NALAIYA THIRAN PROJECT BASED LEARNING

on

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

Industry-specific intelligent fire management system

Project Report Submitted by

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BACHELOR OF ENGINEERING

IN

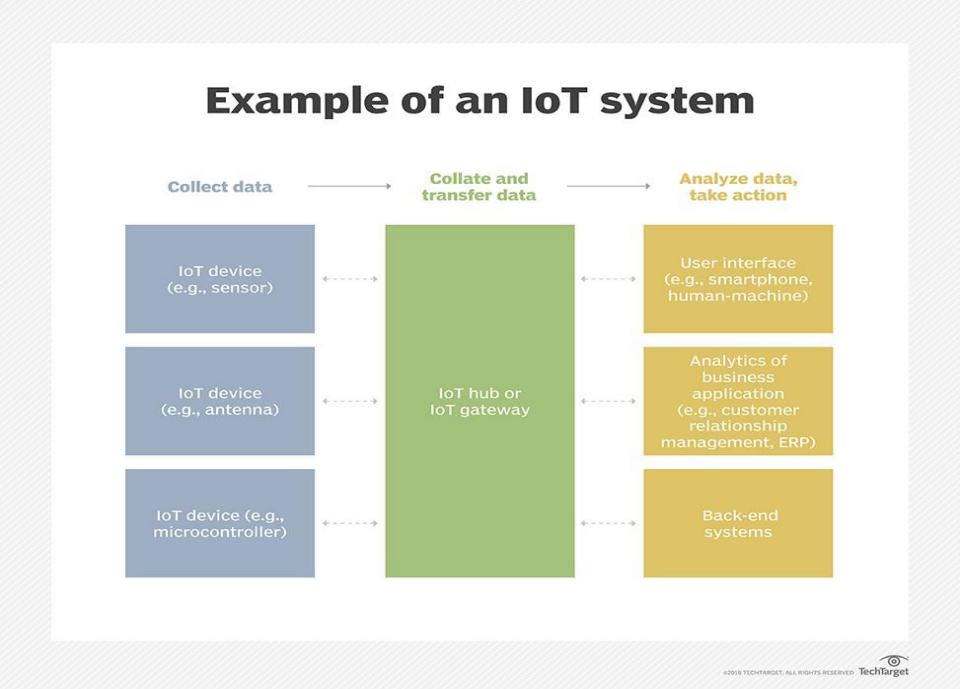
ELECTRONICS AND COMMUNICATION ENGINEER

CONTENT

1. INTRODUCTION

Internet of Things (IoT) is a network of physical objects or people called "things" that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data. The goal of IoT is to extend to internetconnectivity from standard devices like computer, mobile, tablet to relatively dumb deviceslike a toaster. IoT makes virtually everything "smart," by improving aspects of our life with
the power of data collection, AI algorithm, and networks. The thing in IoT can also be aperson with a diabetes monitor implant, an animal with tracking devices, etc.

How IoT works?



An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. **IoT devices** share the sensor data they collectby connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devicesdo most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data.

1.1 PROJECT OVERVIEW

Nowadays Internet of things can be anything in the world that actually gathering or collecting everything in our world to basically connect all things to the internet. All connected things are then being used to make a group of information or sending information or it can be for both processes in this system. Safety is significant and it is vital that acceptable wellbeing framework be executed in the spots of all fields. This system is used in buildings and home dwellings for the fire detection and prevention purpose. It should be implemented in all the establishments where the risk of fire accident is very high. The sensor nodes are placed in important areas of building, which we create a network and the monitored data is transmitted to control unit through wireless sensor network and if the temperature or pressure reach above the threshold value and building damage is detected automatically, alerts the surroundings and take necessary precautions to prevent the disaster. This safety system that can be used in any constructing and constructed environments. The sensor node detects the maximum level that it can withhold, in the meantime it calculates where the damage is occuring and remaining time that the building can offer further resistance to damage.

PROJECT FLOW

- ✓ The temperature, gas and flame values will be sent to the IBM IoT platform.
- ✓ Values can be viewed in the Web Application.
- ✓ In case of any unnormal readings detected the alert will be given.
- ✓ If the flame is detected, the sprinkler will be on.
- ✓ If the gas is detected, the fan will be on.

To accomplish this, we have to complete all the activities and tasks listed below:

- ✓ Create and configure IBM Cloud Services
  - ii. Create IBM Watson IoT Platform
  - iii. Create a device & configure the IBM IoT Platform
  - iv. Create Node-RED service
  - v. Create a database in Cloudant DB to store location data
- ✓ Develop a web Application using Node-RED Service.
  - vii. Develop the web application using Node-RED.
  - viii. Integrate the values of temperature, gas and flame.
- ✓ Develop a python script to publish the to the IBM IoT platform.

1.2 PURPOSE

The objective of “Industry specific-intelligent fire management system” is to avoid the unintended fire accidents in industries and also take appropriate measures to avoid any mishap. The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment. If any flame is detected the sprinklers will be switched on automatically. The model incorporates MQ2 gas sensor for detecting propane and methane gases,flame is detected by IR flame sensor module and LM35 Temperature Sensor for the measurement of the environment. These readings are monitored continuously by IBM Watson IOT Platform and stored in Cloudant DB. Based on the temperature readings and if any Gases are present, the exhaust fans are powered ON. In case any variation occurs, the authorities and fire station will be alerted via Fast2SMS web service. Emergency alerts are notified to the authorities and Fire station

2. LITERATURE SURVEY

2.1 & 2.2 Existing problem and Reference

Topic:1

IOT BASED FIRE ALARM SECURITY SYSTEM

Authors:

Hari Varshini S, Boomika S, Sherene Amalia G, Leena R

About:

Fire alarm systems are essential in alerting people before fire engulfs their homes. However, fire alarm systems, today, require a lot of wiring and labor to be installed. This discourages users from installing them in their homes. Therefore, we are proposing an IoT based wireless fire alarm system that is easy to install. The proposed system is an ad-hoc network that is distributed over the house. This system consists of a microcontroller (ESP8266 nodeMCU) connected to an infrared flame sensor that continuously senses the surrounding environment to detect the presence of fire. The microcontrollers create their own Wi-Fi network. Once fire is detected by a sensor, it sends a signal to a microcontroller that is triggered to send an SMS to the user, call the user and alert the house by producing a local alarm. The user can also get information about the status of his home via sending an SMS to the system. A prototype was developed for the proposed system and it carried out the desired functionalities successfully with an average delay of less than 30 seconds.

Limitations:

- Very sensitive, which can lead to false alarms as a product of cooking.
- Use of radioactive material is a concern.
- Not as responsive to smoldering fires

Topic:2

LPWAN Based IoT Surveillance System for Outdoor Fire Detection

Authors:

GABRIEL ROQUE

AND VLADIMIR SANCHEZ PADILLA , (Member, IEEE)

About:

Many fire situations have represented the loss of lives and material costs due to the lack of early fire detection through smoke or gas sensing, which can become complex and critical. Meanwhile, engineers worldwide develop and test multiple systems for smoke and gas detection, commonly based on sensor networks, digital image processing, or computer vision. Furthermore, the detection system must work thoroughly with alarms and warnings that aware of a risk situation for prompt evacuation of the population in the surroundings based on a reliable data network topology with adequate device deployments that will let us know the moment a fire outbreak. This paper presents a low-cost Internet of Things (IoT) prototype for fire detection in outdoor environments based on sensors and Low Power Wide Area Network (LPWAN), focused on the accuracy in the temperature and gas measurement at

the moment a fire starts. For its achievement, we integrated wireless components, development boards, and electronic devices, following the management of information updates through a database schema for the alarm settings based on the data gathered from the sensor

Limitations:

- Cost may be high.
- Miscommunication may happen as it is wireless system.

