Gas Leakage Monitoring

And

Alerting System for Industries

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***Team members:*** *Shriya.R(Team Leader), Swathy Santhosh, Akila.G, LavanyaDevi.K*

## Abstract:

The Internet of Things (IOT) is a network of devices, cars, and home appliances that have

the hardware, software, actuators, and networks necessary to communicate with each other,

function together, and exchange information. IOT entails expanding the Internet network

transcend standard hardware, such as workstations, workstations, mobilephones,and tablet,

to any type of often unintelligent or web-enabled physicalhardware and everyday objects.

These devices are loaded with innovation,allowingthem to communicate and connect via

the Internet, as well as be monitored andmanaged from a distance. The industries benefit

from this development's assistance in monitoring hazardous gas emissions.The gas sensors

will be incorporated to monitorthe gas leakage so that we can prevent the discharge of gas

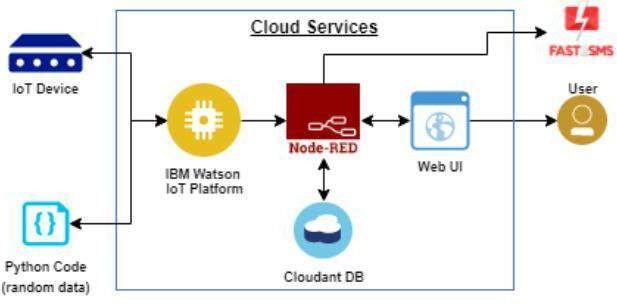
in various places. If a gas leakis discovered anywhere, the admins will get an alert with the

location now they can sensor it

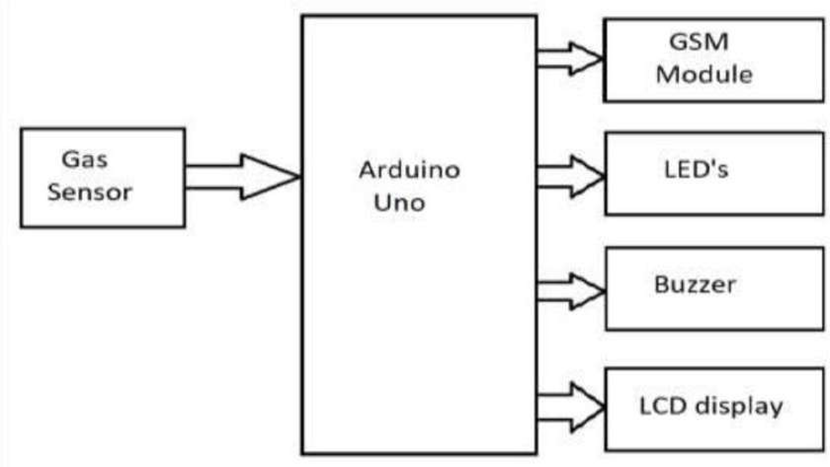
## Introduction:

An increasing trend of technological, social, and financial centrality is the Internet of Things. Customers' products, durable goods, automobiles, fashionable and utility components, sensors, and other common items are being combined with Internet availability and fantastic information system capabilities that promise to transform how we work, live, and play. Numerous aspects of how we live are expected to alter as a result of the widespread use of IoT devices. The "smart home," which effectively improves security and efficiency, is becoming a reality thanks to new IoT products including Information devices, home automation components, and executive gadgets. The Internet of Things (IoT) is a crucial matter in the designing, planning, and innovation industries. We are getting closer to "wonderful urban areas," which reduce overcrowding and resource use, thanks to IoT systems like coordinated transportation, intelligent traffic systems, and sensors installed in streets and buildings. By increasing the accessibility of data along the value chain of generation using positioned sensors, Internet of Things technology offers the potential to alter horticulture, industry, and the creation and distribution of energy.

## Block diagram: Technical Architecture:



**System Architecture:**

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## Literature Survey:

* Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System

with MQ-2 Sensor by Rohan Chandra Pandey, Manish Verma, Lumesh Kumar

Sahu in the year of 2017 and it was for the choice of using a real time gas leakage

monitoring and sensing the output levels of gas has been clearly observed by the

help of this system

* Gas Leakage Detection and Smart Alerting and Prediction Using IoT by Asmita

Varma,Prabhakar S, Kayalvizhi Jayavel in the year of 2017 and it was the

proposed gas leakage detector that is promising in the Field of safety.

* IOT Based Gas Leakage Detection System with Database Logging, Prediction

and Smart Alerting by Chaitali Bagwe, Vidya Ghadi, Vinayshri Naik, Neha

Kunte as a result of this the system provides constant monitoring and detection

of gas leakage along with storage of data in database for predictions and analysis.

The IOT components used help in making the system much more cost effective

in comparison with traditional Gas detector systems.

## Existing Problem:

A warning and controlling system-equipped sensor-based automatic gas leakage detector has been proposed. This equipment for detecting gas is competitively priced, uses less power, is lightweight, portable, safe, easy to use, effective, and has an uncomplicated system. Not only will gas leak detection be crucial for our health, but it will also help our economy grow because gas leaks not only contaminate the atmosphere but also waste gases, which is bad for business. Over the next few years, the industry is forecasted to be driven mainly by the necessity to guarantee worker safety.

## Reference:

* Anusha, Nagesh, Venkata Sai, Srikanth, Rupalin Nanda,.LPG Leakage Detection

and Alerting System with Customer SMS Alerts. International Journal for Modern

Trends in Science and Technology (IJMTST) ISSN: 2455-3778: Volume: 06, Issue

No: 05, May 2020.

* Title = Implementation of automatic gas accident prevention system using arduino, author=Chafekar, Zamir Khan, Mohd Husain,Lakra, Kuldeep Dhonde,SB, journal

International Journal of Computer Applications, volume=180, number= 47, pages

5–7, year=2018

* Title=LPG LEAKAGE DETECTION AND PREVENTION SYSTEM, author

Kadam, Swapnil More, Sumit Borkar, Prathamesh Gailwad, Ritesh Gadhire,

Prachi, year=2018

* Title=LPG Gas Leakage Detection and Alert System, author=Leavline, Jebamalar

Singh, Asir, Antony Gnana, Abinaya, Deepika, H, journal=International Journal

of Electronics Engineering Research, volume=9, number=7, pages=1095–1097,

year=2017.

* Huan Hui Yan, Yusnita Rahayu, Design and Development of Gas Leakage

Monitoring System using Arduino. Proceeding of International Conference on

Electrical Engineering, Computer Science and Informatics (EECSI 2014),

Yogyakarta, Indonesia, 20-21 August 2014.

