HAZARDOUS AREA MONITORING IN INDUSTRIAL POWER PLANT POWERED BY IOT

CHAPTER 1

INTRODUCTION

This Project provides an option for monitoring and controlling of boilers in power plant even in remote location in addition to the control room. The proposed method develops the remote monitoring and control of boiler temperature using wireless communication. The need for power generation in India increases day by day due to various factors. Nearly 70% of the power production is from the thermal power plants in various locations of the country. Monitoring and control of these power plants at all times is a must, since these power plants are operated continuously. This method uses Internet of Things (IoT) as the platform of communication. The proposed method also provides an option for monitoring and control even in remote location in addition to the control room. Internet of Things (IoT) will play a major role in the future concept of power plant integration. The proposed method will suit and provide a start-up initiation for this future concept. In this project we are using temperature sensor to sense the temperature of the boiler. The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin. Temperature sensor sense the temperature of the boiler which is given to micro controller. Whenever the temperature value is exceeded to prescribed value it gives the alerts through Wi-Fi.

1.1 PROJECT OVERVIEW

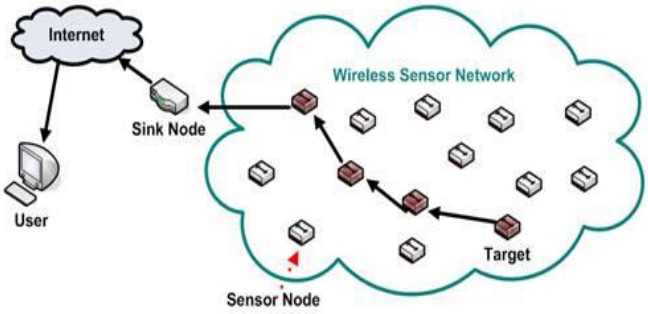
This Project provides an option for monitoring and controlling of boilers in power plant even in remote location in addition to the control room. The proposed method develops the remote monitoring and control of boiler temperature using wireless communication. This method uses Internet of Things (IoT) as the platform of communication. The proposed method also provides an option for monitoring and control even in remote location in addition to the control room. Internet of Things (IoT) will play a major role in the future concept of power plant integration. The proposed method will suit and provide a start-up initiation for this future concept. Temperature sensor sense the temperature of the boiler which is given to micro controller. Whenever the temperature value is exceeded to prescribed value it gives the alerts through Wifi.

1.2 PURPOSE

WIRELESS SENSOR NETWORK

A **wireless sensor network** (WSN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control.

In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. The size a single sensor node can vary from shoebox-sized nodes down to devices the size of grain of dust. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few cents, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost conshumants on sensor nodes result in corresponding conshumants on resources such as energy, memory, computational speed and bandwidth. In computer science, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year.



Applications

The applications for WSNs are many and varied. They are used in commercial and industrial applications to monitor data that would be difficult or expensive to monitor using wired sensors. They could be deployed in wilderness areas, where they would remain for many years (monitoring some environmental variable) without the need to recharge/replace their power supplies. They could form a perimeter about a property and monitor the progression of intruders (passing information from one node to the next). There are a many uses for WSNs.

Typical applications of WSNs include monitoring, tracking, and controlling. Some of the specific applications are habitat monitoring, object tracking, nuclear reactor controlling, fire detection, traffic monitoring, etc. In a typical application, a WSN is scattered in a region where it is meant to collect data through its sensor nodes.

- Environmental monitoring
- Habitat monitoring
- Acoustic detection
- Seismic Detection
- Military surveillance
- Inventory tracking
- Medical monitoring
- Smart spaces
- Process Monitoring

Area monitoring

Area monitoring is a typical application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. As an example, a large quantity of sensor nodes could be deployed over a battlefield to detect enemy intrusion instead of using landmines. When the sensors detect the event being monitored (heat, pressure, sound, light, electro-magnetic field, vibration, etc), the event needs to be reported to one of the base stations, which can take appropriate action (e.g., send a message on the internet or to a satellite). Depending on the exact application, different objective functions will require different data-propagation strategies, depending on things such as need for real-time response, redundancy of the data (which can be tackled via data aggregation techniques), need for security, etc.

Characteristics

Unique characteristics of a WSN are:

- Small-scale sensor nodes
- Limited power they can harvest or store
- Harsh environmental conditions
- Node failures
- Mobility of nodes
- Dynamic network topology
- Communication failures
- Heterogeneity of nodes
- Large scale of deployment
- Unattended operation

Sensor nodes can be imagined as small computers, extremely basic in terms of their interfaces and their components. They usually consist of a processing unit with limited computational power and limited memory, sensors (including specific conditioning circuitry), a communication device (usually radio transceivers or alternatively optical), and a power source usually in the form of a battery. Other possible inclusions are energy harvesting modules, secondary ASICs, and possibly secondary communication devices (e.g. RS232 or USB).

The base stations are one or more distinguished components of the WSN with much more computational, energy and communication resources. They act as a gateway between sensor nodes and the end user.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

In the existing system, techniques such as visual inspection, video transmission, and Magnetic field methods can identify the Hazardous Area on the industry area. Physical checking is one of the earliest method in which all the necessary components will be scanned manually. This process is commonly used in India, despite generating the worst outcome. A camera is used for continuous monitoring of the track while streaming content. In this procedure small Hazardous Area and a high-cost system cannot be seen. The current passes through the industry track for detection of flaws in the eddy current method and the results produced are not accurate. Many of these techniques require a lot of processing power and an extremely long period of time, making the robot's speed slow and therefore uncomfortable.

2.2 REFERENCES

[1]. "Implementation of Industry Track Hazardous Area Detection and Protection" by N.Karthick, R.Nagarajan, S.Suresh and R. Prabhu, International Journal Of Bodyering And Computer Science, Volume 6 Issue 5 May 2017.

In this world people uses various types of transportation system to travel from one place to another place. Mostly they give importance to public transportation for safer journey. At the same time the transport departments check out the safety measures implemented in them. The proposed system is suitable for industrys transportation to identify the Hazardous Area in the industry area earlier and prevent the accidents. In this paper to use Hazardous Area detection sensor, this will be placed in the human body. By this, if some Hazardous Area is detected on the track the human starts to slow and stop at respective point automatically and exact place of Hazardous Area would be given to control room. Secondly the next cause of accidents is prevented from two humans opposite in same track by using the same sensors fitted in the body, if the sensor senses the same signal from opposite human then it automatically applies the brake and stops the human at certain distance. The derailment causes several loses in industry accidents. The proposed system introduces Bluetooth based technology, to prevent the humans accident. The Bluetooth device is installed at each front end of the locomotive. If the human starts to derail, automatically signal is breaked and

an alert is given to body driver and on the other emergency brake is applied automatically. The main aim of the work is to avoid the human accidents without manual power.

[2]. "Industry Hazardous Area Detection System", by Akhil N., Dinu Mohan, Fayis P., SijaGopinath, International Research Journal of Bodyering and Technology, Vol. 3, 2016.

