INDUSTRY SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

A PROJECT REPORT

Submitted by

BOOMESHWARAN V	**(711119104017)**
CHILAKAM BINDU REDDY	**(711119104018)**
DANAENDRARAJ R	**(711119104019)**
GAYAM NAVEENA	**(711119104023)**

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ANNA UNIVERSITY: CHENNAI 600 025

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1.INTRODUCTION

1.1 PROJECT OVERVIEW

IOT devices are hardware devices, such as sensors, gadgets, appliances and other machines that collect and exchange data over the Internet.

➢ Sending random fire and temperature values will be sent to the IBM IOT platform

➢ Sensors values can be viewed in the Web Application

➢ Notifies the admin the random values cross the threshold value

✓ To accomplish this, we have to complete all the activities and tasks listed below:

Create and configure IBM Cloud Services

➢ Create IBM Watson IoT Platform

➢ Create a device & configure the IBM IoT Platform

➢ Create Node-RED service

➢ Create a database in Cloudant DB to store location data

Develop a web Application using Node-RED Service

➢ Develop the web application using Node-RED.

➢ Develop a python script to publish the location details to the IBM IoT platform.

1.2 PURPOSE

As the term suggests, fire safety management is all about putting in place the arrangements to help protect both people and property from fire. This encompasses not only helping to prevent a fire from breaking out in the first place, but also helping to shield people from harm in the event that a fire does occur.

- It provides safe environment for the workers who are working in the industries.
- This Application is used to reduce the intensity of the damage.
- The deaths caused by the fire accident can be reduced

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

The fire alarm monitoring system of fire protection engineering has formed a complete system, including alarm monitoring, automatic fire control, fire linkage control, and fire data monitoring and analysis modules. This project mainly analyses the fire alarm computer monitoring system in fire engineering. The measuring devices and single-chip microcomputer in the intelligent fire early warning and monitoring system own many advantages in judging the fire situation. The structural form is a structure that organically combines the main network and the secondary network, so it has strong adaptability and can effectively improve the reliability of the building's fire emergency function. At the same time, the fire alarm computer monitoring system in the fire protection engineering can faithfully reflect the small changes in the monitored environmental objects, and can automatically compensate for the factors that prevent fires in the environment, it also can automatically handle the adverse effects caused by electrical interference. The use of software code programming in the system significantly improves the linkage and repairability of the system regarding fire protection.

The benefits of this fire detection system can detect early fire occurrence based on the detection of temperature conditions by accommodating the nature of the fire and able to detect any rise in temperature caused by the existence of the fire. To realize the system, required sensors capable of reading the temperature and smoke. The Arduino Uno microcontroller is the brain control system of the system. At a temperature of> 35 C, the system will activate the DHT 11 and MQ 2 sensors that detect smoke> 50 ppm from fire. The system will activate Buzzer as a warning in the form of the next alarm sound Global Positioning System (GPS) will provide information in the form of coordinates of the location of the point of fire through GSM SIM900 Module Short Message Service (SMS) to the user. The results obtained mq2 = 128 ppm and temperature value = 38 ° C and GPS data with latitude of -3.04798388 and a longitude of 104.78263092. From the data it is seen that the mq2 value reaches> 50ppm and the temperature value reaches> 35 ° C, and the detector outputs buzzer sound and warning notification of coordinate point in the form of SMS containing the message "FIRE available" with the coordination of the location of the fire detected by GPS.

This research refers to an Arduino and Global System for Mobile (GSM) based system for efficient detection of fire hazards. This purpose is industrial and domestic safety, and the primary concern is to avoid the fire hazards that occur to the employees and the properties inside the buildings. As a solution, a smart fire and high-temperature detection system is designed using GSM technology, smoke/temperature sensors, and Arduino technology. A smoke sensor is used to detect the smoke from the fire and a temperature sensor is used to detect temperature increase inside the building. In the event of a fire, an alert message will be sent to the user via short message service (SMS) via the GSM module. Furthermore, when a fire is detected, a signal will be sent to the main power supply circuit breaker via a microcontroller and then the power supply of the particular building will shut down. Results from the test are documented and discussed in this paper. This system helps users to respond immediately to the situation and so improve their safety by protecting their lives and the properties from a disaster.

To help with fire-fighting operations, an alarm application based on Telos B motes was proposed in (Bernardo, Oliveira et al. 2007). The authors used a combination of temperature, light and humidity sensors in difficult access environments. They considered a scattered WSN consisting of several isolated WSNs. The situation, in which sensor nodes are destroyed by fire, was also taken into account. They concluded that mote longevity (avoiding synchronisation costs during idle period) can be applied in the fire situations where a timely response to destructive events is needed. In Bagheri 2007, the author utilised FWI index and his novel k-coverage algorithm to detect forest fires. K-coverage algorithm monitors each point by using k or more sensor nodes to increase fault tolerance. Therefore, some sensors can be put in standby mode to extend network lifetime. Although there are many algorithms to find the minimum number of sensors to be used, they are usually NP complete problems. The proposed k-coverage solution proved to prolong the network life time. Forest fire detection was not the focus of this work and was considered as an application for the novel k-coverage problem

2.2 REFERENCES

Bagheri, M. (2007). Efficient K-Coverage Algorithms for Wireless Sensor Networks and Their Applications to Early Detection of Forest Fires. Computing Science, SIMON FRASER UNIVERSITY. MSc.

Baumann, A., M. Boltz, et al. (2008). "A Review and Comparison of Measures for Automatic Video Surveillance Systems." EURASIP Journal on Image and Video Processing.

Bernardo, L., R. Oliveira, et al. (2007). A Fire Monitoring Application for Scattered Wireless Sensor Networks: A peer-to-peer cross-layering approach International Conference on Wireless Information Networks and Systems (WINSYS'07), Barcelona, Spain.

Vescoukis, V., T. Olma, et al. (2007). Experience from a Pilot Implementation of an "In-Situ" Forest Temperature Measurement Network. Personal, Indoor and Mobile Radio Communications (PIMRC2007). Wikipedia EN 54, http://en.wikipedia.org/wiki/EN_54.

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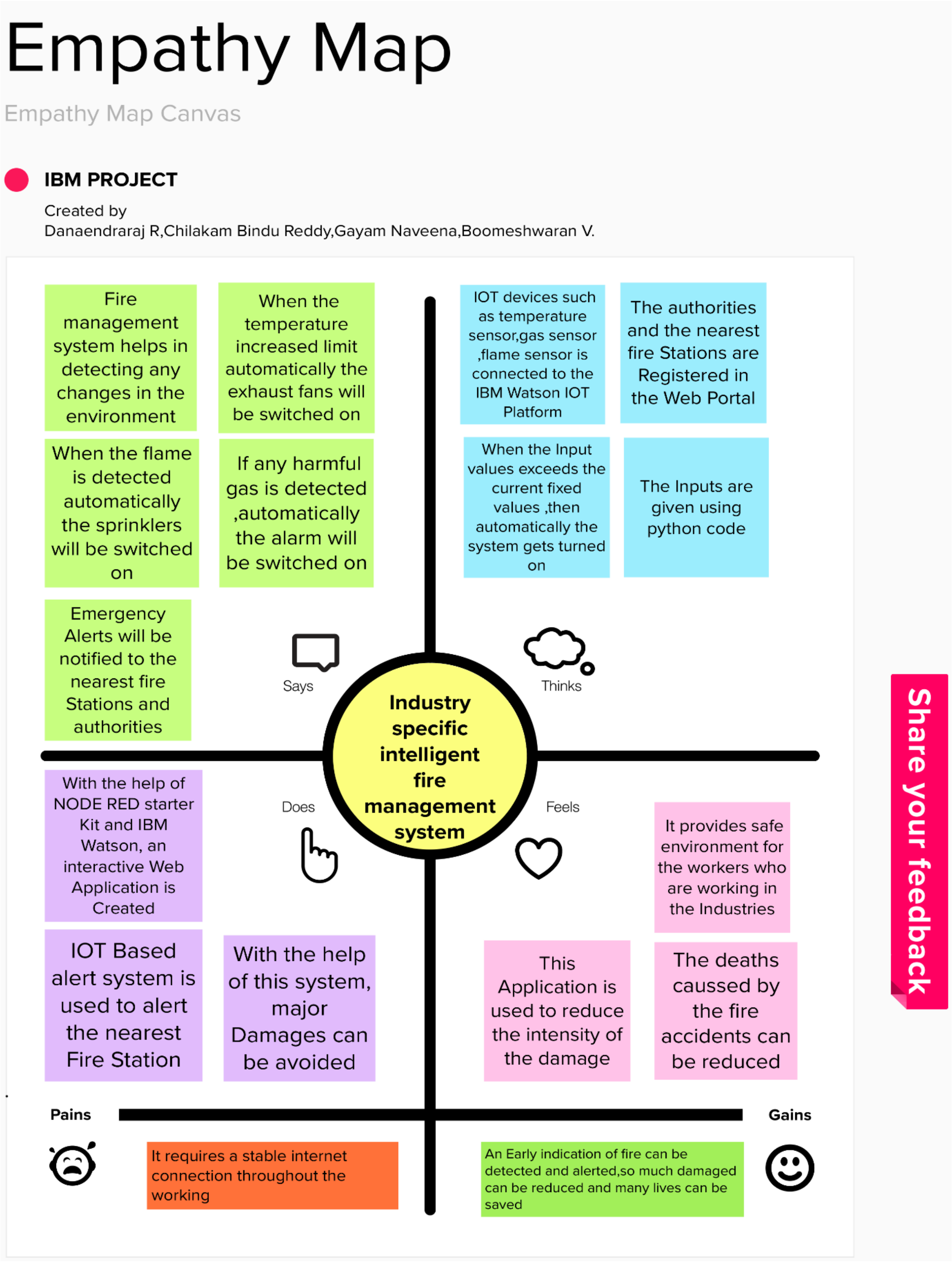
Brain, M. (2000). "How Smoke Detectors Work ", from http://home.howstuffworks.com/smoke1.htm.

2.3 PROBLEM STATEMENT DEFNITION

It includes temperature sensor, gas sensor, flame sensor. If the temperature increased limit automatically the exhaust will switch on. If suppose the flame is detected automatically the sprinklers will be switched on. If the harmful gases detected automatically the alarm will be switched on. Emergency alerts are noticed to the nearest fire stations and authorities.

3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



Empathy Map

Empathy Map Canvas

IBM PROJECT

Created by
Danaendraraj R,Chilakam Bindu Reddy,Gayam Naveena,Boomeshwaran V.

Fire management system helps in detecting any changes in the environment

When the temperature increased limit automatically the exhaust fans will be switched on

When the flame is detected automatically the sprinklers will be switched on

If any harmful gas is detected ,automatically the alarm will be switched on

Emergency Alerts will be notified to the nearest fire Stations and authorities

IOT devices such as temperature sensor,gas sensor ,flame sensor is connected to the IBM Watson IOT Platform

The authorities and the nearest fire Stations are Registered in the Web Portal

When the Input values exceeds the current fixed values ,then automatically the system gets turned on

The Inputs are given using python code

Industry specific intelligent fire management system

With the help of NODE RED starter Kit and IBM Watson, an interactive Web Application is Created

