

# PROJECT REPORT

## INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

Team ID	PNT2022TMID33266
Project Name	Industry Specific Intelligent Fire Management System

### Project Report Submitted By

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## 1. INTRODUCTION

### 1.1 Project overview

Fire, explosion and toxic release are the three major hazards in the process industry, while fire is the most common one. Increasing number of fire incidents coupled with loss of property has enhanced the demand for automatic intelligent fire alarm systems in residential and commercial buildings. An intelligent fire alarm system is specifically designed to provide advantages such as identification of the fire location, locate any fault in the alarm system wiring, and ensure easier maintenance. This system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the

environment. Based on the temperature readings and if any Gases are present the exhaust fans are powered ON. If any flame is detected the sprinklers will be switched on automatically. Emergency alerts are notified to the authorities and Fire station. Moreover, these modern intelligent fire alarm systems are more sensitive as compared to the classic models and are competent to detect false alarms.

## **1.2 Purpose**

The primary purpose of fire alarm system is to provide an early warning of fire so that people can be evacuated & immediate action can be taken to stop or eliminate the fire effect as soon as possible.

## **2. LITERATURE SURVEY**

### **2.1 Existing problem**

Systems for monitoring fires have typically relied on a single sensor, like smoke or flame. These single sensor systems are unable to differentiate between actual and fictitious fire presence. Energy inefficiency and environmental harm result from relying on a single sensor all day and risking false alarms. Not only do we need a system that is effective in precisely detecting fire, but we also need a smart solution. The smart fire management system incorporates a temperature sensor, a flame sensor, and a gas sensor to enhance the performance of current single sensor systems. Additionally, a reliable network with numerous smart devices connected to different panels is needed for this system.

### **2.2 References**

[1]N N Mahzan, N I M Enzai, N M Zin and K S S K M Noh, "Design of an Arduino-based home fire alarm system with gSM module", 1st International conference on green and Sustainable computing (ICoGeS), 2017.

1. ZHANG Ying-Cong, YU Jing, "Study on the Fire IOT

Development Strategy”, Shenyang Fire Research Institute -- Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling, US: ANSI/FMRC, pp. FM3260- 2004.

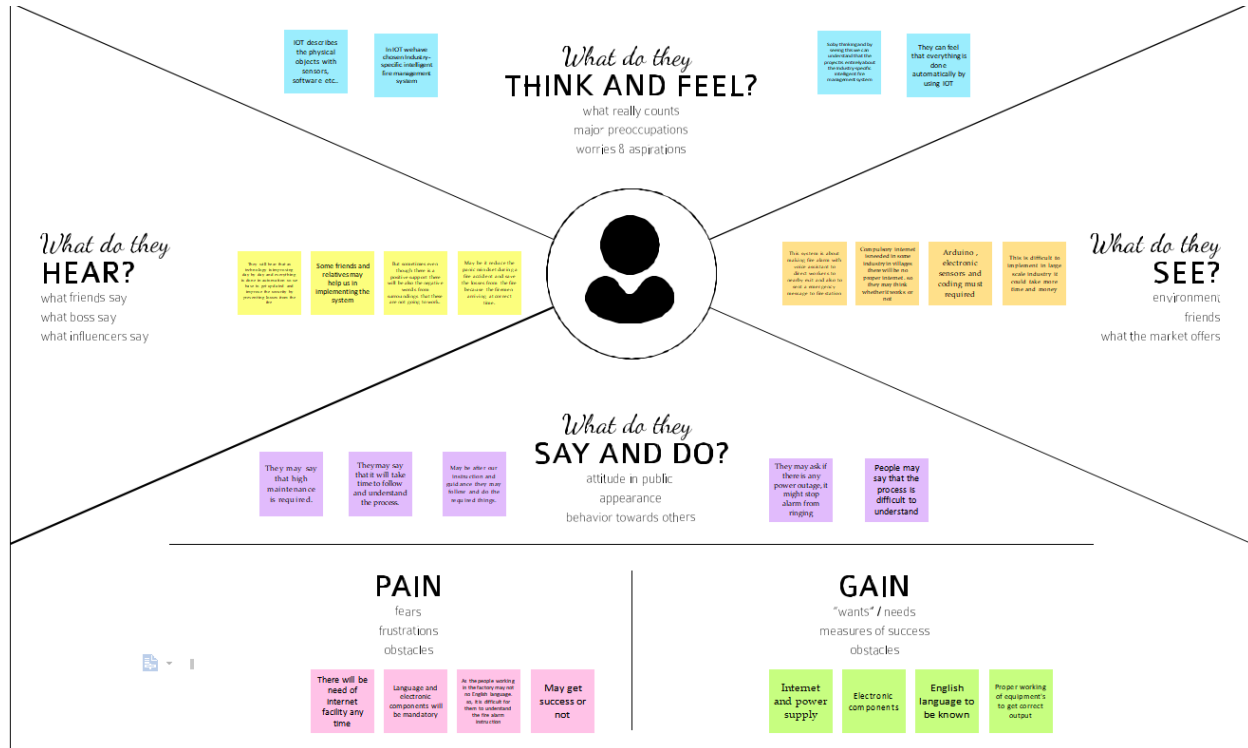
2. Public Security, Shenyang 110034, China Shenyang Institute of Engineering, Shenyang 110136, China, 2019. Liu Yunhong Qi Meini, "The Design of Building Fire Monitoring System Based on ZigBee-WiFi Networks", Eighth International Conference on Measuring Technology and Mechatronics Automation, IEEE, 2016, pp-733-735.
3. R.A. Sowah, A.R. Ofoli, S.N. Krakani, S.Y. Fiawoo, hardware Design and Web-Based Communication Modules of a Real-Time multisensor Fire Detection and Notification System Using Fuzzy Logic, IEEE Transactions on Industry Applications, 53 (2016) 559-566.

