**PROJECT REPORT**

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| --- | --- |
| **TEAM ID:** | **PNT2022TMID53587** |
| **PROJECT NAME** | **Industry - Specific Intelligent Fire**  **Management System** |
| **TEAM MEMBERS** | **HARI PRASAD.P**  **LAWVANYAA.R**  **RESHMA.S**  **SHRUTHI.S** |

**1. INTRODUCTION**

**1.1 Project Overview:**

A fire alarm system has several devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide, or other emergencies are present. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pulsations. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes that sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators. Fire alarm sounders can be set to certain frequencies and different tones including low, medium, and high, depending on the country and manufacturer of the device. Most fire alarm systems in Europe sound like a siren with alternating frequencies. Fire alarm electronic devices are known as horns in the United States and Canada and can be either continuous or set to different codes. Fire alarm warning devices can also be set to different volume levels. Manually actuated devices; also known as fire alarm boxes, manual pull stations, or simply pull stations, break glass stations, and (in Europe) call points. Devices for manual fire alarm activation are installed to be readily located (near the exits), identified, and operated. They are usually actuated using physical interaction, such as pulling a lever or breaking glass. Automatically actuated devices can take many forms intended to respond to any number of detectable physical changes associated with fire: convicted thermal energy; heat detector, products of combustion; smoke detector, radiant energy; flame detector, combustion gases; fire gas detector, and release of extinguishing agents; water-flow detector. The newest innovations can use cameras and computer algorithms to analyze the visible effects of fire and movement in applications inappropriate for or hostile to other detection methods.

* 1. **Purpose:**

Fire alarm system is designed to detect fire in two main ways: smoke and heat. It should also have the capability of manual pull, in case a fire is observed before smoke or heat reaches the sensors of the system. Other systems are activated when movement in the sprinkler system is detected, indicating that the sprinklers are responding to a fire. When the fire alarm system detects smoke, heat, or water movement, it alerts occupants of the building using both audible and visible alarms. These alarms will be bright, loud, obnoxious, and impossible to ignore, which help mobilize individuals to follow your evacuation plan. Using both types of alarms ensure that every person in the building is alerted.Your building’s fire alarm system works in a third way to protect you: by reacting to potential risks using control measures. When the alarm is activated, some systems perform a set of tasks that help prevent fire and smoke from spreading as well as protect occupants, such as: automatically shutting doors in different zones, powering off ventilation and air conditioning, or redirecting elevators to bring cars to a designated level. The fourth purpose of your fire alarm system is to notify authorities. This ensures the fire department is en route as quickly as possible, so they can respond and extinguish the fire before it becomes an even bigger threat.

1. **LITERATURE SURVEY:**

**2.1 Existing problem:**

Safety is a crucial consideration in the design of residential and commercial buildings to safeguard against the loss of life and damage to property. The existing fire alarm system on market nowadays is too complex in terms of its design and structure. Since the system is too complex, it needs regular maintenance to be carried out to make sure the system operates well. Meanwhile, when the maintenance is being done to the existing system, it could raise the cost of the system

**2.2 References:**

**PAPER 1**

**AUTHORS: Noah Akhimien**

**YEAR: 2017**

**DESCRIPTION:**

The aim of this study was to examine fire safety measures and their viability in buildings, the required measures are technology based. Buildings should be designed in such a way that occupants can escape by themselves in case of fire. However, case-studies shows that occupants often are found incapable to escape in time and often times undermine precautional measures required to avoid or escape fire. The study methodology was based on incident evaluations and real-life experiments, such as unannounced evacuation drills. The possibilities of virtual reality for studying human behavior in fires are so far hardly adopted by researchers. Nevertheless, since in virtual environments test persons can be faced with the phenomenon of fire in a safe way, Data was also collected from books, magazines, journals and related articles, the application of a behavioral assessment and research tool in virtual reality is expected to be a valuable supplement on the existing research methods. In general little information is known about actual human behavior in an event of fire outbreak. Therefore, it is better to let the fire safety of buildings be based upon actual human behavior in fire. It is important to enlighten occupants on safety measures to be taken during fire outbreak in and around their buildings and other fire prevention methods to adopt for their safety. The study recommended suitable fire safety measures in accordance to best practices after due evaluation of existing fire safety measures as it applies to users and the effectiveness of these measures.

**PAPER 2**

**AUTHORS: C. Sivakumar, Palanisamy Sivaprakash**

**YEAR: 2018**

**DESCRIPTION:**

The construction industry in India is the country’s second largest industrial sector, after agriculture. The construction industry makes a remarkable contribution to the Indian economy and provides employment to a large number of people of India. Fire is a chemical reaction of a combustible substance with oxygen, involving heat and is usually accompanied by a visual flame or incandescence. Ensuring fire safety has always been a challenge to the stakeholders, i.e. building owners, construction companies, contractors and sub-contractors, and government employees due to the multiplicity of the factors involved and their complexity. There are various legal standards and requirements for ensuring fire safety on construction sites. The buildings are normally provided with firewalls during construction and these firewalls separate two structures or divide a structure into smaller portions to prevent the spread of fire. The lightweight construction and trusses are designed to support only their own weight. During a fire, if one fails, a domino effect happens and all fail rapidly within 5 to 10 minutes. Prolonged exposure to fire may result in structural collapse and injury or death of the occupants of the building under construction. Fire safety on construction sites is still in its primitive stages in India. There is a great necessity to improve fire safety on construction sites to protect construction workers and other occupants of the buildings. This study aims to design and implement fire safety systems for construction sites, thereby enhancing the standards to meet the system requirements at par with global standards.