In this paper, we have established into use and operation of the integration of Temperature Hazardous Area detection method and complete station for eternal industry track geometry surveying system. This system comprises of GPS module, GSM modem, IR sensor, PIR sensor to bring into operation the Hazardous Area detection, communication purpose and identification of any living being crossing the industry track. The GPS module and GSM modem contribute in identification and transmission of industry geometric parameter of Hazardous Area detection to the nearby industry station. This paper also explains the summation of an Temperature-based non-destructive testing (NDT) and wireless sensor networks (WSNs) to keep in a continuous record the material without interruption in nobility during run-time. The PIR sensor is executed to keep away manual patrolling and finding of living beings across the area. This can operate during the night as well as the daytime. The summation of both the technologies WSN and NDT will form various advanced and trending applications to make wireless material scanning more cost-effective in real-time

[3]. "Industry Area Hazardous Area Detection Based on the GSM Technique" by A. S. Muley, S B. Patil, A.H.Shelar, IRJET, 2017

The Indian Industrys has one of the largest industry networks in the wor1d and it provides the most important mode of pub1ic transport in India which is most commonly used and cost-effective long-distance transport system of the country. The main problem about a industry analysis is detection of Hazardous Area on track. If these damages are not controlled at early stages, they might lead to a number of derailments resulting in a heavy loss of life and property. In this work we are introducing a project that aims in designing robust industry Hazardous Area detection scheme (RRCDS) using IR Sensor. This avoids the human accidents by detecting the Hazardous Area on industry area. The Robotic model is designed with a camera which sends pictures and live videos. And also capable of alerting the authorities in the form of SMS messages along with

location by using GPS and GSM modules. The system also includes distance measuring sensor which displays the track deviation distance between the two area. This will save several humans in India from unwanted damages from the rail track.

[4]. "IR Sensor Based Hazardous Area Detection of Industry Track Using GSM & GPS System", by P Nikhar, R Pise, Avinash IJRASET, 2017.

In India industry is one of the most common means of transport, which is the fourth largest industry community in the world. Even though Indian industrys has an outstanding boom, it remains plagued because of some of the major issues like problem in gate crossing, fire accidents and problem in the track which remains unmonitored causing derailment. The area contract and expand due to changes in season. Due to this Hazardous Area may develop on the track. This proposed system identifies the Hazardous Area and the obstacles on the track using sensors and inform the control room through an SMS using GSM and GPS module

[5].An Arduino based Method for Detecting Hazardous Area and Obstacles in Industry Area" by Er.Kunduru Umamaheswari and Er.Polepogu Rajesh, International Journal of Electronics, Electrical and Computational System, Volume 6, April 2017.

In the fast developing country, people are facing many accidents; it would be undesirable for any nation to losing their life for unwanted cause. Industrys are one of the important transports in India. There is a need for manual checking to detect the Hazardous Area on industry track and always industry personnel takes care of this issue, even though the inspection is made regularly. Sometimes the Hazardous Area may unnotice. Because of this the human accident or derailment may occur. In order to avoid this situation and automate the industry Hazardous Area detection has been proposed. Here Temperature sensor is used to detect the Hazardous Area in the industry track by measuring distance from track to sensor, if the distance is greater than the assigned value the microcontroller identifies there is a Hazardous Area and IR sensor is used to detect the obstacle presence in the track, Here we are Using Arduino microcontroller. After Hazardous Area detection or object detection the testing robotic vehicle stops and the longitudinal and latitudinal positions are sent via SMS to GSM and GPS and also send the information to nearby humans through RF

Communication, Here RF Transmitter is placed on Robotic Section and RF Receiver is placed on Human section.

2.2 PROBLEM STATEMENT DEFINITION

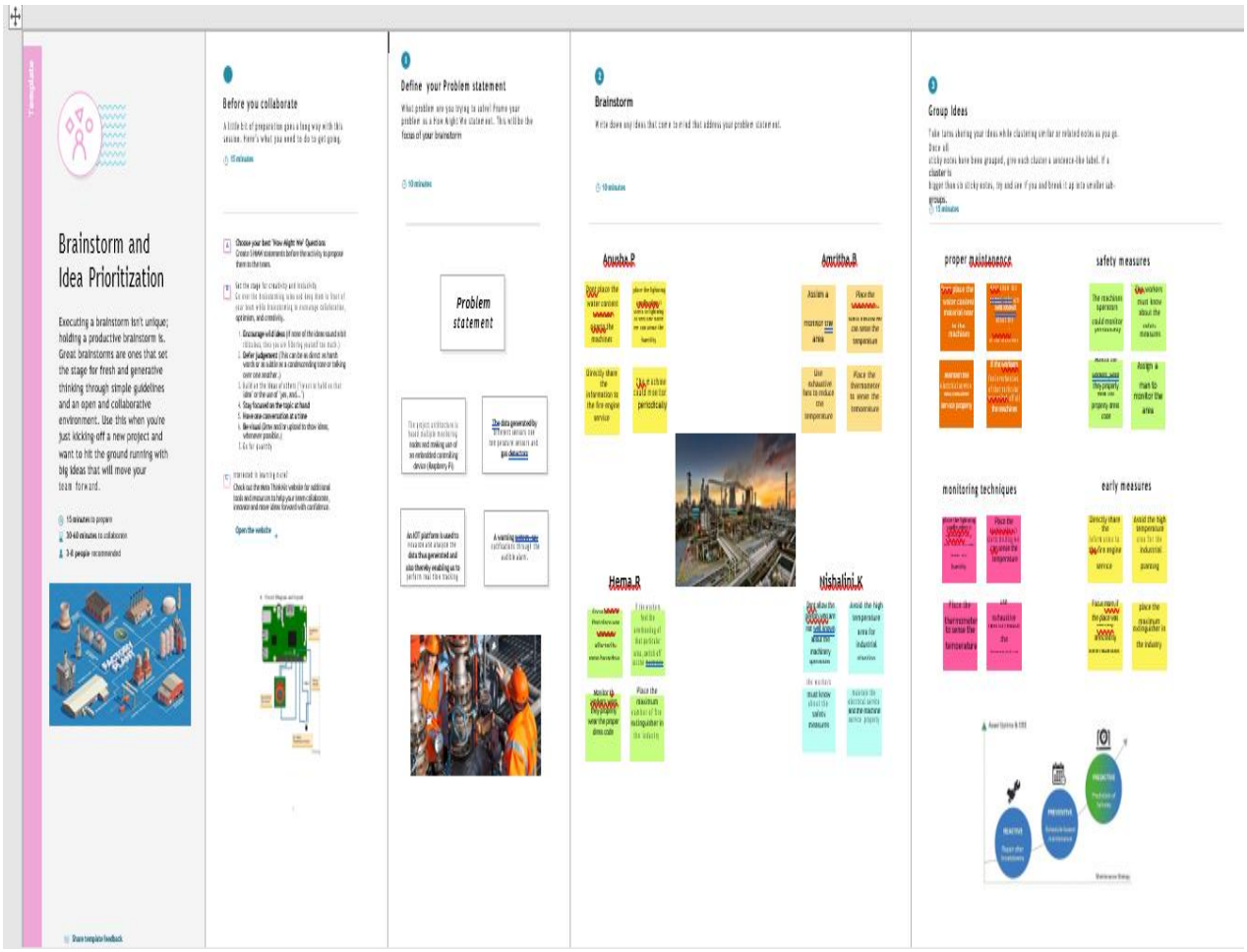
In industry, changes in the chemical reaction and environment affects the machines and causes some explosions. Due to this hazardous problem the industry will meet a million of losses and also loss the lives of the workers and nearby people. Who does the problem affect? Those who work in the industry, the management and the residential people. What are the boundaries of the problem? The boundaries are workflow, geographic area and environment pollution. What is the issue? Due to unawareness of the early defects of temperature raising, the problems were occurred. When the problem is fixed, there is no loss of machines and the lives of workers. When the problem is not solved, the industry should face the catastrophic losses. When does the issue occur? The issues occur when the machines are not maintained properly or due to environmental changes. Where is the issue occurring? The issue occurs in the industry, because we can't predict it earlier. Why is it important that we fix the problem? It is very important to safe the lives of the workers and residential people.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP

3.2 IDEATION AND BRAINSTROMING

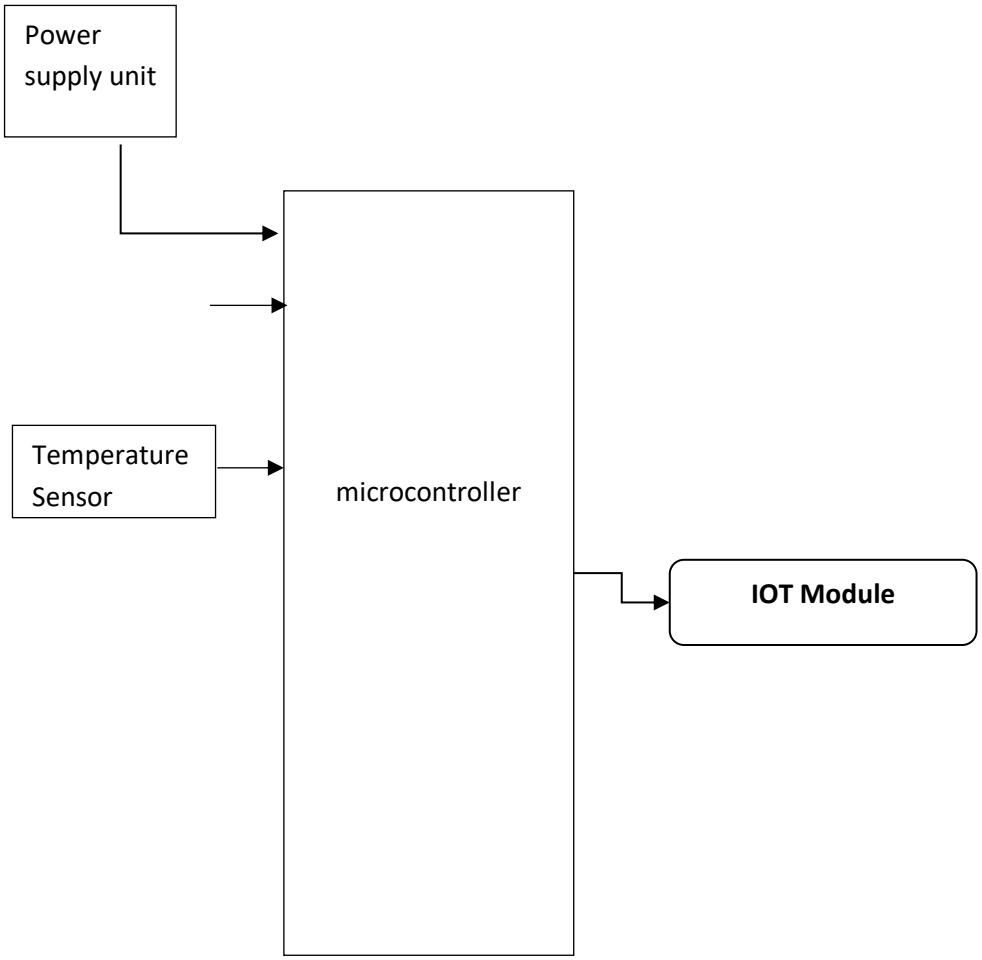


3.3PROPOSED SOLUTION

The proposed system surpassed the existing system limitations used to identify defective railroad area. To use Arduino NODEMCU board in this proposed system. Arduino is an integrated open source development environment, which simplifies coding considerably. The system proposed is consisting of an Temperature sensor designed to detect Hazardous Area and IR sensors used to detect obstacles. The motor controller L293D helps to power the DC motors. The Arduino controller is primarily used for controlling the sensor outputs and is used for the transmission of information through IOT module, the purpose of which is to send the signal to the base station whenever a Hazardous Area or obstacle is detected via an SMS. Using the GPS module, the exact latitude and longitudinal direction of the faulty track is obtained. In this device subtle Hazardous

Area that are not visible to the naked eye can also be observed. The proposed system is therefore productive and minable.

BLOCK DIAGRAM



3.4 PROBLEM SOLUTION FIT

1.CUSTOMER SEGMENT(S)	2.JOBS-TO-BE-DONE / PROBLEMS	3.TRIGGERS
Employees who monitor hazardous area in industrial plants	To check and alert the humidity, temperature, infrared radiation and air quality	Successful execution of our solution will make even other industry to implement this solution
4.EMOTIONS: BEFORE/AFTER It will be easy for employee to identify or to know about their environment	**5.AVAILABLE SOLUTIONS** Smart area monitoring sensors WIFI connectivity for sensors Pros: Successful monitoring of area Cons: Network coverage for sensors can't be reached	**6.CUSTOMER C O N S T R A I N T S** Smart Beacon coverage area Network access for beacon. Beacon to watch connectivity
7.BEHAVIOUR The employees have a wearable watch where they can see the required or specified details and act safely according to it.	**8.CHANNELS OF BEHAVIOUR** 8.1 ONLINE Any information will be stored in cloud, so the employees can see the cloud storage or mobile application for referring the details of surroundings	8.2 OFFLINE Employees used to wear a watch which captures the information of the surroundings
9.PROBLEM ROOT/CAUSE It is important to note the employee's safety. working in hazardous area in industries are highly risk. therefore, this project helps employee to know about their environment	**10.YOUR SOLUTION** We are going to monitor the area using Beacon. Administrative control and personal protective equipment. From the cloud we will be accessing the reading and using that we will have a web page and a mobile application to display them. We will have the SMS service to alertthe abnormal readings	

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 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

4.2 NON- FUNCTIONAL REQUIREMENTS

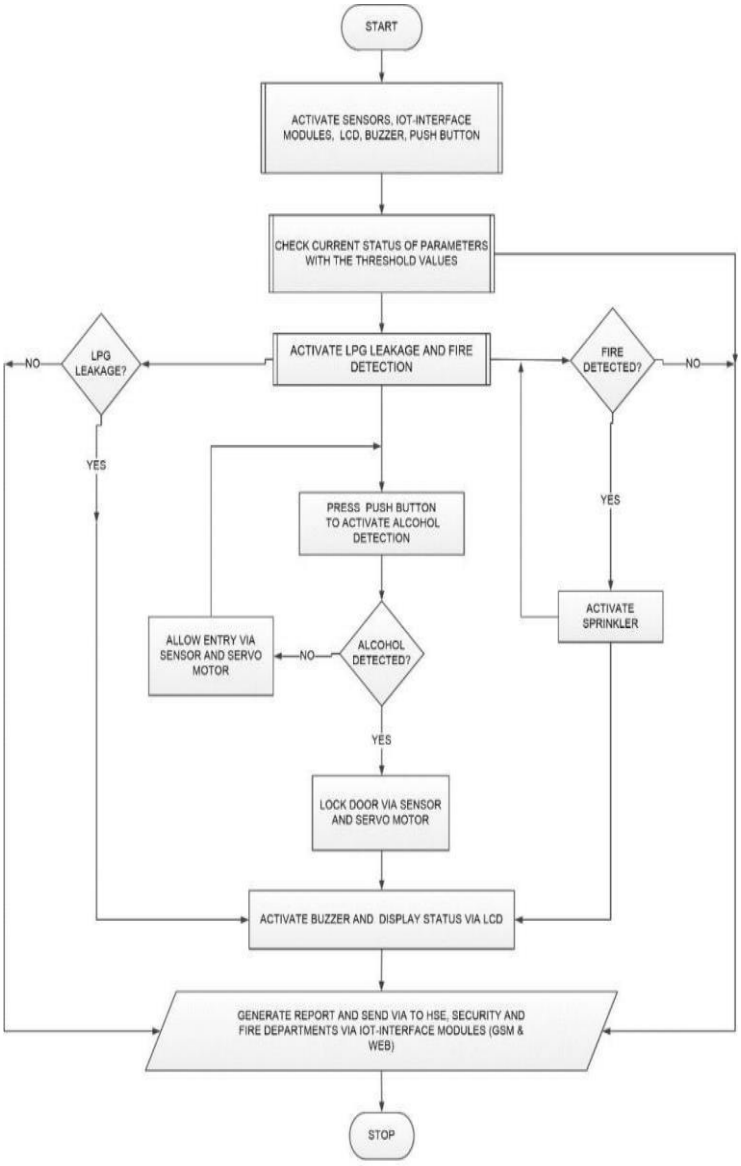
Following are the non-functional requirements of the proposed solution.