### **2.3 Problem Statement Definition**

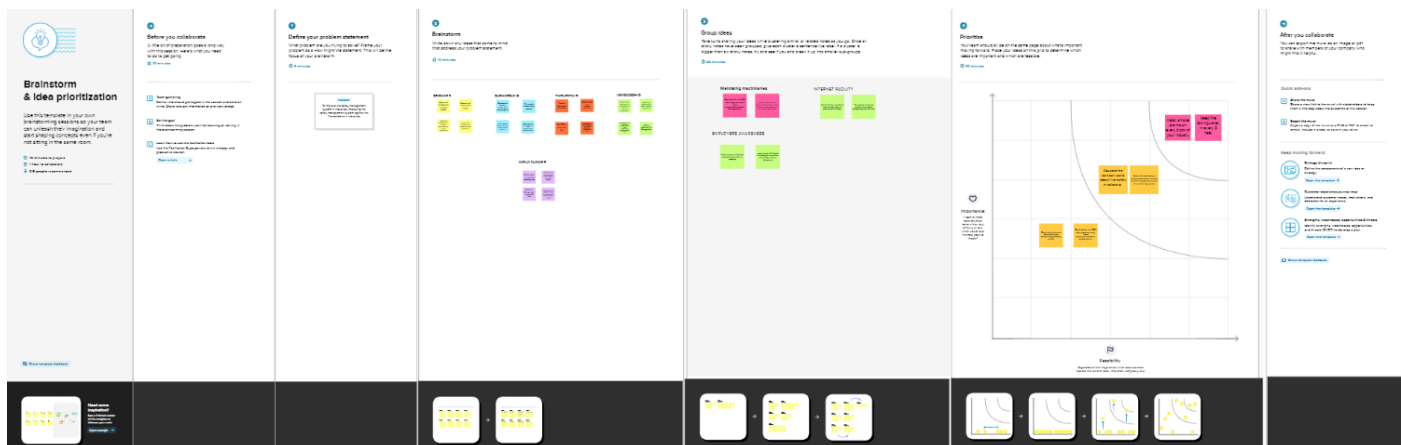
Definition Industry Specific Intelligent fire management system are designed to Prevent fire accidents due to Gas leakage and flame in industry.

## **3. IDEATION & PROPOSED SOLUTION**

## 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming



### 3.3 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 accidents in industries.
2	Idea/Solution description	To implement the fire safety management in industry based on IOT using Arduino board with ESP8266 and using some Sensors (smoke, Temperature), LCD display and speaker.
3	Novelty/Uniqueness	An SMS is sent to fire station with live location .Pre recorded voice assistant guide people to nearby exit.
4	Social Impact/Customer Satisfaction	It early prevents the accident cost by fire in industries. Nearby location so maximum extend more accurate reliability.
5	Business Model (Revenue Model)	This product can be utilized by industries. It is a productive and helpful item in industries for rescuing people from fire accidents and also damage of machines.
6	Scalability of the Solution	It is trying to execute this technique as we need to introduce on Arduino gadget which was modified with an Arduino that takes received signals from sensors. Easy maintenance.