**PAPER 3**

**AUTHORS: Kamal Padhiar, Ajay Rajpurohit , Dinesh Saldiwal, Kahar Shaikh, Rudradeep Sarvaiya , Sejal Patel**

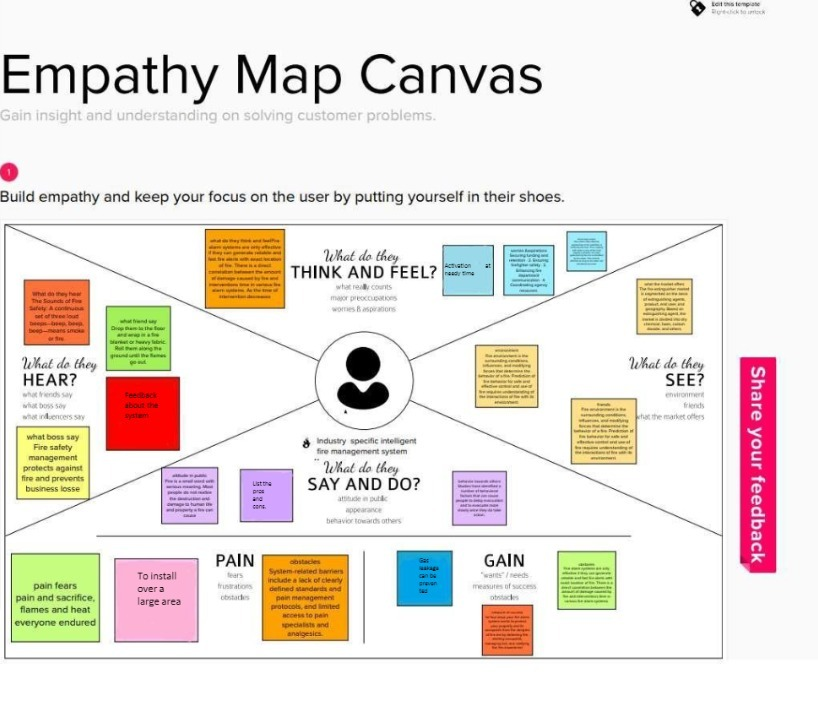
**YEAR: 2018**

**DESCRIPTION:**

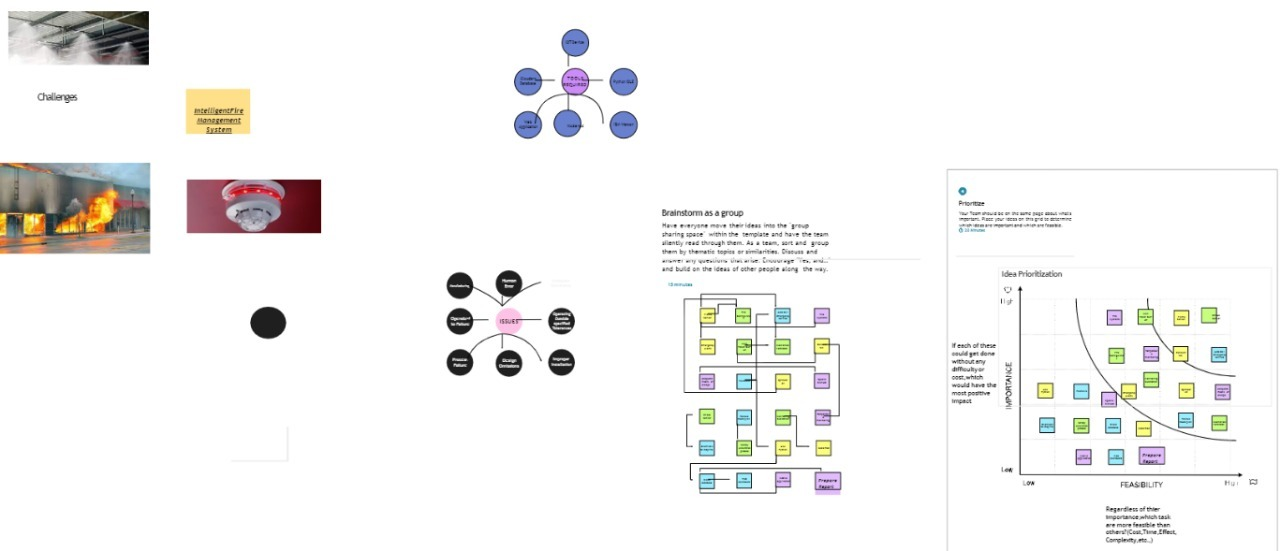
Constant attention is required to minimize adverse impact due to fire. Fire safety system is the essential part of any building although it’s not been taken into consideration by the building developers and planners, thus it is necessary to take initiatives for development of fire safety system. Electrical fault is one of the main causes of fire in all types of buildings i.e. residential, industrial, commercial buildings and its potential hazard is increasing as more electrical appliances are used nowadays. Wiring has a higher possibility to be ignited. There were even cases reported due to short-circuit in electric box set caught fire. The present fire safety system of Surat city is good but have some lacking as it is not developed as per the municipal corporation norms, so more cases of fire bursting out has been arose due to improper fire safety system and also due to less maintenance. Thus at the time of fire the building structure gets heavily damaged and there are chances of losses of life and property. In this project the residential & commercial buildings suffered by the fire problems would be surveyed and lacking in the safety system will be shown and its upgradation will also be given so as to provide a better and safer fire safety system. Thus properly designed, installed, and maintained, these upgraded systems can overcome deficiencies in risk management, building construction, and emergency response. These may also provide enhanced flexibility of building design and increase the overall level of fire safety.