Topic: 3

GSM based Smoke detector with SMS alert using Arduino

Reference link:

https://www.projectsof8051.com/gsm-based-smoke-detector-with-sms-alert-using-arduino/amp/

About:

Smoke Sensor: We have used an MQ series gas sensor to detect the smoke. This sensor operates on 5 volts and gives analog output. The output from the MQ smoke sensor is connected to the analog input pin of the Arduino UNO.Arduino has an inbuilt ADC which converts the analog input into the respective digital value.

Arduino Uno displays this value of the smoke sensor on the LCD display. We have used a 16 by 2 alphanumeric Liquid crystal display (LCD display) in the smoke detector project. Arduino continuously keeps on displaying the value of the smoke sensor on the LCD display. Arduino turns on a buzzer and a relay, whenever the value of the smoke sensor crosses the threshold level.

And at the same time, an SMS is sent to the registered mobile number. We can send SMS to two mobile numbers. Also, we can dial a call to these two mobile numbers. We have used a relay as an output device in this project. This relay is an additional feature of this project. The relay will be turned on when smoke is detected. For demonstration purposes, we have connected a 12-volt dc fan to this relay. The function of the fan is to clear the smoke whenever it is detected. You can connect any AC or DC output device to this relay.

Limitations:

- High Sensitivity
- High sensitivity to Ammonia, Sulphide, and Benzene
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins – 6mm High

Topic: 4

An Automated Smart Embedded System on Fire Detection and Prevention for Ensuring Safety

Authors:

Publication No: 21464147(IEEE)

About:

One of the biggest issues for architects, planners, and landowners is house combustion. Singular sensors have been used in the case of a fire for a long time, but they cannot quantify the volume of fire to warn emergency service units. To resolve this problem, this research aims to develop an intelligent smart fire warning system that detects fires utilizing connected sensors and alerts property owners,

emergency services. The current model is divided into three modules: Smoke Detection Module (SDM), which is responsible for detecting smoke to prevent unwanted incidents; Notification Send Module (NSM), which is responsible for creating an alert service to alert the closest support center and user; and Emergency Alarm Module (EAM), which is responsible for handling the emergency alarm schedule when a fire arises. The results prove that the device worked well, and it should be remembered that our proposal can be integrated into any kind of setting, such as a house, workplace, ship, or industry.

Limitations:

- Little complex to set up.
- Cost of set up is high.

Topic: 5

IOT Based Fire Alarm Notification and Extinguisher System

Authors:

Saravanan Kalaivanan, Madduri Sanketh , Vasanth S, Paluvara Maruthi Siva Sai Sriveer, Kuraku Vinod New Horizon College of Engineering, Bengaluru

About:

Because of the potential loss of life and property, a fire outbreak must be avoided at all costs. If left unattended, a fire can quickly spread and take days to extinguish. As a result, when this technology becomes available, it will aid in the reduction of uncontrollable this technology must be used to reduce or possibly eliminate this significant risk as a result of the cause of heavy damage. A fire alarm detection, notification, and extinguisher system was designed in this study. When a fire occurs, this system includes a GSM module that allows it to send SMS (short messaging service) notifications and phone calls to shop owners or house owners about the fire incident before the fire makes damage. The study also identifies a system that is both affordable and can be accessible by the general public and private sector, allowing it to be used to protect people and property in homes, offices, shops, public places, and schools. If and when the system is commercially available, fires. It has grown 50% because it will warn potentially harmful situations prior to a fire accidents. If the smoke sensor detects a temperature that is not within the range we specify, the fire alarm will sound using a buzzer; if the temperature exceeds the specified level, the photo will be sent to the owner via mail, and a call and message will be sent to the specified owner. If the owner confirms and sends a message indicating to turn on the pump, the extinguisher will activate.

2.3 Problem Statement Definition

Template:
As a worker-

As an industrialist:

Problem Statement (PS)	I am	I'm trying to	But	Because	Which makes me feel
Identify the chemical explosion and fire in industry	A worker	Handle fire explosion issues in my industry	Manually its difficult	Its is hard to find the exact location and move towards it	Scared of loosing my life and co workers life.
To reduce the fire accidents in my industry	An industrialist	To reduce fire accidents in my industry	Its not possible to control large fires	Fire should cause huge loss it should be found at the begining	Bad that huge loss of life of precious workers and drastic loss in property

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

SAYS

How many sensors required ?
Parameters required to implement?
How much it will cost to set up ?
Detection of fire and gas?
Usage of sprinklers ?

THINKS

Sensor requirements are based on area.
Might be costlier to set in big industries.
Temperature , gas , flame senor...

Industry-Specific Intelligent Fire Management System

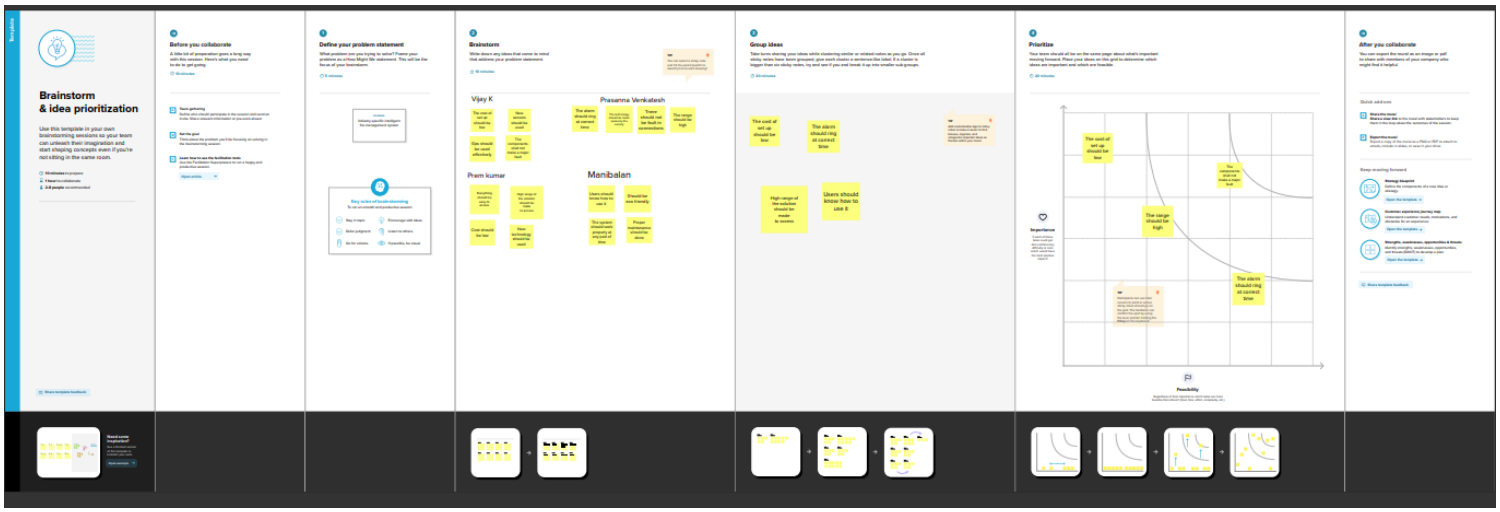
FEELS

It will ensure the safety of workers.
It will reduce the loss of life of people.
Microcontroller can control the whole process.
Ways for sending messages to fire station.

DOES

Detects the flame, gas , and temperature.
Turn on Sprinklers when undefined parameters is observed or detected.
Send message to nearest fire station.

