

SETHU INSTITUTE OF TECHNOLOGY, KARIAPATTI

An Autonomous Institution

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

Gas Leakage Monitoring and Alerting System for Industries

INNOVATIVE PROJECT REPORT

Submitted by

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for the course of

**PROFESSIONAL READINESS FOR INNOVATION,
EMPLOYABILITY AND ENTREPRENEURSHIP
(Naalaiya Thiran Program)**

INDEX

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

7.3 Database Schema (if Applicable)

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

Source Code

GitHub & Project Demo Link

1.

INTRODUCTION

1.1 Project Overview

Leakage of any kind of gas has been a concern in recent years, whether it is in a residential setting, a business, a cafe, or a canteen. In this paper development of an IoT based gas wastage monitoring, leakage detecting and alerting system is proposed. This paper elaborates design such an intelligent system that will help save gas and smartly prevent accidents. The system needs to be integrated with the cooker. The technology includes ultrasonic sensors that determine if the cooker is being utilized for cooking purposes or not. If it is discovered that the cooker is not in use, the system uses an automatic switching off mechanism to cutoff the gas supply. The moment gas leakage will probably be recognized, users will be informed via SMS through GSM, and so that user can solve the issue as soon as possible. The system will monitor flame and fire through flame sensor. When a fire is detected, the buzzer begins to sound. Aside from that, the system also has a cloud storage capability. The usage of gas for each user each day may be tracked with the aid of this cloud storage solution. At the end of the day, this procedure will assist in detecting per- user natural gas usage. The system has been tested and it is able to monitor gas wastage, leakage and send a SMS to the user. The resulting performance indicated its effectiveness toward saving a significant portion of the wasted gas in domestic.

1.2 Purpose

The design of a sensor-based automatic gas leakage detector with an alert and control system has been proposed. This is an affordable, less power using, lightweight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Now a days the home safety detection system plays the important role for the security of people. Since all the people from the home goes to work on daily bases, it makes impossible to check on the appliances available at home specially LPG gas cylinder, wired circuits, Etc. Since last three years there is a tremendous hike in the demands of liquefied petroleum gas (LPG) and natural gas. To meet this access amount of demand for energy and replace oil or coal due to their environmental disadvantage, LPG and natural gas are preferred. These gases are mostly used on large scale in industry, heating, home appliances and motor fuel. So as to track this leakage gas, the system includes MQ6 gas sensor. This sensor senses the amount of leak gas present in the surrounding atmosphere. Through this, explosion or getting affected by the leakage of gas could be avoided.

2.2 REFERENCES

Survey 1:

Pal-Stefan Murvay, Ioan Silea (2012)

'Journal of Loss Prevention in the Process Industries'

The main purpose of this paper is to identify the state-of-the-art in leak detection and localization methods. Additionally we evaluate the capabilities of these techniques in order to identify the advantages and disadvantages of using each leak detection solution.

Survey 2:

Srinivasan, Leela, Jeyabharathi, Kirthik, Rajasree; (2014) 'Adapted approach for Species Classification'

In this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in household and other areas where household gas is handled and used. It alerts the subscriber through the alarm and the status display besides turning off the gas supply valve as a primary safety measure. This simplicity results in a high instruction turnout and spectacular real time interrupt response from a tiny and cost-efficient processor core. The microcontroller provides the data to the coil valve to shut its knob. The coil valve consists of a disc that's in touch with the spring. Once the gas leaks the disc comes in touch with the spring so it stops the flow of gas. Finally the gases area unit thrown out the disc moves so the gas flows. At that point the buzzer starts direful thereby to alert the neighbors. A Buzzer or electronic device is a signal device,

typically electronic,generally used in cars, manage appliances.such as microwave kitchen appliance or game shows.

Survey 3:

V Suma, Ramy

a R Shekar, Kumar A Akshay(2019) 'Gas Leakage Detection Based on IOT'

The aim of this paper is to present a new system automatically books a cylinder when the gas is about to empty is by sending a notification to the gas agency using wifi using Internet of Things approach.

Survey 4:

Adil Ahmad, Shaik Shaheeda

Department of Information Science and Engineering, Bengaluru Gas Leakage Detection Based System(ICEA2017).

The author has observed gas leakage and LPG levels where gas leakage occurs automatically. The authors suggests that gas leakage is performed by various gas sensors. Whose author has worked on gas leaks and mentions that we can take care if a found using a sensor and gas booking can be done automatically when a small amount of gas is taken closed.

Survey 5;

Mohd Abid PG student

Design and Embedded system, VTU PG centre kalaburagi, India IJETER volume 6,issue 4, April (2018).

Through this paper important parameters are used to find the level of gas in the container. The good purpose of this project is to get notification of gas leak to user when gas leakage is started. Arduino was originally created as a tool for fast sampling and activities for students with no knowledge for electronics. This paper uses a microcontroller, buzzer and a gas sensor to detect gas leakage system. When a gas leak is detected by a gas sensor ,the microcontroller turn on the buzzer in critical condition. The author suggest that this message or instruction may be displayed using an LCD display for LPG monitoring.

Survey 6:

Kulothungan. S, Gukan. A , Arunprabu.K.B Student, IFET College of Engineering. IJEDR 2019.

The proposed system detects LPG leaks and alerts customers. The alarm starts when the system notice and increases in LPG leakage concentration by sending an alarm and sending a message to specific mobile phone. The device assures safety and prevents explosions. A microcontroller based system based on gas sensor(MQ6) has been developed in proposed system to detect LPG leakage .The unit is also integrated with an alarm unit to detect signal

