

# Anna University Regional Campus, Madurai Nalaiya Thiran

**executed by**



# Industry-specific intelligent fire management system Team ID : PNT2022TMID34745

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## 

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1. **INTRODUCTION**

## Project Overview

* + - 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.

## Purpose

* + - he purpose of the system is :To prevent life losses , assets damage and uncontrollable spread of fire.
    - To ensure the safety of workers and alert the manager and fire department.
    - To not to recklessly endanger the life of the fire workers. This can be done by taking the control measures automatically.

## LITERATURE SURVEY

* 1. **Existing problem**

The existing problems of the system are:

* + - Cost of ownership : The fire management system should be cost effective. In average, the fire management is expected to last 10 years. The biggest problem is when the system cannot be maintained any longer due to component non-availability or due to being unsupported by the manufacturer.
    - Structural changes : The structure of the hospital changes over time. The fire management system should be easily able to upgrade and adaptable to the changing structure.
    - Evacuation and fire strategy : The alert and the control measures are taken immediately, so that the building can be completely evaculated.
    - System performance changes within specific environments : The industry will have unique or specified condition at some time. The major problem caused is the false fire alarm.

## References

1. Gazi weldesyase, Bahta G/meskel, Mekonen Abreha, Solomon Baynes, “GSM Based

Fire and Smoke Detection and Prevention System”, on 08/10/2010, Adigrat, Tigray, Ethiopia.

1. May Zaw Tun, Htay Myint, “Arduino based Fire Detection and Alarm System Using Smoke Sensor”, Volume 6, Issue 4, on April – 2020, Myanmar.
2. Nitin Galugade, Mahesh Jakka, Devika Nair, Madhur Gawas, “Fire Monitoring and Controlling System based on Iot”, 2020, Mumbai, India.

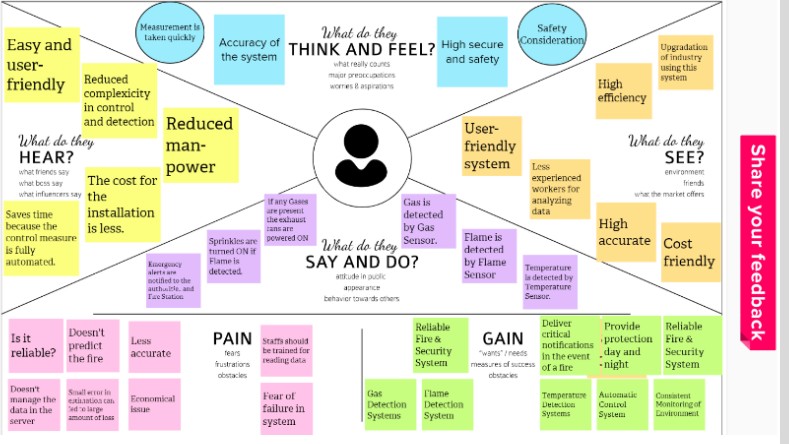
## Problem Statement Definition

**Background**: Fire is the rapid oxidation of a material in the exothermic chemical process of combustion, releasing heat, light and various reaction products. Although it’s a natural process, it can lead to great destruction. On average, everyday 35 people killed due to Fire-related accidents in the five years between 2016 and 2020, according to a report by Accidental Deaths and Suicides in India (ADSI), maintained by the National Crime Records Bureau. Fire is one of the major concerns when analyzing the potential risks on the building. Industrial Fires and Explosions cost companies and governments billions of Rupees every year apart from the loss of life, which can’t be described in monetary terms. These Fires not only results only in huge loss of Lives and Property but also disrupt production in the Industry. The Nilflisk says that the five major causes of industrial fires and explosions are Combustible dust, hot works, Flammable liquids and gasses, equipment and machinery and Electrical hazards.