IOT Based alert system is used to alert the nearest Fire Station

With the help of this system, major Damages can be avoided

It provides safe environment for the workers who are working in the Industries

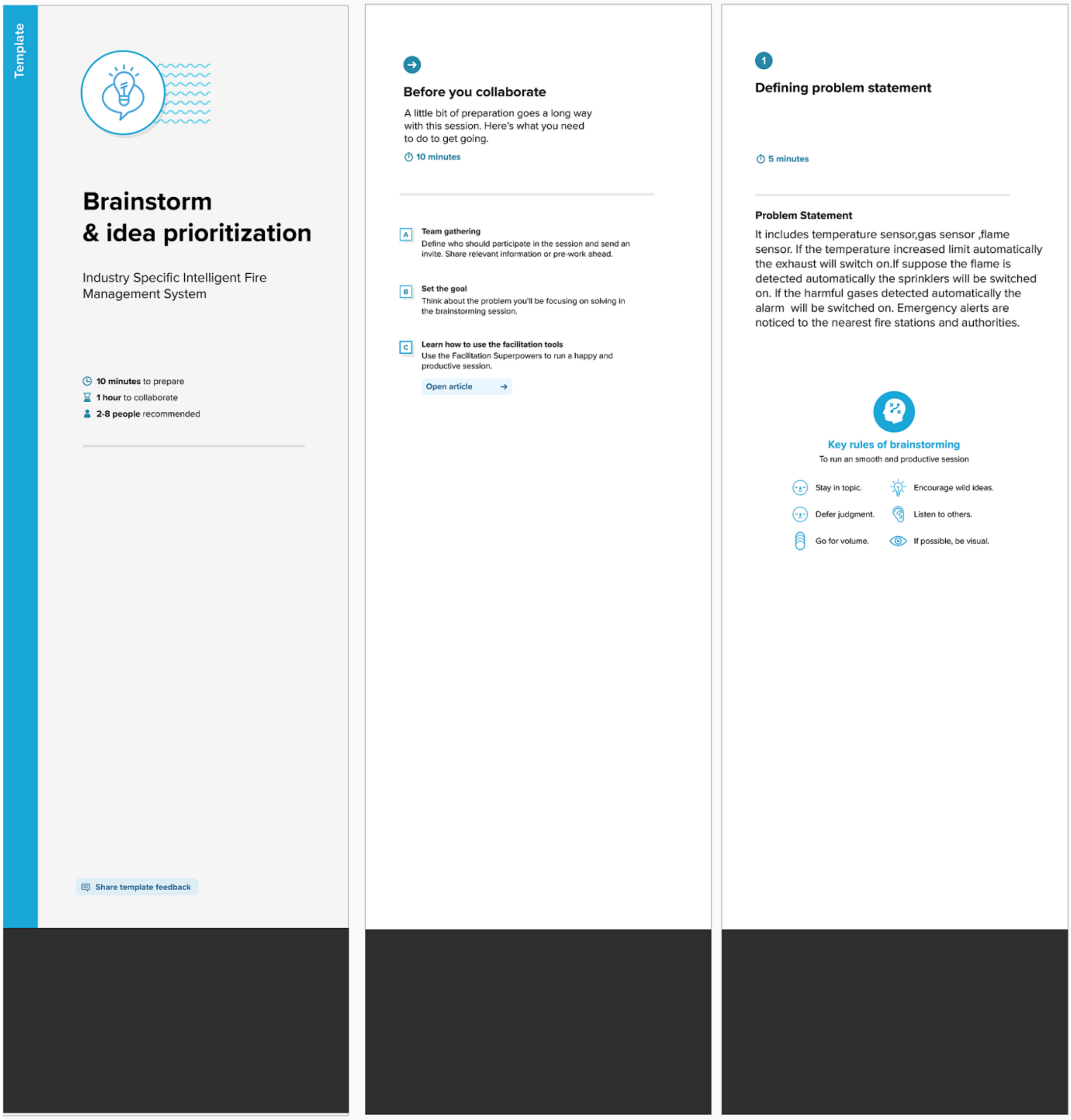
This Application is used to reduce the intensity of the damage

The deaths caussed by the fire accidents can be reduced

It requires a stable internet connection throughout the working

An Early indication of fire can be detected and alerted,so much damaged can be reduced and many lives can be saved

3.2 IDEATION AND BRAINSTROMING



Template

Brainstorm & idea prioritization

Industry Specific Intelligent Fire Management System

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Defining problem statement

5 minutes

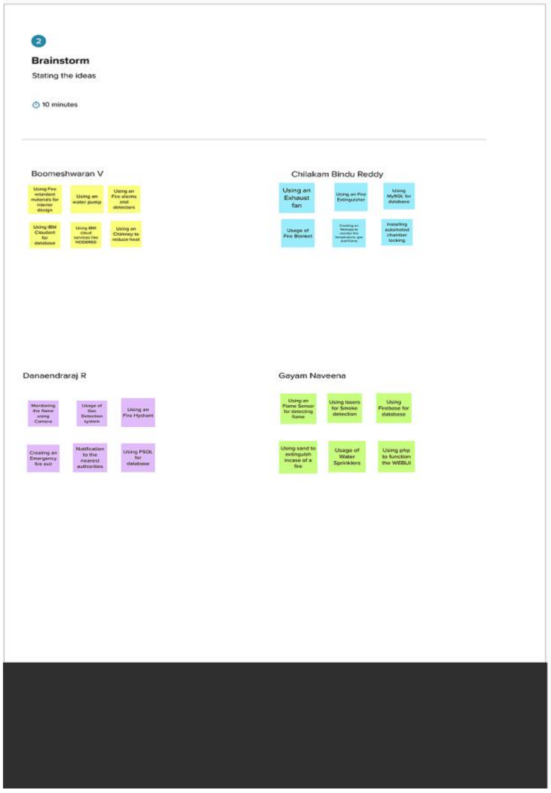
Problem Statement

It includes temperature sensor,gas sensor ,flame sensor. If the temperature increased limit automatically the exhaust will switch on.If suppose the flame is detected automatically the sprinklers will be switched on. If the harmful gases detected automatically the alarm will be switched on. Emergency alerts are noticed to the nearest fire stations and authorities.

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.



2

Brainstorm

Stating the ideas

10 minutes

Boomeshwaran V

- Using Fire retardent materials for interior design
- Using an water pump
- Using an Fire alarms and detectors
- Using IBM Cloudent for database
- Using IBM cloud services like NODERED
- Using an Chimney to reduce heat

Chilakam Bindu Reddy

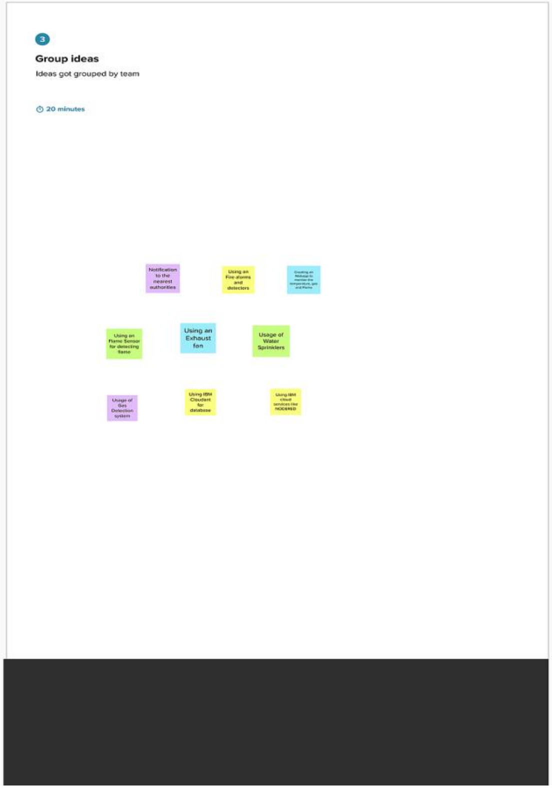
- Using an Exhaust fan
- Using an Fire Extinguisher
- Using MySQL for database
- Usage of Fire Blanket
- Creating an Webapp to monitor the temperature, gas and Flame
- Installing automated chamber locking

Danaendraraj R

- Monitoring the flame using Camera
- Usage of Gas Detection system
- Using an Fire Hydrant
- Creating an Emergency fire exit
- Notification to the nearest authorities
- Using PSQL for database

Gayam Naveena

- Using an Flame Sensor for detecting flame
- Using lasers for Smoke detection
- Using Firebase for database
- Using sand to extinguish incase of a fire
- Usage of Water Sprinklers
- Using php to function the WEBUI



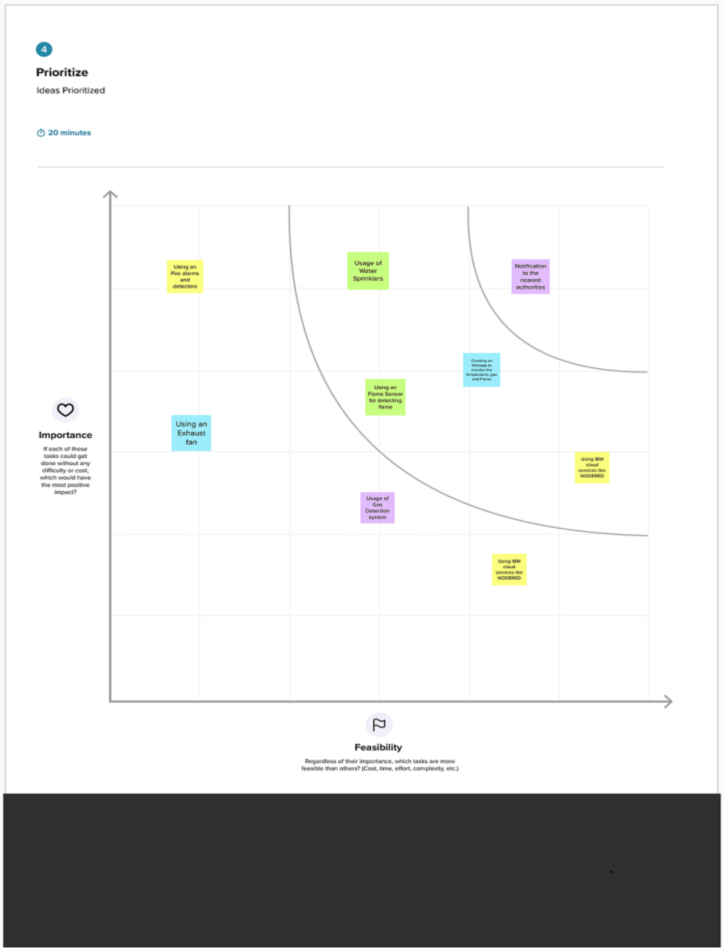
3

Group ideas

Ideas got grouped by team

20 minutes

Notification to the nearest authorities
Using an Fire alarms and detectors
Creating an Webapp to monitor the temperature, gas and Flame
Using an Flame Sensor for detecting flame
Using an Exhaust fan
Usage of Water Sprinklers
Usage of Gas Detection system
Using IBM Cloudent for database
Using IBM cloud services like NODERED



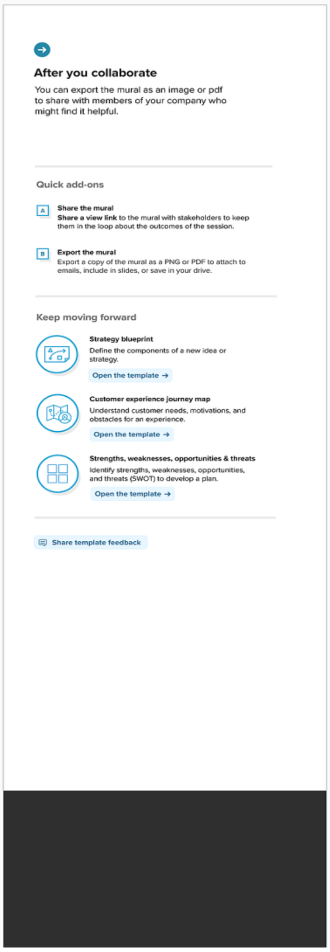
4

Prioritize

Ideas Prioritized

20 minutes

Using an Fire alarms and detectors
Usage of Water Sprinklers
Notification to the nearest authorities
Creating an Webapp to monitor the temperature, gas and Flame
Using an Flame Sensor for detecting flame
Using an Exhaust fan
Using IBM cloud services like NODERED
Usage of Gas Detection system
Using IBM cloud services like NODERED
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

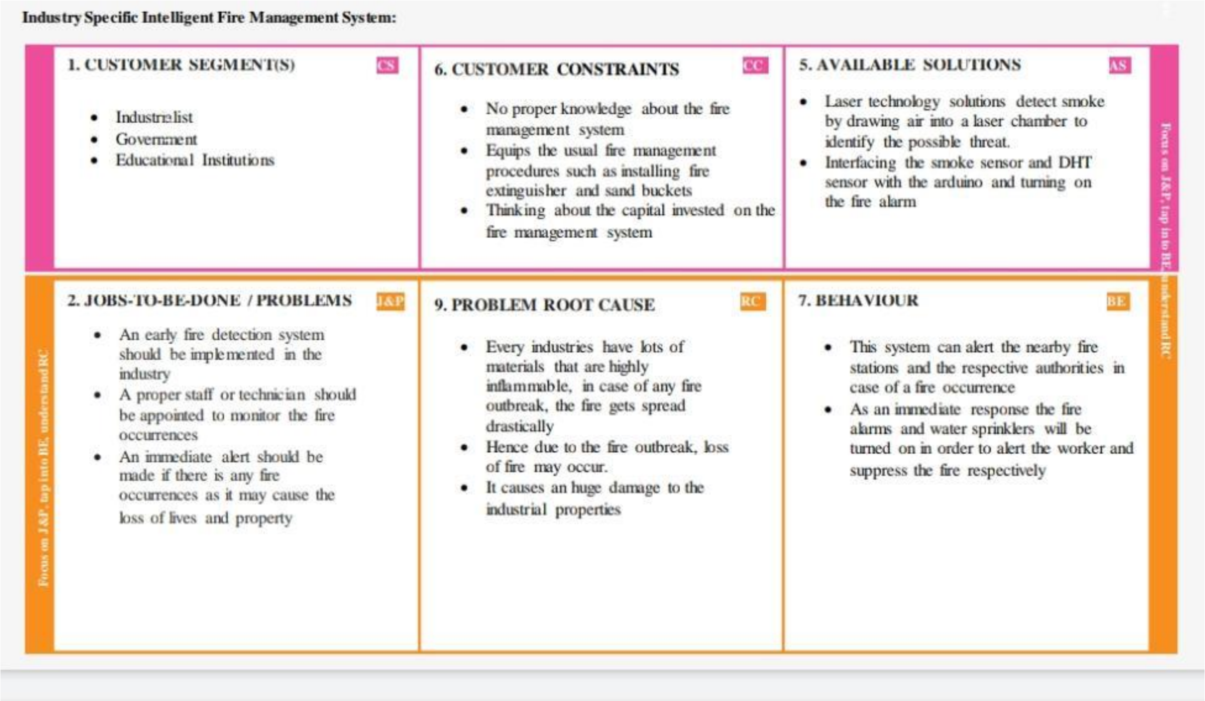
Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To improve the Fire management and alert system in industries. Providing a safe environment for the workers.
2.	Idea / Solution description	To provide fire management and alert system in industry based on IOT with fire detection. And using some sensors (Gas sensor, Flame sensor, temperature sensor).
3.	Novelty / Uniqueness	An fire system Integrated with temperature sensor, gas sensor, flame sensor , exhaust fan ,water sprinkler and fire alert through SMS to the authority.
4.	Social Impact / Customer Satisfaction	It reduces the damages caused by fire accidents in industries. And also reduce the damage in the nearby locations and the environment , reduce the pollution.
5.	Business Model (Revenue Model)	This product can be used in industries .This system can be used as a safety system in industries, which reduce the damage and can be used avoid decease from the fire accident.
6.	Scalability of the Solution	This project trying to execute the method with an help of an IOT gadget which provide a safe environment for workers in industries. Easy to install and maintain .It can be used in multiple industry area.