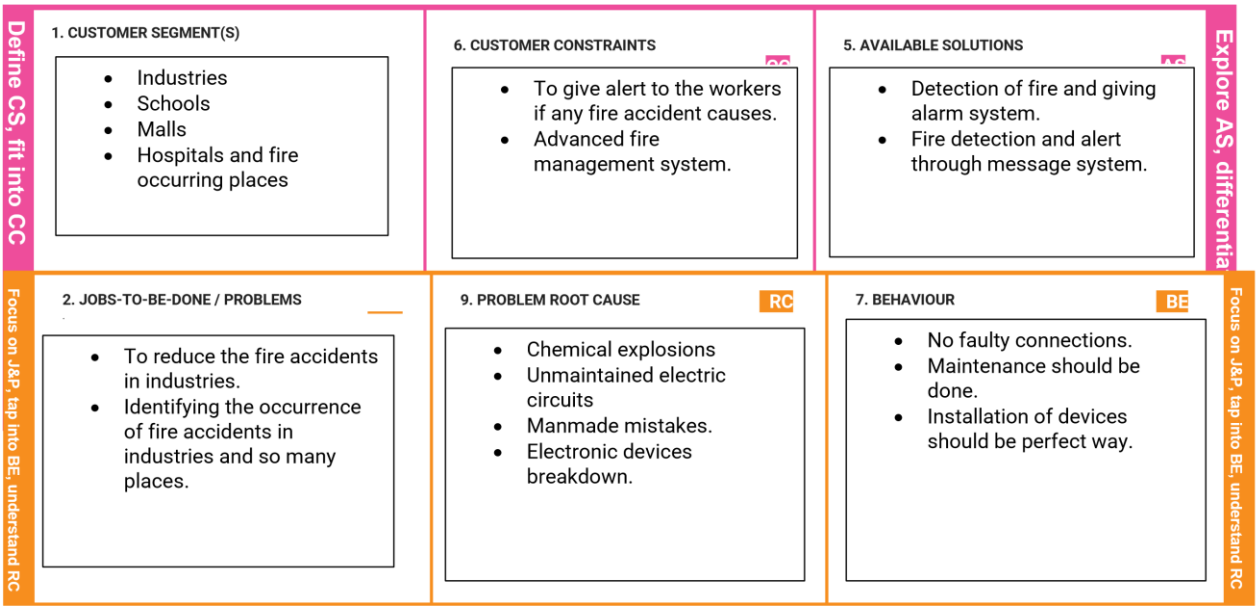
3.2 Ideation & Brainstorming



3.1 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To improve the safety management system in industries. Improving the safety management system against the fire incidents in industries.
2.	Idea / Solution description	To implement the fire safety management in industry based on IOT using Arduino uno board and with fire detection and fire extinguisher system. And using some sensors (Humidity sensor, Flame sensor, smoke sensor) with GPS tracking system.
3.	Novelty / Uniqueness	An Integrated system of temperature monitoring, gas monitoring, fire detection automatically fire extinguishing using sprinklers with accurate information about locations and response through SMS notification and call and we keeping three levels of range of temperature, gas and humidity for every range the message will be going to the authority in the industry and when the fire occurs the message will forwarded to fire stations.
4.	Social Impact / Customer Satisfaction	It early prevents the accident cost by fire in industries . It acts very accurately, finely and user friendly. As the automation of fire extinguishing is done and life of lot of workers Is saved
5.	Business Model (Revenue Model)	It can be used in many industries. If it is made at easy installation there will lot of use of this device and it should be user friendly and eco- friendly as well.
6.	Scalability of the Solution	It could be done in cost effective and work effective. As we are using normal sensors we can make it less cost , effective and with good compatibility.

3.2 Problem Solution



3. TRIGGERS TR

- Giving alert to the workers.
- Giving warnings.
- Awareness over fire safety

8. CHANNELS of BEHAVIOUR CH

Online:

The message was sent to the officers in fire station through the usage of gsm module.

Offline:

Protecting workers from fire using extinguishers.

4. EMOTIONS: BEFORE / AFTER EM

Before:

Scared of loss of life Loss of property.

After:

Life is in safe hands

No tension while working or maintaining in the industries.

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

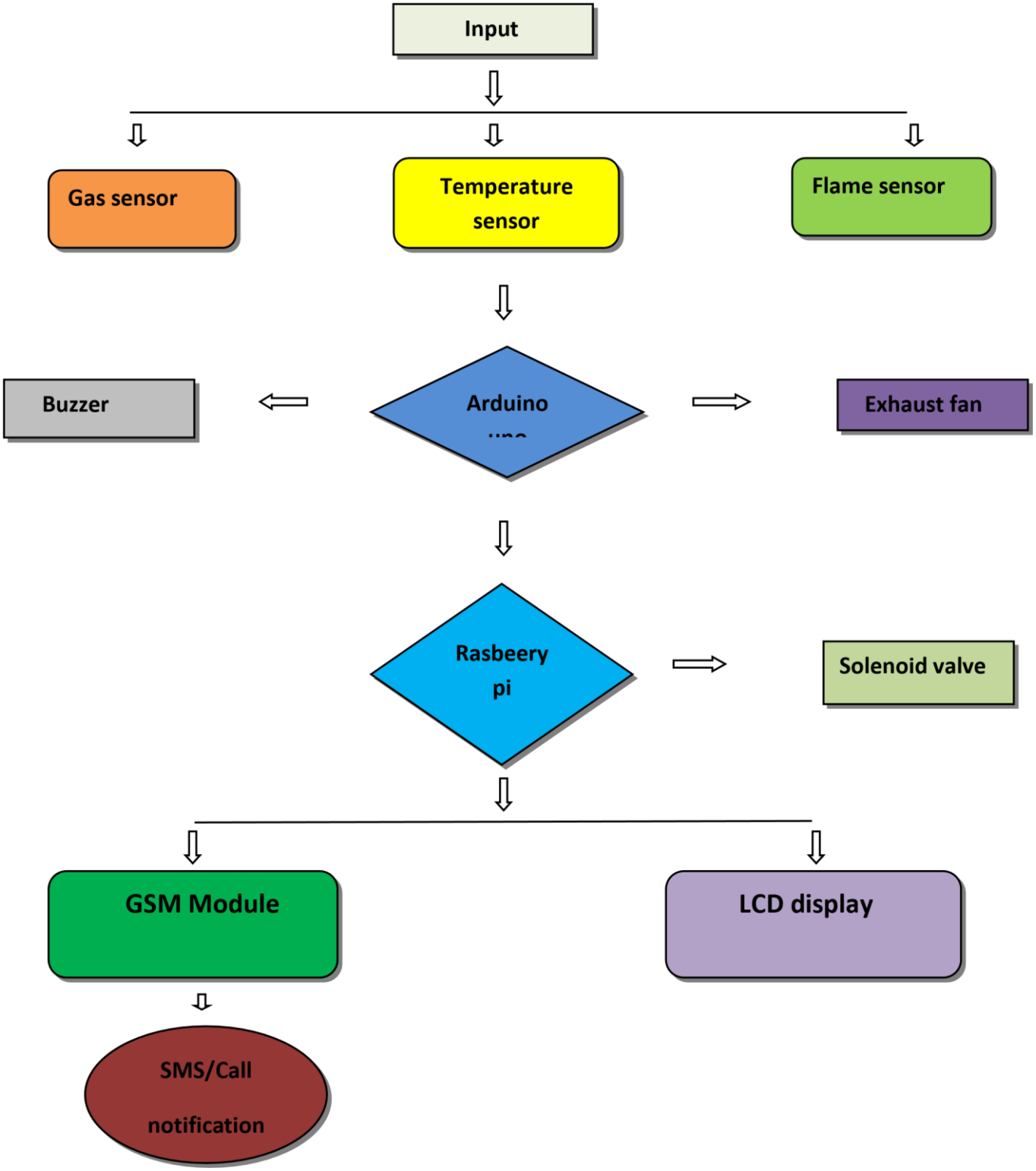
FR NO:	Functional requirements (Epic)	Sub requirements(story/Subtask)
FR-1	User Registration	The system shall support registration through forms. The system shall provide a quick and secure registration process. The system shall support online payment for the service.
FR-2	User Access	The system shall allow access to the details using a web browser. The system shall allow access to the details using mobile applications too.
FR-3	User alert	The system shall provide alerts as an SMS message or call. The system shall alert using the alarm in the working place. . The system shall provide alert emergency messages to the hospitals and fire stations.

