PROJECT REPORT

TEAM ID:	PNT2022TMID38337
PROJECT NAME	**Industry - Specific Intelligent Fire Management System**
TEAM LEADER **TEAM MEMBERS**	**EZHILARASAN G** **MAHAKAVI S** **GOPINATH S** **GUHAN M**

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.

1.1Purpose:

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.

2. 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.

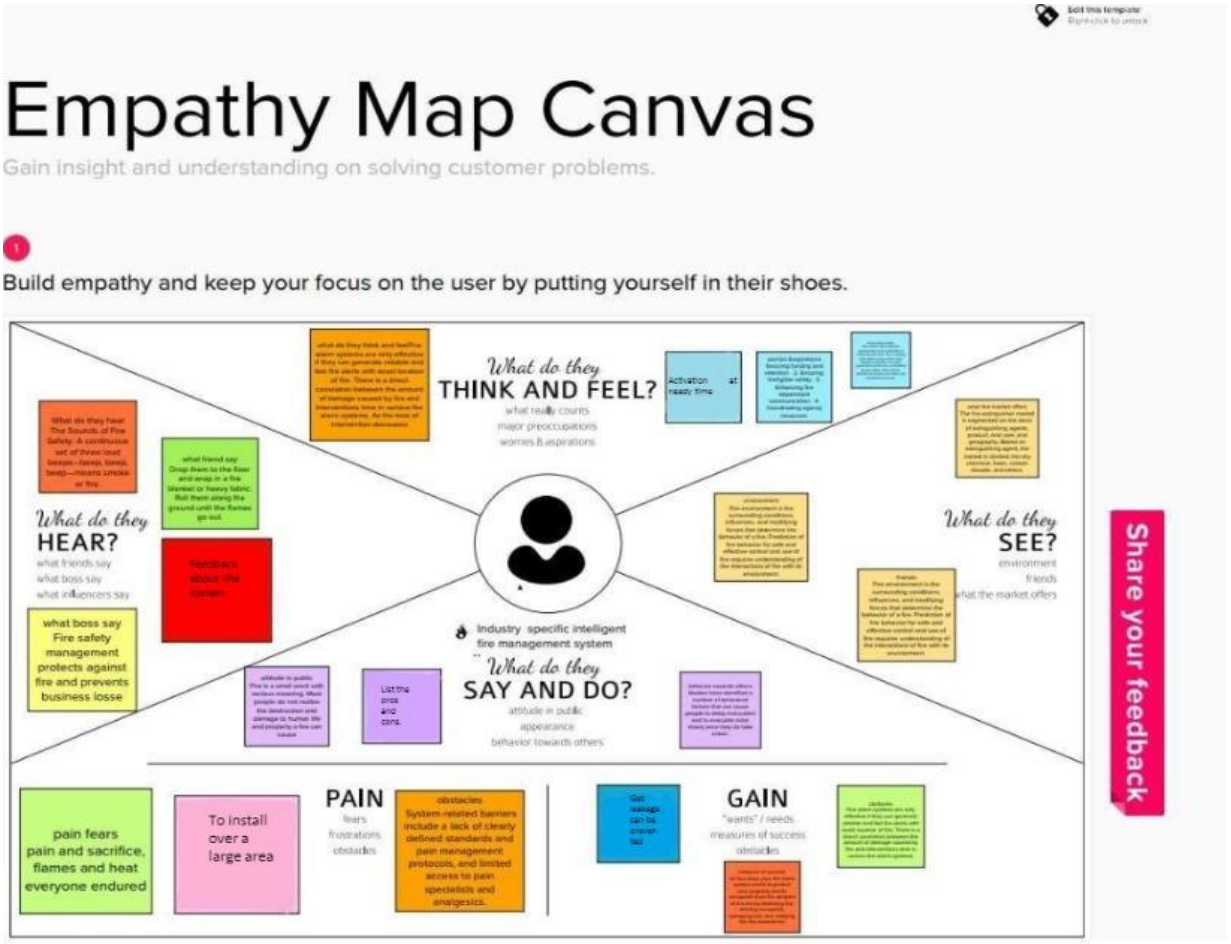
PAPER 3

AUTHORS: Kamal Padhiar, Ajay Rajpurohit , Dinesh Saldiwal, Kahar Shaikh, Rudradeep Sarvaiya , Sejal Patel
YEAR: 2018
DESCRIPTION:

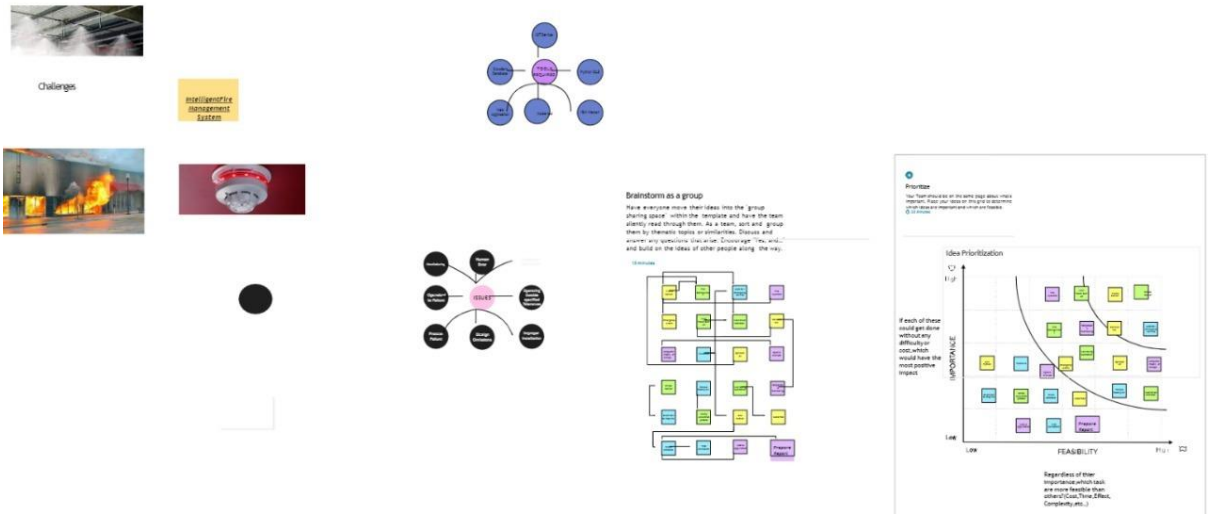
Constant attention is required to minimize adverse impact due to fire. Fire safety system is the essential part of any building although it's not been taken into consideration by the building developers and planners, thus it is necessary to take initiatives for development of fire safety system. Electrical 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.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation and Brainstorming



3.3 Proposed Solution

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	- Mitigate False alarms - Early signal - Automatic alerting system
2.	Idea / Solution description	- Putting off fire using various methods such as water and chemical
3.	Novelty / Uniqueness	- Highly reliable - Low economic cost
4.	Social Impact / Customer Satisfaction	- Saving lives - Saving resources
5.	Business Model (Revenue Model)	- Subscription model
6.	Scalability of the Solution	- Highly scalable - Easily available raw materials - Cost effective

3.4 Problem Solution fit

CUSTOMER SEGMENT:
- Office Buildings
- Factories
- Educational Institutions

PROBLEMS:
- Loose Connections
- Faulty Installation

AVAILABLE SOLUTIONS:
- Sprinklers
- Portable Fire extinguishers
- Avoids toxic Inhalation

TRIGGER TO ACT:
- Fire
- Smoke
- Gas

ROOT CAUSES:
-Low Maintenance
-Lack of safety measures

OUR SOLUTION:
-An IoT based fire management system which deduces false alarms and gives early warnings effectively.

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through website or application Registration through Social medias Registration through LinkedIN
FR-2	User Confirmation	Verification via Email or OTP
FR-3	User Login	Login through website or App using the respective username and password
FR-4	User Access	Access the app requirements
FR-5	User Upload	User should be able to upload the data
FR-6	User Solution	Data report should be generated and delivered to user for every 24 hours
FR-7	User Data Sync	API interface to increase to invoice system

4.2 Non Functional requirement

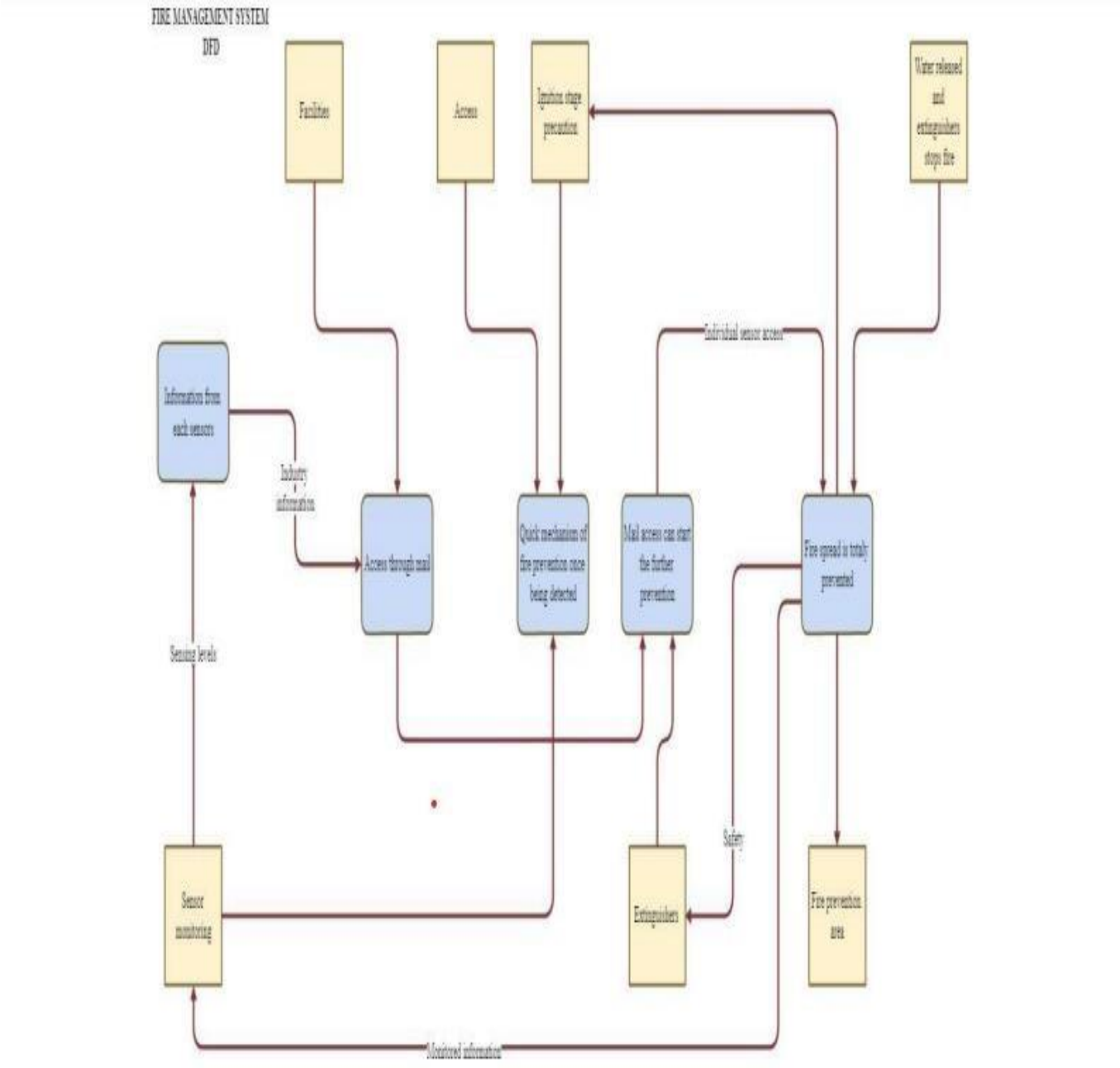
Non-functional Requirements:

