HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT

A PROJECT REPORT

- Submitted by

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CONTENT OF PROJECT

1.Introduction

1.1 Project Overview

To monitor the temperature parameters of the hazardous areas in industrial plants. The area is integrated with smart beacon devices every employees working there will be given smartwearable device.

With beacon scanners the employees can view the temperature on his smart wearable device and if the temperature is high, they will receive the alerts to the mobile through SMS, the information is sent to the cloud and through that, the in-charge of that particular plant can view the data and take safety precautions priorly.

1.2 Purpose

For safety purpose it is used in the industry areas since any descripancies may happen anytime but prior safety alert has to be given by monitoring the area. Surveillance is a major issue in public restricted areas. The robot is hired here to monitor throughout the day, his robotic vehicle has ability to substitute the human in hazardous area to provide surveillance for the betterment of the industry these are installed and maintained for the industry purpose. They keep a check of all the things to be delivered at the ease without any problems.

2. LITERATURE SURVEY

2.1 Existing problem

Working in radiated and harmful environment and become chronic to various diseases and this could be avoided by the development in the industry like installing monitoring systems.

Hazardous classified locations are areas where the possibility of fire or explosion hazards may exist under normal or abnormal conditions because of the presence of flammable, combustible or ignitable gases, vapors, liquids, dust, or fibersDetermining the class, division and group and a particular group is criticalto correctly applyingthe requirements for a givenhazardous locality.

2 2.References

IEEE Papers:

i. *2022 HYPERLINK "https://ieeexplore.ieee.org/xpl/conhome/9751779/proceeding" HYPERLINK "https://ieeexplore.ieee.org/xpl/conhome/9751*

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Reference Links:

1. *http://159.122.174.217:31458/-Nodered*
2. *http://159.122.174.217:31458/sensor -Sensing URL*
3. *http://159.122.174.217:31458/ui/#!/0?socketid=Umm7oFpqvrobz5EaAACY- Web UI*

4. *http://159.122.174.217:31458/control - Control Command*

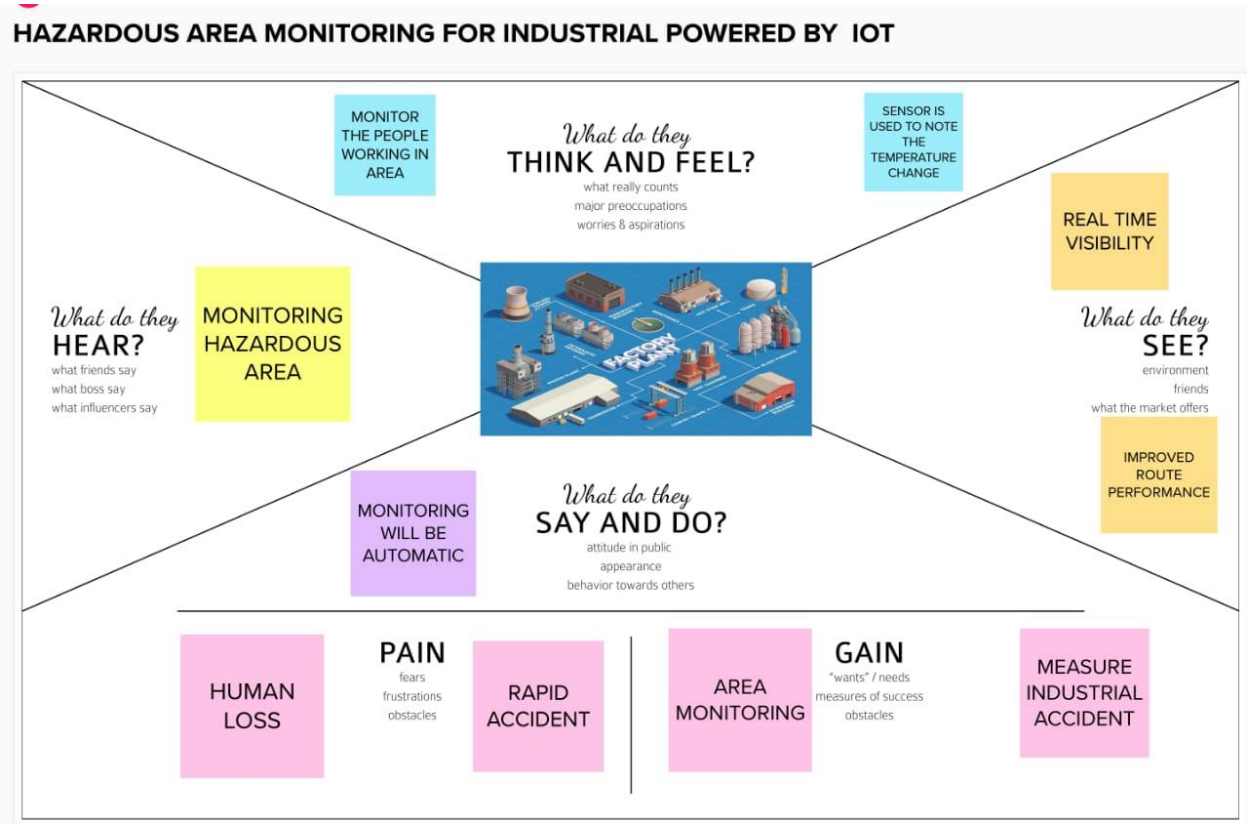
2.3 Problem Statement Definition

Employees working in the industry, nearby office and resident people can be safe guarded by the precautions that can be taken in the industry. How significant it is and why does it matter compared to otherways are being analyzed.

3.IDEATION & PROPOSED SOLUTION

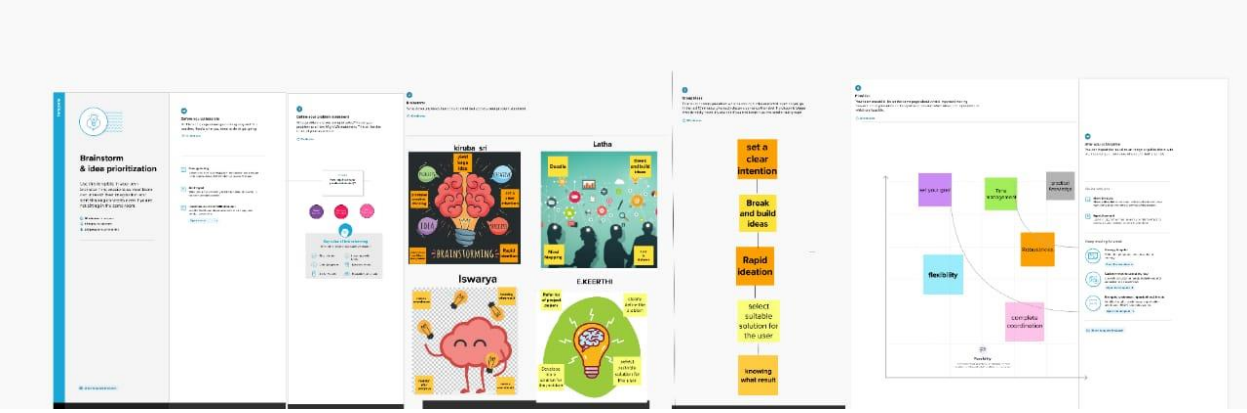
3.1 Empathy Map Canvas

It Creates an effective solutionrequires 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 their goals and challenges.



