HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT

INTRODUCTION

Project Overview

- Through this, we can monitor the temperature parameters of the hazardous areas in industrial plants.
- The area is integrated with smart beacon devices which will be broadcasting the temperature of that particular area.
- Every person working in those areas will be given smart wearable devices which will be acting as beacon scanners.
- Whenever the person goes near the beacon scanners, he can view the temperature on his wearable device and if the temperature is high, he will receive the alerts to the mobile through SMS using API.
- Through this wearable device, the data is sent to the cloud and through the dashboard, the admins of that particular plant can view the data and take necessary precautions if required.

Purpose

- In some industrial plants, there are some areas which are to be monitored time to time. Sometimes the conditions may become critical which may lead to loss of property and also human loss.
- To monitor the conditions, we can integrate the smart devices in the areas which are needed to be monitored. Every device will be acting as a beacon and it is connected to temperature sensors. We can broadcast the temperature data along with the location of that particular area through beacons.

- The persons who generally monitor these places will be given a wearable device which will be acting as a beacon scanner. Whenever the person enters the desired area then he can view the required parameters and can be alerted, these are sent to cloud.

- Industrial accidents are as old as industry itself and so are preventive measures. The Standards for Explosive Areas or Atmospheres have also has evolved diversely worldwide, based on the local needs

  of the industries for the overall safe operation of the plants. Explosion and a fire are two of the major constituents of these mishaps. Depending upon the environment, these can be termed 'Accidents' or fade away as simply the 'incidents' or 'Near Misses' in the safety officers' statistics. The first step to logically is to start defining and understanding some of the terms used in the whole scope of the loss prevention in accidents due to explosion and fire.

- FIRE is a rapid oxidation-reduction reaction (combustion) which results in the production of heat and generally visible light.

- EXPLOSION is a violent and sudden expansion of gases produced by rapid combustion; that very strong force when shut in a small space and a generally associated with a loud, sharp noise and a supersonic shock wave.

LITERATURE SURVEY

Existing problem:

Hazardous Area Monitoring for Industrial Plant powered by IoT is a project report that focuses on the necessity of the monitoring of hazardous areas in industrial plants. Industrial plants are the ones that contain both hazardous and non-hazardous areas. The monitoring of the hazardous areas in industrial plants is important from time to time. If the damage that occurs in hazardous areas can result in the loss of property or lives.

References:

S.NO	TITLE	AUTHORS	DESCRIPTION
1	Design and Implementation of Real-Time Mobile? Based Water Temperature Monitoring System	PaulBb.Bbokingto Jr, Orven E.Lllantos.	The objective of this research is to design and develop a real-time mobile-based water temperature monitoring system capable of decreasing the reliance on manpower at the monitoring site to reduce the cost and to assess fish production cycle and fish grow out system. The system implementation resulted in a monitoring system that collects the current water temperature from the core? controller in real-time. Also, the system provides and displays information that includes normal range, maximum, minimum, average and findings of the collected temperatures. The results obtained in this study has shown the ability of data acquisition in the remote and real-time detection of water temperature accurately and efficiently. It provides decision support to help and guide fisher folks in avoiding distress to fish and obtaining the optimum water temperature range.

2	Design of an Industrial IOT based Monitoring System for power substations	Long Zhoa, Igor matsuo, Wei-jen lee , Yuhao Zhou.	The Internet of Things (IoT) idea enables things to communicate by sharing data across wired or wireless connections. The term "Industrial Internet of Things" (IOT) refers to the integration of data collection, transmission, and processing through a real-time network. In several applications, IOT is currently involved in the creation of smart grids. Low-latency communication needs to be taken into account for the majority of control and monitoring applications since the operation of power systems is particularly time-critical. IoT's real-time capacity is seen as a crucial component for applications that monitor and manage power supplies. As a result, system operators may make better judgments for both technical and financial-related issues by using the real-time monitoring system. This research presents a fast IOT based monitoring system is created and put into use for a power system substation with recording capabilities. An FPGA embedded controller is used in this system because of the high processing speed and dependability of FPGAs. The IoT platform also offers real? Time remote visualization for system administrators. The primary goal of this study is to present a real-

			world application that was put to use and tested in a power substation. The system uses a single high-resolution time source as the reference for steady-state and transient situations and combines the capabilities of an IoT platform with the requirements of highspeed real-time applications.
3	Security for the Industrial IoT: The Case for Information? Centric Networking	Michael Frey, Martine s. lenders, Peter kietzmann	Sensors are typically used in industrial production plants to monitor or record operations, and actuators are used to enable corrective actions in the event of errors, failures, or harmful situations. Embedded controllers connect these "things" to local networks, which are now made possible by the Internet of Things (IoT). These local networks are frequently wireless low-power networks that connect to a cloud via the global Internet. Under the industrial IoT, interconnected sensors and actuators form a crucial subsystem that typically operates in challenging circumstances. How to interconnect vital industrial components in a secure and safe way is now up for discussion. In this study, we examine ICN's potential to offer limited controllers in industrial safety systems a secure and reliable networking solution. Hazardous gas sensing is demonstrated here. Compare

			with IP-based techniques like CoAP and MQTT in common industrial settings, such as refineries. Based on our research, information centric networking should be implemented in a safety? critical industrial IoT due to the content entered security model and improved DoS resistance. Evaluation of the RIOT operating system's crypto efforts for content security reveals their viability in typical deployment settings.
4	Data-Driven Monitoring and Safety Control of Industrial Cyber-Physical Systems: Basics and Beyond	Yuchen jiang, Shen yin, Okyay kayanak	The overall safety and stability of the system have begun to face new threats as a result of the expanding size and complexity of systems, inadequate information flow, and the exploitation of existing knowledge. These difficulties, along with the strategic and practical requirements of creating ICPSs for safety-critical systems like the intelligent factory and the smart grid, serve as the driving forces behind this effort. It explores the state of the art in ICPS monitoring and control research and examines new developments in monitoring, fault diagnosis, and control strategies based on data-driven realisation, which can fully exploit the wealth of data available from prior observations. and those that are continuously gathered online.