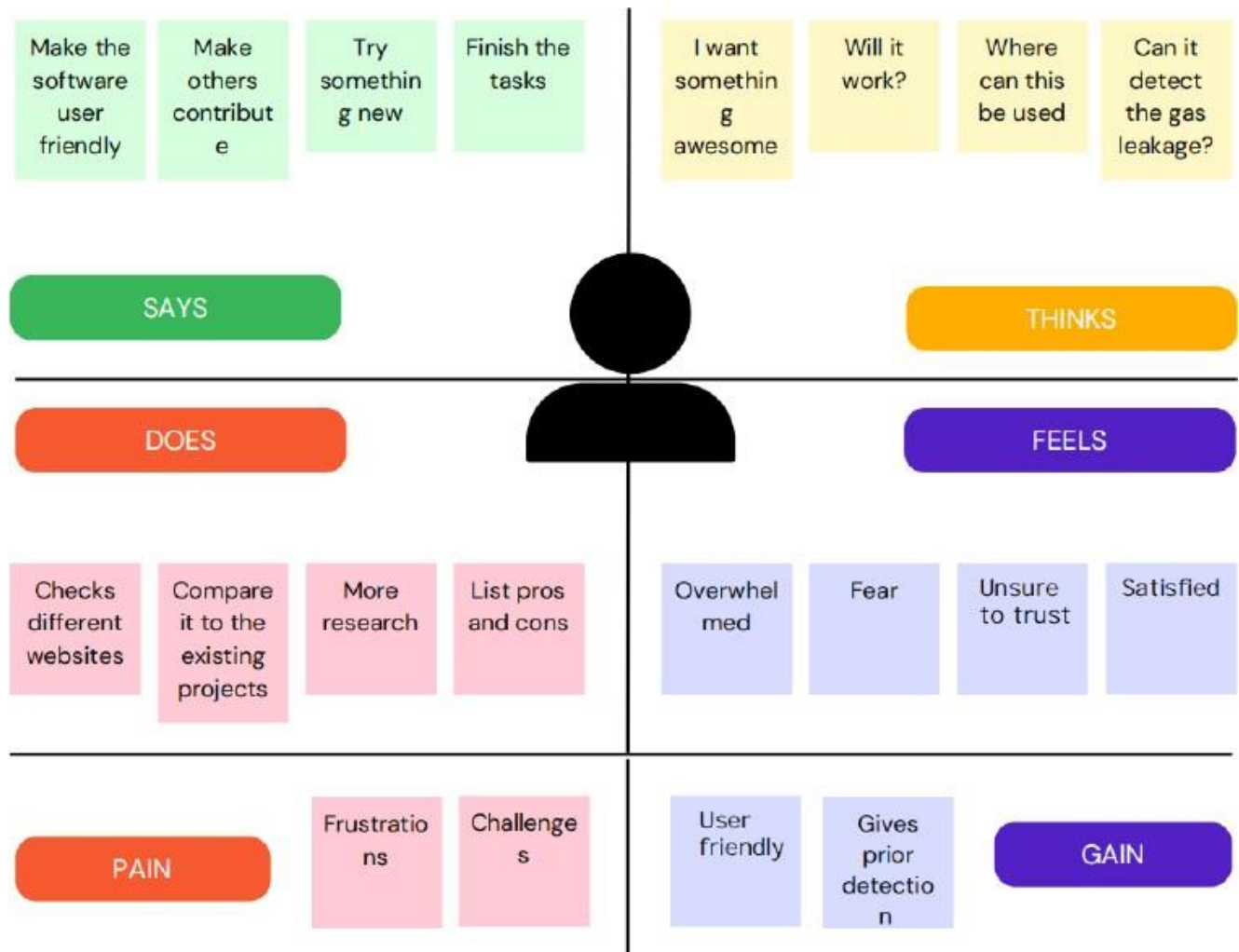
a leak.

2.3 PROBLEM STATEMENT DEFINITION

Domestically we use natural gas and it is very useful for burning purposes. If this gas is leaked in our kitchens, offices or factories and not sensed in time, it may lead to a fatal disaster, and may cause human loss. For this purpose, we came forward with an idea of making such an electronic device to sense that leakage and alarm the respective persons to solve that leakage problem and save assets and human lives. It also down our economical rate.

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a *How Might We* statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

HOW MIGHT WE DETECT AND CONTROL GAS
LEAKAGE THAT LEADS TO VARIOUS ACCIDENT
RESULTING INTO BOTH FINANCIAL LOSS AS
WELL AS HUMAN INJURIES