* Premalatha, Aswini, Haritha, Ajitha,. A HOME SAFETY GAS LEAKAGE

DETECTION SYSTEM. International Journal of Advanced Research in

Science, Engineering and Technology. International Research Journal of

Engineering and Technology (IRJET) e-ISSN: 2395- 0056 Volume: 05

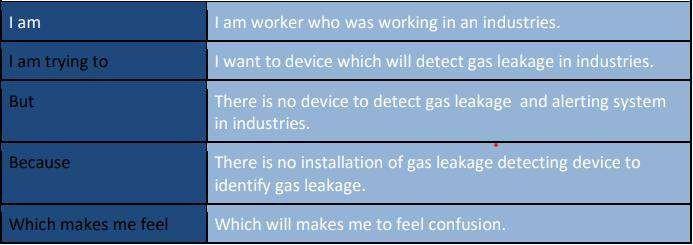
Issue: 03 — Mar-2018 [www.irjet.net](http://www.irjet.net/) p-ISSN: 2395-0072.

## Problem Statement:

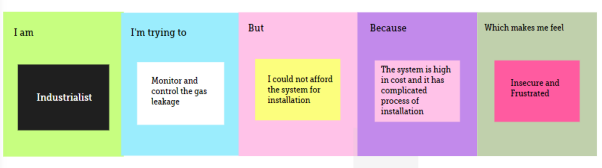
Equipment leakages might become harmful. A facility's periodic leak detection

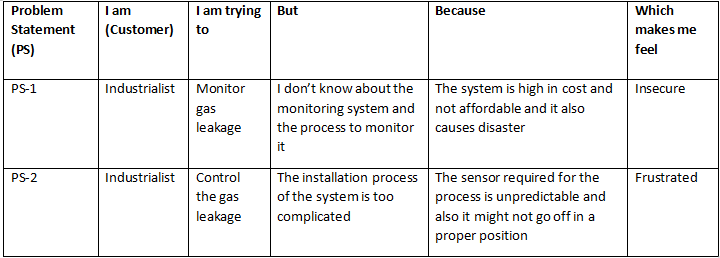
inspections can minimize unplanned incidents.By installing a gas leak detection

system, many unforeseen incidents can be avoided.



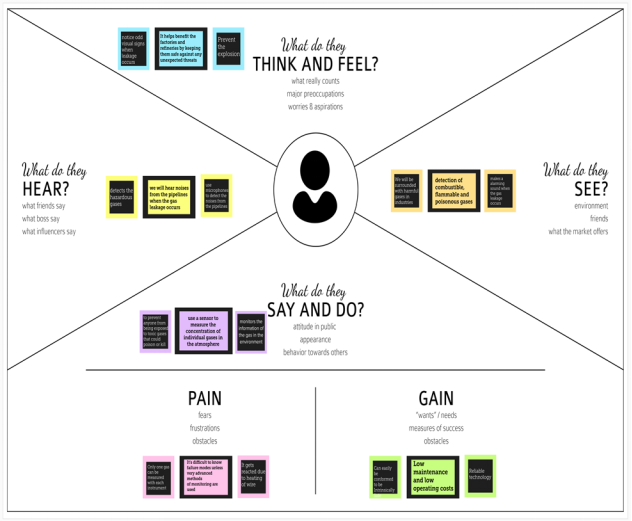
Example:



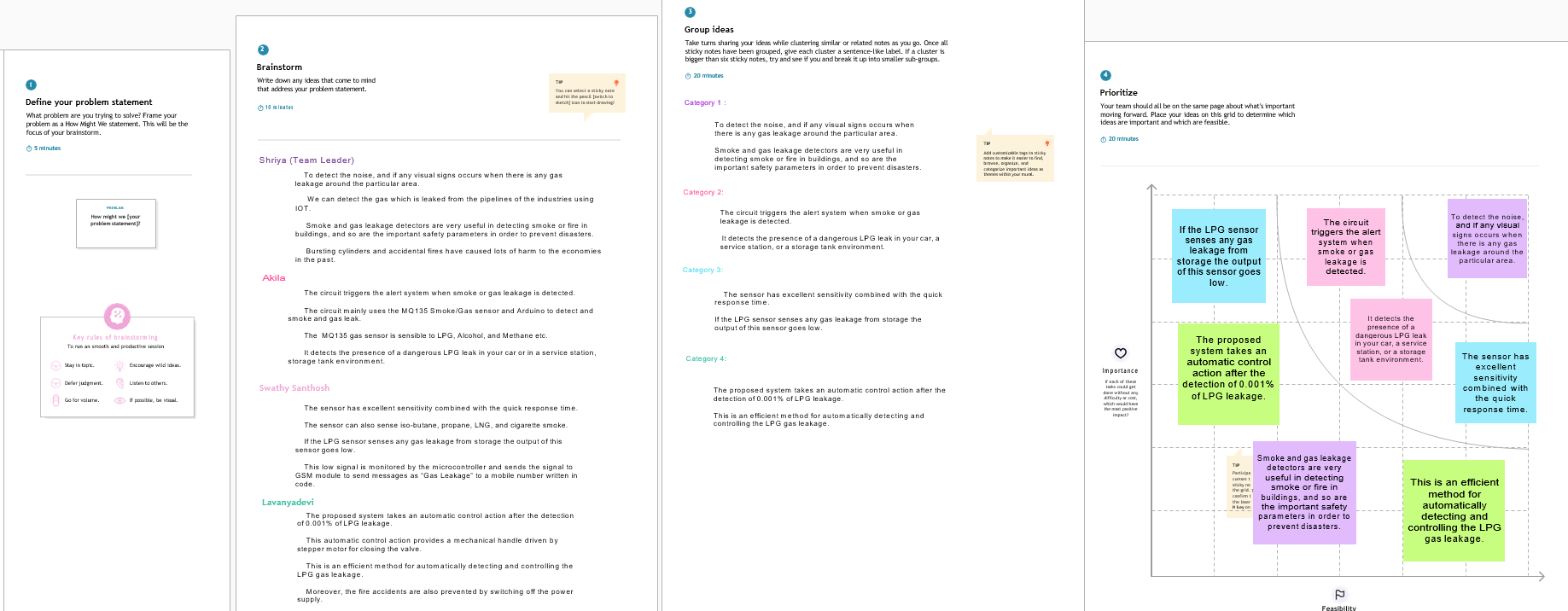


# Ideation and Proposed solution:

## Empathy map canvas:



**Ideation and Brainstorming:**

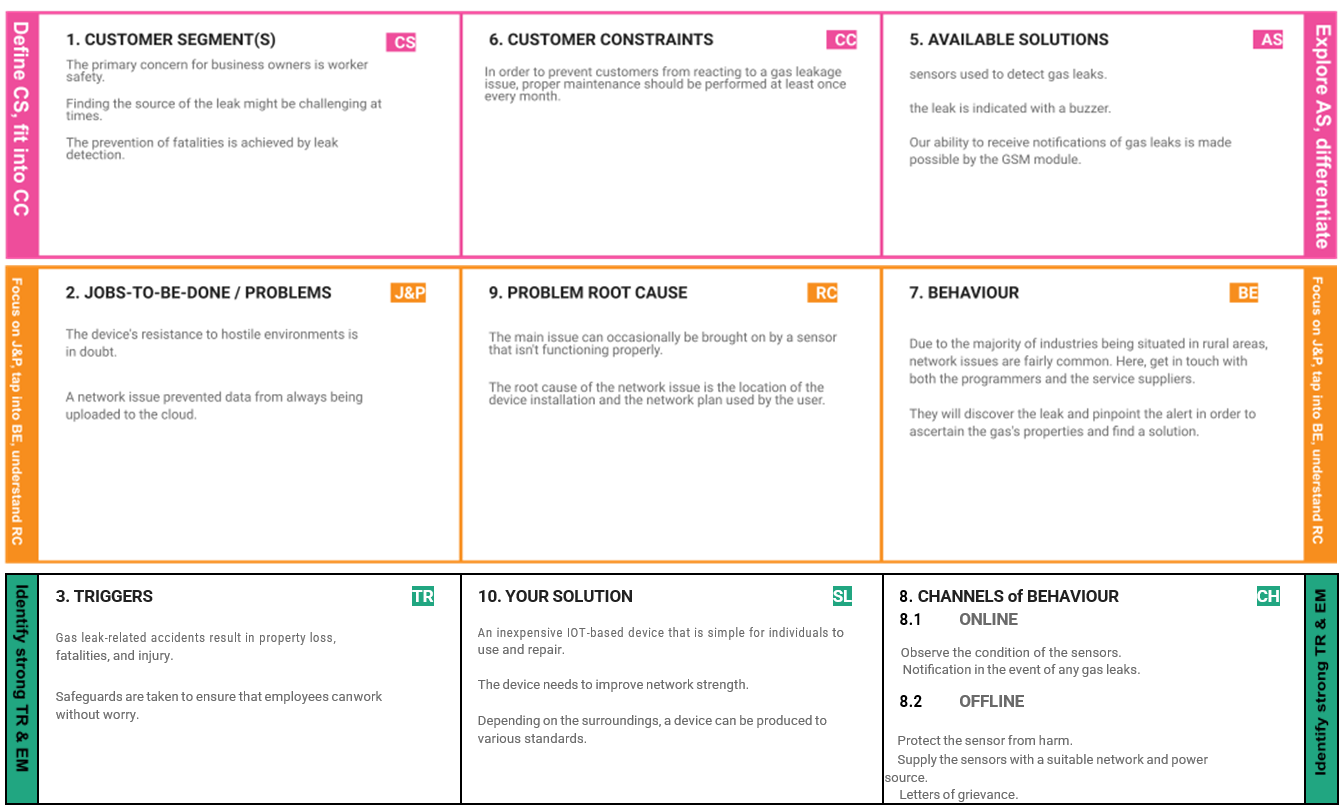
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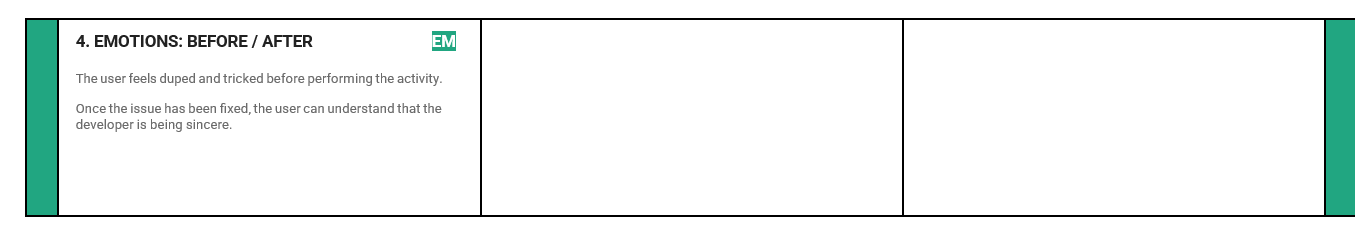
## Proposed Solution:

|  |  |  |
| --- | --- | --- |
| **S.no** | **Parameter** | **Description** |
| **1.** | Problem Statement (Problem to be solved) | Workers in busy businesses that use gas—whether it's harmful or not—need a mechanism to continuously check their gas pipelines.Find any gas leaks in their system as soon as possible.Environment that will allow them to work effectively on big disasters as opposed to being concerned with monitoring a gas leak, this will in fact lessen the human resources of the sector and foster a environment. |
| **2.** | Idea / Solution description | Workers in busy industries that use gas, either dangerous or innocuous, require a mechanism to continuously check their gas pipelines. Detecting any gas leaks in their systems as soon as possible so that they can operate productively rather than stressing about monitoring, significant crises or gas leakage, this will lower the build a tranquil environment by using the industry's personnel environment. |
| **3.** | Novelty / Uniqueness | Despite the number of rational individuals to this issue, none have been able to meet client demands. Some methods only detect certain gases, while others fail to notify the primary department, and yet others experience delays. Our system will inform the workers even if there is a little gas leak, notifying the industry person as well as the fire fighters so they can take care of the issue. |
| **4.** | Social Impact / Customer Satisfaction | For the staff and the community who surrounds or are affiliated with the industry, our solution will be highly beneficial. Our method will stop major catastrophes like the Bhopal Gas Tragedy, saving countless lives. The goal of this initiative is to relieve the workers' mental strain so they may relax or focus on other tasks  . |
| **5.** | Business Model (Revenue  Model) | Since industries are the primary audience for our solution, we have scheduled visits to inform them of the advantages of our products.In order for them to understand the significance |

|  |  |  |
| --- | --- | --- |
|  |  | of this solution and implement it. |
| **6.** | Scalability of the Solution | Because the solution we've provided will be the foundation or first stage of any improved version, it can be integrated for additional future use. |

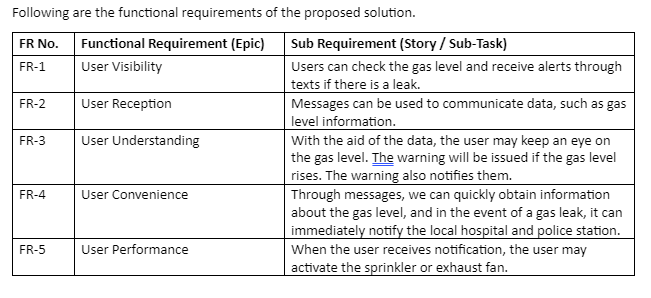
**Problem Solution fit:**

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# Requirement Analysis:

## Functional Requirement:

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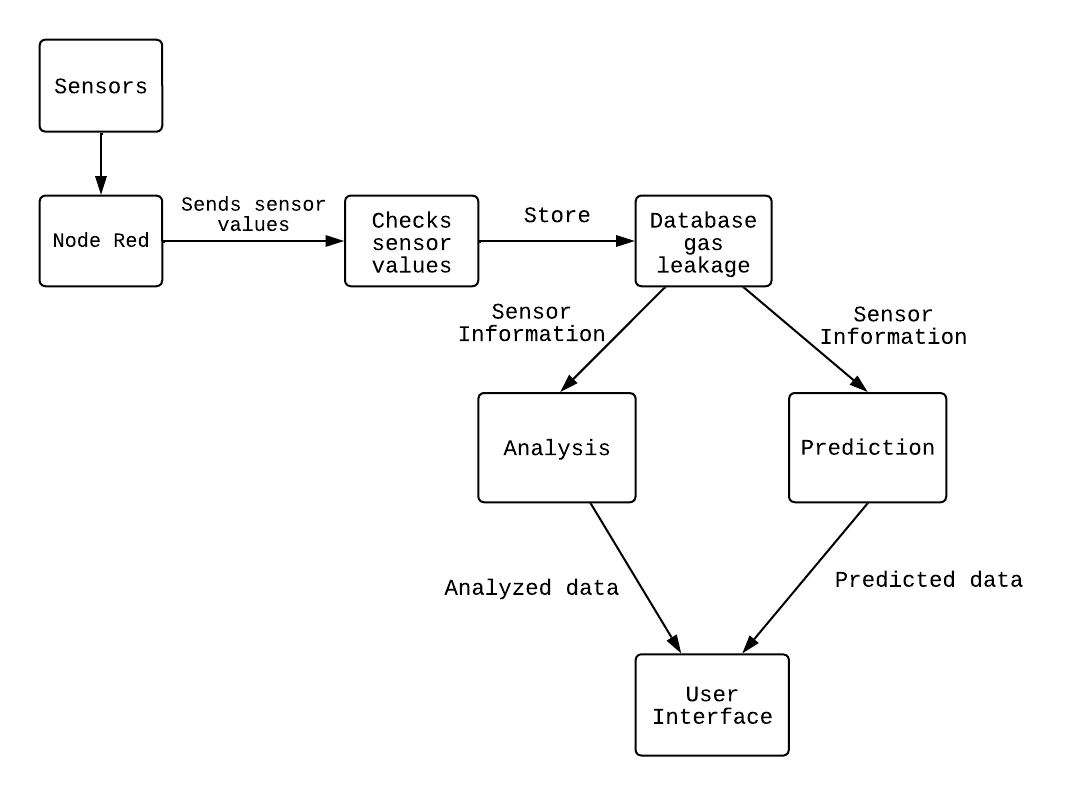
**Non-Functional Requirement:**

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | It safeguards the workers while also routinely updating the data. |
| NFR-2 | **Security** | Our ability to protect people and property is made possible by emergency alerts. |
| NFR-3 | **Reliability** | It can be in a position to give reliable values.  It may be capable of precisely identifying the smoke and does not provide a misleading reading. |
| NFR-4 | **Performance** | When there is a crisis, sprinklers and exhaust fans are deployed. |
| NFR-5 | **Availability** | It contains both the day and the night, so it can be used every day. |

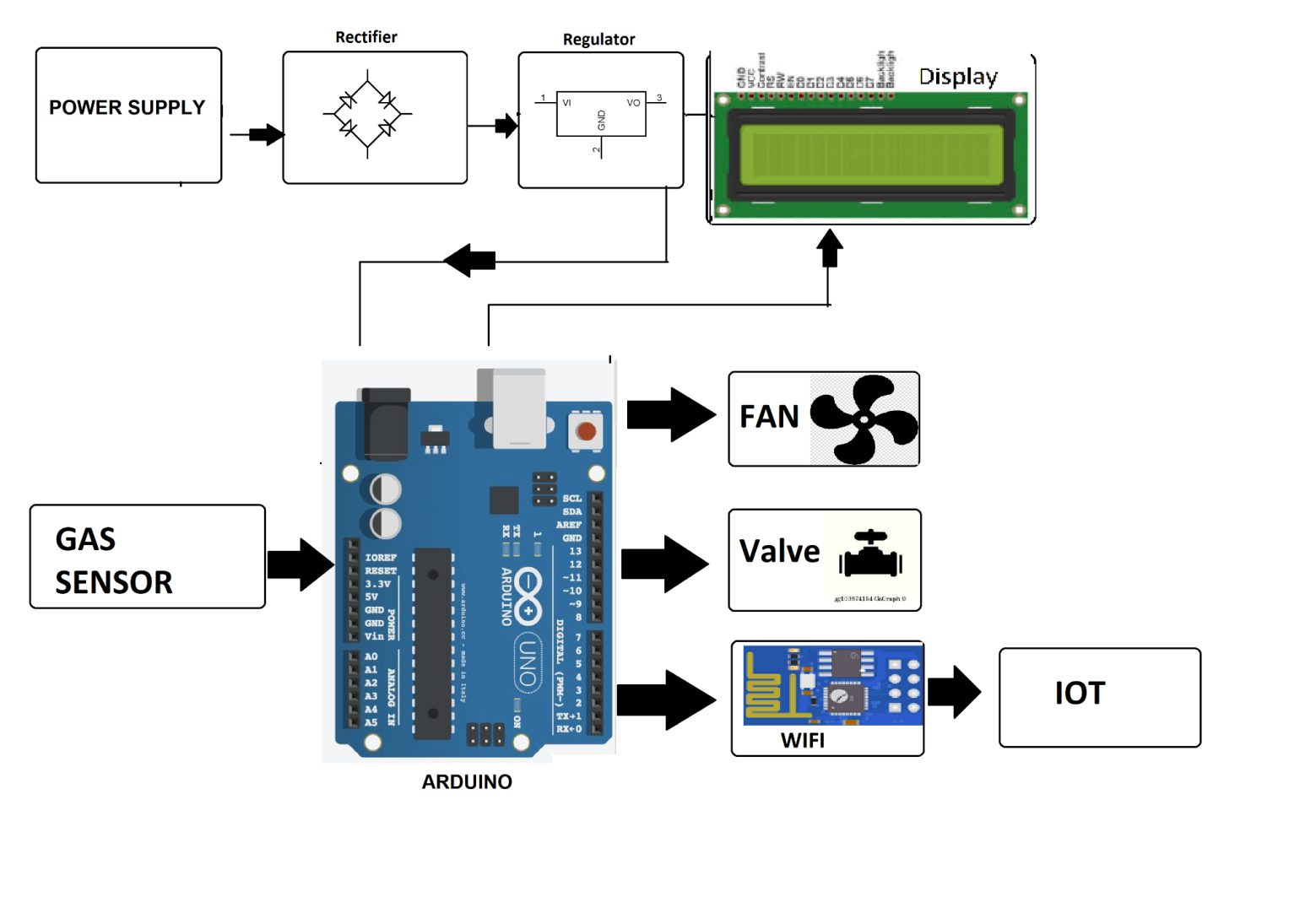
|  |  |  |
| --- | --- | --- |
|  |  |  |
| NFR-6 | **Scalability** | Every time the sensor malfunctions, another one can be installed |

# Project Design:

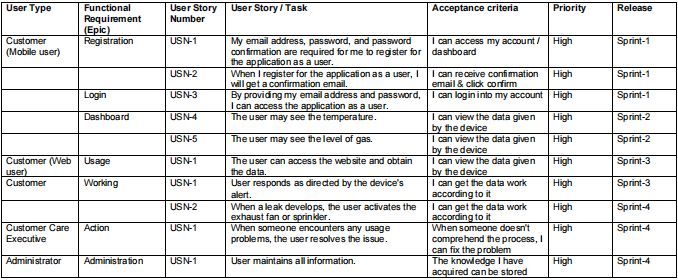
## Data flow Diagram:



**Technical Architecture:**

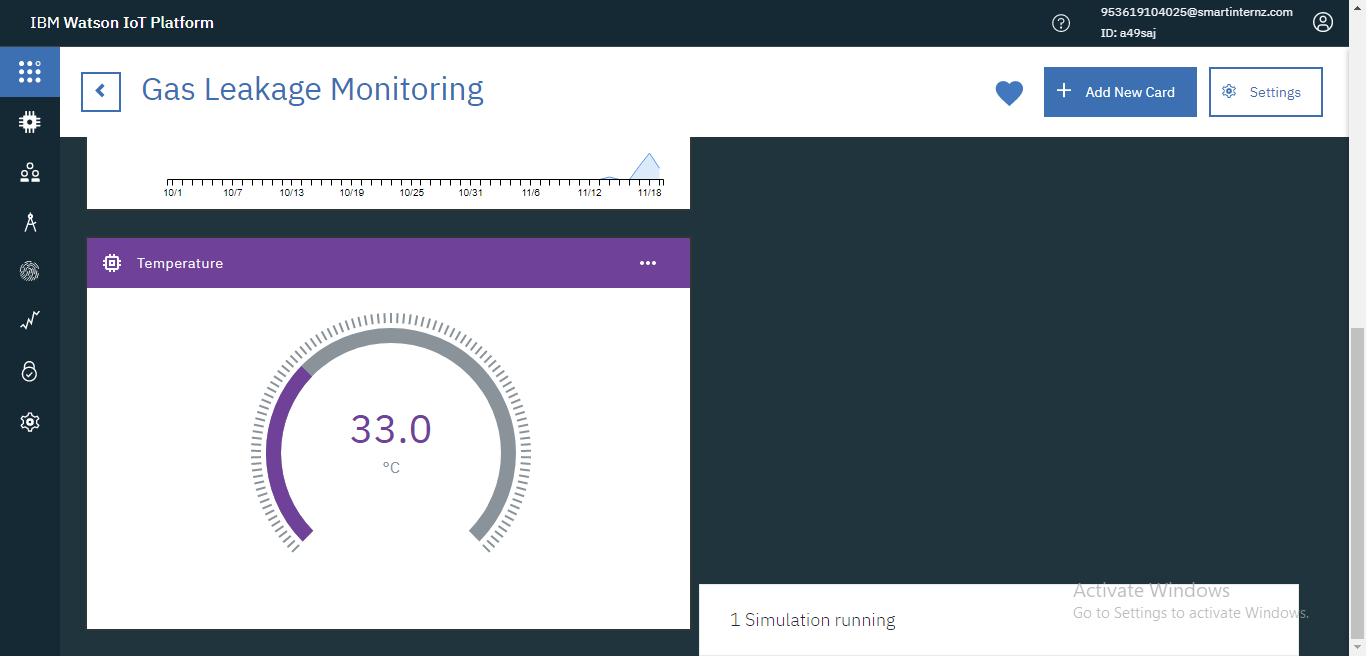
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## User Stories:

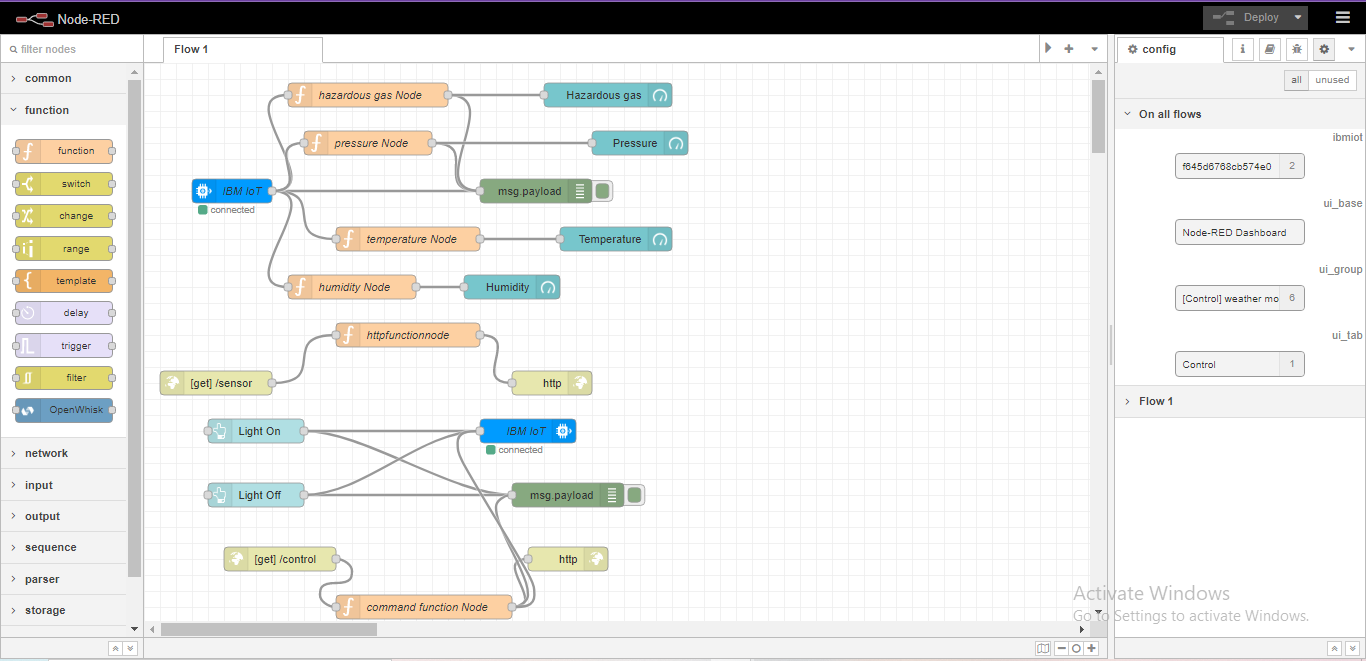
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**Project planning and Scheduling:**

Step 1: Creating IBM Watson and Node red.

