PROJECT DOCUMENTATION REPORT

DATE	19 NOVEMBER 2022
TEAM ID	PNT2022TMID42644
PROJECT TITLE	INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

Team Members	:	BALLAM PRAVEEN KUMAR MONICA NANCY V SATHYAMOORTHY M JEEVITHA P
Industry Mentor Name	:	Santoshi
Faculty Mentor(s) Name	:	Surya M , Gowtham P.

1. INTRODUCTION

1.1 Project Overview

Abstract :

Fire prevention and protection in industrial plant basically include procedures for preventing, detecting and extinguishing fires. There is much to be done to promote safe systems for fire prevention in India. The systems should be designed to protect the employees and property and to assure safe working systems. Fire prevention and protection in any industrial plant include fire detection system, fire alarm system, fire prevention plan and employing legal requirements relevant to fire and safety management.

1.2 Purpose

Nowadays, fire incidents have become a critical issue, which must be dealt with on time without any unnecessary delay to avoid the loss in lives and belongings. It is considered a fire situation when the monitored temperature exceeds 50°C. According to the national fire protection association (NFPA), two-third of U.S. household fires occur in premises with no working smoke alarms, alarms with no proper maintenance, or misplaced alarms.

This is the IOT (internet of things) based fire monitoring and controlling system which not only gives the real time information about the situation on the monitor but also takes the corrective action as per the need. In a publish and subscribe system, a device can publish a message on a topic, or it can be subscribed to a particular topic to receive message. Also it is perfect solution for internet of things application. Due to this all data can be stored in server and this data can be access by the Application program interface which we can display on the monitor and with the help of software, the operator can visualize the condition at the time of fire accident.

2. LITERATURE SURVEY

2.1 Existing problem :

In the Industries, mostly manufacturing sectors are affected due to fire accidents. Manufacturing sectors may contain specific equipment’s, that can lead to such kind of accidents. As fire accidents are considered that may include the Geographic and confined spaces of the industry also. Many of the fire accidents occurs in the industries are unexpected which could cause life and property damage. The major reasons are neglecting and breaking the government norms. The fire accidents may occur frequently in large scale heavy manufacturing industries. To create safe working conditions and to reduce the property loses, the problem solution is needed.

2.2 References :

[1] Shokouhi, M., Nasiriani, K., Khankeh, H., Fallahzadeh, H. and Khorasani-Zavareh, D., “Exploring barriers and challenges in protecting residential fire-related injuries: a qualitative study,” Journal of injury and violence research, vol. 11, no. 1, pp. 81-92, 2019.

[2] V. Jelicic; M. Magno; G. Paci; D. Brunelli; L. Benini, "Design, characterization and management of a wireless sensor network for smart gas monitoring," in 2011 4th IEEE Int. Workshop on Adv. in Sensors and Interfaces (IWASI), pp. 115-120.

[3] Saeed, F., Paul, A., Karthigaikumar, P. and Nayyar, A., “Convolutional neural network based early fire detection,” Multimedia Tools and Applications, vol. 79, pp. 9083-9099, 2020.

[4] Shah, R., Satam, P., Sayyed, M.A. and Salvi, P., “Wireless Smoke Detector and Fire Alarm System,” International Research Journal of Engineering and Technology (IRJET), vol. 6, no. 1, pp. 1407-1412, 2019.

[5] F. He; Z. Du; Y. Sun, “Indoor dangerous gas environment detected by mobile robot,” in 2009 IEEE International Conference on Robotics and Biomimetic (ROBIO), pp. 396-401.

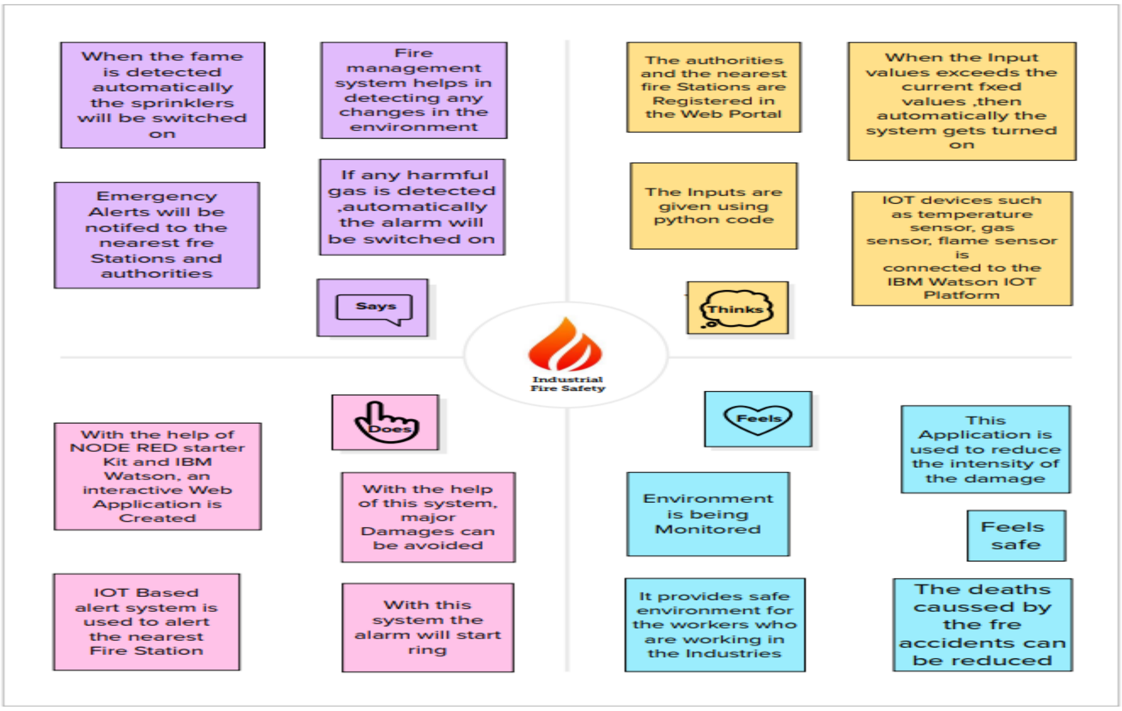
[6] Mahzan, N. N., Enzai, N. M., Zin, N. M. and Noh, K. S. S. K. M., “Design of an Arduino based home fire alarm system with GSM module,” Journal of Physics: Conference Series, vol. 1019, no. 1, 2018, Art. no. 012079.

2.3 Problem Statement Definition

Safety is considered first in the designing of residential and commercial buildings in order to safe guard the property damage as well as loss of life. Nowadays the existing fire alarm in the markets is too complex in terms of its design and structures. It needs regular maintenance to be carried out to make sure the system performance. Meanwhile the maintenance is being done to the existing system, it could raise the cost of the system.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



Says

When the fame is detected automatically the sprinklers will be switched on

Fire management system helps in detecting any changes in the environment

Emergency Alerts will be notifed to the nearest fre Stations and authorities

If any harmful gas is detected ,automatically the alarm will be switched on

Thinks

The authorities and the nearest fire Stations are Registered in the Web Portal

When the Input values exceeds the current fxed values ,then automatically the system gets turned on

The Inputs are given using python code

IOT devices such as temperature sensor, gas sensor, flame sensor is connected to the IBM Watson IOT Platform

Industrial Fire Safety

Does

With the help of NODE RED starter Kit and IBM Watson, an interactive Web Application is Created