			The primary challenges to be addressed for the monitoring and safety control tasks are summarized as the practical requirements in the usual ICPS applications. As a guide
5	Industrial Internet of Things for Safety Management Applications: A Survey	Sudip misra, Chandana roy, Thilo sauter.	The Industrial Internet of Things (IOT) connects all of the actors who are involved in an industrial environment in order to increase operational and management efficiencies. Data can travel over a communication network that is frequently complicated and heterogeneous thanks to this bridging. It allows for prompt decision-making that has an impact on a variety of organisational areas, including business, operations, maintenance, safety, stock, and logistics. Despite the abundance of works in the IOT field addressing the aforementioned aspects, very few works address safety in industries. Industrial safety is a crucial area that has room for improvement in the context of IOT? based solutions for industrial safety management, especially whenever it is linked to human safety. We give a thorough overview of through this examination of the industrial safety problems that are common. The safety aspects of several IOT application domains, including healthcare, transportation, manufacturing,

			and mining, are then categorized and thoroughly examined. Finally, we review the research gaps in several fields and suggest new lines of investigation. To secure people's safety and reduce hazards, we explore a variety of technologies, prototypes, systems, models, methodologies, and applications. This research's main goal is to investigate, synthesize, and acknowledge the applicability of previous studies to safety management using the IOT.
6	Two compact robots for remote inspection of hazardous areas in nuclear power plants	J. Savall, A. Avello, L. Briones	Two mobile robots for the inspection of radioactive areas in nuclear power plants are described. Robicen III is a compact pneumatic robot of 3 kg designed for the inspection of radioactive cylindrical tanks. With a novel locomotive mechanism based on pneumatic actuators and suction pads, it is able to climb vertical walls at speeds close to 110 mm/s. MonoCaRob is a rail-guided autonomous robot for inspection in the drywell of BWR power plants. Copper rails and brushes provide a rugged and robust means for power supply and communications. A video camera and a variety of sensors can be carried by the robot during drywell inspections

7	Applications of Wireless Sensor Networks in the Oil, Gas and Resources Industries	Mohammad reza akhondi, Alex talevski, Simon carlsen.	The work focuses on networks that monitor the production process, to either prevent or detect health and safety issues or to enhance production. WSN applications offer great opportunities for production optimization where the use of wired counterparts may prove to be prohibitive. They can be used to remotely monitor pipelines, natural gas leaks, corrosion, H2S, equipment condition, and real-time reservoir status. Data gathered by such devices enables new insights into plant operation and innovative solutions that aids the oil, gas and resources industries in improving platform safety, optimizing operations, preventing problems, tolerating errors, and reducing operating costs. In this paper, we survey a number of WSN applications in oil, gas and resources industry operations.

8	Wireless goes process automation - challenges in hazardous areas	Stephan schultz	Wireless is predicted to be one of the fastest growing technologies in the area of automation technology in the upcoming years. It is obvious that the ongoing trend towards wireless transmission of data like e.g., WLAN, Bluetooth, ZigBee is entering the hazardous areas of the chemical, petrochemical or pharmaceutical industry too. There is unfortunately not the one and only technology covering all needs. The applied wireless solution needs to be selected carefully based on the demands of the application. Beside all mentioned challenges in the field of wireless functions what are the specifics when wireless enters the hazardous area? Could a wireless signal become an ignition source? What are the limits for the radiated power? How could wireless technology be implemented in the hazardous area? What is the best and most effective way to install it? The presentation discusses these questions and will explain solutions with the advantages and disadvantages. The Pros and Cons of available and future explosion protection techniques will be discussed with the necessary background information and standards.

9	A reliable Internet of A reliable Internet of	Wazir zada khan, Wazir zada khan,	Anomaly detection systems deployed for monitoring in oil
10	Self-powered wireless sensor nodes for monitoring radioactivity in contaminated areas using unmanned aerial vehicles	Andres gomez, Marie francicne lagadec, Michele magno	A self-sustainable wireless sensor node for the monitoring radiation in contaminated and poorly accessible areas is presented. The node is designed to work in collaboration with an unmanned aerial vehicle used for two essential mission steps: air-deploying the wireless sensor nodes at suitable locations and acquiring data logs via ultra-low power, short-range radio communication in fly-by mode, after a wake-up routine. The system allows for the use of off the-shelf components for defining mission, drop-zone and trajectory, for compressing data, and for communication management. The node is equipped with a low-power nuclear radiation sensor and it was designed and implemented with self-sustainability in mind as it will be deployed in hazardous, inaccessible areas. To this end, the proposed node uses a combination of complementary techniques: a low-power microcontroller with non-volatile memory, energy harvesting, adaptive power management and duty cycling, and a nano-watt wake-up radio. Experimental results show the power consumption efficiency of the solution, which achieves 70uW in sleep mode and 500uW

