KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

GAS LEAKAGE MONITORING AND ALERTING SYSTEM

DOMAIN NAME: INTERNET OF THINGS

SUBMITTED BY,

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In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERRING

In

Electronics and communication Engineering

NOVEMBER 2022

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Project Overview

1.2 Purpose

2. LITERATURE SURVEY

2.1 Existing problem

2.2 References

2.3 Problem Statement Definition

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation & Brainstorming

3.3 Proposed Solution

3.4 Problem Solution fit

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

4.2 Non-Functional requirements

5. PROJECT DESIGN

5.1 Data Flow Diagrams

5.2 Solution & Technical Architecture

5.3 User Stories

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

6.2 Sprint Delivery Schedule

6.3 Reports from JIRA

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

7.1 Feature 1

7.2 Feature 2

8. TESTING

8.1 Test Cases

8.2 User Acceptance Testing

9. RESULTS

9.1 Performance Metrics

10. ADVANTAGES & DISADVANTAGES

11. CONCLUSION

12. FUTURE SCOPE

13. APPENDIX

13.1Source Code

13.2 GitHub & Project Demo Link

1 INTRODUCTION

Gas leakage causes a variety of accidents that result in both material loss and human injuries. IoT refers to a growing network of physical objects linked by various sensors and internet access. Despite their high level of precision, standard gas leak detection systems miss a few critical details when alerting the public to a leak. As a result, we developed a Gas Leakage Detector using IoT technology, which includes Smart Alerting approaches such as a buzzer and display to the appropriate authority, as well as the ability to predict hazardous situations. Liquid petroleum gas (LPG), which is widely used at home and in the workplace. We intend to develop an examination system that identifies IOT, which is an expanding network of physical devices that are linked. As a result, we used IoT technology to create a Gas Leakage Detector with Smart Alerting techniques such as a buzzer and display to the appropriate authority, as well as the ability to predict hazardous situations. Liquid petroleum gas (LPG), which is widely used in the home and at work. In this project, we decided to create an examining system that detects LPG gas leaks and protects the work noticed. Sensors in the project are used to detect gas leaks and immediately turn on the buzzer for the danger. The usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquidized petroleum gas (LPG), which is excessively used in the house As a result, we used IoT technology to create a Gas Leakage Detector with Smart Alerting techniques such as a buzzer and display to the appropriate authority, as well as the ability to predict hazardous situations. Liquid petroleum gas (LPG), which is widely used in the home and at work. In this project, we decided to create an examining system that detects LPG gas leaks and protects the work noticed. Sensors in the project are used to detect gas leaks and immediately turn on the buzzer for the danger. The use of gas

causes significant problems in both the home and the workplace. The inflammable gas, such as liquid petroleum gas (LPG), which is widely used in the home and at work.

1.1 Project Overview

The process of detecting potentially hazardous gas leaks using sensors is known as gas leak detection. A sensor used to detect the gas leakage and it will display the amount of hazardous gas in the industries it will give alert message to the worker and test the pressure and humidity level of air.

1.2 Purpose

The main purpose of this project is to detect the gas leakage occurring in industries using sensor and alert them by mobile application.

1. LITERATURE SURVEY

Gas leakage detection and alert system using IOT, Uma Karanje & 2020

This advantage of this project is its simplicity and its ability to warn about the leakage of the LPG gas. This system uses GSM technique to send the alert message to respective person is no one is there in the house.

Detection of Gas Leakage and Automatic Alert System using Arduino, Juhi Chaudhary and Anurag Mishra & 2020

The primary objective of this basic gas leakage detector is its effortlessness and its capacity to caution its owner about the spillage of the LPG gas. The other preferred standpoint of this framework is its audio cautioning system.

Gas leakage detection and alerting system using Arduino Uno, Syeda Bushra Shahewaz and Chandra Rajendra Prasad & 2020

The LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we are able to save the life by using this system.

Gas Leakage Detection Using GSM Module & Arduino with SMS Alert, Mr. Sivaprasad Lebaka & 2022

The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, the system consists of Alarm unit which is Buzzer gives an audible sign of the presence of LPG volume.

2.1 Existing problem

The current issue is that it only detects gas leaks and issues an alarm, but in our project, we will add a messaging method to alert people when they are not inside the industries. If a gas leak occurs at night when no one is present, it is dangerous to the environment. To address this issue, we have proposed sending a message to any workers, managers, or owners of the industry.

2.2 References

- Shrivastava, A., Prabhaker, R., Kumar, R., & Verma, R. GSM based gas leakage detection system. International Journal of Emerging Trends in Electrical and Electronics (IJETEE- ISSN: 2320-9569), 2013; 3(2):42-45.

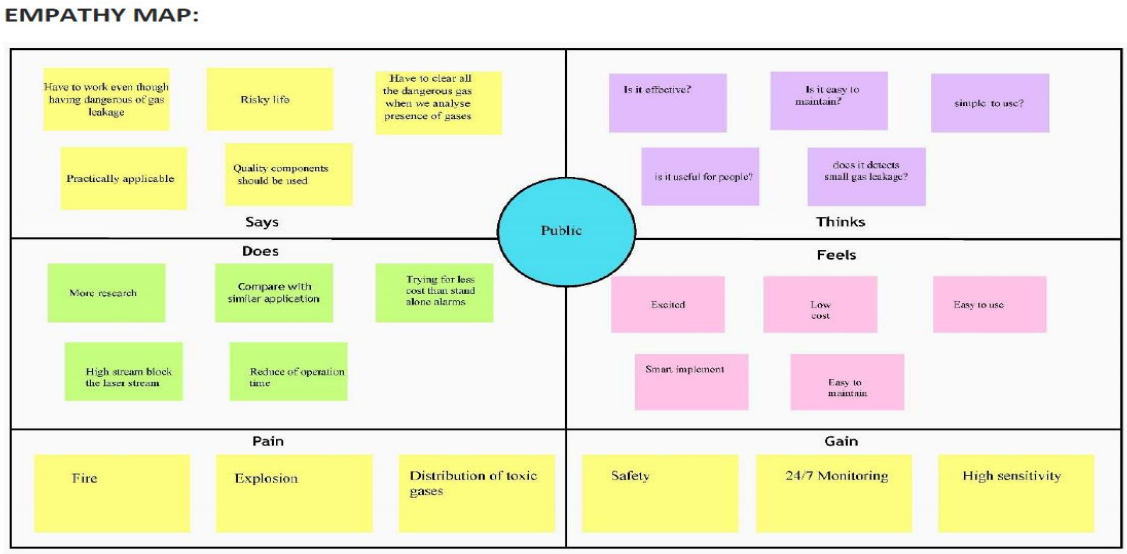
- Hema, L. K., Murugan, D., & Chitra, M. WSN based Smart system for detection of LPG and Combustible gases. In National Conf. on Architecture, Software systems and Green computing-2013.
- Ramya, V., & Palaniappan, B. Embedded system for Hazardous Gas detection and Alerting. International Journal of Distributed and Parallel Systems (IJDPS), 2012; 3(3):287-300. 4.Priya, P. D., & Rao, C. T. Hazardous Gas Pipeline Leakage Detection Based on Wireless Technology. International Journal of Professional Engineering Studies, India, 2014; 2(1).
- Jero, S. E., & Ganesh, A. B. 2011, March. PIC18LF4620 based customizable wireless sensor node to detect hazardous gas pipeline leakage. In 2011 International Conference on Emerging Trends in Electrical and Computer Technology (pp. 563-566). IEEE.
- Anusha, O., & Rajendra prasad, C. H. Experimental investigation on road safety system at crossings. International Journal of Engineering and Advanced Technology, 2019; 8(2):214–218.
- Ramu, M., & Prasad, C. R. Cost effective atomization of Indian agricultural system using 8051 microcontrollers. International journal of advanced research in computer and communication engineering, 2013; 2(7):2563-2566.