1. **IDEATION & PROPOSED SOLUTION**

**3.1 Empathy Map Canvas**



**3.2 Ideation and Brainstorming**



**3.3 Proposed Solution**

Table

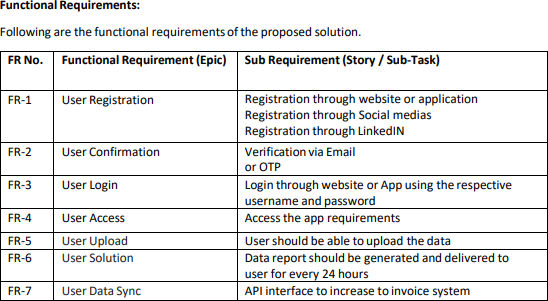
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**3.4 Problem Solution fit**

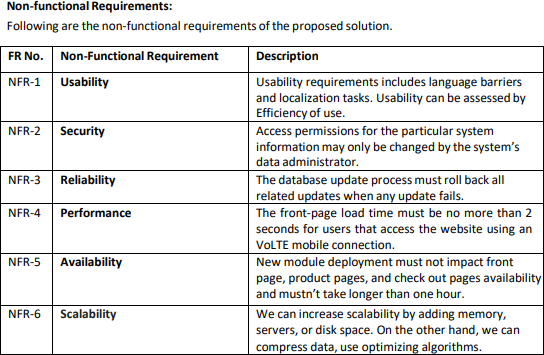


1. **REQUIREMENT ANALYSIS**

**4.1 Functional requirement**

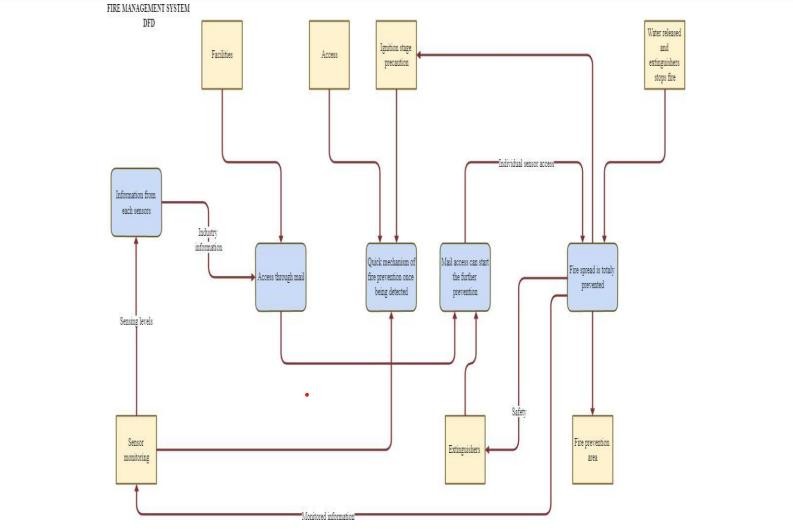


**4.2 Non Functional requirement**

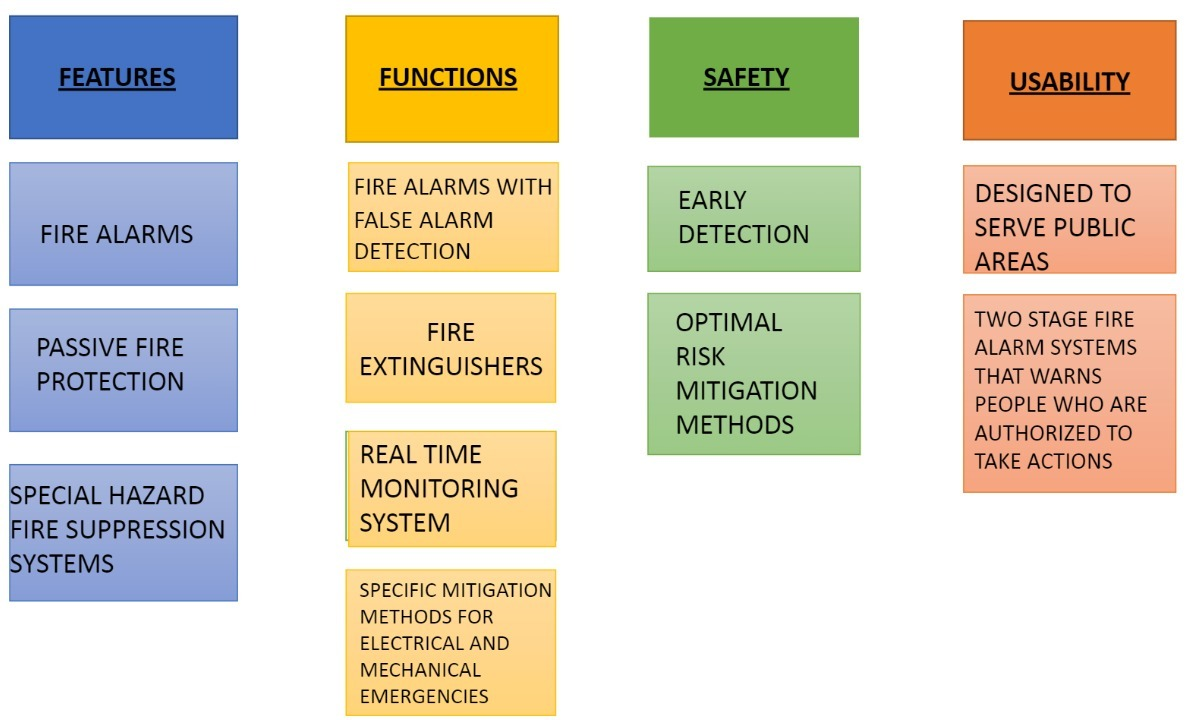


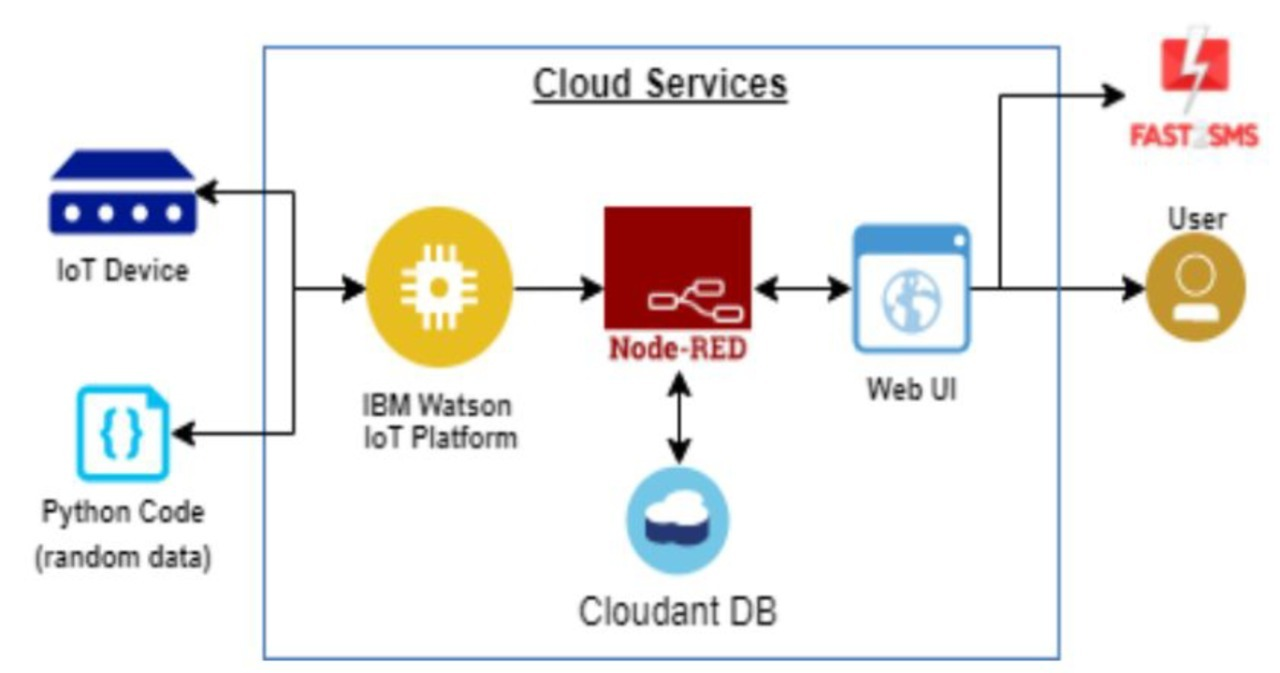
1. **PROJECT DESIGN**

**5.1 Data Flow Diagrams**



**5.2 Solution & Technical Architecture**





1. **PROJECT PLANNING AND SCHEDULING**

**6.1. Sprint Planning and Estimation**

|  |  |  |
| --- | --- | --- |
| **TITLE** | **DESCRIPTION** | **RELEASE DATE** |
| Literature Survey and  Information Gathering | Surveying on the topic of selected project & gathering information by referring the, technical papers  ,research publications etc. | 23 SEPTEMBER 2022 |
| Prepare Empathy Map | Prepare Empathy Map Canvas to capture the user pains & gains on particular issue. | 25 SEPTEMBER 2022 |
| Ideation | Jot down the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance. | 27 SEPTEMBER 2022 |
| Proposed Solution | Prepare your proposed solution of the project which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc. | 28 SEPTEMBER 2022 |
| Problem Solution Fit | Prepare problem - solution fit document. | 28 SEPTEMBER 2022 |
| Solution Architecture | Prepare solution architecture document. | 30 SEPTEMBER 2022 |
| Customer Journey Map | Prepare the customer journey maps to understand the user interactions  & experiences with the application  (entry to exit) | 17 OCTOBER 2022 |
