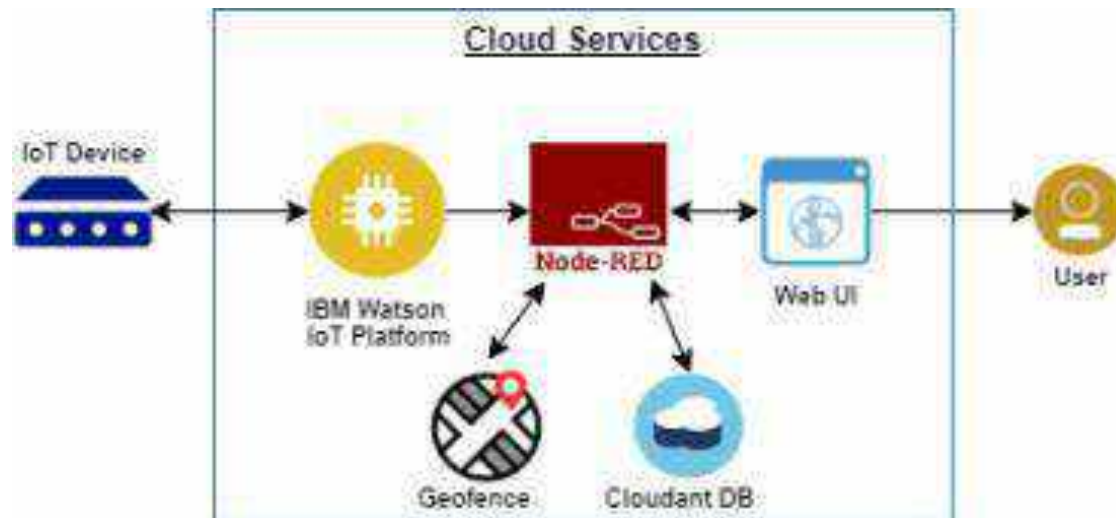
5.1 Data Flow Diagrams:

A data-flow diagram is a way of representing a flow of data through a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow — there are no decision rules and no loops

A data flow diagram (DFD) is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement. They are often elements of a formal methodology such as Structured Systems Analysis and Design Method (SSADM).



5.2 Solution & Technical Architecture:



5.3 User Stories:

In software development and product management, a user story is an informal, natural language description of features of a software system. They are written from the perspective of an end user or user of a system, and may be recorded on index cards, Post-it notes, or digitally in project management software.

In agile software development, user stories help articulate what value a product feature can bring and have a better understanding of why users want a certain functionality. It helps the product manager and development team shift their focus from writing about the software features to discussing the features

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	I am able to get location updates correctly	I can get location constraints	High	Sprint-1
		USN-2	As a user, I can register in the application correctly	I can perfectly get synced account details	Medium	Sprint-1
		USN-3	As a user, I can keep an eye on my child whether he /she is within the geofence.	Correct updates of child location	High	Sprint-4
		USN-4	As a user, I am able to get a warning message when my child crosses the geofence.	I can get notified when my child gets out of geofence area	High	Sprint-4
	Login	USN-5	As a user, I can log into the application by entering email & password	I can log into the application	High	Sprint-1
Customer (Web user)	Generating data	USN-6	Location of child checked periodically after some time.	Python code connected with IBM platform to do so	High	Sprint-2
		USN-7	Location details of the child is constantly updated online.	I can access information from web UI	High	Sprint-3
Customer Care Executive	Problem solving	USN-8	As an executive I am able to solve the problems of the users with the given instructions	Easy maintenance and problem solving	Medium	Sprint-3
Administrator	Administering the timely data	USN-9	As an admin I am able to get through the interface and administer the data functionality.	Easy administration when data is timely updated	High	Sprint-3

6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation

SPRINT	ISSUES TO BE DEALT WITH	FUNCTIONAL REQUIREMENT	STORY POINTS
SPRINT 1	Install python software from python.org	PYTHON COMPILER	10
	Create account in IBM platforms	IBM CLOUD IBM IOT IBM WATSON	10
SPRINT 2	Create device in IBM Watson and note down the credentials	IBM WATSON	10
	Develop python code to connect with IBM Watson to send location	PYTHON COMPILER IBM WATSON	10
SPRINT 3	Install needed libraries and connect required nodes in NODE RED	NODE RED	5
	Connect IBM Watson and IBM Cloudant with NODE RED	IBM CLOUDANT IBM WATSON NODE RED	5
	Type in an message so for all the nodes ... formatting all nodes in circuit with respect to their function	NODE RED IBM CLOUDANT IBM WATSON	10
	Debug and verify outputs for in area and out area location	NODE RED IBM WATSON IBM CLOUDANT	10
SPRINT 4	Location always updated in NODE RED	PYTHON COMPILER NODE RED IBM WATSON IBM CLOUDANT	5
	Show data during our area in NODE RED WEB UI	NODE RED DASHBOARD	7
	In area location specified in world map in NODE RED WEB UI	NODE RED DASHBOARD	7

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	I am able to get location updates correctly	10	High	Haripriyadharshini Harshavardhini
Sprint-1		USN-2	As a user, I can register in the application correctly	10	Medium	Hithayathun Nihma Kauri Sheetal
Sprint-2		USN-3	As a user, I can keep an eye on my child whether he /she is within the geofence.	10	High	Haripriyadharshini Hithayathun Nihma
Sprint-2		USN-4	As a user, I am able to get a warning message when my child crosses the geofence	10	High	Harshavardhini Kauri Sheetal
Sprint-3	Login	USN-5	As a user, I can log into the application by entering email & password	10	High	Haripriyadharshini Kauri Sheetal
Sprint-3	Generating data	USN-6	Location of child checked periodically after some time.	10	High	Harshavardhini Hithayathun Nihma
		USN-7	Location details of the child is constantly updated online.	10	High	Haripriyadharshini
Sprint-4	Problem solving	USN-8	As an executive I am able to solve the problems of the users with the given instructions	10	Medium	Kauri Sheetal
Sprint-4	Administering the timely data	USN-9	As an admin I am able to get through the interface and administer the data functionality	10	High	Harshavardhini Hithayathun Nihma Haripriyadharshini

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	06 Nov 2022	20	06 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

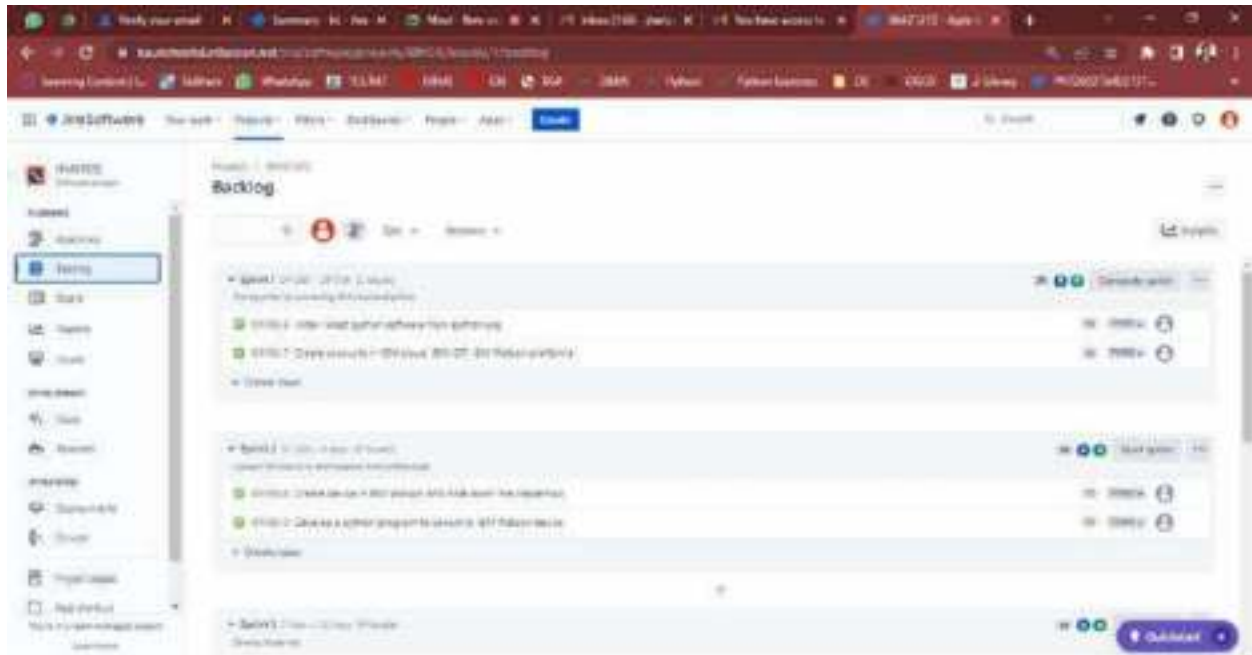
Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{\text{sprint duration}}{\text{velocity}} = \frac{20}{10} = 2$$

6.3 Reports from JIRA

Sprint Creation



Sprints:

The screenshot displays a Jira board with four sprints. Each sprint card includes a title, a description, and a list of tasks. The tasks are organized into columns: 'To Do', 'In Progress', 'Done', and 'Backlog'. The tasks are listed with their status, priority, and assignee.

Sprint 1: 24 Oct - 25 Oct (2 issues)
Preparation for connecting IBM cloud and python

- ISS-6: Install python software from python.org (18, 3000, [Assignee])
- ISS-7: Create accounts in IBM cloud, IBM IoT, IBM Watson platforms (18, 3000, [Assignee])

Sprint 2: 31 Oct - 1 Nov (2 issues)
Connect IBM cloud to Watson services from python code

- ISS-8: Create device in IBM Watson and note down the credentials (18, 3000, [Assignee])
- ISS-9: Develop a python program to connect to IBM Watson device (18, 3000, [Assignee])

Sprint 3: 7 Nov - 12 Nov (4 issues)
Develop Node-red

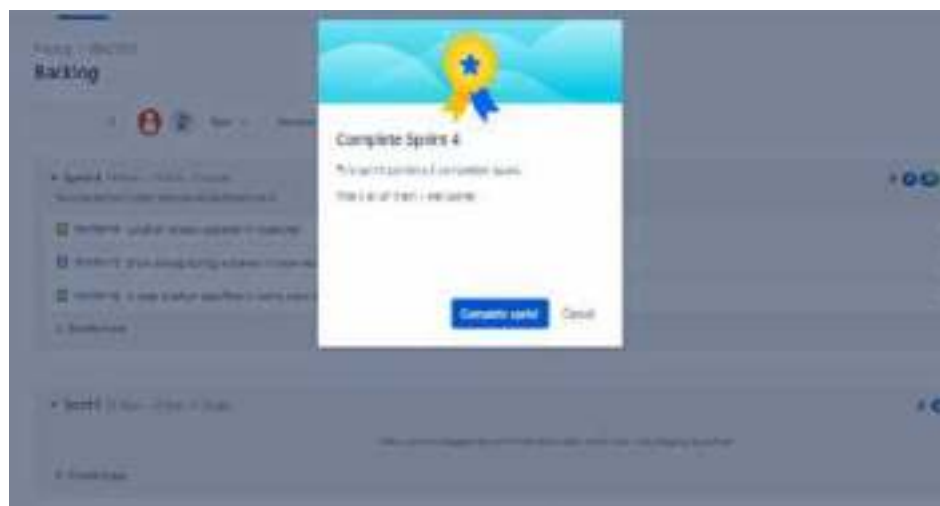
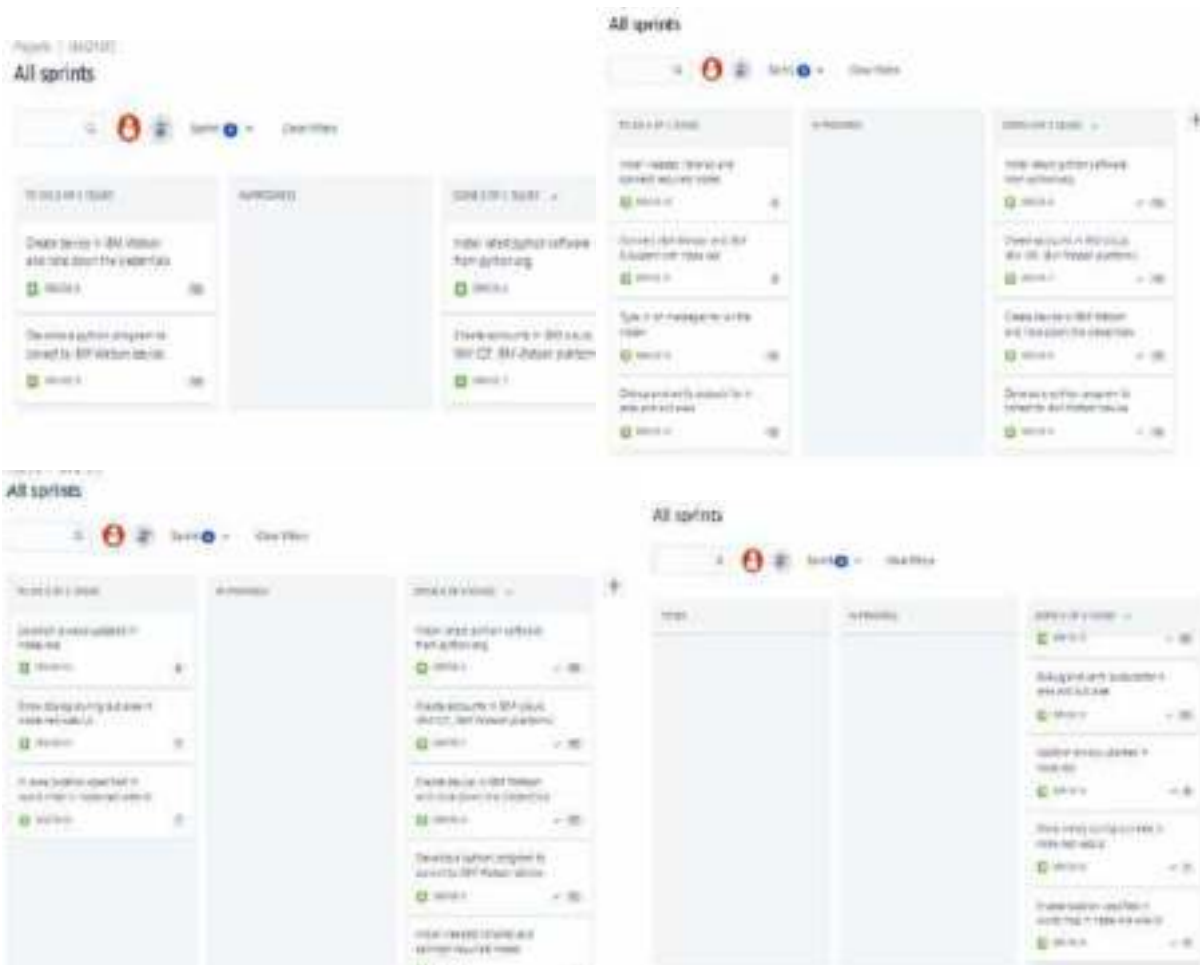
- ISS-10: Install needed libraries and connect required nodes (8, 3000, [Assignee])
- ISS-11: Connect IBM Watson and IBM Cloudant with node-red (8, 3000, [Assignee])
- ISS-12: Type in an message for all the nodes (10, 3000, [Assignee])
- ISS-13: Debug and verify outputs for in-aka and out-aka (10, 3000, [Assignee])

