**NAALAIYA THIRAN PROJECT - 2022**
**19ECI01-PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP**

# IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

**A PROJECT REPORT**

***Submitted by***


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# COIMBATORE INSTITUTE OF TECHNOLOGY

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## BONAFIDE CERTIFICATE

Certified that this report **"IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION"** is the Bonafide workof **SAMUTHIRIKA S (1904107), SHAFAHATH S (1904110), SOORYA R (2004208)** and **TAMILARASAN M (2004209)** who carried out **19ECI01 Professional Readiness for Innovation, Employability and Entrepreneurship** project offered by IBM and Anna University ,Chennai.

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| Phase | Phase Description | Week | Dates | Activity Details |
|---|---|---|---|---|
| 1 | Preparation Phase (Pre-requisites, Registrations, Environment Set-up, etc.) | 2 | 22 - 27 Aug 2022 | Creation GitHub account & collaborate with Project repository in project workspace |
| 2 | Ideation Phase (Literature Survey, Empathize, Defining Problem Statement, Ideation) | 2 | 29 Aug – 3rd Sept 2022 | Literature survey (Aim, objective, problem statement and need for the project) |
| | | 3 | 5 - 10th Sept 2022 | Preparing Empathy Map Canvas to capture the user Pains & Gains |
| | | 4 | 12 - 17 Sept 2022 | Listing of the ideas using brainstorming session |
| 3 | Project Design Phase -I (Proposed Solution, Problem-Solution Fit, Solution Architecture) | 5 | 19 - 24 Sept 2022 | Preparing the proposed solution document |
| | | 6 | 26 Sept - 01 Oct 2022 | Preparing problem - solution fit document & Solution Architecture |
| 4 | Project Design Phase -II (Requirement Analysis, Customer Journey, Data Flow Diagrams, Technology Architecture) | 7 | 3 - 8 Oct 2022 | Preparing the customer journey maps |
| | | 8 | 10 - 15 Oct 2022 | Preparing the Functional Requirement Document & Data- Flow Diagrams and Technology Architecture |
| 5 | Project Planning Phase (Milestones & Tasks, Sprint Schedules ) | 9 | 17 - 22 Oct 2022 | Preparing Milestone & Activity List, Sprint Delivery Plan |
| 6 | Project Development Phase (Coding& Solutioning, acceptance Testing, Performance Testing) | 10 | 24 - 29 Oct 2022 | Preparing Project Development - Delivery of Sprint-1 |
| | | 11 | 31 Oct - 5 Nov 2022 | Preparing Project Development - Delivery of Sprint-2 |
| | | 12 | 7 - 12 Nov 2022 | Preparing Project Development - Delivery of Sprint-3 |
| | | 13 | 14 - 19 Nov 2022 | Preparing Project Development - Delivery of Sprint-4 |
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# CHAPTER 1

# INTRODUCTION

## 1.1 PROJECT OVERVIEW:

Internet of Things (IoT) plays a major role in every day to day life . The development of sensors technology, availability of internet connected devices; data analysis algorithms make IoT devices to act smart in emergency situations without human interventions. Child and women safety is a challenging problem nowadays due to antisocial elements in the society. The crime rate is day by day increasing. Child safety and tracking is a major concern as the more 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 parent can send a message to the GSM module, according to the message information the GSM module reply back with particular details of the children. The location can be seen on the Google map. When a particular child is facing an emergency situation, device button should be pressed so that the device sends the user information to the enrolled mobile numbers. The life of the child can be saved within no time. For the children point of view GPS and GSM are used to monitor the speed and location tracking purpose. The system is developed using Node red and interfaced with temperature, vibrator , touch sensors and also GPS and GSM. 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 emergency. The parameters such as touch, temperature of the child are used for parametric analysis The above system ensures the safety and tracking of children.

## 1.2 PURPOSE:

Actually, there is a need to use IoT-based child security system since the safety of children has become a major concern. In fact, crimes on children keep increasing despite actions have been taken by the government. The overall percentage of child abusements worldwide is about 80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world. Due to that, parents are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out. So to Protect the child from being Harassed, to Save the children from child Trafficking, to Protect the children from being converted to child labour, to develop them a safe and secure environment to live and grow, this project is developed. It is achieved by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM module calling for help and various sensors are interfaced to monitor the child when abnormal situation occurs.

# CHAPTER – 2
# LITERATURE SURVEY

## 2.1 EXISTING SOLUTION:

Crowd sourced children monitoring and finding with holding up detection based on internet-of-things technologies et al., In this paper, a crowd-sourced children monitoring and finding framework was proposed to detect holding-up behaviors and find missing children using IoT localization, wearable devices, and surrounding smart phones. The proposed framework extracts representative acceleration features of the target child to distinguish holding-up behaviors from non-holding up actions. In addition, diverse holding-up behaviors from different postures of the target child are classified with the extracted representative acceleration features. In the finding mode, the CCMF framework can cooperatively find missing children equipped with wearable devices consisting of mobile I Beacon and 3-axis accelerometer modules through crowd sourced sensing networks formed by smart phone users with outdoor GPS and indoor IoT localization**.**

A novel hybrid fusion algorithm for low-cost GPS/INS integrated navigation system during GPS outages et al, A new GPS/INS hybrid method is proposed to bridge GPS outages. Firstly, a data pre-processing algorithm based on empirical mode decomposition (EMD) for wavelet de-noising is developed to reduce the uncertain noise of IMU raw measurements and provide accurate information for subsequent GPS/INS data fusion and training samples. Then, the interactive multi-model extended
Kalman lter(IMM-EKF) algorithm is proposed to improve the robustness of Kalman lter output and the accuracy of model training target output. Finally, a new intelligent structure of GPS/INS based on Extreme Learning Machine (ELM) is proposed. When the GPS is available, the IMM-EKF is used to fuse the GPS and de-noised INS data,

and the de-noised INS data and the outputs of IMM-EKF are used to train the ELM. During GPS outages, the ELM is used to predict and correct the INS position error. In order to evaluate the effectiveness of the proposed method, 3 tests were performed in the actual test. The comparison results show that the proposed fusion method can significantly improve the accuracy and reliability of positioning during GPS outages.

A flexible and pervasive IoT-based healthcare platform for physiological and environmental parameters monitoring et al.**,** In this work, we introduced a flexible, pervasive, prolonged, and convenient IoT-based platform for monitoring of ambient,physiological, and behavioral. In addition, we introduced an innovative wrist-worn prototype in ambient monitoring. An IoT-gateway as an intermediate hub between physical layer (sensor nodes) and server has been developed for data collection and synchronization to facilitate an efficient end-to end communication between user and medic in real-time. From one side, the smartphone as the IoT-gateway supports the physicians to define tasks, configure the wearables, select the required parameters for measurement, specify the activation/deactivation sensors' period, and from the other side,the user is not restricted to some specific vendors. Indeed,the IoT-gateway is flexible to adapt different wearables from Authorized licensed.

An integrated child safety seat cooling system—Model and test et al.,A thermally protected child safety seat using Peltier effect thermoelectric modules has been developed to address the danger posed to small children accidentally left in parked cars. Numerical results from the lumped capacitance modeling of
the overall system and thermoregulatory physiological model predicted acceptable results from the TEC-based system for extended exposure to high cabin temperatures. A physical system was experimentally tested in a laboratory-based environmental chamber and in-vehicle to demonstrate the ability to maintain an acceptable occupant temperature for elevated cabin temperatures. However, the system could not maintain

survivable temperatures for extended operating periods, which demonstrates that greater thermoelectric cooling capacity is necessary. These challenges may be addressed by the addition of more TECs and supplemental cooling such as chemical cold packs. Additionally, the overall problem of child entrapment demands further societal education to minimize the occurrence of such events.

An indoor positioning system based on the dual-channel passive RFID technology et al ,In this work, a dual-channel low-power passive RFID positioning system is proposed to solve this problem. The probability for accurately locating a target within 0.5 m from its real position can reach 96.7% in this system. The positioning area of this work is bigger than those of the prior arts. The total RF radiation power of one block of the proposed system is 23.14 dBm, which is the lowest among reported RFID positioning systems. Furthermore, this proposed architecture can be easily expanded to a large system. RFID positioning system possesses a large positioning area because of the use of biostatic dislocated architecture.

## 2.2 PROBLEM STATEMENTS:

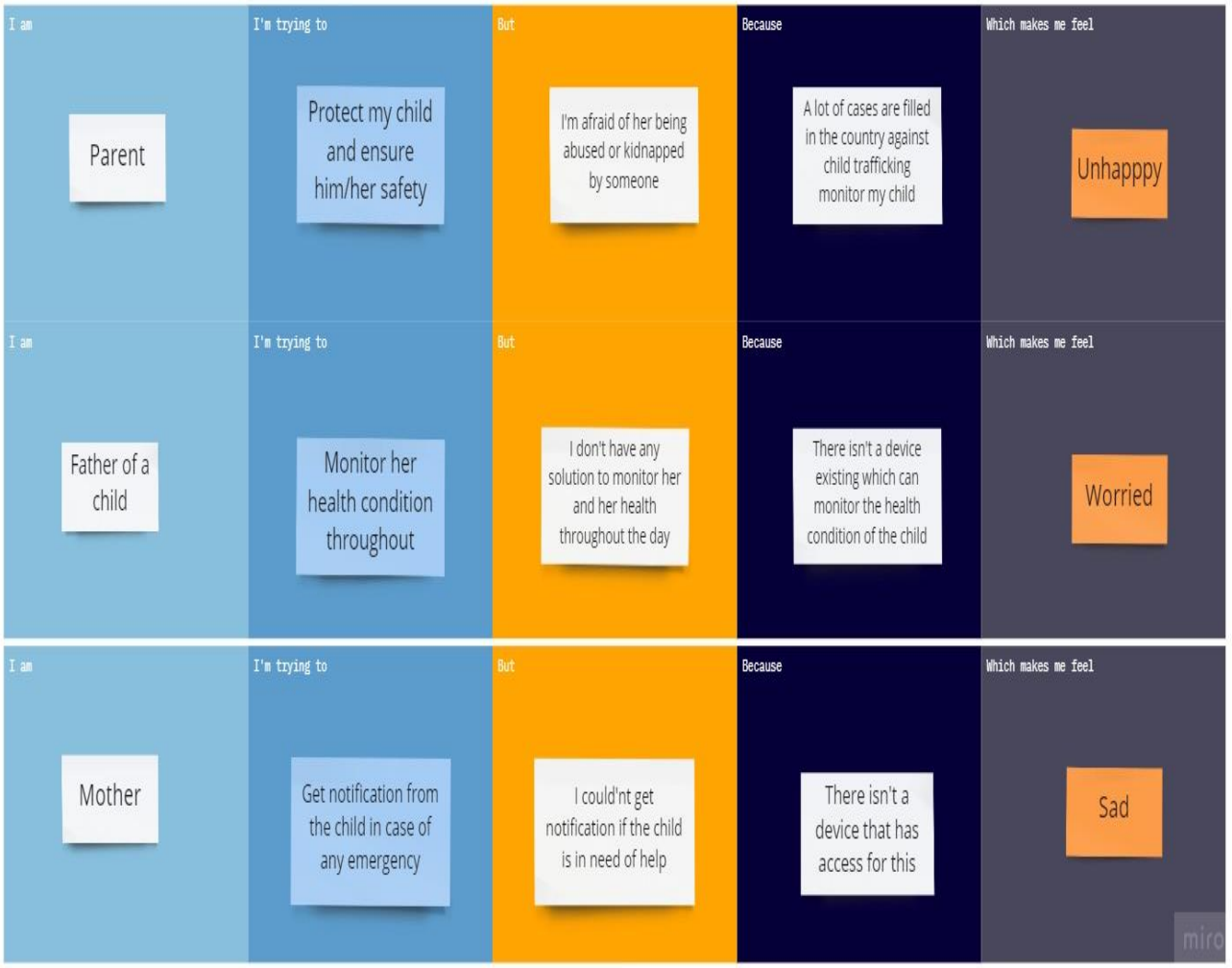


Figure 2.1 Problem Statements

# CHAPTER 3

# IDEATION AND PROPOSED SOLUTION

## 3.1 EMPATHY MAP CANVAS:

An empathy map is a collaborative visualization used to express clearly what one knows about a particular type of user. It externalizes knowledge about users in order to create a shared understanding of user needs, and aid in decision making.

Empathy maps are split into 4 quadrants (Says, Thinks, Does, and Feels), with the user in the middle. Empathy maps provide a glance into who a user is as a whole. The Says quadrant contains what the user says or what he needs. The Thinks quadrant captures what the user is thinking throughout the experience. The Does quadrant encloses the actions the user takes. The Feels quadrant is the user's emotional state.

The empathy map for the safety system is shown in Fig 3.1

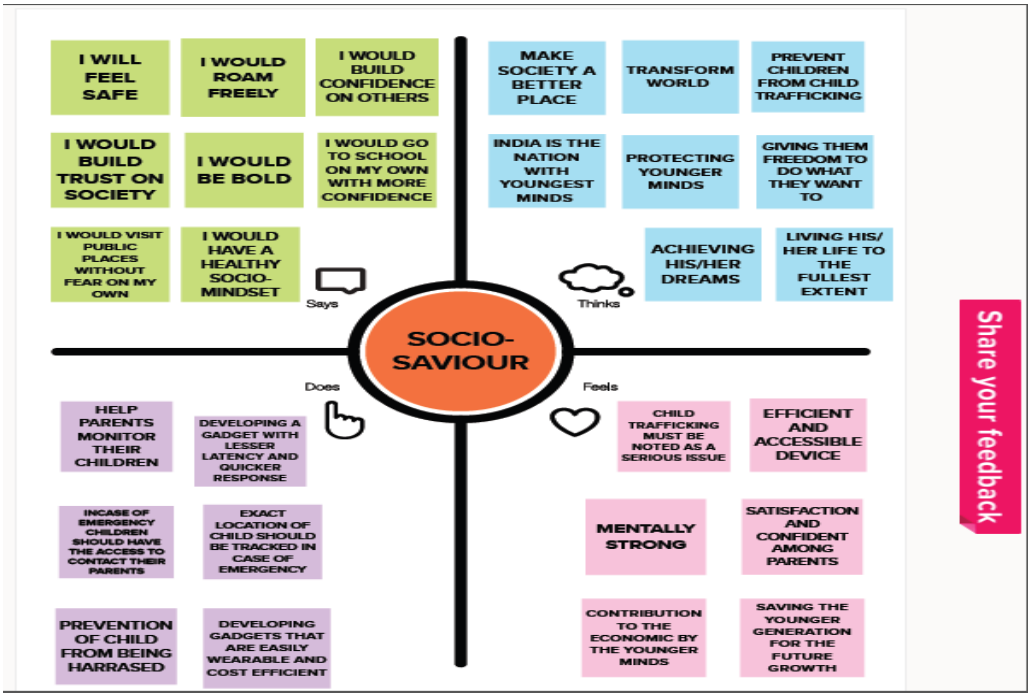


Fig 3.1 Empathy map

## 3.2 IDEATION AND BRAINSTORMING:

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. Brainstorming is usually conducted by getting a group of people together to come up with either general new ideas or ideas for solving a specific problem or dealing with a specific situation. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity. Both brainstorming and ideation are processes invented to create new valuable ideas, perspectives, concepts and insights, and both are methods for envisioning new frameworks and systemic problem solving.