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.

CHAPTER 5

PROJECT DESIGN

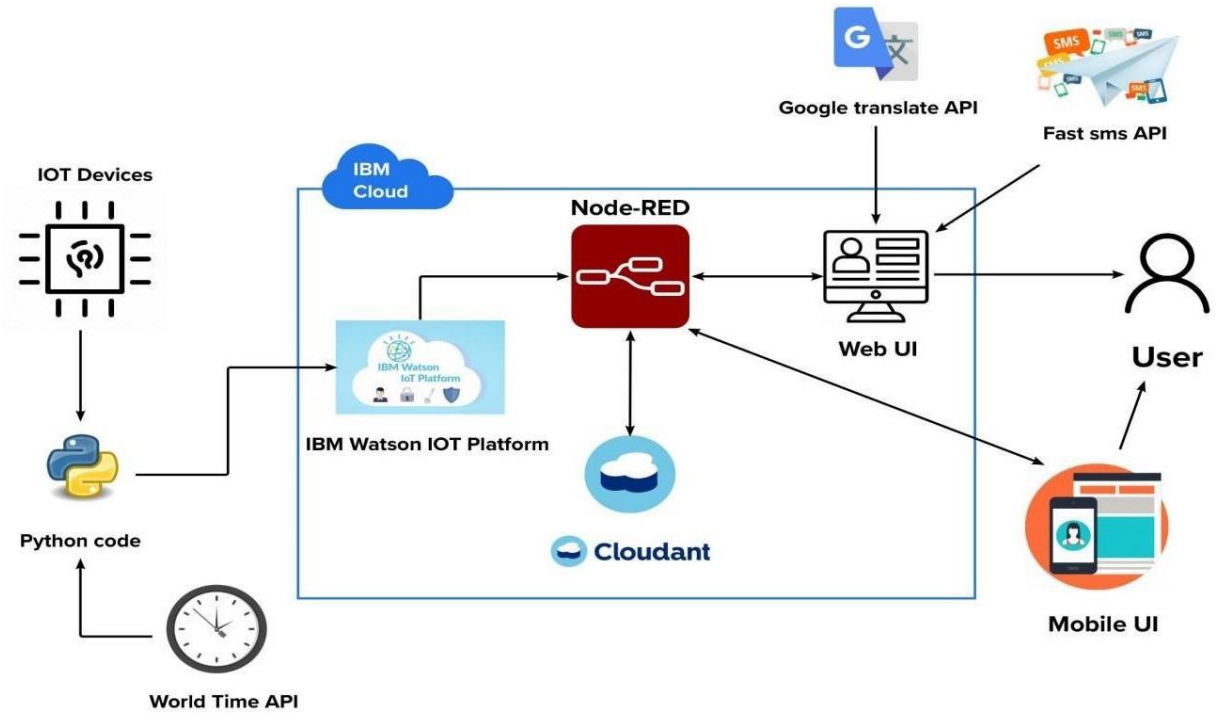
5.1 DATA FLOW DIAGRAMS



5.2 TECHNOLOGY ARCHITECTURE

S.No	Component	Description	Technology
1.	User Interface	Web UI, Mobile App, SMS service and Wearabledevices	Node-RED, Fast sms and MIT Appinventor

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 DBand Node-RED
4.	Application Logic-3	Display data to the user	Web UI, Fast sms and Mobileapplication
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

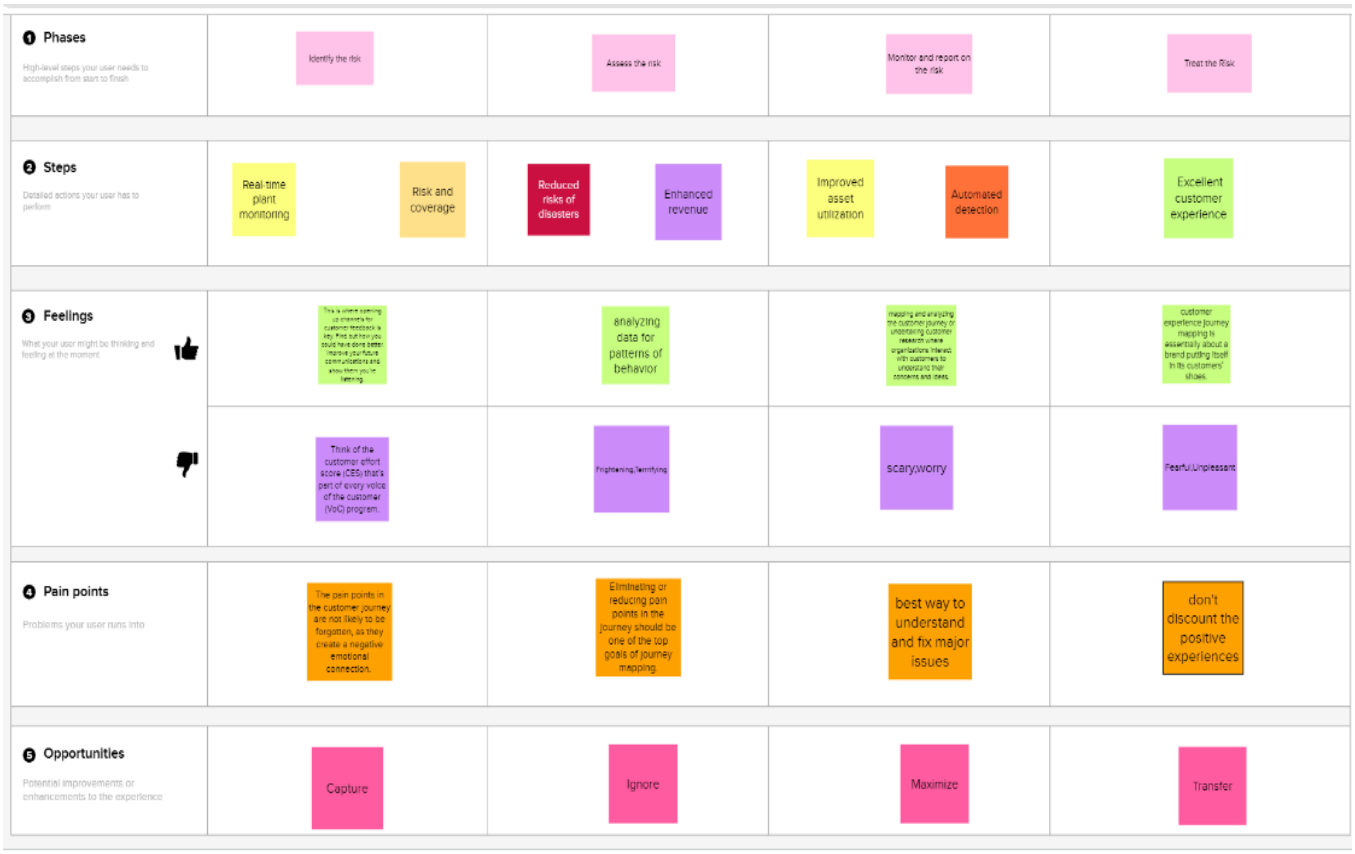


SOLUTION ARCHITECTURE

- The reach of IOT based systems in industrial areas is still limited, but it hashuge potential.
- The system actively records, process and analyzes the temperature of surroundings, which is a prime safety parameter in areas where moltenmetal is processed, manufacturing is done or welds are made.

