PROJECT REPORT

PROJECT NAME : GAS LEAKAGE MONITORING AND ALERTING SYSTEM

1. INTRODUCTION:

1.1 Project Overview:

In today's world, safety is of the utmost importance, and certain measures must be taken at both work and home to ensure it. Working or living in a dangerous environment necessitates specific safety measures, whether the subject is electricity or oil and gas. A type of natural gas known as "Liquified Petroleum Gas" (LPG) is compressed under high pressure and stored in a metal cylinder. LPG is extremely vulnerable to fire and can result in catastrophic damage if left unprotected near any fire source. LPG is primarily utilised for cooking and is more readily available than any other natural gas. Sadly, its widespread use makes gas leakage or even a blast a common occurrence. As a result, a system for detecting and monitoring gas leaks is required. Through a flame sensor, the system will keep an eye on fire and flame. The buzzer begins to ring when a fire is detected. Tests have shown that the system can keep track of the wastage of gas and leaks and notify the user. The performance that was produced showed that it was successful in reducing the amount of domestic gas that was wasted.

1.2 Purpose:

Nowadays the home safety detection system plays an important role in the security of people. Since all the people from the home go to work on a daily basis, it makes it impossible to check on the appliances available at home, especially LPG gas cylinders, wired circuits, Etc. In the last three years, there has been a tremendous hike in the demand for 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 used mostly on a large scale in industry, as heating, home appliances, and motor fuel. To monitor this gas leak, the system includes an MQ6 gas detector. This sensor detects the amount of leaking gas present in the surrounding atmosphere. In this way, the consequences of an explosion or gas leak can be avoided.

2.LITERATURE SURVEY:

2.1 Existing problem:

The Internet of Things aims towards making life simpler by automating every small task around us. As much as IoT helps in automating tasks, the benefits of IoT can also be extended to enhancing the existing safety standards. Safety, the elementary concern of any project, has not been left untouched by IoT. Gas Leakages in open or closed areas can prove to be dangerous and lethal. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting people about the leakage. Therefore, we have used IoT technology to make a Gas Leakage Detector for society which has Smart Alerting techniques involving sending a text message to the concerned authority and the ability to perform data analytics on sensor readings. Our main aim is to propose a gas leakage system for a society where each flat has gas leakage detector hardware. This will detect the harmful gases in the environment and alert society members through the alarm and sending notifications.

2.2 References:

LITERATURE SURVEY: A number of reviews have been done in the past on the topic of gas leak detection techniques, both in research papers/technical reports on a particular leak detection method and other gas-related topics.

PAPER 1

AUTHORS: A. Mahalingam, r. T. Naayagi, n. E. Mastorakis

YEAR: 2012

DESCRIPTION:

Designed a cost economic gas leakage detector. They adopted UK safety standards for the design of the system. Their proposed system mainly detects LPG leakage and also the amount of gas leakage. It mainly detects gases like propane and butane. The safety level of butane gas is 600 ppm above which it is considered hazardous.

When the gas level in the air increases, the system produces audio alarms warning the people/workers in industry about the gas leakage.

PAPER 2

AUTHORS: Prof. M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi, M.Gunasekaran

YEAR: 2015

DESCRIPTION:

In this research paper on "GSM based LPG leak detection and control system", LPG gas leak is detected by the MQ-6 gas sensor. The analog output is sent to the microcontroller.

It Consists of a predefined set of instructions. Based on the instructions specified, the exhaust fan gets turned on. The gas concentration in the room will thus be reduced. Then the stepper motor rotates, closing the cylinder knob. Then , the gas leak is stopped. The relay is de-energized. Then The buzzer sounds an alarm that signals a gas leak. The user is then notified by SMS via the GSM module. They designed their methodology that the system takes automatic control action upon detection of 0.001% LPG leakage. This automatic control is provided by a mechanical handle to close the valve. They increase safety for humans with a relay that will turn off the electricity supply to the house. They also use GSM to send a warning message to users and a buzzer is available to alert neighbours of a leak.

PAPER 3

AUTHORS: M Athish Subramanian, Naveen Selvam, Rajkumar S, R Mahalakshmi, and J Ramprabhakar

YEAR: 2020

DESCRIPTION:

This paper reviews the previous state of art and also has proposed a gas leakage detection system using MQ5 gas sensor and Arduino Uno controller is incorporated with a cloud storage for data collection and also used for storing and analysing data. Gas leaked is converted from Parts per Million (PPM) to volts through the Arduino IDE and results in notifying the user when the threshold limit is crossed. The user is alerted via an application for quick notification through the internet and also through a buzzer /LED for physical notification. The prime novelty of the proposal may be claimed as the usage of cloud storage for detection and notification. The system, though simple and straightforward, can be very efficiently used for domestic purposes.

PAPER 4

AUTHORS: Falohun A.S., Oke A.O., and Abolaji B.M.

YEAR: 2016

DESCRIPTION:

In this paper they proposed gas detection using integrated circuits and MQ-9. In this they basically used a built-in design which includes typical input and output devices such as switches, relays, solenoids, LEDs, small or custom LCDs displays, radio frequency devices and sensors for data such as temperature, humidity, light level, etc.

Embedded systems typically do not have a keyboard, screen, disks, printers, or other recognizable I/O devices personal computer and may lack human interaction facilities. Number and type of detectors and the type of fire alarm system one chooses for property protection will depend on the owner's property protection objectives, property value and the requirements of the owner's insurance company.

PAPER 5

AUTHORS: B. Did paye, Prof. S. K. Nanda

YEAR: 2015

DESCRIPTION:

In this paper they talked about their research in leak detection and review "Automated unified system for LPG using microcontroller and GSM module". Their paper is designed based on an advanced and innovative approach to LPG leak detection, prevention and automation reservation for replenishment. The system ensures in advance the automatic control of the LPG regulator and possibly a leak is detected, the system will automatically turn off the main power switch. That's why it helps to avoid explosions.

PAPER 6

AUTHORS: P.Meenakshi Vidya, S.Abinaya, G.Geetha Rajeswari, N.Guna

YEAR: 2014

This Paper “Automatic detection of LPG and hazards controlling” published in April 2014 proposed a real-time gas leak detection and monitoring system. In this system, gas leakage is detected and controlled by an exhaust fan. LPG level in the cylinder is also continuously monitored.

PAPER 7

AUTHORS: Ch. Manohar Raju and N. Sushma Rani

YEAR: 2008

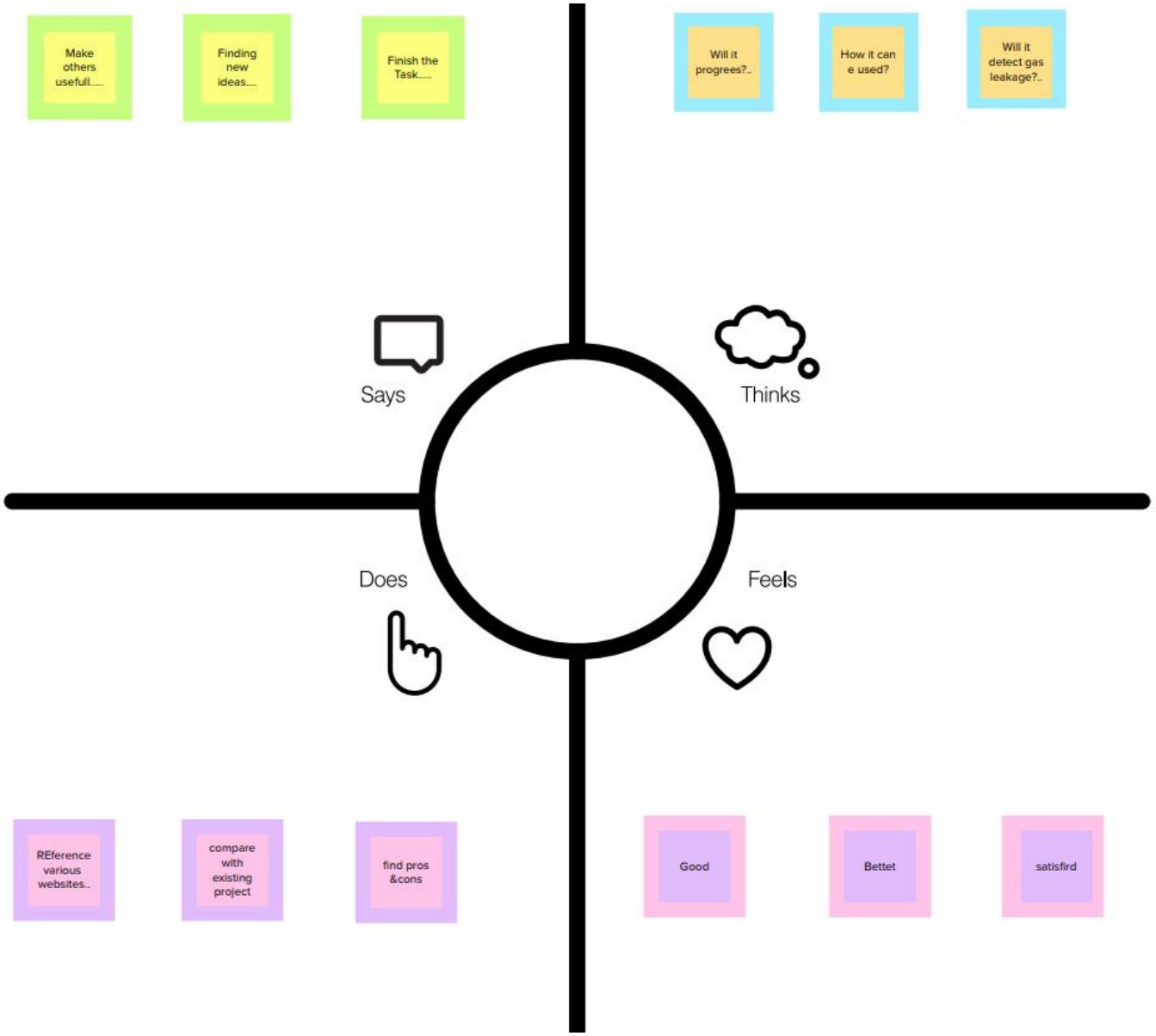
In this paper, they introduce an android based automatic gas detection and indication robot. Their proposed prototype depicts a mini mobile robot which is capable of detecting gas leakage in hazardous places. Whenever there is a gas leakage, the robot immediately identifies it and sends the data to android mobile through wireless communication like Bluetooth. They developed an android application for android based smartphones which can receive data from robots directly through Bluetooth. The application signals an indication whenever there is a gas leakage and they can also control the robot movements via Bluetooth by text as well as voice commands. The previous mobile robots are based on heterogeneous technologies like GPS, GSM & internet based etc., but the main disadvantage of those prototypes were the lack of communication in specific areas. So, with the rapid developments and tremendous changes in technology. They have implemented some of the techniques to remove such previous problems. Wireless communication protocols play a vital role in present trends. Bluetooth, Wi-Fi, ZigBee etc. They use one of the best features of smartphones, i.e., the Bluetooth technology to control and monitor the robot.
They present a robot and a mobile application for Meanwhile; the system prototype impressively proved its use and capabilities in an intensive series of tests.. Additionally, it helps avoid mishandling human inspectors in a potentially dangerous situation. However, more development (e.g blast protection, package development, etc.) and in fact leg issues should be dealt with earlier in a business environment. Nevertheless, it is certain that autonomous, mobile gas detection and leakage of a locator robot is possible today and can significantly increase security.