2.2 Problem Statement Definition

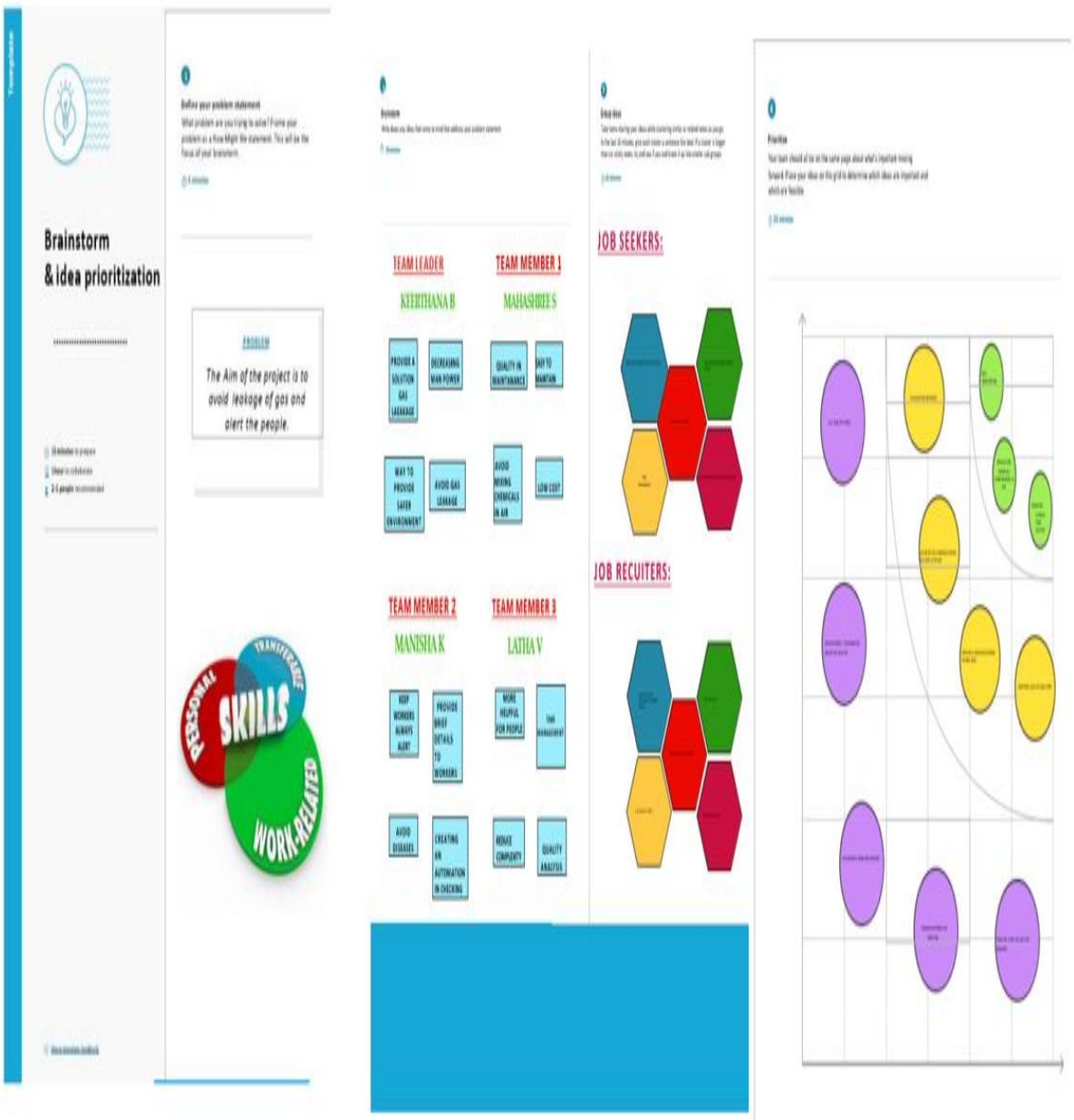
In most of the industries gas leakage will occur and cause severe damage to the people who work in the industries. They have certain flaws that cause the gas leakage. Gas leakage can only be detected if there is a human nearby, and if there is no human nearby, it cannot be detected. However, it is not always detectable by humans with poor senses of smell. As a result, this system will aid in detecting the presence of gas leakage. Furthermore, gas leaks can cause fires, which can result in serious injury or death, as well as the destruction of human property. This system was created by using IoT to provide real-time responses to the user.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



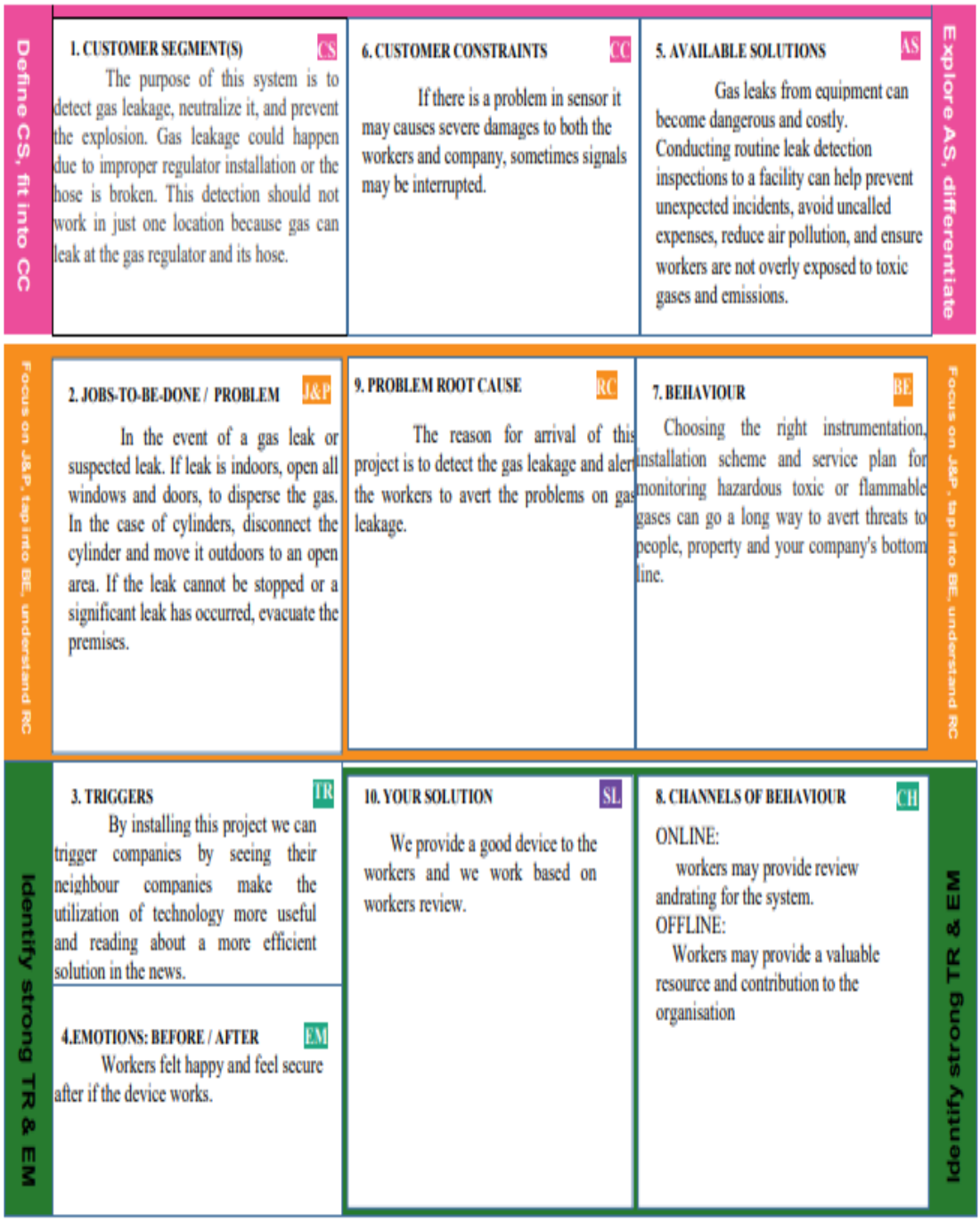
3.2 Ideation & Brainstorming



3.3 Proposed Solution

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A gas detector can sound an alarm to operates in the area where the leakage is occurring, giving them the opportunity to leave.
2.	Idea / Solution description	It not only detects the toxic gases but also identify changes in the air quality.
3.	Novelty / Uniqueness	The uniqueness of the project is, it gives alarm when any leakage occur.
4.	Social Impact / Customer Satisfaction	It really helpful to prevent the risk of high explosions.
5.	Business Model (Revenue Model)	The cost of the product is low and the overall size is small.
6.	Scalability of the Solution	It will continuously detect if there is any gas leakage in home or industries. It really helps people in a effective manner.