With the help of this system, major Damages can be avoided

IOT Based alert system is used to alert the nearest Fire Station

With this system the alarm will start ring

Feels

This Application is used to reduce the intensity of the damage

Environment is being Monitored

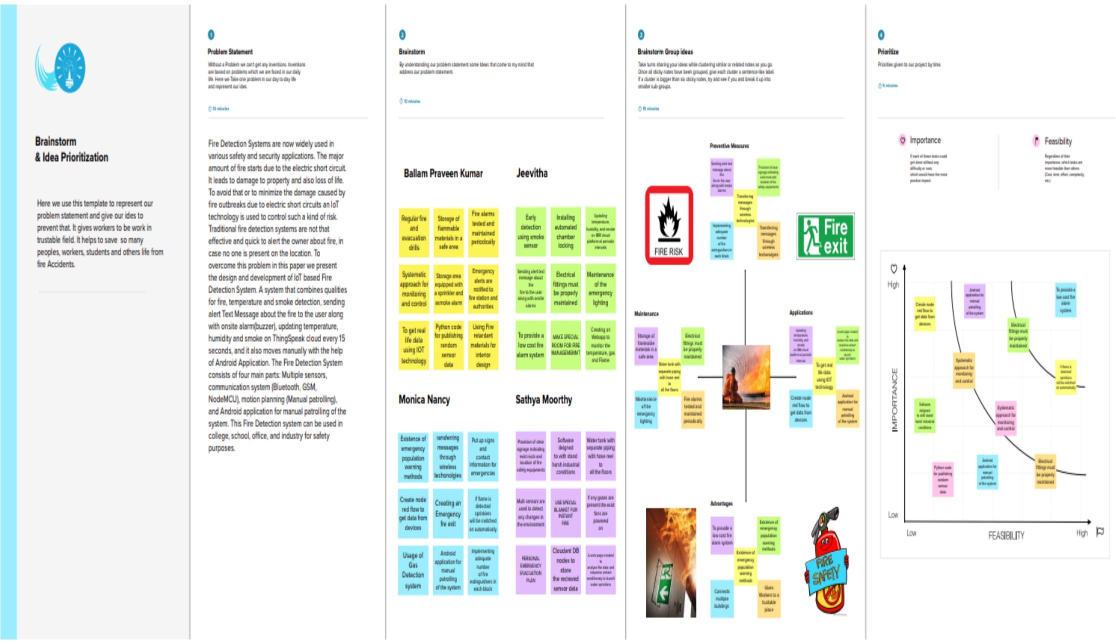
Feels safe

It provides safe environment for the workers who are working in the Industries

The deaths caussed by the fre accidents can be reduced

Mural Link: https://app.mural.co/invitation/mural/b66m2eempathymap2834/1666853699179?sender=u0e62f13a49dd379cfa3d2746&key=e549d3a1-c5e0-4975-9e0f-877cf1844181

3.2 Ideation & Brainstroming



Brainstorm & Idea Prioritization

Here we use this template to represent our problem statement and give our ides to prevent that. It gives workers to be work in trustable field. It helps to save so many peoples, workers, students and others life from fire Accidents.

1 Problem Statement

Without a Problem we can't get any inventions. Inventions are based on problems which we are faced in our daily life. Here we Take one problem in our day to day life and represent our idea.

10 minutes

Fire Detection Systems are now widely used in various safety and security applications. The major amount of fire starts due to the electric short circuit. It leads to damage to property and also loss of life. To avoid that or to minimize the damage caused by fire outbreaks due to electric short circuits an IoT technology is used to control such a kind of risk. Traditional fire detection systems are not that effective and quick to alert the owner about fire, in case no one is present on the location. To overcome this problem in this paper we present the design and development of IoT based Fire Detection System. A system that combines qualities for fire, temperature and smoke detection, sending alert Text Message about the fire to the user along with onsite alarm(buzzer), updating temperature, humidity and smoke on ThingSpeak cloud every 15 seconds, and it also moves manually with the help of Android Application. The Fire Detection System consists of four main parts: Multiple sensors, communication system (Bluetooth, GSM, NodeMCU), motion planning (Manual patrolling), and Android application for manual patrolling of the system. This Fire Detection system can be used in college, school, office, and industry for safety purposes.

2 Brainstorm

By understanding our problem statement some ideas that come to my mind that address our problem statement.

10 minutes

Ballam Praveen Kumar

- Regular fire and evacuation drills
- Storage of flammable materials in a safe area
- Fire alarms tested and maintained periodically
- Systematic approach for monitoring and control
- Storage area equipped with a sprinkler and asmoke alarm
- Emergency alerts are notified to fire station and authorities
- To get real life data using IOT technology
- Python code for publishing random sensor data
- Using Fire retardent materials for interior design

Jeevitha

- Early detection using smoke sensor
- Installing automated chamber locking
- Updating temperature, humidity, and smoke on IBM cloud platform at periodic intervals
- Sending alert text message about the fire to the user along with onsite alarms
- Electrical fittings must be properly maintained
- Maintenance of the emergency lighting
- To provide a low cost fire alarm system
- MAKE SPECIAL ROOM FOR FIRE MANAGEMENMT
- Creating an Webapp to monitor the temperature, gas and Flame

Monica Nancy

- Existence of emergency population warning methods
- ransferring messages through wireless techonolgies
- Put up signs and contact information for emergencies
- Create node red flow to get data from devices
- Creating an Emergency fire exit
- If flame is detected sprinklers will be switched on automatically
- Usage of Gas Detection system
- Android application for manual patrolling of the system
- Implementing adequate number of fire extinguishers in each block

Sathya Moorthy

- Provision of clear signage indicating exit routs and location of fire safety equipments
- Software deigned to with stand harsh industrial conditions
- Water tank with separate piping with hose reel to all the floors
- Multi sensors are used to detect any changes in the environment
- USE SPECIAL BLANKET FOR INSTANT FIRE
- If any gases are present the exist fans are powered on
- PERSONAL EMERGENCY EVACUATION PLAN
- Cloudant DB nodes to store the recieved sensor data
- A web page created to analyze the data and response extract conditionally to launch water sprinklers

3 Brainstorm Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

15 minutes

Preventive Measures

- Sending alert text message about the fire to the user along with smoke alarms
- Provision of clear signage indicating exit routs and location of fire safety equipments
- Transferring messages through wireless technologies
- Implementing adequate number of fire extinguishers in each block
- Transferring messages through wireless technologies

Maintenance

- Storage of flammable materials in a safe area
- Electrical fittings must be properly maintained
- Water tank with separate piping with hose reel to all the floors
- Maintenance of the emergency lighting
- Fire alarms tested and maintained periodically

Applications

- Updating temperature, humidity and smoke on IBM cloud platform at periodic intervals
- A web page created to analyze the data and response extract conditionally to launch water sprinklers
- To get real life data using IOT technology
- Create node red flow to get data from devices
- Android application for manual patrolling of the system

Advantages

4 Prioritize

Priorities given to our project by time.

5 minutes

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact

Feasibility

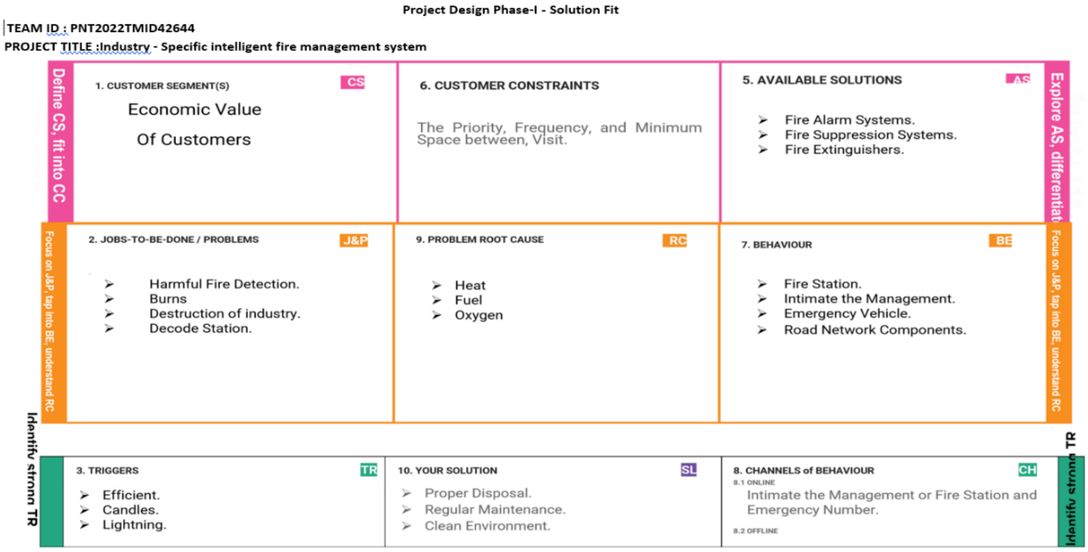
Regardless of their importance, which tasks are more feasible than others (Cost, time, effort, complexity, etc.)

