PROJECT REPORT

PROJECT TITLE : INDUSTRY-SPECIFICINTELLIGENT FIRE MANAGEMENT SYSTEM TEAM ID PNT2022TMID22484

1.INTRODUCTION

1.1 Project overview The three main risks for the process industry are fire, explosion, andhazardous leakage, with fire being the most frequent one. The needforautomatic intelligent fire alarm systems in residential and commercial buildingshas increased due to an increase in fire incidences and propertyloss. Anintelligent fire alarm system is made expressly to offer benefits includingpinpointing the location of the fire, finding any wiring issues, andensuringsimpler maintenance. To detect any changes in the environment, this systemhastemperature, flame, and gas sensors. The exhaust fans are turned onbasedonthe temperature readings and whether any gases are present. The sprinklerswillbe turned on automatically if any flame is found. The authorities andtheFirestation are notified of emergency notifications. Additionally, thesecontemporary intelligent fire alarm systems are capable of recognising false alarm

Purpose The main goal of a fire alarm system is to give people advance noticeofafire so they can escape and take swift action to minimise the effects of thefireas soon as possible.

2.LITERATURE SURVEY

2.1 Existing problem Traditionally, fire monitoring systems have only used a singlesensor, such as smoke or flame. These single sensor systems cannot distinguishbetween real and fake fire presence. Relying on a single sensor all dayandrunning the risk of false alarms results in energy inefficiency and environmentalharm. We require a system that is capable of accurately detecting fire as well asan intelligent solution. To improve the functionality of existing singlesensorsystems, the smart fire management system includes a temperature sensor, aflame sensor, and a gas sensor. This system also requires a good networkwithseparate smart devices connected to various panels.

2.2 References

[1] N N Mahzan, N I M Enzai, N M Zin and K S S K MNoh, ”DesignofanArduino-based home fire alarm system with gSMmodule”, 1st Internationalconference on green and Sustainable computing (ICoGeS), 2017. [2] ZHANG Ying-Cong, YU Jing, “Study on the Fire IOTDevelopmentStrategy”, Shenyang Fire Research Institute --Radiant Energy-SensingFireDetectors for Automatic Fire Alarm Signaling, US: ANSI/FMRC, pp. FM3260-2004. [3] Public Security, Shenyang 110034, China Shenyang Institute of Engineering,Shenyang 110136, China, 2019. Liu Yunhong Qi Meini,"The Designof BuildingFire Monitoring System Based on ZigBee-WiFi Networks", Eighth InternationalConference on Measuring Technology and Mechatronics Automation,