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

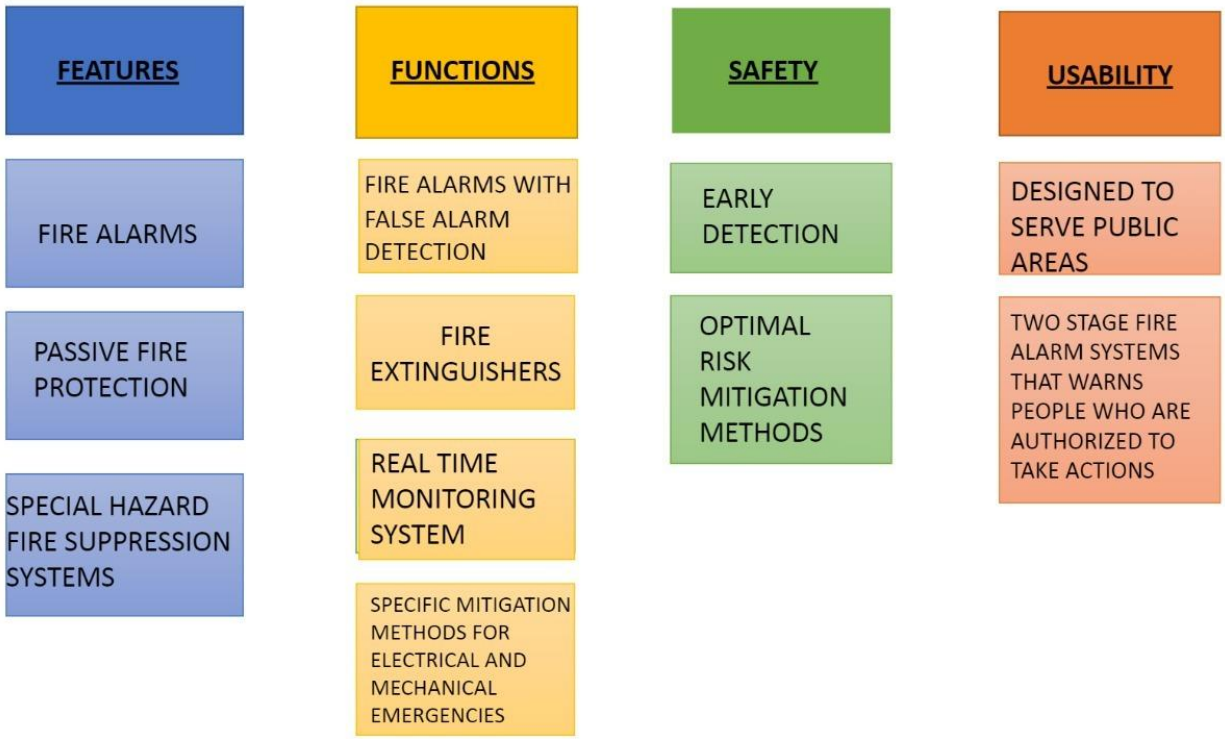
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability requirements includes language barriers and localization tasks. Usability can be assessed by Efficiency of use.
NFR-2	**Security**	Access permissions for the particular system information may only be changed by the system's data administrator.
NFR-3	**Reliability**	The database update process must roll back all related updates when any update fails.
NFR-4	**Performance**	The front-page load time must be no more than 2 seconds for users that access the website using an VoLTE mobile connection.
NFR-5	**Availability**	New module deployment must not impact front page, product pages, and check out pages availability and mustn't take longer than one hour.
NFR-6	**Scalability**	We can increase scalability by adding memory, servers, or disk space. On the other hand, we can compress data, use optimizing algorithms.