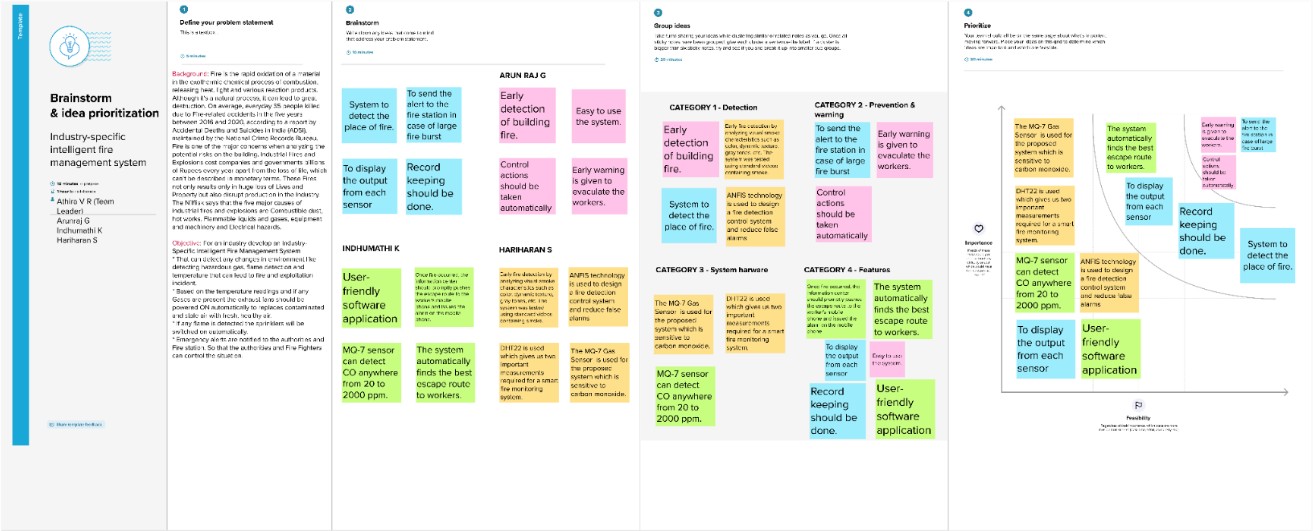
**Objective**: The objective of this Industry-Specific Intelligent Fire Management System is to

detect any changes in environment like detecting hazardous gas, flame detection and temperature that can lead to fire and exploitation incident. Based on the temperature readings and if any Gasses are present the exhaust fans should be powered ON automatically to replace contaminated and stale air with fresh, healthy air. If any flame is detected the sprinklers will be switched on automatically. Emergency alerts are notified to the authorities and Fire station. So that the authorities and Fire Fighters can control the situation.

