INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

DOMAIN: INTERNET OF THINGS

Team ID: PNT2022TMID28313

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INDEX

INTRODUCTION

OVERVIEW:

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. Moreover, these modern intelligent fire alarm systems are more sensitive as compared to the classic models and are competent to detect false alarms.

Intelligent fire alarm systems utilize smart devices along with wireless technology to protect & manage buildings or workstations through a remote-control panel (essentially a mobile application that can be downloaded, installed, and accessed from a smartphone). Intelligent fire alarm systems are usually available in three designs: addressable, conventional, and wireless.

PURPOSE:

The primary purpose of a fire management system is to design, manage, plan and co-ordinate appropriate fire safety procedures to reduce the risks of fire and to ensure the safety of building occupants.

A complete fire management system ensures legal compliance and protection of lives and assets**.**

LITERATURE SURVEY:

1)Title: Urban Fire Risk Evaluation Based on 2-tuple AHP—Taking the 8th Division with Shihezi City for Example

Author: Caihong Yin; Kaixuan Qi; Kunze Li; Qiangling Duan; Lijing Gao; Jinhua Sun

Published in : 2019

Abstract: The evaluation of urban fire risk was an important gist of scientific and effective urban firefighting management, planned and constructed. This study, took the 8th division with Shihezi city (Shi-City) as an example, an evaluation index system of urban fire risk was first built through analyzing the influential factors of fire risk in urban areas, which contained four first-class indexes and twenty-two second-class indexes. Then, to overcome the weaknesses of the analytic hierarchy process (AHP), 2-tuple fuzzy linguistic representation model was incorporated into AHP to calculate the weights of indexes. After that, an urban fire risk evaluation model was proposed. Finally, the developed model was applied into the fire risk evaluation of Shi-City and the fire risk rating of Shi-City was derived as slightly higher than medium, which offered significant guidance for fire control and safety management

2)Title: Application of PHM Technology in the Design of Tank Fire Control System

Author: Jing Xu;Yang Lei; Bin Liu; Chao Ji; Lijun Nan

Published in : 2018

Abstract: Combined with the process of Prognostics Health Management (PHM), the technology and application of armored vehicle fire control system PHM were discussed. The architecture of the health management system for tank fire control system was researched. According to the information characteristics of tank fire control system, the dual redundant bus transmission technology of FLEXRAY and CAN was applied, and the corresponding software and hardware systems were designed. Through the vehicle test, it was proved that the health management system will be effective for locating the fault, comparing the aim and assisting the soldier training. The data and video collected by this system were convenient for both maintenance and further study as the basic data.

3)Title: Fire Safety Management in Transportation of Municipal Wastes with the Use of Geographic Information System

Author: O.P. Savoshinsky; A.A. Zakharova; A.V. Pak

Published in : 2018

Abstract: Fire safety management is one of the main tasks in the field of waste safety. The transportation of municipal waste was a complex management task that requires a

highly skilled decision maker. The current management technique is based on the approach to the construction of systems based on the analysis, by assessing the set of initial factors, which does not allow to achieve the management goal. The proposed approach based on synthesis was devoid of this drawback. The application of the system was shown by the example of the use of geoinformation systems to the problem of fire safety in the transportation of municipal waste.

4)Title: Fire incidents Management System in the city of Manila through Geo-Mapping

Author: Maricor Y. Ingal; Ralph Louisse T. Tolentino; Mico J. Valencia; Francis F. Balahadia; Arlene R. Caballero

Published in : 2016

Abstract: Fires had become a concern in recent years in the city of Manila, posing a threat to the entire community. Manila Fire District was facing problems in their internal transactions between different sub-stations. The study served as an automated fire incidents management system that can provide a chart and a summary based on the input data of each sub-station and can provide a map of all the fire incidents through geo-mapping in districts of Manila. This study, Manila Fire District implemented appropriate programs and lead awareness campaign to the community to help lessen fire incidents and mitigated its damages.

5)Title: Fire Safety Management Information System Design for Key Social Organizations

Author: Xu Fang; Zhang Di; Wang Jun

Published in : 2014

Abstract: Aimed at the actual fire safety management needs of key social organizations and units, this paper introduced the design and implementation of the fire safety management information systems of the networked key organizations and units, provide information sharing and services on fire-fighting facilities' operating conditions, fire alarm information, and fire management information to the networked users, fire maintenance enterprises, and the fire supervision and administrative authorities so as to improve the fire safety management efficiency for these organizations and units, offered a scientific tool to the organizations to improve their fire safety management level, extended the functions of fire remote monitoring control system, and promoted fire prevention and controlled capability of the whole community.

6)Title: Discussion of Society Fire-Fighting Safety Management Internet of Things Technology System

Author: Wang Jun; Zhang Di; Liu Meng; Xu Fang; Sui Hu-Lin; Yang Shu-Feng
Published in: 2014

Abstract: IOT is regarded as another information industry wave following computer, Internet and mobile communication network, and had become one of strategic dominant positions of new economic and technological development all over the world. The society fire-fighting safety management was an important application field of Internet of Things (IOT) technology. This paper combines application features of IOT technology according to fire fighting business requirement to discuss the fire-fighting IOT systematic frame, plan society fire-fighting safety management IOT technology system, and proposed priority development points of society fire-fighting safety management IOT technology, thereby provided reference for technology research and development of IOT technology in society fire-fighting safety management field.

7)Title: Automatic fire alarm and fire control linkage system in intelligent buildings

Author: Wang Suli; Liu Ganlai

Published in : 2010

Abstract: This paper described a comprehensive program of an office building intelligent systems Fire Control Linkage System subsystem design, At the same time, it described the following: the idea of the system design, the system components, selecting equipment, the linkage of alarming and controlling gas extinguishing, and the technical features. Projects under this program have been completed, can realize the intelligent prediction of fire, automatic fire alarm and linkage functions.

8)Title: A System design of the Tahe's forest -Fire -prevention Management System

Author: Xindan Gao; Nihong Wang; Jun Li

Published in : 2010

Abstract: This article paper aimed to introduces how a system was designed for Tahe's forest-fire prevention management in Northeast China after a brief introduction to the overall functional characteristics, the overall function flow chart and the operating environment of the forest -fire -prevention management system. firstly, and then This system design consists of seven function modules, which were geographic information system module, fire-risk each function module of the system in detail, including geographic information system module, fire forecast module, forest -fire -alarm receiving module, blazes fire-put out-aided decision-making module, forest-fire-put-out troops sending module, loss evaluation module, forest -fire -prevention office and information management module and as well as GPS real-time monitoring module.

Among all modules, the geographic information system module was the core of those fire -prevention -management system, and other various modules were carried out various functions through links with the core module, based on its function, realized link. In conclusion, that this paper summarized the whole system design work done by this paper and as well as the advantages and disadvantages of this system.