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

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

RAJESH

OPENING OF
WINDOWS
WHENEVER
WE FEEL GAS
LEAKAGE

CLOSING THE
NOB OF
CYLINDER TO
PREVENT GAS
LEAKAGE

REGULAR
MAINTAINACE
OF CYLINDER
IN HOTELS

NOT ALLOWING
KINDS OR
OTHERS TO
SWITCH ON/OFF
ANY ELECTRIC
DEVICES

PROTECTING
SYSTEM
FROM FIRE

SETTING OF
FIRE
ALARMS IN
HOTELS

MUKESH

INCREASING
SECURITY IN
GAS
INDUSTRIES

USAGE IF FIRE
EXTINGUISHERS

PROPER
MAINTAINACE
OF NOB

ALARAM TO
INDICATE GAS
LEAKAGE IN
GAS
INDUSTRIES

PROPER
MAINTAINACE
TO AVIOD
SHORTT
CIRCUIT

OPENING
OF DOORS

NANDHA

CAREFUL
HANDLING
WHILE
DELERING THE
CYLINDERS

CHECKING
REGULATORS
PROPERLY

ALERTING
DOCTOR IN
CASE OF
EXPLOTION

EVACUATION
EVERYONE
IMMEDIATELY IF GAS
LEAKAGE IS
DETECTED IN HOME/
INDUSTRIES

REGULARY
CHECKING
OF GAS
CYLINDER

AVOIDING
PHONE CALLS
WHEN GAS
LEAKAGE IS
SENSED

KEEPING
CYLINDER
AWAY FROM
SUNLIGHT

CALL FIRE
SERVICE AWAY
FROM HOME
WHEN
LEAKAGE IS
SENSED

AVIOD
SWITCHING ON
EXHAUSTING
FANS WHEN
GETS LEAKAGE
IS SENSED

HANDLE
CAREFULLY
WHILE
CHANGING THE
CYLINDER IN
HOME

AVIOD PUTTING
GAS CYLINDERS
TOGETHER/CLOSER

TEACHING KIDS
ABOUT GAS
LEAKSE SAFETY
MEASUREMENTS

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes

REQUIREMENT

SENSORS

ALARMS

COMMUNICATION
DEVICE

PROPER
MAINTAINANCE

GAIN

SENDS THE
DATA TO
USER

VARIOUS
THEMES IN
THE APP

ENVIRONMENTALLY
FRIENDLY

PROTECT
THE
WEALTH OF
INDUSTRY

ALERTING

ALERTING
THROUGH CALL

ALERTING
THROUGH SMS

ALERTING BY
SOUND

IF ANY GAS LEAK
SENSOR DETECT
AND GIVE
BUZZER SOUND

PRECAUTION

PROPER
MAINTAINANCE

SAFETY
MEASUREMENT
SHOULD BE
TAKEN

FREQUENT
CHECKING

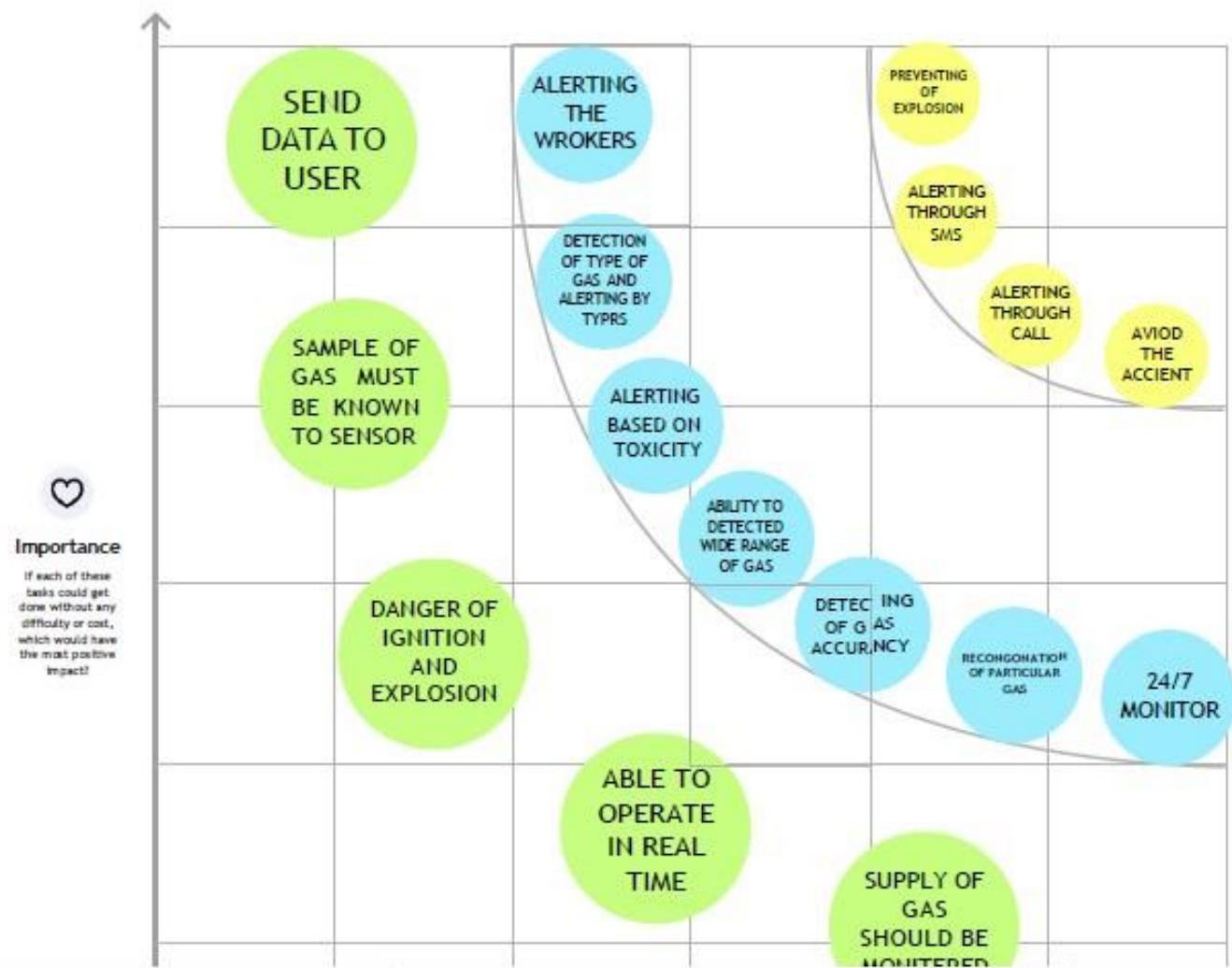
PROPER
CONTROL

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Workers who are engaged with a busy industries packed with gas either harmful or harmless needs a way to monitor their gas pipelines continuously and detect early if there is any leakage of gas in their surroundings so that they can work efficiently on major crises rather than worrying about monitoring or leakage of gas, this will indeed reduce the manpower of that industry and create a peaceful environment.
2.	Idea / Solution description	The system can be taken as a small attempt in connecting the existing primary gas detection methods to a mobile platform integrated with IoT platforms. The gases are sensed in an area of 1m radius of the rover and the sensor output datas are continuously transferred to the local server. The accuracy of MQ sensors are not upto the mark thus stray gases are also detected which creates an amount of error in the outputs of the sensors, especially in case of methane. Thus the system at this stage can only be used as a primary indicator of leakage inside a plant.
3.	Novelty / Uniqueness	Even though there are many existing solutions for this problem they failed to satisfy the needs of customer. Some of the solutions are only detecting some particular gases where some others failed to alert the main department and other solutions are with some delays. Our solution not only notify the industry person but also notify the fire fighters so that can take control over the situation and our solution will alert the workers even there is a small leak of gases.
4.	Social Impact / Customer Satisfaction	Our solution will be very helpful for the workers and the society which is associated or located nearby the industries. Our solution will prevent great disasters like Bhopal Gas Tragedy so that so many lives can be saved. Through this project the workers mental pressure will be reduced so that they can concentrate on other works or by relaxing them.

5.	Business Model (RevenueModel)	The main target of our solution is Industries so we have planned to visit industries and explain them about the benefits of our products. So that they can aware of the importance of this solution and use it.
6.	Scalability of the Solution	Our solution can be integrated for further future use because the solution we have provided will be lay on the basic or initial stage of any upgraded version.