### 3.4 Problem Solution Fit

**Project Title:** Industry specific intelligent fire management system.

**Project Design Phase-I**  
**Solution Fit Template**

**Team ID:** PNT2022TMID33266

Define CS, fit into C	<b>1. CUSTOMER SEGMENT(S)</b> Industry members as well as others <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">CS</span>	<b>6. CUSTOMER CONSTRAINTS</b> The customer should just click the alert message to enhance the further step to stop the fire. Proper network connection and available devices are needed. <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">CC</span>	<b>5. AVAILABLE SOLUTIONS</b> The customer used to call for the emergency number 101 to call the fire service team to stop the fire at that time of reporting many products in the industry gets damaged and many lives were death. Now with the use of our product the industry can sense the fire explosion and stop at the initial stage itself. So, it is quite much more easy. <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">AS</span>	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <b>Fire Detection:</b> We are solving the problem of fire spread by automatically detecting the fire at the ignition stage and stop the fire spread easily using Artificial Intelligence and IOT based ideas. <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">J&amp;P</span>	<b>9. PROBLEM ROOT CAUSE</b> The fire causes a lot of damages in the industry. Usually when it gets fired in an industry the fire service team is called to stop the fire. But now our solution use can stop the fire without the help of fire service. <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">RC</span>	<b>7. BEHAVIOUR</b> At once the message is send to the customers mobile from the sensors-controlled intelligence the customer himself can give the access to stop the fire spread on the whole. <span style="float: right; background-color: #ff69b4; color: white; padding: 2px;">BE</span>	
Focus on J&P, tap into BE, understand RC				Focus on J&P, tap into BE, understand RC

## 4. REQUIREMENT ANALYSIS

### 4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through website or application Registration through Social medias Registration through LinkedIN
FR-2	User Confirmation	Verification via Emailor OTP
FR-3	User Login	Login through website or App using the respective username and password

FR-4	User Access	Access the app requirements
FR-5	User Upload	User should be able to upload the data
FR-6	User Solution	Data report should be generated and delivered to user for every 24 hours
FR-7	User Data Sync	API interface to increase to invoice system