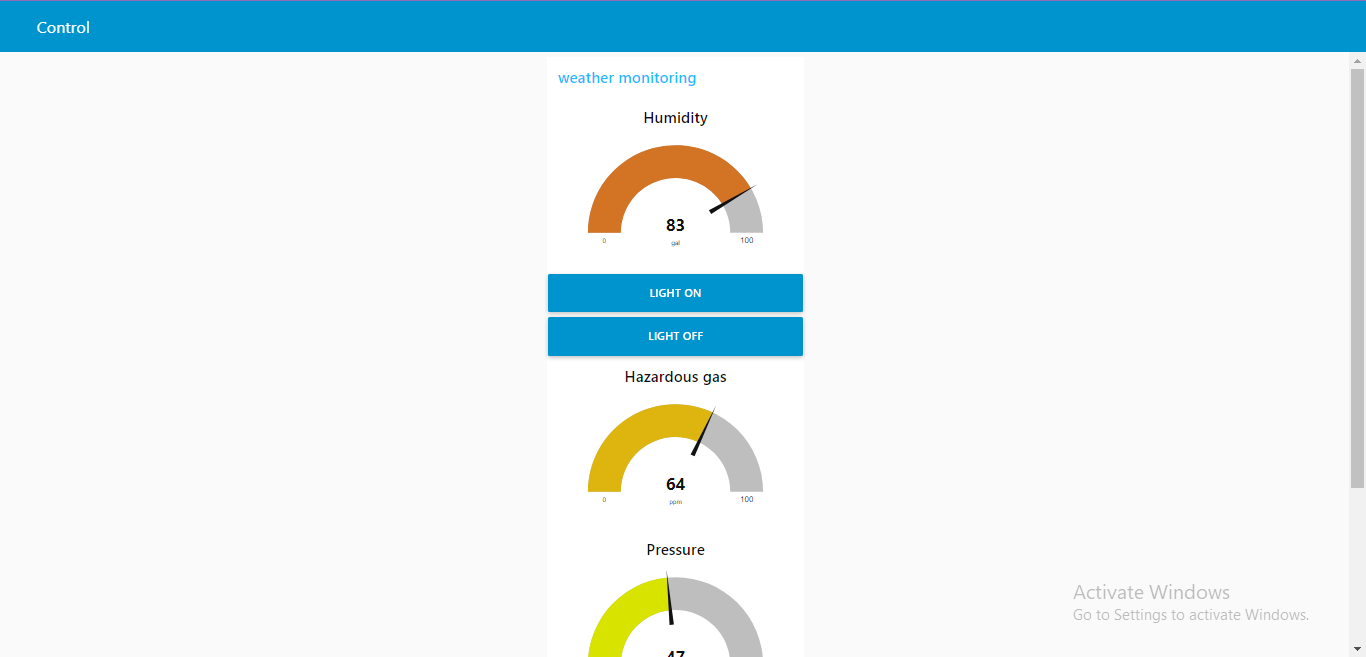


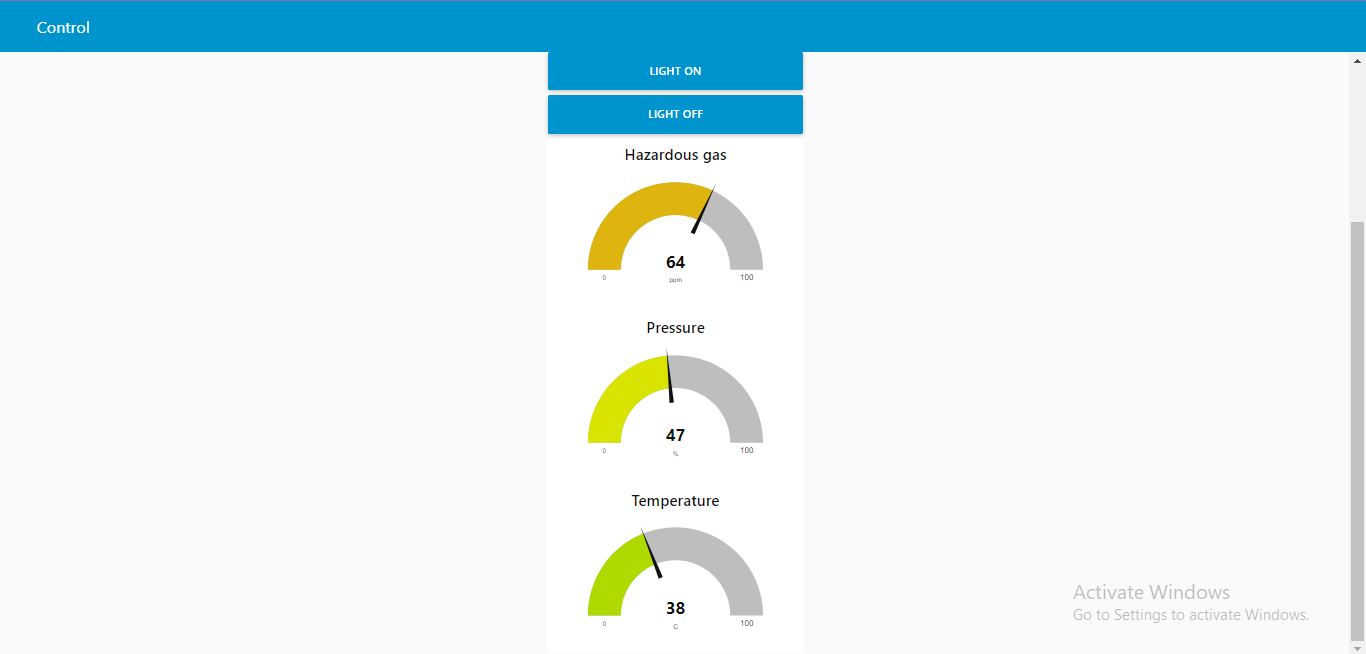
Step 2: Connecting the flow with IBM modules with node red package.



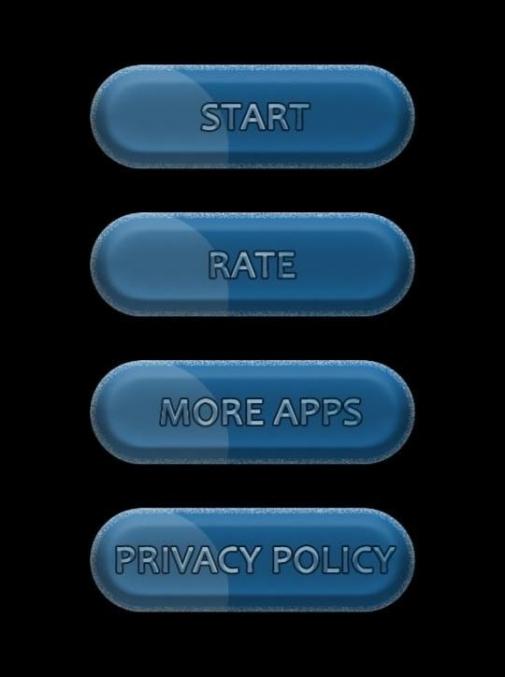
Step 3:

By using Python we have connecting with Ibm aunthenication keys.