3.2 Ideation & Brainstorming

Brainstorming techniques are proven frameworks for coming up with lots of ideas quickly Establishing an ideation mindset and encouraging creative thinking will benefit your organization in the long term, and findingnew ways to push your team in the directionof generating effective ideas has positive effects for your whole organization.



3.3 Proposed solution

1. Problem statement:

Certain area in industrial settings are classified as hazardous due to the presense of flammable gases,vapors,dusts, or fibers. A sensor is fixed at different places

2. Solution Description:

Peer-to-peer network enhances worker safety by easily sharing alarms and gas readings between monitors

3. Uniqueness:

This saves time and eliminates the need for additional areas

4. Social Impact:

The better customers feel about an interaction with a brand, the more likely they are to repeat the process.

5. Business Model:

To provide its high flexibility and scalability, the IoT allows a new, agile approach to digitisation in hazardous areas.

3.4 problem solution fit

1. Customer segments

Industrialist, who is managing the hazardous industry.

2. Jobs to be done

What the jobs to be done do you address for your customer
Monitoring the hazardous area in a industry.

3. Customer constrain

What constraint prevent your customer?
*Have a proper place for setting an product.
*should have an better person to handle it.

4. Problem Root Cause

What is the real reason for this problem?
Problem root cause :The auto- ignition temperature of the hazardous material . The likelihood of the hazard being present in flammable concentrations.

5. Available Solutions

Which solution are available to the customer?
ABB has developed a new generation of smart sensors designed for rotating equipment in hazardous atmospheres. It enables operators in oil, gas, and chemical industries to benefit from cost-effective condition monitoring.

6. Behaviour

Functional safety applications are ones in which safe operation must be ensured due to the risk of equipment damage or personal injury. Linear-position sensors are widely used in all manners of industrial systems. In many cases, the potential for hazardous events occurring needs to be taken into account; otherwise, the consequences could be serious—with expensive equipment being severely damaged or even lives being put in danger.

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

User registration, verification, authentication and notification has been given based on the needs of the requirements of the industrial area.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Certificationions	Certificate are included clearly through company's
FR-4	Strength	High security for maintenance of hazardous area
FR-5	Specifications	Describe what the monitors does and check its operations
FR-6	Durability	Check what types of things used in the monitors through the form

4.2 Non-Functional requirements

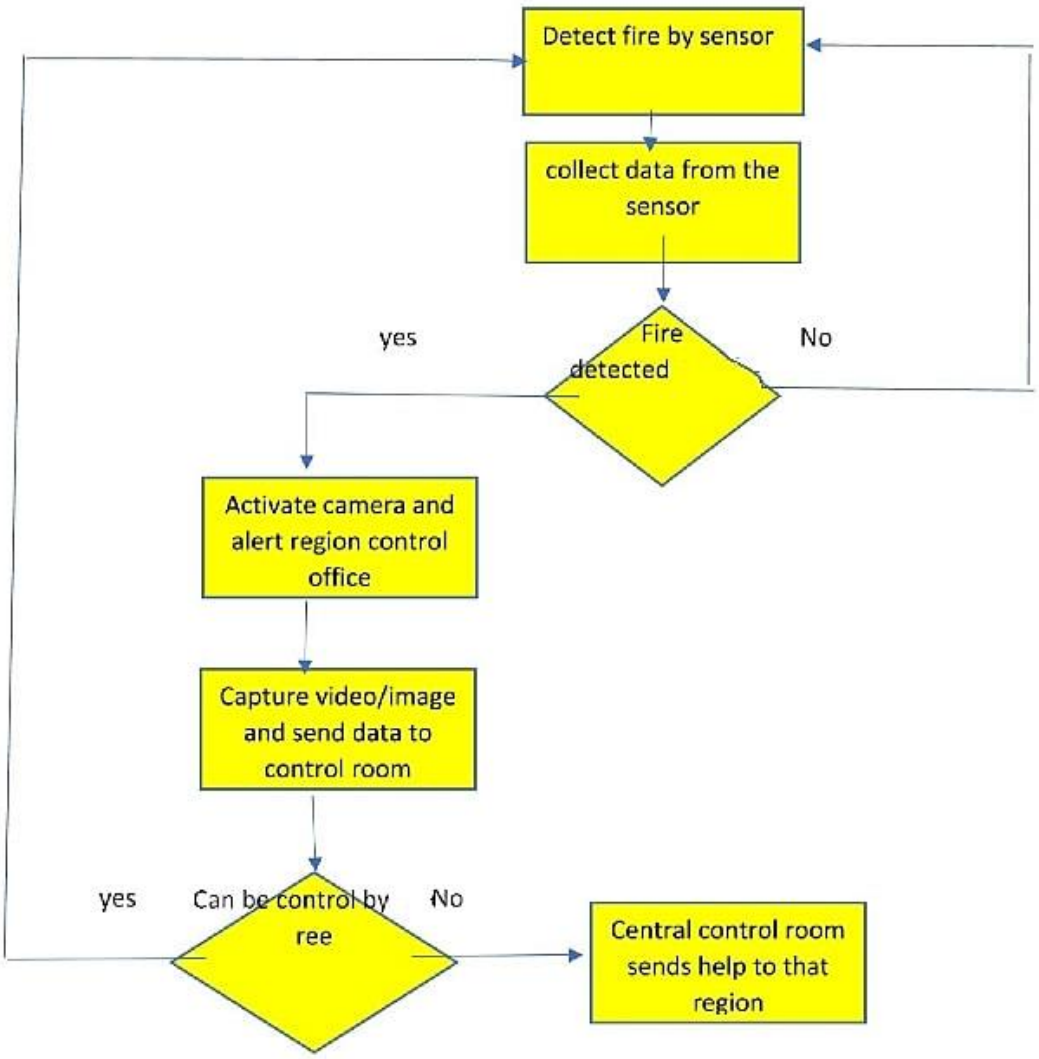
Performance, usability, security has to be assured based on these requirements the way of using the resource can be accomplished.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Using area monitors is allows to create a safe buffer zone between workers and potential gas hazardous
NFR-2	**Security**	To avoid the injuries and minimize incidents in hazardous area
NFR-3	**Reliability**	It is possible to minimize the risk in a hazardous area and also that enables its detection
NFR-4	**Performance**	Identification and monitoring system for hazardous area
NFR-5	**Availability**	For hazardous area monitoring we will consider the sensors and tracking system
NFR-6	**Scalability**	When weighing in hazardous environments, safety is critical and hazardous-area scale indicators work with a variety of scale types