Sprint 4: 18 Nov - 19 Nov (3 issues)
Reviewing data a Cloudant polychorded database web UI

- ISS-14: Location always updated in node-red (8, 3000, [Assignee])
- ISS-15: Show if-else during out-aka in node-red web UI (8, 3000, [Assignee])
- ISS-16: In-aka location specified in word map in node-red web UI (8, 3000, [Assignee])

Sprint 1: 24 Oct - 25 Oct (2 issues)
Preparation for connecting IBM cloud and python

The bottom section shows a detailed view of the first sprint, with a list of tasks and their status, priority, and assignee.



Sprint Burndown Chart

A burndown chart shows the amount of work that has been completed in an epic or sprint, and the total work remaining. Burndown charts are used to predict your team's likelihood of completing their work in the time available. They're also great for keeping the team aware of any scope creep that occurs.



7.CODING AND SOLUTIONING

7.1 Feature 1 - PYTHON SCRIPT

Sprint 1 :

Develop a python script and connect it with IBM Watson device to send the location specified in code

Python code function is to constantly update the location of the child and provide the information to IBM IOT platform.

CODE

```
import time

import random

#import ibmiotf.application

import ibmiotf.device

import sys

config={

    "org":"phsvnq",

    "type" : "CS1",

    "id": "1234",

    "auth-method": "token",

    "auth-token": "123456789"

}

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 3.7.3 Shell
File Edit Shell Debug Console Window Help
Import libtorrent.pylibtorrent
api = libtorrent.device
apiport = 999

import json

def get_data():
    url = "http://api.libtorrent.org/v1/info/"
    headers = {"User-Agent": "libtorrent"}
    response = requests.get(url, headers=headers)
    data = response.json()
    return data

def save_data(data):
    with open("data.json", "w") as f:
        json.dump(data, f)

def load_data():
    with open("data.json", "r") as f:
        data = json.load(f)
    return data

def main():
    data = get_data()
    save_data(data)
    data = load_data()
    print(json.dumps(data, indent=2))

if __name__ == "__main__":
    main()
```


Out Area Location

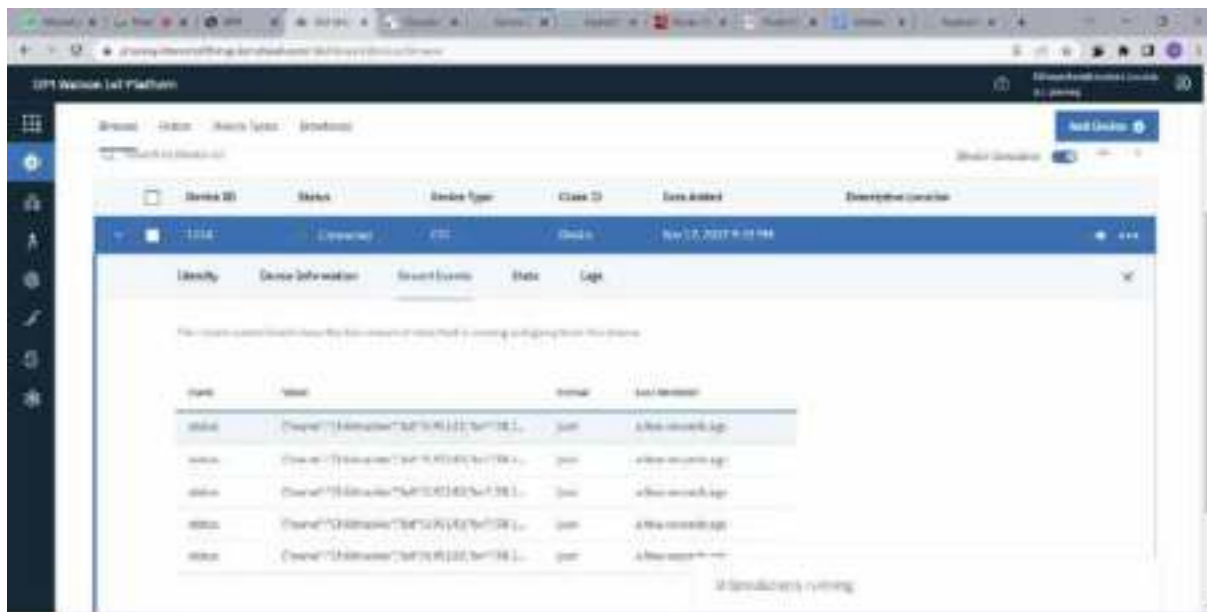
```
#!/usr/bin/perl -w
# Perl script to fetch the OpenVPN config file
# Author: [redacted]
# Date: [redacted]
# Version: 1.0
# Description: This script fetches the OpenVPN config file from the server and saves it to the local machine.

# Configuration
my $url = "http://[redacted]";
my $username = "[redacted]";
my $password = "[redacted]";
my $output = "[redacted]";

# Fetch the config file
my $response = LWP::Simple::get($url);
my $config = $response;

# Save the config file
open(FILE, ">$output");
print FILE $config;
close(FILE);
```

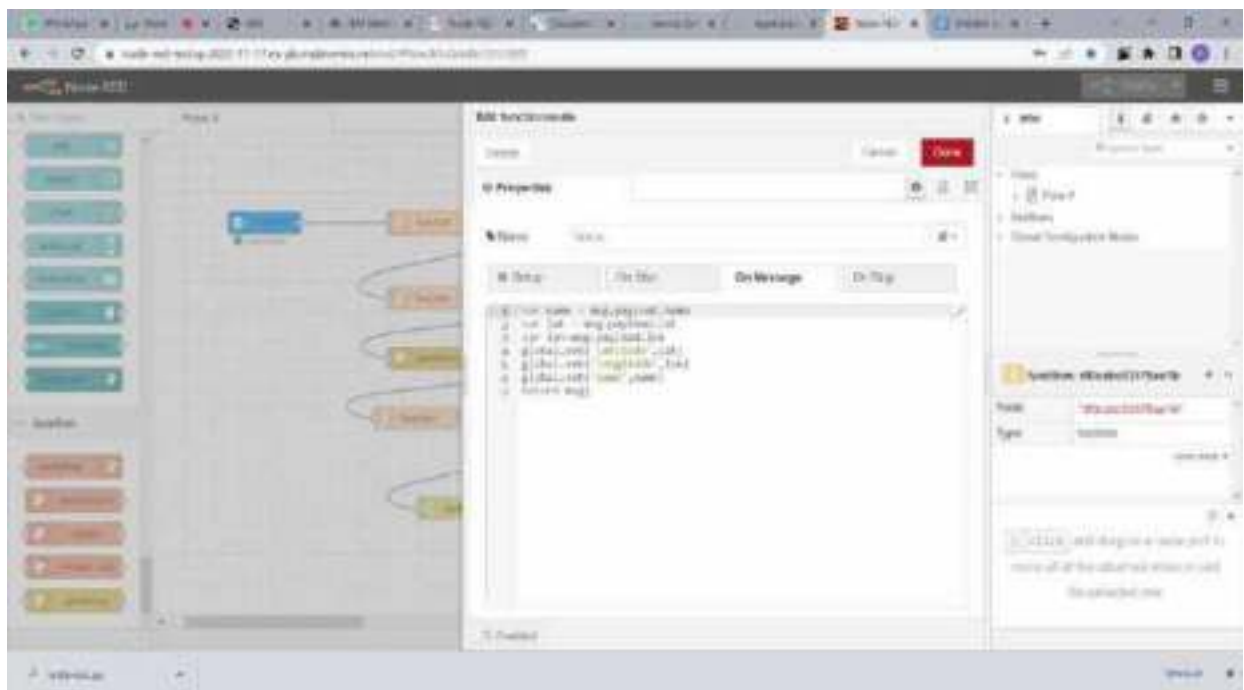
Connecting python code to IBM Watson device



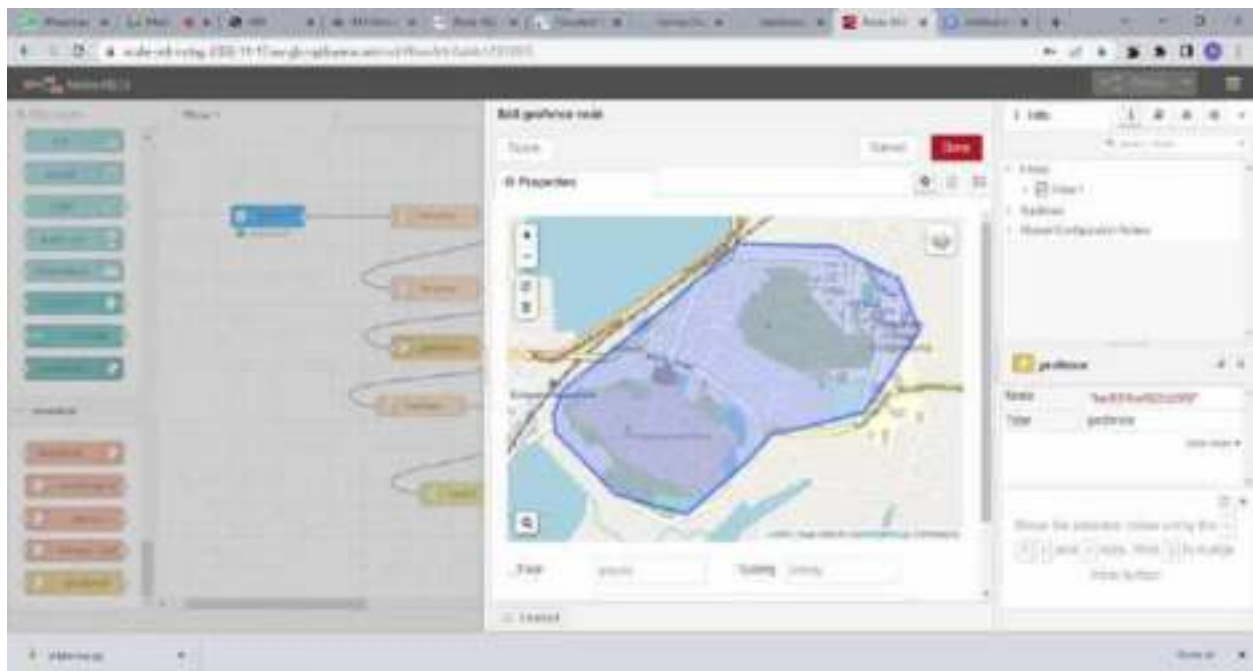
Additionally we need to configure and connect world map and IBM IOT with
NODE RED

IBM Iot:





Geofence node:



Worldmap node:



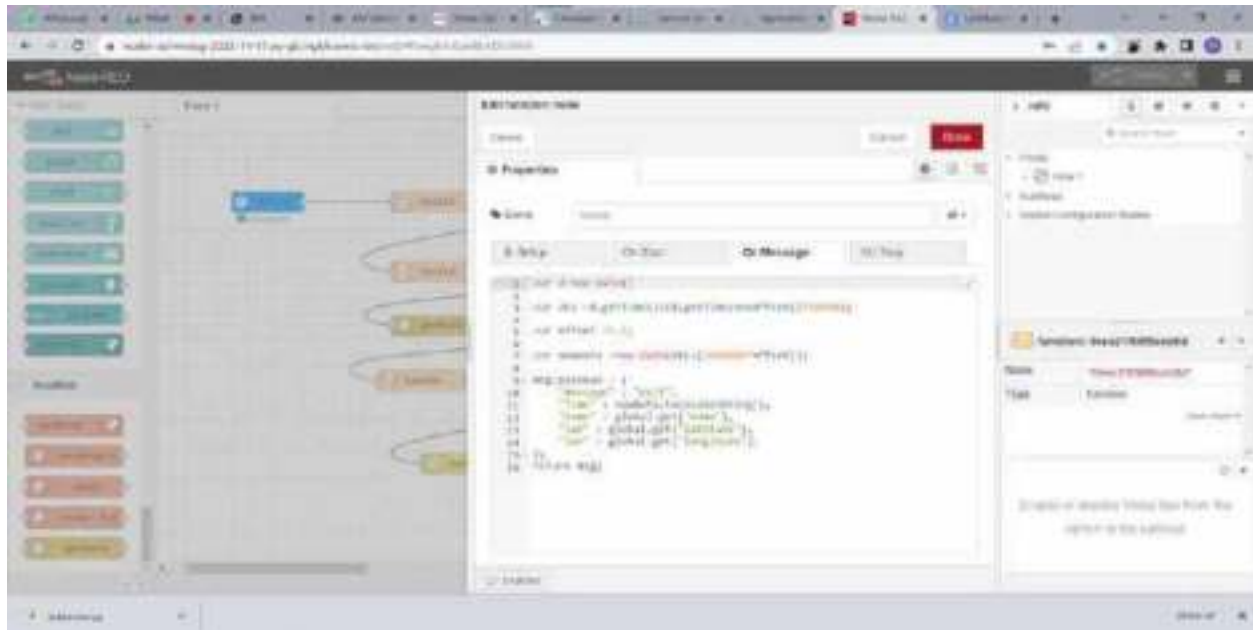
Filter node:



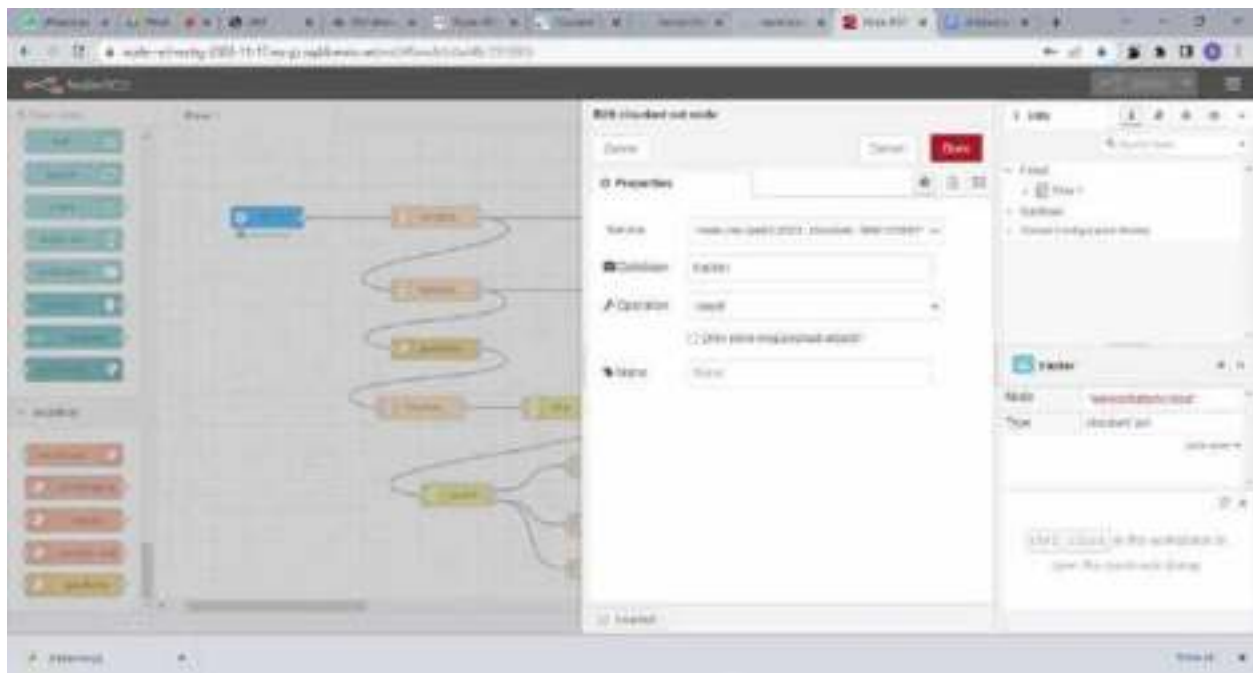
Switch node:



Function node:



Cloudant out node:



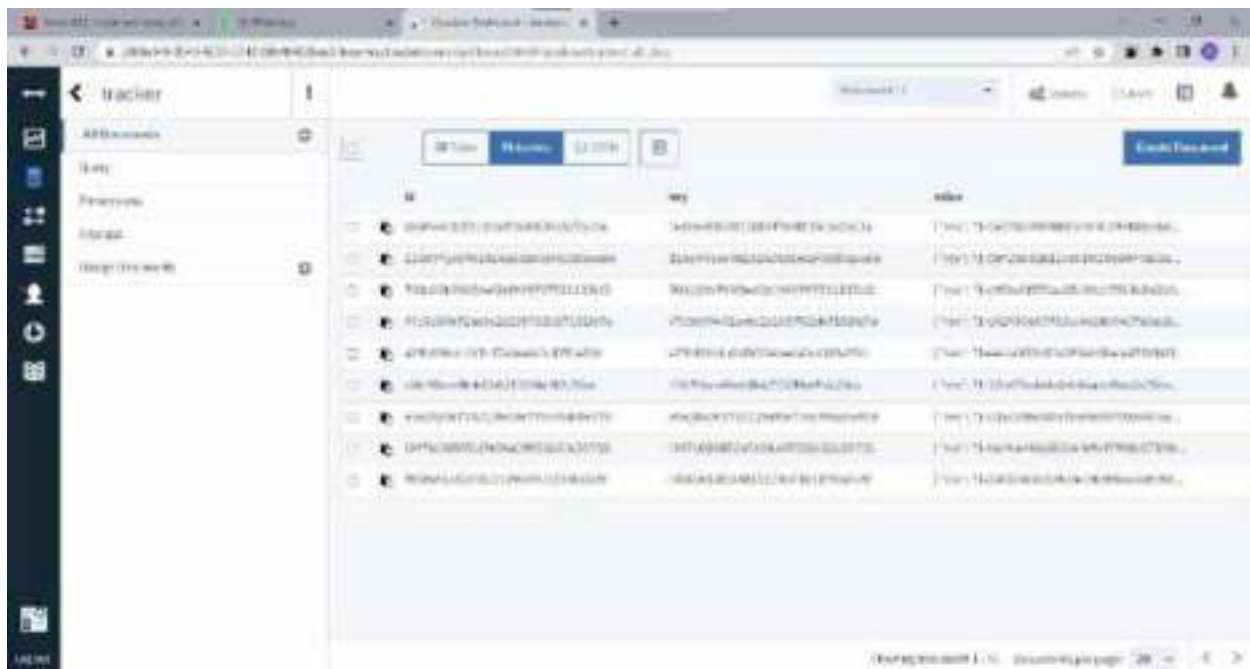
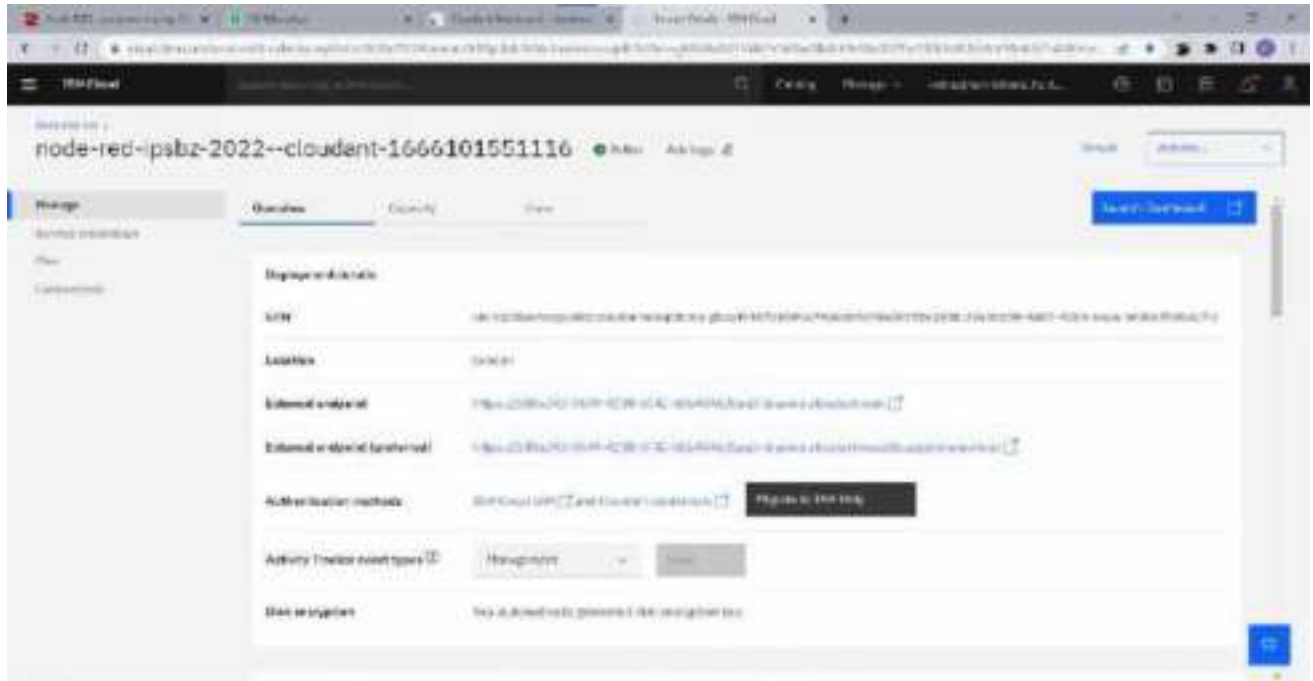
Debug node:

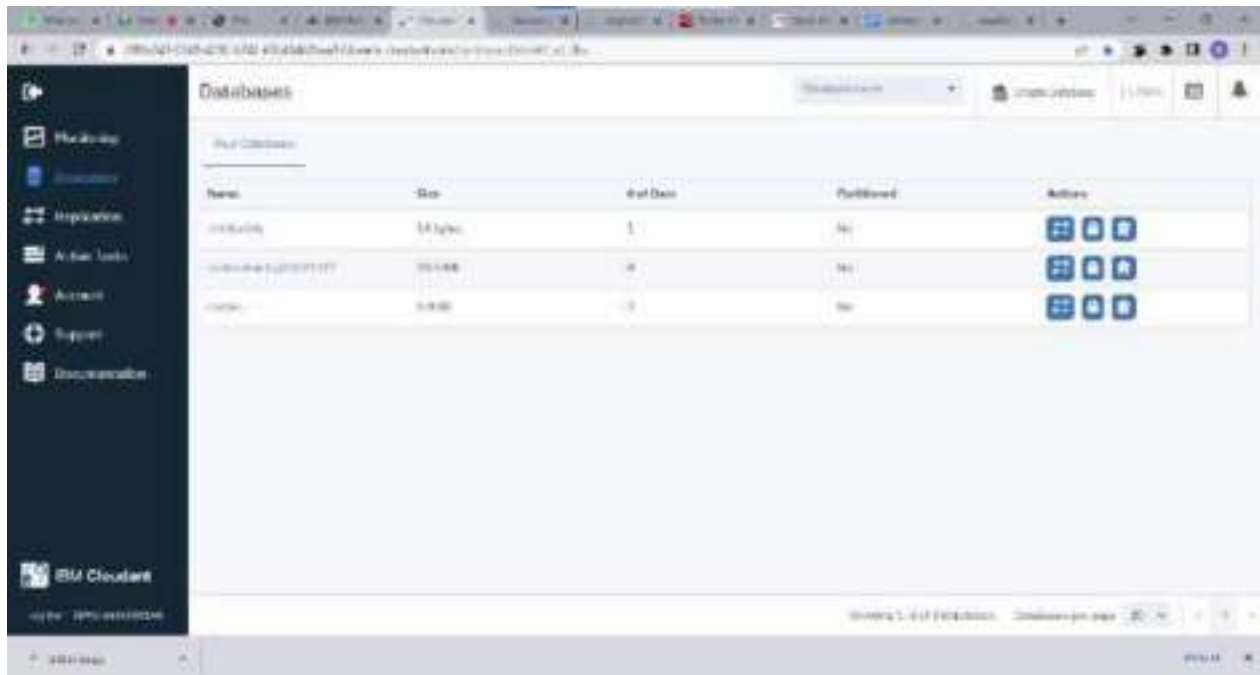


7.4 Feature 4- CLOUDANTDB

Sprint 4 :OUTPUT IMAGES AND DATA STORED IN CLOUDANT

Create Cloudant DB:

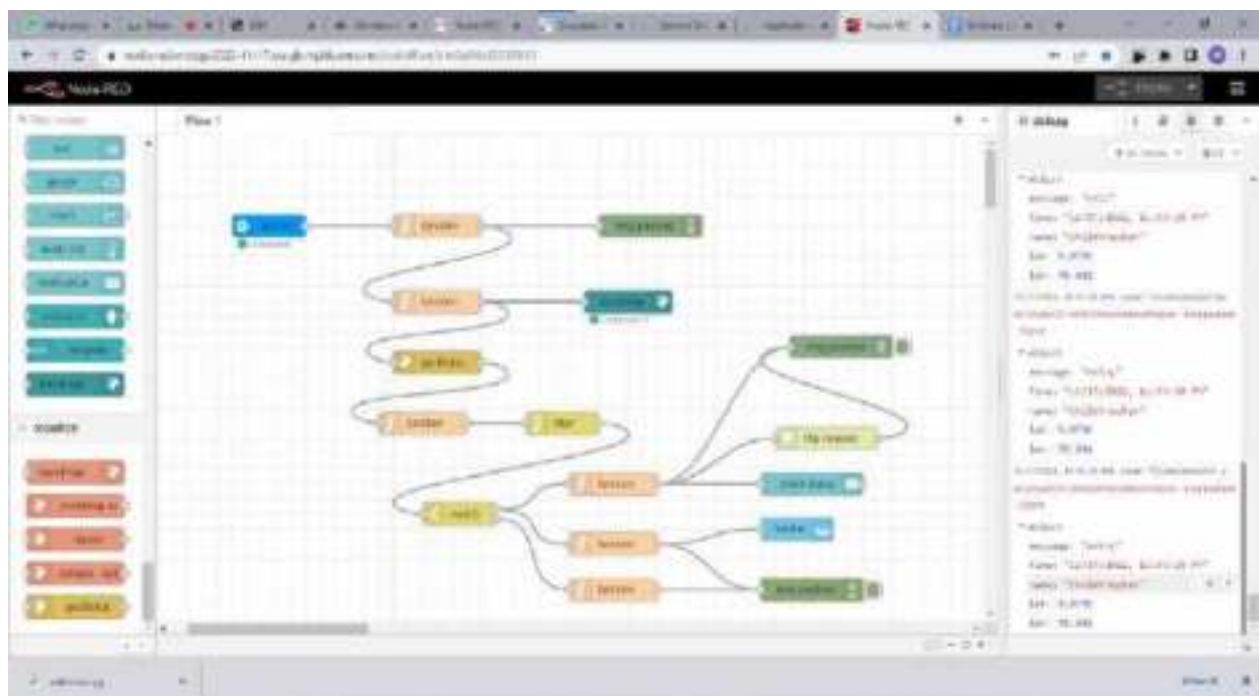




The screenshot shows the IBM Cloud Databases console. On the left is a sidebar with navigation links: Overview, Databases, Applications, Action Links, Account, Support, and Documentation. The main area is titled 'Databases' and contains a table of databases.

Name	Size	# of Data	Partitioned	Actions
database1	10 MB	1	No	[Icons]
database2	10 MB	1	No	[Icons]
database3	10 MB	1	No	[Icons]

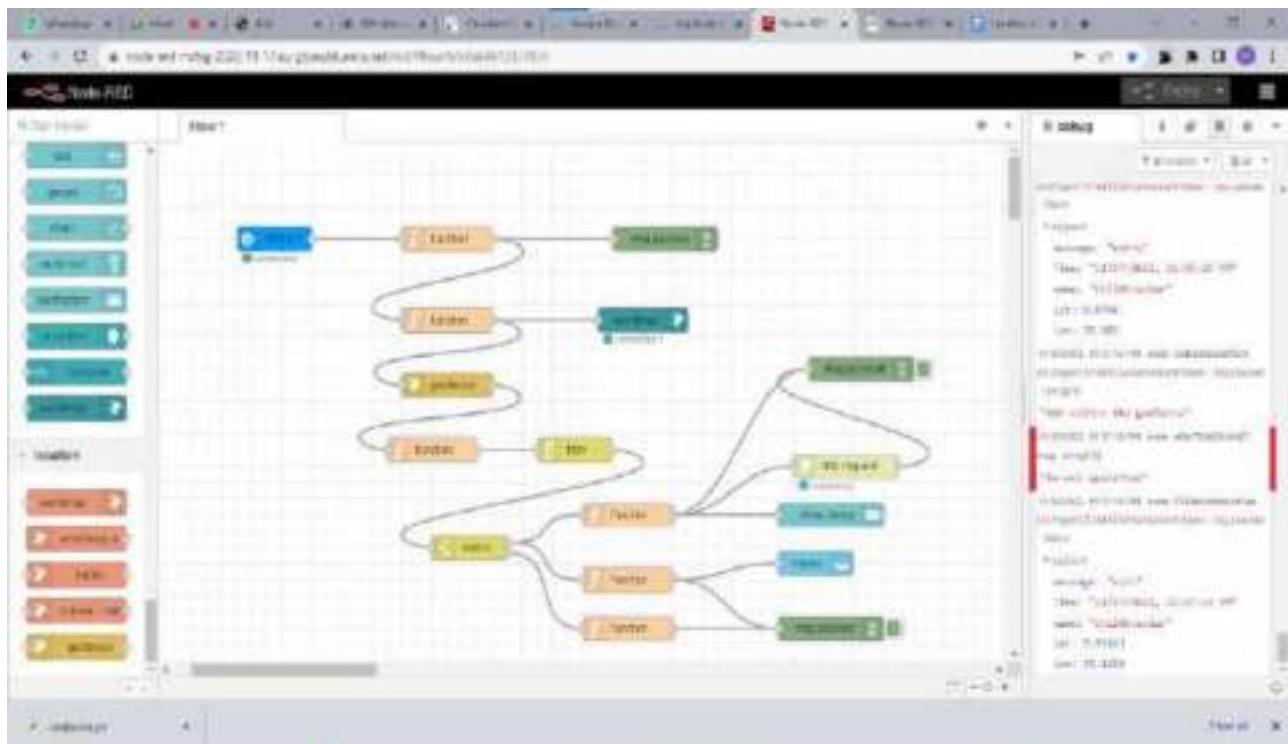
NODE RED – In Area



In Area Output



NODE RED – Out Area

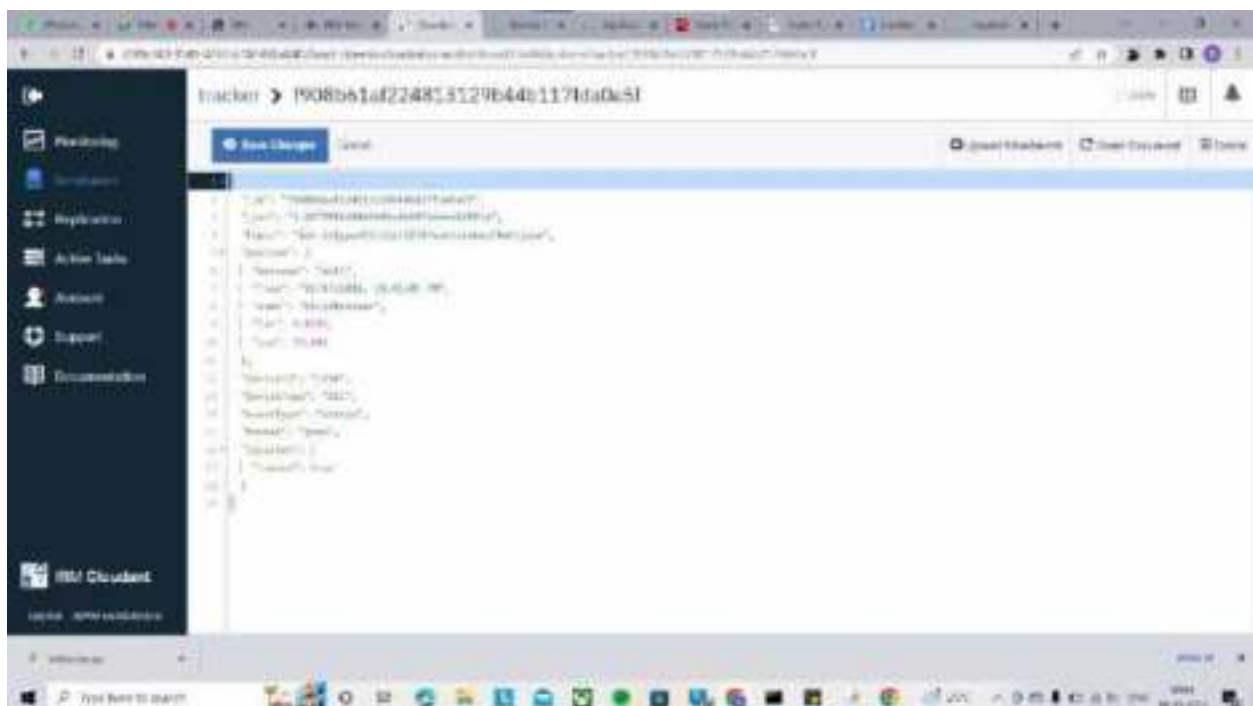


Out Area Output

```
11/17/2022, 11:57:15 PM node: 534ecdadeabf5c9
iot-2/type/CS1/id/1234/evt/status/fmt/json : msg.payload
: string[23]
"Not within the geofence"

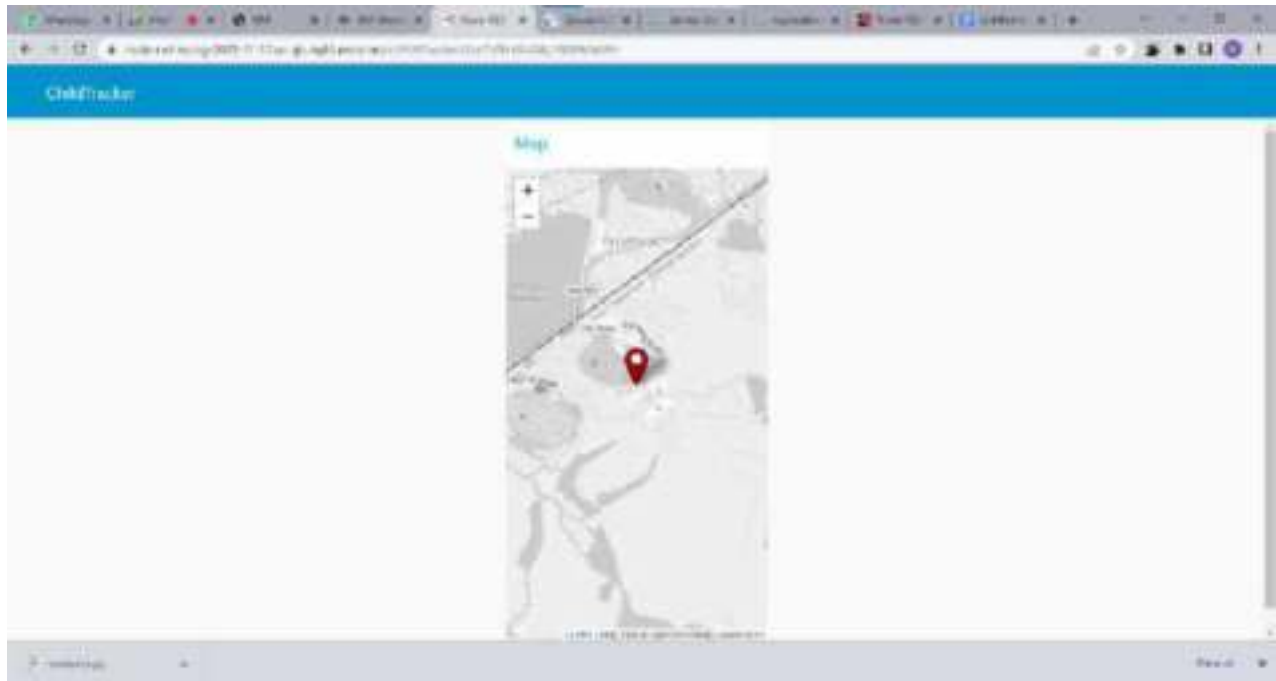
11/17/2022, 11:57:15 PM node: 7324e0c5bba2d1aa
iot-2/type/CS1/id/1234/evt/status/fmt/json : msg.payload
Object
▼ object
  message: "exit"
  Time: "11/17/2022, 11:57:15 PM"
  name: "Childtracker"
  lat: 9.95143
  lon: 78.1158
```