3.4 PROBLEM FIT SOLUTION



Industry Specific Intelligent Fire Management System:

1. CUSTOMER SEGMENT(S) CS

- Industrelist
- Government
- Educational Institutions

6. CUSTOMER CONSTRAINTS CC

- No proper knowledge about the fire management system
- Equips the usual fire management procedures such as installing fire extinguisher and sand buckets
- Thinking about the capital invested on the fire management system

5. AVAILABLE SOLUTIONS AS

- Laser technology solutions detect smoke by drawing air into a laser chamber to identify the possible threat.
- Interfacing the smoke sensor and DHT sensor with the arduino and turning on the fire alarm

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

- An early fire detection system should be implemented in the industry
- A proper staff or technician should be appointed to monitor the fire occurrences
- An immediate alert should be made if there is any fire occurrences as it may cause the loss of lives and property

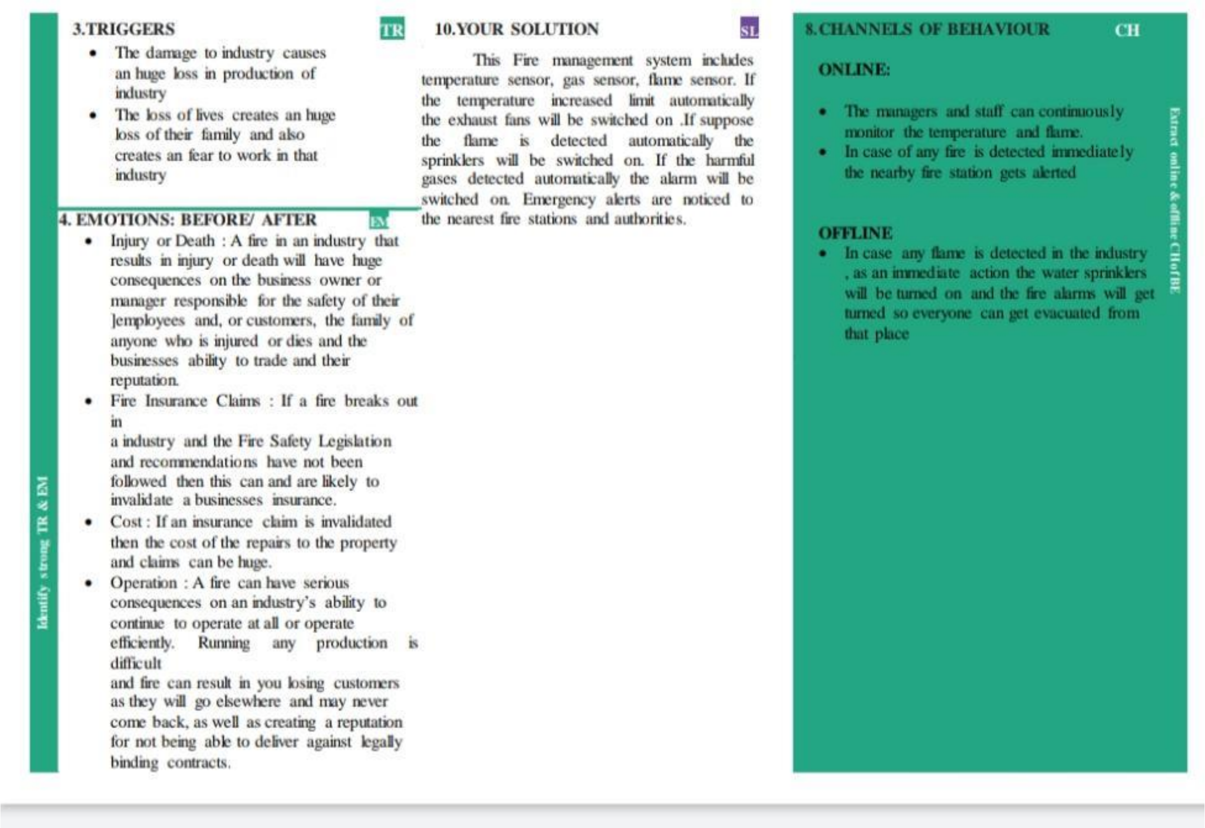
9. PROBLEM ROOT CAUSE RC

- Every industries have lots of materials that are highly inflammable, in case of any fire outbreak, the fire gets spread drastically
- Hence due to the fire outbreak, loss of fire may occur.
- It causes an huge damage to the industrial properties

7. BEHAVIOUR BE

- This system can alert the nearby fire stations and the respective authorities in case of a fire occurrence
- As an immediate response the fire alarms and water sprinklers will be turned on in order to alert the worker and suppress the fire respectively

Focus on J&P, tap into BE, understand RC



3.TRIGGERS TR

- The damage to industry causes an huge loss in production of industry
- The loss of lives creates an huge loss of their family and also creates an fear to work in that industry

4. EMOTIONS: BEFORE/ AFTER EM

- Injury or Death : A fire in an industry that results in injury or death will have huge consequences on the business owner or manager responsible for the safety of their]employees and, or customers, the family of anyone who is injured or dies and the businesses ability to trade and their reputation.
- Fire Insurance Claims : If a fire breaks out in a industry and the Fire Safety Legislation and recommendations have not been followed then this can and are likely to invalidate a businesses insurance.
- Cost : If an insurance claim is invalidated then the cost of the repairs to the property and claims can be huge.
- Operation : A fire can have serious consequences on an industry's ability to continue to operate at all or operate efficiently. Running any production is difficult and fire can result in you losing customers as they will go elsewhere and may never come back, as well as creating a reputation for not being able to deliver against legally binding contracts.

Identify strong TR & EM

10.YOUR SOLUTION SL

This Fire management system includes temperature sensor, gas sensor, flame sensor. If the temperature increased limit automatically the exhaust fans will be switched on .If suppose the flame is detected automatically the sprinklers will be switched on. If the harmful gases detected automatically the alarm will be switched on. Emergency alerts are noticed to the nearest fire stations and authorities.

8.CHANNELS OF BEHAVIOUR CH

ONLINE:

- The managers and staff can continuously monitor the temperature and flame.
- In case of any fire is detected immediately the nearby fire station gets alerted

OFFLINE

- In case any flame is detected in the industry , as an immediate action the water sprinklers will be turned on and the fire alarms will get turned so everyone can get evacuated from that place

Extract online & offline CH of BE

4.REQUIREMENT ANALYSIS

4.4 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 Form Registration through phone number
FR-2	User Registration Successful	Registration Successful message in web window Storing the registered data in IBM Cloundant
FR-3	Creating IOT Devices	Creating Sensors in IOT Watson Platform Creating a simulation and sending data to NODE-RED Dashboard
FR-4	Monitoring the Sensor values	Creating a Node-RED Dashboard Publishing the data in the dashboard
FR-5	Sending Emergency Alerts	Fetching the phone number of the registered users and Sending emergency alerts through Fast2SMS

4.5 NON-FUNCTIONAL REQUIREMENTS

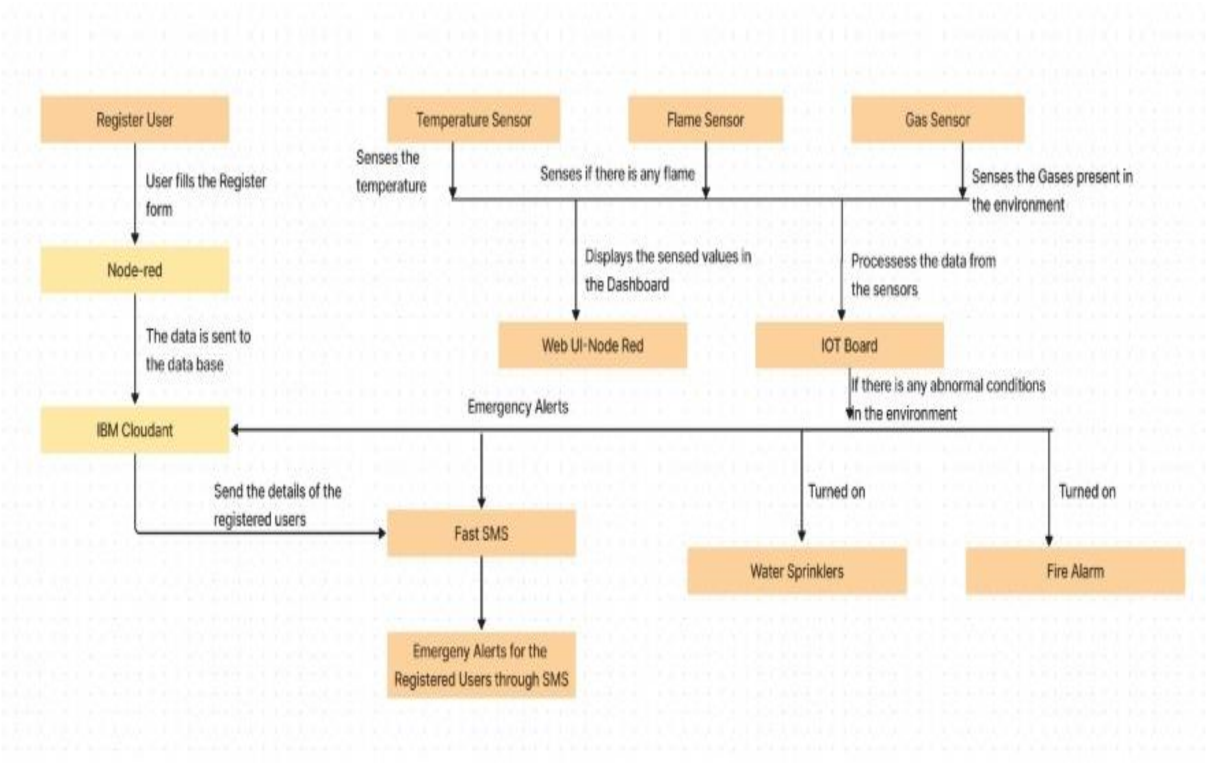
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system should be easy for the customers to use. Ease to maintenance. Low pressure to workload. The instructions should be straightforward.
NFR-2	**Security**	No should have access to modify the data sent from the sensors. It should resist the attacks made by the hackers.
NFR-3	**Reliability**	The system should be made fail-safe operation using redundancy. If one module fails then the parallel module should take over the operation. Response timer will be faster. Hardware components are routinely examined.