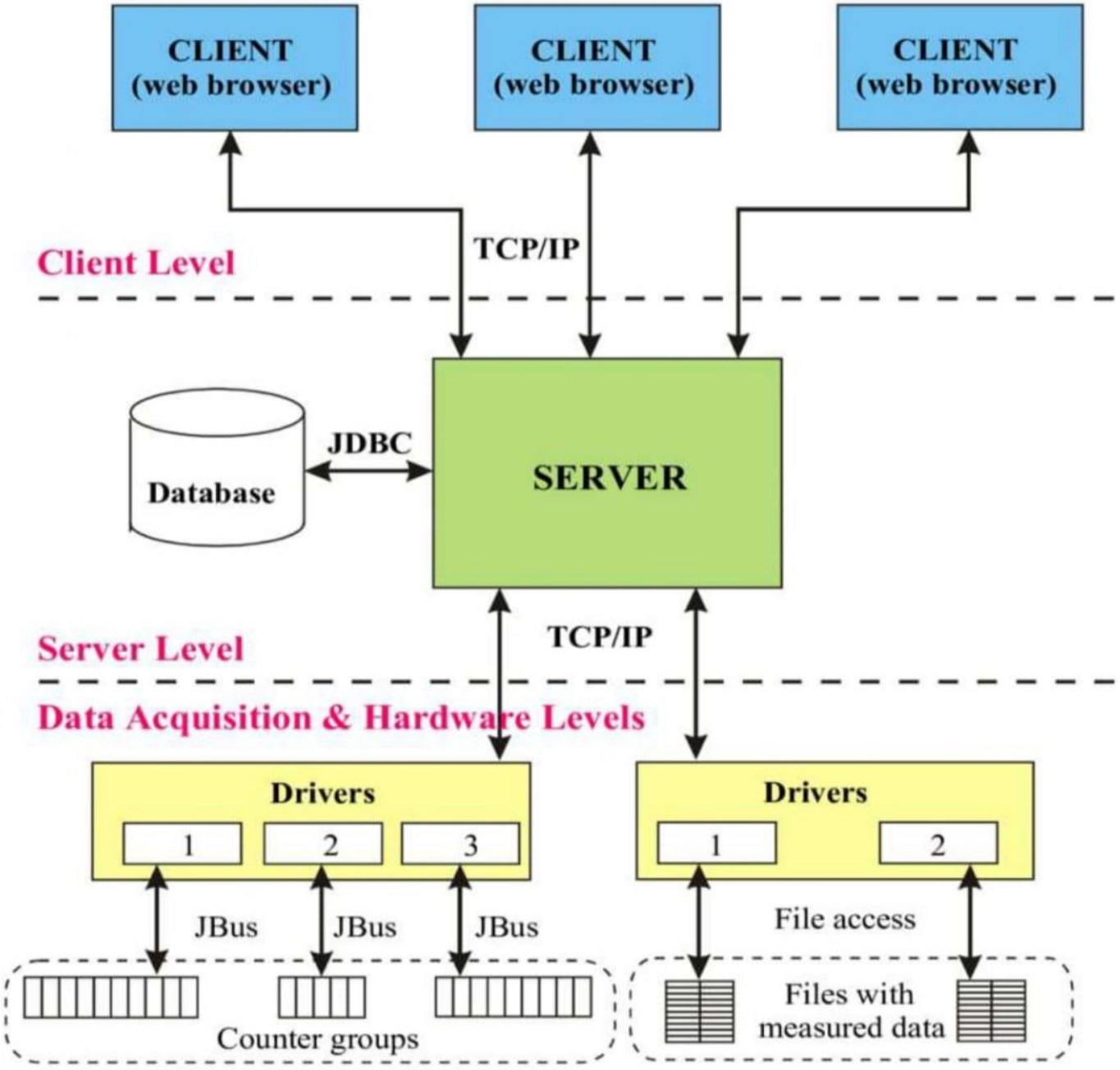
5. PROJECT DESIGN

5.1 Data Flow Diagram

Basic representation of the system flow is followed,



5.2 Solution And Technical Architecture



5.3 User Stories:

All the customersneeds are given based on the requirements that are necessarily available and building up the right architecture needed. The robot is hired here to monitor throughout the day. This robotic vehicle has ability to substitute the human in hazardous area to provide surveillance.

6. PROJECT PLANNING& SCHEDULING

6.1 Sprint Planning & Estimation

Creation of Watson IOT, Node-Red and the MIT app inventor are being proposed for the delivery if the sprints it is totally based on the system administration that has to take place in the estimation of the sprint is given by the output obtained.

6.2 Sprint Delivery Schedule

Sprints are given by the proper scheduling with the requiredanalysis that couldbe done for themonitoring of the temperature and humidity.

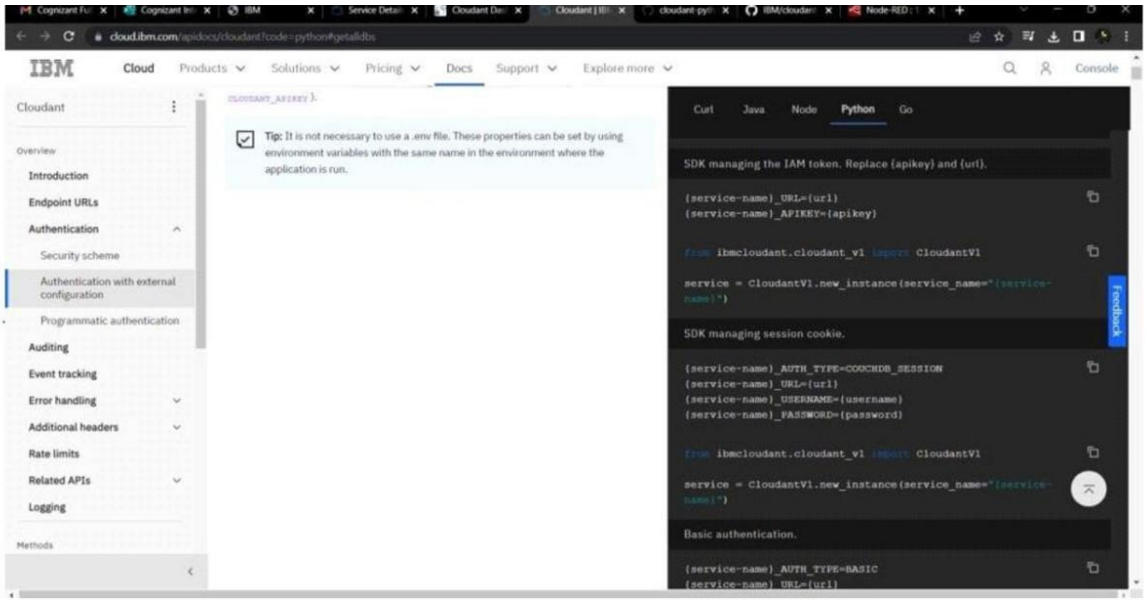
6.3 Reports from JIRA

This represents the solutions given from the sprints.