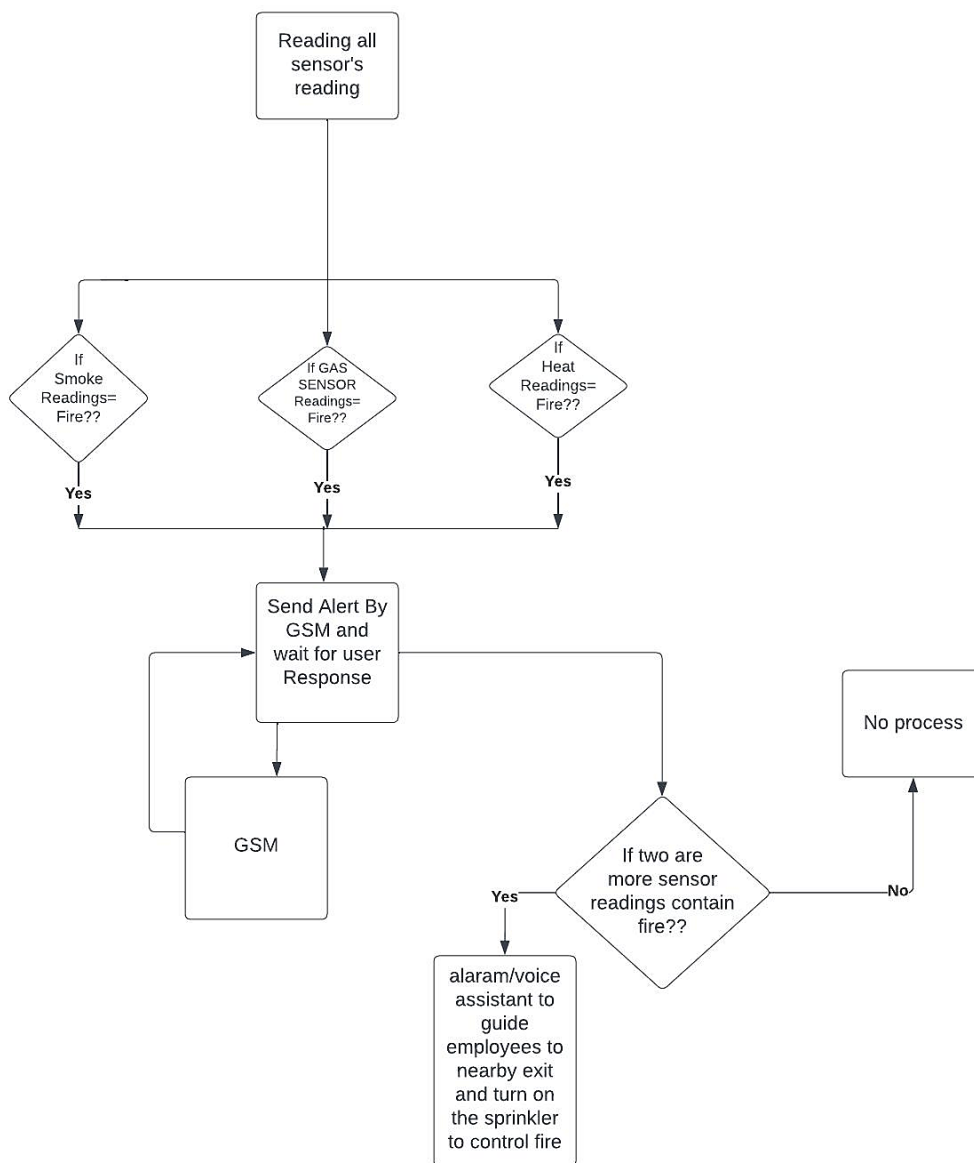
## 4.2 Non-Functional requirement

FR No.	Non-Functional Requirement	Description
NF R-1	<b>Usability</b>	Usability requirements includes language barriers and localization tasks. Usability can be assessed by Efficiency of use.
NF R-2	<b>Security</b>	Access permissions for the particular system information may only be changed by the system's data administrator.
NF R-3	<b>Reliability</b>	The database update process must roll back all related updates when any update fails.
NF R-4	<b>Performance</b>	The front-page load time must be no more than 2 seconds for users that access the website using an VoLTE mobile connection.
NF R-5	<b>Availability</b>	New module deployment must not impact frontpage, product pages, and check out pages availability and mustn't take longer than one hour.

NF R- 6	<b>Scalability</b>	We can increase scalability by adding memory,servers, or disk space. On the other hand, we can compress data, use optimizing algorithms.
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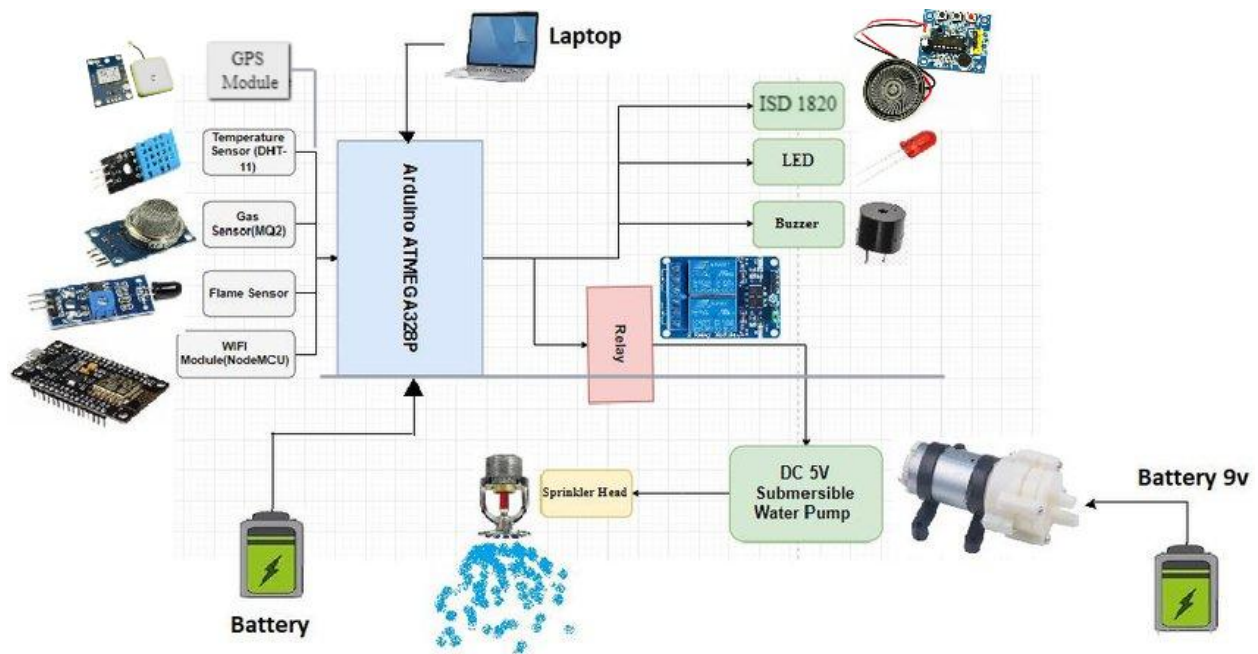
## 5. PROJECT DESIGN

### 5.1 Data Flow Diagram





## 5.2 Solution Architecture & Technical Architecture



## 5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Installation	USN-1	As a user, I can install the fire management device in every sections in the floor	I can do it by myself	High	Sprint-1
Customer	Power connection	USN-2	As a user, I want ensure power supply for all devices	I will ensure it	High	Sprint-2
Customer	Safety	USN-3	As a user, I want to ensure that the device should not be in contact with water	I will ensure that	High	Sprint-3
Customer	Battery Status	USN-4	As a user, I want check the battery status monthly once	I can assure that	Medium	Sprint-4