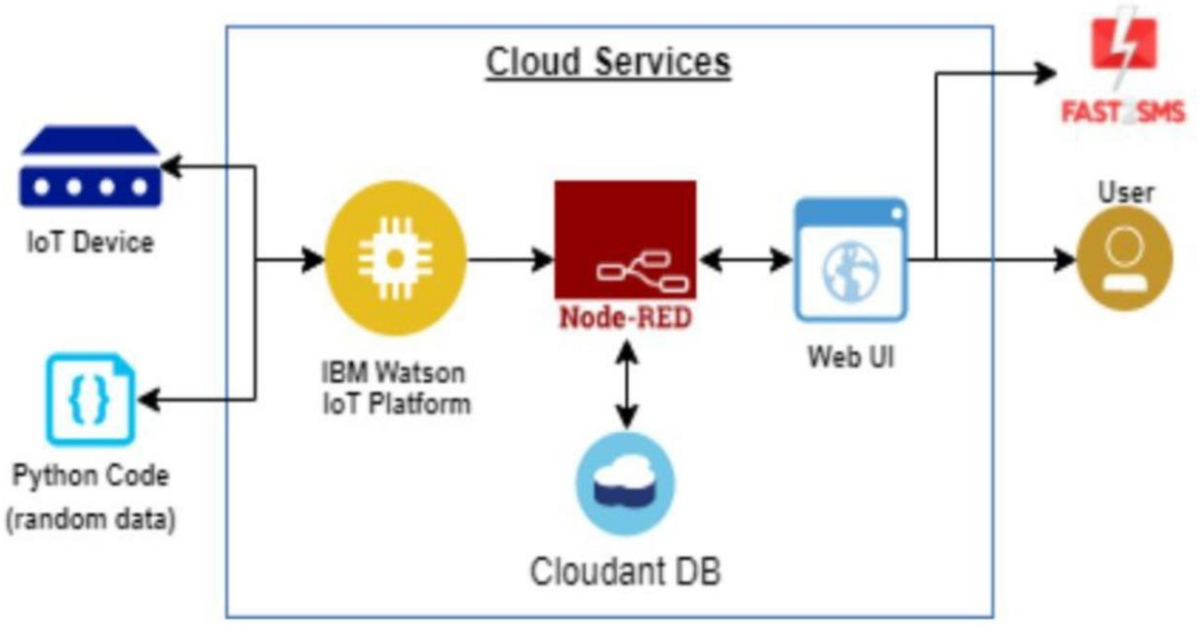
5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture





6. 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.	09 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user pains & gains on particular issue.	09 SEPTEMBER 2022
Ideation	Jot down the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	03 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.	21 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	29 SEPTEMBER 2022
Customer Journey Map	Prepare the customer journey maps to understand the user interactions & experiences with the application	7 OCTOBER 2022
Functional Requirement	Prepare the functional requirement for the project.	13 OCTOBER 2022

Data Flow Diagrams	Draw the data flow diagrams to understand the flow of execution of the project.	13 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	14 OCTOBER 2022
Milestone & Activity List	Prepare the milestones & activity list of the project.	21 OCTOBER 2022
Delivery of Sprints	Submit the coding development of the project and submit in sprints. Sprint -1 Sprint -2 Sprint -3 Sprint -4	39 October 2022 5 November 2022 12 Nov, 19 Nov

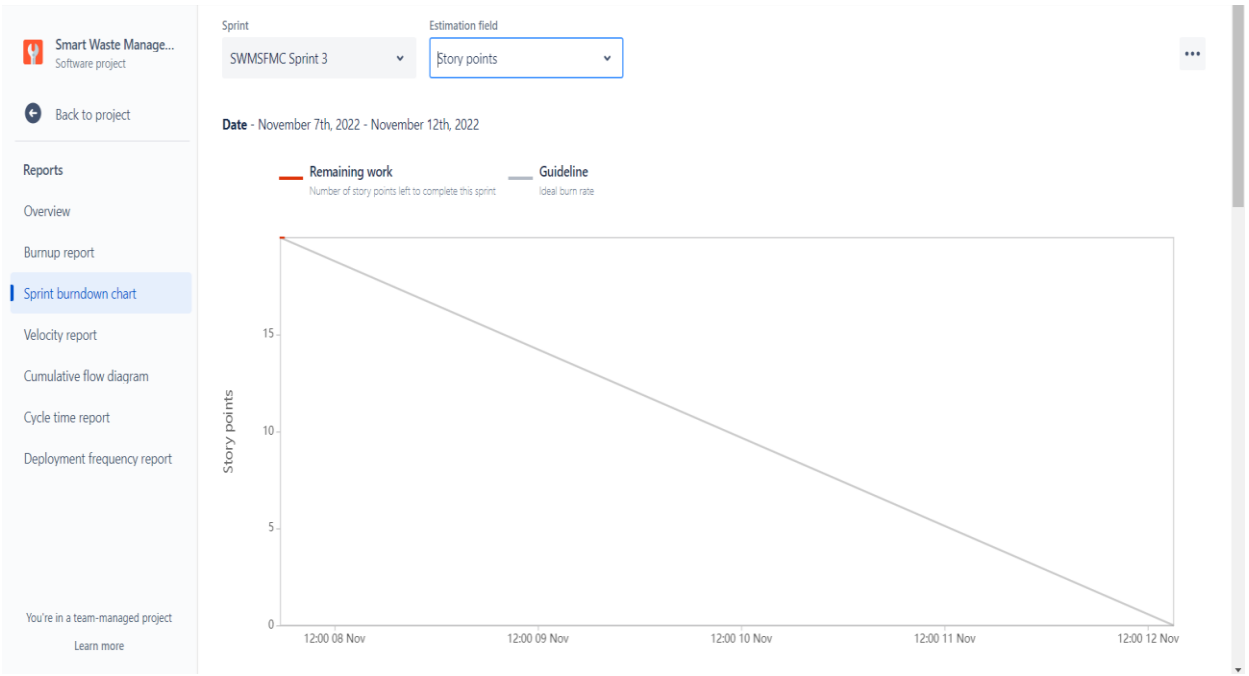
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-1	Simulation software	USN-1	Connect flame sensor with NodeMCU	2	High	Shruthi S, Hari Prasad P, Reshma S, Lawvanyaa R
Sprint-2	Cloud software	USN-2	Integrate NodeMCU and flamesensor 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 MITApp 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 MobileApplication	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