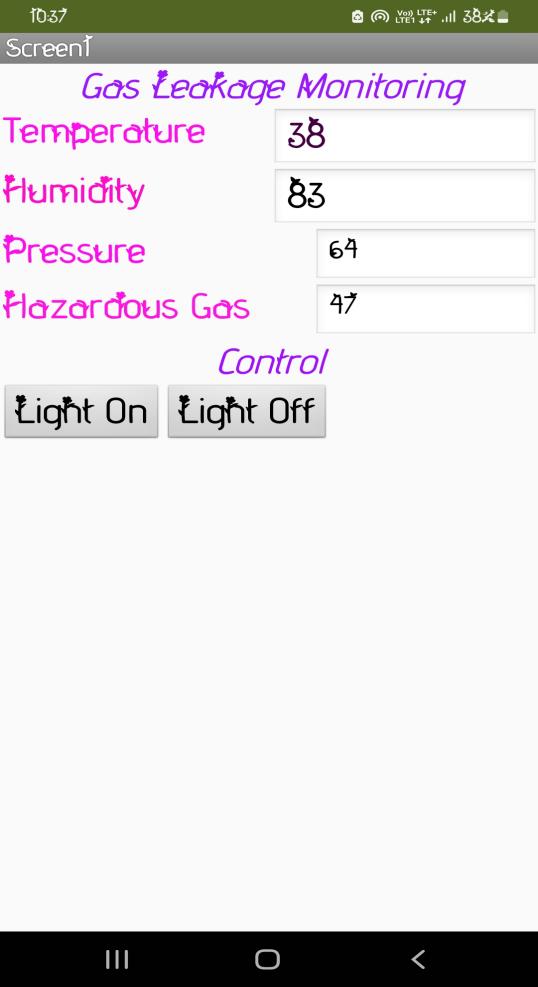


Step 4: Using fast2SMS it will notification to our mobile.



Step 5: Using MIT inventor app, user interface is created.





**Coding and Solution:**

**TINKERCARD CODE:**

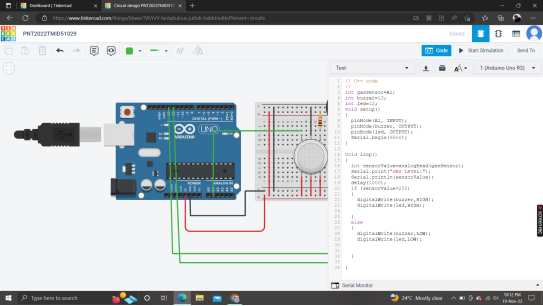
int gasSensor=A1;  
 int buzzer=13;  
 int led=12;  
 void setup()  
 {  
  pinMode(A1, INPUT);  
  pinMode(buzzer, OUTPUT);  
  pinMode(led, OUTPUT);  
  Serial.begin(9600);  
 }  
  
 void loop()  
 {  
  int sensorValue=analogRead(gasSensor);  
  Serial.print("GAS LEVEL:");  
  Serial.println(sensorValue);  
  delay(1000);  
  if (sensorValue>250)  
  {  
    digitalWrite(buzzer,HIGH);  
    digitalWrite(led,HIGH);  
  
  }  
  else  
  {  
    digitalWrite(buzzer,LOW);  
    digitalWrite(led,LOW);  
 }  
  }

**PYTHON CODE:**

import time  
import sys  
import ibmiotf.application  
import ibmiotf.device  
import random  
  
  
#Provide your IBM Watson Device Credentials  
organization = "a49saj"  
deviceType = "weather\_device"  
deviceId = "weather\_device\_1"  
authMethod = "token"  
authToken = "T?GTpUXf2q7+MrvYil"  
  
# Initialize GPIO  
  
  
def myCommandCallback(cmd):  
    print("Command received: %s" % cmd.data['command'])  
    status=cmd.data['command']  
    if status=="lighton":  
        print ("led is on")  
    else :  
        print ("led is off")  
     
    #print(cmd)  
     
         
  
  
try:  
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}  
deviceCli = ibmiotf.device.Client(deviceOptions)  
#..............................................  
  
except Exception as e:  
print("Caught exception connecting device: %s" % str(e))  
sys.exit()  
  
# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times  
deviceCli.connect()  
  
while True:  
        #Get Sensor Data from DHT11  
         
        temp=random.randint(0,100)  
        Humid=random.randint(0,100)  
        hazard=random.randint(0,100)  
        pres=random.randint(0,100)  
         
        data = { 'temp' : temp, 'Humid': Humid, 'hazard' : hazard, 'pres' : pres }  
        #print data  
        def myOnPublishCallback():  
            print ("Published Temperature = %s C" % temp, "Humidity = %s gal" % Humid, "Hazardous Gas = %s ppm" % hazard, "Pressure = %s %%" % pres, "to IBM Watson")  
  
        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on\_publish=myOnPublishCallback)  
        if not success:  
            print("Not connected to IoTF")  
        time.sleep(1)  
         
        deviceCli.commandCallback = myCommandCallback  
  
# Disconnect the device and application from the cloud  
deviceCli.disconnect()

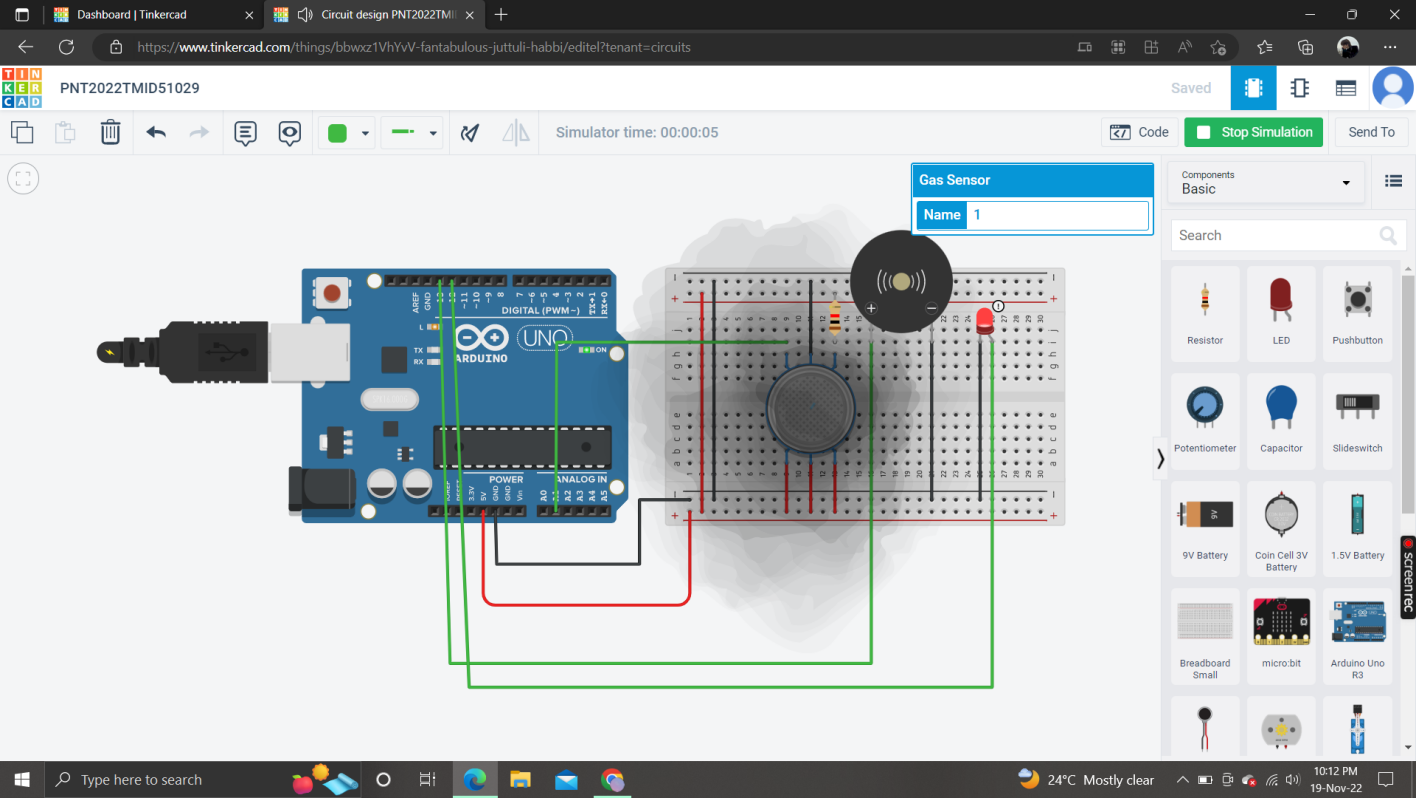
## Testing:

**Test case 1:**

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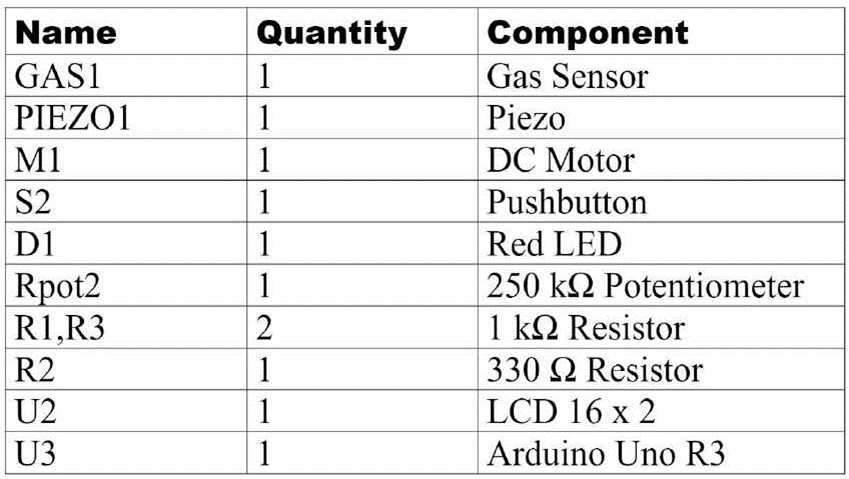
Industries at normal temperature, it is not alerted.

## Test case 2:

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Due to gas leakage in industries, this circuit model is alerting the worker through their mobile phone. It will be monitored and rectified by workers in industries.

# List of component



## Arduino UNO R3:

One type of ATmega328P-based microcontroller board is the ArduinoUno R3.It comes

with everything needed to operate the microcontroller; all you need to do is use a USB

cable to connect it to a computer and also provide power using an AC-DC adapter or a

rechargeable to get things going. The word "Uno" was chosen to signify the launch of

the Arduino IDE 1.0 software. "Uno" is Italian for "one." The third and most latest

version of the Arduino Uno is called the R3. The reference versions of the Arduino

board and IDE software are currently being updated.

## Breadboard:

A breadboard is a common tool for circuit design and testing. Using a bread board reduces

the need for soldering wires and components together to form a circuit.Component installation

and reuse are simpler. Components are not soldered together, allowing for straightforward

circuit design changes at any time.

## LED:

An optoelectronic LED (Light Emitting Diode) operates on the electro-luminance principle. The ability of a substance to transform electrical energy into light energy and then emit that light energy is known as electro-luminance. The semiconductor in an LED operates similarly, emitting light when an electric field is present

## Resistor:

A passive electrical device that has two terminals and is utilized in electrical circuits to limit or

manage the flow of current.

## Gas Sensor:

A device that detects the existence or intensity of gases in the environment is called a gas sensor.

By altering the resistance of the substance inside the sensor, the sensor generates a proportional

potential difference based on the gas concentration, which may be recorded as output voltage.

The type and concentration of something like the gas can be inferred from this voltage value.

## LCD 16\*2:

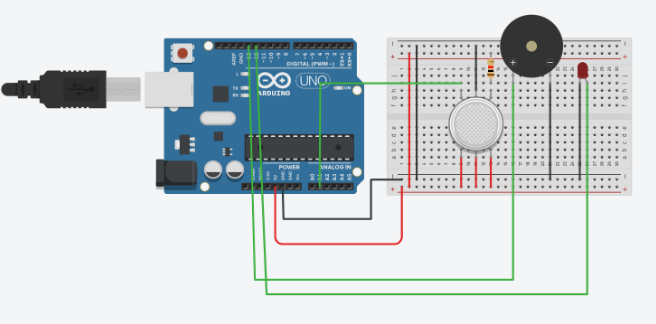
One type of electronic gadget used to display the information and data is a 162 LCD. Liquid

Crystal Display is indeed the term's full name. Since it has 16 Columns and 2 Rows, the display

is known as a 162 LCD. It can display a total of (16 + 2) 32 characters, each of which is

composed of 5 x 8 pixels.

# Circuit Diagram:



**Advantage and Disadvantage:**

## Advantage:

* This project is useful for finding gas leakage in industrial settings.
* Equipment and Components are more functional.
* Low power consumption and dependability.
* Can also be used for LPG gas leakage in the household.

## Disadvantage:

* Since numerous locations have gas cylinders, the exact location of the leak cannot be

determined.

* Temperature and relative humidity both affect how sensitive it is.
* This won't function and run without the internet.
* Installation is challenging.

# Conclusion:

We can infer from the project's performance that the system's detection of LPG gas

leakage is remarkable.Useful for both residential and commercial purposes.We can

use this technique to save lives in dangerous situations. The GSM module indicates

an alert.Propane, CO2, and other gases are detected by a sensor node. Power usage

and transmission range estimates are made. The sensor was constructed using

straightforward techniques and an Arduino UNO Microcontroller.

**Appendix:**

// C++ code  
 //  
 int gasSensor=A1;  
 int buzzer=13;  
 int led=12;  
 void setup()  
 {  
  pinMode(A1, INPUT);  
  pinMode(buzzer, OUTPUT);  
  pinMode(led, OUTPUT);  
  Serial.begin(9600);  
 }  
  
 void loop()  
 {  
  int sensorValue=analogRead(gasSensor);  
  Serial.print("GAS LEVEL:");  
  Serial.println(sensorValue);  
  delay(1000);  
  if (sensorValue>250)  
  {  
    digitalWrite(buzzer,HIGH);  
    digitalWrite(led,HIGH);  
  
  }  
  else  
  {  
    digitalWrite(buzzer,LOW);  
    digitalWrite(led,LOW);  
 }  
  }

**Github Link:** https://github.com/IBM-EPBL/IBM-Project-17296-1659633652