Customer	Internet Connectivity	USN-5	As a user, I want to check the internet connectivity	I will ensure that	High	Sprint-5
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## 6. PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

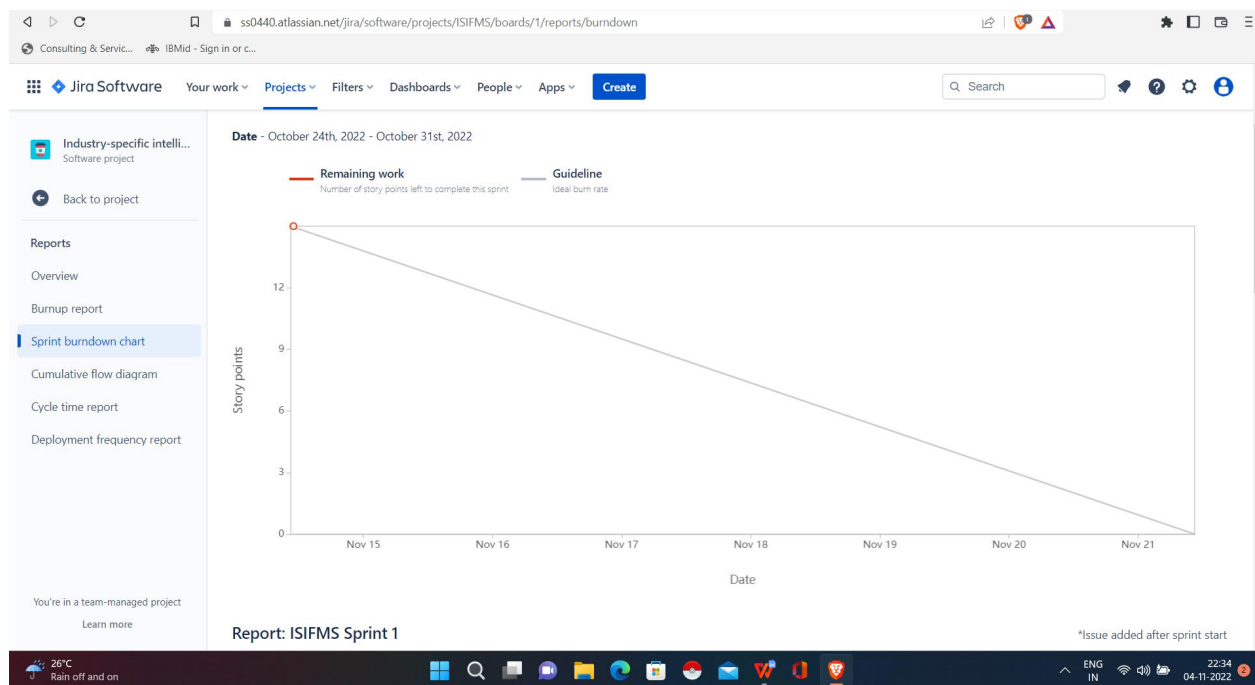
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a client, I can download the application	5	High	Sudharsun B
Sprint-1	Registration	USN-2	As a client, I can enlist for the application by entering my mobile number, email, password.	5	High	Sudharsun B
Sprint-1	Registration	USN-3	As a client, I will get confirmation email or OTP to SMS once I have enrolled for the application	4	High	Sudharsun B
Sprint-2	Login	USN-4	As a client, I can log into the application by entering email and secret code.	5	High	Sridhar R
Sprint-2	View	USN-5	As a client, I can see Temperature Readings.	2	Medium	Sridhar R