9)Title: Building fire rescue with evacuation management information system and its application

Author: Xu Tao; Mao Guozhu; Li Xin; Zhao Lin

Published in : 2009

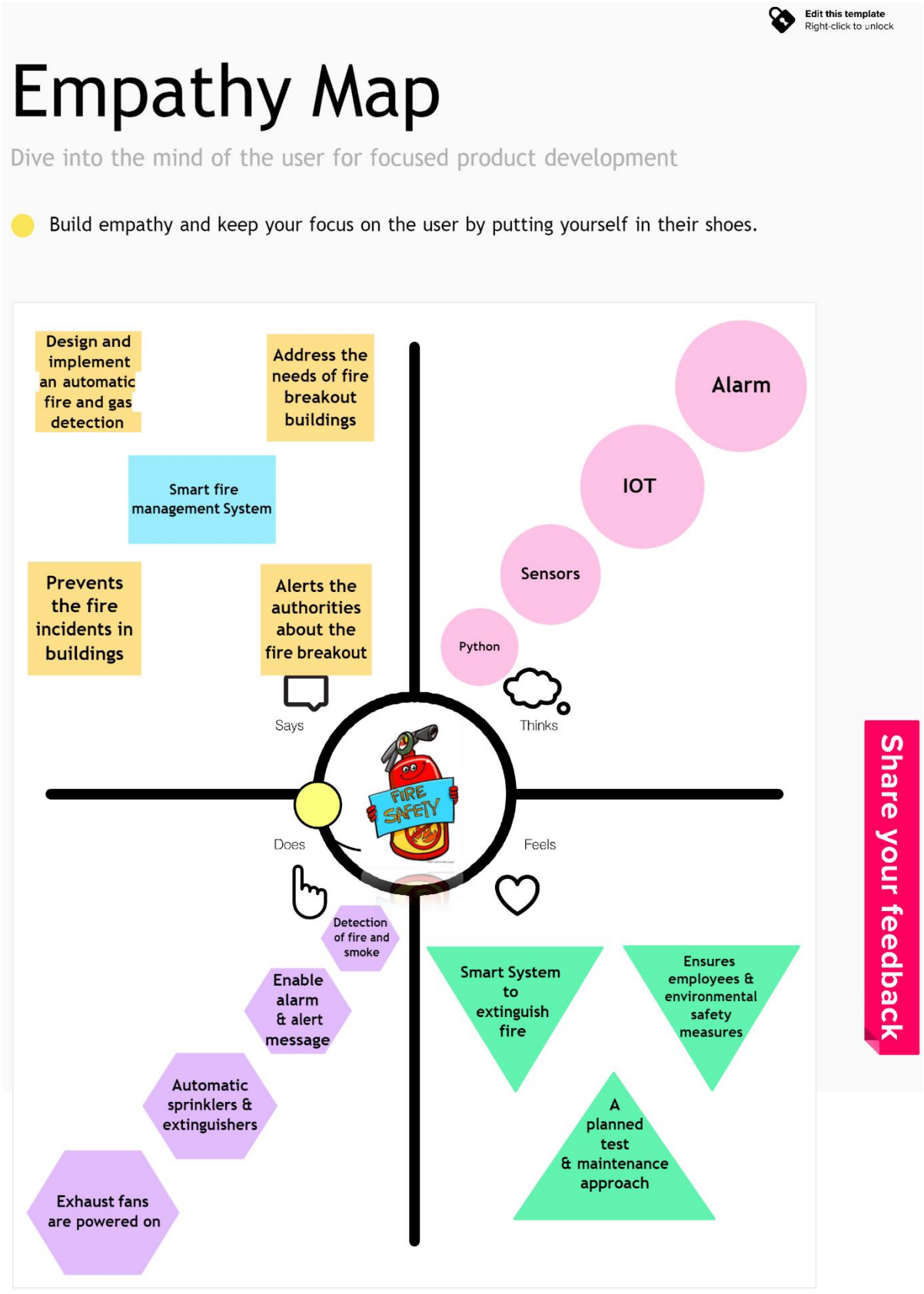
Abstract: Building Fire Rescue with Evacuation Management Information System (BFREMIS) was established. And the evacuation model of BFREMIS was analyzed and presented in this paper. Based on the constructed network model, the evacuation of the teaching building in the university was analyzed by using the software EVACNET4. The analysis items included: the total evacuation time, the floor clear time, evacuation bottleneck, and the visual path of the evacuation on MAPGIS platform. BFREMIS was valuable in building safety assessment and building fire rescue.

10) Title: Forest Fire Management at Aggtelek National Park Integrated Vegetation Fire Management Program from Hungary

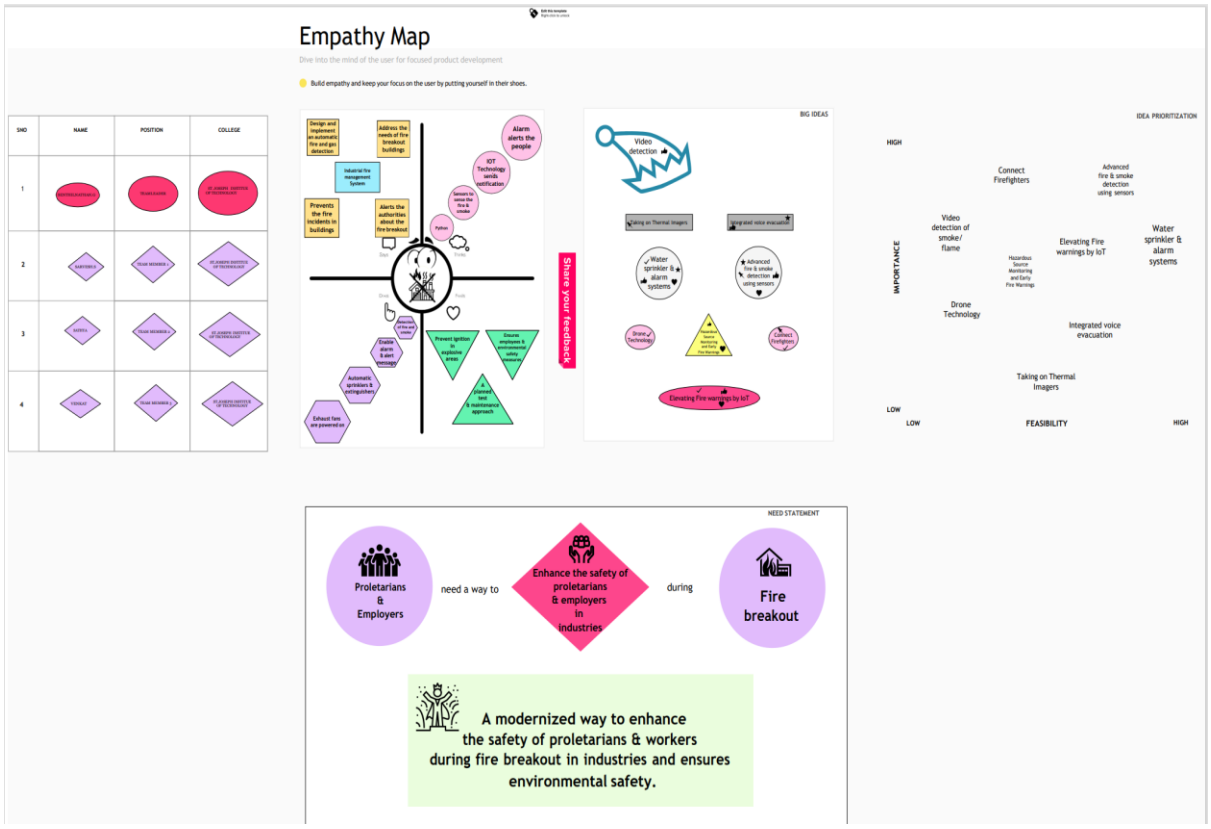
Author: Agoston Restas Published in : 2006