## IDEATION & PROPOSED SOLUTION

* 1. **Empathy Map Canvas**

## Ideation & Brainstorming

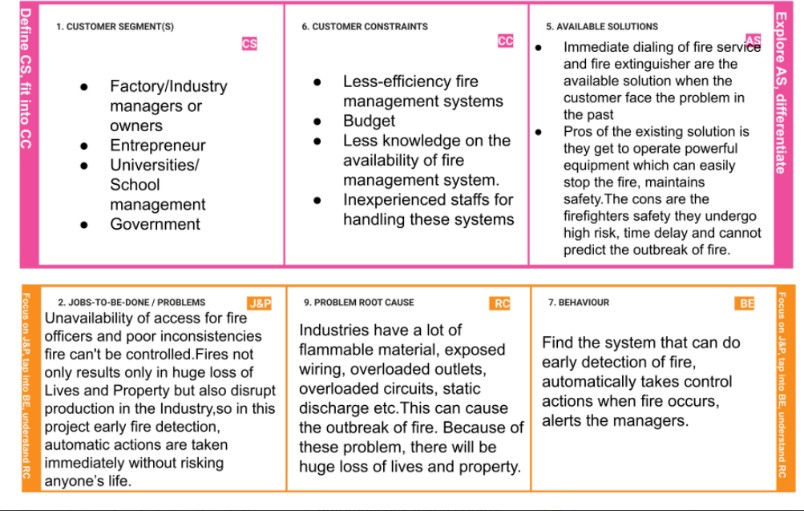


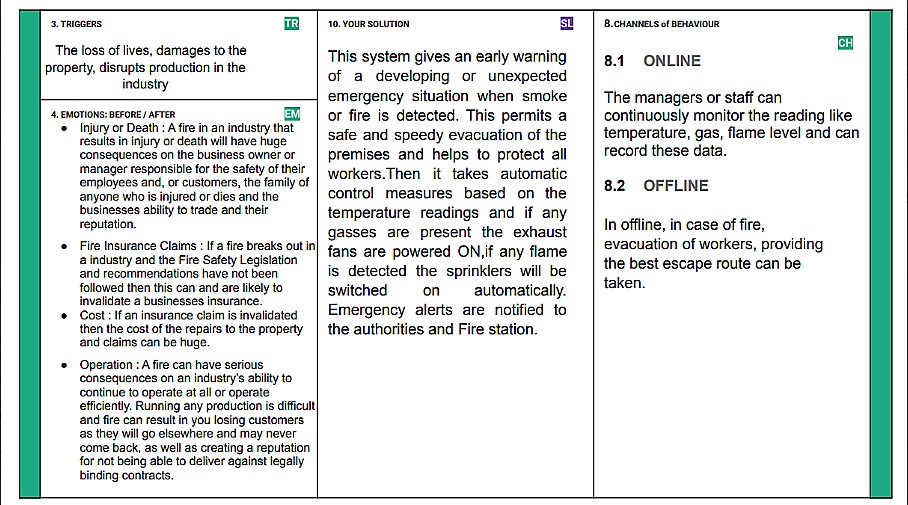
* 1. **Proposed Solution**

|  |  |  |
| --- | --- | --- |
| **S.N**  **o.** | **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 micro controller 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. |

## Problem Solution fit





1. **REQUIREMENT ANALYSIS**

## Functional requirement

Following are the functional requirements of the proposed solution.

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User visibility | Emergency alerts via Fast SMS. |
| FR-2 | User reception | The data like amount of gas levels, smoke content and temperature are received via SMS. |
| FR-3 | User Understanding | Based on the data, the user understands that if any of the data is above the threshold value, then there is a fire burst. |
| FR-4 | User action | In case of fire bursts, the user needs to take actions like find the best escape route, evacuate the workers and take necessary actions to control the fire. |

## Non-functional Requirements:

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