2.3 Problem Statement Definition:

To ensure the safety of workers in the industries,we develop an efficient system & an application to monitor the gas pipelines continuously and detect early if there is any gas leakage in the surroundings.Generally in gas industries there are some places that are too noisy. So, in those areas workers can't hear the siren sound when the gas leakage alerting system alerts.

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



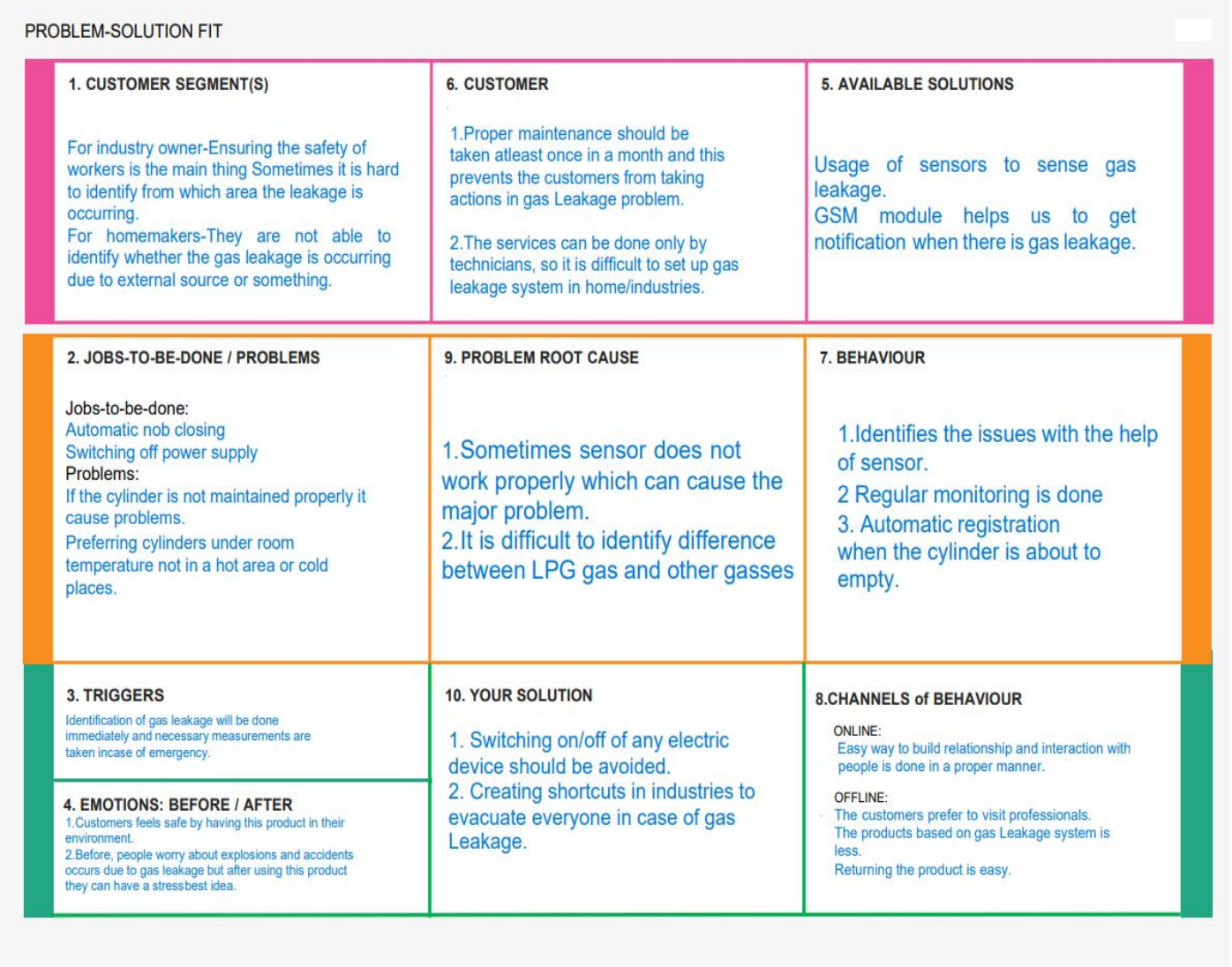
3.2 Ideation & Brainstorming

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To ensure the safety of workers in the industries,we develop an efficient system & an application to monitor the gas pipelines continuously and detect early if there is any gas leakage in the surroundings.Generally in gas industries there are some places that are too noisy. So ,in those areas workers can't hear the siren sound when the gas leakage alerting system alerts.
2.	Idea / Solution description	➢ If there is any gas leakage occurs inside the industry, the knob of the gas pipeline will automatically closed. ➢ The gas leakage level will be indicated by the LED lights: • Red – Critical • Yellow – Warning • Green - Normal ➢ If the gas leakage is in critical level, the surrounding people will be notified through a siren ➢ To detect the different harmful gases like methane,hydrogen sulphide,LPG,carbon monoxide etc.,by using the required sensors. ➢ If in any area gas leakage is detected the admins will be notified along with the location. ➢ In the web application, admins can view the sensor parameters.
3.	Novelty / Uniqueness	➢ Our solution not only notify the industry person but also notify the fire fighters ➢ Low latency ➢ The use of stepper motor helps to close the knob ➢ immediately if gas leakage is sensed

		➢ The position of the LED displays is placed on the conspicuous part ➢ It has the ability to detect various type of gases, not just of single type. Hence the system makes more efficient.
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 (Revenue Model)	➢ The main target of our solution is Industries so we have planned to visit industries and explain them about the benefits of our products. ➢ They can't just installed and left they needed to get serviced.we can make profit by servicing ,upgrading, installing devices. ➢ No one wants to destroy their factory . so it's assured that our product will be sold and installed in every gas industries
6.	Scalability of the Solution	Alerting system over this methods offers quick response time and sends alert to people in short period of time.So that people can evaculate as fast as they can and also the workers in the industries can fix before the explosion as fast as they can.Even when the gas leakage is more, the product sense the accurate values and alerts the workers effectively

3.4 Problem Solution fit



\4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	Objective	The purpose of the system is to detect early gas leakage in the industries through the gas pipelines and alert the user with their location.
FR-2	Focus	To alert the user immediately if any gas leakage is sensed.
FR-3	Features	Gas leakage level will be indicated by the LED lights. It detects the different harmful gases like methane, LPG etc., by using the required sensors. It updates the sensor parameters in web applications.
FR-4	Essentiality	To prevent the industry workers from being exposed to toxic gases.
FR-5	Gas leakage location sent	Location sent to the web application through GPS module.