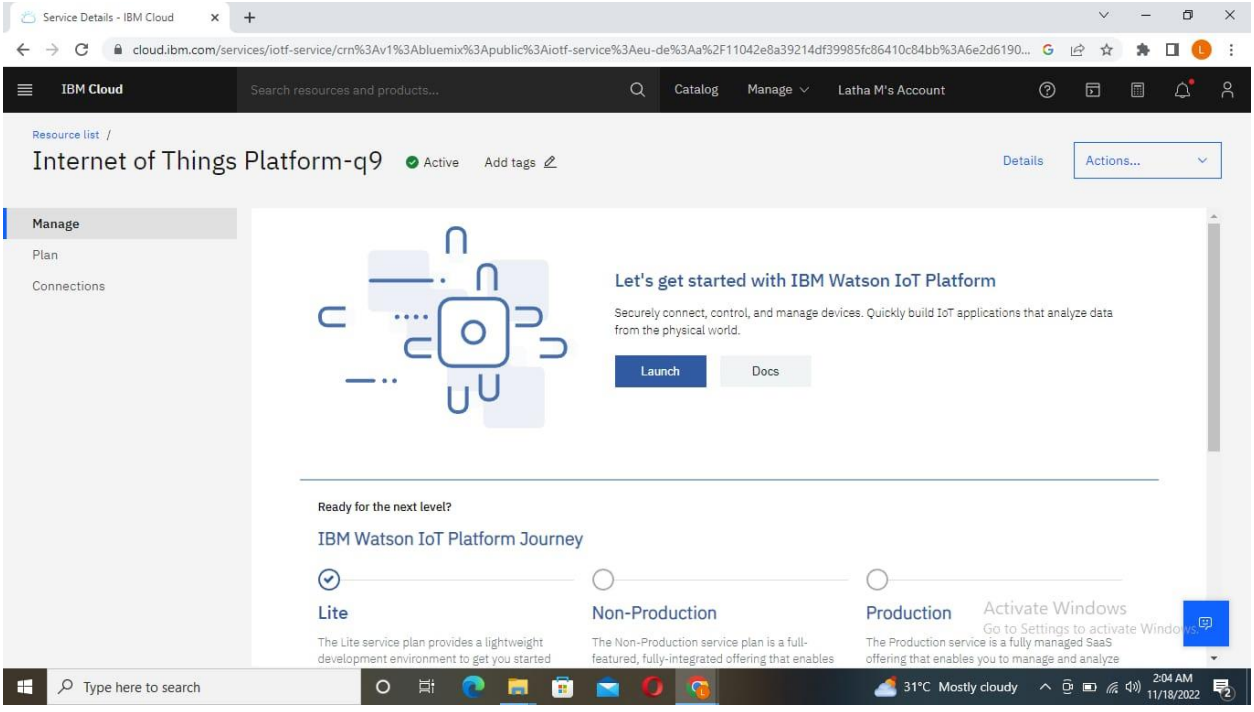
7. CODING & SOLUTIONING

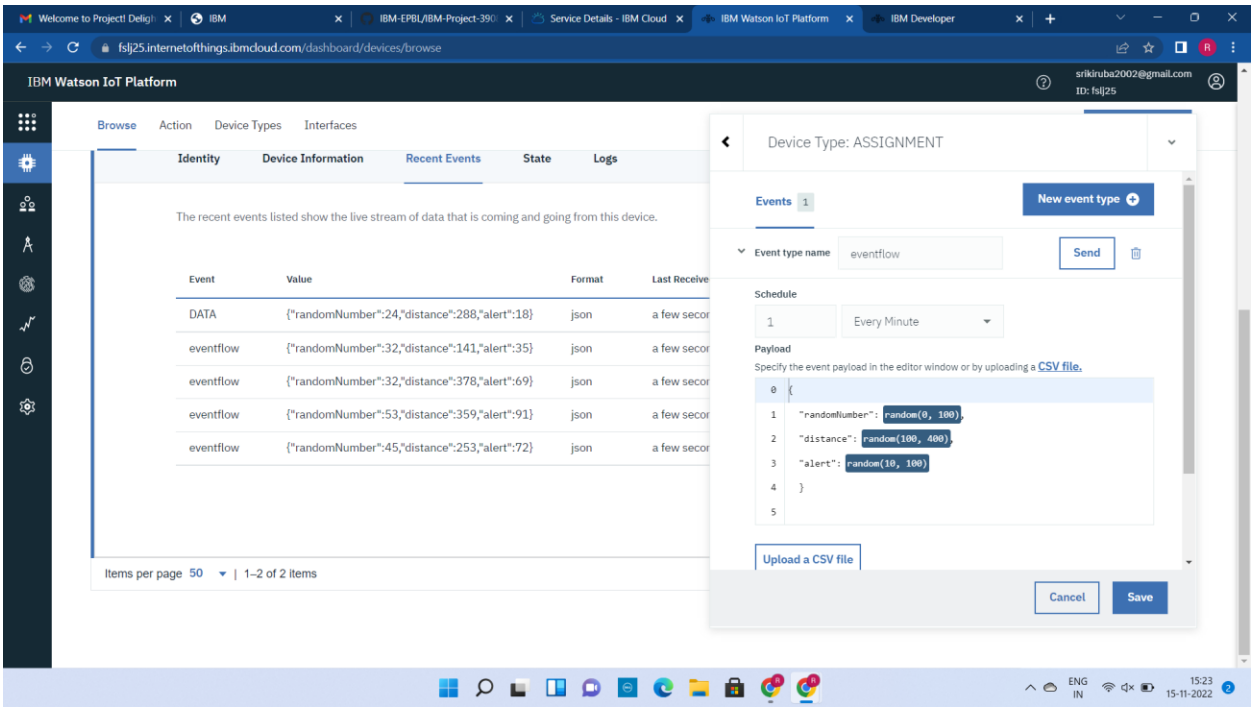
7.1 Feature 1

From Node red HTTP link has been created and this is used in MIT app for the creation and the used code is given below,