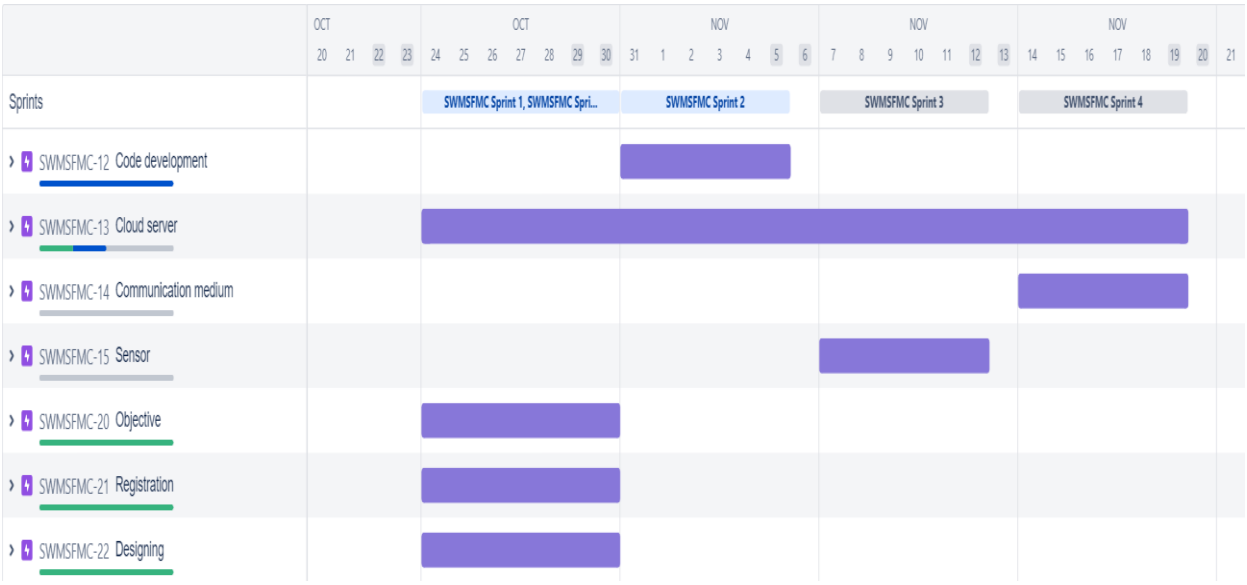
6.3 Reports from JIRA

BURNOUT CHART

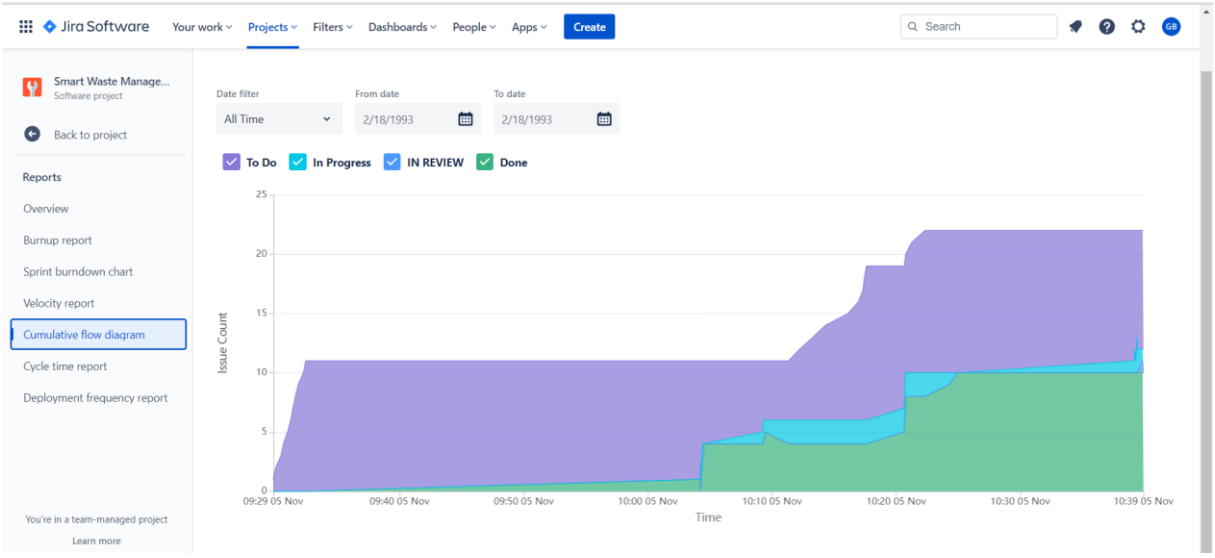


JIRA SOFTWARE SCREENSHOTS

ROADMAP



CUMULATIVE FLOW DIAGRAM



7. CODING & SOLUTIONING (Explain the features added in the