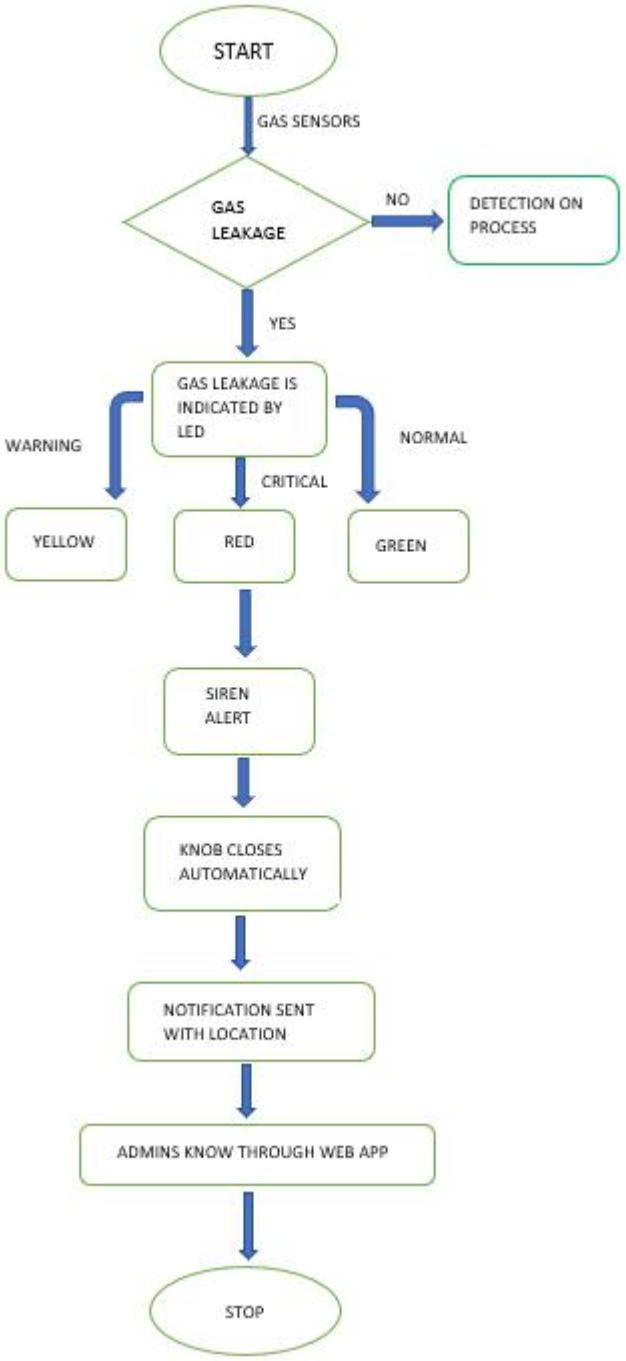
4.2 Non-Functional Requirements:

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

FR No.	Non-Functional Requirement	Description
FR-1	Usability	The web application is simple and easy to use. Efficiency is high.
FR-2	Reliability	The application runs accurately.
FR-3	Availability	The application can be accessed at any time and anywhere.
FR-4	Security	The web application is highly secure. Software is protected from unauthorized access.
FR-5	Scalability	Application is not limited to the users.

5.PROJECT DESIGN

5.1 Data Flow Diagrams



USER STORIES

Use the below template to list all user stories for the product

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

5.2 Solution & Technical Architecture

SOLUTION ARCHITECTURE

TECHNOLOGY ARCHITECTURE

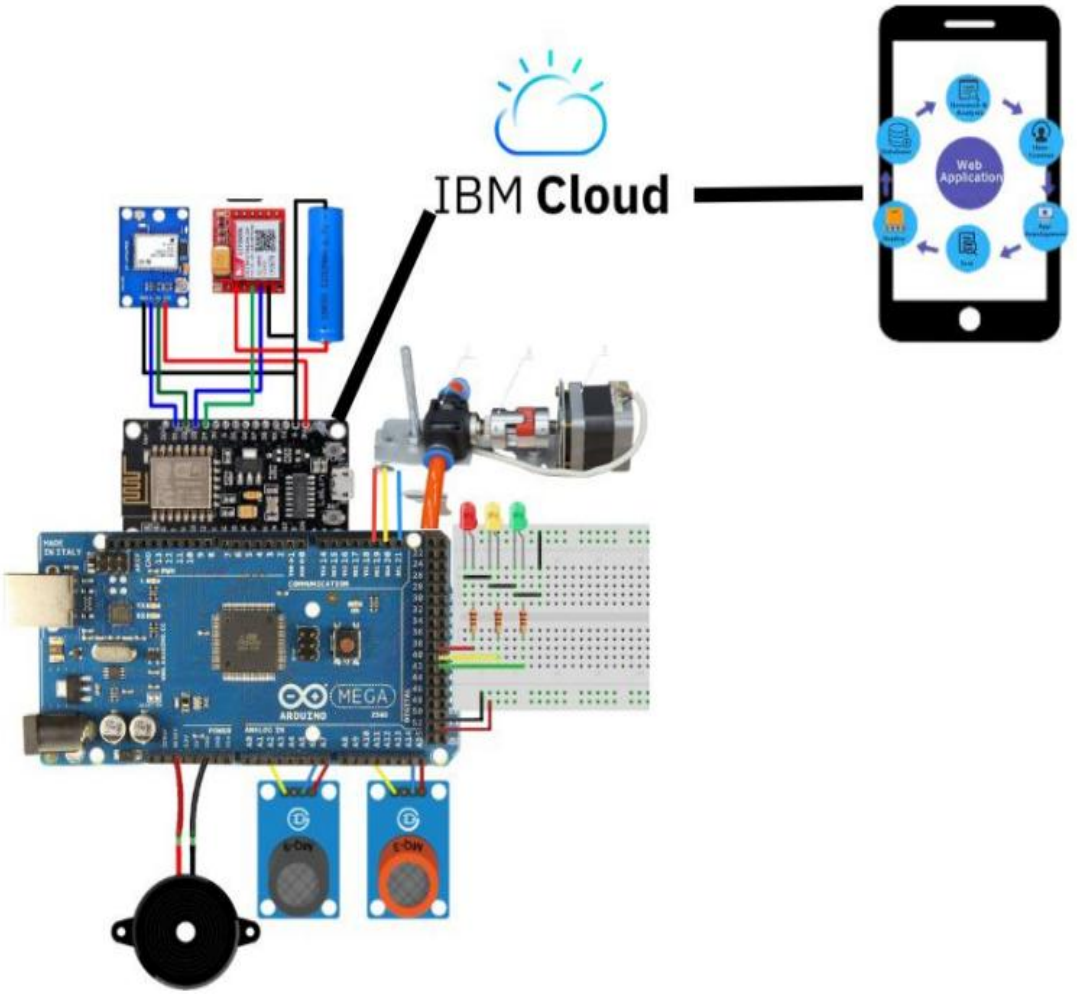


TABLE-1: COMPONENTS & TECHNOLOGIES

S.No	Component	Description	Technology
1.	Arduino MEGA	The Arduino Mega 2560 is **a microcontroller board based on the ATmega2560** (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.	Basically, the processor of the Arduino board uses the Harvard architecture where the program code and program data have separate memory. It consists of two memories such as program memory and data memory. Wherein the data is stored in data memory and the code is stored in the flash program memory.
2.	LED-Red,Yellow,Green	LED, in full light-emitting diode, in electronics, a semiconductor device that emits infrared or visible light when charged with an electric current.	LEDs operate by electroluminescence, a phenomenon in which the emission of photons is caused by electronic excitation of a material.
3.	ESP8266 WiFi Module	The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.	The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability
4.	Siren	A siren is **a loud noise-making device**. Civil defense sirens are mounted in fixed locations and used to warn of natural disasters or attacks. Sirens are used on emergency service vehicles such as ambulances, police cars, and fire trucks. There are two general types: mechanical and electronic.	Mechanical sirens **blow air through a slotted disk or rotor**. The cyclic waves of air pressure are the physical form of sound. In many sirens, a centrifugal blower and rotor are integrated into a single piece of material, spun by an electric motor.
5.	MQ5,9,135 gas sensor	The Grove - Gas Sensor (MQ5,9,135) module is useful for gasleakage detection and for monitoring the air quality	A **gas sensor** is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

6.	Valve or Knob with stepper motor	Self-closing Sampling Valves are **safety valves designed to allow safe and quick sampling of volatile gases under pressure on process lines, storage tanks or pressure vessels**.	The Self Closing Valve is opened by means of a lever lifting up the disc from the seat in the valve body. **Spring force will automatically close the valve when the hand lever is unengaged**. The valve is permanently closed using the hand wheel Automatic control valves are **specialty valves fitted with actuators that can be controlled by temperature or flow sensors**.
7.	GPS module	The NEO-6M GPS module is **a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability**	**It can track up to 22 satellites on 50 channels and achieves the industry's highest level of sensitivity i.e. -161 dB tracking, while consuming only 45mA supply current**.
8.	GSM and Fast SMS	GSM (**Global System for Mobile communication**) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world.Fast2SMS **provide API for bulk SMS, which ensures security and it is a very reliable source of sending data**	When you send an SMS message, **the message gets transmitted from the sending device to the nearest cell tower**. That cell tower passes the message to an SMS center (SMSC). Then the SMSC forwards the SMS message to a cell tower near the receiving device. Lastly, that tower sends the message to the recipient's device
9.	Mobile Phone	Whenever the excess gas is detected SMS will be sent to a particular phone number. Smoke and gas leakage detectors are very useful in detecting smoke or fire in buildings, and so are the important safety parameters in order to prevent disasters.	The system alerts notifications to the end-user - who responds accordingly with the help of connected devices such as a smartphone on the go.
10.	Web App	An application that is used to the see the gas level, gps location and see the total overview of the system	an app is a type of software that allows you to perform specific tasks. Applications for desktop or laptop computers are sometimes called desktop applications, while those for mobile devices are called mobile apps. **When you open an application, it runs inside the operating system until you close it**.
11.	IBM Cloud	The IBM Cloud platform combines platform as a service (PaaS) with infrastructure as a service (IaaS) to provide an integrated experience. The platform scales and supports both small development teams and organizations, and large enterprise businesses.	Platform as a Service (PaaS) is a cloud computing solution that provides developers with an easy-to-use platform to create their own software, web applications, or other programming projects.