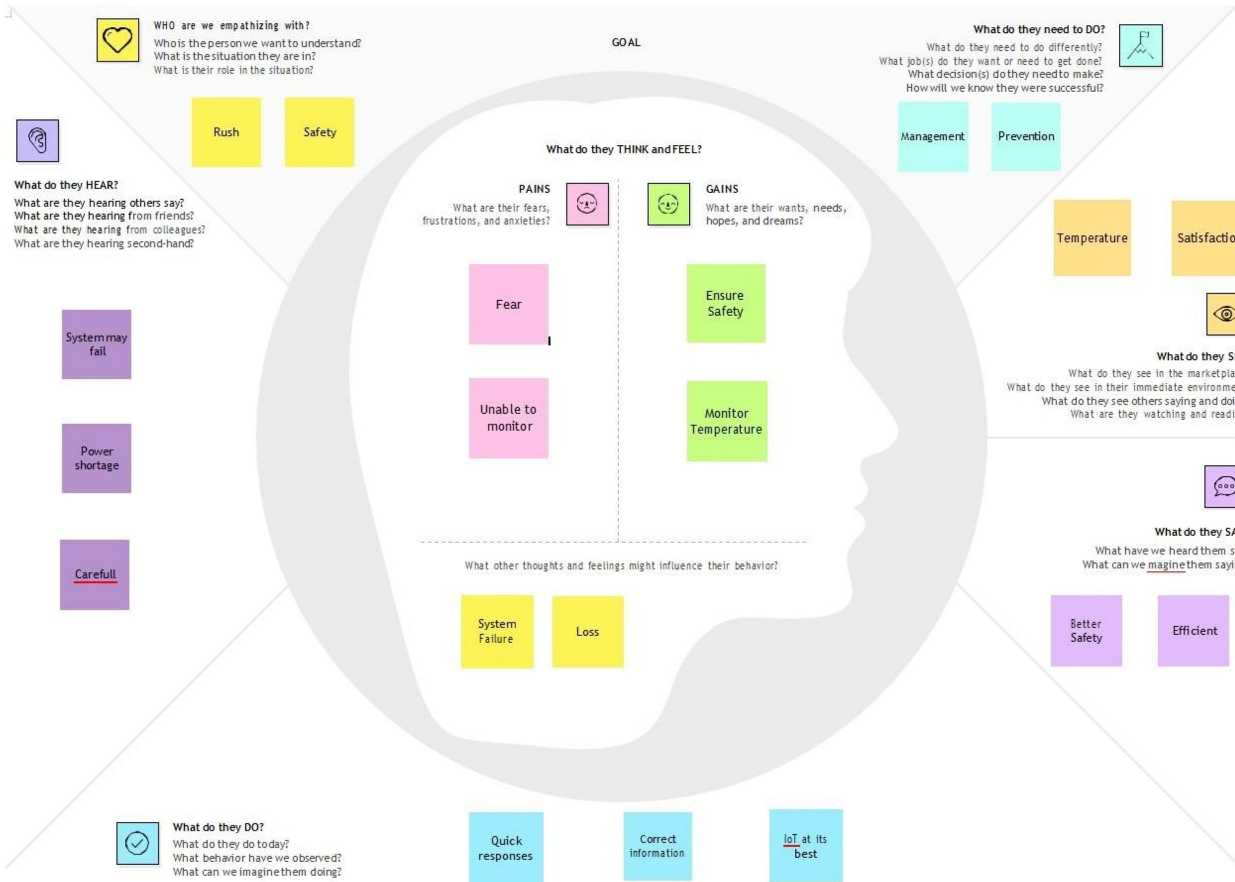
IEEE,2016, pp-733-735 [4] R.A. Sowah, A.R. Ofoli, S.N. Krakani, S.Y. Fiawoo, hardware DesignandWeb-Based Communication Modules of a Real-Time multisensor Fire Detection