3.3 Problem Solution fit



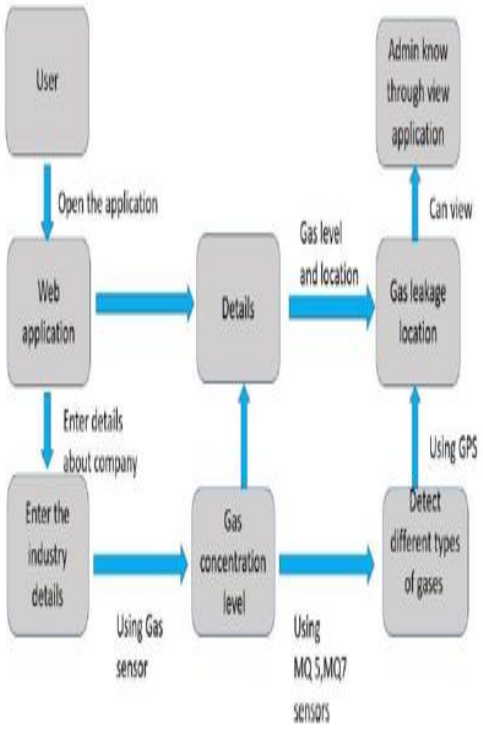
4 REQUIREMENT ANALYSIS

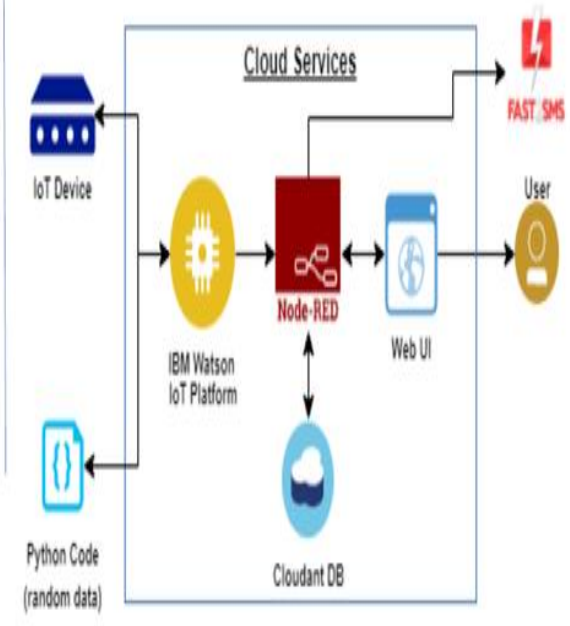
4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Access	Should be able to Access the current as well as the previous data.
FR-4	User Security	Application should be secured and also it should have two step verification.
FR-5	Performance	Application should be able to access huge amount of data and provide information in a span of time
FR-6	Display	The Application should display the information in same page and their should be a download option