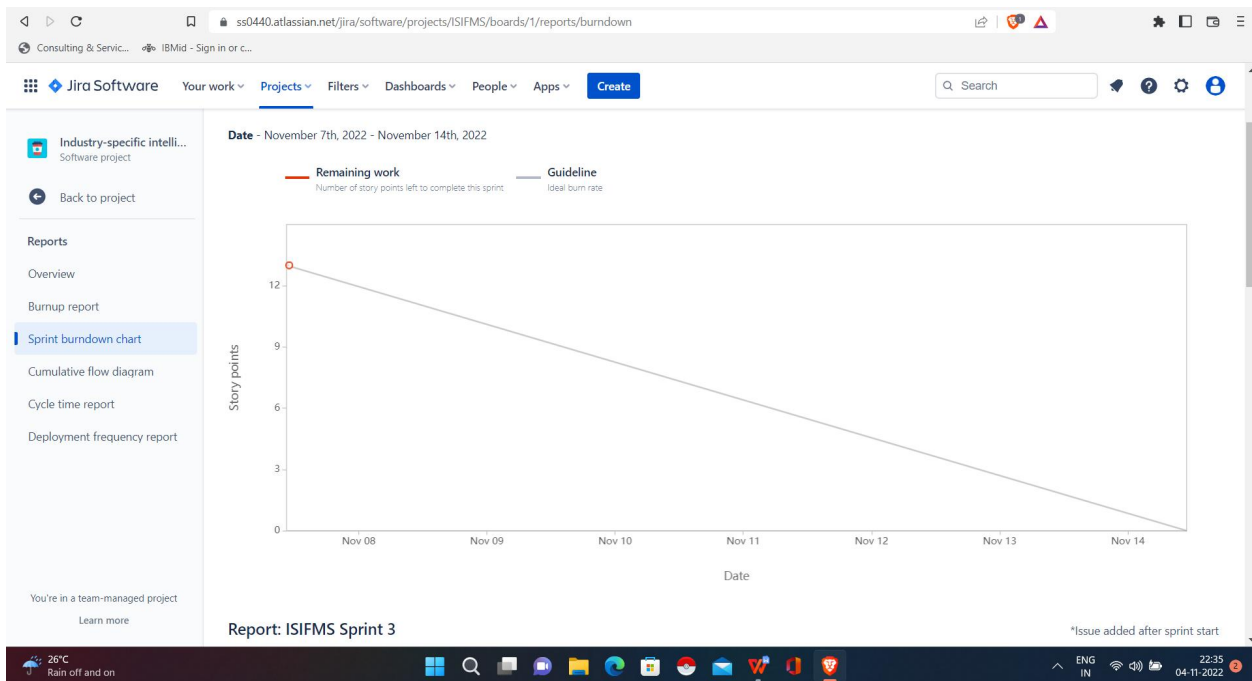
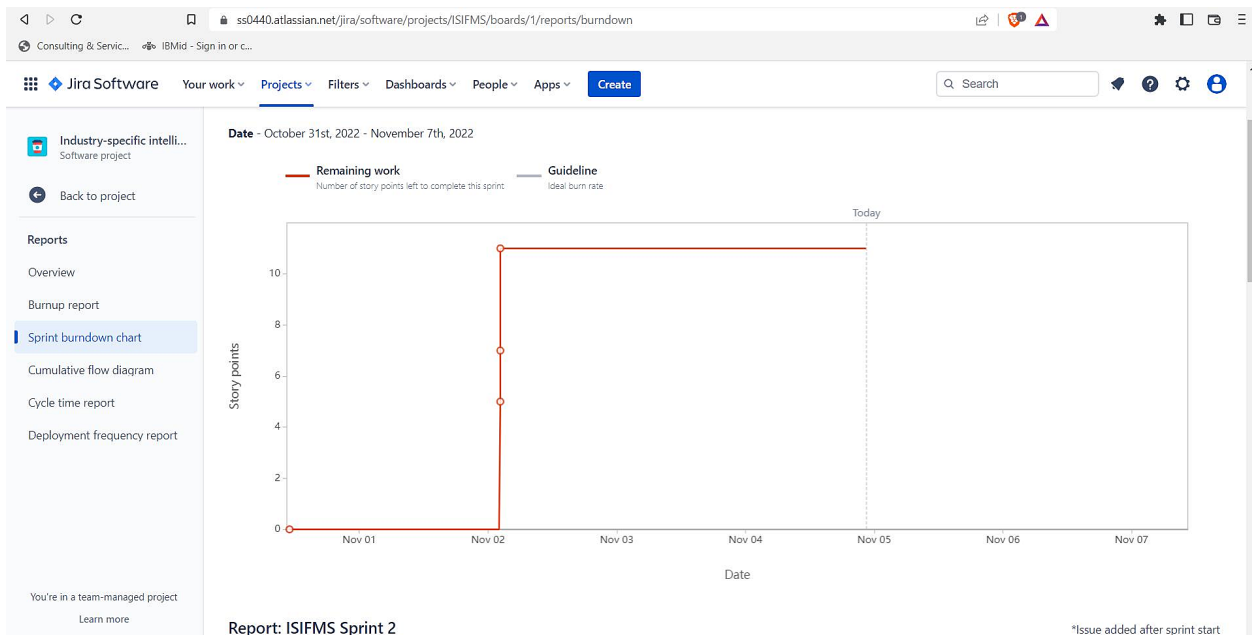
Sprint-2	View	USN-6	As a client , I can see any flame is detected in the industry.	4	High	Thirupathi R
Sprint-3	Actions	USN-7	As a client, I will have on and off button for operate sprinklers.	1	Medium	Vengadesh G