The Ideation chart for the safety system is shown in Table 3.1.

Table 3.1 ideation chart

| IDEA 1 | IDEA 2 | IDEA 3 |
|---|---|---|
| By using the GPS the location of the children can be traced.<br>It is also used to update the location to the parents.<br><br>Parents can control the gadgets. Parents need not worry about the safety of children. | Monitor the health condition of the children.<br><br>Vibration and temperature sensor is used to monitor the children.<br>SOS Button is present the device to contact the parents or nearby relatives in case of emergency situation. | Sending messages to the close contact list by usig GSM.<br><br>Notify the parents by sending the alarm messages if the child is in danger<br><br>Message alert to the nearby police station in case of danger. |

## 3.3 PROPOSED SOLUTION:

The proposed solution for IOT based safety gadget for child safety monitoring and notification is shown in table 3.2

Table 3.2 proposed solution

| ATTRIBUTE | DEFINITION | DESCRIPTION |
|---|---|---|
| Feasibility of idea | Project feasibility is the study of a project's various elements to determine if it has the potential for success. | Using a user friendly gadget which monitors parameters such as the location, health condition and sudden movements of child and sends notification to his/her relatives. |
| Novelty | The proposed solution needs to be fundamentally different from what people already know.. | We are using a microchip board in the device with the help of which parents can monitor the location of child and also get message in case of any emergency. |
| Social Impact | Social impact is how organizations, businesses or individuals' actions affect the surrounding community. | Cost efficient and protecting the children from child trafficking and any kind of abuse. |
| Business Model | Create a model for identifying products and services to sell the market to target and also take into account anticipated expenses. | With using, parents can safely send their child out without the fear of getting into any kind of trouble.<br><br>Without using, increases the probability of child trafficking and less security for the child. |
| Scalability of the Solution | Scalability is system that can accommodate expansion without hampering the existing workflow and ensure an increase in the output or efficiency of the process | Cost efficient device and it is developed in such a way that the location of the children is tracked continuously and it ensure the safety of the children. |

## 3.4 PROBLEM SOLUTION FIT:

The Problem solution fit simply means that one have found a problem with the customer and that the solution one have realized for it actually solves the customers problem. The problem solution fit is an important step towards the Product-Market Fit. The structure of problem solution fit is given below.

**Customer state fit:** To make sure one understands the target group, their limitations and their currently available solutions, against which one is going to compete.

**Problem-Behavior fit:** To help one to identify the most urgent and frequent problems, understand the real reasons behind them and see which behavior supports it.

**Communication-Channel fit:** To help one to sharpen the communication with strong triggers, emotional messaging and reaching customers via the right channels.

**Solution guess:** Translate all the validated data one have gathered into a solution that fits the customer state and his/her limitations, solves a real problem and taps into the common behavior of the target group.

The problem solution fit IoT Based Safety Gadget for Child Safety Monitoring and Notification is shown in Fig 3.2


Fig 3.2 Problem Solution fit

# CHAPTER 4
# REQUIREMENT ANALYSIS

Requirements analysis is very critical process that enables the success of a system or software project to be assessed. Requirements are generally split into two types: Functional and Non-functional requirements.

## 4.1 FUNCTIONAL REQUIREMENTS

These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike the non-functional requirements.

The following table 4.1 shows the functional requirements for IoT Based Safety Gadget for Child Safety Monitoring and Notification.

Table 4.1 functional requirements for
IoT Based Safety Gadget for Child Safety Monitoring and Notification.

| FR No. | Functional Requirement(Epic) | Sub Requirement(Story/Sub-Task) |
|---|---|---|
| FR-1 | User Registration | Registration through Form<br>Registration through<br>Gmail Registration<br>through LinkedIn |
| FR-2 | User Confirmation | Confirmation via Email<br>Confirmation via OTP |
| FR-3 | Authentication | Only the authorized person for that product will know ensures security |
| FR-4 | User Interface | The Inventor Able to see the location of children when they are out of geo fence will also track the exact Information about the children. |
| FR-5 | Notification | Notified through mobile and mail |

**Non-functional Requirements:**

These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioral requirements.

They basically deal with issues like Portability, Security, Maintainability, Reliability, Scalability, Performance, Reusability, and Flexibility.

The following table 4.2 shows the Nonfunctional requirements for IoT Based Safety Gadget for Child Safety Monitoring and Notification.

Table 4.2 Nonfunctional requirements for IoT Based Safety Gadget for Child Safety Monitoring and Notification.

| **FR No.** | **Non-Functional Requirement** | **Description** |
|---|---|---|
| NFR-1 | Usability | Accessed through Mobile App Showing location (latitude and longitude) of child and also other measure stone sure safety like notification .Portable and comfortable to use. |
| NFR-2 | Security | Database security and ensuring the safety of the Product while in use. |
| NFR-3 | Reliability | Once logged in, the webpage is available until logging out of the app, and a comfortable platform or creates a good environment for users to use. |
| NFR-4 | Performance | Each page must load within 4 seconds and database needs to be updated every few seconds and a notification must be sent immediately if seen a Change in the child's location. |
| NFR-5 | Availability | The data must be available when ever needed and The product should be able to use at any time. |
| NFR-6 | Scalability | The process must be flexible to use at any time and Versatile. |

# CHAPTER 5

# PROJECT DESIGN

## 5.1 DATA FLOW DIAGRAMS

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually "say" things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That's why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

There are four main elements of a DFD - external entity, process, data store, and data flow.

### External entity

An external entity, which are also known as terminators, sources, sinks, or actors, are an outside system or process that sends or receives data to and from the diagrammed system. They're either the sources or destinations of information, so they're usually placed on the diagram's edges. External entity symbols are similar across models except for Unified, which uses a stick-figure drawing instead of a rectangle, circle, or square.

**Process**

Process is a procedure that manipulates the data and its flow by taking incoming data, changing it, and producing an output with it. A process can do this by performing computations and using logic to sort the data, or change its flow of direction. Processes usually start from the top left of the DFD and finish on the bottom right of the diagram.

**Data store**

Data stores hold information for later use, like a file of documents that's waiting to be processed. Data inputs flow through a process and then through a data store while data outputs flow out of a data store and then through a process.

**Data flow**

Data flow is the path the system's information takes from external entities through processes and data stores. With arrows and succinct labels, the DFD can show the direction of the data flow.

The data flow diagram for IoT Based Safety Gadget for Child Safety Monitoring and Notification is shown in following figure 5.1

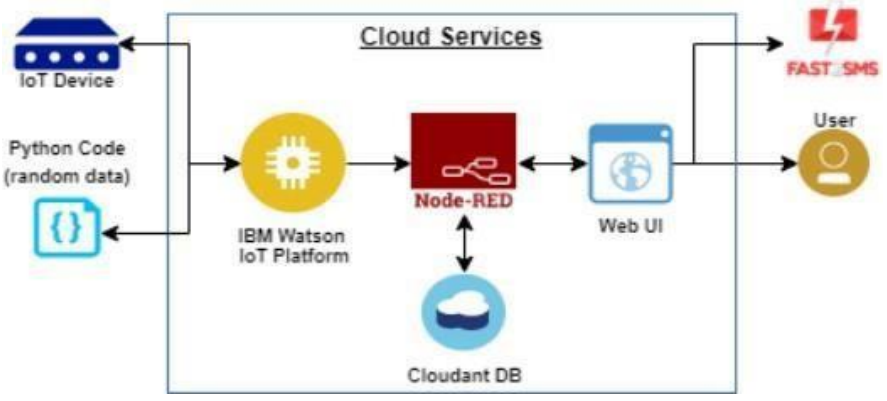


Figure 5.1 Block diagram

Figure 5.1 shows the block diagram of the Hazardous area monitoring in industries

**Steps:**

1. Consort IoT device with python code.
2. IBM Watson understanding the language and send Node RED.
3. In cloud services, clouding DB, Web UI are also there and it connect intouser.
4. Send the notification to the user as a Fast SMS.

## 5.2 SOLUTION AND TECHNICAL ARCHITECHTURE:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

• To monitor temperature in areas of industrial plants using IOT enabled devices

• Temperature sensors are interfaced with a light weight microcontroller which makes them wearable. These microcontrollers are interfaced with LORA communication devices to communicate with distributed gateways. These gateways are connected to the internet through which the temperature is monitored.

• The devices (E.g., BEACON) with similar features which are available now are fixed in a single position and they are costly.

• The sensing devices are mobile and hence they can give accurate measurements of temperature across the industrial plant.

• The proposed solution communicates about the temperature across the industrial plant monitored through sensors, to the users .It can be scaled to include gas sensors and other wide variety of sensors enabling safety of the user.

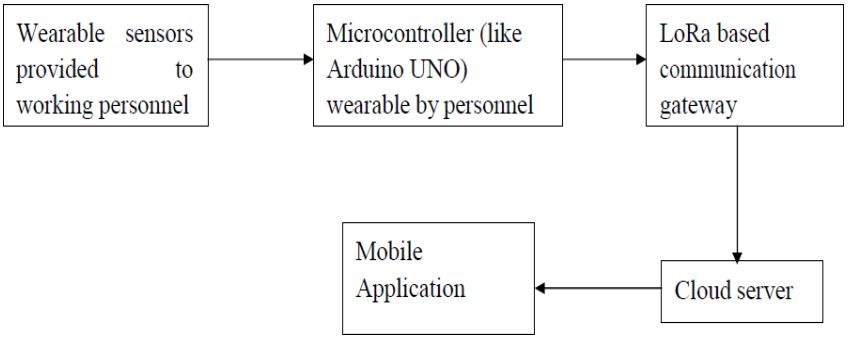


Fig 5.2 Solution Architecture of IoT Based Safety Gadget for Child Safety Monitoring and Notification

Figure 5.2 shows the block diagram of the solution architecture which describes the solution we approaching for the project

## 5.3Technology Architecture

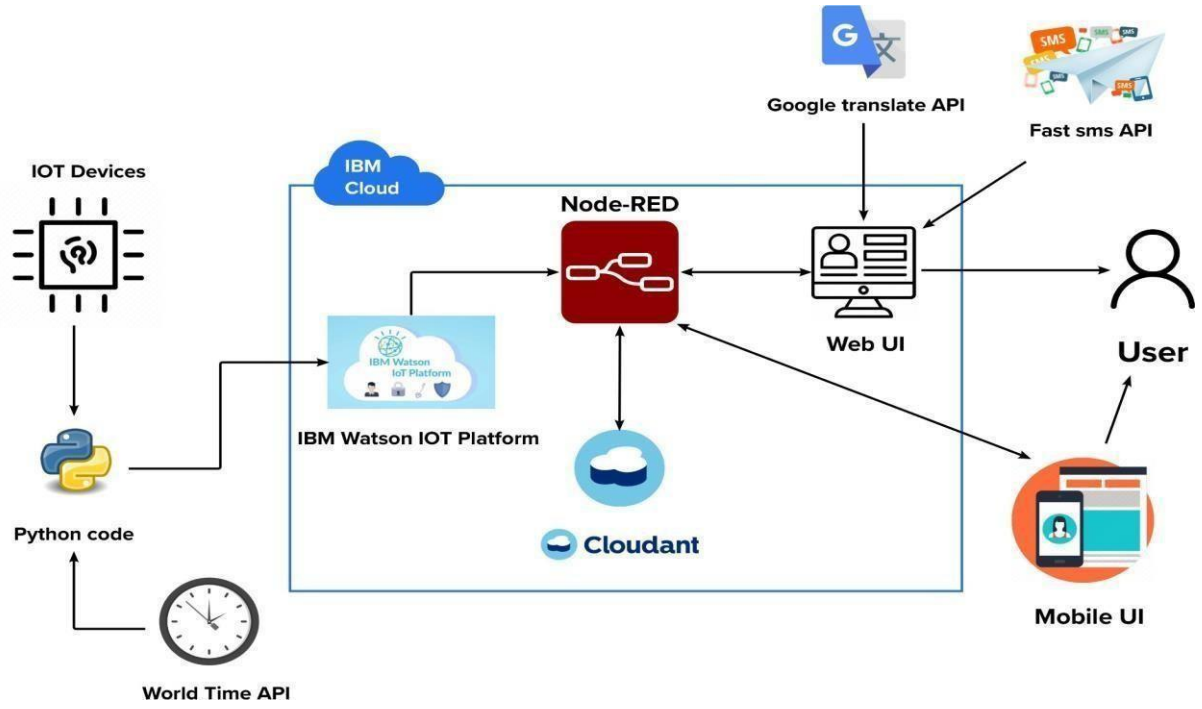


Figure 5.3 Technical architecture

Figure 5.3 shows the technical architecture of the proposed system attached to the proposed model.