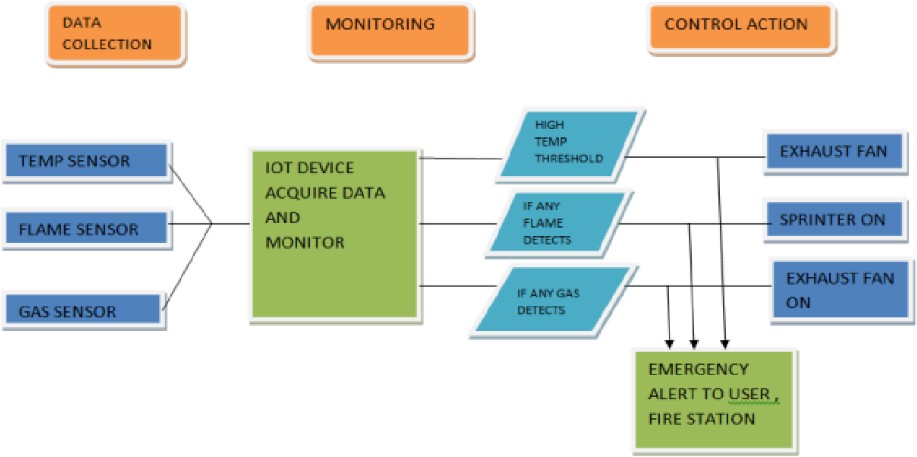
|  |  |  |
| --- | --- | --- |
| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | It ought to have the option to caution inhabitants of the structure the utilization of every perceptible and apparent alert. |
| NFR-2 | **Security** | It ought to be utilized to guarantee the insurance of both important properties, as well as human existence. |
| NFR-3 | **Reliability** | It might have a capacity to recognize the smoke accurately and doesn't give a false caution or signal. |

|  |  |  |
| --- | --- | --- |
| NFR-4 | **Performance** | It ought to have Programmed fire sprinklers combined with identification which distinguishes the flames, yet in addition smother the flames in the underlying stage itself. |

|  |  |  |
| --- | --- | --- |
| NFR-5 | **Availability** | It could be accessible for day in and day out hours so it tends to be useful for individuals. |
| NFR-6 | **Scalability** | The sensors and boards utilized in this framework ought to have the option to effortlessly change overhaul concurring to change and need in requirements |