Data received in Cloudant

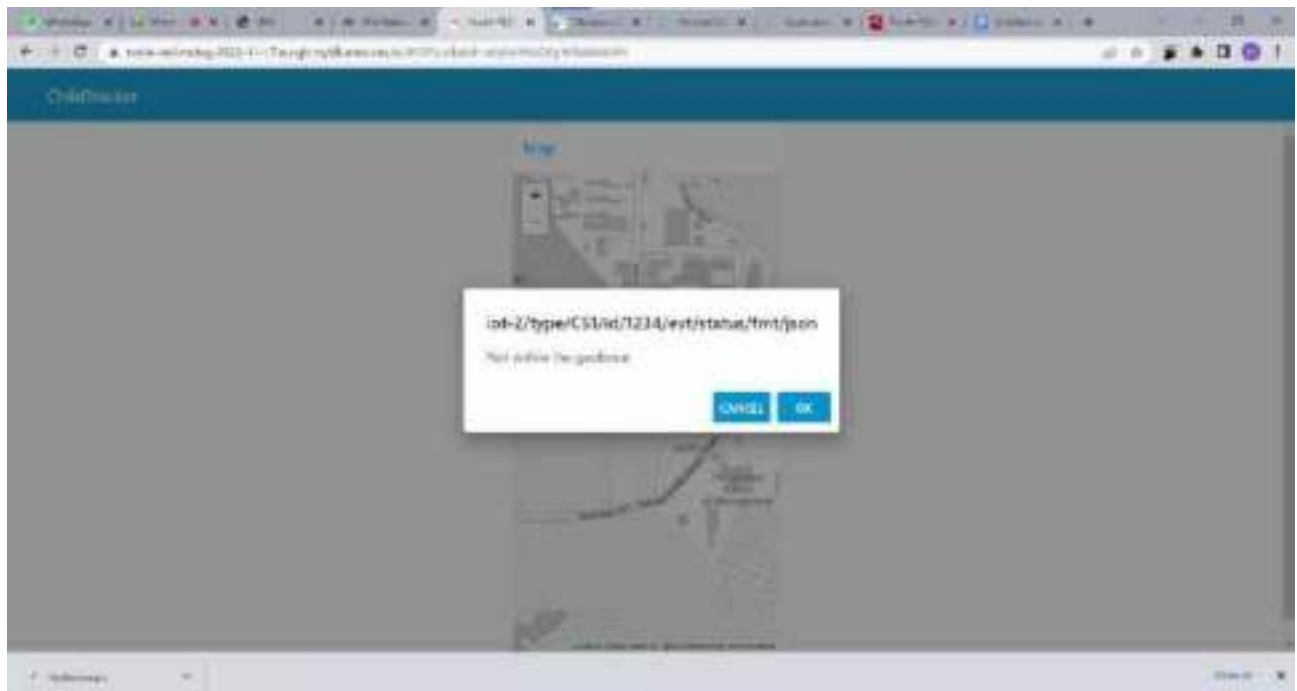


NODE RED DASHBOARD(WEB UI)

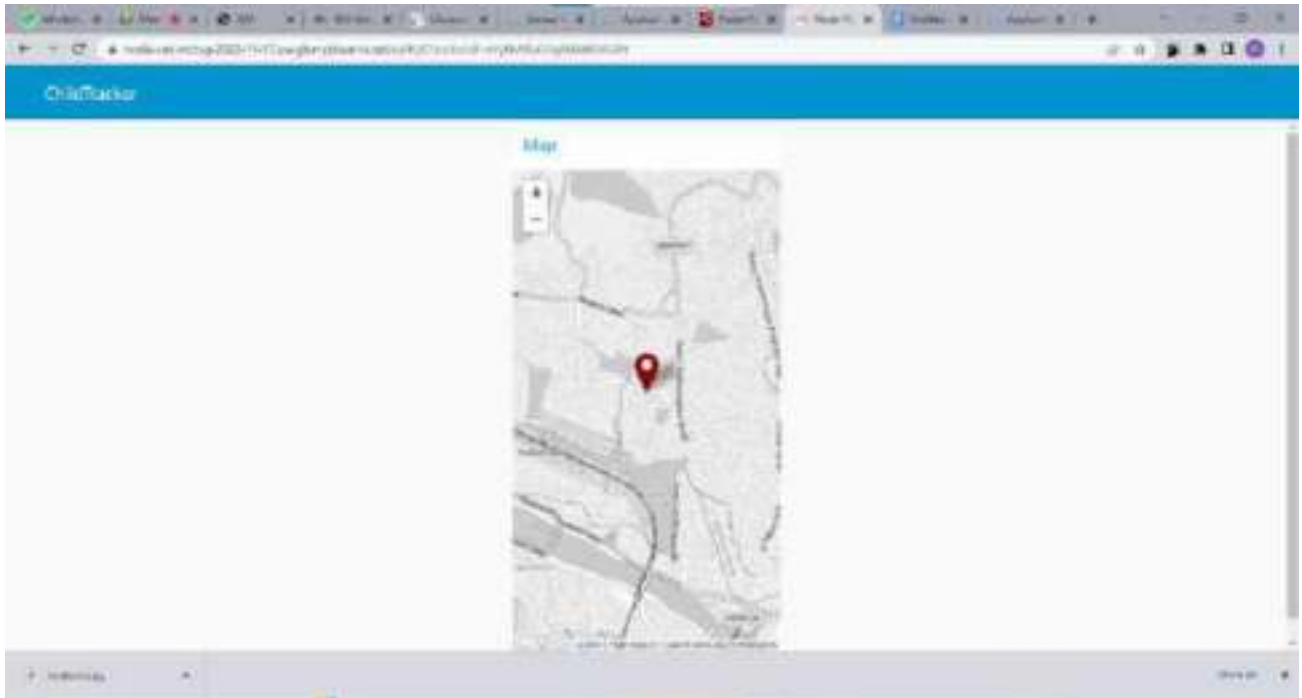
In Area:



Out Area:



Out Area Location:



8.TESTING

8.1 Test Cases

Test case ID	Feature Type	Test case ID	Test Scenario	Pre-Requirement	Steps To Execute	Test Data	Expected Result	Actual Result
TC_001	Functional	Login Page	Verify user when Sign in button is clicked	MIT App Inventor(MQTT server)	1.Enter username 2.Enter password 3.Click Login button	Username: ibm Password: 123	Login successful	Login successful
TC_002	Functional	Location Input	Python code to send location to IBM IoT	IBM Watson Python compiler	1.Develop Python script 2.Create device in IoT Platform 3.Specify device credentials in python code	IN Area or OUT area in Python code	Connected status in IBM Watson	Connection successful
TC_003	Functional	Node-Red	Installing nodes and creating circuit for location tracker	Node-Red(Node-JS)	Create the circuit	Format on messages for all nodes	Deployment of circuit	Deployed successfully
TC_004	Functional	Connection Interface	Connect IBM IoT with Node-Red	IBM IoT Node-Red	Location in python code sent to node red function node through IoT platform	Location available in Python	Location received in Node-Red	Location updates successfully
TC_005	Functional	Geofence	Boundary circle decided	Node-Red	Update the charts and graphs in the dashboard	Database	The dashboard has been updated successfully	The dashboard has been updated successfully

TC_006	Functional	World Map	Showing Location status	World map	1.Upload the location through python code 2.Compare with geofence 3.Show the result	Location available in Python and geofence	If in area the location is to be shown by a pin and if out area a dialog is to be shown and the location is to be shown by a pin	The locations are shown and if OUT pop up dialog is shown
TC_007	Functional	Switch	TRUE	Switch Node	The location from the python code is within the geofence	Location available in Python and geofence	Show Output as the person is in area	The output is shown as the person is in area
TC_008	Functional	Switch	FALSE	Switch Node (Cloudant)	The location from the python code is outside the geofence	Location available in Python and geofence	Show Output as the person is out area	The output is shown as the person is out area
TC_009	Functional	Switch	FALSE	Switch Node (HTTP request)	The location from the python code is outside the geofence	Location available in Python and geofence	Sends the location of the person to the URL	Only Requesting connection to URL
TC_010	Functional	Cloudant	Database storage	IBM Cloud	Location Updated periodically by info from Node-red	Information from Node-Red	Data entry in cloudant	Data Stored successfully

8.2 User Acceptance Testing

Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	2	0	5	0	7
Duplicate	0	0	3	0	3
External	0	0	0	7	7
Fixed	1	1	2	0	4
Not Reproduced	1	2	0	0	3
Skipped	0	0	0	3	3
Won't Fix	0	0	0	6	6
Totals	4	3	10	16	33

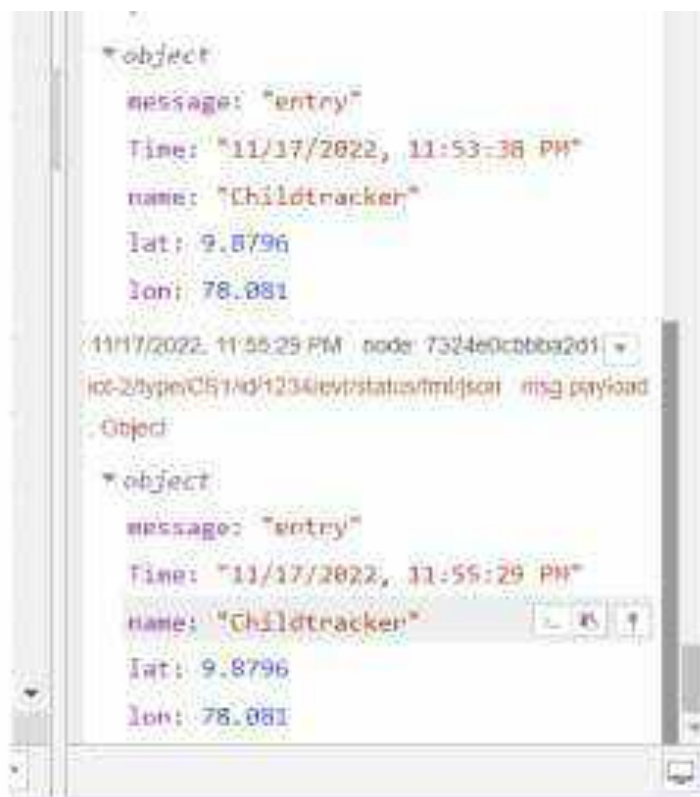
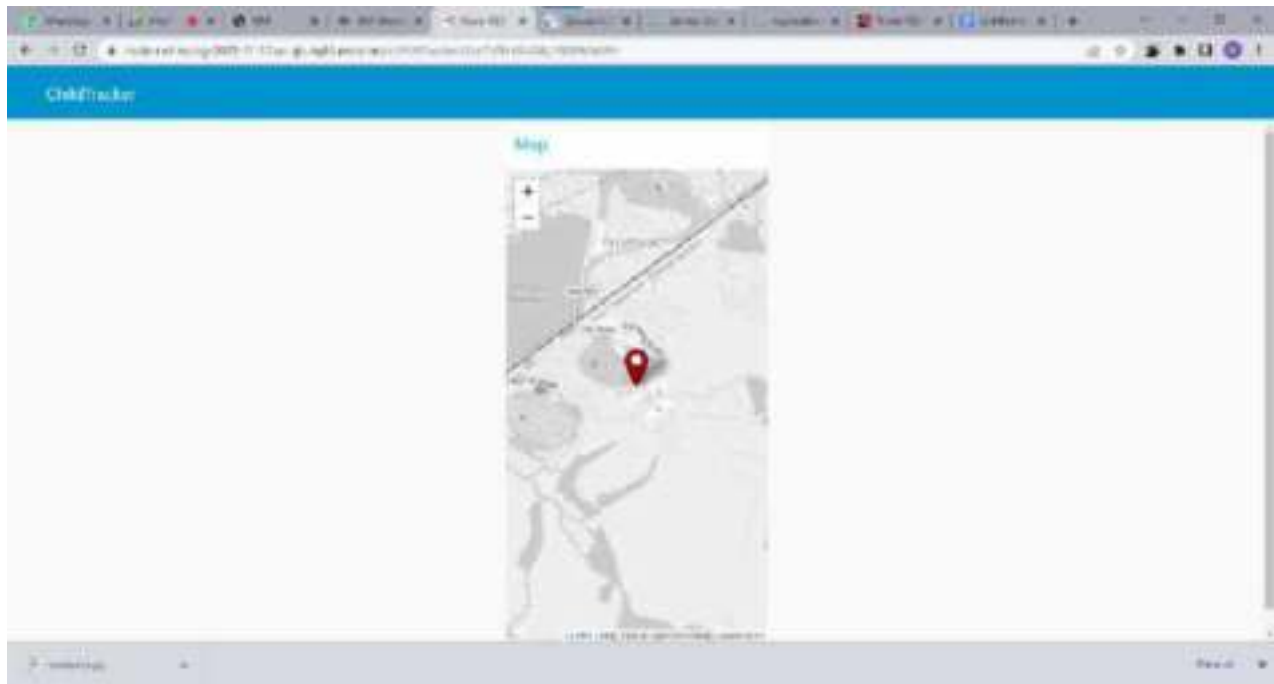
Test Case Analysis