2.3 Problem Statement

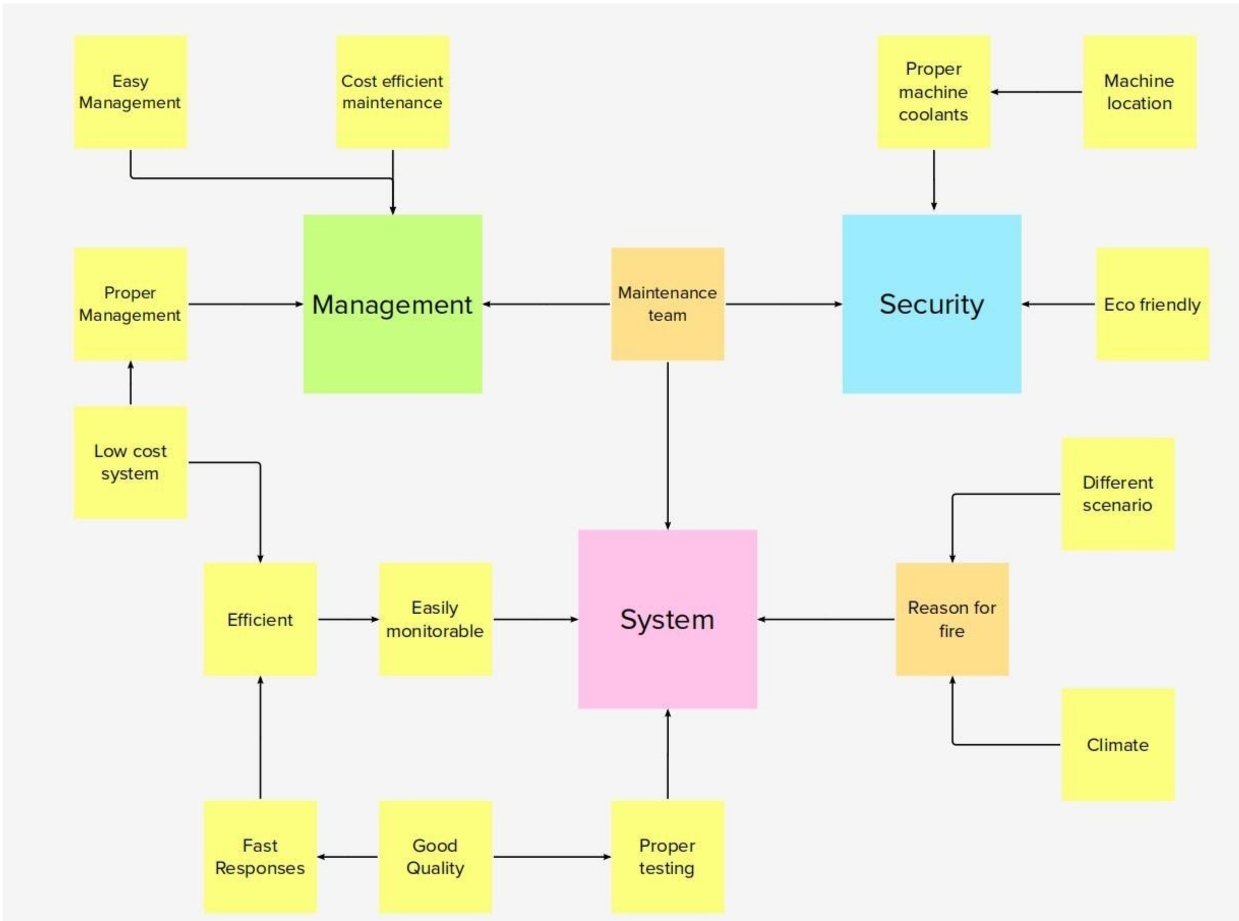
Definition Industry-Specific Systemsformanaging firesintelligently are intendedtopreventindustrialfires caused by gasleaks and flame.

3.IDEATION & PROPOSED SOLUTION

EMPATHY MAP AND BRAINSTORMING



WHO are we empathizing with?
Who is the person we want to understand?
What is the situation they are in?
What is their role in the situation?
Rush
Safety
GOAL
What do they need to DO?
What do they need to do differently?
What job(s) do they want or need to get done?
What decision(s) do they need to make?
How will we know they were successful?
Management
Prevention
What do they HEAR?
What are they hearing others say?
What are they hearing from friends?
What are they hearing from colleagues?
What are they hearing second-hand?
System may fail
Power shortage
Carefull
What do they THINK and FEEL?
PAINS
What are their fears, frustrations, and anxieties?
Fear
Unable to monitor
GAINS
What are their wants, needs, hopes, and dreams?
Ensure Safety
Monitor Temperature
What other thoughts and feelings might influence their behavior?
System Failure
Loss
Temperature
Satisfaction
What do they SEE?
What do they see in the marketplace?
What do they see in their immediate environment?
What do they see others saying and doing?
What are they watching and reading?
What do they SAY?
What have we heard them say?
What can we magine them saying?
Better Safety
Efficient
What do they DO?
What do they do today?
What behavior have we observed?
What can we imagine them doing?
Quick responses
Correct information
IoT at its best


Easy Management
Cost efficient maintenance
Proper machine coolants
Machine location
Proper Management
Management
Maintenance team
Security
Eco friendly
Low cost system
Different scenario
Efficient
Easily monitorable
System
Reason for fire
Climate
Fast Responses
Good Quality
Proper testing