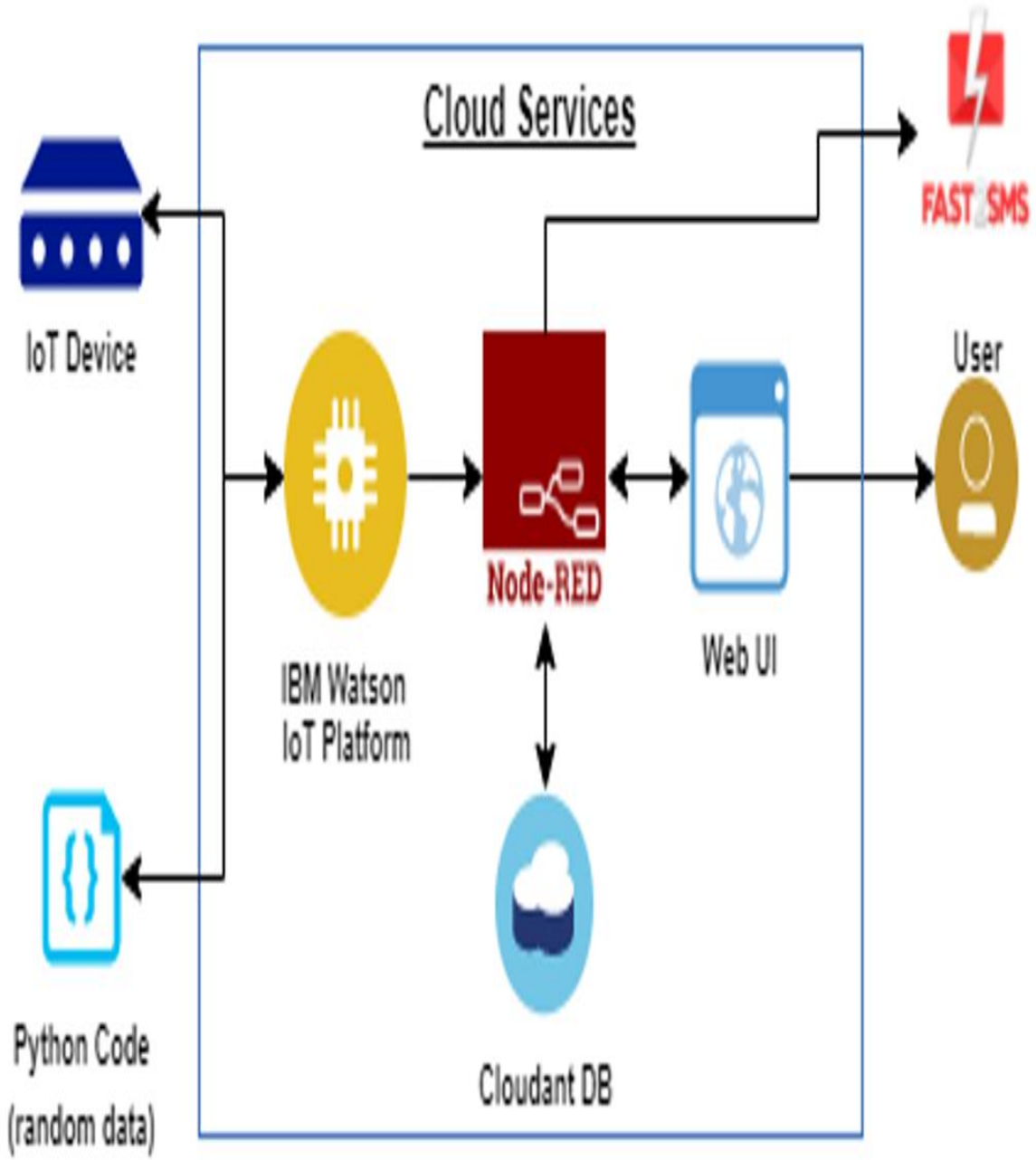
5 PROJECT DESIGN

5.1 Data Flow Diagrams





5.2 Solution & Technical Architecture



6 PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

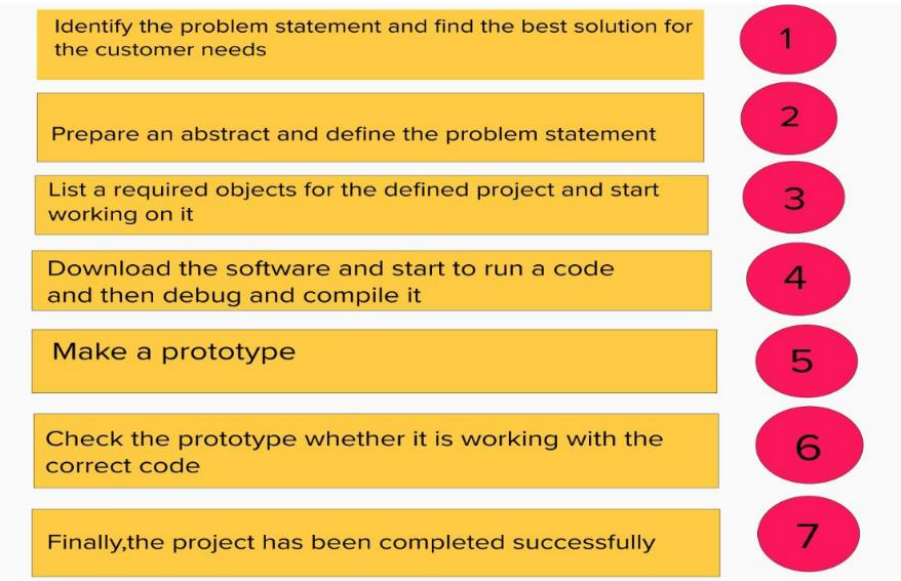
Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

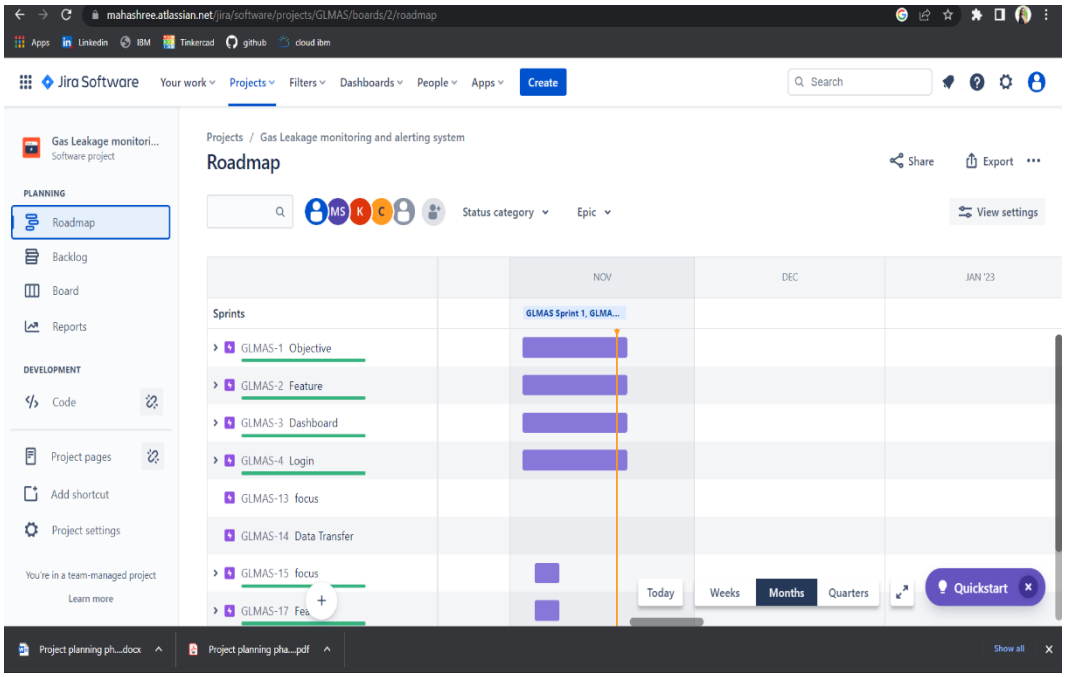
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Objective	USN-1	As a system, the gas sensor should detect the gas	8	High	Mahashree, Keerthana
Sprint-1	Features	USN-2	As a system, the gas sensor values should be displayed in a LCD screen	2	Low	Mahashree, keerthana
Sprint-1	Features	USN-3	As a system, as soon as the detected gas reaches the threshold level, the red color LED should be turned ON.	5	High	Manisha,Keerthana
Sprint-1	Features	USN-4	As a system, as soon as the detected gas reaches the threshold level, the siren should be turned ON.	5	High	Latha,Mahashree
Sprint-2	Focus	USN-5	As a system, it should the send the location where the gas is detected	8	High	Latha Manisha
Sprint-2	Focus	USN-6	As a system, it should also send the alerting SMS to the registered phone number	2	Low	Mahashree,Manisha

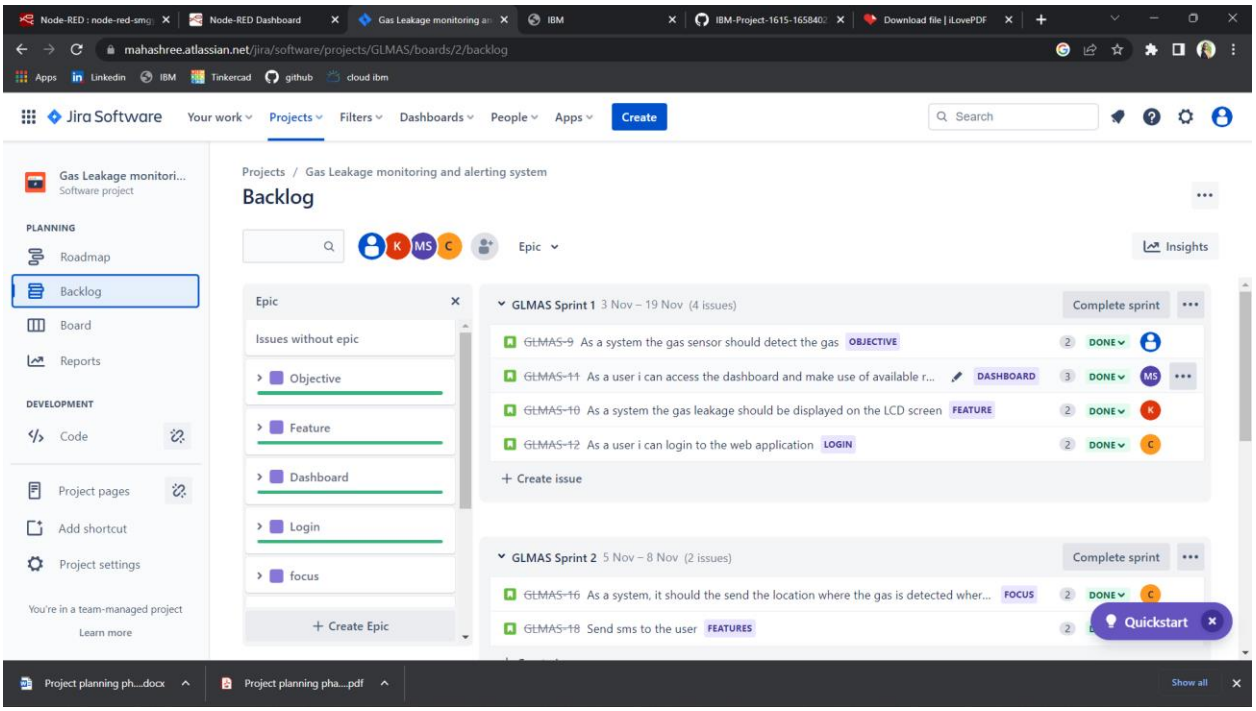
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Features	USN-7	As a system, the gas leakage pipe should be closed automatically once there it attains the threshold value	5	Medium	Latha,Mahashree
Sprint-2	Features	USN-8	As a system, it will indicate that the gas leakage pipe is closed in the LCD screen and send SMS to the registered mobile number.	5	Medium	Mahashree, keerthana
Sprint-3	Data Transfer	USN-9	As a program, it should retrieve the API key of the IBM cloud to send the details of the system.	2	Low	Manisha,Keerthana
Sprint-3	Data Transfer	USN-10	As a system, it should send the data of sensor values along with latitudes and longitudes to the IBM cloud	5	Medium	Manisha, Keerthana
Sprint-3	Data Transfer	USN-11	As a cloud system, the IBM cloud should send the data to NodeRed	2	Medium	Mahashree,keerthana
Sprint-3	Data Transfer	USN-12	As a system, it should collect the data from the NodeRed and give it to the backend of the mit app.	3	Medium	Latha,Mahashree
Sprint-3	Data Transfer	USN-13	As an application, it should display the details of the gas level and other details to the user through the frontend of the mit app.	8	High	Manisha,Keerthana
Sprint-4	Registration	USN-14	As a user, I must first register my email and mobile number in the website	2	High	Mahashree,keerthana