Abstract: Szendro Fire Department is located in the northeastern part of Hungary. The main task was to fight against wildfire and mitigate the impact of fire at the Aggtelek National Park - which belongs to the UNESCO World Heritage list. In 2004 the Fire Department started a project named Integrated Vegetation Fire Management (IVFM). The IVFM consist of two main parts: Peripheries and Modules. The Modules are: Tower based environment monitoring and fire detection system, Mobile command control unit and Static and dynamic decision support system. The Tower based environment monitoring and fire detection system addressed the Fire Department by hot information. The Static and dynamic decision supported system was based on robot reconnaissance aircraft (UAV-RRA)- dynamic parts; and the GIS - static parts. The data supplied by the robot reconnaissance aircraft was combined with the GIS based fuel model and other information to predict the fire activity. The environment monitoring and fire detection system and the Dynamic part (UAV-RRA) of Decision support system based on remote sensing

PREPARE EMPATHY MAP:



IDEATION:


Empathy Map
Dive into the mind of the user for focused product development
Build empathy and keep your focus on the user by putting yourself in their shoes.
SNO
NAME
POSITION
COLLEGE
Share your feedback
BIG IDEAS
Video detection
Water sprinkler & alarm systems
Advanced fire & smoke detection using sensors
Drone Technology
Elevating Fire warnings by IoT
IDEA PRIORITIZATION
HIGH
IMPORTANCE
LOW
FEASIBILITY
LOW
HIGH
Connect Firefighters
Advanced fire & smoke detection using sensors
Video detection of smoke/ flame
Elevating Fire warnings by IoT
Water sprinkler & alarm systems
Drone Technology
Integrated voice evacuation
Taking on Thermal Imagers
NEED STATEMENT
Proletarians & Employers
need a way to
Enhance the safety of proletarians & employers in industries
during
Fire breakout
A modernized way to enhance the safety of proletarians & workers during fire breakout in industries and ensures environmental safety.

PROPOSED SOLUTION:

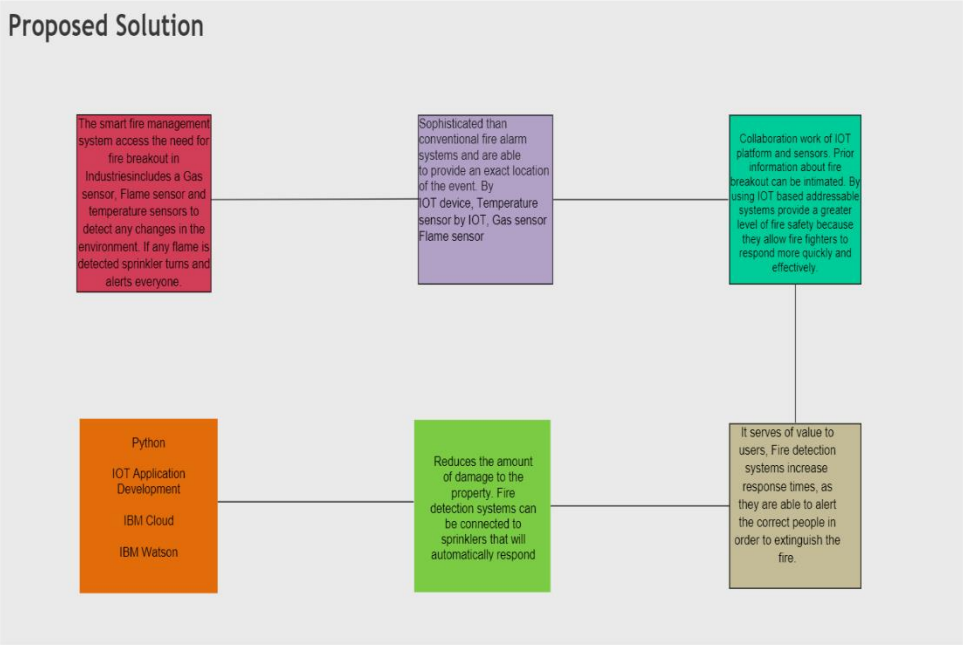
Project team shall fill the following information in proposed solution template.

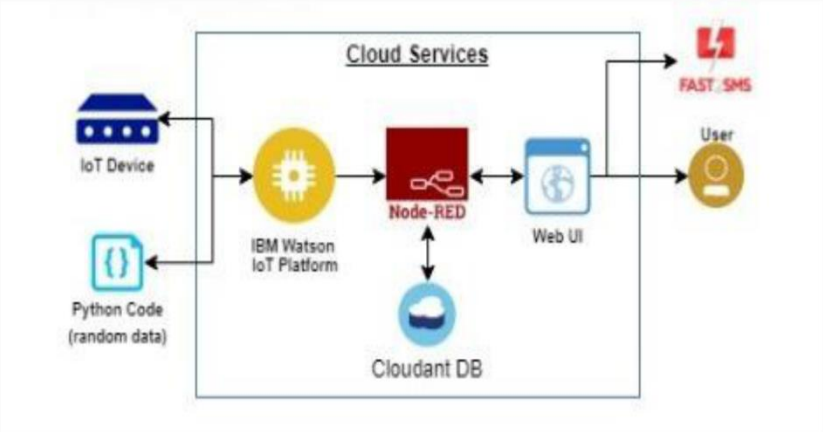
S.NO.	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to be solved)	• The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment. • Based on the temperature readings and if any Gases are present the exhaust fans are powered ON. • If any flame is detected the sprinklers will be switched on automatically. • Emergency alerts are notified to the authorities and Fire station • Access the needs of fire breakout buildings.
2	Idea / Solution description	• Intelligent fire management system is otherwise known as addressable fire alarms, intelligent control systems are more sophisticated than conventional fire alarm systems and are able to provide an exact location of the event. • IOT device • Temperature sensor by IOT • Gas sensor • Flame sensor
3	Novelty / Uniqueness	• Collabarotion work of IOT platform and sensors • Prior information about fire breakout can be intimated • By using IOT based sensor addressable systems provide a greater level of fire safety because they allow fire fighters to respond more quickly and effectively by pinpointing the exact location of a fire in a building.
4	Social Impact/ Customer Satisfaction	It serves of value to users, Fire detection systems increase response times, as they are able to alert the correct people in order to extinguish the fire.

5	Business Model (Revenue Model)	• Reduces the amount of damage to the property. • Fire detection systems can be connected to sprinklers that will automatically respond when a fire is detected.
6	Scalability of the Solution	• Python • IOT Application Development • IBM Cloud • IBM Watson

PROBLEM SOLUTION FIT:

SOLUTION ARCHITECTURE:





CUSTOMER JOURNEY:

Phases	Motivation	Information gathering	Analysis various products	Chooses the most efficient product	payment
Actions	Wants to reduce the tension and loss in fire accident.	Wants to choose an efficient product to get rid of fire accident.	Other similar products either detect or suppress the fire	Smart boards are more efficient compared to static board	After the product satisfication
Touch points	The Customers feel relaxed.	After installation the goverment no need to worry about the fire accident and management.	Customers will get attracted by multi-tasking and automation.	After getting this the government won't worry about the fire accident	After find the product worthy, the government get's it.
Customer Feeling					
Customer Thoughts	Customer thinks that it will be helpful to control the fire accident.	Customer thinks that it will lead for long duration.	Customer feel safe and secured by managing the fire automatically	The product choosing will be easy and also comfortable for them.	They think the product will be user friendly
Opportunities	The Buyer gets relieved from the damage due to fire accident.	The customer knows about the process of product.	The customer will be aware of other product	The customer comes to know that which one is the best product.	The customer will enjoy the journey