4.2 Functional requirement

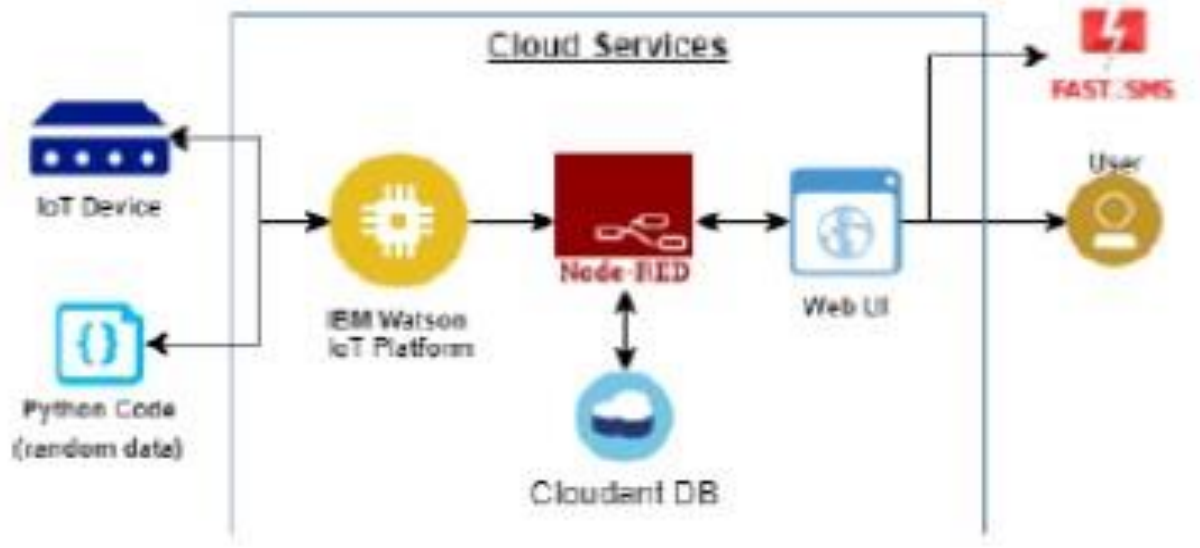
NFR NO.	Non -Functional Requirements	Description
NFR-1	Usability	The device must be usable by the customer anywhere. The device must be usable by the customer anytime.
NFR-2	Security	Data from the sensors are stored securely and away from other data. Only authorised people can access the data stored.
NFR-3	Reliability	Data can be retrieved anytime. No data is discarded without the customer's knowledge.
NFR-4	Performance	The system shouldn't have any type of delay in its performance as it is used for emergency situations. No performance delay in case of large number of data or parameters.
NFR-5	Availability	The device doesn't fail even under harsh conditions. Even after going under an alert situation, the device continues to send the parameters.
NFR-6	Scalability	Device must be capable of measuring conditions even in larger industry.

5.PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



Guidelines:

1. Include all the processes (As an application logic / Technology Block)
2. Provide infrastructural demarcation (Local / Cloud)
3. Indicate external interfaces (third party API's etc.)
4. Indicate Data Storage components / services
5. Indicate interface to machine learning models (if applicable)

Table-1 : Components & Technologies:

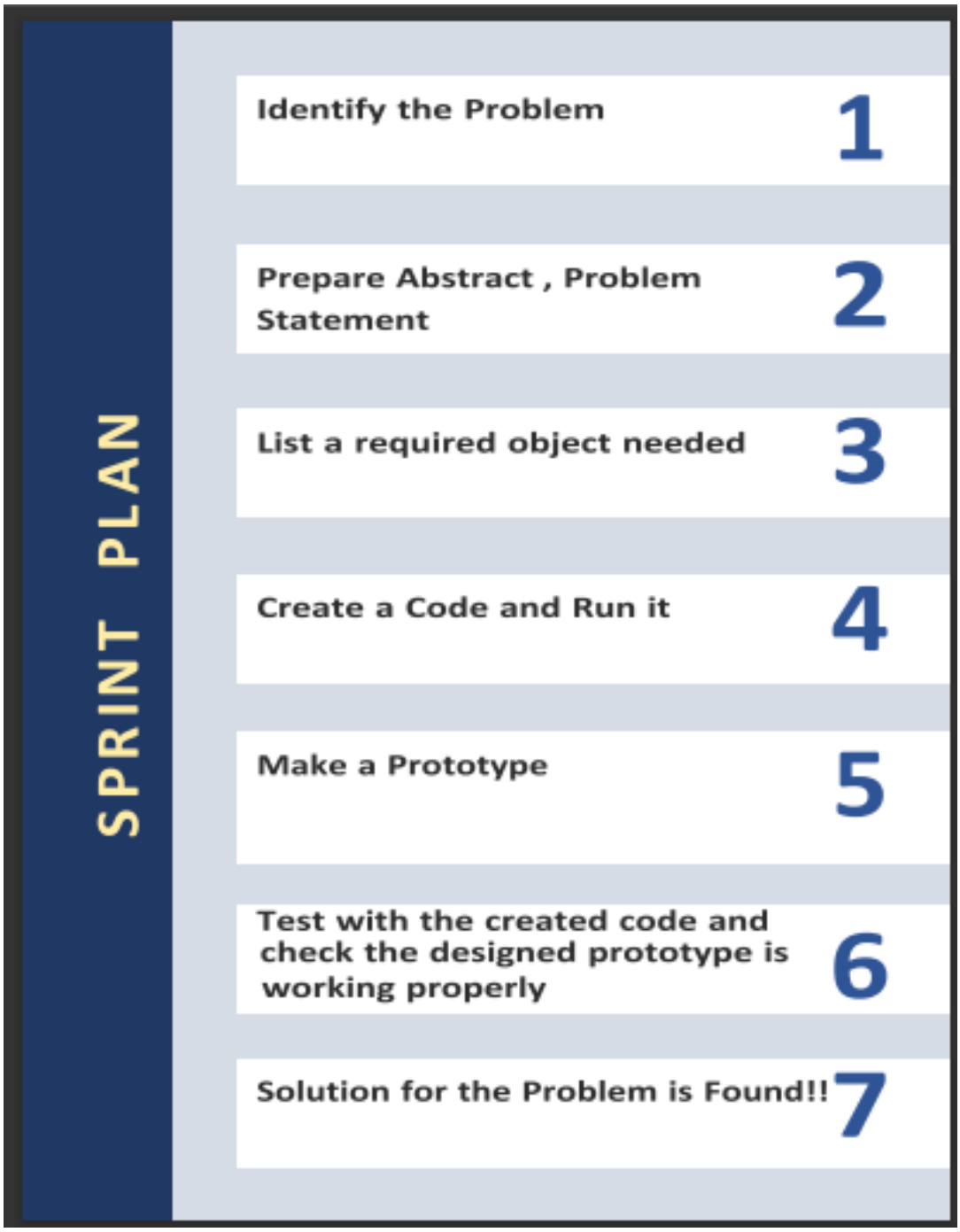
S.No	Component	Description	Technology
1.	User Interface	The point of human-computer interaction and communication in a device.	IBM IoT Platform, IBM Node red, IBM Cloud
2.	Application Logic-1	Create IBM Watson IoT platform and collect connected device data and perform analytics on real-time data	IBM Watson, IBM cloud ant service, IBM node red
3.	Application Logic-2	To develop a python script to publish and subscribe to IoT Platform	python
4.	Application Logic-3	To build a web application using node-red service	IBM Node-red
5.	Database	an organized collection of data, stored in a computer system.	MySQL
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloud ant etc.
7.	File Storage	For developing mobile application to store and receive the sensors information and to react accordingly	Web UI, python
8.	External API-1	We can track the temperature of the incident place and where the fire had been attacked	IBM fire management API
9.	External API-2	It detects the fire, gas leaks, temperature	IBM Sensors
10.	Machine Learning Model	We can derive the object recognition model	Object Recognition Model
11.	Infrastructure (Server /Cloud)	Application Deployment on Cloud Server Configuration	IBM cloud ant, IBM IoT Platform