TABLE-2:APPLICATION CHARACTERISTICS

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	MQ5,9,135 gas sensor, WiFi, Arduino processor chips.	Internet of Things.
2.	Security Implementations	MQ5,9,135 gas sensor, Alerting device which consists of siren andLED light.	Internet of Things.
3.	Scalable Architecture	Detecting room temperature, if temperature is above specified temperature, it will alert workers.	Python
4.	Availability	Use of WiFi IP address	Wireless Network
5.	Performance	Performance is efficient	Internet of Things

6.PROJECT PLANNING AND SCHEDULING

6.1. Sprint Planning and Estimation

S.NO	ACTIVITY TITLE	ACTIVITY DESCRIPTION	DURATION
1	Understanding the project requirement	Assign the team members and create repository in the Github,Assign the task to each members and teach how to useand open and class the Githuband IBM career education	1 WEEK
2	Starting of project	Advice students to attend classes of IBM portal create and develop an rough diagrambased on project description and gather of information on IOT and IBM project and team leader assign task to eachmember of the project	1 WEEK
3	Attend class	Team members and team leadmust watch and learn from classes provided by IBM and NALAYATHIRAN and must gain access of MIT license for theirproject	4 WEEK
4	Budget and scope of project	Budget and analyze the use ofIOT in the project and discusswith team for budget prediction to predict the favorability for the customerto buy	1 WEEK

6.2. Sprint Delivery 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	Ashfaq
Sprint-1	Features	USN-2	As a system, the gas sensor values should be displayed in a LCD screen	2	Low	Deepak
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	Akilesh
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	Jagan
Sprint-2	Focus	USN-5	As a system, it should the send the location where the gas is detected	8	High	Ashfaq
Sprint-2	Focus	USN-6	As a system, it should also send the alerting SMS to the registered phone number	2	Low	Akilesh

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

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	Akilesh
Sprint-4	Login	USN-16	As a user, I can login into the web application through email and password.	3	High	Deepak
Sprint-4	Dashboard	USN-17	As a user, I can access the dashboard and make use of available resources.	2	Medium	Jagan
Sprint-4	Focus	USN-18	As a user, I must receive an SMS once the leakage is detected.	5	High	Akilesh
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	Deepak
Sprint-4	Allocation	USN-20	As an admin, I must allot particular person to look after the leakage in a particular location.	3	High	Jagan

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

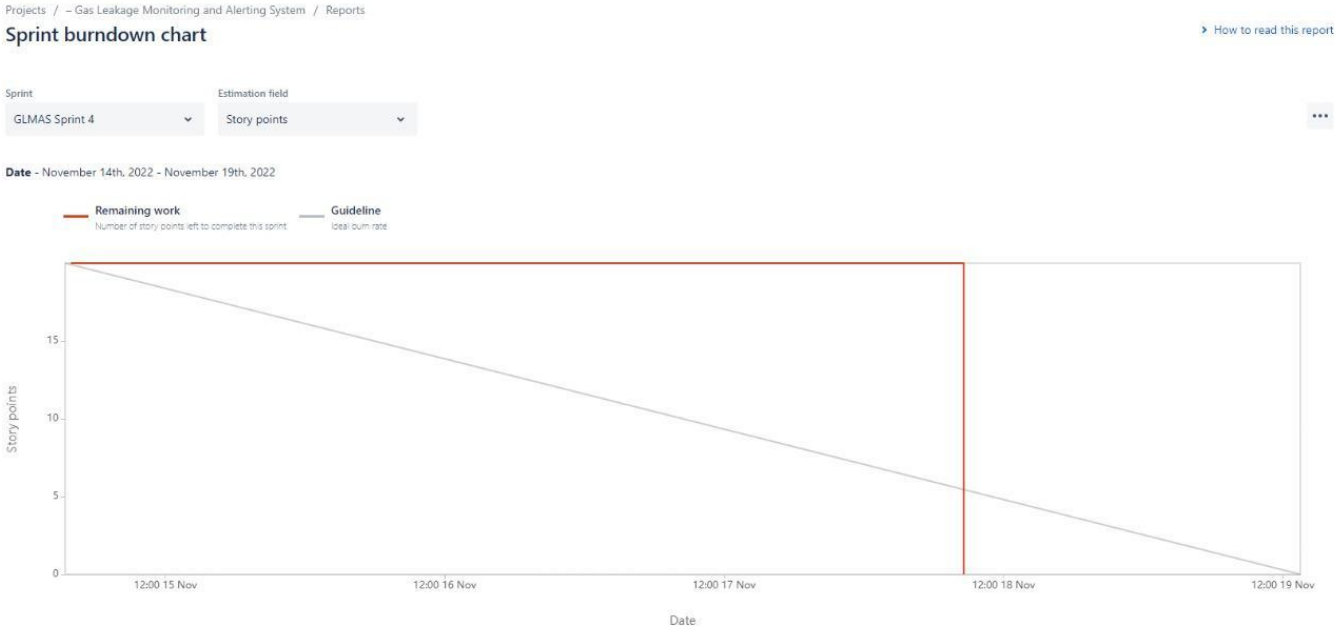
Velocity:

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)

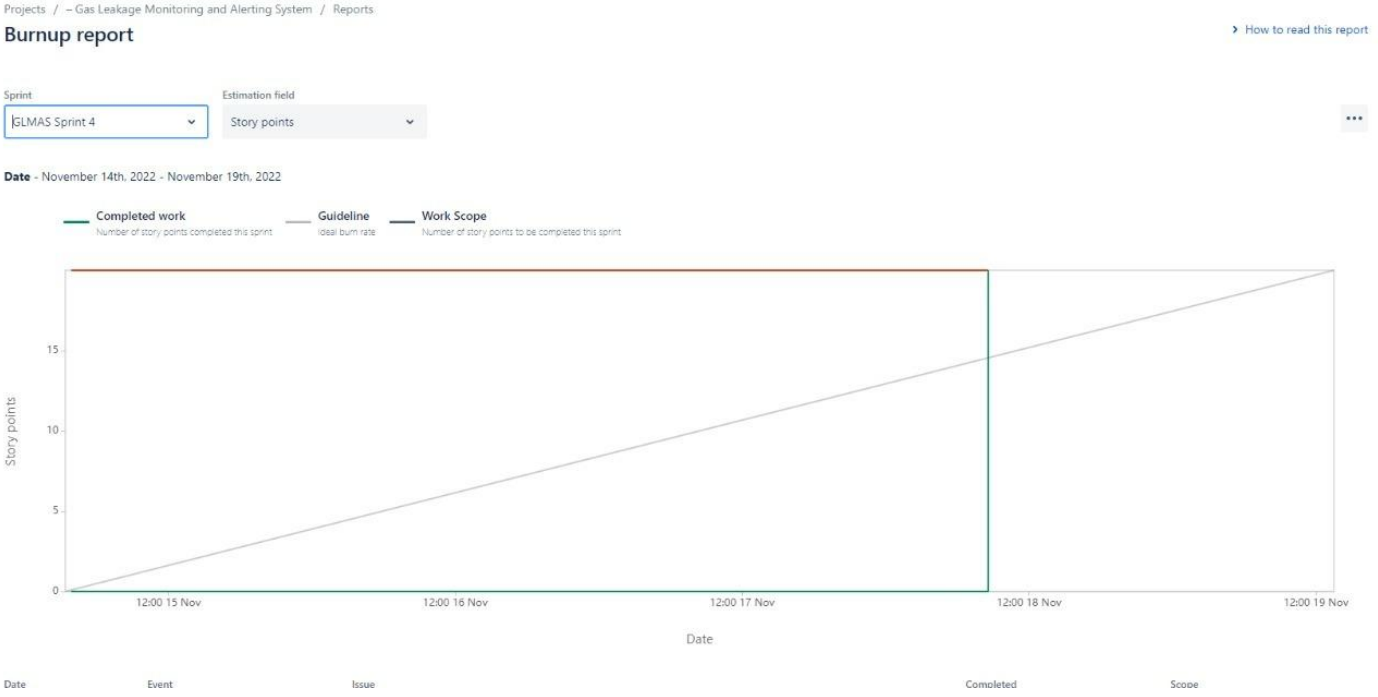
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