## PROJECT DESIGN

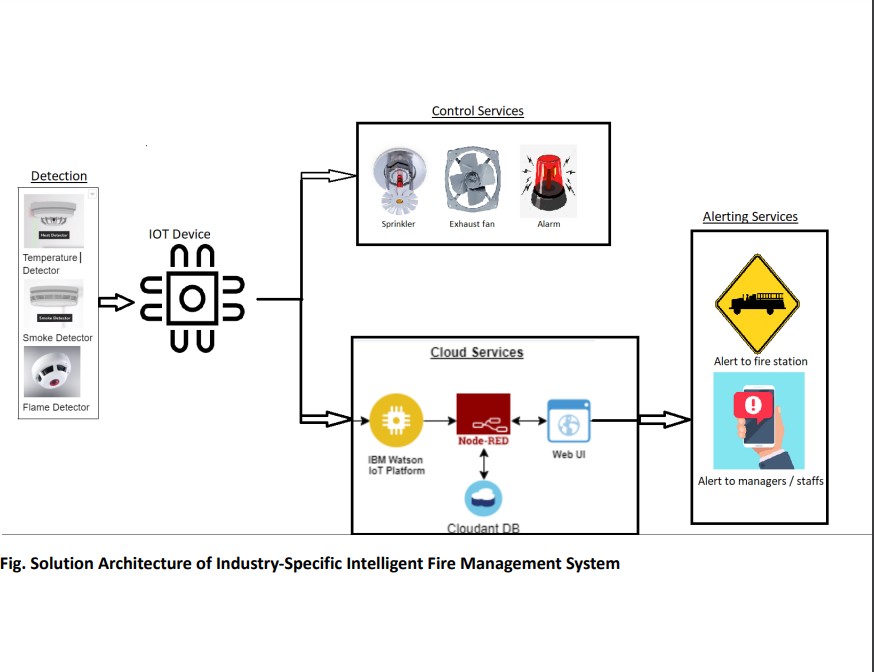
* 1. **Data Flow Diagrams**



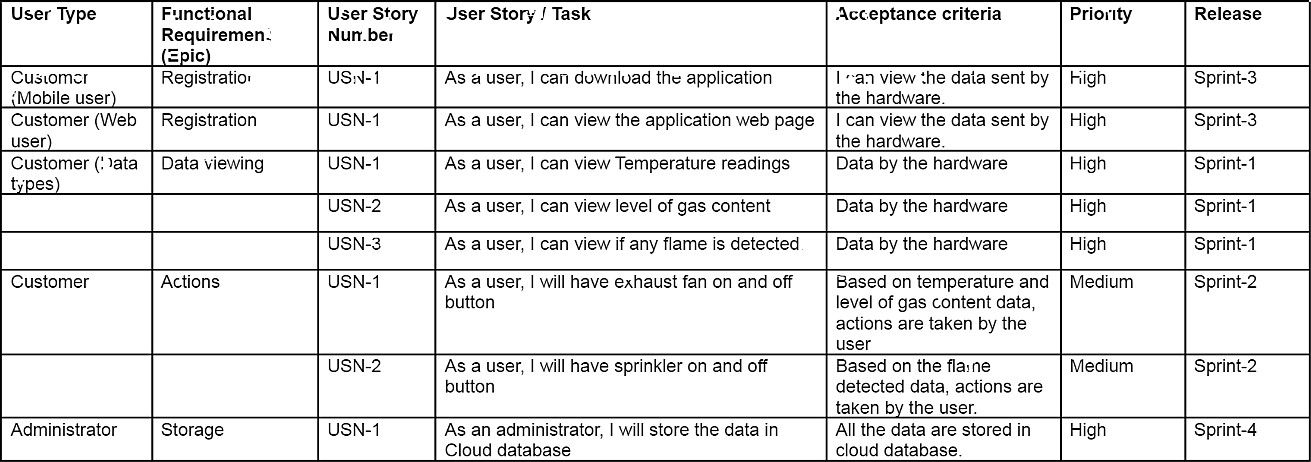
## Solution & Technical Architecture

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

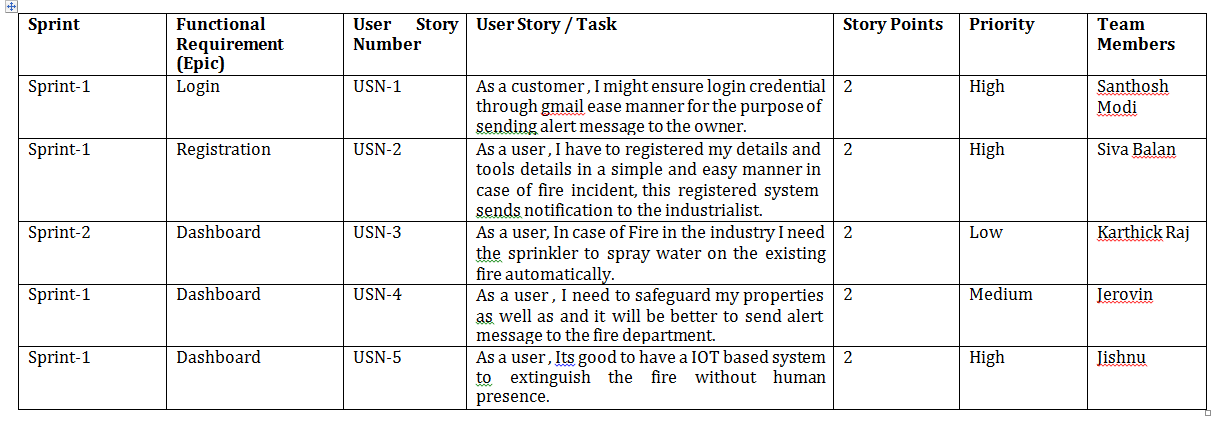
* Find the best tech solution to solve existing business problems.
* Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
* Define features, development phases, and solution requirements.
* Provide specifications according to which the solution is defined, managed, and delivered