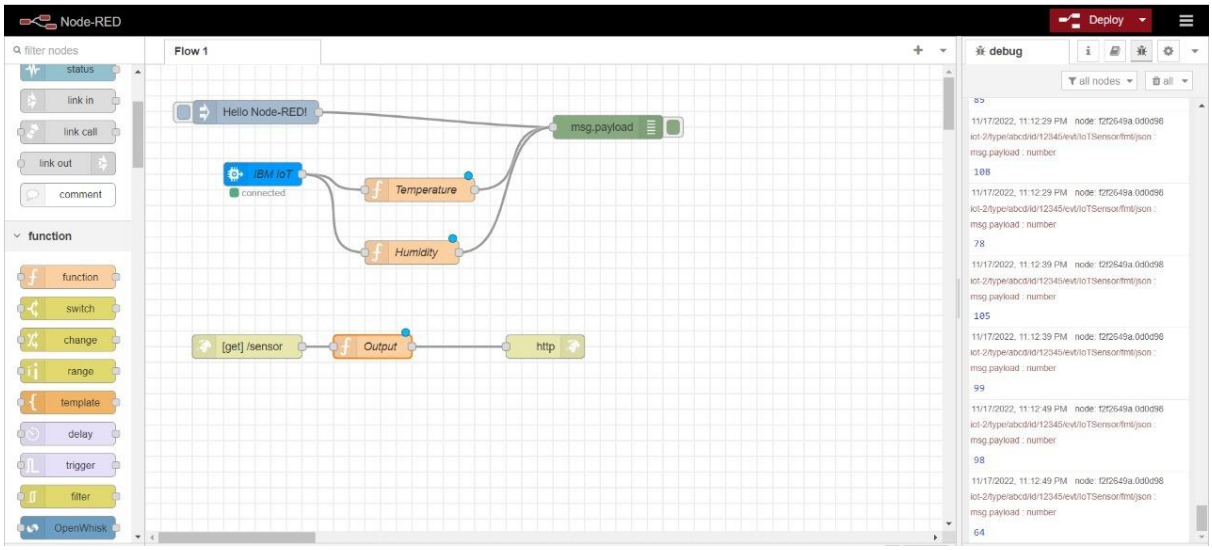
project along with code)

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:
```

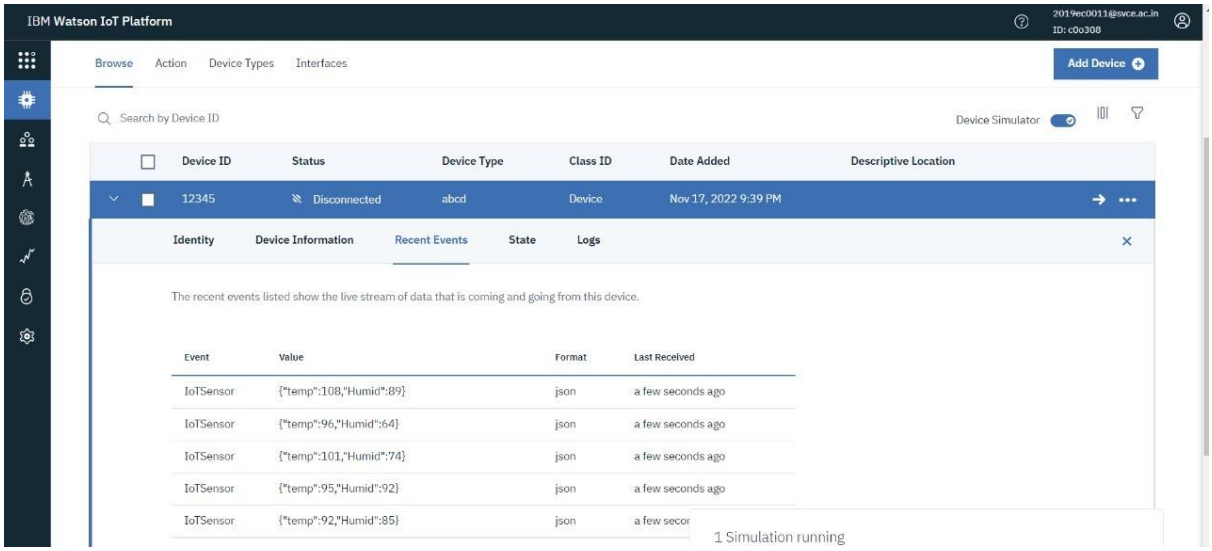
```
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()