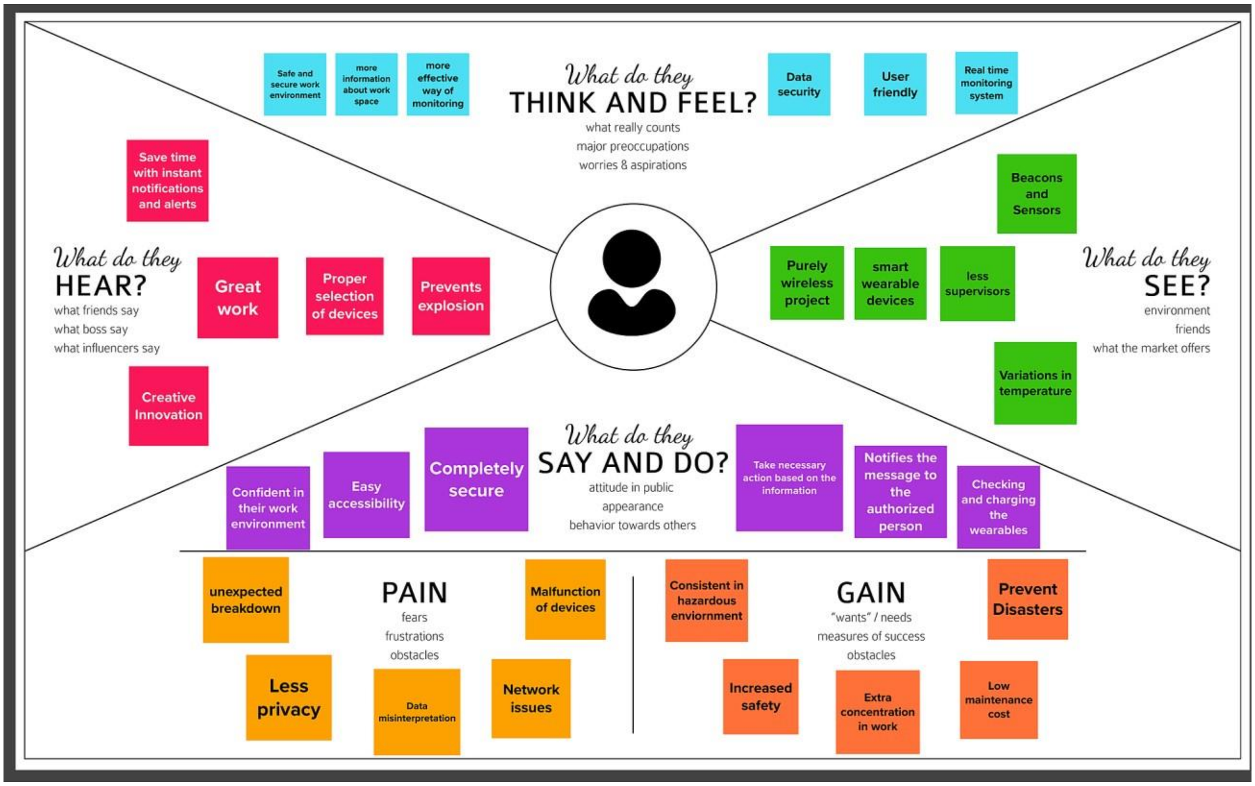
			in active mode. Finally, simulations based on actual field measurements confirm the solution's self-sustainability and illustrate the impact of different sampling rates and that of the wake? up rad

Problem Statement Definition :

- People who are working in industry are in chance of affecting by hazardous gases, high temperature, high humidity, fire explosion. Sometimes the conditions may become critical which may lead to loss of property and human loss.

IDEATION & PROPOSED SOLUTION

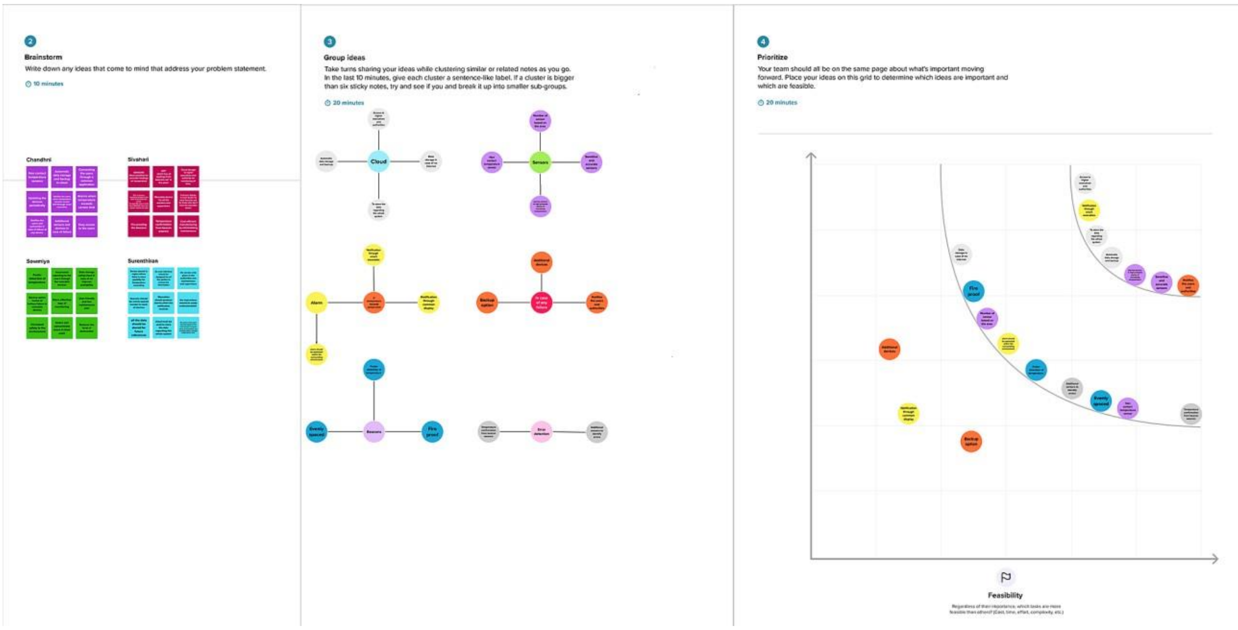
Empathy Map Canvas:



Empathy Map Canvas link:

https://app.mural.co/invitation/mural/projectibm0869/1661404288660?sender=u6331f1a5887a4616360c1130&key=a02a5684-bd11-47a7-b65ddcfe49499397

<u>Ideation & Brainstorming:</u>



Ideation & Brainstorming link:

https://app.mural.co/invitation/mural/projectibm0869/1663321767283?sender=u6331f1a5887a4616360c1130&key=68f3b754-da6c-450eafab-b3b2732f4b26

Proposed Solution:

S:No	Parameter	Description
1	Problem Statement (Problem to be solved)	Difficulty in continuous manual monitoring of temperature and communication in hazardous areas.
2	Idea / Solution description	The hazardous area is integrated with smart temperature beacons which will be sensing and broadcasting the temperature of that particular area. Every person working in those areas will be given smart wearable devices which will be acting as beacon scanners. Whenever the person goes near the beacons, he can view the temperature on his wearable device and if the temperature is high, he will receive the alerts to the mobile through SMS using API. Through this wearable device, the data is sent to the cloud database and through which the dashboard, the admins of that particular plant can view the data and take necessary actions if required.
3	Novelty / Uniqueness	Smart wearable devices are used. Advanced monitoring through beacons
4	Social Impact / Customer Satisfaction	Due to safe environment, workers can work efficiently.