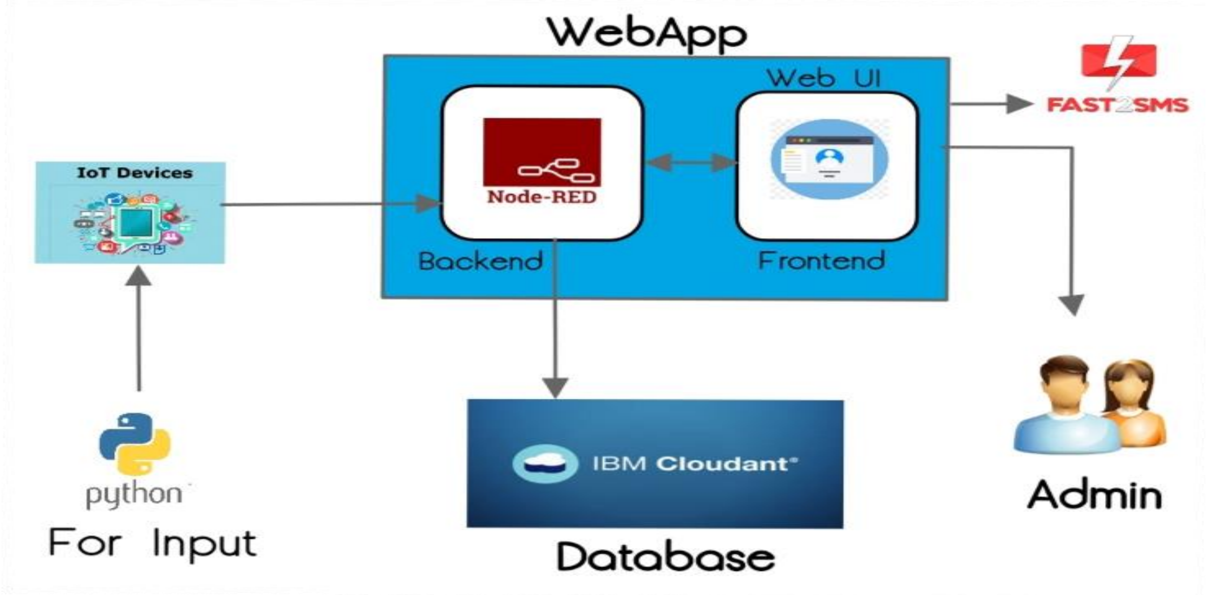
NFR-4	**Performance**	All the modules should work without any connection interruption. Quickly Responsive. Efficiency is higher than fire alarms
NFR-5	**Availability**	The system should be continuously monitoring the environment 24/7. Ability to use the system for other types of emergency communication. Based on the user's needs, all function should be offered.
NFR-6	**Scalability**	The system should have the capacity to accommodate a greater amount of usage. Easy to adoptable for future changes. Based on Fire alarm signals and should cover the entire Placed.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS


Register User
User fills the Register form
Node-red
The data is sent to the data base
IBM Cloudant
Send the details of the registered users
Temperature Sensor
Senses the temperature
Flame Sensor
Senses if there is any flame
Gas Sensor
Senses the Gases present in the environment
Displays the sensed values in the Dashboard
Processess the data from the sensors
Web UI-Node Red
IOT Board
If there is any abnormal conditions in the environment
Emergency Alerts
Fast SMS
Turned on
Turned on
Water Sprinklers
Fire Alarm
Emergeny Alerts for the Registered Users through SMS

5.2 SOLUTION AND TECHNICAL ARCHITECTURE



1. The user should provide information to get registered in the web application and this user database will be stored in IBM cloudant through node-red.

2. Here we use IOT’s such as temperature sensor, gas sensor, flame sensor.

3. Temperature sensor senses the temperature, flame sensor senses if there is any flame and the gas sensor senses the gases present in the environment.

4. The Web UI-Node Red will display the sensed values in the dashboard. Whereas IOT Board process the data from the sensors, if any changes detected in the environment then it will turn on the water sprinklers and fire alarm.

5. It will also send an emergency alert to IBM cloudant so that the registered user will receive a Fast SMS and nearby fire station will be notified

5.3 USER STORIES

User Story Number	**User Story / Task**
	Sprint 1
USN-1	As a admin, I can log into the application by entering username & password
USN-2	When the admin, doesn't enter the username it display an error message popup
USN-3	When the admin, doesn't enter the password it displays an error message popup
USN-4	When the admin,enters the invalid credentials it displays an error popup
USN-5	When the admin enter the correct username and password it redirects to the dashboard
	Sprint 2
USN-1	Creating device in IBM IOT Watson Platform
USN-2	Devoloping a python script to publish data to ibm cloud
	Sprint 3
USN-1	Creating a node red dashboard
USN-2	Connecting the node red dashboard and ibm Watson Platform
USN-3	Creating a Registered Form in node red
USN-4	Registering the user to get alerts
	Sprint 4
USN-1	As a admin, I can monitor the sensor data continuously in the dashboard
USN-2	Retrieving the data from cloudant and send alerts if the values cross the threshold values
USN-3	Python script for sending alerts using fast2sms

6. PROJECT PLANNING & SCHEDULING

6.1. Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a admin, I can log into the application by entering username & password	4	Medium	Boomeshwaran V
Sprint 1		USN-2	When the admin, doesn't enter the username it display an error message popup	4	Medium	Boomeshwaran V
Sprint 1		USN-3	When the admin, doesn't enter the password it displays an error message popup	4	Medium	Boomeshwaran V
Sprint 1		USN-4	When the admin,enters the invalid credentials it displays an error popup	4	Medium	Boomeshwaran V
Sprint 1		USN-5	When the admin enter the correct username and password it redirects to the dashboard	4	High	Boomeshwaran V
Sprint 2	Creating Device	USN-1	Creating device in IBM IOT Watson Platform	10	High	Chilakam Bindu Reddy
Sprint 2	Python Code	USN-2	Devoloping a python script to publish data to ibm cloud	10	High	Chilakam Bindu Reddy

Sprint 3	Dashboard	USN-1	Creating a node red dashboard	4	Medium	Danaendraraj R
Sprint 3		USN-2	Connecting the node red dashboard and ibm Watson Platform	5	High	Danaendraraj R
Sprint 3	IBM Watson IOT	USN-3	Creating a Registered Form in node red	6	High	Danaendraraj R
Sprint 3		USN-4	Registering the user to get alerts	6	High	Danaendraraj R
Sprint-4	Monitoring	USN-1	As a admin, I can monitor the sensor data continuously in the dashboard	2	Medium	Gayam Naveena
Sprint 4	Alerts	USN-2	Retrieving the data from cloudant and send alerts if the values cross the threshold values	10	High	Gayam Naveena
Sprint 4	Python	USN-3	Python script for sending alerts using fast2sms	8	High	Gayam Naveena

6.2. Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart:

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	20	4 Days	31 Oct 2022	3 Nov 2022	20	2 Nov 2022
Sprint-2	20	5 Days	04Nov 2022	08 Nov 2022	20	7 Nov 2022
Sprint-3	20	5 Days	09 Nov 2022	13 Nov 2022	20	13 Nov 2022
Sprint-4	20	4 Days	14 Nov 2022	17 Nov 2022	20	17 Nov 2022

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)

Sprint 1=AV=Sprint Duration/velocity=20/4=5

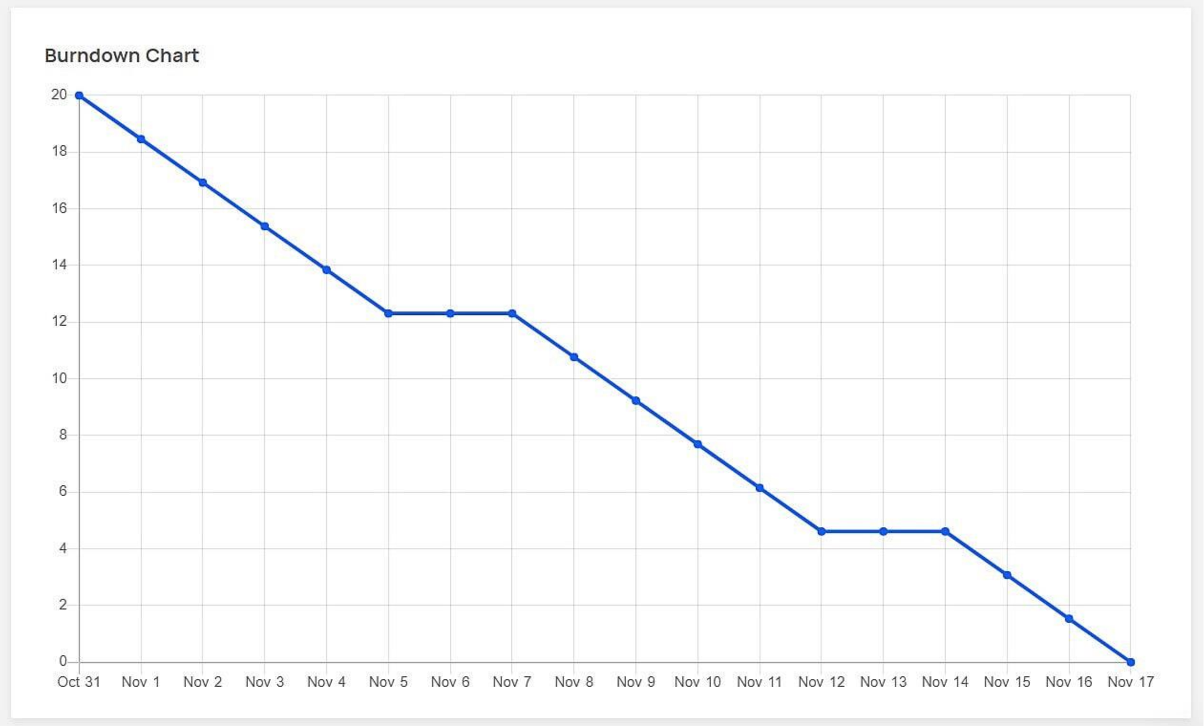
Sprint 2=AV=Sprint Duration/velocity=20/5=4

Sprint 3=AV=Sprint Duration/velocity=20/5=4

Sprint 4=AV=Sprint Duration/velocity=20/4=5

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agilesoftware developmentmethodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



https://www.visual-paradigm.com/scrum/scrum-burndown-chart/

https://www.atlassian.com/agile/tutorials/burndown-charts

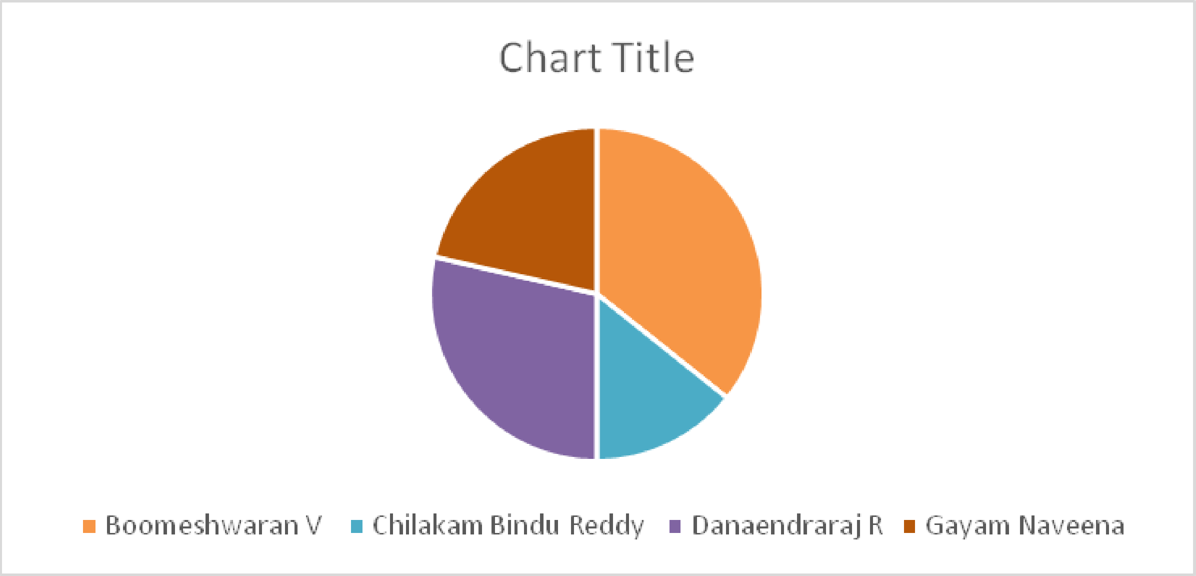
6.3. Reports from JIRA

JIRA software is used to create user Stories and issues,plan sprints and distribute task among the software team.Jira Software is part of a family of products designed to help teams of all types manage work. Originally, Jira was designed as a bug and issue tracker. But today, Jira has evolved into a powerful work management tool for all kinds of use cases, from requirements and test case management to agile software development.