| Functional Requirement | Prepare the functional requirement for the project. | 17 OCTOBER 2022 |
| Data Flow Diagrams | Draw the data flow diagrams to understand the flow of execution of the project. | 18 OCTOBER 2022 |
| Technology Architecture | Prepare the technology architecture diagram. | 18 OCTOBER 2022 |
| Milestone & Activity List | Prepare the milestones & activity list of the project. | 29 OCTOBER 2022 |
| Delivery of Sprints | Submit the coding development of the project and submit in sprints. Sprint -1  Sprint -2  Sprint -3  Sprint -4 | 30 October 2022  5 November 2022  11 November 2022  17 November 2022 |

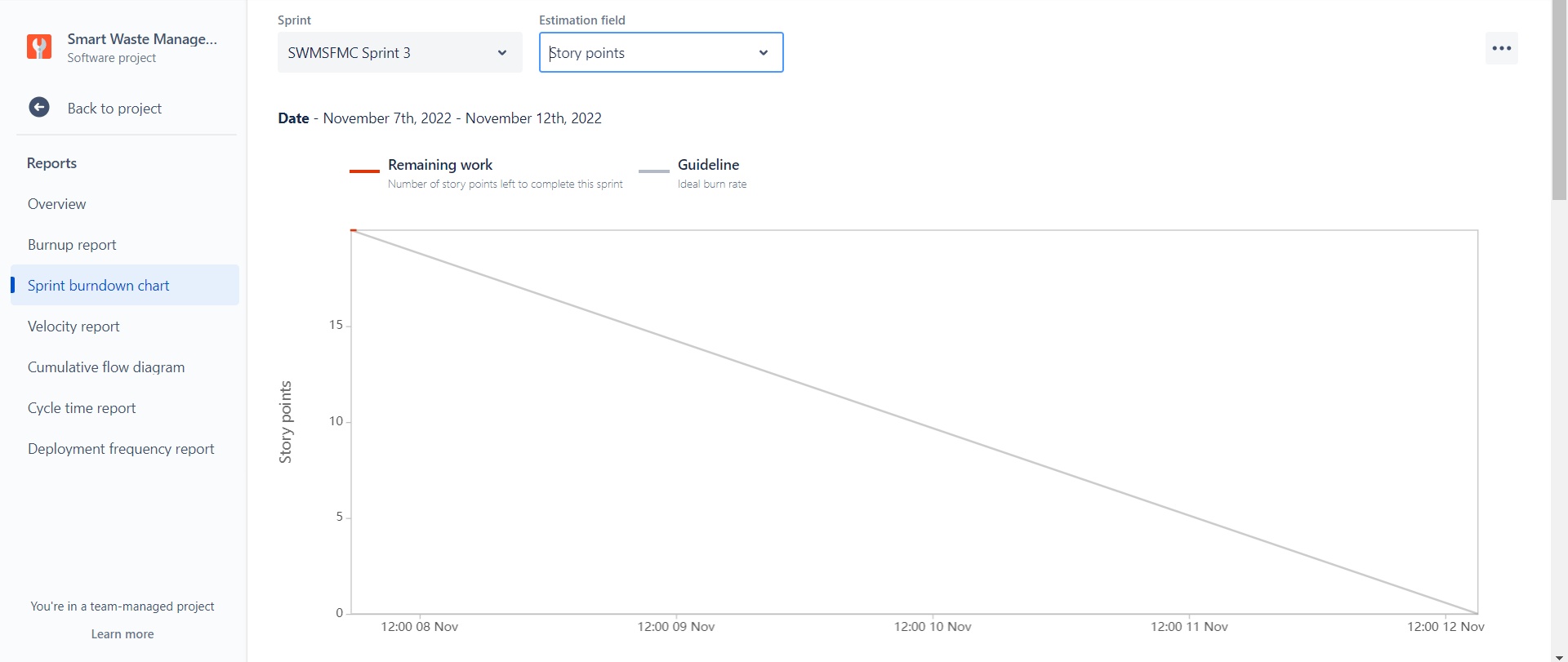
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| --- | --- | --- | --- | --- | --- | --- |
| **Sprint** | **Functional Requirement (Epic)** | **User Story Number** | **User Story / Task** | **Story Points** | **Priority** | **Team Members** |
| Sprint-1 | Simulation software | USN-1 | Connect flame sensor with NodeMCU | 2 | High | Shruthi S,  Hari Prasad P,  Reshma S, Lawvanyaa R |
| Sprint-2 | Cloud software | USN-2 | Integrate NodeMCU and flame sensor with GSM Module | 2 | High | Shruthi S,  Hari Prasad P,  Reshma S, Lawvanyaa R |
| Sprint-3 | MIT app invertor | USN-3 | Develop a mobile application using MIT App invertor | 2 | High | Shruthi S,  Hari Prasad P,  Reshma S, Lawvanyaa R |
| Sprint-4(i) | Linking | USN-4 | Link IBM Cloud and the developed App Application | 2 | High | Shruthi S,  Hari Prasad P,  Reshma S, Lawvanyaa R |
| Sprint-4(ii) | Dashboard | USN-5 | Design the modules and Test the Mobile Application | 2 | High | Shruthi S,  Hari Prasad P,  Reshma S, Lawvanyaa R |