## 5.4 CONFIGURATION OF IBM CLOUD SERVICES

### Creating node-red service

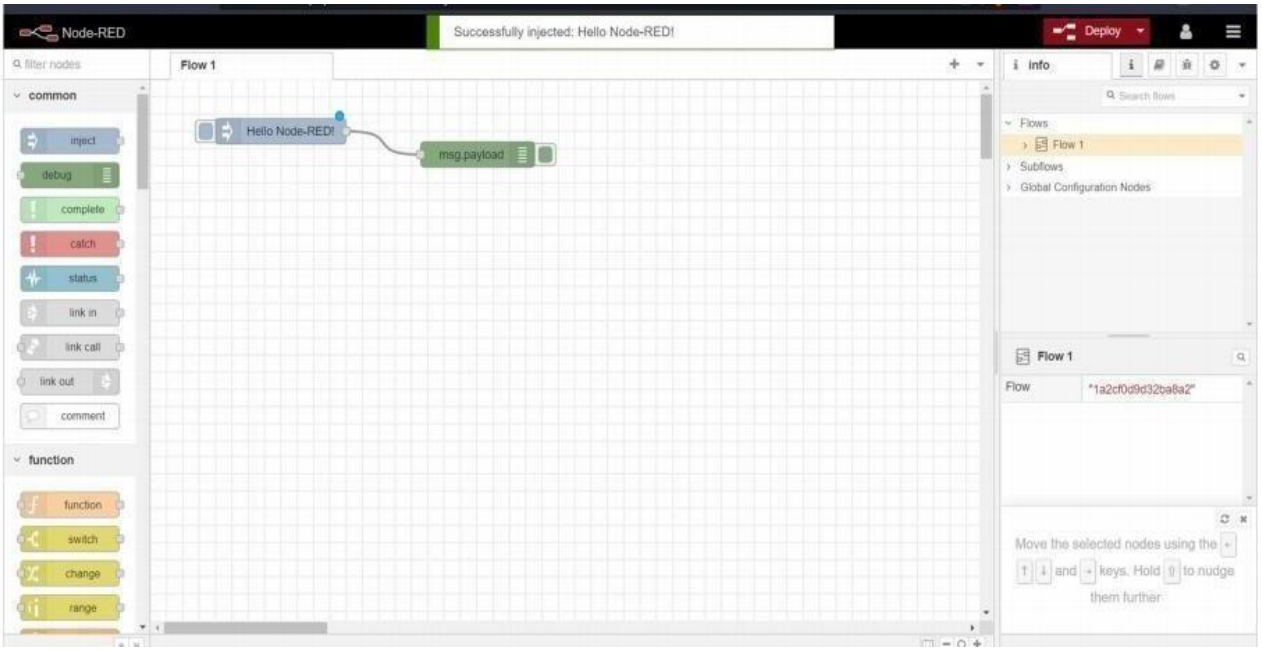


Figure 5.4 Creation of node red service Figure 5.4 shows the creation of node red service using IBM cloud

### 5.4.1 DATABASE IN CLOUDANT DB

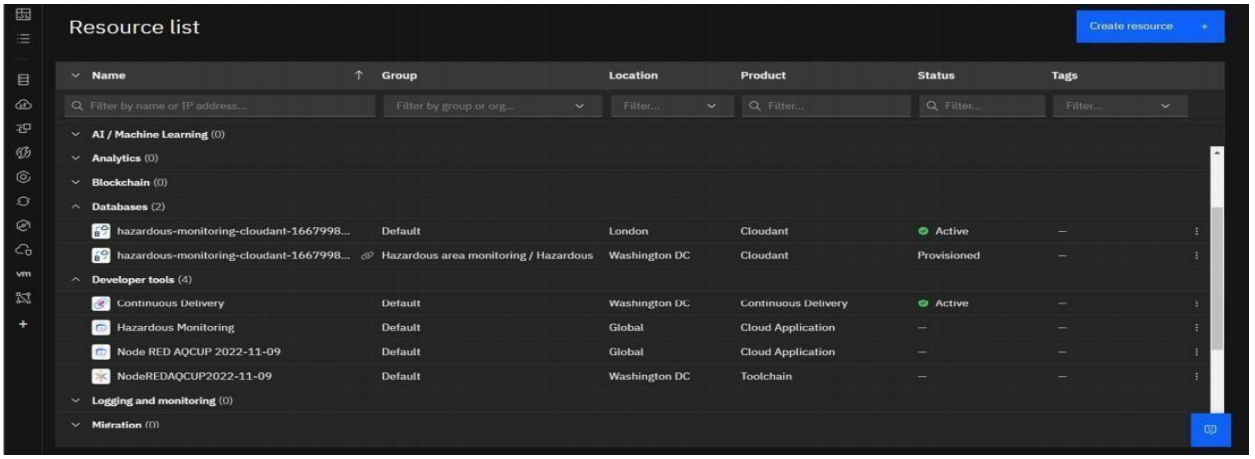


Figure 5.5 creating a database in the cloudant DB

Figure 5.5 shows a creation of database in the cloud database

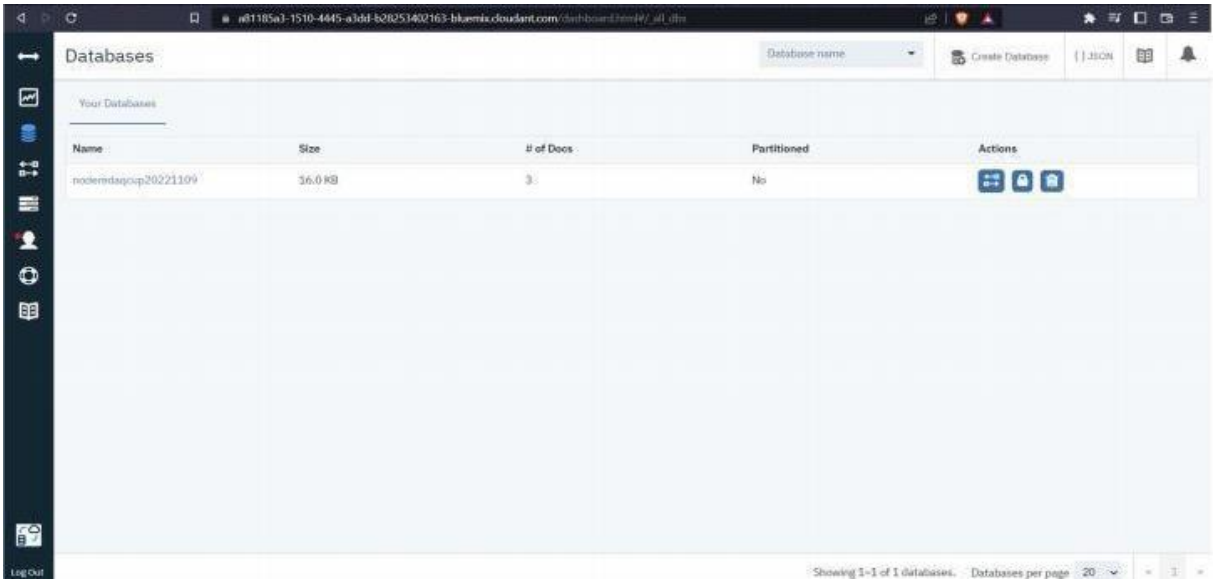


Figure 5.6 Created databases 2

Figure 5.6 shows a created database in the extended version to process the data

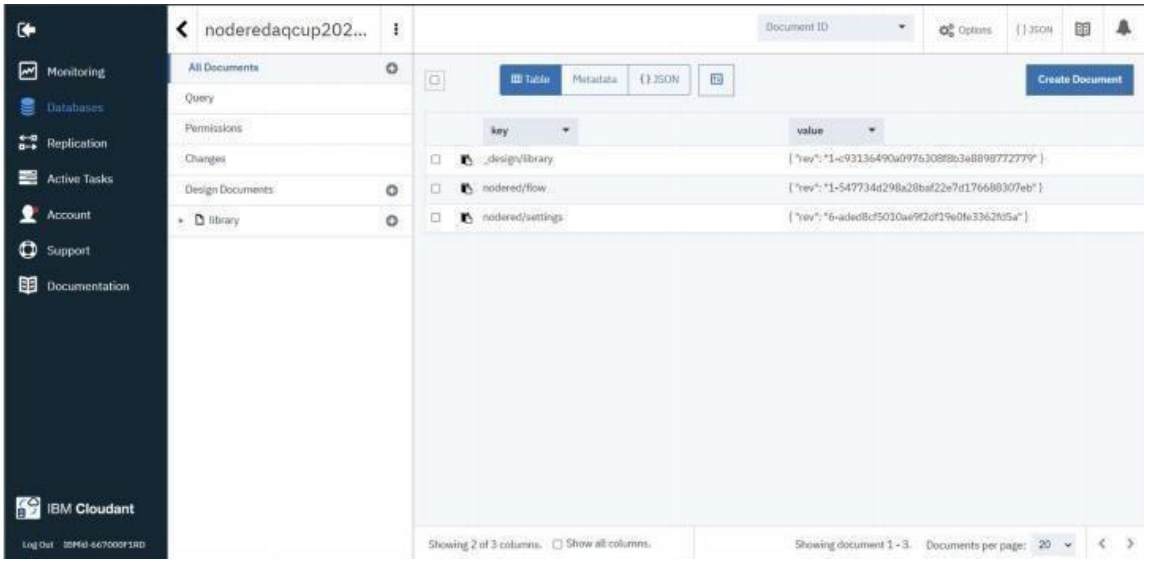


Figure 5.7 IBM cloudant

Figure 5.7 shows the IBM cloudant data and its subcategories where user can see the database that it being registered