5.3 User Stories

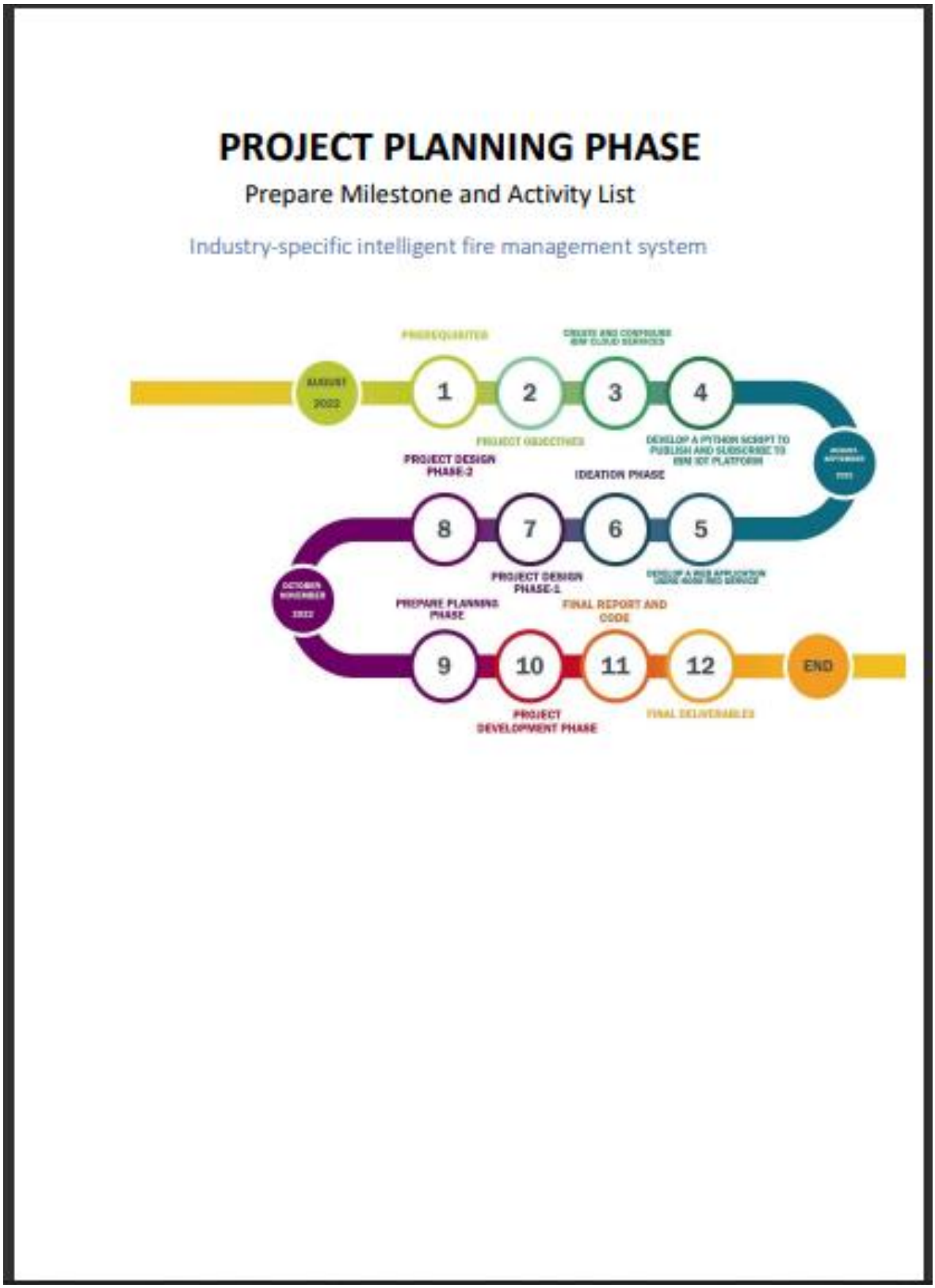
User type	Functional requirement	User story	User story/Task	Acceptance criteria	Priority	Release
1.Customer (Mobile user,Web user) 2.Customer Care 3.Executive Administrator	Registration	USN-1	User can register for the application through e mail, password and confirming my password	Access account /dashboard	High	Sprint-1
		USN-2	User will receive a confirmation email once,registered for the application	User receive a confirmation email & click confirm	High	Sprint-1
		USN-3	User can register for the application through Facebook	User can register &access the dashboard with login	Low	Sprint -2
		USN-4	User can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	User can log into the application by entering email & password		High	Sprint-1

6.Project Planning and scheduling

6.1 Sprint Planning and Estimation



6.2 Milestones and activity list



5. CODING & SOLUTIONING

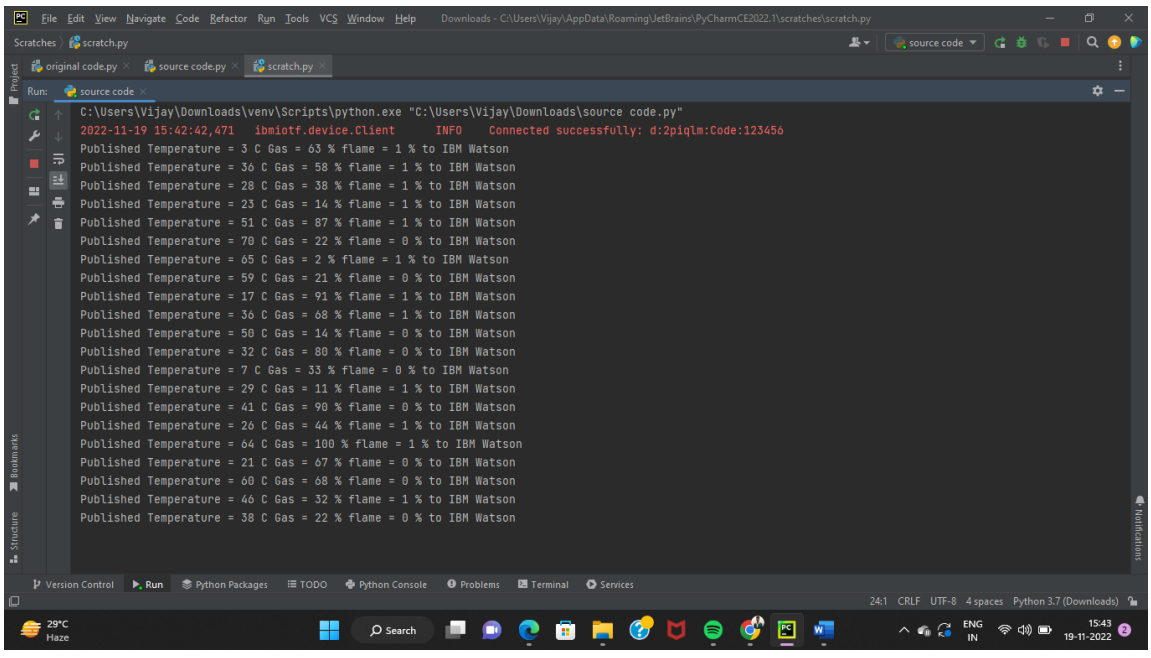
5.1 Feature 1 - PYTHON CODE

Instead of hardware, we are using python code. In this code we generate the random values for temperature, gas and flame details to theIBM Watson IoT platform.