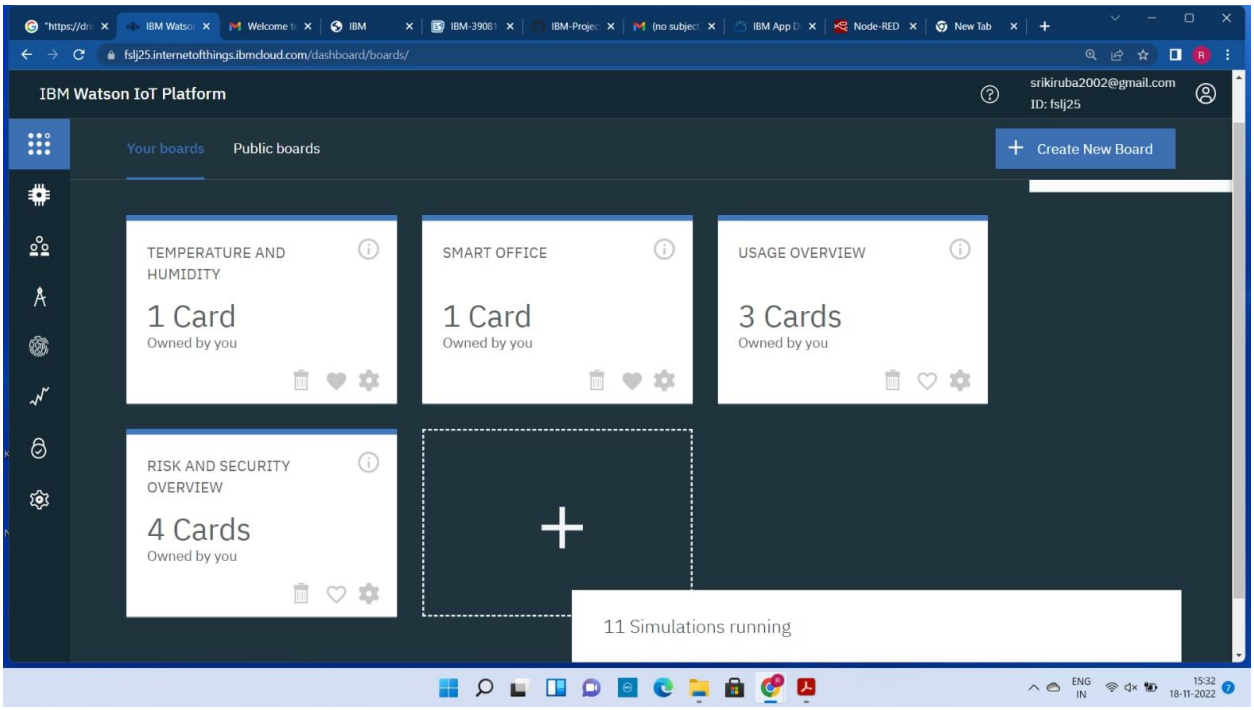


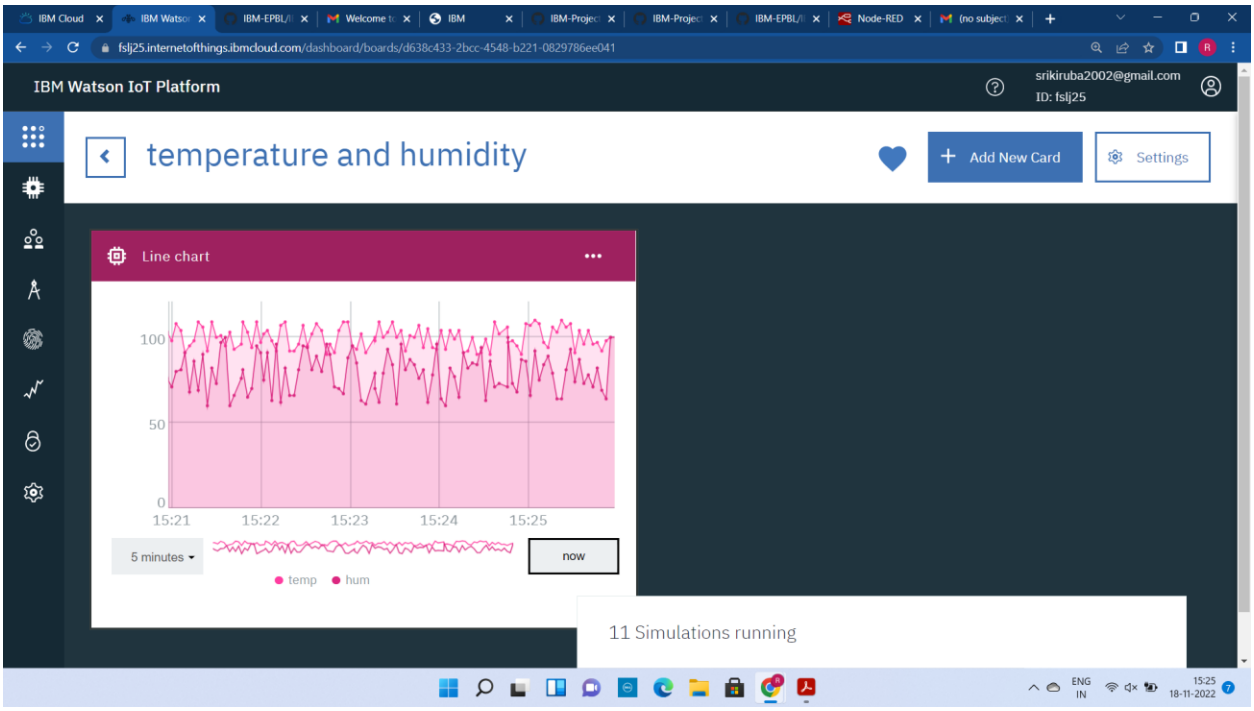
Creating device in the IBM Watson IoT platform