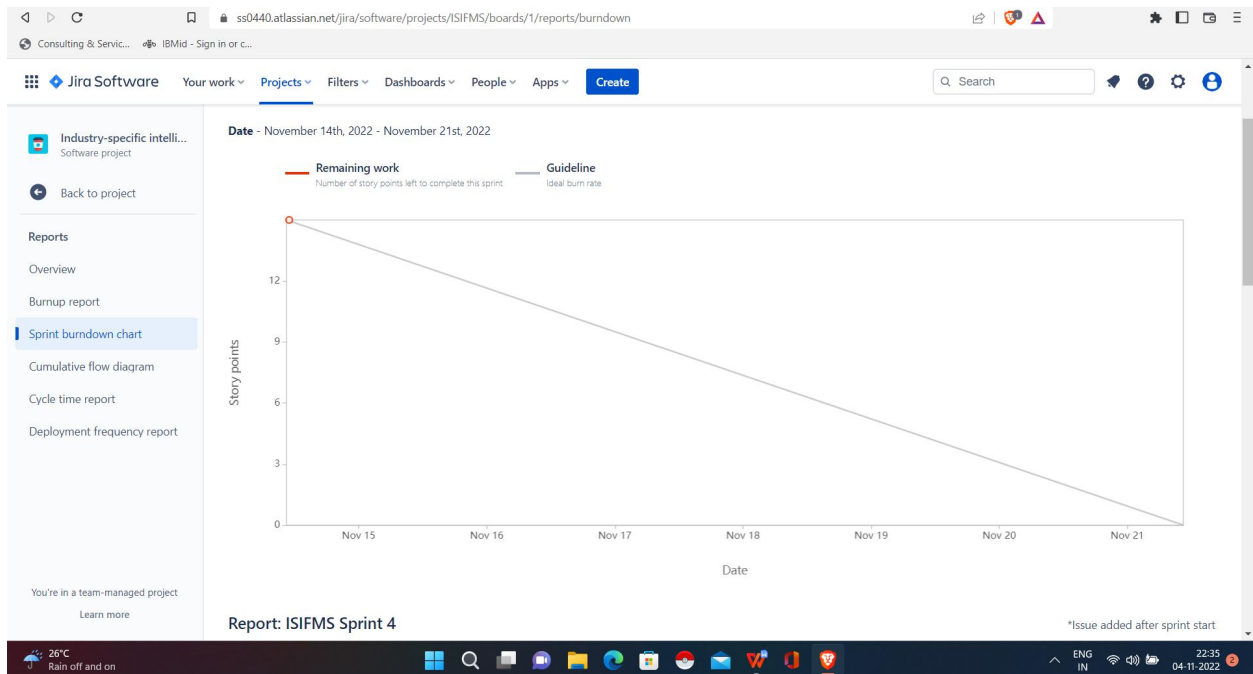
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Actions	USN-8	As a user, I will have an proper system for the conveyance of alert messages with accurate location.	2	Medium	Vengadesh G
Sprint-3	Management	USN-9	As a Administrator I can store the data in cloud database.	5	High	Sridhar R
Sprint-4	Testing	USN-10	As a tester , I can check whether the sensors are working properly.	5	High	Vengadesh G
Sprint-4	Testing	USN-11	As a tester I can check whether the sprinklers are working well and the warning messages are sent to respective persons with locations.	5	High	Varun kumar R

Sprint-4	Testing	USN-12	As a tester I can get the appropriate readings of the Temperature.	5	High	Varun kumar R
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## 6.2 Reports from JIRA







	SEP	OCT	NOV	DEC	JAN '23
Sprints			ISIFMS-52 Registration		
> ISIFMS-52 Registration					
> ISIFMS-40 Login					
> ISIFMS-42 View					
> ISIFMS-43 Actions					
> ISIFMS-47 Management					
> ISIFMS-51 Testing					

