# INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

**TEAM ID - PNT2022TMID20469**

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## ABSTRACT

The goal of an industry-specific intelligent fire control system is to stop industrial fires before they start and to take the necessary precautions. Preventing fire accidents brought on by flammable gas, smoke, and temperature increases is the primary goal of the industry-specific intelligent fire control system.The system includes sensors to track any environmental changes.Temperature sensor to gauge the ambient temperature. The flame sensor can also determine if there is a fire or not.

# 1.INTRODUCTION

## 1.1 PROJECT OVERVIEW

The smart fire management system includes a gas, flame, and temperature sensor to detect any environmental changes. 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 the Fire station

## 1.2 Purpose

- To give a detect the status of the room with IoT devices
- To turn on sprinkler and exhaust fan when there is accident
- To detect the flow of water
- To send and store the temperature status in a cloud storage
- To give a easy management system on dashboard
- To give a overview of what’s happening to the user
- To send a sms to the authorities when there is a fire accident.

# 2. LITERATURE SURVEY

## 2.1 Existing Problem

### A.) Intelligent Fire Warning System Based on Fuzzy Extension Constraint Algorithm

**AUTHOR:** Zhao Peng

**YEAR**:2014

**ABSTRACT:**

The traditional fire alarm systems sense the temperature change produced a fire and took the fire warning. When the space height is too high, and the gas velocity is too big all the environment factors influence the sensor working, and the induction effect is not good, the early warning cannot be reached. The intelligent fire warning system is proposed and designed based on a fuzzy extension constraint algorithm, the detailed system design scheme is obtained. The short fire feature recognition algorithm is presented, and in the characteristics recognition process, the concept of feature space transformation elastic restraint is proposed, the elastic fuzzy matching recognition region is established for the fire pixel feature, and the fuzzy recognition problem caused by small flame features is solved. The intelligent fire detection and warning system is established, and the experiment is based on the system, the fire monitoring and detection results show that the new system can avoid the recognition defects when the flame of spark is small, the fuzzy colour feature of flame also can be recognized perfectly.

B.) **TITLE: Fire Safety Management Information System Design for Key Social Organizations**

**AUTHOR:** Xu Fang, Zhang Di,Wang Jun

**YEAR:**15-16 June 2014

**ABSTRACT:**

Aiming at the actual fire safety management needs of key social organizations and units, this paper introduces the design and implementation of the fire safety management information systems of the networked key organizations and units, providing 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, offer a scientific tool to the organizations to improve their fire safety management level, extend the functions of fire remote monitoring control system, and promote fire prevention and control capability of the whole community.

**C.)TITLE: Discussion of Society Fire-Fighting Safety Management Internet of Things Technology System**

**AUTHOR:** Wang Jun,Zhang Di, Liu Meng, Xu Fang

**YEAR:** 2016

**ABSTRACT:**

The society fire-fighting safety management is 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 propose priority development points of society fire-fighting safety management IOT technology, thereby providing reference for technology research and development of IOT technology in society fire-fighting safety management field.

**D.)TITLE: IoT and Light bend based Intelligent Platform for Fire Monitoring System**

**AUTHOR:** L. Dan, W. Hongli

**YEAR:** July 2020

**ABSTRACT:**

Once a fire breaks out in high-rise buildings, it is likely to cause serious casualties and huge property losses. High-rise building fire cases occur year by year all over the world. Although experts and scholars at home and abroad have been doing a lot of theoretical and Experimental Research on the smoke and evacuation of the built high-rise buildings. However, there are very few studies on smoke law and evacuation of complex high-rise buildings under construction in case of fire. It is of great practical significance to study such problems. We combined the smart building methodologies to construct the efficient system for the data based analysis and intelligent platform based assistance.

**E.) TITLE: Design of fire detection and alarm system based on intelligent neural network**

**AUTHOR:** Mingyi Zhu;Jiamin Zhang

**YEAR:** 2011

**ABSTRACT:**

For fire detection and alarm systems with simple function, positioning difficulties, false positive and false negative in traditional intelligent building, the fire detection and alarm systems based on intelligent neural networks have been designed. It can do integrated estimation with a variety of fire detection information detected by the microcontroller, neural network intelligent algorithm was joined in the software design, MATLAB simulation realizes multiple synchronous intelligent detection, which effectively detect various types of early fire and reduce the fire.

