INDUSTRY-SPECIFIC INTELLGENT FIRE MANAGEMENT SYSTEM

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TEAM ID	PNT2022TMID36769
PROJECT NAME	INDUSTRY SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM
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TEAM MEMBER 1	KAMALA KANNAN.M
TEAM MEMBER 2	PAUL ABINASH.P
TEAM MEMBER 3	DIVYA RAJ.N
TEAM MEMBER 4	UMAR ALI.J

1. INTRODUCTION

1.1 PROJECT 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.

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 of the fire effect as soon as possible. Alarm can be triggered by using detectors or by manual call point (Remotely). To alert/evacuate the occupants siren are used. With the Intelligent Building of the rapid development of technology applications, commercial fire alarm market demand growth, the key is to use the bus system intelligent distributed computer system fire alarm system.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

This Project focuses on Detection on fire management using smart sensors iot to ensure the safe supply of avoiding gas leakage and the quality should be monitored in real time as per alarm for that purpose new approach IOT (Internet of Things) based on fire sensor equipments monitoring has been proposed. This system consists some sensors.

2.2   REFERENCES

- 1. National Interagency Fire Center. [2012a]. Incident management situation report. Date accessed: July 13, 2012
- 2. Britton. [2010]. Risk factors for injury among federal wildland firefighters in the United States [dissertation]. Athens, Ohio: University of Ohio, College of Public Health.

2.3   PROBLEM STATEMENT DEFINITION

It must be able to detect fires at all locations, residents must be able to activate it from convenient locations themselves, and it must alert residents in all portions of the house. This system should reduce the cost of fire-insurance protection as well as provide security for the homeowner.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

An Empathy map is a collaborative tool teams can use to gain a precaution of fire incase of accident for customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. Our empathy map canvas is shown as fire management system.
The *Thinks* quadrant captures what the user is thinking throughout the experience. It is possible to have the same content in both *Says* and *Thinks*. However, pay special attention to what users think, but may not be willing to vocalize. Try to understand why they are reluctant to share — are they unsure, self-conscious, polite, or afraid to tell others something

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

Build empathy and keep your focus on the user by putting yourself in their shoes.

3.2 IDEATION & BRAINSTORMING

Ideation refers to the hole crreative process of coming up with and communicating new ideas.It can take many different forms,from coming up with a totally new idea to combining multiple existing ideas to create a new process or organizational system.Ideation is similar to a pratice known as brainstorming.
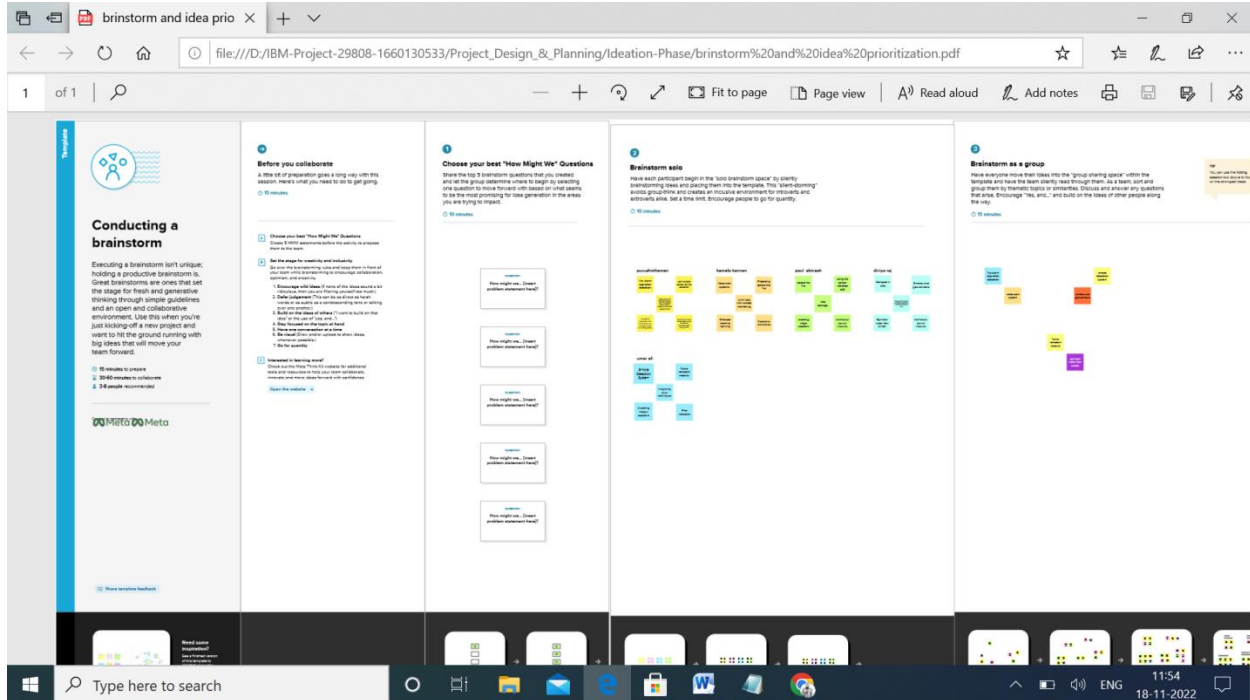
3.3 PROPOSED SOLUTION