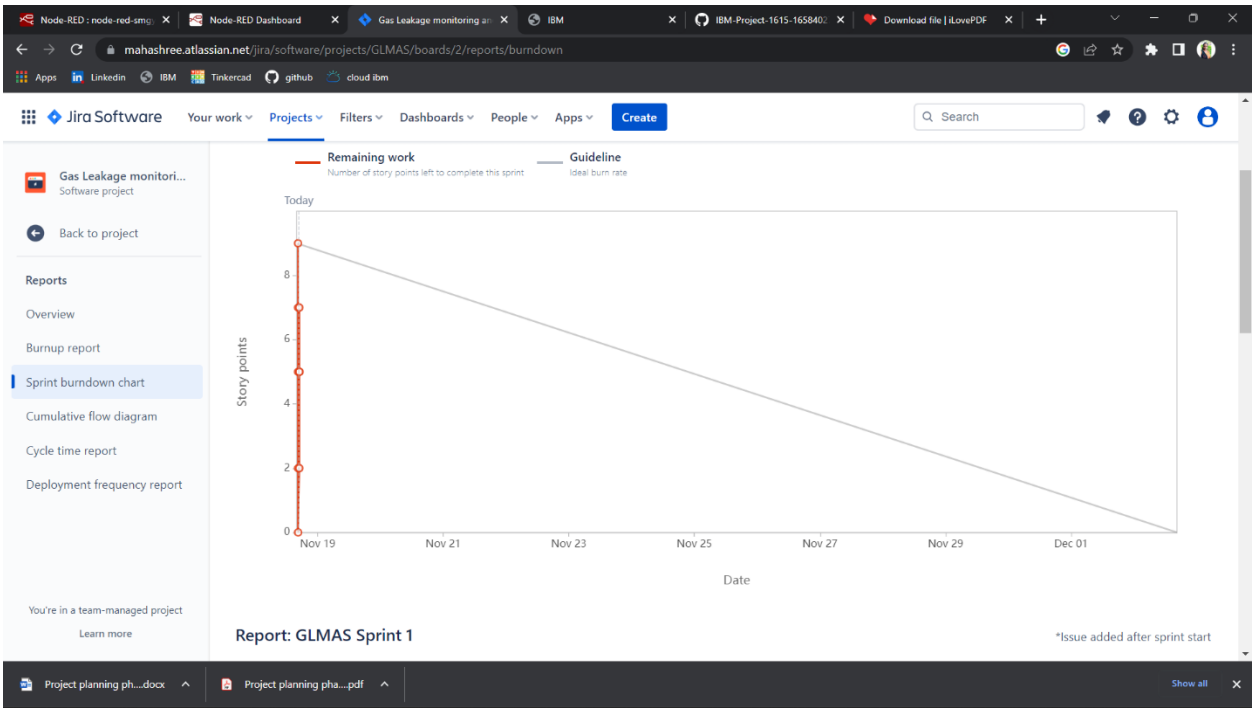
6.2 Sprint Delivery Schedule



6.3 Reports from JIRA

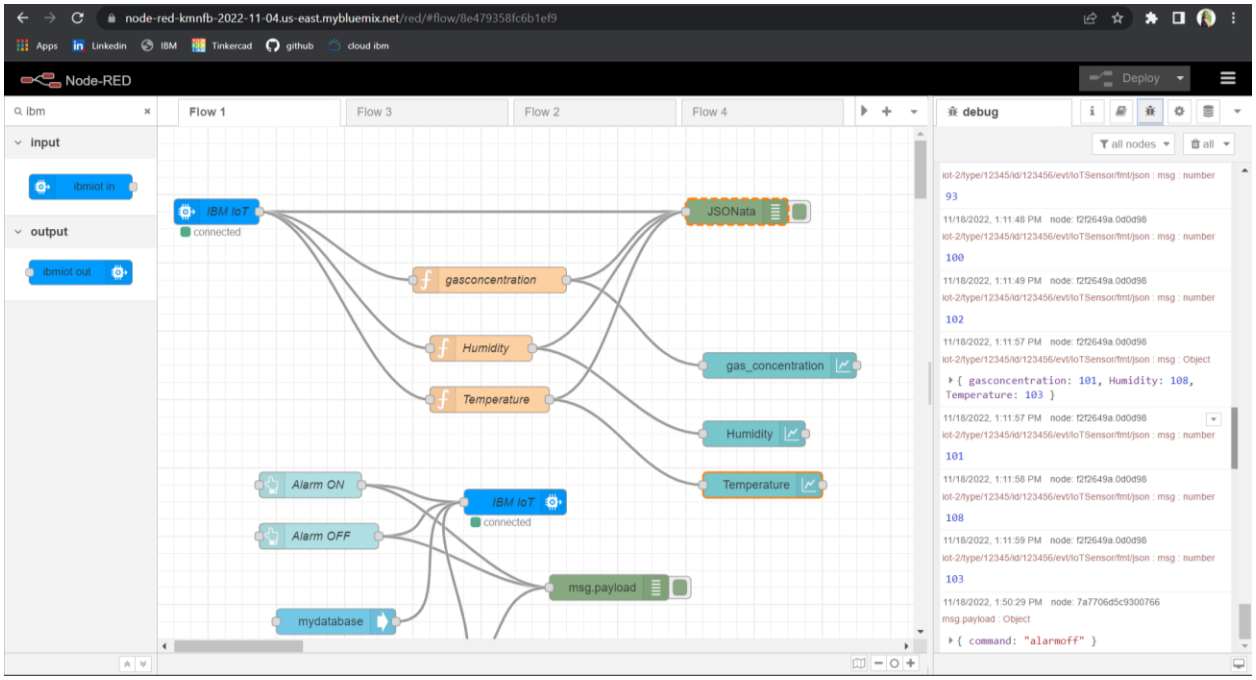



Node-RED : node-red-smg
Node-RED Dashboard
Gas Leakage monitoring an
IBM
IBM-Project-1615-165840
Download file | iLovePDF
mahashree.atlassian.net/jira/software/projects/GLMAS/boards/2/backlog
Apps
Linkedin
IBM
Tinkercad
github
cloud ibm
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Gas Leakage monitori...
Software project
PLANNING
Roadmap
Backlog
Board
Reports
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / Gas Leakage monitoring and alerting system
Backlog
Epic
Insights
Epic
Issues without epic
Objective
Feature
Dashboard
Login
focus
Create Epic
GLMAS Sprint 1 3 Nov – 19 Nov (4 issues)
Complete sprint
GLMAS-9 As a system the gas sensor should detect the gas OBJECTIVE
GLMAS-11 As a user i can access the dashboard and make use of available r... DASHBOARD
GLMAS-10 As a system the gas leakage should be displayed on the LCD screen FEATURE
GLMAS-12 As a user i can login to the web application LOGIN
DONE
Create issue
GLMAS Sprint 2 5 Nov – 8 Nov (2 issues)
Complete sprint
GLMAS-16 As a system, it should the send the location where the gas is detected wher... FOCUS
GLMAS-18 Send sms to the user FEATURES
Quickstart
Project planning ph....docx
Project planning pha....pdf
Show all