**6.2. Sprint Delivery Schedule**

|  |  |
| --- | --- |
| **Sprint** | **Milestones** |
| Sprint-1 | Fire detection using flame sensor |
| Sprint-2 | Integrating the GSM and alerting the user about the occurrence of fire. |
| 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 MIT app invertor with IBM cloud platform Set the modules and test the software |

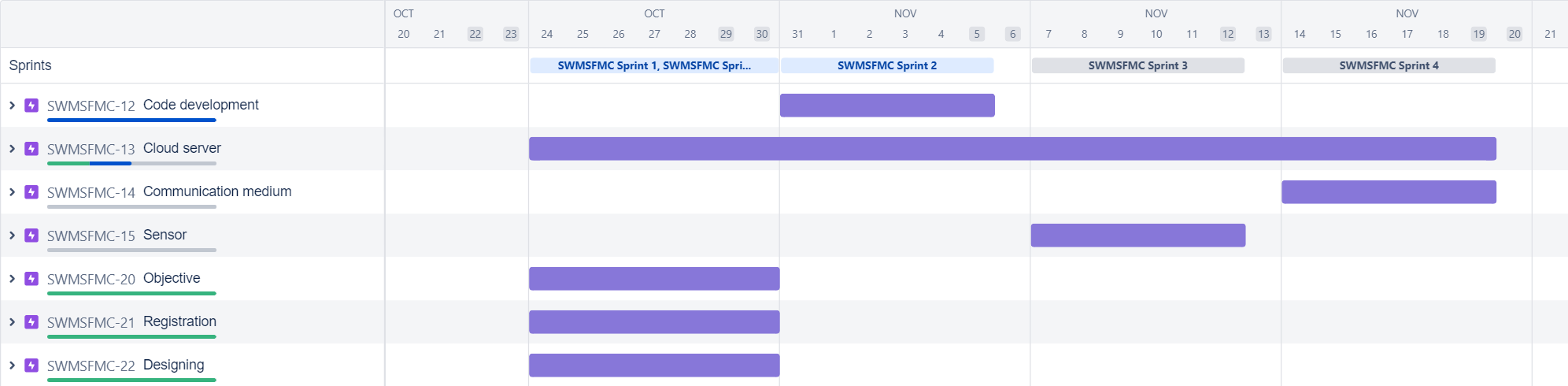
**6.3 Reports from JIRA**

**BURNOUT CHART**

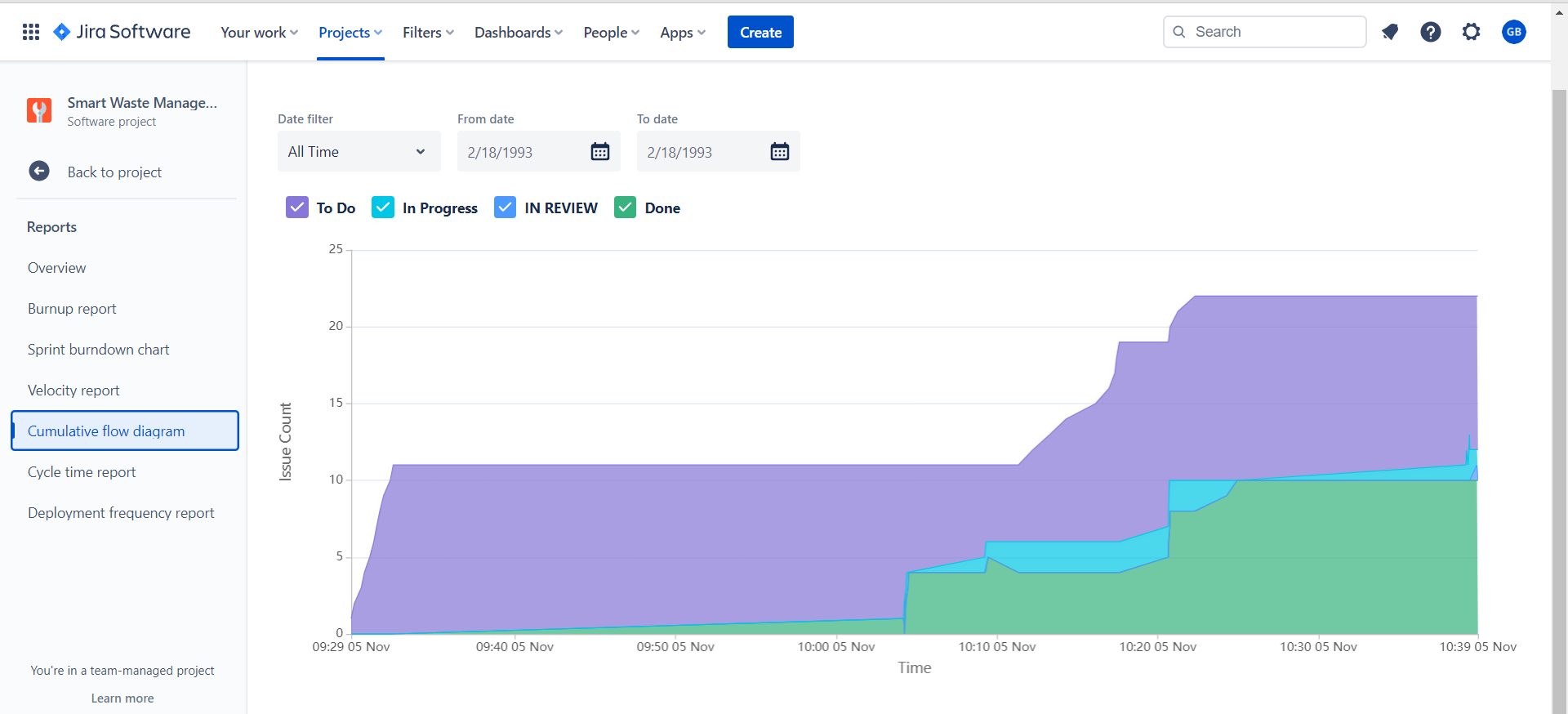
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**JIRA SOFTWARE SCREENSHOTS**

**ROADMAP**

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**CUMULATIVE FLOW DIAGRAM**

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1. **CODING & SOLUTIONING (Explain the features added in the project along with code)**

**CODE:**

import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

#Provide your IBM Watson Device Credentials

organization = "c0o308"

deviceType = "abcd"

deviceId = "12345

authMethod = "token"

authToken = "12345678"

# Initialize GPIO

def myCommandCallback(cmd):

print("Command received: %s" % cmd.data['command'])

status=cmd.data['command']

if status=="lighton":

print ("led is on")

elif status == "lightoff":

print ("led is off")

else :

print ("please send proper command")

try:

deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}

deviceCli = ibmiotf.device.Client(deviceOptions)

#..............................................

except Exception as e:

print("Caught exception connecting device: %s" % str(e))

sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times

deviceCli.connect()

while True:

#Get Sensor Data from DHT11

temp=random.randint(90,110)

Humid=random.randint(60,100)

data = { 'temp' : temp, 'Humid': Humid }

#print data

def myOnPublishCallback():

print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "to IBM Watson")

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on\_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

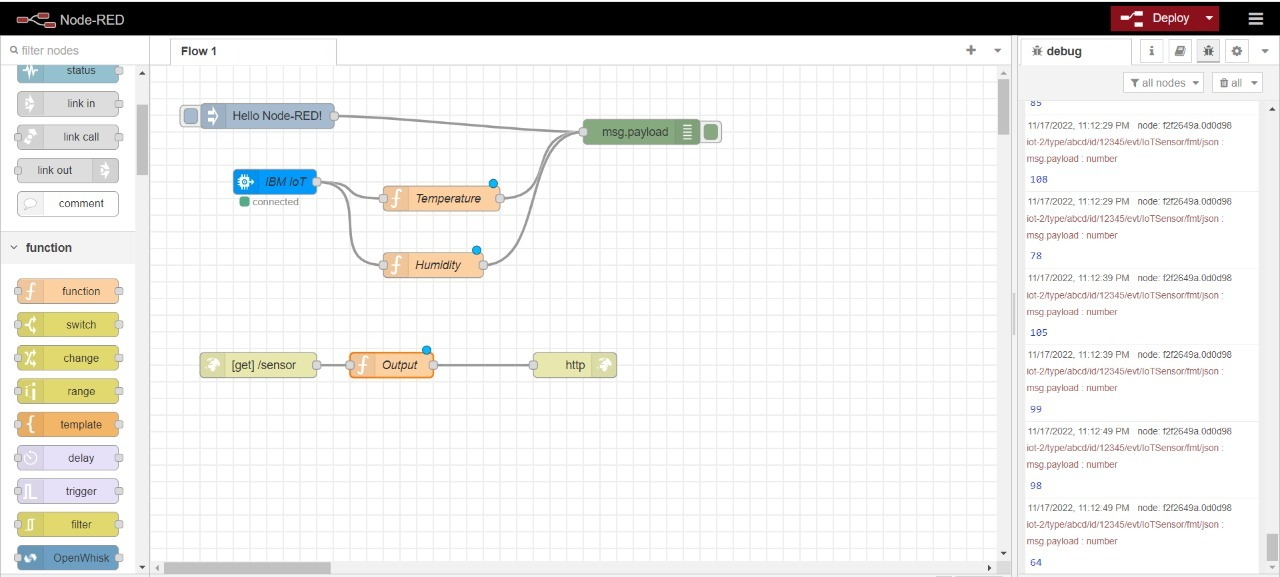
time.sleep(10)