6.3 Reports from JIRA

BURNOUT CHART

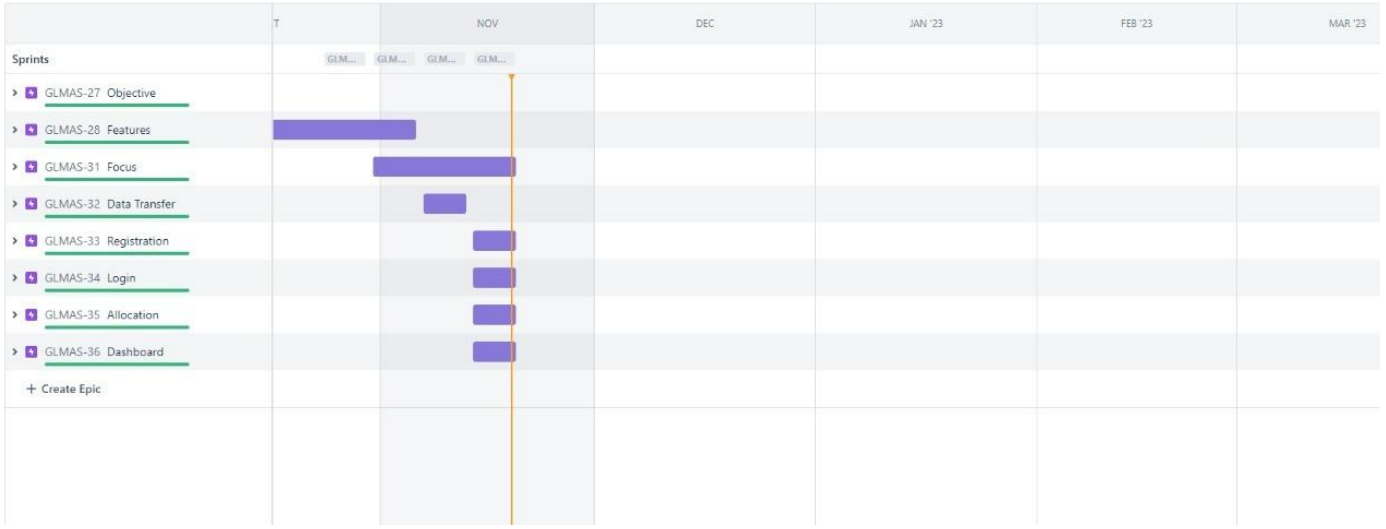


BURNUP CHART



JIRA SOFTWARE SCREENSHOTS

ROADMAP



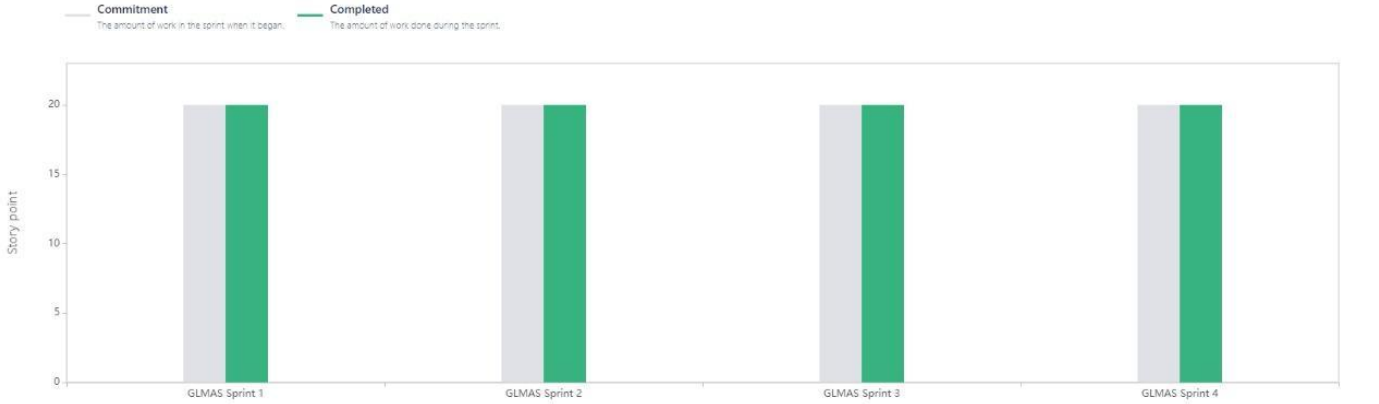
CUMULATIVE FLOW DIAGRAM

VELOCITY REPORT

Projects / – Gas Leakage Monitoring and Alerting System / Reports

Velocity report

› How to read this report



Sprint	Commitment	Completed
GLMAS Sprint 1	20	20
GLMAS Sprint 2	20	20
GLMAS Sprint 3	20	20
GLMAS Sprint 4	20	20