Proposed Solution means the technical solution to be provide by the implementation agency in response to the requirements and the objectives of the project. he following information may be useful to you in completing this portion of your team's work. Skim this section, then refer back to it as necessary.

Project Design Phase-I
Proposed Solution Template

Date	28 September 2022
Team ID	PNT2022TMID36769
Project Name	Project - Industry specific intelligent fire management
Maximum Marks	2 Marks

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	this system can perform different parameter measurements early detection of building fires
2.	Idea / Solution description	This fire alarm system incorporates the heat and flame detector that are connected in parallel.The microcontroller is used as the heart of this fire alarm system that controls the entire operation involved . The fire alarm system is capable to locate and identified the place that is in fire where by its monitored using the monitoring system.
3.	Novelty / Uniqueness	In this paper, the installed Arduino device which was programmed with Android Studio receives gas smoke ,the temperature and humidity signal from the sensors . The sensor is connected to the input of the arduino with the help of connecting the cables or jumper cables . Further the circuit goes toward output where the buzzer is connected. If we differ the value of the buzzer then we get a variation in the buzzer sound.
4.	Social Impact / Customer Satisfaction	This product has huge social impact as presentation of the industry workers from fire related accidents.Prevention of the industry fire accident can also increases the industrial financial status
5.	Business Model (Revenue Model)	This product can be utilized by a industries .This can be thought of as a productive and helpful item as industries great many current rescuing people and machine from the fire accident
6.	Scalability of the Solution	It is trying to execute this technique as we need to introduce an arduino gadget which was modified with an arduino studio that takes received signals from sensors . This recognizes the fire from each area in turn assuming there is fire in other area the framework can not distinguish . So this item will be introduced in each required area independently.

3.4 PROBLEM SOLUTION FIT

Problem solving is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution. In order to effectively manage and run a successful organization, leadership must guide their employees and develop problem-solving techniques. Finding a suitable solution for issues can be accomplished by following the basic four-step problem-solving process and methodology outlined below.

4. REQUIREMENT ANALYSIS

Requirement analysis also called as requirement engineering is the process of determining user expectation for a new or modified product. These features are called requirement must be qualifiable relevant and detailed. Its classified as two major type.

4.1 FUNCTIONAL REQUIREMENT

The FlameRanger system, jointly presented by Unifire AB & Tyco, meet or exceed all of the functions described above, and all of the specifications set out in the functional Requisition.

4.2 NON-FUNCTIONAL REQUIREMENT

NFR generally stated, often contracdictory, difficult to enforce during development and evaluate for the customer prior to delivery.