## 5.4.2 IBM WATSON IOT PLATFORM AND DEVICE

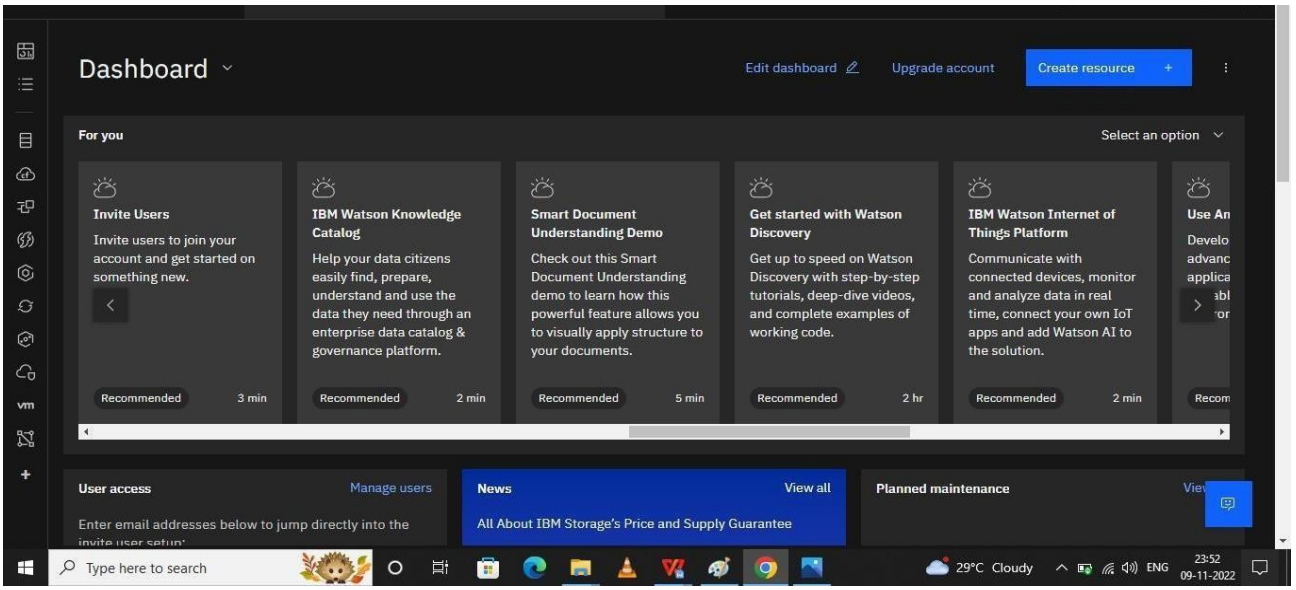


Figure 5.8 IBM Watson Dashboards

Figure 5.8 shows the IBM Watson Dashboard in the IoT IBM Cloud

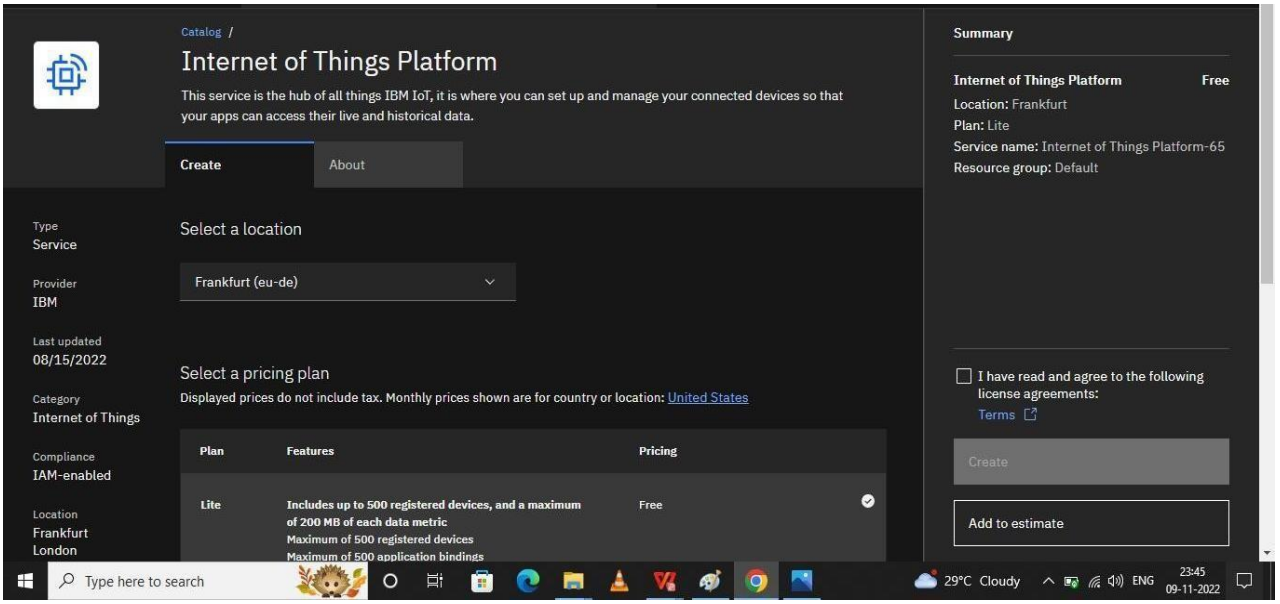


Figure 5.9 IoT catalogue in IBM Watson

Figure 5.9 shows the IoT catalogue in IBM Watson which defines the IoT platform

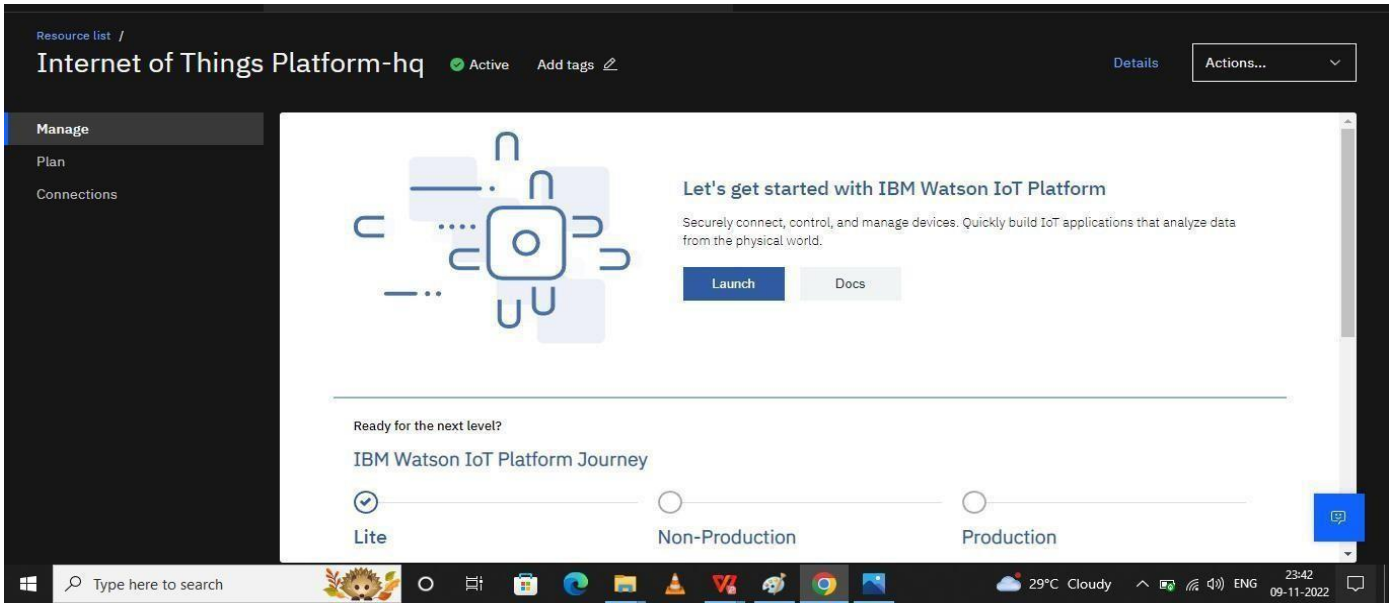


Figure 5.10 IoT platform in IBM cloud

Figure 5.10 shows the Iot Platform in the IBM cloud with is the initial step for the IBM cloud

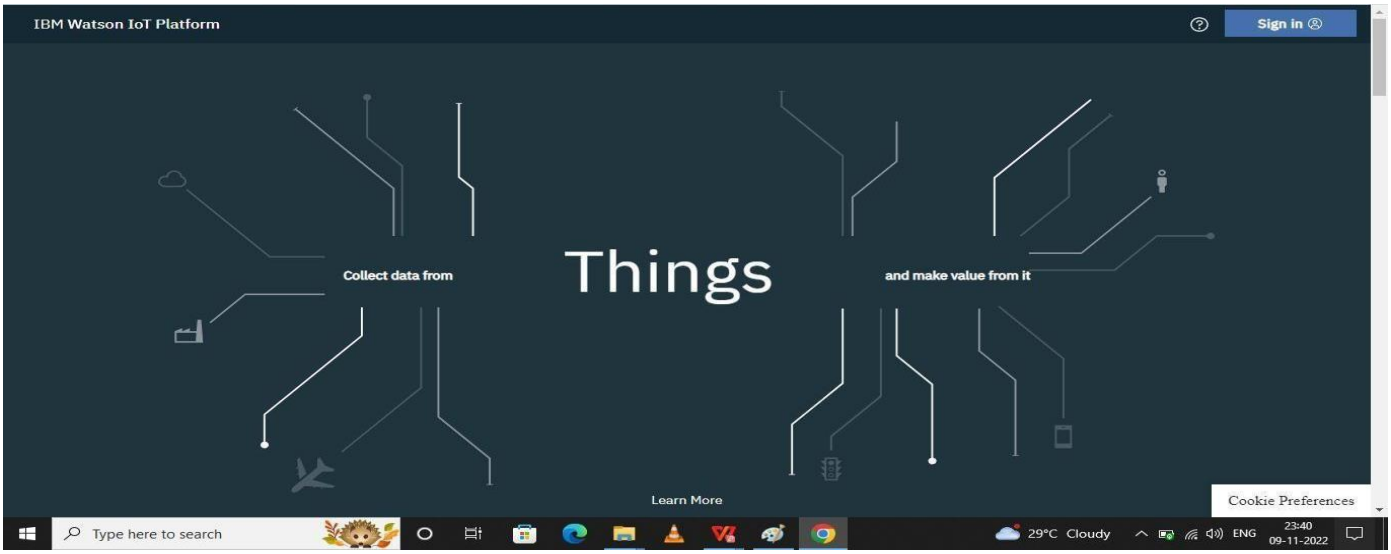


Figure 5.11 Module creations in IBM cloud

Figure 5.11 shows the module creation in the IBM cloud that describes the initial stage Watson.

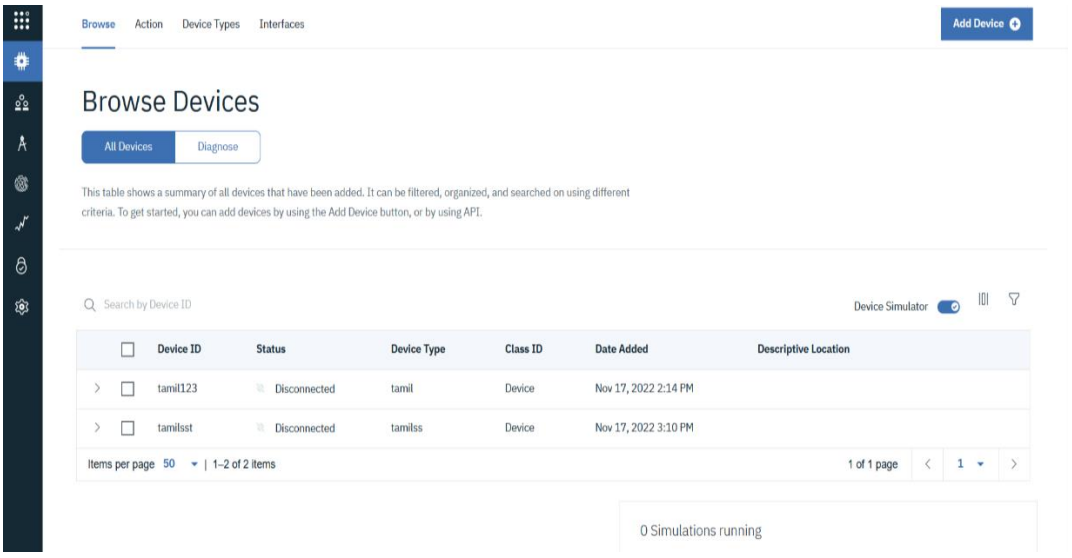


Figure 5.12 Adding modules and devices in the IBM cloud

Figure 5.12 shows the adding modules and different devices in the IBM cloud

### 5.4.3 NODE RED FLOW TO GET DATA FROM DEVICE:

Configuring the Node-RED flow to receive data from the IBM IoT platform.

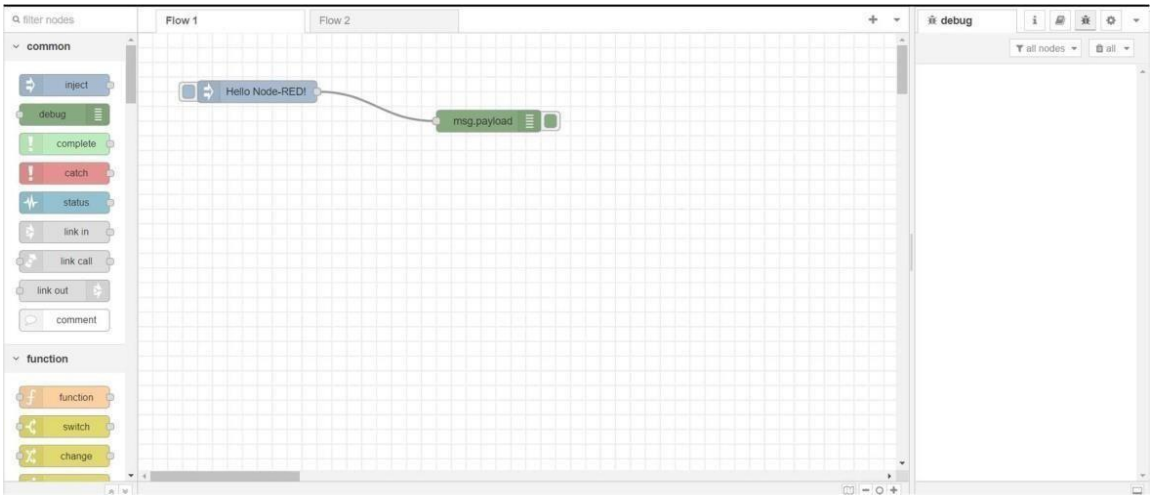


Figure 5.13 Node red configurations

Figure 5.13 shows the initial configuration of Node-red which is to added by the different components

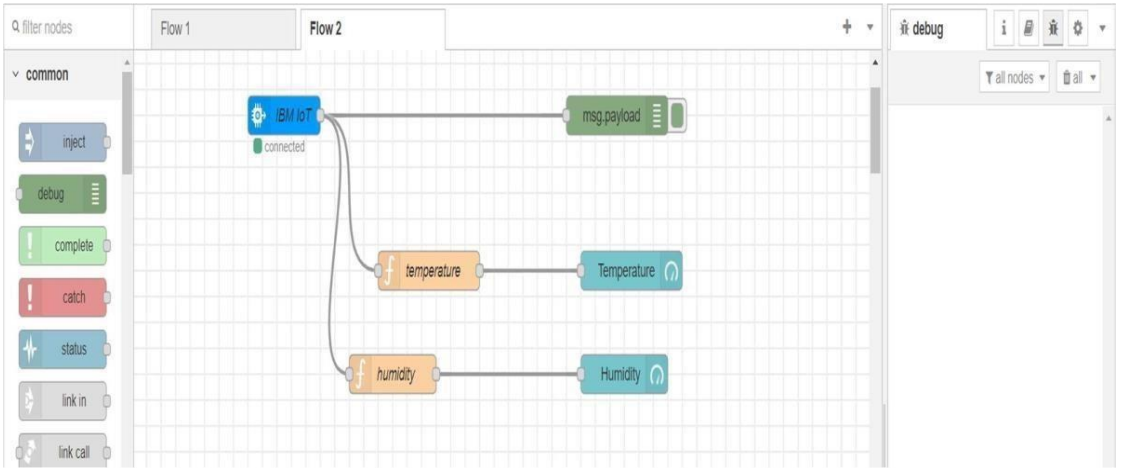


Figure 5.14 Creating Node red initial flow

Figure 5.14 shows an adding different level of components to the IBM Node-re

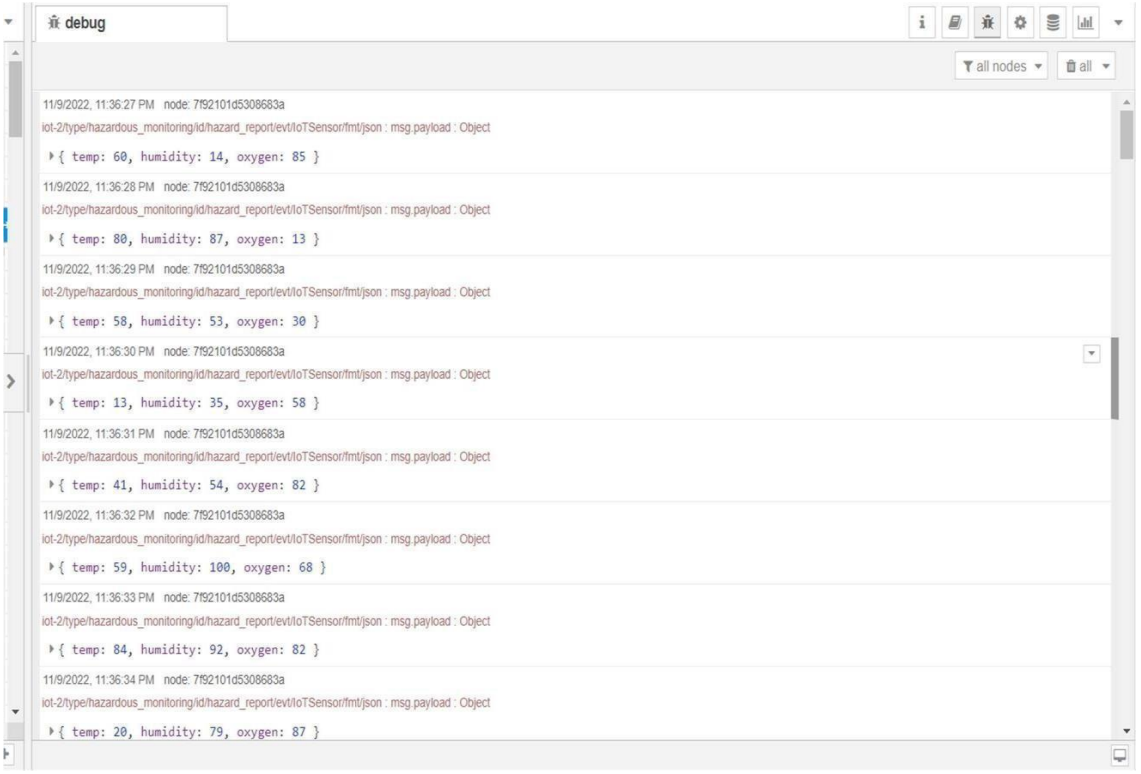


Figure 5.15 Debugging of Node red flow

Figure 5.15 shows the debugging of Node red flow diagram in the range to find the temperature, humidity and oxygen level of the sensors.

### 5.4.4 Creating HTTP Requests to Communicate with Mobile App

Creating an HTTP API for communicating with Mobile applications and also use Cloudant DB nodes to store the received sensor data in the Cloudant DB.