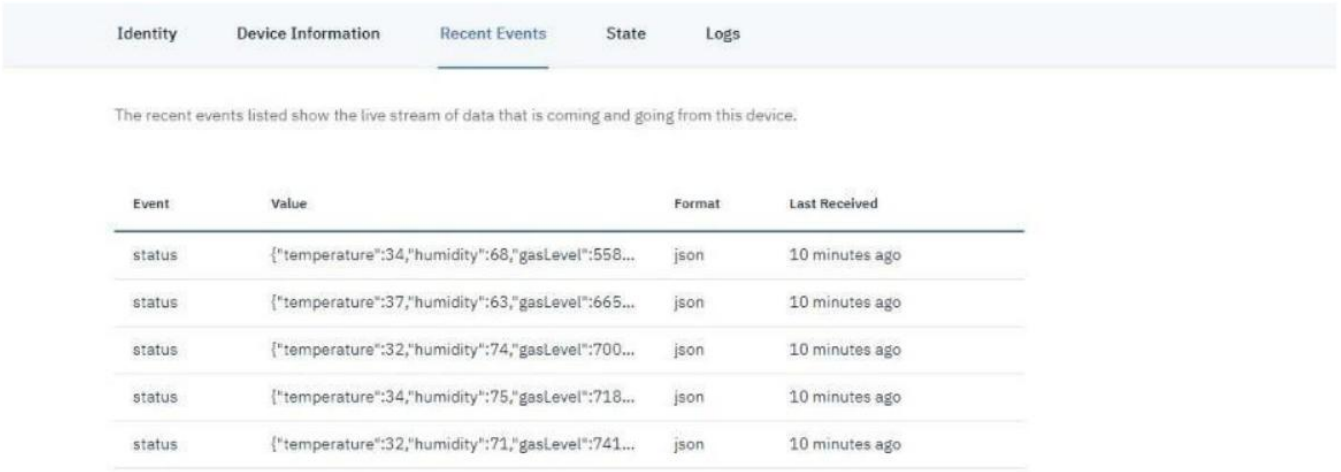
7.CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

```
#IBM Watson IOT Platform
 #pip install wiotp-sdk import wiotp.sdk.device
 import time
 import random
myConfig = {
      "identity": {
        "orgId": "oqhi1j",
       "typeId": "NODEMCU",
       "deviceId":"BHAVAN0108"
},
 "auth": {
     "token": "bharathi0503"
 }
 }
 def myCommandCallback(cmd):
        print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
        m=cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    temp=random.randint(32,40)
    hum=random.randint(60,80)
    gas=random.randint(500,800)
    pres=random.randint(20,80)
    myData={'temperature':temp, 'humidity':hum, 'gasLevel':gas, 'pressure':pres, 'latitude':13.148760,
'longitude':80.229100}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

7.2 Feature 2

PUBLISH THE DATA TO IBM CLOUD:



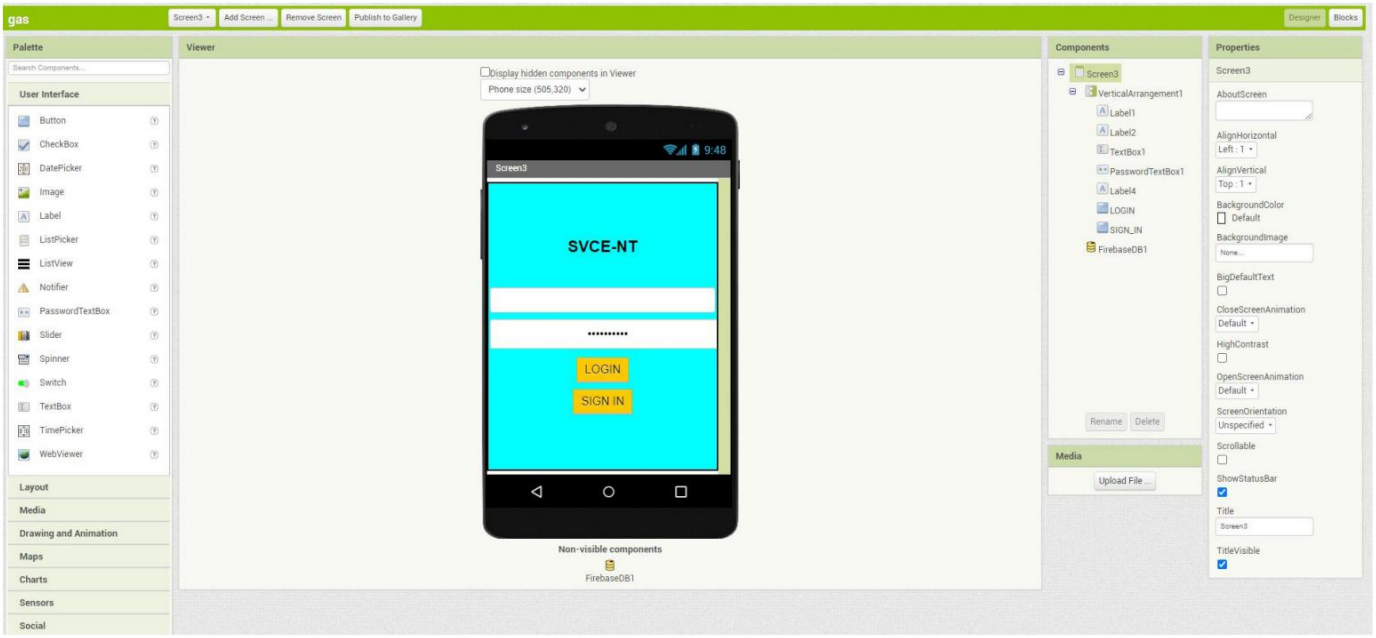
Identity | Device Information | Recent Events | State | Logs

The recent events listed show the live stream of data that is coming and going from this device.

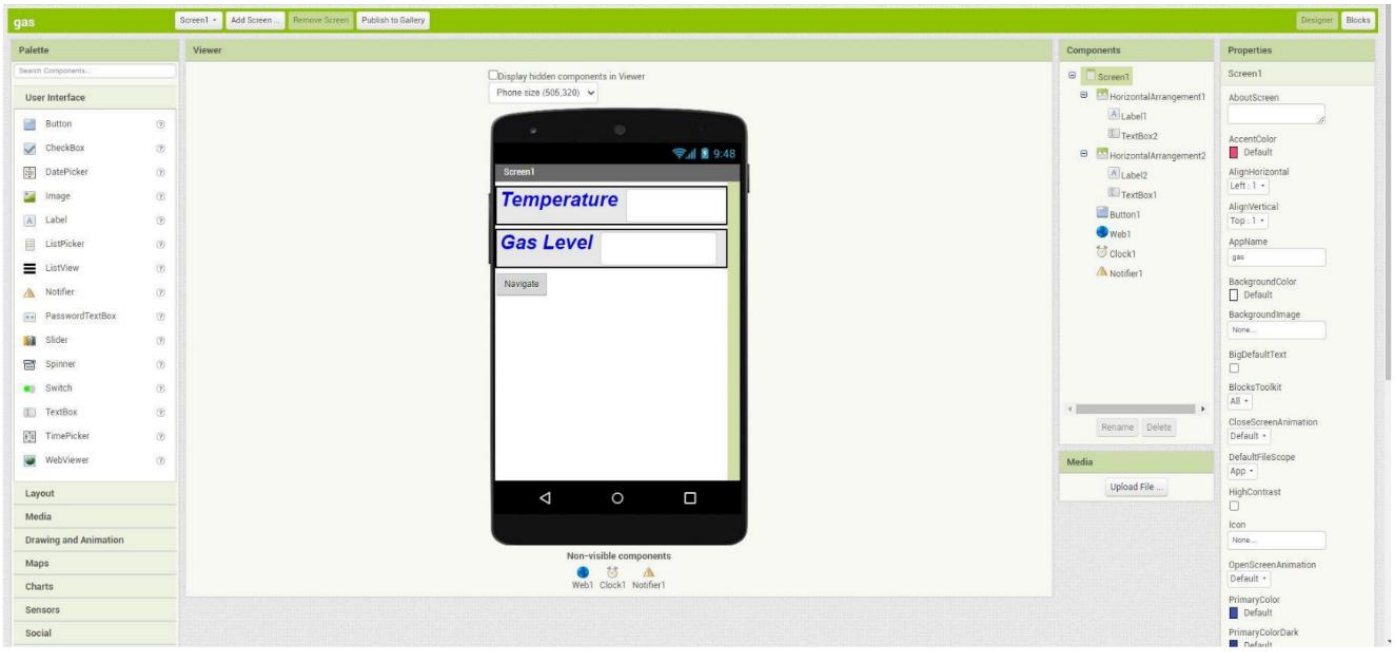
Event	Value	Format	Last Received
status	{"temperature":34,"humidity":68,"gasLevel":558...	json	10 minutes ago
status	{"temperature":37,"humidity":63,"gasLevel":665...	json	10 minutes ago
status	{"temperature":32,"humidity":74,"gasLevel":700...	json	10 minutes ago
status	{"temperature":34,"humidity":75,"gasLevel":718...	json	10 minutes ago
status	{"temperature":32,"humidity":71,"gasLevel":741...	json	10 minutes ago

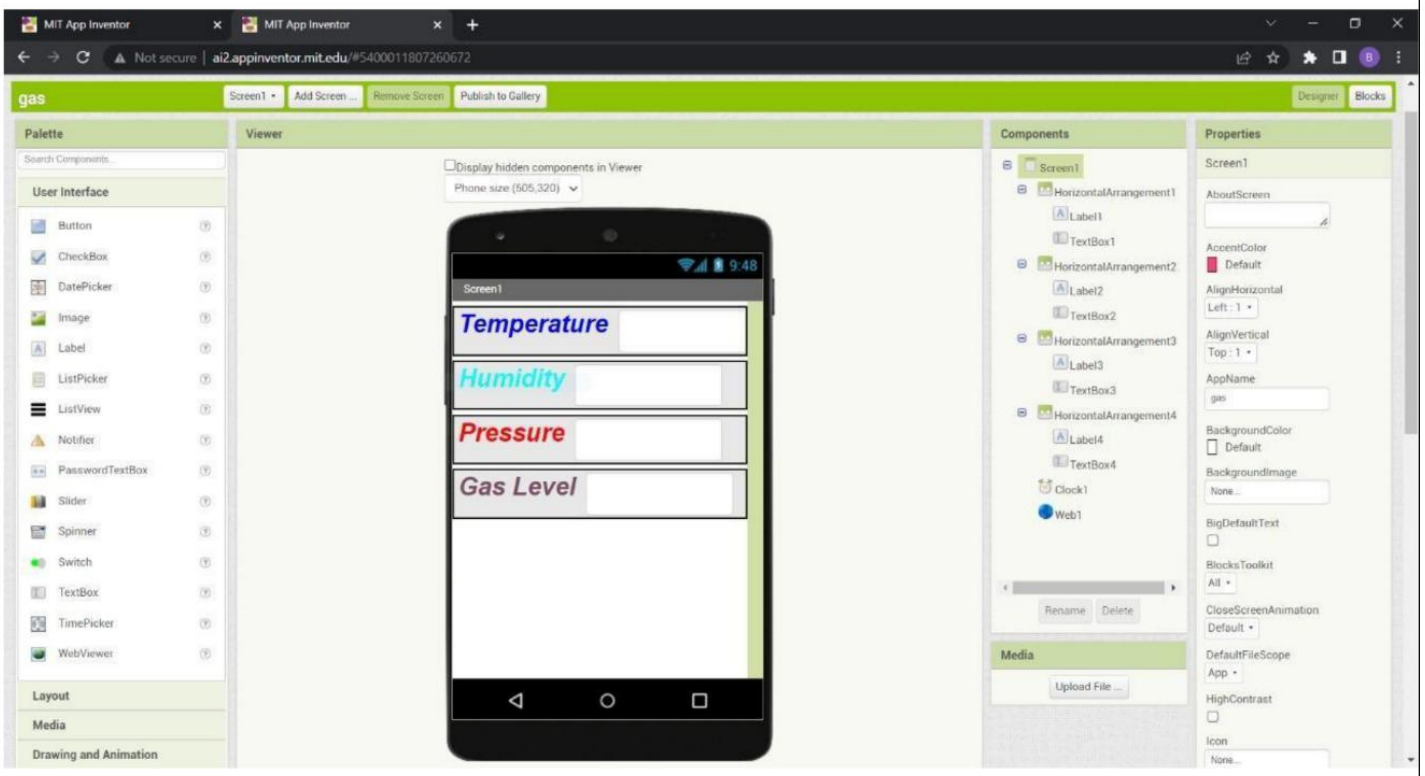
7.3 Feature 3-Live update on collected Data

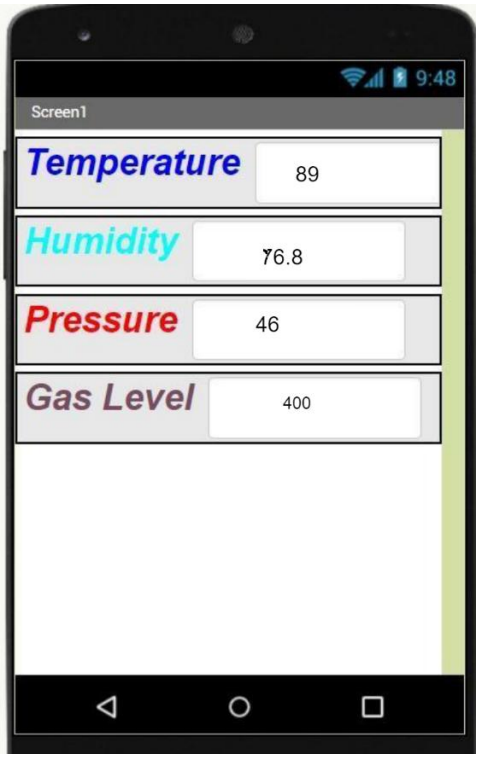
USER LOGIN



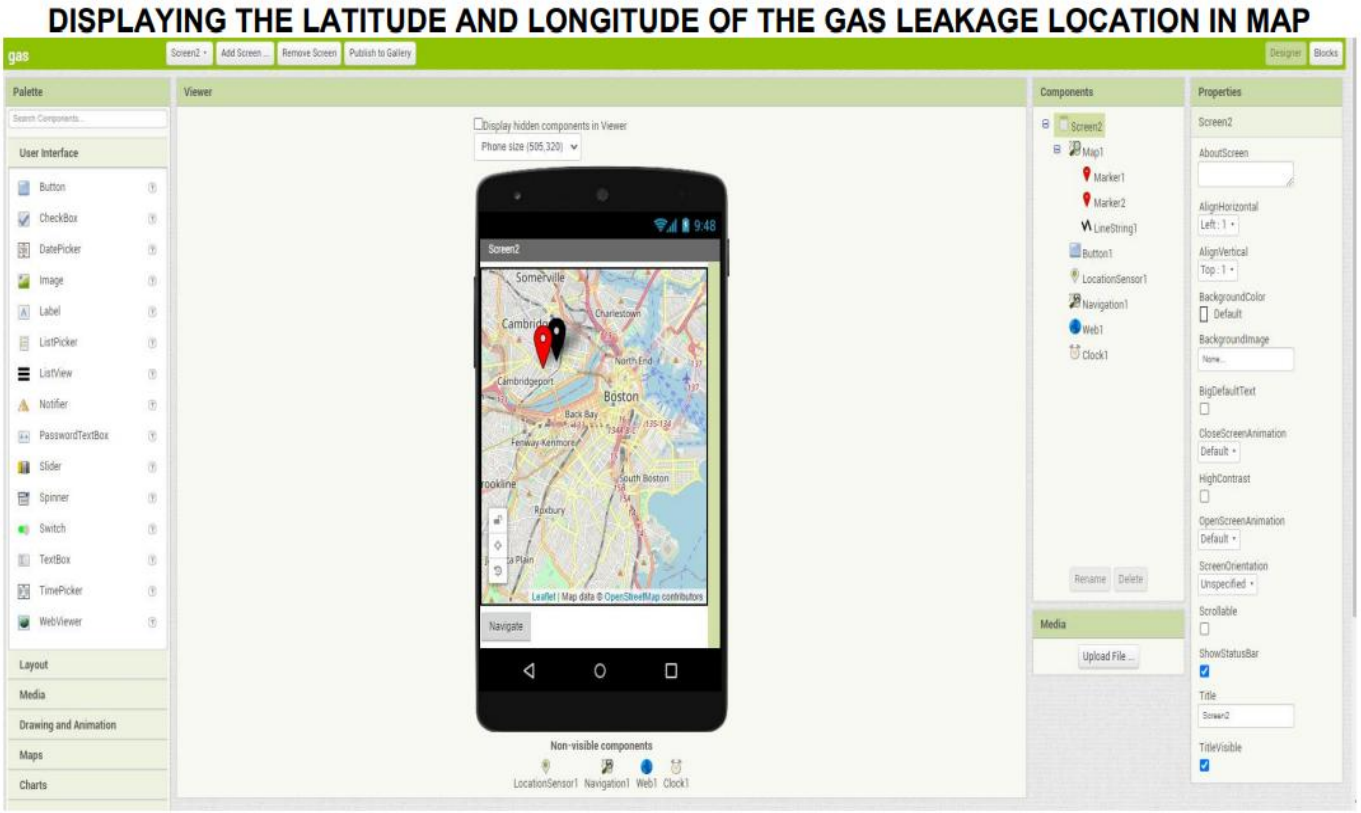
DISPLAYING THE VALUE FROM NODE RED TO MIT INVERTER APP




MIT App Inventor
MIT App Inventor
Not secure | ai2.appinventor.mit.edu/#5400011807260672
gas
Screen1
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Palette
Search Components...
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Layout
Media
Drawing and Animation
Viewer
Display hidden components in Viewer
Phone size (505,320)
9:48
Screen1
Temperature
Humidity
Pressure
Gas Level
Components
Screen1
HorizontalArrangement1
Label1
TextBox1
HorizontalArrangement2
Label2
TextBox2
HorizontalArrangement3
Label3
TextBox3
HorizontalArrangement4
Label4
TextBox4
Clock1
Web1
Rename
Delete
Media
Upload File ...
Properties
Screen1
AboutScreen
AccentColor
Default
AlignHorizontal
Left : 1
AlignVertical
Top : 1
AppName
gas
BackgroundColor
Default
BackgroundImage
None...
BigDefaultText
BlocksToolkit
All
CloseScreenAnimation
Default
DefaultFileScope
App
HighContrast
Icon
None...