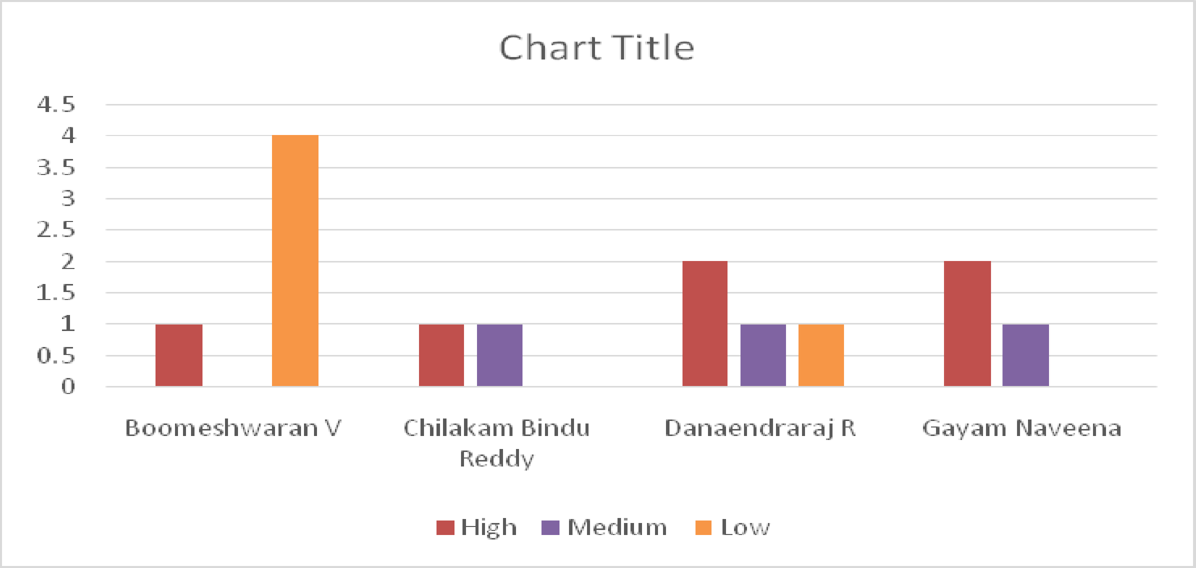
Report:

Total Number of User Stories: 14

The Pie chart displays the user story distribution



Based on the priority the user story are assigned as

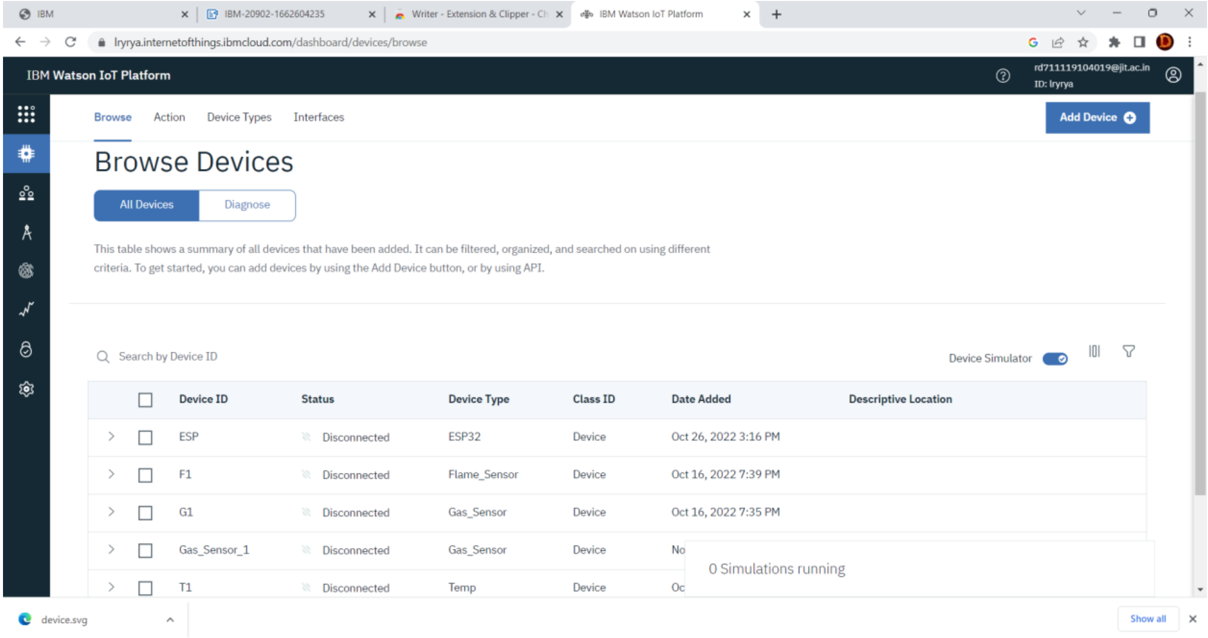


7.CODING & SOLUTIONING:

7.1. IBM Watson IOT Platform interfaced with NODE-RED

IBM Watson™ IoT Platform is a fully managed, cloud-hosted service that makes it simple to derive value from Internet of Things (IoT) devices.

Simply register and connect your device, be it a sensor, a gateway, or something else, to Watson IoT Platform and start sending data securely up to the cloud using the open, lightweight MQTT messaging protocol. You can set up and manage your devices using your online dashboard or our secure APIs, so that your apps can access and use your live and historical data.



Browse Devices

This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
ESP	Disconnected	ESP32	Device	Oct 26, 2022 3:16 PM	
F1	Disconnected	Flame_Sensor	Device	Oct 16, 2022 7:39 PM	
G1	Disconnected	Gas_Sensor	Device	Oct 16, 2022 7:35 PM	
Gas_Sensor_1	Disconnected	Gas_Sensor	Device	No	
T1	Disconnected	Temp	Device	Oc	

Basic concepts

Familiarize yourself with some basic Platform Service concepts.

Organizations

When you register with the Platform Service, you are provided with an organization ID, a unique six character identifier for your account. Organizations ensure that your data is only accessible by your devices and applications.

After registration, devicesand API keys are bound to a single organization. When an applicationconnects to the service by using an API key, it registers to the organization that is associated with that API key.

Important: For security reasons, direct communication between different organizations is not possible. To transmit data between two organizations, you must register one application with each organization and have the two applications communicate with each other to transfer data.

Devices

A device can be anything that has a connection to the internet and that can push data into the cloud. However, devices cannot communicate directly with other devices, instead devices accept commands from applications, and send events to applications.

Devices in Platform Service are identified by a unique authentication token. Devices must be registered before they can connect to Platform Service.

Platform Service recognizes two classes of device:

Device type	Description
Managed devices	Devices that contain a device management agent. A device management agent is a set of logic that allows the device to interact with the Platform Service Device Management service by using the Device Management Protocol. Managed devices can perform device management operations, including location updates, firmware downloads and updates, restarts, and factory resets.
Unmanaged devices	Devices without a device management agent. Unmanaged devices can connect to the Platform Service and send and receive events and commands, but they cannot send device management requests or perform device management operations.

Gateways

Gateways are specialized devices that have the combined capabilities of an application and a device. This lets them serve as access points for other devices. Devices that cannot connect directly to the internet can access the Platform Service service by first connecting to the gateway device.

Gateways must be registered before they can connect to the service, and like standard devices can be managed or unmanaged.

Applications

An application is anything that has a connection to the internet and interacts with data from devices and control the behavior of those devices. Applications identify themselves with the Platform Service by using an API key and a unique application ID. Unlike devices, individual applications do not need to register before they can connect to the Platform Service. However, they must use a valid registered API key.

Events

Events are the mechanism by which devices publish data to the Platform Service. Devices control the content of their messages, and assign a name for each event that is sent. The Platform Service uses the credentials that are attached to each event received to determine which device sent the event. This architecture prevents devices from impersonating one another.

Applications can process events in real time, and see the source of the event and the data that is contained if. Applications must be configured to define which devices and events they subscribe to.

Commands

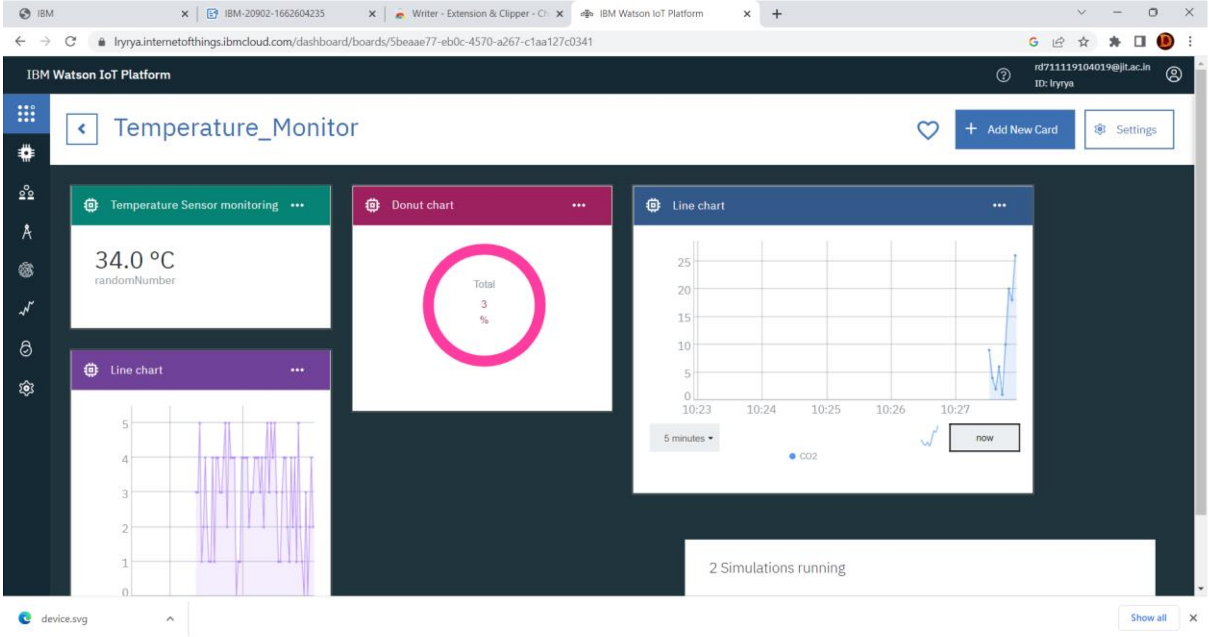
Commands are the mechanism by which applications communicate with devices. Only applications can send commands, and the commands are sent to specific devices. The device must determine which action to take on receipt of a command. Devices can be designed to listen for any command or to subscribe to a specified list of commands.Last even cache. For Lite plans, you can store information for a minimum of one day and a maximum of seven days. For other plans, you can store information for a minimum of one day and a maximum of 45 days.

Service status

To find out about the status and any upcoming planned service maintenance updates for Platform Service, go to the following service status page:

http://status.internetofthings.ibmcloud.com

Using the boards the simulated values can be displayed in different format



7.2. Automated Alerting using Fast2sms

Fast2SMSis a popular **bulk SMS service provider in India**. It was started in 21st July 2011. Due to its simplicity and ease of use it has become one of the mostly used SMS portals and has 2 million users.

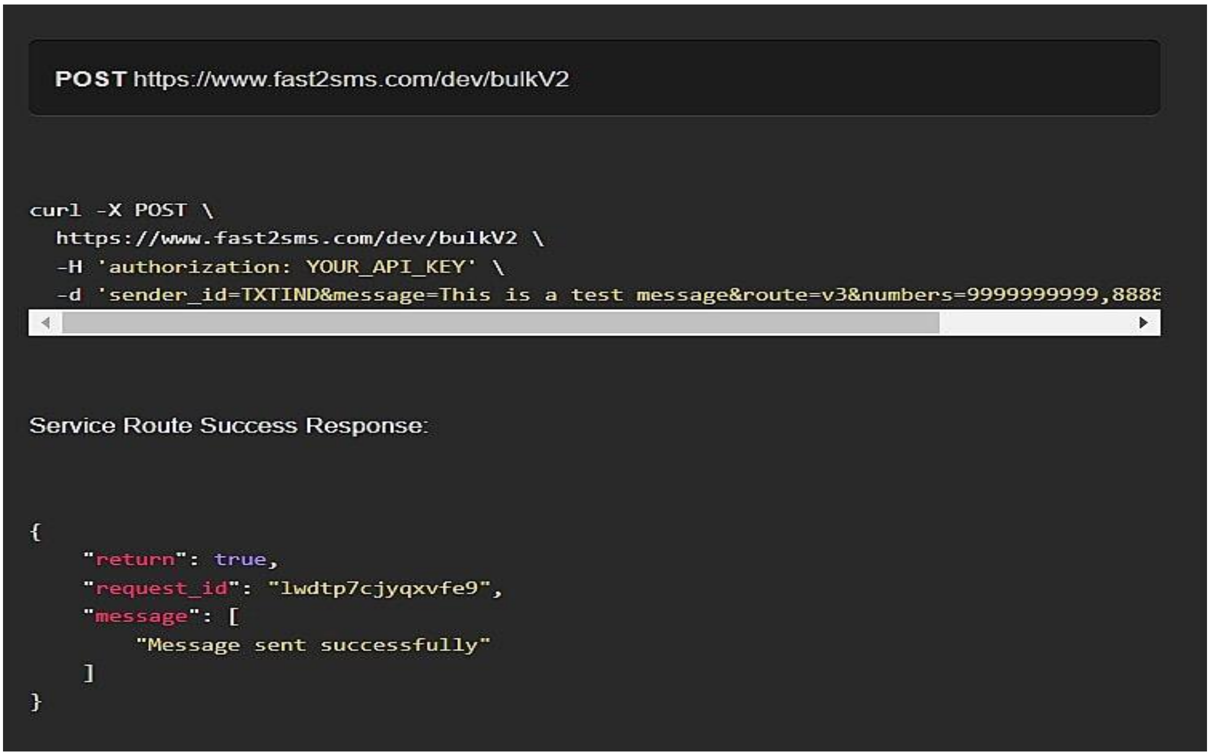
Features of Fast2SMS

Bulk SMS – Bulk SMS refers to business sending SMS to one or more recipients and can scale up to millions of persons at the same time. It refers to sending large number of messages to a predefined set of customers.