## User Stories

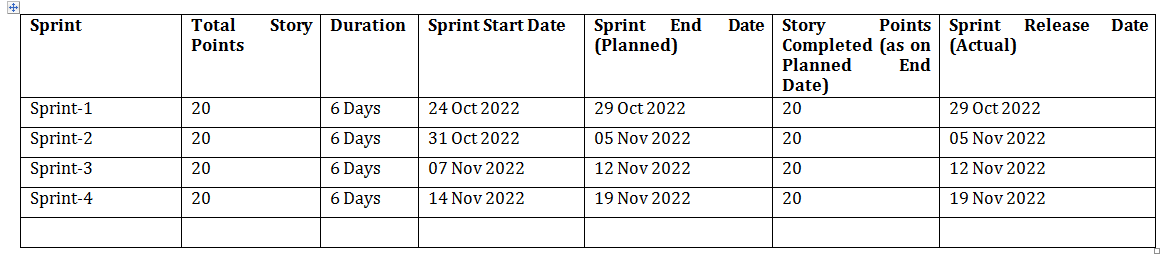


1. **PROJECT PLANNING & SCHEDULING**

## Sprint Planning & Estimation

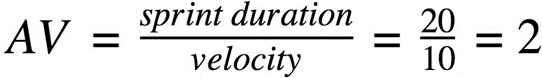
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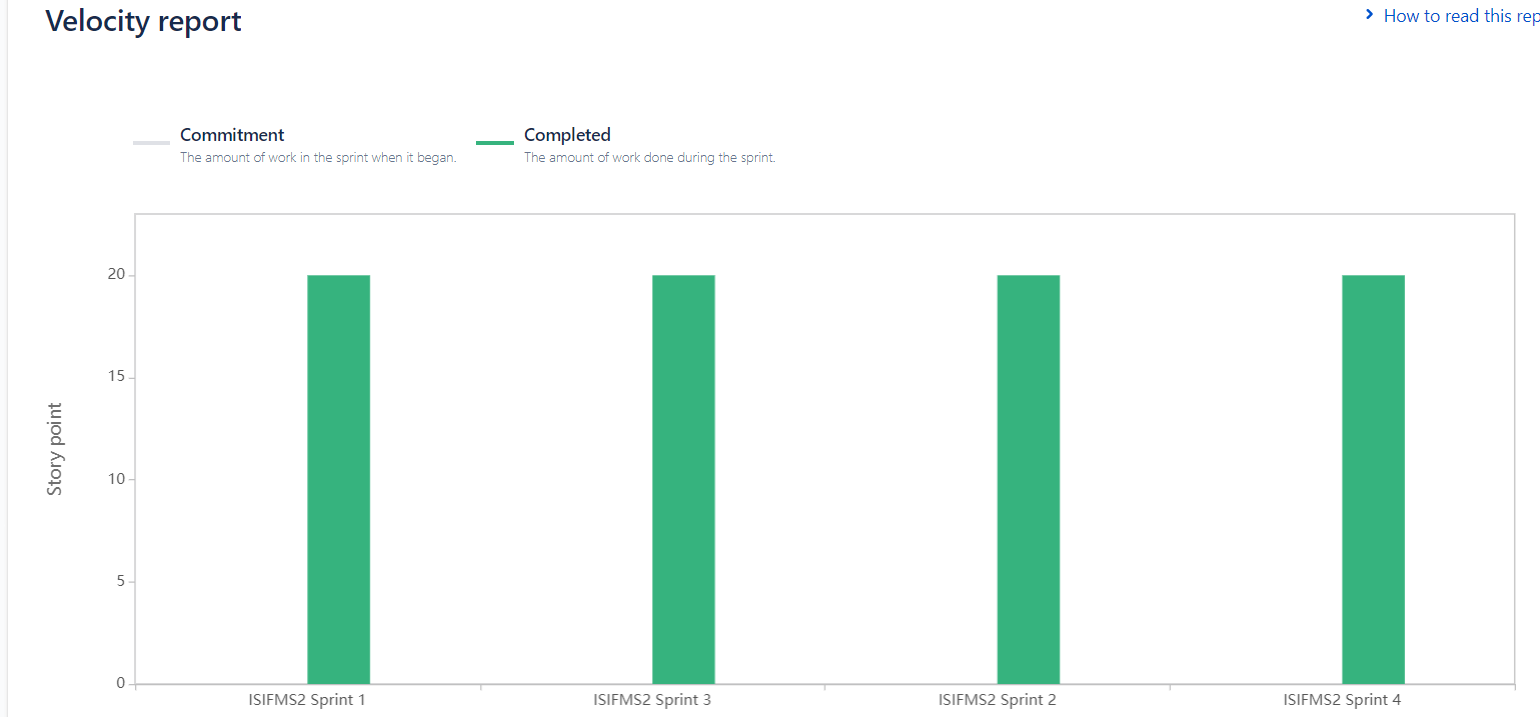
* 1. **Sprint Delivery Schedule**



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

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let’s calculate the team’s average velocity (AV) per iteration unit ( story points per day)