		More focus on work without any fear.
5	Business Model (Revenue Model)	Can be implemented in different hazardous areas. Can make the wearables more advanced and customizable to ones need.
6	Scalability of the Solution	By increasing the number of devices, this can be implemented in a commercial level. In future, other elements like radiation and gases can also be monitored.

Problem Solution fit:

1. CUSTOMER SEGMENT(S)

Who is your customer?

1. Industrialist.
2. Power plants.
3. Nuclear plants.
4. Government.
5. People around nuclear facilities & Industries.

6. CUSTOMER CONSTRAINTS

What constraints prevent your customers from taking action or limit their choices of solutions?

1.Network connection
2.Maintenance
3.Power consumption

5. AVAILABLE SOLUTIONS

Which solutions are available to the customers when they face problem the or need to get the job done? What have they tried in the past? What pros & cons do these solutions have?

Hazard monitoring system in industry using embedded systems.

Pros:

Automatic monitoring and controlling industrial parameters

Cons:

No backup and storage

2. JOBS-TO-BE-DONE / PROBLEM

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

1. Placing the beacons
2. Login to the app
3. Monitoring the Updates from the app

9. PROBLEM ROOT CAUSE

What is the real reason that this problem exists?--

1.Occurrence of industrial accidents
2.Lose of human lives
3.Damage to propertie.

7. BEHAVIOUR

What does your customer do to address the problem and get the job done?

1.By finding the right beacons,smart wearables
2.Find the right place for installation or find the place where problem occurs
3.Note caution period
4.Maintaining the place regularly

3. TRIGGERS

What triggers customers to act?

With the huge usage of electrical equipment and appliances, industries are prone to fatal accidents which leads to loss of human lives,injuries and damage to properties.This calls for a monitoring system that can give early alerts to avoid such hazards.

4. EMOTIONS: BEFORE / AFTER

How do customers feel when they face a problem or a job and afterwards?

1.Insecure >Confident in work
2.More manual security >Less manual security
3.Constantly monitoring for early signs of hazards >Concentrating only in work

10. YOUR SOLUTION

Continuous monitoring of the hazardous areas and sending the information through smart wearable devices to the workers and notifying them through mobile application, the accidents can be avoided.

8. CHANNELS of BEHAVIOUR

ONLINE

1.Network connectivity
2.Cloud storage
3.Mobile application

OFFLINE

1.Beacons
2.Wearable devices

Refer: https://github.com/IBM-EPBL/IBM-Project-333-1658292404/blob/main/Project%20design%20%26%20planning/Project%20Design%20Phase%201/Problem%20solution%20fit.pdf

REQUIREMENT ANALYSIS

Functional requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**Temperature sensors**	To detect the temperature of a particular area
FR-2	**Beacons**	To broadcast the data
FR-3	**Smart wearables**	To notify the users about the temperature of the area
FR-4	**Mobile Application**	To alert the users if the temperature is increased beyond a certain limit
FR-5	**Alarm**	To alert the workers in the nearby sectors
FR-6	**Cloud storage**	To store and access the data

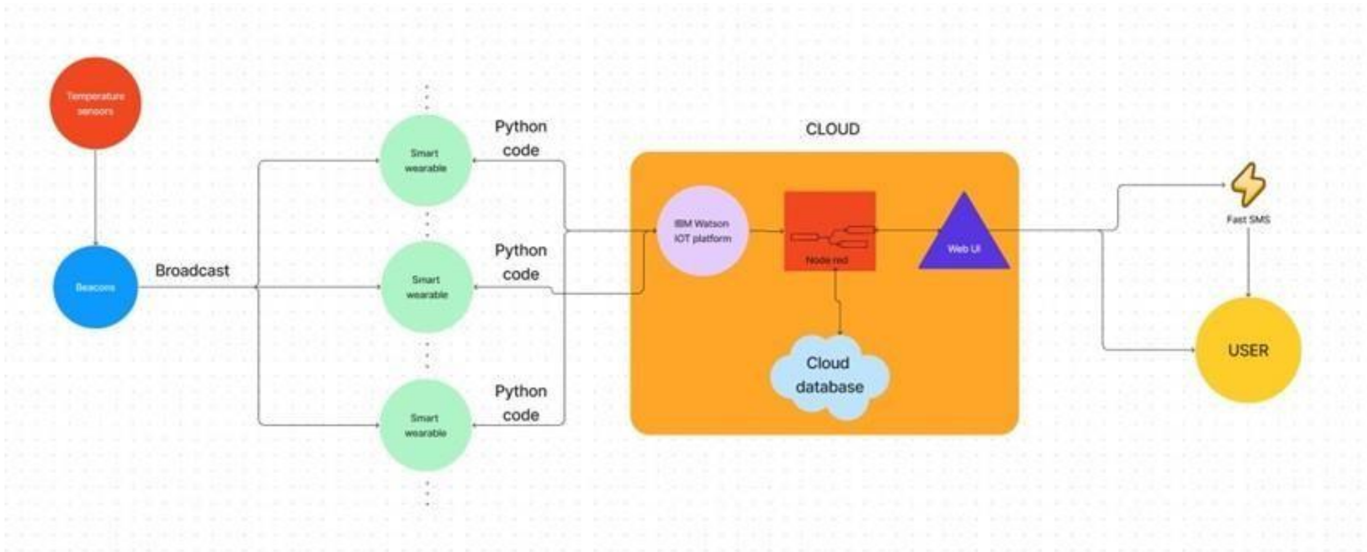
Non-Functional requirements:

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

NFR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Availability of user-friendly wearable devices
NFR-2	**Security**	It will be safe for the workers by installing the devices in the industry
NFR-3	**Reliability**	Data are saved in the secured server so they don’t provide any loopholes for the hackers.
NFR-4	**Performance**	No server crash or server down
NFR-5	**Availability**	Information is available through wearable devices and mobile application
NFR-6	**Scalability**	Easily accessible with high reliability.