Quick SMS feature – Fast2SMS provides a very unique and useful feature which is not available in any other bulk SMS service provider. You can send SMS to DND and Non DND numbers even if you are not registered in the DLT portal.

API SMS – API refers to Application Programming Interface. **SMS API integration**is the fastest and simplest way to send automated messages directly from your platform. Fast2SMS provide **API for bulk SMS,** which ensures security and it is a very reliable source of sending data.

Add contacts with QR – Fast2SMS offers the facility of adding contacts with QR. QR stands for quick response. The main benefit of QR code is it takes very less space for storing information. It is a form of barcode and has become quite popular these days. In this feature you can add contacts by creating a QR code. Simply you need to add your group name and group URL name and then click on create QR. The QR code gets created



POST https://www.fast2sms.com/dev/bulkV2

```
curl -X POST \
  https://www.fast2sms.com/dev/bulkV2 \
  -H 'authorization: YOUR_API_KEY' \
  -d 'sender_id=TXTIND&message=This is a test message&route=v3&numbers=9999999999,8888
```

Service Route Success Response:

```
{
    "return": true,
    "request_id": "lwdtp7cjyqxvfe9",
    "message": [
        "Message sent successfully"
    ]
}
```

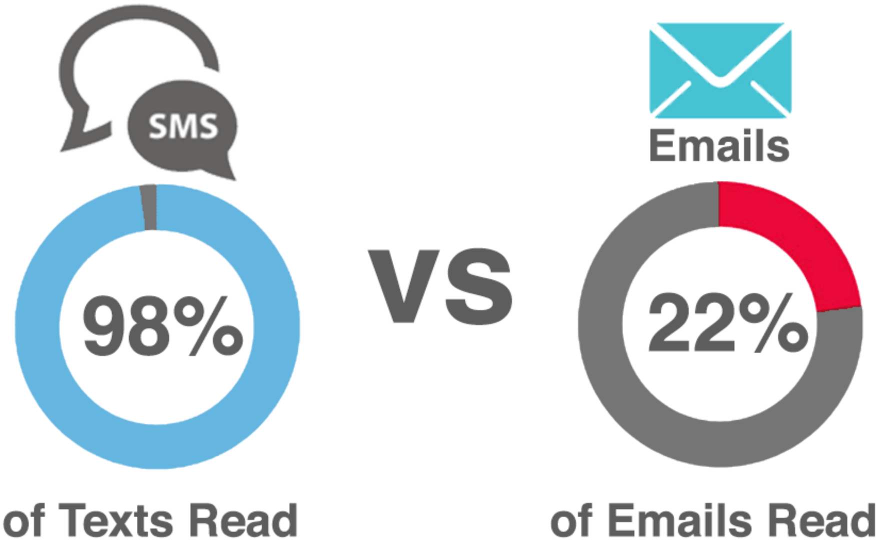
.

There is a lot of debate on the topic whether to go for bulk SMS or email marketing. Let's look into some facts related to email and SMS:

- The average person receives 178 text messages in a month.
- And they receive approx. 1216 emails in a month.
- 98% of text messages get read in a month
- 22% of emails are read in a month.
- 91% of adults have their smartphone within arm's reach.
- There are 6 billion active mobile phones in the world.
- 6 billion Email accounts are there in the world.
- According to the findings, 19% of people click the URL in the SMS.
- According to the findings, 2% of people click the URL sent in the email.

The picture is clear. SMS is a more powerful way to connect to the target audience and establish rapport with them. The open rate of an SMS is more than that of an email. As everybody of us might have noticed that as soon as a notification sounds comes in our mobile, we immediately grab our phone and check who has sent SMS and the details. This is why SMS has a high readability and is more likely to get opened.

In case of an email we postpone reading it as it is usually very long. The positive points of an SMS are that it is to the point, conveys essential information in a clear cut manner and does not require an internet connection to view it.



So we have decided to send the alert using bulk SMS service through fast2sms

8.TESTING

8.1. Test Cases

A test case is a document which has a set of conditions or actions that are performed on the software application in order to verify the expected functionality of the feature.

After test scripts, test cases are the second most detailed way of documenting testing work. They describe a specific idea that is to be tested, without detailing the exact steps to be taken or data to be used. For example, in a test case, you document something like 'Test if coupons can be applied on actual price'. This doesn't mention how to apply the coupons or whether there are multiple ways to apply. It also doesn't mention if the tester uses a link to apply a discount, or enter a code, or have a customer service apply it. They give flexibility to the tester to decide how they want to execute the test.

Benefits of Writing Test Cases

The key purpose of a test case is to ensure if different features within an application are working as expected. It helps tester, validate if the software is free of defects and if it is working as per the expectations of the end users. Other benefits of test cases include:

- Test cases ensure good test coverage
- Help improve the quality of software,
- Decreases the maintenance and software support costs
- Help verify that the software meets the end user requirements
- Allows the tester to think thoroughly and approach the tests from as many angles as possible
- Test cases are reusable for the future – anyone can reference them and execute the test.

So, these are a few reasons why test cases are extremely useful in software testing. Test cases are powerful artifacts that work as a good source of truth for how a system and a particular feature of software works. However, before we deep dive into the lessons for writing top-notch test cases, let us have a basic idea on the terminologies associated with them.

Test Case Format

The primary ingredients of a test case are an ID, description, bunch of inputs, few actionable steps, as well as expected and actual results. Let's learn what each of them is:

- **Test Case Name:**A test case should have a name or title that is self-explanatory.
- **Test Case Description:**The description should tell the tester what they're going to test in brief.
- **Pre-Conditions:**Any assumptions that apply to the test and any preconditions that must be met prior to the test being executed should be listed here.
- **Test Case Steps:**The test steps should include the necessary data and information on how to execute the test. The steps should be clear and brief, without leaving out essential facts.

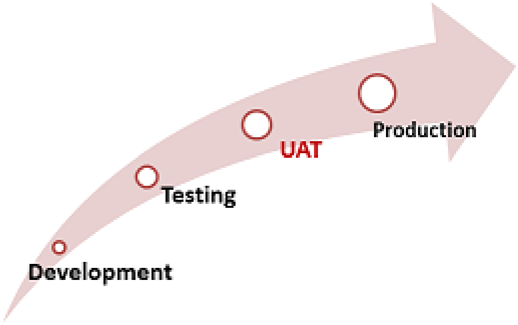
- **Test Data:**It's important to select a data set that gives sufficient coverage. Select a data set that specifies not only the positive scenarios but negative ones as well.
- **Expected Result:**The expected results tell the tester what they should experience as a result of the test steps.
- **Actual Result:**They specifies how the application actually behaved while test cases were being executed.
- **Comments:**Any other useful information such as screenshots that tester want's to specify can be included here.

Test Case no	Test Data	Actions	Pass/Fail	Comments
1	Temperature: 65C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:OFF Fire Alarm:OFF Alert:NOT SENT	Pass	Alert Not Sent
2	Temperature: 55C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:OFF Fire Alarm:OFF Alert:NOT SENT	Pass	Alert Not Sent
3	Temperature: 85C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:ON Fire Alarm:ON Alert: SENT	Pass	Alert Sent Successfully
4	Temperature: 35C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:OFF Fire Alarm:OFF Alert:NOT SENT	Pass	Alert Not Sent
5	Temperature: 45C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:ON Fire Alarm:ON Alert:SENT	Pass	Alert Sent Successfully
6	Temperature: 75C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:ON Fire Alarm: ON Alert: SENT	Pass	Alert Sent Successfully
7	Temperature: 15C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:OFF Fire Alarm:OFF Alert:NOT SENT	Pass	Alert Not Sent
8	Temperature: 90C Gas NO2:20% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:ON Fire Alarm:ON Alert: SENT	Pass	Alert Sent Successfully

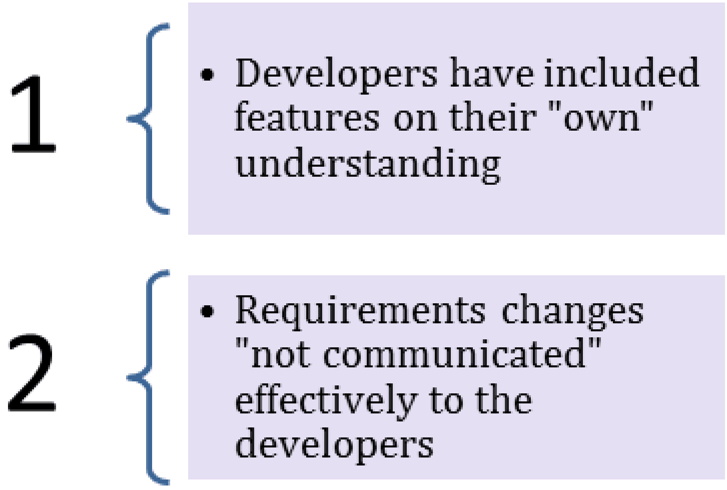
9	Temperature: 25C Gas NO2:20% CO2:10% CO:2%	Exhaust Fan: OFF Water Sprinkler:OFF Fire Alarm:OFF Alert:NOT SENT	Pass	Alert Not Sent
10	Temperature: 95C Gas NO2:90% CO2:30% CO:2%	Exhaust Fan: ON Water Sprinkler:ON Fire Alarm:ON Alert: SENT	Pass	Alert Sent Successfully

8.2. User Acceptance Testing

User Acceptance Testing (UAT)is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing is done.



Purpose of UAT



1 — Developers have included features on their "own" understanding

2 — Requirements changes "not communicated" effectively to the developers

The main **Purpose of UAT**is to validate end to end business flow. It does not focus on cosmetic errors, spelling mistakes or system testing. User Acceptance Testing is carried out in a separate testing environment with production-like data setup. It is kind of black box testing where two or more end-users will be involved.

UAT is performed by –

- Client
- End users

Need of User Acceptance Testing

Need of User Acceptance Testingarises once software has undergone Unit, Integration and System testing because developers might have built software based on requirements document by their own understanding and further required changes during development may not be effectively communicated to them, so for testing whether the final product is accepted by client/end-user, user acceptance testing is needed.

- Developers code software based on requirements document which is their “own” understanding of the requirements and **may not actually be what the client needs from the software**.
- Requirements changes during the course of the project may not be communicated effectively to the developers.

Defect Analysis

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

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
ByDesign	5	2	2	1	10
Duplicate	1	0	2	1	4
External	2	3	0	1	6
Fixed	10	2	4	15	31
NotReproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	0	5	2	1	8
Totals	18	12	12	20	52

Test Case Analysis

This reports hows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Login Page	6	0	0	6

Node Red Dashboard	35	0	0	35
IBM Watson IOT Platform	2	0	0	2
Python	3	0	0	3

9. Result

9.1) Performance Metrics

These metrics are used to track and measure the effectiveness and profitability of various projects.

Each stage of the project is tracked and measured against the goals that the project set out to achieve.

The data compiled from the metrics can be used to plan future projects and gives insight on how to make projects more efficient.

10) Advantages and Disadvantages

Advantages:

As far as fire alarm installers go, a wireless system is ideal because they are much easier to install. A wireless system essentially involves mounting the devices to the appropriate locations around a building or room, setting up the actual system and syncing it to WiFi. Compare this to a wired system, which requires fire alarm installers to connect the system to power supplies and ensure cables are connected properly.

Another great advantage of a wireless fire alarm system is it operates off of a battery. This frees up a wall outlet and you can feel safe knowing the system will still work in the event of a power outage. And adding a second or subsequent wireless device is easy if you add on to your home or office.