## 2.2 Reference

https://www.mdpi.com/2224-2708/7/1/11

https://pdfs.semanticscholar.org/f3e7/a7c0cf2d448be592421045033506e845e6c2.pdf

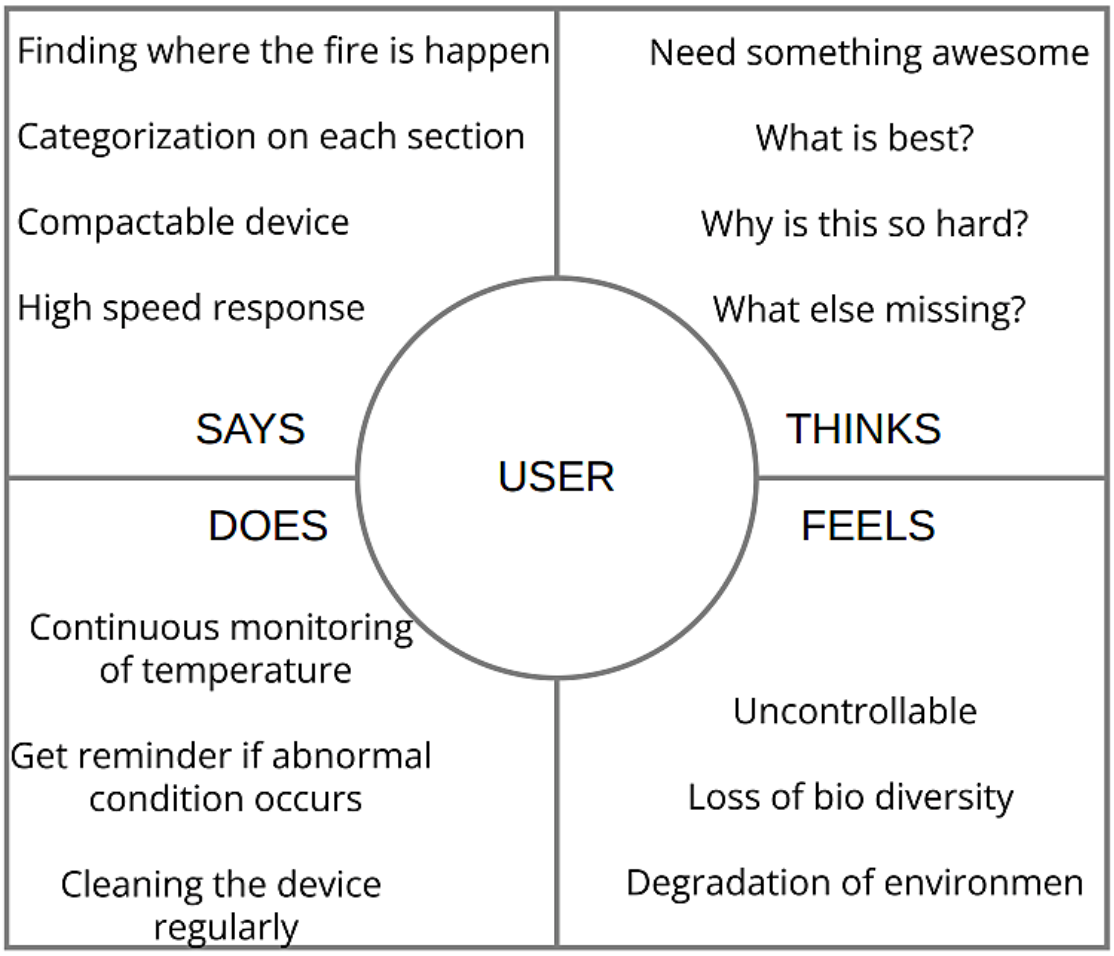
## 2.3 Problem Statement Definition

The most frequently used applications of the lot in the fire management system are for detecting fire and alerting fire departments over IOT. Fire management system includes application of multiple sensors with automatic water sprinkler which can help to detect fire and alert emergency services to protect lives and valuable assets.

# 3.IDEATION AND PROPOSED SOLUTION

## 3.1 Empathy map canvas

● An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes
● It is a useful tool to helps teams better understand their users.Creating an effective solution requires understanding the true problem and the person who is experiencing it
● The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.