- Also, it keeps track of high levels of dangerous gases present in the environment (LPG/Natural gas).
- If a parameter is violated, the system sends an immediate notification to aset of preset lists of users on their smartphones, and continues logging andmonitoring data for further analysis to improvements in the safety regulations.

USER STORIES


1 Phases
High-level steps your user needs to accomplish from start to finish
Identify the risk
Assess the risk
Monitor and report on the risk
Treat the Risk
2 Steps
Detailed actions your user has to perform
Real-time plant monitoring
Risk and coverage
Reduced risks of disasters
Enhanced revenue
Improved asset utilization
Automated detection
Excellent customer experience
3 Feelings
What your user might be thinking and feeling at the moment
This is where opening up channels for customer feedback is key. Find out how you could have done better, improve your future communications and show them you're listening.
analyzing data for patterns of behavior
mapping and analyzing the customer journey or undertaking customer research where organizations interact with customers to understand their concerns and needs.
customer experience journey mapping is essentially about a brand putting itself in its customers' shoes.
Think of the customer effort score (CES) that's part of every voice of the customer (VoC) program.
Frightening,Terrifying
scary,worry
Fearful,Unpleasant
4 Pain points
Problems your user runs into
The pain points in the customer journey are not likely to be forgotten, as they create a negative emotional connection.
Eliminating or reducing pain points in the journey should be one of the top goals of journey mapping.
best way to understand and fix major issues
don't discount the positive experiences
5 Opportunities
Potential improvements or enhancements to the experience
Capture
Ignore
Maximize
Transfer

CHAPTER 6

PROJECT PLANNING & SCHEDULING

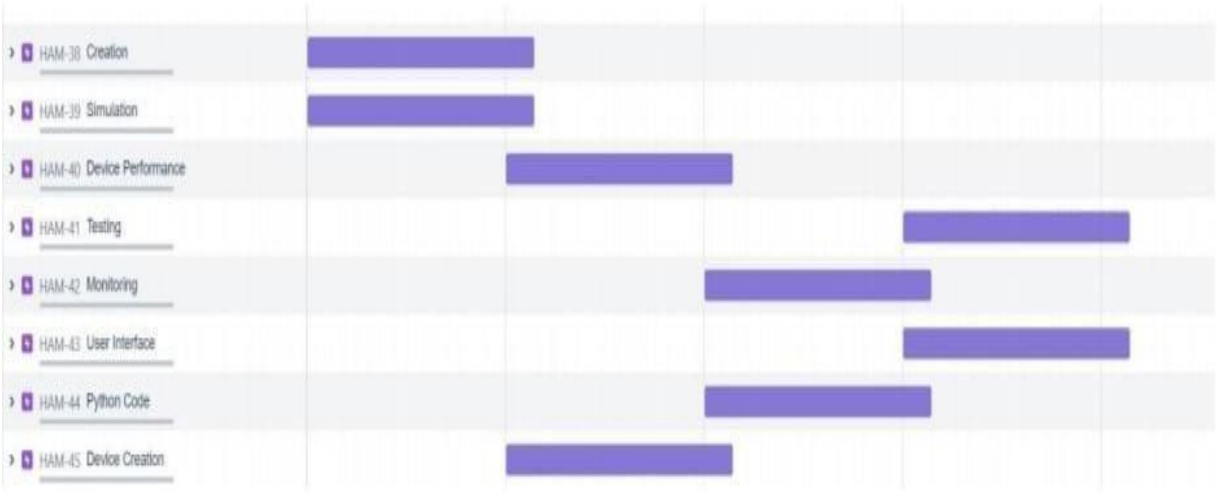
6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Installation of Beacons	USN-1	First the Admin will be installing smart beacons at necessaryplaces.	15	High	Anusha P Amritha B Hema R Nishalini S
Sprint-1	Providing Wearables	USN-1	The admin will be providing everyone at the industry a wearable device.	5	Medium	Anusha P Amritha Hema R Nishalini S
Sprint-2	Cloud Setup	USN-2	The smart Beacons will connect with the cloud services. Wherewe can get the real time data from the wearable	20	High	Anusha P Amritha B Hema R Nishalini S
Sprint-3	Online Monitoring via Web	USN-3	Websites will be created and connected with the cloud services.	20	High	Anusha P Amritha B Hema R Nishalini S
Sprint-4	Monitoring via Mobile	USN-4	Mobile Application will be created and fast SMS will be usedto alert abnormality to the user.	20	High	Anusha P Amritha B Hema R Nishalini S

6.2 SPRINT DELIVERY

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

6.3 REPORTS FROM JIIRA



CHAPTER 7

CODING AND SOLUTIONING

7.1 FEATURE 1

Language: Python

Tools IDE: Wowki, IBM Watson, Node red, IBM cloud, DB, Python 3.7.4, MIT Inventor

```
#include <ESP8266WiFi.h>

#include <WiFiClient.h>

#include <PubSubClient.h>

#include <ESP8266WebServer.h>

#include <ESP8266HTTPClient.h>

#include "DHT.h"

const char* ssid = "SMART-G";

const char* password = "10112019";


#define DHTPIN D6

#define G D0
```

```
#define DHTTYPE DHT11

DHT dht(DHTPIN, DHTTYPE);

int i =0;

#define ID "duozdv"

#define DEVICE_TYPE "ESP8266"

#define DEVICE_ID "TEST"

#define TOKEN "TEST-12345"

char server[] = ID ".messaging.internetofthings.ibmcloud.com";

char publish_Topic1[] = "iot-2/evt/Data1/fmt/json";

char publish_Topic2[] = "iot-2/evt/Data2/fmt/json";

char publish_Topic3[] = "iot-2/evt/Data2/fmt/json";

char publish_Topic4[] = "iot-2/evt/Data2/fmt/json";

char authMethod[] = "use-token-auth";

char token[] = TOKEN;

char clientId[] = "d:" ID ":" DEVICE_TYPE ":" DEVICE_ID;

WiFiClient wifiClient;

PubSubClient client(server, 1883, NULL, wifiClient);

void setup() {

 pinMode(D0,OUTPUT);

 digitalWrite(D0,HIGH);

  Serial.begin(115200);

  dht.begin();

  Serial.println();

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {

    delay(500);
```

```
    Serial.print(".");
  }
  Serial.println("");
  Serial.println(WiFi.localIP());

  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
    }
    Serial.println("Connected TO IBM IoT cloud!");
  }
}

long previous_message = 0;
void loop() {
  client.loop();
  long current = millis();
  if (current - previous_message > 3000) {
    previous_message = current;
     float hum = dht.readHumidity();
     float temp = dht.readTemperature();
     float MOI =  map(analogRead(A0), 0, 1023, 100, 0);
     float bi = map(digitalRead(D1), 0, 1, 100, 0 );
```

```
      if (isnan(hum) || isnan(temp)  ){
   Serial.println(F("Failed to read from DHT sensor!"));
   return;
  }

  Serial.print("Temperature: ");
  Serial.print(temp);
  Serial.print("°C");
  Serial.print(" Humidity: ");
  Serial.print(hum);
//  Serial.print("%");
//  Serial.print("SOIL MOITURE: ");
//  Serial.print(MOI);
//  Serial.print("ANIMAL AND BIRD: ");
//  Serial.print(bi);
//  if(MOI<=10)
//  {
//     digitalWrite(D0,LOW);
//     delay(100);
//     digitalWrite(D0,HIGH);
//   }
//   else
//   {
//     digitalWrite(D0,HIGH);
//   }
String payload = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
```