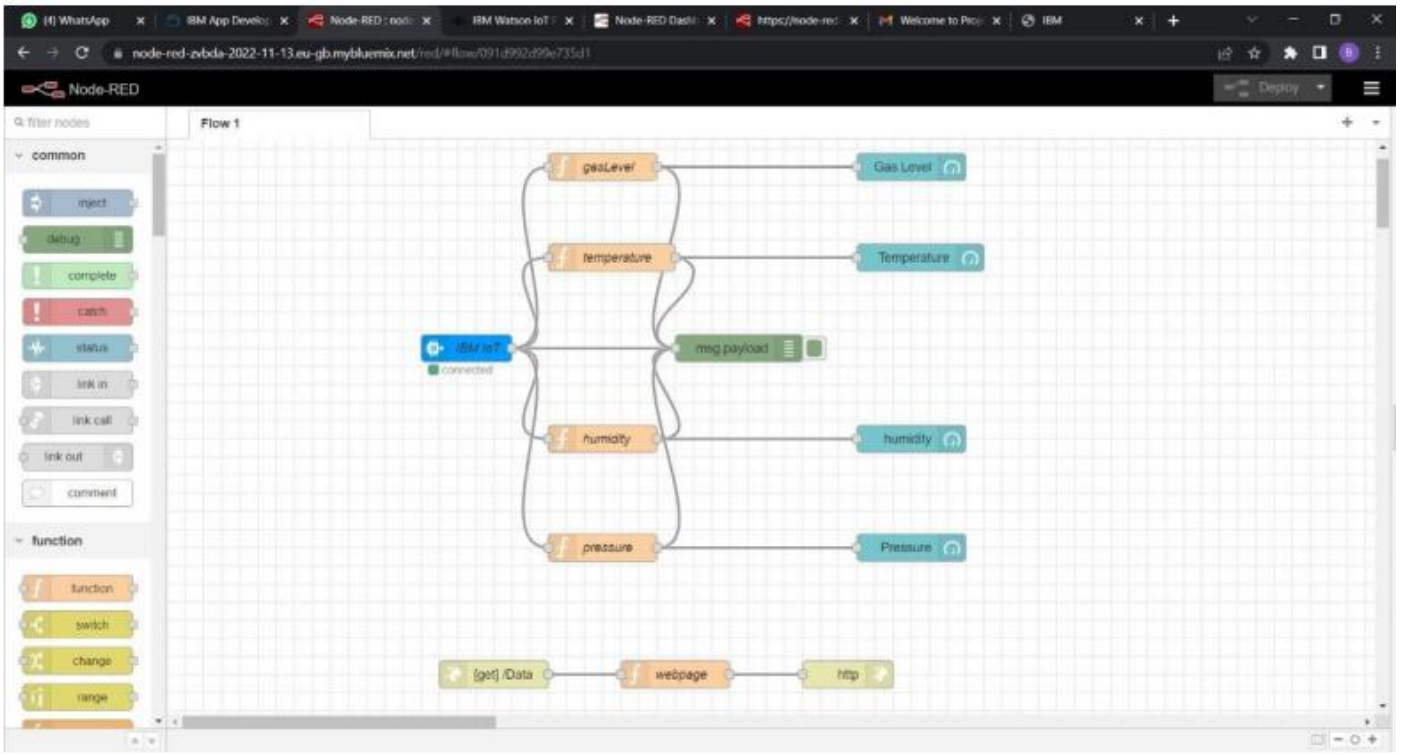

9:48
Screen1
Temperature
89
Humidity
76.8
Pressure
46
Gas Level
400

7.4 Feature 4 - Location Tracker



8. TESTING

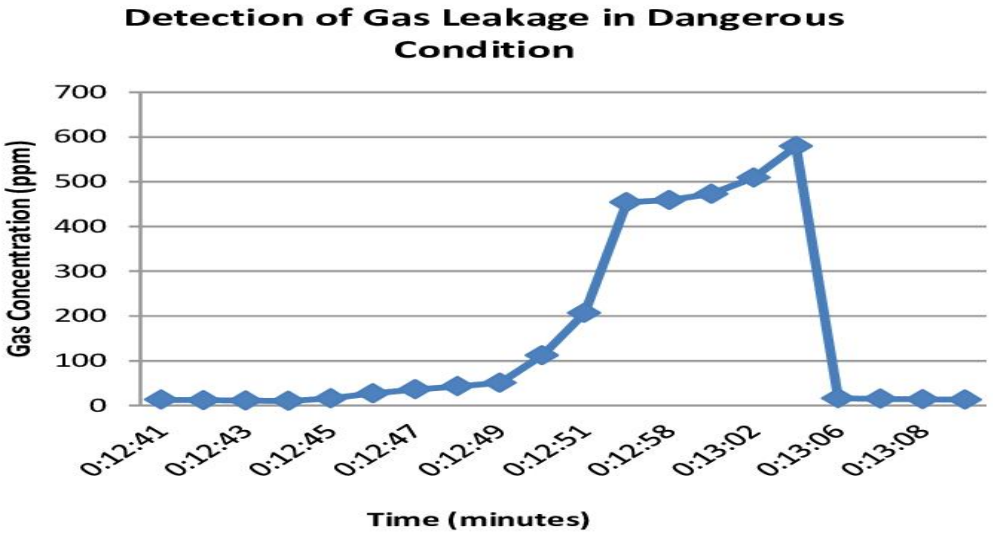
8.1 TEST CASES

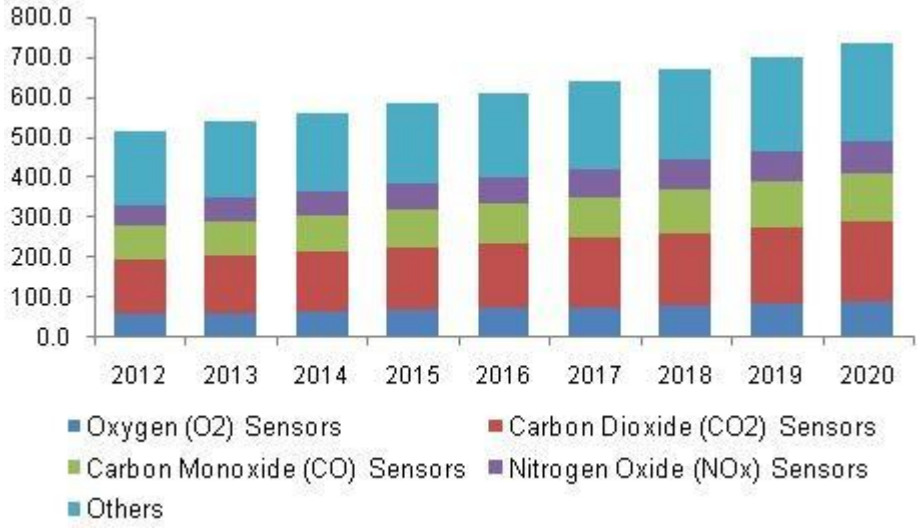


8.2 USER ACCEPTANCE TESTING

9.RESULTS

9.1 Performance Metrics





10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1.Prevents the high risk of gas explosion

2.Real-time updates about leakages

3.Get immediate gas leak alerts

4.Cost-effective installation

5. Automatic closure of knob after a sudden gas leakage

DISADVANTAGES:

Poor stability and greater environmental impact; in particular, the selectivity of each sensor is not possible so, the output parameters cannot be determined. Therefore, it should not be used in places where accurate measurement is required.

11.CONCLUSION

The Internet of Things is the new revolution of the Internet and is a key research topic for researchers in embedded, computer science and information technology due to its very diverse field of application and a heterogeneous mix of different communications and embedded technologies in its architecture. In the modern scenario, the use of LPG has increased on a larger scale. As a result, damage caused by gas leakage is increasing day by day. To eradicate these problems, They introduced a highly advanced system known as Internet Of Things (IOT). It is used in a wide variety of applications in present society and introducing a huge scale into the future. Our proposed system is more efficient and environmentally friendly due to gas leak detection and gas valve control. That's the main thing designed for the safety of people and property. It also allows us to reserve gas from gas using IOT agency, when the weight of the gas cylinder is reduced below the threshold value. People could easily do so and use your time effectively. It is also used to alert consumers to the waste of gas during disposal dishes from the burner using the object detection sensor.

12.FUTURE SCOPE

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

1) A Mobile Application can be created for this system which can give information about the concentration of gas present in the area, setting reminders to check gas level and detect any gas leakage.

2) Relay motors can be added into the system to provide more safety. These motors can switch off the Main Gas Supply and Main Power supply in case the gas concentration exceeds a certain limit.

3) The present gas spillage recognition framework can be additionally improved. For modern purposes, versatile robots can be produced for recognizing numerous gas fixations.

13. APPENDIX

SOURCE CODE