3.4 Problem Solution Fit

PROJECT TITLE: Gas Leakage Monitoring and Alerting System

TEAM ID : PNT2022TMID17318

Define CS, fit into	1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none"> ✓ Oil, Gas, Polymer Industries ✓ Hospitals ✓ Mining ✓ Chemical Industries 	6. CUSTOMER CONSTRAINTS C What constraints prevent your customers from taking action or limit their choices of solutions? (i.e. spending power, budget, no cash, network connection, available devices) <ul style="list-style-type: none"> ✓ Technical constraints ✓ Budget constraints 	5. AVAILABLE A Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? (i.e. pen and paper is an alternative to digital monitoring) <p>Existing systems provides constant monitoring and detection of gas leakage along with storage of data in database for predictions and analysis.</p> <p>The drawback of existing system's includes chance of malfunctioning of devices (i.e) when dust, steam, fog blocks the system, it will not be able to take measurements</p>
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Which jobs-to-be-done (or problems) do you understand? <p>Gas leakage is an important aspect to be noted as it cause major damage when ignored. It is important to raise an intimation when the gas level surpasses certain threshold value. Survey's state that in the Oil & gas industries, gas leakage problems occur frequently and lack of proper intimation at those situation leads to hazards. IOT can be utilized for efficient and easy monitoring of gas leakages on a continuous basis and from any distance.</p>	9. PROBLEM ROOT CAUSE R What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. <p>Improper maintenance of the system and carelessness leads to gas leakage hazards. The following are few causes that paves way to gas leakage</p> <ul style="list-style-type: none"> ✓ Unreliable metal-metal seals ✓ Improperly installed tube fittings ✓ Poor tubing selection preparation 	7. BEHAVIOUR B What does your customer do to address the problem and get the job done? (i.e. directly related; find the right solar panel installer; calculate usage and benefits; indirectly associated; customers spend free time on volunteering work (i.e. Greenpeace)) <ul style="list-style-type: none"> ✓ Calculate usage and benefits of the system ✓ Customer volunteer work ✓ Take initiative steps towards problem if any in case.

J&P, tap into BE, understand

Focus on J&P, tap into BE, understand

Focus		Brand
	3. TRIGGERS TR What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.	10. YOUR SOLUTION SL What kind of solution suits Customer scenario the best? Adjust your solution to fit Customer behaviour, use Triggers, Channels & Emotions for marketing and communication.
		8.1 ONLINE CHANNELS CH What kind of actions do customers take online? Extract online channels from box #7 Behaviour
Define CS, fit into CL	✓ Need for safety of lives & environment ✓ Reviews from customers 4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure → confident, in control - use it in your communication strategy & design.	✓ Stable internet connectivity required ✓ Check out for rescue measures ✓ Call emergency helplines
	Anxiety, phobic → Decisive mindset, calm, confident <small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small>	8.2 OFFLINE CHANNELS CH What kind of actions do customers take offline? Extract offline channels from box #7 Behaviour and use them for customer development.
		✓ Open all windows doors during gas leakage ✓ Ensure that main electrical supply is turned off ✓ Keep in reach of first aid kit & extinguishers
		Explore A.S, differentiate

4.REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through Mobile
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Detection	The said system can be deployed in homes, hotels, factory units, LPG cylinder storage areas, and so on. The main advantage of this Arduino based application is that it can determine the leakage and send the data over to a site.
FR-4	Monitoring	The leakage can be monitored and can be optimized for detecting toxic gasses.
FR-5	Alerting	Along with monitoring the leakage it can alert the registered user and people in the vicinity are alerted by sounding the buzzer this can help in preventing any disaster.
FR-6	Communication	The registered user is able to get alert from the system through a SMS and can also be able to get notification in app.

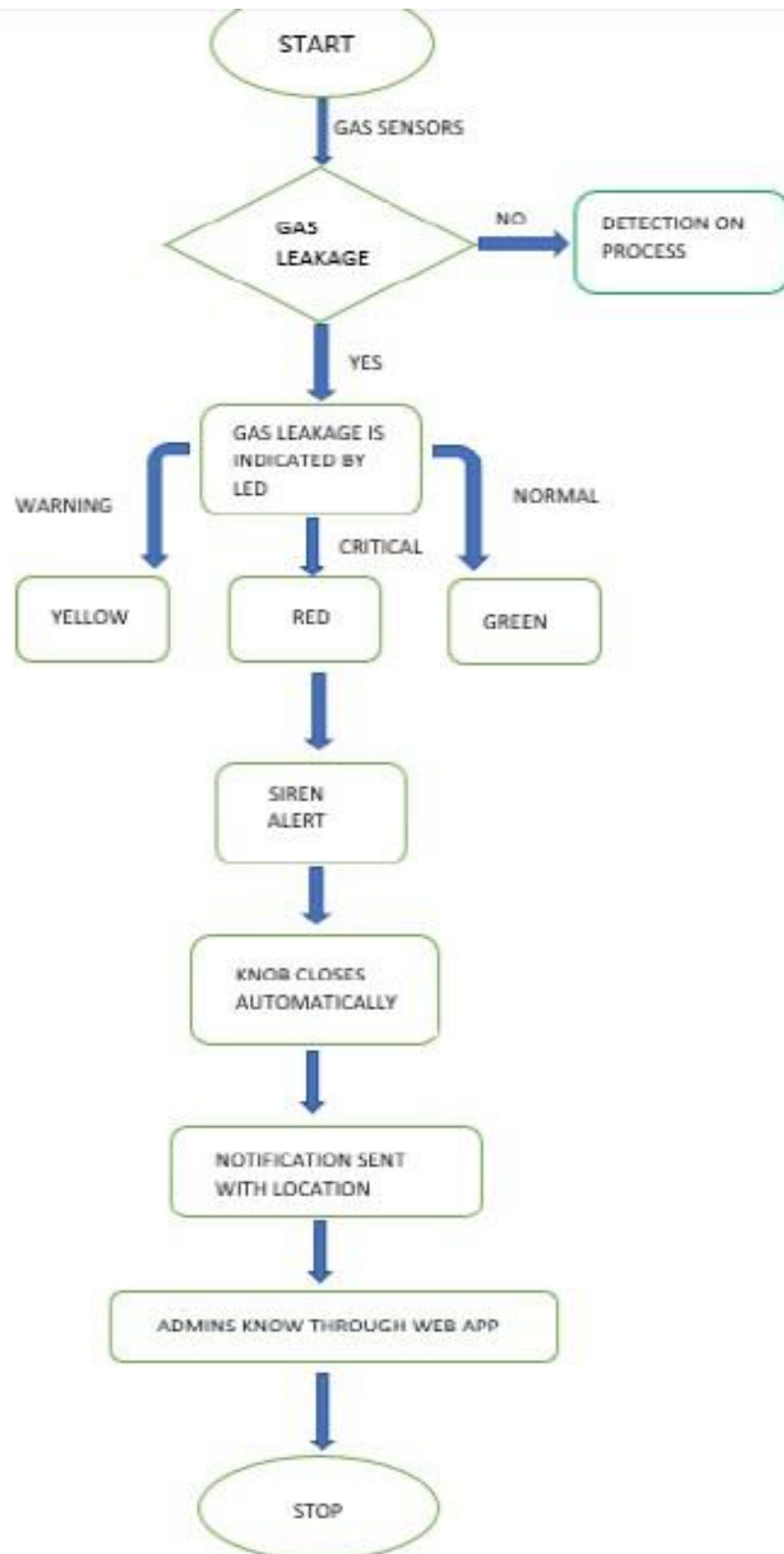
4.2 Non functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	This tool verifies that usability is a special and important perspective to analyse user requirements, which can further improve the tool quality. In the model process with user experience as the core, the analysis of users' usability can indeed help designers better understand users' potential needs, behaviour and experience.
NFR-2	Security	By identifying the danger of hazardous gas leakage with prior notification people can evacuate in time.