PROJECT DESIGN

Data Flow Diagram:



Solution & Technical Architecture:

Technical Architecture:

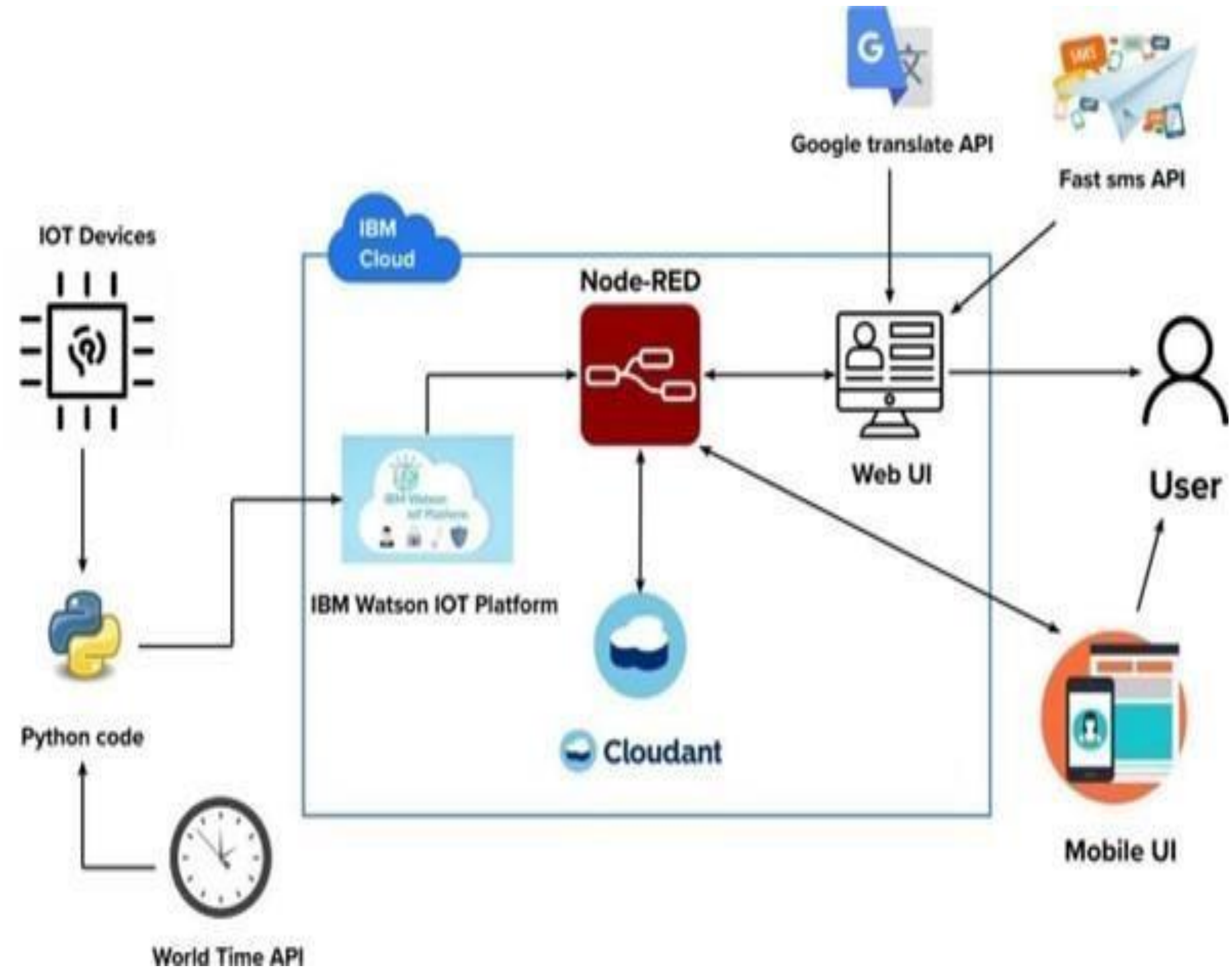


Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	Web UI, Mobile App, SMS service and Wearable devices	Node-RED, Fast SMS and MIT App inventor
2.	Application Logic-1	Getting input from smart beacons	Embedded C and Python

3.	Application Logic-2	Process data in cloud	IBM Watson IOT platform, Cloudant DB and Node-RED
4.	Application Logic-3	Display data to the user	Web UI, Fast SMS and Mobile application
5.	Database	Real time database	Cloudant DB
6.	Cloud Database	Database Service on Cloud	IBM Cloudant
7.	External API-1	To send SMS to user	Fast SMS API
8.	External API-2	Language for the website is written to be dynamic	Google translate API
9.	External API-3	To access time	World time API
10.	Smart Beacon	To monitor the area and update the stats in the cloud	Node MCU and Sensors
11.	Infrastructure (Server / Cloud)	Application Deployment on Cloud	IBM Cloud

Table-2: Application Characteristics:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Technician	Installation	USN-1	As a user, I must install the smart beacons at points to ensure the entire area of the plant is covered.	A beacon can be found in every area of the plant.	High	Sprint-1
	Data Gathering	USN-2	The beacons obtain the temperature of their respective area using sensors.	The temperature of areas within the plant is obtained.	High	Sprint-1

	Data Sync	USN-3	The beacons send their data to the cloud in the real time which is in turn sent to nearby wearable devices	Data is sent to the cloud successfully and synced with other devices.	High	Sprint-1

User Stories:

S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The Node-RED open-source frameworks are used to build the web application as well as to communicate with the mobile application and to handle alert SMS	Node-RED framework
2.	Scalable Architecture	The 3 – tier architecture used with a separate user interface, application tier and data tier makes it easily scalable	IBM Watson Studio
3.	Availability	The web application is highly available as it is deployed in cloud	IBM Cloud
4.	Performance	The performance of the website is improved with caching and security	IBM Cloud Internet Services

PROJECT PLANNING & SCHEDULING

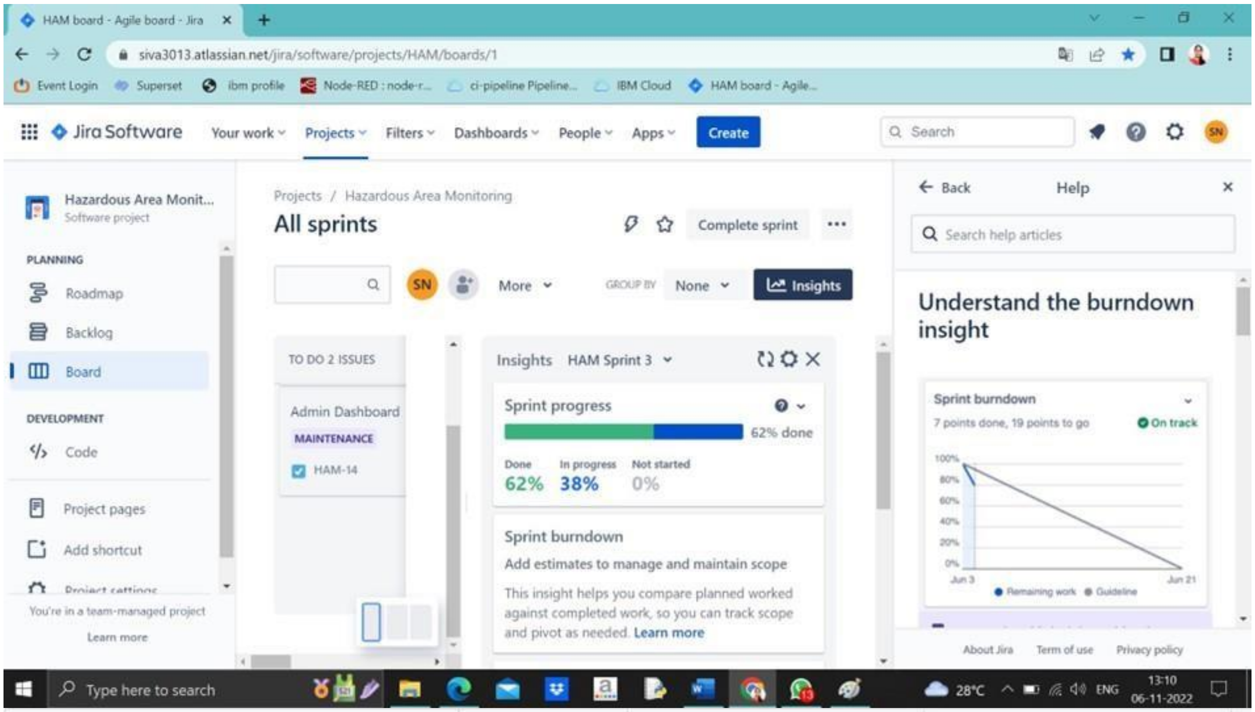
Sprint Planning & Estimation:

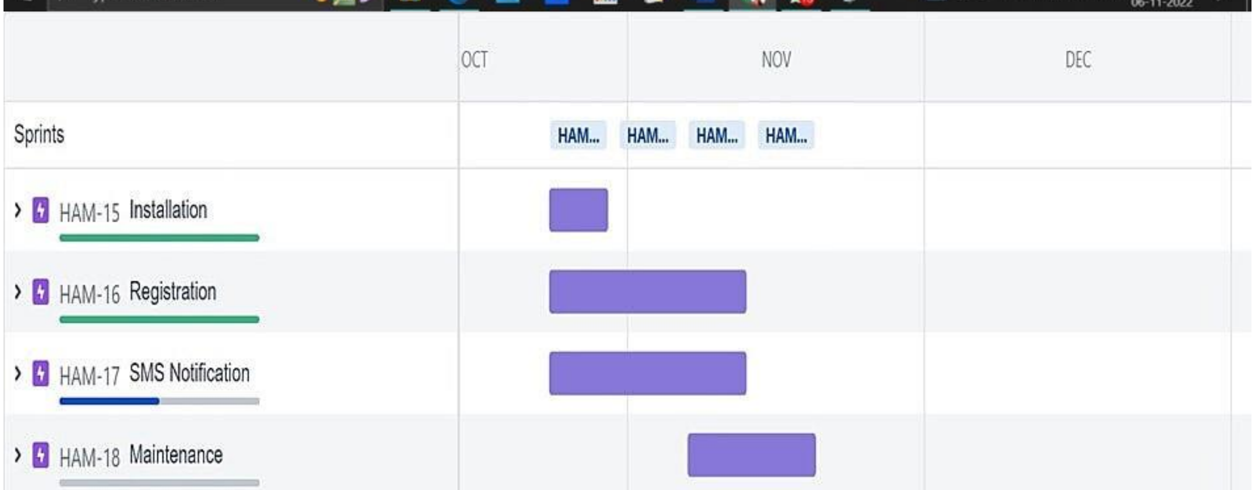
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task
Sprint-1	User Installation	USN-1	As a user, I must install the smart beacons at points to ensure the entire area of the plant is covered.
Sprint-1	Data Gathering	USN- 2	As a user, I can monitor the beacons obtain the temperature of their respective area using sensors.
Sprint-2	Data Sync	USN- 3	The beacons send their data to the cloud in the real time which is in turn sent to nearby wearable devices and the administrator's dashboard.
Sprint-1	User Registration	USN- 1	As a user, I can register for the application by entering my email, password and confirming my password.
Sprint-3	Administrative response	USN-2	As a User, I can login to the application by entering email & password.
Sprint-4	Administrative response	USN-2	As an Admin, I must allot particular person to look after the atmospheric changes.