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random


#Provide your IBM Watson Device Credentials
organization = "2piqlm"
deviceType = "Code"
deviceId = "123456"
authMethod = "token"
authToken = "12345678"

# Initialize GPIO


def myCommandCallback(cmd):
  print("Command received: %s" % cmd.data['command'])
  status = cmd.data['command']
  if status == "alerton":
    print("Fire detected")
  else:
    print("The surrounding environment is normal")

  #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 times
deviceCli.connect()

while True:
  #Get Sensor Data from DHT11

  temp = random.randint(0, 50)
  Gas = random.randint(0, 50)
  Flame = random.randint(0, 1)




  data = {'temp': temp, 'Gas': Gas, 'Flame': Flame}



  #print data
  def myOnPublishCallback():
    print("Published Temperature = %s C" % temp, "Gas = %s " % Gas,
          "Flame = %s" % Flame, "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 cloud
deviceCli.disconnect()
```

Output :

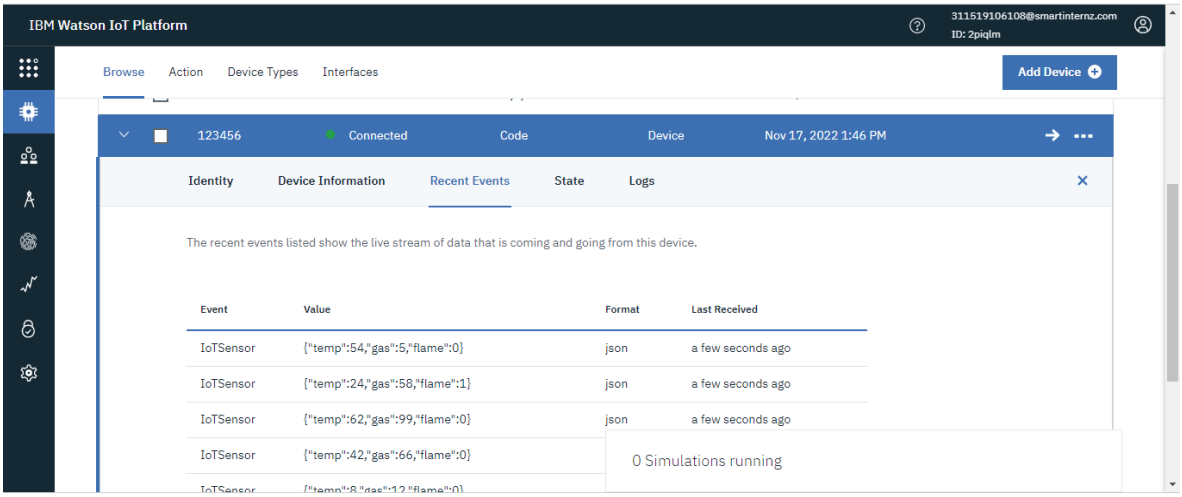


5.2 Feature 2 – IBM Watson IoT Platform To NODE-RED Service

- Once we get the location details in the IBM Watson IoT Platform, We are extracting thatdata into the NODE-RED Service.
- We are going to pass the data to node it is going to check whether that values are abnormal.

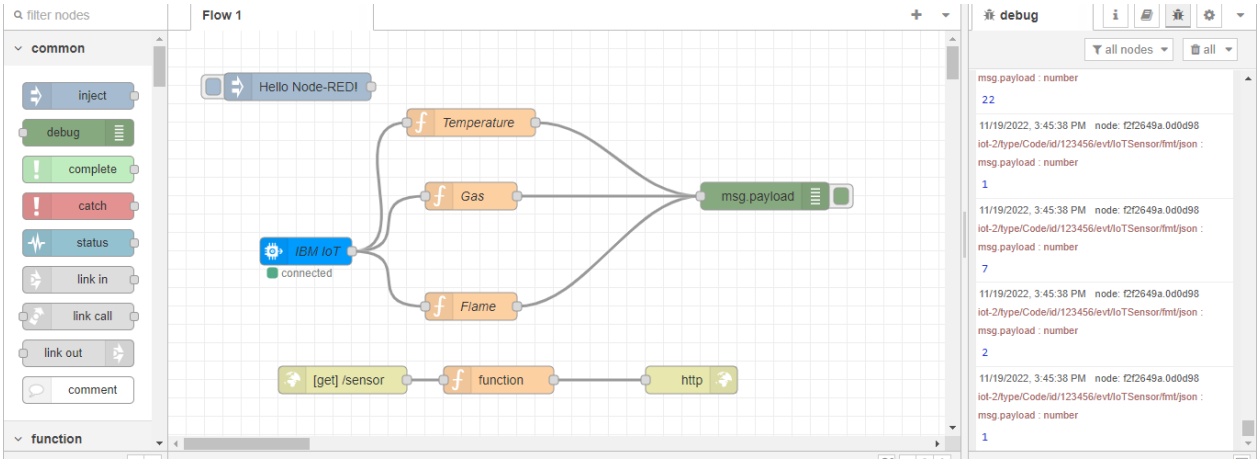
Python To IBM Watson IOT Platform:

Here the randomly generated values of temperature, gas and flame are received in IBM Watson.

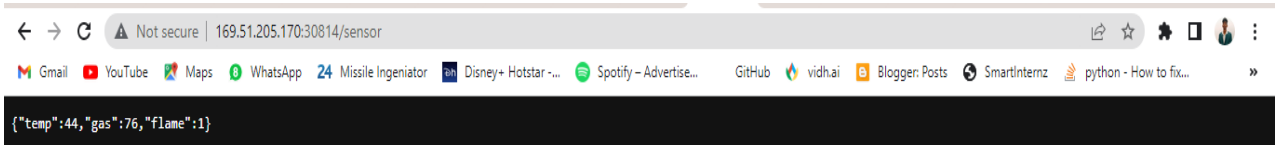


IBM IOT to Node Red:

The values from Watson to node red is transfered.

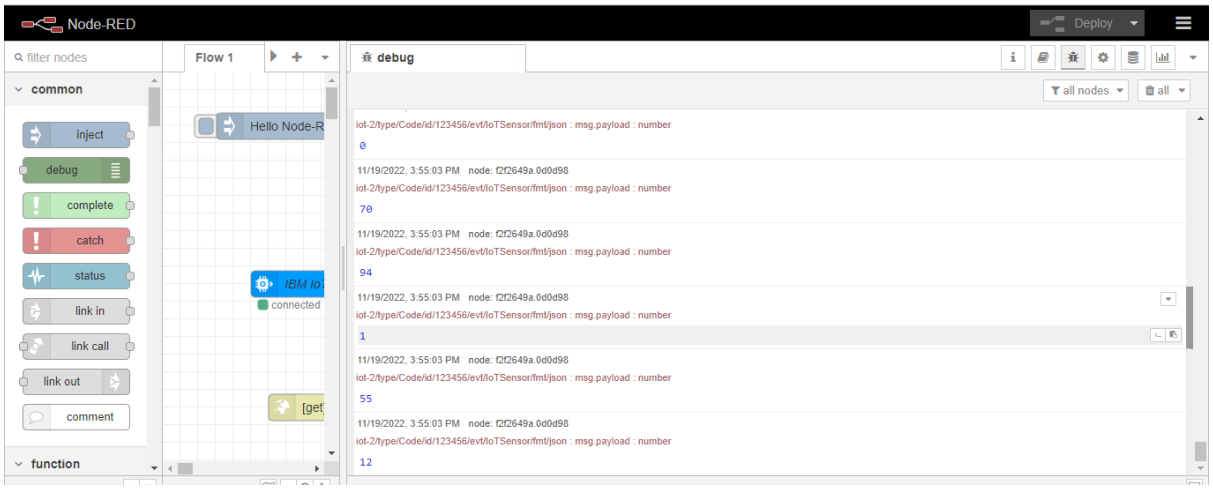


Node Red Link to MIT:



Node Red Output:

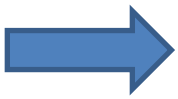
The output in the node is shown below.

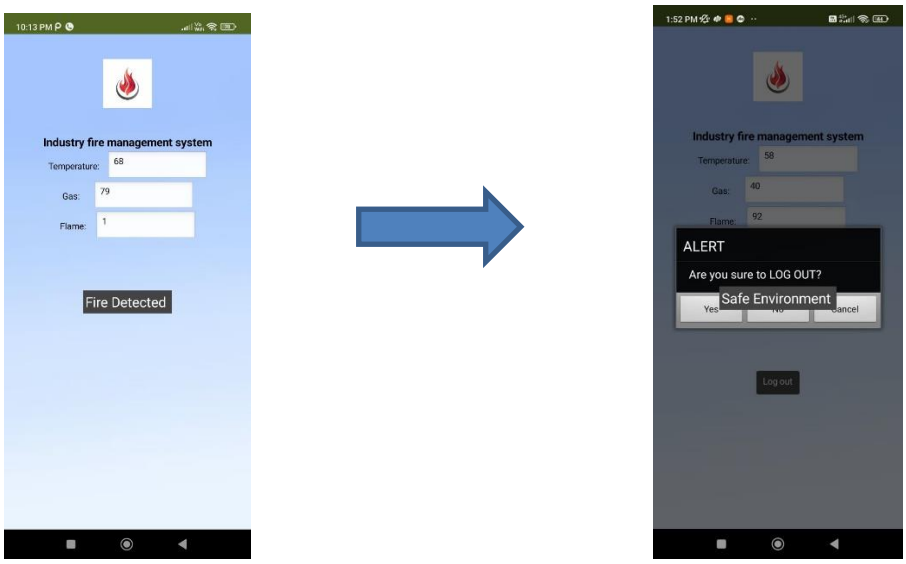


5.3 Feature 3 – App Creation.

The values from the node red will be shown in the app. The temperature, gas and flame values are measured constantly and shown in app.

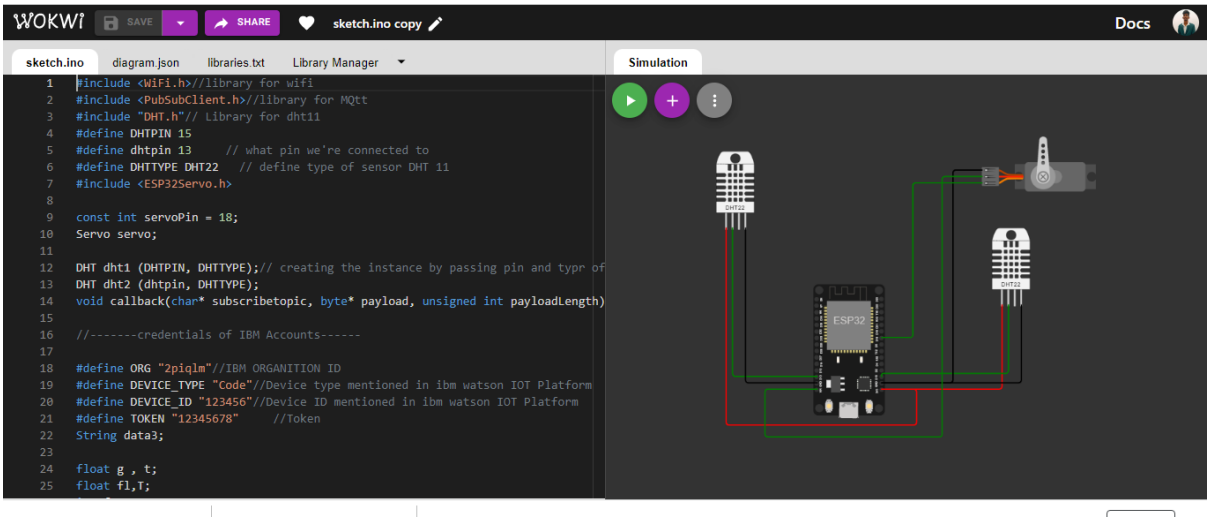
MIT App Output in Screen:



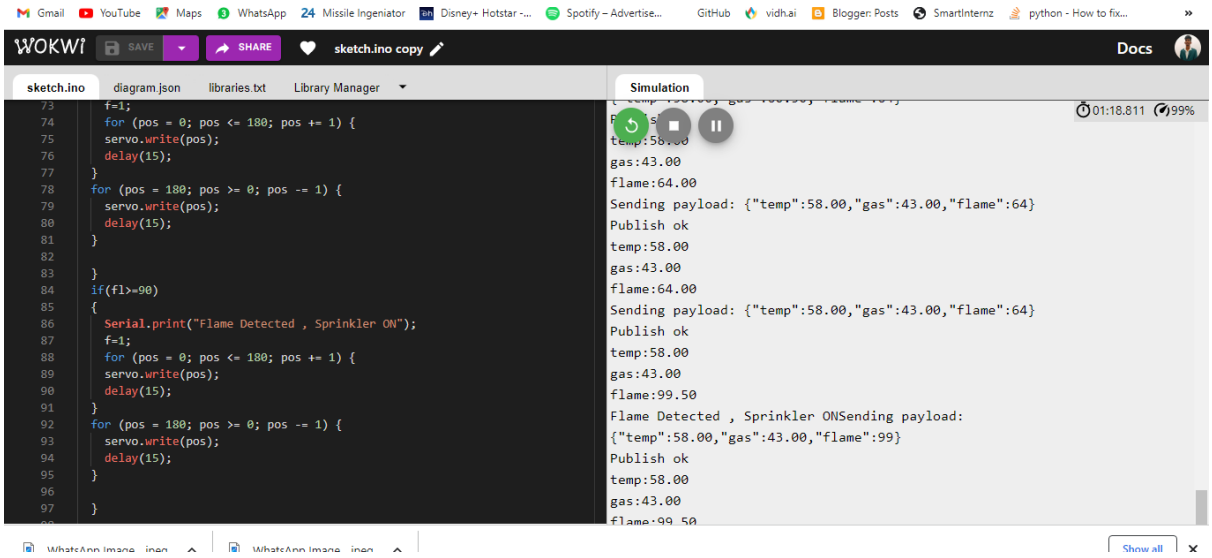


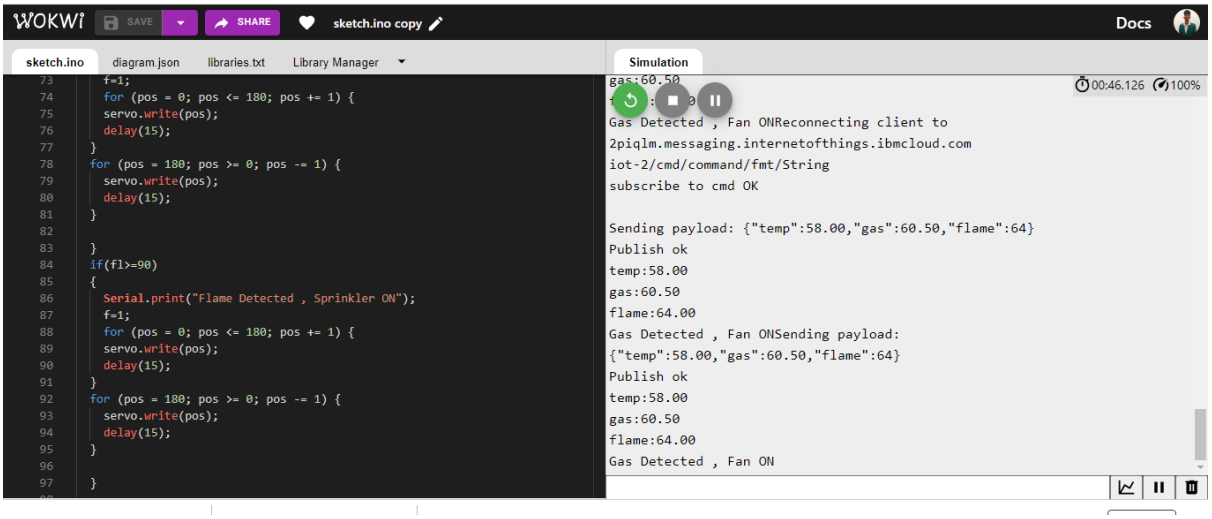
The final output values are displayed in the app. The alert is also shown in ap

7.4 Feature 4 – Using Wokwi IoT platform to generate sensor values

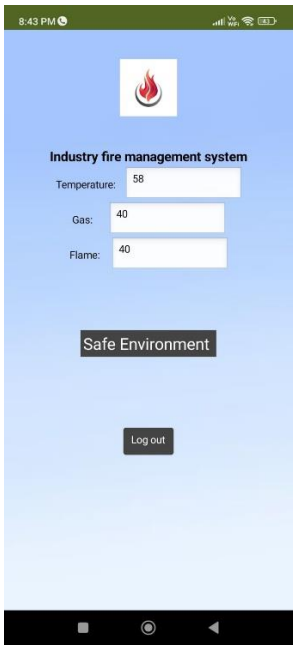


WOKWI OUTPUT:





- The process is same as how the values transferred from python to app is used here.
- The generated values will moved through Watson to node red and to app.
- It also gives the alert as usual.



8. Testing

8.1 Sceneario

- Verify python code is run without error.