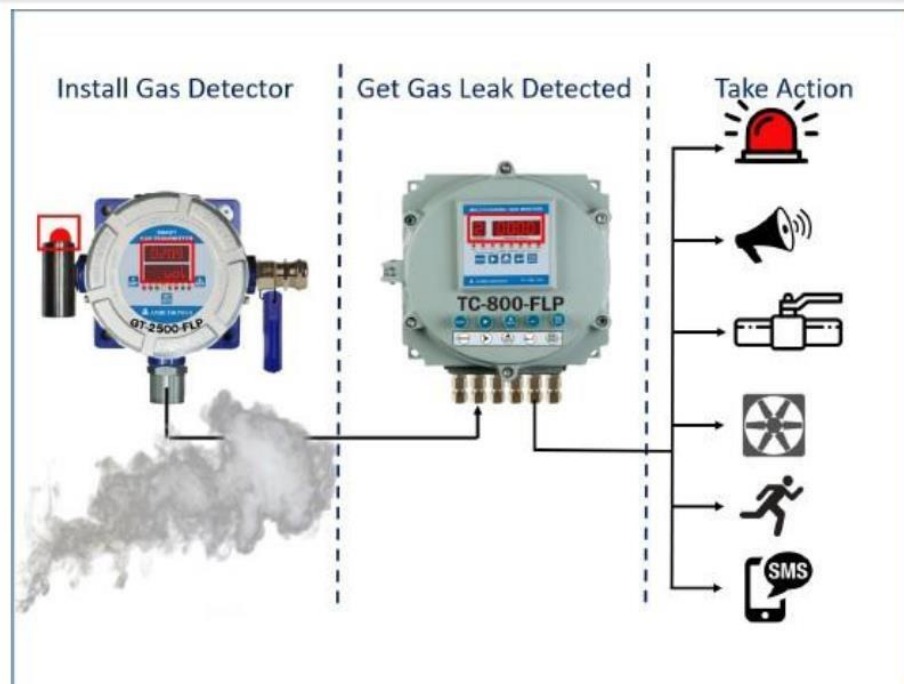
NFR-3	Reliability	By the use of various sensors we can detect various gas leakage and can identify the location of the leakage
NFR-4	Performance	In this technique the gas sensor sends the signal to the Arduino UNO after detecting the gas leakage . Arduino to other externally connected devices such as buzzer and GSM send vigorous signals. SMS is sent by GSM module to the provided mobile number as a result. IN practice, results are noticed by the people surrounding by the area are alerted by buzzer sound indicate the danger to the people by making beep sound.
NFR-5	Availability	By developing & deploying resilient tool we alert the user by sounding the alarm and sending a SMS to a registered user.
NFR-6	Scalability	By using this system that detects the gas leakage applicable usefully in the industrial and domestic purpose. In danger situations we are able save lives by using this system.

5.PROJECT DESIGN

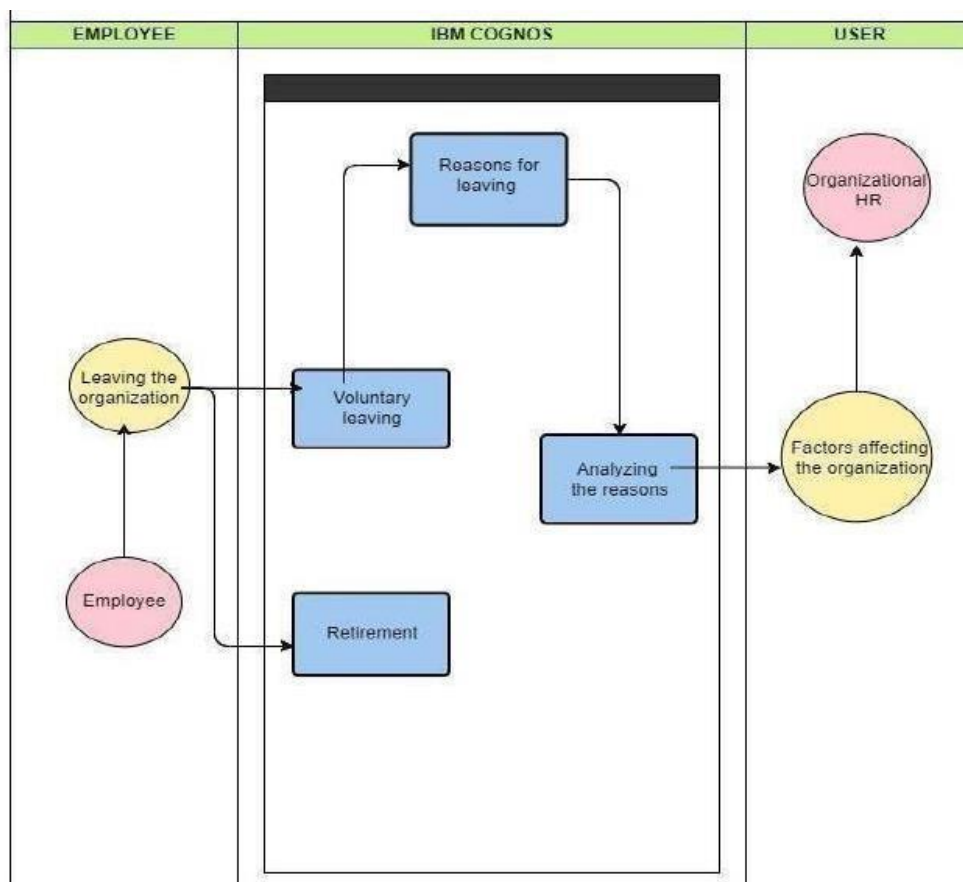
5.1 Data Flow Diagrams



5.2 Solution Architecture



Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by google.	I can access confirmation email.	High	Sprint-1
		USN-2	As a user, I can register for the application by firebox.	I can access confirmation Login.	low	Sprint-2
	Login	USN-3	As a user, I can register for the application through Gmail		Medium	Sprint-1
Administrator	Registration	USN-1	As a user, I can register for the application through Mobile app.	I can access confirmation My account	High	Sprint-1
		USN-2	As a user, I can register for the application through Mobile app.	I can access confirmation email	low	Sprint-2