3.2 Ideation

IDEATION-1:

Our project aim is to detect the fire accident in Industries. Industry fires generally occurs may result in human deaths. So that, it must be detected early and alert the information to the admins through cloud services. We use flame sensor to detect the fire and inform the fire station by using wifi module, buzzer alarms at the fire station. Finding exact location of where fire happens is very difficult to make it easier we have to add google map with cloud services to get exact location.

IDEATION-2:

Industry fire is the very dangerous that will harmful to Human life and Environment. It could be avoided if a robust system could be deployed in industries to detect the fire and alert to Fire station authority to take immediate action. Our project intention is to build a industry fire detection system using IOT which would detect the fire and send an emergency alert to Fire station through IOT.A GSM/GPRS module is used to communicate with IOT sever.

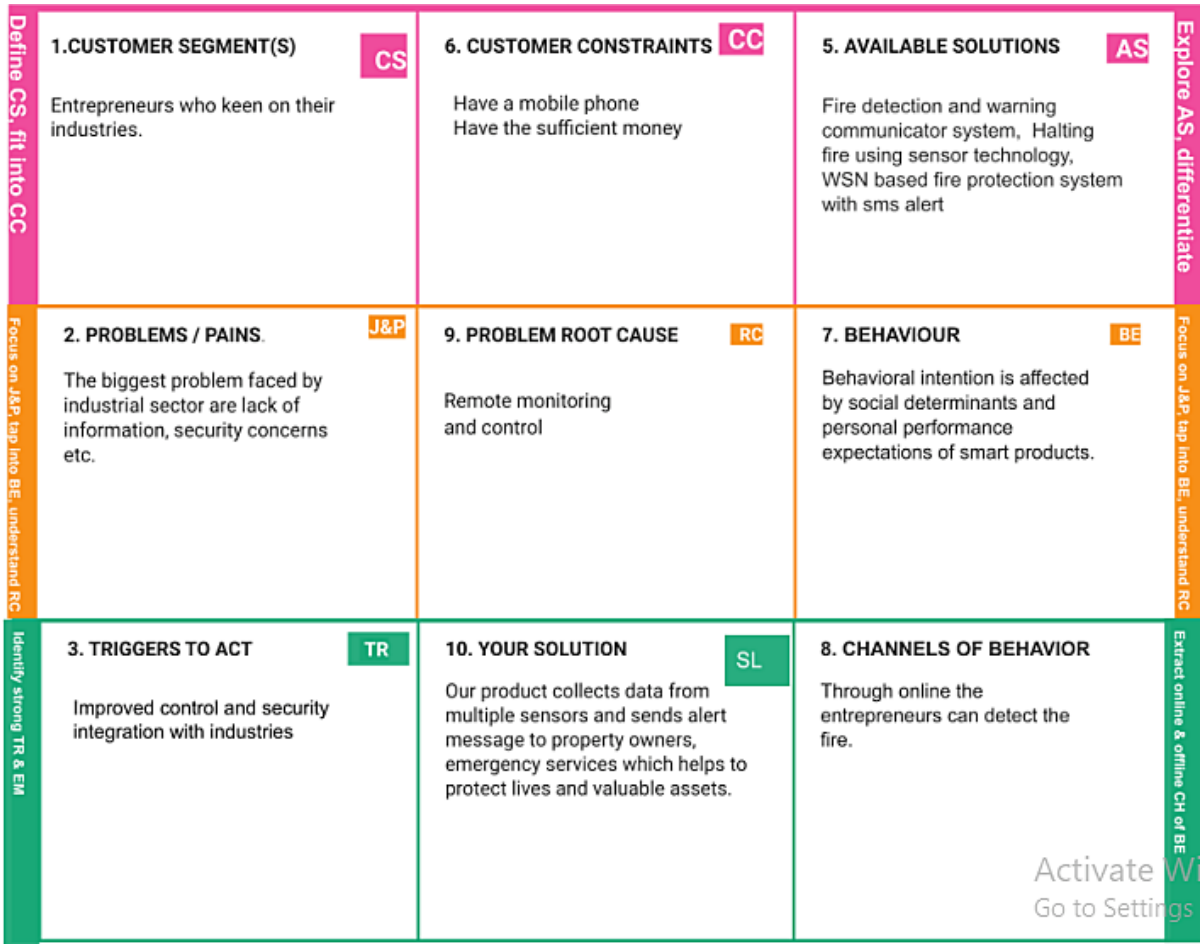
IDEATION-3:

Our project deals with the detection and management of Industry fire. Industry fire are very common which is a massive disaster to the environment and Human life. In order to protect these, there need to be taken early caution measures to control the spreading fire. Usually it requires massive dependency of man power, transportation facility will leads to delay in taking actions.The DHT11 and flame sensors detects the fluctuation in the temperature and humidity continuously and using Node MCU microcontroller which is also a Wi-Fi module sends these values to the cloud as database, if these value exceeds the threshold value then a pop up alert message will be sent by the cloud to the respective department immediately. Where we can avoid major loss and spreading of fire to large area at its early stage

## 3.3 Proposed Solution

| S. No | Parameter | Description |
|---|---|---|
| 1. | Problem Statement | Our project will be given the problem statement in Fire Management in industry using IOT. |
| 2. | Idea/Solution description | The most frequently used applications of the Iot in the fire management system are for detecting fire and alerting fire departments over IOT. |
| 3. | Novelty/Uniqueness | Fire management system includes application of multiple sensors with automatic water sprinkler which can help to detect fire and alert emergency services to protect lives and valuable assets. |
| 4. | Social Impact / Customer Satisfaction | Certain substances commonly used in industrial settings can ignite with the slightest spark, or even by static electricity, so even a small leak can cause a fire.The proposed model employs different integrated detectors, such as heat, smoke, and flame. |
| 5. | Business Model(Revenue Model) | A smart fire system is generally made up of various components, including fire alarms, smoke detectors, heat detectors and a method of fire suppression. A smart fire system will use these components to collect data, manage and notify the user of a triggered event, all through a smartphone or device. |
| 6. | Scalability of the Solution | Fire detection systems increase response times, as they are able to alert the correct people in order to extinguish the fire. |

## 3.4 Proposed Solution Fit




# 4. REQUIREMENT ANALYSIS

## 4.1 Functional Requirements

● A functional requirement defines a function of a system or its component, where a function is
● described as a specification of behaviour between inputs and outputs.
● It specifies “what should the software system do?”
● Defined at a component level
● Usually easy to define
● Helps you verify the functionality of the software

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|---|---|---|
| FR-1 | Device configuration | New IoT device is created in the cloud<br>The device is configured with the new cloud device |
| FR-2 | Admin dashboard/admin panel | Data from sensors shown in pictorial form<br>Controls are given in the button format |
| FR-3 | Internet connectivity | Make sure fully-fledged internet connectivity is required for smooth communication between device and cloud |
| FR-4 | SMS API | A external SMS API is required |