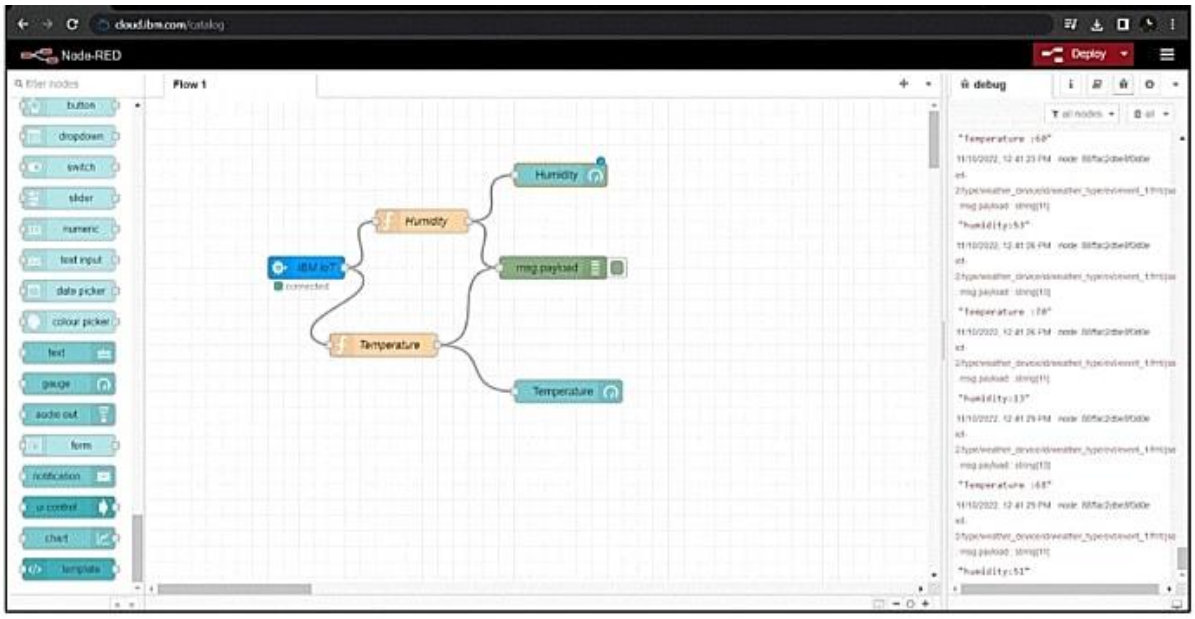


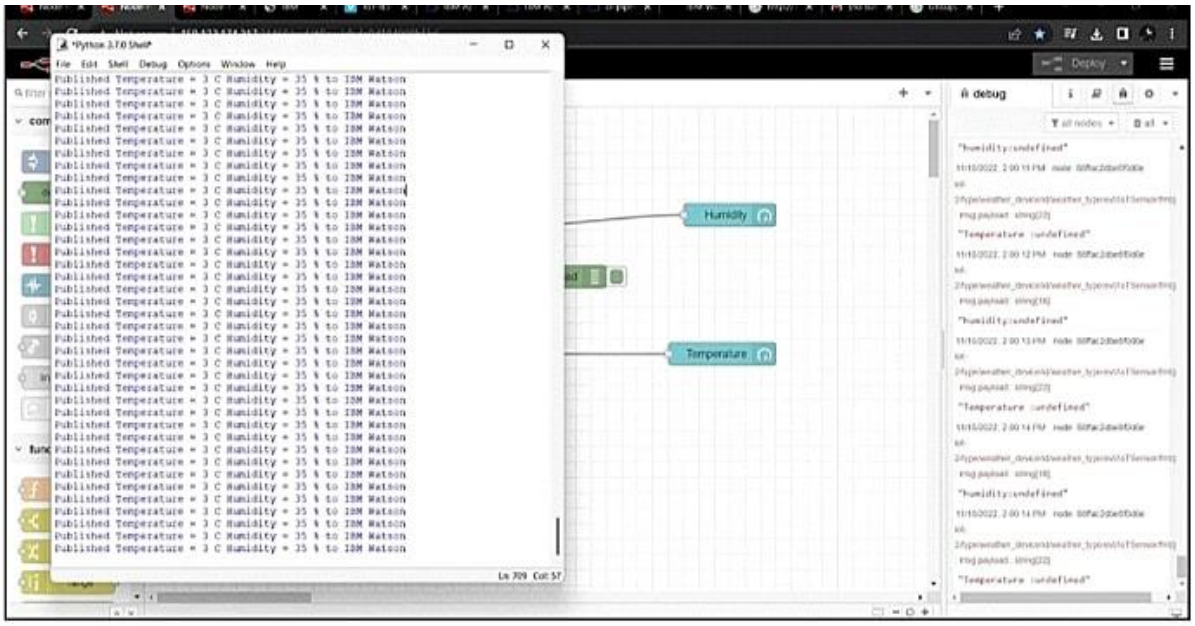
Displaying charts for temperature and humidity values fetched from weather_monitoring device created in IBM Watson IoT platform.



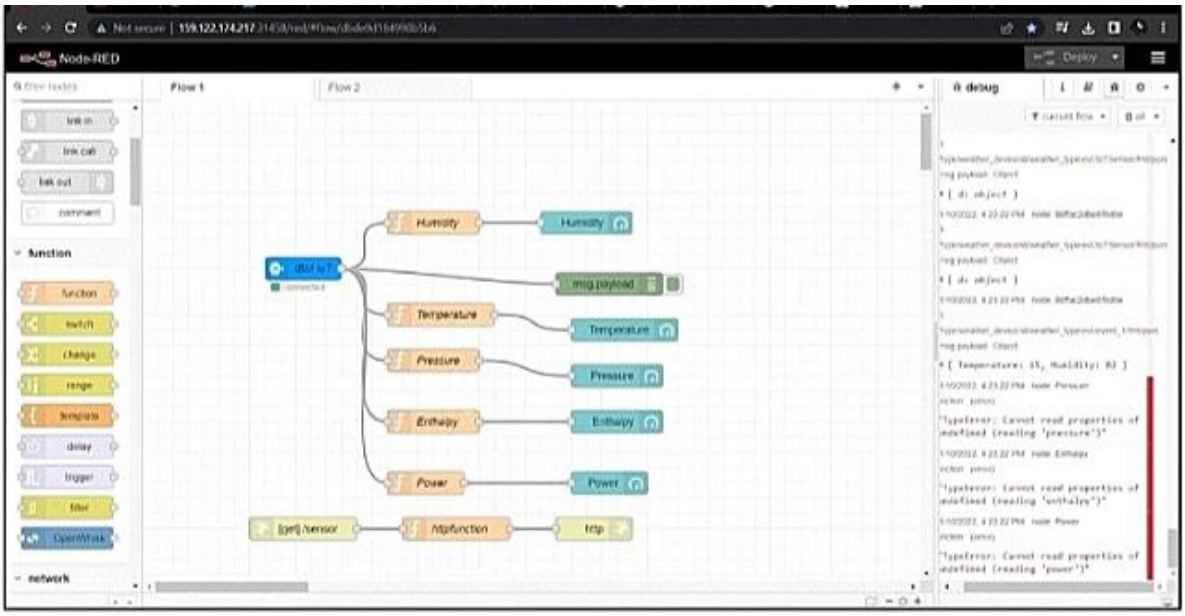


Unique API and authentication key generated from IBM Watson IoT platform for the weather montoring device (here, Device name : weather_monitoring) is used to connect the device created in IoTplatform (IBM cloud) to Node-RED workflow.