Section	Total Cases	Not Tested	Fail	Pass
Login page	6	0	0	6
Geofencing	20	0	0	20
Security	4	4	0	0
Visual popup notification	5	0	0	5
Fast2sms	3	0	3	0
Cloudant database	8	0	0	8
Plotting world map	5	0	0	5

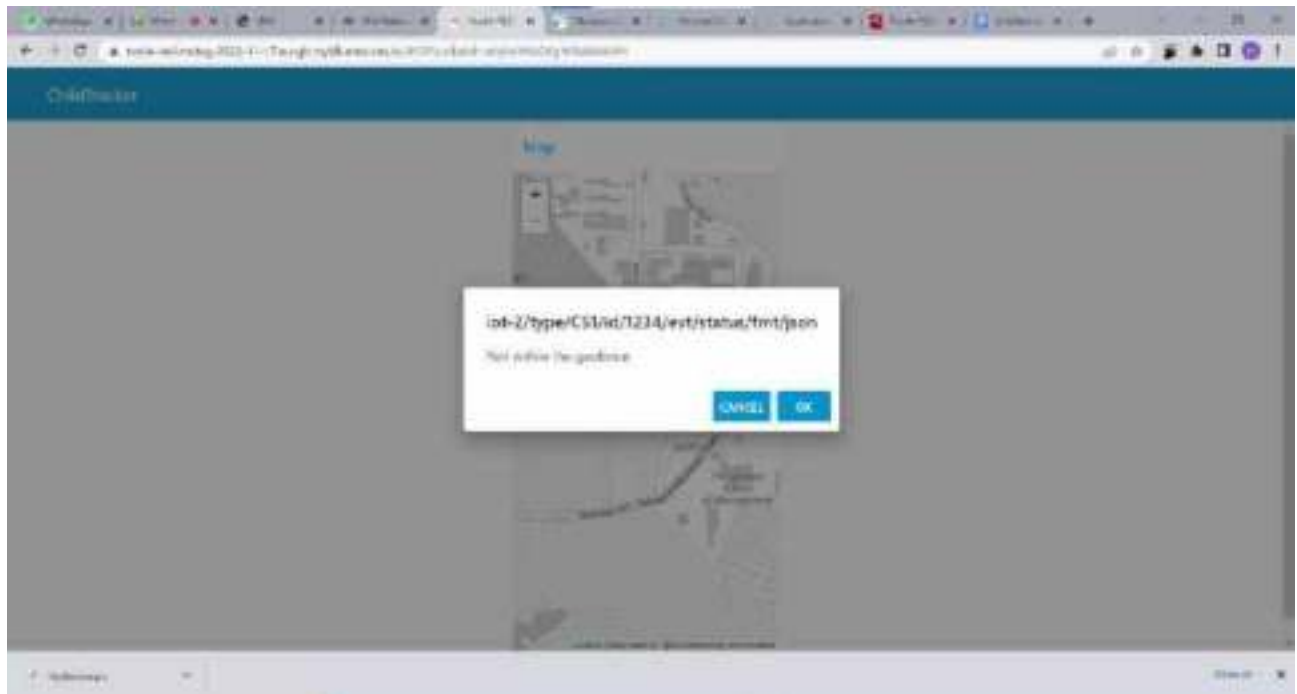
9. Result:

9.1 Outputs and Performance Matrix:

In Area Output:



Out Area Output:



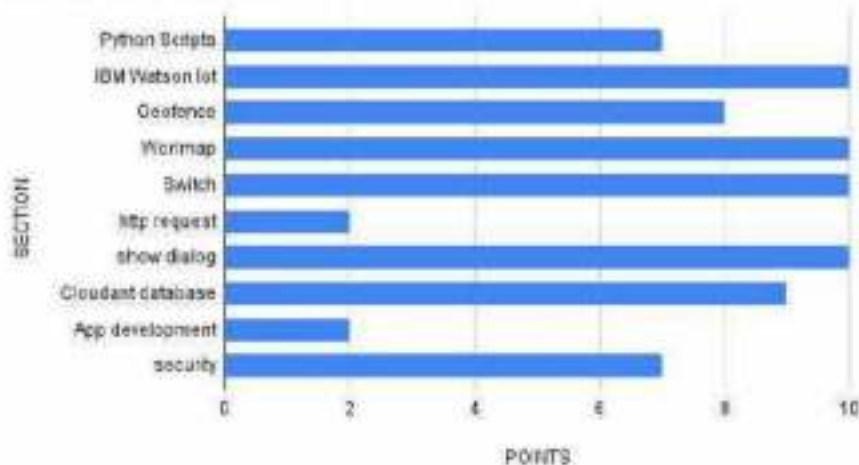
```
11/17/2022, 11:57:15 PM node: 534ecdadeabff5c9
iot-2/type/CS1/id/1234/evt/status/fmt/json : msg payload
: string(23)
"Not within the geofence"
```

```
11/17/2022, 11:57:15 PM node: 7324e0cbbba2d1aa
iot-2/type/CS1/id/1234/evt/status/fmt/json : msg payload
Object
  ◯ object
    message: "exit"
    Time: "11/17/2022, 11:57:15 PM"
    name: "Childtracker"
    lat: 9.95143
    lon: 78.1158
```

Performance Analysis

SECTION	Description	POINTS	REASON
Python Scripts	Provides latitude and longitude details	7	Static location information is given,requires dynamic location information to update periodically
IBM Watson Iot	Gets location information from python script	10	Connection established securely
Geofence	Tracks whether a device is inside or outside a "fence," a virtual boundary around an area in the real world.	9	Inorder to change geofence area,the user cannot directly change it as it is a backend process, geofencing needs to be maintained and updated in order to function optimally
Workmap	Plots location detail on map	10	Plots every location whenever the location gets updated in python script
Switch	Makes decision based on values obtained	10	takes decision exactly as the input condition changes
http request	Sends message via network to registers url	2	requires high speed network connectivity all time
show dialog	Shows message as a popup notification on the user interface.	10	pop up notification occurs whenever desired contins are met
Cloudant database	Stores the result obtained in database	9	No reset option to delete stored data oncthe storage gets loaded
App development	Developing a complete user interfacedle app to track the child	2	the application is not completely developed
Security	Secure connectivity should be required for lot based objects	7	Without security the device is vulnerable to attacks.

POINTS vs. SECTION



10. ADVANTAGES & DISADVANTAGES:

Advantages:

1.Tracking Made Easy:

Fueled by IOT, the GPS enabled Wearable Device act as a saviour for parents who are always clouded with worries about their kids. Tracking a child was never this easy. These Wearable Devices allow parents to track their children in crowded/public places or when they are out of sight, say at school, picnic or an outing. Parents can use these gadgets to track the location of their kids.

2. Guarantees Peace of Mind to Parents:

Parents, whether at home or office, are always worried about the safety of their kids. The fear of losing your child to avoidable circumstances is the concern area for all mommies and daddies. On the other hand, a smart gadget equipped kid is always traceable and reachable in case of contingencies and emergencies. This in fact, offers great solace for parents, who are relieved at the thought of maintaining an uninterrupted connectivity with their children, anytime, anywhere. Enough to of course, guarantee the much-needed peace of mind

Disadvantages:

Keeping the data gathered and transmitted by IoT devices safe is challenging, as they evolve and expand in use. Although cybersecurity is a high priority, IoT devices aren't always included in the strategy. Devices must be protected from physical tampering, internet-based software attacks, network-based attacks and hardware-based attacks.the device has dependencies on power and internet for continuous function.when either goes down,so as the device.Requires active internet connection. Children need to login once into the application. System will provide inaccurate results if data not entered correctly

11.CONCLUSION:

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 abuse, which entirely ruins 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 a regular basis, which makes them ensure the safety of their children and guarantees peace of mind.

This report clearly explains the IoT concept, child safety issues and the need of using a child security system. It assists parents to monitor their children remotely. In case situations when the kid steps out of geofence, notifications will be sent to parents so that actions can be taken. Through this, child safety can be ensured and safety will be reduced.

12.FUTURE SCOPE:

The proposed solution only checks whether the kid is within geofence or not and sends notification to parent if the kid crosses the fence area. This requires high speed network connectivity and satellite communication in order to send notification to the parent. However it is difficult to ensure secure internet connectivity and communication. This problem can be overcome by using Zigbee technology or LoRa technology. LoRa is the de facto wireless platform of Internet of Things (IoT). Semtech's LoRa chipsets connect sensors to the Cloud and enable real-time communication of data and analytics that can be utilized to enhance efficiency and productivity. Also the proposed system can be upgraded by adding additional features like SOS emergency button, sensing sudden vibration/high sound and send a call alert, pulse rate detection etc.

13.Appendix

PYTHON SCRIPT:

```
import time

import random

#import ibmiotf.application

import ibmiotf.device

import sys


config={

    "org":"phsvnq",

    "type" : "CS1",

    "id":"1234",

    "auth-method":"token",

    "auth-token":"123456789"

}

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)
```

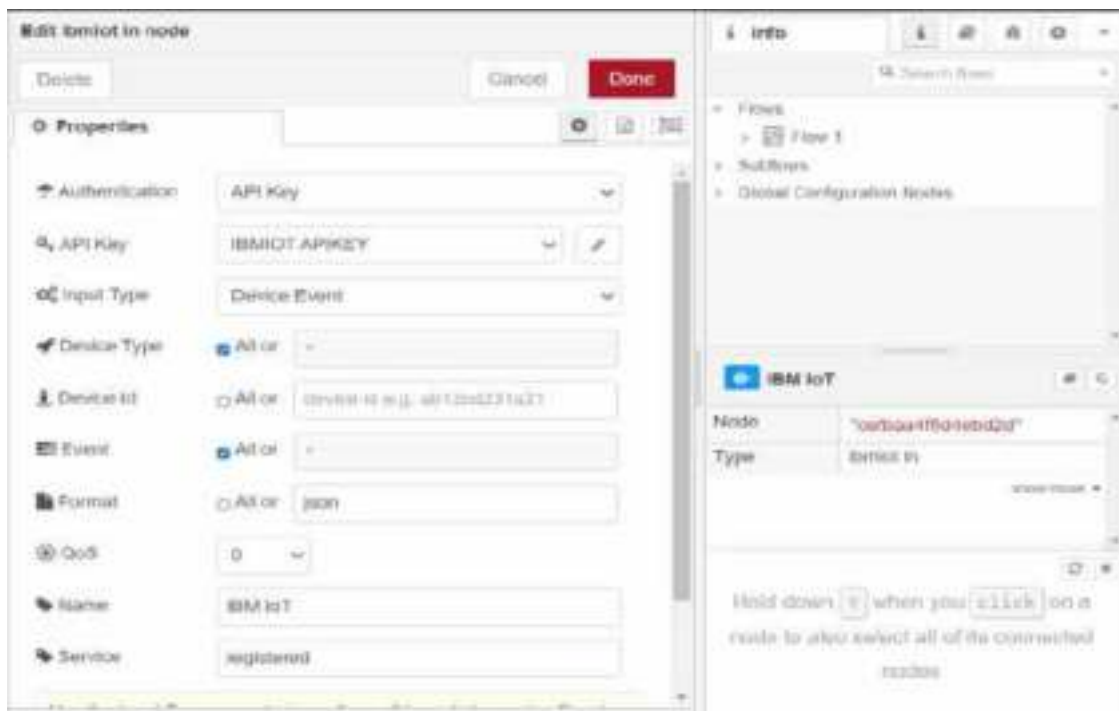
```
client.commandCallback = myCommandCallback
```

```
time.sleep(2)
```