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	Objective	USN-1	As a system, the gas sensor should detect the gas	8	High	Rajesh,Ibrahim
Sprint-1	Features	USN-2	As a system, the gas sensor values should be displayed in a LCD screen	2	Low	Nandha
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	Mukesh
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	Ibrahim
Sprint-2	Focus	USN-5	As a system, it should send the location where the gas is detected	8	High	Mukesh,Rajesh
Sprint-2	Focus	USN-6	As a system, it should also send the alerting SMS to the registered phone number	2	Low	Ibrahim

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	Rajesh
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	Nandha
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	Rajesh
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	Mukesh
Sprint-3	Data Transfer	USN-11	As a cloud system, the IBM cloud should send the data to NodeRed	2	Medium	Nandha
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	Rajesh
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	Mukesh,Nandha
Sprint-4	Registration	USN-14	As a user, I must first register my email and mobile number in the website	2	High	Nandha

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Registration	USN-15	As a user, I must receive confirmation mail and SMS on registration	2	Medium	Muukesh
Sprint-4	Login	USN-16	As a user, I can login into the web application through email and password.	3	High	Rajesh
Sprint-4	Dashboard	USN-17	As a user, I can access the dashboard and make use of available resources.	2	Medium	Ibrahim
Sprint-4	Focus	USN-18	As a user, I must receive an SMS once the leakage is detected.	5	High	Ibrahim
Sprint-4	Allocation	USN-19	As an admin, I must receive information about the leakage along with location and share exact location and route to the person.	3	High	Rajesh
Sprint-4	Allocation	USN-20	As an admin, I must allot particular person to look after the leakage in a particular location.	3	High	Rajesh

6.2 Sprint Delivery Schedule

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA

	OCT	NOV	NOV	NOV
	24 25 26 27 28 29 30	31 1 2 3 4 5 6	7 8 9 10 11 12 13	14 15 16 17 18 19
Sprints	GLMAS Sprint 1	GLMAS Sprint 2	GLMAS Sprint 3	GLMAS Sprint 4
> GLMAS-21 Objective				
> GLMAS-22 Features				
> GLMAS-23 Focus				
> GLMAS-24 Data Transfer				
> GLMAS-25 Registration				
> GLMAS-26 Login				
> GLMAS-27 Dashboard				
> GLMAS-28 Allocation				

7.CODING AND SOLUTIONING

```
#include
<LiquidCrystal.h>

LiquidCrystal lcd(5,6,8,9,10,11);

int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;

void setup()
{
  pinMode(redled, OUTPUT);
  pinMode(greenled,OUTPUT);
  pinMode(buzzer,OUTPUT);
  pinMode(sensor,INPUT);
  Serial.begin(9600);
  lcd.begin(16,2);
}

void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
  if(analogValue>sensorThresh)
  {
    digitalWrite(redled,HIGH);
    digitalWrite(greenled,LOW);
    tone(buzzer,1000,10000);
    lcd.clear();
    lcd.setCursor(0,1);
    lcd.print("ALERT");
    delay(1000);
    lcd.clear();
    lcd.setCursor(0,1);
    lcd.print("EVACUATE");
    delay(1000);
  }
  else
  {
```

```

        digitalWrite(greenled,HIGH);
        digitalWrite(redled,LOW);
        noTone(buzzer);
        lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("SAFE");
        delay(1000);
        lcd.clear();
        lcd.setCursor(0,1);
        lcd.print("ALL CLEAR");
        delay(1000);
    }
}

```

FEATURE:

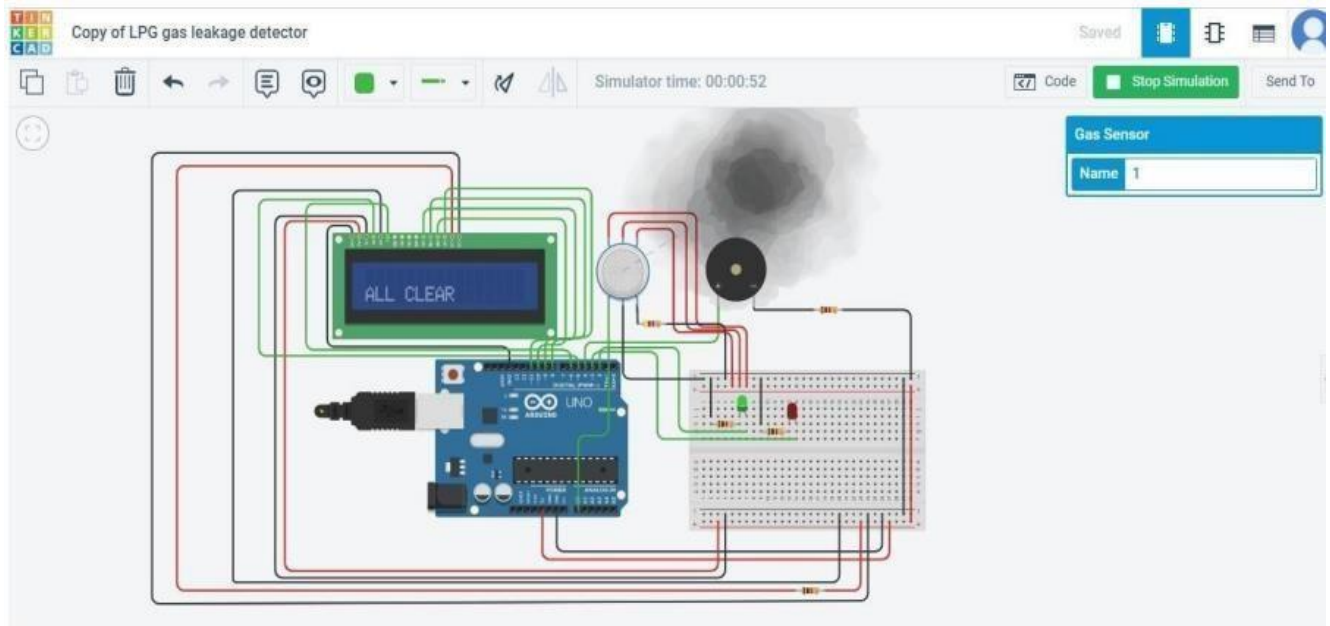
The system might be viewed as a modest attempt to link up the principal gas detection techniques now in use with a mobile platform coupled with IoT platforms. One metre around the rover, the gases are detected, and the sensor output data is continually sent to the nearby server. Stray gases are also detected because of the sensors' subpar precision, which introduces some inaccuracy into their results, particularly in the case of methane. Additionally, the storage and availability of hazardous gases like hydrogen sulphide makes it difficult to test the integrated gear. The complexity of system maintenance and material selection for the system in the event of corrosive gases is reduced because the system operates outside the pipeline. The system can only be used as a primary indicator of leakage inside a plant at this point.