Node-RED : node-red-smg
Node-RED Dashboard
Gas Leakage monitoring an
IBM
IBM-Project-1615-165840
Download file | iLovePDF
mahashree.atlassian.net/jira/software/projects/GLMAS/boards/2/reports/burndown
Apps
Linkedin
IBM
Tinkercad
github
cloud ibm
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Gas Leakage monitori...
Software project
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Today
Story points
0
2
4
6
8
Nov 19
Nov 21
Nov 23
Nov 25
Nov 27
Nov 29
Dec 01
Date
Report: GLMAS Sprint 1
*Issue added after sprint start
Project planning ph....docx
Project planning pha....pdf
Show all

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

7.1Feature 1(Node-Red)

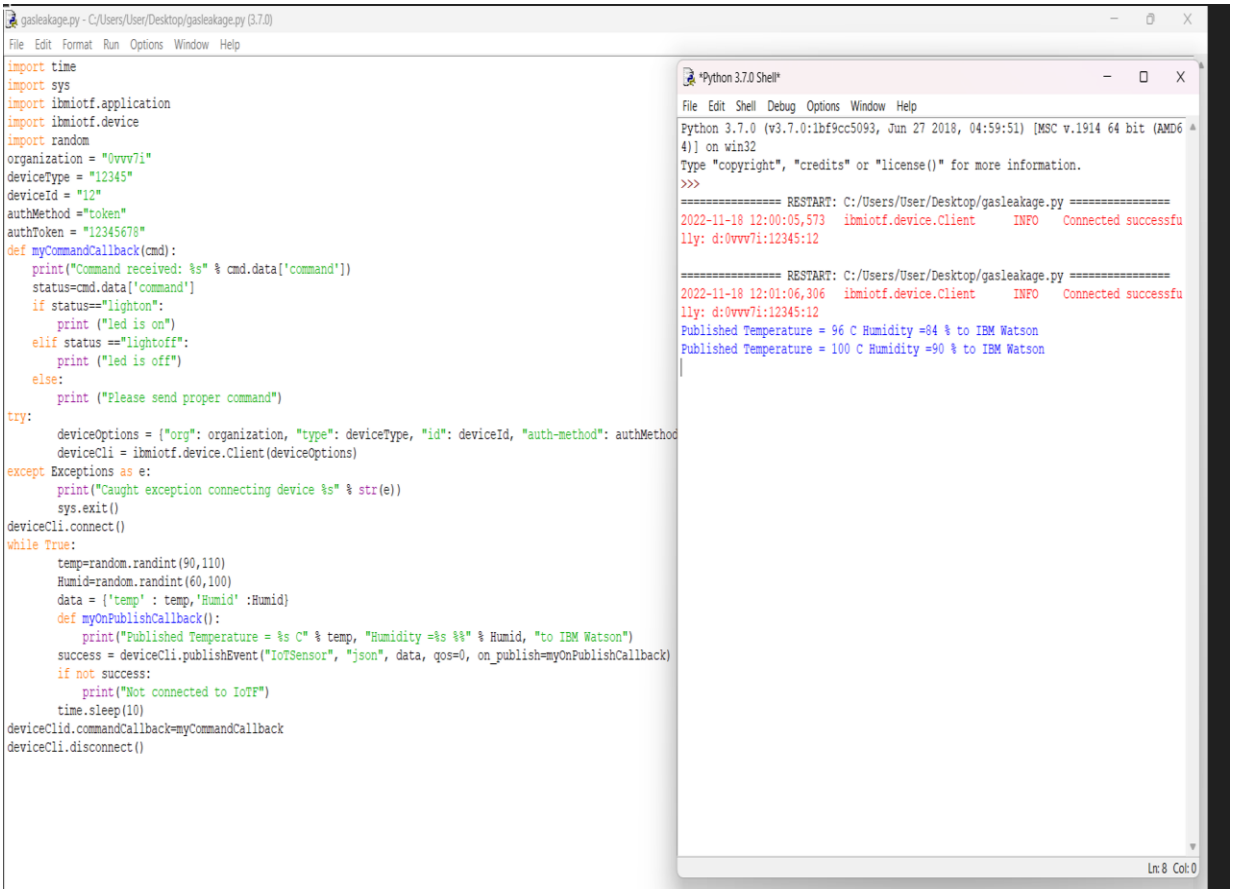


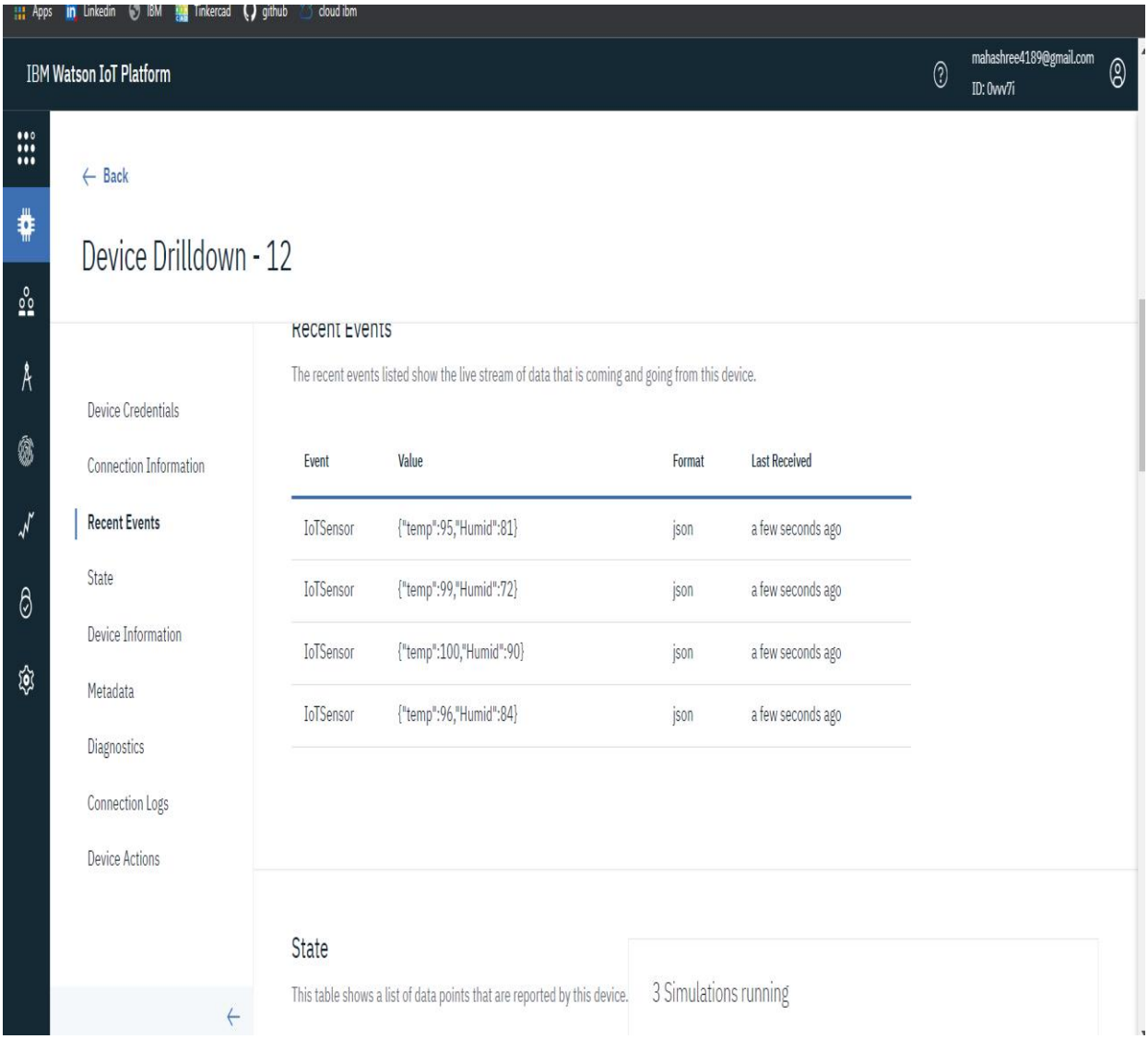
7.1 Feature 2(IBM Watson Iot platform)