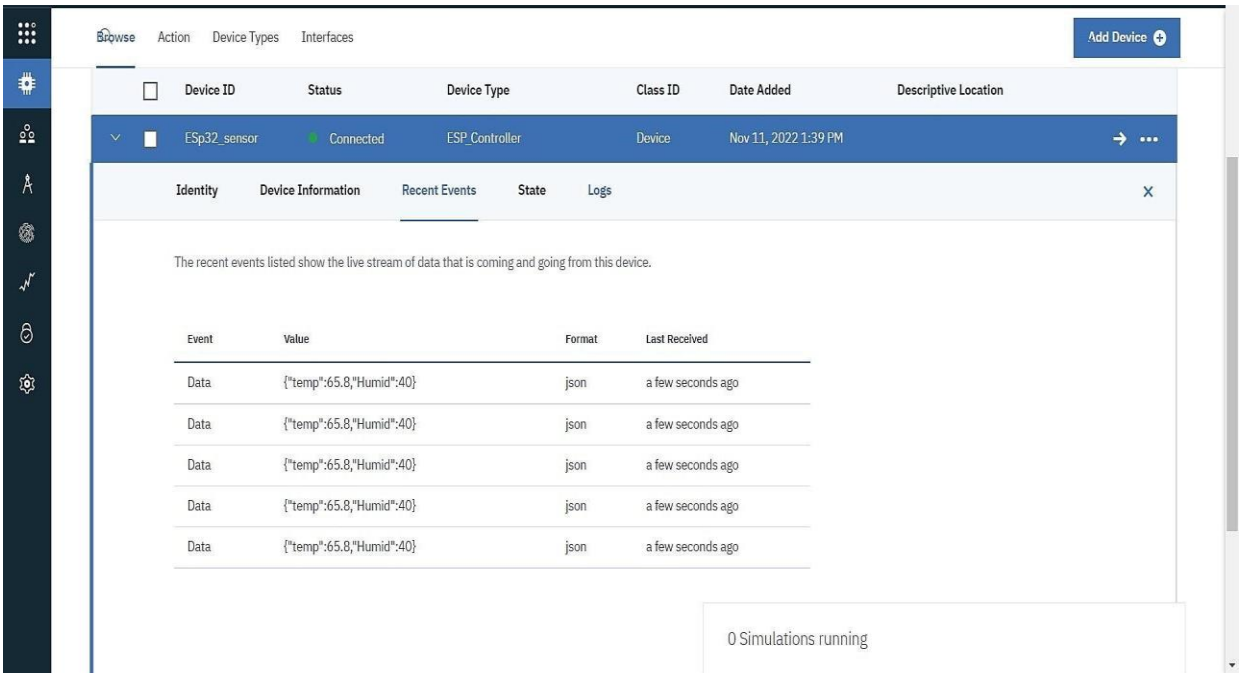
```
      payload += ",\"Temperature\":";
      payload += temp;
      payload += "}}";

    Serial.print("Sending payload: ");
    Serial.println(payload);

    if (client.publish(publish_Topic1, (char*) payload.c_str())) {
      Serial.println("Published successfully");
    } else {
      Serial.println("Failed");
    }
    String payload1 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
      payload1 += ",\"Humidity\":";
      payload1 += hum;
      payload1 += "}}";
      Serial.print("Sending payload: ");
      Serial.println(payload1);
      Serial.println('\n');

     if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
      Serial.println("Published successfully");
    } else {
      Serial.println("Failed");
    }
//
```

```
//
//      String payload3 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
//            payload3 += ",\"Moiture\":";
//            payload3 += MOI;
//            payload3 += "}}";
//
//      Serial.print("Sending payload: ");
//      Serial.println(payload3);
//
//      if (client.publish(publish_Topic3, (char*) payload3.c_str())) {
//          Serial.println("Published successfully");
//      } else {
//          Serial.println("Failed");
//      }
//
//
//
//String payload4 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
//            payload4 += ",\"Animal&Bird\":";
//            payload4 += bi;
//            payload4 += "}}";
//
//      Serial.print("Sending payload: ");
//      Serial.println(payload4);
//
//      if (client.publish(publish_Topic4, (char*) payload4.c_str())) {
```

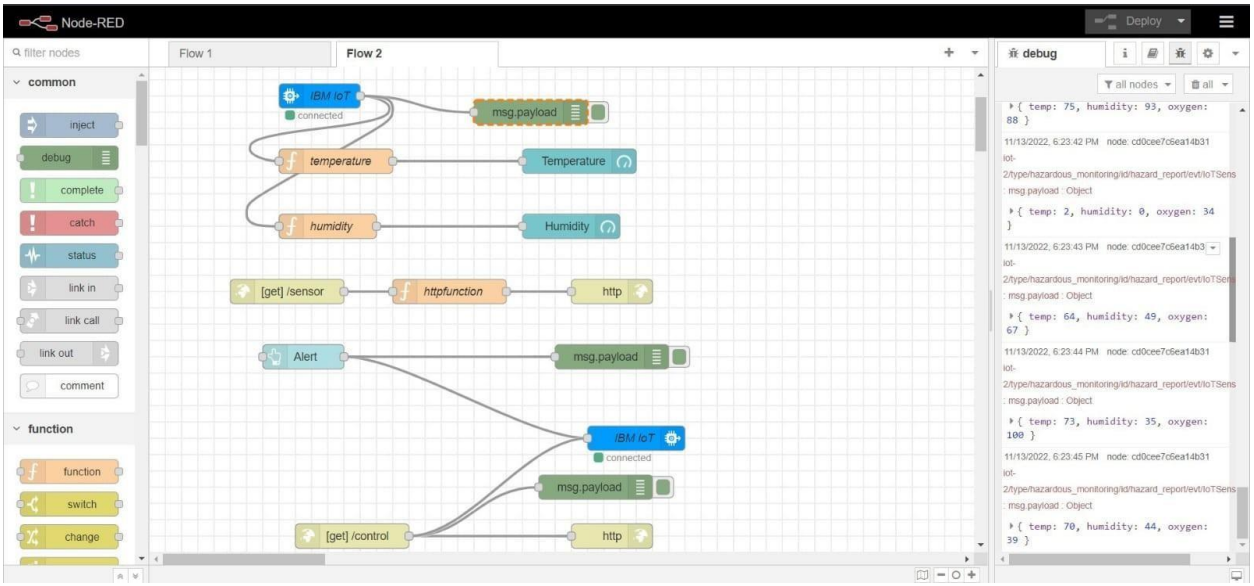
```
//          Serial.println("Published successfully");
//       } else {
//          Serial.println("Failed");
//       }
//
//
  HTTPClient http;
  String postData;
  //String key = Serial.readString();
    //Serial.print(key);
  if(temp >= 35)//8870599026
  {


    i++;
    if(i<=1)
  {
    postData = "username=fantasy&password=596692&to=9361692114&from=FSSMSS&message=Dear user  your msg is ABNORMAL TEMPERATURE DETECTED LEVEL IS "+String(temp)+" C H is"+String(hum)+ " Sent By FSMSG FSSMSS&PEID=1501563800000030506&templateid=1507162882948811640";
     Serial.print(postData);
   http.begin("http://smsserver9.creativepoint.in/api.php");
  http.addHeader("Content-Type", "application/x-www-form-urlencoded");
  int httpCode = http.POST(postData);
  String payload = http.getString();
  Serial.println(payload);  http.end();
  delay(1000);
  }
```

```
 }
if(temp<35)
{
   i=0;}
  }
}
```