deviceCli.commandCallback = myCommandCallback

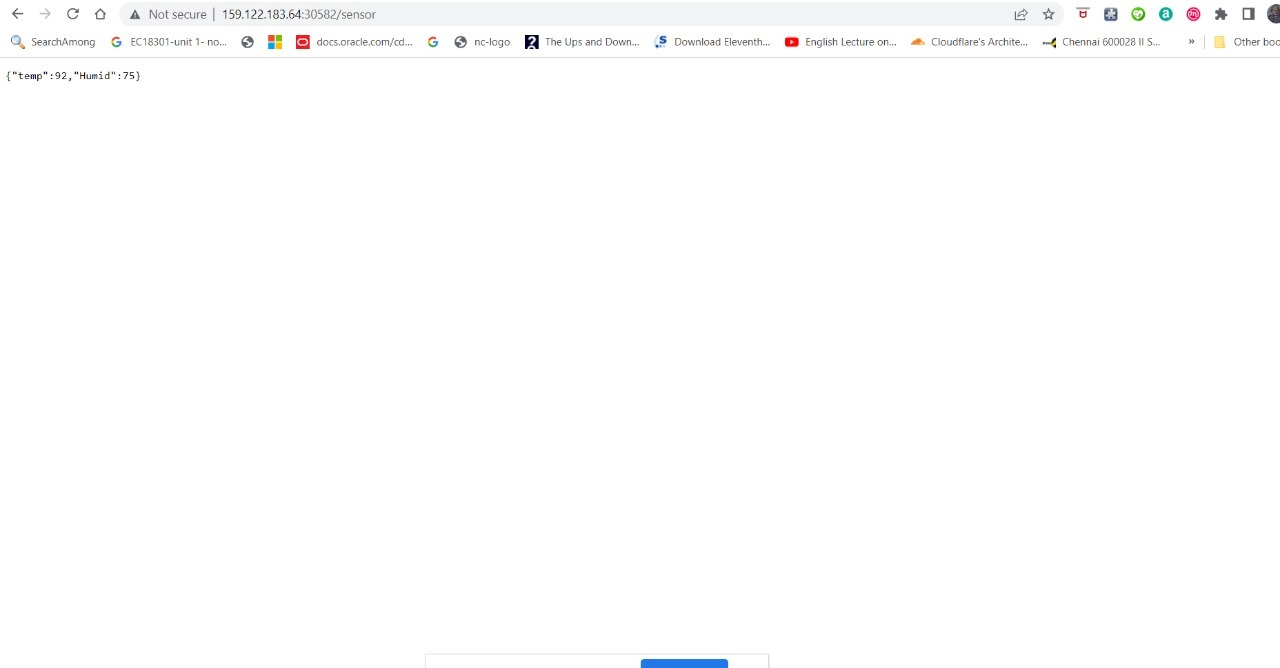
# Disconnect the device and application from the cloud

deviceCli.disconnect()