Disadvantages:

The one thing most fire alarm system inspectors caution against with wireless systems is having to replace the battery. The system is essentially useless if the batteries aren’t charged, since it won’t work properly. There is a bit of a burden to homeowners or business owners to always remember to keep the batteries fresh so the system operates properly when you need it most.

A couple other disadvantages fire alarm system inspectors point out is wireless systems have limited range and don’t have centralized monitoring. Range can be a problem for large offices or homes, since a weak wireless connection may cause the system to not operate reliably. Wireless fire alarm systems also don’t connect directly to the telephone lines, which are linked to the fire departments, so the response to an emergency could be slower as a result.

11) Conclusion

Thus this Fire management system play a very important role in Industries, Shops, Malls, Residential complexes, and parking areas. They help in detecting fire or harmful gas at an early stage and can help in saving lives. Commercial Fire detecting systems usually have an alarm signaling, with the help of a buzzer or Siren. We have designed an this system to send an immediate alert through the bulk sms service via fast2sms. These systems do not require any human interaction. In this Industrial fire management system using temperature, flame and gas sensors using the IOT project, we can send LIVE information like Temperature, gas and flame detected by a particular device to the Fire Department so the capital damage can be avoided

12) Future Scope

Although their name suggests the opposite of what they do, fireballs actually take the place of a traditional fire extinguisher, covering more space and doing it much faster. If you don't believe it, you should check out the video in the link. Created by a company called Elide, the fireball can even fight fires when a user cannot be present to use it. As their website states, "When a fire occurs and no one is present, Fire Extinguishing Ball will self-activate when it comes into contact with fire and give a loud noise as a fire alarm. Because of this feature, it can be placed in a fire prone area such as near an electrical circuit breaker or in a kitchen."

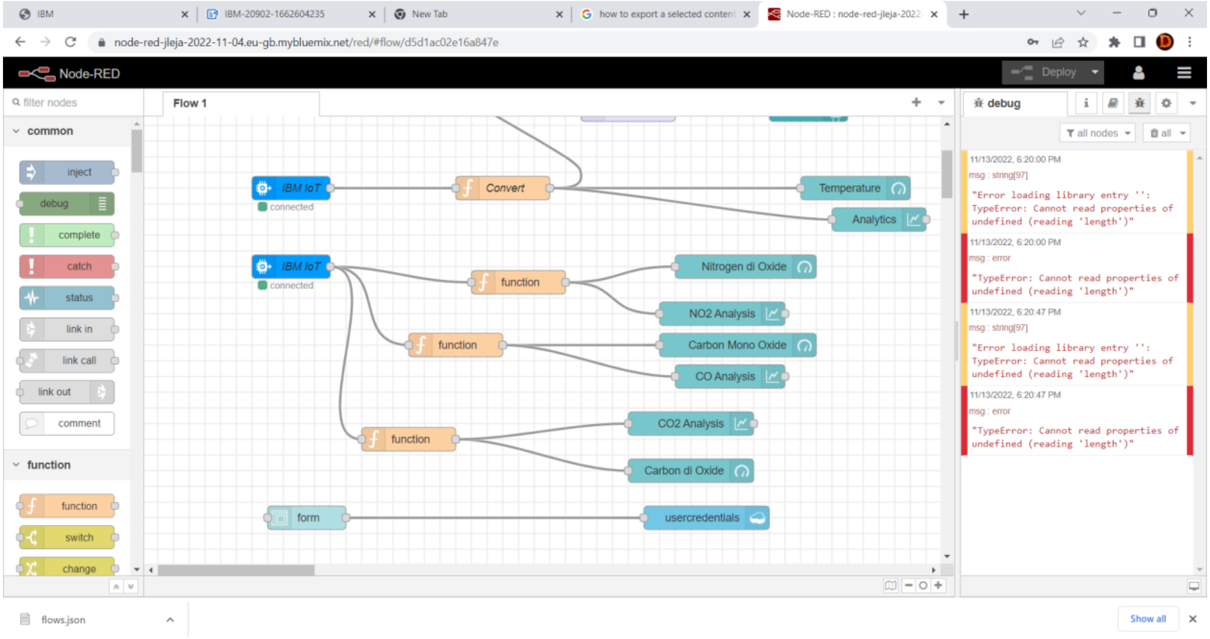
Perhaps most applicable to dealers looking to grow their RMR, wireless devices provide mobile capabilities to homeowners looking to install themselves, or even to take with them when relocating. According to firesystemsltd.co.uk, "Some of the systems on the market are using mesh network for the first time in wireless fire detection technology. The detectors are connected to each other and are using different frequencies on different bandwidths." For those who look for something truly reliable in any situation, many devices can be connected in wired and non-wired formats. This dual connectivity provides unprecedented coverage and ultimate reliability. Yet, for buildings that are difficult to wire, or consumers who want something simple, wire-free systems will take the market by storm.

As new technologies emerge, dealers should be sure to leverage both timeless and emerging technologies to target more customers. Devices are becoming more and more capable, and regardless their application, they are all evolving to connect to the internet and cooperate with other devices. Consumers look for smart home technology along with commercial products that work in a cohesive environment. Along with investigating which products to sell, we encourage dealers to take a serious look at reliable partners to provide wholesale alarm monitoring services for devices so that consumers never go without protection.

13)Appendix

Source Code

Node Red Flows



11/13/2022, 6:20:00 PM
msg : string[97]

```
"Error loading library entry '':
TypeError: Cannot read properties of
undefined (reading 'length')"
```

11/13/2022, 6:20:00 PM
msg : error

```
"TypeError: Cannot read properties of
undefined (reading 'length')"
```

11/13/2022, 6:20:47 PM
msg : string[97]

```
"Error loading library entry '':
TypeError: Cannot read properties of
undefined (reading 'length')"
```

11/13/2022, 6:20:47 PM
msg : error

```
"TypeError: Cannot read properties of
undefined (reading 'length')"
```

Flows.json

```
[
{
"id": "d5d1ac02e16a847e",
"type": "tab",
"label": "Flow 1",
"disabled": false,
"info": "",
"env": []
},
{
"id": "1533d345e1dc36a9",
"type": "ui_gauge",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "b0b2466424d96a85",
"order": 1,
"width": 0,
"height": 0,
"gtype": "gage",
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"label": "Celsius",
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"#ca3838"
],
"seg1": "40",
"seg2": "60",
"className": "",
"x": 910,
"y": 340,
"wires": []
},
{
"id": "cbd881198ad25821",
"type": "function",
"z": "d5d1ac02e16a847e",
"name": "Convert",
"func": "msg.payload=msg.payload.Temperature\nreturn msg;",
"outputs": 1,
"noerr": 0,
"initialize": "",
"finalize": "",
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"x": 460,
"y": 340,
"wires": [
[
"1533d345e1dc36a9",
"1cba1c03ecf32aa5",
"c883c624a3b90fc4"
]
]
},
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"ruleId": "",
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"eventType": "+",
"commandType": "",
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]
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"type": "ibmiot in",
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"apiKey": "8d9dadc21a8b3d2f",
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"applicationId": "",
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"eventType": "+",
"commandType": "",
"format": "json",
"name": "IBM IoT",
"service": "registered",
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"allCommands": "",
"allFormats": "",
"qos": 0,
"x": 190,
"y": 440,
"wires": [
[
"cce26a0bf1e99e72",
"d4be4869ed5d4f8c",
"9669c4a7a1ddc6de"
]
]
},
{
"id": "cce26a0bf1e99e72",
"type": "function",
"z": "d5d1ac02e16a847e",
"name": "",
"func": "msg.payload=msg.payload.NO2\nreturn msg;",
"outputs": 1,
"noerr": 0,
"initialize": "",
"finalize": "",
"libs": [],
"x": 480,
"y": 460,
"wires": [
[
"152e5e18a22ea640",
"c0b625de4d3f7730"
]
]
},
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"763a9ae51ae799ec"
]
]
},
{
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"type": "ui_gauge",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "d2d6e984eb71a537",
"order": 1,
"width": 0,
"height": 0,
"gtype": "gage",
"title": "Nitrogen di Oxide",
"label": "Percentage",
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"min": 0,
"max": "100",
"colors": [
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"#ca3838"
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"className": "",
"x": 770,
"y": 440,
"wires": []
```

```
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"name": "",
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"width": 0,
"height": 0,
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"format": "{{value}}",
"min": 0,
"max": "100",
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"#00b500",
"#e6e600",
"#ca3838"
],
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"seg2": "5",
"className": "",
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"name": "",
"group": "d2d6e984eb71a537",
"order": 3,
"width": 0,
"height": 0,
"gtype": "gage",
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"label": "Percentage",
"format": "{{value}}",
"min": 0,
"max": "100",
"colors": [
"#00b500",
"#e6e600",
"#ca3838"
],
"seg1": "20",
"seg2": "30",
"className": "",
"x": 700,
"y": 700,
"wires": []
},
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"id": "8a41db8811f572d9",
"type": "ui_form",
"z": "d5d1ac02e16a847e",
"name": "",
"label": "",
"group": "c8492bdcd68680a2",
"order": 0,
"width": 0,
"height": 0,
"options": [
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"label": "Username",
"value": "Username",
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"value": "Email",
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"required": true,
"rows": null
},
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"value": "Phonenumber",
"type": "number",
"required": true,
"rows": null
}
],
"formValue": {
"Username": "",
"Email": "",
"Phonenumber": ""
```

```
},
"payload": "",
"submit": "submit",
"cancel": "cancel",
"topic": "topic",
"topicType": "msg",
"splitLayout": "",
"className": "",
"x": 210,
"y": 760,
"wires": [
[
"40123f46207d3c68"
]
]
},
{
"id": "40123f46207d3c68",
"type": "cloudant out",
"z": "d5d1ac02e16a847e",
"name": "",
"cloudant": "3d10849a8821b6a7",
"database": "usercredentials",
"service": "_ext_",
"payonly": true,
"operation": "insert",
"x": 720,
"y": 760,
"wires": []
},
{
"id": "7c787911c08c4fcb",
"type": "inject",
"z": "d5d1ac02e16a847e",
"name": "",
"props": [
{
"p": "payload"
},
{
"p": "topic",
"vt": "str"
}
],
"repeat": "",
"crontab": "",
```