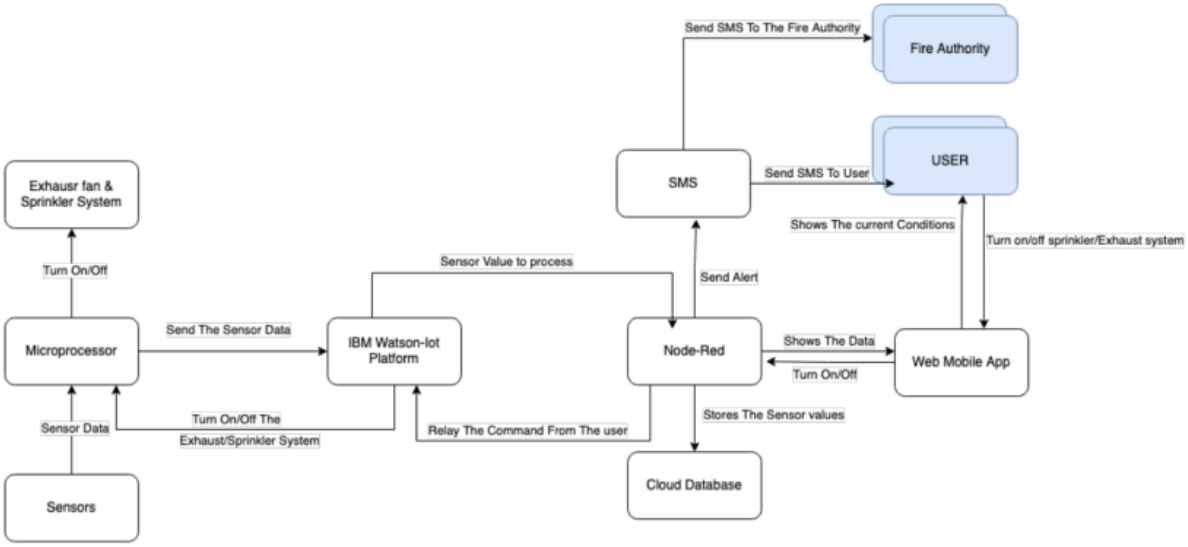
## 4.2 Non Functional Requirements

● A non-functional requirement defines the quality attribute of a software system
● It places constraint on “How should the software system fulfil the functional requirements?”
● It is not mandatory
● Applied to system as a whole
● Usually more difficult to define
● Helps you verify the performance of the software

| FR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | **Usability** | The dashboard can be used via a web browser<br>It gives an abstract view in an easy-to-use form. |
| NFR-2 | **Security** | As the data is sent through HTTPS the data is encrypted, so it is safe. |
| NFR-3 | **Reliability** | The system is completely reliable as long as the internet and power is reliable |
| NFR-4 | **Performance** | Only the data input and basic checking is done in smart device other heavy tasks are done in cloud. |
| NFR-5 | **Availability** | The entire system is available for your service and for configuration . |
| NFR-6 | **Scalability** | The smart system is scalable,we can add any number of devices as long as the IBM IoT platform supports it. |