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
organization = "0vvv7i"
deviceType = "12345"
deviceId = "12"
```

```
authMethod ="token"
authToken = "12345678"
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 Exceptions as e:
      print("Caught exception connecting device %s"str(e))
      sys.exit()
deviceCli.connect()
while True:
      temp=random.randint(90,110)
      Humid=random.randint(60,100)
      data = {'temp' : temp,'Humid' :Humid}
      def myOnPublishCallback():
         print("Published Temperature = %s C" % temp, "Humidity =%s %%" % Humid, "to IBM Watson")
```

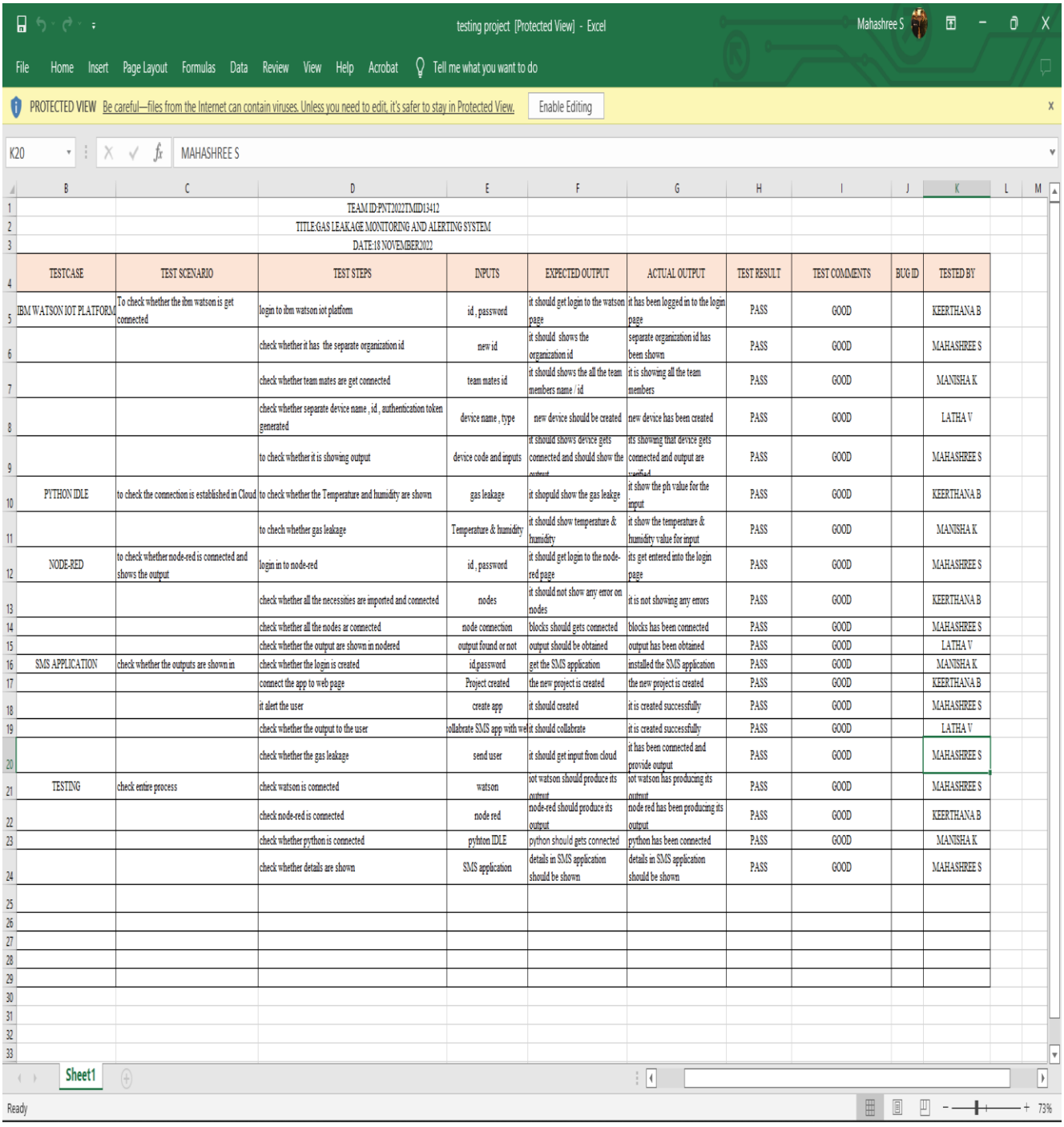
```
        success =deviceCli.publishEvent("IoTSensor", "json", data,
qos=0, on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(10)
deviceClid.commandCallback=myCommandCallback
deviceCli.disconnect()
```




Apps
LinkedIn
IBM
Tinkercad
github
cloud ibm
IBM Watson IoT Platform
mahashree4189@gmail.com
ID: 0vvv7i
Back
Device Drilldown - 12
Recent Events
The recent events listed show the live stream of data that is coming and going from this device.
Device Credentials
Connection Information
Recent Events
State
Device Information
Metadata
Diagnostics
Connection Logs
Device Actions
Event
Value
Format
Last Received
IoTSensor
{"temp":95,"Humid":81}
json
a few seconds ago
IoTSensor
{"temp":99,"Humid":72}
json
a few seconds ago
IoTSensor
{"temp":100,"Humid":90}
json
a few seconds ago
IoTSensor
{"temp":96,"Humid":84}
json
a few seconds ago
State
This table shows a list of data points that are reported by this device.
3 Simulations running

8 TESTING

8.1 Test Cases



testing project [Protected View] - Excel

Mahashree S

File Home Insert Page Layout Formulas Data Review View Help Acrobat Tell me what you want to do

PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing

K20 MAHASHREE S

TEAM ID:PNT2022TMID13412

TITLE:GAS LEAKAGE MONITORING AND ALERTING SYSTEM

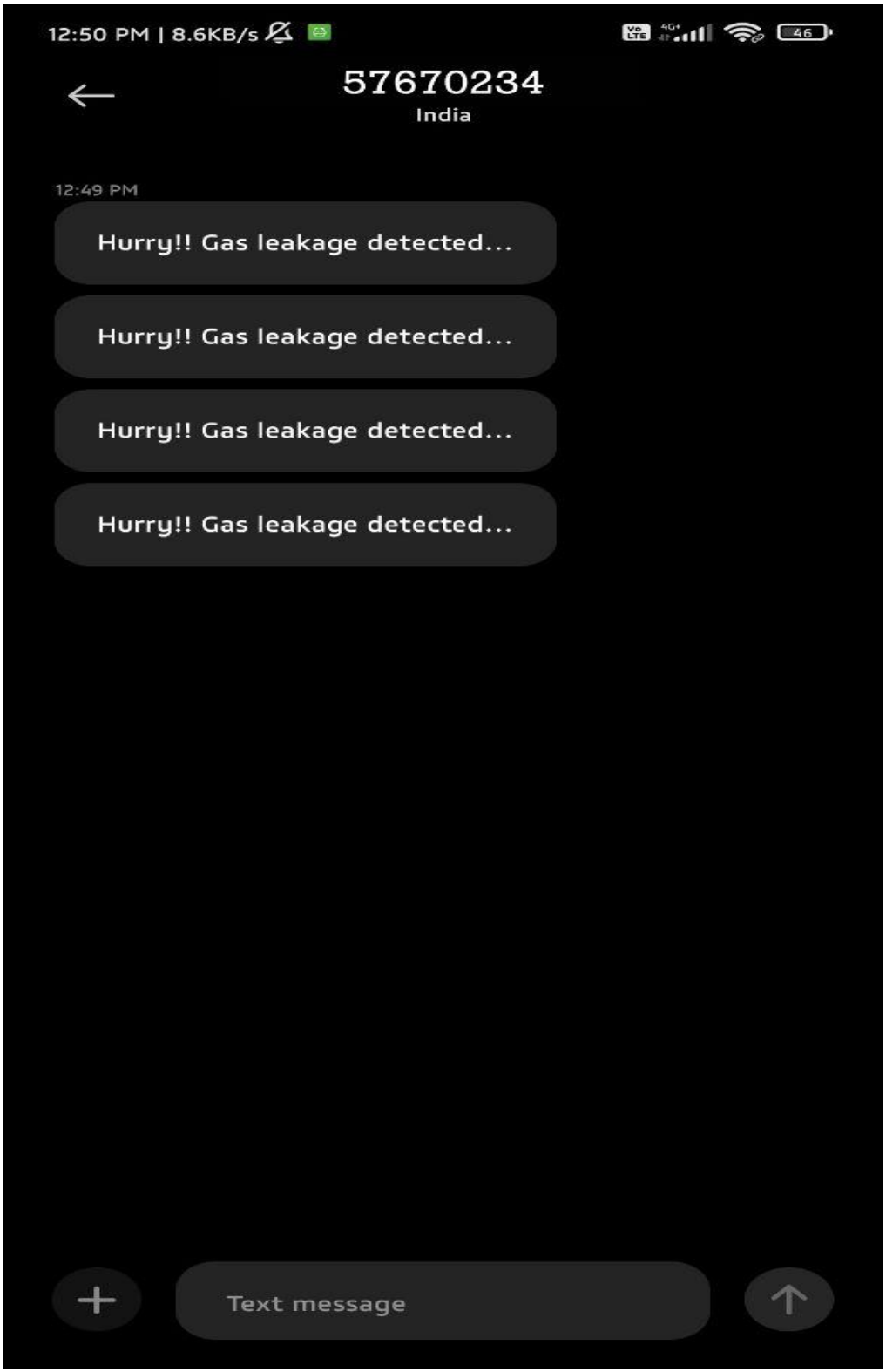
DATE:18 NOVEMBER2022

TESTCASE	TEST SCENARIO	TEST STEPS	INPUTS	EXPECTED OUTPUT	ACTUAL OUTPUT	TEST RESULT	TEST COMMENTS	BUG ID	TESTED BY
IBM WATSON IOT PLATFORM	To check whether the ibm watson is get connected	login to ibm watson iot platform	id , password	it should get login to the watson page	it has been logged in to the login page	PASS	GOOD		KEERTHANA B
		check whether it has the separate organization id	new id	it should shows the organization id	separate organization id has been shown	PASS	GOOD		MAHASHREE S
		check whether team mates are get connected	team mates id	it should shows the all the team members name / id	it is showing all the team members	PASS	GOOD		MANISHA K
		check whether separate device name , id , authentication token generated	device name , type	new device should be created	new device has been created	PASS	GOOD		LATHA V
		to check whether it is showing output	device code and inputs	it should shows device gets connected and should show the output	its showing that device gets connected and output are verified	PASS	GOOD		MAHASHREE S
PYTHON IDLE	to check the connection is established in Cloud	to check whether the Temperature and humidity are shown	gas leakage	it shopuld show the gas leakge	it show the ph value for the input	PASS	GOOD		KEERTHANA B
		to chech whether gas leakage	Temperature & humidity	it should show temperature & humidity	it show the temperature & humidity value for input	PASS	GOOD		MANISHA K
NODE-RED	to check whether node-red is connected and shows the output	login in to node-red	id , password	it should get login to the node-red page	its get entered into the login page	PASS	GOOD		MAHASHREE S
		check whether all the necessities are imported and connected	nodes	it should not show any error on nodes	it is not showing any errors	PASS	GOOD		KEERTHANA B