High
IMPORTANCE
Low
Low
FEASIBILITY
High
Create node red flow to get data from devices
Android application for manual patrolling of the system
To provide a low cost fire alarm system

3.3 Proposed Solution

S.No.	Parameters	Outcomes
1.	Problem Statement (Problem to be solved)	*Improving the Fire management and alert system in industries. And also providing a safe environment for the workers…
2.	Idea / Solution description	*Providing fire management and alert system in industries on IoT with fire detection and using some sensors (Gas sensor, flame sensor, temperature sensor).
3.	Novelty / Uniqueness	*An IoT system that is integrated with temperature sensor, gas sensor, flame sensor, exhaust fan ,water sprinkler and fire alert through SMS to the authority…
4.	Social Impact / Customer Satisfaction	*We can also able to reduce the damages caused by fire accidents in industries using this device by alerting everyone early….
5.	Business Model (Revenue Model)	*This product can be used in industries .This system can be used as a safety system in industries. * High Efficient and Secure…
6.	Scalability of the Solution	*This project is trying to execute the method with the help of an IoT gadget which provides a safe environment for workers in industries. *Easy to Install and Maintain…

3.4 Problem Solution fit

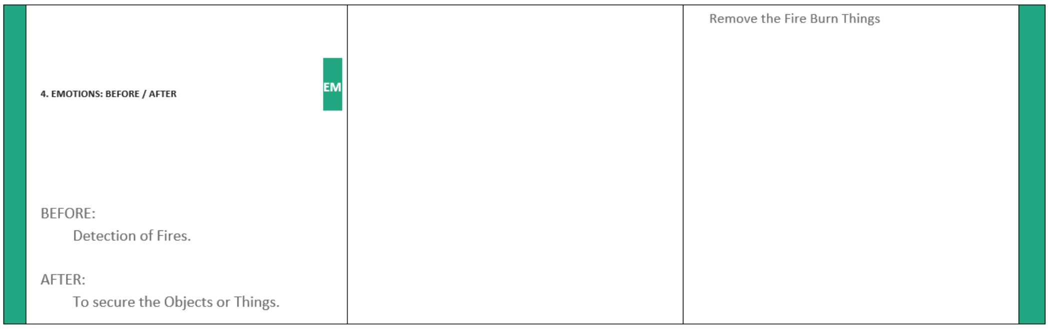


Project Design Phase-I - Solution Fit

TEAM ID : PNT2022TMID42644

PROJECT TITLE :Industry - Specific intelligent fire management system

1. CUSTOMER SEGMENT(S) CS Economic Value Of Customers	6. CUSTOMER CONSTRAINTS The Priority, Frequency, and Minimum Space between, Visit.	5. AVAILABLE SOLUTIONS AS ➢ Fire Alarm Systems. ➢ Fire Suppression Systems. ➢ Fire Extinguishers.
2. JOBS-TO-BE-DONE / PROBLEMS J&P ➢ Harmful Fire Detection. ➢ Burns ➢ Destruction of industry. ➢ Decode Station.	9. PROBLEM ROOT CAUSE RC ➢ Heat ➢ Fuel ➢ Oxygen	7. BEHAVIOUR BE ➢ Fire Station. ➢ Intimate the Management. ➢ Emergency Vehicle. ➢ Road Network Components.
3. TRIGGERS TR ➢ Efficient. ➢ Candles. ➢ Lightning.	10. YOUR SOLUTION SL ➢ Proper Disposal. ➢ Regular Maintenance. ➢ Clean Environment.	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE Intimate the Management or Fire Station and Emergency Number. 8.2 OFFLINE



4. EMOTIONS: BEFORE / AFTER

EM

BEFORE:
Detection of Fires.

AFTER:
To secure the Objects or Things.

Remove the Fire Burn Things

4.REQUIRMENT ANALYSIS

4.1 **Functional Requirements**

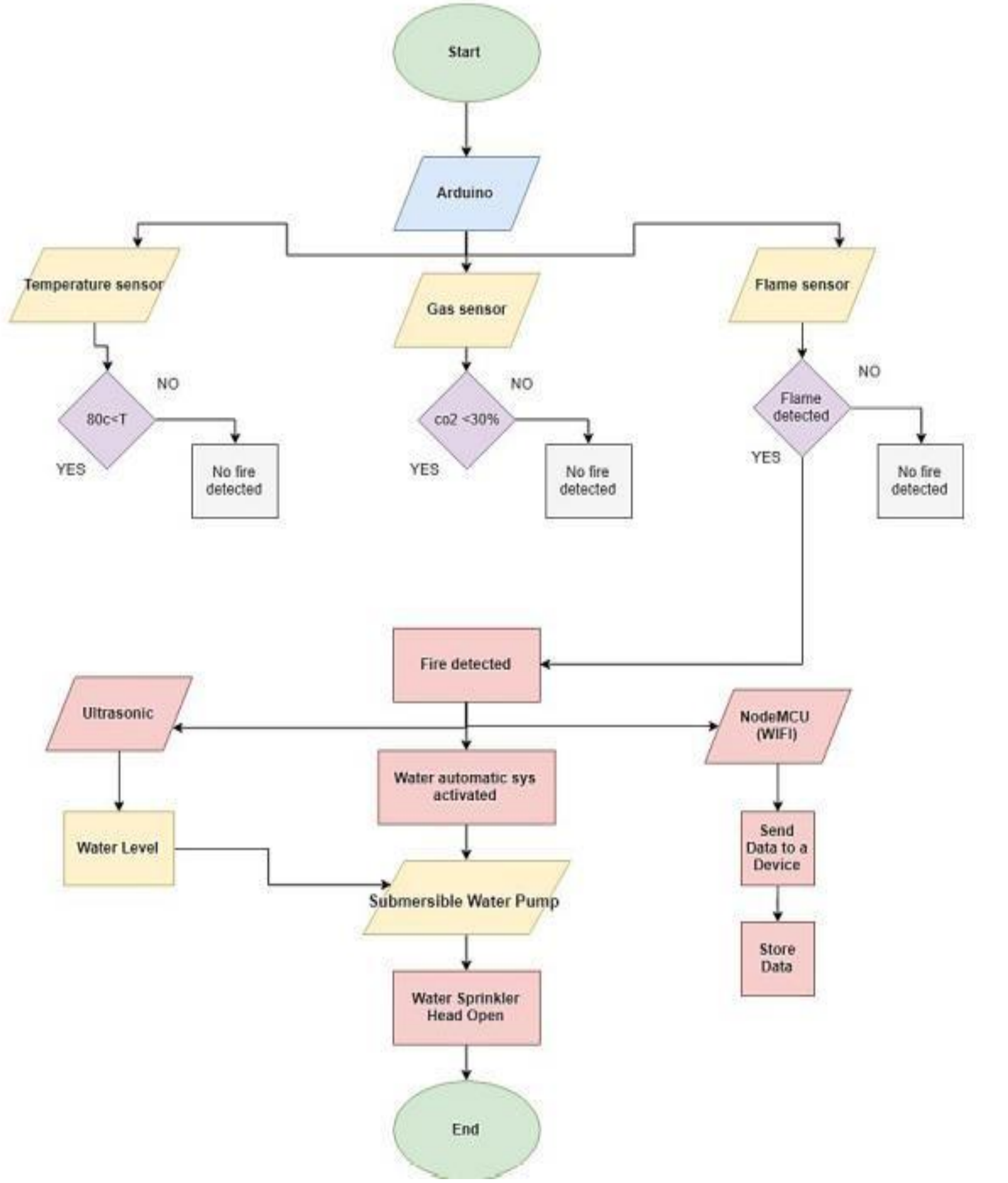
FR No.	**Functional Requirement (Epic)**	**Sub Requirement (Story / Sub-Task)**
FR-1	**User Requirements**	Workers and Product Protection Automatic Sprinkler System Monitors Smoke ,Gas and Temperature
FR-2	**User Registration**	Manual Registration Registration through webpage Registration through Form Registration through Gmail
FR-3	**User Confirmation**	Confirmation via Phone Confirmation via Email Confirmation via OTP
FR-4	**Payment Options**	Cash on Delivery Net Banking/UPI Credit/Debit/ATM Card
FR-5	**Product Delivery and Installation**	Door Step delivery Take away Free Installation and 1 year Warranty
FR-6	**Product Feedback**	Through Webpage Through Phone calls Through Google forms