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

<u>**Reports from JIRA:**</u>





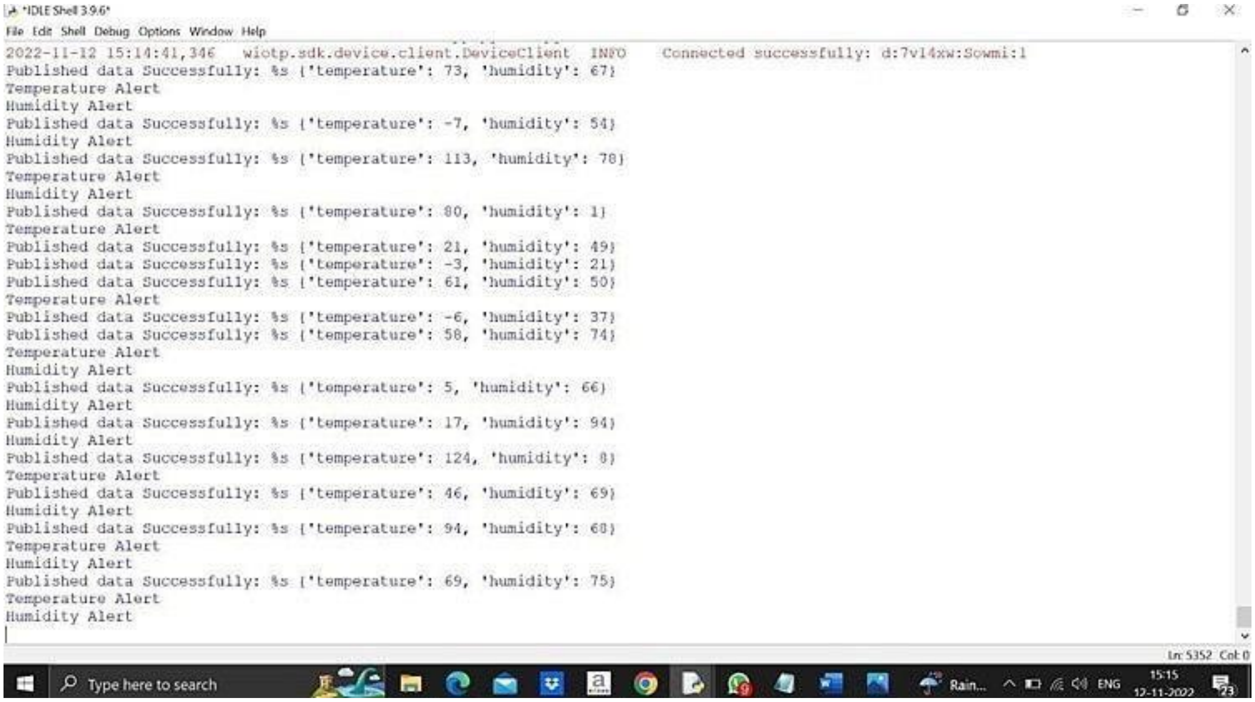
CODING & SOLUTIONING

#IBM Watson IOT Platform

#pip install wiotp-sdk import

wiotp.sdk.device import time

```
import random   myConfig =
{
 "identity": {
 "orgId": "7v14xw",
 "typeId": "Sowmi",
 "deviceId":"1"
 },
 "auth": {
 "token": "Sowmi@12"
 }
}
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:      temp=random.randint(-20,125)
hum=random.randint(0,100)
myData={'temperature':temp,'humidity':hum}
client.publishEvent(eventId="status", msgFormat="json",  data=myData,
qos=0, onPublish=None)     print("Published data Successfully: %s",
myData)     client.commandCallback = myCommandCallback
   if(temp>50):
      print("Temperature Alert")
if(hum>50):        print("Humidity Alert")
time.sleep(5)  client.disconnect()
```



```
2022-11-12 15:14:41,346   wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:7v14xw:Sowmi:1
Published data Successfully: %s {'temperature': 73, 'humidity': 67}
Temperature Alert
Humidity Alert
Published data Successfully: %s {'temperature': -7, 'humidity': 54}
Humidity Alert
Published data Successfully: %s {'temperature': 113, 'humidity': 78}
Temperature Alert
Humidity Alert
Published data Successfully: %s {'temperature': 80, 'humidity': 1}
Temperature Alert
Published data Successfully: %s {'temperature': 21, 'humidity': 49}
Published data Successfully: %s {'temperature': -3, 'humidity': 21}
Published data Successfully: %s {'temperature': 61, 'humidity': 50}
Temperature Alert
Published data Successfully: %s {'temperature': -6, 'humidity': 37}
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Temperature Alert
Humidity Alert
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Humidity Alert
Published data Successfully: %s {'temperature': 17, 'humidity': 94}
Humidity Alert
Published data Successfully: %s {'temperature': 124, 'humidity': 8}
Temperature Alert
Published data Successfully: %s {'temperature': 46, 'humidity': 69}
Humidity Alert
Published data Successfully: %s {'temperature': 94, 'humidity': 68}
Temperature Alert
Humidity Alert
Published data Successfully: %s {'temperature': 69, 'humidity': 75}
Temperature Alert
Humidity Alert
```

TESTING

Test Cases:

Section	Total cases	Not tested	Fail	pass
Print Engine	12	0	0	12
Client Application	30	0	0	30
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	7	0	0	7
Final Report output	4	0	0	4
Version Control	3	0	0	3

Drive link:

https://docs.google.com/spreadsheets/d/1qQl_2pZTLpML1IrLcqdkIZJ2LUMR8GA/edit?usp=sharing&ouid=100753412618769947141&rtpof=true&sd =true

User Acceptance Testing

Purpose of this test:

The purpose of this document is to briefly explain the test coverage and open issues of the web UI which provides “Hazardous area monitoring for Industrial power plant powered by IOT” at the time of the release to User Acceptance Testing (UAT).