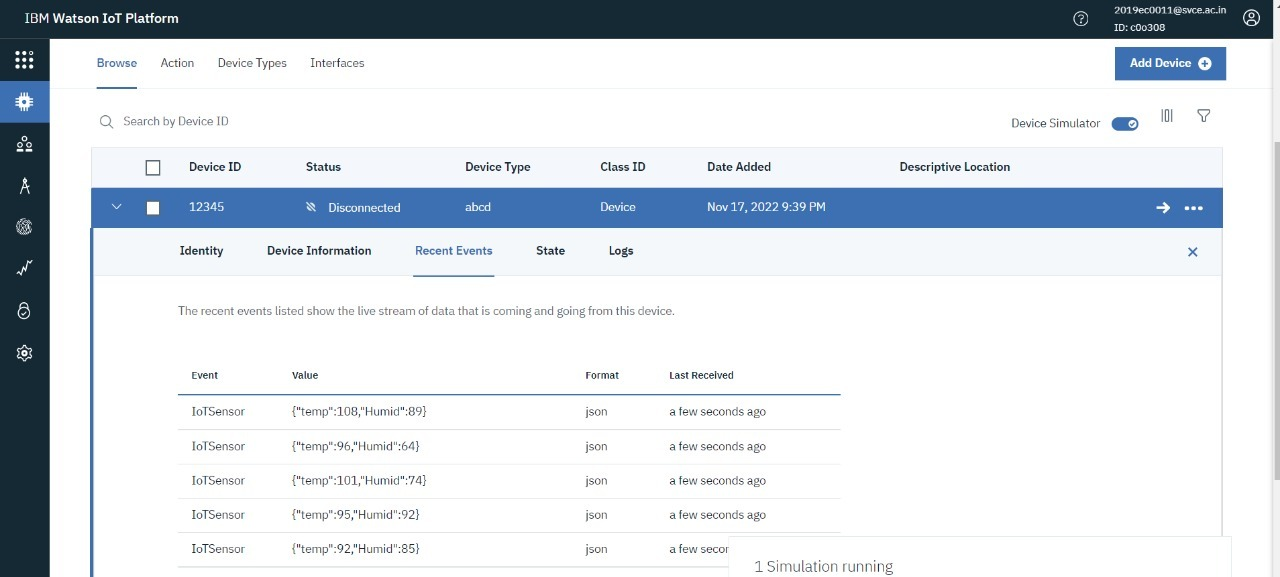
* 1. **Feature 1 - Node Red**

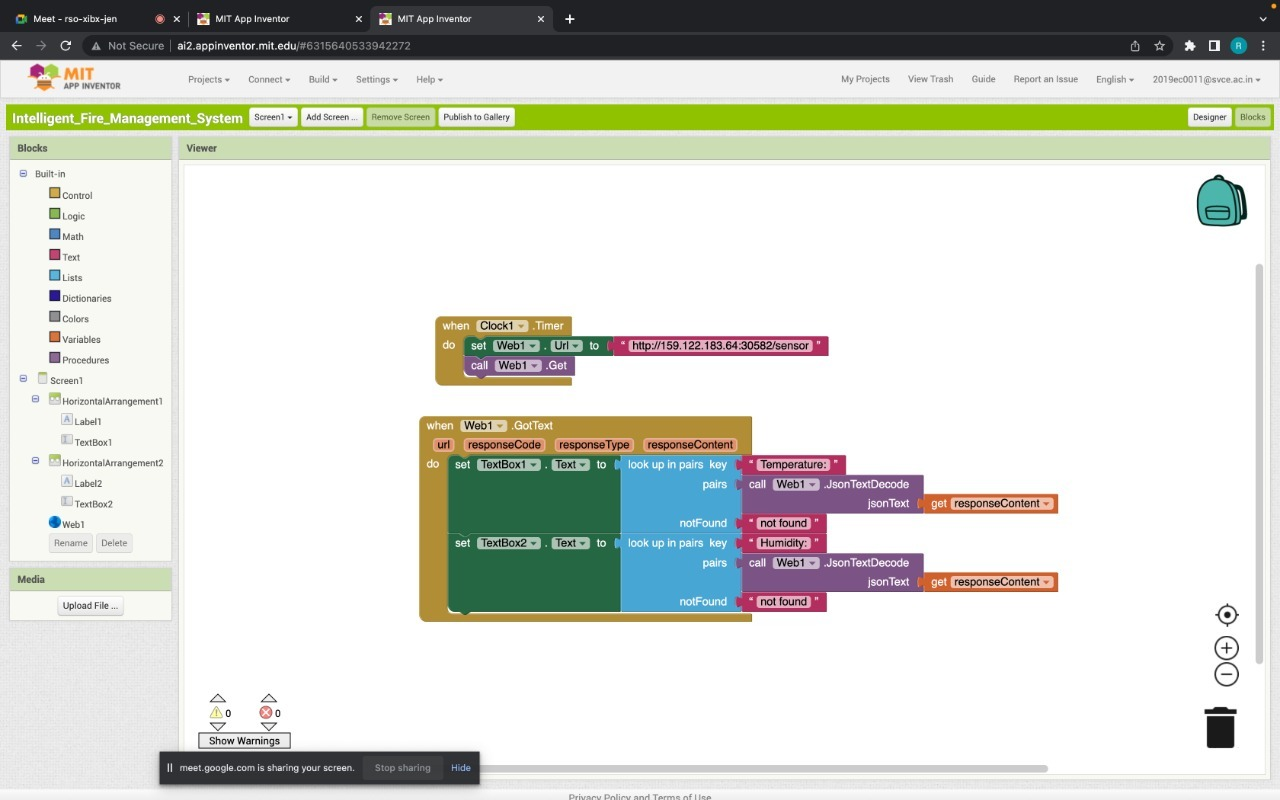


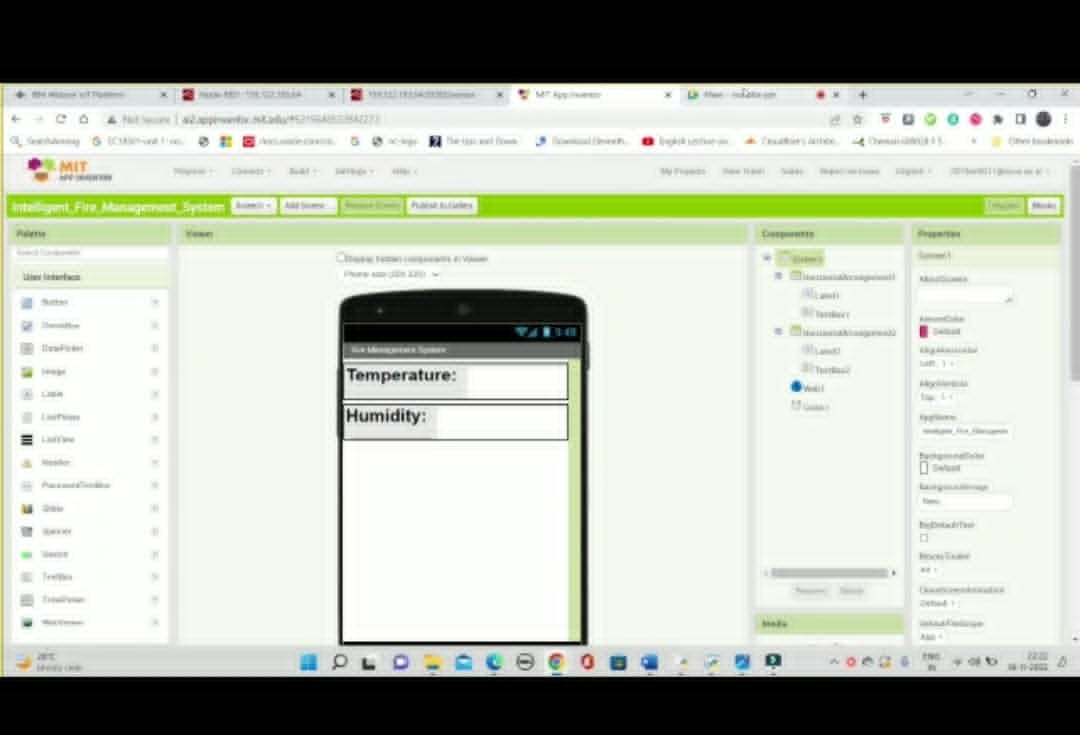
* 1. **Feature 2- Web UI Displaying**



**7.3 Feature 3- LIVE UPDATE ON COLLECTED DATA**







Shape

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**8.RESULTS**

**8.1 Performance Metrics**

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**9. ADVANTAGES & DISADVANTAGES**

**ADVANTAGES:**

1.Reduction in Cost

2.No Missed fires

3.Reduced accidents

4.tempertaure Analysis

5.CO2 Emission Reduction

**DISADVANTAGES:**

System requires a greater number of sensors for separate buildings as per population in the city.

This results in high initial cost due to expensive smart dustbins compare to other methods.

Sensor nodes used in the modules have limited memory size.

1. **CONCLUSION**

Smoke detectors are devices created and designed to alarm by voice signals when Lighting

energy reduce safe levels. They are supposed to alert people if there is a danger of fire, and they

are required in public places, especially ones where fire accidents are more likely to happen,

such as kitchens.

**11.FUTURE SCOPE**

There are several future works and improvements for the proposed system, including the following:

1.Having case study or data analytics on the type and times fire started on different days or seasons, making bin filling predictable and removing the reliance on electronic components, and fixing the coordinates.

2.Improving the Server's and Android's graphical interface.