- Verify the login the Cloud Services.
- Verify create a device in the IBM Watson IoT platform and get the device credentials.
- Verify the events is shown in the card.
- Verify the events is stored in the database.
- Verify to create a node -red services.
- To create a web UI to interact with user.
- To give alert to the workers.
- Verify user is able to log into app with Valid credentials.
- Verify the alert is shown in app.

8.2 User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the[IoT Based] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

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

.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	3	2	0	10
Duplicate	0	0	0	1	2
External	2	0	0	1	1
Fixed	6	2	0	0	8
Not Reproduced	0	1	1	3	5
Skipped	0	0	0	4	4
Won't Fix	0	0	0	0	0
Totals	13	6	3	2	30

3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	1	0	0	1
Client Application	2	0	0	2
Security	1	0	0	1
Outsource Shipping	1	0	0	1
Exception Reporting	1	0	0	1
Final Report Output	2	0	0	2
Version Control	2	0	0	2

9. RESULTS

9.1 Performance Metrics

NFT - Risk Assessment

S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	Receiving sensor va	Existing	Moderate	No Changes	Moderate	No	>5 to 10%	ORANGE	As we have seen the changes
2	Sprinkler ON/OFF	Existing	Low	No Changes	Low	No	>5 to 10%	GREEN	As we have seen the changes
3	Exhaust Fan ON/OF	Existing	Low	No Changes	Low	No	>5 to 10%	GREEN	As we have seen the changes
4	Fast SMS	New	Low	No Changes	No Changes	No	>5 to 10%	GREEN	As we have seen the changes
5	Cloudant DataBase	New	No Changes	No Changes	No Changes	No	>5 to 10%	GREEN	As we have seen the changes

NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	sumptions/Dependencies/Ri	Approvals/SignOff
1	Python 3.7.0	Developing Python Scr	Depends on the code	https://www.python.org/psf/sponsors/#heroku
2	IBM Watson IoT Platform	Creating and configuri	Depends on the Device Cred	https://4aqwut.internetofthings.ibmcloud.com/dashboard/
3	Node-Red	Creating Web-UI	Depends on the sensor valu	https://nodered.org/
4	MIT App Devoloper	Developing Mobile ap	Depends on the Sensor valu	https://appinventor.mit.edu/about/tgrmsofservice
5	Cloudant DB	Storing Sensor values	Depends on the Sensor valu	https://2587b83c-debe-4618-8ea6-c3bdd6111fb4-bluemix.cloudant.com/dashboard.html

End Of Test Report

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	ame sensor and te	This is done by devel	Met	Pass	GO	Code working properly	Closed	https://www.python.org/psf/sponsors/#heroku
2	Based on the temp	This is done by creat	Met	Pass	GO	Sprinkler is turning on and o	Closed	http://159.122.183.108:32627/red/#flow/51cd2ad32ac08578