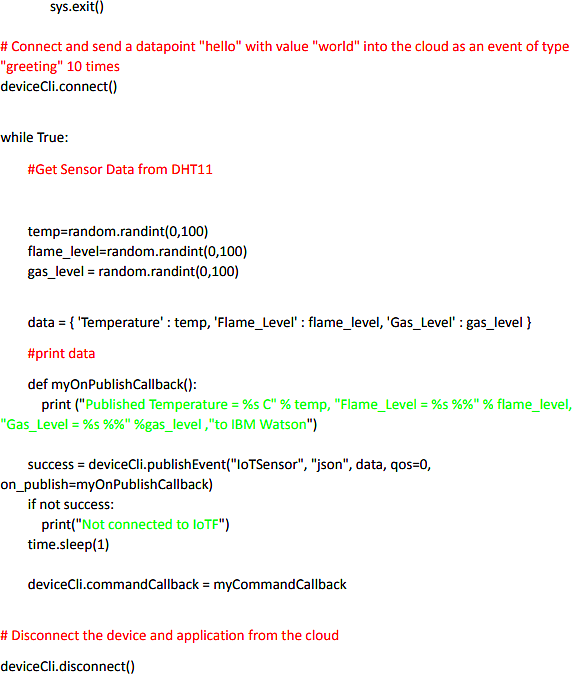




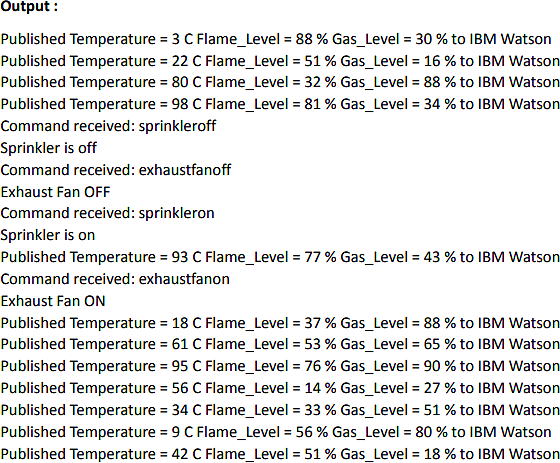
## CODING & SOLUTIONING

* 1. **Feature 1**



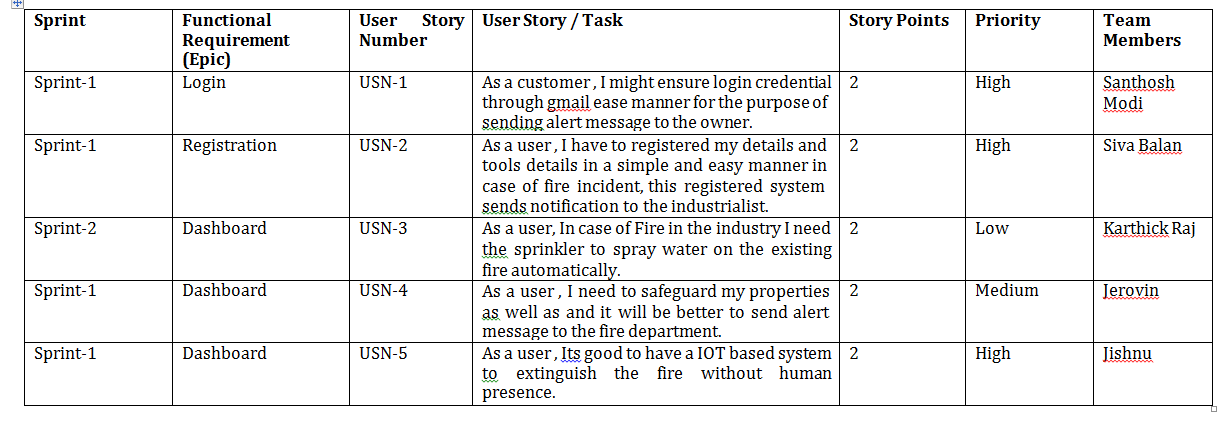


## Feature 2



1. **TESTING**

## Test Cases



* 1. **User Acceptance Testing**

**Purpose of Document :** The purpose of this document is to brieﬂy explain the test coverage and open issues of the Industry-speciﬁc intelligent ﬁre management system project at the time of the release to User Acceptance Testing (UAT).

# Defect Analysis :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section** | **Total Cases** | **Not Tested** | **Fail** | **Pass** |
| Print the Sensor values | 7 | 0 | 0 | 7 |
| Client Mobile Application | 51 | 0 | 0 | 51 |
| Security | 2 | 0 | 0 | 2 |

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Resolution** | **Severity 1** | **Severity 2** | **Severity 3** | **Severity 4** | **Subtotal** |
| By Design | 10 | 4 | 2 | 3 | 20 |
| Duplicate | 1 | 0 | 3 | 0 | 4 |
| External | 2 | 3 | 0 | 1 | 6 |
| Fixed | 11 | 2 | 4 | 20 | 37 |
| Not Reproduced | 0 | 0 | 1 | 0 | 1 |
| Skipped | 0 | 0 | 1 | 1 | 2 |
| Won't Fix | 0 | 0 | 0 | 1 | 8 |
| Totals | 24 | 14 | 13 | 26 | 70 |