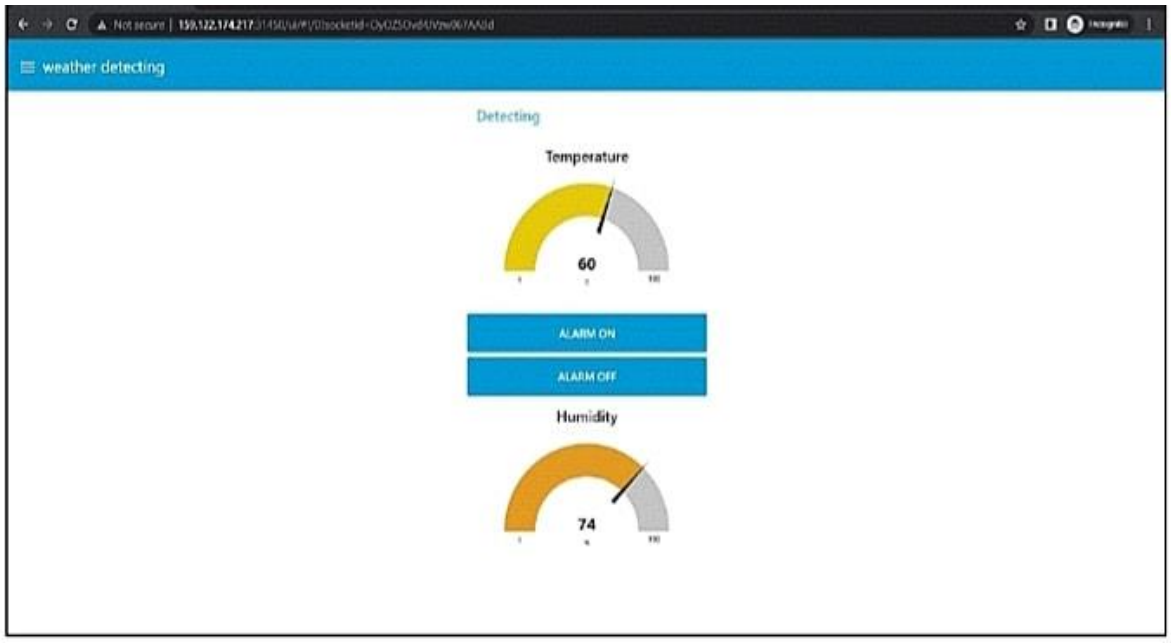




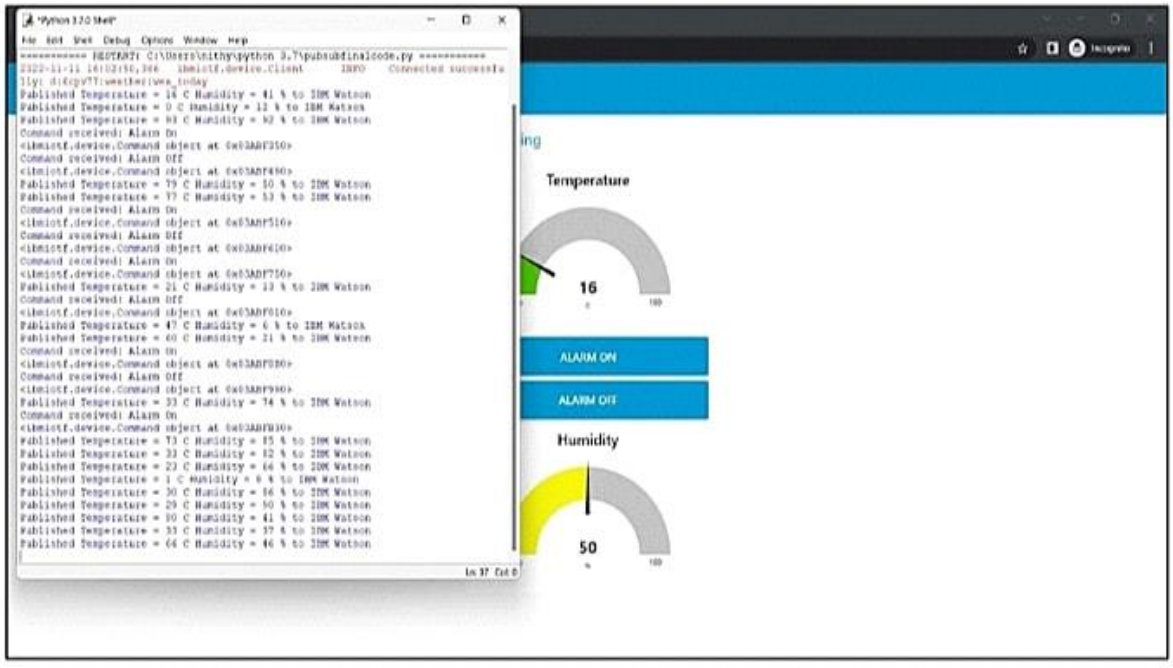
Unique device credentials for the weather_monitoring device created in IoT platform is dumped into python code and Internal device simulator is ON for the same device to fetch parameters like temperature and humidity when node flow is deployed



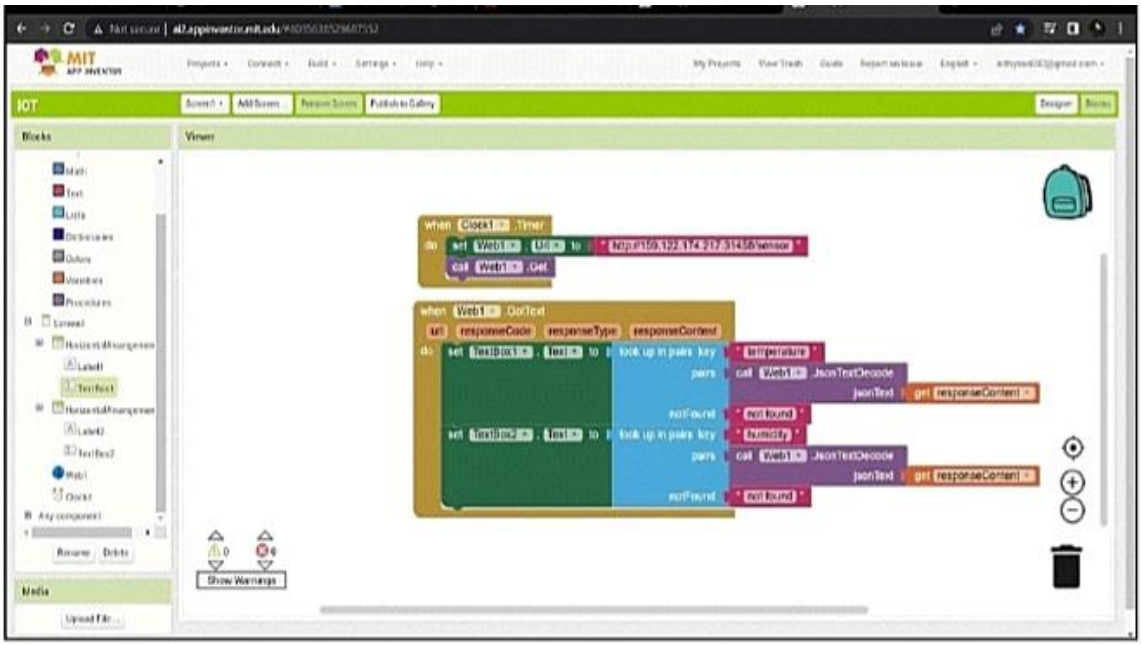
Creating dashboard for the work flow scenario created in Node-RED.

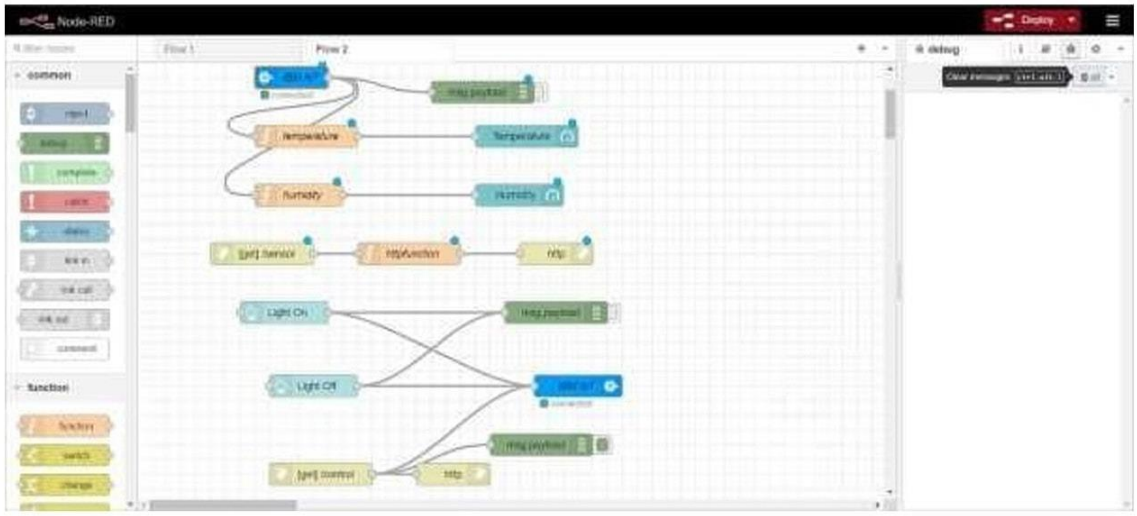


Alarm will be ON if temperature reaches critical point and OFF when in acceptable level.