FUNCTIONAL REQUIREMENT:

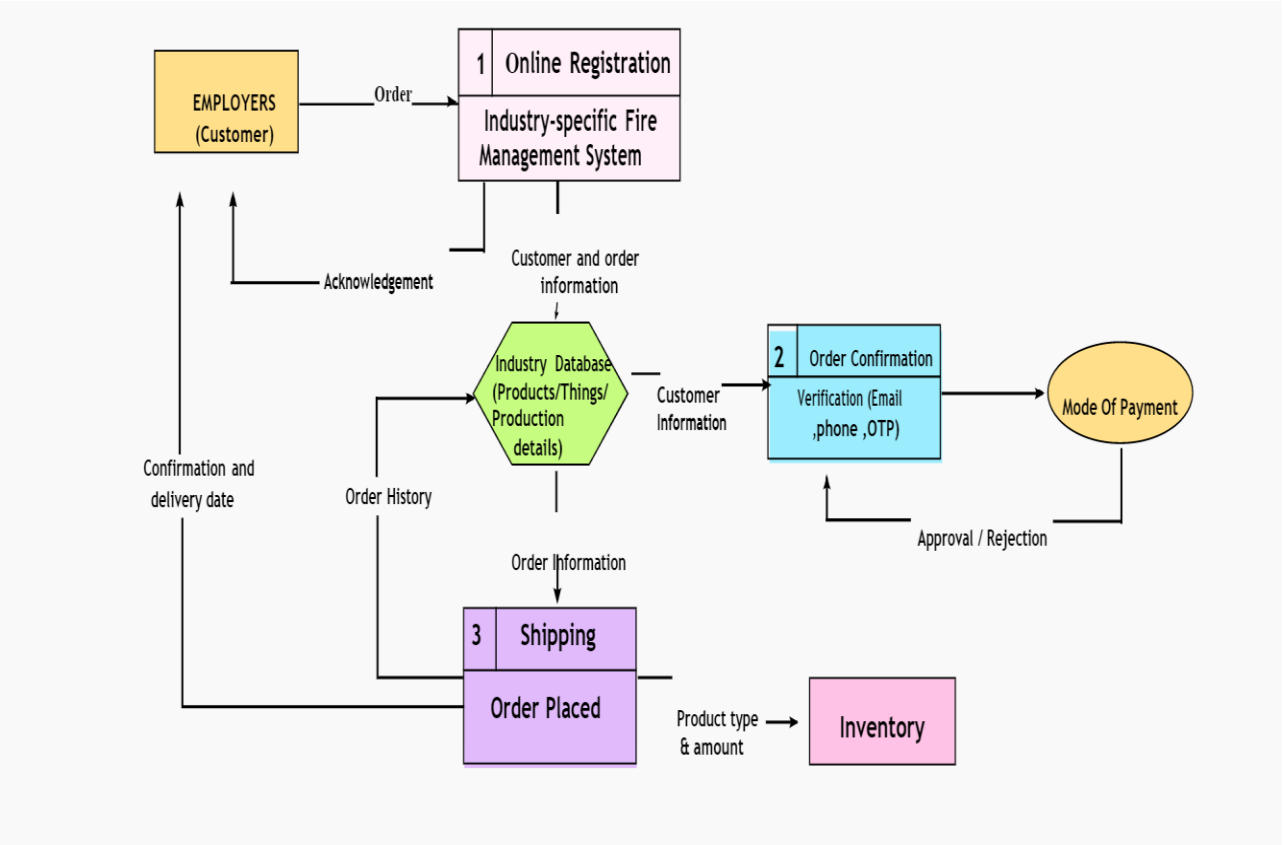
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Requirements**	Workers and Product Protection Automatic Sprinkler System Monitors Smoke ,Gas and Temperature
FR-2	**User Registration**	Manual Registration Registration through webpage Registration through Form Registration 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

Non-functional Requirements:

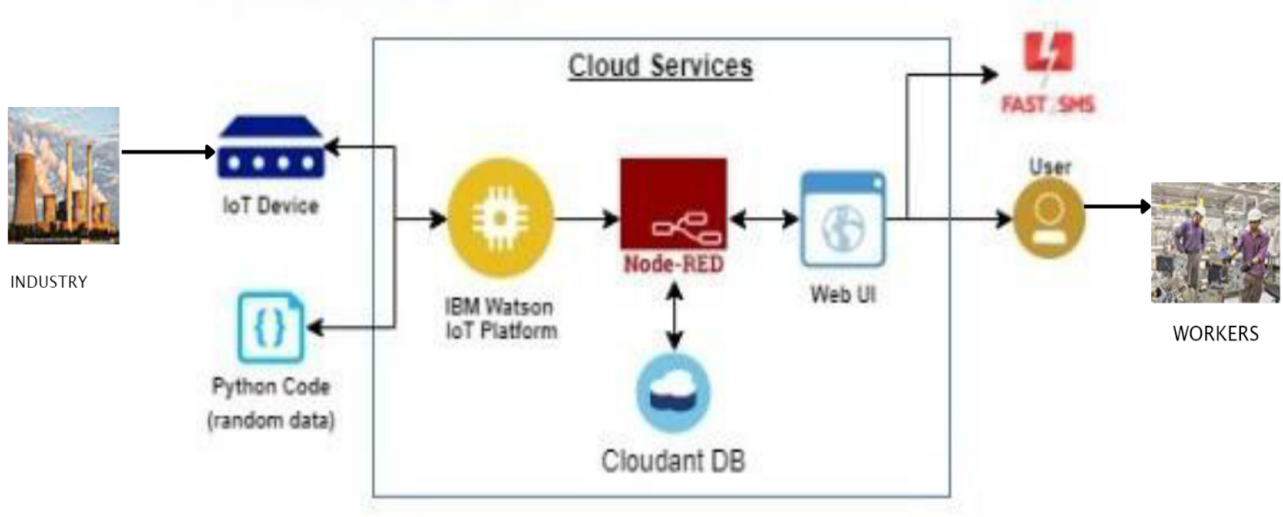
Following are the non-functional requirements of the proposed solution.

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.

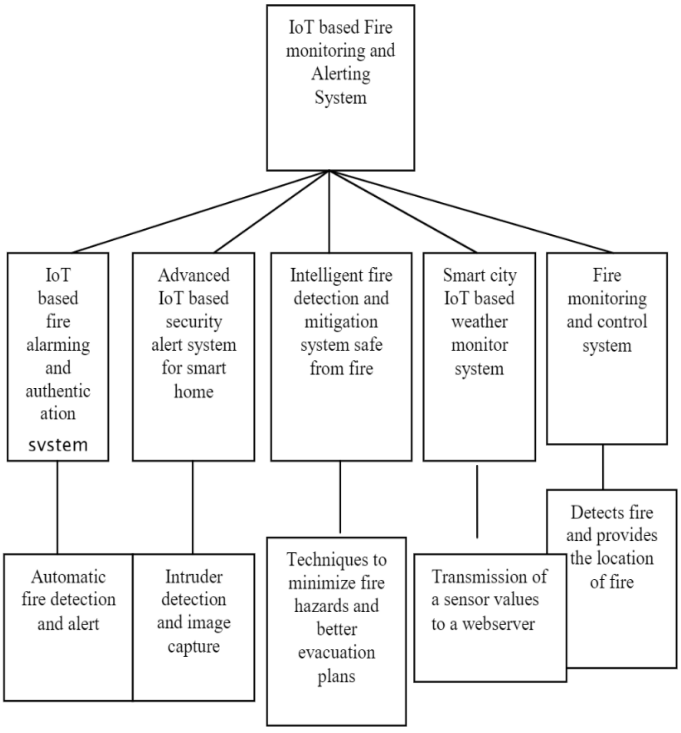
DATA FLOW DIAGRAMS:



TECHNOLOGY ARCHITECTURE:



Architecture and Data flow of the IOT Based Industry – specific Fire Management System



PREPARE MILESTONE & ACTIVITY LIST:

SPRINT	Milestones
SPRINT 1	Using WOKWI, we are going to connect temperature, flame and gas sensor to the Arduino. If the sensed temperature is greater than the threshold ,fire alert msg send to cloud.
SPRINT 2	Create and configure the IBM cloud platform and workshop using Node-Red service
SPRINT 3	Using MIT app inverter, develop a software application for fire management system. It is used to display the alert message to the user.
SPRINT 4	Connect WOKWI and MIT app invertor with IBM cloud platform. Set the modules and test the software

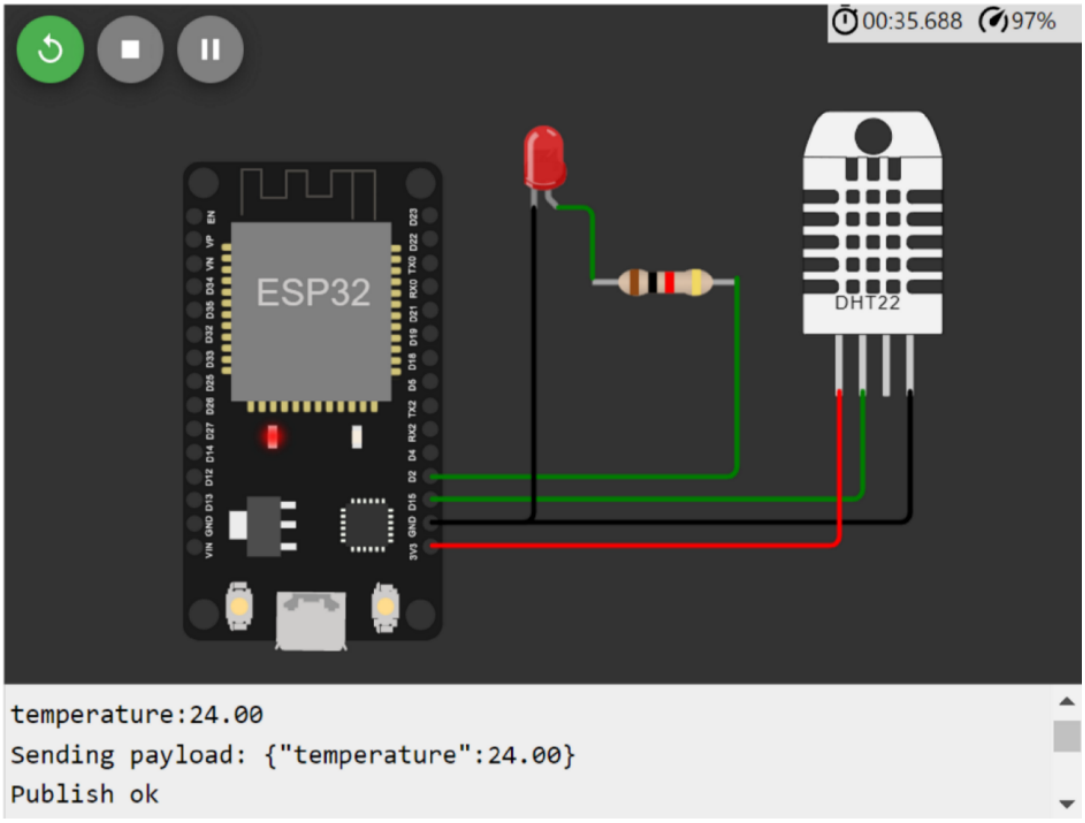
SPRINT DELIVERY PLAN:

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulationsoftware	USN-1	Using WOKWI, connect temperature, flame, gas sensors to ARDUINO with python script	2	High	Senthilnathan, Sathyamurthy, Venkata Narayanan, Sarvesh
Sprint-2	Cloud software	USN-2	Create device in the IBM Watson IoT platform, and link it to Node-Red	2	High	Senthilnathan, Sathyamurthy, Venkata Narayanan, Sarvesh
Sprint-3	MIT app invertor	USN-3	Develop a mobile application using MIT App invertor	2	High	Senthilnathan, Sathyamurthy, Venkata Narayanan, Sarvesh
Sprint-4	linking	USN-4	Link WOKWI, IBM Cloud and the developed App Application	2	High	Senthilnathan, Sathyamurthy, Venkata Narayanan, Sarvesh
Sprint-4	Dashboard	USN-5	Design the modules and Test the Mobile Application	2	High	Senthilnathan, Sathyamurthy, Venkata Narayanan, Sarvesh

PROJECT DEVELOPMENT -DELIVERY OF SPRINT-I:

Display the temperature values:



Program:

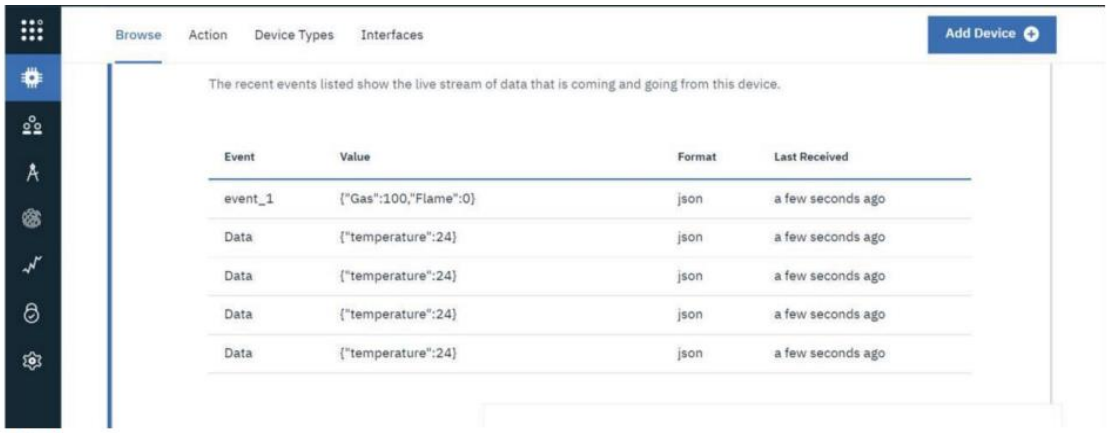
```
 #include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT22 // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of
dht connected


void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);
```

```
//-------credentials of IBM Accounts------
#define ORG "zbgr67"//IBM ORGANITION ID
#define DEVICE_TYPE "fershidevicetype"//Device type mentioned in ibm watson
IOT Platform
#define DEVICE_ID "fershideviceid"//Device ID mentioned in ibm watson IOT
Platform
#define TOKEN "fershiageona" //Token
String data3; float t;
//-------- Customise the above values -------- char server[] = ORG
".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event
perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT
command type AND COMMAND IS TEST OF FORMAT STRING char
authMethod[] = "usetoken-auth";// authentication method char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
//-----------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined
client id by passing parameter like server id,portand wificredential void setup()//
configureing the ESP32
{
 Serial.begin(115200); dht.begin();
pinMode(LED,OUTPUT); delay(10);
Serial.println(); wificonnect();
mqttconnect();
} void loop()// Recursive
Function
{
t = dht.readTemperature();
```