Defect Analysis:

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Severity 5
By design	7	3	2	1	13
Duplicate	2	0	3	0	5
External	2	1	0	1	4
Fixed	8	2	4	7	21
Not reproduced	0	0	0	0	0
Skipped	0	0	1	1	2
Won’t fix	0	2	1	1	4
Totals	19	8	11	11	49

The above is the number test cases taken and the error rectification list in out project **.**

Performance Metrics:

NFT - Risk

S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volume Changes	Risk Score	Justification
1	Hazardous Area Monitoring for Industrial power plants powered by IOT	Existing	Moderate	No Changes	Low	No impacts	>10 to 30%	GREEN	As we have seen the changes, it adds the setup time

NFT - Detailed

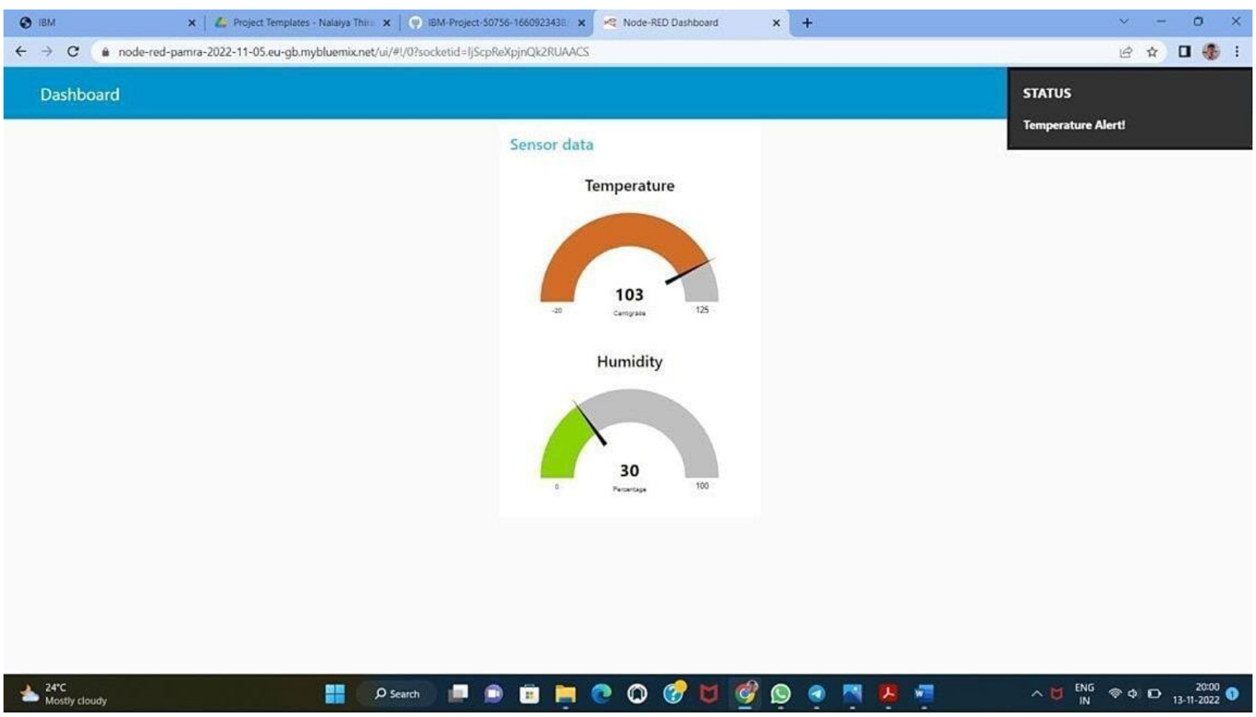
S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff
1	Measuring Temperature and Humidity in Industrial power	LOAD	Requirment of Alternates in hardware, Improved Accurate	SignOff

End Of Test

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Measuring Temperature and Humidity in Industrial power plants through beacon scanners, and alerting the	LOAD	NFR	1.Temperature and Humidity values 2.Alert notifications	GO	To have advanced versions of web application	Closed	Approval

RESULT:

Web Page



Mobile App

ADVANTAGES:

IOT technology is an effective concept that contributes to measuring the temperature and humidity ratio within any industrial premises. It helps the authorities in maintaining a proper ambiance required for the workers to work under certain environmental conditions by keeping real-time control on the IoT-powered solution. The temperature and humidity monitoring helps analyse the situation and maintains a favourable environment as required.

DISADVANTAGES:

They rely heavily on the internet and are unable to function effectively without it. With the complexity of systems, there are many ways for them to fail.

CONCLUSION:

This system measures the Temperature and Humidity in industrial power plants and alerts the workers in case of any danger through Mobile app. This system helps the workers to work more efficiently. The data is stored in cloud and can be accessed by higher authorities. This system reduces manual monitoring.

FUTURE SCOPE:

The Internet of Things (IoT) has risen to prominence as a global technology. It has grown in popularity in a short period. Moreover, advances in Artificial Intelligence and Machine Learning have made IoT device automation easy. In general, AI and machine learning programs are paired with IoT devices to provide proper automation. As a result, the Internet of Things (IoT) has broadened its field of application across various industries.

SourceCode:

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {
                    "identity": {
                    "orgId": "hj5fmy",
                    "typeId": "NodeMCU",
                    "deviceId":"12345"
                    },
                    "auth": {
                    "token": "12345678"
                    }
                    }

          def myCommandCallback(cmd):
          print("Message received from IBM IoT
     Platform:%s" % cmd.data['command'])
```

```
m=cmd.data['command']

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

    while True:
    temp=random.randint(-20,125)
    hum=random.randint(0,100)
    myData={'temperature':temp,
'humidity':hum}
    client.publishEvent(eventId="status",msgForma
t="json",         data=myData,        qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
    client.discon
    nect()
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-333-

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Project Demo link:

https://drive.google.com/file/d/16EwNz-aTtZwrRwEpryExkyInUdpAayhn/view?usp=share_link