```
#include<Servo.h>
#include<LiquidCrystal_I2C.h>
#include <WiFi.h>
#include <PubSubClient.h>
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
int GPSBaud = 9600;
TinyGPSPlus gps;
SoftwareSerial sgps(13, 15); //Rx ,  Tx gps
SoftwareSerial sgsm(3, 1); // Rx ,  Tx gsm
LiquidCrystal_I2C lcd(32, 16, 2);
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
#define ORG "oqhilj"//IBM ORGANITION ID
#define DEVICE_TYPE "NODEMCU"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "BHAVAN0108"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "bharathi0503" //Token
String data3;
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
char publishTopic[] = "iot-2/evt/Gas/fmt/json";
char publishTopic2[] = "iot-2/evt/Data/fmt/json";
char subscribetopic[] = "iot-2/cmd/home/fmt/String";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
WiFiClient wifiClient;
PubSubClient client(server, 1883, callback ,wifiClient);

#define KNOB 3
Servo myservo;
int green = 2;
int yellow = 3;
int red = 4;
int siren = 5;
int gas = A3;
int sensorValue = 0;
int c = 0;
int m = 0;
String latitude = "0.000000";
String longitude = "0.000000";
int t=0,h=0,p=0;

void setup()
{
  Serial.begin(9600);
  myservo.attach(KNOB);
  myservo.write(90);
  sgsm.begin(9600);
  sgps.begin(9600);
  lcd.init();
  lcd.clear();
  lcd.backlight();
  lcd.setCursor(3,0);
  lcd.print("GAS LEAKAGE");
  lcd.setCursor(4,1);
  lcd.print("DETECTION");
  delay(3000);
  lcd.clear();
  pinMode(green, OUTPUT);
  pinMode(yellow, OUTPUT);
  pinMode(red, OUTPUT);
  pinMode(siren, OUTPUT);
  digitalWrite(red, LOW);
  digitalWrite(yellow, LOW);
  digitalWrite(green, LOW);
  wificonnect();
  mqttconnect();
}

void loop()
{
  sensorValue = random(500,1000);
  t=random(36,38);
  h=random(62,68);
  p=random(20,80);
  Serial.print("Temperature: ");
  Serial.println(t);
  Serial.print("Humidity: ");
  Serial.println(h);
  Serial.print("Gas Level: ");
  Serial.println(sensorValue);
  Serial.print("Pressure: ");
  Serial.println(p);
  if(g >= 750)
  {
```

```
    latitude = "13.147327";
    longitude = "80.226269";
  }
  else
  {
    latitude = "0.000000";
    longitude = "0.000000";
  }
  if(sensorValue > 500 && c==0)
  {
    lcd.clear();
    Serial.println("GAS DETECTED");
    Serial.println("SMS: GAS IS DETECTED!!");
    myservo.write(90);
    Serial.println("SMS: THE KNOB IS CLOSED");
    sendSMS("GAS IS DETECTED!!");
    sendSMS("THE KNOB IS CLOSED");
    lcd.setCursor(0,0);
    lcd.print("GAS DETECTED");
    lcd.setCursor(0,1);
    lcd.print("KNOB IS CLOSED");
    delay(1000);
    c=1;
    m=1;
  }
  if(sensorValue < 499)
  {
    c=0;
    myservo.write(0);
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Gas Value: ");
    lcd.setCursor(11,0);
    lcd.print(sensorValue);
    if(m == 1)
    {
      Serial.println("LEAKAGE STOPPED");
      Serial.println("THE KNOB IS OPENED");
      lcd.setCursor(0,0);
      lcd.print("LEAKAGE STOPPED");
      lcd.setCursor(0,1);
      lcd.print("THE KNOB IS OPENED");
      m=0;
      sendSMS("LEAKAGE HAS BEEN STOPPED");
      sendSMS("THE KNOB IS OPENED");
    }
    if(sensorValue > 500)
    {
      lcd.setCursor(0,1);
      lcd.print("GAS DETECTED");
      digitalWrite(red, HIGH);
      digitalWrite(yellow, LOW);
      digitalWrite(green, LOW);
      tone(siren, 200);
    }
    else if(sensorValue > 281 && sensorValue < 500)
    {
      lcd.setCursor(0,1);
      lcd.print("            ");
      digitalWrite(yellow, HIGH);
      digitalWrite(red, LOW);
      digitalWrite(green, LOW);
      noTone(siren);
    }
    else
    {
      lcd.setCursor(0,1);
      lcd.print("            ");
      digitalWrite(green, HIGH);
      digitalWrite(red, LOW);
      digitalWrite(yellow, LOW);
      noTone(siren);
    }
    delay(1000);
  }
}

void sendSMS(char*message)
{
  while (sgps.available() > 0)
    if (gps.encode(sgps.read()))
    {
      if (gps.location.isValid())
      {
        sgsm.listen();
```

```
        sgsm.print("\r");
        delay(1000);
        sgsm.print("AT+CMGF=1\r"); // AT COMMAND TO SEND SMS
        delay(1000);
        sgsm.print("AT+CMGS=\"+919025681637\"\r"); // REGISTERED NUMBER TO SEND SMS
        delay(1000);
        //The text of the message to be sent.
        sgsm.print(message);
        sgsm.print("https://www.google.com/maps/?q="); // MAPS
        sgsm.print(gps.location.lat(), 6); // LAT
        sgsm.print(",");
        sgsm.print(gps.location.lng(), 6); // LONG    delay(1000);
        sgsm.write(0x1A);
        delay(1000);
      }
    }
}

void PublishData(int temp, int hum, int gas, int pres, String lat, String lng)
{
  mqttconnect();
  String payload2 = "{\"d\":{\"temperature\":";
  payload2 += t;
  payload2 += ",""\"humidity\":";
  payload2 +=h;
  payload2 += ",""\"gasLevel\":";
  payload2 += gas;
  payload2 += ",""\"pressure\":";
  payload2 += pres;
  payload2 += ",""\"latitude\":";
  payload2 += lat;
  payload2 += ",""\"longitude\":";
  payload2 += lng;
  payload2 +="}}";
  Serial.print("Sending Payload: ");
  Serial.println(payload2);
  if (client.publish(publishTopic2, (char*) payload2.c_str()))
  {
    Serial.println("Published");
  }
  else
  {
    Serial.println("Not Published");
  }
}


void mqttconnect()
{
  if (!client.connected())
  {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token))
    {
      Serial.print(".");
      delay(500);
    }
  initManagedDevice();
  Serial.println();
  }
}
```

```
void wificonnect()
{
  Serial.println();
  Serial.print("Connecting to ");
  WiFi.begin("Wokwi-GUEST", "", 6);
  while (WiFi.status() != WL_CONNECTED)
  {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}
void initManagedDevice()
{
  if (client.subscribe(subscribetopic))
  {
    Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  }
  else
  {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 0; i < payloadLength; i++)
  {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }
  Serial.println("data: "+ data3);
  data3="";
}
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-10888-1659242378

Video Link:

hthttps://drive.google.com/file/d/1LNptB9XySCtI8OfOvjIVLLju2wZZI0rW/view?usp=drivesdk