# 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()
```

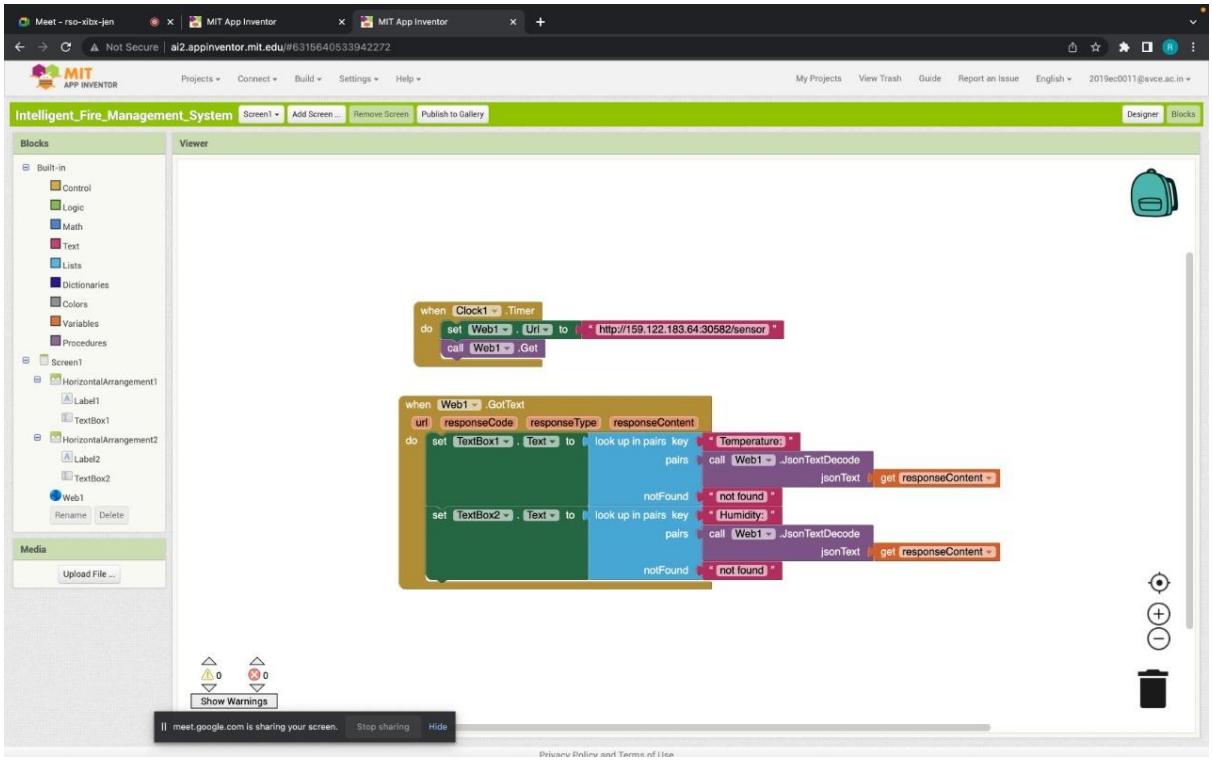
7.1 Feature 1 - Node Red

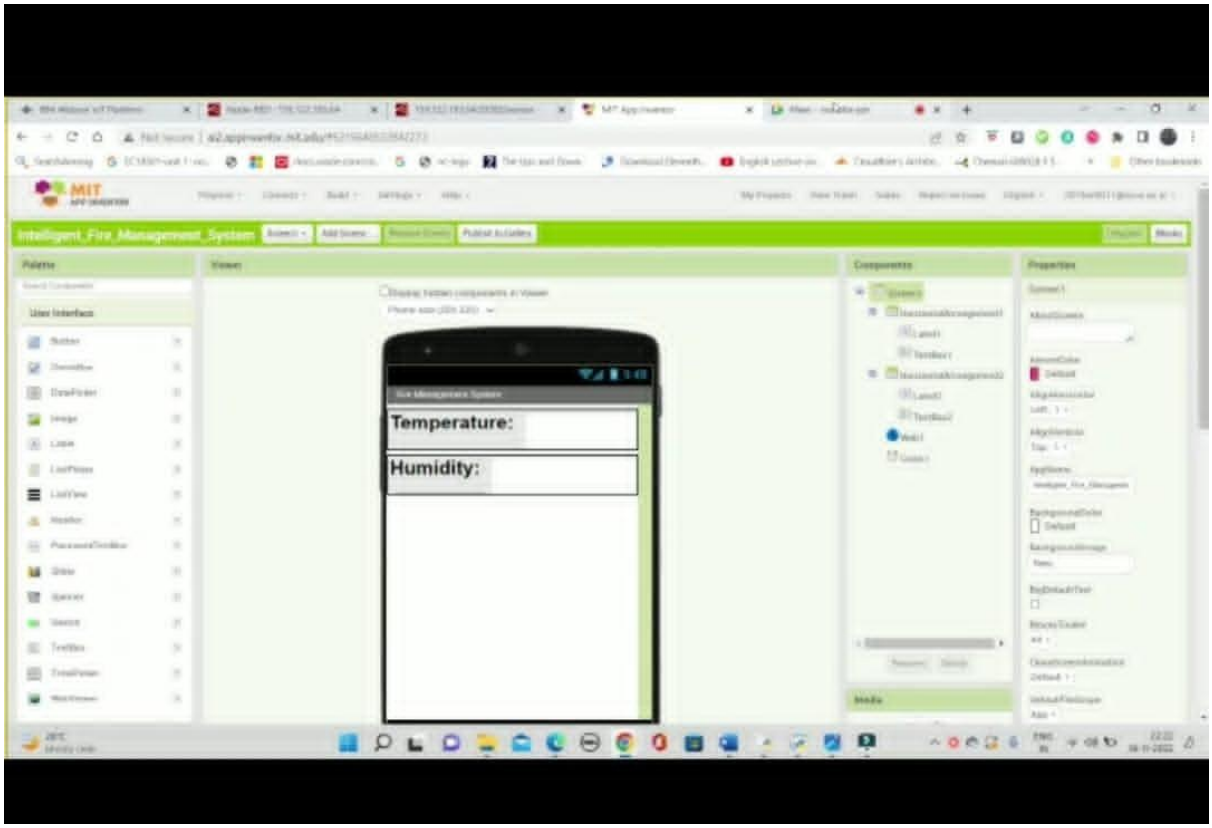


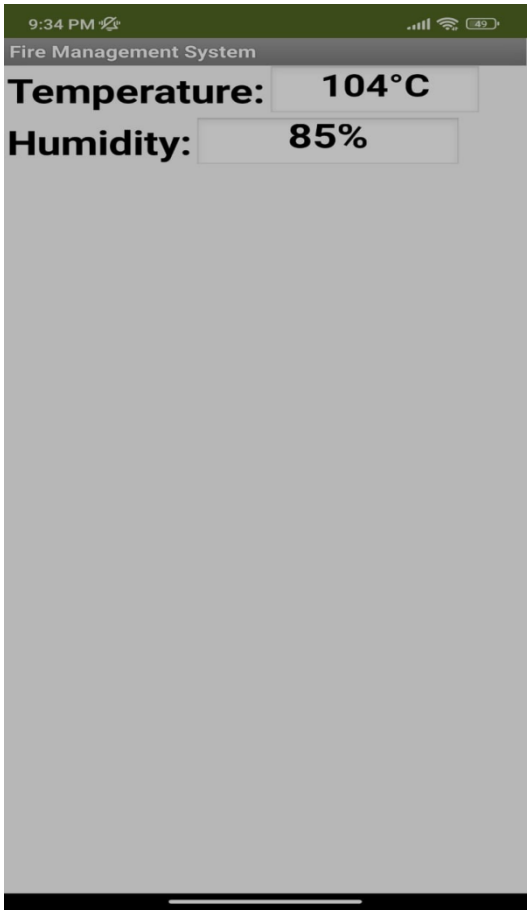
7.2 Feature 2- Web UI Displaying

7.3 Feature 3- LIVE UPDATE ON COLLECTED DATA


IBM Watson IoT Platform
2019ec0011@svce.ac.in
ID: c0o308
Browse
Action
Device Types
Interfaces
Add Device
Search by Device ID
Device Simulator
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
12345
Disconnected
abcd
Device
Nov 17, 2022 9:39 PM
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
IoTSensor
{"temp":108,"Humid":89}
json
a few seconds ago
IoTSensor
{"temp":96,"Humid":64}
json
a few seconds ago
IoTSensor
{"temp":101,"Humid":74}
json
a few seconds ago
IoTSensor
{"temp":95,"Humid":92}
json
a few seconds ago
IoTSensor
{"temp":92,"Humid":85}
json
1 Simulation running

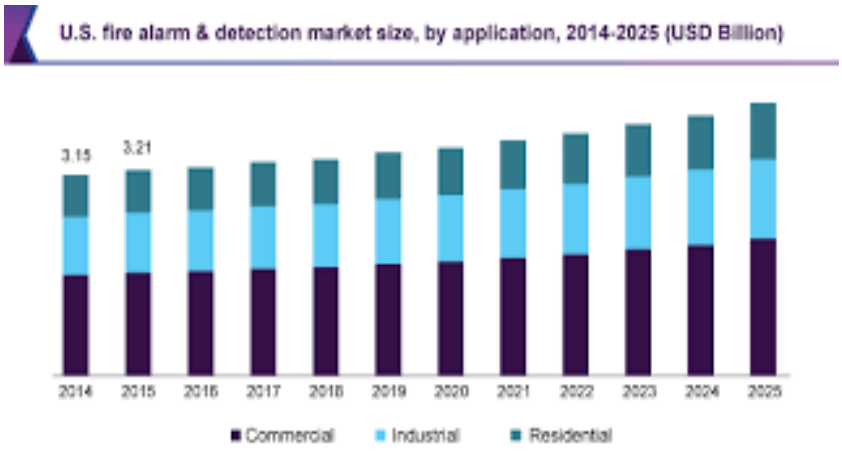

MIT App Inventor
ai2.appinventor.mit.edu/#6315640533942272
Intelligent_Fire_Management_System