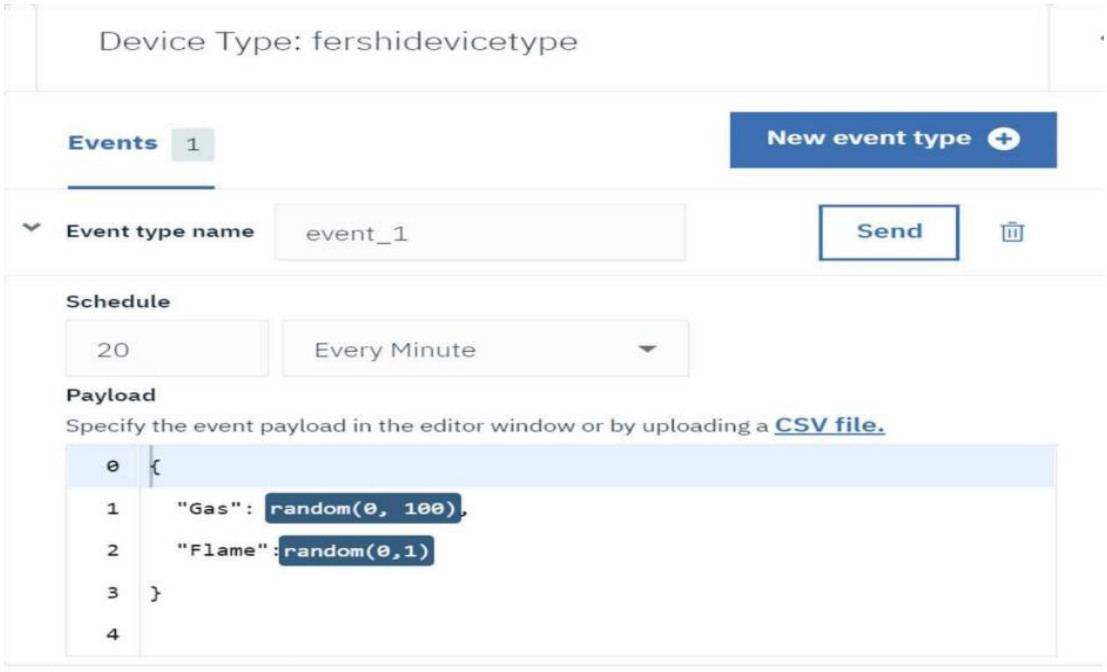
```
 Serial.print("temperature:");
 Serial.println(t);
 PublishData(t); delay(1000); if
(!client.loop()) { mqttconnect();
 }
}
/*.....retrieving to
Cloud.....*/
void PublishData(float temp) { mqttconnect();//function call for
connecting to ibm
 /* creating the String in in form JSon to update the data to ibm cloud */

 String payload = "{\"temperature\":"; payload
+= temp; payload += "}";
Serial.print("Sending payload: ");
Serial.println(payload);
 if (client.publish(publishTopic, (char*) payload.c_str()))
{
 Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will
print publish ok in Serial monitor or else it will print publish failed
 } else {
 Serial.println("Publish failed");
 }
 } void mqttconnect() { if
(!client.connected()) {
 Serial.print("Reconnecting client to ");
Serial.println(server); while
(!!!client.connect(clientId, authMethod, token)) {
Serial.print("."); delay(500);
 } initManagedDevice();
```

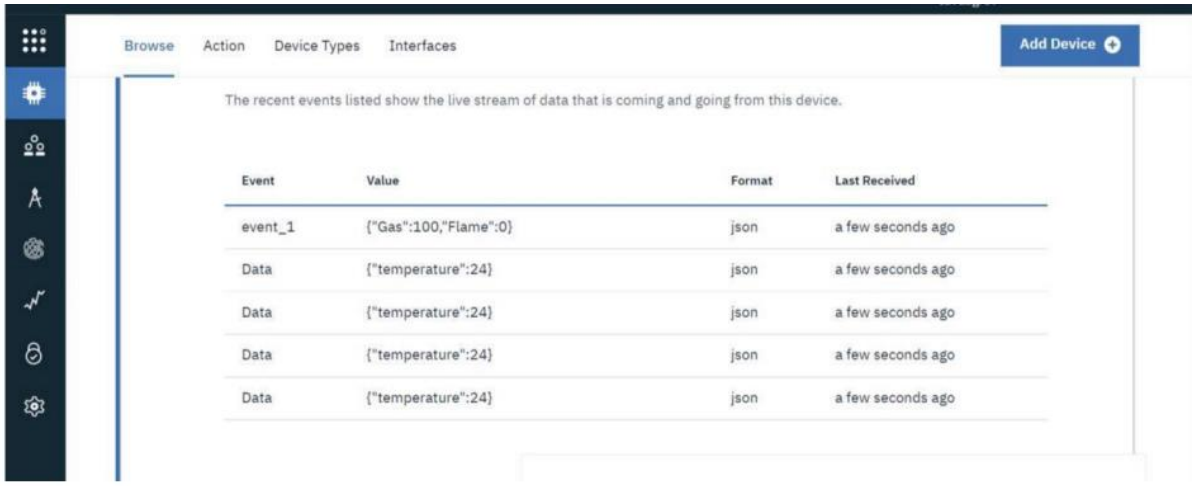
```
Serial.println();
 } } void wificonnect() //function defination for wificonnect
{
Serial.println();
Serial.print("Connecting to ");
 WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to
establish the connection while (WiFi.status() != WL_CONNECTED) {
delay(500);
 Serial.print(".");
 }
 Serial.println("");
 Serial.println("WiFi connected");
 Serial.println("IP address: ");
Serial.println(WiFi.localIP());
} void initManagedDevice() { if
(client.subscribe(subscribetopic)) { Serial.println((subscribetopic));
 Serial.println("subscribe to cmd OK");
 } else {
Serial.println("subscribe to cmd FAILED");
 }


}
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic); for (int i = 0; i <
payloadLength; i++) {
//Serial.print((char)payload[i]); data3 +=
(char)payload[i];
 }
```

```
 Serial.println("data: "+ data3); if(data3=="lighton")
 {
Serial.println(data3); digitalWrite(LED,HIGH);
 } else
 {
Serial.println(data3); digitalWrite(LED,LOW);
 }
data3="";
}
```