7.2 FEATURE 2



7.3 DATABASE SCHEMA

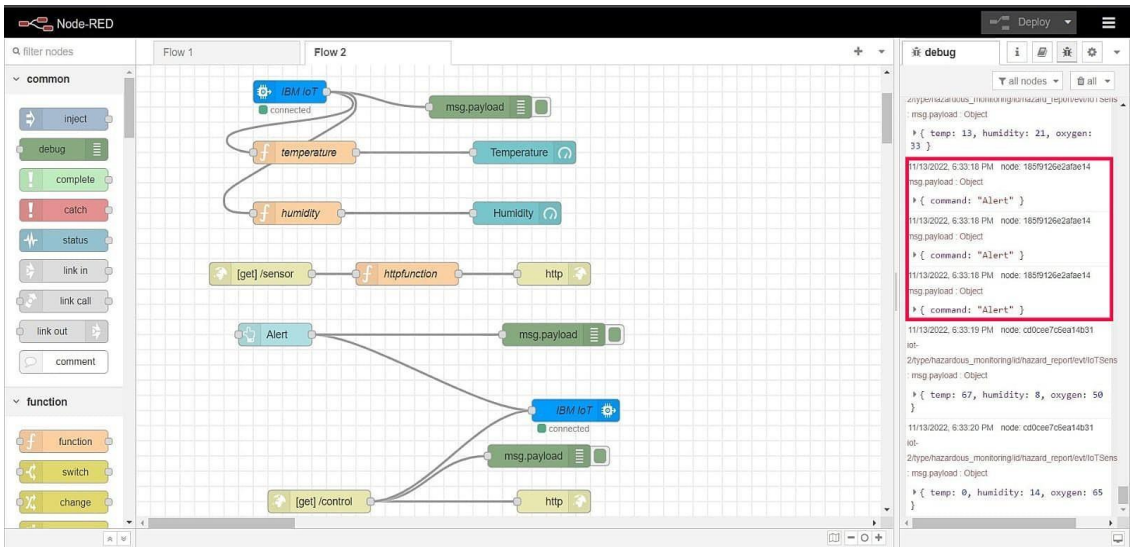


CHAPTER 8

TESTING

8.1 TEST CASES

8.2 USER ACCEPTANCE TESTING

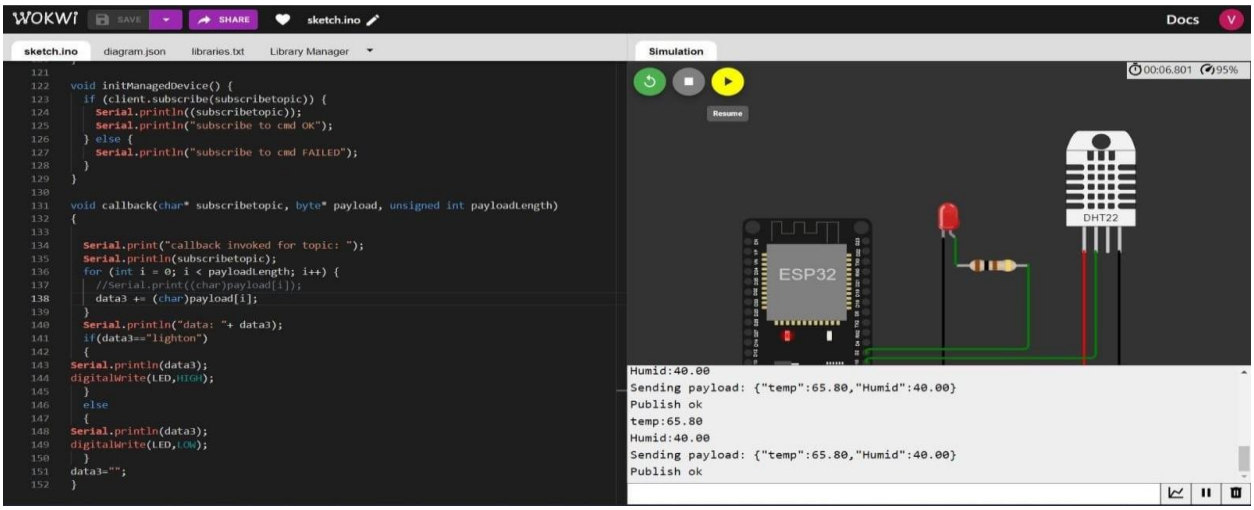


CHAPTER 9

RESULT

9.1 PERFORMANCE METRICS

SENSOR PERFORMANCE



CHAPTER 10

ADVANTAGES

- IoT-powered level monitoring proves highly effective even in mobile tankers carrying harmful fluids like inflammable and temperature-sensitive.
- The level monitoring sensors get installed on the tanks and with the help of internet connectivity, the managers can watch their activities in real-time
- It uses high-end devices like sensors and gateway connectivity that automate the industrial processes on a pocket-friendly budget.
- While sensoring with the beacon, we can easily find the hazardous and dangerous area and provide that.
- Several areas to be monitoring time to time in our software and alarm will possibility on sudden strange.
- Whenever the person entered the desired area ,then he can view the required parameters then can be alerted these are send to cloud

DIS - ADVANTAGES

- Misuse of privacy and data.
- Expense.
- Communication channel disconnection occurs oftern.
- Complex uses
- We couldn't monitor the sensor whether it is in offline.The monitor is based on cloud secured system.

CHAPTER 11

CONCLUSION

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming.The result shows that this exciting new technology will keep increasing the efficiency of the safety features for rail infrastructure. We can prevent accidents of up to 70% by enforcing these functionalities in the real-time implementation. Areas where manual testing is not feasible with this vehicle, such as in shallow coalmines, mountainous areas and thick and deep forests regions, can be easily carried out. When this vehicle is used for industry inspections and breakage detection, automatic SMS will be sent to a predetermined mobile number if Hazardous Area or abnormalities are identified by the device sensors. This will lead without errors to the management and control of the state of the industry area, and thus to the preservation of the area in good condition.

CHAPTER 12

FUTURE SCOPE

IoT is bound to be an effective technology in the future, and IoT enabled devices are likely to be all-pervasive, from industry to households. The **future scope of IoT** is bright and varied, and it is only a matter of time before the above applications of the technology are realized.

While wearable technology allows patients to self-monitor their health in real-time, the sensors and variants used in the healthcare industry are significantly more sophisticated. As sensors' accuracy and precision based on IoT increases, the share of manual errors in taking medical readings will decrease.