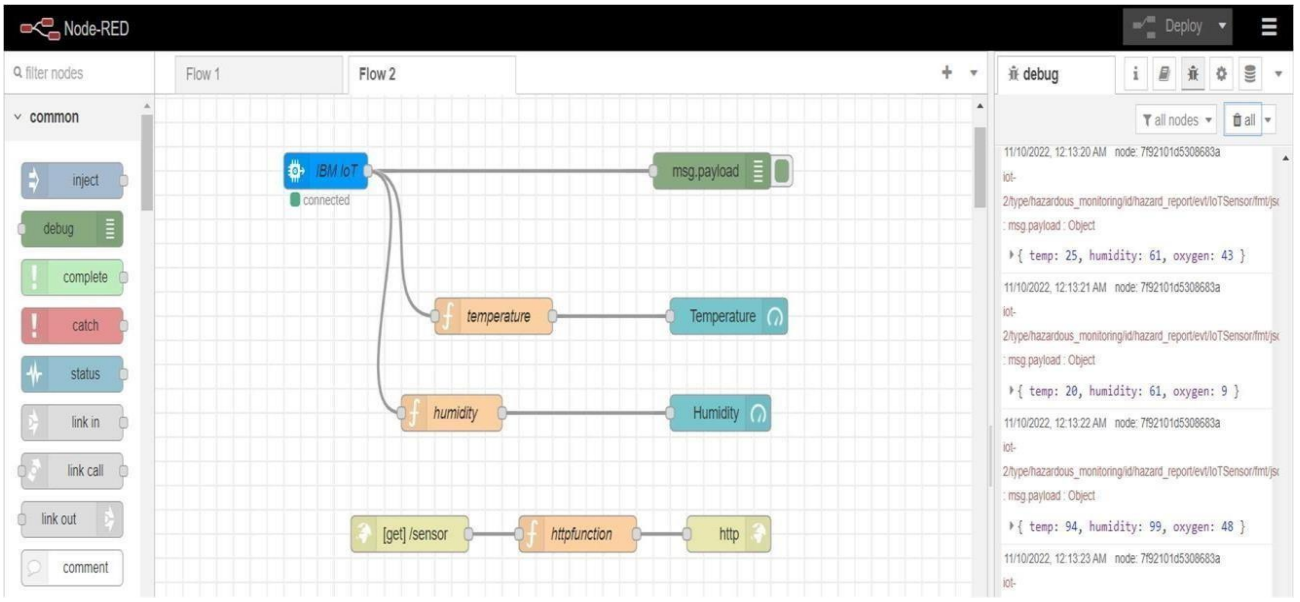


Figure 5.16 HTTP request to communicate

Figure 5.16 shows the HTTP request to communicate to the sensors and devices

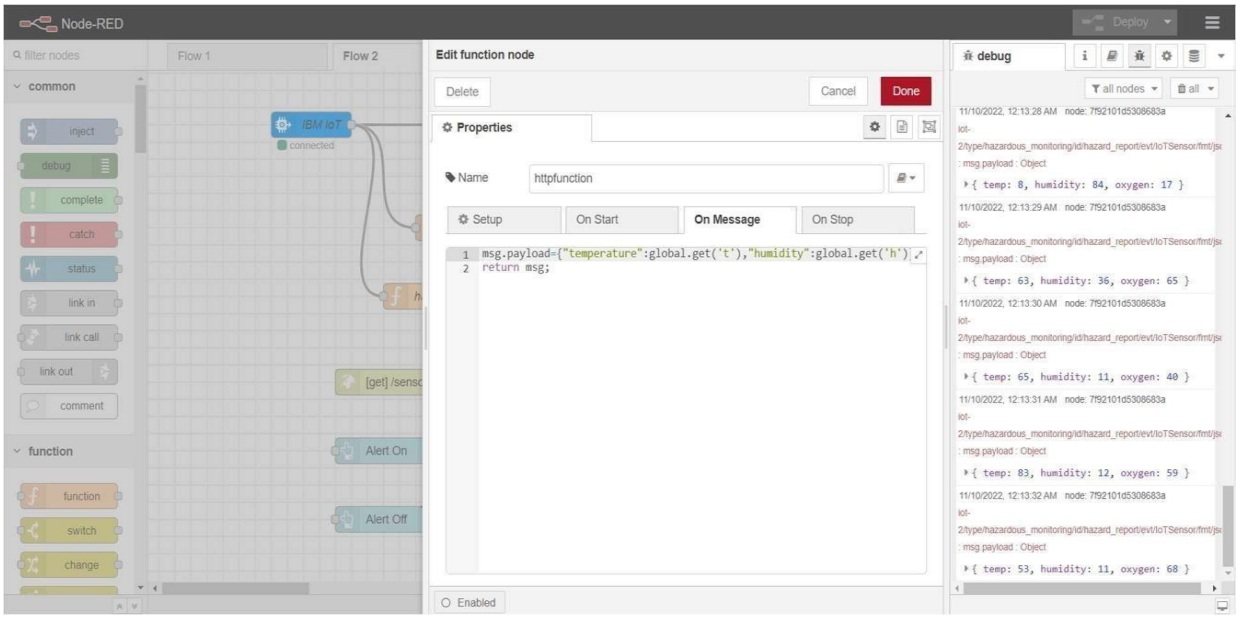


Figure 5.17 Debugging of Functional Node 1

Figure 5.17 shows the debugging of functional node of the Node-red which shows the level of the different sensors.

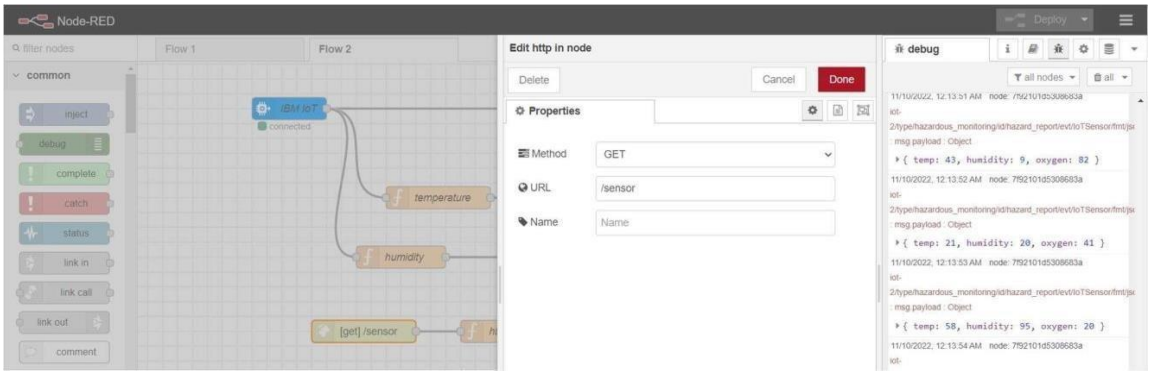


Figure 5.18 Deploying of function Node 2

Figure 5.18 shows the deploying of functional node in the IBM Node-red.

### 5.4.5 Using Dashboard Nodes for Creating UI (Web app)

- ✓ To create a dashboard using a template: Select a template from the DASHBOARD TEMPLATES list. Click Create Custom Dashboard. Name your dashboard. Click Create and Open.
- ✓ To create a dashboard without a template: Click Add Dashboard. . The New Dashboard page opens.
- ✓ IBM Cognos Analytics can help you create visualizations and dashboards without needing a data science background.

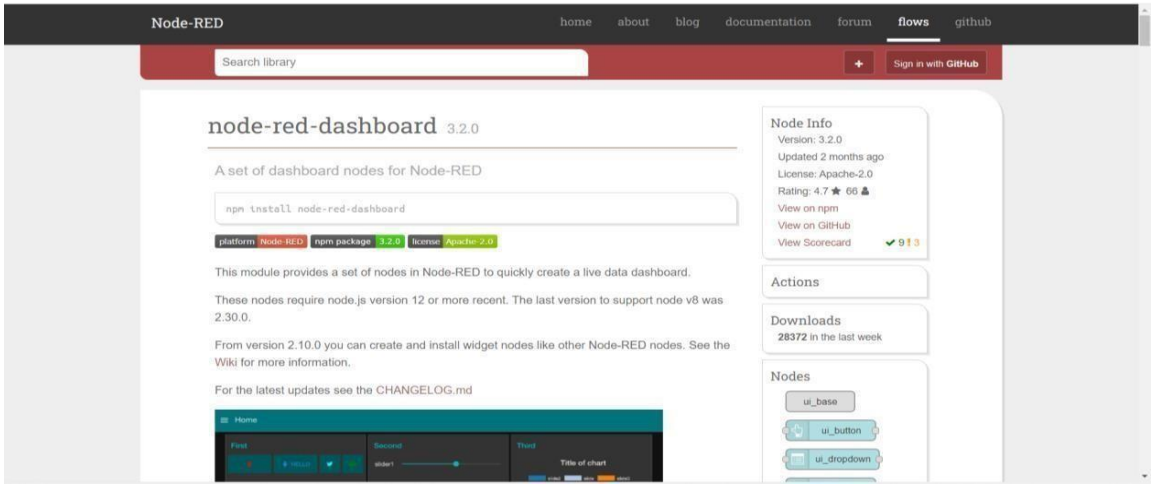


Figure 5.19 Creating dashboards in web UI

Figure 5.19 shows the creating dashboard in web UI to link the different components to the proposed system.

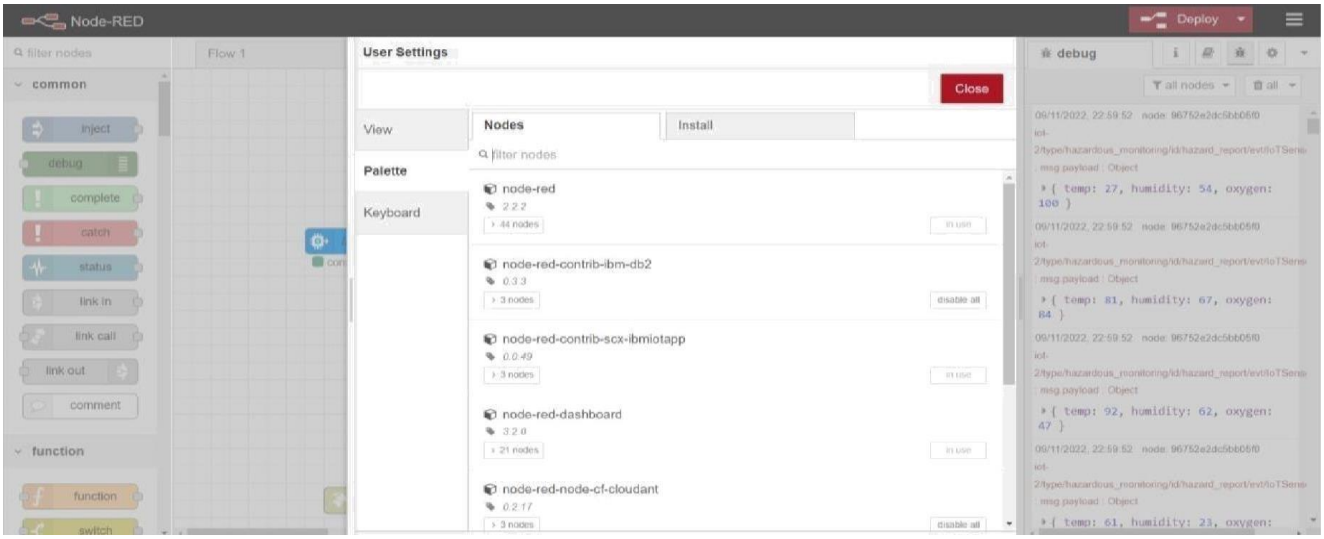


Figure 5.20 User setting in Web UI

Figure 5.20 shows the user setting in web UI in the Node-red to connect different components in the system

# CHAPTER 6
# PROJECT PLANNING & SCHEDULING

## 6.1SPRINT PLANNING AND ESTIMATION

Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team.

The sprint is a set period of time where all the work is done. However, before leap into action it is necessary to set up the sprint. It needs to decide on how long the time box is going to be, the sprint goal, and where it is going to start. The sprint planning session kicks off the sprint by setting the agenda and focus. If done correctly, it also creates an environment where the team is motivated, challenged, and can be successful.

The Table 6.1 shows the sprint planning and estimation of IoT Based Safety Gadget for Child Safety Monitoring and Notification

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint-1 | Registration | USN-1 | As a user, I can register for the application by entering my email, and password, and confirming my password. | 4 | High | SAMUTHIRIKA S,SOORYA S |
| Sprint-1 | Confirmation Email | USN-2 | As a user, I will receive a confirmation email once I have registered | 3 | Medium | SHAFAHATH S, SOORYA R |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | for the application | | | |
| Sprint-1 | Login | USN-2 | As a user, I can log into the application by entering email & password | 3 | Medium | SOORYA R,SHAFAHATH S |
| Sprint-1 | Dashboard | USN-1 | As a user, I need to be able to view the functions that I can perform | 4 | High | SHAFAHATH ,SOORYA R |
| Sprint-2 | Interfacing sensor | USN-3 | Interface the sensor with raspberry pi and then the application is developed. So it notifies the user via mail and message whenever there is a movement of animals and birds. | 2 | Low | TAMILARASAN |
| Sprint-2 | Notification | USN-1 | As a user, I should be able to notify my parent and guardian in emergency situations | 7 | High | SAMUTHIRIKA S |
| Sprint-2 | Interfacing Modules | USN-3 | As a developer, I used GPS NEO 6m to fetch the co-ordinates and interface it with the cloud | 7 | High | SOORYA R, TAMILRASAN M |
| Sprint-2 | Update and store data | USN-1 | As a developer, I need to continuously | 6 | Medium | SHAFAHATH SOORYA R |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | store my Location data into the database fetched from GPS module. | | | |
| Sprint-3 | Communication | USN-3 | I should be able to communicate with my Parents at times of emergency | 7 | High | SAMUTHIRIKA S, TAMILARASAN .M |
| Sprint-3 | IoT Device – Watson communication | USN-2 | The data from IoT device should reach IBM Cloud | 6 | Medium | SOORYA R, TAMILARASAN .M |
| Sprint-4 | Node RED-Cloudant DB communication | USN-1 | The data stored in IBM Cloud should be properly integrated with Cloudant DB | 7 | Medium | SHAFAHATH S, TAMILARASAN .M |
| Sprint -4 | User-Web UI interface | USN -3 | As a developer, I should provide battery package for the device. | 10 | Medium | SAMUTHIRIK A S,SHAFAHAT H S |

## 6.2 SPRINT DELIVERY SCHEDULE:

The sprint delivery plan is scheduled accordingly as shown in the below table 6.2 which consists of the sprints with respective to their duration, sprint start and end date and the releasing data.