3	If any flame is dete	This is done by creat	Met	Pass	GO	Exhaust fan is turning on an	Closed	http://159.122.183.108:32627/red/#flow/51cd2ad32ac08578
4	Emergency alerts are notified to the auth		Met	Pass	GO	Emergency alerts are send vi	Closed	https://www.fast2sms.com/dashboard/sms/bulk

10. ADVANTAGES & DISADVANTAGES

Advantages:

The Advantages of this Industry-Specific Intelligent Fire Management system are as follows

- The user need not require expertise knowledge to control this system.
- This system is simple. The user can easily view the sensor values and take control actions.
- The control actions are taken automatically.
- If it is implemented in hardware, then the cost of implementation will be affordable.
- As we are sensing the sensor values continuously, any slight change in the environment is detected
- This system is in User-Friendly format.

Disadvantages:

- This system will not be able to detect the origin of fire.
- This system will not provide the escape route if there is fire outbreak.
- If the industry has specific changes in the environment, then this system will gives false alarm

11. CONCLUSION

An understanding and having Fire Management system in the industry is of utmost importance. This project is a fire management system that can be user in the industry based on IOT. This system creates a simulation device credentials in IBM WATSON IOT PLATFORM. In node-red, necessary nodes are installed and used. These nodes are installed and used. These nodes are deployed and the data is collected. In the event of fire, this system can issue sprinkler on, exhaust fan on. This remote user monitoring system can monitor the system status of each node in real time. This system monitors the data continuously so that the any slight change in the environment can be easily detected. This ensures good control accuracy. This Industry- Specific Intelligent Fire Management ensures the protection of property, asset and the processes are cost effective and the automatic measures are in control.

12.FUTURE SCOPE

The future scope of this project is to add additional features like triggering the extinguisher automatically, predict the escape route if the fire outbreaks and to implement this system in real time using hardware.

13.APPENDIX

Source Code:

Link:

https://github.com/IBM-EPBL/IBM-Project-18515-1659686336/blob/main/Final%20Deliverables/Python%20Random%20variables.pdf

Github & Project Demo Link:

Github Link: https://github.com/IBM-EPBL/IBM-Project-18515-1659686336.git