		check whether all the nodes ar connected	node connection	blocks should gets connected	blocks has been connected	PASS	GOOD		MAHASHREE S
		check whether the output are shown in nodered	output found or not	output should be obtained	output has been obtained	PASS	GOOD		LATHA V
SMS APPLICATION	check whether the outputs are shown in	check whether the login is created	id,password	get the SMS application	installed the SMS application	PASS	GOOD		MANISHA K
		connect the app to web page	Project created	the new project is created	the new project is created	PASS	GOOD		KEERTHANA B
		it alert the user	create app	it should created	it is created successfully	PASS	GOOD		MAHASHREE S
		check whether the output to the user	collabrate SMS app with we	it should collabrate	it is created successfully	PASS	GOOD		LATHA V
		check whether the gas leakage	send user	it should get input from cloud	it has been connected and provide output	PASS	GOOD		MAHASHREE S
TESTING	check entire process	check watson is connected	watson	iot watson should produce its output	iot watson has producing its output	PASS	GOOD		MAHASHREE S
		check node-red is connected	node red	node-red should produce its output	node red has been producing its output	PASS	GOOD		KEERTHANA B
		check whether python is connected	python IDLE	python should gets connected	python has been connected	PASS	GOOD		MANISHA K
		check whether details are shown	SMS application	details in SMS application should be shown	details in SMS application should be shown	PASS	GOOD		MAHASHREE S

Sheet1

Ready

8.2 User Acceptance Testing



9 RESULTS

9.1 PerformanceMetrics

10 ADVANTAGES & DISADVANTAGES

The benefits of this project include cheap maintenance, low running costs, and dependable technology.

The major downside is that cross interference from other gases can impair a gas sensor's function, and changing the calibration curve can result in erroneous or incorrect results. Component failure: Your gas detectors, like anything else, are subject to wear and strain.

11 CONCLUSION

Finally, we concluded that our project detects gas leaks in industries and sends alarm messages using a web application. It detects changes in temperature, pressure, and humidity in the air, and if any of these changes occur, it displays the gas level and sends an alarm message. This is beneficial to the employees and helps to prevent accidents.

12 FUTURE SCOPE

In this study, we employ IOT technologies to improve on current safety requirements. The goal in creating this prototype was to bring about a revolution in the field of safety against the leaking of dangerous and poisonous gases in the environment and thereby eliminate any big or small threat created by them. We employed IOT technology to create a Gas Leakage Detector for society, which includes Smart Alerting strategies such as sending text messages to the appropriate authorities and the capacity to do data analytics on the sensor.

APPENDIX

13.1 Source Code

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
```

```
import random
organization = "0vvv7i"
deviceType = "12345"
deviceId = "12"
authMethod ="token"
authToken = "12345678"
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 Exceptions as e:
   print("Caught exception connecting device %s" % str(e))
      sys.exit()
deviceCli.connect()
while True:
      temp=random.randint(90,110)
      Humid=random.randint(60,100)
      data = {'temp' : temp,'Humid' :Humid}
```

```
        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)
    deviceClid.commandCallback=myCommandCallback
    deviceCli.disconnect()
```

GitHub:https:github.com/IBM-EPBL/IBM-Project-1615-1658402713

Project Demo Link: https://youtu.be/dCpXCwc3s5E