"once": false,
"onceDelay": 0.1,
"topic": "",
"payload": "",
"payloadType": "date",
"x": 160,
"y": 860,
"wires": [
[
"ab2c14742c0e6cb4"
]
]
},
{
"id": "ab2c14742c0e6cb4",
"type": "cloudant in",
"z": "d5d1ac02e16a847e",
"name": "",
"cloudant": "3d10849a8821b6a7",
"database": "usercredentials",
"service": "_ext_",
"search": "_all_",
"design": "Usercredentials",
"index": "Phonenumber",
"x": 460,
"y": 860,
"wires": [
[
"5cd6db4b75445da3"
]
]
},
{
"id": "5cd6db4b75445da3",
"type": "debug",
"z": "d5d1ac02e16a847e",
"name": "",
"active": true,
"tosidebar": true,
"console": false,
"tostatus": false,
"complete": "payload",
"targetType": "msg",
"statusVal": "",
"statusType": "auto",
"x": 690,

```
"y": 920,
"wires": []
},
{
"id": "1d8c19444aee18bf",
"type": "debug",
"z": "d5d1ac02e16a847e",
"name": "",
"active": true,
"tosidebar": true,
"console": false,
"tostatus": false,
"complete": "false",
"statusVal": "",
"statusType": "auto",
"x": 850,
"y": 20,
"wires": []
},
{
"id": "057ef750bef3fc86",
"type": "inject",
"z": "d5d1ac02e16a847e",
"name": "",
"props": [
{
"p": "payload"
},
{
"p": "topic",
"vt": "str"
}
],
"repeat": "",
"crontab": "",
"once": false,
"onceDelay": 0.1,
"topic": "",
"payload": "",
"payloadType": "date",
"x": 180,
"y": 20,
"wires": [
[
"3c36398fb917a7c9"
]
]
},
{
"id": "3c36398fb917a7c9",
"type": "python-function",
"z": "d5d1ac02e16a847e",
"name": "",
"func": "import requests\nurl = \"https://www.fast2sms.com/dev/bulkV2\"\npayload = \"sender_id=FSTSMS&message=Alert!&language=english&route=p&numbers=9095057479\"\nheaders = {\n'authorization': \"o0azwVFNHOM5B3hrRxdenyU2cfZujqSpYEX7t8LAgJPb9kliWCugDvo1n0kcY8TGHOt3dIQwsKpLbAJU\",\n'Content-Type': \"application/x-www-form-urlencoded\",\n'Cache-Control': \"no-cache\",\n}\nresponse = requests.request(\"POST\", url, data=payload, headers=headers)\nprint(response.text)\n",
"outputs": 1,
"x": 580,
"y": 20,
"wires": [
[
"1d8c19444aee18bf"
]
]
},
{
"id": "cec01e40a908c48e",
"type": "ui_led",
"z": "d5d1ac02e16a847e",
"order": 0,
"group": "b0b2466424d96a85",
"width": 0,
"height": 0,
"label": "Water Sprinkler",
"labelPlacement": "left",
"labelAlignment": "left",
"colorForValue": [
{
"color": "#ff0000",
"value": "false",
"valueType": "bool"
},
{
"color": "#008000",
"value": "true",
"valueType": "bool"
}
],
"allowColorForValueInMessage": false,
"shape": "circle",
"showGlow": true,
"name": "",
"x": 850,
"y": 120,
"wires": []
},
{
"id": "1cba1c03ecf32aa5",
"type": "function",
"z": "d5d1ac02e16a847e",
"name": "",
"func": "msg.payload=(msg.payload>65)? true: false;\nreturn msg;",
"outputs": 1,
"noerr": 0,
"initialize": "",
"finalize": "",
"libs": [],
"x": 380,
"y": 120,
"wires": [
[
"80a720021c12cce7",
"cebd50b2ed69ccd3",
"56b6fd723b216743"
]
]
},
{
"id": "80a720021c12cce7",
"type": "delay",
"z": "d5d1ac02e16a847e",
"name": "",
"pauseType": "delay",
"timeout": "45",
"timeoutUnits": "seconds",
"rate": "1",
"nbRateUnits": "1",
"rateUnits": "second",
"randomFirst": "1",
"randomLast": "5",
"randomUnits": "seconds",
"drop": false,
"allowrate": false,
"outputs": 1,
"x": 620,
"y": 120,
"wires": [
[
"cec01e40a908c48e"
]
]
},
{
"id": "cebd50b2ed69ccd3",
"type": "delay",
"z": "d5d1ac02e16a847e",
"name": "",
"pauseType": "delay",
"timeout": "30",
"timeoutUnits": "seconds",
"rate": "1",
"nbRateUnits": "1",
"rateUnits": "second",
"randomFirst": "1",
"randomLast": "5",
"randomUnits": "seconds",
"drop": false,
"allowrate": false,
"outputs": 1,
"x": 620,
"y": 180,
"wires": [
[
"1b0bc39e91d2d4dc"
]
]
},
{
"id": "56b6fd723b216743",
"type": "delay",
"z": "d5d1ac02e16a847e",
"name": "",
"pauseType": "delay",
"timeout": "10",
"timeoutUnits": "seconds",
"rate": "1",
"nbRateUnits": "1",
"rateUnits": "second",
"randomFirst": "1",
"randomLast": "5",
"randomUnits": "seconds",
"drop": false,
"allowrate": false,
"outputs": 1,
"x": 620,
"y": 240,
"wires": [
[
"dc9bb5498dd98dfc"
]
]
},
{
"id": "1b0bc39e91d2d4dc",
"type": "ui_led",
"z": "d5d1ac02e16a847e",
"order": 1,
"group": "b0b2466424d96a85",
"width": 0,
"height": 0,
"label": "Exhaust fan",
"labelPlacement": "left",
"labelAlignment": "left",
"colorForValue": [
{
"color": "#ff0000",
"value": "false",
"valueType": "bool"
},
{
"color": "#008000",
"value": "true",
"valueType": "bool"
}
],
"allowColorForValueInMessage": false,
"shape": "circle",
"showGlow": true,
"name": "",
"x": 850,
"y": 180,
"wires": []
},
{
"id": "dc9bb5498dd98dfc",
"type": "ui_led",
"z": "d5d1ac02e16a847e",
"order": 2,
"group": "b0b2466424d96a85",
"width": 0,
"height": 0,
"label": "Fire Alarm",
"labelPlacement": "left",
"labelAlignment": "left",
"colorForValue": [
{
"color": "#ff0000",
"value": "false",
"valueType": "bool"
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{
"color": "#008000",
"value": "true",
"valueType": "bool"
}
],
"allowColorForValueInMessage": false,
"shape": "circle",
"showGlow": true,
"name": "",
"x": 850,
"y": 240,
"wires": []
},
{
"id": "c883c624a3b90fc4",
"type": "ui_chart",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "b0b2466424d96a85",
"order": 0,
"width": 0,
"height": 0,
"label": "Analytics",
"chartType": "line",
"legend": "false",
"xformat": "auto",
"interpolate": "linear",
"nodata": "Waiting for data",
"dot": false,
"ymin": "0",
"ymax": "100",
"removeOlder": "60",
"removeOlderPoints": "",
"removeOlderUnit": "1",
"cutout": 0,
"useOneColor": false,
"useUTC": false,
"colors": [
"#42b0ff",
"#aec7e8",
"#ff7f0e",
"#1adb1a",
"#98df8a",
"#d62728",
"#ff9896",
"#9467bd",
"#c5b0d5"
],
"outputs": 1,
"useDifferentColor": false,
"className": "",
"x": 940,
"y": 380,
"wires": [
[]
]
},
{
"id": "763a9ae51ae799ec",
"type": "ui_chart",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "5a710181faf582af",
"order": 5,
"width": 0,
"height": 0,
"label": "CO2 Analysis",
"chartType": "line",
"legend": "false",
"xformat": "HH:mm:ss",
"interpolate": "linear",
"nodata": "",
"dot": false,
"ymin": "0",
"ymax": "100",
"removeOlder": "60",
"removeOlderPoints": "",
"removeOlderUnit": "1",
"cutout": 0,
"useOneColor": false,
"useUTC": false,
"colors": [
"#1f77b4",
"#aec7e8",
"#ff7f0e",
"#2ca02c",
"#98df8a",
"#df2a2a",
"#ff9896",
"#9467bd",
"#c5b0d5"
],
"outputs": 1,
"useDifferentColor": false,
"className": "",
"x": 700,
"y": 640,
"wires": [
[]
]
},
{
"id": "c0b625de4d3f7730",
"type": "ui_chart",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "5a710181faf582af",
"order": 3,
"width": 0,
"height": 0,
"label": "NO2 Analysis",
"chartType": "line",
"legend": "false",
"xformat": "HH:mm:ss",
"interpolate": "linear",
"nodata": "",
"dot": false,
"ymin": "0",
"ymax": "100",
"removeOlder": "60",
"removeOlderPoints": "",
"removeOlderUnit": "1",
"cutout": 0,
"useOneColor": false,
"useUTC": false,
"colors": [
"#1f77b4",
"#aec7e8",
"#ff7f0e",
"#2ca02c",
"#98df8a",
"#d62728",
"#ff9896",
"#9467bd",
"#c5b0d5"
],
"outputs": 1,
"useDifferentColor": false,
"className": "",
"x": 740,
"y": 500,
"wires": [
[]
]
},
{
"id": "f3dd2fc7f39bf5f7",
"type": "ui_chart",
"z": "d5d1ac02e16a847e",
"name": "",
"group": "5a710181faf582af",
"order": 4,
"width": 0,
"height": 0,
"label": "CO Analysis",
"chartType": "line",
"legend": "false",
"xformat": "HH:mm:ss",
"interpolate": "linear",
"nodata": "",
"dot": false,
"ymin": "0",
"ymax": "100",
"removeOlder": "60",
"removeOlderPoints": "",
"removeOlderUnit": "1",
"cutout": 0,
"useOneColor": false,
"useUTC": false,
"colors": [
"#1f77b4",
"#aec7e8",
"#ff7f0e",
"#2ca52c",
"#98df8a",
"#d62728",
"#ff9896",
"#9467bd",
"#c5b0d5"
],
"outputs": 1,
"useDifferentColor": false,
"className": "",
"x": 750,
"y": 580,
"wires": [
[]
]
},
{
"id": "b0b2466424d96a85",
"type": "ui_group",
"name": "Temperature",
"tab": "477494a5baf03dbe",
"order": 3,
"disp": true,
"width": "6",
"collapse": false,
"className": ""
},
{
"id": "8d9dadc21a8b3d2f",
"type": "ibmiot",
"name": "IBM_IOT",
"keepalive": "60",
"serverName": "lryrya.messaging.internetofthings.ibmcloud.com",
"cleansession": true,
"appId": "",
"shared": false
},
{
"id": "d2d6e984eb71a537",
"type": "ui_group",
"name": "Gas Sensor",
"tab": "e208207b5344b7ac",
"order": 2,
"disp": true,
"width": "6",
"collapse": false,
"className": ""
},
{
"id": "c8492bdcd68680a2",
"type": "ui_group",
"name": "Register Form",
"tab": "94803c79c48f4a14",
"order": 3,
"disp": true,
"width": "6",
"collapse": false,
"className": ""
},
{
"id": "3d10849a8821b6a7",
"type": "cloudant",
"host": "https://apikey-v2-
2uxme1xe4ze15rnf5fh8l40eg4coz66pm8ateuwy93py:0172158934b6c3a3e8b39b0511e7af20
@e8e96f53-33f3-4fd1-bb73-6fb98205f7c2-bluemix.cloudantnosqldb.appdomain.cloud",
"name": ""
},
{
"id": "5a710181faf582af",
"type": "ui_group",
"name": "Gas Analytics",
"tab": "e208207b5344b7ac",
"order": 3,
"disp": true,
"width": "6",
"collapse": false,
"className": ""
},
{
"id": "477494a5baf03dbe",
"type": "ui_tab",
"name": "Temperature",
"icon": "dashboard",
"disabled": false,
"hidden": false
},
{
"id": "e208207b5344b7ac",
"type": "ui_tab",
"name": "Gas Sensor",
"icon": "dashboard",
"disabled": false,
"hidden": false
},
{
"id": "94803c79c48f4a14",
"type": "ui_tab",
"name": "Register Form",
"icon": "dashboard",
"disabled": false,
"hidden": false
}
]
```

Temperature.py

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import ibmiotf.api
import requests
import json
#Provide your IBM Watson Device Credentials
organization = "lryrya"
deviceType = "Temp"
deviceId = "T1"
authMethod = "token"
authToken = "123456789"
def Alert():
url = "https://www.fast2sms.com/dev/bulkV2"
my_data = {
'sender_id': 'FSTSMS',
'message': 'Alert Fire has been detected in XYZ industry! Kindly Evacuvate from the place',
'language': 'english',
'route': 'p',
'numbers': '9095057479'
}
headers = {
'authorization':
'o0azwVFNHOM5B3hrRxdenyU2cfZujqSpYEX7t8LAgJPb9kliWCugDvo1n0kcY8TGHOt3dIQwsKpLbAJU',
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache"
}
response = requests.request("POST",
url,
data = my_data,
headers = headers)
returned_msg = json.loads(response.text)
print(returned_msg['message'])


def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="lighton":
print ("led is on")
else :
print ("led is off")
#print(cmd)
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(0,70)
data = { 'Temperature' : temp}
#print data
def myOnPublishCallback():
print ("Published Temperature = %s C" %temp, "to IBM Watson")
if(temp>65):
Alert();
time.sleep(1)
success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
if not success:
print("Not connected to IoTF")
time.sleep(1)
deviceCli.disconnect()
```

Gas Sensor.py

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import ibmiotf.api
import requests
import json
#Provide your IBM Watson Device Credentials
organization = "lryrya"
deviceType = "Gas_Sensor"
deviceId = "G1"
authMethod = "token"
authToken = "123456789"
def Alert():
url = "https://www.fast2sms.com/dev/bulkV2"
my_data = {
'sender_id': 'FSTSMS',
'message': 'Alert Some abnormality is found is XYZ industry! Kindly Evacuvate from the
place',
'language': 'english',
'route': 'p',
'numbers': '9095057479'
}
headers = {
'authorization':
'o0azwVFNHOM5B3hrRxdenyU2cfZujqSpYEX7t8LAgJPb9kliWCugDvo1n0kcY8TGHOt3
dIQwsKpLbAJU',
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache"
}
response = requests.request("POST",
url,
data = my_data,
headers = headers)
returned_msg = json.loads(response.text)
print(returned_msg['message'])


def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="lighton":
print ("led is on")
else :
```

```
print ("led is off")
#print(cmd)
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
NO2=random.randint(0,30)
CO2=random.randint(0,25)
CO=random.randint(0,5)
data = { 'NO2' : NO2 , 'CO2': CO2,'CO' : CO}
#print data
def myOnPublishCallback():
print ("Published Nitrogen di Oxide = %s %" % NO2, "Carbon di oxide = %s %%" % CO2,
"Carbon monoxide = %s %%" % CO, "to IBM Watson")
if(NO2>29) or (CO2>24) or (CO>4):
Alert();
time.sleep(1)
success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
if not success:
print("Not connected to IoTF")
time.sleep(1)
deviceCli.disconnect()
```

Github Repositry:
https://github.com/IBM-EPBL/IBM-Project-20902-1659766144

Project Demo:

https://youtu.be/QzRIlRW0nvo