CHAPTER 13

APPENDIX

SOURCE CODE

Code for connecting sensor and IBM Cloud

```
#include <ESP8266WiFi.h>

#include <WiFiClient.h>

#include <PubSubClient.h>

#include <ESP8266WebServer.h>

#include <ESP8266HTTPClient.h>

#include "DHT.h"


const char* ssid = "SMART-G";

const char* password = "10112019";


#define DHTPIN D6

#define G D0
```

```
#define DHTTYPE DHT11

DHT dht(DHTPIN, DHTTYPE);

int i =0;

#define ID "duozdv"

#define DEVICE_TYPE "ESP8266"

#define DEVICE_ID "TEST"

#define TOKEN "TEST-12345"


char server[] = ID ".messaging.internetofthings.ibmcloud.com";

char publish_Topic1[] = "iot-2/evt/Data1/fmt/json";

char publish_Topic2[] = "iot-2/evt/Data2/fmt/json";

char publish_Topic3[] = "iot-2/evt/Data2/fmt/json";

char publish_Topic4[] = "iot-2/evt/Data2/fmt/json";

char authMethod[] = "use-token-auth";

char token[] = TOKEN;

char clientId[] = "d:" ID ":" DEVICE_TYPE ":" DEVICE_ID;


WiFiClient wifiClient;

PubSubClient client(server, 1883, NULL, wifiClient);


void setup() {

  pinMode(D0,OUTPUT);

  digitalWrite(D0,HIGH);

    Serial.begin(115200);

    dht.begin();

    Serial.println();
```

```
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
   delay(500);
   Serial.print(".");
  }
  Serial.println("");
  Serial.println(WiFi.localIP());

  if (!client.connected()) {
     Serial.print("Reconnecting client to ");
     Serial.println(server);
     while (!client.connect(clientId, authMethod, token)) {
        Serial.print(".");
        delay(500);
     }
     Serial.println("Connected TO IBM IoT cloud!");
  }
}

long previous_message = 0;
void loop() {
  client.loop();
  long current = millis();
  if (current - previous_message > 3000) {
     previous_message = current;
      float hum = dht.readHumidity();
```

```
      float temp = dht.readTemperature();
      float MOI =  map(analogRead(A0), 0, 1023, 100, 0);
      float bi = map(digitalRead(D1), 0, 1, 100, 0 );
      if (isnan(hum) || isnan(temp)  ){
  Serial.println(F("Failed to read from DHT sensor!"));
  return;
 }

 Serial.print("Temperature: ");
 Serial.print(temp);
 Serial.print("°C");
 Serial.print(" Humidity: ");
 Serial.print(hum);
//  Serial.print("%");
//  Serial.print("SOIL MOITURE: ");
//  Serial.print(MOI);
//  Serial.print("ANIMAL AND BIRD: ");
//  Serial.print(bi);
//  if(MOI<=10)
//  {
//     digitalWrite(D0,LOW);
//     delay(100);
//     digitalWrite(D0,HIGH);
//   }
//   else
//   {
```

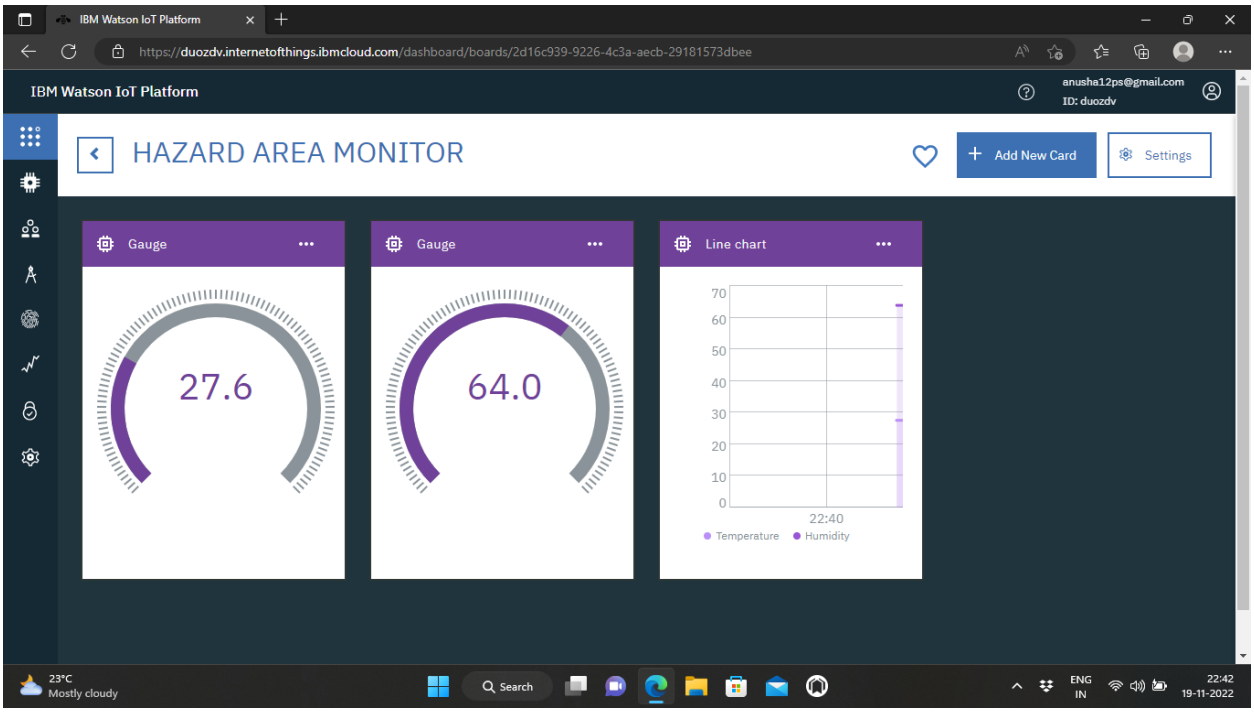
```
//     digitalWrite(D0,HIGH);
//   }



      String payload = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
            payload += ",\"Temperature\":";
            payload += temp;
            payload += "}}";

       Serial.print("Sending payload: ");
       Serial.println(payload);

       if (client.publish(publish_Topic1, (char*) payload.c_str())) {
          Serial.println("Published successfully");
       } else {
          Serial.println("Failed");
       }
       String payload1 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
            payload1 += ",\"Humidity\":";
            payload1 += hum;
            payload1 += "}}";
            Serial.print("Sending payload: ");
            Serial.println(payload1);
            Serial.println('\n');

        if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
```

```
      Serial.println("Published successfully");
    } else {
      Serial.println("Failed");
    }
//
//
//    String payload3 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
//          payload3 += ",\"Moiture\":";
//          payload3 += MOI;
//          payload3 += "}}";
//
//    Serial.print("Sending payload: ");
//    Serial.println(payload3);
//
//    if (client.publish(publish_Topic3, (char*) payload3.c_str())) {
//      Serial.println("Published successfully");
//    } else {
//      Serial.println("Failed");
//    }
//
//
//
//String payload4 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
//          payload4 += ",\"Animal&Bird\":";
//          payload4 += bi;
//          payload4 += "}}";
```

```
//
//       Serial.print("Sending payload: ");
//       Serial.println(payload4);
//
//       if (client.publish(publish_Topic4, (char*) payload4.c_str())) {
//          Serial.println("Published successfully");
//       } else {
//          Serial.println("Failed");
//       }
//
//
  HTTPClient http;
  String postData;
  //String key = Serial.readString();
    //Serial.print(key);
  if(temp >= 35)//8870599026
  {
     i++;
    if(i<=1)
  {
    postData = "username=fantasy&password=596692&to=9361692114&from=FSSMSS&message=Dear user  your msg is ABNORMAL TEMPERATURE DETECTED LEVEL IS "+String(temp)+" C H is"+String(hum)+" Sent By FSMSG FSSMSS&PEID=1501563800000030506&templateid=1507162882948811640";
     Serial.print(postData);
   http.begin("http://smsserver9.creativepoint.in/api.php");
  http.addHeader("Content-Type", "application/x-www-form-urlencoded");
  int httpCode = http.POST(postData);
```

```
 String payload = http.getString();
 Serial.println(payload);
 http.end();
 delay(1000);
 }
 }
if(temp<35)
{
  i=0;
}
}
}
```

Output:



GITHUB & PROJECT LINK: https://github.com/IBM-EPBL/IBM-Project-16244-1659610188

DEMO LINK: https://youtu.be/kd_7Pq1yZkE