Building block codes for deploying hazardous area monitoring app

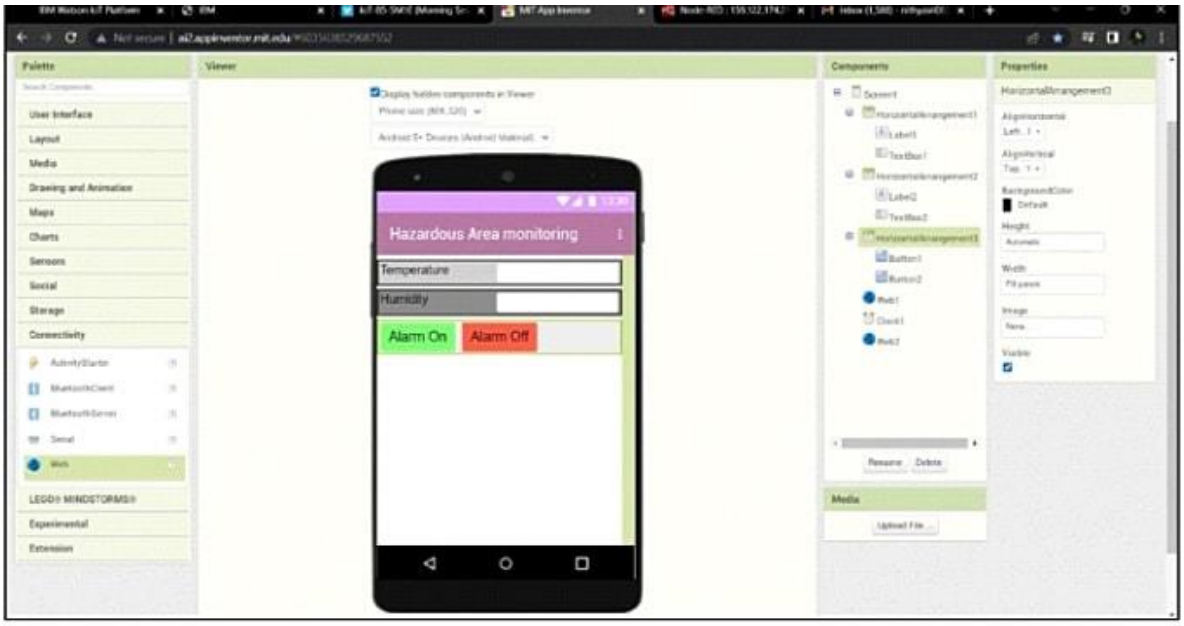




Using GET function in block codes which allow us to request http (URL) of Node-RED workflow and a clock timer (1 sec) is set to get reading

or information on temperature and humidity of industrial plant at remote location for every second sequentially.

App is deployed for monitoring industrial plant with alarm ON and OFF features thus avoiding certain unexpected accidents industrial plants.



7.2 Feature 2

Temperature and Humidity is being measured using the final code given in the MIT application

7.3 Database Schema (if Applicable)

HTTP link generated from node red is being taken so this is the only database that has been taken since HTTP link createdin the node red is being obtainedfor the MIT application for the sensing of temperature and humidity.

8. TESTING

8.1 Test Cases

The main test case is to deliver the Temperature and Humidity of the hazardous area if there is an increase in temperature there would be an alert messagethrough which we can take safety measures priorly.

8.2 User Acceptance Testing

To input the code based on the accepteduser input is being testedfor the purposeof obtaining the desired output.

9.RESULT

The IoT-based study can be enhanced further by offering extra functionality to industry personnel through the use of an Android app to improve industry control and monitoring.

Data can be used to minimise industrial dangers in high-profile factories, track yield in power plants,assure safety in fast-paced industries, and assess nuclear safety levels, among other things.

For reliable damage and fault detection, real-time monitoring systems based on physical models are required.

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Constant measurement of relative temperature and humidity is done so that there are no discrepancies.
- Information of power andenergy consumption is lessened upto 10%.

DISADVANTAGES:

- Smart sensors for hazardous areas monitor are the key parameters if these face any problemthere would be a major failure in the whole monitoring system.

- Accessing immediately to the hazardous areas is difficult hence it is costly and time- consuming to monitor the condition and their performance.

11. CONCLUSION

- The hazardous area is beingmonitored using the temperature and humidity sensors.

12. FUTURE SCOPE

- Safety precautions are relatively more than the usual monitoring system.

- The way of using these without manual input can be upgradedeven more for the betterment than these technologies used in our generation. 3. Safety of the employees in the industrial plant is the most important so these systems can make them more secured.

13. APPENDIX

Source Code

```
import timeimport sys
import ibmiotf.applicationimport ibmiotf.deviceimport random

#Provide your IBM Watson Device Credentialsorganization =
"6cpv77"deviceType = "weather"deviceId = "wea_today"authMethod =
"token"authToken = "Fo9af9o00doS8VUsb2"

# Initialize GPIO




def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command'])
   status=cmd.data['command']
```

```
   if status=="Alarm On":
print("Alarm is off")
   else:
print("Alarm is On")
   #print(cmd)



try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method":
authMethod, "auth-token": authToken}deviceCli =
ibmiotf.device.Client(deviceOptions)
#.....

except Exception as e:print("Caught exception connecting device: %s" %
str(e))sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as
an event of type
"greeting" 10 timesdeviceCli.connect()while True:
       #Get Sensor Data from DHT11
       temp=random.randint(0,200)
       humidity=random.randint(0,200)
       if temp>=100:
          print("Alert")
       else:
          print("safe")

      data = {"d":{ 'temp' : temp, 'humidity': humidity}}
       #print data
       def myOnPublishCallback():
          print ("Published Temperature = %s C" % temp, "Humidity = %s %%" %
humidity, "to IBM Watson")

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

```
time.sleep(1)
deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the
clouddeviceCli.disconnect()
```

VIDEO LINK

https://drive.google.com/file/d/13nSyesUPBhbLA62XyVLUeGpaapCyhXko/view

GITHUB LINK

https://github.com/IBM-EPBL/IBM-Project-39081-1660392247