Proper machine coolants
Machine location
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Different scenario
Easy Management
Fast Responses
Low cost system
Reason for fire
Good Quality
Proper testing
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Efficient
Climate
Proper Management
Cost efficient maintenance
Eco friendly
Maintenance team
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

Rithik

- Reason for fire
- Easy Management
- Low cost system
- Eco friendly

Kumar

- Proper Management
- Good Quality
- Fast Responses
- Climate

Ritthik Raj

- Efficient
- Proper testing
- Easily monitorable
- Different scenario

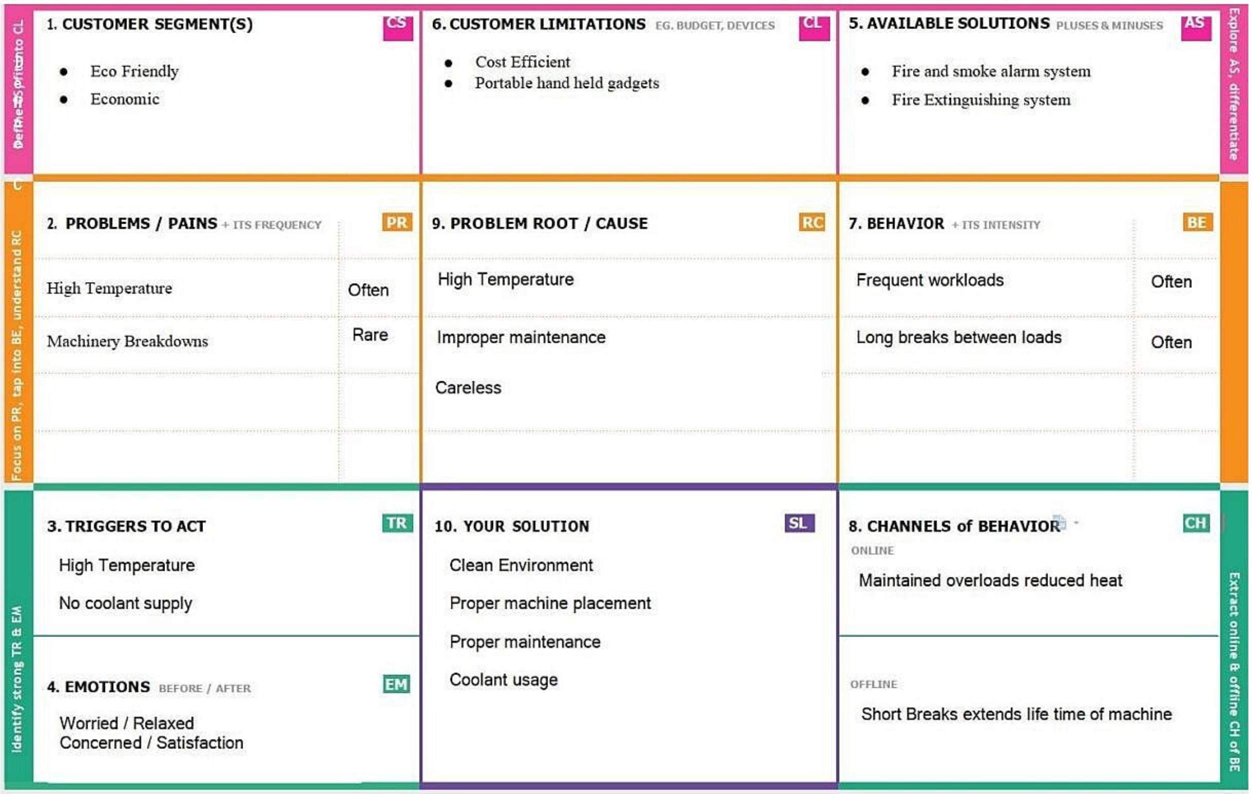
Rithika

- Cost efficient maintenance
- Proper machine coolants
- Maintenance team
- Machine location

PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Many industries face fire related problems and accidents. To prevent these accidents and to manage temperature we need a fire management system.
2.	Idea / Solution description	The idea is to detect high temperature and smoke. And the temperature is reduced by maintaining room humidity and suppressing fire in-case of any accident
3.	Novelty / Uniqueness	Detects the fire even before it starts. Easy Management and efficient work flow.
4.	Social Impact / Customer Satisfaction	Fearless work hours for industry employees. Reduce the amount of destruction. To warn everyone if there is some caution.
5.	Business Model (Revenue Model)	The successful launch of the system will be great impact and leads to new revolution
6.	Scalability of the Solution	It helps in reducing destruction of machine, prevents loss of life, reduces expenditure, easy maintenance.

PROPOSED SOLUTION FIT



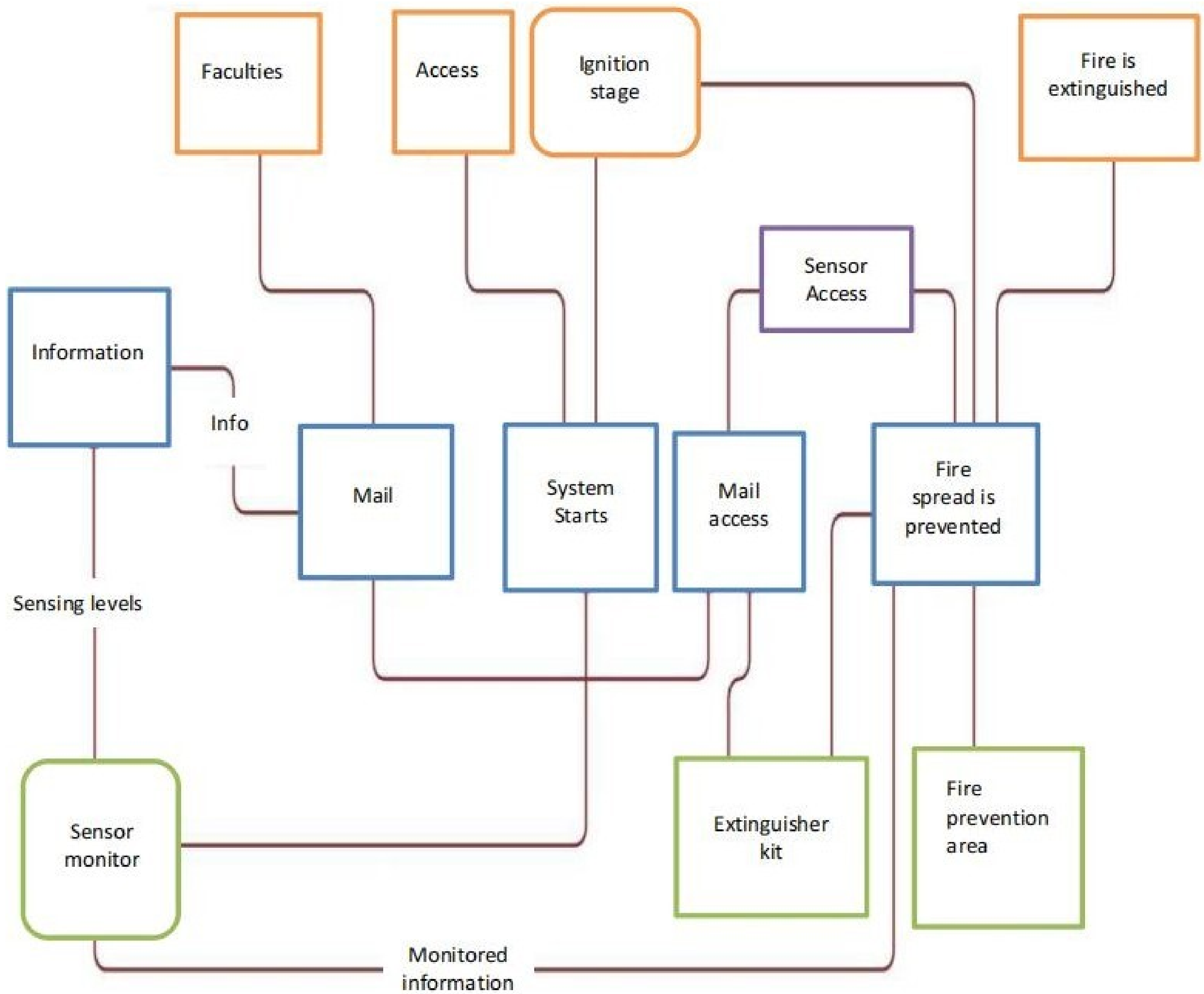
FUNCTIONAL REQUIREMENT