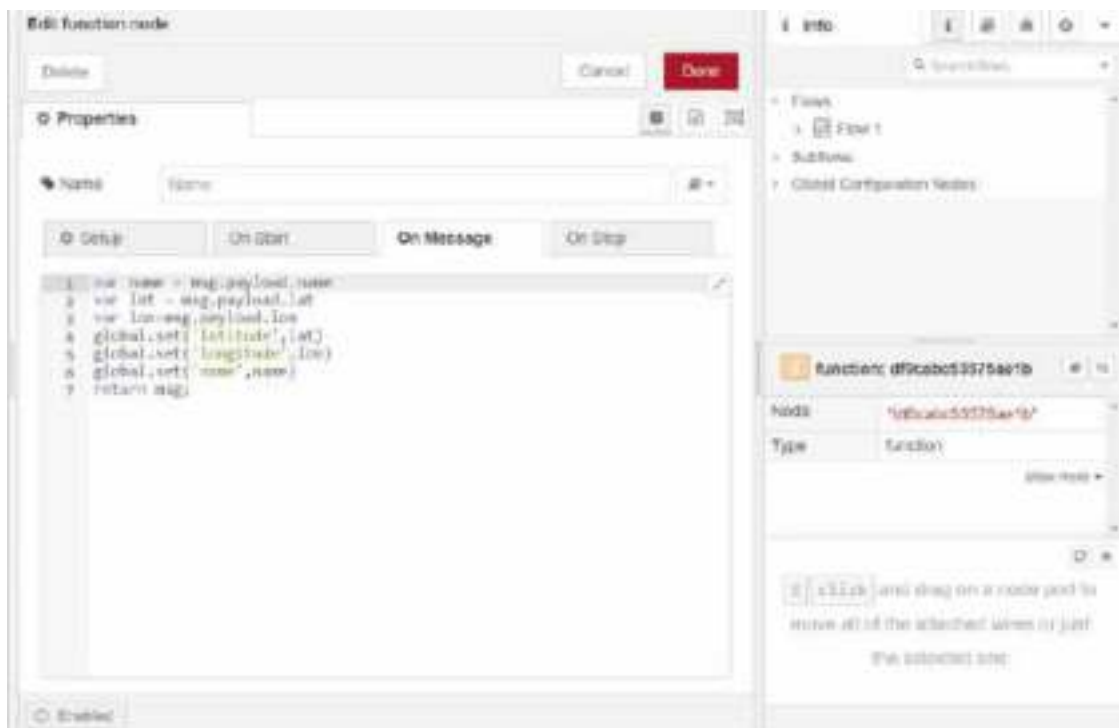
```
client.disconnect()
```

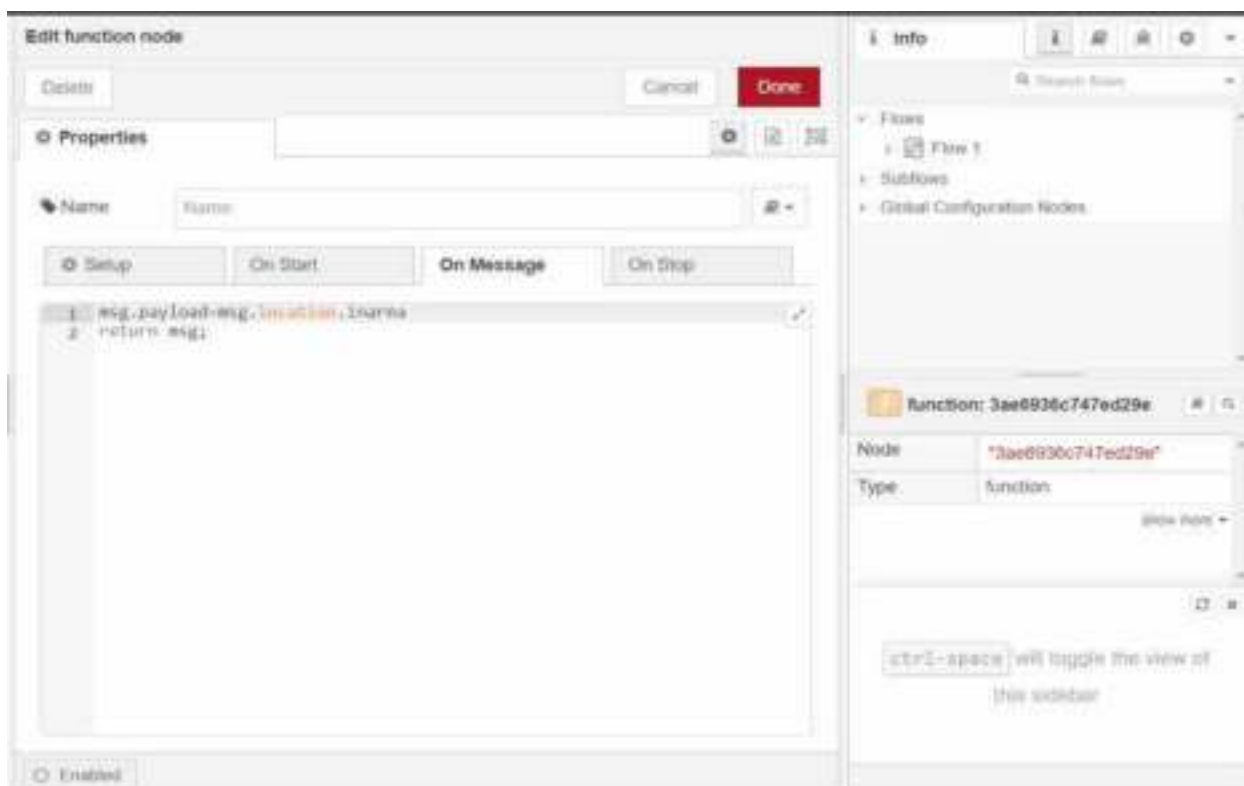
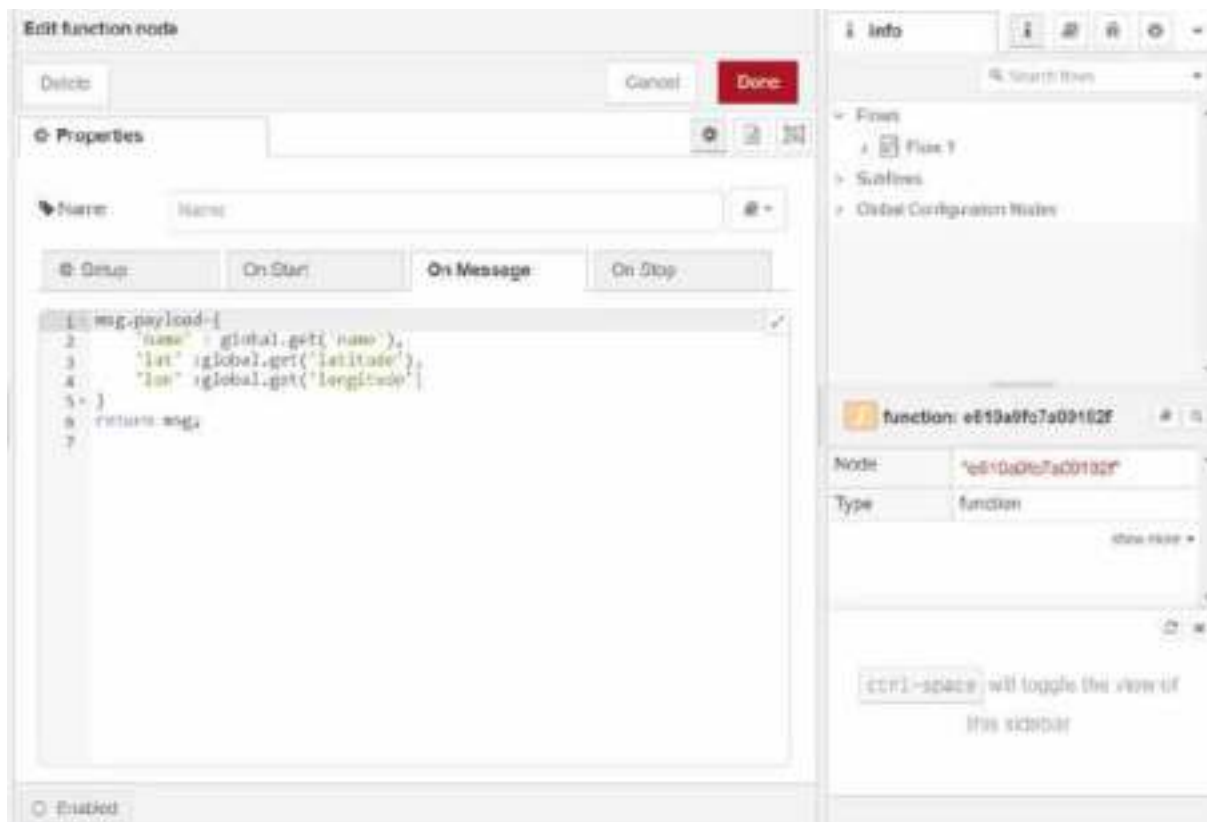
NODERED:

IBM IOT:



FUNCTIONS:





Edit function node

Delete

Cancel

Done

Properties

Name

Name

Setup

On Start

On Message

On Stop

```

1 var d=new Date()
2
3 var utc =d.getTime()+[d.getTimezoneOffset()*-1000];
4
5 var offset =5.5;
6
7 var newDate =new Date(utc+(1000*offset));
8
9 msg.payload = {
10   "message": "wait",
11   "time": newDate.toLocaleString(),
12   "name": global.get('name'),
13   "lat": global.get('latitude'),
14   "lon": global.get('longitude'),
15 };
16 return msg;

```

Enabled

Info

Search flows

Flows

Flow 1

Subflows

Global Configuration Nodes

function: 0eac21f06f50eb8d

Node

0eac21f06f50eb8d

Type

function

show more

Enable or disable these tips from the option in the settings

Edit function node

Delete

Cancel

Done

Properties

Name

Name

Setup

On Start

On Message

On Stop

```

1 var d = new Date()
2
3 var utc = d.getTime() + (d.getTimezoneOffset() * -1000);
4
5 var offset = 5.5;
6
7 var newDate = new Date(utc + (1000 * offset));
8
9 msg.payload = {
10   "message": "entry",
11   "time": newDate.toLocaleString(),
12   "name": global.get('name'),
13   "lat": global.get('latitude'),
14   "lon": global.get('longitude'),
15 };
16 return msg;

```

Enabled

Info

Search flows

Flows

Flow 1

Subflows

Global Configuration Nodes

function: deafe1b76a81661e

Node

deafe1b76a81661e

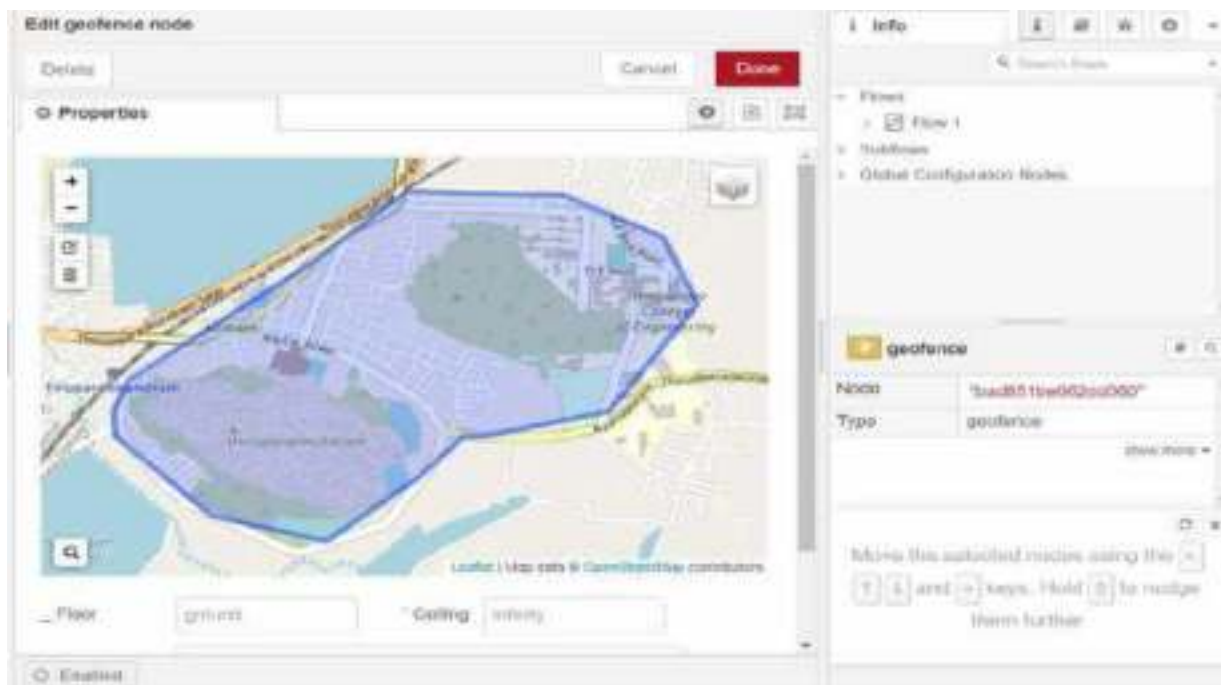
Type

function

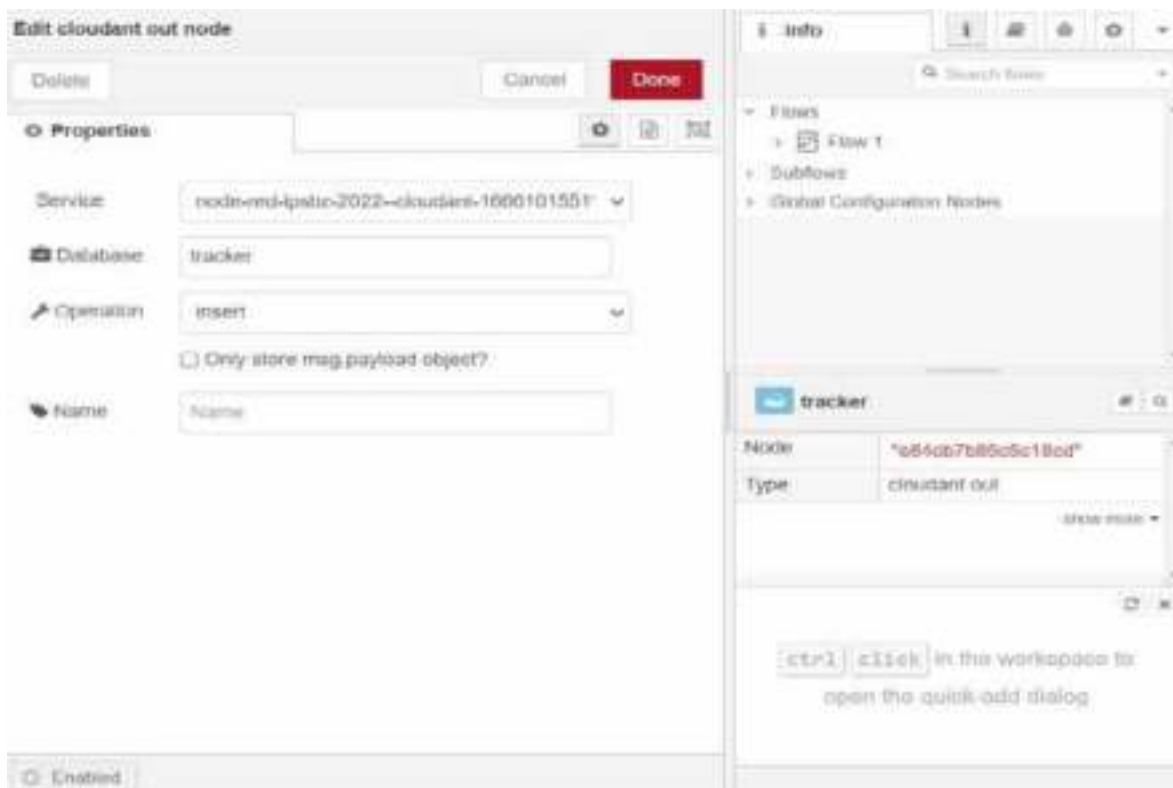
show more

You can confirm your changes in the node edit tray with **ctrl+enter** or cancel them with **ctrl+escape**