Date	15 October 2022
Team ID	PNT2022TMID36769
Project Name	Project – Industry Specific Intelligent Fire Management System
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Sensing function	Fire breakout has to be sensed by smoke detectors. Gas leakage has to be sensed by gas sensors.
FR-2	Alerting function	Blaring of alarms.
FR-3	Actuation function	Activation of sprinklers. Turning ON the exhaust Fan.
FR-4	Notification	Sending SMS with location to the fire station. Sending SMS to the authorities.

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Ease of use and longevity of the system.
NFR-2	Security	Software remains secured in the face of attacks.
NFR-3	Reliability	High accuracy.
NFR-4	Performance	Faster response.
NFR-5	Availability	Availability of the systems for institutions, restaurants and other public places
NFR-6	Scalability	It accommodates easy modification for various requirements

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

Data flow diagram is a way of representing a flow of data through a processer or a system. DFD also provide information about the input and output of each entity and the process itself. A data flow diagram as no control flow they are no decision rules and no loops.

Date	14 October 2022
Team ID	PNT2022TS1ID16769
Project Name	Project - Industry Specific Intelligent Fire Management Studies
Maximum Marks	4 Marks

Data Flow Diagram:
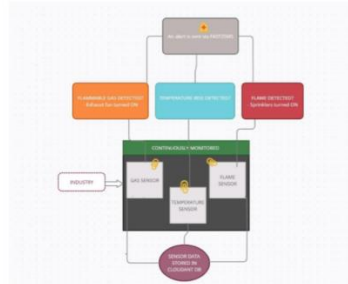
5.2 SOLUTION & TECHNICAL ARCHITECTURE

INDUSTRY SPECIFIC – INTELLIGENT FIRE MANAGEMENT SYSTEM
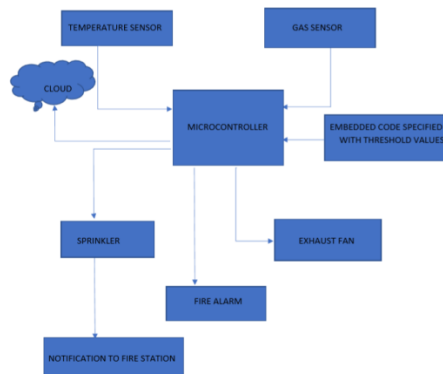
A Solution architecture is an architectural description of a specific solution. SAs combine guidance from different enterprise architectural viewpoints (business, information and technical) as well as from the enterprise solution architecture (ESA).

5.3 USER STORIES

(1)Information collection module In order to realize the real-time collection and update of the information and ensure the accuracy of the information, the existing internet of things equipment such as monitoring, smoke feeling, fire control sign and so on are used to collect the field information and efficiently understand the situation on the spot. (2)Model module The BIM model of the building is established by using BIM technology. The model includes the information of all the components in the building, the information of water, electricity and gas and all the information of fire extinguishing equipment, thus which can provide data support for indoor escape and rescue of building firefighting. (3)Intelligent processing module The intelligent processing module can automatically plan the rescue path, rescue tools, indoor escape path, and modify the contents of fire protection sign by synthetically processing the data of the information collection module and the model module. (4)Decision module The rescue center reads the information on the equipment and models of internet of things, and other information through the decision module, and issues the emergency evacuation command, at the same time, which chooses the outdoor rescue routes and rescue tools, and sends rescue orders to the rescue teams. (5)Information feedback module After the decision is made, the information feedback module automatically releases the best escape route to the survivors, and indicates the location of the fire rescue tools nearby, besides provides the best rescue route, rescue ways, rescue tools and other information to the rescuers, and relieves the alarm in time after the rescuing. (6)Escape terminal APP module

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint planning is an event in scrum that kicks of the sprint. The purpose of sprint planning is to define what we can deliver in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team