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 Email or 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

NON FUNCTIONAL REQUIREMENT

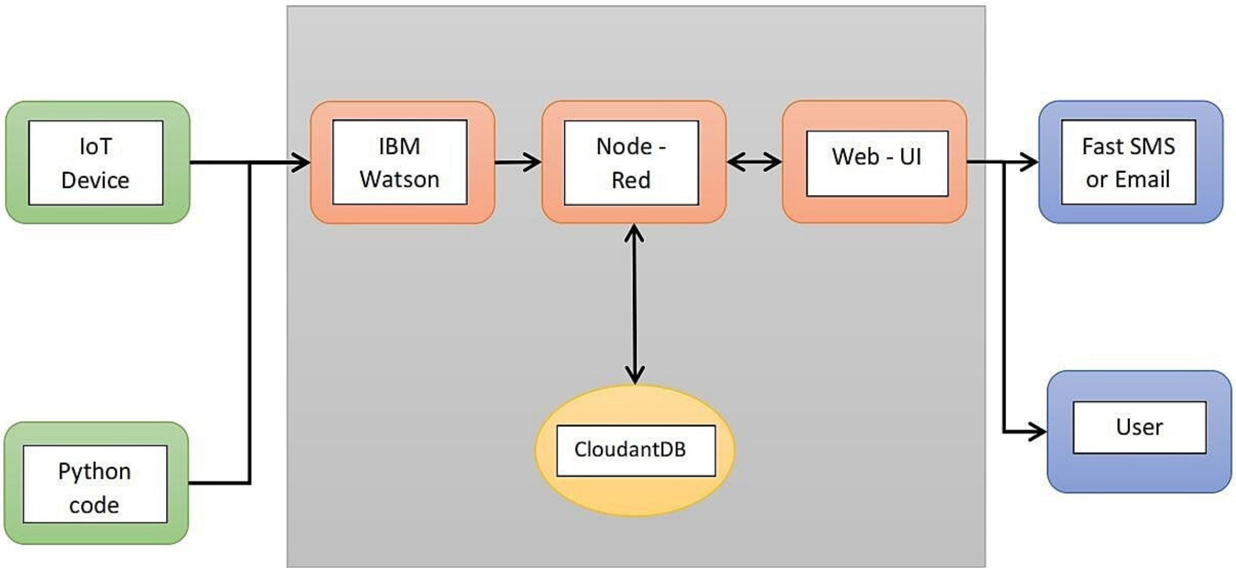
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability requirements includes language barriers and localization tasks. Usability can be assessed by Efficiency of use.
NFR-2	**Security**	Access permissions for the particular system information may only be changed by the system' s data administrator.
NFR-3	**Reliability**	The database update process must roll back all related updates when any update fails.
NFR-4	**Performance**	The front-page load time must be no more than 4 seconds for users that access the website using an VoLTE mobile connection.
NFR-5	**Availability**	New module deployment must not impact front page, product pages, and check out pages availability and mustn't take longer than one hour.
NFR-6	**Scalability**	We can increase scalability by adding memory, servers, or disk space. On the other hand, we can compress data, use optimizing algorithms.