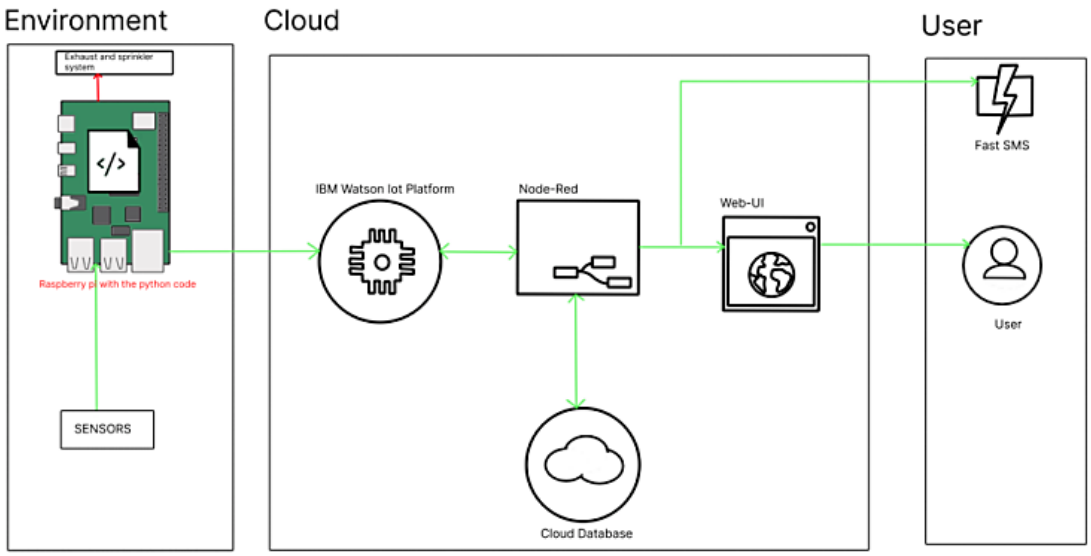
# 5. PROJECT DESIGN

## 5.1 Dataflow Diagram

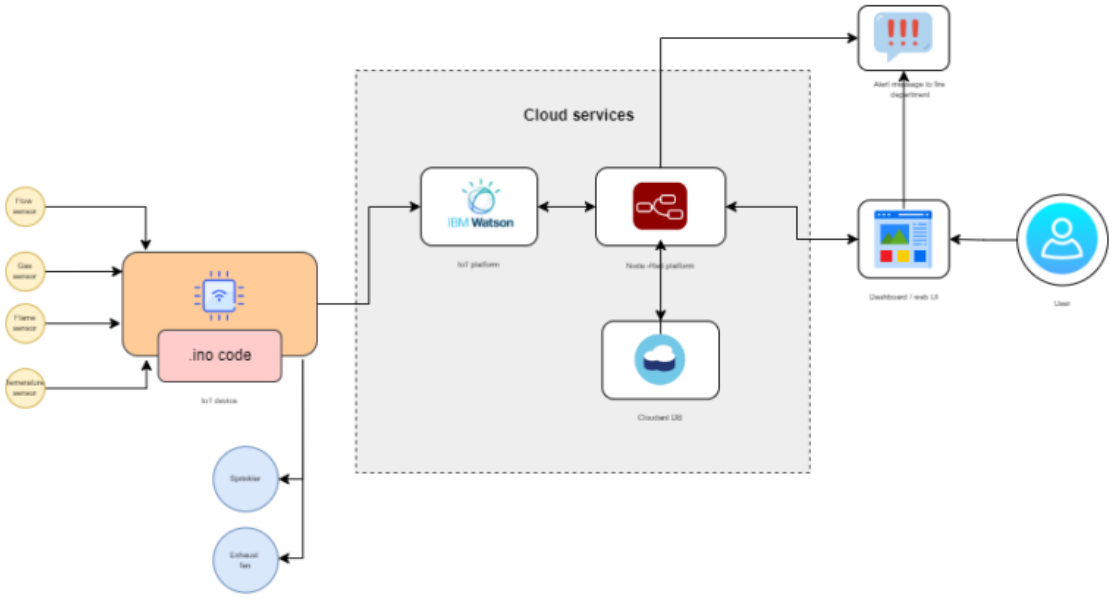



## 5.2 Solution and Technical architecture

## Solution Architecture




## Technical Architecture




# 6. PROJECT DESIGN AND PLANNING

## 6.1 Sprint planning and estimation

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority |
|---|---|---|---|---|---|
| Sprint-1 | Sensing the values | USN-1 | As a user, I want to see the temperature values | 3 | High |
| Sprint-1 | Sensing the values | USN-2 | As a user, I want to see gas values | 2 | High |
| Sprint-1 | Sensing the values | USN-3 | As a user, I want to see if flame is present | 2 | High |
| Sprint-2 | Displaying temperature value | USN-4 | As a user, I want to see the temperature values in dashboard | 2 | Medium |
| Sprint-2 | Displaying gas value | USN-5 | As a user, I want to see the gas values in dashboard | 2 | Medium |
| Sprint-2 | Displaying flame value | USN-6 | As a user, I want to see flame values in dashboard | 2 | Medium |
| Sprint-3 | Alarm On | USN-7 | As a user, the alarm should be turned on immediately if temperature, gas, flame values exceeds a particular threshold in web application | 3 | High |
| Sprint-3 | Alarm Off | USN-8 | As a user, I need to turn off alarm in web application | 2 | Low |
| Sprint-3 | Sprinkler On | USN-9 | As a user, the sprinkler should be turned on immediately if temperature, gas, flame values exceeds a particular threshold in web application | 3 | High |
| Sprint-3 | Sprinkler Off | USN-10 | As a user, I need to turn off sprinkler in web application | 2 | Low |
| Sprint-4 | Registration | USN-11 | As a user, I can register for the application by entering email, password, and confirming my password | 3 | High |
| Sprint-4 | Displaying sensor values | USN-12 | Displaying gas, flame and temperature sensor values | 3 | High |
| Sprint-4 | Alarm On | USN-13 | As a user, the alarm should be turned on immediately if temperature, gas, flame values exceeds a particular threshold using mobile application | 3 | High |

| | | | | | |
|---|---|---|---|---|---|
| Sprint-4 | Alarm Off | USN-14 | As a user, I need to turn off alarm using mobile application | 2 | Low |
| Sprint-4 | Sprinkler On | USN-15 | As a user, the sprinkler should be turned on immediately if temperature, gas, flame values exceeds a particular threshold using mobile application | 3 | High |
| Sprint-4 | Sprinkler Off | USN-16 | As a user, I need to turn off sprinkler using mobile application | 2 | Low |