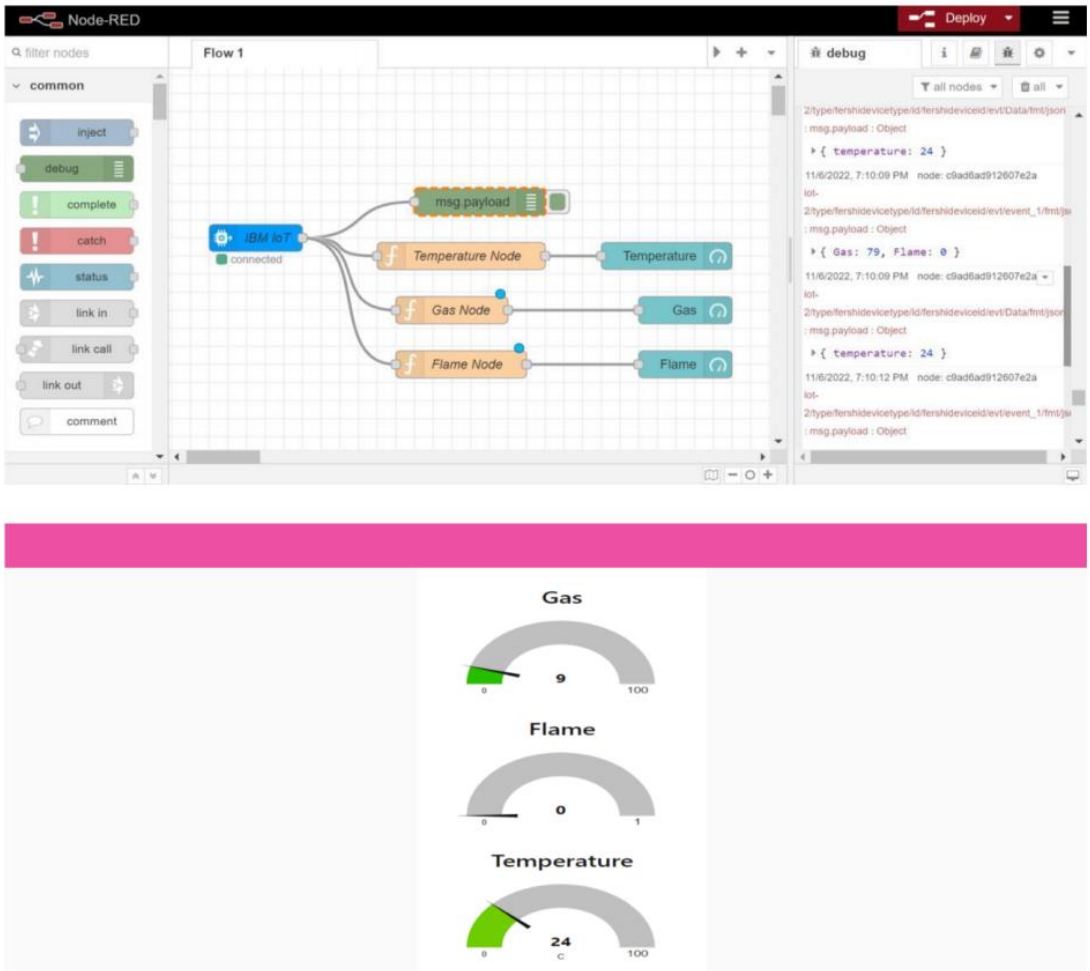
Code:



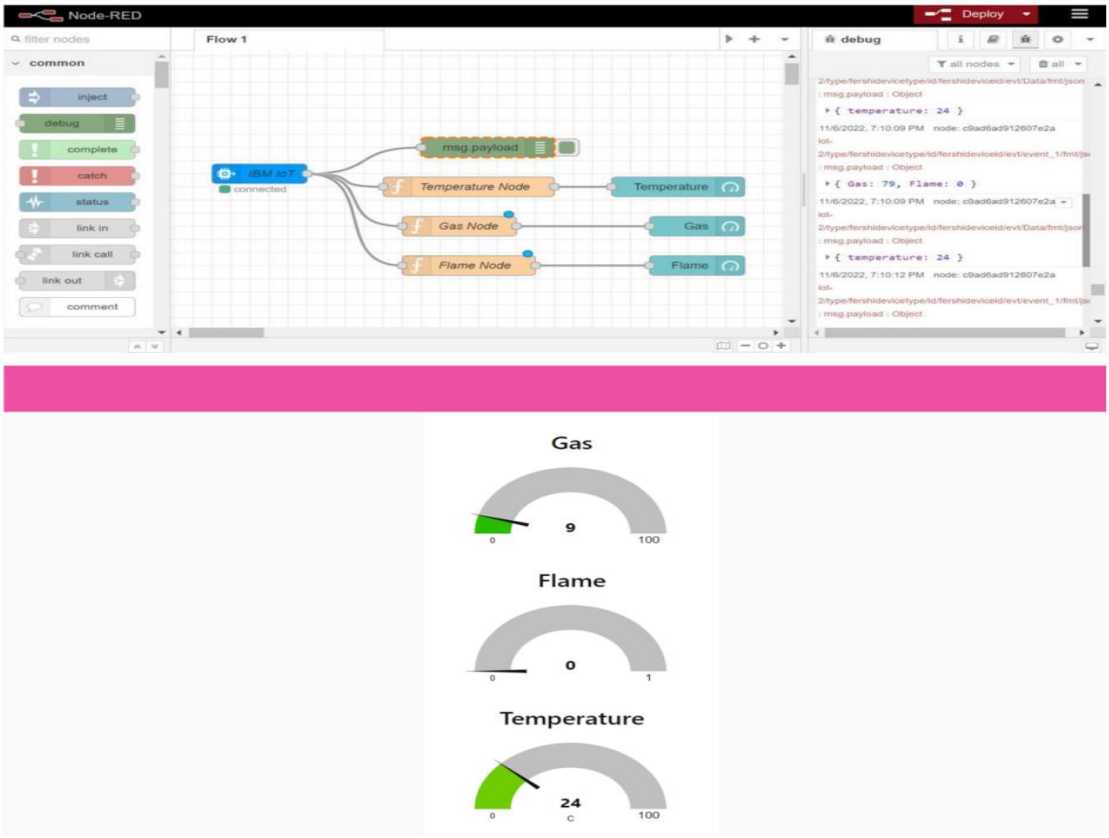


PROJECT DEVELOPMENT -DELIVERY OF SPRINT-2:

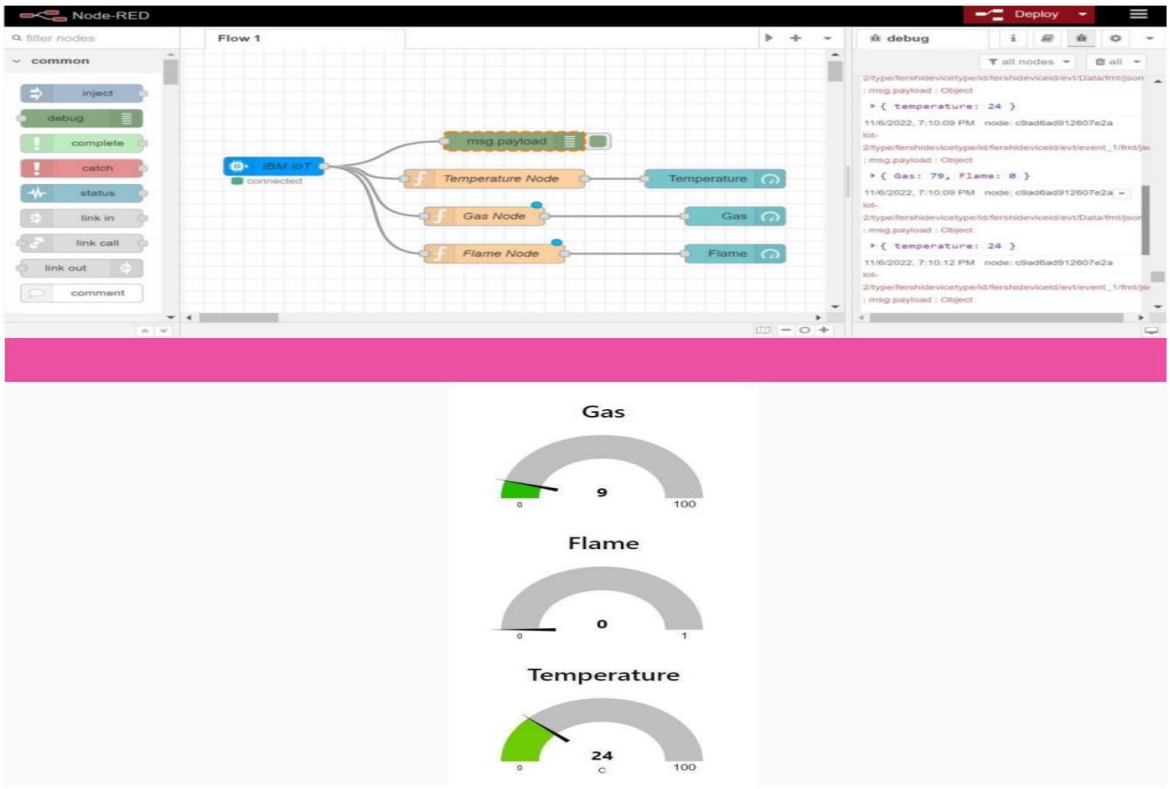
MONITORING SENSOR VALUES Display the temperature values in the dashboard:



Displaying flame sensor values:



Displaying gas sensor values:



PROJECT DEVELOPMENT -DELIVERY OF SPRINT-3

```
#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; // the current reading from the input pin
int BUZZER_PIN= 12; const int mq2
= 4;
int value = 0;
//Flame int flame_sensor_pin = 10 ;// initializing pin 10 as the sensor digital output
pin int flame_pin = HIGH ; // current state of sensor
 char ssid[] = "RATHIDEVI"; char pass[]
= "RATHIDEVI"; WiFiClient client;
#define PIN_LM35 39
#define ADC_VREF_mV 3300.0
#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("Connecting 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(client); pinMode(LED_PIN, OUTPUT); pinMode(mq2, INPUT);
pinMode ( flame_sensor_pin , INPUT ); // declaring sensor pin as input pin for
Arduino 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("Temperature: ");
 Serial.print(tempC);
Serial.print("°C"); if(tempC
> 60)
 {
 Serial.println("Alert");
 digitalWrite(BUZZER_PIN, HIGH); // turn on
 } else
 {
 digitalWrite(BUZZER_PIN, LOW); // turn on
 }
 int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey); }
void GasSensors()
{
 //mq2
 int gassensorAnalogmq2 = analogRead(mq2);
 Serial.print("mq2 Gas Sensor: ");
Serial.print(gassensorAnalogmq2);
```

```
 Serial.print("\t");
 Serial.print("\t");
 Serial.print("\t");
 if (gassensorAnalogmq2 > 1500)
 {
 Serial.println("mq2Gas"); Serial.println("Alert");
digitalWrite(RELAY_PIN1, HIGH); // turn on fan 10 seconds delay(100);
 } else
 {
 Serial.println("No mq2Gas"); digitalWrite(RELAY_PIN1,
LOW); // turn off fan 10 seconds delay(100);
 }
 int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2,
myWriteAPIKey);


}
void flamesensor()
{ flame_pin = digitalRead ( flame_sensor_pin ) ; // reading from the sensor if
(flame_pin == LOW ) // applying condition
{
Serial.println ( " ALERT: FLAME IS DETECTED" ) ; digitalWrite (BUZZER_PIN,
HIGH ) ;// if state is high, then turn high the BUZZER } else
{
Serial.println ( " NO FLAME DETECTED " ) ;
digitalWrite (BUZZER_PIN , LOW ) ; // otherwise turn it low
} int value = digitalRead(flame_sensor_pin); // read the analog value from sensor
 if (value ==LOW) { Serial.print("FLAME");
digitalWrite(RELAY_PIN, HIGH);
 } else {
 Serial.print("NO FLAME"); digitalWrite(RELAY_PIN,
```

```
LOW);
 }
} void loop() {
temperature(); GasSensors(); flamesensor();
}
```

PROJECT DEVELOPMENT -DELIVERY OF SPRINT-4

```
#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; // the current reading from the input pin
int BUZZER_PIN= 12; const int mq2
= 4; int value
= 0;
//Flame int flame_sensor_pin = 10 ;// initializing pin 10 as the sensor digital output
pin int flame_pin = HIGH ; // current state of sensor
char ssid[] = "Rathi"; char pass[] =
"Rathidevi"; WiFiClient
client;
#define PIN_LM35 39
#define ADC_VREF_mV 3300.0
#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("Connecting 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(client); pinMode(LED_PIN, OUTPUT); pinMode(mq2, INPUT);
pinMode ( flame_sensor_pin , INPUT ); // declaring sensor pin as input pin for
Arduino 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("Temperature: ");
 Serial.print(tempC);
Serial.print("°C"); if(tempC
> 60)
 {
 Serial.println("Alert");
 digitalWrite(BUZZER_PIN, HIGH); // turn on
 } else
 {
 digitalWrite(BUZZER_PIN, LOW); // turn on
 }
```

```
 int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey); }
void GasSensors()
{
 //mq2
 int gassensorAnalogmq2 = analogRead(mq2);
 Serial.print("mq2 Gas Sensor: ");
 Serial.print(gassensorAnalogmq2);
 Serial.print("\t");
 Serial.print("\t");
 Serial.print("\t");
 if (gassensorAnalogmq2 > 1500)
 {
 Serial.println("mq2Gas"); Serial.println("Alert");
digitalWrite(RELAY_PIN1, HIGH); // turn on fan 10 seconds delay(100);
 } else
 {
 Serial.println("No mq2Gas"); digitalWrite(RELAY_PIN1,
LOW); // turn off fan 10 seconds delay(100);
 }
 int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2,
myWriteAPIKey);
}
void flamesensor()
{ flame_pin = digitalRead ( flame_sensor_pin ) ; // reading from the sensor if
(flame_pin == LOW ) // applying condition
{
Serial.println ( " ALERT: FLAME IS DETECTED" ) ; digitalWrite (BUZZER_PIN,
HIGH ) ;// if state is high, then turn high the BUZZER } else
{
Serial.println ( " NO FLAME DETECTED " ) ;
```

```
digitalWrite (BUZZER_PIN , LOW ) ; // otherwise turn it low
} int value = digitalRead(flame_sensor_pin); // read the analog value from sensor
 if (value ==LOW) { Serial.print("FLAME");
digitalWrite(RELAY_PIN, HIGH);
 } else {
 Serial.print("NO FLAME"); digitalWrite(RELAY_PIN,
LOW);
 }
} void loop() {
temperature(); GasSensors(); flamesensor(); }
```

CONCLUSION:

The conventional fire alarm systems provide an adequate and cost effective fire alarm system for many small buildings, however with rise of more complex buildings more sophisticated ‘intelligent’ fire alarm systems were needed-systems which can offer benefits in speed of detection, identification of the location of a fire and easier maintenance

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-28616-1660114356

Project Demo Link:

https://youtu.be/dD_F8hr1WzA