Blocks
Viewer
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
Screen1
HorizontalArrangement1
Label1
TextBox1
HorizontalArrangement2
Label2
TextBox2
Web1
Media
Upload File ...
when Clock1 .Timer
do set Web1 . Url to " http://159.122.183.64:30582/sensor "
call Web1 .Get
when Web1 .GotText
url responseCode responseType responseContent
do set TextBox1 . Text to look up in pairs key " Temperature: "
pairs call Web1 .JsonTextDecode
jsonText get responseContent
notFound " not found "
set TextBox2 . Text to look up in pairs key " Humidity: "
pairs call Web1 .JsonTextDecode
jsonText get responseContent
notFound " not found "
Show Warnings
meet.google.com is sharing your screen.
Stop sharing
Hide

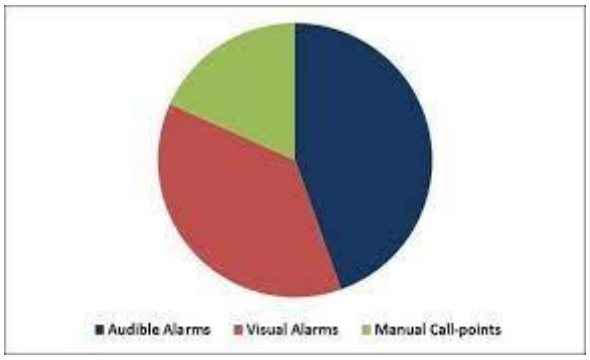

Intelligent_Fire_Management_System
Temperature:
Humidity:


9:34 PM
Fire Management System
Temperature:
104°C
Humidity:
85%

8.RESULTS

8.1 Performance Metrics





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.

10. 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.