DATA FLOW DIAGRAM



SOLUTION ARCHITECTURE

CLOUD SERVICES



USER STORIES

User Type	Functional requirement	User story number	User story/task	Acceptance criteria	Priority	Release
Customer (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 and password	High	Sprint-1

PROJECT PLANING AND SCHEDULING

1 sprint planing and estimation

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like Open Weather Map API.	1	LOW	Rithik Rithik raj Rithika Kumar
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM	Rithik Rithik raj Rithika Kumar
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	Rithik Rithik raj Rithika Kumar
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Rithik Rithik raj Rithika Kumar
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Rithik Rithik raj Rithika Kumar

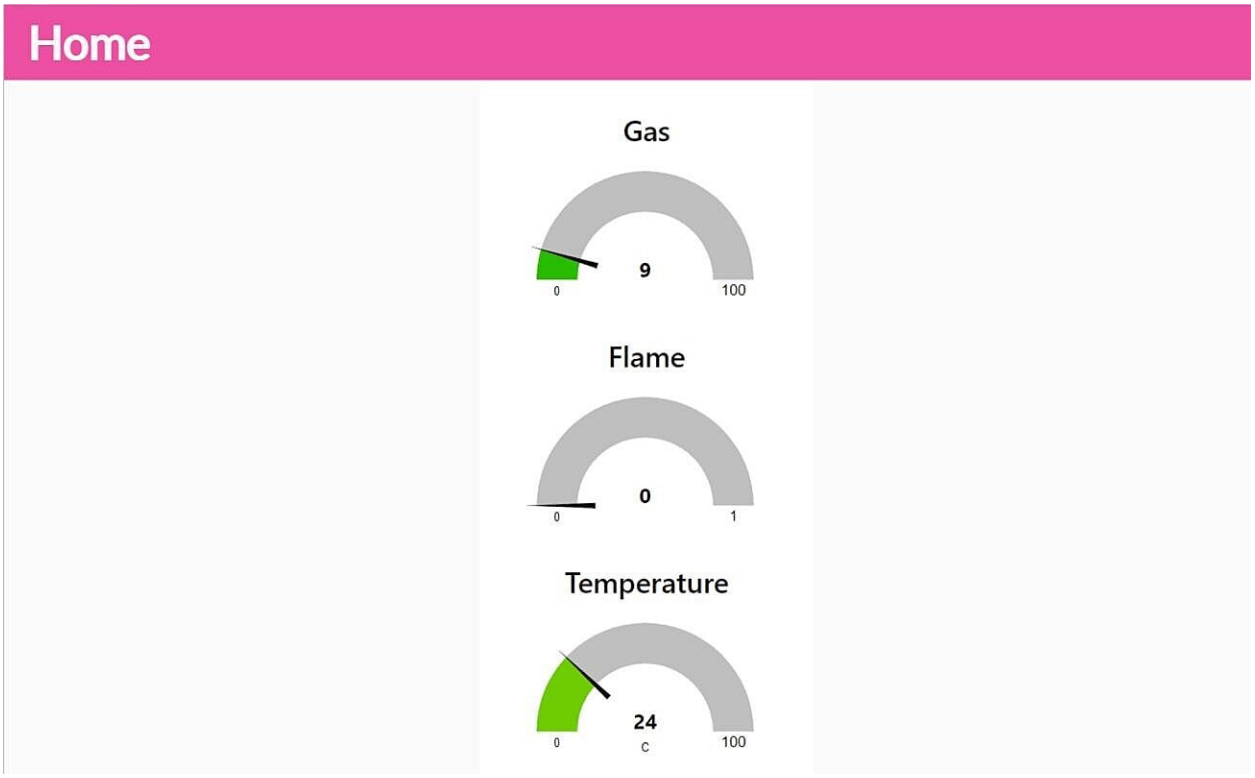
1. CODING & SOLUTION

   a. Features

      i. IoT device
      ii. IBM Watson Platform
      iii. Node red
      iv. Cloudant DB
      v. Web UI
      vi. MIT App Inventor

vii. Python code
viii. Wokwi

TESTING AND RESULT



1. ADVANTAGES

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

2. DISADVANTAGES

- Heat detectors are not considered as life savingdevices because they aresensitive only to heat.
- High battery or current consumption will need for these detectors.
- Control pannel may need to be replacedif it becomes damaged.