Table 6.2 sprint delivery schedule

| Sprint | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
|---|---|---|---|---|---|---|
| Sprint-1 | 20 | 6 Days | 24 Oct 2022 | 29 Oct 2022 | 20 | 29 Oct 2022 |
| Sprint-2 | 20 | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 20 | 05 Nov 2022 |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 20 | 12 Nov 2022 |
| Sprint-4 | 20 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 20 | 19 Nov 2022 |

`

# CHAPTER 7
# CODING & SOLUTIONING

## 7.1 FEATURE:

- To track the location of the child using GPS location tracking.
- Send notification to the parents if the child goes out the geofence area.
- App through which parents can access location of the child and reach them in case of emergency.

**Random:**

Sometimes we want the computer to pick a random number in a given range, pick a random element from a list, pick a random card from a deck, flip a coin, etc. The random module provides access to functions that support these types of operations.
In this case random is used to generate the random values between specified float values to recreate sensor data.

**JSON:**

JSON is an open standard file format and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute–value pairs and arrays. It is a common data format with diverse uses in electronic data interchange, including that of web applications with servers.

**Time:**

Python time module allows working with time in Python. It allows functionality like getting the current time, pausing the Program from executing, etc. In this program the time library is used to get the current time so that the data can be stored using time stamps

**Datatime:**

Module supplies classes for manipulating dates and times. While date and time arithmetic is supported, the focus of the implementation is on efficient attribute extraction for output formatting and manipulation.

**Data publish to IBM cloud:**

WOKWI Simulation using ESP32 and Ultrasonic Sensor:

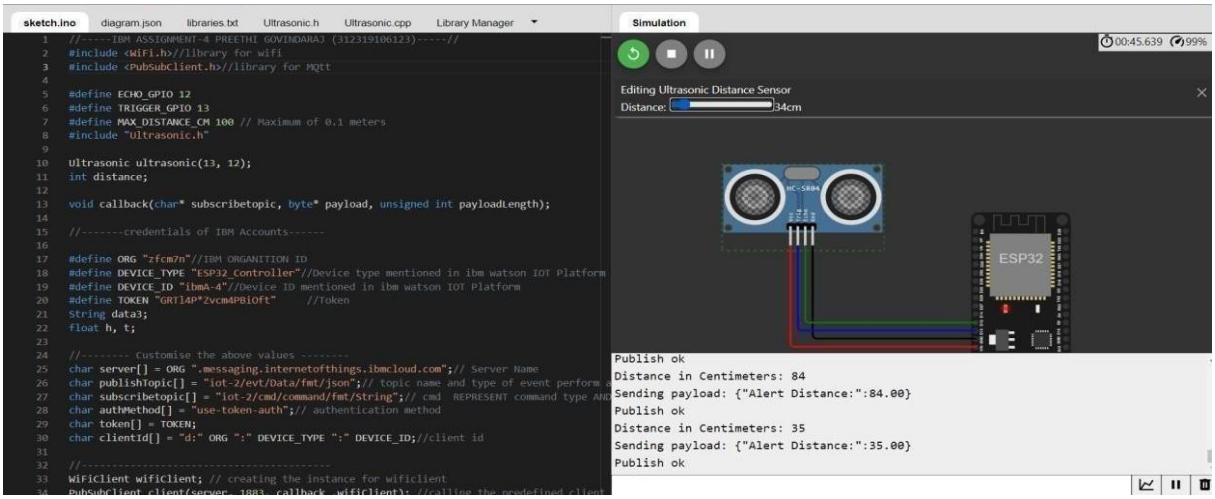


Figure 7.1 Wokwi simulation

Figure 7.1 shows the wokwi simulation of the ultrasonic sensor and wifi module

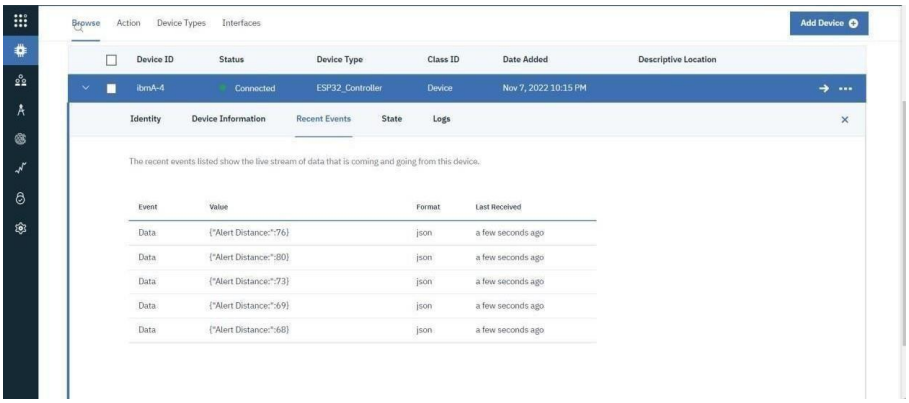


Figure 7.2 IBM Watson

Figure 7.2 shows the IBM Watson platform device-event log which shows different setof data.

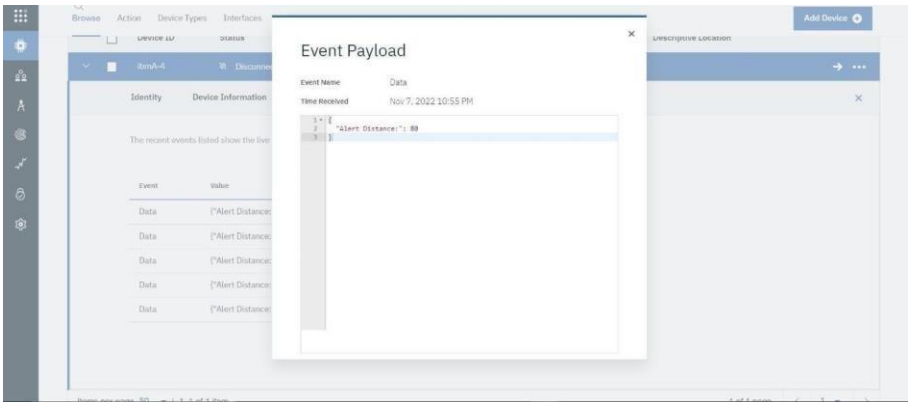


Figure 7.3 Event payload

Figure 7.3 shows the event payload that shows the alert system.

## Configuring the Application to Receive The Data From Cloud

Node red flow created to get values

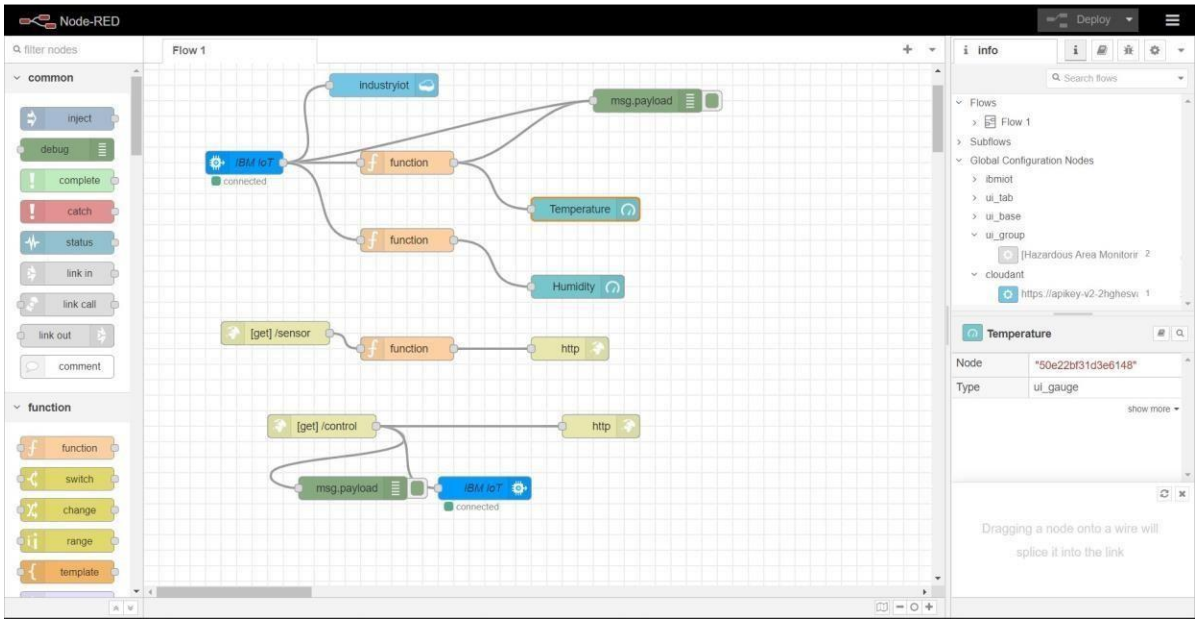


Figure 7.4 Node red flow created to get values.

Figure 7.4 shows the flow of the connected components to get values of the individual solution in it

Configuring function to fetch the desired value

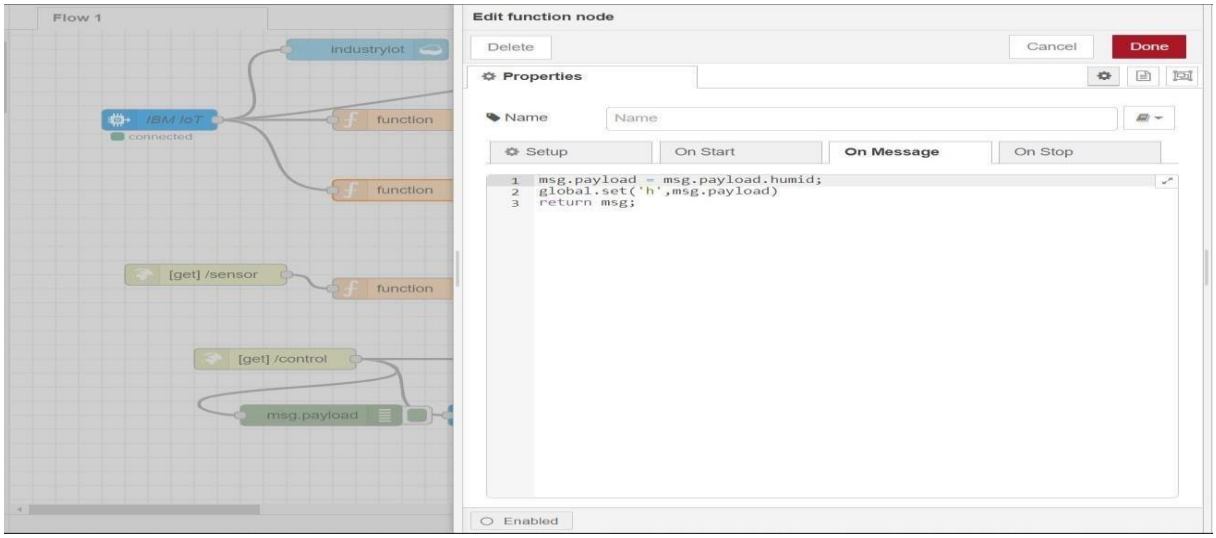


Figure 7.5 Configuration function to fetch value

Figure 7.5 shows the configuration of the function to fetch value to the data from the sensors

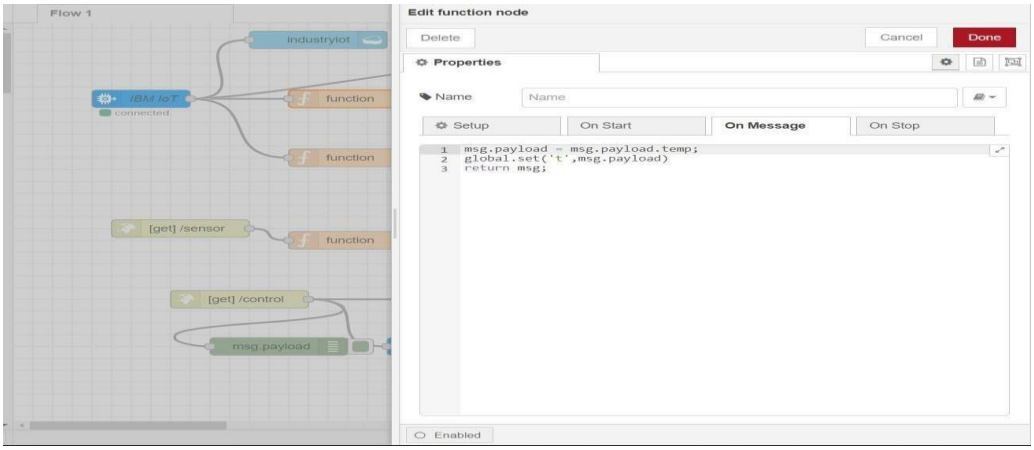


Figure 7.6 App blocks to render the values and display it in app 1

Figure 7.6 shows the app blocks to render the values and display it in the application of the proposed system.

App Blocks to render the values and display it in app

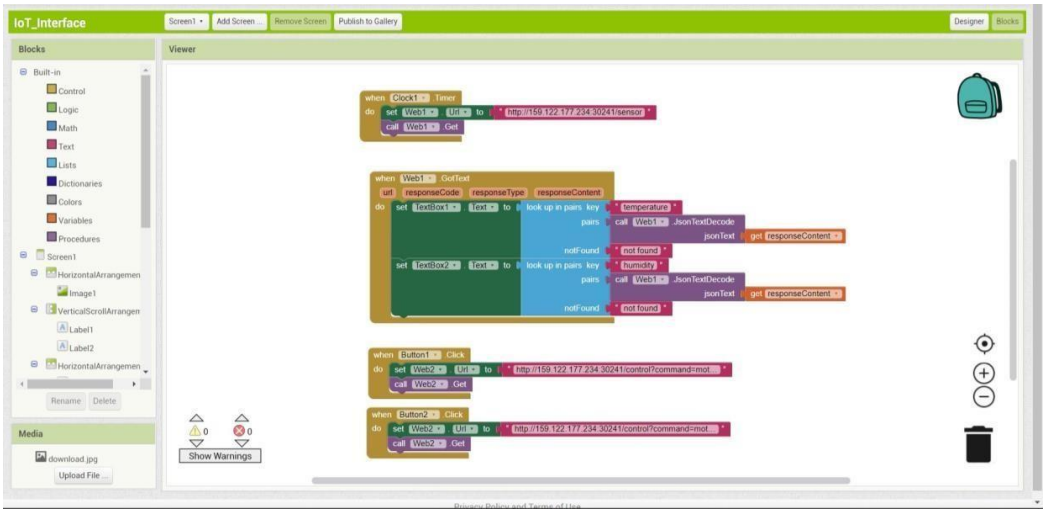


Figure 7.7 App blocks to render the values and display it in app 2

Figure 7.7 shows the application blocks to render the values and display it the same application as above.