4.2 **Non-Functional Requirements**

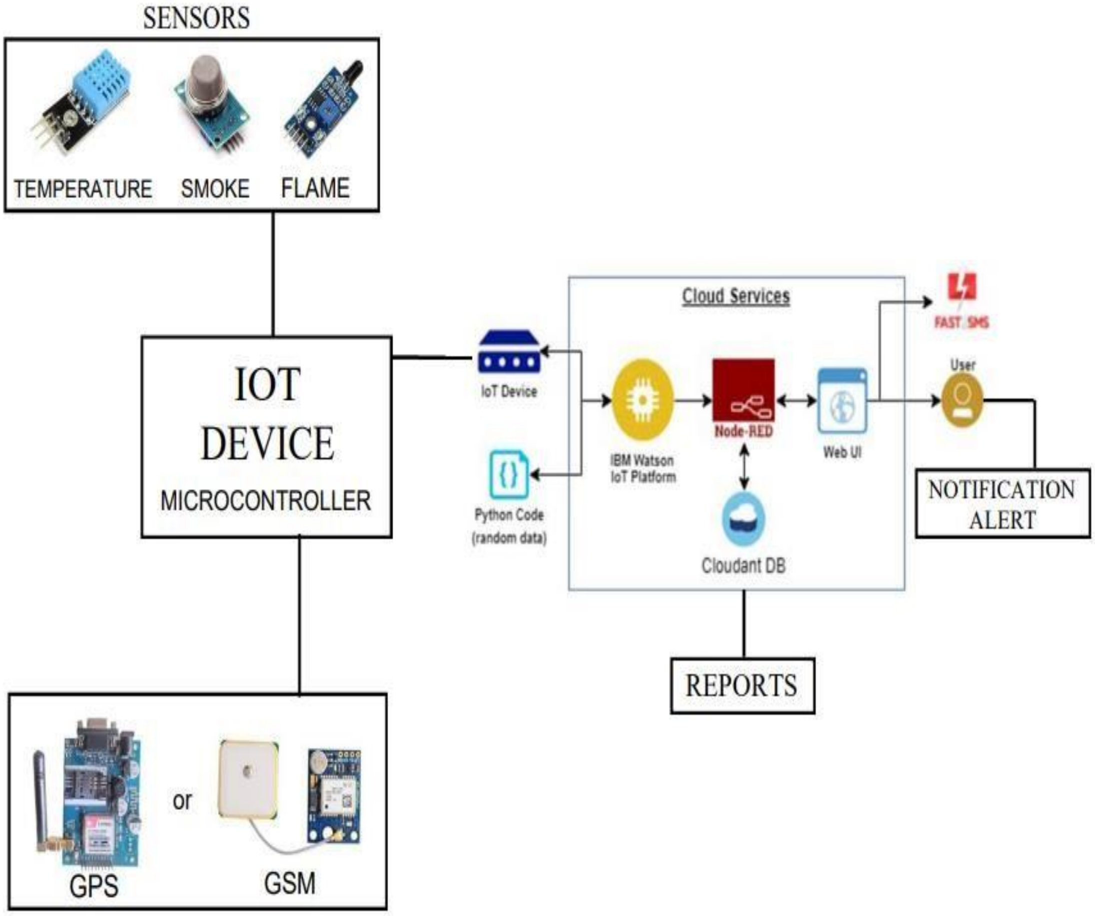
FR No.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	Have a clear and self-explanatory manual. Easier to use. Easily accessible by everyone.
NFR-2	**Security**	Are inspected monthly by the Fire Alarm Technician. Inspected and tagged by a contractor annually.
NFR-3	**Reliability**	Hardware requires a regular checking and service. Software may be updated periodically. Immediate alert is provided in case of any system failure.
NFR-4	**Performance**	The equipment must have a good user interface It should have a minimal energy requirement It has to save lives of people and things.
NFR-5	**Availability**	All the features will be available when the user requires. It depends on the need of the user and the customization of the user has done.
NFR-6	**Scalability**	The product has to cover all the space of industry irrespective of the size or area.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functional Requirement	User Story Number	User Story/Task	Acceptance Criteria	Priority	Release
Customers (Mobile user, web user, care executive, Administrator)	Registration	USN - 1	As a user, I can register for the application by entering my mail, password, and confirming my password	I can access my account/ dashboard	High	Sprint - 1

		USN - 2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint - 1
	Dashboard	USN - 3	As a user, I can register for the application through internet	I can register & access the dashboard with Internet login	Low	Sprint - 2
		USN - 4	As a user, I can register for the application through Gmail	I can confirm the registration in Gmail	Medium	Sprint - 1
	Login	USN - 5	As a user, I can log into the application by entering email & password	I can login with my ID & password	High	Sprint - 1

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

S.No	Milestones	Activities	Timeline
1.	Literature Survey & Information Gathering	**Prepare Literature Survey for the selected project & gather necessary information.**	**29 Aug - 3rd Sept 2022**
2.	Empathy Map	**Prepare Empathy Map Canvas to capture the user gains and pains.**	**5 - 10th Sept 2022**
3.	Brainstorm	**Ideas are listed and top 3 ideas are prioritized.**	**12 - 17 Sept 2022**

4.	Proposed Solution	**Proposed solution document is prepared which includes novelty, feasibility of idea, social impact, scalability of solution.**	**19 - 24 Sept 2022**
5.	Problem Solution Fit	**Includes customer segments and customer constraints, the problem root cause and jobs to be done.**	**26 Sept - 01 Oct 2022**
6.	Solution Architecture	**From receiving data to notifying user are represented in architectural diagrams.**	**26 Sept - 01 Oct 2022**
7.	Customer Journey	**Prepare customer journey maps to understand user interactions and experiences with the applications.**	**3 - 8 Oct 2022**
8.	Functional Requirements	**Functional Requirements and non functional requirements like scalability, and accuracy are described.**	**10 - 15 Oct 2022**
9.	Data Flow Diagrams and User Stories	**Data flow diagrams and user stories are prepared and four sprint phases are described.**	**10 - 15 Oct 2022**
10.	Technology Architecture	**Technical flow graphs are created and the functions of technical stacks are defined.**	**10 - 15 Oct 2022**
11.	Prepare Milestones & Activities List	**Prepare the list for milestones & activities.**	**17 - 22 Oct 2022**
12.	Sprint Delivery Plan	**Prepare the sprint delivery plan of the project.**	**17 - 22 Oct 2022**
13.	Project Development – Delivery of Sprint 1,2,3& 4	**Develop and submit the developed code by testing it.**	**29 Oct 2022 - 19 Nov 2022**

6.2 Sprint Delivery Schedule

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration (Mobile user)	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	1	Low	Praveen Kumar B Monica Nancy V

Sprint-1	Login (Mobile user)	USN-2	As a user, I can log into the application by entering email & password	3	High	Sathyamoorthy M Jeevitha P
Sprint-2	Dashboard (Mobile user)	USN-3	By entering correct password, I could access the dashboard.	13	Medium	Praveen Kumar B Sathyamoorthy M
Sprint-3	Alert message (Mobile user)	USN-4	As a user, I can get alert messages regarding smoke and temperature parameters.	13	High	Jeevitha P Monica nancy V
Sprint-4	Data storage (Mobile user)	USN-5	As a user, I will able to store parameter values.	2	High	Praveen Kumar B Jeevitha P
Sprint-4	Checking (Mobile & web user)	USN-6	As a user I can Test the system performance, for an emergency case, it is deployed and I can use the system 24/7.	8	High	Monica Nancy V Sathyamoorthy M
Sprint-1	Login (web user)	USN-7	As a user, I can log into the application by entering email & password	13	High	Jeevitha P, Sathyamoothy M
Sprint-1	Dashboard (web user)	USN-8	I could access the dashboard.	3	Medium	Monica Nancy V Praveen Kumar
Sprint-3	Alert message (web user)	USN-9	As a user, I can get alert messages regarding smoke and temperature parameters.	5	High	Jeevitha P Praveen Kumar B
Sprint-4	Data Storage message (web user)	USN-10	As a user, I will able to store parameter values.	2	High	Sathyamoorthy M Monica Nancy V
Sprint-4	Checking (Mobile & web user)	USN-11	As a user, I can check whether the system correctly detects the fire and gas, and does it alerts the user, also whether the fire or smoke has been put down or not.	8	High	Jeevitha P Monica Nancy V