## 7. CODING & SOLUTIONING

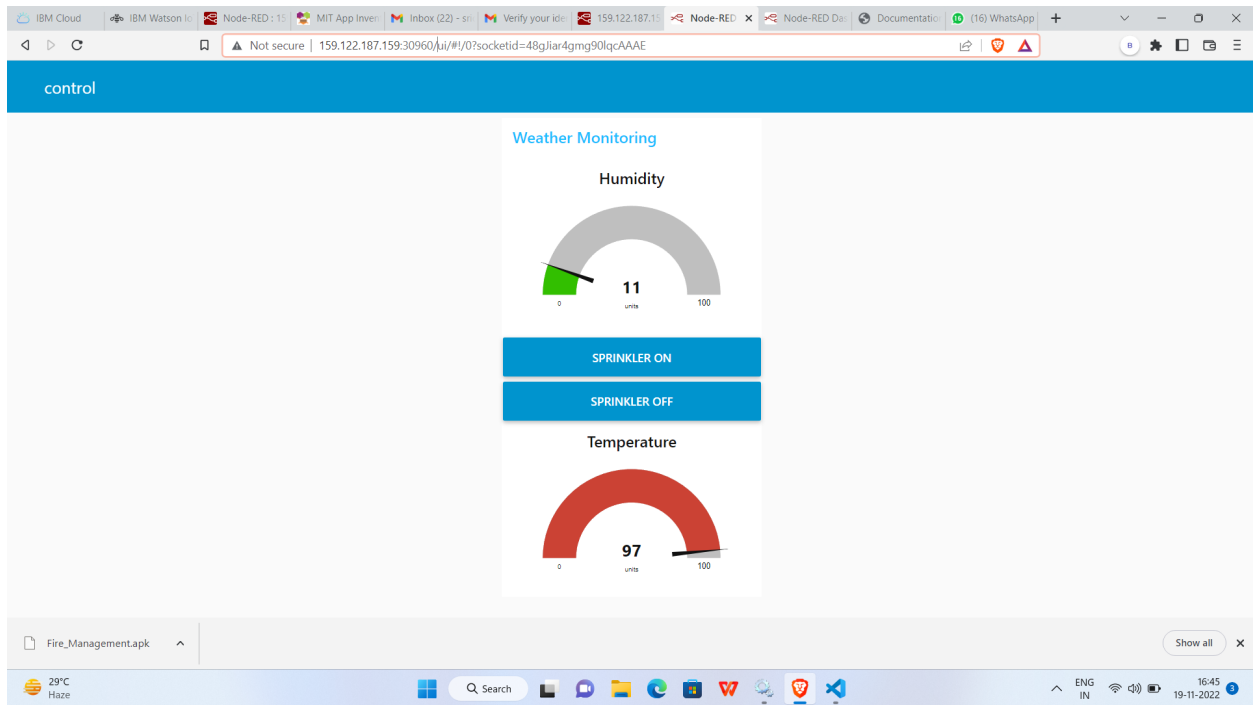
### 7.1 Feature 1

#### 1 IoT device

#### 2 IBM Watson Platform

## 8.1 TESTING AND RESULTS

## 8.1 Test Cases



## 9. ADVANTAGES

- 1 Reduced installation cost.
- 2 They monitor 24/7.
- 3 Improved security in homes, industries and Offices
- 4 It pin points location of the fire.

## 10. DISADVANTAGES

- 1 Heat detectors are not considered as life saving devices because they are sensitive only to heat.
- 2 High battery or current consumption will need for these detectors.
- 3 Control panel may need to be replaced if it becomes damaged.

## 11. CONCLUSION

This gas leakage device has numerous industrial applications in addition to home security. In the past, industrial and residential fires and gas leaks have caused extensive damage and losses. If the right steps are not taken promptly, gas leaks and fire outbreaks can expand rapidly and cause considerably greater loss of life and property. So, in this case, we suggested a system that alerts us to gas and fire outbreaks and identifies them so that the appropriate steps can be done to manage them.

## 12. FUTURE SCOPE

The function of smoke detectors and alarms is evolving from simple smoke detection to combination detectors and multicriteria detectors. The identification of more combustion byproducts, such as carbon monoxide, carbon dioxide, sulphur dioxide, and nitrogen dioxide, in addition to heat and particulate matter, will be possible in the future with multicriteria detection. Within the next ten years, video image detection (VID), which enables the isolation and detection of the picture of smoke or flame from within a room or place using analytics, will become more widely used. The VID system would also be capable of detecting the presence of a person inside the area and, through integration with the notification appliances, would be able to provide an exit route.

## 13. APPENDIX

### 13.1 Source Code

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

#Provide your IBM Watson Device Credentials
organization = "7qysjg"
```



```

deviceType = "VENGADESH"
deviceId = "VENGAD123"
authMethod = "use-token-auth"
authToken = "2001VENGAD"

# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    else :
        print ("led is off")
    #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(0,100)

Humid=random.randint(0,100)

data = { 'temp' : temp, 'Humid': Humid }

#print data

def myOnPublishCallback():

    print ("Published Temperature = %s C" % temp, "Humidity = %s"
%%" % Humid, "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:

```

C:\Windows\system32\cmd.exe
Microsoft Windows [version 10.0.22000.1888]
(c) Microsoft Corporation. All rights reserved.

C:\Users\user\Documents\ASDFGH\shootpython.exe sample.py
Enter ambient room temperature (°C): 25
Enter the horizontal distance between the fire and sprinkler head (m): 5
Enter the vertical distance between the fire and sprinkler head (m): 0
Enter RRD value of the sprinkler head: 5
Enter conduction value of the sprinkler head: 11
Enter sprinkler activation temperature (°C): 48
Enter fire's growth rate. Select from the list [slow, medium, fast, ultra-fast]: fast

```

## Github Link:

<https://github.com/IBM-EPBL/IBM-Project-2290-1658469331>