8. TESTING

TEST CASES:

sno	parameter	Values	Screenshot
1	Model summary	-	
2	accuracy	Training accuracy- 95% Validation accuracy- 72%	
3	Confidence score	Class detected- 80% Confidence score-80%	

TINKERCAD:



PYTHON CODE EXECUTION:

```
code.py - C:\Users\bala\AppData\Local\Programs\Python\Python36-32\code.py
File Edit Format Run Options Window Help

import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

#Provide your IBM Watson Device Credentials
organization = "s9xrcm"
deviceType = "ESP32"
deviceId = "1234"
authMethod = "token"
authToken = "12345678"

# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="sprinkleron":
        print ("Sprinkler is on")
    else:
        print ("Sprinkler 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
deviceCli.connect()

While True:
    #Get Sensor Data from DHT11
    temperature, humidity = dht11.read()
    #Send data to cloud
    deviceCli.sendDatapoint("hello", "world")
    time.sleep(10)
```

```
*Python 3.6.0 Shell*
File Edit Shell Debug Options Window Help

Python 3.6.0 (v3.6.0:41df79263a11, Dec 23 2016, 07:18:10) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
-- RESTART: C:\Users\bala\AppData\Local\Programs\Python\Python36-32\code.py --
2022-11-16 02:20:17,405 ibmiotf.device.Client INFO Connected successfully: d:\s9xrcm\ESP32\1234
>>>
Published Temperature = 88 C Humidity = 59 % gasconcentration = 78 % to IBM Watson
Published Temperature = 28 C Humidity = 99 % gasconcentration = 57 % to IBM Watson
Published Temperature = 32 C Humidity = 60 % gasconcentration = 8 % to IBM Watson
Published Temperature = 41 C Humidity = 54 % gasconcentration = 67 % to IBM Watson
Published Temperature = 81 C Humidity = 64 % gasconcentration = 17 % to IBM Watson
Published Temperature = 51 C Humidity = 93 % gasconcentration = 38 % to IBM Watson
Published Temperature = 5 C Humidity = 1 % gasconcentration = 79 % to IBM Watson
Published Temperature = 44 C Humidity = 88 % gasconcentration = 69 % to IBM Watson
Published Temperature = 76 C Humidity = 54 % gasconcentration = 27 % to IBM Watson
Published Temperature = 37 C Humidity = 78 % gasconcentration = 10 % to IBM Watson
```

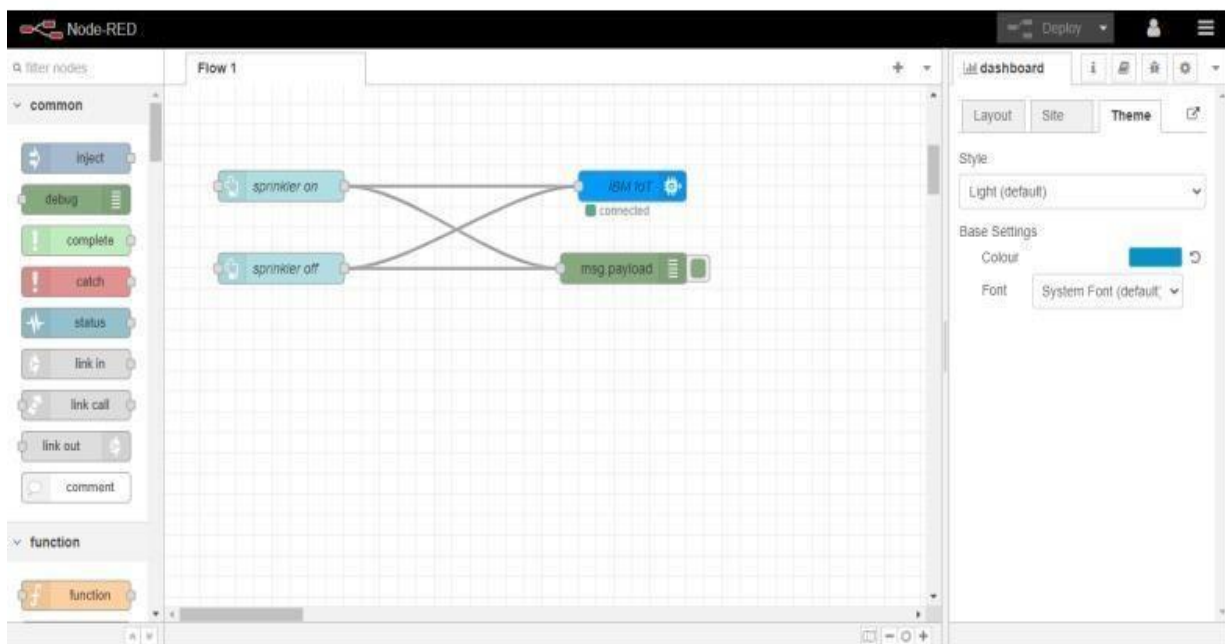
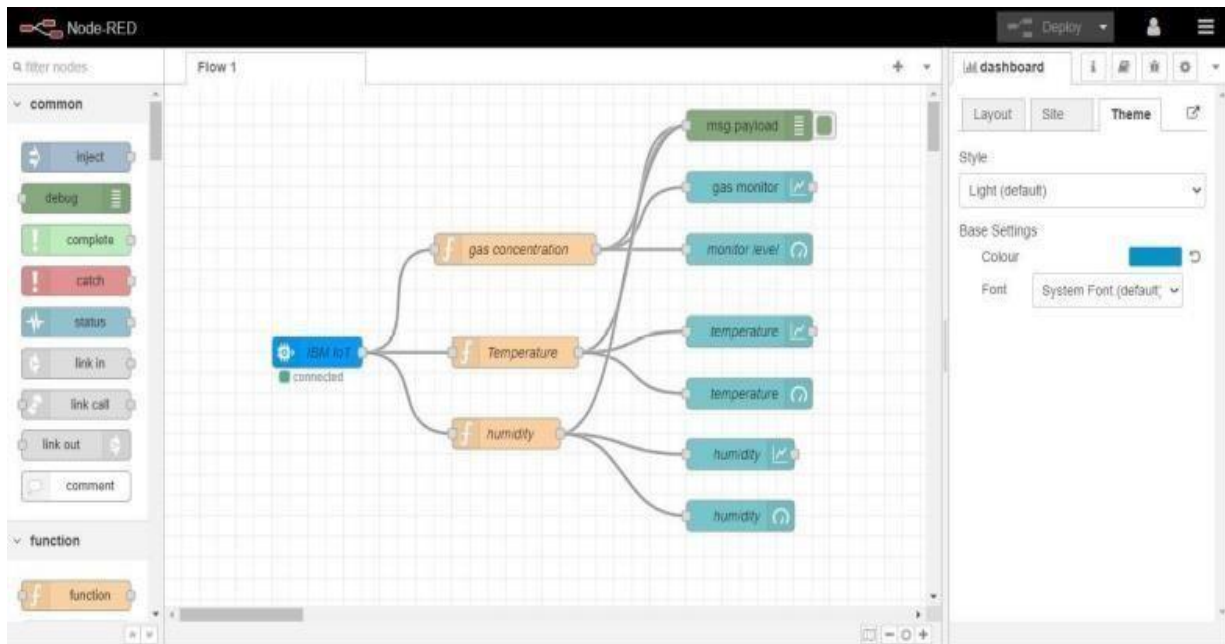
RECENT EVENTS IN IBM WATSON IOT PLATFORM:

The screenshot displays the 'Recent Events' tab for a device in the IBM Watson IoT Platform. The interface includes a top navigation bar with 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains various icons for navigation. The main content area shows a table of recent events, each representing a live stream of data from the device. The table has four columns: 'Event', 'Value', 'Format', and 'Last Received'. Below the table, there is a status bar indicating '1234' and 'Disconnected', along with a 'python' label and a 'Device' dropdown menu. A notification at the bottom right states '2 Simulations running'.

Event	Value	Format	Last Received
IoT Sensor	{"temp":17,"Humid":97,"gasconcentration":12}	json	a few seconds ago
IoT Sensor	{"temp":61,"Humid":49,"gasconcentration":48}	json	a few seconds ago
IoT Sensor	{"temp":91,"Humid":49,"gasconcentration":77}	json	a few seconds ago
IoT Sensor	{"temp":51,"Humid":79,"gasconcentration":43}	json	a few seconds ago
IoT Sensor	{"temp":52,"Humid":52,"gasconcentration":57}	json	a few seconds ago

The screenshot displays a line chart titled 'gas leakage' in the IBM Watson IoT Platform. The chart shows three data series: 'temp' (blue), 'Humid' (orange), and 'gasconcentration' (green). The y-axis ranges from 0 to 100, and the x-axis shows a time range from 01:54 to 01:54:30. A legend at the bottom identifies the series. The chart is set to a '1 minute' interval. A notification at the bottom right states '2 Simulations running'.

NODE RED FLOW:



DASHBOARD CREATED USING NODE:



11.CONCLUSION

Gas escape could result in severe accidents which ends in material losses and human injuries. Gas escape happens chiefly because of poor maintenance of apparatus and inadequate awareness of the individuals. Thus LPG escape detection are useful to stop accidents and to avoid wasting human lives. This paper conferred LPG escape detection and alert system. This technique triggers buzzer and displays the severity of the escape to alert individuals once LPG escape is detected. This technique is incredibly straightforward nevertheless reliable.

It leaves United States with the additional scope of improvement. Battery utilized in this technique is of 5V that isn't that a lot of tolerable, in future improvement, we are able to use a much bigger, reversible one, which may sustain the gas detection module for an extended amount of your time, with alert whenever battery runs out' In additional modification, additionally to solely escape detectionwe are able to resolve the concentration of the gas too. The paper includes a smart viability to be launched in industrial market, tiny scale industries having multiple cylinders hold on. With additional improvement in style the system will be created additional handy and price effective for the users.

APPENDIX:

SOURCE CODE:

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(5,6,8,9,10,11);

int redled = 2;

int greenled = 3;

int buzzer = 4;

int sensor = A0;

int sensorThresh = 400;

void setup()

{

pinMode(redled, OUTPUT);

pinMode(greenled,OUTPUT);

pinMode(buzzer,OUTPUT);

pinMode(sensor,INPUT);

Serial.begin(9600);

lcd.begin(16,2);

}

void loop()

{

int analogValue = analogRead(sensor);

Serial.print(analogValue);

if(analogValue>sensorThresh)

{
```

```
    digitalWrite(redled,HIGH);

    digitalWrite(greenled,LOW);

    tone(buzzer,1000,10000);

    lcd.clear();

    lcd.setCursor(0,1);

    lcd.print("ALERT");

    delay(1000);

    lcd.clear();

    lcd.setCursor(0,1);

    lcd.print("EVACUATE");

    delay(1000);

}

else

{

    digitalWrite(greenled,HIGH);

    digitalWrite(redled,LOW);

    noTone(buzzer);

    lcd.clear();

    lcd.setCursor(0,0);

    lcd.print("SAFE");

    delay(1000);

    lcd.clear();

    lcd.setCursor(0,1);

    lcd.print("ALL CLEAR");

    delay(1000);

}

}
```