Project Tracker, Velocity & Burndown Chart:

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	17 Nov 2022

Velocity:

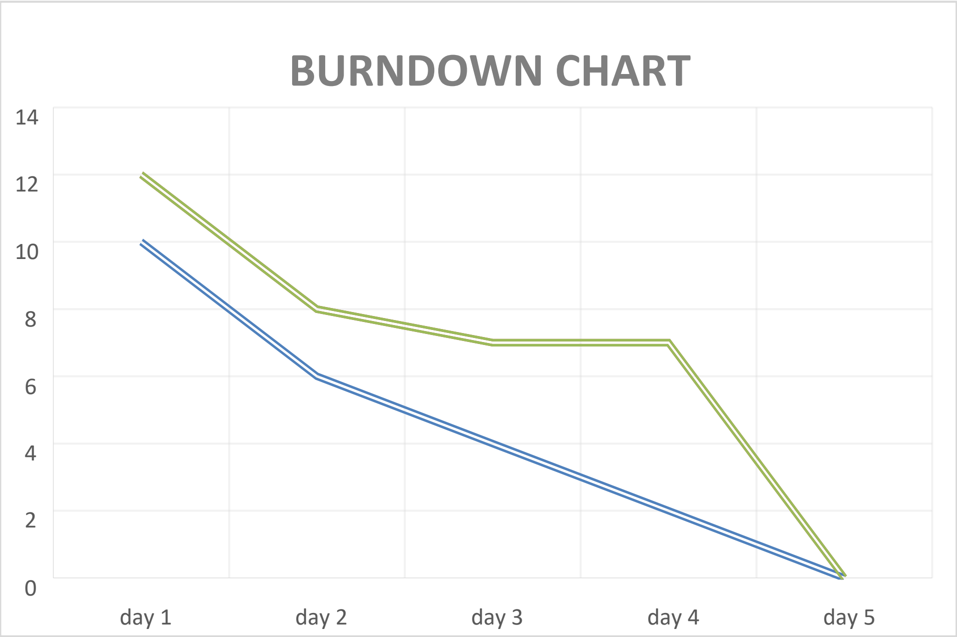
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let’s calculate the team’s average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

https://www.visual-paradigm.com/scrum/scrum-burndown-chart/
https://www.atlassian.com/agile/tutorials/burndown-charts



Reference:

https://www.atlassian.com/agile/projectmanagement
https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software
https://www.atlassian.com/agile/tutorials/epics
https://www.atlassian.com/agile/tutorials/sprints
https://www.atlassian.com/agile/project-management/estimation
https://www.atlassian.com/agile/tutorials/burndown-charts

7. CODING AND SOLUTIONING (Explain the features added to the project along with code) :

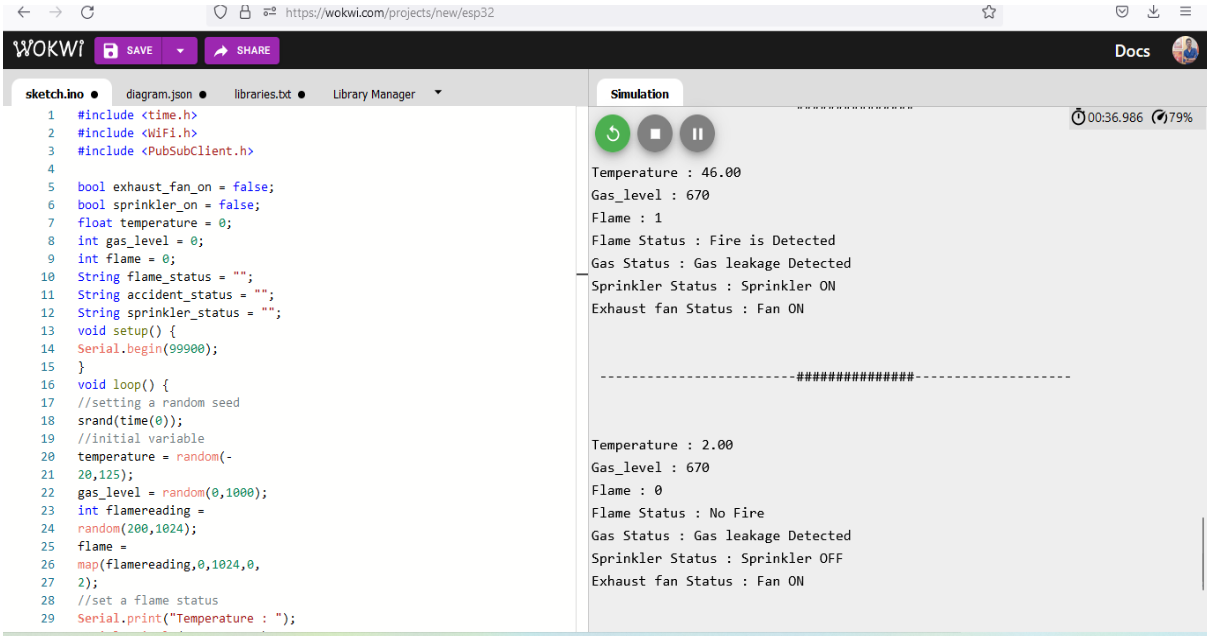
CODE :

```
#include <time.h>
#include <WiFi.h>
#include <PubSubClient.h>

bool exhaust_fan_on = false;
bool sprinkler_on = false;
float temperature = 0;
int gas_level = 0;
int flame = 0;
String flame_status = "";
String accident_status = "";
String sprinkler_status = "";
void setup() {
Serial.begin(99900);
}
void loop() {
//setting a random seed
srand(time(0));
//initial variable
temperature = random(-20,125);
gas_level = random(0,1000);
int flamereading =
random(200,1024);
flame = map(flamereading,0,1024,0,2);
//set a flame status
Serial.print("Temperature : ");
Serial.println(temperature);

Serial.print("Gas_level : ");
Serial.println(gas_level);

Serial.print("Flame : ");
Serial.println(flame);
switch (flame) {
case 0:
flame_status = "No Fire";
Serial.println("Flame Status : "+flame_status);
break;
case 1:
flame_status = "Fire is Detected";
Serial.println("Flame Status : "+flame_status);
break;
}
//Gas Detection
if(gas_level > 100){
Serial.println("Gas Status : Gas leakage Detected");
}
else{
exhaust_fan_on = false;
Serial.println("Gas Status : No Gas leakage Detected");
}
//send the sprinkler status
if(flame){
sprinkler_status = "Sprinkler ON";
Serial.println("Sprinkler Status : "+sprinkler_status);
}
else{
sprinkler_status = "Sprinkler OFF";
Serial.println("Sprinkler Status : "+sprinkler_status);
}
//toggle the fan according to gas
if(gas_level > 100){
exhaust_fan_on = true;
Serial.println("Exhaust fan Status : Fan ON");
}
else{
exhaust_fan_on = false;
Serial.println("Exhaust fan Status : Fan OFF");
}
Serial.println("");
Serial.println("");
Serial.println(" --------------------------###############--------------
------");
Serial.println("");
Serial.println("");
delay(3000);
}
```

7.1 Feature 1

In the above code, we have added a feature that when the fire is detected in the industry, then the Sprinkler will be ON.