Project Planning Phase
Milestone and Activity List

Date	24 October 2022
Team ID	PNT20227TMID56769
Project Name	Industry-specific intelligent fire management system

TITLE	DISCRIPTION	DATE
Literature Survey& Information Gathering	Literature survey on the selected project & gathering information by referring the. technical papers. research publications etc.	03 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains. Prepare list of problem statements	07 SEPTEMBER 2022
Problem Statement	Prepare Problem statement of Industry-specific intelligent firemanagement system	10 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	16 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	23 SEPTEMBER 2022

Problem Solution Fit	Prepare problem - solution fit document.	26 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	30 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	8 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	11 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	14 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	16 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	24 OCTOBER 2022
Sprint Schedules	Prepare the sprint plan and divided tasks according to agile method.	24 OCTOBER 2022
Project Development- Delivery Sprint - 1	Develop & submit the developed code by testing it.	29 OCTOBER 2022 IN PROGRESS.
Sprint - 2	Develop & submit the developed code by testing it.	05 NOVEMBER 2022 IN PROGRESS.
Sprint - 3	Develop & submit the developed code by testing it.	12 NOVEMBER 2022 IN PROGRESS.
Sprint - 4	Develop & submit the developed code by testing it.	19 NOVEMBER 2022 IN PROGRESS.

6.2 SPRINT DELIVERY SCHEDULE

The deliverables of the sprint are not as predictable as they are for the other project. Sprint participance have produced sketches and drawing, writing, photograph, comic, strip, video and fully coded working prototypes

Date	23 October 2022
Team ID	PNT2022TMID36769
Project Name	Industry specific intelligent fire management system
Maximum Marks	8 Marks

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a customer, I might ensure login credential through gmail ease manner for the purpose of sending alert message to the owner.	2	High	purushothaman.s kamala Kannan
Sprint-1	Registration	USN-2	As a user, I have to registered my details and tools details in a simple and easy manner in case of fire incident, this registered system sends notification to the industrialist	2	High	Paul abinash Umar ali Diviya raj
Sprint-2	Dashboard	USN-3	As a user, In case of Fire in the industry I need the sprinkler to spray water on the existing fire automatically.	3	Medium	Purushothaman Kamala Kannan Paul abinash
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**

Sprint-3	Dashboard	USN-4	As a user, I need to safeguard my properties as well as and it will be better to send alert message to the fire department .	2	High	Umar ali Diviya raj
Sprint-3	Dashboard	USN-5	As a user, Its good to have a IOT based system to extinguish the fire without human presence.	2	High	Purushothaman Kamala kannan
Sprint -4	Monitoring the environment	USN 1	User can monitor the situation of the environment from a dashboard that displays sensor information about the environment	2	High	Paul abinash Umar ali Diviya raj
Sprint- 4	Event Notification	USN 6	Sending an alert SMS to the fire authority in case of fire	2	High	Purushothaman

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	4	6 Days	24 Oct 2022	29 Oct 2022	4	29 Oct 2022
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-2	3	6 Days	31 Oct 2022	05 Nov 2022	3	05 Nov 2022
Sprint-3	4	6 Days	07 Nov 2022	12 Nov 2022	4	12 Nov 2022
Sprint-4	4	6 Days	14 Nov 2022	19 Nov 2022	4	19 Nov 2022

Velocity:

Imagine we have a 6-day sprint duration, and the velocity of the team is 4 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = 6.66$$

7. CODING & SOLUTIONING
FEATURE

```cpp
#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[] = "use-token-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");
    }
```

```cpp
  }
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="";

}
```

8. TESTING
8.1 Test Cases

sl no	Inputs	Outputs	Results
1	Temperature:59.30 Flow:false	Fan on:false Sprinkler work:false Status logged:done	Sent
2	Temperature:59.30 Flow:true	Fan on:true Sprinkler work:true Status logged:done	Sent