CONCLUSION

This gas leakage device has several industrial uses 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 breakouts and identifies them so that the appropriate steps may be done to manage them.

FUTURE SCOPE

Thefunction 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, carbondioxide, 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 capableof detecting the presence of a person inside the area and, through interaction with the notification appliances, would be able to give an evacuation route.

APPENDIX

SOURCE CODE

```
#include
<WiFi.h>
#include
<Wire.h>
#include
<SPI.h>
#include
"ThingSpeak
.h"#include
<WiFiClient.
h>



unsigned long myChannelNumber = 2;
const char * myWriteAPIKey =
"25V40ZAPI6KIZFGY";int LED_PIN = 32;
const
int
mq2 =
4;int
value
= 0;
int
flame_sensor_
pin = 10;
lame_pin =
HIGH;
char ssid[] = "NALAIYA";
char pass[]= "NALAIYATHIRAN";
WiFiClient client;
```

```
#define PIN_LM35 39
#define ADC_VREF_mV3300.0
#define ADC_RESOLUTION 4096.0
#define RELAY_PIN 17
#define RELAY_PIN1 27


void setup(){
Serial.begin(115200);
pinMode(RELAY_PIN,
OUTPUT);
pinMode(RELAY_PIN1,
OUTPUT);
Serial.print("Con
necting to ");
Serial.println(ssid
); WiFi.begin(ssid,
pass);
int wifi_ctr = 0;
while (WiFi.status() !=
WL_CONNECTED){
delay(1000); Serial.print(".");
}
Serial.println("WiFi
connected");
ThingSpeak.begin(cli
ent);
pinMode(LED_PIN,
OUTPUT);
pinMode(mq2, INPUT);
pinMode (
flame_sensor_pin , INPUT
);pinMode(BUZZER_PIN,
OUTPUT);
}


void temperature(){
int adcVal = analogRead(PIN_LM35);
float milliVolt = adcVal * (ADC_VREF_mV /
ADC_RESOLUTION);float tempC = milliVolt / 10;
Serial.print("Tem
perature: ");
Serial.print(temp
C);
Serial.print("°C"
);
```

```
if(tempC > 60){
Serial.println("Alert");
digitalWrite(BUZZER_P
IN, HIGH);
}
else{
digitalWrite(BUZZER_PIN, LOW);
}
int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey);
}


void GasSensors(){
int gassensorAnalogmq2 =
analogRead(mq2);Serial.print("m
q2 Gas Sensor: ");
Serial.print(gassensorAnalogmq2
); Serial.print("\t");
Serial.print("\t");
Serial.print("\t");
if (gassensorAnalogmq2
>
1500){Serial.println("m
q2Gas");
Serial.println("Alert");
digitalWrite(RELAY_PI
N1, HIGH);
}
else{
Serial.println("No
mq2Gas");
digitalWrite(RELAY_PI
N1, LOW);delay(100);
}
int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2, myWriteAPIKey);
}


void flamesensor(){
flame_pin = digitalRead(
flame_sensor_pin );if (flame_pin
== LOW ){
Serial.println (" ALERT: FLAME IS
DETECTED" );digitalWrite
(BUZZER_PIN,HIGH ) ;
}
else{
Serial.println ( " NO FLAME
```

```
DETECTED " );digitalWrite
(BUZZER_PIN , LOW );
}
int value =
digitalRead(flame_sensor_pin
);if (value ==LOW) {
Serial.print("FLAME");
digitalWrite(RELAY_PIN,
HIGH);
} else {
Serial.print("NO
FLAME");
digitalWrite(RELAY_
PIN, LOW);
}
}
void loop(){
temperature()
 gas sensor()
flame sensor()
}
```