<u>Solutioning of this feature:</u>



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srand(time(0));
//initial variable
temperature = random(-
20,125);
gas_level = random(0,1000);
int flamereading =
random(200,1024);
flame =
map(flamereading,0,1024,0,
2);
//set a flame status
Serial.print("Temperature : ");
```

```
Temperature : 46.00
Gas_level : 670
Flame : 1
Flame Status : Fire is Detected
Gas Status : Gas leakage Detected
Sprinkler Status : Sprinkler ON
Exhaust fan Status : Fan ON

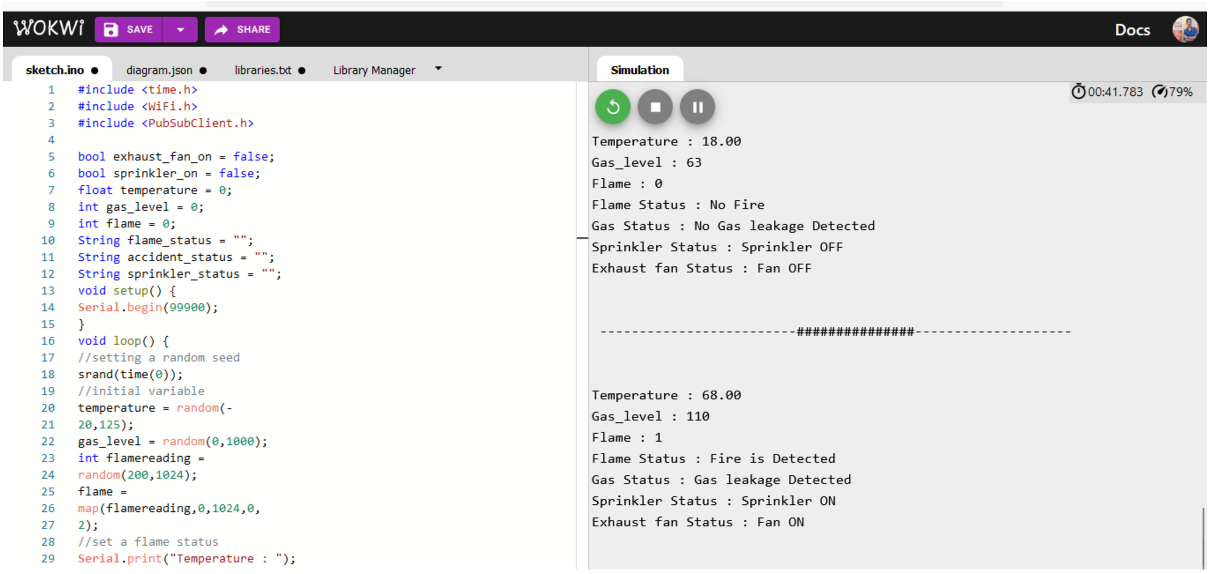

 -------------------------###############--------------------


Temperature : 2.00
Gas_level : 670
Flame : 0
Flame Status : No Fire
Gas Status : Gas leakage Detected
Sprinkler Status : Sprinkler OFF
Exhaust fan Status : Fan ON
```

7.2 Feature 2:

In the above code, we have added another feature is that when the “Gas leakage is detected” in the industry, then the Exhaust fan will be ON.

<u>Solutioning of this feature:</u>



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float temperature = 0;
int gas_level = 0;
int flame = 0;
String flame_status = "";
String accident_status = "";
String sprinkler_status = "";
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Serial.begin(99900);
}
void loop() {
//setting a random seed
srand(time(0));
//initial variable
temperature = random(-
20,125);
gas_level = random(0,1000);
int flamereading =
random(200,1024);
flame =
map(flamereading,0,1024,0,
2);
//set a flame status
Serial.print("Temperature : ");
```

```
Temperature : 18.00
Gas_level : 63
Flame : 0
Flame Status : No Fire
Gas Status : No Gas leakage Detected
Sprinkler Status : Sprinkler OFF
Exhaust fan Status : Fan OFF


 -------------------------###############--------------------


Temperature : 68.00
Gas_level : 110
Flame : 1
Flame Status : Fire is Detected
Gas Status : Gas leakage Detected
Sprinkler Status : Sprinkler ON
Exhaust fan Status : Fan ON
```

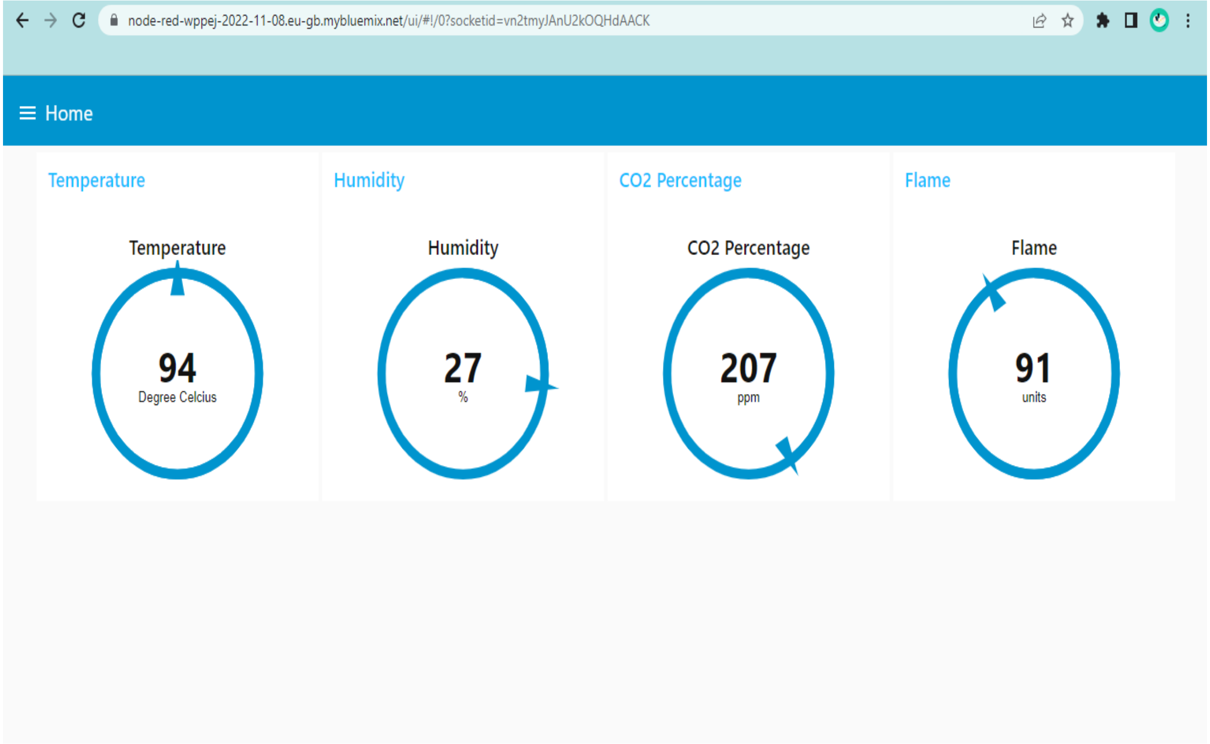
8. TESTING :