3	Temperature:59.30 Flow:true	Fan on:true Sprinkler work:true Status logged:done	Sent
4	Temperature:59.30 Flow:false	Fan on:true Sprinkler work:false Status logged:done	Sent
5	Temperature:59.30 Flow:false	Fan on:true Sprinkler work:false Status logged:done	Sent
6	Temperature:59.30 Flow:false	Fan on:true Sprinkler work:false Status logged:done	Sent
7	Temperature:59.30 Flow:false	Fan on:true Sprinkler work:true Status logged:done	Sent
8	Temperature:27.90 Flow:false	Fan on:true Sprinkler work:false Status logged:done	Sent
9	Temperature:27.90 Flow:true	Fan on:false Sprinkler work:false Status logged:done	Sent
10	Temperature:27.90 Flow:true	Fan on:true Sprinkler work:false Status logged:done	Sent

8.2 User Acceptance Testing

You must **test smoke detectors and smoke alarms in place to ensure smoke entry into the sensing chamber and to verify an alarm response**. You may test with smoke or listed aerosol, acceptable to the manufacturer of the smoke detector or smoke alarm and identified in the manufacturer's published instructions.

9. RESULTS

We have successfully used to built a web based UI and integrated all the servies using Node RED web Application: https://node-red-yugla-2022-11-10.eu-gb.mybluemix.net/ui/#!/0?socketid=sdbNhGopXZR34mb5AABK

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES OF INTELLIGENT FIRE ALARM SYSTEM:

- Cost effective for larger applications.

- The location of a fire condition is detected and recorded at each individual device, identifying exactly where the fire is occurring. This will improve response time for emergency responders.

- Lower ongoing service cost, because when a device goes into trouble (i.e. needs cleaning, repair or replacement), the panel will tell you the exact location of the device needing service.

- Online capabilities: New intelligent panels have the capability to provide detailed online notification of alarm/trouble/supervisory events.

DISADVANTAGES OF ADDRESSABLE FIRE ALARM SYSTEM:

- Cost, not as competitively priced for smaller applications.

- Typically with an intelligent panel, your peripheral devices (i.e. smoke detectors, etc…) tend to be more expensive than conventional devices.

- This panel is computer like and at times there maybe issues caused by the firmware (panel software). However, this is not common and the advantages of intelligent panel far outweigh any of these firmware issues.

11. CONCLUSION

Fire alarm systems are only effective if they can generate reliable and fast fire alerts with exact location of fire. There is a direct correlation between the amount of damage caused by fire and interventions time in various fire alarm systems. As the time of intervention decreases, the damage also decreases. Hence the most important factor in a fire alarm system is the reaction or response time of fire alarm system, that is, the time between fire detection and extinguishing.

The earliest recorded examples of fire protection can be traced back to the Roman Empire and the catastrophic fires that started in Rome. As a result, Emperor Neron has adopted regulations that required fireproof material for walls and buildings restoration to be used. The second recorded case of adopting fire protection regulations occurred in the year 1666, after the Great

fire of London, which destroyed more than 80% of the city. The fire of London spurred interest in the development of the first equipment for fire suppression in the form of hand pumps and fire hydrant installation for water supply.

12. FUTURE SCOPE

The development of advanced natural fibre composites for construction could play a key role in the transition of an oil-based economy towards a bio-based economy. This chapter first looks at the future scope for the development and uses of advanced natural fibre composites and then goes on to discuss the challenges that relevant industries, both composite manufacturing and construction sectors, have yet to overcome for successful outcomes. The chapter finally investigates the new technologies and potential development of intelligent natural fibre composites for not only application with traditional materials but also specific high value-added applications.

13. APPENDIX

Source Code

```
#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
```

```cpp
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command
type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-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
```

```arduino
    */
    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="";


}
```

GitHub & Project and demo link

https://github.com/IBM-EPBL/IBM-Project-29808-1660130533.git

https://github.com/IBM-EPBL/IBM-Project-29808-1660130533/blob/main/FINAL_DELIVERABLES/final%20delivery%20video.mp4