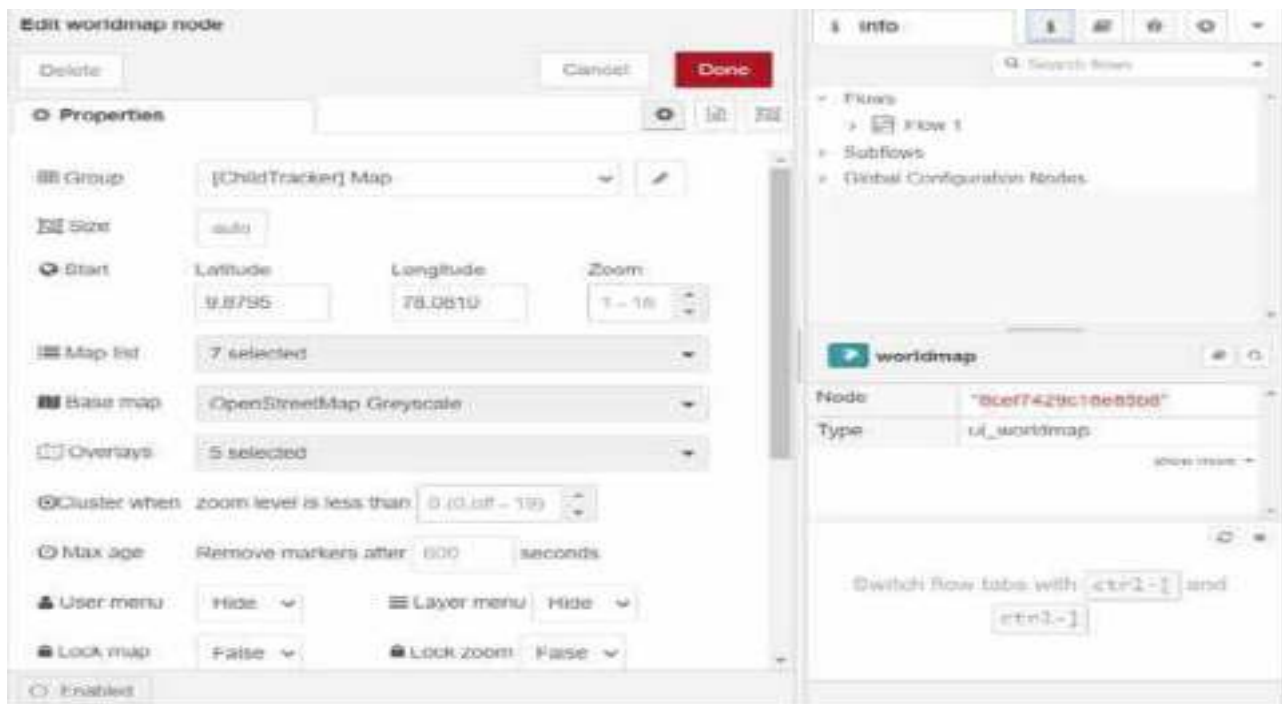
GEOFENCE:



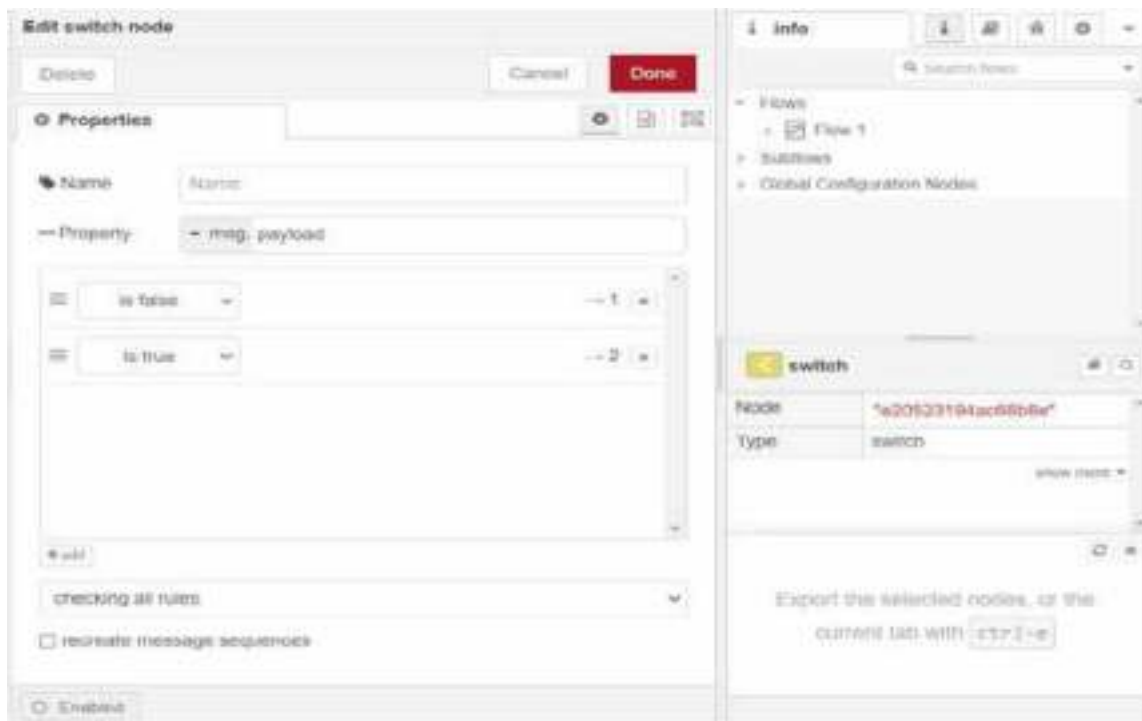
CLOUDANT:



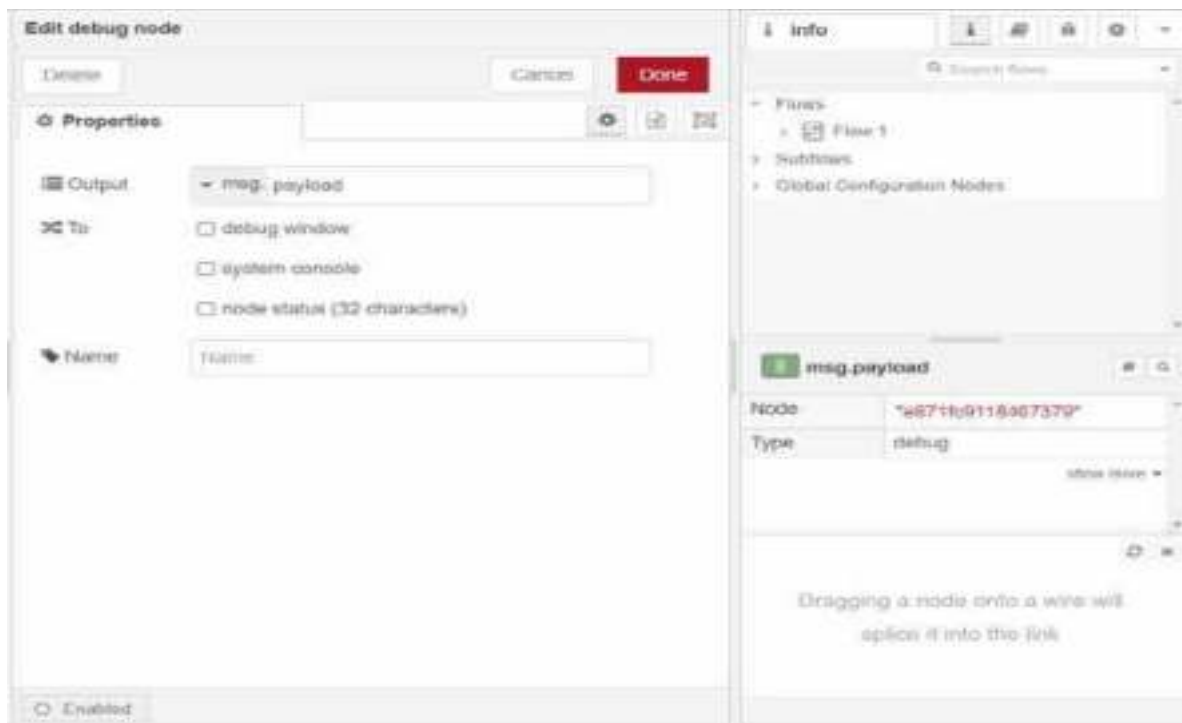
WORLDMAP NODE:



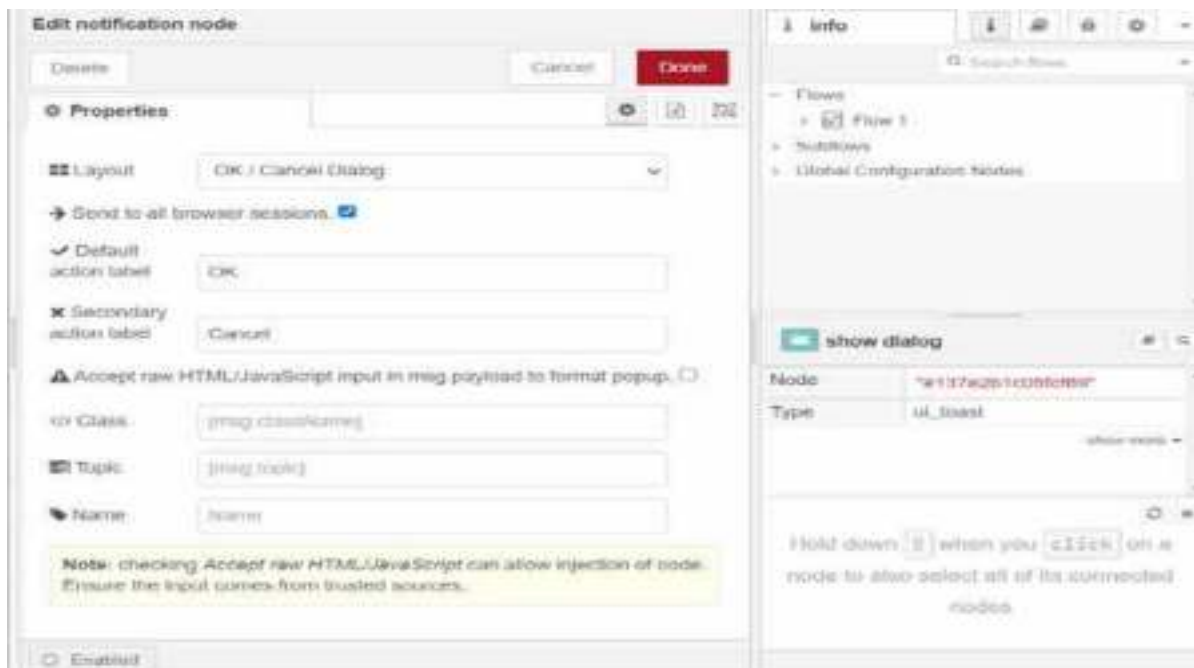
SWITCH NODE:



DEBUG NODE:



NOTIFICATION NODE:



GITHUB LINK

<https://github.com/IBM-EPBL/IBM-Project-27722-1660063606>

DEMO VIDEO LINK

[https://drive.google.com/file/d/1TOHuebob8GRzfcOhNQB70x7g4CFWB21x/view?usp=share link](https://drive.google.com/file/d/1TOHuebob8GRzfcOhNQB70x7g4CFWB21x/view?usp=share_link)