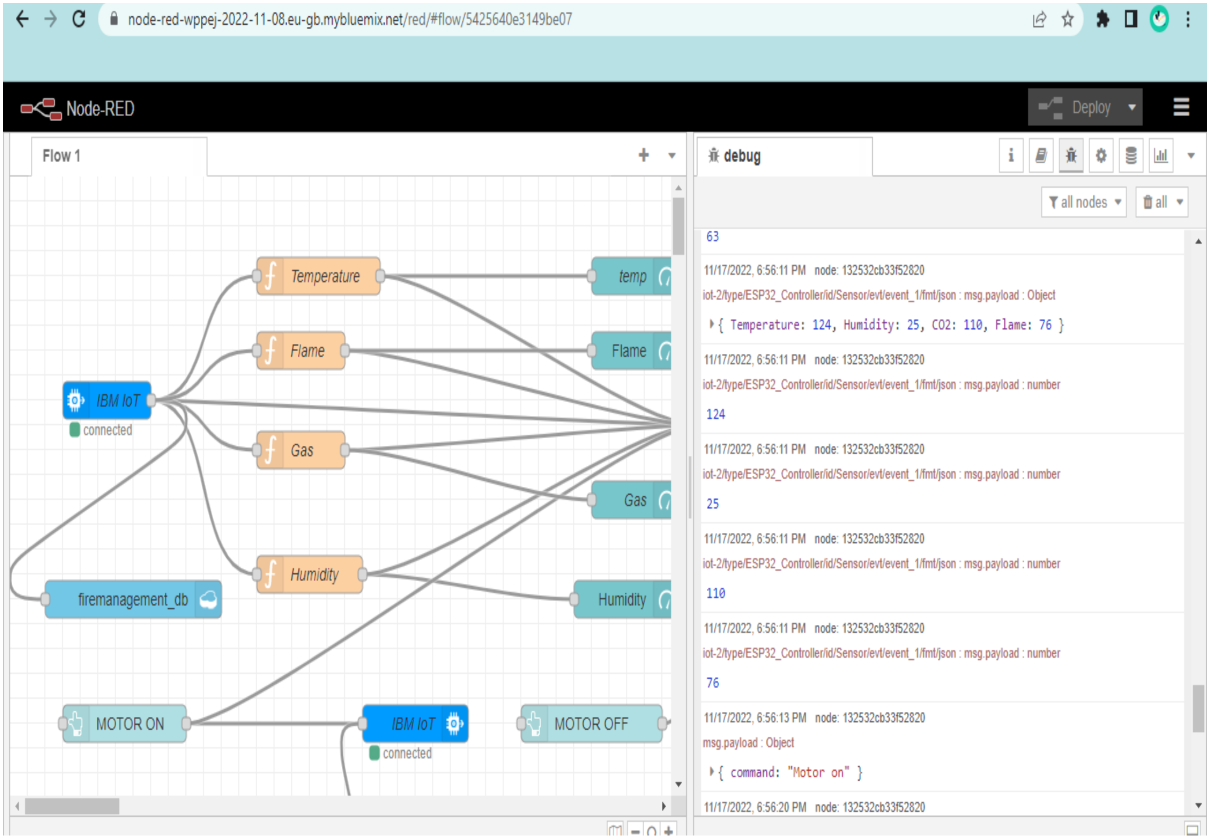
8.1 Test Cases

s.no	Inputs	Outputs	Results
1	Temperature : 113.00 Gas_level : 945 Flame : 0	Flame Status : No Fire Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler OFF Exhaust fan Status : Fan ON	Passed
2	Temperature : 122.00 Gas_level : 41 Flame : 0	Flame Status : No Fire Gas Status : No Gas leakage Detected Sprinkler Status : Sprinkler OFF Exhaust fan Status : Fan OFF	Passed
3	Temperature : 39.00 Gas_level : 639 Flame : 1	Flame Status : Fire is Detected Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler ON Exhaust fan Status : Fan ON	Passed
4	Temperature : 40.00 Gas_level : 761 Flame : 0	Flame Status : No Fire Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler OFF Exhaust fan Status : Fan ON	Passed
5	Temperature : 67.00 Gas_level : 21 Flame : 1	Flame Status : Fire is Detected Gas Status : No Gas leakage Detected Sprinkler Status : Sprinkler ON Exhaust fan Status : Fan OFF	Passed
6	Temperature : 107.00 Gas_level : 592 Flame : 1	Flame Status : Fire is Detected Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler ON	Passed

		Exhaust fan Status : Fan ON	
7	Temperature : 8.00 Gas_level : 990 Flame : 0	Flame Status : No Fire Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler OFF Exhaust fan Status : Fan ON	Passed
8	Temperature : 84.00 Gas_level : 532 Flame : 0	Flame Status : No Fire Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler OFF Exhaust fan Status : Fan ON	Passed
9	Temperature : 123.00 Gas_level : 272 Flame : 1	Flame Status : Fire is Detected Gas Status : Gas leakage Detected Sprinkler Status : Sprinkler ON Exhaust fan Status : Fan ON	Passed
10	Temperature : 163.00 Gas_level : 94 Flame : 1	Flame Status : Fire is Detected Gas Status : No Gas leakage Detected Sprinkler Status : Sprinkler ON Exhaust fan Status : Fan OFF	Passed

9. RESULTS :





```
63
11/17/2022, 6:56:11 PM   node: 132532cb33f52820
iot-2/type/ESP32_Controller/id/Sensor/evt/event_1/fmt/json : msg.payload : Object
▸{ Temperature: 124, Humidity: 25, CO2: 110, Flame: 76 }
11/17/2022, 6:56:11 PM   node: 132532cb33f52820
iot-2/type/ESP32_Controller/id/Sensor/evt/event_1/fmt/json : msg.payload : number
124
11/17/2022, 6:56:11 PM   node: 132532cb33f52820
iot-2/type/ESP32_Controller/id/Sensor/evt/event_1/fmt/json : msg.payload : number
25
11/17/2022, 6:56:11 PM   node: 132532cb33f52820
iot-2/type/ESP32_Controller/id/Sensor/evt/event_1/fmt/json : msg.payload : number
110
11/17/2022, 6:56:11 PM   node: 132532cb33f52820
iot-2/type/ESP32_Controller/id/Sensor/evt/event_1/fmt/json : msg.payload : number
76
11/17/2022, 6:56:13 PM   node: 132532cb33f52820
msg.payload : Object
▸{ command: "Motor on" }
11/17/2022, 6:56:20 PM   node: 132532cb33f52820
```

10. ADVANTAGES :

The main advantage and function of a fire alarm system is to ensure ultimate safety. The system warn and keep people safe and reduce the amount of destruction to a building. Proactively gave protection to secure business processes and valuable goods from fires. Protect from multiple hazards with just one system.

DISADVANTAGES

The system is essentially useless if the batteries aren't charged, since it won't work properly. It must be borne in mind that a major disadvantage of heat detectors is the fact they rely on heat to actuate. For large buildings, they can be expensive to install because of the extensive amounts of wire that are necessary to accurately monitor initiating devices.

11. CONCLUSION

It is important to implement the fire protection system in places like industries, colleges and so on as a part of building safety as well as prevention of life loss.This system recommends the use of fire alarms system,sprinkler system and smoke control system, these are helpful in notify the actions like fire and smoke conditions. It can also helps to slow down the growth of fire. The followence of guidelines make the place safe to work and in case of fire the building will include protection that will results in minimum loss.

12. FUTURE SCOPE

There haven’t really been any momentous industry standards which will keep up with technological advances a lot faster, those responsible for benefit fire detection manufacturers and the marketplace. Interconnection between multiple system has been implemented in upcoming period. Different Gas Sensor can be used to identify the accuracy of the gas while fire occurs. Making the Devices more and more capable, and their application, so that they all are evolving to connect to the internet and cooperate with other devices. The future will be with the detectors. Detector will be more of a sensor, with the detection capability for the products of combustion, such as carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides in addition to heat and and other subordinates matters.