## 6.2 Sprint delivery schedule

| 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 | | 6 Days | 24 Oct 2022 | 29 Oct 2022 | 7 | |
| Sprint-2 | | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 6 | |
| Sprint-3 | | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 10 | |
| Sprint-4 | | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 16 | |
| | | | | | | |
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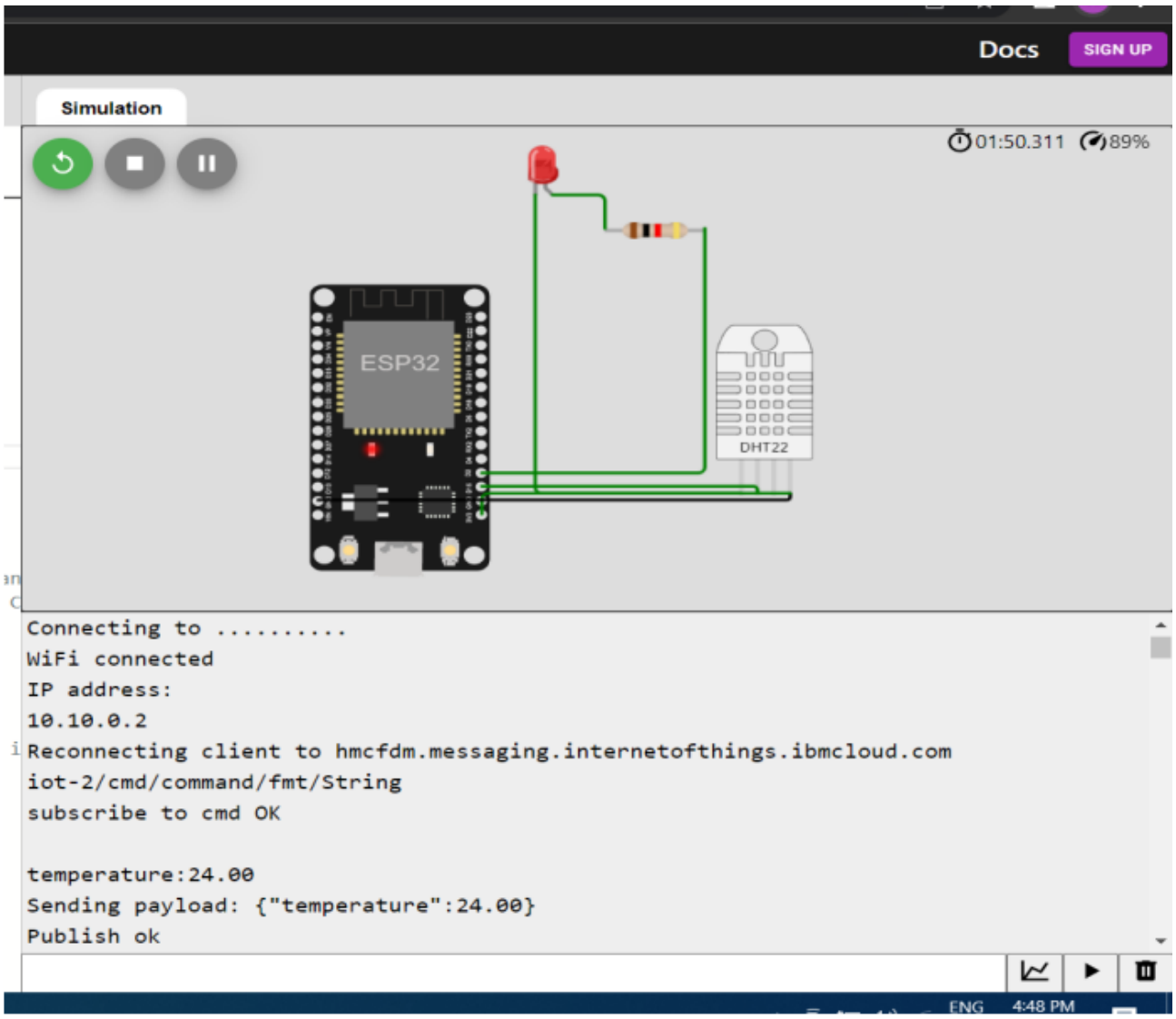
## SPRINT 1

Display the temperature values:
https://wokwi.com/projects/348683544624628306




### Demo Video

https://youtube.com/shorts/3yTN3TaL79Y?feature=share