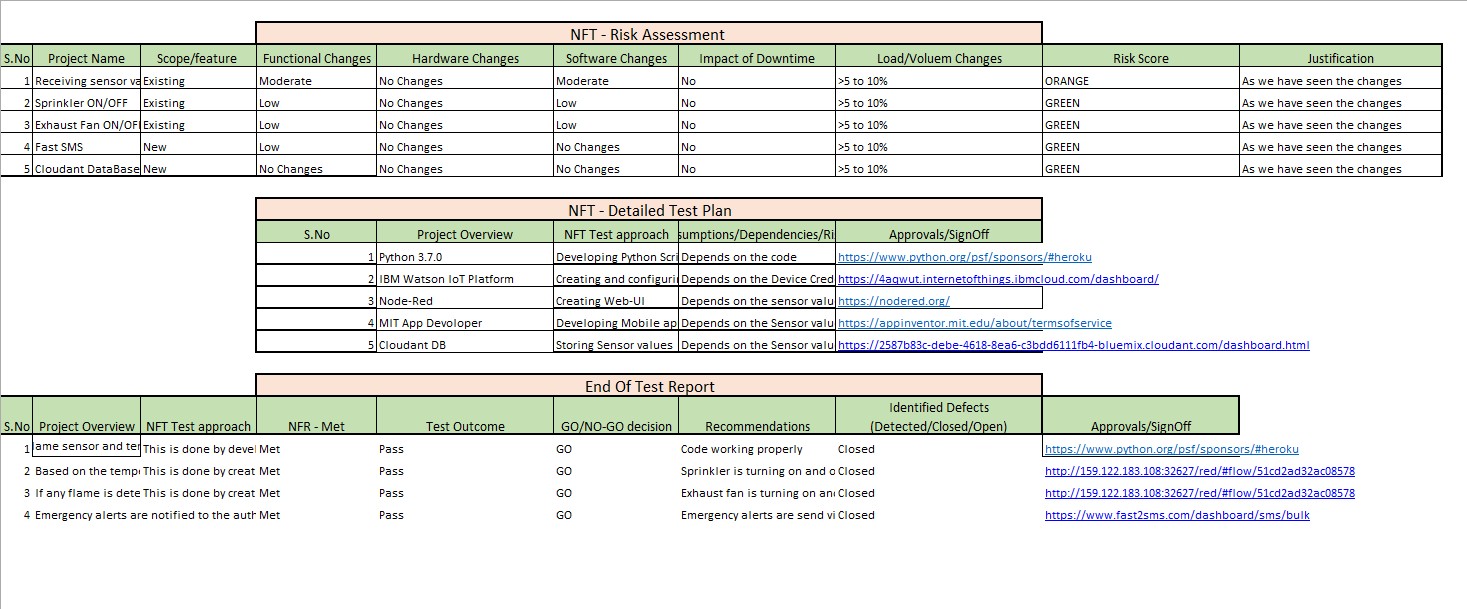
# Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outsource Shipping | 3 | 0 | 0 | 3 |
| Exception Reporting | 9 | 0 | 0 | 9 |
| Final Report Output | 4 | 0 | 0 | 4 |

Version Control 2 0 0 2

## RESULTS

* 1. **Performance Metrics**

## ADVANTAGES & DISADVANTAGES

The Advantages of this Industry-Speciﬁc Intelligent Fire Management system are as follows

* The user need not require expertise knowledge to control this system. This system is simple. The user can easily view the sensor values and take control actions.
* The control actions are taken automatically.
* If it is implemented in hardware, then the cost of implementation will be affordable.
* As we are sensing the sensor values continuously, any slight change in the environment is detected
* This system is in User-Friendly format.

The Disadvantage of this Industry-Speciﬁc Intelligent Fire Management system are as follows

* This system will not be able to detect the origin of ﬁre.
* This system will not provide the escape route if there is ﬁre outbreak.
* If the industry has speciﬁc changes in the environment, then this system will gives false alarm.

## CONCLUSION

An understanding and having Fire Management system in the industry is of utmost importance.This project is a ﬁre management system that can be user in the industry based on IOT.This system creates a simulation device credentials in IBM WATSON IOT PLATFORM.In node-red,necessary nodes are installed and used.These nodes are installed and used.These nodes are deployed and the data is collected.In the event of ﬁre, this system can issue sprinkler on,exhaust fan on.This remote user monitoring system can monitor the system status of each node in real time.This system monitors the data continuously so that the any slight change in the environment can be easily detected.This ensures good control accuracy .This Industry- Speciﬁc Intelligent Fire Management ensures the protection of property, asset and the processes are cost effective and the automatic measures are in control.

## FUTURE SCOPE

The future scope of this project is to add additional features like triggering the extinguisher automatically, predict the escape route if the ﬁre outbreaks and to implement this system in real time using hardware**.**

## APPENDIX

**Fig : Technology architecture of our project**

Source Code

<https://github.com/IBM-EPBL/IBM-Project-41177-1660639926/blob/main/Project%20Development%20Phase/Sprint%201/SPRINT%201.pdf>

GitHub & Project Demo Link

<https://drive.google.com/file/d/1BStguJwl_q1QpDsp76eY3R5FcY93j1Jn/view?usp=share_link>

<https://github.com/IBM-EPBL/IBM-Project-41177-1660639926>