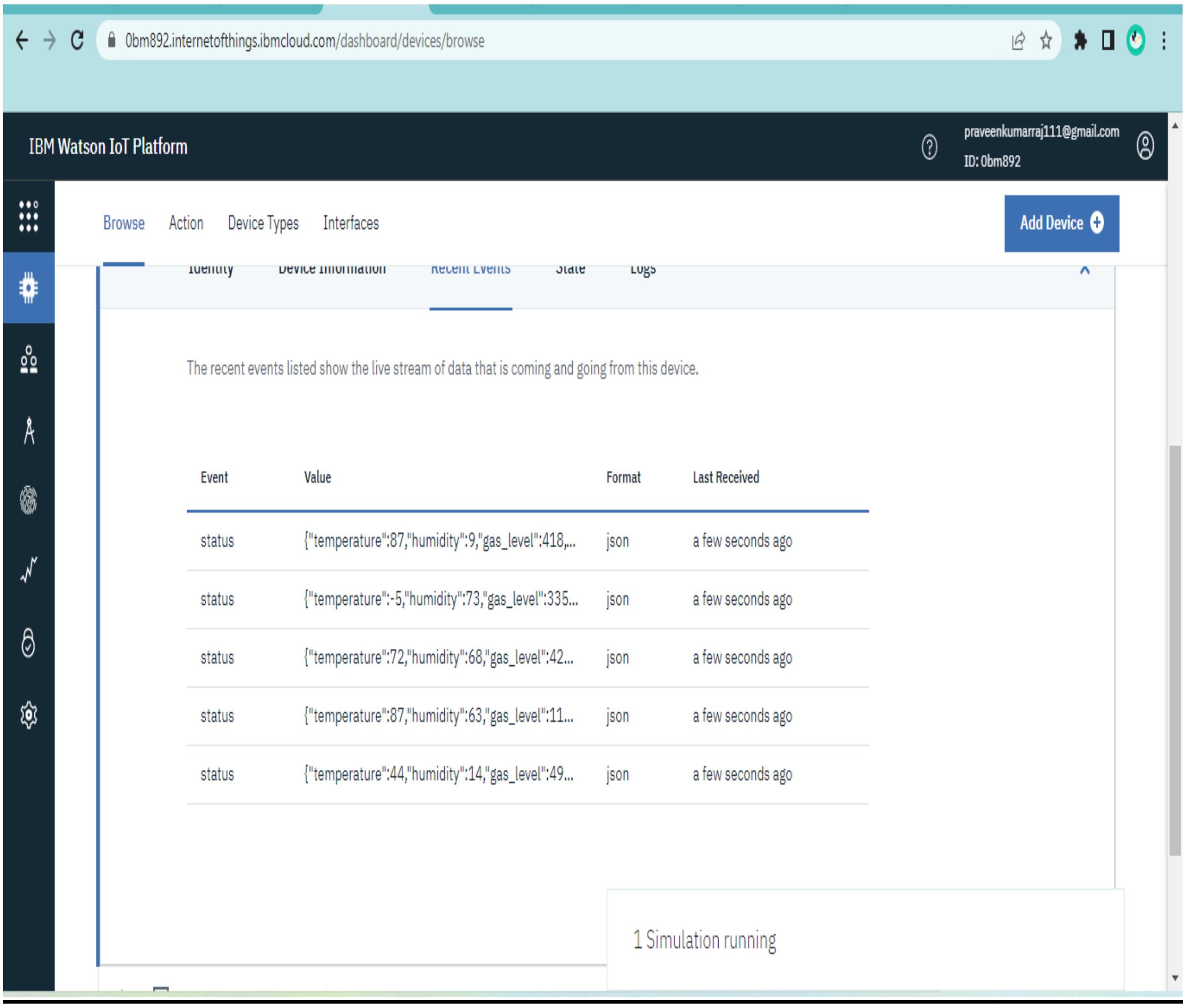
13. APPENDIX

Source Code :

```
import wiotp.sdk.device
import time
import random
```

```
myConfig = {
    "identity": {
        "orgId": "0bm892",
        "typeId": "NodeMcu",
        "deviceId":"1234"
    },
    "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(config=myConfig, logHandlers=None)
client.connect()

while True:
    temperature=random.randint(-20,125)
    humidity=random.randint(0,100)
    gas_level =random.randint(0,500)
    flame=random.randint(0,200)

    if (flame>80):
        print("Sprinkler ON")
    else:
        print("Sprinkler OFF")

    if (gas_level>100):
        print("Exhaust Fan ON")
    else:
        print("Exhaust Fan OFF")

    myData={'temperature':temperature, 'humidity':humidity, 'gas_level':
gas_level,'flame':flame}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

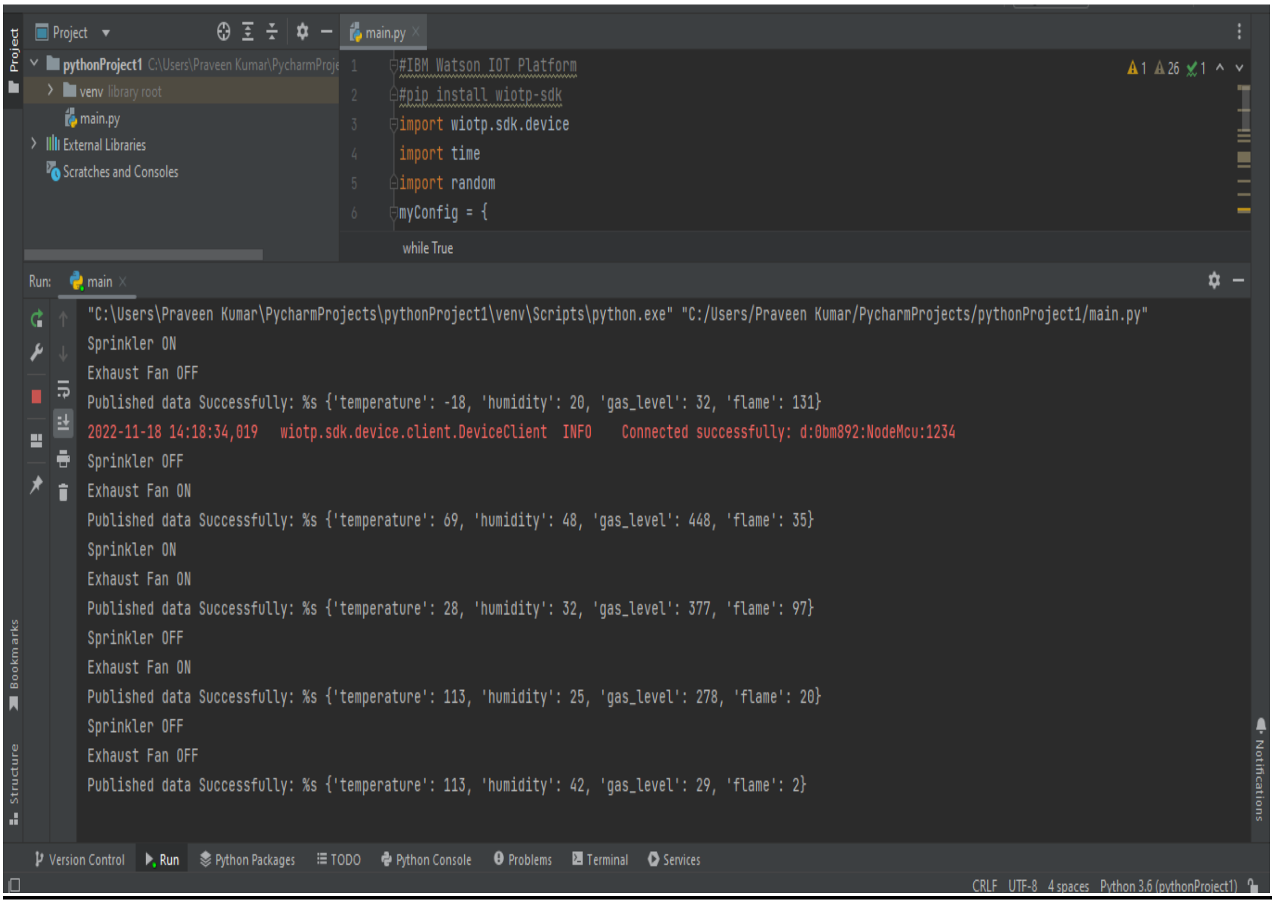
OUTPUT :



The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
status	{"temperature":87,"humidity":9,"gas_level":418,...	json	a few seconds ago
status	{"temperature":-5,"humidity":73,"gas_level":335...	json	a few seconds ago
status	{"temperature":72,"humidity":68,"gas_level":42...	json	a few seconds ago
status	{"temperature":87,"humidity":63,"gas_level":11...	json	a few seconds ago
status	{"temperature":44,"humidity":14,"gas_level":49...	json	a few seconds ago

1 Simulation running



```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {
```

```
"C:\Users\Praveen Kumar\PycharmProjects\pythonProject1\venv\Scripts\python.exe" "C:/Users/Praveen Kumar/PycharmProjects/pythonProject1/main.py"
Sprinkler ON
Exhaust Fan OFF
Published data Successfully: %s {'temperature': -18, 'humidity': 20, 'gas_level': 32, 'flame': 131}
2022-11-18 14:18:34,019   wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:0bm892:NodeMcu:1234
Sprinkler OFF
Exhaust Fan ON
Published data Successfully: %s {'temperature': 69, 'humidity': 48, 'gas_level': 448, 'flame': 35}
Sprinkler ON
Exhaust Fan ON
Published data Successfully: %s {'temperature': 28, 'humidity': 32, 'gas_level': 377, 'flame': 97}
Sprinkler OFF
Exhaust Fan ON
Published data Successfully: %s {'temperature': 113, 'humidity': 25, 'gas_level': 278, 'flame': 20}
Sprinkler OFF
Exhaust Fan OFF
Published data Successfully: %s {'temperature': 113, 'humidity': 42, 'gas_level': 29, 'flame': 2}
```

<u>Github Link :-</u>

https://github.com/IBM-EPBL/IBM-Project-20918-1659766664