**Configuring The Mobile App For Controlling Motor Using Buttons**

App Blocks to render the values and display it in app

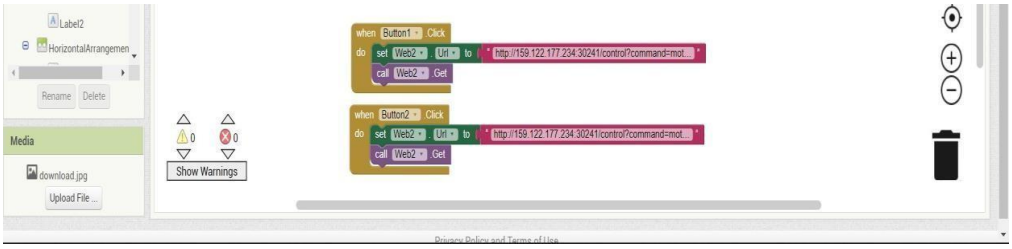


Figure 7.8 App blocks to render the values

Figure 7.8 shows the application blocks to render the values which has got from the sensor and components.

Python block that changes the state of motor based on input from app

```
def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status =="motoron":
        print("motor in on")
    else :
        print ("motor is off")
```

Figure 7.9 Python blocks changes the state of motor

Figure 7.9 shows the python block changes to the state of the motor which also shows thecommand status.

```
Command received: motoron
motor in on
Published Temperature = 100 C Humidity:68
Published Temperature = 63 C Humidity:7
Published Temperature = 32 C Humidity:67
Command received: motoroff
motor is off
```

Figure 7.10 Output window

Figure 7.10 shows output window of the status of the motor and temperature and humiditylevel of the sensors.

# CHAPTER 8

# TESTING

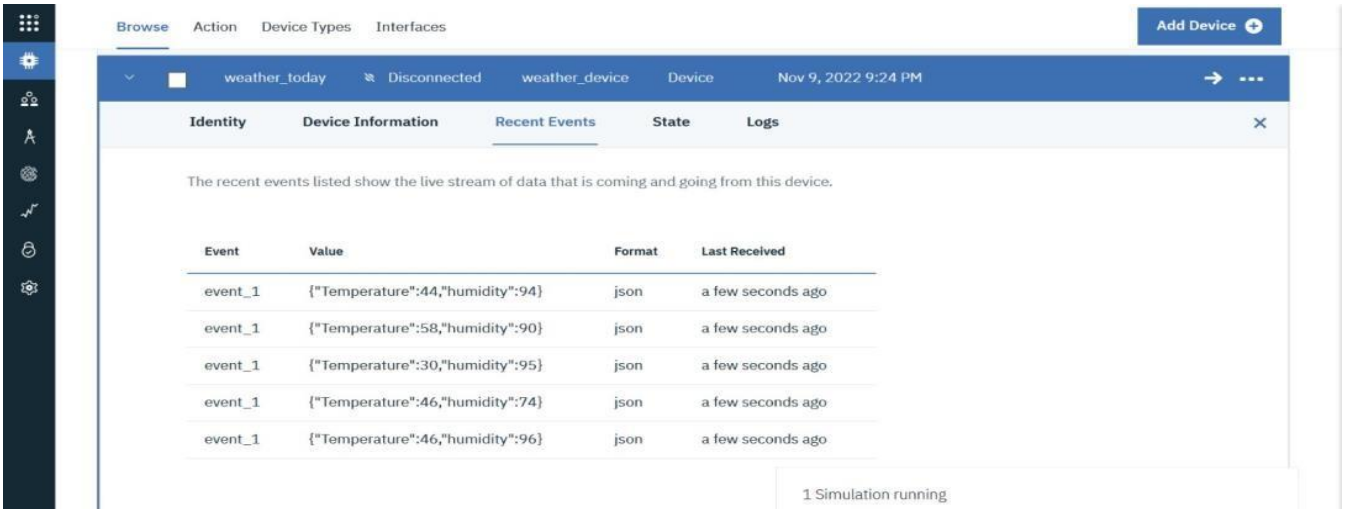


Figure 8.1 Devices in IBM cloud

Figure 8.1 shows the devices in IBM cloud which shows the temperature and humiditylevel of the sensors

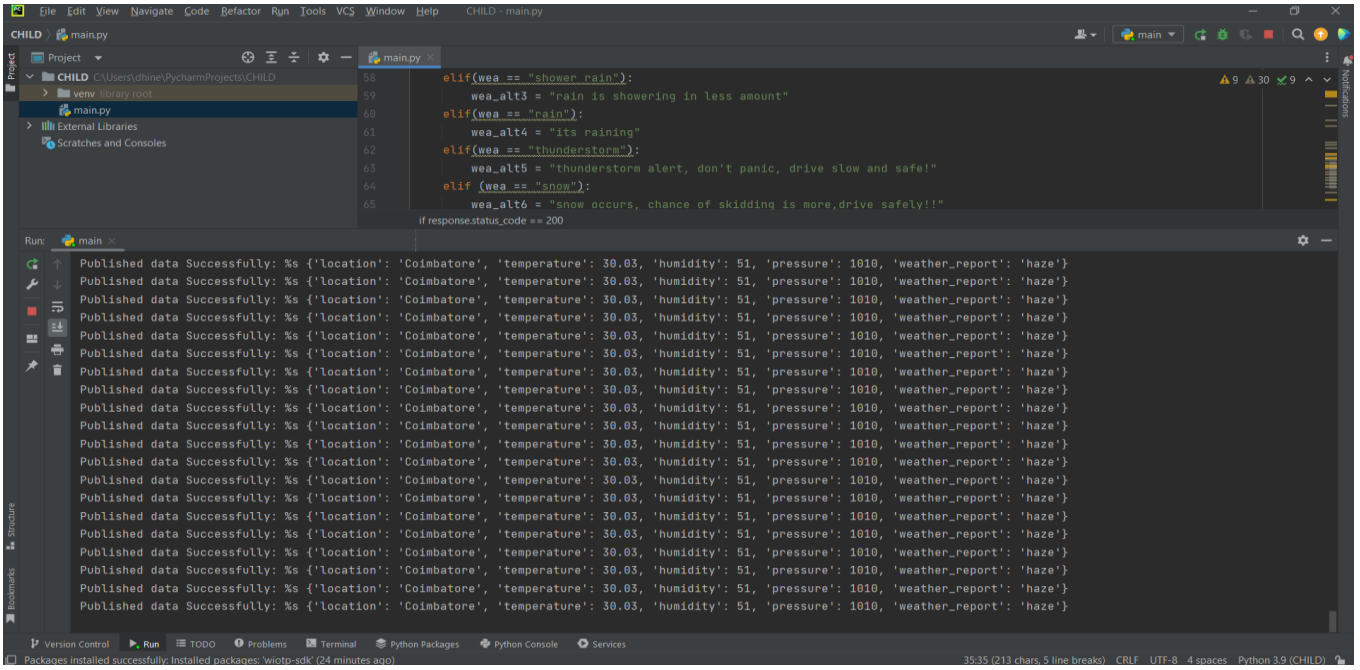


Figure 8.2 Temperature Humidity output

Figure 8.2 shows the temperature and humidity level in the output window of the python
software.

Make a connection between the node functions in the node redapplication.

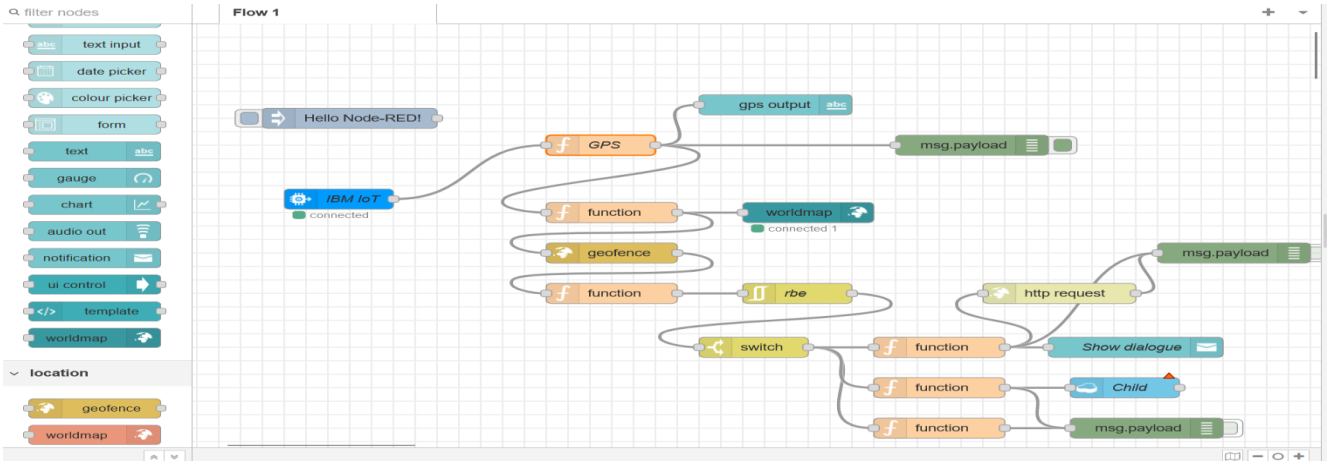


Figure 8.3 Connections of Nodes

Figure 8.3 shows the connections of nodes which shows the overall connectionof webpage and sensor values in the window.

To view the Output views the node-red dashboard.

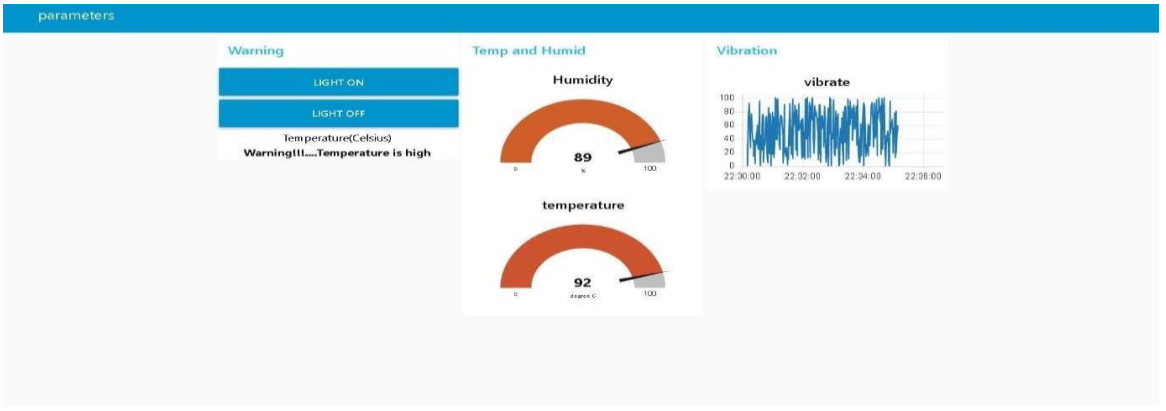


Figure 8.4 Output of nodes

Figure 8.4 shows the output of nodes which also shows the humidity and temperature value and state of the light indicator.

To view the web UI copy the link in the node red upto .net/ and type data anduser can viewthe temperature , humidity and vibration.

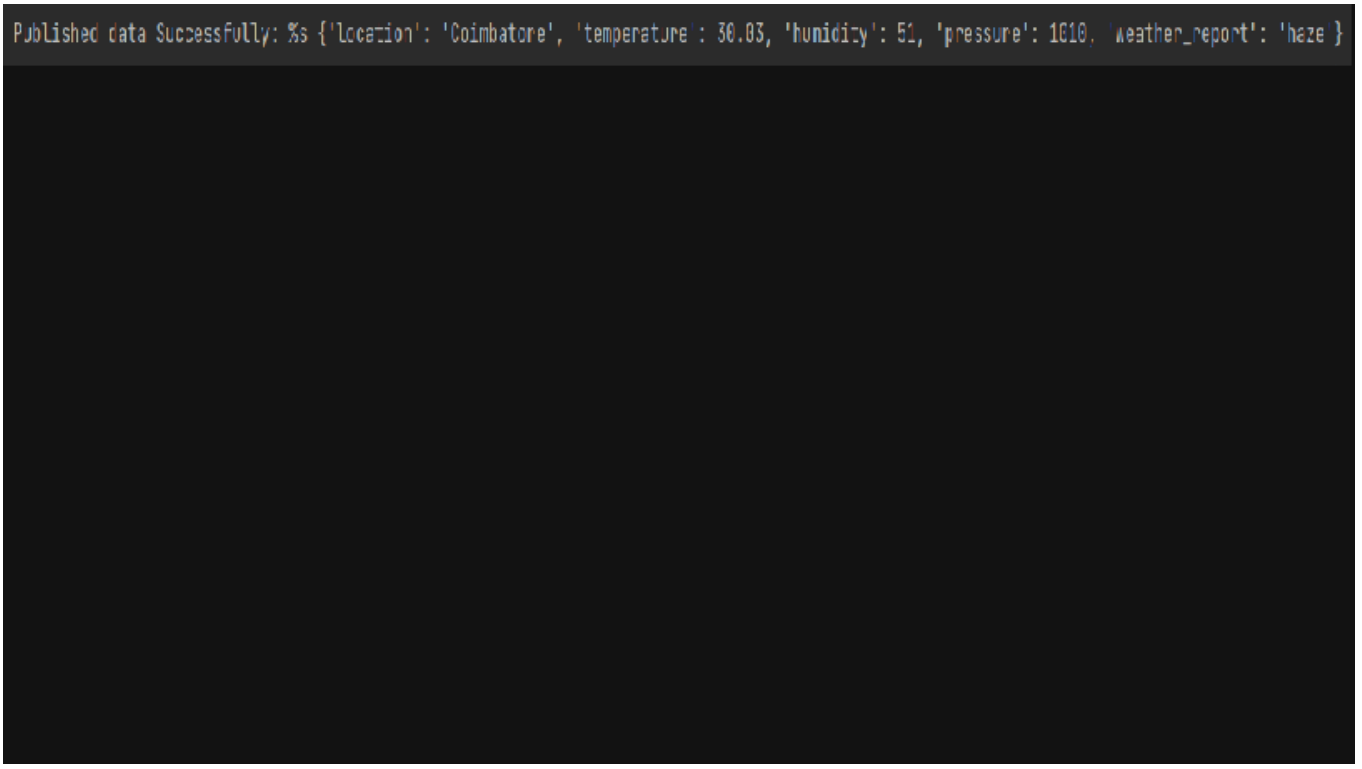


Figure 8.5 Temperature Humidity Output

Figure 8.5 shows the temperature and humidity output in the node red webpage

# CHAPTER 9

# RESULTS

# PERFORMANCE METRICES

Connect the app  with Node-Red Service:

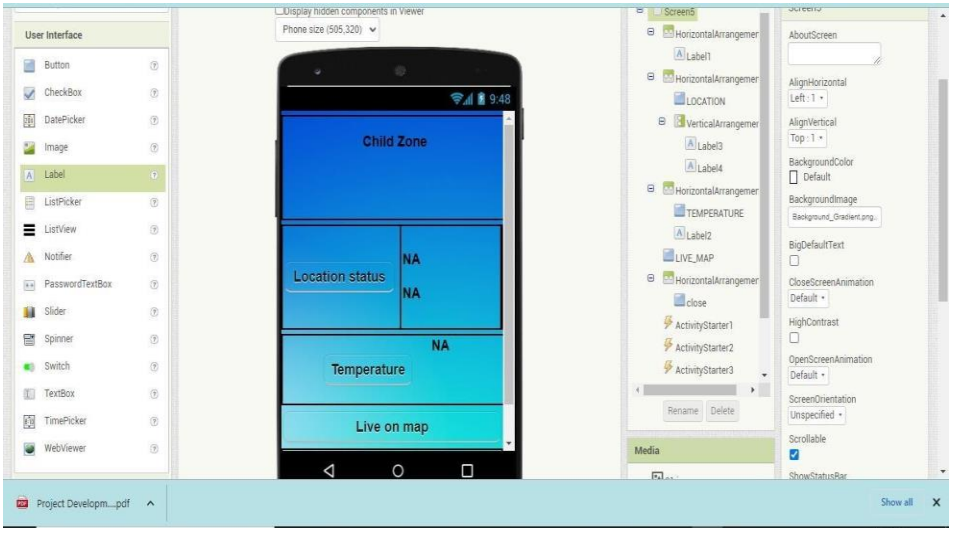


Figure 9.1 App with Node Red


Figure 9.2 MIT App

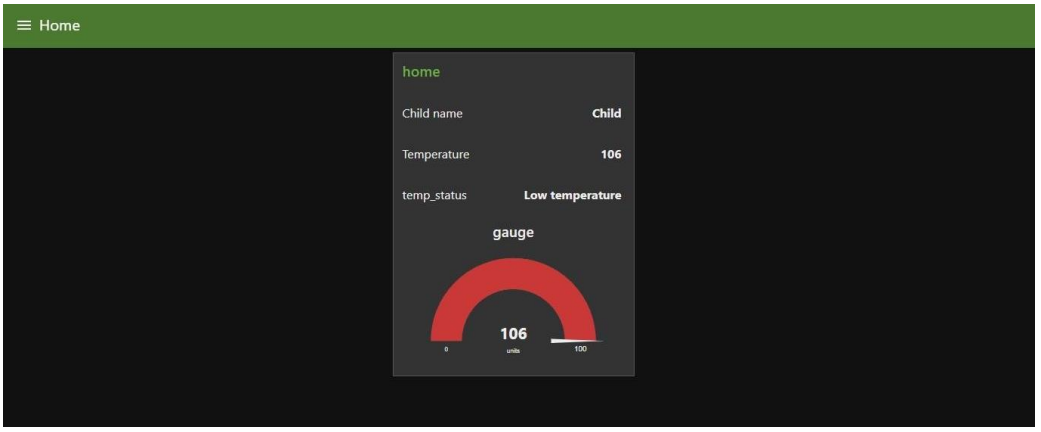


Figure 9.3 UI of the App


Figure 9.4 Data fetched and displayed

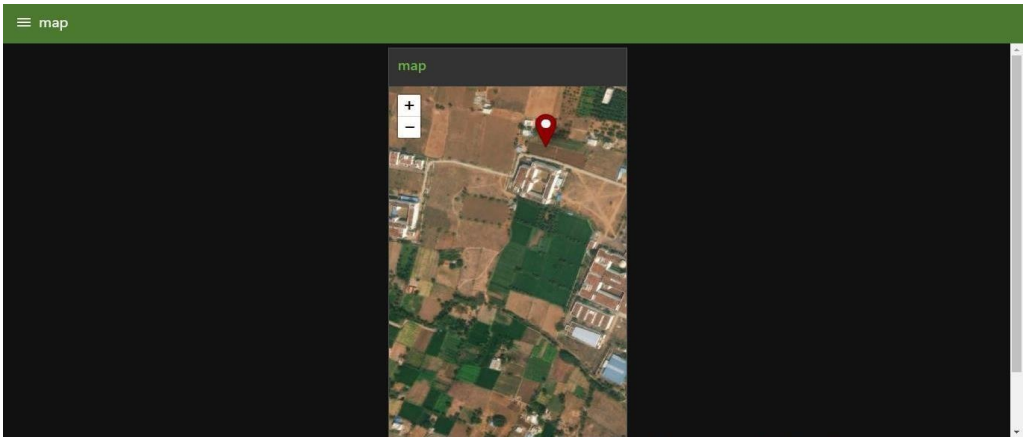


Figure 9.5 Map API used to interface Map with app

# CHAPTER 10
# ADVANTAGES AND DISADVANTAGES

## ADVANTAGES

This proposed work successfully designs a working prototype of an integrated IoT based child safety hardware which has the following functions of tracking the child by finding its location using GPS tracking and alerting to their parents in GSM It is designed in such a way that the parents are alerted in case the child is in Emergency.

Thus parents are notified with the message through vibration using vibration sensor.

It helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geo fence around the particular location.

By continuously checking the child's location notifications will be generated if the child crosses the geo fence. 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.

## DISADVANTAGES

The use of this technology for child safety and tracking in spite of its advantages has some drawbacks. Children and parents being the user of this need to be given aware of the technologies used.

Especially children should have the knowledge of using the gadget, only then they can use it at the correct time.

The gadget needs to be charged frequently and this turns out to be a major drawback. Also battery requirements for the given model need to be improved and also this system needs availability of internet continuously. Rural part of most of the

developing countries does not fulfill this requirement. Moreover internet connection is slower.

In areas where the network goes out of reach, the GPS location tracking goes wrong or at times GPS location cannot be detected.

# CHAPTER 11

# UAT

## Acceptance Testing

## UAT Execution & Report Submission

### 1. Purpose of Document

The main Purpose of UAT is to validate end-to-end business flow. It does not focus on cosmetic errors, spelling mistakes or system testing. User Acceptance Testing is carried out in a separate testing environment with production-like data setup. It is kind of black box testing where two or more end-users will be involved.

UAT is performed by :

1. Client
2. End users

### 2. Defect Analysis

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

Table 11.1 defect analysis

| RESOLUTION | SEVERITY1 | SEVERITY2 | SEVERITY3 | SEVERITY4 | SUB TOTAL |
|---|---|---|---|---|---|
| By Design | 3 | 2 | 1 | 0 | 9 |
| Duplicate | 2 | 1 | 2 | 0 | 5 |
| External | 4 | 1 | 1 | 1 | 7 |
| Fixed | 3 | 4 | 6 | 8 | 21 |
| Not Reproduced | 1 | 1 | 0 | 2 | 4 |
| Skipped | 1 | 0 | 1 | 1 | 3 |
| Won’t fix | 1 | 2 | 0 | 0 | 3 |
| Totals | 15 | 11 | 11 | 12 | 49 |

### 3. Test Case Analysis

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

Table 11.2 test case analysis

| Section | TotalCases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| PrintEngine | 5 | 0 | 0 | 5 |
| ClientApplication | 47 | 0 | 0 | 47 |
| Security | 3 | 0 | 0 | 3 |
| OutsourceShipping | 2 | 0 | 0 | 2 |
| ExceptionReporting | 7 | 0 | 0 | 7 |
| FinalReportOutput | 6 | 0 | 0 | 6 |
| VersionControl | 3 | 0 | 0 | 3 |

# CHAPTER – 12

# CONCLUSION

The Internet of Things offers a large scope for influencing the world of future. The IoT system has several drawbacks, but these are outweighed by its benefits, such assaving consumers time and money. IoT applications are expected to soon be installed and used equally in residential and commercial settings. Businesses are putting a lot of effort into combating IoT drawbacks and improving this cutting-edgetechnology for the benefit of humanity.

Future IoT technologies will undoubtedly be successful, and IoT enabled devices will probably be found everywhere, from businesses to homes. IoT has a bright future, and it won't be long before the a fore mentioned uses of the technology become a reality.

Through IoT security can be enhanced and can be used in a positive and healthy manner to monitor the movements of the children, So that parents need not worry about their wards by implementing this, Crime rate can be reduced drastically

# CHAPTER 13

# FUTURE SCOPE

It is evident that IoT has changed our lives completely, Further IoT has been nowadays used in security and surveillance, Thus implementing IoT in Child safety monitoring can help them feel secured and can bring change in the society.

In future this technology can be extended further to protecting all women and children at a cheaper and efficient manner.

**APPENDIX - I**

**Source Code**

**PYTHON CODE FOR CONNECTING WITH IBM CLOUD:**

```
import wiotp.sdk.device
import time
import random
import requests,json
import datetime
import time
myConfig = {
    "identity": {
        "orgId": "8pqusj",
        "typeId": "tamilss",
        "deviceId":"tamilsst"
    },
    "auth": {
        "token": "V?quzXKKZ5P6(u**L6"
    }
}
BASE_URL = "https://api.openweathermap.org/data/2.5/weather?"
CITY = "Coimbatore"
API_KEY = "46faa4ab6fede1d9ae549b90d91253f2"
URL = BASE_URL + "q=" + CITY + "&appid=" + API_KEY
response =  requests.get(URL)
if response.status_code == 200:
```

```
    data = response.json()
    main = data['main']
    temp = round(main['temp'] - 273,2)
    humy = main['humidity']
    pres = main['pressure']
    rept = data['weather']
    report = rept[0]['description']
    # #time = datetime.datetime.now()
    # morning = time.replace(hour=11, minute=59, second=0, microsecond=0)
    # if time <= morning:
    #     me = '8.30 AM - 9.30 AM'
    # else:
    #     me = '3.45 PM - 5.00 PM'
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    temp1=temp - 273
    if(temp1 < 14):
        temp_alert = "snow may occur"
    hum=humy
    if(hum>95):
        hum_alert2 = "rain will occur for sure"
```

```
    elif (hum > 90):
        hum_alert1 = "chances for raining is high"
    pre = pres
    wea = report
    if(wea == "clear sky"):
        wea_alt1 = "possibility of raining is low"
    elif(wea == "few clouds"):
        wea_alt2 = "drive safely!"
    elif(wea == "shower rain"):
        wea_alt3 = "rain is showering in less amount"
    elif(wea == "rain"):
        wea_alt4 = "its raining"
    elif(wea == "thunderstorm"):
        wea_alt5 = "thunderstorm alert, don't panic, drive slow and safe!"
    elif (wea == "snow"):
        wea_alt6 = "snow occurs, chance of skidding is more,drive safely!!"
    elif(wea == "mist"):
        wea_alt7 = "mist is formed, switch on the foglamp"
    else:
        good_alt = "good day!! Drive safely!!"
    myData={'location':CITY,'temperature':temp, 'humidity':hum, 'pressure':pre,
'weather_report':wea}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

**CODE FOR INTERFACING GSM AND SENSORS WITH ARDUINO**

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>

SoftwareSerial GPS_SoftSerial(4, 3);

TinyGPSPlus gps;

volatile float minutes, seconds;
volatile int degree, secs, mins;

void setup() {
  Serial.begin(9600);
  GPS_SoftSerial.begin(9600);
}

void loop() {
  smartDelay(1000);
  unsigned long start;
  double lat_val, lng_val, alt_m_val;
  bool loc_valid, alt_valid;
  lat_val = gps.location.lat();
  loc_valid = gps.location.isValid();
  lng_val = gps.location.lng();
  alt_m_val = gps.altitude.meters();
  alt_valid = gps.altitude.isValid();
```

```
  if (!loc_valid)
  {
    Serial.print("Latitude : ");
    Serial.println("***");
    Serial.print("Longitude : ");
    Serial.println("***");
    delay(4000);
  }
  else
  {
    Serial.println("GPS READING: ");
    DegMinSec(lat_val);
    Serial.print("Latitude in Decimal Degrees : ");
    Serial.println(lat_val, 6);

    DegMinSec(lng_val);
    Serial.print("Longitude in Decimal Degrees : ");
    Serial.println(lng_val, 6);
    delay(4000);
  }
}

static void smartDelay(unsigned long ms)
{
  unsigned long start = millis();
  do
  {
```

```
    while (GPS_SoftSerial.available())
    gps.encode(GPS_SoftSerial.read());
  } while (millis() - start < ms);
}

void DegMinSec( double tot_val)
{
  degree = (int)tot_val;
  minutes = tot_val - degree;
  seconds = 60 * minutes;
  minutes = (int)seconds;
  mins = (int)minutes;
  seconds = seconds - minutes;
  seconds = 60 * seconds;
  secs = (int)seconds;
}
```

**Code for interfacing sensors with Arduino**

```
#include "dht.h"
#define dht_apin A0
dht DHT;
int vib_pin=7;
int led_pin=13;
void setup() {
  Serial.begin(9600);
  Serial.println("DHT11 Humidity & temperature Sensor\n\n");
  delay(1000);
```

```
  pinMode(vib_pin,INPUT);
  pinMode(led_pin,OUTPUT);
}

void loop() {
  DHT.read11(dht_apin);

    Serial.print("Current humidity = ");
    Serial.print(DHT.humidity);
    Serial.print("%  ");
    Serial.print("temperature = ");
    Serial.print(DHT.temperature);
    Serial.println("C  ");

  int val;
  val=digitalRead(vib_pin);
  if(val==1)
  {
    digitalWrite(led_pin,LOW);
   }
   else
   digitalWrite(led_pin,HIGH);
}
```

**GITHUB LINK : https://github.com/IBM-EPBL/IBM-Project-12045-1659367882**

**PROJECT DEMO LINK: https://drive.google.com/file/d/1JzWElreLbidRhK6zgJ3ShhhH3zHVRMNY/view?usp=sharing**

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